Systematics of genus *Lygodium* Sw. (Lygodiaceae) in India

S SINGH and G PANIGRAHI
Botanical Survey of India, Howrah 711 103, India

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Abstract. *Lygodium* Sw. belongs to the monogeneric family Lygodiaceae Presl. s.s. and is comprised of about 40 species in the world flora. Out of these 10 species are from India. *L. giganteum* Tagawa and Iwat. and *L. mearnsii* Copel. are new records while *L. longifolium* (Wild.) Sw., *L. cirinnatum* (Burm. f.) Sw., *L. polystachyum* Wall. ex Moore and *L. alta* (Clarke) v.A.v.R, are poorly represented amongst the Indian collections in herbaria. A key is provided for diagnosing the species from India along with the correct nomenclature of each taxon.

Keywords. Lygodiaceae; *Lygodium*.

1. Introduction

Beddome (1883, 1892) recorded five species/varieties of *Lygodium* L. from India: *L. cirinnatum* (Burm. f.) Sw., *L. microphyllum* (Cav.) R. Br., *L. flexuosum* (L.) Sw., *L. japonicum* (Thunb.) Sw. and *L. flexuosum* (L.) Sw. var. *alta* C. B. Clarke. Mehra and Bir (1964) listed *L. flexuosum* and *L. japonicum* from Darjeeling-Sikkim Himalayas. Panigrahi and Dixit (1967), described and illustrated the four species *sensu* Beddome and listed the chromosome numbers of 10 species investigated up to 1966. Although *L. longifolium* (Wild.) Sw. (1803) was originally described from South India, neither Beddome nor Panigrahi and Dixit (1967) included the taxon in their treatment; Holttum (1959) treated *L. mearnsii* Copel. from the Philippines as conspecific with *L. japonicum* Sw. and reported one more species: *L. polystachyum* Sw. and reported one more species: *L. polystachyum* Wall. ex Moore as extending its range to Assam. *L. salicifolium* Presl was originally based on plants from India and Bangladesh. However this taxon was not recognised in the Indian herbaria correctly until Holttum (1959) reported the extension of its range to Assam. Thus the taxonomy of *Lygodium* is in a state of flux. The present studies based on field observations and on the materials deposited in CAL and ASSAM clearly show that the genus is represented in India by 10 species.

2. Materials and methods

A large number of specimens from all over India and abroad (in CAL and ASSAM) have been examined. For correct identification, materials, protologues, photographs, illustrations and microfiche-photographs of 'Types' and/or of authentic specimens as available at CAL were consulted.
3. Systematic account


Type genus: Lygodium Sw. in J. Bot. (Schrader) 1800(2): 7, 106. 1801 nom. cons.

Terrestrial, with rhizome short-to long-creeping, on or under the surface, apex covered with rigid multiseptate hairs. Fronds in juvenile plants erect, once or twice forked or dichotomously branched with lamina palmatifoliate; the fronds of the older plants grow further by the elongation of rachis to an unlimited growth; stipe with one vascular bundle; rachis (or main rachis) branch into unequal dichotomies, the dominant branch elongates, twists and climbs up by branching similarly repeatedly upwards at regular intervals; recessive branch develops into palmate leaflets or pinnae; flexible, stout or plastic, glabrous or hairy, dorsal surface flat; with very narrow wing of raised edges (except L. polystachyum), ventral and lateral surfaces terete, wings interrupted, all sub-branch-rachises similarly winged; Pinnae forked, palmati-lobed; Primary rachis-branch short, hardly developed or to 10 mm long, forked, glabrous or pubescent, dorsal surface flat (except in L. polystachyum), ending into dormant apex bearing brown to black-brown sepalate, pointed hairs; sometimes the dormancy is overcome if the apex is injured, each branch of the fork of the primary rachis-branch develops into long secondary rachis-branches, these may either directly bear stalked or subsessele pinnales or may further give rise to tertiary and quaternary rachis-branches, morphology similar to primary or secondary rachis-branches; junction beyond may be jointed or continuous; pinnales simple to lobed to bi-tripinnate, sessile to stalked, stalks articulated (or jointed) or nonarticulated to secondary rachis-branches or to the pinnule-lamina; margin entire to crenate; veins 1–3 times forked, very oblique, free, if reticulate then without free included veinlets (not in Indian taxa); surfaces may be glabrous or pubescent. Sorophores at the margin, usually with 2–7 sporangia or more, acropetal, alternate, in two rows, one on each side of the vein; indusium individual, attached along the vein and opening forwards; edges entire or fringed or hairy; sporangia bullet-shaped or pear-shaped, annulus at one end in a single row of elongated thickened cells, bursting longitudinally or irregularly, arising at the margin but becoming superficial due to subsequent extra-marginal growth; spores pale green or looking brown in dried specimens, trilete, variously sculptured but perispore absent.

