

CEPHALOTAXACEAE

三尖杉科 san jian shan ke

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Trees or shrubs evergreen, dioecious (occasionally monoecious); bud scales persistent. Leaves 2-ranked, pectinately arranged and leafy branchlets elliptic to obdeltoid in outline, decussate or ± opposite, sessile or subsessile, basally somewhat twisted; blade linear, linear-lanceolate, or occasionally lanceolate, midvein green abaxially, elevated on both surfaces, stomatal bands 2, abaxial, each comprising 11–24 rows of stomata, usually appearing white because of powdery covering, as wide as or usually wider than midvein, marginal bands green, as wide as or narrower than midvein, resin canal abaxial. Pollen cones borne on branches of preceding year, aggregated into capitula of 6–8; capitula axillary, solitary, pedunculate or subsessile; peduncle usually with several spirally arranged scales, rarely naked; cones subtended by 1 ovate or triangular-ovate bract; microsporophylls 4–16, each with (2 or)3(or 4) pollen sacs; pollen nonsaccate. Seed cones borne from axils of terminal bud scales, 1–6(–8) per bud, long pedunculate; floral axis with several pairs of decussate bracts each bearing 2 erect, axillary ovules. Seeds ripening in 2nd year, drupelike, completely enclosed by succulent aril, ovoid, ellipsoid, or globose, apex mucronate. Cotyledons 2. Germination epigeal.

One genus and eight to eleven species: China, India, Japan, Korea, Laos, Myanmar, Thailand, Vietnam; six species (three endemic) in China. There is currently debate about whether the Cephalotaxaceae should continue to be recognized as separate from the Taxaceae. *Cephalotaxus* appears to form a distinct lineage related to Taxaceae; however, it differs from that family in its seed cones, which have several 2-ovulate bracts, instead of a single fertile, 1-ovulate bract. The total number of distinct species of *Cephalotaxus* is quite open to question and much in need of detailed biosystematic study.

Cheng Wan-chün, Fu Li-kuo & Chao Chi-son. 1978. Cephalotaxaceae. In: Cheng Wan-chün & Fu Li-kuo, eds., Fl. Reipubl. Popularis Sin. 7: 423–436.

1. CEPHALOTAXUS Siebold & Zuccarini ex Endlicher, Gen. Pl., Suppl. 2: 27. 1842.

三尖杉属 san jian shan shu

Morphological characters and geographical distribution are the same as those for the family.

- 1a. Leaves strongly convex, midvein, stomatal bands, and marginal bands on abaxial surface all ± equal in width, 0.8–1 mm wide, base shallowly cordate or cordate-truncate 1. *C. oliveri*
- 1b. Leaves ± flat, midvein and marginal bands both narrower than stomatal bands, base truncate, obtuse, cuneate, or shortly attenuate.
 - 2a. Leaves ± linear, tapered from widest point above middle near apex, stomatal bands with 11–15(–18) rows of stomata.
 - 3a. Leaves 7–10 × as long as wide, apex gradually drawn out into a cusp 0.5–1 mm; peduncle of pollen-cone capitula naked except at apex 2. *C. sinensis*
 - 3b. Leaves 5–7 × as long as wide, apex abruptly mucronate, mucro less than 0.5 mm; peduncle of pollen-cone capitula bracteate, or unknown.
 - 4a. Trees to 15 m tall; leaves slightly falcate, with obtuse or truncate base and very short, apical mucro 0.1–0.2 mm 4. *C. mannii*
 - 4b. Shrubs or small trees to 5 m tall; leaves ± straight, with cuneate base and slightly longer, apical mucro 0.2–0.4 mm 3. *C. latifolia*
 - 2b. Leaves linear or linear-lanceolate, tapered from widest point usually below middle, stomatal bands with (13–)17–26 rows of stomata.
 - 5a. Seed cones borne at base of branchlets; seeds 3.5–4.5 cm; leaves thin textured and leathery 6. *C. lanceolata*
 - 5b. Seed cones borne at apex of branchlets; seeds 1.6–3 cm; leaves firm textured.
 - 6a. Leafy branchlets oblong-elliptic in outline, about 1/2 as wide as long 4. *C. mannii*
 - 6b. Leafy branchlets obtriangular in outline, ± rectangular or obovate, about as wide as or wider than long 5. *C. fortunei*

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1. *Cephalotaxus oliveri* Masters, Bull. Herb. Boissier 6: 270. 1898.

