

CYATHEACEAE

桫欏科 suo luo ke

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Plants terrestrial, large to very large, less often medium-sized, with short to usually long, erect, slender to robust, apically scaly stem. Stems with dictyosteles, apices (and usually stipe bases) covered with large scales, sometimes also with small scales or hairs. Fronds usually large (up to 5 m); stipe with obvious, usually discontinuous pneumathodes in two lines; lamina 1–3-pinnate (rarely simple); veins simple to forked, free, rarely anastomosing. Sori superficial (abaxial) or terminal on veins and marginal or submarginal, orbicular, exindusiate, or indusia saucerlike, cuplike, or globose and completely surrounding sporangia, or bivalvate; sporangia maturing gradually, with oblique annuli; receptacles raised; paraphyses usually present; spores tetrahedral, trilete, variously ornamented; gametophytes green, cordate. $x = 69$.

About five genera and more than 600 species: pantropical; two genera and 14 species (one endemic) in China.

Zhang Xianchun. 2004. Cyatheaaceae. In: Zhang Xianchun, ed., *Fl. Reipubl. Popularis Sin.* 6(3): 249–274.

- 1a. Stipe stramineous or purple, not black; cells of scale all essentially similar and edge often toothed or even ciliate 1. *Sphaeropteris*
1b. Stipe dark or black; cells of scale narrow near center, surrounded by a broad margin of differently shaped cells, edge toothed or ciliate, with a prominent dark terminal seta or spine 2. *Alsophila*

1. SPHAEROPTERIS Bernhardt in Schrader, *J. Bot.* 1800(2): 122. 1801.

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Tree ferns, large, usually with a single tall stem, with dense fibrous mass of roots at base of trunk. Fronds 1–5 m or more, most 2-pinnate-pinnatifid, not persistent and leaving distinct rounded scars on trunk, young uncurling fronds and stipe bases covered with scales; stipe stramineous or purple, smooth or with warts or spiny; scales on stipe pale or brown; cells uniform, similar in orientation, shape, size, thickness, and color, margin with teeth, setae, or cilia, apical cell dark or unpigmented. Sori orbicular, distant from margins, with or without indusia; spore surface fine, coarsely spiny, or perforate. $x = 69$.

About 120 species: S temperate and almost pantropical, but absent from Africa and Madagascar, maximum diversity in Malesia, north to Indochina, S China, Japan (Ryukyu Islands), and E Himalaya, south to New Zealand, Tasmania, and E Australia, ca. five species in the New World, including Central and South America and islands of the Caribbean; two species in China.

Plants of rain forests and tropical montane forests (variable in forest layer: in canopy, medium-canopy, or understory), ravines, forest margins, clearings, swampy areas, and disturbed areas, species of *Sphaeropteris* are all large plants and require space to grow, in general, in less-shaded conditions than those of *Alsophila*.

- 1a. Rachis and costae glabrous; abaxial side of midveins glabrous or slightly hairy 1. *S. brunoniana*
1b. Rachis and costae finely warty at base; abaxial side of midveins with flat ovate scales and long gray hairs 2. *S. lepifera*

1. *Sphaeropteris brunoniana* (Wallich ex Hooker) R. M. Tryon, *Contr. Gray Herb.* 200: 21. 1970.

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Alsophila brunoniana Wallich ex Hooker, *Sp. Fil.* 1: 52. 1844; *A. contaminans* Wallich ex Hooker var. *brunoniana* (Wallich ex Hooker) Scott; *A. contaminans* var. *inermis* Kurz; *A. sollyana* Griffith; *Cyathea brunoniana* (Wallich ex Hooker) C. B. Clarke & Baker; *C. hainanensis* Ching; *Sphaeropteris hainanensis* (Ching) R. M. Tryon.

