

HYPERICACEAE¹ (N. K. B. Robson, London)

Trees, shrubs or perennial or annual herbs. *Leaves* simple, opposite and decussate (Mal. *spp.*), entire (Mal. *spp.*), sessile to shortly petioled, often with \pm translucent and sometimes black or red glandular dots and/or lines. Stipules 0. *Inflorescences* terminal and sometimes axillary, very rarely axillary only, cymose to thyrsoid or rarely racemose, bracteate at least initially, 1- ∞ -flowered. *Flowers* bisexual, actinomorphic, homostylous or heterodistylous. *Sepals* 5 (Mal. *spp.*), free or \pm united, imbricate, entire or with margin variously divided and often glandular, lamina glandular like the leaves, usually with greater proportion of glands linear rather than punctiform, persistent (Mal. *spp.*). *Petals* 5 (Mal. *spp.*), free, imbricate (contorted), alternisepalous, entire or with margin variously divided and often glandular, lamina usually glandular like the leaves, sometimes with nectariferous basal appendage, glabrous (Mal. *spp.*), caducous or persistent. *Stamen fascicles* 5 (Mal. *spp.*), epipetalous, free or variously united, each with 1- ∞ stamens; filaments variously united or sometimes apparently free, the free part usually slender; anthers 2-thecal, dorsifixed, often with gland terminating connective. *Staminodial fascicles* 3 or 0 (Mal. *spp.*), when present alternating with stamen fascicles. *Ovary* 1, superior, 5-3-celled or 1-celled with 5-2 parietal placentas; styles 5-3 (2), free or \pm united, \pm slender; stigma punctiform to capitate; ovules ∞ -2 on each placenta (Mal. *spp.*), anatropous, horizontal or ascending. Fruit capsular (Mal. *spp.*), dehiscent septically or loculicidally. Seeds ∞ -1 on each placenta, sometimes winged or carinate; embryo cylindric, straight or curved, with cotyledons longer to shorter than hypocotyl; endosperm absent.

Distribution. There are 7 genera with *c.* 550 *spp.*, cosmopolitan except for Arctic regions and most of Polynesia, but only *Hypericum* and *Triadenum* occur outside the tropics and immediately adjacent areas. Of the three tribes, the *Vismieae* (3 genera) occur in Africa (including Madagascar) and America, the *Cratoxyleae* (3 genera) in Madagascar, Indo-Malesia, E. Asia and NE. America, and the *Hypericeae* (*Hypericum*) throughout most of the range of the family except for most lowland tropical areas. In Malesia only two genera are present: *Cratoxylum* BL. and *Hypericum* L.

Ecology. Apart from *Hypericum* and *Triadenum*, the genera are confined to lowlands or intermediate altitudes in the tropics and subtropics, in \pm mesophytic habitats. *Hypericum* tends to be a high altitude mesophytic genus in the tropics; but some species occasionally grow at low altitudes. In temperate regions it ranges widely in altitude and habitat, but never occurs under extremely arid conditions. Many species of *Hypericaceae* are tolerant of a wide range of soil conditions, but others (especially some herbaceous species of *Hypericum*) are restricted to particular soil types.

Pollination. Flowers of *Hypericum* are nearly all open-pollinated, being visited only for pollen by *e.g.* Syrphid flies and *Bombus spp.* Specialized pollination with nectar secretion and sometimes dimorphic heterostyly has evolved twice in *Hypericum* and also occurs in *Cratoxylum* and *Eliaea* (see below, under Morphology).

Dispersal. Seeds of the *Hypericeae* and *Cratoxyleae* are small and sometimes have wing-like expansions of the testa which would tend to promote wind dispersal. Those without such an aid are normally dispersed by gravity; but the seeds of some species of wet habitats may be carried in mud on the feet of wading birds. Birds or other animals are instrumental in the dispersal of those few species of *Hypericum* (in four distinct parts of the genus) in which the

(1) As will appear in the treatment, *Hypericaceae* do not deserve family rank and should be viewed as a subfamily of *Guttiferae*. It is merely for convenience that this name is maintained here.

normally capsular fruit has become \pm baccate, as well as those of the *Vismieae*, where the fruit is always baccate or drupaceous.

Morphology. The three tribes of the *Hypericeae* can be distinguished by several floral characters, as follows:

Vismieae: Perianth 5-merous; petals adaxially pubescent; staminodial fascicles 5; stamen fascicles 5; ovary 5-merous; fruit baccate or drupaceous.

Cratoxyleae: Perianth 5-merous; petals glabrous; staminodial fascicles 3; stamen fascicles 3 (*i.e.* 2 + 2 + 1); ovary 3-merous; fruit capsular.

Hypericeae: Perianth 5-4-merous; petals glabrous; staminodial fascicles absent or very rarely 3; stamen fascicles 5-4 (free or variously grouped or united); ovary 5-2-merous; fruit capsular or rarely baccate.

The grouping of the stamens has attracted much attention. (For a discussion of this question see ROBSON, *Trans. Bot. Soc. Edinb.* 41, 1972, 365-383, and works cited therein). Evidence from morphology, vascular anatomy and ontogeny indicates that in this family as well as the *Guttiferae*, the androecium basically comprises two diplostemonous whorls of stamen fascicles. In the *Hypericeae* the episepalous fascicles are sterile or absent, whereas the epipetalous ones are fertile and may be free (*Vismieae*, *Hypericum pro parte*), united 2 + 2 + 1 (*Cratoxyleae*, *Hypericum pro parte*) or all united (*Hypericum pro parte*). The individual filaments of each fascicle may be united for over $\frac{1}{4}$ of their length or less; or they may arise independently from the receptacle, so that the androecium appears to be afascicular. The number of stamens in each fascicle varies from 80-100 to 1 in *Hypericum*, plants with an androecium in the latter state typifying the genus *Sarothra* L., which LINNAEUS placed in his group *Pentandria*. These, however, cannot be recognized as distinct from *Hypericum*.

Some species of *Cratoxylum*, and some specimens of the monospecific genus *Eliaea*, have an appendage at the base of the petal ('petal scale') which encloses nectariferous tissue (*cf.* HOCHREUTNER, *C. R. Soc. Phys. Hist. Nat. Genève* 35, 1918, 82-85), and some of these exhibit dimorphic heterostyly, indicating a trend towards specialized insect pollination. This pollination syndrome also occurs exceptionally in *Hypericum* (see ROBSON, *l.c.*). It is associated with stiff erect sepals, resulting in an effectively tubular corolla. In such flowers, HOCHREUTNER (*l.c.*) has shown that the sterile episepalous stamen fascicles ('hypogynous scales') may act like lodicules by swelling and thereby expanding the perianth whorls.

Anatomy. Research on the anatomy of the *Hypericeae* has been summarized in METCALFE & CHALK (*Anat. Dicot.* 1, 1950, 165-169), while a more detailed discussion of floral and vegetative anatomy of the genera *Eliaea* and *Cratoxylum* will be found in P. BAAS (*Blumea* 18, 1970, 369-391). Some of the most important anatomical papers for systematic purposes concern the nature and distribution of the secretory system that is found throughout the *Hypericeae* and *Guttiferae*. Owing to a photosensitive reaction induced by hypericin ('hypericism'), the biochemistry of this and related substances, as well as the clinical details, have been much studied (review in J. M. WATT & M. G. BREYER-BRANDERWIJK, *Med. & Poison Pl. Southern Africa*, ed. 2, 1962, 495). The most recent summaries of the biochemical studies on hypericin and its distribution in *Hypericum*, both morphologically and systematically, are by C. MATHIS & G. OURISON (*Phytochemistry* 2, 1963, 157-171) and C. MATHIS (*Étude Chimiotaxonomique du genre Hypericum L.*, Thèse Fac. Pharm. Univ. Strasbourg, 1963). The form and distribution of 'black' glands has proved to be of taxonomic importance in *Hypericum*, while in *Cratoxylum* the form of the glands in the petals is of sectional significance. Other recent papers concerning anatomical topics in the *Hypericeae* are few, but that by E. K. SCHONFIELD (*Mem. N.Y. Bot. Gard.* 18, 1, 1968), on petiole anatomy in the *Guttiferae* and related families, may be mentioned.

Taxonomy. The tribes *Vismieae*, *Cratoxyleae* and *Hypericeae* are frequently treated as the subfamily *Hypericoideae* of the *Guttiferae*, from which they differ by no one constant character, and so the rank of subfamily may well be the most appropriate one. The combination of the following characters, however, make it immediately recognizable:

Flowers bisexual. Antesepalous stamen fascicles sterile or absent; epipetalous fascicles free or variously united; stamens with filaments slender, free or partly united, and anthers small, dehiscing longitudinally. Ovary with styles 2-5, \pm elongate, free or partly or rarely wholly united and placentae 2-5, axile to parietal, each with 1-~ ovules. Fruit capsular or baccate or

drupaceous. Seeds exarillate; embryo with cotyledons free, not incassate, and hypocotyl \pm slender. Germination epigeal. Leaves usually with venation \pm reticulate; glandular canals often interrupted or replaced by globular lacunae ('punctate glands'), often coloured dark red or black by hypericin.

Cytology. The basic chromosome number for the *Hypericeae* (i.e. *Hypericum*) appears to be $n = 12$, from which there is a descending series along several separate evolutionary lines to $n = 7$ or, possibly, 6 (N. K. B. ROBSON & W. P. ADAMS, *Brittonia* 20, 1968, 95-106). Tetraploids occur on all the base numbers; but the only higher degrees of 'ploidy' recorded (pentaploidy and hexaploidy in *H. perforatum* L. and its hybrids) are associated with a partially apomictic breeding system. Only four species in the other two tribes have known chromosome numbers; two unspecified species of *Vismia* (*Vismieae*) have $n = 10$, whereas in the *Cratoxyleae*, *Cratoxylum formosum* (JACK) DYER has $n = 7$ and *Triadenum virginicum* (L.) RAFIN. $n = 19$. Structural hybridity occurs in two American species of *Hypericum*, *H. punctatum* LAMK and *H. mitchellianum* RYDB. (ROBSON & ADAMS, l.c.).

Chemotaxonomy. *Hypericeae* were treated as *Guttiferae-Hypericoideae* in my 'Chemotaxonomie der Pflanzen' 4 (1966) 223, to which the reader is referred for references of work published before 1965.

Our chemical knowledge of *Hypericaceae* is based largely on *Hypericum*. A great variety of polyphenolic compounds seems to be characteristic of *Hypericum* and related genera. Among them catechins, leucoanthocyanins including leucodelphinidin, chlorogenic acids, flavonols and condensed tannins very often occur in large amounts. The quercetin glycosides rutin, quercitrin and hyperin are very common in *Hypericaceae*; hyperin (= quercetin-3-galactoside) was isolated in 1938 from *Hypericum perforatum* and named after this plant. Most characteristic, however, are anthraquinonoid and xanthonoid pigments. They are mainly located in schizogenous cavities which are present in roots, stems, leaves and flowers. Two photodynamically active emodin-type naphthodianthrone, hypericin and pseudohypericin, seem to occur in all members of the sections *Euhypericum sensu* R. KELLER, *Campyloporus* and *Campylopus* (monotypic; *H. cerastoides* (= *rhodopeum*) only), but not in other sections of the genus *Hypericum*. Hypericin occurs probably also in roots of *Psorospermum guineense* but seems to be lacking in species previously placed in *Ascyrum*. Celebixanthone was isolated from the bark of *Cratoxylum sumatranum* (= *celebicum*) and *Haronga* (= *Harungana*) *madagascariensis* contains anthraquinones, anthrones and xanthones. Chrysophanol, physcion, madagascin, madagascinanthron, harunganin, haronginanthron and euxanthone were isolated from its bark. Very recently 2,7'-biemodol, a new type of dimeric anthraquinones, was extracted from its leaves (D. G. BUCKLEY *et al.* *Austr. J. Chem.* 25, 1972, 843). Maculaxanthone, a complex xanthone derivative has been isolated from roots of *Hypericum maculatum* (P. ARENDS, *Tetrahedron Letters* 1969: 4893) and uliginosin-A and -B were extracted from whole plants of the Mexican *Hypericum uliginosum*; both compounds are isoprenylated and acylated phloroglucin-derived phenols with strong antibiotic activity (H. L. TAYLOR & R. M. BROOKER, *Lloydia* 32, 1969, 217). *Eliaea articulata* contains quercitrin, leucocyanidin and condensed tannins; anthraquinones are absent but the xanthone mangiferin is present in its leaves (H. JACQUEMIN *et al.* *Pl. Méd. Phytothérapie* 3, 1969, 196). Mangiferin occurs also in leaves of *Hypericum humifusum* (PH. LEBRETON & M.-P. BOUCHEZ, *Pl. Méd. Phytothérapie* 1, 1967, 188).

Species of *Hypericum* do also contain essential oils stored in schizogenous cavities. A special feature of these oils is the presence of appreciable amounts of aliphatic compounds like 2-methyloctane, nonane, undecane, octanal and decanal.

Free triterpenes seem to be common in roots and barks. Friedelin and betulinic acid were isolated from the bark of *Harungana madagascariensis* and recently betulinic acid was shown to be a constituent of rootbark of *Hypericum inodorum* MILL. (= *elatum* AIT.) and *H. androsaemum* L. (K. R. HARGREAVES *et al.* *Phytochemistry* 7, 1968, 331). Saponins (i.e. glycosylated triterpenes) and alkaloids seem to occur rarely in *Hypericaceae*.

Chemically *Hypericaceae* are closely related to *Guttiferae*. The latter produce highly characteristic pigments in their resins, oleoresins or 'latices'. The pigments are complex polyisoprenylated and acylated compounds derived from phloroglucin (the so-called coumarin-type neoflavonoids), benzophenones and xanthones. Besides, they produce biflavonoids in wood and

leaves. This group of plant constituents was believed some years ago to be practically restricted to gymnosperms. Constituents like the uliginosins, euxanthone, mangiferin, celebixanthone and maculaxanthone connect *Hypericaceae* chemically intimately with *Guttiferae*.

The same is valid for the preponderance of friedelan-type and lupan-type (lupeol, betulin, betulinic acid) compounds among triterpenes and for the patterns of simple phenolics.

From the phytochemical point of view there is absolutely no need to separate *Hypericaceae* from *Guttiferae* (= *Clusiaceae*), i.e. to postulate family rank for *Hypericoideae*.—R. HEGNAUER.

Embryology. Embryo sac development in *Hypericum* is of the *Polygonum* type. Endosperm development is at first free-nuclear, and a chalazal cyst is produced at the 8- or 16-nucleate stage. This is later absorbed in the rest of the endosperm, which then becomes cellular (cf. A. N. RAO, *Phytomorphology* 7, 1957, 36–45, for details and some earlier references). Aposporous embryos occur in over 90% of the seeds of *H. perforatum* L. (K. L. NOACK, *Z. Indukt. Abstamm. Vererb.* 76, 1939, 569–601). In *Triadenum* the embryo sac development resembles that of *Hypericum*, and apospory has been reported (O. MYERS, *Amer. J. Bot.* 51, 1964, 664).

KEY TO THE GENERA

1. Trees. Flowers red, pink or white. Leaves without red or black glands. Stamen fascicles alternating with hypogynous scales. Capsule loculicidally 3-valved. Seeds winged 1. *Cratoxylum*
1. Herbs or shrubs. Flowers yellow, often tinged red. Leaves with translucent glands and sometimes with black or red glands. Hypogynous scales (in Mal.) absent. Capsule (in Mal.) septicial. Seeds (in Mal.) not or scarcely winged. 2. *Hypericum*

1. CRATOXYLUM

BLUME, *Verh. Bot. Gen.* 9 (1823) 174; *Bijdr.* (1825) 144; *Mus. Bot. Lugd. Bat.* 2 (1852) 15; CORNER, *Gard. Bull. S. S.* 10 (1939) 21; GOGELIN, *Blumea* 15 (1967) 453. — *Elodea* (non JUSS., nec MICHX, nec *Elodes* ADANS.) JACK, *Mal. Misc.* 2 (1822) 21. — *Hornschuchia* (non NEES) BLUME, *Cat. Gew. Btzg* (1823) 15; cf. STEEN. *Bull. Jard. Bot. Btzg III*, 17 (1948) 459. — *Hypericum sect. Tridesmos* CHOISY in DC. *Prod.* 1 (1824) 546. — *Tridesmis* (non LOUR.) SPACH, *Suit. Buff.* 5 (1836) 358; *Ann. Sc. Nat.* II, 5 (1836) 351; *BL. Mus. Bot. Lugd. Bat.* 2 (1852) 18. — *Ancistrolobus* SPACH, *Suit. Buff.* 5 (1836) 360; *Ann. Sc. Nat.* II, 5 (1836) 352. — **Fig. 1–10.**

Trees or shrubs, glabrous (in Mal.). Bark at base of stem exuding yellow resinous sap, hardening black. Branchlets compressed, 4(–6?)-lined, with interpetiolar scars linear, closed (continuous and straight or curved upward) or open (interrupted and curved downward) (fig. 1). *Leaves* opposite or rarely subopposite, entire, sessile or petioled, often with fine translucent ('pale') glandular dots, without black or red glands. *Inflorescences* terminal, racemiform, paniculate to axillary racemes or single flowers. *Flowers* (except staminodial fascicles and gynoeceium) 5-merous, sometimes heterodistylous. *Sepals* quincuncial-imbricate, coriaceous, persistent, with longitudinal pale or black glandular lines or dots, sometimes elongating in fruit. *Petals* deep crimson to pink or white, sometimes tinged orange or green, with reddish or black glandular dots or lines (fig. 1e), sometimes with nectariferous scale-like, basal appendage (fig. 1e, 6f, 8e–f), caducous to subsistent. *Stamen fascicles* united 2 + 2 + 1, single one epipetalous and double ones episepalous, glabrous, caducous, each with ∞ stamens; filaments crimson to white, slender, united for over half their length; anthers crimson to white, ± shortly oblong to rhombic, dorsifixed, sometimes with 1–2 brown resiniferous glands terminating the connective. *Staminodial fascicles* 3, alternating with the fascicles, varying in shape and size (fig. 6g, i, j, 8g, i). (Flowers with 4–5-merous inner whorls occasionally occur). *Ovary* incompletely 3-celled; styles 3, free, ± slender, stigmas small, ± capitate. *Ovules* ∞–4 on the basal half of each placenta, erect or ascending. *Fruit* loculicidal, 3-valved, ± ligneous capsule, with slightly prominent longitudinal

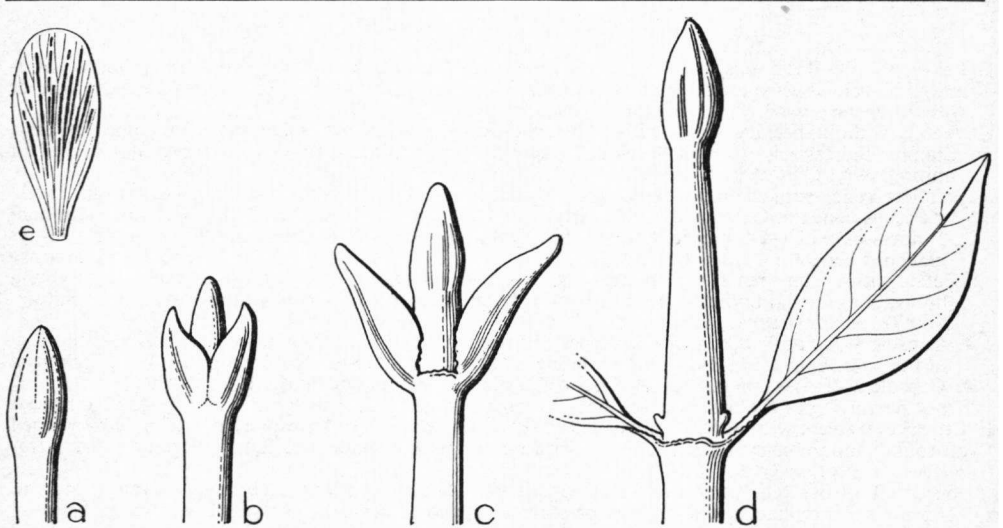


Fig. 1. a-d. Scheme of development of terminal bud in *Cratoxylum*, showing the origin of the interpetiolar scar; in this case the latter is 'continuous'. — *C. sumatranum* (JACK) BL. ssp. *sumatranum*. e. Petal from inside, appendage absent, $\times 3$.

vittae. *Seeds* \sim 4 on each woody placenta (columella), cylindrical to ovoid, imbricate; testa not sculptured; winged unilaterally or all round; embryo cylindrical, straight, with cotyledons longer than the hypocotyl.

Distr. 6 species, occurring in continental Asia from India (east of 92°E) east to S. China (south of c. 24°N and including Hong Kong and Hainan) and throughout *Malesia*, but not in the Moluccas and New Guinea. Fig. 2.

Ecol. In various habitats, from dense primary or secondary forests to grassland, and on various soils, occurring from sea-level to c. 1000 m or rarely to 1800 m.

Morph. The bodies described above as staminodial fascicles have been the subject of much investigation. Morphological and anatomical evidence indicates that they are sterile members of the episepalous androecial whorl (see ROBSON, *Trans. Bot. Soc. Edinb.* 41, 1972, 375, 381); but, whereas the five fertile members of the epipetalous whorl are still present (four of them united in pairs to form double fascicles opposite sepals), the three sterile members of the episepalous whorl are all single organs *i.e.* two members of this whorl do not develop.

