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STUDIES IN THE BORAGINACEAE, XX  
REPRESENTATIVES OF THREE SUBFAMILIES IN  
EASTERN ASIA

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3. *Ehretia Dicksoni* Hance, Ann. Sci. Nat. ser. 4, 18: 224 (1862); Kanehira, Formosan Trees ed. 2, 635, f. 592 (1936) — "In China interiori coll. Dr. Dickson, a 1861."

*Ehretia macrophylla* var. *tomentosa* Gagnep. & Cour., Fl. Gen. Indo-Chine 4: 212 (1914) — type from Hainan, *Henry* 8294.

*Ehretia Dicksoni* var. *liukiensis* Nakai, Jour. Arnold Arb. 5: 40 (1924) — type from Ryukyu Islands.

*Ehretia Dicksoni* var. *japonica* Nakai, Jour. Arnold Arb. 5: 40 (1924); Terasaki, Nippon Shokubutsu Zufu t. 1221 (1933) and t. 2509 (1938) — type from Japan.

*Ehretia Dicksoni* var. *velutina* Koidzumi, Acta Phyt. et Geobot. 10: 140 (1941) — a comprehensive substitute name for the three varieties listed above.

*Ehretia macrophylla* sensu Shirasawa, Icon. Essent. Forest Trees Japan 2: t. 69 (1908).

Tree to 12 m.; leaves elliptic or ovate to obovate-elliptic, usually 10–18 cm. long and 5–12 cm. broad, apex acute, base usually obtuse or rounded, only rarely acute or slightly subcordate, margin serrate with usually spreading triangular teeth, upper surface green, somewhat scabrous from short appressed hairs, lower surface paler with abundant soft short hairs and frequently somewhat velvety, petiole 1–3 cm. long; leaves on very vigorous shoots usually larger, broader, and more coarsely toothed, 15–20 cm. long, 8–12 cm. broad, and scantily hairy on the lower surface; inflorescence terminal, corymbose or loosely panicle, 6–12 cm. broad, usually hairy; calyx 3–4 mm. long, usually paler and slightly indurate near base, sessile or subsessile, lobes 1.5–2 mm. long oblong; corolla white or yellowish, fragrant, 1 mm. long, tube 6 mm. long, gradually expanded, 2 mm. thick at base, to 6 mm. thick at summit, lobes 4 mm. long spreading or recurving; filaments 4–4.5 mm. long, attached 4.5–5 mm. above base

of tube, anthers oblong, 1.5–2 mm. long; style 7–9 mm. long, frequently bearing some appressed hairs, lobes 0.8–1 mm. long; drupe yellow, 10–20 mm. in diameter, depressed globose; endocarp 9–12 mm. long, 7–9 mm. broad, outer surface smooth, at maturity dividing into 2-seeded halves.

Ranging in the typical form (var. *typica*) from Kiangsu and Hunan south to northern Kwangtung, and also from southern Japan to Hainan.

KIANGSU: Pao Hwa Shan, Nanking, *V. L. King* 1551 (A); Nanking, *Meyer* 1415 (A).

KIANGSI: Lu Shan, *N. K. Ip* 1071 and *Chung & Sun* 667 (A); Kuling, *Wilson* 1571 (A).

HUNAN: Sinhwa, *Handel-Mazzetti* 782 (A); Yang Shan, Changning Hsien, *Fan & Li* 361 (A).

KWEICHOW: Do-Wan, Chenfeng, *S. W. Teng* 90859 (A); Sui-luk, southwest of Nanning, *W. T. Tsang* 21940 and 21890 (A).

KWANGTUNG: Yam Na Shan, Kaying District, *W. T. Tsang* 21326 (A, NY); Tsing Leung Shan, *McClure* 6712 (NY).

JAPAN: Awa, Mt. Kiyosumi, 1906, *Sakurai* (A).

RYUKYU ISLANDS: without locality, *Yokohama Nursery Co.* (type of var. *liukuensis*).

FORMOSA: Tamsuy, *Oldham* 347 (G); Tansui, Taihoku-shu, *Tanaka & Shimada* 10962 (A, NY); Tentana, Shinchiku prov., *Wilson* 10306 (A); Bankinsing, *Henry* 190 and 456 (A); Takow, *Henry* 313 (A, NY); South Cape, *Henry* 323 (A, NY); without locality, *Faurie* 8272 and 8273 (A).

HAINAN: Hoi How, *Native Collector Hongkong Bot. Gard.* 2183 (A); Kingshan, *F. C. How* 71322 (A); without locality, *Ford* (A).

3A. *Ehretia Dicksoni* var. *glabrescens* Nakai, *Jour. Arnold Arb.* 5: 40 (1924) — type from near Ichang, Hupeh, *Wilson* 3554.

Differing from the typical form in having usually thinner, commonly elongate leaves with the lower surface glabrous or nearly so.

Ranging from Honan and Hupeh west to eastern Sikang; also known from southern Yunnan.\*

HONAN: Chengchow, *J. Hers* 69 (A); Yu Tai Shan, *Teng Feng Hsien, J. Hers* 275 (A).

HUPEH: Patung Hsien, *H. C. Chow* 526 (A, NY); Patung, western Hupeh, *Wilson* 84 (A, NY); near Ichang, *Wilson* 3554 (TYPE, A) and 3554A; without locality, *Henry* 1881 bis (G), 3866 (NY), and 7171 (G); Siao Ya-tsze, *W. Y. Chun* 3614 (A); Fan-sien, *Silvestri* 1923 (A); Ou-tan-sien, *Silvestri* 1929 (A).

SZETCHUAN: Mao-chou, Min Valley, *Wilson* 3554B (A); north of Wen-chuan Hsien, *F. T. Wang* 2176 (A); Mt. Tsing-cheng, Kuan Hsien, *W. P. Fang* 13587 (A); Kuan Hsien, *W. P. Fang* 2265 (A, NY); west of Kuan Hsien, *F. T. Wang* 20904 (A); north of Chengtu Plain, *F. T. Wang* 22171 and 22182 (A); Mt. Omei, *W. P. Fang* 3217, 14459, and 16890 (A); Mt. Omei, *H. C. Chow* 9725 (A) and *C. L. Chow* 4746 (A);

\* "*Ehretia macrophylla*" is reported by K. S. Hao, *Bot. Jahrb.* 68: 632 (1938) from the mountains south of Koko-Nor, in northeastern Tibet. Other collections of the same species he reports from along the Kialing Ho, above Chungking, Szechuan, and from the Szechuan-Kansu border northwest of Chaohwa, Szechuan. Possibly *E. Dicksoni* var. *glabrescens* may be represented.



Omei Shan, *Chiao & Fan* 206 and 825 (A); Omei Hsien, *Sun & Chang* 616 (A).

SIKANG: 10 km. from Yong-ging, *C. Y. Chiao* 2101 (A); Ya-an, *C. Y. Chiao* 1150 (A).

YUNNAN: Mengtze, mountain forests, 5000 ft. alt. *Henry* 10515 (A, NY).

3B. *Ehretia Dicksoni* var. *tilioides*, var. nov.

Folia late elliptica plus minusve chartacea, subtus glaberrima sublucida, margine minute regulariter serrata.

Known only from Kweichow and Kwangsi.

KWEICHOW: Tungtze, *Y. Tsiang* 4882 (A, NY).

KWANGSI: Nan Hung, Ling Yun Hsien, *Steward & Cheo* 357 (TYPE, Arnold Arboretum, ISOTYPE, NY); Nantan, *C. Wang* 41189 (A).

*Ehretia Dicksoni* has close relatives only in *E. corylifolia* Wright of the highlands of southwestern China and *E. macrophylla* Wall. of Nepal. From both it is readily separable by its very large fruit. From *E. corylifolia* in particular it differs further in its usually less hairy, more coarsely serrate, rarely cordate leaves and coarser broader calyx-lobes and usually stouter corolla-tube. Unlike its relatives, *E. Dicksoni* is a plant of low altitudes. In its three forms it is widely distributed in the southern half of China and also on the islands to the east, from Japan to Hainan.

The type of *E. Dicksoni* lacks precise geographic data but probably came from Kiangsu through which Dickson traveled in 1861 on his overland journey from Canton to Hankow, cf. Bretschneider, *Hist. European Bot. Disc. China* 68 (1898). The original description calls for oblong leaf-blades pallid beneath from a short dense tomentose indument. In these as well as in other less critical details it agrees well with material I have cited from northern Kiangsi. Similar plants are known from southern Kiangsi to northern Kwangtung and west to Hunan and Kweichow and also from southern Japan to Hainan. Characteristic of the var. *typica* is the pallid tomentulose or velvety indument on the lower surface of the generally large broad leaves. This is present only on the foliage on old branches. Foliage on vigorous shoots differs in being not only larger in size, thicker, and very coarsely toothed, but also scantily hairy and even green on the lower surface. Several collections from China show this very well, cf. *Tsang* 21326 and 21890, *Wilson* 1571, and *Handel-Mazzetti* 782 in part. Material from the Ryukyu Islands and Formosa can be matched among material from the mainland, and, though showing a greater frequency of broad rounded rather sharply serrate leaves, is not worthy of nomenclatorial recognition. The material from Japan is notable for its rounded, coarse, thick leaves, and also for the frequent development of mineralized disks at the base of the stiff scabrous hairs on the upper leaf-surface. At most it is a minor form, but whatever its merit the name *E. Dicksoni* var. *japonica* Nakai is available should its recognition prove useful.

