

The Symplocaceae of Gaoligong Shan

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A taxonomic revision of the flowering plant family Symplocaceae in the Gaoligong Shan region of western Yunnan Province in China and eastern Kachin State in northern Myanmar is presented. Sixteen species are recognized from the region. The treatment includes a key to species, descriptions, specimen citations, and images of several species. Also included are species distribution maps based on estimates of geographic coordinates of old specimens and GPS-derived coordinates of more recent collections.

KEYWORDS: Burma, China, Gaoligong Shan, Kachin, Myanmar, Taxonomy, Symplocaceae, Symplocos, Yunnan

高黎贡山山矾科

本文对高黎贡山地区的有花植物类群山矾科进行了系统修订, 高黎贡山位于中国云南西部, 缅甸北方克钦邦东部。研究确认该地区有 16 种本科植物。这一修订包括了分种检索表、文献引证、种的特征描述和根据目前可得到的全部新老标本资料估算得出的地理信息所绘制的种分布图。

关键词: 缅甸、中国、高黎贡山、克钦邦、分类订正、山矾科、山矾属、云南

The Gaoligong Shan (GLGS) is a 600 km-long high-elevation mountain range that over much of its length straddles the border between western Yunnan Province in southwestern China and eastern Kachin State in northern Myanmar (Burma; Figure 1). The mountain range extends north in China into the Xizang (Tibetan) Autonomous Region where it runs into the heavily dissected part of the southeastern part of the Qinghai-Xizang Plateau. This north-to-south-oriented range lies between two of Asia's great river systems, the Irrawaddy (Ayerawaddy) and the Salween (Nujiang). Together with the adjacent Himalaya and Hengduan mountain systems, the Gaoligong Shan forms a vast biodiversity hotspot, i.e., an ecoregion of tremendous biodiversity under severe threat of destruction through human activity (Li et al. 2000; Liu and Kress 2005; Stotz et al. 2003; Chaplin 2006).

As part of a long-term, large-scale multidisciplinary biotic survey and inventory of the Gaoligong Shan, we have begun to examine the taxonomy of vascular plant groups of this region in which we have expertise. One such group, Symplocaceae, appeared to us to be in need of taxonomic clarification because of the apparent inconsistency in which Gaoligong Shan specimens have been identified. Here we provide a detailed taxonomic treatment of Symplocaceae for Gaoligong Shan, in the hope that it can serve as a model for similar treatments of other vascular plant groups of interest to us in the region.

The *Symplocaceae* (Angiospermae: Ericales *sensu* APG 2003) comprise a single genus of about 325 species of trees and shrubs distributed widely in the tropical and subtropical regions of

the Americas and eastern Asia to Australia. Phylogenetic analysis of Ericales DNA sequences with 11 gene regions supports a clade comprising Styracaceae and Diapensiaceae as the sister group of Symplocaceae (Schönenberger et al. 2005). The monophyly of *Symplocos* is well established on the basis of morphology and molecular data (Wang et al. 2004; Fritsch et al. 2006; Fritsch and Almeda, in press).

The species of *Symplocos* in China have been treated taxonomically in various ways. Brand's (1901) work is the last worldwide revision of the genus, but it is now largely outdated. Nooteboom has conducted a comprehensive taxonomic revision of *Symplocos* of the Old World in several publications (Nooteboom 1975, 1977, 1980, 2005). In the most recent of these, Nooteboom recognized 41 species in China. In the *Flora Reipublicae Popularis Sinicae* (FRPS), Wu (1987) recognized many more Chinese species (77) of *Symplocos*. Later, however, Wu modified species concepts in *Symplocos* to agree more closely with those of Nooteboom, as reflected in the collaborative treatment of *Symplocos* for *Flora of China* (Wu and Nooteboom 1996), such that 42 species were recognized in this treatment. Subsequent authors have nonetheless maintained recognition of some FRPS segregate *Symplocos* species (e.g., Chen et al. 2003; Ye et al. 2003).

The only comprehensive work to address the flora of Myanmar is a checklist of the country's seed plants (Kress et al. 2003) as revised from earlier editions by other authors. In this work, 37 species of *Symplocos* are listed for Myanmar, but it is clear that many of these are best treated as synonyms of other species, and the 17 species of *Symplocos* reported from Myanmar by Nooteboom (2005) should be taken as the more accurate estimate.

Flora of Gaoligong Mountain (Li et al. 2000) comprises a list of all vascular plant species in the Gaoligong Shan known up to the time of its publication. For each species, it provides information on distribution (in descriptive form), habit, habitat, elevation, and locality, and cites representative voucher specimens for each species. Although our list of species largely agrees with that of Li et al. (2000), it differs in several notable respects. Li et al. recognize 15 species and four varieties of *Symplocos* from the region, with one species endemic, whereas we recognize 16 species and no varieties, and none of the species are endemic to the region. Five species in our treatment are new to the region (i.e., they are not listed in Li et al., either as a species recognized by us or as a synonym), and four additional names are new (i.e., four species in Li et al. are synonyms of species that are not listed by them). We could not locate the cited voucher specimens of two *Symplocos* species included in Li et al. (2000), viz., those of *S. groffii* Merrill (X.C. Shi & S.X. Yang 537 and *Gaoligong Shan Vegetation Expedition 2-116*) and *S. hookeri* C.B. Clarke (X.C. Shi 353); therefore we could not confirm the membership of these species in the Gaoligong Shan flora. Other differences between our treatment and that of Li et al. (2000) are discussed under relevant species entries.

MATERIALS AND METHODS

More than 1000 collections from nine herbaria were studied. The material examined comprises the Gaoligong Shan collections from PE and KUN, the two herbaria with the richest collections in SW China, and also those from A, BM, CAS, E, K, P, and W. Only collections that occur within the GLGS region (Figure 2) as defined by Chaplin (2006) were included. Figure 3 gives the political units at the level of county or district in the GLGS region. Many of the collections have resulted from a biotic survey and inventory project primarily involving staff from KUN, CAS, and E, at which the first, second, and third sets from most of these expeditions, respectively, have been deposited. At the time this *Symplocos* treatment was completed there had been 11 collecting expeditions undertaken in the context of this inventory, all of which use the same series of collecting numbers; these are referred to herein as "GLGS" collections. The various teams collecting under

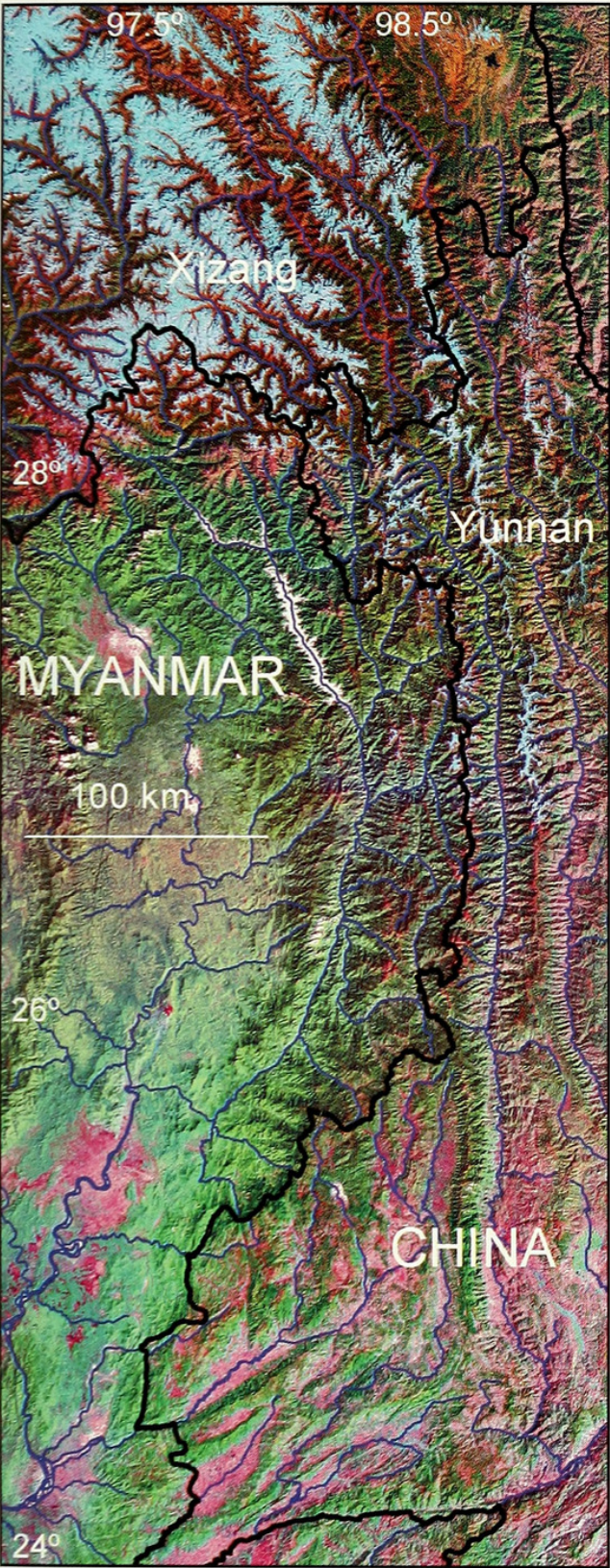


FIGURE 1. Satellite image covering the GLGS region and adjacent part of China and Myanmar. Modified from Cloudless Mosaic N-47-20_loc and N-47-25_loc 1989-1994 obtained from the Global Land Cover Facility, University of Maryland.

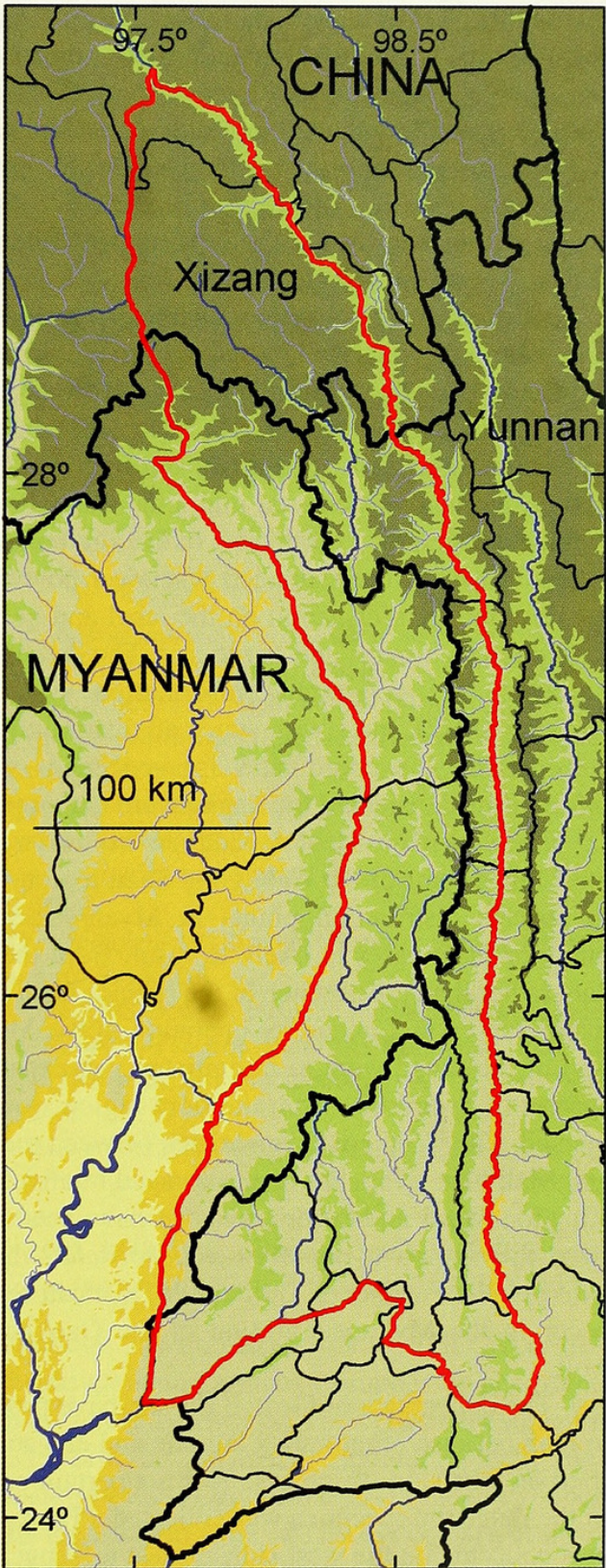


FIGURE 2. Elevation of map of the GLGS region (inside red line) and adjacent part of China and Myanmar showing range in meters: < 305, 305–914, 914–2134, 2134–3353, > 3353.

this number series that appear on specimen labels are listed in Appendix 1, as are abbreviations for other major collectors or collecting teams (with ten or more *Symplocos* collections) that have conducted expeditions to Gaoligong Shan.

Species descriptions are derived from examination of herbarium specimens except where noted. Most of the species have been seen in the field by the authors, and characters such as flower color have been confirmed. Descriptions generally reflect character variation occurring only within the Gaoligong Shan region. Flowering and fruiting times, elevation ranges, habitats, distributions, common names, and uses were derived from label information of herbarium specimens. Specimen information of all collections examined was entered into a database. For specimens without geographic coordinates indicating collecting locality, coordinates were estimated whenever possible by using the descriptive information on the label and georeferencing with published maps and gazetteers. The database was then linked to the geographic information system software ArcView (ESRI, Inc.), with which all distribution maps were constructed. The coordinates for specimens with locality information considered too vague were not mapped.

The vast majority of expeditions has taken place within the Chinese part of the Gaoligong Shan region. The paucity of species distribution points in Myanmar, therefore, in many or most cases is likely to result from the absence of data rather than the absence of the species from the area. If a major survey and inventory operation in the Myanmar portion of the range were to be initiated, we expect that more species of *Symplocos* from the flora region would be documented. The Northern Triangle area between the N'mai Kha and Mali Kha rivers has been surveyed relatively well by F. Kingdon Ward and others, and we have seen two species from this region (*Symplocos dolichotricha* Merrill and *S. macrophylla* Panchar ex Guillaumin) that can be expected to occur in the Myanmar portion of the Gaoligong Shan as well.

The collections of George Forrest have proven difficult to map because often only a latitude and elevation are specified on labels, in which case it is not certain on which side of the range the specimen was collected. (There is a strong probability that any particular specimen was collected on the west side, closest to Tengchong, because that city was Forrest's base of operations, but this is not discernable in any specific case.) Further, the coordinates and elevation sometimes do not agree with the description of the general area in which the collection was made. In his later years, Forrest depended heavily on native collectors to reach areas of difficult access (both for physiographic and political reasons). The label information of many of Forrest's collections is based on his interpretations of these collectors' notes. Thus it is difficult to map Forrest's collection local-

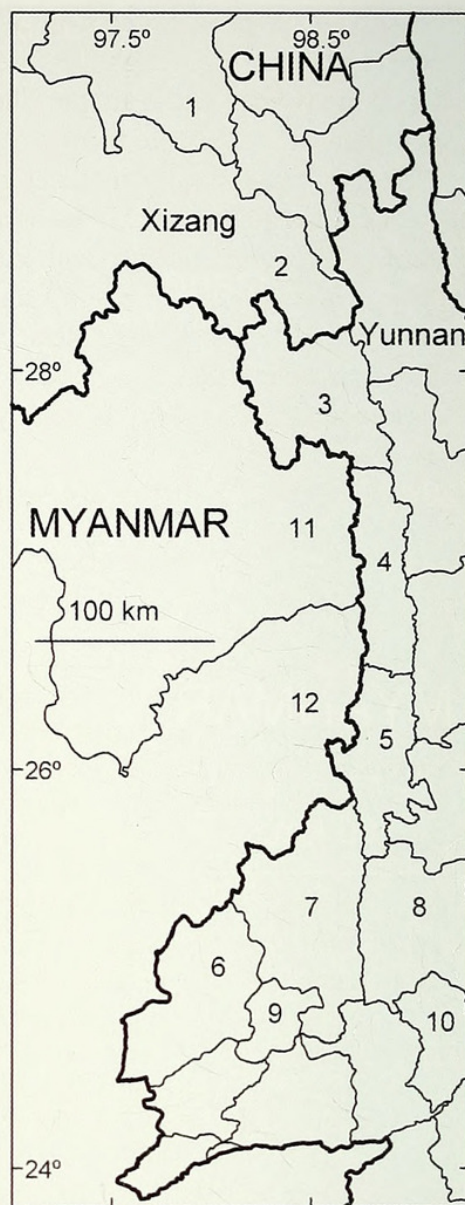


FIGURE 3. Chinese Xian (County) or Qu (District) and Myanmar Districts included in the GLGS region: 1–10. **CHINA.** 1–2. **Xizang** (Tibet): –1. Zuogong Xian. –2. Zayü Xian. 3–10. **Yunnan:** –3. Gongshan Xian –4. Fugong Xian. –5. Lushui Xian. –6. Yingjiang Xian. –7. Tengchong Xian. –8. Longyang Qu. –9. Lianghe Xian. –10. Longling Xian. 11–12. **MYANMAR. Kachin State:** –11. Putao District. –12. Myitkyina District.

ities with any degree of precision. We have nonetheless mapped many of them because of their historical importance, although they are presented with the caveat that they should be considered general and interpreted with caution. The database of collections examined with estimates of geographic coordinates is available from the authors and at the web site www.calacademy.org.

Synonymy generally includes only names based on material from Gaoligong Shan or other provinces in southwestern China or northern Myanmar. Other synonyms are provided when nomenclaturally or taxonomically significant, as needed. When numerous synonyms exist, as in the case of, e.g., widespread or complex taxa, only names based on types from Gaoligong Shan or adjacent areas are included, other than the accepted name when its type does not come from Gaoligong Shan. In these cases, reference to works with a more detailed or complete synonymy is provided.

Botanical terminology generally follows that of Harris and Harris (2001).

TAXONOMIC TREATMENT OF SYMPLOCACEAE

SYMPLOCOS Jacquin, Enum. Syst. Pl., a 5, b 24. 1760.

TYPE: *Symplocos martinicensis* Jacquin.

- Bobua* Adanson, Fam. Pl. 2:88, 526. 1763 ('Bobu'). Type: *Bobua laurina* (Retzius) de Candolle (lectotype, designated by Nootboom 1975) [= *Symplocos laurina* (Retzius) Wallich ex G. Don].
- Hopea* Linnaeus, Mant. Pl. 1:105. 1767 and Syst. Nat., ed. 12, 2:509. 1767, nom. rej., non Roxburgh (1811). *Protohopea* Miers, J. Linn. Soc., Bot. 17:289. 1879. Type: *Hopea tinctoria* Linnaeus (lectotype, designated by Nootboom 1975) [= *Symplocos tinctoria* (Linnaeus) L'Héritier].
- Drupatris* Loureiro, Fl. Cochinch. 1:314. 1790. Type: *Drupatris cochinchinensis* Loureiro (lectotype, designated by Nootboom 1975) [= *Symplocos cochinchinensis* (Loureiro) S. Moore].
- Decadia* Loureiro, Fl. Cochinch. 1:315. 1790. Type: *Decadia aluminosa* Loureiro (lectotype, designated by Nootboom 1975) [= *Symplocos laurina* Wallich ex G. Don].
- Dicalix* Loureiro, Fl. Cochinch. 2:663. 1790. Type: *Dicalix cochinchinensis* Loureiro (lectotype, designated by Nootboom 1975) [= *Symplocos cochinchinensis* (Loureiro) S. Moore].
- Lodhra* Guillemain, Ann. Sci. Nat., Bot. 15:158. 1841, nom. illeg.; (G. Don) Decaisne in Jacquemont, Voy. Inde. 4:104. 1844, quoad basionym, excl. species. Basionym: *Symplocos* section *Lodhra* G. Don, Gen. Hist. 4:2. 1837. Type: *Symplocos racemosa* Roxburgh (lectotype, designated by Nootboom 1975) [= *Symplocos racemosa* Roxburgh].
- Palura* (G. Don) Miers, J. Linn. Soc., Bot. 17:297. 1879. Basionym: *Symplocos* (subgen. *Symplocos*) section *Palura* G. Don, Gen. Hist. 4:3. 1837. Type: *Symplocos crataegoides* Buchanan-Hamilton ex D. Don (lectotype, designated by Nootboom 1975) [= *Symplocos paniculata* (Thunberg) Miquel].
- Cordyloblaste* Henschel ex Moritzi, Bot. Zeitung (Berlin) 6:606. 1848. Type: *Cordyloblaste henschelii* Moritzi (lectotype, designated by Nootboom 1975) [= *Symplocos henschelii* (Moritzi) Benth. ex C.B. Clarke].

Shrubs or trees, evergreen or rarely deciduous. Stipules absent. Leaves spirally (GLGS) or distichously arranged, simple, margin of young leaf blade glandular, glands caducous or persistent. Inflorescences spikes, racemes, panicles, or glomerules, rarely 1-flowered. Pedicel usually subtended by 1 bract. Flowers actinomorphic, bisexual (GLGS) or rarely unisexual, fragrant, typically subtended by 2 bracteoles. Hypanthium completely adnate to ovary. Calyx limb (3–)5-lobed (5-lobed in GLGS), persistent. Corolla gamopetalous ca. half total length (rare in GLGS) or only at base. Margin of corolla lobes distinct except at base; lobes (3–)5(–11) (5 in GLGS), imbricate. Stamens usually numerous, adnate only at base of corolla or rarely (GLGS) ca. half their length, monadelphous or loosely pentadelphous; filaments terete or tangentially flattened; anthers subglobose, 2-locular. Ovary inferior, unilocular, incompletely 2–5-septate; ovules 2–4 per locule. Epigynic disk or ring present, persistent. Style 1, filiform; stigma capitate or prominently 2–5-lobed. Fruit a drupe; endocarp (1–)3(–5)-locular. Seeds with copious endosperm; embryo straight or curved; cotyledons

much shorter (GLGS) or somewhat longer than radicle.

One genus and ca. 325 species (Fritsch and Almeda, in press): widely distributed in tropics and subtropics of Asia, Australia, and America; 41 species (18 endemic) in China (Wu and Nooteboom 1996; Nooteboom 2005); ca. 17 species in Myanmar (Kress et al. 2003; Nooteboom 1975, 2005), none endemic; 16 species in Gaoligong Shan, none endemic.

Key to Species of *Symplocos* in Gaoligong Shan

* indicates species with two entries in key

- 1a. Articulation immediately below hypanthium absent; corolla gamopetalous and stamens adnate to corolla ca. half the total length; corolla lobes papillose adaxially; filaments abruptly constricted apically, papillose; fruit fusiform 9. *S. pendula*
- 1b. Articulation immediately below hypanthium present; corolla gamopetalous and stamens adnate to corolla only at base; corolla lobes smooth adaxially; filaments not abruptly constricted apically, smooth; fruit not fusiform.
 - 2a. Deciduous; inflorescences pseudo-terminal (but bracts sometimes leaf-like) 8. *S. paniculata*
 - 2b. Evergreen; inflorescences pseudo-terminal and axillary.
 - 3a. Leaf blade midvein adaxially prominent at least toward base.
 - 4a. Pseudo-terminal buds strigillose or lanate-sericeous; young branchlets densely appressed-hirtellous, trichomes incurved; mature branchlets grayish; pedicel present (2–5 mm); hypanthium strigillose; fruit strigillose 1. *S. anomala*
 - 4b. Pseudo-terminal buds glabrous (margins often ciliolate); young branchlets glabrous or rarely sparsely tomentellous, puberulent, or lanate, trichomes not incurved; mature branchlets greenish, often purplish mottled; pedicel absent; hypanthium glabrous; fruit glabrous 14. *S. theifolia*
 - 3b. Leaf blade midvein adaxially impressed.
 - 5a. Hypanthium and fruit pubescent.
 - 6a. Young branchlets lanate to tomentose; leaf blade abaxially lanate; inflorescence rachis, bracts, bracteoles, hypanthium, calyx lobes, and fruit pilose or sericeous 12. *S. sulcata*
 - 6b. Young branchlets strigose, hispidulous, puberulent, or glabrous; leaf blade abaxially strigose or glabrous; inflorescence rachis, bracts, bracteoles, hypanthium, calyx lobes, and fruit strigose, strigillose, puberulent, or glabrous.
 - 7a. Petiole 5–12 mm; leaf blade abaxially typically drying green or pale brown, adaxially often minutely hispidulous on midvein or occasionally glabrous, secondary veins 6–10 on each side of midvein, apex long-acuminate; fruit ellipsoid 11. *S. ramosissima**
 - 7b. Petiole 2–6 mm; leaf blade abaxially typically drying pale green or pale grayish green, adaxially glabrous, secondary veins 3–5(–7) on each side of midvein, apex caudate; fruit narrowly ampulliform, or rarely subglobose at maturity. 15. *S. viridissima*
 - 5b. Hypanthium and fruit glabrous.
 - 8a. Inflorescences glomerulate, rachis not evident.
 - 9a. Petiole 18–35 mm; leaf blade 17–25 cm, abaxially glaucous, papillose toward base; longest stamens 3–4 mm; fruit ovoid-ampulliform, 12–18 × 6–8 mm; endocarp smooth 4. *S. glauca*

- 9b. Petiole 6–12 mm; leaf blade 8–18 cm, abaxially not glaucous, not papillose; longest stamens 7–9 mm; fruit cylindrical or ellipsoid-cylindrical, 6–9 × 2.5–3.5 mm; endocarp ribbed 5. *S. glomerata*
- 8b. Inflorescences with rachis evident.
 - 10a. Disk pubescent.
 - 11a. Bracts deltoid; bracteoles deltoid; inflorescence rachis white-strigillose. 7. *S. oxyphylla*
 - 11b. Bracts broadly ovate to suborbicular; bracteoles broadly ovate, suborbicular, linear, lanceolate, or oblanceolate; inflorescence rachis tawny-, yellow-, or ferruginous-lanate-villous to -pilose.
 - 12a. Pseudo-terminal vegetative buds 9–16 mm, outer scales glabrous or strigillose; leaf blade apex acuminate; bracteoles linear, lanceolate, or oblanceolate; calyx lobes 0.5–1 × 0.6–0.8 mm; disk inconspicuous 3. *S. dryophila*
 - 12b. Pseudo-terminal vegetative buds 2–6(–8) mm, outer scales sericeous or lanate; leaf blade apex acute to obtuse; bracteoles broadly ovate to suborbicular; calyx lobes 1.3–1.8 × 1.2–1.8 mm; disk annual-pentagonal to 5-lobed 10. *S. racemosa*
 - 10b. Disk glabrous.
 - 13a. Bracts persistent; bracteoles covering most or all of hypanthium; fruit 4.5–7 mm.
 - 14a. Young branchlets tomentose; mature branchlets brown to black; inflorescences 5–10.5 cm, rachis tomentose; calyx lobes sericeous; style 3.5–5 mm 2. *S. cochinchinensis*
 - 14b. Young branchlets glabrous or strigose; mature branchlets greenish; inflorescences 0.4–5.9 cm, rachis strigillose or pilulose; calyx lobes glabrous; style 1–3 mm 6. *S. laurina*
 - 13b. Bracts caducous (rarely persistent or semi-persistent in *S. ramosissima* and *S. sumuntia*); bracteoles covering less than half of hypanthium; fruit (6–)7–29 mm.
 - 15a. Vegetative buds 2.5–4 mm; leaves typically drying yellowish green, apex abruptly acuminate to caudate; inflorescences villous; fruit ampulliform to ovoid 13. *S. sumuntia*
 - 15b. Vegetative buds 4–11 mm; leaves typically drying green to brown, apex acuminate or long-acuminate; inflorescences puberulent or glabrous; fruit ellipsoid to obovoid.
 - 16a. Vegetative buds 4–8 mm, pubescent at least along distal portion of outer scale midvein; leaf blade secondary veins 6–10 on each side of midvein, margin crenulate-serrulate; bracteoles usually persistent; fruit 7–11 × 4–6 mm; endocarp indurate throughout. 11. *S. ramosissima**
 - 16b. Vegetative buds 8–13 mm, glabrous except for ciliolate scale margins; leaf blade secondary veins 13–17 on each side of midvein, margin entire; bracteoles caducous; fruit 24–29 × ca. 12 mm; endocarp with indurate part irregularly intercalated with network of softer spongy tissue 16. *S. xylopyrena*

1. *Symplocos anomala* Brand, Bot. Jahrb. Syst. 29:529. 1900. *Bobua anomala* (Brand) Migo, Bot. Mag. (Tokyo) 56:267. 1942. *Dicalix anomalus* (Brand) Migo, Bull. Shanghai Sci. Inst. 13:198. 1943. TYPE.—CHINA. Sichuan: northern Wushan, A. Henry 7094 (lectotype [designated by Nootboom 1975]: E; isolectotype: K!).

