A census of pteridophytes in Eastern Ghats, India

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Abstract: The present study focused on pteridophytes of the Eastern Ghats, India. A census of pteridophytes distributed in different states of the Eastern Ghats was prepared based on taxonomic literature, herbaria and field studies. Altogether, 184 species belonging to 75 genera under 40 families were enumerated. Of these, 20 species are common in states of the Eastern Ghats. The state-wise analysis shows that Odisha part of Eastern Ghats harbors a highest number of pteridophytes (142 spp.) followed by Andhra Pradesh (91 spp.), Tamil Nadu (67 spp.) and Karnataka (49 spp.). Odisha represents the highest number of unique species (65 spp.) followed by Karnataka (19) and Andhra Pradesh (13).

Keywords: Eastern Ghats - Odisha - Andhra Pradesh - Tamil Nadu - Karnataka - Ferns.

INTRODUCTION

Most of the information is available on woody plants of tropical forests (Gentry 1988, 1995), even though non-woody life forms typically contribute at least half of the vascular plant species richness in these habitats (Whitemore et al. 1985, Gentry & Dodson 1987, Duivenvoorden 1994, Galeano et al. 1998, Balslev et al. 1999, Dittrich et al. 2005). Pteridophytes, i.e. ferns and fern-allies, are one of the most abundant and diverse non-woody plant groups, including primarily terrestrial and epiphytic herbs, in addition to some tree ferns. They form an important group of vascular plants. Pteridophytes are grown in a variety of habitats and in all climatic zones of India. The nomenclature of ferns has undergone far more radical changes during the current century than those possibly of any other group of plants.

The disorder in nomenclatural confusion in Indian ferns in indeed very great and becomes a primary task for Indian botanists today. Nayar & Kaur (1974) have listed the nomenclatural changes with regards to Beddome (1883, 1892) names only. Later, Chandra & Kaur (1987, 1994) have also updated the nomenclature of all the taxa illustrated in Beddome’s Ferns of South India (1863–1864) and Ferns of British India (1865–1870, 1876). Chandra (1981) presented a list of additions of 123 species to the Indian Flora (1960–1980). Dixit (1984) presented a comprehensive summary of the then known ferns from the present political boundary of India and has enumerated more than 1000 species of pteridophytes. Several novelties have since been discovered or described.

In India, pteridophytes are represented by about 1200 taxa under 204 genera (Bir 1987, Ghosh & Ghosh 1997). The nomenclatures of 219 taxa are updated by Chandra (2000). India represents about 17% of endemic species. The families Polypodiaceae (137 spp.), Dryopteridaceae (125 spp.), Athyriaceae (97 spp.), Thelypteridaceae (83 spp.), Selaginellaceae (62 spp.) and genera Selaginella (62 spp.), Pteris (62 spp.), Dryopteris (53 spp.), Asplenium (45 spp.) and Polystichum (45 spp.) dominate the pteridophytic flora. Pteris (28 spp.) and Asplenium (26 spp.) dominate the peninsular India. The Eastern Himalaya and northeast India with about 845 taxa in 179 genera is the richest region representing 67% of pteridophytes known from the country, followed by south India with 345 taxa in 117 genera and north India including Western Himalaya with 340 taxa in 101 genera. However, most of these studies have focused on the Himalayas, the Western Ghats and North...
East India, little is known about the distribution of pteridophyte diversity in the Eastern Ghats region. State-wise and region-wise studies of ferns and fern allies have been made in other parts of India—*i.e.*, Darjeeling and Sikkim Himalayas (Mehra & Bir 1964), North-Western Himalayas (Dhir 1980), Garhwal Himalaya (Bir *et al.* 1982), Meghalaya (Baishya & Rao 1982), Palni hills (Manickam 1986), Western Ghats – South of Palghat gap (Manickam & Irudayaraj 1992), North Eastern India (Bir *et al.* 1992), Malabar (Nayar & Geervarghese 1993), Orissa (Saxena & Brahmam 1996), Polypodioid ferns of south India (Nampy & Madhusoodanan 1998), Karnataka (Rajagopal & Bhat 1998), Andhra Pradesh (Pullaiah *et al.* 2003) and Arunachal Pradesh (Singh & Panigrahi 2005). The present paper highlights a comprehensive database on the pteridophytes of the Eastern Ghats for the first time covering Odisha, Andhra Pradesh, Tamil Nadu and Karnataka.

