



Pteridophyte diversity in Pampadum shola national park southern Western Ghats, India

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ABSTRACT

Diversity of pteridophytes in shola forests of Kerala, which are a part of Western Ghats, is less studied. The present study assessed the pteridophyte diversity at Pampadum Shola National Park. A total of 16 families belonging to 24 genera and 44 species of pteridophytes were recorded from Pampadum Shola National Park. Among these, 14 families, 22 genera, and 39 species were ferns, while 2 families, 4 genera and 5 species were fern allies. Six species were new record to this region.

KEYWORDS

Biodiversity, Fern, Kerala, Forest, Taxonomy.

Introduction

Pteridophytes or cryptogams are the first true land plants on earth. They were known for the origin and early evolution of seed plants in the land (Schneider et al. 2004; Pryer et al. 2001; Kenrick & Crane 1997). The Western Ghats, one of the richest biodiversity hotspots in the world, is considered the pteridophyte diversity centre due to its Gondwanaland origin. The habitat types of the mountain chain of Western Ghats include shola forests or Tropical montane forests. It is considered the most threatened ecosystem in the world and is restricted to valleys, depressions and along the folds of hills and watercourses (Bunyan et al. 2012; Swarupanandan et al. 1998). The sholas or tropical montane evergreen forest includes many endangered and endemic species. Microclimatic conditions, altitude variations, and disturbances influence the species richness and community composition of these forests (Shylesh et al. 2012; Trigass 2013; Tielborger et al. 2014; Mohandass et al. 2015 & 2016).

Ferns are very sensitive to forest disturbance and considered accurate indicators of forest health (Oldekop et al. 2012). Earlier studies revealed that pteridophytes in Southern India consist of approximately 233 species of ferns of which 44 species are facing extinction. The states of Kerala and Tamil Nadu themselves have a high number of pteridophytes (Manickam & Irudayaraj 1992). There were fewer studies carried out on pteridophytes, a relictual community in the shola forests of Kerala (Swarupanandan et al.; Muktesh Kumar 1998). The present study aims to assess the pteridophyte diversity in the Pampadum Shola, the smallest National Park in Kerala. 1998; Muktesh Kumar 1998)

Materials and methods

Study area

Pampadum Shola National Park (PSNP) was established in 2003 which comprises the mountain chain of the eastern portion of the Southern Western Ghats. It lies between Palani Hills, the eastward extension of the Western Ghats from Tamil Nadu and Cardamom Hills in the Southeast of Kerala with a total area of 11.753 sq. km. The terrain of PSNP is undulating with hill locks of varying height and altitude ranges between 1600 - 2500. Accordingly, the natural vegetation of the park changes from Tropical montane forest to subtropical broad-leaved hill forests and grassland. The Park receives both the Northeast and South-West monsoon profusely and misty and cloudy during most of the time in a year. Some parts of the PSNP were deforested for the monoculture plantations of wattle (*Acacia mearnsii*), Eucalyptus (*Eucalyptus obliqua*) and Pine in the past. The quadrat (1x1m) method was used for estimating the pteridophyte diversity in the National Park.

Fieldwork and sample collection

Quadrates were randomly laid in the forest areas and plantations for diversity studies (Figure 1). Pteridophytes were collected and identified with the help of experts and standard keys. The herbarium sheets were prepared with all the taxonomic details and deposited in the Herbarium at the School of Environmental Sciences, Mahatma Gandhi University. Ecological indices were also calculated using standard methods (Odum 1971; Causing 1991; Zar, 1999).

