



## **Diversity and Distribution of Freshwater Bryozoa in India: A Review**

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### **Abstract**

The article reviews the diversity and distribution records of freshwater Bryozoa in India. The two classes namely Gymnolaemata and Phylactolaemata are represented by 29 species. The Gymnolaemata is represented by four species and Phylactolaemata is represented by 25 species. The papers also give you an idea about the distribution records of all 28 species in 18 states and 1 union territory of the India and reveal vacant the areas which are have to be explored for understand the real picture of diversity and distribution of these animals in India.

**Keywords:** Diversity, Distribution, Freshwater, Bryozoa, India, Review

### **1. Introduction**

Bryozoans are also known as polyzoa, ectoprocta or moss animals. Bryozoa are small benthic aquatic invertebrates growing on submerged objects as colonies of genetically identical zooids produced by budding (Massard *et al.*, 2008). They grow on submerged substances like wood, rock, plastic, glass, rubber, macrophytes etc. Most species grow best in places where they can be protected from settling particles (Wood, 2005). Bryozoans are also represented in the plankton by their statoblasts (Asexual reproductive bodies) or by free swimming larvae (Welch, 2005). Statoblasts are used to distinguish

phylactolaematae Bryozoans. Bryozoan taxonomy is complex and depends largely on microscopic details. Colony morphology and statoblast morphology are used for the identification. Scanning electron microscopy (SEM) photographs are used to describe the surface feature of statoblasts (Wood and Lore, 2005).

### **2. Diversity**

In India, Nelson Annandale was the pioneer of bryozoan taxonomy. Most of the Annandale's work is published in the *Records of Indian Museum*.

According to (Wood et al (2010) Annandale described two genera and 16 new species of freshwater bryozoans form Indian subcontinent. He recorded the diversity of these animals form numerous localities in India. Annandale published 16 to 20 papers and one book entitled *Freshwater Sponges, Hydroids and Polyzoa - Fauna of British India (1911)* to elucidate freshwater bryozoans of India. The legacy of Annandale was followed by very few workers. Roonwal (1969) restarted the study of bryozoans form Rajasthan. Rao and his associates (1961- 1992) added valuable information in the diversity, distribution and ecology of Bryozoa. Genus *Swarupella* was established in India by Shrivastava (1981) with the disruption of *Swarupella anandmanensis*. This genus is represented by three species across the globe from which *Swarupella andamanensis* (Rao, 1961) is recorded from Andaman Island and Madhya Pradesh while *Swarupella divina* (Wood, 2010) is reported from Maharashtra (Mokashe et. al 2015). Rao and associates also described *Swarupella andamanensis*, *Plumatella ganapati* and *Hyalinella diwananiensis* as new species. According to Massard and Geimer (2007) *Plumatella fruticosa* reports from India are incorrect and a specimen of *C. mucedo* in the Bryozoa collection at the Zoological Survey of India in Calcutta is not from India but from England. Wiebach (1974) reported *Varunella coronifera* and *Varunella indorana* from India. Rao and Agarwal (1971) reported *Hyalinella minuta* and Ravi Praskash et al (1971) reported *Plumatella casmiana* form India. Harkal and Mokashe (2018) also recorded the first report on the occurrence of *Hislopia malayensis* from India from various localities of Maharashtra. According to Valarmathi and Mitra (2017), 22 species under 13 genera and 6 families belonging to classes namely Gymnolaemata and Phylactolaemata are recorded in India. This list not included the *Hyalinella lendenfeldi*, and *Hislopia malayensis*. *Plumatella geimermassardi* is also reported form Maharashtra (Swami P.S. 2016) but not included in this updated list. The records *Stolella indica*, *Hyalinella minuta* and *Varunella coronifera* are also found in literature but not recorded in the list of Valarmathi and

Mitra (2017). This means that there are 29 species of freshwater bryozoan in India.

