

## PLAGIOGYRIACEAE

瘤足蕨科 liu zu jue ke

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Plants terrestrial, small to medium-sized, 10–150(–200) cm tall, without scales. Rhizomes dictyostelic, erect, suberect, or shortly decumbent, stout, thickened; stipe bases persistent. Roots blackish, wiry, regularly arranged on stem, one beside each stipe base, sparsely branched. Fronds dimorphic, bearing minute, uniseriate, multicellular, gland-tipped, mucilage-secreting trichomes. Stipes orbicular, ovate, triangular, or tetragonal in cross section, bases swollen; vascular bundle 1 per stipe, expanded or divided into 3 meristemes in enlarged base; rachises winged or not, abaxially semiterete, flat, or carinate, adaxially sulcate. Aerophores variously present on stipes and rachises, cushionlike or elongate and hornlike with blunt apex. Sterile fronds herbaceous, firmly so, or subleathery; lamina 1-pinnate, pinnatifid, or pinnatilobed, apices coadunate, pinnalike, pinnatifid, or confluent; pinnae sessile, shortly stalked, or adnate to rachises, falcate to linear-lanceolate, widest near base or below middle, glabrous or abaxially sparsely glandular pubescent, margin entire to serrulate, apex minutely serrulate to dentate; veins simple or paired at base, mostly 1- or 2-forked, reaching pinna margins, distinct on both surfaces. Fertile fronds erect at middle of plant, with proportionally longer stipes and shorter lamina; lamina pinnate or deeply pinnatifid; pinnae sessile, shortly stalked, or adnate to rachises; apical pinna usually pinnatifid or pinnalike, margin entire, subentire, or erose-toothed, glabrous or with few short glandular hairs, scarious; tissue above veinlets hygroscopic and reversible, functioning as indusium (false indusium), scarious margins covering sori in juvenile stage, recurved at maturity; veins free, 1- or 2-forked, solitary or paired at base. Sori borne on swollen vein tips, extending slightly, confluent, acrostichoid, almost wholly covering abaxial surface of pinnae when ripe. Paraphyses numerous, mixed with sporangia, uniseriate, orange to dark brown, multicellular, glandlike, slightly longer than sporangia, apically subcapitate. Sporangia with a complete oblique annulus, not interrupted by stalk, laterally dehiscent. Spores 64 per sporangium, tetrahedral; aperture trilete; arms of aperture ca. 3/4 radius; surface ornamentation irregular, coarse, tuberculate with coalescent papillae and rodlets.  $x = 65$  (sexual).

One genus and ca. ten species: mainly in E and SE Asia, one species in tropical America; eight species (one endemic) in China.

Ching Ren-chang, Fu Shu-hsia, Wang Chu-hao & Shing Gung-hsia. 1959. Plagiogyriaceae. In: Ching Ren-chang, ed., *Fl. Reipubl. Popularis Sin.* 2: 85–105.

### 1. PLAGIOGYRIA (Kunze) Mettenius, *Abh. Senckenberg. Naturf. Ges.* 2: 265. 1858.

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*Lomaria* sect. *Plagiogyria* Kunze, *Farnkräuter* 2: 63. 1850.

Morphological characters and geographic distribution are the same as those of the family.

- 1a. Sterile lamina pinnate, most pinnae cuneate, rounded, truncate, or attenuate at base.
  - 2a. Sterile lamina glaucous abaxially ..... 2. *P. glauca*
  - 2b. Sterile lamina not glaucous abaxially.
    - 3a. Aerophores on stipes and rachises elongate and hornlike with blunt apex ..... 1. *P. pycnophylla*
    - 3b. Aerophores on stipes and rachises cushionlike.
      - 4a. Veins usually simple, or as many simple as forked ..... 3. *P. euphlebia*
      - 4b. Veins usually paired at base or forked above base ..... 4. *P. japonica*
- 1b. Sterile lamina pinnate to pinnatifid or pinnatilobed, pinnae usually adnate to rachises.
  - 5a. Sterile lamina glaucous abaxially ..... 5. *P. assurgens*
  - 5b. Sterile lamina not glaucous abaxially.
    - 6a. Rachises of sterile lamina abaxially semiterete to trigonous ..... 6. *P. adnata*
    - 6b. Rachises of sterile lamina abaxially carinate or flattened.
      - 7a. Stipes distally tetragonal in cross section ..... 7. *P. stenoptera*
      - 7b. Stipes distally triangular in cross section ..... 8. *P. falcata*

