



Fern and fern allies of Udagamandalam, Ooty, Tamil Nadu, India

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Abstract

The study was carried out in Udagamandalam, Ooty district of Tamil Nadu India during the year 2020-2021. The region is located in the Western Ghat Mountains within the coordinates of 11.41° N 76.70° E. The area is surrounded by lofty mountains which contain great variety of fern and their allies. Therefore, the current study was aimed to undertake deep systematic survey of different habitats of the area. A total of 87 species of ferns were collected from the area, out of which 9 species were identified of various families like Davalliaceae, Selaginellaceae, Aspleniaceae, Nephrolepidaceae, Cyatheaceae, Salvinaceae and Polypodiaceae etc. A list of fern and their allies along with nomenclature, description, synonym, distribution and habitat have been provided here.

Keywords: distribution, fern, habitat, identification, Ooty, udagamandalam etc

Introduction

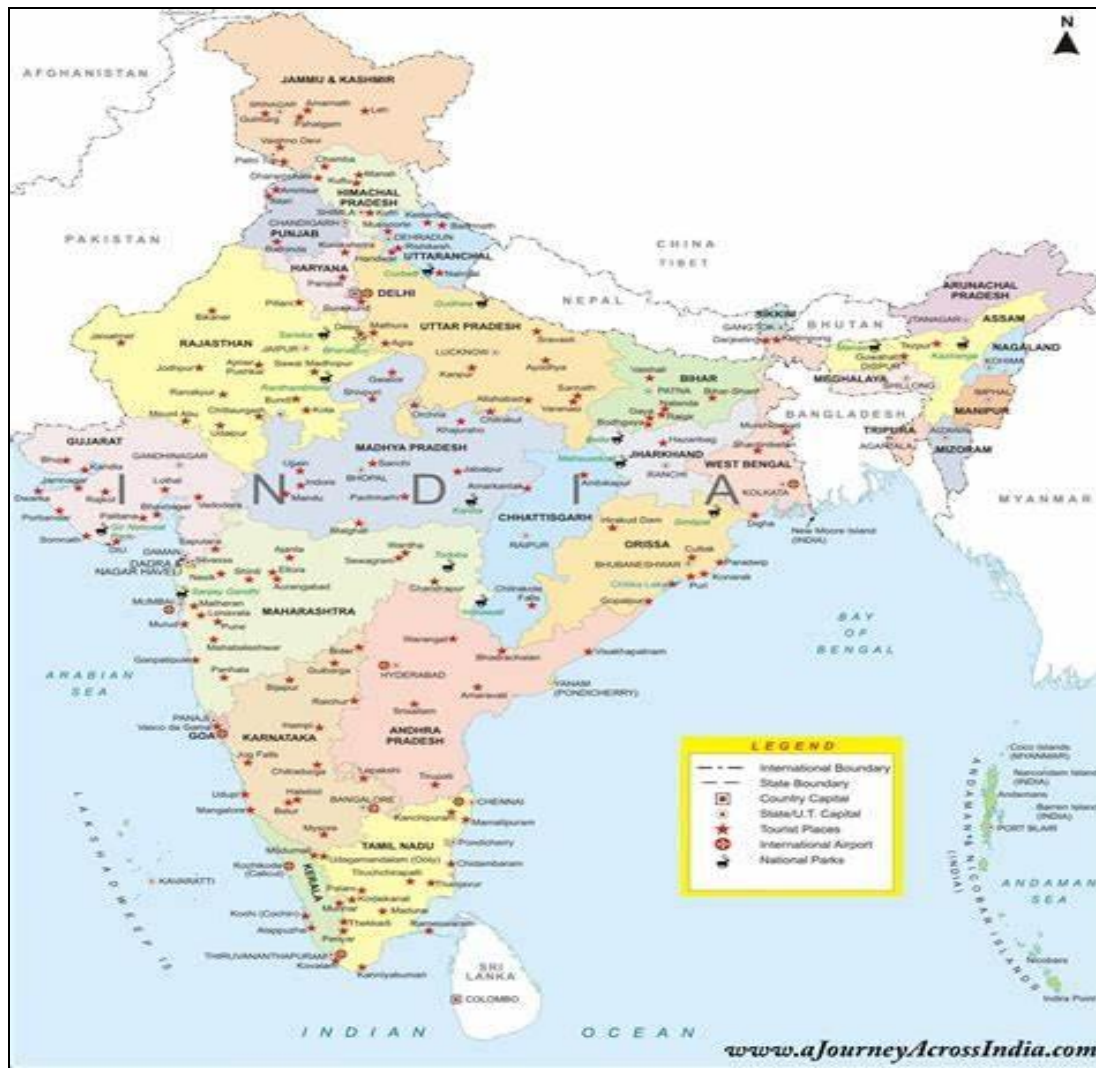
Pteridophytes are seedless but spore-producing plants that are divided into two lineages: lycophytes, which have no leaf gap in the stem stele, and Monilophytes, which have a leaf gap in the stem stele (Euphylls) (Pryer *et al.* 2004, Smith *et al.* 2006) [18, 22]. For millions of years, they have been an important part of the earth's flora (Pryer *et al.* 2001) [17]. There are approximately 300 genera of pteridophytes worldwide, with approximately 9600 ferns and 1400 lycophytes (Smith *et al.* 2008) [21], with the highest diversity in the tropics (Jacobsen and Jacobsen 1989, Kornas 1993; Linder 2001) [8, 10, 12]. There are 1150 species of ferns and fern allies in India, according to the current revised treatment (Fraser- Jenkins 2008; Fraser Jenkins and Benniamin 2010) [6]. For thousands of years, ferns have thrived in a variety of environments, having originated in ancient tropical habitats. Ferns first appeared in the fossil record during the middle devonian period 390 million years ago, according to Rothwell and Stockey (2008) [20]. Ferns have been evolving and diversifying in recent centuries. According to Chapman (2006), approximately 15% of all fern and lycophyte species are unknown to science. Around 1200 species of ferns are known to exist in the world, with 225-230 genera (Kramer and Green 1990) [11] and 37 families (Smith *et al.* 2006) [22].

