

A REVISION OF THE GENUS *CRATOXYLUM* BL. (GUTTIFERAE)

A. J. F. GOGELIN

SUMMARY

A complete revision is given of the Indo-Malesian genus *Cratoxylum*. The subdivision of the genus into 3 sections, as given by Engler (1925) and Corner (1939), has been found correct. The characters by which these sections are discriminated concern the interpetiolar scars on the twig, the type of venation, the occurrence of petal-scales and their shape and size, the shape of the hypogynous scales alternating with the three staminal phalanges, and whether the seeds are surrounded by a wing or are winged on one side only.

Each section contains two species.

A concise review has been given about the history of the genus, an account of the uses made of it, and the ecology. It appears that almost all species can act as pioneers for which they are fully qualified by their euredaphic requirements and early and abundant seed production. Though some species, notably *C. arborescens* and *C. glaucum*, are evergreen, and *C. formosum* is deciduous, the others are not specifically one or the other way round; in *C. maingayi* Corner noted that sometimes particular branches shed their leaf. There is no major correlation between leaf-shedding species and seasonal climate regime.

A brief summary is given on the morphology, in particular the structure of the inflorescence. Two points have not become entirely clarified, for example, whether all species are always heterodistylous: this should be studied further in the field. Another point is the want of more exact data on the degree in which the ovary is incompletely celled which seems to differ from one species to another, and to compare this with the ovary of the allied Madagascan genus *Eliaea* (*vide infra*).

C. glaucum excepted all species show a distinct variability. In three species this is grading and no infra-specific taxa can be distinguished in a key on the basis of herbarium material. Within Malesia the variability is more or less of a geographical character and could be classified under clinal variation. This is also the case in *C. sumatranum* and *C. formosum*, within which I can distinguish, however, three and two infra-specific taxa respectively, which accordingly have been given racial rank, that is, as subspecies. Within each a still finer distinction might be feasible of subsubraces which mostly coincide with separate islands of Malesia.

The closest related genus is the monospecific genus *Eliaea* Camb. from Madagascar with which it forms a tribe of the *Guttiferae*. With regard to the exact structure of the ovary claimed to be distinct from that of *Cratoxylum* a close comparative-morphological study should be made of the ontogeny of the ovary in *Eliaea* and all species of *Cratoxylum*.

Except from taxa described by Loureiro, Jack, and Blanco, of whose names no types seem to exist, I have for the first time examined type material of all names and checked their detail floral characters which were often not mentioned in the original diagnoses.

A listed account of all numbered material on which this study was based will be published in a separate 'Identification List'.

INTRODUCTION

Although Corner had given a discussion (1939) of some names of taxa described in *Cratoxylum* and preliminary to their evaluation, in particular of the Malayan species in conjunction with his 'Wayside Trees of Malaya', he limited his research to the material in the Singapore Herbarium and his conclusions, though valuable, were for the greater part tentative and his observations in Malayan forests restricted. Obviously unaware of Gagnepain's (1909) and Engler's (1925) subdivisions of the genus, he reached independently the same conclusion which is here also maintained. He did not evaluate the continental Asiatic names and also refrained from giving an identification key.

In the present paper I have tried to place all names, to find additional differentiating characters and check some disputed ones of predecessors, to cover the literature, to examine as many type specimens as could be obtained, and to study as many specimens as could be borrowed.

The result is that in my opinion many names should be suppressed, no novelties are proposed, and only 6 species and 3 subspecies are recognized in the entire genus.

I had the privilege to study borrowed material of the following Herbaria for which I express my gratitude to the Directors, Keepers and Curators:

- A — Arnold Arboretum, Cambridge, Mass., U. S. A.
 BM — British Museum (Nat. Hist.), London, U. K.
 C — Botanical Museum and Herbarium, Copenhagen, Denmark.
 CAL — Indian Botanic Gardens, Howrah, Calcutta, India.
 CGE — Botany School, University of Cambridge, U. K.
 E — The Royal Botanic Garden, Edinburgh, U. K.
 FI — Herbarium Universitatis Florentinae, Florence, Italy.
 KEP — Forest Research Institute, Kepong, Malaya.
 KW — Botanical Institute of the Academy of Sciences, Kiev, U. S. S. R.
 L — Rijksherbarium, Leyden, Netherlands.
 LD — Botanical Museum and Herbarium, Lund, Sweden.
 MICH — University Herbarium, Michigan, Ann Arbor, Mich., U. S. A.
 P — Muséum National d'Histoire Naturelle, Paris, France.
 SING — Herbarium of the Botanic Gardens, Singapore, Malaya.
 U — Botanisch Museum and Herbarium, Utrecht, Netherlands.
 US — National Museum, Smithsonian Institution, Washington, D.C., U. S. A.
 W — Naturhistorisches Museum, Vienna, Austria.

During the early part of the work I obtained valuable advice from Mr. J. H. Kern. I have also to thank Prof. Dr. C. G. G. J. van Steenis for supervising this work and polishing the final version.

The specimens on which this study is based will be enumerated in a separate 'Identification List'.

CRATOXYLUM

Blume, Verh. Bat. Gen. 9 (1823) 174; Bijdr. Fl. Ned. Ind. (1825) 144; Korth., Verh. Nat. Gesch. Bot. (1842) 175; Blume, Mus. Bot. Lugd. Bat. 2 (1852) 15; Miq., Fl. Ind. Bat. 1, 2 (1859) 515; Benth. & Hook., Gen. Pl. 1 (1862) 166; Dyer in Hook. f., Fl. Br. Ind. 1 (1874) 257; Kurz, For. Fl. Br. Burma 1 (1877) 83; Koord. & Val., Bijdr. Booms. Java 5 (1900) 131; Gagn., Not. Syst. 1 (1909) 14; Ridl., Fl. Mal. Pen. 1 (1922) 152; Engl. in E. & P., Nat. Pfl. Fam. ed. 2, 21 (1925) 183; Corner, Gard. Bull. Str. Settl. 10 (1939) 21; Wayside Trees 1 (1940) 325; Kimura in Nakai & Honda, Nov. Fl. Jap. 10 (1951) 16; Backer & Bakh. f., Fl. Java 1 (1963) 283. — *Hornschuchia* Blume, Cat. Gew. Btzg (1823) 15, non Nees 1821. — Typus: *Hornschuchia hypericina* Blume.

Elodes Jack, Mal. Miscell. 2 (1822) 21 ('*Elodea*'), non *Elodes* Adanson 1763, nec *Elodea* Juss. 1789; Hance in Hook., Lond. J. Bot. 7 (1848) 472; Griff., Notul. 4 (1854) 569; Merr., J. Arn. Arb. 33 (1952) 223.

Hypericum sect. *Tridesmos* Choisy in DC., Prod. 1 (1824) 546. — *Tridesmis* Spach, Suit. Buff. 5 (1836) 358, non Lour. 1790 *quae est Croton* (*Euph.*) cf. Merr., Comm. Lour. (1935) 235; Ann. Sc. Nat. II, 5 (1836) 351; Korth., Verh. Nat. Gesch. Bot. (1842) 175; Blume, Mus. Bot. Lugd. Bat. 2 (1852) 18; Miq., Fl. Ind. Bat. 1, 2 (1859) 516. — Lectotypus: *Hypericum biflorum* (non Lamk) Choisy = *Tridesmis ochroides* Spach.

Ancistrolobus Spach., Suit. Buff. 5 (1836) 360; Ann. Sc. Nat. II, 5 (1836) 352; non Griff., Notul. 4 (1854) 568. — Typus: *Ancistrolobus ligustrinus* Spach.

Deciduous to evergreen trees or shrubs; nodes on twigs somewhat flattened, mostly with linear, interpetiolar scars forming either a straight continuous line or curved upward (closed) or an interrupted line and descending; 1 or 2 serial, axillary to supra-axillary

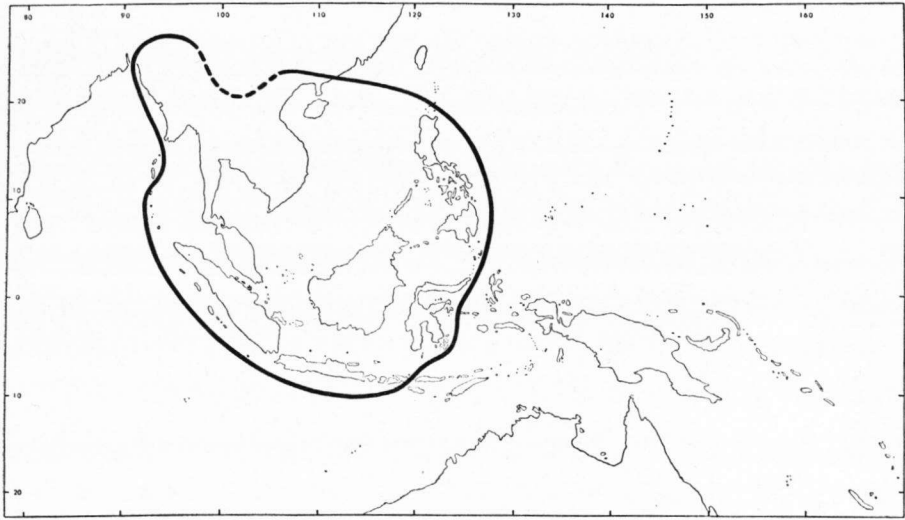


Fig. 1. Range of *Cratoxylum* Bl. (Hongkong omitted; cf. fig. 4 left).

buds sometimes indistinct; all parts glabrous except in *C. pruniflorum*. Bark of the stem-base (at least in *C. formosum*) exuding a yellow resinous sap, hardening black. *Leaves* sessile to petioled, base subcordate to attenuate, apex rounded to cuspidate, underneath often pruinose and waxy, often finely pellucid-punctate between the nerves; venation closed (either submarginal or arched) or open. *Inflorescences* from rather large, leafy, terminal panicles with reduced leaves to axillary, sometimes only pauciflorous racemes or short cymes in or below the lowest leaf axils. Bracteoles minute, soon caducous. *Flowers* heterodistylous in sect. *Tridesmos* and in *C. cochinchinensis*. *Calyx* 5-merous, persistent, sepals \pm unequal, all coriaceous, mostly accrescent. *Corolla* 5-merous, alternisepalous, choripetalous, caducous to subsistent; petals obovate, exceeding the sepals, up to c. $1\frac{1}{2}$ cm, often less, deep crimson to pink or white (orange and green sometimes noted), often with punctiform or linear resinous glands in the parenchymy between the dichotomous veins, whether or not provided with a more or less adnate petal-scale. *Staminal phalanges* 3, stalked, \pm unequal; anthers subsistent, dorsifix, introrse, mostly opening in bud then reclining, sometimes with a brown, resinous dot or knob on the connective. *Hypogynous scales* 3, alternating with the phalanges, either distinct or minute and obscure, fleshy, whether or not recurved to cucullate. *Pistil* of 3 carpels; ovary 3-celled, ovoid to ellipsoid; styles free, often divergent; stigmas punctiform, truncate or somewhat thickened, slightly papillose, ovules ∞ , anatropous, attached on the basal half of axial placentas. *Capsule* hard, ellipsoid to slender oblongoid, at apex rounded or acute, loculicidally dehiscent, the columella-like placenta in the base of the capsule persistent and becoming woody; septa attached to the columella, higher up free but the thickened margins touching; valves and septa often detaching together. *Seeds* either oblong and winged all round or oblong to obovate and winged unilaterally; embryo erect, oblong.