Trunk erect, up to 10–20 m tall, up to 20 cm in diam. Stipe and rachis yellowish to purplish, smooth, or finely warty at base; scales pale brown or brown, thin, with setiferous edges; lamina 2-pinnate-pinnatifid, 2–3 × to 1.6 m; pinnae 20–30 pairs, ascending, lanceolate; largest pinnae up to 90 × 25 cm; pinnules narrowly lanceolate, 9–14 × 2–3 cm, slightly narrowed

at base, apex caudate, pinnatifid to pinnatisect; pinnule segments 16–25 pairs, falcate, 10–16 × 3–5 mm, wider at base, entire or minutely crenate, rarely with small segments; veins 2- or 3-forked; abaxial side of pinnules glabrous, adaxial side glabrous or with sparse hairs; lamina glaucous abaxially; adaxial side of pinna rachis with pale antrorse hairs, a few pale hairs and scales along costules abaxially. Sori close to midveins of fertile pinnule segments, often throughout lower lamina; paraphyses pale to brown, filamentous, longer than sporangia or equal in length; indusia absent.

Evergreen forests in valleys; 500–1200 m. Hainan, Xizang, Yunnan [Bangladesh, India (N Himalaya), Myanmar, Nepal, Vietnam].

A very similar species, *Sphaeropteris glauca* (Blume) R. M. Tryon (syn. *Cyathea contaminans* Wallich ex Hooker), is mysteriously absent from China and is widely distributed from N India, Thailand, and Laos to New Guinea and the Philippines. The obvious difference is

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the stipe, rachis, and rachillae of *S. glauca* are prominently spiny (vs. smooth or only finely warty at the stipe base in *S. brunoniana*).

2. *Sphaeropteris lepifera* (J. Smith ex Hooker) R. M. Tryon, Contr. Gray Herb. 200: 21. 1970.

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Alsophila lepifera J. Smith ex Hooker, Sp. Fil. 1: 54. 1844;
Cyathea lepifera (J. Smith ex Hooker) Copeland.

Trunk erect, often more than 6 m tall, up to 20 cm in diam. near base, with distinct leaf scars on surface; scales on trunks and at stipe base pale brown to nearly white, thin, up to 4 cm, 2–4 mm wide at base, fimbriate at margin, without distinct prickles but granular from deciduous scales. Fronds pale green to green, large, up to 2.5 cm; stipe purple at base, green above,

up to 16 cm or more, swollen at base, up to 7 cm in diam., smooth or with warts and scattered scales, densely scaly, with abscission marks on trunks; lamina 2-pinnate to almost 3-pinnate, oblong-obovate, 2–4(–5?) m; larger pinnae up to 80 cm, basal ones smaller; larger pinnules 10–15 × 1.5–2.3 cm, caudate at apex; scales on abaxial side of axes dense, whitish, ovate to oblong-ovate, mixed with spreading hairs; ultimate segments thick, entire or nearly so, glaucous on abaxial surface. Sori subcostal on pinnules, without indusia; paraphyses pale, longer than sporangia, sometimes narrow and scalelike.

On slopes in valleys, mountain forests, forest margins, sunny grasslands, often on wet soils; below 1500 m. Guangxi, Hainan, Taiwan, Yunnan; introduced into botanical gardens in S China [Japan (Ryukyu Islands), New Guinea, Philippines].

2. **ALSOPHILA** R. Brown, Prodr. 158. 1810.

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Gymnosphaera Blume.

Plants tree-like; trunk erect, rarely branching, or creeping, shrub-like, apices covered with scales. Fronds large; stipe stramineous, dark brown, or black, smooth, spiny, or warty; scales brown or dark brown, margin differentiated; lamina 1–3-pinnate; veins simple or forked. Sori orbicular, dorsal on veinlets; indusia various in form or absent, paraphyses present. $x = 69$.

About 230 species: pantropical, extending into the S temperate zone as far as the subantarctic Auckland Islands; plants of cold or wet montane forests, on slopes or in ravines, and low canopy, middle understory, or ground cover; 20 species in Asia; 12 species (one endemic) in China.

Most species have an indusium, but this structure may be lost as the frond matures; in some species, the indusium is absent. The Chinese species in *Alsophila* subg. *Alsophila* all have an indusium; the species of *A.* subg. *Gymnosphaera* (Blume) Q. Xia are all without an indusium.