Heterodistyly occurs regularly in *sect. Tridesmos* and *C. cochinchinensis* and may be an occasional feature of other species. It is also present in the closely related genus *Eliaea*. This tendency towards specialized insect pollination is accompanied by the development of nectariferous petal appendages (absent in *sect. Cratoxylum*). In addition, the flowers of those species in which heterodistyly is most pronounced tend to be pseudo-tubular, *i.e.* to have erect rigid sepals which prevent the petals from spreading. In these species (at least), the sterile fascicles probably act like the lodicules of grasses by swelling and thus aiding the expansion of the sepals and petals from the bud (see HOCHREUTNER, *C. R. Soc. Phys. Hist. Nat. Genève* 35, 1918, 85).

Uses. Species of *sect. Cratoxylum* and *Tridesmos* have hard, heavy wood. *C. sumatranum* is good for making charcoal and implements. *C. cochinchinense* has fairly durable wood, but is not used much for timber. Species of *sect. Tridesmos*, on the other hand, give a flexible durable timber, which is sometimes used by Indonesians for construction. The species of *sect. Isopterygium* have rather soft, red wood that splits badly and blunts tools on account of its high silica content. The Dayak of Indonesian Borneo, however, make drums of old hollow trunks of *C. arborescens*.

HEYNE (Nutt. Pl. 1927, 1080) stated that the bark at the base of the trunk of *C. formosum* produces a resinous exudate (at first golden yellow, then red, finally black) that is used as a remedy for scabies and leg wounds.

Notes. *Cratoxylum* is closely related to, but distinct from the Madagascan monotypic genus *Eliaea* CAMBESS., according to GOGELIN (1967) and BAAS (*Blumea* 18, 1970, 369-391). It is intermediate in distribution between that genus and *Triadenum* RAFIN., a herbaceous genus that has been wrongly included in *Hypericum* but appears to have been derived from *Cratoxylum*. *Triadenum* has an E. Asia-E. North American disjunct distribution (Assam, Taiwan, Japan, Korea, Siberia—eastern U.S.A. and Canada).

This account is based largely on the revision of the genus by GOGELIN (1967).

KEY TO THE SPECIES

1. Leaves usually deciduous, with nerves \pm curved, distinct, uniting or not but not forming an intramarginal vein. Seeds unilaterally winged. Inflorescence terminal and/or axillary. Petals with or without nectary scale, with punctate or linear glands.
2. Petals without nectary scale, with linear glands. Inflorescence terminal and sometimes axillary. Staminal fascicles (if well developed) recurved or cucullate. Leaves with nerves not arched or uniting. *Sect. Cratoxylum*.
3. Inflorescence paniculate, many-flowered, terminal and sometimes also axillary. Leaves very rarely glaucous beneath. Columella $\frac{1}{4}$ to nearly $\frac{1}{2}$ as long as capsule. 1. *C. sumatranum*
3. Inflorescence of 1-5-flowered cymes, terminal and axillary or axillary only. Leaves nearly always glaucous beneath. Columella basal. 2. *C. cochinchinense*
2. Petals with nectary scale, with punctate glands. Inflorescence axillary on old or the base of young shoots. Staminal fascicles (if well developed) never recurved. Leaves with nerves arched, uniting. *Sect. Tridesmos* (CHOISY) DYER.
4. Capsule 4-6 mm ϕ . Seeds (7-)12-17 per cell, obovoid-cylindric, 2-4 mm wide, with wing narrow at the base. Leaves $3\frac{1}{4}$ -14 cm long, oblong to elliptic or more rarely obovate 3. *C. formosum*
4. Capsule 2-4(-5 $\frac{1}{4}$) mm ϕ . Seeds 4-6 per cell, cylindric to ovoid-cylindric, 1 $\frac{1}{4}$ -2 mm wide, with wing not narrowing at the base. Leaves 2-9 mm long, elliptic to obovate. 4. *C. maingayi*
1. Leaves evergreen, with nerves straight, obscure, uniting to form an intramarginal vein. Seeds winged all round. Inflorescence terminal. Petals with minute nectary scale and punctate glands. *Sect. Isopterygium* ENGL.
5. Seeds 10-13 per cell. Leaves acute to acuminate, 2-4 times as long as broad, obovate-oblong to obovate-oblongate or elliptic, not or scarcely papillose beneath, not yellow or orange beneath. 5. *C. arboreascens*
5. Seeds 4-7 per cell. Leaves rounded to obtuse-apiculate or rarely acute, usually 2 times as long as broad, elliptic, papillose-glaucous in the vein alveoli and usually yellow to orange beneath. 6. *C. glaucum*

1. *Cratoxylum sumatranum* (JACK) BLUME, Mus. Bot. Lugd. Bat. 2 (1852) 16; MIQ. Fl. Ind. Bat. 1, 2 (1859) 516; Suppl. (1861) 194; CORNER, Gard. Bull. S. S. 10 (1939) 35; GOGELIN, Blumea 15 (1967) 459. — *Elodea sumatrana* JACK, Mal. Misc. 2 (1822) 22. — *Hornschurchia hypericina* BL. Cat. Gew. Btzg (1823) 15. — *C. hornschurchii* BL. Verh. Bat. Gen. 9 (1823) 174; KORTH, Verh. Nat. Gesch. Bot. (1842) 178; BL. Mus. Bot. Lugd. Bat. 2 (1852) 15; MIQ. Fl. Ind. Bat. 1, 2 (1859) 516; K. & V. Bijdr. 5 (1900) 134; GAGNEP. Not. Syst. 1 (1909) 20. — *C. clandestinum* BL. Mus. Bot. Lugd. Bat. 2 (1852) 15; MIQ. Fl. Ind. Bat. 1, 2 (1859) 516; K. & V. Bijdr. 5 (1900) 132; GAGNEP. Not.

Syst. 1 (1909) 20; BACK. Schoolfl. Java (1911) 87; ENGL. in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 183. — *C. racemosum* BL. Mus. Bot. Lugd. Bat. 2 (1852) 16; MIQ. Fl. Ind. Bat. 1, 2 (1859) 516; K. & V. Bijdr. 5 (1900) 135; BACK. Schoolfl. Java (1911) 87; ENGL. in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 183; BACK. & BAKH. f. Fl. Java 1 (1963) 383. — *C. celebicum* BL. Mus. Bot. Lugd. Bat. 2 (1852) 16; MIQ. Fl. Ind. Bat. 1, 2 (1859) 516; MERR. Philip. J. Sc. 4 (1909) Bot. 293; En. Philip. 3 (1923) 76; MELJER, Bot. Newsbull. Herb. For. Dept. Sandakan 7 (1967) 64. — *Ancistrolobus floribundus* TURCZ. Bull. Soc. Nat. Mosc. 31 (1858) 382. — *C. arboreum* ELMER, Leaf. Philip. Bot. 8 (1919) 3084. — *C. hypericinum* (BL.) MERR. En. Born. (1921) 392; BACK. & BAKH. f. Fl. Java 1 (1963) 383. — Fig. 3a-d.

Tree or shrub, to 35 m tall, deciduous to subdeciduous, glabrous; bark fissured, peeling in strips, dark brown; young shoots with interpetiolar scar continuous. Leaves sessile or with petiole up to 15 mm, 4-18 by 2-7 cm, elliptic to ovate-oblong, apex rounded to cuspidate, base subcordate or rounded to attenuate, herbaceous to chartaceous, sometimes glaucous beneath. Inflorescence a foliate panicle, often large; pedicels 1 $\frac{1}{4}$ -5 mm. Flowers homostylous. Sepals 3-6 $\frac{1}{4}$ by 3-4 $\frac{1}{4}$ mm. Petals dark or brownish red to brick red, pale green at base, 4-9 by 1 $\frac{1}{4}$ -4 mm. Stamen fascicles 2 $\frac{1}{4}$ -7 $\frac{1}{4}$ mm long, with stamens \pm congested, c. 120 per fascicle; anther gland absent. Staminal fascicles (if well developed) yellow, up to 3 mm long, flattened, oblong to obovate, cucullate. Ovary 1 $\frac{1}{4}$ -3 mm long; styles 1 $\frac{1}{4}$ -3 mm. Capsule 7-10 by 3-5 mm, c. 1-3 times as long as the sepals, cylindric, with columella basal to half as long as capsule. Seeds 3-10 per loculus, 5-7 $\frac{1}{4}$ by 1 $\frac{1}{4}$ -2 mm, oblanceolate to oblong.

Distr. SE. Asia and Malesia: Sumatra, Java,

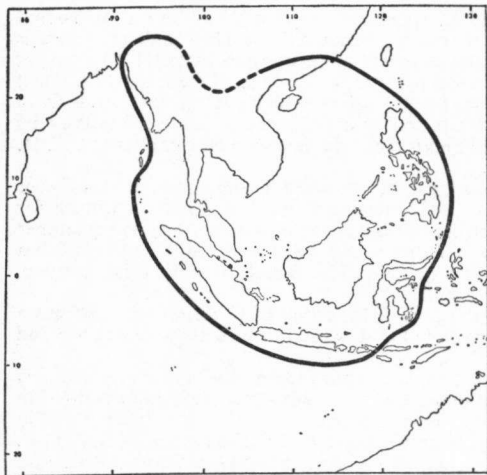


Fig. 2. Range of the genus *Cratoxylum*.

Lesser Sunda Is. (Bali to Sumbawa), Borneo, Celebes, and the Philippines. Fig. 4.

Note. *C. sumatranum* comprises 3 subspecies, one of which (*ssp. neriiifolium* (KURZ) GOGELEIN) occurs from Bengal to Thailand and Laos. It differs from the Flora Malesiana subspecies in having leaves always sessile to subsessile and sometimes glaucous beneath, always relatively few-flowered terminal and axillary panicles, petals bright red to brick red, and sepals in fruit 8–9 by 4–5 mm, almost as long as the capsule. In contrast, *ssp. sumatranum* and *blancoi* have leaves sessile or petiolate (to 15 mm), usually relatively many-flowered terminal (and sometimes axillary) panicles, petals dark red to brownish red, and sepals in fruit 3–7 by 2–4 mm, up to $\frac{1}{4}$ as long as the capsule.

KEY TO THE SUBSPECIES

1. Leaves oblong to lanceolate, 2–4½ times as long as broad, apex acuminate to cuspidate.
ssp. sumatranum
1. Leaves elliptic to elliptic-oblong, 1¼–2¼ times as long as broad, apex rounded or, more rarely, acute to shortly acuminate. . . *ssp. blancoi*

ssp. sumatranum. — Fig. 3a–c.

Leaves oblong to ovate-lanceolate or lanceolate, 2–4½ times as long as broad, 5–18 by 2–5 cm, apex acute to cuspidate, base rounded to attenuate. Panicle variable in size. Capsule 7–12 by 3–5 mm, with sepals up to $\frac{1}{4}$ as long. Seeds 3–10 per loculus.

Distr. *Malesia*: Sumatra, Java, Lesser Sunda Is. (Bali, Lombok, Sumbawa), Borneo, Celebes, Philippines (Luzon, Mindoro, Samar, Leyte, Panay, Siargao). Fig. 4.

Ecol. In primary or secondary forest, open woodland or grassland (Philippines) on well-drained soils of various types, 200–800(–1200) m. Fl. Nov.–May (Borneo), July–Dec. (Java); fr. March–Sept. (Borneo), Dec.–April (Java, Sumatra).

Vern. Sumatra: *garènggang* (P. Simalur), *garunggang*, *kémutusan*; Java: *maron(g)* (Salak), *rènjung gedé* (Sund.), *wuluan* (Central Java); Borneo: *garonggang*, *gèrungang*, *sèrungan* (N. Borneo), *laka-laka*, *sèrungan-mampat* (Brunei), *lingan*, *mampat* (W. Kutai); Celebes: *kaju arang*, *sisio puté* (Malili); Philippines: many names, cf. MERRILL 1923: 76.

Note. This rather variable subspecies is represented in various islands by slightly different races which, although distinguishable locally, cannot be recognized or keyed out as taxonomic entities.

ssp. blancoi (BL.) GOGELEIN, *Blumea* 15 (1967) 463. — *Hypericum olympicum* (non L.) BLANCO, *Fl. Filip.* (1837) 613. — *C. blancoi* BL. *Mus. Bot. Lugd. Bat.* 2 (1852) 17; GAGNEP. *Not. Syst.* 1 (1909) 21; MERR. *En. Philip.* 3 (1923) 75. — *Ancistrolobus micradenius* TURCZ. *Bull. Soc. Nat. Mosc.* 31 (1858) 382. — *C. blancoi* var. *apiculatum* MERR. *Philip. J. Sc.* 4 (1909) Bot. 294. — *C. punctulatum* ELMER ex MERR. *En. Philip.* 3 (1923) 76, *nomen, in sched.* — Fig. 3d.

Leaves ovate or rarely elliptic-oblong to obovate, 1¼–2¼ times as long as broad, 4–14 by 3¼–7 cm, apex rounded to acute or shortly acuminate, base

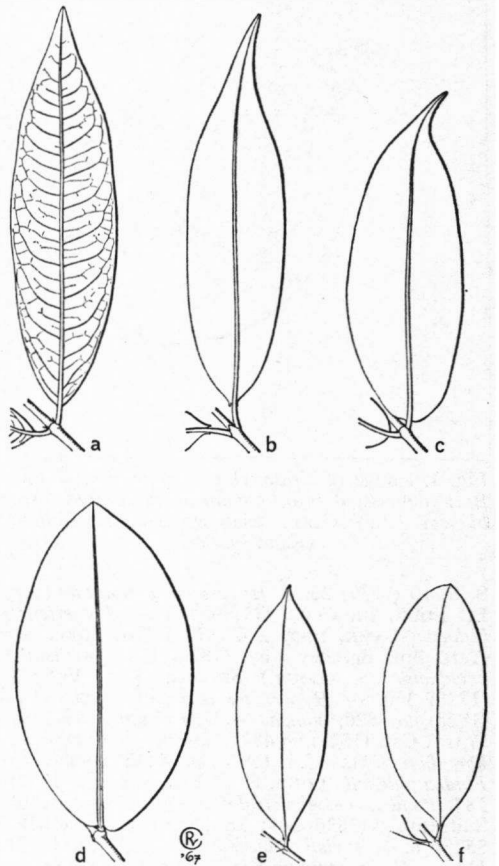


Fig. 3. Leaf shapes, $\times \frac{1}{4}$. a–c. *Cratoxylum sumatranum* (JACK) BL. *ssp. sumatranum*, d. *ssp. blancoi* (BL.) GOG., e–f. *C. cochinchinense* (LOUR.) BL.

broadly to narrowly cuneate. Panicles variable in size, often large. Capsule 8–12 by 3–4 mm, with sepals over half as long. Seeds 6(–7) per loculus.

Distr. *Malesia*: Philippines (Luzon, Catanduanes, Panay, Guimaras, Negros, Bohol, Leyte, Samar, Palawan, Mindanao, Basilan). Fig. 4.

Ecol. "In thickets and secondary forests at low altitudes" (MERRILL).

Vern. Philippines: many names, cf. MERRILL 1923: 76.

Note. *Ssp. blancoi* often intergrades with *ssp. sumatranum* where their respective distributions overlap.

2. *Cratoxylum cochinchinense* (LOUR.) BLUME, *Mus. Bot. Lugd. Bat.* 2 (1852) 17; MERR. *En. Philip.* 3 (1923) 77; BURK. *Dict.* (1935) 678; CORNER, *Gard. Bull. S. S.* 10 (1939) 34; SMYTHIES, *Comm. Sarawak Trees* (1965) 69; GOGELEIN, *Blumea* 15 (1967) 463. — *Hypericum chinense* (non OSBECK nec L.) RETZ. *Observ.* 5 (1789) 27. — *Hypericum cochinchinense* LOUR. *Fl. Coch.* (1790) 472; CORNER, *Gard. Bull.*

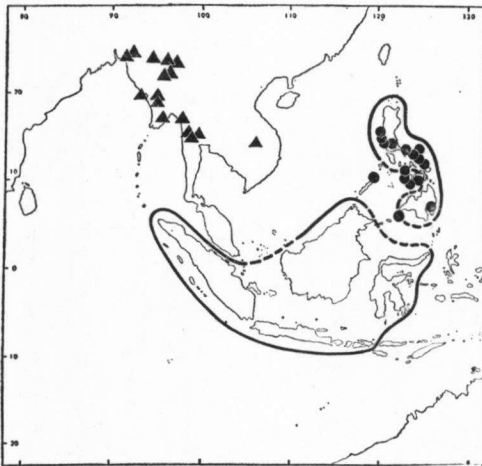


Fig. 4. Range of *Cratoxylum sumatranum* (JACK) BL.; delineated *ssp. sumatranum*, dotted *ssp. blancoi* (BL.) GOG., triangles *ssp. nerifolium* (KURZ) GOG.

S. S. 10 (1939) 26. — *Hypericum petiolatum* (non L.) LOUR. Fl. Coch. (1790) 472. — *Hypericum biflorum* LAMK. Encycl. 4 (1797) 170; HOOK. & ARN. Bot. Beechey Voy. (1833) 173. — *Vismia cochinchinense* (LOUR.) SPRENG. Syst. Veg. 3 (1826) 350. — *Hypericum carneum* WALL. Cat. (1828) no 4820, nomen. — *Hypericum pulchellum* WALL. Cat. (1828) no 4821, nomen. — *Hypericum horridum* WALL. Cat. (1828) no 4822, nomen. — *Elodea pulchella* LOUD. Hort. Brit. Suppl. 1 (1832) 587, nomen. — *Ancistrolobus ligustrinus* SPACH, Suit. Buff. 5 (1836) 361; Ann. Sc. Nat. II, 5 (1836) 352, t. 6. — *Ancistrolobus* sp., WIGHT, Ill. 1 (1840) 111. — *C. polyanthum* KORTH. Verh. Nat. Gesch. Bot. (1842) 175, t. 36; BL. Mus. Bot. Lugd. Bat. 2 (1852) 16; KURZ, J. As. Soc. Beng. 43, ii (1874) 85, incl. var. *genuinum* et var. *carneum* KURZ; DYER, Fl. Br. Ind. 1 (1874) 257, incl. var. *ligustrinum* (SPACH) DYER et var. *wightii* DYER; KURZ, Fl. Burma 1 (1877) 84; PIERRE, For. Fl. Coch. 1 (1882) t. 50; FORB. & HEMSL. J. Linn. Soc. Bot. 23 (1886) 72; KING, J. As. Soc. Beng. 59, ii (1890) 145; BOERL. Cat. Hort. Bog. (1901) 62, incl. var. *macrocarpum* BOERL.; GAGNEP. Not. Syst. 1 (1909) 19; Fl. Gén. I.-C. 1 (1910) 290; GAMBLE, Fl. Pres. Madras 1 (1915) 71; RIDL. Fl. Mal. Pen. 1 (1922) 152; CRAIB, Fl. Siam. En. 1 (1925) 112; ENGL. in E. & P. Nat. Pl. Fam. ed. 2, 21 (1925) 183; HUNDLEY & KO KO, List Trees etc. Burma ed. 3 (1961) 19; SMYTHIES, Comm. Sarawak Trees (1965) 68. — *Ancistrolobus carneum* VOIGT, Hort. Calc. Cat. (1845) 89, nomen. — *Elodea chinensis* (RETZ.) HANCE in Hook. Lond. J. Bot. (1848) 472. — *C. petiolatum* (LOUR.) BL. Mus. Bot. Lugd. Bat. 2 (1852) 17. — *C. ligustrinum* (SPACH) BL. l.c. 16; MERR. En. Philip. 3 (1923) 77; Trans. Am. Phil. Soc. 24 (1935) 268; BURK. Dict. (1935) 678; CORNER, Gard. Bull. S. S. 10 (1939) 29, 34. — *C. myrtifolium* BL. Mus. Bot. Lugd. Bat. 2 (1852) 17. — *C. wightii* BL. l.c. 18; CORNER, Gard. Bull. S. S. 10 (1939) 24. — *Elodea* sp., GRIFF. Notul. 4

(1854) 569. — *Ancistrolobus brevipes* TURCZ. Bull. Soc. Nat. Mosc. 31 (1858) 383. — *C. lanceolatum* MIQ. Fl. Ind. Bat. Suppl. (1861) 500. — *Stalagmites erosipetala* MIQ. J. Bot. Néerl. 1 (1861) 126. — *C. biflorum* (LAMK) TURCZ. Bull. Soc. Nat. Mosc. 36 (1863) 580. — *C. chinense* (RETZ.) MERR. Philip. J. Sc. 4 (1909) Bot. 292. — *C. hypoleuca* ELMER, Leaf. Philip. Bot. 5 (1913) 1787. — Fig. 3e-f.

Tree or shrub, to c. 30 m tall, deciduous, glabrous; bark smooth, pale or scaly, grey-brown; young shoots with interpetiolar scar continuous or interrupted. *Leaves* with petiole 2–5 mm, 3–10¼ by 1–4 cm, elliptic to ovate-lanceolate or lanceolate, apex obtuse to acutely acuminate, base broadly cuneate to attenuate, herbaceous to chartaceous, nearly always glaucous beneath. *Inflorescence* of 1–5-flowered axillary and usually terminal cymes; pedicels 1–2 mm. *Flowers* heterodistylous. *Sepals* 5–7 by 2–5 mm. *Petals* dark red to pink or orange, 5–10 by 2¼–5 mm. *Stamen fascicles* 4–8 mm long, with stamens ± congested, c. 45–55 per fascicle; anther gland sometimes present. *Staminodial fascicles* (if developed) yellow, up to 3 mm long, flattened, oblong to obovate, cucullate. *Ovary* 2–3 mm long; styles 1–3 mm. *Capsule* 8–12 by 4–5 mm, c. 1–1¼ times as long as sepals, ellipsoid-cylindric, with columella basal. *Seeds* (5–)6–8 per loculus, 6–8 by 2–3 mm, oblanceolate to elliptic or oblong.