Distribution: In all 6 species. South of about 24° N in continental Asia and Malesia; in India only in the extreme eastern part beyond c. 92° E in Assam (S. Lushai hills), Burma, S. China, Hongkong, Hainan, Indo-China, Siam, Andaman Is., in Malesia: Sumatra, Malaya, Java, Lesser Sunda Islands, Borneo, Celebes and the Philippines. Fig. 1.

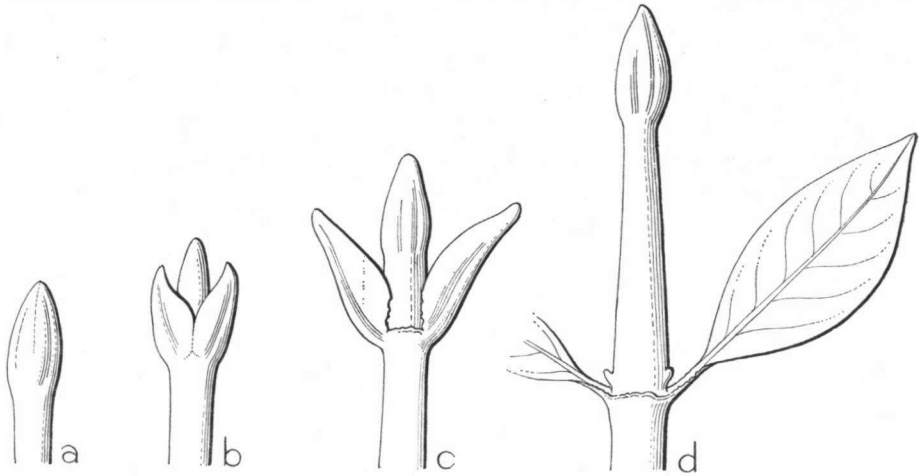


Fig. 2. Scheme of development of terminal bud in *Cratoxylum*, showing origin of interpetiolar scar; in this case the latter is 'continuous'.

Ecology: The localities show different ecological edaphic characters: from podsolized sandgrounds, granitic sand, or sandy loam, clay or limestone to rich forest ground and peat swamps, and different vegetation types; from dense primary or secondary forests to open forests, savannahs or grassland. The altitude varies from sea-level up to about 1000 (—1800) m. Flowering starts even when the plant is very small.

Several species are capable to act as pioneers in secondary vegetation, often on poor soils. They are very indifferent to soil types, can produce fruit and abundant seed at an early stage and in all months of the year, and germination is light-tolerant.

Morphology: Some taxa of this genus show on the nodes of the twigs an interpetiolar scar. In bud the two opposite leaves are fused together and are also whether or not continuously fused with the axis. By subsequent growth of the blades and petioles the blade margins separate from the axis and a scar is left as a fine line from the petiole-base, which is either continuous and slightly curved upward (in sect. *Isopterygium* and mostly in sect. *Cratoxylum*) or not continuous (in sect. *Tridesmos* and sometimes in sect. *Cratoxylum*). See fig. 2, 3, 5c, and 7c.

The two extremes of inflorescence are: large panicles, flowering simultaneously with the outcoming leaves, red flowers with either minute or cucullate, well developed hypogynous scales (sect. *Isopterygium*), or axillary peduncles at the lower nodes of the axils, flowering before the outcoming leaves, with pink to white flowers with linguiform hypogynous scales (sect. *Tridesmos*). Several intermediates in degree of branching of the panicle and flower colour occur in different taxa. Compare fig. 5a and 7a.

The arrangement of the filaments is largely dorsal on the phalange-stalk, the dorsal filaments are shorter and thinner than the terminal ones, but in many taxa they are becoming slender after flowering so that the width is less different. See fig. 5g and 7 g,h.

The hypogynous scales are whether or not developed; this can already be observed in bud. This development appears as a rather variable character, however some regional races may show some constancy. Compare fig. 5i, j and 7g, i.

Heterodistylism occurs regularly in sect. *Tridesmos* and in *C. cochinchinensis*; it is difficult to ascertain in the herbarium whether this is a general feature of the entire genus occurring at least occasionally. See fig. 5g, h.

Taxonomy: Originally botanists described several species under *Hypericum* affiliating them to the fruticose ones (e.g. *H. olympicum* L. and *H. petiolatum* L.), for instance Retzius 1789, Loureiro 1790, Vahl 1791, Lamarck 1797, and Blanco 1837. Choisy 1824 arranged several of these in a separate section *Tridesmos* within *Hypericum*, which Hooker & Arnott 1833 later suggested to represent a distinct genus. Jack 1822 described two species under *Elodes* Adans., using the etymological variant *Elodea*. Though Adanson (Fam. Pl. 2, 1763, 444) based his concept obviously on the 9th species mentioned by Linnaeus 1753, that is *Hypericum aegypticum*, a suffruticose species, Jack emended the generic concept, mentioning that it was taken up by an American author (probably Pursch), and used it in the sense of what is now *Cratoxylum*. In 1823 Blume described it as a separate genus *Hornschuchia*, a name he changed into *Cratoxylum* in the same year because of homonymy.

Spach 1836 distinguished the genera *Ancistrolobus*, *Tridesmis* and *Cratoxylum* (together with the Madagascan genus *Eliaea*) in one suprageneric taxon (? tribe) *Tridesmineae*.

The first complete list of species, known up to then, Blume gave in 1852 comprising 15 species in two genera: *Cratoxylum* and *Tridesmis*. Bentham & Hooker 1862 and Dyer 1874 combined these into one genus *Cratoxylum*, the latter dividing it into two sections based on the former generic concepts.

Difficulties in subdividing *Cratoxylum* depend on the appreciation given to certain characters. Part of the difficulty was that some species, notably *C. arborescens* and *C. glaucum*, were said to lack petal-scales, caused by the fact that they are of minute size; they were first observed by King in the said species (1890). I could verify that they occur also in the type specimens of both *C. arborescens* and *C. glaucum*.

The first satisfactory modern subdivision of the genus in three sections was given in 1925 by Engler following the observation by Gagnepain in 1909, and quite independently from these two authors later by Corner in 1939.

The main characters used in the definition of the sections are: type of venation (fig. 3a, 5b, and 7b), presence or absence and size of petal-scales (fig. 3e, 5e, f, and 7e, f), shape of hypogynous scales (fig. 5g, i, j and 7g, i), and structure of seed (fig. 5l, m, n and 7m).

When this paper was ready for printing, I saw number 7 of the Botanical News Bulletin of the Herbarium, For. Dept., Sandakan, Sabah, Malaysia, by W. Meijer, who gave a key to the North Borneo species of *Cratoxylum* (l.c. 64–65), which agrees with my specific delimitation within the genus. Obviously Meijer united the following species: *C. celebicum* Bl. with *C. hypericinum* (Bl.) Merr. and *C. ligustrinum* (Spach) Bl. with *C. cochinchinense* (Lour.) Bl. *sensu* Corner. I came to the same conclusion mentioning them as *C. sumatranum* ssp. *sumatranum* and *C. cochinchinense* respectively.

Generic distinction: Within the *Guttiferae* *Cratoxylum* is arranged, with the monospecific Madagascan genus *Eliaea* Camb., in the tribe *Hypericoideae-Cratoxyleae*. It is certainly closely allied to *Eliaea*, the chief distinction of *Eliaea* against *Cratoxylum* being (characters of the latter added in brackets): ovary with 6 ovules (at least 12, mostly more), incompletely 6-celled (incompletely 3-celled), style and filaments cottony hairy (glabrous), fruit with finally 6 semipersistent valves (3 valves, often partly caducous, in *C. cochinchinense* often showing a small slit apically in the septum).

Perrier de la Bâthie (Fl. Madag. 1951, fam. 135) does give assumedly more reliable information than Engler (1925). The latter says e.g. that *Eliaea* would have yellow flowers, but Perrier defines them as white, hence not different from those of *Cratoxylum*.

If I would have studied material of *Eliaea* before that genus was described, I doubt whether I would have made a separate genus of it, but would certainly have given it distinction as a section or even subgenus close to sect. *Tridesmos*, most closest to *C.*

maingayi. This is to demonstrate to my readers that I find them very closely related indeed, especially in habit (bark, twigs, foliage) save in the above-mentioned technical flower and fruit details. And these are not yet very certain as far as the ovary and fruit is concerned: Engler calls the ovary and fruit 3-celled, Perrier in his key (*l.c.* 2) says "loges biovulées" but in his description of the genus the ovary is defined as having "6 (8) loges incomplètes uniovulées". I have examined the ovary of *Eliaea articulata* Camb., the sole species distinguished by Perrier de la Bâthie (coll. Alleizette). From the dried material available my impression is that the ovary of *Eliaea* is incompletely 3-celled, but it is true that there are 3 inward extensions alternating with these septa and resembling these but not quite homologous, giving the impression of a 6-celled ovary. The 3 additional septa or false septa are never found in *Cratoxylum*. For a better knowledge of the comparative development of the ovarian structure in both *Eliaea* and *Cratoxylum* all species should be closer examined in a separate morphological study. Until that has been performed it seems advisable to retain *Eliaea* as a distinct allied genus.

Uses: Concerning the wood, two different types are to be distinguished: a soft and a rather hard heavy wood. The species of sect. *Isopterygium* have rather soft, red wood; this is not very much used for it splits very badly and some amount of silica blunts the tools. It can be used for planking. Hard, heavy wood is found in the species of sections *Cratoxylum* and *Tridesmos*. *C. sumatranum* is excellent for making charcoal, but it is said not to be useful for house-building; its ssp. *neriifolium* is also fit for making implements. The wood of *C. cochinchinense* is rather durable; it is sometimes used but is of no importance for timber. The species of sect. *Tridesmos* give a flexible, durable timber which is sometimes used for native constructions. According to Dr. A. J. G. H. Kostermans (personal comm.) in Indonesian Borneo drums are made of the old (hollow) trunks of *C. arborescens*; the vernacular name 'gerunggang' sounds onomatopie.

Heyne (Nutt. Pl. 1927, 1080) mentions from *C. formosum* that the bark of the stem-base exudes golden-yellow, later becoming red, and finally black resinous drops which are used for curing scabies and leg wounds.

A similar sap is exuded by the bark of the allied genus *Eliaea* from Madagascar.

KEY TO THE SPECIES

1. Leaf-nerves distinct often curved, whether or not arched; no submarginal vein. Petals either with fine dots or lines between the veins or absent. Seeds obovate, unilaterally winged (fig. 5l, m, n). Petal-scale distinct or absent. Mostly deciduous. Interpetiolar scars interrupted (fig. 5c) or closed (fig. 7c). Inflorescences axillary, or axillary and terminal.
2. Petals without basal scale. Scars on nodes mostly closed and arched (fully interpetiolar). Venation open, not arched (fig. 3a). Inflorescences terminal and axillary. Phalanges mostly congested; filaments unequal in width (fig. 7g). Hypogynous scales (if well developed) recurved or cucullate-obovate. Sect. *Cratoxylum*.
3. Leaves underneath almost never waxy, 4—18 by 2—7 cm, 0—15 mm petioled. Interpetiolar scars always continuous. Inflorescences small to rather large, terminal, foliated panicles. Pedicels 1½—5 mm, in fruit accrescent to 3—5 mm. Columella ¼ to nearly ½ as long as the capsule.
 1. *C. sumatranum*
 3. Leaves underneath almost always waxy, 3—10½ by 1—4 cm, 2—5 mm petioled. Interpetiolar scars not always continuous. Inflorescences with small terminal racemes and axillary peduncles, mostly pauciflorous. Pedicels 1—2 mm, in fruit accrescent to 1—4 mm. Columella in the capsule basal 2. *C. cochinchinense*
2. Petals with basal scale. Scars on nodes shortly descending from leaf-base, not forming a closed interpetiolar line, or absent. Venation closed, nerves arched (fig. 5b). Inflorescences axillary or at the base of the young twigs, never terminal. Phalanges slender; filaments almost equal in width (fig. 5g). Hypogynous scales (if well developed) never recurved. Sect. *Tridesmos*.