- 1a. Stipes stramineous, pale green, or brown, spiny or warty; fertile and sterile pinnules almost same size; lateral veinlets forked, bearing sori at forks; indusia developed, sometimes very small, scalelike, covered by sorus when mature; 16 spores per sporangium (*A.* subg. *Alsophila*).
 - 2a. Abaxial side of midvein of pinnules and segments with pale acicular hairs 1. *A. costularis*
 - 2b. Abaxial side of midvein of pinnules and segments glabrous.
 - 3a. Indusia enveloping sori.
 - 4a. Stipes spiny; indusia open toward midveins 2. *A. spinulosa*
 - 4b. Stipes not spiny; indusia not open toward midveins 3. *A. loheri*
 - 3b. Indusia almost covered by sori at base.
 - 5a. Indusia flat, margin toothed 4. *A. latebrosa*
 - 5b. Indusia scalelike 5. *A. fenicis*
- 1b. Stipes, rachises, and costae black or red-brown, not spiny (except *A. austroyunnanensis*), slightly warty; fertile pinnules or segments normally narrow and smaller than sterile ones; veins simple; sorus without indusium; 64 spores per sporangium (*A.* subg. *Gymnosphaera*).
 - 6a. Fronds dimorphic, or pinnae dimorphic; fertile pinnules or segments narrow; stipes spiny at base ... 12. *A. austroyunnanensis*
 - 6b. Fronds monomorphic; stipes not spiny at base.
 - 7a. Lateral abaxial sides of stipes and rachises with spreading brown scales.
 - 8a. Both sides of frond with acicular hairs 6. *A. andersonii*
 - 8b. Both sides of frond glabrous 7. *A. gigantea*
 - 7b. Lateral abaxial sides of stipes and rachises without spreading brown scales.
 - 9a. Pinnules shallowly pinnatifid but not reaching halfway to costae, or only crenate 8. *A. podophylla*
 - 9b. Pinnules pinnatifid more than halfway to costae.
 - 10a. Small scales on abaxial side of pinnules flat, not bullate 11. *A. khasyana*
 - 10b. Small scales on abaxial side of pinnules bullate.
 - 11a. Scales at stipe base concolorous, golden-yellow; bullate scales on abaxial sides of costae and midveins of pinnules and segments, with a prominent dark tip 9. *A. denticulata*
 - 11b. Scales at stipe base bicolorous, dark brown, with rather wide paler margins; bullate scales on abaxial side of costae, toward apex with acicular hairs 10. *A. metteniana*

1. *Alsophila costularis* Baker, Bull. Misc. Inform. Kew 1906: 8. 1906.

中华桫欏 zhong hua suo luo

Alsophila verruculo-spinula Y. K. Yang, Z. Y. Yu & Y. H. Li; *Cyathea chinensis* Copeland; *C. yunnanensis* Domin.

Trunk up to 5 m or more, 15–30 cm in diam. Stipe red-brown toward base, up to 45 cm, minutely spiny or warty; scales at base of stipes dark brown, lustrous, up to 2 cm × 1.5 mm, stiff, with fragile edges; lamina 3-pinnate, up to 2 × 1 m; pinnae ca. 15 pairs, lanceolate, up to 60 × 17 cm; abaxial side stramineous, warty and hairy to distal portion; adaxial side of costae sulcate, hirsute; pinnules up to 30 pairs, sessile, spreading, lanceolate, 6–10 × 1.3–2 cm, base cuneate or truncate, apex acuminate or caudate, ca. 1.5 cm apart, pinnatifid up to 2/3 or almost to costules; both sides of costules with soft, curled, pale brown hairs, and with thick pale brown bullate scales also on midveins; segments of pinnules oblong, margin crenate, base connate, lateral veins up to 13 pairs, forked, rarely simple or 3-forked. Lamina papery, abaxially pale green, adaxially deep green; abaxial side of midveins of sterile pinnules normally with some small pale bullate scales. Sori 3–6 pairs at forks of lateral veinlets, close to midvein; indusia membranous, at base of sorus on midvein side, lateral, reflexed and covering midvein when mature; paraphyses longer than sporangia.

