

DIVERSITY, DISTRIBUTION PATTERN AND CONSERVATION OF PTERIDOPHYTES IN MEHAO WILDLIFE SANCTUARY, ARUNACHAL PRADESH

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Introduction

The Indian Himalayan Region (IHR), extends from Jammu & Kashmir to Arunachal Pradesh. It is known for its natural, representative and unique flora. The pteriophytic flora of the IHR constitutes a very prominent part of the vegetation and over 600 species of pteridophytes are known from the region (Bir, 1993). A few species are medicinal and edibles. Pteriophytic flora of the IHR has not received much attention compared to higher group of plants, and many parts in IHR particularly Protected Areas (PAs) have not been explored adequately.

The Mehao Wildlife Sanctuary lies between 95°15' - 97°50'E longitudes and 27° - 29°30' N latitudes. It is located in Debang Valley District of Arunachal Pradesh and covers an area of 281.50km². The terrain is entirely hilly, varying in altitude from 400m to 3,000m. There are a number of perennial streams and lakes (Mehao, Epipani, Ejo, Aba, Defu etc.) draining the sanctuary. The area falls with in the geographical sub-tropics and temperate climate. The biological importance of the area can be visualized by the fact that the area includes

Palaearctic, Indo-Chinese and Indo-Malayan floral and faunal elements. Centrally located natural water bodies like mehao lake covering an area about 200 ha and Mini Mehao lake add to the beauty and wealth of the sanctuary. The sanctuary enjoys a cool climate throughout the year with 2,680 mm average annual rainfall.

The main tribes inhabiting in MWLS are the Idus and Mishmis. The staple food of the people is rice, millet and meat. Apart from this, a variety of wild leafy vegetables, roots, tubers, fruits as well as pumpkin, potato, brinjal, ginger, onion, mustard, bamboo shoots, mushrooms are included in their diet. A beer called 'Yu' or 'Apong' is the common drink and it is fermented from rice or millets. Agriculture is the mainstay of the economy and the traditional shifting of 'Jhum' is the most popular method practiced by the people.

The sanctuary area is rich in faunal resource and a large number of animals like tiger, fishing cat. Himalayan bear, sloth bear, jackal, mongoose, otters, elephant, with buffalo, goral, serrow, sambhar, barking deer, wild boar, porcupines, rats, shrews etc. and several

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species of bats occur in this area. The avian fauna comprises of about 400 species.

Study site

Topography : The terrain is entirely hilly, varying in altitude from 400m to 3,000m. There are a number of perennial streams and lakes (Mehao, Epipani, Ejo, Aba, Defu etc.) draining the sanctuary. The area falls within the geographically sub-tropics and temperate climate. The biological importance of the area can be visualized by the fact that the area includes palaerctic, Indo-Chinese and Indo-Malayan flora and faunal elements.

Climate : The sanctuary area falls within the geographically subtropical zone, and enjoys subtropical climate with a distinct, through short, cold weather from November to February in the lower reaches. This is the most pleasant period when humidity in the air is least. However, on the basis of the experience and available information, seasons can be classified as follows :

The cold season - December to February
The pre monsoon season - March to May
The monsoon season followed by South-West monsoon – June to September
The post-monsoon season from October to November. It is also a period of transition.

Rainfall : The climate of sanctuary is a typical monsoon type. The mean annual rainfall over the Mehao Wildlife Sanctuary is of the order of 2,680mm. The maximum rainfall is experienced during the months from June to September. During the months of November to March, the region periodically comes under the influence of western disturbances causing

precipitation, mostly snowfall over the mountains.

Temperature : The maximum temperature is in the range of 12°C to 39°C and minimum in the range of 2°C to 23°C. Both day and night temperatures rise rapidly from March and continue till June which is the hottest month with maximum and minimum temperatures 39°C and 22°C respectively.

Humidity : The relative humidity in the sanctuary area is high throughout the year however, winter months are slightly less humid with the humidity ranging from 44 to 96%. The humidity starts rising rapidly from May onwards.

Special Weather Phenomena : Thunder storms mainly occur from February to September. It's maximum frequency is in April and minimum in the month of December. During the pre-monsoon months, thunder storms are often violent and from December to April they are occasionally accompanied by hail. Fog is frequent in the valleys during the winter months.

Material and Methods

The present study is based on primary surveys conducted in the different localities of Mehao Wildlife sanctuary (Shalley Lake, Mayodia, Mehao Lake, Epipani) in 2001, and also on the secondary information available from literature (Beddome, 1883; Borthakur and Barua, 2000; Chandra, 2000; Dixit, 1984; Singh and Panigrahi, 2005). For each species information on altitudinal range and habitat was collected during exploration tour. The samples of each species were collected and identified with the help of literature. Rarety of the

species has been decided on the basis of habitat specificity, population size and distribution range.