4. Leaves $3\frac{1}{2}$ —14 by 1—7 cm. Fruits 4—6 mm \varnothing . Seeds (7—)12—17 per cell, obovate-oblong, 2—4 mm wide, wing-base attenuate (fig. 5l) 3. *C. formosum*
4. Leaves 2—9 by 1—4 $\frac{1}{2}$ cm. Fruits 2—4(—5 $\frac{1}{2}$) mm \varnothing . Seeds 5—6 per cell, oblong to ovate-oblong, 1 $\frac{1}{2}$ —2 mm wide, wing not attenuate (fig. 5m, n) 4. *C. maingayi*
1. Leaf-nerves straight, fine, ending in a submarginal vein (fig. 7b). Petals with fine dots between the veins. Seeds lanceolate, winged all around (fig. 7m). Petal-scale minute. Evergreen. Nodes of the twigs with closed interpetiolar scars. Inflorescences terminal in mostly leafless panicles. *Sect. Isopterygium*.
5. Seeds 10—13 per cell. Leaves acute or acuminate, obovate-oblong to obovate-lanceolate or elliptic, 2—4 times as long as broad, 5—16 by 2—6 cm, underneath not or scarcely papillose and waxy. Sepals shallowly convex, not boat-shaped. Petal-scale often deeply lacinate, often to $\frac{1}{2}$ its length adnate with the petal (fig. 7e, f) 5. *C. arborescens*
5. Seeds 4—7 per cell. Leaves rounded or obtuse with blackish mucro to acute, elliptic, mostly less than 2 times as long as broad, 2—10 by 1—5 cm, underneath mostly yellow, orange¹⁾, finely velutinous by very small globular papillae (strong lens!) from the epidermis-cells in shallowly alveoles between the nerves and waxy. Sepals mostly boat-shaped. Petal-scale mostly shallowly denticulate and largely adnate with the petal. 6. *C. glaucum*

Section I. *Cratoxylum*

Cratoxylum sect. *Ancistrolobus* (Spach) Dyer in Hook. f., Fl. Br. Ind. 1 (1874) 257, p.p. excl. *C. arborescens*; King, J. As. Soc. Beng. 59, ii (1890) 145; Koord. & Val., Bijdr. Booms. Java 5 (1900) 132; Engl. in E. & P., Nat. Pfl. Fam. ed. 2, 21 (1925) 183; Corner, Gard. Bull. Str. Settl. 10 (1939) 33. — *Ancistrolobus* Spach, Suit. Buff. 5 (1836) 360. — Typus: *Hornschurchia hypericina* Blume. — Fig. 3.

Mostly deciduous. Interpetiolar scars closed as in § *Isopterygium* or open; venation open, no intramarginal vein. Inflorescences either in foliate terminal panicles resembling those of § *Isopterygium* or with a small terminal raceme and pauciflorous axillary peduncles. Petals crimson to pink, sometimes yellowish, with linear resinous glands between the veins, without a petal-scale. Phalanges similar to those of § *Isopterygium*, congested or slightly slender. Hypogynous scales (if developed) cucullate as in § *Isopterygium* or with recurved apex. Seeds unilaterally winged, obovate as in some forms of § *Tridesmos*.

1. *Cratoxylum sumatranum* (Jack) Blume: 1a. — *Ancistrolobus floribundus* Turcz.: 1a. — *Ancistrolobus micradenius* Turcz.: 1b. — *C. arboreum* Elm.: 1a. — *C. blancoi* Blume: 1b. — *C. blancoi* var. *apiculatum* Merr.: 1b. — *C. celebicum* Blume: 1a. — *C. clandestinum* Blume: 1a. — *C. hornschurchii* Blume: 1a. — *C. hypericinum* Merr.: 1a. — *C. neriifolium* Kurz: 1c. — *C. punctulatum* Elm. ex Merr.: 1b. — *C. racemosum* Blume: 1a. — *Eloдея sumatrana* Jack: 1a. — *Hornschurchia hypericina* Blume: 1a. — *Hypericum neriifolium* Wall.: 1c. — *Hypericum olympicum* (non L.) Blanco: 1b. — Fig. 3a—e, h.

Deciduous to subdeciduous tree, interpetiolar scars always a continuous line. Leaves elliptic to oblong often ovately so, 4—18 by 2—7 cm, herbaceous to chartaceous, base subcordate, rounded to attenuate, apex rounded to cuspidate; petiole 0—15 mm. Inflorescences often large, foliated panicles, pedicels 1 $\frac{1}{2}$ —5 mm. Sepals 3—6 $\frac{1}{2}$ by 3—4 $\frac{1}{2}$ mm. Petals 4—9 by 1 $\frac{1}{2}$ —4 mm, red. Phalanges 2 $\frac{1}{2}$ —7 $\frac{1}{2}$ mm, stalk compressed to slender. Hypogynous scales (if developed) oblong to obovate cucullate up to 3 mm long. Pistils 3—6 mm (ovary 1 $\frac{1}{2}$ —3 mm). Capsule 7—10 by 3—5 mm, halfway or almost completely covered by the sepals 3—9 mm long, columella low to half as long as the capsule. Seeds 3—10 per cell, 5—7 $\frac{1}{2}$ by 1 $\frac{1}{2}$ —2 mm partly covering each other imbricately.

Distribution: One subspecies in an isolated region, the others intergrading partly. See fig. 4, and under the distribution of the subspecies.

¹⁾ Seldom grey but this is caused by poisoning by corrugated sublimate!

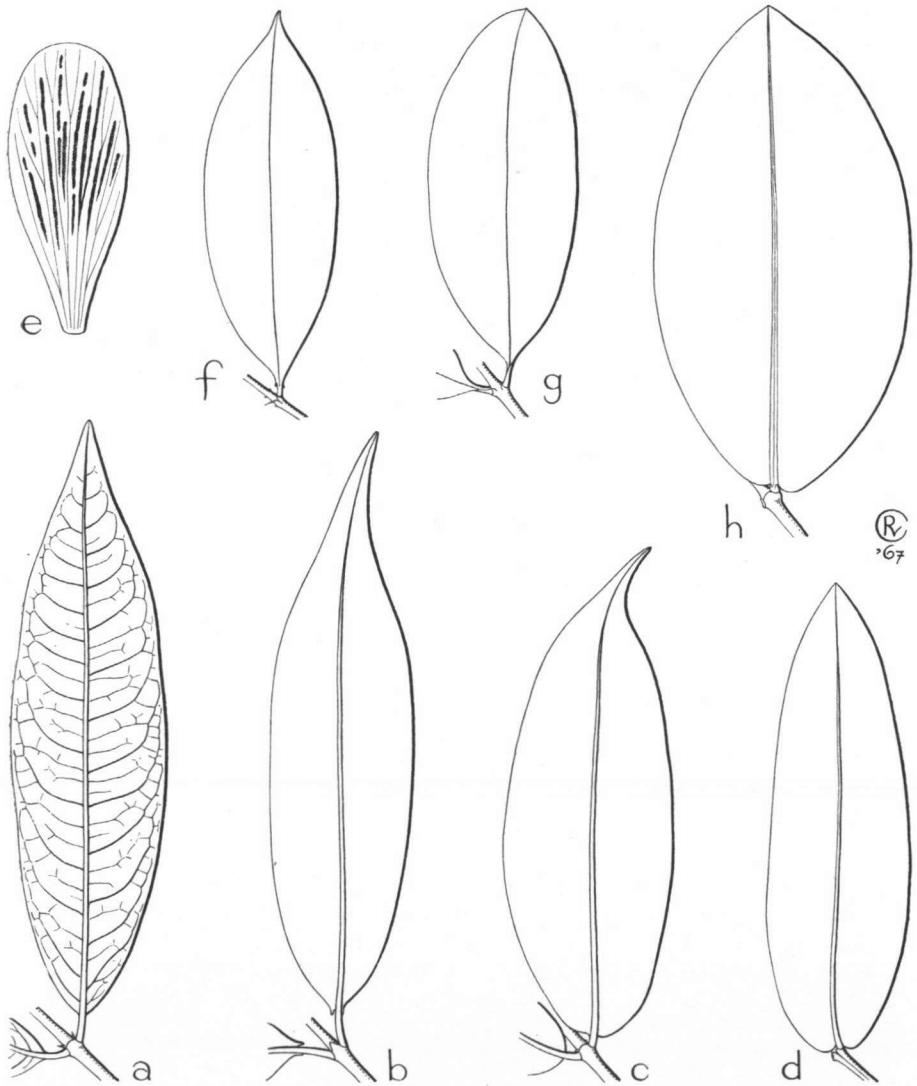


Fig. 3. § *Cratoxylum*. *C. sumatranum* (Jack) Blume ssp. *sumatranum*. a—c. Leaf-shapes, $\times \frac{2}{3}$, e. petal, from inside, scale absent, $\times 6$. — *C. sumatranum* ssp. *nerifolium* (Kurz) Gog. d. Leaf-shape, $\times \frac{2}{3}$. — *C. sumatranum* ssp. *blancoi* (Blume) Gog. h. Leaf-shape, $\times \frac{2}{3}$. — *C. cochinchinense* (Lour.) Blume. f—g. Leaf-shapes, $\times \frac{2}{3}$ (a. Forsten s.n. L. 904. 31, 59, b. & c. Cuming 492, c. Blume s.n. L. 904. 31, 125, d. Put 3940, f. Korthals s.n. L. 904. 31, 147, g. Walker 1104a, h. species Blancoanae 929).



Fig. 8. *Cratoxylum glaucum* Korth. (Photogr. Father Agatheia Elsener, Indonesian Borneo, Sanggau, 14/9/61).

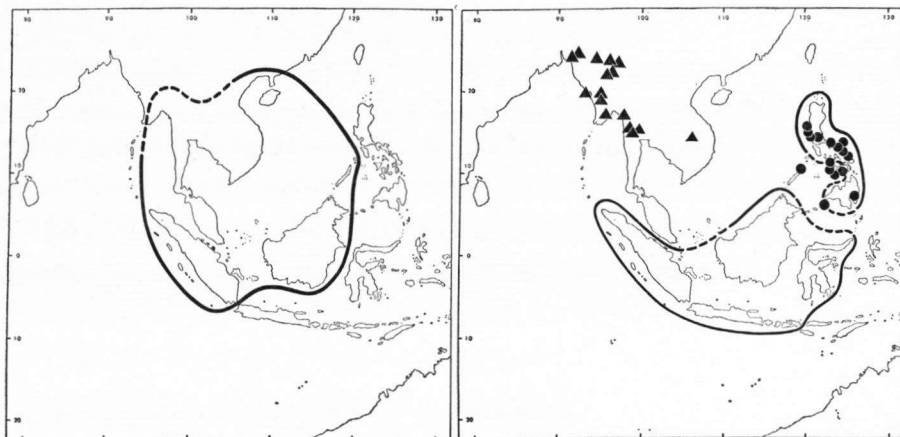


Fig. 4. Range of § *Cratoxylum*. Left *C. cochinchinense* (limit to NE. to be widened to include Hongkong). Right *C. sumatranum*; ssp. *sumatranum* (delineated), ssp. *blancoi* (●), ssp. *neriifolium* (▲).

