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A DIVERSITY ACCOUNT OF BRYACEAE (BRYOPHYTA: MUSCI) OF NEPAL

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Abstract

Bryums are diverse mosses distributed widely throughout the country. The species diversity of Bryaceae which were documented in various periods has been presented here. This paper includes 82 species including three subspecies and five varieties under seven genera of the total recorded 1150 bryofloral species in Nepal so far. Besides published records, the field survey of the first author within last five years has also been included here.

Key words: Bryoflora, cosmopolitan, diversity, distribution, species

Introduction

Bryaceae is a large and cosmopolitan family which includes genera of considerable taxonomic difficulties. Basically, this family has interesting genera with odd gametophytic structures including acrocarpous stems and unicostate leaves with acute apex. This is a small to robust plant, commonly known as Hump moss, Silver moss, Thread moss, etc. It bears an erect solitary or branched stem. Leaves are arranged spirally and are usually small and distant below, equally spaced and occasionally form a rosette or structured differently. Gemmae are often present. Plant may be autoecious or dioecious, sometimes synoecious. Sporophytes generally bear pendulous capsules which are spherical and lightly papillose. Andrew (1935) suggested that the family might best be understood as a single large natural genus *Bryum*.

Mitten (1859) has enumerated 52 species of Bryum including 17 species from Nepal. Noguchi et al. (1966) enumerated 13 species of Bryum which were collected by Dr. Yoda during the East Himalayan Expedition in 1963. The second work of Noguchi (1966) during the first phase of the East Himalaya Expedition in 1960 and 1963 came up with a list of 26 species and four varieties including 14 species from Nepal. Noguchi's next work (1971) added three more species collected during the second phase Expedition of the Eastern Himalaya. Gangulee (1974) recorded 35 species in eastern Nepal.

The notable work of Iwatsuki (1979a) brought out a list of 13 species of bryaceae from Central Nepal which was reported during Kochi Himalaya Expedition of 1976. Similarly, the East Himalayan Expedition of Chiba University in 1977 added 18 more species (Iwatsuki 1979b) to the overall list. Hedderson and Harold (1990) has added a new moss species Plagiobryum duthiei Broth. ex. Hedderson & Harold recorded from western and central Nepal.

Other notable works on Nepalese Bryaceae were done by Karczmarz (1981) who reported five species in Kathmandu.Valley. Higuchi and Takaki (1990) enumerated 41 species in the central and eastern regions. Kattel and Adhikari (1992) presented a list of 62 species and two varities in their publication. The recent work of Pradhan (2000a) brought out a list of 78

species and four varities under six genera collected at different localities of the country.

Pradhan (2000b) in her study recorded 15 species of Bryum from Phulchowki of Central midland. Likewise, Pradhan and Shrestha (2002) recorded 26 species from the alpine zone. Long (1995) made an interesting study on the type localities of some bryaceae occurring at different ecological zones of the country.

Materials and Methods

Various habitat preferences can be found among the members of this family. Specimens were collected by peeling off the substrate; generally a small knife was used very carefully for this purpose. All the collected materials were placed in hand made paper packets with proper field notes. These specimens were dried in mild sun for an hour or so to evaporate moisture content of the specimens. These specimens later were identified at the Natural History Museum, Swayanbhu and Central Department of Botany, Tribhuvan University, Kathmandu. Some specimens were also tallied in Museum for these specimens besides consulting relevant literatures like Watson and Richards (1968), Gangulee (1974), Nyholm (1974), Chopra (1975), Eddy (1996), and Allen (2002). The author's names were checked consulting Brummitt and Powell (1992). The website of MOBOT was used to check the accepted names.

Results

The report includes 82 species including three subspecies and five varieties belonging to seven genera of Bryaceae which are provided below in tabulated form. This also includes some species recorded by the foreign expedition team to the central and east Himalayas, besides authors' own field research across the country. The distribution of every species has been provided region wise with altitudinal ranges and status category. They are arranged alphabetically.