Results and Discussion

Based on field collections and study of flora a total of 205 species belonging to 72 genera and 35 families of ferns have been recorded to be occurring in Mehao Wildlife Sanctuary (Table 3).

Polypodiaceae was found to be the largest family in that area which represented 30 species followed by Athyriaceae (27 species). Dryopteridaceae (21 species), Thelypteridaceae (17 species) and Aspleniaceae (4 species). Family Polypodiaceae shows the maximum generic diversity with 13 genera followed by Thelypteridaceae (7), Athyriaceae (5) and Dryopteridaceae (4). At generic level *Athyrium* shows the maximum species diversity with 16 species followed by *Asplenium* (11 spp.), *Polystichium* (10 spp.), *Diplazium*, *Dryopteris*, *Pyrrosia* and *Selaginella* (8 spp. each) (Table 2). Ten families including Monachosoraceae, Oncocleaceae, Botrychiaceae, Dipteridaceae, Lomaripteridaceae, Loxogrammeaceae, Lygodiaceae, Angiopteridaceae, Pteridiaceae and Vittariaceae were recorded as monotypic (Table 2).

Ferns are so diverse in structure and adaptation that they can be found in every habitat. As to the diversity in size of sporophyte, the species of *Asplenium* was recorded as smallest ferns whereas *Alsophylla spinulosa* was as largest.

Distribution Pattern : The fern vegetation of MWLS can be broadly categorized based on the altitude and species composition in to following main types :

1. Tropical forests : up to 900m.
2. Sub-tropical forest : between 900-1,800m.
3. Temperate forests : between 1800-3500m.
4. Sub-alpine/Alpine forests : between 3,500-5,000m.

The sub-tropical zone of MWLS was very rich in pteridophytes and the majority of the ferns and fern-alies occur there were in exceedingly diverse habitats. Most of the *Selaginella* and *Equisetum* species were available in this zone. Most of the species of *Asplenium*, *Diplazium*, *Dryopteris*, *Polystichum* and Thelypteroid ferns are restricted to the subtropical parts of MWLS. Distribution pattern of the species indicated that along an altitudinal gradient, species richness was maximum in sub-tropical and

Table 1

Ecological classification of Pteridophytes of Mehao Wildlife Sanctuary, Arunachal Pradesh.

Sl. No.	Categories	Families	Genera	Species	Percentage
1.	Terrestrials	26	52	125	62
2.	Epiphytes	7	21	46	22
3.	Lithophytes	6	12	28	14
4.	Hydrophillous	5	5	5	2

Table 2
Comparison of five dominant Pteridophytic families in India, Meghalaya, Nagaland, Western Himalayas and Western Ghats.

Present Study	India (Dixit, 1984)	Meghalaya (Baishya and Rao, 1982)	Nagaland (Jamir and Rao, 1988)	Western Himalayas (Khullar, 2000)	Western Ghats
Polypodiaceae (14:33)	Polypodiaceae (27:132)	Polypodiaceae (23:51)	Polypodiaceae (16:53)	Dryopteridaceae (4:71)	Aspleniaceae (1:26)
Athyriaceae (5:24)	Dryopteridaceae (4:103)	Dryopteridaceae (6:21)	Aspleniaceae (11:43)	Athyriaceae (6:45)	Adiantaceae (1:25)
Thelypteridaceae (7:18)	Athyriaceae (14:85)	Thelypteridaceae (10:20)	Thelypteridaceae (15:31)	Polypodiaceae (9:43)	Thelypteridaceae (14:25)
Dryopteridaceae (4:19)	Thelypteridaceae (21:81)	Aspleniaceae (1:14)	Athyriaceae (5:21)	Aspleniaceae (1:30)	Dryopteridaceae (8:21)
Aspleniaceae (1:11)	Aspleniaceae (4:53)	Adiantaceae (5:14)	Aspleniaceae (1:17)	Thelypteridaceae (12:23)	Polypodiaceae (12:20)

temperate zone. It decreased sharply in the sub-alpine and alpine zones. The high diversity in subtropical and temperate zones may be due to diverse habitats and suitable climatic conditions or the growth and development of the species. The low diversity in the alpine zone may be due to severe climatic condition and also, a very short period for the growth and development of the species. The epiphytic Pteridophytes shows species in between subtropical and temperate forest

Habitat Diversity : The terrestrial species were more than 62 per cent while epiphytes constituted 23 per cent of the total fern flora. Only 14 per cent species of ferns

were found occurring as lithophytes in the sanctuary (Table 1).

