

FAGACEAE

壳斗科 qiao dou ke

Huang Chengjiu (黄成就 Huang Ching-chieu)¹, Zhang Yongtian (张永田 Chang Yong-tian)²; Bruce Bartholomew³
Trees or rarely shrubs, monoecious, evergreen or deciduous. Stipules usually early deciduous. Leaves alternate, sometimes false-whorled in *Cyclobalanopsis*. Inflorescences unisexual or androgynous with female cupules at the base of an otherwise male inflorescence. Male inflorescences a pendulous head or erect or pendulous catkin, sometimes branched; flowers in dense cymes. Male flower: sepals 4–6(–9), scalelike, connate or distinct; petals absent; filaments filiform; anthers dorsifixed or versatile, opening by longitudinal slits; with or without a rudimentary pistil. Female inflorescences of 1–7 or more flowers subtended individually or collectively by a cupule formed from numerous fused bracts, arranged individually or in small groups along an axis or at base of an androgynous inflorescence or on a separate axis. Female flower: perianth 1–7 or more; pistil 1; ovary inferior, 3–6(–9)-loculed; style and carpels as many as locules; placentation axile; ovules 2 per locule. Fruit a nut. Seed usually solitary by abortion (but may be more than 1 in *Castanea*, *Castanopsis*, *Fagus*, and *Formanodendron*), without endosperm; embryo large.

Seven to 12 genera (depending on interpretation) and 900–1000 species: worldwide except for tropical and S Africa; seven genera and 294 species (163 endemic, at least three introduced) in China.

Many species are important timber trees. Nuts of *Fagus*, *Castanea*, and of most *Castanopsis* species are edible, and oil is extracted from nuts of *Fagus*. Nuts of most species of this family contain copious amounts of water soluble tannin. Members of the Fagaceae are the main element of both broad-leaved evergreen and mixed mesophytic forests from 500–3200 m.

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- 1a. Male inflorescences heads, pendulous; female flowers (1 or)2; germination epigeal 1. *Fagus*
1b. Male inflorescences elongated catkins, erect or pendulous; female flowers solitary or in spikes; germination hypogeal (epigeal in *Formanodendron*).
2a. Male inflorescences erect; anthers ca. 0.3 mm; stigma punctiform or a minute terminal pore.
3a. Leaves deciduous; ovary 6(–9)-loculed 2. *Castanea*
3b. Leaves evergreen; ovary 3(–6)-loculed.
4a. Cupules solitary on rachis, mostly bilaterally symmetric with abaxial and adaxial sides differing in shape and/or spines (\pm radially symmetric in *C. calathiformis*, *C. cerebrina*, *C. uraiana*, and *C. sclerophylla*) 3. *Castanopsis*
4b. Cupules in cymes on rachis (often some cupules abort but still evident at base of developed cupules, except in *L. fenzelianus*, radially symmetric 4. *Lithocarpus*
2b. Male inflorescences pendulous; anthers 0.5–1 mm; stigma capitate or dilated.
5a. Cupules splitting into 3–5 valves; nuts angular, winged 5. *Formanodendron*
5b. Cupules indehiscent; nuts circular in cross section, wingless.
6a. Bracts of cupule not united, arranged spirally 6. *Quercus*
6b. Bracts of cupule united, arranged in concentric rings 7. *Cyclobalanopsis*

1. FAGUS Linnaeus, Sp. Pl. 2: 997. 1753.

水青冈属 shui qing gang shu

Trees deciduous. Bark smooth. Winter buds elongated, reddish brown, apex acute. Leaves alternate, 2-ranked, plicate in bud; secondary veins \pm parallel. Male inflorescence in leaf axils toward base of branchlets, a lax pedunculate head; flowers many; perianth 4–7-lobed; stamens 8–16; rudimentary ovary pubescent. Female inflorescences in axils of leaves; flowers usually 2, subtended by a single (3-or)4-parted cupule and surrounded by numerous bracts; styles 3, recurved. Cupules woody, (3 or)4-valved; bracts leaflike or filiform to short, triangular. Nuts (1 or)2(or 3), ovoid to 3-sided. Germination epigeal; cotyledons plicate.

Ten species: N temperate regions; four species (three endemic) in China.

The status of *Fagus chienii* W. C. Cheng (Contr. Biol. Lab. Chin. Assoc. Advancem. Sci., Sect. Bot. 10: 70. 1935) is uncertain. It is only known from the type collection (Pingwu, Sichuan) and is similar to *F. lucida*, except for having longer recurved cupule bracts.

Important timber trees.

- 1a. Cupules covered with leaflike bracts; leaf blade secondary veins curving upward, fusing near margin 1. *F. engleriana*

¹ Herbarium, Department of Taxonomy, South China Institute of Botany, Chinese Academy of Sciences, Wushan, Guangzhou, Guangdong 510650, People's Republic of China.

² Herbarium, Laboratory of Phytotaxonomy, Fujian Institute of Subtropical Botany, Xiamen, Fujian 361006, People's Republic of China.

³ Botany Department, California Academy of Sciences, Golden Gate Park, San Francisco, California 94118-4599, U.S.A.

- 1b. Cupules covered with filiform and recurved or short, triangular bracts; leaf blade secondary veins ending in teeth.
 - 2a. Cupules 2–2.5 cm 2. *F. longipetiolata*
 - 2b. Cupules 0.7–1.5 cm.
 - 3a. Cupules 0.7–1 cm; leaf blade abaxially with glandular dots and tufts of hairs in axil; cupule bracts linear, recurved 3. *F. hayatae*
 - 3b. Cupules 1–1.5 cm; leaf blade abaxially without glandular dots and tufts of hairs but with silky pubescence on midvein; cupule bracts tuberculate, closely appressed 4. *F. lucida*

1. **Fagus engleriana** Seemen in Diels, Bot. Jahrb. Syst. 29: 285. 1900.

米心水青冈 mi xin shui qing gang

Fagus sylvatica Linnaeus var. *chinensis* Franchet.

Trees to 25 m tall. Petiole 0.5–1.5 cm, glabrous; leaf blade ovate, elliptic-ovate, or rarely oblong-ovate, 5–9(–11) cm, abaxially glaucescent and glabrous except for long silky hairs along veins, base broadly cuneate to sometimes rounded or subcordate, margin sinuate, apex shortly acuminate; secondary veins 9–14 on each side of midvein, curving upward, fusing near margin. Peduncle 2–7 cm. Cupule 1.5–1.8 cm; basal bracts greenish, leaflike, glabrous, veined; apical bracts brownish, filiform, hairy. Nuts slightly exserted, apex with 3 small wings. Fl. Apr–May, fr. Aug–Oct.

• Broad-leaved and mixed forest on mountain slopes; 1500–2500 m. Anhui, N Guangxi, S Guizhou, Henan, NW Hubei, Hunan, Shaanxi, E Sichuan, Yunnan, Zhejiang.

2. **Fagus longipetiolata** Seemen, Bot. Jahrb. Syst. 23(Beibl. 57): 56. 1897.

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Fagus bijiensis C. F. Wei & Y. T. Chang; *F. brevipetiolata* Hu; *F. clavata* Y. T. Chang; *F. longipes* (Oliver) H. Léveillé; *F. longipetiolata* f. *clavata* (Y. T. Chang) Y. T. Chang; *F. sylvatica* Linnaeus var. *bracteolis* Oliver; *F. sylvatica* var. *longipes* Oliver; *F. tientaiensis* Liou.

Trees to 25 m tall. Winter buds to 2 cm. Petiole 1–3.5 cm; leaf blade ovate to ovate-oblong, 9–15 cm, abaxially finely densely pubescent and glaucescent, base broadly cuneate to nearly rounded, margin remotely serrate, apex acute to acuminate; secondary veins 9–15 on each side of midvein, ending in teeth. Peduncle 1–10 cm. Cupule 2–2.5 cm; bracts linear, recurved, pubescent, apical ones to 7 mm but basally shorter. Nut as long or slightly shorter than cupule, with narrowed wings near apex. Fl. Apr–May, fr. Aug–Oct.

Broad-leaved evergreen and mixed mesophytic forests on mountain slopes; 300–2400 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Shaanxi, Sichuan, Yunnan, Zhejiang [Vietnam].

3. **Fagus hayatae** Palibin in Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 286. 1911.

台湾水青冈 tai wan shui qing gang

Fagus hayatae var. *zhejiangensis* M. C. Liu & M. H. Wu ex Y. T. Chang & C. C. Huang; *F. pashanica* C. C. Yang.

Trees to 20 m tall. Winter buds to 1.5 cm. Leaf blade rhomboid-ovate, 3–7 cm, covered with silky pubescence when young, glabrescent except for glandular dots and tufts of hair on midvein and abaxially on axils of secondary veins, base broadly cuneate to nearly rounded, apex acute to shortly acuminate; veins blackish when dry; midvein flexuous toward apex; secondary veins 5–9 on each side of midvein, ending in teeth. Peduncle 0.5–2 cm, pilose. Cupule 7–10 mm; bracts linear, recurved, 1–3 mm, pilose. Nut as long as cupule, with very small wings near apex. Fl. Apr–May, fr. Aug–Oct.

• Mountain ridges and summits in deciduous forests; 1300–2300 m. Hubei, Hunan, Shaanxi, Sichuan, N Taiwan, Zhejiang.

Occurs in three disjunct areas; the plants from each area are slightly different and have been treated as taxonomically distinct.

4. **Fagus lucida** Rehder & E. H. Wilson in Sargent, Pl. Wilson. 3: 191. 1916.

光叶水青冈 guang ye shui qing gang

Fagus lucida var. *opienica* Y. T. Chang; *F. nayonica* Y. T. Chang.

Trees to 25 m tall. Winter buds ca. 1.5 cm. Petiole 0.6–2 cm; leaf blade ovate to elliptic-ovate, 5–11 cm, lustrous green and glabrous except for silky pubescence abaxially on midvein, base broadly cuneate to rounded, margin slightly sinuate, apex acute to shortly acuminate; secondary veins 8–12 on each side of midvein, ending in minute teeth. Peduncle 0.5–1.5 cm, glabrous. Cupule 1–1.5 cm; bracts tuberculate, closely appressed, triangular mucronate, 1–2 mm, rarely apical ones slightly ascending. Nut slightly exserted, with minute or hardly evident wings near apex. Fl. Apr–May, fr. Sep–Oct.

• Mixed mesophytic forests on mountain slopes; 800–2000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Zhejiang.

2. CASTANEA Miller, Gard. Dict., Abr. ed. 4, 1: [278]. 1754.

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Trees or rarely shrubs, deciduous. Bark furrowed. Axillary buds of most apical leaves in false-terminal buds, usually enclosed by 2 outer scales, imbricate within. Leaves spirally arranged but twisted and appearing 2-ranked; secondary

veins \pm parallel. Male inflorescences erect catkins; flowers in clusters of 1–3(–5) with each cluster subtended by a bract; perianth 6-parted; stamens 10–12(–20); rudimentary pistil pubescent. Female flowers borne on proximal part of androgynous inflorescences, rarely on a separate inflorescence, usually 3 and subtended by 1 symmetric cupule; ovary 6–9-loculed; styles 6–9; stigmas terminal, minutely punctiform. Cupules splitting into 2–4 valves; bracts spinelike. Nuts 1–3 per cupule. Germination hypogeal.

About 12 species: Asia, Europe, North America; four species (two endemic, one introduced) in China.

Most species are cultivated for edible nuts and durable wood.

- 1a. Nut 1 per cupule, usually longer than wide 4. *C. henryi*
 1b. Nuts usually 2 or 3 per cupule, usually shorter than wide.
 2a. Leaf blade abaxially often without scalelike glands but at least when young densely covered with tomentose or stellate hairs 1. *C. mollissima*
 2b. Leaf blade abaxially covered with scalelike glands.
 3a. Leaf blade glabrous or abaxially sparsely pubescent along veins 2. *C. seguinii*
 3b. Leaf blade abaxially tomentose 3. *C. crenata*

1. *Castanea mollissima* Blume, Mus. Bot. 1: 286. 1850.

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Castanea bungeana Blume; *C. duclouxii* Dode; *C. fargesii* Dode; *C. formosana* (Hayata) Hayata; *C. hupehensis* Dode; *C. mollissima* var. *pendula* X. Y. Zhou & Z. D. Zhou; *C. sativa* Miller var. *formosana* Hayata; *C. sativa* var. *mollissima* (Blume) Pampanini; *C. vulgaris* Lamarck var. *yunnanensis* Franchet.

Trees to 20 m tall. Branchlets with short pubescence, often also with long spreading hairs. Petiole 1–2 cm; leaf blade elliptic-oblong to oblong-lanceolate, 10–17 cm or rarely shorter, at least along veins abaxially tomentose to softly pubescent, adaxially scalelike glands sometimes absent, base rounded to truncate, margin coarsely serrate, apex acute to acuminate. Male inflorescences 10–20 cm. Cupule densely covered with pubescent spinelike bracts. Nuts usually 2 or 3 per cupule, 2–3 cm in diam. or rarely narrower. Fl. Apr–Jun, fr. Aug–Oct.

Cultivated or wild particularly on mountain slopes; near sea level to 2800 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Nei Mongol, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Korea].

Extensively cultivated for its edible nuts. Most collections are impossible to determine if they are cultivated, escaped, or native.

2. *Castanea seguinii* Dode, Bull. Soc. Dendrol. France 8: 152. 1908.

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Castanea davidii Dode.

Trees or shrubs small, rarely to 12 m tall. Stipules narrowly lanceolate, 0.7–1.5 cm, deciduous in fruit. Petiole 0.5–1.5 cm; leaf blade oblong-obovate to elliptic-oblong, 6–14 cm, abaxially covered with yellowish brown or grayish, scalelike glands and sparsely hairy along veins when young, base rounded to sometimes subcordate but cuneate when young, margin coarsely serrate, apex acuminate. Male inflorescences 5–12 cm. Female flowers solitary or few per cupule. Cupule 3–5 cm in diam., covered with sparsely pilose spinelike bracts 6–10 mm. Nuts 2 or 3 or rarely more per cupule, 1.5–2 cm in diam. Fl. May–Jul, fr. Sep–Nov.

• Mixed mesophytic forests, thickets, and in orchards; 400–2000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Shanxi, Sichuan, Yunnan, Zhejiang. Cultivated for its edible nuts but not as extensively as *Castanea mollissima*.

3. *Castanea crenata* Siebold & Zuccarini, Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 4: 224. 1846.

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Castanea japonica Blume; *C. stricta* Siebold & Zuccarini.

Trees or shrubs to 15 m tall. Petiole 0.5–2.5 cm; leaf blade oblong-lanceolate, 8–19 cm, abaxially tomentose and covered with yellowish brown to yellowish gray scalelike glands, base broadly cuneate, rounded, or rarely subcordate, margin finely serrate, apex acuminate to acute; secondary veins ending on teeth and often reduced to long bristlelike points. Male inflorescences 7–20 cm. Female flowers 3 per cupule. Cupule 5–6 cm in diam., covered with spinelike bracts 1–1.5 cm. Nuts 2 or 3 or rarely more per cupule, 2–3 cm in diam., apex sparsely covered with appressed pubescence. Fl. Apr–Jun, fr. Sep–Oct.

Cultivated. Jiangxi (Lu Shan), Liaoning, Shandong (Qingdao Shi), Taiwan [native to Japan, S Korea].

Castanea crenata was introduced from Korea about 1910; var. *dulcis* Nakai has been reported from NE China, but probably only var. *crenata* is grown.

4. *Castanea henryi* (Skan) Rehder & E. H. Wilson in Sargent, Pl. Wilson. 3: 196. 1916.

锥栗 zhui li

Castanopsis henryi Skan in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 523. 1899; *Castanea sativa* Miller var. *acuminatissima* Seemen; *C. vilmoriniana* Dode. Trees to 30 m tall. Petiole 1–2.5 cm; leaf blade oblong-ovate, oblong-lanceolate, or lanceolate, 10–23 cm, abaxially covered with yellowish brown scalelike glands and sparsely pilose along veins when young, glabrescent, base rounded to broadly cuneate but

narrowly cuneate when young, margin with bristlelike teeth 2–4 mm, apex long acuminate. Male inflorescences 5–16 cm. Female flowers 1(–3) per cupule. Cupules on a short spike, 2.5–3.5 cm in diam. including bracts, covered with slightly pubescent spinelike bracts. Nut 1 per cupule, globose-ovoid, 1.5–2 cm, longer than wide. Fl. May–Jul, fr. Sep–Oct.

• Mixed mesophytic forests on mountain slopes; 100–1800 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Yunnan, Zhejiang.
Castanea henryi var. *omeiensis* W. P. Fang (Acta Phytotax. Sin. 9: 307. 1964) has stellate tomentose hairs on the young leaf blades and 1–3 nuts per cupule, and is probably not a variety of *C. henryi* but rather a hybrid between *C. henryi* and *C. mollissima*.

3. CASTANOPSIS (D. Don) Spach, Hist. Nat. Vég. 11: 142, 185. 1841, nom. cons.

锥属 zhui shu

Quercus Linnaeus [unranked] *Castanopsis* D. Don, Prodr. Fl. Nepal. 56. 1825; *Limlia* Masamune & Tomiya; *Pasaniopsis* Kudo; *Shiia* Makino.

Trees evergreen. Winter buds ovoid to ellipsoid, with decussate scales. Stipules extrapetiolar. Leaves alternate, distichous, or for a few species spirally arranged. Inflorescences usually unisexual, erect, spicate or paniculate. Male flowers in fascicles of 3–7, rarely solitary and scattered; perianth 5- or 6(–8)-lobed; stamens (8 or)9–12; rudimentary pistil very small, densely covered with curved woolly hairs. Female flowers solitary or in clusters of 3–5(–7) per cupule; staminodes when present opposite perianth lobes; ovary 3-loculed; styles (2 or)3(or 4); stigmas punctiform or shallow terminal pores. Cupules solitary on rachis, actinomorphic or zygomorphic, rarely indehiscent, completely or partially enclosing nut; bracts sparsely to densely covering outside of cupule, spinelike or rarely scalelike or tubercles (cupule measurement always includes bracts). Nuts 1–3 per cupule, maturing after 2nd year or rarely in 1st year; abortive ovule apical. Germination hypogeal; cotyledons slightly convex, rarely cerebriform rugose.

About 120 species: tropical and subtropical Asia; 58 species (30 endemic) in China.

Most species are used for timber, and the nuts of many are edible.

- 1a. Cupules each with 2 or 3(–7) female flowers at anthesis (occasionally on a given inflorescence a cupule can be found with only 1 flower); mature cupules with (1 or)2 or 3 nuts.
 - 2a. Cupule bracts 1–2 cm; leaf blade midvein adaxially slightly raised.
 - 3a. First-year branchlets and leaf blades densely pilose; leaf blade secondary veins 16–22 on each side of midvein 49. *C. tessellata*
 - 3b. First-year branchlets and leaf blades with scalelike trichomes; leaf blade secondary veins 10–17 on each side of midvein.
 - 4a. Leaf blade margin serrate; secondary veins 10–13 on each side of midvein 47. *C. xichouensis*
 - 4b. Leaf blade margin entire; secondary veins 14–17 on each side of midvein 48. *C. rockii*
 - 2b. Cupule bracts less than 1 cm (to 1.5 cm in *C. lamontii*); leaf blade midvein adaxially impressed or flat.
 - 5a. First-year branchlets and leaf blades abaxially at least adjacent to midvein pilose or villous.
 - 6a. Leaf blade 16–30 × 5–8 cm; secondary veins 16–22 on each side of midvein 50. *C. kweichowensis*
 - 6b. Leaf blade 10–18 × 2–5 cm; secondary veins 13–17 51. *C. ceratacantha*
 - 5b. First-year branchlets and leaf blades glabrous or apex of young branchlets and midvein of young leaf blades abaxially with sparse coarse hairs.
 - 7a. Nuts glabrous or with sparse short hairs only around scar when young 52. *C. fabri*
 - 7b. Nuts covered with appressed hairs.
 - 8a. Leaf blade apex mucronate or caudate.
 - 9a. Leaf blade apex mucronate; cupule bracts transversely united to discontinuous cristate rings 55. *C. crassifolia*
 - 9b. Leaf blade apex caudate and bent; cupule bracts in bundles 56. *C. chunii*
 - 8b. Leaf blade apex acute to acuminate.
 - 10a. Petiole 1.5–3 cm 54. *C. lamontii*
 - 10b. Petiole 0.8–1.5 cm.
 - 11a. First-year leaf blades glabrous 57. *C. orthacantha*
 - 11b. First-year leaf blades abaxially covered with reddish brown to yellowish brown slightly loose waxy scalelike trichomes.
 - 12a. Leaf blade secondary veins 13–19 on each side of midvein 53. *C. wattii*
 - 12b. Leaf blade secondary veins 9–13 on each side of midvein 58. *C. platyacantha*

- 1b. Cupules each with 1 female flower at anthesis (on a given inflorescence occasionally a cupule can be found with up to 3 flowers); mature cupules with 1(–3) nut.
- 13a. Cupule bracts scalelike or only bract base transversely adnate to rib rings; nuts maturing and falling in 1st year but empty cupules persisting on rachis; shoot leaves spirally arranged (distichous in *C. uraiana*).
- 14a. Cotyledons cerebriform rugose; young leaf blades glaucous, covered with brown to reddish brown waxy scalelike trichomes.
- 15a. Base of cupules shortly stipitate; branchlets pubescent 3. *C. cerebrina*
- 15b. Base of cupules sessile; branchlets glabrous.
- 16a. Cupules cupular, enclosing 1/2–2/3 of nut; nut 0.3–0.6 cm in diam. 1. *C. calathiformis*
- 16b. Cupules ellipsoid to ovoid, completely or almost completely enclosing nut; nut 1.1–1.6 cm in diam. 2. *C. fissa*
- 14b. Cotyledons plano-convex; young leaf blades not glaucous, without or only abaxially with ± adherent waxy scalelike trichomes.
- 17a. Cupules globose to subglobose, completely or almost completely enclosing nut; nut scar 7–9 mm in diam. 6. *C. sclerophylla*
- 17b. Cupules shallowly cupular, rarely enclosing more than 1/4–1/3 of nut; nut scar 4–6 mm in diam.
- 18a. Leaf blade base inaequilateral; fruit maturing on previous year's branches 4. *C. uraiana*
- 18b. Leaf blade base attenuate; fruit maturing on current year's branches 5. *C. longzhouica*
- 13b. Cupule bracts spiny or rarely tubercular; nuts maturing and falling in 2nd year, cupules falling with nut; shoot leaves usually distichous.
- 19a. Cupule outside wall completely covered by spinelike bracts.
- 20a. Leaf blade margin serrate.
- 21a. First-year branchlets, petioles, and leaf blades abaxially glabrous or sparsely pubescent.
- 22a. Leaf blade margin shallowly serrate from middle to apex; secondary veins usually not reaching margin; petiole rarely longer than 1 cm 8. *C. hystrix*
- 22b. Leaf blade margin serrate from near base to apex; secondary veins reaching margin; petiole 1–3 cm.
- 23a. Leaf blade usually narrower than 5 cm; young leaf blades abaxially covered with sometimes early glabrescent brownish powdery waxy scalelike trichomes; cupules 2.5–4 cm in diam. 17. *C. choboensis*
- 23b. Leaf blade 5–10 cm wide; young leaf blades abaxially thinly covered with reddish brown to yellowish brown waxy scalelike trichomes; cupules 6–8 cm in diam. 13. *C. tibetana*
- 21b. First-year branchlets, petioles, and leaf blades abaxially puberulent.
- 24a. Transverse section of cupule bracts triangular or trapeziform 16. *C. clarkei*
- 24b. Transverse section of cupule bracts circular.
- 25a. Leaf blade secondary veins 15–25 on each side of midvein, reticulate veins abaxially conspicuous; petiole usually less than 1 cm 14. *C. indica*
- 25b. Leaf blade secondary veins 10–15 on each side of midvein, reticulate veins abaxially very slender and evident to inconspicuous; petiole 1–1.8 cm 15. *C. hainanensis*
- 20b. Leaf blade margin entire or rarely a few leaves shallowly serrate toward leaf blade apex.
- 26a. Branches and leaf blades glabrous or leaves abaxially with membranous scalelike trichomes.
- 27a. Cupules 6–8 cm in diam., wall ca. 3 mm thick; bracts 2–3 cm; nuts oblate, puberulent, scar covering 1/3 of nut 7. *C. kawakamii*
- 27b. Cupules 2–3 cm in diam., wall ca. 1 mm thick; bracts 0.4–1 cm; nuts broadly conical, glabrous, scar covering only basal part of nut 34. *C. eyrei*
- 26b. Branches and leaf blades hairy (at least on 1st-year branchlets and abaxial midvein) or leaf blades abaxially covered with waxy scalelike trichomes.
- 28a. Leaf blade base cordate, shallowly auriculate, or rarely rounded; petiole 1–3(–5) mm 12. *C. fordii*
- 28b. Leaf blade base not cordate or auriculate but may be rounded; petiole (4–)8–20 mm.
- 29a. Leaf blade 4–10 cm.
- 30a. Infructescences ca. 15 cm; cupules 2.5–4 cm in diam., bracts 0.6–1 cm 8. *C. hystrix*
- 30b. Infructescences 4–8 cm; cupules 5–6 cm in diam., bracts 1–2 cm 9. *C. concinna*
- 29b. Leaf blade 10–25 cm.

- 31a. Petiole 1–2 cm; leaf blade 15–25 cm, midvein adaxially usually impressed, secondary veins 12–16 on each side of midvein; nuts oblate, 1.5–2 cm in diam., scar covering ca. 1/3 of nut 10. *C. mekongensis*
- 31b. Petiole 0.8–1 cm; leaf blade 10–15 cm, midvein adaxially raised, secondary veins 9–12 on each side of midvein; nuts broadly conical, 2–3.5 cm in diam., scar covering only basal part of nut 11. *C. globigemmata*
- 19b. Cupule outside wall visible (if spinelike bracts completely cover wall then spines transversely adnate to cristate rings)
- 32a. Scar covering basal 2/3 or more of nut.
- 33a. Rachis of infructescences covered with pale grayish brown, feltlike, short hairs, glabrescent; cupule bracts 2–6 mm 19. *C. argyrophylla*
- 33b. Rachis of infructescences glabrous or very shortly and sparsely mealy puberulent; cupule bracts 7–12 mm 20. *C. tcheponensis*
- 32b. Scar at base or covering only basal 1/3 of nut.
- 34a. Mature nuts with appressed hairs.
- 35a. Rachis of infructescences 5–8 mm thick and leaf blade margin entire.
- 36a. Cupules 2–2.5 cm in diam.; petiole 0.3–0.6 cm; leaf blade margin subconvolute 23. *C. damingshanensis*
- 36b. Cupules 2.5–4.5 cm in diam.; petiole 1–3 cm; leaf blade margin not subconvolute.
- 37a. Leaf blade 26–45 cm, young leaf blades abaxially with slender stellate hairs along midvein; secondary veins 16–20 or more on each side of midvein; petiole 2–3 cm 21. *C. megaphylla*
- 37b. Leaf blade 8–15 cm, young leaf blades abaxially covered with yellowish brown tightly adnate layers of waxy scalelike trichomes; secondary veins 10–13 on each side of midvein; petiole 1–2 cm 22. *C. nigrescens*
- 35b. Rachis of infructescences less than 5 mm thick but if 5 mm thick then leaf blade margin with short and sharp serrations.
- 38a. Petiole 2.5–3.5 cm; young leaf blades abaxially sometimes with slender stellate hairs 24. *C. jianfenglingensis*
- 38b. Petiole rarely to 2.5 cm; young leaf blades abaxially without stellate hairs.
- 39a. Leaf blade secondary veins and midvein adaxially slightly raised; cupules 3–3.5 cm in diam. 25. *C. remotidenticulata*
- 39b. Leaf blade secondary veins and sometimes midvein adaxially impressed; cupules 1.5–3 cm in diam.
- 40a. Leaf blade margin mostly entire.
- 41a. Leaf blade lanceolate, 1.5–4 cm wide, apex caudate to sometimes shortly acute, secondary veins 9–13 on each side of midvein; nuts densely pilose 26. *C. tonkinensis*
- 41b. Leaf blade ovate-elliptic, ovate, or oblong, 4–6 cm wide, apex acuminate, secondary veins 13–17 on each side of midvein; nuts puberulent 28. *C. boisii*
- 40b. Leaf blade margin serrate but some leaves on same plant may be entire.
- 42a. First-year leaf blades concolorous or adaxially darker green and abaxially greenish 29. *C. densispinosa*
- 42b. First-year leaf blades not concolorous.
- 43a. Cupules ca. 3 cm in diam.; leaf blade midvein adaxially usually slightly raised at base 32. *C. oblonga*
- 43b. Cupules 1.5–2 cm in diam.; leaf blade midvein adaxially impressed.

- 44a. Petiole usually shorter than 1 cm; leaf blade abaxially covered with slightly adherent waxy scalelike trichomes 30. *C. ledongensis*
- 44b. Petiole ca. 1.5 cm; leaf blade abaxially covered with early glabrescent waxy scalelike trichomes 31. *C. subuliformis*
- 34b. Mature nuts glabrous or glabrescent, or sparsely covered with appressed hairs only near apex, or rarely puberulent.
- 45a. Cupules 0.7–2(–2.2) cm in diam.; bracts 1–6 mm.
- 46a. Leaf blade margin predominantly entire but sometimes shallowly serrate at apex.
- 47a. First-year leaf blades abaxially greenish; cupules 0.7–1.1 cm in diam.; leaf blade secondary veins 7–10 on each side of midvein 40. *C. fleuryi*
- 47b. First-year leaf blades abaxially red-brown; cupules 1.2–2.2 cm in diam.; leaf blade secondary veins 11–18 on each side of midvein.
- 48a. Petiole shorter than 1 cm; leaf blade secondary veins 14–18 on each side of midvein; leaf blades abaxially and infructescence rachises densely covered with early glabrescent powdery waxy scalelike trichomes 41. *C. rufotomentosa*
- 48b. Petiole 1–1.5 cm; leaf blade secondary veins 11–14 on each side of midvein; leaf blades abaxially and infructescence rachises pubescent, covered with slightly adherent waxy scalelike trichomes 42. *C. tribuloides*
- 46b. Leaf blade margin predominantly serrate but sometimes entire.
- 49a. First-year leaf blades abaxially with a thin greenish layer of adnate scalelike trichomes when young, concolorous with age 43. *C. wenchangensis*
- 49b. First-year leaf blades abaxially covered with reddish brown to yellowish brown waxy scalelike trichomes, remaining distinctly different in color from adaxial surface with age.
- 50a. Leaf blade apex acute to rounded; midvein adaxially slightly raised; leaf blade widest usually from middle to apex 44. *C. delavayi*
- 50b. Leaf blade apex acuminate to caudate; midvein adaxially impressed when dry (flat when fresh); leaf blade widest from base to middle.
- 51a. Petiole base not pillow-shaped; mature cupules rarely splitting; nut scar 8–9 mm in diam. 45. *C. echinocarpa*
- 51b. Petiole base pillow-shaped; mature cupules splitting at apex; nut scar ca. 5 mm in diam. 46. *C. carlesii*
- 45b. Cupules 2–3.5 cm in diam.; bracts 4–15 mm.
- 52a. Leaf blade midvein adaxially raised at least from base to middle of blade.
- 53a. Petiole 1.5–2 cm; rachis of infructescences pubescent; mature cupules and bracts glabrescent 33. *C. chinensis*
- 53b. Petiole 0.7–1.2 cm; rachis of infructescences glabrous; mature cupules and bracts pubescent.
- 54a. Bracts usually not in bundles; nuts broadly conical 34. *C. eyrei*
- 54b. Bracts usually in bundles; nuts subglobose but apex pointed 35. *C. ferox*
- 52b. Leaf blade midvein adaxially flat to impressed.
- 55a. Leaf blade margin predominantly serrate.
- 56a. Cupule splitting irregularly 36. *C. fargesii*
- 56b. Cupule splitting regularly.
- 57a. Leaf blade 4–8 cm wide; bud scales and 1st-year branchlets covered with reddish brown slightly loose waxy scalelike trichomes; petiole 1–2.5 cm; cupules 2.5–3.5 cm in diam. 38. *C. jucunda*
- 57b. Leaf blade 1.5–3.5 cm wide; bud scales and 1st-year branchlets glabrous or covered with early glabrescent waxy scalelike trichomes; petiole 0.3–0.7 cm; cupules 2–2.2 cm in diam. 39. *C. hupehensis*
- 55b. Leaf blade margin predominantly entire.
- 58a. Leaf blade apex caudate 27. *C. amabilis*
- 58b. Leaf blade apex acute to acuminate.
- 59a. Petiole 2–2.5 cm; leaf blade elliptic to obovate-elliptic; cupule bracts 0.4–0.8 cm 37. *C. ouonbiensis*

59b. Petiole 1–2 cm; leaf blade oblong, obovate-oblong, lanceolate, or rarely ovate; cupule bracts 0.8–1.5 cm.

60a. Young shoots tufted puberulent; leaf blade abaxially stellate cespitose along midvein;

cupule bracts 1.3–1.5 cm; nuts ellipsoid 18. *C. longispina*

60b. Young shoots from middle to apex with scalelike trichomes; leaf blade abaxially with a

thick and mealy layer of scalelike trichomes; cupule bracts 0.8–1 cm; nuts conical to

subglobose 36. *C. fargesii*

1. *Castanopsis calathiformis* (Skan) Rehder & E. H. Wilson in Sargent, Pl. Wilson. 3: 204. 1916.

縑丝锥 bao si zhui

Quercus calathiformis Skan in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 508. 1899; *Lithocarpus calathiformis* (Skan) A. Camus; *Pasania calathiformis* (Skan) Hickel & A. Camus; *Synaedrys calathiformis* (Skan) Koidzumi.

Trees 5–10(–20) m tall. First-year branchlets black, dark black-brown, or dusky when dry, glabrous. Leaves spirally arranged, yellowish brown to gray; petiole 1–2.5 cm; leaf blade oblong to obovate-elliptic, very variable in size, often 15–25 × 5–9 cm, thickly papery, covered with brown-red slightly adnate small lamellate waxy scalelike trichomes when young, base cuneate, margin from base to middle undulate and crenate, apex acute, acuminate, or rounded; midvein adaxially raised; secondary veins 20–28 on each side of midvein or rarely fewer. Female inflorescences usually borne more toward apex of branches and if axillary then solitary, 8–16 cm. Infructescences 10–20 cm. Cupules yellowish brown to dark grayish brown when dry, cupular, 0.8–1.2 cm in diam., wall ca. 1 cm thick; bracts scalelike, triangular, annular or sometimes imbricate when young, thickened with age, adnate, arranged in 4–7 rib rings, waxy. Nut ovoid to ellipsoid, 1–1.5 cm × 3–6 mm, apically brown-red tomentose; scar basal, 3–6 mm in diam. Fl. Mar–May, fr. Oct–Dec.

Mixed and broad-leaved evergreen forests; 700–2200 m. SE Xizang, S Yunnan [Laos, Myanmar, N Thailand, N Vietnam].

Castanopsis calathiformis, *C. cerebrina*, *C. fissa*, *C. longzhouica*, *C. sclerophylla*, and *C. uraiana* form a group of related species with 1 flower per cupule, and cupule bracts reduced to scales. The first two species are also united by having plicate cotyledons, and the latter three by having flat-convex cotyledons.

2. *Castanopsis fissa* (Champion ex Benth) Rehder & E. H. Wilson in Sargent, Pl. Wilson. 3: 203. 1916.

縑蒴锥 li shuo zhui

Quercus fissa Champion ex Benth, Hooker's J. Bot. Kew Gard. Misc. 6: 114. 1854; *Castanopsis fissoides* Chun & C. C. Huang ex Luong; *C. tunkinensis* (Drake) Barnett (1944), not *C. tonkinensis* Seemen (1897); *Lithocarpus fissus* (Champion ex Benth) A. Camus; *Pasania fissa* (Champion ex Benth) Oersted; *Q. tunkinensis* Drake; *Shiia fissa* (Champion ex Benth) Kudo; *Synaedrys fissa* (Champion ex Benth) Koidzumi.

Trees; bud scales, shoot apexes, and young leaf blades abaxially yellowish brown puberulent and covered with rust-colored, small, lamellate, slightly adnate, waxy scalelike trichomes. Branchlets red-purple, prominently angular. Leaves spirally arranged, yellowish brown to gray; petiole 1–2.5 cm; leaf blade oblong to obovate-elliptic, very variable in sizes, often 15–25 × 5–9 cm, thickly papery, base cuneate, margin from base to middle undulate and crenate, apex acute, acuminate, or rounded; midvein raised adaxially; secondary veins 20–28 on each side of midvein or rarely fewer.

Infructescence 8–18 cm; rachis glabrous. Cupule 1–1.5 cm in diameter, irregularly 2- or 3(or 4)-valved with valves often curled, covered with dark reddish brown mealy waxy scalelike trichomes, apex slightly cuspidate, wall 0.5–1 mm thick; bracts scalelike, triangular to squarish, imbricate when young but mostly united and in ring ribs with age. Nut globose to elliptic, 1.3–1.8 × 1.1–1.6 cm, apically brown-red tomentose; scar basal, 4–7 mm in diam. Fl. Apr–Jun, fr. Oct–Dec.

Broad-leaved evergreen forests; below 1600 m. S Fujian, Guangdong, Guangxi, S Guizhou, Hainan, S Hunan, S Jiangxi, SE Yunnan [N Thailand, N Vietnam].

Cupule shape of this species ranges from ellipsoid to ovoid and correlates with the distribution. Ellipsoid cupules occur in Fujian, E Guangdong, Jiangxi, and Hunan, while ovoid cupules occur in more western regions such as SE Yunnan and neighboring regions, including W Hainan and NE Vietnam.

3. *Castanopsis cerebrina* (Hickel & A. Camus) Barnett, Trans. & Proc. Bot. Soc. Edinburgh 34: 183. 1944.

毛叶杯锥 mao ye bei zhui

Pasania cerebrina Hickel & A. Camus, Ann. Sci. Nat., Bot., sér. 10, 3: 408. 1921; *Lithocarpus cerebrinus* (Hickel & A. Camus) A. Camus.

Trees; young branchlets and leaf blades reddish brown, densely puberulent with simple and stellate hairs and covered with slightly loose, small, lamellate, waxy scalelike trichomes. Branchlets red-purple, prominently angular. Leaves spirally arranged, yellowish brown to gray; petiole 1–2.5 cm; leaf blade oblong to obovate-elliptic, often 15–25 × 5–9 cm, thickly papery, base cuneate, margin from base to middle undulate and crenate, apex acute, acuminate, or rounded; midvein adaxially raised; secondary veins 20–28 on each side of midvein or rarely fewer. Rachis of female inflorescences sparsely puberulent and covered with

waxy scalelike trichomes. Cupule cupular, 1.8–2.2 × 1.5–2.5 cm, base stipitate, stipe 5–8 mm, wall 0.5–1 mm thick; bracts mound-shaped, arranged in disconnected rings, sparsely puberulent, covered with waxy scalelike trichomes. Nut narrowly conical, 2–2.5 × 1.4–2.2 cm, tomentulose, apex sometimes 3-angled; scar 0.8–1.2 cm in diam. Fl. Apr, fr. Oct.

Broad-leaved evergreen forests; 200–700 m. SE Yunnan [N Thailand, N Vietnam].

4. *Castanopsis uraiana* (Hayata) Kanehira & Hatusima, Trans. Nat. Hist. Soc. Taiwan 29: 155. 1939.

淋漓锥 lin li zhui

Quercus uraiana Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 299. 1911; *Limlia uraiana* (Hayata) Masamune & Tomiya; *Lithocarpus uraiana* (Hayata) Hayata; *Pasania uraiana* (Hayata) Schottky; *Q. paohangii* Chun & Tsiang; *Q. randaiensis* Hayata; *Shiia uraiana* (Hayata) Kanehira & Hatusima; *Synaedrys uraiana* (Hayata) Koidzumi.

Trees. Young shoots often sparsely puberulent and with small, lamellate, waxy scalelike trichomes or glabrous, sparsely lenticellate. Leaves distichous; petiole 0.7–1.5 cm; leaf blade ovate-elliptic, ovate, lanceolate, or sometimes obovate, 7–13 × 2–3 cm, papery, abaxially covered with brown to reddish brown, tight, waxy scalelike trichomes when young but grayish brown to nearly concolorous with age, base attenuate and inaequilateral, margin apically sparsely serrate or entire, apex slightly pointed, acute, or caudate and often bent to 1 side; midvein adaxially flat to slightly impressed or from middle to apex slightly raised; secondary veins 7–12 on each side of midvein, very slender, evident. Infructescences 5–10 cm; rachis ca. 2 mm thick, sparsely gray lenticellate. Cupule shallowly cupular, 5–6 × 7–12 mm, enclosing 1/4–1/3 of nut, wall less than 1 mm thick; bracts reduced to scales, triangular to ovate, adnate, imbricate, dusky puberulent. Nut 1 per cupule, broadly conical, 0.7–1.5 cm; scar basal, 5–6 mm in diam. Fl. Mar–May, fr. Sep–Oct of following year.

• Broad-leaved evergreen forests; 400–1500 m. Fujian, E to N Guangdong, NE Guangxi, S Hunan, S Jiangxi, Taiwan.

5. *Castanopsis longzhouica* C. C. Huang & Y. T. Chang, Guihaia 5: 186. 1985.

龙州锥 long zhou zhui

Trees; branchlets, leaf blades, and infructescences glabrous. Young shoots grayish, sparsely lenticellate; lenticels grayish, slightly raised. Petiole 1–1.5 cm; leaf blade elliptic, ovate-elliptic, or sometimes obovate, 8–10 cm, firmly papery, slightly brittle, concolorous, abaxially with a thin layer of closely adherent grayish waxy scalelike trichomes, base attenuate, margin from middle to apex dentate to crenate, apex acute and slightly pointed; midvein abaxially prominently raised;

secondary veins 9–12 on each side of midvein. Female inflorescences 1–2 cm; flowers few, solitary along rachis. Infructescences almost as long as rachis, sparsely lenticellate; lenticels grayish. Cupule shallowly cupular, 5–6 mm, covering base or no more than basal 1/4 of nut; bracts imbricate, adnate, broadly ovate to ovate-elliptic, gray puberulent, margin slightly membranous. Nut broadly conical, 1–1.5 cm in diam.; scar basal, ca. 4 mm in diam. Fl. Feb–Mar, fr. Aug–Sep.

• Broad-leaved evergreen forests; 400–600 m. Guangxi (Longzhou Xian).

6. *Castanopsis sclerophylla* (Lindley & Paxton) Schottky, Bot. Jahrb. Syst. 47: 638. 1912.

苦槠 ku zhu

Quercus sclerophylla Lindley & Paxton, Paxt. Fl. Gard. 1: 59. 1850; *Lithocarpus chinensis* (Abel) A. Camus; *Q. chinensis* Abel (1818), not *Castanopsis chinensis* Hance (1868); *Q. cuspidata* Thunberg var. *sinensis* A. de Candolle; *Synaedrys sclerophylla* (Lindley & Paxton) Koidzumi.

Trees; branches and leaf blades glabrous. Young shoots reddish brown, slightly angulate. Petiole 1.5–2.5 cm; leaf blade oblong, ovate-elliptic, or obovate-elliptic, 7–15 cm, leathery, adaxially silver-gray with age, base rounded to broadly cuneate and usually inaequilateral, margin from middle to apex serrulate or rarely entire, apex acuminate, cuspidate, or shortly caudate; midvein slightly impressed from base to middle and slightly raised from middle to apex; secondary veins 10–15 on each side of midvein, prominent to very slender, evident. Rachis of inflorescences glabrous. Female inflorescence ca. 15 cm. Infructescences 8–15 cm. Cupule globose to subglobose, 1.2–1.5 cm in diam., completely or almost completely enclosing nut, irregularly valved, outside yellowish brown puberulent, wall to 1 mm thick; bracts scalelike, 3- or 4-angled, sometimes only base connate, in annular umbones. Nut 1(–3) per cupule, subglobose, 1–1.4 cm in diam., tomentulose, apex mucronulate; scar basal, 7–9 mm in diam. Fl. Apr–May, fr. Oct–Nov.

• Broad-leaved evergreen forests; 200–1000 m. Anhui, Fujian, Guangxi, NE Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, E Sichuan, Zhejiang.

The nuts are used for food.

Castanopsis ×kuchugouzhui C. C. Huang & Y. T. Chang (Guihaia 16: 301. 1996) is a hybrid between *C. sclerophylla* and *C. tibetana* with a population on Yuelu Shan in Changsha Shi, Hunan. The bracts apically and along the sides of the cupule are 5–8 mm and spinelike, like those of *C. tibetana*, but among them, as well as the basal bracts, are small, triangular to multiangular, and lamellate bracts like those of *C. sclerophylla*.

7. *Castanopsis kawakamii* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 300. 1911.

吊皮锥 diao pi zhui

Castanopsis greenii Chun; *C. oerstedii* Hickel & A. Camus.

Trees. Branches glabrous; young shoots dark reddish brown, glabrous, sparsely lenticellate; lenticels dark gray. Petiole 1–2.5 cm; leaf blade ovate to lanceolate, 6–12 × 2–5 cm, dark reddish brown when young and remaining so abaxially, leathery with age, base broadly cuneate to rounded and inaequilateral, margin entire or rarely 1–3-toothed near apex, apex caudate; midvein adaxially slightly raised from base to middle but flat to slightly impressed from middle to apex; secondary veins 9–12 on each side of midvein; tertiary veins reticulate, conspicuous. Female inflorescences 5–10 cm; rachis glabrous. Cupule globose, 6–8 cm in diam., splitting into 4(or 5) segments when mature, inside densely dusky tomentulose, wall ca. 3 mm thick; bracts spinelike, connected to radial branched bundles in middle part of cupule or slightly basally, 2–3 cm, sparsely pubescent to nearly glabrous. Nut 1 per cupule, obovate, 1.2–1.5 × 1.7–2 cm, densely orangish brown puberulent; scar covering ca. 1/3(–1/2) of nut. Fl. Mar–Apr, fr. Aug–Oct of following year.

Broad-leaved evergreen forests; below 1000 m. S Fujian, Guangdong, SE Guangxi, S Jiangxi, C Taiwan [Vietnam].

Reports of *Castanopsis borneensis* King from Taiwan are referable to *C. kawakamii*. *Castanopsis concinna*, *C. fordii*, *C. globigemmata*, *C. hainanensis*, *C. hystrix*, *C. indica*, *C. kawakamii*, *C. mekongensis*, and *C. tibetana* form a group of related species with cupules splitting regularly into 4 parts, bract with varying length that are basally connate into fascicles, and a scar that occupies the basal 1/4 to 1/3 of the nut.

8. *Castanopsis hystrix* J. D. Hooker & Thomson ex A. de Candolle, J. Bot. 182. 1863.

红锥 hong zhui

Castanea bodinieri H. Léveillé & Vaniot; *Castanopsis bodinieri* (H. Léveillé & Vaniot) Koidzumi; *C. brunnea* (H. Léveillé) A. Camus; *C. lohfauiensis* Hu; *C. tapuensis* Hu; *Quercus brunnea* H. Léveillé.

Trees. Young shoots purple-brown, slender, sparsely to densely puberulent and with yellowish brown small lamellate waxy scalelike trichomes. Petiole ca. 1 cm or rarely longer; leaf blade lanceolate to obovate-elliptic, 4–9 × 1.5–4 cm or rarely smaller or larger, papery to thinly leathery, pubescent when young but early glabrescent, at least adaxially along midvein with very lax and thick or tight and thin, reddish brown to yellowish brown, small, lamellate, waxy scalelike trichomes, base sharply acute to rounded and inaequilateral, apex mucronate to caudate; midvein adaxially impressed; secondary veins 9–15 on each side of midvein, very slender, evident. Female inflorescence solitary in leaf axil. Infructescence ca. 15 cm. Cupule globose, 2.5–4 cm in diam., splitting into 4 segments, wall ca. 2.5 mm thick; bracts spinelike, completely covering cupule, 6–10 mm, sparsely puberulent, base of some connate into bundles. Nut 1 per cupule, broadly

conical, 1–1.5 × 0.8–1.3 cm, glabrous; scar basal. Fl. Apr–Jun, fr. Aug–Nov of following year.

Broad-leaved evergreen forests; near sea level to 1600 m. SE Fujian, Guangdong, Guangxi, Guizhou, Hainan, SW Hunan, SE Xizang (Mêdog Xian), S Yunnan [Bhutan, Cambodia, NE India, Laos, Myanmar, Nepal, Sikkim, Vietnam].

9. *Castanopsis concinna* (Champion ex Benth) A. de Candolle in Hance, J. Bot. 1: 182. 1863.

华南锥 hua nan zhui

Castanea concinna Champion ex Benth, Hooker's J. Bot. Kew Gard. Misc. 6: 115. 1854; *Castanopsis oblongifolia* W. C. Cheng & C. S. Chao.

Trees; young shoots and rachis of inflorescences yellowish brown to reddish brown puberulent and with early glabrescent, very thick, small, lamellate, waxy scalelike trichomes. Petiole ca. 4–12 mm; leaf blade elliptic, oblong-orbicular, or sometimes oblanceolate, 5–10 × 1.5–3.5(–5) cm, leathery, brittle, margin and midvein pilose when young, base shortly attenuate to broadly cuneate and usually symmetric but sometimes slightly asymmetric, margin entire or apically sparsely serrulate, apex mucronate to acuminate; midvein adaxially prominently impressed; secondary veins 12–16 on each side of midvein. Female inflorescences 5–10 cm. Infructescences 4–8 cm; rachis 4–6 mm thick. Cupule globose, 5–6 cm in diam., splitting into 4 regular segments, wall 2–4 mm thick; bracts spinelike, entirely covering cupule, 1–2 cm, puberulent, base connate into bundles. Nut 1 per cupule, ± conical, ca. 1 × 1.4 cm, densely pubescent; scar covering ca. 1/3 but no more than 1/2 of nut. Fl. Apr–May, fr. Sep–Oct of following year.

• Broad-leaved evergreen forests; below 500 m. S Guangdong, S Guangxi.

10. *Castanopsis mekongensis* A. Camus, Bull. Soc. Bot. France 85: 653. 1938 [1939].

湄公锥 mei gong zhui

Castanopsis fohaiensis Hu; *C. lantsangensis* Hu; *C. wangii* Hu & W. C. Cheng.

Trees; young shoots, petioles, leaf blades abaxially, and rachis of inflorescences densely pubescent. Petiole 1–2 cm; leaf blade ovate-elliptic, broadly elliptic, or sometimes ovate, 15–25 × 5–8 cm, thickly papery to leathery, abaxially grayish, adaxially dark black-brown when young, grayish brown to yellowish gray when dry, puberulent on midvein, base rounded to acute and symmetric or inaequilateral, margin entire, apex acuminate; midvein and secondary veins adaxially usually impressed; secondary veins 12–16 on each side of midvein. Infructescence ca. 10 cm or rarely longer. Cupule globose, 5–6 cm in diam., wall ca. 2 mm thick; bracts spinelike, entirely covering cupule, 1–1.5 cm, sparsely pubescent, base connate into bundles. Nut 1 per cupule, obovate, 1.3–1.6 × 1.5–2 cm, densely pubescent; scar covering ca. 1/3 of nut. Fl. Mar–Apr, fr. Aug–Oct of following year.

Broad-leaved evergreen forests; 600–2000 m. S to SE Yunnan [Laos].

11. *Castanopsis globigemmata* Chun & C. C. Huang in C. C. Huang & Y. T. Chang, *Guihaia* 16: 300. 1996.

圆芽锥 yuán ya zhui

Trees. Branchlet black-brown when dry, densely lenticellate; lenticels slightly raised. Petiole 8–10 mm; leaf blade ovate-elliptic to lanceolate, 10–15 × 3.5–5 cm, nearly leathery, pilose and with tight brown, waxy scalelike trichomes, abaxially when young and on both sides along midvein, base broadly cuneate to acute and inaequilateral, margin entire or with 1–3 shallow teeth from middle to apex, apex long acuminate to caudate; midvein at least from base to middle adaxially raised; secondary veins 9–12 on each side of midvein. Rachis of inflorescences sparsely puberulent and with brown, stellate, waxy scalelike trichomes. Infructescences 5–7 cm; cupules clustered from middle to apex of rachis. Cupule globose, 6–7 cm in diam., splitting into 4 regular segments when mature, wall 3–4 mm thick; bracts spinelike, entirely covering cupule, 1–1.5 cm, base connate into bundles. Nut 1 per cupule, broadly conical, 2–3.5 cm in diam., densely pubescent; scar basal. Fl. Aug–Sep, fr. Oct–Nov of following year.

• Broad-leaved evergreen forests; ca. 1400 m. SE Yunnan (Pingbian Miaozu Zizhixian).

12. *Castanopsis fordii* Hance, *J. Bot.* 22: 230. 1884.

毛锥 mao zhui

Trees; bud scales, young shoots, petioles, leaf blades abaxially, and rachis of inflorescences densely covered with brown to reddish brown, slightly rough long tomentum. Petiole 1–3(–5) mm, usually tapering toward apex; leaf blade oblong, lanceolate, or oblanceolate-oblong, 9–18 × 3–7 cm, leathery, abaxially reddish brown when young but grayish brown to grayish with age, base cordate, shallowly auriculate, or rarely rounded, margin entire and revolute, apex acute, mucronate, or rarely rounded; midvein adaxially prominently impressed; secondary veins 14–18 on each side of midvein or fewer. Infructescences dense, 6–12 cm. Cupule 5–6 cm in diam., splitting into 4(or 5) regular segments, wall 3–4 mm thick; bracts spinelike, entirely covering cupule, 1–2 cm, pubescent, base connate into many bundles. Nut 1 per cupule, ± conical, 1.2–1.5 × 1.5–2 cm, densely pubescent; scar covering ca. 1/3 of nut. Fl. Mar–Apr, fr. Sep–Oct of following year.

• Broad-leaved evergreen forests; below 1200 m. S Fujian, Guangdong, SE Guangxi, S Hunan, S Jiangxi, S Zhejiang.

13. *Castanopsis tibetana* Hance, *J. Bot.* 13: 367. 1875.

钩锥 gou zhui

Castanopsis chengfengensis Hu; *Quercus franchetiana* H. Léveillé ex A. Camus.

Trees. Young shoots black to black-brown when dry, glabrous. Petiole 1.5–3 cm; leaf blade ovate-elliptic, ovate, oblong, or obovate-elliptic, 15–30 × 5–10(–13) cm, leathery, dark purple-brown when young, abaxially thinly covered with reddish brown to yellowish brown, waxy scalelike trichomes, base rounded to shortly cuneate and symmetric or sometimes inaequilateral, margin serrate except basally entire, apex acuminate, mucronate, or caudate; midvein adaxially impressed; secondary veins 15–18 on each side of midvein. Female inflorescences 5–25 cm; rachis 4–6 mm thick. Cupule globose, 6–8 cm in diam., splitting into 4(or 5) regular segments, wall 3–4 mm thick; bracts spinelike, entirely covering cupule, 1.5–2.5 cm, subglabrous to sparsely puberulent, base usually connate into bundles. Nut 1 per cupule, ± conical, 1.5–1.8 × 2–2.8 cm, hairy; scar covering ca. 1/4 of nut. Fl. Apr–May, fr. Aug–Oct of following year.

• Broad-leaved evergreen forests; below 1500 m. S Anhui, Fujian, Guangdong, Guangxi, Guizhou, SW Hubei, Hunan, Jiangxi, SE Yunnan, S Zhejiang.

14. *Castanopsis indica* (Roxburgh ex Lindley) A. de Candolle in Hance, *J. Bot.* 1: 182. 1863.

印度锥 yin du zhui

Castanea indica Roxburgh ex Lindley in Wallich, *Pl. Asiat. Rar.* 2: 5. 1830; *Castanopsis macrostachya* Hu; *C. sinensis* A. Chevalier; *C. subacuminata* Hayata; *Quercus indica* (Roxburgh ex Lindley) Drake.

Trees; young shoots, petioles, leaf blades abaxially, and rachis of inflorescences yellowish brown puberulent. Petiole 5–10(–15) mm; leaf blade ovate-elliptic, elliptic, or sometimes obovate-elliptic, 9–20 × (4–)6–10 cm, thickly papery, abaxially puberulent or glabrescent, base cuneate to rounded and usually inaequilateral, margin serrate except basally entire, apex mucronate to acuminate; midvein adaxially impressed; secondary veins 15–25 on each side of midvein. Female inflorescence ca. 40 cm. Infructescences dense, 10–27 cm. Cupule globose, 3.5–4 cm in diam., usually splitting into 4 segments when mature, wall ca. 1 mm thick; bracts spinelike, entirely covering cupule, to 1.5 cm, straight or bent, base connate into bundles. Nut 1(or 2) per cupule, broadly conical, 1–1.4 cm in diam., densely hairy; scar covering ca. 1/4 of nut. Fl. Mar–May, fr. Sep–Nov of following year.

Broad-leaved evergreen forests; below 1500 m. S Guangdong, S Guangxi, S Hainan, Taiwan, SE Xizang (Mêdog Xian), S Yunnan [Bangladesh, Bhutan, NE India, Laos, Myanmar, Nepal, Sikkim, Thailand, Vietnam].

15. *Castanopsis hainanensis* Merrill, *Philipp. J. Sci.* 21: 340. 1922.

海南锥 hai nan zhui

Trees; branchlets, petioles, young leaf blades abaxially, rachis of inflorescences, and perianth covered with reddish brown, dusky, or grayish brown, very short, felted puberulence. Petiole 1–1.8 cm; leaf blade obovate, obovate-elliptic, ovate-elliptic, or broadly ovate, 5–12(–17) × 2.5–5(–6) cm, thickly papery to nearly leathery, abaxially often grayish with age, base acute to broadly cuneate, margin serrate except basally entire, apex rounded to mucronate; midvein adaxially impressed but often slightly raised on sprouted branch leaves; secondary veins 10–15(–18) on each side of midvein. Infructescences 10–17 cm; rachis 5–6 mm thick. Cupule 4–5 cm in diam., wall ca. 1 mm thick; bracts spinelike, congested, entirely covering cupule, to 1.5 cm, basally connate. Nut 1 per cupule, broadly conical, 1.2–1.5 × 1.6–2 cm, densely pubescent; scar exceeding base of nut. Fl. Mar–Apr, fr. Aug–Oct of following year.

• Broad-leaved evergreen forests; below 400 m. Hainan. Could be recognized as an insular subspecies of *Castanopsis indica*. The status of *C. undulatifolia* G. A. Fu (Guihaia 14: 301. 1994) is uncertain, but it may be conspecific with *C. hainanensis*.

16. *Castanopsis clarkei* King ex J. D. Hooker, Fl. Brit. India 5: 623. 1888.

棱刺锥 leng ci zhui

Trees; young shoots and rachis of inflorescences densely puberulent. Winter bud scales velutinous. Petiole 1.5–3 cm; leaf blade elliptic to oblong, 10–20 × 5–9 cm, thickly papery to nearly leathery, base acute and inaequilateral, margin serrate except basally entire, apex mucronate; midvein abaxially conspicuously raised, adaxially slightly impressed; secondary veins 14–20. Female inflorescences ca. 20 cm. Infructescence rachis 4–5 mm thick. Cupule subglobose, 3.5–4(–5) cm in diam., wall ca. 1.5 mm thick; bracts spinelike, congested, entirely covering cupule, 1–1.5 cm, 3- or 4-angled in cross section, free or base connate into bundles, nearly glabrous. Nut 1 per cupule, broadly conical, 1.4–1.6 cm, apex cuspidate; scar basal. Fl. Mar–May, fr. Oct–Dec of following year.

Broad-leaved evergreen forests; 500–800 m. SE Xizang (Mêdog Xian), S Yunnan [NE India, NE Myanmar].

17. *Castanopsis choboensis* Hickel & A. Camus, Notul. Syst. (Paris) 4: 122. 1928.

窄叶锥 zhai ye zhui

Trees. Petiole 1–2 cm; leaf blade narrowly elliptic to lanceolate, 8–15 × 3–5 cm or rarely larger, thickly papery, base acute to cuneate and often oblique, margin serrate-dentate, apex mucronate to caudate; midvein slightly impressed; secondary veins 16–20 on each side of midvein, adaxially shallowly furrowed and impressed or slightly raised. Inflorescence rachis sparsely and shortly hairy. Infructescences 8–18 cm. Cupule wall 1–2 mm thick; bracts spinelike, congested,

entirely covering cupule, free or base connate into bundles. Nut 1 per cupule, ovoid, ca. 1.5 cm, pubescent; scar basal, ca. 1 cm in diam. Fl. Apr–Jun, fr. Oct–Dec of following year.

Broad-leaved evergreen forests on limestone; below 1000 m. W Guangxi, S Guizhou, SE Yunnan [NE Vietnam].

Very similar, if not identical, to *Castanopsis indica*.

18. *Castanopsis longispina* (King ex J. D. Hooker) C. C. Huang & Y. T. Chang, Guihaia 12: 1. 1992.

长刺锥 chang ci zhui

Castanopsis tribuloides Smith var. *longispina* King ex J. D. Hooker, Fl. Brit. India 5: 623. 1888; *C. ferox* Spach var. *longispina* (King ex J. D. Hooker) A. Camus.

Trees. Young shoots purple-brown, slightly angulate, tufted puberulent, glabrescent. Petiole 1–1.5 cm; leaf blade oblong to obovate-oblong, 14–24 × 5–8 cm, 1st-year leaf blades papery and abaxially covered with very small stellate cespitose hairs along midvein, base acute to rounded, margin entire, apex shortly acuminate; secondary veins 12–16 on each side of midvein, adaxially ± impressed. Infructescence rachis 4–5 mm thick. Cupule wall ca. 1 mm thick; bracts spinelike, congested, almost completely covering cupule, 1.3–1.5 cm, stiff, free or a few in bundles, puberulent. Nut ellipsoid, 2–3 × ca. 1 cm, glabrescent; scar ca. 8 mm in diam.

Broad-leaved evergreen forests; 800–900 m. SE Xizang (Mêdog Xian) [Bangladesh, NE India, Myanmar, Sikkim].

In India, the species grows at elevations from 200–1200 m.

19. *Castanopsis argyrophylla* King ex J. D. Hooker, Fl. Brit. India 5: 622. 1888.

银叶锥 yin ye zhui

Trees; branches and leaf blades glabrous. Shoots blackish brown when dry. Petiole 1–2.5 cm; leaf blade elliptic, ovate, lanceolate, or sometimes obovate, 10–20 × 4–7 cm, thickly leathery, abaxially often grayish, adaxially yellow-green when dry, base cuneate to rounded, margin entire, apex mucronate to acuminate; midvein adaxially raised; secondary veins 10–13 on each side of midvein. Infructescences 10–25 cm; rachis covered with pale grayish brown, feltlike, short hairs, glabrescent. Cupule globose, 2.5–3.5 cm in diam., puberulent when young, outside glabrescent, wall 1–1.5 mm thick; bracts spinelike, arranged in discontinuous rings or spirals, 2–6 mm, free or base slightly connate. Nut 1(–3) per cupule, subglobose, 1.5–1.8 cm in diam., densely puberulent. Fl. May–Jun, fr. Oct–Dec of following year.

Broad-leaved evergreen forests; 1000–1500 m. S Yunnan [NE India, Laos, Myanmar, Thailand, Vietnam].

20. *Castanopsis tcheponensis* Hickel & A. Camus, Notul. Syst. (Paris) 4: 123. 1928.

薄叶锥 *bao ye zhui*

Trees; branches and leaf blades glabrous. Petiole ca. 1 cm; leaf blade elliptic to ovate-elliptic, 10–15 × 4–6 cm, papery, yellow-green when dry; midvein and secondary veins adaxially slightly raised; secondary veins 9–13 on each side of midvein. Rachis of inflorescences glabrous or very shortly and sparsely mealy puberulent. Female inflorescences 10–25 cm. Cupules shortly stalked when young, subglobose when mature, ca. 3 cm in diam., blackish brown when dry, wall ca. 1 mm thick; bracts spinelike, almost entirely covering cupule, 7–12 mm, slender, free or a few in bundles, glabrous, without scalelike trichomes, basally blackish brown when dry, apically yellowish brown. Nut 1 per cupule, broadly ovoid to subglobose, 1.5–1.8 × 1.2–1.4 cm, glabrous or subglabrous; scar covering more than 3/4 of nut. Fl. Mar–Apr, fr. Oct–Nov.

Broad-leaved evergreen forests; 900–1400 m. S Yunnan [Laos, Myanmar, Vietnam].

21. *Castanopsis megaphylla* Hu, Bull. Fan Mem. Inst. Biol., Bot. 10: 85. 1940.

大叶锥 *da ye zhui*

Trees; bud scales, young shoots, and rachis of inflorescences grayish brown puberulent with small, lamellate, waxy scalelike trichomes. First-year branchlets thick, black-brown when dry, lenticellate; lenticels yellowish brown. Petiole 2–3 cm; leaf blade elliptic, sometimes obovate-elliptic, 26–45 × 8–18 cm, thinly leathery, abaxially midvein and secondary veins stellate puberulent and with small lamellate waxy scalelike trichomes when young, surface with a thick tight layer of lamellate waxy scalelike trichomes with age, buff when dry, base cuneate to rounded and often oblique, margin entire, apex obtuse to mucronate; midvein adaxially impressed; secondary veins 16–20 or more on each side of midvein. Female inflorescence ca. 28 cm; rachis densely tawny to dusky puberulent. Infructescence rachis 6–8 mm thick, sparsely lenticellate. Cupule subglobose, ca. 2.5 cm in diam., outside sparsely puberulent and with waxy scalelike trichomes, basally blackish brown, wall ca. 3 mm thick near base and ca. 1 mm thick near apex; bracts of young cupules spinelike, congested, yellowish brown when dry. Nut subglobose, 1 per cupule, ca. 1 cm in diam., pubescent when young. Fl. May–Jul, fr. of following year.

• Broad-leaved evergreen forests; 1100–1500 m. SE Yunnan (Pingbian Miaozu Zizhixian).

May be the same as the earlier published Vietnamese *Castanopsis chevalieri* Hickel & A. Camus.

22. *Castanopsis nigrescens* Chun & C. C. Huang in C. C. Huang & Y. T. Chang, Guihaia 16: 301. 1996.

黑叶锥 *hei ye zhui*

Trees usually 8–15 m tall. First-year branchlets dull blackish brown, often sparsely and thinly grayish pruinose. Petiole 1–2 cm; leaf blade ovate, ovate-elliptic, or rarely lanceolate, 8–15 × 3–6 cm, leathery, abaxially covered with yellowish brown, tightly adnate layers of waxy scalelike trichomes when young, but layers becoming grayish, sparser and thinner with age, adaxially blackish brown to brownish black when dry, base rounded and symmetric or slightly oblique, margin entire, apex acuminate to mucronate; midvein at least from middle to apex adaxially slightly impressed or rarely flat; secondary veins 10–13 on each side of midvein, slender, evident, abaxially slightly raised. Rachis of inflorescences grayish puberulent, glabrescent. Infructescences 5–15 cm; rachis 5–7 mm thick, with cupules crowded from middle to apex. Cupule subglobose, 4–4.5 cm in diam., outside grayish to yellowish gray puberulent, inside brown long tomentose, wall 3–5 mm thick; bracts spinelike, very dense, 1–1.6 cm, grayish to yellowish gray puberulent, free or connate at base or to apical 1/2 and in bundles, usually united to cristate rings. Nut 1 per cupule, broadly ovoid, ca. 2.5 cm, densely pubescent, apex acute; scar covering ca. 1/3 of nut. Fl. May–Jun, fr. Set–Oct of following year.

• Mixed mesophytic and broad-leaved evergreen forests; 200–1000 m. S Fujian, Guangdong, S Guangxi, S Hunan, Jiangxi (Dingnan Xian, Ningdu Xian).

23. *Castanopsis damingshanensis* S. L. Mo ex C. C. Huang & Y. T. Chang, Guihaia 16: 300. 1996.

大明山锥 *da ming shan zhui*

Trees 5–9 m tall. Branches glabrous. Petiole 3–6 mm; leaf blade ovate to broadly elliptic, 5–8 × 2.5–4 cm, leathery, concolorous, abaxially sparsely covered with a thin layer of small, yellowish, lamellate scalelike trichomes, base broadly cuneate, margin entire and subconvolute, apex obtuse, rounded, or mucronate; midvein adaxially flat but slightly raised from base to middle; secondary veins 7–10 on each side of midvein. Infructescences few fruited, glabrous; rachis ca. 5 mm thick. Cupule broadly ovoid, 2–2.5 cm in diam., outside and bracts puberulent and with scalelike trichomes, wall 1–2 mm thick; bracts spinelike, basal bracts with a few connected to cristate rings. Nut 1 per cupule, broadly conical, ca. 1.2 cm in diam., brownish pubescent; scar basal, ca. 1 cm in diam. Fr. Oct–Nov.

• Broad-leaved evergreen forests; 1100–1400 m. C Guangxi (Daming Shan).

24. *Castanopsis jianfenglingensis* Duanmu in W. C. Cheng & al., Sci. Silvae 8: 187. 1963.

尖峰岭锥 *jian feng ling zhui*

Trees ca. 20 m tall; branchlets and young leaf blades abaxially covered with simple or stellate hairs. Petiole 2.5–3.5 cm, very short when young; leaf blade ovate-elliptic, oblong, or rarely broadly ovate, 12–24 × 5–8

cm, thickly papery, concolorous, base broadly cuneate and often slightly inaequilateral, margin entire or rarely subcrenate from middle to apex, apex caudate; midvein adaxially slightly impressed or rarely flat to slightly raised from base to middle; secondary veins 12–14 on each side of midvein. Infructescences 5–15 cm; rachis 2–3 mm thick. Cupule subglobose, 2–3 cm in diam., wall 1–2 mm thick; bracts spinelike, 3–6 mm, free but usually some in bundles. Nut ellipsoid, 1.2–2 cm, densely rust-colored pubescent; scar basal, 8–10 mm in diam. Fr. Oct–Nov.

• Broad-leaved evergreen forests; 500–800 m. SW Hainan (Dongfang Xian).

25. *Castanopsis remotidenticulata* Hu, Acta Phytotax. Sin. 1: 104. 1951.

疏齿锥 shu chi zhui

Trees ca. 25 m tall. Branches glabrous; 1st-year branchlets purplish brown. Petiole to 1 cm; leaf blade oblong to obovate-elliptic, 6–12 × 3–4 cm, firmly papery, abaxially covered with tight grayish waxy scalelike trichomes, base broadly cuneate to rounded and often slightly oblique, margin sparsely serrate, apex acuminate to sometimes caudate; midvein and secondary veins adaxially with small ribs; secondary veins 10–13 on each side of midvein. Infructescences 7–10 cm; rachis 4–5 mm thick. Cupule subglobose, 3–3.5 cm in diam., wall 1–2 mm thick; bracts spinelike, 3–6 mm, free but a few in bundles and transversely united to discontinuous cristate rings. Nut 1 per cupule, flat-conical, 1.8–2.4 cm, puberulent; scar basal, 1.8–2.4 cm in diam. Fl. Apr–May, fr. Sep–Nov.