Notes. The description of Jack's *Elodea sumatrana* agrees entirely with specimens of Sumatra which have always been named as *Cratoxylum sumatranum* Blume.

The species is subdivided into three subspecies, which are very closely allied and differ largely in the shape and size of the leaves and petioles.

KEY TO THE SUBSPECIES

- 1. Leaves sessile to $1\frac{1}{2}$ cm petioled, underneath never waxy. Sepals of fruits 3—7 by 2—4 mm, less than $\frac{1}{4}$ to $\frac{2}{3}$ as long as the capsule. Panicles often rather large.
 - 2. Leaves oblong to lanceolate, 2—4 times as long as broad, apex acuminate to cuspidate. Fig. 3a—c.
 - Ia. ssp. *sumatranum*
 - 2. Leaves elliptic to elliptic-oblong, $1\frac{1}{2}$ to $2\frac{1}{2}$ times as long as broad, apex mostly rounded to acute or shortly acuminate. Fig. 3h Ib. ssp. *blancoi*
- 1. Leaves always sessile or subsessile, underneath sometimes with wax. Sepals of fruits 8—9 by 4—5 mm, almost covering the capsule. Foliated panicles with often pauciflorous axillary peduncles. Fig. d.
 - Ic. ssp. *neriifolium*

Ia. ssp. *sumatranum*. — Fig. 3a—c, e.

C. sumatranum (Jack) Blume, Mus. Bot. Lugd. Bat. 2 (1852) 16. — *Elodea sumatrana* Jack, Mal. Miscell. 2 (1822) 22. — Typus: Jack, Sumatra, ins. Nias, Tello Dalam (*non vidi*).

Hornschuchia hypericina Blume, Cat. Gew. Btzg (1823) 15. — *C. hornschuchii* Blume, Verh. Bat. Gen. 9 (1823) 174; Korth., Verh. Nat. Gesch. Bot. (1842) 178; Blume, Mus. Bot. Lugd. Bat. 2 (1852) 15; Koord. & Val., Bijdr. Booms. Java 5 (1900) 134. — *C. hypericinum* Merr., En. Born. (1921) 392; Backer & Bakh. f., Fl. Java 1 (1963) 383. — Typus: Blume, Java, mons Salak (BM 2 sched.!, L plura specim. collecta mense Dec. et Jan.! L 904.31.125 lectotypus!, W 2 sched.!).

C. clandestinum Blume, Mus. Bot. Lugd. Bat. 2 (1852) 15; Koord. & Val., Bijdr.

Booms. Java 5 (1900) 132; Backer, Schoolfl. Java (1911) 87. — Typus: Waitz, Java (BM!, L plura specim.! L 904.31.64 lectotypus!).

C. racemosum Blume, Mus. Bot. Lugd. Bat. 2 (1852) 16; Backer, Schoolfl. Java (1911) 87; Backer & Bakh. f., Fl. Java 1 (1963) 383. — Typus: Kuhl & v. Hasselt, Java (L!).

C. celebicum Blume, Mus. Bot. Lugd. Bat. 2 (1852) 16; Merr., Philip. J. Sc. 4 (1909) Bot. 293; Meijer, Bot. News Bull. Herb. For. Dep. Sandakan 7 (1967) 64. — Typus: Forsten, Celebes, Tondano et Minahassa Likoepong (L plura specim.! L 904.31.59 lectotypus!).

Ancistrolobus floribundus Turcz., Bull. Soc. Nat. Mosc. 31, 1 (1858) 382. — Syntypi: Cuming 492 (non 792) Philipp., Luzon, Calawang (BM p.p.!, C!, CGE!, FI!, L 2 sched.!), Cuming 965 Philipp., Luzon, prov. Pangasinan (BM p.p.!, CGE!, L!, W 2 sched.!), Cuming 1221 Philipp. ins. (BM p.p.!, CGE!, W 2 sched.!), Lobb 443 [Philipp.] (BM!, W 2 sched.!).

C. arboreum Elm., Leaf. Philip. Bot. 8 (1919) 3084. — Typus: Elmer 17724, Philipp., Luzon, prov. Laguna, Los Baños (BM p.p.!, C!, L!, U!, W!).

Leaves oblong to lanceolate often ovately so, 2—4½ times as long as broad, 5—18 by 2—5 cm, base rounded to attenuate, apex acute to cuspidate; petiole 0—10 mm, sometimes to 15 mm (Philippines). Panicles variable in size. Capsules 7—12 by 3—5 mm covered to ¾ of its length by the sepals. Seeds 3—10 per cell.

Distribution: Sumatra, Java, Lesser Sunda Islands (Bali, Lombok, Sumbawa), Borneo, Celebes, Philippines (Luzon, Mindoro, Samar, Leyte, Panay, and Siargao). Fig. 4, right.

Ecology: On dry grounds, rich ground of primary forests, clay, clayey loam, sandstone, 'red soil' (Sumatra), 'black soil' (N. Borneo), coral lime and red sandstone (Celebes). Primary or secondary forests to open country, and in grassland (Philippines). Altitude: 200—800 m (Sumatra), collected also lower in Java, Bali, Borneo, Celebes, and the Philippines, once noted at 1200 m (Luzon). Flowering and fruiting throughout the year, while earlier in Borneo than in the Philippines. Flowers noted from July to December (Java, Sumatra), November—May (Borneo), fruits collected in December—April (Java, Sumatra) and March—September (Borneo).

Field characters: Small tree or shrub to maximum 35 mm tall; bark fissured, peeling off in 20 cm wide stripes 5—10 mm thick, dark brown. Flowers dark-red, brown-red with pale-green petal-claws. Hypogynous scales yellow.

Vernacular names: Sumatra: *garènggang* (P. Simaluer), *garunggang*, *kèmutun*. Java: *maron(g)* (Salak), *rènjung gèdè* (Sund.), *wuluan* (C. Java). Borneo: *gèrungang*, *garonggang*, *sèrungan* (N. Borneo), *sèrungan-mampat*, *lakalaka* (Brunei), *mampat*, *lingan* (W. Kutai). Celebes: *kaju arang*, *sisio puté* (Malili). Philippines: *paguringun* (Luzon), *aliguyun*, *balincucurog*.

Notes. A rather variable subspecies, represented in various islands by slightly different races. Thus, there is a race in Celebes related to one in the Philippines which differ together from two other races in Sumatra and Java which form also together a sort of race of higher rank. In the intervening area in Borneo, however, the distinguishing characters between those northern and southern races are obscured and more or less blended. Though it is possible to define such races for a local area, it is impossible to provide any reliable key for their distinction over the whole of Malesia.

Already Blume suggested that there were two taxa in Java and this has been maintained by Backer (1911) and Backer & Bakhuizen van den Brink Jr (1963) under the names *C. hypericinum* (Bl.) Merr. and *C. racemosum* Bl., the difference being mainly whether the hypogynous scales are developed or not. This can, however, not serve for specific distinction.

1b. ssp. blancoi (Blume) Gog., *stat. nov.* — **Fig. 3h.**

C. blancoi Blume, Mus. Bot. Lugd. Bat. 2 (1852) 17; Merr., En. Philip. 3 (1923) 75. — *Hypericum olympicum* (non L.) Blanco, Fl. Filip. (1837) 613. — Typus: Blanco, Philipp. (*non vidi*).

Ancistrolobus micradenius Turcz., Bull. Soc. Nat. Mosc. 31, 1 (1858) 328. — Typus: Cuming 1822, Philipp., Bohol (BM!, CGE!, C!, W 2 specim.!, FI!, KW!).

C. blancoi var. *apiculatum* Merr., Philip. J. Sc. 4 (1909) Bot. 294. — Typus: Ritchie F.B. 31, Philipp., Guimaras (BM!, US!).

C. punctulatum Elm. ex Merr., En. Philip. 3 (1923) 76, in sched. — Sp.: Elmer 15479, Philipp., Luzon (BM!, C!, L!, U!, W!).

Leaves mostly ovate seldom obovate to elliptic-oblong, $1\frac{1}{2}$ to less than 3 times as long as broad, 4—14 by $3\frac{1}{2}$ —7 cm, base obtuse to obtuse-acute, apex rounded or acute to shortly acuminate; petiole 0—5 mm. Panicles often large. Capsules 8—12 by 3—4 mm, covered over more than half its length by the sepals 4—7 mm. Seeds 6(—7) per cell.

Distribution: Philippines: Luzon, Catanduanes, Panay, Guimaras, Negros, Bohol, Leyte, Samar, Palawan, Mindanao (Davao Prov.), and Basilan. Fig. 4, right.

Ecology: "In thickets and secondary forests at low altitudes" (Merrill).

Vernacular name: Philippines: *guyong-guyong* (Luzon, tagalog).

Notes. Of the two subspecies of *C. sumatranum* which occur in the Philippines, Blanco must have described ssp. *blancoi* with the ovate leaves, as Merrill suggested.

In the Philippines ssp. *blancoi* often intergrades with ssp. *sumatranum*.

1c. ssp. neriifolium (Kurz) Gog., *stat. nov.* — **Fig. 3d.**

C. neriifolium Kurz, J. As. Soc. Beng. 41, ii (1872) 293; Dyer in Hook. f., Fl. Br. Ind. 1 (1874) 257; Kurz, For. Fl. Br. Burma 1 (1877) 85; Gagn., Fl. Gén. I.—C. 1 (1910) 291; Craib, Fl. Siam. En. 1 (1925) 112. — *Hypericum neriifolium* Wall., Cat. (1828) 4824, *nomen*. — Typus: Wallich 4824, Burma, ripa Irawaddi (CAL! 2 sched. cum foliatis ramul., floribus fructibusque, 1 sched. modo cum foliis partim ssp. neriifolii partim *C. form. ssp. pruniflori*; BM!).

Leaves ovate-elliptic to ovate-lanceolate, mostly 3 to $4\frac{1}{2}$ times as long as broad, 6—17 by 2—4 cm, base slightly cordate to cuneate-obtuse, apex acute to shortly acuminate, sessile or almost sessile. Panicles small with often pauciflorous axillary peduncles. Capsules 9—10 by 3—4 mm covered largely by the sepals 8—9 mm. Seeds 6—8(—9) per cell.

Distribution: India: Bengal (Chittagong). Assam: S. Lushai Hills. Burma: from Irrawaddi-valley (Mandelay, Ava, and Pegu) south to Tenasserim (Mergui), Ramree Is, Siam, along the Mekong, down to Stung Treng (Indo-China). Fig. 4 right.

Ecology: "Frequent in the drier, upper mixed and dry forests, less so in the lower mixed ones" (Kurz, For. Fl. Br. Burma 1, 1877, 85), on sandy loam soil, on limestone hill (Siam). Altitude: from c. 100 m up to 450 m or 600 m (Assam), and almost 800 m (Siam: Kwae Noi Basin exped.). Flowering noted May—August, fruiting (August—) September—March.

Field characters: Trees to 20 m tall. Leaves often gray beneath. Flowers bright or brick-red.