The var. *glabrescens* Nakai is a well-marked geographical variety con-



fined to Honan, Hupeh, Szechuan, Sikang, and Yunnan. It differs from *E. Dicksoni* var. *typica* in its thinner, usually narrower and more elongate leaves, glabrous or only inconspicuously hairy beneath. Nakai based the variety on three collections without any designation of a type: 1) *Wilson 3554* from near Ichang, Hupeh, 2) *Wilson 3554B* from Mao-chou, Min Valley, northwestern Szechuan, and 3) *Henry 10515* from Mengtze, southern Yunnan. The collections are very similar. They have the lower leaf-surface bearing only a very few scattered hairs and hence apparently glabrous. Wilson's collection from Ichang, no. 3554, has been accepted as the type. It is the extreme glabrous form, apparently the one most abundant in western Szechuan. In western Hupeh, and even about Ichang, many plants have moderate quantities of inconspicuous short hairs on the lower surface of their leaves. Such plants, however, never have the pallid, densely soft-hairy lower leaf-surfaces that are found on the foliage produced along old stems of the more easterly ranging var. *typica*. It is to be noted, however, that they can simulate in type of indument that sometimes found on the large coarse leaves produced by vigorous shoots in the var. *typica*. Characters of the var. *typica* and var. *glabrescens* are apparent, accordingly, only when foliage from mature wood is compared. Curiously, though the var. *typica* has conspicuously different foliage on soft and hard wood, no such marked dimorphy has been detected among the specimens of the var. *glabrescens* examined.

The var. *tilioides* differs from the var. *typica* in having evidently thinner, more sharply and finely serrate leaves that are completely glabrous and even somewhat lustrous beneath. Its broad, rounded, thinner and more finely serrate leaves, somewhat glossy beneath, separate it from the most glabrous forms of the var. *glabrescens*. In texture and broad rounded outline the foliage is very suggestive of *Tilia* or *Actinidia*. The three collections cited are very similar in appearance and separable at a glance from other forms of the species. Coming from a small area off to themselves they merit nomenclatorial recognition. Only fruit has been seen. Possibly the status of the plants will have to be revised when flowers have been studied. In general terms, the var. *tilioides* comes from an area lying on the western boundary of the var. *typica* and to the east and south of the area of the var. *glabrescens*.

At least two forms of *E. Dicksoni* are in cultivation. The plant of Japan is grown in France, cf. Caille & Poisson, Bull. Mus. Hist. Nat. Paris 26: 580 (1920), sub "*E. macrophylla*." I have seen specimens of it from gardens in California (Bard Place, Hueneme, *Walther 301*). The plant of Hupeh, *E. Dicksoni* var. *glabrescens*, formerly grew in the Arboretum. Specimens from similar cultivated plants are at hand from "Hort. Vilmorin" and La Mortola. Hillier, Jour. R. Hort. Soc. 61: 109, f. 17 (1936), reports it still grown in southern England. The plant growing at Toulouse, described and illustrated by Pinelle, Rev. Hort. 86: 173-76, f. 50-51 (1914), is also the var. *glabrescens*. It is said to have been introduced by Vilmorin through seeds sent by Farges from Szechuan.



4. *Ehretia resinosa* Hance, Jour. Bot. 18: 299 (1880); Kanehira, Formosan Trees 639, f. 595 (1936) — type from Tak-kan, Formosa, *Swinhoe*.

*Ehretia formosana* Hemsley, Jour. Linn. Soc. Bot. 26: 144 (1890) — type-material from Formosa, *Wilford* 539 and *Swinhoe*.

Tree; leaves ovate to elliptic or broadly lanceolate, 7–15 cm. long, 4.5–8.5 cm. broad, base usually obtuse or rounded, apex acuminate or rarely obtuse, upper surface glabrous or nearly so, more or less lustrous, when young somewhat vernicose, lower surface bearing short soft spreading hairs; petiole 1–3 cm. long; inflorescence terminal on an elongate leafy shoot and becoming oppositifolious or associated with a few reduced leaves on an abbreviated shoot from old leaf-axils, and produced just before or more commonly during period of leaf-renewal, corymbose 2–8 cm. broad, hairy and frequently glandular, at times vernicose when very young, branches dichotomous, ebracteate, borne on peduncle about 2 cm. long; calyx 4–6 mm. long, lobes lanceolate to linear-cuneate, 3.5–5 mm. long, pedicels usually 1–3 mm. long; corolla white, fragrant, 8–11 mm. long, tube cylindric, 2–2.5 mm. thick, 4.5–6 mm. long, lobes 3.5–5 mm. long, usually about 0.5 mm. shorter than the tube but rarely about as long; filaments 3–4.5 mm. long, attached 0.5 mm. below summit of tube; anthers about 2 mm. long, with a deep narrow sinus below the middle; ovary glabrous, ca. 1 mm. long; style 5–8 mm. long, lobes 1–2 mm. long; fruit 5–6 mm. in diameter; endocarp rugose, the ridges mostly very narrow, breaking up into 4 single-seeded parts.

Endemic to Formosa.

FORMOSA: Takao, Kotobukiyama, *Tanaka* 10345 (A, NY); Apes Hill, Takao, *Wilson* 9871 (A); Takao, *Henry* 1277 (A) and *Faurie* 390 (A); near Tak-kan, 1865, *Swinhoe*, photo of type of *E. resinosa* (A); Bankinsing, *Henry* 1277 (A) and *Faurie* 391 (A); Kosyun, *Ito* 229 (A); betw. Boryo and Kuraru, Koshun, *Wilson* 10967 (A); without locality, April 5, 1914, *S. Kawagoe* (A).

This Formosan tree has only one close relative, the scarcely separable *E. Navesii* Vidal (1886) of the Philippines. Among our species it is notable for its slender elongate sepals.

5. *Ehretia confinis*, sp. nov.

Arbor parva 6–10 m. alta; foliis ellipticis vel obovatis glabris 6–11 cm. longis 2.5–5.5 cm. latis, basi angustatis vel rotundis, margine integris vel raritate apicem versus sparse dentatis, subtus pallidioribus costa et nervis (utroque latere costae 4–7) evidenter donatis; petiolo 1–1.5 cm. longo; inflorescentia saepe corymbosa 4–7 cm. crassa 1–4 cm. longe pedunculata ebracteata plus minusve puberulenta et glandulifera, ramulis glabris foliatis terminata; calyce 2–2.5 mm. longo 1–5 mm. longe pedicellato, lobis oblongis 1.2–1.8 mm. longis apice obtusis rotundisve, margine inconspicue sparseque ciliolatis alibi glabris; corolla flavescenti 5.5–6.5 mm. longa, tubo 2.5–3.5 mm. longo, basi 1.5 mm. crasso deinde sursum gradatim valdeque expanso, apice 5–6 mm. diametro, lobis 3–3.5 mm. longis tubo



longioribus vel subaequilongis; filamentis 5–6 mm. longis, ca. 1.5 mm. supra basim tubi corollae affixis, antheris 1.2 mm. longis, stylo 6 mm. longo glabro, lobis ca. 1 mm. longis; ovario 1 mm. longo; endocarpio 5–7 mm. crasso, extus conspicue rugoso, intus cavitate centrali conspicua donato, maturitate in pyrenis 4 uniseminatis disrupto.

Known only from extreme southwestern China, Yunnan.

YUNNAN: Shunning, Wenkaunkuai, common tree in forest, 30 ft. tall, *T. T. Yü 16333* (A); Shweli-Salwin divide, lat. 25°45', shrub in open situations by streams, 30–35 ft. tall, *Forrest 24311* (G); north of Ho-tou, Shweli-Salwin divide, lat. 25°30', shrub, 20–30 ft. tall, in thickets, *Forrest 26357* (TYPE, Arnold Arboretum; NY).

A very distinct species especially notable for its moderate-sized corollas with very widely flaring tube.

#### 6. *Ehretia Tsangii*, sp. nov.

Arbor parva, 3 m. alta; foliis glaberrimis ellipticis vel oblongo-ellipticis 10–20 cm. longis 5–10 cm. latis basi rotundis vel angulatis 1–2 cm. longe petiolatis apice acutis vel plus minusve acuminatis, margine integerrimis, nervis utroque latere costae 5–6 ascendentibus in faciebus inferioribus prominentibus; inflorescentia corymbosa ramulis foliatis terminante vel e axillis ramulis defoliatis orienti perinconspicue puberulenta et glandulifera 2–6 cm. diametro, 5–7 cm. (pedunculo brevi incluso) longo, infra medium bracteis 1–2 mm. longis caducis vel foliis reductis gesta alibi ebracteata stricte dichotome ramosa; calyce 1.5–2 mm. longo inconspicue puberulento et glandulifero, lobis ovatis 1–1.3 mm. longis margine brevissime ciliolatis; corolla alba odorata 7–8 mm. longa glabra, tubo 4–5.5 mm. longo gradatim ampliato, basi 1.5–2 mm. crasso apice 3–4.5 mm. crasso, lobis oblongis 3–3.5 mm. longis tubo brevioribus; filamentis 3–3.5 mm. longis saepissime 3–3.5 mm. supra basim tubi corollae affixis; antheris oblongis 1.2–2 mm. longis; stylo glabro 6 mm. longo, lobis ca. 1 mm. longis; fructu ignoto.

Known only from southern Kwangsi and Yunnan.

KWANGSI: mountains surrounding Pa Lau Village, Sui Luk, southwest of Nanning, fairly common, scattered shrub 3 m. tall, fl. white, fragrant, *W. T. Tsang 21888* (TYPE, Arnold Arboretum) and *21854* (A).

YUNNAN: Szemao, *Henry 13379* (NY).

A well-marked species for which I can suggest no close relationship.

#### 7. *Ehretia Dunniana* Lévillé, Fedde Repert. 11: 65 (1912); Rehder, Jour. Arnold Arb. 15: 320 (1934) — type from Lou-fou, Kweichow, *Cavalerie 3479*.

