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The biodiverse rotifers (Rotifera: Eurotatoria) of Majuli River Island – an alluvial floodplain of Assam state (northeast India) and the largest river island

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Abstract

Our assessment of Rotifera biodiversity of the floodplain wetlands of the Majuli River Island of the Brahmaputra basin in Assam state, northeast India (NEI) reveals a total of 175 species belonging to 39 genera and 19 families. The rich and diverse assemblages of the phylum categorize the Majuli as one of the megadiverse Rotifera region of India. The observed biodiversity of Rotifera is hypothesized to be associated with the habitat diversity of the Majuli wetlands, including its varied aquatic macrophytes, the location of the study areas in the 'Indo-Burmese biodiversity hotspot' and the 'Rotiferologist effect', and merits conservation interest in light of the extinction threat to this alluvial floodplain. We record one rotifer species each as new to the Indian sub-region and NEI, and 29 species as new records from the Majuli. We also consider various newly recorded species to be of global and regional biogeography interest, with some hypothesized to have a biogeographic role linked to the 'Assam gateway'. High richness of *Lecane* > *Lepadella* ≥ *Trichocerca*, the richness of *Testudinella*, and the paucity of *Brachionus* species are noteworthy features. Reports of 175 species from floodplain lakes and 148 species from small wetlands indicate biodiverse rotifer assemblages in these two categories of wetlands and present a useful contribution to Rotifera ecological diversity of the Indian and the tropical floodplains.

Key words: Alluvial floodplain, biodiversity, distribution, largest river island, megadiverse, wetlands

Introduction

Rotifera, an important group of aquatic Metazoa and an integral component of aquatic food-webs, have been examined from distant localities of India since the pioneering taxonomic survey of Anderson (1889). A recent assessment of the Indian Rotifera, however, highlights the regional biodiversity disparity attributed to paucity of sampling of diverse aquatic ecosystems (Sharma and Sharma, 2021a). Referring to the latter, Segers et al. (1993) hypothesized tropical and subtropical floodplain lakes as globally important rotifer habitats. Our meta-diversity updates (Sharma and Sharma, 2014a; 2019a; 2021b) extended this hypothesis to the rotifer assemblages of the floodplain lakes of northeast India (NEI), as well as small floodplain wetlands of Assam (Sharma and Sharma, 2019b; 2019c). On the other hand, inadequately explored Rotifera of diverse aquatic environs elsewhere in India lack any such viable generalization (Sharma and Sharma, 2017; 2021a).

Floodplain lakes and small wetlands comprise an integral part of the Majuli –an interesting alluvial floodplain of the Brahmaputra river basin in the state of Assam, NEI, and located within the 'Indo-Burmese biodiversity hotspot'. We hypothesize the global and the regional interest of Rotifera biodiversity assessment of wetlands of this largest river island following the reports of Segers et al. (1993) and

Sharma and Sharma (2019a), and 'the Rotiferologist effect' (Fontaneto et al., 2012). Moreover, we expand this hypothesis to include biogeography significance of the rotifer assemblages of the Majuli wetlands in light of the 'Assam gateway'– an interesting biogeographic corridor of India (Sharma and Sharma, 2019a). The present study, following on from earlier limited surveys (Sharma, 2014; Sharma et al., 2015), comprises an intensive assessment of the Majuli Rotifera with references to biodiversity and biogeography, and comparisons with reports from the Indian and tropical floodplains. Our results assume biodiversity conservation interest due to the threat of extinction of the Majuli Island by the continued flood erosion, and are relevant to the ecological diversity of Rotifera of Indian and tropical floodplains.