• Broad-leaved evergreen forests; 1000–2200 m. C to SE Yunnan.

26. *Castanopsis tonkinensis* Seemen, Bot. Jahrb. Syst. 23 (Beibl. 57): 55. 1897.

公孙锥 gong sun zhui

Trees 10–20 m tall. Branches glabrous. Petiole 1–2 cm; leaf blade lanceolate, 6–13 × 1.5–4 cm, membranous, abaxially greenish and sparsely covered with reddish brown, small, lamellate, waxy scalelike trichomes when young, glabrous at maturity, adaxially deep green, base narrowly cuneate, decurrent on petiole, and symmetric or slightly oblique, margin entire, apex caudate to sometimes shortly acute; midvein adaxially somewhat impressed and villous but glabrescent; secondary veins 9–13 on each side of midvein. Female inflorescence ca. 20 cm. Cupule broadly ellipsoid, ovoid, or rarely subglobose, 2–3 cm in diam., dark brownish black when dry, outside glabrescent, wall 0.5–1 mm thick; bracts spinelike, rarely entirely covering cupule, 6–10 mm, glabrescent. Nut 1 per cupule, narrowly conical to broadly ellipsoid, 0.9–1.2 cm in diam., densely brown pilose; scar basal, 8–9 mm in diam. Fl. May–Jun, fr. Sep–Oct of following year.

Broad-leaved evergreen forests; below 2000 m. Guangdong, SW Guangxi, Hainan, SE Yunnan [NE Vietnam].

Most Chinese collections are var. *tonkinensis*, but some specimens from Guangxi and SE Yunnan may be var. *laocaiensis* Luong, which has broader and thicker leaf blades, and bracts of cupules thicker and shorter than those of var. *tonkinensis*.

27. *Castanopsis amabilis* W. C. Cheng & C. S. Chao in W. C. Cheng & al., Sci. Silvae 8: 5. 1963.

南宁锥 nan ning zhui

Castanopsis amabilis var. *brevispinosa* W. C. Cheng & C. S. Chao.

Trees ca. 20 m tall; branches and rachis of inflorescences glabrous. Petiole 0.5–1.5 cm; leaf blade lanceolate to narrowly ovate, 7–12 × 2–3.5 cm, firmly papery, abaxially with tight layers of yellowish brown scalelike trichomes when young, often grayish with age, base broadly cuneate and symmetric or slightly oblique, margin entire or with 1–3 shallow teeth, apex caudate; midvein adaxially shallowly impressed or occasionally flat; secondary veins 9–13 on each side of midvein, slender, evident. Female inflorescence ca. 26 cm. Infructescence rachis 2–3 mm thick. Cupule broadly ellipsoid to subglobose, 2.2–2.8 cm in diam., outside grayish pubescent or with yellowish brown waxy scalelike trichomes, wall ca. 1 mm thick and exterior visible through bracts; bracts spinelike, 4–8 mm, dispersed or subannular. Nut 1 per cupule, broadly ovoid to subglobose, 0.8–1.2 cm in diam., glabrous; scar basal, 7–10 mm in diam. Fl. Aug–Oct, fr. Oct–Dec of following year.

• Broad-leaved evergreen forests; 300–900 m. SW Guangxi.

28. *Castanopsis boisii* Hickel & A. Camus, Bull. Soc. Bot. France 68: 396. 1921.

榄壳锥 lan qiao zhui

Castanopsis hamata Duanmu; *C. megaphyllya* Hu (1948 [1949]), not *C. megaphylla* Hu (1940).

Trees ca. 25 m tall; branchlets, petiole of young leaves, and mature leaf blades abaxially pubescent and with usually glabrescent yellowish brown to reddish brown, small, lamellate, waxy scalelike trichomes. Petiole 1.5–2 cm; leaf blade ovate-elliptic, ovate, or narrowly oblong, 9–18 × 4–6 cm, thickly papery, base rounded to shortly cuneate and symmetric or slightly oblique, margin entire or rarely from middle to apex shallowly undulate, apex acuminate; midvein adaxially impressed or sometimes slightly raised or flat from base to middle; secondary veins 13–17 on each side of midvein. Infructescence 27 cm; rachis from base to middle 2–3.5 mm thick. Cupule ellipsoid to broadly obovoid, 2.5–3 cm in diam., outside and bracts pubescent and with usually glabrescent yellowish brown to reddish brown small lamellate waxy scalelike trichomes, wall 0.5–1 mm thick and exterior visible through bracts; bracts spinelike, 8–10 mm, greatly variable in thickness, base connate into scattered bundles. Nut 1 (or 2) per cupule, broadly ovoid, 1.2–1.4 × 0.9–1.2 cm, puberulent; scar

basal, 8–10 mm in diam. Fl. Jun–Aug, fr. Oct–Nov of following year.

Broad-leaved evergreen forests; 1000–1500 m. Guangdong, SW Guangxi, Hainan, SE Yunnan [NE Vietnam].

29. *Castanopsis densispinosa* Y. C. Hsu & H. W. Jen, Acta Phytotax. Sin. 13(4): 16. 1975.

密刺锥 mi ci zhui

Trees ca. 15 m tall. Branchlets glabrous, densely lenticellate; lenticels small, grayish. Petiole 1–2 cm; leaf blade ovate to oblong-lanceolate, 13–18 × 3.5–6 cm, green on both surfaces, glabrous, margin coarsely dentate but entire on leaves borne apically on branchlet; midvein abaxially raised and adaxially impressed; secondary veins 10–13 on each side of midvein; tertiary veins abaxially conspicuous. Infructescences to 18 cm. Cupule 2–3 cm in diam., splitting into 3 segments, inside densely grayish villous, wall 1–2 mm thick; bracts spinelike, densely covering outside of cupule, ca. 1 cm, free but basal bracts in bundles. Nut 1 per cupule, ovoid, 1–1.4 × ca. 1 cm, sparsely brownish puberulent, apex obscurely 4- or 5-ridged. Fr. Dec.

• Broad-leaved evergreen forests; ca. 1700 m. Yunnan (Jinping Xian).

30. *Castanopsis ledongensis* C. C. Huang & Y. T. Chang, Guihaia 16: 301. 1996.

乐东锥 le dong zhui

Trees ca. 18 m tall; young shoots and rachis of male inflorescences pubescent, with reddish brown, small, lamellate, waxy scalelike trichomes, glabrescent. Branchlets dull brown to brownish black. Petiole ca. 1 cm or rarely longer; leaf blade oblong to sometimes obovate-elliptic, 5–9 × 2–3.5 cm, when young abaxially covered with slightly tight layers of reddish brown, small, lamellate scalelike trichomes and with sparsely but soon glabrescent pilose hairs along midvein, base acute and sometimes slightly asymmetric, margin somewhat crenate, apex mucronate to shortly caudate; midvein adaxially impressed; secondary veins 9–12 on each side of midvein. Infructescence ca. 16 cm; rachis 1.5–2 mm thick, glabrous. Cupule subglobose, to ca. 2 cm in diam., splitting into 2 segments, basally abruptly narrowed and slightly decurrent to shortly stalked, wall ca. 1 mm thick; bracts spinelike, 3–5 mm or rarely longer, 3- or 4-angular in cross section, base wide and sometimes several transversely united in a cockscomblike pattern, puberulent and with brownish scalelike trichomes. Nut broadly conical, 1–1.2 cm in diam., apex sparsely puberulent; scar basal, ca. 1 cm in diam. Fr. Oct–Nov.

• Broad-leaved evergreen forests; ca. 800 m. Hainan (Ledong Xian).

31. *Castanopsis subuliformis* Chun & C. C. Huang in C. C. Huang & Y. T. Chang, Guihaia 16: 301. 1996.

钻刺锥 zuan ci zhui

Trees ca. 25 m tall. First-year branchlets dark brown, glabrous. Petiole ca. 1.5 cm; leaf blade oblong to lanceolate, 7–14 × 3–5 cm, firmly papery, abaxially

covered with reddish brown to yellowish brown, small, lamellate waxy scalelike trichomes but soon glabrescent, base rounded to very acute and sometimes slightly inaequilateral, margin from middle to apex with shallow teeth or rarely entire, apex acute to caudate; midvein adaxially impressed; secondary veins 11–14 on each side of midvein. Infructescences ca. 11 cm; rachis 3–4 mm thick, glabrous. Cupules blackish brown, globose, 1.5–2 cm in diam., wall ca. 1 mm thick; bracts spinelike, scattered, conical, 2–5 cm, yellowish gray pubescent and with small, lamellate, waxy scalelike trichomes, base wide. Nut 1 per cupule, slightly flat-conical, ca. 1.2 × 1.5 cm, densely brown pilose; scar basal, ca. 1.3 cm in diam. Fr. Dec.

• Broad-leaved evergreen forests; 700–900 m. Guangdong, Guangxi.

32. *Castanopsis oblonga* Y. C. Hsu & H. W. Jen, Acta Phytotax. Sin. 13(4): 19. 1975.

矩叶锥 ju ye zhui

Trees 8–10 m tall. First-year branchlets blackish brown when dry. Petiole 6–10 mm; leaf blade ovate, broadly elliptic, narrowly elliptic, or lanceolate, 6–9 × 2–3.5 cm, thickly papery, brittle when dry, puberulent along midvein and abaxially reddish brown and with a tight layer of scalelike trichomes when young, brownish gray with age, base broadly cuneate to acute and symmetric, margin somewhat crenate to dentate or entire, apex acuminate, caudate, or obtuse; midvein adaxially flat to slightly impressed but usually slightly raised from base to middle; secondary veins 10–14 on each side of midvein. Infructescences 5–10 cm; rachis 2–4 mm thick. Cupule broadly obovoid, ca. 3 cm in diam., dark grayish brown when mature and dry, wall ca. 1 mm thick and exterior ± visible through bracts; bracts spinelike, 4–7 mm, free and evenly scattered or connate at base into short rings, basally gray puberulent, apically yellowish brown and glabrous. Nut broadly conical, 1–1.8 cm in diam., puberulent; scar basal, 0.8–1.4 cm in diam. Fr. Oct–Nov.

• Broad-leaved evergreen forests; ca. 2000 m. SE Yunnan (Yuanjiang Xian).

33. *Castanopsis chinensis* (Sprengel) Hance, J. Linn. Soc., Bot. 10: 201. 1868.

锥 zhui

Castanea chinensis Sprengel, Syst. Veg. 3: 856. 1826;
Castanopsis remotiserrata Hu.

Trees 10–20 m tall; branches and leaf blades glabrous. Petiole 1.5–2 cm; leaf blade lanceolate to rarely ovate, 7–18 × 2–5 cm, thickly papery to nearly leathery, concolorous, base rounded to acute, margin at least from middle to apex serrate, apex caudate; midvein and secondary veins adaxially raised; secondary veins 9–12 on each side of midvein. Female inflorescences borne on apical part of 1st-year branchlets; flowers 1 per cupule. Infructescences 8–15 cm. Cupule globose, 2.5–3.5 cm in diam., usually splitting into 3–5 segments, outside densely grayish brown puberulent when young

but glabrescent, inside densely brown villous, wall 1–1.5 mm thick; bracts spinelike, almost entirely covering outside cupule, 6–12 mm, connate into bundles from base to nearly middle. Nut conical, 1.2–1.6 × 1–1.3 cm, glabrous or rarely puberulent from middle to apex; scar basal, 8–10 mm in diam. Fl. May–Jul, fr. Sep–Nov of following year.

Mixed and broad-leaved evergreen forests; below 1500 m. Guangdong, Guangxi, SW Guizhou, Hunan, SE Yunnan [Vietnam].

34. *Castanopsis eyrei* (Champion ex Benth) Tutcher, J. Linn. Soc., Bot. 37: 68. 1905.

甜槠 tian zhu

Quercus eyrei Champion ex Benth, Hooker's J. Bot. Kew Gard. Misc. 6: 114. 1854; *Castanopsis asymetrica* H. Léveillé; *C. brachyacantha* Hayata; *C. caudata* Franchet; *C. chingii* A. Camus; *C. eyrei* var. *brachyacantha* (Hayata) C. F. Shen; *C. incana* A. Camus; *C. neocavaleriei* A. Camus; *Lithocarpus eyrei* (Champion ex Benth) Rehder; *Pasania eyrei* (Champion ex Benth) Oersted; *Q. castanopsis* H. Léveillé; *Q. cavaleriei* H. Léveillé & Vaniot; *Q. cepifera* H. Léveillé; *Q. trinervis* H. Léveillé; *Shiia brachyacantha* (Hayata) Kudo & Masamune; *Synaedrys brachyacantha* (Hayata) Koidzumi.

Trees 8–20 m tall; branches glabrous. Petiole 0.7–1.5 cm or rarely longer; leaf blade lanceolate, ovate, ovate-elliptic, or oblong, 5–13 × 1.5–5.5 cm, leathery, abaxially reddish brown to dark reddish brown when dry and with brownish to silver-gray, membranous scalelike trichomes, base slightly decurrent on petiole and inaequilateral or sometimes symmetric, margin entire or with few shallow teeth from middle to apex, apex long acuminate; midvein at least from base to middle adaxially slightly raised; secondary veins 7–11 on each side of midvein, very slender, evident. Infructescence rachis 2–5 mm thick, glabrous or glabrescent. Cupule broadly ovoid to subglobose, 2–3 cm in diam., splitting into 2–4 segments, outside and bracts grayish to yellowish gray puberulent, apically acute to obtuse, wall ca. 1 mm thick; bracts spinelike, usually entirely covering outside of cupule, more densely toward apex but if cupule subglobose then basally glabrous and spines sparser, 4–10 mm but apical ones shorter. Nut 1 per cupule, broadly conical, 0.8–1.4 cm in diam., glabrous; scar basal, 8–10 mm in diam. Fl. Apr–Jun, fr. Sep–Nov of following year.

• Mixed and broad-leaved evergreen forests; 300–1700 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Qinghai, Sichuan, Taiwan, Xizang, Zhejiang.

35. *Castanopsis ferox* (Roxburgh) Spach, Hist. Nat. Vég. 11: 185. 1842.

思茅锥 si mao zhu

Quercus ferox Roxburgh, Fl. Ind., ed. 1832, 3: 639. 1832; *C. tribuloides* (Smith) A. de Candolle var. *ferox* King ex J. D. Hooker.

Trees 10–20 m tall. Branches glabrous. Petiole 0.8–1.2 cm; leaf blade lanceolate, oblong, or rarely ovate, 8–16 × 2–5 cm, leathery, abaxially with a grayish tight layer of scalelike trichomes, rarely concolorous, base broadly cuneate to cuneate, inaequilateral or symmetric, margin entire, apex acute to acuminate; midvein at least from base to middle adaxially slightly raised or from middle to apex flat to slightly impressed; secondary veins 9–14 on each side of midvein. Rachis of inflorescences tomentulose. Female inflorescence ca. 20 cm. Perianth puberulent. Infructescence rachis glabrous. Cupule globose to rarely broadly ovoid, 2–2.8 cm in diam., outside and bracts brown to grayish brown pubescent and with waxy scalelike trichomes, wall to 1 mm thick; bracts spinelike, 4–8 mm, base connate into bundles or united to discontinuous rings. Nut subglobose, 0.8–1.2 × 0.9–1.2 cm, glabrous, apex pointed; scar basal, 8–10 mm in diam. Fl. Aug–Oct, fr. Sep–Nov of following year.

Broad-leaved evergreen forests; 700–2000 m. SE Xizang, S to SW Yunnan [Bangladesh, NE India, Laos, Myanmar, Sikkim, N Thailand, Vietnam].

36. *Castanopsis fargesii* Franchet, J. Bot. (Morot) 13: 195. 1899.

栲 kao

Castanopsis argyracantha A. Camus; *C. cryptoneuron* (H. Léveillé) A. Camus ex Rehder; *C. taiwaniana* Hayata; *Pasania ischnostachya* Hu; *Quercus cryptoneuron* H. Léveillé; *Q. pinfaensis* H. Léveillé & Vaniot.

Trees 10–30 m tall; bud scales, young branchlets from middle to apex, petiole of young leaf blades, and leaf blades abaxially covered with glabrescent, rust-colored, small, lamellate, waxy scalelike trichomes. Branches glabrous. Petiole 1–2 cm; leaf blade oblong, lanceolate, or rarely ovate, 7–15 × 2–5 cm, abaxially covered with a thick and mealy layer of scalelike trichomes, reddish brown to yellowish brown when young, but tawny with age, base rounded to broadly cuneate and sometimes inaequilateral, margin entire or sometimes with few shallow teeth from middle to apex, apex acute to acuminate; midvein at least from middle to apex adaxially impressed; secondary veins 11–15 on each side of midvein. Female inflorescences solitary, glabrous, to 30 cm; cupules scattered on rachis. Infructescence rachis 1.5–3 mm thick. Cupule globose to broadly ovoid, 2.5–3 cm in diam., splitting irregularly, outside and bracts whitish gray to brownish puberulent or with reddish brown waxy scalelike trichomes and sparse pubescence, wall ca. 1 mm thick; bracts spinelike, 8–10 mm, connate and in bundles

basally or rarely from base to middle. Nut 1 per cupule, conical and 1–1.5 × 0.8–1.2 cm to subglobose and 0.8–1.4 cm in diam., glabrous; scar basal, 8–10 mm in diam. Fl. Apr–Jun and Aug–Oct, fr. Apr–Oct of following year.

• Broad-leaved evergreen forests; 200–2100 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang.

37. *Castanopsis ouonbiensis* Hickel & A. Camus, Bull. Soc. Bot. France 68: 398. 1921.

屏边锥 ping bian zhui

Trees ca. 25 m tall; 1st-year branchlets, petioles, and rachis of infructescences yellowish brown to dark dirty brown tomentulose. Petiole 2–2.5 cm; leaf blade elliptic to obovate-elliptic, 10–18 × 4–6 cm, subleathery, abaxially puberulent and with early glabrescent, reddish brown, mealy, waxy scalelike trichomes, base broadly cuneate to rounded and often inaequilateral, margin entire, apex shortly acuminate to acute; midvein adaxially impressed; secondary veins 10–15 on each side of midvein. Female inflorescences 10–20 cm. Infructescences 10–16 cm; rachis slender. Cupule subglobose to broadly ellipsoid, 2.5–3 cm in diam., outside and bracts rusty brown puberulent and with lamellate, waxy scalelike trichomes, wall 1–2 mm thick and exterior visible through bracts; bracts spinelike, 4–8 mm, in separated bundles, usually connate at middle or apically, rarely connate basally. Nut conical, 1.4–1.8 × 1.2–1.4 cm, glabrous; scar basal, 1–1.2 cm in diam. Fl. Oct–Nov, fr. Oct–Nov of following year.

Broad-leaved evergreen forests; 1100–1600 m. SE Yunnan [N Vietnam].

38. *Castanopsis jucunda* Hance, J. Bot. 22: 230. 1884.

秀丽锥 xiu li zhui

Castanopsis formosana (Skan) Hayata; *C. tribuloides* (Smith) A. de Candolle var. *formosana* Skan.

Trees 10–26 m tall; 1st-year branchlets and leaf blades adaxially brownish black when dry; bud scales, branchlets, petiole of young leaf, mature leaf blades abaxially, and rachis of inflorescences sparsely covered with glabrescent, reddish brown, waxy scalelike trichomes. Petiole 1–2.5 cm; leaf blade ovate, ovate-elliptic, or oblong, sometimes obovate to obovate-elliptic, (4–)10–18 × (2–)4–8 cm, base rounded to broadly cuneate and inaequilateral or symmetric, margin at least from middle to apex serrate or rarely undulate, apex acute to acuminate; midvein adaxially impressed; secondary veins (5–)8–11 on each side of midvein. Female inflorescences axillary, solitary. Infructescences 10–15 cm. Cupule subglobose, 2.5–3.5 cm in diam., splitting into 3–5 segments, outside and bracts pubescent and with grayish brown, lamellate, waxy scalelike trichomes especially when young, wall 0.5–1(–1.5) mm thick; bracts spinelike, 6–10 mm, free but a few in bundles, sometimes transversely united to

discontinuous rings. Nut broadly conical to ovoid, 1–2 × 1–1.5 cm, glabrous or glabrescent; scar basal, 1–1.2(–1.5) cm in diam. Fl. Apr–May, fr. Aug–Oct of following year.

Broad-leaved evergreen forests; below 1500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, E to SC Taiwan, Yunnan, Zhejiang [Vietnam].

39. *Castanopsis hupehensis* C. S. Chao in W. C. Cheng & al, Sci. Silvae 8(2): 187. 1963.

湖北锥 hu bei zhui

Trees 10–20 m tall; 1st-year branchlets and bud scales glabrous. Petiole 3–7(–10) mm; leaf blade lanceolate to oblong, sometimes obovate-elliptic to oblanceolate, 6–11 × 1.5–3.5 cm, subleathery, abaxially brownish when young and dry but grayish with age and with tight layers of scalelike trichomes, base broadly cuneate and often slightly oblique, margin serrate from middle to apex or entire, apex acuminate to abruptly narrowly caudate; midvein adaxially slightly impressed; secondary veins 10–13 on each side of midvein. Rachis of inflorescences glabrous, without waxy scalelike trichomes. Infructescence rachis 1.5–3 mm thick. Cupule ellipsoid to subglobose when mature, 2–2.2 cm in diam., outside grayish to yellowish brown puberulent, basally often shortly stalked, wall ca. 1 mm thick; bracts spinelike, 4–6 mm, few of them connate into bundles, others transversely united to 4 or 5 cristate rings. Nut 1 per cupule, broadly conical, glabrescent; scar basal, 9–12 mm in diam. Fl. Jun–Sep, fr. Jun–Nov of following year.

• Broad-leaved evergreen forests; 600–1000 m. NE Guizhou, W Hubei, NW Hunan, E Sichuan.

40. *Castanopsis fleuryi* Hickel & A. Camus, Bull. Soc. Bot. France 68: 395. 1921.

小果锥 xiao guo zhui

Castanopsis microcarpa Hu.

Trees to 10 m tall. Branches glabrous. Petiole 0.8–1.5 cm; leaf blade elliptic, lanceolate, or ovate, 9–20 × 3–7 cm, subleathery, abaxially with tight layers of trichomes, 1st-year leaf blades concolorous, base cuneate to rounded and sometimes oblique, margin entire, apex acuminate; midvein adaxially raised from base to middle and slightly impressed from middle to apex; secondary veins 7–10 on each side of midvein. Infructescences 8–15 cm; rachis 2–4 mm thick, yellowish gray pubescent. Cupule ellipsoid to broadly ovoid, 7–11 mm in diam., outside sparsely covered with spinelike bracts and yellowish gray to grayish brown pubescence and waxy scalelike trichomes, basally shortly stalked, apically narrowly pointed, wall to 0.5 mm thick; bracts 1–3 mm, in rows, 3- or 4-angular in cross section, free or a few connected at base to continuous or discontinuous rings. Nut 1 per cupule, broadly conical, 8–12 × 7–10 mm, glabrescent when

mature; scar basal, 6–8 mm in diam. Fl. May–Jul or Oct–Nov, fr. Oct–Nov of following year.

Broad-leaved evergreen forests; 600–2400 m. S to SW Yunnan [Laos, Vietnam].

41. *Castanopsis rufotomentosa* Hu, Bull. Fan Mem. Inst. Biol., n.s. 1: 223. 1948 [1949].

红壳锥 hong qiao zhui

Trees 18–25 m tall; 1st-year branchlets, petioles, and leaf blades abaxially covered with early glabrescent, dark reddish brown, small, lamellate, waxy scalelike trichomes. Petiole 2–8 mm; leaf blade narrowly lanceolate to oblong, 10–20 cm × 2–4 mm, leathery, base acute to rounded, margin entire or rarely with a few shallow teeth from middle to apex, apex narrow and obtuse; midvein and secondary veins adaxially impressed; secondary veins 14–18 on each side of midvein. Infructescences 8–15 cm; rachis covered with mealy, waxy scalelike trichomes. Cupule globose, 1.2–2.2 cm in diam., outside and bracts covered with early glabrescent, dark reddish brown, small, lamellate, waxy scalelike trichomes, wall ca. 1 mm thick and exterior visible through bracts; bracts spinelike, 3–6 mm, free or several with base connate into bundles. Nut 1 per cupule, oblate-globose to subglobose, ca. 1 cm in diam., glabrous, apex pointed; scar basal, ca. 9 mm in diam. Fr. Nov–Dec.

• Broad-leaved evergreen forests; ca. 1300 m. SE Yunnan (Xichou Xian).

42. *Castanopsis tribuloides* (Smith) A. de Candolle in Hance, J. Bot. 1: 182. 1863.

蒺藜锥 ji li zhui

Quercus tribuloides Smith in Rees, Cycl. 29: *Quercus* no. 13. 1814; *Castanea tribuloides* (Smith) Lindley.

Trees 5–10 m tall; young branchlets and young leaf blades abaxially pubescent and with glabrescent, rusty brown, waxy scalelike trichomes. Petiole 1–1.5 cm; leaf blade elliptic to ovate, 9–16 × 3.5–5 cm, abaxially reddish brown but may become gray to grayish brown with age, base acute to rounded, margin entire or rarely with 1 or 2 teeth, apex acute; midvein adaxially impressed; secondary veins 11–14 on each side of midvein, sometimes impressed. Infructescences ca. 25 cm; rachis slender. Cupules loosely arranged, globose to ellipsoid, 1.6–2.2 cm in diam., outside covered with brownish, small, lamellate, waxy scalelike trichomes, sometimes pubescent, wall to 1 mm thick; bracts spinelike, sparsely covering cupule, 3–5 mm, slender, free but a few in bundles. Nut 1 per cupule, broadly conical, 1.5–2 × 1–1.6 cm, glabrous; scar basal, 8–10 mm in diam. Fl. Apr–May, fr. Sep–Oct of following year.

Broad-leaved evergreen forests; ca. 1300 m. SE Xizang (Médog Xian), SW Yunnan [N India, Myanmar, Nepal, N Thailand].

43. *Castanopsis wenchangensis* G. A. Fu & C. C. Huang, Acta Phytotax. Sin. 27: 151. 1989.

文昌锥 wen chang zhui

Trees 5–8 m tall; branches, bud scales, and rachis of inflorescences glabrous. Petiole 1–2 cm; leaf blade lanceolate to ovate, (3–)5–9(–12) × (1.2–)2–3.5(–6) cm, leathery, abaxially with thin greenish layers of adnate scalelike trichomes when young, concolorous with age, base rounded to acute, margin with shallow to deep teeth, apex acuminate to rarely acute; midvein at least from base to middle adaxially raised to rarely slightly impressed; secondary veins 6–10 on each side of midvein, adaxially raised. Female inflorescences 3–8 cm. Infructescences 4–5 cm, with 1–6 fruit; rachis 1–1.5 mm thick. Cupule subglobose, 1.5–2 cm in diam., completely enclosing nut, irregularly splitting into 3 or 4 segments, outside sparsely pubescent and with small, lamellate, waxy scalelike trichomes, basally without bracts, wall 1–2 mm thick; bracts spinelike, scattered, free or a few in bundles, 2–4 mm. Nut subglobose, 1.3–1.4 cm in diam., puberulent; scar basal, 1–1.2 cm in diam. Fl. Jul–Aug, fr. Oct–Dec of following year.

• Broad-leaved evergreen forests. Hainan (Wenchang Xian).

44. *Castanopsis delavayi* Franchet, J. Bot. (Morot) 13: 194. 1899.

高山锥 gao shan zhui

Castanopsis tsaii Hu; *Synaedrys delavayi* (Franchet) Koizumi.

Trees ca. 20 m tall. Branches glabrous. Petiole 0.7–1.5 cm; leaf blade obovate, obovate-elliptic, ovate, or elliptic, 5–13 × 3–7 cm, subleathery, abaxially sparsely covered with yellowish brown membranous trichomes when young, grayish to silver-gray with age, base acute to rounded, margin serrate or rarely undulate, apex acute to rounded; midvein adaxially raised; secondary veins 6–9 on each side of midvein, slightly raised. Female inflorescence rachis glabrous. Infructescences 10–15 cm; rachis 2–3 mm thick. Cupule ellipsoid when young but broadly ovoid to subglobose with age, 1.5–2 cm in diam. or slightly larger, splitting into 2 or 3 segments, outside with yellowish brown, waxy scalelike trichomes and adnate pubescence, basally long stalked, wall 0.5–1 mm thick; bracts spinelike, 3–6 mm, free or connate at base and transversely united to 3–5 circular or spiral rings, covered with yellowish brown waxy scalelike trichomes and adnate pubescence. Nut broadly ovoid, 1.3–1.4 cm in diam.; scar basal, 6–8 mm in diam. Fl. Apr–May, fr. Sep–Nov of following year.

• Mixed and broad-leaved evergreen forests; 1500–2800 m. Guangdong, SW Guizhou, SW Sichuan, Yunnan.

45. *Castanopsis echinocarpa* J. D. Hooker & Thomson ex Miquel, Ann. Mus. Bot. Lugduno-Batavi 1: 119. 1863.

短刺锥 duan ci zhui

Castanopsis echinocarpa var. *seminuda* W. C. Cheng & C. S. Chao; *C. longispicata* Hu; *C. tribuloides* (Smith)

A. de Candolle var. *echinocarpa* (J. D. Hooker & Thomson ex Miquel) King ex J. D. Hooker.

Trees 7–15(–25) m tall. Branches glabrous; branchlets dark brown to brownish black when dry. Petiole 1–1.5 cm; leaf blade elliptic, ovate, or lanceolate, (5.5–)7–12.5(–14.5) × (1.5–)2.5–5(–6) cm, thickly papery, abaxially covered with a very tight layer of scalelike trichomes and reddish brown to yellowish brown when young but grayish brown with age, base rounded to sometimes acute, margin serrate to rarely subentire, apex acuminate to abruptly narrowly caudate; midvein adaxially slightly impressed to rarely nearly flat; secondary veins 9–13 on each side of midvein. Rachis of inflorescences glabrous or glabrescent.

Infructescence rachis base 2–3.5 mm thick. Cupule globose, 1.5–2 cm in diam., rarely splitting, wall ca. 1 mm thick; bracts spinelike, thick, 1–3 mm, sometimes no more than tubercles, 3- or 4-angular in cross section, pale grayish brown pubescent, sometimes base loosely connected to discontinuous rings. Nut 1 per cupule, subglobose to conical, 1–1.3 cm in diam., glabrous, apex acute; scar basal, 8–9 mm in diam. Fl. Apr–May, fr. Sep–Oct of following year.

Broad-leaved evergreen forests; 500–2300 m. SE Xizang, S Yunnan [Bangladesh, Bhutan, NE India, Myanmar, Nepal, Thailand, Vietnam].

46. *Castanopsis carlesii* (Hemsley) Hayata, Icon. Pl. Formosan. 6 Suppl.: 72. 1917.

米楮 mi zhu

Trees ca. 20 m tall; young shoots and rachis of inflorescences sparsely covered with reddish brown, lamellate, waxy scalelike trichomes. Petiole to ca. 1 cm, base becoming thick, pillow-shaped; leaf blade lanceolate to ovate, 4–12 × 1–4.5 cm, leathery, abaxially with layers of reddish brown to yellowish brown, slightly adnate, small, lamellate scalelike trichomes when young but grayish brown to silvery with age, base slightly cuneate to broadly so and oblique, margin entire or with a few shallow teeth, apex acuminate to narrowly caudate; midvein adaxially flat to slightly impressed but impressed when dry; secondary veins 8–13 on each side of midvein. Rachis of male catkins glabrous or glabrescent. Infructescence rachis 2–3 mm thick, glabrous. Cupule subglobose to ovoid, 1–1.5 cm, outside yellowish brown to reddish brown feltlike pubescent and covered with waxy scalelike trichomes, wall 0.5(–1) mm thick; bracts spinelike or reduced to tubercles. Nut subglobose to broadly conical, apex shortly pointed; scar basal, ca. 5 mm in diam. Fl. Mar–Jun, fr. Sep–Nov of following year.

• Mixed and broad-leaved evergreen forests, mixed mesophytic forests; below 1700 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang.

The variation in cupule spines length is continuous between the two extremes, and it is not always possible to distinguish the two varieties.

- 1a. Cupules tuberculate or cupules from middle to apex with free scattered spinelike bracts 1–2 mm and from base to middle without bracts or with very short bracts 46a. var. *carlesii*
- 1b. Cupules covered with adnate to fascicled spinelike bracts 2–5(–7) mm 46b. var. *spinulosa*

46a. *Castanopsis carlesii* var. *carlesii*

米楮(原变种) mi zhu (yuan bian zhong)

Quercus carlesii Hemsley, Hooker's Icon. Pl. 26: t. 2591. 1899; *Castanopsis carlesii* var. *sessilis* Nakai; *C. cuspidata* (Thunberg) Schottky var. *carlesii* (Hemsley) T. Yamazaki; *C. cuspidata* var. *longicaudata* (Hayata) S. S. Ying; *C. longicaudata* (Hayata) Nakai; *C. stipitata* (Hayata ex Koidzumi) Nakai; *Lithocarpus stipitatus* Hayata ex Koidzumi; *Q. longicaudata* Hayata; *Shiia carlesii* (Hemsley) Kudo; *Synaedrys carlesii* (Hemsley) Koidzumi.

Cupules with tubercles or sometimes apically with spinelike bracts ca. 1–2 mm, sometimes adnate but not connate into fascicles.

• Mixed and broad-leaved evergreen forests. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang.

46b. *Castanopsis carlesii* var. *spinulosa* W. C. Cheng & C. S. Chao in W. C. Cheng & al., Sci. Silvae 8: 6. 1963.

短刺米楮 duan ci mi zhu

Cupule bracts spinelike, more dense apically, 2–5(–7) mm, longer from middle to apex of cupule, basal bracts connate into bundles.

• Mixed mesophytic forests; 1000–1700 m. Guangxi, Guizhou, Hunan, Sichuan, Yunnan.

47. *Castanopsis xichouensis* C. C. Huang & Y. T. Chang, Guihaia 10: 2. 1990.

西畴锥 xi chou zhui

Trees ca. 15 m tall. Branches glabrous. Petiole 1.5–2.5 cm; leaf blade elliptic, ovate-elliptic, or rarely obovate-elliptic, 10–15 × 3.5–6 cm, firmly leathery, abaxially reddish brown, sparsely covered with adnate, black-brown, rounded, lamellate, waxy scalelike trichomes when young, grayish and waxy with age, base shortly attenuate to broadly cuneate and sometimes oblique, margin serrate from middle to apex, apex acute; midvein adaxially slightly raised; secondary veins 10–13 on each side of midvein. Infructescences dense, 10–30 cm; rachis 6–10 mm thick. Cupule 4–4.5 cm in diam., wall 1–2 mm thick; bracts spinelike, entirely covering outside of cupule, connate at base or to middle 1/2 into 3–7-spined bundles. Nuts (2 or)3 per cupule, broadly conical, ca. 1.2 cm in diam., densely brown puberulent; scar 6–10 mm in diam. Fr. Oct.

• Broad-leaved evergreen forests; 1400–1700 m. Yunnan (Xichou Xian).

48. *Castanopsis rockii* A. Camus, Bull. Bimestr. Soc. Linn. Lyon 8: 88. 1929.

龙陵锥 long ling zhui

Castanopsis lunglingensis Hu.

Trees 20–27 m tall. Branches glabrous; young shoots dark purplish red, dark brown when dry. Petiole 1.5–2 cm; leaf blade oblong, narrowly elliptic, or sometimes oblanceolate, 15–25 × 4–7 cm, papery, abaxially with a tight and thin layer of scalelike trichomes, base cuneate and oblique, margin entire, apex acute to acuminate; midvein and secondary veins adaxially slightly raised; secondary veins 14–17 on each side of midvein. Male inflorescences ca. 20 cm; rachis sparsely puberulent. Female flowers 3 per cupule. Infructescence rachis glabrous, 5–8 mm thick, fruit loosely arranged. Cupule subglobose to broadly elliptic, 4–5 cm in diam., outside glabrescent, dark brown when dry, wall 2–3 mm thick; bracts spinelike, entirely covering cupule, 1–1.5 cm, base connate into bundles. Nuts 2 or 3 per cupule, broadly conical, ca. 1.2 mm in diam., densely hairy; scar covering ca. 1/3 of nut. Fr. Oct–Nov.

Mixed and broad-leaved evergreen forests; below 2100 m. S and W Yunnan [Thailand, Vietnam].

49. *Castanopsis tessellata* Hickel & A. Camus, Bull. Soc. Bot. France 68: 399. 1921.

棕毛锥 zong mao zhui

Trees 10–15 m tall; bud scales, young shoots, petioles, leaf blades abaxially, and rachis of inflorescences densely brown pilose. Petiole 1.5–3 cm; leaf blade oblong, sometimes lanceolate, 15–30 × 5–8 cm, base acute to broadly cuneate and symmetric to sometimes oblique, margin entire, apex long acuminate; midvein adaxially slightly raised and puberulent; secondary veins 16–22 on each side of midvein, slightly impressed. Male flowers spirally arranged on rachis. Female inflorescences crowded from middle to apex of branchlets; flowers 3 per cupule, often with staminodes. Infructescences 10–30 cm. Cupule subglobose, 5–6 cm in diam., base narrowing into a stalk 3–5 mm, wall 1–1.5 mm thick, outside except basally densely covered with spinelike bracts, inside densely yellowish brown pilose, spinelike bracts basally in bundles, yellowish brown pilose. Nuts 2 or 3 per cupule, broadly conical, 1.5–1.8 × 1.5–2 cm, pilose; scar basal, 1–1.5 cm in diam. Fl. Apr–Jun, fr. Sep–Oct.

Broad-leaved evergreen forests; below 500 m. SE Yunnan [C to N Vietnam].

50. *Castanopsis kweichowensis* Hu, Bull. Fan Mem. Inst. Biol., n.s. 1: 221. 1948 [1949].

贵州锥 gui zhou zhui

Trees ca. 20 m tall; young shoots, petioles, leaf blades abaxially, and rachis of inflorescences densely yellowish brown pilose. Petiole 0.5–1.5 cm, thick; leaf blade narrowly oblong to oblanceolate-oblong, 16–30 ×

5–9 cm, firmly papery, base rounded to broadly cuneate and symmetric or oblique, margin apically serrate, apex abruptly acute; midvein and secondary veins adaxially impressed; secondary veins 16–25 on each side of midvein. Female inflorescences 10–25 cm; flowers 3 per cupule. Infructescence rachis 7–12 mm thick. Cupule irregularly globose, 3–3.5 cm in diam., outside pubescent, basally narrowed, wall 2–2.5 mm thick; bracts spinelike, basal bracts often transversely connected to ring but apically in bundles, 5–8 mm, pubescent. Nuts 2 or 3 per cupule, broadly conical, 1.6–2 × 1.6–2.2 cm, tomentose; scar basal, 1–1.5 cm in diam. Fl. May–Jun, fr. Oct–Dec of following year.

• Broad-leaved evergreen forests; 400–800 m. N Guangxi, S Guizhou. Very similar to *Castanopsis ceratocantha* but with denser cupule spines and larger leaves; it could be conspecific.

51. *Castanopsis ceratocantha* Rehder & E. H. Wilson in Sargent, Pl. Wilson. 3: 199. 1916.

瓦山锥 wa shan zhui

Castanopsis chuniana W. P. Fang.

Trees 8–15 m tall; 1st-year branchlets and rachis of inflorescences yellowish brown to brownish villous. Petiole ca. 1 cm; leaf blade lanceolate, oblong, or sometimes oblanceolate, 10–18 × 2–5 cm or rarely shorter or wider, papery, 1st-year leaf blades at least along veins abaxially villous and with layers of reddish brown to yellowish brown scalelike trichomes, base broadly cuneate to acute and oblique, margin apically with 2–5 shallow teeth or entire, apex long acuminate to mucronate; midvein adaxially impressed; secondary veins 13–17 on each side of midvein, slightly impressed to raised. Female inflorescences in clusters on apical part of branchlet of previous year; flowers 2 or 3 per cupule. Cupule subglobose, ca. 3 cm in diam., outside and bracts brown villous and with small, lamellate, waxy scalelike trichomes, wall 1–1.5 mm thick; bracts spinelike, to 5 mm, several connate into bundles from middle or apical part, sometimes cristate. Nuts 1 or 2 (or 3) per cupule, broadly conical, 1.5–1.8 × 1.4–1.8 cm, pubescent; scar basal, ca. 1 cm in diam. Fl. Apr–May, fr. autumn to early winter of following year.

Mixed and broad-leaved evergreen forests; 1500–2500 m. Guizhou, Hubei, SW Sichuan, Yunnan [Laos, NE Thailand, Vietnam].

52. *Castanopsis fabri* Hance, J. Bot. 22: 230. 1884.

罗浮锥 luo fu zhui

Castanopsis brevispina Hayata; *C. brevistella* Hayata & Kanehira ex A. Camus; *C. ceratocantha* Rehder & E. H. Wilson var. *semiserrata* (Hickel & A. Camus) A. Camus; *C. hickelii* A. Camus; *C. kusanoi* Hayata; *C. matsudai* Hayata ex A. Camus; *C. ninbiensis* Hickel & A. Camus; *C. quangtriensis* Hickel & A. Camus; *C. semiserrata* Hickel & A. Camus; *C. sinsuiensis* Kanehira; *C. stellatospina* Hayata; *C. tenuispinula* Hickel & A. Camus; *C. traninhensis* Hickel & A. Camus.

Trees 8–20 m tall. Young shoots sparsely pubescent. Petiole rarely to 1.5 cm; leaf blade ovate, narrowly oblong, or lanceolate, 8–18 × 2.5–5 cm, leathery, base oblique and rounded to rarely cuneate, margin serrate or rarely entire, apex acuminate and rarely mucronate; midvein adaxially conspicuously impressed; secondary vein 9–15 on each side of midvein. Rachis of male catkins sparsely pubescent. Female flowers 2 or 3 per cupule. Infructescences 8–17 cm. Cupule globose, broadly ellipsoid, or ovoid, 2–4 cm in diam., splitting irregularly, wall ca. 1 mm thick; bracts spinelike, 5–10 mm, brown to yellowish brown when dry, sparsely pubescent to glabrescent, base connate into bundles, apex branched. Nut (1 or)2(or 3) per cupule, conical, 1–1.4 × 1–1.2 cm, glabrous; scar basal, 8–10 mm in diam. Fl. Apr–May, fr. Sep–Nov of following year.

Broad-leaved evergreen forests; 100–2000 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Taiwan, Yunnan, Zhejiang [Laos, Vietnam].

53. *Castanopsis wattii* (King ex J. D. Hooker) A. Camus, *Câtaigniers* 421. 1929.

变色锥 bian se zhui

Castanopsis tribuloides (Smith) A. de Candolle var. *wattii* King ex J. D. Hooker, *Fl. Brit. India* 6: 663. 1888.

Trees 15–20 m tall. Young shoots purplish brown, sparsely pubescent, glabrescent, or glabrous. Petiole 0.8–1.5 cm; leaf blade narrowly ovate, lanceolate, or narrowly oblong, (7–)11–20 × 3–5 cm, firmly papery, base broadly cuneate to acute and oblique, margin apically with 2–5 shallow teeth, apex long acuminate; midvein adaxially impressed; secondary veins 13–19 on each side of midvein. Female inflorescence ca. 20 cm; rachis glabrous. Female flowers 3 per cupule. Cupule subglobose when mature, ca. 3 cm in diam., outside and bracts yellowish gray villous and with red to brownish small lamellate waxy scalelike trichomes, wall 1–1.5 mm thick; bracts spinelike, 5–8 mm, several basally or apically connate into bundles. Nuts (1 or)2 or 3 per cupule, 2–2.5 × 1–1.5 cm, hairy; scar basal, triangular to lenticular, 7–10 mm in diam. Fl. Jul–Sep, fr. Aug–Oct of following year.

Broad-leaved evergreen forests; 900–1700 m. SE Xizang (Mêdog Xian), W Yunnan [NE India, Sikkim].

Reports in the literature of *Castanopsis rufescens* J. D. Hooker & Thomson ex A. Camus in China are referable to *C. wattii*.

54. *Castanopsis lamontii* Hance, *J. Bot.* 13: 368. 1875.

鹿角锥 lu jiao zhui

Castanopsis goniacantha A. Camus; *C. lamontii* var. *shanghangensis* Q. F. Zheng; *C. pachyrachis* Hickel & A. Camus; *C. robustispina* Hu.

Trees 8–15(–25) m tall; branches, leaf blades, and rachis of inflorescences glabrous. Petiole 1.5–3 cm; leaf blade elliptic, ovate, or oblong, 12–30 × 4–10 cm, thickly papery to subleathery, base rounded to acute and oblique, margin entire or sometimes apically with few shallow teeth, apex acuminate; midvein adaxially flat; secondary veins 10–15 on each side of midvein. Female inflorescences axillary, borne above male catkins; flowers 3(–7) per cupule. Infructescences 10–20 cm; rachis thick, base 6–10 mm thick. Cupule globose, subglobose, or ovoid, 2.5–6 cm in diam., wall 1.5–7 mm thick; bracts spinelike, thick, ca. 1.5 cm, connate into bundles with a deer-hornlike pattern, or base connate and united to 4–6-cristate rings. Nuts 2 or 3 per cupule, broadly conical, (1.5–)2–2.8 (–4.8) × (1.5–)3(–3.8) cm, densely pubescent; scar covering 2/5–1/2 of nut. Fl. Mar–May, fr. Sep–Nov of following year.

Montane and broad-leaved evergreen forests; 500–2500 m. S Fujian, Guangdong, Guangxi, S Guizhou, S Hunan, S Jiangxi, SE Yunnan [N Vietnam].

55. *Castanopsis crassifolia* Hickel & A. Camus, *Notul. Syst.* (Paris) 4: 122. 1928.

厚叶锥 hou ye zhui

Trees ca. 15 m tall; branches and leaf blades glabrous. Branchlets brownish black when dry, covered with a thin grayish waxy layer. Petiole 2–5 mm; leaf blade broadly ovate, (6–)12–18 × (4–)8–11 cm, leathery, base shortly attenuate to broadly cuneate, margin entire, apex mucronate and oblique; midvein adaxially flat; secondary veins 8–12 on each side of midvein. Rachis of male catkins glabrous. Infructescence rachis ca. 5 mm thick. Cupule ca. 3.5 cm in diam., outside pubescent, wall ca. 2 mm thick; bracts spinelike, densely covering cupules, 6–8 mm, transversely united to discontinuous cristate rings. Nuts 3 per cupule, broadly ovoid, ca. 1.2 × 1.2–1.4 cm, pubescent; scar basal, round to slightly elliptic, 5–7 mm in diam. to 5–7 × 7–10 mm. Fl. Apr–May, fr. Aug–Oct of following year.

Broad-leaved evergreen forests; 1000–1300 m. SW Guangxi [N Thailand, NE Vietnam].

56. *Castanopsis chunii* W. C. Cheng in W. C. Cheng, S. Y. Chang, T. Hong & al., *Sci. Silvae* 8: 5. 1963.

厚皮锥 hou pi zhui

Trees 10–15 m tall; branches, leaf blades, and rachis of inflorescences glabrous. Young shoots dark purplish brown, angulate. Petiole 1–1.5 cm; leaf blade ovate, broadly elliptic, or ovate-elliptic, 8–18 × 4–9 cm, thickly leathery, base rounded and oblique, margin entire or rarely with 1–3 shallow teeth apically, apex caudate and bent; midvein adaxially impressed to flat; secondary veins 9–12 on each side of midvein. Inflorescences sometimes androgynous, ca. 20 cm. Female flowers 3 per cupule. Cupule subglobose and with 1 or

2 nuts or broadly ellipsoid and with 3 nuts, 3–4 cm in diam., splitting irregularly, wall 2–3 mm thick; bracts spinelike, 4–7 mm, yellowish brown pubescent, basally connate into bundles, often a few bundles connected to cristate rings. Nuts 1–3 per cupule, broadly conical, 1.5–1.8 × 1.7–2 cm, densely brown pubescent; scar covering ca. 2/5 of nut. Fl. May–Jun, fr. Sep–Oct of following year.

- Mixed and broad-leaved evergreen forests; 1000–2000 m. N Guangdong, NE Guangxi, SE Guizhou, S Hunan, S Jiangxi.

57. *Castanopsis orthacantha* Franchet, J. Bot. (Morot) 13: 194. 1899.

元江锥 yuan jiang zhui

Castanopsis concolor Rehder & E. H. Wilson; *C. mianningensis* Hu; *C. tenuinervis* A. Camus; *C. yanshanensis* Hu.

Trees 10–15(–20) m tall; branches, leaf blades, and rachis of inflorescences glabrous. Petiole ca. 1 cm; leaf blade ovate, ovate-elliptic, or lanceolate, 7–14 × 2.5–5 cm, leathery, base rounded to acute and oblique or symmetric, margin serrulate or entire, apex acute and bent; midvein adaxially flat; secondary veins 9–13 on each side of midvein. Female flowers 2 or 3 per cupule. Infructescences ca. 15 cm. Cupule subglobose, sometimes broadly ovoid when young, 3–3.5 cm in diam., splitting into 4 segments, outside and bracts pubescent and with brown, small, lamellate, waxy scalelike trichomes, wall 2–3.5 mm thick; bracts spinelike, ca. 7 mm, basally connate and transversely

united to 4–6-cristate rings or basally connate into bundles. Nuts 1–3 per cupule, conical, 1–1.5 cm in diam., densely pubescent; scar basal. Fl. Apr–May, fr. Sep–Nov of following year.

- Mixed and broad-leaved evergreen forests; 1500–3200 m. W Guizhou, SW Sichuan, Yunnan.

58. *Castanopsis platyacantha* Rehder & E. H. Wilson in Sargent, Pl. Wilson. 3: 200. 1916.

扁刺锥 bian ci zhui

Trees ca. 20 m tall. Branches glabrous. Petiole 0.8–1.5 cm; leaf blade ovate, oblong, or obovate elliptic, 10–18 × 3–6 cm, covered with early glabrescent, reddish brown, small, lamellate, waxy scalelike trichomes when young, yellowish gray to silver-gray with age, base rounded to broadly cuneate and oblique, margin serrate or entire, apex acute to acuminate; midvein flat or adaxially slightly impressed; secondary veins 9–13 on each side of midvein. Female flowers 1–3 per cupule. Infructescences 8–15 cm. Cupule subglobose to broadly ellipsoid, 3–4 cm in diam., irregularly splitting into 2–4 segments, outside grayish brown pubescent; bracts spinelike, ca. 3 mm, basally connate into bundles, sometimes united to cristate rings, grayish brown pubescent. Nuts 1–3 per cupule, broadly conical, 1.5–2 × 1.4–2 cm, wall 1.5–2 mm thick, densely brown pubescent; scar covering ca. 1/3 of nut. Fl. May–Jun, fr. Sep–Nov of following year.

- Broad-leaved evergreen forests; 1500–2500 m. NW Guizhou, Sichuan, NE Yunnan.

4. LITHOCARPUS Blume, Bijdr. 526. 1826.

柯属 ke shu

Pasania Oersted.

Trees or rarely shrubs, evergreen. Winter buds terminal, ovoid to ellipsoid, scales spirally imbricate. Stipules extrapetiolar. Leaves spirally arranged. Inflorescences male, female, or androgynous, in leaf axils toward base of branchlets or in a dense panicle cluster on subterminal shoots, ± erect. Male inflorescences erect, simple or branched; flowers usually 3–5(–7) in dichasial clusters; perianth 4–6-lobed; stamens 10–12; rudimentary pistil small, enclosed by hairs. Female flowers solitary or in clusters of (2 or)3(–5), 1 or 2(or 3) well developed; perianth 6-lobed; staminodes 10–12; ovary 3(–6) loculed; styles (2 or)3(–5), (0.5–)1–2(–3) mm; stigmas a terminal pore. Cupules grouped together in cymes on rachis but often many aborted, corky, horny, woody, or crustaceous, completely or partly enclosing nut; bracts variously shaped. Nut 1 per cupule. Germination hypogeal; cotyledons flat-convex (although surface between cotyledons may not be completely flat).

About 300 species: mainly in Asia, one species in W North America; 123 species (69 endemic) in China.

The northern limit of *Lithocarpus* is on the S flank of the Qinling Mountains. Guangdong, Guangxi, and Yunnan have the highest diversity and the most primitive of the Chinese species.

1a. Nut scar convex (± concave or impressed at margin but conspicuously convex at center in *L. cinereus*, *L. crassifolius*, *L. handelianus*, *L. laetus*, *L. pachyphyllus*, and *L. variolosus*).

2a. Cupules mostly completely enclosing nut.

3a. Scar covering less than 3/4 of nut.

4a. Cupule bracts triangular, inconspicuous, fused with cupule and often apically in 2–4 rings.

5a. Scar covering 1/2–3/4 of nut; leaf blade apex falcate; petiole 1.5–2 cm 14. *L. damiaoshanicus*

5b. Scar covering ca. 1/4 of nut; leaf blade apex not falcate; petiole less than 1 cm 15. *L. irwinii*

4b. Cupule bracts triangular but subulate from middle to apex of cupule, conspicuous, obliquely spreading.

- 6a. Leaf blade secondary veins 8–12 on each side of midvein; young shoots and petioles with tawny to grayish waxy scalelike trichomes 19. *L. craibianus*
- 6b. Leaf blade secondary veins more than 12 on each side of midvein; young shoots and leaf blades at least abaxial midvein hairy.
- 7a. Petiole rarely longer than 1 cm; leaf blade on fruiting branches 9–20 cm wide, secondary veins 21–26 on each side of midvein 18. *L. tephrocarpus*
- 7b. Petiole 2–3 cm; leaf blade on fruiting branches 4–9 cm wide, secondary veins 12–19 on each side of midvein.
- 8a. Bracts of young cupules subulate, 4-angled; styles with short hairs 16. *L. handelianus*
- 8b. Bracts of young cupules linear, subterete; styles glabrous 17. *L. amoenus*
- 3b. Scar covering more than 3/4 of nut.
- 9a. Cupules solitary along rachis 13. *L. fenzelianus*
- 9b. Cupules in clusters of 3–5 or more, often clusters scattered along rachis.
- 10a. Cupules entirely covered by bracts.
- 11a. Cupule bracts spiny; cupules 7–9 cm in diam., including bracts; leaf blade 25–40 cm 1. *L. xizangensis*
- 11b. Cupule bracts not spiny; cupules less than 5 cm in diam.; leaf blade rarely to 30 cm.
- 12a. Cupule bracts straight, multiangular in cross section; wall of nut ca. 4 mm thick 2. *L. jenkinsii*
- 12b. Cupule bracts curved, ± round in cross section; wall of nut 2–3 mm thick.
- 13a. Cupules subglobose; cupule bracts 2–3 mm; nut subglobose to broadly ellipsoid, scar covering 4/5–5/6 of nut 3. *L. xylocarpus*
- 13b. Cupules globose; cupule bracts ca. 10 mm; nut turbinate, scar covering ca. 2/3 of nut 4. *L. pseudoxizangensis*
- 10b. Cupules sparsely covered by bracts.
- 14a. Cupule bracts clawlike 5. *L. howii*
- 14b. Cupule bracts not clawlike.
- 15a. Cupules corky or spongy and with smooth concentric lines outside.
- 16a. Rachis of inflorescences 1–2 cm thick; cupule wall 2–5 mm thick 6. *L. pasania*
- 16b. Rachis of inflorescences 0.6–1 cm thick; cupule wall 5–15 mm thick 7. *L. balansae*
- 15b. Cupules covered with squamose or scurfy bracts and with raised concentric ridges outside.
- 17a. Cupules with bracts conspicuous or inconspicuous, spirally arranged, sometimes scalelike and overlapping.
- 18a. Cupules flat at apex 12. *L. lepidocarpus*
- 18b. Cupules rounded at apex 11. *L. amygdalifolius*
- 17b. Cupules with bracts united into 4–8 thin concentric ridges.
- 19a. Cupules ellipsoid, narrowed to 1 or both ends, 1.2–1.6 cm in diam. 10. *L. levis*
- 19b. Cupules globose to subglobose, 2–3 cm in diam.
- 20a. Wall of cupule ca. 1.5 mm thick; branchlets of current year blackish when dry 8. *L. laoticus*
- 20b. Wall of cupule ca. 1 mm thick; branchlets of current year dark brown when dry 9. *L. chifui*
- 2b. Cupules mostly not completely enclosing nut.
- 21a. Wall of cupule more than 3 mm thick or rarely thinner; leaf blade concolorous or with scalelike glands (like tiny drops of water and visible only under high magnifying lens), margin dentate or if entire then abaxially covered with long or stellate hairs.
- 22a. Nut conspicuously wider than long; cupules ± flat to discoid 41. *L. pachylepis*
- 22b. Nut ± as long as wide; cupules cupular.
- 23a. Leaf blade glabrous or with short hairs only along midvein or at axils of secondary veins 40. *L. corneus*
- 23b. Leaf blade abaxially hairy.
- 24a. Hairs simple 38. *L. uvariifolius*
- 24b. Hairs stellate or branched.
- 25a. Leaf blade abaxially densely covered with stellate hairs; secondary veins (15–)20–28 on each side of midvein 39. *L. fordianus*
- 25b. Leaf blade sparsely covered with stellate or branched hairs; secondary veins rarely more than 16 on each side of midvein 40. *L. corneus*

- 21b. Wall of cupule rarely to 2 mm thick; leaf blade not concolorous (concolorous in *L. truncatus* and sometimes in *L. dealbatus*) abaxially covered with tightly adherent waxy or lax pulveraceous scalelike trichomes, margin entire or rarely undulate.
- 26a. Scar usually covering more than 2/3 of nut; cupules enclosing most of nut.
- 27a. Petiole 3–4 cm 24. *L. tabularis*
- 27b. Petiole less than 2.5 cm.
- 28a. Leaf blade hairy at least abaxially on midvein 20. *L. talangensis*
- 28b. Leaf blade glabrous or abaxially covered with tightly adherent waxy scalelike trichomes.
- 29a. Cupules 3–3.5 cm 21. *L. truncatus*
- 29b. Cupules less than 3 cm.
- 30a. Cupules outside glaucous; bracts imbricate or united into interrupted ring 21. *L. truncatus*
- 30b. Cupules outside grayish brown or grayish tawny; bracts (except for subulate tip) fused to cupule, rarely united into concentric rings.
- 31a. Leaf secondary veins 7–10 on each side of midvein; branches of 2nd- or 3rd-year growth with grayish lamelliform waxy scalelike trichomes 22. *L. cleistocarpus*
- 31b. Leaf secondary veins 12–16 on each side of midvein; branches without waxy scalelike trichomes 23. *L. tenuilimbus*
- 26b. Scar covering at most 1/2 of nut; cupules enclosing 1/3–3/4 of nut.
- 32a. Nut glabrous.
- 33a. Petiole 0.2–0.5 cm; leaf blade apex rounded, obtuse, or rarely shortly acute 25. *L. crassifolius*
- 33b. Petiole 1–2.5 cm; leaf blade apex acuminate to caudate.
- 34a. Leaf blade secondary veins conspicuous, abruptly curving, and fusing near margin, secondary and tertiary veins adaxially impressed 26. *L. pachyphyllus*
- 34b. Leaf blade secondary veins inconspicuous and not fusing, secondary and tertiary veins adaxially not or only slightly impressed.
- 35a. Young leaf blades abaxially covered with reddish brown to yellowish brown pulverulous scalelike trichomes 27. *L. apricus*
- 35b. Young leaf blades abaxially without pulverulous scalelike trichomes.
- 36a. Leaf buds, young branchlets, and female flower buds without resin; leaf blade abaxially glaucous when dry 28. *L. variolosus*
- 36b. Leaf buds, young branchlets, and female flower buds with dark brown \pm translucent resin; leaf blade abaxially not glaucous when dry 22. *L. cleistocarpus*
- 32b. Nut hairy at least with pulverulent minute hairs around base of styles.
- 37a. Leaf blade abaxially hairy.
- 38a. Nut with hairs only around stylopodium 29. *L. dealbatus*
- 38b. Nut (except for scar) hairy throughout.
- 39a. Leaf blade margin usually undulate 30. *L. thomsonii*
- 39b. Leaf blade margin entire (sometimes shallowly undulate in *L. cucullatus*).
- 40a. Leaf blades of current year pubescent or rusty scurfy; wall of cupule 2–4 mm thick . 31. *L. laetus*
- 40b. Leaf blades of current year abaxially grayish brown tomentose and with waxy scalelike trichomes; wall of cupule ca. 1.5 mm thick 32. *L. cucullatus*
- 37b. Leaf blade abaxially glabrous.
- 41a. Leaf blades of current year abaxially with tightly adherent, waxy scalelike trichomes.
- 42a. Nut concave around stylopodium; petiole 2–2.5 cm 36. *L. triqueter*
- 42b. Nut flat/convex around stylopodium; petiole 1–1.5 cm 37. *L. cinereus*
- 41b. Leaf blades of current year covered with early glabrescent, loose, pulveraceous scalelike trichomes.
- 43a. Branchlets of current year puberulent 33. *L. chrysocomus*
- 43b. Branchlets of current year glabrous.
- 44a. Nut conspicuously concave around stylopodium; petiole 1.5–2 cm 34. *L. lycoperdon*
- 44b. Nut flat/convex around stylopodium; petiole 2–3 cm 35. *L. paihengii*

- 1b. Nut scar concave (margin concave or impressed but center \pm convex in *L. carolineae*, *L. cyrtocarpus*, *L. echinophorus*, *L. grandifolius*, *L. gymnocarpus*, *L. konishii*, and *L. quercifolius*).
- 45a. Cupules mostly solitary along rachis but sometimes a few in clusters of 2 or 3.
- 46a. Cupules completely enclosing nut.
- 47a. Cupules stalked; nuts white farinose; bracts inconspicuous, triangular; petiole 1.5–3 cm . 42. *L. attenuatus*
- 47b. Cupules sessile; nuts with appressed hairs; bracts linear or clawlike; petiole less than 1.5 cm.
- 48a. Cupules abruptly narrowed and \pm elongate at apex; bracts clawlike; petiole less than 1 cm 43. *L. tubulosus*
- 48b. Cupules not elongated at apex; bracts linear; petiole 1–1.5 cm 44. *L. echinotholus*
- 46b. Cupules not completely enclosing nut.
- 49a. Cupules stalked.
- 50a. Cupules enclosing only base or to 1/2 of nut.
- 51a. Nut \pm white farinose; petiole 1–1.5 cm; stalk of cupule 3–5 mm 48. *L. longipedicellatus*
- 51b. Nut not farinose; petiole less than 1 cm; stalk of cupule 4–7 mm in fruit 49. *L. brachystachyus*
- 50b. Cupules usually enclosing 1/2–3/4 of nut.
- 52a. Nut covered with appressed minute hairs 45. *L. pseudoreinwardtii*
- 52b. Nut glabrous.
- 53a. Stalk of mature cupules ca. 1.5 cm; petiole 3–4 cm 46. *L. caudatilimbus*
- 53b. Stalk of mature cupules less than 0.8 cm; petiole 1–1.5 cm 47. *L. shinsuiensis*
- 49b. Cupules sessile.
- 54a. Nut covered with minute yellowish gray appressed hairs.
- 55a. Cupule bracts linear; petiole 10–20 mm 50. *L. leucodermis*
- 55b. Cupule bracts triangular to rhomboid; petiole 2–5 mm 51. *L. quercifolius*
- 54b. Nut glabrous.
- 56a. Leaf blade margin with 3–6 obtuse teeth; nut scar margin impressed but center \pm convex 52. *L. konishii*
- 56b. Leaf blade margin entire; nut scar concave.
- 57a. Cupule bracts inconspicuous or \pm united into a few concentric rings; nut scar rarely more than 6 mm in diam.
- 58a. Leaf blade abaxially covered with lamellate waxy scalelike trichomes, apex acuminate to caudate; secondary veins 10–15 on each side of midvein; cupule discoid, 1.2–1.5 cm 53. *L. nantoensis*
- 58b. Leaf blade abaxially covered with punctiform waxy scalelike trichomes, apex acuminate to rarely acute; secondary veins 6–10 on each side of midvein; cupule bowl-shaped, 0.5–0.8 cm 54. *L. iteaphyllus*
- 57b. Cupule bracts imbricate or \pm spirally arranged (basal bracts usually united into 3 or 4 concentric rings and obscure in *L. pakhaensis*); nut scar (7–)8–19 mm in diam.
- 59a. Petiole 2–2.5 cm; nuts 2.5–3 cm in diam. 55. *L. elmerrillii*
- 59b. Petiole rarely to 2 cm; nuts 1–2.2 cm in diam.
- 60a. Petiole 0.4–0.8 cm; leaf blade 1–2 cm wide 56. *L. dodonaeifolius*
- 60b. Petiole 1–1.5 cm; leaf blade 1.5–4 cm wide.
- 61a. Leaf blade 2–3 cm wide, apex rounded 57. *L. formosanus*
- 61b. Leaf blade more than 3 cm wide, apex acuminate.
- 62a. Leaf blade lanceolate; inflorescence ca. 4 cm; basal bracts usually united into 3 or 4 concentric rings 58. *L. pakhaensis*
- 62b. Leaf blade elliptic to ovate-elliptic; inflorescence 5–15 cm; bracts imbricate 59. *L. yongfuensis*
- 45b. Cupules in clusters of 3–5 or more scattered along rachis (solitary or 3 together in *L. cyrtocarpus*).
- 63a. Cupules stalked.
- 64a. Nut glabrous.
- 65a. Nut 0.7–1.2 cm in diam., scar 4–5 mm in diam. 66. *L. farinulentus*
- 65b. Nut 1.2–1.6 cm in diam., scar 7–10 mm in diam. 67. *L. propinquus*
- 64b. Nut covered with appressed minute hairs.
- 66a. Cupules enclosing more than 2/3 of nut.
- 67a. Cupules completely enclosing nut, wall ca. 0.5 mm thick; bracts triangular 60. *L. sphaerocarpus*
- 67b. Cupules enclosing 2/3–4/5 of nut, wall 1.5–2.5 mm thick; bracts reduced to concentric rings 61. *L. magneinii*
- 66b. Cupules enclosing up to 1/2 of nut.
- 68a. Nut scar 8–12 mm in diam. 65. *L. bacgiangensis*
- 68b. Nut scar 4–6 mm or more in diam.
- 69a. Leaf secondary veins 16–22 on each side of midvein; petiole 1–1.5 cm 62. *L. microspermus*

- 69b. Leaf secondary veins 9–15 on each side of midvein; petiole rarely to 1 cm.
70a. Nut broadly conical, 1.6–2 cm in diam.; leaf blade oblanceolate, sometimes oblong 63. *L. pseudovestitus*
70b. Nut depressed globose, 1.1–1.4 cm in diam.; leaf blade elliptic to ovate-elliptic 64. *L. mekongensis*
- 63b. Cupules sessile.
71a. Nut (3–)4–5 cm in diam., wall 10–14 mm thick.
72a. Leaf blade margin lobate-dentate 68. *L. cyrtocarpus*
72b. Leaf blade margin entire or rarely with 1–3 teeth near apex 69. *L. gymnocarpus*
- 71b. Nut rarely over 3.5 cm in diam., wall less than 5 mm thick.
73a. Cupules enclosing at least 1/2 to all of nut; wall of nut crustaceous.
74a. Cupules enclosing less than 3/4 of nut.
75a. Petiole less than 1 cm.
76a. Branchlets tomentose; secondary veins 8–11 on each side of midvein 82. *L. fangii*
76b. Branchlets with crispy hairs; secondary veins 12–16 on each side of midvein 84. *L. elaeagnifolius*
- 75b. Petiole 1–2 cm.
77a. Leaf secondary veins 6–8 on each side of midvein; bracts, except for apex, fused to cupule 78. *L. longanoides*
77b. Leaf secondary veins 10–22 on each side of midvein; bracts not fused to cupule.
78a. Leaf secondary veins abruptly arcuate apically near margin, apical ones often fusing.
79a. Cupules 1.6–1.8 cm in diam., bracts 2–3 mm; nut scar 0.8–0.9 cm in diam. 79. *L. bonnetii*
79b. Cupules 2–2.5 cm in diam., bracts 4–6 mm; nut scar 0.9–1.2 cm in diam. 80. *L. garrettianus*
- 78b. Leaf secondary veins not curving nor fusing.
80a. Leaf tertiary veins abaxially numerous and conspicuous, apex caudate 81. *L. rosthornii*
80b. Leaf tertiary veins abaxially inconspicuous or not visible, apex acuminate.
81a. Branches and leaves pilose 74. *L. oleifolius*
81b. Branches and leaves glabrous.
82a. Leaf blade narrowly oblong to lanceolate; rachis of infructescence 4–6 mm thick 71. *L. elizabethiae*
82b. Leaf blade elliptic to narrowly elliptic; rachis of infructescence ca. 12 mm thick 72. *L. echinophorus*
- 74b. Cupules completely or sometimes almost completely enclosing nut.
83a. Branchlets of current year, leaf blades, and rachis of inflorescences glabrous, glabrescent, or sparsely pubescent.
84a. Petiole 2–3 cm; nut scar ca. 1 cm in diam. 70. *L. cryptocarpus*
84b. Petiole 0.5–2 cm; nut scar 1–1.8 cm in diam.
85a. Leaf blade abaxially pubescent along midvein; secondary veins abruptly arcuate apically near margin, apical ones often fusing; tertiary veins abaxially evident . 85. *L. fenestratus*
85b. Leaf blade glabrous; secondary veins not curving nor fusing; tertiary veins abaxially inconspicuous.
86a. Rachis of infructescence 4–6 mm thick; cupule apically elongated into a nipple 71. *L. elizabethiae*
86b. Rachis of infructescence ca. 12 mm thick; cupule apically flat 72. *L. echinophorus*
- 83b. Branchlets of current year and leaf blades abaxially hairy; rachis of inflorescences pilose to tomentose (puberulent in *L. trachycarpus*).
87a. Mature leaf blades abaxially densely hairy.
88a. Leaf blade 2–4 cm wide, widest at or from base to middle, abaxially covered with appressed hairs 74. *L. oleifolius*
88b. Leaf blade 4–6 cm wide, widest usually from middle to apex, abaxially pilose 75. *L. rhabdostachyus*
- 87b. Mature leaf blades abaxially glabrous, pilose on midvein, or with scalelike trichomes.
89a. Rachis of inflorescences and branchlets of current year sparsely pilose or subglabrous, oily and shiny when dry; leaf blade tertiary veins abaxially conspicuous 76. *L. trachycarpus*
89b. Rachis of inflorescences and branchlets of current year densely hairy, not oily and shiny when dry; leaf blade tertiary veins abaxially inconspicuous.
90a. Leaf secondary veins 6–8 on each side of midvein; bracts, except for apex, fused to cupule 78. *L. longanoides*
90b. Leaf secondary veins 10–16 on each side of midvein; bracts not fused to cupule.
91a. Leaf secondary veins abruptly curving apically; nut broadly conical 83. *L. paniculatus*
91b. Leaf secondary veins not curving; nut depressed globose.
92a. Petiole 8–12 mm; rachis of inflorescences 6–8 mm thick 77. *L. chungchungensis*

- 92b. Petiole 5–8 mm; rachis of inflorescences 2–3 mm thick.
- 93a. Branchlets tomentose; petiole base not thickened; nut 1.4–2.2 cm in diam. 73. *L. skanianus*
- 93b. Branchlets with crispy hairs; petiole base thickened; nut 1.2–1.4 cm in diam. 84. *L. elaeagnifolius*
- 73b. Cupules usually enclosing less than 1/2 of nut (sometimes to 2/3 of nut in *L. grandifolius*); wall of nut thick and woody.
- 94a. Cupule bracts linear, usually curved downward.
- 95a. Nuts with 3 longitudinal obtuse ridges near apex 123. *L. areca*
- 95b. Nuts without ridges.
- 96a. Petiole 2–3.5 cm; nut height ± same as width 121. *L. haipinii*
- 96b. Petiole 1–1.5 cm; nut height less than width 122. *L. qinzhouicus*
- 94b. Cupule bracts triangular to rhomboid, imbricate or united into continuous or interrupted concentric rings.
- 97a. Cupules enclosing almost 1/2 of nut.
- 98a. Cupule bracts fused with wall or basal bracts connate into concentric rings.
- 99a. Branchlets glabrous; petiole 0.5–1 cm; leaf blade secondary veins 13–20 on each side of midvein 13–20 100. *L. grandifolius*
- 99b. Branchlets pilose; petiole 1–1.5 cm; leaf blade secondary veins 10–12 on each side of midvein 112. *L. silvicularum*
- 98b. Cupule bracts imbricate.
- 100a. Leaf blade abaxially with tufts of stellate hairs at axils of veins, margin serrate from middle to apex, apex caudate; cup shortly stalked 89. *L. carolineae*
- 100b. Leaf blade abaxially without tufts of stellate hairs, margin entire, apex not caudate; cup sessile.
- 101a. Branches lenticellate; leaf blade base rounded to auriculate 102. *L. obscurus*
- 101b. Branches not lenticellate; leaf blade base cuneate.
- 102a. Petiole 1.5–3.5 cm; leaf blade 12–22 cm 111. *L. henryi*
- 102b. Petiole 0.5–1.5 cm; leaf blade 4–11 cm.
- 103a. Rachis of inflorescences covered with scalelike trichomes; leaf blade secondary veins 6–10 on each side of midvein 86. *L. mairei*
- 103b. Rachis of inflorescences tomentose; leaf blade secondary veins 10–15 on each side of midvein 87. *L. melanochromus*
- 97b. Cupules enclosing basal part or at most 1/3 of nut.
- 104a. Leaf blade 5–10 × as long as wide.
- 105a. Cupules 1.2–1.8 cm in diam.; nut scar 8–12 mm in diam. 90. *L. naiadarum*
- 105b. Cupules 0.5–0.8 cm in diam.; nut scar 3–4 mm in diam. 92. *L. ithyphyllus*
- 104b. Leaf blade rarely 5 × as long as wide.
- 106a. Leaf blade when young abaxially variously pubescent.
- 107a. Leaf blade abaxially with stellate hairs.
- 108a. Petiole 2.5–4 cm; cupule 2.5–3.5 cm in diam., wall 3–6 mm thick; nut subglobose, 2.5–3.8 cm in diam. 95. *L. eriobotryoides*
- 108b. Petiole 1–2 cm; cupule 1.8–2.2 cm in diam., wall to 2 mm thick; nut conical to ellipsoid, 1–1.5 cm in diam. 94. *L. petelotii*
- 107b. Leaf blade abaxially without stellate hairs.
- 109a. Leaf blade less than 3 cm wide; petiole ca. 1 cm.
- 110a. Leaf blade midvein at least basally adaxially raised 98. *L. obovatilimbus*
- 110b. Leaf blade midvein at least from base to middle adaxially impressed.
- 111a. Leaf blade with tufts of minute crisp hairs on both surfaces when young, abaxially scurfy; nuts not white farinose; styles less than 1 mm 96. *L. macilentus*
- 111b. Leaf blade abaxially minutely scalelike glands and floccose-tomentose when young; nuts white farinose; styles to 2 mm 97. *L. floccosus*
- 109b. Leaf blade usually over 3 cm wide (sometimes ca. 2 cm wide in *L. taitoensis*); petiole longer than 1 cm.
- 112a. Leaf blade usually broadest from middle to apex 99. *L. glaber*
- 112b. Leaf blade usually broadest at middle.
- 113a. Petiole 1–1.5 cm; leaf secondary veins 14–20 on each side of midvein .. 101. *L. collettii*

- 113b. Petiole 1.5–3 cm; leaf secondary veins 11–15 on each side of midvein.
- 114a. Leaf blade 4–6 cm wide, base cuneate and decurrent on petiole; petiole 1.5–2 cm; rachis of inflorescences 1–1.3 cm thick 104. *L. mianningensis*
- 114b. Leaf blade 5–8 cm wide, base broadly cuneate to subrounded; petiole 2–3 cm; rachis of inflorescences ca. 0.9 cm thick 105. *L. gaoligongensis*
- 106b. Leaf blade when young abaxially glabrous or with scalelike glands.
- 115a. Branchlets of current year and leaf blades abaxially hairy (hairs on leaf blades wiped off easily)
- 116a. Leaf blade tertiary veins abaxially inconspicuous; branchlets with tawny minute lamellate waxy scalelike trichomes 114. *L. taitoensis*
- 116b. Leaf blade tertiary veins abaxially conspicuous; branchlets without waxy scalelike trichomes.
- 117a. Leaf blade rigidly leathery; petiole 2.5–5 cm; male catkins less than 3 cm; cupule 1.5–2.5 cm in diam. 93. *L. calophyllus*
- 117b. Leaf blade papery to subleathery; petiole 1.5–2.5 cm; male catkins to 25 cm; cupule 0.8–1.5 cm in diam. 113. *L. litseifolius*
- 115b. Branchlets of current year and leaf blades abaxially glabrous or with scalelike glands.
- 118a. Leaf blade margin obtusely lobate-dentate from middle to apex or near apex.
- 119a. Nut 2.2–2.8 cm (longer than wide); leaf tertiary veins abaxially inconspicuous 106. *L. harlandii*
- 119b. Nut 1.6–2.2 cm (shorter than or \pm as long as wide); leaf tertiary veins abaxially slender, evident 107. *L. kawakamii*
- 118b. Leaf blade margin entire.
- 120a. Leaf blade base auriculate or rounded 108. *L. brevicaudatus*
- 120b. Leaf blade base neither auriculate nor rounded.
- 121a. Leaf blade secondary veins adaxially impressed.
- 122a. Leaf blade broadest at or slightly from base to middle; tertiary veins abaxially inconspicuous 114. *L. taitoensis*
- 122b. Leaf blade broadest from middle to apex; tertiary veins abaxially conspicuous.
- 123a. Bracts \pm connate into concentric and \pm raised rings 88. *L. fohaiensis*
- 123b. Bracts imbricate.
- 124a. Leaf blade 6–13 cm wide 110. *L. megalophyllus*
- 124b. Leaf blade 4–7 cm wide.
- 125a. Leaf blade secondary veins 12–25 on each side of midvein; nuts 1.6–2.2 cm, wall ca. 0.5 mm thick 107. *L. kawakamii*
- 125b. Leaf blade secondary veins 9–11 on each side of midvein; nuts 2.4–3 cm, wall 1–1.5 mm thick 109. *L. oblanceolatus*
- 121b. Leaf blade secondary veins adaxially flat.
- 126a. Petiole less than 1 cm.
- 127a. Mature leaf blades abaxially without waxy scalelike trichomes.
- 128a. Leaf blade 5–10 cm; rachis of infructescences 0.2–0.3 cm thick 91. *L. hancei*
- 128b. Leaf blade 10–18 cm; rachis of infructescences 1–1.4 cm thick ... 115. *L. nitidinus*
- 127b. Mature leaf blades with waxy scalelike trichomes.
- 129a. Leaf blade firmly leathery, apex rounded; secondary veins 10–12 on each side of midvein; petiole 3–5 mm 116. *L. phansipanensis*
- 129b. Leaf blade papery, apex shortly acuminate to obtuse; secondary veins 12–16 on each side of midvein; petiole to 10 mm 117. *L. confinis*
- 126b. Petiole 1–5 cm.
- 130a. Leaf blade 20–35 \times 8–12 cm 119. *L. listeri*
- 130b. Leaf blade 5–20 \times 2–8 cm.
- 131a. Leaf secondary veins 12–16 on each side of midvein.
- 132a. Nut scar 1.2–1.5 cm in diam. 120. *L. calolepis*
- 132b. Nut scar 0.5–1 cm in diam.
- 133a. Rachis of infructescences 0.8–1.8 cm thick; leaf blade secondary veins 12–16 on each side of midvein 103. *L. arcaulus*
- 133b. Rachis of infructescences 0.2–0.3 cm thick; leaf blade secondary veins 6–13 on each side of midvein 91. *L. hancei*

- 131b. Leaf secondary veins 6–11 on each side of midvein.
 134a. Leaf blade oily shiny when young 114. *L. taitoensis*
 134b. Leaf blade not oily shiny when young.
 135a. Leaf blade not glaucous 91. *L. hancei*
 135b. Leaf blade glaucous.
 136a. Tertiary veins abaxially slender, evident, lax, and reddish to yellowish brown when dry; basal bracts of cupule connate into concentric rings 113. *L. litseifolius*
 136b. Tertiary veins inconspicuous; cupule bracts spirally arranged 118. *L. hypoglaucus*

1. *Lithocarpus xizangensis* C. C. Huang & Y. T. Chang in C. C. Huang, *Acta Phytotax. Sin.* 16(4): 70. 1978.