*Ehretia volubilis* Hand.-Mazz., Anz. Akad. Wiss. Wien 61: 164 (1924) and Symb. Sin. 816 (1936) — type from Manhao, valley of Red River, southern Yunnan, *Handel-Mazzetti 5895*.

A tree or scrambling shrub differing from *E. longiflora* only as follows: Leaves thinner, beneath with not only the midrib and primary veins but also the secondary and tertiary veins evident and clearly anastomosing,



usually minutely glandular beneath when young; young twigs, inflorescence and calyx densely and minutely glandular; calyx 2–3 mm. long, glandular and minutely hairy, lobes acute to obtuse, ovate to oblong or lanceolate, 1–2 mm. long; corolla 9–9.5 mm. long, glabrous or (*Henry 11797*) densely puberulent and glandular outside, tube 5–7 mm. long, lobes 3–4.5 mm. long; filaments 2–5 mm. long, attached 4.5–5 mm. above base of corolla-tube; anthers 0.9–1.5 mm. long; style 5.5–10 mm. long, lobes 1.5–2.5 mm. long.

Known only from southern China (Yunnan and Kweichow).

KWEICHOW: Lo-fou, *Cavalerie 3479*, photo of type (A).

YUNNAN: Manhao, *Handel-Mazzetti 5895*, photo of type of *E. volubilis* (A); mountains south of Szemao, *Henry 11797* (A, NY); mountain east of Szemao, *Henry 11797A* (A); Szemao, *Henry 13021* (NY); Szemao, *Henry 11797B* (NY).

A very well marked species which, though evidently related to *E. longiflora* of southeastern China, is readily distinguished by its evidently veiny leaves and glandular inflorescence.

8. *Ehretia longiflora* Champ., Hooker's Jour. Bot. & Kew Miscell. 5: 58 (1853); Gagnep. & Cour., Fl. Indo-Chine 4: 210 (1914); Kanehira, Formosan Trees 637, f. 593 (1936); Jarrett, Hong Kong Naturalist 3: 152 (1932); Herklots, Hong Kong Naturalist 5: 111, t. 9 (1934) — type from Hong Kong.

*Ehretia glaucescens* Hayata, Icon. Pl. Formosa 3: 153 (1913) — type from Kizan near Mai, Formosa, *Hayata & Susaki*.

Tree to 12 m. tall, deciduous; leaves glabrous, commonly broadest at or above middle, elliptic to broadly oblanceolate, 10–18 cm. long, 3–8 cm. broad, apex abruptly acuminate, base usually angled, lower surface light green with evident midrib and 4–6 pairs of primary veins, secondary veins obscure, petiole 1–2.5 cm. long; inflorescence axillary, usually numerous, produced from axillary buds on usually leafless twigs of the previous season and generally just before the period of vigorous new vegetative growth, dichotomously branched, corymbose or paniculate, bractless, 3–6 cm. broad, glabrous or minutely brownish puberulent; peduncle 1–4 cm. long, commonly bearing below the middle two early-deciduous reduced leaves 1–2 cm. long; calyx 1.5–2 mm. long, glabrous, sessile but occasionally borne terminal on short branchlets of inflorescence and hence seemingly pedicellate, calyx-lobes 0.5–1 mm. long, ovate or oblong, apex rounded, margins ciliolate; corolla white to pink, 11–13 mm. long, lobes ovate or elliptic-ovate, becoming reflexed, 2–3.5 mm. long, tube 7–10 mm. long, from base 1.5 mm. thick gradually expanding to 4–5 mm. thick at summit; filaments filiform, 7–11 mm. long, attached 3–6.5 mm. above base of tube, anthers 0.6–0.9 mm. long; ovary 1 mm. long, glabrous; style 10–15 mm. long, lobes 1–3 mm. long; drupe yellowish red to red or pinkish purple, 7–10 mm. in diameter; endocarp bony, laterally compressed, hollow at center, outside very sharply and prominently ribbed (some ribs even knife-like), at maturity breaking up into 4 single-seeded parts.



Southern China and adjacent Indo-China (Tonkin); Formosa; Hainan.

KIANGSI: Hsin Feng Hsien, *H. H. Hu* 1116 (A).

KWANGTUNG: Lai Ka Shan, *Tse Hei* 2 (A); Yu-Yuen, *S. P. Ko* 52690 (A); Lok Chong, *C. L. Tso* 20806 (A, NY); Wong Chuk I, Wung Yuen District, *S. K. Lau* 2143 (A); Yang Mei Lang, Yao-shan, *S. S. Sin* 9709 (NY); Shan Kai Kou, Lungchun, near Kiangsi border, *C. L. Tso* 21627 (NY); Naam Kwan Shan, Tsengshing District, *W. T. Tsang* 20326 (A, NY); Ngok Shing Shan, Sin-fung District, *Y. W. Taam* 547 (A); Ah Po Kai Shan, Sin-fung District, *Y. W. Taam* 655 (A); Nam Shan, Ho-yuen District, *W. T. Tsang* 28932 (A); Hong Kong, *Y. W. Taam* 2033 (A), *W. Y. Chun* 4790 and 7524 (A, NY), *Y. Tsiang* 725 (A), *L. Gibbs* 7464 (A), *Ford s.n.* (A), *C. Wright* 416 (G, NY).

KWANGSI: Yao Shan, Ping Nam, *C. Wang* 39355, 39364, and 40266 (A); Chuen Yuen, *T. S. Tsoong* 82016 (A); Ling Wun, *S. K. Lau* 28756 (A); Shap Man Taai Shan, Shang-sze District, *W. T. Tsang* 22488 (A).

YUNNAN: Mar-li-po, Hwang-jin-in, *K. M. Feng* 13004 (A).

FORMOSA: Hiiran-zan, *R. Kanehira* 23 (A); Mt. Kappan, *Y. Simada* (A); Bankinsing, *Henry* 432 and 563 (A); Sozan, Taihoku-shu, *Tanaka & Shimada* (A, NY); Horisha, prov. Nanto, *Wilson* 11190 (A); *L. Candidius*, *Gressitt* 233 (A, NY).

HAINAN: Yeung Ling Shan, *S. K. Lau* 115 (A); Ka Chik Shan, *S. K. Lau* 1712 (A, NY); Five Finger Mt., *McClure* 9475 (A); Manning, *F. C. How* 73196 (A); Po-ting, *F. C. How* 73294 (A).

One of a group of very closely related but geographically isolated species of which the first named is the Javanese *E. javanica* Blume, *Bijdr.* 14: 842 (1826). The other members of this group are *E. Dunniana* of southern China and *E. Wallichiana* Hook. f. & Thoms. ex Clarke, *Fl. Brit. India* 4: 143 (1883), of eastern India and Burma. *Ehretia javanica* differs from our plant only in having more rounded, more evidently veined, broadly elliptic leaves. The Indian *E. Wallichiana* has thinner, much more evidently veined leaves, a larger (3–3.5 mm. long) calyx, and a corolla with shorter (5–6 mm.) tube and longer (3–4.5 mm.) lobes, and larger (1.7 mm. long) anthers.

The Chinese plants referable to *E. longiflora* are reasonably uniform. I have detected only one minor geographically correlated variation. Coastal plants, typical *E. longiflora*, usually have minutely pubescent inflorescences, whereas those on plants of more interior localities have them glabrous. Plants of Formosa and Hainan differ from those of the mainland only in having the corollas slightly thinner in texture and perhaps also in their more slender filaments.

9. *Ehretia asperula* Zollinger & Moritzi in Moritzi, *Verzeichn. Zollinger* Pfl. 52 (1846) — type from Java, *Zollinger* 1548.

*Ehretia Hanceana* Hemsl., *Jour. Linn. Soc. Bot.* 26: 145 (1890); Gagnep. & Cour., *Fl. Indo-Chine* 4: 207 (1914) — type from Hainan.

Scandent shrub, clambering to 5 m.; twigs with minute brownish pubescence when young and frequently also with scattered bristles (0.2–0.5 mm. long) arising from bulbous bases, usually glabrate in age; leaves coriaceous, elliptic to oblong-elliptic or obovate-elliptic, 5–15 cm. long,



2–7 cm. broad, at maturity glabrous or with a minute inconspicuous brownish pubescence on the petiole and along the midrib beneath, apex obtuse or abruptly short-acuminate, base rounded or obtuse, margin usually entire but occasionally with few to numerous small to coarse irregular teeth, petiole 7–20 cm. long, frequently somewhat tuberculate and bristly; inflorescence terminal on elongate leafy twigs, minutely brownish pubescent, corymbose or broadly paniculate, 5–20 cm. broad, dichotomously much branched, axis and branches and branchlets bearing scattered persistent curved linear bracts 3–10 mm. long, leafless or bearing a few reduced leaves towards the base; calyx 1.5–2.5 mm. long, commonly borne on a slender stiffish pedicel 1–3 mm. long; corolla white or pink, 3.5–5 mm. long, tube 1.2–2 mm. long, lobes 2–3 mm. long; filaments attached about 1 mm. above base of tube, 4–5 mm. long; anthers 1 mm. long; style 3–4 mm. long, lobes 1 mm. long; drupe red, orange or yellow, 3–4 mm. in diameter; endocarp rugose, breaking up into 4 single-seeded parts.

Known only from Hainan, northern Indo-China, and Java.

HAINAN: Po-ting, *F. C. How* 73256 (A); Lingshui, *F. C. How* 73769 (A); Pat Ka Shan, *C. I. Lei* 1173 (A); Ko Leng, *S. K. Lau* 529 (A); Kingtung, *S. K. Lau* 27923 (A); Bo-ting, *S. K. Lau* 28192 (A); Tung Koo Shan, *H. Fung* 20392 (A, NY) and 20408 (A, NY); without locality, *C. Wang* 34611 (A, NY); without locality, *Henry* 47 (G), 8027 (G), and 8186 (G); Hoi-how, *Bullock* (BM, photo); Hoihow, *Hancock* 30 (K, photo); without locality, *Sampson* (K, photo).

