

The Symplocaceae of Japan

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ABSTRACT A taxonomic revision of the family Symplocaceae (*Symplocos* Jacq. only) in Japan is provided. Throughout a broad survey of herbarium specimens and living plants in the field, pollen grains, inflorescences, and fruits are found to be major source of taxonomic character. Twenty-three species are recognized in Japan, one species (*S. sonoharae*) being assigned to subgen. *Symplocos*, and 22 species to subgen. *Hopea* (L.) Clarke. The species of subgen. *Hopea* are further classified into eight sections. Keys, distribution maps and complete synonymy with full description for all species are provided. Six new taxa are described and two new names are proposed: sect. *Glaucæ*, sect. nov.; sect. *Lancifoliae*, sect. nov.; sect. *Okinawenses*, sect. nov.; *S. sonoharae* var. *oblonga*, var. nov. (from China); *S. liukuensis* var. *iriomotensis*, var. nov.; *S. prunifolia* var. *tawadae*, var. nov.; *S. kuroki*, nom. nov.; *S. sawafutagi*, nom. et stat. nov. The first chromosome counts of three Japanese species are also presented: $2n = \text{ca. } 90$ in *S. sonoharae*; $n = 11$ in *S. stellaris*; $2n = 22$ in *S. tanakae*.

KEY WORDS Symplocaceae/ *Symplocos*/ Japan/ taxonomy

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Introduction

The family Symplocaceae Desfontaines consists of a single genus *Symplocos* Jacq., with about 400 species of shrubs or trees. It is widespread in moist tropical and subtropical regions, but is not distributed in Africa, western Asia, and Europe. This family is often placed in the Ebenales as a close ally of Styracaceae (e.g., Cronquist, 1981), although its ordinal position is not yet established (see Nooteboom, 1975: 3–4).

Symplocos is a morphologically diverse, and taxonomically difficult genus. It is often hard to find good diagnostic characters for species. The poverty of collected specimens is also one of the reasons for such difficulties. Often only a few specimens are known for some species, because many species occur only in the higher elevations or on small islands in

the tropical and/or subtropical regions. Probably many sister species have been formed by isolation, causing the taxonomic difficulties.

Such taxonomic difficulties are reflected in the recent revisional works. Nootboom (1975) revised the Symplocaceae of the Old World, but his species concept was extremely wide. Some species contain many infraspecific taxa: for example, *S. cochinchinensis* (Lour.) Moore comprises 4 subspecies, 29 varieties and one topodeme, and *S. macrophylla* Wall. ex DC. 6 subspecies and 13 varieties. Some species have no infraspecific taxa, because of their broader limits. Concerning *Symplocos* of Taiwan, Nootboom (1975) accepted 6 species, while Ying (1975) distinguished 31 species in total. Thereafter, the species of Taiwan were revised by Nootboom (1978) to be counted 14 species, and by Ying (1987) to be counted 21 species. As regards the species of *Symplocos* of China including Taiwan, Nootboom (1975) recognized 33 species, but Wu (1987) reported 77 species.

Concerning the species of *Symplocos* in Japan, Nootboom accepted 10 species, which made a marked contrast to 21 species recognized by Murata (1989). In their treatments, four deciduous species recognized by Murata are reduced by Nootboom to *S. paniculata* (Murray) Miq.; likewise, and *Symplocos nakaharae* (Matsumura) Masamune, *S. lucida* Sieb. & Zucc. and *S. tanakae* Matsumura are merged into *S. lucida*.

When Nootboom (1975) reduced many deciduous taxa to a single species *S. paniculata*, he commented that "although typical drought forms occur, there usually is neither any correlation between ecology and hairiness or leaf shape, nor between geography and these varying characters". In this paper, not only full descriptions but also distribution maps for all distinct species are presented to show correlations between geography and morphological characters.

Consequently, I recognize here 23 species of *Symplocos* in Japan. Five new taxa (3 new sections and 2 new varieties, addingly one new variety from China) are described and two new names are proposed.

Materials and Methods

Specimens preserved in the herbaria, A, BK, BKF, BM, BO, E, K, KAG, KANA, KUN, KYO, L, MAK, MATSU, P, PE, RYU, SHIN, SING, TAI, TI, TNS, TOFO, TUS, UC, W, and the Herbarium of Shizuoka University, Japan, were examined. Field studies were made in various localities in Japan.

Preparations of acetolyzed pollen grains mounted in silicon oil were used for the measurements of pollen size (see Nagamasu (1989a) for voucher specimens and further information).

For observations of somatic chromosomes, root tips from cultivated plants were used. After pretreatment in 0.002 M aqueous solution of 8-hydroxyquinoline for 4 hr at 18–20°C, the root tips were fixed in 45% acetic acid, then macerated with 1 N HCl for 1 min at 60°C, stained with 1% aceto-orcein, and squashed. For meiotic preparations, flower buds were fixed in acetic alcohol (1:3), and the anthers were stained in 1% aceto-carmin after mordanting in 1% iron alum for 30 min. Voucher specimens and localities are listed in Table 1 (see p. 183).

Gross Morphology

Habit. Shrubs or Trees. Most species are evergreen except for the species of sect. *Palura*.

Twigs slender to rather thick, terete, ridged or winged, glabrous to densely hairy, terminated by a scaly bud. Hairs simple, 1-celled.

In some species the ridges of twigs are well developed and look almost like wings (e.g., *S. kawakamii*). Usually a twig is covered by one kind of hair, but in some species two kinds of hairs are observed. For example, twigs of *S. lancifolia* are densely short villose and sparsely pilose. The density of hairs is usually varied within species, but characters of hairs are often taxonomically of use. In some species, the twigs are always glabrous.

Leaves simple, bilateral and exstipulate, spirally or distichously arranged, rarely pseudovercillate; margin usually glandular-serrate or glandular-crenate, often more or less recurved; midrib impressed or prominent on upper surface; nerves pinnate.

In Japanese species, only spiral phyllotaxis is observed. Whether the midrib is prominent on upper surface or impressed is a taxonomically important feature. In Japanese species, the prominent midrib is distributed in sects. *Lancifoliae*, *Palaeosymplocos* and *Okinawenses*. In the latter two sections, all species have prominent midribs.

Inflorescence axillary and/or situated on branches without a subtending leaf, rarely terminal; determinate; racemose (botryoid), spicate (stachyoid) or paniculate, simple or compound. Flowers with a bract and 2 bracteoles at the base of flower except for terminal flower; terminal flower with 2–4(–many) scales on the stalk, the scales spirally arranged. Bracts and bracteoles often keeled, caducous or persistent.

The inflorescence of *Symplocos* is morphologically a botryoid, a stachyoid, or a panicle, because the axis is terminated by a flower. In some species with elongate inflorescences such as *S. prunifolia* or *S. cochinchinensis*, however, the terminal flower is sometimes not developed well and may drop before flowering. The inflorescence is often branched at the base, forming a double botryoid (branched raceme, Fig. 1a) or a double stachyoid (branched spike, Fig. 1d). The terminal inflorescence is characteristic of the sect. *Palura* comprising deciduous species. All other evergreen species have axillary inflorescences.

Axillary Inflorescences. The simple and/or double raceme with persistent bracts (Fig. 1a & b) is observed in *S. sonoharae* (subgen. *Symplocos*) and *S. okinawensis* (subgen. *Hopea*). But, these two species do not seem to be so closely related to each other, because other morphological characters, such as pollen, corolla, stamens or fruits are different.

The racemose inflorescence with caducous bracts (Fig. 1c) is distributed in sect. *Lodhra*. The branched form (double botryoid with caducous bracts) is not observed in Japanese species. The inflorescence of *S. myrtacea* is loosely 3–6-flowered and its terminal flower has a long stalk. On the other hand, that of *S. prunifolia* is densely 10–30-flowered and the terminal flower is short stalked or often not developed.

Fig. 1d–f represent spicate (stachyoid) inflorescences. *S. cochinchinensis* and its allies (sect. *Bobu*) are characterized by elongate spikes branched near the base (double stachyoid, Fig. 1d). Its reduced form, the simple elongate spike (Fig. 1e), is observed in *S. lancifolia* and its allies (sect. *Lancifoliae*).

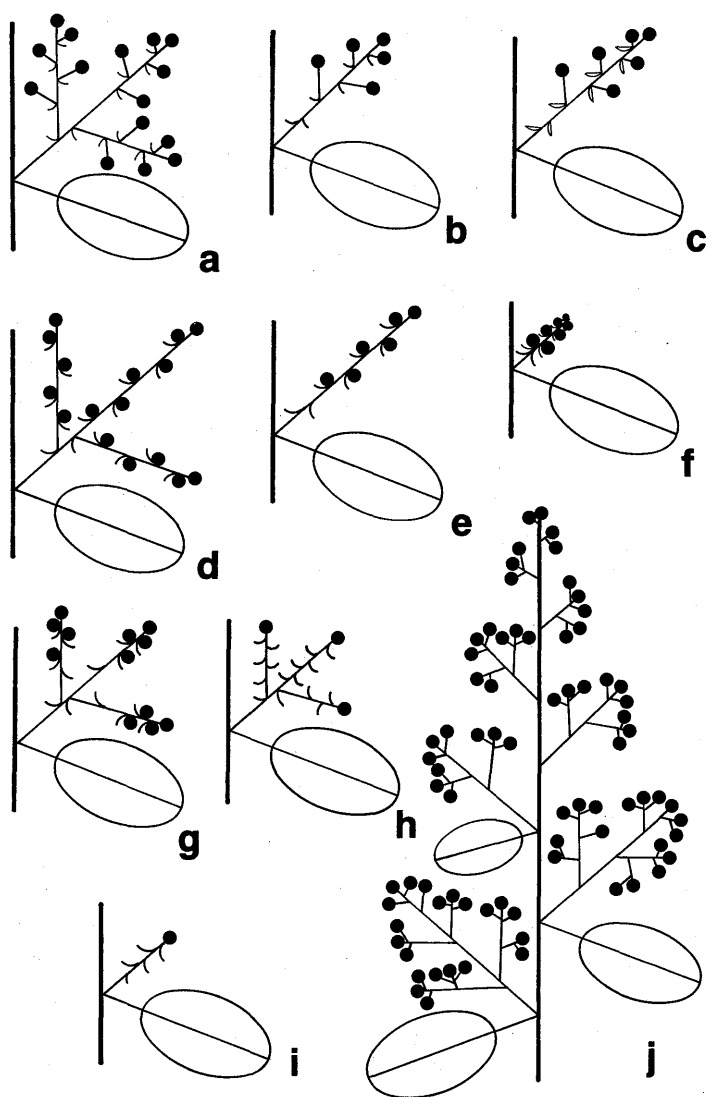


Fig. 1. Diagrammatic representation of inflorescence types in Japanese *Symplocos*. — a: axillary raceme branched at base (double botryoid), bracts persistent (in *S. okinawensis*). — b: axillary raceme (botryoid), bracts persistent (in *S. sonoharae* and *S. okinawensis*). — c: axillary raceme (botryoid), bracts caducous (in *S. caudata*, *S. liukiensis*, *S. myrtacea* and *S. prunifolia*). — d: axillary spikes branched at base (double stachyoid), bracts persistent (in *S. cochinchinensis*, *S. konishii* and *S. theophrastifolia*). — e: axillary spike (stachyoid) with persistent bracts (in *S. lancifolia* and *S. microcalyx*). — f: axillary condensed spike (stachyoid), bracts persistent (in *S. glauca* and *S. stellaris*). — g: axillary condensed spikes branched at base (double stachyoid), the lower flowers often reduced, bracts persistent (in *S. kawakamii*, *S. kuroki*, *S. nakaharae* and *S. tanakae*). — h: axillary condensed spikes branched at base (double stachyoid), flowers reduced except terminal one, bracts persistent (in *S. boninensis*). — i: axillary condensed spike (stachyoid), flowers reduced except terminal one, bracts persistent (in *S. pergracilis*). — j: terminal panicle, bracts caducous, partly reduced (in sect. *Palura*). Bracts omitted in fig. 1j.

The spicate inflorescence condensed in a head-like cluster (Fig. 1f) is of *S. glauca* and *S. stellaris* (in Japanese species). In *S. glauca*, however, the inflorescence often elongates after anthesis.

In sect. *Palaeosymplocos*, the inflorescence is specialized in another way (Fig. 1g-i): the inflorescence tends to be condensed, and the lower bracts are often sterile. Fig. 1g shows rather loose inflorescence in *S. nakaharae* and *S. kawakamii*. Its further condensed form is observed in *S. kuroki* and *S. tanakae*. In *S. boninensis*, all flowers are reduced except for the terminal one, and the condensed inflorescence axis is densely covered by the sterile bracts (Fig. 1h). The extreme form of this line is represented in *S. pergracilis* (Fig. 1i): the inflorescence is unflowered, but many scales are observed on the condensed axis as a trace of the sterile bracts.

Terminal Inflorescences. The terminal panicle (Fig. 1j) is characteristic of all deciduous species of sect. *Palura*. The inflorescence of this section is much specialized: the branches are irregularly concaulescent and/or recaulescent; bracts and bracteoles are principally caducous and linear, but often reduced; the structure of a branch of the panicle is basically similar to the double raceme as in Fig. 1a. This type may be derived from the axillary double raceme (Fig. 1a) by the reduction of subtending leaves in the upper part of the shoot.

The lower branches of the panicle are subtended by foliage leaves; consequently the panicle contains a few foliage leaves. In *S. coreana*, however, the foliage leaves rarely occur in the panicle, because only the lowest branch is usually subtended by a foliage leaf.

Flowers. Flowers are actinomorphic, bisexual or plants rarely polygamous.

Calyx. Calyx tube adnate to the inferior or semi-inferior ovary; calyx limb (free part of calyx) divided into (3-)5 lobes (Fig. 2); calyx lobes more or less equal, imbricate or valvate, connate at base.

The calyx is glabrous or hairy depending on species, but in *S. coreana* and *S. sawafutagi*, both glabrous and hairy calyx tube is observed within a species. In some species, only calyx limb or lobes are hairy but calyx tube is glabrous. The indument, shape, size of calyx are taxonomically good characters.

Corolla shallowly to deeply (3-)5(-11)-lobed, white, often tinged pink, yellow, or violet, lobes imbricate, glabrous or hairy, sometimes ciliate.

Characters of corolla has been regarded important to divide the genus into subgenera

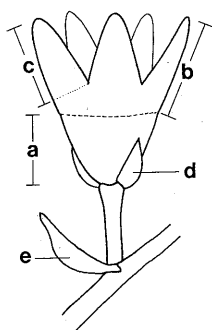


Fig. 2. a: length of calyx tube; b: length of calyx limb; c: length of calyx lobe; d: bracteole; e: bract. (Corolla removed).

(Brand, 1901; Nooteboom, 1975). In subgen. *Symplocos*, the long corolla tube is formed. In subgenera *Hopea* and *Microsymplocos*, the corolla is deeply divided nearly to the base, and the tube is very short.

Stamens 4 to many, inserted on the corolla, monadelphous, pentadelphous or free; filaments flattened or cylindrical, glabrous or hairy, rarely papillose.

This character also has been regarded as very important for the infrageneric classification (Bentham & Hooker, 1876; Brand, 1901; Nooteboom, 1975). In subgen. *Symplocos*, the stamens are monadelphous, forming a rather long staminal tube. The filaments are more or less flattened and the apex is abruptly narrowed forming a short whip below the anther. In subgen. *Microsymplocos*, the stamens are monadelphous but the tube is very short; the free part is gradually narrowed to the base. In subgen. *Hopea*, the stamens are variously pentadelphous, or connate only at the base; the staminal group are alternipetalous.

Disk. Nectary disk surrounding the base of single slender style; globose, cylindrical, 5-glandular, pulvinate or flat; glabrous or hairy.

As *S. sonoharae* (subgen. *Symplocos*) has a semi-inferior ovary, its disk-like protuberance includes the upper part of ovary.

The shape and/or indument of the disk are rather constant character within a species. But, in *S. coreana* and *S. sawafutagi*, both hairy and glabrous disk are observed within a species, and plants with hairy calyx tube tend to have hairy disk.

Ovary inferior or semi-inferior, 2- to 5-locular, but septa not always complete at the uppermost part; ovules 2–4 in each locule.

In Japanese species, the ovary is 2 or 3-locular. The 2-locular ovary is observed in *S. sonoharae* (subgen. *Symplocos*) and 6 species of subgen. *Hopea*: *S. coreana*, *S. sawafutagi*, *S. paniculata*, *S. tanakana*, *S. kuroki* and *S. nakaharae*. As the 3-locular ovary is widely distributed in subgen. *Hopea*, the 2-locular is considered a derived character.

The number of ovules in each locule is always 4 in Japanese species.

Fruit a monopyrenous drupe, globose, ellipsoidal, ovoid, obovoid, ampulliform or cylindrical (Fig. 3); calyx lobes persistent, forming an acute or blunt beak, or a crown; outer part of mesocarp fleshy, blue, dark blue or black when ripe.

Stone globose, ellipsoidal, ovoid, obovoid, ampulliform, cylindrical or trigonous; surface smooth or longitudinally grooved; inner part of mesocarp corky or woody.

The locules of ovary recognized in anthesis are not always developed in fruits. Fig. 4 shows the transverse sections of stone of several representative species in Japan. In some species all locules are developed (Fig. 4a–d), but in others only one locule is developed (Fig. 4e–k). The development of mesocarp is also various but constant within a species. In *S. tanakae* (Fig. 4b), the mesocarp is well developed forming a thick stone wall, on the other hand, in *S. myrtacea* (Fig. 4k) or in *S. coreana*, the mesocarp is very thin. These characters of stone are important to recognize species groups.

Seed and embryo. Seed usually solitary in each developed locule, straight or curved; seed coat very thin, surface often striate. Embryo embedded in copious endosperm, and similarly curved with the seed.

Since Bentham & Hooker (1876), the shape of seed has been regarded as an important character in recognizing infrageneric taxa. Fig. 4 shows the shapes of seed and embryo.

Straight to slightly curved seeds are presented in Fig. 4a–g. In species whose fruit wall is hard and well developed, the seeds tend to be straight, probably because the septa are not destroyed by the development of seed. But, in *S. tanakae* (Fig. 4b) and *S. kuroki* (Fig. 4c), seeds often longitudinally curved without destroying septa. Fig. 4h–k shows the curved seeds. In this case the septa are destroyed. In *S. lancifolia* (Fig. 4h), the seed develops and destroys the septa, and becomes obliquely laterally curved. In *S. cochinchinensis* (Fig. 4i), the seed is similar to that of *S. lancifolia*, but it is twice curved in two planes, at first longitudinally and then laterally, because the stone is ampulliform. On the other hand, in *S. sawafutagi* (Fig. 4j) or *S. myrtacea* (Fig. 4k), the seed longitudinally curved.

As noted by Nooteboom (1975), the shape of the seed seems to be correlated with the shape of the fruit: globose and ampulliform fruits mostly have curved seeds, cylindrical fruits

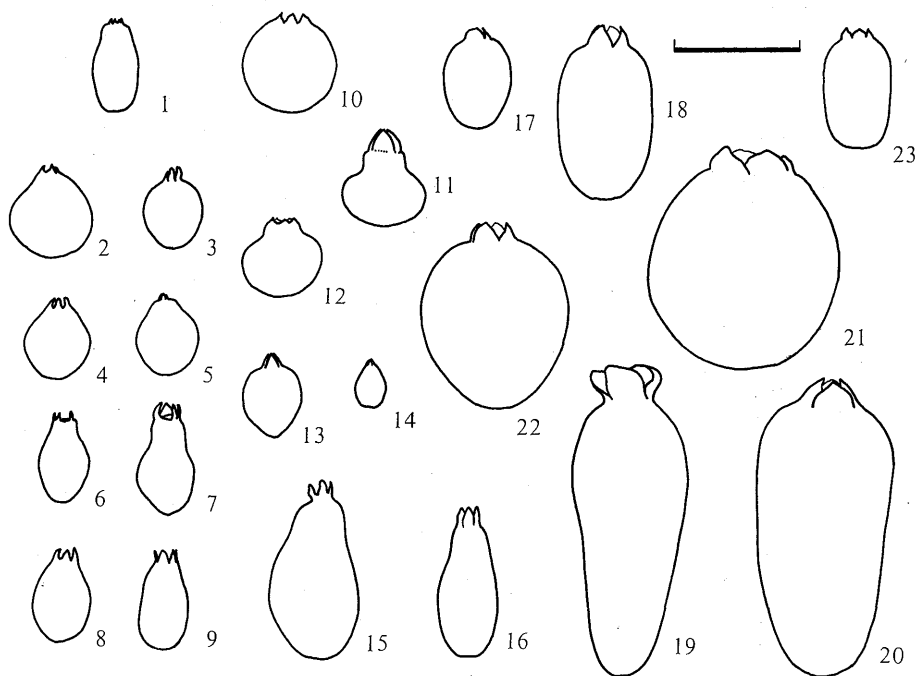


Fig. 3. Fruits in outline. 1: *S. sonoharae* var. *sonoharae* (M. Tamura et al. 47, KYO). 2: *S. coreana* (N. Kurosaki 14752, KYO). 3: *S. sawafutagi* (N. Fukuoka 10507, KYO). 4: *S. paniculata* (G. Murata 20884, KYO). 5: *S. tanakana* (Z. Tashiro s.n., 9 Sept. 1937, KYO). 6: *S. myrtacea* (Z. Tashiro s.n., 31 Aug. 1935, KYO). 7: *S. liukiensis* var. *liukiensis* (H. Ohba 12, KYO). 8: *S. caudata* (G. Koidzumi s.n., 25–31 July 1923, KYO). 9: *S. prunifolia* var. *prunifolia* (N. Kurosaki 8084, KYO). 10: *S. konishii* (H. Nagamasu, cult. Kyoto Univ.). 11: *S. cochinchinensis* (H. Nagamasu 1131, KYO). 12: *S. theophrastifolia* (K. Tsuchiya et al. 6, KYO). 13: *S. lancifolia* (H. Migo s.n., 10 Nov. 1954, KYO). 14: *S. microcalyx* (H. Nagamasu & M.N. Tamura 2111, KYO). 15: *S. glauca* (E. Kinoshita 1096, KYO). 16: *S. stellaris* (T. Shimizu 86-255, KYO). 17: *S. nakaharae* (Y. Miyagi 9173, KYO). 18: *S. kuroki* (Z. Tashiro s.n., 25 Aug. 1924, KYO). 19: *S. pergracilis* (G. Murata et al. 258, KYO). 20: *S. boninensis* (G. Murata et al. 646, KYO). 21: *S. tanakae* (G. Koidzumi s.n., Sept. 1921, KYO). 22: *S. kawakamii* (G. Murata et al. 110, KYO). 23: *S. okinawensis* (G. Koidzumi s.n., 27–31 May 1923, KYO). bar = 1 cm.

straight seeds, and ovoid and ellipsoid fruits straight or curved seeds.

Seedling epigeal, phanerocotylar; primary root distinct and slender, persistent root-hairs not observed; hypocotyle erect, terete, glabrous but often densely papillose; cotyledons 2, opposite, linear, slightly thick, obtuse at apex, subsessile and connate to each other at base; eophylls spirally arranged without cataphylls.

The radicle emerges from the apical pore of the stone. The number of the apical pores is correlated with that of the developed locules. In Japanese species, the radicle usually emerges in autumn of the second year, and the cotyledons appear in spring of the third year (Yamanaka, 1975; Yamanaka et al., 1992). Yanagida (1938: no. 532, t. 531, ut '*S. zentaroana* Makino', *nomen*) reported that in *S. tanakae*, three seedlings in total emerged from each apical pore of the stone.

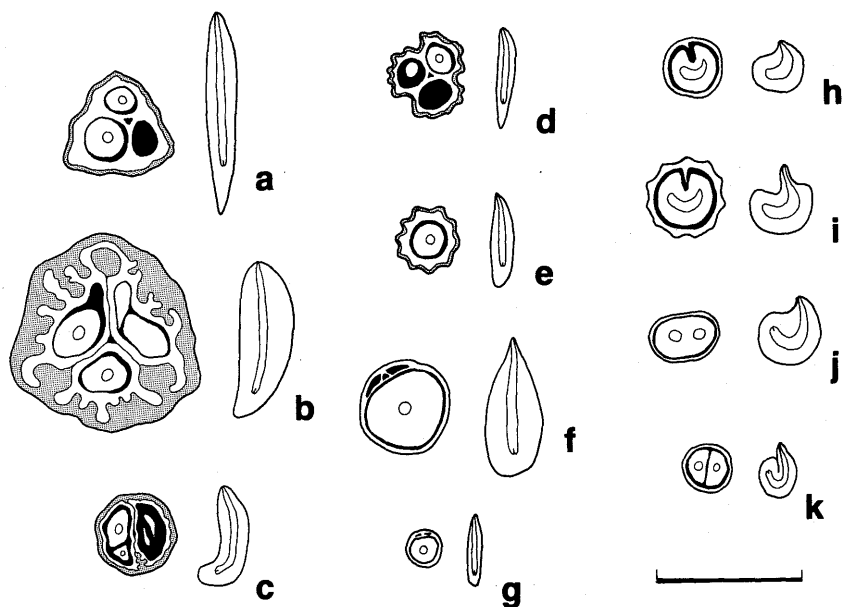


Fig. 4. Transverse sections of stones (left), and shapes of seeds and embryos (right). a: *S. boninensis* (G. Murata et al. 646, KYO), all locules developed, seed straight. — b: *S. tanakae* (G. Koidzumi s.n., Sept. 1921, KYO), all locules developed, seed slightly curved, mesocarp well developed. — c: *S. kuroki* (Z. Tashiro s.n., 25 Aug. 1924, KYO), all locules developed, seed longitudinally curved. — d: *S. okinawensis* (G. Koidzumi s.n., 27–31 May 1923, KYO), all locules developed, seed straight. — e: *S. stellaris* (T. Shimizu 86-255, KYO), f: *S. glauca* (E. Kinoshita 1096, KYO) and g: *S. prunifolia* (N. Kurosaki 8084, KYO), only one locule developed, seed straight. — h: *S. lancifolia* (H. Migo s.n., 10 Nov. 1954, KYO), only one locule developed, seed laterally curved. — i: *S. cochinchinensis* (H. Nagamasu 1131, KYO), only one locule developed, seed laterally curved. In this case seed twice curved. — j: *S. sawafutagi* (N. Fukuoka 10507, KYO), only one locule developed, seed longitudinally curved. — k: *S. myrtacea* (Z. Tashiro s.n., 31 Aug. 1935, KYO), only one locule developed, seed longitudinally curved.

Wood Anatomy

Vessels small and often angular, exclusively solitary, often with spiral thickening. Perforation plates scalariform, usually with more than 20 fine bars, occasionally slightly reticulate. Intervascular pitting scalariform to opposite; pitting to ray and wood parenchyma typically small and round, occasionally scalariform. Parenchyma apotracheal, as scattered cells or short uniseriate lines, the latter sometimes finely reticulate. Strands of 4–8 cells. Rays typically up to 3–5 cells wide, but occasionally not more than 2 cells wide and in some species up to 9–12 cells (in *S. spicata* Roxb.). Uniseriate rays numerous and composed entirely of upright cells; typically heterogeneous (Kribs' (1935) Types I and IIA) with 3 to many marginal rows of upright cells. Fibers with distinctly bordered pits on both radial and tangential walls. Spiral thickening commonly present. (Metcalf & Chalk, 1950).

Yamauchi (1975) reported the wood anatomy of nine Japanese species, of which three are deciduous, and six are evergreen. As a result, she concluded on the basis of wood anatomy that Japanese Symlocaceae could be divided into two genera: *Dicalix* Lour. consisting of evergreen species with axillary inflorescences and *Palura* (G. Don) Miers consisting of deciduous species with terminal inflorescences. The important anatomical differences between the two genera were summarized as follows:

Palura: Vessels 40–85 per square millimeter, larger, 80–85 μm in tangential diameter. Mean length of vessel segments less than 900 μm (860–880 μm). Spiral thickening is lacking in vessel walls and fiber-tracheids. Ray crossing pitting smaller, 3–5 μm in diameter, opposite.

Dicalix: Vessels 100–135 per square millimeter, smaller, 40–65 μm in tangential diameter. Mean length of vessel segments longer than 900 μm (910–1430 μm). Fine spiral thickening present in vessel walls and fiber-tracheids. Ray crossing pitting larger, 4–28 μm in diameter, scalariform and intermediate between opposite and scalariform.

These differences are, however, not so clear as commented by Yamauchi (1975) herself. It is also known that spiral thickenings most frequently occur in narrow vessels (Metcalf & Chalk, 1983). The differences of wood anatomy between evergreen and deciduous species do not seem to be enough to distinguish the genera.

Palynology

Pollen grains simple, isopolar to biconvex, 2–3(–4)-colporate with short colpi or 2–3(–4)-porate, 20–70 μm (E), usually about 30 μm (E); exine comprising ectexine and endexine, endexine very thin but thickened near apertures; tectum pitted to reticulate; supratectal ornamentation gemmate, verrucate, corrugate, echinate, spinulate, clavate, suprareticulate or lacking, rarely globulate; columellae distinct or indistinct; foot layer rather thick.

The pollen morphology has been regarded as an important character in recognizing subgenera. In subgenera *Symplocos* and *Microsymplocos*, pollen grains have a massive tectum without supratectal ornamentation, and columellae are indistinct. In subgen. *Hopea*, pollen grains have a thin tectum with supratectal ornamentation, and columellae are distinct. Nooteboom (1975) reduced subgen. *Microsymplocos* to subgen. *Hopea* on the basis of palynological evidence provided by van der Meijden (1970). Recent works (Barth, 1979, 1982;

Nagamasu, 1989a, b) showed that the pollen grains of subgen. *Microsymplocos* is distinct from those of subgen. *Hopea* and rather similar to those of subgen. *Symplocos*.

Pollen grains of all Japanese species are examined with light and electron microscopy by Nagamasu (1989a) and classified into two types (Type I and II) primarily on the basis of wall structure. Type I, characterized by a thick tectum lacking a supratectal structure and reduced columellae occurs in *S. sonoharae* (subgen. *Symplocos*); Type II characterized by a thin tectum with supratectal structure and generally distinct columellae in subgen. *Hopea*. Within Type II, five subtypes were recognized primarily on the basis of sculpture combined with other pollen characters: suprareticulate subtype (IIa), verrucate subtype (IIb), rugulate subtype (IIc), spinulate subtype (IId) and scabrate subtype (IIe). The echinate pollen type and areolate pollen type are not observed in Japanese species. These pollen types are used in the descriptions in Taxonomic Treatment.

It should be noted that some names used by Nagamasu (1989a) are revised in this paper as follows: *S. chinensis* (Lour.) Druce to *S. sawafutagi* Nagamasu; *S. confusa* Brand to *S. sonoharae* Koidz.; *S. lucida* Sieb. & Zucc. to *S. kuroki* Nagamasu.

The pollen characters are stable within a species, and taxonomically important. On the contrary, Nooteboom (1975: 10) discussed infraspecific variations in subgen. *Hopea*, citing 8 species which have more than 2 pollen subtypes of van der Meijden (1970). Of 8 species cited by Nooteboom, *S. cochinchinensis* has 5 subtypes, and *S. ophirensis* has 3 subtypes. He commented that within subgen. *Hopea*, a peculiar pattern of variation is found, possibly reflecting reticulate relationships between the species concerned. These infraspecific variations, however, seem to be due to his extremely wide species concept. In Nooteboom's revision (1975), *S. cochinchinensis* consists of 4 subspecies, 29 varieties and one topodeme, and *S. ophirensis* comprises 3 subspecies and 7 varieties.

Cytology

The reported chromosome numbers of the genus *Symplocos* are $n = 11$ (Mehra & Bawa 1969; Nooteboom, 1975; Mehra, 1976; Bir et al., 1984; Carr & McPherson, 1986; Catha & Bir, 1987), 12 (Nevling, 1969), 14 (Hardin, 1966), $2n = 22$ (Mehra & Bawa, 1968; Mehra, 1972; Nooteboom, 1975; Bedi et al., 1985; Ono, 1975, 1977, 1990), 24 (Borgmann, 1964) and ca. 90 (Nooteboom, 1975). All recent authors reported $n = 11 + 0-2B$ and/or $2n = 22 + 0-2B$. The basic number of the genus is probably $x = 11$ and Asiatic species of subgen. *Hopea* are mostly diploids as pointed by Nooteboom (1975). He assumed that the reports of $n = 12$ or 14, $2n = 24$ were erroneous counts due to the presence of B chromosomes. In Japan, the chromosome numbers of two species endemic to the Bonin Isls. have been reported as $2n = 22$ (Table 1; Ono, 1975, 1977, 1990). I newly examined three Japanese species in the present study, *S. sonoharae*, *S. stellaris*, and *S. tanakae*, whose chromosome numbers were $2n =$ ca. 90, $n = 11$, $2n = 22$, respectively (Table 1). In subgen. *Symplocos* only one count has been made by Nooteboom (1975) as $2n =$ ca. 90. He supposed this species *S. pendula* var. *confusa*, is an octaploid. The chromosomes of *S. sonoharae*, which is the only species of subgen. *Symplocos* in Japan, was interpreted to be $2n =$ ca. 90. It agrees with the previous count, although the chromosomes are minute and I could not decide exact

Table 1. Chromosome numbers of Japanese *Symplocos*.

Species	n	2n	Source	Literature
<i>S. boninensis</i>		22	Mukohjima Is., Bonin Isls. Cult. in Tokyo	Ono (1990)
<i>S. pergracilis</i>		22	Chichijima Is., Bonin Isls. Cult. in Tokyo	Ono (1975)
		22	Chichijima Is., Bonin Isls. Cult. in Tokyo	Ono (1977)
		22	Chichijima Is., Bonin Isls. Cult. in Tokyo	Ono (1990)
<i>S. sonoharae</i>		ca.90	Mt. Inokawadake, Tokunoshima Isl. seedling from Tamura <i>et al.</i> 47 (KYO)	present study
<i>S. stellaris</i>	11		Mt. Nagodake, Okinawa Is. Nagamasu 1663 (KYO)	present study
<i>S. tanakae</i>		22	Yakushima Is. Nagamasu, cult. Kyoto Univ.	present study

number. In subgen. *Microsymplocos* distributed in the New World, only one species has been investigated and reported to be $n = 12$ (*S. micrantha* Krug & Urban: Nevling, 1969).

Infrageneric Classification

The Symplocaceae are morphologically diverse, and often classified into several genera. Miers (1879) recognized 14 genera in the family. In Japanese species, Nakai (1922, 1927) recognized two genera, *Palura* (G. Don) Miers and *Bobua* DC. correlating to the deciduous habit with terminal inflorescences and to the evergreen habit with axillary inflorescences, respectively. Hatusima (1936) added *Cordyloblaste* Moritzi with monadelphous stamens, this treatment was followed by Hara (1948) although *Bobua* was replaced with *Dicalix* Lour. Recent authors, however, treat this family as monotypic.

Brand (1901) divided the genus into four subgenera, with special reference to the corolla and staminal morphology, subgen. *Eusymplocos* with monadelphous stamens and a long corolla tube, subgen. *Microsymplocos* Brand with monadelphous stamens and a short corolla tube, subgen. *Hopea* (L.) Clarke with pentadelphous stamens and a short corolla tube and subgen. *Epigenia* Brand with free stamens and a short corolla tube. Nooteboom (1975) reduced subgen. *Microsymlocos* and subgen. *Epigenia* to subgen. *Hopea*, recognizing only two subgenera on the basis of palynological and brief phytochemical data. On the contrary, Barth (1979) discussed that the pollen morphology of Brazilian *Symplocos* agrees with Brand's three subgenera *Eusymplocos*, *Microsymplocos* and *Epigenia*. Nagamasu (1989a, b) pointed that the pollen of subgen. *Microsymplocos* is distinct from that of subgen. *Hopea*, but rather similar to that of subgen. *Eusymplocos*, but between the pollen morphology of subgenera *Epigenia* and *Hopea*, there is no significant differences. Brand (1901) distinguished these two subgenera by the staminal morphology and geographical distribution, namely American species with free stamens (subgen. *Epigenia*) or Asiatic species with pentadelphous stamens (subgen. *Hopea*). Asiatic species, however, do not always have distinct

Table 2. Distinctive characters of Japanese *Symplocos* and their distribution.

	habit	midrib	inflorescence	bract
Subgen. <i>Symplocos</i>				
1. <i>S. sonoharae</i>	evergreen	impressed	axillary raceme	persistent
Subgen. <i>Hopea</i>				
Sect. <i>Palura</i>				
2. <i>S. coreana</i>	deciduous	impressed	terminal panicle	caducous
3. <i>S. sawafutagi</i>	deciduous	impressed	terminal panicle	caducous
4. <i>S. paniculata</i>	deciduous	impressed	terminal panicle	caducous
5. <i>S. tanakana</i>	deciduous	impressed	terminal panicle	caducous
Sect. <i>Lodhra</i>				
6. <i>S. myrtacea</i>	evergreen	impressed	axillary simple raceme	caducous
7. <i>S. liukiensis</i>	evergreen	impressed	axillary simple raceme	caducous
8. <i>S. caudata</i>	evergreen	impressed	axillary simple raceme	caducous
9. <i>S. prunifolia</i>	evergreen	impressed	axillary simple raceme	caducous
Sect. <i>Bobu</i>				
10. <i>S. konishii</i>	evergreen	impressed	axillary branched spike	persistent
11. <i>S. cochinchinensis</i>	evergreen	impressed	axillary branched spike	persistent
12. <i>S. theophrastifolia</i>	evergreen	impressed	axillary branched spike	persistent
Sect. <i>Lancifoliae</i>				
13. <i>S. lancifolia</i>	evergreen	slightly prominent or sulcate	axillary spike	persistent
14. <i>S. microcalyx</i>	evergreen	slightly prominent or sulcate	axillary spike	persistent
Sect. <i>Glaucæ</i>				
15. <i>S. glauca</i>	evergreen	impressed	axillary condensed spike	persistent
Sect. <i>Glomeratae</i>				
16. <i>S. stellaris</i>	evergreen	impressed	axillary condensed spike	persistent
Sect. <i>Palaeosymplocos</i>				
17. <i>S. nakaharae</i>	evergreen	prominent	axillary, condensed branched spike	persistent
18. <i>S. kuroki</i>	evergreen	prominent	axillary, condensed branched spike	persistent
19. <i>S. pergracilis</i>	evergreen	prominent	axillary condensed spike	persistent
20. <i>S. boninensis</i>	evergreen	prominent	axillary, condensed branched spike	persistent
21. <i>S. tanakae</i>	evergreen	prominent	axillary, condensed branched spike	persistent
22. <i>S. kawakamii</i>	evergreen	prominent	axillary, condensed branched spike	persistent
Sect. <i>Okinawenses</i>				
23. <i>S. okinawensis</i>	evergreen	prominent	axillary raceme	persistent

stamens	disk	ovary	stone	seeds	Pollen type
monadelphous	hairy	2-locular	1-locular	straight	I
pentadelphous	glabrous	2-locular	1-locular	longitudinally curved	IIa
pentadelphous	/hairy glabrous	2-locular	1-locular	longitudinally curved	IIa
pentadelphous	/hairy glabrous	2-locular	1-locular	longitudinally curved	IIa
pentadelphous	glabrous	2-locular	1-locular	longitudinally curved	IIa
connate at base	glabrous	3-locular	1-locular	longitudinally curved	IIb
connate at base	glabrous	3-locular	1-locular	longitudinally curved	IIc
connate at base	glabrous	3-locular	1-locular	longitudinally curved	IIb
indistinctly pentadelphous	glabrous	3-locular	1-locular	straight	IIc
indistinctly pentadelphous	glabrous	3-locular	1-locular	laterally curved	IIc
indistinctly pentadelphous	glabrous	3-locular	1-locular	laterally curved	IIc
indistinctly pentadelphous	glabrous	3-locular	1-locular	laterally curved	IIc
connate at base	glabrous	3-locular	1-locular	laterally curved	IIc
pentadelphous	hairy	3-locular	1-locular	laterally curved	IIb
indistinctly pentadelphous	glabrous	3-locular	1-locular	straight	IIc
pentadelphous	glabrous	3-locular	1-locular	straight	IIe
pentadelphous	hairy	2-locular	2-locular	longitudinally curved	IIb
pentadelphous	hairy	2-locular	2-locular	longitudinally curved	IIb
pentadelphous	hairy	3-locular	3-locular	straight	IIb
pentadelphous	hairy	3-locular	3-locular	straight	IIb
pentadelphous	hairy	3-locular	3-locular	longitudinally curved	IIb
pentadelphous	hairy	3-locular	3-locular	longitudinally slightly curved	IIb
pentadelphous	hairy	3-locular	3-locular	straight	IIc

pentadelphous stamens.

In conclusion, subgen. *Microsymplocos* should be treated as a distinct taxon from both subgenera *Symplocos* and *Hopea*, and subgen. *Epigenia* could be reduced to subgen. *Hopea*. New subgeneric system is proposed as follows.

1. subgenus **Symplocos**

Corolla connate at least half way, forming distinct tube; stamens monadelphous, forming long staminal tube, filaments flattened; pollen grains with massive tectum without supratectal ornamentation, columellae indistinct.

2. subgenus **Microsymplocos** Brand

Corolla deeply divided to the base; stamens monadelphous, but tube very short, filaments cylindrical; pollen grains with massive tectum without supratectal ornamentation, columellae indistinct.

3. subgenus **Hopea** (L.) Clarke

Corolla deeply divided to the base; stamens free or pentadelphous, filaments cylindrical; pollen grains with thin tectum with supratectal ornamentation, columellae distinct.

Brand (1901) divided subgen. *Hopea* into two sections, *Palaeosymplocos* Brand with distinctly pentadelphous stamens and *Bobua* (DC.) Brand with indistinctly pentadelphous stamens. Handel-Mazzetti (1943) recognized 4 sections, *Palaeosymplocos*, *Lodhra*, *Bobua* and *Palura*, in the subgen. *Hopea* (he used subgen. *Eosymplocos* Hand.-Mazz.) of China. He regarded the following characters as important: midrib impressed or prominent on upper surface; the shape of fruits; disk glabrous or hairy; ovary 2- or 3-locular. Nooteboom (1975) did not subdivide subgen. *Hopea* in his revision at all. Recently, Wu (1986a & b, 1987) recognized six sections in China, principally based on the characters of inflorescence and the shape of fruits, adding two sections to Handel-Mazzetti's system, namely sect. *Glomeratae* and sect. *Singuliflorae*. These sections are characterized by a glomerate and a uniflorous inflorescence, respectively.

In the present study, I classify Japanese species of subgen. *Hopea* into eight sections based on the morphological characters listed in Table 2. Three sections, *Glaucæ*, *Lancifoliae* and *Okinawenses* are newly described.

Taxonomic Treatment

Symplocaceae Desfontaines, *nom. conserv.*

'Symplocaceae' Desfontaines, Mem. Mus. Hist. Nat. Paris 6: 9 (1820). — Type: *Symplocos* Jacq.

Evergreen or deciduous shrubs or trees. *Leaves* simple, alternate, exstipulate. *Inflorescences* axillary or terminal; racemes, spikes, panicles, fascicles or condensed clusters, or rarely flowers solitary. *Flowers* with a bract and 2 bracteoles; actinomorphic, bisexual, or plants rarely polygamous; calyx lobes (3–)5, imbricate or valvate; corolla shallowly or deeply (3–)5(–11)-lobed, the lobes imbricate; stamens 4 to many in 1–4 series, inserted on the corolla, free, pentadelphous or monadelphous; anthers introrse, bilocular, longitudinally dehiscent; ovary inferior or semi-inferior, 2- to 5-locular; style single, slender, the base surrounded by a nectary disk; ovules 2–4 in each locule, pendulous on axile placentae, anatropous.

pous, epitropous or amphitropous, unitegmic, tenuinucellate. *Pollen grains* in monads, 2–3-colporate or 3-porate, oblate to oblate-spheroidal. *Fruits* monopyrenous drupes, usually crowned by persistent calyx lobes; seeds usually solitary in each developed cell, straight or curved, with copious endosperm; embryo straight or curved, with very short cotyledons. *Seedlings* epigeal, phanerocotylar; cotyledons 2, linear, slightly thick; hypocotyl terete, slender, usually densely papillate; leaves all spirally arranged. $X = 11(-14)$.

One genus with 300 to 400 species, in moist tropical, subtropical and temperate regions of Asia, Oceania and America.

Symplocos Jacquin

- Symplocos* Jacquin, Enum. Syst. Pl.: 5, 24 (1760); DC., Prodr. 8: 246 (1844); Miers, J. Linn. Soc. Bot. 17: 285 (1879); Brand, Pfl. R. Heft 6: 13 (1901); Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 1 (1943); Nootboom, Leid. Bot. Ser. 1: 33 (1975); Wu, Fl. Reip. Pop. Sin. 60(2): 1 (1987). — Type: *Symplocos martinicensis* Jacq.
- Bobu* Adanson, Fam. Pl. 2: 88, 526 (1763); DC., Prodr. 3: 23 (1828), ut '*Bobua*'; Nakai, Tr. & Shr. 1: 223 (1922). — *Eugeniodes* ['*Eugenioides*'] Linn., Fl. Zeyl.: 192 (1747)] O. Kuntze, Rev. Gen. Pl. 2: 409, 975 (1891), *nom. illeg.* — *Symplocos* sect. *Bobua* Brand, Pfl. R. Heft 6: 25, 32 (1901); Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 4 (1943); Wu, Fl. Reip. Pop. Sin. 60(2): 51 (1987). — Type: *Bobua laurina* (Retz.) DC.
- Hopea* Garden ex Linn., Syst. Nat. ed. 12: 509 (1767); Mant. Pl. 105 (1767), *nom. rejic.*, non Roxb. (1811). — *Symplocos* sect. *Hopea* Benth. & Hook., Gen. Pl. 2: 668 (1876). — *Protohopea* Miers, J. Linn. Soc. Bot. 17: 289 (1879). — *Symplocos* subgen. *Hopea* Clarke, Fl. Br. Ind. 3: 572 (1882); Brand, Pfl. R. Heft 6: 25 (1901); Nootboom, Leid. Bot. Ser. 1: 43 (1975); Wu, Fl. Reip. Pop. Sin. 60(2): 8 (1987). — Type: *Hopea tinctoria* Linn.
- Ciponima* Aubl., Hist. Pl. Guin. Fr.: 567 (1775). — *Symplocos* sect. *Ciponima* Benth. & Hook., Gen. Pl. 2: 669 (1876). — *Symplocos* subgen. *Ciponima* Clarke, Fl. Br. Ind. 3: 587 (1882). — Type: *Ciponima guianensis* Aubl.
- Alstonia* Mutis ex Linn. f., Suppl. Pl.: 39 (1781), non R. Br. (1810), *nom. conserv.*, nec Scopoli (1777), *nom. rejic.* — *Symplocos* sect. *Alstonia* G. Don, Gen. Syst. 4: 1 (1837 or 1838); Benth. & Hook., Gen. Pl. 2: 669 (1876). — *Praealstonia* Miers, J. Linn. Soc. Bot. 17: 291 (1879). — Type: *Alstonia theaeiformis* Linn. f.
- Decadia* Lour., Fl. Cochinch. 1: 315 (1790). — Type: *Decadia aluminosa* Lour.
- Dicalix* Lour., Fl. Cochinch. 1: 663 (1790); Hara, Enum. Sperm. Jap. 1: 103 (1948). — Type: *Dicalix cochinchinensis* Lour.
- Drupatris* Lour., Fl. Cochinch. 1: 314 (1790). — Type: *Drupatris cochinchinensis* Lour.
- Barberina* Vell., Fl. Flumin.: 235 (1825). — *Symplocos* sect. *Barberina* DC., Prodr. 8: 253 (1844); Brand, Pfl. R. Heft 6: 25, 26 (1901). — *Symplocos* subsect. *Barberina* Benth. & Hook., Gen. Pl. 2: 668 (1876). — Type: *Barberina hirsuta* Vell.
- Mongezia* Vell., Fl. Flumin.: 183 (1825).
- Sariava* Reinw., Syll. Ratisb. 2: 12 (1825).
- Stemmatosiphum* Pohl, Pl. Bras. Ic. 2: 86, t. 157–159 (1831).
- Symplocos* sect. *Lodhra* G. Don, Gen. Syst. 4: 2 (1837 or 1838); Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 4, 18 (1943); Wu, Fl. Reip. Pop. Sin. 60(2): 19 (1987). — *Lodhra* Guillemain, Ann. Sc. Nat. Ser. 2(15): 158 (1841), *nom. illeg.*; Decaisne, Voy. Jacquinet 4: 104 (1844), *quoad basionym*; Miers, J. Linn. Soc. Bot. 17: 298 (1879). — *Symplocos* subsect. *Lodhra* Benth. & Hook., Gen. Pl. 2: 668 (1876); Brand, Pfl. R. Heft 6: 25, 42. — Type: *Symplocos racemosa* Roxb.
- Symplocos* sect. *Palura* G. Don, Gen. Syst. 4: 3 (1837 or 1838); Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 4, 38 (1943); Wu, Fl. Reip. Pop. Sin. 60(2): 72 (1987). — *Symplocos* subsect. *Palura* Benth. & Hook., Gen. Pl. 2: 668 (1876). — *Palura* Miers, J. Linn. Soc. Bot. 17: 297 (1879); Nakai, Tr. & Shr. 1: 228 (1922); Hara, Enum. Sperm. Jap. 1: 107 (1948). — Lectotype: *Symplocos crataegoides* Ham. ex G. Don (Lectotypification: Nootboom, Leid. Bot. Ser. 1: 34 (1975)).
- Scyrtoarpus* Miers in Lindl., Veg. Kingd.: 593a (1847).

- Cordyloblaste* Moritz, Bot. Zeit. 6: 606 (1848); Ridley, Fl. Mal. Pen. 2: 307 (1923); Hatusima, J. Jap. Bot. 12: 281 (1936). — *Symplocos* sect. *Cordyloblaste* Benth. & Hook., Gen. Pl. 2: 669 (1876); Brand, Pfl. R. Heft 6: 26, 88 (1901). — *Symplocos* subgen. *Cordyloblaste* Gamble, J. As. Soc. Beng. 74(2), extra number 248 (1906). — Type: *Cordyloblaste henschelii* Moritz
- Carlea* Presl, Epimel. Bot.: 216 (1851). — Type: *Carlea oblongifolia* Presl
- Barandra* Llanos, Mem. Acad. Cien. Madr. 3(2): 502 (1857). — Type: *Barandra angatensis* Llanos
- Hypopogon* Turcz., Bull. Soc. Imp. Nat. Mosc. 31(1): 246 (1858). — Type: *Hypopogon brevipes* Turcz.
- Chasseloupia* Vieill., Bull. Soc. Linn. Norm. 10: 101 (1866). — Lectotype: *Chasseloupia lucida* Vieill. (Lectotypification: Nootboom, Blumea 26: 411 (1980)).
- Suringaria* Pierre, Bull. Soc. Linn. Paris 1: 635 (1866). — Type: *Suringaria cambodiana* Pierre
- Symplocos* subgen. *Eusymplocos* Brand, Pfl. R. Heft 6: 26, 73 (1901). — Type: *Symplocos martinicensis* Jacq.
- Symplocos* subgen. *Microsymplocos* Brand, Pfl. R. Heft 6: 25, 70 (1901).
- Symplocos* sect. *Neosymplocos* Brand, Pfl. R. Heft 6: 25, 70 (1901).
- Symplocos* sect. *Palaeosymplocos* Brand, Pfl. R. Heft 6: 25, 30 (1901); Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 4, 13 (1943); Wu, Fl. Reip. Pop. Sin. 60(2): 8 (1987). — Lectotype: *Symplocos phyllo-calyx* Clarke, Fl. Br. Ind. 3: 575 (1882). Redesignated here. See the note under Sect. 7. *Palaeosymplocos* Brand (p. 191).
- Symplocos* sect. *Pseudosymplocos* Brand, Pfl. R. Heft 6: 25, 30 (1901); Mai, Fedde. Repert. 97(1–2): 9 (1986).
- Symplocos* sect. *Symplocastrum* Brand, Pfl. R. Heft 6: 26, 73 (1901).
- Symplocos* sect. *Urbaniocharis* Brand, Pfl. R. Heft 6: 25, 70 (1901); Mai, Fedde. Repert. 97(1–2): 13 (1986).
- Symplocos* subsect. *Ciponimastrum* Brand, Pfl. R. Heft 6: 26, 78 (1901).
- Symplocos* subsect. *Pseudoalstonia* Brand, Pfl. R. Heft 6: 26, 73 (1901).
- Symplocos* subgen. *Eosymplocos* Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 4 (1943). — Lectotype: *Symplocos racemosa* Roxb. (Lectotypification: Nootboom, Leid. Bot. Ser. 1: 34).
- Symplocos* sect. *Glomeratae* Y.-F. Wu, Acta Phytotax. Sin. 24(3): 193 (1986); Fl. Reip. Pop. Sin. 60(2): 58 (1987). — Type: *Symplocos glomerata* King & Gamble
- Symplocos* sect. *Singuliflorae* Y.-F. Wu, Acta Phytotax. Sin. 24(3): 193 (1986); Fl. Reip. Pop. Sin. 60(2): 17 (1987). — Type: *Symplocos ovatilobata* Nootboom
- Symplocos* subgen. *Epigenia sensu* Brand, Pfl. R. Heft 6: 25, 26 (1901), excl. *basionym*, *Epigenia* Vell., Fl. Flumin.: 183 (1825).

