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## Bryoflora of Ranthambhore Tiger Reserve, Rajasthan (India)

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### Abstract

India is among of the 12 mega biodiversity countries in the world. The huge area and the range of phyto-climatic conditions met within its eight bio-geographical zones contribute to the great diversity of the Indian flora. These bio-geographical zones have diverse topographical variations and climatic conditions. The present work deals with the bryo-diversity of western part of the country which is greatly neglected due to its comparatively harsh environmental conditions by the bryologists. It is an attempt to provide a comprehensive account of the bryophyte wealth of the region by stepwise exploration and it has initiated with Ranthambhore National Park.

**Keywords:** Biodiversity/Bryophyte/Moss/Liverwort/Hornwort/Western India

### Introduction

Bryophytes, make a significant contribution to the floral diversity of this 'watery planet' and constitute an important component of the - forest ecosystem, they become first colonizers on variety of habitats. They are highly specific group of plants with second highest assemblages among land plant after angiosperms. Their surviving capability is immense as they survive under wide range of ecological conditions and forming strong part of the ecosystem where they grows in forest, wet lands, desert (hot as well as cold) and other habitats. They classified under three diversified classes, are Hepaticae, Anthocerotae and Musci. The Indian sub-continent is bestowed with a vast range of climate coupled with varied ecological conditions in different regions. Currently, about 2480 taxa of bryophytes (including infraspecific taxa) are reported from India (including island groups, and Sikkim), comprising about 722 taxa of liverworts in 128 genera and 52 families, 36 taxa in 6 genera and 2 families of hornworts (Singh, V. B., 1966; Parihar et al, 1994; Singh, D. K., 1997; Srivastava, 1998) and about 1623 taxa in 342 genera and 57 families of mosses (Gangulee, 1969-1980; Lal, 2005; Aziz and Vohra, 2008; Nath et al, 2011).

The Western part of India particularly Rajasthan (Fig. 1) is one of the country's most overlooked bryological region due to its harsh environmental condition. But being a desert it also have certain localities which are instrumental in nurturing these amphibians of plant kingdom. The present study is an effort to explore the region and provide consolidated account of bryo-diversity which will fill the existing lacuna in bryological research.

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## Topography

The Ranthambhore Tiger Reserve (Plate 1; Fig. 2) is the single largest expanse of dry deciduous *Anogeissus pendula* Forest left intact in India. Such forests were found all along the North and Central Aravalis but in the last few decades they have been badly degraded and right now this Tiger Reserve is their last strong hold. In Ranthambore the biodiversity is made even richer by the intrusion of the Vindhyan hill system. The terrain of Ranthambhore tiger reserve is mostly rugged and hilly and is intimately related to the Great boundary fault.

The highest point of this is Gazella peak, 507 m above sea level. The lowest altitude of this tract is 244 m above sea level. at Bodal. Streams flowing in northern tract form the catchment of the river Banas and streams flowing in southern tract drain directly in the river Chambal. Most of the streams are very short lived but the streams facing sharp ridges maybe perennial, as the folded impervious rocky strata beneath, does not permit the water to percolate (Plate1; Fig. 3 & 4). Its cardinal points are 25° 54' to 26° 12' N Lat. and 76° 23' to 76° 39' E Long., annual average rainfall 800m, temperature range 4°C (minimum) -47°C (maximum). The annual mean humidity is 72%, which reaches to its maximum (99%) during monsoon. The sand stone beds of these hills are flat-topped and form extensive table lands known as "Dangs". These dangs rise abruptly from flat ground and have sandstone ridges running continuously along their edges. At places, small and short-lived streams have eroded deep, long and narrow gorges that are locally known as "Khohs".

## Forest Types

The forests are mainly of edaphic climax and belong to the sub group 5B- Northern Tropical Dry Deciduous forests and subgroup 6B -DS1-*Zizyphus* scrub. The degradation stages found here are DS1-Dry deciduous scrub and SS4 -Dry Grass lands (Champion & Seth ,1968) according to the vegetation map prepared by French Institute, Pondicherry. The area is representative of dry deciduous *Anogeissus pendula* Forests sub type in association with *Acacia*, *Capparis*, *Zizyphus* and *Prosopis* species. The Reserve comprises of shallow perennial lakes, steep hills, gentle slopes, plateaus, narrow valleys, etc. and as such a variety of plant communities or associations are found. The main floral habitats of Ranthambore can be classified as follows :- (a) Steep slopes and cliffs, (b) Gentle slopes of hills, (c) Plateaus, (d) Valleys, (e) Lakes, reservoirs and its surroundings, (f) Sandy plain.