Rarity : Apart from these species *A. crassipes*, *A. wallichianum*, *Alsophylla spinulosa*, *Angiopteris evecta*, *Arthromeris lehmannii*, *Asplenium cheilosorum*, *Athyrium flebalulatum*, *Belvisia spicata*, *Lepisorus biclor*, *Lindsea odorata*, *Metteuccia orientalis*, *Microsorium zippelli*, *Oleandra mucifolia*, *Onychium siliculosum*, *P. subfurfaracia*, *P. varia*, *Phymatopteris chrysotricha*, *Plagiogyria glaucascenes*, *Polypodiastrium argutum*, *Polystichum luctuosum* and *Pyrrosia costata* have restricted habitats, narrow distribution range and a small population size in the sanctuary.

Table 3

Checklist of Pteridophytic species of Mehao Wildlife Sanctuary

Family, Genus & Species	Altitude (m)	Habitat	Status in India	Localities				
				1	2	3	4	5
1	2	3	4	5	6	7	8	9
SUB-DIVISION: LYCOPHYTINA								
CLASS : LYCOPSIDA								
Fern-Allies								
LYCOPODIACEAE								
Lycopodium								
<i>L. japonicum</i> Thunb.	800	T	R					+
<i>L. obscurum</i> L.	800	T	R					+
<i>L. pseudoclavatum</i> Ching	800	T	R					+
Palhinia								
<i>P. cernuam</i> L.	2000	L						+
HUPERZACEAE								
Huperzia								
<i>H. dixitiana</i> Mondal et Ghosh	1800	E	R					+

Contd...

1	2	3	4	5	6	7	8	9
<i>H. herteiriana</i> (Kumm.) Sen et Sen.	1900	E	R				+	
Phlegmariurus								
<i>P. hemiltonii</i> (Spreng) Love et Love	2000	E	F				+	
<i>P. cryptomeriarus</i> (Max.) Ching	1800	E	F				+	
<i>P. pulcherrimus</i> (Wall. ex Hook et Grev.) Love et Love	1200	E	R			+		
<i>P. subulifolia</i> (Wall. Ex Hook et Grev.) Ghosh	1750	E				+		
SELAGINELLACEAE								
Selaginella								
<i>S. involvens</i> (Sw.) Spreng.	2200	TL	S		+			
<i>S. monospora</i> Spreng.	2400	L	F		+			
<i>S. pentagona</i> Spreng.	2650	L	S		+			
<i>S. picta</i> A. Br. ex Bak.	2000	L	F		+			
<i>S. semicordata</i> (Wall. ex Hook. et. Grev.) Spreng.	1750	L	F			+		
<i>S. tenuifolia</i> Spreng.	1600	L	S			+		
<i>S. wallichhi</i> (Hook. et. Grev.) Spreng.	1700	L	S			+		
SUB-DIVISION - SPHENOPHYTINA								
CLASS - EQUISETOPSIDA								
EQUISETACEAE								
Equisetum								
<i>E. diffusum</i> D.Don.	800	T	S					+
<i>E. ramosissimum</i> Desf.	2200	T	A		+			
<i>E. ramosissimum</i> Desf. subsp. <i>debile</i> (Roxb. ex. D.C.) Hauke	2650	T	R		+			
SUBDIVISION -								
CLASS - FILICOPSIDA								
Ferns								
ADIANTACEAE								
Adiantum								
<i>A. capillus-veneris</i> L.	1500	T	S				+	
<i>A. edgeworthii</i> Hook.	2000	L	S				+	
<i>A. philippense</i> L.	1750	L	F			+		

Contd...