Key to the subgenera

- 1a. Petals connate at least half way, forming a distinct corolla tube; stamens monadelphous; filaments flattened, abruptly narrowed at apex forming a short whip Subgen. 1. *Symplocos*
- 1b. Petals connate only at base; stamens pentadelphous or connate at base; filaments cylindrical, gradually narrowed toward the apex Subgen. 2. *Hopea* (L.) Clarke

Subgen. 1. *Symplocos*

Symplocos Jacq. — *Ciponima* Aubl. — *Alstonia* Mutis ex Linn. f. — *Mongezia* Vell. — *Stemmatosiphum* Pohl — *Cordyloblaste* Moritz — *Hypopogon* Turcz. — *Symplocos* subgen. *Eusymplocos* Brand — *Symplocos* sect. *Symplocastrum* Brand — *Symplocos* subsect. *Pseudoalstonia* Brand — *Symplocos* subsect. *Ciponimastrum* Brand.

Leaves usually not becoming yellow when dry. *Flowers*: petals connate at least half way, forming a distinct corolla tube; stamens monadelphous; lower part of staminal tube adherent to corolla tube; filaments flattened and abruptly narrowed at apex, forming a short whip; ovary 2–5-locular. *Pollen grains* 2–3-colporate; tectum massive, perforate to foveolate, without distinct supratectal ornamentation; columellae indistinct.

More than 100 species in Asia and the New World. One species in Japan (Ryukyu).

1. *Symplocos sonoharae* Koidz.

Subgen. 2. **Hopea** (L.) Clarke

Bobu Adanson—*Hopea* Garden ex L. non Roxb.—*Decadia* Lour.—*Dicalix* Lour.—*Drupatris* Lour.—*Barberina* Vell.—*Sariava* Reinw.—*Symplocos* sect. *Lodhra* G. Don—*Symplocos* sect. *Palura* G. Don—*Scyrtocarpus* Miers—*Carlea* Presl—*Barandra* Llanos—*Chasseloupia* Vieill.—*Suringaria* Pierre—*Symplocos* sect. *Palaeosymplocos* Brand—*Symplocos* sect. *Pseudosymplocos* Brand—*Symplocos* subgen. *Eosymplocos* Hand.-Mazz.—*Symplocos* sect. *Glomeratae* Y.-F. Wu—*Symplocos* sect. *Singuliflorae* Y.-F. Wu—*Symplocos* subgen. *Epigenia* sensu Brand.

Leaves usually becoming yellow when dry. Flowers: petals connate only at base; stamens pentadelphous or free, connate only at base, and adnate to corolla tube at base; filaments cylindrical, gradually narrowed to the apex; ovary 2–3-locular. Pollen grains 3-colporate or 3-porate; tectum thin, reticulate, usually with distinct supratectal ornamentation; columellae distinct.

About 200 species in Asia, Oceania and the New World. 22 species in Japan.

Key to the sections of subgen. *Hopea*

- 1a. Deciduous trees or shrubs; inflorescences terminal, paniculate Sect. 1. *Palura* G. Don
- 1b. Evergreen trees or shrubs; inflorescences axillary.
 - 2a. Bracts caducous; inflorescences racemose Sect. 2. *Lodhra* G. Don
 - 2b. Bracts persistent.
 - 3a. Inflorescences simply or compoundly spicate (flowers sessile or rarely shortly pedicellate), rarely 1-flowered.
 - 4a. Inflorescences elongate spikes.
 - 5a. Leaf-midrib impressed above; spikes usually branched near the base; stones ampulliform; seeds twice curved Sect. 3. *Bobu* (Adanson) Brand
 - 5b. Leaf-midrib slightly prominent or sulcate above; spikes usually simple; stones ovoid to obovoid; seeds (once) curved Sect. 4. *Lancifoliae* Nagamasu
 - 4b. Inflorescences 1-flowered or condensed spikes, often in head-like clusters.
 - 6a. Midrib of leaf impressed on upper surface; twigs and terminal buds more or less hairy; disk glabrous or hairy.
 - 7a. Leaves papillate on lower surface; stones rather smooth Sect. 5. *Glaucæ* Nagamasu
 - 7b. Leaves not papillate on lower surface; stones with 10 longitudinal grooves Sect. 6. *Glomeratae* Y.-F. Wu
 - 6b. Midrib of leaf prominent on upper surface, at least in life; twigs and terminal buds glabrous; disk hairy Sect. 7. *Palaeosymplocos* Brand
 - 3b. Inflorescences racemose (flowers distinctly pedicellate); midrib of leaf prominent on upper surface Sect. 8. *Okinawenses* Nagamasu

Sect. 1. **Palura** G. Don

Symplocos sect. *Palura* G. Don

Deciduous trees or shrubs. Leaves: midrib impressed above. Inflorescences terminal panicles. Flowers: ovary 2-locular; disk 5-glandular, glabrous or pilose. Fruits: one locule developed; seed 1, longitudinally curved with curved embryo. Pollen grains 3-colporate,

semi-lobate to semi-angular in polar view, oblate in equatorial view; surface ornamentation suprareticulate.

2. *Symplocos coreana* (Lév.) Ohwi
3. *Symplocos sawafutagi* Nagamasu
4. *Symplocos paniculata* (Thunb. ex Murray) Miq.
5. *Symplocos tanakana* Nakai

Sect. 2. **Lodhra** G. Don

Symplocos sect. *Lodhra* G. Don

Evergreen trees or shrubs. *Leaves*: midrib impressed above. *Inflorescences* axillary racemes; bracts caducous. *Flowers*: stamens pentadelphous or connate only at the base; disk glabrous or hairy; ovary 3-locular. *Fruits*: 1 to 3-locular; seed mostly 1, straight or longitudinally curved. *Pollen grains* usually 3-colporate, surface ornamentation verrucate or corrugate.

6. *Symplocos myrtacea* Sieb. & Zucc.
 - 6-1. var. *myrtacea*
 - 6-2. var. *latifolia* Hatusima
7. *Symplocos liukiuensis* Matsumura
 - 7-1. var. *liukiuensis*
 - 7-2. var. *iriomotensis* Nagamasu
8. *Symplocos caudata* Wall. ex G. Don
9. *Symplocos prunifolia* Sieb. & Zucc.
 - 9-1. var. *prunifolia*
 - 9-2. var. *tawadae* Nagamasu

Sect. 3. **Bobu** (Adanson) Brand

Bobu Adanson — *Decadia* Lour. — *Dicalix* Lour. — *Drupatris* Lour.

Evergreen trees or shrubs. *Leaves*: midrib impressed above. *Inflorescences* axillary, elongate spikes usually branched at base; bracts persistent. *Flowers*: stamens indistinctly pentadelphous; disk glabrous; ovary 3-locular. *Fruits*: one locule developed; seed 1, twice curved and laterally developed. *Pollen grains* 3-colporate or 3-porate; surface ornamentation verrucate to spinulate.

10. *Symplocos konishii* Hayata
11. *Symplocos cochinchinensis* (Lour.) Moore
12. *Symplocos theophrastifolia* Sieb. & Zucc.

Sect. 4. **Lancifoliae** Nagamasu, sect. nov.

Frutices vel arbores sempervirentes. Costa supra leviter prominens ad impressa. Inflorescentia axillaris simplex elongata-spicata vel elongata-racemosa pedicellis brevissimis, bracteis persistentibus. Fructus 1-loculares cum 1 semine latororsum curvato. — Typus: *Symplocos lancifolia* Sieb. & Zucc., Fam. Nat. 2: 133 (1846).

Evergreen trees or shrubs. *Leaves*: midrib slightly prominent to sulcate above. *Inflorescences* axillary, elongate spikes or shortly pedicellate racemes, usually simple; bracts persistent. *Flowers*: stamens connate at the base or pentadelphous; disk glabrous or hairy; ovary 3-locular. *Fruits* 1-locular; seed 1, laterally curved. *Pollen grains* 3-colporate or 3-porate; surface ornamentation verrucate or corrugate.

13. *Symplocos lancifolia* Sieb. & Zucc.

14. *Symplocos microcalyx* Hayata

Sect. 5. *Glaucæ* Nagamasu, sect. nov.

Frutices vel arbores sempervirentes. Costa supra impressa. Inflorescentia axillaris vel cauliflora, contracta-spicata, spicis saepe ramosis, bracteis persistentibus. Fructus 1-locularis cum semine recto. — Typus: *Symplocos glauca* (Thunb.) Koidz., Bot. Mag. Tokyo 39: 313 (1925).

Evergreen shrubs or trees. *Leaves*: midrib impressed above. *Inflorescences* axillary and/or cauliflorous, condensed spikes in head-like clusters, often branched; bracts persistent. *Flowers*: stamens pentadelphous, disk glabrous or hairy; ovary 3-locular. *Fruits* 1-locular; stone smooth; seed 1, straight. *Pollen grains* 3-colporate or 3-porate; surface ornamentation corrugate to verrucate.

15. *Symplocos glauca* (Thunb.) Koidz.

Sect. 6. *Glomeratæ* Y.-F. Wu

Symplocos sect. *Glomeratæ* Y.-F. Wu

Evergreen shrubs or trees. *Leaves*: midrib impressed above. *Inflorescences* axillary and/or cauliflorous spikes, condensed in head-like clusters; bract persistent. *Flowers*: stamens pentadelphous; disk glabrous or hairy; ovary 3-locular. *Fruits* 1 to 3-locular; stone with ca. 10 longitudinal grooves; seed mostly 1, straight.

16. *Symplocos stellaris* Brand

Sect. 7. *Palaeosymplocos* Brand

Symplocos sect. *Palaeosymplocos* Brand

Evergreen trees or shrubs. *Leaves*: midrib prominent above. *Inflorescences* axillary spikes, branched at the base, often condensed in head-like clusters; bracts persistent, lower ones often sterile. *Flowers*: stamens pentadelphous; disk hairy; ovary 2- or 3-locular. *Fruits* 1- to 3-locular, usually all locules developed; seeds 1–2 in each locule, straight or longitudinally curved.

17. *Symplocos nakaharæ* (Hayata) Masamune

18. *Symplocos kuroki* Nagamasu

19. *Symplocos pergracilis* (Nakai) Yamazaki

20. *Symplocos boninensis* Rehder & Wilson

21. *Symplocos tanakæ* Matsumura

22. *Symplocos kawakamii* Hayata

Note. *Symplocos japonica* A. DC. was selected as the lectotype of sect. *Palaeosymplocos* Brand by Nooteboom in his revision (1975). As commented in the notes under *S. kuroki* Nagamasu, *S. japonica* is nomenclaturally identical with *Pourthiaea villosa* var. *laevis* (Rosaceae), whose morphological character disagrees with the protologue for the section, '*Stamina manifeste pentadelphica*.' I select *S. phyllocalyx* Clarke as the lectotype species of sect. *Palaeosymplocos* replacing *S. japonica* A. DC.

Sect. 8. **Okinawenses** Nagamasu, sect. nov.

Arbores vel fruteces sempervirentes. Costa supra elevata. Inflorescentia axillaris racemosa base raro ramosa, bracteis persistentibus. Flores staminibus pentadelphis, ovario 3-loculari, disco pubescenti. Fructus 3-loculares 1 semine in quoque loculo. — Typus: *Symplocos okinawensis* Matsumura, Bot. Mag. Tokyo 15: 78 (1901).

Evergreen trees or shrubs. *Leaves*: midrib prominent above. *Inflorescences* axillary racemes, rarely branched at the base; bracts persistent. *Flowers*: stamens pentadelphous; disk hairy; ovary 3-locular. *Fruits* 3-locular; seed 1 in each locule, straight.

23. *Symplocos okinawensis* Matsumura

Subgen. 1. **Symplocos**

1. ***Symplocos sonoharae*** Koidzumi — Fig. 3-1, Map 1, Plate 53a.

S. sonoharai Koidzumi, Pl. Nov. Amami-Oshima: 6 (1928); Makino & Nemoto, Fl. Jap. ed. 2: 918 (1931). — Lectotype: *S. Sonohara* 1 (KYO, Plate 53a), Uchina Is., Ryukyu Is. (designated here).

S. confusa Brand var. *lysiostemon* sensu Hand.-Mazz., Sitzganz. Ak. W. W. 68: 92 (1921), *non vidi*; Symb. Sin. 7: 808 (1936); Beih. Bot. Centralbl. 62-B: 40 (1943), *p.p.*, *excl. typ.*, *Poillane* 7209 (P, isotype in P!).

Cordyloblaste confusa auct.: Hatusima, J. Jap. Bot. 12: 282 (1936); Hara, Enum. Sperm. Jap. 1: 103 (1948).

Bobua confusa auct.: Sonohara, Useful Tr.: 83 (1952).

S. confusa auct. *non* Brand: Walker, Imp. Tr. Ryukyu Is.: 261, *excl. t.* 167 (1954); Hatusima, Fl. Ryukyus: 447 (1971); Walker, Fl. Okinawa S. Ryukyu Is.: 830, *excl. t.* 164 (1976); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 173, pl. 193-3 (1989); Shimabuku, Check List Ryukyu Is.: 352 (1990).

S. pendula var. *hirtystylis* sensu Nooteboom, Leid. Bot. Ser. 1: 42 (1975), *p.p.*

Distr. Japan (Ryukyu), Taiwan, S China, ?Indochina.

Note. This species has been confused with *S. confusa* Brand, but the latter is distinguished by the subspherical disk narrowed toward the base of style and the larger corolla and fruits.

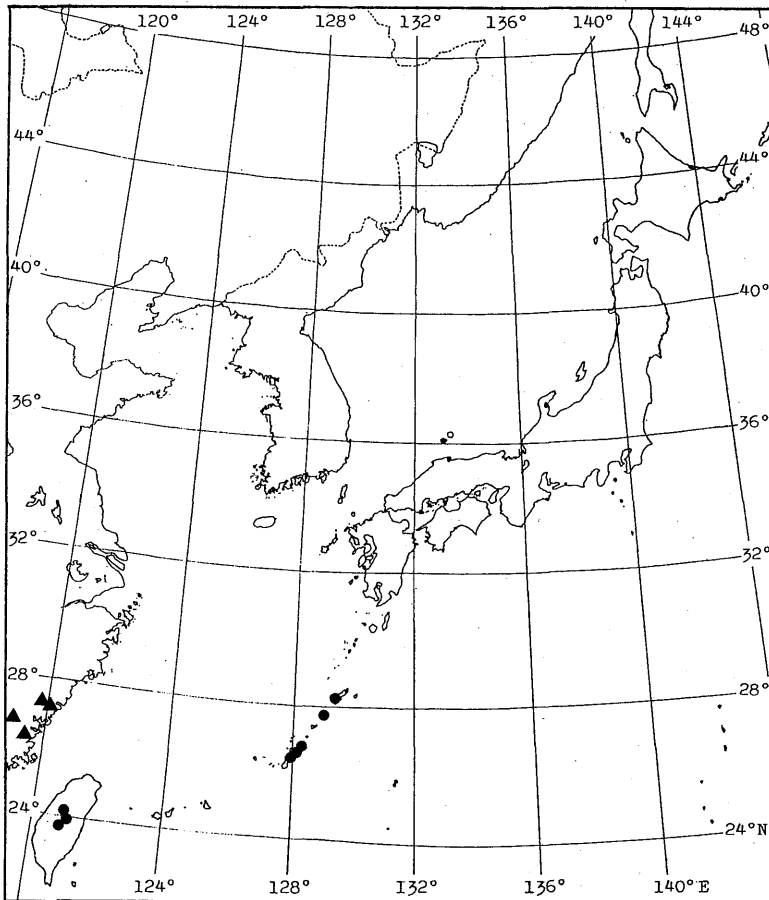
Key to the varieties

- 1a. Blades elliptic, sometimes obovate, brown to dark brown when dry; nerves 5–8-paired; fruits ellipsoid, sparsely pilose, 6–9 mm long. 1-1. var. *sonoharae*
- 1b. Blades oblong, elliptic to narrowly obovate, yellowish brown to brown when dry; nerves (7–)8–11-paired; fruits ovoid, pilose, 5–6 mm long. (China). 1-2. var. *oblonga*

1-1. var. *sonoharae*

S. sonoharae Koidz.

Evergreen trees; bark gray-brown, smooth. Twigs grayish dark brown, terete; young twigs brown, sparsely appressed hairy, glabrescent, ridged below petioles. Terminal buds white to pale brown, obliquely ovoid, acute at apex, densely appressed hairy, 1–3 mm long. *Leaves*: blades coriaceous, elliptic, sometimes obovate, brown to dark brown when dry, (5–)6–9 cm long, (2–)2.5–4 cm wide; apex obtuse to acuminate; base cuneate to (shortly) attenuate; margin slightly recurved, entire or glandular crenate-serrate with teeth 5–10 mm apart; both surfaces glabrous; midrib impressed above, prominent beneath; nerves 5–8-paired, slightly prominent beneath; reticulation obscure; petioles glabrous or sparsely hairy, narrowly winged, sulcate above, 7–15 mm long. Inflorescence an axillary short raceme



Map 1. Distribution of *Symplocos sonoharae* Koidz. Var. *sonoharae* (disk) and var. *oblonga* Nagamasu (triangle).

(botryoid), 1 to 5-flowered, to 1 cm long, axis and pedicels with dense appressed white hairs; pedicels to 3 mm long; bracts and bracteoles persistent, with same indument as inflorescence axis; bracts elliptic to ovate, obtuse to acute at apex, 1–2 mm long; bracteoles 2, ovate, acute at apex, 0.5–1 mm long. *Flowers*: calyx appressed hairy; calyx tube about 2 mm high; calyx limb 1–1.5 mm long; calyx lobes imbricate, transversely elliptic, rounded or truncate at apex, ciliate, about 0.5 mm long; corolla white, trumpet-shaped, 6–8(–10) mm long, glabrous or slightly hairy or papillose, 5-lobed, the lobes spreading, obovate to spatulate, margin papillate or ciliate; corolla tube 2–3(–5) mm long; stamens monadelphous, 30–50 in number, about 5 mm long; staminal tube adnate to corolla tube, inside glabrous, free part 1–2.5 mm long, filaments flattened, abruptly narrowed at apex forming a short whip, papillose; disk cylindrical, 0.5–1 mm long, tomentose; style papillose, glabrous, 4–6(–8) mm long; ovary semi-inferior, 2-locular with 4 ovules in each locule. *Fruits* black, ellipsoidal, sparsely pilose, 6–9 mm long 3–5 mm in diameter, crowned by persistent calyx lobes, only 1 locule developed; stones obliquely ellipsoidal, smooth, with 2 lengthwise grooves, about 6 mm long, 3 mm in diameter; mesocarp and endocarp thin; seeds 1, straight or slightly curved with straight embryo. *Pollen grains* 3-colporate, semiangular in polar view, oblate in equatorial view; tectum smooth, perforate, without supratectal processes; ektoaperture slitlike, endoaperture circular; $27.8\text{--}29.0\text{ }\mu\text{m}$ (P) $\times$ $38.0\text{--}40.2\text{ }\mu\text{m}$ (E); pollen type I. — *Flowers*: July–Aug. (in Japan). *Fruits*: Oct.–Nov.

Jap. name: Miyama-shirobai, *Rusun*, *Dosun*.

Habitat. Subtropical montane evergreen forests.

Chrom. numb. $2n = \text{ca. } 90$.

Distr. Japan (Ryukyu), Taiwan.

JAPAN. **Ryukyu**. Kagoshima. Amami-Oshima Is.: Yuwan-dake, *G. Koidzumi* (KYO), *H. Migo* (KYO), *H. Ohba* 11 (KYO), *M. Furuse* 7972, 8012 (RYU); Yamato–Sumiyo, *G. Koidzumi*. Tokunoshima Is.: Inokawa-dake, *K. Iwatsuki et al.* 256 (KYO), *H. Migo* 26884 (KYO), *Y. Miyagi & S. Hatusima* 39405 (RYU); 500–645 m, *H. Nagamasu* 1762 (KYO), 430–645 m, *M. Tamura et al.* 47 (KYO). — Okinawa. Okinawa Is.: *S. Sakaguchi* 15 (KYO); Oku, *K. Higashi* (RYU); Nishime-dake, 350–420 m, *H. Nagamasu* 2023 (KYO); Mt. Yona, *S. Hatusima* 18214 (TI); Yona, 300 m, *H. Nagamasu* 2021 (KYO); Sade, Benoki-gawa, *S. Sonohara* 1, 2 (KYO), *M. Furuse* 5034 (RYU); Sade, *G. Koidzumi* (KYO); Henoki, *T. Naito* (TI); Yonaha-dake, *F.H. Walker et al.* 7018 (TI), *Y. Niuro* 2261 (RYU); Udenawa-yama, Higashi-son, *T. Kaneshiro* 1423 (RYU); Mt. Iyu-dake, *Y. Miyagi* 5250 (RYU); Ibu-dake, *Anonymous* (KYO); Tano-dake, *Y. Niuro* 3381 (RYU); Agariebaru, Nago, *T. Kaneshiro* 1538 (RYU), *E. Takamine* 2258 (RYU); Nago-dake, *H. Nagamasu* 1664 (KYO); Nago, *E. Takamine* 2055 (TNS); Nakagami, *G. Koidzumi* (KYO).

TAIWAN. without precise locality, *Anonymous* 927 (TI). — Nantou: Mt. Niitaka, 7000–8000', *Kawakami & Mori* 1785 (TI), 2006 (TI); Rarirari-sha, *G. Nakahara* 469 (TI); Mt. Feng-shan, Chitou, 1600 m, *T. Yamazaki* 149 (TI). — Kaohsiung: Daizyurinzan, *E. Matuda* 12–19 (TI).

Note. The plants of Taiwan have larger flowers than those of Japan.

1-2. var. *oblonga* Nagamasu, var. nov.

S. confusa Brand var. *lysioctemon sensu* Hand.-Mazz., *Symb. Sin.* 7: 808 (1936); *Beih. Bot. Centralbl.* 62-B: 40 (1943), *p.p.*, *excl. typ.*, *Poillane* 7209(P).

S. confusa auct. non Brand: Y.-F. Wu, *Fl. Reip. Pop. Sin.* 60(2): 75 (1987).

Laminae oblongae, ellipticae ad anguste obovatae, luteo-brunneae ad brunneae in sicco, 6–11 cm longae, 2.5–4 cm latae, apice acuminatae, base attenuatae, venis primariis (7–)8–11 paribus. Corolla 4.5–7 mm longa, tubo ca. 2 mm longo. Fructus ovoideus, pilosus, 5–6 mm longus. — Typus: R.-C. Ching 2088 (W), between Ping Yung and Tai Suan, 500–900 m, S Zhejiang, China.

Terminal buds obliquely ovoid to subulate, 3–7 mm long. *Leaves*: blades oblong, elliptic to narrowly obovate, yellowish brown to brown when dry, 6–11 cm long, 2.5–4 cm wide; apex acuminate; base attenuate; nerves (7–)8–11-paired. *Inflorescences* 1–7-flowered. *Flowers*: corolla 4.5–7 mm long; corolla tube ca. 2 mm long; style 4–5 mm long. *Fruits* ovoid, pilose, 5–6 mm long. — *Flowers*: June–Aug. *Fruits*: Sept.–Nov.

Distr. S China, ?Indochina.

CHINA. Zhejiang: between Ping Yung and Tai Suan, 500–900 m, R.-C. Ching 2088 (W, syntype of *S. confusa* var. *lysistemon* Hand.-Mazz.); Tai Shun, Y.-L. Keng 255 (A). — Fujian: Kuliang, H.-H. Chung 6614 (A), 6709 (A), 6727 (A); Kushan, Foochow, H.-H. Chung 8111 (A). — Jiangxi: Tzu Chi Hsien, H.-H. Hu 1252 (A); Oo Chi Shan, near Lam Uk Village, Lungnan Distr., S.-K. Lau 4751 (A); Tong Ku, Y.-K. Hsiung 6154 (A). — Guangdong: Thai Yong, W pr. the Port of Swatow, Dalziel s. n. (W); Mts. Tsatmukugao, Lienping, 950–1050 m, Rud. Mell. 674 (A); Lin Fa Shan, Pak Shui Chai, Hai-fung Distr., W.-T. Tsang 25490 (A); Sha Lo Shan, Lo-Lo-Ha Village, Sin-fung Distr., Y.-W. Taam 981 (A, KYO); Yam Na Shan (Yit Nga Shan), Mei (Kaying) Distr., W.-T. Tsang 21406 (KYO). — Guangxi: C. Wang 39647 (A). — Guizhou: Nandjing-schan, Liping, 700 m, H. F. Handel-Mazzetti 10986 (W).

Subgen. 2. *Hopea* (L.) Clarke

Sect. 1. *Palura* G. Don

Key to the species

- 1a. Bark transversely fissured; leaves ovate to elliptic, glaucous on lower surface; fruits black. 5. *S. tanakana*
- 1b. Bark longitudinally fissured or exfoliating; leaves obovate, elliptic, oblong, or ovate, lower surface pale green but not glaucous; fruits blue, dark blue, or black.
 - 2a. Lower surface of leaves finely reticulate, often tinged red and distinctly visible, but not prominent on lower surface; fruits black. 4. *S. paniculata*
 - 2b. Lower surface of leaves coarsely reticulate, veins more or less prominent; fruits dark blue or blue.
 - 3a. Leaves ovate to obovate, apex acuminate to caudate, margin coarsely glandular dentate; panicles without foliage leaves; fruits dark blue. 2. *S. coreana*
 - 3b. Leaves obovate to elliptic, apex abruptly acute to acuminate, margin serrulate; panicles with a few foliage leaves; fruits blue. 3. *S. sawafutagi*

2. *Symplocos coreana* (Lév.) Ohwi — Fig. 3-2, Map 2, Plate 53b–c.

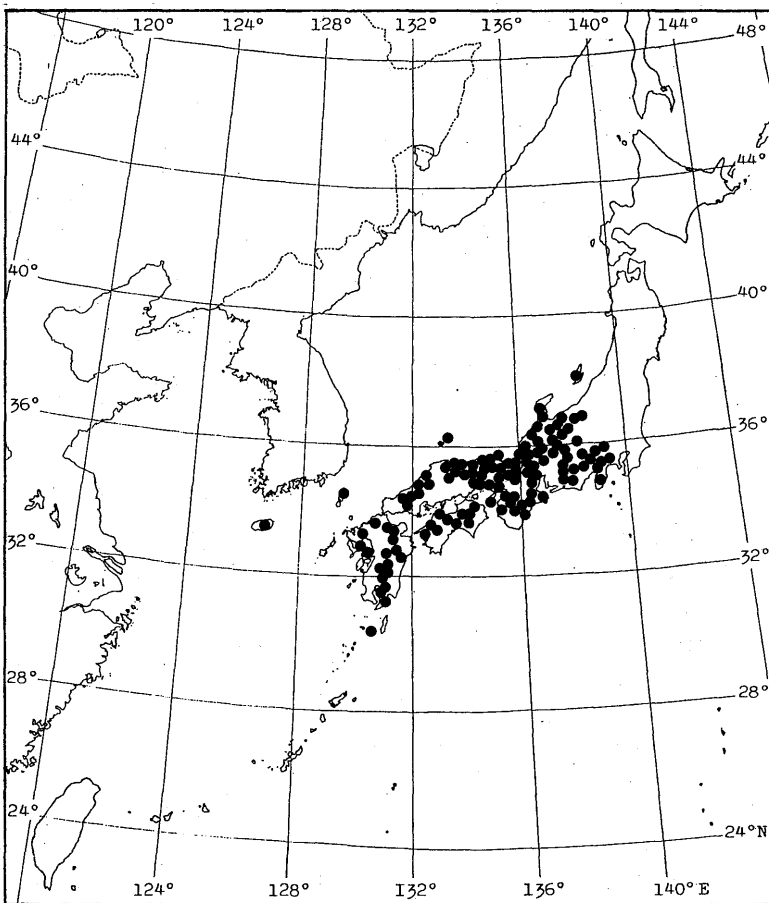
- S. coreana* (Lév.) Ohwi, Bull. Nat. Sc. Mus. Tokyo 33: 227 (1918); Hatusima, J. Geobot. 12: 71 (1963); Ohwi, Fl. Jap. English ed.: 725 (1965); Kitamura & Murata, Wood. Pl. Jap. 1: 95, t. 110 (1971); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 171, pl. 187-1 & 3 (1989). — *Cotoneaster coreanus* Lév., Fedde Repert. 11: 64 (1912). — *Palura coreana* Nakai, Bot. Mag. Tokyo 48: 773 (1934); Hara, Enum. Sperm. Jap. 1: 109 (1948). — Type: *Taquet 1106* (E!), Plate 53b), Hallaisan, 1400 m, Quelpaert, Korea.
- S. arguidens* Nakai, Bot. Mag. Tokyo 32: 228 (1918); Nakai, Bot. Mag. Tokyo 35: 121 (1921). — *Palura arguidens* Nakai, Tr. & Shr. 1: 231, t. 129 (1922); Fl. Sylv. Koreana 13: 35, t. 10 (1923); Tr. & Shr. ed. 2: 311, t. 145 (1927); Masamune, Fl. & Geo. Yakus.: 363 (1934). — Lectotype: *Nakai 6408* (TI!, Plate 53c), in sylvis lateris borealis, Quelpaert, Korea. (designated here).
- S. papyracea* Nakai, Bull. Nat. Sc. Mus. Tokyo 33: 20 (1953), *nomen, descr. in angl.*

S. paniculata auct. non Miq.: Franch. & Sav., Enum. Pl. Jap. 1: 308 (1875), *p.p.*; Nooteboom, Leid. Bot. Ser. 1: 258 (1975), *p. min. p.*

S. crataegoides forma *major sensu* Franch. & Sav., Enum. Pl. Jap. 2: 433 (1878), *p.p.*

S. crataegoides auct. non Buch.-Ham. ex D. Don: Brand, Pfl. R. Heft. 6: 33 (1901), *p.p.*

Deciduous trees or shrubs; bark gray-brown, longitudinally fissured or thinly exfoliating. Twigs gray-brown, glabrous or sometimes hairy. Buds brown, with glabrous or puberulous scales, the margin ciliate. *Leaves*: blades papery, ovate to obovate, 4–8 cm long, 2–5 cm wide; apex acuminate to caudate, base cuneate to rounded, margin ciliate and coarsely glandular dentate with teeth curved upward; upper surface glabrous or rarely appressed hairy; lower surface pilose especially on sides of midrib and nerves; midrib impressed on upper surface, prominent on lower surface; nerves 5–7 pairs, prominent on lower surface; reticulation coarse; petioles 3–7 mm long, abaxially glabrous. *Inflorescence* a panicle, 4–8 cm long, the axis pilose on one side to villose or glabrous; bracts and bracteoles linear, ciliate,



Map 2. Distribution of *Symplocos coreana* (Lév.) Ohwi.

glandular dentate, 1 mm long, soon caducous; pedicels slender 0–3(–5) mm long. *Flowers*: calyx tube glabrous or pilose, 1–1.5 mm high; calyx lobes imbricate, pilose or glabrous, elliptic to narrowly ovate with ciliate margin, ca. 1 mm long; corolla white, deeply 5-lobed, 3–4 mm long, lobes elliptic, short ciliate on margin; stamens 25–40, pentadelphous; disk 5-glandular, glabrous or hairy, if hairy the calyx tube also hairy; style 2–3 mm long, glabrous; ovary 2-locular, with 4 ovules in each locule. *Fruits* bluish black, globose to obliquely ovoid, 6–7 mm in diameter, crowned by the persistent calyx lobes; mesocarp thin; seed 1, reniform, with copious endosperm and curved embryo. *Pollen grains* 3-colporate, angular to semiangular in polar view, oblate in equatorial view; irregularly supracreticulate; ora slit-like; $19.3\ \mu\text{m}$ (P) $\times$ $29.2\text{--}33.2\ \mu\text{m}$ (E); pollen type IIa. — *Flowers*: June. *Fruits*: Sept.–Oct.

Jap. name: Tanna-sawafutagi

Habitat. Temperate deciduous forests, often on ridges or on mountain slopes.

Distr. Japan (Honshu, Shikoku, Kyushu), Korea (Jeju Is.)

JAPAN. **Honshu**. Tokyo: Nippara, Nishitama-gun, *H. Aoki* 2046 (TI); Karikurayama, Nishitama-gun, *M. Mizushima* (TI); Kori-mura, 300–800 m, *M. Mizushima* 2336 (TI); Hikawa, Gozen-yama, 700 m, *T. Yamazaki* 170 (TI); Musashi-otake, *F. Maekawa* (TI); Hichiishi-dani, Okutama, *H. Kanai* 2838 (TI). — Kanagawa: Mt. Oyama, *M. Hashimoto* (TI); Hakone, *I. Hurusawa* 1483 (TI), *T. Sawada* 2155 (TI), *F.G. Greatrex* (TI). — Niigata: Sado Is.: *Faurie* 2548 (KYO), *H. Muramatsu* (TI); Ogawa, *Y. Ikegami* (TI); Aikawa, *Y. Ikegami* 419 (TI), *M. Honda* (TI). — Toyama: along Katakai-gawa, Uozu-shi, *K. Nagai* (KYO); Kamiichi, Nakaniikawa-gun, *N. Kurosaki* 1687 (KYO); Kanetsuri-onsen, Kurobe, *J. Ohwi* 7501 (KYO); Muraki, Himi-shi, *H. Takano* 994 (KYO); Tochiya, Unazuki-cho, 100 m, *M. Nagai* 105 (TI); Nakagochi, *N. Satomi* (TI). — Ishikawa: Mt. Sekido, Kashima-gun, *N. Fukuoka* 3099 (KYO); Kanazawa, *T. Sawada* (KYO, TI); Yuwaku-onsen, *H. Hara* (TI); Mt. Iozen, *K. Honda* (KYO); Tatsunokuchi, Nomi-gun, *Y. Sugie* (KYO); Mt. Hakusan, Shiramine-mura, 1200 m, *H. Koyama* 1884 (KYO); Mt. Fujishiga, Enuma-gun, *N. Fukuoka* 1924 (KYO); Monzen-cho, Hoshi-gun, *Y. Matsuoka* (TI); Mt. Kuragatake, *H. Hara* (TI). — Fukui: Toritate-yama, Katsuyama-shi, 1200 m *S. Watanabe* 18414 (KYO); Mt. Arashima-dake, 600 m, *S. Watanabe* 17156 (KYO); Hinoyama, Takefu-shi, *S. Watanabe* 16370 (KYO); NW of Yashagaike, Nanjo-gun, 250–400 m, *N. Fukuoka* & *Y. Inamasu* 328, 365 (KYO); Kuroka-gawa, Tsuruga-shi, 400–500 m, *N. Kurosaki* 6371 (KYO, TI); Mikuni-dake, Nadasho-mura, 550 m, *S. Watanabe* 19183 (KYO); Ito-mura, *M. Maeda* (TI). — Yamanashi: Matsuhime-tohge, Otsuki to Kosuge, *H. Taoda* 3813 (KYO); Shinmisaka-tohge, *H. Kanai* (TI); Motosuko, Kyugatake-rindo, *H. Kanai* (TI); Kenashiyama, Kamiide-mura, Fuji-gun, 1300 m, *H. Kanai* (TI); Abetohge, *K. Hisauchi* 2572 (TI); Aoki-kosen, Mts. Ho'o, 1100 m, *F. Kimura* (TI). — Nagano: Okuwamura, Nishichikuma-gun, 780–1100 m, *J. Murata* 7778 (TI); Togakushi, Hokosha, 1000 m, *K. Midorikawa* 1994 (TI); Nagata-mura, Shimominochi-gun, *M. Mizushima* 2900 (KYO), 11676 (TI); Izuna, *M. Togashi* (TI); Iizuna-kogen, 1000 m, *M. Ito* 203 (KYO); Maruyama, Shimoina-gun, 1300 m, *T. Yamazaki* (TI); Omachi, Sangaku-hakubutsukan, 700 m, *H. Kanai* (TI); Morigami, Kitashiro-mura, Kitaazumi-gun, *F. Yamazaki* (TI); Nakabusa to Ariake, *S. Momose* (TI); Tsuta-onsen, Takase-gawa, Kita-Alps, 800 m, *H. Kanai* (TI); Suwa, *H. Tobita* (KYO); Taruzawa-kokuyurin, Otaki-mura, *M. Mizushima* (TI); Agematsu, Kiso, *K. Hisauchi* (TI). — Gifu: Mt. Genjidake, Takayama-shi, 600–900 m, *N. Fukuoka* 7466 (KYO); Dangumi to Mt. Funagawa, Ono-gun, *N. Fukuoka* 7537, 7549 (KYO); Exp. Forest of Gifu Univ., Mashita-gun, 800–900 m, *H. Takahashi* 1936, 2225 (KYO); Shioya, Sakaide-mura, Yoshiki-gun, *H. Kanai*; Hogogaike, Ena-shi, 650 m, *G. Murata* & *H. Nishimura* 96 (KYO); Hirugano, 890 m, *G. Murata* 14438 (KYO); Mt. Dainichi-dake, Gujo-gun, *H. Nishimura* & *K. Ueda* (KYO); Mt. Funabuse, Yamagata-gun, *H. Takahashi* 5368 (KYO); Nogohakusan, Neo-mura, 900 m, *H. Takahashi* 2007 (KYO); Osaidani, Kasuga-mura, Ibi-gun, 600–900 m, *H. Takahashi* 185 (KYO); Mt. Ena, *H. Kanai* (TI); Yoronotaki, *H. Kanai* (TI). — Shizuoka: Umegashima spa to Abetoge, *H. Ohashi* & *J. Murata* 1864 (TI); Sasazuka, Mt. Fuji, 1500 m, *B. Hayata* (TI); Ashitakayama, Hosogiridake, *H. Kanai* 7353 (TI); Osawa, *H. Kanai* 7329 (TI); Jokojiyama, Iwata-gun, 1100 m, *T. Yamazaki* (TI); Ryusozan, *J. Sugimoto*; Kurata, Setonotani-mura, *D. Shimizu* 239 (TI); Amagi-tohge, Izu, 800 m, *H. Ohba et al.* 7005 (KYO, TI); Mt.

Amagi, Ito (TI), *T. Sawada* 859 (TI). — Aichi: Chausu-yama, Toyone-mura, Kitashitara-gun, 1300–1415 m, *H.T. Im* 3140 (TI); Motomiya-yama, Minamishitara-gun, *Y. Momiyama* (TI); Kawai, Miwa-mura, *K. Torii* 8945 (TI); Zenbu, Tsukude-mura, *K. Torii* (KYO). — Mie: Mie Univ. Exp. Forest, Yahata-mura, 700 m, *H. Kanai* 6821 (TI); Mt. Kuruson, Taro-mura, Isshi-gun, 900 m, *H. Kanai* (TI); Shinchayanoike, Akeno, Obata-cho, *C. Chyuma*; Mt. Gozaisho, *G. Nakai* 4636N (KYO), 600–800 m, *N. Fukuoka* 5933 (KYO); Nagano-mura, Minamimuro-gun, *T. Nakajima* (TI); Osugidani, Hinodedake-Momonoki, 1300 m, *T. Yamazaki et al.* (TI); Momonoki to Odaigahara, *M. Hiroe* 7282 (TI), 7289 (KYO); Yamawa-tohge, Kumano-shi, *T. Koike* 253 (KYO). — Shiga: Makino, Takashima-gun, *H. Kanai* (TI); Kutsuki-mura, 200 m, *H. Ohashi et al.* 8555 (TI); Mt. Ibuki, *C. Hashimoto* 11052 (TI), 280 m, *T. Shimizu* 453, 457 (KYO); Busshoji-cho to Ouri-cho, Hikone-shi, 400–600 m, *M. Ito* 7001 (KYO); Mt. Mikuni-yama, Makino-cho, *G. Murata* 20250 (KYO); Katsurakawa, Shiga-gun, *G. Koidzumi* (TI); Mt. Hira, 1000–1200 m, *G. Murata* 19009 (TI); Mt. Hiei, *H. Yamamoto* (TI). — Kyoto: Mt. Taiko-yama, Yasaka-cho, Takeno-gun, *K. Nagai* 25085 (KYO); Mt. Ryugatake, Kitakuwata-gun, *H. Yamamoto* 281 (TI); Tauta, Miyama-cho, *Y. Tateishi & J. Murata* 4157 (KYO, TI); Ashiu, Kitakuwata-gun, *H. Nagamasu* 2063, 2064, 2070 (KYO); Mt. Chorogatake, Funai-gun, *G. Nakai* 4186 (KYO), *H. Yamamoto* 1565 (TI); Ruri-kei, Funai-gun, *G. Koidzumi* (KYO); Mt. Kumotori, Keihoku-cho, 700–920 m, *H. Nagamasu* 150, (KYO); Seryo-tohge, *T. Takahashi* (TI); Hanase-mura, Atago-gun, *Y. Momiyama* 607 (TI); Ponpon-yama, Otokuni-gun *H. Yamamoto* 165 (TI); Oharanomura, Otoguni-gun, *G. Murata* 13339 (KYO); Iwakura, Kyoto-shi, 180 m, *M. Umebayashi* 989 (KYO). — Osaka: Mt. Katsuragi-san, Izumi, 600 m, *G. Murata* 11344 (KYO); Mt. Iwawaku-yama, *Yamaguchi* (KYO); Mt. Kongo-san, *T. Nakai* (TI); Sakai, *Ui* 59 (TI). — Hyogo: Mt. Oginosen, Onsen-cho, 920–1100 m, *N. Kurosaki* 12696 (KYO); Mt. Sugasosen, *N. Fukuoka & Y. Inamasu* 703 (KYO); Dainichidake, Kinokuni-cho, *Z. Tashiro* (KYO); Mt. O'okayama, Kinokuni-gun, *N. Fukuoka* 12382 (KYO); Mt. Hyonosen, *G. Koidzumi* (KYO); Mt. Kogane-dake, Sasayama-cho, 500–700 m, *N. Kurosaki* 14752, 14753 (KYO); Mt. Mino-san, Shingu-cho, Ibo-gun, 300–400 m, *N. Fukuoka* 9149 (KYO); Kamiso-cho, Kakogawa-shi, 20–60 m, *N. Kurosaki* 6855 (KYO); Takarazuka-shi, 250–350 m, *N. Fukuoka & N. Kurosaki* 2506 (KYO); Mt. Rokko, *G. Koidzumi, Z. Tashiro* (KYO); Mt. Yuzuruha-san, Awajishima Is., *N. Satomi* 10178 (TI); Koyoen, Nishinomiya-shi, *N. Kurosaki* 6297 (TI). — Nara: Mt. Kongo-san, 1100 m, *S. Okamoto* 13421 (KYO); Nosegawa-mura, Yoshino-gun, *G. Koidzumi* (KYO); Mt. Omine, 1000–1900 m, *M. Hiroe* 12853 (KYO), *N. Fukuoka & M. Hotta* 131 (KYO), *H. Okada* 1542 (KYO); *Y. Tateishi & J. Murata* 4242 (TI); Kariyasu-one, Totsukawa-mura, *M. Ito* 293 (KYO). — Wakayama: Arida, *S. Okamoto* 19245, 19246 (TI). — Tottori: Mt. Oginosen, Iwami-gun, *A. Tanaka* 20618 (KYO); Mt. Hyonosen, Yazu-gun, *A. Tanaka* 11563 (KYO); Mt. Nagi-san, Yazu-gun, *A. Tanaka* 25184 (KYO); Kitadani, Saji-mura, Yazu-gun, 600–1000 m, *G. Murata et al.* 319 (KYO); Misasa-machi, Tohaku-gun, 500 m, *S. Ishizawa* 17232 (KYO); Nakayama-cho, Saihaku-gun, *A. Tanaka* 15914 (KYO); Mt. Daisen, *Faurie* 3498 (KYO); Mt. Kenashiyama, Hino-gun, *A. Tanaka* 13011 (KYO). — Shimane: Akaya-mura, Nogi-gun, *T. Hiroe* 977 (KYO); O'etakayama, Nima-gun, *S. Takagi* 210 (KYO); Mt. Sanbe, *T. Sawada* (TI), *K. Midorikawa* 2257 (TI); Asayama, Ichiki-mura, Ochi-gun, 900 m, *H. Kanai*; Kamedake-mura, Nita-gun, *N. Satomi* 42 (TI); Nakamura, Saigo-cho, Oki Is., *K. Deguchi & S. Tsugaru* 3770 (KYO). — Okayama: Okutsu-mura, Tomata-gun, *S. Kajiya* (KYO); Mt. Nakahiruzen, Maniwa-gun, 800–900 m, *M. Hiroe* 16396 (KYO). — Hiroshima: Nakatsudani, Yoshiwa-mura, 900 m, *H. Hara & S. Kurosawa*; Mt. Kanmuri, Yamagata-gun, *M. Hiroe* 7743 (KYO); Sandan-kyo, Yamagata-gun, *S. Suzuki* (KYO); Togouchi-machi, Yamagata-gun, *T. Makino* 156527 (KYO); Mt. Tenguishi, Geihoku-cho, 1190 m, *K. Ueda* 709 (KYO). — Yamaguchi: Aradani, Yoshiki-gun, *T. Goya* 19 (TI); Jakuchi-zan, Kuga-gun, *T. Oda* 2766 (KYO), *J. Nishina* 2803 (TI); Takane-mura, Kuga-gun, *M. Wada* 4011 (KYO); Chojagahara, Tokuji-cho, Sabagun, *K. Oka* 22794 (TI), 22795 (KYO); Sasanami-mura, Abu-gun, *J. Nishina* 439 (TI); Tokusa, Ato-cho, Abu-gun, *T. Oda* 2392 (KYO); Kogushi, Toyoma-gun, *S. Yoshioka* 7 (TI). **Shikoku.** Tokushima: Mt. Nakatsu-san, Miyoshi-gun, 1000 m, *G. Murata* 7739, 7743 (KYO); Mt. Takagoshiyama, *Z. Tashiro* (KYO); Mt. Otakisan, Mima-gun, 900 m, *M. Takahashi* 1089 (KYO); Mt. Tsurugi-san, *J. Nishina* 2289 (TI), 1500–1900 m, *M. Hiroe* 13403 (KYO); Kuwadaira to Myoto-ike, Ichii-mura, Miuma-gun, *M. Hotta* 10804 (KYO). — Kagawa: Miki-cho, Nakayama–Otakiji, Kida-gun, *H. Kanasaki* (TI); Mt. Otakisan, 550 m, *M. Hiroe* 15613 (KYO), 950 m, *H. Nagamasu & M. Takahashi* 1791 (KYO). — Ehime: Mt. Kurotaki-san, Tokuda-mura, Shuso-gun, *H. Yamamoto* (KYO); Mt. Ishizuchi, *M. Hiroe* 12063, 12066 (KYO), *R. Kubo* (TI); Omogokei, Kamiukena-gun, 1300 m, *H. Takahashi* 3419 (KYO); Nakahama-cho, Kita-gun, 820 m, *Y. Nomura* 13 (KYO); Onogahara, Shirokawa-cho, Higashiura-gun, *N. Fujita & E. Miki* 154 (KYO); Soto'obara, Uwa-cho, 230 m, *S. Yamamoto* 20232 (KYO). — Kochi:

Mt. Hozo-san, Umaji-mura, Aki-gun, *M. Tagawa* (KYO); Jinkichi-mori, Aki-gun, *M. Tagawa* (KYO); Zinsenji to Shii-tohge, N of Kochi-shi, *G. Murata & T. Shimizu* 1195 (KYO); Monobe-mura, Kami-gun, *Y. Momiyama t-270* (TI); Nanokawa, Agara-gun, *K. Watanabe* (TI). **Kyushu.** Fukuoka: Mt. Inugatake, 1000 m, *M. Hotta 6176* (KYO); Mt. Hikosan, *M. Togashi 7376* (TI).—Saga: Mt. Tenzan, *T. Baba* (TNS); Mt. Tara-dake, *T. Yamazaki* (TI), 600–983 m, *H.-T. Im 2234* (KYO).—Nagasaki: Mt. Unzen, *F.C. Graetx 118, 119a* (TI), 1100 m, *S. Toyama* (TI); Tsushima Is., Mt. Mitake, *Z. Tashiro* (KYO), Toyozaki-mura, *I. Haratomo* (KYO), Mt. Mokkoku–Mt. Terata, Shimoagata, 500 m, *H. Ohashi & H. Soma* (TI), Yatateyama, *Y. Yabe* (TI), Anagizaka, *T. Nakai* (TI).—Kumamoto: Kukino-mura, Aso-gun, 600 m, *Y. Shimada 13435* (KYO); Mt. Noke'eboshi, Kuma-gun, *K. Maebara 591* (KYO); Mt. Shiraga, Itsuki-mura, *K. Maebara K582* (KYO); Mt. Ichifusa, *Z. Tashiro* (KYO).—Oita: Mt. Hiko-san, *N. Ida 341* (KYO); Karan-san, Usa-shi, *Z. Tashiro* (KYO); Mt. Kujiu, *S. Kitamura* (KYO); Mt. Haneyama, Kusu-gun, *K. Ikebe* (KYO); Mts. Sobo-Katamuki, Shirouzu to Oshoji, 700–1500 m, *J. Murata* (TI).—Miyazaki: Mt. Okue, Sanrigawara, 1300 m, *S. Hatusima & S. Sako 24987* (KYO), *N. Fujita & M. Kato 403* (KYO, TI), Obiragoe, 1200 m, *J. Murata 7940* (TI); Kitakata-mura, Higashiusuki-gun, 1100 m, *M. Hotta 6362* (KYO); Shiiba, 1000–1100 m, *H. Kanai* (TI); Omae to Mt. Kurumi, Shiiba, 1300 m, *M. Hotta 6539* (KYO); Mt. Osuzu, Togo-mura, 1200–1300 m, *H. Kanai* (TI); Mt. Kirishima, *T. Yamazaki* (TI), *H. Muramatsu* (TI), Karakuni-dake, 1400–1500 m, *H. Koyama 7537* (KYO).—Kagoshima: Mt. Kirishima, *Z. Tashiro* (KYO); Kokubu, Aira-gun, *Z. Tashiro* (KYO); Mts. Takakuma, 1150 m, *S. Noshiro & M. Suzuki 4850* (TI); Mt. Bishago, Tarumizu-shi, 800 m, *S. Hatusima 19819* (KYO); Mt. Hoyoshi-dake, *Y. Momiyama* (TI); Yakushima Is., 900–1930 m, *G. Koidzumi* (KYO), *Z. Tashiro* (KYO), *M. Tagawa 1931* (KYO), *K. Iwatsuki et al. 39* (KYO), *G. Murata & H. Tabata 408, 497* (KYO), *K. Okada & A. Takahashi 3059* (KYO), *T. Yamazaki et al. 2063, 2120* (TI), *T. Yahara et al. 6030, 6072, 6073* (TI), *7532* (KYO).

KOREA. Jeju-do: *Faurie 2137* (KYO), *H.-D. Chang 1581* (KYO), *T. Nakai 6408, 6409* (TI), *Faurie 2137* (TI); Hallaisan, *Taquet 1106* (E), *Faurie 1891 p.p.* (KYO), *T. Nakai* (TI).

Note. In Hokuriku district, a dwarf form of this species is often observed, which is probably due to deep snow in winter in this region.

3. *Symplocos sawafutagi* Nagamasu, **nom. nov.**—Fig. 3-3 & 4j, Map 3, Plate 53d, 54a.