**1. *Plagiogyria pycnophylla* (Kunze) Mettenius, *Abh. Senckenberg. Naturf. Ges.* 2: 272. 1858.**

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*Lomaria pycnophylla* Kunze, *Bot. Zeitung (Berlin)* 6: 143. 1848; *Plagiogyria coerulescens* Ching; *P. communis*

Ching; *P. decrescens* Ching; *P. gigantea* Ching; *P. glauca* (Blume) Mettenius var. *virescens* C. Christensen; *P. lamuginosa* Ching; *P. lineata* Ching; *P. minguingensis* R. D. Dixit & A. Das; *P. pycnophylla* var. *mixta* Copeland; *P. pycnophylla* var. *remota* Christ; *P. scandens* Mettenius; *P. simulans* Ching; *P. taliensis* Ching; *P. tetraptera* W. M. Chu & J. J. He; *P. virescens* (C. Christensen) Ching; *P. wilhelmensis* Nakaïke.

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Stipes 6–60 cm on sterile fronds, 10–70 cm on fertile fronds, distally tetragonal, terete, ovate, or triangular in cross section; vascular bundle U-shaped; stipes and rachises glabrous to hairy, sometimes densely hairy; aerophores elongate and hornlike with blunt apex. Sterile lamina pinnate, 15–100 × 6–40 cm, not glaucous, apically with a pinnatilobed segment or a pinnalike segment; rachises abaxially flattened, semiterete, or grooved; pinnae 20–50 pairs; proximal pinnae sessile to shortly stalked, base truncate or rounded, subdeflexed or not, gradually abbreviated or slightly shorter, sometimes becoming vestigial on stipe; middle pinnae sessile, base truncate or rounded; veins simple or sometimes 1-forked. Fertile lamina pinnate, 20–70 × 4–20 cm; rachises abaxially flattened, semiterete, or grooved, sometimes winged; pinnae 16–40 pairs, sessile or shortly stalked; proximal pinnae gradually abbreviated or some pairs aerophore-like or vestigial. Paraphyses few, shed early, brown or dark brown. Spores yellow to brown, not obviously tuberculate.

Forests, wet areas; 1200–3500 m. Sichuan, Xizang, Yunnan [Bhutan, N India, Indonesia, Malaysia (including Borneo), N Myanmar, Nepal, New Guinea, Philippines (Luzon)].

**2. *Plagiogyria glauca*** (Blume) Mettenius, Abh. Senckenberg. Naturf. Ges. 2: 273. 1858.

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*Lomaria glauca* Blume, Enum. Pl. Javae 2: 204. 1828; *Blechnum papuanum* Brause; *Plagiogyria brausei* Nakaike; *P. distanta* R. D. Dixit & A. Das; *P. formosana* Nakai; *P. formosana* var. *angustata* Nakaike; *P. glauca* subsp. *formosana* (Nakai) Nakaike; *P. glauca* var. *nana* (Copeland) C. Christensen; *P. glauca* var. *philippinensis* Christ; *P. glaucescens* Ching; *P. glaucescens* var. *arguta* Ching; *P. media* Ching; *P. nana* Copeland; *P. papuana* (Brause) Alston (1939), not C. Christensen (1937); *Struthiopteris papuana* (Brause) Ching.

Stipes 3–55(–60) cm on sterile fronds, 5–75 cm on fertile fronds, distally tetragonal, orbicular, or ovate in cross section; vascular bundle U-shaped; stipes and rachises glabrous to hairy, sometimes densely hairy; aerophores elongate and hornlike with blunt apex. Sterile lamina pinnate, 7–110 × 2–30 cm, glaucous abaxially, apically with a pinnatilobed segment or a pinnalike segment; rachises abaxially semiterete to flattened, or grooved; pinnae 13–43 pairs; proximal pinnae sessile to shortly stalked, base truncate or rounded, not deflexed to subdeflexed, abruptly abbreviated or not, sometimes becoming vestigial on stipe; middle pinnae sessile, base truncate or rounded; veins as many simple as forked. Fertile lamina pinnate, 11–77 × 4–24 cm; rachises abaxially semiterete, flattened, or grooved; pinnae 13–43 pairs, shortly stalked or sessile; proximal pinnae gradually abbreviated or some pairs becoming aerophore-like vestiges. Paraphyses few, shed early, dark brown or yellow. Spores yellow to brown, not obviously tuberculate.