Monogenic (sensu Pichi Sermolli 1981)


4. Key to the species

1a. Primary rachis-branches hardly distinct or up to 3 mm long; rhizome short-creeping or suberect.
2a. Secondary rachis-branches pinnate with 10–15 pairs of pinnules; axes terete and wingless throughout; sterile pinnules pinnatifid throughout ........................................ 9. L. polystachyum

2b. Secondary rachis-branches pinnate with 2–6 pairs of pinnules or branches dichotomously; axes flat on dorsal side and winged; sterile pinnules simple pinnate at base or palmate

3a. Secondary rachis-branches regularly pinnate, with 3–6 pinnules on either side

4a. Basal pinnules the largest, the succeeding ones gradually reduced; basal pinnules stalked becoming sessile and sub sessile and thereafter adnate upwards ..................................... 3. L. flexuosum

4b. Pinnules ± all equal and stalked

5a. Stalks articulated at their junction with lamina which falls off leaving the naked stalks; occasionally the basal pinnules of secondary pinnae lobed to pinnate; dormant apex hairs without swollen bases; costules ± raised only to the mid lamina ...................... 10. L. salicifolium

5b. Stalks not articulated with the lamina; basal ultimate pinnules at most with one lobe; dormant apex hairs with swollen bases; costules prominently raised below and conspicuous to the tip of the lamina ........... 1. L. altum

3b. Secondary rachis-branches once or twice-forked or dichotomously branched, sometimes sub-pinnate with 1–2 tertiary pinnules.

6a. Sterile pinnules finely serrate or crenate, margin not much thickened, veins ending into teeth; dormant apices of primary branch not sunk; hairs of dormant apex with swollen bases; spores coarsely or irregularly warty verrucose ........................................ 6. L. longifolium

6b. Sterile pinnules entire, margin thickened by the joining of the veins; dormant apices sunk; bases of hairs of dormant apices not swollen; spores finely or evenly verrucose ........................................ 2. L. circinnatum

1b. Primary rachis-branches 3–10 mm long; rhizome generally long-creeping, or short-creeping.

7a. Fertile secondary branches either simple pinnate, or if more, then finely dissected; rhizome long-creeping and fronds distantly placed.

8a. Secondary branches simple pinnate, pinnules deciduous, basal pinnules occasionally lobed; pinnule stalks thickened at the apex; spores with raised reticulum on the upper side .................................. 8. L. microphyllum

8b. Secondary rachis-branches bipinnate or more pinnate in fertile pinnae; pinnules palmately-lobed and persistent; pinnule stalks not thickened; spores finely verrucose ........................................ 5. L. japonicum

7b. Fertile secondary rachis-branches pinnate with pinnules palmately lobed at base or sometimes these lobes are free; rhizome short-creeping and fronds close together

9a. All junctions beyond the secondary rachis-branch jointed or articulated; spores smooth ................................ 4. L. giganteum

9b. None of the junctions is joined or articulated, (axes continuous in growth at every junction); spores finely verrucose ........................................ 7. L. mearnsii
5. Description of the species

1. **Lygodium altum** (C. B. Clarke) v.A.v.R., Malayan Ferns 114. 1908.

   *Lygodium flexuosum* var. *alta* C. B. Clarke in *J. Linn. Soc. Bot.* 25 101. t. 44. 1890; Beddome, Suppl. Handb. Ferns Br. India 108 1892.