Materials and Methods

The study was carried out in Udagamandalam, Ooty district of Tamil Nadu India. The region is located in the Western Ghat Mountains within the coordinates of 11.41° N 76.70° E. Ooty officially known as Udagamandalam is a

town and a municipality in the Nilgiris district of the Indian state of Tamil Nadu. It is located 86 Km north of Coimbatore. It is a popular hill station located in the Nilgiris hills. Ooty features a subtropical highland climate under Koppen climate classification. Despite its location in the tropics, in contrast with most of South India, Ooty generally features mild conditions and is spring- like throughout the year. The average high temperature ranges from 17-20 °C [63-68 °F] and the average low temperature ranges from 5-12 °C [41-54 °F] throughout the year. In Ooty, the rainy season is generally cool, windy, and humid. The city receives about 105 centimetres (41 inches) of precipitation on an annual basis. It's at an elevation of 2,240 metres (7,350 feet) above sea level. Government Rose Garden, Ooty Botanical Garden, Sims Park, Deer Park, and other tourist attractions can be found in the district. Ooty is surrounded by a dense tropical forest. Doddabetta (2,623 m) is the highest peak in the Nilgiris, located about 10 kilometres from Ooty.

Udagamandalam had an estimated population of 88,430 people according to the 2011 census. Diverse habitats such as plains, hills, streams etc. of study area were surveyed for the collection of fern diversity during the year 2020-21. The major research sites are shown in fig.b and c. Each specimen was photographed, numbered as it was collected and the detail notes were entered in the notebook. The collected specimens were pressed and dried in the standard way and described and identified with the relevant literature (Beddome, south Indian Fern etc.). The identity of specimens was authenticated from Department of Botany, Annamalai University.