Ravine forests; 700–2100 m. W Guangxi, SE Xizang, S and SW Yunnan [Bangladesh, Bhutan, India, Myanmar, Vietnam].

2. *Alsophila spinulosa* (Wallich ex Hooker) R. M. Tryon, Contr. Gray Herb. 200: 32. 1970.

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Cyathea spinulosa Wallich ex Hooker, Sp. Fil. 1: 25. 1844; *Alsophila boninsimensis* (Christ ex Diels) Christ; *A. confucii* Christ; *A. decipiens* Scott ex Beddome; *A. fauriei* Christ; *Amphicosmia decipiens* (J. Scott) Beddome; *C. austrosinica* Christ; *C. boninsimensis* (Christ ex Diels) Copeland; *C. confucii* (Christ) Copeland; *C. decipiens* (J. Scott) C. B. Clarke & Baker; *C. fauriei* (Christ) Copeland; *C. taiwaniana* Nakai; *Hemitelia beddomei* C. B. Clarke; *H. boninsimensis* Christ ex Diels; *H. decipiens* (J. Scott) J. Scott.

Trunk 5–15 m or sometimes more than 20 m, 10–20 cm in diam. or more, densely covered by adventitious roots. Fronds 2-pinnate-pinnatifid; stipes persistent and forming an irregular skirt, lustrous, greenish, purple-black toward base, 30–50 cm, with spines and lustrous brown scales; scales on trunks and stipes dark brown, lustrous, several cells thick, stiff, narrowly lanceolate, apex dark brown, setose, with pale and thin toothed margins, scales falling off leaving sharp prickles at base. Lamina 2-pinnate-pinnatisect, oblong-obovate; middle pinnae oblong, 40–50 × 14–18 cm; pinnules 18–20 pairs, basal pinnules shorter, middle ones lanceolate, 9–12 × 1.2–1.6 cm, base cuneate, sessile or shortly stipitate, apex long acuminate and caudate, pinnatisect; pinnule segments 18–20 pairs, ascending, basal segments shorter, middle ones falcate, up to 7 × 4 mm, margin dentate, apex acute or mucronate; veins pinnate. Lamina papery, green; abaxial side with small membranous

pale scales, adaxial side of rachis, costa, and midvein densely hairy. Sori at forks of lateral veinlets; indusia globose, thin, membranous, completely enveloping sori from base when young, irregularly falling off at maturity.

Forests, beside valley streams; 300–1600 m. Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Jiangxi, Sichuan, Taiwan, Xizang, Yunnan [Bangladesh, Bhutan, India, Indochina, S Japan, Myanmar, Nepal, Sri Lanka, N Thailand].

3. *Alsophila loheri* (Christ) R. M. Tryon, Contr. Gray Herb. 200: 32. 1970.

南洋桫欏 nan yang suo luo

Cyathea loheri Christ, Bull. Herb. Boissier, sér. 2, 6: 1007. 1906.

Trunk erect, up to 5 m or more tall, ca. 15 cm in diam. Stipe and rachis brown to dark purple-brown, not spiny, with wartlike projections and scales; scales lanceolate, 16–20 × ca. 2 mm, pale brown, lustrous, or minute and irregular, sometimes with a light brown central longitudinal band, margins flabellate-celled at base, with reddish setulae; lamina 2-pinnate-pinnatifid, up to 2 m; lowest pinnae usually reduced; pinnae up to 35–50 cm; pinnules 5–9 × ca. 2 cm, mostly divided up to costules into adnate segments; abaxial side with flat yellowish scales 5–6 mm, with flabellate margins and very small farinose brown scales; adaxial side of costae densely covered with matted brownish hairs and narrow scales; abaxial side of costules with light brown bullate scales; veinlets usually forked. Sori costular; indusia lustrous, brown to purplish, globose, opening along an apical slit, later fragmenting and sometimes appearing cup-shaped; paraphyses absent.

