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Distribution of Pteridophytes along the Eastern Ghats of India - A Review

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Abstract: *Studies on Pteridophytes in India were reported since British India by Beddome[1]. The Fern studies gained momentum after the establishment of the Indian Fern Society in 1983. Varieties of Pteridophytes are present in Himalayan mountain range, Eastern Ghats and Western Ghats of India and are in use by tribal people as food, medicine and ornamental plants since ancient periods. The distribution and diversity of Pteridophytes has been studied along east coast in parts of Tamil Nadu, Andhra Pradesh and Odisha. This review focussed on the effects of elevation, humidity, temperature and environment on Pteridophytes distribution. The present paper provides comprehensive review of studies on Pteridophytes carried out by researchers on east coast of India and presents the species of Pteridophytes that are becoming extinct. The effects of climatic conditions, rainfall, land use pattern and environmental effects on pteridophytes distribution and sustainability are highlighted.*

Key Word*: Pteridophytes, Distribution, Ecology, Endemic, Eastern Ghats of India.*

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I. Introduction

The Pteridophytes include ferns and fern-allies, which are the non-flowering, vascular and spore-bearing plants. They form a prominent part of the earth's vegetation as they provide evidence of vascular system evolution and reveal emergence of seed habitat in the plants. Thus the Pteridophyte group forms a connecting link between non-vascular lower group plants and the higher group seed bearing plants. Though they were the predominant part of earth's vegetation 250 million years ago, afterwards seed bearing plants replaced them to a larger extent. The Pteridophytes grow abundantly in moist tropical and temperate forests, rocky faces, shady tree branches, wetlands (which include marshes, swamps, bogs, ferns and similar areas lying between the land and water interface), mangroves and water bodies. Interestingly, they exist in different eco-geographically endangered regions from sea level to the highest mountains[2].

The Pteridophytes spread over the world comprises of over 300 genera and 12,000 species of which almost 1000 species are present in India. 47 species are endemic to India and some of these species are placed under Rare Endangered and Threatened (RET) category[3]. Some of the Pteridophytes have been reported to be edible, possess medicinal value, potential for use as bio-fertiliser and ornamental plants. In India, the Pteridophytes are distributed in Himalaya region, Eastern Ghats and Western Ghats. The dominance of the species was reported in high altitude, high rainfall and temperate forests. The distribution of the Pteridophytes on Eastern Ghats of India reported by various researchers is presented below.

Eastern Ghats, a discontinuous mountain range present on east coast of India run through the states of Odisha (earlier known as Orissa), Andhra Pradesh, Telangana, Tamil Nadu and parts of Karnataka. The mountain ranges run parallel to Bay of Bengal with Deccan plateau on west side. Eastern Ghats are relatively lesser in height compared to Western Ghats. The peak elevation of Eastern Ghats is 1690 m above MSL (Jindhagada Peak of Araku in Andhra Pradesh). In comparison to Himalayan mountain range, the Eastern Ghats are closer to the equator and hence relatively warm climatic conditions exist.

II. Pteridophytes of Odisha

Subhadra et al.[4] reported presence of 9 species of Pteridophytes belonging to 6 families (*Salviniaceae, Pteridaceae, Azollaceae, Marsileaceae, Thelypteridaceae, Parkeriaceae)* and 6 genera in wetlands of Bhubaneshwar and its adjoining areas of Khurda district. 141 ferns and fern allies were reported from odisha state by Saxena and Brahman[5] and Panigrahi[6]. During rigorous floristic study in connection with "Diversity assessment and documentation of Pteridophytes of Similipal Biosphere Reserve, Odisha", Biswal and Rout[7] identified a rare fern "***Antrophyum henryi****",* which is endemic to eastern Himalaya: Arunachal Pradesh and Sikkim in India and China. Similarities of taxa in Similpal and Himalayan region were reported. The identification of distribution of rare pteridophyte species namely, *Antrophyum henryi* has added bio-

geographical importance to Similipal hill ranges in Chhotnagpur Plateau. The Similipal hill ranges are at an elevation of 559 m above mean sea level.

III. Pteridophytes of Andhra Pradesh

Prayaga Murty et al.[8] studied the diversity and distribution of Pteridophytic flora in Punyagiri hills, located at 55 km away from Visakhapatnam. Punyagiri hills are at an altitude of 230 m above MSL. Quadrate method was adopted to calculate the Importance Value Index (IVI) of species. A total of 13 species belonging to 10 genera and families were recorded. Maximum relative density was reported for *Selaginella involvence* (10.6) and *Pteris vittata* (8.4). Minimum relative density and relative frequency were reported for the species *Nephrolepis cordifolia* (5.5) and *Pteris pellucide* (6.3). The maximum IVI was reported in *Selaginella involvence* (10.6) and *Pteris vittata* (8.4). *Adiantum lanulatum (25.4) , Pleopeltis pallida* (24.5) and minimum in *Nephrolepis cordifolia* (18.6). The study revealed the population of Pteridophytes in the region to be heterogeneous.