Distr. Burma, China (south of 23°N), Hongkong, Hainan, Indo-China, Thailand, in *Malesia*: Sumatra, Malaya, Borneo, Philippines (Palawan, Culion). Fig. 5.

Ecol. In primary or secondary forest, open woodland, grassland and river banks on usually well-drained soils of various types, 0–500 m (to 1200 m in China). *Fl. fr.* throughout the year.

Vern. Sumatra: *mulu* (Lampungs), *kaju lulus*, *lélulus* (Palembang), *mengidjang* (Banka); Malaya: *dèrum sèlunchor*, *sèlunchor* (Perak), *kaju arang*, *kèmunjong*, *pèlawan* (Kelantan), *bèlawan padang*,

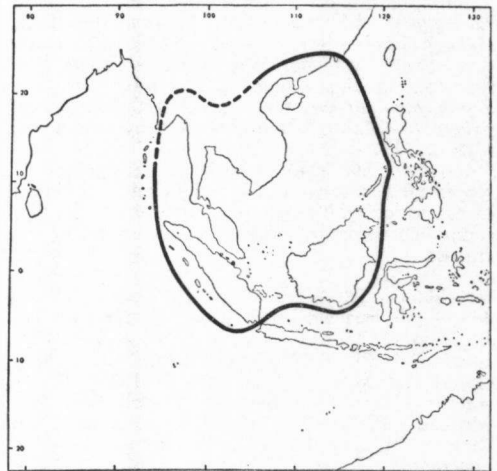


Fig. 5. Range of *Cratoxylum cochinchinense* (LOUR.) BL., coinciding with the range of sect. *Cratoxylum*.

kêlochus (Pahang), *bêluchus* (Negri Sembilan), *sêrapat*; Borneo: *mampat*, *maradjalang*, *mulun* (W. Borneo), *baduk-baduk*, *gêronggang*, *mogizon*, *pêlawan-pêlawan* (Brunei), *selangan-biabas*, *taik-akan* (Selangan Is.).

Note. The variation in *C. cochinchinense* ranges between the following extremes:

- (1) '*C. polyanthum* var. *wightii*' (DYER). Shrub or small tree; bark rough, grey-brown; interpetiolar scar usually interrupted. Leaves sometimes subopposite; lamina apex usually obtuse, base broadly to narrowly cuneate, seldom separating from midrib. Stamen fascicle stalks slender, over $\frac{1}{2}$ of the total fascicle length (in flowers with staminode fascicles present).
- (2) '*C. polyanthum* var. *ligustrinum*' (DYER). Becoming large tree; bark smooth, pale; interpetiolar scar continuous. Leaves opposite; lamina apex acuminate, base attenuate, often slightly separating from midrib to produce minute appendages. Stamen fascicle stalks often compressed, short.

3. *Cratoxylum formosum* (JACK) DYER, Fl. Br. Ind. 1 (1874) 258; KURZ, Fl. Burma 1 (1877) 84; PIERRE, For. Fl. Coch. 1 (1882) t. 51; KING, J. As. Soc. Beng. 59, ii (1890) 147; K. & V. Bijdr. 5 (1900) 137; GAGNEP. Not. Syst. 1 (1909) 288; Fl. Gén. I.-C. 1 (1909) 288; BACK, Schoolfl. Java (1911) 88; RIDL, Fl. Mal. Pen. 1 (1922) 153, f. 16; CRAIB, Fl. Siam. En. 1 (1925) 111; ENGL. in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 184; HEND. Gard. Bull. S. S. 4 (1928) 222; CORNER, Gard. Bull. S. S. 10 (1939) 34; Wayside Trees Mal. (1940) 325, t. 69; BACK & BAKH, f. Fl. Java 1 (1963) 363; MEIJER, Bot. Newsbull. For. Dept. Sandakan 7 (1967) 64; GOGELIN, Blumea 15 (1967) 467. — *Elodea formosa* JACK, Mal. Misc. 2 (1822) 24. — *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; BL. Mus. Bot. Lugd. Bat. 2 (1852) 18. — *Tridesmis jackii* SPACH, Ann. Sc. Nat. II, 5 (1836) 352; TURCZ. Bull. Soc. Nat. Mosc. 31 (1858) 384. — *Hypericum aegyptium* (non *H. aegypticum* L.) BLANCO, Fl. Filip. (1837) 615. — *Tridesmis formosa* (JACK) KORTH, Verh. Nat. Gesch. Bot. (1843) 197, t. 37. — *C. pentadelphum* TURCZ. Bull. Soc. Nat. Mosc. 36 (1863) 580; K. & V. Bijdr. 5 (1900) 139. — Fig. 6a-l.

Tree to 35 m tall, deciduous, glabrous, or partly pubescent; trunk spiny at base, bark grey, coarsely fissured, scaly; young shoots glabrous or pubescent, with interpetiolar scar interrupted. Leaves with petiole 5–15 mm, $3\frac{1}{4}$ –14 by 1–7 cm, elliptic or sometimes obovate to oblong or lanceolate or ovate, apex acute or shortly acuminate to rounded, base broadly cuneate to rounded, herbaceous to chartaceous, sometimes glaucous beneath. Inflorescence of 1–6-flowered cymes in lower axils of current shoots or, if shoot fails to develop, apparently axillary on older stems; pedicels 3–10(–15) mm. Flowers heterodistylous. Sepals 4–7 by 2–4 mm. Petals white or pink to red or (very rarely) purplish, 7–17 by 3–7 mm; nectary scale 2–4 mm, rounded, entire or subentire. Stamen fascicles 5–14 mm, with stamens relatively lax, 20 per fascicle; anther gland present,

purple, or absent. *Staminodial fascicles* (if well developed) orange-red, trigonous, linguiform, attenuate to truncate, not cucullate. *Ovary* 2–4½ mm long; styles 2–8 mm. *Capsule* 10–16 by 4–6 mm, three times as long as sepals, ellipsoid, with columella \pm half as long as capsule. *Seeds* (7–)12–17 per loculus, 6–7½ by 2–4 mm, oblanceolate.

Distr. Hainan, South Vietnam, Cambodia, S. Thailand, S. Andaman Is., in *Malaysia*: Sumatra, Malaya, Banka, Java, Borneo, Celebes (incl. P. Buton), Philippines (Luzon, Polillo, Mindoro, Sibuyan, Guimaras, Negros, Busuanga, Culion, Palawan, Mindanao). Fig. 7.

Ecol. In primary or old secondary forest, hill slopes, river margins or swamps, on sand or clay soils, 0–600(–1200) m. Fl. March–July (Borneo) or later (Sumatra, Banka) or earlier (Malaya).

Vern. Sumatra: *kêbutul*, *kêmutul* (Lampungs), *kêmbutul*, *têmbutul* (Palembang), *mampat* (Palembang, Riouw), *ampêt*, *mampêt*, *têmutun* (Banka); Malaya: *dêrom* (Kedah, K. Lumpur), *bêtina*, *gêronggang*, *mumpat* (Perak), *kêmunlong*, *mampat* (Kelantan), *mampat* (K. Lumpur), *drum* (P. Penang); Java: *rêmbang putun*; Borneo: *butun*, *kasat baku*, *mulun* (S. & E. Borneo), *pêlawan* (Brunei), *biabas tahun*, *gêronggang*, *kalambunan*, *mengkutan*, *obah bukit*, *sêrungan* (N. Borneo); Philippines: *mango-gong*, *maranguub*, *salingagon* (Palawan).

Note. *C. formosum* comprises two subspecies which scarcely overlap in distribution. Only *ssp. formosum* occurs in the Flora area. It differs from *ssp. pruniflorum* (KURZ) GOGELIN (S. China and Burma to S. Thailand) in being completely glabrous with leaves elliptic to oblong or rarely lanceolate (not oblong to lanceolate) and the anther connective eglandular (not glandular).

4. *Cratoxylum maingayi* DYER, Fl. Br. Ind. 1 (1874) 258; KING, J. As. Soc. Beng. 59, ii (1890) 147; Ann. R. Bot. Gard. Calc. 5 (1896) 138, t. 165; GAGNEP. Not. Syst. 1 (1909) 19; RIDL, Fl. Mal. Pen. 1 (1922) 154; BURK. Dict. (1935) 679; CORNER, Gard. Bull. S. S. 10 (1939) 35; Wayside Trees Mal. (1940) 327; GOGELIN, Blumea 15 (1967) 470. — *C. harmandii* PIERRE, For. Fl. Coch. 1 (1882) t. 53; GAGNEP. Not. Syst. 1 (1909) 18; Fl. Gén. I.-C. 1 (1909) 288. — *C. formosum* var. *thorellii* GAGNEP. Not. Syst. 1 (1909) 19; Fl. Gén. I.-C. 1 (1909) 289. — *C. cochinchinense* var. *calcareum* RIDL, Kew Bull. (1938) 115. — *C. acuminatum* MERR. Pap. Mich. Ac. Sc. 23 (1938) 185. — *C. subglaucum* MERR. l.c. 186. — *C. parviflorum* MERR. J. Arn. Arb. 19 (1938) 56. — *C. thorellii* PIERRE ex GAGNEP. Fl. Gén. I.-C. Suppl. 1 (1943) 252. — Fig. 6m-o.

Shrub or small tree, to 20 (rarely 35) m tall, deciduous or partly deciduous, glabrous; bark narrowly fissured with small scales, dark greyish-brown; young shoots with interpetiolar scar interrupted. Leaves with petiole 3–7 mm, 2–9 by 1–4½ cm, elliptic to oblong, apex shortly acuminate to rounded, base cuneate to subattenuate, chartaceous, not glaucous beneath. Inflorescence of 1–4-flowered cymes in lower (or sometimes also upper) axils of current shoots or, if shoot fails to develop, apparently axillary on older stems; pedicels 2–6(–8) mm. Flowers heterodistylous. Sepals 2½–5 by 1–3 mm. Petals white or pink,

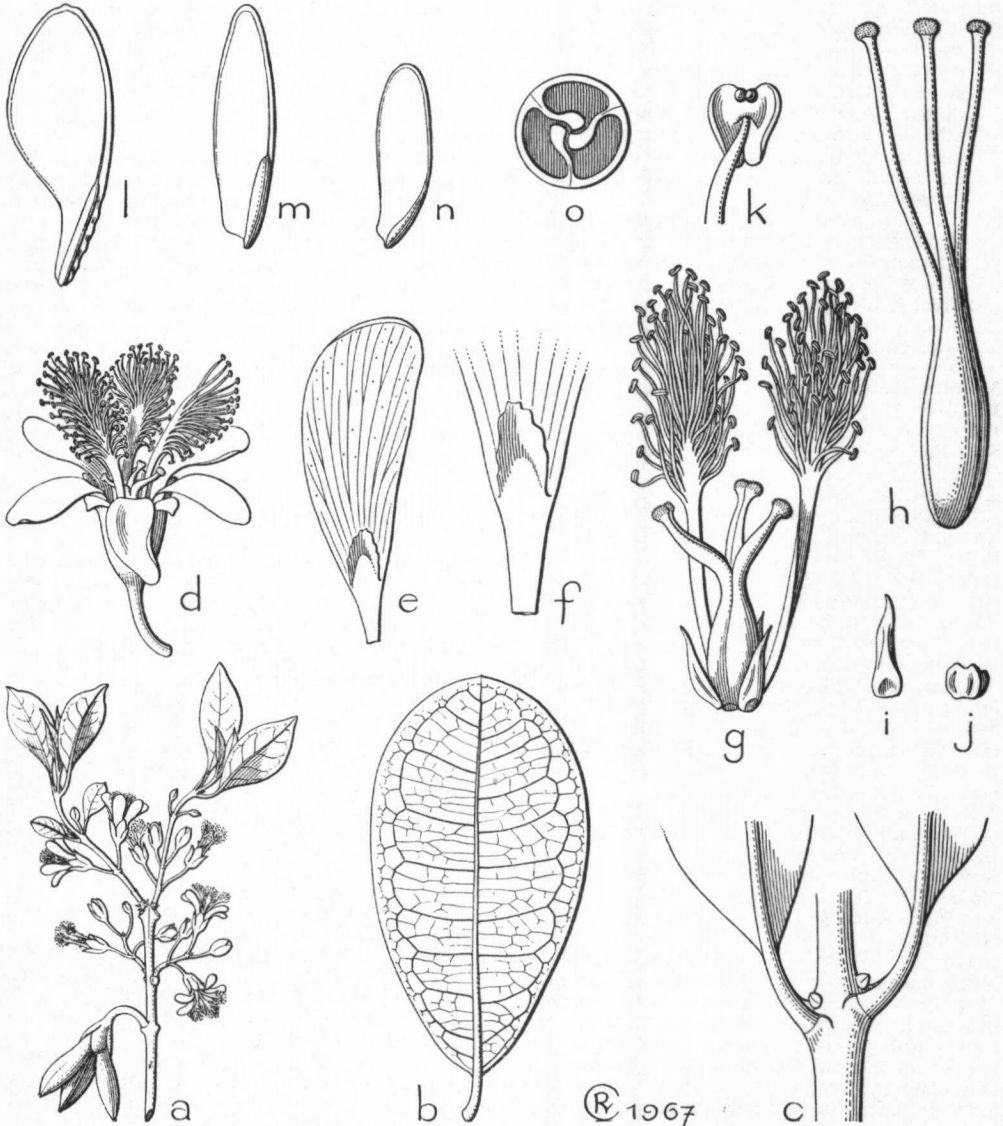


Fig. 6. Sect. *Tridesmos*. — *Cratoxylum formosum* (JACK) DYER *ssp. formosum*. a. Fertile twig apex, $\times \frac{1}{4}$, b. leaf, $\times \frac{1}{4}$, c. node, showing open interpetiolar scar, enlarged, d. short-styled flower, $\times 2$, e. petal, from inside, $\times 4$, f. base of same, showing appendage, $\times 8$, g. genitals and staminodial fascicles of short-styled flower, $\times 6$, h. pistil of long-styled flower, $\times 6$, i. staminodial fascicle, $\times 6$, j. staminodial fascicle, $\times 6$, k. anther, showing connective glands, $\times 20$. — *C. formosum ssp. pruniflorum* (KURZ) GOG. j. Staminodial fascicle, $\times 6$, 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. 12-11-1927, d-h MAGNEN, GOURGAND, CHÂTILLON, dd. 20-10-1909, j-k HENRY 10687, m-n SF 36465, o RAHMAT SI BOREA 7907).

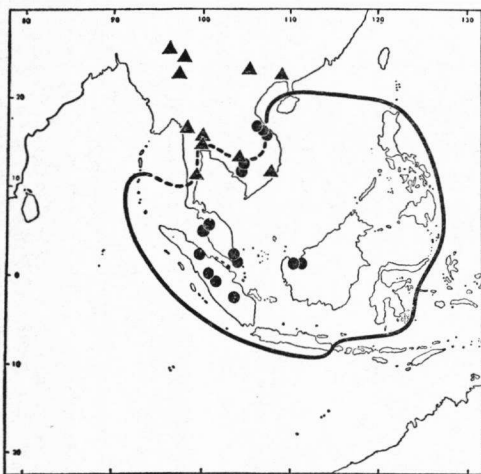


Fig. 7. Range of sect. *Tridesmos*; delineated *Cratoxylum formosum* (JACK) DYER *ssp. formosum*, triangles *ditto ssp. pruniflorum* (KURZ) GOG., dotted *C. maingayi* DYER.

6–12 by 2–5 mm; nectary scale 2–3 mm, truncate, undulate-denticulate. *Stamen fascicles* (5?)–7–9 mm, with stamens relatively lax, nearly always <20 per fascicle; anther gland present. *Staminodial fascicles* trigonous (?), linguiform, attenuate, not cucullate. *Ovary* 2–3 mm long; styles 1–5 mm. *Capsule* (6–)9–15 by 3–4(–5¼) mm, c. 2¼ times as long as sepals, fusiform, with columella ±½ as long as capsule. *Seeds* 5–6 per loculus, 6–6¼ by 1¼–2 mm, oblong to oblanceolate-oblong.

Distr. Burma, Cambodia, Central Vietnam, in *Malesia*: Sumatra (Payakumbu, Asahan, Riouw, Palembang), Malaya (Kedah, P. Penang, Johore, Singapore), Borneo (Sarawak, only near Kuching). Fig. 7.

Ecol. In lowland forest and on limestone hills, (60–)300–800 m. *Fl.* March–May (Malaya), Oct. (Sarawak).

Vern. Sumatra: *səmapat* (West), *pəmatang* (Palembang), *kaju bonbon*, *kaju si haras* (Asahan); Malaya: *dərom bukit* (Kedah), *mampat* (Johore); Borneo: *gərunggang* (Sarawak).

Note. The discontinuous populations of *C. maingayi* tend to be morphologically distinguishable. They all differ from *C. formosum*, however, in the form and number of the seeds, the number of stamens per fascicle, the size of the leaves and the capsule shape.

5. *Cratoxylum arborescens* (VAHL) BLUME, Mus. Bot. Lugd. Bat. 2 (1852) 17; KURZ, J. As. Soc. Beng. 43, ii (1874) 83; DYER, Fl. Br. Ind. 1 (1874) 258; KURZ, Fl. Burma 1 (1877) 85; KING, J. As. Soc. Beng. 59, ii (1890) 146, *incl. var. miquelii* KING; RIDL, Fl. Mal. Pen. 1 (1922) 153; ENGL. in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 184; FOXW. Mal. For. Rec. 3 (1927) 138, tt.; HEND. Gard. Bull. S. S. 4 (1928) 223; BURK. Dict. (1935) 678; CORNER, Gard. Bull. S. S. 10 (1939) 22, 31, 34; Wayside Trees Mal. (1940) 325; HUNDLEY & Ko Ko, List Trees etc. Burma ed. 3 (1961) 19;

MEIJER, Bot. Newsbull. For. Dept. Sandakan 7 (1967) 64; GOGELIN, Blumea 15 (1967) 471. — *Hypericum arborescens* VAHL, Symb. 2 (1791) 86, t. 43. — *Vismia arborescens* (VAHL) CHOISY, Prod. Monogr. Hypér. (1821) 36; in DC. Prod. 1 (1824) 543. — *Hypericum coccineum* WALL. Cat. (1828) no 4823, *nomen*. — *Ancistrolobus glaucescens* TURCZ. Bull. Soc. Nat. Mosc. 31 (1858) 383. — *C. cuneatum* MIQ. Fl. Ind. Bat. 1, 2 (1859) 517; GAGNEP. Not. Syst. 1 (1909) 21. — Fig. 8.

Tree, up to 45 m tall, evergreen, glabrous; bark scaly, reddish; young shoots with interpetiolar scar continuous. *Leaves* with petiole 5–10 mm, 5–16 by 2–6 cm, obovate-oblong to obovate-oblanceolate or elliptic (2–4 times longer than broad), apex acute to cuspidate, base cuneate to attenuate, usually coriaceous, not or scarcely glaucous or papillose beneath. *Inflorescence* a many-flowered terminal pyramidal panicle; pedicels 1¼–3 mm. *Flowers* homostylous. *Sepals* 3¼–6 by 2–4¼ mm. *Petals* deep red or very rarely orange or white, 4¼–7 by 2¼–5 mm; nectary scale up to 1 mm, often deeply lacinate. *Stamen fascicles* 4–5 mm, with stamens relatively congested, 30–40 per fascicle; anther gland absent? *Staminodial fascicles* (if well developed) greenish yellow, flattened, obovate, cucullate. *Ovary* 1¼–2 mm long; styles 1¼–3 mm. *Capsule* 7–9 by c. 4 mm, c. 1¼ times as long as sepals, cylindrical, with columella half as long as capsule. *Seeds* 10–18 per loculus, c. 5 by 0.8 mm, narrowly oblong.

Distr. Burma (Tenasserim), in *Malesia*: Sumatra, Malaya (except the NE. part), Borneo. Fig. 10.

Ecol. Primary forest, dipterocarp forest, open forest, peat- and swamp-forest and fresh-water swamps on sand or sandy loam, 0–900 m or higher (to 1800 m on Mt Kinabalu).

Vern. Sumatra: *gəronggang*, *gronggang*; *lédé* (Atjeh), *kalat* (Riouw), *ampèt*, *idat* (Banka), *kaju dori* (Billiton), *kaju si pare-pare* (Asahan); Borneo: *gərongan*, *gərunggang*, *sərunan* (N. Borneo, Brunei).

Note. '*Var. miquelii*' is an extreme form with slender petioles and thin lanceolate-elliptic leaf-laminae, which is connected to the typical form by many intermediates.

6. *Cratoxylum glaucum* KORTH. Verh. Nat. Gesch. Bot. (1842) 176; BL. Mus. Bot. Lugd. Bat. 2 (1852) 17; MIQ. Fl. Ind. Bat. 1, 2 (1859) 517; HALL, f. Ann. Jard. Bot. Btzg 14 (1897) 26; GAGNEP. Not. Syst. 1 (1909) 21; GOGELIN, Blumea 15 (1967) 473. — *C. microphyllum* MIQ. Fl. Ind. Bat. Suppl. 1 (1861) 500; RIDL, Fl. Mal. Pen. 1 (1922) 153; SMYTHIES, Comm. Sarawak Trees (1965) 69. — *C. polystachyum* TURCZ. Bull. Soc. Nat. Mosc. 36 (1863) 579. — *C. procerum* DIELS, Bot. Jahrb. (1926) 311. — *Cratoxylum* A CORNER, Gard. Bull. S. S. 10 (1939) 32. — Fig. 9.