**MATERIAL AND METHODS**

**Study area**

The Eastern Ghats are spread over in parts of five states, *viz.*, Odisha (Orissa), Andhra Pradesh, Telangana, Tamil Nadu and Karnataka in Peninsular India (Fig. 1). It is situated between 11° 30' to 21° 0' N latitude and 77° 22' to 85° 20' E longitude. The wide range of topography and varied climate of the Eastern Ghats, provided by the hills rising from almost sea level to about 1672 m altitude, shaped the land to harbor rich and diverse flora. They are not formed of one particular geological formation but consist of rocks varying in origin and structure according to the location (Meher-Homji 2001). The forests in the Eastern Ghats are broadly classified into Evergreen, Semi-evergreen, Moist deciduous and Dry deciduous types (Champion & Seth 1968).

![Figure 1. Location map of the study area.](image)

The geographical area of the Eastern Ghats is about 2,05,088.60 km², whereas natural vegetation covers an area of 98,780 km² (48.16 %) (Reddy *et al.* 2015). The Eastern Ghats of Odisha occupy 49532.60 km² and distributed in Phulbani, Kalahandi, Gajapati, Rayagada, Ganjam, Koraput and Malkangiri districts similarly the Eastern Ghats of Andhra Pradesh occupies 98,662 km² and represented in parts of Visakhapatnam, East Godavari, West Godavari, Guntur, Krishna, Kurnool, Prakasham, Nellore, Cuddapah, Anantapur and Chittoor districts whereas the Eastern Ghats of Tamil Nadu covers 42,653 km² and spread over in parts of Vellore, Erode, Salem, Namakkal, Dharmapuri, Tiruvanamalai, Tiruchirapalli, Pudukkottai and Villupuram districts and the Eastern Ghats of Karnataka part spread over 14,241 km² and found in Chamrajnagar, Kolar and Bellary districts.
Methodology

Three sources of data were utilized for compiling the information on pteridophytes: intensive literature survey, a study of pteridophytic species in herbaria of different Universities and Botanical Survey of India and field observations. The main sources of taxonomic literature for the Eastern Ghats are from Census of Indian Pteridophytes (Dixit 1984), Flora of Orissa (Saxena & Brahmam 1996), Pteridophytic flora of Karnataka (Rajagopal & Bhat 1998) and Pteridophytes in Andhra Pradesh (Pullaiah et al. 2003). Classification of Pichi-Sermolli (1977) has been followed in the enumeration of families.

RESULTS AND DISCUSSION

During the present study as many as 184 species of ferns and fern allies, representing 75 genera under 40 families were documented (Table 1). The genus and species ratio was 1:8 with family and genus ratio was 2.4. These include Tree ferns (Alsophila and Cyathea species), Royal ferns (Osmunda species), Maiden-hair ferns (Adiantum species), Brake ferns (Pteris species), Silver ferns (Cheilanthes species), Dryopteroid ferns (Dryopteris species), Walking ferns (Ampelopteris species), Spleenworts (Asplenium species), Edible ferns (Diplazium species), Sword ferns (Nephrolepis species), Hardy ferns (Blechnum orientale L.), Polypods (Microsorium, Pleopeltis), Whisk ferns (Psilotum nudum (L.) P. Beauv.), Horse tails or scouring rushes (Selaginella species), Quill-worts (Isoetes species) and Water ferns (Marsilea, Salvinia cucullata Roxb. ex Bory and Azolla species).