鬲子三尖杉 *bi zi san jian shan*

Shrubs or small trees to 4 m tall; bark yellow to grayish brown, scaly. Leafy branchlets oblong-elliptic in outline, plane, $7-9 \times 3.5-5$ cm. Leaves borne at $55-70^\circ$ to branchlet axis; petiole ca. 0.5 mm; blade dull matt green adaxially, linear-lanceolate, \pm straight or very slightly falcate, strongly convex, (1.5-) 1.6-2.5(-3.2) cm \times 2.3-3.2 mm, hard and leathery, midvein ca. 0.8-1 mm wide, stomatal bands on abaxial surface 0.8-1 mm wide abaxially, of 13-17 rows of stomata, as wide as (rarely wider than) midvein and marginal bands, marginal bands ca. 0.8 mm wide, base shallowly cordate or cordate-truncate, margin flat, apex obtuse, shortly cuspidate, cusp often breaking off. Pollen-cone capitula axillary, borne on lower side and toward distal end of terminal branchlets; buds developing before the subtending leaves expand; microsporophylls 6-10, each with 3 or 4 pollen sacs. Seeds cones solitary; peduncle ca. 6 mm. Seed obovoid, ovoid, or almost globose, $2.2-2.7 \times 1.4-1.8$ cm, apex with small mucro. Pollination Mar-Apr, seed maturity Aug-Oct. $2n = 24^*$.

• Coniferous and broad-leaved forests; 300-1800 m. N Guangdong, Guizhou, W Hubei, Hunan, E Jiangxi, S and W Sichuan (especially Emei Shan), E Yunnan.

A vulnerable species, endemic to China; records from Vietnam are referable to *Cephalotaxus mannii*.

2. *Cephalotaxus sinensis* (Rehder & E. H. Wilson) H. L. Li, Lloydia 16: 162. 1953.

粗榧 *cu fei*

Shrubs or small trees to 12(-15) m tall; trunk to 1.2 m d.b.h.; bark reddish, gray, or grayish brown. Leafy branchlets elliptic, oblong, or more usually obovate-rectangular in outline, plane, $5-12(-18) \times 4-8(-10)$ cm. Leaves borne \pm perpendicular to branchlet axis, or directed forward at $50-85^\circ$; petiole 0-1 (-2.5) mm; blade green adaxially, linear or linear-lanceolate, \pm parallel sided almost throughout length and tapered from near apex only, or tapered from point above middle of blade but well below apex, straight or very slightly falcate, flat, (1-)1.8-5(-7) cm \times 2-3.5(-4) mm, $7-10 \times$ as long as wide, leathery but relatively soft, midvein 0.2-0.6 mm wide abaxially, stomatal bands white (very rarely green), 0.8-1.2 mm wide, of (12-)13-15(-18) rows of stomata, $2-4 \times$ as wide as midvein, marginal bands 0.1-0.3 mm wide, base cuneate or rounded-cuneate, symmetric or very slightly asymmetric, margin narrowly revolute, apex acute and shortly mucronate to long acuminate. Pollen-cone capitula globose, 4-7 mm in diam., each of 6 or 7 pinkish brown cones; peduncle ca. 3 mm, naked except at apex; microsporophylls 4-11, each with (2 or)3(or 4) pollen sacs. Seed cones solitary or borne 2-5(-8) together; peduncle 3-8 mm; seed scales grayish green,

ovate, apex shortly cuspidate. Aril red or reddish purple when ripe, $1.6-2.5 \times 0.8-1.6$ cm, with 6 prominent, longitudinal ridges. Seeds ovoid or obovoid to ellipsoid, $1.8-2.5 \times 0.9-1.2$ cm, apex mucronate or cuspidate. Pollination Mar-Jun, seed maturity (Jun-)Jul-Nov.

• Montane coniferous or mixed forests, thickets, stream valleys, valley bottoms, open situations, on granite, sandstone, and limestone substrates; 600-3000(-3200) m. S Anhui, Fujian, S Gansu, SW Guangdong, Guangxi, NE Guizhou, Henan, Hubei, Hunan, S Jiangsu, Jiangxi, S Shaanxi, Sichuan, C and N Taiwan, SE Yunnan, Zhejiang; cultivated in Shandong.

- 1a. Leaves \pm parallel sided almost throughout length, tapered from near apex only, $5-10 \times$ as long as wide; mainland 2a. var. *sinensis*
- 1b. At least some leaves tapered from point above middle of blade but well below apex, ca. $10 \times$ as long as wide; Taiwan ... 2b. var. *wilsoniana*

2a. *Cephalotaxus sinensis* var. *sinensis*

粗榧(原变种) *cu fei* (yuan bian zhong)

Cephalotaxus drupacea Siebold & Zuccarini var. *sinensis* Rehder & E. H. Wilson in Sargent, Pl. Wilson. 2: 3. 1914; *C. drupacea* var. *sinensis* f. *globosa* Rehder & E. H. Wilson; *C. harringtonii* (Knight ex J. Forbes) K. Koch var. *sinensis* (Rehder & E. H. Wilson) Rehder; *C. sinensis* f. *globosa* (Rehder & E. H. Wilson) H. L. Li. Leaves \pm parallel sided almost throughout length, tapered from near apex only, $5-10 \times$ as long as wide.