Grasslands, slightly shaded or open places; 1200–3800 m. Sichuan, Taiwan, Xizang, Yunnan [E India, Indonesia, Malaysia (Borneo), N Myanmar, New Guinea, Philippines (Luzon, Mindanao); SW Pacific islands (S New Ireland, Solomon Islands)].

**3. *Plagiogyria euphlebia*** (Kunze) Mettenius, Abh. Senckenberg. Naturf. Ges. 2: 274. 1858.

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*Lomaria euphlebia* Kunze, Bot. Zeitung (Berlin) 6: 521. 1848; *Lomariopsis triquetra* (Wallich ex Mettenius) Ettingshausen; *Plagiogyria attenuata* Ching; *P. chinensis* Ching; *P. christii* Copeland; *P. elongata* R. D. Dixit & A. Das; *P. euphlebia* var. *grandis* (Copeland) De Vol; *P. euphlebia* var. *triquetra* (Wallich ex Mettenius) Ching; *P. grandis* Copeland; *P. integripinna* Ching; *P. koidzumii* Tagawa; *P. maxima* C. Christensen; *P. triquetra* Wallich ex Mettenius; *Stenochlaena henryi* Christ.

Stipes (7–)25–35(–70) cm on sterile fronds, (9–)40–75 cm on fertile fronds, distally ovate or tetragonal, rarely orbicular, in cross section; vascular bundle V-shaped to U-shaped; stipes and rachises glabrous to hairy, sometimes densely hairy; aerophores cushionlike. Sterile lamina pinnate, (11–)20–60(–135) × (7–)12–30(–40) cm, not glaucous, apically with a pinnalike segment; rachises abaxially usually semiterete; pinnae 7–25 pairs; proximal pinnae shortly stalked or rarely sessile, base usually equilateral, cuneate, rounded, or attenuate, not deflexed, not abbreviated or basal pair slightly shorter; middle pinnae shortly stalked or sessile, base cuneate or rounded; veins mostly simple to as many simple as forked. Fertile lamina pinnate, (9–)20–50(–80) × (3–)10–20(–33) cm; rachises abaxially semiterete, rarely flattened or grooved; pinnae 7–25 pairs, shortly stalked or sessile; proximal pinnae not abbreviated or basal pair slightly shorter. Paraphyses many, brown. Spores yellow or brown, with reddish tubercles.  $2n = 260$ .

Forests; near sea level to 2500 m, usually 600–1500 m. Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [Bhutan, India, Japan (including Ryukyu Islands), Korea, Myanmar, Nepal, Philippines, Vietnam].

**4. *Plagiogyria japonica*** Nakai, Bot. Mag. (Tokyo) 42: 206. 1928.

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*Plagiogyria adnata* (Blume) Beddome var. *distans* Rosenstock; *P. caudifolia* Ching; *P. hainanensis* Ching; *P. intermedia* Copeland; *P. japonica* var. *pseudojaponica* (Nakaike) K. Iwatsuki; *P. liangkhwangensis* Ching; *P. pseudojaponica* Nakaike.

Stipes (7–)20–40 cm on sterile fronds, 40–55 cm on fertile fronds, distally tetragonal, orbicular, or ovate in cross section; vascular bundle V-shaped; stipes and rachises glabrous; aerophores cushionlike, present only on stipe base. Sterile lamina pinnate, (12–)20–43 × (4–)10–20 cm, not glaucous, apically with a pinnalike segment; rachises abaxially semiterete, flattened, or grooved; pinnae (8–)12–20(–30) pairs; proximal pinnae sessile, base usually inequilateral, rounded, or cuneate, not deflexed to subdeflexed, slightly shortened; middle pinnae shortly stalked, sessile, or rarely acroscopically adnate to rachises, base rounded or cuneate; distal pinnae inequilaterally adnate to rachises, basiscopically decurrent to rounded; veins mostly paired at base or forked above base. Fertile lamina pinnate, 23–50 × 6–17 cm; rachises abaxially flattened or semiterete; pinnae 9–19 pairs, shortly stalked; proximal pinnae longest. Paraphyses many, brown or yellow. Spores yellow, with reddish tubercles.  $2n = 260$ .