Table 1. Enumeration of Pteridophytes of the Eastern Ghats.

| Family/Species          | Habitat | Odisha | Andhra Pradesh | Tamil Nadu | Karnataka |
|-------------------------|---------|--------|----------------|------------|-----------|
| Actiniopteridaceae      |         |        |                |            |           |
| Actiniopteris radiata  (Sw.) Link | Terrestrial | +      | +              | +          | +         |
| [= A. dichotoma Kuhn]   |         |        |                |            |           |
| Adiantaceae             |         |        |                |            |           |
| Adiantium capillus-veneris L. | Terrestrial | +      | +              | +          | +         |
| Adiantium caudatum L.   | Terrestrial | -      | +              | +          | -         |
| Adiantium incisum Forssk. | Terrestrial | +      | +              | +          | +         |
| [= A. caudatum auct. non L.] |         |        |                |            |           |
| Adiantium lunatum Burm.f. | Terrestrial | +      | +              | +          | +         |
| [= A. philippense auct. non. L.] |         |        |                |            |           |
| Adiantium raddianum Presl. | Terrestrial | -      | -              | -          | +         |
| Angiopteridaceae        |         |        |                |            |           |
| Angiopteris evecta (Forst.) Hoff. | Terrestrial | +      | +              | +          | -         |
| Antrophyaceae           |         |        |                |            |           |
| Antrophyum reticulatum Beddome | Epiphyte | +      | +              | +          | -         |
| [= A. plantagineum (Cav.) Kaulf.] |         |        |                |            |           |
| Aspleniaceae            |         |        |                |            |           |
| Asplenium aethiopicum (Burm.f.) Bech. | Terrestrial | +      | +              | -          | -         |
| Asplenium decressens Kuntze | Epiphyte | -      | -              | -          | +         |
| Asplenium formosum Willd. | Epiphyte | +      | +              | +          | -         |
| Asplenium indicum Sledge | Epiphyte | +      | +              | +          | -         |
| Asplenium inequilaterale Willd. | Epiphyte | +      | +              | -          | -         |
| Asplenium laciniatum D.Don | Epiphyte | +      | +              | +          | -         |
| Asplenium lunatum Sw.   | Epiphyte | +      | -              | -          | -         |
| Asplenium obscurum Blume | Epiphyte | -      | +              | +          | -         |
| Asplenium perakensc Mathew & Christ | Epiphyte | +      | -              | -          | -         |
| Asplenium polyodon G. Forster | Epiphyte | -      | +              | -          | -         |
| [= A. falcatum Lam.]    |         |        |                |            |           |
| Asplenium rockii C. Chr. | Epiphyte | -      | -              | -          | +         |
| Asplenium unilaterale Lam. var. majus (C.Chr.) | Epiphyte | +      | -              | -          | -         |
| Sledge                  |         |        |                |            |           |
| Asplenium unilaterale Lam. var. unilaterale | Epiphyte | +      | -              | -          | -         |
| Asplenium varians Wall. ex Hook. & Grev. | Epiphyte | +      | -              | -          | -         |
| Athyriaceae             |         |        |                |            |           |
| Antisocampium cumingianum Presl | Terrestrial | +      | -              | -          | -         |
| Athyrium drepanopterum (Kunze) R. Br. | Terrestrial | +      | -              | -          | -         |
| Species | Family | Habitat | Terminology |
|---------|--------|---------|-------------|
| Tectaria coadunata | | Terrestrial | + - - - |
| Polystichum squarrosum | | Terrestrial | + + + - |
| Dryopteris sparsa | | Terrestrial | + - - - |
| Dryopteris sparsa | | Terrestrial | + - - - |
| Dryopteris hirtipes | | Terrestrial | + - - - |