Table1. Species diversity of Bryaceae in listed form

S. No.	Scientific names	Distributional Ranges			Altitudinal Differences m.	Status	Remarks
		W	C	E			
1	*Anomobryum auratum* (Mitt.) A. Jaeger *Bryum auratum* Mitt.		+	+	1700-2900	R	
2	*Anomobryum cymbifolium* (Lindb.) Broth. *Brachymnium filiforme* Griff.	+				T	
3	*Anomobryum filiforme* (Dicks.) Husn. *Bryum filiforme* Dicks.		+	+	2000-2200	R	
4	*Anomobryum filiforme* ssp. *concinnatum* (Spruce) Loeske *Bryum filiforme* var. *concinnatum* (Spruce) Boulter		+	+	1500-41000	C	
5	*Anomobryum germigenum* Broth. *Bryum germigerum* (Broth.) E. B. Bartram		+		1200-2700	M	
6	*Anomobryum polymorphum* Dixon *Bryum indicopolymorphum* Ochi		+	+	1600-2100	R	
7	*Anomobryum yasudae* Broth. *Bryum yasudae* (Broth.) Ochi			+	1350	R	
8	*Brachymenium acuminatum* Harv.		+	+	250-3000	T	
9	*Brachymenium bryoides* Hook.			+	1900-2000	T	
10	*Brachymenium capitulatum* (Mitt.) Kindb.		+	+	1500-2600	C	
11	*Brachymenium indicum* (Dozy & Molk.) Bosch & Lacey			+	2720	R	

S. No.	Scientific names	Distributional Ranges			Altitudinal Differences m.	Status	Remarks
		W	C	E			
12	*Brachymenium longicolle* Ther.		+	+	1700-3400	R	
13	*Brachymenium longidens* Renner & M. A. Cardenas		+		3700	R	
14	*Brachymenium microstomum* Harv.					T	
15	*Brachymenium nepalensis* Hook.		+	+	1500-2900	M	
16	*Brachymenium ochianum* Gangulee			+	2000-2600	M	
17	*Brachymenium ptychothecium* (Besch.) Ochi		+		3600-4200	R	
18	*Brachymenium splachnoides* Harv.					T	
19	*Bryum algovicum* Sendtn. ex C. Muell.			+	3900	R	Erosion control
20	*Bryum alpinum* Huds. ex With.		+		3300	C	
21	*Bryum angustirete* Kindb.		+		4400	R	
22	*Bryum apiculatum* Schwaegr. *B. plumosum* Dozy & Molk. *B. nitens* Hook.		+	+	150-4400	R	
23	*Bryum argenteum* Hedw. *Bryum argenteum* var. *lanatum* (P. Beauv.) Hampe	+	+	+	800-5100	C	Food values (birds); heavy metal detector; Ornamental value (bonsai)
24	*Bryum atrovirens* Vilh. ex Brid. *B. erythrocarpum* Schwaegr.			+	1600-1900	M	
25	*Bryum billardieri* Schwaegr.			+	2600	C	
26	*Bryum blandum* Hook. f. & Wilson spp. *handelii* (Broth.) Ochi *B. setschwanicum* Broth.		+	+	3300-4200	M	
27	*Bryum bohnhofii* C. Muell. ex Broth.		+		3900	R	
28	*Bryum caespiticium* Hedw.		+	+	300-4800	C	
29	*Bryum capillare* Hedw.		+		900-1300	C	Resistant to Pollution
30	*Bryum cellulare* Hook. *Brachymenium splachnoides* Harv. *B. splachnoides* (Harv.) Muell. Hal.		+		900-1300	T	Common in lowland
31	*Bryum clavatum* (Schimp.) C. Muell.			+	350-4850	R	
32	*Bryum coronatum* Schwaegr. *B. doliolum* Duby	+	+	+	150-1000	C	
33	*Bryum dichotomum* Hedw. *B. bicolor* Dixon	+	+	+	500-4600	M	
34	*Bryum evanidinerve* Broth.		+		2000	R	
35	*Bryum funariodes* Ochi		+		2000-4000	M	
36	*Bryum haematoneurum* C. Muell.		+		1400-2000	R	
37	*Bryum knowltonii* Barnes		+			R	
38	*Bryum leptotorquescens* C. Muell. ex. Broth.		+		3000-3900	R	
39	*Bryum leucophylloides* Broth.		+		3000-4000		
40	*Bryum pachytheca* C. Muell.		+		1400-1500		
41	*Bryum pallescens* Schleich. ex Schwaegr. *B. tibetanum* Mitt.			+	5000	R	
42	*Bryum paradoxum* Schwaegr. *B. teretiusculum* Hook.		+	+	1600-2900	T	
43	*Bryum pellucidum* (Dixon & Badhw.) Ochi			+			
44	*Bryum petelotii* Thér. & R. Henry *Brachymenium exile* (Dozy & Molk.) Bosch & Lacey		+	+	1400-2900	C	Soil Ph indicator, use for bonasai
45	*Bryum pseudotriquetrum* (Hedw.) P. Gaertn. *B. ventricosum* Relhan	+	+	+	2900-6100	C	Rock builder
46	*Bryum recurvulum* var. *flexicaule* (C. Muell.) Ochi *B. flexicaule* C. Muell.			+	1700-1900		
47	*Bryum ramosum* (Harv.) Hook.					T	Harvey 124 (TCD) Wallich H3650 (BM)
48	*Bryum reflexifolium* (Ochi) Ochi			+	2000-2500		
49	*Bryum retusifolium* M.A.Cardenas et P. Vard.			+	1500-1900		