S. sawafutagi Nagamasu—*Palura paniculata* (Thunb. ex Murray) Nakai var. *pilosa* Nakai, Tr. & Shr. ed. 2: 309, t. 144 (1927), *descr. in japon.*—*P. ciliata* Nakai ex [H. Ito, Bot. Mag. Tokyo 47: 897 (1933), *nom. nud.*] Hara, J. Jap. Bot. 10: 322 (1934).—*P. chinensis* (Lour.) Koidz. var. *pilosa* Nakai, Bot. Mag. Tokyo 48: 774 (1934).—*P. pilosa* Nakai ex Honda, Nom. Pl. Jap.: 274 (1939), *nomen nud.*—*S. chinensis* (Lour.) Druce forma *pilosa* Ohwi, Bull. Nat. Sc. Mus. Tokyo 33: 83 (1953); Fl. Jap. English ed.: 726 (1965); Kitamura & Murata, Wood. Pl. Jap. 1: 95, t. 111 (1971); Murata in SAtake et al., Wild Fl. Jap. Wood. Pl. 2: 171, pl. 187-4 65 (1989).—*S. chinensis* subsp. *pilosa* M. Kitagawa, Neo-Lineam. Fl. Manshur.: 509 (1979).—Type: *Anonymous s. n.* (TI!, Plate 53d), 11 May 1878, Shirako, Japan.

S. paniculata (Thumb. ex Murray) Miq. var. *leucocarpa* Nakai, Bot. Mag. Tokyo 32: 227 (1918).—*Palura paniculata* var. *leucocarpa* Nakai, Fl. Sylv. Koreana 13: 33 (1923); Tr. & Shr. ed. 2: 310 (1927).—*S. crataegoides* var. *leucocarpa* Makino & Nemoto, Fl. Jap. ed. 2: 98 (1931).—*P. chinensis* var. *pilosa* forma *leucocarpa* Nakai, Bot. Mag. Tokyo 48: 774 (1934).—*P. pilosa* forma *leucocarpa* Nakai ex Honda, Nom. Pl. Jap.: 274 (1939), *nom. nud.*—*P. chinensis* var. *leucocarpa* Hara, Enum. Sperm. Jap. 1: 108 (1948).—*S. chinensis* var. *leucocarpa* Ohwi, Bull. Nat. Sc. Mus. Tokyo 33: 83 (1953); Ohwi, Fl. Jap. English ed. 725 (1965).—Type: *Nakai 6074* (TI!, Plate 54a), in colle Chang-zen, Corea Orient.

S. sinica auct. non Ker. Miq., Prol. Fl. Jap.: 267 (1867); Franch. & Sav., Enum. Pl. Jap. 1: 309 (1874), *p.p.*; *op. cit.* 2: 433 (1879), *p.p.*; Matsumura, Ind. Pl. Jap. 2(2): 488 (1912), *p.p.*

S. paniculata var. *typica* sensu Nakai, Bot. Mag. Tokyo 32: 227 (1918).

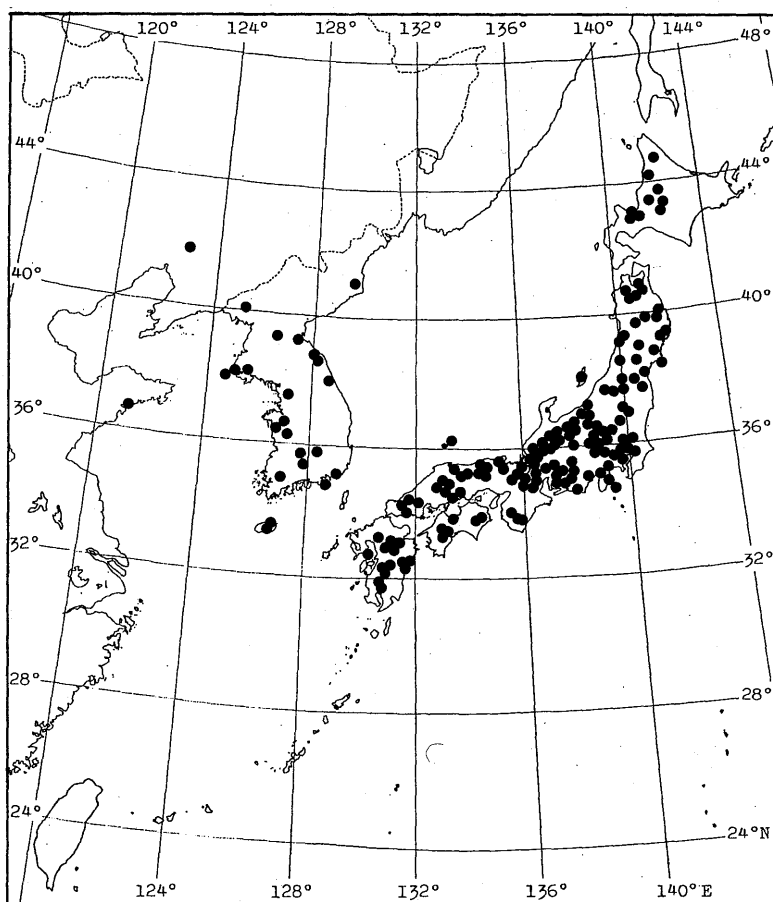
Palura chinensis sensu Koidzumi, Bot. Mag. Tokyo 43: 397 (1929).

S. chinensis auct. non (Lour.) Druce: Hatusima, J. Geobot. 12: 71 (1963).

S. paniculata auct. non (Thunb. ex Murray) Miq.: Hand.-Mazz., Beih. Bot. Centralbl. 62B: 39 (1943); Nooteboom, Leid. Bot. Ser. 1: 258 (1975); Wu, Fl. Reip. Pop. Sin. 60(2): 72 (1987).

S. crataegoides auct. non D. Don: Miq., Prol. Fl. Jap.: 267 (1867); Brand, Pfl. R. Heft 6: 33 (1901); Matsumura, Ind. Pl. Jap. 2(2): 486 (1912).

Deciduous shrubs; bark gray-brown, irregularly exfoliating. Twigs green to gray-brown, ciliate on one side to villose, or rarely glabrous. Buds gray-brown, with puberulous or glabrous scales with ciliate margin. *Leaves*: blades papery, obovate to elliptic, 3–8(–12) cm long, 1.5–4(–6) cm wide, apex abruptly acute to acuminate, sometimes rounded or shortly caudate, base cuneate, margin ciliate and glandular serrulate, the teeth incurved; upper surface sparsely hairy; lower surface pale green, sometimes glaucous, hairy especially on midrib and nerves, sometimes glabrescent; midrib impressed on upper surface, prominent on lower surface; nerves 5–7 pairs, prominent on lower surface; reticulation coarse; petioles 3–7 mm long. *Inflorescence* a cylindrical panicle, 2–6(–8) cm long, often one or two foliage leaves are scattered in the panicle, and the axillary branches of the panicle often concaulescent, the axis pilose on one side to villose, rarely glabrous; bracts and bracteoles linear, ciliate, 0.5–2



Map 3. Distribution of *Symplocos sawafutagi* Nagamasu.

mm long, soon caducous; pedicells slender, 0–6 mm long. *Flowers*: calyx tube glabrous or pilose, 1–1.5 mm high; calyx lobes imbricate, glabrous or sparsely pilose, elliptic to narrowly ovate with ciliate margin, 1–1.5 mm long; corolla white, 3–4 mm long, deeply 5-lobed with shortly ciliate margin; stamens 25–40, pentadelphous; disk 5-glandular, glabrous or pilose, if pilose the calyx tube also hairy; style 2–3 mm long, glabrous; ovary 2-locular, with 4 ovules in each locule. *Fruits* blue or rarely white, obliquely ovoid, 6–7 mm long, 5–6 mm in diameter, crowned by the persistent calyx lobes; mesocarp thin; seeds 1, reniform with copious endosperm and curved embryo. *Pollen grains* 3(–4)-colporate, angular to semilobate in polar view, oblate in equatorial view; tectum irregularly suprareticulate; ora slit-like; 19.4–20.5 μm (P) $\times$ 30.1–32.2 μm (E); pollen type IIa. — *Flowers*: May–June. *Fruits*: Sept.–Oct.

Jap. name: Sawafutagi

Habitat. Temperate deciduous forests, usually on alluvium in shaded places along streamlets.

Distr. Japan (Hokkaido, Honshu, Shikoku, Kyushu), Korea, NE China.

JAPAN. Hokkaido. Rumoi: Kasambetsu Forest Office, Tomamae-cho, *T. Hamaya* 6806d (TNS). — Kamikawa: Kamiotoineppu, Nakagawa-gun, *G. Koidzumi* (KYO); Mt. Yubari-dake, *Akiyama* 121 (TI); Kamuikotan, *K. Miyabe* (TI); Mt. Ashibetsu, 350–750 m, *G. Murata & T. Yahara* 37722 (KYO). — Sorachi: Mt. Minamishokanbetsu-dake, 600 m, Uryu-cho, *G. Murata et al.* 38675 (KYO), 500–700 m, *S. Tsugaru* 4960 (KYO). — Ishikari: Nopporo-shinrin-koen, Ebetsu-shi, 50 m, *H. Takahashi* 6198 (TI); Asari pass, Asari–Jozankei, *S. Kurosawa & Y. Tateishi* (KYO, TI). — Shiribeshi: Ranshima, Otaru-shi, near sea shore, *K. Deguchi* 4395 (KYO). **Honshu.** Aomori: Eboshi-dake, Kamikita-gun, *K. Hosoi* 2212 (TI); Natsudomari, Higashitsugaru-gun, *K. Hosoi* (TI); Mt. Hakkoda, the summit, *Faurie* 867 (KYO), Yachi-onsen, 900 m, *T. Yamazaki et al.* (KYO, TI); Towada lake, Namari-yama, *Sato* (TI); Mt. Iwaki, *S. Kitamura* (KYO); Karekidaira, Iwaki-cho, Nakatsugaru-gun, *K. Mimoro et al.* 3868 (KYO). — Iwate: Kamikasshi, Mt. Goyo-zan, 1000 m, *H. Koyama & M. Hotta* 2214 (KYO); Osaki, Kamaishi-shi, 100 m, *H. Koyama* 2484 (KYO); Hayachine, *U. Faurie* 13122 (KYO); Mt. Ureira, Iwaizumi, 50 m, *T. Shimizu* 1811 (KYO); Akka-mura, Shimohei-gun, 300 m, *T. Shimizu* 2087 (KYO); Mizusawa, Ichinoseki, *Y. Chiba* 37 (TI); Osukeyama, Shizukuishi, *K. Sugawara et al.* (KYO, TI); Okita-mura, Higashiiwai-gun, *K. Hosoi* (TI). — Miyagi: Sadayoshiguchi, Hunagata-yama, *H. Hara* (TI); Motogoya, Mt. Daito, *H. Ohashi* 3092, 3240 (TI); Sendai, *Faurie* 2256 (KYO); Kinkazan, *Faurie* 5096 (KYO), *G. Koidzumi* (KYO); Mt. Fubo-dake, Shiraishi-shi, 900–1700 m, *H. Nishimura* 866 (KYO); Mt. Zao, *Y. Momiyama* 1704 (TI). — Akita: Tashiro-cho, Kitaakita-gun, *T. Makino* (MAK); Kuroyu, Senpoku-gun, *K. Mori* (MAK). — Yamagata: Fukura, *S. Muramatsu* 65 (KYO), *Ohashi* 6636 (TI); Mt. Chokai, Unodai to Osawa-jinja, 500–800 m, *N. Kurosaki* 3301 (KYO); Mt. Gassan, *T. Yamazaki* (TI); Komatsu, Kawanishi-cho, Higashiokitama-gun, *K. Deguchi* 3401 (KYO); Oyama-kokuyurin, Nishitagawa-gun, *K. Mori* (TI). — Fukushima: Sotoba pass, Sohma-shi, *S. Noshiro* 4908 (KYO); Hibara, Kitashiobara-mura, Yama-gun, *K. Deguchi et al.* 3614 (KYO); Mt. Azuma, *G. Koidzumi* (TI); Mt. Asakusa, Tadami-mura, 600 m, *T. Yamazaki* 6555 (TI); Tadami-machi, Minamiaizu-gun, *E. Kinoshita* 701 (KYO); Hinoemata, Minamiaizu-gun, *J. Ohwi & M. Tagawa* (KYO); Oze, *M. Mizushima* 134 (TI), *D. Hoshi* (KYO). — Ibaraki: Shimotsuna, *Anonymous* 36 (MAK); Mt. Tsukuba, *I. Hurusawa* (TI), *S. Kishida* (TI); Tsuchiura, *Iizuka* (MAK). — Tochigi: Sandogoya-onsen, Nasu-gun, 1100 m, *M. Mizushima* (TI); Nikko, *M. Honda*, *M. Mizushima* 2042 (KYO), 2347 (TI); Kasamatsu-yama, Kawachi-gun, *C. Stowe* (TI); Ochiai-cho, Kamitsuga-gun, *C. Stowe* (TI); Fujiwara-cho, Shioya-gun, *H. Kanai* (TI); Mt. Kamongatake, Mts. Haruna, *N. Fukuoka* 7389 (KYO). — Gunma: Tataranuma, *K. Hisauchi* 1705 (TI); Kitakaruizawa, 1120 m, *T. Yahara et al.* 6830 (TI); Mt. Akagi, 1500 m, *M. Nishida* 666 (TI); Mt. Myogi, *M. Honda* (TI); Mt. Haruna, *T. Sawada* (TI); Yubiso-gawa, *H. Kanai* (TI); Tsumagoi-mura, *T. Enomoto* 2528 (TI); Arafune, *K. Sato* 224 (TI); Tanigawa-dake, Ichinokura-sawa, *T. Yamazaki* (TI); Naramata-gawa, 1000 m, *H. Matsuda* (TI). — Saitama: Urawa, *T. Koyama* 451 (KYO); Nobidome, Kitaadachi-gun, *H. Ohashi* (TI); Higashiagano-mura, Iruma-gun, *M. Mizushima* 11091 (TI); Kamafuse-yama, Chichibu-gun, *S. Kurosawa* 10972 (TI). — Chiba: Tsuchi, Kashiwa-shi, *H. Ohba* 662777 (TI); Shiroishi-

machi, Inba-gun, 20 m, *H. Ohba et al.* 66 (TI); Sonno, Chiba-shi, *H. & M. Ohba* 79426 (TI); Konodai, Ichikawa-shi, *T. Tuyama* (TI). — Tokyo: Mitaka, *M. Mizushima* 1731 (TI); Oizumi, Kitatama-gun, *H. Kanai* (TI); Haramachida, Minamitama-gun, *T. Yamazaki* 26 (TI). Izu-oshima Is.: Okadamura, *M. Mizushima* (TI); Yuba, *N. Satomi* 8990 (TI). — Kanagawa: Daigatake, Hakone, *Sawada* (TI); Sengokuhara, 650 m, *N. Kurosaki* 3448 (KYO). — Niigata: Shimodago, Minamikambara-gun, *T. Nagai* (KYO); Oyu to Komanoyu, Yunotani-mura, Kitaonuma-gun, 300–400 m, *S. Kitamura & G. Murata* 2744 (KYO); Tsuchitaru to Yomogi pass, Yuzawa-cho, Minamiuonuma-gun, *E. Miki* 2108 (KYO); Mt. Kurohime, Nishikubiki-gun, *T. Shimizu* 154, 166 (KYO); Mt. Yoneyama, S of Kashiwazaki, *N. Fukuoka* 1837 (KYO); Suginosawa-mura, Nakakubiki-gun, *M. Togashi* TNS1238 (KYO, TNS). Sado Is.: *Faurie* 2511 (KYO); Mt. Donden to Mt. Kongo, 800–900 m, *M. Okamoto* 2430 (KYO). — Toyama: Kanezuronsen, Kurobe, *J. Ohwi* 7486 (KYO); Kamiichi-machi, Nakaniiikawa-gun, *N. Kurosaki* 1839, 2161, 2320 (KYO); Tateyama-onsen–Fujishashi, *Z. Tashiro*; Ainokura–Kaguma-toge, Taira-mura, Higashitonami-gun, 300–600 m, *G. Murata* 30053 (KYO). — Ishikawa: Ushirotakayama, Ishikawa-gun, *N. Satomi* (KANA, KYO); Yokodani-tohge, Kanazawa, *N. Satomi* 13260 (KANA); Mt. Iozen, *H. Furuie* 23747 (KANA); Itinose, Mt. Hakusan, *G. Masamune* 8724 (KANA); Tatsunokuchi-machi, Nomi-gun, *G. Masamune* (KANA). — Fukui: Nakaryu, Izumi-mura, 600 m, *S. Watanabe* 17191 (KYO); Hatogayu to Karikomi-ike, Ono-shi, *N. Fukuoka* 461 (KYO); Mt. Arashima, 1200 m, *G. Murata et al.* 67066 (KYO); Mt. Kyogatake, Ono-shi, 900 m, *G. Murata & T. Shimizu* 386 (KYO); Bushiyama, Ono-gun, *G. Koidzumi* (KYO); Mt. Kanmuri, Ikeda-cho, Imadate-gun, 1100 m, *G. Murata et al.* 67261 (KYO); Yashaga-ike, Imajo-cho, Nanjo-gun, 1100 m, *G. Murata et al.* 67180 (KYO); Ikenokochi, Tsuruga-shi, *H. Takahashi* 1664 (KYO). — Yamanashi: Daibosatsu, *Y. Terauchi* 6890 (KYO); Mt. Yatsugatake, Kiyosato, *F. Yamazaki* (KYO); Yamanaka, Minamitsuru-gun, 1000 m, *N. Fukuoka* 7311 (KYO); Mt. Ho'osan, Takanota, 900 m, *T. Yamazaki* (TI); Torii-tohge, 1000 m, *H. Matsuda* (TI); Otoriyama, Higashiyamanashi-gun, *Y. Fujita* (TI); Mt. Kushigata, 800 m, *H. Matsuda* (TI); Yamanaka-ko, I. Hurusawa (TI); Mt. Kentokusan, Santomi-mura, Higashiyamanashi-gun, *K. Midorikawa* 1742 (TI). — Nagano: Mt. Moriya-san, Suwa-shi, 1100–1650 m, *K. Midorikawa* (TI); Mt. Amakazari, *T. Yahara et al.* 7168 (TI); Yoriaido–Sakai-toge, Nagawa-mura, *T. Yahara et al.* 6841, 7205 (TI); Oyouni-shitsugen, near Aoki-ko, 700 m, *T. Yamazaki* 3717 (TI); Mt. Ena, Chisato-mura, *H. Kanai* (TI); Uriki, Shimoina-gun, 900 m, *T. Yamazaki* 3809 (TI); Mts. Yatsugatake, *H. Kanai* 673 (TI); Mt. Asama, *Faurie* 548 (KYO); *H. Ito* (TI); Mt. Ontake, *G. Koidzumi* (TI); Kirigamine, *T. Yamazaki* (TI); Mt. Nyugasa-yama, 1000 m, *T. Yamazaki* (TI); Mt. Fuji, 1000 m, *B. Hayata* (TI); Karuizawa, *H. Kanai* 2028 (TI); Sugadaira, *K. Sato* (TI); Togakushi-hara, *Hattori* (TI); Nonoumi-shitsugen, Minochi-mura, Shimominoichi-gun, 1100 m, *M. Mizushima* 11335 (TI). — Gifu: Mannami to Utsubo, Miyagawa-mura, Yoshiki-gun, 800 m, *K. Iwatsuki & N. Fukuoka* 364 (KYO); Kotori pass to Umehara, N of Mt. Ibuse-yama, Yoshiki-gun, *N. Fukuoka* 7425 (KYO); Mt. Norikura, *Z. Tashiro* (KYO); Miboro, Shirakawa-mura, Ono-gun, *A. Nitta* 12146 (KYO); Nishiure pass, Kiyomi-mura, Ono-gun, 1100 m, *H. Takahashi* 1848 (KYO); Hirugano, Takasu-mura, Gujo-gun, 900 m, *G. Murata* 14377 (KYO); Mt. Dainichi-dake, Shiratori-cho, Gujo-gun, *H. Nishimura & K. Ueda* (KYO); Hosokute, Hiyoshi-cho, Nizunami-shi, 400 m, *G. Murata et al.* 323 (KYO); Monzen to Mt. Myohogatake, Tanigumi-mura, Motosu-gun, *H. Takahashi* 4568 (KYO); Sugihara to Mt. Hinaga-dake, Itadori-mura, Mugi-gun, 400 m, *Y. Inamasu* 391 (KYO); Dodogamine, Mitahora, Gifu-shi, 100–200 m, *H. Takahashi* 6282 (KYO); Kanmuri-toge to Mt. Kanmuri-yama, Fujishashi-mura, Ibi-gun, 1000 m, *H. Takahashi et al.* 1046 (KYO); NE slope of Mt. Ibuki, 400 m, *N. Fukuoka* 5865 (KYO). — Shizuoka: Ippeki-ko, Izu, *K. Kumura* 301796 (KYO); Tokuyama, Suruga, 300 m, *T. Yamazaki* (TI); Ryuko-san, N of Shizuoka, *Y. Kurosawa* (KYO); Shizuoka, *Faurie* 3501 (KYO); Koizumi-mura, *H. Muramatsu* (TI); Mts. Ashitaka, 900 m, *H. Kanai* 7328 (TI); Mizukubo, Sunto-gun, *H. Kanai* 7044 (TI). — Aichi: Kiyosaki, Shitara-cho, *K. Torii* (KYO); Tsukude-mura, Kitashitara-gun, 450 m, *G. Murata* 7361, 13230 (KYO), *K. Torii* (KYO); Jokoji to Miagari-ike, Seto-shi, 200 m, *M. Ito* 691, 693 (KYO); Tashiro, Nagoya-shi, *T. Makino* (TI); Kamiwatarai, Fujioka-cho, Nishikamo-gun, 150 m, *K. Ueda & M. Ito* 104 (KYO). — Mie: Kitayama-gawa, Kamikawa-mura, Minamimuro-gun, *H. Kanai* (TI); *T. Koike* 48 (KYO); Mifune-mura, Minamimuro-gun, *T. Nakajima* (TI). — Shiga: Takayama to Mt. Kanakuso, Asai-cho, 700 m, *G. Murata* 20770 (KYO); Mt. Ibuki, 1200–1370 m, *N. Fukuoka* 6335 (KYO); Mt. Ryozen, 1000 m, *N. Fukuoka* 6244, 6247 (KYO); Oike-dake, Inukami-gun, *H. Koyama & N. Fukuoka* 18 (KYO); An'yoji, Kirihara-mura, Gamo-gun, *C. Hashimoto* 4308 (KYO); Mikuni-san, *Z. Tashiro* (KYO); Mt. Hira, 400–1200 m, *S. Kitamura* (KYO), *T. Yahara et al.* 99 (KYO), *G. Murata* 19011 (KYO); Mt. Hiei, 700 m, *H. Ohashi* 8871 (TI). — Kyoto: Ikari-kogen, Takeno-gun, 700 m, *M. Hiroe* 8016 (KYO); Mt. Oeyama, 800 m, *G. Murata* 20098 (KYO); Ashiu Ex-

perimental Forest, 400–650 m, *M. Tagawa* (KYO), *G. Nakai* 3322 (KYO), *H. Nagamasu* 2062, 2067, 2068 (KYO); Daihizan, Sakyo-ku, 500–900 m, *H. Nagamasu* 76 (KYO); Kibune, *M. Tagawa* 925 (KYO); Hirogawara to Hatcho, Keihoku-cho, *G. Murata* 20849 (KYO, TI); Ohara, Kyoto, *G. Nakai* 2252 (KYO).—Hyogo: Mt. Torokawa-yama, Muraoka-cho, Mikata-gun, 700 m, *G. Murata* 20908 (KYO, TI); Kirigataki, NE foot of Mt. Oginosen, Onsen-cho, Mikata-gun, 400–740 m, *N. Fukuoka* 11095 (KYO); Umigami to Mt. Oginosen, *G. Murata* 20708 (KYO); S slope of Mt. Hachibuse-yama, Sekinomiya-cho, Yabu-gun, 800–1200 m, *N. Fukuoka* 10507 (KYO); Myokensan, Yabu-gun, *S. Hosomi* (KYO); Hyonosen, *S. Hosomi* 6017 (KYO).—Nara: Ninnikusen, Nara-shi, 300 m, *M. Ito & E. Kinoshita* 60 (KYO); Sakamoto, Totsukawa-mura, Yoshino-gun, *H. Nishimura & I. Kozima* 4 (KYO).—Wakayama: Koyasan, *N. Kinashi* (KYO), *Z. Tashiro* (KYO), *N. Satomi* 13130 (TI); Doro-kyo, *Ui* 61 (TI).—Tottori: Okinoyama-kokuyurin, *Z. Tashiro* (KYO); Wakasa-cho, Yazu-gun, *A. Tanaka* 22763 (KYO); Mt. Daisen, *G. Koidzumi* (KYO), 1400 m, *N. Kitagawa* 5225 (KYO); Tari-mura, Hino-gun, *N. Satomi* 43 (TI).—Shimane: Oki Is., Daimanji-yama, Saigo-cho, *K. Nagai* (KYO), *N. Satomi* 9428 (TI).—Okayama: Kuroiwa-kogen, Aba-mura, Tomata-gun, *A. Tanaka* 17569 (KYO); Onbara-kogen, Kamisaibara-son, Tomata-gun, 740–850 m, *T. Fujii* 1269 (KYO); Mt. Kamihiruzen, Nakahukuda to the summit, 1000 m, *G. Murata* 27204 (KYO); Nakayama, Wake-gun, *G. Masamune* (TI); Ikeda-mura, Kibi-gun, *J. Nishida* 1162 (TI).—Hiroshima: Mt. Eboshi to Mt. Hiba, Saijo-cho, Hiba-gun, 800–1300 m, *K. Ueda & M. Takamiya* 723, 730 (KYO, TI); Goryo-san, Mts. Hiba, *S. Takafuji* 611 (KYO); Miyoshi-shi, *S. Okamoto* (KYO); Joge-cho, Konu-gun, *Z. Tashiro* (KYO).—Yamaguchi: Sasanami, Abu-gun, *K. Oka* 19085 (KYO). **Shikoku.** Tokushima: Mt. Takagi-yama, Kisawa-mura, Naka-gun, 1350–1500 m, *S. Fujii* 1046 (KYO), *G. Murata et al.* 56065 (KYO).—Kagawa: Kitaura-mura, Shozu-gun, *R. Hiramata* 805 (TI).—Ehime: Mt. Higashiakaishi–Mt. Hutatsudake, Uma-gun, 1600 m, *G. Murata* 14990 (KYO).—Kochi: E foot of Mt. Torigata, Takaoka-gun, *T. Shimizu* 5916 (KYO); Tengu ridge to Ohikiwari pass, Shikoku-karst, Yasuhara-cho, Takaoka-gun, *N. Fujita & E. Miki* 64 (KYO); Mt. Yokogura, *T. Tuyama* (TI). **Kyushu.** Fukuoka: Asakura-gun, *Z. Tashiro* (KYO); Amagi-cho, Asakura-gun, *C. Kuwano* (KYO).—Nagasaki: Unzen, *S. Okamoto* (KYO), 1100 m, *S. Toyama* (TI), 1360 m, *K. Midorikawa* (TI).—Kumamoto: Hiramaki-mura, Kikuchi-gun, *S. Tokunaga* (KYO); Oguni, Aso-gun, *H. Kaneda* TNS91366 (TNS); Nojiri-mura, Aso-gun, *H. Kamizuma* (KYO); Namino-mura, Aso-gun, 600 m, *S. Hatusima et al.* 22272 (KYO); Kunimidake, *K. Nakajima* (KYO); Mt. Shiraga, Itsuki-mura, *K. Maebara* 590 (KYO); Kawa-mura, Kuma-gun, *T. Doi* 265 (KYO).—Oita: Kurodake, *S. Okamoto* (KYO).—Miyazaki: Hososhima, *Z. Tashiro* (KYO), *S. Kitamura* (KYO); Onikubo, Kawaminami-cho, 30 m, *S. Hatusima et al.* 22752 (KYO); Mt. Osuzu, *I. Hurusawa* (TI).—Kagoshima: Mt. Kirishima, Karakunidake, *S. Kitamura* (KYO); Komura, *Z. Tashiro* (KYO); Aira-gun, *Z. Tashiro* (KYO).

KOREA. Hamkyongpuk-do: Myongchon, *T. Nakai* 7676 (TI).—Hamkyongnam-do: Hamhung, *N. Nomura* (KYO); Shinhung, *G. Koidzumi* (KYO).—Pyonganpuk-do: Unsan, *T. Nakai* 2214 (TI); Myohyangsan, *G. Koidzumi* (KYO).—Pyonganngam-do: Yangduk, *T. Nakai* 12432 (TI).—Whanghaenam-do: Changsu-san, *R.K. Smith* 38 (TI); Changsan Cut, *T. Nakai* 13344 (TI); Taechong do, *T. Nakai* 13345 (TI).—Kangwon-do: *Faurie* 522, 769 (KYO); Changjun, *T. Nakai* 6074 (TI); Kumgangsan, *J. Ohwi* 45 (KYO), *G. Koidzumi* (KYO); Wekumgang-san, *G. Koidzumi* (KYO), *S. Kitamura* (KYO); Sulak-san, *T. Nakai* 17550 (TI).—Kyonggi-do: Seoul, *S. Kitamura* (KYO), *Sakaguchi* 57 (KYO); Pukansan, Seoul, *Faurie* 523 (KYO); Kapyong, *H.-D. Chang* 1178 (KYO); Kwangnung, *G. Koidzumi* (KYO).—Kyongsangpuk-do: Mt. Kayasan, *G. Koidzumi* (KYO).—Kyongsangnam-do: Mt. Chirisan, *S. Okamoto* (KYO), *J. Ohwi* 6772, 6773 (KYO), *T. Nakai* 114 (TI); Haeinsa to Mt. Kayasan, Hyeonchon-gun, 700–800 m, *K. Ueda et al.* 1115, 1120 (KYO); Pomosa, Pusan, *Faurie* 988 (KYO), *G. Koidzumi* (KYO); Pusan, *Faurie* 723 p.p. (KYO); Koje do, *T. Nakai* 11993 (TI).—Chungchongnam-do: *T. Nakai* 8137, 8138 (TI), *M. Kitagawa* (TI).—Chollapuk-do: Togyu-san, Changsu-gun, *H. Chang* 981 (KYO).—Chollanam-do: Paegyung-san, *G. Koidzumi* (KYO).—Jeju-do: Jeju, *K. Nakajima* 79 (KYO); Yengsil, *Taquet* 4341 (TI); Hallaisan, *T. Nakai* 322 (TI).

CHINA. Liaoning: Hoten (Shenyang), *M. Nishimura* (TI).—Shandong: Qingdao, *S. Miki* (KYO).

Notes. 1. In western Japan, *S. sawafutagi* is often sympatrically distributed with *S. coreana*, but the former usually blooms 1 to 2 weeks earlier than the latter.

2. Neither the epithet 'pilosa' nor 'leucocarpa' is available at species rank because

of the existence of earlier homonyms, *S. pilosa* Rehder (1916) and *S. leucocarpa* Brand (1916). The proposed new epithet 'sawafutagi' is a Japanese vernacular name of this species.

3. *Symplocos sawafutagi* has been treated as a variety of *S. chinensis* (Lour.) Druce distributed in S China and Taiwan. The latter is distinguished by yellowish hairs, a larger corolla of 4–5 mm long, more stamens ranging 50–60 and black fruits. Here, *S. sawafutagi* is treated as a distinct species, because I am not sure whether these species are the closest allies or not in this complicated section *Palura*.

4. ***Symplocos paniculata*** (Thunb. ex Murray) Miq. — Fig. 3-4, Map 4, Plate 54b–d, 55a.

- S. paniculata* (Thunb. ex Murray) Miq., Ann. Mus. Bot. Lugd-Bat. 3: 102 (1867); Prol. Fl. Jap.: 266 (1867), p.p.; Sargent, Pl. Wils. 2: 593 (1916); Li, Taiwania 1: 315 (1950); Ohwi, Fl. Jap.: 931 (1953); Bailey, Man. Cult. Pl. ed. 2: 792, t. 164 (1954); Hatusima, J. Geobot. 12: 72 (1963); Ohwi, Fl. Jap. English ed.: 725 (1965); Kitamura & Murata, Wood. Pl. Jap. 1: 96, t. 112 (1971); Nooteboom, Leid. Bot. Ser. 1: 258 (1975), p. *min. p.*; Wu, Fl. Reip. Pop. Sin. 62(2): 72 (1987), p.p.; Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 171, pl. 188-1 & 2 (1989). — *Prunus paniculata* Thunb. ex Murray, Syst. Veg. ed. 14: 463 (1784); Thunberg, Fl. Jap.: 200 (1784); Persoon, Syn. Pl. 2: 34 (1807); Steudel, Nomencl. Bot. ed. 1.: 663 (1821). — *S. crataegoides* Buch.-Ham. ex D. Don forma *major* Franch. & Sav., Enum. Pl. Jap. 2: 433 (1878). — *Eugeniodes paniculatus* O. Kuntze, Rev. Gen. Pl. 2: 410 (1891). — *Palura paniculata* Nakai, Tr. & Shr. ed. 1: 229 (1922); Hara, Enum. Sperm. Jap. 1: 109 (1948). — Type: *Thunberg* (UPS, microfiche! and photograph!), Japan.
- S. paniculata* var. *glabrifolia* Miq., Prol. Fl. Jap.: 266 (1867). — *S. crataegoides* var. *glabrifolia* Koidzumi, Fl. Symb. Or. Asia: 19 (1930). — Type: *Keiske* (L!, Plate 54b), Mt. Hiruyama, Figo, Japan.
- S. paniculata* var. *parvifolia* Miq., Prol. Fl. Jap.: 266 (1867). — Type: *Keiske* (L!, Plate 54c), Japan.
- S. pallida* Franch. & Sav., Enum. Pl. Jap. 1: 308 (1875), *nomen nud.* — *S. crataegoides* var. *pallida* Franch. & Sav., op. cit. 2: 433 (1878); Matsumura, Ind. Pl. Jap. 2(2): 486 (1912). — *Palura paniculata* var. *pallida* Nakai, Tr. & Shr. ed. 2: 307 (1927); Hara, Enum. Sperm. Jap. 1: 109 (1948). — Type: *Savatier* 2908 (P, *non vidi*, isotype in P!, Plate 54d), Japan.
- S. paniculata* var. *glabra* Makino, Bot. Mag. Tokyo 18: 112 (1904). — *S. crataegoides* var. *glabra* Matsumura, Ind. Pl. Jap. 2(2): 486 (1912). — *Palura paniculata* var. *glabra* Honda, Bot. Mag. Tokyo 47: 298 (1933). — Lectotype: *K. Mori* (MAK!, Plate 55a), Kamikano-mura, Mino, Japan. (designated here).
- S. crataegoides* auct. *non* Buch.-Ham. ex D. Don: Brand, Pfl. R. Heft 6: 33 (1901), p.p.

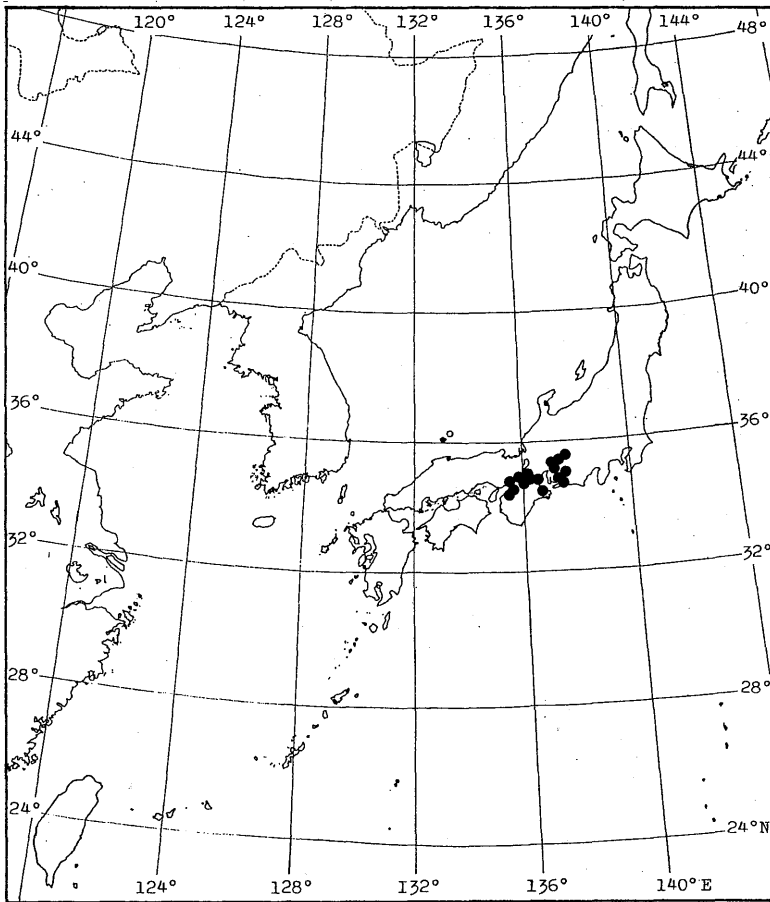
Deciduous shrubs or small trees; bark gray-brown, longitudinally fissured. Twigs glabrous, often tinged red. Buds dark brown, with glabrous scales with ciliate margin. Leaves: blades papery, obovate to oblong, 4–10 cm long, 2.5–4 cm wide, apex acute to acuminate, base cuneate, margin glandular serrulate; upper surface glabrous or pilose on midrib; lower surface glabrous or patently hairy on midrib and nerves; midrib impressed on upper surface, prominent on lower surface; nerves 4–5 pairs, prominent on lower surface; reticulation fine, distinctly visible; petioles 3–10 mm long. Inflorescence a panicle, 4–10 cm long, the axis glabrous; bracts and bracteoles linear to ovate, ciliate, 0.5–1 mm long, soon caducous; pedicels slender, 0–5 mm long. Flowers: calyx tube glabrous, 1–1.5 mm long; calyx lobes imbricate, glabrous, elliptic to narrowly ovate with ciliate margin, 1–1.5 mm long; corolla white, deeply 5-lobed, with shortly ciliate margin, about 4 mm long; stamens 25–45, pentadelphous; disk 5-glandular, glabrous; style glabrous, 3–4 mm long; ovary 2-locular, with 4 ovules in each locule. Fruits black, globose to obliquely ovoid, 6–8 mm long, 4–6 mm in

diameter, crowned by the persistent calyx lobes; mesocarp thin; seeds 1, reniform with copious endosperm and curved embryo. Pollen grains (2-)3(-4)-colporate, angular to semi-angular in polar view, oblate in equatorial view; tectum irregularly suprareticulate; ora transversely slit-like; $18.9-21.3 \mu\text{m}$ (P) $\times$ $29.0-34.4 \mu\text{m}$ (E); pollen type IIa. — Flowers: May–June. Fruits: Oct.

Jap. name: Kuromi-no-nishigori

Habitat. On marshy ground on swamps or ponds.

Distr. Japan (Honshu), endemic.



Map 4. Distribution of *Symplocos paniculata* (Thunb. ex Murray) Miq.

JAPAN. Honshu. Nagano: Oto, Misaka-mura*, Nishichikuma-gun, H. Okuhara (KANA), H. Okumura (MAK). — Shizuoka: Umeda, Kosai-shi, 50 m, I. Yamashita 150 (Herb. of Shizuoka Univ.). — Aichi: Tsukude-mura, Minamishitara-gun, N. Fujita & H. Tabata (KYO), K. Torii 8898 (KYO), S. Mimoro et al. 2252 (KYO), G. Murata 13222 (KYO), N. Naruhashi & H. Tabata 1123 (KYO, TI, TNS); Ichinomiya-cho, Hoi-gun, K. Torii (TI); Ashige-shitsugen, S. & K. Okuyama 22343 (TNS); Iwato-cho, Toyohashi-shi, K. Torii 8904 (KYO); Tenpakubara, K. Torii 8904, 8919 (KYO), 8935 (TI); Jyosui, Toyota-shi, S. Fujii 2466 (KYO); Joukouji, Kutsukake to Miyagami-ike, Seto-shi, K. Ueda & M. Ito 94

(KYO); Higashiyama, Nagoya, *F. Maekawa 166B916* (TI). — Gifu: Kasaji, Ena-gun, *N. Kinashi* (KYO); Hiyoshi-cho, Mizunami-shi, 400–500 m, *S. Mimoro 2595* (KYO); Sue, Kagamihara-shi, 50 m, *K. Ueda & M. Ito 675* (KYO); Kasahara-cho, Doki-gun, *K. Shioda 463* (KYO); Tajimi, *K. Shioda 7* (KYO), 11, 12 (TI). — Mie: Mt. Nyudogatake, Suzuka-shi, 500 m, *T. Takagi 22* (KYO); Shinchaya-no-ike, Akeno, Obata-cho, Watarai-gun, *C. Chuma* (TI). — Shiga: Shinohara, *C. Hashimoto*; Ushioyama–Ishiyama, 300 m, *S. Kitamura & G. Murata 2009* (KYO, TI); Seta, *C. Hashimoto 314* (KYO); Gio-cho, Yasu-gun, *C. Hashimoto 270* (KYO); Ishiyama, Shiga-gun, *S. Tanaka* (KYO); Mikami-yama, *C. Hashimoto* (KYO), *G. Murata 13049* (KYO); Gamo-gun, *C. Hashimoto* (KYO); Fuse, Yokaichi-shi, 100–200 m, *C. Hashimoto 993, 1011, 1663, 2347* (KYO), *H. Nagamasu 1933, 1934, 1935, 2524* (KYO). — Kyoto: Mizorogaike, Kyoto-shi, *G. Koidzumi, Y. Araki 13779–13782, M. Hiroe 647, S. Kitamura, H. Nagamasu 1815* (KYO); Rengedani, NW of Kyoto, *G. Nakai 306* (KYO); Hanazano, Kyoto-shi, *S. Miki*. — Osaka: Okamachi, Osaka-shi, *Ui 60* (TI); Momoyamadai, Sakai-shi, *K. Hirano* (KYO), *K. Murata* (KYO). — Hyogo: Nakayama, Kawabe-gun, *M. Togashi* (TI). — Nara: Mizukami-ike, Nara-shi, *G. Murata 20884* (KYO, TNS).

*Misaka-mura was incorporated into Nakatsugawa-shi, Gifu Pref.

Notes. 1. This species has also been reported from Hokuriku district. In several herbaria, I saw the specimens identified as *S. paniculata* from Hokuriku district, but they were all misidentified specimens of a glabrous form of *S. coreana* (Lév.) Ohwi.

2. The type specimen of *S. paniculata* var. *glabrifolia* Miq., *Keiske* (L) is labeled as Mt. Hiruyama, Figo. But, in Figo (Kumamoto Pref., Kyushu), this species is not distributed. It might be mislabelled by *Keiske*.

5. *Symplocos tanakana* Nakai — Fig. 3-5, Map 5, Plate 55b–c.

S. tanakana Nakai, Bot. Mat. Tokyo 32: 227 (1918); Ohwi, Fl. Jap. rev. ed.: 1072 (1965); Kitamura & Murata, Wood. Pl. Jap. 1: 96 (1971); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 171, pl. 186-4 (1989). — *Palura tanakana* Nakai, Fl. Sylv. Koreana 12: 34, t. 19 (1923); Tr. & Shr. ed. 2: 312, t. 146 (1927); Hara, Enum. Sperm. Jap. 1: 109 (1948). — Lectotype: *Nakai 6411* (TI!, Plate 55b), sectus torrentes Yibi, Quelpaert, Korea. (designated here).

Palura paniculata var. *pubescens* Nakai, Tr. & Shr. ed. 2: 310 (1927). — *P. chinensis* var. *pubescens* Nakai, Bot. Mag. Tokyo 48: 774 (1934). — *P. pilosa* var. *pubescens* Nakai ex Honda, Nom. Pl. Jap.: 274 (1939), *nomen*. — *S. paniculata* var. *pubescens* Ohwi, Bull. Nat. Sc. Mus. Tokyo 33: 83 (1953); Fl. Jap. English ed.: 726 (1965). — Lectotype: *Nakai 1359* (TI!, Plate 55c), Quelpaert, Korea. (designated here).

S. crataegoides auct. non Buch.-Ham. ex D. Don: Hatusima, J. Geobot. 12: 72 (1963).

S. paniculata auct. non (Thunb. ex Murray) Miq.: Nooteboom, Leid. Bot. Ser. 1: 258 (1975), *p. min.* p.; Wu, Fl. Reip. Pop. Sin. 60(2): 72 (1987), *p.p.*

S. chinensis auct. non (Lour.) Druce: Hand.-Mazz., Beih. Bot. Centralb. 62-B: 39 (1943).

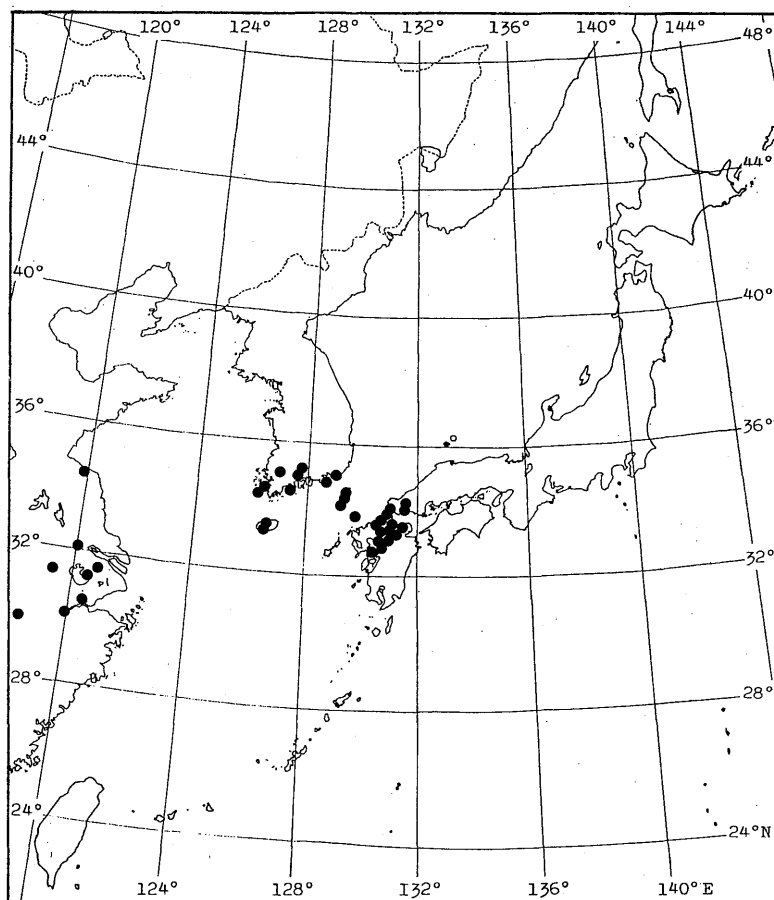
Deciduous trees; bark transversely fissured. Twigs gray-brown to grayish dark violet, densely hairy, sometimes glabrescent. Buds brown, with glabrous or puberulous scales with ciliate margin. Leaves: blades ovate to elliptic, 5–10 cm long, 2.5–4(–5) cm wide; apex acute to acuminate; base cuneate to rounded; margin ciliate and glandular serrulate; upper surface glabrous except on the midrib; lower surface glaucous and densely appressedly hairy to glabrescent, with curved hairs on sides and axils of midrib; midrib impressed on upper surface, prominent on lower surface; nerves 6–8 pairs, prominent on lower surface; reticulation fine; petioles 3–10 mm long. Inflorescence a panicle, 3–8 cm long, the lower branches usually subtended by foliage leaves; axis densely hairy to glabrescent; bracts and bracteoles linear, ciliate, 0.5–1 mm long, soon caducous; pedicels slender, 0–4 mm long. Flowers: calyx tube glabrous, 1–1.5 mm high; calyx lobes imbricate, glabrous, margin ciliate, semi-

circular to ovate, about 1 mm long; corolla white, deeply 5-lobed, 4–5 mm long; stamens 25–40, pentadelphous; disk 5-glandular, glabrous; style 3–4 mm long, glabrous; ovary 2-locular, with 4 ovules in each locule. *Fruits* black, obliquely ovoid, 6–8 mm long, 5–6 mm in diameter, persistent calyx lobes forming a very short beak; mesocarp thin; seed 1, reniform, with endosperm and curved embryo. *Pollen grains* 3-colporate, angular to semi-angular in polar view, oblate in equatorial view; tectum irregularly suprareticulate; ora slit-like; $19.1\text{--}19.3\text{ }\mu\text{m}$ (P) $\times$ $27.1\text{--}27.5\text{ }\mu\text{m}$ (E); pollen type IIa. —Flowers: Apr.–May. Fruits: Oct.–Nov.

Jap. name: Kuromi-no-sawafutagi

Habitat. Warm-temperate mixed forests, often in secondary forests.

Distr. Japan (Honshu: Yamaguchi; Kyushu), S Korea, China.



Map 5. Distribution of *Symplocos tanakana* Nakai.

JAPAN. **Honshu.** Yamaguchi: Niho-mura, Yoshiki-gun, *K. Oka* 6920 (TI); Ryuosan, Onodacho, *T. Oda* 3778 (TI); Hosenji, Konomine, Suwo, *T. Oda* 2145 (KYO); Niho, Yamaguchi-shi, *K. Oda* 6920 (KYO); Higashiatsuho, Kiuzan, *T. Oda* 3674 (KYO); Hatabu, Shimonoseki, *S. Murata* (KYO);

Shintchi, Shimonoseki, *M. Yamazaki* (KYO). **Kyushu.** Fukuoka: Katsuki, Onga, *M. Takenouchi* 12317 (KYO); Kusaba-onsen, Kashii, *M. Takaenouchi* 1659 (KYO); Koshosan, *G. Koidzumi* (KYO); Takagi-son, Asakura-gun, *Y. Nabeshima*; Munakata-gun, *T. Nakano* (KYO); Kawara-take, *G. Tashiro* (KYO), *Takenouchi & Hanai* 12265 (KYO). — Nagasaki: Mayu-yama, Shimabara, *S. Toyama* (KYO); Shimabara, *S. Toyama* 6 (TI); Mt. Unzen, *M. Togashi* (TI). Iki Is.: *T. Shinagawa* 1950 (TI). Tsushima Is.: *Faurie* 4838 (KYO); Mitake, *Z. Tashiro* (KYO); Funakoshi, *Y. Hara* (KYO); Kamiagata-gun, *Hara* (KYO); Tsutsu, Shimoagata-gun, *H. Ohashi & H. Ohba* 267 (KYO, TI); Mine, *Y. Yabe* (TI). — Kumamoto: Tsuetate, Aso, *Z. Tashiro* (KYO); Kimbosan, *H. Kamizuma* (KYO); Shodaisan, *Z. Tashiro* (KYO); Yamaga-shi, *Y. Shimada* 11371B (KYO); Mitama-mura, Kamoto-gun, *Z. Tashiro* (KYO); Kiyomizu-cho, Kumamoto-shi, *Tak. Shimizu* 86-1195 (KYO). — Oita: Usa, *Z. Tashiro* (KYO); Yokoyama-mura, Usa-gun, *Z. Tashiro* (KYO); Osada, Shimoge-gun, *Z. Tashiro* (KYO); Shimogo, Shimoge-gun, *T. Yamazaki* (KYO); Onodai-yama, Shimoge-gun, *T. Yamazaki* (KYO); Hachimensan, Sanko-mura, *Z. Tashiro* (KYO); Hiji, *Z. Tashiro* (KYO); Daitaro-toge, Hita-gun, *Z. Tashiro* (KYO); Nishitoko, Bungotakada-shi, *Z. Tashiro* (KYO); Mori, *Z. Tashiro* (KYO).

KOREA. Kyongsangnam-do: Pusan, *Faurie* 723 p.p. (KYO), *T. Nakai* 11996 (TI), *Z. Tashiro* (KYO); Jinhae, *T. Nakai* 11992 (TI); Koje Do, *T. Nakai* 11994 (TI); Mt. Chiri, *T. Nakai* 509 (TI); Nogodan, Chiisan, *M.-K. Pak* 188 (KYO). — Chollanam-do: *J. Ohwi* (KYO); Mudung-san, Kwangju, *H.-D. Chang* 1764 (KYO); Moppo, *T. Uchiyama* (TI); Owelalo Do, *T. Nakai* 11989 (TI); Tolsan Do, Yeosu, *T. Nakai* 11990 (TI); Chongsan Do, *T. Nakai* 11997 (TI). — Jeju-do: *Nakai* 1359, 6410, 6411 (TI), *Taquet* 5801 (TI); Hallai-san, *Faurie* 1891 p.p. (KYO).