Tree, up to 25 m tall, evergreen, glabrous; bark scaly (?); young shoots with interpetiolar scar continuous. *Leaves* with petiole 2–3 mm, 2–10 by 1–5 cm, elliptic (mostly less than twice as long as wide), apex acute or obtuse with often blackish mucro to rounded, base broadly to narrowly cuneate, coriaceous, densely greyish to orange-yellow papillose-glaucous beneath. *Inflorescence* a few- to many-flowered terminal, cylindrical to

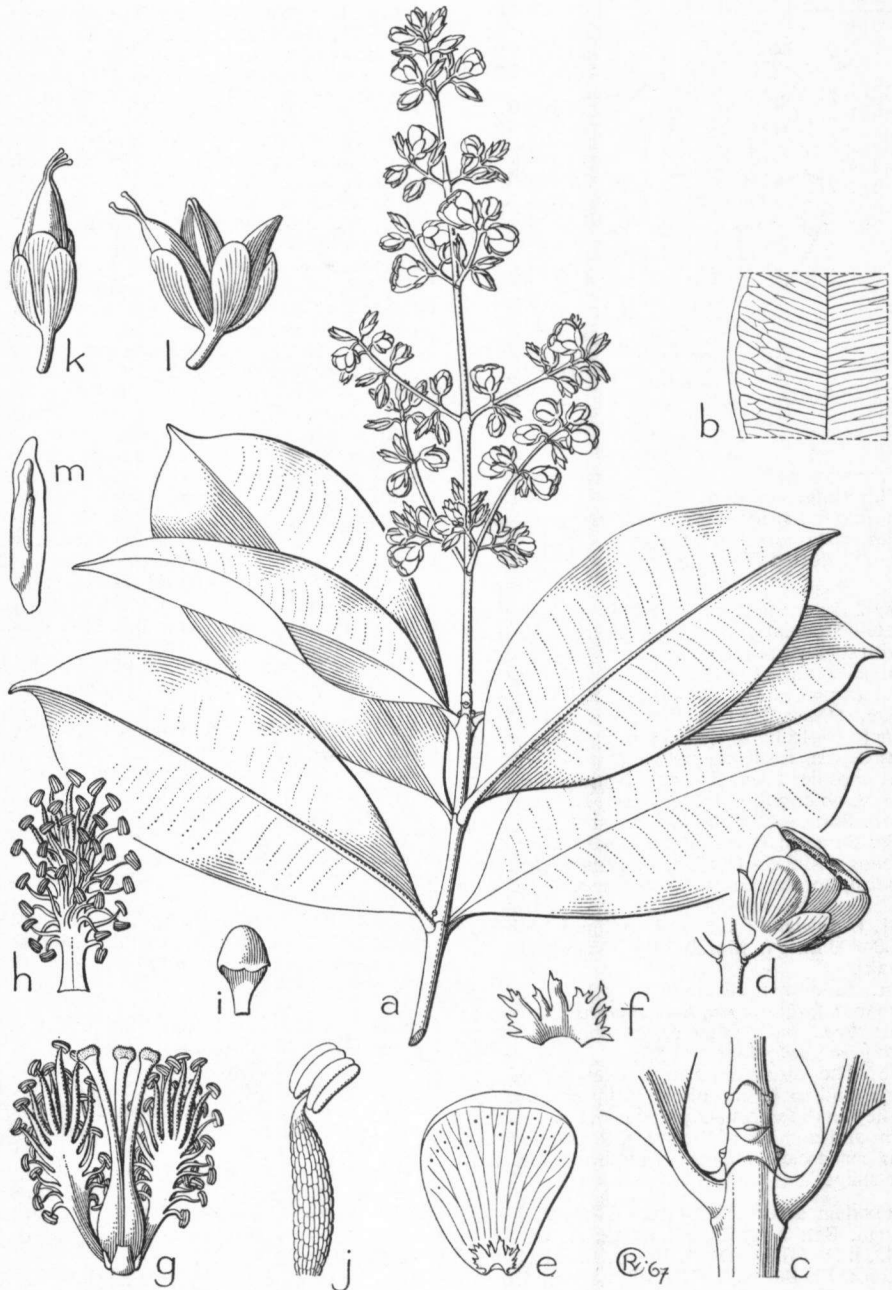


Fig. 8. *Cratoxylum arborescens* (VAHL) BL. a. Flowering twig, $\times \frac{1}{4}$, b. venation of leaf, c. upper node of a, enlarged, showing continuous petiolar scar, d. flower, $\times 2$, e. petal from inside, with appendage, $\times 4$, f. petal appendage, $\times 8$, g. genitals with small staminodial fascicles, $\times 6$, h. staminal phalange from outside, i. large, well-developed staminodial fascicle, $\times 6$, 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 seed proper, $\times 4$ (a-h, j SAN 23821, i HAMID 6383, k-m GRIFFITH 839).

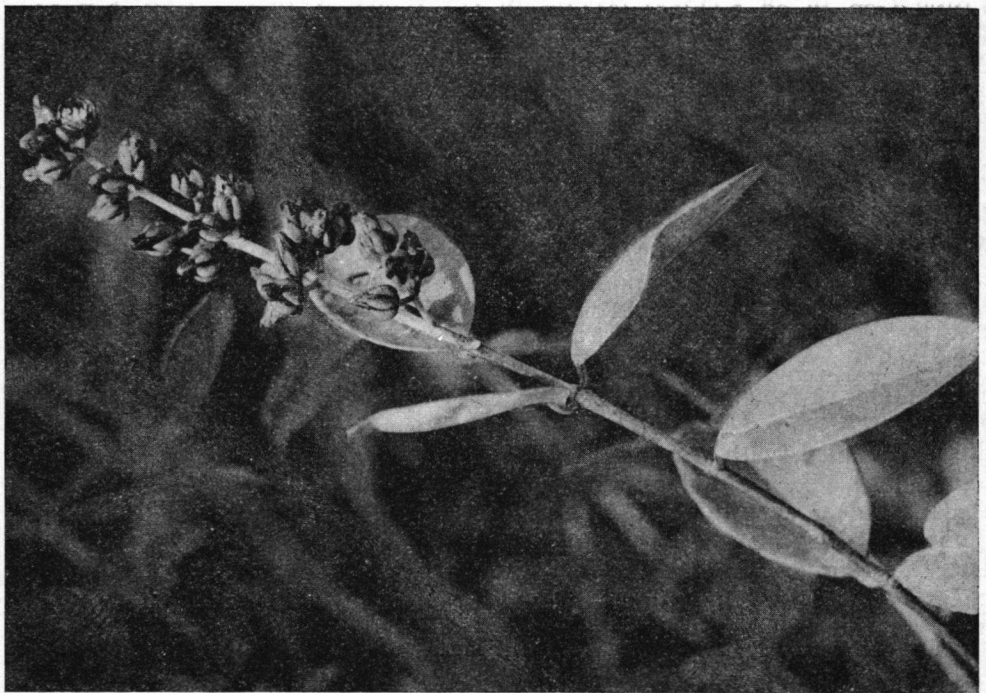
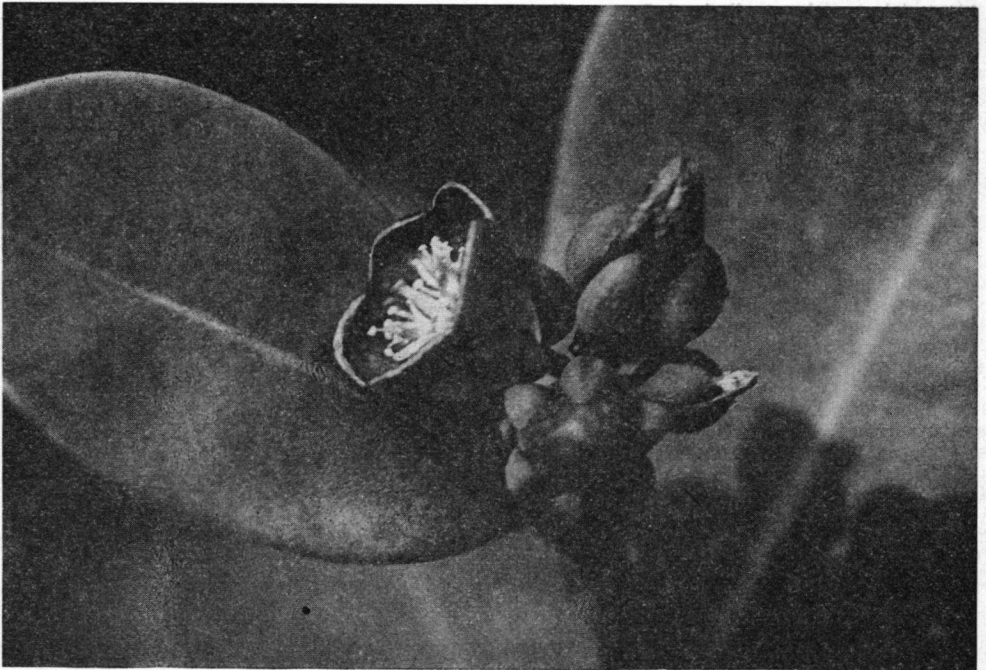


Fig. 9. *Cratoxylum glaucum* KORTH. (Photogr. Father A. ELSENER, Kalimantan, Sanggau, 1961).

pyramidal panicle; pedicels 1–3 mm. *Flowers* homostylous. *Sepals* 3–6 by 2¼–5 mm. *Petals* deep red to crimson, 6–8 by 4–5 mm; nectary scale up to 1 mm (usually shorter), shallowly denticulate. *Stamen fascicles* c. 5 mm, with stamens relatively congested, 30–40 in each fascicle; anther gland absent. *Staminodial fascicles* (if well developed) 1¼ mm, flattened, oblong, cucullate. *Ovary* 1¼–2¼ mm long; styles 2¼–3 mm. *Capsule* 7¼–10 by 3–4 mm, 2¼–3 times as long as sepals, cylindrical, with columella ±¼ as long as capsule. *Seeds* (4–) 6–8 per loculus, 5–5¼ by 1 mm, narrowly oblong.

Distr. Malesia: Malaya (E. Johore: Mt Ophir, G. Arong near Mersing), E. Sumatran Is. (Lingga, Banka, Billiton, Karimata), Natuna Is. (Bunguran), Borneo (west: Sarawak, Brunei; central: Sanggau, Kenepai; south-east, also P. Lampei). Fig. 10.

Ecol. Mainly on podsolised sands and kèrangas (heath woodland, raised beaches, etc.), also in swampy or peaty areas (fresh-water swamps, peat swamp, peat forest), 0–100 m, rarely higher (600 m on Mt Maros, Banka, 1000 m and above on Mt Ophir in Johore).

Vern. E. Sumatran Is.: *édát, idat, idet* (Banka), *grunggang* (Billiton); Borneo: *édát, kaju longgang* (Pontianak), *gèronggang, gèrungan* (Samarinda, Sampit, Sarawak), *sèrongan* (Brunei).

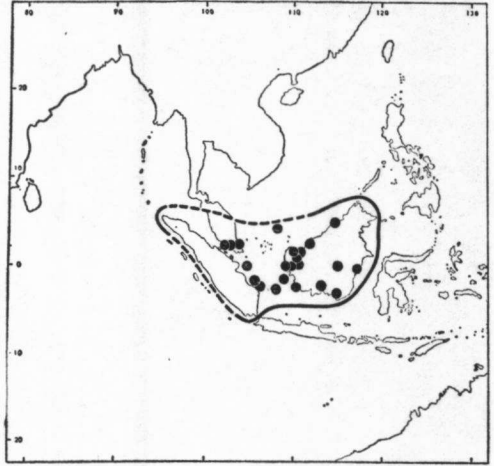


Fig. 10. Range of sect. *Isopterygium*; delineated *Cratoxylum arborescens* (VAHL) BL., dotted *C. glaucum* KORTH.

2. HYPERICUM

LINNE, Gen. Pl. ed. 5 (1754) 341; Sp. Pl. (1753) 783; R. KELLER in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 175, *pro parte excl. sect. IV Elodea*; Y. KIMURA in Nakai & Honda, Nova Fl. Jap. 10 (1951) 108; ROBSON, Blumea 20 (1972) 251–274.—*Ascyrum* L. Gen. Pl. ed. 5 (1754) 342; Sp. Pl. (1753) 787; ENGL. in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 174.—*Sarothra* L. Gen. Pl. ed. 5 (1754) 133; Sp. Pl. (1753) 272; Y. KIMURA in Nakai & Honda, Nova Fl. Jap. 10 (1951) 229.—*Brathys* MUTIS *ex L. f.* Suppl. Pl. (1781) 43; SPACH, Hist. Nat. Vég. Phan. 5 (1836) 446; Ann. Sc. Nat. II, Bot. 5 (1836) 366; MIQ. Fl. Ind. Bat. 1, 2 (1859) 513.—*Norysca* SPACH, Hist. Nat. Vég. Phan. 5 (1836) 426; Ann. Sc. Nat. II, Bot. 5 (1836) 363; Y. KIMURA in Nakai & Honda, Nova Fl. Jap. 10 (1951) 96.—*Takasago* Y. KIMURA, Bot. Mag. Tokyo 50 (1936) 498; in Nakai & Honda, Nova Fl. Jap. 10 (1951) 85.

Small trees, shrubs or perennial or annual herbs, glabrous (in Mal.). Bark not exuding resinous sap. Branchlets terete or 2–4-lined or -angled. *Leaves* opposite (rarely whorled), entire (rarely gland-fringed in extra-Mal. *spp.*), sessile or shortly petioled, with translucent ('pale') glands containing essential oils and sometimes black or red glands containing hypericin or pseudohypericin. *Inflorescences* terminal, cymose, dichasial or monochasial. *Flowers* (sometimes except the gynoeceium) 5(–4)-merous, homostylous (in Mal.). *Sepals* quincuncial or rarely decussate, coriaceous to chartaceous, persistent (in Mal.), glandular like the leaves. *Petals* yellow, often tinged red, glandular like the leaves, without nectariferous appendage (in Mal.), glabrous, caducous or persistent. *Stamen fascicles* epipetalous, free or variously united (2 + 1 + 1 + 1 or 2 + 2 + 1 or (5) or (4)) and then with double ones epispalous, glabrous, caducous or persistent, each with 1–c.60 stamens; filaments yellow, slender, usually united only towards the base or apparently free; anthers yellow or reddish, shortly oblong, dorsifixed or apparently

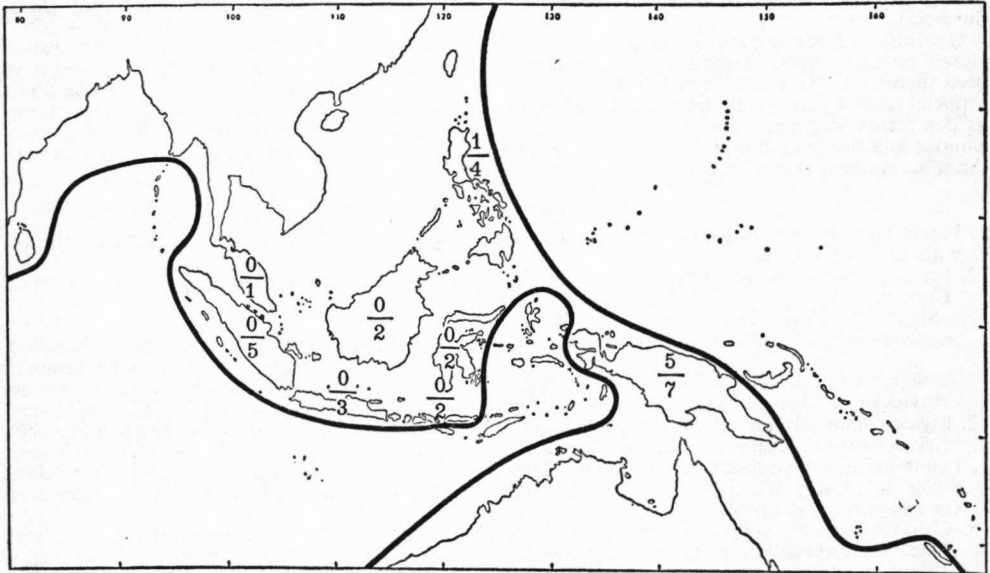


Fig. 11. Distribution of *Hypericum* in Malesia. Figures above the hyphen indicate the number of endemic species in each island or island group, that below the hyphen the total number of species.

basifixed (*sect. Takasagoya*), with amber or black gland terminating the connective. *Staminodial fascicles* absent (or very rarely 3, alternating with 2 + 2 + 1 stamen fascicles in extra-Mal. *spp.*). *Ovary* 5-3-celled or 1-celled with 5-3(-2) parietal placentas; styles 5-3(-2), free or \pm united, \pm slender; stigma small, flat or \pm capitate. *Ovules* ∞ -2 on each placenta, horizontal. *Fruit* a septicidal 5-3(-2)-valved \pm coriaceous capsule (rarely tardily dehiscent or \pm baccate in extra-Mal. *spp.*), with \pm prominent vittae in the valves. *Seeds* ∞ -1 on each placenta, curved-cylindric to ellipsoid, sometimes carinate with a membranous wing; testa variously sculptured; embryo cylindric, straight or curved, with cotyledons usually shorter than the hypocotyl.

Distr. About 400 *spp.* throughout most of the tropical and temperate zones, but absent from some lowland tropical areas (e.g. the Amazon basin) and rare in Australasia (2 native species, here *spp.* 14 and 15), in Malesia 13 *spp.* Fig. 11.

Ecol. In forest margins, grasslands, marshes or among rocks; rare in general in tropical lowland, but occurring in Malesia from sea-level in Sumatra to 3400 m in New Guinea.

Notes. *Hypericum*, as recognised here, is identical with ENGLER's *Hypericeae* except for *Hypericum sect. Elodea* (JUSS.) CHOISY, which, as the genus *Triadenum* RAFIN., belongs in the *Cratoxyleae* and appears to be a herbaceous derivative of *Cratoxylum*.

The geographical relationships of the Malesian species are interesting. *Sect. Ascyreia* (Sumatra to SW. Celebes) also occurs in south continental Asia, Taiwan, Ceylon, Turkey, and Socotra. *Sect. Takasagoya* (Philippines) is otherwise confined to Taiwan. *Sect. Hypericum* (Philippines, Sabah, Sumatra) is panboreal in distribution; but the Philippine species is found elsewhere only in Taiwan and Japan, whereas the species of Sabah and Sumatra is otherwise eastern Himalayan in distribution. One of the two species of *sect. Brathys*, which also occurs from Japan to Ceylon and in Australia, New Zealand and Hawaii, is closely related to a species of southeastern U.S.A., whereas the other has a mainly southern distribution (Australia, New Zealand, New Caledonia, New Guinea) with outliers in South and East Asia (eastern Himalayas, Vietnam, Taiwan) and affinities with western South America. The affinities of the remaining section, *sect. Humifusoideum*, lie in quite a different direction, namely with Africa. The New Guinea species form a closely related group which appears to be derived from *sect. Campylosporus* of Africa, Madagascar and the Mascarene Islands. In addition, however, there are three species of *sect. Humifusoideum* in Africa and Madagascar (*H. natalense* WOOD & EVANS, *H. wilmsii* R. KELLER and *H. peplidifolium* A. RICH.), which are apparently derivatives, in turn, of this New Guinea group. The relationships therefore are Africa \rightarrow New Guinea \rightarrow Africa. This New Guinea group also appears to

have given rise to two other species, *H. pulogense* MERR. (Philippines) and *H. beccarii* N. ROBSON (Java, Sumatra).

Hybrids of *Hypericum* species have been found from time to time in nature, but only between rather closely related species. Artificial hybrids are not always easy to produce, but some 'wide' crosses have been successful. The resultant plants, however, are usually weak and have always proved sterile. Some artificial crosses between closely related species, however, have thrived, and one or two are well-known garden plants. In general, apart from the hybrids involving *H. perforatum* L., which is largely pseudo-gamous and produces n and 2n gametes, crosses are likely to be successful only between species with the same chromosome number.