S. No.	Scientific names	Distributional Ranges			Altitudinal Differences m.	Status	Remarks
		W	C	E			
50	*Bryum rostratum* Schrad. ex. Sm.			+			
51	*Bryum salakense* M.A. Cardenas			+	2000	R	
52	*Bryum subrotundum* Brid.			+			
53	*Bryum teretiusculum* var. *reflexifolium* (Ochi) Ochi			+	2600-3500	C	
54	*Bryum thomsonii* Mitt.		+	+	2600-4300		
55	*Bryum trachyrhizon* C. Muell.			+	4100	R	
56	*Bryum turbinatum* (Hedw.) Turner	+		+	4200-4500	R	
57	*Bryum wrightii* Mitt.			+	1800-3800	M	
58	*Mielichhoferia macrophylla* Ochi		+		2400	R	
59	*Mielichhoferia mielichhoferi* (Hook.) Wijk & Margad var. *noguchinnum* Gangulee					T	Zimmermann 555a (BM)
60	*Mielichhoferia sasaokae* Broth.		+	+	370-4400	R	
61	*Plagiobryum demissum* (Hook.) Lindb.		+		3800	M	
62	*Plagiobryum duthiei* Broth. ex Hedd. & Harold	+	+		3300-4500	T	Voucher No.634b
63	*Plagiobryum giraldii* (C. Muell.) Par. *Bryum giraldii* C. Muell.			+	3950	R	
64	*Pohlia acuminata* Hoppe & Hornsch.		+	+	2700-4100	C	
65	*Pohlia camptotrachela* (Renner & M.A.Cardenas) Broth.			+	1100-2100	R	
66	*Pohlia cruda* (Hedw.) Lindb. *Bryum longescen* C. Muell. *Webera cruda* (Hedw.) Fuener.	+	+	+	3800-4500	C	
67	*Pohlia crudoides* (Sull. & Lesq.) Broth.		+	+	3200-3900	C	
68	*Pohlia crudoides* var. *revolvens* (M.A.Cardenas) Ochi			+	4200		
69	*Pohlia elongata* Hedw. *Webera elongata* (Hedw.) Schwaegr.	+	+		1500-4400	C	
70	*Pohlia flexuosa* Hook. *P. scabridens* (Mitt.) Broth.		+	+	1300-2000	C	
71	*Pohlia flexuosa* var. *propagulifera* (Renner & M.A. Cardenas) Gangulee		+		1500	C	
72	*Pohlia leucostoma* (Bosch. & Lacey) M. Fleisch.		+	+	1400-2300	C	
73	*Pohlia leucostomoides* (Broth.) Ochi			+	550-3400	C	
74	*Pohlia longicollis* (Hedw.) Lindb.		+	+	3300-3500	C	
75	*Pohlia microstoma* (Harv.) Ochi			+	2800-**6250**	R	Highest known alt. record of Bryaceae in the world.
76	*Pohlia minor* Schieich. ex Schwaegr. ssp. *acuminata* (Hoppe & Hornsch.) Wijk & Margad. *Webera acuminata* (O. Hopp. & Hornsch.) Schimp.			+	3000-4300	R	
77	*Pohlia nutans* (Hedw.) Lindb. *Webera nutans*			+	3600-4200	C	
78	*Pohlia proligera* (Kindb.) Broth. *P. camptotrochela* var. *vestitissima* (Sak.) Ochi		+	+	1500-4500	C	
79	*Pohlia wahlenbergii* (F. Weber & Mohr.) A.L. Andrews				1800-2100	R	
80	*Rhodobryum giganteum* (Schwaegr.) Par. *Bryum giganteum* (Schwaegr.) Arnott		+	+	1000-2700	M	Ornamental and medicinal uses
81	*Rhodobryum laxe-limbatum* (Ochi) Z. Iwats. & Takaki *Bryum laxe-limbatum* Hampe ex. Ochi			+	2500-2600	R	
82	*Rhodobryum roseum* (Hedw.) Limpr. *Bryum roseum* Hedw.		+		1000-4000	M	Ornamental uses