Symplocos alata Brand, Bot. Jahrb. Syst. 29:529. 1900.

Symplocos argentea Brand, Pflanzenr. 6(IV. 242):67. 1901.

Symplocos dielsii H. Léveillé, Repert. Spec. Nov. Regni Veg. 9:445. 1911.

Symplocos esquirolii H. Léveillé, Repert. Spec. Nov. Regni Veg. 9:445. 1911.

Symplocos fusonii Merrill, Philipp. J. Sci. 15:251. 1919. *S. anomala* Brand var. *fusonii* (Merrill) Handel-Mazzetti & E. Peter, Beih. Bot. Centralbl. 62(B):24. 1943. *Dicalix fusonii* (Merrill) Migo, Bull. Shanghai Sci. Inst. 13:201. 1943.

Symplocos anomala Brand var. *liosiphon* Handel-Mazzetti, Symb. Sinicae 7:808. 1936.

Symplocos anomala Brand var. *nitida* H.L. Li, J. Arnold Arbor. 24:452. 1943.

Shrubs or trees, evergreen, to 5 m tall. Young branchlets densely white- to brown-appressed-hirtellous, trichomes at least slightly incurved; mature branchlets grayish; pseudo-terminal vegetative buds 3–9 mm, strigillose to lanate-sericeous. Petiole 3–7 mm, usually sparsely and minutely glandular, glands frequently caducous; leaf blade typically oblong-elliptic to oblong-ob lanceolate, less commonly narrowly elliptic, elliptic, or oblanceolate, $4.5\text{--}11.5 \times 1.6\text{--}3.9$ cm, 2.5–3.8 times as long as wide, subcoriaceous, typically drying abaxially green, yellowish green, or grayish green and adaxially yellowish green to dark green, abaxially glabrous or occasionally strigose along midvein, adaxially glabrous or occasionally uncinat-hirtellous on midvein, midvein adaxially prominent, secondary veins 7–18 on each side of midvein, base attenuate-cuneate, margin entire or finely serrulate and revolute, apex acuminate. Inflorescences pseudo-terminal and axillary raceme-like cymes, 0.7–1.4 cm, 1–8-flowered; rachis white-, yellow-, or yellowish ferrugineous-strigillose; bract apex acute. Bracts and bracteoles ovate to deltoid, nearly isomorphic but bracts slightly larger, $0.4\text{--}1.3 \times 0.3\text{--}1.3$ mm, persistent, strigillose, margin ciliolate and often glandular. Pedicel 2–5 mm; bracteoles covering less than half of hypanthium, apex rounded, obtuse, or acute. Hypanthium white- or brown-strigillose, subtending articulation present. Calyx limb gamosepalous for 0–0.6 mm; lobes semi-oblong, semi-elliptic, or semi-orbicular, $0.5\text{--}1.5 \times 0.9\text{--}1.5$ mm, strigillose or occasionally glabrous, margin ciliolate and often glandular, apex obtuse to occasionally acute. Corolla white or pale green, 4–5 mm, membranous, gamopetalous only at base; lobes narrowly elliptic, glabrous, adaxially smooth. Stamens ca. 30–60, adnate to corolla only at base, longest 5–6 mm; filaments not abruptly constricted apically, smooth. Disk pentagonal and 5-lobed, hirtellous. Style 4–7 mm, glabrous. Fruit brown, globose to cylindrical, $5\text{--}12 \times 4\text{--}6$ mm, strigillose; endocarp indurate throughout, 3 locules developed, perimeter faintly ribbed. Seeds straight.

This species is easily distinguished from other species of *Symplocos* in Gaoligong Shan by the combination of its adaxially prominent leaf blade midvein and pubescent pseudo-terminal buds. It is widespread throughout southern China but has only been rarely collected in Gaoligong Shan.

SELECTED ILLUSTRATIONS.—R.F. Wu, Flora Reipublicae

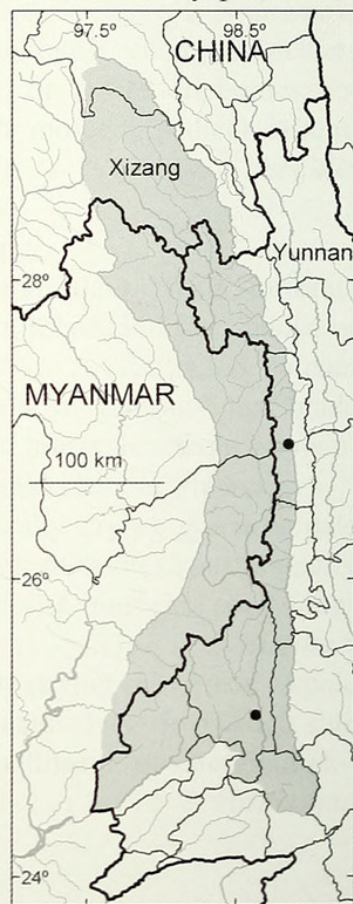


FIGURE 4. Distribution map of *Symplocos anomala* in the GLGS region.

Popularis Sinicae 60(2):18 t. 4(12–15). 1987; G.H. Zhu, ed. Fl. China Ill. 15:t. 173(12–15). 2000.

PHENOLOGY.— Fl. and fr. Apr–Dec.

DISTRIBUTION AND HABITAT.— Mixed forests; 1600–2000 m. In GLGS: CHINA. Yunnan: Fugong Xian (Shangpa Zheng), Longling Xian (The eighth district), Tengchong Xian (Puchuan Xiang); Figure 4. Outside of GLGS: Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Indonesia, Japan (Okinawa), Malaysia, Myanmar, Thailand, Vietnam].

LOCAL NAME.— 薄叶山矾 *bao ye shan fan*

ADDITIONAL SPECIMENS EXAMINED.— **CHINA. YUNNAN: FUGONG XIAN.** Shangpa Zheng. The valley behind the first middle School, W of Fugong, 1600–1700 m, 30 Sep 1997, *GLGS* 9778 (E, KUN); 2700 m, 10 Oct 1933, *Tsai* 54376 (A); 2700 m, 19 Oct 1933, *Tsai* 54459 (A, KUN); 2000 m, 20 Sep 1933, *Tsai* 56561 (A, KUN). **LOGLING XIAN.** Tian Ling Temple, 2400 m, 10 Aug 1941, *Wang* 90011 (KUN); Hong Mu Shu, 15 Aug 1941, *Wang* 90066 (KUN); Hong Mu Shu, 2400 m, *Wang* 90118 (KUN); the eighth district, 18 Aug 1941, *Wang* 90160 (KUN). **TENGCHONG XIAN.** Puchuan Xiang. The ninth district, 1880–1980 m, 8 Oct 1960, *W.C. Yin* 60-1383 (KUN).

2. *Symplocos cochinchinensis* (Loureiro) S. Moore, J. Bot. 52:148. 1914. Basionym: *Dicalix cochinchinensis* Loureiro, Fl. Cochinch. 2:663. 1790. *Dicalix cochinchinensis* Loureiro, Fl. Cochinch. 2:663. 1790. TYPE.— VIETNAM: “Cochinchina,” *J. de Loureiro s.n.* (lectotype [designated by Nooteboom 1975]: BM).

Drupatris cochinchinensis Loureiro, Fl. Cochinch. 1:314. 1790.

Symplocos cochinchinensis var. *puberula* M.S. Huang & Y.F. Wu, Acta Phytotax. Sin. 24:202. 1986.

Trees, evergreen, to 9 m tall. Young branchlets brown-tomentose; mature branchlets dark brown to black; pseudo-terminal vegetative buds 5–7 mm, brown-tomentose. Petiole 0.9–1.7 cm, not glandular; leaf blade elliptic, 18–22.5 × 7–10.1 cm, 2–3.3 times as long as wide, subcoriaceous, typically drying yellowish green to green, abaxially yellow-, ferrugineous-, or brown-villous, -tomentose, or -pilose, densely so on principal veins, adaxially brown- to ferrugineous-tomentose proximally on midvein, otherwise glabrous, midvein adaxially impressed, secondary veins 8–12 on each side of midvein, base broadly cuneate, margin serrulate, revolute, apex acute, acuminate, or occasionally emarginate through tip abortion. Inflorescences pseudo-terminal and axillary simple or more often branched spike-like cymes, 5–10.5 cm, 10–ca. 40-flowered; rachis densely reddish brown- to yellowish brown-tomentose. Bracts and bracteoles broadly ovate to orbicular, isomorphic but bracts usually larger, 1.5–4 × 1.8–3.5 mm, persistent, densely strigillose, margin ciliate, not glandular, apex acute to rounded. Pedicel absent; bracteoles keeled, covering most or all of hypanthium. Hypanthium glabrous, subtending articulation present. Calyx limb not gamosepalous; lobes suborbicular, 1.3–2 × 1.3–1.7 mm, sericeous, margin ciliate, not glandular, apex obtuse to rounded. Corolla white, 3–5 mm, membranous, gamopetalous only at base; lobes narrowly oblong, glabrous, adaxially smooth. Stamens ca. 50–70, adnate to corolla only at base, longest 4–6 mm; filaments not abruptly constricted apically, smooth. Disk annular, glabrous. Style 3.5–5 mm, glabrous. Fruit ampulliform to globose, 4–7 × 4–5 mm; glabrous; endocarp indurate throughout, 1 locule developed, perimeter finely ribbed. Seeds twice-curved.

Symplocos laurina is often treated within the circumscription of *S. cochinchinensis*, but here we treat the two as distinct species. See discussion under *S. laurina*. Only the Gongshan Xian specimen can be mapped with confidence; the Fugong Xian specimen does not indicate a more precise locality and may be on the non-Gaoligong Shan side of the Nujiang.

SELECTED ILLUSTRATIONS.— Y.F. Wu, Fl. Reipubl. Popularis Sin. 60(2):59 t. 21(8–10). 1987;

G.H. Zhu, ed. Fl. China Ill. 15:t. 189(11–13). 2000.

PHENOLOGY.— Fl. Aug–Sep, fr. Oct–Nov.

DISTRIBUTION AND HABITAT.— Mixed forests; 1100–2200 m. In GLGS: CHINA. Yunnan: Fugong Xian (Shangpa Zheng), Gongshan Xian (Dulongjiang Xiang); Figure 5. Outside of GLGS: S Fujian, Guangdong, Guangxi, Hainan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [India, Indonesia, Japan, Laos, Malaysia, Myanmar, Papua New Guinea, Philippines, Thailand, Vietnam].

LOCAL NAME.— 越南山矾 yue nan shan fan

USES.— Timber used for making furniture. Seeds oil used in industry.

ADDITIONAL SPECIMENS EXAMINED.— **CHINA. YUNNAN: FUGONG XIAN.** Shangpa Zheng, 2000 m, 1 Oct 1934, Tsai 59127 (A, KUN). **GONGSHAN XIAN.** Dulongjiang Xiang. From Bapo to Maku, 1500 m, 15 Aug 1982, QX 9358 (KUN).

3. *Symplocos dryophila* C.B. Clarke in J.D. Hooker, Fl. Brit. Ind. 3:578. 1882. **TYPE.**— INDIA. Sikkim: 8000–10000 ft., J.D. Hooker s.n. (Herb. Ind. Or. J.D. Hooker & T. Thomson 53) (holotype: K!; isotypes: BM!, GH!, L, P, W!).

Symplocos delavayi Brand, Repert. Spec. Nov. Regni Veg. 3:218. 1906.

Dicalix delavayi (Brand) Migo, Bull. Shanghai Sci. Inst. 13:200. 1943.

Symplocos longipetiolata Rehder in Sargent, Pl. Wilson. 2:599. 1916.

Symplocos forrestii W.W. Smith, Notes Roy. Bot. Gard. Edinburgh 13:185.

1921. *Dicalix forrestii* (W.W. Smith) Migo, Bull. Shanghai Sci. Inst. 13:201. 1943.

Dicalix shunningensis Migo, Bull. Shanghai Sci. Inst. 13:205. 1943.

Shrubs or trees, evergreen, to 10 m tall. Young branchlets glabrous or more often proximally white- to tawny-sericeous to -pilose; mature branchlets purplish; pseudo-terminal vegetative buds 0.9–1.6 cm, outer scales glabrous or strigillose, inner scales usually strigose to sericeous. Petiole 0.8–1.9 cm, not glandular; leaf blade elliptic, oblong-elliptic, obovate, or oblanceolate, 7.4–14.5 × 1.9–5.0 cm, 2.3–4.8 times as long as wide, subcoriaceous, typically drying abaxially pale green to yellowish green and adaxially green to yellowish green, abaxially glabrous or rarely sparsely pilose along midvein, adaxially glabrous, midvein adaxially impressed, secondary veins 5–17 on each side of midvein, base cuneate, margin serrulate or occasionally entire and planar or rarely slightly revolute, apex acuminate. Floral buds axillary, globose, 4–10 mm; scales suborbicular to orbicular, glabrous or strigillose. Inflorescences pseudo-terminal and axillary, simple or rarely branched racemes or spikes, 1.6–7.5 cm, 12–22-flowered, frequently shorter and with fewer flowers distally; rachis tawny-, yellow-, or pale ferruginous-lanate to -pilose; bract broadly ovate to suborbicular, 5–6 × 3–5 mm, apex obtuse to rounded. Bracts and bracteoles caducous, densely sericeous, not glandular. Pedicel 0–2 mm; bracteoles linear, lanceolate, or oblanceolate, 1–6 × 0.1–1.2 mm, covering less than half of hypanthium. Hypanthium glabrous, subtending articulation present. Calyx limb gamosepalous for 0 to ca. 0.3 mm; lobes deltoid, 0.5–1 × 0.6–0.8 mm, glabrous or rarely sparsely sericeous, margin entire or ciliate and not glandular, apex acute with a blunt tip. Corolla white or yellow, 4–5 mm, membranous, gamopetalous only at base; lobes ± oblong-elliptic, glabrous, adaxially smooth. Stamens ca. 45–60, adnate to corolla only at base, longest 5–7 mm; filaments not abruptly constricted apically, smooth. Disk inconspicuous, annular or 5-lobed, strig-

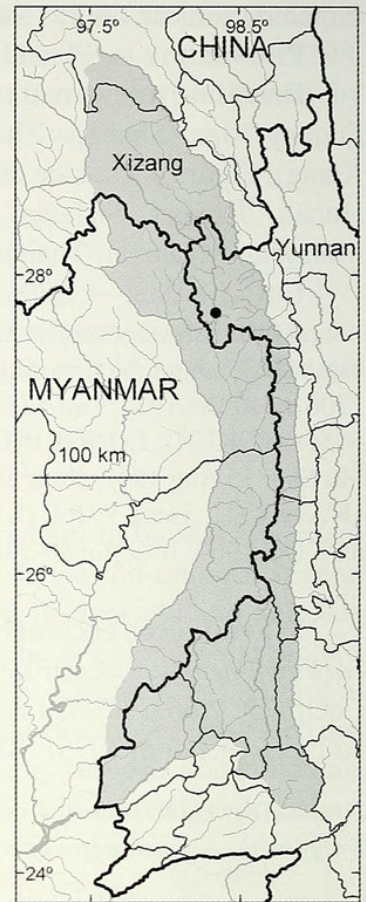


FIGURE 5. Distribution map of *Symplocos cochinchinensis* in the GLGS region.

illose to pilulose. Style 3.5–5 mm, glabrous. Fruit blue, ellipsoid-cylindrical, 5–10 × 3–4.5 mm, glabrous; endocarp indurate throughout, 2 or 3 locules developed, perimeter smooth. Seeds straight.

This is one of the most common species of *Symplocos* in the Gaoligong Shan, and is often observed in abundance as a subdominant understory tree. In the sterile condition it is easily distinguished from other species of *Symplocos* by its conspicuous (4–10 mm) globose axillary floral buds.

SELECTED ILLUSTRATIONS.— R.F. Wu, *Fl. Reipubl. Popularis Sin.* 60(2):44 t. 16(1–4). 1987; G.H. Zhu, ed. *Fl. China* III. 15:t. 186(1–4). 2000.

PHOTOGRAPHIC IMAGES.— Figures 6–7.

PHENOLOGY.— Fl. Mar–Jun, fr. Jul–Nov.

DISTRIBUTION AND HABITAT.— Mixed evergreen and deciduous broadleaf forest, Coniferous



FIGURE 6. Flowering branch of *Symplocos dryophila*. Photo by M. Dickson.

forest, Deciduous broadleaf forest, Subtropical evergreen broadleaf forest, Thicket; 1300–3500 m. In GLGS: CHINA. Xizang: Zayü Xian (Tsarong Xiang). Yunnan: Fugong Xian (Lishadi Xiang, Lumadeng Xiang, Shangpa Zheng), Gongshan Xian (Bingzhongluo Xiang, Cikai Zheng, Dulongjiang Xiang), Longling Xian (Longjiang Xiang), Lushui Xian (Chen'gan Xiang, Liuku Zheng, Luzhang Xiang, Pianma Xiang), Tengchong Xian (Guyong Zheng, Qushi Xiang, Wuhe Xiang, Zhonghe Xiang), MYANMAR. KACHIN: Myitkyina District (Chibyaw Township); Figure 8. Outside of GLGS: Guangdong, Guangxi, Hainan, SW Sichuan, Yunnan [India, Myanmar, Thailand, Vietnam].

LOCAL NAME.— 坚木山矾 *jian mu shan fan*.

ADDITIONAL SPECIMENS EXAMINED.— **CHINA. XIZANG: ZAYÜ XIAN.** Chaw-ji Pass, 9000–10000 ft., 20 May 1920, *R.J. Farrer 1564* (E); 2800 m, 18 Jul 1973, *QX 73-774* (KUN). **Tsarong Xiang.** SE Xizang, 9000–10000 ft., May 1922, *F 21620* (A, E, K); Mount Kenichunpo and region of Champutong, Salween-Irrawaddy watershed, 1923, *Rock 10246* (A, W); N slopes of Mt. Kenichunpo, N of Sikitung, upper Salween River, 11000 ft., 1 May 1932, *Rock 22116* (A, E, K); N slopes of Mt. Kenichunpo, N of Sikitung, upper Salween River, 10000 ft., May–Jun 1932, *Rock 22118* (A, E, K). **YUNNAN:** W Slope of Gaoligong Shan, 1540–3500 m, 15 Jul 1979, *Bijiang Expedition 972* (KUN [2]); 1917–1919, *F 16067* (K); 1917–1919, *F 17805* (A, K); 1917, *F 26635* (K); *F 29837* (E); bank of Kiukiang, NW of Sbchin, 1700 m, 25 Jul 1937, *Yü 19400* (KUN [2]). **FUGONG XIAN.** 2700 m, 21 Jun 1978, *Bijiang Expedition 609* (KUN [2]); Shala Valley, 2900 m, 16 Jul 1978, *Bijiang Expedition 1187* (KUN); DaZhi team to Mashiding, 2350 m, 1 Aug 1979, *Bijiang Expedition 1945* (KUN [2]). **Lishadi Xiang.** Moist canyon just S of the Shibali Logging Station on the rd from the Nujiang to Yaping Pass, E side of Gaoligong Shan, 2506 m, 28 Apr 2004, *GLGS 19993* (CAS); between Shibali Logging Station and Yaping Pass, ca. 4 km W of Shibali, from the Nujiang to Yaping Pass, E side of Gaoligong Shan, 2785 m, 2 May 2004, *GLGS 20090* (CAS); between Shibali Logging Station and Yaping



FIGURE 7. Fruiting branch of *Symplocos dryophila*. Photo by Lihua Zhou.

Pass, ca. 4.1 km W of Shibali, from the Nujiang to Yaping Pass, E side of Gaoligong Shan, 3007 m, 2 May 2004, *GLGS* 20150 (CAS); between the Nujiang and Shibali Logging Station, ca. 16 km W of the Nujiang, from the Nujiang to Yaping Pass, E side of Gaoligong Shan, 2181 m, 7 May 2004, *GLGS* 20383 (CAS); Yaduo Cun, above Shibali, on S side of the N fork of Yamu He, along the rd to the Myanmar border at Yaping Yakou, E side of Gaoligong Shan, 2830 m, 6 Aug 2005, *GLGS* 26543 (CAS); Yaduo Cun, above Shibali on the way to the Myanmar border at Yaping Yakou, N side of the N fork of Yamu He, E side of Gaoligong Shan, 2750 m, 10 Aug 2005, *GLGS* 26909 (CAS); loc. cit., *GLGS* 26910 (CAS); loc. cit., *GLGS* 26913 (CAS); loc. cit., *GLGS* 26918 (CAS); Yaduo Cun, above Shibali along the N side of S fork of Yamu He, E side of Gaoligong Shan, 2800 m, 15 Aug 2005, *GLGS* 28359; Yaduo Cun, Luodigoulu, N side of N fork of Yamu He, E side of Gaoligong Shan, 2520 m, 16 Aug 2005, *GLGS* 28431 (CAS); loc. cit., *GLGS* 28432 (CAS). **Lumadeng Xiang.** Rd along the S fork of the Yamu River, on the rd to Amero Pass, ca. 23 km SW of the confluence of the N and S forks of the Yamu, E side of Gaoligong Shan, 3022 m, 2 May 2004, *GLGS* 20292 (CAS); Yaping Cun, below Amero Pass along the rd back down to the confluence of the N and S fork of Yamu He, E side of Gaoligong Shan, 3120 m, 13 Aug 2005, *GLGS* 27168 (CAS); Yaping Cun, vicinity of Mapa, below Amero Pass, along a ridge from the rd using the old trail down to the S fork of Yamu He, E side of Gaoligong Shan, 3100 m, 13 Aug 2005, *GLGS* 27228 (CAS); Yaping Cun, above the southern Shibali, along the S fork of Yamu He, on the rd to Amero Pass, E side of Gaoligong Shan, 2800 m, 14 Aug 2005, *GLGS* 27278 (CAS); loc. cit., *GLGS* 27280 (CAS); Yaping Cun, Shibali, on the S side of N fork of Yamu He, E side of Gaoligong Shan, 2510 m, 16 Aug 2005, *GLGS* 28470 (CAS); loc. cit., *GLGS* 28486 (CAS); loc. cit., *GLGS* 28487 (CAS); 2900 m, 28 May 1982, *QX* 7018 (KUN [2]). **Shangpa Zheng.** 20 Oct 1933, *Tsai* 54487 (A). **GONGSHAN XIAN. Bingzhongluo Xiang.** 2400 m, 25 Jun 1982, *QX* 7692 (KUN [2]); Xiaohe, bank of Nujiang, 13 Nov 1959, *Wu* 24558 (PE); 13 Nov 1959, *Feng* 24567 (KUN [3]); 13 Nov 1959, *Feng* 54558 (KUN [3]); Gongdan Holy Hills, E side of Gaoligong Shan, along the trail from Bingzhongluo to top of Holy Hills, 2500 m, 17 Apr 2002, *GLGS* 14444 (CAS); Gongdan Holy Hills, E side of Gaoligong Shan, along the trail from Bingzhongluo to top of Holy Hills, 2500 m, 17 Apr 2002, *GLGS* 14461 (CAS, KUN); Gongdan Holy Hills, E side of Gaoligong Shan, along the trail from Bingzhongluo to top of Holy Hills, 2000 m, 17 Apr 2002, *GLGS* 14473 (CAS, KUN); loc. cit., *GLGS* 14474 (CAS, KUN); Gongdan Holy Hills, E side of Gaoligong Shan, along the trail from Bingzhongluo to top of Holy Hills, 2540 m, 24 Apr 2002, *GLGS* 14669 (CAS, KUN); loc. cit., *GLGS* 14689 (CAS, KUN); Gong Dang (God's Mountain) beyond the end of the rd to a marble quarry just SW of Bingzhongluo, E side of Gaoligong Shan, 2620 m, 9 Oct 2002, *GLGS* 17103 (CAS, KUN); 2650 m, 24 Jun 1982, *QX* 7456 (KUN [2]). **Cikai Zheng.** 5 km from Qiqi towards Dongshaofang, 2400 m, 21 Sep 1997, *GLGS* 9509 (E, KUN); E side of divide above Dong Shao Fang forest station on Nan Mo Wang Shang, 3400 m, 22 Sep 1997, *GLGS* 9531 (E, KUN [2]); E side of Gaoligong Shan, along the Danzhu He on the rd from Nu Jiang at Danzhu to the Myanmar border, 2750 m, 1 Jul 2000, *GLGS* 11843 (CAS, GH, KUN); E side of Gaoligong Shan, W of Gongshan, along a branch of the Pula He, W of Rizhidi Bridge on the trail from Qiqi to Dongshao Fang and the Dulong Jiang Valley, 2100–2200 m, 11 Jul 2000, *GLGS* 12300 (CAS, GH, KUN); E side of Gaoligong Shan, below Xiaoxue Cao along the Danzhu He on the rd from the Nu Jiang at Danzhu to the Myanmar border, 2610 m, 2 Jul 2000, *GLGS* 12307 (CAS, GH, KUN); E side of Gaoligong Shan, W of Gongshan, Qiqi above the Pula He, 2300–2570 m, 12 Jul 2000, *GLGS* 12507 (CAS, GH, KUN); Heiwadi, E side of Gaoligong Shan, along the Pula He on the new rd to Dulong Jiang Valley, 2210 m, 12 Apr 2002, *GLGS* 14135 (CAS, KUN); E side of Gaoligong Shan, W of Gongshan, along the Pula He on the trail from Qiqi to No. 12 Bridge and Dulongjiang Valley, 2500 m, 3 May 2002, *GLGS* 14874 (CAS, KUN); along rd from Gongshan to Kongdang, E side of Gaoligong Shan, 2750 m, 23 Sep 2002, *GLGS* 16521 (CAS, KUN); E side