   **Type:** India, West Manipur (Muneypore) Clarke 42331.


   *Rhizome* short-creeping. *Frons* very long, 70–85 cm wide, *rachis* c. 2 mm across, *pinnae* each half 35–42 cm long, 30–40 cm broad, deltoid to oblique deltoid, tripinnate; *primary rachis-branches* indistinct, dormant apex hairs up to 2 mm long, blackish-pale, separte with swollen base intermixed with/without swollen base; *secondary rachis-branches* 6–20 cm long, wing distinct, dorsal flattened surface with simple or separtate, hyaline to brown hairs; pinnate; *pinnules* largest lateral 20–25 cm long, 2-3–3.5 cm wide in middle, 2–4 pairs, basal ones with or without lobes, terminal pinnae forked or deeply lobed, 23–28 cm long, 2–3 cm broad, all stalked, stalk 1–1.5 cm long in basal, gradually reducing upwards, winged, glabrous on both surfaces or a little bit pubescent on dorsal side as on sec. rach.-br., pinnule lamina base cordate, sterile margin subcrenate, mid vein pubescent (or with scattered hairs) on upper surface; lower surface glabrous; pinnule-stalk nonarticulate, veins free, 3–4 times forked, prominent; glabrous, shining, texture subcoriaceous. *Sorophores* 2–6 mm long, 1:5 mm broad, indusium not hairy; spores 75–75–75 ìm, pale brown, tuberculate or verrucose (figures 1–4).

   **Specimens examined:** India: Meghalaya, K. & J. Hills. Thleu Syrryngam, 100 m. 6 Dec. 1915, Kanjilal 6320 (ASSAM); Arunachal Pradesh, Subansiri District, Itanagar, ca. 450 m, 21 Dec. 1970, G. D. Pa170325 (Bsl Herb. Itanagar). Burma: Salween District. Papun, Jan. 1912, Meebold 16969 (CAL). This specimen has got brown, long, separtate, pointed hairs on the upper surface of pinnules and more so at the base of the sorophores on both surfaces.

   **Distribution:** India (Meghalaya, Manipur, Arunachal Pradesh) and Burma.


   **Ophioglossum circinnatum** Burm. f. Fl. Ind. 228. 1768.

   **Type locality:** Habitat in Amboina and Java (Burman s.n. – G, Vide Holttum i.e. – not seen)


   *Ugena dichotoma* Cav. Ic. Descr. Pl. 6: 74. t. 594. f. 2. 1801.

   **Type:** "Marianis et Philippines . . . . " (Nee s.n.)

Figures 1-11. 1-4. *L. altum* (1,3,4-Kanjilal 6320, 2-Meebold 16969); 5-8. *L. microphyllum* (R S Rao 20036); 9-11. *L. flexuosum* (Nair 40657); 1, 5, 6, 9. parts of pinnae; 2, 3, 10. hair of dormant apices; 7. pinnule; 4, 8, 11. spores (scale = 25 μm).
Rhizome short-creeping, bearing stipes very close. Fronds very long, 35–50 cm broad, linear, juvenile fronds once dichotomous, each branch bearing a pedato-palmatisect leaflet, lobes usually 6; rachis ca 3 mm across, stout, glabrous; pinnae each half 18–25 cm long, 15–25 cm broad, once forked or sometimes dichotomously branched, palmatisect; secondary rachis-branches 2–5 cm long, glabrous, once forked, each forked branch-bearing trifoliate pinnules, all lobes adnate at base, innermost not forked subequal; ultimate lobes (sterile) 1.5–2.3 cm broad, elliptic, entire, and thickened; midvein with a few long, brown, septate, pointed hairs on the lower surface; veins once or twice forked, jointed with each other forming thick margin, veins and margin paler than lamina, the lobes broadest in the middle and narrowing towards both ends; (fertile) twice or thrice dichotomously branched, each branch with 3–4 deeply lobed pinnules, 7–10 mm broad; veins once forked, texture subcoriaceous. Sorophores 2–5 mm long, spores 72–72–72 μm, pale, tuberculate or evenly verrucose (figures 35–39).


Distribution: India (North India, Beddome 1883); N.E. India (Holttum 1959), Andaman and Nicobar Islands, Sri Lanka, Bangladesh, Burma, Southern China, Thailand, the New Hebrides and Solomons; throughout Malaysia.