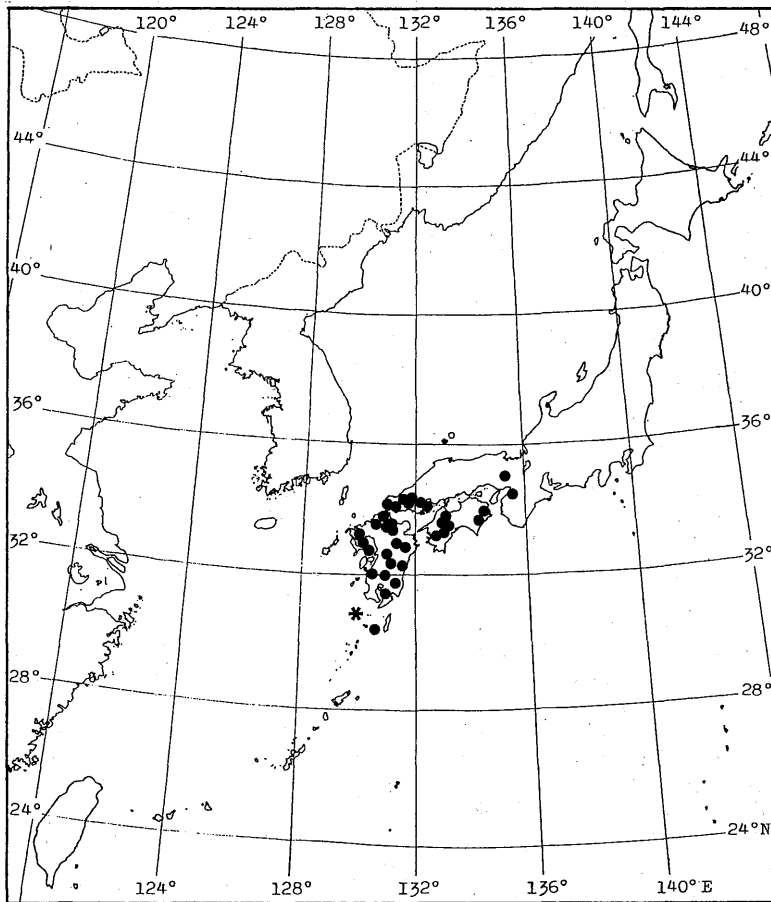
CHINA. Jiangsu: Lianyung, *T. Kanashiro* 5539 (KYO); Nanjing, 75 m, *K.-S. Chow* 80332 (KYO). — Zhejiang: Ningpo, *C.W. Everard* (KYO). — Anhui: Wangshan, *Chow* 143 (KYO); Ma'anshan, *K. Yao* 8521 (KYO). — Hubei: Wuhan, *Long* 038 (KYO); Shennongjia, 980 m, *G.-F. Tao & Z.-D. Jiang* 248 (KYO).

Sect. 2. *Lodhra* G. Don

Key to the species

- 1a. Racemes 10 to 30-flowered; stones narrowly ovoid to ellipsoid; seeds straight; young twigs gray. 9. *S. prunifolia*
 - 1b. Racemes 3 to 12(–17)-flowered; stones ampulliform to ovoid; seeds curved; young twigs green or brown.
 - 2a. Young twigs brown; racemes 5 to 10-flowered. 8. *S. caudata*
 - 2b. Young twigs green; racemes 3–6 or 5–12(–17)-flowered.
 - 3a. Pedicels slender, 8–15 mm long; racemes loosely 3 to 6-flowered; ora of pollen grains prominent. 6. *S. myrtacea*
 - 3b. Pedicels 1–8(–12) mm long; racemes 5 to 12(–17)-flowered; ora of pollen grains not prominent. 7. *S. liukiensis*
6. ***Symplocos myrtacea* Sieb. & Zucc.** — Fig. 3-6 & 4k, Map 6, Plate 55d, 56a–b.
- S. myrtacea* Sieb. & Zucc., Fam. Nat. 2: 133 (1846); Miq., Prol. Fl. Jap.: 267 (1867); Franch. & Sav., Enum. Pl. Jap. 1: 509 (1874); Brand, Pfl. R. Heft 6: 66 (1901); Matsumura, Ind. Pl. Jap. 2(2): 487 (1912); Ohwi, Fl. Jap.: 931 (1953); *ibid.* English ed.: 726 (1965); Kitamura & Murata, Wood. Fl. Jap. 1: 96, t. 96 (1971); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 171, pl. 188-4 & 5 (1989). — *Bobua myrtacea* Miers, J. Linn. Soc. Bot. 17: 306 (1879); Nakai, Tr. & Shr. ed. 1: 237, t. 132 (1922); *ibid.* ed. 2: 319, t. 149 (1927); Masamune, Fl. & Geo. Yakus.: 365 (1934). — *Dicalix myrtacea* Hara, Enum. Sperm. Jap. 1: 106 (1948). — Type: *von Siebold* (L!, Plate 55d; LE, MAK!), Japan.
- S. myrtacea* var. *latifolia* Hatusima, J. Jap. Bot. 26: 373 (1951). — Type: *S. Hatusima* 13431 (KAG!), Kuroshima Is., Ohsumi, Japan.
- S. myrtacea* var. *pubescens* Uyeki & Tokui, J. Jap. Bot. 29: 229 (1954). — Type: *O. Tokui* (MATSU!, Plate 56a; isotype in KYO!), Omogo-kei, Iyo, Shikoku, Japan.
- S. sumuntia* auct. non Buch.-Ham. ex D. Don: Nooteboom, Leid. Bot. Ser. 1: 284 (1975), *p. min. p.*

Small evergreen trees; bark dark brown tinged with violet, smooth. Twigs brown, terete; young twigs green, glabrous, slender, about 1 mm in diameter. Terminal buds glabrous, subulate, often curved, 3–7 mm long. *Leaves*: blades thinly coriaceous, widely elliptic to elliptic, ovate, narrowly ovate to lanceolate, 3–7 cm long, 1–3 cm wide; apex caudate with apiculate tip; base rounded or sometimes cuneate; margin slightly recurved, undulate serrate with teeth 2–5 mm apart; both surfaces glabrous; midrib slightly impressed on upper surface at least near base, slightly prominent on lower surface; nerves 4–6 pairs, slightly prominent on both surfaces; petioles slender 8–15 mm long. *Inflorescence* an axillary simple raceme, loosely (1–)3 to 6-flowered, (1–)2–4 cm long, axis and pedicels glabrous or rarely sparsely with brown hairs, on nodes often with brown hairs; pedicels slender, 8–15 mm long; bracts ovate to elliptic, boat-shaped, 4–6 mm long, caducous, inside glabrous, outside with dense appressed brown hairs; bracteoles 2, narrowly ovate to lanceolate, boat-shaped, about 3 mm long, caducous, inside glabrous, outside with same indument as bracts.



Map 6. Distribution of *Symplocos myrtacea* Sieb. & Zucc. Var. *myrtacea* (disk) and var. *latifolia* Hatusima (star).

Flowers: calyx tube glabrous, 1.5 mm high, calyx lobes triangular, about 1 mm long, glabrous, the margin often ciliate, rarely with brown hairs at the apex; corolla white, deeply 5-lobed, 6–7 mm long, lobes elliptic; stamens 25–40, connate only at base; disk annular, glabrous; style 5–6 mm long; ovary 3-locular, with 4 ovules in each locule. **Fruits** dark violet, narrowly ovoid, 7–8 mm long, 3–5 mm in diameter, crowned by the persistent calyx lobes; stone ampulliform to ovoid, smooth to slightly grooved, 4–6 mm by 3–4 mm; mesocarp thin; seed 1, curved, with endosperm and curved embryo. **Pollen grains** 3(–4)-colporate, semiangular in polar view, oblate to suboblate in equatorial view; colpus very short; tectum densely and fine verrucate; ora circular to transversely elliptic; 22.0–23.4 μm (P) $\times$ 28.8–32.1 μm (E); pollen type IIb. — **Flowers:** late Apr. – May. **Fruits:** Aug. – Sept.

Jap. name: Hainoki

Habitat. Warm-temperate forests, often dominant in understory of *Abies-Tsuga* forests.

Distr. Japan (Honshu, Shikoku, Kyushu), endemic.

Key to the varieties

- 1a. Blades elliptic, ovate, narrowly ovate to lanceolate, 2.5–5 times longer than broad. 6-1. var. *myrtacea*
- 1b. Blades widely elliptic to ovate, 1.7–2.5 times longer than broad. 6-2. var. *latifolia*

6-1. var. *myrtacea* — Plate 56a.

All synonyms except *S. myrtacea* var. *latifolia* Hatusima

Blades elliptic, ovate, narrowly ovate to lanceolate, 4–7 cm by 1–2.5 cm.

Distr. Japan (Honshu, Shikoku, Kyushu), endemic.

JAPAN. Honshu. Osaka: Nanokawa, Izumi, *S. Matsuda* TNS32085 (TNS). — Hyogo: Saikouji-san, Nishiwaki-shi, *H. Muroi* TNS100062 (TNS). — Shimane: Suzuno'otani-yama, *S. Okuyama & H. Utsumi* 11549, 11550, 11553, 11554, 11555 (TNS). — Hiroshima: Aku-dani, Shiwa-mura, Saeki-gun, *M. Wada* 4043 (KYO); Itsukushima Is., *M. Hotta* 6087 (KYO), *H. Muramatsu* (TI). — Yamaguchi: Sazanami-mura, Abu-gun, *J. Nishina* TNS260795 (TNS); Nameri-yama, Saba-gun, *S. Okamoto* (KYO), *K. Oka* 6738 (KYO), 12031 (TNS); Chomon-kyo, *G. Koidzumi* (KYO), *H. Migo* (KYO), *H. Masaki* 13676 (KYO); Doigatake, Ayagi-mura, Mine-gun, *T. Nakai* (TI); Sakane-mura, Kuga-gun, *Z. Tashiro* (KYO); Miyano, Suwo, *J. Oda* (KYO); Sekichukei, Toyoura-gun, *H. Migo* (KYO). **Shikoku.** Tokushima: Sanagochi-mura, Myodo-gun, *T. Inobe* 8 (TI), *J. Nishina* 46906 (TNS). — Ehime: Onigajoyama, *T. Nakai* (TI); Mt. Ishizuchi, *R. Yatabe* (TI); Omogo, *N. Satomi* (TI); Nametoko, *S. Okuyama* 22986 (TNS); Kita-gun, *T. Imaizumi* 103 (KYO); Nishiwa-gun, 820 m, *Y. Nomura* 15 (KYO); Sakaseyama, Kamiukena-gun, *G. Koidzumi*. — Kochi: Godai-san, TNS23506 (TNS); Kuroson, *S. Okuyama* 15751 (TNS); Mt. Irazu-yama, Higahsitsunoyama-mura, Takaoka-gun, *M. Tagawa* 2868 (KYO); Mt. Yokogura, Ochi-cho, Takaoka-gun, *G. Murata & T. Shimizu* 697 (KYO); Mt. Kakusho-mori, Takaoka-gun, *T. Shimizu* 5918 (KYO); Narukawa–Otakijinja, Tamioka-mura, 600 m, *G. Murata & T. Shimizu* (KYO). **Kyushu.** Fukuoka: Adachi-yama, Moji, *T. Hashimoto* (TI); Ehiko-san, *Faurie* 111 (KYO); Mt. Inugatake, 600 m, *M. Hotta* 6159 (KYO), 400–1130 m, *T. Yahara et al.* 5508 (KYO). — Saga: Mt. Tara-dake, *J. Chiba* (KYO); Mt. Kurokami-san, 120–518 m, *H. Nagamasu* 1889 (KYO). — Nagasaki: Mt. Tara-dake, *Z. Tashiro* (TNS), *T. Yamazaki* (TI); Omura, *S. Toyama* (TNS); Unzen to Shimabara, *M. Togashi* TNS81712 (TNS). — Kumamoto: Yadake, *Z. Tashiro* (KYO, TNS); Izumi-mura, Yatsushiro-gun, 600–700 m, *M. Hotta* 12011 (KYO); Ichifusa, *Faurie* 3899 (KYO). — Oita: Mt. Sobu, *Faurie* 3276 (KYO), *Z. Tashiro* (KYO), Obira to the summit, *N. Fujita* 660 (KYO); Mt. Katamuki-san, *S. Kitamura* (KYO); Uwahara to Tsuzura, Onogun, 500 m, *N. Fujita & H. Takahashi* 45 (KYO); Kin'unryo, Fukayabakei, Kusu-gun, 400 m, *G. Murata* 45669 (KYO). — Miyazaki: Mt. Okue, Sanriga-

wara, 900 m, *K. Inoue 1122* (TI); Mt. Osuzu-yama, 500–700 m, *H. Koyama 7590* (KYO), *N. Fukuoka 7166* (KYO); Mt. Ougiyama to Matuki, Shiiba-mura, Higashiusuki-gun, *M. Hotta 10464* (KYO); Mts. Kirishima, Mt. Hinamori, *Z. Tashiro* (KYO), Mt. Karakuni, *Z. Tashiro* (KYO); Ebino-kogen, *G. Murata et al. 165* (KYO); Mt. Wanizuka, Tano-mura, *M. Nagasawa TNS113285* (TNS). — Kagoshima: Mt. Takakuma, *G. Koidzumi* (KYO, TI), Uchino to Ontake, 500 m, *G. Murata & H. Nakamura 32* (KYO), *T. Yamazaki et al.* (KYO, TI); Mts. Kirishima, Maruo, *Z. Tashiro* (KYO); Mt. Shibisan, Shibitoge, 400 m, *M. Togashi MT7002* (KYO); Mt. Kaimon, *Y. Hashiguchi* (KYO). Yakushima Is.: *Faurie 3811* (KYO); Mt. Kuniwari-dake, *S. Okamoto* (KYO); Mt. Shichigo-dake, 1000–1100 m, *H. Doei & H. Nagamasu 4* (KYO); Kosugidani, 750 m, *H. Ohba 662599* (TI); Kosugidani–Takatsuka-goya, 800 m, *G. Murata & H. Tabata 514* (KYO); Shiratani-unsuikyo, 620–900 m, *J. Murata et al. 15817* (TI); Hanayama, *S. Miisuta & H. Doei 704* (KYO, TI); and many other collections.

6-2. var. *latifolia* Hatusima — Plate 56b.

S. myrtacea var. *latifolia* Hatusima

Blades widely elliptic to ovate, 3–6 cm by 1.5–3 cm.

Jap. name: Hiroha-hainoki

Distr. Japan (Kyushu: Kuroshima Is.), endemic.

JAPAN. Kyushu. Kagoshima. Kuroshima Is.: *S. Hatusima 13431* (KAG), *M. Sato 2017* (TNS); Mt. Yokodake, 600 m, *S. Sako 599* (KAG; KYO, Plate 56b).

7. *Symplocos liukiensis* Matsumura — Fig. 3-7, Map 7, Plate 56c–d, 57a.

S. liukiensis Matsumura, Bot. Mag. Tokyo 15: 78 (1901); Walker, Imp. Tr. Ryukyu Is.: 268 (1954); Hatusima, Fl. Ryukyus: 478 (1971) 478. — *Bobua liukiensis* Sasaki, Cat. Gov. Herb.: 408 (1930); Nemoto, Fl. Jap. Suppl.: 582 (1936). — *Dicalix liukiensis* Hara, Enum. Sperm. Jap. 1: 105 (1948). — Type: *Y. Tashiro* (TI!, Plate 56c), Okinawa, Ryukyu Is., Japan.

S. obana Masamune, Trans. Nat. Hist. Soc. Form. 30: 60 (1940). — *Dicalix obanus* Hara, Enum. Sperm. Jap. 1: 106 (1948). — Type: *Ohba 12* (TAI, *non vidi*, isotype in KYO!, Plate 56d), Tina, Okinoerabu Is., Ryukyu Is., Japan.

S. sumuntia auct. *non* Buch.-Ham. *ex* D. Don: Nooteboom, Leid. Bot. Ser. 1: 284 (1975), *p. min. p.*; Shimabuku, Check List Ryukyu Is.: 354 (1990).

S. caudata auct. *non* Wall. *ex* G. Don: Hatusima, Fl. Ryukyus rev. ed.: 888 (1975); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 173, pl. 193-4 (1989).

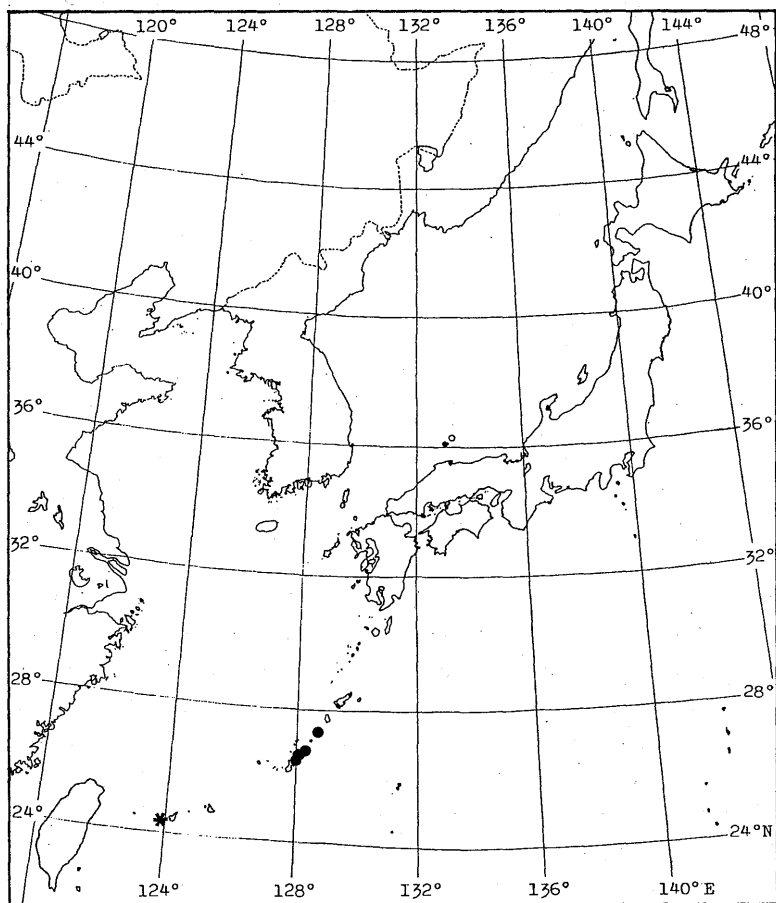
S. prunifolia auct. *non* Sieb. & Zucc.: Walker, Fl. Okinawa South Ryukyu Is.: 832 (1976).

Evergreen trees; bark dark brown, smooth. Twigs dark brown, terete; young twigs green, glabrous. Terminal buds ovoid, narrowly ovoid or subulate, 2–6 mm long, apex acute and often curved, with a few glabrous or puberulous, ciliate-margined scales. Leaves: blades coriaceous, elliptic to narrowly elliptic, 4–12 cm long, 1.5–4 cm wide; apex caudate with apiculate tip; base cuneate-attenuate; margin recurved, crenate with teeth 2–8 mm apart; both surfaces glabrous; midrib impressed on upper surface, prominent on lower surface; nerves 4–7(–8) pairs, slightly prominent on both surfaces; petioles glabrous, 5–15 mm long. Inflorescence an axillary simple raceme, loosely 5 to 12(–17)-flowered, 2–8 cm long, axis and pedicels glabrous or sparsely pilose; pedicels 1–8(–12) mm long; bracts gradually changing from orbicular at base to obovate at top, or ovate at base to obovate at top, boat shaped, 3–5 mm long, caducous, adaxially glabrous, abaxially densely appressed hairy, but lower bracts often glabrescent except for ciliate margin; bracteoles 2, elliptic or narrowly

elliptic, 2.5–3 mm long, the apex acute, margin ciliate, often glandular denticulate near base, inside glabrous, outside with same indument as bracts. *Flowers*: calyx tube glabrous, 1.5 mm high; calyx limb 1.5–3 mm long; calyx lobes ovate to triangular 1.5–3 mm long, outside often pilose near apex, margin ciliate; corolla pale violet, deeply 5-lobed, 6–7 mm long, the lobes elliptic; stamens 15–35(–45), connate at base; disk annular, glabrous; style glabrous, 5–9 mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* ampulliform, 7–8 mm by 4–5 mm, crowned by persistent calyx lobes; stone ampulliform, smooth to slightly grooved, 5–6 mm by 3–4 mm; mesocarp thin; seed 1, curved, with curved embryo. *Pollen grains* 3-colporate, angular to semiangular in polar view, oblate in equatorial view; tectum fine corrugate and partly verrucate; colpi very short; ora transversely elliptic; $23.3\text{--}24.2\text{ }\mu\text{m}$ (P) $\times$ $32.5\text{--}33.7\text{ }\mu\text{m}$ (E); pollen type IIc. — *Flowers*: Jan. – Apr. *Fruits*: Dec. – Feb. (Takushi, 1983).

Jap. name: Aobana-hainoki

Habitat. Subtropical montane evergreen forest.



Map 7. Distribution of *Symplocos liukiensis* Matsumura. Var. *liukiensis* (disk) and var. *iriomotensis* Nagamasu (star).

Distribution. Japan (Ryukyu), endemic.

Key to the varieties

- 1a. Leaves coriaceous, nerves 4–6 pairs, blades 4–8 cm long, 1.5–3 cm wide. 7-1. var. *liukiuensis*
 1b. Leaves thinly coriaceous, nerves 6–7(–8) pairs, blades 7–12 cm long, 2.5–4 cm wide.
 7-2. var. *iriomotensis*

7-1. var. *liukiuensis* — Plate 56c–d.

All synonyms

Terminal buds ovoid to narrowly ovoid, 2–4 mm long, with a few glabrous or puberulous ciliate-margined scales, apex acute, often curved. *Leaves*: blades coriaceous, elliptic, 4–8 cm long, 1.5–3 cm wide; margin with teeth 4–8 mm apart; nerves 4–6 pairs; petioles 5–10(–12) mm long. *Inflorescences*: axis and pedicels glabrous or rarely sparsely pilose; bracts gradually changing from orbicular at base to obovate at top, 3–4 mm long; bracteoles elliptic. *Flowers*: calyx limb 1.5–2.5 mm long; calyx lobes ovate to triangular, 1.5–2 mm long; stamens 20–35; style 5–7 mm long.

Jap. name: Aobana-hainoki

Distr. Japan (Ryukyu: Okinoerabu Is., Okinawa Is.), endemic.

JAPAN. **Ryukyu**. Kagoshima. Okinoerabu Is.: *S. Hatusima* & *Y. Miyagi* 39112, 39310 (RYU); China, *H. Ohba* 12 (KYO); Oyama, *T. Amano* 6420 (KYO, RYU), *S. Hatusima* & *S. Sako* 21498, 21500, 21572, 31008, 31010 (KAG, TI), *T. Shimizu* 85-418 (KYO). — Okinawa. Okinawa Is.: *T. Miyagi* 350 (KYO); Kushima, *Y. Tashiro* (TI, type); Kunigami, *S. Sakaguchi* (KYO); Benokigawa, *Z. Tashiro* (KYO); Sade, *S. Sakaguchi* (KYO), *S. Sonohara* (KYO); Tanyu-dake, Haji-mura, *T. Kinjo* 1637 (RYU); Ibu-dake, *Z. Tashiro* (KYO); Meijiyama, Nago, *S. Hatusima* 39338 (RYU); Nago-dake, 200–345 m, *H. Nagamasu* 1662, 1665, 1994 (KYO); Yonaha-dake, *S. Sakaguchi* (KYO), *S. Tawada* 285 (KYO), *M. Furuse* 4896 (RYU); Nakagami, *Tashiro* (TI); Mt. Onnadake, 150 m, *S. Hatusima* 17803 (RYU, TI).

7-2. var. *iriomotensis* Nagamasu, var. nov. — Plate 57a.

Laminae tenuiter coriaceae, 7–12 cm longae, 2.5–4 cm latae, venis primariis 6–7(–8) paribus. — Typus: *S. Mitsuta* & *H. Nagamasu* 435 (KYO, Plate 57a), the river Yutsun to the pond Maboroshi-no-ike, Iriomote-jima Is., Okinawa Pref., 260–380 m alt. March 15, 1984.

Terminal buds subulate and often curved, 3–6 mm long, puberulous to glabrescent, margin of the scales ciliate. *Leaves*: blades thinly coriaceous, elliptic to narrowly elliptic, 7–12 cm long, 2.5–4 cm wide; margin with teeth 2–8 mm apart; nerves 6–7(–8) pairs; petioles 5–15 mm long. *Inflorescences*: axis and pedicels sparsely pilose to glabrescent, nodes often hairy; bracts gradually changing from ovate at base to obovate at top, 3–5 mm long, apex acute; bracteoles narrowly elliptic. *Flowers*: calyx limb 2–3 mm long, deeply divided to base, lobes ovate, triangular, narrowly elliptic; stamens 15–20 (30–45 in one specimen); style 7–9 mm long. *Fruits*: mature fruits unknown.

Jap. name: Iriomote-hainoki

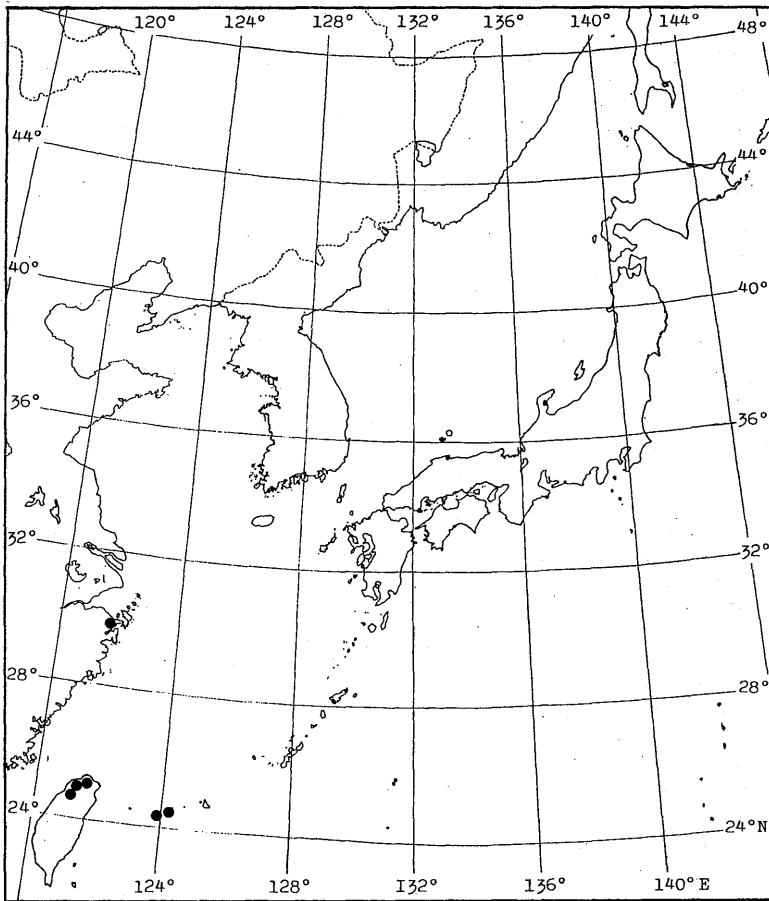
Distr. Japan (Ryukyu: Iriomote Is.), endemic.

JAPAN. **Ryukyu.** Okinawa. Iriomote Is.: Y. Miyagi 3553 (RYU); F. Yamazaki et al. (TI), Y. Tateishi & J. Murata 4779, 4780A, 4780B (TI); Urauchi River, 30–280 m, H. Okada et al. 242, 245, 264, 301 (KYO), H. Nagamasu 1611, 1613, 1620 (KYO), S. Noshiro & M. Suzuki 5084 (KYO); Urauchi River to Mt. Tedoh, S. Mitsuta & H. Nagamasu 611 (KYO); Mt. Komi, Y. Miyagi 9705 (RYU); Yutsun River, 260–380 m, S. Mitsuta & H. Nagamasu 430, 431, 434, 435, 437, 445, 446 (KYO); Nakama River, S. Noshiro 5163 (KYO).

8. **Symplocos caudata** Wall. ex G. Don—Fig. 3-8, Map 8, Plate 57b–d, 58a–d.

- S. caudata* Wall. [Cat. 4413 (1830), *nomen nud.*] ex G. Don, Gen. Syst. 4: 3 (1837 or early 1838); A. DC., Prodr. 8: 256 (1844); Kurz, J. As. Soc. Beng. 46(2): 237 (1877); For. Fl. Br. Burma 2: 147 (1877); C.B. Clarke, Fl. Br. Ind. 3: 577 (1882); Brand, Pfl. R. Heft 6: 42 (1901); Brandis, Ind. Tr.: 440 (1906); Sargent, Pl. Wilson. 2: 595 (1916); Gontscharow, Not. Syst. Ross. 5: 103 (1904); Guillaumin, Bull. Soc. Bot. Fr. 71: 276 (1924); Fl. Gen. I.-C. 3: 1021 (1933); Fletcher, Fl. Siam. En. 2: 385 (1838); Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 18 (1943); Li, J. Wash. Ac. Sc. 43: 107 (1953); Wood, Fl. Taiwan: 742 (1963); Hatusima, Fl. Ryukyus: 477 (1971); Ying, Bull. Exp. Forest Nat. Taiwan Univ.: 116 (1975); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 173, excl. pl. (1989).—Type: *Wallich 4413* (K-W, photo!, isotypes in BM! Plate 57b, CGE, E!, G-DC, L!, LE, NY, W!), Sylhet, India.
- S. swinhoeana* Hance, Ann. Soc. Nat. ser. 4(15): 226 (1861).—Type: *de Grijs in Herb. Hance 6697* (BM!, Plate 57c), Fu Kien.
- S. caudata* var. *maculata* Brand, Pfl. R. Heft 6: 42 (1901).—Type: *Warburg 5851* (K!, Plate 57d), Mt. Kushan, Futschau, South China.
- S. somai* Hayata, Ic. Pl. Form. 9: 69 (1919); Mori, Sylvia 5: 244 (1934); Kanehira, Form. Tr. (ed. 1936): 599, t. 556.—*Bobua somai* Kanehira & Sasaki, List Pl. Form.: 332 (1928); Sasaki, Cat. Govt. Herb.: 408 (1930).—Type: *T. Soma s.n.* (TI!, Plate 58a), Dec. 1915, Daikwakei, Toyencho, Formosa.
- S. sozanensis* Hayata, Ic. Pl. Form. 9: 70 (1919); Mori, Sylvia 5: 244 (1934); Kanehira, Form. Tr. (ed. 1936): 599, t. 557.—*Bobua sozanensis* Kanehira & Sasaki, List Pl. Form.: 332 (1928); Sasaki, Cat. Govt. Herb.: 408 (1930).—Type: *Y. Shimada s.n.* (TI!, Plate 58b), July 1918, Sozan, Formosa.
- S. yaeyamensis* Masamune, Trans. Nat. Hist. Soc. Form. 30: 61 (1940).—Type: *Takamine N.F. 6913* (TAI, *non vidi*), Kare-zan, Ishigaki Is., Ryukyu Is., Japan.
- Bobua austrosinensis* Migo, Bot. Mag. Tokyo 56: 267 (1942).—Type: *McClure CCC13164* (SH, *non vidi*, isotype in KYO!, Plate 58d), near Kong Ts'eun, little North river, Kwangtung.
- S. sumuntia* auct. *non* Buch.-Ham. ex D. Don: Nooteboom, Leid. Bot. Ser. 1: 284 (1975), *p. min. p.*
- S. prunifolia* auct. *non* Sieb. & Zucc.: Walker, Fl. Okinawa South. Ryukyu Is.: 832 (1976), *p.p.*

Evergreen trees; bark brown, smooth. Twigs dark brown, terete; young twigs brown, puberulous and densely to sparsely pilose to glabrescent. Terminal buds subulate, 3–6 mm long, apex often curved, puberulous and densely to sparsely pilose. *Leaves*: blades coriaceous, elliptic to narrowly elliptic, rarely ovate, 4–8 cm long, 2–4(–5) cm wide; apex caudate with apiculate tip; base cuneate-attenuate; margin slightly recurved, crenate-serrate with teeth 2–5(–7) mm apart; both surfaces glabrous, or sparsely hairy on the midrib on lower surface; midrib impressed on upper surface, prominent on lower surface; nerves 5–7 (–8) pairs, slightly prominent on both surfaces; reticulation fine, often slightly prominent on both surface; petioles glabrous, or puberulous and/or sparsely pilose, 5–8 mm long. *Inflorescence* axillary, a simple raceme, 5 to 10-flowered, 1–3(–4) cm long, axis and pedicels pilose, often with minute bristly hairs; pedicels 1–4(–8) mm; bracts gradually changing from orbicular at base to obovate at top, apex obtuse and abruptly acute, meniscoid to boat-shaped, 2–3 mm long, caducous, inside glabrous, outside appressed hairy, margin ciliate;



Map 8. Distribution of *Symlocos caudata* Wall. ex G. Don.

bracteoles 2, narrowly elliptic to lanceolate, boat-shaped, 1.5–2 mm long, apex acute, margin ciliate, often glandular denticulate near base, inside glabrous, outside with same indument as bracts. *Flowers*: calyx tube glabrous, 1–1.5 mm high; calyx limb 1–2 mm long; calyx lobes ovate to narrowly ovate, 1–1.5 mm long, the apex acute or obtuse; outside appressedly hairy at least near the apex; corolla white, deeply 5-lobed, 3–4 mm long, the lobes elliptic; stamens 35–60, connate at base; disk annular, glabrous; style glabrous, 4–5 mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* ampulliform, 5–7(–10) mm by 3–4(–5) mm, crowned by persistent calyx lobes; stone ampulliform, smooth to slightly grooved; mesocarp thin; seed 1, curved, with curved embryo. *Pollen grains* 3-colporate, semiangular in polar view, oblate to suboblate in equatorial view; tectum densely finely verrucate; colpi very short; ora circular to transversely elliptic; $22.7\ \mu\text{m}$ (P) $\times$ $29.4\ \mu\text{m}$ (E); pollen type IIb. — *Flowers*: Nov. – Dec. *Fruits*: mature fruits unknown.

Jap. name: Yaeyama-kurobai

Habitat. Subtropical evergreen forests.

Distr. Japan (Ryukyu: Ishigaki & Iriomote Isls.), Taiwan, China, Indochina, Thailand, ?Burma, India, Malay Peninsula.

JAPAN. **Ryukyu.** Okinawa. Ishigaki Is.: Kare-san, *S. Tawada* 289 (KYO), *G. Koidzumi* (KYO, Plate 58c), *E. Takamine* 227 (KYO); Banna-dake, 150 m, *T. Yamazaki* 22105 (KYO, TI), *H. Nagamasu* 1087, 1095, 1098, 1103, 1141 (KYO); Mt. Omoto-dake, *Y. Niino* 2053 (RYU), *M. Furuse* 2397 (RYU); Mt. Fukaimoto, 100 m, *G. Ikeda* 4388 (RYU). Iriomote Is.: *S. Sonohara* 1239 (RYU), *G. Koidzumi* (KYO); Aira River, *Y. Miyagi* 9744 (RYU, TI), Urauchi-gawa, *H. Nagamasu* 1325, 1327 (KYO).

TAIWAN. Taipei Co.: Neihu, *C.M. Kuo* 9284 (KYO, TI). — Taoyuan: *T. Soma* (TI). — Xinzhu: Hetin, *Y. Shimada* 1180 (TI). Okaseki, *Faurie* 182 (KYO, TI).

CHINA. Zhejiang: Ningpo, *C.W. Everard* (KYO). — Guangdong: Sha Lo Shan, Sin-fung District, *Y.M. Taam* 169 (KYO); Tai Mo Shan, Tapu District, *W.T. Tsang* 21063, 21138 (KYO). — Hainan.: *S.K. Lau* 27001 (KYO); Chim Fung Mt., near Sha Mo Kwat Village, Kan-en District, *S.K. Lau* 4974 (KYO).

INDOCHINA. Annam: Blao Prov., Haut Donnai, 800 m, *Poilane* 22247 (KYO). — Cambodia: Cheko, Koh Kong, near Sihanoukville, *T. Kira et al.* 1065 (KYO).

THAILAND. Loei: Phu Kradung, 900–1250 m, *T-22662*, 22693, 23056, 23192, 31320, 40193, 40258, 42306, 42914 (KYO). — Nakon Ratchasima: Kao Yai, 650–1050 m, *T-19697*, 35037 (KYO). — Chaiyaphum: Tunkamang, 800 m, *van Beusekom et al.* 4276 (KYO). — Chiang Mai: Doi Inthanon, 1020 m, *T-35395* (KYO). — Payap: Sop Aep village–Pa Mon village, *E. Hennipman* 3372 (KYO).

INDIA. Sylhet: *Wallich* 4413 (BM, E, W).

MALAY PENINSULA. Pahang: Gunung Tahan, *Ridley* 16079 (SING); Cameron Highland, *Asakusa* (SING).

9. *Symplocos prunifolia* Sieb. & Zucc. — Fig. 3-9 & 4g, Map 9, Plate 59a–d.

S. prunifolia Sieb. & Zucc., *Fam. Nat.* 2: 133 (1846), *Miq.*, *Prol. Fl. Jap.*: 265 (1867); *Franch. & Sav.*, *Enum. Pl. Jap.* 1: 308 (1875); *Forbes & Hemsley*, *J. Linn. Soc. Bot.* 26: 74 (1889); *Hand.-Mazz.*, *Beih. Bot. Centralbl.* 62B: 22 (1943), *p.p.*; *Walker*, *Imp. Tr. Ryukyu Is.*: 266 (1954); *Ohwi*, *Fl. Jap.*: 933 (1953); *ibid.* English ed.: 727 (1965); *Hatusima*, *Fl. Ryukyus*: 477 (1971); *Kitamura & Murata*, *Wood. Fl. Jap.* 1: 97, t. 114 (1971); *Walker*, *Fl. Okinawa South. Ryukyu Is.*: 832, t. 167 (1976), *p.p.*; *Murata in Satake et al.*, *Wild Fl. Jap. Wood. Pl.* 2: 273, pl. 192-1 & 2 (1989); *Shimabuku*, *Check List Ryukyu Is.*: 354 (1990). — *Bobua prunifolia* *Miers*, *J. Linn. Soc. Bot.* 17: 306 (1879); *Nakai*, *Tr. & Shr. ed.* 1: 235, t. 131 (1922); *Fl. Sylv. Koreana* 13: 36, t. 11 (1923); *Masamune*, *Fl. & Geo. Yakus.*: 365 (1934). — *Dicalix prunifolius* *Hara*, *Enum. Sperm. Jap.* 1: 107 (1948). — Type: *von Siebold* (L!, Plate 59a), Japan.

S. prunifolia var. *paucistaminosa* *Gontscharow*, *Not. Syst. Ross.* 5: 104 (1924). — Type: *Fortune* 25 (BM! Plate 59b, K!, P, W!), China borealis. (Lectotypification: *Nooteboom*, *Leid. Bot. Ser.* 1: 285 (1975)).

S. prunifolia var. *uia* *Makino*, *J. Jap. Bot.* 3: 10 (1926); *Ohwi*, *Fl. Jap.*: 933 (1953). — *Bobua prunifolia* var. *uia* *Nakai*, *Tr. & Shr. ed.* 2: 319 (1927). — *B. uia* *Nakai*, *Bot. Mag. Tokyo* 43: 448 (1929). — *B. prunifolia* forma *uia* *Sugimoto*, *Key Tr. & Shr. Jap.*: 323 (1936). — *Dicalix prunifolius* var. *uia* *Hara*, *Enum. Sperm. Jap.* 1: 107 (1948). — *S. prunifolia* forma *uia* *Ohwi*, *Fl. Jap. English ed.*: 727 (1965), *nomen nud.* — Lectotype: *N. Ui* (TI!), Inari Prov., Kii, Japan, 15 May 1925 (designated here).

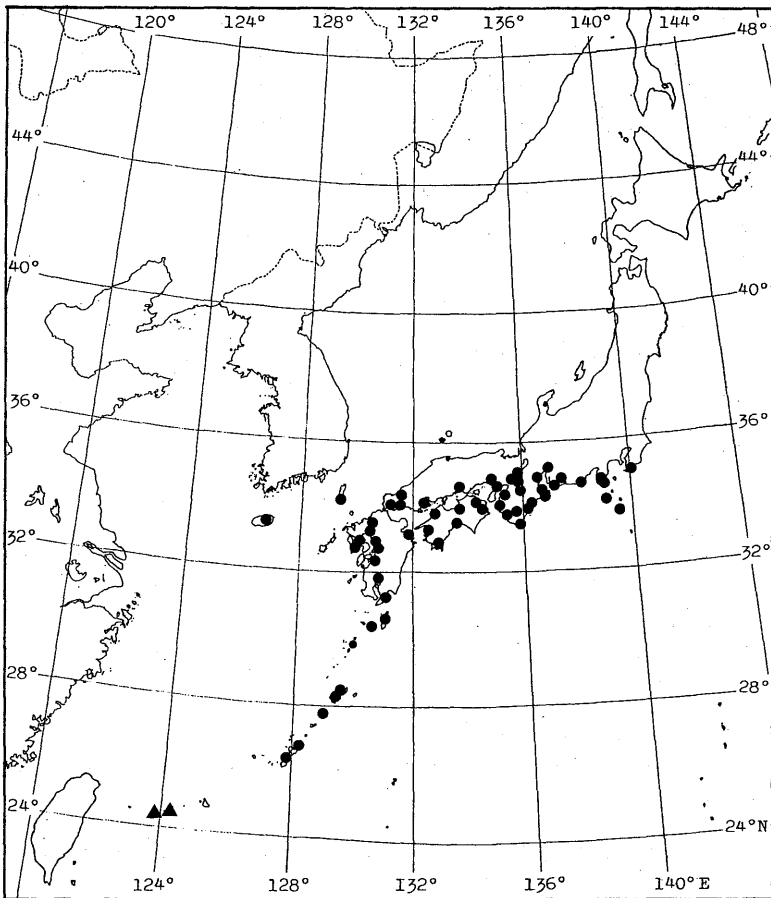
S. caudata auct. non *Wall. ex G. Don*: *Brand*, *Pfl. R. Heft.* 6: 42 (1901), *p.p.*; *Matsumura*, *Ind. Pl. Jap.* 2(2): 485 (1912).

S. caudata var. *maculata* sensu *Brand*, *Pfl. R. Heft* 6: 42 (1901), *p.p.*

S. sumuntia auct. non *Buch.-Ham. ex D. Don*: *Nooteboom*, *Leid. Bot. Ser.* 1: 284 (1975); *Wu*, *Fl. Reip. Pop. Sin.* 60(2): 22 (1987).

Evergreen trees; bark gray-violet, smooth. Young twigs ridged below petioles, glabrous, gray, later gray-violet. Terminal buds glabrous; apex acute to caudate, often curved, 5–10 mm long. Leaves: blades coriaceous, narrowly elliptic to narrowly oblong, 4–12 cm

long, 2–3 cm wide; apex caudate, base cuneate to acute; margin slightly recurved, undulate-serrate with teeth 2–5 mm apart; both surfaces glabrous; midrib impressed on upper surface, prominent on lower surface; nerves 7–12 pairs, slightly prominent on lower surface; reticulation coarse; petioles often tinged red, 8–15 mm long. *Inflorescence* axillary, a simple raceme, forming a globose cone in buds, rather densely 10 to 30-flowered, (2–)3–8 cm long, axis and pedicels puberulent; pedicels 0.5–4 mm long; bracts orbicular to elliptic, boat-shaped, 3–5 mm long, caducous, inside glabrous, outside glabrescent, margin ciliolate or glabrous; bracteoles 2, ovate, 1.5–2.5 mm long, caducous, inside glabrous, outside pilose, margin ciliate. *Flowers*: calyx tube glabrous, 1.5 mm high; calyx lobes imbricate, glabrous, semicircular to ovate with ciliate margin, 1–1.5 mm long; corolla white, deeply 5-lobed, 4–6 mm long, lobes elliptic; stamens 25–35, indistinctly pentadelphous; disk annular, glabrous; style 4–5 mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* black, narrowly ovoid to ellipsoid, 6–8 mm long, 3–4 mm in diameter, crowned by persistent calyx lobes; stone narrowly ellipsoid, smooth, 6–7 mm by 2–3 mm, mesocarp thin; seed 1, straight with



Map 9. Distribution of *Symlocos prunifolia* Sieb. & Zucc. Var. *prunifolia* (disk) and var. *tawadae* Nagamasu (triangle). A small disk is based on the literature.

endosperm and straight embryo. *Pollen grains* (2-)3(-4)-colporate, subangular to semilobate in polar view, oblate in equatorial view; tectum finely corrugate and partly verrucate; colpi very short; ora transversely elliptic; 20.3–23.5 μm (P) $\times$ 28.8–34.1 μm (E); pollen type IIc. — Flowers: Mar. (Ryukyu), Apr. – early May. Fruits: Oct. – Nov.

Jap. name: Kurobai

Habitat. Subtropical to warm-temperate evergreen forests.

Distr. Japan (Honshu, Shikoku, Kyushu, Ryukyu), Korea (Jeju Is.), China.

Notes. 1. This species is closely related to *S. heishanensis* Hayata of Taiwan. The latter differs from *S. prunifolia* by having smaller bracts (2–3 mm long) and narrower and thinner leaves.

2. Several collections from around Tanabe-shi, Wakayama Pref. (with asterisk in the list of *S. prunifolia* var. *prunifolia*), have orbicular leaves and short racemose inflorescences. The plants of this form have been treated as a distinct species, *S. uiae*, or a variety or a form of *S. prunifolia*. The stamens are only four, and the lower part of the style is obliquely swollen with undeveloped ovules (*i.e.* the ovary is superior to semi-inferior!). I visited Tanabe-shi and searched for this plant, but only found that the usual form of *S. prunifolia* is common, there. Thus, it does not seem that this form represents a local variety of *S. prunifolia*. All collections of this form were made in 1924 or 1925, soon after the first discovery by Mr. N. Ui on 5 May 1924, and might be collected from the same tree. I treat this taxon as a monstrous form of *S. prunifolia* var. *prunifolia*, because it has unusual floral characters in the genus.

Key to the varieties

- | | |
|---|-----------------------------|
| 1a. Blades 4–9 cm long, nerves 7–9(–10) pairs. | 9-1. var. <i>prunifolia</i> |
| 1b. Blades 7–12 cm long, nerves 9–12 pairs. | 9-2. var. <i>tawadae</i> |

9-1. var. *prunifolia*

All synonyms.

Terminal buds about 5 mm long. *Leaves*: blades 4–8 cm long, 2–3 cm wide; nerves 7–9(–10) pairs; petioles 8–15 mm long. *Inflorescences* (2–)3–8 cm long. *Flowers*: calyx lobes about 1 mm long; corolla 4–5.5 mm long; style about 4 mm long. *Fruits* 6–7 mm long; stone narrowly ellipsoid, smooth, about 6 mm by 2 mm. — Flowers: Mar. (Ryukyu), Apr. – early May. Fruits: Oct. – Nov.

Jap. name: Kurobai

Distr. Japan (Honshu, Shikoku, Kyushu, Ryukyu: south to Okinawa Is.), Korea (Jeju Is.), China.

JAPAN. **Honshu.** Chiba: Nigorikawa, Experimental Forest, Honda (TI); Mt. Kiyosumi, Honda (TI), T. Tuyama & S. Takahashi (TI); Mt. Uchiurayama, Awakominato, < 300 m, H. Ohba et al. 6808043 (TI). — Tokyo. Izu Is.: Mikurajima Is., N. Satomi 20375 (TI), H. Ohba 677060 (TI); Kozushima Is., Tenzyozan, 450 m, T. Yamazaki (TI). — Shizuoka: Yugashima, Y. Momiyama 995 (TI); Suzaki, Izu, H. Hara (TI); Nanjo-mura, Kamo-gun, Y. Kimura (TI); Goka-mura, Haibara-gun, J. Sugi-

moto. — Aichi: Kenkoji, *H. Muramatsu* (TI); Higashiyama, Nagoya, *F. Maekawa* 180443; Ichinomiya-mura, Mikawa, *K. Torii* 8936 (TI). — Mie: Kosugi, Mie-mura, *N. Yasui* (KYO); Gegu, Ise, *H. Kanai* (TI); Hamashima, Shima, *H. Hara & S. Kurosawa* (TI); Akabane, Kitamuro-gun, *Y. Tsukamoto* (KYO); Owase-shi, *M. Furuse* 20 (TNS). — Kyoto: Yoshida-yama, *G. Koidzumi* (KYO, TI), *Z. Tashiro* (KYO); Daimonji-yama, *G. Koidzumi, N. Fujita* 720 (KYO); Nanzenji, Kyoto, *M. Tagawa* 7207 (KYO, W); Momoyama, *G. Nakai* (KYO); Tennozan, *G. Murata* 22299 (KYO), 200 m, 44522 (KYO). — Osaka: Mikita-jinja, Sakai-shi, *M. Okamoto* 1202 (KYO); Shakudai, Shimamoto-cho, Mishima-gun, *G. Murata* 45622 (KYO). — Hyogo: Yamamoto, Settsu, *M. Togashi* TSM1043 (KYO, TI, W); Taisanji, Tarumi-ku, Kobe-shi, 100 m, *N. Kurosaki* 8084 (KYO); Taisanji, Akashi-shi, *S. Hosomi* 17116 (KYO), *Z. Tashiro* (KYO); Ichijoji, Sakamoto-cho, Kasai-shi, 200 m, *N. Fukuoka* 8795 (KYO). — Nara: Kasuga-yama, *Anonymous* (TI). — Wakayama: Oshima, *I. Namikawa* (KYO); Kizetsukyo, *S. Nishimura* (KYO); Tanabe-cho, Ryujin-yama, *T. Yamamoto* (KYO); Tanabe-cho, *T. Nakajima* (KYO); Inari-mura, Nishimuro-gun, **N. Ui* (KYO, TI), **N. Ui* 9409 (TI, Plate 59c), **T. Nakajima* (TI); Tanabe-cho, Nishimuro-gun, **K. Matsushima* TNS37083, 37084 (TNS), **T. Nakajima* (KYO, TNS); Seto, Kanayama-mura, **K. Nakajima* TNS37085 (TNS); Goboyama, Wakayama-shi, *T. Nakajima* (TI). — Okayama: Sogo, Hinase-cho, Wake-gun, 40–200 m, *N. Fukuoka & N. Kurosaki* 4159 (KYO). — Hiroshima: Miyajima, *B. Hayata* (TI), *G. Koidzumi* (TI). — Yamaguchi: Nago, Abu-gun, *K. Oka* 8548 (TNS), 8549 (KYO); Fukagawa-cho, Otsu-gun, *F. Tamai* TNS50956 (TNS); Narutaki, Kosaba-mura, Yoshiki-gun, *J. Nishina* 744 (TNS); Miyano-mura, Yoshiki-gun, *J. Nishina* TNS260799 (TNS). **Shikoku**. Tokushima: Mayuyama-koen, Tokushima-shi, *T. Inobu* 5 (KYO). — Kagawa: Hiketa-machi, Okawa-gun, *M. Takahashi* 1687 (KYO, TI). — Ehime: Izumi, Futaiwa-mura, Nishiwa-gun, *Y. Nomura* 16 (KYO). — Kochi: Godai-san, *M. Tagawa* 846 (KYO); Ida, Hata-gun, *K. W.* (TI); Ahioeyama, *Yoshinaga* (TI). **Kyushu**. Fukuoka: Kasuga, *K. Nakajima* 787 (TNS); Takara-yama, Kurume-shi, 200 m, *J. Ouchi* 9884 (RYU); Nakahirokawa-mura, Yame-gun, *Anonymous* TNS31129 (TNS). — Nagasaki: Yasuman-dake, Hirado, *Z. Tashiro* (KYO, TI); Michinoo, Urakami, *Z. Tashiro* (KYO); Omura, *S. Toyama* 20030, 23315 (TNS); Isahaya, *Y. Yokoo* 10 (KYO). Tsushima: *Faurie* 4815 (KYO, W); *C. Wilford* (W). — Kumamoto: Shodai-san, *Z. Tashiro* (KYO); Nishize, *K. Maebara* (KYO); Mt. Kimbo-san, *H. Kozuma* ATNS22756 (KYO). — Oita: Kamato-hanto, *Z. Kiyohara* (KYO); Ochinnoura, Youra, Kitaamabe-gun, *Z. Kiyohara* (KYO). — Miyazaki: Mt. Osuzu-yama, 400 m, *F. Yamazaki* (TI). — Kagoshima: Sendai-shi, *H. Yahata* (RYU); Takuchi, Higashisonoyama-mura, Aira-gun, *Z. Tashiro* (KYO); Mt. Hoyoshi-dake, *Y. Momiyama* (TI); Mt. Takakuma, *K. Hasegawa* (TI). Yakushima Is.: Shiro-tani-rindo, 300–500 m, *K. Deguchi* 4843 (KYO); Isso, 150–250 m, *G. Murata et al.* 664 (KYO); Mt. Mottchomu, 200–350 m, *H. Doeï & H. Nagamasu* 50 (KYO); Hanayama trail, 900 m, *G. Murata et al.* 569 (KYO, TI); Hanayama, 50–150 m, *H. Takasaki* 80040 (KYO), 1150–1300 m, *J. Murata et al.* 17866 (TI); Ambo to Kosugidani 400 m, *S. Mitsuta et al.* 391 (KYO). **Ryukyu**. Kagoshima. Amami-Oshima: Naze–Yamamoto, *G. Koidzumi* (KYO); Yamato-son, 200 m, *S. Sako* 5133 (KAG, KYO, RYU); Mt. Yuwan-dake, *T. Amano* 6485 (RYU). Tokunoshima Is.: Mt. Inokawa-dake, 400 m, *H. Nagamasu* 1767 (KYO); Mt. Intabu, Isen-cho, *Y. Miyagi & Hatusima* 39750 (RYU). — Okinawa. Okinawa Is.: Benokiyama, *S. Sonohara* 1240 (RYU); Sade, *G. Koidzumi* (KYO); Maji-yama, Kunigami, *Tashiro* (TI); Mt. Nishime-dake, 350–420 m, *H. Nagamasu* 2022 (KYO); 200–300 m, *G. Murata et al.* 56714 (KYO); Mt. Yonaha-dake, 400–500 m, *N. Kurosaki* 3808 (KYO), *S. Mitsuta & H. Nagamasu* 727 (KYO); Yona to Aha, 150 m, *H. Nagamasu* 1651 (KYO); Onna, *E. Takamine* 2526 (RYU); Naha, *Tanaka* (TI).