2. *Cratoxylum cochinchinense* (Lour.) Blume, Mus. Bot. Lugd. Bat. 2 (1852) 17; Corner, Gard. Bull. Str. Settl. 10 (1939) 26—27, 34. — *Hypericum cochinchinense* Lour., Fl. Coch. (1790) 471. — *Vismia cochinchinensis* Spreng., Syst. Veg. 3 (1826) 350. — Typus: Loureiro, "in sylvis Cochinchinae" (*non vidi*). — **Fig. 3f—g.**

Hypericum chinense Retz., Observ. 5 (1789) 27, *non L.* 1759. — *Hypericum biflorum*

Lamk, Encycl. 4 (1797) 170; Hook. & Arnott, Bot. Beech. Voy. (1833) 173. — *Elodea chinensis* Hance in Hook., Lond. J. Bot. (1848) 472. — *C. chinense* Merr., Philip. J. Sc. 4 (1909) Bot. 292. — Typus: Bladh, China (LD!).

Hypericum petiolatum (non L.) Lour., Fl. Coch. (1790) 479. — *C. petiolatum* Blume, Mus. Bot. Lugd. Bat. 2 (1852) 17. — Typus: Loureiro, "China prope Cantonem" (non vidi).

Hypericum carneum Wall., Cat. (1828) 4820, *nomen*. — *Ancistrolobus carneus* Voigt, Hort. Calc. Cat. (1845) 89, *nomen*. — *C. polyanthum* var. *carneum* Kurz, J. As. Soc. Beng. 43, ii (1874) 85. — *C. (Ancistrolobus) biflorus* Turcz., Bull. Soc. Nat. Mosc. 36, I (1863) 580. — Typus: Reeves Wall. 4820, China (BM p.p.!, CGE 2 sched.!, KW!).

Hypericum pulchellum Wall., Cat. (1828) 4821, *nomen*. — *Elodea pulchella* Hort. Chels. ex Loud., Hort. Brit. Suppl. I (1832) 587, *nomen*. — Typus: Wallich, Singapore (BM!, CGE!).

Hypericum horridum Wall., Cat. (1828) 4822, *nomen*. — Typus: Wallich, Chappedong et Tavoy (BM 2 specim.: e Chapp.! et Tavoy!).

Ancistrolobus ligustrinus Spach, Suit. Buff. 5 (1836) 361; Ann. Sc. Nat. II, 5 (1836) 352, t. 6. — *C. ligustrinum* Blume, Mus. Bot. Lugd. Bat. 2 (1852) 16; Merr., Trans. Am. Phil. Soc. 24, 2 (1935) 268; Corner, Gard. Bull. Str. Settl. 10 (1939) 34; Meijer, Bot. News Bull. For. Dep. Sandakan 7 (1967) 64. — *C. polyanthum* var. *ligustrinum* Dyer in Hook. f., Fl. Br. Ind. I (1874) 257. — *C. polyanthum* var. *genuinum* Kurz, J. As. Soc. Beng. 43, ii (1874) 85, p.p. excl. *C. polyanthum* var. *wightii* Dyer 1874. — Typus: Decaisne herb., China circa Macao (non vidi).

C. polyanthum Korth., Verh. Nat. Gesch. Bot. (1842) 175, t. 36; Blume, Mus. Bot. Lugd. Bat. 2 (1852) 16; Dyer in Hook. f., Fl. Br. Ind. I (1874) 257; Kurz, J. As. Soc. Beng. 43, ii (1874) 85; For. Fl. Br. Burma I (1877) 84; King, J. As. Soc. Beng. 59, ii (1890) 145; Gagn., Fl. Gén. I.-C. I (1910) 290; Ridl., Fl. Mal. Pen. I (1922) 152; Craib, Fl. Siam. En. I (1925) 112. — Typus: Korthals & Müller, Borneo in monte Pamatton, ad ripas fluminis Doeson, iuxta ins. Lampei, cet. (BM!, L plura specim.! L 904.31.147 lectotypus.!, W!).

C. myrtifolium Blume, Mus. Bot. Lugd. Bat. 2 (1852) 17. — *C. polyanthum* Korth., Verh. Nat. Gesch. Bot. (1842) 175, p.p. — Typus: Müller, Borneo, ins. Lampei (L pauca sched.!).

C. wightii Blume, Mus. Bot. Lugd. Bat. 2 (1852) 18. — *Ancistrolobus* sp. Wight, Ill. I (1840) III. — *Elodea* sp. Griff., Notul. 4 (1854) 569. — *C. polyanthum* var. *wightii* Dyer in Hook. f., Fl. Br. Ind. I (1874) 257; Corner, Gard. Bull. Str. Settl. 10 (1939) 21—36. — Typus: Griffith 1104, Mergui (CGE "Griff. 1104a"!).

Ancistrolobus brevipes Turcz., Bull. Soc. Nat. Mosc. 31, I (1858) 383. — Typus: Lobb 485, Singapore (BM 2 sched., una p.p. cum num. Beccari!, W 2 sched.!, KW!).

C. lanceolatum Miq., Fl. Ind. Bat. Suppl. I (1861) 500. — Typus: Teysmann HB 3813, Sumatra prov. Palembang (U!, W!).

Stalagmites erosipetala Miq., J. Bot. Néerl. I (1861) 126. — Typus: Krone 168, China (U!).

C. polyanthum var. *macrocarpum* Boerl., Cat. Hort. Bog. (1901) 62. — Typus: Boerlage, Cult. in Hort. Bog. ex (?) Siam (L!).

C. hypoleuca Elm., Leaf. Philip. Bot. 5 (1913) 1787. — Typus: Elmer 12913, Philipp. Palawan Puerto Princesa (mons Pulgar) (BM!, E!, L!, U!, W!).

Deciduous tree; interpetiolar scars on twigs not always continuous. *Leaves* elliptic to lanceolate often ovately so, 3—10½ by 1—4 cm, herbaceous to chartaceous, often glaucous underneath (wax), base obtuse to attenuate, apex obtuse to sharply acuminate; petioles 2—5 mm. Inflorescences poor-flowered axillary and terminal racemes, the latter sometimes absent; pedicels 1—2 mm. *Flowers* heterodistylous. *Sepals* 5—7 by 2—5 mm.

Petals 5—10 by $2\frac{1}{2}$ —5 mm. *Phalanges* 4—8 mm, stalk compressed to slender. *Hypogynous scales* (if developed) oblong to obovate cucullate up to 3 mm long. *Pistil* 3—6 mm (ovary 2—3 mm). *Capsule* 8—12 by 4—5 mm for $\frac{2}{3}$ or more covered by the sepals 5—10 mm long, columella basal. *Seeds* (5—)6—8 per cell, 6—8 by 2—3 mm, covering each other almost completely.

Distribution: Burma, China (south of 23° N), Hongkong, Hainan, Indo-China, Siam, Malaya, Sumatra, Borneo, Philippines (Palawan and Culion). Fig. 4, left.

Ecology: Mostly on dry grounds; clay, sandy soil, granitic sand, limestone rocks, 'red soil' (Sumatra), 'black soil' (Borneo), yellow sandy clay (Brunei). In primary and secondary forests, dense or open forests, in thickets, open grassland, on river-banks, ridges or flat land. Altitude: from sea-level up to 500 m, sometimes collected higher, up to 1000 m (China, San-on Distr.). Flowering and fruiting throughout the year, flowers and fruits often found together.

Field characters: Becoming a rather large tree, up to almost 30 m (Malaya), mostly of moderate size, often noted as shrub (Indo-China, China, and Hainan), once noted to be a climber (Hainan). Bark either smooth or scaly, Corner (l.c. 30) recognized this as a taxonomic distinction between *C. cochinchinense* and *C. ligustrinum* which he kept separate (see notes). Flowers from dark-red to pink, sometimes orange (noted: 'pinkish-yellow', 'red-orange', 'mèrah-kuning', etc.). Hypogynous scales yellow.

Vernacular names: Malaya: *səlunchus*, *dërüm səlunchor* (Perak), *kəmuntong*, *kaju arang*, *pəlawan* (Kelantan), *bəlawan padang*, *kəluchus* (Pahang), *bəluchus* (N. Sembilan), *sərapat*. Sumatra: *mulu* (Lampungs), *ləlulus*, *kaju lulus* (Palembang), *məngidjang* (Banka). Borneo: *mampat*, *mulun*, *maradjalang* (W. Borneo), *gəronggang*, *baduk-baduk*, *mogizon*, *pəlawan-pəlawan* (N. Borneo, Brunei), *taikakan*, *səlangan-biabab* (Selangan Is.).

Notes. Merrill (Trans. Am. Phil. Soc. 24, 2, 1935, 268) identified *C. cochinchinense* with *C. formosum* Jack. This seems incorrect and I agree with Corner who denied this conspecificity (l.c. 26).

The variability of the species is between two extremes, already properly recognized by Dyer, in Fl. Br. Ind. 1 (1874) 257, and distinguished by him under the specific name *C. polyanthum* as var. *wightii* and var. *ligustrinum*. Corner noted differences in living trees from Malaya, but conceded that herbarium material conveys no good idea of the differences (l.c. 25).

Together with some observations of Corner I come to the following characterization of the extremes:

'var. *wightii*' — A shrub or small tree with a rough grey brown bark (Corner); the interpetiolar scars mostly not closed, sometimes the leaves not exactly opposite, leaf base cuneate or obtuse seldom separating from midrib, apex mostly obtuse; in flowers with developed hypogynous scales the stalks of the staminal bundles are slender and more than $\frac{1}{3}$ of the bundle-length.

The type specimen of *C. wightii* Blume and Wall. 4822, likewise the Loureiro-specimen (see below) belong to this form, which occurs in Burma, Malaya, Siam, and Indo-China.

'var. *ligustrinum*' — Up to a large tree with a pale smooth bark (Corner); always closed interpetiolar scars, leaves always attenuate at both ends, leaf base often slightly separating from midrib so that very tiny appendages are to be seen; flowers are often smaller, staminal bundles often short-stalked and compressed.

Type specimens of *Hypericum chinense* Retz. non L., *Ancistrolobus ligustrinus* Spach, *C. polyanthum* Korth., *Hypericum? carneum* Wall. 4820, *Ancistrolobus brevipes* Turcz., *C. lanceolatum* Miq., *C. hypoleuca* Elm., and also Wall. 4821 belong to the latter form,