西藏柯 xi zang ke

Trees to 30 m tall. Branchlets of last year growth, petioles, and abaxial leaf blade surface pubescent. Petiole 2–4 cm, stout, pubescent; leaf blade elliptic to obovate-elliptic, 25–40 × 9–15 cm, papery, abaxially pubescent, base cuneate, margin entire or sometimes apically undulate, apex acute; secondary veins 11–16 on each side of midvein, adaxially impressed when young, pubescent, covered with adherent scurfy scalelike trichomes, grayish when dry; tertiary veins abaxially conspicuous. Male inflorescences solitary, ca. 25 cm. Infructescence to 20 cm, rachis lenticellate, base 1–1.2 cm thick; cupules in clusters of 3–5. Cupule globose, (5–)7–9 cm in diam. including bracts, completely enclosing nut; bracts subulate, completely covering cupule, 1.5–2.5 cm, straight or apical ones slightly curved, ± woody, pubescent. Nut broadly conical, ca. 2.5 × 2.8 cm, covered with minute hairs, base slightly narrowed, apex flat or slightly convex, wall 1–2 mm thick; scar covering ca. 2/3 of nut, convex. Fl. Aug–Sep, fr. Sep–Oct of following year.

• Broad-leaved evergreen forests; 1700–2000 m. SE Xizang (Mêdog Xian).

2. *Lithocarpus jenkinsii* (Bentham) C. C. Huang & Y. T. Chang, *Guihaia* 8: 36. 1988.

盈江柯 ying jiang ke

Quercus jenkinsii Bentham, *Hooker's Icon. Pl.* 14: 8. 1880; *Lithocarpus parkinsonii* A. Camus.

Trees to 10 m tall. Branchlets of current year sturdy, lenticellate, glabrous. Petiole ca. 3 cm, base ca. 4 mm thick; leaf blade elliptic to ovate-elliptic, 25–30 × 8–10 cm, leathery, concolorous, abaxially covered with minute scalelike trichomes, base broadly cuneate and symmetric, margin entire, apex acute and oblique; secondary veins 12–16 on each side of midvein, adaxially slightly impressed, abruptly curving apically, obscure near margin; tertiary veins subparallel. Female inflorescences ca. 3; cupules solitary, scattered on rachis. Infructescence ca. 15 cm, rachis lenticellate, glabrescent, base 0.9–1.4 cm thick. Cupule subglobose, 3.5–4.5 cm in diam., completely enclosing nut, wall 4–6 mm thick and ± woody when dry; bracts subulate, 6–

10 mm, woody and multiangular, base 4–8 mm in diam., apex shortly pointed. Nut subglobose but flat at apex, 2.5–3.5 cm in diam., wall ca. 4 mm thick; scar covering more than 3/4 of nut, convex. Fr. Jun–Aug.

Moist places in broad-leaved evergreen forests; ca. 1500 m. SW Yunnan [NE India, NE Myanmar].

The nuts were originally described as being separate from the cupules except for the basal part, but the authors found a considerable portion of the nut to be adnate to the cupule.

3. *Lithocarpus xylocarpus* (Kurz) Markgraf, *Bot. Jahrb. Syst.* 59: 66. 1924.

木果柯 mu guo ke

Quercus xylocarpa Kurz, *J. Asiat. Soc. Bengal Pt. 2, Nat. Hist.* 44: 196. 1875; *Lithocarpus shunningensis* Hu; *Pasania xylocarpa* (Kurz) Hickel & A. Camus; *Synaedrys xylocarpa* (Kurz) Koidzumi.

Trees to 30 m tall. Young branchlets sulcate, tawny tomentose. Petiole ca. 1 cm; leaf blade narrowly oblong to sometimes lanceolate, 9–15 × 2–5 cm, leathery, abaxially pilose when young and glaucous with age, adaxially lustrous, base cuneate, margin entire, apex acute; midvein ± flat to slightly raised on both surfaces and usually pubescent; secondary veins 12–15 on each side of midvein; tertiary veins abaxially very slender, evident or not visible. Male inflorescences often partly androgynous, solitary, 5–10 cm; rachis tomentose. Female inflorescence rachis 5–8 cm, ca. 3 mm thick; cupules in clusters of ca. 3. Cupule subglobose but apically slightly narrowed, 3–4.5 cm in diam., completely enclosing nut, wall 3–5 mm thick; bracts linear, 2–3 mm, curved inward, densely and completely covered by minute hairs. Nut subglobose to broadly ellipsoid, 2–3 cm in diam.; scar covering 4/5–5/6 of nut, convex. Fl. May–Jun, fr. Sep–Oct of following year.

Dry mixed mesophytic forests; 1800–2300 m. SE Xizang, S Yunnan [NE India, N Laos, NE Myanmar, Vietnam].

4. *Lithocarpus pseudoxizangensis* Z. K. Zhou & H. Sun, *Acta Bot. Yunnan.* 18: 216. 1996.

假西藏柯 jia xi zang ke

Trees ca. 20 m tall. Petiole ca. 2 cm; leaf blade elliptic, 15–25 × 10–12 cm, abaxially with sparse appressed hairs, adaxially glabrous, base cuneate to broadly cuneate and decurrent on petiole, margin entire, apex cuspidate; midvein flat above or slightly impressed; secondary veins ca. 11 on each side of midvein.

Infructescence rachis 7–12 cm, ca. 1 cm thick. Cupule globose, completely enclosing nut, wall 4–6 mm thick; bracts ca. 1 cm, curved, sericeous-puberulent. Nuts turbinate, ca. 2.5×2.8 cm, appressed tomentulose, base narrow, apex depressed; scar covering ca. 2/3 of nut, convex.

- 800–2000 m. SE Xizang (Médog Xian).

5. *Lithocarpus howii* Chun, J. Arnold Arbor. 28: 235. 1947.

梨果柯 li guo ke

Trees 10–15 m tall. Branchlets of current year terete, densely pubescent; branchlets of 2 or 3 year's growth with scars of bud scales and leaf blades, sparsely lenticellate. Petiole 1.5–3.5 cm; leaf blade obovate-elliptic to oblong, $12\text{--}20 \times 4\text{--}7$ cm, thickly papery, concolorous, when young abaxially with stellate hairs especially on axils of veins, base cuneate, margin shallowly undulate to obtusely dentate, apex obtuse to acute; secondary veins 15–18 on each side of midvein, ending in teeth; tertiary veins abaxially conspicuous. Inflorescences androgynous, spicate; ca. 10 cm. Female inflorescence with cupules in clusters of 3(–5), rarely solitary. Infructescence 2–3 cm; rachis 6–8 mm thick. Cupule pear-shaped to subglobose, $5\text{--}6 \times 4.5\text{--}5.5$ cm including bracts, completely enclosing nut, wall 1–2 mm thick; bracts clawlike, basally reflexed, apically erect. Nut subglobose, $3\text{--}3.5 \times$ ca. 4 cm, apex \pm flat, wall 6–10 mm thick but basally ca. 1.5 cm thick, horny; scar covering more than 1/2 of nut, convex. Fl. May, fr. Jul–Aug.

- Broad-leaved evergreen forests; 1000–1400 m. SW Guangdong (Yangchun Xian), Hainan.

6. *Lithocarpus pasania* C. C. Huang & Y. T. Chang, Guihaia 8: 35. 1988.

石柯 shi ke

Pasania lithocarpaea Oersted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1866: 84. 1867.

Trees to 20 m tall. Leaves not seen. Infructescences 14–28 cm; rachis terete, light brownish gray, 1–2 cm thick, epidermis flaky, reticulate, sparsely lenticellate; lenticels slightly raised. Cupules 5–9 fused in clusters, only 1 or 2 developed, globose or nearly so, $3.5\text{--}5$ cm in diam., completely enclosing nut, apically flat or rounded, wall 2–5 mm thick and spongy; bracts \pm imbricate in young cupules and squamose but united into 8–12 concentric rings and inconspicuous with age. Nut broadly ellipsoid to subglobose, adnate to cupule except apically, apex flat, wall 1.5–4 mm thick and firmly woody.

Broad-leaved evergreen forests; ca. 800 m. SE Xizang (Médog Xian) [NE India].

An incompletely known species which Oersted described as *Pasania lithocarpaea*, based merely on 3 cupules. Only three infructescences have been seen by the authors.

7. *Lithocarpus balansae* (Drake) A. Camus, Rivière Sci. 18: 39. 1931 [1932].

猴面柯 hou mian ke

Quercus balansae Drake, J. Bot. (Morot) 4: 152. 1890; *Castanopsis balansae* (Drake) Schottky; *Lithocarpus eremiticus* Chun & C. C. Huang ex Y. C. Hsu & H. W. Jen; *L. luchunensis* Y. C. Hsu & H. W. Jen; *L. lutchuensis* Koidzumi; *Pasania balansae* (Drake) Hickel & A. Camus; *Synaedrys balansae* (Drake) Koidzumi.

Trees to 30 m tall. Branches of last-year growth yellowish gray, sparsely lenticellate; lenticels slightly raised. Petiole 1.5–2.5 cm, base thickened; leaf blade oblong to obovate-oblong, $10\text{--}38 \times 5\text{--}13$ cm, \pm rigidly papery, abaxially glaucous when dry and with waxy scalelike trichomes, base cuneate and \pm decurrent on petiole, margin entire, apex acuminate; secondary veins 9–12 on each side of midvein, abruptly curving apically near margin but not fusing; tertiary veins reticulate, conspicuous on both surfaces. Male inflorescences paniculate; rachis tawny pubescent. Female inflorescence with cupules in clusters of 5–7 scattered on rachis. Infructescences ca. 15 cm; rachis base 6–10 mm thick. Cupule obovoid, subglobose, or irregularly shaped, to 5×8 cm, completely enclosing nut, wall 0.5–1.5 cm thick and corky; bracts reduced to spiral or concentric lines. Nut subglobose, $2.5\text{--}3.5 \times 2\text{--}3$ cm, wall 2–3 mm thick; scar covering more than 1/2 of nut, convex. Cotyledons plicate. Fl. Apr–May, fr. Sep–Nov of following year.

Broad-leaved evergreen forests by streams; 400–1900 m. SE Yunnan [N Laos, Vietnam].

Possibly conspecific with *Lithocarpus pasania*, but additional specimens are needed to confirm this.

8. *Lithocarpus laoticus* (Hickel & A. Camus) A. Camus, Rivière Sci. 18: 41. 1931 [1932].

老挝柯 lao wo ke

Pasania laotica Hickel & A. Camus, Ann. Sci. Nat., Bot., sér. 10, 3: 402. 1921.

Trees to 20 m tall. Branchlets of current year blackish when dry; branches of previous year growth and rachis of infructescences conspicuously lenticellate. Petiole 1.5–2.5 cm; leaf blade elliptic to lanceolate, $12\text{--}20 \times 4\text{--}9$ cm, \pm rigidly papery, abaxially light gray and with adherent, waxy scalelike trichomes, adaxially dark gray when dry, base broadly cuneate to acute, margin entire, apex narrowly acuminate to acute; secondary veins 10–13 on each side of midvein, sometimes fusing near margin on apical part of leaf; tertiary veins abaxially \pm visible. Male inflorescences terminal clusters on branchlets of current year, 4–10 cm; rachis pubescent. Female inflorescences 10–15 cm; cupules in clusters of ca. 3. Infructescence rachis base 4–6 mm thick. Cupule

subglobose, ca. 3.5×2 – 2.5 cm, completely enclosing nut, with many concentric ridges and inconspicuous bract scars between ridges, wall ca. 1.5 mm thick; bracts scalelike. Nut subglobose, 2 – 2.5×1.6 – 2.2 cm in diam., glabrescent, apex rounded, wall less than 1 mm thick; scar covering more than 1/2 of nut, convex. Fl. Mar, fr. Sep of following year.

Broad-leaved evergreen forests; 1500–2200 m. SE Yunnan [N Laos, Vietnam].

According to A. Camus (Chênes 3: 587. 1953), the typical mature leaf blades are leathery and adaxially oily when dry, the tertiary veins are abaxially inconspicuous, and the nut apex is flat.

9. *Lithocarpus chifui* Chun & Tsiang, J. Arnold Arbor. 28: 320. 1947.

粤北柯 yue bei ke

Trees to 20 m tall. Young branchlets slightly sulcate, dark brown when dry. Petiole 1.5–2.8 cm; leaf blade elliptic to oblanceolate, 15 – 30×6 – 12 cm, leathery, abaxially with lamellate, waxy scalelike trichomes and grayish brown when dry, base attenuate and decurrent on petiole, margin entire, apex acuminate; secondary veins 10–14 on each side of midvein, abruptly curving apically, often fusing near margin; tertiary veins abaxially slender, evident, subparallel. Male inflorescences paniculate, basal spike 3–4 cm; rachis tawny scurfy. Female inflorescences 10–18 cm; cupules in clusters of 3–5. Infructescences to 17 cm; rachis base 6–10 mm thick, basal part lenticellate and without fruit. Cupule globose, 2.5–3 cm in diam., completely enclosing nut, wall ca. 1 mm thick; bracts squamose when young, in 3–5 thin concentric ridges on mature cupule. Nut subglobose, 1.8–2 cm in diam., apex with minute tawny hairs, wall 2–2.5 mm thick and woody; scar covering more than 1/2 of nut, convex. Fl. May–Jun, fr. Aug–Oct of following year.

• Mixed mesophytic forests in valleys; 1200–1400 m. NE Guangdong (Ruyuan Yaozu Zizhixian), S Guizhou.

10. *Lithocarpus levis* Chun & C. C. Huang in C. C. Huang & Y. T. Chang, Guihaia 8: 2. 1988.

滑壳柯 hua qiao ke

Trees 10–15 m tall. Young branchlets sulcate; branches of last year's growth dark brown, sparsely lenticellate. Petiole 1–1.5 cm; leaf blade ovate-elliptic to elliptic, 13 – 20×4 – 7 cm, ± rigidly papery, abaxially with adherent, waxy scalelike trichomes and grayish when dry, adaxially glabrous, base broadly cuneate, margin entire, apex acuminate; secondary veins 12–16 on each side of midvein, abruptly curving apically near margin but not fusing; tertiary veins abaxially conspicuous, subparallel. Male inflorescences axillary, solitary, 6–9 cm; rachis pubescent. Female inflorescence with cupules in clusters of ca. 3. Infructescences 6–8 cm; rachis 7–8 mm thick, lenticellate. Cupule ellipsoid, 0.5 – 2×1.2 – 1.6 cm, completely enclosing nut, outside with yellowish brown to dark gray, waxy scalelike trichomes,

both ends narrowed, wall ca. 1 mm thick; bracts united into concentric lines. Nut broadly ellipsoid to subglobose, 1–1.4 cm in diam., apex with appressed minute hairs, wall 1.5–3 mm thick and thickened gradually from apex to base; scar covering more than 1/2 of nut, convex. Fl. Aug–Sep, fr. Sep–Oct of following year.

• Broad-leaved evergreen forests; 900–1500 m. S Guizhou.

11. *Lithocarpus amygdalifolius* (Skan) Hayata, Icon. Pl. Formosan. 6 Suppl.: 72. 1917.

杏叶柯 xing ye ke

Quercus amygdalifolia Skan in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 506. 1899; *Lithocarpus amygdalifolius* var. *praecipitiorum* Chun; *Pasania amygdalifolia* (Skan) Schottky; *Synaedrys amygdalifolia* (Skan) Koidzumi.

Trees to 30 m tall; young shoots and young leaf blades abaxially densely covered with tawny crisp hairs, glabrescent. Petiole 1–2 cm; leaf blade lanceolate to narrowly oblong, 8 – 15×2.5 – 4 cm, ca. 20×9 cm on young shoots, thickly leathery, abaxially often oily when young and dry, grayish and covered with waxy scalelike trichomes in mature leaf blades, base cuneate, margin entire or rarely undulate near apex to obtusely undulate-dentate, apex narrowly acuminate to acute; secondary veins 10–16 on each side of midvein; tertiary veins abaxially not visible or obscure. Male inflorescences solitary or in a panicle; rachis densely pubescent. Female inflorescence with cupules in clusters of ca. 3, sometimes solitary. Infructescences 3–5 cm; rachis 2–4 mm thick. Cupule subglobose, 2–2.5 cm in diam., smooth, completely enclosing nut, wall 1–2 mm thick; bracts usually fused with cupule into intercepted concentric rings, triangular to multilateral. Nut subglobose 1.8–2 cm in diam., puberulent at apex, wall 1.5–2 mm and slightly thicker than wall of cupule; scar covering more than 1/2 of nut, convex. Fl. Mar–Sep, fr. Aug–Dec of following year.

Broad-leaved evergreen forests; 500–2300 m. S Fujian, Guangdong, S Guangxi, Hainan, C to S Taiwan [Vietnam].

12. *Lithocarpus lepidocarpa* (Hayata) Hayata, Icon. Pl. Formosan. 6 Suppl.: 72. 1917.

鬼石柯 gui shi ke

Quercus lepidocarpa Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 291. 1911; *Lithocarpus castanopsifolius* (Hayata) Hayata; *Pasania lepidocarpa* (Hayata) Schottky; *Q. castanopsifolia* Hayata; *Synaedrys lepidocarpa* (Hayata) Koidzumi.

Trees tall. Branchlets of last-year growth with a thin layer of grayish wax, conspicuously lenticellate near nodes. Petiole 1–1.5 cm; leaf blade lanceolate-oblong to obovate, 15 – 32×4 – 10 cm, leathery, abaxially grayish, base broadly cuneate, margin entire or undulate-dentate

from middle to apex, apex acuminate to shortly caudate; secondary veins 13–17 on each side of midvein; tertiary veins abaxially slender, evident. Female inflorescence with cupules in clusters of 2 or 3, rarely solitary. Cupule subglobose, 3–3.2(–5) × 2.9–3(–3.8) cm, completely enclosing nut, apically flat; bracts imbricate to spirally arranged apically on cupule, rhomboid, squamose, with grayish waxy scalelike trichomes; midvein slightly raised and conspicuous. Nut subglobose, ca. 2 cm in diam.; scar covering more than 1/2 of nut, convex. Fl. Jul–Oct, fr. Aug–Dec of following year.

• Mixed mesophytic forests; (300–)1000–2800 m. C to S Taiwan.

This species has been reported from Vietnam (P. H. Ho, Ill. Fl. Vietnam 2(2): 786. 1993), but it is probably a misidentification.

13. *Lithocarpus fenzelianus* A. Camus, Bull. Mus. Natl. Hist. Nat., sér. 2, 7: 912. 1932.

红柯 hong ke

Quercus fenzeliana (A. Camus) Merrill.

Trees to 30 m tall. Young branchlets sulcate. Petiole 2–3 cm; leaf blade ovate, ovate-lanceolate, or obovate-elliptic, 10–18 × 3–6 cm, leathery, leaf blades of last year abaxially brownish gray to grayish and with adherent, waxy scalelike trichomes, base cuneate and decurrent on petiole, margin entire or undulate from middle to apex, apex caudate to shortly acuminate; secondary veins 7–10 on each side of midvein, usually impressed adaxially; tertiary veins abaxially obscure. Male inflorescences solitary or in a panicle; rachis pubescent. Female inflorescence ca. 15 cm; cupules solitary, scattered on rachis. Infructescence ca. 10 cm; rachis 3–4 mm thick. Cupule globose to depressed globose, 1.6–2.2 cm in diam., completely enclosing nut, wall ca. 1 mm thick; bracts triangular when young, fused into 6–8 concentric rings on mature cupules, squamose. Nut subglobose, ca. 1.5 cm in diam., apex puberulent, wall 0.5–1 mm thick; scar covering more than 2/3 of nut, convex. Fl. Feb–Apr, fr. Aug–Sep of following year.

• Broad-leaved evergreen forests, commonly in association with *Dacrydium pectinatum* and *Dacrycarpus imbricatus* var. *patulus*; 300–1000 m. Hainan.

14. *Lithocarpus damiaoshanicus* C. C. Huang & Y. T. Chang, Guihaia 16: 301. 1996.

大苗山柯 da miao shan ke

Trees 5–9 m tall. Branchlets of current year sulcate; branchlets of last-year growth dark gray to blackish when dry, sparsely lenticellate; lenticels tawny. Petiole 1.5–2 cm, white farinose when dry; leaf blade lanceolate to oblong, 5.5–13 × 2–6 cm, often asymmetric, thickly leathery, abaxially with adherent, waxy scalelike trichomes, adaxially white farinose when dry, base cuneate and decurrent on petiole, margin entire, apex narrowly acuminate and falcate; secondary veins 6–9 on each side of midvein, abruptly

curving apically near margin but not fusing; tertiary veins abaxially very slender, evident to inconspicuous. Male inflorescences solitary; rachis covered with lax, rust-colored, lamellate scalelike trichomes. Female inflorescence: cupules in clusters of ca. 3 but usually 1 or 2 developed. Infructescences rarely over 10 cm; rachis 4–8 mm thick, basally without fruit and sparsely lenticellate. Cupule broadly turbinate, 2–2.5 × 2–3 cm, completely or almost completely enclosing nut, apically flat, wall 3–5 mm thick in middle; basal bracts reduced to scars but apically imbricate to ± arranged in rings, triangular, appressed. Nut broadly depressed turbinate, ca. 1.5 cm in diam., puberulent, wall 1–2 mm thick; scar covering 1/2–3/4 of nut, convex. Fl. Nov–Dec, fr. Oct–Dec of following year.

• Dense forests; 1500–1900 m. Guangxi (Damiao Shan).

15. *Lithocarpus irwinii* (Hance) Rehder, J. Arnold Arbor. 1: 127. 1919.

广南柯 guang nan ke

Quercus irwinii Hance, Ann. Sci. Nat., Bot., sér. 2, 18: 229. 1862; *Pasania irwinii* (Hance) Oersted; *Synaedryx irwinii* (Hance) Koidzumi.

Trees ca. 10 m tall. Young branchlets sulcate, densely tawny pilose, glabrescent; lenticels raised. Petiole usually less than 1 cm; leaf blade elliptic to lanceolate, 7–12 × 2–4 cm, thickly and rigidly leathery, abaxially with reddish brown, scurfy, waxy scalelike trichomes and when young sparsely pilose on midvein, adaxially dark brown and often oily when dry, base cuneate and decurrent on petiole, margin entire or undulate from middle to apex and ± recurved, apex acute to acuminate; secondary veins 10–15 on each side of midvein; tertiary veins abaxially very slender, evident to inconspicuous. Male inflorescences solitary in axils of leaves, or 2 or 3 in panicles; rachis tawny pubescent. Female inflorescence with cupules in clusters of ca. 3, sometimes solitary. Infructescences 2–5 cm; rachis 5–8 mm thick. Cupule turbinate, 2–2.6 × 1.8–2.4 cm, completely enclosing nut, apically broadest and ± flat, wall 2–4 mm thick; bracts imbricate, triangular, center and margin thickened in ridges. Nut subglobose, ca. 1.5 cm in diam., densely covered with appressed minute hairs, wall 2–2.5 mm thick; scar covering ca. 1/4 of nut, convex. Fl. Apr–May, fr. Oct–Nov of following year.

• Sparse forests, common in hilly regions S of the Tropic of Cancer; below 400 m. Fujian, Guangdong, Guangxi.

16. *Lithocarpus handelianus* A. Camus, Bull. Mus. Natl. Hist. Nat., sér. 2, 6: 93. 1934.

瘤果柯 liu guo ke

Trees to 28 m tall. Branchlets of current year stout, conspicuously sulcate, grayish brown pubescent; branchlets of previous year with yellowish brown, thick, waxy scalelike trichomes. Leaves congested at apex of branchlets; petiole 2–3 cm, sturdy with yellowish brown, thick, waxy scalelike trichomes; leaf blade elliptic to rarely ovate, 15–20 × 6–9 cm, ca. 45 × 17 cm

on stump sprouts, thickly leathery, abaxially pubescent when young, with yellowish brown, thick, waxy scalelike trichomes, and pale yellowish gray, usually oily, and shiny when dry, adaxially pubescent on midvein or glabrous, base broadly cuneate to acute, margin entire, apex acute to acuminate; secondary veins 12–19 on each side of midvein; tertiary veins abaxially subparallel. Male inflorescences terminal or rarely axillary, solitary, ca. 20 cm; rachis covered with appressed short hairs. Female inflorescence with cupules in clusters of ca. 3. Infructescence rachis stout. Cupule subglobose, 2–3 cm in diam., completely enclosing nut, apex narrowed, wall 0.5–1 mm thick; bracts imbricate, triangular-subulate, 2–4 mm, thickened, apex \pm curved. Nut conical, 1.6–1.7 cm in diam., with tawny appressed minute hairs, apex narrowed; scar ca. 1.2 cm in diam., covering base of nut, \pm concave at margin but conspicuously convex at center. Fl. May and Aug–Oct, fr. summer–autumn of following year.

- Moist sites of broad-leaved evergreen forests; 400–1000 m. Hainan.
- 17. *Lithocarpus amoenus*** Chun & C. C. Huang in C. C. Huang & Y. T. Chang, *Guihaia* 8: 12. 1988.

榆柯 yu ke

Trees 10–15 m tall. Branchlets of current year sulcate; branchlets and inflorescences densely tawny to grayish brown tomentose. Petiole 2–3 cm; leaf blade elliptic to ovate-elliptic, 12–18 \times 4–8 cm, thickly leathery, abaxially covered with \pm loose, lamellate, waxy scalelike trichomes, adaxially tomentose and with pulveraceous scalelike trichomes when young, base broadly cuneate, margin entire, apex acute to narrowly acuminate; secondary veins 12–16 on each side of midvein, slightly impressed adaxially, abruptly curving apically near margin but not fusing; tertiary veins abaxially usually conspicuous, subparallel. Male inflorescences solitary in axils of leaves or 3 in a panicle. Cupule globose, 2–2.5 cm in diam., usually completely enclosing nut; bracts of young cupules linear, 3–6 mm, slightly incurved, cross section terete to nearly so, grayish puberulent, wall ca. 1 mm thick; bracts of mature cupules reduced to scars or apical ones to shortly linear scales. Nut subglobose, 1.6–2.2 \times 1.6–2 cm, densely covered with tawny appressed minute hairs; scar at most covering ca. 1/4 of nut, convex. Fl. May–Jun, fr. Aug–Oct of following year.

- Mixed mesophytic forests; 300–1000 m. SW Fujian, Guangdong, S Guizhou, SW Hunan.

18. *Lithocarpus tephrocarpa* (Drake) A. Camus, *Riviera Sci.* 18: 42. 1932.

灰壳柯 hui qiao ke

Quercus tephrocarpa Drake, *J. Bot. (Morot)* 4: 151. 1890; *Pasania tephrocarpa* (Drake) Hickel & A. Camus; *Synaedrys tephrocarpa* (Drake) Koidzumi. Trees 10–15 m tall; branchlets, bud scales, young leaf blades, and rachis of inflorescences densely covered

with \pm rough brown long hairs. Branches stout, conspicuously lenticellate. Petiole rarely longer than 1 cm, 5–7 mm thick; leaf blade spatulate, obovate-oblong, or oblong, 30–50 \times 9–10 cm, leathery to thickly papery, \pm glaucous and abaxially with adherent, waxy scalelike trichomes when mature, base rounded to auriculate, margin entire or with a few teeth from middle to apex, apex acute with a blunt tip; secondary veins 21–26 on each side of midvein, adaxially slightly impressed, abruptly curving apically near margin but not fusing; tertiary veins subparallel. Infructescences 8–12 cm; rachis basally ca. 1 cm thick, hairy. Cupules in clusters of ca. 3 but 1 or 2 developed, subglobose, 3–4 cm in diam., completely enclosing nut, apically narrowed and nipple-shaped, wall 3–5 mm thick; bracts imbricate, ovate-triangular, brownish pubescent. Nut subglobose, ca. 2.5 cm in diam., sparsely covered with appressed hairs, wall ca. 2 mm thick; scar covering base of nut, slightly convex. Fr. Aug.

Broad-leaved evergreen forests; 600–1100 m. SE Yunnan [NE Vietnam].

19. *Lithocarpus craibianus* Barnett, *Bull. Misc. Inform. Kew* 1938: 103. 1938.

白穗柯 bai sui ke

Trees to 20 m tall; young branchlets, leaf blades abaxially, and rachis of female inflorescences covered with tawny to grayish, waxy scalelike trichomes. Petiole 1–2.5 cm; leaf blade ovate to ovate-elliptic, 12–19 \times 4–7 cm, leathery, adaxially oily when young and dry, base acute to broadly cuneate, margin entire, apex acuminate; secondary veins 8–12 on each side of midvein, adaxially impressed; tertiary veins abaxially inconspicuous to very slender. Male inflorescences axillary or rarely paniculate, to 15 cm. Female or androgynous inflorescences to 30 cm; cupules in clusters of 5–7. Cupule globose to slightly depressed, 1.5–2 cm in diam., completely enclosing nut, apically with a short, convex nipple, wall 0.5–1 mm thick; bracts imbricate, triangular, subulate, appressed, with tawny, lamellate, waxy scalelike trichomes. Nut subglobose, 1.3–1.8 cm, 1.3–1.8 cm in diam., sparsely covered with appressed minute hairs especially at apex, wall ca. 0.5 mm thick; scar covering ca. 1/3 of nut, convex. Fl. Aug–Sep, fr. Aug–Sep of following year.

Mixed mesophytic forests, usually on dry slopes; 1500–2700 m. SW Sichuan, S to SW Yunnan [Laos, N Thailand].

Possibly conspecific with the Vietnamese *Lithocarpus ollus* (Kurz) A. Camus, which name has priority but is based on a fruiting specimen only. More material is needed to confirm this synonymy.

20. *Lithocarpus talangensis* C. C. Huang & Y. T. Chang, *Guihaia* 8: 21. 1988.

石屏柯 shi ping ke

Lithocarpus dealbatus (J. D. Hooker & Thomson ex Miquel) Rehder var. *yunnanensis* A. Camus.

Trees 15–25 m tall; branchlets of current year and leaf blades abaxially densely pubescent. Branchlets of last-year growth glabrescent, conspicuously lenticellate. Petiole 1–1.5 cm; leaf blade oblong, 12–20 × 4–7 cm, leathery, abaxially covered with dark gray, minute, waxy scalelike trichomes, base cuneate, margin entire, apex shortly acuminate; midvein slightly raised and pilose; secondary veins 10–14 on each side of midvein, adaxially impressed; tertiary veins abaxially ± conspicuous. Male inflorescences paniculate, to 27 cm; rachis pubescent. Female inflorescences 2–4 congested above middle of branches, 5–15 cm; cupules in clusters of ca. 3. Infructescence rachis 5–8 mm thick. Cupule turbinate, 2–2.4 × 1.8–2.6 cm, broadest slightly apical from middle, enclosing more than 1/2 of nut; bracts triangular to rhomboid, from base to middle of cupule fused with wall, grayish puberulent and with waxy scalelike trichomes. Nut subglobose, 1.5–1.8 × 1.6–2.6 cm, with appressed minute hairs, apex flat or concave; scar covering 1/2–2/3 of nut, convex. Fl. May–Jun, fr. Oct–Nov of following year.

• Broad-leaved evergreen forests; 2000–2400 m. S Yunnan.

21. *Lithocarpus truncatus* (King ex J. D. Hooker) Rehder & E. H. Wilson in Sargent, Pl. Wilson. 3: 207. 1916.

截果柯 jie guo ke

Trees to 30 m tall. Branchlets of last year growth lenticellate; lenticels yellowish gray, ± raised. Petiole 1–1.5 cm, basally dark brown to blackish when dry; leaf blade narrowly oblong to lanceolate, 10–25 × 3–7 cm, thinly leathery, concolorous, abaxially glaucous and with adherent waxy scalelike trichomes, adaxial surface of young leaves glossy when dry, base cuneate to narrowly so, margin entire, apex narrowly attenuate with apiculate-caudate tip; secondary veins 11–15 on each side of midvein; tertiary veins abaxially visible. Male inflorescences solitary in leaf axils or congested at apex of branches; rachis pubescent. Female inflorescences solitary or congested; cupules in clusters of 3–5(–7). Infructescence rachis base 4–7 mm thick. Cupule turbinate to obconic, 2.5–3.5 × 2.5–3 cm, enclosing most of nut, apically usually flat; bracts conspicuous, imbricate and triangular or united into interrupted rings, appressed, from base to middle of cupule, densely tawny puberulent. Nut subglobose, ca. 3 × 2.6 cm, with tawny appressed minute hairs, apex ± flat or slightly convex, wall ca. 1 mm thick on sides and ca. 1.5 mm thick near apex; scar covering 2/3–4/5 of nut, convex. Fl. Jun–Aug, fr. Aug–Oct of following year.

Broad-leaved evergreen forests, common on sides of valleys; 700–2200 m. SE Xizang, S Yunnan [NE India, NE Myanmar, N Thailand, N Vietnam].

- 1a. Cupules to 3.5 cm 21a. var. *truncatus*
- 1b. Cupules ca. 2.5 cm 21b. var. *baviensis*

21a. *Lithocarpus truncatus* var. *truncatus*

截果柯(原变种) jie guo ke (yuan bian zhong)

Quercus truncata King ex J. D. Hooker, Fl. Brit. India 5: 618. 1890; *Lithocarpus cathayanus* (Seemen) Rehder; *L. grandicupulus* Y. C. Hsu & al.; *Pasania truncata* (King ex J. D. Hooker) Schottky; *Q. cathayana* Seemen.

Cupule to 3.5 cm; bracts imbricate, triangular, squamose.

Broad-leaved evergreen forests, common on sides of valleys; 700–2200 m. SE Xizang, SW Yunnan [NE India, NE Myanmar, N Thailand, N Vietnam].

21b. *Lithocarpus truncatus* var. *baviensis* (Drake) A. Camus, Chênes, Atlas 3: 63. 1948.

小截果柯 xiao jie guo ke

Quercus baviensis Drake, J. Bot. (Morot) 4: 150. 1890; *Pasania baviensis* (Drake) Schottky; *Synaedrya baviensis* (Drake) Koidzumi.

Cupule ca. 2.5 cm; bracts triangular, except for subulate tip, fused with wall of cupule or united into concentric rings near cupule apex.

Broad-leaved evergreen forests; ca. 1500 m. S to SE Yunnan [N Vietnam].

22. *Lithocarpus cleistocarpus* (Seemen) Rehder & E. H. Wilson in Sargent, Pl. Wilson. 3: 205. 1916.

包果柯 bao guo ke

Trees 5–10 m tall. Branchlets of current year sulcate. Petiole 1–2.5 cm; leaf blade ovate-elliptic to oblong, 9–16 × 3–5 cm, leathery, abaxially with adherent, waxy scalelike trichomes, base attenuate and decurrent on petiole, margin entire, apex acuminate; secondary veins 7–10 on each side of midvein, abruptly curving apically, obscure near margin; tertiary veins abaxially slender, evident, laxly spaced. Male inflorescences solitary in a paniculate cluster; rachis with lamellate waxy scalelike trichomes. Female and androgynous inflorescences with cupules in clusters of 3–5 scattered on rachis. Infructescences 7–10 cm; rachis 4–5 mm thick. Cupule subglobose or turbinate, 2–2.5 cm in diam., enclosing 2/3 to most of nut, apically flat, wall ca. 1.5 mm thick at middle; basal bracts fused to wall and reduced to scars, apically triangular, appressed, and covered with tawny or grayish brown, minute, waxy scalelike trichomes. Nut turbinate, sparsely puberulent or glabrous, apex slightly concave, ± flat, or arcuate-convex; scar covering 1/2–3/4 of nut, convex. Fl. Jun–Oct, fr. summer to winter of following year.

• Broad-leaved evergreen forests, mixed mesophytic forests; 1000–2400 m. Anhui, Fujian, N Guizhou, W Hubei, Hunan, Jiangxi, S Shaanxi, Sichuan, NE Yunnan, Zhejiang.

- 1a. Young leaves usually with oily resins when dry; nuts hairy 22a. var. *cleistocarpus*
- 1b. Young leaves without oily resins when dry; nuts glabrous 22b. var. *omeiensis*

22a. *Lithocarpus cleistocarpus* var. *cleistocarpus*

包果柯(原变种) bao guo ke (yuan bian zhong)

Quercus cleistocarpa Seemen, Bot. Jahrb. Syst. 23(Beibl. 57): 52. 1897; *Lithocarpus kiangsiensis* Hu & F. H. Chen; *Pasania cleistocarpa* (Seemen) Schottky; *Q. fragifera* Franchet; *Q. wilsonii* Seemen; *Synaedrys cleistocarpa* (Seemen) Koidzumi.

Young leaves usually with oily resin when dry. Cupule globose, enclosing most of nut, wall with tawny scalelike trichomes. Nut hairy; scar covering more than 2/3 of nut. Fl. Jun–Oct, fr. autumn and winter of following year.

• Broad-leaved evergreen forests; mixed mesophytic forests; 1000–1900 m. Anhui, Fujian, NE Guizhou, W Hubei, Hunan, Jiangxi, S Shaanxi, E Sichuan, Zhejiang.

22b. *Lithocarpus cleistocarpus* var. *omeiensis* W. P. Fang, Ic. Pl. Omeien. 2(1): t. 117a. 1945.

峨眉包果柯 e mei bao guo ke

Lithocarpus cleistocarpus (Seemen) Rehder & E. H. Wilson var. *fangianus* A. Camus.

Young leaves without oily resins when dry. Petiole 1–2 cm or rarely longer. Cupule turbinate, enclosing 2/3–4/5 of nut, wall with grayish brown scalelike trichomes. Nut glabrous; scar covering 1/2 to essentially all of nut. Fl. Jun–Jul, fr. Aug–Sep of following year.

• Mixed mesophytic forests; 1500–2400 m. NW Guizhou, W Sichuan (Emei Shan), NE Yunnan.

23. *Lithocarpus tenuilimbus* H. T. Chang, Acta Sci. Nat. Univ. Sunyatseni 1960(1): 31. 1960.

薄叶柯 bao ye ke

Trees to 25 m tall; apex of young branchlets, petioles, and young leaf blades sparsely covered with early glabrescent long hairs. Branchlets of last-year growth sparsely lenticellate; lenticels conspicuously raised. Petiole 1–2 cm; leaf blade oblong to elliptic-lanceolate, 12–20 × 4–7 cm, rigidly papery, abaxially ± glaucous when dry and with lamellate, waxy scalelike trichomes and usually sparsely pilose from base to middle of midvein when young, base cuneate and usually asymmetric, margin entire, apex acute; secondary veins 12–16 on each side of midvein, abruptly curving apically and gradually obscured; tertiary veins abaxially visible, subparallel. Male inflorescences solitary in axils of leaves or paniculate; rachis densely tawny puberulent. Female inflorescence with cupules in clusters of 3–5. Infructescence rachis 8–10 mm thick, lenticellate. Cupule turbinate, 2–3 × 2–2.8 cm, broadest apically, usually enclosing most of nut, outside pubescent when young, basally narrowed into a stalk, wall 2–3.5 mm thick; bracts basally enclosing and ± fused with cupule, apically triangular and thick. Nut subglobose, 1.5–2.2 cm in diam., with appressed minute hairs, apex ± flat, wall 1–2 mm thick on sides and ca. 3 mm near apex; scar covering 3/4–5/6 of nut, convex. Fl. May–Jun, fr. Sep–Oct of following year.

Broad-leaved evergreen forests, 700–1200 m. Guangdong, S Guangxi, SE Yunnan [NE Vietnam].

24. *Lithocarpus tabularis* Y. C. Hsu & H. W. Jen, Acta Phytotax. Sin. 14(2): 83. 1976.

平头柯 ping tou ke

Trees to 30 m tall; branchlets and petioles sparsely covered with brownish early glabrescent long hairs when young. Branchlets of current year and petioles dark brown when dry; branchlets of last-year growth lenticellate; lenticels raised. Petiole 3–4 cm; leaf blade oblong, 15–25 × 6–8 cm, leathery, adaxially with dense, tawny, puberulent scalelike trichomes, base cuneate and decurrent on petiole, margin entire, apex acuminate to acute; secondary veins 8–14 on each side of midvein. Male inflorescences axillary, solitary. Female inflorescences 8–10 cm, sometimes androgynous and to 16 cm; cupules in clusters of ca. 3. Infructescences 6–10 cm; rachis 7–9 mm thick, lenticellate. Cupule broadly turbinate, 1.5–2 × 2.5–2.8 cm, broadest apically, enclosing most of nut, wall 2–5 mm thick; bracts triangular, thickened, usually ridged in center. Nut ± depressed globose, 1.2–1.5 × 1–2 cm, with appressed minute hairs, apex ± flat; scar covering 2/3–3/4 of nut, convex. Fl. Apr–May, fr. Oct–Nov of following year.

• Broad-leaved evergreen forests in moist places; ca. 1500 m. SE Yunnan (Pingbian Miaozu Zizhixian).

25. *Lithocarpus crassifolius* A. Camus, Bull. Soc. Bot. France 86: 155. 1939.

硬叶柯 ying ye ke

Lithocarpus pachyphyllodes Y. C. Hsu & al.

Trees to 10 m tall. Branchlets dark brown when dry, lenticellate. Petiole 2–5 mm; leaf blade broadly elliptic to obovate, 5–9 × 3–5 cm, rigidly leathery, yellowish brown when dry, abaxially covered with appressed hairs on midvein and with waxy scalelike trichomes when young, base broadly cuneate, margin entire and slightly recurved, apex rounded, obtuse, or rarely acute; secondary veins 6–9 on each side of midvein, adaxially slightly impressed, sometimes ramified near margin; tertiary veins abaxially slender, evident to inconspicuous. Infructescences 3–5 cm; rachis 4–6 mm thick, glabrous, lenticellate; cupules in clusters of ca. 3. Cupule cupular, 0.8–1.2 × 1.5–2.2 cm, enclosing 1/3–1/2 of nut, wall ca. 2 mm thick; bracts imbricate, triangular, appressed, with loose, rust-colored, waxy scalelike trichomes. Nut depressed, 1–1.2 × 1.5–1.8 cm, glabrous; scar covering 1/4–1/3 of nut, convex but margins ± impressed. Fr. Aug.

Broad-leaved evergreen forests; ca. 2700 m. S Yunnan [N Laos, Vietnam].

26. *Lithocarpus pachyphyllus* (Kurz) Rehder, J. Arnold Arbor. 1: 129. 1919.

厚叶柯 hou ye ke

Trees to 25 m tall. Young branchlets covered with lamellate, rust-colored, waxy scalelike trichomes, sulcate. Petiole 1.2–1.5 cm; leaf blade elliptic to ovate-elliptic, 10–20 × 4–7 cm, thinly or thickly leathery, abaxially dark red when young, glaucous with age, and with minute lamellate waxy scalelike trichomes, base broadly cuneate and ± decurrent on petiole, margin

entire and usually emarginate, apex caudate with tip blunt to rounded; secondary veins 9–15 on each side of midvein, adaxially impressed, abruptly curving apically, fusing near margin. Male inflorescences solitary in axils of leaves or terminal panicles. Female inflorescences in clusters of 2 or 3, to 15 cm; cupules in clusters of 3–5. Infructescences 3–6 mm. Cupule cupular, 0.5–2.5 × 1.5–4.6 cm, variable in size, enclosing most of nut or sometimes only 1/3–1/2 when mature, wall 2–4 mm thick; bracts fused with cupule and reduced to scars or triangular, irregularly multilateral, with rust-colored, lamellate, waxy scalelike trichomes. Nut depressed globose, 1.2–2 × 1.5–3 cm, glabrous, apex rounded to slightly pointed, wall 1–1.2 mm thick; scar 1.2–1.5 cm in diam., convex with impressed margin. Fl. May–Jun, fr. Aug–Sep of following year.

Broad-leaved evergreen and mixed forests, mixed mesophytic forests; 800–2000(–3200) m. SE Xizang, SW Yunnan [Bhutan, NE India, NE Myanmar, Nepal, Sikkim].

The two varieties are not very distinct and could be treated as a single species.

- 1a. Leaf blade thinly leathery; scar confined to nut base 26a. var. *pachyphyllus*
1b. Leaf blade thickly leathery; scar covering 1/3–1/2 of nut 26b. var. *fruticosus*

26a. *Lithocarpus pachyphyllus* var. *pachyphyllus*

厚叶柯(原变种) *hou ye ke* (yuan bian zhong)

Quercus pachyphylla Kurz, J. Asiat. Soc. Bengal, Pt. 2, Nat. Hist. 44: 197. 1875; *Lithocarpus woon-youngii* Hu; *Pasania pachyphylla* (Kurz) Schottky; *Synaedrys pachyphylla* (Kurz) Koidzumi.

Leaf blade thinly leathery. Cupule 1.5–4.6 cm in diam., enclosing most of nut when young but only 1/3–1/2 when mature; bracts fused with cupule and reduced to scars or triangular, irregularly multilateral. Scar only at base of nut.

Broad-leaved evergreen and mixed forests; 800–1000(–3200) m. SE Xizang, SW Yunnan [Bhutan, NE India, NE Myanmar, Nepal, Sikkim].

In Yunnan, this variety is found in mixed mesophytic forests from 2400–3200 m.

26b. *Lithocarpus pachyphyllus* var. *fruticosus* (G. Watt ex King) A. Camus, Chênes 3: 624. 1953.

顺宁厚叶柯 *shun ning hou ye ke*

Quercus pachyphylla Kurz var. *fruticosa* G. Watt ex King, Ann. Roy. Bot. Gard. (Calcutta) 2: 45. 1889; *Lithocarpus dulongensis* H. Li & Y. C. Hsu; *L. hypoviridis* Y. C. Hsu & al.; *L. variolosus* (Franchet) Chun subsp. *shunningensis* A. Camus.

Leaf blade thickly leathery. Cupule 2.2–2.8 cm in diam., enclosing most of nut; bracts united into 3–5 continuous or interrupted rings, basal ones almost completely fused with cupule. Scar covering 1/3–1/2 of nut.

Mixed mesophytic forests; ca. 2000 m. SW Yunnan [NE Myanmar].

27. *Lithocarpus apricus* C. C. Huang & Y. T. Chang, Guihaia 8: 40. 1988.

向阳柯 *xiang yang ke*

Trees 2–5 m tall. Branchlets grayish puberulent at apex, blackish when dry, densely lenticellate; lenticels gray. Petiole 1.5–2.5 cm; leaf blade ovate to elliptic, 8–15 × 3.5–6 cm, subleathery, with reddish brown, lamellate, glaucous, pulverulous scalelike glands when young, base acute, margin entire, apex narrowly acuminate to caudate; secondary veins 8–12 on each side of midvein, adaxially slightly impressed, usually fusing near margin; tertiary veins abaxially inconspicuous. Male inflorescences racemose or rarely paniculate, 8–12 cm. Infructescences 5–12 cm; rachis 6–12 mm thick; cupules in clusters of ca. 3. Cupule cupular, 0.6–1.2 × 1.4–2.2 cm, enclosing 1/2 or slightly more of nut, wall 2–4 mm thick; bracts imbricate, broadly triangular, appressed, with reddish, lamellate scalelike glands and short hairs. Nut depressed globose, 1.1–1.6 × 1.4–2.2 cm, usually with longitudinal fissures, glabrous, apex ± flat, wall ca. 0.5 mm thick; scar at basal part of nut, 1.2–1.6 cm in diam., slightly convex. Fr. Aug–Sep.

• Sunny dry slopes, usually associated with shrubs, bamboo, and ferns; ca. 2500 m. C Yunnan (Jingdong Xian, Xiping Yizu Daizu Zizhixian).

28. *Lithocarpus variolosus* (Franchet) Chun, J. Arnold Arbor. 9: 153. 1928.

麻子壳柯 *ma zi qiao ke*

Quercus variolosa Franchet, J. Bot. (Morot) 13: 156. 1899; *Lithocarpus chienchuanensis* Hu; *L. hui* A. Camus; *L. leucostachyus* A. Camus; *Pasania hui* (A. Camus) Hu; *P. variolosa* (Franchet) Schottky; *Synaedrys variolosa* (Franchet) Koidzumi.

Trees to 20 m tall. Branchlets blackish when dry, sparsely lenticellate; lenticels grayish brown. Petiole 1(–1.5) cm; leaf blade broadly ovate, ovate-elliptic, or lanceolate, 6–15(–24) × 3–5(–7) cm, leathery to thickly papery, abaxially with thick adherent, waxy scalelike trichomes and ± glaucous when dry, base subrounded to broadly cuneate, margin entire, apex acuminate and usually falcate; secondary veins 6–10 on each side of midvein, adaxially ± impressed, fusing near margin; tertiary veins abaxially inconspicuous to slender, evident. Male inflorescences solitary in axils of leaves or paniculate. Female inflorescences usually terminal clusters, 3–6(–10) cm; rachis stout, usually twisted, with tawny scalelike trichomes; cupules in clusters of ca. 3. Infructescences 4–7 cm; rachis ca. 3 mm thick. Cupule cupular, 0.6–1.8 × 1.5–2.5 cm, usually broadest slightly apically from middle, enclosing 1/2 to most of nut, wall 1–1.5 mm thick; bracts reddish to dark grayish brown, basal bracts usually united in continuous or interrupted rings and obscurely broadly ovate or multilateral, apically triangular and small. Nut depressed globose, 1–2 × 1.2–2.6 cm, glabrous, wall ca. 0.5 mm thick; scar covering 1/5–1/3(–1/2) of nut,

convex but concave at margin. Fl. May–Jul, fr. Jul–Sep of following year.

Mixed mesophytic forests, usually in association with *Picea*, *Abies*, and subalpine *Quercus*; 2500–3000 m. SW Sichuan, NW Yunnan [Vietnam]

29. *Lithocarpus dealbatus* (J. D. Hooker & Thomson ex Miquel) Rehder, *J. Arnold Arbor.* 1: 124. 1919.

白柯 bai ke

Quercus dealbata J. D. Hooker & Thomson ex Miquel, *Ann. Mus. Bot. Lugduno-Batavi* 1: 107. 1863; *Lithocarpus tapintzensis* A. Camus; *L. viridis* (Schottky) Rehder; *Pasania dealbata* (J. D. Hooker & Thomson ex Miquel) Oersted; *P. viridis* Schottky p.p. (syntype A. Henry 9636); *P. yenshanensis* Hu; *Q. thalassica* Hance var. *vestita* Franchet; *Synaedrys dealbata* (J. D. Hooker & Thomson ex Miquel) Koidzumi.

Trees rarely to 20 m tall; bud scales, branchlets, petioles, leaf blades abaxially, rachis of inflorescences, and scales of cupule tawny tomentose with short hairs. Petiole 1–2 cm; leaf blade ovate, ovate-elliptic, or lanceolate, 7–14 × 2–5 cm, thickly papery to leathery, concolorous or abaxially grayish and with waxy scale, base cuneate, margin entire or rarely apically shallowly undulate, apex acuminate to acute; midvein adaxially slightly raised and usually sparsely pubescent; secondary veins (8–)10–13 on each side of midvein; tertiary veins abaxially conspicuous, ± parallel. Male inflorescences clustered at apex of branches, rarely to 15 cm. Female inflorescences sometimes androgynous, rarely to 20 cm; cupules in clusters of 3(–5). Infructescences usually 5–8 cm. Cupule cupular, 0.8–1.4 × 1–1.8 cm, enclosing 1/2 to most of nut; bracts imbricate, triangular, appressed or a few spreading. Nut depressed globose to subglobose, slightly smaller than cupule, apex rounded, ± flat, or rarely convex, wall ca. 1 mm thick; scar covering ca. 1/3 (–1/2) of nut, convex. Fl. Aug–Oct, fr. Aug–Oct of following year.

Mixed mesophytic forests, usually in association with *Pinus yunnanensis*, *Picea*, and other species of Fagaceae; 1000–2800 m. Guizhou, SW Sichuan, SE Xizang, Yunnan [Bhutan, NE India, N Laos, NE Myanmar, N Thailand, Vietnam].

30. *Lithocarpus thomsonii* (Miquel) Rehder, *J. Arnold Arbor.* 1: 132. 1919.

潞西柯 lu xi ke

Quercus thomsonii Miquel, *Ann. Mus. Bot. Lugduno-Batavi* 1: 109. 1863; *Pasania thomsonii* (Miquel) Hickel & A. Camus; *Q. turbinata* Roxburgh (1832), not Blume (1825); *Synaedrys thomsonii* (Miquel) Koidzumi. Trees 8–10 m tall; branchlets, petioles, young leaf blades abaxially, and inflorescences densely covered with grayish, crisp minute hairs. Branches of last year dark brown to blackish when dry, glabrescent, lenticellate; lenticels gray. Petiole rarely longer than 1 cm; leaf blade ovate to broadly elliptic or sometimes

obovate to obovate-elliptic, 9–20 × 4–6.5 cm, thickly papery, abaxially glaucous and with adherent, waxy scalelike trichomes, base acute to cuneate, margin usually undulate, apex obtuse to acuminate; secondary veins 10–13 on each side of midvein, ramified near margin but rarely fusing; tertiary veins abaxially slender, evident. Male inflorescences solitary in axils of leaves, 5–10 cm. Female inflorescences 5–10 cm; cupules in clusters of ca. 3; young cupules depressed globose, apically flat. Infructescence ca. 10 cm. Cupule cupular, 1.5–1.8 cm in diam., outside and nut densely covered with grayish crisp minute hairs and scurfy scalelike trichomes. Nut 1.3–1.4 × 1.4–1.6 cm; scar covering ca. 1/3 of nut, convex. Fl. Jun–Aug, fr. Aug–Oct of following year.

Broad-leaved evergreen forests; 800–3000 m. SE Xizang (Médog Xian), S and W Yunnan [NE India, Myanmar, N Thailand, Vietnam].

31. *Lithocarpus laetus* Chun & C. C. Huang ex Y. C. Hsu & H. W. Jen, *Acta Phytotax. Sin.* 14(2): 83. 1976.

屏边柯 ping bian ke

Trees to 30 m tall. Branchlets of current year tawny pubescent. Petiole 1–1.5 cm; leaf blade oblong-lanceolate, 7–11 × 1.5–3 cm, subleathery, abaxially pubescent, glabrescent, and with lax, rust-colored scalelike trichomes, adaxially pubescent when young but glabrescent except for midvein with age, base broadly cuneate and sometimes asymmetric, margin entire, apex acuminate; secondary veins 13–16 on each side of midvein; tertiary veins abaxially not visible. Infructescence ca. 4 cm; cupules in clusters of ca. 3. Cupule obconic to cupular, 1–1.2 × 2–2.2 cm, enclosing ca. 2/3 of nut, wall 2–4 mm thick; bracts imbricate, triangular, appressed. Nut broadly conical, 1.8–2 × 1.6–1.8 cm, with appressed, rust-colored minute hairs, base broadest, gradually narrowed apically, apex pointed, wall 1–2 mm thick; scar covering ca. 1/3 of nut, convex but margin ± impressed. Fr. Oct.

• Broad-leaved evergreen forests; ca. 1700 m. SE Yunnan (Pingbian Miaozu Zizhixian).

32. *Lithocarpus cucullatus* C. C. Huang & Y. T. Chang, *Guihaia* 8: 23. 1988.

风兜柯 feng dou ke

Trees ca. 15 m tall; young branchlets and young leaf blades tawny tomentose. Branchlets of last-year growth blackish, obscurely lenticellate. Petiole 1–1.5 cm; leaf blade narrowly oblong to lanceolate, 6–11 × 1.5–3 cm, rigidly papery, adaxially with a thick layer of tawny, waxy scalelike trichomes and sometimes with minute wrinkles when dry, base cuneate, margin entire or sometimes shallowly undulate, apex acuminate; secondary veins 10–14 on each side of midvein; tertiary veins abaxially not visible or very slender, evident. Androgynous inflorescence to 18 cm; rachis densely tawny tomentose with short hairs. Female inflorescences 6–10 cm; cupules in clusters of ca. 3.

Infructescences 4–5 cm. Cupule obconic, ca. 1.7 cm, enclosing most of nut, wall ca. 1.5 mm thick; basal bracts fused to wall and reduced to scars, apically separate from wall by a subulate apex, appressed, and ovate-triangular, tawny puberulent and with waxy scalelike trichomes when young, glabrescent. Nut broadly conical, ca. 1.4 cm in diam., with appressed minute hairs, wall ca. 1 mm thick; scar covering ca. 1/3 of nut, convex. Fl. Jun–Jul, fr. Jul–Aug of following year.

• Broad-leaved evergreen forests; 700–1200 m. N Guangdong, Hunan.

33. *Lithocarpus chrysocomus* Chun & Tsiang, J. Arnold Arbor. 28: 321. 1947.

金毛柯 jin mao ke

Lithocarpus chrysocomus var. *zhangpingensis* Q. F. Zheng.

Trees to 20 m tall; branchlets of current year and rachis of inflorescences densely tawny puberulent and with scurfy scalelike trichomes. Petiole 1–2 cm; leaf blade ovate, oblong, or rarely lanceolate, (6–)8–15 × (1.5–)2.5–5.5 cm, rigidly leathery, abaxially densely covered with lax yellowish brown to reddish brown, scurfy scalelike trichomes, adaxially glabrous, base broadly cuneate and sometimes asymmetric, margin entire, apex acuminate to acute; secondary veins 9–13 on each side of midvein; tertiary veins abaxially not visible. Male inflorescences solitary in axils of leaves or in paniculate clusters, usually androgynous. Female inflorescences in clusters of ca. 3. Infructescences less than 5 cm; developed cupules 2–6. Cupule subglobose, 2–2.5 cm in diam., enclosing most of nut, wall 1–1.5 mm thick; bracts imbricate, triangular, puberulent and with rust-colored scalelike trichomes when young, apex subulate and spreading. Nut subglobose but broadest apically, 1.7–1.8 × 1.2–2 cm, densely covered with tawny, appressed minute hairs, wall ca. 1 mm thick; scar covering ca. 1/3 of nut, convex. Fl. Jun–Aug, fr. Aug–Oct of following year.

• Broad-leaved evergreen and mixed mesophytic forests, often a dominant species of broad-leaved evergreen forest; 600–1400 m. N Guangdong, NE Guangxi, S Hunan (Yizhang Xian).

34. *Lithocarpus lycoperdon* (Skan) A. Camus, Rivière Sci. 18: 41. 1931 [1932].

香菌柯 xiang jun ke

Quercus lycoperdon Skan in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 518. 1899; *Lithocarpus elatus* (Hickel & A. Camus) A. Camus; *L. krempfii* (Hickel & A. Camus) A. Camus; *Pasania elata* Hickel & A. Camus; *P. krempfii* Hickel & A. Camus; *P. lycoperdon* (Skan) Schottky; *Synaedrys lycoperdon* (Skan) Koidzumi.

Trees to 30 m tall. Branchlets of current year sulcate, dark brown when dry. Petiole 1.5–2 cm, dark brown to blackish when dry, base ± thickened; leaf blade oblong

to sometimes ovate-elliptic, 10–15 × 4–6 cm, rigidly leathery, abaxially rust-colored to tawny pulverulent-scurfy, adaxially glabrous, base cuneate and decurrent on petiole, margin entire, apex acute to acuminate; secondary veins 8–11 on each side of midvein, sometimes ramified near margin; tertiary veins abaxially not visible or very slender, evident. Male inflorescences in a panicle, rarely solitary in leaf axils. Female inflorescences sometimes androgynous, 8–20 cm; cupules in clusters of ca. 3. Infructescences usually less than 10 cm; rachis base 7–12 mm thick; lenticels yellowish brown. Cupule turbinate to cupular, 2–2.5 × 2.4–2.8 cm, broadest at middle, enclosing most of nut, wall 2–3 mm thick; bracts triangular-subulate, appressed, puberulent and scurfy. Nut depressed globose to subglobose, ca. 1.5 × 2 cm, appressed puberulent and scurfy, apex narrowed, wall 2–2.5 mm thick; scar covering ca. 1/3 of nut, convex. Fl. May–Jun, fr. Sep–Oct of following year.

Broad-leaved evergreen forests; 1000–1500 m. W Guangxi, SE Yunnan [Laos, N Vietnam].

35. *Lithocarpus paihengii* Chun & Tsiang, J. Arnold Arbor. 28: 322. 1947.

大叶苦柯 da ye ku ke

Trees to 15 m tall. Branches glabrous. Petiole 2–3 cm, stout, sometimes white farinose; leaf blade ovate-elliptic, oblong, or rarely obovate-elliptic, 15–25 × 4–9 cm, thickly leathery, abaxially tawny to reddish brown scurfy when young, adaxially dark brown to reddish brown, glabrous, and often glossy, base broadly cuneate and decurrent on petiole, margin entire, apex acuminate to shortly acute; secondary veins 8–13 on each side of midvein; tertiary veins abaxially not visible or very slender, evident. Male inflorescences solitary in axils of leaves or in a panicle, to 20 cm; rachis sparsely tawny pubescent. Androgynous inflorescences 7–13 cm, with a few male flowers at apex. Female inflorescence with cupules in clusters of ca. 3. Infructescences 6–10 cm; rachis 6–8 mm thick, lenticellate. Cupule globose to depressed globose, 2–2.8 cm in diam., enclosing most of nut, outside grayish scurfy, wall 1.5–2.5 mm thick; basal bracts obscure, sometimes united into concentric rings but with a subulate tip, apical ones triangular, appressed. Nut depressed globose to broadly conical, 1.2–2 × 1.4–2.4 cm, covered with tawny minute hairs; scar covering ca. 1/3 of nut, convex. Fl. May–Jun, fr. Oct–Nov of following year.

