Chapter-7

SYSTEMATIC ACCOUNT
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1. LYCOPODIACEAE P. Beauv. ex Mirb.

(The club-mass family)

Lycopodiaceae P. Beauv. ex Mirb. in Lamark et Mirbel Hist.

Nat. Veg. 4: 293. 1802.


Terrestrial or epiphytic, herbaceous; trailing much branched creeping plants; leaves simple, lamina narrow, single celled sporangia at the tip of the sporophylls in form of cones.

Taxonomically the family Lycopodiaceae is still controversial. However, some taxonomists strongly split it into two families viz., Lycopodiaceae P. Beauv. ex Mirbel sensu str. and Huperziaceae Rothm., but majority of workers (cf. Crabbe et al., 1975; Dixit, 1988; Holub, 1964, 1975; Manickam & Irudayaraj, 1992; Pichi-Sermolli, 1971, 1977; Vasconcellos and Franco., 1967;) have accepted, Lycopodiaceae P. Beauv. ex Mirbel sensu lato as only one family in their current taxonomic treatment. I also accept the Lycopodiaceae family in broad sense to include 12 genera.

The family comprising of 9 genera and more than 500 species throughout the world flora, of which 6 genera and more than 25 species have been reported from India. Two genera with singular species are found in Central India.
Key to the Genera

1a. Stem short erect to pendulous; branching usually isodichotomous; spores with faveolate to fossulata exine.

    Huperzia

1b. Stem wide trailing or creeping.

    Palhinhaea

HUPERZIA Berh.


Lectotype species: Huperzia selago (L.) Berh. ex Schrank et Mart., Hort. Monac. 3. 1829.

Epiphytic or lithophytic, terrestrial plants, rarely semiaquatic; stems erect to suberect, pendulous, creeping, simple to isodichotomously branched; leaves ovate-oblong to subulate, entire or serrate, thin to coriaceous, uniform, multifarious; sporophylls aggregated in dense terminal or lateral strobili. Spores trilette, yellow.


Plants 6-14 cm long; stems pendulous or erect, 2-4 times dichotomously branched, 1.0 x 2.5 cm thick (including leaves); leaves dense, close, subpentagonal, tough, oblong to linear-
Fig. 1 *Huperzia hamiltonii* (Spring) Trev. - (a) Habit; (b) Spore
(c) leaf; (d) Sporophyll
lanceolate, 10-12 x 2-3 mm, narrowed at both the ends, margins flat to inflexed, midrib distinct, coriaceous, pale to shining green when dry; sporophylls like vegetative leaves but smaller in size, sporangia, up to 2 x 1 mm, reniform, yellow-brown, in the axils of unaltered leaves in the upper part of stem and branches. Spores numerous, 25-32 μm, round or oval, trilette, pale in colour, pitted. (Fig. 1)


ECOLOGY: Plants epiphytic on tree trunks and branches covered with moss. (900-2000 m altitude).

FERTILE: October-February.

SPECIMENS EXAMINED: None. Only on the basis of literature. (cf. Mooney, 1942).

DISTRIBUTION: INDIA- Throughout the country in hilly regions.

Central India: Bastar.

Note: H. hamiltonii is one of the polymorphic species. Its number of transitional forms has been examined from all over India.

PALHINHAEA Franco. et Vasc. in Vasc. et Franco.


Terrestrial plants; rhizome subterranean; herbaceous; stem 1-2 cm glabrous to glabrescent; leaves crowded, linear-lanceolate, sparsely ciliate; sporophylls laciniate or dentate in the margins; sori ellipsoidal-globose, valves unequal. Spores trilette, tetrahedral, yellow.
Local name: *Rumi-Jhumi*

Plants terrestrial; rhizome subterranean, producing arborescent lateral stems, stem rigid, up to 124 x 0.5 cm, rooting at nodes, base of stem unbranched, primarily monopodial, only the lateral and young branches distinctly dichotomous, branches pubescent to glabrescent. Leaves brownish-green, linear-lanceolate, 3-5 mm long spreading and upwardly curved; midvein prominent beneath, green to brownish at maturity, sparsely ciliate at base; sporophylls shorter but broader than leaves, 3-10 x 1-2 mm, ovate-hastate, acuminate, laciniate or dentate in margins; sporangia 0.5 x 1.5 mm, clavate, narrow transversely ellipsoidal-globose, opening on the abaxial side by a fissure with laciniate margins, valves unequal. Spores 22-33 μm, trilete, pale green, rugulate, proximal surface faintly undulating. (Plate 7b)


**ECOLOGY:** Plants grow on rocks and cliffs under moist situation in Calcium rich soil or trailing on ground among grasses in exposed places along streamsides. (900-1000 m altitude).

**FERTILE:** May-September.

**SPECIMENS EXAMINED:** Bastar, *Shweta Singh*, 59417 Bailadilla hills (Sagar Uni); Bilaspur: Jashpurnagar, *Arora*, 3892 (BSA); Chhindwara: Tamiya, *Shukla*, 11983 (SFRI); *Shweta Singh*, Tamia
58520 (Sagar Uni.); Hoshangabad: Pachmarhi-Panarpani, Shweta Singh, 55614 (BSA).

**DISTRIBUTION: INDIA**- Assam, Arunachal Pradesh, Chhattishgarh, Himachal Pradesh, Jammu-Kashmir, Kerala, Karnataka, Madhya Pradesh, Meghalaya, Sikkim, Tamil Nadu.

**Central India:** Bastar, Bilaspur, Chhindwara, Hoshangabad.


(The club-mass family)

14. 1861.

**Type genus:** *Selaginella* P. Beauv., Prod. Fam. Aétheog. 101.
1805. *(nom. cons.)*

Plants herbaceous, terrestrial, xerophytic or lithophytic; annual or perennial moss like, creeping or sub-erect; rhizophores confined at the base to apical part; leaves iso or heteromorphic; spike terminal; sporophylls uni or dimorphic; heterosporous; ligule present.

A monotypic family comprising of about 200 species throughout the world flora, of which 64 species are reported from India. 9 species are found in Central India.

**SELAGINELLA** P. Beauv.

**Selaginella** P. Beauv., Prod. Fam. Aétheog. 101. 1805. *(nom. cons.)*

**Type species:** *Selaginella selaginoides* (L.) Link, Fil. Hort. Berol.
158. 1841.
Plants herbaceous, terrestrial, xerophytic or lithophytic, often moss like; stem creeping or sub-erect, dichotomously branched; rhizophores confined at the base to apical part; leaves iso or heteromorphic, arranged in lateral and median parallel planes; spike terminal; sporophylls uni or dimorphic; heterosporous; ligule small; megasporangia confined to in basal region and microsporangia to the upper region. Megaspores usually four and microspores numerous. Spores trilette having various ornamentations.

**Key to the species**

1a. Leaves isomorphic, linear and spirally arranged.
   
   *S. indica*

1b. Leaves heteromorphic and arranged in four rows.
   
   2a. Plants xerophytic; sporophylls of the spike uniform.

   3a. Leaves heteromorphic throughout; lateral leaves ciliate at the base; median leaves acute to acuminate.

   *S. repanda*

3b. Leaves isomorphic on the main stem; dimorphic on the branches.

   4a. Median leaves acuminate to long aristate; spores without perispore.

   *S. bryopteris*

4b. Median leaves short, acuminate; spores with perispore.

   *S. involvens*

2b. Plants not xerophytic; sporophylls of the spike dimorphic.

   5a. Lateral leaves denticulate on both sides; sporophylls not ciliate.

   6a. Lateral leaves ovate-lanceolate, spreading,
obliquely cordate at base, acute.

*S. vaginata*

6b. Lateral leaves ovate-oblong, distantly serrulate, sub-obtuse, rarely obtuse.

*S. jainii*

5b. Lateral leaves ciliate or denticulate on the proximal side; sporophylls ciliate.

7a. Median leaves acute to acuminate; lateral leaves distinctly ciliate at base, the rest entire.

*S. ciliaris*

7b. Median leaves subacute; lateral leaves denticulate on the proximal side.

*S. panigrahii*


Local name: *Sangivani*.

Plants xerophytic; stem 6-25 cm, erect or suberect, simple in the basal lower 2/3, profusely branched and deltoid in the upper 1/3; rhizophores confined to the base. Isomorphic leaves on the main stem, distant, ca up 3 x 2 mm, ovate-lanceolate, denticulate, long-acuminate at tip, heteromorphic leaves on the other branches, contiguous, ascending; lateral leaves ovate, oblique at base, acute to acuminate at apex, midrib short, obscure, white
translucent, imbricate, denticulate, green; axillary leaves similar to lateral leaves; median leaves small, ovate, oblique at base, acute to acuminate at apex, entire to minutely denticulate. Spike short, 3-5 x 1-2.5 mm, at the tip; sporophylls uniform, ovate, acuminate, cuspidate, entire to minutely denticulate. Microspores 12-24 μm, yellow granulose. Megaspores 198-268 μm, dull yellow, verrucoid. (Plate 5a)


ECOLOGY: Common on heavy rocks boulders forming thick and green carpet during the rainy season. Leaves curled up in dry weather but retain original colour and shape if dipped upside down in water for sometime. (900-1000 m altitude).

FERTILE: July-September.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Prashant, 1720, (SFRI); Shamundhara, Saxena, 10190 (SERI); forest near Samundhara, Shweta Singh, 58634 (BSA); Bastar, Panigrahi, 5684, 5027; Bailadilla hills (BSA); Bilaspur: Jashpurnagar, Arora, 20673 (BSA); Chhindwara: Patalkot, Sruvastava, 40888; Panigrahi, Tamiya 4482 (BSA); Hoshangabad: Pachmarhi, Shweta Singh, Tridhara 55699, Dhupgarh 55818 (BSA); Jagdalpur, Khanna, 55884 Kangar Valley National Park (BSA); Sidhi: Sanjay National Park-Kusmi forest, Shweta Singh, 58504, 58619 (BSA).

DISTRIBUTION: INDIA: Throughout the country in hilly regions.

Central India: Throughout the Madhya Pradesh and Chhattishgarh in hilly regions.


Small, inconspicuous, moss like plants; stems 2-8 cm, prostrate, much branched at base, erecto-patent; rhizophores thin, wiry, restricted to the basal one fourth. Leaves dimorphic, membranaceous, ca 1-2 mm, bright green; lateral leaves oblong-ovate, oblique, cordate, distantly ciliated at base; axillary leaves ovate-oblong, cordate, acute, ciliate at base; median leaves ovate, sub-falcate, cordate, acute to acuminate at apex, distantly denticulate. Spike short, 8-15 x 2-4 mm, at the tip; sporophylls dimorphic, ovate, membranaceous, ciliate; longer sporophylls ovate-oblong, sterile, dentate, obtuse, spreading, resupinate; smaller sporophylls ascending, fertile, ovate, cordate, aristate, ciliate, acute to acuminate; micro and megasporangium met within the same strobilus. Microspores small, trilete, 30-42 x 36-46 μm, yellow. Megaspores large, 125-225 x 120-185 μm, yellow to brown. (Plate 5b)  

ECOLOGY: Common in moist sandy soil inside dripping caves or protected places. (900-1000 m altitude).

FERTILE: September.

SPECIMENS EXAMINED: Anuppur: Amarkantak, *Saxena*, 6384 (SFRI); Kapildhara, *Saxena*, 6384 (SFRI); Mai ki bagia, *Indorkar*, 10737 (SFRI); Mai ki bagia, *Shweta Singh*, 58633 (BSA); Bastar, *Shweta Singh*, Bailadilla hills 61051, 61008, 61009, 61044 (BSA); Das, Bailadilla hills 4957 (BSA); Bilaspur, *Panigrahi*, 13257A (BSA); Hoshangabad: Pachmarhi, *Shweta Singh*, Rajatprapat 55782 (BSA); Jagdalpur, *Shweta Singh*, Keshkal 61047, Kangar Valley National Park 61042 (BSA); Sidhi, *Panigrahi*, 2117 (BSA);
Sidhi: Sanjay National Park-Kanhaiya Dah, Shweta Singh, 58625; Bandaria Khoh, 58627 (BSA).

DISTRIBUTION: INDIA- Throughout the country in hilly regions and plain.

Central India: Throughout the Madhya Pradesh and Chhattishgarh in hilly regions.


Local name: Mardjadi.

Plants xerophytic; stem 6-25 cm, creeping, bi to tripinnate branched at the base; rhizophores wiry, long, throughout the plant. Leaves isomorphic, erect or ascending, imbricate, long triangular, adnate at base, linear or subulate, ca 2.4-5 x 2-3 mm, margins ciliolate, cilia piliform at the base, dentiform at above. Spike short, 5-7 x 1-1.5 mm, at the apex, sessile; sporophylls uniform, ovate-lanceolate, acuminate, denticulate to ciliate at base, apex acute. Microspores 40-44 µm, deep yellow rugose to reticulate. Megaspores 350-375 µm, pale orange, rugose. (Plate 6c) Chromosome number: 2n=20 (cf. Fabbri, 1965; Kuriachan, 1965; Dixit, 1992).

ECOLOGY: Plants grow in open places or in sunny situation on heavy rocks. (900-1000 m altitude).

FERTILE: July-September.

SPECIMENS EXAMINED: Bastar: Bailadiilla hills (s.l.) 114 (CAL).
DISTRIBUTION: **INDIA**—Arunachal Pradesh, Bihar, Chhattishgarh, Meghalaya, Madhya Pradesh, Orissa, Tamil Nadu, Uttar Pradesh, West Bengal.

**Central India**: Bastar, Chhindwara.


Plants xerophytic, small; stem 12-45 cm, ascending with trailing base, terete, branches flabellate; rhizophores thin, wiry, restricted to the basal. Leaves uniform on the main stem, dimorphic on branches, ca up to 3 x 2 mm; lateral leaves ovate, oblique, apex acute, imbricate; axillary leaves ovate, acuminate; median leaves small, ovate, cuneate base, acute to acuminate at apex, falsely two nerved, denticulate. Spike quadrangular, 4-8 x 0.8-2 mm, at the apex; sporophylls uniform, ovate, acute, denticulate. Microspores small, 30-35 μm, yellow; Megaspores large, 600-1000 μm, yellow to brown. (Plate 5c)


**ECOLOGY**: Xerophytic plants growing among rock boulders or on the ground in rock soil. The fronds curled up during dry weather. (900-1000 m altitude).

**FERTILE**: July-September.

**SPECIMENS EXAMINED**: Chhindwara: Patalkot, *Shukla*, 10691 (SFRI); Jabalpur: Tilwaraghat, 13871 (SFRI).

**DISTRIBUTION: **INDIA**—Throughout the country in hilly regions.

**Central India**: Bastar, Chhindwara, Hoshangabad.

Small plants; stem 1.5-3.5 cm, erect or suberect, thin, pinkish brown, copiously branched from base, pinnate; rhizophores confined to the base, short, wiry, like thread; leaves dimorphic throughout, ca 1-2 mm, pale brownish green, firm; lateral leaves ovate-oblong, distantly serrulate, sub-obtuse; axillary leaves similar to lateral leaves; median leaves small, ovate, distantly serrate, cordate, subacute. Spike short, 5-7 x 2.5-3 mm, at the tip; sporophylls dimorphic, dentate; large sporophylls ovate-oblong, acute; smaller sporophylls ovate, acute. Microspores trilette, deep orange, 35-40 μm, verrucoid. Megaspores 198-200 μm, dull yellow, verrucoid. (Plate 5d)

Chromosome number: Not known.

**ECOLOGY:** Grow abundantly on rocks full of moss and muddy soil alders forming thick along tricking water. (850-1000 m altitude). Endemic.

**FERTILE:** July-September.

**SPECIMENS EXAMINED:** Type: Bilaspur: Siang, *Panigrahi*, 16838A Plant No. 2 (CAL); Isotype: Lc. 16838B (BSA); Bastar, *Shweta Singh*, Bailadilla hills 61010, 61004 (BSA); Hoshangabad, *Dixit*, Bee fall 41141, Mahadeo 41122, Dutches fall 41322, Twyanam pool 41238 (BSA).

**DISTRIBUTION:** INDIA- Chhattishgarh.

**Central India:** Bilaspur.

Small plants; stem 1.0-3.0 cm, prostrate, thin, brown, branched from base, branches pinnate; rhizophores confined to the base, short, wiry, like thread; leaves dimorphic throughout, contiguous, ca 1-2 mm, brownish green, on drying membranaceous; lateral leaves ovate-oblong, denticulate, oblique, subobtuse; axillary leaves similar to lateral leaves; median leaves small, ovate, denticulate, subacute. Spike, 3-7 x 2-3 mm, at the tip of branchlets, larger longer than branchlets; sporophylls dimorphic; large sporophylls sterile, ovate-oblong, ciliate at base; smaller sporophylls fertile, ovate, acute, long ciliate throughout. Microspores trilette, deep orange, 60-65 μm. Megaspores trilette, 198-200 μm.

Chromosome number: Not known.

ECOLOGY: Grow abundantly on rocks full of moss and muddy soil along permanent source of water. (850-1000 m altitude). Endemic.

FERTILE: July-September.

SPECIMENS EXAMINED: Type: Bastar-Kutumsar Kanger Valley, Panigrahi, 1119A (CAL); Isotype: l.c. 1119B (BSA).

DISTRIBUTION: INDIA- Chhattishgarh.

Central India: Bastar.


Plants small; stem 5-15 cm, decumbent, thick, prostrate, branched throughout, trailing; ascending with trailing base, terete, branches flabellate; rhizophores thin, wiry, throughout. Leaves
dimorphic, ca up to 2 x 1.5 mm; lateral leaves ovate-oblong, spreading, ciliate at base, sub-acute at apex; axillary leaves similar to lateral leaves; median leaves small, ovate, cordate, ciliated at base, acute to acuminate at apex. Spike tetrastrichous, 5-10 x 1-2 mm, at the apex; sporophylls uniform, ovate, acute, oblique, denticulate, one median and two lateral veins. Microspores small, 30-40 μm, deep orange, warty; Megaspores large, 250-230 μm, orange, irregularly reticulate.


ECOLOGY: Trailing habit covers large area of moist and shady rock and boulders. Not Common. (850-950 m altitude).

FERTILE: July-September.


DISTRIBUTION: INDIA- Arunachal Pradesh, Madhya Pradesh, Tamil Nadu.

Central India: Hoshangabad.


Stems 6-25 cm, erect or suberect, branching from base; rhizophores confined to the base. Leaves heteromorphic throughout, ca 3 x 1 mm, contiguous, ascending, coriaceous, pale-golden brown at maturity; lateral leaves dentate to denticulate, acute; axillary leaves similar to lateral leaves; median leaves small,
ovate, imbricate, cordate, ciliate at base, acute to acuminate at apex, entire to minutely denticulate. Spike tetragonal, short, 5-8 x 1-2.5 mm, at the tip; sporophylls uniform, ovate, acuminate. Microspores 48-55 µm, orange-red, irregular elevations. Megaspores 200-275 µm, yellow-brown, flat, irregular elevations. (Plate 6a)

Chromosome number: Not known.

ECOLOGY: Common on rocks crevices of moist mossy cover over rock boulders. Fronds curled up in dry weather. (850-900 m altitude).

FERTILE: July-September.

SPECIMENS EXAMINED: Anuppur: Amarkantak-Forest near Samundhara, Shweta Singh, 58635 (BSA); Dudhdhara 58640 (BSA); Bastar, Shweta Singh, Bailadilla hills 61119, 61120, (BSA); Bilaspur: Jashpurnagar, Panigrahi, 21141 (BSA); Sidhi, Panigrahi, 5646 (BSA); Chhindwara, Srivastava, Tamiya 40141 (BSA); Hoshangabad: Pachmarhi, Shweta Singh, Rajatprapat 55755, Pagaragaon 55804, Dutch’s fall 55735 (BSA); Jagdalpur, Shweta Singh, Kangar Valley National Park 61006, 61007, 61117 (BSA); Panna, Ramlal, 31438 (BSA); Sidhi: Sanjay National Park-way to Kusmi, Shweta Singh, 58626, Bandaria Khoi, 58494 (BSA).

DISTRIBUTION: INDIA- Arunachal Pradesh, Bihar, Chhattishgarh, Meghalaya, Madhya Pradesh, Orissa, Tamil Nadu, Uttar Pradesh, West Bengal.

Central India: Throughout the Madhya Pradesh and Chhattishgarh in hilly regions.

Stems 3-6 cm, slender, quadrangular, branching from base; rhizophores throughout. Leaves heteromorphic throughout, ca 2 x 3 mm, contiguous, thin, firm; lateral leaves ovate-lanceolate, spreading, oblique cordate, subacute to acute, ciliated at base; axillary leaves similar to lateral leaves; median leaves small, ovate, imbricate, dentate, semi-cordate, ciliate at base, acute to acuminate at apex. Spike, short, 3-4 x 1-2 mm, at the tip; sporophylls uniform, ovate, dimorphic, denticate; larger sporophylls resupinate, rhomboid, subacute to obtuse; smaller sporophylls ovate, acuminate. Microspores 30-40 μm, deep orange-red, warty. Megaspores 240-270 μm, deep brown, verrucoid. (Plate 6b)

Chromosome number: Not known.

ECOLOGY: On rocks crevices and moist mossy cover over rock boulders. (950-1000 m altitude).

FERTILE: July-September.

SPECIMENS EXAMINED: Bilaspur, Panigrahi, forest area 13549 (BSA); Shweta Singh, Baidadilla hills 61157, 61098 (BSA).

DISTRIBUTION: INDIA- Throughout the country in hilly regions.

Central India: Bilaspur.

3. ISOETACEAE Reichend.

(Quillwort or Merlin’s Grass Family)


Small, herbaceous, aquatic, amphibious or marshy plants, grass like; rhizome or corm buried, 3-4 lobed with dichotomously
branched roots; stem long; compacted tuft of leaves; leaves close, spiral or distichous, ± acicular, ligulate; single veined; Sporangia imbedded, heterosporous, velum present, tuberculate.

A monotypic family comprising of about 150 species throughout the world flora, of which 15 species are reported from India. 9 species are found in Central India.

**ISOETES** L.

**Isoetes** L., Sp. Pl. 2: 1100. 1753.

**Type species:** *Isoetes locustris* L., Sp. Pl. 2: 1100. 1753.

Perennial, submerged, aquatic, wet-terrestrial, marshy plant; stem stout; rhizomorph (corm) 3-4 lobed, bearing black roots & grass like leaves; leaves crowded in a dense resettled, broad, terete to flattened above, ligule at the base. Sporangium membranaceous, solitary, sessile, velum present, heterosporous; megasporangia and microsporangia bearing respectively mega and microspores.

**Key to the species**

1a. Megaspore tuberculate or postulate.

2a. Sporangia described as microsporangia containing mixed small spores and few large megaspores.

   *I. pantii*

2b. Megasporangia containing only di or trimorphic megaspores.

3a. Megasporangia tuberculate, tubercles with pointed apices and of almost uniform size

   *I. indica*
3b. Megaspores postulate, pustules with rounded apices.

4a. Pustules of almost uniform size.

5a. Velum present.

I. bilaspurensis

5b. Velum absent.

I. coromandelina

4b. Pustules of distinctly heterogenous size.

I. dixitei

1b. Megaspores reticulate, retate, regulate.

6a. Muri almost as wide as or wider than tall, velum rudimentary.

I. mahadevensis

6b. Muri almost taller than broad.

7a. Muri sparsely placed and almost forming areoles, velum ¼, sporangia all pigmented.

I. panchananii var. panchananii

7b. Muri closely aligned generally do not form areoles, velum ¼ to ¾, sporangial wall unpigmented.

I. panchananii var. pachmarkiensis

7c. Muri in form of very short cristae rarely forming areoles, velum ½ to ¾.

I. sampathkumaranii

Fresh water aquatic or amphibious plant; height up to 14 cm; rhizomorph (corm) 3-lobed, peripheral strands not mentioned; leaves tufted, erect, 15-30 in number, 5-10 cm long, dull olive green-dark green, ligule deltoid, lobed, velum 2/3 to ¾; sporangia round or elongated, heterosorous, sporangial wall unpigmented; megasporangium ovate, megasporas dimorphic, white when dry grayish when wet, the larger ones 390-440 μm, smaller 250-300 μm, tuberculate, tubercle ends blunt and rounded, a few jointed bilobed megasporas and sterile cells present with in the same megasporangium; microsporangium unknown.

Chromosome number: Not known.

ECOLOGY: One of the endemic species occurring along the edges of tanks, streams, paddy fields, and shallow ponds during rainy season. Endemic (750-800 m altitude)

FERTILE: August-October.


DISTRIBUTION: INDIA- Chhattishgarh.

Central India: Bilaspur.


English name: Coromandel quillwort

Fresh water aquatic or amphibious plant; height 32-57 cm (Triploid), 56-87 cm (Tetraploid); rhizomorph (corm) 3-lobed, sometime 4-5 lobed, peripheral strands present; leaves tufted,
erect, 10-60 in number, 30-60 cm long, dull olive green-dark green, velum absent; sporangia round or elongated, heterosoruous, sporangial wall unpigmented; megasporangium circular to oval, megasporos dimorphic, white when dry grayish when wet, the larger ones 354-575 μm, smaller 236-439 μm, girdle absent, tuberculate, tubercle ends blunt and rounded; microsporangium elongated, microspores red-brown, 25-47 μm, echinate, spines stout with pointed apices and sparsely placed. (Plate 7a)

Chromosome number: Triploid, 2n=22+1; Tetraploid, 2n=44+1; Triploid, 2n= 33+1. (cf. Abraham & Ninan, 1958; Pant & Srivastava, 1962).

ECOLOGY: One of the common species occurring along the edges of tanks, streams, paddy fields, and shallow ponds during rainy season. (750-800 m altitude)

FERTILE: August-October.

SPECIMENS EXAMINED: Bilaspur, Panigrahi, Kota-Bilaspur 13055 (BSA); Raipur, Verma, Saraipali 25807 (BSA); Hoshangabad: Pachmarhi, Shweta Singh, Matculi 55835, 55836, 55838 (BSA); Kanker, Subramanyam, Rajbandhatak 7145 (CNH).

DISTRIBUTION: INDIA- Throughout the country in plain.

Central India: Throughout the Madhya Pradesh and Chhattishgarh in hills as well as plains.


Fresh water aquatic or amphibious plant; height 11-40 cm; rhizomorph (corm) 3-lobed, elongated, peripheral main 4 with 20-
30 subsidiary strands; leaves tufted, erect, 6-32 in number, up to 2 cm long, dull olive green-dark green, velum rudimentary; sporangia round or elongated, heterosorous, sporangial wall unpigmented; megasporangium ovate, megaspores tuberculate, white when dry grayish when wet, large ones 483-660 μm, smaller ones 320-485 μm; microsporangium elongated microspores 16-45 μm, monolate, sometime trilete, spines stout with pointed apices and sparsely placed. Sterile cells present, 20-22 μm, disc shaped, transparent with yellow marginal ring.


ECOLOGY: Occurring along the edges of tanks, streams, paddy fields, and shallow ponds during rainy season. (750-800 m altitude)

FERTILE: August-October.


DISTRIBUTION: INDIA- Chhattishgarh, Maharashtra, Madhya Pradesh.

Central India: Bastar, Hoshangabad in hills as well as plains.


Fresh water, submerged or amphibious plant, height 5-15 cm; rhizomorph 2-lobed (rarely 3-lobed), peripheral strand absent; leaves 5-29 in number, up to 14 cm long, green-dark green, ligule triangular with bulbous base; velum rudimentary dome shaped; megasporangia ovoid; megaspores retate dimorphic, distally
lacunae complete or broken, large ones 338-524, smaller ones 237-406 μm, white when dry, dark grey when wet, siliceous gel-fibers form irregular network in lacunae; microsporangiate sporophylls more in number, peripheral in position; microspores 10-47 μm, echinate, generally monolet round to roundly triangular, rarely trilet.


ECOLOGY: Plants growing along the margin of shallows ponds and slopes. (750-800 m altitude).

FERTILE: August-October.


DISTRIBUTION: INDIA- Madhya Pradesh, Endemic.

Central India: Hoshangabad. T. 18265


Fresh water aquatic or amphibious plant; height 15-33 cm; rhizomorph (corm) 3-lobed, peripheral strands main 4 with 28 accessory strands; leaves 9-33 in number, 15-33 cm long, dull olive green-dark green, velum absent; sporangia round or elongated, heterosorous, sporangial wall unpigmented; megasporangium elongate, megaspores trimorphic, white when dry gash-coloured when wet, the larger ones 480-660 μm, smaller 70-110 μm, tuberculate, tubercle ends blunt and rounded;
microsporangium ovate, microspores red-brown, 25-47 μm, echinate, spines stout with pointed apices and sparsely placed.


ECOLOGY: Occurring along the edges of tanks, streams, paddy fields, and shallow ponds during rainy season. (750-800 m altitude) Endemic.

FERTILE: August-October.


DISTRIBUTION: INDIA- Madhya Pradesh.

Central India: Rewa.


Fresh water, submerged or amphibious plant, height up to 25 cm; rhizomorph 2-lobed, peripheral strand absent; leaves 4-38 in number, 10-25 cm long, green-dark green, ligule triangular with bulbous base; velum about half (rarely complete) ¼ to ½ pigmented; surface of sporangium with dark brown spots; megasporangia oval; megaspores reticulate, large ones 372-548 (x= 451 μm), smaller ones 196-314 μm (x=248 μm), muri sparsely placed and generally form areoles (lacunae); microsporangia elongated; microspores 16.4-45 (x= 31.6 μm) x 12.3-41 μm (x= 27.4 μm), echinate, generally monolete round to roundly oval.

ECOLOGY: Plants growing on the hilly region and plains, along the margin of shallows ponds and slopes. (850-900 m altitude). Endemic.

FERTILE: August-October.

SPECIMENS EXAMINED: Hoshangabad: Pachmarhi-Pologround, Shweta Singh, 55635 (BSA); Pachmarhi-Hawaii Pattii, Shweta Singh, 55736 (BSA); Pachmarhi-Near Polo ground, Shweta Singh, 55840 (BSA).


Central India: Rewa, Hoshangabad.


Fresh water, submerged or amphibious plant, height 8-34 cm; rhizomorph 2-lobed, peripheral strand absent; leaves 12-30 in number, 9-31 cm long, green-dark green, ligule triangular with bulbous base; velum generally ½ to ¾ unpigmented; megasporangia oval; megaspores dimorphic, cristate reticulate, large ones 354-456 (x= 309 μm), smaller ones 191-310 μm (x=257 μm), white when gory, black when wet, muri irregularly closely aligned, areoles (lacunae) incomplete or complete; microsporangia elongated; microspores 16-45 (x= 32 μm), echinate, generally monolete round to roundly oval. (Plate 6d)

Chromosome number: Tetraploid, 2n=44+1 (cf. Srivastava et al., 1997).

ECOLOGY: Plants growing on the hilly region and plains, along the margin of shallows ponds and slopes. (850-900 m altitude). Endemic.
FERTILE: August-October.


Central India: Hoshangabad.


Fresh water aquatic or amphibious plant; height 11 cm; rhizomorph (corm) 2-lobed, elongated, peripheral strands absent; leaves tufted, erect, 3-16 in number, up to 9-10 cm long, olive green-dark green, velum ¼ to ½; sporangia round or elongated, heterosorous, sporangial wall unpigmented; megasporangium oval, megaspores dimorphic, reticulate, branched ridges, white when dry fuscous black when wet, larger one 256-458 μm, smaller ones 28; microsporangium unknown. Sterile cells absent.


ECOLOGY: Occurring along the edges of tanks, streams, paddy fields, and shallow ponds during rainy season. (750-800 m altitude)

FERTILE: August-October.

DISTRIBUTION: INDIA- Andhra Pradesh, Karnataka, Maharashtra, Madhya Pradesh.

Central India: Bhopal, Shivpuri.


Aquatic or amphibious plant; height up to 56 cm; Rhizomorph 3-lobed, sometime 4 lobes, peripheral strands main 4-6 and many accessory strands; leaves 9-35 in number up to 56 cm long, velum coverage absent; megasporangia elongated, 0.6-1.9 x 0.4-0.9 cm; megaspores polymorphic, large ones 458-636 μm in diameter, medium ones 407-509 μm in diameter, small ones 89-380 μm in diameter, tuberculatate, tubercles somewhat pointed, white when dry, grey when wet; microsporangia oval, 0.4-0.6 x 0.3-0.4 cm; microspore dimorphic, 16-48 μm in diameter, finely tuberculatate, monolete or trilete, oval or rounded, abortive; sterile cells present, 13-18 μm in diameter, transparent, roundly quadrangular, granulose with a thickened rim or margin.


ECOLOGY: Occurring along the edges of tanks, streams, paddy fields, and shallow ponds. (750-800 m altitude)

FERTILE: August-October.

DISTRIBUTION: INDIA- Andhra Pradesh, Bihar, Chhattishgarh, Madhya Pradesh, Maharashtra, Gujarat, Tamil Nadu, Uttar Pradesh.

Central India: Bilaspur, Rewa.

4. EQUISETACEAE L. C. Richard ex A.R. De Candolle

(The horsetail family)


Plants terrestrial to subaquatic or amphibious, perennial, small or large, slender or stout, rush like; rhizome creeping, subterranean, root nodded; aerial stems erect, symmetrical hollow angled, bearing whorls of branches at the node, silicated; sporophylls scaly, spike terminal; sporangia homosporous.

A monotypic family comprising of 30 species throughout the world flora, of which 7 species have been recorded from India. 3 species are found in Central India.

EQUISETUM L.


Type species: Equisetum arvense L., Sp. Pl. 2: 1050. 1753.

Terrestrial, amphibious to subaquatic; perennial; rhizome creeping, subterranean; stem erect; leaves small, whorled, joint at nodes forming nodal ring, laterally connected so as to form distinct toothed tubular base of the internodations of the stems and
branches; sporophylls scaly, sporangia homosporous, terminal. Spores numerous, trilette, globose.

**Key to the species**

1a. Small plants

2a. 40-50 cm long, erect; branches thick diffuse, dense, more than 6 branchlets at each nodes, sheath loose, strobilus shortly peduncled, obtuse.

*E. diffusum*

1b. Large plant

2b. Up to 1.5 m or more, ribs 16-22, narrow and much scabrous, branches slender; sheath loss; teeth black-brown; scrambling or subscendent; strobilus sessile, apiculate, oblong, long, 1.2-2.4 cm.

*E. ramosissimum* var. *altissimum*

2c. 50-70 cm, ribs 10-20, not much prominent and less scabrous; sheaths tight; teeth light-brown margined; strobilus sessile or subsessile, apiculate, oblong, small, 0.8-1.8 cm.

*E. ramosissimum* subsp. *debile*


Small plants, stem erect, 30-50 cm long, sterile and fertile alike, short, firm, branches diffused, dense; branchelet 5-6 at each node in whorl, internodes 2-4 cm apart, ridged; sheaths 6-12, loose up to 1 cm long, ribbed; leaf-teeth linear-lanceolate, entire. Strobilus shortly, penduncled, oblong-cylindrical, 1-2 cm long.
Fig. 2 *Equisetum diffusum* D.Don - (a) Habit; (b) Spore
obtuse. Spores 25-34 μm, round or oval, 4 hygroscopic elaters, trilete, hyaline, rugulate, proximal surface faintly undulating. (Fig. 2)


ECOLOGY: Plants grow in sandy or gravely soil in moist or subaquatic areas in exposed situations. (600-950 m altitude).

FERTILE: May-September.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Shweta Singh, forest near Dudhdhara 58632, 58668 (BSA); Bilaspur: Jashpurnagar, Arora, 3866 (BSA); Bastar: Kutumsar, Panigrahi, 1184 (BSA); Hoshangabad: Pachmarhi, Shweta Singh, Panarpani 55668; Bee fall 55647; Jatashankar 55585 (BSA); Sagar, Shweta Singh, Forest near Sagar University 59349, 593406; Mandala, J.Lal, Ganghar nala 33159 (BSA); Sidhi: Sanjay National Park-Nag Dah, Shweta Singh, 58513, 58493 (BSA): Vidhisha, Pant, Near Betwa river 28121 (BSA).

DISTRIBUTION: INDIA- Arunachal Pradesh, Assam, Chhattishgarh, Himachal Pradesh, Jammu-Kashmir, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Sikkim, Tamil Nadu.

Central India: Bastar, Bilaspur, Chhindwara, Hoshangabad, Raigarh, Raipur, Sidhi, Shivpuri.


Large plants, stem erect, 50-70 cm long, hollow, weak, smooth, irregularly branched, evergreen, branchelet 1-3 at each node in whorl, internodes 2-6 cm, ridged; sheaths 6-14, tight up to
1.5-2.8 cm long, ribbed, ribs 10-20, flattened towards the apex, tubular to funnel; leaf-teeth subulate, acuminate, black, deciduous, 7-10; sporophyll peltate, pale black; spike subsessile, 0.8-1.8 cm long, oblong, apiculate. Spores 35-60 µm, round or oval, simple, globose, 4 hygroscopic elaters, trilete, hyaline, rugulate, proximal surface faintly undulating. (Plate 6e)


ECOLOGY: Plants grow in sandy or gravelly soil in moist or subaquatic areas in exposed situations. (600-950 m altitude).

FERTILE: May-September.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Saxena, 4734 (SFRI); Dudhdhara, Saxena, 4734 (SFRI); Durgadghara, Shweta Singh, 58634 (BSA); Bastar, Shweta Singh, Bailadilla hills 61118 (BSA); Hoshangabad: Pachmarhi, Shweta Singh, Jamboor deep 55586, Little fall 55648, Chhote Mahadeo 55617, Tridhara 55702 (BSA); Jagdalpur: Kangar Valley National Park, Khanna, 56141, 611901 (BSA); Shweta Singh, Chhitrakoot 61163 (BSA); Raipur, Verma, 17601 (BSA); Sidhi: Sanjay National Park-Jorbo Khoh, Shweta Singh, 58626; Singhar Nala, 58629 (BSA).

DISTRIBUTION: INDIA- Arunachal Pradesh, Assam, Chhattishgarh, Himachal Pradesh, Jammu-Kashmir, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Sikkim, Tamil Nadu.

Central India: Bastar, Bilaspur, Chhindwara, Hoshangabad, Raigarh, Raipur, Sidhi, Shivpuri.

Large plants, rhizome black subterranean, deep, creeping, slender, scabrous, rooting at nodes; barren and fertile stems alike, large sized unusually 60-130 cm, erect, with large central cavity 4-8 mm in diameter, somewhat rough, dull green when dry; simple or branched usually in the upper portion, branches from main stem at their base ascending, up to 4 at each node; ribs prominent, 16-22 on main stem, narrow, very scabrous, internode 3-10 cm; sheaths rather lose, 3-8 mm long, teeth of sheaths triangular, acute, below the cone pale yellow and at nodes rather whitish, not grooved on their keel, deciduous; spikes usually solitary, oblong, apiculate, sessile 1.5-2.5 cm long with black sporophylls and yellow sporangia; spores alete, simple, globose, yellow with 4 elaters, 38-57 μm. (cf. Vasudeva & Bir, 1992).


ECOLOGY: Plants grow in sandy or gravely soil in moist or subaquatic areas in exposed situations. (900-950 m altitude). Rare

FERTILE: August-September.


DISTRIBUTION: INDIA- Arunachal Pradesh, Assam, Himachal Pradesh, Jammu-Kashmir, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Sikkim, Tamil Nadu.

Central India: Hoshangabad.

5. PSILOTACEAE Kanit.
(The whisk-fern family)

Psilotaceae Kanitz, Noveny. Attek. 43. 1887.

Slender, lithophytic or epiphytic herb; rhizome creeping, dichotomously branched; true roots absent. Leaves microphyllous, reduced to minute scales; Sporangia solitary, sessile, 2-3 locular or triquetrous, fused, yellowish, homosporous.

A monotypic family comprising of 3 species throughout the world flora, of which 2 species from India. Only one species is found in Central India.

**PSILOTUM** Sw.


**Type species:** *Psilotum nudum* (L.) P. Beauv., Prod. Fam. Ae’thog. 112. 1805.

Plants terrestrial, lithophytic or epiphytic; perennial; true root absent and represented by short-creeping rhizoids; aerial stem erect or pendant, dichotomously branched. Leaves minute, scale like, subulate, sessile, triangular, in 2-3 rows; sporophylls sessile, adnate, acutely bilobate-dentate; sporangia glaboso-triangular, trilocular, larger than sporophylls. Spores bilateral, bean shaped or reniform.


Local name: *Bhulbhari*

Plants erect, mostly 22-35 cm; rootless, rhizome creeping branched; stems angled, distinctly dichotomous, rigid, dark green;
Fig. 3 *Psilotum nudum* (L.) P. Beauv. - (a) Habit; (b) Spore; (c, d) Portion of an enlarged shoot with sporangium-bearing complex
branches triquetrous; leaves scale-like, minute, ca up to 2 x 1 mm, distant, ovate-subulate, narrowly triangular to lanceolate; fertile leaves bifid; sporangia at the angle of the branches globosotriangular (Synangium), trilocular, dull brownish-green, sessile, ca up to 2 mm. Spores monolette, bilateral, bean shaped, oblong-ellipsoid, hyaline, pale yellow spiny, nonperinious 35-68 x 23-32 μm. (Fig. 3)
Chromosome number: 2n=104, 156, 208 (cf. Love et al., 1977).
ECOLOGY: Plants grow as epiphytes on tree trunks or lithophytes and fronds hanging downwards along streamsides in hilly regions. (800-950 m altitude).
FERTILE: July-September.
SPECIMENS EXAMINED: Bastar: Bailadilla hills, Panigrahi, 1064 (BSA); Chhindwara: Tamiya, Panigrahi, 4581 (BSA); Hoshangabad: Pachmarhi, Shueta Singh, Dutch’s fall 55758, Rajatparapat 55783 (BSA); Dixit, Dhupgarh 41203 (BSA); Panigrahi, 6683 (BSA); Duthie, 10683 (CNH).
DISTRIBUTION: INDIA-Throughout the country in hilly regions.
Central India: Throughout the Madhya Pradesh and Chhattishgarh in hilly regions.

6. BOTRYCHIACEAE Nakai
(The Grape, Rattlesnake and Moonwort Family)

Terrestrial ferns; rhizome short, erect to suberect; fronds dimorphic, common stipe; sterile lamina pinnate, compound, glabrous or hairy; veins free, forked; fertile lamina arise from base
of the barren portion; spike usually a panicle. Sporangia distinct, large, dehisce transversely.

The family comprising of 2 genera throughout the world flora, of which only one genus and 9 species are reported from India and two species from Central India.

**BOTRYCHIUM** Sw.


**Type species:** *Botrychium lunaria* (L.) Sw., Schard. J. Bot. 1800(2): 110. 1801.

Rhizome short, erect to suberect, hairy; fronds dimorphic, common stipe partially or mostly underground; sterile lamina 1-3 pinnate, variously dissected, compound, glabrous or hairy; veins free, forked; fertile lamina arise from base of the barren portion; spike simple or branched. Sporangia distinct, large, dehisce transversely, glandular. Spore tetrahedral, trilette, yellowish, exine reticulate or verrucose.

**Key to the species**

1a. Fertile segment arising from common stalk inserted below the sterile blade; texture coriaceous.

   **B. daucifolium**

1b. Fertile segment arising laterally as pinna of sterile blade; texture thin.

   **B. lanuginosum**

Plants 35-50 cm, rhizome small, erect, rarely creeping, normally one but two fronds arise from same rhizome. Frond dimorphic; sterile segment 15 x 20 cm, deltoid, tripinnatifid or tripinnate, lower pinnae the largest one; pinnae lanceolate-oblong, up to 3.5 x 1 cm, toothed margin, acute apex, stipe 1.5 cm long; veins free. Fertile segment taller than sterile segment at maturity, panicle, tripinnate, stalked 4.5-15 cm. Spikes 5-15 cm, paniculate; sporangia in two rows, naked, large, globose, distinct, sessile, transversely slit; spores trilete with circular amb, *ca.* 28-30 μm, copious, sulphur yellow with spinulose exine. (Fig. 4; Plate 8c)


**ECOLOGY:** Plants grow in exposed places such as grasslands or among rocks boulders on moist cover. (900-1000 m altitude). Rare.