KOREA. Jeju-do: *Faurie* 1889 (KYO, W), *K. Katakura* (KYO), 800 m, *Taquet* 6248 (TI); in sylvis Hongno, *Taquet* 284 (KYO, W); in sylvis Yangkwin, 700 m, *Taquet* 1107 (KYO, TI).

CHINA. China borealis, *Fortune* 25 (BM, K, W).

Note. This species is also reported from Nakanoshima Is. of Tokara Isls. (Hatusima, 1986: 131).

9-2. var. *tawadae* Nagamasu, var. nov. — Plate 59d.

Laminae 7–12 cm longae, venis primariis 9–12 paribus. — Typus: *S. Mitsuta & H. Nagamasu* 424 (KYO, Plate 7d), the river Yutsun to the pond Maboroshi-no-ike, Iriomote-jima Is., Okinawa Pref., 260–380 m alt. March 15, 1984.

Terminal buds 5–10 mm long. *Leaves*: blades 7–12 cm long, 2–3 cm wide; nerves 9–12 pairs; petioles 10–15 mm long. *Inflorescences* 4–8 cm long. *Flowers*: calyx lobes 1–1.5 mm long; corolla 5–6 mm long; style 4–5 mm long. *Fruits* 6–8 mm long; stone narrowly ellipsoid to narrowly ovoid, smooth, 6–7 mm long, 2–3 mm in diameter. —Flowers: March. Fruits: mature fruits unknown.

Jap. name: Nagaba-kurobai

Distr. Japan (Ryukyu: Ishigaki Is., Iriomote Is.), endemic.

JAPAN. **Ryukyu.** Okinawa. Ishigaki Is.: *G. Koidzumi* (KYO), *E. Takamine* 2013 (RYU); Maedake, *E. Takamine* 2209 (RYU); Nagura-gawa, *M. Furuse* 2570 (RYU); Banna-dake, 70–230 m, *H. Nagamasu* 1142 (KYO); Mt. Omoto-dake, 100–526 m, *H. Nagamasu* 970 (KYO), *T. Amano* 7669 (RYU). Iriomote Is.: *G. Koidzumi* (KYO); Sonai, *Tanaka* 349 (TI); Omizugawa, *S. Tawada* (KYO); Shirahama to Mt. Antena-yama, 100 m, *H. Okada & K. Ueda* 2742 (KYO, RYU, TI); Nakama-gawa, Goza-take, 200 m, *T. Yamazaki* 2913 (TI); Kampira fall, *M. Furuse* 1928 (RYU), *F. Yamazaki* (TI); Yutsun River to Maboroshi-no-ike, 260–380 m, *S. Mitsuta & H. Nagamasu* 424, 433 (KYO); Omija River, *H. Okada & K. Ueda* 2812 (KYO, RYU); Urauchi River, 100 m, *S. Hatusima* 18606 (RYU, TI), 120–220 m, *H. Nagamasu* 1616, 1626 (KYO); Mt. Komi-dake, *Hatusima* 33027 (RYU), *Y. Miyagi* 9607 (RYU).

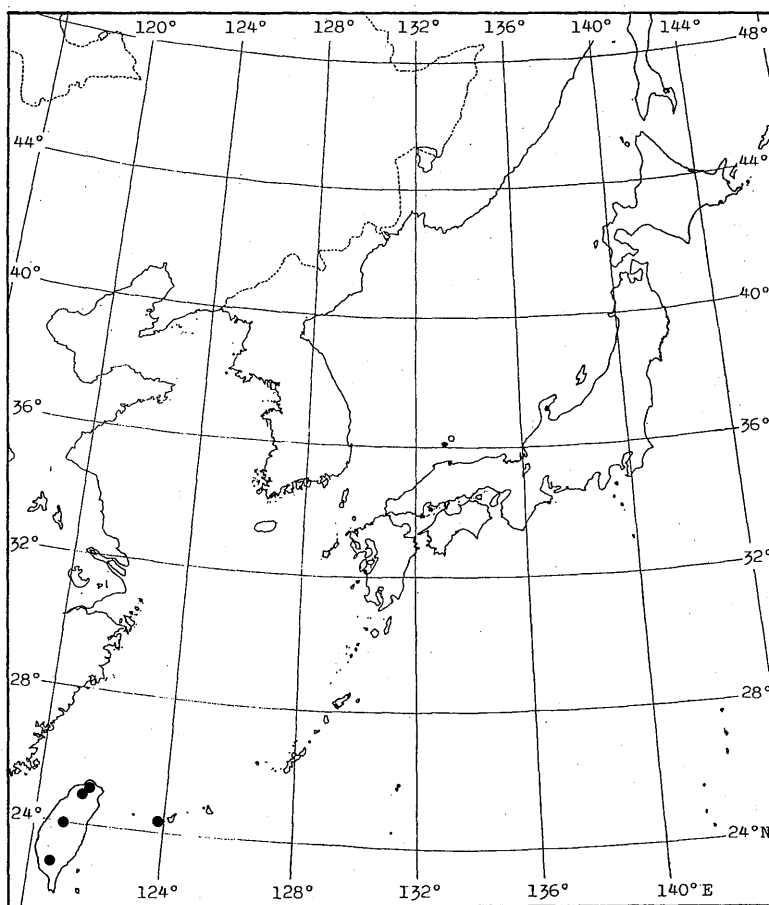
Sect. 3. **Bobu** (Adanson) Brand

Key to the species

- 1a. Young twigs green, glabrous; leaves narrowly obovate to narrowly oblong, 12–18 cm long. 10. *S. konishii*
 - 1b. Young twigs brown, more or less hairy; leaves elliptic, narrowly elliptic or narrowly oblong.
 - 2a. Leaves 14–25 cm long; nerves distinctly prominent on lower surface; calyx lobes 1.5–2(–2.5) mm long, forming a beak on top of fruits. 11. *S. cochinchinensis*
 - 2b. Leaves 7–15 cm long; nerves slightly prominent on lower surface; calyx lobes 0.5–1 mm long, not forming a beak on top of fruits. 12. *S. theophrastifolia*
10. ***Symplocos konishii*** Hayata — Fig. 3-10, Map 10, Plate 60a–b.

- S. konishii* Hayata, Icon. Pl. Form. 5: 105, t. 25a (1915); Mori, Sylvania 5: 234 (1935); Kanehira, Form. Tr. rev. ed.: 590, t. 548 (1936); Liu, Lign. Pl. Taiwan: 1049, t. 873 (1962); Li, Wood. Fl. Taiwan: 737 (1963); Hatusima, Fl. Ryukyus (ed. 1975): 887, Wu, Fl. Reip. Pop. Sin. 60(2): 56 (1987). — *Bobua konishii* Kanehira & Sasaki, Cat. Govt. Herb.: 407 (1930). — Type: *Anonymous* (TI!, Plate 60a), in montibus Kusshaku, Taiwan, Jun. 1907 (Fr.).
- S. cochinchinensis* ssp. *laurina* auct.: Nooteboom, Leid. Bot. Ser. 1: 156 (1975); in Li et al., Fl. Taiwan 4: 118 (1978); Shimabuku, Check List Ryukyu Is.: 352 (1990).
- S. spicata* auct. non Roxb.: S.-S. Ying, Bull. Exp. For. Nat. Taiwan Univ. 116: 557 (1975).

Evergreen trees. Twigs gray-brown, terete; young twigs thick, green, glabrous, ridged below petioles. Terminal buds obliquely ovoid, rusty tomentose to pubescent; apex acuminate, often slightly curved. *Leaves*: blades coriaceous, narrowly obovate to narrowly oblong, 12–18 cm long, 4–6 cm wide; apex acuminate; base cuneate to short attenuate; margin often slightly recurved, glandular-dentate with teeth 3–5(–6) mm apart; upper surface shining, glabrous; midrib impressed on upper surface, very prominent on lower surface; nerves 8–10 pairs, prominent on both surfaces; petioles glabrous, adaxially sulcate, 15–25 mm long. *Inflorescence* axillary, a spike usually branched at base, (2.5–)3–5(–6) cm long, axis pubes-



Map 10. Distribution of *Symplocos konishii* Hayata.

cent; bracts depressed ovate, 1.5–2 mm long, apex obtuse to acute; bracteoles 2, depressed ovate to kidney-shaped, about 1.5 mm long, apex obtuse to acute; both persistent, keeled, adaxially glabrous, abaxially pubescent, margin ciliate. *Flowers*: calyx tube glabrous, 0.5–1 mm high; calyx lobes imbricate, ovate, 1–1.5 mm long, apex obtuse, abaxially appressed pubescent, margin ciliate; corolla white, about 5 mm long, deeply 5-lobed, lobes narrowly elliptic; corolla tube about 1 mm long; stamens 60–70, shortly monadelphous to indistinctly pentadelphous; disk annular, later pulvinate, glabrous; style glabrous, about 5 mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* globose to ampulliform, 5–6 mm in diameter, persistent calyx lobes surrounding pulvinate disk; stones ampulliform, slightly grooved, 4–5 mm long, 4–5 mm in diameter; mesocarp thin; endocarp woody; seed 1, twice curved, with similarly curved embryo. *Pollen grains* 3-porate or 3-colporate, circular to semiangular in polar view, suboblate in equatorial view; tectum spinulate; colpi indistinct, outline of ektoaperture vague; ora circular; $22.8 \mu\text{m}$ (P) $\times$ $27.4 \mu\text{m}$ (E); pollen type IId. — *Flowers*: Sept.–Oct. *Fruits*: ? Nov. (following year).

Jap. name: Konishi-hainoki

Habitat. Subtropical evergreen forests.

Distr. Japan (Ryukyu: Iriomote Is.), Taiwan.

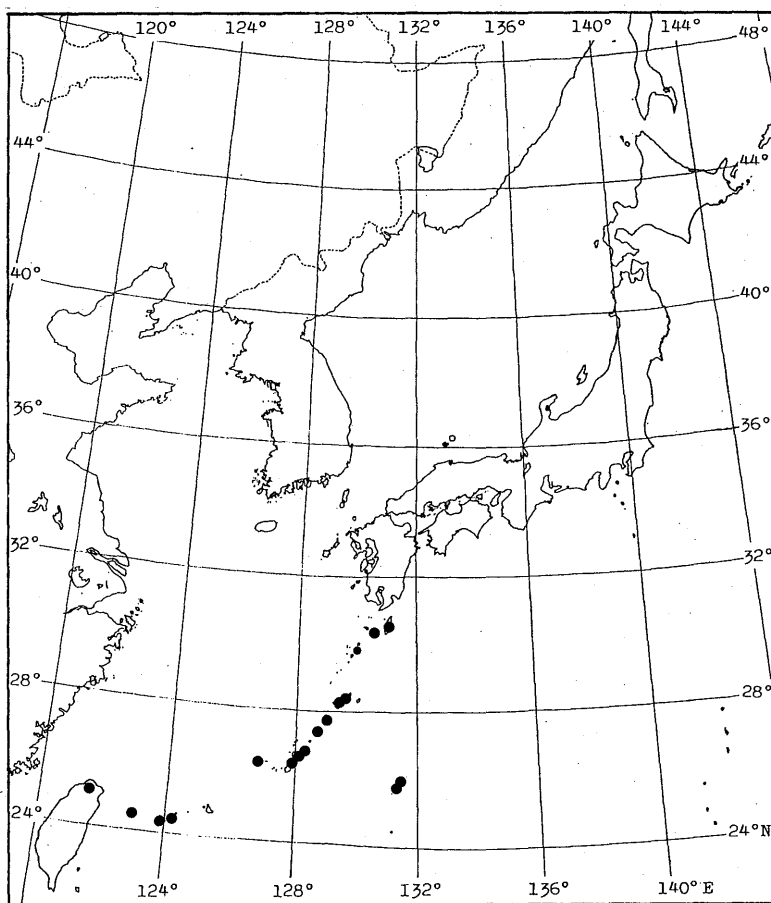
JAPAN. **Ryukyu.** Okinawa. Iriomote Is.: Yutsun River, 0–250 m, *H. Okada et al.* 320 (KYO); Urauchi River, *T. Yamazaki* (TI), 20–100 m, *S. Mitsuta & H. Nagamasu* 545 (KYO, Plate 60b); Kannabaru-goya, *M. Furuse* 4086 (RYU); Aira River, *Y. Miyagi* 9741 (KYO, RYU, TI); Mt. Komi-dake, 200–300 m, *Hatusima et al.* 35264, 33088 (RYU).

TAIWAN. *S. Nakai & J. Tanaka* (TI). — Taipei: in montibus Kusshaku, *Anonymous* (TI). — Taoyuan: from Mt. Peitzatenshan (Takaishan) to Shaurai, Fushin-shi, 740 m, *M. Minaki et al.* 2128 (KYO). — Chiayi: Heishana–Jujiro, *B. Hayata* (TI). — Kaohsiung: Qishan, *Y. Yamamoto & K. Mori* (TI).

Note. Plants in Taiwan have thinner leaves, more prominent veins on lower surface and more distinct serration than those in Iriomote Is.

11. ***Symplocos cochinchinensis*** (Lour.) S. Moore — Fig. 3-11, Map 11, Plate 61 & 62a.

- S. cochinchinensis* (Lour.) S. Moore, J. Bot. 52: 148 (1914); Guillaumin, Bull. Soc. Bot. Fr. 71: 277 (1924); Fl. Gen. I.-C. 3: 998 (1933); Merr., Comm. Lour.: 304 (1935); Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 32 (1943); Li, J. Wash. Ac. Sc. 43: 107 (1953); Liu, Lign. Pl. Taiwan: 1045, t. 869 (1962); Li, Wood. Fl. Taiwan: 738 (1963); Hatusima, Fl. Ryukyus: 476 (1971); Nooteboom, Leid. Bot. Ser. 1: 1441 (1975); Walker, Fl. Okinawa South. Ryukyu Is.: 833, t. 164 (1976); Nooteboom in Li et al., Fl. Taiwan 4: 114 (1978); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 173 (1989), pl. 192-3, *excl. syn. S. patens*; Shimabuku, Check List Ryukyu Is.: 352, *excl. subsp. laurina* (1990). — *Dicalix cochinchinensis* Lour., Fl. Cochinch. 1: 660 (1790), *excl. syn. Arbor rediviva* Rumph. — *S. spicata* (non Roxb.) H. Heine, Pfl. Samml. Clemens Kinabalu: 89 (1953). — Type: *Loureiro s.n.* (BM!, Plate 60c), Cochinchina.
- S. loha* Buch.-Ham. ex D. Don, Prod. Fl. Nepal: 144 (1825); G. Don, Gen. Syst. 4: 2 (1837 or 1838); DC., Prod. 8: 255 (1844). — *Lodhra loha* Miers, J. Linn. Soc. Bot. 17: 298 (1879). — Lectotype: *Hamilton 'Symplocos? subspinosus'* (BM!, Plate 60d), Nepal, Narainhetty. (Lectotypification: Nooteboom, Leid. Bot. Ser. 1: 142 (1975)).
- Dicalix javanicus* Bl., Bijdr.: 1117 (1826). — *S. javanica* Kurz, J. As. Soc. Beng. 40(2): 64 (1871); Form., Fl. Burma: 145 (1877); J. As. Soc. Beng. 46(2): 239 (1877), *excl. syn. S. rubiginosa*; Sargent, Pl. Wils. 2: 597 (1916). — *Lodhra javanica* Miers, J. Linn. Soc. Bot. 17: 302 (1879). — *S. cochinchinensis* var. *javanica* S.-S. Ying, Bull. Exp. For. Nat. Taiwan Univ. 116: 559 (1975). — Type: *Blume s. n.* (BO!, Plate 61a), Java.
- S. ferruginea* Roxb., [Hort. Beng.: 40 (1814), *nomen*; Wall., Cat.: 4412 (1831), *nomen*] Fl. Ind. ed. Carey 2: 542 (1832); G. Don, Gen. Syst. 4: 2 (1837 or 1838); DC., Prod. 8: 257 (1844); Brand, Pfl. R. Heft 6: 40 (1901); Ridley, Fl. Mal. Pen. 2: 302 (1923); Fletcher in Craib, Fl. Siam. Enum. 2: 386 (1938). — *Lodhra ferruginea* Miers, J. Linn. Soc. Bot. 17: 299 (1879). — *Eugeniodes ferrugineum* O. K., Rev. Gen. Pl. 2: 975 (1891). — Type: *Roxburgh s. n.* (BM!, Plate 61b), Assam, Garo Hills, 1813.
- S. mollis* Wall. [Cat.: 4433 (1831), *nomen*] ex G. Don, Gen. Syst. 4: 3 (1837 or 1838). — Type: *Wallich 4433* (K-W, microfiche!, isotypes in BM, CGE, LE, NY, W!), Penang.
- S. spicata* Roxb. var. *platistachya* G. Don, Gen. Syst. 4: 2 (1837 or 1838). — *S. polystachya* Wall. [Cat.: 4428 (1831), *nomen*] ex DC., Prod. 8: 254 (1844); Zoll., Syst. Verz.: 34 (1854); Miq., Fl. Ind. Bat. 1(2): 465 (1859). — *Lodhra polystachya* Miers, J. Linn. Soc. Bot. 17: 300 (1879). — *S. ferruginea* Roxb. var. *polystachya* Clarke, Fl. Br. Ind. 3: 575 (1882). — Type: *Wallich 4428* (BM photo!, CGE, K-W, LE, W!), Sylhet.
- S. verhuellii* Jungh. & De Vriese, Pl. Ind. Bat. Or. 3: 12 (1845); Miq., Fl. Ind. Bat. 1(2): 467 (1859). — *Lodhra verhuellii* Miers, J. Linn. Soc. Bot. 17: 302 (1879). — Type: *Junghuhn s. n.* (L, *non vidi*, isotype in A), Sumatra, Batak Lands.
- S. horsfieldiana* Miq., Fl. Ind. Bat. Suppl. 1: 475 (1861). — Type: *Horsfield 40* (CGE, K, *non vidi*), Banka.



Map 11. Distribution of *Symlocos cochinchinensis* (Lour.) Moore var. *cochinchinensis*. A small disk is based on the literature.

- S. lachnobotrys* Miq., Fl. Ind. Bat. Suppl. 1: 475 (1861). — *Eugeniodes lachnobotrys* O. K., Rev. Gen. Pl. 2: 975 (1891). — Type: *Diepenhorst* s. n. (HB2876 BO!, isotype in K), W. Sumatra, Priaman.
- S. lachnobotrys* var. *glabrior* Miq., Fl. Ind. Bat. Suppl. 1: 475 (1861). — Type: *Teysmann* s. n. (HB665 BO!, isotype in L), Sumatra, Padang, Pulau Pisang.
- S. ferruginea* Roxb. var. *philippinensis* Brand, Philip. J. Sc. Bot. 3: 6 (1908). — *S. cochinchinensis* var. *philippinensis* Nootboom, Leid. Bot. Ser. 1: 154 (1975); in Li et al., Fl. Taiwan 4: 116 (1978). — Lectotype: *Ahern* 440 (BO! see note below, US), Philippines, Dinagat. (Lectotypification: Nootboom, Leid. Bot. Ser. 1: 144 (1975)). Note. The specimen deposited in BO as lectotype is not *Ahern* 440 but *Ahern* 4409 (Plate 61d) collected in Mindanao.
- S. kotoensis* Hayata, Icon. Pl. Form. 5: 106, t. 31 (1915); Kanehira, Form. Woods: 151 (1921); Maki-no & Nemoto, Fl. Jap. ed. 2: 920 (1931); Mori, Sylvia 5(4): 235 (1934); Kanehira, Form. Tr. (ed. 1936): 593, t. 550 (1936); Walker, Imp. Tr. Ryukyu Is.: 263, t. 168 (1954); Ohwi, Fl. Jap.: 932 (1953); Fl. Jap. English ed.: 739 (1965); Li, Wood. Fl. Taiwan: 739 (1963). — *Bobua kotoensis* Yamamoto, Suppl. Ic. Pl. Form. 4: 19 (1928). — *Dicalix kotoensis* Hara, Enum. Sperm. Jap. 1: 104 (1948). — Type: *Kawakami* & *Sasaki* s. n. (TI!, Plate 62a), Kotosho (Lanyu Is.), Taiwan.

- S. lithocarpoides* Nakai, Bot. Mag. Tokyo 36: 136 (1921). — *Bobua lithocarpoides* Nakai, Tr. & Shr. ed. 1: 243, t. 136 (1922); Bot. Mag. Tokyo 38: 42 (1924); Tr. & Shr. ed. 2: 326, t. 153 (1927). — Lectotype: *T. Uchiyama s. n.* (TI!), Plate 61c), Higanakama, Amami-Oshima, 7 Dec. 1900. (selected by Nakai *in sched.*, published here).
- S. ferruginifolia* Kanehira, Trans. Nat. Hist. Soc. Form. 20: 383 (1930); Form. Tr. (ed. 1936): 585, t. 542 (1936). — Type: *Z. Fujiwara (non vidi)*, Dec. 1929, Bunzan-gun, Taihoku Pref., 100 m.
- S. ferruginea* Roxb. var. *glabra* Fletcher, Kew Bull. 1937: 505 (1938). — Type: *Kerr 15397* (K, *non vidi*, isotypes in BM, E, SING!), Lam Saka, Thailand.
- S. patens* auct. *non* Presl: Liu, Lign. Pl. Taiwan: 1054 (1962); Kitamura & Murata, Wood. Pl. Jap. 1: 98, t. 117 (1971); Ohwi, Fl. Jap. rev. ed.: 1073 (1972); Ying, Bull. Exp. For. Nat. Taiwan Univ. 116: 560 (1975).

Distr. Japan (Kyushu, Ryukyu), Taiwan, China, Indochina, Thailand, ?Burma, India, Malay Peninsula, Sumatra, Java, Borneo, Philippines, New Guinea.

11-1. var. *cochinchinensis*

All synonyms except *S. ferruginea* var. *philippinensis* Brand and *S. kotoensis* Hayata

Evergreen trees; bark gray-brown, smooth. Twigs gray-brown, terete; young twigs thick, rusty tomentose to glabrescent; slightly ridged below petioles. Terminal buds narrowly ovoid, rusty tomentose, 7–12 mm long, apex acuminate, usually curved. *Leaves*: blades coriaceous, elliptic to narrowly elliptic, 14–25 cm long, 5–9 cm wide; apex caudate; base cuneate; margin slightly recurved, glandular dentate to crenulate with teeth 2–4 mm apart; upper surface glabrous; lower surface pale green, brownish pubescent especially on midrib and nerves, sometimes glabrescent and the midrib appressed pilose, rarely rusty tomentose; midrib impressed on upper surface, prominent on lower surface; nerves 9–12(–14) pairs, distinctly prominent on lower surface, curved in parallel upwards; petioles brownish pubescent, tomentose or glabrescent, (7–)10–25(–30) mm long. *Inflorescence* an axillary spike, usually branched, 3–10(–12) cm long, axis brownish to rusty tomentose; bracts ovate 2.5–4 mm long, apex acute; bracteoles 2, ovate to depressed ovate 2.5–3 mm long, apex acute; both persistent, keeled, adaxially glabrous, abaxially with same indument as inflorescence axis. *Flowers*: calyx tube glabrous, 0.5–1 mm high; calyx limb 1.5–2(–2.5) mm long; calyx lobes imbricate, ovate, 1.5–2(–2.5) mm long, the apex obtuse, outside appressed pubescent, the margin ciliate; corolla white, 4.5–6 mm long, deeply 5-lobed, the lobes elliptic; corolla tube 1–1.5 mm long; stamens 60–80, indistinctly pentadelphous; disk glabrous, annular to cylindrical; style glabrous, 4–6 mm long; ovary 3-locular with 4 ovules in each locule. *Fruits* ampulliform or globose, often with a cylindrical neck, 6–7 mm long, 6–7 mm in diameter, persistent calyx lobes forming a conical beak; stones ampulliform, shallowly grooved, 5–6 mm by 5–6 mm; mesocarp thin; endocarp woody; seed 1, twice curved, with similarly curved embryo. *Pollen grains* 3-porate or 3-colporate, circular to semiangular in polar view, oblate in equatorial view; tectum spinulate; colpi indistinct and the outline of ektoaperture vague; ora circular; 18.4–19.9 μm (P) $\times$ 22.2–26.3 μm (E); pollen type II_d. — Flowers: July–Aug. (in Japan). Fruits: ? May–? July (in Japan).

Jap. name: Aoba-no-ki

Habitat. Subtropical evergreen forests, often in secondary growth.

Distr. Japan (Kyushu, Ryukyu), Taiwan, China, Indochina, Thailand, ?Burma, India, Malay Peninsula, Sumatra, Java, Borneo, ?Philippines, New Guinea.

JAPAN. **Kyushu.** Kagoshima. Tanegashima Is.: Nakawari, *Z. Tashiro* (KYO). Yakushima Is.: *Faurie* 3808 (KYO, W); Kurio, *M. Tagawa* 1832 (KYO); Ambo, *M. Togashi* 1436 (KYO); Miyanoura, *M. Tagawa* 1831 (KYO); Nagata River, 100–200 m, *J. Murata et al.* 15485 (KYO, TI); Kosugidani, *M. Togashi* 374 (TI). **Ryukyu.** Kagoshima. Amami-Oshima Is.: Higanakama, *T. Uchiyama* (TI); Naze to Yamato G. *Koidzumi* (KYO); Naze, *Z. Tashiro* (KYO); Shidokan, Yamato-son, *S. Sako* 5964 (KYO, TI); Yuwan—Ikegachi, *H. Ohba* 95 (KYO); Mt. Yuwan, *T. Amano* 6527 (RYU); Sumiyo-son, *T. Amano* 6531 (RYU); Uken-son, *M. Furuse* 8063 (RYU); 30 m, *S. Sako* 4862 (TI). Tokunoshima Is.: Mikyo, *H. Migo* (KYO), *H. Ohba* 263, 264 (KYO). Okinoerabu Is.: *Y. Miyagi* 5767 (RYU), *S. Hatusima & Y. Miyagi* 39090 (RYU). —Okinawa. Okinawa Is.: Kunigami, *Y. Niiro* 510 (RYU); Oku, *S. Sonohara* (KYO); Sate, *G. Koidzumi* (KYO); Sosu, Kunigami, *Z. Tashiro* (KYO); Onna-dake, Onna, *T. Kanagusuku* (KYO); Misato-son, Nishibaru, *S. Tawada* 231 (KYO); Kanekadan, Gushikawa, *Y. Miyagi* 9488 (RYU). Kume Is.: *S. Hatusima* 34237 (RYU), *Y. Niiro* 758 (RYU). Kita-daito Is.: *T. Kanshiro* 5754 (RYU), *Y. Miyagi & Y. Niiro* 3083 (RYU), *T. Yamazaki* 579 (KYO, TI); on pond, *S. Hatusima* 33797 (RYU). Minami-daito Is.: *S. Gima* 59 (KYO, RYU), *Y. Miyagi* 8220 (RYU, TI); Hakubu-jinja, *A. Minami* TNS348901 (TNS). Ishigaki Is.: *F.R. Fosberg* 38060 (TI), *G. Koidzumi* (KYO); Maedake, Kabira, *M. Furuse* 3683 (RYU); Banna-dake, *H. Nagamasu* 1131 (KYO), 100 m, *T. Yamazaki* (TI); Mt. Omoto-dake, *S. Tamaki* (RYU); Urasoko, *E. Takamine* 5654 (RYU); Hona, *E. Takamine* 2376 (RYU). Iriomote Is.: *G. Koidzumi* (KYO), *E. Takamine* 6896 (RYU); Yutsun-Omija, 30 m, *Y. Miyagi* 9276 (KYO, RYU, TI); along a crosscut from Komi, *K. Iwatsuki* 685 (KYO); Yutsun River, 5–260 m, *S. Mutsu & H. Nagamasu* 357 (KYO); a branch of Nakama River, *K. Iwatsuki et al.* 697, 701 (KYO), *Y. Kimura & Furusawa* (TI); Kampira waterfall, 60–80 m, *G. Murata et al.* 56449 (KYO); Urauchi River, *F. Yamazaki et al.* (TI), *S. Hatusima* 18810 (TI); Mt. Komi, *S. Gima* 243 (RYU). Yonaguni Is.: *G. Koidzumi* (KYO), *Hatusima et al.* 35474 (RYU); Donan-dake, 40–100 m, *H. Nagamasu* 1533 (KYO).

TAIWAN. Shinten, *K. Mori* (TI).

CHINA. Guangdong: Yam Na Shan, Mei Distr., *W.-T. Tsang* 21377 (KYO); Sha Lo Shan, Wa Mei Tong Village, Sin-fung Distr., *Y.-W. Taam* 179 (KYO, TI); Sha Lo Shan, Lo-Lo-Ha Village, Sin-fung Distr., *Y.-W. Taam* 901 (KYO). —Guangxi: Yao Shan, *C. Wang* 39353 (KYO). —Hainan: Chim Fung Mt., near Fong Ngau Po Village, Kan-en Distr., *S.-K. Lau* 5562 (KYO); Bak Sa, *S.-K. Lau* 26056 (KYO); Loktung, *S.-K. Lau* 27421 (KYO); Nam Tung and vicinity, Lam Ko Distr., *C.-I. Lei* 418 (KYO, TI); Pak Shik Ling and vicinity, Ku Tung Village, Ching Mai Distr., *C.-I. Lei* 810 (KYO, TI); Yeung Lam Shan, near Yeung Lam Village, Yai Hsien Distr., *S.-K. Lau* 6172 (KYO).

INDOCHINA. Tonkin: station expérimentale de Phu Tho, *M. A. Chevalier* 41024 (KYO); Taai Wong Mo Shan, NE of Chuk-pai, Ha Coi, *W.-T. Tsang* 29279 (TNS); Sai Won Mo Shan, Long Ngong Village, Dam Ha, *T.-S. Tsang* 30461 (TNS).

THAILAND. Chiang Mai: Doi Chang, Maetaeng Distr., 1500 m, *H. Koyama et al.* T-32788 (KYO). —Loei: Phu Kradung, 1150–1250 m, *G. Murata et al.* T-42682 (KYO). —Pangnga: Khao Pawta Luang Keow, 900–1000 m, *R. Geesink et al.* (KYO).

INDIA. Nepal: Narainhetty, *Hamilton* (BM); between Kutī and Lamjung, 1000 m, *J. Fujimura* 212 (KYO); Siwalik Hill, between Buditola and Bhasu, 1300 m, *H. Tabata et al.* 563 (KYO). —Butan: Paro, *K. Nishimura* (KYO). —Assam: Garo Hills, Roxburgh (BM). —Sylhet: *Wallich* 4412, 4428 (W).

MALAY PENINSULA. Perak: 200–300', *King's Coll.* 7091 (W). —Penang: *Kook* 807 (W); 150', *King's Coll.* 1353 (W).

SUMATRA. Aceh: G. Leuser Nat. Res., upper Mamas River, 1300 m, *Wilde & Wilde-Dujfies* 19034 (KYO). —West Sumatra: Arau Nature Res., Payakumbuh, 600 m, *M. Hotta & R. Tamin* 305 (KYO); Air Sirah, near Padang, 1000–1100 m, *M. Hotta et al.* 945 (KYO); Ulu Gadut, Padang, 350 m, *M. Hotta* 25157 (KYO).

JAVA. Mt. Lawu, Tawang-manggu, *S. Yoshida* 1826 (KYO); G. Gedeh, Tjibodas, *Arsin* 19622 (W); Preanger, Tjadas malang bij Tjidadap, 1000m, *Winckel* 1829b (W).

BORNEO. Sarawak: *J. & M. Clemens* 20392 (W).

NEW GUINEA. Wandammen Peninsula: Wondiwoi Mts., 600 m, *F.A.W. Schram* BW 13460 (KYO). —Morobe Distr.: on road to Kauli Creek, Wau, 3700', *A.N. Miller* NGF14576 (KYO).

Note. This species is also known from Nakanoshima Is., Tokara Isls. (Hatusima, 1986).

12. **Symplocos theophrastifolia** Sieb. & Zucc. — Fig. 3-12, Map 12, Plate 62b–d.

- S. theophrastefolia* Sieb. & Zucc., Fam. Nat. 2: 134 (1846); Miq., Prol. Fl. Jap.: 266 (1867); Franch. & Sav., Enum. Pl. Jap. 1: 508 (1875); Mori, Sylvia 5: 246 (1934); Sylvia 6: 29, t. 31 (1935); Kanehira, Form. Tr. rev. ed.: 601, t. 558 (1936); Li, J. Wash. Ac. Sc. 43: 109 (1953); Ohwi, Fl. Jap.: 932 (1953); Liu, Lign. Pl. Taiwan: 1057, t. 881 (1962); Li, Wood. Pl. Taiwan: 738 (1963); Ohwi, Fl. Jap. English ed.: 720 (1965); Kitamura & Murata, Wood. Pl. Jap. 1: 97, t. 116 (1971); Ying, Bull. Exp. For. NTU 116: 558 (1975); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 173, pl. 191-3, 4 & 5 (1989). — *Bobua theophrastefolia* Miers, J. Linn. Soc. Bot. 17: 306 (1879); Nakai, Tr. & Shr. ed. 1: 241, t. 135 (1922); op. cit. ed. 2: 324, t. 152 (1927). — *Dicalix theophrastefolius* Migo, Shangh. Sizenk. Kenk. Iho 13: 207 (1943); Hara, Enum. Sperm. Jap. 1: 107 (1948). — Type: *Siebold s. n.* (L! Plate 62b, isotype in MAK!), Japan.
- S. stenostachys* Hayata, Ic. Pl. Form. 5: 115 (1915); Kanehira, Form. Tr.: 361 (1917); Makino & Nemoto, Fl. Jap. ed. 2: 923 (1931). — Type: *Kawakami 1438* (TI!, Plate 62c), Goshizan, Shinchiku, Taiwan.
- S. spicata* auct. non Roxb.: Brand, Pfl. R. Heft 6: 39 (1901), p. p.; Matsumura & Hayata, J. Coll. Sc. Univ. Tokyo 22: 231 (1906); Matsumura, Ind. Pl. Jap. 2(2): 488 (1912).
- S. spicata* var. *acuminata* auct.: Brand, Pfl. R. Heft. 6: 40 (1901), Matsumura, Ind. Pl. Jap. 2(2): 488 (1912); Hayata, Icon. Pl. Form. 5: 115 (1915).
- S. cochinchinensis* subsp. *laurina* auct.: Nooteboom, Leid. Bot. Ser. 1: 156 (1975); in Li et al., Fl. Taiwan, 4: 118 (1978).
- S. laurina* auct.: Hatusima, Wood. Pl. Japan: 738 (1976); Wu, Fl. Reip. Pop. Sin. 60(2): 55 (1987).

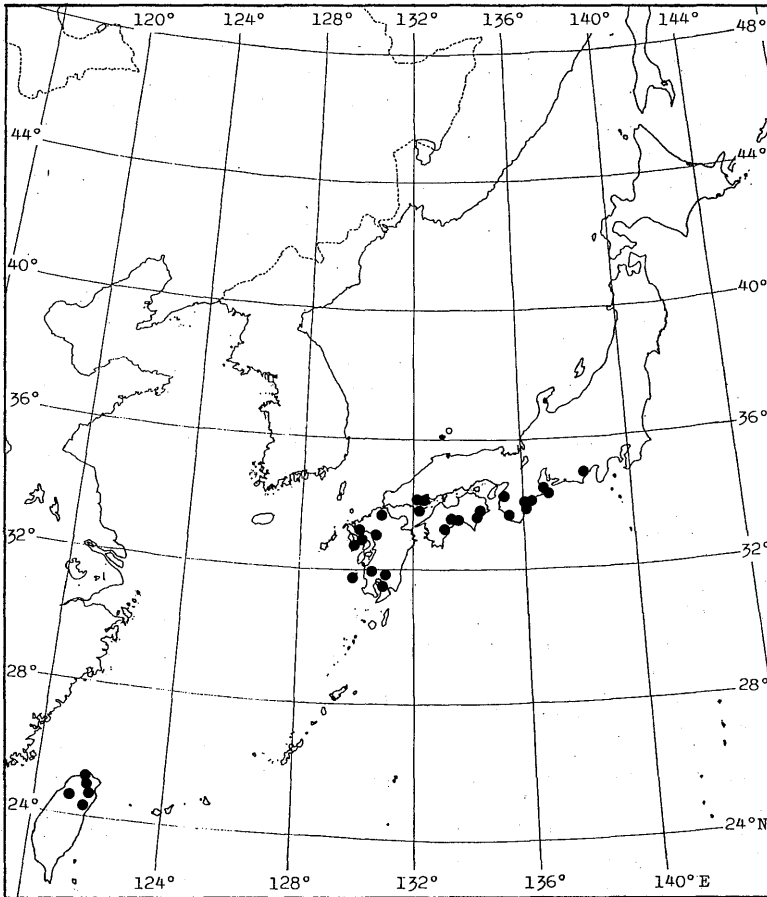
Evergreen trees; bark gray-brown, smooth. Twigs gray-brown, terete; young twigs brown with brown appressed hairs, soon glabrescent, slightly ridged below petioles. Terminal buds obliquely ovoid, tomentose to glabrescent, cinnamon-colored to rusty, apex acuminate, usually curved, 3–8 mm long. *Leaves*: blades coriaceous, narrowly elliptic to narrowly oblong, 7–15 cm long, 2–5 cm wide; apex caudate to acuminate; base cuneate to short attenuate; margin slightly recurved, crenate to serrate, with teeth 3–8 mm apart; upper surface glabrous; lower surface pale green to slightly glaucous, glabrous, sometimes sparsely appressed hairy on midrib; midrib impressed on upper surface, prominent on lower surface; nerves 8–12(–13) pairs, prominent on lower surface; petioles glabrous or sparsely appressed hairy, abaxially sulcate, 7–15 mm long. *Inflorescence* an axillary spike, often branched at base, (2.5–)3–5(–7) cm long, axis tomentose, cinnamon-colored; bracts ovate to transversely widely ovate, 1–1.5 mm long, apex obtuse to acute; bracteoles 2, ovate about 1 mm long; both persistent, keeled, adaxially glabrous, abaxially with same indument as inflorescence axis. *Flowers*: calyx tube glabrous, 0.5–0.8 mm high; calyx limb 0.5–1 mm long; calyx lobes imbricate, depressed ovate, 0.5–1 mm long, apex rounded to obtuse, outside sparsely appressed pubescent, margin ciliate; corolla white, 4–5 mm long, deeply 5-lobed, lobes elliptic to oblong; corolla tube about 1 mm long; stamens (40–)50–60, indistinctly pentadelphous; disk annular, glabrous; style glabrous, about 4 mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* dark violet, globose to ampulliform, 5–6 mm long, 5–6(–7) mm in diameter, crowned by persistent calyx lobes; stones ampulliform, slightly grooved, 4–5 mm long, 4–5 mm in diameter; mesocarp thin; endocarp woody; seed 1, twice curved, with similiary curved embryo. *Pollen grains* 3-porate or 3-colporate, circular to

semiangular in polar view, oblate to suboblate in equatorial view; tectum spinulate; colpi indistinct, outline of ektoaperture vague; ora circular; $18.4-19.3 \mu\text{m}$ (P) $\times$ $24.0-24.2 \mu\text{m}$ (E); pollen type IId. — Flowers: Aug. – Sept. Fruits: Oct. – Dec. (following year)

Jap. name: Kanzaburo-no-ki

Habitat. Warm-temperate evergreen forests.

Distr. Japan (Honshu, Shikoku, Kyushu), Taiwan, S China.



Map 12. Distribution of *Symplocos theophrastifolia* Sieb. & Zucc.

JAPAN. **Honshu.** Shizuoka: Okadeyama, Fujieda, D. Shimizu (KYO), H. Shimizu 265 (TI); Fujieda, J. Sugimoto (TI). — Mie: Ise-jinja, Gegu, Y. Yoriga, K. Tsuchiya et al. 6 (KYO); Oniga, T. Hattori 18 (KYO); Mt. Takakura, Gegu, N. Fujita et al. 2 (KYO); Osawa-Isobe, Shima, M. Honda (TI); Kajiya-toge, Nansei-cho, H. Hara & S. Kurosawa (TI); Nunobiki, Mifune-mura, Minamimuro-gun, T. Nakajima (TI); Owase, Futatsukiya-dani, T. Yamamoto 153 (KYO); Owase, Minami-dani, G. Murata 10042, 10052 (KYO); Owase, T. Hattori (KYO); Funada, Mifune-mura, Minamimuro-gun, T. Koide (KYO). — Osaka: Sennan-cho, Kintai-ji, S. Nakanishi 8750 (KYO). — Wakayama: Nishitonda-mura, Nishimuro-gun, N. Ui (KYO); Shinjo-mura, Nishimuro-gun, T. Nakajima (TI); Doro, Z. Tashiro (KYO). — Hiroshima: Miyajima, K. Oka 44708, Z. Tashiro (KYO). — Yamaguchi: Tononyu, Oshima, Z. Tashiro (KYO); Shiroyama, Iwakuni-shi, S. Okamoto, K. Oka 3404, A. Minami 32661 (KYO). **Shi-**

koku. Tokushima: Tairyuji-san, *Z. Tashiro* (KYO); Shishikui-cho, 300 m, *T. Yamazaki* (TI). — Kochi: Godai-san, *H. Ito* (TI), *G. Koidzumi*, *M. Tagawa* 851 (KYO); Sagawa-cho, *G. Koidzumi* (KYO); Honokawa, Takaoka-gun, *H. Ito* (TI). **Kyushu.** Fukuoka: Ueno-kyo, Akaike-cho, Tagawa-gun, *N. Kumagai* 15-B. — Saga: Kurokami-san, Arita-cho, 120–518 m, *H. Nagamasu* 1881, 1883, 1897 (KYO). — Nagasaki: Sakaegawa valley, *F.C. Greatrex* 52/33 (TI); Mt. Tara-dake, *Z. Tashiro* (KYO). — Kumamoto: Shodai-san, *T. Sugino* (KYO). — Miyazaki: Tano–Miyakonojo, *Z. Tashiro* (KYO). — Kagoshima: Mt. Takakuma, Tarumizu-shi, *H. Takahashi* 4189 (KYO); Manedaira, Oguchi, *H. Muramatsu* (TI); Koshiki-jima, *Z. Tashiro* (KYO), *S. Sako* 1514 (KYO).

TAIWAN. Taipei: Agyoku, Bunzan-gun, *M. Tagawa* 207 (KYO, TI); inter Urai et Tanpiya, *M. Tagawa* 304 (KYO, TI); Urai, *T. Soma* (TI); Kusshaku, *T. Nagasawa* 665 (KYO); prope Hokuto, *M. Tagawa* 667 (TI); near Toulintli zoo, *C.M. Kuo* 12092 (TI); Sozan, *M. Honda* & *H. Ito* (TI); Mt. Tatung, *M.T. Kuo* 6299 (TI); Shinko, *S. Nagasawa* 233 (TI), *T. Kawakami* & *U. Mori* 1330 (TI). — Hsinchu: Goshizan, *T. Kawakami* 1438 (TI). — Ilan: Mt. Bonbon, *M.T. Kao* 5996 (TI). — Hualien: Tabirakei, *Anonymous* (TI).

CHINA. Guangdong: Sha Lo Shan, Wa Mei T'ong Village, Sing-fung Distr., *Y.-W. Taam* 220 (KYO, TI); Hau T'ong Shan, Fuk Lung Monastery, Sin-fung Distr., *Y.-W. Taam* 878 (KYO, TI); White Cloud Mt., *C.O. Levine* 2057 (TI).

Sect. 4. *Lancifoliae* Nagamasu

Key to the species

- 1a. Bracts 1–2 mm long; disk usually glabrous; fruits 4–6 mm long; flowering in autumn.
..... 13. *S. lancifolia*
- 1b. Bracts 0.7–1 mm long; disk pilose; fruits 3–4 mm long; flowering in spring.
..... 14. *S. microcalyx*

13. *Symplocos lancifolia* Sieb. & Zucc. — Fig. 3-13 & 4h, Map 13, Plate 62b–d & 63a–d.

S. lancifolia Sieb. & Zucc., *Fam. Nat.* 2: 133 (1846); Miq., *Prol. Fl. Jap.*: 265 (1867); Franch. & Sav., *Enum. Pl. Jap.* 1: 307 (1875); Brand, *Pfl. R. Heft* 6: 41 (1901); Matsumura, *Ind. Pl. Jap.* 2(2): 487 (1912); Gontscharow, *Not. Syst. Herb. Ross.* 5: 103 (1924); Rehder, *J. Arn. Arb.* 15: 299 (1934); Hand.-Mazz., *Beih. Bot. Centralbl.* 62-B: 36 (1943); Ohwi, *Fl. Jap.*: 932 (1953); *op. cit.* English ed.: 726 (1965); Kitamura & Murata, *Wood. Pl. Jap.* 2: 97, t. 115 (1971); Nooteboom, *Leid. Bot. Ser.* 1: 214 (1975), *p. min. p.*; Wu, *Fl. Reip. Pop. Sin.* 60(2): 52 (1987); Murata in Satake et al., *Wild Fl. Jap. Wood. Pl.* 2: 173, pl. 191-1, 2 (1989). — *Bobua lancifolia* Miers, *J. Linn. Soc. Bot.* 17: 306 (1879); Nakai, *Tr & Shr. ed.* 1: 238, t. 239 (1922); *op. cit.* ed. 2: 320, t. 150 (1927). — *Dicalix lancifolius* Hara, *Enum. Sperm. Jap.* 1: 105 (1948); Migo, Yamaguchi J. Sc. Yamaguchi Univ. 7: 1 (1956). — Type: *von Siebold s. n.* (L!, Plate 62d), Japan. (Lectotypification: Nooteboom, *Leid. Bot. Ser.* 1: 214 (1975)).

S. leptostachys Sieb. & Zucc., *Fam. Nat.* 2: 134 (1846). — *S. lancifolia* var. *leptostachys* Miq., *Prol. Fl. Jap.*: 265 (1867). — *Bobua leptostachys* Miers, *J. Linn. Soc. Bot.* 17: 306 (1879). — Type: *von Siebold s. n.* (L!, Plate 63a), Japan. (Lectotypification: Nooteboom, *Leid. Bot. Ser.* 1: 214 (1975)).

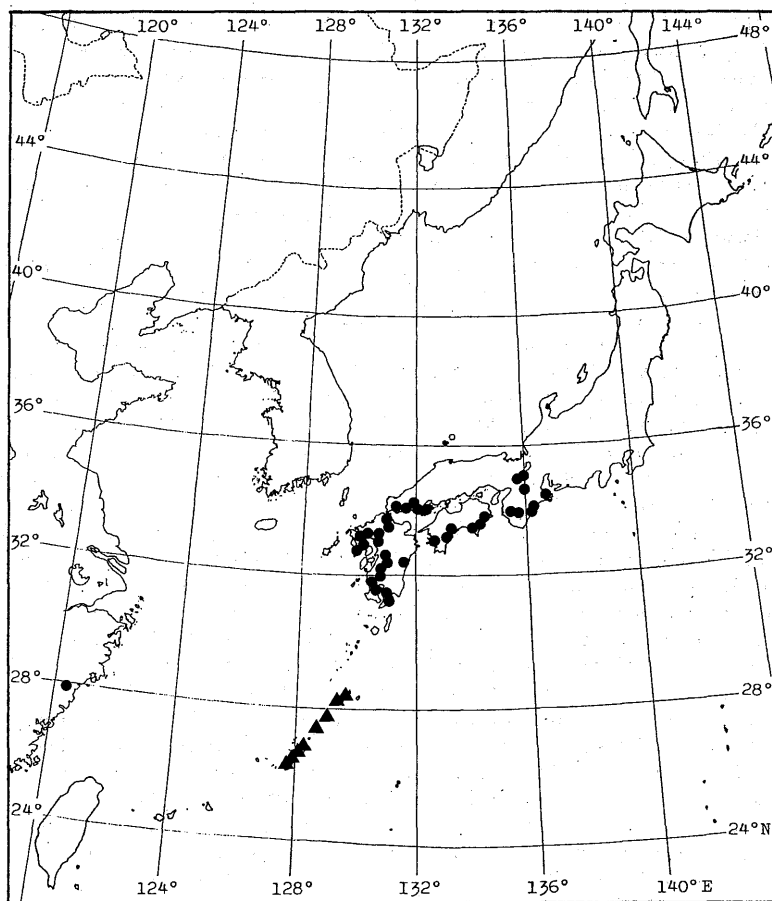
S. microcarpa Champ. ex Benth., *Hook. J. Bot.* 4: 303 (1852); *Fl. Hongkong*: 212 (1861). — *Lodhra microcarpa* Miers, *J. Linn. Soc. Bot.* 17: 302 (1879). — *S. lancifolia* var. *microcarpa* Hand.-Mazz., *Beih. Bot. Centralbl.* 62-B: 37 (1943). — Type: *Champion s. n.* (A!, K! Plate 63b), Hongkong.

S. lancifolia var. *cryptostachya* Miq., *Prol. Fl. Jap.*: 265 (1867). — Type: *Textor* (L!, Plate 63c), Japan. (Lectotypification: Nooteboom, *Leid. Bot. Ser.* 1: 214 (1975)).

S. lancifolia var. *fulvipes* Clarke, *Fl. Br. Ind.* 3: 578 (1882). — *S. fulvipes* Brand, *Pfl. R. Heft* 6: 41 (1901). — Type: *Hook. f. & Thomson* 50 (K! Plate 63d, isotypes in A!, BM!, E!, FI, L!, MEL, NY, W!), Mont. Khasia, India. (Lectotypification: Nooteboom, *Leid. Bot. Ser.* 1: 214 (1975)).

Small evergreen trees; bark brownish gray, smooth. Twigs dark brown, terete; young

twigs brown, villose and pilose, terete. Terminal buds ovoid, with several scales, appressed hairy, apex acute. *Leaves*: blades thinly coriaceous, narrowly ovate to lanceolate, 3–8(–10) cm long, 1.5–2.5(–4) cm wide; apex acuminate to caudate with apiculate tip; base cuneate to rounded; margin serrate to crenate, with teeth 1.5–4 mm apart; upper surface glabrous except the pilose midrib; lower surface appressed hairy when young, soon glabrescent except for pilose midrib, more or less glossy; midrib slightly prominent or sulcate on upper surface, prominent on lower surface; nerves 3–10 pairs, slightly prominent on lower surface; petioles villose and/or (sparsely) pilose, 1–3(–4) mm long. *Inflorescence* an axillary simple spike or a short pedicelled raceme, 7 to 20-flowered, 0.5–3 cm long, the axis pilose and villose; pedicels up to 1 mm long; bracts 2, ovate to widely ovate, keeled, 1–2 mm long, apex acute; bracteoles 2, widely ovate, keeled, 1–1.5 mm long; both persistent, inside glabrous, outside appressed hairy. *Flowers*: calyx tube glabrous to sparsely hairy, 0.5–1 mm high; calyx lobes imbricate, ovate, about 1 mm long, outside appressed hairy or rarely glabrescent;



Map 13. Distribution of *Symlocos lancifolia* Sieb. & Zucc. (disk) and *S. microcalyx* Hayata (triangle).

corolla white, deeply 5-lobed, 2.5–3 mm long, the lobes elliptic; stamens 15–25, connate at base; disk 5-glandular, glabrous or rarely minutely pilose; style glabrous 2.5–3(–4) mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* black, widely obovoid to globose, 4–6 mm by 4–5 mm, the persistent calyx lobes forming a blunt beak; stones (broadly) obovoid, smooth to slightly grooved, 4–5 mm by 3–4 mm; mesocarp thin; endocarp woody; seed 1, curved, with curved embryo. *Pollen grains* 3(–4)-porate or 3(–4)-colporate, circular to semiangular in polar view, suboblate in equatorial view; tectum densely corrugate; colpi indistinct, outline of ektoaperture irregular; ora circular; 18.3–18.6 μm (P) $\times$ 22.0–22.4 μm (E); pollen type IIc. — Flowers: Sept. – Oct. Fruits: Oct. – Dec. (following year).