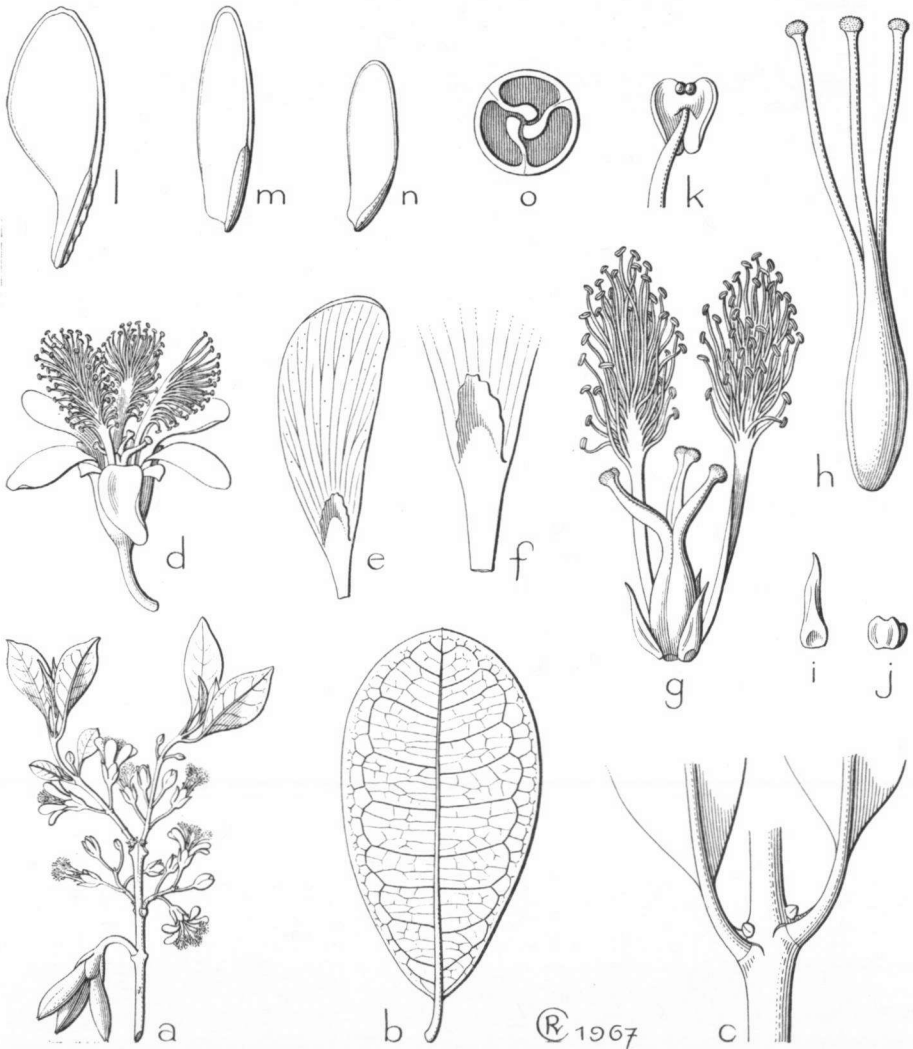


Fig. 5. ♂ *Tridesmos*. *Cratoxylum formosum* ssp. *formosum*. a. Fertile twig apex, $\times \frac{2}{3}$, b. leaf, $\times \frac{2}{3}$, c. node, showing open interpetiolar scar, enlarged, d. short-styled flower, $\times 2$, e. petal, from inside, $\times 4$, f. base of same, showing petal-scale, $\times 8$, g. genitals and hypogynous scales of short-styled flower, $\times 6$, h. pistil of long-styled flower, $\times 6$, i. hypogynous scale, $\times 6$, l. seed, a fine vein running submarginally through wing towards top of seed proper, $\times 4$. — *C. formosum* ssp. *pruniflorum* (Kurz) Gog.-j. Hypogynous scale, $\times 6$, k. anther, showing connective glands, $\times 20$. — *C. maingayi* Dyer. m—n. Seeds, $\times 4$, o. cross-section of capsule, schematic (a, e—g, i. Haviland 16, b—c, l. Braskamp s.n., dd. 12/11/27, d—h. Magnen, Gourgard, Châtillon, 20/10/1909, j—k. Henry 10687, m—n. SF 36465, o. Rahmat Si Boeea 7907).

which is distributed in China, Sumatra, Borneo, and Philippines (rare), while in Indo-China, Siam, Burma, and Malaya both forms occur.

Concerning Loureiro's description of *Hypericum petiolatum* ("habitat incultum prope Cantonem Sinarum"), the size (3 feet) fits well with the small forms which are often found in the northernmost limit of the area of *C. cochinchinense*, like Canton and Hongkong. The orange colour of the corolla, though not uncommon, is sometimes noted as 'pinkish-yellow', 'red-orange', 'mèrah-kuning', etc. agreeing with Loureiro's 'flavo-ruber'. Therefore I will maintain Blume's and Merrill's identification with *Cratoxylum*.

Corner's doubt about the identification (l.c. 30—31) which he derived from the flower colour and small size, seems therefore not warranted. Further Corner misunderstood Loureiro's signs, assuming "the Greek letters for a and b" to stand for varieties. However, Loureiro himself, in his introduction (l.c. xii) stated that these were meant to indicate distribution, α meaning Cochinchina, β China, etc.

Merrill (1935, l.c.) identified Loureiro's *Hypericum petiolatum* as well as *Hypericum olympicum* with *C. ligustrinum*. To me *Hypericum olympicum* is a very doubtful species, for the inflorescences are too poor-flowered (Loureiro l.c. 471: "pedunculis —, sub-bifloris") and the flower is "luteus". Agreeing with Corner (l.c. 30—31) I believe this to have been a species of *Hypericum*, but I can not agree with Corner's arguments: the misunderstanding of α and β I mentioned already above. Furthermore Loureiro used several pronunciation-signs on vernacular names (l.c. xv), for instance a query, but that was not meant to represent doubt by Loureiro, as Corner thought.

Section 2. *Tridesmos*

(Choisy) Dyer in Hook. f., Fl. Br. Ind. 1 (1874) 258; King, J. As. Soc. Beng. 59, ii (1890) 145, p.p. excl. *C. arborescens*; Koord. & Val., Bijdr. Booms. Java 5 (1900) 137; Engl. in E. & P., Nat. Pfl. Fam. ed. 2, 21 (1925) 184; Corner, Gard. Bull. Str. Sett. 10 (1939) 33. — *Hypericum* sect. *Tridesmos* Choisy in DC., Prod. 1 (1824) 546. — *Tridesmis* Spach, Suit. Buff. 5 (1836) 358, non Lour. 1790. — *Cratoxylum* sect. *Micropterygium* Kimura in Nakai & Honda, Nov. Fl. Jap. 10 (1951) 16—17, p.p. fetus proprietatibus *C. harmandii* Pierre, nomen. — Typus: *Hypericum biflorum* (non Lamk) Choisy = *Tridesmis ochnoides* Spach. — Fig. 5.

Mostly deciduous; interpetiolar scars not closed. Leaves with often wax underneath; venation arched, closed. Inflorescences at the base of whether or not developed twigs or axillar in some rare specimens, never terminal. Flowers often larger than in other sections, heterodistylous. Petals mostly punctate between the veins, red or pink to white, with distinct petal-scale much larger than in § *Isopterygium*. Phalanges slender. Hypogynous scales often developed, mostly linguiform, sometimes truncate, never with recurved top. Seeds unilaterally winged, wing either obovate as in § *Cratoxylum*, or oblong to ovate-oblong.

Distribution: Fig. 6 right.

Taxonomy: The characters of both specimens on which Gagnepain based his description of *C. harmandii* Pierre, and on which description apparently Kimura based his section, fall within those of *C. maingayi*; so I will distinguish only one section (see notes under *C. maingayi*).

3. *Cratoxylum formosum* (Jack) Dyer: 3a. — *C. dasyphyllum* Hand.-Mazz.: 3b. — *C. pentadelphus* Turcz.: 3a. — *C. pruniflorum* Kurz: 3b. — *C. prunifolium* Dyer: 3b. — *Elodea*

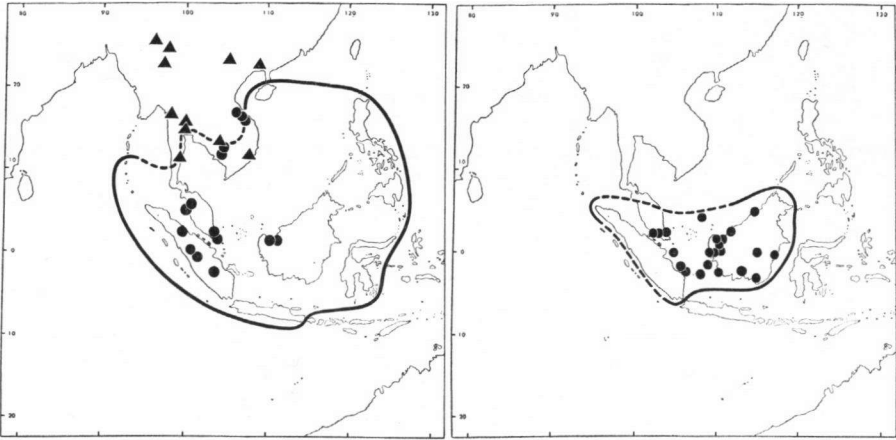


Fig. 6. Left: range of § *Tridesmos*: *C. formosum* ssp. *formosum* (delineated), *C. formosum* ssp. *pruniflorum* (▲), *C. maingayi* (●). Right: range of § *Isopterygium*: *C. arborescens* (delineated), *C. glaucum* (●).

formosa Jack: 3a. — *Hypericum aegyptium* (non L.) Blanco: 3a. — *Hypericum biflorum* (non Lamk) Choisy: 3a. — *Hypericum prunifolium* Wall.: 3b. — *Tridesmis billardieri* Spach: 3a. — *Tridesmis formosa* Korth.: 3a. — *Tridesmis jackii* Spach: 3a. — *Tridesmis ochnoides* Spach: 3a. — *Tridesmis pruniflora* Kurz: 3b. — Fig. 5a—l.

Deciduous. Leaves elliptic to lanceolate, sometimes ovate or obovate 3½—14 by 1—7 cm; petiole 5—15 mm. Inflorescences pauciflorous at the base of whether or not developed twigs; pedicels 3—10(—15) mm, in fruit accrescent 4—15 mm. Sepals 4—7 by 2—4 mm. Petals 7—17 by 3—7 mm; petal-scale 2—4 mm. Filaments more than 20 per phalange. Pistil 4—12½ mm (ovary 2—4½ mm). Capsules about ellipsoid 10—16 by 4—6 mm. Seeds 12—16 per cell, seldom less, obovate, base attenuate 2—4 mm wide.

Distribution: Fig. 6, left.

Note. This species is subdivided into two subspecies, largely based on the occurrence of an indumentum or not; other characters not exclusive. The subspecies are also geographically defined and hardly overlapping.

KEY TO THE SUBSPECIES

- i. All parts glabrous 3a. ssp. **formosum**
- i. Young twigs, pedicels and outside of the calyx pubescent 3b. ssp. **pruniflorum**

3a. ssp. **formosum**. — Fig. 5a—i, l.

C. formosum (Jack) Dyer in Hook. f., Fl. Br. Ind. 1 (1874) 258; Kurz, For. Fl. Br. Burma 1 (1877) 84; King, J. As. Soc. Beng. 59, ii (1890) 147; Koord. & Val., Bijdr. Booms. Java 5 (1900) 137; Gagn., Fl. Gén. I.-C. 1 (1909) 288; Ridl., Fl. Mal. Pen. 1 (1922) 153, fig. 16; Craib, Fl. Siam. En. 1 (1925) 111; Corner, Gard. Bull. Str. Settl. 10 (1939) 23, 28; Meijer, Bot. News Bull. For. Dep. Sandakan 7 (1967) 64. — *Elodea formosa* Jack, Mal. Miscell. 2 (1822) 24. — *Tridesmis jackii* Spach, Ann. Sc. Nat. II, 5 (1836) 352. — *Tridesmis formosa* Korth., Verh. Nat. Gesch. Bot. (1843) 197, t. 37. — Typus: Jack, Sumatra (non vidi).

Hypericum biflorum (non Lamk) Choisy in DC., Prod. 1 (1824) 546. — *Tridesmis ochnoides* Spach, Suit. Buff. 5 (1836) 359; Ann. Sc. Nat. II, 5 (1836) 351, t. 4A (*Tridesmis*

billardieri in textu); Blume, Mus. Bot. Lugd. Bat. 2 (1852) 18. — Typus: La Billardièrre ins. Bouton (FI! “*T. billardieri*” in sched.).

Hypericum aegyptium (non L.) Blanco, Fl. Filip. (1837) 615.

C. (Tridesmis) pentadelphus Turcz., Bull. Soc. Nat. Mosc. 36, 1 (1863) 580 (terat.). — Typus: Horsfield s.n., Java [?] (BM!, CGE!, KW!).