**FERTILE:** March-November.

**SPECIMENS EXAMINED:** Hoshangabad: Pachmarhi, *M. Srivastava*, forest near Dhupgarh 25828 Lucknow (LWG).

**DISTRIBUTION:** **INDIA-** Throughout the Madhya Pradesh and Chhattishgarh states.

**Central India:** Hoshangabad and Bastar.

Fig 4. *Botrychium daucifolium* Wall. ex Hook. et Grev.- (a) Habit; (b) A pinnae; (c) Fertile enlarged spike; (d) Spore
Plants 30-50 cm, stout, pilose to glabrescent; rhizome short, erect, roots many, fleshy, covered with leafy brown sheaths; Frond dimorphic; sterile segment 15-28 x 20-35 cm, stipe 12-25 cm long, quaripinnatifid with ultimate division obtuse or acute apex; veins free, simple, forked. Fertile segment laterally above the base from rachis of the sterile blade, stipe 5-10 cm long, paniculate. Spores trilete with circular amb, pale green, 20-30 μm, exine reticulate. (Plate 8d)

Chromosome number: 2n=180 (cf. Abraham et al., 1962).

ECOLOGY: Plants grow in hilly slopes among grasses, on moist mossy cover of rock boulders along flowing stream in shady situations. (900-1000 m altitude).

FERTILE: July-November.

SPECIMENS EXAMINED: Bastar, Panigrahi, Bailadilla hills 7744 (CAL).

DISTRIBUTION: INDIA- Throughout the Madhya Pradesh and Chhattishgarh states.

Central India: Hoshangabad.

7. OPHIOGLOSSACEAE (R. Br.) C.A. Agardh
(The adder’s tongue fern family)


Terrestrial; rhizome short, erect to suberect, glabrous; roots fibrous or thickened, tuberous; fronds simple, a tropophyll (sterile lamina with reticulate vein) and fertile spike; sporangia in two rows joined, naked, large, sessile, opening by a transverse slit.

The primitive family comprising 4 genera throughout the world flora, of which two genera into 15 species have been reported from India and 10 species from Central India.

**OPHIOGLOSSUM L.**


**Lectotype species:** *Ophioglossum vulgatum* L., Sp. Pl. 2: 1062. 1753.

Terrestrial plants; rhizome usually short, erect to suberect, glabrous, sometime tuberous, fibrous; fronds dimorphic; sterile one leafy, stalked, coriaceous, reticulate venation; fertile fronds urcated, lanceolate, taller than the sterile one; Sporangia in two lateral rows partially immersed in to the axis. Spore tetrahedral, trilette.

The genus always shows a very high level polyploidy and lowest chromosome number known is 2n=240. *(cf. Dixit, 1969).*

**Key to the species**

1a. Rhizome globose, many fibrous roots present; tropophyll with a conspicuous pale median band; venation double; strobilus 1-6 cm long.

*O. costatum*

1b. Rhizome sub-globose to cylindrical, bearing a few or many fibrous roots; tropophyll without a conspicuous pale median
band; venation not double; strobilus 1-2.5 cm long.

2a. Tropophyll linear, subcoriaceous, more than 6 time as long broad, common stalk 1.0-3.5 cm, apex always acute to ± acuminate.

   O. gramineum

2b. Tropophyll elliptic-lanceolate, oblong or spatulate, somewhat fleshy, common stalk 0.5-2.0 cm, apex acute to rarely acuminate.

   O. lusitanicum L. ssp. lusitanicum

2c. Tropophyll not linear

3a. Rhizome subglobose.

4a. Tropophyll ovate, mucronate; spores trilette, bilette or monolette.

   O. eliminatum

4b. Tropophyll suborbicular or elliptical or ovate; spores trilette.

5a. Tropophyll attached at the lower quarter of frond.

   O. nudicaule var. nudicaule

5b. Tropophyll attached at the base of frond.

   O. nudicaule var. macrorrhizium

3b. Rhizome cylindrical.

6a. Rhizome with persistent, conspicuous brown sheaths formed by the base of the old leaf stalk; tropophyll elliptical to lanceolate.

   O. polyphyllum

6b. Rhizome without persistent, brown sheaths; tropophyll ovate to ovate-lanceolate.

7a. Tropophyll ovate-lanceolate, tuncate
or broadly cuneate at base, membranaceous.

*O. petiolatum*

**7b.** Tropophyll ovate, reniform or orbicular, cordate to variable at base, many free-ending veinlets, subcoriaceous.

*O. reticulatum*

**7c.** Tropophyll ovate, lanceolate or truncate, always slightly cordate at base, a few free-ending veinlets, subcoriaceous.

*O. reticulatum* L.f. *dilatatum*

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Local name: *Sheambli*

Plants 5-25 cm high; rhizome subterranean, short, tuberous with many fibrous roots; Fronds dimorphic, sessile or petiolate. Stipe short, 0.5-4 cm; sterile frond leafy, tropophyll simple, 2.5-10 x 1-2.5 cm, elliptic, ovate-lanceolate or obovate, cuneate at base, apex acute or obtuse, margin entire, subcoriaceous; veins free,
Fig 5. *Ophioglossum costatum* R.Br. - (a) Habit; (b) Part of tropophyll enlarged showing venation pattern; (c) Spore
forked in the areoles; fertile frond (sporophylls) always taller than sterile one, stalk 3-12 cm long; strolilus 1-6 x 0.2-0.3 cm, linear-lanceolate, rarely branched, brownish at maturity, apex acute; sporangia 9-12 pairs (seen only one specimen); spores trilette, 30-35 μm, exine reticulate. (Fig. 5.)

Chromosome number: 2n=240 (cf. Love et al., 1977).

ECOLOGY: Plants grow among grasses in open places or under shade of tree. (800-900 m altitude).

FERTILE: July-December.

SPECIMENS EXAMINED: Bastar, Subramanyum, Bailadilla hill 8655 (CAL); Hoshangabad, Panigrahi, Pachmarhi 4222, 20700, 20878 (BSA); Joseph, Kesla 12828 (BSMH); Mandla, A. Kumar, Kanha Tigar Reserve 33156, 33057 (BSA); Seoni, Banerji, 22801 (BSA); Shivpuri, Panigrahi, National Park 16999 (BSA).

DISTRIBUTION: INDIA- Throughout the country in hilly regions.

Central India: Throughout the Madhya Pradesh and Chhattishgarh in hilly regions.


Plant 1.8-15 cm high; rhizome subglobose, tuberous with many fibrous roots; Fronds dimorphic, sessile or petiolate. Stipe short, 0.5-4 cm; sterile frond leafy, tropophyll simple, 0.5-3.5 x 0.3-2.5 cm, ovate-lanceolate, mucronate, apex acute or obtuse, margin entire, subcoriaceous; veins free, forked in the areoles; fertile frond (sporophylls) with stalk 1-8 cm long; strolilus 0.3-3 cm, linear-lanceolate, apex acute; spores trilette, bilette, moonolet and alete in same sporangium, rarely jointed. (cf. Dixit, 1993)

Chromosome number: 2n=240 (cf. Love et al., 1977).
ECOLOGY: It grows among grasses in under shade of tree. Endemic. (800-900 m altitude).

FERTILE: July-December.


DISTRIBUTION: INDIA- Madhya Pradesh.

Central India: Gwalior.


Plants slender, 3-9.5 cm high; rhizome short, thick, erect; Fronds dimorphic, sessile or petiolate, 1-3 simultaneously. Stipe short, 1-3.5 cm; sterile frond leafy, tropophyll simple, 1-3 cm, attenuate at base, subcoriaceous to herbaceous, sessile, narrow, apex acute, margin entire; veins free, 8-10, indistinct, forked in the areoles without veinlets; fertile frond (sporophylls) always taller than sterile one, stalk 1-3.5 cm long; strolilus 0.8-2.4 cm, linear-lanceolate, rarely branched, apex acute; spores trite, 32-35 μm, with circular outline, exine reticulate. (Fig. 6)

Chromosome number: 2n=240 (cf. Love et al., 1977).

ECOLOGY: It grows among grasses in open places or under shade of tree in forest floor. (800-900 m altitude).

FERTILE: July-September.
Fig 6. *Ophioglossum gramineum* Wild. - (a) Habit; (b) Part of tropophyll enlarged showing venation pattern; (c) Spore
SPECIMENS EXAMINED: Hoshangabad: Pachmarhi, Panigrahi, 44490B (BSA); Joseph, Kesla 12838 (BSMH); Mandla, A. Kumar, Kanha Tiger Reserve 33209 (BSA).

DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Andhra Pradesh, Chhattishgarh, Madhya Pradesh, Rajasthan, Tamil Nadu, Kerala, Karnataka, Uttarakhal, Uttar Pradesh, West Bengal.

Central India: Throughout the Madhya Pradesh and Chhattishgarh in hilly regions.


Plant 3-6.5 cm high; rhizome seems to be round rather than elongated in shape (cf. Mahabale's, 1962) erect, short, tuberous with many fibrous roots; Fronds dimorphic, sessile or petiolate. Stipe short, 0.5-2 cm; sterile frond leafy, tropophyll simple, 1-1.7 x 0.2-0.7 cm, elliptic, ovate-lanceolate, oblongate or sometimes spathulate, blunt, apex acute or apiculate, margin entire, cuneate base, subcoriaceous; venation lax with few parallel veins free, forked in the elongated large areoles; fertile frond (sporophylls) always taller than sterile one, stalk 2-3 cm long; strobilus 0.5-1 cm; spores trilette, 32-40 µm with circular outline, exine reticulate. Chromosome number: 2n=450 (cf. Love et al., 1977).

ECOLOGY: It grows among grasses in open places or under shade of tree. (800-900 m altitude).

FERTILE: July-August.

 DISTRIBUTION: INDIA- Madhya Pradesh, Tamil Nadu.

Central India: Hoshangabad.


English name: Slender Adder’s tongue

Plants 3.5-8.5 cm high; rhizome subglobose, rarely cylindrical, short, erect, sometime tuberous with many fibrous roots; Fronds dimorphic. Stipe 0.1-1.5 cm; sterile frond leafy, tropophyll simple, 0.7-2.5 x 0.4-0.8 cm, stalked, ovate, sometime elliptic or elliptic-lanceolate, cordate, attenuate or truncate at base, apex acute or obtuse, margin entire, fleshy; veins distinct, many to few free-ending veinlets; fertile frond (sporophylls) always taller than sterile one, stalk 2-5 cm long, stolilus 0.5-1.2 cm; usually rather abruptly set off against its stalk and the lowest sporangia, mostly reaching at maturity; spores trilete, 30-45 μm with circular outline, exine reticulate. (Fig. 7)

Chromosome number: 2n=240 (cf. Love et al., 1977).

ECOLOGY: Plants growing in the forest floor amidst grasses in open places or under shade of tree. (800-900 m altitude).

FERTILE: July-September.
Fig 7. *Ophioglossum nudicaule* L. f. var. *nudicaule* - (a) Habit; (b) Part of tropophyll enlarged showing venation pattern; (c) Spore
SPECIMENS EXAMINED: Hoshangabad: Pachmarhi, Panigrahi, 4490A (BSA); Pachmarhi, Shweta Singh, Reechgarh 55771, Polo ground 55589, 55638, (BSA); Mandla: Kesle, A. Kumar, 33155 (BSA).


Plants slender, 3.5-6.5 cm high; rhizome subglobose, short, tuberous with many fibrous roots; Fronds dimorphic, sessile or petiolate. Stipe short, 0.1-1.4 cm; sterile frond leafy, tropophyll simple, 0.5-0.8 x 0.4-0.6 cm, ovate-lanceolate, cordate at base, usually shortly apiculate, apex obtuse, margin entire, coriaceous; veins free, forked in the areoles; fertile frond (sporophylls) always taller than sterile one, stalk 2-4.5 cm long; stolilus 0.5-1.5 cm, spores trilette with circular amb, 42-45 μm, exine reticulate. (Fig. 8) Chromosome number: Not known.

ECOLOGY: It grows among grasses in open places or under shade of tree in the forest floor. (800-900 m altitude).

FERTILE: July-December.

SPECIMENS EXAMINED: Hoshangabad: Kesla Banglopore, Joseph, 12836 (BSMH); Pachmarhi, Shweta Singh, Pologround 55732,
Fig 8. Ophioglossum nudicaule L. f. var. macrorrhizum (Kunze) Clausen.- (a) Habit; (b) Part of tropophyll enlarged showing venation pattern; (c) Spore
Pachmarhi Lake 55819 (BSA); Rewa: Chachai fall, Sen Gupta, 13034 (BSA).

**Distribution:** India - Gujarat, Madhya Pradesh, Maharashtra, Tamil Nadu, Uttar Pradesh, Uttaranchal, West Bengal.

**Central India:** Hoshangabad, Rewa, Shivpuri. Rare.


**Local name:** Stalked Adder's tongue

Plant 10-15 cm high; rhizome short, slender, cylindrical, erect, sometime tuberous with many fibrous roots, fleshy roots, brittle when dry; Fronds dimorphic. Stipe 1.2-3.5 cm; sterile frond leafy, tropophyll simple, 1.2-2.0 x 0.5-1.0 cm, stalked, ovate, sometime elliptic or elliptic-lanceolate, cordate, truncate or cuneate at base, apex acute or mucronate, margin entire, fleshy; venation lax with large areoles, veins distinct, many to few free-ending veinlets; fertile frond (sporophylls) always taller than sterile one, stalk 5-7.5 cm long, strolilus 1.2-1.5 cm; spores trilete with circular amb, 30-40 μm, exine reticulate. (Fig. 9)

Chromosome number: 2n=870-1200 (cf. Love et al., 1977).

**Ecology:** Plants growing in the forest floor amidst grasses under shade of tree. (800-900 m altitude).

**Fertile:** July-September.
Fig 9. Ophioglosum petiolatum Hook. - (a) Habit; (b) Part of tropophyll enlarged showing venation pattern; (c) Spore
**Fig 10. Ophioglossum reticulatum** L. - (a) Habit; (b) Part of tropophyll enlarged showing venation pattern; (c) Spore
**DISTRIBUTION:** **INDIA-** Chhattishgarh, Himachal Pradesh, Uttarakhand.

**Central India:** Bastar.


Local name: *Vanpalak, Gondi.*

Plants 7-30 cm high; rhizome cylindrical, short, erect, subglobose, sometime tuberous with many fibrous roots; Fronds dimorphic. Stipe 2-15 cm, glabrous; sterile frond leafy, tropophyll simple, 1-7.5 x 0.5-2.5 cm, ovate, various interlinked shapes, cuneate at base, apex acute or obtuse, margins entire, membranaceous to subcoriaceous; venation lax with hardly any free vein-ending from base to middle of a tropophyll but not to apex, with or without few areoles; fertile frond (sporophylls) always taller than sterile one, stalk 2-16 cm long; strollis 1-6 cm; spores trilete (sometime triradiate mark forked at the ends), 35-50 µm with circular outline, exine reticulate. (Fig. 10)

Chromosome number: 2n=870-1260 (cf. Love et al., 1977).

**ECOLOGY:** Plants growing in the forest floor amidst grasses in open places or under shade of tree or in moist alluvial sandy soil or heavy rock boulders along flowing streams with little of humus. (800-900 m altitude).

**FERTILE:** Throughout year.
SPECIMENS EXAMINED: Chhindwara, Panigrahi, Tamiya 4426 (BSA); Jagdalpur, Subramaniam, Keskal Parewanala stream 8959 (BSMH).

DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Chhattishgarh, Himachal Pradesh, Panjab, Madhya Pradesh, Nagaland, Sikkim, Tamil Nadu, Uttar Pradesh.

Central India: Bastar, Chhindwara, Jagdalpur.


Plant up to 10 cm high; rhizome long, vertical, tap root shaped, tuberous with many fibrous roots; Fronds dimorphic. Stipe up to 4 cm, glabrous; sterile frond leafy, tropophyll simple, 3.5-5.5 x 0.5-1.0 cm, linear-lanceolate or obovate, glabrous, attenuate at base, apex acute or mucronate, firm; veins reticulate, forming large-oblong areoles, midrib indistinct; fertile frond (sporophylls) always arise from the little above the base of the sterile frond, stalk 3-4 cm long; strolilus 1-2.5 cm; spores trilete, 37-38 μm, with circular outline, exine reticulate. (Plate 8a) Chromosome number: 2n=240 (cf. Love et al., 1977).

ECOLOGY: Plants grow in the forest floor among the grasses or under shade of tree. Rare. (800-900 m altitude).

FERTILE: July-December

SPECIMENS EXAMINED: Bastar, Nair, Bailadiilla hills 30076 (CAL).
**SPECIMENS EXAMINED:** Anuppur: Amarkantak, *Indorkar*, Amodob 11101 (SFRI); Balaghat, *Nair*, Baihar forest 18194, 18459, 29638 (BSA); Bilaspur, *Murti*, 19195 (BSA); Hoshangabad, *Panigrahi*, Pachmarhi 4280 (BSA); *Shweta Singh*, Pologround 55820, 55760, Way to Reechgarh 55807 (BSA); Seoni, *Banerji*, 22314, (BSA).

**DISTRIBUTION:** **INDIA.** Throughout the country in hilly regions.

**Central India:** Throughout the Madhya Pradesh and Chhattishgarh in hilly regions.

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Plant 10-13 cm high; rhizome short, subglobose, sometime tuberous with many fibrous roots, fleshy roots, brittle when dry; Fronds dimorphic. Stipe 2-5 cm; sterile frond leafy, tropophyll simple, 3.0-3.4 x 1.0-2.0 cm, stalked, trullateate, sometime elliptic or elliptic-lanceolate, cordate, trullate, cordate at base, apex acute, margin entire, fleshy; venation lax with a few big areoles, veins distinct, many to few free-ending veinlets; fertile frond (sporophylls) always taller than sterile one, stalk 3.6-4 cm long, strolilus 1.5-2 cm; spores trilete with circular amb, 30-40 μm, exine reticulate.


**ECOLOGY:** Plants growing in the forest floor amidst grasses under shade of tree. (800-900 m altitude).

**FERTILE:** July-September.

**SPECIMENS EXAMINED:** Hoshangabad: Pachmarhi, *Shweta Singh*, Pologround 55779 (BSA).
DISTRIBUTION: INDIA- Madhya Pradesh, Uttarakhal.

Central India: Hoshangabad.

8. ANGOPTERIDACEAE Fée ex Bonner

1867.

29. 1793-1796.

Terrestrial ferns; rhizome short, massive; fronds huge, circinate
venation, bipinnate; stipe long; veins free, forked. Sori dorsal,
marginal and along the veins, either reaching the margin or not,
contiguous.

A monotypic family comprising of more than 100 species
throughout the world flora, of which 15 species has been reported
from India. One species is found in Central India.

ANGOPTERIS Hoffm.

1796.

Type species: Angiopteris evecta (Forst.) Hoffm., Comm. Soc. Reg.

Large sized ferns; rhizome short, massive, fleshy; fronds
huge, circinate venation, bipinnate to tripinnate; stipe long with
swollen bases, green; veins free, false veins or recurrent veins
running from the margin between the true veins. Sporangia in
two elongated rows, dehiscing along slits on facing the veins. Spores tetrahedral, trilette or bilateral and monolete.


Local Name: Ghora tap

Plants more than 2 m high; rhizome erect, short, massive, fleshy; Fronds bipinnate, more than 1 m, stipe 90-120 cm long, green with swollen base, minutely hairy, fleshy stipule like appendages; lamina 130-200 cm long, bipinnate; pinnae 28-48 x 12-21 cm, pinnae costae swollen at the base, articulated, pinnules numerous, 4-15 x 1-2.5 cm, linear-oblong, base sub-truncate or cuneate, opposite, glabrous, shining-green, margins entire when young serrate at age, apex acute to acuminate, strongly toothed, sessile or short petiolated, herbaceous to subcoriaceous; veins free, simple or twice forked, parallel, reaching upto the margins, glabrous; sori submarginal, small, ellipsoid, exindusiate; sporangia 7-14 in each group, united, boat shape. Spores trilette, ovate to spherical, bilateral, monolete, exine smooth or granulose, yellow-brown, 30-40 x 25-35 μm. (Fig. 11; Plate 9b)

Chromosome number: n=40 (cf. Love et al., 1977).

ECOLOGY: Plants abundantly grow in swampy forest floors, in humid slope near water fall in evergreen forest along the roadside,
Fig 11. *Angiopteris evecta* (Forst.) Hoffm.- (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore
on sandy loam among bamboo grooves and rocky substratum.
(900-1000 m altitude).
**FERTILE:** September-November.
**SPECIMENS EXAMINED:** Bastar, *Panigrahi*, Bailadilla hills 6881 (BSA); *Shweta Singh*, Bailadilla hills 61083, 61090, 61110, 61111, 61112, 610752 (BSA).
**DISTRIBUTION:** **INDIA:** Assam, Arunachal Pradesh, Chhattishgarh, Himachal Pradesh, Madhya Pradesh, Nagaland, Sikkim, Uttaranchal, West Bengal.
**Central India:** Bastar, Hoshangabad.

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**9. OSMUNDACEAE** Berch. *et* Presl

(The Royal fern family)


**Type genus:** **Osmunda** L., Sp. Pl. 2: 1063. 1753.

Terrestrial ferns; rhizome erect, covered with leaf-bases and roots; fronds iso or dimorphic, circinate vernation; stipe long, thick, hairy; veins free, forked. Sporangia large, in clusters, ventrally to distally slit.

The family comprising of 3 genera throughout the world flora, of which single genera with 7 species have been reported from India. Two species are found in Central India.

**OSMUNDA L.**


**Lectotype species:** **Osmunda regalis** L., Sp. Pl. 2: 1063. 1753.
Rhizome erect, covered with hairy leaf-bases and roots; fronds dimorphic, circinate vernation, large crown, erect; Sterile lamina, bipinnate to tripinnatifid, stipe long, thick, hairy, spirally arranged; fertile segment much contracted; veins free, forked. Sporangia globose, short petiolate, thin, opening in halves the rudimentary transverse annulus in form of some parallel thickened cells near the apex; Spores trilet, copious greenish.

**Key to the species**

1a. Plant smaller, 12-25 cm high; fronds bipinnate, 10-20 x 2-10 cm, with 3-5 pinnae; pinnules 1.0-2.5 x 0.3-1.0 cm, shallowly crenate-crenulate margin, membranaceous.

   *O. hugeliana*

1b. Plant larger, 30-150 cm high; fronds bipinnate, 30-95 x 6-35 cm, with 5-7 pinnae; pinnules 1.5-4.0 x 0.5-2 cm, serrate margin, subcoriaceous.

   *O. regalis*


Plant 12-25 cm high; rhizome short, erect, fleshy, massive, scaly at apex; scales rufo-brown. Fronds tufted, dimorphic, bipinnate, 10-20 x 2-10 cm, erect; stipes slender, tufted, shinning, hairy at the base when young, more than 3-10 x 0.2-0.4 cm, green swollen at base, stramineous. Sterile fronds bipinnate, pinnae 3-5 pairs, sub-opposite to alternate, 3-6 x 1.5-2.3 cm, oblong, terminal
Fig 12. Osmunda hugetiana Presl- (a) Habit; (b) Fertile spike; (c) Part of sterile pinnae enlarged showing venation; (d) Spore
pinnae largest, apical and lateral pinnae similar; pinnules sessile or very shortly stalked, 1.0-2.5 x 0.3-1.0 cm, oblong-lanceolate, oblique at the base, obtuse to minutely apiculate at apex, margin crenate-crenulate, membranaceous, stiff, rufous brown hairs at the base of pinnae and pinnules; veins free, 2-3 times forked near base; fertile fronds pinnate, pinnae 3-5 pairs, forming a panicle above the sterile part, stalked, slender; pinnules compressed, cylindrical, dense clusters of sporangia all over the branchlets, 0.5-1.0 x 0.1-0.2 cm. Spores trilete, globose, light brown, oval to ± spherical, granulose exine, 32-50 x 30-45 μm. (Fig. 12)

Chromosome number: diploid sexual n=22 (cf. Love et al., 1977; Manickam & Irudayaraj, 1988).

**ECOLOGY:** Plants abundantly grow in exposed marshy places, in humid slope near waterfall, bank of streams and evergreen forest along streamside on sandy loam soil. (950-1000 m altitude).

**FERTILE:** September-November.

**SPECIMENS EXAMINED:** Hoshangabad: Pachmarhi, Dixit, Tridhara 41303, 41207, 41299; Panigrahi, Pachmarhi fall 6639 (BSA); Shweta Singh, Tridhrara 55704, 55620 Panarpani (BSA).

**DISTRIBUTION:** INDIA- Chhattishgarh, Madhya Pradesh, Maharashtra, Tamil Nadu.

**Central India:** Bastar, Hoshangabad.


English name: 'Royal Fern'
Plant 30-150 cm high; rhizome short, stout, erect, fleshy, massive, scaly at apex; scales brown; Fronds bipinnate, clustered, dimorphic, erect, 30-95 x 6-35 cm; stipes tufted, 12-40 cm long, green swollen at base, glossy. Sterile fronds pinnate, pinnae 5-7, opposite, 4-15 x 1.5-8 cm, oblong, apical and lateral pinnae similar; pinnules sessile or very shortly stalked, 1.5-4.0 x 0.5-2 cm, oblong-lanceolate, oblique at the base, apex obtuse-rounded, serrate margins, subcoriaceous; veins free, simple or twice forked near base, reaching at the margin; fertile fronds pinnate, pinnae above the sterile portion, 5-7 pairs; pinnules compressed, cylindrical, forming a panicle above the sterile part, up to 1.5-3 x 0.3-0.5 cm, dense clusters of spherical sporangia all over the branchlets. Spores trilete, globose, light brown, oval to ± spherical, granulose exine, 32-54 x 30-46 μm. (Plate 9a)

Chromosome number: diploid sexual n=22 (cf. Love et al., 1977).

ECOLOGY: Plants abundantly grow in exposed marshy places, in humid slope near waterfall, bank of streams and evergreen forest along streamside on sandy loam soil. (950-1000 m altitude).

FERTILE: September-November.


DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Chhattishgarh, Himachal Pradesh, Kerala, Karnataka, Madhya Pradesh, Nagaland, Sikkim, Tamil Nadu, Uttaranchal, West Bengal.

Central India: Bastar, Hoshangabad.
10. GLEICHENIACEAE Presl

**Gleicheniaceae** Presl, Rel. Haenk. 1: 70. 1825.

**Type genus:** *Gleichenia* J. Smith, Mem. Ac. Sc. Turin 5: 419. 1793

*nom. cons.*

Terrestrial ferns family, usually unlimited growth and climbing; rhizome long-creeeping, hairy. Fronds dichotomously branched; stipe thick, dominant buds present between the forking; lamina pinnate, repeatedly pseudodichotomously branched; veins free, forked. Sori exindusiate, arranged at the forks of the veins.

The family comprising of 8 genera throughout the world flora, of which three genera, 23 species and 10 varieties have been reported from India. Only one genus and one species is found in Central India.

**DICRANOPTERIS** Bernh.


**Type species:** *Dicranopteris dichotoma* Bernh., Schrad. Neu. J.

*Bot. 1: 28. 49. t. 1. f. 13. 1806.*

Rhizome long creeping, hairy. Fronds dichotomously branched at the top of the stipe; stipes thick, dominant buds present between the forking; lamina repeatedly pseudodichotomously branched, veins free, forked. Sori exindusiate, arranged at the forks of the veins. Spores trilette or bilateral.

Fig 13. *Dicranopteris linearis* (Burm.f.) Underw. var. linearis- (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore

English name: 'Thicket fern'

Terrestrial, widely spreading and subscandent fern; rhizome long-creeping, hairy, bearing distantly spaced stipes. Fronds dichotomously branched, pinnate; stipe thick, brown to purplish, shining and glowing apex covered with red-brown hairs, dominant buds present between the forking. Lamina pinnate to pinnatifid, coriaceous, glabrous beneath, repeatedly pseudodichotomously branched, pinnae in divaricated pairs at the forks, the lower pairs short, 3-8 x 12-22 cm; pinnules at right angle to the costa, the lowest pinnule towards notched apex, scales absent; veins free, 1-3 times forked, the central ones being again forked. Sori exindusiate, rounded, arranged near to coste of the pinnules on the acrosopic branch of the veinlets, each with 10-18 sporangia. Spores tetrahedral, trilete, 26-30 x 30-36 μm, exine smooth. (Fig. 13; Plate 7c)


**ECOLOGY:** Plants abundantly grow in little humus or in rocky sandy-alluvial soil, along flowing stream, in humid slope near waterfall, bank of streams in exposed places (950-1000 m altitude).

**FERTILE:** September-November

**SPECIMENS EXAMINED:** Bastar: Bailadilla hills, Panigrahi, 6928, (BSA); *Shweta Singh*, Bailadilla hills 61072, 61077, 610762, 610768 (BSA); Bilaspur: Pasarkhet-520 m, *Murti*, 19403, (BAS); Chhindwara: Patalkot, *Shweta Singh*, 58524, 58525 (Sagar Uni.); Hoshangabad: Pachmarhi-Dhopgarh, *Dixit*, 41231, (BSA);

**Distribution**: **India**: Assam, Arunachal Pradesh, Chhattishgarh, Himachal Pradesh, Kerala, Karnataka, Madhya Pradesh, Nagaland, Sikkim, Tamil Nadu, Uttaranchal, West Bengal.

**Central India**: Bastar, Bilaspur, Chhindwara, Hoshangabad, Sidhi, Jagdalpur.

11. **Loxogrammaceae** Pic. Ser.

(The family of terrestrial and epiphytic fern)


**Type genus**: *Loxogramme* (Bl.) Presl, Tent. Pterid. 214. t. 9. f. 8. 1836.

Terrestrial ferns; rhizome long to short-creeping, scaly, hairy; fronds with short stalk or sessile, stripe not articulated, short; rachis prominent, glabrous; lamina simple, isomorphic, thick, glabrous; veins obscure, forked; Sori exindusiate, linear, on either side of the midrib, paraphyses usually present.

The family comprising 2 genera throughout the world flora, of which only single genus with 7 species have been reported from India and one genus and one species from Central India.

**Loxogramme** (Bl.) Presl

**Loxogamme** (Bl.) Presl, Tent. Pterid. 214. t. 9. f. 8. 1836.

**Type species**: *Loxogramme lanceolata* (Sw.) Presl, Pterid. 215. t.
9. f. 8. 1836.

Terrestrial ferns; rhizome creeping, apex scaly, hairy; fronds sessile or petiolate; stipe short, smooth, tremendous. Lamina simple, elliptic-lanceolate, coriaceous, margin entire; veins indistinct, reticulate, areolae with or without included veinlets. Sori exindusiate, long filamentous paraphyses usually present. Spores light brown, bilateral monolete or tetrahedral trilette.


Rhizome short-creeping, fleshy, root hairs present, apex, hairy, scaly; scales dark brown, ca 3-4 x 0.5 1.0 mm, lanceolate, apex acuminate, margins entire; fronds simple, 10-30 x 1.5-5 cm; stipe short, 1-1.3 cm long, glabrous, stramineous; rachis prominent, similar to stipe. Lamina simple, 8-28 x 1-4 cm, lanceolate, gradually narrowed towards the basal part, apex acuminate, margins entire, texture leathery, thick, coriaceous, glabrous; veins obscure, reticulate, areolae with or without free included veinlets. Sori exindusiate, arranged in two rows, not reaching up to margin, oblique, linear, elongated, up to 2.5 x 0.1 cm long, filamentous, uniseriate, multisepitate. Spores light brown, reniform, bilateral monolete, 32-36 x 58-62 μm, exine smooth. (Plate 8b)

Chromosome number: Diploid sexual, n=70 (cf. Love et al., 1977).

ECOLOGY: Plants epiphytic on trees and shrubs in moist shady places in the deep forest. Very Rare. (800-900 m altitude).

FERTILE: September-December

DISTRIBUTION: INDIA- Assam, Chhattishgarh, Himachal Pradesh, Jammu, Karnataka, Madhya Pradesh, Maipur, Nagaland, Meghalaya, Sikkim, Tamil Nadu, Uttaranchal, West Bengal.

Central India: Bastar, Hoshangabad.

12. POLYPODIACEAE Berch.
(The polypodious fern family)


Ching, Sunyat. 5: 257. 1940.

Type genus: Polypodium L., Sp. Pl. 2: 1082. 1753. emend. Ching,


Epiphytic fern family, rarely terrestrial; rhizome long, short-
creeping, cylindrical or dorsiventrally compressed, branched, scaly,
hairy; fronds iso or dimorphic; stipes articulated, compound,
glabrous; rachis prominent, glabrous; lamina simple or pinnate;
veins free, forked; Sori exindusiate, rounded, superficial on lower
surface, paraphyses usually present.

The family comprising 65 genera throughout the world flora,
of which 28 genera have been reported from India and 6 genera
with 6 species from Central India.

Key to the genera

1a. Sori arranged in two regular rows; umbrella shaped
paraphyses always present.
Lepisorus

1b. Sori irregularly scattered throughout the lower surface; umbrella shaped paraphyses absent.

2a. Frond not dimorphic.

3a. Fertile fronds much contracted

4a. Lamina subcoriaceous; main veins and hydathodes distinct and clear on drying. Sori acrostichoid on a constricted narrow apical part of frond.

Belvisia

2b. Frond dimorphic.

4b. Lamina thin, herbaceous; main veins and hydathodes indistinct on drying. Sori oval to rounded, covering the whole lower surface except midrib.

Leptochilus

4c. Lamina coriaceous; main veins and hydathodes distinct and clear on drying. Sori oval to rounded, covering the whole lower surface except midrib.

Paraleptochilus

3b. Fertile fronds slightly or not contracted:

5a. Lamina membranaceous, glabrous, veins prominent.

Microsorium

5b. Lamina coriaceous, densely covered with stellate hairs, veins concealed.

Pyrrrosia

BELVISIA Mirb.


Epiphytic, rarely terrestrial, moderate size fern; rhizome creeping, short, covered with mass of root and brown scales; fronds simple, articulate to rhizome, shortly petiolate; stipe short, closely or distantly placed; lamina simple, linear-lanceolate, mambranaceous, coriaceous, usually glabrous, margin entire; veins anastomosing, reticulate ending with hydathodes, main vein not developed. Sori exindusiate, round or elliptical, restricted to distal segment of fronds, usually sharply delimited and linear, occupying the entire lamina surface except at the margin, served by a specialized vascular plate, paraphyses usually present. Spores hyaline to yellow, bilateral monolete, without epispore.

Genus comprising 4 species throughout India, of which only one species has been reported from the Central India.


Epiphytic; rhizome short-creeping, covered with numerous fibrous roots, densely hairy and scaly; scales dark brown, ca 2-3 x 0.5-1 mm, ovate-lanceolate with acuminate apex, base broad, margin entire; fronds simple, lanceolate-aristata, 15-30 x 1-2.5 cm; stipe short, 1-3 cm long, glabrous, sparsely scaly; rachis sparsely scaly. Lamina simple, rigid, green to yellow, 15-25 x 1-2.5 cm, linear-laceolate, subcoriaceous, glabrous, upper portion from 6-15 cm gradually contracted and fertile, base decurrent, margin
entire, midrib slightly raised above and distinctly raised below, grooved above and rounded below; veination distinct, reticulate, hexagonal, anastomosing from 2-3 uniform areolae, with 1-2 included veinlets ending in hydathodes, irregular with forked, free included veinlets. Sore exindusiate, superficial, acrostitcoid, light brown, confined to narrow apex, mixed with sporangiasters, peltate to umbrella shaped paraphyses; sporangia stalked. Spores hyaline or yellow, bilateral, monolete, oval to round, 50-60 x 65-75 µm, light brown, exine smooth and minutely rugulose. (Plate 9c)

Chromosome number: Diploid sexual, n=35 (cf. Love et al., 1977).

ECOLOGY: Plants epiphytic on moist rock boulders in moist shady places near water channel in the deep forest. (900-1300 m altitude). New record to Central India and Chhattishgarh.

FERTILE: May-October

SPECIMENS EXAMINED: Bastar, Shweta Singh, Bailadilla hills 61041, 611011 (BSA).

DISTRIBUTION: INDIA- Throughout the country in hilly region. Central India: Bastar.

LEPISORUS (J. Sm.) Ching


Rhizome wide creeping, long, clathrate scales present, hairy; fronds articulate to rhizome, simple rarely pinnate; stipe short, closely or distantly placed; lamina simple, linear-lanceolate, mambranaceous, coriaceous, margin entire; veins evident or immersed, irregular or regular, with or without free simple or
forked veinlets. Sori exindusiate, round or elliptical, in single row on the plexes of radiate veinlets, umbrella shaped paraphyses usually present. Spores hyaline to yellow, bilateral monolette.

Genus comprising 40 species throughout the world flora, of which 24 species and 6 verities are known from India and in the present investigation single species, has been reported from the Central India.


Rhizome long-creeping, thin scaly; scales dark brown, concolours, ca 2-4 x 0.5-1 mm, lanceolate, margin entire, apex acuminate; fronds simple, 10-25 x 1-1.5 cm, rigid; stipe short, 1-3 cm long, glabrous, sparsely scaly; rachis sparsely scaly. Lamina simple, rigid, 8-20 x 1-1.5 cm, linear-lanceolate, gradually attenuate at the lower end, margin entire, apex acuminate, texture lathery, thick, fleshy, glabrous, light green to yellow brown; veination indistinct, anastomosing from 2-3 areolae, irregular with forked, free included veinlets. Sori exindusiate, superficial, medium to large sized, round, golden-brown, covering the more than half of the lamina, copious, peltate to umbrella shaped paraphyses, 1.8-2 mm. Spores hyaline or yellow, bilateral monolette, oval to round, 40-60 x 20-45 μm, light brown, exine smooth and minutely rugulose. (Fig. 14; Plate 9d)

Chromosome number: Diploid sexual, n=35 (cf. Love et al., 1977).
Fig 14. *Lepisorus nudus* (Hook.) Ching - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome scale (e) Paraphysis
ECOLOGY: Plants epiphytic on trees, shrubs and on moist rock boulders in moist shady places in the deep forest. (900-1300 m altitude).

FERTILE: August-October

SPECIMENS EXAMINED: Anuppur: Amarkantak, Shweta Singh, Forest near Dudhhdhara 58700 (BSA); Bastar Shweta Singh, Bailadilla 41132, 55623 (Sagar Uni.), 61172, 66782 (BSA); Bilaspur: Panigrahi, 8957 (BSA); Hoshangabad: Pachmarhi, Shweta Singh, Bare Mahadeo 55808, Bee fall 55623, Dutche’s fall 55782 (BSA); Sidhi: Sanjay National Park-Kanhaiya Dah, Shweta Singh, 58630, 58495 (BSA).

DISTRIBUTION: INDIA- Throughout the country in hilly region. Central India: Bastar, Chhindwara, Hoshangabad.

Note: The species is easily separated form other members of this group because of its specific broadly ovate rhizome scales with an almost entire margin; sori large, medial, covering more than half of the lamina. The lower surface smooth, some deciduous scales on the rachis.

LEPTOCHILUS Kaulf.

Leptochilus Kaulf., Enum. Fil. 147. 1824.

Type species: Leptochilus axillaris (Cav.) Kaulf., Enum. Fil. 147.

Rhizome widely creeping, branched, dark brown clathrate scales present, hairy; fronds articulate to rhizome, simple rarely pinnate, dimorphic; sterile fronds simple, lanceolate, herbaceous, smooth, margin entire; stipe remote, inconspicuous articulate; veins anastomosing to form numerous areolae with simple or branched free veinlets, ending in hydathodes; fertile fronds longer
than sterile one, linear; sori exindusiate, round or elliptical, covering whole lower surface, paraphyses receptacular. Spores bilateral, monolete, reniform, smooth.

Genus comprising of 4 species from India and in the present investigation single species has been reported from the Central India.


Rhizome wide-creeping, slender, tortuous, scaly; scales dark brown, clathrate, concolours, 1.8-2 x 0.5-0.6 mm, ovate-lanceolate, margins entire, apex acuminate; fronds simple, 1.5-2.0 cm long, dimorphic; sterile lamina simple, larger, lanceolate, thin but firm in texture, glabrous, apex acuminate, base decurrent, entire, green but blackens-green when old, stipe 2.5-10 cm long; rachis sparsely scaly; veins forming oblique anastomosing polygonal main areoles, these areoles form 2-3 smaller, ones with branched free veinlets; fertile lamina longer than the sterile ones, narrow, contracted, 11-20 x 0.2-0.4 cm, stipes 11-35 cm long. Sori exindusiate, covering the whole lower surface expect midrib edges inflexed on maturity, paraphyses receptacular, inconspicuous. Spores pale-yellow, bilateral monolete, oval to round, 30-55 x 22-45 μm, light brown, exine smooth and minutely rugulose. (Fig. 15) Chromosome number: n=36 *(cf. Manickam & Irudayaraj 1988)*

**ECOLOGY:** Plants epiphytic on trees, shrubs and on moist rock boulders in moist shady places near water channel. Plants
Fig 15. *Leptochnus axillaris* (Cav.) Kaulf. - (a) Habit; (b) Part of sterile pinnae enlarged showing venation; (c) Spore; (d) Rhizome scale
reported from Central India are smaller in size. (900-1000 m altitude).

**FERTILE:** September-November

**SPECIMENS EXAMINED:** Anuppur: Kabirchabutra, *Panigrahi*, 13316 (BSA); *Shweta Singh*, 58637 Kapildhara (BSA); Bastar *Shweta Singh*, Bailadilla 58637 (Sagar Uni.), 61105 (BSA); Chhindwara, *Shukla*, Patalkot 9162 (BSA); Hoshangabad: Pachmarhi, *Dixit*, Dutche's fall 41317, Dhupgarh 41214; *Panigrahi*, Mahadeo 4575; *Shweta Singh*, Jamboor deep 55591, Dutche's fall 55783, 55705 Tridhara (BSA); Jagdalpur, *Shweta Singh*, Kangar Valley National Park 61105 (BSA); Sidhi: Sanjay National Park-Kanhaiya Dah, *Shweta Singh*, 58601, 58496 (BSA).

**DISTRIBUTION:** INDIA- Assam, Arunachal Pradesh, Chhattishgarh, Himachal Pradesh, Kerala, Karnataka, Tamil Nadu, Madhya Pradesh, Sikkim, West Bengal.

**Central India:** Anuppur, Bastar, Chhindwara, Hoshangabad, Sidhi.

**PARALEPTOCILUS** Copel.


**Type species:** *Paraleptochilus decurrens* (Bl.) Copel., Gen. Fil. 198. 1947.

Rhizome creeping, dark brown clathrate scales present, hairy, inconspicuously articulate. Fronds simple rarely pinnate, dimorphic; sterile fronds simple, stipe short, inconspicuous articulate; lamina lanceolate-ob lanceolate, entire, acuminate, narrowly attenuate at the base; veins anastomosing, primary conspicuous, rest is inconspicuous; fertile fronds linear-lanceolate, sori exindusiate, round or elliptical, covering whole lower surface except midrib, paraphyses receptacular. Spores biletal, monolete.
Genus comprising 2 species throughout the world flora, of which only single species is known from India and the Central India.