• Mixed mesophytic forests; 700–1600 m. S Fujian, Guangdong, Guangxi, S Hunan, S Jiangxi.

36. *Lithocarpus triqueter* (Hickel & A. Camus) A. Camus, Rivière Sci. 18: 42. 1932.

棱果柯 leng guo ke

Pasania triquetra Hickel & A. Camus, Ann. Sci. Nat., Bot., sér 10, 3: 400. 1921.

Trees tall; Petiole 2–2.5 cm; leaf blade narrowly oblong to oblanceolate-elliptic, 15–25 × 5–7 cm, thickly papery, leaf blades abaxially and rachis of inflorescences with

lamellate, appressed, waxy scalelike trichomes, abaxially grayish brown, adaxially dark brown when dry, base cuneate and decurrent on petiole, margin entire, apex shortly acuminate; secondary veins 8–11 on each side of midvein, curving apically, obscure near margin. Male inflorescences in a panicle, to 20 cm. Female inflorescences 8–10 cm; cupules in clusters of ca. 3. Infructescence rachis stout, base ca. 1 cm thick. Cupule subglobose, ± asymmetric, 2.2–2.6 cm in diam., enclosing nut; bracts imbricate, triangular, squamose, gray to light brown when dry, densely scurfy. Nut subglobose, 1.6–2.4 cm, depressed on 1 or 2 sides, obtusely ridged from middle to apex, wall ca. 1 mm thick; scar covering ca. 1/2 of nut, convex. Fl. Jun, fr. Sep–Oct of following year.

Broad-leaved evergreen forests; 600–1200 m. SE Yunnan [N Vietnam].

37. *Lithocarpus cinereus* Chun & C. C. Huang in C. C. Huang & Y. T. Chang, *Guihaia* 8: 11. 1988.

炉灰柯 *lu hui ke*

Trees. Branches glabrous; branchlets of current year sulcate. Petiole 1–1.5 cm; leaf blade oblong to lanceolate, 8–11 × 2–3.5 cm, thickly leathery, abaxially grayish green, dark grayish brown when dry, and with waxy scalelike trichomes, adaxially glabrous, base cuneate, margin entire or obscurely undulate near apex and ± recurved, apex narrowly acuminate; secondary veins 11–15 on each side of midvein, adaxially ± impressed; tertiary veins abaxially not visible.

Infructescences 8–10 cm; rachis 6–8 mm thick, basally lenticellate; lenticels brown; cupules in clusters of ca. 3 but only 1 developed. Cupule cupular, 1.6–2.2 × 2–2.5 cm, broadest slightly from middle to apex, enclosing ca. 2/3 of nut, basally narrowed, wall 2–4 mm thick; basal bracts fused to wall except for a subulate tip, triangular, with lax dark grayish brown waxy scalelike trichomes, apical ones smaller, imbricate. Nut broadly conical, 1.6–2 × 1.6–2 cm, densely covered with tawny appressed minute hairs, wall 1–1.5 mm; scar covering ca. 1/3 of nut, convex but margin impressed. Fr. Nov.

• Broad-leaved evergreen forests; ca. 1000 m. SW Guangxi, SE Yunnan.

38. *Lithocarpus uvariifolius* (Hance) Rehder, *J. Arnold Arbor.* 1: 132. 1919.

紫玉盘柯 *zi yu pan ke*

Trees 10–15 m tall or shrubs 1–4 m tall; young branchlets, petioles, and rachis of inflorescences densely with tawny to rust-colored, ± coarse long hairs. Branches with large and conspicuous bud scars. Petiole 1–3.5 cm; leaf blade 4–22 × 2–10 cm, leathery to thickly papery, concolorous, base subrounded, margin dentate to undulate near apex or entire, apex acute, shortly caudate, or rarely shortly acuminate; secondary veins 22–35 on each side of midvein, abaxially pilose, abruptly curving apically, fusing near margin; tertiary veins abaxially conspicuous, subparallel, pilose. Male

inflorescences spicate, solitary in axils of leaves or clustered at apex of branchlets; rachis stout. Female flowers usually borne on base of male inflorescence rachis, in clusters of ca. 3 or sometimes solitary. Infructescence with 1–4 developed cupules. Cupule cupular to subglobose, 2–3.5 × 3.5–5 cm, enclosing more than 1/2 of nut, outside puberulent and scurfy or rarely glabrescent, wall 2–5 mm thick; bracts narrowly oblong to lanceolate when young, rhomboid to multilateral with age. Nut subglobose, densely covered with appressed minute hairs, apex rounded, flat, or rarely concave, wall 4–8 mm thick; scar covering more than 1/2 of nut, convex. Fl. May–Jul, fr. Oct–Dec of following year.

• Broad-leaved evergreen forests or in association with *Castanopsis* and *Cyclobalanopsis* or *Pinus massoniana*, dry, hilly areas; 200–1000 m. Fujian, N to NE Guangdong, Guangxi.

1a. Trees; leaf blade 9–22 × 5–10 cm, apex

rounded, obtuse, abruptly acute, or sometimes shortly caudate; secondary veins 25–35

on each side of midvein 38a. var. *uvariifolius*

1b. Shrubs or small trees; leaf blade 4–10 × 2–

4.5 cm, apex acuminate; secondary veins 14–20

on each side of midvein 38b. var. *ellipticus*

38a. *Lithocarpus uvariifolius* var. *uvariifolius*

紫玉盘柯(原变种) *zi yu pan ke* (*yuan bian zhong*)

Quercus uvariifolia Hance, *J. Bot.* 22: 227. 1884;

Pasania uvariifolia (Hance) Schottky; *Synaedrys*

uvariifolia (Hance) Koidzumi.

Trees 10–15 m tall. Leaf blade obovate, obovate-elliptic, or rarely elliptic, 9–22 × 5–10 cm, abaxially with 2–4-branched, stellate, short hairs, margin dentate to undulate near apex or rarely entire, apex rounded, obtuse, abruptly acute, or sometimes shortly caudate; secondary veins 25–35 on each side of midvein. Cupule apically 3.5–4.5 cm in diam.

• Broad-leaved evergreen forests or in association with *Castanopsis* and *Cyclobalanopsis* or *Pinus massoniana*; 200–800 m. SW Fujian, N to NE Guangdong, Guangxi.

38b. *Lithocarpus uvariifolius* var. *ellipticus* (F. P. Metcalf)

C. C. Huang & Y. T. Chang, *Guihaia* 8: 16. 1988.

卵叶玉盘柯 *luan ye yu pan ke*

Lithocarpus ellipticus F. P. Metcalf, *Lingnan Sci. J.* 20:

218. 1942; *L. kwangtungensis* H. T. Chang.

Shrubs or small trees, 1–4 m tall. Leaf blade ovate, 4–10 × 2–4.5 cm, abaxially with short hairs, margin entire, apex acuminate. Cupule rarely over 3.5 cm in diam.

• Dry, hilly areas; 400–1000 m. C to S Fujian, NE Guangdong.

39. *Lithocarpus fordianus* (Hemsley) Chun, *J. Arnold Arbor.*

8: 21. 1927.

密脉柯 mi mai ke

Quercus fordiana Hemsley, Hooker's Icon. Pl. 27: t. 2664. 1901; *Synaedrys fordiana* (Hemsley) Koidzumi.

Trees usually less than 10 m tall; branchlets, leaf blades abaxially, and inflorescences rachis tawny pilose and with stellate hairs. Petiole 1–3 cm; leaf blade oblong to obovate-elliptic, 10–25 × 3–9 cm, thickly papery, concolorous, base cuneate and sometimes asymmetric, margin at least near apex remotely dentate, apex acute, caudate, or rarely acuminate; secondary veins (15–)20–28 on each side of midvein, basal ones fusing near margin, apical ones ending in teeth; tertiary veins abaxially slender, evident, subparallel. Inflorescences usually androgynous, 3–10 cm; male flower on distal 1/2. Female inflorescence cupules fewer than 10, in clusters of ca. 3 or sometimes solitary. Infructescence rachis ca. 5 mm thick. Cupule cupular, 2–3 × 2.5–3.5 cm, enclosing 2/3–3/4 of nut, wall ca. 1 mm thick; bracts triangular to rhomboid, center and margin ridged, tawny puberulent and scurfy or rarely glabrescent. Nut turbinate, ca. 2 × 3 cm, hairy, apex rounded or flat, wall 4–10 mm thick; scar covering more than 1/2 of nut, convex. Fl. May–Sep, fr. Aug–Oct of following year. Broad-leaved evergreen forests, frequent in moist sites; 700–1500 m. SW Guizhou, S Yunnan [Vietnam].

40. *Lithocarpus corneus* (Loureiro) Rehder in Bailey, Stand. Cycl. Hort. 3569. 1917.

烟斗柯 yan dou ke

Trees usually less than 15 m tall. Branchlets light tawny, dark gray, or silver-gray, glabrous or pubescent, sparsely lenticellate; lenticels raised. Leaves usually congested at apex of branches; petiole 0.5–4.5 cm; leaf blade (5–)10–15 × 2–4.5 cm, papery to leathery, concolorous, with ± translucent, minute (visible under hand lens) scalelike glands, base cuneate to subrounded and symmetric or oblique, margin dentate, shallowly undulate, or rarely entire, apex acuminate to acute; secondary veins 9–26 on each side of midvein, ending in teeth; tertiary veins abaxially slender, evident, subparallel. Male inflorescences often with female flowers borne at base of rachis; Female inflorescences less than 10 cm; cupules in clusters of ca. 3 or sometimes solitary. Infructescences 5–7; rachis 3–4 mm thick. Cupule cupular to subglobose, 2.2–4.5 × 2.5–5.5 cm, enclosing ca. 1/2 of nut, wall (1–)2–3 mm thick, woody, and basally thickened; bracts triangular to rhomboid, center and margin ridged or fused with cupule and ± united into concentric rings. Nut subglobose to turbinate, rarely glabrous, apex rounded, flat, or slightly concave, wall ± horny and usually thicker than wall of cupule; scar covering 1/2 to most of nut, convex. Cotyledons 4–8-lobed. Fl. almost all year around but mainly May–Jul, fr. maturing on 1-year-old branchlets.

Broad-leaved evergreen forests, frequent on sunny slopes and in dry places, coastal regions; below 1000 m. S Fujian, Guangdong, Guangxi, S Guizhou, Hainan, S Hunan, Taiwan, EC and SE Yunnan [NE Vietnam].

A widespread and variable species. A critical review of the pattern of variation within *Lithocarpus corneus* may show that the acceptance of most of the varieties below is unjustified.

- 1a. Leaf blade abaxially hairy 40e. var. *hainanensis*
- 1b. Leaf blade glabrous or abaxially with short hairs only along midvein or at axils of secondary veins.
 - 2a. Bracts on cupule mostly reduced and often united into a few concentric rings, slightly convex 40b. var. *zonatus*
 - 2b. Bracts triangular to rhomboid, center and margin ridged and interweaved.
 - 3a. Cupules 2–5.5 cm in diam.
 - 4a. Leaf blade elliptic, obovate-oblong, or ovate; secondary veins less than 20 on each side of midvein 40a. var. *corneus*
 - 4b. Leaf blade narrowly oblong to oblanceolate; secondary veins 20–26 on each side of midvein 40c. var. *angustifolius*
 - 3b. Cupules to 2 cm in diam..
 - 5a. Leaf blade secondary veins flat or adaxially slightly impressed; fruit to 16 per infructescence 40d. *fructuosus*
 - 5b. Leaf blade secondary and tertiary veins adaxially conspicuously impressed; fruit ca. 5 per infructescence 40f. var. *rhytidophyllus*

40a. *Lithocarpus corneus* var. *corneus*

烟斗柯(原变种) yan dou ke (yuan bian zhong)
Quercus cornea Loureiro, Fl. Cochinch. 2: 572. 1790; *Lithocarpus ellipticus* F. P. Metcalf var. *glabratus* F. P. Metcalf; *L. kodaihoensis* (Hayata) Hayata; *L. tsangii* A. Camus; *Pasania cornea* (Loureiro) Oersted; *Q. kodaihoensis* Hayata; *Synaedrys cornea* (Loureiro) Koidzumi.

Petiole 0.5–4 cm; leaf blade elliptic, obovate-oblong, or ovate, 4–20 × 1.5–7 cm, with ± translucent, minute (visible under hand lens) scalelike glands. Cupule 2.2–4.5 × 2.5–5.5 cm, enclosing ca. 1/2 of nut, wall woody and basally thickened; bracts triangular to rhomboid, center and margin ridged. Nut subglobose to turbinate, rarely glabrous, apex rounded, flat, or slightly concave, wall ± horny and usually thicker than wall of cupule; scar covering ca. 1/2 to most of nut.

Broad-leaved evergreen forests, frequent on sunny slopes and in dry places. S Fujian, Guangdong, Guangxi, S Guizhou, S Hunan, Taiwan, SE Yunnan [NE Vietnam].

40b. *Lithocarpus corneus* var. *zonatus* C. C. Huang & Y. T. Chang, *Guihaia* 8: 14. 1988.

环鳞烟斗柯 huan lin yan dou ke

Lithocarpus hemisphaericus (Drake) Barnett; *Pasania hemisphaerica* (Drake) Hickel & A. Camus; *Quercus hemisphaerica* Drake (1890) not W. Bartram ex Willdenow (1805); *Synaedrys hemisphaerica* (Drake) Koidzumi.

Petiole 2–4.5 cm; leaf blade lanceolate to narrowly oblong, variable in size, large blades ca. 20 × 6 cm, small blades ca. 7 × 2 cm, sparsely pubescent on midvein or sometimes abaxially at axils of veins. Cupule 3.5–4.5 × 4–5 cm. Nut with appressed minute hairs, glabrescent, apex flat but with center slightly impressed, wall rigidly horny and 2–4 × thicker than wall of cupule.

Guangdong, Guangxi [NE Vietnam].

40c. *Lithocarpus corneus* var. *angustifolius* C. C. Huang & Y. T. Chang, *Guihaia* 8: 15. 1988.

窄叶烟斗柯 zhai ye yan dou ke

Petiole 1.5–2 cm; leaf blade narrowly oblong to oblanceolate, 2.5–3.8 × 1–2.3 cm, abaxially with branched, short hairs when young, usually sparsely pilose on midvein, occasionally with tuft of hairs at axils of veins. Cupule 2–3 cm in diam. Nut hairy at apex, wall thicker than that of cupule.

• W Guangxi, SE Yunnan.

40d. *Lithocarpus corneus* var. *fructuosus* C. C. Huang & Y. T. Chang, *Guihaia* 8: 15. 1988.

多果烟斗柯 duo guo yan dou ke

Petiole 0.5–1.5 cm; leaf blade abaxially with tuft of hairs at axils of veins. Cupule 1.5–2.5 cm in diam. Nut rounded, 1.5–2 cm in diam., apex pointed, wall 2–4 mm thick and slightly thicker than wall of cupule.

• Guangxi.

40e. *Lithocarpus corneus* var. *hainanensis* (Merrill) C. C. Huang & Y. T. Chang, *Guihaia* 8: 14. 1988.

海南烟斗柯 hai nan yan dou ke

Quercus hainanensis Merrill, *Philipp. J. Sci.* 23: 239. 1923.

Petiole 1–2(–3.5) cm; leaf blade obovate, obovate-oblong, or rarely elliptic, abaxially sparsely covered with short, early glabrescent stellate hairs, sometimes short hairs remaining on midvein and secondary veins. Cupule apically flat or slightly convex, outside densely hairy. Nut wall much thicker than cupule wall.

• Coastal regions. S and SW Guangdong, Hainan.

40f. *Lithocarpus corneus* var. *rhytidophyllus* C. C. Huang & Y. T. Chang, *Guihaia* 8: 15. 1988.

皱叶烟斗柯 zhou ye yan dou ke

Petiole less than 1 cm; leaf blade adaxially bullate. Cupule less than 2 cm in diam. Nut convex at apex.

• Forests on dry slopes. EC Yunnan (Mile Xian).

41. *Lithocarpus pachylepis* A. Camus, *Bull. Soc. Bot. France* 82: 437. 1935.

厚鳞柯 hou lin ke

Quercus wangii Hu & W. C. Cheng.

Trees 10–20 m tall; branchlets of current year, petioles, and rachis of inflorescences covered with short stellate hairs. Petiole 1.5–2.5 cm; leaf blade obovate-oblong to oblong, 20–35 × 6–11 cm, rigidly papery, concolorous, abaxially covered with short, stellate hairs along veins and sometimes with tuft of hairs on axils of veins, base broadly cuneate, margin serrate-dentate, apex obtuse to acute; secondary veins 25–30 on each side of midvein, ending in teeth; tertiary veins abaxially conspicuous, subparallel. Male inflorescences solitary in axils of leaves or in a panicle. Female inflorescences 3–5 cm; cupules in clusters of ca. 3. Infructescence ca. 7 cm; rachis ca. 5 mm thick. Cupule turbinate when young, discoid when mature, 1.5–3 × 4.5–6 cm, covering base of nut, wall 7–9 mm thick and woody; bracts ovate-triangular to oblique rhomboid margin and midvein ridged, apex subulate and incurved. Nut broadly conical when young and densely tawny puberulent, depressed globose when mature, 1.5–2.5 × 4–6.5 cm, apex flat but slightly concave in center, wall horny and 7–10 mm thick; scar covering ca. 1/2 of nut, ± convex. Fl. Apr–Jun, fr. Oct–Dec of following year.

Broad-leaved evergreen forests, also on dry slopes; 900–1800 m. W Guangxi, SE Yunnan [N Vietnam].

42. *Lithocarpus attenuatus* (Skan) Rehder, *J. Arnold Arbor.* 1: 123. 1919.

尖叶柯 jian ye ke

Quercus attenuata Skan in F. B. Forbes & Hemsley, *J. Linn. Soc., Bot.* 26: 506. 1899; *Pasania attenuata*

(Skan) Schottky; *Synaedrys attenuata* (Skan) Koidzumi.

Trees 10–15 m tall. Branchlets of last-year growth white farinose. Petiole 1.5–3 cm; leaf blade ovate-elliptic to lanceolate, 7–13 × 2–4 cm, thinly leathery, abaxially glaucous when dry and with adherent, waxy scalelike trichomes, adaxially glabrous, base cuneate and decurrent on petiole, margin entire or sometimes undulate, apex narrowly acuminate; secondary veins 9–13 on each side of midvein, slender, evident; tertiary veins abaxially not visible or obscure. Male inflorescences axillary, paniculate or racemose, 10–14 cm; rachis with grayish, waxy scalelike trichomes. Female inflorescences racemose, 10–12 cm; rachis sulcate, with grayish, waxy scalelike trichomes; cupules often solitary, scattered. Cupule globose, 3–3.5 × 2.5–3 cm, completely enclosing nut, basally slightly narrowed into a stalk, wall less than 0.5 mm thick and crustaceous; basal bracts united into concentric rings, triangular, apical ones reduced to a subulate tip or a wartlike appendage, small and obscure. Nut subglobose, 2–2.5 × 1.8–2.8 cm, white farinose, base flat, apex slightly narrowed and obtuse, wall ca. 0.5 mm thick; scar 7–12 mm in diam., concave to 1–1.5 mm. Fl. Jun–Oct, fr. Jun–Oct of following year.

• Broad-leaved evergreen forests, in coastal mountains; below 1000 m. S Guangdong, SW Guangxi.

43. *Lithocarpus tubulosus* (Hickel & A. Camus) A. Camus, *Riviera Sci.* 18: 42. 1931 [1932].

壶嘴柯 hu zui ke

Pasania tubulosa Hickel & A. Camus, *Ann. Sci. Nat., Bot., sér.* 10, 3: 405. 1921; *Cyclopasania tubulosa* (Hickel & A. Camus) Nakai.

Trees ca. 15 m tall; branchlets, bud scales, and infructescences densely grayish brown tomentose. Petiole rarely to 1 cm, stout, hairy; leaf blade elliptic, 20–25 × 7–10 cm, both surfaces with simple and branched hairs but more densely so on midvein and secondary veins, base rounded, apex shortly caudate and falcate; secondary veins 12–15 on each side of midvein, abruptly curving near margin, apical ones often fusing; tertiary veins abaxially conspicuous, subparallel. Male inflorescences paniculate. Female and androgynous inflorescences 6–8 cm; rachis ca. 5 mm thick, tawny tomentose. Cupules solitary, scattered on rachis, ca. 3.5 × 2.5–3 cm, completely enclosing nut, apically abruptly narrowed and ± elongate, wall less than 1 mm thick; bracts clawlike, reflexed. Nut chestnut brown, depressed globose, 1.2–1.7 × 2–2.3 cm, with appressed minute hairs, apex shortly pointed, wall ca. 1 mm thick; scar 1–1.3 cm in diam., concave. Fl. Apr–May, fr. Sep–Oct.

Mixed mesophytic forests; ca. 1000 m. SE Yunnan [Laos, N Thailand, NE Vietnam].

44. *Lithocarpus echinotholus* (Hu) Chun & C. C. Huang ex Y. C. Hsu & H. W. Jen, *Acta Phytotax. Sin.* 14(2): 74. 1976.

刺壳柯 ci qiao ke

Pasania echinothola Hu, *Bull. Fan Mem. Inst. Biol., Bot.* 10: 96. 1940; *Lithocarpus echinocupula* Hu ex A. Camus; *L. hamatus* A. Camus.

Trees 10–20 m tall; young branchlets and leaf blades abaxially covered with adherent waxy scalelike trichomes. Petiole 1–1.5 cm; leaf blade elliptic to rarely obovate-elliptic, 15–35 × 5–11 cm, rigidly papery, brown to brownish gray when dry, base acute, margin entire, apex narrowly acuminate to acute; secondary veins 11–14 on each side of midvein, adaxially slightly impressed, abruptly curving apically near margin but not fusing; tertiary veins abaxially slender, evident or not visible. Male inflorescences axillary, 8–12 cm. Female inflorescences 10–15 cm; rachis slender, densely pubescent, sometimes with a few male flowers near apex; cupules solitary, scattered on rachis. Infructescence rachis 4–6 mm thick. Cupule depressed globose, 1–2 × 2–3 cm, completely enclosing nut, often apically split, wall less than 1 mm thick and crustaceous; bracts linear, curved, 3–5 mm, tawny appressed pubescent. Nut depressed globose, 1.2–1.5 × 2–2.8 cm, with tawny appressed ± glossy long hairs, wall ca. 1

mm thick; scar 1.5–1.8 cm in diam., concave. Fl. Mar, fr. Sep–Oct.

Broad-leaved evergreen forests; 200–1200 m. SE Yunnan [N Vietnam].

45. *Lithocarpus pseudoreinwardtii* A. Camus, *Chênes, Atlas* 3: 72. 1948.

单果柯 dan guo ke

Lithocarpus gagnepainianus A. Camus.

Trees ca. 20 m tall; branchlets of current year and young leaf blades brownish black and oily glossy when dry. Branches sulcate. Petiole 1–1.5 cm; leaf blade ovate to ovate-elliptic, 8–15 × 4–6 cm, papery, abaxially with waxy scalelike trichomes and glaucous when dry, adaxially glabrous, base broadly cuneate, margin entire, apex abruptly acute with a tip blunt to caudate; secondary veins 7–10 on each side of midvein; tertiary veins abaxially slender, evident, subparallel. Male inflorescences 10–15 cm. Female inflorescences to 20 cm; rachis and cupule stalks grayish scurfy; cupules solitary, rarely in clusters of 2, stalk 2–4 mm but 8–10 mm in fruit. Young cupules shortly tubular, concave in center, apex flat; mature cupules basin-shaped, 1–1.2 × 1.6–2.4 cm excluding stalk, enclosing more than 3/4 of nut, with ca. 8 concentric rings, tawny scurfy, wall ca. 1 mm thick. Nut depressed globose, ca. 1 × 1.4–1.8 cm, with tawny appressed minute hairs, base flat, apex rounded; scar ca. 1 cm in diam., concave. Fl. Mar–Jun, fr. Mar–Jun of following year.

Broad-leaved evergreen forests; ca. 1200 m. S Yunnan [Laos, C to NW Vietnam].

46. *Lithocarpus caudatilimbus* (Merrill) A. Camus, *Notul. Syst. (Paris)* 6: 185. 1938.

尾叶柯 wei ye ke

Quercus caudatilimba Merrill, *Sunyatsenia* 2: 212. 1935; *Pasania caudatilimba* (Merrill) Chun.

Trees 15–25 m tall. Young branchlets sulcate. Petiole 3–4 cm; leaf blade broadly ovate to suborbicular, 7–14 × 3–8 cm, rigidly papery, abaxially with adherent, waxy scalelike trichomes, adaxially glabrous, base broadly cuneate and decurrent on petiole, margin entire, apex abruptly acute, shortly caudate, or rarely acuminate; secondary veins 6–10 on each side of midvein; tertiary veins abaxially slender, evident or not visible. Male inflorescences in a panicle, 6–10 cm. Female inflorescences solitary or in pairs, terminal on branches; cupules stalked, often solitary, scattered on rachis. Infructescences 5–10 mm; rachis ca. 4 mm thick. Cupule subglobose, 2.5–3 × 2–2.5 cm including stalk, enclosing 1/2–3/4 of nut, wall (0.5–)1 mm thick and crustaceous; bracts triangular, wartlike, apical ones

reduced to scars. Nut depressed globose, 1.4–1.8 × 1.8–2.3 cm, glabrous, base flat, wall ca. 1 mm thick; scar 1.2–1.4 cm in diam., concave. Fl. Oct–Dec, fr. Oct–Dec of following year.

- Broad-leaved evergreen forests; ca. 700 m. SW Guangdong (Yangchun Xian), Hainan.

47. *Lithocarpus shinsuiensis* Hayata & Kanehira in Hayata, Icon. Pl. Formosan. 10: 30. 1921.

浸水营柯 jin shui ying ke

Lithocarpus ternaticupulus (Hayata) Hayata var. *shinsuiensis* (Hayata & Kanehira) Nakai; *Pasania shinsuiensis* (Hayata & Kanehira) Nakai; *Synaedrys shinsuiensis* (Hayata & Kanehira) Kudo.

Trees. Branchlets grayish brown, densely lenticellate. Petiole 1–1.5 cm; leaf blade oblong-lanceolate, 8–18 × 2–5 cm, abaxially glaucous, base cuneate and decurrent on petiole, margin entire, apex caudate-acuminate; midvein raised on both surfaces; secondary veins 6–12 on each side of midvein; tertiary veins abaxially conspicuous. Female inflorescence with cupules in clusters of 1–3, usually only 1 developed. Cupule subglobose, ca. 1.8 × 2.2 cm, enclosing 1/2–2/3 of nut, basally narrowed into a stalk to 7 mm, wall thin and crustaceous; basal bracts imbricate or in concentric rings, squamose, tawny puberulent. Nut subglobose, ca. 2 cm in diam.; scar concave. Fl. Feb–Apr, fr. Oct–Dec of following year.

- Broad-leaved evergreen forests; 300–1000 m. S Taiwan.

48. *Lithocarpus longipedicellatus* (Hickel & A. Camus) A. Camus, Rivière Sci. 18: 41. 1931 [1932].

柄果柯 bing guo ke

Pasania longipedicellata Hickel & A. Camus, Bull. Mus. Natl. Hist. Nat. 34: 365. 1928; *Lithocarpus podocarpus* Chun.

Trees to 20 m tall. Branches glabrous. Petiole, 1–1.5 cm; leaf blade elliptic, ovate, or ovate-elliptic, 8–15 × 3–6 cm, subleathery, abaxially with adherent, waxy scalelike trichomes and glaucous when dry, adaxially glabrous, base broadly cuneate, margin entire or sometimes undulate, apex acuminate to acute with tip obtuse to rounded; secondary veins 9–14 on each side of midvein, abruptly curving apically near margin but usually not fusing; tertiary veins abaxially slender, evident or not visible. Male inflorescences in a panicle or solitary in axils of leaves; rachis light yellowish gray scurfy. Female inflorescence 3–5 mm; cupules solitary, scattered on rachis soon after anthesis. Infructescence rachis base 8–10 mm thick, thicker than branches. Cupule discoid, 1.2–1.5 cm in diam., enclosing basal part or rarely to middle of nut, wall less than 1 mm thick; bracts sometimes entirely or partly united into concentric rings, triangular, tiny but visible under lens, tawny scurfy. Nut depressed globose to subglobose, 1–

1.4 × 1.2–2.2 cm, ± white glaucous, base flat, wall 0.5–1 mm thick; scar 0.7–1.8 cm in diam., concave. Fl. Oct–Jan, Fl. Oct–Jan of following year.

Scattered in broad-leaved evergreen forests; below 1200 m. W Guangxi, Hainan, SE Yunnan [N Vietnam].

49. *Lithocarpus brachystachyus* Chun, J. Arnold Arbor. 28: 230. 1947.

短穗柯 duan sui ke

Trees 3–8 m tall; bud scales and young leaf blades often with brown ± translucent resin when dry. Branchlets dark brown to blackish when dry, glabrous, sparsely lenticellate. Petiole less than 1 cm; leaf blade ovate to ovate-elliptic, 3–7 × 1–3 cm, rigidly leathery, dark brown when dry, abaxially with grayish adherent waxy scalelike trichomes, adaxially glabrous, base sometimes asymmetric, margin entire, apex acute to caudate-acuminate with tip obtuse to rounded. Male inflorescences axillary, solitary, rarely in clusters of 2–4, 3–5 cm; rachis slender, 1–2 mm thick. Female inflorescences rarely over 5 cm; rachis grayish scurfy; cupules 3–10, solitary; cupule stalks ca. 1 mm, 4–7 mm in fruit. Cupule discoid, 2–5 mm × 1–1.5 cm, enclosing ca. 1/3 of nut; bracts ± united into concentric rings from base to middle of cupule, triangular, obscure. Nut depressed globose to conical, 1–1.4 × 1.2–1.6 cm, glabrous, base flat; scar 7–10 mm in diam., concave. Fl. Oct–Nov or Feb, fr. Aug–Oct of following year.

- Mixed mesophytic forests; 800–1000 m. SW Guangdong, Hainan (Changjiang Xian).

50. *Lithocarpus leucodermis* Chun & C. C. Huang in C. C. Huang & Y. T. Chang, Guihaia 8: 18. 1988.

白枝柯 bai zhi ke

Trees to 25 m tall. Branches of last-year growth covered with a ± translucent, longitudinally splitting, thin waxy layer. Petiole 1–2 cm; leaf blade narrowly oblong, 14–20 cm, leathery, concolorous, glabrous, base cuneate, apex acuminate with tip obtuse; secondary veins 8–10 on each side of midvein, curving apically near margin, apical ones fusing. Inflorescences unknown. Fruit solitary, sessile; rachis 4–5 mm thick, grayish, glabrous or glabrescent. Cupule bowl-shaped, 5–8 mm × 1.8–2.5 cm, enclosing ca. 1/2 of nut, basally ± flat, wall less than 1 mm thick and crustaceous; bracts linear, 1–3 mm, ± curved. Nut depressed globose, 1.6–2 × 1.7–2.4 cm, densely covered with appressed, short hairs; scar 1–1.2 cm in diam., concave; stylopodium to 4 mm. Fr. Oct.

- Broad-leaved evergreen forests; ca. 1600 m. SE Yunnan (Pingbian Miaozu Zizhixian).

51. *Lithocarpus quercifolius* C. C. Huang & Y. T. Chang, Guihaia 8: 16. 1988.

栎叶柯 li ye ke

Trees 5–6 m tall. Branchlets of current year pubescent. Leaves usually congested at apex of branches; petiole 2–5 mm; leaf blade oblong to obovate-elliptic, 4–11 × 1–3 cm, rigidly papery, concolorous, abaxially usually

with tuft of hairs in axils of veins, base rounded to broadly cuneate, margin with a few acute teeth, apex acute; secondary veins 8–11 on each side of midvein, branched near margin with outer branch ending in a marginal tooth; tertiary veins conspicuous, slender. Male inflorescences ca. 5 cm. Female flowers solitary, scattered above middle of male inflorescence rachis; rachis tawny pubescent. Infructescences 2–3 cm; rachis ca. 2 mm thick. Cupule discoid, 2–5 mm × 2–2.5 cm, enclosing basal part of nut; bracts imbricate, lanceolate when young, rhomboid to broadly triangular when mature, appressed, midvein ridged. Nut depressed globose, 1.2–1.6 × 2–2.4 cm, covered with appressed minute hairs; scar 1.6–2 cm in diam., margin concave but center ± convex. Fl. Apr–Jun, fr. Sep–Oct.

• Secondary forests or scrub; ca. 600 m. Guangdong (Huiyang Xian), Jiangxi (Suichuan Xian).

52. *Lithocarpus konishii* (Hayata) Hayata, Icon. Pl. Formosan. 6 Suppl.: 72. 1917.

油叶柯 you ye ke

Quercus konishii Hayata, J. Coll. Sci. Imp. Univ. Tokyo 25(19): 201. 1908; *Pasania konishii* (Hayata) Schottky; *Q. cornea* Loureiro var. *konishii* (Hayata) Hayata; *Synaedrys konishii* (Hayata) Koidzumi.

Trees usually less than 5 m tall. Spring shoots glabrous, autumn shoots tawny pubescent. Petiole 0.5–1.5 cm; leaf blade ovate, obovate, elliptic, or obovate-elliptic, 4–9 × 1–4 cm, papery and slightly rigid, concolorous, abaxially with tufts of hairs at axils of veins, base cuneate, margin with 3–6 obtuse teeth, apex acute to caudate-acuminate; midvein puberulent adaxially; secondary veins 7–10 on each side of midvein, adaxially slightly impressed; tertiary veins slender, evident. Female flowers borne on basal part of androgynous inflorescences; rachis tawny tomentose; cupules 1 (or 2). Infructescences 2–3 cm; rachis 1.5–2 mm thick, lenticellate. Cupule discoid, 4–8 mm × 1.5–2.5 cm, enclosing basal part of nut, wall 1.5–2 mm thick; bracts imbricate, broadly triangular, covered with grayish brown, shortly tomentose hairs, midvein ridged. Nut depressed globose, 1–1.8 × 2–3 cm, glabrous, apex rounded or flat, wall 3–6 mm thick and horny; scar 1.3–2.4 cm in diam., margin impressed but center ± convex. Fl. Apr and Aug, fr. Jul–Oct of following year.

• Broad-leaved evergreen forests; 300–1600 m. E Hainan, C to S Taiwan.

53. *Lithocarpus nantoensis* (Hayata) Hayata, Icon. Pl. Formosan. 6 Suppl.: 72. 1917.

南投柯 nan tou ke

Quercus nantoensis Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30: 293. 1911; *Pasania nantoensis* (Hayata) Schottky; *Synaedrys nantoensis* (Hayata) Koidzumi.

Trees to 15 m tall. Branchlets chestnut brown, glabrous, conspicuously lenticellate. Petiole usually less than 1

cm; leaf blade lanceolate to narrowly oblong, 7–14 × 2–4.5 cm, subleathery, abaxially glaucous to light green and with adherent, waxy scalelike trichomes, base cuneate and decurrent on petiole, apex acuminate to caudate; midvein abaxially slender, evident and adaxially conspicuously raised; secondary veins 10–15 on each side of midvein. Male inflorescences arising near apex of branchlets of current year; rachis with scalelike glands, sparsely waxy. Female inflorescences 10–16 cm; cupules solitary, scattered, glabrous. Infructescence rachis ca. 3 mm thick. Cupule enclosing ca. 1/2 of nut when young; discoid when mature, 1.2–1.5 cm in diam., enclosing only basal part of nut, basally narrowed; bracts reduced and united into concentric rings, with tawny, waxy scalelike glands. Nut conical, 1–2 cm; scar 5–8 mm in diam., concave. Fl. Jun–Aug, fr. Oct–Dec of following year.

• Broad-leaved evergreen forests; 300–1500 m. C to S Taiwan.

54. *Lithocarpus iteaphyllus* (Hance) Rehder, J. Arnold Arbor. 1: 127. 1919.

鼠刺叶柯 shu ci ye ke

Quercus iteaphylla Hance, J. Bot. 22: 229. 1884; *Lithocarpus iteaphylloides* Chun; *Pasania iteaphylla* (Hance) Schottky; *Synaedrys iteaphylla* (Hance) Koidzumi.

Trees 5–10 m tall. Branchlets of current year conspicuously sulcate, dark reddish brown, glabrous. Petiole 5–8 mm, sometimes to 3 cm, base ± thickened; leaf blade narrowly oblong to lanceolate, 8–13 × 2.5–4.5 cm, thick to rigidly papery, base broadly cuneate and decurrent on petiole, margin entire, apex acuminate; midvein raised on both surfaces; secondary veins 6–10 on each side of midvein, slender, conspicuous on both surfaces; tertiary veins inconspicuous. Inflorescence solitary or congested at apex of branches of last-year growth, usually androgynous; rachis with early glabrescent, tawny minute hairs. Male flowers above middle of inflorescence, solitary, scattered on rachis. Infructescences 5–8 cm; rachis ca. 2 mm thick, lenticellate. Cupule bowl-shaped, 5–8 mm × 1–1.4 cm, enclosing 1/8–1/5 of nut, wall 0.5–1 mm thick with basal part woody; bracts reduced and united into 6–8 irregular concentric rings, with tawny, waxy scalelike glands and sparsely puberulent. Nut ellipsoid, 1–1.8 × 1–1.4 cm, glabrous, apex pointed to rounded, wall 0.2–0.5 mm thick; scar 5–6 mm in diam., concave. Fl. Apr–May, fr. Jul–Oct of following year.

• Stream banks, sunny slopes; ca. 500 m. Guangdong, Guangxi, S Hunan, S Jiangxi, Zhejiang.

55. *Lithocarpus elmerrillii* Chun, J. Arnold Arbor. 28: 232. 1947.

万宁柯 wan ning ke

Trees to 25 m tall. Branchlets of current year sulcate, glabrous, dark brown when dry. Petiole 2–2.5 cm; leaf blade oblong to rarely obovate-elliptic, 10–17 × 3–6 cm, thinly leathery, abaxially with adherent waxy scale and glaucous when dry, base attenuate and decurrent on

petiole, margin entire, apex acuminate; secondary veins 9–12 on each side of midvein, abruptly curving apically; tertiary veins slender, evident. Female inflorescences rachis 6–7 mm thick; cupules solitary, scattered above middle of rachis. Cupule bowl-shaped, 0.6–1 × 1.7–2.5 cm, basally narrowed into a stalk, wall woody; basal bracts usually united into concentric rings, others imbricate, triangular, appressed, apical ones smaller. Nut subglobose to depressed globose, 2–2.5 × 2.5–3 cm, glabrous, apex pointed, wall to 2.5 mm thick; scar 1.4–1.6 cm in diam., concave. Fr. Sep–Oct.

• Broad-leaved evergreen forests; 500–800 m. Hainan (Baoting Xian).

56. *Lithocarpus dodonaeifolius* (Hayata) Hayata, Icon. Pl. Formosan. 6 Suppl.: 72. 1917.

柳叶柯 liu ye ke

Quercus dodonaeifolia Hayata, Icon. Pl. Formosan. 3: 181. 1913; *Pasania dodonaeifolia* (Hayata) Hayata; *Synaedrys formosana* (Hayata) Koidzumi f. *dodonaeifolia* (Hayata) Kudo.

Trees ca. 10 m tall. Young shoots ± sulcate; branchlets of last year growth obscurely lenticellate. Petiole 4–8 mm, base ± thickened; leaf blade narrowly lanceolate to oblanceolate, 5–14 × 1–2 cm, rigidly leathery, base cuneate and decurrent on petiole, margin entire, apex obtuse, rounded, or acute and usually slightly recurved; secondary veins 8–12 on each side of midvein, abaxially inconspicuous, adaxially slightly impressed; tertiary veins not visible. Male inflorescences unknown. Infructescences 3–5 cm; rachis slender, 1.5–3 mm thick, conspicuously lenticellate. Cupules solitary, scattered on rachis, discoid, 3–6 mm × 1–1.4 cm, enclosing basal part of nut, wall thickly woody; bracts spirally arranged or basal ones united into concentric rings, triangular, small, appressed, tawny tomentose. Nut broadly conical, 1–1.5 × 1–1.4 cm, base flat, apex pointed; scar 7–10 mm in diam., concave. Fl. Feb–May, fr. Oct–Dec.

• Mixed mesophytic forests; 500–1500 m. S Taiwan.

57. *Lithocarpus formosanus* (Skan) Hayata, Icon. Pl. Formosan. 6 Suppl.: 72. 1917.

台湾柯 tai wan ke

Quercus formosana Skan in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 513. 1899; *Pasania formosana* (Skan) Schottky; *Synaedrys formosana* (Skan) Koidzumi.

Trees tall. Young shoots ± sulcate, glabrous. Petiole 1–1.3 cm, base ± thickened; leaf blade elliptic to sometimes obovate-elliptic and ± recurved, 5–8 × 2–3 cm, thickly leathery, rigid and crustaceous when dry, abaxially glaucous, turning grayish brown when dry, and with adherent, waxy scalelike trichomes, adaxially glabrous, base cuneate and decurrent on petiole, margin entire, apex rounded; secondary veins 7–11 on each

side of midvein, abaxially slightly raised or not; tertiary veins not visible or very slender, evident. Male inflorescences congested at apex of branches, 3–6 cm. Female inflorescence with cupules solitary, scattered on rachis. Infructescence ca. 3 cm; rachis equalling branches in thickness. Cupule discoid, ca. 3 mm × 1.2 cm; bracts imbricate, triangular, small, appressed, grayish tomentose. Nut broadly conical, ca. 1.3 × 1.6 cm, glabrous, apex pointed; scar ca. 8 mm in diam., concave. Fl. Feb–Mar, fr. Sep–Nov.

• Mixed mesophytic forests; 100–500 m. S Taiwan.

58. *Lithocarpus pakhaensis* A. Camus, Chênes, Atlas 3: 65. 1948.

滇南柯 dian nan ke

Trees to 25 m tall; branchlets of current year and petioles dark brown to blackish and slightly white farinose when dry, glabrous. Petiole 1–1.5 cm; leaf blade lanceolate, 7–12 × 1.5–3 cm, thinly leathery, concolorous, adaxial surface of young leaves oily glossy when dry, base narrowly cuneate and decurrent on petiole, margin entire, apex narrowly acuminate; secondary veins 8–12 on each side of midvein; tertiary veins not visible. Female inflorescences rachis 4–6 mm thick, tomentose and with small, waxy scalelike trichomes; cupules mostly solitary, scattered on rachis, sometimes in clusters of ca. 3 near apex of rachis. Infructescence ca. 4 cm; rachis ca. 3 mm, thick; with 2–5 fruit. Cupule discoid, 0.8–1.2 × 1.5–2 cm, enclosing basal part of nut, basally abruptly narrowed, wall to 3 mm near base; basal bracts usually united into 3 or 4 concentric rings, triangular, lax and obscure, appressed. Nut conical, rarely depressed globose, 1.5–2 × 1.6–2 cm, glabrous, apex pointed, wall ca. 1 mm thick; scar 1–1.5 cm in diam., concave. Fl. Feb–Mar, fr. Sep–Oct of following year.

Dense forests in moist places; 1000–1400 m. SE Yunnan [N Vietnam].

59. *Lithocarpus yongfuensis* Q. F. Zheng, Acta Phytotax. Sin. 23: 149. 1985.

永福柯 yong fu ke

Trees to 16 m tall; bud scales, branchlets, and rachis of inflorescences with sparse and lax, waxy scalelike glands. Petiole ca. 1 cm; leaf blade elliptic to ovate-elliptic, 7–13 × 2–4 cm, thinly leathery, abaxially scurfy, base cuneate to acute, margin entire, apex acuminate; secondary veins 10–14 on each side of midvein, abaxially slightly raised, adaxially slightly impressed; tertiary veins not visible. Female and androgynous inflorescences sometimes congested at apex of branches, 5–15 cm; cupules solitary, scattered on rachis. Infructescences 5–10 cm; rachis base 3–5 mm thick. Cupule discoid, 1.5–1.8 cm in diam., covering basal part of nut, basally narrowed into an elongated stalk; bracts imbricate, triangular, appressed.

Nut broadly conical, 1.6–1.8 × 2–2.2 cm, glabrous, base flat, apex pointed; scar 0.7–1.9 cm in diam., concave. Fl. Jul–Aug, fr. Oct–Nov of following year.

• Mixed mesophytic forests; 800–900 m. Fujian (Zhangping Xian).

60. *Lithocarpus sphaerocarpus* (Hickel & A. Camus) A. Camus, *Riviera Sci.* 18: 42. 1931 [1932].

球壳柯 qiu qiao ke

Pasania sphaerocarpa Hickel & A. Camus, *Bull. Mus. Natl. Hist. Nat.* 29: 603. 1923.

Trees 10–20 m tall. Branchlets dark gray when dry, glabrous. Petiole 1.5–2 cm; leaf blade elliptic to ovate-elliptic, 12–20 × 4–7 cm, thickly leathery, abaxially glaucous and with adherent, waxy scalelike trichomes, adaxially glabrous and surface of young leaves oily glossy when dry, base cuneate and decurrent on petiole, margin entire, apex acuminate to acute; secondary veins 14–18 on each side of midvein; tertiary veins abaxially slender, evident to inconspicuous, subparallel. Male inflorescences in a panicle, sometimes solitary in axils of leaves. Female inflorescences 10–20 cm; cupules in clusters of (2 or)3, rarely solitary near base of rachis; stalk of cupule clusters 3–7 mm, with tiny triangular bracts. Infructescence rachis 7–12 mm thick. Cupule globose to ± depressed globose, 1.5–2 cm in diam., completely enclosing nut, outside grayish puberulent, wall ca. 0.5 mm thick and crustaceous; bracts triangular, small, lax. Nut depressed globose, 1.2–1.6 × 1.4–1.9 cm, densely tawny scurfy; scar 0.8–1.2 cm in diam., concave. Fl. Dec–Jan, fr. Sep–Oct of following year.

Broad-leaved evergreen forests; 600–1300 m. W Guangxi, S Yunnan [Vietnam].

61. *Lithocarpus magneinii* (Hickel & A. Camus) A. Camus, *Riviera Sci.* 18: 41. 1931 [1932].

黑家柯 hei jia ke

Pasania magneinii Hickel & A. Camus, *Ann. Sci. Nat., Bot.*, sér. 10, 3: 405. 1921.

Trees 5–25 m tall. Young parts with oily resin when dry; branchlets and petioles drying blackish. Petiole 1–1.5 cm; leaf blade obovate-oblong to elliptic, 8–15 × 4–6 cm, papery, abaxially with waxy scalelike trichomes and glaucous when dry, base broadly cuneate, margin entire, apex abruptly acute with a blunt tip to caudate; secondary veins 7–10 on each side of midvein; tertiary veins abaxially slender, obscure, subparallel. Male inflorescences solitary in axils of leaves or in a panicle. Female inflorescences usually 6–10 cm; cupules in clusters of ca. 3, rarely solitary, scattered on basal part of rachis; stalk of cupule clusters 3–8 mm × 3–4 mm, to 7 mm thick in fruit. Infructescence rachis thicker than branches from which it arises, sparsely lenticellate; lenticels conspicuous. Cupule bowl-shaped, 1–1.5 × 1.6–2.2 cm, enclosing 2/3–4/5 of nut, with 6–8 linear concentric rings, wall 1.5–2.5 mm thick. Nut broadly conical to depressed globose, 1.2–1.6 × 1.8–2 cm,

covered with tawny, appressed, silky minute hairs, wall ca. 1.5 mm thick; scar 1.2–1.5 cm in diam., concave. Fl. Feb–Apr, fr. Feb–Apr of following year.

Broad-leaved evergreen forests; 700–1200 m. SE Yunnan [Laos, N Vietnam].

62. *Lithocarpus microspermus* A. Camus, *Bull. Soc. Bot. France* 81: 818. 1934 [1935].

小果柯 xiao guo ke

Pasania microsperma (A. Camus) Hu.

Trees 10–15 m tall. Branches and leaf blades. Petiole 1–1.5 cm; leaf blade oblong, 15–25 × 5–8 cm, abaxially with adherent waxy scalelike trichomes and ± glaucous when dry, adaxially glabrous, base broadly cuneate, margin entire, apex acute to acuminate; midvein raised adaxially; secondary veins 16–22 on each side of midvein; tertiary veins abaxially conspicuous, subparallel. Male inflorescences solitary in axils of leaves or 3–5 arranged in a panicle; rachis densely scurfy. Female inflorescence with cupules in clusters of 2 or 3. Infructescences 10–18 cm; rachis ca. 5 mm thick. Cupule shallowly bowl-shaped, 3–5 × 8–10 mm, enclosing 1/4–1/3 of nut, wall 0.2–0.5 mm thick; bracts inconspicuous, imbricate or united into rings at base of cupule, triangular. Nut depressed globose, 5–7 mm, rarely over 1 cm in diam., sparsely pulverulous, apex flat, wall 0.2–0.5 mm thick; scar 4–6 mm in diam., concave. Fl. Oct–Dec, fr. Oct–Dec of following year.

Broad-leaved evergreen forests; 800–1500 m. S Yunnan [Laos, N Vietnam].

63. *Lithocarpus pseudovestitus* A. Camus, *Bull. Soc. Bot. France* 86: 155. 1939.

毛果柯 mao guo ke

Trees to 25 m tall. Branches glabrous. Petiole rarely longer than 1 cm, leaf blade lanceolate to rarely oblong, 8–18 × 2–4 cm, thickly papery, abaxially gray and with a thick layer of waxy scalelike trichomes, adaxially glabrous, base cuneate and decurrent on petiole, margin entire, apex obtuse, subrounded, or rarely acute; secondary veins 9–14 on each side of midvein, adaxially sometimes slightly impressed, not fusing; tertiary veins abaxially not visible. Male inflorescences solitary in axils of leaves or in a panicle; rachis scurfy. Female inflorescences with cupules in clusters of 2 or 3, rarely solitary; base of cupule clusters narrowed, stalklike, to 5 mm. Infructescence rachis to 1 cm thick, sparsely lenticellate. Cupule discoid, 2–5 mm × 1–2 mm, covering base of nut, wall 0.2–0.5 mm thick; basal bracts united into concentric rings, small, tawny puberulent. Nut broadly conical, 1.2–1.5 × 1.6–2 cm, tawny puberulent, wall ca. 0.5 mm thick; scar 4–6 mm in diam., concave. Fl. Aug–Oct, fr. Aug–Oct of following year.

Broad-leaved evergreen forests in valleys; 200–900(–1500) m. SW Guangdong, SW Guangxi, Hainan, SE Yunnan [N Vietnam].

64. *Lithocarpus mekongensis* (A. Camus) C. C. Huang & Y. T. Chang, *Guihaia* 12: 2. 1992.

澜沧柯 lan cang ke

Lithocarpus microspermus A. Camus subsp. *mekongensis* A. Camus, *Chênes*, Atlas 3: 116. 1948.

Trees ca. 10 m tall. Petiole less than 1 cm; leaf blade elliptic to ovate-elliptic, 10–15 × 4–5 cm, papery, abaxially with waxy scalelike trichomes and glaucous when dry, adaxially glabrous, base cuneate, margin entire, apex acuminate; secondary veins 12–15 on each side of midvein, apical ones fusing near margin; tertiary veins abaxially slender, evident. Male inflorescences solitary, axillary, 8–15 cm; rachis scurfy, puberulent, or glabrous. Female inflorescences 8–15 cm; cupules of ca. 3, sometimes solitary. Infructescence rachis 5–6 mm thick, lenticellate; lenticels small. Cupule bowl-shaped, 3–5 mm × 1–1.2 cm, enclosing basal part of nut; bracts imbricate, triangular, small. Nut depressed globose, 5–8 mm × 1.1–1.4 cm, sparsely puberulent, apex ± flat or sometimes concave; scar ca. 6 mm in diam., concave. Fl. Oct–Dec, fr. Aug–Oct of following year.

Broad-leaved evergreen forests, frequent on dry slopes; ca. 1000 m. S Yunnan [Laos, Vietnam].

65. *Lithocarpus bacgiangensis* (Hickel & A. Camus) A. Camus, *Rivière Sci.* 18: 39. 1931 [1932].

茸果柯 rong guo ke

Pasania bacgiangensis Hickel & A. Camus, *Ann. Sci. Nat., Bot.*, sér. 10, 3: 396. 1921; *P. tomentosinux* Hu. Trees 10–15 m tall. Branches glabrous, lenticellate. Petiole rarely longer than 1 cm, leaf blade elliptic, ovate-elliptic, or occasionally ovate, 10–15 × 3–6 cm, papery, ± rigid, abaxially with adherent, waxy scalelike trichomes and glaucous when dry, adaxially glabrous, base broadly cuneate, margin entire, apex narrowly acuminate to acute; secondary veins 10–15 on each side of midvein; tertiary veins abaxially conspicuous. Male inflorescences solitary in axils of leaves or 3–5 arranged in a panicle; rachis densely scurfy. Female and androgynous inflorescences with cupules in cluster of 2 or 3. Infructescences 8–18 cm; rachis 6–8 mm thick. Cupule bowl-shaped, 0.5–1 × 1.2–2 cm, enclosing rarely 1/2 of nut, basally with a stalk 3–5 mm, wall to 2 mm and woody near base; bracts triangular, small, densely tawny scurfy. Nut depressed globose to conical, 1–2 × 1.2–2.5 cm, densely covered with tawny minute hairs, apex rounded to pointed; scar 0.8–1.2 cm in diam., concave. Fl. Dec–Mar, fr. Oct–Dec.

Broad-leaved evergreen forests; 200–1700 m. Guangxi, Hainan, SE Yunnan [N Vietnam].

66. *Lithocarpus farinulentus* (Hance) A. Camus, *Rivière Sci.* 18: 40. 1931 [1932].

易武柯 yi wu ke

Quercus farinulenta Hance, *J. Bot.* 13: 365. 1875; *Pasania farinulenta* (Hance) Hickel & A. Camus. Trees 6–12 m tall. Branches glabrous, light brown, ± oily when dry. Petiole ca. 1 cm; leaf blade broadly ovate to elliptic, 8–15 × 3–7 cm, thinly leathery, abaxially ± glaucous and with appressed, lamellate, waxy scalelike trichomes, adaxially glabrous, base broadly cuneate and decurrent on petiole, margin entire, apex obtuse to shortly acuminate; secondary veins 8–11 on each side of midvein, abruptly curving apically, obscure near margin; tertiary veins abaxially not visible or very slender, evident. Female inflorescences often with a few male flowers above middle of rachis, 8–22 cm; rachis 1.5–2.5 mm thick, glabrous or pulverulent; cupules in clusters of 2 or 3 but often solitary on basal part of rachis. Infructescences to 20 cm; rachis 3–4 mm thick. Cupule discoid, 3–5 × 8–10 mm, enclosing basal part of nut, basally with a stalk 3–4 × 3–4 mm, wall ca. 0.5 mm thick; bracts almost fused with cupule wall, basal ones united into 6–8 concentric rings, triangular, small. Nut broadly conical, 7–10 × 7–12 mm, glabrous, apex pointed, wall ca. 5 mm thick; scar 4–5 mm in diam., concave. Fl. Aug–Oct, fr. Oct–Nov of following year.

Broad-leaved evergreen forests in mountains; below 1000 m. S Yunnan [Cambodia, Thailand, Vietnam].

67. *Lithocarpus propinquus* C. C. Huang & Y. T. Chang, *Guihaia* 8: 19. 1988.

三柄果柯 san bing guo ke

Trees 10–15 m tall. Branches glabrous, dark brown when dry, lenticellate with age. Petiole 6–10 mm; leaf blade oblong, 10–15 × 3–4.5 cm, thinly leathery, abaxially with scurfy, waxy scalelike trichomes and ± glaucous, adaxially glabrous, base cuneate, margin entire, apex narrowly acuminate; secondary veins 10–13 on each side of midvein; tertiary veins abaxially slender, evident. Male inflorescences solitary in axils of leaves or arranged in a panicle; rachis scurfy. Female inflorescence with cupules in clusters of ca. 3; clusters stalked. Infructescences 8–12 cm; stalk of fruit clusters 3–6 mm. Cupule bowl-shaped, 5–7 mm × 1.2–1.5 cm; basal bracts united into obscure concentric rings, triangular, small, with scurfy, waxy scalelike trichomes. Nut depressed globose, 0.8–1.1 × 1.2–1.6 cm, glabrous, base flat, apex rounded; scar 7–10 mm in diam., concave. Fl. Dec–Jan, fr. Dec–Jan of following year.

• Broad-leaved evergreen forests; 1300–1700 m. SE Yunnan (Pingbian Miaozu Zizhixian, Xichou Xian).

68. *Lithocarpus cyrtocarpus* (Drake) A. Camus, *Rivière Sci.* 18: 40. 1931 [1932].

鱼篮柯 yu lan ke

Quercus cyrtocarpa Drake, *J. Bot.* (Morot) 4: 150. 1890; *Lithocarpus anisobalanos* Chun & F. C. How; *L. uncinatus* A. Camus; *Pasania cyrtocarpa* (Drake) Schottky; *Synaedrys cyrtocarpa* (Drake) Koidzumi.

Trees 10–18 m tall. Branchlets densely pubescent and with early glabrescent, brown long hairs. Petiole 1–2 cm; leaf blade ovate, ovate-elliptic, or oblong, 5–10 × 2–4 cm, papery, concolorous, abaxially covered with stellate, minute scalelike trichomes and sparsely pilose on midvein, adaxially crisply pubescent when young, base acute and sometimes ± asymmetric, margin with a few undulate teeth, apex acute to acuminate; secondary veins 8–12 on each side of midvein, ending in teeth; tertiary veins abaxially slender, evident. Male inflorescences axillary, solitary, 3–6 cm; rachis slender, sparsely pubescent. Female inflorescences 2–5 cm; cupules solitary or in clusters of ca. 3. Cupule disc- to bowl-shaped, 1–2 × 3.5–4.5 cm, enclosing basal part of nut, wall thickly woody; bracts clawlike, woody when dry, apex curved. Nut depressed globose, 1.5–2.2 × 4–5 cm, densely tawny pubescent, apex flat, wall 1–1.5 cm thick and horny; scar 2.5–3.5 cm in diam., concave but with center conspicuously convex. Fl. Apr and Sep–Oct, fr. Oct–Dec.

Broad-leaved evergreen forests; 400–900 m. SW Guangdong, SW Guangxi [NE Vietnam].

69. *Lithocarpus gymnocarpus* A. Camus, Bull. Soc. Bot. France 81: 818. 1934 [1935].

假鱼篮柯 jia yu lan ke

Trees 10–15 m tall. Branches and glabrous. Petiole ca. 1.5 cm; leaf blade elliptic to sometimes obovate-elliptic, 11–13 × 3–5 cm, papery, concolorous, abaxially with early glabrescent stellate hairs, adaxially glabrous, base cuneate and decurrent on petiole, margin usually entire or rarely apically with 1–3 obtuse teeth, apex acuminate; secondary veins 16–18 on each side of midvein; tertiary veins abaxially conspicuous. Female inflorescence with cupules in clusters of 3(–5). Infructescences to 18 cm; rachis base 7–10 mm thick, scurfy. Cupule shallowly bowl-shaped, ca. 3 cm in diam., covering basal 1/4 of nut, wall ca. 1 mm thick and basally thickened; bracts imbricate, appressed, warty, grayish brown when dry. Nut slightly depressed globose, 2–2.5 × (3–)4.5 cm, glabrous, wall ca. 5 mm thick; scar concave but rarely with convex center, ca. 2 cm in diam. Fr. Aug–Oct.

Broad-leaved evergreen forests; 800–1000 m. SW Guangdong, SW Guangxi, SE Yunnan [NE Vietnam].

70. *Lithocarpus cryptocarpus* A. Camus, Bull. Soc. Bot. France 81: 816. 1934 [1935].

闭壳柯 bi qiao ke

Trees 10–15 m tall; branches and leaf blades glabrous. Petiole 2–3 cm; leaf blade elliptic to sometimes obovate-elliptic, 18–25 × 6–8 cm, papery, concolorous or abaxially ± glaucous, base cuneate and decurrent on petiole, margin entire, apex acuminate; secondary veins 10–12 on each side of midvein; tertiary veins abaxially conspicuous. Female inflorescence with cupules in clusters of 3(–5). Infructescences to 18 cm; rachis base 7–10 mm thick, scurfy. Cupule depressed globose, 1.5–

2 cm in diam., completely enclosing nut, wall ca. 2.5 mm thick; bracts imbricate, broadly triangular, appressed, grayish brown when dry. Nut slightly depressed globose, 1.2–1.6 cm in diam., glabrous, wall ca. 1 mm thick; scar slightly concave, ca. 1 cm in diam. Fr. Aug–Oct.

Broad-leaved evergreen forests by streams, at low elevations. Yunnan (Hekou Yaozu Zizhixian) [C to NE Vietnam].

71. *Lithocarpus elizabethiae* (Tutcher) Rehder, J. Arnold Arbor. 1: 125. 1919.

厚斗柯 hou dou ke

Quercus elizabethiae Tutcher, J. Bot. 49: 273. 1911;

Pasania elizabethiae (Tutcher) Schottky; *Synaedrya elizabethiae* (Tutcher) Kudo.

Trees 9–15 m tall; branches and leaf blades glabrous. Petiole 1–2 cm; leaf blade narrowly oblong to lanceolate, 9–17 × 2–4 cm, thickly papery, concolorous to ± glaucous abaxially, base cuneate and decurrent on petiole, margin entire, apex acuminate; secondary veins 13–16 on each side of midvein, slender, evident; tertiary veins abaxially inconspicuous. Male inflorescences 3–many in a panicle, sometimes solitary in axils of leaves; rachis sparsely pubescent. Female inflorescences 2–4 congested at apex of branches; cupules usually in clusters of ca. 3. Infructescence rachis 4–6(–10) mm thick. Cupule subglobose, 1.5–3 × 1.5–2.8 cm, usually enclosing nut, apically abruptly narrowed and slightly elongated into a nipple, wall apically ca. 2 mm thick and basally to 4 mm thick; bracts imbricate, broadly triangular to rhomboid, apical ones incurved. Nut depressed globose to subglobose, 1.4–2.4 cm in diam., wall ca. 1 mm thick; scar 1.3–1.6 cm in diam., concave. Fl. Jul–Sep, fr. Aug–Nov of following year.

• Mixed mesophytic forests, frequent in moist places; 100–1200 m. SW Fujian, Guangdong, Guangxi, SE Guizhou, SE Yunnan.

72. *Lithocarpus echinophorus* (Hickel & A. Camus) A. Camus, Riviera Sci. 18: 40. 1932.

壶壳柯 hu qiao ke

Trees ca. 15 m tall; branchlets, petioles, and rachis of inflorescences covered with early glabrescent, short hairs. Branchlets blackish when dry, inconspicuously lenticellate. Petiole 1–1.5 cm; leaf blade elliptic, narrowly elliptic, oblong, or lanceolate, 9–15 × 1.5–4 cm, subleathery, base cuneate, margin entire, apex acuminate; secondary veins 10–17 on each side of midvein; tertiary veins abaxially not visible. Infructescences ca. 10 cm; rachis ca. 1.2 cm thick; immature cupules in clusters of ca. 3, oblong when young, apically flat. Cupule enclosing all of nut or occasionally only 1/2, wall ca. 3 mm thick; bracts linear to subulate, ± curved. Nut depressed globose; scar concave but center ± convex. Fr. Oct–Nov.

Sparse forests in dry places, broad-leaved evergreen forests; 1900–2000 m. S and SE Yunnan [Laos, Myanmar, N and NE Vietnam].

- 1a. Leaf blade glabrous 72b. var. *chapensis*
 1b. Leaf blade (at least on midvein when young)
 abaxially pubescent, glabrescent.
 2a. Cupules completely enclosing
 nut 72a. var. *echinophorous*
 2b. Cupules enclosing ca. 1/2 of
 nut 72c. var. *bidoupensis*

72a. *Lithocarpus echinophorus* var. *echinophorus*

壶壳柯(原变种) hu qiao ke (yuan bian zhong)

Pasania echinophora Hickel & A. Camus, Bull. Mus. Natl. Hist. Nat. 34: 364. 1928.

Petiole 1–1.5 cm; leaf blade narrowly elliptic to lanceolate, 9–15 × 1.5–3 cm, abaxially pubescent at least on midvein when young, glabrescent, glaucous, and with adherent waxy scalelike trichomes; secondary veins 13–17 on each side of midvein. Cupule usually enclosing all of nut; bracts imbricate, linear, ± curved, basal ones ca. 1.5 mm, apical ones 3–4 mm, scurfy. Nut depressed globose, 1–1.2 × 1.4–1.8 cm. Fr. Nov.

Sparse forests in dry places; ca. 2000 m. S Yunnan (Yuanjiang Xian) [Laos, Myanmar, N Vietnam].

72b. *Lithocarpus echinophorus* var. *chapensis* A. Camus, Notul. Syst. (Paris) 13: 266. 1948.

沙坝柯 sha ba ke

Petiole ca. 1 cm; leaf blade oblong to lanceolate, 10–12 × 3 cm, glabrous; secondary veins 10–15 on each side of midvein, obscure near margin. Cupule depressed globose, 1.5–2 × 3–3.5 cm including bracts, enclosing ca. 3/4 of nut, wall crustaceous; bracts many, curved linear, 5–8 mm. Nut depressed globose, 2.2–2.5 cm in diam.; scar 1.5–1.8 cm in diam.

Broad-leaved evergreen forests; ca. 1900 m. SE Yunnan (Pingbian Miaozu Zizhixian) [NE Vietnam].

72c. *Lithocarpus echinophorus* var. *bidoupensis* A. Camus, Notul. Syst. (Paris) 13: 267. 1948.

金平柯 jin ping ke

Leaf blade elliptic to oblong, 10–14 × 2–4 cm, abaxially with sparse and slender hairs; secondary veins 12–14 on each side of midvein, not fusing. Cupule depressed globose, 2–2.5 cm in diam., enclosing ca. 1/2 of nut; bracts linear to subulate, 2–3 mm, curved to appressed, with tawny waxy scalelike trichomes. Nut glabrous, apex ± flat; scar concave, 1.5–2 cm in diam. Fl. Jul–Aug, fr. Oct–Nov of following year.

SE Yunnan [N Vietnam].

73. *Lithocarpus skanianus* (Dunn) Rehder, J. Arnold Arbor. 1: 131. 1919.

滑皮柯 hua pi ke

Quercus skianiana Dunn, J. Linn. Soc., Bot. 38: 366. 1908; *Pasania skianiana* (Dunn) Schottky.

Trees to 20 m tall; bud scales, branchlets, petioles, and rachis of inflorescences tawny tomentose. Petiole rarely to 1 cm; leaf blade obovate-elliptic, oblanceolate, or rarely elliptic to oblong, 6–20 × 4–9 cm, thickly papery, abaxially pilose on midvein but otherwise pubescent with simple and branched hairs, base cuneate, margin entire or ± undulate near apex, apex shortly caudate-acute to acuminate; secondary veins 9–14 on each side of midvein, adaxially usually slightly impressed; tertiary veins abaxially conspicuous, subparallel. Male panicle terminal or rarely solitary spikes in axils of leaves, to 25 cm. Female inflorescence with cupules in clusters of ca. 3. Infructescences 1–1.2 cm; rachis 2–3 mm thick. Cupule depressed globose to subglobose, 1.4–2 × 1.5–2.5 cm, almost completely enclosing nut, wall ca. 1 mm thick; bracts subulate to linear and 2–3 mm or triangular-squamiform and appressed, puberulent and scurfy. Nut depressed globose to broadly conical, 1.2–1.8 × 1.4–2.2 cm, glabrous, wall ca. 0.5 mm thick; scar 1.1–1.3 cm in diam., concave. Fl. Sep–Oct, fr. Sep–Oct of following year.

• Broad-leaved evergreen forests; 500–1000 m. C and S Fujian, Guangdong, Guangxi, Hainan, S Hunan, S Jiangxi, SE Yunnan.

74. *Lithocarpus oleifolius* A. Camus, Bull. Soc. Bot. France 94: 271. 1947.

榄叶柯 lan ye ke

Trees 8–15 m tall; branchlets, petioles, leaf blades abaxially, and rachis of inflorescences rusty pilose. Petiole 1–1.5 cm; leaf blade oblong to lanceolate, 8–16 × 2–4 cm, rigidly papery, abaxially with appressed hairs and waxy scalelike trichomes, base cuneate, margin entire or rarely ± undulate on apical part, apex narrowly acuminate; secondary veins 11–14 on each side of midvein; tertiary veins abaxially not visible. Male inflorescences 3–many in a panicle, rarely solitary. Female inflorescence with cupules in clusters of ca. 3. Infructescences 8–12 cm; rachis 4–5 mm thick. Cupule globose, depressed globose, or pear-shaped, 2.6–3.2 cm in diam., completely enclosing nut or sometimes 3/4 of nut, wall to 2 mm thick near base; bracts imbricate, triangular, appressed, with lanceolate, ± lax scalelike trichomes. Nut depressed globose to subglobose, 2–2.5 cm in diam., glabrous; scar 1.4–2 cm in diam., concave. Fl. Aug–Sep, fr. Oct–Nov of following year.

Mixed mesophytic forests; 500–1200 m. S Fujian, Guangdong, Guangxi, S Guizhou, S Hunan, S Jiangxi [Vietnam].

Very close to *Lithocarpus echinophorus*, and additional work is needed.

75. *Lithocarpus rhabdostachyus* (Hickel & A. Camus) A. Camus subsp. *dakhaensis* A. Camus, Bull. Soc. Bot. France 92: 84. 1945.

毛枝柯 mao zhi ke

Trees 8–15 m tall; branchlets, petioles, and rachis of inflorescences densely covered with rust-colored simple and branched hairs. Petiole 1–2 cm; leaf blade obovate

to obovate-elliptic on sterile shoots, sometimes elliptic on fruiting branches, 16–30 × 5–12 cm, subleathery, rusty pilose, adaxially with hairs crisp and early glabrescent, base broadly cuneate, margin entire, apex acute; secondary veins 11–17 on each side of midvein, abruptly curving apically near margin, apical ones fusing; tertiary veins abaxially slender, evident, subparallel. Male panicle terminal or rarely solitary spikes in axils of leaves, to 25 cm. Female inflorescences to 30 cm; cupules in clusters of ca. 3. Infructescence rachis to 1 cm thick. Cupule depressed globose, 1.5–2 × 2.5–3 cm, entirely or almost completely enclosing nut, wall 0.5–1.5 cm thick; bracts imbricate, ovate-triangular, appressed, puberulent. Nut depressed globose, 2.2–2.7 cm in diam., glabrous, wall 0.5–1 mm thick; scar 1.5–1.8 cm in diam., ± concave. Fl. Sep–Oct, fr. Oct–Dec of following year.