Topographically and climatologically Ranthambhore provides the affable environment for the maximal growth of the liverworts in the western India (Rajasthan zone). There is no report regarding the bryophytic wealth of this locality is available till date. The last work related to bryoflora of Rajasthan was done by Bapna and Vyas (1961) where they provided an account on the Liverworts of Mount Abu. Chaudhary and Deora (2001) also provide an account of moss flora of Mount Abu to an extent but complete bryophytic wealth yet to know. Therefore this work is first attempt to assess the complete bryophytic diversity in this region. It is based on the latest collection made by the authors during August, 2011 and the collected specimens are available in Bryophytic Herbarium, Department of Bioscience and Biotechnology, Banasthali Vidyapith (BHB), 24 species of bryophyte have been validly recognized. It is remarkable that hepatic flora hosts only thalloid liverworts that include 17 species with a 71 % representation of the largest and most successful order Marchantiales. The order Pottiales stand second in terms of frequency and variety with 4 genera, 5 species and about 21% representation, followed by meager Anthocerotales that include 2 genera, 2 species and 8% share of the total hepatic flora of the region (Fig. 5).

Plant diversity and distribution of an area is subjected to the modifications by the adversities of the environmental factors, climate, geology and biotic factors, a study of the distributional pattern of the various taxa of the area discernibly indicate that Ranthambhore National Park hosts an

'admixture' of the flora Western Himalayas with 21 taxa, followed by Central India 20 taxa, then with South India with 18 taxa and 17 taxa with Eastern Himalayas. (Fig. 6)

A list of liverwort encountered in the present study is enumerated below:

Name of Taxa	DISTRIBUTION OF BRYOFLORE OF RANTHABHORE TIGER RESERVE IN DIFFERENT BRYOGEOGRAPHICAL REGIONS OF THE COUNTRY			
	Distribution in India			
	Western Himalayas	Eastern Himalayas	Central India	South India
<b>CLASS -HEPATICOPSIDA</b>				
<b>ORDER - METZGERIALES SCHUST. EMEI</b>				
<b>SCHLJAK.</b>				
<b>Fossombroniaceae Hazslinszky</b>				
<i>Fossombronia</i> Raddi				
<i>Fossombronia himalayensis</i> Kashyap	+	+	+	+
<b>ORDER – MARCHANTIALES LIMPR.</b>				
<b>Targioniaceae Dum.</b>				
<i>Targionia</i> L.				
<i>Targionia hypophylla</i> L.	+	+	+	+
<b>Cythodiaceae K. Müll</b>				
<i>Cyathodium</i> Kunze				
<i>Cyathodium cavernarum</i> Kunze	+	+	+	+
<i>Cyathodium tuberosum</i> (Kashyap) Mehra	+	-	-	-
<b>Aytoniaceae Cavers</b>				
<i>Asterella</i> P. Beauv.				
<i>Asterella. angusta</i> (Steph.) Kachroo	+	+	-	-
<i>Asterella blumeana</i> (Nees) Kachroo	+	+	+	+
<b>Plagiochasma</b> Lehm. & Lindenb.				
<i>Plagiochasma appendiculatum</i> Lehm. & Lindenb.	+	+	+	+
<i>Plagiochasma rupestre</i> (Frost.) Steph.	+	-	-	+
<b>Marchantiaceae (Bisch.) Endl.</b>				
<i>Marchantia</i> L.				
<i>Marchantia polymorpha</i> L.	+	+	+	+
<b>Ricciaceae Reichenb.</b>				
<i>Riccia</i> L.				
<i>Riccia billardieri</i> Mont. & Nees	+	+	+	+
<i>Riccia crystalina</i> L.	-	-	+	-
<i>Riccia melanospora</i> Kashyap	+	-	-	-
<i>Riccia fluitans</i> L.	+	+	+	+
<i>Riccia gangetica</i> Ahmad	+	+	+	+
<i>Riccia plana</i> Tayl.	+	-	-	+
<i>Riccia stricta</i> Duthie ex Arnell	-	-	+	-
<i>Riccia aravalliensis</i> Pande et Udar	-	-	+	-
<i>Riccia discolor</i> Lehm. et Lindenb.	+	+	+	+

**CLASS –ANTHOCEROTOPSIDA DE BARY EX JANCZ. CORR. PROSK.****ORDER – ANTHOCEROTALES LIMPR. IN COHN****Anthocerotaceae** (Gray) Dumort. corr. Trevis. emend. Hassel*Anthoceros* L.*Anthoceros subtilis* Steph. - - - +*Phaeoceros* Prosk. + + + +*Phaeoceros himalayensis* (Kash.) Bapna**CLASS BRYOPSIDA ROTHM.****ORDER POTTIALES M. FLEISCH.****Pottiaceae** Schimp.*Anoetangium* Schwagr.*Anoetangium stracheyanum* Mitt. - - + -*Barbula* Hedw.,*Barbula javanica* Doz. et Molk. + + + +*Hyophila* Brid.*Hyophila involuta* (Hook.) Jaeg. + + + +*Hyophila nymaniana* (Fleisch.) Menzel, + + + +*Hyophila spathulata* (Harv.) Jaeg. + + + +*Gymnostomiella* M. Fleisch.*Gymnostomiella vernicosa* M. Fleisch. + + + +**Discussion**