INDO-CHINA: Tourane, Annam, *Clemens* 4335 (A); Kau Nga Shan, Tien-yen, Tonkin, *W. T. Tsang* 30503 (A); Sai Wong Mo Shan, Long Ngong Village, Tonkin, *W. T. Tsang* 30341 (A).

JAVA: without locality, *Zollinger* 1548 (ISOTYPE of *E. asperula*, G.).

Distinctive of this species, and aiding in recognizing it, are the persistent curved linear bracts borne scattered throughout the inflorescence. Another unusual feature of the plant is its scandent habit of growth. The leaves in this species, furthermore, show unusual variability as to leaf-margin. Though on most branches the leaves are all entire, on some one or more leaves may have the margin toothed in varying degrees. When present the toothing is erratic in distribution and irregular as to size and form. Occasionally it becomes very coarse and almost capable of description as lobulate-dentate. The type collection of *E. asperula* has conspicuously and coarsely toothed foliage. *Ehretia Hanceana* was based upon specimens having entire leaves. It represents the most common form of the species on Hainan.

10. *Ehretia laevis* Roxb., Pl. Coromandel 1: 42, t. 56 (1795); Gagnep. & Cour., Fl. Indo-Chine 4: 208 (1914) — type from India.

*Ehretia laevis* var. *platyphylla* Merrill, Lingnan Sci. Jour. 14: 55 (1935) — type from Hainan, *Lau* 323.

Tree to 10 m.; leaves ovate-elliptic or obovate or even suborbicular, 6–18 cm. long, 5–11 cm. broad, rounded or angled at base and apex, above somewhat lustrous when mature, below minutely glandular-pubescent



when young, but except for some hairs in the vein-axils becoming glabrous at maturity, petiole 1–2.5 cm. long; inflorescence appearing just before leaf-renewal and usually maturing fruit as new leaves expand, terminal and axillary, loosely dichotomous, 5–15 cm. broad, with a few bracts on the primary axis but otherwise naked, ultimate branches bearing the sessile flowers unilaterally in two crowded ranks, hence somewhat scorpioid and particularly so just before anthesis; calyx 1–2 mm. long, sessile or subsessile, tawny tomentulose; corolla white, 2.5–3.5 mm. long, sub-rotate, not conspicuous; tube open, 0.7–1.5 mm. long; lobes 2–2.5 mm. long, recurving; filaments attached 0.5–1 mm. above base of corolla-tube, anthers 0.5–0.7 mm. long; style 2–3 mm. long, lobes as much as 1 mm. long; drupe yellow or orange, 3–4 mm. in diameter, endocarp rugose, breaking up at maturity into 4 single-seeded parts.

Hainan, Indo-China, Burma, and India.

HAINAN: Lektung, *S. K. Lau* 27149 (A); Bak Sa, *S. K. Lau* 26485 (A); Yaichow, *F. C. How* 70328 (A, NY); Naam Shan Leng, *S. K. Lau* 323 (A); I Kap Shan, *S. K. Lau* 1143 (A, NY) and 6025 (A); Lok Mooi Shan, *S. K. Lau* 1289 (A, NY); Ka Chik Shan, *S. K. Lau* 1521 (A, NY), 1541 (A, NY), and 2856 (A); Ue Lung Shan, *S. K. Lau* 3209 (A); Chim Fung Ling, *S. K. Lau* 3386 (A) and 5149 (A); without locality, *H. Y. Liang* 63558 (A, NY), 64138 (A, NY), 65125 (A, NY), 65223 (A, NY), 65304 (A, NY), 66427 (A, NY), and 66445 (A, NY).

The tree of Hainan is obviously conspecific with the Indian *E. laevis*. Though the latter usually has appreciably larger corollas, its smaller-flowered forms are indistinguishable from our plant of Hainan.

11. *Ehretia hainanensis*, sp. nov.

Arbor 8 m. alta inflorescentia inconspicue puberulenta alibi glaberrima; ramulis gracilibus elongatis laevibus; foliis chartaceis integerrimis elongatis aliquantum asymmetricis 7–15 cm. longis 2.5–5 cm. latis lanceolatis medium vel supra medium latioribus, apice valde acuminatis, basi acutis vel obtusis 1.5–3 cm. longe graciliterque petiolatis, subtus opacis, venis primariis prominulis utrinque latere costae 4–6, venis secundariis et tertiaribus inconspicuis sub lente reticulum laxum prominulum formantibus; inflorescentiis axillaribus et terminalibus (e ramulis foliatis hornotinis erumpentibus) laxe dichotomis 1–4 cm. latis, ramulis fertilibus sparsis ebracteatis 1–2 cm. longis crassiusculis, pedunculo 1–3 cm. longo bracteis sparsis 1–3 mm. longis donato; floribus sessilibus secundis laxe inconspicueque biseriatis; calyce 1.3–1.5 mm. longo, lobis ovatis tubo subaequilongis; corolla 4.2–4.5 mm. longa alba, tubo 2 mm. longo basi 1–1.3 mm. crasso, apice ad 2.5 mm. crasso, lobis ellipticis 2.2–2.5 mm. longis recurvatis; filamentis 3 mm. longis gracilibus 1 mm. supra basim tubi corollae affixis, antheris 0.8 mm. longis; ovario glabro 1 mm. longo; stylo 3–3.5 mm. longo, 1–1.3 mm. profunde lobatis; fructu ignoto.

HAINAN: Yaichow, tree 8 mm. tall in forest, flower greenish white, 1200 ft. alt., Dec. 1932, *N. K. Chun & C. L. Tso* 44626 (TYPE, Arnold Arboretum; ISOTYPE, NY).



Related to *E. laevis* Roxb. and its allies, but readily distinguished by having thin, elongate, slender-petiolate, somewhat asymmetric leaves, as well as loose, not distinctly scorpioid inflorescences that are borne on elongate new leafy twigs, and not on branches of the previous season. Merrill & Chun, *Sunyatsenia* 2: 315 (1935), have reported the type-collection as representing *Ehretia canarensis* Miq. That, however, is a plant of the high mountains of southern peninsular India, very closely related to *E. laevis*, and differing from our plant in the characters enumerated for *E. laevis*.

12. *Ehretia dichotoma* Blume, *Bijdr.* 14: 842 (1826) — type from Java.

Tree to 15 m.; specimens usually darkening in drying; branchlets slender, smooth, glabrous, and even somewhat glaucous; leaves lanceolate or somewhat oblanceolate to elliptic-oblong, entire, glabrous, 6–15 cm. long, 2–5 cm. broad, base acute to broadly acute, apex acute and slenderly attenuate, above somewhat glossy; petiole 7–10 mm. long, slender; inflorescence mostly axillary, with very slender axis and branches, produced on elongate new shoots bearing numerous well-developed leaves, glabrous or minutely and scantily puberulent and sometimes minutely glandular, 2–7 cm. long, 2–5 cm. broad, usually loose and open, dichotomous; peduncles 1–3 cm. long, below the middle usually bearing one or a few minute bracts and commonly producing short fertile branches from their axils; flowers sessile or subsessile or some of the lowermost on slender pedicels up to 3 mm. long, usually secund along the slender branches of the inflorescence; calyx 1.5 mm. long, lobes oblong to cuneate, 0.5–0.7 mm. long, glabrous or inconspicuously puberulent or glandular; corolla white, 3.5–4.5 mm. long, texture thin, tube 1.5–2 mm. long; lobes 2–3 mm. long, recurving, longer than the tube; filaments 2 mm. long, attached 1.5 mm. above base of tube; anthers 0.7–0.9 mm. long; style 2–3 mm. long, lobes to 1.3 mm. long; drupe 3–5 mm. in diameter, “yellow”; endocarp rugose, breaking up at maturity into 4 single-seeded parts.

Indo-China, Malaya, Andaman Islands and Java.

INDO-CHINA: Saigon, etc., *Pierre* (A).

MALAY PENINSULA: Pulau Timun, *Henderson* 29115 (A).

ANDAMAN ISLANDS: Port Monat, 1895, *King's Collector* (A).

This tree has been reported from Indo-China as “*E. laevis* var. *canarensis*,” *Fl. Indo-Chine* 4: 209 (1914), and from Malaya as “*E. laevis*,” *King & Gamble, Fl. Malay.* 18: 283 (1905), and as “*E. Timorensis*” *Ridley, Fl. Malay.* 2: 442 (1923) or “*E. laevis* var. *timorensis*,” *Clarke, Fl. Brit. Ind.* 4: 142 (1883). The plant is readily distinguished from both *E. laevis* Roxb. and *E. canarensis*. In our plant the much more slenderly branched inflorescences arise from the axils along very smooth leafy twigs representing vigorous recent growth, whereas in *E. laevis* and *E. canarensis* the inflorescences arise from the axils along roughened and verrucose twigs of the previous season just before leaf-renewal.



## 6. HELIOTROPIUM L.

**Heliotropium** L., Sp. Pl. 130 (1753) and Gen. Pl. 130 (1754) — type-species, *H. europaeum* L.

Annual or perennial, herbaceous or more or less shrubby; leaves small to large, sessile or petiolate; cymes unilateral and generally distinctly scorpioid, with or without bracts; corolla white, yellow, or purple, variable in form, throat frequently pubescent inside; anthers included, filaments extremely short; style present or absent; stigma usually frustum-like or conic, mostly sterile, receptative only in a band around the base; fruit dry, at maturity breaking up into 4 single-seeded or 2 biseminiferous nutlets; seeds usually with a thin endosperm.