Forests, ravines, rocky places; 100–1800 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [N India, Japan (including Ryukyu Islands), Korea].

**5. *Plagiogyria assurgens*** Christ, Boll. Soc. Bot. Ital. 1901: 293. 1901.

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*Blechnum faberi* C. Christensen; *Lomaria deflexa* Baker (1888), not Colenso (1844), nor Liebmann (1849); *Spicanta deflexa* Kuntze.

Stipes 8–20 cm on sterile fronds, 15–45 cm on fertile fronds, distally tetragonal in cross section; vascular bundle U-shaped; stipes and rachises glabrous; aerophores cushionlike, present only on stipe base. Sterile lamina pinnatifid, 23–65 × 10–20 cm, glaucous abaxially, apex confluent, terminating in a pinnatilobed segment; rachises abaxially trigonous or carinate; pinnae 22–47 pairs; proximal pinnae adnate to rachises, deflexed, abruptly abbreviated; middle pinnae acroscopically adnate to rachises, basiscopically rounded; distal pinnae subequilaterally adnate to rachises, basiscopically rounded; veins usually paired at base. Fertile lamina deeply pinnatifid, 28–60 × 7–14 cm; rachises abaxially carinate; pinnae 20–35 pairs, base broadly adnate to rachises; proximal 1–4 pairs of pinnae much shorter than others, deflexed, often sterile. Paraphyses few, shed early, brown. Spores yellow, with reddish tubercles.

• Humus-rich forests, mountain slopes; 1200–2500 m. Chongqing, Sichuan, Yunnan.

**6. *Plagiogyria adnata*** (Blume) Beddome, Ferns Brit. India 1: t. 51. 1865.

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*Lomaria adnata* Blume, Enum. Pl. Javae 2: 205. 1828; *L. brooksii* Alderwerelt; *Plagiogyria adnata* var. *condensata* Christ; *P. adnata* var. *reflexa* C. Christensen & Tardieu; *P. adnata* var. *yakushimensis* (K. Satô) K. Iwatsuki; *P. distinctissima* Ching; *P. meghalayensis* R. D. Dixit & A. Das; *P. rankanensis* Hayata; *P. rankanensis* var. *yakushimensis* (K. Satô) Nakaike; *P. subadnata* Ching; *P. wulingshanensis* C. M. Zhang & S. F. Wu; *P. yakumonticola* Nakaike; *P. yakushimensis* K. Satô; *P. yunnanensis* Ching; *Struthiopteris brooksii* (Alderwerelt) Ching.

Stipes (4.5–)15–25(–35) cm on sterile fronds, (17–)40–50(–65) cm on fertile fronds, distally tetragonal or rarely triangular in cross section; vascular bundle V-shaped; stipes and rachises glabrous; aerophores cushionlike, present only on stipe base. Sterile lamina pinnatifid, (8–)15–25(–36) × (3–)5–15(–26) cm, not glaucous, apex confluent, terminating in a pinnatilobed segment; rachises abaxially semiterete to trigonous; pinnae (8–)13–20(–35) pairs; proximal pinnae adnate to rachises, not deflexed to subdeflexed, not abbreviated or slightly shortened; middle pinnae acroscopically adnate to rachises, basiscopically rounded; distal pinnae subequilaterally adnate to rachises, basiscopically decurrent; veins mostly paired at base, forked above base, or rarely simple. Fertile lamina pinnate, (8–)16–26(–45) × (2–)4–10(–16) cm; rachises abaxially flattened or grooved; pinnae (9–)13–17(–24) pairs, sessile or shortly stalked; proximal pinnae shortly stalked, not abbrevi-

ated. Paraphyses many or few, rarely shed early, yellow or brown. Spores yellow, with reddish tubercles.  $2n = 260$ .

Forests, wet areas, mountain slopes; near sea level to 2000 m, common above 500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hubei, Hunan, Jiangxi, Sichuan, Taiwan, Yunnan, Zhejiang [E and N India, Indonesia (Java, Sumatra), Japan, Malaysia (including Borneo), Myanmar, Philippines (Luzon), Thailand, Vietnam].