A revised list has been prepared incorporating the new findings. This list includes 27 species belonging to 13 genera distributed to 8 families. The thalloid taxa are predominant with Ricciaceae having 9 taxa followed by Aytoniaceae and Pottiaceae (4 taxa), Anthocerotaceae and Cythodiaceae having 2 taxa each and Targionaceae, Marchantiaceae and Fossombroniaceae with one taxon each. The maximum similarities in bryo-diversity is with Central India followed by Western Himalaya and then Eastern Himalayas and least with south India (Fig. 7).

The present communication provides 24 recognized taxa excluding some earlier dubious reports having no specific epithet or without complete details, in addition it also provides an updated enumeration of the bryophyte taxa from Ranthambhore Tiger Reserve and its environs with a hope that further explorations may prove to be highly worthwhile in our understanding of the bryo-diversity of the region.

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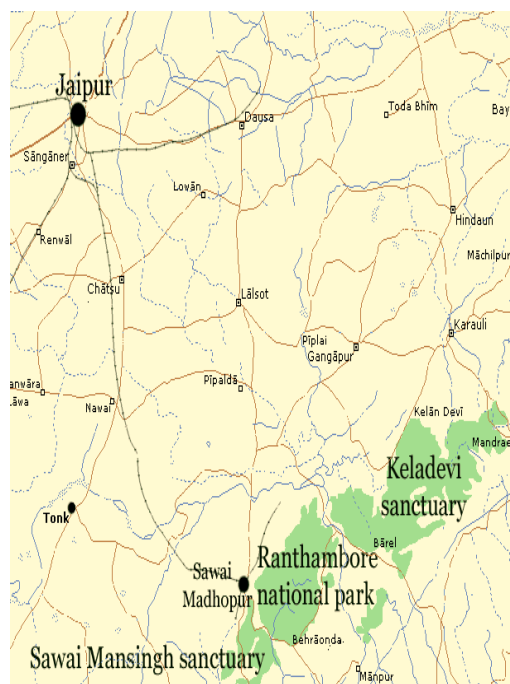
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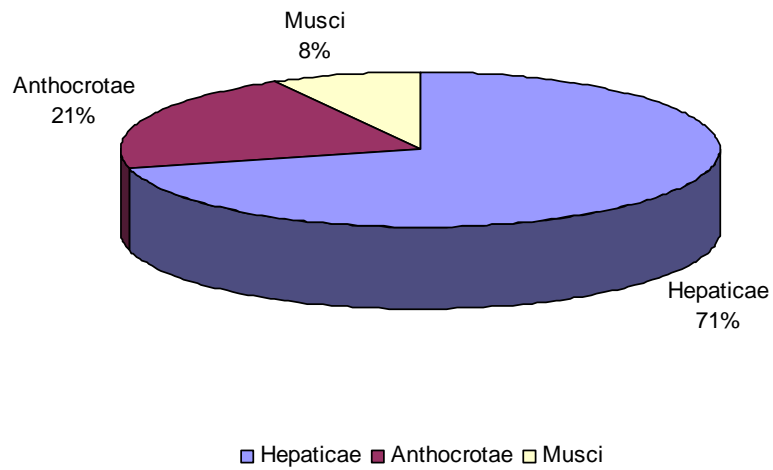
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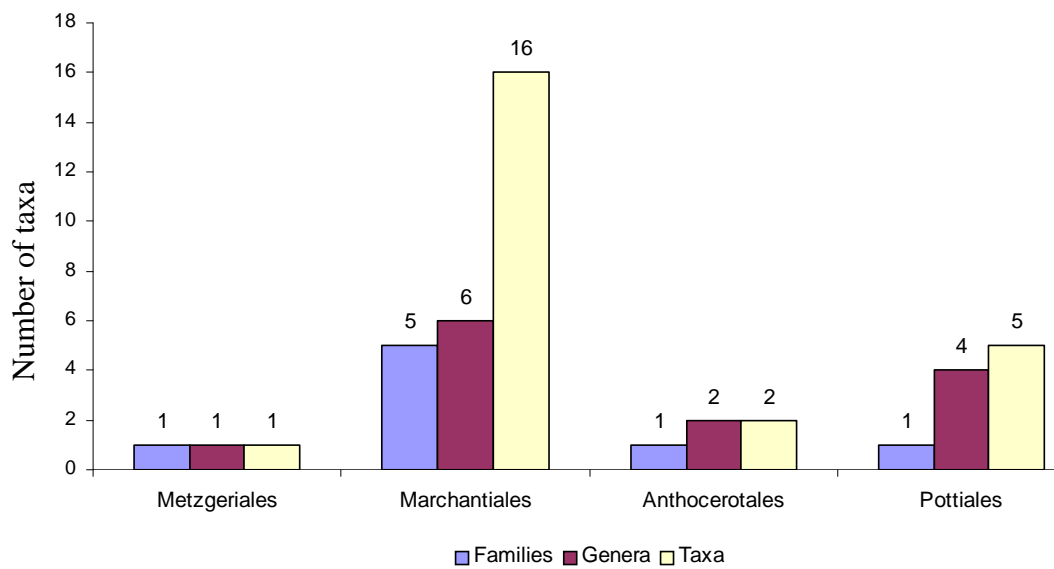
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Figure 1. Map of India Showing Rajasthan, Figure 2. Map showing location of Study Area, Figures 3 and 4. View of Ranthambore Tiger Reserve