KEY TO THE SPECIES

1. Petals and stamens caducous. Stamen fascicles, styles and ovary loculi 5. Broad-leaved shrubs, without black glands.
2. Styles free or partially united. Anthers dorsifixed. Inflorescence up to 3 nodes long. *Sect. Ascyreia* CHOISY.
3. Styles free. Leaves laxly or scarcely reticulate beneath.
4. Sepals acute to subacute. Petals (20-)25-45 mm long. Branches erect or arching, not frondose.
 1. *H. leschenaultii*
 2. *H. uralum*
 3. Styles united almost to the apex. Leaves densely reticulate beneath. 3. *H. monogynum*
2. Styles completely united. Anthers apparently basifixed. Inflorescence up to 14 nodes long. *Sect. Takasagoia* (Y. KIMURA) N. ROBSON 4. *H. geminiflorum*
1. Petals and stamens persistent. Stamen fascicles 5-3 (*i.e.* 2 + 2 + 1) or stamens apparently fasciculate. Styles 3-5. Ovary loculi 1-4. ± Ericoid shrubs or shrublets or herbs, often with black glands on various parts of the plant.
5. Capsule longitudinally vittate (scarcely so in *H. beccarii* *ssp.* *steenisti*). Placentation axile to parietal. Black glands usually present. Petals pale yellow (flavus) to golden yellow (aureus). Shrubs or herbs.
6. Plant an erect or ± straggling shrub or woody herb. Styles 3-5, equalling or shorter than the ovary. Placentation axile to parietal. *Sect. Humifusoideum* R. KELLER.
7. Flowers solitary, not in dichasial cymes nor with shoots in the axils of the uppermost leaf pair.
8. Leaves cuneate at the base, linear to elliptic or ovate-lanceolate, rarely broader, with laminar pale glands almost always linear towards the leaf base.
 9. Leaves spreading or ascending, 8-12 mm long, flat. Styles 2¼-3 mm long. 5. *H. sewense*
 9. Leaves imbricate, ± appressed, 2-9 mm long, flat or incurved. Styles 1¼-2¼ mm long.
 10. Leaves flat, ovate-lanceolate to narrowly elliptic-oblong, with laminar glands mostly interrupted to punctate. Placentation axile. 6. *H. macgregorii*
 10. Leaves incurved, narrowly elliptic or lanceolate-elliptic to linear with laminar glands mostly linear. Placentation parietal. 7. *H. saruwagedicum*
8. Leaves rounded to cordate at the base, narrowly ovate or ovate-triangular or elliptic to subcircular, with laminar pale glands linear towards the leaf base only or wholly punctate.
 9. *H. papuanum*
7. Flowers in regular or irregular dichasial cymes or, if solitary, then with shoots in the axils of the uppermost leaf pair.
 11. Flowers always solitary with shoots in the axils of the uppermost leaf pair; leaves with laminar pale glands linear, often with parallel rows of dots. Styles 3 8. *H. bifurcatum*
 11. Flowers in regular or irregularly dichasial cymes; leaves with laminar pale glands linear or punctate, without parallel rows of dots. Styles 3-5. 9. *H. papuanum*
6. Plant a perennial or annual herb or, if suffrutescent, then styles 1.4-1.7 times as long as the ovary. Styles 3 (4). Placentation axile.
 12. Stem internodes 2-4(-6)-lined, at least when young. Stamen fascicles 3-5 or stamens not obviously in fascicles. Flowers solitary or with shoots in uppermost leaf axils. Suffrutescent or wiry herbs. *Sect. Humifusoideum* R. KELLER.
 13. Plant a suffrutescent herb with erect or ascending stems. Leaves sessile. Flowers 2-3 cm ø.
 10. *H. pulogense*
 11. *H. beccarii*
12. Stem internodes terete. Stamen fascicles 3. Flowers in dichasial or monochasial cymes. Tufted or straggling perennial or annual herbs. *Sect. Hypericum*.
14. Sepal apex rounded. Petiole absent or up to 0.7 mm long. Perennial. 12. *H. pseudopetiolum*
14. Sepal apex acute. Petiole 1-3 mm long. Annual 13. *H. petiolulatum*
5. Capsule smooth, not vittate. Placentation parietal. Black glands absent. Petals usually apricot yellow (*armeniacus*) to orange (*aurantiacus*), sometimes red-tinged; small herbs with quadrangular stems. *Sect. Brathys* (MUTIS *ex* L. *f.*) CHOISY.
 15. Petals c. 1.3 times as long as sepals. Sepals lanceolate to narrowly elliptic, acute or subacute. Stamens 30-50. Leaves mostly ovate-lanceolate to linear-lanceolate or narrowly oblong. Erect perennial or annual 14. *H. gramineum*
 15. Petals c. 0.85-1(-1.3) times as long as sepals. Sepals narrowly oblong to elliptic or obovate, acute to rounded. Stamens 5-30. Leaves very variable in shape. Erect to prostrate annual (always?)
 15. *H. japonicum*



Fig. 12. *Hypericum leschenaultii* CHOISY, West Java, Mt Pangrango, summit, 3000 m (Photogr. DOCTERS VAN LEEUWEN).

1. *Hypericum leschenaultii* CHOISY in DC. Prod. 1 (1824) 545; in Zoll. Syst. Verz. (1854) 151; Pl. Jav. (1858) 6; GUILLEMIN in Delessert, Ic. Sel. Pl. 3 (1837) 17, t. 27; BACK. Schoolfl. Java (1911) 87; KELLER in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 176; HOCHR. Candollea 2 (1925) 435, incl. var. *typicum* HOCHR., f. *elatior* HOCHR. et var. *coriaceum* (BL.) HOCHR.; STAFF, Bot. Mag. (1926) t. 9160; DOCT. v. LEEUWEN, Trop. Natuur 16 (1927) 115, f. 23, 24; MERR. Contr. Arn. Arb. 8 (1934) 107; STEEN. Bull. Jard. Bot. Btzg III, 13 (1934) 219; BACK. & BAKH. f. Fl. Java 1 (1963) 382; ROBSON, J. R. Hort. Soc. 95 (1970) 489; STEEN. Mt Fl. Java (1972) t. 23: 6. — *H. javanicum* BL. Bijdr. 1 (1825) 141; HASSK. Cat. Hort. Bog. (1844) 213; MOR.

Syst. Verz. (1846) 25; CHOISY in Zoll. Syst. Verz. (1854) 151. — *H. coriaceum* BL. Bijdr. 1 (1825) 142. — *H. triflorum* BL. l.c. 142, 143, incl. var. *angustatum* BL.; HASSK. Cat. Hort. Bog. (1844) 213; MOR. Syst. Verz. (1846) 25; (BURBIDGE), The Garden 23 (1883) 158, t. 376; KELLER in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 176, f. 73. — *H. nervosum* CHOISY in Zoll. Syst. Verz. (1854) 152, non D. DON, 1825, nom. illegit. — *Norysca leschenaultii* (CHOISY) BL. Mus. Bot. Lugd. Bat. 2 (1856) 24; MIQ. Fl. Ind. Bat. 1, 2 (1859) 515; Y. KIMURA in Nakai & Honda, Nova Fl. Jap. 10 (1951) 98. — *Norysca javanica* (BL.) BL. Mus. Bot. Lugd. Bat. 2 (1856) 24; MIQ. Fl. Ind. Bat. 1, 2 (1859) 514. — *Norysca coriacea* (BL.) BL. Mus.

Bot. Lugd. Bat 2 (1856) 24; MIQ. Fl. Ind. Bat. 1, 2 (1859) 515. — *H. nervosa* (CHOISY) MIQ. l.c. — *H. hookerianum* var. *leschenaultii* (CHOISY) DYER, Fl. Br. Ind. 1 (1874) 254, *quoad typum*; RIDL. J. Fed. Mal. Stat. Mus. 8, 4 (1917) 17. — *H. patulum* (ssp.) ♂ *leschenaultii* (CHOISY) O.K. et (ssp.) ♀ *variabile* O.K. Rev. Gen. Pl. 1 (1891) 60. — *H. hookerianum* (non W. & A.) BUYSMAN, Flora 107 (1914) 358. — *Norysca hookeriana* var. *leschenaultii* (CHOISY) Y. KIMURA in Hara, Fl. E. Himal. (1966) 210, *quoad typum*. — Fig. 12.

Shrub or treelet, $\frac{1}{4}$ – $2\frac{1}{4}$ m, branchlets 4-lined and flattened when young, becoming terete. *Leaves* subsessile or up to 7 mm petiolate, $2\frac{1}{4}$ –8 by 1– $3\frac{1}{4}$ cm, lanceolate to narrowly ovate or rarely ovate, apex acute to rounded-apiculate, base broadly cuneate to rounded, margin often reflexed, glaucous beneath; 4 main lateral veins, with lax reticulate venation; glands all pale, shortly striate and punctate. *Inflorescence* 1–3(–10, rarely up to 18)-flowered, terminal (1–2 nodes), corymbose. *Flowers* ($3\frac{1}{4}$ –)4–7 cm ϕ , flat or slightly concave; buds \pm broadly ovoid, acute or subacute. *Sepals* 7–20 by 2–8 mm, free, imbricate, narrowly oblong or narrowly elliptic or rarely ovate to oblanceolate, very acute to subacute, entire, midrib sometimes visible below and sometimes incrassate above; spreading or recurved in flower and fruit; glands all pale, linear. *Petals* deep golden yellow, (2–) $2\frac{1}{4}$ – $4\frac{1}{4}$ by $1\frac{1}{4}$ –3 cm, broadly obovate to obovate-circular, entire, deciduous; apiculus \pm distinct, acute to obtuse; glands all pale, linear. *Stamen fascicles* 5, 9–12 mm long, c. $\frac{1}{4}$ as long as petals, each with c. 80 stamens, caducous; anthers yellow, gland amber. *Ovary* 6–9 mm, ovoid or \pm narrowly ovoid-conic to narrowly ellipsoid, acuminate; styles 5, $3\frac{1}{4}$ –7 mm, about half as long as ovary, erect or suberect, outcurved near apex, free; stigma small; placentas 5, axile, with central lacuna. *Capsule* 1–2 cm, narrowly ellipsoid or narrowly ovoid-conic. *Seeds* dark orange-brown to reddish-brown, 0.8–1 mm, cylindrical, sometimes curved, scarcely carinate, shallowly and minutely linear-foveolate to reticulate.

Distr. *Malesia*: Sumatra, Java, Lesser Sunda Is. (Bali, Lombok, Flores), SW. Celebes (Mts Bonthain & Latimodjong). Fig. 13.

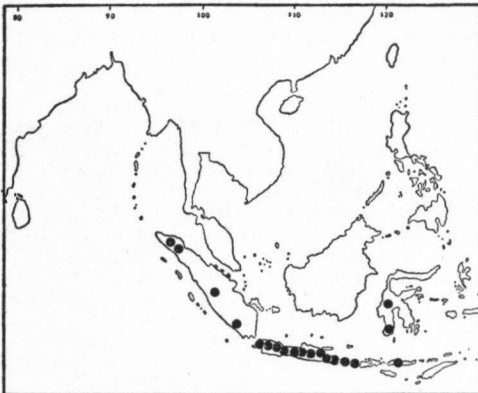


Fig. 13. Range of *Hypericum leschenaultii* CHOISY.

Ecol. Grassy slopes, thickets, open woodland, 1500–3300 m.

Note. The form on Mt Kerintji (Sumatra) has more prominent main lateral leaf veins, larger flowers and broader sepals than the remainder of the species. In this it comes closest to the nearest relative of *H. leschenaultii*, a hitherto undescribed species from Thailand that differs in having elliptic-oblong leaves, with an intramarginal vein, more prominent secondary lateral veins and an apiculate apex, and ovate-triangular sepals.

2. *Hypericum uralum* BUCH.-HAM. ex D. DON, Bot. Mag. (1823) t. 2375. — *H. patulum* (non THUNB.) WALL. Cat. (1831) no 4809; DYER, Fl. Br. Ind. 1 (1874) 254; STEEN. Bull. Jard. Bot. Btzg III, 13 (1934) 219; GAGNEP. Fl. Gén. I.-C. Suppl. 1 (1943) 248; HUNDLEY & KO KO, List trees etc. Burma ed. 3 (1961) 19. — *Norysca urala* (BUCH.-HAM. ex D. DON) K. KOCH, Hort. Dendrol. (1853) 66, no 3; Y. KIMURA in Nakai & Honda, Nova Fl. Jap. 10 (1951) 102. — *H. patulum* var. *uralum* (BUCH.-HAM. ex D. DON) KOEHNE, Deut. Dendrol. (1893) 415. — *H. garrettii* var. *ovatum* CRAIB, Fl. Siam. En. 1 (1925) 111.

Bushy shrub, 1.2–1.8 m (in Sumatra), with arching, sometimes frondose branches; branchlets 4-lined or 4-angled when young, eventually becoming 2-lined or terete. *Leaves* subsessile or up to $\frac{1}{4}$ mm petiolate, 1– $4\frac{1}{4}$ by $\frac{1}{4}$ – $2\frac{1}{4}$ cm, lanceolate to ovate, apex acute to rounded-apiculate, base narrowly or rarely broadly cuneate, very glaucous below; 3 main lateral veins, with scarcely visible lax reticulate venation; glands all pale, shortly striate towards midrib, otherwise punctate. *Inflorescence* 1–3(–10)-flowered, terminal (1–2 nodes), corymbose, and often also lateral, racemiform. *Flowers* $1\frac{1}{4}$ –3 cm ϕ , \pm concave; buds broadly ovoid to globose, obtuse to rounded. *Sepals* $3\frac{1}{4}$ –9 by (1–)2– $6\frac{1}{4}$ mm, free, \pm imbricate, oblong or elliptic to obovate-spathulate, rounded, entire, midrib invisible or almost so; spreading or ascending in flower, ascending in fruit; glands all pale, linear. *Petals* bright yellow to golden yellow, 9–18 by 5–12 mm, broadly obovate to obovate-circular, entire, caducous; apiculus distinct to obscure, \pm rounded; glands all pale, linear. *Stamen fascicles* 5, 4–6(–8) mm long, c. $\frac{1}{4}$ – $\frac{1}{4}$ as long as petals, each with 40–60 stamens, caducous; anthers bright yellow to orange-yellow, gland amber. *Ovary* 3–5 mm, ovoid to globose; styles 5, $2\frac{1}{4}$ – $4\frac{1}{4}$ mm, (0.6–)0.7–0.9 times as long as ovary, partially or wholly outcurving, free; stigma narrowly capitate; placentas 5, axile. *Capsule* 7–11 mm, subglobose to globose. *Seeds* dark brown, c. $\frac{1}{4}$ mm, cylindrical-ellipsoid, not curved, slightly carinate, shallowly linear-reticulate.

Distr. Thailand, China (Yunnan, Szechuan), Tibet, Burma, Khasia and Himalaya from Assam to Kashmir, in *Malesia*: northern half of Sumatra (Mt Kerintji northward to Mt Telong in the Gajo Lands).

Ecol. Grassy or rocky slopes, pastures, thickets, open woodland and montane forest, 1700–3300 m.

Note. The Sumatran form of *H. uralum* tends to be more luxuriant and to have larger flowers than those elsewhere; but its more erect habit is matched by some Nepal specimens. The form in cultivation in Europe, dwarfier, with arching

frondose branches and small flowers, is apparently confined to the Himalaya; but the variation between these extreme forms appears continuous.

3. *Hypericum monogynum* LINNÉ, Sp. Pl. ed. 2 (1763) 1107; MILL. Gard. Dict. ed. 8 (1768) no 11; BL. Bijdr. 1 (1825) 141. — *H. chinense* LINNÉ, Syst. Nat. ed. 10, 2 (1759) 1184, non OSBECK, Dagbok Ostind. Resa (1757) 244; AMOEN. Acad. 8 (1785) 323; CURTIS, Bot. Mag. 10 (1796) t. 334; CHOISY, Prod. Monogr. Hypér. (1821) 40; in DC. Prod. 1 (1824) 545; in Zoll. Syst. Verz. (1854) 150; PL. Jav. (1858) 5; HASSK. Pl. Jav. Rar. (1848) 278; FORB. & HEMSL. J. Linn. Soc. Bot. 23 (1886) 72; BACK. Schoolfl. Java (1911) 87; HAYATA, Ic. Pl. Formos. 1 (1911) 78; KELLER in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 176; HAND.-MAZZ. Symb. Sin. 7 (1931) 401; BACK. & BAKH. f. Fl. Java 1 (1963) 382; ROBSON, J. R. Hort. Soc. 95 (1970) 489. — *H. aureum* LOUR. Fl. Coch. (1790) 472. — *Norysca chinensis* (L.) SPACH, Hist. Nat. Vég. Phan. 5 (1836) 427; Ann. Sc. Nat. II, Bot. 5 (1836) 364; BL. Mus. Bot. Lugd. Bat. 2 (1856) 22; MIQ. Fl. Ind. Bat. 1, 2 (1859) 514; KIMURA in Nakai & Honda, Nova Fl. Jap. 10 (1951) 103. — *Norysca aurea* (LOUR.) BL. Mus. Bot. Lugd. Bat. 2 (1856) 22. — *Norysca punctata* BL. Lc. 23. — *H. chinense* ssp. *obtusifolium* O.K. Rev. Gen. Pl. 1 (1891) 60.

Bushy shrub, $\frac{1}{4}$ –1.3 m, with spreading branches; branchlets 2(–4)-lined when young, eventually becoming terete. *Leaves* sessile or with petiole up to $\frac{1}{4}$ mm, 2– $\frac{4}{5}$ by 1– $\frac{1}{4}$ cm, elliptic or oblong to oblanceolate, apex obtuse or minutely apiculate to rounded, base cuneate to rounded or subcordate paler below; 4–6 main lateral veins, with intramarginal vein and conspicuous dense reticulate venation; glands all pale, punctate. *Inflorescence* 1–c. 15-flowered, terminal (1–3 nodes), corymbose. *Flowers* 3–5 cm σ , plane or convex; buds ovoid, subacute to acute. *Sepals* $\frac{4}{5}$ –10 by $\frac{1}{4}$ –3 mm, free, imbricate, narrowly elliptic or narrowly oblong to lanceolate, acute or more rarely obtuse to rounded, entire, midrib invisible or almost so; spreading or ascending in flower and fruit; glands all pale, linear. *Petals* golden-yellow to lemon-yellow, 2–3 by $\frac{1}{4}$ – $\frac{1}{4}$ cm, obovate, entire, caducous; apiculus variable, acute to rounded or absent; glands all pale, linear. *Stamen fascicles* 5, 18–28 mm long, almost equalling petals, each with 25–35 stamens, caducous; anthers bright yellow, gland amber. *Ovary* $\frac{2}{4}$ –4 mm, broadly ovoid to subglobose; styles 5, 12–18 mm, c. $\frac{3}{4}$ –5 times as long as the ovary, united almost to the apex; stigma small; placentas 5, axile. *Capsule* 6–10 mm, broadly ovoid or ovoid-conic to subglobose. *Seeds* dark reddish-brown, cylindrical, curved, narrowly carinate, shallowly linear-reticulate to linear-foveolate.

Distr. SE. China, Taiwan. Introduced to England in 1753 and now cultivated in many parts of the world, including Java and Celebes.

Ecol. Only as a cultivated ornamental, largely in estates in hill stations up to c. 1800 m. Not quite hardy in temperate areas.

Notes. The plant cultivated in Malasia, to which the above synonymy and description refer, is the type form, with smaller, obtuse to rounded leaves and smaller flowers, which is native to Kwangtung and adjacent parts of China. The plant

with larger, acute leaves and larger, more numerous flowers, known as *H. salicifolium* SIEB. & ZUCC., *H. chinense* var. *salicifolium* (SIEB. & ZUCC.) CHOISY, *H. chinense* ssp. *salicifolium* (SIEB. & ZUCC.) O. K., etc., appears to intergrade with the typical one in China, so that segregation, even as a variety, is not possible.

Unfortunately the epithet *chinense* cannot be maintained.

4. *Hypericum geminiflorum* HEMSL. Ann. Bot. 9 (1895) 144; LÉV. Bull. Soc. Bot. Fr. 54 (1908) 590; HAYATA, Ic. Pl. Formos. 1 (1911) 76; *ibid.* 3 (1913) 41. — *H. trinervium* HEMSL. Ann. Bot. 9 (1895) 144; LÉV. Bull. Soc. Bot. Fr. 54 (1908) 590; HAYATA, Ic. Pl. Formos. 1 (1911) 79. — *H. loheri* MERR. Philip. J. Sc. 4 (1909) Bot. 294; En. Philip. 3 (1923) 75. — *H. acutisepalum* HAYATA, J. Coll. Sc. Tokyo 30, 1 (1911) 308; Ic. Pl. Formos. 1 (1911) 77, t. 15. — ? *H. pustulosum* KELLER in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 176. — *H. lackeyi* ELM. Leaf. Philip. Bot. 9 (1934) 3190. — *Takasagoya geminiflora* (HEMSL.) Y. KIMURA, Bot. Mag. Tokyo 50 (1936) 501, f. 2; in Nakai & Honda, Nova Fl. Jap. 10 (1951) 93, t. 40. — *Takasagoya acutisepalum* (HAYATA) Y. KIMURA, Bot. Mag. Tokyo 50 (1936) 501, f. 3 j–o; in Nakai & Honda, Nova Fl. Jap. 10 (1951) 92. — *Takasagoya trinervia* (HEMSL.) Y. KIMURA, Bot. Mag. Tokyo 50 (1936) 503; in Nakai & Honda, Nova Fl. Jap. 10 (1951) 95.

Lax shrub, $\frac{1}{4}$ – $\frac{1}{2}$ m, branches long, often pendulous then ascending near apex; branchlets 4-lined when young, eventually becoming terete. *Leaves* subsessile, 2– $\frac{4}{5}$ by 0.6–2.2 cm, oblong to elliptic or ovate-oblong, apex subacute to rounded, usually apiculate, base broadly to narrowly cuneate, paler below; c. 7 main lateral veins, uniting to form strong intramarginal vein, the reticulate venation not or scarcely visible; glands all pale, punctate. *Inflorescence* 1-flowered, terminal and on solitary or paired short shoots from up to 14 nodes below, more rarely axillary shoots 2(–3)-flowered with flowers pedunculate. *Flowers* 2–3 cm σ , plane; buds ovoid, acute or subacute. *Sepals* (1)– $\frac{1}{4}$ – $\frac{2}{4}$ by 1– $\frac{1}{4}$ (–2) mm, free or connate at the base, broadly ovate or triangular or oblong-lanceolate or subcircular, subacute to rounded, entire, midrib invisible; spreading in flower, ascending in fruit; glands all pale, linear and punctate. *Petals* bright yellow, 9–15 by 5–7 mm, narrowly obovate, entire, caducous; apiculus absent; glands all pale, linear. *Stamen fascicles* 5, 6–10 mm long, c. $\frac{2}{3}$ as long as petals, each with 6–11 stamens, caducous; anthers bright yellow, gland amber. *Ovary* $\frac{2}{4}$ – $\frac{3}{4}$ mm, narrowly ellipsoid; styles 5, 4–6(–7) mm, c. 1.3–2 times as long as ovary, completely united; stigmas small; placentas 5, axile with small central lacuna. *Capsule* 8–11 mm, narrowly cylindrical to narrowly cylindrical-conic. *Seeds* dark reddish-brown, c. $\frac{1}{4}$ mm, fusiform to narrowly ovoid or narrowly cylindrical, scarcely carinate, with long terminal appendage sometimes expanded to form narrow wing, very shallowly elongate-reticulate.