| Dryopteris cochleata | | Terrestrial | + - - + |
| Diplazium dilatatum Bl. | | Terrestrial | + - - - |
| Diplazium esculentum (Rez.) Sw. | | Terrestrial | + + + - |
| Diplazium japonicum (Thunb.) Beddome | | Terrestrial | - + + - |
| Dicranopteris linearis | | Terrestrial | + - - - |
| Microlepia speluncae | | Terrestrial | + - - - |
| Microlepia platyphylla | | Terrestrial | + - - - |
| Hypolepis glandulifera | | Terrestrial | + - - - |
| Woodwardia unigemmata | | Terrestrial | + - - - |
| Cheilanthes tenuifolia | | Terrestrial | + + + - |
| Cheilanthes swartzii | | Terrestrial | - - - + |
| Cheilanthes mysorensis | | Terrestrial | - - - + |
| Cheilanthes grisea | | Terrestrial | - - - + |
| Cheilanthes farinosa | | Terrestrial | + - - - |
| Cyathea spinulosa | | Terrestrial | - - - + |
| Azolla imbricata (Roxb. ex Griff.) Nakai | | Aquatic | + - - - |
| Azolla pinnata R.Br. | | Aquatic | + + + - |
| Blechnum orientale L. | | Terrestrial | + + + - |
| Woodwardia unigemmata (Makino) Nakai | | Terrestrial | + - - - |
| Botrychium daucifolium Wall. ex Hook. & Grev. | | Terrestrial | + + + - |
| Botrychium lanuginosum Wall. ex Hook. & Grev. | | Terrestrial | - - - + |
| Cheilanthus albolimbinata Clarke | | Terrestrial | + - - + |
| Cheilanthus anceps Blanf. | | Terrestrial | + + + - |
| Cheilanthus dalhousiae Hook. | | Terrestrial | + - - - |
| Cheilanthus farinosa (Forrsk.) Kaulf. | | Terrestrial | + + + - |
| Cheilanthus grisea Blanf. | | Terrestrial | + - - - |
| Cheilanthus myosorensis Wall. ex Hook. | | Terrestrial | + + + - |
| Cheilanthus swartzii Webb. & Benth. | | Terrestrial | + - - - |
| Cheilanthus tenutifolia (Burm.f.) Sw. | | Terrestrial | + + + - |
| Cyathea gigantea (Wall. ex Hook.) Holttum | | Terrestrial | + - + - |
| Cyathea spinulosa Wall.ex Hook. | | Terrestrial | + + + - |
| Cyathea nilgirensis Holttum | | Terrestrial | + - + - |
| Davallia australis (Wall. ex Hook.) Presl | | Epiphyte | + - - + |
| Leucostegia immersa (Wall. ex Hook.) Presl | | Terrestrial | + - - - |
| Dennstaedtiaceae | | | | |
| Hypolepis glandulifera Browney & Chinnock | | Terrestrial | - - - + |
| Microlepia marginata (Houit.) C. Chr. | | Terrestrial | + - - - |
| Microlepia platyphylla (D.Don) J. Sm. | | Terrestrial | + + + - |
| Microlepia speluncae (L.) Moore | | Terrestrial | + + + - |
| Dicranopteridaceae | | | | |
| Dicranopteris linearis (Burm.f.) Underwood | | Terrestrial | + + + + |
| Drynariaceae | | | | |
| Drynaria quercifolia (L.) J. Smith | | Epiphyte | + + + + |
| Dryopteridaceae | | | | |
| Arachniodes aristata (Forst.f.) Tindale | | Terrestrial | + + + - |
| Dryopteris coehleata (D.Don.) C.Chr. | | Terrestrial | + + + + |
| Dryopteris hirtipes (Blume) Kunze | | Terrestrial | - - + + |
| Dryopteris sparsa (Buch.-Ham. ex D.Don) Kuntze | | Terrestrial | - + + + |
| Dryopteris sparsa (D.Don) Kunze | | Terrestrial | + - - + |
| Polystichum squarrosum (D.Don) Fee | | Terrestrial | - - - + |
| Tectaria coadunata (J.Smith) C.Chr. | | Terrestrial | + + + + |
| Family                  | Genus and Species                                      | Habit      | Tropical Plant Research 2020 7(1): 117–125 |
|------------------------|-------------------------------------------------------|------------|-------------------------------------------|
| **Equisetaceae**        | Equisetum diffusum D.Don.                             | Terrestrial|                                           |
|                        | Equisetum ramossissimum Desf. subsp. debile (Roxb. ex Vouch.) Hanke | Terrestrial|                                           |
| **Helminthostachyaceae**| Helminthostachys zeylanica (L.) Hook.                 | Terrestrial|                                           |
| **Hemionitidaceae**     | Coniopteris fraxinea (D.Don) Fee ex Diels             | Terrestrial|                                           |
|                        | Hemionitis arifolia (Burman.) Moore                   | Terrestrial|                                           |