Ophioglossum flexuosum L. Sp. Pl. 2: 1063. 1753. LT.: Ceylon, Herb. Harmann 375 (BM) (selected by Alston and Holttum l.c.)


Rhizome short-creeping. Fronds very long, 25–40 cm broad, juvenile fronds once or twice dichotomous, each branch deeply palmately lobed, almost equal at the base, the whole leaflet cordate, serrate, and sometimes crenately lobed, acute; rachis ca 2 mm across or more, dorsal surface puberulous; pinnae each half 10–30 cm long, 10–30 cm broad, ovate to deltoid, tripinnate to quadripinnatifid; primary rachis-branches indistinct or rarely to 2 mm long, dormant apex bearing hairs 1–1.5 mm long, brown, septate, pointed, dorsal surface puberulous; secondary rachis-branches 5–22 cm long, narrowly winged, hairy or puberulous; pinnules 3–18 cm long, 1–6 cm broad, ovate-oblong to deltoid, or oblique deltoid, base cordate or auricled and lobed, basal ones largest and stalked becoming sessile upwards, stalks 5–10 mm long, apical smaller and sessile, terminal sessile or stalked simple to lobed to pinnate, in the forms more than 10 cm long then with 2–3 pairs of free pinnule lobes, ultimate segments 1–4 cm long, 1–3 cm broad; these basal pairs stalked; midveins hairy; hairs simple to septate, veins hairy. Sorophores 2–10 mm long, ca 1 mm broad, spores 80–80–80 × 100–100–100 μm, pale, coliculate or finely verrucose (figures 9–11).
Systematics of Lygodium


Distribution: India (almost in all the states) Sri Lanka, Burma, S. China, Thailand-Vietnam, Malaya Peninsula, Malesian Islands, Australia (Queensland) and the Pacific islands.


Type: Thailand, Chiang Mai, Tagawa, Iwatsuki & Fukuoka T-2362 (KVO).

Rhizomes short-creeping. Frons 3–4 m long, 30–40 cm broad, linear; rachis 1.5–2.5 mm across, dorsal surface puberulous; pinnae each half 15–20 cm long, 13–20 cm broad, deltoid, tripinnate; primary rachis-branches 4–7 cm long, distinct, like main rachis; dormant apex bearing 1–1.5 cm brown septate, pointed hairs; dormancy overcomes sometimes; secondary rachis-branches 7–15 cm long, stout, joints beyond secondary rachis jointed or articulated; pinnate or bipinnate pinnules 5–10 cm long, 3–6 cm broad, largest at the base becoming smaller upwards, all stalked, may be at apex sessile, terminal simple or forked, obtuse, basal pinnules with further lobed or cleft base; stalks 5–15 mm long, articulated to the secondary rachis, every junction as a whole swollen and streaked giving 'Y' shaped blackish brown appearance; every junction beyond this similar except the stalk of the ultimate pinnules where the apex is swollen (club-shaped) or if stalk indistinct then the pinnule apex stalk may not be swollen but then forming 'Y' shaped joint directly on the secondary rachis; ultimate pinnules 3–8 cm long, basal ones distinctly stalked with one or two lateral lobes, lobes adnate, oblique, obtuse, crenate, midvein distinctly hairy, veins hairy, 1–3 times forked, in between also a few hairs present, these very short; texture subcoriaceous. Sorophores 2–5 mm long, hairs present on and at the margin of the indusium; spores ca 62–62–62 μm pale and very prominent, surface smooth with a few tubercles (figures 23–29).


Distribution: India: (Assam, Manipur, Nagaland and Mizoram); Burma, Thailand, China (Yunnan). A new record for India.

5. Lygodium japonicum (Thunb.) Sw. in J. Bot. (Schrader) 1800(2): 106. 1801; Beddome, op. cit. 457; Alston and Holttum, op. cit.: 14; Holttum, op. cit.: 50. f. 8d-f: Panigrahi and Dixit op. cit.: 221. f. 3a-g.


Type: Japan, Herb. Thunberg s.n. (UPS-microfiche spec. no. 25221 and 25222 CAL).