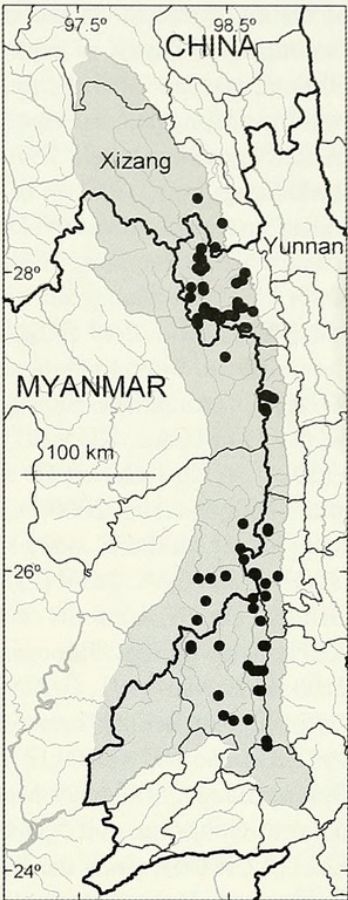


FIGURE 8. Distribution map of *Symplocos dryophila* in the GLS region.

of Gaoligong Shan on the rd from Gongshan to Kongdang, 2720 m, 12 Nov 2004, *GLGS 23052* (CAS). **Dulongjiang Xiang.** W bank of Nujiang, Sicui, Maku, 2000 m, 17 Nov 1959, *Feng 24336* (KUN [3]); Bapodi, 2000 m, 10 Nov 1959, *Feng 24425* (KUN [4]); Sandui, NE of Shigong Bridge and NW of Xishaofang on the trail from Gongshan to Bapo, 22 Nov 1990, *GLGS 742* (CAS, KUN [3]); Sandui, NE of Shigong Bridge, 1900 m, 22 Nov 1991, *GLGS 785* (KUN [2]); Maku, southern region of the Dulong Jiang Valley on the W side of the Dulong Jiang, 1950 m, 16 Dec 1990, *GLGS 1095* (CAS, KUN); Maku, southern region of the Dulong Jiang Valley on the W side of the Dulong Jiang, 2020 m, 16 Dec 1990, *GLGS 1107* (CAS, KUN); along the Mabiluo River which is the most northeastern tributary of the Dulong Jiang, 1310 m, 30 Dec 1990, *GLGS 1393* (CAS, KUN [2]); Meiliwang, along the trail from Bapo to Gongshan on the E side of the Dulong Jiang, 1900 m, 14 Jan 1991, *GLGS 1943* (KUN); Meiliwang, 2300 m, 16 Jan 1991, *GLGS 3056* (KUN [2]); Meiliwang, along the trail from Bapo to Gongshan on the E side of the Dulong Jiang, 2100 m, 16 Jan 1991, *GLGS 3066* (CAS, KUN [2]); along the Dandangwang He, NW of Bapo on the W side of the Dulong Jiang, 1400 m, 16 Jan 1991, *GLGS 3145* (CAS, KUN [2]); along the Dandangwang He, NW of Bapo on the W side of the Dulong Jiang, 1350 m, 16 Jan 1991, *GLGS 3167* (KUN [2]); Maku, southern region of the Dulong Jiang Valley on the W side of the Dulong Jiang, 2000 m, 8 Mar 1991, *GLGS 4290* (CAS, KUN [2]); Maku, southern region of the Dulong Jiang Valley on the W side of the Dulong Jiang, 2000 m, 13 Mar 1991, *GLGS 4579* (CAS, KUN [2]); loc. cit., *GLGS 4584* (CAS, KUN [2]); Maku, 2100 m, 13 Mar 1991, *GLGS 4600* (KUN [2]); Qiawudang, S side of the Gamolai He, ca. 4 km SE of Bapo on the E side the Dulong Jiang, 2100 m, 22 Mar 1991, *GLGS 4779* (CAS, KUN); Qiawudang, Dulongjiang, 2100 m, 22 Mar 1991, *GLGS 4780* (KUN [3]); Qiawudang, Dulongjiang, 2100 m, 22 Mar 1991, *GLGS 4781* (KUN [2]); Qiawudang, Kaladi, 2350 m, 23 Mar 1991, *GLGS 4865* (KUN [2]); Shigong Bridge, between Xishaofang and Bapo on the trail from Gongshan to Bapo, 2200 m, 24 Mar 1991, *GLGS 4941* (KUN [2]); Qiawudang, S side of the Gamolai He, ca. 4 km SE of Bapo on the E side the Dulong Jiang, 2500 m, 25 Mar 1991, *GLGS 4968* (CAS, KUN [2]); along the Wangmei He, N of the trail from Bapo to Gongshan and NW of Xishaofang on the E side of the Dulong Jiang, 2200 m, 26 Mar 1991, *GLGS 5203* (KUN [2]); along the Wangmei He, N of the trail from Bapo to Gongshan and NW of Xishaofang on the E side of the Dulong Jiang, 2100 m, 26 Mar 1991, *GLGS 5204* (KUN [2]); Langbendang, middle region of the Dulong Jjiang on the W side, 2100 m, 26 Mar 1991, *GLGS 5229* (KUN [2]); Langbendang, middle region of the Dulong Jjiang on the W side, 2150 m, 27 Mar 1991, *GLGS 5236* (CAS, KUN [2]); Xishaofang, 3200 m, 20 Mar 1991, *GLGS 5257* (KUN); Xishaofang, along the trail from Gongshan to Bapo on the E side of the Dulong Jiang, 3200 m, 30 Mar 1991, *GLGS 5357* (CAS, KUN); Longyuan, ca. 6 km S of Dizhengdang on the W side of the Dulong Jiang, 1650 m, 11 Apr 1991, *GLGS 5405* (KUN [2]); Longyuan, ca. 6 km S of Dizhengdang on the W side of the Dulong Jiang, 1650 m, 11 Apr 1991, *GLGS 5467* (KUN [2]); Longyuan, ca. 6 km S of Dizhengdang on the W side of the Dulong Jiang, 1700 m, 11 Apr 1991, *GLGS 5500* (KUN); Dizhengdang, 1880 m, 13 Apr 1991, *GLGS 5703* (KUN [2]); Xuebalaka, ca. 7 km SE of Dizhengdang between Kongdang and Dizhengdang on the E side of the Dulong Jiang, 2100 m, 15 Apr 1991, *GLGS 5919* (CAS, KUN); Wangnulaka, ca. 5 km NW Dizhengdang, on the W side of the Dulong Jiang, 2500 m, 18 Apr 1991, *GLGS 6074* (KUN); Chi Ba Ji, 2400 m, 17 Apr 1991, *GLGS 6111* (KUN [2]); Silaolaka, ca. 5 km SW Dizhengdang, on W side of the Dulong Jiang, 2400 m, 21 Apr 1991, *GLGS 6293* (CAS, KUN); 2500 m, 16 May 1991, *GLGS 6840* (KUN [2]); 2500 m, 22 May 1991, *GLGS 7024* (KUN [2]); Sandui, NE of Shigong Bridge and NW of Xishaofang on the trail from Gongshan to Bapo, 2700 m, 22 May 1991, *GLGS 7038* (KUN [2]); S of the second team, Dulongjiang, 22 May 1991, *GLGS 7049* (KUN [2]); W side of Gaoligong Shan, W of Gongshan, below the pass on the trail from Qiqi to Bapo in the Dulong Jiang Valley, 2800 m, 18 Jul 2000, *GLGS 12949* (CAS, KUN); Xianjiudang, W side of Gaoligong Shan, along Dulongjiang Valley on the trail from Kongdang to Dizhengdang, 1560 m, 23 Jul 2002, *GLGS 15208* (CAS, KUN); vicinity of Sandui camp-site between Shigong Qiao and Xixiaofang on trail from Bapo to Gongshan via Qiqi on the W side of Gaoligong Shan, 2500 m, 29 Oct 2004, *GLGS 21981* (CAS); Zhizizhu, 2700 m, 9 May 1979, *Nujiang Expedition 71* (KUN [2]); Qiqi, 2200 m, 18 Jul 1982, *QX 8093* (KUN [2]); Qiqi, 2000 m, 19 Jul 1982, *QX 8207* (KUN [2]); Qiqi, 2000 m, 19 Jul 1982, *QX 8267* (KUN [2]); Jidu to Dongshaofang, 2600 m, 22 Jul 1982, *QX 8426* (KUN [2]); Maku, 2200 m, 6 Aug 1982, *QX 8920* (KUN [3]); Maku, 1900 m, 6 Aug 1982, *QX 8935* (KUN); Kongdang to Xianjiudang, 1600 m, 23 Sep 1982, *QX 9553* (KUN); Xianjiudang, 1700 m, 24 Aug 1982, *QX 9607* (KUN); Longyuan River, 1900 m, 29 Aug 1982, *QX 9744* (KUN); Longyuan, 2300 m, 30 Aug 1982, *QX 9785* (KUN); Bapo, E bank of Dulong River, 10 Nov 1959, *Wu 24125* (PE); Kiukiang Valley, Taron,

2000 m, 19 Aug 1938, *Yü 19904* (A, KUN); Taron-Taru Divide, Tangtehwang, 1850 m, 27 Aug 1938, *Yü 19994* (A). **LONGLING XIAN.** Daba, 2400 m, 18 Aug 1941, *Wang 90165* (KUN). **Longjiang Xiang.** Xiaoheishan, 2800 m, 26 Jul 1982, *QX 8644* (KUN [2]); 2800 m, 26 Jul 1982, *QX 8777* (KUN [2]); Xiaoheishan, 2000 m, 28 Jul 1959, *Wang 89818* (KUN). **LUSHUI XIAN.** Tiemu Xiang, 2700 m, 21 Jun 1978, *Bijiang Expedition 1761* (KUN [2]); Shanghong, Caijaba, 2900 m, 14 Mar 1989, *H. Sun et al. 1655* (KUN); Shanghong, Caijaba, 2100 m, 25 Mar 1989, *H. Sun et al. 1656* (KUN); 2800 m, 25 Jan 1942, *Wang 89739* (KUN). **Chen'gan Xiang.** N'Maikha-Salween divide, Close to upper Burma, Aug 1925, *F 27211* (A, E, K). **Liuku Zheng.** Shweli-Salween divide, N of Ho-tou, 7000–8000 ft., May 1925, *F 26335* (A, E, W); Shweli-Salween divide, 9000 ft., May 1925, *F 26377* (A, E, K). **Luzhang Xiang.** Yaojiaping, 2200 m, 14 Mar 1989, *GLGS 89* (KUN); rd from Pian Ma to Liuku, between Pian Ma Ya Kou and Yao Jia Ping Forest Station, E slope of Salween/Irrawaddy Divide, 2750–2850 m, 5 Oct 1997, *GLGS 10059* (E); just below the Fengxue Yakou (the pass between Lushui and Pianma), between km 54 and 58, E side of Gaoligong Shan, 3125 m, 19 May 2005, *GLGS 24535* (CAS). **Pianma Xiang.** Fengxue Yakou, 2800 m, 27 Jul 1978, *Bijiang Expedition 1350* (KUN [2]); vicinity of Km 62 on the rd from Lushui to Pianma, W side of Gaoligong Shan, 2790 m, 17 May 2005, *GLGS 23307* (CAS); vicinity of Feng Xue Yakou (Windy and Snowy Pass) on rd from Lushui to Pianma, W side of Gaoligong Shan, 3127 m, 11 May 2005, *GLGS 23935* (CAS); Wuzhong Village, 2400 m, 4 Aug 1964, *Wu 8006* (KUN [2]); Zhong Pianma, 2800 m, 13 Jul 1964, *Wu 8020* (KUN [2]); 13 Jul 1964, *Wu 8125* (KUN [2]); Wuzhong Village, 2800 m, 25 Jul 1964, *Wu 8217* (KUN [2]); Pianma Yakou, 2200 m, 14 Aug 1964, *Wu 8363* (KUN). **TENG-CHONG XIAN.** 7000–8000 ft., 1 Sep 1925; Shweli River drainage basin to summit of Shweli-Salween watershed E of Tengyueh, 9000 ft., Nov 1922, *Rock 7669* (A). **Guyong Zheng.** Hills NW of Tengyueh, 8000 ft., *F 11909* (A, E, K, W); hills around Tengyueh, *F 27202* (A, E, K, W); Houqiao, 2950 m, 20 May 1964, *Wu 6752* (KUN); Houqiao, 2950 m, 20 May 1964, *Wu 6762* (KUN); Houqiao, 3200 m, 1 Jun 1964, *Wu 6893* (KUN); Liangyashan, 3000 m, 8 Jun 1964, *Wu 7098* (KUN [2]); Liangyashan, 7 Apr 1980, *D.Y. Xia 7* (KUN); Liangyashan, 14 Apr 1980, *D.Y. Xia 74* (KUN [2]); Changping Batou to Liangyashan, Danzha, 2940 m, 15 Apr 1980, *L.S. Xie 877* (KUN [2]). **Jietou Xiang.** W flank of the Shweli-Salween divide, 8000–9000 ft., 1914, *F 8991* (BM, K); Shweli-Salween divide, 8000, *F 12093* (E); Shweli-Salween divide, 10000 ft., Jul 1917, *F 15653* (E [2], K); Shweli-Salween divide, 9000–10000 ft., *F 15654* (A, E, K); loc. cit., *F 15668* (A, E); loc. cit., *F 16007* (A, E, K); Shweli-Salween divide, 8000–9000 ft., Jul 1917, *F 15771* (A, E, K); loc. cit., *F 18311* (E, K); Shweli-Salween divide, Jul 1918, *F 17627* (A, E, K, W). **Qushi Xiang.** Daba, Gaojiaoyan (High Foot Rock), 2780 m, 16 May 1997, *Z.L. Dao et al 9465* (KUN [2]); Shweli-Salween divide, 10000 ft., Jul 1917, *F 15814* (A, K, W); Jul 1918, Shweli-Salween divide, 9000 ft., *F 17717* (E, K); Shweli-Salween divide, 6000–7000 ft., *F 17780* (A, E, K, W); 1917–1919, Shweli-Salween divide, 7000 ft., Apr 1924, *F 24018* (E, K); Liangyashan to Diantan, 2800 m, 10 Jun 1964, *Wu 7123* (KUN). **Ruidian Xiang.** Shweli Valley, 6000 ft., *F 12056* (A, E, K). **Tengyue.** Divide between the Shweli and Tengyueh valleys, 6000–7000 ft., Jun 1912, *F 8241* (E, K). **Wuhe Xiang.** Km 24.7 along hwy S 317, Xiaodifang Village and vicinity, W side of Gaoligong Shan, 2169 m, 25 May 2005, *GLGS 24882*. **Zhonghe Xiang.** Lava bed W of Tengyueh, 5000 ft., Jun 1912, *F 8147* (E). **MYANMAR.** Upper Burma, 1914, *F. Kingdon Ward 16* (E [3]). **KACHIN:** Shing Hong Pass, N Burma, 10000 ft., 18 Jun 1920, *R.J. Farrer 1621* (E). **MIYTKYINA DISTRICT.** Laikam-Fengshui, 8000 ft., 22 Apr 1938, *W.D. Kermode 17208* (K); W of Hpawte, 10000 ft., 2 May 1938, *W.D. Kermode 17282* (K); Laluga and Htebu, 7000–9000 ft., 13 May 1953, *Tha Hla 3955* (K). **Chibyaw Township.** Tawgaw, NE frontier, 1 May 1912, *I.A. Abbay 16* (E); hills around Tzi-tzo-ti, 9000 ft., May 1925, *F 26467* (A, E, K); hills around Tzi-tzo-ti, 9000 ft., Oct 1925, *F 27411* (A, E, K); above Langyaw, 6000–7000 ft., 30 Mar 1938, *W.D. Kermode 16694* (K); between Sadon and the Yunnan-Chinese border at Changtifang and Kambaiti, 1 Nov 1922, *Rock 7402* (A).

4. *Symplocos glauca* (Thunberg) Koidzumi, Bot. Mag. (Tokyo) 39:313. 1925. Basionym: *Laurus glauca* Thunberg in Murray, Syst. Veg., ed. 14, 383. 1784. *Litsea glauca* (Thunberg) Siebold, Verh. Batav. Genootsch. Kunsten 12:24. 1830. *Myrsine thunbergii* Tanaka, Bull. Sci. Fak. Terk. Kjusu Imp. Univ. 1:201. 1925. *Bobua glauca* (Thunberg) Nakai, Trees Shrubs Japan, Revis. Ed. 1:322. 1927. *Dicalix glauca* (Thunberg) Migo ex H. Hara, Enum. Spermatophytarum Japon. 1:104. 1948. TYPE.— JAPAN. *C.P. Thunberg s.n.* (holotype: UPS).

Symplocos grandis Handel-Mazzetti, Beih. Bot. Centralbl. 62(B):15. 1943.

Symplocos oblanceolata Y.F. Wu, Acta Phytotax. Sin. 24 (3):198. 1986.

Trees, evergreen, to 8 m tall. Young branchlets ferrugineous- to brown-lanate; mature branchlets dark brown; pseudo-terminal vegetative buds 6–10 mm, ferrugineous- to brown-lanate. Petiole 1.8–3.5 cm, not glandular; leaf blade elliptic, oblanceolate, or obovate, 17–25 × 3–9 cm, 2.8–4.5 times as long as wide, subcoriaceous, typically drying abaxially pale greenish white to greenish brown and glaucous and drying adaxially green to brown, abaxially glabrous or black to brown lanate and minutely papillose at least proximally, adaxially glabrous or occasionally white- or ferrugineous-lanate especially along midvein, midvein adaxially impressed, secondary veins 7–16 on each side of midvein, base cuneate, margin entire, denticulate, or serrulate and revolute, apex acuminate, abruptly acuminate, acute, or occasionally obtuse and often rounded or emarginate through tip abortion. Inflorescences pseudo-terminal or axillary, simple or basally branched glomerules, often produced in axils of leaf scars on proximal leafless regions of branchlets, 0.8–1.5 cm, to 20-flowered; rachis not evident; bract orbicular, margin erose and often glandular. Bracts and bracteoles 1.8–3 × 0.8–3 mm with bracts larger than bracteoles, persistent, ferrugineous- to dark brown-tomentose, apex rounded. Pedicel absent; bracteoles broadly spatulate, margin entire and not glandular, covering less than half of hypanthium. Hypanthium glabrous, subtending articulation present. Calyx limb gamosepalous for 0.5–1 mm; lobes semi-oblong, 0.8–1.3 × 0.5–1.3 mm, ferrugineous- to dark brown-tomentose, margin entire or tomentose and not glandular, apex rounded. Corolla white or yellow, 3–5 mm, membranous, gamopetalous only at base; lobes narrowly oblong, glabrous, adaxially smooth. Stamens ca. 15–30, adnate to corolla only at base, longest 3–4 mm; filaments not abruptly constricted apically, smooth. Disk annular to cylindrical, glabrous or villous. Style 2.5–5 mm, glabrous. Fruit bluish black, ovoid-ampulliform, 1.2–1.8 × 0.6–0.8 cm, glabrous; endocarp indurate throughout, 1 locule developed, perimeter smooth. Seeds straight.

SELECTED ILLUSTRATIONS.— R.F. Wu, Fl. Reipubl. Popularis Sin. 60(2):31 t. 10(8–10). 1987; G.H. Zhu, ed. Fl. China Ill. 15:t. 180(8–10). 2000.

PHENOLOGY.— Fl. Apr–Aug, fr. Aug–Oct.

DISTRIBUTION AND HABITAT.— Thicket, 2400–2500 m. In GLGS: China. Yunnan: Tengchong Xian (Jietou Xiang); Figure 9. Outside of GLGS: Fujian, Guangdong, Guangxi, Hainan, Hunan, Sichuan, Taiwan, Yunnan, Zhejiang [India, Japan, Myanmar, Thailand, Vietnam].

LOCAL NAME.— 羊舌树 yang she shu

USES.— Bark used medicinally.

ADDITIONAL SPECIMENS EXAMINED.— **CHINA. YUNNAN:** 8000 ft., Jun 1924, *F* 24641 (K). **TENGCHONG XIAN. Jietou Xiang.** Shweli-Salween divide, 9000 ft., Nov 1924, *F* 25241 (E, K).

This species has apparently not been collected since Forrest's expedition in 1924. The locality information of only one of the Forrest collections is specific enough by which to estimate geographic coordinates.

5. *Symplocos glomerata* King ex C.B. Clarke in J.D. Hooker, Fl. Brit. Ind. 3:577. 1882. *Dicalix glomeratus* (King ex C.B. Clarke)

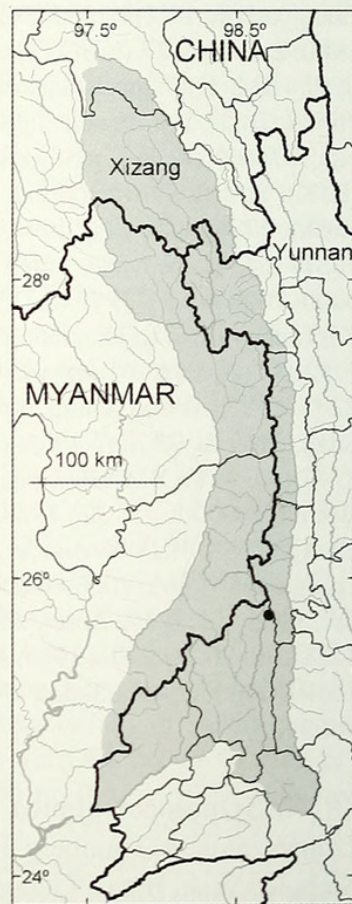


FIGURE 9. Distribution map of *Symplocos glauca* in the GLGS region.

Migo, Bull. Shanghai Sci. Inst. 13:201. 1943. TYPE.— INDIA. Assam (Khasia Hills) or Sikkim: 8000–10000 ft., *J.D. Hooker & T. Thomson s.n. (Herb. Ind. Or. Hook. f. & T. Thomson 55)* (holotype: K[4]!; isotypes: BM!, C, CGE, FI, GH[2]!, L, P, W).

Symplocos wenshanensis M.S. Huang & Y.F. Wu, Acta Phytotax. Sin. 24:199. 1986.

Symplocos yizhangensis Y.F. Wu, Acta Phytotax. Sin. 24:200. 1986.

Shrubs or trees, evergreen, to 10 m tall. Young branchlets glabrous or ferrugineous-tomentose; mature branchlets purplish; pseudo-terminal vegetative buds 3–6 mm, glabrous or ferrugineous-tomentose. Petiole 6–12 mm, occasionally glandular; leaf blade narrowly oblong-elliptic, oblong-ob lanceolate, or oblanceolate, $8\text{--}18 \times 1.7\text{--}4.1$ cm, 2.8–5.6 times as long as wide, subcoriaceous, typically drying adaxially olive green to dark brown and abaxially dark green to brown, abaxially glabrous or sparsely ferrugineous to brown-tomentose when young but glabrescent, adaxially glabrous, midvein adaxially impressed, secondary veins 7–13 on each side of midvein, base cuneate to slightly attenuate, margin serrulate to serrate and planar or slightly revolute, apex acuminate. Inflorescences axillary basally branched glomerules or simple compact spikes, 0.9–1.1 cm, 1–14-flowered; rachis not evident. Bracts and bracteoles deltoid-ovate, nearly isomorphic but bracts slightly larger, $1.0\text{--}1.5 \times 1.2\text{--}2.0$ mm, persistent, ferrugineous-tomentose to nearly glabrous, margin entire and not glandular, apex acute to rounded. Pedicel absent. Hypanthium glabrous, subtending articulation present. Calyx limb gamosepalous for 0–0.2 mm; lobes suborbicular to semi-elliptic, $1.0\text{--}1.5 \times 1.0\text{--}2.0$ mm, glabrous abaxially but margin frequently ferrugineous- to brown-tomentose and not glandular. Corolla white, 4–5 mm, membranous, gamopetalous only at base; lobes oblong, glabrous, adaxially smooth. Stamens ca. 20–35, adnate to corolla only at base, longest 7–9 mm; filaments not abruptly constricted apically, smooth. Disk annular, glabrous. Style 4–5.5 mm, glabrous. Fruit blue, cylindrical to ellipsoid-cylindrical, $6\text{--}9 \times 2.5\text{--}3.5$ mm, glabrous; endocarp indurate throughout, 1 locule developed, perimeter 7–10-ribbed. Seeds straight.

Symplocos glomerata is a very common species, growing within the middle elevations in Gaoligong Shan. It is the only one of the commonly encountered species of *Symplocos* with glomerules or compact spikes, the rachis being hidden by the rest of the inflorescence; the other common species (*S. dryophila*, *S. ramosissima*, and *S. theifolia*) have more elongate inflorescences with an evident rachis.

This species may not be distinct from *Symplocos adenopus* Hance. *Symplocos glomerata* supposedly differs from *S. adenopus* by a leaf blade margin with less than 6 glands (versus 6 to 12) per cm, but this character appears to vary continuously and may be clinal, with the variation ascribed to *S. adenopus* distributed to the east of Gaoligong Shan.

The inclusion of *Symplocos heishanensis* Hayata in Li et al. (2000) appears to be based on a misidentification of a specimen of *S. glomerata* (GLGS 1539).

SELECTED ILLUSTRATIONS.— R.F. Wu, Fl. Reipubl. Popularis Sin. 60(2):62 t. 22(17–20), 65 t. 23(8–10). 1987; G.H. Zhu, ed. Fl. China Ill. 15:t. 192(17–20), t. 193(8–10). 2000.

PHENOLOGY.— Fl. and fr. Feb–Oct.