45. Paraleptochilus decurrens (Bl.) Copel. var. lanceolata

Rhizome long-creeping, slender, tortuous, scaly; scales dark brown, clathrate, concolours, 2.5-3 x 0.8-1 mm, ovate-lanceolate, margins entire, apex acuminate; fronds close, not tufted, dimorphic; sterile fronds simple, 3-10 cm long; lamina simple, lanceolate, leathery in texture, glabrous, apex acute-acuminate, narrowly long-attenuate and decurrent to stipes, margin smooth, blackens-green when old, midvein very clear on lower side, stipes 2.5-10 cm long; rachis sparsely scaly; veins forming oblique anastomosing indistinct ending into hydathodes, distinct dots when dry; fertile fronds longer than sterile one, narrow, contracted, lamina 18-40 x 0.5-1.0 cm, linear-lanceolate, gradually narrowed at both the ends, coriaceous, glabrous, margin entire, inflexed on drying, stipes 15-20 cm long, veins anastomosing areole with free, forked veinlets. Sori exindusiate, forming a single row half-way between the costa and margin, when young covered with peltate scales, paraphyses receptacular, inconspicuous. Spores pale-yellow, bilateral monolette, oval to round, 30-50 x 22-40 µm, exine smooth. (Fig. 16)

Chromosome number: Not Known.
Fig 16. *Paraleptochilus decurrens* (Bl.) Copel. var. *lanceolata* (Fée) Dixit *comb-nov.* (a) Habit; (b) Part of sterile pinnae enlarged showing venation; (c) Spore; (d) Rhizome scale
ECOLOGY: Plants epiphytic on trees, shrubs and lithophytic on massive rock boulders in moist shady places near water channel. (900-1000 m altitude).

FERTILE: October-November

SPECIMENS EXAMINED: Anuppur: Amarkantak, Saxena, 4665 (SFRI); Khotele, 6830 (SFRI); Bastar, Panigrahi, Bailadilla hills 11016 (BSA); Shweta Singh, Bailadilla hills 61124, 61101 (BSA); Bilaspur, Panigrahi, 13399, 8952, 1016 (BSA); Chhindwara, Panigrahi, Tamiya 4445 (BSA); Hoshangabad: Pachmarhi, Dixit, Dhopgarh 41214 (BSA); Pachmarhi, Shweta Singh, Bee fall 55650 (BSA), Tridhara 55707 (Sagar Uni.); Jagdalpur, Shweta Singh, Kangar Valley National Park 61101 (BSA); Sidhi: Sanjay National Park, Shweta Singh, Kanhaiya Dah 58605, 58497 (BSA).

DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Chhattishgarh, Himachal Pradesh, Kerala, Madhya Pradesh, Meghalaya, Sikkim, Tamil Nadu, West Bengal.

Central India: Anuppur, Bastar, Bilaspur, Chhindwara, Hoshangabad.

Note: It is drought resistance species. Lamina curled up in dry weather.

MICROSORIUM Link


Medium sized ferns, rhizome long, short-creeping, dark brown clathrate scales present, hairy. Fronds simple or pinnatifid, rarely pinnate, isomorphic; stipe short, distant, articulate, glabrous, hairy or scaly; rachis similar to stipes; lamina simple,
margin entire or deeply lobed; veins anastomosing, copiously, free, forked veinlets, ending into hydathodes, herbaceous; sori exindusiate, globose, copious, scattered, round, sometime in two rows, without paraphyses. Spores bileral, monolete.

Genus comprising 40 species throughout the world flora, of which 17 species are known from India and single species from Central India.


Rhizome short-creeping, thick, branched, densely scaly, older portion glabrous; scales dark brown, clathrate, concolours, 1-1.5 x 1.5-2 mm, ovate-lanceolate, margins entire, apex acuminate; fronds isomorphic, elliptic-oblong-lanceolate, 20-55 x 5-15 cm; stipes 2.5-12 cm long, distant on rhizome or approximate, straminous; rachis sparsely scaly; lamina simple, decurrent almost up to base, 15-50 x 5-15 cm, membranaceous, apex attenuate, margin entire or wavy; veins distinct, visible, anastomosing areole with free, forked veinlets. Sori compital, numerous, small, scattered in 2-3 parallel or irregular series, rarely in 4-5 series, paraphyses filamentous. Spores yellow-brown, bilateral, monolete, oval to round, 40-50 x 22-30 μm, exine thick, irregular, granulose. (Plate 10b)

Chromosome number: Diploid sexual, n=36 (cf. Love et al., 1977).

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ECOLOGY: Plants epiphytic on trees, shrubs and lithophytic on massive rock boulders in moist shady places near water channel in rainy season. (900-1000 m altitude).

FERTILE: July-October

SPECIMENS EXAMINED: Anuppur: Amarkantak, Khotele, 8062 (SFRI); Bastar, Shweta Singh, Bailadilla hills 68928, 61171 (BSA); Hoshangabad: Pachmarhi, Panigrahi, Dhupgarh 4511; Dixit, Jatashankar 41287, Twyagnum pool 41239 (BSA); Shweta Singh, Jatashankar 55593, Little fall 55651 (BSA).

DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Chhattishgarh, Himachal Pradesh, Kerala, Madhya Pradesh, Meghalaya, Sikkim, Tamil Nadu, West Bengal.

Central India: Annuppur, Bastar, Bilaspur, Chhindwara, Hoshangabad.

Note: Plants appear in rainy season and disappear in the end of November.

PYRROSIA Mrib.


Type species: Pyrrrosia chinensis Mirb., Hist. Nat. Veg. 5: 92. 1803.

Epiphytic; rhizome wide-creeping, scaly; scales lanceolate-setaceous. Fronds isomorphic or dimorphic, stipe short; lamina simple, coriaceous, covered with persistent stellate scales; veins indistinct, anastomosing with free included veinlets. Sori superficial, exindusiate, rounded to elongated, paraphyses absent; spores bilateral, monolette.

Genera comprising of 100 species throughout the world flora, of which 27 species are known from India and only one from Central India.

Epiphytic plant, rhizome wiry, creeping, compactly scaly; scales peltate, up to 5 x 1 mm, lanceolate pale brown to redish brown, apex acuminate base rounded, margins entire; Frond dimorphic, thick fleshy, sterile and fertile fronds usually differ in shape and size; sterile fronds short-stalked, 3-7 x 0.3-0.5 cm, stipe 1-2 cm long, lamina spathulate, obtuse, apex acute, upper surface with small scattered stellate hairs or become smooth when mature, lower surface bearing appressed stellate hairs with red-brown center and veins not visible; fertile fronds 6-15 x 0.5-1.0 cm, stipes 2-4 cm long; lamina linear or oblong, obtuse or acute at apex, tapering towards base, veins indistinct, anastomosing forming areoles with free included veinlets ending into clavate apices. Sori close, small, round, occupying the upper half of the lamina; spores pores light brown, 38-50 x 60-70µm exine tuberculate, bilobed. (Plate 10a)


**ECOLOGY:** Epiphytic or lithophytic on tree trunks and moist rocks in shady places probably near streams. (900-1000 m altitude).

**FERTILE:** May-February.

**SPECIMENS EXAMINED:** Bastar, *Shweta Singh*, Bailadilla hills 61148 (BSA).

**DISTRIBUTION:** INDIA- Throughout the country in hilly regions.

**Central India:** Bastar.

**Note:** The fronds are cured up in absence of moisture. It is also drought resistance. The species is highly polymorphic. The lamina dimorphic and this should serve well to distinguish it form *P.*
lanceolata (L.) farewell, with which it has frequently been confused in the past (cf. Clarke, 1880; Bedde., 1883). Further, this fern differ from P. lanceolata in subglobose or sparsely hairy undersurface of fronds. Upper 1/3 or 1/2 portion of the fronds is fertile (cf. Mehra & Bir, 1964).

13. DRYNARIACEAE Ching

(Oak-leaf fern family)


Type genus: Drynaria (Bory) J. Smith, Hooker’s J. Bot. 4: 60. 1841.

Epiphytic ferns rarely terrestrial; rhizome creeping, fleshy, stout, scaly. Fronds dimorphic, articulate to rhizome; stipe very small, hairy or scaly; sterile fronds smaller than fertile fronds; veins anastomosing, copiously forming large areoles, containing veinlets. Sori globose, exindusiate, borne on the junction of veins.

The monotypic family comprising 20 spp throughout the world flora, of which 5 species have been reported from India. Only one single species is found in Central India.

Drynaria (Bory) J. Smith

Drynaria (Bory) J. Smith, Hooker’s J. Bot. 4: 60. 1841 nom. cons.

Type species: Drynaria quercifolia (L.) J. Smith, J. Bot. 3: 392. 1841.

Large epiphytic; rhizome long-creeping, thick, fleshy, densely scaly; fronds dimorphic; sterile fronds simple, lamina sessile, shorter than fertile; fertile pinnatifid, deeply lobed, staked, ovate or
lanceolate, hairy or glabrous, persistent, dry; stipe very short, fertile fronds; veins anastomosing with or without free veinlets. Sori exindusiate, small round, paraphyses, absent or 2 celled. Spores bilateral, monolete.


**English name:** Oak-leaf fern.

Epiphytes; rhizome long-creeping, stout, densely scaly, thick, fleshy, roots present; scales reddish-brown, 10-12 x 1.8–2 mm, ovate-lanceolate, margins dentate- ciliate, subulate at apex. Fronds dimorphic. Sterile fronds 15-35 x 7-20 cm; leaves 7-15 x 1-2 cm, sessile, green when young, turning dark-brown at age, cordate-ovate, variously lobed, pinnatifid, lobes 3.5 x 1.5 cm, entire, glabrous; mid rib and primary veins distinct, interconnected. Fertile fronds 50-100 x 20-35 cm, larger than sterile ones; leaves 30-100 x 15-18 cm, ovate-oblanceolate, deeply pinnatifid, lobes up to 15 pairs, alternate, 12-25 x 25-5 cm, coriaceous, glabrous, oblong, acuminate, entire; stipe 15-18 cm, glabrous, grey brown. Veins distinct on both the surfaces, anastomosing forming areoles with or without free included veinlets. Sori exindusiate, small, superficial, along veinlets, compital, many, scattered throughout the surface of lamina. Sporangia round, stalked. Spores oval, hyaline, light-brown, 45-50 x 29-35 μm, exine reticulated and with minute blunt projections. Chromosome number: 2n=74  (*cf. Love et al.*, 1977).

**ECOLOGY:** Epiphytic on tree trunks and branches in shady places. (450-100 m altitude).
**FERTILE:** October-June.

**SPECIMENS EXAMINED:** Bastar, *Shweta Singh*, 61153, 61043, 66798 Bailadilla hills (BSA).

**DISTRIBUTION:** **INDIA:** Throughout the country in hilly region.

**Central India:** Bastar, Hoshangabad.

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14. **LYGODIACEAE** Presl

(The Climbing fern Family)

**Lygodiaceae** Presl, Suppl. Tent. Pterid. 98. 1845.

**Type genus:** *Lygodium* Sw., Schard. J. Bot. 1800(2): 7. 106. 1801.

Terrestrial ferns; rhizome dichotomously branched, subterranean, hairy, widely creeping fronds various; stipe and rachis slender, very long, twining, rachis bearing primary branches, primary branches bearing secondary branches; pinnules pinnate. Length indeterminate due to active apical growth maintained for a long period. Sterile leaflets toothed margin; veins free; fertile pinnules narrow than sterile ones. Sporangia indusiate, biserate on marginal spikes.

The monotypic family comprising 40 spp throughout the world flora, of which 11 species have been reported from India and two species from Central India.

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**LYGODIUM** Sw.


**Type species:** *Lygodium scandens* (L.) Sw., Schard. J. Bot. 1806(2): 100. 1801.
Terrestrial, climbing ferns; Rhizome slender, short-long creeping, apex hairy; fronds various; stipe and rachis slender, twining, branched, several meter long, rachis bearing short primary branches ending in a tuft of brown hairs, each primary branches bearing narrowly winged secondary branches; secondary branches bearing pinnules in pinnate arrangement or bearing digitate leaflets; veins forked, free, reaching up to margin. Length indeterminate due to active apical growth maintained for a long period. Fertile pinnules narrow than sterile ones. Sporangia indusiate, biserate on marginal spikes. Spores trilette.

**Key to the species**

1a. Pinnules linear-oblong (Palmate in young plants) margins acutely serrulate; some or most of the fertile pinnules 10-15 cm long.

*L. flexuosum*

1b. Pinnules mostly lanceolate with cordate base in sterile, mostly ovate in fertile pinnae, rarely 2.5 cm long, margins minutely crenulate.

*L. microphyllum*


English name: Climbing fern
Climbing ferns; rhizome short creeping, apex hairy; hairs dark brown, uniseriate, ca 1 mm. Fronds long unlimited, 25-40 cm broad, dichotomous when young, deeply palmately lobed, tripinnate, widely spreading; ultimate pinnules, shortly stalked, linear-oblong, cordate, serrate, crenately lobed apex; stipes and rachis slender, twining, branched, several meter long, rachis bearing short primary branches ending in a tuft of brown hairs, each primary branches bearing narrowly winged secondary branches; secondary branches alternately pinnate bearing 3-6 leaflets; leaflets tripinnate to quaripinnatifid, stalked, 12-32 x 12-32 cm, ovate to deltoid; gradually tapering towards apex, subcoriaceous, margins toothed or serrate, apical pinnae smaller and sessile, terminal pinnae sessile or stalked; veins forked, free, hairy, reaching up to margin. Length indeterminate due to active apical growth maintained for a long period. Fertile leaflets narrow than sterile ones; Sorophores large, protruding from margin, 0.1-0.3 x 0.1 cm long. Spores trilete, pale yellow, finely verrucose, 70-70 x 100-100 μm. (Plate 10c, d)


ECOLOGY: Plants grow climbing on bushes and trees or trailing on the ground along the edges of forest in gravelly and sandy soil. (800-900 m altitude).

FERTILE: August-September

SPECIMENS EXAMINED: Anuppur: Amarkantak, Indorkar, 11101 (SFRI); Amarkantak: forest of Mai ki bagia, Shweta Singh, 58674, 58680 (BSA); Bastar, Saxena, Bailadilla hills 5505 (SFRI); Bastar, Shweta Singh, Bailadilla hills 58611 (Sagar Uni.), Bailadilla hills 68403, 61162 (BSA); Chhindwara: Patalkot, Shweta Singh, Rajagufa 58680; Hoshangabad: Pachmarhi, Shweta Singh, Rajatprapat 55762, Apsara fall 55763, Reechgarh 55737, Jambodeep 55598 (BSA); Mandla: Kanha Tiger Reserve, Lal, 33145
(BSA); Jagdalpur, *Shweta Singh*, Kangar Valley National Park 61012 (BSA); Raigarh, *G. Sengupta*, 16213, (BSA); Sagar, *Shweta Singh*, 58525, Forest near University (BSA); Sidhi: Sanjay National Park-way to Kusmi, *Shweta Singh*, 58611, 58504; Bandaria Khoth, 58505 (BSA).

**DISTRIBUTION**: **INDIA**- Throughout the country in hilly region as well as plains.

**Central India**: Anuppur, Bastar, Betul, Bilaspur, Chhindwara, Damoh, Gwalior, Hoshangabad, Indore, Khandwa, Mandla, Raigarh, Raipur, Sidhi, Shivpuri.

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Climbing ferns; rhizome long-creeping, apex hairy; hairs ca 0.8-1 mm, dark brown, uniseriate; fronds long, 50-70 x 15-45 cm, tripinnate, widely spreading; pinnae 12-20 x 4-8 cm, shortly stalked, ovate-oblong, primary rachis branches ending in a tuft of brown hairs, dormant apex bearing 0.5-1.5 cm, hairy, each primary branches bearing narrowly winged secondary branches; secondary branches glabrous, zig-zag, bearing alternately pinnate 3-6 leaflets; leaflets ultimate pinnate, winged or sometime lobed at the base, 1-4.5 x 1-2, apex round, thin, margins entire, wavy, base auricled or cordate, ovate oblong, surface smooth; veins many forked, prominent, ending up to margin. Length indeterminate due to active apical growth maintained for a long period. Fertile leaflets narrow than sterile ones; Sorophores large, protruding from
margin, orbicular or ovate, 0.1-0.3 x 0.1cm long. Spores trilete, pale yellow, finely verrucose, 60-60 x 65-65 μm.


ECOLOGY: Plants climbing through bushes or forming thickets along the streams in edges of dry deciduous forest. Not much common. (800-900 m altitude).

FERTILE: August-September.

SPECIMENS EXAMINED: Chhindwara: Patalkot, Shweta Singh, 58505 (Sagar Uni.).


15. CHEILANTHACEAE Nayar
(The lip fern family)


Type genus: Cheilanthes Sw., Syn. Fl. 5: 126. 1806.

Small ferns; rhizome short, erect or creeping, scaly; fronds 3-4 pinnate or pinnatifid, rarely once pinnate, stipe not articulate, clustered, lamina hairy or glabrous or papillose, papillae often white-waxy, veins free. Sori terminal, linear, indusiate or exindusiate, covered by somewhat modified at length partially or wholly recurved margin of the frond.

A monotypic family comprising more than 200 species throughout the world flora, of which 26 species have been reported from India and 5 species, are found in Central India.
CHEILANTHES Sw.

Cheilanthes Sw., Syn. Fl. 5: 126. 1806.

Type species: Cheilanthes micropteris Sw., Syn. Fl. 5: 126. t. 3. f. 5. 126.1806.

Rhizome short, erect to suberect, scaly; fronds narrow to deltoid, decumbent, sub membranaceous to coriaceous, margins wavy to crenate, pinnate; stipes slender, blade, hairy when young; lamina broad, deeply pininatifid or incised with midrib central; veins oblique to midrib forked. Sori indusiate, at the vein tips, more or less confluent. Spores tetrahedral, trilette.

Key to the species

1a. Lamina pinnatifid-bipinnatifid, ultimate segment enlarged; coriaceous to subcoriaceous.

2a. Rhizome scales bicoloured; stipes, rachis, costae and costules glabrous.

3a. Plant scaly throughout.

   C. albomarginata

3b. Plant not scaly.

   4a. Stipes, rachis, costae and costule scaly.

      C. anceps

   4b. Stipes, rachis, costae and costule naked above.

      C. farinosa

2b. Rhizome scales concolorous; stipes, rachis, costae and costules hairy.

      C. grisea

1a. Lamina bipinnate to tripinnatifid, ultimate segment enlarged; submembranaceous.

      C. tenuifolia

Local name: *Bhoot kesari, Nanha*

Rhizome short, erect, thick, apex scaly; scales brown-black, bicolorous, α 0.5-1 x 3-4 mm, lanceolate, apex acuminate, margin entire. Fronds tufted, 10-20 cm, scaly, generally thinly farinose; stipe 2.5-10 cm long, shining, dark chest-nut coloured, densely scaly; rachis scaly. Lamina 1-2 pinnate, 5-15 x 3-10 cm, ovate-lanceolate to deltoid-lanceolate, acute apex; pinnae up to 8-12 pairs, 3-5 x 2-4 cm, sub opposite, elongate-ovate, coriaceous or subcoriaceous, lower surface of young lamina ± thinly farinose with yellowish-white farina which turns pale towards the end of the growing season, sessile, margin entire or deeply to costa, c. 1-1.4 x 0.2-0.3 cm, linear, apex acute, lowest pinnae almost largest, 3.5-5.0 x 2.0-3.0 cm, margin deeply lobed to costa; basiscopoc lobes (pinnules) larger than the acrosopic ones; veins pinnate, 3-4 pairs, scaly; costae and costules scaly. Sori indusiate, marginal, hardly interrupted at sinus; indusia light brown, triangular, membraneous, margin fimbriate. Spores trilete, dark brown, 30-35 x 40-45 μm, tetrahedral to globose, exine verrucose. (Fig. 17; Plate 11b)

**ECOLOGY:** Xerophytic ferns rooting in rock crevices, along newly build forest roads and in the forest floor in open sunny situations. (800-900 m altitude).
Fig 17. *Cheilanthes albomarginata* Clarke - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome scale
FERTILE: October-February.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Shweta Singh, Gupteshwar 58877 (BSA); Bastar, Shweta Singh, Bailadilla hills 61029, 61079 (BSA); Hoshangabad: Pachmarhi, Dixit, Twynaman pool 41222 (BSA); Shweta Singh, Handi koh 55653, Dutche’s Fall 55787 (BSA); Sidhi, Sanjay National Park, Shweta Singh, Kanhaiya dah 58685 (BSA).

DISTRIBUTION: INDIA- Throughout the hilly regions of India.

Central India: Anuppur, Bastar, Betul, Bilaspur, Chhindwara, Damoh, Gwalior, Hoshangabad, Indore, Khandwa, Raigarh, Raipur, Sidhi, Shivpuri.

Note: Fronds are variable in the size and shape. Small mature fronds are white with thick farina and scaly at lower surface. Sori obliterate the whole lower surface of pinnules. Very large fronds have less and usually farina is absent and sori are restricted to margin only. Pinnae curled up in summer and dry weather but retain their original shape and colour during rainy season. Species is easily separable from other species of the genus by the presences of bicolorous scales on stripe and primary, secondary and tertiary rachises.


Rhizome short, erect, thick, apex scaly; scales brown-black, bicolorous, ca 0.5–1 x 2.5-3 mm, lanceolate, apex acuminate,
margins entire. Fronds tufted, 10-25 cm, scaly, generally thinly farinosa, pinnate; stipes 5-20 cm long, shining, dark brown, densely scaly; rachis glabrous. Lamina 1-2 pinnate, large, 8-20 x 6-10 cm, ± as long as stipe, deltoid-lanceolate, acute apex; pinnae c 15 pairs, 5-6 x 2-3 cm, lanceolate, sub opposite, sessile, apex acute, thick, subcoriaceous, lower surface thickly farinose with bright-white farina, upper surface dark-green, glabrous, margins deeply lobed to the costa, c. 0.8-1.0 x 0.2-0.3 cm, lower 2 or 3 pairs of pinnae distant, lowest pair of pinnae ± as the 2 or 3 pairs above it, largest pair 3.5-4.0 x 0.5-0.6 cm; basioscopic lobes (pinnules) larger than the acroscopic ones; veins pinnate, 4-5 pairs, simple or forked, scaly; costae and costules scaly. Sori indusiate, marginal, present on the pinnules or lobes; indusia brown, narrow, margin frimbriate or toothed, continuous or discontinuous. Spores trilete, light brown, 32-42 x 45-55 μm, reticulate, circular, spinulose.


ECOLOGY: Individuals grow in brown soil along hilly slope. (800-900 m altitude).

FERTILE: July-November

SPECIMENS EXAMINED: Bastar, Shweta Singh, Bailadilla hills 61074, 610540 (BSA); Hoshangabad: Pachmarhi, Panigrahi, 4566A (BSA).

DISTRIBUTION: INDIA- Throughout the hilly regions of India.

Central India: Bastar, Betul, Bilaspur, Chhindwara, Damoh, Gwalior, Hoshangabad, Indore, Khandwa, Raigarh, Raipur, Sidhi, Shivpuri.

Note: Species is easily separable from other species of the genus by having deltate lanceolate lamina, rachis glabrous and tetraploid sexual.

Local name: Chooti Brahmi.

Rhizome short, erect, thick; roots tufted, densely scaly; scales pale brown-reddish brown, ca 0.6–1 x 3-5 mm, lanceolate, apex acuminate, margin entire, lanceolate, apex acuminate. Fronds triangular, lanceolate, 10-50 cm, scaly, generally thinly farinose, pinnate; stipe 7-20 cm long, glossy, chestnut-brown, glabrous above, scaly at base; rachis glabrous. Lamina 1-2 pinnate, large, 5-25 x 4-10 cm, deltoid-lanceolate, acute apex, lower surface thickly farinose with bright-white farina; pinnae c 10 pairs, 1.5-5 x 0.5-1.2 cm, lowest pair of pinnae often distant; pinnules 5-10 x 2-3 mm, opposite, sessile, apex acute, thick, subcoriaceous; veins free, forked once and more; costae and costules scaly. Sori indusiate, submarginal, rounded, sometime confluent; sporangia large; indusia false, brown, membranous. Spores globose, dark-brown, trilete, dark brown, faintly granulose, 45-55 x 40-50 μm, exine reticulate. (Fig. 18; Plate 11a)

Chromosome number: Diploid sexual n=30 (cf. Vasudeva & Bir, 1982).

ECOLOGY: Grows in rock crevices in dry and exposed places. (600-1000 m altitude).

FERTILE: July-February

SPECIMENS EXAMINED: Anuppur: Amarkantak, Saxena, 3561, 3872, 10463; Indorkar, Kapildhara 10763 (SFRI); Lakhshamandhara, Shweta Singh, 58687, 58677 Sonemura (BSA); Bastar, Shweta Singh, Bailadilla hills 59217, 58518, 58614 (Sagar
Fig 18. *Cheilanthes farinosa* (Forssk.) Kaulf. - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome scale
Uni.), 61127; Chhindwara, Panigrahi, Tamiya 4423 (BSA); Hoshangabad: Pachmarhi, Shweta Singh, Jatashankar 55599, Jalgali 55708 (BSA); Jagdalpur, B. Singh, Keshkal 18258, (SFRI); Shweta Singh, Kangar Valley National Park 61052 (BSA); Sidhi: Sanjay National Park-Bandaria Khoth, Shweta Singh, 58613; Kurchughati, 58498 (BSA).

**DISTRIBUTION**: **INDIA**- Throughout the hilly regions of India.

**Central India**: Anuppur, Bastar, Bilaspur, Chhindwara, Damoh, Gwalior, Hoshangabad, Khandwa, Raigarh, Raipur, Sidhi, Shivpuri.

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Rhizome short, erect, scaly; scales light-brown, ca 0.5-1 × 3-5 mm, concolorous, linear lanceolate, margins entire. Fronds tufted, deltoid-lanceolate, 6-20 cm; stipe thin, 3-20 cm, scaly at the base, smooth above, glossy, dark purplish, erect; rachis similar to stipes. Lamina 1-2 pinnate, 9.0-10 × 5.5-6.0 cm, lanceolate, deltate or ovate-lanceolate, herbaceous, lower surface farinose, farina thick, grayish white; pinnae 5-6 pairs, 1.5-2.0 × 1.0-1.5 cm, triangular, alternate, sessile, margin deeply lobed; basioscopic lobes larger than acroscopic ones; pinnules 0.3-1.0 × 0.1-2.0 mm, linear, apex acute, margin entire, lowest margin the largest, 2.5-3.0 × 2.0-2.5 cm, margin lobed to the costa; veins indistinct above, distinct below, simple or 1-2 forked; costa and costule smooth.
Sori indusiate, marginal; indusia light brown, marginal irregularly lobed, discontinuous. Spores circular, dark-brown, trilete, tetrahedral, 30-34 x 34-40 μm, exine verrucose to spinulose.

Chromosome number: Diploid sexual n=30 (cf. Love et al., 1977).

ECOLOGY: Plant rooting in rock crevices along hill slopes and streams in sandy alluvial soil. (900-1000 m altitude).

FERTILE: November

SPECIMENS EXAMINED: Not examined (cf. Dixit, 1993).

DISTRIBUTION: INDIA- Assam, Chhatishgarh, Himachal Pradesh, Jammu-Kashmir, Madhya Pradesh, Meghalaya, Orissa, Sikkim, Uttaranchal, West Bengal.

Central India: Bastar, Bilaspur, Chhindwara, Hoshangabad, Rewa, Sidhi.


Local name: Veli-chhoti, Dodhari.

Small fern, rhizome short-creeping, densely scaly; scales brown, ca 2-4 x 0.25-0.6 mm, narrow, lanceolate, apex acuminate. Fronds tufted, dimorphic, bipinnate-tripinnatifid; sterile fronds 7.5-10 cm, deltoid, pale beneath but not white-mealy, nearly glabrous, sparsely hairy; fertile fronds 30-55 cm including stipes, longer than sterile; stipe 5-50 cm long, glossy, dark purplish, glabrous above, scaly at base; main rachis winged, glabrous,
secondary and tertiary rachis narrow winged. Lamina triangular, 10-55 x 5-20 cm, submembranaceous, glabrous; pinnae 3-8 x 1.5-2.5 cm; pinnules 10-15 x 5-10 mm, oblong, lanceolate, crenate, various shaped; veins indistinct above, distinct below, 1-2 forked; costa and costule smooth. Sori indusiate, submarginal, confluent, margin of the lobes more or less recurved; sporangia large. Spors globose, dark-brown, trilete, tetrahedral, brown, exine smooth, 40-48 x 32-44 μm.

Chromosome number: n=56 (cf. Abraham et al., 1962).

**ECOLOGY:** Abundantly grow in dry situations and exposed places. (900-1000 m altitude).

**FERTILE:** July-August

**SPECIMENS EXAMINED:** Anuppur: Amarkantak, *Shweta Singh*, - Lakhsamandhara 58686, 58681 (BSA); Bastar, *Murti*, Bailadilla hills (520m) 19405 (BSA); *Shweta Singh*, Bailadilla hills 58686, 58681 (Sagar Uni.), Bailadilla hills 61020 (BSA); Chhindwara: Tamiya, *Panigrahi*, 4423, 4480 (BSA); Hoshangabad: Pachmarhi, *Shweta Singh*, Handi khah 55639, Jalgali 55740, Near forest guest house 55811 (BSA); Rewa: Hanumana, *R. Prashad*, 38253 (BSA); Jagdalpur, *Shweta Singh*, Kangar Valley National Park 61121 (BSA); *B. Singh*, Keshkal 18258 (SFRI); Sidhi: Sanjay National Park, *Shweta Singh*, Ramha Ghati 58500; Dugdugi, 58499 (BSA).

**DISTRIBUTION:** **INDIA**- Throughout the hilly regions of India.

**Central India:** Anuppur, Bastar, Betul, Bilaspur, Chhindwara, Damoh, Gwalior, Hoshangabad, Indore, Khandwa, Raigarh, Raipur, Sidhi, Shivpuri.

**Actinopteridaceae** Pichi Sermolli, Webbia 17: 5.1962.

**Type genus:** *Actiniopteris* Link, Fil. Sp. 79.1841.

Terrestrial, tufted ferns; rhizome short, erect to suberect; fronds dichotomously flabellately divided; stipes inarticulate; venation flabellate with a midrib to each main segment, secondary nerves much oblique. Sori linear, arranged on an intramarginal vein connecting the secondary nerve-endings.

A monotypic family comprising 5 species throughout the world flora, of which only one species has been reported from India and Central India.

**ACTINIOPTERIS** Link

**Actiniopteris** Link, Fil. Sp. 79.1841.

**Type species:** *Actiniopteris radiata* (Sw.) Link, Fil. Sp. Hort. Bot.

Berol. 80.1841.

Terrestrial plants; rhizome erect to suberect, scaly; scales lanceolate, margins entire; fronds triplicate to the base and each once or more dichotomous, the segment linear; stipes bicolour; lamina, semicircular, deeply lobed and repeatedly forked; fertile fronds taller than the sterile one; veins free. Sori indusiate, at the vein tips covering the whorle lower surface protected by inflexed margins of lamina. Spores tetrahedral, trilette.

Fig 19. *Actiniopteris radiata* (Sw.) Link - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome scale
Actiniopteris australis (Vahl.) Ettingsh., Frank. 85. t. 51. ft. 10-13. 1865. non Link 1841.
Local name: Morpankhi, Mayur-shikha.

Small erect, xerophytic plants, rhizome short-creeping, scaly, scales brown, ca 6-7 x 0.8-1 mm, bicolourus, margin entire, apex long acuminate; hairy, hairs dark brown; Fronds tufted, 5-20 cm, repeatedly dichotomously divided into linear segments with acutely toothed tips; stipe 4-10 cm long, stramineous to light brown, scaly. Lamina flabellate, deeply notched dichotomously in to two symmetrical, fan shaped, each half 3-4 x 4-6 cm, linear, narrow, apex divided into 2-4 acute teeth, margin entire, coriaceous, fertile fronds taller than sterile ones; veins free devoid of midrib, dichotomous with the ultimate branches extending to the outer margin of lamina. Sori indusiate, continuous on the lateral margins of both the segments of the lamina; indusia false; sporangia stalked. Spores trilete, yellowish-brown, 50-58 x 40-45 μm, exine verrucose. (Fig. 19)
Chromosome number: n=87 (cf. Manickam & Irudayaraj, 1988).

ECOLOGY: Plants grow on rocks in exposed places such as grasslands where during summer the leaves curl up. (800-900 m altitude).

FERTILE: November.

SPECIMENS EXAMINED: Bastar, Shweta Singh, Bailadilla hills 69922 (Sagar Uni.), Bailadilla hills 68318, Keshkal 68313 (BSDA); Chhindwara: Shweta Singh, Tamiya 585320 (BSA); Hoshangabad: Pachmarhi, Panigrahi, 4299 (BSA); Shweta Singh, Denwa darshan 55812, (BSA); Jagdalpur, Shweta Singh, Chitrakoot 69920 (Sagar Uni.); Panna, Ramlal, 31427, (BSA); Shivpuri National Park, Panigrahi, 16937, (BSA).
DISTRIBUTION: INDIA- Throughout the country in hills and planes.

Central India: Bastar, Betul, Bilaspur, Chhindwara, Damoh, Gwalior, Hoshangabad, Indore, Khandwa, Raigarh, Raipur, Sidhi, Shivpuri.

17. PTERIDACEAE Ching

(The brake fern family)


Terrestrial ferns; rhizome short, erect to suberect, long-growing, scaly; fronds pinnate, simple or compound, close together; venation free or anastomosing. Sori marginal, continuous.

A family comprising 8 genera throughout the world flora, of which only single genus and 48 species including one verity have been reported from India and 6 species from Central India.

PTERIS L.


Type species: Pteris longifolia L., Sp. Pl. 2: 1074. 1753.

Terrestrial, robust tufted ferns; rhizome erect, short-growing, covered with narrow brown to black scales; fronds simple to bipinnate rarely tripartite; stipe scaly; lamina 2-3 pinnate, herbaceous or coriaceous; venation free without including veinlets, forming series of narrow areoles along costa / costules ending in to
hydathodes. Sori submarginal, linear, indusiate. Spores trilete, tetrahedral, exine smooth, tuberculate-rugulose.

**Key to the species**

1a. Fronds simply pinnate.
   2a. Pinnae 10-35 on each side, linear, entire, lowest pair much reduced.

   _P. vittata_

2b. Pinnae less than 10 on each side, never linear or entire, lowest pair not reduced.
   3a. Lateral pinnae 2-6 on each side, the basal 1-4 pairs cleft down near to the base into 2-3 linear pinnules, sterile ones with spinulose serrated margins.

   _P. cretica_

3b. Pinnae 1-7 on each side, pair simple or bifid, sterile ones with spinulose serrated margins.

   _P. pellucida_

1b. Fronds bipartite at base, the above rest bipinnatifid.
   4a. Veins free throughout.
   4b. Veins not free throughout, always anastomosing forming arc.

   _P. quadriaurita_

5a. Pinnae not deeply dissected segment smooth wavy, not falcate.

   _P. biaurita_

5b. Pinnae deeply bipinnatifid, segment crenate, falcate.

   _P. geminata_

Large fern; rhizome short, erect, apex scaly; scales brown, bicolourus with few projections, ca 3-4 x 0.6.-0.8 mm pale brown, apex acuminate, margin hairy. Fronds pinnate, pinnatifid except at the base, 90-180 x 60-75 cm; stipe 35-60 cm long, green to purplish, scaly at base, stramineous; rachis hairy in the groove. Lamina pinnate, 25-50 x 20-40 cm, 5-10 pairs of pinnae, herbaceous, glabrous, short petiolate, deeply pinnatifid, thin; pinnae 15-25 x 3-5 cm, alternate, short petiolate, lanceolate, margin deeply lobed to the costa, lowest basal pinnae forked once or twice on the basal basiscopic side, sterile pinnae close whereas fertile once distant; lobes 16-18, 1.4-3.0 x 0.4-1.0 cm, oblong, apex rounded, margin entire; veins distinct on both the surfaces, basal veins of adjacent forming an arc along costa with five to seven excurrent veins forked once. Sori indusiate, continuously arranged all around the segment but not reaching the apex of the lobes; indusia continous, curl back at maturity. Spores dark brown, 42-48 x 45-58 μm, densely rugulose on the distal surface, verrucose on the proximal one. (Fig. 20)

Chromosome number: Diploid and triploid apomict, n=58, n=87 (cf. Love et al., 1977).

**ECOLOGY:** Plants grow in crevices of under deep shady rocks. (900-1000 m altitude).

**FERTILE:** May-September.
Fig 20. *Pteris biaurita* L. - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome scale
**SPECIMENS EXAMINED:** Anuppur: Amarkantak, *Shweta Singh*, 58654 (BSA); Bastar, *Panigrahi*, Bailadilla hills 6927 (BSA); *Shweta Singh*, Bailadilla 58654 (Sagar Uni.), 61102, 61127 (BSA); Hoshangabad: Pachmarhi-Bee Fall, *Panigrahi*, 6638, (BSA); Hoshangabad: Pachmarhi, *Shweta Singh*, Apsara fall 55768 (BSA); Sidhi, *Shweta Singh*, Kanhaiya Dah 58492, 58620 (BSA).

**DISTRIBUTION:** **INDIA-** Assam, Anunachal Pradesh, Chhatishgarh, Madhya Pradesh, Sikkim, Tamil Nadu, Uttaranchal.

**Central India:** Anuppur, Bastar, Bilaspur, Chhindwara, Hoshangabad, Sidhi.

**Note:** Large, tufted, quite similar to *P. quadriaurita* Retz., from which it differ in having some of the veins arched; the pinnae and generally less deeply divided and plant is generally larger and coarser.

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**English name:** *The cretan fern*.

Rhizome creeping, thick, scaly; scales dark-brown, concolorous, ca 3-4 x 4-5 mm, linear-lanceolate, margin entire, apex acuminate; fronds dimorphic, 15-30 x 5-18 cm; sterile fronds smaller than fertile; stipe 5-15 cm, erect, naked, dark brown, scaly at base; rachis tremendous, glabrous. Lamina pinnate, 15-30 x 10-15 cm, lance late, herbaceous to subcoriaceos, glabrous; sterile pinnae 3-5 pairs, sessile to subsessile, herbaceous, glabrous,
opposite, acute or obtuse, margin spinulose serrate, lowest pair of
pinnae usually once forked at base; fertile pinnae 8-10, 15-30 x
0.5-1.0 cm, narrower than the sterile ones, similar to sterile
pinnae, rachis similar to stipe; veins free, simple or forked; costa
and costule glabrous. Sori indusiate, marginal, continuous, except
near the base and apex; indusia membranaceous, continuous.
Spore brown, 35-40 x 30-40 μm, reticulate exine. (Plate 12a)
Chromosome number: Diploid sexual n=58 (cf. Vasudeva & Bir,
1982).

ECOLOGY: Extremely rare fern, grow under the shad in humid and
moist places. (400-700 m altitude).

FERTILE: August-October.

SPECIMENS EXAMINED: Bastar Shweta Singh, Bailadilla 58618
(Sagar Uni.), 61166, 61167, 61165 (BSA); Chhindwara: Patalkot,
Shweta Singh, Rajagufa 58557, Tamiya 58583, 58584 (BSA);
Hoshangabad: Pachmarhi, Shweta Singh, Apasara Fall 55768,
Dhupgarh 55825, Dutche’s fall 55825 (BSA).

DISTRIBUTION: INDIA- Throughout the country in hilly regions.

Central India: Anuppur, Bastar, Hoshangabad, Sidhi.

1839; Dixit, Cens. Indian Pterid. 70. 1984; Verma et al. in Fl.
Camptera kleiniiana Presl, Tent. Pterid. 147. t. 5. f. 19. 1836. Pteris
biaurita var. geminata (Wall. ex Ag.) Clarke, Trans. Linn. Soc. Lond.
II. Bot. 1: 469. 1880.

Rhizome erect; plant 1-2 m high. Fronds pinnate; pinnae
subsessile, lanceolate, long acuminate; lowest pair with two large
pinnae descending from the lower margin of the costa, pinnae
deply, pinnatifid, falcate; sterile ones crenate and fertile ones
undulate, except crenate apices; basal veins anastomosing in pairs
forming an arc below the sinus, rest of veins forked, free, ending
with in the margin. Sori indusiate, marginal; indusia short, never
reaching the base or apex of the segment.

Chromosome number: Not known.

**ECOLOGY:** Extremely rare fern, rooting in crevices along the
flowing water. (900-1000 m altitude).

**FERTILE:** August-September.

**SPECIMENS EXAMINED:** None. On the basis of literature. (cf.

**DISTRIBUTION:** **INDIA-** Tamil Nadu, Kerala, Karnataka, Madhya
Pradesh, Chhatishgarh.

**Central India:** Bastar, Hoshangabad.

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**60. *Pteris pellucida*** Presl, Rel. Haenk. 1. 55. 1825; Dixit,
Cens. Indian Pterid. 71. 1984; Verma *et al.* in Fl. Madhya Pradesh

Large and stouter ferns; rhizome erect, densely scaly at the
apex; scales lanceolate, ca 0.4-0.5 x 2.8-3.5 mm, pale brown,
gland tipped, margin with multicellular glands, finger like
outgrowth; fronds tufted, 20-100 cm, pinnate; stipe 10-15 cm,
erect, naked, glossy, pinkish at base, stramineous above; rachis
glabrous. Lamina pinnate, 15-45 x 15-25 cm, lanceolate,
herbaceous to subcoriaceous, glabrous; pinnae 2-7 pairs, 10-17 x
1.5-3.0 cm, sessile, glabrous, opposite, acute or obtuse, margin
spinulose serrate, lowest pair of pinnae bifid or simple, terminal
pinnae larger than the lateral ones, entire or serrate, upper slightly
decurrent, elliptic, cuneate at the base, coriaceous, surface dark
green, glossy, acuminate at the apex; rachis glabrous; costa and
costule glabrous; veins free, simple or forked at right angle from
Fig 21. *Pteris pellucida* Presl - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome scale with glandular hairs
the midrib. Sori indusiate, marginal; indusia persistent. Spores trilette, tetrahedral, yellow brown, 50-55 x 50-55 μm. (Fig. 21)

**ECOLOGY:** Extremely rare fern, grow in the forest floor in dry situation a little away from stream-sides. (900-1000 m altitude).

**FERTILE:** August-September.

**SPECIMENS EXAMINED:** Bastar, Panigrahi, Bailadilla hills 1186 (BSA); Shweta Singh, Bailadilla hills 58652 (Sagar Uni.), 61040 (BSA); Chhindwara: Patalkot, Shweta Singh, Rajaguda 58581, Tamiya 58582 (BSA); Hoshangabad: Pachmarhi, Shweta Singh, Apsara Fall 55769, 55770, Near Handi Khooh 55654 (BSA); Jagdalpur, Balakrishnana, Kangar Valley National Park: Kutumsar cave 12050 (CAL); Das, Kangar Valley National Park: Kutumsar cave - 520 m 14997 (BSA).

**DISTRIBUTION:** INDIA- Throughout the country in hilly regions.

**Central India:** Anuppur, Bastar, Hoshangabad, Sidhi.

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Rhizome short-erect to suberect, massive, scaly; scales pale brown, concolorous, ca 3-4 x 0.4-0.5 mm, linear-lanceolate, margins entire, apex acuminate, transparent, membranaceous; fronds tufted, 100-120 x 15-30 cm, bipinnatifid, glabrous; stipe 20-35 cm long, pale dark to purplish, scaly at base, stramineous. Lamina pinnate, deltoid or broadly ovate, bipinnatifid, 6-9 pairs of
pinnae, subcoriaceous, glabrous, short petiolate, deeply pinnatifid, thin; pinnae 8-20 x 2-4.5 cm, alternate, short petiolate, narrowly oblong acuminate or cordate, opposite to subopposite, lanceolate, base broadly cuneate, lowest pair of pinnae simple or forked once at the base; pinnules numerous, uniform, obtuse or acute, entire or serrate, 0.9-0.22 x 0.5-0.8 cm, membranaceous; costa and costule with spinules; veins distinct below, forked once. Sori indusiate, continuously arranged all around the segment but not reaching the apex of the lobes; indusia continous, curl back at maturity. Spores dark brown, triletate, tetrahedral, 36-52 x 25-45 μm, densely rugulose on the distal surface, verrucose on the proximal one. (Plate 11d)

Chromosome number: Not known.