Jap. name: Shirobai

Habitat. Warm temperate evergreen forests.

Distribution. Japan (Honshu, Shikoku, Kyushu), S China, NE India.

JAPAN. **Honshu.** Mie: Gekuu shrine, Ise, 20 m, *H. Kanai* 6881 (TI); Minami-dani, Owase, *G. Murata* 10051 (KYO); Kowa-dani, Owase, *J. Sugimoto* TNS163821 (TNS). — Shiga: Miidera-yama, *C. Hashimoto* 2301 (KYO), 8354 (TI, TNS). — Kyoto: Higashiyama, Kyoto, *G. Koidzumi* (KYO), *G. Murata* 636 (KYO, TI, TNS); Kiyomizuyama, Kyoto, *Z. Tashiro* (KYO); Yoshidayama, Kyoto, *S. Kitamura* (KYO); Matsuo-jinja, Ukyo, *G. Nakai* 5390 (KYO); Kamigamo, Kyoto, *Y. Araki* 14127 (KYO), *H. Nagamasu* 1898 (KYO); Yamashina, Kyoto, *K. Takeuchi* (KYO). — Nara: Kasuga-yama, Nara-shi, 300–400 m, *S. Fujii* 2025 (KYO). — Wakayama: Oto-san, *S. Sakaguchi* 9 (KYO); Shingu, *T. Makino* 129077 (KYO); Nachi-san, Higashimuro-gun, *T. Nakajima* (TI); Kozuke, Nachikatsuura, *K. Oohara* (KYO); Hirai, Nanakawa-mura, Nishimuro-gun, *T. Nakajima* (KYO); Hidaka-gun, *S. Sakaguchi* 8 (KYO). — Hiroshima: Itsukushima Is., *Y. Miyagi* 1856 (RYU). — Yamaguchi: Hosenji, Yamaguchi-shi, *K. Oka* 3652 (TI), 3653 (KYO); Sako, Kawakami, Tokuyama-shi, *H. Masaki* 12917 (KYO); Ogori-cho, *A. Minami* 36258 (KYO); Kameyama, Yamaguchi-shi, *H. Migo* (KYO); Izumo-jinja, Tokuyi-cho, Saba-gun, *A. Minami* 35596 (KYO); Nishiatsuho-cho, Mine-shi, *K. Oka* 36545 (RYU). **Shikoku.** Tokushima: Dairyuji-san, *Z. Tashiro* (KYO); Kainose, Kainan-cho, *H. Koyama* 1158 (KYO, TNS); Kawanishi, Kaifu-gun, *T. Inobe* 261 (TI); Shishikui-mura, Kaifu-gun, *J. Nishina* 1652 (TI, TNS). — Kagawa: Onigajo-yama, *Anonymous* (TI). — Ehime: Hakogatani, Kiyomitsu-mura, Kitaawa-gun, *M. Ogata* 17 (KYO), *Z. Tashiro* TNS39248 (TNS); Nametoko-yama, *M. Ogata* (KYO). — Kochi: Nakano-kawa, Nakayama-mura, Aki-gun, *M. Tagawa* (KYO); Izuta, Hata-gun, *K. W.* (TI); Chosoji, Takaoka-gun, *Makino* (TI). **Kyushu.** Fukuoka: Mt. Kora, *T. Osada* TNS106127 (TNS); Akaike-cho, Tagawa-gun, *S. Tsugaru* 508 (KYO); Ehiko-mura, Tagawa-gun, *S. Tokunaga* (TNS). — Saga: Mt. Kurokami, 120–518 m, *H. Nagamasu* 1884, 1890 (KYO); Saga-gun, *Anonymous* (KYO). — Nagasaki: Nagasaki, *Maximowicz* (TNS); Mt. Taradake, *F.C. Greatrex* 180/38 (TI); Ikeda, Omura, 280 m, *H. Taoda* 3614 (KYO); Kigitsu, Nishisonogi-gun, *Anonymous* (KYO); Shiroyama, Isahaya, *Z. Tashiro* (KYO), *H. Hara* (TI). — Kumamoto: *Anonymous* (KYO); Aida, *K. Maebara* 570 (KYO); Shotai-san, *Z. Tashiro* (KYO), *H. Kamizuma* (KYO); Koura, Toyo-cho, Yatsushiro-gun, *Y. Shimada* 8130 (KYO, TNS); Takada-mura, Yatsushiro-gun, *T. Nakajima* (TI); Koonose, *K. Maebara* 569 (KYO), 3564 (TI); Hitoyoshi, *K. Maebara* 3566 (TI); Mt. Noke'eboshi, *Z. Tashiro* TNS 25008 (TNS). — Miyazaki: Yatogi-no-taki, Tsuno-cho, Koyu-gun, 400 m, *H. Takahashi* 4123 (KYO); Todoroki to Yatogi-no-taki, 200–400 m, *H. Takahashi* 6732 (KYO); Aoi-dake, *Z. Tashiro* (KYO); Mt. Osuzu-yama, 400–500 m, *N. Fukuoka* 7172 (KYO), *H. Takahashi* 1351 (KYO). — Kagoshima: Kurino-dake, *S. Muramatsu* 37 (KYO); Takakuma-keikoku, 200–300 m, *S. Mutsuta et al.* 50 (KYO); Hiwaki, Satsuma-gun, *S. Hatusima & S. Sako* 27240 (KAG, KYO, TI); Shibi-san, *Z. Tashiro* (KYO, TI); Gamou-mura, Aira-gun, *Z. Tashiro* (KYO); Mt. Hoyoshi-dake, *Y. Momiyama* (TI); Izaku-toge, Taniyama-city, *S. Hatusima* 16986 (RYU, TNS).

CHINA. Zhejiang: *R.-C. Ching* 1743 (TI); between Ping Yung and Tai Suan, 500–900 m, *R.C. Ching* 2188 (W). — Fujian: Ingkok, *H.-H. Chung* 2663 (W). — Guangdong. Tapu District: Tai Mo Shan, *W.-T. Tsang* 21038 (KYO); Tung Koo Shan, *W.-T. Tsang* 21564 (KYO). Mei [Kaying] District: Yam Na Shan, *W.-T. Tsang* 21375 (KYO). Sin-fung District: Ngong T'in Lo Shan, *Y.-W. Taam* 310 (KYO); Ngok Shing Shan, *Y.-W. Taam* 529 (KYO); Ah P'o Kai Shan, *Y.-W. Taam* 646 (KYO); Hau T'ong Shan, *Y.-W. Taam* 836 (KYO). Ho-yuen District: Kwai Shan, Tsing-lo-kong Village, *W.-T. Tsang* 28681 (KYO); Nam Shan, Ts'ung-shue Village, *W.-T. Tsang* 28851 (KYO). Lung-men District: Sam

Kok Shan, W.-T. *Tsang* 20577 (KYO); Naam Kwan Shan, Sheung P'ing Village, W.-T. *Tsang* 25267 (KYO). — Hong Kong: Kowloon Shan, Y.-W. *Taam* 1998 (KYO); Ta-mau-shan, 300–700 m, *M. Togashi* & *G. Murata* 8072 (KYO). — Guangxi: *C. Wang* 39180 (KYO); Kulung, 1400 m, *Chun* 91362 (W); Seh-feng Dar Shan, S Nanning, 2550', *R. C. Ching* 8050 (W, with paniculate inflorescences). — Hainan: *S.-K. Lau* 25927 (KYO, W).

INDIA. Khasia, *Hook. f. & Thomson* 50 (A, BM, E, K, L, W); East Bengal, *Griffith* 3648 (W).

Note. The pollen wall of this species is very thin, in contrast with the thicker pollen wall of *S. microcalyx* Hayata.

14. ***Symplocos microcalyx* Hayata** — Fig. 3-14, Map 13, Plate 64a.

S. microcalyx Hayata, Ic. Pl. Form. 5: 108, t. 32 (1915); Hatusima, Fl. Ryukyus: 476 (1971); Walker, Fl. Okinawa South Ryukyu Is. 834, t. 169 (1976); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 174, pl. 193-2 (1989); Shimabuku, Check List Ryukyu Is.: 353 (1990). — *Bobua microcalyx* Sasaki, Cat. Gavt. Herb.: 408 (1930). — *Dicalix microcalyx* Hara, Enum. Sperm. Jap. 1: 106 (1948). — Type: *G. Nakahara* s. n. (TI!, Plate 64a), Nago-dake, Okinawa Is., Ryukyu Isls., Japan.

S. okinawensis auct. non Matsumura: Walker, Imp. Tr. Ryukyu Is.: 265, t. 170 (1954).

S. lancifolia auct. non Sieb. & Zucc.: Nooteboom, Leid. Bot. Ser. 1: 214 (1975), *p. min.* p.

Evergreen shrubs or small trees; bark dark brown, smooth. Twigs dark brown, terete; young twigs grayish brown to ferrugineous, short pilose or villose. Terminal buds ovoid, with a few scales, appressed hairy, the apex acuminate and slightly curved. *Leaves*: blades coriaceous, elliptic, ovate or lanceolate, 2–6 cm long, (0.7–)1–2 cm wide; apex acute, acuminate or caudate with apiculate tip; base cuneate to short attenuate; margin more or less recurved, crenate to glandular dentate with teeth 2–5(–6) mm apart; upper surface shining, glabrous except the pilose midrib; lower surface dull, sparsely appressed hairy; midrib slightly prominent or sulcate on upper surface, prominent beneath; nerves (4–)5–7 pairs, slightly prominent beneath; petioles appressedly hairy, (1–)2–3(–4) mm long. *Inflorescence* axillary, a simple spike or a short pedicelled raceme, (5–)10–20(–28)-flowered, 1–3(–4.5) cm long, the axis grayish brown, villose; pedicels up to 1 mm long; bracts ovate to widely ovate, keeled, 0.7–1 mm long, apex acute or obtuse; bracteoles 2, ovate to widely ovate, 0.7–1 mm long; both persistent, adaxially glabrous, abaxially appressed hairy. *Flowers*: calyx tube glabrous or rarely sparsely appressed hairy, 0.5–1 mm high; calyx limbs ca. 1 mm long; calyx lobes imbricate, orbicular to widely ovate, apex obtuse, 0.5–1 mm long, outside glabrous or sparsely appressed hairy; corolla deeply 5-lobed, white, often tinged red-violet at apex of lobes, 3.5–4 mm long, lobes elliptic; stamens 18–30, pentadelphous; disk 5-glandular, pilose; style glabrous, 2.5–3.5(–4) mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* black, ovoid, 3–4 mm by ca. 3 mm, persistent calyx lobes forming a blunt beak; stones ovoid, smooth, 3 mm by 2.5 mm; mesocarp and endocarp thin, seed 1, curved with curved embryo. *Pollen grains* 3-colporate, semiangular in polar view, oblate to suboblate in equatorial view; tectum finely verrucate and partly corrugate; colpi short; ora transversely elliptic; 18.8–19.1 μm (P) $\times$ 24.8–25.0 μm (E); pollen type IIb. — Flowers: Mar. – Apr. Fruits: Sept. – Oct.

Jap. name: Ama-shiba

Habitat. Subtropical evergreen forests, often along streamlets.

Distr. Japan (Ryukyu), endemic.

JAPAN. **Ryukyu.** Kagoshima. Amami-oshima Is.: *Z. Tashiro* (KYO), *G. Koidzumi* (KYO); Yamato-son, 250 m, *S. Sako* 5342 (KYO, RYU); between Uken-son and Sumiyo-son, 250–400 m, *G. Murata* 56325 (KYO); Kawachi River, Uken-son, *H. Ohba* 35 (KYO), *M. Furuse* 8198 (RYU); Kaneku-Ofuji, *G. Koidzumi* (KYO); Nase-Gusku, *H. Ohba* (KYO); Naze, *J.R. Ferrie* 36 (KYO), *U. Faurie* 3817 (KYO); Sumiyo-gawa, 10–150 m, *S. Mitsuta & H. Nagamasu* 1099 (KYO); Shinson, Sumiyo-son, *M. Furuse* 7900 (RYU); Sumiyo-son, *T. Shimizu* 85-367 (KYO); Mt. Yuwan, 470–694 m, *H. Nagamasu* 1127 (KYO); Mt. Takabachi, Sumiyo-son, 360–400 m, *S. Mitsuta & H. Nagamasu* 1040, 1072 (KYO). Tokunoshima Is.: Kamezu-Isen, *H. Ohba* 222 (KYO); Mt. Inokawa-dake, 100–550 m, *K. Iwatsuki* 257 (KYO), *H. Nagamasu* 1725, 1749 (KYO), *H. Nagamasu & M. Tamura* 2111 (KYO), *G. Murata* 56260 (KYO), *Y. Miyagi & S. Hatusima* 39557 (RYU); Mt. Intabu-dake, Isen-cho, *Y. Miyagi & S. Hatusima* 40218 (RYU). Okinoerabu Is.: *S. Hatusima & Y. Miyagi* 39292 (RYU); China, *H. Ohba* 58 (KYO); Oyama, *G. Ikeda* (RYU), *S. Hatusima & S. Sako* 21527 (TI). — Okinawa. Okinawa Is.: Mt. Iyu-dake, *Y. Miyagi* 3520 (RYU); Yona Exp. Forest of the Univ. Ryukyus, *M. Furuse* 1757, 5104 (RYU), *S. Hatusima* 33493 (RYU); Aha, 50–100 m, *S. Tawada* 396 (KYO), *H. Nagamasu* 2024, 2025 (KYO); Tanagagumui, *T. Amano* 10472 (KYO, TI), *G. Murata et al.* 56623 (KYO), *S. Mitsuta & H. Nagamasu* 871 (KYO); Fuku-gawa, middle stream, *M. Furuse* 4962 (RYU); Genka, *S. Sakaguchi* (KYO); Sade, *G. Koidzumi* (KYO), *S. Sonohara* (KYO); Mt. Yonaha-dake, 400–500 m, *N. Kurosaki* 3858 (KYO), *S. Mitsuta & H. Nagamasu* 718 (KYO), *K. Iwatsuki et al.* 26 (KYO); Hentona-san, *S. Tawada* 278 (KYO); Kuru-san, *S. Tawada* 277 (KYO); Kunchan, *S. Sakaguchi* (KYO); Tanyu-dake, *Y. Taira* 383 (TNS), *S. Sonohara et al.* 6303 (TI); Nago-dake, *G. Nakahara* (TI); Onna-dake, *G. Koidzumi* (KYO), *T. Amano* 6203 (RYU), 6204 (TNS); Naha, *G. Koidzumi* (KYO).

Notes. 1. Plants growing along streamlets often have narrower leaves as in rheophytes.

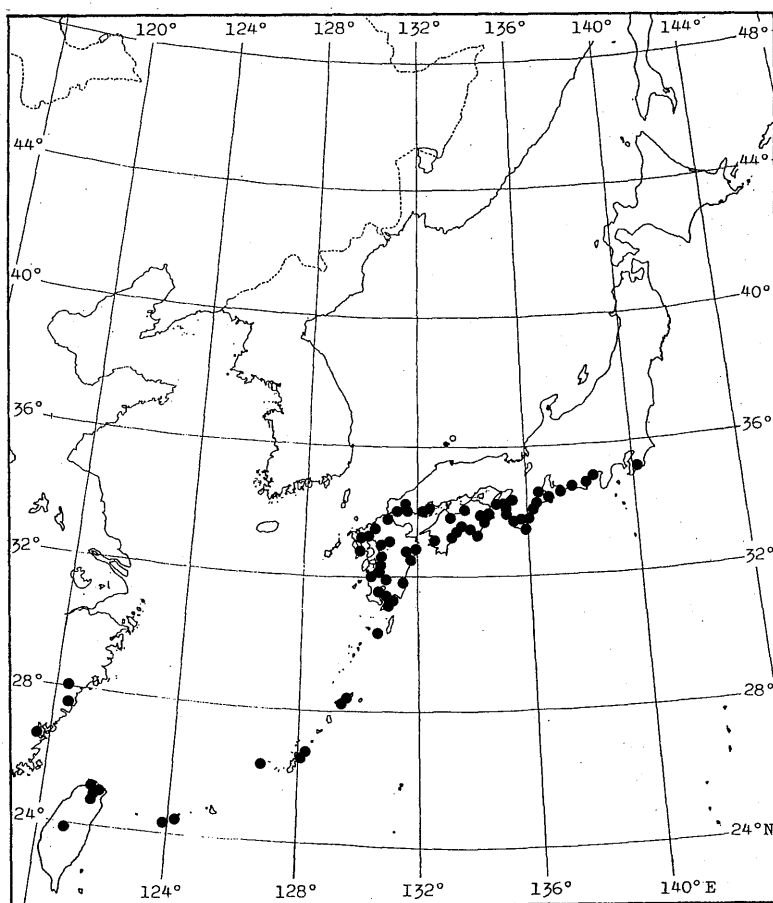
2. This species seems to be closely related to *S. taiheizanensis* of Taiwan and *S. aurea* and its allies of S China. The relationships between these taxa need further studies.

Sect. 5. *Glaucae* Nagamasu

15. *Symplocos glauca* (Thunb.) Koidz. — Fig. 3-15 & 4f, Map 14, Plate 64b.

- S. glauca* (Thunb.) Koidz., Bot. Mag. Tokyo 39: 313 (1925); Makino & Nemoto, Fl. Jap. ed. 2: 919 (1931); Mori, Sylvia 6: 20 (1936); Kanehira, Form. Tr. rev. ed.: 587, t. 544 (1936); Hand.-Mazz., Beih. Bot. Centralbl. 62B: 31 (1943); Li, Taiwania 1: 313 (1950); Walker, Imp. Tr. Ryukyu Is.: 262, t. 168 (1954); Ohwi, Fl. Jap.: 932 (1953); Liu, Lign. Pl. Taiwan: 1047, t. 871 (1962); Li, Wood. Fl. Taiwan: 745, t. 300 (1963); Hatusima, Fl. Ryukyus: 478 (1971); Kitamura & Murata, Wood. Pl. Jap. 1: 98, t. 118 (1971); Nootboom, Leid. Bot. Ser. 1: 196 (1975); Ying, Bull. Exp. For. Nat. Taiwan Univ. 116: 552 (1975); Walker, Fl. Okinawa South. Ryukyu Is.: 831, t. 166 (1976), *quoad* var. *glauca*; Nootboom in Li et al., Fl. Taiwan 4: 119, t. 936 (1978); Wu, Fl. Reip. Pop. Sin. 60(2): 30 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 172, pl. 190-1, 2 & 3 (1989); Shimabuku, Check List Ryukyu Is.: 352 (1990). — *Laurus glauca* Thunb., Nov. Acta Reg. Soc. Sc. Ups. 4: 37 (1783); Murray, Syst. Veg. ed. 14: 383 (1784); Thunb., Fl. Jap.: 173 (1784). — *Litsea glauca* Sieb., Verh. Bat. Gen. K. & W. 12: 24 (1830), *quoad* nom. — *Myrsine thunbergii* Tanaka, Bult. Sc. Fak. Terkult. Kjusu Imp. Univ. 1: 208 (1925); Momor, Pap. 150 Anniv. Thunb. Journ.: 34 (1925), *non vidi*. — *Bobua glauca* Nakai, Tr. & Shr. ed. 2: 322, t. 151 (1927); Bot. Mag. Tokyo 41: 521 (1927); Masamune, Fl. Geobot. Yakus. (= Mem. Fac. Sc. Agr. Taihoku Imp. Univ. 11): 364 (1934). — *Dicalix glaucus* Migo, Shangh. Sizenk. Kenk. Iho 14: 335 (1944); Hara, Enum. Sperm. Jap. 1: 104 (1948). — Type: *Thunberg* (UPS, microfiche!), Japan.
- S. nerifolia* Sieb. & Zucc., Fam. Nat.: 134 (1846); Franch. & Sav., Enum. Pl. Jap. 1: 308 (1875); Brand, Pfl. R. Heft 6: 69 (1901); Matsumura, Ind. Pl. Jap. 2(2): 488 (1912); Kanehira, Form. Tr.: 358 (1917); Guillaumin, Bull. Soc. Bot. Fr. 71: 282 (1924); Fl. Gen. I.-C. 3: 1011, t. 115, f. 5 & 6 (1933); Mori, Sylvia 5: 229 (1934). — *Bobua nerifolia* Miers, J. Linn. Soc. Bot. 17: 306 (1879); Nakai, Tr. & Shr. ed. 1: 239, t. 134 (1922). — *Eugeniodes nerifolium* O. Kuntze, Rev.

Gen. Pl. 2: 975 (1891). — Type: *Siebold s. n.* (L!, Plate 64b), Japan.



Map 14. Distribution of *Symlocos glauca* (Thunb.) Koidz.

Small evergreen trees; bark brown, smooth. Twigs brown, terete, the pith often lamellated; young twigs thick, red-brown, glabrous or rusty tomentose, ridged below petioles. Terminal buds ovoid to narrowly ovoid, glabrescent to rusty tomentose, apex acuminate, 3–8 mm long. *Leaves*: blades coriaceous, narrowly oblong, narrowly elliptic or narrowly obovate, 8–15(–18) cm long, (1.5–)2–4 cm wide; apex acuminate, caudate or sometimes acute; base cuneate; margin recurved, entire or often distally with glandular teeth; both surfaces glabrous or sparsely cobwebby hairy, especially on midrib; lower surface densely papillose; midrib impressed on upper surface, very prominent on lower surface; nerves 8–13 pairs, prominent on both surfaces, rarely impressed on upper surface; petioles glabrescent to rusty tomentose, lengthwise deeply grooved when dry, 8–20 mm long. *Inflorescence* a contracted spike, from axils of leaves and/or on twigs, up to 1 cm long, the axis rusty tomentose; bracts orbicular, widely ovate or widely obovate, 2–3 mm long, apex rounded; bracteoles 2, ovate to oblong, 1.5–2 mm long, apex obtuse to rounded; both persistent, adaxially glabrous, ab-

axially rusty tomentose. *Flowers*: calyx tube glabrous, 0.5–0.8 mm high; calyx limb 1.5–2 mm long; calyx lobes, elliptic to oblong, 1–1.5 mm long, apex rounded to obtuse, outside tomentose; corolla white, 4–5.5 mm long, deeply 5-lobed, lobes elliptic; corolla tube about 1 mm long; stamens indistinctly pentadelphous, 35–55; disk annular, short cylindric or pulvinate, glabrous; style glabrous, 4–5.5 mm long; ovary 3-locular with 4 ovules in each locule. *Fruits* bluish black, (obliquely) ovoid, 12–19 mm by 6–8 mm; calyx lobes caducous or partly persistent; stones (obliquely) ovoid, shallowly grooved lengthwise or rather smooth, 10–17 mm by 5–7 mm; mesocarp thin; endocarp woody; seeds 1, straight with straight embryo. *Pollen grains* 3-porate or 3-colporate, semiangular in polar view, oblate in equatorial view; tectum corrugate and partly verrucate; colpi indistinct and the outline of ectoaperture irregular; ora circular; 18.8–20.2 μm (P) $\times$ 25.0–26.5 μm (E); pollen type IIc. — *Flowers*: July–Aug. (in Japan). *Fruits*: Aug.–Sept. (following year; in Japan).

Jap. name: Mimizu-bai

Habitat. Subtropical to warm-temperate evergreen forests.

Distr. Japan (Honshu, Shikoku, Kyushu, Ryukyu), Taiwan, S China, ?Indochina.

JAPAN. **Honshu**. Chiba: Mt. Kiyosumi, *T. Nakai* (TI). — Shizuoka: Mt. Kuno-zan, *M. Honda* (TI), *H. Kanai* 4096 (TI); Fujieda, *J. Sugimoto* (KYO); Noman-ji, Yoshida-cho, *T. Ohmura* 18625 (TNS); Mikkabi, Shimozono (TI); Hamamatsu, *H. Muramatsu* (TI). — Aichi: Noda-mura, *K. Torii* 8905 (KYO); Senpukuji-yama, Atsumi Peninsula, *S. Okuyama* 7596 (TNS). — Mie: Gegu, Ise, *Y. Yariga* 384 (KYO), *N. Fujita et al.* 3 (KYO), *H. Nagamasu* 1964 (KYO); Shiroyama, Hisai-cho, *Z. Tashiro* (KYO); Arima-cho, Kumano-shi, *T. Koide* 479 (KYO); Nako, Kuki, Owase-shi, 30 m, *S. Ishizawa* 16360, 16606 (KYO); Shimakatsuura, Miyama-cho, 60 m, *N. Fukuoka* 8773 (KYO); Jizodani, Kirihara, Kiho-cho, Minamimuro-gun, 100–300 m, *E. Kinoshita* 1096 (KYO); Sugari-mura, Kitamuro-gun, *G. Nakai* 4304 (KYO); Dorohatcho, *G. Nakai* 5484 (KYO, TNS). — Osaka: Inaba, Izumi, *S. Matsuda* TNS32086 (TNS); Misaki-cho, Sennan-gun, *S. Nakanishi* 3650 (KYO). — Hyogo. Awaji-shima Is.: Mt. Mikumayama, Sumoto, *G. Koidzumi* (KYO), *N. Kurosaki et al.* 2632, 2642 (KYO); Shiroyama, Sumoto-shi, *Z. Tashiro* (KYO); Chigusa, Sumoto-shi, *S. Hosomi* 10032 (KYO). — Wakayama: Ogura, Wakayama-shi, *N. Kurosaki* 12320 (KYO); Kankiji, Ishigaki-mura, Arida-gun, *S. Tanaka* (KYO); Ina, Hidaka-gun, *G. Murata* 55654 (KYO); Hachiman-yama, Gobo-shi, *S. Kitamura & G. Murata* 2301 (KYO); Kiitanabe, *N. Ui* (KYO), *T. Nakajima* (KYO, TI); Yunomine, *S. Yamaguchi* (KYO). Oshima Is., *S. Kitamura* (KYO), *M. Hiroe* 13264 (KYO). — Hiroshima: Miyajima Is., *H. Taoda* 3509 (KYO), *S. Miyake* RYU46259 (RYU), 10–30 m, *H. Akiyama* 8928 (KYO). — Yamaguchi: Shiroyama, Iwakuni-shi, *S. Okamoto* (KYO); Ushinoya-cho, Iwakuni-shi, *K. Oka* 42755 (KYO); Hofu, *K. Oka* 38233 (KYO, RYU); Kagawa, Yamaguchi-shi, *K. Oka* 37376 (KYO); Kuroiwahachimangu, Ube-shi, *K. Oka* 38338 (KYO); Hikari-shi, *M. Togashi* 670 (KYO, TI, TNS, W), *H. Migo* (KYO). **Shikoku**. Tokushima: Mugi-sho, Kaifu-gun, *S. Takafuji* 501 (KYO); Myodo-gun, *T. Inabe* 4 (KYO); Shiratori-jinja, Ishii-cho, Myosai-gun, *S. Takafuji* 1340 (KYO); Dairyujisan, Kamodani-yama, Naka-gun, *T. Inabe* 105 (TI). — Kagawa: Kannonji-shi, 50 m, *M. Takahashi* 1170 (KYO). — Ehime: Ichinomiya-jinja, Kaneko-mura, Nii-gun, *T. Oda* 1544 (TNS); Shiroyama, Uwajima, *T. Nakai* (TI). — Kochi: Muroto-misaki, 160 m, *S. Fujii* 2063 (KYO); Kochi, *U. Faurie* 11908 (KYO); Yokonami, Tosa-shi, near sea level, *G. Murata et al.* 331 (KYO); Ioki-do, Aki-shi, near sea level, *K. Minoru et al.* 5558 (KYO); Yasuda-cho, Aki-gun, *M. Tagawa* 868 (KYO, TNS); Katsura-hama, Nagahama-cho, Agawa-gun, *H. Ito* (TI); Onogo-mura, Takaoka-gun, *H. Ito* (TI); Honokawa-yama, Takaoka-gun, *H. Ito* (TI); between Usa and Uranouchi, Takaoka-gun, *G. Murata* 11300 (KYO). **Kyushu**. Fukuoka: Hiraodai, Kokura-shi, 200 m, *N. Fukuoka & Inamasu* 830 (KYO); Mt. Abura-yama, *Y. Momiyama* (TI); Shiouji-san, *T. Osada* 583 (TNS). — Saga: Irino-son, Nishimatsuura-gun, *Z. Tashiro* (KYO); Mt. Mifune-yama, Takeo-shi, *K. Oka* 44361 (KYO); Mt. Kurokami-san, Arita-cho, 100–518 m, *Y. Tateishi & H. Hoshi* (TI), *H. Nagamasu* 1895 (KYO). — Nagasaki: Nagasaki, *Maximowicz* (TNS, W), *S. Kitamura* (KYO), *N. Kinashi* 1904 (KYO), *U. Faurie* (KYO), *B. Hayata* (TI), *F.C. Greatrex* 27a/33 (TI); Urakami, *Y. Tashiro* 38 (TI). — Kumamoto: Amitsu-sanchi, Uto-shi, *Y. Shimada* 11370B (YNS); Mt. Shodaisan, Tamana-shi, *Y. Shimada* 8109B (TNS); Miyaji-mura, Yatsuhira-gun, *T. Nakajima* (TI); Mt. Kura-dake, Aso-gun, *H. Taka-*

hashi (TI); Konose, Kuma-mura, Kuma-gun, 150 m, *N. Fukuoka 10813* (KYO). — Oita: Minamiamabe-gun, *M. Ogata 388, 391* (KYO). — Miyazaki: Mukabakiyama, *S. Kato* (KYO); Mimitsu, *K. Narita TNS9954* (TNS); Hosojima, *S. Kitamura* (KYO); Gongen-dani, Kitazato-mura, Minaminaka-gun, *I. Hurusawa & S. Hattori 353* (TI). — Kagoshima: Akune, *S. Muramatsu 48* (KYO, TI); Takakuma-keikoku, 200–300 m, *S. Mitsuta et al. 49* (KYO); Maruo, Kirishima-san, *Z. Tashiro* (KYO); Uchinomaki, *T. Nakai* (TI); Uchinoura, *I. Hurusawa* (TI); Mt. Hoyoshi-dake, *Y. Momiyama* (TI); Hama-koen, Kagoshima-shi, *G. Murata & H. Tabata 312* (KYO); Yeboshi-dake, Kagoshima-shi, *T. Yamazaki & H. Ohba 534* (KYO, TI), 200 m, *S. Hatusima 20976* (KYO, TI). Yakushima Is.: *U. Faurie 4142* (KYO), *G. Koidzumi* (KYO), *Z. Tashiro* (KYO), *G. Masamune* (TI); Mt. Yoshida-dake, Miyanoura-gawa, 400 m, *Suzuki et al.* (TI); Menoko, 60–80 m, *S. Mitsuta et al. 156* (KYO); Ambo–Kosugidani, 100–700 m, *M. Kato & H. Kurosaki 53* (KYO); Hanayama, *S. Mitsuta & H. Doeji 65* (KYO), 800 m, *G. Murata et al.* (KYO); Kusakawa-Kosugidani, *M. Tagawa 1833* (KYO). **Ryukyu.** Kagoshima. Amami-oshima Is.: *H. Ohba* (KYO); Naze, *H. Ohba* (KYO); Yuwan-dake, *H. Ohba 8* (KYO); Okaneku-Hukumoto-Naon, 300 m, *Y. Miyagi & S. Hatusima 40215* (RYU). — Okinawa. Okinawa Is.: Oku, *S. Hatusima 35161* (RYU); Nishime-dake, *G. Murata et al. 56771* (KYO); Sade, Kunigami, *G. Koidzumi* (KYO); Mt. Yonaha-dake, *E. Nakahara* (RYU), *Y. Niiru 2254* (RYU), 300 m, *T. Yamazaki 195* (KYO, RYU, TI); Yona, *Y. Miyagi 3714* (RYU); Mt. Iyu, 446.2 m, *Y. Miyagi 5241* (RYU); Fuku-gawa, *S. Hatusima 34156* (RYU); Mt. Nago-dake, *S. Hatusima 34777* (RYU); Gaji-rindo, *H. Higa RYU18977* (RYU). Kume Is.: Ue-gusuku, *S. Tawada 274* (KYO). Ishigaki Is.: Urasoko, *E. Takamine 2208* (RYU); Mt. Omoto-dake, *S. Hatusima 34745*, 100–523 m, *H. Nagamasu 963, 1004* (KYO), *N. Fukuoka & M. Ito 233* (KYO), *F. Yamazaki et al.* (TI), *M. Furuse 877, 2747, 3368, 3808* (RYU). Iriomote Is.: *G. Koidzumi* (KYO); Takabishi, Funaura, *Y. Miyagi 9609* (RYU); the upper stream of Urauchi to Komi, *F. Yamazaki et al.* (TI); Urauchi River, *Y. Kimura & I. Hurusawa* (TI); Mt. Goza-dake, *T. Yamazaki* (TI), 100–400 m, *C & Y. Miyagi 8120* (RYU); Otomi, *M. Furuse 974* (RYU); Mt. Komi, 200 m, *S. Hatusima 33105* (RYU).

TAIWAN. Taipei: Kelung, *U. Faurie 312* (KYO, TI, W); Sozan, *K. Kimura* (KYO); Sinten, *K. Odashima 17773* (KYO, TI, TNS, W); Tamsuy, *R. Oldham 295* (W); Shiratsuku, Shinko, *T. Kawakami & U. Mori 1320* (TI); Pihu, *C.-M. Kuo 6654* (KYO); Yuanshan, *T.-C. Huang 2367* (TI); Urai, *I. Sasaki 189* (TI); Nuannuan, *C.-M. Kuo 5833* (TI). — Nantou: Riyue Tan, *Y. Kimura & I. Hurusawa* (TI).

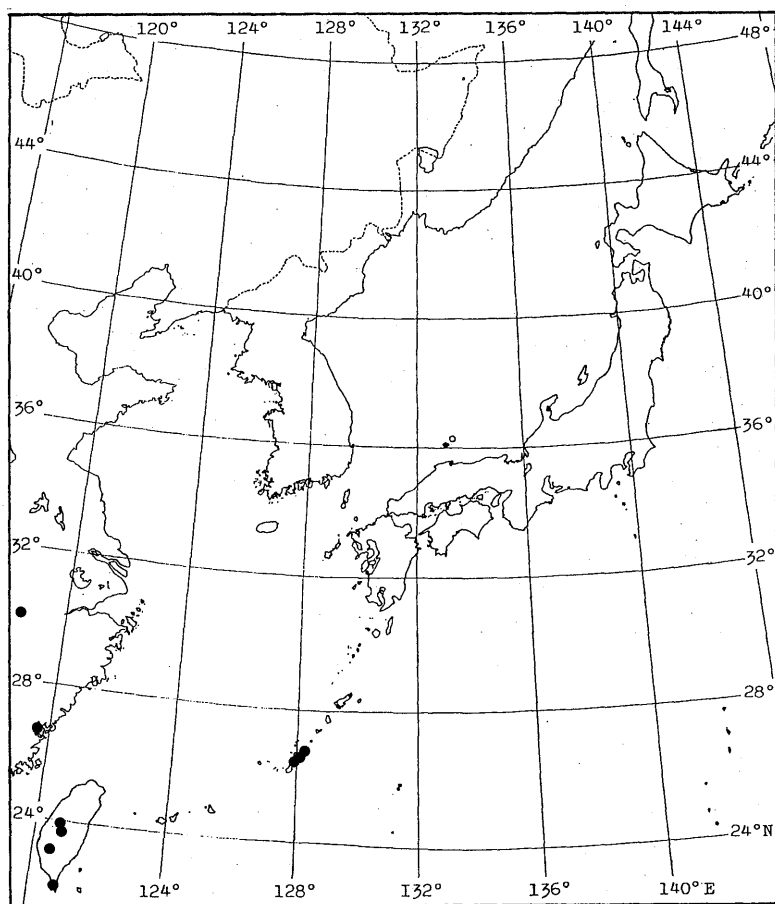
CHINA. Zhejiang: Region 20 to 40 miles west of Wenchow, 250–450 m, *R.-C. Ching 1887* (W); Pingyung, *R.-C. Ching 1990* (W). — Fujian: Minhouw Hsien, Kushan Monastery, *H.-H. Chung 2264* (W). Hunan: Changning Hsien, I-Chia-Ao, 300 m, *C.-S. Fan & Y.-Y. Li 154* (W). — Guangdong: Tai Mo Shan, Tapu Distr., *W.-T. Tsang 21015, 21219* (KYO); Ng-Tung Shan, San-on Distr., 3080', *T.-M. Tsui 268, 275* (KYO). — Hongkong: *S.-Y. Hu 5089* (TI); New Territory, Clear Water Bay, *Y.-W. Taam 1418* (KYO); Saigon, *W.-Y. Chun 6836* (W). — Guangxi: Yaoshan, ? 364 (W). — Hainan: Pak Shik Ling and vicinity, Ku Tung Village, Ching Mai Distr., *C.-I. Lei 245* (KYO, TI, W), 617 (KYO, TI, W); Bak sa, *S.-K. Lau 26062* (KYO).

Sect. 6. *Glomeratae* Y.-F. Wu

16. *Symplocos stellaris* Brand—Fig. 3-16 & 4e, Map 15, Plate 64c–d & 65a–d.

- S. stellaris* Brand, Bot. Jahrb. 29: 528 (1900); Pfl. R. Heft 6: 68 (1901); Sargent, Pl. Wils. 2: 597 (1916); Rehder, J. Arn. Arb. 15: 301 (1934); Hand.-Mazz., Beih. Bot. Centralbl. 62B: 31 (1943); Li, J. Wash. Ac. Sc. 43: 109 (1953); Liu, Lign. Pl. Taiwan: 1056, t. 880 (1962); Li, Wood. Fl. Taiwan: 744 (1963); Hatusima, Fl. Ryukyus: 479 (1971); Nooteboom, Leid. Bot. Ser. 1: 282 (1975); S.-S. Ying, Bull. Exp. For. Nat. Taiwan Univ. 116: 552 (1975); Nooteboom in Li et al., Fl. Taiwan 4: 129 (1978); Wu, Acta Phytotax. Sin. 24: 284 (1986); Fl. Reip. Pop. Sin. 60(2): 64, t. 24 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 172, pl. 190-4 (1989); Shimabuku, Check List Ryukyu Is.: 354 (1990). — *Bobua stellaris* Migo, Bot. Mag. Tokyo 56: 267 (1942). — *Dicalix stellaris* Migo, Shangh. Sizenk. Kenk. Iho 13: 206 (1943). — Type: *Bock & von Rosthorn 135* (W!, Plate 64c), Setschwan, Nanchuan, China.
- S. tashiroi* Matsumura, Bot. Mag. Tokyo 15: 77 (1901); Ind. Pl. Jap. 2(2): 488 (1912), 'tasiroi'. — *S. glauca* var. *tashiroi* Walker, J. Jap. Bot. 46: 68 (1971); Fl. Okinawa South. Ryukyu Is.: 832 (1976). — Lectotype: *Y. Tashiro* (TI!), Kushi, Okinawa Is. (designated here).
- S. wilsonii* Hemsley, Kew Bull.: 161 (1906). — Type: *Wilson 4067* (K!, Plate 65a), Szechwan.

- S. dunniana* Lév., Fedde Repert. 9: 445 (1911). — Type: *Cavalerie 3016* (E! Plate 65b, isotype in K!), Kweichow, Pin fa.
- Litsea chaffanjonii* Lév., Fedde Repert. 12: 182 (1913). — Type: *Chaffanjon (Bodnier) 2244* (E! Plate 65c, isotype in P), Kweichow, environs de Kouy Yang, Mont du Collège.
- S. eriobotryaefolia* Hayata, Icon. Pl. Form. 5: 98, t. 26 & pl. X (1915); Kanehira, Form. Tr.: 354, t. (1917); Makino & Nemoto, Fl. Jap. ed. 2: 919 (1931); Mori, Sylvania 5: 227 (1934); Kanehira, Form. Tr. rev. ed.: 584, t. 541 (1936). — *Bobua eriobotryaefolia* Kanehira & Sasaki, List. Pl. Form.: 330 (1928); Sasaki, Cat. Govt. Herb.: 407 (1930). — Syntypes: *T. Doi* (TAI, *non vidi*), Rinkihō; *B. Hayata* (TAI, *non vidi*), Mt. Arisan, inter Heishana et Nimandaira ad 6500 ped. alt., April 1914. Taiwan.
- S. limprichtii* Winkler, Fedde Repert. Beih. 12: 461 (1922). — Type: *Limpricht 1287* (B, K! Plate 65d, S), Szechwan, Kwan Hsien, China.



Map 15. Distribution of *Symplocos stellaris* Brand.

Evergreen shrubs or small trees. Twigs dark brown, terete, the pith regularly lamellate; young twigs thick, grayish, red-brown tomentose and soon glabrescent, ridged below petioles. Terminal buds ovoid to obliquely ovoid, red-brown tomentose, 5–7 mm long. *Leaves*: blades thick coriaceous, narrowly elliptic, narrowly oblong or narrowly obovate, 8–

15(–22) cm long, (2–)2.5–5(–6) cm wide; apex acute to short acuminate; base cuneate to short attenuate, rarely rounded; margin (often much) recurved, entire but often distally with glandular teeth; upper surface shining, glabrous; lower surface glaucous, glabrous or rarely sparsely hairy on midrib; midrib impressed on upper surface but often slightly prominent near base, very prominent on lower surface; nerves 7–16 pairs, impressed on upper surface, slightly prominent on lower surface; reticulation obscure on lower surface; petioles glabrous or sparsely hairy, adaxially sulcate, 10–40 mm long. *Inflorescence* a condensed spike, on twigs and/or from axils of leaves, to 1 cm long; bracts orbicular to widely ovate, 2–4 mm long, apex obtuse, abruptly acute, sometimes with few glandular teeth on distal margin; bracteoles 2, obliquely oblong to obliquely ovate, (1.5–)2–3 mm long, apex rounded; both persistent, inside glabrous, outside rusty tomentose, margin ciliate. *Flowers*: calyx tube glabrous, about 1 mm high; calyx limb 1.5–2 mm long; calyx lobes ovate, 1–1.5(–2) mm long, rusty tomentose, margin ciliate; corolla white, 7–9 mm long, deeply 5-lobed, lobes elliptic, ciliate on distal margin; corolla tube 1.5–2 mm long; stamens 20–40, pentadelphous; disk cylindrical, glabrous, 0.5–1 mm high; style glabrous 9–13 mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* bluish black, narrowly ovoid, often slightly curved, 7–10 mm by 3–5 mm excluding persistent calyx lobes; stones narrowly ovoid, with 10 lengthwise grooves; mesocarp thin; endocarp woody; seed 1, straight, with straight embryo. *Pollen grains* 3-colporate, brevicolpate, semiangular in polar view, suboblate in equatorial view; tectum corrugate, surface densely papillose and globulate; ora transversely elliptic; 25.0–28.9 μm (P) $\times$ 31.8–34.3 μm (E); pollen type IIe. — *Flowers*: Mar. – Apr. *Fruits*: Apr. – June (following year).

Jap. name: Yanbaru-mimizubai

Chrom. numb. $n = 11$.

Habitat. Subtropical evergreen forests.

Distr. Japan (Ryukyu: Okinawa Is.), Taiwan, S China.

JAPAN. Ryukyu. Okinawa Is.: Kushi, *Tashiro* (TI), *S. Tanaka* 179 (TI, Plate 12d); Mt. Nishime-dake, *Miyazato* (RYU); Gaji-rindo, *T. Shinzato* (RYU); Aha, *M. Furuse* 4807, 4809 (RYU), 20–60 m, *S. Mitsuata* & *H. Nagamasu* 860, 862 (KYO); Kesaji, *Z. Tashiro* (KYO); Mt. Yonaha-dake, *Z. Tashiro* (KYO), *Y. Miyagi* 3274, 3664 (RYU); Okuma-san, Kunigami, *T. Kinjo* 248 (KYO); Genka-san, *S. Sakaguchi* (KYO); Sosu, *Z. Tashiro* (KYO); Sade, *S. Sonohara* (KYO), *G. Koidzumi* (KYO); Benoki-gawa, *Y. Miyagi* & *Hatusima* 37126 (RYU); Benoki-yama, *S. Murata* 1734 (RYU); Mt. Nagodake, *H. Kuroiwa* (KYO), *T. Shimizu* 86-255 (KYO), *Hatusima* 34773A (RYU), 80–345.2 m, *H. Nagamasu* 1465, 1663, 2398, 3401 (KYO); Nakagami, *G. Koidzumi* (KYO); Kuru-san, Nakagami, *S. Tawada* 271, 272 (KYO); Mt. Tanodake, the summit, *Hatusima* 34780 (RYU); Mt. Tanyu-dake, 150 m, *S. Hatusima* 18043 (TI).

TAIWAN. Nantou: Fengshan, Chitou, 1500 m, *T. Yamazaki* & *F. Yamazaki* 150 (TI). — Chiayi: Arisan, *U. Faurie* 178 (KYO), *S. Kokawa* 82 (KYO), *T. Satow* 202 (TI). — Kaohsiung: Qishan, *K. Mori* (TI). — Pingtung: Ken-ting, *H. Izumi* & *M. Togashi* (TI).

CHINA. Anhui: Huangshan, *S.-S. Chien* 1033 (W). — Fujian: Foochow, *H.-H. Chung* 2208 (W). — Jiangxi: Mt. Lu-shan, *M. Takahashi* (TI). — Guangdong: Sam Kok Shan, Tsungfa-Lungmoon Distr., *W.-T. Tsang* 20448 (KYO, TI); Sam Kok Shan, Ch'an Woh T'ung Village, Tsungfa Distr., *W.-T. Tsang* 25000 (KYO); Sam Kok Shan, Cheung Uk Village, Tsungfa Distr., *W.-T. Tsang* 24915 (KYO); Ngok Shing Shan, Sai-lin-shan Village, Sin-fung Distr., *Y.-W. Taam* 452, 544 (KYO); Chong Uen Shan near Kau Fung, Loh Ch'ang Distr., *W.-T. Tsang* 20982 (KYO, W). — Sichuan: Nanchuan, *Bock & Rosthorn* 135 (W). — Guizhou: Shihtsiensan Distr., *Y. Tsiang* 4134 (TI); Fan Ching Shan, Ma Chao Ho, 1000 m, *A.N. Steward et al.* 767 (W).

Sect. 7. *Palaeosymplocos* Brand

Key to the species

- 1a. Twigs conspicuously ridged, nearly winged; leaves revolute, upper surface rugose. 22. *S. kawakamii*
- 1b. Twigs more or less ridged; leaves (slightly) recurved, upper surface not rugose.
 - 2a. Inflorescences 1 to 3-flowered.
 - 3a. Twigs thick, not zigzag; blades 6–9 cm long; inflorescences 1 to 3-flowered; calyx lobes of fruit bending inward, forming a blunt beak. 20. *S. boninensis*
 - 3b. Twigs slender, often zigzag; blades 3–6 cm long; inflorescences 1(–2)-flowered; calyx lobes of fruit erect or spreading, forming a crown. 19. *S. pergracilis*
 - 2b. Inflorescences more than 5-flowered.
 - 4a. Blades 7–13 cm long; stamens more than 50 in number; ovary 3-locular; fruits globose to ellipsoid, 15–20 mm in diameter 21. *S. tanakae*
 - 4b. Blades 4–7 cm long; stamens 20–40 in number; ovary usually 2-locular; fruits ellipsoid, 5–9 mm in diameter.
 - 5a. Bracteoles 1.5–2 mm long; corolla 3.5–4 mm long; fruits 6–10 mm excluding persistent calyx lobes. 17. *S. nakaharae*
 - 5b. Bracteoles 2–3 mm long; corolla (3.5–)4–5 mm long; fruits 9–13 mm long excluding persistent calyx lobes. 18. *S. kuroki*

17. *Symplocos nakaharae* (Hayata) Masamune — Fig. 3-17, Map 16, Plate 66a.

S. nakaharae (Hayata) Masamune, Trans. Nat. Hist. Form. 30: 62 (1940); Nagamasu, Acta Phytotax. Geobot. 38: 289 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 172 (1989). — *S. japonica* A. DC. var. *nakaharai* Hayata, Icon. Pl. Form. 5: 103 (1915); Masamune, Sc. Rep. Kanazawa Univ. 3(2): 61 (1958). — *S. lucida* Sieb. & Zucc. var. *nakaharai* Makino & Nemoto, Fl. Jap.: 373 (1925); Walker, Imp. Tr. Ryukyu Is.: 264 (1954). — *Bobua japonica* (A. DC.) Miers var. *nakaharai* Sasaki, Cat. Govt. Herb.: 407 (1930); Nemoto, Fl. Jap. Suppl.: 581 (1936). — *Dicalix lucida* (Thunb. ex Murray) Hara var. *nakaharai* Hara, Enum. Sperm. Jap. 1: 106 (1948). — Type: *G. Nakahara* (TI!, Plate 66a), Nagotake, Okinawa Is., Ryukyus.

S. lucida auct. non Wall. ex G. Don nec Sieb. & Zucc.: Makino & Nemoto, Fl. Jap.: 373 (1925); Ohwi, Fl. Jap.: 933 (1953); Hatusima, Fl. Ryukyus: 478 (1971); Nooteboom, Leid. Bot. Ser. 1: 217 (1975); Walker, Fl. Okinawa South. Ryukyu Is.: 831 (1976). *p. p., quoad pl. ex Ryukyus.*

S. japonica auct. non A. DC.: Masamune, Sc. Rep. Kanazawa Univ. 3(2): 61 (1955), *p. p., quoad pl. ex Ryukyus.*

Bobua japonica auct. non Miers: Nemoto, Fl. Jap. Suppl.: 581 (1936), *p. p., quoad pl. ex Ryukyus.*

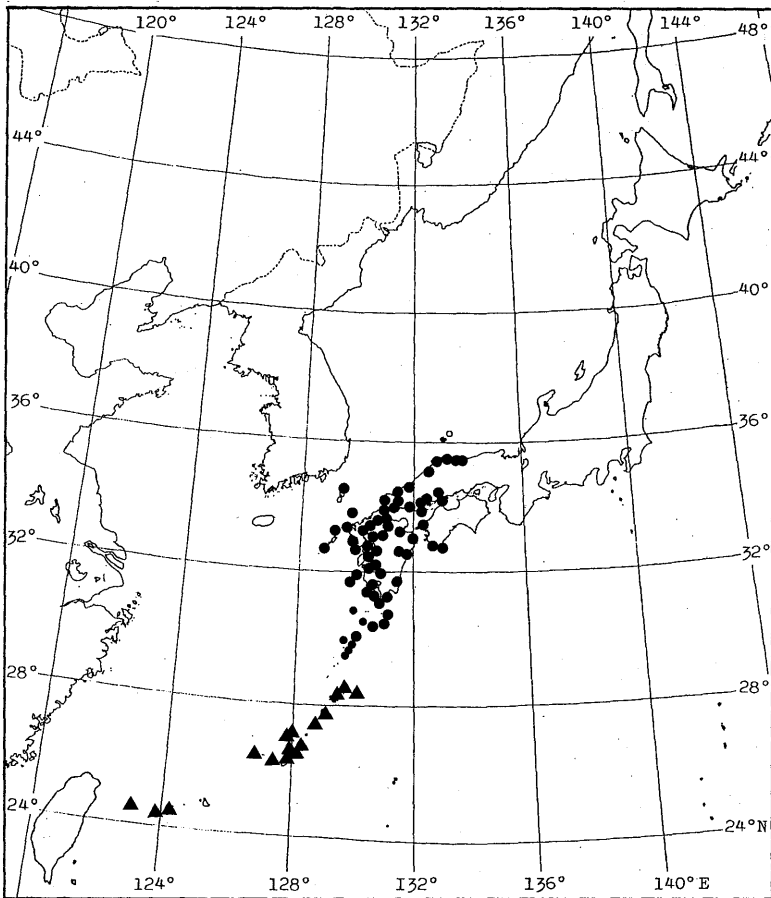
Small evergreen trees. Twigs ashy brown to dark brown, terete or ridged; young twigs green, glabrous, ridged below petioles. Terminal buds narrowly ovoid to subulate, acute to acuminate, often curved at apex, glabrous, 5–10 mm long. *Leaves*: blades coriaceous, elliptic, 4–7(–8) cm long, 1.5–3.5(–4.5) cm wide; apex rounded, obtuse to acuminate; base cuneate to shortly attenuate; margin recurved, entire or glandular-crenate with teeth 4–10 mm apart; both surfaces glabrous; midrib prominent on both surfaces; nerves 5–8 pairs, slightly prominent on both surfaces; petioles glabrous, adaxially sulcate, 4–10 mm long. *Inflorescence* an axillary spike, branched near base, to 1 cm long, axis puberulous; bracts and bracteoles persistent, inside glabrous, outside (sparsely) appressed pubescent, margin ciliolate; bracts ovate to semi-orbicular, sometimes split, 1–1.5 mm long, apex rounded or obtuse; bracteoles 2, depressed ovate to kidney-shaped, apex rounded, obtuse or acute, 1.5–2 mm long. *Flowers*: calyx tube glabrous, about 1 mm high; calyx limb 1–1.5(–2) mm long; calyx lobes imbricate, widely ovate to ovate, apex rounded or obtuse, glabrous,

ciliolate, 1–1.5(–2) mm long; corolla white, 3.5–4 mm long, deeply 5-lobed, the lobes elliptic; stamens 20–30(–35), pentadelphous; disk pulvinate, with 5 glands, densely soft pilose; style glabrous or pilose toward base, 4–4.5 mm long; ovary 2- (rarely 3-)locular. *Fruits* bluish black, ellipsoidal, 6–10 mm long, 5–7 mm in diameter, excluding blunt beak formed by the persistent calyx lobes; stones ellipsoid, rather smooth, 3–4 mm in diameter; mesocarp and endocarp woody; seeds 1(–2) in each locule, J-shaped to slightly curved with similarly curved embryo. *Pollen grains* 3-colporate, brevicolpate; semiangular in polar view, oblate to suboblate in equatorial view; tectum verrucate and partly corrugate; ora transversely elliptic; $19.7\text{--}20.0\text{ }\mu\text{m}$ (P) $\times$ $25.4\text{--}25.8\text{ }\mu\text{m}$ (E); pollen type IIb. — Flowers: Dec. – Feb. Fruits: Aug. – Sept.