DISTRIBUTION AND HABITAT.— Mixed evergreen and deciduous broadleaf forest, Subtropical evergreen broadleaf forest; 1300–2800 m. In GLGS: CHINA. Xizang. Yunnan: Fugong Xian (Lishadi Xiang, Shangpa Zheng), Gongshan Xian (Bingzhongluo Xiang, Cikai Zheng, Dulongjiang Xiang), Longling Xian (Longjiang Xiang), Longyang Qu (Lujiang Xiang), Lushui Xian (Gudeng Xiang, Pianma Xiang), Tengchong Xian (Dongshan Xiang, Guyong Zheng, Jietou Xiang, Puchuan Xiang, Qushi Xiang, Shangying Xiang, Wuhe Xiang), Yingjiang Xian. MYANMAR. Kachin: Myitkyina District (Chibyaw Township); Figure 10. Outside of GLGS: Fujian, N Guangdong, Hunan, Jiangxi, Xizang, Yunnan, Zhejiang [Bhutan, India, Sikkim].

LOCAL NAME.— 团花山矾 *tuan hua shan fan*

USES.— Root used medicinally.

ADDITIONAL SPECIMENS EXAMINED.— **CHINA. XIZANG:** Buqiong Lake, SE Xizang, 1450 m, 15 Nov 1992, *H. Sun et al.* 1372 (KUN). **YUNNAN:** Shweli-Salween divide, 7000–8000 ft., Jun 1918, *F* 17628 (A, E, K, W [2]); Shweli-Salween divide, 8000 ft., Jul 1918, *F* 17655 (W); 1933–1934, *Tsai* 55880 (A); the first district, from Tong Yang to Xiong Ku, 2700 m, 6 Jun 1960, *Wu* 9280 (KUN). **FUGONG XIAN.** Bijiang to Fa Du Feng, 5 Jun 1978, *Nujiang Expedition* 445 (KUN); Lhuo-mo-geer, 2400 m, 1 Jan 1942, *Wang* 90588 (KUN); Bi Jiang, 1 Jan 1942, *Wang* 90703 (KUN). **Lishadi Xiang.** Between Shibali Logging Station and Yaping Pass, ca. 4.5 km W of Shibali, from the Nujiang to Yaping Pass, E side of Gaoligong Shan, 2884 m, 2 May 2004, *GLGS* 20241 (CAS); between the Nujiang and Shibali Logging Station, ca. 16 km W of the Nujiang, from the Nujiang to Yaping Pass, E side of Gaoligong Shan, 2181 m, 7 May 2004, *GLGS* 20368 (CAS). **Shangpa Zheng.** Qiao Mi Gu Lu, 2200 m, 8 Jun 1982, *QX* 7079 (KUN); Qiao Mi Gu Lu, 2300 m, 8 Jun 1982, *QX* 7095 (KUN); 2500 m, 19 Oct 1933, *Tsai* 54470 (A); 2500 m, 20 Oct 1933, *Tsai* 54529 (A); 2800 m, 20 May 1934, *Tsai* 58808 (A, KUN); 2800 m, 20 Oct 1934, *Tsai* 58847 (A, KUN). **GONGSHAN XIAN.** W slope of Gaoligong Shan, 2400 m, 28 Feb 1982, *QX* 8819 (KUN); A Lu La Ka, 2500 m, 30 May 1960, *Wu* 9155 (KUN). **Bingzhongluo Xiang.** Cha Pu Tong, 2000–2307 m, 5 Sep 1940, *Feng* 7497 (KUN); E slope of Gaoligong Shan, 2500 m, 1 Aug 1979, *Nujiang Expedition* 791252 (KUN); Chinatung, Cham Pu Tung, 2300 m, 1 Sep 1935, *Wang* 66613 (A, KUN, PE, PE); Chi na tung, Cham pu tung, 2500 m, 1935–1936, *Wang* 66662 (A, KUN, PE, PE); from Shan Ma to Bingzhongluo, 1700 m, 2 May 1960, *Wu* 8766 (KUN); Gongdan Holy Hills, E side of Gaoligong Shan, along the trail from Bingzhongluo to top of Holy Hills, 2540 m, 24 Apr 2002, *GLGS* 14672 (CAS, KUN). **Cikai Zheng.** Qiqi, W side of Palehe River, 2040 m, 14 Oct 1996, *GLGS* 7524 (E); NE Qiqi Nature Reserve Station track heading towards Dulongjiang, margin of disturbed evergreen, 2150 m, 16 Oct 1996, *GLGS* 7705 (E); Qiqi Nature Reserve Station, 1900–2000 m, 19 Sep 1997, *GLGS* 9309 (E); 2–3 km along track from Qiqi towards Dongshaofang, 2050–2200 m, 20 Sep 1997, *GLGS* 9387 (E); E side of Gaoligong Shan, below Daxue Cao waterfall, along the Danzhu He on the rd from the Nu Jiang at Danzhu to the Myanmar border, 2350–2470 m, 4 Jul 2000, *GLGS* 11972 (CAS, KUN); loc. cit., *GLGS* 11976 (CAS, KUN); E side of Gaoligong Shan, W of Gongshan and W of Qiqi, along the Pula He on the trail to Dongshao Fang and Dulong Jiang Valley, 2250 m, 10 Jul 2000, *GLGS* 12255 (CAS, GH, KUN); E side of Gaoligong Shan, W of Gongshan, along the Pula He on the trail from Qiqi to No. 12 Bridge and Dulong Jiang Valley, 2770 m, 30 Apr 2002, *GLGS* 14771 (CAS, KUN); loc. cit., *GLGS* 14775 (CAS, KUN); E side of Gaoligong Shan, W of Gongshan, along the Pula He on the trail from Qiqi to No. 12 Bridge and Dulongjiang Valley, 2700 m, 3 May 2002, *GLGS* 14864 (CAS, KUN); E side of Gaoligong Shan at Km 28 on the rd from Gongshan to Kongdang, 2550 m, 13 Nov 2004, *GLGS* 22625 (CAS); Heiwadi, E side of Gaoligong Shan, along the Pula He on the new rd to Dulong Jiang Valley, 1990 m, 17 May 2001, *GLGS* 13886 (CAS, KUN); Qiqi, 2300 m, 19 Jul 1982, *QX* 8201 (KUN); Qiqi, 2000–2100 m, 19 Jul 1982, *QX* 8212 (KUN). **Dulongjiang Xiang.** Nengpula, directly opposite Bapo on the W side of the Dulong Jiang, 1400 m, 11 Dec 1990, *GLGS* 985 (CAS, KUN [2]); Kongdang, on the E side of the Dulong Jiang, 1420 m, 30 Dec 1990, *GLGS* 1504 (CAS, KUN [2]); Meiliwang, 1420 m, 30 Dec 1991, *GLGS* 1539 (KUN [2]); Meiliwang, 1900 m, 10 Jan 1991, *GLGS* 1935 (KUN [2]); Meiliwang, 1900 m, 14 Jan 1991, *GLGS* 1949 (KUN [2]); Songdangluo, 1560 m, 14 Jan 1991, *GLGS* 1994 (KUN [2]); Xianjiudang, middle region of the Dulong Jiang Valley, ca. 8 km N of Kongdang on the E side of the Dulong Jiang, 1550 m, 22 Nov 1990, *GLGS* 2125 (CAS, KUN [2]); loc. cit., *GLGS* 2144 (CAS, KUN [2]); Meiliwang, along the trail from Bapo to Gongshan on the E side of the Dulong Jiang, 2300 m, 16 Jan 1991, *GLGS* 3061 (CAS, KUN [2]); along the Dandangwang He, NW of Bapo on the W side of the Dulong Jiang, 1380 m, 17 Jan 1991, *GLGS* 3204 (CAS, KUN [2]); along the Dandangwang He, NW of Bapo

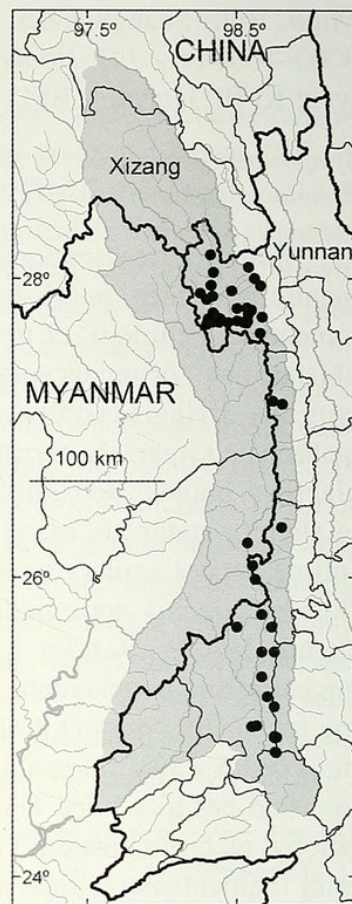


FIGURE 10. Distribution map of *Symplocos glomerata* in the GLGS region.

on the W side of the Dulong Jiang, 1600 m, 29 Jan 1991, *GLGS 3680* (KUN [2]); along the Telawang He which is the southernmost tributary of the Dulong Jiang, S of Bapo on the E side of the Dulong Jiang, 1380 m, 31 Jan 1991, *GLGS 3845* (KUN [2]); along the Telawang He which is the southernmost tributary of the Dulong Jiang, S of Bapo on the E side of the Dulong Jiang, 1350 m, 31 Jan 1991, *GLGS 3896* (KUN [2]); Maku, 2000 m, 8 Mar 1991, *GLGS 4288* (KUN [2]); Maku, southern region of the Dulong Jiang Valley on the W side of the Dulong Jiang, 1950 m, 8 Mar 1991, *GLGS 4321* (CAS, KUN [3]); loc. cit., *GLGS 4329* (KUN [2]); Mabidang, ca. 5 km N of Bapo on the E side of the Dulong Jiang, 1400 m, 8 Mar 1991, *GLGS 4635* (CAS, KUN [2]); E bank of Dulongjiang, 1500 m, 9 Mar 1991, *GLGS 4662* (KUN [2]); Kaladi, ca. 5 km SE of Bapo on the E side of the Dulong Jiang, 2350 m, 23 Mar 1991, *GLGS 4900* (KUN [2]); Qiawudang, S side of the Gamolai He, ca. 4 km SE of Bapo on the E side the Dulong Jiang, 2000 m, 25 Mar 1991, *GLGS 5077* (KUN [2]); Lang Ben Dang, 2000 m, 27 Mar 1991, *GLGS 5235* (KUN); Chawudang, 1850 m, 28 Mar 1991, *GLGS 5278* (KUN [2]); Xuebalaka, ca. 7 km SE of Dizhengdang between Kongdang and Dizhengdang on the E side of the Dulong Jiang, 1850 m, 20 Apr 1991, *GLGS 6163* (KUN [2]); Xianjiudang, middle region of the Dulong Jiang Valley, ca. 8 km N of Kongdang on the E side of the Dulong Jiang, 1680 m, 27 Apr 1991, *GLGS 6595* (KUN [2]); Kongdang, 1550 m, 28 Apr 1991, *GLGS 6666* (KUN [2]); N of the second team, 2300 m, 16 May 1991, *GLGS 6801* (KUN [2]); loc. cit., *GLGS 6802* (KUN [2]); loc. cit., *GLGS 6819* (KUN [2]); Meiliwang, 2100 m, 20 May 1991, *GLGS 6911* (KUN [2]); W side of Gaoligong Shan, W of Gongshan, on the trail from Qiqi to Bapo in the Dulong Jiang Valley, 2050–2150 m, 17 Jul 2000, *GLGS 12917* (CAS, KUN); near the Tibet-Burma border, Djiou-djiang (Irrawaddy or. sup.), 2400–2800 m, 9 Jul 1916, *H.F. v. Handel-Mazzetti 9461* (A, W); Zhi Zhi Zu camping site, on the way from Gongshan to Dulongjiang, 2180 m, 9 May 1979, *Nujiang Expedition 79-68* (KUN); Qin Lang Dang, 1700 m, 12 Aug 1982, *QX 9325* (KUN); Xian Jiu Dang, 1600 m, 23 Aug 1982, *QX 9488* (KUN); Kong Dang to Xian Jiu Dang, 1600 m, 12 Aug 1982, *QX 9497* (KUN).

LONGLING XIAN. Longjiang Xiang. Xiaoheishan Provincial Preserve, Xiaotai Shan, Xiaoshui He, on W side of Gaoligong Shan, S of the new rd from Baoshan to Tengchong via Nankang Yakou, 2011 m, 21 Aug 2003, *GLGS 17271* (CAS, KUN); vicinity of Xiaoheshan, along trail on S side of hwy S317 (new hwy from Baoshan to Tengchong via Nankang Yakou) at km 23.5, W side of Gaoligong Shan, 2075 m, 24 May 2005, *GLGS 24740*; Xiaoshuihe, in Xiaoheishan, Provincial Nature Reserve area, 1990 m, 27 May 2005, *GLGS 25064* (CAS).

LONGYANG QU. Lujiang Xiang. Bawan Cun, Dasheyao, on E side of Gaoligong Shan along the old rd from Baoshan to Tengchong via Dashaoping, 2240 m, 2 Sep 2003, *GLGS 18577* (CAS, KUN).

LUSHUI XIAN. Cai Jia Ba, 2100 m, 25 Mar 1989, *H. Sun et al. 1654* (KUN).

Gudeng Xiang. N'Maikha-Salween divide, 8000 ft., May 1925, *F 26574* (E, K, W).

Pianma Xiang. Along the S bank of the Wuzhong River, W of Gulang Cun, between Pianma and Gangfang, W side of Gaoligong Shan, 1823 m, 14 May 2005, *GLGS 24111* (CAS); Piansihe Village, 2050 m, 16 May 2005, *GLGS 24299* (CAS).

TENGCHONG XIAN. 6000 ft., Feb 1925, *F 26241* (A, K).

Dongshan Xiang. Hills S of Tengyuel, Feb 1925, 6000 ft., *F 26241* (E).

Guyong Zheng. Lang Ya Shan, 9 Apr 1980, *D.Y. Xia B-22* (KUN); Lang Ya Shan, 9 Apr 1980, *D.Y. Xia BG-23* (KUN).

Jietou Xiang. Shweli-Salween divide, 10000 ft., July 1917, *F 15713* (A, E, K); Shweli-Salween divide, 8000 ft., Aug 1919, *F 18297* (A, E, K); Shweli-Salween divide, 7000–8000 ft., Apr 1924, *F 24013* (E, K); Shweli-Salween divide, 7000–8000 ft., Apr 1924, *F 24082* (E, K); Da Chuang Team, 2000 m, 9 Apr 1980, *L.S. Xie 817* (KUN).

Puchuan Xiang. Yang Lao Qing forest station, 1880–2020 m, 4 Oct 1960, *W.C. Yin 60-1339* (KUN).

Qushi Xiang. Shweli-Salween divide, 7000–8000 ft., Apr 1914, *F 12301* (BM); Shweli-Salween divide, 8000 ft., Jul 1918, *F 17655* (A, E, K); Shweli-Salween divide, 8000 ft., Apr 1924, *F 24007* (E, K).

Shangying Xiang. Gaoligong Shan State Nature Reserve, top of ridge at border between Baoshan Shi and Tengchong Xian, N and S of the old rd from Baoshan to Tengchong via Dashaoping, 2400 m, 4 Sep 2003, *GLGS 18759* (CAS, KUN).

Wuhe Xiang. Ridge at the pass of Daohaoping by following trail to the N of the pass, W side of Gaoligong Shan, 2432 m, 30 May 2005, *GLGS 25162* (CAS).

YINGJIANG XIAN. From Yingjiang to Shuili, 1952, *R. C. Ching 50247* (KUN).

MYANMAR. KACHIN: MYITKYINA DISTRICT. Chibyaw Township. 6 miles from Kangfang, 20 Feb 1939, *Naw Mu Pa 15505* (K).

6. *Symplocos laurina* (Retzius) Wallich ex G. Don, Gen. Hist. 4:3. 1837. Basionym: *Myrtus laurinus* Retzius, Observ. Bot. 4:26. 1786. *Eugenia laurina* (Retzius) Willdenow, Sp. Pl., ed. 5, 2:967. 1799. *Bobua laurina* (Retzius) de Candolle, Prodr. 3:24. 1828. *Symplocos spicata* var. *laurina* (Retzius) C.B. Clarke in J.D. Hooker, Fl. Brit. Ind. 3:573. 1882. *Dicalix laurinus* (Retzius)

Migo, Bull. Shanghai Sci. Inst. 13:202. 1943. *Symplocos cochinchinensis* (Loureiro) S. Moore subsp. *laurina* (Retzius) Nootboom, Leiden Bot. Ser. 1:156. 1975. *Symplocos cochinchinensis* var. *laurina* (Retzius) Nootboom, Leiden Bot. Ser. 1:156. 1975. TYPE.—*P. Hermann* s.n. (holotype: P; isotype: L).

Decadia aluminosa Loureiro, Fl. Cochinchin. 1:315. 1790.

Symplocos loha Buchanan-Hamilton ex D. Don, Prodr. Fl. Nepal. 144. 1825.

Symplocos spicata Roxburgh var. *zeylanica* A. de Candolle, Prodr. 8:254. 1844.

Symplocos bodinieri Brand, Repert. Spec. Nov. Regni Veg. 3:217. 1906. *Maesa aurea* H. Léveillé, Repert. Spec. Nov. Regni Veg. 10:375. 1912. *Symplocos laurina* var. *bodinieri* Handel-Mazzetti, Beih. Bot. Centralbl. 62(B):34. 1943. *Dicalix bodinieri* (Brand) Migo, Bull. Shanghai Sci. Inst. 13:198. 1943.

Symplocos pinfaensis H. Léveillé, Repert. Spec. Nov. Regni Veg. 9:77. 1910.

Symplocos balfourii H. Léveillé, Repert. Spec. Nov. Regni Veg. 9:77. 1910.

Eurya cavaleriei H. Léveillé, Repert. Spec. Nov. Regni Veg. 9:450. 1911.

Maesa bodinieri H. Léveillé, Fl. Kouy-Tcheou 286. 1914.

Symplocos vinoso-dentata H. Léveillé, Bull. Acad. Int. Geogr. Bot. 24:283. 1914.

Trees, evergreen, to 16 m tall. Young branchlets and vegetative buds usually glabrous, rarely tawny brown-strigose; mature branchlets greenish; pseudo-terminal vegetative buds 3–11 mm, glabrous or densely strigose. Petiole 0.5–1.7 cm, glabrous, not glandular; leaf blade elliptic to slightly oblanceolate, 6.0–19.5 × 1.7–5.4 cm, 2.2–4.3 times as long as wide, subcoriaceous, typically drying yellowish green, both surfaces glabrous, midvein adaxially impressed, secondary veins 6–11(–13) on each side of midvein, base cuneate to rarely subrounded, margin serrulate to serrate and planar or slightly revolute, apex usually abruptly acuminate or occasionally acute to acuminate. Inflorescences pseudo-terminal and axillary simple or basally branched (rarely also more distally branched) spikes or racemes, 0.4–5.9 cm, 1–70-flowered; rachis white- or ferrugineous-strigillose to -pilulose. Bracts and bracteoles ovate, nearly isomorphic but bracts slightly larger, 0.8–2.6 × 0.5–2 mm, persistent, strigillose, margin often ciliate and rarely also glandular, apex acute to obtuse. Pedicel 0–2 mm; bracteoles keeled, covering most or all of hypanthium. Hypanthium glabrous, subtending articulation present. Calyx limb not gamosepalous; lobes semi-orbicular, 0.5–1.2 × 0.7–1.7 mm, glabrous, margin entire and not glandular, apex rounded. Corolla white or yellow, 2.5–3.5 mm, membranous, gamopetalous only at base; lobes oblong, glabrous, adaxially smooth. Stamens ca. 40, adnate to corolla only at base, longest to 3.5 mm; filaments not abruptly constricted apically, smooth. Disk annular, glabrous. Style 1.5–3 mm, glabrous. Fruit blue to purple, ampulliform to globose, 4–7 × 3.5–6 mm, glabrous; endocarp indurate throughout, 1 locule developed, perimeter smooth. Seeds U-shaped.

Nootboom (1975, 2003) has recognized this taxon as one of four subspecies under a broadly circumscribed species *Symplocos cochinchinensis* [i.e., as subsp. *laurina* (Retzius) Nootboom]. Although in areas outside the Gaoligong Shan intermediates are apparent, possibly through extensive hybridization (Nootboom 1996), we have not detected such intermediacy in the Gaoligong Shan and it thus seems best for the present purpose to here treat the two entities as species.

The inflorescences of both *Symplocos laurina* and *S. cochinchinensis* display a distinctive combination of characters (although they were found difficult to incorporate in the key): the inflorescence is often branched at the base, the rachis is stout and more or less rigid, and the pedicels are usually very short or more commonly lacking.

SELECTED ILLUSTRATIONS.—R.F. Wu, Fl. Reipubl. Popularis Sin. 60(2):59 t. 21(1–5, 11–13). 1987; G.H. Zhu, ed. Fl. China Ill. 15:t. 189(1–8). 2000.

PHOTOGRAPHIC IMAGE.—Figure 11.

PHENOLOGY.—Fl. Jun–Oct, fr. Oct–Jul.



FIGURE 11. Fruiting branch of *Symplocos laurina*. Photo by Lihua Zhou.

DISTRIBUTION AND HABITAT.— Subtropical broadleaved evergreen forest; 1400–2800 m. In GLGS: CHINA. Xizang: Zayü Xian. Yunnan: Gongshan Xian (Dulongjiang Xiang), Lianghe Xian (Pingshan Xiang), Longling Xian (Longjiang Xiang, Zhen'an Zheng), Longyang Qu (Lujiang Xiang), Lushui Xian (Liuku Zheng), Tengchong Xian (Heshun Xiang, Jietou Xiang, Puchuan Xiang, Qushi Xiang, Shangying Xiang, Wuhe Xiang, Zhonghe Xiang); Figure 12. Outside of GLGS: Xizang, Yunnan, Guizhou, Hunan, Guangxi, Guangdong, Fujian, Taiwan, Jiangsu, Zhejiang [India, Japan, Myanmar, Sri Lanka; Pacific Islands].

LOCAL NAME.— 黄牛奶树 huang niu nai shu

ADDITIONAL SPECIMENS EXAMINED.— **CHINA. XIZANG: ZAYÜ XIAN.** Chayi, 2200 m, 16 Jul 1973, QX 73-747 (KUN [2]). **YUNNAN:** Oct 1918, F 17741 (A, E, K); Oct 1918, F 17745 (A, E, K, W). **GONGSHAN XIAN. Dulongjiang Xiang.** Kongdang, on the E side of the Dulong Jiang, 1420 m, 31 Dec 1990, GLGS 1554 (CAS, KUN [2]); Moqiewang, 1800 m, 9 Jan 1990, GLGS 1758 (KUN [2]); Meiliwang, along the trail from Bapo to Gongshan on the E side of the Dulong Jiang, 1900 m, 14 Jan 1991, GLGS 1943 (CAS, KUN); Moqiewang, 1800 m, 9 Jan 1991, GLGS 1958 (KUN); along the Dandangwang He, NW of Bapo on the W side of the Dulong Jiang, 1420 m, 17 Jan 1991, GLGS 3202 (CAS, KUN [2]); along the Dandangwang He, NW of Bapo on the W side of the Dulong Jiang, 1400 m, 19 Jan 1991, GLGS 3336 (KUN [2]); Maku, southern region of the Dulong Jiang Valley on the W side of the Dulong Jiang, 1900 m, 8 Mar 1991, GLGS 4332 (CAS, KUN [2]); Maku, southern region of the Dulong Jiang Valley on the W side of the Dulong Jiang, 1900 m, 8 Mar 1991, GLGS 4345 (CAS, KUN [2]). **LIANGHE XIAN. Pingshan Xiang.** Hills around Lung-Fau, 8000–9000 ft., Sep 1924, F 27436 (A, E, K). **LONGLING XIAN. Longjiang Xiang.** Damahe Tang, Gucheng Shan, E side of Gaoligong Shan, N of the pass on the new rd from Baoshan to Tengchong via Nankang Yakou, 2100 m, 26 Aug 2003, GLGS 17968 (CAS, KUN); Damahe Tang, Gucheng

Shan. E side of Gaoligong Shan, N of the pass on the new rd from Baoshan to Tengchong via Nankang Yakou, 2100 m, 26 Aug 2003, *GLGS* 17978 (CAS, KUN); Damahe Tang, Gucheng Shan, E side of Gaoligong Shan, N of the pass on the new rd from Baoshan to Tengchong via Nankang Yakou, 2100 m, 26 Aug 2003, *GLGS* 17984 (CAS, KUN); vicinity of Xiaoheshan, along trail on S side of hwy S317 (new hwy from Baoshan to Tengchong via Nankang Yakou) at km 23.5, W side of Gaoligong Shan, 2075 m, 24 May 2005, *GLGS* 24734 (CAS); Xiaoheshan Provincial Nature Reserve, S side trail at 23.5 km along hwy S317, 2075 m, 24 May 2005, *GLGS* 24756 (CAS); Xiaoshuihe, in Xiaoheshan Provincial Nature Reserve area, 1990 m, 27 May 2005, *GLGS* 25070 (CAS). **Zhen'an Zheng.** Jieye Ba (Fern Leaf Dam), 2700 m, 1 Aug 1945, *Wang* 89869 (KUN). **LONGYANG QU. Lujiang Xiang.** Nankang Botany Garden (Lihuipo), summit of the Gaoligong Shan, 2130 m, 18 Nov 2000, *GLGS* 13202 (CAS, KUN); Nankang Botanical Garden (Lihuipo), 2150 m, 19 Nov 2000, *GLGS* 13283 (CAS, KUN); Lihuipo area near Nankang Village, E side of Gaoligong Shan near the crest of the range, just N of the new rd from Baoshan to Tengchong via Nankang Yakou, 2230 m, 23 Aug 2003, *GLGS* 17593 (CAS, KUN). **LUSHUI XIAN. Liuku Zheng.** Shweli-Salween divide, 8000–9000 ft., Jul 1924, *F* 24704 (E, K). **TENGCHONG XIAN. Heshun Xiang.** Jang-Jao Shan, Shweli-Salween divide, 7000–8000 ft., Aug 1919, *F* 18480 (A, E, K). **Jietou Xiang.** Hillsides near Chii-Tung on the Teng Yueh-Talifu rd, 6000–7000 ft., Sep 1905, *F* 1095 (A, K); Shweli-Salween divide, 9000 ft., Jun 1917, *F* 15842 (A, E, K, KUN, W); Shweli-Salween divide, 10000 ft., Aug 1917, *F* 15844 (A, E, K, KUN, W); Shweli-Salween divide, 7000–8000 ft., Jun 1924, *F* 24401 (E, K); Shweli-Salween divide, 8000 ft., Sep 1924, *F* 25189 (E). **Puchuan Xiang.** The ninth district, 1880 m, 3 Oct 1960, *W.C. Yin* 60-1280 (KUN). **Qushi Xiang.** Shweli-Salween divide, 6000–7000 ft., Sep 1905, *F* 1037 (A, E, K); Shweli-Salween divide, 8000 ft., Jun 1918, *F* 17491 (A, E, K); Shweli-Salween divide, 9000 ft., Jun 1918, *F* 17522 (A, E). **Shangying Xiang.** Datianpo Cun, on the W side of Gaoligong Shan between Dahaoping and the pass dividing the Irrawaddy and Salween watersheds, on the old rd between Baoshan and Tengchong, 2170 m, 6 Nov 1998, *GLGS* 11570-B (CAS, GH, KUN); small N–S valley in the Tangchang area above Dahaoping in the Gaoligong Shan State Nature Reserve. W side of Gaoligong Shan, SW of the old rd from Baoshan to Tengchong via Dahaoping, 2200 m, 2 Sep 2003, *GLGS* 18520 (CAS, KUN); loc. cit., *GLGS* 18525 (CAS, KUN); Tangchang area, 3.4 km above the forestry station at Dahaoping in the Gaoligong Shan State Nature Reserve, W side of Gaoligong Shan, on the old rd from Baoshan to Tengchong via Dahaoping, 2208 m, 3 Sep 2003, *GLGS* 18666 (CAS, KUN); from Longling to Tengchong 47 km, close to Shan Qing Forestry Station, 2000 m, 28 Oct 1965, *J.Z. Zhao* 59 (KUN). **Wuhe Xiang.** Zhengding Cun, W side of Gaoligong Shan above the new rd from Baoshan to Tengchong via Nankang Yakou, 1830 m, 27 Aug 2003, *GLGS* 18030 (CAS, KUN); Km 24.2 on hwy S 317, rd to Tenglang Village, Xiaodifang River drainage, W side of Gaoligong Shan, 2146 m, 27 May 2005, *GLGS* 25028. **Zhonghe Xiang.** Flanks of volcanic mountain NW of Tengyueh, 7000, Jun 1912, *F* 8056 (E).