Broad-leaved evergreen forests, 900–2200 m. W Guangxi, SE Yunnan [C to N Vietnam].

Lithocarpus rhabdostachyus subsp. *rhabdostachyus* occurs in Laos and Vietnam.

76. *Lithocarpus trachycarpus* (Hickel & A. Camus) A. Camus, *Riviera Sci.* 18: 42. 1931 [1932].

糙果柯 *cao guo ke*

Pasania trachycarpa Hickel & A. Camus, *Bull. Mus. Natl. Hist. Nat.* 29: 604. 1923; *Lithocarpus trachycarpus* var. *jakhuangensis* Hu ex A. Camus; *Pasania yui* Hu.

Trees to 20 m tall. Branchlets sulcate, sparsely covered with early glabrescent long hairs. Leaf blade lanceolate to elliptic, 8–15 × 2–6 cm, rigidly papery, base cuneate, margin entire, apex acuminate to acute; midvein abaxially covered with early glabrescent long hairs; secondary veins 12–16 on each side of midvein, abruptly curving near margin but not fusing; tertiary veins abaxially slender, evident to conspicuous, subparallel. Male inflorescences paniculate, 5–9 cm. Female inflorescences to 20 cm; rachis puberulent; cupules in clusters of ca. 3. Cupule globose to depressed, 1.5–2 cm, completely enclosing nut, outside with oily scalelike glands, reddish brown when dry, wall ca. 0.5 mm thick; bracts subulate, 1–1.5 mm. Nut ± depressed globose, 1–1.3 × 1.6–1.8 cm, glabrous, wall ca. 1 mm thick; scar at basal part of nut, ca. 1 cm in diam., slightly concave. Fl. Nov–Mar, fr. Nov–Mar of following year.

Broad-leaved evergreen forests; 800–1300 m. S to SW Yunnan [Laos, N Thailand, Vietnam].

77. *Lithocarpus chungchungensis* Chun & P. C. Tam, *Acta Phytotax. Sin.* 10: 207. 1965.

琼中柯 *qiong zhong ke*

Trees 5–10 m tall; branchlets and rachis of inflorescences densely tawny pubescent. Petiole 0.8–1.2 cm; leaf blade obovate, ovate-elliptic, or oblong, 6–15 × 2–5 cm, rigidly papery, pubescent but early

glabrescent, abaxially ± glaucous and with waxy scalelike trichomes, base cuneate and decurrent on petiole, margin entire or undulate, apex caudate-acuminate; midvein pilose abaxially; secondary veins 10–14 on each side of midvein, obscure near margin; tertiary veins abaxially inconspicuous or not visible. Male inflorescences sometimes androgynous, 2–5 cm; rachis with short, tomentose hairs. Female inflorescence with cupules in clusters of 3–5. Infructescences 9–15 cm; rachis 6–8 mm thick. Cupule globose to ± depressed, 1.5–2 cm in diam., usually completely enclosing nut, wall less than 1 mm thick and crustaceous when dry; bracts triangular to shortly subulate, small. Nut depressed globose, 0.7–1.2 × 1.2–1.8 cm, glabrous, apex flat; scar ± concave. Fl. Jul, fr. Oct–Nov of following year.

• Broad-leaved evergreen forests; ca. 800 m. Hainan.

78. *Lithocarpus longanoides* C. C. Huang & Y. T. Chang, *Guihaia* 8: 26. 1988.

龙眼柯 *long yan ke*

Trees 8–18 m tall. Young branchlets covered with tawny, crisp, short hairs, blackish when dry. Branches of last-year growth densely lenticellate; lenticels visible only under lens. Petiole ca. 1.5 cm; leaf blade ovate, elliptic, or lanceolate, 4–10 × 1.5–3.5 cm, rigidly papery, abaxially at least along midvein densely covered with tawny, early glabrescent, short hairs and with tiny, grayish glandular dots, adaxially reddish brown to dark brown when dry, base decurrent on petiole, margin entire or rarely ± undulate near apex, apex narrowly acuminate to caudate; secondary veins 6–8 on each side of midvein, abruptly curving apically near margin but not fusing; tertiary veins abaxially not visible or very slender, evident. Male inflorescences in a panicle, 8–15 cm; rachis densely tawny puberulent. Androgynous inflorescences often with male flowers above middle; cupules in clusters of ca. 3. Cupule globose to ± depressed, 1–1.8 cm in diam., usually almost completely enclosing nut, wall less than 1 mm thick and crustaceous when dry; bracts fused to cupule except for subulate apex ca. 1 mm, triangular, reddish brown when dry. Nut depressed globose to subglobose, 0.8–1.6 cm in diam., glabrous; scar 6–12 mm in diam., concave. Fl. Jul–Oct, fr. Jul–Oct of following year.

• Broad-leaved evergreen forests; 500–1200 m. Guangdong, Guangxi, SE Yunnan.

79. *Lithocarpus bonnetii* (Hickel & A. Camus) A. Camus, *Riviera Sci.* 18: 39. 1931 [1932].

帽柯 *mao ke*

Pasania bonnetii Hickel & A. Camus, *Ann. Sci. Nat., Bot.*, sér. 10, 3: 402. 1921.

Trees to 20 m tall. Branchlets stout, terete, tawny tomentose. Petiole 1.5–2 cm, thick; leaf blade oblanceolate to obovate-oblong, 15–24 × 6–9 cm, leathery, abaxially tawny tomentose when young, base narrowed, margin entire or ± undulate near apex, apex

acute; secondary veins 12–16 on each side of midvein, adaxially impressed, apical ones abruptly curving apically, fusing near margin; tertiary veins abaxially inconspicuous, \pm parallel. Infructescences 6–13 cm; rachis tawny tomentose. Cupules in clusters of ca. 3 but only 1 or 2 developed, 0.8–1 \times 1.6–1.8 cm, enclosing slightly more than 1/2 of nut, wall less than 1 mm thick; bracts linear, 2–3 mm, puberulent. Nut depressed conical, 1.2–1.4 \times 1.4–1.6 cm, apex narrowed, wall less than 0.5 mm thick; scar 8–9 mm in diam., deeply concave. Fl. May–Jun, fr. Jul–Aug of following year. Mixed mesophytic forests in mountain valleys; 700–1300 m. SW Hainan, SE Yunnan [C to NE Vietnam].

Very close if not the same as *Lithocarpus garrettianus*; the only difference is the length of the cupule bracts.

80. *Lithocarpus garrettianus* (Craib) A. Camus, Rivière Sci. 18: 40. 1931 [1932].

望楼柯 wang lou ke

Quercus garrettiana Craib, Bull. Misc. Inform. Kew 1911: 471. 1911; *Pasania garrettiana* (Craib) Hickel & A. Camus.

Trees ca. 20 m tall. Branchlets stout, densely tawny tomentose. Petiole 1–2 cm, stout, hairy; leaf blade oblanceolate to sometimes ovate, 12–22 \times 4–8 cm, leathery, tawny tomentose when young, abaxially glabrescent but with tawny, waxy scalelike trichomes with age, base cuneate, apex acute; midvein abaxially pilose; secondary veins 10–13 on each side of midvein, adaxially \pm impressed, abruptly curving apically near margin, apical ones fusing; tertiary veins abaxially conspicuous, subparallel. Male inflorescences spicate or paniculate; rachis tomentose. Female and androgynous inflorescences to 20 cm; cupules in clusters of ca. 3. Cupule ca. 1.5 \times 2–2.5 cm including bracts, enclosing \pm 2/3 of nut, outside hairy, wall less than 1 mm thick; bracts 4–6 mm, squamose when young but elongating after flowering and linear and curved in fruit. Nut depressed globose, 0.8–1.2 \times 1.2–1.5 cm, apex \pm pointed, wall ca. 0.5 mm thick; scar 0.9–1.2 cm in diam., concave. Fl. Jun–Aug, fr. in Autumn of following year.

Mixed mesophytic forests; above 1000 m. SW Yunnan [Laos, Myanmar, N Thailand, Vietnam].

81. *Lithocarpus rosthornii* (Schottky) Barnett, Trans. & Proc. Bot. Soc. Edinburgh 34: 179. 1944.

南川柯 nan chuan ke

Pasania rosthornii Schottky, Bot. Jahrb. Syst. 47: 674. 1912; *Lithocarpus dictyoneuron* Chun; *Synaedrya rosthornii* (Schottky) Koidzumi.

Trees 10–15 m tall; branchlets and petioles covered with crisp, early glabrescent hairs and tawny, lamellate waxy scalelike trichomes. Petiole 1–2 cm; leaf blade obovate-elliptic, oblanceolate, or sometimes elliptic, 12–30 \times 4–10 cm, \pm thickly papery, abaxially pilose along midvein when young but soon glabrescent, margin entire, apex abruptly narrowed and caudate;

secondary veins 14–22 on each side of midvein, adaxially conspicuously impressed; tertiary veins abaxially conspicuous, numerous, subparallel. Male inflorescences paniculate or rarely spicate, to 15 cm. Female inflorescences usually with a few male flowers near apex; cupules in cluster of ca. 3. Infructescences 10–12 cm; rachis 4–5 mm thick. Cupule 1–1.6 \times 2–3 cm, enclosing 1/2–3/4 of nut, wall ca. 0.5 mm thick and crustaceous; bracts imbricate, triangular, small, covered with tawny waxy scalelike trichomes. Nut depressed globose, 1.4–2 \times ca. 2.8 cm, glabrous, apex \pm narrowed and pointed, wall ca. 0.5 mm in diam.; scar 1–1.5 cm in diam., concave. Fl. Aug–Oct, fr. Aug–Oct of following year.

• Mixed mesophytic forests; 300–900 m. EC to SW Guangdong, S to SW Guangxi, NE Guizhou, Hunan, SE Sichuan.

82. *Lithocarpus fangii* (Hu & W. C. Cheng) C. C. Huang & Y. T. Chang, Guihaia 8: 32. 1988.

川柯 chuan ke

Pasania fangii Hu & W. C. Cheng, Acta Phytotax. Sin. 1: 118. 1951; *Lithocarpus glaber* (Thunberg) Nakai var. *szechuanicus* W. P. Fang.

Trees 8–15 m tall. Branchlets \pm sulcate, tawny tomentose. Petiole less than 1 cm; leaf blade obovate, elliptic, oblanceolate, or oblong, 5–10(–16) \times 2–3(–4) cm, \pm thickly papery, abaxially covered with appressed hairs more densely along midvein, base cuneate, margin entire, apex abruptly acute and shortly caudate; secondary veins 8–11 on each side of midvein, abruptly curving apically, obscure near margin; tertiary veins abaxially not visible. Male inflorescences congested at apex of branches, to 12 cm. Female and androgynous inflorescences terminal, to 15 cm. Female inflorescence with rachis 3–4 mm thick; cupules in clusters of ca. 3. Cupule bowl-shaped, 7–9 mm \times 1.8–2 cm, enclosing ca. 1/2 of nut, wall 1–1.5 mm thick; bracts imbricate, triangular, squamose, appressed, tawny scurfy. Nut subglobose, glabrous, apex \pm narrowed, wall ca. 1 mm thick; scar 1–1.2 cm in diam., concave. Fl. Oct–Dec, fr. Oct–Dec of following year.

• Mixed mesophytic forests; 800–1000 m. Guizhou, SW to W Sichuan.

83. *Lithocarpus paniculatus* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 59: 51. 1922.

圆锥柯 yuan zhui ke

Pasania paniculata (Handel-Mazzetti) Chun.

Trees to 15 m tall; bud scales, branchlets, and rachis of inflorescences hairy. Petiole 6–10 mm; leaf blade oblong to obovate-oblong, 6–15 \times 2.5–5 cm, rigidly papery, abaxially hairy along midvein when young, base cuneate, margin entire, apex abruptly acute to caudate; secondary veins 10–14 on each side of midvein, abruptly curving apically, obscure near margin; tertiary veins abaxially not visible. Male inflorescences paniculate. Female and androgynous inflorescences to 20 cm; cupules in clusters of 3–5. Infructescence rachis

4–7 mm thick. Cupule depressed globose to subglobose, 0.8–1.8 × 1.8–2.5 cm, enclosing most of nut or occasionally completely enclosing nut, wall 0.2–0.5 mm thick and crustaceous; bracts imbricate, triangular, rarely longer than 1 mm. Nut broadly conical to slightly depressed, 1.6–2.3 cm in diam., apex pointed to rounded, wall ca. 0.5 mm thick; scar 1–1.4 cm in diam., concave. Fl. Jul–Sep, fr. Jul–Sep of following year.

• Broad-leaved evergreen forests; 600–1200 m. N Guangdong, NE Guangxi, S Hunan, SW Jiangxi.

84. *Lithocarpus elaeagnifolius* (Seemen) Chun, J. Arnold Arbor. 9: 151. 1928.

胡颓子叶柯 hu tui zi ye ke

Quercus elaeagnifolia Seemen, Bot. Jahrb. Syst. 23 (Beibl. 57): 51. 1897; *Pasania elaeagnifolia* (Seemen) Schottky; *Synaedrys elaeagnifolia* (Seemen) Koidzumi.

Trees 10–15 m tall. Branchlets of current year covered with early glabrescent, tawny crisp hairs; branches of last-year growth blackish brown, with gray to pale yellowish brown, lamellate wax layer, densely and minutely lenticellate. Petiole 5–8(–10 or more) mm, base thickened; leaf blade narrowly oblong to sometimes narrowly oblanceolate, 7–15 × 1–2.5 cm, rigidly papery, with tawny crisp hairs on both surfaces when young, soon glabrescent, adaxially with waxy scalelike trichomes and grayish brown when dry, base cuneate, margin entire or ± undulate near apex, apex narrowly acuminate; secondary veins 12–16 on each side of midvein, obscure near margin; tertiary veins abaxially very slender, evident or not visible. Male inflorescences terminal panicles, 3–7 cm; rachis tomentose with tawny, short hairs. Female and androgynous inflorescences to 18 cm. Female inflorescence with rachis 2–3 mm thick; cupules in clusters of ca. 3. Cupule depressed globose to subglobose, 1–1.2 × 1.4–1.7 cm, enclosing 3/4–4/5 of nut, wall ca. 1 mm thick and crustaceous; bracts triangular, squamose, appressed, tawny scurfy. Nut ± depressed globose, 1–1.2 × 1.2–1.4 cm, glabrous, apex ± pointed, wall ca. 0.5 mm thick; scar 1–1.1 cm in diam., concave. Fl. Jul–Sep, fr. Jul–Sep of following year.

Mixed mesophytic forests in valleys; below 300 m. C to S Hainan [Vietnam].

85. *Lithocarpus fenestratus* (Roxburgh) Rehder, J. Arnold Arbor. 1: 126. 1919.

泥柯 ni ke

Quercus fenestrata Roxburgh, Fl. Ind. ed. 1832, 3: 633. 1832; *Lithocarpus fenestratus* var. *brachycarpus* A.

Camus; *Pasania fenestrata* (Roxburgh) Oersted; *Synaedrys fenestrata* (Roxburgh) Koidzumi.

Trees 25–30 m tall. Branchlets of current year pubescent or with tawny lamellate waxy scalelike trichomes. Petiole 5–10 mm, pilose; leaf blade lanceolate, ovate-oblong, or ovate-elliptic, 5–22 × 2–7 cm, papery to thickly papery, abaxially with yellowish gray to gray, adherent, waxy or lamellate scalelike

trichomes, base cuneate to narrowly so and decurrent on petiole, margin entire, apex acute to acuminate; secondary veins 12–17 on each side of midvein, sometimes adaxially impressed, abruptly arcuate apically near margin, apical ones often fusing; tertiary veins abaxially slender, evident, numerous, subparallel. Male inflorescences usually in a panicle. Female inflorescences to 25 cm. Infructescences to 18 cm; rachis 5–8 mm thick; cupules in clusters of ca. 3, only 1 or 2 developed. Cupule depressed globose, 1–2.8 cm in diam., enclosing most of nut, wall 0.5–1 mm thick; bracts imbricate, triangular, appressed, sparsely covered with minute hairs and brown waxy scalelike trichomes. Nut depressed globose to broadly conical, wall 0.4–1 mm thick; scar 1–1.8 cm in diam., concave. Fl. Aug–Oct, fr. Aug–Dec of following year.

Broad-leaved evergreen forests; below 1700 m. C to S Guangdong, SW Guangxi, Hainan, SE Xizang (Médog Xian), Yunnan [Bhutan, NE India, Laos, NE Myanmar, Sikkim, N Thailand, NE Vietnam].

86. *Lithocarpus mairei* (Schottky) Rehder, J. Arnold Arbor. 1: 128. 1919.

光叶柯 guang ye ke

Pasania mairei Schottky, Bot. Jahrb. Syst. 47: 665. 1912; *Synaedrys mairei* (Schottky) Koidzumi.

Trees rarely to 10 m tall, glabrous except branchlets and inflorescences covered with tawny, waxy scalelike trichomes. Petiole 0.8–1.5 cm; leaf blade lanceolate to elliptic, 5–10 × 1.5–4 cm, leathery to papery, yellowish brown when dry, base cuneate and decurrent on petiole, margin entire, apex acuminate; secondary veins 7–10 on each side of midvein, slender, evident, adaxially slightly impressed; tertiary veins abaxially not visible. Male inflorescences paniculate, 4–8 cm, sometimes spicate. Female inflorescences 5–8 cm; rachis covered with tawny, lamellate, waxy scalelike trichomes; cupules in clusters of ca. 3. Infructescences 3–5 cm. Cupule bowl-shaped, 5–8 mm × 1–1.8 cm, enclosing ca. 1/2 of nut, wall ca. 1 mm thick; bracts imbricate, triangular, squamose, appressed, covered with tawny, waxy scalelike trichomes. Nut broadly conical to ± depressed globose, 1–1.5 × 1.1–1.8 cm, glabrous, apex ± flat, wall 0.5–1 mm thick; scar 6–8 mm in diam., slightly concave. Fl. Aug–Sep, fr. Aug–Sep of following year.

• Mixed mesophytic forests in dry places; 1500–2500 m. C to N Yunnan.

87. *Lithocarpus melanochromus* Chun & Tsiang ex C. C. Huang & Y. T. Chang, Guihaia 8: 29. 1988.

黑柯 hei ke

Trees 8–15 m tall; young branchlets and petioles tawny pilose, soon glabrescent. Petiole 0.5–1.5 cm; leaf blade narrowly oblong to lanceolate, 4–11 × 1–3.5 cm, rigidly leathery, abaxially glaucous and with adherent, waxy

scalelike trichomes, adaxially tawny pilose when young, base cuneate and decurrent on petiole, margin entire and \pm recurved, apex acuminate to abruptly acute and with a blunt tip; secondary veins 10–15 on each side of midvein, slender, inconspicuous to \pm conspicuous; tertiary veins abaxially not visible. Male inflorescences in a panicle, 3–5 cm; rachis pubescent. Female inflorescences 3–8 cm; rachis ca. 3 mm thick; cupules in clusters of ca. 3. Cupule cupular, 5–8 mm \times 1.2–1.8 cm, enclosing ca. 1/2 of nut, wall 1–1.5 mm thick and basally thickened; bracts imbricate, triangular, squamose, appressed. Nut covered with tawny, lamellate, waxy scalelike trichomes, apex pointed, wall 0.5–1 mm thick; scar 8–11 mm in diam., concave. Fl. May–Jul, fr. Aug–Oct of following year.

• Broad-leaved evergreen forests; 600–1200 m. SW Guangdong, SW Guangxi.

88. *Lithocarpus fohaiensis* (Hu) A. Camus, Bull. Soc. Bot. France 94: 271. 1947.

勐海柯 meng hai ke

Pasania fohaiensis Hu, Bull. Fan Mem. Inst. Biol., Bot. 10: 97. 1940; *Lithocarpus cheliensis* (Hu) A. Camus; *P. cheliensis* Hu.

Trees to 25 m tall, glabrous except for inflorescences and nuts. Petiole 1–3 cm, base thickened; leaf blade narrowly oblong to rarely obovate-oblong, 15–24 \times 5–8 cm, thickly papery, concolorous, base broadly cuneate, decurrent on petiole, and often asymmetric, margin entire, apex shortly acuminate; secondary veins 11–16 on each side of midvein; tertiary veins abaxially slender, evident. Male inflorescences solitary or clustered; rachis densely tawny pubescent or sometimes glabrescent. Female inflorescences in clusters of 2 or 3 at apex of branches, to 25 cm; cupules in clusters of 3–5. Infructescence rachis 6–8 mm thick. Cupule shallowly bowl-shaped, 0.8–1.3 \times 2–2.5 cm, enclosing less than 1/2 of nut, wall woody and basally thickened; bracts \pm connate into concentric and \pm raised rings, broadly triangular, densely rusty puberulent. Nut depressed globose to conical, 1.4–3 \times 1.5–2.5 cm, densely tawny to rusty farinose. Fl. Mar–May, fr. Aug of following year.

• Sparse forests; 600–1500 m. S Yunnan.

89. *Lithocarpus carolineae* (Skan) Rehder, J. Arnold Arbor. 1: 123. 1919.

红心柯 hong xin ke

Quercus carolineae Skan in Dunn, J. Linn. Soc., Bot. 35: 518. 1903; *Pasania carolineae* (Skan) Schottky; *Synaedrys carolineae* (Skan) Koidzumi.

Trees to 20 m tall, glabrous except for inflorescences and leaf blade vein axils. Branchlets of current year sulcate, dark brown when dry. Petiole 1.5–2 cm; leaf

blade oblong to rarely obovate-oblong, 13–18 \times 4–6 cm, thickly papery, concolorous, dark brown when dry, with tuft of stellate hairs on axils of veins, base cuneate, margin serrate from middle to apex, apex shortly caudate; secondary veins 15–20 on each side of midvein, ending in teeth or abruptly curving apically near margin and gradually obscured. Infructescence with cupules in clusters of 3–5. Cupule plate-shaped, 1–1.5 \times 3–4 cm, enclosing ca. 1/2 of nut, dark brown when dry, basally with a short stalk; bracts imbricate, broadly triangular, appressed, base rhomboid, midvein thickened. Nut depressed globose, 2.4–3 \times 4–4.5 cm, \pm glossy, apex flat with a \pm concave center, wall 6–10 mm thick; scar 2.5–3 cm in diam., margin concave but center \pm convex. Fr. Sep–Oct.

• Mixed mesophytic forests; 1500–2000 m. S to SE Yunnan.

90. *Lithocarpus naiadarum* (Hance) Chun, J. Arnold Arbor. 9: 152. 1928.

水仙柯 shui xian ke

Quercus naiadarum Hance, J. Bot. 22: 227. 1884; *Pasania naiadarum* (Hance) Schottky; *Q. neriifolia* Seemen; *Synaedrys naiadarum* (Hance) Koidzumi.

Trees 4–10 m tall, glabrous except for inflorescences. Branchlets with a thin translucent wax layer. Leaf blade narrowly oblong to lanceolate, (5–)10–15(–30) \times (0.7–)1–1.5 (–2.5) cm, rigidly papery, concolorous and without waxy scalelike trichomes, base attenuate and decurrent on a very short petiole, apex shortly acuminate and with a blunt tip; secondary veins 11–15 on each side of midvein, slender, evident; tertiary veins abaxially reticulate. Male inflorescences in a panicle; rachis densely tawny pubescent. Female inflorescences to 20 cm; rachis ca. 3 mm thick; cupules in clusters of ca. 3. Cupule discoid, 1.2–1.8 cm in diam., enclosing basal part of nut, outside puberulent, wall to 1 mm thick and \pm woody near base; bracts usually connate into concentric rings, triangular, appressed. Nut broadly conical to rarely subglobose, 1–2 \times 1.5–2.5 cm, apex pointed or flat; scar concave to almost flat. Fl. Jul–Aug, fr. Aug–Sep of following year.

• Frequent on stream banks; near sea level. Hainan.

91. *Lithocarpus hancei* (Benth) Rehder, J. Arnold Arbor. 1: 127. 1919.

硬壳柯 ying qiao ke

Quercus hancei Benth, Fl. Hongk. 322. 1861; *Cyclobalanopsis ternaticupula* (Hayata) Kudo; *C. ternaticupula* f. *arisanensis* (Hayata) Kudo; *Cyclobalanus hancei* (Benth) Oersted; *C. ternaticupula* (Hayata) Nakai; *Lithocarpus arisanensis* (Hayata) Hayata; *L. jingdongensis* Y. C. Hsu & H. J. Qian; *L. matsudai* Hayata; *L. mupinensis* (Rehder & E. H. Wilson) A. Camus; *L. omeiensis* A. Camus; *L. spicatus* (Smith) Rehder & E. H. Wilson var. *mupinensis* Rehder & E. H. Wilson; *L. subreticulatus*

(Hayata) Hayata; *L. ternaticupulus* (Hayata) Hayata; *Pasania brevicaudata* (Skan) Schottky var. *arisanensis* (Hayata) Ying; *P. confertifolia* Hu; *P. hancei* (Benth) Schottky; *P. hancei* var. *arisanensis* (Hayata) J. C. Liao; *P. hancei* var. *ternaticupula* (Hayata) J. C. Liao; *P. rhododendrophylla* Hu; *Q. arisanensis* Hayata; *Q. subreticulata* Hayata; *Q. ternaticupula* Hayata; *Synaedrys hancei* (Benth) Koidzumi; *S. kuaruensis* Tomiya.

Trees usually less than 15 m tall, glabrous except for inflorescences. Branchlets ± tawny to gray, usually with a thin layer of translucent wax. Petiole 0.5–4 cm; leaf blade variable in shape and size, ovate, broadly elliptic, obovate-elliptic, narrowly elliptic, or lanceolate, 5–10 × 2.5–5 cm, thinly papery to rigidly leathery, concolorous and sometimes adaxially white farinose when dry, base usually decurrent on petiole, margin entire and ± recurved, apex rounded, obtuse, acute, or narrowly acuminate; secondary veins 6–13 on each side of midvein, slender, evident; tertiary veins abaxially obscure, reticulate. Male inflorescences usually in a panicle, sometimes with female flowers from base to middle, rarely longer than 10 cm; rachis sometimes twisted. Female inflorescences 2–many congested at apex of branches; cupules usually in clusters of 3–5, rarely solitary. Infructescence 6–8 cm; rachis less than 8 mm thick. Cupule shallowly bowl-shaped to plate-shaped, 3–7 mm × 1–2 cm, enclosing nearly 1/3 of nut, wall 1–2 mm thick; bracts imbricate and appressed or connate into a few concentric rings, triangular, squamose. Nut depressed globose, subglobose, or broadly conical, 0.8–2 × 0.6–2.5 cm, apex rounded, pointed, or rarely flat, wall ca. 0.5 mm thick; scar 5–10 mm in diam., concave. Fl. Jul–Aug, fr. Aug–Nov of following year.

• Various habitats; below 2600 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang.

92. *Lithocarpus ithyphyllus* Chun ex H. T. Chang, Acta Sci. Nat. Univ. Sunyatseni 1960(1): 32. 1960.

挺叶柯 ting ye ke

Trees to 15 m tall, glabrous except for inflorescences. Branches of current year conspicuously sulcate. Petiole rarely to 3 mm; leaf blade narrowly oblong, 1–2 × 5–20 cm, rigidly leathery, concolorous, abaxially often white farinose, base rounded to auriculate, margin entire and recurved, apex narrowed and obtuse; secondary veins 12–18 on each side of midvein, slender, evident, adaxially impressed; tertiary veins abaxially not visible or very slender, evident. Male inflorescences sometimes androgynous, often congested at apex of branches, to 10 cm; rachis puberulent. Female inflorescence with cupules in clusters of ca. 3. Infructescences 6–8 cm; rachis puberulent, ca. 2 mm thick. Cupule plate- to shallowly bowl-shaped, 2–4 × 5–8 mm, covering base

of nut, wall to 1 mm thick near base; bracts imbricate and appressed or sometimes connate into 3 or 4 concentric rings, triangular, small. Nut narrowly ellipsoid to conical, 1.2–1.8 × 1–1.2 cm, often ± white farinose, base flat, apex pointed, wall ca. 0.5 mm thick; scar 3–4 mm in diam., concave. Fl. May–Jun, fr. Aug–Sep of following year.

• Broad-leaved evergreen forests, more frequent in secondary forests; 400–900 m. E Guangdong.

93. *Lithocarpus calophyllus* Chun ex C. C. Huang & Y. T. Chang, Guihaia 8: 27. 1988.

美叶柯 mei ye ke

Trees to 28 m tall. Young branchlets sparsely puberulent above middle; branchlets of last year growth blackish, lenticellate. Petiole 2.5–5 cm; leaf blade broadly elliptic, ovate, or oblong, 8–15 × 4–9 cm, rigidly leathery, abaxially densely tawny to rusty scurfy when young and ± glaucous with age, adaxially glabrous, base subrounded to slightly auriculate and sometimes asymmetric, apex acute to acuminate with a caudate tip; secondary veins 7–11 on each side of midvein, adaxially impressed, abruptly curving, obscure near margin; tertiary veins abaxially slender, evident, subparallel. Male inflorescences in a panicle, less than 3 cm. Female inflorescences to 20 cm; rachis 5–6 mm thick; cupules in clusters of 3–5, rarely solitary on basal part of rachis. Cupule 0.5–1 × 1.5–2.5 cm, shallowly cupular, enclosing 1/6–1/5 of nut, wall to 3 mm thick and thickly woody near base. Nut 1.5–2 × 1.8–2.6 cm, often slightly white farinose, apex flat with a ± concave to shortly pointed center, wall ca. 1 mm thick; scar 1–1.4 cm in diam., concave. Fl. Jun–Jul, fr. Aug–Sep of following year.

• Broad-leaved evergreen forests; 500–1200 m. SW Fujian, SW Guangdong, Guangxi, S Guizhou, S Hunan, SW Jiangxi.

94. *Lithocarpus petelotii* A. Camus, Notul. Syst. (Paris) 5: 75. 1935.

星毛柯 xing mao ke

Trees to 28 m tall. Branchlets and rachis of inflorescences tawny pubescent. Petiole 2.5–4 cm, pubescent when young; leaf blade elliptic to ovate-elliptic or sometimes obovate to obovate-elliptic, 9–15 × 3.5–6 cm, rigidly leathery, abaxially with rust-colored, scurfy scalelike trichomes and stellate hairs, base subrounded to broadly cuneate and sometimes asymmetric, margin entire, apex acuminate to acute; secondary veins 7–13 on each side of midvein, abaxially pubescent; tertiary veins abaxially conspicuous. Male inflorescences in a panicle, less than 3 cm. Female inflorescences to 20 cm; rachis ca. 8 mm thick; cupules in clusters of 3–5, rarely solitary on basal part of rachis. Cupule shallowly bowl-shaped, 0.8–1.5 × 2.5–3.5 cm, covering base of nut, basally narrowed and slightly elongate into a short stalk, wall 3–6 mm thick and woody; bracts imbricate, triangular to rhomboid, densely tawny puberulent; midvein ridged. Nut sub-

globose, 3–7.5 × 2.5–3.8 cm, often white farinose, apex shortly pointed; scar 1–1.4 cm in diam., concave. Fl. Aug–Sep, fr. Sep–Oct of following year.

Mixed mesophytic forests; 1000–1800 m. Guangxi, S Guizhou, W Hunan, SE Yunnan [Vietnam].

Lithocarpus wenxianensis Y. J. Zhang & al. (Acta Bot. Yunnan. 16: 121. 1994), from SE Gansu, is close to *L. petelotii*, but its status needs further study. With such a disjunct distribution, it seems unlikely that the two species are the same.

95. *Lithocarpus eriobotryoides* C. C. Huang & Y. T. Chang, Guihaia 8: 25. 1988.

枇杷叶柯 pi pa ye ke

Trees 10–15 m tall; branches of current year and leaf blades abaxially with tawny stellate or forked long hairs. Petiole 1–2 cm; leaf blade obovate-elliptic, obovate, or sometimes elliptic, 12–20 × 4–7 cm, rigidly papery, concolorous, base cuneate to broadly so and decurrent on petiole, margin entire, apex acute to acuminate; secondary veins 12–16 on each side of midvein, adaxially impressed, abruptly curving apically, partly fusing near margin; tertiary veins abaxially conspicuous, ± parallel. Male inflorescences in a panicle. Female inflorescence with cupules in clusters of ca. 3. Infructescences ca. 12 mm; rachis 5–8 mm thick. Cupule plate-shaped, 5–8 mm × 1.8–2.2 cm, enclosing 1/8–1/5 of nut, wall to 2 mm thick and woody near base; bracts imbricate, triangular to rhomboid, appressed, puberulent. Nut conical to ellipsoid, 2.5–3 × 1–1.5 cm, apex ± flattened, wall ca. 1 mm thick; scar ca. 1.3 cm in diam., concave. Fl. May–Jun, fr. Aug–Oct of following year.

• Mixed mesophytic forests; 1000–1500 m. NE Guizhou, W Hubei, NW Hunan, E Sichuan.

96. *Lithocarpus macilentus* Chun & C. C. Huang in C. C. Huang & Y. T. Chang, Guihaia 8: 30. 1988.

粉叶柯 fen ye ke

Trees 7–12 m tall; branches of current year, petioles, and rachis of inflorescences tawny tomentose. Petiole under 1 cm; leaf blade lanceolate to rarely oblanceolate, 6–11 × 2–3 cm, thinly leathery, with tufts of minute crisp hairs on both surfaces when young, abaxially scurfy, narrowed at both ends, base broadly cuneate and decurrent on petiole, margin entire, apex acuminate with a caudate tip; secondary veins 6–8 on each side of midvein; tertiary veins abaxially inconspicuous. Male inflorescences in a panicle. Female inflorescence with cupules in clusters of ca. 3. Cupule bowl-shaped, 6–8 mm × 1.5–2 cm, enclosing basal part of nut, wall thin but basally ± thickened. Nut broadly conical to depressed globose, 1.3–1.5 × 1.5–1.7 cm, glabrous; scar 7–8 mm in diam., concave. Fl. Jul–Aug, fr. Oct–Nov of following year.

• Broad-leaved evergreen forests on stream banks; below 400 m. W Guangdong, E Guangxi.

97. *Lithocarpus floccosus* C. C. Huang & Y. T. Chang, Guihaia 8: 20. 1988.

卷毛柯 juan mao ke

Trees 7–10 m tall; young branchlets, petioles, and rachis of inflorescences densely floccose-tomentose. Petiole ca. 1 cm; leaf blade ovate to elliptic, 5–10 × 1.5–3 cm, papery, abaxially with minute scalelike glands and floccose-tomentose but glabrescent, base cuneate, margin entire, apex abruptly acute to shortly caudate and with a blunt tip; secondary veins 6–9 on each side of midvein, not fusing; tertiary veins abaxially inconspicuous. Inflorescences usually androgynous, 8–15 cm. Female inflorescence with cupules in clusters of ca. 3. Infructescences 5–9 cm; rachis ca. 2 mm thick. Cupule cupular, 1–1.5 cm in diam., enclosing 1/5–1/3 of nut, wall ca. 0.5 mm thick but basally × thickened; bracts imbricate, triangular, small, appressed, sparsely puberulent. Nut broadly conical, 1–1.5 cm in diam., ± white farinose; scar ca. 5 mm in diam., ± concave. Fl. May–Jun, fr. Jul–Aug of following year.

• Broad-leaved evergreen forests with *Ormosia*, *Schefflera*, and species of Lauraceae; 400–700 m. Fujian, E Guangdong, S Jiangxi.

98. *Lithocarpus obovatilimbus* Chun, J. Arnold Arbor. 28: 236. 1947.

卵叶柯 luan ye ke

Trees to 15 m tall; branches and rachis of inflorescences pubescent. Petiole 3–10 mm; leaf blade obovate, oblanceolate, or elliptic, 4–8 × 1.5–2.5 cm, subleathery, abaxially with grayish scalelike glands and pubescent on basal part of midvein when young, base broadly cuneate to cuneate, margin entire, apex obtuse, acute, shortly caudate, or rarely acuminate; secondary veins 7–9(–13) on each side of midvein; tertiary veins abaxially slender, evident or not visible. Male inflorescences in a panicle. Female inflorescence with cupules in clusters of ca. 3. Infructescences 2 or 3, congested at apex of branches; rachis pubescent. Cupule cupular, 4–7 mm × 0.8–1.4 cm, enclosing 1/4–1/2 of nut, wall ca. 1 mm thick and basally woody; bracts imbricate, triangular, small, appressed, puberulent. Nut ellipsoid to broadly conical, 1–1.5 × 0.8–1.4 cm, often ± white farinose; scar 4–7 mm in diam., concave. Fr. Oct–Dec.

• Broad-leaved evergreen forests; 800–1100 m. Hainan (Lingshui Xian).

99. *Lithocarpus glaber* (Thunberg) Nakai, Cat. Hort. Bot. Univ. Tokyo 8. 1916.

柯 ke

Quercus glabra Thunberg in Murray, Syst. Veg., ed. 14, 858. 1784; *Kuromatea glabra* (Thunberg) Kudo; *Lithocarpus thalassicus* (Hance) Rehder; *Pasania glabra* (Thunberg) Oersted; *P. sieboldiana* (Blume)

Nakai; *P. thalassica* (Hance) Oersted; *Q. sieboldiana* Blume; *Q. thalassica* Hance; *Q. thalassica* var. *obtusiglans* Dunn; *Synaedrys glabra* (Thunberg) Koidzumi.

Trees to 15 m tall; branchlets and rachis of inflorescences densely tawny tomentose. Petiole 1–2 cm, tomentose when young; leaf blade obovate, obovate-elliptic, or oblong, 6–12 × 2.5–5.5 cm, leathery to thickly papery, abaxially with dense scalelike glands and shortly tomentose when young, base cuneate, margin entire or with 2–4 teeth on apical part, apex abruptly acute, shortly acute, or long acuminate; secondary veins rarely over 10 on each side of midvein; tertiary veins abaxially usually not visible. Male inflorescences in a panicle or solitary in leaf axils, to 15 cm. Female inflorescences often with a few male flowers; cupules in clusters of 3(–5). Infructescences ca. 6 cm; rachis usually pubescent. Cupule plate- to cupular, 5–10 mm × 1–1.5 cm, enclosing 1/5–2/5 of nut, wall to 1.5 mm and woody near base; bracts imbricate or connate into concentric rings, triangular, small, appressed, densely puberulent. Nut ellipsoid, 1.2–2.5 × 0.8–1.5 cm, ± white glaucous, apex pointed, wall 0.5–1 mm thick; scar 3–5(–8) mm in diam., concave. Fl. Jul–Nov, fr. Jul–Nov of following year.

Mixed mesophytic forests, frequent on sunny slopes; below 1500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Taiwan, Zhejiang [Japan].

100. *Lithocarpus grandifolius* (D. Don) S. N. Biswas, Bull. Bot. Surv. India 10: 258. 1968.

耳叶柯 *er ye ke*

Quercus grandifolia D. Don in Lambert, Descr. Pinus 2: 27. 1824; *Lithocarpus spicatus* (Smith) Rehder & E. H. Wilson; *Q. spicata* Smith (1814), not Humboldt & Bonpland (1806); *Q. squamata* Roxburgh.

Trees 10–15 m tall, glabrous except for inflorescences. Petiole 5–10 mm; leaf blade obovate, oblanceolate, or sometimes oblong, 15–40 × 5–15 cm, leathery to rigidly papery, concolorous, base often oblique and ± auriculate, subrounded, or rarely cuneate, margin entire, apex acute; secondary veins 13–20 on each side of midvein, fusing near margin; tertiary veins abaxially conspicuous. Male inflorescences usually solitary, occasionally 3–many in a panicle; rachis tomentose with short hairs, rarely glabrescent. Female inflorescences terminal, usually in pairs, to 20 cm; rachis base 1–1.6 cm thick; cupules in clusters of 3–5, usually 1 or 2 developed. Cupule cupular, ca. 2.6 cm in diam., enclosing 1/3–2/3 of nut, wall to 4 mm near base and woody; basal bracts often connate into horizontal ridges, broadly ovate to broadly rhomboid, puberulent. Nut depressed globose, 1.5–2.2 × 2–2.6 cm, apex flat and ± concave or rarely rounded and pointed, wall 1.5–2 mm thick; scar 1.6–2 cm in diam., concave but center sometimes convex. Fl. Apr–May, fr. Aug–Sep of following year.

Broad-leaved evergreen forests; 600–1900 m. S to SW Yunnan [Bhutan, NE India, N Laos, Nepal, NE Myanmar, Sikkim, N Thailand].

Records of *Lithocarpus elegans* (Blume) Hatusima ex Soepadmo from China are referable to *L. grandifolius*.

101. *Lithocarpus collettii* (King ex J. D. Hooker) A. Camus, Chênes, Atlas 3: 117. 1948.

格林柯 *ge lin ke*

Quercus spicata Smith var. *collettii* King ex J. D. Hooker, Fl. Brit. India 5: 610. 1888; *Lithocarpus gelinicus* C. C. Huang & Y. T. Chang, nom. illeg. (included *Q. spicata* var. *collettii*); *L. himalaicus* C. C. Huang & Y. T. Chang.

Trees 8–25 m tall. Branchlets of current year purplish brown, sulcate, sparsely hairy and with early glabrescent, stellate scalelike trichomes. Petiole 1–1.5 cm, base thickened; leaf blade oblong, elliptic, or obovate-elliptic, (6–)15–28 × 3.5–5(–11) cm, thinly papery to rigid and crustaceous, abaxially with scalelike trichomes when young and glaucous with age, base attenuate, decurrent on petiole, and sometimes asymmetric, margin entire, apex acute, acuminate, or shortly caudate; midvein sparsely hairy abaxially; secondary veins (6–)14–20 on each side of midvein, adaxially impressed, abruptly curving apically, fusing near margin; tertiary veins abaxially reticulate.

Infructescence ca. 4 cm; rachis ca. 4 mm thick, obscurely lenticellate; cupules in clusters of 3–5 but 1 or 2 developed. Cupule cupular, 4–10 mm × 1.5–2.2 cm, enclosing ca. 1/4 of nut, wall woody and basally thickened; bracts broadly triangular, with grayish minute hairs. Nut depressed globose to broadly conical, 1.2–1.5 × 1.5–2 cm, glabrous, apex flat to rounded; scar 0.8–1.5 cm in diam., concave. Fr. Aug.

Broad-leaved evergreen forests, on slopes and along river banks; 700–2400 m. SE Xizang (Médog Xian) [NE India, NE Myanmar, N Thailand].

102. *Lithocarpus obscurus* C. C. Huang & Y. T. Chang in C. C. Huang, Acta Phytotax. Sin. 16(4): 71. 1978.

墨脱柯 *mo tuo ke*

Trees to 30 m tall, glabrous except for inflorescences. Branchlets blackish brown when dry, sparsely lenticellate; lenticels slightly raised. Petiole 3–7 mm; leaf blade 10–19 × 4–8 cm, papery, concolorous, without scalelike glands, base rounded to auriculate, sometimes obtuse, and often asymmetric, margin entire, apex acute to obtuse; secondary veins 9–12 on each side of midvein; tertiary veins abaxially conspicuous. Female inflorescences 10–35 cm; rachis puberulent; cupules in clusters of 3–5. Infructescences to 35 cm; rachis 0.8–1.4 cm thick. Cupule cupular, 6–8 mm × 1–1.5 cm, enclosing hardly 1/2 of nut, dark gray when dry, wall basally thickened; bracts imbricate, small, appressed, usually only subulate apex conspicuous. Nut broadly conical, 1–1.4 × 1.5–2 cm; scar concave. Fr. Oct–Nov.

• Broad-leaved evergreen forests; 1500–2500 m. SE Xizang (Médog Xian), W Yunnan.

103. *Lithocarpus arcaulus* (Buchanan-Hamilton ex Sprengel) C. C. Huang & Y. T. Chang in C. C. Huang, Acta Phytotax. Sin. 16(4): 72. 1978.

小箱柯 xiao xiang ke

Quercus arcaula Buchanan-Hamilton ex Sprengel, Syst. Veg. 3: 857. 1826.

Trees to 30 m tall, glabrous except for inflorescences. Branchlets dark purplish brown. Petiole ca. 1.5 cm, base thickened; leaf blade ovate-elliptic to oblong, 10–20 × 5–8 cm, papery, concolorous, without scalelike glands, margin entire, apex shortly acuminate; secondary veins 12–15 on each side of midvein, abruptly curving apically near margin but not fusing; tertiary veins abaxially reticulate. Male inflorescences in a panicle or sometimes solitary, 15–30 cm. Female and androgynous inflorescences 25–40 cm; rachis pubescent; cupules in clusters of (3–)5–7. Infructescences 20–40 cm; rachis base 8–18 mm thick, sparsely lenticellate. Cupule plate-shaped, 5–8 mm × 1.5–2 cm, wall ± woody; bracts imbricate or sometimes basal ones connate into concentric rings, sometimes triangular, appressed, obscure. Nut depressed conical, 1.4–2 × 1.5–2 cm, glabrous, ± white farinose, wall thin; scar 8–10 mm in diam., concave. Fl. May–Jun, fr. Sep–Oct of following year.

Broad-leaved evergreen forests; 1100–2300 m. Xizang (Nyalam Xian, Médog Xian), Yunnan (Tengchong Xian) [Nepal].

104. *Lithocarpus mianningensis* Hu, Acta Phytotax. Sin. 1: 106. 1951.

緬寧柯 mian ning ke

Trees to 25 m tall. Young branchlets purplish brown, sparsely pubescent. Petiole 1.5–2 cm, sparsely pubescent when young; leaf blade ovate, broadly elliptic, or obovate-elliptic, 10–20 × 4–6 cm, ± rigidly papery, abaxially with silky scalelike glands, sparsely pubescent along midvein when young, and grayish brown to ± purplish when dry, base broadly cuneate and sometimes slightly asymmetric, margin entire, apex acute to shortly acuminate; secondary veins 11–16 on each side of midvein, abaxially impressed; tertiary veins abaxially slender, evident or not visible. Inflorescences terminal at apex of current year's branches; Male inflorescences in a panicle; rachis puberulent. Female inflorescence with cupules in clusters of ca. 3 or solitary, scattered on rachis. Infructescences 8–15 cm; rachis 0.7–1.3 cm thick, sparsely lenticellate. Cupule plate-shaped, 0.7–1.2 × 2.5–3 cm, wall basally woody; bracts imbricate, broadly triangular to rhomboid, densely puberulent. Nut broadly ellipsoid, 2–2.6 × 2–3 cm, densely puberulent, apex rounded to flat or sometimes with a ± concave center; scar concave. Fl. Jun, fr. Aug–Oct of following year.

• Broad-leaved evergreen forests; 1100–2500 m. SW Yunnan (Lincang Xian).

105. *Lithocarpus gaoligongensis* C. C. Huang & Y. T. Chang, Guihaia 8: 39. 1988.

高黎贡柯 gao li gong ke

Trees to 25 m tall. Branchlets of current year densely dark gray puberulent. Petiole 2–3 cm; leaf blade oblong to obovate-elliptic, 15–20 × 5–8 cm, subleathery, abaxially sparsely pilose and scurfy on midvein when young, base broadly cuneate to subrounded, margin entire, apex acuminate to acute; secondary veins 12–15 on each side of midvein, adaxially impressed; tertiary veins abaxially slender, obscure. Infructescences to 7 cm; rachis ca. 9 mm thick; cupules in clusters of ca. 3. Cupule shallowly cupular, 1–1.4 × 2–2.6 cm, enclosing ca. 1/3 of nut, wall basally woody; bracts imbricate, triangular to rhomboid, appressed, thickened, adaxially ± raised, gray puberulent. Nut depressed globose, 1.2–1.6 × 2–2.4 cm, apex rounded; scar concave. Fl. Oct–Nov.

• Broad-leaved evergreen forests; ca. 2000 m. W Yunnan (W flank of Gaoligong Shan).

106. *Lithocarpus harlandii* (Hance ex Walpers) Rehder, J. Arnold Arbor. 1: 127. 1919.

港柯 gang ke

Quercus harlandii Hance ex Walpers, Ann. Bot. Syst. 3: 382. 1852; *Lithocarpus cuneiformis* A. Camus; *L. kawakamii* (Hayata) Hayata var. *chiaratuangensis* J. C. Liao; *Pasania chiaratuangensis* (J. C. Liao) J. C. Liao; *P. harlandii* (Hance ex Walpers) Oersted; *Q. harlandii* var. *integrifolia* Dunn; *Synaedrys harlandii* (Hance ex Walpers) Koidzumi.

Trees to 18 m tall, glabrous except for inflorescences. Branchlets purplish brown, dark brown when dry, sulcate. Petiole 2–3 cm; leaf blade lanceolate, elliptic, or oblanceolate, 7–18 × 3–6 cm, rigidly leathery, abaxially with scalelike glands, base often asymmetric and attenuate-cuneate to rarely acute or subrounded, margin obtusely undulate-dentate on apical part or rarely entire, apex caudate and often falcate; secondary veins 8–13 on each side of midvein; tertiary veins abaxially obscure. Inflorescences terminal at apex of current year's branches. Male inflorescences arranged in a panicle; rachis puberulent. Female inflorescence with cupules in clusters of ca. 3 or solitary, scattered on rachis. Infructescences 10–15 cm; rachis 4–5 mm thick. Cupule cupular, 6–10 mm × 1.4–2 cm, enclosing 1/10–1/6 of nut, wall 1–2 mm thick; bracts imbricate, triangular to rhomboid, lamellate, puberulent, margin and midvein ± ridged. Nut conical to broadly ellipsoid, 2.2–2.8 × 1.6–2.2 cm, apex rounded to obtuse, wall 1.5–2 mm thick; scar 0.9–1.2 cm in diam., concave. Fl. May–Jun, fr. Sep–Oct of following year.

• Broad-leaved evergreen forests; 400–700 m. Fujian, Guangdong, S Guangxi, Hainan, Hunan, S Jiangxi, Taiwan, Zhejiang.

107. *Lithocarpus kawakamii* (Hayata) Hayata, Icon. Pl. Formosan. 6 Suppl.: 72. 1917.

齿叶柯 chi ye ke

Quercus kawakamii Hayata, J. Coll. Sci. Imp. Univ. Tokyo 25(19): 201. 1908; *Pasania kawakamii* (Hayata) Schottky; *Synaedrys kawakamii* (Hayata) Koidzumi. Trees; trunk to 70 cm d.b.h. Branchlets grayish, densely lenticellate. Petiole 2–5 cm; leaf blade obovate-oblong to oblong, 12–25 × 5–7.2 cm, papery to thinly leathery, with scalelike glands when young, abaxially rusty scurfy along midvein, adaxially glabrous, base acute to attenuate and decurrent on petiole, margin with a few obtuse teeth near apex or sometimes entire, apex acute to shortly acuminate; secondary veins 12–25 on each side of midvein; tertiary veins abaxially conspicuous, subparallel. Male panicles to 20 cm; rachis and branches stout, with grayish scalelike glands. Female inflorescence rachis puberulent; cupules in clusters of ca. 3. Infructescence rachis 1–1.2 cm thick, lenticellate. Cupule plate-shaped, 7–10 mm × 1.5–2.5 cm, enclosing 1/5–1/4(–1/3) of nut, wall 1–2 mm thick and woody; bracts imbricate, triangular to rhomboid, appressed, with puberulent-scalelike glands. Nut chestnut brown, depressed globose to broadly conical, 1.6–2.2 × 2–2.8 cm, apex flat or pointed, wall ca. 0.5 mm thick; scar 1–1.5 cm in diam., concave. Fl. May–Aug, fr. Aug–Nov of following year.

• Broad-leaved evergreen forests; 700–2900 m. Taiwan.

108. *Lithocarpus brevicaudatus* (Skan) Hayata, Icon. Pl. Formosan. 6 Suppl.: 72. 1917.

短尾柯 duan wei ke

Quercus brevicaudata Skan in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 508. 1899; *Lithocarpus brevicaudatus* var. *pinnativenus* Yamamoto; *L. impressivenus* (Hayata) Hayata; *L. impressivenus* var. *falcatoaudata* Yamamoto; *Pasania brevicaudata* (Skan) Schottky; *Q. impressivena* Hayata; *Synaedrys brevicaudata* (Skan) Koidzumi.

Trees 10–15 m tall. Branchlets of current year purplish brown, sulcate. Petiole 2–3 cm; leaf blade usually ovate, sometimes elliptic, oblong, or suborbicular, 6–15 × 4–6.5 cm, leathery, abaxially with pulverulent scalelike glands, base broadly cuneate, subrounded, or acute, ± auriculate, and sometimes asymmetric, margin entire, apex acute, acuminate, or long caudate; secondary veins 9–13 on each side of midvein; tertiary veins abaxially inconspicuous, reticulate. Male inflorescences arranged in a panicle, 4–8 cm; rachis tawny puberulent. Female inflorescences 8–10 cm; cupules in clusters of 3–5, rarely solitary. Cupule disc-shaped to cupular, rarely to 7 mm, 1.4–2 cm in diam., enclosing 1/8–1/6 of nut, outside tawny puberulent, wall to 3 mm and woody near base; bracts imbricate, triangular to rhomboid, squamose. Nut broadly conical, 1.4–2.2 cm in diam., often ± white farinose, apex shortly pointed or flat, wall ca. 3 mm thick near base; scar at base of nut, 0.9–1.2 cm in diam., concave. Fl. May–Jul, fr. Sep–Nov of following year.

• Mixed mesophytic forests, 300–1900 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Zhejiang.

Very close to *Lithocarpus hancei*, and further studies may show that they are conspecific.

109. *Lithocarpus oblanceolatus* C. C. Huang & Y. T. Chang, Guihaia 8: 24. 1988.

峨眉柯 e mei ke

Trees to 15 m tall. Branchlets glabrous, lenticellate. Petiole 2–3 cm; leaf blade oblanceolate to sometimes oblong, 15–30 × 4–7 cm, rigidly leathery, concolorous, abaxially with grayish, pulverulent scalelike glands (visible under lens), adaxially glabrous, base cuneate and decurrent on petiole, margin entire, apex acuminate; secondary veins 9–11 on each side of midvein, adaxially ± impressed; tertiary veins abaxially conspicuous. Male inflorescences paniculate; rachis tawny pubescent. Female inflorescences to 20 cm, often with a few male flowers near apex; cupules in clusters of 3(–5). Infructescence rachis 6–10 mm thick. Cupule plate-shaped to cupular, 5–8(–13) mm × 1.5–3 cm, enclosing ca. 1/3 of nut, wall to 2.5 mm thick and woody near base; bracts imbricate, triangular to rhomboid, appressed, grayish puberulent. Nut conical, 2.4–3 × 1.8–2.8 cm, wall 1–1.5 mm thick; scar 1.2–1.8 cm in diam., concave. Fl. Jul–Aug, fr. Aug–Sep of following year.

• Sparse forests; ca. 2000 m. W Sichuan (Emei Shan).

110. *Lithocarpus megalophyllus* Rehder & E. H. Wilson in Sargent, Pl. Wilson. 3: 208. 1916.

大叶柯 da ye ke

Lithocarpus pleiocarpus A. Camus; *Quercus mairei* H. Léveillé (1913), not *Pasania mairei* Schottky (1912). Trees 15–25 m tall. Branchlets glaucous, glabrous, lenticellate. Petiole 2.5–6 cm, 3–6 mm thick; leaf blade obovate, obovate-elliptic, or elliptic, 14–30 × 6–13 cm, rigidly leathery, concolorous, abaxially with grayish, pulverulent scalelike glands (visible under hand lens), adaxially glabrous, base cuneate to subrounded, margin entire, apex acute; secondary veins 14–18 on each side of midvein, abaxially strongly raised, adaxially impressed; tertiary veins abaxially conspicuous, subparallel. Male panicle to 20 cm; rachis sparsely pubescent when young. Female inflorescences usually at apex of branches; cupules in clusters of 3(–5), sometimes solitary. Infructescences 10–14 cm; rachis 1–1.5 cm thick. Cupule plate-shaped to cupular, 4–10 mm × 2–3 cm, enclosing 1/6–1/3 of nut, wall 1–2 mm thick; bracts 1–1.4 mm. Nut conical and 2.4–2.8 × 2–2.5 cm to depressed globose and 1.6–1.8 × 2.8–3.2 cm, slightly shining, sometimes ± white farinose, apex flat or with a ± concave center, wall ca. 1 mm thick; scar 1.2–1.8 cm in diam., concave. Fl. May–Jun, fr. May–Jun of following year.

Mixed mesophytic forests; 900–2200 m. W Guangxi, N Guizhou, W Hubei, W Sichuan, E Yunnan [NE Vietnam].

111. *Lithocarpus henryi* (Seemen) Rehder & E. H. Wilson in Sargent, Pl. Wilson. 3: 209. 1916.

灰柯 hui ke

Quercus henryi Seemen, Bot. Jahrb. Syst. 23(Beibl. 57): 50. 1897; *Pasania henryi* (Seemen) Schottky.

Trees to 20 m tall. Branchlets of current year purplish brown. Petiole 1.5–3.5 cm; leaf blade narrowly oblong, 12–22 × 3–6 cm, leathery to rigidly leathery, abaxially with scalelike glands and grayish when dry, adaxially glabrous, base broadly cuneate and often asymmetric, margin entire, apex shortly acuminate; secondary veins 11–15 on each side of midvein, ± adaxially impressed; tertiary veins abaxially not visible. Male inflorescences solitary in leaf axils, racemose, 10–14 cm. Female and androgynous inflorescences to 20 cm; rachis tawny puberulent; cupules in clusters of ca. 3. Infructescences 7–12 cm; rachis 6–9 mm thick. Cupule cupular, 0.6–1.4 × 1.5–2.4 cm, enclosing ca. 1/2 of nut, wall to ca. 1.5 mm thick and ± woody near base; bracts imbricate, triangular, appressed, apical ones often separated. Nut depressed globose, 1.6–2 × 1.8–2.2 cm, often white farinose, apex rounded, wall 0.5–1 mm thick; scar 1–1.5 cm in diam., concave. Fl. Aug–Oct, fr. Aug–Oct of following year.

• Mixed mesophytic forests; 1400–2100 m. Anhui, NE Guizhou, W Hubei, W Hunan, Jiangsu, Jiangxi, S Shaanxi, E Sichuan.

112. *Lithocarpus silvicularum* (Hance) Chun, J. Arnold Arbor. 9: 152. 1928.

犁耙柯 li pa ke

Quercus silvicularum Hance, J. Bot. 22: 229. 1884; *Lithocarpus nariakii* (Hayata) Sakaki ex Kudo; *Pasania silvicularum* (Hance) Schottky; *Q. nariakii* Hayata; *Synaedrys silvicularum* (Hance) Koidzumi.

Trees to 20 m tall. Branchlets tawny pilose. Petiole 1–1.5 cm; leaf blade elliptic to obovate-elliptic, 10–20 × 3.5–6 cm, papery, abaxially with scalelike glands and tawny pilose along side, base cuneate and decurrent on petiole, margin entire or undulate on apical part, apex acute to narrowly acuminate; secondary veins 10–12 on each side of midvein; tertiary veins slender, inconspicuous to conspicuous. Male inflorescences in a panicle, rarely solitary; rachis sparsely pubescent. Female inflorescences 8–20 cm; cupules in clusters of 3–5. Infructescence rachis 1–1.2 cm thick. Cupule cupular, 0.8–1.5 × 2–3.5 cm, enclosing ca. 1/2 of nut, wall 1–1.5 mm thick and basally ± woody; bracts dark reddish brown, fused with wall of cupule or sometimes only subulate apex free, broadly triangular to rhomboid. Nut depressed globose, 1.2–1.6 × 2–2.5(–3) cm, glabrous, base flat, apex rounded or flat, wall 0.5–1 mm

thick; scar 1.4–1.8(–2.5) cm in diam., concave. Fl. Mar–May, fr. Jul–Sep of following year.

Broad-leaved evergreen forests; below 1200 m. SW Guangdong, SW Guangxi, Hainan, SE Yunnan [NE Vietnam].

113. *Lithocarpus litseifolius* (Hance) Chun, J. Arnold Arbor. 9: 152. 1928.

木姜叶柯 mu jiang ye ke

Trees to 20 m tall; branchlets and petioles sometimes ± white farinose when dry. Petiole 1.5–2.5 cm; leaf blade elliptic, obovate-elliptic, ovate, or rarely narrowly elliptic, 8–18 × 3–8 cm, papery to subleathery, concolorous to ± glaucous abaxially, base cuneate to broadly so, margin entire, apex acuminate to acute; secondary veins 8–11 on each side of midvein, obscure near margin; tertiary veins abaxially slender, evident, lax, reddish to yellowish brown when dry. Male inflorescences in a panicle, rarely solitary, to 25 cm. Female and androgynous inflorescences usually 2–6 congested at apex of branches, spiciform, to 35 cm; rachis sparsely pubescent; cupules in clusters of 3–5. Infructescences to 30 cm; rachis slender, rarely over 5 mm thick. Cupule plate-shaped, 0.8–1.5 cm in diam., covering base of nut, outside glabrous, wall 0.5–1 mm thick and woody basally; bracts imbricate but basal ones connate into concentric rings, triangular, appressed. Nut broadly conical, subglobose, or rarely depressed globose, 0.8–1.5 × 1.2–2 cm, glabrous or often ± white farinose, wall 0.2–0.5 mm thick; scar ca. 1.1 cm in diam., concave. Fl. May–Sep, fr. Apr–Oct of following year.

Broad-leaved evergreen forests, dense forests; 500–2500 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Yunnan, Zhejiang [Laos, NE Myanmar, N Vietnam]. Specimens reported from China as the Indian *Lithocarpus polystachyus* (Wallich ex A. de Candolle) Rehder are referable to *L. litseifolius* var. *litseifolius*.

- 1a. Rachis of infructescences glabrous 113a. var. *litseifolius*
1b. Rachis of infructescences densely pubescent 113b. var. *pubescens*

113a. *Lithocarpus litseifolius* var. *litseifolius*

木姜叶柯(原变种) mu jiang ye ke (yuan bian zhong)
Quercus litseifolia Hance, J. Bot. 22: 228. 1884; *Lithocarpus mucronatus* (Hickel & A. Camus) A. Camus; *L. synbalanos* (Hance) Chun; *Pasania litseifolia* (Hance) Schottky; *P. lysistachya* Hu; *P. mucronata* Hickel & A. Camus; *P. synbalanos* (Hance) Schottky; *P. viridis* Schottky p.p. (all syntypes except A. Henry 9636); *P. wenshanensis* Hu; *Q. synbalanos* Hance; *Synaedrys litseifolia* (Hance) Koidzumi.

Branchlets glabrous. Rachis of infructescences glabrous. Cupule 0.8–1.4 cm in diam. Fr. Jun–Oct.

Broad-leaved evergreen forests. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Yunnan, Zhejiang [Laos, NE Myanmar, N Vietnam].

This variety is drought resistant and is common in areas of high light intensity.

113b. *Lithocarpus litseifolius* var. *pubescens* C. C. Huang & Y. T. Chang, *Guihaia* 8: 11. 1988.

毛枝木姜叶柯 *mao zhi mu jiang ye ke*

Branchlets puberulent at apex. Leaf blade secondary veins adaxially impressed when young. Rachis of infructescences densely pubescent. Cupule 5–8 mm × 1.2–1.5 cm. Fr. Apr–May.

• Dense forests. Guangxi (Tian'e Xian).

114. *Lithocarpus taitoensis* (Hayata) Hayata, *Icon. Pl. Formosan.* 6 Suppl.: 72. 1917.

菱果柯 *ling guo ke*

Quercus taitoensis Hayata, *J. Coll. Sci. Imp. Univ. Tokyo* 30(1): 297. 1911; *Lithocarpus brunneus* Rehder; *L. nakaii* Hayata; *L. rhombocarpus* (Hayata) Hayata; *L. suishaensis* Kanehira & Yamamoto; *L. tremulus* Chun; *Pasania nakaii* (Hayata) Nakai; *P. suishaensis* (Kanehira & Yamamoto) Nakai; *P. taitoensis* (Hayata) J. C. Liao; *Q. rhombocarpa* Hayata; *Synaedrys nakaii* (Hayata) Kudo; *S. rhombocarpa* (Hayata) Kudo; *S. taitoensis* (Hayata) Koidzumi.

Trees to 20 m tall. Branches of current year glabrous, sparsely puberulent, or densely pubescent. Petiole 1.5–3.5 cm; leaf blade ovate, broadly elliptic, narrowly elliptic, or sometimes obovate-elliptic, 6–12 × 2–5 cm, leathery, abaxially with lamellate scalelike glands and oily and shiny when young, base broadly cuneate to sometimes cuneate and often ± asymmetric, margin entire, apex abruptly acuminate and shortly caudate; secondary veins 7–10 on each side of midvein, usually adaxially impressed; tertiary veins abaxially not visible or rarely slender, reticulate. Male inflorescences usually solitary in leaf axils, 4–6 cm. Female inflorescences to 20 cm; cupules in clusters of ca. 3. Infructescence rachis 3–7 mm thick. Cupule plate-shaped, 1–1.5 cm in diam., covering base of nut, wall woody and basally thickened; bracts usually connate into concentric rings but apical ones imbricate, triangular, small, appressed. Nut conical, 1.2–1.8 × 1–1.5 cm, often white farinose, apex shortly pointed or rarely flat, wall 0.5–1 mm thick; scar 5–9 mm in diam., concave. Fl. May–Sep, fr. Aug–Dec of following year.

• Mixed mesophytic forests; ca. 1500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang.

Very close to *Lithocarpus litseifolius*, and could be treated as conspecific.

115. *Lithocarpus nitidinix* (Hu) Chun ex C. C. Huang & Y. T. Chang, *Guihaia* 8: 27. 1988.

光果柯 *guang guo ke*

Pasania nitidinix Hu, *Acta Phytotax. Sin.* 1: 115. 1951. Trees to 18 m tall, glabrous except for inflorescences. Petiole ca. 1 cm; leaf blade narrowly oblong, 10–18 × 4–6 cm, thickly papery, concolorous, base cuneate, margin entire, apex acuminate; secondary veins 11–16 on each side of midvein; tertiary veins reticulate,

abaxially slender, conspicuous on both surfaces.

Infructescence rachis 1–1.4 cm thick, sparsely lenticellate; lenticels small. Cupules in clusters of ca. 3, cupular, enclosing 1/5–1/4 of nut, wall ± woody and basally thickened; bracts imbricate, broadly triangular, appressed, grayish puberulent. Nut depressed globose, ca. 1.4 × 2.5 cm, apex ± flat; scar ca. 1.3 cm in diam., concave. Fr. Aug–Oct.

• Sparse forests on calcareous mountains; ca. 1100 m. SW Guizhou, SE Yunnan (Xichou Xian).

116. *Lithocarpus phansipanensis* A. Camus, *Bull. Soc. Bot. France* 90: 199. 1943 [1944].

桂南柯 *gui nan ke*

Trees ca. 3 m tall. Branchlets of current year sulcate. Petiole 3–5 mm, white farinose when dry; leaf blade broadly obovate, 4–6.5 × 2.5–4 cm, rigidly leathery, abaxially with dense scalelike glands and ± glaucous when dry, base broadly cuneate and decurrent on petiole, apex rounded; secondary veins 10–12 on each side of midvein, ending at margin; tertiary veins abaxially not visible. Female inflorescences 2–4, congested at apex of branches, 4–7 cm; rachis ± with scalelike glands; cupules in clusters of ca. 3. Mature cupules unknown. Fl. Feb.

Scrub on hill tops; ca. 1000 m. Guangxi (Shangsi Xian) [N Vietnam].

Further study is needed to determine whether plants named as *Lithocarpus phansipanensis* from Guangxi are in fact this species.

117. *Lithocarpus confinis* C. C. Huang ex Y. C. Hsu & H. W. Jen, *Acta Phytotax. Sin.* 14(2): 84. 1976.

窄叶柯 *zhai ye ke*

Trees to 10 m tall, glabrous except for inflorescences. Branchlets blackish when dry. Petiole rarely to 1 cm, base ± thickened; leaf blade oblong to lanceolate, 5–13 × 1.2–3.5 cm, thickly papery, abaxially ± glaucous and with scalelike glands, base cuneate and decurrent on petiole, margin entire, apex shortly acuminate to obtuse; secondary veins 12–16 on each side of midvein, slender, evident, irregularly spaced, sometimes ramified far from margin; tertiary veins abaxially very slender, evident or not visible. Male inflorescences solitary or in a panicle; rachis glabrous or subglabrous. Female inflorescences in clusters of 2–6 at apex of branches; rachis ± puberulent, with tawny scalelike glands; cupules in clusters of ca. 3. Infructescence rachis 4–7 mm thick. Cupule plate-shaped, 1–3 mm × 1–1.6 cm, covering only base of nut, wall 0.5–1 mm thick; bracts imbricate, triangular, very small, appressed, with puberulent scalelike glands. Nut depressed globose to rarely conical, 1–1.8 × 1.4–2 cm, sometimes ± white farinose, apex ± flat with a concave center to rarely shortly pointed, wall ca. 1 mm thick; scar 5–8 mm in diam., concave. Fl. Jun–Aug, fr. Aug–Oct of following year.

• Secondary forests on dry slopes; 1500–2400 m. W Guizhou, C to E Yunnan.

118. *Lithocarpus hypoglaucus* (Hu) C. C. Huang ex Y. C. Hsu & H. W. Jen, Acta Phytotax. Sin. 14(2): 76. 1976.

灰背叶柯 hui bei ye ke

Pasania hypoglauca Hu, Bull. Fan Mem. Inst. Biol., Bot. 10: 101. 1940; *Lithocarpus houanglipinensis* A. Camus; *L. wangianus* A. Camus; *Pasania yungjenensis* Hu.

Trees 10–20 m tall. Branchlets glabrous. Petiole 1.5–2 cm; leaf blade ovate to lanceolate, 7–15 × 2–6 cm, thickly papery, concolorous when young, abaxially glaucous and often with scurfy scalelike glands with age, adaxially glabrous, base attenuate-cuneate and decurrent on petiole, margin entire, apex acuminate to acute; secondary veins 7–9 on each side of midvein; tertiary veins abaxially inconspicuous. Male inflorescences solitary or in a panicle, 6–15 cm. Female inflorescences at apex of branches, 7–15 cm; rachis with scurfy scalelike glands; cupules in clusters of (2 or)3. Cupule plate-shaped when mature, 1.5–5 mm × 1.2–1.8 cm, covering on base of nut, wall 0.5–1.5 mm thick; bracts imbricate, triangular, small, appressed, with tawny, scurfy scalelike glands. Nut depressed globose to broadly conical, 1–1.5 × 0.8–2 cm, apex slightly concave to pointed, wall ca. 0.5 mm thick; scar 0.8–1.2 cm in diam., concave. Fl. Jul–Sep, fr. Aug–Oct of following year.