Rhizome long-creeping. Fronds 2–3 m long, 20–60 cm broad, rachis cm 2 mm across, dorsal surface pubescent; pinnae in sterile frond tripinnate and fertile frond quadripinnate to further decompound, ovate-deltoid; primary rachis-branches 6–8 mm long, pubescent, dormant apex hairs ca 1 mm long, brown and pointed; secondary rachis-branches 10–30 cm long, in sterile frond pinnate and in fertile frond tripinnate to further decompound, pubescent, none of the primary, secondary or tertiary rachis articulate, ultimate pinnules auricled, ovate or deltoid–lanceolate, margin in sterile frond crenate and deeply cleft to the midvein in fertile; apex of the pinnule stalks not swollen; lamina pubescent; midvein and veins pubescent below; texture firm, blackish-brown when dried. Sorophores up to 7 mm long, 4–7 solitary sporangia, spores c. 96 × 96 × 96 μm, colliculate. (figures 12–15)


Distribution: India (S. India, Assam, Meghalaya, Arunachal Pradesh, Nagaland, Manipur and Mizoram); Sri Lanka, China, Japan, Korea, Malaya Peninsula, Malesian Islands, Thailand-Vietnam, the Philippines and Australia (Queensland).

6. Lygodium longifolium (Willd.) Sw. in J. Bot. (Schrader) 1801(2): 305. 1803; Alston and Holttum op. cit.: 19; Holttum, op. cit.: 59. f. 5a. 12.


Type: Malabar. Herb. Wildenow s.n. (B—microfiche no. 1410 spec. no. 19482 CAL). Lygodium dichotomum sensu Beddome, Ferns S. India t. 62. 1863; non (Cav.) Sw. (1806).
**Rhizomes** short-creeping. **Fronds** very long, sterile 30–45 cm broad, fertile 18–60 cm broad, juvenile fronds once or twice dichotomous each branch bearing a palmately lobed 4–5 subequal lobes, each pinnule cuneate to cordate at base; **rachis** 1.5–2.5 mm across, glabrous; **pinnules** each half 9–30 cm long, 7–40 cm broad, once or twice dichotomously branched, tripininate, **primary rachis-branches** indistinct, dormant apex hairs 0.5–1.5 mm long, base of the hairs swollen, brown or black; **secondary rachis-branches** 5–10 cm long, pubescent, once forked in sterile and twice in fertile, ultimate lobes (sterile) forked and palmatisect, each lobe 2–3.5 cm broad, lanceolate, acuminate, crenate; veins twice or thrice forked, ending into crenation; lower surface with hairs scattered, upper surface also with scattered very long, septate, brown pointed hairs on the junctions with veins; (fertile) 1–2 cm broad, lanceolate, gradually acuminate, surface smooth or having hairs at the base or on sorophores both sides, veins once or twice forked, very prominent, texture coriaceous. **Sorophores** up to 4 mm long, 1 mm wide, upper surface with a few hyaline hairs; indusium not hairy; **spores** 133-133-133 × 137-137-137 μm, irregular reticulum with tubercles, pale brown (figures 40–44).


Beddome’s (1863) illustration t. 62 is based on *Johnston s.n.* from Travancore (K), according to Alston and Holttum (1959).

**Distribution:** India (Meghalaya, Kerala); China (Hainan) Malaya Peninsula.


**Type:** Insula Batan, *Mears s.n.* (Bur. Sc. 3136).


**Rhizomes** short-creeping. **Fronds** 2–3 m long, tripininate, **rachis** ca 1 mm across, pubescent on dorsal surface: **pinnules** 7–10 cm long, 6–8 cm broad, bipinnate, deltoid; **primary rachis-branches** c. 4 mm long, dormant apex hairs light brown, upto 8.5 mm long; **secondary rachis-branches** 3–7 cm long, pinnate, with basal pinnules or ultimate pinnules auricled; ultimate-pinnules deltoid-ovate to ovate-lanceolate, basal ones stalked and largest 3–5 cm long, 1.5–2.5 cm broad, terminal ones subsessile to sessile, auricled or cordate at base, acute; in sterile the margin crenate and in fertile fronds not deeply cut, costule, midveins and veins hairy; veins forked, hairs pale, drying pale green, texture herbaceous. **Sorophores** 1–3 mm long, 3–5 sporangia on each side, indusium margin fringed or hairy; **spores** 64–72 × 50–64 μm, pale green, surface irregular (figures 16–19).