FIGURE 12. Distribution map of *Symplocos laurina* in the GLGS region.

7. *Symplocos oxyphylla* Wallich ex A. de Candolle, Prodr. 8:256. 1844. *Lodhra oxyphylla* (Wallich ex A. de Candolle) Miers, J. Linn. Soc., Bot. 17:300. 1879. TYPE.—INDIA Chattisgarh: Silhet, *N. Wallich* 4430 (holotype: G-DC; isotypes: BM, K, LE).

Symplocos pedicellata Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 42:89. 1873.

Trees, evergreen, to 6 m tall. Young branchlets glabrous; mature branchlets brown; pseudo-terminal vegetative buds ca. 9 mm, strigillose. Petiole 0.7–1.3 cm, not glandular; leaf blade elliptic, 7–15 × 3–5 cm, 2.6–2.7 times as long as wide, chartaceous, drying green, both surfaces glabrous,

midvein adaxially impressed, secondary veins 6–9 on each side of midvein, base attenuate, margin nearly entire to crenulate and revolute, apex acute to acuminate. Inflorescences pseudo-terminal or axillary, basally branched racemes, to 4 cm, ca. 15–50-flowered; rachis white-strigillose. Bract caducous. Bracts and bracteoles deltoid, keeled, isomorphic, $0.5\text{--}0.9 \times 0.2\text{--}0.4$ mm, caducous or bracteoles persistent, strigillose at least medially, margin entire and not glandular, apex acute to acuminate. Pedicel 0–1.5 mm; bracteoles covering less than half of hypanthium. Hypanthium glabrous, subtending articulation present. Calyx limb not gamosepalous; lobes broadly deltoid to semi-orbicular, $0.3\text{--}0.5 \times 0.5\text{--}0.6$ mm, glabrous or occasionally sparsely strigillose apical-medially, margin ciliolate, apex obtuse to rounded. Corolla white, 3–5 mm, membranous, gamopetalous only at base; lobes oblong-elliptic, glabrous, adaxially smooth. Stamens ca. 50, adnate to corolla only at base; filaments not abruptly constricted apically, smooth. Disk 5-glandular, thinly pilulose. Style ca. 3 mm, glabrous or basally pilulose. Fruit ovoid, ca. 9×6 mm, glabrous; endocarp indurate throughout, perimeter proximally longitudinally ribbed, conical beak smooth. Seeds straight, much lobed.

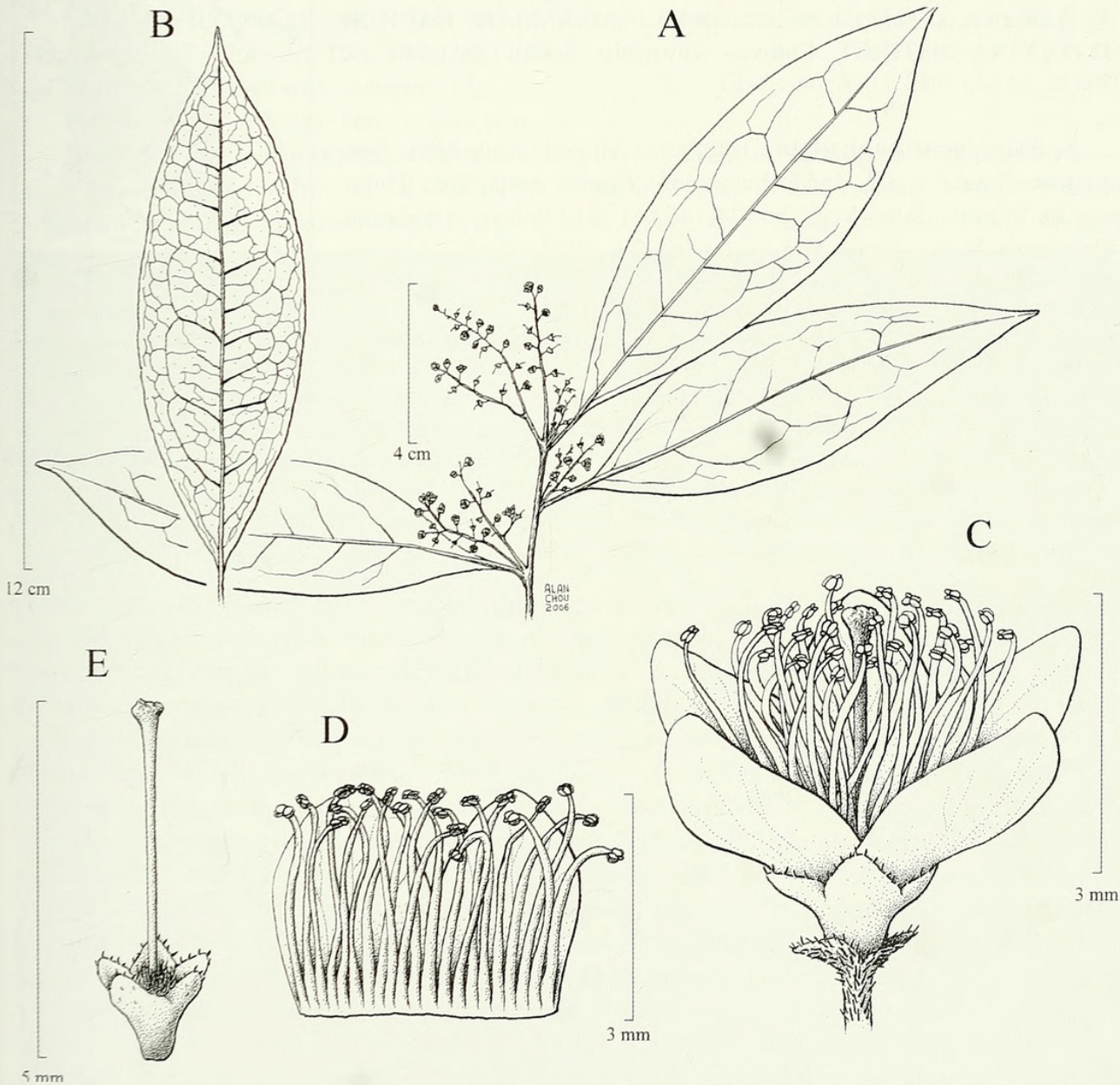


FIGURE 13. *Symplocos oxyphila*. - A. Flowering branch. - B. Leaf. - C. Flower. - D. Portion of opened corolla. - E. Flower with corolla and stamens removed showing remaining hypanthium, calyx, and gynoecium.

As judged from the few specimens collected (Nooteboom 1975), this species appears to be rare. It is known in Gaoligong Shan only from a single collection near the N'mai Kha in Myanmar, although we have seen an additional collection from Tenasserim Division in southern Myanmar (*J. Keenan et al. 1709, A*). Neither of these specimens have fruit; the description of the fruit here is therefore based on Nooteboom (1975). It has apparently not been collected in the Gaoligong Shan since 1912.

ILLUSTRATION.— Figure 13.

PHENOLOGY.— Fl. Sep.

DISTRIBUTION AND HABITAT.— 700–800 m. In GLGS: MYANMAR. Kachin: Myitkyina District. Chibyaw Township; Figure 14. Outside of GLGS: India, Myanmar, Thailand.

LOCAL NAME.— 尖叶山矾 (中文新名称) *jian ye shan fan*

ADDITIONAL SPECIMENS EXAMINED.— **MYANMAR. KACHIN: MYITKYINA DISTRICT. Chibyaw Township.** Seniku-Laukhaung rd, 2500 ft., 24 Sep 1912, *Mg Kyaw 50* (E).

8. *Symplocos paniculata* (Thunberg) Miquel, *Ann. Mus. Bot. Lugduno-Batavi* 3:102. 1867. Basionym: *Prunus paniculata* Thunberg in Murray, *Syst. Veg.*, ed. 14. 463. 1784. *Palura paniculata* (Thunberg) Nakai, *Trees Shrubs Japan* 229. 1922. TYPE.— JAPAN. *C.P. Thunberg s.n.* (holotype: UPS).

Myrtus chinensis Loureiro, *Fl. Cochinch.* 1:313. 1790. *Symplocos chinensis* (Loureiro) Druce, *Bot. Soc. Exch. Club Brit. Isles* 4(suppl. 2):650. 1917. *Palura paniculata* var. *chinensis* (Loureiro) Nakai, *Trees Shrubs Japan*, Revis. Ed. 310. 1927. *Palura chinensis* (Loureiro) Koidzumi, *Bot. Mag. (Tokyo)* 43:397. 1929. *Symplocos crataegoides* Buchanan-Hamilton ex D. Don var. *chinensis* (Loureiro) Makino & Nemoto, *Fl. Japan*, ed. 2, 918. 1931.

Symplocos crataegoides Buchanan-Hamilton ex D. Don, *Prodr. Fl. Nepal.* 145. 1825.

Symplocos hunanensis Handel-Mazzetti, *Symb. Sinica* 7:807. 1936.

Shrubs or trees, deciduous, to 7 m tall. Young branchlets glabrous or densely pubescent; mature branchlets grayish brown, dark reddish, or purplish; pseudo-terminal vegetative buds 2–3 mm, glabrous. Petiole 1–9 mm, pubescent or occasionally glabrous, usually sparsely glandular; leaf blade broadly ovate, elliptic, oblong-elliptic, oblanceolate, oblong-ob lanceolate, or obovate, $3.7\text{--}11.5 \times 1.5\text{--}6.8$ cm, 1.4–2.8 times as long as wide, chartaceous, typically drying abaxially grayish green, green, or pale brown and adaxially green to brown, abaxially usually pubescent at least along midvein laterally and often throughout or rarely glabrous throughout, adaxially pubescent at least basally along midvein or rarely glabrous throughout, midvein adaxially impressed, secondary veins 4–6 on each side of midvein, base cuneate to slightly cordate, margin serrulate to denticulate, planar or slightly revolute, apex cuspidate, acuminate, or rarely rounded. Inflorescences pseudo-terminal panicles with additional smaller panicles often present internodally (these often reduced to 1 or 2 flowers) and some leaves often bract-like, occasionally panicles borne directly on mature branchlets; pseudo-terminal panicle, 1–10 cm, 3 to ca. 100-flowered; internodal panicles 0.4–3 cm, 1–12-flowered; rachis glabrous or pubescent. Bracts and bracteoles 0 or 1 per flower, linear, ovate, or lanceolate, isomorphic, $0.5\text{--}0.8 \times 0.1\text{--}1.5$ mm or sometimes larger and leaf-like, caducous, glabrous or pubescent, margin often ciliate, glandular, or both, apex rounded to acuminate. Pedicel

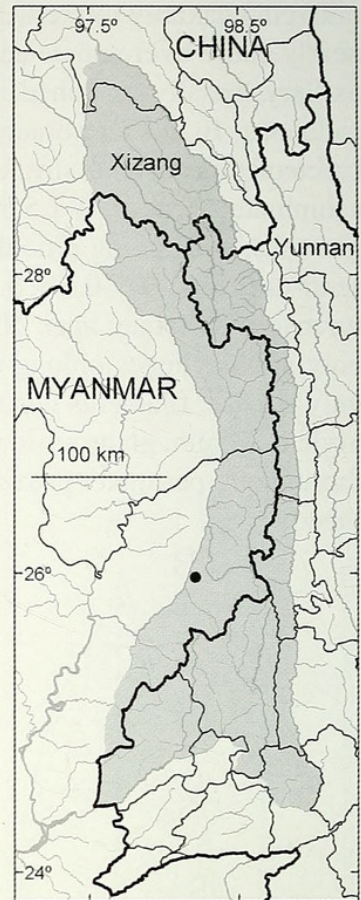


FIGURE 14. Distribution map of *Symplocos oxyphila* in the GLGS region

0.5–8 mm. Bracteoles covering less than half of hypanthium. Hypanthium glabrous or pubescent, subtending articulation present. Calyx limb not gamosepalous; lobes semi-orbicular, oblong, or deltoid, $0.3\text{--}1.8 \times 0.5\text{--}1$ mm, abaxially glabrous or occasionally pubescent, margin ciliate, apex rounded to acuminate. Corolla white or pale yellow, 3–6.5 mm, membranous; lobes oblong, broadly elliptic, or ovate, glabrous, adaxially smooth. Stamens ca. 40–60, adnate to corolla only at base, longest 3–6 mm; filaments not abruptly constricted apically, smooth. Disk 5-lobed or low-annular, glabrous or pubescent. Style 2–3.5 mm, glabrous. Fruit dark brown, blue, or black, ovoid to slightly pyriform, $4\text{--}8 \times 4\text{--}6.5$ mm, glabrous or pubescent; endocarp indurate throughout, 1 or 2 locules developed, perimeter smooth. Seeds U-shaped.

Symplocos paniculata is the only deciduous species of *Symplocos* in Gaoligong Shan (as well as Asia, *S. tinctoria* (Linnaeus) L'Héritier of the southeastern United States being the only other documented deciduous species in the genus). In cases where deciduousness is difficult to determine, the pseudo-terminal panicles of the species serve as an easy way to distinguish this species from others in Gaoligong Shan, being unique in the genus.

SELECTED ILLUSTRATIONS.— R.F. Wu, *Fl. Reipubl. Popularis Sin.* 60(2):73 t. 26(1–9). 1987; G.H. Zhu, ed. *Fl. China* III. 15:t. 195(1–9). 2000.

PHOTOGRAPHIC IMAGE.— Figure 15.

PHENOLOGY.— Fl. Apr–Jun, fr. Sep–Nov.

DISTRIBUTION AND HABITAT.— Disturbed or shrubby areas of subtropical broadleaved evergreen forest; 1200–1300 m. In GLGS: CHINA. Xizang: Zayü Xian (Tsarong Xiang). Yunnan: Gongshan Xian (Dulongjiang Xiang), Longling Xian, Tengchong Xian (Dongshan Xiang, Guyong



FIGURE 15. Fruiting branch of *Symplocos paniculata*. Photo by Lihua Zhou.

Zheng, Qingshui Xiang, Qushi Xiang, Wuhe Xiang), Yingjiang Xian (Tongbiguan Xiang). MYANMAR. Kachin: Putao District. (Khawbude Township); Figure 16. Outside of GLGS: Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Nei Mongol, Ningxia, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, India, Japan, Korea, Laos, Myanmar, Vietnam].

LOCAL NAME.— 白檀 bai tan

ADDITIONAL SPECIMENS EXAMINED.— **CHINA. XIZANG: ZAYÜ**

XIAN. Chayi, 2200 m, 26 Jul 1973, *QX* 73-899 (KUN). **Tsarong Xiang.**

Trulung, Po Tsangpo, Pome, 6500 ft., 25 May 1947, *F. Ludlow* 13033 (A).

YUNNAN: *F* 6797 (K); May 1912, *F* 7883 (K); *F* 9842 (K); *F* 12748 (K); *F*

13880 (K); *F* 13884 (K); *F* 15027 (K); 8000 ft., *F* 24023 (K). **GONGSHAN**

XIAN. Dulongjiang Xiang. Taron-taru divide, valley of Bucahwang, 1700

m, 5 Nov 1958, *J. Chen* 239 (KUN). **LOGLING XIAN.** 1510 m, 30 Nov

1958, *J. Chen* 684 (KUN [2]); 1800 m, 9 Apr 1934, *Tsai* 55714 (KUN); 1800

m, 11 Apr 1934, *Tsai* 55729 (KUN [3]); 1800 m, 13 Apr 1934, *Tsai* 55775

(KUN). **TENGCHONG XIAN. Dongshan Xiang.** Qingcaitang, on the old

rd from Tengchong to Baoshan between Tengchong and the Longchuan Jiang,

1860 m, 2 Nov 1998, *GLGS* 11369 (CAS, GH, KUN [2]). **Guyong Zheng.**

Heinitang, Houqiao, 1600 m, 17 Apr 1985, *Fragrance Resources Expedition*

277 (KUN [3]); Houqiao, Guyong River bank, 1680 m, *Wu* 6830 (KUN [2]).

Qingshui Xiang. Rehai Hot Spring ca. 10 km SW of Tengchong, 1500 m, 24

Oct 1998, *GLGS* 10888 (CAS, GH, KUN). **Qushi Xiang.** Daba, 1900 m, 18

May 1997, *Z.L. Dao et al* 9478 (KUN [2]); Jiangzuo, 1930 m, 12 Sep 1960,

W.C. Yin 1012 (KUN [2]); 1930 m, 21 Sep 1960, *W.C. Yin* 1227 (KUN [2]);

Daba. Dashuijing, 2050 m, 9 Sep 1995, *S.X. Yang* 831 (KUN [2]). **Wuhe**

Xiang. Huangcaoling area, near Zhengding Village, W side of Gaoligong Shan on the new rd from Baoshan

to Tengchong via Nankang Yakou, 1900 m, 26 Aug 2003, *GLGS* 17937 (CAS, KUN). **Zhonghe.** Margin of

lava bed W of Tengyueh, 5000 ft., May 1912, *F* 7457 (K). **YINGJIANG XIAN.** Kachangcaoba Village, 1240

m, 10 Apr 1985, *Fragrance Resources Expedition* 210 (KUN [2]). **Tongbiguan Xiang.** 1350 m, 8 Apr 1985,

Fragrance Resources Expedition 125 (KUN [2]); Shibie Village, 1350 m, 8 Apr 1985, *Fragrance Resources*

Expedition 145 (KUN [2]). **MYANMAR. KACHIN: PUTAO DISTRICT. Khawbude Township.** Salween-

Kiu Chiang divide, 9000 ft., Oct 1924, *F* 25665 (E), *F* 25889 (E).

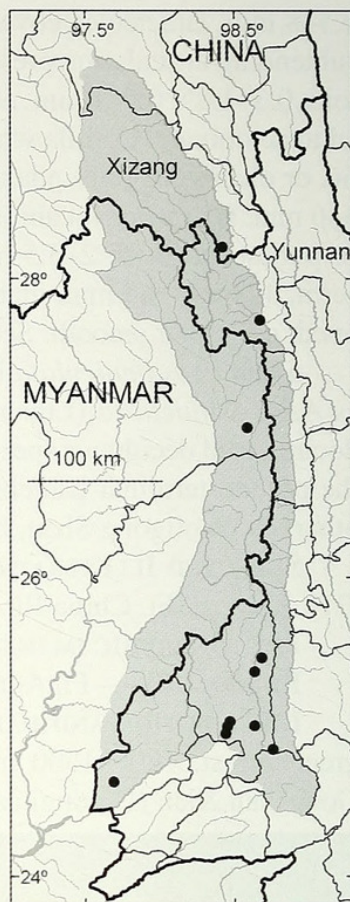


FIGURE 16. Distribution map of *Symplocos paniculata* in the GLGS region.

9. *Symplocos pendula* Wight, Icon. Pl. Ind. Orient. 4:11. 1848. *Palura pendula* (Wight) Miers, J. Linn. Soc., Bot. 17:297. 1879. *Cordyloblaste pendula* (Wight) Alston in Trimen, Handb. Fl. Ceylon 6(6):188. 1931. TYPES.— INDIA: Pulney Mts., *Herb. Wight* 2136 (syntype: K; isosyntypes: E, L); SRI LANKA. *Herb. Wight* s.n. (syntype: K).

Symplocos confusa Brand in Engler, Pflanzenr. 6(IV. 242):88. 1901. *Bobua confusa* (Brand) Kanehira & Sasaki in Sasaki, List Pl. Formosa 330. 1928. *Cordyloblaste confusa* (Brand) Ridley, Fl. Malay. Penins. 2:307. 1923.

Symplocos punctulata Masamune & Syozi, Acta Phytotax. Geobot. 12:201. 1950.

Shrubs or trees, evergreen, to 6 m tall. Young branchlets glabrous, hirtellous-tomentellous, or sparsely pilulose; mature branchlets grayish brown; pseudo-terminal vegetative buds 3–5 mm, strigillose. Petiole 0.7–1.6 cm, not glandular; leaf blade elliptic to obovate, 8.3–11.5 × 3.5–5.0 cm, 1.9–2.9 times as long as wide, subcoriaceous, drying grayish green to brown, abaxially glabrous,

adaxially glabrous or occasionally white-puberulent along midvein, midvein adaxially impressed, secondary veins 8–12 on each side of midvein, base subrounded to cuneate and often slightly attenuate, margin entire, shallowly crenate, or slightly undulate and slightly revolute, apex rounded to acuminate. Inflorescences pseudo-terminal or axillary, raceme-like cymes, 1–1.7 cm, 1–7-flowered; rachis tawny- to ferruginous-strigillose to -hirtellous; bract deltoid to linear, $1.2\text{--}1.8 \times 0.8\text{--}1$ mm, apex acute to obtuse. Bracts and bracteoles caducous or persistent, strigillose, margin hirtellous and not glandular. Pedicel 1.5–5 mm; bracteoles triangular, $0.5\text{--}0.8 \times 0.2\text{--}0.8$ mm, covering less than half of hypanthium, apex acute. Hypanthium white to tawny-strigillose, subtending articulation absent. Calyx limb gamosepalous for ca. 1–1.5 mm; lobes low-hemispheric, $0.4\text{--}1.1 \times 1\text{--}1.8$ mm, strigillose at least medially, margin ciliate and not glandular, apex rounded to often nearly truncate. Corolla white, 0.5–1.5 cm, fleshy, gamopetalous ca. half the total length; lobes spatulate, abaxially usually pubescent, adaxially papillose. Stamens ca. 30–50, longest 3–15 mm, adnate to corolla for ca. half the total length, connate distally beyond corolla adnation for 3–5 mm, distalmost portions distinct for 1–3.5 mm; filaments abruptly constricted apically, longest distinct portions erect, shortest down-curved. Disk cylindrical, prominent, apex at least sparsely hirtellous. Style 4–15 mm, glabrous or densely hirtellous to hirsute. Fruit fusiform, $10\text{--}15 \times 3\text{--}6$ mm, strigillose; endocarp indurate throughout, 2 or 3 locules developed, perimeter smooth. Seeds straight.

SELECTED ILLUSTRATIONS.—R.F. Wu, *Fl. Reipubl. Popularis Sin.* 60(2):76 t. 27(1–8). 1987; G.H. Zhu, ed. *Fl. China* Ill. 15:t. 196(1–8). 2000.

PHENOLOGY.—Fl. Jun–Aug, fr. Sep–Nov.

DISTRIBUTION AND HABITAT.—Broadleaved forest; ca. 1200 m. In GLGS: CHINA. Yunnan: Gongshan Xian (Dulongjiang Xiang), MYANMAR. Kachin: Myitkyina District (Saulot Township); Figure 17. Outside of GLGS: Fujian, Guangdong, Guangxi, Guizhou, S Hainan, Hunan, Jiangxi, Taiwan, Yunnan, Zhejiang [India, Indonesia, Japan, Malaysia, Myanmar, Vietnam].

LOCAL NAME.—吊钟山矾 *diao zhong shan fan*

Symplocos pendula is one of two species comprising *Symplocos* subgenus *Cordyloblaste* (Henschel ex Moritzi) Gamble, the first-diverging clade in the genus (Wang et al. 2004; Fritsch et al. 2006; Fritsch and Almeda, in press). The other species [*S. henschelii* (Moritzi) Benthām ex C.B. Clarke)] ranges from Southeast Asia to Malesia.

ADDITIONAL SPECIMENS EXAMINED.—CHINA. YUNNAN: GONGSHAN XIAN. **Dulongjiang Xiang.** Salween-Kiu Chiang divide, 10000 ft., Aug 1924, *F* 25758 (E, K); the 4th village, Miliwaluo, 1200 m, 12 Nov 1959, *Feng* 24211 (KUN [2]); Kongdang, 1550 m, 28 Apr 1991, *GLGS* 6658 (KUN [2]); Longyuan, 1900 m, 29 Aug 1982, *QX* 9742 (KUN); Taron-taru divide, valley of Bucahwang, 1500 m, 6 Sep 1959, *Yü* 24211 (KUN). MYANMAR. KACHIN: MYITKYINA DISTRICT. **Saulot Township.** Hills around Htawgaw, 7000 ft., Sep 1924, *F* 25073 (E, K).



FIGURE 17. Distribution map of *Symplocos pendula* in the GLGS region.

10. *Symplocos racemosa* Roxburgh, *Fl. Ind.* ed. 1832, 415. 1832. *Symplocos racemosa* var. *composita* Kurz, *J. Asiatic Soc. Bengal*, Pt. 2, Nat. Hist. 46:238. 1877. TYPE.—INDIA. West Bengal: Burdwan and Midnapore, *W. Roxburgh s.n.* (lectotype [designated by Nooteboom 1975]: P).

Symplocos rigida Wallich ex G. Don, Gen. Syst. 4:3. 1837. *Symplocos racemosa* var. *roxburghiana* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 46:238. 1877.