All parts glabrous. Leaves elliptic to oblong (to lanceolate) $3\frac{1}{2}$ —14 by 2—7 cm; petiole 6—15 mm. Connective not glandulose. Hypogynous scales linguiform often attenuate, sometimes blunt or truncate.

Distribution: Hainan (rare), Indo-China: S. Cochinchina, Cambodia, and about Hue, Siam, Andamans (“rather rare . . . South Andam.” sec. Kurz), Sumatra, Malaya, Banka, Java, Borneo, Celebes, P. Buton, Philippines (Luzon, Polillo, Mindoro, Sibuyan, Guimaras, Negros, Busuanga, Culion, Palawan, Mindanao). Fig. 6, left.

Ecology: Granitic sand, dry (Banka), red soil (N. Borneo), clay, rocky hill slopes (Palawan), or fresh-water swamps, along rivers or near mangrove swamps (N. Borneo), in open or dense primary forests or old secondary forests (‘bèlukar and ladang lands’ Sampit, Borneo), thickets (Hainan, rare). Altitude mostly low, sometimes up to 600 m, or seldom more (1200 m in Luzon). Flowering: noted May (Celebes), March—May (Philippines) or March—July (Borneo) or later (Sumatra, Banka) or earlier (Malaya).

Field characters (partly from lit.): trees maximum 35 m tall, young specimens and saplings spiny (Backer), base of the trunk spiny. Bark “coarsely fissured, scaly” (Corner). Flowers pink or white, once noted purplish. Hypogynous scales orange-red.

Vernacular names: Malaya: *derom* (Kedah, K. Lumpur), *mumpat*, *gèrunggang betina* (Perak), *mampat*, *kèmuntong* (Kelantan), *mampat* (K. Lumpur), *drum* (P. Penang). Sumatra: *kèmutul*, *kèbutul* (Lampongs), *tèmbutun*, *kèmbutul* (Palembang), *mampat* (Palembang, Riouw), *ampèt*, *mampet*, *tèmutun* (Banka). Java: *rèmbang putun*. Borneo: *mulun*, *kasat baku*, *butun* (S. & E. Borneo), *pèlawan* (Brunei), *obah bukit*, *mèngkutan*, *biabas tahun*, *kalambulan*, *gèronggang*, *sèrungan* (N. Borneo). Philippines: *salingagon*; *mango-gong*, *marangguub* (Palawan).

Note. What has always been referred to *C. formosum* fully agrees with Jack’s description of *Elodea formosa* (Corner, l.c. 28).

3b. ssp. *pruniflorum* (Kurz) Gog., *stat. nov.* — Fig. 5j, k.

Hypericum prunifolium Wall., Cat. (1828) 7276, *nomen*. — *Tridesmis pruniflora* Kurz, J. As. Soc. Beng. 41, ii (1872) 293. — *C. (errore) ‘prunifolium’* Dyer in Hook. f., Fl. Br. Ind. 1 (1874) 258; Pierre, Fl. For. Coch. 1 (1882) t. 52; Gagn., Not. Syst. 1 (1909) 19. — *C. pruniflorum* Kurz, J. As. Soc. Beng. 43, ii (1874) 84; For. Fl. Br. Burma 1 (1877) 84; Craib, Fl. Siam. En. 1 (1925) 113. — Typus: Wallich 7276, Moulmein (BM!, CAL! 1 schedula cum ramulis floribusque, altera modo cum foliis partim ssp. *pruniflori* partim *C. Sumatr. ssp. neriifolii*!).

C. dasyphyllum Hand.-Mazz., Sinensia 2 (1931) 4. — Typus: R. C. Ching 7980, China, Nanning merid., Sch-feng Dar Shan (W!).

Young twigs, leaves, outside of sepals pubescent. Leaves oblong to lanceolate 4—8 (—15) by 1—4½ cm; petioles 5—6 (—10) mm. Connective glandulose. Hypogynous scales truncate.

Distribution: South of about 24° N. From the high hills of Burma down to Moulmein; South Siam, and from South China (red river, South Yunnan and Nanning provinces) down to Cambodia, apparently not growing below 10° N. Fig. 6, left.

Ecology (partly from lit.): Mostly among sandy ground, dry mixed jungles or open

forests; bamboo-jungle (Indo-China), and savannah. Altitude low (20 m)—1000 m. Flowering from March to May—June.

Field characters: Medium tree to 15 m tall, base of the trunk spiny. Flowers light pink to red; connective glands purple (Pierre).

Notes. Very alike the former subspecies, though pubescent, the leaves tending to be more lanceolate, and with an apically glandular anther connective like in some specimens of *C. maingayi*. The latter character is also found in other *Guttiferae*, and in *Eliaea* Camb., a genus which is closely allied with *Cratoxylum*.

Kurz (1874) kept the epithet *pruniflora* because Wallich himself had, in sched., in the Calcutta Herbarium, the sheet called *Elodea prunifolia* changed into *Elodea pruniflora*, although this was not effected in his printed Catalogue. Dyer kept to the etymology used in the Catalogue. Kurz's epithet, being the valid one, must be maintained.

4. *Cratoxylum maingayi* Dyer in Hook. f., Fl. Br. Ind. 1 (1874) 258; King, Ann. Roy. Bot. Gard. 5 (1896) 138, t. 165; Gagn., Not. Syst. 1 (1909) 19; Corner, Gard. Bull. Str. Settl. 10 (1939) 23, 28. — Typus: Maingay, Penang (BM!, CGE!, L!). — **Fig. 5m—o.**

C. harmandii Pierre, Fl. For. Coch. 1 (1882) t. 53; Gagn., Not. Syst. 1 (1909) 18. — Typus: Harmand herb. Pierre 3235, Indo-China, inter Mekong et Hué (P!).

C. formosum var. *thorelii* Pierre ex Gagn., Not. Syst. 1 (1909) 19. — Typus: Godefroy 295, Indo-China Merid.-Occid., Grand-Lac (P!).

C. cochinchinense var. *calcareum* Ridl., Kew Bull. (1938) 115. — Typus: Haviland 1463, Sarawak, Mons Start (SING!).

C. acuminatum Merr., Pap. Mich. Acad. Sc. 1937, 23 (1938) 185. — Typus: Rahmat si Boeca 7687, Sumatra, Asahan (A!, MICH!, SING!).

C. subglaucum Merr., Pap. Mich. Acad. Sc. 1937, 23 (1938) 186. — Typus: Rahmat si Boeca 7907, Asahan, Sumatra (A!, MICH!, SING!).

C. parvifolium Merr., J. Arn. Arb. 19 (1938) 56. — Typus: J. & M. S. Clemens 3454, Indo-China, Tourane et vicin. (A!, BM!, P!, U!, US!, W!).

C. thorelii Pierre ex Gagn., Fl. Gén. I.-C. Suppl. 1 (1943) 252. — Typus: Thorel 2065, Indo-China, Chompong-Luong (P!).

Deciduous or partly deciduous. *Leaves* elliptic to oblong, 2—9 by 1—4½ cm; petiole 3—7 mm. *Inflorescences* pauciflorous at the base of whether or not developed twigs, sometimes axillary (as some specimens in Indo-China); pedicels 2—6(—8) mm, in fruit accrescent 4—10(—15) mm. *Sepals* 2½—5 by 1—3 mm. *Petals* 6—12 by 2—5 mm, petal-scales 2—3 mm. *Filaments* less than 20 per phalange, seldom more. *Pistil* 3—8 mm (ovary 2—3 mm). *Capsules* about oblongoid, 9—15 by 3—4 mm (once found a subglobose one 6 by 5½ mm). *Seeds* 5—6 per cell, oblong to ovate-oblong 1½—2 mm wide.

Distribution: Rather rare, in discontinuous areas. Burma: rare; around the Grand-Lac (Tonle Sap) in Cambodia; and apart from this area one between the Mekong and Hué, between Tourane and Quan Tri. Malaya: rather abundant in Singapore and Johore, also in P. Penang and Kedah. Sumatra: very rare, some specimens found about Payakumbu, others in Asahan, Palembang (Rawas), and Riouw (upper Indragiri). Borneo: Sarawak in a small area on hills among Kuching (Bau Distr., and Sungei Semengoh F. R.). Fig. 6, left.

Ecology (data from a few notes and lit.): Indo-China: specimens from the area about Tourane, Hué, etc. are growing in the forest on fertile clayish soil; the surroundings of the Grand-Lac, though no habitat is mentioned, is a mere savannah. In Malaya the specimens are growing mostly at very low altitude, in forests (once noted on rocky

sea coast, in Singapore), like the specimens of Sumatra Eastcoast localities, which are rather inland. The localities in Payakumbu (Sumatra) and those in Sarawak are on limestone hills, sometimes completely exposed. Altitude: in lowland forest, and on limestone hills about (60—)300—800 m. Flowering, in Malaya from March to May, to October in Sarawak.

Field characters: A shrub or small tree up to 20 m, may sometimes reach 35 m (Johore). The limestone specimens are often smaller (to 6 m, seldom more). The bark is "narrowly fissured with small scales" (Corner, in Singapore specimens). Flowers pink or white.

Vernacular names: Malaya: *dërom bukit* (Kedah), *mampat* (Johore). Sarawak: *gerunggang*. Sumatra: *sëmpat* (W. Sum.), *pëmatang* (Palembang), while Rahmat si Boeca for both the Asahan specimens gave the names *kaju bonbon* and *kaju si haras* respectively.

Notes. A rather variable species, occurring in several isolated localities, every population with some characteristics of its own. The Malayan (Sumatra and Indo-China) specimens are superficially very alike the glabrous *C. formosum*, though smaller (Corner, l.c. 29), the limestone specimens show a more congested habit, and the specimens of the locality about Hué (Indo-China) possess a different inflorescence, namely entirely axillary, all others having inflorescences on the lower nodes of the twigs. The specimen Thorel 2065 has an anomalous fruit: subglobular, not lignified, and with undeveloped seeds; this form is only found once.

The main difference with *C. formosum* is the form of the seeds (as King described), the number of seeds in the fruit and, moreover, the number of the filaments in the phalange, the size of the leaves, and the fruits.

Section 3. *Isopterygium*

Engl. in E. & P., Nat. Pfl. Fam. ed. 2, 21 (1925) 184. — *Section 1* Corner, Gard. Bull. Str. Settl. 10 (1939) 33. — Typus: *C. arborescens* (Vahl) Blume. — **Fig. 7, 8.**

Evergreen; interpetiolar scars continuous. Leaves mostly coriaceous and thicker than in the other sections, venation closed, the indistinct fine veins running out in a straight submarginal nerve. Panicles terminal, rich-flowered, mostly leafless. Petals crimson, punctate between the veins, with a minute petal-scale sometimes largely adnate with the petal. Phalanges congested, as is usual in § *Cratoxylum*. Hypogynous scales (if developed) cucullate as in § *Cratoxylum*. Seeds lanceolate, winged all around.

Distribution: Fig. 6, right.

5. *Cratoxylum arborescens* (Vahl) Blume, Mus. Bot. Lugd. Bat. 2 (1852) 17; Dyer in Hook. f., Fl. Br. Ind. 1 (1874) 258; Kurz, For. Fl. Br. Burma 1 (1877) 85; King, J. As. Soc. Beng. 59, ii (1890) 146; Ridl., Fl. Mal. Pen. 1 (1922) 153; Corner, Gard. Bull. Str. Settl. 10 (1939) 22, 31; Meijer, Bot. News Bull. For. Dep. Sandakan 7 (1967) 64. — *Hypericum arborescens* Vahl, Symb. 2 (1791) 86, t. 43. — *Vismia arborescens* Choisy, Prod. Hyp. (1821) 36. — Typus: König, Malaya 1778 (cf.: Fl. Mal. I, 1, 1950, 288) (C!). — **Fig. 7.**

Hypericum coccineum Wall., Cat. (1828) 4823, *nomen*.