1	2	3	4	5	6	7	8	9
ASPLENIACEAE								
Asplenium								
<i>A. cheilosorum</i> Kunze. ex. Mett.	800	L	F					+
<i>A. crinicaule</i> Hance	1000	L	R					+
<i>A. ensiforme</i> . Wall ex. Hook. et. Grev.	1600	E	R			+		
<i>A. excisum</i> C. Presl.	1200	T	S			+		
<i>A. griffithianum</i> Hook.	700	L	S	+				
<i>A. gueinzianum</i> Mett. ex. Kuhn.	800	E	S	+				
<i>A. nidus</i> . L.	600	E	S					+
<i>A. nitidum</i> Sw.	600	E	S					+
<i>A. normale</i> D.Don.	800	E	S					+
<i>A. prolongatum</i> Hook.	1500	L	S					+
<i>A. teneuifolium</i> D.Don.	1100	L	F				+	
ATHYRIACEAE								
Athyrium								
<i>A. atkinsonii</i> Bedd.	600	T	S	+				
<i>A. davidii</i> (French) Christ.	800	T	R	+				
<i>A. distans</i> (D.Don) Moore	700	T	S	+				
<i>A. drepanopterum</i> (Kunze.) A. Br. ex. Milde.	1500	T	S					+
<i>A. falcatum</i> (Bedd.)	800	T	R					+
<i>A. fimbriatum</i> Moore	1000	T	F					+
<i>A. flebellulatum</i> (Clarke) Tard. Blot.	1800	T	R				+	
<i>A. foliolosam</i> Wall. apud. T. Moore ex. R.Sim.	2000	T	F				+	
<i>A. himalaicum</i> Ching ex. Mehra & Bir.	1800	T	S				+	
<i>A. lanceum</i> Kunze) T. Moore.	1600	T	S				+	
<i>A. pretermisum</i> Sledge	1650	T	F				+	
<i>A. rubricaule</i> (Edgeworth ex Clarke)	1500	T	S				+	
<i>A. rupicola</i> (Edge ex Hope) Bir. Chr	1560	T	F				+	
<i>A. schimperii</i> Moug. ex Fee	1700	T	F				+	
<i>A. solenopteris</i> (Kunze) T. Moore.	1600	T	F					+
Cornopteris								
<i>C. opaca</i> (D. Don) Tagawa	2200	T	S		+			
Deparia								
<i>D. petersenii</i> (Kunze) M. Kato	800	LT	R	+				

Contd...

1	2	3	4	5	6	7	8	9
Diplazium								
<i>D. apicisorum</i> Panigr. and S. Singh.	800	T	S	+				
<i>D. axillare</i> Ching.	650	T	S	+				
<i>D. dilatatum</i> Blume.	1700	T	F				+	
<i>D. dolichosorum</i> Copel.	2000	T	S				+	
<i>D. esculentum</i> (Koenig ex. Retz.) Sw.	1800	T	S				+	
<i>D. griffithii</i> T. Moore.	1500	T	F			+		
<i>D. sikkimense</i> (C.B. Clarke) C. Chr.	1600	T	A			+		
Dryoathyrium								
<i>D. boryanum</i> (Willd) Ching.	800	T	F	+				
BLECHNACEAE								
Blechnum								
<i>B. orientale</i> L.	650	TL	F	+				
Woodwardia								
<i>W. uniqemmata</i> (Makino) Nakai	1750	T	R			+		
BOTRYCHIACEAE								
Botrychium								
<i>B. lanuginosum</i> Wall. ex. Hook.	1600	T	S			+		
CYATHEACEAE								
Alsophila								
<i>A. andersonii</i> J. Scott ex Bedd. var. <i>andersonii</i> .	600	T	S	+				
<i>A. spinulosa</i> (Wall ex Hook.) Tryon.	750	T	R	+				
<i>A. khasyana</i> T. Moore ex Kuhn	1200	T	S			+		
DAVALLIACEAE								
Araiostegia								
<i>A. pseudocystopteris</i> (Kunze) Copel	800	E	F	+				
<i>A. pulchra</i> (D.Don) Copel.	1700	E	F			+		
Davallia								
<i>D. divaricata</i> Blume.	2600	E	S		+			
<i>D. griffithieana</i> Hook.	2200	E	F		+			
<i>D. trichomanoides</i> Blume subsp. <i>bullata</i> (Wall ex Hook.) S. Singh et Pinigr.	1800	E	S				+	

Contd...