Wet forests, not common; 400–1600 m. SE Taiwan [Indonesia (Borneo), Philippines].

4. *Alsophila latebrosa* Wallich ex Hooker, Sp. Fil. 1: 37. 1844.

阴生桫欏 yin sheng suo luo

Cyathea latebrosa (Wallich ex Hooker) Copeland; *C. tsangii* Ching & S. H. Wu; *Dichorexia latebrosa* (Wallich ex Hooker) C. Presl; *Hemitelia latebrosa* (Wallich ex Hooker) Mettenius.

Trunk erect, 3–5 m tall, ca. 8 cm in diam. Stipes reddish brown, up to 30 cm, many persistent and forming a messy skirt on trunk, abaxial side densely warty or shortly spiny; scales at base of stipes lustrous, with fragile edges; lamina 2-pinnate-pinnatifid, ca. 2 m; pinnae up to 50 × 14 cm; pinnules ca. 25 pairs, spreading, shortly stipitate, 1.5–2 cm apart, 6–7 × ca. 1.5 cm at base, base truncate, pinnatifid almost to costules, apex long acuminate; pinnule segments 16–20 pairs, 6–8 mm, base wider, margin crenate, apex obtuse; veinlets forked. Lamina papery, pale green, glabrous on both surfaces; rachis and costae brown, warty on abaxial side, abaxial side of costules densely hairy. Sori close to midveins of fertile pinnule segments; indusia small, bilobed, scalelike, paraphyses longer than sporangia.

Forests, secondary forests beside valley streams; 300–1000 m. Hainan, S Yunnan [Cambodia, Indonesia (Borneo, Sumatra), Malaysia, Thailand].

5. *Alsophila fenicis* (Copeland) C. Christensen, Index Filic., Suppl. 1906–1912: 5. 1913.

兰屿桫欏 lan yu suo suo

Cyathea fenicis Copeland, Philipp. J. Sci., C, 3: 354. 1909; *Alsophila fujiiiana* Nakai; *C. fujiiiana* (Nakai) Tagawa (1951), not Domin (1930).

Trunk erect, ca. 1 m tall, ca. 6 cm in diam.; lowest pinnae usually reduced. Stipe brown to dark purple-brown, 36–65 cm, ca. 1 cm in diam.; spiny, with both long, dark brown scales and minute brown scales, or scales pale; rachis green, spiny, without scales; lamina 2-pinnate-pinnatifid, 1.5–2 m; pinnae 30–40 cm, lower pinnae obviously shorter; pinnules 7–10 × 1.3–2.1 cm, sessile; margin of pinnule segments serrulate; veinlets 10 or 11 pairs, forked; abaxial side of lamina glabrous, with very few thin small scales along costae; adaxial surface setose along costae and costules. Sori orbicular, at forks of veinlets; indusia very small, scalelike.

Wet forests, hillsides; 100–400 m. Taiwan (Lan Yu) [Philippines].

6. *Alsophila andersonii* J. Scott ex Beddome, Ferns Brit. India, t. 310. 1869.

毛叶桫欏 mao ye suo suo

Cyathea andersonii (J. Scott ex Beddome) Copeland; *Gymnosphaera andersonii* (J. Scott ex Beddome) Ching & S. K. Wu.

Trunk erect, 6–10 m. Fronds 2-pinnate-pinnatifid, 2–3 m; stipe dark, almost black, with sparse scattered scales and ± scabrous; scales dark, lanceolate, margin with pale fringes; rachis dark purple, abaxial side sparsely hirsute; pinnae up to 70 cm; largest pinnule 12–14 × 2.5–3(–4) cm, often with a lower free basal segment, other part pinnatifid to 1–2 mm to costule; veins 10–12 pairs, simple or forked; pinnule segments slightly falcate, subentire, apex obtuse, serrulate; both sides of costule, midvein, and veinlets with spreading gray stiff hairs ca. 0.5 mm; small scales often at base of costules. Sori close to midveins of fertile pinnule segments; paraphyses gray, longer than sporangia; indusia absent.