**Specimens examined:** India: Arunachal Pradesh, Tirap District, Miao, ca. 350 m, 11 Aug. 1979, Singh 77559; Lohit district, Deuning, 19 Sept. 1969, A. S. Rao 47937 (ASSAM).

We have compared the Indian specimens with the Philippines (Babuyan Ist. Herb. Bur. Sc. 3916) available at CAL.

We have got a few specimens from Dehradun and Goa closely resembling *L. mearnsii* Copel.
Figures 30–44. 30–34. L. polystachyum (Kurz 778); 35–39. L. circinnatum (King’s collector s.n.) 40–44. L. longifolium (40, 42-Jerdon s.n. and 41, 43, 44-sine lect 8057); 30, 35, 36, 40, 41. parts of pinnae; 40, 41, portion of pinnae showing edges; 32, 33, 38, 43. hairs of dormant apices; 34, 39, 44. spores (scales = 25 μm).
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**Distribution:** India: (Arunachal Pradesh); the Philippines (Baten, Babuyan Islands).

This is a new record for India.

*L. mearnsii* Copel. was merged with *L. japonicum* (Thunb.) Sw. by Holttum (1959); the distinguishing characters delineated by Copeland and as set out in the key above, appear reasonable. Besides, differences in the size of the spores viz. 80–100 μm in *L. flexuosum* *vis-a-vis* 64–72 x 50-64 μm in *L. mearnsii* are also distinctive. *L. mearnsii* appears to be intermediate between *L. flexuosum* and *L. japonicum*, differing from the former in having an elongate primary rachis.

8. **Lygodium microphyllum** (Cav.) R. Br. Prod. Fl. Nov. Hollandae: 162. 1810; Beddome, *op. cit.*: 282; Alston and Holttum *op. cit.*: 12; Holttum *op. cit.* 47. f. 5e–f. 6, 7; Panigrahi and Dixit, *op. cit.*: 224. f. 4.

*Ugena microphylla* Cav. Ic. Descr. Pl. 6(2): 76. t. 595. f. 2. 1801.

**Type:** Luzon, Nee s.n. (MA-vide Holttum *l.c.*)


**Iconotype:** Roxb. Icon. No. 748 (CAL! K) (see Sealy, Kew Bull. 11: 364. 1956).

**Rhizome** long-creeping. **Fronds** reaching to a length of 5–7 m, 15–45 cm broad, tripinnate; **rachis** c. 2 mm across, surfaces glabrous; **pinnae** each half 12–20 cm long, 4–8 cm broad, ovate-oblong, pinnate; **primary rachis-branches** 3–5 mm long, dormant apex bearing 0.5–1.5 mm long, brown, septate hairs; **secondary rachis-branches** glabrous; ultimate pinnules 1–4.5 cm long, 1–2 cm broad, all stalked (terminal ones also), stalk 2–4 mm long, apex of the stalk swollen *i.e.* pinnule lamina articulated with stalk, when dried these pinnules fall off from this junction leaving stalk attached to the secondary rachis; ovate-oblong, base cordate or auricled, entire or just crenulate, obtuse, surfaces smooth; veins many times forked, prominent, ending into the margin, sterile pinnules comparatively larger than the fertile. **Sorophores** up to 3 mm long, 4–5 sporangia on each side, **spores** 62–62–62 × 65–65–65 μm, surface with reticulum (figures 5–8).

**Specimens examined:** India: Kerala, Valiaparathode, 800 m, 20 Apr. 1980, Vohra & Ghosh 56265; Tamilnadu, Yerkaud, 1857 m, 13 Sept. 1958, Subramanyan 6879; Assam, N. Lakhimpur, 14 Mar. 1962, Panigrahi 27859 (CAL); Jorhet, 13 Sept. 1978, Singh 72761; Cacher district, Johar band R.F. 24 Aug. 1978, Singh 72733 (ASSAM); Meghalaya, Garo Hills, 50 m, Feb. 1903, Morten s.n. (CAL); Baghmara, 12 Dec. 1960, Panigrahi 22541 (ASSAM). Arunachal Pradesh, base Duphla Hills, 1874, Lister s.n. (CAL); Tirap district, Nampong, c. 123 m, 12 Oct. 1959, R. S. Rao 20036 (ASSAM); South Andaman, Wandur, sea level, 3 July 1974, Balakrishnan 1669 (CAL).