## 2.1 List of Species of freshwater Bryozoa of India:

*Hislopia lacustris* (Annandale, 1911) *Hislopia monoliformis* (Annandale, 1911), *Hislopia malayensis* (Annandale, 1911), *Victorella provida* (Saville Kent, 1870), *Afrindella tanganyikae* (Annandale, 2011), *Plumatella bombayensis* (Annandale, 1908), *Plumatella emarginata* (Allman, 1844), *Plumatella casmiana* (Oka, 1907), *Plumatella fruticosa* (Allman, 1844), *Plumatella javanica* (Kraepelin, 1906), *Plumatella repens* (Linnaeus, 1758), *Plumatella ganapati* (Rao, 1985), *Plumatella agilis* (Marcus, 1942), *Hyalinella diwanensis* (Rao, 1985), *Hyalinella punctata* ( Hancock, 1850), *Rumarcanela vorstmani* (Toriumi, 1952), *Hyalinella lendenfeldi* (Ridley, 1886 ), *Hyalinella minuta* (Toriumi, 1941), *Swarupella andamanensis* (Rao, 1961), *Swarupella divina* (Wood et al, 2006), *Asajirella gelatinosa* (Oka, 1891), *Lophopodella carteri* (Hyatt, 1866), *Pectinatella burmanica* (Annandale, 1908), *Varunella indorana* (Wiebach, 1974), *Varunella coronifera* (Wiebach, 1974). *Stolella indica* (Annandale, 1909), *Hyalinella lendenfeldi* (Ridley, 1886), and *Plumatella geimermassardi* (Wood & Okamura, 2004)

## 3. Distribution

The distribution records of freshwater Bryozoa in India are very scanty. The Annandale (1911) recorded distribution of various species across the India. Rao (1992) provided the distribution maps of various species in India. Most the study was focused in central part of the country. Zoological Survey of India (ZSI), established by Annandale in 1916 also contributing in understanding diversity and distribution of freshwater bryozoans of India recently. They had published various volumes of animal resources of India, Fauna of various states in India and some papers. All the publications of ZSI are available on <https://zsi.gov.in> website. Recently Samanta (1998, 1999, 2000a, 2000b, 2003, 2005, 2007,

2009, 2013) reported the distribution of bryozoans in West Bengal, Meghalaya, Tripura, Sikkim, Andhra Pradesh, Uttar Pradesh, Arunachal Pradesh, Assam, Tamil Nadu. Kalita and Goswami (2005) also reported bryozoans from Assam. Jakhalkar S. (2012), Harkal and Mokashe (2013), Swami et al. (2014, 2015, 2016, 2017) and Swami P.S. (2016) reported freshwater

bryozoans of Maharashtra with the three new records from India (*Hislopia malayensis*, *Swarupella divina* and *Plumatella geimermassardi*) and one new record from Maharashtra (*Plumatella minuta*). The distribution records of various species in different states of India are recorded in table 1 as per the available literature.