1	2	3	4	5	6	7	8	9
Humata								
<i>H. assamica</i> (Bedd.) Diels.	1750	E	R			+		
<i>H. repens</i> (L.f.) Diels.	1700	E	F			+		
Leucostegia								
<i>L. immersa</i> (Wall. ex Hook.) Presl.	2000	E	F				+	
DENNETAEDTIACEAE								
Microlepia								
<i>M. hallbergii</i> (d' Almeida) C.Chr.	1600	T	S				+	
<i>M. hookeriana</i> (Wall ex. Hook.) C. Presl.	1700	T	S				+	
<i>M. pilosiuscula</i> (J.E. Smith) Morton.	1750	T	R			+		
<i>M. speluncae</i> (L.) T. Moore var. <i>speluncae</i>	1600	T	S			+		
DICKSONIACEAE								
Cibotium								
<i>C. assamicum</i> Hook.	650	T	S	+				
<i>C. barometz.</i> (L.) J. Smith.	2000	T	F				+	
DIPTERIDACEAE								
Dipteris								
<i>D. wallichii</i> (R.Br. ex. Hook. et Grev.) T. Moore	1800	TL	R				+	
DRYOPTERIDACEAE								
Arachnoides								
<i>A. assamica</i> (Kuhn) Ohwi.	1250	T	S			+		
<i>A. aristata</i> (Forst.) Tindale	800	T	F	+				
Cyrtomium								
<i>Cyrtomium hookerianum</i> (C. Presl.) C. Chr.	1600	T	S			+		
Dryopteris								
<i>D. assamensis</i> (Hope) C. Chr.	700	T	F	+				
<i>D. chrysocoma</i> (Christ.) C.Chr.	650	T	S	+				
<i>D. conjugata</i> Ching.	165	T	R			+		
<i>D. gamblii</i> (Hope) C.Chr.	1800	T	F				+	
<i>D. palvinulifera</i> (Bedd.) O.K.	1750	T	R				+	
<i>D. sparsa</i> (B. Ham ex. D.Don) Ktze.	800	T	S	+				

Contd...

1	2	3	4	5	6	7	8	9
<i>D. splendens</i> (Bedd.) O. Ktze.	1200	T	S				+	
<i>D. xanthomelas</i> (Chirst.) C.Chr.	1200	T	S				+	
<i>D. yorii</i> Seriz.	2000	T	F				+	
Polystichum								
<i>P. discreatum</i> (D. Don) J. Smith.	1750	T	S			+		
<i>P. lentum</i> (D. Don) T. Moore.	800	T	F	+				
<i>P. longipaleatum</i> Chirst.	1600	T	S			+		
<i>P. luctuosum</i> (Kunze) T. Moore.	1200	T	S			+		
<i>P. neolobatum</i> Nakai.	650	T	R					+
<i>P. nepalense</i> (Spre.) C.Chr.	700	T	R					+
<i>P. obliquum</i> (D.Don.) T. Moore.	1600	T	R					+
<i>P. squarrosum</i> (D.Don) Fee.	1500	T	S					+
GLEICHENIACEAE								
Dicranopteris								
<i>D. linearis</i> (N. Burm.) Underw. var. <i>linearis</i> .	1800	T	S				+	
<i>D. linearis</i> (N. Burn.) Underw. var. <i>montana</i> Holttum	1750	T	F				+	
HEMIONITIDACEAE								
Coniogramme								
<i>C. falcata</i> (D. Don) Salom.	1250	T	S			+		
<i>C. fraxinea</i> (D. Don) Fee ex Diels. var. <i>fraxinea</i>	1600	T	F			+		
<i>C. procera</i> Wall. ex Fee.	2000	T	F				+	
Gymnopteris								
<i>G. vestita</i> L.	2000	T	R				+	
Pityrogramma								
<i>P. calomelanos</i> (L.) Link.	600	TL	F	+				
HYMENOPHYLLACEAE								
Crepidomanes								
<i>C. bilabiatum</i> (Nees et Blume) Copel.	2650	E	R		+			
Lacosteopsis								
<i>L. auriculata</i> (Blume) Nakaike, var. <i>redicans</i>	2200	E	F		+			

Contd...

1	2	3	4	5	6	7	8	9
Mecodium								
<i>M. badium</i> (Hook. et Grev.) Copel.	2000	E	R		+			
Hymenophyllum								
<i>H. denticulatum</i> Sw.	2000	E	R				+	
HYPOLEPIDACEAE								
Hypolepis								
<i>H. punctata</i> (Thunb.) Mett. ex. Kuhn.	1700	E	F			+		
LINDSAEACEAE								
Lindsaea								
<i>L. ensifolia</i> Sw.	2000	EL	F				+	
<i>L. odorata</i> Roxb. in Griff. var. <i>odorata</i> .	1800	EL	R				+	
<i>L. himalaica</i> . Kramer	1750	E	F			+		
Odontosoria								
<i>O. chinensis</i> (L.) J.Smith.	1700	T	F			+		
LOMARIOPSIDACEAE								
<i>B. angustipinna</i> (Hayata) H.Ito.	1800	T	F				+	
LOXOGRAMMACEAE								
Loxogramma								
<i>L. involuta</i> (D.Don.) C. Presl.	2600	E	F		+			
LYGODIACEAE								
Lygodium								
<i>L. japonicum</i>	500	TL	F		+			
MARRATIACEAE								
Angiopteris								
<i>A. evecta</i> (G. forst.) Hoffm	550	T	R		+			
MONACHOSORACEAE								
Monachosourm								
<i>M. henryi</i> Christ.	1600	T	F			+		
NEPHROLEPIDACEAE								
Nephrolepis								
<i>N. auriculata</i> (L.) Trimen	600	L	F		+			

Contd...