Jap. name: Nakahara-kuroki, *Ryukyu-kuroki*

Habitat. Subtropical evergreen forests, often on ridges.

Distr. Japan (Ryukyu), endemic.



Map 16. Distribution of *Symplocos nakaharae* (Hayata) Masamune (triangle) and *S. kuroki* Nagamasu (disk). Small disks are based on the literature.

JAPAN. **Ryukyu.** Kagoshima. Amami-oshima Is.: Okatsu, *S. Kawagoe* (KYO); Kasari, *H. Ohba* 25 (KYO); Akakina, Kasari-mura, 30 m, *S. Sako* (TI, RYU); Naze to Okuma, *H. Ohba* 161 (KYO); Naze, *Z. Tashiro* (KYO); Sotsukatazaki, Nishikomi, Nishikata-son, *Z. Tashiro* (KYO); near the summit of Mt. Yuwan-dake, 660 m, *S. Sako* 5303 (KAG, KYO, RYU); Uken, Uken-son, *M. Furuse* 8062, 8064 (RYU); Mt. Jiwa-dake, near the summit, *M. Furuse* 7945 (RYU). Kikai Is.: *Y. Miyagi* 7303 (RYU), *Y. Yoshinaga* 1421 (RYU). Tokunoshima Is.: the summit of Mt. Inokawa-dake, 640 m, *H. Nagamasu* 1764 (KYO); Mt. Inokawa-dake, *T. Kabashima* RYU32052 (RYU). Okinoerabu Is.: *S. Hatusima* & *Y. Miyagi* 39057 (RYU); Wadamari, *H. Ohba* 115, 137, 149, 178, 201 (KYO); Mt. Koshiyama, 100 m, *S. Hatusima* & *S. Sako* 21411 (KAG, TI); Mt. Oyama, 190 m, *S. Hatusima* & *S. Sako* 21569 (KAG, TI). — Okinawa Is.: *I. Nagatomo* (KYO), *T. Miyagusuku* 773 (KYO); Oku, *Y. Miyagi* 7997 (RYU, TI); Mt. Hedo-ishiyama, *S. Hatusima* 33551 (RYU); Koen, *T. Miyagusuku* 435 (KYO); Hentona-san, *S. Tawada* 282 (KYO); Hentona, *T. Yamazaki* (TI, TNS); Benoki, *M. Furuse* 5578 (RYU); Higashi-son, *Y. Niuro* 3442 (RYU); Yona, *Nakamine* 266 (TNS), *S. Tamagusuku* (RYU), *M. Furuse* 1667 (RYU); Sade, Kunigami-gun, *G. Koidzumi* (KYO); Mt. Yonaha-dake, *S. Sakaguchi* (KYO); Kunigami-son, *Y. Miyagi* 1978 (KYO); Shoshi, Nakijin-son, *Z. Tashiro* (KYO); Nakijin-son, *E. Takamine* 2057 (TNS), 2058 (RYU); Mt. Katsuu-dake, *C. Sakihara* 106 (RYU), *Y. Miyagi* 3861, 3950 (RYU); Nago, *Z. Tashiro* (KYO); Nago-cho, Koen, *T. Kaneshiro* 881 (RYU); Mt. Nago-dake, *G. Nakahara* (TI), 200 m, *J. Murata* 4714 (KYO, TI), 80–345.2 m, *H. Nagamasu* 1470, 1488, 1971, 1991, 1996, 2002, 2397 (KYO); Nago-cho to Ikeda (Motobu-son), *H. Ohba* 9 (KYO); Seifa-utaki, Chine, *K. Shimabuku* 5247 (KYO, RYU); Haji, *T. Miyagi* 70 (TI); Yaezu-dake, Tancha, Onna-son, *Nakamine* 302 (TNS); Tanyu-dake, *S. Sonohara et al.* 6304 (TI); Katsuyama, Yabe-son, *Y. Nakasone* 79 (KYO); Unten, Yagaji, *G. Koidzumi* (KYO); Yagaji Islet, *Z. Tashiro* (KYO); Onna, Onna-son, *J. Matsumura* (TI), *Y. Takushi* 11328 (KYO), *E. Takamine* 2377 (RYU); Onna-dake, *T. Ito* 1084 (TNS); Kooroosan, Nakagami-son, *S. Tawada* 280 (KYO); Misato, *S. Hatusima* 17653 (TI); Ikehara, Misato-son, *S. Tawada* 281; Chibana, Misato-son, *N. Satomi* 25815 (KYO); Shuri, *Sakaguchi* (KYO); prope Naha, *G. Koidzumi* (KYO). Iheya Is.: *H. Kuroiwa* (TI), *Y. Niuro* 3004 (RYU). Izena Is.: *S. Hatusima* 34821 (RYU); *E. Nakata* (RYU); Onoyama, 40–119 m, *M. Tamura et al.* 26611 (KYO). Kerama Is.: Tokashiki Is., *Y. Miyagi* 1106 (RYU), *Y. Miyagi* & *T. Kabashima* 4727 (RYU); Maedake, 50–120 m, Tokashiki Is., *Y. Miyagi* 9173 (KYO, RYU, TI); Aka-jima Is., *Y. Miyagi* & *T. Kabashima* 4972 (RYU); Geruma Is., *Y. Miyagi* 7836 (RYU); Zamami Is., *S. Hatusima* 33401 (RYU). Kume Is.: *H. Kuroiwa* (TI), *Y. Niuro* 589 (RYU), *S. Hatusima* 34303 (RYU); Shirase-gawa, *S. Tawada* 284 (KYO); Nakazato-yama, Gushikawa-son, *T. Amano* 7072 (RYU), 7089 (RYU, TNS); Gushikawa, *N. Satomi* 25817 (TI). Ishigaki Is.: Kabira-mae-dake, *E. Takamine* 2023 (RYU); Mt. Omoto-dake, 100–525.8 m, *G. Murata* & *H. Tabata* 815 (KYO, TI, TNS), *H. Nagamasu* 1032, 1048 (KYO). Iriomote Is.: *G. Koidzumi* (KYO); Mt. Komi-dake, 200 m, *S. Hatusima* 33126 (RYU); Urauchi to Komi, *H. Okada et al.* 281 (KYO, TI); Yutsun River to the summit of Mt. Komi-dake, 260–469 m, *S. Mitsuta* & *H. Nagamasu* 393, 399 (KYO); Yutsun River to Maboroshi-no-ike Pond, 260–380 m, *S. Mitsuta* & *H. Nagamasu* 428 (KYO). Yonaguni Is.: *G. Koidzumi* (KYO), *M. Furuse* 1343 (RYU); Mt. Ubura, *S. Hatusima et al.* 35814 (RYU); S slope of Donan-dake, 40–100 m, *H. Nagamasu* 1539 (KYO).

18. **Symplocos kuroki** Nagamasu, **nom. nov.** — Fig. 3-18 & 4c, Map 16, Plate 66b.

- S. kuroki* Nagamasu — *Laurus lucida* Thunb. ex Murray, Syst. Veg. ed. 14: 384 (1784); Thunb., Fl. Jap.: 174 (1784). — *Hopea lucida* Thunb., Icon. Pl. Jap. 2, t. 4 (1800). — *Dicalix lucida* Hara, Enum. Sperm. Jap. 1: 105 (1948). — Type: Thunberg (UPS, microfiche!), Japan.
- S. lucida* (non Wall. ex G. Don, 1837 or 8 Mar. – 8 Apr. 1838) *sensu* Sieb. & Zucc., Fl. Jap. 1: 55, t. 24 (1837 or early 1838), *p. p.*, *quoad descr. et tab.*, *excl. typ. et syn.* *Myrtus laevis*; Matsumura, Ind. Pl. Jap. 2(2) 487 (1912); Makino & Nemoto, Fl. Jap. ed. 2: 921 (1931); Ohwi, Fl. Jap.: 933 (1953); Kitamura & Murata, Wood. Pl. Jap. 1: 99, t. 120 (1971); Nooteboom, Leid. Bot. Ser. 1: 217 (1975); Nagamasu, Acta Phytotax. Geobot. 38: 288 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 172, pl. 189-4, 5 (1989); Shimabuku, Check List Ryukyu Is.: 353 (1990). — *S. japonica* A. DC., Prodr. 8: 255 (1844), *excl. typ.*; Sieb. & Zucc., Fam. Nat. 2: 133 (1846); Miq., Prol. Fl. Jap.: 265 (1867); Franch. & Sav., Enum. Pl. Jap. 1: 307 (1875); Brand, Pfl. R. Heft 6: 31 (1901). — *Bobua japonica* Miers, J. Linn. Soc. Bot. 17: 306 (1879), *excl. typ.*; Nakai, Tr. & Shr. ed. 1: 233, t. 130 (1922); *op. cit.* ed. 2: 315, t. 147 (1927).

Evergreen trees; bark dark brown, smooth. Twigs gray or dark brown, terete or ridged; young twigs green, glabrous, ridged below petioles. Terminal buds narrowly ovoid to subulate, acute to acuminate, usually curved at apex, glabrous, 6–15 mm long. *Leaves*: blades coriaceous, elliptic, narrowly elliptic(oblanceolate), obovate or narrowly obovate, 4–7 cm long, (1.5–)2–3.5 cm wide; apex obtuse or acute; base cuneate; margin recurved, entire or glandular-crenate with teeth 3–15 mm apart; both surfaces glabrous; midrib prominent on both surfaces; nerves 5–9 pairs, slightly prominent on both surfaces; reticulation obscure on lower surface; petioles glabrous, adaxially sulcate, 5–15 mm long. *Inflorescence* an axillary, contracted spike branched near base, to 1(–1.5) cm long, axis densely puberulous; bracts widely ovate to depressed ovate, often split, 2–3 mm long, apex rounded or acute; bracteoles 2, depressed ovate to kidney-shaped, often keeled, rounded or acute at apex, 2.5–3 mm long; both persistent, inside glabrous, outside appressedly pubescent and ciliolate. *Flowers*: calyx tube glabrous, 1–1.5 mm high; calyx limb 1.5–2.5 mm long; calyx lobes imbricate, widely ovate to ovate, rounded at apex, glabrous or rarely appressed pubescent, ciliolate, 1.5–2.5 mm long; corolla white, (3.5–)4–5 mm long, deeply 5-lobed, the lobes elliptic; corolla tube about 1 mm long; stamens pentadelphous, 25–40; disk pulvinate with 5 glands, densely soft pilose; style glabrous (3.5–)4–6 mm long; ovary 2- (rarely 3-)locular. *Fruits* bluish black, 2- (rarely 3-) locular, ellipsoid, 9–13 mm long, 6–9 mm in diameter, excluding blunt beak formed by the persistent calyx lobes; stones ellipsoid, rather smooth, about 5 mm in diameter; mesocarp and endocarp woody; seeds 1–2(–3) in each locule, J-shaped to slightly curved with similarly curved embryo. *Pollen grains* 3-colporate, brevicolate, semiangular in polar view, suboblate to oblate in equatorial view; tectum corrugate and partly verrucate; ora transversely elliptic; 18.7–18.8 μm (P) $\times$ 23.6–24.0 μm (E); pollen type IIb. — Flowers: Dec. – Apr. Fruits: Sept. – Nov.

Jap. name: Kuroki

Habitat. Warm temperate evergreen forests.

Distr. Japan (Honshu, Shikoku, Kyushu), endemic.

JAPAN. Honshu. Tottori: Kusaka-son, Tohaku-gun, *Y. Ikoma* (KYO); Mt. Daisen, *Z. Tashiro* (KYO); *K. Hisauchi* 662 (TI). — Shimane: Arashima-son, Nogi-gun, *R. Kishino* (KYO); near Matsue, *R. Kishino* (KYO); Izumotaisha, *S. Okuyama* 17723 (TNS); Shizuma-son, Nima-gun, *S. Takaki & E. Matsubara* 131 (KYO); Ukinuno-ike in Mt. Sanbe, Ota-shi, 400 m, *G. Murata* 22136 (KYO, TI, TNS). — Hiroshima: Muko-jima, Hiroshima-shi, *T. Yamazaki* 432 (TI, TNS); Hiji-yama, Hiroshima-shi, *Y. Miyagi* 238 (KYO); Osakikami-jima, Higashino-cho, Toyota-gun, *Z. Tashiro* (KYO), *G. Murata* 22314 (KYO); Gokurakuji-yama, *Z. Tashiro* (KYO); Takehara-cho, *Kato* (KYO); Miya-jima, Saeki-gun, *H. Akiyama* 8929 (KYO); *F. Shimozono* (TI). — Yamaguchi: Shimonoseki, *U. Faurie* 3100 (KYO), *Z. Tashiro* (KYO), *H. Migo* (KYO); Akiyoshidai, *Z. Tashiro* (KYO, TNS); Hikari-shi, *M. Togashi* 1800 (KYO, TI, TNS); Shuhodo, Mine-gun, *H. Migo* (KYO); Shiroyama, Iwakuni-shi, *M. Tagawa* 2451 (KYO); Otori, Yamaguchi-shi, *H. Migo* (KYO); Kurokami-jima, Tomita, Tsuno-gun, *H. Migo* (KYO); Maruo, Ube-shi, *H. Migo* (KYO); Kurae, Yamada-son, Abu-gun, *J. Nishina* (KYO); Taika-san, Tokuyama-shi, 300 m, *M. Umebayashi* 12, 30 (KYO); Ko-jinja, Tokuyama-shi, 50 m, *M. Umebayashi* 393 (KYO); Kyodai-shikenchu, Tokuyama, *S. Okamoto* (KYO); Kogushi, Kawatana, Toyoura-machi, 20–120 m, *N. Kurosaki* 8994, 8997 (KYO), *J. Murata* 9535 (KYO, TI); Shizuki-san, Hagi-shi, *H. Hara & S. Kurosawa* (TI); Yashiro-jima, Mt. Monju-san, 350–600 m, *J. Murata* 9601 (TI); Mukai-jima, Hofu-shi, *K. Oka* (KYO). **Shikoku.** Ehime: Kawanagata, Ikata-son, Nishiuwa-gun, *Y. Nomura* 10 (KYO). — Kochi: Odo-government-forest, Otsuki-sho, Hata-gun, *G. Murata* 17978 (KYO, TNS); Kashiwa-jima, Hata-gun, *H. Yamamoto* TNS22755 (TNS); Ohama to Ashizuri-misaki, Tosashimizu-shi, 70 m, *N. Fukuoka* 10565 (KYO). **Kyushu.** Fukuoka: Moji, Kojo-yama, *T. Hashimoto* (TI); Moji, Shizuchi-

yama, *T. Hashimoto* (TI); Adachi-yama, Moji, *T. Hashimoto* (TI); circa Kukura, *U. Faurie* 5529 (KYO); Togamiyama, Osato, *T. Sugino* (KYO); Jingo to Hirao, Hiraodai, 200 m, *N. Kurosaki* & *Y. Inamasu* 850 (KYO, TNS); Kawara-dake, *Anonymous* 3052 (TNS); the summit of Toishi-yama to Kurobaru, Chikuhō-cho, Kaho-gun, 200–850 m, *N. Kurosaki* 9847 (KYO, TI); Abura-yama, *Anonymous* (TI), *H. Yamamoto* 4579 (TNS); Mt. Hiko-san, *J. Ouchi* (*S. Okuyama* 200) (TNS). — Saga: Omagari, Higashisefuri-son, Kanzaki-gun, *T. Baba* 50 (TNS); Kitataku-cho, Taku-shi, *T. Baba* (TNS). — Nagasaki: circa Nagasaki, *U. Faurie* 3101 (KYO), *Maximowicz* (TNS); Hirayama to the top of Mt. Hachiro-dake, Nagasaki-shi, *N. Fujita* 596 (KYO); Mt. Hichimen-yama of Mayuyama, Shimabara-shi, *N. Naruhashi* 3040 (KYO); Mt. Unzen, *Y. Tashiro* (TI), *J. Matsumura* & *G. Koidzumi* (TI); Isaura-gawa, Nishisonogi-gun, *H. Ohba* & *K. Midorikawa* 302 (TI); Omura, *Z. Tashiro* (KYO); Jo-yama, Hoshikacho, Matsuura-shi, 20–125.6 m, *H. Nagamasu* 1827 (KYO); Azuchi, O-shima, *Z. Tashiro* (KYO, TNS); Yasuman-dake, Hirado-shi, *S. Kitamura* (KYO), 200 m, *N. Fujita* & *S. Mitsuata* 22 (KYO); Funaki, Hirado, about sea level, *M. Hotta* & *M. Ito* 80 (KYO). Iki Is.: Komaki-fure-higashi, Gonoura-cho, *K. Mimoro* 1701 (KYO). Tsushima Is.: *U. Faurie* 4804 (KYO), *T. Nakai* (TI); Toyo to Toorazuhama, Kamitsushima-cho, Kamiagata-gun, up to 20 m, *N. Fukuoka* 7854 (KYO, RYU, TI). Goto Is., Fukue Is.: Arakawa, Tamanoura-cho, 0–30 m, *K. Ueda et al.* 1337 (KYO); Terawaki, Kisugi-sho, 100 m, *G. Murata* & *H. Koyama* 14556 (KYO); Mt. Oto-zan, Yoshida-cho, Fukue-shi, 60–100 m, *N. Fukuoka* & *N. Kurosaki* 3723 (KYO); Shiratori-jinja, 60 m, *H. Taoka* 3623 (KYO). Goto Is., Uku Is.: NE foot of Mt. Jogatake 100 m, *Y. Tateishi* 4669 (TI). — Kumamoto: Akada, Arao-shi, *Y. Shimada* 11377 (KYO); Gyokuto-cho, Tamana-gun, *Y. Shimada* 13483 (KYO); Misumi-dake, Udo-gun, *Y. Shimada* 11375 (KYO); Uchinomaki, *M. Togashi* 1427 (KYO, TI); Kume-mura, Kuma-gun, *Y. Nabeshima* (KYO); Oura, Kamishima, Amakusa-gun, *T. Yamazaki* (TI); Yunoko-jima, Minamata-shi, *Y. Shimada* 8128B (TNS). — Oita: Beppu, *T. Nakai* (TI); Oita-shi, Takashiro, *Y. Shimada* 8123B (TNS); Tsukumi-jima, *Z. Tashiro* (KYO). — Miyazaki: Totoro, *K. Narita* TNS9952 (TNS); Hosojima, *S. Kitamura* (KYO); Yamage, Togo, Higashiusuki-gun, *H. Kanai* (TI); Futobaru, Obi-cho, Naka-gun, *S. Hattori* & *I. Hurusawa* 342, 367 (TI), *S. Hattori* 17 (TNS). — Kagoshima: Yunono, Mt. Kirishima, *M. Nagasawa* (TI); Noma-dake, *I. Inami* (KYO); Yaseo, Kawanabe-gun, *M. Shinagawa* (KYO); Shiroyama, Kagoshima-shi, *T. Nakai* (TI); Akakuebana, Makurazaki-shi, *S. Kitamura* & *G. Murata* 2913, 2925 (KYO); near Fukiagehama-eki, Fukiage-cho, Hioki-gun, 30 m, *N. Kurosaki* 10837 (KYO); Bonotsu-cho, Kawanabe-gun, *S. Kitamura* & *G. Murata* 2891 (KYO); Ikeda-ko, *Z. Tashiro* (KYO, TNS); Satsuma-gun, *Z. Tashiro* (KYO); Sata-misaki, *N. Fukuoka* 3289 (KYO), *S. Kitamura* (KYO), *G. Murata* 12891 (KYO); Odomari to Tajiri, Sata-cho, Kimotsuki-gun, *A. Nitta* 2 (KYO); Odomari to Satonoura, Sata-cho, 100 m, *T. Yamazaki* & *H. Ohba* 400 (KYO, TI); Minashiri, Uchinomaki-cho, *M. Tagawa* & *K. Iwatsuki* 4036 (KYO); Funayuki, Uchinoura, *Z. Tashiro* (KYO); Kajiki, *Z. Tashiro* (KYO). Koshiki-jima Is.: Kuwanoura, Kamikoshiki-mura, *A. Nitta* 388 (KYO); Shimokoshiki-jima, Seo, near Kannon-daki, 200 m, *M. Togashi* TNS273076 (TI, TNS). Tanegashima Is.: *U. Faurie* 307 (KYO), *Anonymous* (TI); Nishino'omote, *Suzuki et al* (TI); Onigasawa, N of Nishino'omote, *K. Iwatsuki* 4173 (KYO); upper course of Shikanaki-zawa, *K. Iwatsuki* 4107 (KYO). Yaku-shima Is.: *G. Koidzumi* (KYO), *H. Muramatsu* (TI), *G. Masamune* (TI); Miyanoura, *S. Okamoto* (KYO); Menokawa, 40–80 m, *J. Murata et al.* 17723 (KYO, TI); Onnagawa, Kamiyaku-cho, *T. Yahara et al.* 9029 (KYO, TI); Hinokuchi to Hirao, 10–60 m, *T. Yahara et al.* 9093 (TI); Funayuki, seashore, *J. Murata* & *S. Sakai* 17209 (TI); Kurio-Yudomari, 50 m, *Suzuki et al.* (TI); Onoaida, *T. Yamazaki* (TI); Segire River to Nagata, 100–300 m, *G. Murata et al.* 40 (KYO). Tokara Is.: Kuchinoshima Is., 150 m, *S. Sako* 7127 (KAG, KYO, TI).

Notes. 1. When *Symplocos lucida* Sieb. & Zucc. (Fl. Jap. 1: 55, 1837 or early 1838) was published, *Kuroggi* Kaempfer, Amoen. exot. 788 (1712) and *Myrtus laevis* Thunb., Fl. Jap. 198 (1784) were cited as synonyms. As the type of *Myrtus laevis* was not excluded in the description, the basionym of *S. lucida* Sieb. & Zucc. is *Myrtus laevis* Thunb. ex Murray [= *Pourthiaea villosa* (Thunb. ex Murray) Decne. var. *laevis* (Thunb. ex Murray) Stapf, Rosaceae].

A. DeCandolle published a new name *S. japonica* for *S. lucida* Sieb. & Zucc. giving the priority to another homonym *S. lucida* Wall. ex G. Don (1837 or 1838). *Symplocos japonica* A. DC. also should be nomenclaturally based on *Myrtus laevis* Thunb. ex Murray, be-

cause he cited only *S. lucida* Sieb. & Zucc. without excluding *Myrtus laevis*.

2. Nootboom (1975) considered that *S. lucida* Sieb. & Zucc. was based on *Laurus lucida* Thunb., Fl. Jap. 174 (1784). These two names should be, however, considered to be heterotypic, because Siebold & Zuccarini never cited *Laurus lucida* Thunb. Although *Laurus lucida* is the oldest synonym of this species, Thunberg's epithet '*lucida*' is not available under the genus *Symplocos* because there are earlier homonyms, *S. lucida* Wall. ex G. Don and *S. lucida* Sieb. & Zucc. Therefore, I propose a new name, *S. kuroki* based on *Laurus lucida* Thunb. ex Murray. The new epithet '*kuroki*' is a Japanese vernacular name for this species.

19. ***Symplocos pergracilis*** (Nakai) Yamazaki—Fig. 3-19, Map 17, Plate 66c.

S. pergracilis (Nakai) Yamazaki, J. Jap. Bot. 44: 366 (1969); Toyoda, Fl. Bonin Is.: 155, photo 70, t. 70 (1981); Nagamasu, Acta Phytotax. Geobot. 38: 290 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 172, pl. 189-1, 2 (1989). — *Bobua pergracilis* Nakai, [Rigakkai 26(5): 7 (1928), *nomen, non vidi*] Bot. Mag. Tokyo 44: 24 (1930); Nemoto, Fl. Jap. Suppl.: 583 (1936). — *Dicalix pergracilis* Hara, Enum. Sperm. Jap. 1: 106 (1948). — Type: *H. Toyoshima* (TI!, Plate 66c), Takeda bokujyo insulae Chichijimae, Bonin Isls.

S. boninensis sensu Rehder & Wilson, J. Arn. Arb. 1: 119 (1919), *p. p.*, *quoad pl. ex Chichijima*; Nootboom, Leid. Bot. Ser. 1: 133 (1975).

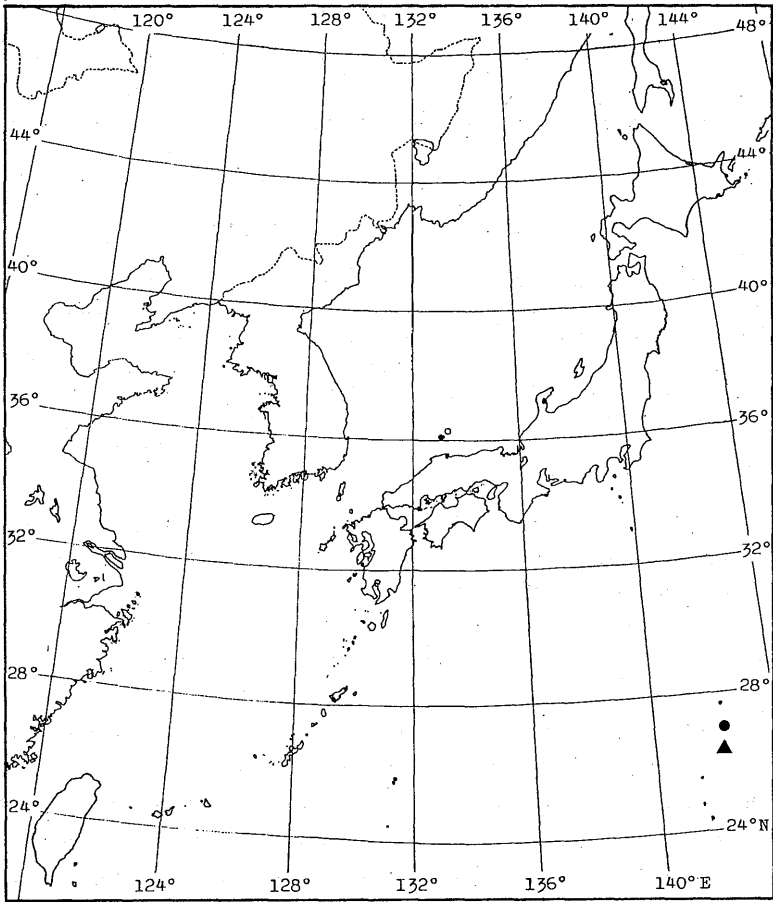
Small evergreen trees. Twigs green or brown, terete; young twigs slender, 1–2 mm in diameter, green, often tinged violet, glabrous, ridged below petioles. Terminal buds subulate, often curved, glabrous, 6–15 mm long. *Leaves*: blades coriaceous, obovate to narrowly obovate, (2.5–)3–6 cm long, 1–2.5(–3) cm wide; apex acute, obtuse or rounded; base attenuate; margin recurved, entire or slightly glandular-crenate with teeth 3–7 mm apart; both surfaces glabrous; midrib prominent to slightly sulcate on upper surface, prominent on lower surface; nerves 6–8 pairs, obscure on lower surface; petioles glabrous, narrowly winged, often tinged with violet, 7–15 mm long. *Inflorescence* axillary, a reduced contracted spike, rarely branched at base, to 5 mm long, 1(–2)-flowered; axis with several persistent sterile bracts; bracts orbicular to transversely widely elliptic, rounded at apex, glabrous, margin ciliate, 2–3.5 mm long. *Flowers*: calyx tube glabrous, about 1 mm high; calyx limb about 3.5 mm long; calyx lobes imbricate, semi-orbicular to kidney-shaped, rounded at apex, glabrous, 3–3.5 mm long, margin ciliate; corolla white, 6–7 mm long, deeply 5-lobed, the lobes elliptic, ciliate; corolla tube about 1 mm high; stamens 100–120 (1 specimen examined), pentadelphous; disk pulvinate to flat, 5-glandular, soft pilose; style glabrous or sparsely pilose the base, 5–6 mm long; ovary 3-locular. *Fruits* 3-locular, (obliquely) narrowly obovoid or narrowly ellipsoidal, 18–25 mm long, 7–12 mm in diameter, excluding calyx lobes; calyx lobes persistent, erect or spread, forming a crown; stones trigonous, smooth or slightly grooved lengthwise, base acute; mesocarp and endocarp woody; seeds 1–2 in each locule, straight, with straight embryo. *Pollen grains* 3-colporate, brevicolpate, semiangular in polar view, suboblate in equatorial view; tectum gemmate and globulate; globules striately sculptured; ora tranversely elliptic; 20.5–22.2 μm (P) $\times$ 28.7–29.6 μm (E); pollen type IIb. — Flowers: Nov.–Dec. Fruits: Nov.–Dec. (following year).

Jap. name: Chichijima-kuroki

Chrom. numb. $2n = 22$.

Habitat. Subtropical dry evergreen forests.

Distr. Japan (Bonin: Chichi-jima Is.), endemic.



Map 17. Distribution of *Symplocos pergracilis* (Nakai) Yamazaki (disk) and *S. boninensis* Rehder & Wilson (triangle).

JAPAN. Bonin. Chichi-jima Is.: Takeda-bokujo, *H. Toyoshima* (TI), *T. Nakai* (TI), *T. Tuyama* (TI); Mt. Chuoizan, *M. Okabe* TNS58203 (TNS), 300 m, *T. Yamazaki* & *K. Enomoto* 137 (KYO, TI), *G. Murata et al.* 251, 258 (KYO, TI), *T. Toyoda* (TI); Chuoosan-higashidaira, 200–250 m, *Y. Shimizu* 77-85, 77-132, 79-22, 79-70, 80-110 (KYO), *T. Shimizu* 84-1835 (KYO); Higashidaira, *K. Inoue* 1457 (TI), *M. Ito et al.* 257907, 257908 (KYO, MAK); Mt. Yoake–Mt. Chuo, *Y. Momiyama et al.* 125983 (KYO, MAK, TI), 250–300 m, *M. Ono* & *S. Kobayashi* 123692 (MAK, TI); Chuoizan to Hatuneyama, 200 m, *T. Yamazaki* (TI); Mt. Hatsune, *Y. Momiyama et al.* 126134, 126135 (KYO, MAK, TI).

Notes. 1. Recently, Shimizu & Yasui (1992) reported this endangered species also from Anijima Is., adjacent to Chichijima Is.

2. See Nagamasu (1987) for a detailed distribution map.

20. **Symplocos boninensis** Rehder & Wilson—Fig. 3-20 & 4a, Map 17, Plate 66d.

S. boninensis Rehder & Wilson, J. Arn. Arb. 1: 119 (1919), *excl. pl. ex Ins. Chichijima.*; Makino & Nemoto, Fl. Jap. ed. 2: 918 (1931); Nooteboom, Leid. Bot. Ser. 1: 133 (1975), *excl. syn. Bobua pergracilis*; Toyoda, Fl. Bonin Is.: 154, photo 69, t. 69 (1981); Nagamasu, Acta Phytotax. Geobot. 38: 287 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 172, pl. 190-5 (1989). — *Dicalix boninensis* Hara, Enum. Sperm. Jap. 1: 104 (1948). — Type: E.H. Wilson 8336 (A! Plate 66d, isotypes in BM, E!, K!), Mukoh-jima, Bonin Isls.

Small evergreen trees. Twigs green or brown, terete; young twigs green, glabrous, ridged below petioles. Terminal buds subulate, apex usually curved, glabrous, 8–15 mm long. *Leaves*: blades coriaceous, elliptic, 6–9 cm long, 2.5–5 cm wide; apex obtuse to rounded; base attenuate; margin recurved, entire or slightly glandular-crenate with teeth 5–10 mm apart; both surfaces glabrous; midrib slightly elevated on upper surface, prominent on lower surface; nerves 5–8 pairs, slightly prominent on both surfaces; petioles glabrous, narrowly winged, often tinged violet, 8–30 mm long. *Inflorescence* axillary, a reduced contracted spike, branched at base, to 1 cm long, 1 to 3-flowered; axis with many persistent sterile bracts; bracts widely ovate, rounded at apex, glabrous except for ciliolate margin, 1.5–3.5 mm long. *Flowers*: calyx tube glabrous, about 1 mm high; calyx limb 3–3.5 mm long; calyx lobes imbricate, widely ovate, rounded at apex, glabrous, 3–3.5 mm long, margin ciliolate; corolla white, 5–6 mm long, deeply 5-lobed, the lobes elliptic, ciliolate; corolla tube about 1 mm long; stamens 60–100, pentadelphous; disk pulvinate, with 5 glands, soft pilose; style sparsely pilose, about 6 mm long; ovary 3-locular. *Fruits* 3-locular, (obliquely) obovoid to narrowly obovoid, (16–)20–25 mm long, (8–)10–13 mm in diameter, persistent calyx lobes bending inwards; stones trigonous with shallow lengthwise grooves, base acute; mesocarp and endocarp woody; seeds 1–2 in each locule, straight, with straight embryo. *Pollen grains* 3-colporate, brevicolpate, semiangular in polar view, suboblate in equatorial view; tectum verrucate or gemmate, globulate; globules loosely attached to tectum, striately sculptured; ora transversely elliptic; $23.5\ \mu\text{m}$ (P) $\times$ $28.6\ \mu\text{m}$ (E); pollen type IIb. — Flowers: Oct. Fruits: July (Toyoda, 1981).

Jap. name: Munin-kuroki

Chrom. numb. $2n = 22$.

Habitat. Subtropical dry evergreen forests.

Distr. Japan (Bonin: Mukoh-jima Is.), endemic.

JAPAN. **Bonin.** Haha-jima Group, Mukoh-jima Is.: *M. Okabe* 59162 (TNS), *Y. Satake* 91356 (TNS), *H. Hara* (TI), *T. Tuyama* (TI), *Murata et al.* 646 (KYO), *M. Ito et al.* 257874, 257875 (KYO, MAK), *H. Kihara* (KYO); 50–100 m, *E.H. Wilson* 8336 (A, E, K), *H. Tabata & Y. Shimizu* 79-51, 79-55 (KYO).

Note. See Nagamasu (1987) for a detailed distribution map.

21. **Symplocos tanakae** Matsumura—Fig. 3-21 & 4b, Map 18, Plate 67a.

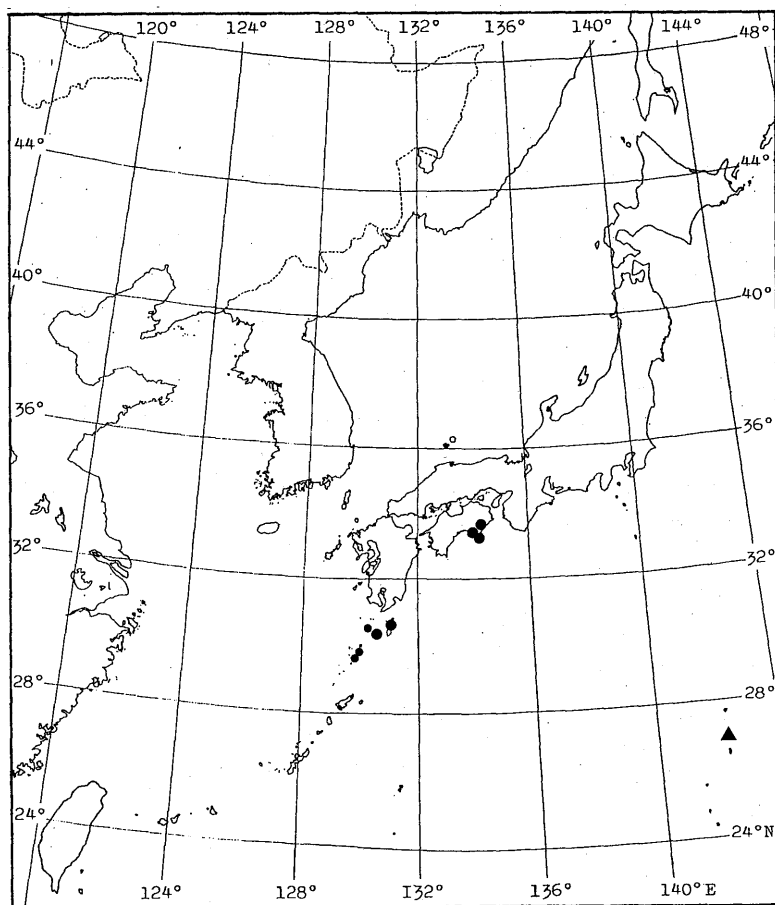
S. tanakae Matsumura, Bot. Mag. Tokyo 15: 79 (1901); Ind. Pl. Jap. 2(2): 488 (1912); Ohwi, Fl. Jap.:

933 (1953); Kitamura & Murata, Wood. Pl. Jap. 1: 99, t. 119 (1971); Nagamasu, Acta Phytotax. Geobot. 38: 290 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 172, pl. 179-3 (1989). — *Bobua tanakae* Masamune, Prel. Rep. Veg. Yakus.: 110 (1929); Fl. Geo. Yakus.: 365 (1934). — *Dicalix tanakae* Hara, Enum. Sperm. Jap. 1: 107 (1948). — Type: *S. Tanaka* 436 (TI!, Plate 67a), Ins. Tanegashima, Japan.

S. zentaroana Makino ex Yanagida, J. Jap. Forestry Soc. 20(3): 115, no. 532, fig. 531 (1938), *nom. nud.*, *descr. in jap.*

S. lucida auct. non Sieb. & Zucc.: Nooteboom, Leid. Bot. Ser. 1: 217 (1975).

Evergreen trees. Twigs green or ashy brown, terete; young twigs green, grabrous, obtusely ridged below petioles. Terminal buds narrowly ovoid to subulate, glabrous, apex acute or acuminate, often slightly curved, 7–14 mm long. *Leaves*: blades coriaceous, narrowly obovate to narrowly oblong-elliptic, 7–13 cm long, 2–3.5(–4) cm wide; apex obtuse, acute or short acuminate; base attenuate; margin recurved, glandular-crenate with teeth 3–10 mm apart, usually the proximal half entire; both surfaces glabrous; midrib slightly promi-



Map 18. Distribution of *Symplocos tanakae* Matsumura (disk) and *S. kawakamii* Hayata (triangle). Small disks are based on the literature.

nent to slightly sulcate on upper surface, prominent on lower surface; nerves 8–14 pairs, slightly prominent on both surfaces; reticulation obscure; petiole glabrous, narrowly winged, 10–25 mm long. *Inflorescence* axillary, a contracted spike, to 1 cm long, 5 to 8-flowered, bracts persistent, orbicular to widely ovate, often split, apex rounded, glabrous, 4–5 mm long, margin ciliolate; bracteoles 2, persistent, elliptic to (obliquely) ovate, keeled, apex acute or rounded, 3.5–4.5 mm long, keel glabrous or sparsely pilose, margin ciliolate. *Flowers*: calyx tube glabrous, about 1.5 mm high; calyx limb glabrous, 3.5–4 mm long; calyx lobes imbricate, widely ovate to elliptic, apex rounded, glabrous, 3.5–4 mm long, margin ciliolate; corolla white, 6–7.5 mm long, deeply 5-lobed, the lobes elliptic; corolla tube about 1 mm long; stamens 60–75, pentadelphous; disk pulvinate, with 5 glands, soft pilose; style glabrous, 7–7.5 mm long; ovary 3-locular with 4 ovules in each locule. *Fruits* 3-locular, globose to ellipsoid, 18–25 mm long, 15–20 mm in diameter, crowned by persistent calyx lobes; stones ellipsoid, smooth or with longitudinal shallow grooves; mesocarp and endocarp woody; seeds 1–2 in each locule, U-shaped to slightly curved with similarly curved embryo. *Pollen grains* 3-colporate, brevicolpate, semiangular in polar view, suboblate in equatorial view; tectum verrucate and/or gemmate; ora transversely elliptic; $22.1 \mu\text{m}$ (P) $\times$ $26.7\text{--}27.3 \mu\text{m}$ (E); pollen type IIb. — *Flowers*: Oct.–Jan. *Fruits*: Sept.–Dec.

Jap. name: Oni-kuroki, *Hiroha-no-mimizubai*

Chrom. numb. $2n = 22$.

Habitat. Warm temperate (montane) evergreen forests.

Distr. Japan (Shikoku, Kyushu), endemic.

JAPAN. **Shikoku**. Tokushima: Kushikawa, Kaifu-cho, Kaifu-gun, *T. Nakayama* 438 (TOFO); 20–40 m, *H. Nagamasu* & *A. Soejima* 4589 (KYO). — Kochi: *T. Makino* MAK197815 (MAK, RYU); Gyodo-misaki, Muroto-cho, *T. Yoshinaga* (KYO); Kongouchou-ji Temple, 160–200 m, Muroto-shi, *H. Nagamasu* & *A. Soejima* 4588 (KYO); Kitayama-son, Sasayani-yama, *Anonymous* (KYO); Nahari-son, Sukawa-dake, *G. Koidzumi* (KYO); Kitagawa-mura, Aki-gun, *T. Yamawaki* 84 (TI). **Kyushu**. Kagoshima. Tanega-shima Is.: Nishinoomote, *S. Tanaka* 436 (TI); Eboshi-dake, *Z. Tashiro* (KYO). Yaku-shima Is.: *G. Koidzumi* (KYO, TI), *G. Masamune* (TI), *Koyama* (TI); Koyoji-rindo, 100–500 m, *S. Amano* et al. 260 (KYO, TI); Koyoji River, 350 m, *S. Mitsuta* et al. 558 (KYO), 1050–1250 m, *J. Murata* et al. 15931 (TI), Migi-tani, 1050–1150 m, *G. Murata* et al. M-7 (KYO, TI); Ambo to Kosugidani, *Z. Tashiro* (KYO); near Hanayama, *S. Sako* 6484 (KYO); Kurio to Hanayama, 700 m, *S. Sako* 6484 (KYO); Hanayama reserved forest, 1020–1280 m, *G. Murata* et al. 505 (KYO, TI), *S. Mitsuta* & *H. Doei* 488, 796 (KYO); Hanayama trail, 850–950 m, *S. Mitsuta* & *H. Doei* 248 (KYO); Segire River, 550 m, *S. Mitsuta* & *H. Nagamasu* 108 (KYO); Kuromi trail, 1000–1100 m, *S. Mitsuta* et al. 289, 305 (KYO, TI); Kuniwari-dake, *S. Okamoto* (KYO), 300 m, *T. Yamazaki* 6880, 6946 (TI); Kusukawa path, 200–600 m, *J. Murata* et al. 15455 (KYO, TI); Kusukawa–Kosugidani, *Y. Doi* (TI); Yudomari, 600 m, *T. Yamazaki* 6176 (TI).

Note. This species is also known from Tokara Is.: Kuchinoerabu Is., Nakanoshima Is. and Suwanosejima Is. (Hatusima, 1986).

22. *Symplocos kawakamii* Hayata — Fig. 3-22, Map 18, Plate 67b–c.

S. kawakamii Hayata, Icon. Pl. Form. 5: 104, t. 30 (1915); Makino & Nemoto, Fl. Jap.: 372 (1925); Toyoda, Fl. Bonin Is.: 175, photo 80, t. 80 (1981); Nagamasu, Acta Phytotax. Geobot. 38: 287 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 104, pl. 188-3 (1989). — *Bobua kawakimii* Nakai, [Rigakkai 26(5): 7 (1928), *nomen, non vidi*] Bot. Mag. Tokyo 44: 24 (1930); Nemoto, Fl. Jap. Suppl.: 581 (1936). — *Dicalix kawakamii* Hara, Enum. Sperm. Jap. 1: 104 (1948). —

Type: *T. Kawakami* (TI), Plate 67b), Bonin Isls.

S. otomoi Rehder & Wilson, J. Arn. Arb. 1: 119 (1919). — Type: *H. Otomo* (A), Plate 67c), Chichijima, Bonin Isls.

Evergreen shrubs. Twigs green or ashy brown, conspicuously ridged; young twigs green, glabrous, conspicuously ridged below petioles. Terminal buds ovoid, apex acute, glabrous, with keeled scales, 3–5 mm long. *Leaves*: blades coriaceous, obovate, elliptic or ovate, 2–5 cm long, 0.7–2 cm wide; apex retuse or rounded; base attenuate; margin conspicuously recurved, nearly revolute, entire; both surfaces glabrous; midrib prominent near base, impressed distally on upper surface, prominent on lower surface, usually ridged near base on lower surface; nerves 5–7 pairs, impressed on upper surface with reticulation (rugose on upper surface), obscure on lower surface; petiole glabrous, winged, abaxially ridged, 2–8 mm long. *Inflorescence* axillary spike branched near base, 0.5–2.5(–3) cm long, 3 to 10-flowered; axis ridged, sparsely pilose, nearly glabrous; bracts persistent, narrowly ovate to ovate, 2–4 mm long, apex rounded, obtuse or acute, glabrous, margin ciliate; bracteoles 2, persistent, ovate to triangular, keeled, 2.5–3 mm long, glabrous, margin ciliate. *Flowers*: calyx tube glabrous, about 1.5 mm high; calyx limb 2.5–3 mm long; calyx lobes imbricate, ovate, rounded or obtuse at apex, margin ciliate, 2.5–3 mm long; corolla white, about 7 mm long, deeply 5-lobed, the lobes elliptic, ciliate; corolla tube about 1 mm long; stamens 70–90 (1 specimen examined), pentadelphous; disk flat to slightly pulvinate, with 5 glands, soft pilose; style glabrous, 3.5–4 mm long; ovary 3-locular with 4 ovules in each locule. *Fruits* 3-locular, globose or (obliquely) obovoid, 14–20 mm long, 10–12 mm in diameter, persistent calyx lobes forming a blunt beak; stones obovoid, smooth, 7–8 mm in diameter; mesocarp and endocarp woody; seeds 1–2 in each locule, straight or slightly curved, with straight or slightly curved embryo. *Pollen grains* 3-colporate, brevicolpate, semiangular in polar view, suboblate in equatorial view; tectum gemmate and globulate; globules striately sculptured; ora transversely elliptic; $23.2\ \mu\text{m}$ (P) $\times$ $28.8\ \mu\text{m}$ (E); pollen type IIb. — Flowers: Nov. Fruits: Oct. (Toyoda, 1981).

Jap. name: Uchidashi-kuroki

Habitat. Subtropical dry scrubs.

Distr. Japan (Bonin: Chichijima Is.), endemic.

JAPAN. **Bonin.** Chichijima Is.: *H. Otomo* (A), *T. Kawakami* (TI), *G. Oka* (KYO); Takeda bokujo, *S. Nishimura* 574 (TI), *s. n.* (KYO), *T. Nakai* (TI) *T. Tuyama* (TI), *M. Okabe* (TI); Chuoizan (Takedabokujo), *H. Toyoshima* (TI); Hatsune-yama, *Toyoda* (TI), *M. Ono & S. Kobayashi* 127498 (MAK, TI); south peak of Mt. Hatsune, *Y. Momiyama et al.* 126315 (KYO, MAK); Hatsuneyama-Ohtaki, 200 m, *T. Yamazaki* (TI); Hatsuneura, *G. Murata et al.* 82, 110 (KYO); along Hatsuneura yuhodo, 180–210 m, *Y. Shimizu* 77-47 (KYO); Mt. Yoake–Chuosan-higashidaira, 230–260 m, *Y. Shimizu* 80-52 (KYO); Yoakedaira to Nagahama, 100 m, *T. Yamazaki* (TI).

Note. See Nagamasu (1987) for a detailed distribution map.

Sect. 8. *Okinawenses* Nagamasu

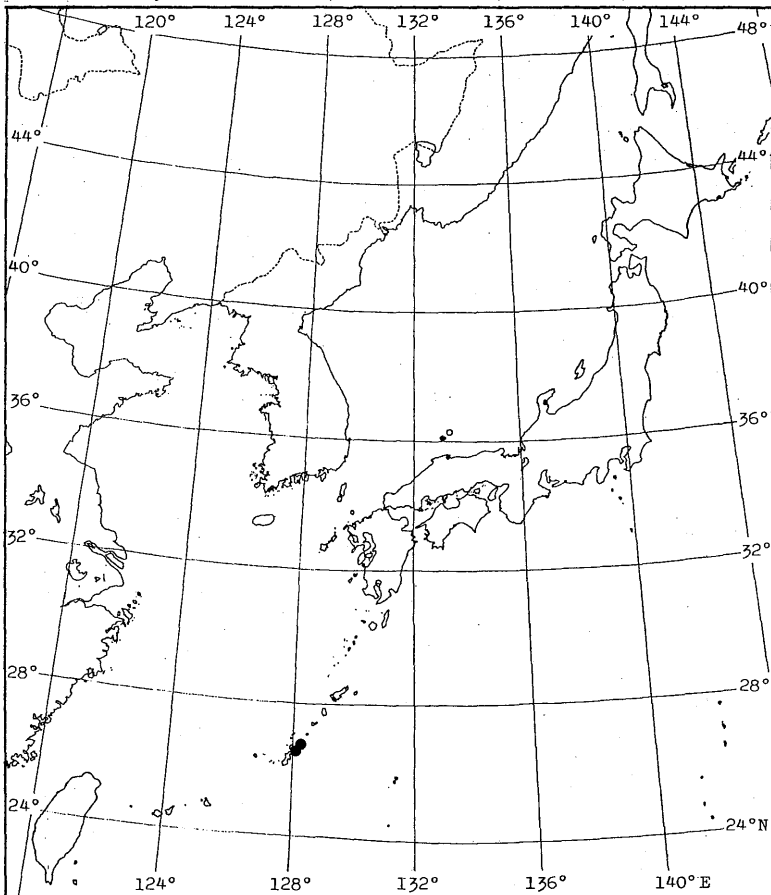
23. *Symplocos okinawensis* Matsumura — Fig. 3-23 & 4d, Map 19, Plate 67d.

S. okinawensis Matsumura, Bot. Mag. Tokyo 15: 78 (1901); Ind. Pl. Jap. 2(2): 488 (1912); Walker,

Imp. Tr. Ryukyu Is.: 265 (1954), *excl. descr. et t. 170*; Hatusima, Fl. Ryukyus: 476 (1971), *excl. syn.*; Walker, Fl. Okinawa South. Ryukyu Is.: 833 (1976); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 174, pl. 193-1 (1989); Shimabuku, Check List Ryukyu Is.: 353 (1990). — *Bobua okinawensis* Nemoto, Fl. Jap. Suppl.: 583 (1936). — Type: *Matsumura* (TII, Plate 67d), Onnaha, Okinawa Is., Ryukyus.