**Figure 5. Percentage distribution of various classes in Ranthambhore Tiger Reserve**



**Figure 6. Representation of different orders in Ranthambhore Tiger Reserve**



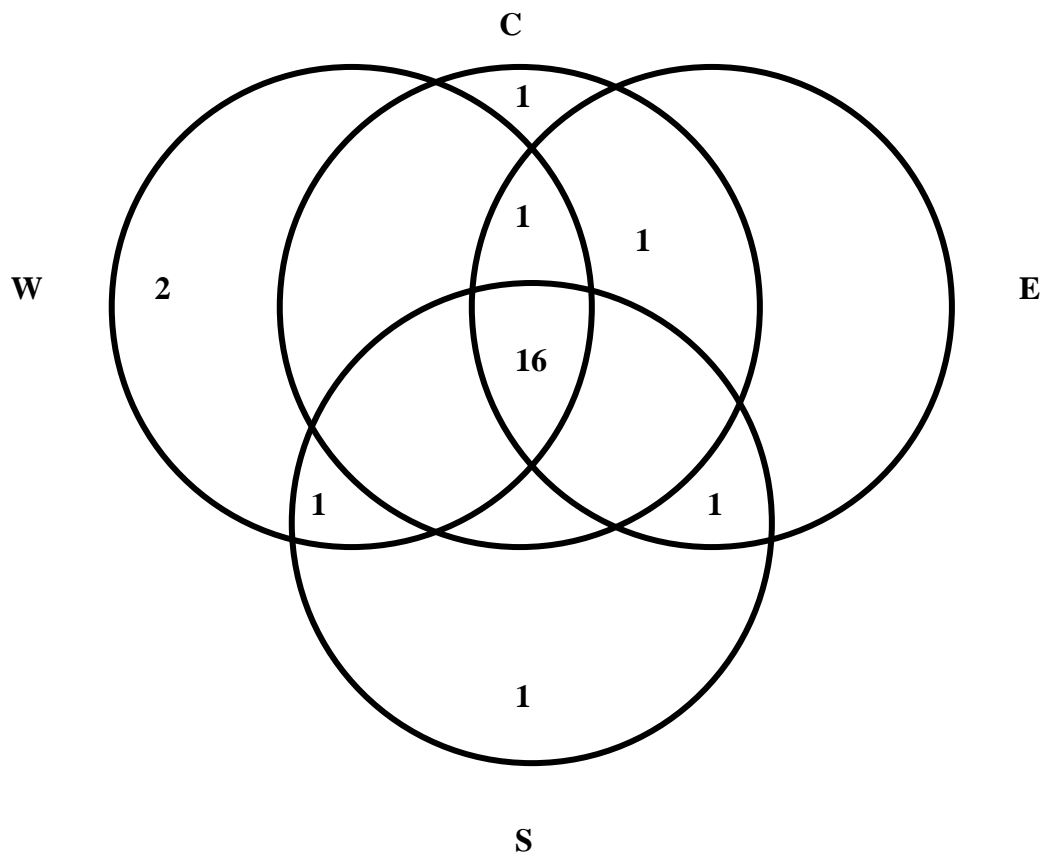


Figure 7. Venn diagram showing distribution of bryophytes in Ranthambhore Tiger Reserve in other bryo-geographical region of India (C: Central India, E: Eastern Himalayas, S: South India, W: Western Himalayas)