**Table 1. Showing distribution record of freshwater Bryozoa in India.**

Sr. No.	State	Number	Distribution record of Bryozoa
1.	Andhra Pradesh	06	<i>Hyalinella punctata</i> , <i>Hislopiala custris</i> , <i>Plumatella diffusa</i> , <i>Stolella indica</i> , <i>Plumatella fruticosa</i> , <i>Plumatella javanica</i>
2.	Arunachal Pradesh	01	<i>Plumatella javanica</i>
3.	Assam	06	<i>Plumatella agilis</i> , <i>Hislopiala custris</i> , <i>Hislopia monoliformis</i> , <i>Plumatella emarginata</i> , <i>Asajirella gelatinosa</i> , <i>Fredericella sultana</i>
4.	Chhattisgarh	01	<i>Plumatella emarginata</i>
5.	Himachal Pradesh	02	<i>Plumatella bombayensis</i> , <i>Lophopodella carteri</i>
6.	Jammu and Kashmir	02	<i>Fredericella sultana</i> , <i>Lophopodella carteri</i> ,
7.	Kerala	04	<i>Fredericella sultana</i> , <i>Plumatella emarginata</i> , <i>Plumatella fruticosa</i> , <i>Plumatella javanica</i>
8.	Madhya Pradesh	18	<i>Fredericella sultana</i> , <i>Plumatella casmiana</i> , <i>Plumatella emarginata</i> , <i>Plumatella repens</i> , <i>Plumatella fruticosa</i> , <i>Plumatella javanica</i> , <i>Plumatella ganapati</i> , <i>Plumatella agilis</i> , <i>Plumatella andamanensis</i> , <i>Varunella coronifera</i> , <i>Varunella indorana</i> , <i>Stolella indica</i> , <i>Hyalinella punctata</i> , <i>Hyalinella minuta</i> , <i>Hyalinella diwanensis</i> , <i>Lophopodella carteri</i> , <i>Asajirella gelatinosa</i> , <i>Hislopia lacustris</i> ,
9.	Maharashtra	13	<i>Plumatella casmiana</i> , <i>Plumatella emarginata</i> , <i>Plumatella fruticosa</i> , <i>Plumatella bombayensis</i> , <i>Hyalinella lendenfeldi</i> , <i>Rumarcanela vorstmani</i> , <i>Lophopodella carteri</i> , <i>Asajirella gelatinosa</i> , <i>Hislopia lacustris</i> , <i>Hislopia malayensis</i> , <i>Swarupella divina</i> , <i>Plumatella geimermassardi</i> , <i>Plumatella minuta</i>
10.	Orissa	04	<i>Plumatella javanica</i> , <i>Lophopodella carteri</i> , <i>Asajirella gelatinosa</i> , <i>Hislopia lacustris</i>
11.	Punjab	01	<i>Hyalinella indica</i>
12.	Rajasthan	07	<i>Plumatella casmiana</i> , <i>Plumatella emarginata</i> , <i>Plumatella repens</i> , <i>Plumatella javanica</i> , <i>Stolella indica</i> , <i>Hyalinella punctata</i> , <i>Lophopodella carteri</i> ,

13.	Sikkim	04	<i>Plumatella diffusa</i> , <i>Plumatella Fruticosa</i> , <i>Plumatella javanica</i> , <i>Hyalinella punctata</i>
14.	Tamilnadu	06	<i>Plumatella javanica</i> , <i>Hyalinella punctata</i> , <i>Lophopodella carteri</i> , <i>Hislopia lacustris</i> , <i>Plumatella diffusa</i> , <i>Stolella indica</i> .
15.	Tripura	04	<i>Plumatella diffusa</i> , <i>Plumatella Fruticosa</i> , <i>Plumatella javanica</i> , <i>Hyalinella punctata</i>
16.	Uttar Pradesh	06	<i>Fredericella sultana</i> , <i>Plumatella javanica</i> , <i>Hyalinella punctata</i> , <i>Hislopia lacustris</i> , <i>Plumatella diffusa</i> , <i>Plumatella fruticosa</i>
17.	Uttarakhand	07	<i>Fredericella sultana</i> , <i>Plumatella casmiana</i> , <i>Plumatella emarginata</i> , <i>Plumatella fruticosa</i> , <i>Plumatella javanica</i> , <i>Plumatella bombayensis</i> , <i>Hyalinella punctata</i>
18.	West Bengal	11	<i>Plumatella emarginata</i> , <i>Plumatella repens</i> , <i>Plumatella fruticosa</i> , <i>Plumatella javanica</i> , <i>Plumatella bombayensis</i> , <i>Plumatella agilis</i> , <i>Stolella indica</i> , <i>Hyalinella punctata</i> , <i>Hislopia lacustris</i> , <i>Hislopia monoliformis</i> , <i>Stolella indica</i>
19.	Andaman Islands	01	<i>Plumatella andamanensis</i> .

#### 4. Remarks and Conclusion

There are 29 documented species with the distribution records in 18 states and one union territory of India. According to Valarmathi and Mitra (2017) the taxonomic revision of this group is essential because the status of certain species is not clear. Even the species namely *Swarupella andamanensis*, *Plumatella ganapati*, *Hyalinella diwanensis* described and reported by Rao from Madhya Pradesh are not reported from other parts of India. The 09 states namely Bihar, Goa, Gujarat, Haryana, Karnataka, Manipur, Meghalaya, Mizoram, Jharkhand Nagaland and Telangana and six union territories are still need to be explored to understand the real picture of diversity and distribution of freshwater bryozoans in India. The some of the states which are less explored will possibly also add valuables information in the faunal resources of India.

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