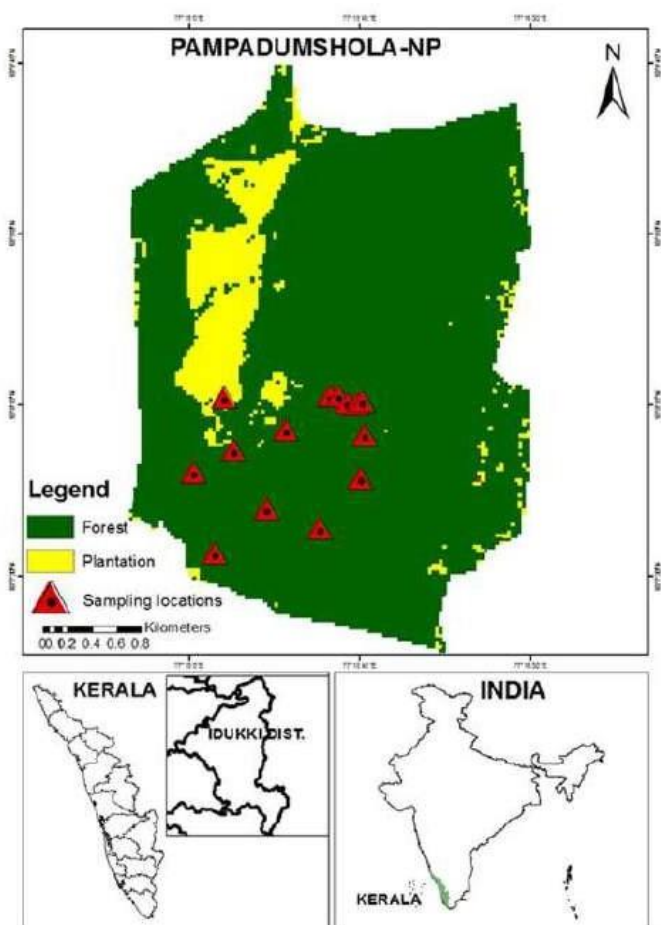


Figure 1. Study area showing sampling locations

Result and discussion

A taxonomic survey of ferns and fern allies at Pampadum Shola National Park was conducted during the summer season. A total of 16 families, 24 genera, and 44 species were recorded. Among them, two family, four genera and five species were fern allies while 14 families, 22 genera and 39 species were ferns (Table 1 & 2).

Table 1 Pteridophyte flora of the Pampadum Shola National Park region

Pteridophytes	Family	Genera	Species
Fern allies	2	4	5
Fern	14	22	39
Total	16	24	44

Table 2 Ferns collected from various localities of Pampadum Shola National park

Sl no.	Species name	Family	R/C/V.R/*	Swarupanandan et al 1998
1.	<i>Adiantum hispidulum</i> Sw.	Adiantaceae	R	A
2.	<i>Adiantum raddianum</i> C.Presl	Adiantaceae	R	A
3.	<i>Adiantum latifolium</i> Lam.	Adiantaceae	R	A
4.	<i>Asplenium aethiopicum</i> (Burm.f.) Bech	Aspleniaceae	R	P
5.	<i>Asplenium auritum</i> Sw.	Aspleniaceae	VR	P
6.	<i>Asplenium erectum</i> Bory de Saint-Vincent	Aspleniaceae	VR	P
7.	<i>Asplenium tenuifolium</i> D.Don	Aspleniaceae	R	P
8.	<i>Asplenium unilaterale</i>	Aspleniaceae	R	P
9.	<i>Asplenium yoshinagae</i> var. <i>indicum</i> (Sledge) Ching & S.K. Wu.	Aspleniaceae	R	A
10.	<i>Asplenium zenkerianum</i>	Aspleniaceae	R	P
11.	<i>Christella dentata</i> (Forssk.) Brownsey & Jermy	Thelypteridaceae	C	A
12.	<i>Pseudocyclosorus tylodes</i> (Kunze) Ching	Thelypteridaceae	R	P
13.	<i>Cyathea spinulosa</i> Wall. Ex Hook	Cyatheaceae	R	A
14.	<i>Cyathea gigantea</i> (Wall. Ex Hook) Holttum	Cyatheaceae	R	A
15.	<i>Cyathea crinita</i> Copel	Cyatheaceae	R	P
16.	<i>Dicranopteris linearis</i> (Burm.f.) Underw	Gleicheniaceae	C	P
17.	<i>Athyrium solenopteris</i> Moore	Athyriaceae	VR	P
18.	<i>Dryothyrium boryanum</i> (Willd.) Ching	Athyriaceae	R	P
19.	<i>Dryopteris hirtipes</i> (Bl.) Kuntze.	Dryopteridaceae	R	P
20.	<i>Dryopsis scabrata</i> (Kunze) R.E. Holttum & P.J. Edwards.	Dryopteridaceae	VR	A
21.	<i>Polystichum harpophyllum</i> (Zenker ex Kunze.) Sledge.	Dryopteridaceae	C	P
22.	<i>Polystichum subinerme</i> (Kunze) Frazer-Jenkins	Dryopteridaceae	R	A
23.	<i>Stenochlaena palustris</i> (Burm.f.) Bedd.	Blechnaceae	VR	A
24.	<i>Lepisorus amaurolepidus</i> (Sledge) Bir & Trikha	Polypodiaceae	R	P
25.	<i>Lepisorus nudus</i> (Hook.) Ching	Polypodiaceae	R	P
26.	<i>Leptochilus decurrens</i> Blume	Polypodiaceae	R	P
27.	<i>Leptochilus thwaitesianus</i> Fee	Polypodiaceae	R	A
28.	<i>Loxogramme involuta</i> (D.Don) C.Presl	Polypodiaceae	R	P
29.	<i>Pyrrosia porosa</i> var. <i>porosa</i> Hovenkamp	Polypodiaceae	C	A
30.	<i>Huperzia phyllantha</i> (Hook. & Arn.) Holub	Lycopodiaceae	C	P
31.	<i>Lycopodiella cernua</i> (L.) Pic. Serm	Lycopodiaceae	R	P
32.	<i>Lycopodium wightianum</i> Grev. & Hook	Lycopodiaceae	R	P
33.	<i>Nephrolepis auriculata</i> Trimen	Oleandraceae	C	P
34.	<i>Nephrolepis cordifolia</i> (L.) C.Presl	Oleandraceae	R	A
35.	<i>Pityrogramma calomelanos</i> var. <i>austroamericana</i> (Domin) Farw	Pteridaceae	R	A
36.	<i>Pteridium aquilinum</i> (L.) Kuhn	Dennstaedtiaceae	C	P
37.	<i>Pteris confusa</i> T.G. Walker	Pteridaceae	NC	P
38.	<i>Pteris cretica</i> L.	Pteridaceae	R	P