|                        | Ptychorhynchus calomelanos (L.) Link                   | Terrestrial|                                           |
| **Huperziaceae**        | Huperzia hamiltonii (Spreng) Trev.                    | Epiphyte   |                                           |
|                        | Huperzia squarrosa (Forst.) Trev.                     | Terrestrial|                                           |
| **Hymenophyllaceae**    | Mecodium exsertum (Wall. ex Hook.) Copel.             | Terrestrial|                                           |
| **Hymenophyllaceae**    | Trichomanes plicatum (Bosch.) Beddome                 | Terrestrial|                                           |
| **Isoetaceae**          | Isoetes coromandelina L.f.                            | Terrestrial|                                           |
|                        | Isoetes dixite Shende                                  | Terrestrial|                                           |
|                        | Isoetes panchananii Pant & Srivastava                 | Terrestrial|                                           |
|                        | Isoetes sampathkumaranii Rao                          | Terrestrial|                                           |
| **Lindsaeaceae**        | Lindsaea ensifolia Sw.                                | Terrestrial|                                           |
|                        | Sphenomeris chinesis (L.) Maxon                       | Terrestrial|                                           |
| **Lomariopsidaceae**    | Bolbitis appendiculata (Willd.) K. Iwats              | Terrestrial|                                           |
|                        | Bolbitis appendiculata (Wild.) J. Smith               | Terrestrial|                                           |
|                        | Bolbitis costata (Wall. ex Hook.) Chung               | Terrestrial|                                           |
|                        | Bolbitis kanarensis Nayar & Chandra                   | Terrestrial|                                           |
|                        | Bolbitis virens (Wall. ex Hook & Grev.) Schott        | Terrestrial|                                           |
|                        | Egenolfia appendiculata (Willd.) J. Sm.               | Terrestrial|                                           |
|                        | Egenolfia bipinnatifida J. Sm.                        | Terrestrial|                                           |
| **Lycopodiaceae**       | Lycopodiella cernua (L.) Pic.                         | Terrestrial|                                           |
|                        | Lycopodiella cernua (L.) Pic.                         | Terrestrial|                                           |
|                        | Lycopodium hamiltonii Spring.                         | Epiphyte   |                                           |
|                        | Lycopodium nilagiricum Spring.                        | Epiphyte   |                                           |
|                        | Lycopodium phyllanthum Hook. & Arn.                   | Epiphyte   |                                           |
| **Lygodiaceae**         | Lygodium alternatum (Clarke) v.A.v.R.                 | Terrestrial|                                           |
|                        | Lygodium flexuosum (L.) Sw.                           | Terrestrial|                                           |
|                        | Lygodium microphyllum R.Br.                           | Terrestrial|                                           |
| **Marsileaceae**        | Marsilea minuta L.                                    | Aquatic    |                                           |
|                        | Marsilea quadrifolia L.                               | Aquatic    |                                           |
| **Nephrlepidaceae**     | Nephrolepis biserrata (Sw.) Schott.                   | Terrestrial|                                           |