ECOLOGY: Grow on grassy slopes under shady situations. (900-1000 m altitude).

FERTILE: July-December.

SPECIMENS EXAMINED: Anuppur: Amarkantak-Kabircabutara, Panigrahi, 15241 (BSA); Saxena, 4699 (SFRI); Bastar: Bailadilla hills, Panigrahi, 6927 (BSA); Hoshangabad: Pachmarhi-Bee Fall, Dixit, 41164 (BSA); Shweta Singh, Apsara Fall 55769, Handi Khoj 55654, (BSA); Sidhi: Sanjay National Park-Kanhaiya Dah, Shweta Singh, 586115 (BSA).

DISTRIBUTION: INDIA- Throughout the tropics of India.

Central India: Anuppur, Bastar, Bilaspur, Chhindwara, Hoshangabad, Sidhi.

Fig 22. *Pteris vittata* L. - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome scale
English name: *The Chinese brake fern*.

Densely tufted fern; rhizome sub erect, short, densely scaly at apex; scales ovate-lanceolate, ca 0.4-0.6 x 3-5 mm, membraneous, pale brown, apex acuminate, margin entire; fronds 20-100 cm, pinnate, terminal and lateral pinnae alike; stipe 5-40 cm, erect, scaly, stout, dark-brown; rachis glabrous. Lamina pinnate, 6-90 x 1-25 cm, oblong-ovate, herbaceous to subcoriaceous, glabrous; pinnae numerous, 0.5-20 x 0.3-0.5 cm, opposite or subopposite, middle one largest, upper one reduced, lower 5-7 pairs gradually reduced, distant and sterile, all sessile, linear, lanceolate, acuminate at apex, base broadly cuneate, margin serrate; costa and costule glabrous; veins free, simple or forked, distinct at both the surfaces. Sori along the margin, continuous from base to nearing apex, indusiate; indusia whitish, membraneous, irregular, serrate. Spores light brown, 35-42.5 x 40-52 μm, tuberculate to rugulose exine. (Fig 22)


**ECOLOGY:** Plant grows in moist situations near nalas and flowing water and in the city areas on dilapidated moist walls. (400-900 m altitude).

**FERTILE:** July-February.

**SPECIMENS EXAMINED:** Anuppur: Amarkantak, *Shweta Singh*, Durgadhara 58652 (BSA); Bastar, *Shweta Singh*, Bailadilla hills 55634 (Sagar Uni.), 61124, 61132, 61133 (BSA); Bilaspur: *Panigrahi*, 13299A (BSA); Hoshangabad: Pachmarhi, *Shweta Singh*, Jatashankar 55603, Handi Khooh 55634, Pachmarhi Lake 55640 (BSA); Jagdalpur, *Shweta Singh*, Chitrakoot 63950, Keshkal 61130, Kangar Valley National Park 63860, 61167, 611470, 611414 Keshkal (BSA); Raigarh, *G. Sengupta*, Champa 16524
(BSA); Sidhi: Sanjay National Park, Shweta Singh, Kaori Khoh 58618; Jarbo Khoh, 58491 (BSA).

**DISTRIBUTION:** INDIA- Throughout the country in hilly regions.

**Central India:** Anuppur, Bastar, Bilaspur, Hoshangabad, Raipur, Sidhi.

### 18. ADIANTACEAE  (Presl) Ching

(The maidenhair fern family)

**Adiantaceae** (Presl) Ching, Suny. 5: 229. 1940.

**Type genus:** *Adiantum* L., Sp. Pl. 2: 1094. 1753.

Usually tufted ferns; rhizome short, erect to suberect, long-creeping, scaly; fronds bright green, delicate, hairy or glabrous; venation free, simple, forked. Sori marginal, globose to linear, indusiate, hairy or glabrous.

A monotypic family comprising 200 species throughout the world flora, of which 26 species has been reported from India and 3 from Central India.

**ADIANTUM L.**


**Type species:** *Adiantum capillus-veneris* L., Sp. Pl. 2: 1096. 1753.

Terrestrial plants; rhizome long-creeping, covered with narrow brown to black scales; fronds simple to tripinnate; stipe slender; lamina pinnate, various shaped (fan to parallel-gramnoid or dominate), sub entire to deeply lobed, bright green, delicate,
hairy or glabrous; venation dichotomously branched. Sori marginal, globose to linear, indusiate, hairy or glabrous. Spores trilete, tetrahedral, exine smooth, rugulose.

**Key to the species**

1a. Fronds bipinnate or more divided.

   *A. capillus-veneris*

1b. Fronds simple pinnae.

   2a. Fronds pubescent or tomentose; pinnae subsessile, half-lanceolate or half-ovate, the acrosopic margin deeply lobed or laciniate.

   *A. incisium*

   2b. Fronds glabrous; pinnae petiolate; half-orbiculate or somewhat oblong, acrosopic margins entire or with rounded lobules.

   *A. philippense*


Local name: *Hansraj*

English name: *Southern maidenhair fern, Venus's-hair fern.*

Rhizome short-creeping, dark brown, densely scaly, scales brown, bicolourous, ca up to 3 x 1 mm, linear lanceolate, margins entire, apex long acuminate; hairy, hairs dark brown; Fronds bipinnate, 8-15 x 2-3.5 cm; stipes 2-8 cm long, dark brown, scaly,
paleate at base. Lamina ovate-deltoid, bipinnate, glabrous, 3-4 pairs of lobed upper pinnae and 1-2 pairs of pinnate pinnae, alternate, petiolate, deltate, flabellate, obtriangular, obovate, lower margin cuneate at the base, rounded at outer edge, deeply cleft; the lobes crenate, thin pellucid-herbaceous, rachis naked; veins numerous, free, dichotomous branched. Sori indusiate, elliptic or linear, roundish to obreniform, placed in roundish sinuses of the crenations; sporangia globose, small and short stalked. Spores trilette, dark brown, 32-46 x 30-35 µm, tetrahedral, amb triangular, walled exine smooth. (Plate 11c)

Chromosome number: n=30 (cf. Love et al., 1977).

ECOLOGY: Plants grow in crevices of shady rocks and forms dense clusters. (900-1000 m altitude).

FERTILE: July- August.

SPECIMENS EXAMINED: Bastar, Panigrahi, Kutumsar 1134 (BSA); Shweta Singh, Bailadilla hills 58529, 54907, 55709 (Sagar Uni.), 61169 (BSA); Bilaspur: Panigrahi, 8790 (BSA); Chhindwara: Patalkot, Shweta Singh, Rajagufa 51168, Tamiya 59407 (BSA); Hoshangabad: Pachmarhi, Shweta Singh, Apsara Fall 55771, Tridhara 55709 (BSA); Panna: Panna National Park, Ram Lal, 31831 (BSA); Sidhi, Panigrahi, Sanjay National Park 2485 (BSA); Shivpuri: Shivpuri National Park, Murti, 17052 (BSA);

DISTRIBUTION: INDIA- Throughout the country in hilly regions.

Central India: Anuppur, Bastar, Bilaspur, Chhindwara, Hoshangabad, Sidhi.

Note: The plants are of much variable in size and shape of leaflets.

Fig 23. *Adiantum incisum* Forssk.: (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome hair

English name: *Walking fern*.

Small tufted fern; rhizome thick erect, dark brown, densely scaly; scales reddish-brown, copious, ca 0.25-0.5 x 3-5 mm, lanceolate, margin entire, apex long acuminate; hairy, hairs dark brown; Fronds pinnate, 20-35 x 2-3 cm; stipes 5-10 cm long, dark chest-nut brown, wiry, spreading, tomentose. Lamina simply pinnate, 10-20 x 0.5-0.8 cm, 15-25 pairs of pinnae, alternate, subpetiolate or subsessile, lower one straight, horizontal, larger in basal part, gradually reduced above and rooting in apical part at intervals giving rise to independent plants after detachment; coriaceous in texture, upper surface glabrous, lower hairy; much variable in size and shape, deeply numerous lobes, rachis similar to stipe; veins numerous, free, forked, hairy. Sori indusiate, hairy, marginal; indusia light brown; sporangia globose, small and short stalked. Spores trilette, light brown, 22-24 x 25-30 μm, tetrahedral, exine smooth to rugulose. (Fig. 23)

Chromosome number: Diploid sexual n=30 (cf. Love et al., 1977).

*ECOLOGY:* A small common fern with spreading leaves and a marked walking habit, forming large colonies in moderately exposed area in the low mountainous region. (400-700 m altitude).

*FERTILE:* July- September.

(BSA); Jagdalpur, Shweta Singh, Kangar Valley National Park 61015, Keshkal 61061 (BSA); Rewa: Sahagi Ghat, Panigrahi, 50001 (BSA); Sarguja, Panigrahi, 8838 (BSA); Satna-Kamatgiri, Prasad, 31781 (BSA); Sidhi: Sanjay National Park, Panigrahi, 2444 (BSA), Shweta singh, Bandari koh 58607, Domar Pat, 58490 (BSA).

**DISTRIBUTION:** INDIA- Throughout the country in hilly regions.
**Central India:** Throughout the Madhya Pradesh and Chhatttishgarh.


Local name: **Kali-Jhant.**

Tufted fern; rhizome short, erect, dark brown, densely scaly at apex; scales brown, concolorous, ca 0.3-0.5 x 2.5-3.5 mm, linear-lanceolate, margin entire, apex long acuminate. Fronds tufted, pinnate, 10-30 x 3-6 cm; stipe 8-12 cm long, dark black, polished grooved, glabrous. Lamina simply pinnate, 15-20 x 0.5-0.8 cm, 10-20 pairs of pinnae, lanceolate or oblanceolate, herbaceous, glabrous; pinnae alternate, petiolate, lunulate, semi orbicular or elliptic-oblong, terminal leaflet of irregular shape, 1-2.5 x 0.5-1.5 cm, lower margin straight or slightly concave, entire, upper margin rounded, lobed, each may be further lobed herbaceous in texture, rachis similar to stipe; veins distinct above and below, continuously fork or branch up to the edge of the pinna. Sori indusiate, continuous along the margin of the lobe, crescent-shaped, slightly depressed from the general outline;
Fig 24. *Adiantum philippense* L. - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome scale.
indusia light brown, coriaceous; sporangia globose, small and short stalked. Spores trilete, dark brown, 32-46 x 20-42 μm, tetrahedral, exine prominently granular. (Fig. 24)

Chromosome number: 2n=60, 90, 120 (cf. Love et al., 1977).

ECOLOGY: Common fern along the roadside in the forest under moist situation in the low mountainous region. (400-700 m altitude).

FERTILE: August-December.

SPECIMENS EXAMINED: Anuppur: Amarkantak Shweta Singh, Shambhudhara 58664 (BSA); Bastar, Das, Bailadilla hills 14994 (BSA); Shweta Singh, Bailadilla hills 58661 (Sagar Uni.), 61036, 61037 (BSA); Hoshangabad: Pachmarhi-Rori Ghat, Panighahi, 6565, (BSA); Pachmarhi, Shweta Singh, Bare Mahadev 55691, Jatashankar, 55813, Near Guest House 55773, Way to Pachmarhi Lake 55641 (BSA); Mandala, J. Lal, 33058 (BSA); Jagdalpur, Shweta Singh, Kangar Valley National Park 61014 (BSA); Panna: Panna National Park, Ram Lal, 31409 (BSA); Raipur, Verma, Sitanadi 2437 (BSA); Sidhi, Panighahi: 23766 Chitrangi Rest House (BSA); National Park, Shweta singh, Kanhaiyadah 58664, 58661, 58602 Kaari Khoh, 58606 Nagdah, 58489 (BSA).

DISTRIBUTION: INDIA- Throughout the country in hilly as well as plain regions.

Central India: Throughout the Madhya Pradesh and Chhattishgarh.


Terrestrial; rhizome erect or acending or short or long creeping; fronds tufted, simple or compound, uniform; stipes continous with rhizome; lamina pinnate, hairy or glabrous or scaly; nerves forming a pseudoindusium; veins free or reticulate without free included veinlets. Sori along the veins or lower surface; exindusiate.

Family comprising 22 species throughout the world flora, of which six genera and twenty species has been reported from India and only one species from Central India.

**HEMIONITIS L.**


**Lectotype:** *Hemionitis palmate* L., Sp. Pl. 2: 1077. 1735.

Small fern; rhizome erect or prostrate. Fronds simple or lobed, rarely pinnate; stipe not articulate; lamina hairy; veins copiously, anastomosing, forming numerous areoles, veinlet rarily. Sori continuously along the veins and copiously reticulate, indusiate.


Local name: *Rabit ear fern, Chakuliya*.

Small tufted fern; rhizome suberect, short, scaly; scales brown, ca 3-3.4 x 0.3-0.5 mm, ovate-lanceolate, margin entire, apex long acuminate, sparsely toothed. Fronds tufted, dimorphic,
Fig 25. *Hemionitis arifolia* (Burm.f.) Moore - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome sca
20-30 cm long; sterile fronds deeply cordate to sagittate base, coriaceous, apex acuter or rounded, margin entire, stipes 6-10 cm stramineous to light brown, scaly at base only, lower surface hairy, upper surface glossy; costa raised below, grooved above, midrib distinct up to half way only; fertile fronds slightly smaller in size, 20-30 cm, stipe shorter than sterile lamina stipe, lamina narrow in apical parts, sagittate at base; veins obscure, reticulate with small elongated areoles, veinlets present. Sori copious, indusiate, continuous covering the whole lower surface, hairy, scaly; sporangia stalked. Spores spherical, trilete, yellowish-brown, 40-45 x 30-35 μm, exine with complete reticulation. (Fig. 25; Plate 12 b) 

Chromosome number: n=2n=90 (cf. Abraham et al, 1962; Manickam & Irudyaraj, 1988)

ECOLOGY: Plants rooting in rock crevices along flowing streams. Extremely rare. (800-900 m altitude).

FERTILE: September-January.

SPECIMENS EXAMINED: Bastar, Panigrahi, Kutumsar 1123 (BSA); Shweta Singh, Bailadilla hills 61022, 61023, 61124 (BSA); Jagdalpur, Shweta Singh, Kangar Valley National Park 61050 (BSA);

DISTRIBUTION: INDIA- Madhya Pradesh, Chhattishgarh, Tamil Nadu, Kerarla.

Central India: Bastar, Betul, Bilaspur, Chhindwara, Damoh, Gwalior, Hoshangabad, Indore, Khandwa, Raigarh, Raipur, Sidhi, Shivpuri.
20. PARKERIACEAE Hook.

Parkeriaceae Hook., Exotic Fl. 2: (20) t. 147. 1825.


Marshy or aquatic fern family; rhizome erect, scaly; fronds pinnatly decompound, dimorphic; stipes spongy. Sterile lamina 1-2 pinnate, herbaceous, glabrous; fertile lamina finely dissected, large; veins anastomosing without included veinlets. Sori indusiate, occupying the entire lower surface.

A monotypic family comprising 5 species throughout the world flora, of which 3 species have been reported from India and only one species from Central India.

CERATOPTERIS Brongn.

186. 1821.

Type species: Ceratopteris thalictrodes (L.) Brongn., Bull. Sci.

Rhizome short, erect, reduced, scaly. Fronds dimorphic; fertile lamina pinnte, finely dissected, margin reflexed and longer than the sterile ones. Sterile lamina pinnate, broad, herbaceous. Veins reticulate, forming numerous areoles with included veinlet. Sori in 1-4 rows; sporangia indusiate, scattered along the veins.

Philom. Paris. Ser. 3. 8: 186. 1821; Dixit, Cens. Indian Pterid. 83.
1984; Verma et al. in Fl. Madhya Pradesh I: 70. 1993; Chandra,
Fig 26. *Ceratopteris thalictroides* (L.) Ad. Brongn. - (a) Habit; (b) Part of frond pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome scale

Local name: *Panir karela*, English name: *Water fern*

Succulent tufted fern, up to 1 m height. Rhizome short, erect, fibrous or fleshy long roots present, scaly; scales soft, uniformly pale brown, ovate, ca 1-1.5 x 2-3 mm, apex acute, margin entire. Fronds dimorphic, green; stripe 2-30 cm, fleshy, rooted, tremendous to light brown, succulent, inflated, glabrous; fertile fronds erect, bi-tri pinnate, longer than sterile ones, 10-100 x 2.3-4.6 cm, lance late; pinnae 5-6 pairs, alternate, 2-10 cm, petiolate, lanceolate or ovate, ultimate lobes linear or deltate, apex acute, margins recurved; sterile fronds pinnate; lamina 1-2 pinnate, 4-38 x 3-8 cm, succulent, pinnae 3-5 pairs, 1-10 x 2-4 cm, alternate, petiolate, floating, oblong, elliptic or lanceolate or ovate, margin entire, apex acute; veins reticulate with small areoles, veinlets present. Sori 1-3 rows, sporangia globose, indusiate, stalked. Spores large, ribber, 30-32 spores per sporangium, tetrahedral, trilette, yellowish-brown, 80-120 μm, exine with characteristic parallel ridges. (Fig. 26)

Chromosome number: 2n = 156 (cf. Love *et al.*, 1977); n = 77 (cf. Ninan, 1956).

**ECOLOGY:** Plants rooting in fresh water ponds, shallow ditches and mud in open places. (800-900 m altitude).

**FERTILE:** July-October.

**SPECIMENS EXAMINED:** Anuppur: Amarkantak, *Indorkar*, Samundhara 11152 (SFRI); Bilaspur, *Panigrahi*, Keochi 7192, 15378 (BSA); Jagdalpur, *Das*, Kangar Velley National Park 14824 (BSA); Raigarh, *Balakrishnan*, 19918 (BSA); Raipur, *Verma*, Dugli 23622 (BSA).
**DISTRIBUTION:** **INDIA**- Assam, Chhattishgarh, Kerarla, Madhya Pradesh, Manipur, Sikkim, Tamil Nadu, Uttaranch.

**Central India:** Throughout the Madhya Pradesh and Chhattishgarh.

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**21. MARSILEACEAE** Mirbel


**Type genus:** *Marsilea* L., Sp. Pl. 2:1090. 1753.

Marshy or aquatic fern family; rhizome creeping, glabose or hairy. Stipes long. Lamina simple or bifid or quadridid; veins free and anastomosing. Sori heterosporous, megasporangium much larger than the microsporangium, one megaspore per sporangium, protuberance or papilla at the anterior end, many microspores per sporangium.

A family comprising 3 genera and 60 species throughout the world flora, of which 14 species have been reported from India and two species from Central India.

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**MARSILEA** L.


**Type species:** *Marsilea quadritofia* L., Sp. Pl. 2: 1099. 1753.

Hydrophytes, herbaceous, rhizome creeping, glabose or hairy. Fronds erect, simple, with 2-4 leaflets at the tip of spite. Sporocarps heterosporous, megaspore solitary, microspore numerous.
Key to the species

1a. Large leaves; leaflets margin entire; sporocarps 2-4 in a group; neither ribbed nor bordered; attachment of pedicels adnate and connate; soral number 16-20.

*M. quadrifolia*

1b. Small leaves; leaflet margin entire, crenate or serrate; sporocarps 2-3 in a group, sometimes up to 5 distinctly ribbed bordered; attachment of pedicels basal slightly connate or free, soral number 10-16.

*M. minuta*

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Local name: 'European water clover'.

Rhizome widely creeping, short branches at the nodes. Fronds distant along the rhizome. Stipes or petioles 5.5-20.5 cm long; leaflets (Lamina) 10-20 x 5-15 mm, texture thin; herbaceous, globous, obdeltoid; veins many, free, dichotomously branched; sporocarps 2-4 in a group, attached to stipes, horizontal, rounded, stalked, oval to rounded, hairy, horny, black to dark brown; Sori 16-20, each sorus with only functional megasporangium and many microsporangia; microspores globose, yellow-brown, trilette, tetrahedral, 34-49 x 19-42 µm.

Chromosome number: 2n= 40 (cf. Love et al., 1977).
ECOLOGY: The small slender, herbaceous, aquatic or sub-aquatic fern floating in the water pond, ditches, rice field and lake. (800-1000 m altitude).

FERTILE: November-February.


DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Bihar, Jammu-Kashmir, Kerarla, Madhya Pradesh, Manipur, Orissa, Sikkim, Tamil Nadu, Uttaranchal.

Central India: Hoshangabad.


Rhizome widely creeping, short branches at the nodes, hairy at internodes; hairs soft, whitish, ca 4-5 x 0.25-0.5 mm. Fronds erect. Stipe or petioles 0.5-25.5 cm long, glabrous or pubescent, green, terete, glabrous or few hairs as in rhizome; leaflets (Lamina) cruciform, oblanceolate or ovate, size variable, 0.6-1.0 x 0.3-0.9 cm, texture thin; herbaceous, margin entire, crenate or serrate; veins many, free, anastomosing, meeting in the marginal veins; sporocarps 2-4 in a group, attached to stipes, horizontal, rounded, stalked, variable in shape and size, hairy, horny, black to dark brown, with two unequal projections (horns) upper and lower. Sori 8-10, each sorus with only functional megasporangium and many
Fig 27. *Marsilea minuta* L. (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore
microsporangia; microspores oval to rounded, yellow-brown, trilete, tetrahedral, 48-51 x 48-52 \( \mu \)m. (Fig. 27; Plate 12c)

Chromosome number: n=40 (cf. Abraham et al, 1962)

ECOLOGY: The small slender, herbaceous, aquatic or sub-aquatic fern floating in the water pond, ditches, rice field and lake. (800-1000 m altitude).

FERTILE: July-September.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Shweta Singh, Durgadhara 58692 (BSA); Bastar, Shweta Singh, Bailadilla hills 68539 (BSA); Nair, Dardha 40520, 40706 (CNH); Bilaspur, Panigrahi, Shahpur 8523 (BSA); Hoshangabad: Pachmarhi, Shweta Singh, Pachmarhi Lake 55692 (BSA); Jagdalpur, Shweta Singh, Chitrakoot 58538, 58539 (Sagar Uni.); Panna, Ramlal, Ajaygarh 31076 (BSA); Raipur, Verma, 23695 (BSA); Rewa, Verma, Sitanadi 23827 (BSA); Satna, Mishra, 31508 (BSA); Sidhi: Sanjay National Park, Shweta Singh, Pond near Ramdah 59410, way to Kusmi 58475, 58472 (BSA).

DISTRIBUTION: INDIA: Throughout India from plain to 1200 m altitude.

Central India: Throughout the Madhya Pradesh and Chhattishgarh.

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22. HYMENOPHYLLACEAE Link.


Type genus: Hymenophyllum Smith, Mem. Acad. Turin. 5: 418. 1793.

Terrestrial, epiphytic or lihophysical, small, delicate, filmy fern family; rhizome slender, long-creeping, erect, covered with
rhizoids, and ramenta. Stipes not articulate to rhizome. Lamina simple or pinnate, variable in size and shape, delicate, filmy, only one celled thick except for the veins, without stomata; veins free and anastomosing, hairy. Sori indusiate, marginal to submarginal; sporangia born on more or less elongated receptacles formed by extention of veinlets; indusia tubular or bivalved to orbiculate, terminal.

The family comprise of 6 genera and about 800 species genera, which are mostly distributed in tropics and in the southern hemisphere. 11 genera and 40 species have been reported from India, of which only one genus with one species is found in Central India.

**TRICHOMANES L.**

(The Bristle fern)

**Trichomanes** L., Sp. Pl. 1097. 1753.

**Type species:** *Trichomanes scandens* L., Sp. Pl. 1097. 1753.

Terrestrial, mostly epiphytic; rhizome long-creeping, erect in some, very slender, hairy, root present or absent. Fronds minute to small, gradually monomorphic, rarely dimorphic, distant; stipe slender or hairy; blade divided to decompound, membraneous, mostly one cell thick, glabrous or hairy; segments mostly adnate and decurrent to next axis. Sori marginal, in conical to tubular involucres with straight or flared, entire to exserted, receptacle growing from base, resulting with age generally in a long-exserted trichome. Spores tetrahedral-globose, green, lacking, perisporous or any conspicuous marking gametophytes filamentous, often gemmiferous.

Rhizome creeping, filiform, thin, densely hairy; hairs dark brown. Fronds about 0.5 cm apart, older buds proliferating new secondary fronds. Stipe 0.1-1.0 cm long, not winged, dark brown, ± glabrous; rachis winged. Lamina 1.0-4.0 x 0.8-2.4 cm, pinnate, flabellate, deltoid, ovate texture thin, triangular-lanceolate or elongated triangular-lanceolate, membranaceous, glabrous; pinnae sessile, close, alternate, margin entire, apex acute, lower pinnae petiolate, slightly reduced, lanceolate or ovate, margins flabellate divided finally producing 6-8 pairs of (lobes) pinnules; pinnules narrow, linear, margin entire, brown trichomes are present at the lower surface; veins simple, free with a single veinlet in each ultimate lobe. Sori indusiate, arranged on the ultimate segments, 1.5 x 1.0 mm, immersed, winged on either side, truncate at the opening, ± dilated, without distinct lips; indusia cup or bell shaped, apex entire. Spores sub-triangular, tetrahedral, trilete, brown, exine sub-granulose, globose, 40-45 µm. (Plate 12d) Chromosome number: n= 36 (cf. Khullar, 1994); n=151 +63111=2n=ca. 141. (cf. Manickam & Irudayaraj, 1988)

**ECOLOGY:** The small epiphytic filmy fern, common on the barks of the trees in deep forest near water stream. (1200-1600m altitude).

**FERTILE:** November-February.

**SPECIMENS EXAMINED:** Bastar, *Shweta Singh*, Bailadilla hills 61042, 61108, 61096, 61091, 61097, 61024 (BSA).
DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Chhattishgarh, Jammu-Kashmir, Karnataka, Kerala, Madhya Pradesh, Manipur, Meghalaya, Sikkim, Tamil Nadu, Uttaranchal.
Central India: Bastar.

23. CYATHEACEAE Kaulf.
(Tree fern family)

Cyatheaceae Kaulf., Wesen. Farrenkr. 119. 1827.
Type genus: Cyathea Smith, Mem. Acad. Sci. Turin. 5: 416. 1793.

Tree fern family; coudex massive, erect-suberect; fronds spirally arranged; stipe scaly at base. Lamina large, huge, pinnate to pinnatifid; pinnules symmetrical; veins free, simple or forked. Sori indusiate or exindusiate, superficial at the apex or surface of the veins.

A family comprising 8 genera and 200 species throughout the world flora, of which 12 species have been reported from India and 4 from Central India.

ALSOPHILA R. Br.

Alsophila R. Br., Prodr. Fl. N. Holl. 158. 1810.
Type species: Alsophila australis R. Br., Prodr. Fl. N. Holl. 158. 1810.

Tree fern; trunk erect, tree like habit, caudex massive, scaly. Fronds spirally arranged; stipes smooth, spiny; lamina bipinnate or tripinnatifid, large, subcoriaceous or coriaceous. Sori indusiate, or exindusiate, dorsally on the veins. Spores tetrahedral, tritele.
**Key to the species**

1a. Sori indusiate.

2a. Stipes spiny throughout; pinnae, rachis and costae
glabrous on the lower surface.

* A. *spinulosa

2b. Stipes spiny usually at the base; pinnae, rachis and costae
hairy on the lower surface.

* A. *nilgirensis

1b. Sori exindusiate.

3a. Pinnae shallowly lobed, 2-3 pairs of simple veins per
lamina segment.

* A. *balakrishnanii

3b. Pinnae deeply lobed up to ½ way, 5-6 pairs of simple
veins per lamina segment; lowest segment not free.

* A. *gigantea

**71. Alsophila balakrishnanii** (Dixit *et* Tripathi) Dixit,
Indian environ. 275. 1991; Verma *et* al. in Fl. Madhya Pradesh I:
72. 1993; Dixit, Indian Fern J. 15: 33. 1998. *Cyathea*

Medium size tree fern; tall, 100-150 cm; rhizome massive,
erect, thick. Fronds pinnate, huge, tufted, spreading; stipes 20-40
cm, thick, fleshy, dark brown to black, hairy, scaly; scales
flabelloid, shinning brown, margin narrow pale fragile; rachis dark
green in live plant turning blackish-green on drying, scaly. Lamina
bipinnate-tripinnatifid, 40-72 cm, glabrous, thin, dark green,
subcoriaceous; pinnae numerous pairs, 35-45 x 10-15 cm,
alternate, short petiolate, lanceolate, apex acuminate; pinnules numerous, 5-7 x 1.0-1.2 cm, shallowly lobed throughout except apex, apex acuminate or crenate; fertile pinnules slightly copious, 2-3 pairs only, lower most pinnules usually 1.0-2.5 x 0.8-1.0 cm; lobes distinct crenate; costa and costules hairy to glabrous, dark purplish, scaly at lower; veins free, 2-3 pairs, 10-24 pairs, simple forked, pinnate, hairy, scaly. Sori indusiate, copious, dark brown, globose, 2-3 pairs; indusia light brown, globose. Spores trilete, pale yellow, 35-48 x 28-43 μm, tetrahedral to globose, exine verrucoid. (Plate 12e)

Chromosome number: Not Known.

ECOLOGY: Abundantly grow along the water channels in humid situations. (900-1200 m altitude).

FERTILE: September-January.

SPECIMENS EXAMINED: Bastar: Bailadilla hills, Panigrahi, 6882 (BSA); Shweta Singh, Bailadilla hills 61065, 61113, 61138, 61155, 61146, 61149, 61113 (BSA); Hoshangabad: Pachmarhi, Dixit, Dhupgarh 41231A, 6630 (BSA); Pachmarhi, Shweta Singh, Bee Fall 55674, Tridhara 55713, Dutche's Fall 55756 (BSA).

DISTRIBUTION: INDIA- Chhatisgarh, Kerala, Karnataka, Madhya Pradesh.

Central India: Bastar, Hoshangabad.


Tree fern, 200-300 cm tall; rhizome massive, erect, thick. Fronds pinnate, huge, tufted, compound; stipes up to 100 cm,
Fig 29. *Alsophila gigantea* Wall. ex Hook. - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore
smooth, blackish, rough at basal part, ± scaly; scales ca 10-12 x 1.0-2.0 mm, dark brown, stiff, shining with pale, fragile margins devoid of setae; rachis purplish. Lamina 2 pinnate-tripinnatifid, 40-72 cm, glabrous, thin, dark green, herbaceous; pinnae numerous pairs, 20-45 x 5-15 cm, deltoid, sessile, apex acuminate, base truncate; pinnules numerous, 8-10 x 1.5-2.0 cm, basal pinnules distinctly stalked, apex acuminate, base truncate, alternate, distinctly lobed up to 2/3\textsuperscript{rd} towards frond costa, rarely from costule, margin serrate; costa and costules scaly; veins free, 4-5 pairs, 10-24 pairs, simple, hairy, scaly. Sori exindusiate, arranged in 'V' inverted shaped, paraphyses dark brown, hair like. Spores trilete, hyaline to pale yellow, 26-34 x 22-30 µm, exine smooth. (Fig. 29; Plate 13a)


ECOLOGY: Grow along the water channels in humid situations. Rare. (800-950 m altitude).

FERTILE: December-February.

SPECIMENS EXAMINED: Bastar, Shueta Singh, Bailadilla hills 69924, 69925 (Sagar Uni.), 61089, 61139, 61142 (BSA); Hoshangabad: Pachmarhi, Panigrahi, Bee fall 4569 (BSA).

PHOTOGRAPH EXAMINED: Wallich List No. 321 (type specimens, designated by R. E. Holttom on. 1.11.1962 (BSA); Sylhet, Nepalia 1829, Wallich List No. 321 (BSA).

DISTRIBUTION: INDIA- Throughout India in hilly regions.

Central India: Bastar, Hoshangabad.

Alsophila latibrosa Hook. var. schmidiana Kunze, Linn. 24: 294. 1851.

Tree fern, ± 4 m tall; rhizome massive, erect, thick, dark purple, spinose, spines short, 1-3 mm long, scaly; scales middle band and narrow, pale, fragile margins, ca 10-15 x 1.0-1.0 mm. Fronds pinnate, huge, tufted, compound; stipes 50-60 cm, blackish, spiny at the base; spines short, stout, few, dark, narrow, thick, thin walled cells at the edge; rachis brown to dark-brown, hairy above, sub glabrous below. Lamina bipinnate to tripinnatifid, decompound, 200-300 x 75-85 cm, hairy, dark green, herbaceous; pinnae numerous pairs, middle pinnae 75 x 50 cm; pinnules numerous, 11 x 1.5 cm, sessile or short petiole, base broadly cuneate, slightly unequal, apex acuminate, lobed to about 100 cm from costa, lobes separated by ¼ to 3/4\textsuperscript{th} of their own width, 0.25-0.3 cm, slightly oblique, falcate, rounded at apex, edge slightly crenulate to sharply toothed; rachis of pinnules beneath bear bullate, often deciduous scales; texture thin; veins generally minutely hairy, veinlets forked, dark coloured; the costa and costules of the pinnules characteristically passes bullate scales. Sori arranged on the 2/3\textsuperscript{rd} of the lower segment, close to costules, paraphyses brown. Spores trilete, tetrahedral, amb triangular, light brown, 30-42 x 40-60 μm, granulose. (cf, Vasudeva & Bir, 1993b)

Chromosome number: Not none.

ECOLOGY: Grow along the water channels in humid situations. Rare. (950-1800 m altitude).

FERTILE: September-December.

SPECIMENS EXAMINED: Bastar, Shweta Singh, Bailadilla hills 61143, 61144, 61147 (BSA).
**DISTRIBUTION:** **INDIA-** Chhattishgarh, Tamil Nadu, Kerala, Karnataka, Madhya Pradesh.

**Central India:** Bastar, Hoshangabad.


Tree fern; tall more than 100 cm; trunk arborescent, erect, massive. Fronds pinnate, huge, ± 200 cm long; stipes 30-40 cm, closely spinose, spiny, scaly; spines 0.2-0.5 cm, pointed, sharp; scales ca 10-20 x 1.0-2.0 mm, linear-lanceolate, shinning brown, margins narrow pale fragile; rachis tremendous brown. Lamina -2 pinnate, 100-200 x 65-75 cm, glabrous, thin, dark green, subcoriaceous; pinnae numerous pairs, 38-45 x 10-15 cm, alternate, short petiolate, lanceolate, apex acuminate, base truncate or subtruncate, lowest pinnae the largest; pinnules numerous, 8-10 x 1.5-2.5 cm, alternate, petiolate, margin deeply lobed to the costa; lobes many, 0.8-1 x 0.3-0.4 cm, falcate, oblong, narrow, acute, margins crenate, serrate, ± recurrent; veins free, 10-24 pairs, simple forked, pinnate, hairy, scaly; costae and costules scaly. Sori indusiate, near to costules, in single row either side of the costa, large, rounded; indusia light brown, globose. Spores trilete, pale yellow, 32-42 x 24-30 μm, tetrahedral to globose, exine smooth. (Fig. 28; Plate 12f, Plate 13b)

Chromosome number: n=69 (cf. Love et al., 1977; Khullar, 1994).

**ECOLOGY:** Common tree fern, grow along the water channels in hilly regions. (900-1200 m altitude).
Fig 28. Alsophila spinulosa (Wall. ex Hook.) Tryon - (a) Habit; (b) Pinnule enlarged showing venation and sori arrangement; (c) Spore
FERTILE: September-December.

SPECIMENS EXAMINED: Bastar, Panigrahi, Bailadilla hills 6883; Shweta Singh, 61086, 61082, 61135 (BSA); Hoshangabad: Pachmarhi, Pant, Tridhara 27173 (BSA); Pachmarhi, Shweta Singh, Jalgali 55712, Bee Fall 55673, Dutche’s Fall, 55789 (BSA).

PHOTOGRAPH EXAMINED: Wallich List No. 178 (BSA).

DISTRIBUTION: INDIA- Arunachal Pradesh, Chhattisgarh, Karnataka, Kerala, Meghalaya, Madhya Pradesh, Sikkim, Tamil Nadu.

Central India: Bastar, Hoshangabad.


(The bracken fern family)


Type genus: Dennstaedtia Berth., Schrad. J. Bot. 1800. 2. t. 3. 1801.

Terrestrial; rhizome usually creeping, slender, hairy; fronds large, compound; stipe stout, erect, hairy or scabrous. Lamina pinnate, much divided, thin in texture or firm; veins free, forked. Sori terminal, indusiate; sporangia staked, hairy or globose.

Family comprising 9 genera and 60 species throughout the world flora. One genus and 11 species including 2 varieties have been reported from India, of which 2 species from Central India.

MICROLEPIA Presl

Microlepis Presl, Tent. Pterid. 124. t. 21-23. 1836.
**Type species:** *Microlepia polydioides* (Sw.) Presl, Tent. Pterid. 125. 1825.

Terrestrial fern; rhizome creeping, hairy; fronds scattered, large, pinnately decompound; stipes broad at base, hairy to glabrescent. Lamina bipinnate or tripinnatifid, ovat-deltoid, membranaceous; veins free, forked. Sori indusiate, submarginal, small, rounded, hairy. Spores tetrahedral, trilette.

**Key to the species**

1a. Lamina bipinnate-tripinnatifid; veins strongly raised below.  
*M. strigosa*

1b. Lamina tripinnate-quadripinnatifid; veins hardly raised below.  
*M. speluncae*


Large terrestrial fern; rhizome widely creeping, hairy; hairs tubular, pale brown, *ca* 3 mm long, multicellular, uniseriate. Fronds pinnate, 80-120 x 18-40 cm, pinnatifid, flaccid, hairy; stipes 30-50 cm, rounded below, thick, erect, hairy, green to purplish; rachis hairy. Lamina ovate-deltoid, 3-4 pinnatifid, hairy, thin, membranaceous, 35-85 x 25-40 cm; pinnae, 2 pinnate, ± 8 pairs, alternate, petiolate, 12-30 x 5-15 cm, ovate-lance late, apex
acuminate, acroscopic base truncate, basal pinnae reduced; pinnules 2.5-5 x 1-1.5 cm, deltoid, acuminate, subopposite or alternate, petiolate, basal acroscopic leaflet much larger; ultimate pinnules 0.5-1.2 x 0.3-0.5 cm, ± oblique, sessile, alternate, apex subacute, acroscopic base truncate, basiscopic base cuneate, margin subentire or crenate; costae and costules scaly; veins free, distinct, forked. Sori submarginal, indusiate, arranged near the base of the sinuses, more copious on the lobed segments, varying in size; indusia cup shaped, smooth, hispid rarely glabrous. Spores trilette, pale yellow, 30-42 x 19-30 µm, tetrahedral to globose, exine granulose. (Plate 13c)


ECOLOGY: Plants grow in the edge of the forest floor under shady situations. Rare. (900-1200 m altitude).

FERTILE: October-November.

SPECIMENS EXAMINED: Bastar, Shweta Singh, Bailadilla 58547 (Sagar Uni.); Hoshangabad: Pachmarhi, Shweta Singh, Bare Mahadeo 58512 (BSA).

distribution: India: Assam, Arunachal Pradesh, Chhattisgarh, Jammu-Kashmir, Karnataka, Kerala, Meghalaya, Madhya Pradesh, Sikkim, Tamil Nadu.

Central India: Bastar, Hoshangabad.


English name: "Scanted fern".
Large terrestrial fern; rhizome long-creeping, thick, hairy; hairs tubular, dark brown, ca 3 mm long, multicellular, uniseriate. Fronds distant, 50-100 x 15-35 cm, pubescent-hispid, bipinnate; stipes 20-60 cm, dark green to brown, thick, hairy or glabrous; rachis hairy. Lamina 2-pinnate, large, 38-50 x 18-22 cm, lance late, coriaceous to subcoriaceous, upper surface glossy, lower surface hairy; pinnae 12-20 pairs, 10-14 x 1.5-2 cm, alternate, short petiolate, upper base truncate, lower lower oblique, apex subacute or rounded, margin lobed 1/2th-1/4th to the costules; costae and costules hairy; veins free, distinct, 1-2 forked, much prominent on the lower surface, hairy. Sori submarginal, indusiate, subglobose, arranged near the base of the sinuses, more copious on the lobed segments, varying in size; indusia cup shaped, smooth, hairy. Spores trilete, brown, 24.5-28 x 24.5-31 μm, tetrahedral to globose, exine granulate.

Chromosome number: n=43 (cf. Love et al., 1977).

ECOLOGY: Plants grow in the edge of the forest floor under shady situations. Rare. (900-1200 m altitude).

FERTILE: July-October.

SPECIMENS EXAMINED: Chhindwara, Shweta Singh, 58540 Tamia (BSA); Bastar, Shweta Singh, Bailadilla hills 58517, 61170 (BSA).

DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Chhattishgarh, Jammu-Kashmir, Karnataka, Kerala, Meghalaya, Madhya Pradesh, Sikkim, Tamil Nadu, Uttaranchal.

Central India: Bastar, Chhindwara, Hoshangabad.
25. PTERIDIACEAE Ching
(The brackens fern family)


Type genus: Pteridium Gled. ex Scop., H. Carniolica 169. 1760.

nom. cons.

Small ferns; rhizome short, erect or creeping, scaly; fronds 3-4 pinnate or pinnatifid, rarely once pinnate; stipe not articulate, clustered; lamina hairy or glabrous or papillose, papillae often white-waxy; veins free. Sori terminal, linear, indusiate or exindusiate, covered by somewhat modified at length partially or wholly recurved margin of the frond.

A monotypic family comprising more than 6 species throughout the world flora, of which single species including 2 varieties have been reported from India. Only single species with typical form has been reported from Central India.

PTERIDUM Gled. ex Scop.

Pteridium Gled. ex Scop., Fl. Carn. 169. 1760. nom. cons.

Type species: Pteridium aquilinum (L.) Kuhn, v. Deck Reis. 3(3):

Bot. 11. 1879.

Terrestrial; rhizome long-creeping, hairy; fronds medium to long; stipes long, erect; lamina tripinrate to quadripinnatifid, subcoriaceous, hairy; veins free. Sori submarginal, linear, indusiate. Spore tetrahedral, trilete.

77. Pteridium aquilinum (L.) Kuhn, v. Deck Reis. 3(3): Bot. 11. 1879; Dixit, Cens. Indian Pterid. 98. 1984; Verma et al. in Fl.
Fig 30. *Pteridium aquilinum* (L.) Kuhn - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome hair
Terrestrial; rhizome massive, wide-creeping, subterranean, scales absent, hairy; hairs pale-brown, ca 5-6 mm long, multicellular, uniseriate, deciduous; fronds tufted, up to 100-150 cm long, deltoid to triangular-lanceolate; stipes 50-70 cm long, erect, naked, dark brown, hairy at the base. Lamina 2-3 deeply pinnate, 30-100 x 30-50 cm, deltoid-ovate, acute apex, broadly cuneate, herbaceous or subcoriaceous, glabrous or sparsely hairy, slightly falcate; pinnae 10-15 pairs, alternate, distal pinnae opposite, lower pinnae the largest one, 20-60 x 10-30 cm, ovate-lanceolate, apex acuminate, truncate at base; secondary pinnae subopposite at the base, alternate above, 25-30 x 4-6 cm, shortly petiolate, oblong-lanceolate, acuminate apex; pinnules 4-6 x 0.8-1.0 cm, sessile, acute or acuminate, margin lobed, lobes 0.5 x 0.3 cm, deltoid, oblique, entire; rachis hairy above, glabrous below; costae and costules grooved above; veins free, forked except basal one joining to form arc. Sori submarginal, linear, indusiate, inconspicuous. Spores tetrahedral, trilette, pale-brown, 21.5-31.5 x 24-35 μm, exine almost smooth. (Fig. 30; Plate13d)

Chromosome number: n=52 (cf. Love et al., 1977).

ECOLOGY: In hilly region along stream-side and in shady situation on the forest floor. (800-1000 m altitude).

FERTILE: July-November.