A large genus widely represented in the warmer parts of the world. The species are particularly numerous in arid regions. Most are herbs or lowly suffruticose plants. The native species of tropical Asia are nearly all members of the section *Orthostachys*, the largest section in the genus and certainly the most perplexing and confused. The group is in great need of careful study and revision. In applying names to the species in our area I have followed what has become traditional usage. It is to be expected that this nomenclature will be altered, at least in part, when the group gets the monographic attention it deserves.

Two members of *Heliotropium* are known to be cultivated in our area. The Peruvian *H. arborescens* L. (*H. peruviana* L.) is a well-known ornamental garden plant in Japan, Formosa, and China. In addition, a collection of *H. europaeum* L. is at hand from Peiping (*T. P. Wang* 314, NY), where it is noted as being cultivated in Prince Park in August 1931.

## KEY TO THE SPECIES

- Leaves large, evidently veined, 2–10 cm. broad; fruit glabrous, strongly ribbed, cleft with the lobes divergent; corolla blue or violet, tube very elongate, lobes imbricate in the bud. § *Tiaridium*.....1. *H. indicum*.
- Leaves smaller, not evidently veined; fruit hairy, convex, before breaking up into nutlets not evidently lobed, not ribbed; corolla white or yellowish, tube not surpassing calyx, lobes involute and erect in the bud. § *Orthostachys*.
  - Inflorescence bractless, the slender scorpioid cymes frequently borne in pairs; stigma sessile on ovary; stem-leaves with slender petiole 5–12 mm. long.....2. *H. ovalifolium*.
  - Inflorescence with bracts, the cymes borne singly; stigma elevated on a short style; stem-leaves sessile or with petioles less than 3 mm. long. Cymes at maturity becoming slender and very elongate, 2–10 cm. long, with flowers very loosely arranged and not evidently 2-ranked, bracts slender and elongate.....3. *H. strigosum*.
  - Cymes at maturity less than 4 cm. long, dense, with flowers crowded in two ranks, bracts elliptic.
    - Leaves 2–5 mm. broad, 8–20 mm. long, the lowermost evidently opposite; calyx-lobes lanceolate, attenuate; corolla not much surpassing the calyx; stigma twice as long as broad.....4. *H. marifolium*.



Leaves 1–2 mm. broad, 3–4 mm. long, all alternate; calyx-lobes oblong or ovate, acute; stigma thrice as long as broad; corolla evidently surpassing the calyx.....5. *H. formosanum*.

1. *Heliotropium indicum* L., Sp. Pl. 130 (1753); Clarke, Fl. Brit. India 4: 152 (1883); Gagnep. & Cour., Fl. Indo-Chine 4: 220 (1914) — “Habitat in India utraque.”

Coarse annual herb, 2–10 dm. tall, becoming loosely branched, more or less bristly especially on the younger parts; leaves ovate to elliptic, abundantly and evidently veined, 4–15 cm. long, 2–10 cm. broad, apex acute, base usually rather abruptly contracted into a well-developed partially winged petiole 2–10 cm. long, margin usually repand or undulate; inflorescence ebracteate, the slender and elongate scorpioid cyme becoming 1–3 dm. long, usually borne singly; flowers crowded in two ranks; calyx herbaceous, 2.5–3 mm. long, sparingly bristly, lobes cuneate to lanceolate, somewhat unequal; corolla salverform, blue or violet, rarely white, limb 3–4 mm. broad, lobes rounded, broader than long, imbricate in the bud, corolla-tube cylindric, evidently longer than the calyx, 3–4.5 mm. long; anthers 0.7–0.9 mm. long, free from one another, borne about the middle of the corolla-tube, filaments very short and slender, attached 1–1.5 mm. above base of tube; ovary glabrous; style 0.5–0.7 mm. long, usually thickening above the middle; stigma broader than long, truncate, 0.3–0.5 mm. in diameter at base; fruit glabrous, deeply bilobed, lobes mitre-like, ribbed, strongly divergent, cleft at the apex, each lobe eventually dividing into a pair of angulate pointed one-seeded nutlets.

Southern China, Ryukyus, Formosa, Hainan, Indo-China; an amphigean weed now widely distributed in the warmer parts of the world; probably American in origin.

FUKIEN: Hinghwa, *Lin Pi* 6001 (G).

KWANGTUNG: Honam Island, *Levine* 668 (G); Tingshushan, *T. N. Liou* 1502 (NY).

YUNNAN: Fo-Hai, *C. W. Wang* 74884 (G); Cha-li Hsien, *C. W. Wang* 81143 (G).

RYUKYU ISLANDS: Naha, Okinawa, *Boehmer* 22 (NY).

FORMOSA: Towapi, *Yamamoto* 2357 (NY); Koshun, *Tanaka* 5428 (NY); without locality, *Henry* 309 (NY).

HAINAN: Chung Ngo Shan, *S. K. Lau* 3263 (G); Fung Leng, *S. K. Lau* 474 (G); Tai Tin Shan, *S. K. Lau* 1296 (G); Fan Ta, *Gressitt* 705 (G); Loktung, *S. K. Lau* 26726 (G); Tai Un, *McClure* 7771 (G).

INDO-CHINA: Dalat, Anam, *R. W. Squires* 750 (G); Haiphong, Tonkin, *Balansa* 918 (G).

2. *Heliotropium ovalifolium* Forsk., Fl. Aegypt. 38 (1775); Clarke, Fl. Brit. India 4: 150 (1883); Gagnep. & Cour., Fl. Indo-Chine 4: 222 (1914) — type for Egypt.

Herb 1–4 dm. tall, usually annual, with a grayish indument of slender pallid appressed hairs; stems usually several, decumbent or ascending, commonly branched below the middle; leaves numerous, elliptic to obovate or oblanceolate, 1–3(–6) cm. long, 4–12(–27) mm. broad, margin



narrowly revolute, apex rounded or obtuse, base obtuse to acute, midrib evident but veins rarely visible; petiole slender, on lowermost leaves nearly as long as the blade, on middle cauline leaves about a fourth as long as the blade; spikes slender, completely bractless, in pairs or less commonly single or ternate, 1–12 cm. long, with very numerous crowded small flowers in two ranks, scorpioid; calyx 1.5–2 mm. long, subsessile, lobes strigose, unequal, cuneate to broadly lanceolate or even ovate; corolla white, 2.5–3 mm. long, limb 2 mm. broad, tube 1.5 mm. long, inside with coarse short hairs above the middle, lobes ovate or oblong, 0.5–0.8 mm. long, infolded and erect in the bud; anthers 0.7 mm. long, lanceolate, acuminate, remaining distinct, attached by an extremely short filament about 0.5 mm. above the corolla-base; ovary glabrous; style none; stigma sessile, about 0.3 mm. thick, length slightly greater, appendage conic, apically bidentate; fruit rounded, about 1.5 mm. high, slightly pointed, with appressed hairs, breaking up into 4 equal nutlets; nutlets on inner faces with inconspicuous circular depressions, caruncular scar-tissue usually massed on one side of the inner angle.

Indo-China: widely distributed in the Old World tropics.

INDO-CHINA: Mekong, *Thorel* 2043 (G).

A species very closely related to *H. procumbens* Mill. (*H. inundatum* Sw.) of the American tropics.

3. ***Heliotropium strigosum*** Willd., Sp. Pl. 1<sup>2</sup>: 743 (1798). — “Habitat in Guinea.”

*Lithospermum chinense* H. & A., Bot. Beechey Voy. 202 (1836); Spengler, Oesterr. Bot. Zeitschr. 68: 120 and 123, t. 2, f. 37 (1919); Hand.-Mazzetti, Symb. Sin. 7: 818 (1936) — type from Macao, *Vachell* 286.

Plant with many very slender prostrate or ascending stems, becoming fruticulose towards the base; indument whitish but thin, strigose, the hairs pallid, very closely appressed, slender, 0.5 mm. long or less; stems scantily branched below the middle, 1–3 dm. long; leaves small and very numerous, lance-linear, 3–15 mm. long, 0.3–1.6 mm. broad, apex acute, base rather abruptly contracted into a slender petiole 0.5–1 mm. long, midrib somewhat impressed above, prominent below, margin usually revolute; inflorescence at anthesis a moderately crowded unilateral cyme, not conspicuously bracteate, in fruit slender, elongate, 2–8 cm. long, with flowers loose and only very obscurely if at all two-ranked, bracts 1–3 mm. long, usually strict and inconspicuous; calyx 3 mm. long, sparsely strigose outside, lobes lanceolate or cuneate, green and contrasting with the pale pedicel and calyx-base; pedicel in fruit 1–2 mm. long, strict, angulate, apparently long decurrent on the stem; corolla white, somewhat strigose outside, 3–5 mm. long, tubular or funnelform; lobes oblong or very short and broad, erect and somewhat involute in the bud, sinus broad and rounded, plicate; throat inside minutely glandular and puberulent at the summit; anthers ovate-lanceolate, 0.75 mm. long, tips thickened and coherent; filaments 0.5 mm. long, attached 0.5 mm. above base of corolla-tube; ovary glabrous; style distinct, 0.4 mm. long; stigma 0.5 mm.



long, with a distinct stigmatic disk about 0.3 mm. in diameter and a superimposed narrowly conic sterile appendage; fruit rounded, depressed, with short closely appressed hairs above the middle, breaking up into 4 equal nutlets; nutlets about 1 mm. high, the inner faces both with a central circular depression, the small caruncle on inner angle usually downwardly prolonged.

Southeastern China and Hainan; India and eastward in the East Indies; Africa.