Distr. Taiwan, in Malasia: Philippines (Luzon).

Ecol. Stony places, river margins, 1000–1500 m.

Note. The Philippine plants should clearly be included in *H. geminiflorum*, while PRICE 688

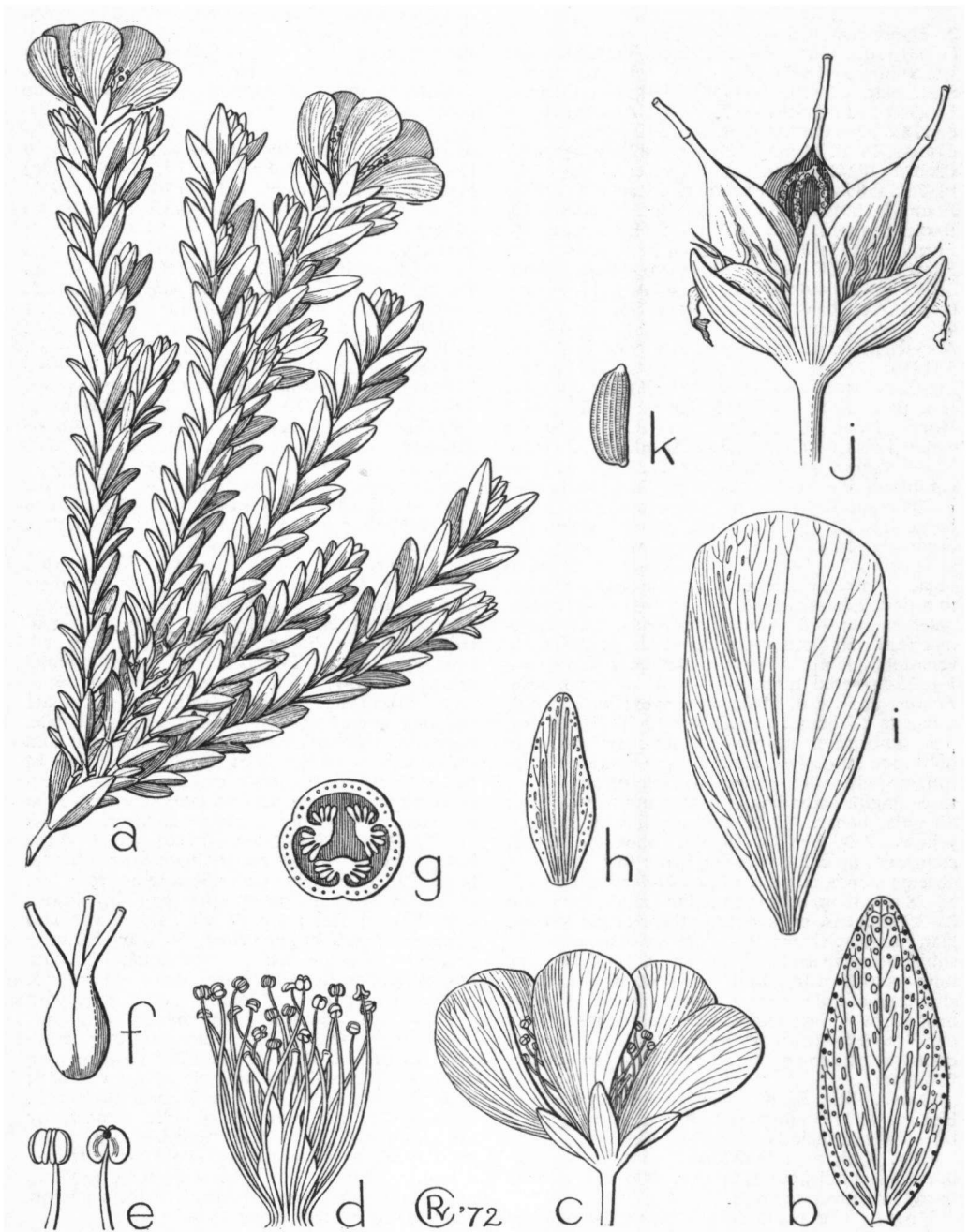


Fig. 14. *Hypericum sewense* N. ROBSON. a. Habit, nat. size, b. leaf, with black marginal dots, $\times 4$, c. flower, $\times 2$, d. pistil & stamens, $\times 4$, e. anther, with gland, $\times 16$, f. pistil, $\times 4$, g. cross section of ovary, $\times 8$, h. sepal, $\times 4$, i. petal, $\times 4$, j. dehisced fruit, $\times 4$, k. seed, $\times 16$ (a-k SAYERS NGF 21418).

(from Taiwan, Prov. Taitung) and HAYATA's and KIMURA's figures indicate that *H. acutisepalum* cannot be distinguished from it. *H. trinervium* seems rather distinct, at first glance, in having stouter shoots and pedicels and relatively broader leaves with a strong submarginal vein. As each of these characters appears in specimens of typical *H. geminiflorum*, although not in the same individual, it seems best to regard *H. trinervium* as a local race of *H. geminiflorum*.

5. *Hypericum sewense* N. ROBSON, *Blumea* 20 (1972) 254. — Fig. 14.

Erect shrub, 0.6 m, branches divaricate-ascending; branchlets 4-lined, flattened when young, soon 2-lined, eventually terete. *Leaves* sessile, 8–12 by 2–4 mm, lanceolate to narrowly elliptic, apex rounded, base narrowly cuneate-amplexicaul, concolorous, plane, spreading or ascending; c. 5 main lateral veins, mostly from basal loops, \pm parallel, branched above on outer side only, without marked reticulate venation; laminar glands pale, linear near the base, sometimes with rows of streaks or dots on either side, becoming punctate towards apex and margin; intramarginal glands pale and black. *Inflorescence* 1-flowered, without flowering shoots in uppermost axils or rarely with 1, branching profusely farther down; pedicels shorter than uppermost leaves, 4–8 mm in fruit. *Flowers* 2.2–2.8 cm ϕ , \pm plane; buds narrowly ovoid, subacute. *Sepals* 5–7 by 1½–2¼ mm, free, imbricate, lanceolate, rounded to subacute, entire; laminar glands pale, mostly linear; submarginal glands pale or occasionally black. *Petals* bright yellow, 10–14 by 5–6¼ mm, obovate, entire, persistent; apiculus almost absent; laminar glands pale, linear, sometimes interrupted distally; submarginal glands absent or 1–3, sessile, black, on or near apiculus. *Stamens* obscurely 3-fascicled, c. 20, longest 8–9 mm, c. ¼ as long as the petals, persistent; anthers bright yellow, gland black. *Ovary* 2¼–3 mm, ovoid; styles 3, 2¼–3 mm, equalling ovary, divergent; stigmas scarcely capitate; placentas 3, parietal. *Capsule* 7–9 by 4–5 mm, ovoid, longitudinally vittate. *Seeds* yellow-brown, c. 0.8 mm, cylindrical, scarcely carinate, densely linear-foveolate.

Distr. *Malesia*: New Guinea (Madang Distr.), one collection. Fig. 15.

Ecol. Boggy tussock sedge-grassland, c. 2700 m.

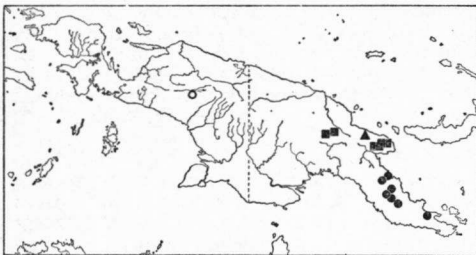


Fig. 15. Range of *Hypericum sewense* N. ROBSON (\blacktriangle), *H. bifurcatum* N. ROBSON (\blacksquare), *H. macgregorii* F.v.M. *ssp. macgregorii* (\bullet) and *ditto ssp. punctatum* N. ROBSON (\circ).

Note. *H. sewense*, an apparently very local species, is the most primitive member of *sect. Humifusoidium*. Its nearest relatives belonging to another section are probably in *sect. Campylosporus*, from Africa, Madagascar and the Mascarene Is.

6. *Hypericum macgregorii* F.v.M. *Trans. R. Soc. Vict.* 1, 2 (1889) 12; BURK. *Kew Bull.* (1899) 97; LAUT. *Bot. Jahrb.* 58 (1922) 4; STEEN. *Bull. Jard. Bot. Btzg III*, 13 (1934) 219. — Fig. 18f.

Erect shrub, 0.15–1 m, branches strict, creeping and rooting at the base; branchlets 2-lined when young, eventually terete. *Leaves* sessile, 4–9 by 1–3 mm, ovate-lanceolate to elliptic or narrowly elliptic-oblong, apex subacute to rounded, base cuneate, concolorous, plane or \pm carinate, \pm imbricate-appressed; c. 6 main lateral veins, \pm parallel, not visibly branching, uniting near margin and apex, without visible reticulate venation; laminar glands pale, linear, becoming \pm interrupted or punctate towards margin; intramarginal glands pale or black. *Inflorescence* 1-flowered, without shoots in uppermost axils, branching farther down stem; pedicels usually shorter than uppermost leaves, 2–6(–10) mm in fruit. *Flowers* 2–2¼ cm ϕ , \pm plane; buds narrowly ovoid, subacute. *Sepals* 3–6¼ by ¼–2¼ mm, free, not imbricate, elliptic to linear-lanceolate, subacute to obtuse or rarely rounded, entire; laminar glands pale, linear to punctate; submarginal glands pale or black. *Petals* dark yellow to pale yellow, sometimes red-tinged below, 7–15 by 3–6 mm, oblanceolate, entire, persistent; apiculus absent or almost so; laminar glands pale, linear, sometimes interrupted distally; submarginal glands absent. *Stamens* obscurely 3-fascicled, c. 17–24, longest 5–8 mm, c. ¼ as long as petals, persistent; anthers bright yellow, gland amber. *Ovary* 2 mm, ovoid; styles 3(–4), 2 mm, equalling ovary, divergent; stigmas not capitate; placentas 3 (4) axile. *Capsule* 6–8 by 3–4 mm, ovoid, longitudinally vittate. *Seeds* yellow-brown, c. 1 mm, cylindrical to cylindrical-ellipsoid, slightly carinate, densely linear-foveolate.

ssp. macgregorii.

Leaves with laminar glands linear, becoming interrupted or punctate towards margin; intramarginal glands pale. Sepals with laminar glands all or mostly linear; submarginal glands always pale.

Distr. *Malesia*: New Guinea (Morobe, Central and Milne Bay Distr.). Fig. 15.

Ecol. Open alpine grassland, usually in shallow soils, (1500–)2700–3900 m.

Note. The population on Mt Dayman (Maneo Ra.) is aberrant in having (a) leaves relatively broader (leaf index 2.2–3.1 compared with 2¼–3¼ in the typical form) with the apex less narrowed and (b) longer pedicels (5–10 mm in fruit compared with 2–6 mm in the typical form).

ssp. punctatum N. ROBSON, *Blumea* 20 (1972) 256.

Leaves with laminar glands mostly dots or short streaks; intramarginal glands black. Sepals with laminar glands punctate; submarginal glands sometimes black.

Distr. *Malesia*: New Guinea (Lake Habbema), one collection. Fig. 15.

Note. *Ssp. punctatum* is very similar in aspect to the Mt Maneao population.

7. *Hypericum saruwagedicum* DIELS, Bot. Jahrb. 62 (1929) 482. — *H. macgregorii* (non F.v.M.) HOOGL. Blumea, Suppl. 4 (1958) 231. — Fig. 18e.

Erect, bushy shrub, 0.1–1.2 m, branches strict, creeping and rooting at the base; branchlets 4-lined when young, soon 2-lined, eventually terete. Leaves sessile, 2–9 by $\frac{1}{4}$ –3 mm, narrowly elliptic or lanceolate-elliptic to linear, apex rounded, base narrowly cuneate, concolorous, incurved and slightly carinate at the base, \pm imbricate-appressed; c. 6 main lateral veins, \pm parallel, not visibly branching, uniting near margin and apex, without visible reticulate venation; laminar glands pale, linear, sometimes interrupted near margin; intramarginal glands pale only or pale and black. Inflorescence 1-flowered, with shoots in uppermost axils, branching farther down stem; pedicels shorter than uppermost leaves, 2–4(–6) mm long in fruit. Flowers 1–2 $\frac{1}{4}$ cm ϕ , plane or \pm concave; buds narrowly ovoid-cylindric, subacute to rounded. Sepals 3 $\frac{1}{4}$ –8 by 1–3 mm, free, imbricate or not, ovate or lanceolate to elliptic or narrowly oblong, subacute to rounded, entire; laminar glands pale, all or mostly linear; submarginal glands pale only or pale or black. Petals dark yellow to pale yellow, sometimes red-tinged below, 7–15 by 3–6 mm, oblanceolate, persistent; apiculus absent or almost so; margin entire, or rarely with a few \pm prominent marginal glands; laminar glands pale, linear, sometimes interrupted distally; marginal glands black or absent. Stamens not obviously in fascicles, 13–26, longest 4–7(–8) mm c. $\frac{1}{4}$ – $\frac{3}{4}$ as long as the petals, persistent; anthers bright yellow, gland amber or black. Ovary 2–3 mm, ovoid; styles 3, 1 $\frac{1}{4}$ –2 $\frac{1}{4}$ mm, $\frac{1}{4}$ – $\frac{3}{4}$ as long as the ovary, divergent; stigmas \pm capitate; placentas 3, parietal, intrusive. Capsule (5 $\frac{1}{4}$ –)6–9 by 3 $\frac{1}{4}$ –5 mm, ovoid, longitudinally vittate. Seeds orange-brown, $\frac{1}{4}$ – $\frac{3}{4}$ mm, cylindric, carinate, densely linear-foveolate.

Distr. *Malesia*: New Guinea (Mts Wilhelmina & Carstensz, Lake Habbema, E. Highlands, Madang, Morobe, Central & Milne Bay Distr.). Fig. 16.

Ecol. Alpine grassland or open scrub, usually in well-drained soil, 2800–4300 m, but to c. 1800 m in Milne Bay District.

Notes. *H. saruwagedicum* is a variable species in which the variation falls into four geographical, more or less morphological intergrading races.

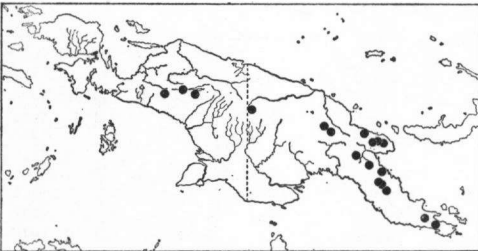


Fig. 16. Range of *Hypericum saruwagedicum* DIELS.

Although it does not appear desirable to name these formally, average members can be recognised by the following characters:

Variant 1 (Mt Wilhelm): Leaves large. Flowers large. Black glands usually on leaves and sepals, not on petals or anthers. Shoot apex outcurving.

Variant 2 (Territory of New Guinea except Mt Wilhelm, West Papua): Leaves medium. Flowers medium to large. Black glands on anthers only or absent. Shoot apex erect.

Variant 3 (West New Guinea): Leaves small. Flowers large. Black glands on leaves, sepals, petals and anthers. Shoot apex sometimes outcurving.

Variant 4 (Papua, Milne Bay District): Leaves small. Flowers small. Black glands on anthers and (rarely) leaves. Shoot apex erect.

8. *Hypericum bifurcatum* N. ROBSON, Blumea 20 (1972) 256. — Fig. 18d.

Erect shrub (? or woody herb), $\frac{1}{4}$ –1 $\frac{1}{2}$ m, branches \pm strict, rooting at the base; branchlets 2-lined when young, eventually terete. Leaves sessile, 7–13(–16) by $\frac{1}{4}$ –6 mm, narrowly ovate to narrowly elliptic-oblong, apex rounded, base cuneate to rounded, concolorous, plane, ascending or appressed; c. 7 main lateral veins, mostly from basal loops, \pm parallel, little branched, uniting near margin and apex, without marked reticulate venation; laminar glands pale, linear, sometimes with rows of dots on either side, becoming \pm interrupted towards margin; intramarginal glands pale only. Inflorescence 1-flowered, with strong flowering shoots in uppermost axils and often weaker ones in axils immediately below, the repeated branching producing an effect of bifurcation; pedicels equalling or exceeding uppermost leaves, 8–15 mm, long in fruit. Flowers 1 $\frac{1}{4}$ –2 $\frac{1}{4}$ cm ϕ , plane; buds narrowly ovoid, rounded. Sepals 4–6 by 1 $\frac{1}{4}$ –2 mm, free, imbricate, ovate-lanceolate, subacute, entire; laminar glands pale, all or mostly linear; submarginal glands pale or reddish. Petals bright yellow, orange- or red-tinged below, 9–14 by 3–5 mm, obovate to oblanceolate, entire, persistent; apiculus absent or almost so; laminar glands pale, linear, sometimes interrupted distally; marginal glands absent or one, sessile, reddish, on apiculus. Stamens obscurely 3-fascicled, 25–35, longest 6–8 mm, c. $\frac{3}{4}$ as long as the petals, persistent; anthers bright yellow, gland black. Ovary 2 mm, ovoid; styles 3, 2 mm, equalling the ovary, divergent; stigmas narrowly capitate; placentas 3, parietal except at the very base. Capsule 6–9 by 3 $\frac{1}{4}$ –4 $\frac{1}{4}$ mm, \pm broadly to narrowly ovoid or ovoid-pyramidal, longitudinally vittate. Seeds yellow-brown, c. $\frac{3}{4}$ mm, cylindric to cylindric-ellipsoid, slightly carinate, densely linear-foveolate.

Distr. *Malesia*: New Guinea (E. Highlands & Morobe Distr.). Fig. 15.

Ecol. Wet to dry grassland, c. 2200–3000 m.

Note. The pair of flowering shoots in each uppermost axil distinguishes *H. bifurcatum* from all other members of sect. *Humifusoidium* except some forms of *H. papuanum* in which, however, the leaf gland pattern differs and 4–5 styles often occur.

9. *Hypericum papuanum* RIDL. Trans. Linn. Soc. II, Bot. 9 (1916) 19; LAUT. Bot. Jahrb. 58 (1922)

5; STEEN. Bull. Jard. Bot. Btzg III, 13 (1934) 219. — *H. japonicum* (non THUNB. ex MURR.) WARB. Bot. Jahrb. 16 (1893) 14. — *H. macgregorii* (non F.V.M.) LAUT. Nova Guinea 8 (1912) 843. — *H. hellwigii* LAUT. Bot. Jahrb. 58 (1922) 4; KELLER in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 181; STEEN. Bull. Jard. Bot. Btzg III, 13 (1934) 219. — *H. habbemense* A. C. SMITH, J. Arn. Arb. 22 (1941) 343. — Fig. 18c.

Erect or \pm straggling shrub or woody herb, 0.1–1.3 m, branches strict or \pm lax, creeping and rooting at the base; branchlets 2–4-lined when young, eventually terete. Leaves sessile, 0.6–2.5 by 0.3–1.7 cm, narrowly ovate or ovate-triangular to elliptic or broadly ovate or subcircular, apex subacute or rarely acute to rounded, base rounded to cordate, concolorous, plane, spreading or ascending; 4–5(–6) main lateral veins, \pm parallel or diverging, much branched, uniting near margin and apex, with marked, usually \pm dense, reticulate venation; laminar glands pale, linear towards the base or wholly punctate and striate or punctate only; intramarginal glands pale only or partly or wholly black. Inflorescence 1-flowered, with or without flowering shoots in uppermost axils, or regularly dichasial or intermediate and irregular; pedicels usually exceeding uppermost leaves, 4–20 mm in fruit. Flowers 1.8–2.6 cm ϕ , plane; buds ovoid to ellipsoid, subacute. Sepals 3–7(–8) by 1–2 $\frac{1}{4}$ (–3 $\frac{1}{4}$) mm, free, imbricate, ovate to lanceolate or narrowly oblong or sometimes broadly ovate and foliaceous, acute to rounded, entire; laminar glands pale, linear; submarginal glands black or absent. Petals bright yellow, 9–15 by 4–9 mm, obovate, entire, persistent; apiculus short or obsolete; laminar glands pale, linear, sometimes striate distally; marginal glands absent or black, sometimes only in apiculus, rarely few to numerous elsewhere on margin. Stamens not obviously in fascicles (15–)25–40(–50), longest 6–9 mm, c. $\frac{3}{4}$ as long as the petals, persistent; anthers bright yellow, gland amber or occasionally black. Ovary (2–)2 $\frac{1}{4}$ –3(–4) mm, narrowly or rarely broadly ovoid; styles 3 (4–5), 2–3 mm, $\frac{3}{4}$ as long to as long as the ovary, divergent; stigmas narrowly to broadly capitate; placentas 3(–4–5), parietal. Capsule (5–)7–9(–10) by 3–4 $\frac{1}{2}$ mm, narrowly ovoid or rarely broadly ovoid to ellipsoid, longitudinally vittate. Seeds yellow-brown to dark brown, 0.7–0.8 mm, cylindric or subcylindric, scarcely carinate, densely linear-foveolate to linear-scalariform.