Symplocos leucantha Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 42:89. 1873.

Symplocos intermedia Brand, Repert. Spec. Nov. Regni Veg. 3:217. 1906.

Symplocos macrostachya Brand, Pflanzenr. 6(IV. 242):36 1901.

Symplocos macrostachya var. *leducii* Brand, Repert. Spec. Nov. Regni Veg. 3:217. 1906.

Shrubs or trees, evergreen, to 12 m tall. Young branchlets yellow-pilose; mature branchlets grayish; pseudo-terminal vegetative buds 2–6(–8) mm, yellow- to ferrugineous-sericeous to -lanate. Petiole 4–15 mm, not glandular; leaf blade elliptic to ovate-elliptic, $9.2\text{--}12.5 \times 3.2\text{--}5.5$ cm, 2.1–3.0 times as long as wide, chartaceous to subcoriaceous, typically drying abaxially pale green and adaxially green to dark green, abaxially sparsely yellow-strigose-pilose at least on midvein or rarely glabrous, adaxially yellow-pilose to -pilulose on midvein or rarely glabrous, midvein adaxially impressed, secondary veins 7–11 on each side of midvein, base rounded to broadly cuneate and occasionally slightly attenuate, margin crenulate-serrulate to nearly entire, planar or slightly revolute, apex acute to obtuse. Inflorescences pseudo-terminal, or axillary, simple or rarely branched racemes, 2.5–7.2 cm, 4–22-flowered; rachis yellow- to ferrugineous-lanate-villous. Bracts and bracteoles broadly ovate to suborbicular, often keeled, isomorphic but bracts larger, $2\text{--}4 \times 1\text{--}2.5$ mm, caducous, strigose to sericeous, margin lanulate and often glandular, apex acute. Pedicel 1–3 mm; bracteoles covering less than half of hypanthium. Hypanthium glabrous, subtending articulation present. Calyx limb gamopetalous for 0.3–0.5 mm; lobes broadly semi-oblong, ovate, or suborbicular, $1.3\text{--}1.8 \times 1.2\text{--}1.8$ mm, glabrous or medially strigose, margin entire, ciliolate, or lanulate, apex rounded to obtuse. Corolla white, 3.5–5 mm, membranous, gamopetalous only at base; lobes oblong-elliptic to oblong-ovate, glabrous, adaxially smooth. Stamens ca. 60–100, adnate to corolla only at base, longest 4.5–7 mm; filaments not abruptly constricted apically, smooth. Disk annual-pentagonal to 5-lobed, villous. Style 1–4 mm, glabrous or villous toward base. Fruit blue, ellipsoid-cylindrical, $5\text{--}11 \times 3\text{--}5$ mm, glabrous; endocarp indurate throughout, 3 locules developed, perimeter smooth or ca. 8–10-ribbed. Seeds straight.

SELECTED ILLUSTRATIONS.— R.F. Wu, Fl. Reipubl. Popularis Sin. 60(2):44 t. 16(5–9). 1987; G.H. Zhu, ed. Fl. China Ill. 15:t. 186(5–9). 2000.

PHENOLOGY.— Fl. Sep–Dec, fr. May–Jul of following year.

DISTRIBUTION AND HABITAT.— Mixed forests, subtropical evergreen broadleaf forest; 1100–1200 m; In GLGS: CHINA. Yunnan: Longling Xian (Zhen'an Zheng), Lushui Xian (Gudeng Xiang), Tengchong Xian (Guyong Xiang), Yingjiang Xian (Tongbiguan Xiang); Figure 18. Outside of GLGS: Guangdong, Guangxi, Hainan, SW Sichuan, Yunnan [India, Myanmar, Thailand, Vietnam].

LOCAL NAME.— 吊钟山矾 *zhu zhi shu*

ADDITIONAL SPECIMENS EXAMINED.— **CHINA. YUNNAN: LONGLING XIAN.** 1600 m, 30 Sep 1933, Tsai 56679 (A). **Zhen'an Zheng.** Zhuging Village, 5 km from Longling three ways crossing, 1190 m, 28 May 2005, GLGS 23917 (CAS). **LUSHUI XIAN.** 1400 m, 30 Sep 1933, Tsai 54551 (A, KUN). **Gudeng Xiang.** N'Maikha-Salween divide, 8000 ft., Jul 1919, F 18234 (A, E, K, W). **TENGCHONG XIAN.** Guyong Zheng.



Figure 18. Distribution map of *Symplocos racemosa* in the GLGS region.

Between Tengyueh and Burmese border, en route to Sadon, 1 Nov 1922, *Rock* 7324 (A). **YINGJIANG XIAN.**
Tongbiguan Xiang. Between Tengyueh and Bhamo, 1 Nov 1922, *Rock* 7845 (A).

Symplocos racemosa has apparently been collected only once since 1933, in 2005 (*GLGS* 23917). This specimen is only in young bud. Collection of a representative from this population in fertile condition would solidify its identification.

11. *Symplocos ramosissima* Wallich ex G. Don, *Gen. Hist.* 4:3. 1837. TYPE.— NEPAL. Sheopore, year 1821, *T. Thomson s.n.* (*N. Wallich Cat. No.* 4425) (holotype: K!; isotypes: BM, C, CGE, E[2]!, FI, G-DC, GH!, L, LE, NY, W).

Symplocos fasciculata Zollinger var. *chinensis* Brand, *Repert. Spec. Nov. Regni Veg.* 3:217. 1906.

Symplocos stapfiana H. Léveillé, *Repert. Spec. Nov. Regni Veg.* 9:444. 1911.

Symplocos myriantha Rehder in Sargent, *Pl. Wilson.* 2:596. 1916. *Dicalix myrianthus* (Rehder) Migo, *Bull. Shanghai Sci. Inst.* 13:203. 1943.

Symplocos ramosissima var. *salweenensis* Handel-Mazzetti, *Symb. Sin.* 7:808. 1936.

Symplocos stapfiana var. *leiocalyx* Handel-Mazzetti, *Beih. Bot. Centralbl.* 26(B):26. 1943.

Trees, evergreen, to 12 m tall. Young branchlets glabrous or ferrugineous-strigose; mature branchlets purplish to brownish; pseudo-terminal vegetative buds 4–8 mm, proximally ferrugineous- to brown- tomentose, pubescence extending onto distal portion of mature branchlet, sericeous at least along distal portion of outer scale midvein. Petiole 5–12 mm, often minutely sparsely glandular, glands caducous; leaf blade elliptic to slightly oblanceolate, 6.4–11.4 × 1.7–3.7 cm, 1.9–4.5 times as long as wide, chartaceous, typically drying green to pale brown, abaxially glabrous or white-strigose proximally along midvein and rarely on surface, adaxially often minutely white-hispidulous proximally along midvein or occasionally glabrous, midvein adaxially impressed, secondary veins 6–10 on each side of midvein, base cuneate to subrounded, margin crenulate-serrulate and planar or slightly revolute, apex long-acuminate. Inflorescences simple or occasional basally branched spikes or racemes, 1–4.5 cm, 1–20-flowered, often produced on proximal leafless regions of branchlets; rachis white- or pale ferrugineous-puberulent or occasionally glabrous; bract usually caducous. Bracts and bracteoles ± deltoid, ± isomorphic but bracts somewhat larger, 0.4–3.2 × 0.4–1.2 mm, sparsely strigillose especially on midvein or glabrous, margin ciliate and occasionally glandular, apex acute. Proximal pedicels 0–2 mm, distal pedicels usually shorter or absent; bracteoles usually persistent, covering less than half of hypanthium. Hypanthium strigillose or rarely glabrous, subtending articulation present. Calyx limb not gamopetalous; lobes broadly ovate to more often hemispherical, 0.6–1 × 0.9–1.3 mm, glabrous or sparsely strigillose, margin ciliate and not glandular, apex broadly obtuse to rounded. Corolla white or pale yellow, 3–5 mm, membranous, gamopetalous only at base; lobes oblong, glabrous, adaxially smooth. Stamens 50–70, adnate to corolla only at base, longest 4–5.5 mm; filaments not abruptly constricted apically, smooth. Disk ± 5-lobed, glabrous. Style 3–4.5 mm, glabrous. Fruit ellipsoid, 7–11 × 4–6 mm, strigillose, puberulent, or rarely glabrous; endocarp indurate throughout, 1 locule developed, perimeter smooth. Seeds straight.

Symplocos ramosissima is one of the most common species of *Symplocos* in Gaoligong Shan, often forming subdominant stands in the forest understory where there are sufficient light gaps, or along forest edges. The white flowers have been observed to be highly attractive to bees, and individuals appear to fruit in abundance.

SELECTED ILLUSTRATIONS.— R.F. Wu, *Fl. Reipubl. Popularis Sin.* 60(2):38 t. 149(6–9). 1987; G.H. Zhu, ed. *Fl. China* III. 15:t. 183(6–9). 2000.

PHOTOGRAPHIC IMAGES.— Figures 19–20.



FIGURE 19. Flowering branch of *Symplocos ramosissima*. Photo by M. Dickson.

PHENOLOGY.— Fl. Apr–Aug, fr. Aug–Oct.

DISTRIBUTION AND HABITAT.— Subtropical broadleaved evergreen forest; 1600–2900 m. In GLGS: CHINA. Xizang: Zayü Xian (Tsarong Xiang). Yunnan: Fugong Xian (Lumadeng Xiang, Shangpa Zheng), Gongshan Xian (Bingzhongluo Xiang, Cikai Zheng, Dulongjiang Xiang), Longling Xian (Longjiang Xiang, Zhen'an Zheng), Longyang Qu (Bawan Xiang, Lujiang Xiang, Mangkuan Xiang), Lushui Xian (Chen'gan Xiang, Pianma Xiang), Tengchong Xian (Guyong Xiang, Jietou Xiang, Mingguang Xiang, Puchuan Xiang, Qushi Xiang, Shangying Xiang, Wuhe Xiang), MYANMAR. Kachin: Myitkyina District (Saulot Township), Putao District (Khawbude Township); Figure 21. Outside of GLGS: Guangdong, Guangxi, Guizhou, Hubei, Hunan, Sichuan, Xizang, Yunnan [Bhutan, India, Myanmar, Nepal, Vietnam].

LOCAL NAME.— 多花山矾 duo hua shan fan

ADDITIONAL SPECIMENS EXAMINED.— **CHINA. XIZANG: ZAYÜ XIAN.** Tsarong Xiang. Salween-Kiu Chiang divide, W of Chamatong, 10000 ft., Jun 1922, *F* 21798 (A, E, K, W). **YUNNAN:** *F* 16083 (A, K); *F* 17606 (A, K). **FUGONG XIAN.** Lumadeng Xiang. Yaping Cun, above old Shibali on the N side of S fork of Yamu He, E side of Gaoligong Shan, 2700 m, 21 Aug 2005, *GLGS* 28824 (CAS). **Shangpa Zheng.** Pumigulu, 1700 m, 7 May 1982, *Nujiang Expedition* 7040 (KUN). **GONGSHAN XIAN.** Doyonlumba at Salween River, 2500–2900 m, 1 Aug 1916, *H.F. v. Handel-Mazzetti* 9604 (W). **Bingzhongluo Xiang.** Der-la, Champutung, 1 Oct 1936, *Wang* 66890 (A, PE). **Cikai Zheng.** NE of Qiqi Nature Reserve Station, track heading towards Dulongjiang, 2000–2500 m, 20 Sep 1997, *GLGS* 7590 (E [2]); 2–3 km along track from Qiqi towards Dongshaofang, 2050–2200 m, 19 Sep 1998, *GLGS* 9340 (E); 2–3 km along track from Qiqi towards Dongshaofang, 2050–2200 m, 20 Sep 1997, *GLGS* 9407 (E); Qiqi, 2000 m, 18 Jul 1982, *QX* 8113 (KUN); Qiqi, 2000 m, 19 Jul 1982, *QX* 8168 (KUN). **Dulongjiang Xiang.** Kaladi, ca. 5 km SE of Bapo on the E side of the Dulong Jiang, 2300 m, 23 Mar 1991, *GLGS* 4859 (CAS, KUN); along the Wangmei He, N of the trail



FIGURE 20. Fruiting branch of *Symplocos ramosissima*. Photo by M. Dickson.

from Bapo to Gongshan and NW of Xishaofang on the E side of the Dulong Jiang, 2200 m, 26 Mar 1991, *GLGS* 5205 (KUN [2]); the second team, 2100 m, 20 May 1991, *GLGS* 6898 (KUN); 2200 m, 27 Jul 1982, *QX* 8688 (KUN). **LONGLING XIAN. Longjiang Xiang.** Xiaoheshan Provincial Preserve, Xiaotai Shan, Xiaoshui He, on W side of Gaoligong Shan, S of the new rd from Baoshan to Tengchong via Nankang Yakou, 2011 m, 21 Aug 2003, *GLGS* 17319 (CAS, KUN); Damahe Tang, Gucheng Shan. E side of Gaoligong Shan, N of the pass on the new rd from Baoshan to Tengchong via Nankang Yakou, 2100 m, 26 Aug 2003, *GLGS* 17971 (CAS, KUN); W side of Nankang Pass, 2181 m, 27 May 2005, *GLGS* 23808 (CAS); vicinity of Xiaoheshan, along trail on S side of hwy S317 (new hwy from Baoshan to Tengchong via Nankang Yakou) at km 23.5, W side of Gaoligong Shan, 2037 m, 23 May 2005, *GLGS* 24616 (CAS). **Zhen'an Zheng.** 1830–2340 m, 4 Dec 1958, *J. Chen* 735 (KUN); Nankang Pass, 2170 m, 26 May 2005, *GLGS* 23726 (CAS); loc. cit., *GLGS* 23755 (CAS); loc. cit., *GLGS* 23759 (CAS). **LONGYANG QU. BAWAN.** Ca. 1.5 direct km SE of E Nankang Yakou on the rd from Baoshan to Tengchong, E side of Gaoligong Shan, 2181 m, 27 May 2005, *GLGS* 23803 (CAS); trail N of hwy S317 (rd from Baoshan to Tengchong) starting at km 22.6 Lihuipo, E side of Gaoligong Shan, 2167 m, 23 May 2005, *GLGS* 24641 (CAS). **Lujiang Xiang.** Nankang Botany Garden (Lihuipo), summit of the Gaoligong Shan, 2050 m, 16 Nov 2000, *GLGS* 13072 (CAS, KUN); Nankang Botany Garden (Lihuipo), summit of the Gaoligong Shan, 2100 m, 17 Nov 2000, *GLGS* 13161 (CAS, KUN); Lihuipo area near Nankang Village, E side of Gaoligong Shan near the crest of the range, just N of the new rd from Baoshan to Tengchong via Nankang Yakou, 2230 m, 23 Aug 2003, *GLGS* 17558 (CAS, KUN); Lihuipo area

near Nankang Village, E side of Gaoligong Shan near the crest of the range, just N of the new rd from Baoshan to Tengchong via Nankang Yakou, 2210 m, 24 Aug 2003, *GLGS* 17725 (CAS, KUN); Weihupo area, near Nankang Village, E side of Gaoligong Shan, S of Nankang Yakou on the new rd from Baoshan to Tengchong via Nankang Yakou, 2180 m, 26 Aug 2003, *GLGS* 17896 (CAS, KUN). **Mangkuan Xiang.** Hanlong, Baihualing Village, 1650 m, 2 Jun 2005, *GLGS* 25338 (CAS). **LUSHUI XIAN. CHEN'GAN.** N'Maikha-Salween divide, 9000 ft., Jun 1925, *F* 26842 (A, E, W); W flank of the N'Maikha-Salween divide, 7000–8000 ft., Jul 1925, *F* 27104 (A, E, K, W); W flank of the N'Maikha-Salween divide, Oct 1925, *F* 27307 (A, E). **Pianma Xiang.** 2700 m, 8 Aug 1978, *Nujiang Expedition 1814* (KUN); 2800 m, 13 Jul 1964, *Wu* 8022 (KUN); 2520 m, 17 Jul 1964, *Wu* 8105 (KUN); 2400 m, 31 Jul 1964, *Wu* 8290 (KUN). **TENGCHONG XIAN. Guyong Zheng.** Lang Ya Shan, 13 Apr 1980, *D.Y. Xia BG-32* (KUN). **Jietou Xiang.** Shweli-Salween divide, 9000 ft., Jul 1917, *F* 15716 (A, E, K); *F* 15739 (A, K, W); Shweli-Salween divide, 9000 ft., Aug 1917, *F* 15904 (A, E, K, W); Shweli-Salween divide, 8000 ft., Jun 1919, *F* 17629 (A, E, K); *F* 18031 (A, E, K); 7000–8000 ft., May 1924, *F* 24180 (E, K); 8000 ft., Jun 1924, *F* 24402 (E, K); Shweli-Salween divide, 8000 ft., Jun 1924, *F* 24372 (E, K); Shweli-Salween divide, 9000 ft., Jun 1924, *F* 24678 (E, K, W); Shweli Salween divide, 8000 ft., Sep 1924, *F* 25159 (E, K). Shaba Cun, community forest of Lidazhai, W side of Gaoligong Shan, 2280 m, 23 Dec 2000, *GLGS* 13648 (CAS, KUN). **Puchuan Xiang.** The ninth district, 1880–2020 m, 3 Oct 1960, *W.C. Yin* 60-1296 (KUN). **Qushi Xiang.** Daba, 2400 m, 17 May 1997, *Z.L. Dao et al* 9473 (KUN [3]); Shweli-Salween divide, 9000 ft., May 1919, *F* 17889 (E, K). **Shangying Xiang.** Qiaojie Cun in vicinity of Henghe Village, W side of Gaoligong Shan on the old rd from Baoshan to Tengchong via Dahaoping, 2230 m, 1 Sep 2003, *GLGS* 18365 (CAS, KUN); small N–S valley in the Tangchang area above Dahaoping in the Gaoligong Shan State Nature Reserve, W side of Gaoligong Shan, SW of the old rd from Baoshan to Tengchong via Dahaoping, 2080 m, 2 Sep 2003, *GLGS* 18473 (CAS, KUN); Gaoligong Shan State Nature Reserve, Taipingpu area, W side of Gaoligong Shan on the old trail (southern silk rd) just N and above the old rd from Baoshan to Tengchong via Dahaoping, 2300 m, 4 Sep 2003, *GLGS* 18694 (CAS, KUN); Gaoligong Shan State Nature Reserve, top of ridge at border between Baoshan Shi and Tengchong Xian, N and S of the old rd from Baoshan to Tengchong via Dahaoping, 2400 m, 4 Sep 2003, *GLGS* 18780 (CAS, KUN); on the way from Baoshan to Tengchong, 50 km along old rd, 2050 m, 30 May 2005, *GLGS* 25212 (CAS); 47 km along old Baoshan to Tengchong rd, Dahaoping, 2200 m, 30 May 2005, *GLGS* 26053 (CAS); loc. cit., *GLGS* 26061 (CAS). **Wuhe Xiang.** Ridge S of the pass at the top of Gaoligong Shan on the old rd from Baoshan to Tengchong via Dahaoping, W side of Gaoligong Shan, 2525 m, 5 Sep 2003, *GLGS* 18848-A (CAS, KUN); Lihuipo, Damatang River, 2190 m, 26 May 2005, *GLGS* 24929 (CAS); above Dahaoping along the ridge S of Dahaoping Yakou (pass at the border between Tengchong Xian and Longyang Qu), W side of Gaoligong Shan, 2405 m, 30 May 2005, *GLGS* 25119 (CAS); ridge at the pass of Dahaoping by following trail to the N of the pass, W side of Gaoligong Shan, 2432 m, 30 May 2005, *GLGS* 25179 (CAS). **MYANMAR. KACHIN: MYITKYINA DISTRICT. Saulot Township.** Htawgaw Bum, N of Htawgaw, 7000 ft., Jun 1924, *F* 24589 (E, K, W). **PUTAO DISTRICT. Khawbude Township.** Salween-Kiu Chiang divide, 9000 ft., Jun 1924, *F* 25653 (E).

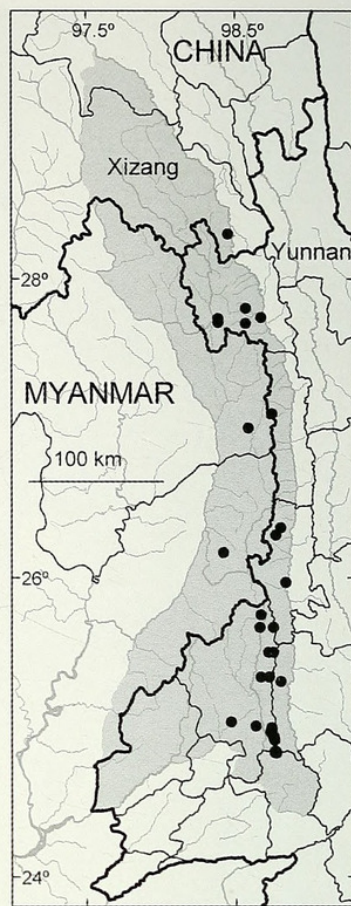


FIGURE 21. Distribution map of *Symplocos ramosissima* in the GLGS region.

12. *Symplocos sulcata* Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 46:65. 1870. *Symplocos macrophylla* Wallich ex A. de Candolle var. *sulcata* (Kurz) Nooteboom, Leiden Bot. Ser. 1:231. 1975. TYPE.—MYANMAR. Mon: Martaban, Daunat Pass, 4000 ft., *D. Brandis* s.n. (holotype: ?CAL).

Symplocos yunnanensis Brand in Engler, Pflanzenr. 6(IV. 242):68. 1901. *Dicalix yunnanensis* (Brand) Migo, Bull. Shanghai Sci. Inst. 13:208. 1943.

Symplocos persistens M.S. Huang & Y.F. Wu, Acta Phytotax. Sin. 24:199. 1986.

Shrubs or trees, evergreen, to 15 m tall. Young branchlets brown- or ferrugineous-lanate to tomentose; mature branchlets brownish to dark purplish; pseudo-terminal vegetative buds 3–6 mm, brown- to ferrugineous-sericeous. Petiole 4–11 mm, not glandular; leaf blade oblong-ovate, elliptic, oblong-elliptic, lanceolate, or oblong-lanceolate, $9.0\text{--}19.4 \times 2.2\text{--}7.0$ cm, 2.5–4.5 times as long as wide, subcoriaceous, typically drying abaxially grayish green, pale brown, or greenish brown and adaxially dark green to dark brown, abaxially tawny- to ferrugineous-lanate, adaxially lanate proximally along midvein or glabrous, midvein adaxially impressed, secondary veins 5–14 on each side of midvein, base cuneate to rounded, margin serrate and planar or slightly revolute, apex long-acuminate to occasionally caudate. Inflorescences spikes or glomerules, 0.5–2.0 cm, 7–15-flowered; rachis ferrugineous-pilose to -sericeous; bract broadly ovate to orbicular, $1\text{--}4 \times 0.7\text{--}3.5$ mm, caducous or occasionally persistent, apex obtuse to rounded. Bracts and bracteoles abaxially ferrugineous-sericeous, margin entire, not glandular. Pedicel absent; bracteoles lanceolate, $1.5\text{--}3 \times 0.7\text{--}1.5$ mm, caducous or persistent, apex acuminate. Hypanthium pilose to sericeous, subtending articulation present. Calyx limb gamopetalous for ca. 0.3 mm; lobes oblong, oblong-ovate, ovate, or broadly deltoid, $0.8\text{--}1.6 \times 0.7\text{--}1.2$ mm, sparsely to densely sericeous, margin ciliate and rarely glandular, apex obtuse to rounded. Corolla white to pale yellow, 2.5–4 mm, membranous, gamopetalous only at base; lobes narrowly oblong to oblanceolate, glabrous, adaxially smooth. Stamens ca. 35–50, adnate to corolla only at base, longest 4–6 mm; filaments not abruptly constricted apically, smooth. Disk cylindrical, white- to ferrugineous-lanate. Style 3–5.5 mm, glabrous. Fruit $7\text{--}10 \times 2.5\text{--}5$ mm, cylindrical, pilose; endocarp indurate throughout, 3 locules developed, perimeter ca. 9–13-ribbed. Seeds straight.

Nooteboom (1975) placed this species under *Symplocos macrophylla* (as var. *sulcata* (Kurz) Nooteboom) but later Wu and Nooteboom (1996) and Nooteboom (2003) recognized it as distinct. *Symplocos sulcata* is clearly distinguishable from *S. macrophylla* by its glomerules or short spikes (versus elongate spikes or racemes). Wu and Nooteboom (1996) and Nooteboom (2003) placed *S. glandulosopunctata* Y.F. Wu from Xizang Province, China as a synonym of *S. sulcata*, but in our opinion *S. glandulosopunctata* should be recognized as distinct on the basis of its elongate racemes. It has not yet been collected in Gaoligong Shan but might be expected to occur there.

Symplocos sulcata is known in Gaoligong Shan only from the Baihualing area, where it is a common medium-size understory tree.

SELECTED ILLUSTRATIONS.— R.F. Wu, Fl. Reipubl. Popularis Sin. 60(2):50 t. 19(1–6), 65 t. 23(14–18). 1987; G.H. Zhu, ed. Fl. China Ill. 15:t. 187(1–6), t. 193(11–15). 2000.

PHENOLOGY.— Fl. May–Nov, fr. Mar–Oct.

DISTRIBUTION AND HABITAT.— Subtropical broadleaved evergreen forest and thickets; 1400–1500 m. In GLGS: CHINA. Yunnan: Longyang Qu (Mangkuan Xiang); Figure 22. Outside of GLGS: Yunnan, Xizang [Myanmar, Thailand].

LOCAL NAME.— 滇灰木 dian hui mu



FIGURE 22. Distribution map of *Symplocos sulcata* in the GLGS region.

ADDITIONAL SPECIMENS EXAMINED.— CHINA. YUNNAN: LONGYANG QU. Mangkuan Xiang.

Yutang, Baihualing, E side of Gaoligong Shan, 1470 m, 6 Jul 2001, *GLGS 14100* (CAS, KUN); Baihualing Cun, Zaotang area, E side of Gaoligong Shan, 1590 m, 9 Sep 2003, *GLGS 18964* (CAS, KUN); Baihualing, 1777 m, 2 Jun 2005, *GLGS 25373* (CAS).

13. *Symplocos sumuntia* Buchanan-Hamilton ex D. Don, Prodr. Fl. Nepal. 145. 1825. TYPE.— NEPAL. Narainhetty, *N. Buchanan-Hamilton s.n.* (holotype: BM; isotype: K).

Symplocos caudata Wallich ex G. Don, Gen. Syst. 4:3. 1837.