• Mixed mesophytic forests; 1700–3000 m. SW Sichuan, NW Yunnan.

119. *Lithocarpus listeri* (King) Grierson & D. G. Long, Notes Roy. Bot. Gard. Edinburgh 40: 134. 1982.

谊柯 yi ke

Quercus listeri King, Ann. Roy. Bot. Gard. (Calcutta) 2: 89. 1889.

Trees to 15 m tall. Branchlets of current year sulcate, glabrous, dark brown when dry, sparsely lenticellate. Petiole 3–5 cm; leaf blade ovate-lanceolate to narrowly lanceolate, 20–35 × 8–12 cm, leathery, base cuneate, margin entire, apex acuminate; secondary veins 9–12 on each side of midvein; tertiary veins subparallel. Male inflorescences in a panicle, 2–3 cm; rachis densely pubescent. Female inflorescences with cupules in clusters of ca. 3; bracts of young cupules imbricate, ovate-triangular. Mature cupules unknown. Fl. Jun–Aug.

Broad-leaved evergreen forests; ca. 1000 m. SE Xizang (Mêdog Xian) [Bhutan, NE India, NE Myanmar, Nepal].

120. *Lithocarpus calolepis* Y. C. Hsu & H. W. Jen, Acta Phytotax. Sin. 14(2): 83. 1976.

美苞柯 mei bao ke

Trees ca. 15 m tall. Young branchlets dark purplish brown, conspicuously sulcate. Petiole 1–2.5 cm; leaf blade lanceolate to oblanceolate, 8–15 × 2.5–5 cm, rigidly papery, base shortly cuneate to broadly so, margin entire, apex shortly to long acuminate; secondary veins 13–16 on each side of midvein, very slender, evident; tertiary veins abaxially not visible.

Male inflorescences in a panicle; rachis puberulent.

Female and androgynous inflorescences 6–18 cm; cupules in clusters of ca. 3. Infructescence rachis 6–10 mm thick, basally minutely lenticellate. Cupule plate-shaped, 0.5–1.5 × 1.8–2.5 cm, basally narrowed; bracts triangular to rhomboid, squamate, appressed, with grayish puberulent scalelike glands, sometimes basal ones connate into 2 or 3 concentric rings. Nut depressed globose, 1.5–2 × 2–2.5 cm, apex rounded to ± flat, wall 1–1.5 mm thick; scar 1.2–1.5 cm in diam., concave. Fl. May–Jun, fr. Oct–Nov of following year.

• Mixed mesophytic forests of calcareous formation; 1000–1800 m. SE Yunnan (Xichou Xian).

121. *Lithocarpus haipinii* Chun, J. Arnold Arbor. 28: 233. 1947.

瘰耳柯 an er ke

Trees to 30 m tall; branchlets, petioles, and rachis of inflorescences densely with grayish to tawny long hairs. Petiole 2–3.5 cm; leaf blade broadly elliptic, ovate, obovate, or obovate-elliptic, 8–15 × 4–8 cm, rigidly leathery, abaxially densely pilose, margin recurved, apex rounded to acute, sometimes shortly cuneate, and often asymmetric; secondary veins 9–13 on each side of midvein, secondary and tertiary veins adaxially impressed; tertiary veins abaxially slender, evident.

Male inflorescences in a panicle, densely brown tomentose. Female inflorescences shorter than male, usually terminal at apex of branches, 6–14 cm; cupules in clusters of 3–5. Young cupules completely enclosing nut; bracts linear. Mature cupules plate-shaped, 3–6 mm × 1.5–2.5 cm, wall ± woody; bracts reflexed, tip hooked. Nut subglobose but slightly depressed, 1.8–2.6 × 2–3 cm, white farinose when young, base flat; scar 0.8–1.4 cm in diam., concave. Fl. Jul–Aug, fr. Jul–Aug of following year.

• Mixed mesophytic forests, frequent on gentle dry slopes; below 1000 m. Guangdong, Guangxi, S Guizhou, S Hunan.

122. *Lithocarpus qinzhouicus* C. C. Huang & Y. T. Chang, Guihaia 8: 17. 1988.

钦州柯 qin zhou ke

Trees; branchlets, petioles, and rachis of inflorescences densely tomentose with short hairs. Petiole 1–1.5 cm; leaf blade lanceolate, 8–12 × 2–3 cm, rigidly leathery, abaxially densely tomentose with short hairs, soon glabrescent, with scalelike glands, and glaucous or grayish when dry, base attenuate, decurrent on petiole, margin entire or undulate from middle to apex; apex attenuate, secondary veins 9–14 on each side of midvein, adaxially slightly impressed; tertiary veins abaxially not visible but very slender, evident. Female and/or androgynous inflorescences in pairs, terminal at apex of branches, 10–15 cm. Female inflorescences with cupules in clusters of 3–5. Cupule plate-shaped, 1.5–2.2 cm in diam., enclosing basal part of nut; bracts spiny when young, thickly linear, 3–5 mm when mature, reflexed, tip hooked, grayish pubescent. Nut depressed

globose, less than 1 cm, 1.5–2 cm in diam., grayish farinose; scar 1–1.2 cm in diam., concave. Fr. Sep–Oct.

• Broad-leaved evergreen forests or in association with *Pinus massoniana* and other species of *Lithocarpus*; ca. 200 m. Guangxi (Qinzhou Xian), Guizhou (Libo Xian).

123. *Lithocarpus areca* (Hickel & A. Camus) A. Camus, Rivière Sci. 18: 39. 1931 [1932].

檳榔柯 bin lang ke

Pasania areca Hickel & A. Camus, Ann. Sci. Nat., Bot., sér. 10, 3: 404. 1921; *P. longinux* Hu.

Trees 10–15 m tall. Branchlets grayish, glabrous, lenticellate. Petiole 0.5–1.5 cm; leaf blade oblanceolate to narrowly oblong, 13–25 × 3.5–5.5 cm, papery, concolorous, both surfaces glabrous or with tuft of hairs at axils of veins, both ends attenuate, base decurrent on petiole, margin with a few sharp teeth from middle to apex or sometimes entire; secondary veins 9–15 on

each side of midvein and usually adaxially ± impressed; tertiary veins abaxially conspicuous. Male inflorescences axillary, solitary or rarely in a panicle, 5–8 cm, densely flowered; rachis slender. Female inflorescences 4–10 cm, often androgynous with female flowers on basal part of rachis; cupules in clusters of 3–5, usually 1 developed. Infructescence rachis ca. 5 mm thick. Cupule discoid, 1.6–1.8 cm in diam., covering base of nut, wall 1–2 mm thick; bracts linear, 2–4 mm when young, to 8 mm when mature. Nut ellipsoid to long conical but flat at apical part, 4–5 × 2–3.5 cm, with 3 longitudinal obtuse ridges, glabrous, apex pointed, wall 2–3 mm thick; scar 0.8–1.5 cm in diam., concave. Fl. Oct, fr. Nov of following year.

Broad-leaved evergreen forests; 800–1500 m. W Guangxi, SE Yunnan [N Vietnam].

5. FORMANODENDRON Nixon & Crepet, Amer. J. Bot. 76: 840. 1989.

三棱栎属 san leng li shu

Trees. Winter buds ovoid; scales imbricate. Stipules free. Leaves alternate. Inflorescences axillary, male, female, or androgynous. Male inflorescences borne on basal part of branches, initially erect then becoming ± pendulous and flexuous; flowers in fascicles of (1–)3–7, each cluster subtended by 1 bract and 2 bractlets; perianth basally connate, imbricate, 6-lobed; stamens 6 and opposite to lobes, anthers ± basifixed but not versatile. Female or androgynous inflorescences erect, borne on apical part of branches. Female flowers solitary or in fascicles of 3–7, subtended by 3–5 bracts; perianth imbricate, lobes 6 and adnate to ovary; staminodes 6, morphologically similar to stamens and often appearing fertile; ovary 3-loculed; styles 3, curved; stigma capitate. Cupules splitting into 3–5 valves; bracts scalelike, transversely arranged. Nuts 1–3(–7) per cupule, prismatic, apex with persistent perianth and styles; pericarp winged; endocarp tomentose. Germination epigeal.

One species: China, Thailand.

1. *Formanodendron doichangensis* (A. Camus) Nixon & Crepet, Amer. J. Bot. 76: 840. 1989.

三棱栎 san leng li

Quercus doichangensis A. Camus, Bull. Soc. Bot. France 80: 355. 1933; *Trigonobalanus doichangensis* (A. Camus) Forman.

Trees to 21 m tall. Young branchlets rust-colored pubescent but dark brown with age. Stipules triangular, pubescent; scar not clear. Petiole 5–12 mm; leaf blade elliptic to ovate-elliptic, 7–12.5(–18) × 3–6 cm,

leathery, densely with rust-colored stellate hairs when young but soon glabrescent, base attenuate, margin entire, apex obtuse to retuse; secondary veins 8–11 on each side of midvein. Male inflorescences 8–14 cm, rust-colored tomentose; stamens ca. 2.5 mm, glabrous, anthers ca. 0.8 mm. Female inflorescences spiciform, 8–10 cm. Stalk of cupule ca. 2 mm. Nut 3-winged, broadly ovate, ca. 5 × 4–5 mm; exocarp rust-colored tomentose; scar triangular, ca. 1.5 mm. Fl. Nov, fr. Mar.

Broad-leaved evergreen forests; 1000–1600(–1900) m. S to SW Yunnan [N Thailand].

6. QUERCUS Linnaeus, Sp. Pl. 2: 994. 1753.

栎属 li shu

Trees or sometimes shrubs, evergreen or deciduous. Trunk bark deeply splitting or exfoliating longitudinally. Winter buds ovoid-globose, ovoid-conical, or rarely ovoid-ellipsoid; scales few to many, imbricate. Leaves spirally arranged. Stipules extrapetiolar. Male inflorescence pendulous, solitary in leaf axils toward base of branchlets or in paniculate clusters on lateral or subterminal shoots; flower solitary and scattered on rachis; perianth calyciform, 4–7-lobed or more lobed; stamens 4–7 or fewer, filaments slender; staminodes small. Female inflorescences in leaf axils toward apex of branchlets, with few to many cupules; flowers solitary; perianth 5- or 6-lobed; staminodes sometimes present, small; ovary (2-or)3(or 4)-loculed; stigmas dilated or ligulate, lining inner faces of styles. Cupules solitary; bracts imbricate, scalelike, linear, or conical, adherent, prostrate, or reflexed. Nut 1 per cupule. Germination hypogeal.

About 300 species: N Africa, Asia, Europe, North America, South America (Colombia); 35 species (15 endemic, two introduced) in China.

- 1a. Leaves deciduous or marcescent in winter.
- 2a. Leaf blade narrowly elliptic-lanceolate to ovate-lanceolate, margin spiniform dentate; bracts of cupule subulate, ligulate, or linear, often reflexed.
- 3a. Mature leaf blades densely grayish stellate tomentose; cork of bark developed; branchlets glabrous 3. *Q. variabilis*
- 3b. Mature leaf blades glabrous or pubescent only abaxially along veins; cork of bark undeveloped; young branchlets pubescent.
- 4a. Cupules including bracts 2–4 cm in diam.; nuts 1.5–2 cm in diam. 1. *Q. acutissima*
- 4b. Cupules including bracts ca. 1.5 cm in diam.; nuts 1.3–1.5 cm in diam. 2. *Q. chenii*
- 2b. Leaf blade elliptic-obovate, narrowly obovate, or elliptic, margin dentate or undulate; bracts of cupule narrowly lanceolate, triangular, or tubercular.
- 5a. Cupule bracts narrowly lanceolate, erect or reflexed.
- 6a. Cupule bracts ca. 10 mm 4. *Q. dentata*
- 6b. Cupule bracts 5–8 mm 5. *Q. yunnanensis*
- 5b. Cupule bracts triangular, narrowly triangular, or ovate-lanceolate, adherent to outside wall of cupule.
- 7a. Mature leaf blades abaxially with stellate or simple hairs.
- 8a. Branchlets glabrous or glabrescent 8. *Q. aliena*
- 8b. Branchlets densely yellowish brown or grayish brown tomentose.
- 9a. Leaf secondary veins 12–18 on each side of midvein 7. *Q. griffithii*
- 9b. Leaf secondary veins 8–12 on each side of midvein.
- 10a. Branchlet and leaf blades abaxially densely with yellowish brown stellate hairs; leaf blade margin dentate; tertiary veins abaxially inconspicuous 5. *Q. yunnanensis*
- 10b. Branchlets and leaf blades abaxially with grayish brown to yellowish gray stellate hairs; leaf blade margin crenate to dentate; tertiary veins abaxially conspicuous 6. *Q. fabri*
- 7b. Mature leaf blades abaxially glabrous or glabrescent.
- 11a. Leaf margin glandular 9. *Q. serrata*
- 11b. Leaf margin not glandular.
- 12a. Leaf margin serrate or with rounded lobes.
- 13a. Leaf margin with 5–7 lobes on each side ending in 10–30 awns; blade glabrous or barbate; bracts of cupule glabrous; nuts mature 1 year after flowering 11. *Q. palustris*
- 13b. Leaf margin with 5–7 rounded or retuse lobes on each side; blade abaxially glabrous; bracts of cupule gray tomentose; nuts mature the same year as flowering 12. *Q. robur*
- 12b. Leaf margin undulate.
- 14a. Petiole 1–3 cm 8. *Q. aliena*
- 14b. Petiole shorter than 1 cm 10. *Q. mongolica*
- 1b. Leaves mostly evergreen.
- 15a. Leaf blade apex obtuse or rarely retuse or mucronate; midvein apically slightly flexuous.
- 16a. Cupules shallowly cupular to discoid; nuts 2–3 cm in diam. 13. *Q. semecarpifolia*
- 16b. Cupules cupular to cuculliform; nuts to 2 cm in diam.
- 17a. Leaf blade abaxially with both stellate and simple hairs.
- 18a. Leaf blade abaxially persistently hairy; cupule rim expanded and wavy rugose at maturity; cupule bracts grayish brown tomentose from base to middle, apex reddish brown glabrous; fruit maturing on 1-year-old branchlets, nut 1.5–1.8 cm in diam. 14. *Q. guajavifolia*
- 18b. Leaf blade abaxially glabrescent; cupule slightly expanded at maturity but not wavy rugose; cupule bracts gray pubescent; fruit maturing in 1st year, nut 1–1.5 cm in diam. 15. *Q. aquifolioides*
- 17b. Leaf blade abaxially with only stellate hairs.
- 19a. Female inflorescences 3.5–16 cm 16. *Q. rehderiana*
- 19b. Female inflorescences less than 3 cm.

- 20a. Mature leaf blades abaxially uniformly with pale grayish brown fascicled hairs 19. *Q. senescens*
- 20b. Mature leaf blades abaxially glabrous, glabrescent, or only midvein hairy.
 - 21a. Trees 6–10(–20) m tall; cupules 4–9 × 7–15 mm, enclosing 1/4–1/2 of nut; cupule bracts triangular to triangular-ovate, 1–1.5 mm, gray pubescent except for apex 17. *Q. spinosa*
 - 21b. Shrub (0.5–)1(–2) m tall; cupules 3–4 × ca. 10 mm, covering base of nut; cupule bracts ovate-lanceolate, ca. 1 mm, grayish brown tomentose 18. *Q. monimotricha*
- 15b. Leaf blade apex acute (if obtuse then blade spatulate); midvein straight.
 - 22a. Cupule bracts linear-lanceolate or subuliform, curved or inflexed.
 - 23a. Leaf blade obovate-spatulate to elliptic-spatulate 20. *Q. dolicholepis*
 - 23b. Leaf blade ovate-lanceolate to narrowly elliptic.
 - 24a. Leaf blade 5–12 × 2–6 cm; cupules 1.2–1.5 × 1.8–2.5 cm; cupule bracts linear-lanceolate, ca. 5 mm, yellowish brown tomentose; nut 2–2.5 cm 21. *Q. oxyphylla*
 - 24b. Leaf blade 3–6 × 1.3–2.5 cm; cupules 0.8–1 × 1.2–1.8 cm; cupule bracts subulate, 3–5 mm, grayish pubescent; nut 1.5–1.8 cm 22. *Q. baronii*
 - 22b. Cupule bracts scalelike, triangular, ovate, or elliptic, adherent to outside wall of cupule.
 - 25a. Petiole 0.2–0.8(–1) cm.
 - 26a. Mature leaf blades abaxially densely yellowish gray stellate tomentose 23. *Q. acrodonta*
 - 26b. Mature leaf blades abaxially glabrous, glabrescent or only midvein hairy.
 - 27a. Leaf blade base cuneate and decurrent on petiole 28. *Q. utilis*
 - 27b. Leaf blade base usually rounded to cordate, if cuneate then not decurrent on petiole.
 - 28a. Leaf margin with spiniform teeth 27. *Q. tarokoensis*
 - 28b. Leaf margin with blunt teeth.
 - 29a. Cupule 6 mm or less, enclosing 1/4–1/3 of nut 26. *Q. bawanglingensis*
 - 29b. Cupule 6 mm or more, enclosing 1/3 or more of nut.
 - 30a. Leaf blade papery; secondary veins 6–8 on each side of midvein; cupules enclosing ca. 3/4 of nut; bracts of cupule not adhering to outside wall of cupule 24. *Q. cocciferoides*
 - 30b. Leaf blade leathery; secondary veins 8–13 on each side of midvein; cupules enclosing 1/3–1/2 of nut; bracts adhering to the outside wall of cupule 25. *Q. phillyreoides*
 - 25b. Petiole 1–3 cm.
 - 31a. Mature leaf blades abaxially with yellowish brown or yellowish gray stellate hairs.
 - 32a. Cupules 1.8–2.2 cm in diam.
 - 33a. Leaf secondary veins 14–18 on each side of midvein; margin sharply serrate apical to base 29. *Q. lodicosa*
 - 33b. Leaf secondary veins 8–12 on each side of midvein; margin dentate from middle to apex 30. *Q. kingiana*
 - 32b. Cupules 1–1.5 cm in diam.
 - 34a. Leaf blade adaxially rugose, abaxially with brown to yellowish brown stellate hairs, margin entire or with scattered teeth 34. *Q. lanata*
 - 34b. Leaf blade adaxially smooth, abaxially with yellowish gray glandular hairs, margin with glandular teeth from middle to apex 31. *Q. franchetii*
 - 31b. Mature leaf blades abaxially glabrous or early glabrescent.
 - 35a. Leaf blade leathery, margin entire, with scattered teeth or serrate from middle to apex.
 - 36a. Leaf blade narrowly elliptic to obovate-elliptic, 6–11 cm wide; secondary veins 16–20 on each side of midvein 32. *Q. marlipensis*

- 36b. Leaf blade elliptic to ovate-lanceolate, 2.5–5.5 cm wide; secondary veins 10–13 on each side of midvein 33. *Q. engleriana*
- 35b. Leaf blade thinly leathery or papery, margin serrate from middle to apex.
- 37a. Leaf narrowly elliptic-lanceolate, 10–20 cm; margin sharply serrate; secondary veins 14–17 on each side of midvein 34. *Q. lanata*
- 37b. Leaf ovate to ovate-lanceolate, 4.5–11 cm; margin hispidulous; secondary veins 9–12 on each side of midvein 35. *Q. setulosa*

1. *Quercus acutissima* Carruthers, J. Linn. Soc., Bot. 6: 33. 1862.

麻栎 ma li

Quercus acutissima var. *depressinucata* H. W. Jen & R. Q. Gao; *Q. acutissima* var. *septentrionalis* Liou; *Q. lunglingensis* Hu.

Trees to 30 m tall, deciduous. Young branchlets 1.5–2 mm, yellowish gray tomentose, glabrescent, yellowish gray with age, lenticellate; lenticels yellowish brown. Petiole 1–3(–5) cm, tomentose, glabrescent; leaf blade narrowly elliptic-lanceolate, 8–19 × 2–6 cm, concolorous, tomentose, glabrescent or only veins abaxially tomentose with age, base rounded to broadly cuneate, margin with spiniform teeth, apex long acuminate; secondary veins 13–18 on each side of midvein, fusing at serration; tertiary veins abaxially slender, evident, ± parallel. Cupules on previous year's branchlets, 1 or 2, cupular to discoid, 1.9–4.2 cm in diam. including bracts, enclosing 1/4–1/2 of nut; bracts subulate to ligulate, ca. 1.5, reflexed, canescent. Nut ovoid to ellipsoid, 1.5–2 × 1.7–2.2 cm, apex impressed; scar ca. 1 cm in diam., raised; stylopodium ca. 4 mm in diam., pale grayish brown sericeous. Fl. Mar–Apr, fr. Sep–Oct of following year.

Deciduous forests; below 100–2200 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, SE Xizang, Yunnan, Zhejiang [Bhutan, Cambodia, NE India, Japan, Korea, Myanmar, Nepal, N Thailand, Vietnam].

2. *Quercus chenii* Nakai, J. Arnold Arbor. 5: 74. 1924.

小叶栎 xiao ye li

Quercus acutissima Carruthers subsp. *chenii* (Nakai) A. Camus; *Q. acutissima* var. *brevipetiolata* G. Hoo; *Q. acutissima* var. *chenii* (Nakai) Menitsky; *Q. chenii* var. *linanensis* M. C. Liu & X. L. Shen.

Trees to 30 m tall, deciduous. First-year branchlets ca. 1.5 mm thick. Petiole 0.5–1.5 cm; leaf blade broadly lanceolate to ovate-lanceolate, 7–12 × 2–3.5 cm, yellowish brown tomentose, glabrescent or only veins abaxially tomentose at axils, base shortly attenuate to broadly cuneate and slightly oblique, margin with spiniform teeth, apex acuminate; secondary veins 12–16 on each side of midvein; tertiary veins abaxially inconspicuous. Cupule cupular, ca. 8 mm × 1.5 cm including bracts, enclosing ca. 1/3 of nut; bracts from base to middle triangular, adherent to cupule, tomentose, ca. 3 mm, apical bracts linear, ca. 5 mm, rectiserial or inflexed. Nut ellipsoid, 1.5–2.5 × 1.3–1.5 cm, apex pale

brown sericeous; scar ca. 5 mm in diam., slightly raised, stylopodium ca. 2 mm in diam., pale brown sericeous.

Fl. Apr, fr. Oct of following year.

• Mixed mesophytic forests; below 600 m. Anhui, Fujian, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shandong, Sichuan, Zhejiang. Very closely related to *Quercus acutissima*, and could just represent the small extreme of that species.

3. *Quercus variabilis* Blume, Mus. Bot. 1: 297. 1850.

栓皮栎 shuan pi li

Quercus bungeana F. B. Forbes; *Q. chinensis* Bunge (1833), not Abel (1818); *Q. variabilis* var. *megaphylla* T. B. Chao; *Q. variabilis* var. *pyramidalis* T. B. Chao & al.

Trees to 30 m tall, deciduous. Branchlets grayish brown, glabrous. Petiole 1–3(–5) cm, glabrous; leaf blade ovate-lanceolate to narrowly elliptic, 8–15(–20) × 2–6(–8) cm, abaxially densely grayish stellate tomentose, base rounded to broadly cuneate, margin with spiniform teeth, apex acuminate; secondary veins 13–18 on each side of midvein; tertiary veins abaxially slender, evident, ± parallel. Female inflorescences axillary on apical part of young shoot. Cupule cupular, ca. 1.5 × 2.5–4 cm including bracts, enclosing 2/3 of nut; bracts subulate, inflexed, pilose. Nut subglobose to broadly ovoid, ca. 1.5 cm in diam., apex rounded, pale brown sericeous; scar ca. 1 cm in diam., raised; stylopodium ca. 2 mm in diam., pale brown tomentose. Fl. Mar–Apr, fr. Sep–Oct of following year.

Evergreen and deciduous forests; below 3000 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea].

4. *Quercus dentata* Thunberg in Murray, Syst. Veg., ed. 14, 858. 1784.

槲树 hu shu

Quercus obovata Bunge.

Trees to 25 m tall, deciduous. Branchlets strong, sulcate, densely yellowish gray stellate tomentose. Petiole 2–5 mm, densely brown tomentose; leaf blade obovate to narrowly so, 10–30 × 6–30 cm, abaxially densely grayish brown stellate tomentose, adaxially dark green and pubescent but glabrescent, base rounded, margin with a few undulate to rough serrations on each side, apex with short, blunt tip; secondary veins 4–10 on each side of midvein; tertiary veins abaxially prominent. Female inflorescences axillary on apical part of young shoot, 1–3 cm. Cupule cupular, 1.2–2 × 2–5 cm including bracts, enclosing 1/2–2/3 of nut; bracts

reddish brown, narrowly lanceolate, ca. 1 cm, inflexed or erect, leathery, abaxially with brown filiform hairs, adaxially glabrous. Nut ovoid to broadly so, 1.5–2.3 × 1.2–1.5 cm, glabrous; scar ca. 1 cm in diam., slightly raised; stylopodium ca. 2 mm in diam. Fl. Apr–May, fr. Sep–Oct.

Mixed mesophytic forests; below 100–2700 m. Anhui, Gansu, Guizhou, Hebei, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Jilin, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang [Japan, Korea].

A number of species have been named for what are probably hybrids between *Quercus dentata* and other species. These species are morphologically intermediate between their putative parental species and include the following: *Quercus fangshanensis* Liou (Contr. Inst. Bot. Natl. Acad. Peiping 4: 7. 1936), which is probable a hybrid with *Quercus aliena* var. *pekingensis* and has been found in Hebei, Henan, and Shanxi; *Quercus stewardii* Rehder (J. Arnold Arbor. 6: 207. 1925) and *Q. fenchengensis* H. W. Jen & L. M. Wang (in H. W. Jen & al., Bull. Bot. Res., Harbin 4(4): 196. 1984), which are probable hybrids with *Quercus aliena* var. *acutiserrata* and have been found in Anhui, Hubei, Jiangxi, Liaoning, Shaanxi, and Zhejiang; *Quercus mongolicodentata* Nakai (Bot. Mag. (Tokyo) 40: 164. 1926) and *Quercus hopeiensis* Liou (Contr. Inst. Bot. Natl. Acad. Peiping 4: 8. 1936), which are probable hybrids with *Quercus mongolica* and have been found in Gansu, Hebei, Henan, Liaoning, Shandong, and Shanxi, as well as in Korea.

5. *Quercus yunnanensis* Franchet, J. Bot. (Morot) 13: 146. 1899.

云南波罗栎 yun nan bo luo li

Quercus dentata Thunberg var. *oxyloba* Franchet; *Q. dentata* subsp. *yunnanensis* (Franchet) Menitsky; *Q. dentatoides* Liou; *Q. griffithii* J. D. Hooker & Thomson ex Miquel var. *urticifolia* Franchet; *Q. malacotricha* A. Camus; *Q. yui* Liou.

Trees to 20 m tall, deciduous. Branchlets sulcate, densely yellowish brown stellate tomentose, lenticellate. Petiole ca. 4–8 mm, densely yellowish brown tomentose; leaf blade elliptic to broadly obovate, (8–)12–25 × (3–)6–20 cm, densely yellowish brown stellate tomentose, base cuneate to narrowly rounded, margin with 8–10 large serrations on each side, apex shortly acuminate; secondary veins 8–13 on each side of midvein. Female inflorescences borne on apical portion of shoot, 2–4 cm; cupules usually 1–3. Cupule campanulate, (0.5–)1.5–1.8 × 1–2.5 cm, enclosing 1/3–2/3 of nut; bracts yellowish gray to brown, narrowly lanceolate to narrowly ovate, 2.5–8 mm, erect or prostrate, leathery, abaxially with gray filiform hairs. Nut ovoid, 1.5–2 × 1–1.5 cm; stylopodium ca. 3 mm. Fl. Mar–Apr, fr. Sep–Oct.

• Broad-leaved and mixed mesophytic forests; 1000–2800 m. Guangdong, Guangxi, Guizhou, W Hubei, Sichuan, Yunnan.

Very close to *Quercus dentata*; the slightly shorter cupule bract length of *Q. yunnanensis* is the only difference between them, and they could be treated as conspecific.

6. *Quercus fabri* Hance, J. Linn. Soc., Bot. 10: 202. 1869.

白栎 bai li

Trees or occasionally large shrubs, to 20 m tall, deciduous. Branchlets densely gray to grayish brown tomentose. Petiole 3–5 mm, yellowish brown pubescent; leaf blade obovate to elliptic-obovate, 7–15 × 3–8 cm, both surfaces with yellowish gray stellate hairs, base cuneate to narrowly rounded, margin undulate to serrate, apex obtuse to shortly acuminate; secondary veins 8–12 on each side of midvein; tertiary veins abaxially conspicuous. Female inflorescences 1–4 cm; cupules 2–4. Cupule cupular, 4–8 × 8–11 mm, enclosing ca. 1/3 of nut; bracts ovate-lanceolate, crowded. Nut narrowly ellipsoid to ovoid, ca. 1.7 × 0.7–1.2 cm, glabrous; scar 5–7 mm in diam., slightly raised. Fl. Apr, fr. Oct.

• Mixed mesophytic forests; below 100–1900 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Shaanxi, Sichuan, Yunnan, Zhejiang.

7. *Quercus griffithii* J. D. Hooker & Thomson ex Miquel, Ann. Mus. Bot. Lugduno-Batavi 1: 104. 1863.

大叶栎 da ye li

Quercus aliena Blume var. *griffithii* (J. D. Hooker & Thomson ex Miquel) Schottky.

Trees to 25 m tall, deciduous. Branchlets yellowish gray pilose or pubescent, glabrescent. Petiole 0.5–1 cm, grayish brown shaggy; leaf blade obovate to obovate-elliptic, 10–20(–30) × 4–10 cm, abaxially densely with grayish stellate hairs, sometimes glabrescent, base rounded to narrowly cuneate, margin serrulate, apex shortly acuminate to acuminate; midvein abaxially with long simple hairs; secondary veins 12–18 on each side of midvein; tertiary veins abaxially conspicuous. Female inflorescences axillary on young shoots; cupules solitary or in fascicles of 2 or 3. Cupule cupular, 1.2–1.5 cm in diam., enclosing 1/3–1/2 of nut; bracts narrowly ovate-triangular. Nut ellipsoid to ovoid-ellipsoid, 1.5–2 × 0.8–1.2 cm; scar ca. 6 mm in diam., slightly raised; stylopodium ca. 1 mm in diam. Fr. Sep–Oct.

Mixed mesophytic forests; 700–2800 m. Guizhou, Sichuan, Xizang, Yunnan [Bhutan, NE India, Myanmar, Sikkim, Sri Lanka, N Thailand].

Very close to *Quercus aliena* var. *acutiserrata* and could be treated as its synonym.

8. *Quercus aliena* Blume, Mus. Bot. 1: 298. 1850.

榲栎 hu li

Trees to 30 m tall, deciduous. Branchlets grayish brown, glabrescent, lenticellate; lenticels brownish, rounded. Petiole 1–1.3 cm, glabrous; leaf blade narrowly elliptic-obovate to obovate, (5–)10–20(–30) × 5–14(–16) cm, base cuneate to rounded, apex slightly obtuse to shortly acuminate; secondary veins 10–15 on each side of midvein. Female inflorescences axillary on young shoots; cupules solitary or in fascicles of 2 or 3. Cupule cupular, 1–1.5 × 1.2–2 cm, enclosing ca. 1/2 of nut; bracts ovate-lanceolate, ca. 2 mm, crowded, grayish pubescent. Nut ellipsoid to ovoid, 1.7–2.5 × 1.3–1.8 cm;

scar slightly raised; stylopodium ca. 1 mm in diam. Fl. Mar–May, fr. Sep–Nov.

Mixed mesophytic forests; 100–2700 m. Anhui, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang [Japan, Korea].

- 1a. Leaf blade margin undulate 8a. var. *aliena*
 1b. Leaf margin serrate.
 2a. Apices of leaf blade serrations
 acute 8b. var. *acutiserrata*
 2b. Apices of leaf blade serrations
 rounded 8c. var. *pekingensis*

8a. *Quercus aliena* var. *aliena*

槲栎(原变种) hu li (yuan bian zhong)

Quercus hirsutula Blume.

Leaf blade abaxially grayish brown, margin undulate.

Fl. Apr–May, fr. Sep–Oct.

Mixed mesophytic forests; 100–2000 m. Anhui, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Liaoning, Shaanxi, Shandong, Sichuan, Yunnan, Zhejiang [Japan, Korea].

8b. *Quercus aliena* var. *acutiserrata* Maximowicz ex Wenzig, Jahrb. Königl. Bot. Gart. Berlin 4: 219. 1886.

锐齿槲栎 rui chi hu li

Quercus acutidentata (Maximowicz ex Shirai)

Koidzumi; *Q. acutidentata* var. *latifolia* Liou; *Q. aliena*

Blume var. *acutidentata* Maximowicz ex Shirai; *Q.*

meridionalis Liou (1936), not Gandoger (1890); *Q.*

meridionalis Liou var. *chungnanensis* Liou; *Q.*

tsinglingensis Liou ex S. Z. Qu & W. H. Zhang.

Leaf abaxially densely gray tomentose, margin serrate, apex of serrations acute.

Mixed mesophytic forests; 100–2700 m. Anhui, Gansu, Guangdong, Guangxi, Guizhou, Hebei, Henan, Hubei, Hunan, Jiangsu, Jiangxi, SE Liaoning, Shaanxi, Shandong, Shanxi, Sichuan, Yunnan, Zhejiang [Japan, Korea].

This variety has been introduced to Taiwan and may be becoming locally naturalized.

8c. *Quercus aliena* var. *pekingensis* Schottky, Bot. Jahrb. Syst. 47: 636. 1912.

北京槲栎 bei jing hu li

Quercus aliena Blume var. *alticupuliformis* H. W. Jen

& L. M. Wang; *Q. aliena* var. *jeholensis* Liou & S. X.

Li; *Q. aliena* var. *pekingensis* f. *jeholensis* (Liou & S. X. Li) H. W. Jen & L. M. Wang.

Leaf blade abaxially glabrous, pilose, or glabrescent, margin serrate, apex of serrations rounded.

• Mixed mesophytic forests; 200–1900 m. Hebei, Henan, Liaoning, Shaanxi, Shandong, Shanxi.

9. *Quercus serrata* Murray, Syst. Veg., ed. 14, 858. 1784.

槲栎 bao li

Quercus glandulifera Blume; *Q. glandulifera* var.

brevipetiolata (A. de Candolle) Nakai; *Q. glandulifera*

var. *stellatopilosa* W. H. Zhang; *Q. glandulifera* var.

tomentosa B. C. Ding & T. B. Chao; *Q. ningqiangensis*

S. Z. Qu & W. H. Zhang; *Q. serrata* var. *brevipetiolata*

(A. de Candolle) Nakai; *Q. serrata* var. *tomentosa* (B.

C. Ding & T. B. Chao) Y. C. Hsu & W. Jen; *Q.*

urticifolia Blume var. *brevipetiolata* A. de Candolle.

Trees to 25 m tall, deciduous. Leaves subsessile to petiolate; petiole to 3 cm, glabrous or glabrescent; leaf blade narrowly elliptic-ovate, ovate-lanceolate, or obovate, (5–)7–17 × (1.5–)3–9 cm, thinly leathery, with adherent single hairs when young, abaxially glabrous or occasionally stellate tomentose, base cuneate to nearly rounded, margin glandular serrate, apex acuminate to acute; secondary veins 7–12 on each side of midvein. Female inflorescences 1.5–3 cm. Cupule cupular, 5–8 mm × 1–1.2 cm, enclosing 1/4–1/3 of nut; bracts triangular, adherent, margin pilose. Nut ovoid to ovoid-globose, 1.7–2 × 0.8–1.2 cm; scar 5–6 mm in diam., flat; stylopodium ca. 1 mm in diam. Fl. Mar–Apr, fr. Sep–Oct.

Deciduous forests; below 100–2000 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, S Liaoning, Shaanxi, Shandong, S Shanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea].

Quercus monnula Y. C. Hsu & H. W. Jen (Acta Bot. Yunnan. 1(1): 148. 1979), from Sichuan, is probably a hybrid between *Quercus serrata* and *Q. aliena*.

10. *Quercus mongolica* Fischer ex Ledebour, Fl. Ross. 3(2): 589. 1850.

蒙古栎 meng gu li

Quercus crispula Blume; *Q. crispula* var. *manschurica*

Koidzumi; *Q. grosseserrata* Blume; *Q. kirinensis* Nakai;

Q. liaotungensis Koidzumi; *Q. mongolica* subsp.

crispula (Blume) Menitsky; *Q. mongolica* var.

grosseserrata (Blume) Rehder & E. H. Wilson; *Q.*

mongolica var. *kirinensis* (Nakai) Kitagawa; *Q.*

mongolica var. *liaotungensis* (Koidzumi) Nakai; *Q.*

mongolica var. *macrocarpa* H. W. Jen & L. M. Wang;

Q. mongolica var. *manschurica* (Koidzumi) Nakai; *Q.*

sessiliflora Salisbury var. *mongolica* (Fischer ex

Ledebour) Franchet; *Q. wutaishanica* Mayr.

Trees to 30 m tall, deciduous. Branchlets purple-brown, angular, glabrous, lenticellate. Petiole 2–8 mm,

glabrous; leaf blade obovate to narrowly so, (5–)7–19(–

23) × (2–)3–11 cm, hairy along veins, glabrescent, base

narrowly rounded to auriculate, margin with (5–)7–10

undulate to rough serrations on each side, apex truncate,

shortly mucronate, or cuspidate; secondary veins (5–

10–)10–18 on each side of midvein; tertiary veins abaxially

slender, evident. Female inflorescences axillary on

apical part of young shoot, 0.5–2 cm; cupules 4 or 5 but

usually only 1 or 2 fertile. Perianth 6-lobed. Cupule

cupular, 0.8–1.5 × 1.2–1.8(–2.8) cm, enclosing 1/3–1/2

of nut; bracts basal from cupule rim triangular-ovate,

abaxial surface semiglobose tuberculate, sparsely to

densely grayish pubescent; bracts at rim of cupule

patent, margin fimbriate. Nut narrowly ovoid, ovoid, or

ovoid-ellipsoid, (1.5–)2–2.4 × (1–)1.3–1.8(–2.3) cm,

glabrous except for apex; scar 5–8(–13) mm in diam.,

slightly raised; stylopodium ca. 1 mm in diam. Fl. May–Jun, fr. Sep–Oct.

Mixed mesophytic forests; 200–2500 m. Gansu, Hebei, Heilongjiang, Henan, Jilin, Liaoning, Nei Mongol, Ningxia, Qinghai, Shaanxi, Shandong, Shanxi, Sichuan [Japan, Korea, Russia].

A widespread and variable species. The name *Quercus wutaishanica* (*Q. liaotungensis*) has been used for those plants from NW China that have smaller leaves and flatter cupule bracts, but these are clinal differences. In addition, many leaf forms of *Q. mongolica* have been recognized as varieties, but these are merely extreme cases within the variation of the species and do not warrant even varietal rank.

11. *Quercus palustris* Münchhausen, Hausvater 5: 253. 1770.
沼生栎 zhao sheng li

Trees to 25 m tall, deciduous. Branchlets brown, glabrous. Petiole 2.5–5 cm, glabrescent; leaf blade ovate to elliptic, 10–20 × 7–10 cm, abaxially greenish and glabrous or floccose, adaxially dark green, base cuneate, margin with 5–7 lobes on each side ending in 10–30 awns, apex acuminate. Female inflorescence ca. 1 cm; cupules solitary or 2 or 3. Cupule cupular, 1–1.2 × 1.5–1.8 cm, enclosing 1/4–1/3 of nut; bracts triangular, crowded, glabrous. Nut brownish, narrowly ellipsoid, 2–2.5 × ca. 1.5 cm, pubescent, glabrescent, apex rounded; scar flat or slightly impressed; stylopodium present. Fl. Apr–May, fr. Sep of following year.

Cultivated. Beijing Shi, Liaoning, Shandong [native to North America].

12. *Quercus robur* Linnaeus, Sp. Pl. 2: 996. 1753.
夏栎 xia li

Trees 40–50 m tall, deciduous. Young branchlets pubescent, soon glabrescent; branchlets reddish brown, glabrous, lenticellate; lenticels brownish, rounded. Petiole 2–5 mm, glabrous; leaf blade obovate to narrowly so, 5–17 × 2–10 cm, abaxially greenish and hairy along veins but glabrescent, adaxially green, base narrowly rounded to auriculate, margin with 5–7 rounded or retuse lobes on each side, apex truncate to shortly acuminate; secondary veins 5–7(–10) on each side of midvein. Female inflorescences axillary on apical part of young shoot, 0.5–2 cm. Perianth usually 6-lobed. Cupule shallowly cupular, ca. 8 mm × 1.2–1.5 cm, enclosing ca. 1/3 of nut; bracts triangular, ca. 1.5 mm, flat or abaxially slightly protruding, sparsely pubescent. Nut ovoid to ovoid-ellipsoid, 1.5–1.8 × 1–1.3 cm, apex pubescent; scar ca. 5 mm in diam., slightly raised. Fl. May–Jun, fr. Sep–Oct.

Cultivated. Beijing Shi, Shandong, Xinjiang [native to Europe].

13. *Quercus semecarpifolia* Smith in Rees, Cycl. 29: *Quercus* no. 20. 1814.

高山栎 gao shan li

Quercus obtusifolia D. Don.

Trees to 30 m tall, evergreen. Branchlets with prominent stellate hairs, glabrescent, lenticellate; lenticels narrowly rounded. Petiole 2–6 mm, brown

tomentose and with stellate hairs, glabrescent; leaf blade elliptic to narrowly so, 5–12 × 3–6.5 cm, abaxially with brown stellate hairs and scurfy powder, adaxially glabrescent or sparsely with stellate hairs, base shallowly cordate, margin entire or with spiniform teeth, apex obtuse; secondary veins 8–14 on each side of midvein; tertiary veins usually abaxially obscured by indumentum. Infructescence with 1 or 2 cupules, 2–7 cm, glabrous. Cupule shallowly bowl-shaped to discoid, 5–8 mm × 1.5–2.5 cm, at maturity inside wall usually in contact with nut ± only in region of scar, inside with a thick pale grayish brown indumentum; bracts lanceolate, 2–3 mm, grayish pubescent, apex brown. Nut sometimes purple-brown, subglobose, 2–3 cm in diam., glabrous or apex glabrescent; scar ca. 6 mm in diam., flat or slightly raised; stylopodium ca. 1 mm in diam. Fl. May–Jun, fr. Aug–Oct of following year.

Montane forests; 2600–4000 m. S Xizang [Afghanistan, India, Nepal, Pakistan].

14. *Quercus guajavifolia* H. Léveillé, Repert. Spec. Nov. Regni Veg. 12: 363. 1913.

帽斗栎 mao dou li

Quercus aquifolioides Rehder & E. H. Wilson var. *rufescens* (Franchet) Rehder & E. H. Wilson; *Q. ilex* Linnaeus var. *rufescens* Franchet; *Q. pannosa* Handel-Mazzetti; *Q. pileata* Hu & W. C. Cheng; *Q. semecarpifolia* Smith var. *rufescens* (Franchet) Schottky.

Shrubs or trees to 15 m tall, evergreen. Branchlets densely reddish to dark brown tomentose, glabrescent. Petiole (1–)2–4(–7) mm, brown tomentose; leaf blade oblong, elliptic, ovate, or obovate, 2–9 × 1.5–5 cm, abaxially with brown spongy glandular hairs and pale brown stellate hairs and not glabrescent, adaxially hairy along midvein, base rounded, margin entire or with spiniform teeth, apex obtuse to mucronate; secondary veins 5–12 on each side of midvein; tertiary veins often hidden by indumentum. Female inflorescences 2–6 cm. Cupule cuculliform to shallowly cupular, 0.6–1 × 1–3 cm, margin of rim expanded to wavy rugose at maturity, inside with a thick, pale grayish brown indumentum; bracts lanceolate to narrowly ovate, 1–2 mm, grayish brown tomentose from base to middle, apex reddish brown, obtuse, distinct from cupule wall, and glabrous. Nut ovoid to subglobose, 1.5–1.8 cm in diam., glabrous, apex obtuse; scar ca. 5 mm in diam., slightly raised; stylopodium ca. 2 mm in diam. Fl. May–Jul, fr. Sep–Nov of following year.

• Montane forests to subalpine scrub; 2500–4000 m. Guizhou, Sichuan, Yunnan.

15. *Quercus aquifolioides* Rehder & E. H. Wilson in Sargent, Pl. Wilson. 3: 222. 1916.

川滇高山栎 chuan dian gao shan li

Trees 10(–20) m tall, evergreen. Young branchlets pale brown stellate tomentose. Petiole 2–5 mm, sometimes nearly sessile; leaf blade elliptic to obovate, 2.5–7 × 1.5–3.5 cm, densely with reddish brown to orangish brown glandular hairs (especially abaxially on midvein) when young, abaxially with slender reddish brown to orangish brown stellate hairs and simple hairs or mealy scurfy scalelike trichomes with age, adaxially glabrescent but pubescent along midvein, base rounded to shallowly cordate, margin entire or with spiniform teeth, apex obtuse; midvein apically flexuous; secondary veins 6–8 on each side of midvein; tertiary veins abaxially obscure. Female inflorescences 0.5–2.5 cm; cupules 1–4. Cupule shallowly cupular, 5–6 cm × 0.9–1.2 cm, covering base of nut, outside gray pubescent, inside densely tomentose; bracts ovate-elliptic to lanceolate, apex obtuse and often free from cupule wall. Nut ovoid to narrowly so, 1.2–2 × 1–1.5 cm, glabrous. Fl. May–Jun, fr. Sep–Oct.

Montane forests to subalpine scrub; 2000–4500 m. Guizhou, W Sichuan, Xizang, Yunnan [Bhutan, Myanmar].

16. *Quercus rehderiana* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 62: 129. 1925.

毛脉高山栎 *mao mai gao shan li*

Quercus longispica (Handel-Mazzetti) A. Camus; *Q. pseudosemcarpifolia* A. Camus; *Q. semcarpifolia* Smith var. *glabra* Franchet; *Q. semcarpifolia* var. *longispica* Handel-Mazzetti.

Trees to 20 m tall, evergreen. Young branchlets pale brown tomentose, glabrescent. Petiole 2–5(–7) mm, pubescent or glabrous; leaf blade narrowly elliptic, elliptic, oblong, or obovate, 3–8(–13) × 2–5(–6) cm, reddish brown to orangish brown stellate, abaxially glabrescent but usually retaining some stellate hairs, adaxially glabrescent but pubescent along the midvein, base rounded to shallowly cordate, margin entire or with spiniform teeth, apex obtuse; midvein flexuous; secondary veins 4–8(–12) on each side of midvein; tertiary veins abaxially obscure. Female inflorescences 3.5–16 cm. Infructescences 6–16 cm; rachis brown tomentose. Cupule shallowly cupular, 4–7 mm × (0.6–)1–1.5 cm, enclosing less than 1/2 of nut; bracts linear-lanceolate to triangular-ovate, ca. 1.5 mm, densely yellowish gray pubescent, apex obtuse, brown, and glabrous. Nut ovoid, 1–1.2 × 0.7–1.2 cm, glabrous or apex slightly pubescent. Fl. May–Jun, fr. Oct–Nov of following year.

Montane forests to subalpine scrub; 1500–4000 m. Guizhou, Sichuan, Xizang, Yunnan [Thailand].

17. *Quercus spinosa* David ex Franchet, Nouv. Arch. Mus. Hist. Nat., sér. 2, 7: 84. 1884.

刺叶高山栎 *ci ye gao shan li*

Quercus bullata Seemen; *Q. gilliana* Rehder & E. H. Wilson; *Q. ilex* Linnaeus var. *spinosa* (David ex Franchet) Franchet; *Q. semcarpifolia* Smith var.

spinosa (David ex Franchet) Schottky; *Q. spinosa* var. *miyabei* Hayata; *Q. taiyunensis* Ling; *Q. tatakaensis* Tomiya.

Trees 6–10(–20) m tall, evergreen. Young branchlets with yellowish brown stellate hairs, glabrescent. Petiole 1–3 mm; leaf blade obovate to elliptic, 2.5–7(–16) × 1.5–4 cm, rugose or smooth, with glandular simple and fascicled hairs when young, abaxially glabrescent but often some hairs remaining on base of midvein, adaxially glabrescent, base rounded to cordate, margin with spiniform teeth or entire, apex rounded to obtuse (sometimes acute to acuminate in Taiwan); midvein and secondary veins adaxially impressed; midvein flexuous; secondary veins 4–8 on each side of midvein; tertiary veins abaxially evident. Female inflorescences 1–3 cm. Cupule cupular, 4–9 × 7–15 mm, enclosing 1/4–1/2 of nut; bracts triangular to triangular-ovate, 1–1.5 mm, crowded, gray pubescent except for apex. Nut ovoid to ellipsoid, 1.2–2 × 0.7–1.3 cm; scar ca. 5 mm in diam.; stylopodium ca. 1 mm in diam. Fl. May–Aug, fr. Sep–Dec of following year.

Montane forests; 900–3100 m. Fujian, Gansu, Guizhou, Hubei, Hunan, Jiangxi, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan [Myanmar].

Quercus tatakaensis Tomiya (*Q. spinosa* var. *miyabei* Hayata) has been named for plants from mountains of Taiwan with leaf blades 6.5–16 cm and leaf blade apices acute to acuminate. These plants grow in populations with typical *Q. spinosa*, and their status needs further study.

18. *Quercus monimotricha* (Handel-Mazzetti) Handel-Mazzetti, Symb. Sin. 7: 41. 1929.

矮高山栎 *ai gao shan li*

Quercus spinosa David ex Franchet var. *monimotricha* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 1925: 129. 1925.

Shrubs (0.5–)1(–2) m tall, evergreen. Branchlets nearly whorled, with brown fascicled indumentum. Petiole ca. 3 mm, densely pubescent; leaf blade elliptic to obovate, 2–3.5 × 1.2–3 cm, with conspicuously stipitate fascicled and floccose hairs when young, abaxially retaining scattered fascicled hairs but sometimes subglabrescent, adaxially glabrescent but base of fascicled hairs remaining evident (under a hand lens), base rounded to shallowly cordate, margin with long spiniform teeth, sometimes entire, apex obtuse to mucronate; secondary veins 4–7 on each side of midvein; tertiary veins abaxially inconspicuous. Infructescence rachis 5–10 mm; cupules 1 or 2. Cupule shallowly cupular, 3–4 × ca. 10 mm, covering base of nut; bracts ovate-lanceolate, ca. 1 mm, grayish brown tomentose, patent at rim of cupule. Nut ovoid, 1–1.3 × 0.8–1 cm, glabrous or apex glabrescent; scar ca. 4 mm in diam., slightly raised, stylopodium ca. 1.5 mm in diam. Fl. Jun–Jul, fr. Sep of following year.

2000–3500 m. W Sichuan, NW Yunnan [Myanmar].

19. *Quercus senescens* Handel-Mazzetti, Symb. Sin. 7: 37. 1929.

灰背栎 hui bei li

Trees or shrubs to 15 m tall, evergreen. Young branchlets densely yellowish grayish brown stellate tomentose, somewhat glabrescent but with a persistent brown indumentum. Petiole 2–4 mm, densely yellowish grayish brown stellate tomentose, glabrescent; leaf blade oblong to obovate-elliptic, (2.5–)3–5(–8) × 1.2–2.5(–4.5) cm, when young densely with pale grayish brown non-glandular fascicled hairs and fascicled hairs on short stalks, abaxially with pale grayish brown fascicled hairs, adaxially glabrescent but base of fascicled hairs remaining evident (under a hand lens), base rounded to shallowly cordate, margin entire or with spiniform teeth, apex obtuse; secondary veins 6–10 on each side of midvein; tertiary veins abaxially obscure under thick indumentum. Infructescence ca. 1 cm, rachis densely pale grayish brown tomentose, glabrescent. Cupule cupular, 5–8 × 7–15 mm, enclosing ca. 1/2 of nut; bracts triangular, ca. 1 mm, crowded, gray tomentose. Nut ovoid, 1.2–1.8 × 0.8–1.1 cm, glabrous; scar 4–5 mm in diam., raised; stylopodium ca. 1 mm in diam. Fl. Apr–May, fr. Sep–Oct.

• 1900–3300 m. Guizhou, Sichuan, Xizang, Yunnan.

Quercus muliensis Hu (Acta Phytotax. Sin. 1: 147. 1951), from Sichuan (Muli Zangzi Zizhixian), is probably a hybrid between *Q. senescens* and *Q. monimotricha*. It has also been treated as *Q. senescens* var. *muliensis* (Hu) Y. C. Hsu & H. W. Jen (J. Beijing Forest Univ. 15(4): 44. 1993). *Quercus muliensis* has the growth habit and leaf dimensions characteristic of *Q. monimotricha* but the leaf and branchlet indumentum characteristic of *Q. senescens*.

20. *Quercus dolicholepis* A. Camus, Chênes 3: 1215. 1954.

匙叶栎 chi ye li

Quercus dolicholepis var. *elliptica* (Y. C. Hsu & H. W. Jen) Y. C. Hsu & H. W. Jen; *Q. spathulata* Seemen (1897), not Watelet (1866); *Q. spathulata* Seemen var. *elliptica* Y. C. Hsu & H. W. Jen.

Trees to 16 m tall, evergreen. Young branchlets yellowish gray stellate tomentose, glabrescent. Petiole 4–5 mm, tomentose; leaf blade elliptic, obovate-spatulate, or obovate-elliptic, 2–8 × 1.5–4 cm, leathery, with yellowish brown simple or fascicled hairs when young, abaxially pubescent or glabrescent, adaxially smooth or rugose, base broadly cuneate, rounded, or cordate, margin entire or apically serrate, apex obtuse to mucronate; secondary veins 7 or 8 on each side of midvein; tertiary veins abaxially slender, evident to obscure. Infructescence with 1 or 2 cupules; rachis ca. 1 cm, tomentose. Cupule cupular, ca. 1 × 2 cm including bracts, enclosing 2/3–3/4 of nut; bracts reddish brown, linear-lanceolate, ca. 5 mm, grayish pilose, apex

reflexed. Nut ovoid to subglobose, 1.2–1.7 × 1.3–1.5 cm, apex tomentose; scar ca. 5 mm in diam., slightly raised; stylopodium ca. 1 mm in diam., easily broken. Fl. Mar–May, fr. Oct of following year.

• Forests in mountains; 500–2800 m. Gansu, Guizhou, Henan, Hubei, Hunan, Shaanxi, Shanxi, Sichuan, Yunnan.

Quercus fimbriata Chun & C. C. Huang ex Y. C. Hsu & H. W. Jen (Acta Phytotax. Sin. 14(2): 86. 1976) from Sichuan and Yunnan, is probably a hybrid between *Q. dolicholepis* and *Q. aquifolioides*.

21. *Quercus oxyphylla* (E. H. Wilson) Handel-Mazzetti, Symb. Sin. 7: 46. 1929.

尖叶栎 jian ye li

Quercus spathulata Seemen var. *oxyphylla* E. H. Wilson in Rehder & E. H. Wilson, J. Arnold Arbor. 8: 100. 1927.

Trees to 20 m tall, evergreen. Branchlets densely yellowish brown stellate tomentose, often finely striate. Petiole 0.5–1.5 cm, densely with yellowish brown stellate hairs; leaf blade ovate-lanceolate, oblong, or elliptic, 5–12 × 2–6 cm, stellate tomentose when young, abaxially pubescent with age, base rounded to cordate, margin apically with shallow teeth or entire, apex acuminate to shortly acuminate; secondary veins 6–12 on each side of midvein; tertiary veins abaxially slender, evident. Infructescence 1–2 cm, rachis pubescent, with 1 or 2 cupules. Cupule cupular, 1.2–1.5 × 1.8–2.5 cm including bracts, enclosing ca. 1/2 of nut; bracts linear-lanceolate, ca. 5 mm, yellowish brown tomentose, apex inflexed. Nut narrowly ellipsoid to ovoid, 2–2.5 × 1–1.4 cm, apex yellowish brown pubescent; scar 3–5 mm in diam., slightly raised; stylopodium ca. 1 mm in diam., easily broken. Fl. May–Jun, fr. Sep–Oct of following year.

• Mixed mesophytic forests; 200–2900 m. Anhui, Fujian, Gansu, Guangxi, Guizhou, Hubei, Hunan, Shaanxi, Sichuan, Zhejiang.

22. *Quercus baronii* Skan in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 507. 1899.

瘰子栎 jiang zi li

Quercus baronii f. *capillata* Kozlov; *Q. baronii* var. *capillata* (Kozlov) Liou; *Q. baronii* var. *pendula* S. Y. Wang & C. L. Chang; *Q. kozloviana* Liou; *Q. pseudoserrata* Liou.

Shrubs or trees to 15 m tall, semievergreen. Branchlets and abaxial surface of blades with grayish white stellate pubescence on 1st-year growth, usually glabrescent. Petiole 3–7 mm, yellowish gray tomentose; leaf blade ovate-lanceolate, 3–6 × 1.3–2 cm, loose stellate pubescent when young; midvein abaxially with yellowish gray villous hairs, glabrescent, base rounded to broadly cuneate, margin apical 1/3 or more sharply serrate, apex acuminate; secondary veins 6 or 7 on each side of midvein and slightly protruding from margin;

tertiary veins abaxially slender, evident to inconspicuous. Female inflorescences 1–1.5 cm; cupules 1–several. Infructescence with 1 or 2 cupules; rachis 0.5–1.5 cm, thinly tomentose, glabrescent. Cupule cupular, 0.8–1 × 1.2–1.8 cm, enclosing 1/2–2/3 of nut; bracts subulate, 3–5 mm, inflexed, grayish pubescent. Nut ovoid to ellipsoid, 1.5–1.8 × 1–1.2 cm, apex flat or slightly depressed; scar 4–5 mm in diam., slightly raised; stylopodium ca. 2 mm, white pubescent. Fl. Apr, fr. Sep of following year.

• Mixed mesophytic forests, frequently on limestone; 500–2200 m. Gansu, Henan, Hubei, Hunan, Shaanxi, Shanxi, Sichuan.

23. *Quercus acrodonta* Seemen, Bot. Jahrb. Syst. 23(Beibl. 57): 48. 1897.

岩栎 yan li

Quercus handeliana A. Camus; *Q. ilex* Linnaeus var. *acrodonta* (Seemen) Skan; *Q. parvifolia* Handel-Mazzetti (1925), not Benthams (1889) nor Small (1895).

Trees or sometimes shrubs, to 15 m tall, evergreen. Young branchlets densely yellowish gray shortly stellate tomentose. Petiole 3–5 mm, densely yellowish gray tomentose; leaf blade elliptic, elliptic-lanceolate, or narrowly obovate, 2–6 × 1–2.5 cm, abaxially densely yellowish gray stellate tomentose, base rounded to nearly cordate, margin with spiniform scattered teeth from middle to apex, apex shortly acuminate; secondary veins 7–11 on each side of midvein, densely pubescent; tertiary veins abaxially inconspicuous beneath indumentum. Female inflorescences axillary on branches toward apex of tree; rachis yellowish brown tomentose; cupules 2 or 3. Infructescence with 1 or 2 cupules; rachis ca. 5 mm, densely yellowish gray tomentose. Cupule cupular, 5–8 mm × 1–1.5 cm, enclosing ca. 1/2 of nut; bracts elliptic, ca. 1.5 mm, imbricate, crowded, grayish tomentose except for reddish apex. Nut narrowly ellipsoid, 8–10 × 5–8 mm, apex yellowish gray tomentose; scar ca. 2 mm in diam., slightly raised; stylopodium ca. 1 mm in diam. Fl. May, fr. Sep–Oct.

• Valleys and mountains; 300–2300 m. Gansu, Guizhou, Henan, Hubei, Hunan, Shaanxi, Sichuan, Yunnan.

24. *Quercus cocciferoides* Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 62: 128. 1925.

铁橡栎 tie xiang li

Quercus cocciferoides var. *taliensis* (A. Camus) Y. C. Hsu & H. W. Jen; *Q. taliensis* A. Camus.

Trees to 15 m tall, semievergreen. Young branchlets tomentose, glabrescent. Petiole 5–8 mm, tomentose; leaf blade narrowly elliptic, ovate-lanceolate, or ovate, 3–8 × 1.5–3 cm, papery, pubescent when young, glabrescent, base rounded to cuneate and often oblique, margin serrate from middle to apex, apex acuminate to shortly

acuminate; secondary veins 6–8 on each side of midvein; tertiary veins abaxially conspicuous. Female inflorescences ca. 2.5 cm, cupules 4 or 5. Cupule cupular to kettle-shaped, 1–1.2 × 1–1.5 cm, enclosing 2/3–3/4 of nut; bracts triangular, ca. 1 mm, usually not adhered to cupule, with appressed grayish hairs. Nut subglobose, 1–1.2 × ca. 1 cm, apex mucronate, tomentose; scar 2–3 mm in diam., slightly raised; stylopodium ca. 1 mm in diam. Fl. Apr–Jun, fr. Sep–Nov.

• Sunny mountains slopes, dry river valleys; 1000–2600 m. Shaanxi, Sichuan, Yunnan.

Quercus yiwuensis C. C. Huang ex Y. C. Hsu & H. W. Jen (Acta Phytotax. Sin. 14(2): 85. 1976), from Yunnan, is probably a hybrid between *Q. cocciferoides* and *Q. aquifolioides*.

25. *Quercus phillyreoides* A. Gray, Mem. Amer. Acad. Arts., n.s., 6: 406. 1859.

乌冈栎 wu gang li

Maesa singuliflora H. Léveillé; *Quercus fokienensis* Nakai; *Q. fooningensis* Hu & W. C. Cheng; *Q. ilex* Linnaeus var. *phillyreoides* (A. Gray) Franchet; *Q. lichuanensis* W. C. Cheng; *Q. myricifolia* Hu & W. C. Cheng; *Q. phillyreoides* subsp. *fokienensis* (Nakai) Menitsky; *Q. singuliflora* (H. Léveillé) A. Camus. Shrubs or trees to 10 m tall, evergreen. Branchlets slender, grayish brown pubescent, gradually glabrescent. Petiole 3–5 mm, pilose; leaf blade green, obovate, narrowly elliptic, or narrowly ovate, 2–6(–8) × 1.5–3 cm, glabrescent or midvein abaxially remaining pilose with age, base rounded to nearly cordate, margin glandular serrulate, apex mucronate to shortly acuminate; secondary veins 8–13 on each side of midvein; tertiary veins abaxially inconspicuous to evident but very slender. Female inflorescences 1–4 cm. Cupule cupular, 6–8 mm × 1–1.2 cm, enclosing 1/3–1/2 of nut; bracts triangular, ca. 1 mm, crowded, grayish pubescent except for apex. Nut ellipsoid, 1–2 × 0.5–1 cm; scar 3–4 mm in diam., flat or slightly raised; stylopodium ca. 1 mm in diam., easily broken. Fl. Mar–Apr, fr. Sep–Oct.

Mixed mesophytic forests; 300–1200 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangxi, Shaanxi, Sichuan, Yunnan, Zhejiang [Japan, Korea].

26. *Quercus bawanglingensis* C. C. Huang & al., in C. C. Huang & Y. T. Chang, Guihaia 10: 10. 1990.

坝王栎 ba wang li

Trees 6–8 m tall, evergreen. Petiole 5–8 mm; leaf blade ovate to elliptic, 4–6 × 1.5–2.5 cm, thickly papery, base broadly cuneate to rounded and sometimes oblique, margin denticulate, apex acute to acuminate; secondary veins 6–9 on each side of midvein; tertiary veins slender, reticulate. Infructescences 3–6 mm, usually 1-fruited at maturity. Cupule cupular, 3–5 × 0.9–1.2 cm, enclosing 1/4–1/3 of nut; bracts ovate to obtusely triangular, appressed imbricate, covered with short, gray hairs and scalelike glands. Nut broadly ellipsoid, 1–1.2 cm, glabrous; scar 5–6 mm in diam.; stylopodium ca. 1 mm.

• Mountains on limestone; ca. 1000 m. Hainan (Changjiang Xian). Related to *Quercus phillyreoides*, but its status is uncertain.

27. *Quercus tarokoensis* Hayata, Icon. Pl. Formosan. 7: 38. 1918.

太鲁阁栎 tai lu ge li

Trees to 12 m tall, evergreen. Branchlets slender, grayish brown pubescent, glabrescent, lenticellate; lenticels brownish, orbicular. Petiole 3–5 mm, brown tomentose; leaf blade narrowly ovate, 2–4 × 1.5–2.8 cm, thinly leathery, abaxially midvein densely with brown stellate hairs or glabrous, adaxially midvein basal portion sometimes stellate, base shallowly cordate, margin with spiniform teeth, apex acuminate; midvein and secondary veins adaxially inconspicuous. Cupule cupular, 5–7 mm × 1–1.3 cm, enclosing ca. 1/2 of nut; bracts ovate, ca. 1 mm, densely grayish brown pubescent except for apex. Nut narrowly ovoid, 1.4–1.8 × 0.8–1 cm, glabrous; scar ca. 3 mm in diam. Fl. Jun–Jul, fr. Nov–Dec of following year.

• Steep slopes and ridges on limestone; 400–1300 m. E Taiwan.

28. *Quercus utilis* Hu & W. C. Cheng in Hu, Acta Phytotax. Sin. 1: 146. 1951.

炭栎 tan li

Trees to 10 m tall, evergreen. Branchlets thin, finely striate, sparsely stellate tomentose, grayish with age, glabrescent. Petiole thin, 2–5 mm, glabrescent; leaf blade ovate, elliptic-lanceolate, or obovate, 2.5–5.5 × 1.5–2.5 cm, thinly leathery, abaxially greenish and with stellate hairs in axil of secondary veins, adaxially brightly green and sparsely stellate on midvein, base cuneate and decurrent on petiole, margin glandular serrulate, apex shortly mucronate; secondary veins 9–11 on each side of midvein, slender, evident, adaxially impressed; tertiary veins abaxially conspicuous. Infructescence with 1 or 2 cupules; rachis ca. 5 mm thick, with stellate hairs. Cupule bowl-shaped, 6–7 mm in diam., enclosing ca. 1/3 of nut; bracts ovate, ca. 1 mm, crowded, densely yellowish brown tomentose. Nut ovoid to narrowly ellipsoid, ca. 10 × 7 mm, brown, glabrous but apex with filiform hairs and acuminate; scar ca. 2 mm in diam., raised; stylopodium ca. 1 mm in diam., easily broken. Fl. Apr–May, fr. Sep–Nov.

• Open or dense woods on rocky hills; 1000–1500 m. SW Guangxi, S Guizhou, SE Yunnan (Xichou Xian).

29. *Quercus lodicosa* O. E. Warburg & E. F. Warburg, J. Roy. Hort. Soc. 58: 188. 1933.

西藏栎 xi zang li

Trees 15–20 m tall, evergreen. Young branchlets densely reddish tomentose, grayish brown with age, glabrescent, lenticellate; lenticels inconspicuous. Petiole 0.8–2 cm, tomentose, glabrescent; leaf blade elliptic to ovate-elliptic, 7–14 × 3.5–5 cm, densely reddish tomentose when young, abaxially densely yellowish gray tomentose with age; midvein basal portion adaxially pubescent, base broadly cuneate and nearly unequal, margin except basal portion sharply serrate, apex cuspidate to shortly acuminate; midvein adaxially slightly raised; secondary veins 14–18 on each side of midvein and adaxially impressed.

Infructescences short, usually 1-fruited. Cupule discoid, 5–10 mm × 1.8–2.2 cm; bracts broadly ovate, thick and hard, crowded, tomentose. Nut oblate-conical, ca. 2 cm in diam., glabrous or apex slightly brown tomentose; scar 1–1.2 cm in diam., flat.

Forests in mountains; 1800–2400 m. SE Xizang [Myanmar].

30. *Quercus kingiana* Craib, Bull. Misc. Inform. Kew 1911: 472. 1911.

澜沧栎 lan cang li

Trees to 12 m tall, evergreen. Branchlets of current year densely with yellowish gray stellate hairs, 2nd-year branchlets glabrous or sparsely hairy. Petiole 1–1.5 cm, densely yellowish brown tomentose; leaf blade narrowly elliptic, 7–11 × 3–5 cm, abaxially with yellowish gray stellate hairs, base nearly rounded to oblique, margin apical portion serrate, apex shortly acuminate to cuspidate; secondary veins 8–12 on each side of midvein, abaxially raised, adaxially inconspicuous; tertiary veins abaxially conspicuous. Infructescences ca. 1.5 cm; rachis with yellowish gray stellate hairs. Cupule campanulate, ca. 1.5 × 2 cm, enclosing more than 1/2 of nut, wall ca. 2 mm thick; bracts triangular-ovate, crowded, gray tomentose. Nut ellipsoid, ca. 2 × 1.5 cm, apex rounded; scar raised.

Mixed mesophytic forests; 800–1600 m. NW and SW Yunnan [Myanmar, N Thailand].

31. *Quercus franchetii* Skan in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 513. 1899.

锥连栎 zhui lian li

Trees to 15 m tall, evergreen. Branchlets densely with yellowish gray simple and fascicled hairs. Petiole 1–2 cm, densely yellowish gray tomentose; leaf blade obovate to elliptic, 5–12 × 2.5–6 cm, thinly leathery, with dense yellowish gray glandular fascicled or simple hairs when young, abaxially densely with yellowish gray and glandular hairs with age, base cuneate to rounded, margin glandular-tipped serrate from middle to apex, apex acuminate to obtuse; secondary veins 8–12 on each side of midvein; tertiary veins abaxially prominent. Female inflorescences 1–2 cm; cupules 5 or 6. Infructescence 1–2 cm; rachis densely yellowish gray tomentose. Cupule cupular to sometimes discoid, (0.4–)0.7–1.2 × 1–1.4 cm, enclosing to 1/2 of nut; bracts triangular, ca. 2 mm, abaxially tuberculate, gray tomentose. Nut subglobose, 1.1–1.3 × 0.9–1.3 cm, sparsely gray tomentose, apex truncate to depressed; scar ca. 5 mm in diam., raised; stylopodium ca. 2 mm in diam. Fl. Feb–Mar, fr. Sep.

Mixed mesophytic forests; 800–2600 m. Sichuan, C to S Yunnan [N Thailand].

32. *Quercus marlipoensis* Hu & W. C. Cheng in Hu, Acta Phytotax. Sin. 1: 142. 1951.