• Thickets, stream valleys, open situations, on granite, sandstone, and limestone substrates; 600-2300 m (-3200 m in Yunnan). S Anhui, Fujian, S Gansu, SW Guangdong, Guangxi, NE Guizhou, Henan, Hubei, Hunan, S Jiangsu, Jiangxi, S Shaanxi, Sichuan, SE Yunnan, Zhejiang; cultivated in Shandong.

The wood is used to make furniture, farm implements, crafts, and utensils. The branches, roots, leaves, and seeds are a source of many alkaloids, which are used to treat leukemia and lymphosarcoma. The tree is also cultivated as an ornamental.

2b. *Cephalotaxus sinensis* var. *wilsoniana* (Hayata) L. K. Fu & Nan Li, Novon 7: 263. 1997.

台湾粗榧 *tai wan cu fei*

Cephalotaxus harringtonii (Knight ex J. Forbes) K. Koch var. *wilsoniana* (Hayata) Kitamura; *C. wilsoniana* Hayata.

At least some leaves tapered from point above middle of blade but well below apex, ca. $10 \times$ as long as wide.

• Montane coniferous or mixed forests, usually in valley bottoms, scattered; 1400-3000 m. C and N Taiwan.

In Fl. Taiwan, ed. 2, this taxon was treated at species rank. However, molecular data suggest that it might be better treated as a variety of *Cephalotaxus harringtonii*.

3. *Cephalotaxus latifolia* W. C. Cheng & L. K. Fu ex L. K. Fu & al., Novon 9: 185. 1999.

宽叶粗榧 *kuan ye cu fei*

Shrubs or small trees to 5 m tall; bark grayish brown; branches stout. Leafy branchlets oblong in outline, plane, $5.5-9 \times 4-5$ cm. Leaves borne at $(60-65-80(-85)^\circ$ to branchlet axis, sessile but decurrent for whole length of internode; blade dark olive green adaxially,

linear, \pm straight, 1.6–3 cm \times 2.8–4(–6) mm, thick and leathery, midvein raised adaxially and bordered on each side by a paler, longitudinal channel, strongly raised abaxially, 0.25–0.5 mm wide, stomatal bands white, 0.8–1 mm wide, of 11–15 rows of stomata, ca. 2–3 \times as wide as midvein, marginal bands green, ca. 0.3 mm wide, base cuneate, slightly asymmetric, margin flat (slightly revolute when dry), apex abruptly mucronate, mucro 0.2–0.4 mm. Pollen-cone capitula axillary on lower side of branchlet axis; peduncle 1.5–2.5 mm, scaly; bracts ca. 9, ovate, in 4 rows, apical bracts ca. 0.7 \times 0.3 mm, apex mucronate. Seeds cones borne 2–6 together; peduncle 2–4 mm, scaly. Seed obovoid, 1.8–2 cm, apex with small mucro at center. Pollination May.

• Thickets in mountainous areas; 900–2400 m. NW Fujian, N Guangdong, NE Guangxi, SE Guizhou, SW Hubei, W Jiangxi, SE Sichuan.

This name was invalid as originally described (as *Cephalotaxus sinensis* var. *latifolia* W. C. Cheng & L. K. Fu in W. C. Cheng & al., Acta Phytotax. Sin. 13(4): 86. 1975), and when later raised to species rank (L. K. Fu, Acta Phytotax. Sin. 22: 280. 1984), because two types (male and female) were designated. *Cephalotaxus latifolia* is more similar to *C. harringtonii* (Knight ex J. Forbes) K. Koch (*C. drupacea* Siebold & Zuccarini), from Japan and Korea, than to *C. sinensis*, with which it has been united by some authors. *Cephalotaxus harringtonii* has often been recorded from China (e.g., by S. Y. Hu, Taiwania 10: 25–26. 1964; A. Farjon, World Checkl. Bibliogr. Conif. 28. 1998), but apparently always as a misidentification of either *C. latifolia* or *C. sinensis*. Its leaves usually terminate in a relatively long cusp (as in *C. sinensis*) but occasional variants with very shortly mucronate leaves occur. These variants are similar to *C. latifolia* and *C. mannii* (*C. hainanensis*); their taxonomic status, and their relationship with the latter two taxa, need investigation.