1	2	3	4	5	6	7	8	9
<i>N. biserrata</i> (Sw.) Schott.	1600	L	R			+		
OLENDRACEAE								
Olendra								
<i>O. wallichii</i> (Hook.) C. Presl.	2000	E	C				+	
<i>O. mucifolia</i> (Bl.) Presl.	2600	E	R		+			
ONCOLEACEAE								
Matteucia								
<i>M. orientalis</i> (Hook.) Trev.	2650	TL	F		+			
PERANEMATACEAE								
Acrophorus								
<i>A. paleolulatus</i> Pich-Ser.	2600	T	S		+			
Paranema								
<i>P. cyatheodus</i> (D.Don.)	2250	T	F		+			
PLAGIOGYRIACEAE								
Plagiogyria								
<i>P. glaucascense</i> Ching.	2650	TL	R		+			
POLYPODIACEAE								
Arthromeris								
<i>A. lehmanii</i> (Mett.) Ching.	2000	E	R				+	
<i>A. wallichiana</i> (Spr.) Ching.	2400	E	F		+			
<i>A. lungtauensis</i> Ching.	2200	E	R		+			
Belvisea								
<i>B. mucronata</i> (Fee) Copel.	1750	E	F			+		
Colysis								
<i>C. elliptica</i>	1600	E	R			+		
<i>C. deccurrens</i> (Blume) Panigh.	1600	E	F			+		
<i>C. hemionitidea</i> (C. Presl.) C. Presl.	1800	E	F				+	
Drynaria								
<i>D. propinqua</i> (Wall. ex.Mett.) J.Smith.	1800	E	F				+	
Goniophlebium								
<i>G. amoenum</i> (Wall. ex.Mett.) J.Smith.	2600	E	F		+			

Contd...

1	2	3	4	5	6	7	8	9
<i>G. micorhizoma</i> (Clarke) Bedd.	2500	E	F		+			
<i>G. wattii</i>	2600	E	F	+				
Lemmaphyllum								
<i>L. rostratum</i> (Bedd.) Taga.	1750	E	F			+		
Leptochilus								
<i>L. axillaris</i> (Cav.) Kauf.	1700	E	F			+		
Microsorium								
<i>M. dilatatum</i> (Bedd.) Sldge.	1600	T	S			+		
<i>M. punctatum</i> (L.) Copel	2000	E	S				+	
<i>M. zippelli</i> (Bl.) Ching.	1200	E	F					+
Neocheiropteris								
<i>N. normalis</i> (D.Don) Tagawa	2600	E	R		+			
Phymatopteris								
<i>P. crysotricha</i> (C. Chr.) Pich.-Serm.	2000	E	F		+			
<i>P. griffithiana</i> (Hook.) Pic.-Ser.	2200	E	F		+			
<i>P. oxyloba</i> (Wall ex. Kunze) Pic. Ser.	2400	E	S		+			
<i>P. rynchophylla</i> (Hook.) Pic.Ser.	2000	E	R				+	
Phymatosorus								
<i>P. cuspidatus</i> (D.Don.) Pic.Ser.	1750	L	F			+		
Pleopeltis								
<i>P. bicolour</i> (Takeda) Sledge	2000	E	S				+	
<i>P. loriformis</i> (Wall. ex. Mett.) T. Moore	1800	E	S				+	
<i>P. nuda</i> Hook	2000	E	S				+	
<i>P. subconfluans</i> (Ching) Panigr.	2200	EL	F		+			
Pyrrosia								
<i>P. adnascens</i> (Sw.) Ching	1750	E	S			+		
<i>P. costata</i> (C Presl) Tagawa.	600	E	S	+				
<i>P. floculosa</i> (D.Don.) Ching	1800	E	S				+	
<i>P. heterectis</i> (Mett ex. Kuhn) Ching	2000	E	F				+	
<i>P. lingua</i> (Thunb.) Farwell	500	E	F					+
<i>P. stenophylla</i> (Bedd.) Ching	2000	E	F		+			
<i>P. subfurfuracea</i> (Hook.) Ching	1800	E	R				+	

Contd...