Ancistrolobus glaucescens Turcz., Bull. Soc. Nat. Mosc. 31, 1 (1858) 383. — Typus: Lobb 419 Singapore aut ins. Penang (BM 2 specim.!, KW!, W!).

C. cuneatum Miq., Fl. Ind. Bat. 1, 2 (1859) 517. — *C. arborescens* var. *miquelii* King, J. As. Soc. Beng. 59, ii (1890) 146; Corner, Gard. Bull. Str. Settl. 10 (1939) 22, 32. — Typus: Teysmann HB 636, Sumatra, Loeboe Sikeppeng (U!).

Leaves obovate-oblong to obovate-lanceolate or elliptic, 2—4 times as long as broad,

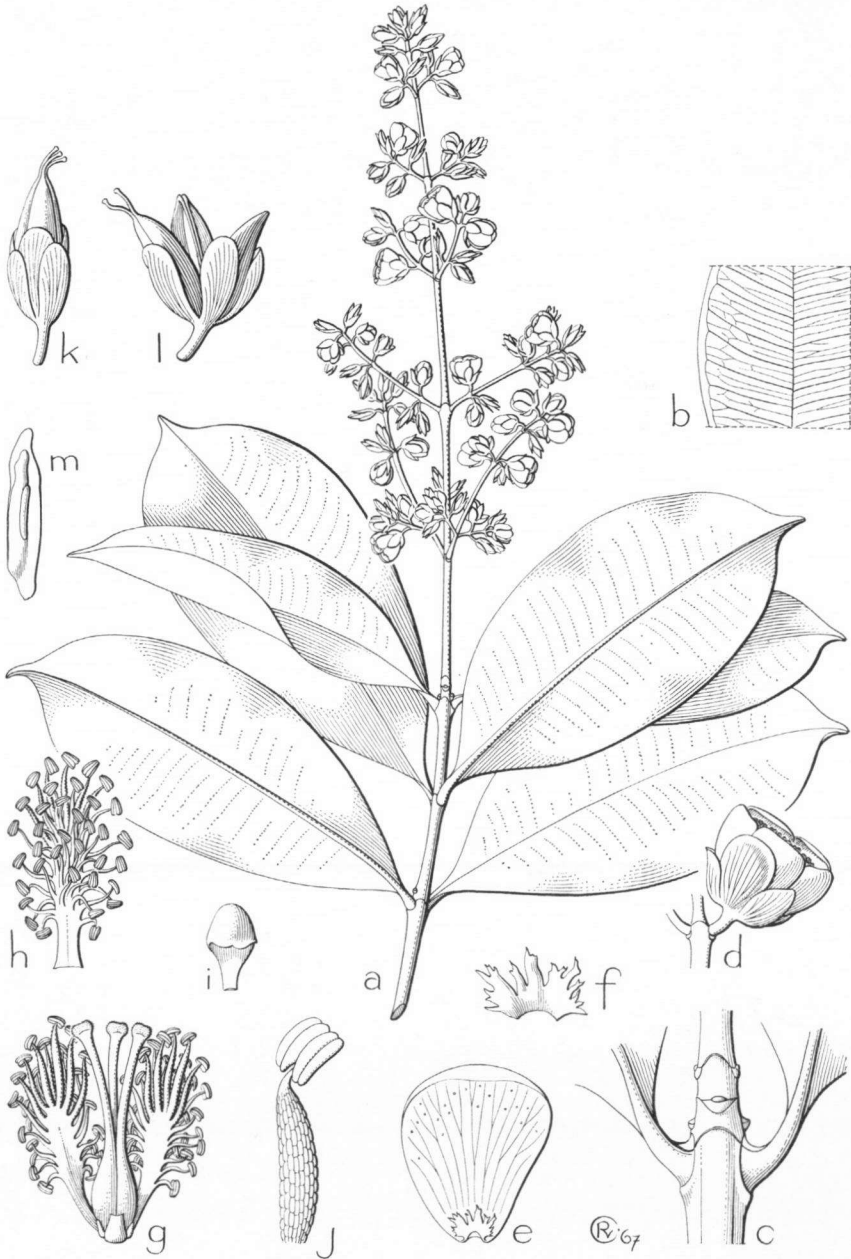


Fig. 7. *Cratoxylum arborescens* (Vahl) Blume. a. Flowering twig, $\times \frac{3}{8}$, b. venation of leaf, c. upper node of a, enlarged, showing continuous petiolar scar, d. flower, $\times 2$, e. petal from inside, with petal-scale, $\times 4$, f. petal-scale, $\times 8$, g. genitals with small hypogynous scales, $\times 6$, h. staminal phalange from outside, i. large, well-developed petal-scale, $\times 6$, j. young anther, filament with swollen cells, $\times 20$, k. young fruit, $\times 2$, l. dehiscent capsule, $\times 2$, m. seed, winged all around, a vein running from margin with a loop through wing towards the centrally situated proper seed, $\times 4$ (a—h, j. SAN 23821, i. Hamid 6383, k—m. Griffith 839).

base attenuate to cuneate, apex acute to cuspidate, 5—16 by 2—6 cm, nerves underneath sometimes slightly raised, submarginal veins 1(—2), underneath not or scarcely papillose or waxy. Petiole 5—10 mm, slender to fairly thick. Pedicels $1\frac{1}{2}$ —3 mm. *Calyx* campanulate, sepals shallowly concave sometimes with slightly recurvate apex, $3\frac{1}{2}$ —6 by 2— $4\frac{1}{2}$ mm. *Petals* mostly caducous, $4\frac{1}{2}$ —7 by $2\frac{1}{2}$ —5 mm, petal-scale up to 1 mm long, often deeply lacinate and often adnate to half of its length, sometimes small and largely adnate. *Pistil* 3—5 mm (ovary $1\frac{1}{2}$ —2 mm). Capsule 7—9 by c. 4 mm; columella half as long as the capsule. *Seeds* 10—18 per cell.

Distribution: Burma: Tenasserim (Kurz); Malaya (incl. P. Penang) except northeastern part; Sumatra; Borneo. Fig. 6, right.

Ecology: Sandy soil, sandy loam, granitic sand (Banka), or freshwater swamps, in primary forests, dipterocarp forest or open forests to peat- and swamp forests. Altitude: low to 900 m, sometimes higher (Kinabalu, to 1800 m). Flowering and fruiting the whole year, less in about December—January.

Field characters: height of the tree maximum 45 m. Bark reddish and scaly. Flowers with deep red petals, only once the colour was noted orange and once white. Hypogynous scales greenish yellow (Malaya, fide Corner).

Vernacular names: Sumatra: *gronggang*, *gèronggang*; *lédé* (Atjeh), *kalat* (Riouw) (while Rahmat si Boeca named a Asahan specimen 'kaju si pare-pare'), *ampèt*, *idat* (Banka), *kaju dori* (Billiton). Borneo: *gèrunggang*, *sèrungan* (N. Borneo, Brunei).

Notes. The type specimen of *C. arborescens* agrees well with currently named material. Though the leaves may vary more or less in size and shape there is no substantial variability. *C. cuneatum* Miq., later reduced to var. *miquelii*, is a form with slender petioles, thin lanceolate elliptic leaves with a fairly long acumen. It is an extreme paramorph connected with the average population by many intermediates. Corner (l.c. 32) believed that in Malaya the more robust form is more characteristic to the lowland forest predominantly of swamps, and that var. *miquelii* would occur from low levels to the hills.

Under the microscope the undersurface of the leaf shows often some minute papillae of the epidermis cells, but not the velutinous, dense-papillose surface of *C. glaucum*.

6. *Cratoxylum glaucum* Korth., Verh. Nat. Gesch. Bot. (1842) 176; Blume, Mus. Bot. Lugd. Bat. 2 (1852) 17; Gagn., Not. Syst. 1 (1909) 21. — Typus: Korthals & Müller, Borneo (L specim. variorum locorum! lectotypus: Müller L 904.31.110, Karrau, Doeson!, BM!, W!). — Fig. 8.

C. microphyllum Miq., Fl. Ind. Bat. Suppl. 1 (1861) 500; Ridl., Fl. Mal. Pen. 1 (1922) 152. — Typus: Teysmann 3395 HB et 3447 HB, Banka (U!, W s.n!).

C. (Ancistrolobus) polystachyus Turcz., Bull. Soc. Nat. Mosc. 36, 1 (1863) 579. — Typus: Horsfield 120, Banka (BM!, SING! ambo 2 specimina, C!).

C. procerum Diels, Bot. Jahrb. (1926) 311. — Typus: Hackenberg 85, Borneo merid., Sampit (*non vidi*).

Cratoxylon A Corner, Gard. Bull. Str. Settl. 10 (1939) 32.

Leaves elliptic, mostly less than 2 times as long as wide, 2—10 by 1—5 cm, base cuneate to acute, apex rounded or obtuse with often blackish mucro to acute, underneath mostly fine yellow orange (seldom gray¹), velutinous by very small globular papillae from the epidermis cells and wax; petioles 2—3 mm. Pedicels 1—3 mm. *Sepals* mostly curved, boat-shaped, 3—6 by $2\frac{1}{2}$ —5 mm. *Petals* subpersistent, 6—8 by 4—5 mm, petal-scale up to 1 mm but mostly less, shallowly denticulate and largely adnate. *Pistil* $4\frac{1}{2}$ —5 mm

¹) Caused by a precipitate of corrugated sublimate used for poisoning specimens.

(proper ovary $1\frac{1}{2}$ — $2\frac{1}{2}$ mm). *Capsule* $7\frac{1}{2}$ —10 by 3—4 mm; columella $\pm \frac{1}{3}$ of the capsule length. *Seeds* 6—8 per cell (4—6 fide Korthals).

Distribution: Malaya: only on Mt Ophir in Malacca (a mountain which stands apart from the Main Range, incl. Alor Gadjah at base and G. Mering at summit at c. 1200 m) and once in G. Arong near Mersing (East Johore, in coastal padang forest). South China Sea: Lingga, Banka, Billiton, Karimata, Natuna Is. (Bunguran). Borneo: West Borneo, Sarawak, Brunei, SE. Borneo (also P. Lampei), Central Borneo (Sanggau, Kenepai). Fig. 6, right.

Ecology: Occupying two allied ecological niches, mainly on podsolized sands, on padangs and kērangas, granitic sands, podsolized white sandy clay, raised beaches, and heath woodland, and in swampy or peaty areas: freshwater swamps (Sarawak), peat-forest (Sampit), flat semi-swamp behind shore, also collected once in peat-forest of ramin type and once in padang alan peat swamp. Altitude: almost always at low altitude, below 100 m, but on Mt Maras (Banka) at 600 m, and on Mt Ophir (Malacca) at 1000 m and even somewhat higher, on peaty soil on granite rock. Flowering and fruiting: sometimes flowers and fruits are found on one twig together; taken over the area throughout the year.

Field characters: Very small specimens on poor soil hardly a foot high may flower and fruit; otherwise in light and secondary forests but also in primary forest where it may be a large tree of the canopy but not emergent, maximum size 25 m tall.

Vernacular names: *Idat*, *idet*, *édat* (Banka), *grunggang* (Billiton); Borneo: *édat*, *kaju longgang* (Pontianak), *gērungan*, *gērōnggang* (Samarinda, Sampit, Sarawak), *sērongan* (Brunei).

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