|                        | Nephrolepis cordifolia (L.) Presl.                    | Terrestrial|                                           |
|                        | Nephrolepis delicata (Decne) Pichi-Sermolli           | Terrestrial|                                           |
|                        | Nephrolepis exaltata (L.) Schott                      | Terrestrial|                                           |
|                        | Nephrolepis hirsutula (Forst.) Presl.                 | Terrestrial|                                           |
|                        | Nephrolepis multiflora (Roxb.) Jarret                 | Terrestrial|                                           |
|                        | Nephrolepis auriculata (L.) Trimen.                   | Terrestrial|                                           |
| **Ophioglossaceae**     | Ophioglossum costatum R.Br.                           | Terrestrial|                                           |
|                        | Ophioglossum radicata L.f.                            | Terrestrial|                                           |
|                        | Ophioglossum polyphyllum A.Br.                        | Terrestrial|                                           |
| Family | Genus | Habitat | S. molesta | + | + | + | + |
|--------|-------|---------|------------|---|---|---|---|
| Ophioglossum reticulatum L. | Terrestrial | + | + | + | - |
| Osmundaceae | Osmunda regalis L. | Terrestrial | - | + | - | - |
| Parkeriaceae | Ceramicitermis thalictroides (L.) Brongn. | Aquatic | + | + | + | + |
| Polyopodiumaceae | Polyopodium aduncum (Sw.) Ching | Epiphyte | + | + | - | + |
| | Polyopodium gardneri (Mett.) Sledge | Epiphyte | + | - | - | - |
| | Polyopodium lanceolatum (L.) Farwell | Epiphyte | + | + | - | - |
| | Polyopodium mamii (Gies.) Ching | Epiphyte | + | - | - | - |
| | Polyopodium mollis (Kunze) Ching | Epiphyte | + | + | - | - |
| | Polyopodium nayariana Ching & Chandra | Epiphyte | + | - | - | - |
| | Polyopodium porosa (Presl.) Hovenkamp | Epiphyte | - | - | - | + |
| | Polyopodium stigmata (Sw.) Ching | Epiphyte | + | - | - | - |
| Psilotaceae | Psilotum nudum (L.) P. Beauv. | Epiphyte | + | + | + | + |
| Pteridaceae | Pteridium aquilinum (L.) Kuhn | Terrestrial | + | + | + | - |
| | Pteris argyrea T. Moore | Terrestrial | - | - | - | + |
| | Pteris biaritii L. | Terrestrial | + | + | + | - |
| | Pteris confusa T.G. Walker | Terrestrial | - | + | - | - |
| | Pteris cretica L. | Terrestrial | + | - | - | - |
| | Pteris heteromorpha Fee | Terrestrial | + | - | - | - |
| | Pteris nemoralis Willd. | Terrestrial | - | + | - | - |
| | Pteris pellicaidea Presl. | Terrestrial | + | + | + | - |
| | Pteris quadriaurita Retz. | Terrestrial | + | + | + | + |
| | Pteris vittata L. | Terrestrial | + | + | + | + |
| Salviniaeae | Salvinia cucullata Roxb. ex Bory | Aquatic | + | + | - | - |
| [= S. molesta Mitch] | Selaginellaceae | Terrestrial | + | + | + | - |
| | Selaginella bryopteris (L.) Baker | Terrestrial | + | + | + | - |
| | Selaginella ciliaris (Retz.) Spring. | Terrestrial | + | + | + | + |
| | Selaginella indica (Milde) Trayon. | Terrestrial | + | + | + | - |
| | Selaginella involvulose (Sw.) Spring. | Terrestrial | - | + | - | - |
| | Selaginella monospora Spring. | Terrestrial | + | - | - | - |
| | Selaginella nairii Dixit | Terrestrial | + | - | - | - |
| | Selaginella pallidissima Spring. | Terrestrial | + | - | - | - |
| | Selaginella plana (Desv. ex Poiré) Hiern. | Terrestrial | - | - | - | + |
| | Selaginella radicata (Hook. & Grev.) Spring. | Terrestrial | + | - | - | - |
| | Selaginella repanda (Desv. ex Poiré) Spring. | Terrestrial | + | + | + | - |
| | Selaginella subdiaaphana (Wall. ex Hook. & Grev.) Spring. | Terrestrial | + | - | - | - |
| | Selaginella tenera (Hook. & Grev.) Spring. | Terrestrial | + | - | + | - |
| | Selaginella vaginata Spring | Terrestrial | + | - | - | - |
| | Selaginella wightii Hiern. | Terrestrial | + | + | + | - |
Sinopteridaceae