Distr. *Malesia*: New Guinea (widespread in all mountainous regions). Fig. 17.

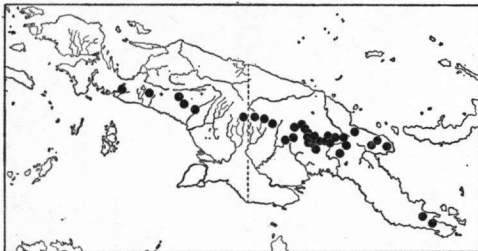


Fig. 17. Range of *Hypericum papuanum* RIDL.

Ecol. Wet to dry alpine grassland and bogs, screes, 1800–3800 m.

Note. *H. papuanum* is a very variable species in which the extreme forms, although quite distinct in appearance, are linked by intermediates with varying combinations of characters, so that the morphological trends are not coordinated. These trends are:

(1) Leaves narrowly ovate and \pm crowded with laminar glands mostly linear (in E., W. and S.

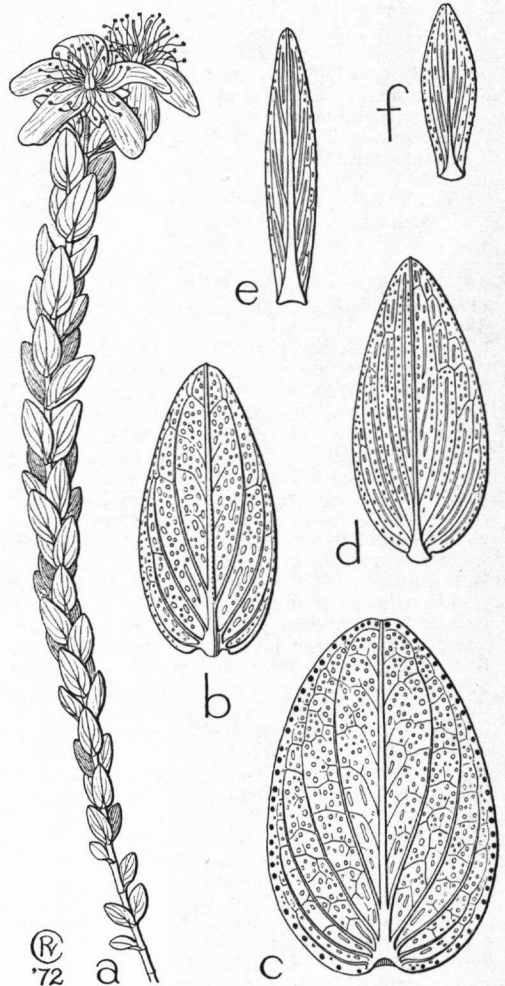


Fig. 18. *Hypericum pulogense* MERR. a. Habit, nat. size, b. leaf, $\times 4$. — Leaves from underside of: c. *H. papuanum* RIDL., $\times 4$, d. *H. bifurcatum* N. ROBSON, $\times 4$, e. *H. saruwagedicum* DIELS, $\times 10$, f. *H. macgregorii* F.V.M., $\times 4$ (a–b ROBBINS s.n., dd. 25–10–1965, c SAYERS NGF 21419, d NGF 15969, e HOOGLAND 10002, f HARTLEY NGF 12799).

- Highlands mainly) to broadly ovate or sub-circular, not crowded, with laminar glands all punctiform (constant in W. New Guinea and E. Papua, Northern and Milne Bay Districts).
- (2) Leaves, sepals, petals and anthers without black glands (mainly eastern) to with black glands, forming a continuous intramarginal row in the leaves (constant in W. New Guinea) and sepals and a continuous marginal row in the petals (rare).
 - (3) Inflorescence 1-flowered (mainly eastern) to regularly dichasial (mainly western).
 - (4) Styles and placentae 3 with ovary and capsule narrowly ovoid (mainly eastern) to styles and placentae 4-5 with ovary and capsule \pm broadly ovoid (mainly western). According to A. C. SMITH, *l.c.*, *H. habbemense* may have up to 6 styles but only up to 5 placentae. A re-examination of the syntype material has failed to reveal an ovary with 6 styles and 5 placentae, a combination of characters that is probably teratological in origin.
 - (5) Habit dense with \pm ascending branches (widespread) to lax with \pm spreading branches (Madang and Morobe Districts).

10. *Hypericum pulogense* MERR. Philip. J. Sc. 5 (1910) Bot. 364; En. Philip. 3 (1923) 75. — Fig. 18a-b.

Suffrutescent herb, 20-40 cm, branches strict, erect or ascending to decumbent from slender branching rhizome, 2(-4-6)-lined or narrowly 2-winged when young, sometimes eventually terete. *Leaves* sessile or very shortly petiolate, 0.8-1.2(-2) by 0.3-0.7 cm, elliptic to oblong or ovate, apex obtuse to rounded, base broadly cuneate to rounded, glaucous beneath, margin recurved (at least when dried), spreading or ascending; c. 4 main lateral veins, \pm parallel, slightly branched, uniting near margin and apex, with scarcely visible reticulate venation; laminar glands pale, \pm prominent, punctate and shortly striate; intramarginal glands pale or apparently absent. *Inflorescence* 1-flowered, with or without flowering shoots in uppermost axils, or regularly dichasial with 3-c. 10 flowers; pedicels shorter than uppermost leaves, 4-6 mm in fruit. *Flowers* 2-2½(-3) cm σ , plane; buds narrowly ovoid, subacute to obtuse. *Sepals* 4-6 by 1.8-2.4 mm, free, imbricate, lanceolate to oblong or elliptic-oblong, rounded or subapiculate, entire; laminar glands pale, linear and punctate; submarginal glands pale. *Petals* bright yellow, 10-12(-14) by 4-6 mm, narrowly oblong-obovate, entire to subentire, persistent; apiculus small, glandular; laminar glands pale, linear, becoming striate and punctate distally; marginal glands pale. *Stamens* not obviously in fascicles (or in 5 fascicles, *vide* MERRILL), c. 30-60, longest c. 9 mm, c. ¼ as long as the petals, persistent; anthers bright yellow, gland amber. *Ovary* 3-4 mm, broadly to narrowly ovoid; styles 3, c. 5 mm, 1.4-2 times as long as ovary, divergent; stigmas not capitate; placentas 3, axile. *Capsule* 5-8 by 4-5 mm, narrowly ovoid to ovoid, longitudinally and diagonally vittate. *Seeds* yellow-brown to dark brown, ¼-1 mm, cylindrical, not carinate, densely linear-scalariform.

Distr. Malesia: Philippines (Luzon). Fig. 20.

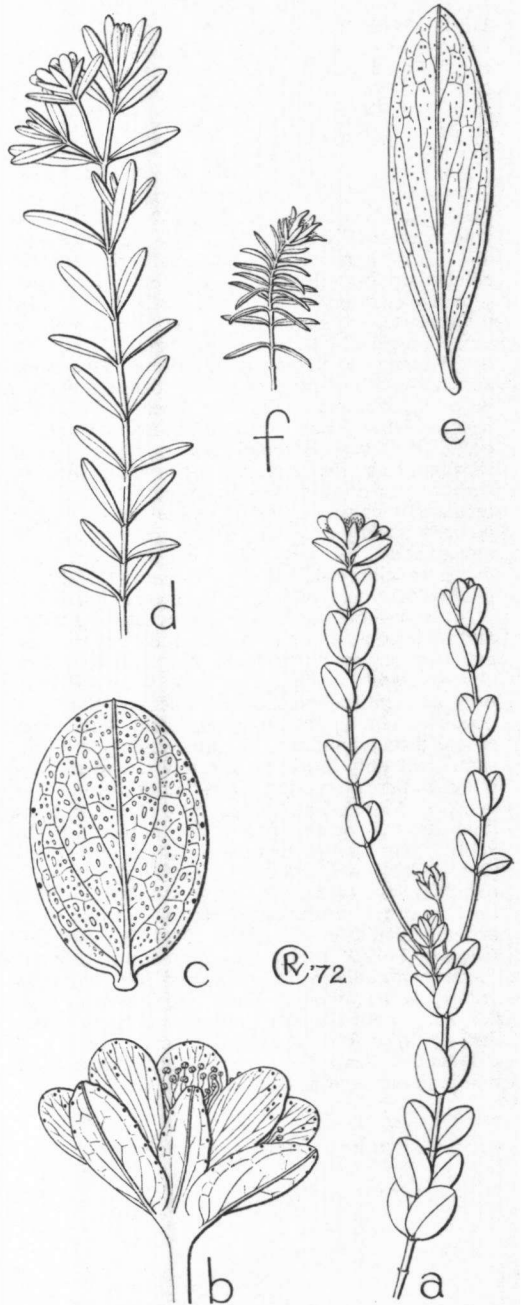


Fig. 19. *Hypericum beccarii* N. ROBSON. a. Habit, nat. size, b. flower, $\times 4$, c. leaf, $\times 4$. — *H. beccarii* *ssp. steenisii* N. ROBSON. d. & f. Habit, nat. size, e. leaf, $\times 4$ (a-c BÜNNEMEIJER 976a, d-e VAN STEENIS 8514, f VAN STEENIS 9599).

Ecol. Summit grasslands and open places in mossy forest, c. 2800 m.

Note. *H. pulogense* is known only from Mt Pulog and Mt Tabayoc. Its nearest relatives (other than *H. beccarii*) are in New Guinea. The only specimen from Mt Tabayoc has slenderer, more decumbent stems than those from Mt Pulog. In these respects it approaches *H. beccarii*.

11. *Hypericum beccarii* N. ROBSON, Blumea 20 (1972) 260. — *H. japonicum* var. *pinnatinervium* BAKH. f. in Back. & Bakh. f. Fl. Java 1 (1963) 382, descr. angl. — Fig. 19.

Weak perennial (? or annual) herb, c. 2–45 cm, stems wiry, decumbent or ascending (or erect *vide* BAKH. f.), creeping and branching irregularly, rooting at the base, narrowly 4–6-lined when young, often becoming 2-lined. Leaves 0.2–1½ mm petiolate, 2¼–10¼ by ¼–6 mm, broadly oblong or elliptic-oblong to oblanceolate or linear, apex rounded to subacute, apiculate to mucous, base rounded to cuneate, glaucous beneath, margin not or slightly recurved, spreading; c. 3 main lateral veins, ± parallel, with reticulate branchings, uniting near margin and apex with dense conspicuous reticulate venation; laminar glands pale, ± prominent or not, irregularly punctate; intramarginal glands dark or pale, irregular. Inflorescence 1-flowered, with flowering shoots in uppermost axil(s); pedicels usually exceeding uppermost leaves, (2–)5–17 mm in fruit. Flowers c. 7–10 mm ø, plane; buds narrowly ovoid, obtuse. Sepals 2¼–5 by 0.6–1.4 mm, free, ± broadly or not imbricate, elliptic-oblong to linear, rounded to subacute or apiculate; margin entire to irregularly glandular-ciliate; laminar glands pale, punctate to shortly striate; submarginal to marginal glands black. Petals yellow, 3–7 by 2–2¼ mm, oblong-oblanceolate, persistent; apiculus small, glandular or glandular-ciliate; margin entire or with few subsessile glands; laminar glands absent or few near apex, pale or black, punctate; marginal glands black. Stamens in 3 fascicles, c. 15–22, longest 2¼–5¼ mm, c. ¼–¼ as long as the petals, persistent; anthers yellow, gland black. Ovary 1½ mm long, narrowly ovoid; styles 3, c. 1¼ mm, about as long as the ovary, gradually divergent; stigmas slightly capitate; placentas 3, axile. Capsule 3–5¼ by 2–3¼ mm, ± narrowly ovoid, densely and ± prominently longitudinally vittate or almost smooth. Seeds reddish brown, 0.7–0.9 mm, cylindrical, not carinate, densely shallowly linear-reticulate.

ssp. beccarii. — Fig. 19a–c.

Leaves 0.2–1 mm petiolate, 0.4–1 by 0.2–0.6 cm, broadly oblong or elliptic-oblong to narrowly obovate, apex rounded, apiculate to mucous, base rounded to cuneate; laminar glands ± prominent. Sepals 3¼–5 by 1–2 mm, ± broadly imbricate. Petals 5–7 mm; laminar glands (when present) black. Stamens c. 20–22, longest 4¼–5¼ mm. Capsule 4–5¼ by 2¼–3¼ mm, densely and ± prominently vittate.

Distr. *Malesia*: West Central Sumatra (Mts Singalang, Talang, Talamau, Kerintji), W. Java (Mt Papandajan, once collected). Fig. 20.

Ecol. Between 1800 and 3000 m.

Note. The specimens with broad leaves and

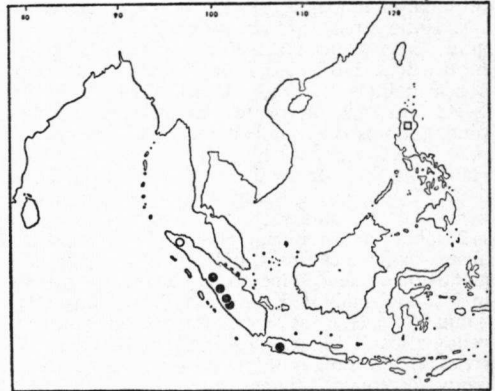


Fig. 20. Range of *Hypericum pulogense* MERR. (□), *H. beccarii* N. ROBSON ssp. *beccarii* (●) and ditto ssp. *steenisii* N. ROBSON (○).

large flowers (from Mts Talamau and Singalang) approach most closely to *H. pulogense* and other related species in this section. The Javanese specimens, although smaller in all parts, cannot otherwise be separated from those of Central Sumatra.

ssp. steenisii N. ROBSON, Blumea 20 (1972) 261. — Fig. 19d–f.

Leaves ¼–1½ mm petiolate, 2¼–10¼ by ¼–4 mm, oblanceolate to linear, apex rounded to subacute, ± apiculate, base cuneate; laminar glands not prominent. Sepals 2¼–5 by 0.6–1.4 mm, not imbricate. Petals 3–6 mm; laminar glands (when present) pale. Stamens c. 15–20, longest 2¼–4¼ mm. Capsule 3–4¼ by 2–3 mm, sparsely and obscurely longitudinally vittate (± smooth).

Distr. *Malesia*: N. Sumatra (Gajo Lands; Mts Losir & Kemiri). Fig. 20.

Ecol. Along streamlets, in open vegetation, 2700–3300 m.

Note. *Ssp. steenisii* differs essentially from *ssp. beccarii* in having narrower leaves and smooth capsules with few vittae.

12. *Hypericum pseudopetiolum* R. KELLER, Bull. Herb. Boiss. 5 (1897) 638; Y. KIMURA, J. Jap. Bot. 15 (1939) 295; in Nakai & Honda, Nova Fl. Jap. 10 (1951) 197, ff. 68, 69.—*H. taihezanense* S. SUZUKI, Trans. Nat. Hist. Soc. Formosa 20 (1930) 239; Ann. Rep. Taihoku Bot. Gard. 1 (1931) 158; in Masamune, Short Fl. Formosa (1936) 141. — *H. pseudopetiolum* var. *taihezanense* (S. SUZUKI) Y. KIMURA, J. Jap. Bot. 15 (1939) 296; Bot. Mag. Tokyo 54 (1940) 81; in Nakai & Honda, Nova Fl. Jap. 10 (1951) 204.

Perennial herb, 15–40 cm, stems slender, ascending, branching above, not rooting, terete. Leaves sessile or up to ¼ mm petiolate, 4–17 by 2–6 mm, lanceolate or ovate to elliptic-oblong, apex rounded, base cuneate to rounded (or the upper ones sometimes cordate-amplexicaul), paler beneath; 3–4 main lateral veins, with reticulate branchings, uniting near margin and apex; reticulate venation ± marked, dense; laminar glands pale, large, often prominent, dense, punctate;

intramarginal glands black, dense. *Inflorescence* 1-c. 10-flowered, cymose, monochasial after 2nd grade, lax; pedicels sometimes exceeding uppermost leaves, 3–6 mm in fruit. *Flowers* 8–10 mm ϕ , concave; buds ellipsoid, obtuse. *Sepals* 3–5½ by 1–1¼ mm, free, imbricate, lanceolate to elliptic-oblong, obtuse to rounded, entire; laminar glands pale, punctate or shortly striate, few; submarginal glands all black or basal ones pale. *Petals* yellow, 5–6 by 2 mm, narrowly obovate or oblong-obovate, persistent; apiculus absent; margin entire or with 1–2 subapical prominent glands; laminar glands absent or few near apex, pale, punctate; marginal glands black, few, sometimes prominent. *Stamens* in 3 (abnormally 4–5) fascicles, c. 30, longest c. 4 mm, c. ¼ as long as the petals, persistent; anthers yellow; gland black. *Ovary* c. 3 mm, ellipsoid; styles 3 (abnormally 4–5), 1¼ mm, shorter than ovary, divergent; stigmas scarcely capitate; placentas 3 (abnormally 4–5), axile. *Capsule* 4–5 by 3–4 mm, broadly ovoid to subglobose, longitudinally vittate. *Seeds* mid-brown, ¼ mm, cylindrical-ellipsoid, not carinate, densely shallowly reticulate-scalariform.

Distr. Taiwan (north and central), and Japan (north to southern Hokkaido), in *Malesia*: Philippines (Luzon, Pauai).

Ecol. Occurs at 2100 m in Luzon, but reaches 2500 m near Arisan in Taiwan.

Note. The Philippine plant resembles some of the specimens from Taiwan. The variation in that island, however, overlaps that of the Japanese *H. pseudopetiolum* to such an extent that it is impossible to recognise *H. taihezanense*, even at varietal level.

13. *Hypericum petiolulatum* HOOK. f. & THOMS. ex DYER, Fl. Br. Ind. 1 (1874) 255; LÉV. Bull. Soc. Bot. Fr. 54 (1908) 594; HAND.-MAZZ. Symb. Sin. 7 (1931) 402; GAGNEP. Fl. Gén. I.-C. Suppl. 1 (1943) 248. — *H. thomsonii* R. KELLER, Bot. Jahrb. 33 (1904) 552, *quoad typum*. — *H. mutilum* (non L.) RIDL. J. Fed. Mal. Stat. Mus. 8 (1917) 17. — *H. petiolulatum* (non L., nec L.f., nec WALT., nec LOUR.) R. KELLER in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 179.

Annual herb, 10–60 cm, stems erect to ascending or procumbent, branching \pm widely, rooting, terete. *Leaves* 1–3 mm petiolate, 0.9–3 by 0.5–1(–1.6) cm, oblong or lanceolate-elliptic to obovate or subcircular, apex rounded or rarely obtuse, base cuneate or attenuate to rarely rounded, \pm glaucous beneath; 3 main lateral veins, not or scarcely branched, uniting near margin and apex; reticulate venation obscure, rather dense to lax; laminar glands pale, very rarely with 1–2 black, large, usually \pm prominent, \pm dense, punctate; intramarginal glands black, \pm dense or irregular. *Inflorescence* (1–)3–9-flowered, cymose, with subsidiary inflorescences on often long lateral branches, monochasial after 1st grade, lax; pedicels exceeding uppermost leaves, 4–13 mm in fruit. *Flowers* 5–7 mm ϕ , plane; buds ellipsoid, obtuse. *Sepals* 2.3–3.4 by 0.5–0.9 mm, free, not imbricate, linear to very narrowly oblong-lanceolate, entire; very acute (or rarely (Nepal) narrowly elliptic-oblong and subacute); laminar glands pale or rarely black, punctate to linear, variable in size and number; marginal glands black, few, some-

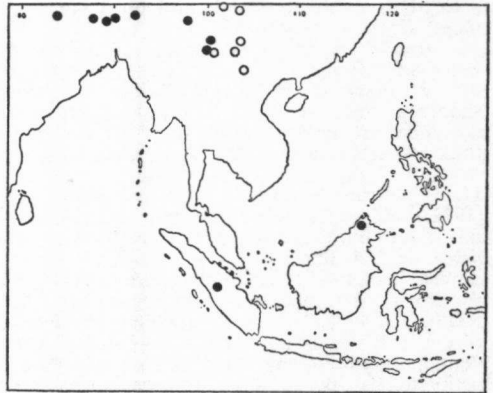


Fig. 21. Range of *Hypericum petiolulatum* HOOK. f. & THOMS. ex DYER ssp. *petiolulatum* (●) and ditto ssp. *yunnanense* (FRANCH.) N. ROBSON (○).

times one apical, or all absent. *Petals* yellow, 4–5½ by 1–1¼ mm, oblanceolate, entire, persistent; apiculus small, acute, subapical; laminar glands absent or 1–2, pale, punctate; marginal glands black, 1–2 on or near the apiculus and occasionally also elsewhere. *Stamens* in 3 fascicles, 9–22, longest (2¼)–3–4¼ mm, c. ¼ as long as the petals; anthers yellow, gland black. *Ovary* 1¼–2 mm, \pm broadly ovoid to subglobose; styles 3(–4), 1–2.1 mm, ¼–1¼ times as long as the ovary, divergent; stigmas not or scarcely capitate; placentas 3(–4), axile. *Capsule* 3–5 by 3–5 mm, broadly ovoid to globose, longitudinally vittate. *Seeds* yellow-brown, 0.5–0.6 mm, cylindrical, not carinate, densely shallowly reticulate-scalariform.