SPECIMENS EXAMINED: Bastar, Panigrahi, Bailadilla hills 6929; Das, 15062; Jain, 3967; Shweta Singh, 610750, 61085, 61075 (BSA).

DISTRIBUTION: INDIA- Throughout the hilly regions of India.

Central India: Bastar, Hoshangabad.


Terrestrial; rhizome creeping, slender, scaly, hairy; fronds simple pinnate to decompound; stipe not articulate; lamina simple to variously compound, 1-3 or more pinnate; veins free or anastomosing. Sori marginal, indusiate.

The family comprising 9 genera and 150 species throughout the world flora, of which 2 genera and 26 species including 3 varieties have been reported from India. Two genera and 5 species including one variety have been reported from Central India.

Key to the genera

1a. Lamina pinnate; sori submarginal, continuous, linear uniting the apices of 2 to many veins.

   Lindsea

1b. Lamina decompound, dissected; sori terminal, arranged on the veins or uniting the apices of 2-3 veins, close to apex.

   Sphenomeris

LINDSAEA Dryand. ex Sm.

Lindsaea Dryand. ex Smith, Mém. Acad. Sci. Turin. 5. 413. t. 9(4): 1793.

Type species: Lindsaea guianensis (Aubl) Dryand., Trans. Linn. Soc. 3: 42. 1797.
Terrestrial; epithelic, scandent or rarely epiphytic; rhizome short-creeping, hairy, scaly; fronds simple pinnate to compound; stipes slender; lamina 1-2 pinnate, texture thin, glabrous, pinnae / pinnules various shaped; veins free or anastomosing. Sori marginal on veins, linear, continuous or discontinuous, indusiate, paraphyses filiform. Spores stetrahedral, trilet.

**Key to the species**

1a. Rhizome scandent, scaly; fronds pinnate; veins free.
   2a. Pinnae 20-30 to each, deeply incised.
      *L. gladulifera*
   2b. Pinnae 40-80 to each side, shallowly incised.
      *L. repens var. pectinata*

1b. Rhizome creeping, scaly; fronds 1-2 pinnate; veins anastomosing.
   3a. Fronds pinnae pinnate, lanceolate, 12-20 x 0.3-3.0 cm.
      *L. ensifolia*
   3b. Fronds bipinnate at base, 1-2 pinnate above;
      pinnae / pinnules parallelogrammoid to subtrapezoid, 1-1.2 x 0.3-0.7 cm.
      *L. malabarica*

Fig 31. *Lindsaea ensifolia* Sw. - (a) Habit; (b) Part of fertile pinnac enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome hair
Terrestrial; rhizome short-creeping, scaly; scales pale brown ca 2-3 x 0.6-0.8 mm, ovate lanceolate, apex acuminate, margin entire, hairy; fronds close pinnate; stipes 10-35 cm, stramineous-dark brown, quadriangular, ridged, glossy, glabrous. Lamina simple pinnate with a terminal pinnae, lateral pinnae one to six pairs, alternate or sub opposite, 15-20 x 1.5-2.0 cm, shortly stalked, ovate-lanceolate, apex acuminate, base cuneate, margin toothed on sterile pinnae; herbaceous to subcoriaceous; costa flattened above rounded below; veins free, anastomosing, forming 2-3 series of areoles. Sori continuous, except at the tip, indusiate; indusia thin, membranous, pale-brown, glabrous. Spores triletet, tetrahedrall1, 28-35 μm, exine with finely reticulation, dark-brown. (Fig. 31)

Chromosome number: 2n=174 (cf. Love et al., 1977).

ECOLOGY: Forest floor along streamsides among rock boulders. (800-1000 m altitude).

FERTILE: February-July.

SPECIMENS EXAMINED: Bastar, Panigrahi, Bailadilla hills 6923; Shweta Singh, 61149 (BSA); Hoshangabad: Pachmarhi, Shweta Singh, Rajatprapat 55774, Tridhara 55714 (BSA).

DISTRIBUTION: INDIA- Throughout the hilly regions of India.

Central India: Bastar, Hoshangabad.

Note: This species shows variation in shape of pinnae, which may be ovate-lance late or oblong-lance late. In addition to simple pinnae, lobed pinnae have also been observed. (cf. Borthakur et al., 2001).

Linsaea repens var. minor (Thw.) Bedd., Fern. South. India t. 214. 1865.

Terrestrial; rhizome scendent, scaly; scales golden yellow to honey coloured, apex acuminate, margin entire, hairy; fronds distant; stipe 10-35 cm, stramineous-dark brown, quadriangular, ridged, glossy, glabrous; rachis castaneous at base, tremendous above, pinnate; Lamina simple pinnate with a terminal pinna; pinnae 20-30 to a side, linear, 10-20 x 1.5-2 cm, spreading, ascending, herbaceous, asymmetrically elongate-triangular, bright green to olivaceous, gradually narrowed from the base to apex; lower margin concave at the base, but convex in apical side, upper margin convex, deeply incised with 2-4 major incisions reaching down ½ to 2/3rd of the pinnules; veins simple to furcated. Sori intramarginal, one per lobe, indusiate; indusia relaxed and often conceal at age. Spore globose, dark-brown.

Chromosome number: Not known.

ECOLOGY: Forest floor along streamsides among rock boulders. (800-1000 m altitude).

FERTILE: February-July.

SPECIMENS EXAMINED: Bastar, Panigrahi, Bailadilla hills 1051 (BSA).

DISTRIBUTION: INDIA- Assam, Chhattishgarh, Sikkim, Tamil Nadu, Karnataka, Kerala.

Central India: Bastar.

Fig 32. *Lindsaea malabarica* (Bedd.) Bak. ex C.Chr.: (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome hair

Terrestrial; rhizome creeping, scaly; scales brown, deciduous, up to 1 x 0.25 mm, apex acuminate, margin entire, narrowly triangular; fronds tufted, bipinnate at basal part; stipe stramineous to light brown, 10-30 cm, quadriangular, except the terete base; Lamina simple pinnate with a terminal pinnae, herbaceous to subcoriaceous; pinnacles / pinnules 10-12 x 0.3-0.7 cm, 25-30 to a side, ascending, shortly stalked, parallelogrammoid to subtrapzoid, upper and lower margins somewhat convex; upper margin with 3-4 shallow incisions, apex acuminate, base cuneate; veins sparingly anastomosing. Sori interrupted by the incisions, indusiate; indusia thin, entire to crenulate, reaching near the margin. Spores trilete, tetraheadral, 30-33 x 30-33 μm, Triangular with rounded corners, exine rugulose, dark-brown. (Fig. 31; Plate 13f)

Chromosome number: Not known.

**ECOLOGY:** Plants grow along the stream sides or among the rock boulders in humid and shady situations. (800-1000 m altitude).

**FERTILE:** February-July.

**SPECIMENS EXAMINED:** Bastar, Panigrahi, Bailadilla hills 6926 (BSA).

**DISTRIBUTION:** **INDIA**- Chhattishgarh, Tamil Nadu, Karnataka, Kerala.

**Central India:** Bastar.

Terrestrial; rhizome scandent, scaly; scales brown, deciduous, fragile; fronds tufted, distant, pinnate; stipe short, 1-2 cm, terete, stramineous to light brown; rachis quadriangular, Lamina simple pinnate, herbaceous to subcoriaceous; pinnae 40-80 to a side, spreading, lower ones falcately deflexed, herbaceous, subtrapezoidal, decurved, ligulate or elliptic, narrowly rounded at apex, larger pinnae straight; veins free, forked. Sori interrupted by the incisions, indusiate; indusia away from the margins, concealed at maturity. Spores globose, dark-brown.

Chromosome number: Not known.

ECOLOGY: Plants grow along the stream sides or among the rock boulders in wet places. (800-1000 m altitude).

FERTILE: February-July.


DISTRIBUTION: INDIA- Assam, Chhattishgarh, Sikkim, Tamil Nadu, Karnataka, Kerala.

Central India: Bastar.

SPHENOMERIS Maxon


Type species: Sphenomeris clavata (L.) Maxon, J. Wash. Acad. Sci. 3: 144. 1913. nom. cons.

Terrestrial; rhizome short-creeping, hairy, scaly, fibril dark-brown; fronds erect, pinnately decompound; stipes grooved on adaxial surface, not articulate to rhizome; lamina 3 pinnate or 4-pinnatitifid, much dissected, texture thin, glabrous; pinnules oblique, deltoid, ultimate segments usually cuneate; veins free.
Sori terminal on veins, indusiate, marginal. Spores bilateral, monolete.


Rhizome short-creeping, thick, scaly fibrillose, dark-brown; scales pale brown to dark, *ca* 2.5- 3 mm long, multicellular hairs, uniseriate to biseriate; fronds tufted, erect, green when young, flushed with dark-brown later on, 10-60 x 8-12 cm; stipes 5-20 cm, light brown stramineous. Lamina 3-pinnate or quadripinnatifid, 10-40 x 8-12 cm, lanceolate or ovate, apex acuminate, base cuneate, glabrous; pinnae many pairs 10 to more, 6-12 x 2-4 cm, close, alternate, oblique, deltate; pinnules many, 1-2 x 0.5-1 cm, alternate, petiolate, oblique, deltate; basal acrosopic pinnulea the largest; basal one more dissected than the others; basal acrosopic tertiary leaflet broader than the basioscopic one; margin variously lobed; veins obscure, 2-3 in each lobe, forked, free. Sori marginal, terminal on veins, indusiate, close to the apex of the ultimate lobes; indusia fixed by the base and slides opening towards margin, toothed. Spores translucent, 35-50-25-35 μm, exine smooth, dark-brown. (Fig. 33; Plate 13e)

Chromosome number: *n*=100 *(cf. Abraham et al., 1962).*

**ECOLOGY:** Generally grows on wet places or moist rocks along flowing water. (800-1000 m altitude).

**FERTILE:** July-December.
Fig 33. *Sphenomeris chinensis* (L.) Maxon - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome hair
SPECIMENS EXAMINED: Anuppur: Amarkantak, Mutri, Kabircabutara 19457 (BSA); Bastar: Bailadilla hills, Panigrahi, 6909 (BSA); Shweta Singh, 69921 (Sagar Uni.), 61071, 61152, 61096, 61081 (BSA); Keshkal 61115, 61116 (BSA); Hoshangabad: Pachmarhi, Shweta Singh, Bee Fall 55675, Tridhara 55715, Dutche’s Fall 55757 (BSA).

DISTRIBUTION: INDIA- Throughout the hilly regions of India.

Central India: Anuppur, Bastar, Hoshangabad.

Note: This species shows variation in shape and size of the ultimate segments of the lamina.

27. THELYPTERIDACEAE Pic. Ser.


nom. cons.

Terrestrial or lithophytes; rhizome creeping, scaly; fronds average, spirally arranged; stipe not articulate. Lamina oblong or elliptic, usually simple, pinnate to pinnatifid, hairy or glabrous; veins all free. Sori usually medial to subapical on the veins, round or elongate or hippocrepiform, indusiate or exindusiate, hairy or glabrous.

The family comprising 32 genera throughout the world flora, of which 21 genera and more than 90 species have been reported from India. Total 7 genera with 15 single have been reported from Central India.
Key to the genera

1a. Plants much proliferating, several buds from rachises giving rise new plants still attached to the old ones.
   Ampelopteris

1b. Plants never proliferating, rarely 1-2 buds on rachises.
   2a. Lower pinnae not or little reduced, glandular hairs absent form lower surfaces of veins and sporangium from stalks.
      3a. Spores trilete
          Trigonospora
      3b. Spores monolete
          Pronephrium
   2b. Lower pinnae gradually or abruptly reduced:
      4a. Lower pinnae gradually reduced, lowest never minute, cylindrical unicellular hairs present on sporangium stalk.
      4b. Lower pinnae abruptly reduced lowest minute, cylindrical glandular hairs present on sporangium stalk absent.
          Christella
   5a. Basal stripe scales broad and thin, spherical gland absent from sporangium
      6a. Veins free, no glands or hairs on sporangium
          Pseudocyclsoros
      6b. Veins anastomosing at least vein, short club shaped glandular hairs present on sporangium
          Pneumatopteris
   5b. Basal stripe scales narrow and hairy spherical glands present on sporangium
**AMPELOPTERIS** Kunze


**Type species:** *Ampelopteris prolifera* (Retz.) Copel., Gen. Fil. 147. 1947.

Rhizome creeping, scaly; fronds pinnate, proliferating irregularly by buds; stipes long, erect; lamina pinnate usually length variable due to an indefinite apical growth; pinnae subentire to crenate; veins anastomosing. Sori elongated, exindusiate. Spores bilateral.


Rhizome long-creeping, thin, apex scaly; scales dark-brown, ovate, peltate, margin toothed. Fronds tufted, erect or creeping, up to 100-110 cm long; stipes simple, 10-15 cm long, close together, stramineous-dark brown, sparsely deciduous scaly throughout, hairy. Lamina simply pinnate, 78 x 5-15 cm, texture herbaceous, vegetative buds present; sterile lamina are with flagelliform and much elongated as the tips appear to be indefinite growth; fertile lamina developed a terminal pinna similar to lateral pinnae; pinnae numerous, alternate, sessile or subsessile, 3-10 x 0.5-1.5
cm; veins anastomosing, up to 10 pairs in each lobes, run near to margins. Sori submarginal, oblong, exindusiate, median on the veins. Spores bilateral, monolette, ovate, 32-55 x 22-40 μm, exine thick, smooth, spinulose, brown. (Plate 14a; Plate 15b)

Chromosome number: Diploid sexual, n=36 (cf. Love et al., 1977).

ECOLOGY: Low altitude fern, the individuals grow near water or in wet places on the bank of streams and rivers. (700-800 m altitude).

FERTILE: July-February.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Shweta Singh, Shambhudhara 58675 (BSA); Bastar, Shweta Singh, Bailadilla hills 61018, 61005 (BSA); Chhindwara: Shweta Singh, Tamiya 58505, Patalkot 68675 (BSA); Shweta Singh, Tamiya, 58503 (Sagar Uni.);

Hoshangabad, Shweta Singh, Reechgarh 58675, Handi khoh 58684 (Sagar Uni.); Satna: Prasad, Chitrakoot 31724 (BSA);

Sarguja, Panigrahi, Divi 8890 (BSA); Jagdalpur, Shweta Singh, Kangar Valley National Park 61016, 61039 Keshkal 61066 (BSA);

Sidhi: Sanjay National Park, Srivastava, 47995 (BSA); Shweta Singh, 58505, 58503 Kanhaiya dah, Nagdah 58488 (BSA).


Central India: Bastar, Hoshangabad.

CHRISTELLA L'ev.


Terrestrial; rhizome wide-creeping, scaly. Fronds simple, bipinnate; lamina pinnate, hairy on both surfaces, lower pinnae (1-5 pairs) reduced, auricled at the base; stipes scaly, narrow, setiferous; veins pinnate, several pairs of veins of adjacent lobes anastomosing. Sori indusiate; indusia reniform. Spores monolete, bilateral.

**Key to the species**

1a. Rhizome suberect; pinnae cut down ¾ the ways or nearly the midrib into oblong, sub obtuse, nearly entire lobes. Spores granulose or spinulose, wrinkled with irregular folds.

*C. cylindrothrix*

1b. Rhizome short and long creeping; basal pinnae not reduced or a few pair gradually reduced but never auricled.

2a. Fronds hairy, basal pinnae not or ± reduced, basal 1 pairs of veins anastomosing, lower surface with orange clavate glandular hairs. Spore brown, wrinkled, granulose, irregular folded.

*C. parasitica*

2b. Fronds ± less hairy, basal pinnae gradually reduced but not auricled, basal 1½ pairs of anastomosing, lower surface with few scale and stiff hairs. Spores wrinkled, granulose, irregular folded.

*C. arida*

2c. Fronds more hairy; 2-4 lower pairs gradually reduced, strongly auricled. Spores deep brown, wrinkled with short irregular folds.

*C. dentata*

2d. Pinnae cut down about half way towards the costa. Spores light brown, faintly granulose, wrinkled into sharp, rugula-like folds.

*C. subpubescens*
1c. Rhizome erect; basal pinnae cut down ½ way to the rachis, middle pinnae the largest, lower pinnae gradually reduced to saggitate auricles. Spores densely spinulose, wrinkled, with irregular folds.

*C. hispidula*


Rhizome long-creeping, scaly at apex; scales light brown, linear lanceolate, hairy, apex acute, margin entire; fronds pinnate, 50-170 cm; stipe tufted, erect, 15-30 cm, thick, brownish, stramineous, hairy when young, smooth when old, scaly at the base; scales linear-lanceolate, apex acuminate; rachis hairy. Lamina 30-145 x 30-40 cm, huge, broadly lanceolate, bipinnatifid, texture coriaceous, lower surface sparsely hairy; pinnae 30 or more pairs, 12-16 x 1.5-1.8 cm, oblong, sessile, alternate or subopposite, sub abruptly reduced, more widely distant, not or hardly acuricled, apex acuminate, margin shallowly lobed; lobes (pinnules) subtriangular with a short stiff point apex; veins prominent beneath, up to 10 pairs, basal one and a ½ pairs at broad angle to costa and anastomosing, next 3 pairs passing to sinus, prominent at the lower surface, hairy; costa and costule hairy. Sori medial,
small, round, divergent, indusiate, hairy; indusia small, reniform, early fugacious, hairy or glabrous. Spores monolet, bilateral, brown, 16-24 x 24-33 μm, exine wrinkled, granulose, irregular folded.


ECOLOGY: Plant grows on the forest floors and margins in humus rich soil along the water streams. (850-1000 m altitude).

FERTILE: October-January.

SPECIMENS EXAMINED: Bastar, Shweta Singh, Bailadilla hills 61099, 610693, 610683 (BSA); Bilaspur, Panigrahi, Pandrapat 8879 (CNH); Chhindwara: Shweta Singh, Patalkot 59405 (BSA); Hoshangabad, Panigrahi, Pachmarhi fall 6242, 6642 (CNH); Jagdalpur, Shweta Singh, 61100, 61065 Kangar Valley National Park (BSA); Jashpur nagar, Panigrahi, 7265 (CNH); Sidhi: Sanjay National Park-Kanhaiya Dah, Shweta Singh, 58614, 58621, Kanhaiyadah 58666, Kusmi 58656 (BSA).

DISTRIBUTION: INDIA- Assam, Chhattishgarh, Himachal Pradesh, Madhya Pradesh, Manipur, Meghalaya, Sikkim, Uttarakhand, Uttar Pradesh.

Central India: Anuppur, Bastar, Bilaspur, Hoshangabad, Sidhi.

Rhizome suberect or creeping, stout, scaly; scales light brown, lanceolate, hairy, apex acute, margin entire; fronds pinnate, 34-70 cm; stipe tufted, 10-22 cm, firm, brown, hairy or smooth, few scales at the base, scales linear-lanceolate, golden brown; rachis scaly or hairy. Lamina 22-45 x 8-19 cm, lanceolate, bipinnatifid, texture subcoriaceous, hairy; pinnae 14-25 pairs, 5-10 x 1-1.5 cm, close, sessile, alternate, basal pair slightly reduced or not, apex caudate-acuminate, truncate base, margin deeply cut down nearly to the costae in to lobes; lobes (pinnules) 1x 0.4 cm, oblique, oblong, rounded or obtuse at the apex, margin entire or slightly crenate; veins simple, 5-7 pairs, lowest pair anastomosing, including excurrent veinlets to sinus; costa and costule hairy. Sori medial, small, round, arranged on the veins in two rows on either side of the costules, indusiate, hairy; indusia small, hairy. Spores monolette, bilateral, yellow-brown, exine wrinkled, granulose, irregular folded, 30-46 x 23-42 μm.


ECOLOGY: Plants grow near flowing water streams on damp rocks in the ravines. (850-1200 m altitude).

FERTILE: November-January.


DISTRIBUTION: INDIA- Assam, Madhya Pradesh, Meghalaya, Sikkim, Uttarakhand, West Bengal.

Central India: Hoshangabad.

Fig 34. Christella dentata (Forssk.) Brown. et Jermy- (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore (d) Rhizome scale
Fig 34. *Christella dentata* (Forssk.) Brown. et Jermy- (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore (d) Rhizome scale
(BSA); Shweta Singh, Bailadilla hills 58515, 58613 (Sagar Uni.), 610357, 610695, 610694 (BSA); Bilaspur, Panigrahi, 15233 (BSA); Lammi, Panigrahi, 15420 (BSA); Chhindwara: Shweta Singh, Patalkot 58886, Tamiya 61159, 58650 (BSA); Hoshangabad: Pachmarhi, Shweta Singh, Jatashankar 55604, Reechgarh 55743, Dutche’s Fall 55790, Jalgali 55716 (BSA); Jagdalpur, Shweta Singh, Kangar Valley National Park 61035 (BSA); Sidhi: Sanjay National Park-Jarbo Khol, Shweta Singh, 58616; Nagdah, 58487, Jarbo Khol 58400, 61158 Kanhaiya dah, 58506 (BSA).

**DISTRIBUTION:** INDIA- Assam, Bihar, Chhattishgarh, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Madhya Pradesh, Meghalaya, Rajasthan, Sikkim, Tamil Nadu, Uttaranchal, Uttar Pradesh, West Bengal.

**Central India:** Anuppur, Bastar, Bilaspur, Hoshangabad, Sidhi, Raipur.

**Note:** It is one of the variable species of the *Christella* L’ev. because of numerous reduced basal pinnae, distribution of hairs on costa and costules, presence of clavate-glands along costules below, lobes of pinnae, size of plant and nature of rhizome.


Rhizome erect or short-creeping, small, hairy, scaly; scales linear-lanceolate, apex acuminate, margin entire; fronds pinnate, 30-35 x 5-12 cm, oblong-lanceolate; stipe erect, 15-40 cm, gray-brown, hairy, scaly at the base; rachis hairy. Lamina 25-32 x 60-

*Thelypteris dentata* (Forssk.) St. John., Amer. Fern J. 26: 44. 1936.


Rhizome shortly-crawling, scaly; scales brown, ca 1.5-2 x 0.8-1.0 mm, apex acuminate, margin entire, linear lanceolate, hairy; fronds pinnate, 56-70 cm; stipe tufted, 10-25 cm, firm, straw colour, hairy or smooth, few scales at the base, scales linear-lanceolate, dark-brown, shining; rachis pubescent. Lamina 30-45 x 15-20 cm, broadly lanceolate, bipinnatifid, texture herbaceous, hairy; pinnae 15-20 pairs, 5-10 x 1-1.5 cm, sessile, alternate or subopposite, basal pair (2-4 pairs) progressively reduced, deflexed to articles, entire, creanate or not, apex acuminate, truncate base, margin deeply cut down nearly to the costae in to lobes; lobes (pinnules) 0.3 x 0.4 cm, oblique, oblong, regular, subfalcate, obtuse at the apex, margin entire or slightly crenate; veins simple, 5-7 pairs, free except basal one pair or two pairs of pinnules unite to form an excurrent veinlets to sinus; costa and costule hairy. Sori medial, small, round, arranged on the veins in single row on either side of the costules, indusiate, hairy; indusia small, reniform, hairy or glabrous. Spores monolete, bilateral, dark-brown, exine wrinkled, granulose, irregular folded, 30-45 x 20-32 µm. (Fig. 34; Plate 15d)

Chromosome number: Tetraploid sexual, n=72 (cf: Manickam & Irudayaraj, 1988; Khullar, 2000).

**ECOLOGY:** Commonly grows on the forest floors and margins in humus rich soil along the water streams. (850-1000 m altitude).

**FERTILE:** July-December.

**SPECIMENS EXAMINED:** Anuppur: Amarkantak, *Shweta Singh*, Kapildhara 58656 (BSA); Bastar: Bailadilla hills, *Panigrahi*, 228
70 cm, pinnate, ovate-lanceolate; pinnae, sessile, subopposite, herbaceous, ca 20 pairs, 3-6 x 1-1.5 cm, oblong-lanceolate, acuminate apex, base truncate, margin lobed 4-5 way to the costa; medial pinnae largest, lower ones gradually reduced with dentate acroscopic auricles; veins distinct, 4-5 pairs or more on both the side, anastomosing with a long excurrent veinlet; costa and costule hairy. Sori medial or sometime supramedial, small, round, indusiate, hairy; indusia small, reniform, early fugacious, hairy or glabrous. Spores monoete, bilateral, light brown, exine wrinkled, granulose, irregular folded, 16-24.5 x 24.5-33.5 μm.

Chromosome number: Not known.

ECOLOGY: Plant grows on the forest floors and margins in humus rich soil along the water streams. (850-1000 m altitude).

FERTILE: April-July.

SPECIMENS EXAMINED: None. On the basis of literature. (cf. Roy & Singh, 1973, 1975) as Cyclosorus contiguus (Rosenst.) Ching and also recorded as Christella quadrangularis (Fe’e) Holtt. (cf. Vasudeva et Bir, 1993c) from same area.

DISTRIBUTION: INDIA- Madhya Pradesh, Karnataka, Tripura.

Central India: Hoshangabad.

Rhizome long-creeping, scaly; scales dark brown, linear lanceolate, up to 10-1.5 mm, apex acuminate, hairy; fronds pinnate, 40-60 cm; stipules tufted, erect, 12-20 cm, thick, stramineous, pubescent with short hairs or glabrous, scaly at base; scales linear-lanceolate, apex acuminate, dark-brown; rachis hairy. Lamina 25-35 x 10-25 cm, oblong-lanceolate, pinnate, herbaceous; pinnae 14-16 pairs, oblong, sessile, alternate or subopposite, basal pair usually deflexed, not or slightly reduced, upper most gradually merging into the base of the deeply lobed apical lamina, base truncate; apex acuminate, toothed almost throughout, margin shallowly lobed; lobes (pinnules) 5-14 x 1-2 cm; costae and costules hairy; veins 5-6 pairs, the lowest only anastomosing forming an excurrent vein passing to the base of the sinus. Sori medial, submarginal on the veins, lower veins divergent, small, round, indusiate, hairy; indusia small, reniform, brown, hairy. Spores monolete, bilateral, oval-elliptic, brown, exine wrinkled, granulose, irregular folded, 22-25 x 30-45 μm. (Plate 15a)


ECOLOGY: Plant grows in humus rich soil along the water streams. (850-1000 m altitude).

FERTILE: October-December.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Shweta Singh, Durgadhara 58666, Shamundhara, 58636 (BSA); Bastar: Bailadilla hills, Panigrahi, 4430 (BSA), 61065, 610680 (BSA); Nair, 40563, 40555, 40570 (CNH); Chhindwara: Tamiya, Panigrahi, 4589 (BSA); Patalkot, Shweta Singh, 586360 (BSA); Patalkot, Shweta Singh, 58656 (Sagar Uni.); Hoshangabad: Pachmrhi-Jatashakar, Panigrahi, 4461 (BSA); Pachmarhi, Shweta Singh, Chhote Mahadev
55629, Duche's Fall 55791, Jalagali, 55718, Little Fall 55656 (BSA); Jagdalpur, Shweta Singh, Kangar Valley National Park 610352 (BSA); Panna: Panna National Park, Suman, 52066 (BSA); Sidhi: Sanjay National Park-Kanhaiya Dah, Shweta Singh, 58613, 58506; Nagdah, 58622 (BSA).

**DISTRIBUTION:** INDIA- Assam, Chhattishgarh, Goa, Himachal Pradesh, Lakshadweep, Madhya Pradesh, Manipur, Meghalaya, Mizoram, Sikkim, Tamil Nadu, Uttaranchal, Uttar Pradesh.

**Central India:** Anuppur, Bastar, Bilaspur, Hoshangabad, Raipur, Sidhi.


Rhizome erect or short-creeping, hairy, scaly; scales linear-lanceolate, apex acuminate; fronds tufted, pinnate; stipe erect, 40-50 cm, gray-brown, hairy, scaly at the base; rachis hairy. Lamina simple pinnate, 80-90 x 22-25 cm, 15-25 pairs, subcoriaceous; pinnae ovate-lanceolate, sessile, alternate or subopposite, lower pairs (2-8) gradually reduced and deflexed, lowest pinnae 4-5 x 1-1.5 cm, apex gradually tapering and acuminate, margin crenate, untoothed at the end, deeply lobed, middle pinnae 12-15 x 2-2.5 cm, base truncate, apex acuminate, margin lobed ½ half way to the costa; lobes (pinnules) 0.3-0.4cm, falcate, apex rounded, margin entire; veins distinct 8-9, the lower one and half or two
pairs anastomosing, other free, simple; costa and costule hairy. Sori medial on the veins, small, round, indusiate, hairy; indusia small, reniform, hairy or glabrous. Spores monoolete, bilateral, light brown, exine wrinkled, granulose, irregular folded.

Chromosome number: 2n=72, 144 (cf. Love et al., 1977).

ECOLOGY: Plant grows under shade in humus rich soil along the water streams. (850-1000 m altitude).

FERTILE: July–December.

SPECIMENS EXAMINED: Bilaspur, Panigrahi, Kabir chabootara 15237 (CNH). (cf. Vasudeva & Bir, 1993c; Chandra, 2000). Also recorded (cf. Singh & Roy 1969) from the same area as Cyclosorus subpubescens (Bl.) Ching

DISTRIBUTION: INDIA- Assam, Meghalaya, Madhya Pradesh, Sikkim, Tamil Nadu, Uttaranchal, West Bengal.

Central India: Hoshangabad.

Note: The species shows some peculiar features, which are easily differentiate form others. Lamina surface pilose; the few pairs of lower pinnae gradually reduced, the smallest one ca. 4 cm with auriculate acrosopic lobe, pinnae lobed ½ way to the costa, glands entirely absent, truly anatmosing. This species differs from C. dentata (Prosk.) Brown. et Jerm. in being less hairs and having shallow divisions of the pinnae.

PNEUMATOPTERIS Nakai


Rhizome erect, scaly. Fronds pinnate, hairy, pinnae dentate and cartilaginous, lower pairs abruptly to gradually reduced, more or less pustular when dry; veins free, anastomosing. Sori round, indusiate; Spores monolete, bilateral, spinulose.


Tufted fern; rhizome short erect, thick, scaly; scales ovate, *ca* 5 x 5 mm, pale brown, apex acuminate, margin entire; fronds firm, up to 120 cm, pinnate; stipe grey, 20-80 cm, stramineous, naked or slightly pubscents the base, glabrescent to glabrous at the age; rachis ± hairy. Lamina lanceolate, pinnate, 60-120 x 50-60 cm long, deeply lobed, triangular, texture firm, subcoriaceous to coriaceous, thick, greenish brown; pinnae numerous pairs, subopposite or alternate, sessile, basal pinnae (4-9 pairs) abruptly reduced to small auricles which are widely spaced; largest pinnae 25 x 3 cm, linear lance late, apex acuminate, broadly cuneate or truncate, margin lobed half way to the costae; lobes (pinnules) 0.4-0.5 cm, oblong, apex rounded or bluntly toothed; costa and costules ± hairy; veins 9-10 pairs, 2-4 each side unite. Sori intermedial, reniform, indusiate, up to 6 pairs, glabrous evanescent, hairy. Spores monolete, 25 x 20 μm., bilateral, brown, exine spinulose.
Chromosome number: 2n=72. (cf. Love et al., 1977; Manickam & Irudayaraj, 1988).

*ECOLOGY:* Grows in the edge of flowing stream, nala in shady places. (900-1100 m altitude).

*FERTILE:* May-December.

*SPECIMENS EXAMINED:* Bastar, *Nair*, Darsha (550 m) 40522, 40557 (CAL).

*DISTRIBUTION:* **INDIA-** Assam, Arunachal Pradesh, Andhra Pradesh, Chhattishgarh, Madhya Pradesh, Meghalaya, Sikkim, Uttarakhand.

**Central India:** Bastar, Hoshangabad, Raigarh.

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**PRONEPHRIUM** Presl


**Type species:** *Pronephrium lineatum* (Bl.) Presl, Epim. Bot. 259. 1849.

Terrestrial; rhizome wide-creeping, scaly. Fronds pinnate, simple to trifoliate, lowest pinnae little or not reduce, scantly hairy; stipes tufted or scattered, scaly, hairy or glabrous; veins anastomosing, united excurrent. Sori round, elliptic or crescent shaped, indusiate or exindusiate; Spores monolete with spinulose out growths.

**Key to the species**

1a. Fronds smaller (less than 150 cm long); stipe tufted, scales lanceolate, linear; sori exindusiate, sporangial capsule setose; spores perisporeiate.

   *P. repandum*

1b. Fronds longer (more than 150 cm long); stipes not tufted,
scales ovate-lanceolate; sori indusiate; sporangial capsule not setose; spores non-perisporiate.

\textit{P. nudatum}


Rhizome long-creeping, thick, stout, densely scaly; scales dark brown, ca 2-2.5 x 1.6-1 mm, lanceolate, apex acuminate, margin entire, unicellular; fronds pinnate, 100 x 125 cm; stipe firm, erect, slightly swollen and scaly at the base, 70-80 cm; scales lanceolate, linear, brown; rachis hairy. Lamina lanceolate, pinnate, 70-80 x 22-28 cm long, texture firm, subcoriaceous to coriaceous, thick, greenish brown, lower surface hairy, upper glabrous; pinnae 8-12 pairs, shortly petiolate, 10.5-28 x 2-3.0 cm, alternate, lanceolate, margins sharply toothed, cartilaginous, acuminate, lower pinnae not reduced; costa and costules hairy; veins numerous up to 15 pairs, anastomosing, forming a zig-zag, excurrent veinlets, hairy. Sori medial, small, round, hairy, indusiate; indusium remiform, yellow in colour, sporangia not bear setae. Spores monolete, bilateral, brown, exine spinulose, 30-50 x 20-35 \(\mu\)m. (Fig. 35; Plate 15g)

Fig 35. *Pronephrium nudatum* (Roxb.) Holtt.- (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome scale.
ECOLOGY: Common fern and grows on humus soil in shady places and near water stream. (900-1100 m altitude).

FERTILE: July-October.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Saxena, Durgadhar 4661 (SFRI); Khotele, Kabirchabutara 5150 (SFRI); Shweta Singh, forest near Sonemura 58670 (BSA); Shweta Singh, Dudhada 58511 (Sagar Uni.); Bastar, Jain, Bailadilla hills 4108 (BSA); Shweta Singh, 58510, 58670 (Sagar Uni.), 61048, 61136, 610641 (BSA); Bilaspur, Panigarhi, 8877 (BSA); Chhindwara, Panigrahi, Tamiya 4453 (BSA); Hoshangabad: Pachmarhi, Panigrahi, Dutche's Fall 6635 (BSA); Shweta Singh, Dutche's Fall 55792, Little Fall 55657, Bee Fall 55677, Jalgali 55719, Vanshi Bihar 55720 (BSA); Shweta Singh, Dutche's fall 58673, Bee fall 59404 (Sagar Uni.); Jagdalpur, Shweta Singh, Kangar Valley National Park 61034, 61151, Keshkal 610641 (BSA); Panna: Panna National Park, Suman, 52066 (BSA); Sidhi: Sanjay National Park-Kanhaiya Dah, Shweta Singh, 58511, 58486, 58485 (BSA).

DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Andhra Pradesh, Chhattisgarh, Jammu-Kashmir, Madhya Pradesh, Meghalaya, Sikkim, Uttarakhand, West Bengal.

Central India: Bastar, Hoshangabad.

Rhizome creeping, scaly; scales pale brown, ca 2.5-3 x 1.6-1 mm, lanceolate, apex acuminate, margin entire, unicellular; fronds pinnate; stipe tufted, 70-80 cm, erect, stout, glabrescent, smooth, scaly at the base; scales lanceolate, linear, brown; rachis hairy. Lamina lanceolate, pinnate, 55-60 cm long, texture thin, greenish brown; pinnae 3-6 pairs, lateral pinnae and apical pinnae similar, upper sessile, lowest shortly stalked, medial pinnae 30-7 cm, margins distinctly serrate or undulate, upper surface finely verrucose, glabrous, lower surface copiously hairy; costa and costules hairy; veins numerous in pairs, anastomosing, excurrent veinlets free or joinig with the next pair of veins above, if free always extending near to the next junction. Sori medial, small, round, exindusiate, hairy; sporangia bear many setae. Spores monolete, bilateral, brown, exine spinulose, 30-48 x 18-38 µm.

(Plate 15f)

Chromosome number: Not known.

ECOLOGY: Plants grow under moist and shady places near water streams. (1000-1100 m altitude).

FERTILE: December-May.


DISTRIBUTION: INDIA- Assam, Chhattishgarh, Madhya Pradesh, Meghalaya, Sikkim, Uttarakhand.

Central India: Bastar, Hoshangabad.

Note: This species can be easily distinguished from P. nudatum (Roxb.) Holtt. because of its smaller size, fewer number of pinnae. The pinnae are usually oblong-lanceolate, variable in size, strongly caudate at the apex and narrowed gradually towards the base. Sori are setose and exindusiate.
**PSEUDOCYCLOSORUS** Ching


**Type species:** *Pseudocyclosorus tylodes* (Kze.) Ching, Acta Phytotax. Sin. 8: 322. 1963.

Rhizome erect or short-creeping, scaly. Fronds pinnate to pinnatifid, denticulate, lowest pinnae little or not reduced, never pustular when dry; stipes tufted, scaly, hairy or glabrous; veins free, anastomosing. Sori round, indusiate; Spores monolette, bilateral, spinulose.


Rhizome erect, stout, with tufted roots at the lower part, scaly; scales dark brown, lanceolate, apex acuminate, margin with few outgrowth, unicellular; fronds pinnate, 20-45 cm, lanceolate; stipe tufted, 7-12 cm, gray, erect, stout, glabrescent, smooth, scaly at the base; scales lanceolate, linear, brown; rachis hairy. Lamina lanceolate, pinnate, 30-40 cm long, texture thin but firm, subcoriaceous, greenish brown; pinnae 12-15 pairs, lower pinnae (6-8 pairs) reduced, larger pinnae narrow, 5-12 x 0.5-1.5 cm, subentire, having a narrow acroscopic auricle, basal basiscopic side narrowly cuneate with short basal lobes; lobed to costa, lobes
Fig 36. *Pseudocyclosorus falcifolius* (Hook.) Ching - (a) Habit; (b) Part of pinnate leaf; (c) Spore capsule showing sori arrangement.
oblique, acute; veins free, 8-10 pairs, basal basiscopic one to edge above base of sinus; costa and coxules hairy. Sori medial, round, indusiate, hairy; indusia firm, hairy. Spores monolete, 30-50 x 25-35 μm, bilateral, brown, light brown, exine spinulose. (Fig. 36; Plate 15e)

Chromosome number: Not known.

ECOLOGY: Plants grow under moist and deep shady places near water streams. (900-1100 m altitude).

FERTILE: Auguat-September.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Shweta Singh, forest near Sonemura 58648 (Sagar Uni.); Hoshangabad: Pachmarhi, Shweta Singh, Jatashankar, 55606, Dutche’s Fall 55793, Jalgali 55721, Bee Fall 55678, Tridhara 55722, Jatashankar 55606 (BSA); Sidhi: Sanjay National Park-Kanhaiya Dah, Shweta Singh, 58623, 58484 (BSA).

Recorded from Hoshangabad (Pachmarhi) (cf. Tiwari, 1964) as Lartea falciloba Hook.

DISTRIBUTION: INDIA- Andhra Pradesh, Assam, Chhattisgarh, Madhya Pradesh, Meghalaya, Orissa, Sikkim, Tamil Nadu, Uttaranchal.

Central India: Anuppur, Bastar, Hoshangabad, Panna, Sidhi.

SPHAEROTEOPHANOS J. Sm.


Terrestrial, medium to large fern; rhizome short, erect, scaly, hairy. Fronds pinnate, lowest pinnae reduced, apical pinnae rarely pinna-like; stipes tufted, scaly, hairy above; veins anastomosing.
Sori round, medial, indusiate; Spores monolet, bilateral, spinulose.


Medium sized fern, up to 40 cm tall, unbranched or branched; rhizome short, erect, scaly, hairy; scales dark brown, lanceolate, ca 8 x 2 mm, magin entire, apex acuminate; fronds tufted, pinnate, 30-60 cm; stipe tufted, erect, 15-20 cm, thick, stramineous, scaly at base; scales linear-lanceolate, apex acuminate, dark-brown; rachis pubescent. Lamina pinnate, 30-60 x 10-15 cm, deeply pinnatifid at the apical part, close, herbaceous; pinnae 5-9 x 1.5-2 cm, petiolate, auricled at the superior base, margin shallowly serrate, lower pinnae gradually reduced, deltoid auricles, pubescent; veins 3-4 basal ones anastomosing, rest free. Sori medial, solitary near the middle of 3-4 lower veins, indusiate, hairy; indusia small, reniform, brown, hairy. Spores trilete, oblong, light brown, exine unwrinkled, granulose, irregular folded, 30-40 x 34-40 μm. (cf. Nayar & Geeverghese, 1993). (Plate 14c)

Chromosome number: 2n=72 (cf. Love *et al.*, 977).
ECOLOGY: Plant grows individually in humus rich soil along the water streams and subjected to flooding during the rainy season. (850-1000 m altitude).

FERTILE: July-September.

SPECIMENS EXAMINED: Bastar, Shweta Singh, Bailadilla hills 610683, 61099, 610991 (BSA).


TRIGONOSPORA Holtt.


Type species: Trigonospora ciliata (Wall. ex Benth.) Holtt., Blum. 19: 29. 1971.

Rhizome short, erect or creeping. Fronds pinnate topinnatifid, lowest pinnae little or not reduce, areophores not or little swollen; pinnae deeply lobed; veins free, simple, lower ones rarely anastomosing. Sori medial, indusiate. Spores tetrahedral, trilette.

Key to the species

1a. Fronds lanceolate with auricles at the base.

2a. Pinnae spreading, cut down 2/3 or more towards the rachis into oblique falcate linear oblong segments; veinlets 3-8 on a side; indusia glabrous or hairy. T. calcarata

1b. Fronds oblong lanceolate without auricles at the base.

2b. Pinnae upto 10 pairs, fertile pinnae slightly narrow than the sterile one, apex subacuminate, lobed (cut to less
than the half; veins in each lobe 4-5 pairs; indusia ciliate.

*T. ciliata*

2c. Pinnae 11-14 pairs, quite obtuse at the apex or ending in a short sudden point (never caudate); lobed (cut down ¾); veins in each lobe 3-4 pairs indusia glabrous.

*T. sericera*


Rhizome erect, stout, scaly at the apex; scales ovate, dark brown, ca 1.6-2 x 0.8-1 mm, apex acute, margin entire with acicular haira on upper and lower surface and along the margin; fronds up to 60 cm long; stipe tufted. Lamina lanceolate, pinnate, pinnae 1.5-2.5 cm above auricled base, cut down 2/3rd or more towards the rachis into oblique falcate, linear oblong segments, the basal one sometime considerable longer than the others, rachis and surfaces more or less hairy; veinlets 3-8 on a side, simple. Sori medial, indusiate; indusium kidney shaped, glabrous or hairy. Spores trilette, tetrahedral.

Chromosome number: Not known.

**ECOLOGY:** Plants grow on rocks near water stream in moist situations. (800-1000 m altitude).

**FERTILE:** December-May.

DISTRIBUTION: INDIA- Assam, Chhattishgarh, Madhya Pradesh, Karnataka, Karela, Tamil Nadu, Uttarakhand.

Central India: Bastar, Hoshangabad.