S. anomala auct. non Brand: Nootboom, Leid. Bot. Ser. 1: 126 (1975).

Small evergreen trees. Twigs brown, terete; young twigs rusty or red-brown, tomentelous to appressedly pubescent, slightly ridged below petioles. Terminal buds obliquely ovoid or subulate, appressedly pubescent, apex acute or acuminate and usually curved, 2–5 mm long. *Leaves*: blades coriaceous, elliptic, 4–6 cm long, 1.5–2.5 cm wide; apex acute to acuminate with apiculate tip; base attenuate; margin slightly recurved, crenate-serrate, with teeth 1.5–5 mm apart; both surfaces glabrous, or rarely young leaves appressed hairy; upper surface shining; midrib prominent on both surfaces; nerves 5–7 pairs, slightly prominent on both surfaces; petioles narrowly winged, glabrous, 2–5 mm long. *Inflorescence* an axillary



Map 19. Distribution of *Symplocos okinawensis* Matsumura.

raceme, rarely branched at base, loosely 3 to 7-flowered, to 1 cm long; pedicels 1–4 mm long; the axis and pedicels silverly tomentellous or appressed pubescent; bracts ovate to narrowly ovate, 0.5–1.5 mm long, apex acute; bracteoles 2, ovate to narrowly ovate, 0.5–1.5 mm long, apex acute; both persistent, inside glabrous, outside with same indument as axis. *Flowers*: calyx with same indument as inflorescence axis; calyx tube 1–1.5 mm high; calyx limb 1–1.5 mm long; calyx lobes imbricate, semi-orbicular, the apex rounded, margin ciliate, 0.7–1 mm long; corolla white, 4–6 mm long, deeply 5-lobed, the lobes elliptic; corolla tube about 1 mm long; stamens pentadelphous, 50–100; disk short cylindrical, tomentose; style glabrous, 5–7 mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* ellipsoid, 3-locular, 7–9 mm long, 4–5 mm in diameter, excluding the persistent calyx lobes; stones ellipsoidal, longitudinally shallowly grooved; mesocarp thin; endocarp woody; seeds 1 in each locule, straight with straight embryo. *Pollen grains* 3-colporate, brevicolpate, subangular to semilobate in polar view, oblate in equatorial view; tectum corrugate and partly verrucate; ora transversely elliptic; $19.9\ \mu\text{m}$ (P) $\times$ $29.8\ \mu\text{m}$ (E); pollen type IIc. — *Flowers*: Aug. – Dec. *Fruits*: next summer?

Jap. name: Ryukyu-hainoki

Habitat. Subtropical montane evergreen forests.

Distr. Japan (Ryukyu: Okinawa Is.), endemic.

JAPAN. **Ryukyu**. Okinawa Is.: Mt. Nishime-dake, 200–300 m, *G. Murata et al.* 56784, 56791 (KYO); from Hentona to Yonaha-dake, *Y. Kimura & I. Hurusawa* (TI); Mt. Yonaha, *Y. Niino* 941 (RYU), *T. Kinjo* 184 (KYO), *Z. Tashiro* (KYO), 300–400 m, *H. Kanai et al.* 732608 (KYO, TI, TNS), *T. Yamazaki* 1958 (RYU, TI); Mt. Yona, 300 m, *S. Hatusima* 18222 (RYU, TI); Mt. Iyu-dake, *Y. Miyagi & S. Hatusima* 37196 (RYU); Sade, *S. Sonohara* (KYO); Onishimori, *S. Sonohara* (KYO), *G. Koidzumi* (KYO); Genka, *T. Miyagi* (KYO), *S. Sakaguchi* (KYO); Benoki-gawa, *Z. Tashiro* (KYO); Hentona-san, *S. Tawada* 279 (KYO); Mt. Ibu-dake, *Z. Tashiro* (KYO); Mt. Tano-dake, *Y. Niino* 3379 (RYU); Mt. Tanyu-dake, *S. Sonohara et al.* 6307 (TI), *S. Hatusima* 813 (RYU); Meiji-yama, Nago, *S. Sonohara* 7042 (RYU); Onnah, *J. Matsumura* (TI); Nakagami, *G. Koidzumi* (KYO).

Note. This species is closely related to *S. morrisonicola* Hayata of Taiwan, but the latter differs in its longer calyx limb and lobes, the valvate calyx lobes and fewer 25–40 stamens.

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 University Museum, University of Tokyo, Tokyo (TOFO).
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 University of California, Berkeley (UC).
 Naturhistorisches Museum Wien, Wien (W).
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APPENDIX 1

Artificial Key to the Species in Japan

- 1a. Deciduous trees or shrubs; inflorescences terminal panicles.
 - 2a. Bark transversely fissured; leaves ovate to elliptic, glaucous on lower surface; fruits black. 5. *S. tanakana*
 - 2b. Bark longitudinally fissured or exfoliating; leaves obovate, elliptic, oblong, or ovate, lower surface pale green but not glaucous; fruits blue, dark blue, or black.
 - 3a. Lower surface of leaves finely reticulate, often tinged red and distinctly visible, but not prominent on lower surface; fruits black. 4. *S. paniculata*
 - 3b. Lower surface of leaves coarsely reticulate, veins more or less prominent; fruits dark blue or blue.
 - 4a. Leaves ovate to obovate, apex acuminate to caudate, margin coarsely glandular dentate; panicles without foliage leaves; fruits dark blue. 2. *S. coreana*
 - 4b. Leaves obovate to elliptic, apex abruptly acute to acuminate, margin serrulate; panicles with a few foliage leaves; fruits blue. 3. *S. sawafutagi*
- 1a. Evergreen trees or shrubs; inflorescences axillary.
 - 5a. Bracts caducous; inflorescence a raceme.
 - 6a. Young twigs green.
 - 7a. Pedicels 1–8(–12) mm long; inflorescences 5 to 12(–17)-flowered; ora of pollen grains not prominent. 7. *S. liukiuensis*
 - 7b. Pedicels slender, 8–15 mm long; inflorescences loosely 3 to 6-flowered; ora of pollen grains prominent. 6. *S. myrtacea*
 - 6b. Young twigs grey or brown.
 - 8a. Young twigs brown, pilose to glabrescent; inflorescences 5 to 10-flowered; ora of pollen grains prominent; fruits ampulliform to ovoid; seeds curved. 8. *S. caudata*
 - 8b. Young twigs grey, glabrous; inflorescences rather densely 10 to 30-flowered; ora of pollen grains not prominent; fruits narrowly ellipsoid; seeds straight. 9. *S. prunifolia*
 - 5b. Bracts persistent; inflorescences racemose, spicate, or 1-flowered.
 - 9a. Young twigs brown or dark brown, more or less hairy.
 - 10a. Inflorescences racemes (flowers distinctly pedicellate).
 - 11a. Leaves brown to dark brown when dry; midrib impressed on upper surface; corolla tube 2–3 mm long; stamens modadelphous; ovary 2-locular. 1. *S. sonoharae*
 - 11b. Leaves not brown when dry; midrib prominent on upper surface; corolla tube ca. 1 mm long; stamens pentadelphous; ovary 3-locular. 23. *S. okinawensis*
 - 10b. Inflorescences simple or compound spikes (flowers sessile or rarely shortly pedicellate); elongate or condensed in head-like clusters.
 - 12a. Inflorescences elongate spikes.
 - 13a. Twigs thick; spikes usually branched near the base; stones ampulliform; seeds twice curved.
 - 14a. Leaves 14–25 cm long; nerves distinctly prominent on lower surface; calyx lobes 1.5–2(–2.5) mm long, forming a beak on top of fruit. 11. *S. cochinchinensis*
 - 14b. Leaves 7–15 cm long; nerves slightly prominent on lower surface; calyx lobes 0.5–1 mm long, not forming a beak on top of fruit. 12. *S. theophrastifolia*
 - 13b. Twigs slender; spikes simple; stones ovoid to obovoid; seeds once curved.
 - 15a. Bracts 1–2 mm long; disk glabrous; fruits 4–6 mm long; flowering in autumn. 13. *S. lancifolia*
 - 15b. Bracts 0.7–1 mm long; disk pilose; fruits 3–4 mm long; flowering in spring. 14. *S. microcalyx*
 - 12b. Inflorescences condensed in head-like clusters.
 - 16a. Leaves coriaceous, papillate on lower surface; corolla 4–4.5 mm long, the lobes spreading; disk annular, shortly cylindrical or pulvinate; stones longitudinally slightly grooved or rather smooth. 15. *S. glauca*
 - 16b. Leaves thick coriaceous, not papillate on lower surface; corolla 7–9 mm long, the lobes not spreading; disk cylindrical; stones with 10 longitudinal grooves. 16. *S. stellaris*

- 9b. Young twigs green, glabrous.
- 17a. Twigs conspicuously ridged, nearly winged; leaves revolute, upper surface rugose. 22. *S. kawakamii*
- 17b. Twigs more or less ridged; leaves (slightly) recurved, upper surface not rugose.
- 18a. Terminal buds hairy; inflorescences more than 2.5 cm long; disk glabrous; seeds twice curved. 10. *S. konishii*
- 18b. Terminal buds glabrous; inflorescences less than 2 cm long; disk hairy; seeds straight to U-shaped.
- 19a. Inflorescences 1 to 3-flowered.
- 20a. Twigs thick, not zigzag; blades 6–9 cm long; inflorescences 1 to 3-flowered; calyx lobes of fruit bending inward, forming a blunt beak. 20. *S. boninensis*
- 20b. Twigs slender, often zigzag; blades 3–6 cm long; inflorescences 1(–2)-flowered; calyx lobes of fruit erect or spreading, forming a crown. 19. *S. pergracilis*
- 19b. Inflorescences more than 5-flowered.
- 21a. Blades 7–13 cm long; stamens more than 50 in number; ovary 3-locular; fruits globose to ellipsoid, 15–20 mm in diameter. 21. *S. tanakae*
- 21b. Blades 4–7 cm long; stamens 20–40 in number; ovary usually 2-locular; fruits ellipsoid, 5–9 mm in diameter.
- 22a. Bracteoles 1.5–2 mm long; corolla 3.5–4 mm long; fruits 6–10 mm excluding persistent calyx lobes. 17. *S. nakaharae*
- 22b. Bracteoles 2–3 mm long; corolla (3.5–)4–5 mm long; fruits 9–13 mm long excluding persistent calyx lobes. 18. *S. kuroki*

APPENDIX 2

Index to Taxa

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Narainhetty, Nepal, *Hamilton* '*Symplocos?* *subspinos*' (BM).

Plate 61

a-c. *Symplocos cochinchinensis* (Lour.) Moore var. *cochinchinensis*. a: Holotype of *Dicalix javanicus* Bl., Java, *Blume* (BO). b: Holotype of *S. ferruginea* Roxb., Assam, Garo Hills, *Roxburgh* (BM). c: Lectotype of *S. lithocarpoides* Nakai, 7 Dec. 1900, Higanakama, Amami-Oshima Is., Ryukyu, *T. Uchiyama* (TI). —d. *Symplocos cochinchinensis* var. *philippinensis* (Brand) Nooteboom: Lectotype? of *S. ferruginea* Roxb. var. *philippinensis* Brand, Mindanao, Philippines, *Ahern* 4409 (BO, not 440?).

Plate 62

a. *Symplocos cochinchinensis* var. *philippineis* (Brand) Nooteboom: Holotype of *S. kotoensis* Hayata, Kotosho (Lanyu Is.), Taiwan, *Kawakami & Sasaki* (TI). b-d. *Symplocos theophrastifolia* Sieb. & Zucc. b: Holotype of *S. theophrastaeifolia*, Japan, *von Siebold* (L). c: Holotype of *S. stenostachys* Hayata, Goshizan, Shinchiku, Taiwan, *Kawakami* 1438 (TI). —d. *S. lancifolia* Sieb. & Zucc.: Lectotype, Japan, *von Siebold* (L).

Plate 63

a-d. *Symplocos lancifolia* Sieb. & Zucc. a: Lectotype of *S. leptostachys* Sieb. & Zucc., Japan, *von Siebold* (L). b: Type of *S. microcarpa* Champ. ex Benth., Hongkong, *Champion* (K). c: Lectotype of *S. lancifolia* var. *cryptostachya* Miq., Japan, *Textor* (L). d: Lectotype of *S. lancifolia* var. *fulvipes* Clarke, Mont. Khasia, India, *Hook. f. & Thomson* 50 (K).

Plate 64

a. *Symplocos microcalyx* Hayata: Holotype, Nago-dake, Okinawa Is., Ryukyu, *G. Nakahara* (TI). —b. *S. glauca* (Thunb.) Koidz.: Holotype of *S. nerifolia* Sieb. & Zucc., Japan, *Siebold* (L). —c-d. *S. stellaris* Brand. c: Holotype of *S. stellaris*, Setschwan, Nanchuan, China, *Bock & von Rosthorn* 135 (W). d: Syntype of *S. tashiroi* Matsumura, Nago-dake, Kushi, Okinawa Is., Ryukyu, *S. Tanaka* 179 (TI).

Plate 65

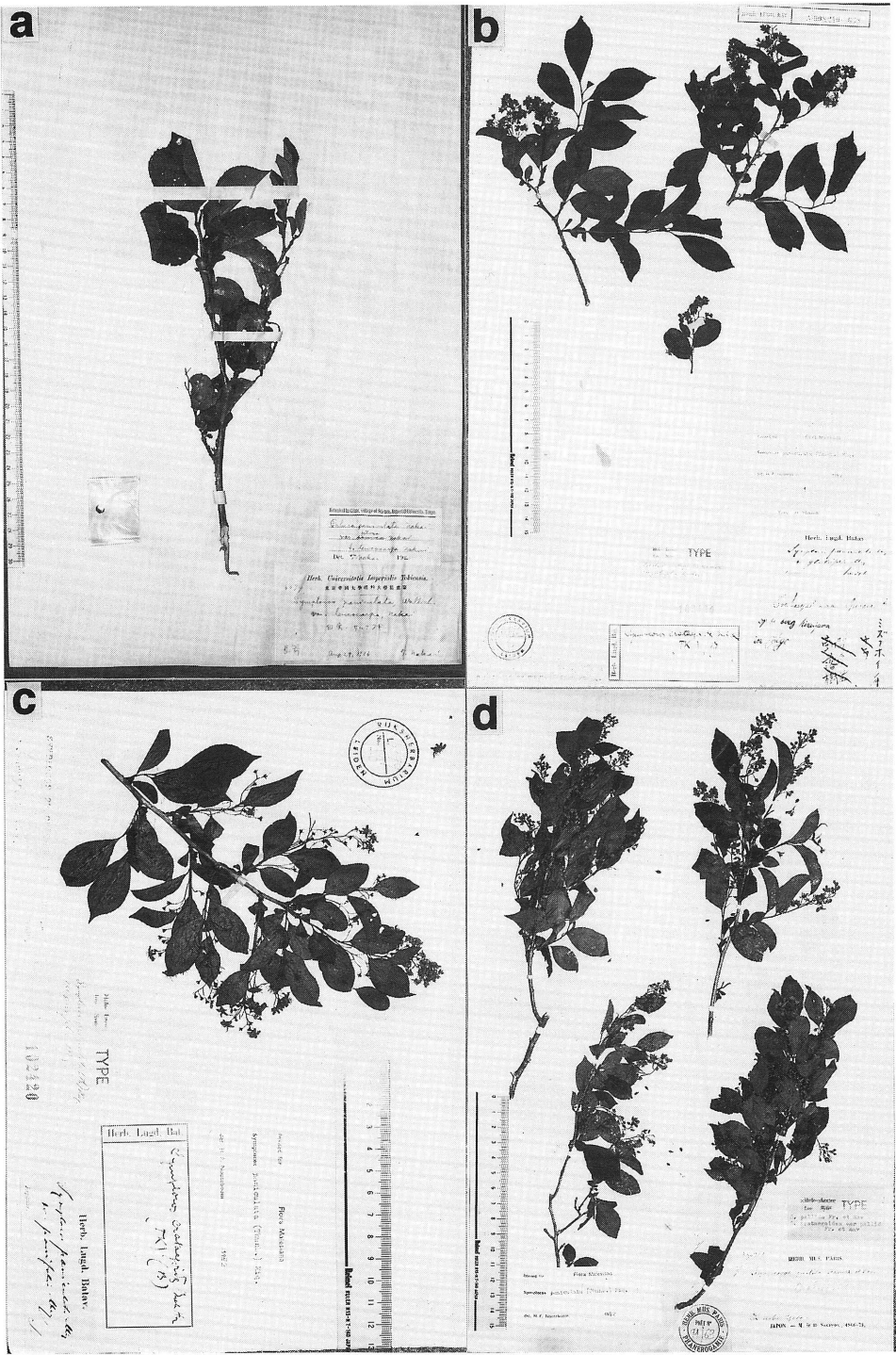
a-d. *Symplocos stellaris* Brand. a: Holotype of *S. wilsonii* Hemsley, Szechwan, China, *Wilson* 4067 (K). b: Holotype of *S. dunniana* Lév., Kweichow, Pin fa, China, *Cavalerie* 3016 (E). c: Holotype of *Litsea chaffanjonii* Lév., Kweichow, China, *Chaffanjon (Bodinier)* 2244 (E). d: Type of *S. limprichtii* Winkler, Szechwan, Kwan Hsien, China, *Limpricht* 1287 (K).

Plate 66

a. *Symplocos nakaharae* (Hayata) Masamune: Type of *S. japonica* DC. var. *nakaharae* Hayata, Nagotake, Okinawa Is., Ryukyu, *G. Nakahara* (TI). —b. *Symplocos kuroki* Nagamasu: Japan, *von Siebold* (L), noted as '*Myrtus laevis* Thunb., *Symplocos* or *Hoppea*'. —c. *S. pergracilis* (Nakai) Yamazaki: Holotype of *Bobua pergracilis* Nakai, Takeda-bokujo, Chichijima Is., Bonin Isls., *H. Toyoshima* (TI). —d. *S. boninensis* Rehder & Wilson: Holotype, Mukoh-jima, Bonin Isls., *E.H. Wilson* 8336 (A).

Plate 67

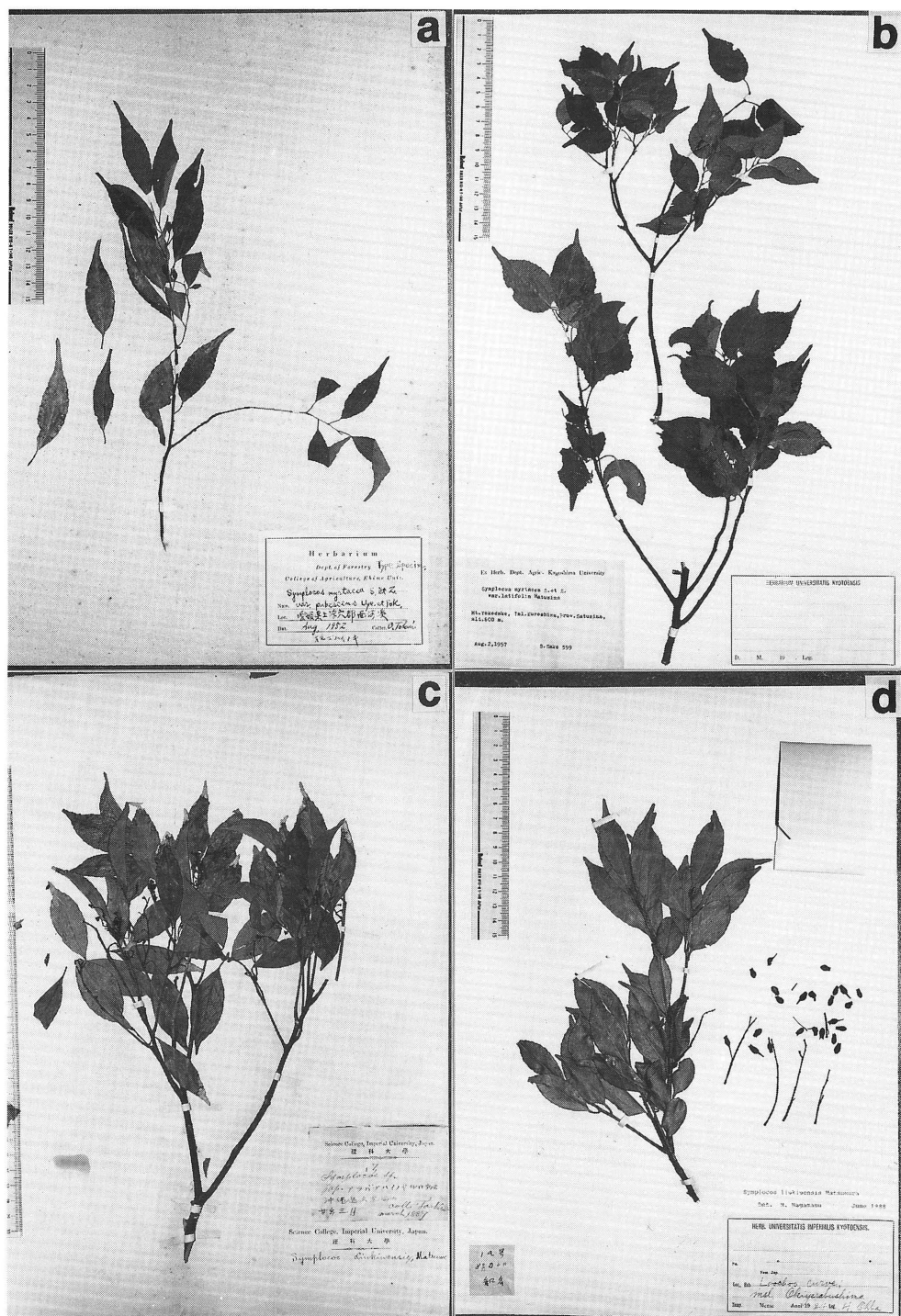
a. *Symplocos tanakae* Matsumura: Holotype, Tanegashima Is., Japan, *S. Tanaka* 436 (TI). —b-c. *S. kawakamii* Hayata. b: Holotype of *S. kawakamii*, Bonin Isls., *T. Kawakami* (TI). c: Holotype of *S. otomoi* Rehder & Wilson, Chichijima Is., Bonin Isls., *H. Otomo* (A). —d. *S. okinawensis* Matsumura: Holotype, Onnah, Okinawa Is., Ryukyu, *Matsumura* (TI).



H. NAGAMASU: Symplocaceae of Japan

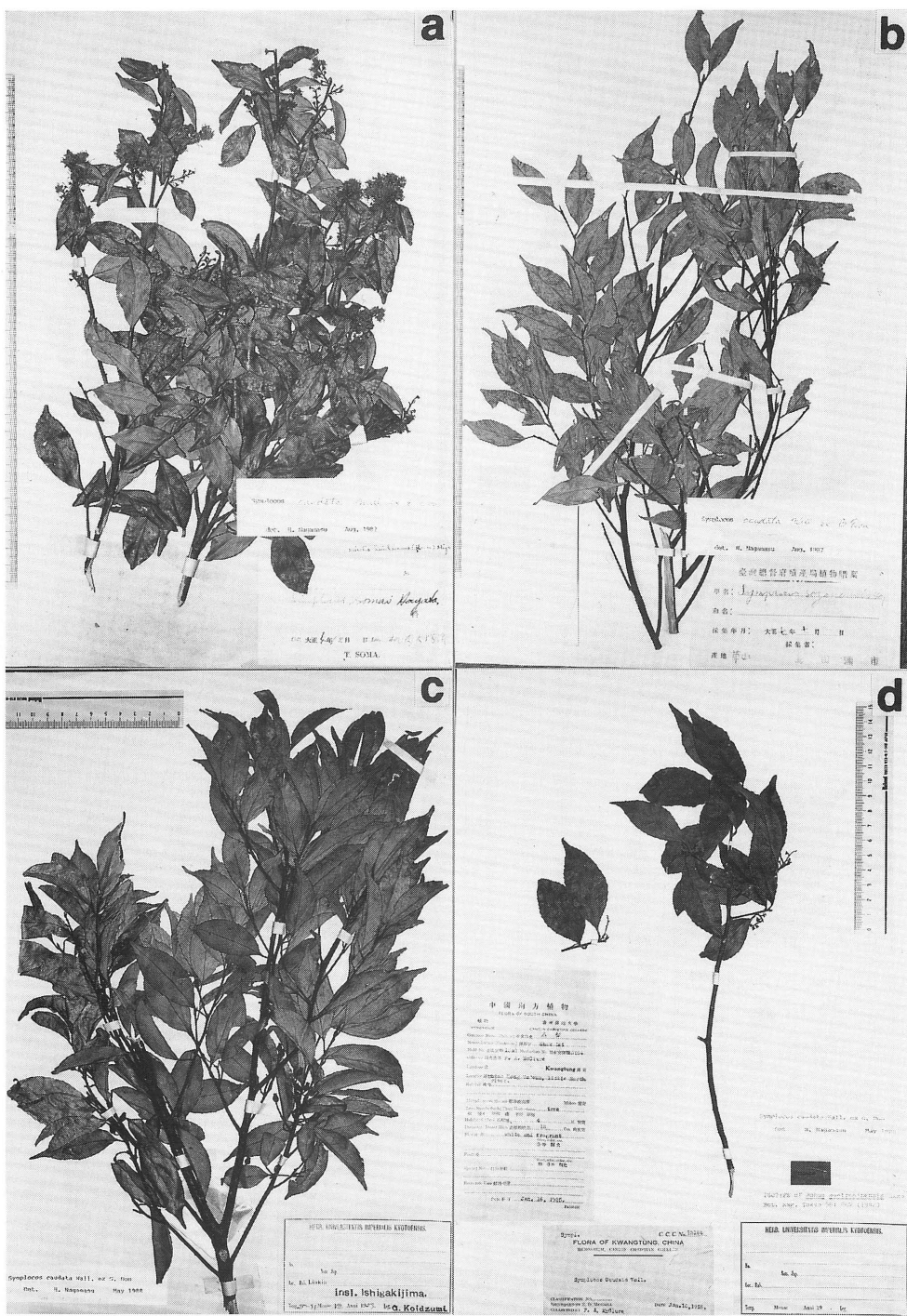


H. NAGAMASU: Symplocaceae of Japan

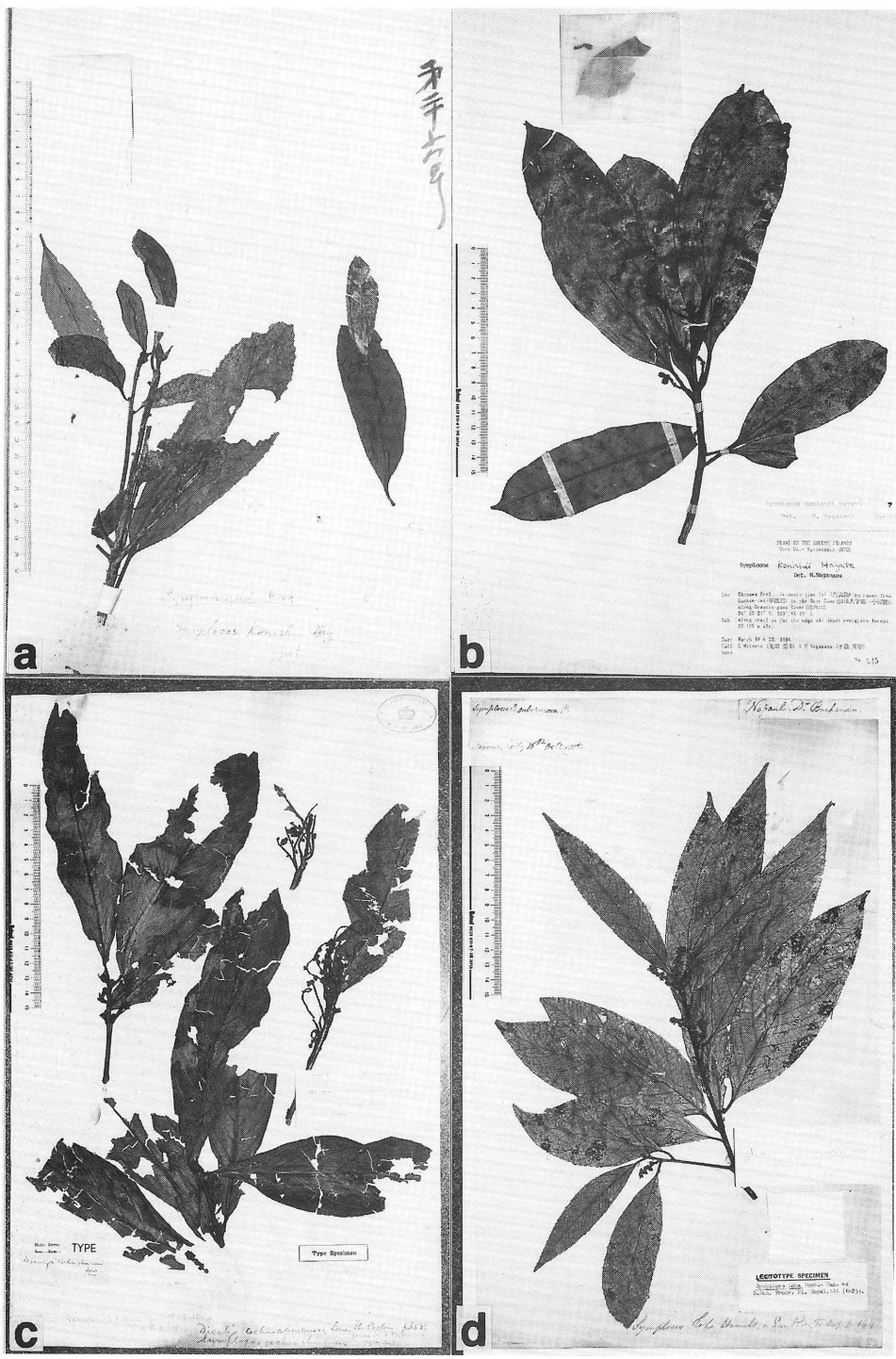


H. NAGAMASU: *Symplocaceae* of Japan

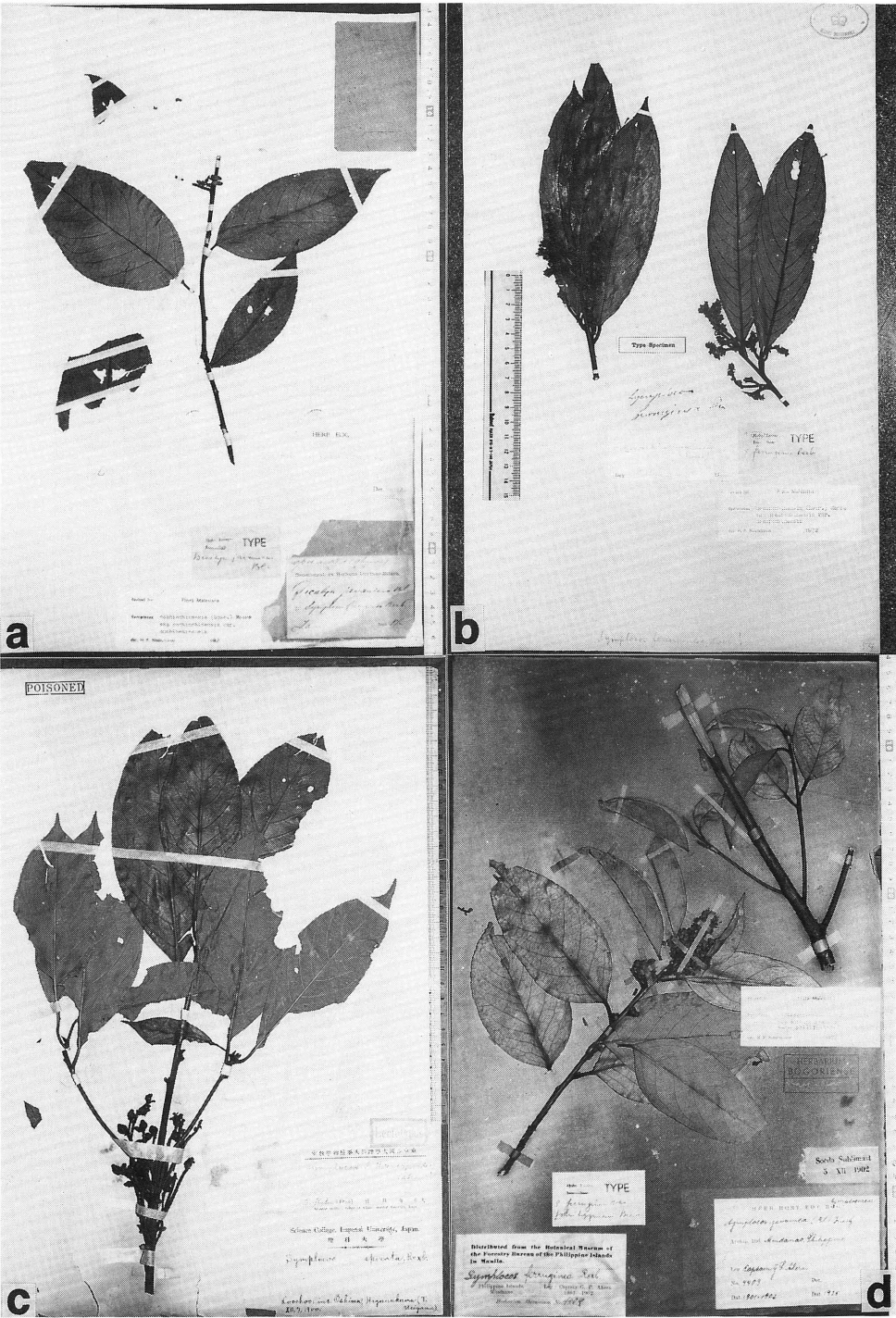




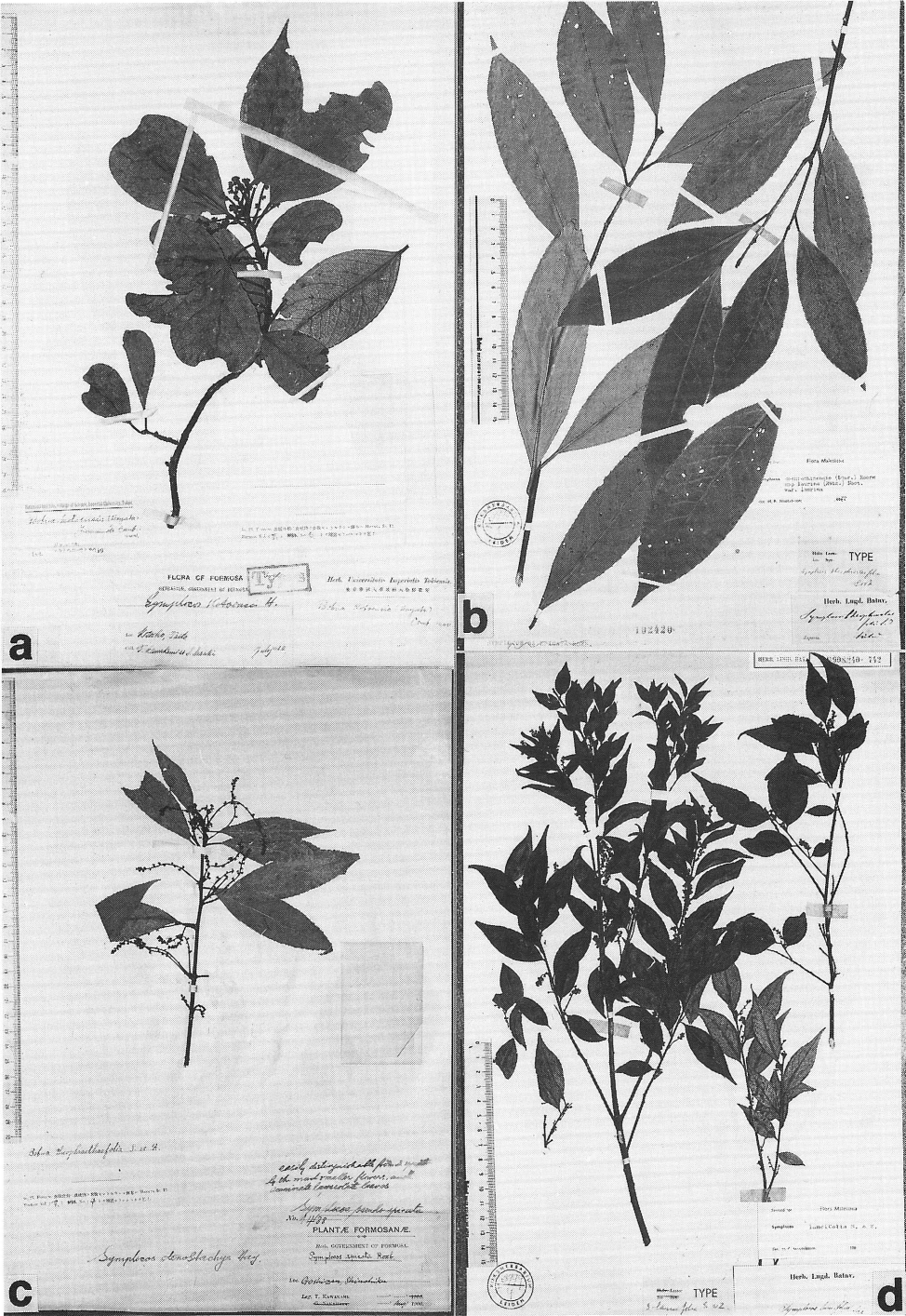
H. NAGAMASU: *Symplocaceae* of Japan



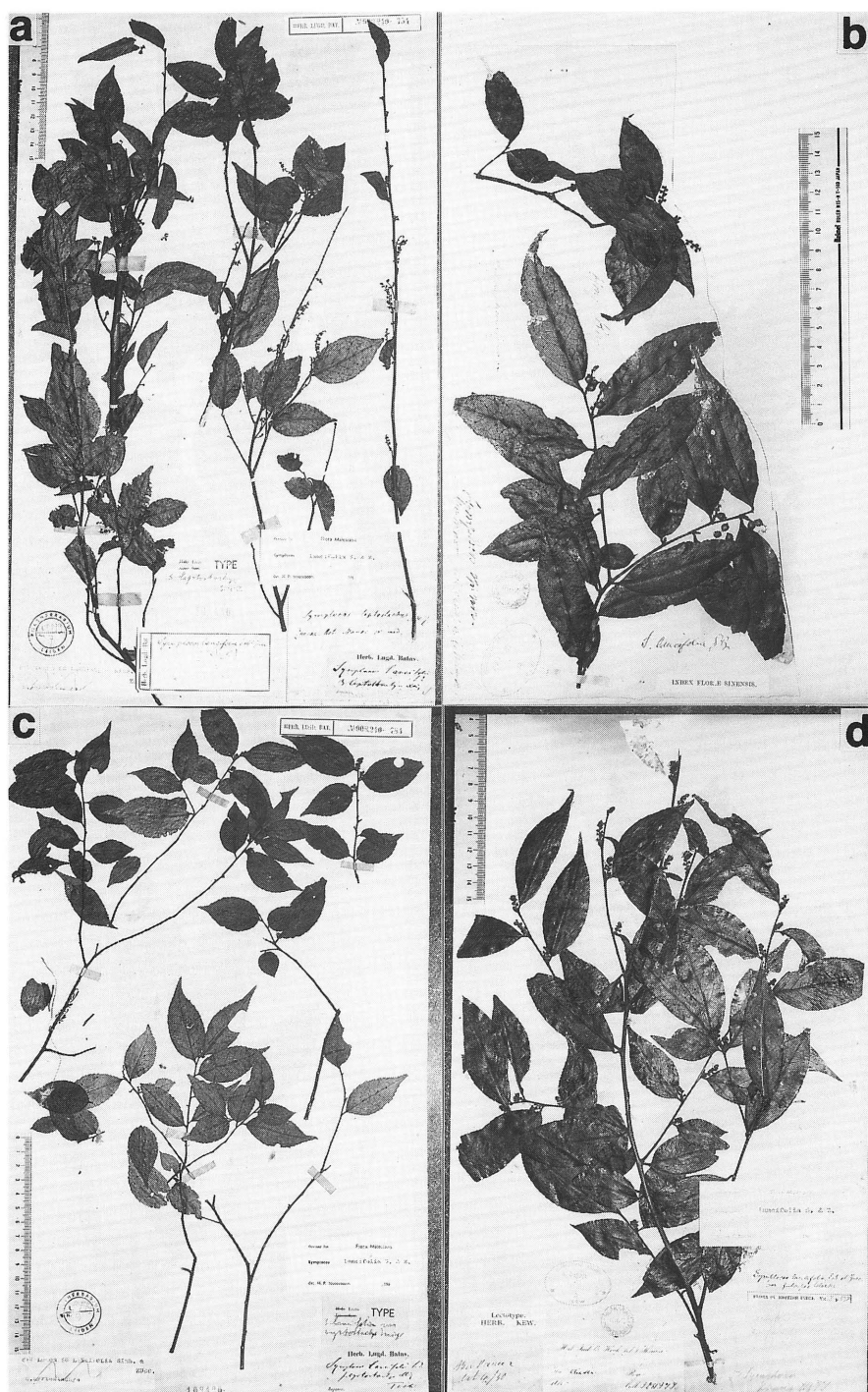
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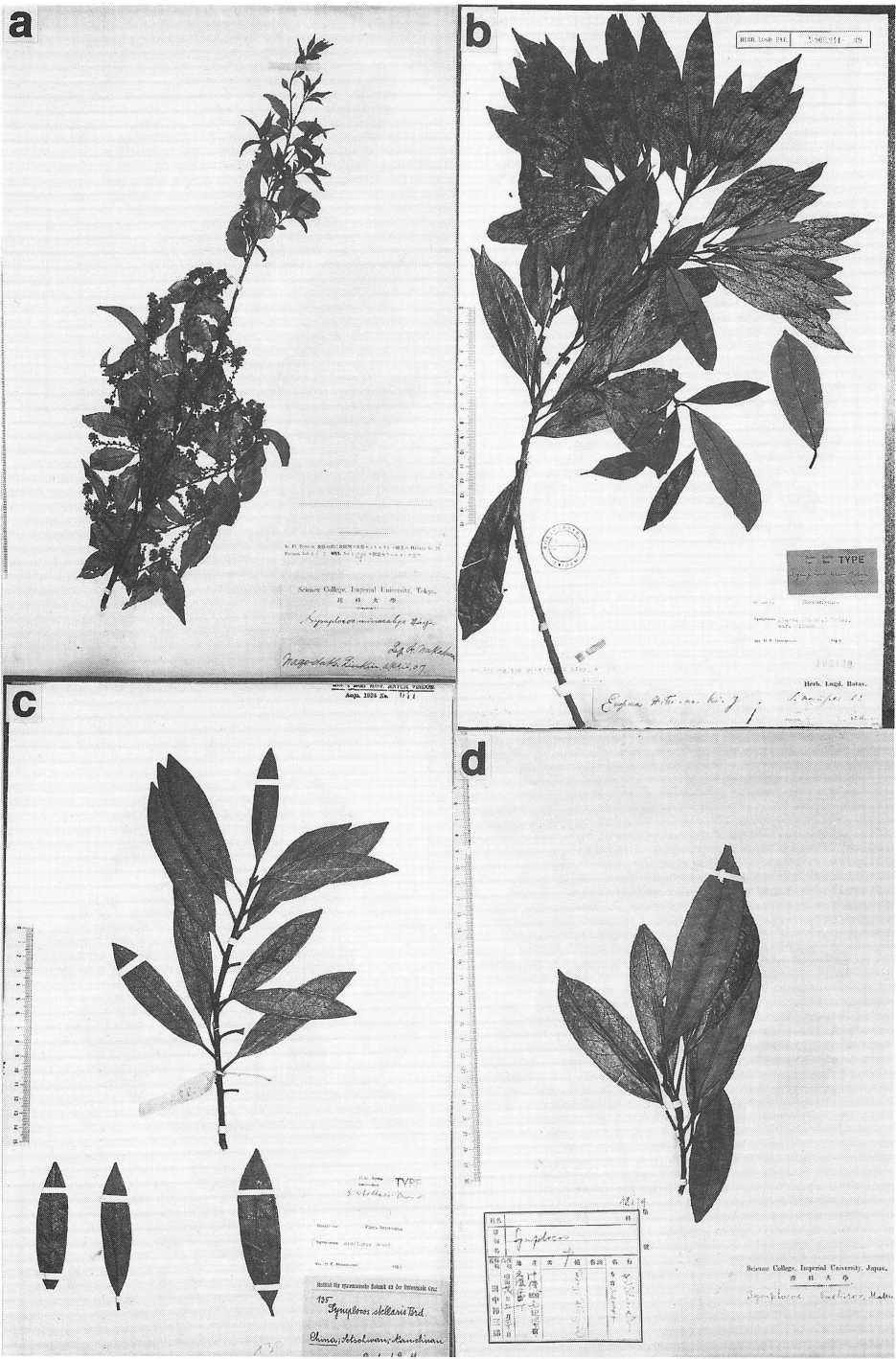


H. NAGASU: Symplocaceae of Japan

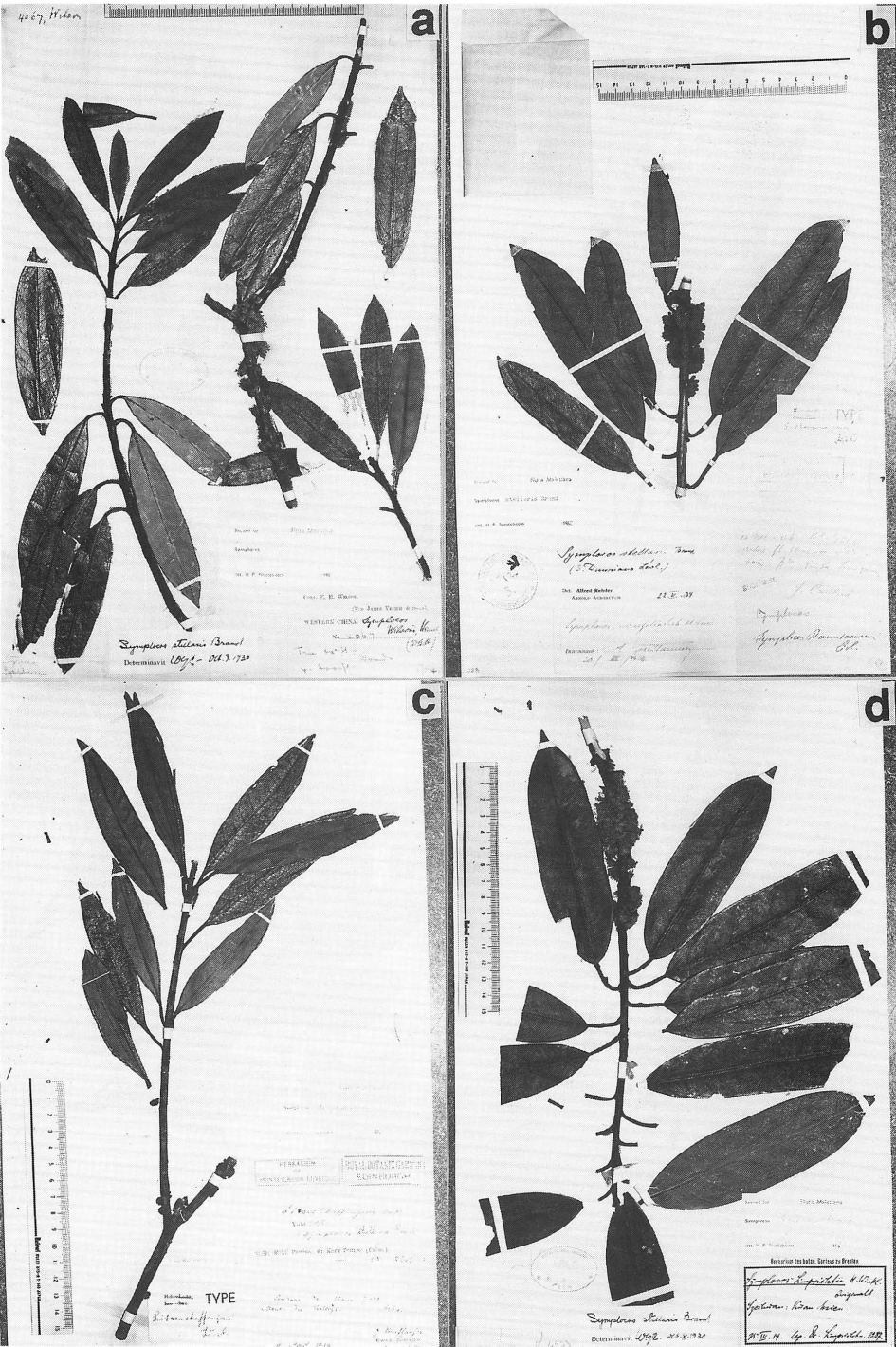


H. NAGAMASU: Symplocaceae of Japan

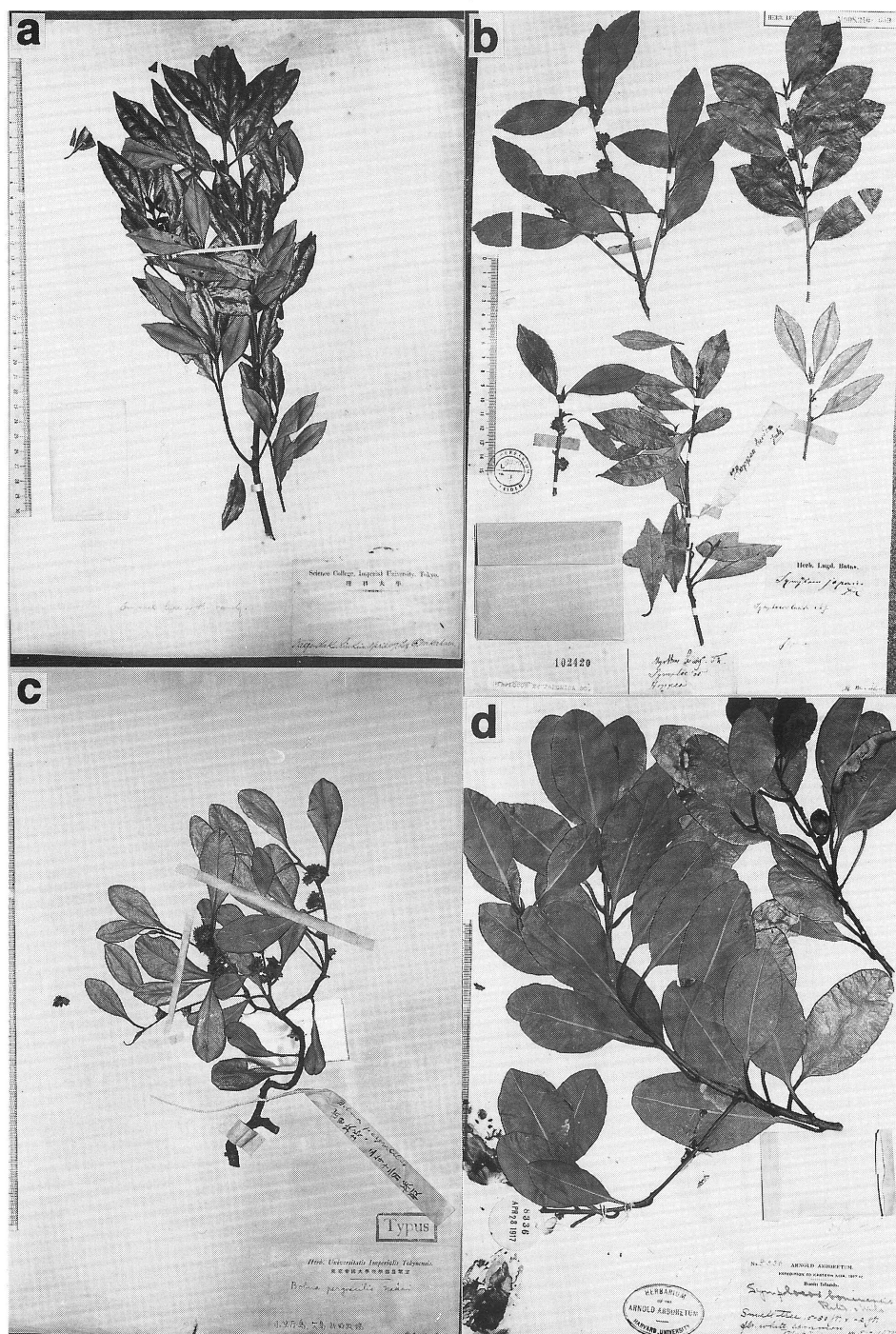
H. NAGAMASU: *Symplocaceae of Japan*



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