Narasimha Rao and Lohitasyudu[9] have studied the composition and distribution of Pteridophytes in G. Madugula Mandal of Visakhapatnam District by Quadrate method. The study was carried out in hilly terrain of the area and the analysis of numerical data revealed maximum density for the species *Selaginella involvense* (11.9) and minimum density was reported for the species *Cyathea gigantea* (6.8). Further, Narasimha Rao[10] reported that *Cyathea gigantean holttum* was a rare and endemic pteridophyte and has occurrence along the running streams and banks of streams where continuous water source was available in Araku, and Paderu apart from G. Madugula. It was reported that the beautiful tree fern, *Cyathea* is destructed by local people for extraction of tannins, alcohol and soft drinks.

The distribution of Pteridophytes in agricultural fields of Razole, East Godavari district, Andhra Pradesh has been studied by Narasimha Rao[11] and reported that *Marselia, Salvinia, Azolla* and *Pteris* were the predominant species. *Salvinia* and *Azolla* were distributed in paddy fields, nearby ponds and lakes whereas the species of Marselia were present along banks of canals, small creeks and edges of lakes and ponds. Though the Pteridophytes are distributed in cool (low temperature) areas with continuous wet conditions (evergreen forests, moist forest regions), the pteridophytic flora from Razole area revealed survival of the species in the sub tropical to tropical conditions where temperature raise is up to 40^0C. Amruthalakshmi and Balaji[12] conducted studies on Fern and Fern Allies of Papikondalu hills of Eastern Ghats of altitude varying from 20m to 850m above MSL. The hills are distributed in 3 districts of united Andhra Pradesh state namely East Godavari, West Godavari and Khammam. Papikondalu hills of Eastern Ghats are reported to be inhibited by a variety of fern and fern allies, which included maiden-hair ferns (*Adiantum* species), Brake ferns (*Pteris* species*),* Climbing ferns *(Lygodium* species*),* Tree ferns (*Cyathea* species), Xerophytic ferns (*Actiniopteris radiata*), Lithophytic ferns (*Selaginella* species) Hardy ferns (*Blechnum orientable*) and water ferns (*Marsilea, Salvinia* and *Azolla* species). Tulasi Rao et al.[13] reported presence of 15 species of Pteridophytes in Nallamala forests and mentioned the medicinal usage of ferns such as *Marsilea, Aspidium, Tectaria, Lycopodium, Osmunda, Davalia, Adiantum, Athyrium and Blechnum*.

IV. Pteridophytes of Tamil Nadu

Kavitha et al.[14] studied Pteridophytes on Sitheri Hills with an altitude of 1097.3 m. 42 species of Pteridophytes are identified in terrestrials, aquatic and epiphytic forms. *Psilotum nudum*, Huperzia species, *Actinopteris radiata* etc are the important identified pieces. The distribution of most of the species was reported to be rare limited. At the study location, the genus *Polypodium* was reported to be present with higher number of 8 species whereas *Adiantum* and *Hymenophyllum* were present with 4 species. The other genus *Cheillanthes* was observed to be present with 3 species. All the remaining genera were reported to be represented by 1 or 2 species only. The distribution of level of the surveyed ferns and fern allies was determined in their communities of occurrence on the basis of visual observation on 5 point scale as, 1 – Rare, 2- Seldom, 3- Common, 4- Frequent and 5- Very much frequent. The diversity of species among the genera was reported to be greater in the studied hill range of the 23 genera surveyed in the Sitheri Hills. The genus *Polypodium* was present with higher number of 8 species. Terrestrial or Lithophytic species were reported to grow gregariously along roadsides of Nilgiri hills by Sonia and Ramachandran[15]. The dominant species at Mahabaleshwaram were reported as Pteridaceae and Adiantaceae.

V. Summary and Conclusions

Pteridophytes distribution was reported in Odisha, Andhra Pradesh and Tamil Nadu. The distribution was more in temperate forests of Eastern Ghats, particularly at higher altitudes. The studies revealed the presence of rare ferns and endangered pteridophyte species with limited occurrence. Though temperate forests and cold climatic conditions favour pteridophytes existence, the species such as *Marselia, Salvinia, Azolla* and *Pteris* are reported to survive in subtropical to tropical climatic conditions.

The population growth and industrialisation are affecting the temperate forests and changing the climatic conditions due to environmental pollution and thereby posing threat for existence of some species of pteridophytes. Even the meagre pteridophytes present on the hill slopes at high altitudes are to be preserved not only due to over exploitation of the species but also, due to their multifaceted usage as ornamental plants, medicinal value and food. Hence, it is essential for the governments to impose restrictions on maintaining the environment conducive for pteridophyte growth on Eastern Ghats as they receive relatively lesser rainfall compared to Western Ghats. There is need to take up focussed studies on pteridophyte distribution and diversity, besides identifying the RET species along Eastern Ghats of Andhra Pradesh and Tamil Nadu as developing/ growing cities along the east coast are involving hill slope constructions at an alarming rate and thereby affecting the favourable environment for pteridophytes on Eastern Ghats.

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