Margins of montane rain forests; 700–1200 m. SE Xizang, S and SW Yunnan [Bhutan, NE India].

7. *Alsophila gigantea* Wallich ex Hooker, Sp. Fil. 1: 53. 1844.

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Alsophila gigantea var. *polynervata* (R. H. Miao) Q. Xia; *A. helferiana* C. Presl; *A. henryi* Baker; *A. polycampta* Kunze; *A. umbrosa* Wallich ex Ridley; *Cyathea gigantea* (Wallich ex Hooker) Holttum; *C. gigantea* var. *polynervata* R. H. Miao; *C. henryi* (Baker) Copeland; *C. pectinata* Ching & S. H. Wu; *C. petiolulata* Ching & S. H. Wu; *C. pseudogigantea* Ching & S. H. Wu; *C. tinganensis* Ching & S. H. Wu; *Gymnosphaera gigantea* (Wallich ex Hooker) J. Smith; *G. gigantea* var. *polynervata* (R. H. Miao) Y. K. Yang & J. K. Wu.

Trunk erect, 2–5(–7) m tall, up to 20 cm in diam. Fronds 2-pinnate-pinnatifid, 2–3 m; stipe black, ca. 1 m or more, scabrous, sparsely hairy, base and adaxial side with dense dark

brown scales; scales dark brown, lustrous, ca. 2 cm × 1.5–3 mm at base, with a narrow paler margin and fragile edges, spreading; rachis dark or black, rough after abscission of scales; pinnae spreading, shortly stipitate, oblong, 50–60 × ca. 20 cm at middle; abaxial side of costae subglabrous, adaxial side with sparse dark hairs; pinnules ca. 25 pairs, lanceolate, ca. 10 × 1.5–2 cm, pinnatifid 1/2–3/4 to costule, alternate, spreading, with short stipe ca. 2 mm; abaxial side of costule with small scales, adaxial side hairy; pinnule segments 12–15 pairs, slightly ascending, broadly triangular, 5–6 × 4–5 mm, margin minutely serrulate, apex obtuse; veinlets 6 or 7 pairs, simple, basal basicopic veinlets arising from costule. Lamina papery, abaxially gray-brown, adaxially dark brown, both surfaces glabrous. Sori orbicular, medial, forming V-pattern; paraphyses as long as sporangia; indusia absent.

Beside valley streams in dense forests; 200–1200 m. Guangdong, Guangxi, Hainan, Yunnan [Cambodia, India, Indonesia (Java), Laos, Myanmar, Nepal, Sri Lanka, Thailand, Vietnam].

8. *Alsophila podophylla* Hooker, Hooker's J. Bot. Kew Gard. Misc. 9: 334. 1857.

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Alsophila podophylla var. *procumbens* Tutcher; *A. rheosora* Baker; *Cyathea bonii* Christ; *C. podophylla* (Hooker) Copeland; *Gymnosphaera podophylla* (Hooker) Copeland.

Trunk erect, 1–3 m tall or to several meters. Stipes persistent, forming irregular skirt around trunk, purple to purple-black, glossy, base of stipe thick, with short spines, warts, and scales; scales lustrous, dark brown, narrow, lanceolate, stiff, margin paler, irregular, often setose, ca. 1.5 cm × 1.8 mm; lamina 1-pinnate at young age to 2-pinnate, 1–2 m; abaxial side of rachis and costa scabrous, with brown scales; pinnae alternate, spreading, with stalk 2.5–3 cm, oblong-lanceolate, 30–50 × 10–18 cm, apex long acuminate; pinnules ca. 20 pairs, alternate, spreading, with short stipe ca. 1.5 mm, lanceolate, base truncate, 1.2–1.5 cm wide, apex caudate, margin subentire or crenate to dentate, often pinnatifid on large fronds to 1/4 or less to midvein; veinlets 3–5 pairs, simple, basal basicopic ones arising directly from pinna costa or from base of pinnule costule, sometimes veins anastomosing, forming triangular areoles. Sori orbicular, subcostular; paraphyses short, indusia absent.