麻栗坡栎 ma li po li

Trees to 18 m tall, evergreen. Branchlets ca. 4 mm in diam., yellowish brown tomentose, glabrescent, lenticellate, lenticels brownish, oblong, convex. Petiole 1.5–3 cm, thinly tomentose; leaf blade narrowly elliptic to obovate, 15–22 × 6–11 cm, leathery, abaxially stellate tomentose along midvein, base rounded, margin with scattered teeth or entire and slightly inflexed, apex shortly acuminate; midvein adaxially impressed; secondary veins 16–20 on each side of midvein; tertiary veins abaxially conspicuous. Cupule cupular, ca. 0.8 × 1.4 cm, inside grayish brown tomentose, wall ca. 2 mm thick; bracts ovate, crowded, purple-red tomentose except for apex.

• Mixed evergreen forests; ca. 1100 m. Yunnan (Malipo Xian).

Very close to *Quercus engleriana* as expressed in its southern range in Guangxi and SE Yunnan. The only difference is that *Q. marlipensis* has larger leaves that are sometimes obovate.

33. *Quercus engleriana* Seemen, Bot. Jahrb. Syst. 23(Beibl. 57): 47. 1897.

巴东栎 ba dong li

Myrica cavaleriei H. Léveillé; *Quercus dolichostyla* A. Camus; *Q. kongshanensis* Y. C. Hsu & H. W. Jen; *Q. lanceolata* S. Z. Qu & W. H. Zhang (1984), not Humboldt & Bonpland (1809); *Q. lyoniifolia* W. C. Cheng; *Q. obscura* Seemen; *Q. shangxiensis* Z. K. Zhou; *Q. sutchuenensis* Franchet.

Trees to 25 m tall, evergreen. Young branchlets yellowish gray tomentose, glabrescent. Petiole 1–2 cm, tomentose, glabrescent; leaf blade lanceolate, ovate, ovate-elliptic, or elliptic, 6–16 × 2.5–5.5 cm, densely yellowish brown pubescent but glabrescent or abaxially retaining fascicled hairs on axil of veins, adaxially flat to rugose, base rounded, broadly cuneate, or rarely shallowly cordate, margin serrate from middle to apex or sometimes entire, apex acuminate; midvein and secondary veins adaxially flat or sometimes impressed; secondary veins 10–13 on each side of midvein; tertiary veins abaxially slender, evident to prominent or obscured by indumentum when young. Female inflorescences axillary on apical portion of young shoots, 1–3 cm. Infructescence 1–5 cm; cupules 1–10. Cupule bowl-shaped, 4–7 × 8–12 mm, enclosing 1/3–1/2 of nut; bracts ovate-lanceolate, ca. 1 mm, grayish brown pubescent basal to middle, apex purple red and glabrous. Nut narrowly ovoid, 1–2 × 0.6–1 cm, glabrous; scar 3–5 mm in diam., raised; stylopodium 2–3 mm. Fl. May–Jun, fr. Nov.

• Mixed mesophytic forests; 700–2700 m. Fujian, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangxi, Shaanxi, Sichuan, Xizang, Yunnan, Zhejiang.

34. *Quercus lanata* Smith in Rees, Cycl. 29: *Quercus* no. 27. 1814.

通麦栎 tong mai li

Quercus leucotrichophora A. Camus; *Q. tungmaiensis* Y. T. Chang.

Trees to 30 m tall, evergreen. Young branchlets densely grayish brown pubescent, glabrescent. Petiole 0.5–1.5 cm, grayish brown tomentose, glabrescent; leaf blade narrowly ovate-lanceolate to narrowly elliptic, 9–20 × 3–8.5 cm, thinly leathery, abaxially densely with grayish stellate hairs but glabrescent, adaxially densely pubescent especially on midvein, base rounded to broadly cuneate, margin sharply serrate, apex acuminate; secondary veins 12–17 on each side of midvein; tertiary veins abaxially conspicuous. Female inflorescences axillary on young shoots, 4–14 cm; cupules 10 or more. Cupule cupular, 0.6–1 × 0.8–1.5 cm, enclosing 1/4–1/2 of nut, wall ca. 1 mm thick; bracts triangular, ca. 1 mm, basal bracts abaxially tuberculate, grayish brown pubescent. Nut ovoid-conical, 1.5–2 × 1–1.2 cm, glabrous; scar ca. 4 mm in diam., slightly raised; stylopodium ca. 1 mm. Fl. Jun–Jul, fr. Jun–Jul of following year.

Mixed mesophytic forests; 1900–3000 m. Guangxi, Xizang, Yunnan [Bhutan, N India, Myanmar, Nepal, N Thailand, Vietnam].

35. *Quercus setulosa* Hickel & A. Camus, Bull. Mus. Natl. Hist. Nat. 29: 598. 1923.

富宁栎 fu ning li

Quercus sinii Chun.

Trees to 20 m tall, evergreen. Branchlets glabrous. Petiole 1–2 cm; leaf blade ovate to ovate-lanceolate, 4.5–11 × 1.5–4.5 cm, abaxially greenish and glabrous or midvein and axil of veins with yellowish brown stellate hairs, adaxially brightly green, base rounded to broadly cuneate, margin hispidulous, apex narrowly acuminate; secondary veins 9–12 on each side of midvein, adaxially inconspicuous. Cupule cupular, ca. 5 × 10 mm, enclosing 1/4–1/3 of nut; bracts ovate, ca. 1 mm, grayish tomentose. Nut brown, narrowly ellipsoid, 1.5–2 × ca. 0.9 cm, glabrous or apex slightly pubescent; scar ca. 3 mm in diam., slightly raised; stylopodium short. Fl. Apr–May, fr. Oct.

Mixed mesophytic forests; 100–1300 m. Guangdong, Guangxi, Guizhou, Yunnan [Laos, Thailand, Vietnam].

7. CYCLOBALANOPSIS Oersted, Vidensk. Meddel. Dansk Naturhist. Foren.

Kjøbenhavn 1866: 77. 1867, nom. cons.

青冈属 qing gang shu

Quercus Linnaeus subgen. *Cyclobalanopsis* (Oersted) C. K. Schneider.

Trees or rarely shrubs, evergreen. Trunk bark usually smooth, rarely deeply splitting. Winter buds ovoid-globose, ovoid-conical, or rarely ovoid-ellipsoid; scales many, imbricate. Stipules extrapetiolar. Leaves spirally arranged. Male inflorescences pendulous; flowers loosely arranged or clustered on rachis; perianth usually 5- or 6-lobed;

stamens as many as perianth lobes, sometimes less, filament slender; pistil rudimentary. Female inflorescences with a solitary flower or spiciform; cupules with 1 flower; perianth 5- or 6-lobed; staminodes sometimes present, small; ovary 3-loculed; styles (2 or)3(or 4); stigmas capitate or dilated. Cupules solitary; bracts scalelike, whorled, connate, in rings or spirally fused. Nut usually 1 per cupule; abortive ovule persisting in subapical, lateral, or basal part of seed. Germination hypogeal.

About 150 species: mainly in tropical and subtropical Asia; 69 species (43 endemic) in China.

Cyclobalanopsis is often treated as a subgenus of *Quercus*, with all other species of *Quercus* belonging to subgenus *Quercus*.

Species of *Cyclobalanopsis* are among the main components of broad-leaved evergreen forests in China's southern provinces N to the Qinling Mountains and the Huai He basin. In general, *Cyclobalanopsis* has a more southern distribution and *Quercus* a more northern distribution.

- 1a. Leaf blade margin entire, crenate, repand, or apically with 1–4 or rarely more shallow serrations, or indistinctly serrulate.
 - 2a. Leaf blade 12 cm or more.
 - 3a. Cupules 1–1.5 cm in diam.
 - 4a. Petiole 0.5–1 cm, not sulcate.
 - 5a. Leaf blade abaxially glabrous, midvein impressed; cupules outside tomentose, enclosing ca. 1/3 of nut 17. *C. sessilifolia*
 - 5b. Leaf blade abaxially slightly farinose, midvein raised; cupules outside glabrous or puberulent, enclosing ca. 1/2 of nut 18. *C. augustinii*
 - 4b. Petiole 2–5 cm, adaxially sulcate.
 - 6a. Branchlets and leaves glabrous; cupules cupular 1. *C. jenseniana*
 - 6b. Branchlets and leaves hairy; cupules bowl-shaped 23. *C. tomentosinervis*
 - 3b. Cupules 1.5–4 cm in diam.
 - 7a. Branchlets glabrous.
 - 8a. Secondary veins 6–8 on each side of midvein 15. *C. albicaulis*
 - 8b. Secondary veins 9–12 on each side of midvein.
 - 9a. Cupules bowl-shaped, enclosing ca. 2/3 of nut; nuts oblate, scar 2–2.5 cm in diam. 5. *C. tenuicupula*
 - 9b. Cupules campanulate to obconic, enclosing less than 1/2 of nut; nuts ellipsoid, scar ca. 0.8 cm in diam. 20. *C. saravanensis*
 - 7b. Branchlets tomentose.
 - 10a. Petiole and leaves glabrous.
 - 11a. Nuts subglobose, ca. 1.7 cm, sericeous 3. *C. camusiae*
 - 11b. Nuts oblong-ellipsoid, 3.5–4 cm, pilose 4. *C. semiserrata*
 - 10b. Petiole and leaves tomentose.
 - 12a. Leaf blade midvein adaxially slightly raised; cupules campanulate to cylindrical, enclosing ca. 2/3 of nut 2. *C. fleuryi*
 - 12b. Leaf blade midvein adaxially impressed or flat; cupules bowl-shaped to discoid, enclosing base to 1/2 of nut.
 - 13a. Midvein adaxially flat; cupule covering only base of nut, bracts in 4–6 rings; nut scar 0.7–1 cm in diam. 14. *C. hui*
 - 13b. Midvein adaxially impressed; cupule covering 1/3–1/2 of nut, bracts in 8–10 rings; nut scar 1.2–1.4 cm in diam. 27. *C. helferiana*
 - 2b. Leaf blade less than 12 cm.
 - 14a. Leaf blade apex obtuse, rounded, retuse, or with a short, blunt tip.
 - 15a. Nuts oblate, subglobose, or broadly ovoid.
 - 16a. Leaf blade midvein adaxially flat; cupule covering only base of nut; nuts tomentose 14. *C. hui*
 - 16b. Leaf blade midvein slightly impressed to impressed; cupule enclosing 1/3–1/2 of nut; nuts glabrous or glabrescent.
 - 17a. Petiole 0.2–0.8 cm; cupule bracts in 7–9 rings; nuts glabrous, scar 5–8 mm in diam. 10. *C. obovatifolia*
 - 17b. Petiole 0.8–1.5 cm; cupule bracts in 4–7 rings; nuts hairy when young, scar 4–5 mm in diam. 12. *C. championii*
 - 15b. Nuts ellipsoid to oblong-ellipsoid, or obovoid.
 - 18a. Petiole 1–1.5 cm; cupules 2–2.5 cm in diam.; nuts 1.7–2 cm in diam. 6. *C. dinghuensis*
 - 18b. Petiole less than 0.5 cm; cupules 1–1.5 cm in diam.; nuts 1–1.6 cm in diam.

- 19a. Cupules saucer-shaped to cupular, 1.3–1.5(–1.8) cm in diam., covering only base of nut 11. *C. neglecta*
 19b. Cupules bowl-shaped, 1–1.2 cm in diam., enclosing ca. 1/3 of nut 7. *C. litseoides*
- 14b. Leaf blade apex acute, acuminate, or caudate.
- 20a. Leaf blade abaxially hairy.
- 21a. Leaf blade abaxially stellate or stellate tomentose at least when young.
- 22a. Nuts ellipsoid, ovoid-ellipsoid, or globose 65. *C. poilanei*
 22b. Nuts oblate to subglobose.
- 23a. Petiole 0.2–0.8 cm; secondary veins 5–8 on each side of midvein; nuts glabrous, scar 5–8 mm in diam. 10. *C. obovatifolia*
 23b. Petiole (0.5–)1–2 cm; secondary veins 10–15 on each side of midvein; nuts velutinous, scar ca. 10 mm in diam. 13. *C. chungii*
- 21b. Leaf blade abaxially woolly, villous, or tomentose at least when young.
- 24a. Petiole 2–3.5 cm; leaf blade apex caudate, midvein abaxially impressed 23. *C. tomentosinervis*
 24b. Petiole 0.5–1.4 cm; leaf blade apex acute to acuminate, midvein abaxially flat.
- 25a. Petiole triangular in cross section; nut scar slightly convex 22. *C. hypophaea*
 25b. Petiole not triangular in cross section; nut scar flat or impressed.
- 26a. Branchlets light brown woolly; petiole 0.6–0.8 cm; leaf blade tertiary veins inconspicuous; nuts ovoid-ellipsoid to ellipsoid 8. *C. tiaoloshanica*
 26b. Branchlets orangish brown tomentose; petiole 1–1.4 cm; leaf blade tertiary veins slender but evident; nuts oblate 14. *C. hui*
- 20b. Leaf blade abaxially glabrous at least when old or only puberulent.
- 27a. Nuts oblate or subglobose, scar 1–2.5 cm in diam.
- 28a. Leaf blade leathery; nuts oblate, ca. 1.7 cm in diam., scar ca. 1 cm in diam. 3. *C. camusiae*
 28b. Leaf blade papery; nuts subglobose, 2.5–3 cm in diam., scar 2–2.5 cm in diam. 5. *C. tenuicupula*
- 27b. Nuts not oblate nor subglobose, scar 0.4–0.8 cm in diam.
- 29a. Cupules campanulate to obconic or bowl-shaped, 2–3 cm in diam.
- 30a. Leaf blade papery, pubescent when young; cupules campanulate to obconic, outside puberulent 15. *C. albicaulis*
 30b. Leaf blade subleathery, glabrous; cupules bowl-shaped, outside villous 20. *C. saravanensis*
- 29b. Cupules cupular, 0.8–1.8 cm in diam.
- 31a. Leaf blade apex acute to acuminate.
- 32a. Leaf blade abaxially glabrous, midvein impressed; cupules outside tomentose, enclosing ca. 1/3 of nut 17. *C. sessilifolia*
 32b. Leaf blade abaxially slightly farinose, midvein raised; cupules outside glabrous or puberulent, enclosing ca. 1/2 of nut 18. *C. augustinii*
- 31b. Leaf blade apex caudate.
- 33a. Petiole 0.5–0.8 cm; nuts 0.6–0.8(–1.5) cm in diam. 19. *C. chevalieri*
 33b. Petiole 1–2 cm; nuts 1–1.5 cm in diam.
- 34a. Leaf blade papery; cupules 1.6–1.8 cm in diam., enclosing ca. 1/3 of nut; nuts ellipsoid, ca. 1.5 cm in diam., velutinous at least apically 16. *C. delicatula*
 34b. Leaf blade subleathery; cupules ca. 1.5 cm in diam., enclosing ca. 1/2 of nut; nuts ovoid-conical, 1–1.3 cm in diam., glabrous 21. *C. motuoensis*
- 1b. Leaf blade margin serrate or serrulate on at least apical 1/3.
- 35a. Leaf blade 14 cm or more.
- 36a. Leaf blade margin serrate or serrulate on apical 1/2 or less.
- 37a. Leaf blade secondary veins 18–22 on each side of midvein 24. *C. rex*
 37b. Leaf blade secondary veins 8–14 on each side of midvein (sometimes to 16 in *C. thorelii*).
- 38a. Leaf blade less than 2.5 × as long as wide.
- 39a. Leaf blade apex shortly acute to ± caudate; cupules enclosing 1/2–2/3 of nut.
- 40a. Leaf blade papery; cupules enclosing ca. 2/3 of nut 5. *C. tenuicupula*
 40b. Leaf blade leathery; cupules enclosing ca. 1/2 of nut 34. *C. kiukiangensis*
- 39b. Leaf blade apex with a short, blunt tip; cupules enclosing 1/4–1/3 of nut.

- 41a. Petiole 1–1.8 cm; leaf blade margin serrate; cupule bracts in 8–12 rings; nut scar 0.8–1 cm in diam. 37. *C. phanera*
- 41b. Petiole 2–3 cm; leaf blade margin serrulate; cupule bracts in 6–8 rings; nut scar ca. 0.7 cm in diam. 38. *C. edithiae*
- 38b. Leaf blade 3 × or more as long as wide.
- 42a. Cupules discoid or cupular.
- 43a. Leaf blade pubescent when young; cupules 2.5–3 cm in diam.; nuts oblate, 2.2–3 cm in diam., scar 1–1.4 cm in diam. 35. *C. bella*
- 43b. Leaf blade glabrous; cupules 1–1.2 cm in diam.; nuts ellipsoid to ovoid-ellipsoid, 1–1.2 cm in diam., scar ca. 0.5 cm in diam. 56. *C. elevaticostata*
- 42b. Cupules semiglobose, campanulate, or cylindrical.
- 44a. Nuts ellipsoid, oblong-ellipsoid, or obovoid, 1.2–1.6 cm in diam., scar 0.5–0.7 cm in diam. 63. *C. pachyloma*
- 44b. Nuts cylindrical-ellipsoid, 2–3 cm in diam., scar 1.2–1.5 cm in diam.
- 45a. Leaf blade midvein adaxially slightly raised; pistillate inflorescences 2.5–3.5 cm; cupule bracts in 10–13 rings, margin subentire; nut scar ca. 1.2 cm in diam. 2. *C. fleuryi*
- 45b. Leaf blade midvein adaxially flat; pistillate inflorescences ca. 1.5 cm; cupule bracts in 8 or 9 rings, margin dentate; nut scar ca. 1.5 cm in diam. 39. *C. kouangsiensis*
- 36b. Leaf blade margin serrate or serrulate at least on apical 2/3.
- 46a. Leaf blade abaxially with stellate or furcate hairs.
- 47a. Cupules oblate to semiglobose, 3–5 cm in diam., enclosing 2/3–4/5 of nut; nuts 3–4 cm in diam. 25. *C. lamellosa*
- 47b. Cupules cupular or discoid, 1.5–2.5 cm in diam., covering base to 1/2 of nut; nuts 1.5–2.8 cm in diam.
- 48a. Petiole 1–2 cm; cupules discoid, 2–2.5 cm in diam.; nuts oblate, 2–2.8 cm in diam., scar 1–2 cm in diam. 26. *C. kerrii*
- 48b. Petiole 2.5–4 cm; cupules cupular, 1.5–2 cm in diam.; nuts ovoid to ellipsoid, 1.2–1.7 cm in diam., scar ca. 0.8 cm in diam.
- 49a. Leaf blade abaxially densely pale brown stellate tomentose; nuts hairy, glabrescent 28. *C. gambleana*
- 49b. Leaf blade abaxially pruinose to whitish farinose and with adnate simple and furcate hairs but soon glabrescent; nuts glabrous or rarely pilose at apex 29. *C. oxyodon*
- 46b. Leaf blade abaxially simple hairs or glabrous.
- 50a. Nuts oblate.
- 51a. Leaf blade barbate in vein axils, midvein impressed; cupules oblate, 3.5–5 cm in diam. 43. *C. sichourensis*
- 51b. Leaf blade not barbate in vein axils, midvein raised to slightly so; cupules saucer-shaped, bowl-shaped, or cupular, 1.5–3 cm in diam.
- 52a. Petiole glabrous when young; cupules covering only base of nut; nuts glabrous or basally pilose 42. *C. chapensis*
- 52b. Petiole hairy when young; cupules covering most of nut; nuts tomentose.
- 53a. Cupules ca. 3 cm in diam., bract margins subentire; nuts 2.5–3 cm in diam., scar ca. 2 cm in diam. 40. *C. thorelii*
- 53b. Cupules 1.5–1.8 cm in diam., bract margins dentate; nuts 1.3–1.8 cm in diam., scar ca. 1.2 cm in diam. 54. *C. austrocochinchinensis*
- 50b. Nuts ovoid to ellipsoid.
- 54a. Leaf blade base ± truncate to somewhat auriculate 32. *C. yonganensis*
- 54b. Leaf blade base cuneate to subrounded.

- 55a. Leaf blade apex with a short, blunt tip; cupule bracts in 9–12 rings 33. *C. litoralis*
 55b. Leaf blade apex acute to acuminate; cupule bracts in 5–7 rings.
 56a. Cupules 2–3 cm in diam., covering only base of nut; nuts 1.5–3 cm in diam. 36. *C. blakei*
 56b. Cupules 1–1.5 cm in diam., covering 1/3–1/2 of nut; nuts 1–1.2 cm in diam.
 57a. Cupule bracts in 6 or 7 rings, margin subentire; nuts ca. 1 cm in diam., scar 3–5 mm in diam. 31. *C. multinervis*
 57b. Cupule bracts in 5 rings, margin dentate; nuts ca. 1.2 cm in diam., scar ca. 7 mm in diam. 46. *C. pentacycla*
- 35b. Leaf blade less than 14 cm.
 58a. Leaf usually less than 2.5(–3) × as long as wide.
 59a. Leaf blade abaxially with stellate hairs at least when young.
 60a. Leaf blade margin serrate on no more than apical 1/2.
 61a. Cupules 3–3.5 cm in diam.; nuts ca. 2.5 cm in diam. 41. *C. chingsiensis*
 61b. Cupules 1–1.8 cm in diam.; nuts 1–1.5 cm in diam.
 62a. Leaf blade elliptic to obovate-elliptic; pistillate inflorescences 1–2 cm, with 3–7 cupules 65. *C. poilanei*
 62b. Leaf blade oblong to ovate-elliptic; pistillate inflorescences ca. 4 cm, with 2 or 3 cupules 66. *C. delavayi*
 60b. Leaf blade margin serrate on apical ca. 2/3.
 63a. Leaf blade margin bluntly serrate 26. *C. kerrii*
 63b. Leaf blade margin sharply serrate.
 64a. Leaf blade secondary veins 9–11 on each side of midvein; cupules 2–3 cm in diam.; nuts oblate, 2.5–2.8 cm in diam. 57. *C. patelliformis*
 64b. Leaf blade secondary veins 13–16 on each side of midvein; cupules ca. 1.5 cm in diam.; nuts broadly ovoid, ca. 1.2 cm in diam. 64. *C. lobbii*
- 59b. Leaf blade abaxially with simple hairs or glabrous.
 65a. Mature leaf blades abaxially glabrous or subglabrous.
 66a. Leaf blade margin serrate for apical 2/3.
 67a. Leaf blade secondary veins 7–9 on each side of midvein; cupules obconic 33. *C. litoralis*
 67b. Leaf blade secondary veins 11–17 on each side of midvein; cupules discoid, bowl-shaped, or cupular.
 68a. Leaf blade secondary veins 11–13 on each side of midvein, midvein adaxially impressed; cupules discoid, covering only base of nut 53. *C. disciformis*
 68b. Leaf blade secondary veins 13–17 on each side of midvein, midvein adaxially raised; cupules bowl-shaped to cupular, enclosing 1/3 to most of nut.
 69a. Branchlets with stellate hairs when young; leaf blade midvein adaxially raised; cupules ca. 3 cm in diam., enclosing almost all of nut; nuts 2.5–3 cm in diam. 40. *C. thorelii*
 69b. Branchlets glabrous; leaf blade midvein adaxially impressed; cupules ca. 1.5 cm in diam., enclosing 1/3–1/2 of nut; nuts 1.2–2 cm in diam. 50. *C. lungmaiensis*
- 66b. Leaf blade margin serrate from middle to apex or only apically.
 70a. Cupule bracts adherent to wall 19. *C. chevalieri*
 70b. Cupule bracts not adherent to wall.
 71a. Nuts 1–1.8 cm in diam.
 72a. Petiole 0.5–0.8 cm; leaf blade apex with a short, blunt tip; cupule enclosing ca. 1/3 of nut, bracts in 5 or 6 rings; nut scar 3–5 mm in diam. 9. *C. daimingshanensis*
 72b. Petiole 1.5–3 cm; leaf blade apex caudate; cupule enclosing ca. 1/2 of nut, bracts in 7 or 8 rings; nut scar ca. 10 mm in diam. 52. *C. morii*
- 71b. Nuts 2–3 cm in diam.
 73a. Nuts semiglobose or oblate, scar more than 2 cm in diam. 5. *C. tenuicupula*
 73b. Nuts cylindrical-ellipsoid to broadly ovoid, scar less than 1 cm in diam.
 74a. Leaf blade apex acuminate, margin with awnlike and incurved serrations; cupules enclosing ca. 1/2 of nut; nuts broadly ovoid, scar flat 30. *C. austroglauca*
 74b. Leaf blade apex with a short, blunt tip, margin serrate to serrulate; cupules enclosing 1/4–1/3 of nut; nuts cylindrical to ellipsoid, scar slightly convex.

- 75a. Petiole 1–1.8 cm; leaf blade margin serrate; cupule bracts in 8–12 rings; nut scar 0.8–1 cm in diam. 37. *C. phanera*
- 75b. Petiole 2–3 cm; leaf blade margin serrulate; cupule bracts in 6–8 rings; nut scar ca. 0.7 cm in diam. 38. *C. edithiae*
- 65b. Mature leaf blades abaxially pubescent.
- 76a. Leaf blade abaxially not pruinose.
- 77a. Leaf blade secondary veins 8–12 on each side of midvein; cupules 0.8–1.2 cm in diam., bracts in 6–8 rings; nuts 0.7–1 cm in diam. 68. *C. glaucooides*
- 77b. Leaf blade secondary veins 12–18 on each side of midvein; cupules 1.8–5 cm in diam., bracts in 9–11 rings; nuts 1.5–4 cm in diam.
- 78a. Petiole 2.5–3.5 cm, tomentose at least when young; leaf blade secondary veins 15–18 on each side of midvein; cupules oblate, 3.5–5 cm in diam.; nut 3–4 cm in diam. . 43. *C. sichourensis*
- 78b. Petiole 1–1.5 cm, glabrous; leaf blade secondary veins 12–14 on each side of midvein; cupules bowl-shaped, ca. 1.8 cm in diam.; nut ca. 1.5 cm in diam. 67. *C. jinpinensis*
- 76b. Leaf blade abaxially pruinose.
- 79a. Cupules obconic.
- 80a. Petiole 1.5–2 cm, glabrous; leaf blade base subrounded and slightly oblique, secondary veins 13–15 on each side of midvein; cupule bract margins dentate 46. *C. pentacycla*
- 80b. Petiole 0.5–1 cm, puberulent; leaf blade base cuneate, secondary veins 8–10 on each side of midvein; cupule bract margins subentire 69. *C. xanthotricha*
- 79b. Cupules saucer-shaped, bowl-shaped, or cupular.
- 81a. Leaf blade margin remotely serrulate 49. *C. glauca*
- 81b. Leaf blade margin awnlike serrate.
- 82a. Cupule bract margins entire or subentire.
- 83a. Cupules cupular; nuts ca. 1 cm in diam., glabrous, scar 3–5 mm in diam. 31. *C. multinervis*
- 83b. Cupules bowl-shaped; nuts 1.1–1.4 cm in diam., loosely incanous, scar 6–7 cm in diam. 51. *C. annulata*
- 82b. Cupule bract margins of at least basal 1 or 2 denticulate or loosely dentate, others entire, subentire, or repand.
- 84a. Leaf blade secondary veins 13–17 on each side of midvein 50. *C. lungmaiensis*
- 84b. Leaf blade secondary veins 10–13 on each side of midvein.
- 85a. Nut scar ca. 1 cm in diam., flat; stylopodium 4- or 5-ringed 30. *C. austroglauca*
- 85b. Nut scar ca. 0.8 cm in diam., convex; stylopodium 3-ringed 34. *C. kiukiangensis*
- 58b. Leaf blade 3 × as long as wide.
- 86a. Leaf blade margin serrate on apical 1/2 or on subapical part.
- 87a. Leaf blade mostly broader from middle to apex.
- 88a. Mature leaf blades abaxially glabrous or glabrescent.
- 89a. Petiole 1.5–2 cm; cupule outside usually densely tawny tomentose, wall ca. 1.5 mm thick; nut densely tawny tomentose when young but glabrescent, scar slightly convex 63. *C. pachyloma*
- 89b. Petiole 0.5–0.8(–1.2) cm; cupule outside glabrous, wall less than 1 mm thick; nut glabrous, scar flat 19. *C. chevalieri*
- 88b. Mature leaf blades abaxially not glabrescent.
- 90a. Nuts oblate, 1.4–1.7 cm in diam., scar ca. 1 cm in diam. 13. *C. chungii*
- 90b. Nuts obovoid-ellipsoid, ovoid, or ellipsoid, 0.9–1.4 cm in diam., scar 0.5–0.6 cm in diam.
- 91a. Leaf blade abaxially with simple or lepidote hairs, margin remotely serrate 49. *C. glauca*
- 91b. Leaf blade abaxially stellate velutinous, margin with short, awnlike serrations 62. *C. gilva*
- 87b. Leaf blade mostly broader from base to middle.
- 92a. Cupules 2.5–3.4 cm in diam.; nuts 2.2–3 cm in diam., scar 1–1.5 cm in diam.
- 93a. Petiole glabrous; cupules discoid, covering only base of nut; nuts oblate 35. *C. bella*
- 93b. Petiole tomentose; cupules campanulate, enclosing more than 1/2 of nut; nuts cylindrical-ellipsoid 39. *C. kouangsiensis*
- 92b. Cupules 0.6–1.8 cm in diam.; nuts 0.8–1.7 cm in diam., scar 0.4–0.8 cm in diam.

- 94a. Cupules obconic 69. *C. xanthotricha*
- 94b. Cupules saucer-shaped, bowl-shaped, or cupular.
- 95a. Leaf blade abaxially pruinose; secondary veins inconspicuous.
- 96a. Leaf blade margin conspicuously serrate; cupule bracts connate at apex; nut scar slightly convex 18. *C. augustinii*
- 96b. Leaf blade margin serrulate; cupule bracts not connate at apex; nut scar flat ... 61. *C. myrsinifolia*
- 95b. Leaf blade abaxially not pruinose; secondary veins evident.
- 97a. Petiole 0.5–0.8 cm 19. *C. chevalieri*
- 97b. Petiole 1–3 cm.
- 98a. Leaf blade glabrous; cupule enclosing ca. 1/3 of nut 56. *C. elevaticostata*
- 98b. Leaf blade abaxially variously pubescent; cupule enclosing ca. 1/2 of nut.
- 99a. Branchlets and petioles stellate tomentose; leaf blade secondary veins 10–14 on each side of midvein; cupule bract margins shallowly denticulate 66. *C. delavayi*
- 99b. Branchlets and petioles glabrous; leaf blade secondary veins 7–10 on each side of midvein; cupule bract margins dentate.
- 100a. Leaf blade brownish when dry, margin remotely and shallowly serrate; cupules cupular, outside whitish pilose but glabrescent 59. *C. stewardiana*
- 100b. Leaf blade not brownish when dry, margin serrate; cupules bowl-shaped, outside grayish brown tomentose 60. *C. longinix*
- 86b. Leaf blade margin serrate at least on apical 2/3.
- 101a. Leaf blade abaxially with stellate or furcate hairs.
- 102a. Cupules discoid or saucer-shaped, 2–3 cm in diam.
- 103a. Cupules discoid, 2–2.5 cm in diam.; nuts oblate 26. *C. kerrii*
- 103b. Cupules saucer-shaped, ca. 3 cm in diam.; nuts ovoid-conical 58. *C. yingjiangensis*
- 102b. Cupules cupular, 1–1.8(–20) cm in diam.
- 104a. Leaf blade margin glandular serrate 45. *C. ningangensis*
- 104b. Leaf blade margin remotely minutely serrate to serrate.
- 105a. Leaf blade secondary veins 9–14 on each side of midvein, midvein flat, margin remotely minutely serrate 44. *C. argyrotricha*
- 105b. Leaf blade secondary veins 16–24 on each side of midvein, midvein impressed, margin serrate.
- 106a. Leaf blade abaxially densely pale brown stellate tomentose; nuts hairy, glabrescent 28. *C. gambleana*
- 106b. Leaf blade abaxially pruinose to whitish farinose and with adnate simple and furcate hairs but soon glabrescent; nuts glabrous or rarely pilose at apex 29. *C. oxyodon*
- 101b. Leaf blade abaxially with simple hairs or glabrous.
- 107a. Nuts ovoid to ellipsoid.
- 108a. Leaf blade base \pm truncate to somewhat auriculate 32. *C. yonganensis*
- 108b. Leaf blade base cuneate to subrounded.
- 109a. Cupules 2–3 cm in diam., covering only base of nut 36. *C. blakei*
- 109b. Cupules 1–1.5 cm in diam., covering 1/3–1/2 of nut.
- 110a. Cupules outside puberulent or velutinous.
- 111a. Cupules outside puberulent, bract margins subentire; nuts ca. 1 cm in diam. 31. *C. multinervis*
- 111b. Cupules outside velutinous, bract margins dentate; nuts ca. 1.5 cm in diam. 47. *C. stenophylloides*
- 110b. Cupules outside tomentose.
- 112a. Cupules 1–1.3 cm in diam.; nuts ellipsoid, ca. 1 cm in diam. 48. *C. gracilis*
- 112b. Cupules ca. 1.5 cm in diam.; nuts broadly ovoid to oblate, 1.2–2 cm in diam. 50. *C. lungmaiensis*
- 107b. Nuts oblate.
- 113a. Cupules covering only base of nut.
- 114a. Petiole glabrous when young; leaf blade secondary veins 15–20 on each side of midvein 42. *C. chapensis*
- 114b. Petiole tomentose when young; leaf blade secondary veins 11–13 on each side of midvein 53. *C. disciformis*
- 113b. Cupules covering 1/3 to nearly all nut.
- 115a. Leaf blade midvein impressed 50. *C. lungmaiensis*
- 115b. Leaf blade midvein raised to slightly so.

- 116a. Cupules 1.5–1.8 cm in diam.; nuts 1.3–1.8 cm in diam., scar ca. 1.2 cm in diam. 54. *C. austrocochinchinensis*
- 116b. Cupules ca. 3 cm in diam.; nuts 2.5–3 cm in diam., scar 1.8–2 cm in diam.
- 117a. Leaf blade secondary veins 13–16 on each side of midvein; fruit maturing during current year 40. *C. thorelii*
- 117b. Leaf blade secondary veins 17–22 on each side of midvein; fruit maturing on 1-year-old branchlets 55. *C. subhinoidea*

1. Cyclobalanopsis jenseniana (Handel-Mazzetti) W. C. Cheng & T. Hong ex Q. F. Zheng, Fl. Fujianica 1: 406. 1982.

大叶青冈 da ye qing gang

Quercus jenseniana Handel-Mazzetti, Anz. Akad. Wiss. Wien, Math.-Naturwiss. Kl. 59: 52. 1922; *Cyclobalanopsis pinbianensis* Y. C. Hsu & H. W. Jen; *Lithocarpus dunnii* F. P. Metcalf; *Q. pinbianensis* (Y. C. Hsu & H. W. Jen) C. C. Huang & Y. T. Chang.

Trees to 35 m tall. Branchlets thick, sulcate, glabrous, densely lenticellate; lenticels pale brown. Petiole 3–5 cm, adaxially sulcate, glabrous; leaf blade elliptic, oblong-elliptic, or obovate-oblong, 12–20(–30) × 6–8(–13) cm, subleathery to leathery, glabrous, base cuneate, broadly cuneate, or subrounded, margin entire, apex caudate to acuminate; midvein abaxially prominent, adaxially impressed; secondary veins 12–18 (–24) on each side of midvein, curving near margin; tertiary veins abaxially slender, evident. Female inflorescences 3–5(–9) cm; rachis lenticels grayish brown, oblong. Infructescences 5–10 cm. Cupule cupular, 0.8–1 × 1.3–1.5 cm, enclosing 1/3–1/2 of nut, outside and inside with thick orangish brown indument but outside glabrescent, wall less than 1 mm thick; bracts in 6–9 rings, margin denticulate. Nut oblong-ovoid, obovoid, or ovoid-conical, 1.7–2.2 × (0.8–)1.3–1.5 cm, yellowish velutinous, glabrescent; scar (3–)6 mm in diam., raised; stylopodium persistent. Fl. Apr–Jun, fr. Oct–Nov of following year.

• Mixed mesophytic forests on mountain slopes, valleys, and along rivers; 300–1700 m. Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Yunnan, Zhejiang.

2. Cyclobalanopsis fleuryi (Hickel & A. Camus) Chun ex Q. F. Zheng, Fl. Fujianica 1: 404. 1982.

饭甑青冈 fan zeng qing gang

Quercus fleuryi Hickel & A. Camus, Bull. Mus. Natl. Hist. Nat. 29: 600. 1923; *Cyclobalanopsis austroyunnanensis* Hu; *C. nengpulaensis* H. Li & Y. C. Hsu; *Q. tsoi* Chun ex Menitsky.

Trees to 25 m tall. Branchlets densely orangish brown tomentose, glabrescent and densely lenticellate. Petiole 2–6 cm, tawny tomentose when young; leaf blade oblong-elliptic to ovate-elliptic, 14–27 × 4–9 cm, leathery, densely orangish brown tomentose when young but glabrescent, abaxially whitish, base cuneate, margin entire or apically undulate and serrulate, apex

acute to shortly acuminate; midvein adaxially slightly raised; secondary veins 10–12(–15) on each side of midvein; tertiary veins abaxially conspicuous. Male inflorescences 10–15 cm, tawny tomentose. Female inflorescence solitary in leaf axils toward apex of branchlets, 2.5–3.5 cm, rachis thick and densely orangish brown tomentose; cupules 4 or 5. Infructescence rachis short, ca. 7 mm thick, thicker than branchlet. Cupule campanulate to cylindrical, 3–4 × 2.5–4 cm, enclosing ca. 2/3 of nut, outside and inside with feltlike orangish brown indument, wall to 6 mm thick; bracts in 10–13 rings, margin subentire. Nut cylindrical-ellipsoid, 3–4.5 × 2–3 cm, densely tawny tomentose; scar ca. 1.2 cm in diam., convex; stylopodium persistent, 5–8 mm. Fl. Mar–Apr, fr. Oct–Dec.

Dense forests in mountains; 500–1500 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Yunnan [Laos, Vietnam].

3. Cyclobalanopsis camusiae (Trelease ex Hickel & A. Camus) Y. C. Hsu & H. W. Jen, J. Beijing Forest. Univ. 15(4): 44. 1993.

法斗青冈 fa dou qing gang

Quercus camusiae Trellease ex Hickel & A. Camus in Lecomte, Fl. Indo-Chine 5: 957. 1929; *Cyclobalanopsis faadoouensis* Hu; *Q. geminata* Hickel & A. Camus (1923), not Small (1897).

Trees to 15 m tall. Branchlets brown tomentose when young, sparsely hairy with age. Petiole 2–3 cm, glabrous; leaf blade green, elliptic-lanceolate to oblanceolate, (9–)11–17 × 3–5 cm, leathery, glabrous, base cuneate to oblique, margin entire or rarely apically 2- or 3-serrulate, apex acuminate to shortly caudate; midvein adaxially raised; secondary veins 8–12 on each side of midvein; tertiary veins abaxially evident. Infructescence ca. 2 cm. Cupule shallowly bowl-shaped, ca. 8 mm × 2–2.5 cm, enclosing 1/2–2/3 of nut, outside and inside tawny tomentose, wall ca. 3 mm thick; bracts in 5–7 rings, margin entire. Nut subglobose, ca. 1.7 cm, pale brown sericeous; scar ca. 1 cm in diam., convex; stylopodium persistent, ca. 2 mm in diam. Fr. Sep.

Dense broad-leaved evergreen forests in mountains; 1400–2000 m. SE Yunnan [Vietnam].

4. Cyclobalanopsis semiserrata (Roxburgh) Oersted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1866: 79. 1867.

无齿青冈 *wu chi qing gang*

Quercus semiserrata Roxburgh, Fl. Ind. ed. 1832, 3: 641. 1832; *Cyclobalanopsis semiserratoidea* Y. C. Hsu & H. W. Jen; *Q. semiserratoidea* (Y. C. Hsu & H. W. Jen) C. C. Huang & Y. T. Chang.

Trees to 10 m tall. Branchlets tomentose when young, glabrescent. Petiole 1–2 cm, glabrous; leaf blade ovate-oblong to obovate-oblongate, 13–25 × 3–7 cm, thinly papery, glabrous, base cuneate, margin entire, apex acuminate to obtuse; midvein and secondary veins abaxially prominent and adaxially slightly raised or flat; secondary veins 9–12 on each side of midvein, curving near margin. Cupule bowl-shaped, ca. 1.2 × 2.5 cm, enclosing 1/2–2/3 of nut, outside brown velutinous, inside brownish tomentose, wall thin; bracts in 6–9 rings, margin undulately denticulate. Nut oblong-ellipsoid, 3.5–4 × ca. 2.2 cm, pilose, apex rounded; scar ca. 1.5 cm in diam., convex; stylopodium persistent.

Wet broad-leaved evergreen forests in valleys; 400–500 m. SE Xizang, Yunnan [Bangladesh, NE India, Myanmar, Thailand].

5. *Cyclobalanopsis tenuicupula* Y. C. Hsu & H. W. Jen, Acta Bot. Yunnan. 1(1): 147. 1979.

薄斗青冈 *bao dou qing gang*

Quercus tenuicupula (Y. C. Hsu & H. W. Jen) C. C. Huang.

Trees to 30 m tall. Branchlets whitish, glabrous, slightly sulcate, densely lenticellate; lenticels whitish. Petiole 2–4 cm, black when dry, glabrous; leaf blade oblong to obovate-elliptic, 10–25 × 5–10 cm, papery, glabrous, abaxially grayish green, adaxially glossy-green, base broadly cuneate, margin entire to remotely crenate and apically serrate, apex somewhat caudate; midvein adaxially impressed; secondary veins 9–12 on each side of midvein, abaxially prominent, parallel; tertiary veins abaxially slender, evident. Female inflorescence 2–6 cm; cupules 3–5. Infructescence ca. 10 cm, with 1–5 fruit. Cupule bowl-shaped, ca. 1.5 × 2–4 cm, enclosing ca. 2/3 of nut, outside thinly grayish velutinous, wall ca. 1 mm thick; bracts in 6 or 7 rings, margin undulately denticulate. Nut oblate, 2–2.5 × 2.5–3 cm, apex depressed; scar 2–2.5 cm in diam., flat; stylopodium persistent, slightly raised. Fl. Apr, fr. Sep.

• 900–1000 m. Yunnan (Jinping Xian).

Very close if not identical to *Cyclobalanopsis sichouensis*; it may no longer be possible to maintain them as separate when additional collections are available.

6. *Cyclobalanopsis dinghuensis* (C. C. Huang) Y. C. Hsu & H. W. Jen, J. Beijing Forest. Univ. 15(4): 44. 1993.

鼎湖青冈 *ding hu qing gang*

Quercus dinghuensis C. C. Huang, Acta Phytotax. Sin. 16(4): 74. 1978.

Trees to 8 m tall. First-year branchlets grayish brown, sulcate, waxy, tawny woolly-tomentose; 2nd-year branchlets dark ashy, glabrescent. Petiole 1–1.5 cm;

leaf blade oblong-elliptic, 8–9 × 2–2.5 cm, pale brown tomentose, glabrescent, abaxially grayish green, adaxially dark green, base cuneate to narrowly rounded, margin entire and slightly recurved, apex rounded; secondary veins 12 or 13 on each side of midvein. Infructescences on terminal new shoots, less than 1 cm, usually 2-fruited. Cupule bowl-shaped, ca. 1.8 × 2–2.5 cm, enclosing ca. 1/3 of nut, outside grayish brown tomentose but glabrescent, wall ca. 4 mm and hard; bracts in 4 or 5 rings, margin entire. Nut ellipsoid, 3–3.5 × 1.7–2 cm; scar ca. 5 mm in diam., slightly convex; stylopodium persistent, evident.

• Broad-leaved evergreen forests in mountains; ca. 1000 m. Guangdong (Dinghu Shan).

7. *Cyclobalanopsis litseoides* (Dunn) Schottky, Bot. Jahrb. Syst. 47: 658. 1912.

木姜叶青冈 *mu jiang ye qing gang*

Quercus litseoides Dunn, J. Bot. 47: 377. 1909.

Trees to 10 m tall. Branchlets sparsely tomentose, glabrescent. Leaves sessile; leaf blade obovate-oblongate to narrowly elliptic, 2.5–7 × 0.8–3 cm, glabrous, abaxially grayish green, adaxially dark green, base cuneate, margin entire, apex obtuse; secondary veins 6–9 on each side of midvein. Female inflorescences ca. 1 cm; cupules 2, apical. Cupule bowl-shaped, 5–6 × ca. 10 mm, enclosing ca. 1/3 of nut, outside, remotely grayish brown tomentose; bracts in 5–7 rings, margin entire or denticulate. Nut ellipsoid, 1.5–1.8 × ca. 1 cm, apex pubescent; scar flat; stylopodium persistent, evident.

• Sparse forests in mountains; 700–1000 m. SE Guangdong, SW Guangxi.

8. *Cyclobalanopsis tiaoloshanica* (Chun & W. C. Ko) Y. C. Hsu & H. W. Jen, Acta Bot. Yunnan. 1(1): 148. 1979.

吊罗山青冈 *diao luo shan qing gang*

Quercus tiaoloshanica Chun & W. C. Ko in Chun & F. C. How, Acta Phytotax. Sin. 7: 42. 1958.

Trees to 12 m tall. First-year branchlets minutely angular, with light brown woolly floss; 2nd-year branchlets indistinctly lenticellate. Leaves crowded apically on branchlets; petiole 6–8 mm, pale brown woolly when young; leaf blade oblong to obovate-elliptic, 4–10 × 1.2–3 cm, leathery, concolorous, abaxially light brown floccose-tomentose when young, base cuneate, margin entire or apically 2–5-crenate, apex acute; midvein adaxially flat; secondary veins 5–7 on each side of midvein; tertiary veins inconspicuous. Female inflorescences 5–15 mm; cupules 2 or 3. Cupule cupular, ca. 1.2 cm in diam., enclosing ca. 1/3 of nut, outside grayish brown pubescent, inside brown villous, wall ca. 1 mm thick; bracts in 6 or 7 rings, margin of basal ones denticulate, apical 2 or 3 ones narrow and with margin entire. Nut ovoid-ellipsoid to ellipsoid, 2–2.2 × 1.4–1.6 cm, puberulent, glabrescent but apically remaining puberulent with age; scar 6–9

mm in diam., flat or impressed; stylopodium persistent, slightly raised. Fl. Jan–Feb, fr. Oct–Dec.

- Broad-leaved evergreen forests in mountains; 900–1400 m. Hainan (Diaoluo Shan).

Very close to *Cyclobalanopsis hui*.

9. *Cyclobalanopsis daimingshanensis* S. Lee in Y. C. Hsu & H. W. Jen, *Acta Bot. Yunnan.* 1(1): 147. 1979.

大明山青冈 da ming shan qing gang

Quercus daimingshanensis (S. Lee) C. C. Huang.

Trees to 15 m tall. Branchlets glabrous. Petiole 5–8 mm, glabrous; leaf blade obovate-elliptic to elliptic, 4–7 × 1.5–3 cm, glabrous, abaxially whitish, adaxially dark green, base cuneate, margin apically remotely serrulate, apex with a short, blunt tip; secondary veins 7–9 on each side of midvein, abaxially slightly raised, adaxially inconspicuous; tertiary veins abaxially slender, evident. Female inflorescence ca. 1 cm; cupules 3–5. Cupule bowl-shaped, ca. 5 mm × 1.2 cm, enclosing ca. 1/3 of nut, outside whitish velutinous; bracts in 5 or 6 rings, margin of apical 2 denticulate, others entire. Nut oblong-ellipsoid, 2–2.2 × ca. 1.3 cm, glabrous; scar 3–5 mm in diam., flat; stylopodium persistent, evident. Fl. Mar–Apr, fr. Oct.

- Mixed mesophytic forests in mountains; ca. 1000 m. C Guangxi (Daming Shan).

10. *Cyclobalanopsis obovatifolia* (C. C. Huang) Q. F. Zheng, *Acta Phytotax. Sin.* 17(3): 118. 1979.

倒卵叶青冈 dao luan ye qing gang

Quercus obovatifolia C. C. Huang, *Acta Phytotax. Sin.* 16(4): 75. 1978; *Cyclobalanopsis meihuashanensis* Q. F. Zheng; *Q. meihuashanensis* (Q. F. Zheng) C. C. Huang.

Trees or shrubs (2–)5–11 m tall. Petiole 2–8 mm, hairy when young, glabrescent; leaf blade narrowly obovate to oblong-elliptic, 2.5–6(–9) × 1.5–2.5(–3.5) cm, abaxially pruinose and loosely covered with stellate hairs but glabrescent, adaxially dark green, base cuneate, margin entire or apically slightly repand, apex rounded to sometimes shortly acute or shortly acuminate; midvein and secondary veins abaxially prominent, adaxially slightly impressed; secondary veins 5–8 on each side of midvein; tertiary veins abaxially obscure. Infructescences 1–2 cm, with 1–3 fruit. Cupules with a stalk 3–8 mm, bowl-shaped, 6–10 mm × (1.1–)1.5–2 cm in diam., enclosing ca. 1/3 of nut, outside grayish brown velutinous, inside grayish brown sericeous; bracts in 7–9 rings, margin of basal and apical ones denticulate, others dentate. Nut oblate to subglobose, 0.8–2 × 1–1.6 cm, glabrous; scar 5–8 mm in diam., flat; stylopodium persistent, umbonate. Fr. Nov.

- Broad-leaved evergreen forests on mountain slopes and peaks; 1600–1800 m. Fujian, Guangdong, S Hunan.

11. *Cyclobalanopsis neglecta* Schottky, *Bot. Jahrb. Syst.* 47: 650. 1912.

竹叶青冈 zhu ye qing gang

Cyclobalanopsis bambusifolia (Hance) Chun ex Y. C. Hsu & H. W. Jen; *Quercus bambusifolia* Hance (1875), not Fortune (1860) nor T. M. Masters (1874); *Q. neglecta* (Schottky) Koidzumi.

Trees to 20 m tall. Branchlets grayish brown sericeous, glabrescent. Leaves crowded toward branchlet apex; petiole 2–5 mm, glabrous; leaf blade narrowly lanceolate to elliptic-lanceolate, 3–11 × 0.5–1.8 cm, subleathery, abaxially whitish and glabrous or basally villous, base cuneate, margin entire or indistinctly 1- or 2-crenate toward apex, apex rounded; midvein adaxially slightly raised or flat; secondary veins 7–14 on each side of midvein, inconspicuous; tertiary veins abaxially inconspicuous to obscure. Female inflorescences 5–10 mm, rachis grayish brown tomentose when young; cupules 2–many. Infructescences 5–10 mm, usually 1-fruited. Cupule saucer-shaped to cupular, 5–10 mm × 1.3–1.5(–1.8) cm, covering base of nut, outside grayish brown velutinous, inside brown tomentose, wall ca. 1 mm thick; bracts in 4–6 rings, margin entire or triangular denticulate. Nut obovoid to ellipsoid, 1.5–2.5 × 1–1.6 cm, puberulent, glabrescent; scar 5–7 mm in diam., slightly convex; stylopodium persistent, evident. Fl. Feb–Mar, fr. Aug–Nov.

- Dense forests in mountains; 500–2200 m. Guangdong, Guangxi, Hainan [Vietnam].

12. *Cyclobalanopsis championii* (Benth) Oersted, *Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn* 1866: 79. 1867.

岭南青冈 ling nan qing gang

Quercus championii Benth, *Hooker's J. Bot. Kew Gard. Misc.* 6: 113. 1854.

Trees to 20 m tall; trunk to 1 m d.b.h.; bark dark ash and slice splitting. Branchlets sulcate, densely grayish brown stellate tomentose. Leaves crowded toward branchlet apex; petiole 0.8–1.5 cm, densely pale orangish brown tomentose; leaf blade obovate, sometimes oblong-elliptic, 3.5–10(–13) × 1.5–4.5 cm, thickly leathery, abaxially pale orangish brown mealy and densely stellate tomentose, hairs pale orangish brown when young but darker with age, adaxially dark green and glabrous, base cuneate, margin recurved and entire or rarely undulate-crenate toward apex, apex with a short, blunt tip to rarely retuse; midvein and secondary veins adaxially impressed; secondary veins 6–10 on each side of midvein; tertiary veins abaxially obscure. Female inflorescences to 4 cm, brown velutinous; cupules 3–10. Cupule bowl-shaped, 4–10 mm × 1–1.3(–2) cm, enclosing 1/3–1/2 of nut, outside brown to brownish velutinous, inside densely pale yellowish brown tomentose, wall ca. 1 mm thick; bracts in 4–7 rings, margin usually entire or sometimes basal 1 or 2 undulately denticulate. Nut broadly ovoid to oblate,

1.5–2 × 1–1.5(–1.8) cm, hairy when young, glabrescent, base and apex rounded; scar 4–5 mm in diam., flat. Fl. Dec–Mar, fr. Nov–Dec.

• Broad-leaved evergreen forests in mountains; 100–1700 m. Fujian, Guangdong, Guangxi, Hainan, Taiwan, Yunnan.

13. *Cyclobalanopsis chungii* (F. P. Metcalf) Y. C. Hsu & H. W. Jen ex Q. F. Zheng, *Fl. Fujianica* 1: 405. 1982.

福建青冈 fu jian qing gang

Quercus chungii F. P. Metcalf, *Lingnan. Sci. J.* 10: 481. 1931.

Trees to 15 m tall. Branchlets densely brown velutinous, glabrescent. Petiole (0.5–)1–2 cm, grayish brown velutinous; leaf blade elliptic to rarely obovate-elliptic, 6–10(–12) × 1.5–4 cm, subleathery, abaxially densely grayish brown stellate tomentose (hairs 8–10-forked), base broadly cuneate to subrounded, margin serrulate toward apex or rarely entire but not recurved, apex acute to somewhat caudate; midvein and secondary veins abaxially prominent, adaxially flat; secondary veins 10–15 on each side of midvein, abaxially raised; tertiary veins abaxially conspicuous. Female inflorescences 1.5–2 cm, rachis and bracts densely brown tomentose, cupules 2–6. Infructescences 1.5–3 cm. Cupule saucer-shaped, 5–8 mm × 1.5–2.3 cm, covering base of nut, outside and inside grayish brown tomentose, wall ca. 2 mm thick; bracts in 6 or 7 rings, margin of basal 2 denticulate, others entire. Nut obovate, ca. 1.5 × 1.4–1.7 cm, velutinous, apex rounded; scar ca. 1 cm in diam., flat or depressed.

• Broad-leaved evergreen forests on mountain slopes and in valleys; 200–800 m. Fujian, Guangdong, Guangxi, Hunan, Jiangxi.

14. *Cyclobalanopsis hui* (Chun) Chun ex Y. C. Hsu & H. W. Jen, *J. Beijing Forest. Univ.* 15(4): 45. 1993.

雷公青冈 lei gong qing gang

Quercus hui Chun, *J. Arnold Arbor.* 9: 126. 1928.

Trees 10–15(–20) m tall. Branchlets densely curly orangish brown tomentose, glabrescent, lenticellate; lenticels minute. Petiole 1–1.4 cm, woolly when young; leaf blade oblong-elliptic, oblanceolate, or elliptic-lanceolate, 7–13 × 1.5–3(–4) cm, subleathery, abaxially pale brown tomentose but glabrescent, base cuneate and slightly oblique, margin recurved and entire or indistinctly serrulate toward apex, apex acuminate to obtuse; midvein and secondary veins abaxially prominent, adaxially flat; secondary veins 6–10 on each side of midvein; tertiary veins abaxially slender, evident. Female inflorescences 1–2 cm; cupules 2–5, apical. Infructescence ca. 1 cm; fruit 1 or 2. Cupule shallowly bowl-shaped to deeply discoid, 4–10 mm × 1.5–3 cm, covering base of nut, outside and inside densely feltlike tawny tomentose, wall ca. 1 mm thick; bracts in 4–6 rings, margin denticulate. Nut obovate, 1.5–2 × 1.5–2.5

cm, densely tawny tomentose, glabrescent; scar 7–10 mm in diam., impressed; stylopodium raised. Fl. Apr–May, fr. Oct–Dec.

• Mixed or dense wet broad-leaved evergreen forests in mountains; 300–1200 m. Guangdong, Guangxi, Hunan.

15. *Cyclobalanopsis albicaulis* (Chun & W. C. Ko) Y. C. Hsu & H. W. Jen, *J. Beijing Forest. Univ.* 15(4): 45. 1993.

白枝青冈 bai zhi qing gang

Quercus albicaulis Chun & W. C. Ko in Chun & F. C. How, *Acta Phytotax. Sin.* 7: 33. 1958.

Trees to 30 m tall. Branchlets whitish, glabrous, cylindric when young, minutely sulcate and with papillate lenticels with age. Petiole 2–3.5 cm, glabrous; leaf blade oblong-elliptic, ovate, ovate-lanceolate, or lanceolate, 10–15(–18) × 3–6(–8) cm, subleathery, pruinose brown pubescent, glabrescent, base rounded to cuneate, decurrent along veins, and oblique, margin entire or shallowly crenate, apex long acuminate to caudate but sometimes shortly acuminate; midvein adaxially slightly impressed; secondary veins 6–8 on each side of midvein. Female inflorescences 2–3 cm. Infructescence rachis whitish, glabrous. Cupule bowl-shaped, 2–3 cm in diam., enclosing 1/3–1/2 of nut, outside pale brown puberulent; bracts in 6–8 rings, margin entire or middle ones crenulate. Nut oblong-ellipsoid, ca. 4 × 2–3 cm, glabrous; scar rounded; stylopodium persistent, umbonate. Fl. Oct, fr. Nov–Dec of following year.

• Mixed mesophytic forests; 200–600 m. Hainan (Ya Xian).

16. *Cyclobalanopsis delicatula* (Chun & Tsiang) Y. C. Hsu & H. W. Jen, *Acta Bot. Yunnan.* 1(1): 148. 1979.

上思青冈 shang si qing gang

Quercus delicatula Chun & Tsiang, *J. Arnold Arbor.* 28: 324. 1947.

Trees to 13 m tall. First-year branchlets ca. 2 mm thick, glabrous. Petiole slender, 1–2 cm, glabrous; leaf blade ovate, oblong-elliptic, or sometimes obovate-elliptic, 6–9 × 2–3.5 cm, papery, base cuneate, margin entire or shallowly crenate toward apex, apex caudate; secondary veins 7 or 8 on each side of midvein, abaxially slightly raised, glabrescent; tertiary veins abaxially inconspicuous to obscure. Infructescence ca. 1 cm, with 1 or 2 fruit. Cupule cupular, ca. 1.5 × 1.6–1.8 cm, enclosing ca. 1/3 of nut, outside and inside grayish brown and pubescent, wall ca. 1 mm thick; bracts in 7 or 8 rings, margin of apical 2 or 3 entire, others denticulate. Nut ellipsoid, 2–2.5 × ca. 1.5 cm, at least apically velutinous, base and apex rounded; scar ca. 5 mm in diam., flat; stylopodium persistent, umbonate. Fl. Apr–May, fr. Oct–Nov.

• Mixed mesophytic forests in mountains; 300–700 m. Guangdong, Guangxi, Hunan.

17. *Cyclobalanopsis sessilifolia* (Blume) Schottky, *Bot. Jahrb. Syst.* 47: 652. 1912.

云山青冈 *yun shan qing gang*

Quercus sessilifolia Blume, Mus. Bot. 1: 305. 1850; *Cyclobalanopsis nubium* (Handel-Mazzetti) Chun ex Q. F. Zheng; *C. paucidentata* (Franchet ex Nakai) Kudo & Masamune; *Q. chingii* F. P. Metcalf; *Q. nubium* Handel-Mazzetti; *Q. paucidentata* Franchet ex Nakai.

Trees to 25 m tall. Branchlets waxy, glaucous, lenticellate; lenticels grayish brown, rounded, hairy, glabrescent. Petiole 5–10 mm, glabrous; leaf blade oblong-elliptic to lanceolate-elliptic, 7–15 × 1.5–4 cm, leathery, subconcolorous, glabrous, base cuneate, margin entire or apically 2–4 serrate, apex acute to shortly acuminate; secondary veins 10–14 on each side of midvein, inconspicuous; tertiary veins abaxially obscure. Female inflorescence ca. 1.5 cm. Cupule cupular, 1–1.5 cm in diam., enclosing ca. 1/3 of nut, outside grayish brown tomentose, inside grayish brown feltlike tomentose, wall ca. 1 mm thick; bracts in 5–7 rings, margin of basal 2 or 3 denticulate, others subentire. Nut obovoid to ellipsoid-obovoid, 1.7–2.4 × 0.8–1.5 cm, base with a few rings; scar 5–7 mm in diam., slightly convex; stylopodium persistent, raised. Fl. Apr–May, fr. Oct–Nov.

Mixed mesophytic forests in mountains; 1000–1700 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Zhejiang [Japan].

18. *Cyclobalanopsis augustinii* (Skan) Schottky, Bot. Jahrb. Syst. 47: 656. 1912.

窄叶青冈 *zhai ye qing gang*

Quercus augustinii Skan in F. B. Forbes & Hemsley, J. Linn. Soc., Bot. 26: 507. 1899; *Pasania chiwui* Hu; *Q. augustinii* var. *angustifolia* A. Camus; *Q. augustinii* var. *rockiana* A. Camus.

Trees to 10 m tall. Branchlets sulcate, with orangish brown scalelike glands when young, glabrescent. Petiole 0.5–2 cm, glabrous; leaf blade ovate-lanceolate to elliptic-lanceolate, 6–12 × 1–4 cm, abaxially slightly farinose, adaxially glabrous, base cuneate and usually oblique, margin slightly recurved and usually serrate in juvenile tree but entire or apically conspicuously serrate in mature tree, apex acuminate; midvein adaxially raised; secondary veins 10–15 on each side of midvein, inconspicuous, usually not fusing; tertiary veins obscure to very slender, evident. Female inflorescences solitary in axil of new shoots, 3–4 cm; cupules 5–10. Cupule cupular, 0.6–1 × 1–1.3 cm, enclosing ca. 1/2 of nut, outside glabrous or puberulent, inside grayish brown sericeous, wall less than 1 mm thick; bracts in 5–7 rings, margin entire to crenulate, basal ones somewhat spreading, apical ones connate or adherent to cupule wall. Nut ovoid to oblong-ovoid, 1–1.7 × 0.8–1.2 cm, glabrous, apex rounded to somewhat depressed; scar ca. 6 mm in diam., slightly convex; stylopodium persistent. Fl. Apr–May, fr. Oct of following year.

Forests in mountains; 1200–2700 m. Guangxi, Guizhou, Yunnan [Vietnam]

19. *Cyclobalanopsis chevalieri* (Hickel & A. Camus) Y. C. Hsu & H. W. Jen, J. Beijing Forest. Univ. 15(4): 45. 1993.

黑果青冈 *hei guo qing gang*

Quercus chevalieri Hickel & A. Camus, Ann. Sci. Nat., Bot., sér. 10, 3: 380. 1921; *Cyclobalanopsis nigrinux* Hu.

Trees to 20 m tall. Branchlets slender and sulcate, with a whitish waxy layer by 2nd year. Petiole 5–8(–12) mm; leaf blade green, elliptic, obovate-elliptic, or lanceolate, 6–11 × 2–4 cm, subleathery, puberulent or glabrous when young, base cuneate, margin entire to remotely repand and serrulate apically, apex caudate; midvein adaxially impressed; secondary veins 8–11 on each side of midvein, slender, evident. Infructescences 2–4 cm, with 2–5 fruit. Cupule cupular, 0.5–1.2 × 0.8–1.8 cm, enclosing 1/3–1/2 of nut, outside glabrous, inside brown sericeous, wall less than 1 mm thick; bracts in 5–7(–9) rings, margins dentate. Nut ovoid to oblong-ellipsoid, 1–1.5(–2) × 0.6–0.8 (–1.5) cm, glabrous; scar ca. 5 mm in diam., flat. Fr. Dec.

Mixed mesophytic and broad-leaved evergreen forests; 600–1500 m. Guangdong, Guangxi, Yunnan [Vietnam].

20. *Cyclobalanopsis saravanensis* (A. Camus) Hjelmquist, Dansk Bot. Ark. 23(4): 503. 1968.

薄叶青冈 *bao ye qing gang*

Quercus saravanensis A. Camus, Chênes, Atlas 1: 19. 1934; *Cyclobalanopsis kontumensis* (A. Camus) Y. C. Hsu & H. W. Jen; *Q. kontumensis* A. Camus.

Trees to 50 m tall. Branchlets slender, sulcate, glabrous. Leaf blade ovate-elliptic to oblong-elliptic, 10–14 × 2.5–4.5 cm, papery, glabrous, abaxially grayish green, adaxially green, base cuneate, margin entire, apex caudate; midvein adaxially impressed; secondary veins (6–)9 or 10 on each side of midvein, inconspicuous. Cupule campanulate to obconic, ca. 1.5 × 2 cm, enclosing less than 1/2 of nut, outside gray villous, inside orangish tomentose, wall 1–2 mm thick; bracts in 8 or 9 rings, margin entire. Nut ellipsoid, 1.5–2 × 1.5–2 cm, glabrous; scar ca. 8 mm in diam., convex.

Wet forests in mountains; ca. 1700 m. Yunnan [Laos, Vietnam].

21. *Cyclobalanopsis motuoensis* (C. C. Huang) Y. C. Hsu & H. W. Jen, J. Beijing Forest. Univ. 15(4): 46. 1993.

墨脱青冈 *mo tuo qing gang*

Quercus motuoensis C. C. Huang in C. C. Huang & Y. T. Chang, Guihaia 12: 306. 1992.

Trees to 30 m tall. Branchlets dark, sulcate, densely lenticellate; lenticels whitish, rounded, glabrous. Petiole 1.5–2 cm, glabrous; leaf blade oblong to ovate-elliptic, 7–10 × 3–4 cm, subleathery, concolorous, glabrous, base rounded and slightly oblique, margin entire or apically remotely serrate, apex caudate; midvein adaxially impressed; secondary veins 7–9 on each side of midvein, slender, inconspicuous; tertiary veins obscure. Infructescences solitary in axil of a higher leaf,

2–4 cm, with 1 or 2 fruit. Cupule cupular, 0.8–1 × ca. 1.5 cm, enclosing ca. 1/2 of nut, outside glabrous, inside sericeous; bracts in 6 rings, margin remotely triangular-denticulate. Nut depressed globose, 1.4–1.8 × 1–1.3 cm, glabrous; scar ca. 4 mm in diam., slightly convex; stylopodium persistent, ca. 2 mm. Fr. Oct.

• Broad-leaved forests; ca. 1700 m. SE Xizang (Mêdog Xian).

22. *Cyclobalanopsis hypophaea* (Hayata) Kudo, J. Soc. Trop. Agric. 3: 389. 1931.

绒毛青冈 rong mao qing gang

Quercus hypophaea Hayata, Icon. Pl. Formosan. 3: 182. 1913; *Lithocarpus hypophaeus* (Hayata) Hayata; *Pasania hypophaea* (Hayata) H. L. Li.

Trees to 18 m tall. Branchlets slender, whitish hairy. Petiole 5–10 mm, triangular in cross section, densely gray tomentose; leaf blade narrowly elliptic-lanceolate, 5–9.5 × 1.5–2.3 cm, subleathery, abaxially whitish tomentose and hairs adnate, adaxially bright green, base cuneate, margin entire, apex acuminate; midvein abaxially prominent and adaxially flat; secondary veins 8–14 on each side of midvein, slender, evident, not fusing; tertiary veins abaxially obscure. Cupule saucer-shaped, 5–8 mm × 1–1.8 cm, outside whitish pubescent; bracts in 7–11 rings. Nut oblate to broadly ovoid, 1.7–2.1 × 1.2–1.8 cm; scar 5–8 mm in diam., slightly convex. Fl. Dec–Jan, fr. Jan–Feb of following year.

• Broad-leaved evergreen forests; near sea level to 1100 m. SE Taiwan.

23. *Cyclobalanopsis tomentosinervis* Y. C. Hsu & H. W. Jen, Acta Phytotax. Sin. 14(2): 84. 1976.

毛脉青冈 mao mai qing gang

Quercus tomentosinervis (Y. C. Hsu & H. W. Jen) C. C. Huang.

Trees to 20 m tall. Branchlets sulcate, villous when young, soon glabrescent. Petiole 2–3.5 cm, adaxially sulcate; leaf blade ovate to oblong-elliptic, 7–15 × 3–5 cm, leathery, abaxially grayish brown tomentose (denser so along veins), adaxially bright green and glabrous, base broadly cuneate to subrounded, margin entire or apically indistinctly serrulate, apex caudate; midvein adaxially impressed; secondary veins 11–15 on each side of midvein; tertiary veins abaxially evident. Female inflorescences 5–7 cm; rachis villous. Cupule bowl-shaped, ca. 8 mm × 1.3–1.5 cm, enclosing ca. 1/3 of nut, outside pubescent, inside orangish brown sericeous, wall less than 1 mm thick; bracts in 6 or 7 rings, margin of apical 2 entire, others triangular denticulate. Nut ovoid-ellipsoid, 1.5–1.7 × 1.3–1.5 cm, glabrous; scar 5–8 mm in diam., convex; stylopodium persistent. Fr. Dec.

• Broad-leaved evergreen forests; ca. 2300 m. SE Guizhou, S to SE Yunnan.

24. *Cyclobalanopsis rex* (Hemsley) Schottky, Bot. Jahrb. Syst. 47: 651. 1912.

大果青冈 da guo qing gang

Quercus rex Hemsley, Hooker's Icon. Pl. 27: t. 2663. 1901.

Trees to 30 m tall. Branchlets pale brown tomentose, glabrescent. Leaves often crowded apically on branches; petiole 2–3 cm, brown tomentose; leaf blade obovate to obovate-oblongate, 15–20(–27) × (4–)6–9 cm, densely brown tomentose when young, glabrescent, base cuneate, margin apically remotely minutely serrate, apex shortly acuminate to acute; midvein and secondary veins abaxially prominent but adaxially impressed or flat; secondary veins 18–22 on each side of midvein; tertiary veins abaxially evident. Cupule saucer-shaped, 1.5–1.8 × 3.5–5(–6) cm, enclosing 1/3–1/2 of nut, outside and inside tawny tomentose, wall to 4 mm thick; bracts in 7 or 8 rings, margin entire or sinuate, basal ones free from wall. Nut oblate, 2.5–3.5 × 3.5–5 cm, pale grayish orange tomentose when young, apically and basally hairy with age, apex rounded to impressed; scar 2–2.5 cm in diam., depressed; stylopodium often deciduous. Fl. Apr–May, fr. Oct–Nov.

Dense forests in valleys; 1100–1800 m. S to W Yunnan [NE India, Laos, Myanmar, Vietnam].

25. *Cyclobalanopsis lamellosa* (Smith) Oersted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1866: 79. 1867.