FUKIEN: Amoy Island, on sand bar, *Steward* 3041 (G, NY); near Diongloh, along way to Sie Su, *Chen Ping En* 2369 (G).

KWANGTUNG: Swatow, Sept. 1901, *Dalziel* (G).

MACAO: dunes along coast, *Hance* 1441 (G).

HAINAN: Yaichow, open sandy places, *H. Y. Liang* 62845 (G); Manning, grassy place, *F. C. How* 71479 (G); Kumyun, *S. K. Lau* 27789 (G); Sam Ah, open sandy regions, *N. K. Chun & C. L. Tso* 43312 (G); Lam Ko District, sandy, *C. L. Lei* 1272 (G); Po Fu Ling, sand, *C. I. Lei* 1044 (G); Tung Koo Shan, sand, *H. Fung* 20417 (G); Singshui-Sunchuankang, *H. Y. Liang* 61802 (G); seashore, *C. Wang* 33785 (G); without locality, *Henry* 8158; Yaichow, sand by seashore, *F. C. How* 70937 (G); Sam Ah, open sandy places, *N. K. Chun & C. L. Tso* 43312 (G).

INDO-CHINA: western Tonkin, *Abbe Bon* 5685 (G).

Our material agrees reasonably well with the variable plant of India passing as *H. strigosum* but differs in details from that of Africa, and especially from that of west Africa, and so, presumably, from the type of the species.

4. *Heliotropium marifolium* Retzius, Obs. Bot. 2: 8 (1781) — type from India?

Plant at first erect and 10–15 cm. tall but later usually depressed with widely spreading or prostrate much-branched stems 1–3 dm. long, thinly clad with loosely appressed stiff straight pallid hairs about 1 mm. long; leaves numerous, lanceolate to elliptic, 0.8–2 cm. long, 2–5 mm. broad, earliest ones opposite but later ones all alternate, midrib impressed above and very prominent beneath, margin usually loosely revolute, apex acute, base obtuse or acute; petiole 0.5–2 mm. long; inflorescence at first leafy and glomerate, in fruit a crowded biseriate scorpioid cyme 1–3(–4) cm. long; bracts spreading, foliaceous, numerous, lanceolate, 3–4 mm. long; calyx 2–4 mm. long; lobes appressed hispid, lanceolate, becoming enlarged and ovate-lanceolate in fruit; pedicels in fruit very short and stout, 1 mm. long or less; corolla white, 2.5–3.5 mm. long, not much surpassing the calyx, limb hairy outside, lobes poorly developed, short but very broad, obtuse, erect and infolded in the bud; throat at summit densely villulose; anthers 0.7 mm. long, lance-ovate, their tips thickened and coherent; filaments 0.2 mm. long, attached 0.5–0.7 mm. above base of corolla; ovary glabrous; stigma 0.5 mm. long, consisting of a stigmatic disk 0.3 mm. in diameter and a superimposed narrowly conic sterile appendage; style 0.2–0.3 mm. long, short but evident; fruit depressed and rounded, bearing



short thickish hairs on the upper half, breaking up into 4 equal nutlets; nutlets 1–1.5 mm. high, the inner faces about equal and each with a small circular depression, a small caruncular mass usually present at the middle of the angulate inner edge.

Hainan, Indo-China; India to New Guinea.

HAINAN: Loktung, S. K. Lau 26779 (G); Kumyun, grassy place, S. K. Lau 27784 (G).

INDO-CHINA: ad montem Krervanh in prov. Pusath in Cambodia, Pierre 1221 (G).

##### 5. *Heliotropium formosanum*, sp. nov.

Planta decumbens vel prostrata minute sparseque griseo-strigosa ut videtur perennis; caulibus 1–2.5 dm. longis pluribus suffructiculis gracilibus laxe ascendente ramosis basi 1.5 mm. crassis, internodiis caulibus 1–2 mm. longis; foliis parvulis numerosissimis 3–4 mm. longis 1–2 mm. latis ellipticis vel ovatis divaricatis, apice late acutis, basi obtusis vel subrotundatis, subtus costa prominenti donatis, infimis 1 mm. longe petiolatis ceteris subsessilibus, superioribus vix reductis; spicis densis apice ramulorum foliosorum numerosorum solitariis obscure scorpioideis 4–8-floris 8–15 mm. longis bracteis foliosis ovatis vel ellipticis 2–3 mm. longis donatis; calyce 2.5–3 mm. longo subsessili extus pilis 0.3–0.6 mm. longis sparsis adpressis vestito intus subglabro; lobis valde inaequalibus acutis 0.5–1.2 mm. latis tubum corollae breviter superantibus; corolla alba 3.5–4 mm. longa, tubo 1.5 mm. longo medium versus 0.8–1 mm. crasso apice modice constricto, limbo ad 4 mm. diametro, lobis ovato-triangularibus 1 mm. latis, sinibus late obtusis plicatis, faucibus subvelutinis pilis minutis erectis numerosis donatis; antheris ovato-lanceolatis 0.6–0.7 mm. longis supra medium valde attenuatis apice cohaerentibus; filamentis gracilibus perbrevibus 0.4–0.6 mm. supra basim corollae affixis; ovario glaberrimo; stylo ca. 0.5 mm. longo, stigmate 0.7–0.8 mm. longo anguste conico triplo longiori quam lato; fructibus convexis 1–1.2 mm. altis supra medium pilis brevibus adpressis sparsis donatis; nuculis 4 in faciebus interioribus foveolatis angulo interiore medium versus cicatricatis.

FORMOSA: South Cape, A. Henry 956 (TYPE, NY).

Because of its slender loosely branching stems and numerous small leaves, this plant is at first glance suggestive of *H. strigosum* Willd. Actually, however, it is most closely related to *H. marifolium*, from which it differs in its slender loosely branched stems, extremely abundant minute mostly subsessile leaves, lack of opposite leaves and branches, slightly denser indument of shorter, more slender grayish hairs, less attenuate calyx-lobes, more elongate stigma, and more exserted corolla. The proportionately broad leaves and bracts, sessile fruiting calyces, and dense short inflorescence quickly distinguish it from *H. strigosum*. The proposed species comes from the tropical south end of Formosa and so from a locality northward from and well beyond the northern limit of *H. marifolium*.



## 7. TOURNEFORTIA L.

**Tournefortia** L., Sp. Pl. 140 (1753) and Gen. Pl. ed. 5, 68 (1754) — type-species, *T. hirsutissima* L.

*Tetrandra* (DC.) Miquel, Fl. Nederl. Ind. 2: 928 (1858) — type-species *T. tetrandra* Blume.

Shrubs, frequently scandent; leaves generally broad and with evident petiole; inflorescence usually dichotomous, terminal or axillary, bearing the flowers in scorpioid cymes; corolla with short or elongate tube, lobes spreading, frequently conduplicate; stamens mostly included, filaments generally very short; drupe with very juicy watery mesocarp, usually white; endocarp usually breaking up into 1- or 2-seeded pyrenes; stigma irregularly globular and broadly receptative laterally or receptative only in a band about the base and above sterile and commonly somewhat bilobed.

A genus composed chiefly of scandent shrubs. The great majority of the species and the greatest intrageneric diversity occur in the American tropics. For a synopsis and complete synonymy of the twelve species of the Old World see Johnston, Jour. Arnold Arb. 16: 145–161 (1935).

## KEY TO THE SPECIES

Mature endocarp breaking up into 4 single-seeded pyrenes; stigma elevated above ovary on a short but distinct style; Formosa...1. *T. sarmentosa*.

Mature endocarp breaking only in half, forming a pair of 2-seeded pyrenes; stigma broadly affixed and sessile on the rounded top of ovary; south China, Indo-China and Hainan.....2. *T. montana*.

1. **Tournefortia sarmentosa** Lam., Tab. Encyc. 1: 416 (1791); Johnston, Jour. Arnold Arb. 16: 147 (1935) — type probably from the East Indies.

Scandent shrub; leaves ovate or elliptic to lanceolate, usually minutely verrucose from an abundance of tiny protruding cystoliths, 6–12 cm. long, 2.5–5 cm. broad, base obtuse or rounded, with a petiole 5–20 mm. long, apex acute and frequently somewhat acuminate, upper surface usually sparsely strigose, usually with appressed veins, lower surface paler, usually with short spreading hairs but at times velutinous or even nearly glabrous; inflorescence terminal on leafy shoots, loosely dichotomous, bearing pairs of slender densely flowered bractless scorpioid cymes usually 1–3 cm. long; calyx sessile 1–1.5(–2) mm. long, strigose, lobes lance-ovate or lanceolate; corolla white, 3–12 mm. long, somewhat strigose on outer surface, limb 2.5–4.5 mm. in diameter, lobes rounded, folded, 1–2 mm. broad, tube subcylindric 1–1.5 mm. thick or when elongate somewhat ampliate and about 1 mm. thick at base and 2 mm. thick above middle; anthers 0.3–2 mm. long, subsessile, attached 0.7–4 mm. above base of corolla; ovary glabrous or with a very few hairs on upper part, somewhat bottle-shaped, elongate, 0.4–0.5 mm. thick, from base to tip of stigma 1.5–2 mm. long, distinctly narrowed above middle and continuing into a



short but distinct style; stigma a somewhat irregular globular or sub-cylindric mass no more than twice the diameter of the style, at times obscurely bilobed at summit; drupe white, about 5 mm. in diameter; endocarp sulcate on four sides, at maturity breaking up into 4 single-seeded pyrenes.

Formosa and south through the Philippines and the Celebes and from Java to New Guinea and northeastern Australia.

FORMOSA: Anping, Tainan, *Wilson* 9904 (A); Arisan Prov., *Wilson* 10896 (A); Takao, *Faurie* 389 (A); Bankinsing, *Faurie* 388 (A); Koshun, *Yanagawa* 3 (A).