39	<i>Pteris pellucida</i> C.Presl	Pteridaceae	VR	A
40	<i>Pteris quadriaurea</i> Retz	Pteridaceae	C	p
41	<i>Pteris vitata</i> L.	Pteridaceae	C	A
42	<i>Selaginella brachystachya</i> (Hook&Grev.) Spring	Selaginellaceae	VR	p
43	<i>Selaginella</i> (Sw.) Spring	Selaginellaceae	VR	p
44	<i>Vittaria elongata</i> Sw.	Vittariaceae	C	p

*c-common, R-mrc, VR-vcr rare: A- absent P- pn::si:nt

PSNP is having a very higher number of native pteridophyte species. In ferns, Aspleniaceae was the most abundant family, there are seven species under one genus that can be found followed by Polypodiaceae (six species under four genera), Pteridaceae (five species under one genus) and Dryopteridaceae (four species under three genera). In fern allies, Lycopodiaceae was the abundant family which belongs to three species under three genera followed by the Selaginellaceae with a single genus *Selaginella*. Among these 44 species under 24 genera, eight species are epiphytic and the rest 36 are either terrestrial or lithophytic. Among the 5 species of fern allies occurring in PSNP only one was found as epiphytic and the rest were either terrestrial or lithophytic.

There is no previous floristic work information about Pampadum Shola National Park alone. Studies on the shola forests of Kerala gave an account of pteridophyte diversity in Eravikulam and Mannavan shola. A considerable extent of the area of the present study was included as part of the Mannavan Shola in the earlier study (Swarupanandan et al. 1998). They recorded a total of 80 species belonging to 24 genera and 43 families of ferns and fern allies from shola forests. The comparison showed that among these 28 species belonging to 18 genera and 13 families have been found to occur in PSNP also (Table 3).

Table 3 Comparison floristic richness of Pampadum Shola with Shola forests of Munnar region

	Shola forests	Pampadum Shola
Species	80	44
Genus	24	24
Family	43	16
Area (sq km)	102.18	11.753

16 species belonging to 12 genera and 10 families were a new record. These species have been listed in Table 2 with comparative information of pteridophyte diversity in shola forests. Among these six species belonging to six genera and six families were new record to this region and are *Adiantum raddianum* C.Presl, *Asplenium yoshinagae* var. *indicum*, *Christella dendata*

(Forssk.) Brownsey&Jermy, *Cyathea spinulosa* Wall ex Hook, *Pyrrosia porosa* var *Porosa* Hovenkamp, *Nephrolepis cordifolia* (L.) C.Presl. (Muktesh Kumar 1998, Swarupanandan et al. 1998). A few important pteridophytes are shown in Figure (2 to 4).

Figure 2. Photos of important pteridophytes



Figure 3 : Photos of important pteridophytes



Ecological diversity indices of PSNP indicated that the park contains the maximum number of species diversity. These indices were calculated for the assessment of the interrelationship between forest type and pteridophyte diversity. In this study higher Shannon-Weiner value, species dominance, richness and evenness index were observed in shola forests followed by Wattle, Pine and Eucalyptus (Table 4).

These results suggest that habitat plays a major role in the species diversity of pteridophytes. *Asplenium auritum* Sw., *Asplenium erectum* Bory ex.Willd., *Athyrium solenopteris* Moore, *Dryopsiss scabrosa* (Kunze) R.E.Holtum&P.J.Edwards., *Stenoch/aena palustris* (Burm.f.) Bedd. are the very rare species identified from this park. The results showed that Pampadum Shola National Park of Southern Western Ghats is rich in pteridophyte diversity and the ecosystem of the shola forests are critically important for the existence of most of the species.

Table.4 Ecological indices of the PSNP

Ecological index	Pampndum SholaNmionnl Park			
	Shola forests	Wattle plantation	Pine plantation	Eucalyptus plantation
No.of Species	1081	632	320	146
Shannon diversity index (H')	4.144	1.99	0.24	0.09
Species dominance index (C)	1.016	0.36	0.12	0.08
Species richness	14.174	357	1.63	0.99
Species evenness (E)	0.186	0.57	0.045	0.008

Conclusion

NP indicated that the park contains the maximum number of species diversity. These indices were calculated for the assessment of the interrelationship between forest type and pteridophyte diversity. In this study higher+ Shannon-Weiner value, species dominance, richness and evenness index were observed in shola forests followed by Wattle, Pine and Eucalyptus (Table 4).

The present study indicated high pteridophyte diversity at PSNP. Many rare species were recorded from the shola forest. Ecological diversity indices suggested low pteridophyte diversity at plantations when compared with montane evergreen forests. More studies have to be carried out to understand the actual species diversity.

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