India: figure a



Ooty (Udagamandalam) Figure b



Tamil Nadu Figure c

Fig 1

Results and Discussion

Davalliaceae

1. *Davallia griffithiana*: (HOOK.); sp. Fil. 1, 168, t. 49 B (1845)

Synonym: *Araiostegia copel*, *Araiostegiella M.Kato & Tsutsumi*, *Davallodes copel*, *Humata cav. Scyphularia Fee*, *Wibelia Bernh.*

Stout rhizome covered in long lanceolate-caudate white or yellowish scales; stipe erect, wiry, 4-6 inches long; deltoid fronds 9-12 inches long, 4-8 inches broad. Pinnules of the lower pinnae are lanceolate-deltoid, 2-3 inches long, and 1 inch or more broad; lower segments are toothed on barren fronds with a coriaceous texture, Cup-shaped involucres with very brief attachments on the sides; large, sub marginal or marginal sori. Distribution: Bhotan and Mishmee, Khasya and Jaintea, North Island, Taranaki, Tibet, Taiwan, Burma, Laos etc. 3,000-5,000 feet. (Also in South China)

Habitat: Epiphytic, bears on rocks, bricks, basalt or scoria walls in old gardens.

Specimen Examined: Botanical garden Ooty, 2500m, 27-02-2021

Aspleniaceae

2. *Asplenium trichomanes*: (Linn.) L. 1N: sp. Pl. 2: 1082, nom. rejic. (1753), TSN 17364

Synonym: Maidenhair spleenwort, harts tongue.

Stipes densely tufted, 1-4 inches long, naked glossy brown or black; fronds 6-12 inches long, about $\frac{1}{2}$ - inch broad, with

15-30 opposite pairs of sessile horizontal pinnae, which are $\frac{1}{4}$ - $\frac{3}{8}$ inch broad, $\frac{1}{2}$ - 2 lines deep, the edge slightly crenate, the two sides unequal, the upper one the broadest and narrowed suddenly at the base; texture sub-coriaceous; veins pinnate, inconspicuous; rachis polished; sori linear oblong, 3-6 on each side of the midrib. Distribution: Kulhatty on the Nilgiris, Himalayas, Kashmir to Kumaon, 5,000- to 10,000 feet elevation. (Also in all four quarters of the world, Australia and Polynesia.)

Habitat: Evergreen, Perennial, Terrestrial, moist, rocky talus slopes.

Specimen examined: Botanical garden Ooty, 2500m, 27-02-2021

Nephrolepidaceae

3. *Nephrolepis exaltata*: (Linn, under *Polypodium*.), (Schott. 1834), TSN 17605

Synonym: *Polypodium exaltata*

Rhizome suberect, stipes tufted, 4-6 inches long, strong, slightly scaly fronds up to nearly 3 feet long, pinnate; pinnae

very similar, 2-3 inches long, $\frac{1}{4}$ - $\frac{1}{2}$ inch wide, generally acute at the apex, margin entire or slightly crenate, superior base with a small narrow auricle, lower base with a smaller rounded one; texture coriaceous, both surfaces nearly glabrous, or rather scaly.

Distribution: South India, mountain forests on the Eastern and Western borders; East Bengal, up to 1,000 feet elevation, from Assam to Chittagong; Ceylon; Malay Peninsula. (Also in nearly all of the world's tropics)

Habitat: Terrestrial or Epiphytic Fern.

Specimen Examined: Coonoor Ooty, 1850m, 26-02-2021

Cyatheaceae

4. *Cyathea nilgirensis* (Holt.) Treefern”-

.In KewBull. 19:468. 1956; Nayar & Kaur, Comp.

Synonym: (*Alsophila nilgirensis* (Holt.) R. Tyron; *Cyathea latibrosa* auct. Non. Copel.) TSN 17937

Unbranched trunk with a crown of fronds at the apex with scales densely covering the younger fronds, measuring 2-4 m in height and 12-13 cm in diameter. Stipes with a bulging base and tiny hairs. Pinnae about 12 pairs, alternate, distinct petiolate, pale green below, dark green above, texture herbaceous. Lamina bipinnate, oblong-lanceolate, pinnae about 12 pairs, alternate, distinct petiolate, light green below, dark green above, texture herbaceous. Ultimate lobes about 15 pairs, alternate, oblong, 1.5x0.4 cm, margin crenate; pinnules acuminate, margin pinnatifid up to the costa; pinnules acuminate, margin pinnatifid up to the costa; pinnules acuminate, margin pinnatifid up to the costa; pinnules acuminate, margin pinnatifid Exindusiate, paraphyses intermingled with sporangia, spores trilete. Soris situated on the vein forks of the bottom half of the segments, exindusiate, paraphyses intermingled with sporangia, spores trilete. Along the banks of shady streams, it grows as a terrestrial species (Manickam & Irudayaraj 1992).