Symplocos sumuntia var. *floribunda* A. de Candolle, Prodr. 8:255. 1844.

Symplocos botryantha Franchet, Nouv. Arch. Mus. Hist. Nat., ser. 2, 10:60. 1888.

S. botryantha var. *stenophylla* Brand, Repert. Spec. Nov. Regni Veg. 3:217. 1906.

S. cavaleriei H. Léveillé, Repert. Spec. Nov. Regni Veg. 9:77. 1910.

Symplocos punctata Brand, Repert. Spec. Nov. Regni Veg. 3:217. 1906.

Symplocos caudata var. *macrantha* Handel-Mazzetti, Beih. Bot. Centralbl. 62(B):18. 1943.

Shrubs to trees, evergreen, to 9 m tall. Young branchlets white- or brown-puberulent, occasionally also pilose, glabrescent; mature branchlets greenish to dark brownish; pseudo-terminal vegetative buds 2.5–4 mm, yellow- or pale ferrugineous-pilose-sericeous or rarely glabrous. Petiole 4–10 mm, usually with 1 or 2 pairs of glands, glands frequently caducous; leaf blade elliptic, narrowly elliptic, slightly obovate, or slightly oblanceolate, $4.8\text{--}9.7 \times 2.1\text{--}3.3$ cm, 2.1–2.6(–3.6) times as long as wide, chartaceous, typically drying yellowish green, abaxially glabrous or occasionally sparsely long-strigose, adaxially minutely puberulent and occasionally also pilose proximally on midvein, midvein adaxially impressed, secondary veins 5–8 on each side of midvein, base cuneate, margin crenate-serrate and revolute, apex abruptly acuminate to caudate. Floral buds axillary or often pseudo-terminal, conical to subglobose, 2–3 mm; scales suborbicular to orbicular, glabrous or strigillose. Inflorescences pseudo-terminal or axillary, simple racemes, 1–4 cm, 2–18-flowered; rachis pale yellow villous; bract ovate to obovate, apex rounded to obtuse. Bracts and bracteoles caducous, keeled, yellow sericeous at least medially, margin ciliate to ciliolate and occasionally glandular. Pedicel 1–3 mm; bracteoles elliptic, lanceolate, or narrowly deltoid, covering less than half of hypanthium, apex acuminate. Hypanthium glabrous, subtending articulation apical-medially. Calyx limb gamosepalous for 1–2 mm; lobes triangular-ovate, margin usually ciliolate and not glandular, apex acute to obtuse. Corolla yellow, 4–5 mm, membranous, gamopetalous only at base; lobes broadly elliptic, glabrous, adaxially smooth. Stamens ca. 25–35, adnate to corolla only at base, longest 5–7 mm; filaments not abruptly constricted apically, smooth. Disk annular, glabrous. Style 4.5–6.5 mm, glabrous. Fruit ampulliform to ovoid, $7\text{--}8 \times \text{ca. } 5$ mm, glabrous; endocarp indurate throughout, 1 or 2 locules developed, perimeter smooth. Seeds curved, ramified.

This species is widespread southern and eastern China, but appears to be rare in Gaoligong Shan. The species can appear similar in leaf morphology to *Symplocos viridissima*, but the pubescent hypanthium and glabrous disk of *S. viridissima* serve to diagnostically distinguish it from *S. sumuntia*, at least in Gaoligong Shan.

SELECTED ILLUSTRATIONS.— R.F. Wu, Fl. Reipubl. Popularis Sin. 60(2):23 t. 6(1–13). 1987; G.H. Zhu, ed. Fl. China Ill. 15:t. 175(1–13). 2000.

PHENOLOGY.— Fl. Feb–Nov, fr. Apr–Nov.

DISTRIBUTION AND HABITAT.— Mixed forests, subtropical evergreen broadleaf forest; 1300–2500 m. In GLGS: CHINA. Yunnan: Lushui Xian (Liuku Zheng), Tengchong Xian (Dazuo Xiang, Guyong Xiang, Mingguang Xiang, Qushi Xiang, Zhonghe Xiang), Yingjiang Xian (Tongbiguan Xiang); Figure 23. Outside of GLGS: Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Japan, Korea,

Malaysia, Myanmar, Nepal, Thailand, Vietnam].

LOCAL NAME.— 山矾 shan fan.

ADDITIONAL SPECIMENS EXAMINED.— **CHINA. YUNNAN:** **LUSHUI XIAN. Liuku Zheng.** Shweli Salween divide, 7000–8000 ft., Mar 1925, *F* 26236 (A, E, K). **TENGCHONG XIAN. Dazuo Xiang.** Hills to NE of Tengyueh, 6000–7000 ft., Jun 1912, *F* 8360 (A, E, K). **Guyong Zheng.** Hou Qiao, Hei Ni Tang, 1950 m, 19 May 1964, *Wu* 6692 (KUN). **Mingguang Xiang.** Shweli Salween divide, 7000–8000 ft., Apr 1931, *F* 29378 (E). **Qushi Xiang.** Shweli Valley, 7000–8000 ft., Mar 1931, *F* 29454 (E); Shweli River drainage basin and environs of Tengyueh, 1 Feb 1923, *Rock* 7987 (A). **YINGJIANG XIAN. Tongbiguan Xiang.** 1350 m, 8 Apr 1985, *Fragrance Resources Expedition* 85-118 (KUN); 1350 m, 8 Apr 1985, *Fragrance Resources Expedition* 85-149 (KUN).

14. ***Symplocos theifolia*** D. Don, Prodr. Fl. Nepal 145. 1825!
TYPE.— NEPAL. Narainhetty, 3 Nov 1802, *F. Buchanan-Hamilton s.n.* (holotype: BM!).

Symplocos phyllocalyx C.B. Clarke in J.D. Hooker, Fl. Brit. India. 3. 575. 1882.

Symplocos setchuensis Brand, Bot. Jahrb. Syst. 29:528. 1900. *Dicalix setchuensis* (Brand) Migo, Bull. Shanghai Sci. Inst. 13:205. 1943.

Symplocos henryi Brand in Engler, Pflanzenr. 6(IV. 242):67. 1901.

Symplocos multipes Brand, Repert. Spec. Nov. Regni Veg. 3:216. 1906.

Symplocos discolor Brand, Feddes Repert. Spec. Nov. Regni Veg. 3:216. 1906. *Symplocos coronigera* H. Léveillé, Repert. Spec. Nov. Regni Veg. 10:431. 1912.

Symplocos xanthoxantha H. Léveillé, Bull. Acad. Int. Geogr. Bot. 24:283. 1914.

Symplocos sinuata Brand, Repert. Spec. Nov. Regni Veg. 14:326. 1916.

Symplocos potaninii Gontscharow, Bot. Mater. Gerb. Glavn. Bot. Sada RSFSR 5:100. 1924.

Dicalix shinodanus Migo, Bull. Shanghai Sci. Inst. 13:205. 1943.

Shrubs or trees, evergreen, to 12 m tall. Young branchlets glabrous or rarely sparsely tomentelous, puberulent, or lanate, trichomes not incurved; mature branchlets greenish, often purplish mottled; pseudo-terminal vegetative buds 0.5–1.9 cm, glabrous except for often ciliolate scale margins. Petiole 0.6–1.5 cm, glabrous, not glandular; leaf blade elliptic to oblanceolate, 6.2–12.0 × 1.9–3.8 cm, 2.1–3.8 times as long as wide, subcoriaceous, typically drying green to yellowish green, both surfaces glabrous, midvein adaxially prominent, secondary veins 7–14 on each side of midvein, base cuneate, margin serrulate and slightly revolute, apex acuminate. Inflorescences pseudo-terminal or axillary, simple or basally branched compact spikes, 0.6–2 cm, 1–10-flowered (branches often 1-flowered); rachis white-puberulent. Bracts and bracteoles, broadly ovate to suborbicular, isomorphic or bracts slightly larger, 0.7–2.0 × 0.9–2.4 mm, persistent, glabrous or rarely strigillose, margin entire or ciliolate but not glandular, apex acute to rounded. Pedicel absent; bracteoles covering less than half of hypanthium. Hypanthium glabrous, subtending articulation present. Calyx limb not gamosepalous; lobes 0.9–2.5 × 0.9–2.3 mm, semi-oblong, broadly ovate, or semi-orbicular, glabrous, margin entire or ciliolate, apex rounded. Corolla white, yellow, or green, 3.5–5 mm, membranous, gamopetalous only at base; lobes oblong, slightly obovate, or linear-oblong, glabrous, adaxially smooth. Stamens 10–40, adnate to corolla only at base, longest 4.5–6 mm; filaments not abruptly constricted apically, smooth. Disk 5-lobed or low-annular, white-lanate. Style 2.5–6 mm,

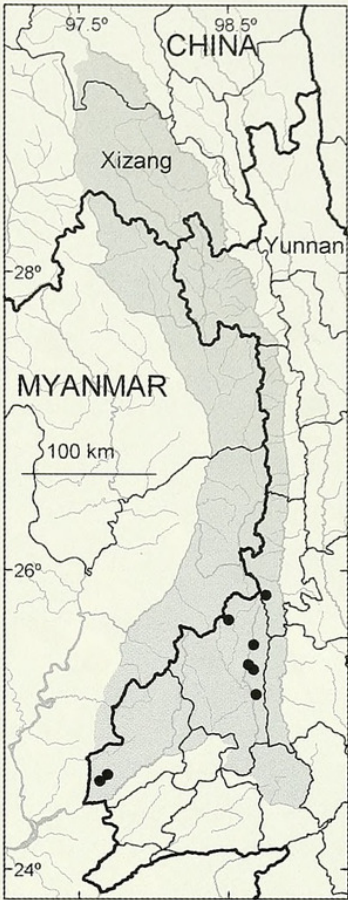


FIGURE 23. Distribution map of *Symplocos sumutia* in the GLGS region.



FIGURE 24. Fruiting branch of *Symplocos theifolia* with galled fruit. Photo by M. Watson.

glabrous or occasionally strigose to hispidulous. Fruit blue, cylindrical to broadly elliptic, $8\text{--}15 \times 4\text{--}8$ mm, glabrous; endocarp indurate throughout, 1 to 3 locules developed, perimeter smooth; galled fruit (as evident from persistent apical remains of unopened corolla and androecium) common, globose, $6\text{--}14 \times 4\text{--}10$ mm, endocarp thin or absent. Seeds U-shaped.

Symplocos theifolia is one of the most common species in the Gaoligong Shan. In the sterile condition it can still be easily distinguished from other species of *Symplocos* by the combination of the prominent leaf blade midvein adaxially and the glabrous pseudo-terminal buds. Most of the fruit of this species, at least in Gaoligong Shan, are sterile and apparently galled, whence they are slightly larger and swollen than fertile fruit, and without a well developed endocarp. In such cases the unopened corolla is often seen to remain attached to the fruit apex.

This species is recognized here in the broad sense, i.e., *sensu* Nooteboom (1975, 2005) and Wu and Nooteboom (1996), as opposed to the treatment of Wu (1987) in which seven species were recognized. Li et al. (2000) recognized the segregate *Symplocos setchuensis* in Gaoligong Shan. Wu (1987) distinguished this species from *S. theifolia* by the length and shape of the inflorescence, but we can detect no consistent differences in these features in correlation with any other characters throughout the distribution in Gaoligong Shan.

Nooteboom (1975) used the name *Symplocos lucida* (Thunberg) Siebold & Zuccarini for this species but, based on the discussion in Nagamasu (1993), corrected it to *S. theifolia* [interactive computerized key and list of synonyms on CD-ROM cited in Nooteboom (2005)].

SELECTED ILLUSTRATIONS.— R.F. Wu, *Fl. Reipubl. Popularis Sin.* 60(2):11 t. 1(1–12), 12 t. 2(1–6), 14 t. 3(1–6). 1987; G.H. Zhu, ed. *Fl. China Ill.* 15:t. 170(1–12), t. 171(1–6), 172(1–6). 2000.

PHOTOGRAPHIC IMAGE.— Figure 24.

PHENOLOGY.— Fl. Mar-Dec, Fr. May-Dec.

DISTRIBUTION AND HABITAT.— Coniferous forest, Deciduous broadleaf forest, Subtropical evergreen broadleaf forest, mixed Subtropical broadleaved evergreen forest and Coniferous forest; 1800–3400 m. In GLGS: CHINA. Xizang: Zayü Xian (Tsarong Xiang). Yunnan: Fugong Xian (Lishadi Xiang, Lumadeng Xiang, Shangpa Zheng), Gongshan Xian (Bingzhongluo Xiang, Cikai Zheng, Dulongjiang Xiang), Lushui Xian (Luyobenzhuo Xiang), Tengchong Xian (Guyong Zheng, Jietou Xiang, Puchuan Xiang, Qushi Xiang, Zhonghe Xiang), MYANMAR. Kachin. Myitkyina District (Chibyaw Township); Figure 25. Outside of GLGS: Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Bhutan, Cambodia, India, Indonesia, Japan, Laos, Malaysia, Myanmar, Thailand, Vietnam].

LOCAL NAME.— 光亮山矾 *guang liang shan fan*

ADDITIONAL SPECIMENS EXAMINED.— **CHINA. XIZANG: ZAYÜ XIAN.** **Tsarong Xiang.** Tsamputang Snow Range, Mount Kengyichunpo and region of Champutong, Salween-Irrawaddy watershed, 10000 ft., 1923, *Rock 10234* (A). **YUNNAN:** *F 11395* (K); 1917, *F 17288* (A, K); 2300 m, 1935–1936, *Wang 88262* (KUN); E slope of GLGS, 2920 m, 4 May 1950, *Wu 9040* (KUN). **FUGONG XIAN.** Sha La He Luo, Bijiang, 3000 m, 16 Jul 1978, *QX 1178* (KUN). **Lishadi Xiang.** Moist canyon just S of the Shibali Logging Station on the rd from the Nujiang to Yaping Pass, E side of Gaoligong Shan, 2506 m, 28 Apr 2004, *GLGS 19996* (CAS); vicinity of Shibali Logging Station on the rd from the Nujiang to Yaping Pass, E side of Gaoligong Shan, 2485 m, 28 Apr 2004, *GLGS 20042* (CAS); between Shibali Logging Station and Yaping Pass, ca. 4 km W of Shibali, from the Nujiang to Yaping Pass, E side of Gaoligong Shan, 2821 m, 2 May 2004, *GLGS 20080* (CAS); between Shibali Logging Station and Yaping Pass, ca. 7.2 km W of Shibali, from the Nujiang to Yaping Pass, E side of Gaoligong Shan, 2999 m, 2 May 2004, *GLGS 20188* (CAS); between the Shibali Logging Station and Yaping Pass, ca. 8.5 km W of Shibali, from the Nujiang to Yaping Pass, E side of Gaoligong Shan, 3106 m, 8 May 2004, *GLGS 20460* (CAS); between the Shibali Logging Station and Yaping Pass, near Km 18 on the rd from the Nujiang to Yaping Pass, E side of Gaoligong Shan, 3030 m, 1 May 2004, *GLGS 20878* (CAS); Yaduo Cun, above Shibali along the N side of S fork of Yamu He, E side of Gaoligong Shan, 2900 m, 15 Aug 2005, *GLGS 28310* (CAS). **Lumadeng Xiang.** Yaping Cun, below Amero Pass along the rd back down to the confluence of the N and S fork of Yamu He, E side of Gaoligong Shan, 2950 m, 13 Aug 2005, *GLGS 27193* (CAS); 2600 m, 28 May 1982, *QX 6981* (KUN). **Shangpa Zheng.** 2600 m, 16 Sep 1933, *Tsai 54255* (A, KUN); 2800 m, 10 Oct 1934, *Tsai 58706* (A, KUN); 2800 m, 20 Oct 1934, *Tsai 58843* (A, KUN). **GONGSHAN XIAN.** Pan Shan Te to Yi Bi Di, 2800 m, 3 May 1960, *NW Yunnan Expedition 10034* (KUN); the first district, A Lu La Ka, Long Po, 2920 m, 1 Jun 1960, *Wu 9241* (KUN); the ninth district, Pang Sha Wu to Yi Bi Di, 2800 m, 30 May 1960, *Wu 10013* (KUN). **Bingzhongluo Xiang.** Middle part of Bingzhongluo River, 2500–3400 m, 30 Aug 1979, *X.F. Deng 791352* (KUN); Chang Pu Tong, 3300 m, 20 Sep 1940, *Feng 7911* (KUN, PE); Ni Wa Qing Long A Bao Di, 2200 m, 13 Oct 1956, *P. I. Mao 560* (KUN); Champu tung, Bar-ru-Lah, Salween-Chukiang divide, 2300 m, 1 Oct 1935, *Wang 67551* (A, KUN, PE). **Cikai Zheng.** Hei Pu Shan, 13 Oct 1940, *Feng 8407* (KUN); E side of Gaoligong Shan, along the Danzhu He on the rd from Nu Jiang at Danzhu to the Myanmar border, 2650 m, 1 Jul 2000, *GLGS 11829* (CAS, GH, KUN); Danzhu, E side of Gaoligong Shan, around the border between Myanmar and China near Danzhuyakou, 3378 m, 14 Apr 2002, *GLGS 14234* (CAS, KUN); E side of Gaoligong Shan, W of Gongshan, along the Pula He on the trail around No. 12 Bridge, 2770 m, 2 May 2002, *GLGS 14847* (CAS,

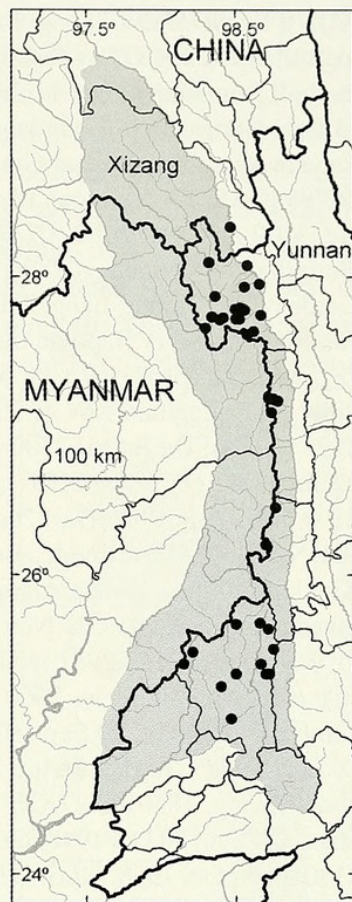


FIGURE 25. Distribution map of *Symplocos theifolia* in the GLGS region.

KUN); E side of Gaoligong Shan, W of Gongshan, along the Pula He on the trail around No. 12 Bridge, 2770 m, 2 May 2002, *GLGS 14849* (CAS, KUN); E side of Gaoligong Shan, W of Gongshan, along the Pula He on the trail from Qiqi to No. 12 Bridge and Dulongjiang Valley, 2500 m, 3 May 2002, *GLGS 14874* (KUN); along rd from Gongshan to Kongdang, E side of Gaoligong Shan, 2800 m, 23 Sep 2002, *GLGS 16513* (CAS, KUN); Labadi, along the rd from Gongshan to Kongdang, E side of Gaoligong Shan, 2970 m, 30 Sep 2002, *GLGS 16788* (CAS, KUN); along rd from Gongshan to Kongdang, on the E side of Gaoligong Shan above the Pula He, 3100 m, 3 Oct 2002, *GLGS 16902* (CAS, KUN [2]); E side of Gaoligong Shan at Km 34 on the rd from Gongshan to Kongdang, 2890 m, 13 Nov 2004, *GLGS 22611* (CAS). **Dulongjiang Xiang.** Kongdang, on the E side of the Dulong Jiang, 2600 m, 2 Jan 1991, *GLGS 1587* (CAS, KUN); Qiawudang, S side of the Gamolai He, ca. 4 km SE of Bapo on the E side the Dulong Jiang, 2650 m, 25 Mar 1991, *GLGS 4990* (CAS, KUN [2]); Dizhengdang, on the W side of the Dulong Jiang, 1880 m, 14 Apr 1991, *GLGS 5737* (CAS); Sandui, NE of Shigong Bridge and NW of Xishaofang on the trail from Gongshan to Bapo, 2500 m, 20 May 1991, *GLGS 6925* (KUN); Da Ba Yi, 2500 m, 6 Sep 1956, *P. I. Mao 429* (KUN); Dulongjiang to Dongshaofang, 2600 m, 22 Jul 1982, *QX 8395* (KUN); Dulongjiang to Dongshaofang, 2200–2400 m, 26 Jul 1982, *QX 8604* (KUN); 2300 m, 30 Aug 1982, *QX 9764* (KUN); Taron Taru divide, Bucashwang Valley, 2000 m, 3 Sep 1937, *Yü 20119* (KUN); Taron Taru divide, Bucashwang Valley, 2600 m, 5 Nov 1937, *Yü 20972* (A, A, KUN); Salween-Kiukiang divide, Swangchiang, 2800 m, 15 Jul 1938, *Yü 22104* (A, E, KUN); Salween-Kiukiang divide, Swangchiang, 2650 m, 11 Nov 1938, *Yü 22960* (A, KUN, PE); Salween-Kiujiang divide, Si Wang Qiang, 2650 m, 4 Nov 1938, *Yü 22961* (KUN). **LUSHUI XIAN. Luobenzhuo Xiang.** E'ga Cun, on forest rd at Km 30, E side of Gaoligong Shan, 2800 m, 8 Aug 2005, *GLGS 25797* (CAS). **TENGCHONG XIAN.** Mountain near Tengyueh, 3300 m, 29 Sep 1974, *C.K. Schneider 2732* (W). **Guyong Zheng.** Dan Za, 2100 m, 17 Oct 1983, *Q. Lin 770683* (KUN). **Jietou Xiang.** Shweli-Salween divide, 9000–10000 ft., Nov 1924, *F 25359* (E, K, W); N of Datang, 1850 m, 27 Oct 1998, *GLGS 11021* (CAS, KUN); E of Datang, on the W slope of Gaoligong Shan, 2180 m, 30 Oct 1998, *GLGS 11260* (KUN); Datang Cun, E of Datang on the W slope of Gaoligong Shan, 2180 m, 30 Oct 1998, *GLGS 11269* (CAS, GH, KUN). **Mazhan Xiang.** Ma-Chang-Kai Valley, N of Tengyueh, 6000 ft., Feb 1913, *F 9533* (E). **Puchuan Xiang.** Laoqing Forest Station, 1880–3120 m, *W.C. Yin 60-1340* (KUN). **Qushi Xiang.** Daba, 2100 m, 18 May 1997, *Z.L. Dao et al 9481* (KUN [2]); W flank of the Shweli-Salween divide, 9000–10000 ft., Aug 1912, *F 9038* (BM, E, K); hills NE of Tengyueh, 7000 ft., Nov 1912, *F 9330* (K, E, W); Shweli-Salween divide, 7000 ft., Aug 1913, *F 12016* (A, BM, E, K); Shweli River drainage basin to summit of Shweli-Salween watershed E of Tengyueh, 1 Nov 1922, *Rock 7608* (A); Shweli River drainage basin to summit of Shweli-Salween watershed E of Tengyueh, 8000 ft., 1 Nov 1922, *Rock 7633* (A). **Zhonghe Xiang.** Flank of volcanic mountain NW of Tengyueh, 7000–8000 ft., Jun 1912, *F 8064* (E, W). **MYANMAR.** Between Sadon and the Yunnan Chinese border at Changtifang and Kambaiti, 1 Nov 1922, *Rock 7393* (A, W). **KACHIN: MYITKYINA DISTRICT. Chibyaw Township.** Eastern flank of Sungku divide, 9000 ft., May 1917, *F 13786* (A, E, K).

15. *Symplocos viridissima* Brand in Engler, *Pflanzenr.* 6(IV. 242):41. 1901. TYPE.— INDIA. Assam: W. Griffith 3659 (holotype: B, destroyed; isotype: GH, K, LE, W).

Symplocos araioura Merrill, *Brittonia* 4:164. 1941.

Symplocos ascidiformis Y.F. Wu, *Acta Phytotax. Sin.* 20:92. 1982.

Shrubs or trees, evergreen, to 3.5 m tall. Young branchlets glabrous or sparsely to rarely densely white- (rarely ferrugineous-) strigose to -hispidulous and sometimes also -puberulent; mature branchlets greenish or less commonly brownish; pseudo-terminal vegetative buds 2.5–6 mm, sericeous. Petiole 2–6 mm; leaf blade elliptic, lanceolate-elliptic, or oblanceolate-elliptic, 4.5–12.7 × 1.3–3.8 cm, 2.7–4.1 times as long as wide, chartaceous, typically abaxially drying pale green to pale grayish green and adaxially green to grayish green, abaxially sparsely tawny- to dull ferrugineous-strigose at least proximally along midvein, adaxially glabrous, midvein adaxially impressed, secondary veins 3–5(–7) on each side of midvein, base subrounded, cuneate, or slightly attenuate, margin serrulate, denticulate, or rarely minutely and irregularly undulate and planar, apex caudate.

Inflorescences simple or branched racemes, 0.8–1.5 cm, 1–8-flowered; rachis tawny- to pale brown-strigose. Bracts and bracteoles deltoid to ovate, $\pm$ isomorphic but bracts somewhat larger, $0.6\text{--}2.1 \times 0.4\text{--}0.9$ mm, caducous, strigillose, margin ciliate and often glandular, apex acute. Pedicel 1–4 mm; bracteoles covering less than half of hypanthium. Hypanthium strigillose, subtending articulation present. Calyx limb not gamosepalous; lobes deltoid-ovate to hemispherical, $0.8\text{--}1.2 \times 1.0\text{--}1.5$ mm, strigillose, margin ciliolate and not glandular, apex broadly acute to rounded. Corolla white, 3–4 mm, membranous, gamopetalous only at base; lobes oblong, ovate-elliptic, linear-oblong, or oblanceolate, glabrous, adaxially smooth. Stamens ca. 35–45, adnate to corolla only at base, longest 4–6 mm; filaments not abruptly constricted apically, smooth. Disk low annular, glabrous. Style 4–5 mm, glabrous. Fruit blue, narrowly ampulliform to rarely subglobose at maturity, $(6\text{--})7\text{--}10 \times 4\text{--}5$ mm, sparsely strigillose; endocarp indurate throughout, 1 locule developed, perimeter smooth or shallowly ca. 11-ribbed. Seeds curved.

Li et al. (2000) list two specimens (*Feng* 24206 and *QX Expedition* 82-8834) under the nomen nudum “*Symplocos caudiformis* Huang ex C. Chen & Gao” that clearly fall within the range of morphological variation of *S. viridissima*.

See also comments under *Symplocos sumuntia*.

SELECTED ILLUSTRATIONS.— R.F. Wu, *Fl. Reipubl. Popularis Sin.* 60(2):31 t. 10(5–7), 46 t. 17(1–4). 1987; G.H. Zhu, ed. *Fl. China* III. 15:t. 180(5–7), t. 184(1–4). 2000.