An extremely variable species as to flower size and as to size, shape, and pubescence of foliage. The capacity for foliar variation is well demonstrated in the Philippines, but only moderately so at the extreme northern limit of its range in Formosa. In flower size and shape, however, the Formosan plants appear to be as inconstant as in other regions. Of the collections cited above four have corollas 3–4 mm. long and anthers 0.3–1 mm. long. One collection (*Faurie* 3891), however, has the corollas 11–12 mm. long and anthers 1.5–2 mm. in length. Although differing greatly in the length of the corolla and particularly in the more elongate tube and anthers, the collections are otherwise similar and especially so in ovary, style, stigma, and fruit. Because of its variation in foliage and corolla size the species has accumulated a large number of synonyms. A listing of them will be found in the paper by Johnston cited above.

2. *Tournefortia montana* Loureiro, Fl. Cochinchin. 1: 122 (1790); Merrill, Trans. Am. Philos. Soc. n. s. 24<sup>2</sup>: 330 (1935); Johnston, Jour. Arnold Arb. 16: 153 (1935) — type from Cochinchina.

*Tournefortia Sampsoni* Hance, Jour. Bot. 6: 330 (1868) — type from Sai-chü-shan, prov. Canton, *Sampson* 13035.

*Tournefortia Boniana* Gagnepain, Not. Syst. 3: 33 (1914) and Fl. Indo-Chine 4: 217 (1914) — type material from Tonkin, *Bon* 1932 and 1357.

*Tournefortia Gaudichaudii* Gagnepain, Not. Syst. 3: 34 (1914) and Fl. Indo-Chine 4: 217, f. 26 (1914) — type from Tourane, Indo-China, *Gaudichaud* 180.

*Tournefortia brachyantha* Merrill & Chun, Sunyatsenia 2: 314, f. 43 (1935) — type from Ngai Yuen, Hainan, *F. C. How* 70424.

Scandent shrub; leaves lanceolate or rarely ovate-lanceolate, 8–15 cm. long, 2–6 cm. broad, base acute to rounded, apex acute and usually slenderly acuminate, above scantily and minutely strigose, frequently minutely dotted by cystoliths, commonly with impressed veins and midrib, below paler, strigose, with prominent veins; petiole 2–15 mm. long; inflorescence terminal on leafy shoots, loosely dichotomous, bractless, the flowers borne crowded in 2–10 slender scorpioid cymes usually 2–15 cm. long; calyx sessile, 1–2.5 mm. long, with appressed hairs, lobed  $\frac{1}{2}$  to  $\frac{2}{3}$  to base, lobes lanceolate; corolla white to greenish or yellowish, 5–12 mm. long, sparsely strigose outside, limb 2.5–6 mm. broad, lobes 1–1.5 mm. long, 1–2 mm. wide, conduplicate, tube about 1 mm. thick at base, expanding to 1.8–2.5



mm. thick at middle and again contracted at the throat; anthers oblong-linear 1.5–2.7 mm. long, subsessile or rarely with filament up to 0.4 mm. long, attached 1–2.5 mm. above base of corolla-tube; ovary glabrous, somewhat ovoid, terminated by a large broadly affixed sessile discoid stigma; drupe subglobose, about 5 mm. in diameter; endocarp conspicuously grooved only dorsally and ventrally, eventually breaking to form plano-convex halves, each containing 2 seminiferous cavities and an intervening sterile one.

Southern China, Hainan, and Indo-China.

YUNNAN: Szemao, Yulo forests, 4000 ft. alt., large climber, fl. yellow, *Henry 12862* (A, NY).

KWANGTUNG: in umbrosis inter rupis porphyriticis, ad cavernulas Sai-chü-shan, prov. Cantoniensis, April 1866, *T. Sampson 13035* (A, ISOTYPE of *T. Sampsoni*).

HAINAN: Yaichow, *F. C. How 70424* (A, ISOTYPE; NY, TYPE of *T. brachyantha*); Wong-Po Por, Kum-Yun District, *H. Y. Liang 65208* (A, NY); Pak Shik Ling, *C. I. Lei 664* (A, NY); Ka Chik Shan, *S. K. Lau 1425* (A, NY).

INDO-CHINA: Lan kok, Mont Bair, Tonkin, *Balansa 3891* (A); Long-Tcheou, Tonkin, *Dr. Simond* (A); O Cach, in monte Ma Dong, Feb. 22, 1883, *H. Bon* (A); Kemarath, Laos, *Thorel 2986* (A).

As here defined *T. montana* is restricted to plants of Indo-China, southern China, and Hainan. In a previous discussion of the species, l.c., it was given a broader definition and included also plants of Siam, Burma, and eastern India. These latter, however, differ from typical *T. montana* in having the discoid stigma not broadly attached and sessile on the rounded summit of the ovary, but elevated on a stout but still distinct stylar prolongation of the ovary. In other respects the eastern and western forms of *T. montana* appear to be similar. The plants ranging from Siam to India can be distinguished under the name *T. montana* var. *Griffithii*, comb. nov. (*T. viridiflora* var. *Griffithii* Clarke, 1883). The stout short style characteristic of them is evident in the flowering state and usually on the maturing fruit also.

Like *T. sarmentosa*, the present species is notable for wide variation in flower size and form, and in size, shape, and indument of the leaves. Flowers on a given plant are uniform in size and form, but from plant to plant they vary from 6 to 12 mm. or more in length. Specimens with corollas of intermediate size are very much less common than those with the corolla either very large or very small. Certainly a strong tendency towards corolla dimorphy is indicated. Such dimorphy is frequently associated with heterostyly or functionally unisexual flowers. As far as can be determined, this does not seem to be so in the present case. Possibly we may have floral differences associated in some manner with different seasons of the year. The problem merits the attention of the field botanist, who can also supply detailed observations on color and size of fruit and color of the flower, information needed for the complete description of the species.



## 8. MESSERSCHMIDIA L. ex Hebenstreit

**Messerschmidia** L. ex Hebenstreit, Nov. Comm. Acad. Sci. Imp. Petrop. 8: 315, t. 11 (1763) — type-species, *Tournefortia sibirica* L.

*Argusia* Amman, Stirp. Rar. Ruth. 29 (1739) — type-species, *Tournefortia sibirica* L.

*Mallotonia* (Griseb.) Britton, Ann. Missouri Bot. Gard. 2: 47 (1915) — type-species, *Tournefortia gnaphalodes* R. Br.

Trees, shrubs, and herbs; leaves large to small, usually narrowed to their attachment or at times with an inconspicuous true petiole; inflorescence ebracteate, dichotomously branched, bearing flowers in unilateral cymes; corolla white, with cylindric or campanulate tube and spreading limb, lobes conduplicate in bud; anthers on very short filaments, mucronulate at apex; stigma frustum-like, about as tall as thick, receptative in a ring about the base, sterile portion thick and somewhat lobed; fruit dry when mature, mesocarp vesicular, corky, endocarp dividing into two parts, each with two seminiferous cavities; the fertile cavities in each half of the endocarp separated by a deep groove or by a sterile cavity.

A discussion of the complicated nomenclatorial history of *Messerschmidia* and a synopsis of the species belonging to the genus has been recently published, Jour. Arnold Arb. 16: 161–166 (1935). Recently, Jour. Arnold Arb. 30: 129–30 (1949), I weakened in my belief that the group merited separation from *Tournefortia*, but now, after a new study, I am again convinced that it should be excluded from that genus. I am now of the belief that *Messerschmidia* has its closest relations not with *Tournefortia*, but rather with *Heliotropium*. Its distinctive feature is the firm vesicular corky mesocarpial tissue in which the endocarp is embedded in the mature fruit. In *Tournefortia* the well-developed mesocarp is very juicy. Though conspicuous in the fresh state, upon drying it so shrinks about the endocarp that commonly it almost seems to disappear, or at any rate gives little evidence of its former size and very pulpy nature. In *Heliotropium* the mesocarp is not differentiated, the endocarps being covered at maturity only by thin epicarp. As a result the fruit is dry and hard.

## KEY TO THE SPECIES

- Plant an herb, stems arising from a strong rhizome; leaves less than 6 cm. long; inflorescence a loose unilateral cyme; calyx pedicellate, lobes cuneate or lanceolate; fruit pubescent, sunken in at summit; endocarps large and relatively thin-walled, with knife-like ridges on back and sides, covered with corky mesocarp; Japan and China. .1. *M. sibirica*.
- Plant a tree with coarse branches, leaves 10–20 cm. long; flowers sessile, in scorpioid cymes; calyx-lobes oblong, obtuse; fruit glabrous, plump and globular; bearing the relatively small thick-walled endocarps above the middle, surrounded and supported by much corky mesocarp; Ryukyus to Hainan. . . . .2. *M. argentea*.
1. **Messerschmidia sibirica** L., Mant. 2: 334 (1771) — type from “Locus in glareosis aridisque apricis Argun fluuii et Iike Dalai Noor



in Dauria," i.e., from the headwaters of the Argun River in extreme eastern Mongolia.

*Tournefortia sibirica* L., Sp. Pl. 141 (1753).

*Messerschmidia Argusia* L., Mant. 1: 42 (1767) — same type as preceding.

*Messerschmidia Argusia* Murray, Syst. Nat. ed. 13, p. 161 (1774); Linn. f., Suppl. Pl. 132 (1781).

*Tournefortia Argusia* (L.) R. & S., Syst. 4: 540 (1819); Maxim., Mel. Biol. 8: 539 (1872).

*Messerschmidia rosmarinifolia* Willd. ex R. & S., Syst. 4: 544 (1819) — type from "E. Siberia, Pallas."