1	2	3	4	5	6	7	8	9
<i>P. varia</i> (Kaulf.) Farwell.	1750	E	S				+	
Polypodiastrium								
<i>P. argutum</i> (Wall ex. Hook.) C.Chr.	2600	E	R		+			
PTERIDACEAE								
Aleuritopteris								
<i>A. albomarginata</i> (C.B. Clarke) Ching	2000	L	S		+			
<i>A. grisea</i> (Bal.) Panigrahi	2050	L	F		+			
<i>A. flava</i> (Ching et S.K. Wu) Ghosh	2000	L	S		+			
Pteris								
<i>P. aspercaulis</i> Wall ex. J. Agar.	650	T	F	+				
<i>P. biaurita</i> L.	600	T	S	+				
<i>P. critica</i> L.	650	T	F	+				
<i>P. linearis</i> Poir.	2000	T	F		+			
<i>P. longipinnula</i> Wall. ex J. Agardh	2000	T	F	+				
<i>P. vittata</i> L.	600	T	S	+				
<i>P. wallichianum</i> J. Agar.	1200	T	F				+	
PTERIDIACEAE								
Pteridium								
<i>P. aquilinum</i> (L.) Kuhn.	2200	T	F		+			
TAENITIDACEAE								
Onychium								
<i>O. japonicum</i> (Thunb.) Kunze.	1200	TL	S				+	
<i>O. siliculosum</i> (Desv.) C.Chr.	650	TL	F	+				
TACTARIACEAE								
Ctenitis								
<i>C. subglandulosa</i> (Hance) Ching	1800	T	F				+	
Tactaria								
<i>T. caudanata</i> (J. Smith) C.Chr.	1400	T	S			+		
<i>T. decurrens</i> (C.Presl.) Copel.	1750	T	A			+		
<i>T. heterocarpa</i> (Bedd.) Morton	600	T	A	+				
<i>T. polymorpha</i> (Wall. ex.Hook.)Copel	650	T	R	+				
<i>T. vasta</i> (Blume) Copel.	1200	T					+	

Contd...

1	2	3	4	5	6	7	8	9
THEYLIPTERIDACEAE								
Cyclosorus								
<i>C. aridus</i> (D.Don.) Ching	600	TL	F	+				
<i>C. assamicus</i> (Bedd.) Ching	650	T	F	+				
<i>C. crinipes</i> (Hook.) Ching	1200	T	F			+		
<i>C. dentatus</i> (Frossk) Ching	1200	T	T	+				
<i>C. evolutus</i> (C.B. Clarke & Bak.) Ching	1200	T	S			+		
<i>C. subpubescens</i> (Blume.) Ching	2000	TL	S				+	
Macrothelypteris								
<i>M. ornata</i> (Wall. ex. Bedd.) Ching	1000	TL	S				+	
Pneumatopteris								
<i>P. truncata</i> (Poir.) Holtt.	800	T	F					+
Pronephrium								
<i>P. artiaculatum</i> (Houlst. and T. Moore) Holtt.	600	T	F	+				
<i>P. nudatum</i> (Roxb. in Griff.) Chandra	650	T	S	+				
Pseudocyclosorus								
<i>P. canus</i> (Bak.) Holtt.	1200	T	F			+		
<i>P. falcilobus</i> (Hook.) Ching.	700	T	S	+				
<i>P. ornatipes</i> Holtt. & Grimes	1400	T	F			+		
<i>P. tuberculiferus</i> (C.Chr.) Ching.	2000	T	F				+	
<i>P. tylodes</i> (Kunze.) Ching.	700	T	F	+				
Pseudophegopteris								
<i>P. aurita</i> (Hook.) Ching	1750	T	F			+		
Trigonospora								
<i>T. caudipinna</i> (Ching) Sledge.	1200	T	S			+		
<i>T. ciliata</i> (Wall. ex. Benth.) Holtt.	2000	T	A				+	
VITTARIACEAE								
Antrophyum								
<i>A. callifolium</i> Blume	1750	E	S					+
<i>A. formosanum</i> Hier.	1600	E	S					+
<i>A. raticulatum</i> (G. Forst.) Kaulf.	1000	E	F				+	

Contd...

1	2	3	4	5	6	7	8	9
Vittaria								
<i>V. elongata</i> Sw.	1350	EL	F	+				
<i>V. flexuosa</i> Fee.	2650	EL	F		+			
<i>V. ophiopogonoides</i> Ching	2655	EL	S		+			
<i>V. zosterifolia</i> Willd.	1750	EL	F			+		
<i>V. wattii</i> Dixit et N.C. Nair	1700	EL	F			+		

(I) Localities :

1. Shalley Lake, Roing zoo & Shalley lake to Tiwari Gaon (alt. ca. 400-1350 m)
2. Mayodia pass and Mandir area (alt. ca. 2000-2655 m)
3. Mehao Lake & adjacent area (alt. ca. 1200-1750 m)
4. Tiwari Gaon to Mayodia (alt. ca. 1000-2000 m)
5. Abango to Mehao Lake via Anda camp, Ghauri camp and Difu river (alt. ca. 400-1750 m).