Distribution: South India, Palni hills, Nilgiri, Kerala etc,

Habitat: Evergreen forests, shaded stream banks etc.

Specimen Examined: Botanical garden Ooty, 2500m, 28-02-2021

Polypodiaceae

5. *Belvisia platyrhynchos* (Kunze) Copel. - *Belvisia platyrhynchos* Copel, Gen. Fil. (1947) 192; Fern Fl. Philipp. 3 (1961) 467. — *Gymnopteris platyrhynchos* J. Sm., Hook. J. Bot. 3 (1841) 403, ibid. 4 (1842) 156, nom. Nud. *Hymenolepis platyrhynchos* (Kunze) Copel. Var. *glauca* Copel, Leaf. Philipp. Bot. 3 (1910) 847. — *Hymenolepis glauca*: C. Chr., Dansk Bot. Ark. 6 (1929) 62. — *Macroplethus glauca* Tagawa, Acta Phytotax. Geobot. 11 (1942) 62. — *Belvisia glauca* Copel, Gen. Fil. (1947) 192; Fern Fl. Philipp. 3 (1961) 467. — Type: Elmer 11444, Mindanao, Mt Apo (K; iso BM, BO, G, L, P, US, W)

Short-creeping rhizome with extended internodes and a thickness of 2-6 mm. Rhizome scales are ovate-oblong to ovate-lanceolate, 6.8-10.5 by 1.5-3 mm, index 3-5, apex acute; edge long-dentate; reddish-brown, cells with thicker walls. Fronds sessile to obviously stalked, stipe up to 1 (-4) cm long, 2-4 mm thick; lamina linear-lanceolate to linear, 5-75 by 1-5 cm, index 5-20; narrower towards base and apex, slightly constricted below the spike; spike lanceolate to linear-lanceolate, 2-10 by 0.5-2 cm, index 3-11.5; spike lanceolate to linear-lanceolate, Sori near to the midrib, when mature covering the midrib and leaving a 1-5 mm broad marginal zone free, paraphyses with laterally affixed or peltate blades, laterally affixed blades flat or cylindrical, 0.15-0.4 by 0.04-0.3 mm, peltate blades 0.25-0.65 mm broad, border entire, cells with thick walls Rugulate spores, 40-90 by 25-60 m.

Distribution: Philippines, New Guinea.

Habitat - Epiphytic, in primary and secondary forest; sea level to 2300 m.

Specimen Examined: Botanical garden Ooty, 2500m, 26-02-2021

Polypodiaceae

6. *Platycerium bifurcatum*: Filic; fasc. 8: 496, 496, 1906, TSN 897654, txid 187371,

(Synonym: *Platycerium*) the elkhorn ferns, sometimes known as common staghorn ferns, are ferns endemic to Java, New Guinea, and eastern Australia, including New South Wales, Queensland, and Lord Howe Island. It's a bracket epiphyte that can be found in and around rainforests. It has heart-shaped sterile fronds 12–45 cm (5–18 in) long and arching grey-green fertile fronds that are forked and strap-shaped and grow up to 90 cm (35 in) long, growing to 90 cm (35 in) tall by 80 cm (31 in) wide.

The genus name *Platycerium* comes from the Greek *platys* (flat), and *ceras* (horn), while the specific epithet *bifurcatum* means bifurcated or forked. Both names are referring to the fertile fronds. It is cultivated as a garden ornamental plant. It can be cultivated outdoors in protected settings in temperate countries, or as a houseplant, with a minimum temperature need of 5 °C (41 °F).

Specimen examined: Botanical garden Ooty, 2500m, 27-02-2021

Salvinaceae

7. *Salvinia auriculata*: (Aubl.) African payal, Butterfly fern, eared watermoss.

Synonym: (*Salvinia biloba* Raddi; *Salvinia herzogii* de la sota, *Salvinia molesta* D.S. Mitela).