Rhizome erect, short, covered with dense mat of tough black roots, scaly at the apex; scales ovate, dark brown, ca 1.8-2 x 0.8-1 mm, apex acute, margin entire with acicular haira on upper and lower surface and along the margin; fronds narrowly oblong-lanceolate; 50-75 x 5-10 cm, bipinnate; scales on young circinate fronds small, broad, dark, deciduous; stipes 32-50 cm, hairy. Lamina pinnate, 20-25 x 4.0-7 cm, up to 16 pairs apex caudate, texture firm, subcoriaceous, lower surface hairy, dark-olive green on upper side; pinnae 2.5-3.5 x 1 cm, sessile, subopposite to alternate, linear-lanceolate, base subequal, apex acute or acuminate; lobes less than half way to costa.; fertile pinnae slightly narrower than the sterile, base unequal, broadly cuneate to truncate on the acrosopic side, incurved, lower pinnae not reduced, not downwards deflexed; veinlets 4-5 pairs, simple, basal acrosopic vein always ends at sinus between two lobes, the basal one passes to the margin above the sinus, hairy; hairs on costa and coatules. Sori medial, indusiate; indusia reniform, hairy, kidney shaped.
Fig 37. *Trigonospora ciliata* (Benth.) Holtt. - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome scale
Spores trilette, tetrahedral, exine spinulose, 25-30 x 25-30 μm. (Fig. 37)
ECOLOGY: Plants grow on rocks near water stream in moist situations. (800-1000 m altitude).
FERTILE: November-February.
SPECIMENS EXAMINED: Chhindwara: Tamiya, Shweta Singh, 58649 (BSA); Shweta Singh, Tamiya 58631 (Sagar Uni.);
DISTRIBUTION: INDIA- Assam, Chhattishgarh, Madhya Pradesh, Meghalaya, Karnataka, Karela, Sikkim, Tamil Nadu, Uttarakhand.
Central India: Bastar, Hoshangabad.


Rhizome erect, short, covered with dense mat of tough black roots, scaly at the apex; scales ovate, dark brown, ca 1.5-2.5 x 0.5-1 mm, apex acute, margin entire with acicular haira on upper and lower surface and along the margin; fronds oblong-lanceo late, 27.5-57.0 cm, bipinnatifid, scales on young circinate fronds small, broad, dark, deciduous; stipes 10-34 cm, pubescent, hairy, without auricles; rachis hairy. Lamina pinnate, 16-23 x 3.5-7 cm, texture subcoriaceous, lower surface hairy, main rachis pilose;
pinnae up to 11 pairs, lower most pinnae shorter, deflexed, sessile, middle pinnae spreading little oblique, the upper more oblique, all sessile, 2-3 x 0.5-5 cm, obtuse apex, never caudate, lobed more than half way to costa, base unequal; lobes or segment oblique, falcate, linear, oblong; veins 4-5 pairs in each lobe, simple, basal acrosopic vein always ends at sinus between two lobes, the basal one passes to the margin above the sinus, hairy; numerous hairs on costa and coatules. Sori medial, covering the maximum surface of the fertile pinna, indusiate; indusia reniform, hairy, kidney shaped. Spores trilete, tetrahedral, oval to spherical, yellow-brown, exine smooth, 27-38 x 19-34 μm. (Plate 14b)


ECOLOGY: Plants grow lithophytically on moist rocks in shady places. (800-1000 m altitude).

FERTILE: November-February.


DISTRIBUTION: INDIA- Assam, Madhya Pradesh, Meghalaya, Tamil Nadu.

Central India: Hoshangabad.

28. ASPLENIACEAE Mett. ex Frank

(The spleen wort family)

Aspleniaceae Mett. ex Frank


Terrestrial, ephiphytic or lithophytic; rhizome erect or creeping, long or short, scaly; fronds simple, pinnate or finely
divided; stipe not articulate. Veins all free or very rarely anastomosing towards the lamina margin. Sori indusiate, linear on one side of the vein.

The family comprising 17 genera throughout the world flora, of which 4 genera and more than 50 species including 17 varieties have been reported from India. Single genus with 9 species have been reported from Central India.

**ASPLENIUM** L.
(The spleen wort)


**Type species:** *Asplenium marinum* L., Sp. 2: 1078. 1753.

Small to large ferns; rhizome short-creeping, scaly; fronds small to large, pinnate; Lamina simple or compound, herbaceous or subcoriaceous, glabrous to scaly; veins free, forked, sometime anastomosing. Sori linear, near margin, indusium small or rarely exindusiate. Spores brown, bilateral, monolete.

**Key to the species**

1a. Rhizome short or long creeping.

2a. Stipe chest-nut coloured, glossy, upper margin of the pinnae deeply cut, lower margin entire. Sori submarginal along the veins.

   *A. cheilosorum*

2b. Stipes green colour, not glossy, pinnae margins serrate-dentate, sometime double serrate. Sori short, linear, ± in the middle.

   *A. obscurum*
2c. Stipe grey; pinnae margins lobed and serrate. Sori linear, nearly to the margins.

*A. polydon*

2d. Stipe dark brown to black, fragile; pinnae ± falcate, lower margin deeply cut at the base, toothed upwards, apex pointed, regular shallow between the lower and upper margins.

*A. unilaterale*

1b. Rhizome ascending.


*A. trichomanes*

3b. Stipes grey coloured, pinnae coriaceous, margins inciso-seriated. Sori elongated.

*A. yoshinagae var. planicaule*

3c. Stipes straw-coloured, pinnae margins deeply toothed. Sori in lobes, 1-4 on each lobe.

*A. laciniatum*

1c. Rhizome erect to suberect.

4a. Stipe dark brown to black; pinnae not reduced but deflexed, oblong with sub-entire or crenate margins. Sori terminal along the veins.

*A. normale*

4b. Stipe green or gray green; pinnae trapezoid-lanceolate, dimidiate, margins serrate or inciso crenate. Sori median on the veins.

*A. inaequilaterale*

Fig 38. *Aspleniumchetiosorum* Kunze ex Mett. - (a) Habit; (b) Part of fertile pinnule enlarged showing venation and sori; (c) Spore; (d) Rhizome scale

Terrestrial; rhizome short-creeping, scaly; scales dark-brown, ca 3-5 x 0.25-0.6 mm, lang acuminate, entire nargin, ovate-lanceolate, hair pointed. Fronds pinnate, erect, 30-50 cm long; stipes simple, 10-20 cm long, dark chestnut colour, shining, firm, erect, scaly only at the base, glabrous, polished; rachis glabrous, grooved above. Lamina simply pinnate, 15-30 x 3-5 cm, smooth, texture membranaceous; pinnae up to 40 pairs or more 1.5-3 x 0.3-0.8 cm, oblong-lanceolate, obtuse, alternate, shortly petiolate, upper pinnae sessile, dimidiate with nearly the entire lower, upper margin and apex deeply lobed; lobes bifid; veins distinct, free, forked. Sori confined to the segments near the lower margins, short; indusia brown, thin. Spores bilateral, monolete, hyaline, elongate, oblique, 25-35 x 35-45 μm, exine spinulose. (Fig. 38; Plate 16b)


ECOLOGY: Grows on moist well-shaded and sheltered rocks along the water streams. (1000-1200 m altitude).

FERTILE: July-February.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Saxena, 7929 (SFRI); Bastar, Shweta Singh, 61026, 61028, 611156 Bailadilla hills (BSA); Hoshangabad: Pachmarhi, Dixit, Dhupgarh 41223, Mahadeo 6599; Shweta Singh, Rajatprapat 55776, Tridhara 55725, Dutche’s Fall 55794 (BSA).
**DISTRIBUTION:** **INDIA**- Assam, Chhattisgarh, Himachal Pradesh, Kashmir-Jammu, Karnataka, Kerela, Sikkim, Tamil Nadu, Tripura, Uttarakhand, West Bengal.

**Central India:** Bastar, Hoshangabad.


Lithophyte; rhizome erect, scaly; scales dark-brown to black, ovate-lanceolate, ca 3.5 x 0.6-0.8 mm, apex acuminate, margin entire. Fronds pinnate, erect, 22-26 cm long, lanceolate; stipes tufted, 7.5-11 cm, sparsely hairy, gray, grooved; rachis glabrous, grooved above. Lamina simply pinnate, 13-15 x 4-6 cm, smooth, texture membranaceous, subcoriaceous; pinnae 12-15 pairs, lowest pinnae the largest one, gradually smaller towards upwards, petiolate, trapezoid-lanceolate, acuminate apex, margin crenated with the crenatures obtusely or acutely bifid, glabrous on both the surfaces; veins forked, discontinuous to the apex of the teeth. Sori on the entire forks of the veins forming a row on each side of the costa, 3-5 in number, indusiate; indusia brown, thin. Spores bilateral, monolette, reniform, yellow to brown, wrinkled, with irregular serrate crests, 30-33 x 18-24 μm, exine spinulose. (Fig. 39)

Chromosome number: 2n=72 (cf. Fabbri, 1965).

**ECOLOGY:** Plant grows lithophytically on moist well-shaded and sheltered rocks along the water streams. (950-1000 m altitude).
Fig 39. *Asplenium inaequilaterale* Willd. - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome scale
FERTILE: July-February.


DISTRIBUTION: INDIA- Madhya Pradesh, Maharashtra, Karnataka, Kerala, Tamil Nadu.

Central India: Hoshangabad.


Terrestrial or epiphytic fern; rhizome short, erect or slightly creeping, apex scaly; scales dark-black, ca 3-4.5 x 0.4-0.5 mm, linear to oblong-lanceolate, hair pointed, apex long acuminate, margin sparsely fimbriate to entire. Fronds tufted, pinnate, erect, 30-45 cm long; stipules simple, 7-15 cm long, erect, green or dark-brown, linear-lanceolate scales; rachis glabrous, green, grooved above. Lamina bipinnate, 25-30 x 6-8 cm, lance late or oblong-lanceolate, glabrous, texture herbaceous to subcoriaceous; pinnae 8-14 pairs, 3-4 x 1.0-1.5 cm, ovate to broadly-lanceolate, obtuse, alternate, shortly petiolate, margin deeply lobed, lowest pair of pinnae slightly reduced; pinnules 2-3 pairs, 0.5-1 cm long, alternate, petiolate, obtuse or almost triangular, base cuneate, apex toothed, margin entire, the basal acroscopic pinnule usually largest and deeply lobed; veins oblique, forked once to each tooth, almost entire. Sori copious, 1-4 on each pinnule, elongate, indusiate, linear; indusia membranaceous, entire. Spores bilateral, monolet, dark-brown, elongate, 22-30 x 30-35 μm, exine wrinkled in to reticulate folds. (Plate 16g)

ECOLOGY: Grows on the moist shady rocks near water or even at the base of tree trunks. (1000-1200 m altitude).

FERTILE: August-February.

SPECIMENS EXAMINED: Bastar, Balakrishnan, 12133 (CAL).

DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Chhattisgarh, Himachal Pradesh, Kashmir, Meghalaya, Sikkim, Tamil Nadu, Uttarakhand, West Bengal.

Central India: Bastar.


Lithophyte; rhizome short-creeping, apex scaly; scales dull-brown, narrow lanceolate, acute, gland tipped, clathrate, margin entire with few glandular hairs. Fronds pinnate, erect, 18-30 cm long, lanceolate-oblong; stipes tufted, wiry, dark-brown, glossy, glabrous, sclaty in young stage, 4-6.5 cm; rachis dark brown, polished, grooved above. Lamina simply pinnate, 13.5-22 x 2-3.5 cm, cordate, acute, pinnae closely placed, oblong-lanceolate, glabrous, texture thin but firm; pinnae up to 30 pairs, close, oblong-lanceolate, alternate, shortly petiolate or sub sessile, 1.0-1.5 x 0.3-0.5 cm, elliptic or oblong, apex acute, upper pinnae gradually reduced, basioscopic base slightly excised, acrososcopic base truncate or auricled, margin incised-crenate; veins distinct on both the surfaces, free, 1-2 time forked, not reaching the margin, midvein thick. Sori arranged in two rows, pale-yellow, elliptic, indusiate; indusia brown, thin. Spores bilateral, monolete,
elliptical, reniform, pale-yellow, wrinkled, 23-42 x 19-30 μm, exine spinulose. (cf. Vasudeva & Bir, 1993b) (Plate 16f)


**ECOLOGY:** Plants grow in clay soil in moist and protected situation in side the dripping caves across the streamlet. (950-1000 m altitude).

**FERTILE:** October-December.

**SPECIMENS EXAMINED:** None. On the basis of literature. (cf. Vasudeva & Bir, 1993b; Chandra, 2000).

**DISTRIBUTION:** **INDIA-** Assam, Karnataka, Madhya Pradesh, Meghalaya, Sikkim, Tamil Nadu, Uttarakhand, West Bengal.

**Central India:** Hoshangabad.


Terrestrial; rhizome creeping, apex scaly; scales dark-black, ca 3 x 1 mm, linear-lanceolate, hair pointed, apex acuminate, margin entire. Fronds tufted, pinnate, erect, 30-45 cm long; stipes simple, 15-20 cm long, erect, dull green, lanceolate scales; rachis glabrous, dull green. Lamina pinnate, 25-40 x 7-9 cm, oblong-lanceolate, texture herbaceous; pinnae 8-15 pairs, 3.5-5.5 x 1.0-1.5 cm, alternate, shortly petiolate, acrosopic base broadly-cuneate to truncate, lanceolate, basioscopic base cut down to the costa to nearly half the length of pinna, apex acute, margin serrate-dentate, sometime doubly serrate above; veins free, forked once, entering to
the apex of the teeth. Sori short, submedial, indusiate, linear; indusia membranaceous, entire. Spores bilateral, monolete, dark-brown, elongate, 20-30 x 32-45μm, exine wrinkled in to reticulate folds. (Plate 16a)

Chromosome number: 2n=144 (cf. Love et al., 1977).

ECOLOGY: Grows on in rock crevices in moist places near water. (900-1000 m altitude).

FERTILE: Augusts-February.

SPECIMENS EXAMINED: Bastar, Shweta Singh, Bailadilla hills 58543 (Sagar Uni.); Chhindwara: Shweta Singh, Tamiya 58546, Patalkot 58544 (BSA); Hoshangabad: Pachmarhi, Dixit, Mahadev 41282 (BSA); Jatashankar 41291 (BSA); Shweta Singh Dutche’s fall 55796, Little fall 55660 (BSA).

DISTRIBUTION: INDIA- Assam, Chhattisgarh, Meghalaya, Madhya Pradesh, Tamil Nadu.

Central India: Bastar, Chhindwara, Hoshangabad.


Lithophytic; rhizome short-creeping, densely scaly; scales dark-brown, lanceolate, ca 10-1.5 mm, long acuminate, margin entire. Fronds tufted, pinnate, erect, 15-75 cm long; stipes simple, 10-30 cm long, grayish, erect, tufted, deciduous scaly at above; rachis glabrous. Lamina pinnate, pale green, 10-15 x 5.0-8.0 cm, lanceolate-coudate, texture herbaceous to coriaceous, glabrous; pinnae 6-20 pairs each side, 1-3.0 x 0.5-1.0 cm, alternate to subsessile, shortly petiolate or sessile, lanceolate, often acute-
acuminate at apex, cuneate base, usually base unequal by the slight excision of the basiscopic base, acrosopic base slightly auricled, margin irregularly biserrate; veins distinct, very oblique, parallel, forked up to 5 times, reaching the margin. Sori linear, on the veins near margin, indusiate, brown; indusia membranaceous, entire. Spores bilateral, monolette, 28-30 x 20-22 μm, dark-brown, exine branched, raised thickenings, reniform.


ECOLOGY: Plant grows on in rock crevices in moist places near water. (900-1000 m altitude).

FERTILE: May-July.


DISTRIBUTION: INDIA- Assam, Himachal Pradesh, Kashmir-Jammu, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Tamil Nadu, Uttaranchal.

Central India: Anuppur, Chhindwara, Hoshangabad, Raipur.

Note: The species is earlier reported as Asplenium falcatum Lam. (cf. Dixit, 1993).


English name: Common spleen wort.

Lithophyte or epiphyte; rhizome short, erect, scaly; scales dark-brown, linear-lanceolate, with few projections. Fronds tufted, pinnate, erect, 15-30 cm long; stipes simple, 2.5-10 cm long, smooth, brown-blackish, shining, glossy; rachis similar to stipe, dark black, glabrous, glossy. Lamina pinnate, 4.0-20 x 0.5-2.0 cm, linear-lanceolate, texture herbaceous to coriaceous, glabrous;
pinnae 10-15 pairs, 0.3-0.5 x 0.2-0.4 cm, alternate, shortly petiolate or sessile, orbicular or suboblong, apex obtuse, basal pinnae distant and reduced, lower margin smooth, upper margin dentate-crenate, lower surface hairy; veins simple or once, forked, glabrous. Sori obliquely placed, indusiate, oblong, light green; indusia membranaceous, entire. Spores bilateral, monolet, dark-brown, elongate, 20-32 x 30-45 μm, exine wrinkled in to reticulate folds.

Chromosome number: Diploid, n=36; tetraploid, n=72 (cf. Love et al., 1977).

ECOLOGY: Grows on in rock crevices in moist places near water. (900-1000 m altitude).

FERTILE: August-February.


DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Chhattisgarh, Himachal Pradesh, Kashmir-Jammu, Karnataka, Kerela, Meghalaya, Manipur, Nagaland, Sikkim, Tamil Nadu.

Central India: Bastar.


Lithophyte; rhizome widely creeping, slender, apex scaly, scaly; scales dull-brown, narrow lanceolate, ca 3 x 1 mm, entire, cathrate, apex acuminate, hair tipped. Fronds pinnate, erect, 25.5-36 cm long, lanceolate-oblong; stipes scattered, brown, glossy, glabrous, 10-20 cm; rachis green, glabrous, grooved above. Lamina simply pinnate, 18-25 x 4-6 cm, oblong-lanceolate, glabrous,
texture membranaceous, herbaceous; pinnae 12-20 pairs, alternate, shortly petiolate, 2.5-4.5 x 6-10 cm, oblong, somewhat falcate, the lower margin completely cut away near the base, toothed upwards, apex acute, upper margin and the distal part of the lower margin with fairly regular shallow blunt toothed; veins distinct on both the surfaces, 1-2 time forked. Sori medial, indusiate; indusia brown, thin. Spores bilateral, monolete, spherical, dark-brown, wrinkled, 25-30 x 30-35 μm, exine spinulose.


ECOLOGY: Common at certain places on moist, moss covered floor inside dense forest near stream. (950-1000 m altitude).

FERTILE: May-December.

SPECIMENS EXAMINED: Bastar, Panigrahi, Bailadilla hills 1065 (BSA); Shweta Singh, Bailadilla hills 58546, 58544 (Sagar Uni.); Hoshangabad; Pachmarhi, Shweta Singh, Dutches’s fall 55795 (BSA).

DISTRIBUTION: INDIA- Arunachal Pradesh, Chhattishgarh, Karnataka, Himachal Pradesh, Kerela, Madhya Pradesh, Maharashtra, Nagaland, Sikkim, Tamil Nadu, Uttaranchal, West Bengal.

Central India: Bastar, Hoshangabad.

Epiphytic fern; rhizome short, erect, apex scaly; scales dark-black, up to 10-1 mm, ovate-lanceolate, with short projections, apex long acuminate, margin entire. Fronds tufted, pinnate, erect, 30-50 cm long; stipes simple, 5-15 cm long, erect, green-grey, deciduous scales, polished; rachis glabrous, grooved above. Lamina simply pinnate, 12-30 x 6-8 cm, broadly lanceolate, glabrous, scaly, texture stiff, subcoriaceous; pinnae 10-20 pairs; 1-3.5 x 0.5-1.0 cm, oblong-lanceolate, obtuse, alternate to subopposite, shortly petiolate, upper margin irregularly lobed, lower margin entire and apex acute; lobes bifid, acrosticipal basal lobe largest, upper side oblique narrow, lower one with truncate base; veins close together, forked once or twice. Sori copious, elongate on acrosticipal side reaching near the margin, indusiate, linear; indusia elongate. Spores bilateral, monolete, brown, elongate, 20-30 x 28-45 μm, exine smooth.


ECOLOGY: Grows as lithophytically or epiphytically on rocks in moist situation. (1000-1200 m altitude).

FERTILE: July-February.

SPECIMENS EXAMINED: Bastar, Panigarhi, 6930 (BSA); Dixit, 53022 (CAL); Shweta Singh, Bailadilla hills 610560, 610570 (BSA);

DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Chhattisgarh, Himachal Pradesh, Kashmir-Jammu, Karnataka, Kerela, Meghalaya, Manipur, Nagaland, Sikkim, Tamil Nadu.

Central India: Bastar.

Note: The species is earlier reported as Asplenium indicum Sledge (cf. Dixit, 1993). It is found that in nature, the fronds are seen hanging downwards from the host tree for long time. (cf. Pande & Pande, 2002).
28. **Athyriaceae** Alston
(The lady & Glade fern family)

*Athyriaceae* Alston, Taxon 5: 25. 1956.

**Type genus:** *Athyrium* Roth, Rom. Mag. 2: 105. 1799.

Terrestrial, rarely ephiphytic or lithophytic; rhizome short or long, erect, rarely creeping, scaly; fronds simple or bipinnate or finely divided; stipe stout, scaly. Veins all free, forked, very rarely anastomosing towards the lamina margin. Sori indusiate or exindusiate, oblong-linear on single or double side of the vein, variable shaped.

The family comprising 23 genera throughout the world flora, of which 14 genera and 127 species including have been reported from India. 4 genera with 9 species have been reported from Central India.

**Key to the genera**

1a. Sori narrow not rounded; indusium curved or elongated.


*Athyrium*

2b. Pinnules less rectangular but sloping. Few sori diplozioid towards the base of the pinnae lobe.

*Deparia*

2c. Pinnules entire or bluntly toothed. Sori on basioscopic side, never curved.

*Diplazium*

1b. Sori broad, rounded; indusium reniform not elongated.
Dryoathyrium

ATPYRIUM Roth.

Athyrium Roth, Rom. Mag. 2: 105. 1799.

Type species: Athyrium filix-femina Roth, Rom. Mag. 2: 106. 1799.

Terrestrial ferns; rhizome long-creeping, stout, erect, scaly, including persistent fronds at the base. Fronds tufted; stipes stramineous, densely scaly. Lamina pinnate to pinnatifid, herbaceous to coriaceous, glabrous to scaly; veins free, forked, sometime anastomosing without included veinlet. Sori dorsal, reniform, indusiate. Spores brown, bilateral, monolete.

Key to the species

1a. Fronds pinnate.

2a. Rhizome short, erect, covered with linear-lanceolate light-golden brown scales.

3a. Lamina small, lanceolate; pinnae not narrow, with lobed about half-way to the mibril, thin, subcoriaceous; involucres large, fimbriated on the margin; spores dark brown, broadly perisporiate.

A. anisopterum

3b. Lamina linear-lanceolate, narrow at both the ends, herbaceous; pinnae sessile, alternate, falcate-ovate, shallowly lobed, generally furnished with a large obtuse auricle at both the sides; spores light-brown, perine usually smooth or lightly spinulose.

A. falcatum

1b. Fronds bipinnate.
2b. Rhizome thick, ascending, densely scaly with brown linear-lanceolate scales.

3c. Lamina ovate-lanceolate, herbaceous; pinnae in numerous pairs, lanceolate, sub-sessile, acute at both the ends, serrated at the tip; sori copious, slightly curved.

A. hohenakerianum

2c. Rhizome widely creeping, scaly.

3d. Lamina large, lanceolate or deltate lanceolate, herbaceous; pinnae alternate, shortly patiolute; pinnules distant; spores dark-brown, translucent, perin wall forming numerous folds.

A. schimperi

2d. Rhizome ascending, covered with many brown linear-lanceolate scales.

3e Lamina laceolate, membranaceous; pinnae linear-oblong, margin acute toothed. Sori short, oblong, sub-persistent.

A. filix-femina

1c. Fronds decompoundly pinnate, oblong-lanceolate to deltoid-lanceolate.

2e. Rhizome short-creeping, clothed with brown linear lanceolate scales.

3f. Lamina finely dissected, lanceolate or subdeltate, herbaceous; pinnae lanceolate, alternate; pinnules narrow, subdeltate, margin deeply lobed to costule, cut down into narrow oblong ultimate lobes. Sori minute, ‘J’ shaped, straight or hippocrepiform; spores light brown, perine loose, forming blunt folds or reticulations.

A. pectinatum

Lithophytes; rhizome ascending, short, erect, thick, scaly, covered with leaf bases; scales light-brown, linear-lanceolate, entire, acute at the apex. Fronds pinnate, linear-lanceolate, narrow end; stipes simple, 5-10 cm long, strawmaceous, sparsely scaly, concolorous, linear-lanceolate, entire, acuminate apex; rachis strawmaceous, sparsely scaly, slightly grooved. Lamina simply pinnate, 10-20 x 2-4 cm, narrowly oblong, triangular-lanceolate, glabrous, texture thin, subcoriaceous; pinnae 10-15 pairs, 1.5-4 x 1.0-1.5 cm, broadly lanceolate or subdeltate, oblique, alternate, shortly petiolate, margin irregular, bluntly lobed about half way to the midrib; veins 4-5 pairs, free or forked; costae and costule glabrous. Sori indusiate, large, medial; indusia grey, linear, margin lanceolate. Spores bilateral, monolette, dark-brown, elliptic, 31.5-49.0 x 42-47.5 μm (cf. Khullar, 2000), exine glabrous or sparsely spinulose, wrinkled.


**ECOLOGY:** Grows on heavy rock boulders in moist shady situation along nalas and streams. (950-1200 m altitude). Extremely rare and endangered.

**FERTILE:** July-February.
SPECIMENS EXAMINED: None. On the basis of literature. (cf. Tiwari, 1964) as Athyrium macrocarpum Bedd.

DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Himachal Pradesh, Kashmir-Jammu, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Sikkim, Tamil Nadu, Tripura, Uttaranchal, West Bengal.

Central India: Hoshangabad.


Terrestrial; rhizome short-creeping, thick, scaly; scales golden-brown, ca 4-6 x 0.6-1 mm, linear-lanceolate, entire, acute at the apex. Fronds pinnate, linear-lanceolate, narrow end, 7.5-30 x 2.5-7.5 cm; stipes simple, 3.5-20 cm long, stramineous, densely scaly, concolorous, linear-lanceolate, entire, acuminate apex; rachis stramineous, sparsely scaly, not grooved. Lamina simply pinnate, 9-20 x 3.5-5.0 cm, glabrous, texture herbaceous; pinnae 12-22 pairs, 1.5-3.5 x 0.3-0.8 cm, falcat-ovate, obtuse, alternate, shortly petiolate, margin shalllowly lobed, serrate-dentate, auricled on both the sides, confluen or binnatifid at the apex, glabrous, lower pinnae (2-4) pairs generally reduced, distant, downward deflexed, deeply lobed; veins 10-12 pairs, in groups of 2-3 corresponding to the pinnae lobe; costa and costule glabrous. Sori indusiate, medial, usually in one row each side of the costa of the
Fig 40. *Athyrium falcatum* Bedd.- (a) Habit; (b) Part of fertile pinnae enlarged, showing venation and sori arrangement; (c) Spore; (d) Rhizome scale
pinnae; indusia yellow, straight or 'J' shaped, oblong. Spores bilateral, monolette, light brown, elliptic, 35-45 x 25-30 μm, exine glabrous or sparsely spinulose, wrinkled. (Fig. 40)


ECOLOGY: Abundantly grows on heavy rock boulders in moist shady situation along nalas and streams. (950-1200 m altitude).

FERTILE: July-February.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Shukla, 2909, 2629 (SFRI); Shweta Singh, Kapildhara 58663 (BSA); Bastar, Jain, Bailadilla hills 5222; Shweta Singh, 61092, 610680 (BSA), 58665, 58603 (Sagar Uni.); Bilaspur, Panigrahi, Karbatoputka 19459 (BSA); Chhindwara, Panigrahi, Sanwali 4413 (BSA); Hoshangabad: Pachmarhi, Dixit, Dhupgarh 41219 (BSA); Shweta Singh, Jatashankar 55608, Near Handi Khol 55695, Reechgarh 55745, Little Fall 55661, Pachmarhi Lake 55644, Vanshi Bihar 55680 (BSA); Jagdalpur, Shweta Singh, Kangar Valley National Park 61033, Keshkal 610314 (BSA); Raigarh, Radhakrishnan, Rajpuri Ghat 21309 (BSA); Sidhi: Sanjay National Park-Kanhaiya Dah, Shweta Singh, 58610; Nagdah, 58603 (BSA).

DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Chhattisgarh, Himachal Pradesh, Kashmir-Jammu, Karnataka, Kerela, Madhya Pradesh, Maharashtra, Mizoram, Nagaland, Orissa, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttaranchal.

Central India: Bastar, Hoshangabad.

Fig 41. *Athyrium filix-femina* (L.) Roth - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome scale
Terrestrial; rhizome suberect or ascending, thick, scaly; scales brown, ca 3-4 x 0.4-0.5 mm, linear-lanceolate, entire, acute at the apex. Fronds tufted, 30-100 cm, pinnate, linear-lanceolate, narrow end; stipes simple, 10-20 cm long, stramineous, densely scaly, concolorous, linear-lanceolate, entire, acuminate apex; rachis triangular or furrowed on drying, sparsely scaly, not grooved. Lamina pinnate to pinnatifid, lanceolate, narrow ends, 30-80 x 10-20 cm, dull green, glabrous, texture membranaceous; pinnae 12-22 pairs, 1.5-3.5 x 0.3-0.8 cm, linear-lanceolate, not narrowed at the base; pinnules oblong, at right angles to the rachis, decurrent, serrate margin, acute apex, toothed; veins 10-12 pairs, in groups of 2-3 corresponding to the pinnae lobe; costa and costule glabrous. Sori indusiate, short, oblong. Spores bilateral, monolete, 30-40 x 28-35 μm, light brown, elliptic, exine rugulose. (Fig. 41)

Chromosome number: 2n=80 (cf. Love et al., 1977)

ECOLOGY: Abundantly grows on heavy rock boulders in moist shady situation along nallas and streams. (950-1200 m altitude).

FERTILE: July-September.

SPECIMENS EXAMINED: Bastar, Panigrahi, Bailadilla hills 6983 (BSA); Shweta Singh, Bailadilla hills 58610 (Sagar Uni.), 61154, 611301 (BSA); Hoshangabad: Pachmarhi, Panigrahi, Bori 6500, Dhupgarh 4506A (BSA); Dixit, Jatashankar 41289, Shweta Singh, Reechgarh 55747, Dutche’s Fall 55696, Little Fall 55662, Bee Fall 55681, Tridhara 55729 (BSA); Rajnandgaon, Pant, Khami Nallaha-Bakarkatha 21626 (BSA).


Central India: Bastar, Hoshangabad.

Tufted fern; rhizome short, ascending, thick, apex scaly; scales dark-brown, ca 5-0.5 mm, linear-lanceolate, thick, margin entire, acute at the apex. Fronds pinnate, 15-45 x 1.8-3 cm, oblong-lanceolate, narrow end, acuminate apex; stipes erect, long, 20-40 cm, firm, pale-stramineous, covered with scattered pale narrow scales when young later glabrous, not articulate; rachis stramineous, sparsely scaly, not grooved. Lamina pinnate, 30-60 x 6.0-27.0-cm, ovate-lanceolate, glabrous, texture firm, herbaceous, upper surface glabrous; pinnae 10-20 pairs, 1.2-2.5 cm, upper pinnae alternate, basal opposite to subopposite, shortly petiolate, lanceolate, serrate margin, deeply serrate in young pinnae, strongly thooothed, lower pairs (1-2) gradually reduced, distantx lobes crenate or shortly incisodentate; veins simple or forked, in groups of 5-10; costae sparsely fibrillose and costule glabrous. Sori copious, curved or horseshoe shaped, attached to the veins, indusiate; indusia light-yellow, linear. Spores bilateral, monolete, 30-40 x 50- 55 μm, yellow brown, elliptic, translucent, exine glabrous or sparsely spinulose, wrinkled.


**ECOLOGY:** Grows on heavy rock boulders in moist shady situation along nalas and water streams. (950-1200 m altitude).

**FERTILE:** August-October.

**SPECIMENS EXAMINED:** Balaghat, *Nair*, 18183; Bastar, *Shweta Singh*, Bailadilla hills 61055, 61060, 61053, 61030, 610589 (BSA);

**DISTRIBUTION:** **INDIA**- Chhatishgarh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Madhya Pradesh, Maharashtra, Orissa, Rajasthan, Tamil Nadu.

**Central India:** Bastar, Hoshangabad, Rajnandaon.


Tufted ferns; rhizome short-creeping, thick, scaly at the apex; scales dark brown, deciduous, concolorous, ca 7-1.5 mm, linear-lanceolate, margin smooth, non clathrate. Fronds pinnate, linear-lanceolate, bright green, membranaceous, glabrous, 25-45 x 6-12 cm; stipes simple, 5-20 cm long, stramineous, densely scaly, concolorous, linear-lanceolate, entire, acute apex; rachis stramineous, grooved. Lamina bi-tripinnate, finely dissected, oblong-lanceolate to deltoid-lanceolate, 30-60 cm long, texture herbaceous, membranaceous when dry; pinnae 10-20 pairs, 3.5-8 x 1-2.5 cm, alternate, petiolate, erecto-patent, lanceolate, delicate; pinnules 1.0-1.2 x 0.2-0.4 cm, ovate-oblong, alternate, sessile, symmetrical, margin deeply lobed to costule or becoming pinnate, cut down into narrow oblong ultimate lobes (0.4-0.2 cm), basal lobes largest; veins 3-5 pairs, simple or forked; costae and costule
glabrous, grooved when dry. Sori indusiate, small, oblong, in two rows, slightly curved on the ultimate pinnules or lobes; indusia short oblong, slightly horseshoe shaped or 'J' shaped, thin, light brown, membranaceous. Spores bilateral, monolete, light brown, 38-57 x 27-38 μm, exine glabrous or sparsely spinulose, wrinkled. (Plate 16d)


ECOLOGY: Plants grows on heavy rock boulders in moist shady situation along nalas and streams. (950-1000 m altitude).

FERTILE: July-February.

SPECIMENS EXAMINED: Bastar, Shweta Singh, Bailadilla hills 61078 (BSA); Hoshangabad, Panigrahi, 11391, 11387 (CNH).

DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Bihar, Himachal Pradesh, Kashmir-Jammu, Karnataka, Kerala, Madhya Pradesh, Manipur, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakanchal.

Central India: Bastar, Hoshangabad.


Lithophyte; rhizome long-creeping, thick, apex scaly; scales dark-brown, ca 4-10 x 1-2 mm, lanceolate, thick, entire, acute at the apex. Fronds pinnate, linear-lanceolate, narrow end, 30-40 x
5.5-11 cm; stipes erect, 10-40 cm long, firm, pale-stramineous, covered with scattered scales; rachis stramineous, sparsely scaly, not grooved. Lamina bi to tripinnate, 30-60 x 6.0-27.0-cm, lanceolate, glabrous, texture firm, herbaceous, upper surface glabrous; pinnae 20-22 pairs, 2.5-6.0 x 7.0-15 cm, alternate, shortly petiolate, lanceolate, lower pairs (1-2) gradually reduced, distant; pinnules 10-15 pairs, 0.5-1.1 x 0.2-0.4 cm, quite green, alternate, sessile, linear-lanceolate, symmetrical, margin variable, shallowly to deeply lobed, basal pairs of pinnule the largest; lobes crenate or shortly incisodentate; veins simple or forked, in groups of 5-10; costae sparsely fibrillose and costule glabrous. Sori small in two rows, indusiate, 2-6 pairs to each lobe of the pinnules; indusia light-yellow, 2-6 pairs to each lobe of pinnules, straight or ‘J’ shaped, oblong. Spores bilateral, monolet, dark brown, elliptic, 40-60 x 25-40 μm, translucent, exine glabrous or sparsely spinulose, wrinkled.


ECOLOGY: Plants grows on heavy rock boulders in moist shady situation along nalas and streams. (950-1200 m altitude).

FERTILE: July-February.


Central India: Hoshangabad.
DEPARIA Hook. et Grev.


Type species: Deparia prolifera (Kaulf.) Hook. et Grev., Icones Fil. addend. 1831.

Terrestrial ferns; rhizome short, thick, ascending, scaly or glabrous. Fronds small or large, with articulated hairs; stipes long, fleshy, erect, scaly at the base; scales lanceolate; rachis hairy, grooved. Lamina small or large, pinnate, broadly ovate, herbaceous, glabrous to scaly; veins free, simple or forked. Sori indusiate or exindusiate, single or double, linear, ‘J’ shaped or hippocrepiform, round. Spores brown, bilateral, monolete.


Rhizome widely creeping, thin, scaly; scales dark-brown, ca 4-6 x 1-2 mm, lanceolate, acuminate apex, margin smooth. Fronds bipinnate, 30-45 x 9-15 cm; stipes 10-18 cm, long, stramineous, dark-brown at the base, thick, erect, scaly, hairy; scales brown, small, lanceolate, smooth margin, apex acuminate; rachis sparsely scaly, hairy. Lamina 1-2 pinnate, deltoid-lanceolate, dark-green, hairy, 15-20 x 5-10 cm, texture herbaceous to subcoriaceous; pinnae 7-9 pairs, 3.5-7 x 1.0-1.5 cm, alternate, distant, lower 4-5 petiolate pinnae upper sessile, lanceolate, margin deeply lobed, obtuse; lobes or pinnules many, 0.3-0.5 cm x 0.2-0.3 cm, regular, symmetrical, oblong with rounded apex, margin finely serrate; veins simple or forked, 4-5 pairs; costae and costule sparsely
Fig 42. *Deparia japonica* (Thunb. ex Murray) Kato - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome-scale
scaly, hairy. Sori indusiate, arranged on middle part of veins in each lobe, linear or some hippocrepiform or double; indusia linear, brown, membranaceous, margin wavy to fimbricate or entire. Spores bilateral, monolete, oblong, densely regulate with short irregular folds, 25-45 x 20-35 μm. (Fig. 42; Plate 16e)
ECOLOGY: A rare fern, occasionally met under shady places in rock crevices. (950-1200 m altitude).
FERTILE: July-February.
SPECIMENS EXAMINED: Chhindwara, Panigrahi, Tamiya 4429 (BSA); Hoshangabad: Pachmarhi, Shweta Singh, Little fall 55663, Tridhara 55730 (BSA).
DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Himachal Pradesh, Jammu-Kashmir, Karnataka, Kerala, Madhya Pradesh, Manipur, Meghalaya, Nagaland, Sikkim, Tamil Nadu, Uttarakland.
Central India: Chhindwara, Hoshangabad.
Note: Individuals show great variation in size of lamina, depth of the pinnae cutting or the size, shape and presence of hairs. (cf. Vasudeva & Bir, 1993b).

DIPLAZIUM Sw.
(The twin-sours fern)

Terrestrial ferns; rhizome thick, erect to rarely creeping, scaly. Fronds tufted, large; stipes stout, erect or tailing, scaly at the base or throughout; scales linear-lanceolate. Lamina large, pinnate to pinnatifid, herbaceous to subcoriaceous, glabrous to
scaly; veins free, forked, sometime anastomosing without included veinlet. Sori indusiate, elongated or short, dorsally arranged on the veins, linear and at least few diplozoid veinlets. Spores brown, bilateral, monolete.


Large fern; rhizome erect or creeping, branched but erect, roots occasionally budding to form new plants in group, densely scaly at apex; scales dark-brown, ca 4-8 x 0.8-1 mm, linear-lanceolate or lanceolate, acuminated apex, margin toothed, ciliate with papillae. Fronds bipinnate, 60-150 cm; stipes 10-40 cm, long, stramineous, strong, erect, tufted, pale, slightly scaly at the base, glabrous at above; rachis pubescent. Lamina 1-2 pinnate, size variable, dark-green, glabrous, 35-85 x 15-25 cm, bipinnate at the base, simple pinnate at the apex, ovate-lanceolate, texture herbaceous to subcoriaceous; pinnate type pinnae 8-12 pairs, 12-22 x 4-10 cm, alternate, distant, subsessile, margin serrate, basal pairs of pinnae (2-3) the largest, lowest pinnae distant and simple, basioscopic pinnules well developed, free, ovate, lanceolate; simple type pinnae 7.5-12 x 1.5-2.5 cm, serrate margin; pinnules 3.0-6.0 x 0.6-0.9 cm, alternate, distant, subsessile, apex obtuse-acuminate, margin ± deeply lobed, base narrowed; veins fine,
Fig 43. *Diplazium esculentum* (Retz.) Sw. - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome scale
distinct, forked, numerous, copiously branched, 5-6 pairs obliquely veinlets, of which 2-3 meet in an included intermediate, excurrent vein leading towards sinus between adjacent lobes; costae and coatules scantly scaly. Sori indusiate, arranged on veinlets in each lobe, many basal acroscopic, diplozoid; indusia linear, membranaceous, margin wavy to fimbriate or entire. Spores bilateral, monolete, oblong, densely regulate with short irregular folds, 30-46 x 15-30 μm. (Fig. 43; Plate 16c)


ECOLOGY: A larger sized fern exceedingly abundant on the gravelly soil, growing in pure formation and covering large areas in exposed places along the water stream. (950-1200 m altitude).

FERTILE: July-February.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Shweta Singh, Kapildhara 58653 (BSA); Bastar, Shweta Singh, Bailadilla hills 58608, 58653 (Sagar Uni.), 61021 (BSA); Bilaspur: Panigrahi, 8909 (BSA); Chhindwara: Shweta Singh, Tamiya 58657, Patalkot 586080 (BSA); Hoshangabad: Pachmarhi, Shweta Singh Jatashankar 55609, Near Handi Kho 55696, Reeachgarh 55748, Dhpargarh 55829, Chhote Mahadev 55849 (BSA); Jagdalpur, Shweta Singh, Kangar Valley National Park 61019 (BSA); Keshkal 61038 (BSA); Sidhi: Sanjay National Park-Kanhaiya Dah, Shweta Singh, 58608, 58483 (BSA).

DISTRIBUTION: INDIA - Assam, Arunachal Pradesh, Chhattishgarh, Himachal Pradesh, Jammu-Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Nagaland, Orissa, Rajasthan, Sikkim, Tamil Nadu, Uttar Pradesh, Uttarakhand, West Bengal.

Central India: Anuppur, Bastar, Bilaspur, Betul, Chhindwara, Jagdalpur, Hoshangabad, Sidhi.
**DRYOATHYRIUM** Ching


Terrestrial ferns; rhizome rather short or ascending to erect, with or without scales. Fronds bi to tripinnatifid; stipes long, scaly at the base or throughout. Lamina large, pinnate to deeply pinnatifid, winged, herbaceous to subcoriaceous, glabrous to scaly; veins free, 1-3 forked. Sori indusiate, rounded. Spores brown, bilateral, monolete.


Large size fern; rhizome short, erect to ascending, densely scaly at apex; scales dull-brown, up to 10-4 mm, oblong-lanceolate, hair pointed, entire. Fronds bipinnate, 100-210 cm; stipes 80-100 cm, long, light brown, strong, erect, tufted, ± scaly at the base, hairy throughout; rachis hairy. Lamina ample, 90-100 cm long, pinnate, dark-green, broadly ovate, deeply tripinnatifid, texture herbaceous; primary pinnae numerous, 27-40 x 8-16 cm, alternate, distant, petiolate, ascending, lower pairs ± reduced, lance late apex acuminate, base truncate; pinnules up to 10 pairs,
6.0-8.5 x 1.5-2.5 cm, alternate, petiolate, lax; veins fine, numerous, slightly distinct at lower surface, forked 1-2 times, not retching at the margin. Sori indusiate, medial, rounded, brown, arranged in single row on each side of the midrib; indusia thin, reniform, small, lacerated margins, fugacious at the early stage. Spores bilateral, monolete, oval to ± spherical, dark-brown, papillate, 30-57 x 27-42 μm.


ECOLOGY: Extremely rare, large sized fern grows in moist and shady places along the water stream. (950-2200 m altitude).

FERTILE: July-February.


DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Chhatishgarh, Himachal Pradesh, Jammu-Kashmir, Karnataka, Kerala, Madhya Pradesh, Nagaland, Sikkim, Tamil Nadu, Uttaranchal.

Central India: Hoshangabad.