**Distribution:** India (S. India, North Eastern India) Sri Lanka, Africa, Melanesia, Malaysia, Hong Kong, Australia (Queensland).

9. **Lygodium polystachyum** Wall. ex Moore, Gard. Chron. 671. 1859; Beddome, *op. cit.*: 284; Alston and Holttum *op. cit.*: 11; Holttum, *op. cit.*: 46–47, f. 5e. 8a–c.
Systematics of Lygodium

Type: Malaya, Penang, Wallich 177 K-W, Microfiche CAL! isotype-CAL!

Rhizome short creeping. Fronds long, 45–90 cm broad; rachis ca 2 mm across, terete, not winged, pubescent to hairy throughout; pinnae each-half 22–45 cm long, 7–13 cm broad, oblong or lanceolate-oblong, quadripinnatifid, acute; primary rachis-branches indistinct, terete, densely hairy, dormant apex bearing 1–1.5 mm long septic, blackish brown, pointed hairs, mature hairs thick either with multiseptate swollen base or to a certain length, secondary rachis-branches 20–35 cm long, stout but brittle, terete, densely hairy throughout, bipinnatifid; pinnae 3–7 cm long, 1.5–2 cm broad, alternate, basal 2–3 pairs reduced, stalked, stalk ca 5 mm long, densely hairy, swollen at the junction with lamina; ovate-lanceolate, base cordate or auricled, truncate, deeply lobed, obtuse, deciduous; midvein hairy on both surfaces, prominent; lobes 3–5 mm broad, entire, veins once or twice dichotomously branched, hairy on both surfaces; in fertile fronds these lobes bear terminal sorophores, sorophore region when mature conspicuously contracted. Sorophores 5–7 mm long, ca 2 mm broad; indusium hairy on surface and at margin; Spores 74–74–74 x 76–76–76 μm, pale brown, finely verrucose (figures 30–34).

Specimens examined: No representation from India in CAL. Burma: Martaban, S. Kurz 778; Pegu, S. Kurz 77689., Tenasseri Bonachung, April 1911, Meebold 15268 (CAL).

Distribution: India (Assam); Burma, China, Thailand, Cambodia, Laos, Vietnam, Malaysia.

We have seen all the Herbarium sheets of the genus Lygodium in CAL and ASSAM but could not spot even a single specimen from Assam or any other Indian localities. Our record of the occurrence of the species in India is based on Holttum (1959).


LT.: Singapore, Cuming 365 (PR, selected by Holttum 1959 as type); isolectotype-W, K.


Lygodium longifolium Wall. Num. list. p. 7. no. 175. 3 and p. 63 no. 175. 3. 6. 1829. nom. nud.

Rhizome short erect. Fronds 30–450 cm long, 25–70 cm broad; rachis ca 2 mm across, stout, dorsal surface pubescent; pinnae 10–35 cm long, 11–30 cm broad, tripinnate, sometimes quadripinnate, ovate or deltoid, primary rachis-branches indistinct to 2 mm long, dorsal surface pubescent, dormant apex bearing 1–1.5 mm long, septicate brown hairs; secondary rachis-branches 7–25 cm long, winged narrowly, pinnate usually, sometimes bipinnate; pinnales 4–13 cm long, 1.5–6 cm broad, (more than 2 cm broad when basal pinna further pinnate* usually 3–5 pairs, up to 7 pairs alternate all stalked; stalks 2–8 mm long, apex swollen at the junction with lamina, all pinnales ± equal in size, base wide cuneate to cordate or auricled, lanceolate to deltoid-lanceolate, obtuse, terminal

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* Wall. Cat. 175.3. (K-W microfiche CAL!) shows up fronds with secondary pinnae bipinnate and Presl described L. salicifolium as "pinnae suspet trifoliatol-pinnatae". Yet, Holttum (1959) delineates L. salicifolium as having the secondary pinnae only lobed at base.