*Doropteris concolor* (Langsd. & Fisch.) Kuhn Terrestrial + + - -
*Doropteris ludens* (Wall. ex Hook.) J. Sm. Terrestrial + - - -

Stenochnaeanae

*Stenochna palustris* (Burm.f.) Bedd. Epiphyte + + + -

Thelypteridaceae

*Ampelopteris prolifera* (Retz.) Copel. Terrestrial + + - -
*Amphineuron opulentum* (Kaulf.) Holtt. Terrestrial + - - -
*Amphineuron terminans* (Hook.) Holtt. Terrestrial + - + +
*Christella dentata* (Forssk.) Browney & Jermy Terrestrial + + + +
*Christella hispidula* (Decne.) Holtt. Terrestrial - + + -
*Christella parasitica* (L.) Leveille Terrestrial + + + +
*Christella semisagittata* (Roxb. ex Griff.) Holtt. Terrestrial + - - -
*Christella subpubescens* (B.L.) Holtt. Terrestrial + - - -
*Cyclosorus gongylodes* (Sekkuhr) Link Terrestrial + + + -
*Macrothelypteris ornata* (Wall. ex Bedd.) Ching Terrestrial + - - -
*Macrothelypteris torresiana* (Gaud.) Ching Terrestrial + + + -
*Pneumotypos tercuma* (Poir.) Holtt. Terrestrial + + - -
*Pronepholium nudatum* (Roxb. ex Griff.) Holtt. Terrestrial + + + -
*Pseudocyclosorus falcilobus* (Hook.) Ching Terrestrial + - - -
*Pseudocyclosorus tylodes* (Kunze) Ching Terrestrial - + - -
*Sphaerostephanus unitissimus* (L.) Holtt. Terrestrial + - - -
*Trigonospora calcarata* (Bl.) Holtt. Terrestrial + - - -
*Trigonospora ciliata* (Benth.) Holtt. Terrestrial + + + -

Vittariaceae

*Vittaria elongata* Sw. Epiphyte - + - -

| Total | 142 | 91 | 67 | 49 |

The predominant families are Polypodiaceae (21 species), Thelypteridaceae (18), Aspleniaceae (14), Athyriaceae (14), Selaginellaceae (14), Pteridaceae (10), Cheilanthaceae (8), Dryopteridaceae (7), Lomariopsidaceae (7) and Nephrolepidaceae (7). These top ten families represent 120 species covering 65% of the total taxa. Whereas, 13 families represent one species each, *i.e.* Actiniopteridaceae, Angiopteridaceae, Antrophyaceae, Dicranopteridaceae, Drynariaceae, Helminthostachyaceae, Oleandraceae, Osmundaceae, Parkeriaceae, Psilotaceae, Salviniaceae, Stenochlaeaceae and Vittariaceae. Of the 75 genera, *Asplenium* and *Selaginella* are the dominant with 14 species each, followed by *Pteris* (9), *Cheilanthus* (8) *Pyrosia* (8), *Adiantum* (5), *Athyrium* (5), *Bolbitis* (5), *Christella* (5) and *Diplazium* (5).