Abbreviations Used :

(II) Habitat : T = Terrestrial, E = Epiphytic, L = Lithophytic

(III) Status in India: R = Rare, S = Scattered, F = Frequent, A = Abundant

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SUMMARY

Maximum number of Pteridophytic diversity observed in Himalayan region and most Protected Areas of the Indian Himalayan Region have not received much attention in terms of floristic exploration. In Mehao Wildlife Sanctuary (MWLS) comprehensive studies on diversity, distribution pattern, habitat preference, rarity and conservation status of the Pteridophytes have been carried and 205 species of Pteridophytes were recorded. The altitudinal distribution of the species revealed that the maximum numbers of species were present in the subtropical to temperate zone (900-3500m) and a decrease in diversity was noticed with increasing altitude. Terrestrial habitats showed maximum species richness and twenty one pteridophytic species had been identified as rare-endangered.

Key words : Pteridophytes, Diversity, Distribution, Conservation, Mehao Wildlife Sanctuary, Arunachal Pradesh.

मेहाव वन्यप्राणि अभयारण्य अरुणाचल प्रदेश में पर्णागोदभिदों की

विविधता वितरण सज्जा और उनका संरक्षण

विनीत कुमार रावत व टी० आर० शाहू

सारांश

हिमालयी भूभाग में देखी जाने वाली पर्णागोदभिदों की अधिकतम संख्या, और भारतीय हिमालयी भूभाग में

अधिकांश सुरक्षित किए क्षेत्र रहने पर भी पादप खोज कार्य के लिए उनकी तरफ ज्यादा ध्यान नहीं दिया गया है। मेहाव वन्यप्राणि अभयारण्य में पर्णागोदभिदों की विविधता, वितरण सज्जा, प्राकृतावास वरीयता, दुर्लभता और उनकी संरक्षण स्थिति पर विस्तृत अध्ययन किए गए हैं तथा वहां 205 पर्णागोदभिद जातियां मिलती आलेखित की गई हैं। जातियों के ऊंचाईगत वितरण से पता लगा कि जातियों की अधिकतम संख्या उपोष्ण से समशीतोष्ण क्षेत्रों में मिलती हैं तथा ऊंचाई बढ़ते जाने के साथ-साथ उनकी विविधता में कमी होती चली जाती है। भौम प्राकृतावासों में अधिकतम जाति सम्पन्नता रहती पाई गई तथा पर्णागोदभिदों की इक्कीस जातियों को दुर्लभ-संकटापन्न रूप में पहचाना गया है।

References

- Baishya, A.K. and R.R. Rao (1982). *Fern and Fern-allies of Meghalaya State, India*. Scietific Publishers, Jodhpur.
- Beddome, R.H. (1883). *A Handbook to the Fern of British India, Ceylon and Malaya Peninsula*. Thacker Spink & Co., Calcutta.
- Bir, S.S., S.M. Vasudeva and P. Kachroo (1989). Pteridophytic flora of northeastern India-1. Families: Huperziaceae-Sinopteridaceae. *Indian Fern J.*, **6** : 30-55.
- Bir, S.S. (1993). Uniqueness of the Pteridophytic flora of the Himalayas and conservation of threatened elements. *Himalayan Biodiversity: Conservation strategies*. Gyanodaya Prakashan, Nainital. pp. 65-82.
- Borthakur and Barua (2000). *Ferns of Assam*. Bishen Singh Mahendra Pal Singh, Dehra Dun.
- Chandra, Subhash (2000). *The Ferns of India*. International Book Distributors, Dehra Dun.
- Dixit, R.D. (1984). *A Census of Indian Pteridophytes*. BSI, Howrah.
- Jamir, N.S. and R.R. Rao (1988). *The Ferns of Nagaland*. Bishen Singh Mahendra Pal Singh, Dehra Dun.
- Kachroo, P. (1976). Fern Flora of Assam with some Phytogeographical notes. *J. Indian Bot. Soc.*, **54**: 13-26.
- Khullar, S.P. (2000). *Illustrated Fern Flora of West Himalaya*, Vol II. International Book Distributors, Dehra Dun.
- Singh, S. and G. Panigrahi (2005). *Ferns and Fern-Allies of Arunachal Pradesh*. Bishen Singh Mahendra Pal Singh, Dehra Dun.
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