30. HYPODEMATIACEAE Ching


Type genus: Hypodematum (Forssk.) Kunze, Fl. 16: 690. 1833.

Xerophytes, terrestrial; rhizome short or creeping, scaly; fronds typically arranged in two rows on the dorsal side of the rhizome, close; stipe clustered, reddish brown, large, soft, persistent, hairy, stipe higher up confluent with a 'V' shaped; rachis grooved. Lamina bi-tripinnatifid, hairy. Veins all free,
forked. Sori indusiate, moderately large, rounded or reniform, hairy.

A monotypic family comprising four species throughout the world flora, of which single species including subspecies have been reported from India. Single species has been reported from Central India.

**HYPODEMATIUM** (Forssk.) Kunze

**Hypodematum** (Forssk.) Kunze, Fl. 16: 690. 1833.

**Type species:** *Hypodematum crenatum* (Forssk.) Kuhn, v. Deck.

  Reis. Bot. 3: 37. 1879.

Xerophytes, terrestrial; rhizome short or creeping, densely scaly; fronds 2-3 pinnate, close, pubescent, deltoid-ovate; stipe swollen at the base, reddish brown, large, soft, persistent, hairy, ± joined at the apex; rachis grooved. Lamina bi-tripinnatifid, decompound with ultimate pinnae, hairy, texture herbaceous, thin. Veins all free, forked, Sori indusiate, dorsally arranged on the veins, moderately large, rounded or reniform, hairy. Spores bilateral, monolet oblong-rounded, dark-brown, exine wrinkled.


Terrestrial; rhizome creeping, scaly; scales bright golden-red, deciduous, concolorous, large, ca 2 x 0.3 cm, linear-lanceolate, apex long acuminate, unicellular papillate glandular hairs, entire. Fronds approximate, 40-50 cm long; stipes simple, 25-30 cm long, stramineous, straw coloured, glossy, scaly at the base; scales lanceolate, golden; rachis grooved on upper side, densely hairy. Lamina simply pinnate to 3-4 pinnatifid, 22-25 cm, pale green, hairy, deltoid, texture thin, herbaceous; pinnae 5-10 pairs, 15-20 x 6.5-8 cm, lanceolate-deltoid, alternate, petiolate, lowest pinnae largest and much deltoid; pinnules 10 pairs or more, 2-5 x 0.8-3.0 cm, ovate-lanceolate, close, often imbricate with oblong pinnatifid segment of obtuse ultimate lobes, apex blunt, margin deeply lobed oblong, rounded; veins 5-6 pairs, free or forked, distinct, hairy, reaching to margins; costae and costule hairy. Sori indusiate, large, rounded, numerous, dorsal on superior veinlets; indusia brown, large, reniform, densely hairy. Spores bilateral, monolette, dark-brown, elliptic, 34-53 x 19-34 μm, exine smooth, wrinkled with few folds. (cf. Vasudeva & Bir, 1993b). (Plate 17a)


ECOLOGY: Extremely rare, xerophytic fern growing in the crevices of dry exposed rocks and boulders in deep valleys. (950-1200 m altitude).

FERTILE: July-February.

SPECIMENS EXAMINED: Bastar, Shueta Singh, Bailadilla hills 61161 (BSA); Hoshangabad: Pachmarhi, Panigrahi, Bori 6483; Shueta Singh, Dutche’s fall 58580 (BSA).

DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Bihar, Himachal Pradesh, Kashmir-Jammu, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Rajasthan, Sikkim, Tamil Nadu, Uttarakanchal.

Central India: Bastar, Hoshangabad.
31. DRYOPTERIDACEAE Ching

Type genus: Dryopteris Adan, Fam. Des Plan. 2: 20. 1763
nom.cons.

Terrestrial; rhizome erect rarely creeping, scaly; fronds bipinnatifid to decompound, glabrous; stipe tufted, elongated, scaly. Lamina compound, pinnation variable, texture firm, glabrous. Veins all free, forked, vein-ends clavate, almost reaching to margin. Sori indusiate, rarely exindusiate, dorsal, superficial on veins; indusium reniform, hairy.

The family comprising 20 genera throughout the world flora, of which 7 genera and 190 more than species including 8 verities, 3 subspecies and 12 hybrids have been reported from India. 4 genera and 5 species have been reported from Central India.

Key to the genera

1a. Veins anastomosing, 1-3 free veinlets; sori many, arranged irregularly on the pinnae.

   Cyrtomium

1b. Veins not anastomosing, free; sori few, arranged in one row on the each side of the costae.

   Arachniodes

2a. Pinnules strongly auricled, auricles ± acute, tip with a long single spinose toothed; indusia orbicular.

   Polystichum

2b. Pinnules not or rounded auricled, tip with numerous spinose teeth; indusia reniform.
**Dryopteris**

**ARACHNOIDES** Blume


**Type species:** *Arachnoides aspidioides* Bl., Enum. Pl. Javae. 2: 241. 1828.

Terrestrial; rhizome creeping, scaly; fronds pinnately compound; stipe rarely hairy, scaly and fibrillose at the apex; rachis grooved. Lamina bi-tripinnatifid, never pinnate, broadly deltate-pentagonal, ultimate lobe terminating in a single spine-like tooth, hairy, texture coriaceous. Veins all free, forked. Sori indusiate, dorsally arranged in a single row on each side of the costae; indusia reniform or circular, hairy. Spores bilateral, monolete.


Lithophytes; rhizome long-reeeping, scaly; scales paleaceous dark-dark, up to 8 x 1 mm, lanceolate, hair pointed, entire. Fronds bipinnate, 35-74 x 13-22 cm, distant; stipes simple, 10-30 cm long, scaly at only base, brown, scattered, above glabrous; rachis scaly. Lamina bipinnate throughout except apex, oblong-ovate,
texture submembranaceous, glabrous; pinnae 8-10 pairs, 7-14 x 2-3 cm, not decreasing to the apex, 30-40 x 15-25 cm, staked, acuminate, basal pinnae ± larger, apical pinnae ± lateral pinnae; pinnules sub-rhomboidal, 1-1.5 x 0.5-0.8 cm, lobes ½ way to the costae, lobes terminate in to long bristle, staked, posterior margin cut away, anterior base truncate, margin spinulose-serrate or toothed, basioscopic pinnule enlarged; veins free or forked. Sori indusiate, submarginal; indusia brown, orbicular or circular with sinus. Spores monolete, bilateral, oblong, exine light brown, smooth, much wrinkled into subconical lobes, 30-46 x 23-30 μm. (cf. Vasudeva & Bir, 1993b).

Chromosome number: 2n=164 (cf. Love et al., 1977).

**ECOLOGY:** Extremely rare, grows in the rock crevices and boulders in moist place along the stream. (950-1200 m altitude).

**FERTILE:** July-February.

**SPECIMENS EXAMINED:** None. On the basis of the literature. (cf. Dixit, 1993; Chandra, 2000)

**DISTRIBUTION:** INDIA- Throughout India in the hilly regions.

**Central India:** Hoshangabad.

**CYRTOMIUM** Presl

**Cyrtomium** Presl, Tent. Pterid. 84. t. 2. f. 19. 1836.

**Type species:** *Cyrtomium falcatum* (L. fil.) Presl, Tent. Pterid. 86: 1836.

Terrestrial; rhizome short, erect, densely scaly; fronds imparipinnate or with pinntiid apex; stipe scaly and fibrillose at the apex; rachis grooved. Lamina pinnate, glabrous, often with basal acrososcopic auricle, texture coriaceous. Veins anastomosing,
forming areoles. Sori indusiate, irregularly scattered on the dorsal surface. Spores bilateral, monolete, tuberculate.


English name: Holy fern

Rhizome erect, short, thick, covered with scales and persistent leaf bases; scales brown, concolorous, large, ca 0.5-1 cm, lanceolate with long marginal filamentous projections, apex acute. Fronds 20-50 x 10-20 cm broad; stipes 12-15 x 0.3-0.4 cm, stramineous, thick and scaly fibrillose; scales brown, ± lanceolate, concolorous, large, marginal filamentous projections, apex acute; rachis fibrillose. Lamina pinnae, 18-45 x 8-20 cm, lanceolate, texture thick, coriaceous, lower surface glaucous-green, misroscales present, small, light-brown fibrillose (visible with lens), upper surface dark-green glossy, glabrous; pinnae 8-10 pairs, large, 6-8 x 1.6-3 cm, alternate, shortly stalked, oblong-lanceolate, slightly falcate on acrosopic side, basiscopscopic margin round at base, margin lobato-serrate or even doubly serrate, terminal pinnae strongly auricled on both sides; veins not visible, much reticulated, veinlets arching, anastomosing usually with inwardly directed vein-lets, areolae hexagonal, costal areolae with a single soriferous, free veinlets, vein-ends clavate. Sori numerous, indusiate, large, rounded, scattered; indusia light-brown, circular,


ECOLOGY: Usually grows in deep shady places in dark ravines near water stream. (950-1000 m altitude).

FERTILE: March-October.

SPECIMENS EXAMINED: Bastar, Nair, Bailadilla hills, 2778 (CAL); Jabalpur: Novratanbagh 68, 22.3.55, (SFRI).

DISTRIBUTION: INDIA- Chhattishgarh, Kashmir, Madhya Pradesh, Meghalaya, Tamil Nadu and Uttaranchal.

Central India: Jabalpur.

DRYOPTERIS Adanson


Type species: Dryopteris filix-mas (L.) Sch., Gen. Fil. ad. t. 9. 1834.

Terrestrial; rhizome short-suberect or erect, thick, densely scaly; fronds tufted, bi-tripinnately compound; stipe tufted, elongated, scaly at the base; rachis grooved. Lamina bi-tripinnatifid, never pinnate, broadly ovate-oblong-lanceolate, glabrous, texture coriaceous. Veins all free, forked. Sori indusiate, large, rounded. Spores bilateral, monolete.

Key to the species

1a. Lamina dimorphic, fertile much contracted.
   D. cochleata

1b. Lamina monomorphic, fertile not ± contracted.
   D. sparsa

Local name: *Jatashankari*

Lithophytes; rhizome long-creeping, thick, scaly; scales light-brown, ca 5-10 x 0.5-2 mm, lanceolate, membranaceous, translucent, apex acuminate, margin with toothed or glandular outgrowth. Fronds dimorphic, 38-78 x 14-22 cm, bipinnate, truncate base, oblong-lanceolate; stipes simple, 15-30 cm long, shinning, stramineous, scaly at only base, thick; scales brown, linear-lanceolate, hair pointed; rachis glabrous. Sterile lamina 15-45 x 10-25 cm, bipinnatifid, texture herbaceous to subcoriaceous, upper surface glossy, lower glabrous; pinnae 20-22 pairs, 9-10 x 2.5-3 cm, alternate, subsessile, oblong-anceolate, margins deeply lobed; pinnules 18-22 pairs, 1.5-2.5 x 0.5-0.8 cm, lanceolate, margins denticulate or serrate, glarous; fertile lamina 10-35 x 10-20 cm, erect, bipinnate, narrowed lanceolate; pinnae 10 or more pairs, 3-5 x 1.5-2.0 cm, subopposite or alternate, petiolate, triangular-lanceolate, margin deeply lobed; pinnules 8-10 pairs, 0.4-0.8 x 0.2-0.3 cm, ± to sterile pinnules but narrowed and more coriaceous; veins distinct, 9-10 pairs, not to margin; costae and costule stramineous. Sori indusiate, 5-7 pairs arranged in single rows on the lower surface, horse-shoe shaped, large, markedly crowded, medial, rounded, 5-7 pairs; indusia pale-brown,
Fig 44. *Dryopteris cochleata* (Buch.-Ham. ex D. Don) C. Chr. - (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome scale
reniform, smooth. Spores monoelote, bilateral, oval to round, brown, perine granulose with zig-zag folds, 35-60 x 22-30 μm. (Fig. 44)

Chromosome number: Diploid sexual, n=41 (cf. Love et al., 1977).

ECOLOGY: Common, grows in shady places on forest slopes and forest floor. (950-1000 m altitude).

FERTILE: March-October.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Shweta Singh, Kapildhara 58672, Lakhshnamdhara 58679, Shambhudhara, 58676, 58690, Panchdhara 58672 (BSA); Amarkantak, Saxena Amodob 3860; Khotele, Dudhdhara 5140 (SFRI); Bastar, Nair, Bailadilla hills 18532, (BSA); Shweta Singh, 53509, 69926 Bailadilla (Sagar Uni.), 61084, 61093, 68391 (BSA); Bilaspur, Arora, Jashpur Nagar 7663, (BSA); Chhindwara, Panigrahi, Tamiya 4588 (BSA); Shweta Singh, Tamiya 58691 (Sagar Uni.); Shweta Singh, Patalkot 58545 (Sagar Uni.); Hoshangabad: Pachmarhi, Panigrahi, 6636, 4583 (BSA); Shweta Singh, Jatashankar 55610, Dutche's Fall 55799, Rajatprapat 55979, Tridhara, 55731 (BSA); Jagdalpur, Jain, Yerumwal 5347 (BSA); Raigarh, Radhakrishnan, 19855 (BSA); Sidhi: Sanjay National Park-Kanhaiya Dah, Shweta Singh, 58509, 58482 (BSA); Sidhi: Sanjay National Park-Kanhaiya Dah, Shweta Singh, 58508 (Sagar Uni.).

DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Chhattisgarh, Himachal Pradesh, Karnataka, Kerela, Madhya Pradesh, Maharashtra, Mizoram, Nagaland, Orissa, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttaranchal.

Central India: Bastar, Hoshangabad.

120. Dryopteris sparsa (Buch.-Ham. ex D. Don) O. Ktze., Rev. Gen. Pl. 2: 813. 1891; Dixit, Cens. Indian Pterid. 154. 1984; Verma et al. in Fl. Madhya Pradesh I: 95. 1993; Vasudeva & Bir,
Lithophytes; rhizome short-creeping, suberect, thick, scaly; scales golden-reddish brown, up to 8 x 4 mm, ovate-lanceolate, margin subentire, apex acute. Fronds decmpound, 28-58 x 10-16 cm, 2-3 pinnate; stipes erect, tufted, up to 15 cm, long, scaly at only base, stramineous, light brown-purple at the base; scales ovate, brown, thin; rachis scaly at the base only. Lamina bipinnatifid, elongated, 35-60 x 15-25 cm, deltoid, triangular-lanceolate, texture herbaceous to subcoriaceous, glabrous, bright green; pinnae 8-10 pairs, 5-10 x 2-4 cm, alternate, petiolate, deltoid, lowest pinnae the largest; pinnules 4-8 pairs, 1-1.5 x 0.4-0.8 cm, alternate, petiolate, oblique-cuneate on the basiscopic side, auricled on the acroscopic side, apex acute, margin serrate; ultimate segment oblong or trapezoidal, serrate; veins slightly, distinct, free, forked, 5-8 pairs; costae and costule glabrous. Sori medial, indusiate, 3-7 pairs arranged in single row on the lower surface, horse-shoe shaped, large, markedly small, not in two rows, rounded; indusia deciduous, pale-brown, reniform, smooth. Spores monoolete, bilateral, oval to round, dark-brown, perine smooth or wrinkled, 36-60 x 20-45 μm. (cf. Vasudeva & Bir, 1993b).

Chromosome number: Diploid sexual, n=41 (cf. Love et al., 1977).

ECOLOGY: Usually grows in moist and shady places on forest slopes and forest floor. (800-950 m altitude).

FERTILE: February-November.
SPECIMENS EXAMINED: Bastar, Panigarhi, Bailadilla hills 6957 (BSA); 1082 (CNH); Shweta Singh, Bailadilla hills 61103, 61104, 61117, 68607, 68687 (BSA); Chhindwara: Panigrahi, Tamiya 4438 (BSA); Hoshangabad: Pachmarhi, Panigarhi, Dhupgarh 6676, Little Fall 6629 (BSA); Dhupgarh 6675 (CAL); Dixit, Handi Khoh 41324; Shweta Singh, Jatashankar 55611, Dhupgarh 55830, Reeachgarh 55749, Dutche’s Fall 55800, Little Fall 55665 (BSA).

DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Chhattisgarh, Himachal Pradesh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Mizoram, Nagaland, Orissa, Rajasthan, Sikkim, Tamil Nadu, Tripura, Uttarakhand.

Central India: Bastar, Hoshangabad.

POLYSTICHUM Roth.

Polystichum Roth, Tent. Fl. Germ. 3: 31. 69. 1799 nom. cons.

Type species: Polystichum lonchitis (L.) Roth, Rom. Mag. 2: 106. 1799.

Terrestrial; rhizome short-suberect or erect, thick, densely scaly; fronds tufted, bi-tripinnately to compound; stipe tufted, more-less scaly; rachis scaly. Lamina pinnate to bipinnate, lanceolate- ± narrowly triangular, ovate-lanceolate, margin spinulose serrate, texture coriaceous. Veins all free, forked. Sori indusiate or exindusiate, large, rounded. Spores bilateral, monolette.

121. Polystichum harpophyllum (Zenk. ex Kze.) Sledge, Bot. J. Linn. Soc. 84: 7. 19. 1982; Chandra, Ferns India. 201. 2000. Polystichum auriculatum sensu Bedd., Ferns South. India t. 120. 1867. Aspidium auriculatum var. normalis Hook., Sp. Fil. 5:

Lithophytes; rhizome oblique, stout-erect or suberect, short, scaly; scales light-brown, up to 7 x 2 mm, oblong-lanceolate, apex acuminate, margin with thread like outgrowth. Fronds pinnate, 30-40 x 5-10 cm; stipes tufted, 10-15 cm long, scaly at the base or throughout, stramineous, brown; rachis sparsely scaly. Lamina 15-50 x 3-6 cm, oblong-lanceolate, apex acuminate, bipinnatifid, not or only slightly attenuated at base, texture subcoriaceous, base truncate, dark-green; pinnae numerous, subsessile, ± variation in size, 5-7.5 cm, narrowly oblong, falcate, base auricle, apex acute, acrosopic base auricled and basioscopic base slightly cuneate, upper margin serrate, lower margin entire; veins distinct, free, forked 2 times, veinslets in groups of three. Sori indusiate, arranged in two rows, small, indusiate, sub-medial, rounded, membranaceous, very fugacious (detected only in very young fronds). Spores monolette, bilateral, spherical, dark-brown, densely granulose with zig-zag folds.

Chromosome number: 2n=82 (cf. Love et al., 1977).

**ECOLOGY:** Rare, rows in deep shady places along the water stream. (950-1000 m altitude).

**FERTILE:** February-October.

**SPECIMENS EXAMINED:** Anuppur: Amarkantak, Saxena, 3521 (SFRI); On the basis of literature. (cf. Singh & Roy, 1969; Chandra, 2000).

**DISTRIBUTION:** INDIA- Assam, Arunachal Pradesh, Kerala, Madhya Pradesh, Uttaranchal.

**Central India:** Anuppur, Hoshangabad.

**Note:** The species is earlier reported as *Polystichum auriculatum* (L.) Presl., several forms or varieties are recovered from India, but
only from Central India and South India. In India only typical forms are reported. (cf. Singh & Roy, 1969; Vasudeva & Bir, 1993b).

32. **TECTARIACEAE** Panigrahi


Terrestrial; rhizome short ascending or creeping, scaly; fronds usually uniform or bipinnatifid to decompound, glabrous; stipe tufted, elongated, scaly. Lamina simple or pinnately compound, pinnation variable, texture firm, glabrous. Veins all free, forked, vein anstomosing with free branched veinlets running all the directions. Sori indusiate, dorsal, superficial on veins; indusium reniform, hairy.

The family comprising more than 15 genera throughout the world flora, of which 8 genera and more than 62 species including 2 verities and 1 hybrid have been reported from India. 2 genera and 3 species have been reported from Central India.

**Key to the genera**

1a. Lamina subcoriaceous, never finely dissected, pinnae and pinnules with an evaluated tooth on the dorsal surface.
   
   *Pleocnemia*

1b. Lamina thin, never finely dissected, pinnae and pinnules commonly entire.
   
   *Tectaria*
**PLEOCNEMIA** Presl

**Pleocnemia** Presl, Tent. Pterid. 183. 1836.

**Type species:** *Pleocnemia leuzeana* (Gaud.) Presl, Tent. Pterid. 184. 1836.

Terrestrial; rhizome short-creeping, scaly; fronds bi-tripinnatifid; stipe tufted, more-less scaly; rachis scaly. Lamina basal pinnate much larger than the rest, texture subcoriaceous. Veins anastomosing or free, forked, hairy. Sori indusiate or exindusiate, large, rounded. Spores bilateral, monolete.


Lithophytes; rhizome large, subbarborescent, apex densely scaly; scales deep-brown, lanceolate, apex acuminate. Fronds up to 180 cm long; stipes stout, 60-90 cm long, abaxially rounded, stramineous, dark-brown, shortly hirsute, not scaly; rachis similar to stripe. Lamina 90-120cm, bi-tripinate, subdeltoid, deeply pinnatifid, apex acuminate, texture subcoriaceous; pinnae up to 15 pairs, alternate to subopposite, petiolate, basal pairs largest, 1-2 accessory branches on the basal basioscopic side, 30-45 x 15-22 cm, oblong-lanceolate, apex acuminate; pinnules up to 20 pairs, alternate, petiolate, largest pinnule 8-10 x 1-2.5 cm, oblanceolate, apex acuminate, base truncate; lobes 0.6 cm, oblong, oblique, apex acute, margins denticulate; veins anastomosing or free and excurrent; costae and costule hairy. Sori copious, indusiate, medial in single row, small, indusiate, hairy. Spores
monolete, bilateral, globose, dark-brown, perine loose, wrinkled into lobate folds. (cf. Vasudeva & Bir, 1993b). (Plate 17b)

Chromosome number: Not known.

ECOLOGY: Rare, rows in deep shady places along the water stream. (950-1000 m altitude).

FERTILE: October-December.

SPECIMENS EXAMINED: Chhindwara, Panigrahi, Tamiya 4472 (BSA).

DISTRIBUTION: INDIA: Assam, Arunachal Pradesh, Kerala, Madhya Pradesh, Sikkim, Uttaranchal, West Bengal.

Central India: Chhindwara, Hoshangabad.


TECTARIA Cav. Blune


Type species: Tectaria trifoliata (L.) Cav., Descr. 249. 1802.

Terrestrial moderate to large; rhizome erect or short-creeping, stout scaly; fronds clustered, ± variable in size, pinnate; stipe tufted, scaly, dark-brown; rachis grooved. Lamina simple or bi-tripinnatifid, never dissected, broadly at base, surface glabrous to hairy, texture thin but firm. Veins variously anastomosing forming areoles enclosing free or forked veinlets. Sori indusiate, rounded or oval; indusia peltate. Spores bilateral, monolete.
Key to the species

1a. Rhizome creeping, stipe pale castaneous; lamina hairy.

   \textit{T. coadunata}

1b. Rhizome sub-erect, stipe, dark-brown at the base; lamina glabrous.

   \textit{T. polymorpha}


Lithophytes; rhizome short-creeping, scaly; scales dark-brown, large, ca 8-2 mm, ovate-lanceolate, margin with short projections, apex acuminate. Fronds bipinnate, 35-70 × 12-20 cm, thick, erect, distant; stipes slender, 15-40 cm long, glossy, glabrous, chest-brown; rachis hairy. Lamina bi-tripinnatifid, deltoid, 65-152 cm, hairy on both the surfaces, broadly oblong-ovate, apex acute, cordate at the base, texture herbaceous to membranaceous; pinnae 3-5 pairs, 6-15 × 1.5-3 cm, opposite, sessile or short petiolate, deltate-lanceolate or oblong, basal pinnae larger than others, lobed to the costae, lowest pinnae the largest one; pinnules (lobes) oblong, basioscopic lobes of lowest pinnae the largest lobes, apex acute and free; veins anastomosing to form
areolae including simple or forked veinlets, hairy, distinct below. Sori indusiate, submarginal, scattered, persistent, dense or more frequently on the terminal veins; indusia dark-brown, glabrous, reniform ± orbicular. Spores monoolete, bilateral, oblong, exine light brown, smooth, perine much wrinkled into or irregularly folds, 28-47 x 22-30 μm. (Plate 17c; Plate 18f)

Chromosome number: n=41 (cf. Love et al., 1977).

ECOLOGY: Common, grows in the rock crevices, boulders in moist place and along the stream. (700-1000 m altitude).

FERTILE: May-December.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Shweta Singh Kapildhara 58660, Sonmura 58662, Mai ki bagia, 58658, 58656, Shambhudhara, 58689 (BSA); Saxena, Kapildhara 3846, 4606 (SRFR); Bastar, Shweta Singh, Bailadilla hills 58662, 58502, 58660, 58530, 58689 (Sagar Uni.), 61070, 610622 (BSA); Chhindwara, Panigarhi, Tamiya 4588 (BSA); Shweta Singh, 58888, 58621, 68609, 58679 Patalkot; 688090, 686991, 58658, 58616, 58649 Tamiya (BSA); Hoshangabad, Panigrahi, Pachmarhi 6636 (BSA); Shweta Singh, Jatashankar 55612, Near Handi Khol 55697, Dhupgarh 55831, Dutche’s Fall 55801 (BSA); Jagdadpur, Shweta Singh, Kangar Valley National park 61062, 61067 (BSA); Sidhi: Sanjay National Park-Kanhaiya Dah, Shweta Singh, 58609, 58604; Kurchughati, 58481 (BSA).

DISTRIBUTION: INDIA- Throughout India in the hilly regions.

Central India: Throughout the Chhattishgarh and Madhya Pradesh.

Note: The species is earlier reported as Tectaria macrodonta (Fée) C. Chr. (cf. Vasudeva & Bir, 1993b).


Lithophytes; rhizome short-erect, scaly; scales dark-brown, linear. Fronds pinnate, 20-100 cm; stipes slender, tufted, 50-60 cm, scaly at the base, glossy, above glabrous, yellowish-brown; rachis similar to stipe. Lamina pinnate, 40-70 cm, deltate-lanceolate, texture herbaceous; pinnae 3-6 pairs, 12-18 x 1.5-3 cm, opposite, sessile or short petiolate, apical pinnae ± similar to lateral pinnae and terminal pinnae, oblong or elliptic, tapering at both the ends, apex acuminate, margin ± toothed, basal pair of pinnae bifurcated; veins irregularly anastomosing to form areolae including simple or forked veinlets, hairy, distinct below. Sori indusiate, numerous, scattered dorsally on the connecting veins or usually between the main vein; indusia dark-brown, glabrous, reniform ± orbicular, fugacious. Spores monolette, bilateral, oval, hyaline, yellow, exine smooth. (Plate 17d)

Chromosome number: 2n=80 (cf. Love et al., 1977).

ECOLOGY: Rare, grows in the rock crevices, boulders in moist place and along the stream. (700-1000 m altitude).

FERTILE: May-December.

SPECIMENS EXAMINED: Bastar, Panigrahi, Bailadilla hills 1068, (CAL).

DISTRIBUTION: INDIA- Throughout India in the hilly regions.

Central India: Throughout the Chhattishgarh and Madhya Pradesh.
Lamoriopsidaceae Alston, Taxon 5: 25, 1956.

Type genus: Bolbitis Schott, Gen. Fil. t. 14. 1834.

Terrestrial; rhizome creeping or high climbing, scaly; fronds simple or simply pinnate. Fertile lamina reduced in size. Veins all free, forked ending in hydathodes. Sori acrostichoidly distributed.

The family comprising 8 genera throughout the world flora, of which 3 genera, 22 species including 4 verities and 2 hybrids have been reported from India. 2 genus and 3 species have been reported from Central India.

The two genera, namely Egenolfia Schott, and Bolbitis Schott, both occur in Central India and because of their distinct habit, fronds, venation pattern, type and position of veins, Ching (1978) and Pichi Sermoli (1977) treated them as two different genera.

Key to the genera

1a. Veins anastomosing.

Bolbitis

1b. Veins free.

Egenolfia

Bolbitis Schott


Type species: Bolbitis serratifolia (Mart. ex Kaulf.) Schott, Gen. Fil. 3: t. 14. 1834.
Terrestrial or lithophytes; rhizome short or long-creeping, densely scaly; fronds dimorphic, close together; stipe tufted, articulate to rhizome, erect, ± scaly; rachis similar to stipe. Lamina pinnate, rarely simple, texture herbaceous to coriaceous, terminal pinnae with proliferating vegetative buds. Veins free or anastomosing, number of areoles with or without veinlets. Sori oblong-rounded, dark-brown, exine wrinkled.


Terrestrial; rhizome short-creeping, thick, scaly; scales brown, linear-lanceolate, somewhat clathrate, margin entire, apex acuminate. Fronds dimorphic; stipes simple, longer in fertile lamina, 30-45 cm long, scaly at the base; scales brown, concolorous, lanceolate, margin entire, apex acuminate; rachis scaly. Sterile lamina simply pinnate, 20-45 x 6-20 cm, lanceolate, producing vegetative buds, texture herbaceous to subcoriaceous, glabrous; pinnae 10 or more pairs, pinnae 4-18 x 1-2.5 cm, subopposite to alternate, linear-lanceolate, subsessile, apex acuminate, base oblique, margin entire at the base, crenate towards the apex; terminal pinnae smaller to lateral pinnae, 20 x 1.0 cm, margin lobed towards base, crenate at the terminal position, producing vegetative buds; veins 4-6 pairs, few end freely while others unite with the next loop, 3-4 loops between costae and margin, glabrous. Fertile lamina up to 15 x 4 cm; pinnae 3-7 x 1-1.5 cm, alternate, sessile, margin strongly recurved covering the
ECOLOGY: Rare, grows in moist-shady places in deep valleys. (950-1200 m altitude).
FERTILE: October-December.
DISTRIBUTION: INDIA: Assam, Kerala, Madhya Pradesh, Meghalaya, Orissa, Sikkim, Uttaranchal.
Central India: Hoshangabad.
Note: The species is earlier reported as Gymnopteris contaminans Wall., from Central India (Pachmarhi). (cf. Tiwari, 1964).

EGENOLFIA Schott

Egenolfia Schott, Gen. Fil. t. 16. 1834.
Type species: Egenolfia hamiltoniana schott, Gen. Fil. t. 16. 1834.
Terrestrial; rhizome short-creeping, densely scaly; fronds dimorphic, close together; stipe stramineous, ± scaly; rachis similar to stipe. Lamina simply pinnate, texture herbaceous to coriaceous, terminal pinnae with proliferating vegetative buds. Veins free, forked. Sori exinusiate. Spores bilateral, monolete.


Terrestrial; rhizome short-creeping, thick, scaly; scales brown, ca 3-5 x 0.8-1mm, clathrate, ovate-lanceolate, narrow, clathrate, lanceolate, margin with some glandular hairs, apex acuminate. Fronds dimorphic; stipes simple, 15-28 cm long, scaly at the base, glabrous above, dark-green; scales brown, concolorous, lanceolate, margins entire, apex acuminate; rachis scaly. Sterile lamina simply pinnate, 39-44 x 7-17 cm, oblong-lanceolate, producing vegetative buds, viviparous at the apex, texture herbaceous to subcoriaceous, glabrous; pinnae 20-25 pairs, pinnae 4-18 x 1-2.5 cm, subopposite to alternate, oblong-lanceolate, subsessile, apex acuminate, base truncate and auricled, oblique, margin crenate or shallowly lobed, pointed bristles borne from the base of each sinus, lower pinnae reduced. Fertile lamina 40-35 x 6-9 cm, much contracted, pinnate, hairy, longer than sterile one; pinnae 4-9 x 0.5-0.8 cm, oblong, apex rounded, base subtrunacte, margin crenate; veins pinnate, free, raised on both the surfaces. Fertile lamina up to 15 x 4 cm; pinnae 3-7 x 1-1.5 cm, alternate, sessile, margin strongly recurved covering the lower surface totally. Sori exindusiate, on lower surface, acrostichoid. Spores bilateral, monolet, dark-brown, perine highly wrinkled with few folds, loose, irregular, 27-53 x 19-53 μm. (cf. Vasudeva & Bir, 1993b) (Plate 17e)


ECOLOGY: Rare, grows in rocky or gravelly soil in moist-shady places near streams. (950-1000 m altitude).

FERTILE: October-February.
SPECIMENS EXAMINED: Bastar, Shweta Singh, Bailadilla hills 61006, 61066, 61087, 61088 (BSA); Hoshangabad: Pachmarhi, Dixit, Dhupgarh 41226 (BSA).

DISTRIBUTION: INDIA-Assam, Karnataka, Kerala, Madhya Pradesh, Meghalaya, Nagaland, Orissa, Sikkim, Tamil Nadu, Uttaranchal, West Bengal.

Central India: Bastar, Chhindwara, Hoshangabad.

Note: The species is earlier reported as Bolbitis appendiculata (Willd.) K. Iwats., from Central India (Pachmarhi). (cf. Dixit, 1993).

34. NEPHROLEPIDACEAE (Ching) Pic. Ser.


Type genus: Nephrolepis Scott., Gen. Fil. 1: t. 3. 1834.

Terrestrial or epiphytic. Rhizome long-creeping, short-erect and radial, usually produsing long runners, scaly; fronds tufted or distant, pinnate; stipes articulated, glabrous, scaly. Lamina pinnate; pinnae sessile or short petiolated, herbaceous, serrate or crenate; veins free forked, branch ending into hydrothodes or not. Sori indusiate or exindusiate, rounded or reniform, submarginal.

A family comprising 4 genera throughout the world flora, of which 2 genera have been reported from India and only one genus with three species from Central India.

NEPHROLEPIS Scott

Nephrolepis Scott., Gen. Fil. 1: t. 3. 1834.

Type species: Nephrolepis exaltata (L.) Schott, Gen. Fil. 1: t. 3.
1834.

Rhizome short, erect, stoloniferous (with tubers), scaly; Fronds dimorphic, long, narrow, pinnate; spite tufted, glabrous, scaly, not articulated to rhizome. Lamina pinnate, sessile, narrow, margine serrate or entire, lowest pair of pinnae reduced or sometime distant; veins free, forked, ending in hydathodes. Sori indusiate, submarginal; Spores brown, bilateral, monolete.

**Key to the species**

1a. Plant not climbing.

2a Rhizome erect, root bearing fleshy tubers; pinnae more than 2 cm long.

* N. cordifolia

2b. Rhizome semierect; roots without tubers; pinnae more than 5 cm.

* N. exaltata

1b. Plant climbing on trees and rocks.

* N. radicans


English name: 'Fish bone fern'
Tufted ferns, rhizome suberect-erect, scaly, roots bearing many elliptic tubers; fronds dimorphic, pinnate, 40-50 long; stripe tufted, wiry, shining dark-brown, scaly; rachis scaly and fibrillose. Lamina pinnate, pinnae numerous, crowded, 1.5-2.8 x 0.5-0.72 cm, narrowly linear elliptic, herbaceous, glabrous, deep green, close together or distant, alternate, sessile, oblong to linear-oblong, slightly falcate, acute auricle or rounded at apex, base unequal, cordate, acroscopic base auricled and covering and overlapping the rachis at lower side, margin serrate or crenate, lower pinnae reduce. Veins distinct, free, simple or forked once, ending in hydathodes, not reaching the lamina margin. Sori indusiate, submarginal, arranged in a single row, rounded, not at the tip of the veins; indusia reniform, brown, margin entire, glabrous. Spores brown, translucent, monoilet, bilateral, exine brown, irregular reticulate, 25-35 x 18-28 µm. (Plate 18a)
Chromosome number: 2n= 82 (cf. Love et al., 1977).

ECOLOGY: The lithophytic fern abundantly grows in rocks crevices near stream in open sunny place. (800-1000 m altitude).

FERTILE: July-October.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Shweta singh, Kapildhara 586880 (BSA); Bastar, Shweta Singh, 58683, 69923 Bailadilla hills (Sagar Uni.), 61003, 610032 (BSA); Chhindwara, Panigrahi, Tamiya 4442 (BSA); Hoshangabad: Pachmarhi, Panigrahi, Dhupgarh 4508, Rori Ghat 6558; Shweta Singh, Jatashankar 55613; Near handi Khoi 55698; Dutche's Fall 55802 (BSA); Indore, Arora, 5515 (BSA); Jagdalpur, Shweta Singh, Kangar Valley National Park 61002 (BSA).

DISTRIBUTION: INDIA- Throughout the India in hilly regions.

Central India: Throughout the Madhya Pradesh and Chhattishgarh.
Note: Venation in pinna margin ranging from entire to serrate with intermediates like crenate or wavy margin have been observed among the plants of the gatherings of present study. (cf. Barthakur et. al., 2001).

English name: ‘Sward fern’

Tufted ferns, rhizome massive suberect-erect, scaly, hairy; fronds linear-oblong, pinnate, up to 100 x 5-20 cm; stripe tufted, 10-15 cm, shining dark-brown, scaly at the base; rachis scaly and fibrillose. Lamina pinnate, pinnae numerous, lateral pinnae oblong-lanceolate, apex acute, 1.5-10 x 0.6-0.13 cm, subcoriaceous, alternate, sessile, base broadly cuneate, acroscopic base auricled, margin entire or crenate. Veins slightly distinct, free, simple or forked once, not reaching the lamina margin. Sori indusiate, submarginal, arranged in a two rows; indusia reniform, dark brown, margin entire, glabrous. Spores monolet, bilateral, oval-elliptic, exine brown, irregular reticulate, 23-43 x 19-27 μm. (cf. Vasudeva & Bir, 1993b) (Plate 18b)
Chromosome number: 2n= 82 (cf. Love et al., 1977).
ECOLOGY: Growing in large population on rocks boulders in exposed sunny places. (700-950 m altitude).
FERTILE: July-October.
SPECIMENS EXAMINED: Anuppur: Amarkantak, Shweta Singh, forest near Sonemura, 58678, Samundhara 58683; Lakhshamandhara 58688 (BSA); Bastar, Panigrahi, Bailadilla hills
6920 (BSA); Bastar, Shweta Singh, 58688 (Sagar Uni.), 61063 (BSA); Chhindwara, Panigrahi, Tamiya 4441 (BSA); Shweta Singh, 58678 (BSA); Hoshangabad: Pachmarhi, Panigrahi, Rori Ghat 6647 (BSA); Shweta Singh, Pachmarhi Lake 55646; Near Handi Khoh 55816 (BSA); Jagdalpur, Shweta Singh, Kangar Valley National Park 61123 (BSA); Sidhi: Sanjay National Park-Kanhaiya Dah, Shweta Singh, 58480; Jarbo Khoh, 58479 (BSA);

**DISTRIBUTION: INDIA**- Throughout the India in hilly regions.

**Central India:** Throughout the Madhya Pradesh and Chhattishgarh.

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Rhizome climbing, stoloniferous, stalons few, with adpressed chestnut scales; scales black, bicolorours, acute; fronds pinnate, stipe 5-20 cm, scaly, bicolour, shining dark-brown at centre of peltate base; rachis scaly when young. Lamina pinnate, 50-60 x 6-8 cm, basal pinnae sterile, narrow at the base, firm, scaly when young, sterile pinnae numerous, 4 x 1.5 cm, sub-truncate at the base, apex rounded or slightly retuse, crenate margin, texture firm; fertile pinnae 0.4-0.8 cm, some what like sterile pinnae, lower pinnae reduced always sterile. Veins distinct, free, simple or forked once or twice, ending in hydathodes, near to the lamina margin. Sori submarginal, indusiate; indusia circular, brown, margin entire, glabrous. Spores brown, translucent, monolete, bilateral, exine smooth, brown. *(cf. Vasudeva & Bir, 1993b).*
Chromosome number: Not known.

**ECOLOGY:** Climbing on tree and rocks in moist situation. (950-1000 m altitude).

**FERTILE:** July-October.

**SPECIMENS EXAMINED:** Hoshangabad: Pachmarhi, Tiwari, 1964, Coll. No.71.

**DISTRIBUTION:** **INDIA-** Assam, Chhattishgarh, Madhya Pradesh, Manipur, Uttaranchal.

**Central India:** Throughout the Madhya Pradesh and Chhattishgarh.

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**35. DAVALLIACEAE** Mett. ex Frank

**Davalliaceae** Mett ex. Frank, Leunis Syn. Pflanzenk. ed. 2. 3:
1474. 1877.

**Type genus:** *Davallia* Smith, Mem. Acad. Sci. Turin 5: 414. t. 9. f. 6. 1793.

Epiphytic or lithophytic fern family; rhizome long-creeping, scaly. Stipes articulate to the rhizome, scaly at base. Lamina pinnately decompound, finily dissected, ultimate divisions have decurrent base, glabrous; veins free and anastomosing. Sori indusiate, submarginal.

A family comprising 10 genera throughout the world flora, of which 5 genera and 12 species have been reported from India and two genera with single species from Central India.

**Key to the genera**

1a. Rhizome covered by both scales and hairs. Lamina glabrous,
pinnae not decurrent, much finely dissected. Sori superficial not depressed, ultimate segment broad.

_Araioestegia_

1b. Rhizome covered by scales only. Lamina not much finely dissected, ultimate segment more or less rhomboid. Sori depressed, ultimate segment narrow.

_Leucostegia_

**ARAIOSTEGIA** Copel.


**Type species:** _Araioestegia hymenophylloides_ (Bl.) Copel., Philipp. J. Sci. 34: 240. 1927.

Rhizome long-creeping, scaly. Fronds tufted, narrowly or broadly ovate, stipe articulated to the rhizome. Lamina 3-pinnatly or 5-pinnatifid, large or small, herbaceous; veins free. Sori terminal, indusiate.

Genera comprising 11 species throughout the world flora. 10 species have been reported from India, of which single species has been encountered in the present investigation from Central India.


Local name: 'Mai Ki Baju'
Rhizome long-creeping, scaly; scales dark brown, ovate, apex obtuse. Fronds pinnate, 15-34 x 3.5-9 cm, delicate, glabrous. Stipe or petioles short, 3-6 cm, naked, tremendous or pale brown. Lamina 3-4 pinnatifid, lanceolate-deltoid, pinnae numerous, herbaceous, glabrous; pinnae alternate, 4.2-7.8 x 2-3 cm, petiolate, ± lanceolate, apex acuminate, lowest pinnae the largest, pinnule many, alternate, 1.0-1.5 x 0.4-0.8 cm, petiolate, deltate, in the lowest pinnae the basal basioscopic pinnules larger than acrosopic pinnules; lobes 4-5 pairs, ultimate lobes narrow, lanceolate, cuneate base, not very acute, margin deeply lobed, glabrous, texture thin, faccid; veins prominent, free, forked; rachis narrowly winged; Sori indusiate, copious, at the base of narrow ultimate segment, indusia yellow-brown, small. Spores reniform, light brown, exine finely tuberculate or reticulate, 35-65 x 20-38 μm.

Chromosome number: Diploid sexual n= 40 (cf. Love et al., 1977).

ECOLOGY: Epiphytic on the mossy rocks or at the base of tree trunks in shady situations. (950-1350 m altitude). Rare.

FERTILE: October-December.


DISTRIBUTION: INDIA- Assam, Arunachal Pradesh, Bihar, Jammu-Kashmir, Kerela, Madhya Pradesh, Manipur, Orissa, Sikkim, Tamil Nadu, Uttaranchal.

Central India: Hoshangabahd.

LEUCOSTEGIA Presl

Leucostegia Presl, Tent. Pterid. 94. 1836.

Type species: Leucostegia imerssa Wall. ex. Presl, Tent. Pterid.
95. 1836.
Large terrestrial or epiphytic fern family; rhizome long-
creeping, scaly, hairy. Fronds deltoid, pinnate to decompound;
stripe articulate to rhizome, hairy, scale. Lamina pinnate to
decompound, herbaceous, pinnae and pinnules oblique at base,
ultimate lobes rhomboidal or ovate, not narrow, margin toothed;
veins free, forked. Sori terminal, indusiate, fixed by narrow basal
part cup-shaped.

Genera comprising 2 species throughout the world flora.
Single species has been reported from India and Central India.