薄片青冈 bao pian qing gang

Quercus lamellosa Smith in Rees, Cycl. 29: *Quercus* no. 23. 1814; *Cyclobalanopsis fengii* Hu & W. C. Cheng; *C. lamelloides* (C. C. Huang) Y. T. Chang; *C. nigrinervis* Hu; *Q. lamelloides* C. C. Huang.

Trees to 40 m tall. Branchlets tawny tomentose, glabrescent. Petiole 2–4 cm; leaf blade ovate-elliptic, 16–30(–39) × 6–8(–10) cm, leathery, abaxially pruinose or with pale brown, shortly stellate hairs and sometimes glabrescent, adaxially green and glabrous, base cuneate to subrounded, margin serrate or entire on basal 1/3, apex acuminate to caudate; midvein and secondary veins abaxially prominent but adaxially impressed; secondary veins 18–25(–33) on each side of midvein; tertiary veins abaxially conspicuous. Infructescences usually with 1–3 fruit. Cupule oblate to semiglobose, 2–3 × 3–5 cm, enclosing 2/3–4/5 or sometimes all nut, outside and inside orangish tomentose, wall 2–5 mm on sides and 3–8 mm at base; bracts in 7–10 rings, thinly lamellate, margin subentire but denticulate when ripe. Nut oblate, 2–3 × 3–4 cm, tomentose, glabrescent, apex flat, rounded, or umbonate; scar 2–3 cm in diam., flat to slightly convex; stylopodium persistent, ca. 5 mm in diam. Fl. Apr–May, fr. Nov–Dec.

Mixed mesophytic forests in mountains; 1300–2500 m. W Guangxi, Xizang, Yunnan [Bhutan, NE India, N Myanmar, Nepal, Sikkim, N Thailand].

26. *Cyclobalanopsis kerrii* (Craib) Hu, Bull. Fan Mem. Inst. Biol., Bot. 10: 106. 1940.

毛叶青冈 mao ye qing gang

Quercus kerrii Craib, Bull. Misc. Inform. Kew 1911: 471. 1911; *Q. dispar* Chun & Tsiang.

Trees to 20 m tall. Branchlets densely tawny tomentose, glabrescent or rarely remaining hairy. Petiole 1–2 cm, tomentose; leaf blade oblong-elliptic, lanceolate, or oblong-oblong-lanceolate, 9–18(–24) × 3–7(–9) cm, densely tawny tomentose when young, glabrescent, abaxially stellate hairy with age, base rounded to broadly cuneate, margin serrate on apical 2/3, apex obtuse to shortly acuminate; midvein flat or adaxially slightly raised; secondary veins 10–14 on each side of midvein; tertiary veins abaxially evident. Female inflorescences solitary, 2–5(–7) cm. Cupule discoid, 5–10 mm × 2–2.5(–3.8) cm, covering base to 1/2 of nut, outside grayish to pale brown tomentose, inside prostrate whitish puberulent, wall ca. 2 mm thick; bracts in 7–11 rings, margin denticulate or entire. Nut oblate, 0.7–1.2 × 2–2.8 cm, apex depressed to flat; scar 1–2 cm in diam., slightly convex; stylopodium persistent, umbonate, grayish sericeous-pubescent. Fl. Mar–May, fr. Oct–Nov.

Sparse forests in mountains; 100–1800 m. Guangxi, Guizhou, Hainan, Yunnan [N Thailand, Vietnam].

This species and *Cyclobalanopsis helferiana* are closely related, and the relationship between them and their distribution needs further study. As interpreted by Hjelmquist (Dansk Bot. Ark. 23(4): 505. 1968), only *C. helferiana*, and not *C. kerrii*, occurs in China.

27. *Cyclobalanopsis helferiana* (A. de Candolle) Oersted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1866: 79. 1867.

毛枝青冈 mao zhi qing gang

Quercus helferiana A. de Candolle, Prodr. 16(2): 101. 1864; *Q. prainiana* H. Léveillé.

Trees to 20 m tall. Branchlets densely pale brown tomentose, glabrescent by 3rd year. Petiole 1–2(–3) cm, pale brown tomentose; leaf blade oblong-elliptic, ovate, or elliptic-lanceolate, 12–15(–22) × 4–8(–9.5) cm, densely pale brown tomentose when young, abaxially pale grayish brown tomentose with age, adaxially glabrescent except for basal part of midvein, base broadly cuneate to rounded, margin crenate, apex acuminate to obtuse; midvein adaxially impressed; secondary veins 9–14 on each side of midvein.

Infructescences 1–2 cm; rachis ca. 2 mm thick, pubescent. Cupule discoid, 5–10 mm × 1.8–2.5 cm, enclosing 1/3–1/2 of nut, outside pale brown tomentose, wall 1.2–2 mm thick; bracts in 8–10 rings, margin denticulate to subentire. Nut oblate, 1–1.6 × 1.5–2.2 cm, gray villous, apex depressed; scar 1.2–1.4 cm in diam., flat to concave at maturity. Fl. Mar–Apr, fr. Oct–Nov. 900–2000 m. Guangdong, Guangxi, S Guizhou, S to SW Yunnan [NE India, Laos, Myanmar, N Thailand, Vietnam].

28. *Cyclobalanopsis gambleana* (A. Camus) Y. C. Hsu & H. W. Jen, Acta Phytotax. Sin. 14(2): 78. 1976.

毛曼青冈 mao man qing gang

Quercus gambleana A. Camus, Bull. Soc. Bot. France 80: 354. 1933; *Cyclobalanopsis dulongensis* H. Li & Y. C. Hsu; *C. nanchuanica* (C. C. Huang) Y. T. Chang; *C. oxyodon* (Miquel) Oersted var. *tomentosa* Hu; *Q. nanchuanica* C. C. Huang.

Trees to 20 m tall. Branchlets tomentose, glabrescent, densely lenticellate; lenticels brown, raised. Petiole 3–4 cm, grayish stellate tomentose; leaf blade oblong-elliptic to elliptic-lanceolate, 12–20 × 2–5 cm, abaxially densely pale brown stellate tomentose, base rounded to broadly cuneate, margin serrate, apex acuminate; midvein abaxially prominent and adaxially impressed; secondary veins 16–24 on each side of midvein; tertiary veins abaxially obscure. Female inflorescences borne toward the apex of new shoots, axillary, solitary, ca. 1 cm, tomentose. Cupule cupular, ca. 1 × 1.5–1.8 cm, enclosing ca. 1/2 of nut, outside pale brown tomentose, inside pale brown sericeous, wall ca. 1 mm thick; bracts in 5–7 rings, margin denticulate. Nut ovoid to ellipsoid, ca. 2 × 1.5 cm, hairy, glabrescent; scar ca. 8 mm in diam., slightly convex. Fl. Apr–May, fr. Oct–Nov.

Mixed mesophytic forests in mountains; 1100–3000 m. Guizhou, Hubei, Sichuan, Xizang, Yunnan [NE India].

29. *Cyclobalanopsis oxyodon* (Miquel) Oersted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1866: 79. 1867.

曼青冈 man qing gang

Quercus oxyodon Miquel, Ann. Mus. Bot. Lugduno-Batavi 1: 114. 1863; *Cyclobalanopsis breviradiata* W. C. Cheng ex Y. C. Hsu & H. W. Jen; *Q. fargesii* Franchet; *Q. lineata* Blume var. *grandifolia* Skan; *Q. lineata* var. *oxyodon* (Miquel) Wenzig.

Trees to 20 m tall. Branchlets tomentose, soon glabrescent. Petiole 2.5–4 cm; leaf blade elliptic to oblong-lanceolate, 12–22 × 3–8 cm, abaxially pruinose to whitish farinose and with adnate simple and furcate hairs but soon glabrescent, adaxially green, base rounded to broadly cuneate and usually oblique, margin serrate, apex acuminate to caudate; midvein abaxially prominent but adaxially impressed; secondary veins 16–24 on each side of midvein; tertiary veins abaxially inconspicuous. Female inflorescences 2–5 cm. Cupule cupular, 1.5–2 cm in diam., enclosing ca. 1/2 of nut, outside thinly grayish brown tomentose, inside white sericeous, wall less than 1 mm thick; bracts in 6–8 rings, margin dentate. Nut ovoid to subglobose, 1.5–2.2 × 1.2–1.7 cm, glabrous or rarely pilose at apex; scar ca. 8 mm in diam., slightly convex; stylopodium ca. 4 mm in diam., with 3 or 4 rings. Fl. May–Jun, fr. Sep–Oct.

Mixed mesophytic forests on mountain slopes and in valleys; 700–2800 m. Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Shaanxi, Sichuan, SE Xizang, Yunnan, Zhejiang [Bhutan, NE India, Myanmar, Nepal].

30. *Cyclobalanopsis austroglauca* Y. T. Chang ex Y. C. Hsu & H. W. Jen, Acta Bot. Yunnan. 1(1): 147. 1979.

滇南青冈 dian nan qing gang

Quercus austroglauca (Y. T. Chang ex Y. C. Hsu & H. W. Jen) Y. T. Chang.

Trees to 10 m tall. Branchlets, glabrous, lenticellate; lenticels brownish, oblong to rounded. Petiole 1.5–2.5 cm, adaxially sulcate, glabrous; leaf blade oblong-elliptic to ovate-lanceolate, 10–14 × 3.5–4.5 cm, abaxially whitish and with prostrate simple hairs or glabrous, base cuneate to slightly oblique, margin with awnlike and incurved serrations apically, apex acuminate; secondary veins 10–12 on each side of midvein; tertiary veins abaxially conspicuous. Infructescences 4–5 cm, with 2 or 3 fruit. Cupule bowl-shaped, ca. 8 mm × 1–1.8 cm, enclosing ca. 1/2 of nut, outside pale grayish brown tomentose, walls ca. 1 mm thick; bracts in 7 rings, margin of apical 1 or 2 entire, others dentate. Nut broadly ovoid, 2–2.2 cm, apex conically acuminate; scar ca. 1 cm in diam., flat; stylopodium persistent, conspicuous, pale grayish brown tomentose, with 4 or 5 glabrous rings.

• Broad-leaved evergreen forests in mountains; 800–1500 m. SE Yunnan (Xichou Xian).

31. *Cyclobalanopsis multinervis* W. C. Cheng & T. Hong in W. C. Cheng & al., Sci. Silvae 8: 10. 1963.

多脉青冈 duo mai qing gang

Cyclobalanopsis hypargyrea (Seemen) Y. C. Hsu & H. W. Jen; *Quercus glauca* Thunberg var. *hypargyrea* Seemen; *Q. hypargyrea* (Seemen) C. C. Huang & Y. T. Chang.

Trees to 12 m tall. Branchlets sulcate, lenticellate. Petiole 1–2.7 cm; leaf blade oblong-elliptic to elliptic-lanceolate, 7.5–15.5 × 2.5–5.5 cm, abaxially grayish green, waxy, and with prostrate simple hairs but glabrescent, base cuneate to subrounded, margin apical 2/3 sharply serrate, apex acute to acuminate; secondary veins 10–15 on each side of midvein; tertiary veins abaxially obscure. Infructescences 1–2 cm, 2–6-fruited. Cupule cupular, ca. 8 mm × 1–1.5 cm, enclosing less than 1/2 of nut, outside thinly grayish brown puberulent, inside whitish sericeous, wall less than 1 mm thick; bracts in 6 or 7 rings, margin subentire. Nut oblong-ovoid, ca. 1.8 × 1 cm, glabrous; scar 3–5 mm in diam., flat or convex; stylopodium persistent, ca. 1.5 mm in diam. Fr. Oct–Nov of following year from fl.

• Often in pure stands in mountains; 1000–2000 m. S Anhui, Fujian, NE Guangxi, W Hubei, Hunan, Jiangxi, Shaanxi, E Sichuan.

32. *Cyclobalanopsis yonganensis* (L. Lin & C. C. Huang) Y. C. Hsu & H. W. Jen, J. Beijing Forest. Univ. 15(4): 45. 1993.

永安青冈 yong an qing gang

Quercus yonganensis L. Lin & C. C. Huang in C. C. Huang, Guihaia 11: 10. 1991.

Trees to 20 m tall. Branchlets purplish brown, thick. Petiole 2.5–4 cm; leaf blade lanceolate to oblong, 13–18 × 4–6 cm, thickly papery, concolorous when young, abaxially glabrous but glaucous with age, base ± truncate to somewhat auriculate, margin serrulate, apex acuminate; midvein adaxially impressed; secondary veins 14–17 on each side of midvein; tertiary veins reticulate. Infructescence rachises basally ca. 5 mm thick. Cupule funnelform, 0.6–1.2 × 1.4–1.8 cm; bracts in 6 or 7 rings, margin of basal 2 or 3 rings irregularly denticulate but others entire, outside yellowish brown pilose and with scalelike trichomes, inside densely yellowish brown appressed tomentose. Nuts ovoid-ellipsoid to appressed orbicular, 1.2–1.8 × 1.4–1.8 cm; scar 6–11 mm in diam.

• Forests and forest margins in mountains; 1000–1400 m. Fujian (Yong'an Xian).

33. *Cyclobalanopsis litoralis* Chun & P. C. Tam ex Y. C. Hsu & H. W. Jen, Acta Bot. Yunnan. 1(1): 147. 1979.

尖峰青冈 jian feng qing gang

Quercus hainanica C. C. Huang & Y. T. Chang, invalid name; *Q. obconicus* Y. C. Hsu ex Z. K. Zhou.

Trees to 15 m tall; trunk to 40 cm d.b.h.; bark grayish brown. Branchlets thick, densely brown tomentose, glabrescent, lenticellate; lenticels minute, raised. Petiole 2.5–5 cm, densely brown tomentose when young but glabrescent; leaf blade elliptic, 10–20 × 5–10 cm, leathery, brown tomentose when young but glabrescent, abaxially grayish green but brownish when dry, base cuneate, margin remotely minutely serrate, apex with a short, blunt tip; midvein and secondary veins adaxially slightly raised; secondary veins 7–9 on each side of midvein; tertiary veins abaxially inconspicuous. Female inflorescences borne in axil of terminal leaf, 2–3 cm; cupules 3–5. Cupule obconic, 2–2.5 × 2.5–3.5 cm, enclosing less than 1/2 of nut, outside grayish brown tomentose, wall 3–5 mm thick; bracts in 9–12 rings, margin of basal ones entire, others denticulate and incurved. Nut ellipsoid, ca. 4.5 × 2.5–2.8 cm; scar conically convex. Fl. Dec, fr. Jun–Jul of following year.

• Mixed mesophytic forests in mountains; 900–1000 m. Hainan (Dongfang Xian).

34. *Cyclobalanopsis kiukiangensis* Y. T. Chang ex Y. C. Hsu & H. W. Jen, Acta Phytotax. Sin. 14(2): 85. 1976.

球江青冈 qiu jiang qing gang

Quercus kiukiangensis (Y. T. Chang ex Y. C. Hsu & H. W. Jen) Y. T. Chang; *Cyclobalanopsis xizangensis* Y. C. Hsu & H. W. Jen; *Q. xizangensis* (Y. C. Hsu & H. W. Jen) C. C. Huang & Y. C. Chang.

Trees to 30 m tall. Branchlets thick, densely lenticellate; lenticels brownish, raised. Petiole 1.5–2.5 cm, glabrous;

leaf blade oblong-elliptic, 10–18 × 3.5–8.5 cm, leathery, abaxially whitish, and loosely covered with simple hairs, base rounded to broadly cuneate, margin apical 1/2 with awnlike and incurved serrations, apex shortly acute, acuminate, or caudate; midvein and secondary veins abaxially prominent but adaxially impressed; secondary veins 10–13 on each side of midvein, tertiary veins abaxially slender, evident to conspicuous, parallel. Infructescence ca. 3.5 cm; rachis ca. 4 mm thick. Cupule saucer- to bowl-shaped, 1.2–1.5 × 1.8–2.2 cm, enclosing to 1/2 of nut, outside tomentose, inside whitish sericeous, wall 1.5–3 mm thick; bracts in 6–9 rings, yellowish brown tomentose, margin of basal ones loosely dentate but apical ones entire. Nut globose, ovoid, or conical, 1.5–1.7(–3) × 1.4–1.7 cm, glabrous; scar ca. 8 mm in diam., convex; stylopodium persistent, conspicuous, 3-ringed. Fr. Aug–Sep.

• Mixed mesophytic forests in mountains; 1300–2000 m. Xizang, NW Yunnan.

35. *Cyclobalanopsis bella* (Chun & Tsiang) Chun ex Y. C. Hsu & H. W. Jen, J. Beijing Forest. Univ. 15(4): 45. 1993.
榔榔青冈 *bing lang qing gang*
Quercus bella Chun & Tsiang, J. Arnold Arbor. 28: 326. 1947.

Trees to 30 m tall. Branchlets subangular, pubescent, glabrescent. Petiole 1–2 cm, glabrous; leaf blade oblong-elliptic to lanceolate, 8–15 × 2–3.5 cm, subleathery, adnate pubescent when young, glabrescent and grayish green with age, base cuneate and slightly oblique, margin apical 1/2 serrate, apex acuminate; midvein and secondary veins adaxially flat; secondary veins ca. 12 on each side of midvein and abaxially raised; tertiary veins abaxially slender, evident. Female inflorescences 1–2 cm; cupules usually 2 or 3. Cupule discoid, ca. 5 mm × 2.5–3 cm, covering base of nut, outside pale grayish brown puberulent and glabrescent, inside pale orangish brown sericeous, wall ca. 1 mm thick; bracts in 6–8 rings, margin irregularly denticulate. Nut oblate, 1.5–2 × 2.2–3 cm, pubescent when young, glabrescent; scar 1–1.4 cm in diam., depressed; stylopodium persistent, to 3 mm. Fl. Feb–Apr, fr. Oct–Dec.

• Wet forests in mountains and hills; 200–700 m. Guangdong, Guangxi, Hainan.

36. *Cyclobalanopsis blakei* (Skan) Schottky, Bot. Jahrb. Syst. 47: 649. 1912.

栎子青冈 *li zi qing gang*

Quercus blakei Skan, Hooker's Icon. Pl. 27: t. 2662. 1901; *Q. blakei* var. *parvifolia* Merrill.

Trees to 35 m tall. Branchlets glabrous; 2nd-year branchlets densely lenticellate. Petiole slender, 1.5–3 cm, glabrous; leaf blade narrowly ovate-elliptic to obovate-oblongate, 7–19 × 1.5–2 cm, subleathery, reddish tomentose when young, soon glabrescent, base cuneate, margin apical 2/3 serrate, apex acuminate; midvein adaxially raised; secondary veins 8–14 on each side of midvein and abaxially raised; tertiary veins

abaxially slender, evident. Female inflorescences 1–2 cm; cupules 1 or 2. Cupules saucer-shaped to shallowly bowl-shaped, 5–10 mm × 2–3 cm, covering base of nut, outside pale grayish brown tomentose, inside orangish brown sericeous, wall ca. 1 mm thick; bracts in 6 or 7 rings, margin entire or dentate. Nut ellipsoid to ovoid, 2.5–3.5 × 1.5–3 cm; scar 7–11 mm in diam., flat to depressed; stylopodium persistent, umbonate, base loosely pale grayish brown villous, late glabrescent. Fl. Mar, fr. Oct–Dec.

Dense forests on mountain valleys; 100–2500 m. Guangdong, Guangxi, Guizhou, Hainan [Laos, Vietnam].

Specimens from China that have been determined as *Cyclobalanopsis chrysocalyx* (Hickel & A. Camus) Hjelmquist are referable to *C. blakei*.

37. *Cyclobalanopsis phanera* (Chun) Y. C. Hsu & H. W. Jen, Acta Bot. Yunnan. 1(1): 148. 1979.

亮叶青冈 *liang ye qing gang*

Quercus phanera Chun, J. Arnold Arbor. 28: 242. 1947; *Q. basellata* Chun & W. C. Ko; *Q. insularis* Chun & P. C. Tam (1965), not Borzi (1911).

Trees to 25 m tall. Branchlets tomentose, glabrescent. Petiole 1–1.8 cm; leaf blade bright green, oblong-elliptic to somewhat obovate, 5–15 × 2–6 cm, thickly leathery, glabrous, base cuneate and oblique, margin apical 1/2 serrate, apex with a short, blunt tip; midvein abaxially prominent but adaxially flat; secondary veins 7–10 on each side of midvein; tertiary veins abaxially slender, evident. Female inflorescence ca. 5 mm, cupules usually 1. Infructescences ca. 1 cm; rachis thick, lenticellate. Cupule bowl-shaped, 1–1.5 × 1.8–2.5 cm, enclosing ca. 1/4 of nut, outside pale grayish brown velutinous, inside brown tomentose, wall 2–3 mm thick; bracts in 8–12 rings, middle 4 or 5 wider and margin deeply dentate, apical 3 narrowest. Nut cylindrical to ellipsoid, 3–4 × 2–2.5 cm, villous; scar 8–10 mm in diam., slightly convex; stylopodium persistent, ca. 3 mm in diam., base ringed. Fr. Dec–Jan.

• Mixed mesophytic forests in mountains; 900–2000 m. Guangxi, Hainan.

38. *Cyclobalanopsis edithiae* (Skan) Schottky, Bot. Jahrb. Syst. 47: 650. 1912.

华南青冈 *hua nan qing gang*

Quercus edithiae Skan, Hooker's Icon. Pl. 27: t. 2661. 1901; *Q. tephrosia* Chun & W. C. Ko.

Trees to 20 m tall. Branchlets slightly angular, glabrous; 2nd-year branchlets lenticellate; lenticels loose, small. Petiole 2–3 cm, glabrous; leaf blade oblong-elliptic to somewhat obovate, 5–16 × 2–6 cm, leathery, adaxially dark green, grayish, or whitish, base cuneate, margin apical 1/3 remotely serrulate, apex with a short, blunt tip; midvein adaxially flat; secondary veins 9–12 on each side of midvein, inconspicuous; tertiary veins abaxially conspicuous. Female inflorescences 1–2 cm; cupules 3 or 4. Infructescence rachis short, ca. 1 cm thick, with 1 or 2 fruit. Cupule bowl-shaped, 1.2–1.5 ×

1.8–2.5 cm, enclosing 1/4–1/3 of nut, outside orangish brown velutinous, inside orangish brown prostrate villous, wall 2–3 mm thick; bracts in 6–8 rings, margin of basal 2 or 3 subtire, others denticulate. Nut ellipsoid to cylindric-ellipsoid, 3–4.5 × 2–3 cm; scar ca. 7 mm in diam., slightly convex; stylopodium persistent, umbonate, puberulent. Fr. Oct–Dec.

Broad-leaved evergreen forests in mountains; 400–1800 m. Guangdong, Guangxi, Hainan [Vietnam].

39. *Cyclobalanopsis kouangsiensis* (A. Camus) Y. C. Hsu & H. W. Jen, Acta Phytotax. Sin. 14(2): 78. 1976.

广西青冈 *guang xi qing gang*

Quercus kouangsiensis A. Camus, Bull. Soc. Bot.

France 84: 176. 1937; *Q. nemoralis* Chun.

Trees to 15 m tall. Branchlets sulcate, densely tawny velutinous. Petiole 1.5–3 cm, densely light brown tomentose; leaf blade oblong-elliptic to lanceolate, 12–20 × 3.5–5.5 cm, leathery, abaxially densely pale grayish brown stellate tomentose, base cuneate and usually oblique, margin apically serrate, apex acuminate; midvein and secondary veins abaxially prominent but adaxially flat; secondary veins 10–14 on each side of midvein; tertiary veins abaxially slender, conspicuous. Female inflorescence ca. 1.5 cm; rachis brown tomentose. Cupule campanulate, ca. 2.5 × 2.5–3.4 cm, enclosing more than 1/2 of nut, outside orangish brown tomentose, inside feltlike orangish tomentose, wall ca. 1.5 mm thick; bracts in 8 or 9 rings, margin dentate. Nut cylindric-ellipsoid, ca. 5 × 2.5 cm, tomentose; scar ca. 1.5 cm in diam., slightly convex; stylopodium umbonate, ca. 3 mm. Fr. Oct.

• Wet, broad-leaved evergreen forests in mountains; 200–2000 m. Guangdong, Guangxi, Hunan, Yunnan.

40. *Cyclobalanopsis thorelii* (Hickel & A. Camus) Hu, Bull. Fan Men. Inst. Biol., Bot. 10: 106. 1940.

厚缘青冈 *hou yuan qing gang*

Quercus thorelii Hickel & A. Camus, Bull. Mus. Natl. Hist. Nat. 29: 599. 1923; *Q. hsiensiui* Chun & W. C. Ko.

Trees to 30 m tall. Branchlets sulcate, densely with tawny stellate hairs when young, glabrescent, lenticellate; lenticels whitish, small. Petiole 1–3 cm, hairy, glabrescent; leaf blade ovate to oblong-elliptic, 12–17 × 3.5–7 cm, subleathery, light orangish brown tomentose when young, glabrescent, abaxially grayish brown, adaxially bright green, base broadly cuneate to subrounded, margin entire near base but otherwise spinose serrate, apex acute to caudate; midvein adaxially raised; secondary veins 13–16 on each side of midvein, branching near margin; tertiary veins abaxially slender, evident. Cupule bowl-shaped to cupular, 1.5–2 × ca. 3 cm, enclosing most of nut and ca. 0.5 mm longer than it, apically incurved, outside and inside tawny tomentose, wall ca. 2 mm thick; bracts in 8 or 9(–12) rings, margin subtire. Nut oblate, 1–1.5 × 2.5–3 cm, densely light brown tomentose, apex depressed; scar ca. 2 cm in diam., flat. Fl. Apr, fr. Sep–Oct.

Broad-leaved evergreen forests in mountain valleys; 1000–1100 m. S Guangxi, S Yunnan [Laos, Vietnam].

41. *Cyclobalanopsis chingsiensis* (Y. T. Chang) Y. T. Chang in Y. T. Chang & Y. Q. Chen, Acta Phytotax. Sin. 34: 339. 1996.

靖西青冈 *jing xi qing gang*

Quercus chingsiensis Y. T. Chang, Acta Phytotax. Sin. 11: 258. 1966.

Trees to 15 m tall. Branchlets reddish brown, densely verrucose; lenticels brownish, elevated. Petiole slender, 1.5–2 cm; leaf blade broadly oblong-elliptic, 8–10 × 3–5 cm, subleathery, abaxially with an indument of fine yellowish brown stellate hairs when young but glabrescent, adaxially glabrous and shiny when dry, base obtusely rounded and oblique, margin subspinulose-serrate ± apically from middle, apex shortly acuminate; midvein basally canaliculate on adaxial surface; secondary veins 11–13 on each side of midvein. Cupules woody, saucer-shaped, ca. 1 × 3–3.5 cm, margin introrse, outside grayish yellow tomentulose, inside densely sericeous-tomentose, wall ca. 3 mm thick; bracts in ca. 8 rings, margin subtire. Nut strongly depressed semiglobose, ca. 7 mm × 2.5 cm, densely puberulent, apex slightly concave; scar subconvex, ca. 2.2 cm in diam.; stylopodium conically rostrate.

• Guangxi (Jingxi Xian), SW Guizhou.

42. *Cyclobalanopsis chapensis* (Hickel & A. Camus) Y. C. Hsu & H. W. Jen, Acta Phytotax. Sin. 14(2): 78. 1976.

扁果青冈 *bian guo qing gang*

Quercus chapensis Hickel & A. Camus, Bull. Mus. Natl. Hist. Nat. 29: 598. 1923; *Cyclobalanopsis koumeii* Hu; *C. shiangpyngensis* Hu.

Trees to 20 m tall. Branchlets sulcate, villous or glabrous when young, lenticellate; lenticels grayish brown, oblong. Petiole 1–2.5 cm, glabrous; leaf blade oblong-elliptic to lanceolate, 9–20 × 2–4(–5) cm, leathery to thickly papery, glabrescent, base broadly cuneate to subrounded, margin apical 2/3 serrulate, apex acuminate; midvein and secondary veins abaxially prominent, adaxially slightly raised; secondary veins 15–20 on each side of midvein; tertiary veins abaxially conspicuous. Cupule saucer-shaped, 5–12 mm × 2.5–3.5 cm, covering base of nut, outside sparsely orangish brown tomentose, inside orangish brown sericeous, wall 3–5 mm thick; bracts in 6–9 rings, margin dentate. Nut oblate, 1–2.2 × 1.5–2.7 cm, glabrous or basally pilose, base flat, apex rounded to slightly depressed; scar ca. 1.5 cm in diam., flat or depressed; stylopodium ca. 3 mm in diam., umbonate. Fr. Oct–Dec.

Wet broad-leaved evergreen forests in mountain valleys; 1300–2000 m. S to SE Yunnan [Vietnam].

43. *Cyclobalanopsis sichourensis* Hu, Acta Phytotax. Sin. 1: 152. 1951.

西畴青冈 xi chou qing gang

Quercus sichourensis (Hu) C. C. Huang & Y. T. Chang.

Trees to 20 m tall. Branchlets thick, slightly sulcate, sparsely hairy, lenticellate; lenticels grayish brown, rounded, raised. Petiole 2.5–3.5 cm, brown tomentose when young; leaf blade oblong to ovate-elliptic, 12–21 × 5–9 cm, thickly leathery, abaxially whitish, pilose, and barbate in vein axils, adaxially bright green, base rounded to broadly cuneate, margin beyond basal 1/4 remotely serrate, apex shortly acute; midvein adaxially impressed; secondary veins 15–18 on each side of midvein; tertiary veins abaxially conspicuous. Cupule oblate, ca. 2.5 × 3.5–5 cm, enclosing nearly all of nut, outside pale brown tomentose, inside pale orangish brown sericeous, wall ca. 1.5 mm thick; bracts in 9 or 10 rings, margin dentate. Nut oblate, ca. 2 × 3–4 cm, pale orangish tomentose, apex impressed and umbonate; scar slightly narrower than nut diam., convex.

• Broad-leaved evergreen forests in mountains; 800–1500 m. SE Yunnan.

44. *Cyclobalanopsis argyrotricha* (A. Camus) Chun & Y. T. Chang ex Y. C. Hsu & H. W. Jen, J. Beijing Forest. Univ. 15(4): 45. 1993.

贵州青冈 gui zhou qing gang

Quercus argyrotricha A. Camus, Bull. Mus. Natl. Hist. Nat., sér. 2, 3: 689. 1931.

Trees. Branchlets yellowish brown tomentose when young, glabrescent. Petiole 1–2 cm, tomentose when young, glabrescent; leaf blade ovate to obovate-elliptic, 6.5–12 × 2–4.5 cm, leathery, abaxially yellowish gray and with stellate velutinous hairs, adaxially bright green, base rounded and oblique, margin remotely minutely serrate, apex acuminate, mucronate; midvein and secondary veins adaxially flat; secondary veins 9–14 on each side of midvein; tertiary veins obscure on both surfaces. Infructescences less than 1 cm, 1-fruited. Cupule cupular, 5–7 mm × 1–1.7 cm, enclosing ca. 1/2 of nut, outside golden tomentose, inside yellowish brown sericeous, wall ca. 2 mm thick; bracts in 6 or 7(–9) rings. Nut broadly ovoid, 0.8–1.5 cm, golden tomentose, apex rounded; stylopodium persistent, 3-lobed.

• Broad-leaved evergreen forests on mountain slopes and in valleys; ca. 1600 m. Guizhou.

45. *Cyclobalanopsis ningangensis* W. C. Cheng & Y. C. Hsu in Y. C. Hsu & H. W. Jen, Acta Bot. Yunnan. 1(1): 146. 1979.

宁冈青冈 ning gang qing gang

Quercus ningangensis (W. C. Cheng & Y. C. Hsu) C. C. Huang.

Trees to 15 m tall. Branchlets gray, sparsely hairy. Petiole 1.5–3 cm, dark when dry, basally tomentose; leaf blade oblong-elliptic, elliptic, or ovate-lanceolate, 8–13 × 2–4 cm, abaxially densely with gray, shortly stellate hairs, base rounded to broadly cuneate, margin glandular serrate, apex acuminate to caudate; midvein

impressed; secondary veins 13–15 on each side of midvein, adaxially slightly raised, fusing at serration. Female inflorescences borne in axil of a higher leaf, solitary, 1.5–2 cm, cupules 7–10 but usually only 2 or 3 fertile. Cupule cupular, ca. 5 mm × 1 cm, outside sparsely gray hairy, inside gray sericeous, wall ca. 1 mm thick; bracts in 6 or 7 rings. Nut tawny, oblong-ellipsoid, 1.5–2 × 0.8–1.2 cm, glabrous; scar ca. 5 mm in diam., subrounded; stylopodium persistent, conspicuous.

• Guangxi, Hunan, Jiangxi.

46. *Cyclobalanopsis pentacycla* (Y. T. Chang) Y. T. Chang ex Y. C. Hsu & H. W. Jen, Acta Phytotax. Sin. 14(2): 79. 1976.

五环青冈 wu huan qing gang

Quercus pentacycla Y. T. Chang, Acta Phytotax. Sin. 11: 256. 1966.

Trees to 15 m tall. Branchlets thick, grayish brown, glabrous, sparsely lenticellate; lenticels gray. Petiole 1.5–2 cm, sulcate, glabrous; leaf blade ovate-elliptic, 10–14 × 4–6 cm, leathery, abaxially whitish chaffy or with prostrate simple hairs, adaxially green and glabrous, base subrounded and slightly oblique, margin serrulate, apex acute to shortly acuminate; secondary veins 13–15 on each side of midvein; tertiary veins abaxially slender, evident. Cupule obconic, ca. 6 mm × 1.2 cm, enclosing 1/3–1/2 of nut, outside whitish tomentose, inside prostrate sericeous, wall ca. 1 mm thick; bracts in (4 or)5 rings, margin dentate. Nut reddish brown, ovoid-ellipsoid, ca. 1.7 × 1.2 cm, shiny; scar ca. 7 mm in diam., convex; stylopodium ca. 2.5 mm in diam. Fr. Nov.

• Mixed mesophytic forests in mountains; 1400–1500 m. SE Yunnan (Malipo Xian).

47. *Cyclobalanopsis stenophylloides* (Hayata) Kudo & Masamune in Kudo, Trans Nat. Hist. Soc. Taiwan 20: 162. 1930.

台湾窄叶青冈 tai wan zhai ye qing gang

Quercus stenophylloides Hayata, Icon. Pl. Formosan. 4: 21. 1914; *Cyclobalanopsis stenophylla* (Blume)

Schottky var. *stenophylloides* (Hayata) J. C. Liao; *Q. salicina* Blume var. *stenophylloides* (Hayata) S. S. Ying; *Q. stenophylla* (Blume) Makino var. *stenophylloides* (Hayata) A. Camus.

Trees to 17 m tall. Branchlets slender, gray, glabrous. Petiole 1.5–2 cm, glabrous; leaf blade oblong-elliptic to lanceolate, 7–12 × 1.5–3.5 cm, leathery, abaxially farinose and with prostrate simple hairs but usually glabrescent, adaxially green, base narrowly acute to rounded, margin with short, awnlike serrations, apex acuminate to caudate; secondary veins 11–13 on each side of midvein, extending into serration; tertiary veins abaxially inconspicuous to obscure. Female inflorescences 2–2.5 cm, cupules 6 or 7. Cupule cupular, 1–1.5 × ca. 1.2 cm, enclosing ca. 1/2 or less of nut, outside and inside grayish velutinous, wall less than 1 mm thick; bracts in 6 or 8 rings, margin dentate. Nut

ellipsoid, 1.7–2 × ca. 1.5 cm, glabrous; scar ca. 5 mm in diam., flat; stylopodium persistent, conspicuous, 3-ringed. Fl. Apr–May, fr. Sep–Oct of following year.

• Broad-leaved evergreen forests in mountains; (500–)1100–2600 m. C to N Taiwan.

The Japanese *Cyclobalanopsis salicina* (Blume) Oersted has been reported in Taiwan (J. C. Liao, Fl. Taiwan, ed. 2, 2: 84. 1996). *Cyclobalanopsis salicina* and *C. stenophylloides* are very closely related, but the plants in Taiwan are apparently populations of *C. stenophylloides* growing on sandstone ridges at lower elevations than is typical for this species.

48. *Cyclobalanopsis gracilis* (Rehder & E. H. Wilson) W. C. Cheng & T. Hong in W. C. Cheng & al., Sci. Silvae 8: 11. 1963.

细叶青冈 xi ye qing gang

Quercus glauca Thunberg f. *gracilis* Rehder & E. H. Wilson in Sargent, Pl. Wilson. 3: 228. 1916;

Cyclobalanopsis glauca (Thunberg) Oersted var.

gracilis (Rehder & E. H. Wilson) Y. T. Chang; *C.*

pseudoglauca Y. K. Li & X. M. Wang; *C. shennongii*

(C. C. Huang & S. H. Fu) Y. C. Hsu & H. W. Jen; *Q.*

ciliaris C. C. Huang & Y. T. Chang; *Q. gracilis*

(Rehder & E. H. Wilson) Wuzhi (1976), not Korthals

(1844) nor Lange (1865); *Q. liboensis* Z. K. Zhou; *Q.*

shennongii C. C. Huang & S. H. Fu.

Trees to 15 m tall. Branchlets tomentose when young, glabrescent. Petiole 1–1.5 cm; leaf blade oblong-ovate to ovate-lanceolate, 4.5–9 × 1.5–3 cm, abaxially whitish and with prostrate simple hairs, adaxially bright green, base cuneate to subrounded, margin apical 2/3 sharply serrulate, apex acuminate to caudate; secondary veins 7–13 on each side of midvein, slender, inconspicuous (especially near margin); tertiary veins abaxially inconspicuous. Female inflorescences 1–1.5 cm, rachis and bracts tomentose; cupules 2 or 3, borne apically. Cupule bowl-shaped, 6–8 mm × 1–1.3 cm, enclosing 1/3–1/2 of nut, outside and inside with prostrate grayish brown tomentose hairs; bracts in 6–9 rings, margin of basal 2 conspicuously dentate, others denticulate. Nut ellipsoid, 1.5–2 × ca. 1 cm, apex hairy; scar ca. 5 mm in diam., slightly convex; stylopodium persistent, short. Fl. Apr–Jun, fr. Oct–Nov.

• Mixed mesophytic forests in mountains; 500–2600 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, W Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Zhejiang.

Part of the *Cyclobalanopsis glauca* complex but with smaller leaves than is typical for that species. *C. gracilis* could nevertheless be treated as conspecific with *C. glauca*.

49. *Cyclobalanopsis glauca* (Thunberg) Oersted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1866: 78. 1867.

青冈 qing gang

Quercus glauca Thunberg in Murray, Syst. Veg., ed. 14, 858. 1784; *Cyclobalanopsis glauca* var. *kuyuensis* (J. C. Liao) J. C. Liao; *C. repandifolia* (J. C. Liao) J. C. Liao; *Q. glauca* var. *kuyuensis* J. C. Liao; *Q. longipes* Hu; *Q.*

repandifolia J. C. Liao; *Q. sasakii* Kanehira; *Q. vaniotii* H. Léveillé.

Trees to 20 m tall. Branchlets glabrous. Petiole 1–3 cm; leaf blade obovate to oblong-elliptic, 6–13 × 2–5.5 cm, often wider apically from middle, leathery, abaxially often becoming pruinous and with prostrate white simple or scalelike hairs but glabrescent, adaxially glabrous, base rounded to broadly cuneate, margin apical 1/2 remotely serrate, apex acuminate to somewhat caudate; secondary veins 9–13 on each side of midvein; tertiary veins abaxially inconspicuous. Infructescences 1.5–3 cm, with 2 or 3 fruit. Cupule bowl-shaped, 6–8 mm × 0.9–1.4 cm, enclosing 1/3–1/2 of nut, outside white puberulent or glabrous, inside white sericeous; bracts in 5 or 6 rings, crowded, margin entire or denticulate. Nut ovoid, oblong-ovoid, or ellipsoid, 1–1.6 × 0.9–1.4 cm, glabrous or rarely hairy; scar ca. 5 mm in diam., flat or slightly convex. Fl. Apr–May, fr. Oct.

Broad-leaved evergreen forests and mixed mesophytic forests on mountain slopes or in valleys; below 100–2600 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Xizang, Yunnan, Zhejiang [Afghanistan, Bhutan, N India, Japan, Kashmir, Korea, Nepal, Sikkim, Vietnam].

Cyclobalanopsis glauca is part of a widespread complex, with a number of segregate species of uncertain status having been named. Additional studies are needed to clarify the relationships and specific limits within this complex. The status of *C. globosa* Lin & Liu (Bull. Taiwan For. Res. Inst. 110: 27. 1965), from Taiwan, is uncertain. It is very close to *C. glauca* and is probably not sufficiently distinct to be recognized as a separate species.

50. *Cyclobalanopsis lungmaiensis* Hu, Acta Phytotax. Sin. 1: 154. 1951.

龙迈青冈 long mai qing gang

Quercus lungmaiensis (Hu) C. C. Huang & Y. T.

Chang; *Cyclobalanopsis fulviseriaca* Y. C. Hsu & D. M.

Wang; *C. longifolia* Y. C. Hsu & Q. Z. Dong; *Q.*

fulviseriaca (Y. C. Hsu & D. M. Wang) Z. K. Zhou; *Q.*

yongchunana Z. K. Zhou.

Trees to 30 m tall. Branchlets conspicuously sulcate, glabrous. Petiole 2–2.5(–4) cm, adaxially sulcate, glabrous; leaf blade green, oblong, obovate-elliptic, or ovate-lanceolate, 9.5–11.5 × 3–4 cm, subleathery, abaxially grayish green and with simple hairs or glabrous, adaxially green and glabrous, base cuneate to subrounded, margin basally entire but apically awnlike serrate, apex acuminate to caudate; midvein abaxially prominent and adaxially impressed; secondary veins 13–17 on each side of midvein; tertiary veins abaxially conspicuous. Female inflorescences ca. 2.5 cm; rachis slender, sparsely tomentose. Cupule bowl-shaped, 0.7–1 × ca. 1.5 cm, enclosing 1/3–1/2 of nut, outside sparsely tomentose; bracts in 7–9 rings, margin of basal ones 1 or 2 denticulate, others subtire to repand-dentate. Nut broadly ovoid to oblate, 1.2–2 cm, apex

flat or depressed and velutinous; scar flat and rounded. Fl. Mar–Apr, fr. Oct.

• Rocky mountains; 1100–1300 m. SE Yunnan.

51. *Cyclobalanopsis annulata* (Smith) Oersted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1866: 70. 1867. 环青冈 huan qing gang

Quercus annulata Smith in Rees, Cycl. 29: *Quercus* no. 22. 1814; *Q. glauca* Thunberg var. *annulata* (Smith) A. Camus.

Trees to 15 m tall. Branchlets grayish brown, sulcate and convex lenticellate, cylindrical and dark gray by 2nd year. Leaf blade oblong-elliptic, elliptic, or ovate-lanceolate, 9–13 × 3.5–5 cm, abaxially whitish and veins grayish brown (whitish on tertiary veins) with prostrate simple hairs, adaxially smooth, base broadly cuneate to subrounded, margin awnlike serrate to sharply serrulate, apex acuminate to caudate; midvein and secondary veins adaxially impressed; secondary veins 10–14 on each side of midvein, often fusing at serration; tertiary veins abaxially prominent. Infructescences solitary, subapical on branchlet, 1–2 cm, 3–5-fruited. Cupule shallowly bowl-shaped, 6–8 mm × 1.2–1.5 cm, outside thinly grayish brown pubescent, inside grayish brown sericeous, wall ca. 1 mm thick; bracts in 7–9 rings, margin entire. Nut ovoid, 1.2–1.5 × 1.1–1.4 cm, loosely incanous; stigmas 3 or 4, often separated; scar 6–7 mm in diam., convex; stylopodium persistent, often basally 4-ringed. Fl. Mar–Apr, fr. Oct–Nov.

Broad-leaved evergreen forests in mountains. W Sichuan, E Xizang, W to SW Yunnan [Nepal].

The type is from Nepal, and specimens from the Himalayas as well as from Vietnam have sometimes been included under this name. This species is questionably distinct from *Cyclobalanopsis glauca*, and further studies may show that they are conspecific.

52. *Cyclobalanopsis morii* (Hayata) Schottky, Bot. Jahrb. Syst. 47: 658. 1921.

台湾青冈 tai wan qing gang

Quercus morii Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(1): 293. 1911.

Trees to 30 m tall. Branchlets thick, glabrous or arachnoid hairy when young, conspicuously lenticellate. Petiole 1.5–3 cm, glabrous; leaf blade oblong to ovate-elliptic, 6–10 × 2.5–4 cm, glabrous or sparsely sericeous when young, base subrounded to broadly cuneate and slightly oblique, margin apical 1/2 serrate, apex caudate; midvein and secondary veins abaxially prominent, adaxially flat or slightly impressed; secondary veins 8–11 on each side of midvein; tertiary veins abaxially slender, evident. Infructescence 2–3 cm; rachis glabrous, lenticellate. Cupule cupular to campanulate, 1.4–1.8 × 1.5–2 cm, enclosing ca. 1/2 of nut, outside brown velutinous, inside brown tomentose, wall ca. 1 mm thick; bracts in 7 or 8 rings, basal ones divergent from cupule wall, apical ones with margin

dentate and apex obtuse. Nut ovoid to cylindrical, 1.5–2.5 × 1–1.8 cm, glabrous or rarely hairy, apex rounded; scar ca. 1 cm in diam., flat or slightly convex; stylopodium persistent, ca. 1 mm in diam. Fl. Apr–May, fr. Oct–Nov of following year.

• Broad-leaved evergreen forests in mountains; 1600–2600 m. Taiwan.

53. *Cyclobalanopsis disciformis* (Chun & Tsiang) Y. C. Hsu & H. W. Jen, Acta Bot. Yunnan. 1(1): 148. 1979.

碟斗青冈 die dou qing gang

Quercus disciformis Chun & Tsiang, J. Arnold Arbor. 28: 324. 1947; *Q. shingjenensis* Y. T. Chang.

Trees 10–14 m tall. Branchlet tawny velutinous, glabrescent. Petiole ca. 2 cm, tawny tomentose when young, glabrescent; leaf blade oblong to obovate-elliptic, 6–13 × 2.5–4 cm, subleathery, glabrescent, base broadly cuneate to subrounded and often oblique, margin serrations incurved and shortly aristate, apex acuminate to caudate; midvein abaxially prominent but adaxially impressed; secondary veins 11–13 on each side of midvein, slender, evident, curving; tertiary veins abaxially conspicuous. Infructescences ca. 5 mm. Cupule discoid, rim flat when ripe, 3–4 cm in diam., covering base of nut, outside densely prostrate grayish brown tomentose, inside with an erect orangish brown feltlike tomentum, wall ca. 4 mm thick; bracts in 8–10 rings, margin denticulate but apical 2 or 3 entire. Nut oblate, 1.5–2 × ca. 2 cm, apex flattened; scar ca. 2 cm in diam., depressed; stylopodium persistent, raised, puberulent. Fl. Mar–Apr, fr. Aug–Dec of following year.

• Broad-leaved evergreen forests in mountains; 200–1500 m. SW Guangdong, Guangxi, Guizhou, Hainan, Hunan.

54. *Cyclobalanopsis austrocochinchinensis* (Hickel & A. Camus) Hjelmquist, Dansk Bot. Ark. 23(4): 503. 1968.

越南青冈 yue nan qing gang

Quercus austrocochinchinensis Hickel & A. Camus, Ann. Sci. Nat., Bot., sér. 10, 3: 386. 1921.

Trees to 15 m tall. Branchlets brownish, with stellate hairs, glabrescent, lenticellate; lenticels brownish, oblong. Petiole 1–2 cm, with stellate hairs, glabrescent; leaf blade green, oblong-elliptic to lanceolate, 10–17(–20) × 3–5 cm, thinly leathery, pubescent when young, glabrescent, base cuneate, margin beyond basal 1/3 remotely minutely serrate, apex shortly acute to acuminate; secondary veins 12–17 on each side of midvein, adaxially slightly raised; tertiary veins abaxially conspicuous. Cupule cupular, 1.3–1.5 × 1.5–1.8 cm, enclosing all but nut apex, outside and inside tawny tomentose, wall ca. 2 cm thick; bracts in 8–10 rings, margin dentate. Nut oblate, 1.1–1.4 × 1.3–1.8 cm, angular, yellowish brown tomentose, apex rounded; scar ca. 1.2 cm in diam., as large as nut base, flat; stylopodium persistent.

Sparse forests in mountain valleys and on river banks; 700–1000 m. Yunnan [Thailand, Vietnam].

55. *Cyclobalanopsis subhinoidea* (Chun & W. C. Ko) Y. C. Hsu & H. W. Jen ex Y. T. Chang in Y. T. Chang & Y. Q. Chen, *Acta Phytotax. Sin.* 34: 339. 1996.

鹿茸青冈 *lu rong qing gang*

Quercus subhinoidea Chun & W. C. Ko in Chun & F. C. How, *Acta Phytotax. Sin.* 7: 39. 1958.

Trees to 13 m tall. Branchlets with yellowish brown, 6–8-furcate, stellate tomentose hairs when young, soon glabrescent; dark brown and sparsely lenticellate with age. Petiole 1.5–2 cm, tomentose, glabrescent; leaf blade grayish green, oblong to lanceolate-elliptic, 7–12 × 2.5–4 cm, subleathery, glabrous, base broadly cuneate and sometimes oblique, margin sharply serrate with serrate points callose, apex acuminate to somewhat caudate; midvein adaxially raised; secondary veins (15–)17–22 on each side of midvein, fusing at serration; tertiary veins abaxially conspicuous. Cupule saucer-shaped, 1–1.5 × ca. 3 cm, outside velutinous; bracts in 8 or 9 rings, basal ones wider and erose, middle 3 or 4 denser, apical ones incurved at cupule rim. Nut obovate, 1–1.5 × 2.5–3 cm, apex impressed; scar ca. 1.8 cm in diam., convex; stylopodium persistent, umbonate, yellowish gray puberulent. Fr. Aug–Dec (on 1-year-old branchlets).

• Dense forests in mountain valleys; 300–500 m. Hainan (Ledong Xian).

56. *Cyclobalanopsis elevaticostata* Q. F. Zheng, *Acta Phytotax. Sin.* 17(3): 118. 1979.

突脉青冈 *tu mai qing gang*

Quercus elevaticostata (Q. F. Zheng) C. C. Huang.

Trees to 20 m tall. Branchlets purple-brown, minutely sulcate, glabrous, sparsely lenticellate; lenticels whitish, small. Petiole 1–2.5 cm; leaf blade narrowly elliptic to elliptic-lanceolate, (5–)8–15 × (1.5–)2.5–4 cm (to ca. 20 × 5.5 cm in budding shoot), glabrous, abaxially grayish green, adaxially green, base cuneate and decurrent on petiole, margin from middle or apically remotely and sharply serrate and sometimes glandular at serration, apex acuminate; midvein and secondary veins prominent; secondary veins 8–12 on each side of midvein. Cupule shallowly cupular, 6–8 mm × 1–1.2 cm, enclosing ca. 1/3 of nut, outside yellowish gray velutinous; bracts in (5–)7 or 8 rings, margin irregularly crenate-dentate but apical 2 or 3 entire. Nut ellipsoid to ovoid-ellipsoid, 1.5–2.2 × 1–1.2 cm, yellowish brown puberulent near apex; scar ca. 5 mm in diam., slightly convex; stylopodium persistent, 1–1.5 mm, 4- or 5-ringed, umbonate. Fr. Nov.

• 600–1000 m. Fujian.

57. *Cyclobalanopsis patelliformis* (Chun) Y. C. Hsu & H. W. Jen, *J. Beijing Forest. Univ.* 15(4): 45. 1993.

托盘青冈 *tuo pan qing gang*

Quercus patelliformis Chun, *J. Arnold Arbor.* 28: 241. 1947.

Trees to 15 m tall. Branchlets conspicuously angular when young; grayish brown, sparsely lenticellate by 2nd year, glabrous. Petiole 2–4.5 cm; leaf blade elliptic, oblong-elliptic, or ovate-lanceolate, 5–12 × 2.5–6 cm, leathery, abaxially grayish green and with stellate hairs when young but glabrescent, adaxially dark green, base cuneate to rarely subrounded and sometimes oblique, margin shortly and sharply serrate with serration somewhat incurved, apex acuminate; midvein adaxially flat; secondary veins 9–11 on each side of midvein; tertiary veins abaxially very slender, inconspicuous to evident. Female inflorescence 2–3 cm; cupules 3–5. Fruit solitary. Cupule shallowly cupular, 6–8 mm or rarely shallower, 2–3 cm in diam., enclosing ca. 1/3 of nut, outside pale grayish brown puberulent, inside pale orangish brown sericeous, wall ca. 3 mm thick; bracts in 8 or 9 rings, margin dentate but apical 2 or 3 entire. Nut obovate, 2–2.5 × 2.5–2.8 cm, grayish brown puberulent; scar 1.5–2 cm in diam., impressed or flat; stylopodium persistent, ca. 4 cm in diam. Fl. May–Jun, fr. Oct–Nov of following year.

• Wet broad-leaved evergreen forests in mountains; 400–1000 m. Guangdong, Guangxi, Hainan, S Jiangxi.

58. *Cyclobalanopsis yingjiangensis* Y. C. Hsu & Q. Z. Dong in Y. C. Hsu & B. S. Sun, *Acta Bot. Yunnan.* 5: 341. 1983.

盈江青冈 *ying jiang qing gang*

Trees to 20 m tall. Branchlets slender, dark purple when dry, slightly sulcate, subglabrous, lenticellate; lenticels gray. Petiole slender, 1–1.5 cm; leaf blade ovate-lanceolate, 9–12 × 3–4 cm, abaxially green, farinose, sparsely with stellate hairs, and glabrescent, base rounded to broadly cuneate and sometimes oblique, margin serrate, apex acuminate. Fruit solitary. Cupule saucer-shaped, ca. 3 cm in diam., wall ca. 2 mm thick. Nut ovoid-conical, ca. 2 × 3 cm.

• Mountains; ca. 2500 m. W Yunnan (Yingjiang Xian).

59. *Cyclobalanopsis stewardiana* (A. Camus) Y. C. Hsu & H. W. Jen, *Acta Bot. Yunnan.* 1(1): 148. 1979.

褐叶青冈 *he ye qing gang*

Quercus stewardiana A. Camus, *Chênes, Atlas* 1: 12. 1934; *Cyclobalanopsis stewardiana* var. *longicaudata* Y. C. Hsu & al.

Trees to 12 m tall. Branchlets glabrous. Petiole 1.5–3 cm, glabrous; leaf blade elliptic-lanceolate to oblong-elliptic, 6–12 × 2–4 cm, sericeous and simple hairy when young, abaxially whitish (browning when dry) and sparsely hairy or glabrescent, adaxially dark green, base cuneate, margin apical 1/2 remotely shallowly serrate, apex acuminate to caudate; secondary veins 8–10 on each side of midvein, abaxially prominent, and adaxially inconspicuous; tertiary veins abaxially inconspicuous. Female inflorescences borne in axil of new shoots, solitary, ca. 2 cm; rachis and bracts brown

tomentose. Cupule cupular, 6–8 mm × 1–1.5 cm, enclosing ca. 1/2 of nut, outside whitish pilose but glabrescent, inside grayish brown tomentose; bracts in 5–9 rings, loosely arranged, margin dentate. Nut broadly ovoid, 0.8–1.5 cm, glabrous; scar ca. 5 mm in diam., convex; stylopodium persistent, ca. 2 mm in diam. Fl. Jul, fr. Oct of following year.

• Mixed mesophytic forests on mountain tops and slopes; 1000–2800 m. Anhui, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Yunnan, Zhejiang.

60. *Cyclobalanopsis longinix* (Hayata) Schottky, Bot. Jahrb. Syst. 47: 657. 1912.

长果青冈 *chang guo qing gang*

Quercus longinix Hayata, J. Coll. Sci. Univ. Tokyo 30(1): 292. 1911; *Cyclobalanopsis longinix* var. *kuoi* J. C. Liao; *C. longinix* var. *lativiolaefolia* J. C. Liao; *C. longinix* var. *pseudomyrsinifolia* (Hayata) J. C. Liao; *Q. pseudomyrsinifolia* Hayata; *Q. taichuensis* Hayata.

Trees. Branchlets glabrous, lenticellate; lenticels oblong. Petiole 1–2 cm, glabrous; leaf blade ovate-lanceolate to narrowly oblong-elliptic, 6–8 × 2–2.5 cm, abaxially farinose or with adnate simple hairs, adaxially bright green, base cuneate, margin apical 1/2 serrate, apex acuminate to caudate; secondary veins 7–9 on each side of midvein. Cupule bowl-shaped, 8–9 mm × 1–1.2 cm, enclosing ca. 1/2 of nut, outside grayish brown tomentose, wall thin; bracts in 6–8 rings, margin dentate. Nut ovoid to ovoid-ellipsoid, ca. 1.2 × 0.9 cm; scar convex; stylopodium persistent, short. Fl. Mar–May, fr. Sep–Nov.

• Broad-leaved evergreen forests in mountains; 300–2500 m. Taiwan.

61. *Cyclobalanopsis myrsinifolia* (Blume) Oersted, Skr. Vidensk.-Selsk. Christiana, Math.-Naturvidens 9(6): 387. 1871.

小叶青冈 *xiao ye qing gang*

Quercus myrsinifolia Blume, Mus. Bot. 1: 305. 1850; *Q. bambusifolia* Fortune.

Trees to 20 m tall. Branchlets glabrous, lenticellate; lenticels grayish brown, oblong, convex. Petiole 1–2.5 cm, glabrous; leaf blade ovate to elliptic-lanceolate, 6–11 × 1.8–4 cm, abaxially whitish farinose but dark gray when dry, adaxially green and glabrous, base cuneate to subrounded, margin apical 1/2 serrulate, apex acuminate to shortly caudate; secondary veins 9–14 on each side of midvein, usually almost reaching margin but not fusing; tertiary veins abaxially inconspicuous. Female inflorescences 1.5–3 cm. Cupule cupular, 5–8 mm × 1–1.8 cm, enclosing 1/3–1/2 of nut, outside whitish pubescent, inside glabrous, wall less than 1 mm thick; bracts in 6–9 rings, margin entire. Nut ovoid to ellipsoid, 1.4–2.5 × 1–1.5 cm, glabrous, apex rounded; scar ca. 6 mm in diam., flat; stylopodium conspicuous, 5- or 6-ringed. Fl. Jun, fr. Oct.

Mixed mesophytic forests in mountain valleys; 200–2500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Henan, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan, Korea, Laos, N Thailand, Vietnam].

The occurrence of *Cyclobalanopsis myrsinifolia* in Taiwan as a native, rather than an introduced and cultivated species, is uncertain.

62. *Cyclobalanopsis gilva* (Blume) Oersted, Vidensk. Meddel. Dansk Naturhist. Foren. Kjøbenhavn 1866: 78. 1867.

赤皮青冈 *chi pi qing gang*

Quercus gilva Blume, Mus. Bot. 1: 306. 1850; *Cyclobalanopsis hunanensis* (Handel-Mazzetti) W. C. Cheng & T. Hong; *Q. hunanensis* Handel-Mazzetti.

Trees to 30 m tall. Branchlets densely pale orangish brown to tawny stellate tomentose. Petiole 1–1.5 cm, puberulent; leaf blade oblanceolate to obovate-elliptic, 6–12 × 2–3.5 cm, abaxially pale brown stellate velutinous, base cuneate, margin apical 1/2 with short, awnlike serrations, apex acuminate; secondary veins 11–18 on each side of midvein, abaxially slightly raised; tertiary veins abaxially obscure. Female inflorescence ca. 1 cm, rachis and bracts densely pale orangish brown tomentose; cupules usually 2. Cupule bowl-shaped, 6–8 mm × 1.1–1.5 cm, enclosing ca. 1/4 of nut, outside and inside pale grayish brown puberulent, wall ca. 1 mm thick; bracts in 6 or 7 rings, margin entire or denticulate. Nut obovoid-ellipsoid, 1.5–2 × 1–1.3 cm, apex puberulent; scar 5–6 mm in diam., slightly raised; stylopodium persistent, puberulent. Fl. May, fr. Oct.

Broad-leaved evergreen forests in mountains; 300–1500 m. Fujian, Guangdong, Guizhou, Hunan, Taiwan, Zhejiang [Japan].

63. *Cyclobalanopsis pachyloma* (Seemen) Schottky, Bot. Jahrb. Syst. 47: 650. 1912.

毛果青冈 *mao guo qing gang*

Quercus pachyloma Seemen, Bot. Jahrb. Syst. 23(Beibl. 57): 54. 1897; *Cyclobalanopsis pachyloma* var. *mubianensis* Y. C. Hsu & H. W. Jen; *C. pachyloma* var. *tomentosicupula* (Hayata) J. C. Liao; *Q. conduplicans* Chun; *Q. gracilentata* Chun; *Q. pachyloma* var. *mubianensis* (Y. C. Hsu & H. W. Jen) C. C. Huang; *Q. tomentosicupula* Hayata.

Trees to 17 m tall. Branchlets orangish brown tomentose, glabrescent. Petiole 1.5–2 cm; leaf blade obovate, oblong-elliptic, or lanceolate, 7–14 × 2–5 cm, leathery, orangish woolly hairy when young, glabrescent, base cuneate, margin apical 1/2 remotely serrate, apex acuminate to caudate; secondary veins 8–11 on each side of midvein; tertiary veins abaxially slender, evident. Female inflorescences 1.5–3 cm, densely brown tomentose, with 2–5 cupules. Cupule semiglobose to campanulate, (1–)2–3 × 1.5–3 cm, enclosing ca. 1/3–2/3 of nut, outside usually densely tawny, tomentose, inside tawny thickly feltlike tomentose, wall ca. 1.5 mm thick; bracts in 7 or 8 rings, margin entire or dentate. Nut ellipsoid, oblong-ellipsoid, or obovoid, 1.2–1.6 cm in diam., densely tawny tomentose when young but glabrescent, apex rounded;

scar 5–7 mm in diam., slightly convex; stylopodium persistent, 2–3 cm in diam. Fl. Mar, fr. Sep–Oct.

• Wet forests on mountain slopes and in valleys; 200–1000 m. Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Taiwan, Yunnan.

64. *Cyclobalanopsis lobbii* (J. D. Hooker & Thomson ex Wenzig) Y. C. Hsu & H. W. Jen, Acta Bot. Yunnan. 1(1): 148. 1979.

滇西青冈 dian xi qing gang

Quercus lineata Blume var. *lobbii* J. D. Hooker & Thomson ex Wenzig, Jahrb. Königl. Bot. Gart. Berlin 4: 232. 1886; *Cyclobalanopsis lineata* (Blume) Oersted var. *lobbii* (J. D. Hooker & Thomson ex Wenzig) Schottky; *Q. lobbii* (J. D. Hooker & Thomson ex Wenzig) A. Camus.

Trees to 15 m tall. Branchlets glabrous, lenticellate; lenticels grayish brown, rounded. Petiole 1.5–2 cm, glabrous; leaf blade oblong-elliptic to rarely obovate, 7–13 × 3–5 cm, subleathery, abaxially whitish and with stellate hairs, adaxially glabrous, base narrowly rounded to cuneate, margin sharply serrate, apex acuminate; secondary veins 13–16 on each side of midvein, abaxially prominent, adaxially flat or slightly raised. Cupule bowl-shaped, ca. 8 mm × 1.5 cm, enclosing 1/3–1/2 of nut, outside whitish tomentose; bracts in 6–8 rings, margin dentate. Nut broadly ovoid, ca. 1.5 × 1.2 cm, glabrous, apex flat; scar slightly convex.

Quercus and *Pinus* forests in mountains; 2800–3300 m. W Yunnan [NE India].

65. *Cyclobalanopsis poilanei* (Hickel & A. Camus) Hjelmquist, Dansk Bot. Ark. 23(4): 508. 1968.

黄背青冈 huang bei qing gang

Quercus poilanei Hickel & A. Camus, Ann. Sci. Nat., Bot., sér. 10, 3: 384. 1921.

Trees to 16 m tall. Branchlets densely pale orangish brown feltlike tomentose. Petiole 1–1.5 cm, tawny tomentose when young, glabrescent; leaf blade elliptic to obovate-elliptic, 4–8 × 3–6 cm, tawny stellate tomentose when young, abaxially hairs persisting or glabrescent, adaxially glabrescent, base rounded to broadly cuneate, margin apically few serrulate or entire, apex acuminate to shortly caudate; secondary veins 10–15 on each side of midvein, adaxially impressed; tertiary veins abaxially conspicuous to inconspicuous, ± parallel. Female inflorescences borne apically on new shoots, 1–2 cm; cupules 3–7. Cupule shallowly bowl-shaped, ca. 8 mm × 1.5–1.8 cm, enclosing 1/4–1/3 of nut, outside tawny to ashy tomentose, inside pale orangish brown sericeous, wall ca. 1.8 mm thick; bracts in 7 or 8 rings, margin entire or basal 1 or 2 denticulate and apical ones crenate. Nut ellipsoid, ovoid-ellipsoid, or globose, 1.5–2 × 1.3–1.5 cm; scar 5–7 mm in diam., flat. Fl. Apr, fr. Apr of following year.

Broad-leaved evergreen forests in mountains; below 1300 m. Guangxi [N Thailand, Vietnam].

66. *Cyclobalanopsis delavayi* (Franchet) Schottky, Bot. Jahrb. Syst. 47: 624. 1912.

黄毛青冈 huang mao qing gang

Quercus delavayi Franchet, J. Bot. (Morot) 13: 158. 1899.

Trees to 20 m tall; branchlets, petioles, young leaf blades densely, mature leaf blades abaxially, and inflorescences pale orangish brown stellate tomentose. Petiole 1–2.5 cm; leaf blade oblong to ovate-elliptic, 8–12 × 2–4.5 cm, subleathery, adaxially glabrescent, base broadly cuneate to subrounded, margin apical 1/2 serrate, apex acuminate to shortly acuminate; midvein abaxially prominent and adaxially impressed; secondary veins 10–14 on each side of midvein; tertiary veins abaxially inconspicuous. Female inflorescences axillary, solitary, ca. 4 cm, cupules 2 or 3. Cupule shallowly bowl-shaped, 5–8(–10) mm × 1–1.5(–1.9) cm, enclosing ca. 1/2 of nut, outside pale orangish brown tomentose, inside pale orangish brown sericeous, wall ca. 2 mm thick; bracts in 6 or 7 rings, margin shallowly denticulate. Nut ellipsoid to ovoid, ca. 1.8 × 1–1.5 cm, tomentose, glabrescent, apically indented; scar 6–8 mm in diam., convex; stylopodium persistent. Fl. Apr–May, fr. Sep–Oct of following year.

• Lauraceous or mixed *Quercus* and *Pinus* forests in mountains; 1000–2800 m. Guangxi, Guizhou, Hubei, Sichuan, Yunnan.

67. *Cyclobalanopsis jinpinensis* Y. C. Hsu & H. W. Jen, Acta Phytotax. Sin. 14(2): 85. 1976.

金平青冈 jin ping qing gang

Trees. Branchlets glabrous or pubescent when young. Petiole 1–1.5 cm, glabrous; leaf blade oblong-elliptic, 7–11 × 3–4.5 cm, abaxially with grayish brown simple hairs (more densely along veins), base narrowly rounded, margin shallowly serrate on apical 1/3, apex acuminate; secondary veins 12–14 on each side of midvein; tertiary veins abaxially slender, evident. Cupules solitary, sessile, bowl-shaped, ca. 1.5 × 1.8 cm, enclosing ca. 1/2 of nut, outside apically densely yellowish brown tomentose but middle and basal hairs relatively sparse; bracts in 9–11 rings, margin entire but most basal ones denticulate. Nut ovoid, ca. 1.8 × 1.5 cm, glabrous; scar ca. 1 cm in diam., flat.

• SE Yunnan (Jinping Xian).

68. *Cyclobalanopsis glaucoides* Schottky, Bot. Jahrb. Syst. 47: 657. 1912.

滇青冈 dian qing gang

Quercus glaucoides (Schottky) Koidzumi (1916), not M. Martens & Galeotti (1843); *Q. schottkyana* Rehder & E. H. Wilson.

Trees to 20 m tall. Branchlets grayish green, tomentose when young, glabrescent. Petiole 0.5–2 cm; leaf blade long elliptic to obovate-oblongate, 5–12 × 2–5 cm, leathery, abaxially grayish green and tawny woolly-tomentose but somewhat glabrescent, adaxially green, base cuneate to subrounded, margin beyond

basal 1/3 serrate, apex acuminate to caudate; midvein abaxially prominent but adaxially impressed; secondary veins 8–12 on each side of midvein; tertiary veins abaxially conspicuous. Female inflorescences 1.5–2 cm. Cupule bowl-shaped, 6–8 × 8–12 mm, enclosing 1/3–1/2 of nut, outside pale brown tomentose, inside pale brown sericeous; bracts in 6–8 rings, margin subentire. Nut ellipsoid to ovoid, 1–1.4 × 0.7–1 cm, pubescent when young, glabrescent; scar 5–6 mm in diam., slightly convex; stylopodium persistent, short. Fl. May, fr. Oct.

• Broad-leaved evergreen forests in mountains; 1500–2500 m. Guizhou, Sichuan, Yunnan.

69. *Cyclobalanopsis xanthotricha* (A. Camus) Y. C. Hsu & H. W. Jen, J. Beijing Forest. Univ. 15(4): 45. 1993.

思茅青冈 *si mao qing gang*

Quercus xanthotricha A. Camus, Chênes, Atlas 2: 119. 1935–1936; *Cyclobalanopsis fuhsingensis* (Y. T. Chang)

Y. T. Chang ex Y. C. Hsu & H. W. Jen; *Q.*

djiringensis A. Camus; *Q. fuhsingensis* Y. T. Chang.

Trees to 8 m tall. Branchlets slender, dark purple, finely sulcate, sparsely lenticellate by 2nd year; lenticels white, small. Petiole 5–10 mm, puberulent; leaf blade narrowly elliptic to elliptic, 5–8 × 1.5–3 cm, subleathery, abaxially grayish green and with simple hairs and base of midvein with brown sericeous hairs, adaxially green, base cuneate, margin apical 1/2 remotely serrulate, apex acuminate; midvein adaxially slightly impressed; secondary veins 8–10 on each side of midvein, slender, evident; tertiary veins abaxially inconspicuous. Infructescences 2–5 cm. Cupule obconic, 4–6 × 6–10 mm, enclosing ca. 2/5 of nut, outside puberulent, inside pale brown sericeous, wall less than 1 mm thick; bracts in 5 or 6 rings, margin denticulate to subentire. Nut ovoid to ellipsoid, 0.9–1.3 × 0.7–1 cm; scar 4–6 mm in diam., convex; stylopodium persistent, raised, puberulent.

Mixed mesophytic forests in mountains; 800–1300 m. Yunnan [Laos, Vietnam].