Discussion

A total of 82 species including three subspecies and five varieties belonging to seven genera of Bryaceae have been reported in this study mainly from the lowland to the alpine zones of Nepal. The species number of each genus is presented below in bar diagram (Fig.1) and percentage in pie chart (Fig. 2). *Pohlia microstoma* (Harv.) Ochi has been recorded from 2800-6250 m. This was reported for the first time by Norkett (6910) in 1961 and is deposited at the British Museum, London. The lowland members of Bryaceae which occur below 1000 m and distributed up to 5100 m are *Brachymenium acuminatum* Harv. (250-1800 m), *Bryum apiculatum* Schwaegr (150-4400 m), *B. argenteum* Hedw, (800-5100 m), *B. caespiticum* Hedw, (300-4800 m), *B. capillare* Hedw. (900-1300 m), *B. coronatum* Schwaegr. (150-1100 m), *B. clavatum* (350-4850 m), *B. dichotomus* Hedw. (500-4600 m), *Pohlia leucostomoides* (Broth.) Ochi (550 3400 m) and three species of *Rhodobryum*. *Bryum coronatum* is the most common species of Bryaceae which occurs in tropical regions only. This study also came up with a list of ten Type Specimens. Studies have shown that the high diversity of Bryaceae was found at subtropical to temperate zones than tropical and alpine regions. Some members of this family carry significant economical values. Such species include *Rhodobryum giganteum* (Giant Bryum) is used to cure angina in China (Glime and Keen, 1984). Similarly, *Bryum algovicum* Sendtn. ex C. Muell. (Drooping Thread Moss) growing in sandy area has an amazing ability to check erosion (Crum, 1973). The experiment conducted in Japan testified that *Bryum argenteum* can be used as a bioindicator of the atmospheric pollution (Taoda 1972). Glime and Saxena (1991) have mentioned that certain species of *Bryum* can alleviate pain caused mainly by cut and burn.

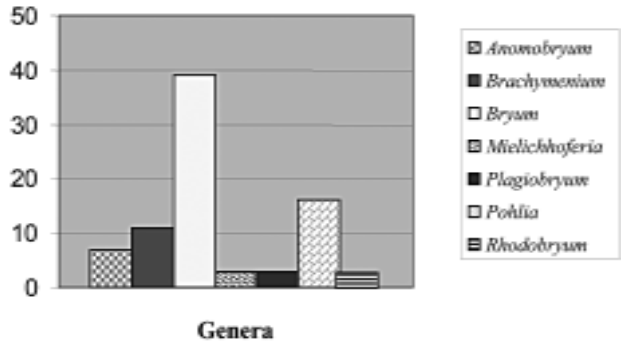

Fig.1. Bar diagram showing species diversity of Bryaceae

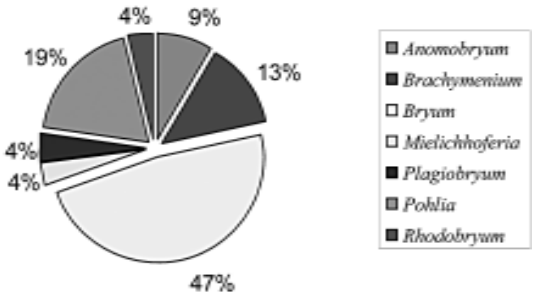

Fig. 2. Pie chart showing percentage of species of Bryaceae

Anomobryum - 7 species

Brachymenium -11 species

Bryum -39 species

Mielichhoferia - 3 species

Plagiobryum -3 species

Pohlia -16 species

Rhodobryum -3 species

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Website MOBOT: http://www.mobot.org/MOBOT/Moss/China/china-b.shtml

Abbreviations:

BM British Museum
C Central, Common
E East, Edinburgh Herbarium
GL Glasgow University Herbarium
W West
T Type
M Medium
m Meter
R Rare
TCD Harvey's Herbarium in Dublin
\+ Distribution

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