(Plant Sci.)—4
pinnae similar to lateral, in some cases the basal pairs of the pinnules further pinnate
then all of them nearly equal in size: pinnule-lamina articulated to stalks, in dried and
older specimens the leaflets break-off from this point, crenate to sub-entire; midveins
hairv, veins once or twice forked, prominent, hairy; texture firm. Sorophores up to 5 mm
long, a few hairs on dorsal surface; spores 82-82-82 × 84-84-84 μm, colliculate or finely
verrucose (figures 20–22).

Representative specimens examined: India: Goa, Maduka bungla jungle, 22 Nov. 1962,
R. S. Rao 85034; Kerala, Quilon, Wight 260; Vazhaohal, Chalakudy, 400 m, 11 Sept.
1974, Nair and Ghosh 52074. Sikkim, 1862, Anderson 1408; Assam, C. N. Hills, Ralsosile,
22 Oct. 1852, Godfrey 255; Cachar, 1890, Prazer s.n. (CAL); Loharband R. F. 24 Aug.
1978. Singh 72733 (ASSAM). Haflong, 850 m, 5 Aug. 1908, Craib 165. Meghalaya, Pandua
(Border K and J Hills) 11 June, 1850, J. D. Hook and T. T. 427; Khasi Hills, 2000 m,
below Cherra, 12, 1880, Fraser s.n.; Garo Hills, Srinivasan 1951. Arunachal Pradesh:
Subansiri District, sine lect 93; (CAL), Tirap District Khela to Changlang, ca. 600 m, 16
Mar. 1958, G. G. K. Murty 12987; Niusa to Wanu, 3 Sept. 1958, Panigrahi 16712;
Degomai, 188–166 m, 19 Oct. 1959, R. S. Rao 20305 (ASSAM). Nagaland, Naga Hills, ca.
300 m, 2 Feb. 1882, Collett 37; Manipur, Imphal, 28 Jan. 1960, Mukerjee 5244; Mizoram,
Aijwal, 13 Jan. 1963, Deb 30645; Tripura (Tipperah) Abhoynagas, West of Agartala,
200–300 m, 27 Dec. 1914, Debarman 403. Andaman islands, sine lect 10793; Between
Ograbary & Partmouat, 28 July 1894, King’s collector s.n.; Herbertabad, sea level, 14

Some of the specimens included under L. flexuosum (L.) Sw. by Panigrahi and Dixit
are here identified with L. salicifolium.

Distribution: India (Kerala, Bihar, Assam, Meghalaya, Arunachal Pradesh, Tripura,
Andaman and Nicobar Islands) Burma, China (Yunnan) Thailand Vietnam, Taiwan,
Malaya Peninsula to Malesia to New Guinea.

Alston and Holttum (1959: 14) remarked that “this species appears to intergrade in
some measure with L. flexuosum (L.) Sw., and in Holttum, Ferns of Malaya (p. 57) the
two are united, but typical habitat of the two species are quite distinct. It is possible that
hybridization occurs, but no experimental investigation has been made. L. flexuosum
has the wider distribution, probably L. salicifolium is confined to moister habitats or
regions with a shorter dry season”.

6. Ecology

Lygodiums are true climbing ferns. The plants climb to a height of 1 to 10 m,
L. microphyllum and L. salicifolium climbing much higher than the others. The rachis
which is tough and plastic can twist and twine around nearby bushes or trees and on
bamboo grooves, and in open situations in secondary forests mostly on the edges of
forests. Sometimes growth is so vigorous that the plants cover the entire surface of
small trees or big bushes thus forming thickets. In many cases the newly formed
rachises twine around the old living and dried-fronds giving a rope like appearance.
L. japonicum grows from plains to higher altitudes in sub-tropical forests, a few species
love comparatively wet climate. In contrast, L. flexuosum (L.) Sw. is almost pantropical
and subtropical and occurs also in dry deciduous forests of India.
Cytology: Panigrahi and Dixit (1967) have tabulated the available cytological information on the genus and discussed the impact of such studies on the origin of the haploid numbers $n = 28$, 29 and 30 and the resulting implications of such findings on the phylogenetic affinities of the genus *Lygodium*.

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