*Plagiogyria japonica* and *P. adnata* hybridize. Specimens of *P. japonica* with acroscopically adnate pinnae may key out to *P. adnata*. Fronds of *P. japonica* usually end in a segment similar to a short lateral pinna, while fronds of *P. adnata* have pinnatifid apices.

**7. *Plagiogyria stenoptera*** (Hance) Diels in Engler & Prantl, Nat. Pflanzenfam. 1(4): 282. 1899.

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*Blechnum stenopterum* Hance, J. Bot. 21: 268. 1883; *Lomaria stenoptera* (Hance) Baker; *Plagiogyria argutissima* Christ; *P. henryi* Christ; *P. petelotii* Copeland.

Stipes (3–)4–8(–12) cm on sterile fronds, (9–)11–22(–28) cm on fertile fronds, distally tetragonal in cross section; vascular bundle V-shaped; stipes and rachises glabrous; aerophores cushionlike, present only on stipe base. Sterile lamina pinnatifid, 20–60 × 4–20 cm, not glaucous, apex confluent, terminating in a pinnatilobed segment; rachises abaxially flattened or carinate distally, sometimes with crisped wings; pinnae 25–35 pairs; proximal pinnae reduced to auricles, middle pinnae adnate to rachises, basiscopically straight or rounded in large fronds; distal pinnae subequilaterally adnate to rachises, basiscopically decurrent; veins mostly forked above base. Fertile lamina pinnate, (10–)35–55(–75) × 4–8(–12) cm; rachises abaxially flattened to grooved, sometimes winged; pinnae 15–30 pairs, subsessile or shortly stalked; some proximal pinnae becoming aerophore-like vestiges or replaced by auriculate pinnae. Paraphyses absent. Spores yellow, with reddish tubercles.

Densely forested mountains, wet ravines, rocky slopes; 500–2500 m. Guangxi, Guizhou, Hubei, Hunan, Sichuan, Taiwan, Yunnan [Japan (Yakushima), Philippines (Luzon), Vietnam].

“*Plagiogyria stenoptera* var. *major*” (Ching, Acta Phytotax. Sin. 7: 152. 1958) belongs in synonymy here; however, it was not validly published because no type was indicated (*Melbourne Code*, Art. 40.1).

**8. *Plagiogyria falcata*** Copeland, Philipp. J. Sci., C, 2: 133. 1907.

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*Lomaria matthewii* Christ ex C. G. Matthew; *Plagiogyria adnata* (Blume) Beddome var. *angustata* Rosenstock; *P. angustipinna* Ching; *P. chekiangensis* P. L. Chiu; *P. dentimarginata* J. F. Cheng; *P. dunnii* Copeland; *P. hayatana* Makino; *P. tenuifolia* Copeland.

Stipes (6–)12–20(–30) cm on sterile fronds, 20–45 cm on fertile fronds, distally sharply triangular in cross section; vascular bundle V-shaped; stipes and rachises glabrous; aerophores cushionlike, present only on stipe base. Sterile lamina pinnatifid, (10–)20–40(–55) × (3–)5–13(–17) cm, not glaucous, apex confluent, terminating in a pinnatilobed segment; rachises abaxially carinate; pinnae (12–)35–55 pairs; proximal pinnae adnate

to rachises, usually deflexed, not abbreviated or abruptly abbreviated; middle pinnae adnate to rachises, basiscopically straight or rounded; distal pinnae subequilaterally adnate to rachises, basiscopically straight or rounded; veins paired at base and forked above, paired or branched at base with both branches forked above, or rarely mostly simple. Fertile lamina deeply pinnatifid, 20–50 × 3–6(–10) cm; rachises abaxially carinate, sometimes winged; pinnae (15–)35–50 pairs, sessile,

broadly adnate to rachises; proximal pinnae not abbreviated or gradually abbreviated, sometimes not well developed. Paraphyses few, often shed early or absent, yellow. Spores yellow, with reddish tubercles.

Densely forested ravines, in shade of rocks; near sea level to 2200 m, usually 500–1500 m. Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Jiangxi, Taiwan, Zhejiang [Philippines].