(Stolze (1983) and Moron (1995) Rhizome with stele U-shaped in cross-section; Floating leaves drying green to brown, oblong-elliptic to nearly round, apex obtuse or retuse, base cordate or subcordate, larger ones 1.5-2.5 cm long, bottom surface sparsely to moderately furnished with minute, castaneous, septate trichomes, upper surface densely furnished with short to substantially elongated papillae, Submerged leaves (2-) 3-10 cm long, sporocarps 1.5-2.5 mm in diameter, organised in rows paralleling the main lateral veins and each of them forming at the apex of a group of four trichomes that are all linked at their ends.

Distribution: South America, Africa, India, Aiustrallia, Pacific Islands.

Habitat: Climates ranging from tropical to warm, slow-moving streams or ponds, rivers, marshes, rice fields, and so on.

Specimen Examined: Botanical garden Ooty, 2500m, 27-02-2021

Selaginellaceae

8. *Selaginella lepidophylla*: (Hooker and Greville), spring. In: Mart., Fl. Bras.1 (2): 126. (1840), TSN 17083

Synonym: *Lycopodium lepidophyllum*

It is made up of hundreds of stems that are linked by a complex root system. These stems are structured in a spiral phyllotaxy, with developing stems in the centre and mature (outer, dying-to-dead) stems spiralling outward from the centre. *S. lepidophylla*'s spirally arranged stems are flat and extended when hydrated, and compactly curl into a spherical nest-ball shape with an average diameter of 6 to 8 cm when dehydrated. The outside stems are usually brittle and grey-brown in colour. Several layers of inner stems comprising the centre of the flattened, green rosette of the plant may be protected within these older outer stems, which uncurl and become photosynthetically active upon rehydration in their native state. A plant in two states: desiccated and hydrated. The stems of *S. lepidophylla* have a spiral phyllotaxy, with

the youngest stems at the centre and the oldest stems toward the plant's outermost edge. Both stems have significant distortion and curling patterns.

Distribution: Chihuahuan Desert, North America

Habitat: Dry, rocky, harsh, desert soils.

Specimen Examined: Botanical garden ooty, 2500m, 27-02-2021

Selaginelliaceae

9. *Selaginella intermedia*: (Blume) spring in Bull. Acad.Brux.10 (66): 144. 1983; Dixit, Cens. Ind. Pterid.: 14. 1984 & Selaginellaceae India: 63, fig. 28. 1992; Manickam & Irudayaraj, Pterid. Fl. Western Ghats: 39. Pl. 17. 1992.

Synonym: *Lycopodioides atroviridis*, *Lycopodioides plumea*, *Lycopodium atroviride*, *Lycopodium cuspidatum*, *Lycopodium furcatum* etc.

Stem erect or sub erect, up to 2 mm thick without leaves; rhizophores borne on the basal one-third of the main stem as stilt roots, entire plants about 30 x 15 cm, distal two-thirds of the main stem bears dichotomously branched lateral branches; leaves dimorphic throughout, lateral leaves oblong-lanceolate, ca. 5 x 2 mm, base uneven, entire plants approximately 30 x 15 cm, apex subacute or obtuse, margin ciliolate at the basal basioscopic part, entire in the rest; middle leaves oblong, 4 x 1.5 mm, apex aristate, border denticulate; cones about 1 x 0.3 cm, sporophylls uniform, ovate, 2 x 1 mm, acuminate, edge denticulate, microspores yellowish-brown.

Distribution: India, Myanmar, Java, Celebes, Annam etc.

Habitat: Terrestrial, growing in moist shady forests.

Specimen Examined: Ooty, 2,637m,26-02-2021



Fig 2

A: *Belvisia platyrhynchos* f: *Cyathea nilgirensis*

B: *Nephrolepis exaltata* g: *Selaginella intermedia*

C: *Salvinia auriculata* h: *Davallia griffithiana*

D: *Asplenium trichomanes* i: *Selaginella lepidophylla*

E: *Platycerium bifurcatum*

Conclusion

The geographical regions of Ooty and Conoor of Udagamandalam having an ample diversity of ferns share a

great significance in the total economic pertinence of pteridophytes. The study will give an insight and serve as a monumental resource in the field of identification of fern species in this region, thereby familiarizing people with these fern species.

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