Forests beside streams and in ravines; 100–1100 m. Fujian, Guangdong, Guangxi, Guizhou, Hainan, Taiwan, Yunnan [Japan (Ryukyu Islands), Thailand, ?Vietnam].

9. *Alsophila denticulata* Baker, J. Bot. 23: 102. 1885.

粗齿桫欏 cu chi suo suo

Alsophila acaulis Makino; *Cyathea hancockii* Copeland; *C. polyodonta* Domin; *Dryopteris hancockii* (Copeland) Nakai; *D. taitunensis* Koidzumi; *Gymnosphaera denticulata* (Baker) Copeland; *G. hancockii* (Copeland) Ching ex L. K. Lin.

Rhizome prostrate or short and erect, not forming treelike trunks, bearing several fronds at apex. Fronds 2-pinnate-pinnatifid, up to 1.5 m; lowest pinnae usually reduced; stipe 30–90 cm, stipe and rachis brown to dark purple-brown, lustrous,

scaly and hairy on adaxial surface; scales on rhizome and stipe base golden-yellow, concolorous, lustrous, linear, ca. 1.5 cm × 1.5 mm, base rounded, margin ciliate; lamina lanceolate, 35–50 cm; pinnae 12–16 pairs, alternate, ascending, with short stipe, oblong, middle pinnae 12–40 cm, basal pair abbreviated; pinnules 7–8 × 1.6–1.8 cm, sessile, apex acute, pinnatifid almost to costule, basal 1 or 2 pairs free; pinnule segments ascending, margin dentate; veinlets 5–7 pairs, simple or rarely forked, basal basicopic ones arising directly from pinnule costule, costae and midveins of pinnules and segments abaxially with bullate scales, scales with prominent dark tip. Sori orbicular, medial between midvein and margin; paraphyses many, slightly longer than sporangia; indusia absent.

Valleys, margins of evergreen forests; 300–1500 m. Chongqing, Fujian, Guangdong, Guangxi, Guizhou, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Japan (including Ryukyu Islands)].

10. *Alsophila metteniana* Hance, J. Bot. 6: 175. 1868.

小黑桫欏 xiao hei suo luo

Alsophila formosana Baker; *A. lamprocaulis* (Christ) Ching; *A. metteniana* var. *subglabra* Ching & Q. Xia; *Aspidium lamprocaulon* Christ; *Cyathea formosana* (Baker) Copeland; *C. lamprocaulis* (Christ) Ching; *C. metteniana* (Hance) C. Christensen & Tardieu; *Dryopteris lamprocaulis* (Christ) C. Christensen; *Gymnosphaera formosana* (Baker) Copeland; *G. lamprocaulis* (Christ) Ching ex L. K. Lin; *G. metteniana* (Hance) Tagawa; *G. metteniana* var. *subglabra* (Ching & Q. Xia) Y. K. Yang & J. K. Wu.

Rhizome not forming erect trunk, ascending to creeping or erect, up to 30 cm tall or more, bearing several fronds at apex. Fronds 2-pinnate-pinnatifid, 1–2.5 m; stipe dark brown, lustrous, up to 1.2 m, base scaly; scales on rhizome and stipe base brown, lustrous, lanceolate with caudate apex, up to 2 cm × 1.5 mm near base, margin paler and fimbriate; lamina 2-pinnate-pinnatifid, oblong-lanceolate, ca. 1.5 × 1 m, narrower near base, acuminate at apex; rachis reddish brown, glabrous with small pale brownish scales; middle pinnae ca. 40 cm; pinnules 6–9 × 1.6–2.2 cm, deeply pinnatifid to 2–4 mm to costule, basal segment not free; pinnule segments narrow, apex crenate; veinlets 5 or 6 pairs, simple, basal basicopic ones arising directly from pinnule costule; costae reddish brown, subglabrous, with some small scales; scales gray, narrow, apex with a long black stiff hair; costules scaly at base; scales dark brown, with paler margin, apex curled, with a stiff hair, with some smaller, gray, basally bullate scales, apex also with a stiff hair. Sori medial; paraphyses many, longer than or as long as sporangia; indusia absent.