*Tournefortia Argusia* var. *rosmarinifolia* (Willd.) Turcz., Bull. Soc. Nat. Moscow 23<sup>1</sup>: 498 (1850).

*Tournefortia Argusia*  $\alpha$  *latifolia* DC., Prodr. 9: 514 (1845). — "In glareosis apricis Dahuriae ad flumen Argun . . . , in siccis et salsis Siberiae ad Irtysh (*Ledeb.*)."

Apparently the typical variety.  
*Messerschmidia sibirica* var. *latifolia* (DC.) Hara, Enum. Spermat. Japan 1: 178 (1948).

*Tournefortia Argusia* var. *angustior* DC., Prodr. 9: 514 (1845) — based upon collections from China, Mongolia, Caspian area, Asia Minor and the Ukraine; "foliis lanceolatis."

*Tournefortia Argusia* var. *cynanchoides* Turcz. ex Steven, Bull. Soc. Nat. Moscow 24<sup>1</sup>: 559 (1851) — an herbarium name associated with material from Mongolia.

*Heliotropium japonicum* Gray, Mem. Am. Acad. ser. 2, 6: 403 (1859) — type from Hakodate, Japan, *Wright*.

*Tournefortia sibirica* var. *grandiflora* H. Winkl., Fedde, Repert. Beihefte 12: 472 (1922) — type from Peking, *Limpricht 2432*.

Herb with a strong underground rhizome, usually densely strigose or hispid-villous especially when young, stems single or clustered, erect to decumbent, simple or with a few ascending branches, 1–4 dm. tall, 1–5 mm. thick; leaves linear to lanceolate or oblong or oblong-obovate, thickish, 1–6 cm. long, 1.5–2.5 cm. broad, appressed hispid-villose or strigose, the hairs commonly thickened at base, apex of blade rounded to acute, base acute, subsessile or sessile; midrib evident, usually impressed on upper surface, prominent on lower; veins few, ascending, frequently inconspicuous, secondary veins very obscure; inflorescence terminal, dichotomous, composed of one-sided cymes, usually corymbosely arranged or glomerate, commonly 2–5 cm. in diameter, very shortly projecting above the leaves; peduncle 0–5 cm. long; corolla funnelform, 10–14 mm. long, appressed hairy outside especially on the tube, tube 1.5–3 mm. thick, subcylindric, 5–7 mm. long, lobes ovate or oblong, conduplicate, separated by plicate obtuse or rounded sinus; anthers 2–3 mm. long, oblong, the apex thickened, mucronulate; filaments very short, attached 2.5–3.5 mm. above base of corolla tube; ovary glabrous at anthesis, depressed globose, somewhat 4-sulcate, 1–1.5 mm. thick, 0.7–1.2 cm. high, seated on a thin nectariferous disk, above abruptly narrowed into a thick style 0.5–1 mm. long; stigma frustum-like, about 1 mm. high and nearly as thick, truncate, with thick basal receptative ring surmounted by an obscurely lobed thick



sterile appendage; fruit ellipsoidal or ovoid, somewhat strigose, sunken in at summit and there bearing the inconspicuous persisting style and stigma, at maturity dry, 9–12 mm. long, 7–10 mm. thick, dividing in half along the nearly plane dorso-ventral commissure, each half with two seminiferous cavities separated by a slightly smaller frequently incomplete sterile cavity; endocarp with only moderately thickened walls, bearing knife-like wings on back and sides; mesocarp vesicular, corky, usually about 1 mm. thick on back and sides of endocarp.

Ranging from Japan across northern China and westward to Roumania and central Russia; most frequent in sandy places and generally where the soil is somewhat moist and saline.

MANCHURIA: Chinchon, near Darien, *Dorsett & Morse* 5854 (G).

HOPEI: vicinity of Peking, *David* (G), *F. T. Wang* 20117 (G), 20230 (G) and 20327 (G); Hsiaowutaishan, *C. W. Wang* 61455 (G); Changpei Hsien, *C. W. Wang* 62315 (G); Yu-tien Hsien, *Meyer* 944 (G).

SHANTUNG: Tsing tao, *C. Y. Chiao* 2496 (G); Loo Shan to Pai Ying Tung, *C. Y. Chiao* 2773 (G); Chefoo, *T. N. Liou* 1507 (G) and *W. Perry* (G).

CHEKIANG: Ning-po, Chuan-shan, *K. K. Tsoong* (G).

KOREA: Port Vhusan, 1859, *C. Wilford* (G); without locality, *R. Oldham* 585 (G).

MONGOLIA: Shararakh Usu, Outer Mongolia, *R. W. Chaney* 58 (G); Toumet, Sartchy, *David* 2604 (G).

SHANSI: without locality, *T. Tang* 727 and 1202 (NY).

KANSU: Chungwei, *R. C. Ching* 213 (G).

JAPAN: Hakodate, Hokkaido, 1861, *Maximowicz* (G); Hakodate, *Wright* (G, type of *H. japonicum*); Samani, Hidoka, Hokkaido, *K. Mayabe* (G); Zenibako, Ishikari, Hokkaido, *Tokubuchi* (G); Tatara, Kasuya, Fukuoka, Kyushu, *T. Tanaka* 197 (G) and *K. Ichikawa* 237 (G).

Herbarium material of the species shows rather wide variation in size of plant and in size and shape of foliage. Some of this variation may be associated with the age of the individual. Hebenstreit, who described and illustrated individuals kept under observation in the garden at St. Petersburg, states that the leaves are linear-lanceolate, crowded, stiff, and pubescent early in the growing season but later becomes thrice larger, greener, less rigid, and less crowded. Some of the specimens before me show reductions readily recognizable as ecological. Indeed fruiting plants which are of small size and have small narrow leaves all seem to have come from dry situations. The most luxuriant forms come from sandy places along the ocean in Japan, Amur, Korea, and northern China. They are the plant described as *Heliotropium japonicum*. The name *M. sibirica* var. *latifolia* has been applied to this very robust and also generally decumbent coastal plant, but nomenclatorially it is the same as *M. sibirica* var. *typica* and consequently properly applicable only to the moderately robust form of the species common in the interior across northern China. Plants with linear leaves have been described as *M. rosmarinifolia* Willd. The description suggests that they may represent the vernal form of the species



mentioned by Hebenstreit. I have been able to detect no well-marked geographic varieties. Possibly the eastern and western forms of the species may differ somewhat in fruit. The eastern plants usually have two knife-like ridges (one lateral and one dorsal) arising from the endocarp and embedded in corky mesocarp over each of the seminiferous cavities. In western plants these ridges are poorly developed or absent. Possibly the inner surface of the calyx-lobes may be more hairy in the western plants.

The species is among the very first of the Chinese Boraginaceae to be described by Europeans. For a more complete listing of its synonyms see Johnston, Jour. Arnold Arb. 16: 161-64 (1935).

2. *Messerschmidia argentea* (L.) Johnston, Jour. Arnold Arb. 16: 164 (1935).

*Tournefortia argentea* L., Suppl. Pl. 133 (1781); Clarke, Fl. Brit. Ind. 4: 145 (1883); Safford, Contr. U. S. Nat. Herb. 9: 389, t. 69 (1905); Gagnep. & Cour., Fl. Indo-Chine 4: 215 (1914); Kanehira, Formosan Trees 641, f. 597 (1936) — type collected on Ceylon by König.

*Tournefortia arborea* Blanco, Fl. Filip. 129 (1837) — type from Negros Island, Philippines.

Shrub or spreading tree, 1-10 m. tall; leaves large, coarse, somewhat fleshy, closely placed at the ends of stout branches, densely clad with appressed silky white hairs (indument grayish white when fresh but changing to golden in the herbarium), blade 10-20 cm. long, 4-8 cm. broad, broadly oblanceolate, broadest well above middle and gradually narrowed downwards into the stout petiole (5-25 mm. long), apex obtuse or somewhat rounded; inflorescence terminal, coarse, stiff, at first more or less glomerate but becoming loosely paniculate and somewhat pyramidal, commonly 9-18 cm. in diameter and nearly as long, borne on a peduncle 5-15 cm. long, dichotomous; flowers very numerous, at first glomerate but after anthesis displayed in crowded two-ranked elongating paired scorpioid cymes 2-10 cm. long; calyx 1.5-2 mm. long, sessile, parted, lobes fleshy oblong to nearly orbicular, densely appressed hairy outside, glabrous inside, not much enlarged in fruit; corolla white, limb 4-7 mm. broad, lobes ovate-orbicular, margin entire or somewhat denticulate, base abruptly narrowed, outer surface strigose down middle, tube shorter than lobes, campanulate, usually 1.5-2 mm. long; anthers ovate-oblong, usually about 1.5(0.5-1.8) mm. long, commonly half extruded from the open corolla-throat, apex acute, thickened, mucronulate at the very tip; filaments very inconspicuous, attached 0.4-0.8 mm. above base of corolla-tube; ovary glabrous, subglobose, 0.8-1.5 mm. thick; stigma about as long as broad, sessile, composed of a thick stigmatic disk surmounted by a pair of stout oblong appendages; fruit when mature dry, smooth, glabrous, depressed globose, 5-8 mm. in diameter, upper part occupied by the bony endocarp, the remainder corky mesocarp, eventually dividing into plano-convex halves; endocarp with relatively thick hard walls, 2-4 mm. long, back smooth and rounded, each half containing 2 ovuliferous cavities and a small interposed sterile one.





Johnston, I. M. 1951. "Studies in the Boraginaceae, XX. Representatives of three subfamilies in eastern Asia [concl.]." *Journal of the Arnold Arboretum* 32(2), 99–122. <https://doi.org/10.5962/bhl.part.9730>.

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