131. **Leucostegia immersa** (Wall. ex Hook.) Presl, Tent.
Pterid. 95. 1836; Dixit, Cens. Indian Pterid. 171. 1984; Verma et
al. in Fl. Madhya Pradesh I: 90. 1993; Vasudeva & Bir, Indian Fern
J. 10. 67. 1993; Chandra, Ferns India 256. 2000. **Davallia
immersa** Willd. ex Hook. Sp. Fil. 1. 156. 1846. **Acrophorus
immersus** sensu Bedd., Ferns South India 11. 1863.

Rhizome long-creeping, short, hairy, scaly; scales dark
brown, linear-lanceolate, apex long acuminate. Fronds deltoid,
pinnate to pinnatifid to tripinnate. Stipe or petioles 10-20 cm
long, tremendous, hairy, scaly in young stage, glabrous with age;
rachis glabrous; Lamina 18-60 x 7-15 cm, quadripinnate at base,
tripinnate at above, apex acute, base cuneate, herbaceous,
glabrous, pale green, pinnae up to 8 pairs, alternate, petiolate,
deltate, lower pair largest, 5-14 x 2-4 cm; pinnules 0.12-0.28 x
0.6-0.14 cm, sessile, rhomboidal or subrhomboidal, cuneate,
margin bluntly toothed; veins free, slightly distinct above, indistinct
below, 1-2 forked, ending submarginal with elliptic dot. Sori large,
terminal, impressed on lower surface, indusiate; indusia
suborbicular, membranaceous, pale-brown. Spores oblong or
reniform, yellow, monolette, bilateral, exine tuberculate, pale-brown, 35-53 x 22-38 μm. (Plate 18c, g)

Chromosome number: Diploid sexual n = 41 (cf. Love et al., 1977).

ECOLOGY: Lithophytic or Epiphytic on the moist mossy rocks near water stream or at the base of tree trunks in shady situations. (850-1100 m altitude).

FERTILE: June-September.

SPECIMENS EXAMINED: Bastar, Panigrahi, Bailadilla hills 8978; Shweta Singh, 61174, 61175 (BSA); Chhindwara, Panigrahi, Tamiya 4570; Shweta Singh, Patalkot 41155 (Sagar Uni.); Hoshangabad: Pachmarhi, Joseph, 11330; Dixit, Mahadev 41285; Shweta Singh, Reechgarh 55752, Dutche's Fall 55803, Little Fall 55667, Bee Fall 55685, Rajatprapat 557821, Tridhara 55982, Way to Bare Mahadev 55686 (BSA).

DISTRIBUTION: INDIA- Throughout Indian hilly regions.

Central India: Bastar, Hoshangabad.

36. BLECHNACEAE (Presl) Copel.


Terrestrial large or moderate size fern family; rhizome erect, massive. Fronds large, tufted, pinnate to pinnatifid, uniform or dimorphic. Stipes non-articulate to the rhizome; lamina usually pinnate, rarely simple or 2 pinnate, texture thick, coriaceous to sub-coriaceous, glabrous; veins branched and anastomosing to form a secondary vein enclosing a row of areolae on each side of
costa. Sori Indusiate or exindusiate, elongated, close to midrib; indusia flap like.

A family comprising 12 genera throughout the world flora, of which 5 genera and one species have been reported from India and single species from Central India.

**BLECHNUM L.**


**Type species:** *Blechnum occidentale* L., Sp. Pl. 2: 1077. 1753.

Terrestrial large to moderate size fern; rhizome erect or ascending, thick, massive. Fronds large, tufted, uniform or slightly dimorphic, pinnate. Stipes non-articulate to the rhizome, scaly; lamina usually pinnate, rarely simple or 2 pinnate, texture thick, coriaceous to sub-coriaceous, pinnae close together, glabrous; veins branched and anastomosing to form a secondary vein enclosing a row of areolae on each side of costa. Sori Indusiate or exindusiate, elongated, close to midrib on the vascular commissure parallal to the costae, uninterrupted; indusia flap like. Spores monolete, bilateral.

Genus comprising 150-156 species throughout world flora and only single species from Indian and Central India.

Fig 45. *Blechnum orientale* L. (a) Habit; (b) Part of fertile pinnae enlarged showing venation and sori arrangement; (c) Spore; (d) Rhizome scale
Rhizome long-creeping, short, hairy, scaly; scales brown, concolorous, ca 8-10 x 1-1.5 mm, linear-lanceolate, apex acuminate, margin entire. Fronds tufted, gigantic, more than 100 cm height, tips scaly, pinnate. Stipe or petioles 6.5-18 cm long, light brown, thick, base scaly, above glabrous; rachis glabrous; Lamina 100-130 x 30-50 cm, ovate, coriaceous, glabrous, pinnate; pinnae green, pinnae many pairs, close, 6-4 x 0.5-1.5 cm, alternate, sessile, oblique, firm, apex long acuminate, margin entire, all pinnae gradually narrowed to the apex, linear, terminal pinnae ± elongated; veins simple, free, forked, glabrous; costa and coatules glabrous. Sori copious, indusiate, linear on the either side of midrib from base nearly to apex of pinna, superficial; indusia dark brown, entire, open out at maturity; sporangia large. Spores round to oval, translucent, monolet, bilateral, yellow brown, 32-50 x 20-35 μm. (Fig. 45; Plate 18e)

Chromosome number: Diploid sexual n= 33, 34 (cf. Love et al., 1977).

ECOLOGY: Plants grow along newly constructed roadside in the edges of the forest area in open situations along streams. (700-1100 m altitude).

FERTILE: July-November.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Saxena, Shambhudhara 7764 (SFRA); Bastar, Panigrahi, Bailadilla hills 6913; Shweta Singh, Bailadilla hills 69927 (Sagar Uni.), 61094, 61109, 61128 (BSA); Chhindwara: Panigrahi, Tamiya 4454, Shweta Singh, 58514 (BSA); Hoshangabad: Pachmarhi, Panigrahi, 6641 (BSA); Shweta Singh, Panarpani 55634 (BSA); Sarguja, Panigarhi, 8970 (BSA).

DISTRIBUTION: INDIA- Throughout Indian hilly regions.

Central India: Madhya Pradesh: Hoshangabad and Chhattishgarh: Bastar.
37. **AZOLLACEAE** Wett.

**Azollaceae** Wett., Handb. Syst. Bot. 2. 77. 1903.

**Type genus:** *Azolla* Lam., Encyclo. Meth. 1: 343. 1783.

Small annual floating hydrophytes; stem dichotomously branched; leaves closely imbricate, each leaves bilobed, photosynthetic, aerial, contains *Nostoc* and *Anabaena* filaments. Roots solitary or tufted. Sorocarps on upper lobes, submerged; dimorphic, megasporocarps ellipsoidal, small; microsporocarp stalked, large, spherical submerged in mucilaginous masses called as 'massule'.

A monotypic family comprising single genus and 7 species throughout the world flora and two species India reported from India and single species is found in Central India.

**AZOLLA** Lam.

**Azolla** Lam., Encyclo. Meth. 1: 343. 1783.

**Type species:** *Azolla filiculoides* Lam., Encyclo. Meth. Bot. 1: 343. 1783.

Small, minute, sub-aquatic annual hydrophytes, free floating; rhizome short creeping, roots many; stem dichotomously branched; leaves in two alternate rows, closely imbricate, each leaves bilobed, photosynthetic, aerial, contains *Nostoc* and *Anabaena* filaments. Soporocarps with mega and microsporangium; megasporogium with single small floating megaspore; microsporangium with numerous microspores, submerged in mucilaginous masses known as 'Massule' which have small anchor shaped 'Glochidia'.

Small, minute, sub-aquatic annual hydrophytes, free floating, usually reddish towards the end of the rainy season; stem 1.5-2 x 2 cm; rhizome much pseudobranched, zig-zag, alternate, short creeping with unbranched many roots, hairy; hairs ca 2 mm long, young root protected by cone-shaped root cap which enclose a bundle of root hairs; leaves in two alternate rows, sessile, photosynthetic, aerial, contains Nostoc and Anabaena filaments, 2-lobed, one floating one submerged lobe, ± rectangular, margin entire; upper leaf lobes much small, imbricate, rhomboidal or oblong, obtuse, papillose on upper surface; lower leaf lobe membranaceous; veins indistinct. Soporocarps on upper lobes, submerged; microsoporocarps glabrous, small, ca 1 mm in diameter, brown, with numerous stalked microsporangia; microspores spherical, many; megasporocarps ovoid, large, with single megaspore, submerged in mucilaginous masses known as 'Massule' which have small anchor shaped appendages called 'Glochidia'. (Plate 18d)

Chromosome number: 2n= 44 (cf. Love et al., 1977).

ECOLOGY: Common floating annual hydrophytes in stagnant ponds and paddy field. (600-900 m altitude).

FERTILE: May-August.

SPECIMENS EXAMINED: Anuppur: Amarkantak, Shweta Singh, Kabirchbutara 58693 (BSA); Bastar, Shweta Singh, Bailadilla hills 61095 (BSA); Bilaspur, Panigrahi, 15343 (BSA); Chhatarpur,
Subramaniyum, Hirapur forest 10151 (BAS); Hoshangabad: Pachmarhi, Shweta Singh, Matculi 55635 (BSA); Mandla, J. Lal, Bahmni, 34620 (BSA); Panna: Pant, Panna National Park 28162 (BSA); Rewa: Sebastine, Roopsagar Lakes 7647 (BSA); Sidhi: Sanjay National Park-way to Kusmi, Shweta Singh, 58474 (BSA).

DISTRIBUTION: INDIA- Throughout Indian hilly regions.

Central India: Throughout the Madhya Pradesh an Chhattishgarh state.

38. SALVINIACEAE H. G. Reich.


Type genus: Salvinia Seguier, Fl. Veron. 3: 352. 1754.

Small annual free-floating hydrophytes; rhizome cylindrical, horizontal; stem long-creeping branched, proliferate through rhizome branches, nodes and internodes present, hairy. Leaves dorsolaterally arranged in whorl of three, sub sessile to petiolate, two of which float on ether side of the main stem and third (the root) is submerged. Floating lamina oval, oblong or broadly deltoid or elliptic, entire margin, hairy at the upper surface; submerged part finely form lateral branched, thread like stalked, hairy structure. Sporocarps heterosporous; sporangia or receptacles.

A monotypic family comprising single genus and 5 species throughout the world flora, of which 4 species have been reported from India. Only one species is found in Central India.
**SALVINIA** Seguier

*Salvinia* Seguier, Fl. Veron. 3: 532. 1754.

**Type species:** *Salvinia natans* (L.) All., Fl. Pedem. 2: 289. 1785.

Small, rootless fresh water fern; rhizome cylindrical, creeping, just below water surface, hairy. Leaves 3 at each node, 2 floating aerial and one submerged. Lamina dorsolateral petiolate or subsessile, ovate or oblong, upper surface hairy; submerged segment short cylindrical stalked and finely dissect into simple, filiform, root like hairy appendages encircling the central 2 or 3 sporocarps bunches. Sporocarps heterosporous, arranged on the base of floating leaves or on submerged segment, globose-ovoid, apiculate, sessile; megasporocarps 1-2 and rest all are microsporocarps.


Small, free-floating fresh water hydrophyes; rhizome long-creeping, branched; branching repeatedly dichotomously, hairy; hairs brown. Leaves in whorls of three, two floating, and rest is submerged under the surface. Floating leaves simple, photosynthetic, aerial, greenish-white, 0.8-1.6 x 0.5-1.4 cm, ovate-oblong, flat, cordate base, margin entire, herbaceous, multicellular hairs on upper surface, lower surface generally smooth or ± hairy; submerged segment 0.1-0.3 cm, finely dissect into simple, filiform, root like hairy 1.8-2.8 cm long appendages, encircling the central 2 or 3 sporocarps bunches; sporocarps 2-6, globose, sessile or short
petiolate, clustered; megasporocarps 1-2 and microsporocarps many at the base of submerged segment.

Chromosome number: n= 9 (cf. Khullar, 1994).

ECOLOGY: Common free floating hydrophytes in stagnant ponds and lakes. (600-900 m altitude).

FERTILE: May-August.

SPECIMENS EXAMINED: Bastar, Shweta Singh, Bailadilla hills (BSA); Chhattarpur, Shweta Singh, Khujarahoo (BSA).

DISTRIBUTION: INDIA- Throughout Indian hilly regions.

Central India: Throughout the Madhya Pradesh and Chhattishgarh state.
### Table: 1 List of Pteridophytes of Central India

#### Fern-allies

<table>
<thead>
<tr>
<th>Name of the families</th>
<th>Name of the genera</th>
<th>Name of the species / varieties</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Huperzia</td>
<td>Huperzia hamiltonii (Spring) Trev.</td>
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<tr>
<td>2. Selaginellaceae</td>
<td>Selaginella</td>
<td>Selaginella bryopteris (L.) Baker</td>
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<td></td>
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<td>S. ciliaris (Retz.) Spring</td>
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<td></td>
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<td>S. indica (Milde) Trayon</td>
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<td>S. involvens (Sw.) Spring</td>
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<td></td>
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<td>S. jainii Dixit</td>
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<td>S. panigrahii Dixit</td>
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<td></td>
<td></td>
<td>S. radicata (Hook. et Grev.) Spring</td>
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<td>S. repanda (Desv. ex Poir.) Spring</td>
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<td>S. vaginata Spring</td>
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<td>3. Isoetaceae</td>
<td>Isoetes</td>
<td>Isoetes bilaspurensis Panigrah,</td>
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<td>I. coromandelina L.</td>
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<td>I. dixitei Shende</td>
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<td>I. mahadevensis Srivastava et Shukla</td>
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<td>I. pantii Goswami et Arya</td>
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<td>I. panchananii var. panchananii Pant et Srivastava</td>
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<td>I. panchananii Pant et Srivastava var. pachmarhiensis</td>
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<td>Srivastava, Srivastava et Shukla</td>
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<td>I. sampathkumarnii L. N. Rao</td>
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<td>I. indica Pant et Srivastava</td>
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<td>4. Equisetaceae</td>
<td>Equisetum</td>
<td>Equisetum diffusum D. Don</td>
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<td>E. ramossissimum Desf. subsp. debile (Roxb. ex Vauch.)</td>
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<td>Hauke</td>
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<td>E. ramossissimum Desf. var. altissimum A. Br.</td>
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<td>5. Psilotaceae</td>
<td>Psilotum</td>
<td>Psilotum nudum (L.) P. Beauv.</td>
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</tbody>
</table>

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## Ferns

<table>
<thead>
<tr>
<th>Name of the families</th>
<th>Name of the genera</th>
<th>Name of the species / varieties</th>
</tr>
</thead>
</table>
B. lanuginosum Wall. ex Hook. et Grev. |
| 2. Ophioglossaceae   | Ophioglossum       | *Ophioglossum costatum* R. Br.  
*O. eliminatum* Khandelwal et Goswami  
*O. gramineum* Willd.  
*O. lusitanicum* L.  
*O. petiolatum* Hook  
*O. polyphyllum* A. Br.  
*O. reticulatum* L.  
*O. nudicaule* L. f. var. *nudicaule*  
*O. nudicaule* L. f. var. *macrorhizum* (Kunze) Clausen |
| 3. Angiopteridaceae  | Angiopteris        | *Angiopteris evecta* (Forst.) Hoffm. |
| 4. Osmundaceae       | Osmunda            | *Osmunda hugeliana* Presl  
*O. regalis* L. |
| 5. Gleicheniaceae    | Dicranopteris      | *Dicranopteris linearis* (Burm. f.) Underw. |
| 7. Polypodiaceae     | Belvisia           | *Belvisia revoluta* (Bl.) Copel  
*Lepisorus nudus* (Hook.) Ching  
*Leptochilus*  
*Paraleptochilus*  
*Microsorium*  
*Pyrrosia* |
| 8. Drynariaceae      | Drynaria           | *Drynaria quercifolia* (L.) J. Smith |
|                      |                    |  

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<thead>
<tr>
<th>Family</th>
<th>Genus</th>
<th>Species</th>
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| 9. Lygodiaceae      | Lygodium| *Lygodium flexuosum* (L.) Sw.  
*L. microphyllum* (Cav.) R. Br.                                           |
| 10. Cheilanthaceae  | Cheilanthes| *Cheilanthes albomarginata* Clarke  
*Cheilanthes anceps* Blanf.  
*Cheilanthes farinosa* (Forssk.) Kaulf.  
*Cheilanthes grisea* (Blanf.) Blanf.  
*Cheilanthes tenuifolia* (Burm.) Sw. |
| 11. Actiniopteridaceae| Actiniopteris| *Actiniopteris radiata* (Sw.) Link                                      |
| 12. Pteridaceae     | Pteris  | *Pteris biaurita* L.  
*Pteris cretica* L.  
*Pteris geminata* Wall. ex Ag.  
*Pteris pellucida* Presl  
*Pteris quadriaurita* Retz.  
*Pteris vittata* L.          |
| 13. Adiantaceae     | Adiantum| *Adiantum capillus-veneris* L.  
*Adiantum incisum* Forssk.  
*Adiantum philippense* L.     |
| 14. Hemionitidaceae | Hemionitis| *Hemionitis arifolia* (Burm.) Moore                                     |
| 15. Parkeriaceae    | Ceratopteris| *Ceratopteris thalictroides* (L.) Brongn                                |
| 16. Marsileaceae    | Marsilea| *Marsilea quadrifolia* L.  
*Marsilea minuta* L.                                                      |
| 17. Hymenophyllaceae| Trichomanes| *Trichomanes proliferum* Bl.                                            |
| 18. Cyatheaceae     | Alsophila| *Alsophila balakrishnanii* (Dixit et Tripathi) Dixit  
*Alsophila gigantea* Wall. ex Hook.  
*Alsophila niigirensis* (Holtt.) Tryon  
*Alsophila spinulosa* (Wall. ex Hook.) Tryon                             |
| 19. Denstaedtiaceae | Microlepia| *Microlepia speluncae* (L.) Moore  
*Microlepia strigosa* (Thunb.) Presl                                    |
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<th>Pteridium</th>
<th>Pteridium aquilinum (L.) Kuhn</th>
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<td>21. Lindseaeae</td>
<td>Lindseae</td>
<td>Lindseae ensifolia Sw.</td>
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<td>Lindseae glandulifera A. v. A. v. R.</td>
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<td>Lindseae malabarica (Bedd.) Bak. C. Chr.</td>
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<td>Lindseae repens (Bory.) Thw. var. pectinata (Bl.) Mett. ex Kuhn</td>
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<td>Sphenomeris</td>
<td>Sphenomeris chinensis (L.) Maxon</td>
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<td>Ampelopteris prolifer (Retz.) Copel.</td>
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<td>Christella</td>
<td>Christella arida (D. Don.) Holtt.</td>
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<td>Christella cylindrothrix (Rosenst.) Holtt.</td>
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<td>Christella subpubescens (Bl.) Holtt.</td>
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<td>Pneumtopteris truncata (Poir.) Holtt.</td>
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<td>Pronephrium repandum (Fe’e.) Holtt.</td>
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<td>Pseudocyclosorus</td>
<td>Pseudocyclosorus falcibolus (Hook.) Ching</td>
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<td>Sphaerostephanos</td>
<td>Sphaerostephanos arbuscula (Willd.) Holtt.</td>
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<td>Trigonospora</td>
<td>Trigonospora calcarata (Bl.) Holtt.</td>
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<td>Trigonospora sericea (Scott. ex Bedd.) Holtt.</td>
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<td>24. Athyriaceae</td>
<td>Athyrium</td>
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<td>Athyrium falcatum Bedd</td>
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<td>25. Hypodematiaeae</td>
<td>Deparia</td>
<td>Athyrium filix-foemina (L.) Roth</td>
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<td>Diplazium</td>
<td>Athyrium hohenackerianum (Kze.) Moore</td>
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<td>Dryoathyrium</td>
<td>Athyrium pectinatum (Wall. ex Hope) Presl</td>
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<td>Athyrium schimperi Moug. ex Fée.</td>
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<td>Deparia japonica (Thun. ex Murray) Kato</td>
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<td>Diplazium esculentum (Retz.) Sw.</td>
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<td>Dryoathyrium boryanum (Willd.) Ching</td>
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<td>26. Dryopteridaceae</td>
<td>Hypodematum</td>
<td>Hypodematum crenatum (Forssk.) Kuhn</td>
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<td>Arachnoïdes</td>
<td>Arachnoïdes amabilis (Bl.) Tindale</td>
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<td>Cyrtomium</td>
<td>Cyrtomium falcatum (L. fil.) Presl</td>
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<td>Dryopteris</td>
<td>Dryopteris coechleata (Buch.-Ham. ex D. Don) C. Chr.</td>
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<td>Dryopteris sparsa (Buch.-Ham. ex D. Don) O. Ktze.</td>
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<td>Polystichum</td>
<td>Polystichum harpophyllum (Zenk. ex Kze.) Sledge</td>
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<td>27. Tectariaeae</td>
<td>Pleocnemia</td>
<td>Pleocnemia winnii Holtt.</td>
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<tr>
<td></td>
<td>Tectacria</td>
<td>Tectaria coadunata (Wall. ex Hook. et Grev.) C. Chr.</td>
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<td>Tectaria polymorpha (Wall. ex Hook.) Copel.</td>
</tr>
<tr>
<td></td>
<td>Egenolfia</td>
<td>Egenolfia appendiculata (Will.) J. Sm.</td>
</tr>
<tr>
<td>29. Nephrolepidaceae</td>
<td>Nephrolepis</td>
<td>Nephrolepis cordifolia (L.) Presl</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nephrolepis exaltata (L.) Schott.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nephrolepis radicans (Burn. f.) Kuhn</td>
</tr>
<tr>
<td>30. Davalliaceae</td>
<td>Araioestegia</td>
<td>Araioestegia pulchra (D. Don) Copel</td>
</tr>
<tr>
<td></td>
<td>Leucostegia</td>
<td>Leucostegia immersa (Wall. ex Hook.) Presl</td>
</tr>
<tr>
<td>31. Blechnaceae</td>
<td>Blechnum</td>
<td>Blechnum orientale L.</td>
</tr>
<tr>
<td>32. Azollaceae</td>
<td>Azolla</td>
<td>Azolla pinnata R. Br.</td>
</tr>
<tr>
<td>33. Salviniaeae</td>
<td>Salvinia</td>
<td>Salvinia natans (L.) All.</td>
</tr>
</tbody>
</table>
List: 1 PTERIDOPHYTES REPORTED FROM CHHATTISGHARH

1. LYCOPODIACEAE P. Beauv. ex Mirb.
1. \textit{Huperzia hamiltonii} (Spring) Trev.

2. SELAGINELLAECAE Willk. in Willk. et Lange
3. \textit{Selaginella bryopteris} (L.) Baker
4. \textit{S. ciliaris} (Retz.) Spring
5. \textit{S. indica} (Milde) Trayon
6. \textit{S. involvens} (Sw.) Spring
7. \textit{S. jainii} Dixit
8. \textit{S. panigrahi} Dixit
9. \textit{S. repanda} (Desv. ex Poir.) Spring
10. \textit{S. vaginata} Spring

3. ISOETACEAE Reichend.
11. \textit{Isoetes bilaspurensis} Panigrahi,
12. \textit{I. coromandelina} L.
13. \textit{I. dixitei} Shende
14. \textit{I. indica} Pant et Srivastava

4. EQUISETACEAE L. C. Richard ex A.R. De Candolle
15. \textit{Equisetum diffusum} D. Don
16. \textit{E. ramossissimum} Desf. subsp. \textit{debile} (Roxb. ex Vauch.) Hauke

5. PSILOTACEAE Kanitz.

6. BOTRYCHIACEAE Nakai
18. \textit{Botrychium daucifolium} Wall. ex Hook. et Grev.

7. OPHIOGLOSSACEAE (R. Br.) C.A. Agardh
20. \textit{O. gramineum} Willd.
22. \textit{O. polyphyllum} A. Br. apud Seubert
23. O. reticulatum L
24. O. nudicaule L. f. var. nudicaule

8. ANGIOPTERIDACEAE  Fe‘e ex Bonner
25. Angiopteris evecta (Forst.) Hoffm.

9. OSNUNDACEAE  Berch. et Presl
26. Osmunda hugeliana Presl

10. GLEICHENIACEAE  Presl
27. Dicranoteris linearis (Burm. f.) Underw var. linearis

11. LOXOGRAMMACEAE  Pic. Ser.
28. Loxogramme involuta (D. Don) Presl

12. POLYPODIACEAE  Berch.
29. Belvisia revoluta (Bl.) Copel.
30. Lepisorus nudus (Hook.) Ching
31. Leptochilus axillaris (Cav.) Kaulf.
32. Paraleptochilus decurrens (Bl.) Copel. var. lanceolata
   (Fée) Dixit, comb-nov.
33. Microsorum membranaceum (D. Don.) Ching
34. Pyrrosia adnascens (Sw.) Ching

13. DRYNARIACEAE  Ching
35. Drynaria quercifolia (L.) J. Smith

14. LYGODIACEAE  Presl
36. Lygodium flexuosum (L.) Sw.
37. L. microphyllum (Cav.) R.Br.

15. CHEILANTHACEAE  Nayar
38. Cheilanthes albomarginata Clarke,
39. C. aniceps Blanf.
40. C. farinosa (Forsk.) Kaulf.
41. C. grisea (Blanf.) Blanf.
42. C. tenuifolia (Burm.) Sw.

16. ACTINIOPTERIDACEAE  Pic.Ser
43. Actiniopteris radiata (Sw.) Link
17. PTERIDACEAE Ching
44. Pteris biaurita L.
45. P. cretica L.
46. P. geminate Wall. ex Ag.
47. P. pellucida Presl
48. P. quadriaurita Retz.
49. P. vittata L.

18. ADIANTACEAE (Presl) Ching
50. Adiantum capillus-veneris L.
51. A. incisum Forssk.
52. A. philippense L.

19. HEMIONITIDACEAE Pic.Ser
53. Hemionitis arifolia (Burm.) Moore

20. PARKERIACEAE Hook.
54. Ceratopteris thalictrodes (L.) Brongn

21. MARSILEACEAE Mirbel
55. Marsilea minuta L.

22. HYMMENOPHYLLACEAE Link
56. Trichomanes proliferum Bl.

23. CYATHEACEAE Kaulf.
57. Alsophila spinulosa (Wall. ex Hook.) Tryon
58. A. balakrishananii (Dixit et Tripathi) Dixit
59. A. gigantea Wall. ex Hook.
60. A. nilgirensis (Holtt.) Tryon

61. Microlepsia spelunca (L.) Moore
62. M. strigosa (Thunb.) Presl

25. PTERIDACEAE Ching
63. Pteridium aquilinum (L.) Kuhn

64. Lindsaea ensifolia Sw.

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65. *L. glandulifera* A. v. A. v. R.
66. *L. malabarica* (Bedd.) Bak. C. Chr.
67. *L. repens* (Bory.) Thw. var. *pectinata* (Bl.) Mett. ex Kuhn
68. *Sphenomeris chinensis* (L.) Maxon

27. **THELYPTERIDACEAE** Pic. Ser.
69. *Ampelopteris prolifer* (Retz.) Copel.
70. *Christella arida* (D. Don.) Holtt.
71. *C. dentata* (Forssk.) Brown. et Jermy
72. *C. parasitica* (L.) Le`v.
73. *Pneumopteris truncatea* (Poir.) Holtt.
74. *Pronephrium nudatum* (Roxb.) Holtt.
75. *P. repandum* (Fe`e.) Holtt.
76. *Pseudocyclosorus falcibolus* (Hook.) Ching
77. *Sphaerostephanos arbuscula* (Willd.) Holtt.
78. *Trigonospora calcarata* (Bl.) Holtt.
79. *T. ciliata* (Benth.) Holtt.
80. *T. sericea* (Scott. ex Bedd.) Holtt.

28. **ASPLENIACEAE** Mett. ex Frank
82. *A. laciniatum* D. Don
83. *A. obscurum* Bl.
84. *A. trichomanes* L
85. *A. unilaterale* Lam.
86. *A. yoshinagae* Makino var. *planicaule* (Wall. ex Mett.) Morton

29. **ATHYRIACEAE** Alston
87. *Athyrium falcatum* Bedd.
88. *A. filix-fœmina* (L.) Roth
89. *A. hohenackerianum* (Kze.) Moore
90. *A. pectinatum* (Wall. ex Hope) Presl
91. *Diplazium esculentum* (Retz.) Sw.
30. **HYPODEMATIACEAE** Ching
   92. *Hypodematiun crenatum* (Forssk.) Kuhn v. Deck.

31. **DRYOPTERIDACEAE** Ching
   93. *Dryopteris cochleata* (Buch.-Ham. ex D. Don) C. Chr.
   94. *D. sparsa* (Buch.-Ham. ex D. Don) O. Ktze.

32. **TECTARIAEAE** Panigrahi
   95. *Tectaria coadunata* (Wall. ex Hook. et Grev.) C. Chr.
   96. *T. polymorpha* (Wall. ex Hook.) Copel.

33. **LAMORIOPSISIDACEAE** Aloton
   97. *Egenolfia appendiculata* (Will.) J. Sm.

34. **NEPHROLEPIDACEAE** (Ching) Pic. Ser.
   98. *Nephrolepis cordifolia* (L.) Presl
   99. *N. exaltata* (L.) Scott.

35. **DAVALLIACEAE** Mett. ex Frank
   100. *Leucostegia immera* Wall. ex. Presl

36. **BLECHNACEAE** (Presl) Copel.
   101. *Blechnum orientale* L.

37. **AZOLLACEAE** Wett.
   102. *Azolla pinnata* R. Br.

38. **SALVINIACEAE** H. G. Reich.
   103. *Salvinia natans* (L.) All.
List: 2 PTERIDOPHYTES REPORTED FROM MADHYA PRADESH

1. LYCOPODIACEAE P. Beauv. ex Mirb.
   1. Palhinhaea cernua (L.) Franco. et Vasc. in Vasc. et Franco.

2. SELAGINELLACEAE Willk. in Willk. et Lange
   2. Selaginella bryopteris (L.) Baker
   3. S. ciliaris (Retz.) Spring
   4. S. indica (Milde) Trayon
   5. S. involvens (Sw.) Spring
   6. S. radicata (Hook. et Grev.) Spring
   7. S. repanda (Desv. ex Poir.) Spring

3. ISOETACEAE Reichend.
   8. I. coromandelina L.
   9. I. dixitei Shende
   10. I. mahadevensis Srivastava et Shukla
   11. I. pantii Goswami et Arya
   12. I. panchananii var. panchananii Pant et Srivastava
   13. I. panchananii Pant et Srivastava var. pachmarhiensis Srivastava,
       Srivastava et Shukla
   14. I. sampathkumarnii L. N. Rao
   15. I. indica Pant et Srivastava

4. EQUISETACEAE L. C. Richard ex A.R. De Candolle
   16. Equisetum diffusum D. Don
   17. E. ramossissimum Desf. subsp. debile (Roxb. ex Vauch.) Hauke
   18. E. ramossissimum Desf. var. altissimum A. Br.

5. PSILOTACEAE Kanitz.

6. BOTRYCHIACEAE Nakai
7. **OPHIOGLOSSACEAE** (R. Br.) C.A. Agardh

22. *Ophioglossum costatum* R. Br.

23. *O. eliminatum* Khandelwal et Goswami


25. *O. lusitanicum* L. ssp. *lusitanicum*


27. *O. reticulatum* L.


29. *O. nudicaule* L. f. var. *nudicaule*

30. *O. nudicaule* L. f. var. *macrorrhizum* (Kunze) Clausen

8. **ANGIOPTERIDACEAE** Fe' e ex Bonner

31. *Angiopteris evecta* (Forst.) Hoffm.

9. **OSNUNDACEAE** Berch. et Presl

32. *Osmunda hugeliana* Presl

33. *O. regalis* L.

10. **GLEICHENIACEAE** Presl

34. *Dicranoteris linearis* (Burm. f.) Underw var. *linearis*

11. **LOXOGRAMMACÉAE** Pic. Ser.

35. *Loxogramme involuta* (D. Don) Presl

12. **POLYPÓDIACEAE** Berch.

36. *Lepisorus nudus* (Hook.) Ching

37. *Leptochilus axillaris* (Cav.) Kaulf.

38. *Paraleptochilus decurrens* (Bl.) Copel. var. *lanceolata*  
   (Fée) Dixit, *comb-nov.*


13. **DRYNARIACEAE** Ching

40. *Drynaria quercifolia* (L.) J. Smith

14. **LYGODIACEAE** Presl

41. *Lygodium flexuosum* (L.) Sw.

42. *L. microphyllum* (Cav.) R.Br.
15. CHEILANTHACEAE  Nayar
43. Cheilanthes albo-marginata  Clarke,
44. C. anceps  Blanf.
45. C. farinosa  (Forsk.) Kaulf.
46. C. grisea  (Blanf.) Blanf.
47. C. tenuifolia  (Burm.) Sw.
16. ACTINOTERIDACEAE  Pic. Ser
48. Actiniopteris radiata  (Sw.) Link
17. PTERIDACEAE  Ching
49. Pteris biaurita  L.
50. P. cretica  L.
51. P. geminate  Wall.  ex  Ag.
52. P. pellucida  Presl
53. P. quadriaurita  Retz.
54. P. vittata  L.
18. ADIANTACEAE  (Presl) Ching
55. Adiantum capillus-veneris  L.
56. A. incisum  Forssk.
57. A. philippense  L.
19. HEMIONITIDACEAE  Pic.Ser
58. Hemionitis arifolia  (Burm. f.) Moore
20. PARKERIACEAE  Hook.
59. Ceratopteris thalictroides  (L.) Brongn
21. MARSILEACEAE  Mirbel
60. Marsilea quadri-folia  L.
61. M. minuta  L.
22. CYATHEACEAE  Kaulf.
62. Alsophila spinulosa  (Wall.  ex  Hook.)  Tryon
63. A. balakrishananii  (Dixit  et  Tripathi) Dixit
64. A. gigantea  Wall.  ex  Hook.
65. A. nilgirensis  (Holtt.)Tryon
23. **DENSTAEDTIACEAE** Pic. Ser.
66. *Microlepia spelunca* (L.) Moore
67. *M. strigosa* (Thunb.) Presl

24. **PTERIDIACEAE** Ching
68. *Pteridium aquilinum* (L.) Kuhn

25. **LINDSAEACEAE** Pic. Ser.
69. *Lindsea ensifolia* Sw.
70. *Sphenomeris chinensis* (L.) Maxon

71. *Ampelopteris prolifera* (Retz.) Copel.
72. *Christella arida* (D. Don.) Holtt.
73. *C. cylindrothrix* (Rosenst.) Holtt.
74. *C. dentata* (Forssk.) Brown. et Jermy
75. *C. hispidula* (Decne.) Holtt.
76. *C. parasitica* (L.) Le’v.
77. *C. subpubescens* (Bl.) Holtt.
78. *Pneumopteris truncatea* (Poir.) Holtt.
79. *Pronephrium nudatum* (Roxb.) Holtt.
80. *P. repandum* (Fe’e.) Holtt.
81. *Pseudocyclosorus falcibolus* (Hook.) Ching
82. *Sphaerostephanos arbuscula* (Willd.) Holtt.
83. *Trigonospora calcarata* (Bl.) Holtt.
84. *T. ciliata* (Benth.) Holtt.
85. *T. sericea* (Scott. ex Bedd.) Holtt.

27. **ASPLENIACEAE** Mett. ex Frank
86. *Asplenium cheilosorum* Kunze ex Mett.
87. *A. inaequilateral* Willd.
88. *A. normale* D. Don.
89. *A. obscurum* Bl.
90 A. polydon Forst. f.
91. *A. unilaterale* Lam.
28. ATHYRIACEAE Alston
92. Athyrium anisopterum Christ
93. A. falcatum Bedd.
94. A. filix-foemina (L.) Roth
95. A. hohenackerianum (Kze.) Moore
96. A. pectinatum (Wall. ex Hope) Presl
97. A. schimperi Mouge. ex Fee.
98. Deparia japonicum (Thunb. ex Murray) Kato
99. Diplazium esculentum (Retz.) Sw.
100. Dryoathyrium boryanum (Willd.) Ching

29. HYPODEMATIACEAE Ching

30. DRYOPTERIDACEAE Ching
102. Arachnoides amabilis (Bl.) Tindale
103. Cyrtomium falcatum (L. fil.) Presl
104. Dryopteris cochleata (Buch.-Ham. ex D. Don) C. Chr.
105. D. sparsa (Buch.-Ham. ex D. Don) O. Ktze.
106. Polystichum harpophyllum (Zenk. ex Kze.) Sledge

31. TECTARIACEAE Panigrahi
107. Pleocnemia winitii Holtt.
108. Tectaria coadunata (Wall. ex Hook. et Grev.) C. Chr.
109. T. polymorpha (Wall. ex Hook.) Copel.

32. LAMORIOPSISIDACEAE Alston
110. Bolbitis virens (Wall. ex Hook. et Grev.) Schott
111. Egenolfia appendiculata (Will.) J. Sm.

33. NEPHROLEPIDACEAE (Ching) Pic. Ser.
112. Nephrolepis cordifolia (L.) Presl
113. N. exaltata (L.) Scott.
114. N. radicans (Burn. F.) Kuhn.

34. DAVALLIACEAE Mett. ex Frank
115. Araiostegia pulchra (D. Don) Copel
116. *Leucostegia immersa* Wall. ex. Presl
35. **BLECHNACEAE** (Presl) Copel.
117. *Blechnum orientale* L.
36. **AZOLLACEAE** Wett.
118. *Azolla pinnata* R. Br.
37. **SALVINIACEAE** H. G. Reich.
119. *Salvinia natans* (L.) All.

A comparison to the earlier record shows that the following 3 species of fern-allies and 31 species of ferns could not be located from the any part of Madhya Pradesh and Chhattisgarh regions in spite of extensive and intensive survey cum collection made during the period (2001-2005). It is due to some of these members might be rare and could have been extirpated due to ecological disbalance, habitat disturbances, landscape changes through forest clearing for cultivation and road building the last seven decades or so. Evidently the areas covered by earlier worker and present study area may not be same. But more plausible is the reason that the record of these pteridophytes is based on erroneous/wrong identification.

**Excluded / Doubtful Species:**


4. *Asplenium dalhousiae* Hook., Icon Pl. t. 105 (1837). Reported by (Saxena, 1973) from Chhattishgarh: Bailadilla hills (Singh, Specimen No. 4294, SFRI, Jabalpur).


7. *Athyrium solenapteris* (Kze.) Moore, Index Fil 43. 1957. Reported from Madhya Pradesh: Chhindwara (Panigrahi, Specimen No. 4439, Tamiya, 24.7.64, BSA).


LEGENDS

PLATE-1
(a) View of Denva river forest in Pachmarhi
(b) Forest view of Handi Khoh in Pachmarhi
(c) Grass land in Bastar

PLATE-2
(a) Dutch’s Fall in Pachmarhi
(b) Forest view of Bailadilla hills in Bastar

PLATE-3
(a) Author observing spores on microscope in Lab
(b) Collecting ethnobotanical information from local tribal
(c) Collection of Pteridophytes from Pachmarhi forest

PLATE-4
(a) Collection of Pteridophytes from Tamia hills
(b) Forest view in Vanshi Vihar, Pachmarhi
(c) Forest view in Amarkantak

PLATE-5
(a) Selaginella bryopteris (L.) Baker
(b) S. ciliaris (Retz.) Spring
(c) S. involvens (Sw.) Spring
(d) S. jainii Dixit

PLATE-6
(a) Selaginella repanda (Desv. ex Poir.) Spring
(b) S. vaginata Spring
(c) S. indica (Milde) Trayon
(d) Isoetes panchananii Pant et Srivastava var. pachmarhiensis
   Srivastava, Srivastava et Shukla
(e) Equisetum ramossissimum Desf. subsp. debile (Roxb. ex Vauch.)
   Hauke
PLATE-7
(a) Isoetes coromandelina L.
(b) Palhinhaea cernua (L.) Franco. et Vasc. in Vasc. et Franco.
(c) Dicranotheris linearis (Burm. f.) Underw

PLATE-8
(a) Ophioglossum polyphyllum A. Br. apud Seubert
(b) Loxogramme involuta (D. Don) Presl
(c) Botrychium daucifolium Wall. ex Hook. et Grev.
(d) B. lanuginosum Wall. ex Hook. et Grev.

PLATE-9
(a) Osmunda regalis L.
(b) Angiopteris evecta (Forst.) Hoffm.
(c) Belvisia revoluta (Bl.) Copel.
(d) Lepisorus nudus (Hook.) Ching

PLATE-10
(a) Pyrrosia adnascens (Sw.) Ching
(b) Microsorium membranaceum (D. Don.) Ching
(c) Enlarged pinnae of Lygodium flexuosum (L.) Sw.
(d) Lygodium flexuosum (L.) Sw.

PLATE-11
(a) Cheilanthes farinosa (Forsk.) Kaulf.
(b) C. albolimbata Clarke
(c) Adiantum capillus-veneris L
(d) Pinnae of Pteris quadriaurita Retz.

PLATE-12
(a) Pteris cretica L.
(b) Hemionitis arifolia (Burm.) Moore
(c) Marsilea minuta L.
(d) Trichomanes proliferum Bl.
(e) Alsophila balakrishnanii (Dixit et Tripathi) Dixit
(f) Alsophila spinulosa (Wall. ex Hook.) Tryon
PLATE-13
(a) Enlarged pinnae of Alsophila gigantea Wall. ex Hook.
(b) Enlarged pinnae of Alsophila spinulosa (Wall. ex Hook.) Tryon
(c) Enlarged pinnae of Microlepis speluncaea (L.) Moore
(d) Enlarged pinnae of Pteridium aquilinum (L.) Kuhn
(e) Enlarged pinnae of Sphenomeris chinensis (L.) Maxon
(f) Enlarged pinnae of Lindsaea malabarica (Bedd.) Bak. ex C. Chr.

PLATE-14
(a) Ampelopteris prolifera (Retz.) Copel.
(b) Trigonospora sericea (Scott. ex Bedd.) Holtt.
(c) Sphaerostephanos arbuscula (Willd.) Holtt.

PLATE-15
(a) Pinnae of Christella parasitica (L.) Levêc
(b) Pinnae of Ampelopteris prolifera (Retz.) Copel.
(c) Enlarged pinnae of Pronephrium nudatum (Roxb.) Holtt.
(d) Pinnae of Christella dentata (Forssk.) Brown. et Jermy
(e) Pinnae of Pseudocyclosorus falcibolus (Hook.) Ching
(f) Pinnae of Pronephrium repandum (Fe’e.) Holtt.
(g) Pronephrium nudatum (Roxb.) Holtt.

PLATE-16
(a) Pinnae of Asplenium obscurum Bl.
(b) Pinnae of A. cheilosorum Kunze ex Mett.
(c) Diplazium esculentum (Retz.) Sw.
(d) Pinnae of Aphytium pectinatum (Wall. ex Hope) Presl
(e) Pinnae of Deparia japonicum (Thunb. ex Murray) Kato
(f) Asplenium normale D. Don
(g) A. laciniatum D. Don
PLATE-17
(a) Hypodematum crenatum (Forssk.) Kuhn, v. Deck.
(b) Pleocnemia winitii Holtt.
(c) Pinnae of Tectaria coadunata (Wall. ex Hook. et Grev.) C. Chr.
(d) Pinnae of T. polymorpha (Wall. ex Hook.) Copel
(e) Egenolfia appendiculata (Will.) J. Sm.

PLATE-18
(a) Pinnae of Nephrolepis cordifolia (L.) Presl
(b) Pinnae of N. exaltata (L.) Scott.
(c) Leucostegia immersa Wall. ex. Presl
(d) Azolla pinnata R. Br.
(e) Blechnum orientale L.
(f) Tectaria coadunata (Wall. ex Hook. et Grev.) C. Chr.
(g) Leucostegia immersa Wall. ex. Presl