Wet forests, forest margins, hillsides. Chongqing, Fujian, Guangdong, Guizhou, Sichuan, Taiwan, Zhejiang [Japan (including Ryukyu Islands)].

11. *Alsophila khasyana* T. Moore ex Kuhn, Linnaea 36: 154. 1869.

西亚桫欏 xi ya suo luo

Alsophila pingbianica Y. K. Yang, Y. M. He & J. K. Wu; *Cyathea khasyana* (T. Moore ex Kuhn) Domin; *Gymnosphaera hongheensis* Y. K. Yang, Z. Y. Yu & J. K. Wu; *G. khasyana* (T. Moore ex Kuhn) Ching; *G. pingbianica* (Y. K. Yang, Y. M. He & J. K. Wu) Y. K. Yang & J. K. Wu.

Trunk erect, ca. 1.5 m or more. Fronds 2-pinnate-pinnatifid, 2–3 m; stipe dark, up to 40 cm or more, glabrous, not spiny, densely scaly at base; scales abundant, dark, ca. 1.5 cm × 1.5 mm, with broad, pale, ciliate margins; lamina up to 70 cm or more; pinnules alternate, spreading, lanceolate, 8.5–10 × 1.5–2.5 cm, base truncate, shortly stalked, deeply pinnatifid, apex acuminate; pinnule segments ca. 17 pairs, alternate, spreading, approximate, oblong, ca. 8 × 4 mm, dentate at apex and margin, basal pair almost free, upper part pinnatifid almost to costule; veinlets 8 or 9 pairs, simple or forked, basal basicopic ones arising directly from pinnule costule. Lamina thin, dark brown on adaxial surface, pale green on abaxial surface; rachis and costae dark brown, glabrous on abaxial side, adaxial side with dense reddish brown stiff hairs; adaxial side of costules with small dark brown, lanceolate scales; adaxial side of midveins with sparse, small, brown bullate scales. Sori close to midveins, often 4 pairs; indusia absent.

Forests; 1200–1800 m. Xizang, Yunnan [India, Myanmar].

12. *Alsophila austroyunnanensis* S. G. Lu, Acta Bot. Yunnan. 20: 45. 1998.

滇南桫欏 dian nan suo luo

Gymnosphaera austroyunnanensis (S. G. Lu) S. G. Lu & C. X. Li.

Trunk erect, 2–7 m tall. Fronds 2-pinnate-pinnatifid, 4–4.5 m; stipe black, lustrous, 1–1.5 cm, with short sharp spines and dense scales at base; scales brown in middle, lanceolate, 1.5–3 cm × 2–3 mm, margin pale brown, irregular; lamina 2–3 × 1–1.8 m; pinnae 50–90 × 15–25 cm; pinnules alternate, spreading, lanceolate, 8–13 × 1.5–2.5 cm, broader at middle, base truncate, shortly stipitate, pinnatifid almost to costule; pinnule segments up to 25 pairs, alternate, slightly ascending; sterile segments 10–15 × 4–5 mm, margin and apex dentate, or shallowly pinnatifid; fertile segments narrow, 5–10 × 1–3 mm; veinlets 10–12 pairs, ascending, simple or forked. Lamina papery, pale brown on abaxial surface, dark brown on adaxial surface; rachis and costa dark brown, abaxial side of costa glabrous or with small scales, adaxial side of costa and costule with dense, brown, stiff hairs, abaxial side of costule and midvein with small, ovate, brown scales, margin of scales dentate; normally lower few pinnae fertile, and often only lower pinnules fertile. Sori medial, close to midveins, ca. 10 pairs per segment, covering whole segment when mature; indusia absent.

• Sunny forested slopes; 800–1400 m. S and SE Yunnan.