PHENOLOGY.— Fl. Mar–May, fr. Jun–Sep.

DISTRIBUTION AND HABITAT.— Subtropical broadleaved evergreen forest and thickets; 1200–2200 m. In GLGS: CHINA. Yunnan: Gongshan Xian (Bingzhongluo Xiang, Dulongjiang Xiang); Figure 26. Outside of GLGS: Guangdong, Guangxi, Guizhou, Hainan, Xizang, S Yunnan [NE India, Myanmar, Vietnam].

LOCAL NAME.— 绿枝山矾 *lu zhi shan fan*

ADDITIONAL SPECIMENS EXAMINED.— **CHINA. YUNNAN: GONGSHAN XIAN.** W slope of Gaoligong Shan, 2400 m, 28 Jul 1982, *QX* 8834 (KUN [2]). **Bingzhongluo Xiang.** Sichun, Miliwaluo, 1200 m, 12 Apr 1959, *Feng* 24406 (KUN). **Dulongjiang Xiang.** 1350 m, 15 Nov 1959, *Feng* 24148 (KUN [2]); Miliwage, E bank of Dulongjiang, 1200 m, 12 Nov 1959, *Feng* 24206 (KUN); Ji Mu Deng, 1200 m, 19 Nov 1990, *GLGS* 539 (KUN); Nei Ben La, 1300 m, 19 Nov 1990, *GLGS* 557 (KUN); the third team, 1800 m, 22 Nov 1990, *GLGS* 788 (KUN); Ji Mu Deng, 1400 m, 6 Dec 1990, *GLGS* 854 (KUN [2]); Ga Mo Lai He, 1350 m, 30 Dec 1990, *GLGS* 1458 (KUN); Ga Mo Lai He, 1400 m, 25 Jan 1991, *GLGS* 2387 (KUN); Mei Li Wang, 2300 m, 16 Jan 1991, *GLGS* 3058 (KUN); Mei Li Wang, 2100 m, 16 Jan 1991, *GLGS* 3068 (KUN); Ga Mo Lai He, 1350 m, 26 Jan 1991, *GLGS* 3409 (KUN); Nei Pu La, 1300 m, 6 Feb 1991, *GLGS* 3950 (KUN); vicinity of Nengpula on the W side of the Dulong Jiang just W of Hongxin Qiao (Red Star Bridge) ca. 0.5 km SW of Bapo, 1330 m, 29 Oct 2004, *GLGS* 20783 (CAS); between Shigong Qiao and Panjiasheng on trail from Bapo to Gongshan via Qiqi on the W side of Gaoligong Shan, 2100–2200 m, 30 Oct 2004, *GLGS* 22000 (CAS); W slope of Gaoligong Shan, 2400 m, 28 Jul 1982, *QX* 8834 (KUN).

16. *Symplocos xylopyrena* C.Y. Wu ex Y.F. Wu, *Acta Phytotax. Sin.* 20:91. 1982. *Symplocos ramosissima* Wallich ex G. Don var. *xylopyrena* (C.Y. Wu ex Y.F. Wu) Nooteboom, *Blumea* 50:409. 2005. **TYPE.**— CHINA. Xizang: Mêdog Xian, 2000 m, 12 August 1974, *Qinghai-Xizang Expedition* 74-1814 (holotype: PE; isotype: KUN!).



FIGURE 26. Distribution map of *Symplocos viridissima* in the GLGS region.

Shrubs or trees, evergreen, to 6 m tall. Young branchlets glabrous or proximally sparsely white-, tawny-, or yellow-puberulent; mature branchlets dark purplish; pseudo-terminal vegetative buds 8–11 mm, glabrous except for ciliolate scale margins. Petiole 3–8 mm, not glandular; leaf blade narrowly elliptic to slightly oblanceolate, $7.6\text{--}11.0 \times 2.9\text{--}3.8$ cm, 2.6–3.9 times as long as wide, membranous to thinly chartaceous, drying green to greenish brown, abaxially glabrous, adaxially minutely white-hispidulous at least proximally along midvein otherwise glabrous, midvein adaxially impressed, secondary veins 13–17 on each side of midvein, base broadly cuneate, margin entire and planar, apex acuminate. Inflorescences simple or branched racemes, 1–1.5 cm, 1–14-flowered; rachis white-, ferrugineous-, or brown-puberulent. Bracts and bracteoles ovate to linear-deltoid, $\pm$ isomorphic but bracts somewhat larger, $1.2\text{--}1.8 \times 0.5\text{--}1$ mm, caducous, glabrous or sparsely puberulent apical-medially, margin ciliolate and not glandular, apex acute to acuminate. Pedicel 1–3 mm; bracteoles covering less than half of hypanthium. Hypanthium glabrous, subtending articulation present. Calyx limb not gamosepalous; lobes hemispherical to broadly deltoid, $1\text{--}1.4 \times 1\text{--}1.5$ mm, glabrous, margin ciliolate and not glandular, apex obtuse to rounded. Corolla white, ca. 6 mm, membranous, gamopetalous only at base; lobes glabrous, adaxially smooth. Stamens ca. 110, adnate to corolla only at base; filaments not abruptly constricted apically, smooth. Fruit ellipsoid to obovoid, $2.4\text{--}2.9 \times \text{ca. } 1.2$ cm, glabrous; endocarp with indurate part irregularly intercalated with network of softer spongy tissue, 2 locules developed, perimeter slightly irregularly undulate. Seeds straight.

Nooteboom (2005) has treated this species as a variety of *Symplocos ramosissima*. There are many morphological features, however, that distinguish *S. xylopyrena* from *S. ramosissima* such that the recognition of *S. xylopyrena* at the species level is justified (e.g., pseudo-terminal vegetative buds 8–11 mm long and glabrous except for ciliate margins [versus 4–8 mm long and pubescent]; secondary leaf veins 13–17 [versus 6–10]; bracteoles caducous [versus usually persistent]; hypanthium glabrous [versus strigillose or rarely glabrous]; calyx lobes 1–1.4 mm [versus 0.6–1 mm]; fruit $2.4\text{--}2.9 \times \text{ca. } 1.2$ cm [versus $0.7\text{--}1.1 \times 0.4\text{--}0.6$ cm]; and endocarp with a network of soft spongy tissue [versus indurate throughout]).

SELECTED ILLUSTRATIONS.— R.F. Wu, Fl. Reipubl. Popularis Sin. 60(2):40 t. 15(1–8); G.H. Zhu, ed. Fl. China Ill. 15:t. 185(1–8). 2000.

PHENOLOGY.— Fl. May–Aug, fr. Aug–Dec.

DISTRIBUTION AND HABITAT.— Subtropical broadleaved evergreen forests; 1300–2200 m. In GLGS: CHINA. Yunnan: Gongshan Xian (Dulongjiang Xiang); Figure 27. Outside of GLGS: Xizang, Yunnan.

LOCAL NAME.— 木核山矾 mu he shan fan

ADDITIONAL SPECIMENS EXAMINED.— **CHINA. YUNNAN: GONGSHAN XIAN. Dulongjiang Xiang.** Nengpula, directly opposite Bapo on the W side of the Dulong Jiang, 1300 m, 21 Nov 1990, GLGS 627 (CAS, KUN); Mengdang, ca. 1.5 km S of Bapo on the E side of the Dulong Jiang, 1310 m, 14 May 1991, GLGS 6720 (CAS, KUN); W side of Gaoligong Shan, W of Gongshan, on the trail from Qiqi to Bapo in the Dulong Jiang Valley, 2050–2150 m, 17 Jul 2000, GLGS 12916 (CAS); between Shigong Qiao and Panjiasheng on trail from Bapo to Gongshan via Qiqi on the W side of Gaoligong Shan, 2100–2200 m, 30 Oct 2004, GLGS 21999 (CAS); 2400 m, 28 Jul 1982, QX 8822 (KUN); Bapo to Maku, 2400 m, 6 Aug 1982, QX

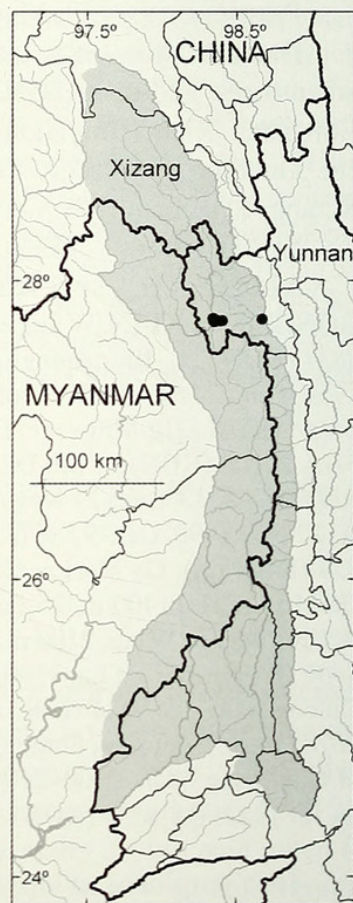


FIGURE 27. Distribution map of *Symplocos xylopyrena* in the GLGS region.

8940 (KUN); Taron-Taru divide. Lahpi, 2000 m, 26 Aug 1938, *Yü* 19946 (A); Tarou-Taru divide. Tangtehwang, 1600 m, 26 Aug 1938, *Yü* 20862 (A).

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LITERATURE CITED

- ANGIOSPERM PHYLOGENY GROUP. 2003. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG II. *Botanical Journal of the Linnean Society* 141:399–436.
- BRAND, A. 1901. Symplocaceae. Pages 205–274 in A. Engler, ed., *Das Pflanzenreich* IV. 242 (Heft 6). Engelmann, Leipzig, Germany.
- CHAPLIN, G. 2006. Physical geography of the Gaoligong Shan area of southwest China in relation to biodiversity. *Proceedings of the California Academy of Sciences* 56:527–556.
- CHEN, H.S., H.G. YE, AND F.Y. ZENG. 2003. A new species of *Symplocos* (Symplocaceae) from China. *Journal of Tropical and Subtropical Botany* 11:169–170.
- FRITSCH, P.W., B.C. CRUZ, F. ALMEDA, Y. WANG, AND S. SHI. 2006. Phylogeny of *Symplocos* based on DNA sequences of the chloroplast *trnC–trnD* intergenic region. *Systematic Botany* 31:181–192.
- FRITSCH, P.W., AND F. ALMEDA. In press. Revised infrageneric classification of *Symplocos* (Symplocaceae) based on phylogenetic data from DNA sequences and morphology. *Taxon*.
- GREUTER, W., ed. 1999. International Code of Botanical Nomenclature (Saint Louis code). Koeltz Scientific, Königstein, Germany.
- HARRIS, J. G., AND M. W. HARRIS. 2001. *Plant Identification Terminology. An Illustrated Glossary*, 2nd ed. Spring Lake Publishing, Spring Lake, Utah, USA.
- KRESS, J.K., R.A. DEFILLIPPS, E. FARR, AND D.Y.Y. KYI. 2003. A checklist of the trees, shrubs, herbs, and climbers of Myanmar. *Contributions from the United States National Herbarium* 45:1–590.
- LI, H., H.J. GUO, AND Z.L. DAO. 2000. *Flora of Gaoligong Mountain*. Science Press, Beijing, China.
- LIU, A.-Z., AND W.J. KRESS. 2005. The Gaoligong Mountains of Southwest China and Northeast Myanmar. Pp. 86–92 in G.A. Krupnick and W.J. Kress, eds., *Plant Conservation. A Natural History Approach*. University of Chicago Press, Chicago, Illinois, USA.
- NAGAMASU, H. 1993. The Symplocaceae of Japan. *Contributions from the Biological Laboratory of Kyoto University* 28:173–260.
- NOOTEBOOM, H.P. 1975. *Revision of the Symplocaceae of the Old World, New Caledonia Excepted*. Universitaire Pers Leiden (Leiden Botanical Series, vol. 1).
- NOOTEBOOM, H.P. 1977. Symplocaceae. Pages 205–274 in C.G.G.J. van Steenis, ed., *Flora Malesiana*, series 1, vol. 8, part 2. Sijthoff & Noordhoff, Alphen aan den Rijn, Netherlands.
- NOOTEBOOM, H.P. 1980. Review of *Symplocos* (Symplocaceae) from New Caledonia. *Blumea* 26:411–415.
- NOOTEBOOM, H.P. 1996. How to deal with complex species with two examples from east Asian *Symplocos*. Pages 335–340 in A. Zhang and S. Wu, eds., *Floristic Characteristics and Diversity of East Asian Plants*. China Higher Education Press, Beijing, China and Springer-Verlag, Berlin, Germany.
- NOOTEBOOM, H.P. 2005. Additions to Symplocaceae of the Old World including New Caledonia. *Blumea* 50:407–411.
- SCHÖNENBERGER, J., A.A. ANDERBERG, AND K.J. SYTSMA. 2005. Molecular phylogenetics and patterns of floral evolution in the Ericales. *International Journal of Plant Sciences* 166:265–288.

- STOTZ, D.F., E.J. HARRIS, D.K. MOSKOVITS, K. HAO, S. YI, AND G.W. ADELMANN, eds. 2003. *China: Yunnan, Southern Gaoligongshan. Rapid Biological Inventories Report no. 4*. The Field Museum, Chicago, Illinois, USA.
- THUNBERG, C.P. 1794–1805. *Icones Plantarum Japonicarum*. J.F. Edman, Uppsala, Sweden.
- WANG, Y., P.W. FRITSCH, S. SHI, F. ALMEDA, B.C. CRUZ, AND L.M. KELLY. 2004. Phylogeny and infrageneric classification of *Symplocos* (Symplocaceae) inferred from DNA sequence data. *American Journal of Botany*. 91:1901–1914.
- WU, R.F. 1987. Symplocaceae. Pages 1–77 in Z.Y. Wu, ed., *Flora Reipublicae Popularis Sinicae* vol. 60(2). Science Press, Beijing, China.
- WU, R.F., AND H.P. NOOTEBOOM. 1996. Symplocaceae. Pages 235–252 in Z.Y. Wu and P.H. Raven, eds., *Flora of China: Myrsinaceae through Loganiaceae*, vol. 15. Science Press, Beijing, China and Missouri Botanical Garden Press, St. Louis, Missouri, USA.
- YE, H.G., F.W. XING, F.G. WANG, AND F.Y. ZENG. 2003. A new species and a new synonym of *Symplocos* (Symplocaceae) from China. *Journal of Tropical and Subtropical Botany* 11:277–279.

Appendix 1

Abbreviations for Collectors and Expeditions that Record
Ten or More *Symplocos* Collections in the GLGS Area

Abbreviation form	Original form
F	Forrest, George
Feng	Feng, K.M.
GLGS	(including 11 collecting activities with the same series of numbers) Dulong Jiang Investigation Team; Gaoligong Shan Expedition; Gaoligong Shan Biodiversity Survey: Li Heng, Bruce Bartholomew, & Dao Zhiling; Li Heng, Bruce Bartholomew, Philip Thomas, Peter Fritsch, Dao Zhiling, Wang Zhonglan & Li Rong; Li Heng, Dao Zhiling & Yin Liwei; Li Heng, Dao Zhiling & Yin Liwei; Li Heng, Dao Zhiling, Long Chunlin, Li Rong & Liu Yitao; Li Heng et al.; Li Heng, Guo Huijin, Li Zhengbo & Shi Xiaochun; Li Heng, Ji Yunheng & Li Rong
QX	Qinghai-Xizang Expedition
Rock	Rock, Joseph F. Charles
Tsai	Tsai, H.T.
Wang	Wang, C.W.
Wu	Wu, S.K.
Yü	Yü, T.T.

Appendix 2

List of Species

1. *Symplocos anomala* Brand
2. *Symplocos cochinchinensis* (Loureiro) S. Moore
3. *Symplocos dryophila* C.B. Clarke
4. *Symplocos glauca* (Thunberg) Koidzumi
5. *Symplocos glomerata* King ex C.B. Clarke
6. *Symplocos laurina* (Retzius) Wallich ex G. Don
7. *Symplocos oxyphylla* Wallich ex A. de Candolle
8. *Symplocos paniculata* (Thunberg) Miquel
9. *Symplocos pendula* Wight
10. *Symplocos racemosa* Roxburgh
11. *Symplocos ramosissima* Wallich ex G. Don
12. *Symplocos sulcata* Kurz
13. *Symplocos sumuntia* Buchanan-Hamilton ex D. Don
14. *Symplocos theifolia* D. Don
15. *Symplocos viridissima* Brand
16. *Symplocos xylopyrena* C.Y. Wu ex Y.F. Wu

Appendix 3

Index to Exsiccatae

All specimens examined by the authors are listed alphabetically by collector, followed by collection numbers (and herbarium if anonymous). Numbers in parentheses correspond to those in the numerical list of species.

I.A. Abbay: 16 (3).

Bijiang Expedition: 609 (3); 972 (3); 1187 (3); 1350 (3); 1761 (3); 1945 (3).

J. Chen: 239 (8); 684 (8); 735 (11).

Z.L. Dao et al: 9465 (3); 9473 (11); 9478 (8); 9481 (14).

X.F. Deng: 791352 (14).

F: 1037 (6); 1095 (6); 6797 (8); 7457 (8); 7883 (8); 8056 (6); 8064 (14); 8147 (3); 8241 (3); 8360 (13); 8991 (3); 9038 (14); 9330 (14); 9533 (14); 9842 (8); 11395 (14); 11909 (3); 12016 (14); 12056 (3); 12093 (3); 12301 (5); 12748 (8); 13654 (3); 13786 (14); 13880 (8); 13884 (8); 15027 (8); 15653 (3); 15654 (3); 15668 (3); 15713 (5); 15716 (11); 15739 (11); 15771 (3); 15814 (3); 15842 (6); 15844 (6); 15904 (11); 16007 (3); 16067 (3); 16083 (11); 17288 (14); 17491 (6); 17522 (6); 17606 (11); 17627 (3); 17628 (5); 17629 (11); 17655 (5); 17717 (3); 17741 (6); 17745 (6); 17780 (3); 17889 (11); 18031 (11); 18234 (10); 18297 (5); 18311 (3); 18480 (6); 21620 (3); 21798 (11); 24007 (5); 24013 (5); 24018 (3); 24023 (8); 24082 (5); 24180 (11); 24372 (11); 24401 (6); 24402 (11); 24589 (11); 24641 (4); 24678 (11); 24704 (6); 25073 (9); 25159 (11); 25189 (6); 25241 (4); 25359 (14); 25653 (11); 25665 (8); 25758 (9); 25889 (8); 26236 (13); 26241 (5); 26335 (3); 26377 (3); 26467 (3); 26574 (5); 26635 (3); 26842 (11); 27104 (11); 27202 (3); 27211 (3); 27307 (11); 27411 (3); 27436 (6); 29378 (13); 29454 (13); 29837 (3).

R.J. Farrer: 1564 (3); 1621 (3).

Feng: 7497 (5); 7911 (14); 8407 (14); 24148 (15); 24206 (15); 24211 (9); 24336 (3); 24406 (15); 24425 (3); 24567 (3); 54558 (3).

Fragrance Resources Expedition: 125 (8); 145 (8); 210 (8); 277 (8); 85118 (13); 85149 (13).

GLGS: 89 (3); 539 (15); 557 (15); 627 (16); 742 (3); 785 (3); 788 (15); 854 (15); 985 (5); 1095 (3); 1107 (3); 1393 (3); 1458 (15); 1504 (5); 1539 (5); 1554 (6); 1587 (14); 1758 (6); 1935 (5); 1943 (3); 1943 (6); 1949 (5); 1958 (6); 1994 (5); 2125 (5); 2144 (5); 2387 (15); 3056 (3); 3058 (15); 3061 (5); 3066 (3); 3068 (15); 3145 (3); 3167 (3); 3202 (6); 3204 (5); 3336 (6); 3409 (15); 3680 (5); 3845 (5); 3896 (5); 3950 (15); 4288 (5); 4290 (3); 4321 (5); 4329 (5); 4332 (6); 4345 (6); 4579 (3); 4584 (3); 4600 (3); 4635 (5); 4662 (5); 4779 (3); 4780 (3); 4781 (3); 4859 (11); 4865 (3); 4900 (5); 4941 (3); 4968 (3); 4990 (14); 5077 (5); 5203 (3); 5204 (3); 5205 (11); 5229 (3); 5235 (5); 5236 (3); 5257 (3); 5278 (5); 5357 (3); 5405 (3); 5467 (3); 5500 (3); 5703 (3); 5737 (14); 5919 (3); 6074 (3); 6111 (3); 6163 (5); 6293 (3); 6595 (5); 6658 (9); 6666 (5); 6720 (16); 6801 (5); 6802 (5); 6819 (5); 6840 (3); 6898 (11); 6911 (5); 6925 (14); 7024 (3); 7038 (3); 7049 (3); 7524 (5); 7590 (11); 7705 (5); 9309 (5); 9340 (11); 9387 (5); 9407 (11); 9509 (3); 9531 (3); 9778 (1); 10059 (3); 10888 (8); 11021 (14); 11260 (14); 11269 (14); 11369 (8); 11570B (6); 11829 (14); 11843 (3); 11972 (5); 11976 (5); 12255 (5); 12300 (3); 12307 (3); 12507 (3); 12916 (16); 12917 (5); 12949 (3); 13072 (11); 13161 (11); 13202 (6); 13283 (6); 13648 (11); 13886 (5); 14100 (12); 14135 (3); 14234 (14); 14444 (3); 14461 (3); 14473 (3); 14474 (3); 14669 (3); 14672 (5); 14689 (3); 14771 (5); 14775 (5); 14847 (14); 14849 (14); 14864 (5); 14874 (3); 14874 (14); 15208 (3); 16513 (14); 16521 (3); 16788 (14); 16902 (14); 17103 (3); 17271 (5); 17319 (11); 17558 (11); 17593 (6); 17725 (11); 17896 (11); 17937 (8); 17968 (6); 17971 (11); 17978 (6); 17984 (6); 18030 (6); 18365 (11); 18473 (11); 18520 (6); 18525 (6); 18577 (5); 18666 (6); 18694 (11); 18759 (5); 18780 (11); 18848A (11); 18964 (12); 19993 (3); 19996 (14); 20042 (14); 20080 (14); 20090 (3); 20150 (3); 20188 (14); 20241 (5); 20292 (3); 20368 (5); 20383 (3); 20460 (14); 20783 (15); 20878 (14); 21981 (3); 21999 (16); 22000 (15); 22611 (14); 22625 (5); 23052 (3); 23307 (3); 23726 (11); 23755 (11); 23759 (11); 23803 (11); 23808 (11); 23917 (10); 23935 (3); 24111 (5); 24299 (5); 24535 (3); 24616 (11); 24641 (11); 24734 (6); 24756 (6); 24929 (11); 25064 (5); 25070 (6); 25119 (11); 25162 (5); 25179 (11); 25212 (11); 25338 (11); 25373 (12); 25797 (14); 26053 (11); 26061 (11); 26543 (3); 26909 (3); 26910 (3); 26913 (3); 26918 (3); 27168 (3); 27193 (14); 27228 (3); 27278 (3); 27280 (3); 28310

- (14); 28431 (3); 28432 (3); 28470 (3); 28486 (3); 28487 (3); 28824 (11).
H.F. v. Handel-Mazzetti: 9461 (5); 9604 (11).
W.D. Kermode: 16694 (3); 17208 (3); 17282 (3).
F. Kingdon Ward: 16 (3).
Mg Kyaw: 50 (7).
Q. Lin: 770683 (14).
F. Ludlow: 13033 (8).
P. I. Mao: 429 (14); 560 (14).
Naw Mu Pa: 15505 (5).
Nujiang Expedition: 71 (3); 445 (5); 1814 (11); 7040 (11); 791252 (5); 7968 (5).
NW Yunnan expedition: 10034 (14).
R. C. Ching: 50247 (5).
QX: 1178 (14); 6981 (14); 7018 (3); 7079 (5); 7095 (5); 7456 (3); 7692 (3); 8093 (3); 8113 (11); 8168 (11); 8201 (5); 8207 (3); 8212 (5); 8267 (3); 8395 (14); 8426 (3); 8604 (14); 8644 (3); 8688 (11); 8777 (3); 8819 (5); 8822 (16); 8834 (15); 8920 (3); 8935 (3); 8940 (16); 9325 (5); 9358 (2); 9488 (5); 9497 (5); 9553 (3); 9607 (3); 9742 (9); 9744 (3); 9764 (14); 9785 (3); 73747 (6); 73774 (3); 73899 (8).
Rock: 7324 (10); 7393 (14); 7402 (3); 7608 (14); 7633 (14); 7669 (3); 7845 (10); 7987 (13); 10234 (14); 10246 (3); 22116 (3); 22118 (3).
C.K. Schneider: 2732 (14).
H. Sun et al.: 1372 (5); 1654 (5); 1655 (3); 1656 (3).
Tha Hla: 3955 (3).
Tsai: 54255 (14); 54376 (1); 54459 (1); 54470 (5); 54487 (3); 54529 (5); 54551 (10); 55714 (8); 55729 (8); 55775 (8); 55880 (5); 56561 (1); 56679 (10); 58706 (14); 58808 (5); 58843 (14); 58847 (5); 59127 (2).
Wang: 66613 (5); 66662 (5); 66890 (11); 67551 (14); 88262 (14); 89739 (3); 89818 (3); 89869 (6); 90011 (1); 90066 (1); 90118 (1); 90160 (1); 90165 (3); 90588 (5); 90703 (5).
Wu: 6692 (13); 6752 (3); 6762 (3); 6830 (8); 6893 (3); 7098 (3); 7123 (3); 8006 (3); 8020 (3); 8022 (11); 8105 (11); 8125 (3); 8217 (3); 8290 (11); 8363 (3); 8766 (5); 9040 (14); 9155 (5); 9241 (14); 9280 (5); 10013 (14); 24125 (3); 24558 (3).
D.Y. Xia: 7 (3); 74 (3); BG22 (5); 23 (5); 32 (11).
L.S. Xie: 817 (5); 877 (3).
S.X. Yang: 831 (8).
W.C. Yin: 1012 (8); 1227 (8); 601280 (6); 601296 (11); 601339 (5); 601340 (14); 601383 (1).
Yü: 19400 (3); 19904 (3); 19946 (16); 19994 (3); 20119 (14); 20862 (16); 20972 (14); 22104 (14); 22960 (14); 22961 (14); 24211 (9).
J.Z. Zhao: 59 (6).



Zhou, Lihua, Fritsch, Peter W, and Bartholomew, Bruce. 2006. "The Symplocaceae of Gaoligong Shan." *Proceedings of the California Academy of Sciences*, 4th series 57(12), 387–431.

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