4. *Cephalotaxus mannii* J. D. Hooker, Hooker's Icon. Pl. 16: t. 1523. 1886.

海南粗榧 hai nan cu fei

Cephalotaxus griffithii J. D. Hooker; *C. hainanensis* H. L. Li.

Trees to 20 m tall; trunk to 50(–110) cm d.b.h.; bark light brown to reddish brown, flaking off. Leafy branchlets elliptic or oblong-elliptic in outline, 8–19(–24) \times 4.5–8(–9.5) cm, about 1/2 as wide as long. Leaves borne at 45–80° to branchlet axis; petiole \pm absent or (0.3–)0.5(–1) mm; blade dark green or shining olive green adaxially, linear or linear-lanceolate, usually straight, occasionally slightly falcate, flat, 1.5–4 cm \times 2.5–4 mm, leathery or relatively thin, midvein prominent adaxially, 0.2–0.3 mm wide abaxially, stomatal bands white or bluish white, often indistinct and green when dry because of white powder being shed, 0.7–1.6 mm wide, of 19–23(–26) rows of stomata, 2.5–8 \times as wide as midvein, marginal bands 0.1–0.3 mm wide, base very broadly obtuse or obtusely truncate, symmetric or not, margin narrowly revolute, apex cuspidate (with leaf tapered into apex from at least middle, often from base), or abruptly and very shortly mucronate (with leaf parallel sided and mucro 0.1–0.2 mm). Pollen cones borne 6–8 together, pale yellow,

globose, 4–4.5 mm in diam.; peduncle (1–)4–5 mm, usually with at least 10 bracts; microsporophylls 7–13, each with 3 or 4 pollen sacs. Seed cones solitary or borne 2 or 3 together; peduncle 6–10 mm. Aril green initially, turning red when ripe, 2.2–3 \times 1.1–1.2 cm. Seeds obovoid-ellipsoid or obovoid, sometimes laterally compressed, 2.2–2.8 cm, apex shortly mucronate or cuspidate. Pollination (Nov–)Feb–Mar, seed maturity Aug–Oct. $2n = 24^*$.

Mixed forests and forested ravines; ca. 1100 m. SW Guangdong (Xinyi Xian), Guangxi (Rong Xian), Hainan (Jianfeng Ling, Limu Ling, Wuzhi Shan), SE Xizang, S and W Yunnan [NE India, Laos, N Myanmar, N Thailand, N Vietnam].

An endangered species in China. Records of *Cephalotaxus mannii* from Xizang and Yunnan require confirmation; they may be misidentifications of *C. fortunei* var. *alpina*. R. R. Mill considers the plants from Hainan (and possibly also those from Guangdong and Guangxi) to be separable as *C. hainanensis* H. L. Li (Lloydia 16: 164. 1953), which was placed in the synonymy of *C. mannii* by L. K. Fu (Acta Phytotax. Sin. 22: 281. 1984). Mill's comparison of the types and other material of both species suggests that they may be distinct taxa, with *C. hainanensis* differing as follows: leafy branchlets 8–10 \times 4.5–5.5 cm in outline (not 11–19(–24) \times 6–8(–9.5) cm); leaves borne at 70–80° to branchlet axis (not 45–70°), parallel sided throughout (not tapered), stomatal bands 0.7–1.3 mm wide (not 1.2–1.6 mm), 2.5–4 \times as wide as midvein (not 6–8 \times), apex abruptly and very shortly mucronate (not cuspidate); seed cones solitary (not 2 or 3 together). N. T. Hiep & J. E. Vidal (Fl. Cambodge, Laos et Vietnam 28: 115–118. 1996) concurred with Fu in adopting a broad concept of *C. mannii*, but identified *C. hainanensis* as a recognizable entity within the complex. H. L. Li, in the protologue, considered *C. hainanensis* to be closer to *C. sinensis* than to *C. mannii*.

5. *Cephalotaxus fortunei* Hooker, Bot. Mag. 76: t. 4499. 1850.