Pteridophytes of the Eastern Ghats exhibit a broad spectrum of ecological types from hydrophytes (*Athyrium hohenackerianum* (Kunze) Moore, *Ceratopteris thalictroides* (L.) Brongn., *Azolla* species, *Selvinia cucullata* and *Marsilea* species) to xerophytes (*Actinopteris radiata* (Sw.) Link, *Selaginella indica* (Milde) Trayon. and *Selaginella wightii* Hiern.) and terrestrial to epiphytic ferns. Of the 184 species, 176 were herbs followed by four tree ferns (*Alsophila* and *Cyathea* species) and four climbers.

Though the terrestrial pteridophytes prefer shady and moist places but a few like *Actinopteris radiata* (Sw.) Link, *Cheilanthes* species, *Leptochilus decurrens* Blume, *Selaginella indica* (Milde) Trayon., *Selaginella wightii* Hiern., *Trichomanes pictatum* (Bosch.) Beddome, *Trigonospora calcarata* (Bl.) Holtt. and *Trigonospora ciliata* (Benth.) Holtt. are lithophytic. *Adiantum lunulatum* Burm.f., *Psilotum nudum* (L.) P. Beauv. grown on rocks covered with mosses. There are 142 (77.6%) species of terrestrial ferns followed by 34 epiphytic and seven aquatic ferns (hydrophytes). *Adiantum capillus-veneris* L., *Selaginella bryopteris* L., *Lycopodium* species, *Actinopteris* species, *Marsilea* species are well known for their medicinal properties (Baskaran et al. 2018).

Of the 184 species, only 20 (11%) species are generalists and share their distribution throughout the Eastern Ghats. These are *Actinopteris radiata* (Sw.) Link, *Adiantum capillus-veneris* L., *Adiantum incisum* Forssk., *Adiantum lunulatum* Burm.f., *Ceratopteris thalictroides* (L.) Brongn., *Christella dentata* (Forssk.) Browney & Jermy, *Christella parasitica* (L.) Leveille, *Dicranopteris linearis* (Burm.f.) Underwood, *Drynaria quercifolia* (L.) J. Smith, *Dryopteris coehleata* (D.Don.) C.Chr., *Hemionitis arifolia* (Burm.f.) Moore, *Isoetes coromandeliana* L.f., *Marsilea minuta* L., *Psilotum nudum* (L.) P. Beauv., *Pteridium aquinimum* (L.) Kuhn, *Pteris pulilicida* Presl., *Pteris quadraiaurita* Retz., *Pteris vittata* L., *Selaginella ciliaris* (Retz.) Spring. and *Selaginella repanda* (Desv. ex Poir et) Spring.

The state-wise analysis shows that Odisha part of the Eastern Ghats harbors a high number of pteridophytes (142 spp.) followed by Andhra Pradesh (91 spp.), Tamil Nadu (67 spp.) and Karnataka (49 spp.). But in parts of
Eastern Ghats of Karnataka area is very less number of pteridophytes as compared with other states. Still, the presence of 49 species in the Eastern Ghats of Karnataka part (within 14,241 km²) is mainly by the presence of evergreen forests in this area and is considered as a transitional region of the Eastern Ghats and the Western Ghats. The presence of 141 species of pteridophytes in Odisha is mainly due to the representation of south Indian and north Indian forest types. Odisha represents a high number of unique species (65 spp.) followed by Karnataka (19 spp.) and Andhra Pradesh state followed by 63 species are common for Andhra Pradesh and Tamil Nadu state.

CONCLUSION
From the study, it is evident that the Eastern Ghats are also rich in the diversity of pteridophytes. The problem of shifting cultivation, forest fires, grazing, biological invasion and other anthropogenic pressures posing much threat to the survival of ferns and fern allies. There is a need for coordinated research efforts to survey and identification of critical areas for the protection of for pteridophytes in the Eastern Ghats. The development of fern gardens in botanic gardens, documentation and digitization of ferns and associated indigenous/traditional knowledge is essential.

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