Distr. Nepal to Burma and Yunnan, in *Malesia*: Sumatra (Mt Kerintji), N. Borneo (Mt Kinabalu). Fig. 21.

Ecol. Stream banks in peaty or stony soil, 2000–2400 m.

Note. *H. petiolulatum* is variable, but the Malesian specimens fall within the range of variation of the type subspecies. On the other side of the Himalayan Range, in Yunnan and Szechuan, it is represented mostly by ssp. *yunnanense* (FRANCHET) N. ROBSON, in which the styles are longer than the ovary, the capsule is \pm broadly ovoid, the leaf lamina is usually broadest at or below the middle and often larger than in ssp. *petiolulatum*, the branching is more regular, and the main inflorescence usually occupies 2–3 nodes.

14. *Hypericum gramineum* G. FORSTER, Fl. Ins. Austr. Prodr. (1786) 53; VAHL, Symb. Bot. 2 (1791) 86; BAILEY, Rep. Austr. Ass. Adv. Sc. 7 (1898) 429; QUEENS. Fl. 1 (1899) 100; HOCHR. Candollea 2 (1925) 437; R. KELLER in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 183; GUILLAUMIN, Fl. Nouv. Caléd. (1948) 217. — *Ascyrum involutum* LABILL. Nov. Holl. Pl. Spec. 2 (1806) 32, t. 174. — *H. involutum* (LABILL.) CHOISY, Prod. Monogr. Hypér. (1821) 50; in DC. Prod. 1 (1824) 549. — *Brathys billardieri* SPACH, Ann. Sc. Nat. II, Bot. 5 (1836) 367. — *Brathys forsteri* SPACH, l.c. — *H. pedicellare* ENDL. En. Pl. Hueg. (1837) 12. — *H. aureum* BANKS & SOL. ex HOOK. f. Fl. Nov. Zel. 1

(1853) 36, in *synon.* — *H. lalandii* (non CHOISY) DYER, Fl. Br. Ind. 1 (1874) 256; LÉV. Bull. Soc. Bot. Fr. 54 (1908) 589, 593; R. KELLER, Bull. Herb. Boiss. II, 8 (1908) 187, *pro parte*; in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 181, *pro parte*; HAND.-MAZZ. Symb. Sin. 7 (1931) 404; KANJILAL & DAS, Fl. Assam 1, 1 (1935) 100. — *H. foetidum* HOOK. f. & THOMS. ex DYER, Fl. Br. Ind. 1 (1874) 257, in *synon.* — *H. japonicum* var. *australe* R. KELLER, Bull. Herb. Boiss. II, 8 (1908) 186. — *H. japonicum* var. *lanceolatum* Y. KIMURA, Bot. Mag. Tokyo 54 (1940) 88. — *Sarothra saginoides* Y. KIMURA in Nakai & Honda, Nova Fl. Jap. 10 (1951) 246, t. 81. — *Sarothra graminea* (G. FORSTER) Y. KIMURA, l.c. 232.

Perennial or annual herb, (2½–)5–72 cm, with stems erect or decumbent, branching strictly from the base (rarely elsewhere) or unbranched below the inflorescence, not rooting, 4-lined. Leaves sessile, 0.4–2.5 by 0.12–0.8 cm, lanceolate to linear or oblong or rarely ovate-lanceolate, apex obtuse to rounded, base cordate to rounded or sometimes cuneate, amplexicaul, ± glaucous beneath; 1–3 main basal veins, not or scarcely branched, with 1 or more lateral veins often visible; reticulate venation absent; laminar glands pale, not prominent, small and dense above, larger and laxer beneath; intramarginal glands absent. Inflorescence (1–2)–3–c. 30-flowered, cymose and regularly dichasial to monochasial or wholly monochasial, or with branches in uppermost leaf axil, or mixed, sometimes with subsidiary inflorescences from upper 1–3 leaf pairs, lax; pedicels usually exceeding uppermost leaves, 2–30 mm in fruit. Flowers (5–)6–12(–15) mm ø, plane; buds ellipsoid, subacute. Sepals 2.8–7.5(–9) by 0.8–2 mm, free, imbricate, lanceolate to narrowly elliptic, entire, acute to subacute, 3–5-nerved, often with ± prominent midrib, especially in fruit; laminar glands pale, linear towards the base, becoming punctate distally; marginal glands absent. Petals pale or bright yellow or orange, 5–10 by 2–5 mm, c. 1.3 times as long as the sepals, obovate to oblanceolate, entire, persistent; apiculus small, mucronate to rounded, lateral; laminar and marginal glands absent. Stamens not in apparent fascicles, c. 30–50, longest 2¼–4 mm, c. ¾ as long as petals; anthers yellow, gland amber. Ovary 1¼–2.3 mm, narrowly ovoid-conic; styles 3, 0.7–1.8 mm, ¼–½ as long as ovary, ± divergent; stigmas capitate; placentas 3, parietal. Capsule 2¼–8 by 1–3¼(–4) mm, narrowly ovoid to cylindrical, not vittate. Seeds yellow-brown, ¼ mm, cylindrical, not carinate, longitudinally ribbed with fine transverse striae.

Distr. Vietnam, Taiwan, China (Yunnan), India (Assam), Bhutan (?), in *Malesia*: New Guinea (Morobe, E., W. & S. Highlands, Western Distr.), Australia, New Zealand, New Caledonia.

Ecol. Grows in wet to dry, but open and well-drained habitats at 10–2600 m.

Note. *H. gramineum* appears to remain quite distinct from *H. japonicum* except in Bhutan, where hybrid (?) intermediates occur. It can be distinguished from *H. japonicum* by its larger flowers and floral parts, longer petals relative to sepals, more numerous stamens and, usually, its narrower leaves and lanceolate to narrowly elliptic acute sepals. In *H. japonicum* the sepals rarely show this combination of characters. In addition, *H.*

gramineum never has the straggling to prostrate habit often found in *H. japonicum*.

15. *Hypericum japonicum* THUNB. ex MURRAY, Syst. Veg. ed. 14 (July 1784) 702; THUNB. Fl. Jap. (Aug. 1784) 295, t. 31; LAMK, Encycl. Méth. 4 (1797) 163; CHOISY, Prod. Monogr. Hypér. (1821) 48; in DC. Prod. 1 (1824) 548, *incl. var. ramosum* CHOISY, l.c. 549; BL. Bijdr. 1 (1825) 143; D. DON, Prod. Fl. Nepal. (1825) 219; ROYLE, Ill. Bot. Himal. (1834) 131, t. 24, f. 2; HOOK. f. Fl. Nov. Zel. 1 (1853) 37, *incl. var. humifusum* (LABILL.) HOOK. f.; CHOISY in Zoll. Syst. Verz. (1854) 151; MIQ. Ann. Mus. Bot. Lugd.-Bat. 2 (1866) 259, *incl. f. microphylla* MIQ. et *f. tenuior* MIQ.; Prol. Fl. Jap. (1866) 147; DYER, Fl. Br. Ind. 1 (1874) 256; KURZ, J. As. Soc. Beng. 43, ii (1874) 84; FRANCH. & SAV. En. Pl. Jap. 2 (1878) 300; FORB. & HEMSL. J. Linn. Soc. Bot. 23 (1886) 73; TRIM. Fl. Ceylon 1 (1893) 93; R. KELLER, Bull. Herb. Boiss. 5 (1897) 641; BAILEY, Queensl. Fl. 1 (1899) 101; LÉV. Bull. Soc. Bot. Fr. 53 (1906) 501; *ibid.* 54 (1908) 593; GAGNEP. Fl. Gén. I.-C. 1 (1908) 286, f. 28, 15–21; R. KELLER, Bull. Herb. Boiss. II, 8 (1908) 185, 186, *incl. var. maximowiczii* R. KELLER, var. *thunbergii* (FRANCH. & SAV.) R. KELLER, var. *calyculatum* R. KELLER et var. *simplicius* R. KELLER; PAMPANINI, Nuov. Giorn. Bot. Ital. n.s. 17 (1910) 670, *incl. var. accumbens* (BL.) PAMP.; LÉV. in Fedde, Rep. 8 (1910) 451, *incl. var. plurinervium* LÉV.; RIDL. J. Str. Br. R. As. Soc. 54 (1910) 16; BACK. Schooffl. Java (1911) 86; HAYATA, Ic. Pl. Formos. 1 (1911) 78; GAMBLE, Fl. Pres. Madras 1 (1915) 70; RIDL. Trans. Linn. Soc. Lond. II, Bot. 9 (1916) 20; Fl. Mal. Pen. 1 (1922) 152; LAUT. Bot. Jahrb. 58 (1922) 5; BAKER f. J. Bot. 62 (1924) Suppl. 7; CRAIB, Fl. Siam. En. 1 (1925) 111; R. KELLER in E. & P. Nat. Pfl. Fam. ed. 2, 21 (1925) 181; MAKINO, Syokubutu Dzakun (1925) 553, t. 628, *cum f. yabei* (LÉV. & VAN.) MAKINO; HOCHR. Candollea 2 (1925) 436, 437, *incl. var. typicum* HOCHR.; KOIDZ. Bot. Mag. Tokyo 40 (1926) 344, *incl. var. robusta* MIQ. ex KOIDZ. l.c. 435; RIDL. Kew Bull. (1926) 59; HEND. Gard. Bull. S. S. 4 (1928) 222; KOIDZ. Fl. Symb. Or. As. (1930) 92, *incl. var. caualeriei* (LÉV.) KOIDZ.; HAND.-MAZZ. Symb. Sin. 7 (1931) 404; FYSON, Fl. S. India Hill Stat. 1 (1932) 49, *incl. var. major* FYSON; BURK. Dict. (1935) 1217; KANJILAL & DAS, Fl. Assam 1, 1 (1935) 102; Y. KIMURA, Bot. Mag. Tokyo 54 (1940) 87; CORNER, Wayside Trees (1940) 324; GAGNEP. Fl. Gén. I.-C. Suppl. 1 (1943) 250; MASAMUNE, Trans. Nat. Hist. Soc. Formosa 33 (1943) 168, *incl. var. kainantense* MASAM.; BANERJI, J. Bomb. Nat. Hist. Soc. 51 (1953) 774; HEND. Malayan Wild Fl. (1954) 34, f. 24; HUNDLEY & KO KO, List trees etc. Burma ed. 3 (1961) 19; BACK. & BAKH. f. Fl. Java 1 (1963) 382; OHWI, Fl. Jap. (Engl. transl.) (1965) 631; BANERJI, Rec. Bot. Surv. Ind. 19 (1966) 27; SHRESTHA, Bull. Dep. Med. Pl. Nepal 1 (1967) 7; STEEN. Mt Fl. Java (1972) t. 23: 7. — *Ascyrum humifusum* LABILL. Nov. Holl. Pl. Sp. 2 (1806) 33, t. 175. — *H. pusillum* CHOISY, Prod. Monogr. Hypér. (1821) 50; in DC. Prod. 1 (1824) 549. — *H. campestre* MOON, Cat. Ind. Exot. Pl. Ceylon (1824) 56, *nomen.* — *H. dichotomum* BUCH.-HAM. ex D. DON, Prod. Fl. Nepal. (1825) 219 in *synon.* — *Brathys humifusa* (LABILL.) SPACH, Ann. Sc. Nat. II, 5 (1836) 367. — *Tridia*

frankenioides KORTH, Tijd. Nat. Gesch. Phys. 3 (1836) 17, t. 1. — *Brathys japonica* (THUNB. ex MURRAY) WIGHT, Ill. Ind. Bot. 1 (1840) 113; BL. Mus. Bot. Lugd. Bat. 2 (1856) 19, incl. var. *accumbens* BL.; MIQ. Fl. Ind. Bat. 1, 2 (1859) 513, 514, incl. var. *mucronisepala* MIQ. et var. *acutisepala* MIQ. — *H. nervatum* HANCE in Walp. Ann. 2 (1851) 188. — *H. sumatranum* MIQ. Pl. Jungh. (1855) 395. — *Brathys laxa* BL. Mus. Bot. Lugd. Bat. 2 (1856) 19. — *Brathys nepalensis* BL. l.c. — *Brathys debilis* BL. l.c. 20. — *Brathys radicans* BL. l.c. — *Brathys caespitosa* BL. l.c., incl. var. *pusilla* BL. — *Brathys oryzetum* BL. l.c. — *H. calycatum* JACQUEM. ex DYER, Fl. Br. Ind. 1 (1874) 256, in *synon.* — *H. thunbergii* FRANCH. & SAV. En. Pl. Jap. 2 (1878) 300; LÉV. Bull. Soc. Bot. Fr. 53 (1906) 498, 501. — *H. mutilum* (non L.) MAXIM. Mém. Biol. 11 (1882) 171; Bull. Ac. Sc. St. Pétersb. 27 (1882) 436; STAPF, Trans. Linn. Soc. Lond. II, Bot. 4 (1894) 132; GIBBS, J. Linn. Soc. Lond. 42 (1914) 59; Arfak (1917) 149; MERR. J. Mal. Br. R. As. Soc. 1 (1923) 53; STEEN. Bull. Gard. Bot. Btzg III, 13 (1934) 220. — *H. yabei* LÉV. & VANT. Bull. Soc. Bot. Fr. 53 (1906) 498, 501. — *H. taquetii* LÉV. & VAN. in Fedde, Rep. 5 (1908) 279. — *H. cavaleriei* LÉV. Bull. Soc. Bot. Fr. 54 (1908) 593. — *H. dominii* LÉV. l.c. — *H. pseudo-japonicum* NAKAI, Bot. Mag. Tokyo 27 (1913) 130, *nomen.* — *H. laxum* (BL.) KOIZ. Bot. Mag. Tokyo 40 (1926) 344; MASAMUNE, Fl. & Geobot. Stud. Ins. Yakusima (1934) 305, incl. var. *hananoegoense* MASAM.; Y. KIMURA, Bot. Mag. Tokyo 51 (1937) 737; HATUSIMA, Bot. Mag. Tokyo 56 (1942) 571, incl. var. *novo-guineense* HATUS.; OHWI, Fl. Jap. (Engl. transl.) (1965) 630. — *Sarothra japonica* (THUNB. ex MURRAY) Y. KIMURA in Nakai & Honda, Nova Fl. Jap. 10 (1951) 235, t. 78, incl. f. *vulgaris* Y. KIMURA, l.c. 240, f. *microphylla* (MIQ.) Y. KIMURA, l.c., et f. *robusta* (MIQ. ex KOIZ.) Y. KIMURA, l.c. — *Sarothra laxa* (BL.) Y. KIMURA in Nakai & Honda, Nova Fl. Jap. 10 (1951) 241, t. 79, incl. f. *repens* Y. KIMURA, l.c. 244, f. *simplex* Y. KIMURA, l.c., f. *ramosa* Y. KIMURA, l.c., f. *erecta* Y. KIMURA, l.c. 245, f. *hananoegoensis* (MASAM.) Y. KIMURA, l.c., et f. *ramosissima* Y. KIMURA, l.c.

Annual (? or perennial) herb, 2–45(–50) cm, with stems erect to decumbent or prostrate, unbranched below the inflorescence or also branched from the base or from various parts of the stem, with branches strict or ascending, rooting at the base, 4-lined. *Leaves* sessile, 2–18 by 1–10 mm, ovate to oblong or elliptic or subcircular or oblong-lanceolate or more rarely oblanceolate or obovate-spathulate, apex obtuse to rounded, base cordate-amplexicaul to cuneate or more rarely attenuate, sometimes glaucous beneath; 1–3 main basal veins, not or scarcely branched, often with 1 or more lateral veins; reticulate venation absent; laminar glands pale, not prominent, small, denser above than beneath; intramarginal glands absent. *Inflorescence* 1-c. 30-flowered, cymose and regularly dichasial to monochasial or with branches in uppermost leaf axils, sometimes with subsidiary inflorescences from the next leaf pairs or with branching becoming sympodial and flowers apparently axillary, lax; pedicels exceeding uppermost leaves or not, (1.4–)2–14 mm in fruit. *Flowers* 4–8 mm \emptyset , plane; buds cylindric-ellipsoid, \pm obtuse. *Sepals* 2–5 $\frac{1}{4}$ by $\frac{1}{4}$ –2 mm, free, imbricate,

narrowly oblong or (rarely) lanceolate to elliptic or obovate, acute or obtuse to rounded, entire, sometimes shortly mucronate, 3–5-nerved, often with \pm prominent midrib, especially in fruit; laminar glands pale, linear towards the base, becoming punctate distally; marginal glands absent. *Petals* pale or bright yellow to orange, 1.7–5 by 0.8–1.8 mm, c. 0.9–1.3 as long as the sepals, elliptic or oblong to obovate, entire, persistent; apiculus absent or vestigial, lateral; laminar and marginal glands absent. *Stamens* not in apparent fascicles but forming 5 irregular groups when few, 5–30, longest $1\frac{1}{4}$ –2.8 mm, $\frac{3}{4}$ – $\frac{1}{2}$ as long as the petals; anthers yellow, gland amber. *Ovary* 1– $1\frac{1}{4}$ (–1.8) mm, \pm broadly ovoid to subglobose; styles (2–)3, 0.4–0.8(–1) mm, $\frac{3}{4}$ – $\frac{1}{2}$ as long as ovary, \pm divergent, gradually broadening towards capitate stigmas; placentas (2–)3, parietal. *Capsule* (2–)2 $\frac{1}{4}$ –6 by 1.3–2.8 mm, cylindric to globose, not vittate. *Seeds* yellow-brown, c. $\frac{1}{4}$ mm, cylindric, not carinate, longitudinally ribbed with fine transverse striae.

Distr. Japan, S. Korea and SE. China to Ceylon, Australia, New Zealand and Hawaii; throughout *Malesia*.

Ecol. Wet or marshy habitats (rice-fields, ditches, stream margins) to dry localities (short grassland, roadsides), but always in exposed places, 0–3400 m.

Notes. *H. japonicum* is an extremely variable species; but the variation appears to be continuous, so that, despite the long list of published segregate species or infraspecific taxa, it seems impossible to distinguish infraspecific categories. The following numbered variants, however, will give some idea of the nature of this variation:

- (1) Stems erect, simple. Leaves \pm broadly ovate, subacute to obtuse, cordate-amplexicaul. Inflorescence terminal only, regularly dichasial at first. Bracts linear. Sepals oblong, acute. Petals as long as sepals. Stamens numerous (25–30). Capsule \pm cylindric, shorter than sepals (Korea, China, Philippines).
- (2) As type 1, but with subsidiary inflorescences and branches, and often somewhat decumbent habit (S. Japan, Korea, China, India (Assam, Madras), Ceylon, Thailand, Malaya, Sumatra, Java, Celebes, Borneo, Philippines).
- (3) As type 1, but inflorescence branching wholly monochasial and stems always \pm decumbent (Vietnam, Malaya, Sumatra, Java, Borneo, Philippines).
- (4) Differs from type 1 in having some or all the bracts foliar and the habit nearly always decumbent to prostrate, often with diffuse branching. This is found throughout the area of the species. The shape of all parts is very variable, but one characteristic form with obovate outer sepals (*var. 'calyculatum'*) occurs in the Himalaya. Another characteristic form—prostrate with radiating branches, small, obovate to circular leaves and obovate or broadly elliptic sepals—occurs in the western half of Java (Priangan Mts & Dieng).
- (5) The stem-branching in this decumbent to prostrate delicate diffuse variant is sympodial (resulting in pseudo-axillary flowers) and the sepals narrowly elliptic to narrowly oblong or oblanceolate (*var. 'humifusum'*); the size of all

parts is small and the stamens few in number (5-10), and the subglobose capsules exceed the sepals (New Guinea, Tasmania, New Zealand).

H. japonicum has been confused with *H. mutilum* L., a species mainly of eastern North America that differs from *H. japonicum* in several characters, e.g. the branches are more widely spreading (40-70° from vertical rather than 20-40°), those of the inflorescence being more slender than the stem and main branches (not equally stout), whilst those at the uppermost pair of nodes are usually more or less congested and often sub-umbellate (not roughly equally spaced); also, the bracts and bracteoles are nearly always linear-subulate and about 1-1½ mm long (not broader and/or 2-7 mm long).

Dubious

Hypericum chinense OSBECK, Dagbok Ostind. Resa (1757) 244.

This name predates *H. chinense* L. (1759), as

MERRILL (Am. J. Bot. 3, 1916, 588) pointed out. MERRILL, however, thought that LINNAEUS and OSBECK had described the same species, whereas OSBECK's description is of a herb with quadrangular stems, and therefore his name cannot be applied to the Linnaean species. If *H. chinense* OSBECK is a *Hypericum*, as seems likely, then it is almost certainly an earlier name for *H. japonicum* THUNB. ex MURRAY. In the absence of a specimen, however, and in the interest of nomenclatural stability, it should be regarded as a *nomen dubium*.

Hypericum consimile R. KELLER, Bot. Jahrb. 33 (1904) 552.

This species was described as coming from Java and belonging to *sect. Androsaemum* (DUN.) GODR., which is otherwise confined to Europe, W. Asia, N. Africa and Macaronesia. It is said to be close to *H. elatum* AIT. (i.e. *H. inodorum* MILL.), which is the hybrid *H. hircinum* L. × *H. androsaemum* L. The type specimen has not been located, but, if it does come from Java—and is correctly described—then it is almost certain to be an escape from cultivation.