三尖杉 san jian shan

Trees or shrubs to 20 m tall; trunk to 20 cm or more d.b.h.; bark dark reddish brown, peeling in strips. Leafy branchlets obovate, obtriangular, or \pm rectangular in outline, plane, (4–)5–21 \times (3–)7–20 cm. Leaves borne at 30–110° to branchlet axis; petiole 0.5–2 mm; blade deep green and glossy adaxially, linear-lanceolate, distally gradually attenuate (from proximal 1/3 of blade), falcate or \pm straight, flat, (1.5–)3.5–12.5 cm \times (1.5–)3.2–5 mm, leathery but usually rather soft and flexible, midvein 0.2–0.5 mm wide abaxially, stomatal bands (0.8–)1.2–2.1 mm wide, usually of (13–)17–24 rows of stomata, 2–5 \times as wide as midvein, marginal bands 0.1–0.4 mm wide, base cuneate or shortly attenuate, asymmetric, margin flat or very narrowly revolute when dry, apex cuspidate, cusp 0.5–2 mm, often breaking off. Pollen-cone capitula of 6–14 cones, distinctly pedunculate (peduncle 2–5 mm), or sessile to subsessile (peduncle 0–2 mm), globose, 6–10 mm in diam.; bracts ovate, largest ca. 2 \times 2.5 mm, margin \pm entire or erose, apex acute; microsporophylls 6–16, each with 3 or 4 pollen sacs. Seed cones borne 3–6 together; peduncle 3–12 mm; seed scales ca. 1.5 mm.

Aril yellow or green initially, turning purple when ripe, 1.4–2.5 × 0.9–1.5 cm, with numerous indistinct striations or prominent longitudinal ridges, apex very shortly mucronate. Seeds ellipsoid, 1.3–2.4 × 0.7–1.4 cm. Pollination Apr–May, seed maturity Jun–Oct.

Mixed, coniferous, and broad-leaved forests, thickets, roadsides; 200–3700 m. S Anhui, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, S Henan, W Hubei, Hunan, Jiangxi, Shaanxi, Sichuan, Yunnan, Zhejiang [N Myanmar].

- 1a. Pollen cones distinctly pedunculate; peduncle 2–5 mm; leaves (2.2–)3.5–5 mm wide; aril with numerous indistinct striations 5a. var. *fortunei*
 1b. Pollen cones sessile or subsessile; peduncle 0–2 mm; leaves 1.5–3.2(–3.5) mm wide; aril with prominent longitudinal ridges 5b. var. *alpina*

5a. *Cephalotaxus fortunei* var. *fortunei*

三尖杉(原变种) san jian shan (yuan bian zhong)

Cephalotaxus fortunei var. *concolor* Franchet; *C. fortunei* var. *globosa* S. Y. Hu.

Leaves (2.2–)3.5–5 mm wide. Pollen cones distinctly pedunculate; peduncle 2–5 mm. Aril with numerous indistinct striations. $2n = 24^*$.

Mixed, coniferous, and broad-leaved forests, open thickets, roadsides; 200–1300 m. S Anhui, Fujian, S Gansu, Guangdong, Guangxi, Guizhou, S Henan, W Hubei, Hunan, Jiangxi, S Shaanxi, Sichuan, Yunnan, Zhejiang [N Myanmar].

5b. *Cephalotaxus fortunei* var. *alpina* H. L. Li, Lloydia 16: 164. 1953.

高山三尖杉 gao shan san jian shan

Cephalotaxus alpina (H. L. Li) L. K. Fu.

Leaves 1.5–3.2(–3.5) mm wide. Pollen cones sessile or subsessile; peduncle 0–2 mm. Aril with prominent longitudinal ridges. $2n = 24^*$.

• *Abies* and mixed forests, thickets by streams; (1100–)1800–3700 m. S Gansu, N Shaanxi, N and W Sichuan, N Yunnan.

6. *Cephalotaxus lanceolata* K. M. Feng in W. C. Cheng & al., Acta Phytotax. Sin. 13(4): 86. 1975.

贡山三尖杉 gong shan san jian shan

Cephalotaxus fortunei Hooker var. *lanceolata* (K. M. Feng) Silba.

Trees to 20 m tall; trunk to 40 cm d.b.h.; bark purple, smooth; branches pendulous. Leafy branchlets resembling 2 adjacent parallelograms in outline, broadly “V”-shaped in cross section, apex abruptly truncate. Leaves spreading ± horizontally at ca. 45° to branchlet axis; petiole very short; blade dark green adaxially, linear-lanceolate, distally tapered, straight or slightly falcate, 4.5–10 cm × 4–7 mm, thin textured and leathery, abaxial stomatal bands white, base rounded, margin revolute, apex long acuminate. Pollen cones unknown. Seeds cones with peduncle 1.5–2 cm at

maturity. Aril turning greenish brown when ripe. Seed obovoid-ellipsoid, 3.5–4.5 cm. Seed maturity Sep–Nov.

Broad-leaved forests, scattered; ca. 1900 m. NW Yunnan (Gongshan Drungzu Nuzu Zizhixian: banks of upper Dulongjiang) [N Myanmar]. An endangered species in China.