Material and Methods

Study area

The Majuli, also called 'Mojali', 'Majali', or 'Majoli', is located (Lat. $26^0 45' N – 27^0 12' N$, Long. $93^0 39' E – 94^0 35' E$, mean height: 84.5 m a.s.l.) in the upper reaches of the Brahmaputra river in Assam, NEI (Fig. 1A–B). This largest river island is purely a region of fluvial geomorphology and a unique geographic occurrence as it arose from the Brahmaputra basin after a catastrophic flood in 1750, and over the course of time, turned into a flat alluvial floodplain (a riverine delta). The island is a part of the vast dynamic river system of the Brahmaputra basin and is bounded by the river Subansiri and her tributaries in the northwest, the Kherkatia Suli (a spill channel of the Brahmaputra) in the northeast, and the main Brahmaputra River in the south and the south west. These tributaries have very steep slopes, shallow braided shifting channels with sandy beds, and usually bring flash floods during monsoon season. The Majuli is dotted with floodplain lakes (*beels*) and small wetlands (*dobas* or *dubies*), which deserve attention as aquatic biodiversity hot-spots due to the presence of diverse macrophytes, and contribute notably to the socio-economy of the region through significant fishery potential. *Alternanthera aquatica*, *Azolla pinnata*, *Eichhornia crassipes*, *Euryale ferox*, *Hydrilla verticillata*, *Lemna minor*, *Nymphaea carpensis*, *Nelumbo nucifera*, *N. lutea*, *Panicum paludosum*, *P. humitorum*, *Pistia stratiotes*, *Scirpus kysoor*, *Trapa bispinosa* and *Utricularia aurea* are aquatic and semi-aquatic macrophytes noted in wetlands of this study area. This important cultural heritage site is alarmingly shrinking due to continued flood erosion.

Methodology

The present study is based on analyses of planktonic and semi-planktonic samples collected from >30 floodplain lakes and small wetlands each of the Majuli River Island during December–February (winter), April–May (pre-monsoon), July–August (monsoon) and October–November of 2016–17, as well as samples collected earlier during a 2011–2012 survey. The samples were collected by towing a plankton net (# 40 µm) from the littoral / semi-limnetic regions of various floodplain wetlands and were preserved in 5% formalin. All samples were screened using a WILD binocular microscope. Rotifers were isolated and mounted in polyvinyl alcohol-lactophenol mixture and were observed with a Leica (DM 1000) stereoscopic phase contrast microscope fitted with an image analyzer. Rotifera species were identified following Sharma (1983; 1998; 2014) and Sharma and Sharma (1999; 2000; 2008; 2014b; 2014c; 2015; 2018a; 2019a; 2021a; 2021b). Various species of interest were presented as new records and illustrated herein. Voucher specimens were deposited in the national holdings of Zoological Survey of India, Kolkata.

Results and Discussion

A total of 175 species, belonging to 37 genera and 19 Eurotatorian families, observed from the Majuli wetlands (Appendix 1) comprise significant fractions of Rotifera species (~40%, ~58% and ~70%), genera (~54%, ~61% and ~80%) and families (76%, 79% and 94%) known to date from India (Sharma and Sharma, 2021a), NEI (Sharma and Sharma, 2019a) and Assam (Sharma and Sharma, 2021b) respectively (Table 1). The reported taxa highlight the species-rich and diverse nature of Rotifera and categorize the Majuli River Island as one of the megadiverse regions of India for the taxon in spite of the limited geographical area. The encountered biodiversity of Rotifera is hypothesized to result from the micro-habitat diversity and ecological heterogeneity of the Majuli wetlands, location of the study area in the 'Indio-Burmese biodiversity hotspot', and the 'Rotiferologist effect' (Fontaneto et al., 2012). Our significant meta-diversity update vis-a-vis the limited initial surveys (Sharma, 2014; Sharma et al., 2015) is hypothesized to be a product of the diverse nature of the sampled wetlands with their varied macrophytic associations (Brito et al., 2020) and the intensive sampling. The tally of Rotifera known from the Majuli also compares well with the overall faunal diversity of the phylum documented from the states of Tripura (176 species) and Arunachal Pradesh (172 species) of NEI (Sharma and Sharma, 2019a), and with 178, 177 and 173 species recorded from other relatively well surveyed Indian states of West Bengal (Sharma, 1998), Tamil Nadu (Sharma and Sharma, 2009) and Jammu and Kashmir (Sharma and Sharma, 2018b) respectively. These comparisons demonstrate the biodiverse nature of Rotifera of the Majuli wetlands.

Our study reveals 31 Rotifera species as new records (Appendix 1) including one species each as new records for the Indian sub-region and NEI, and 29 new records for species from the Majuli.

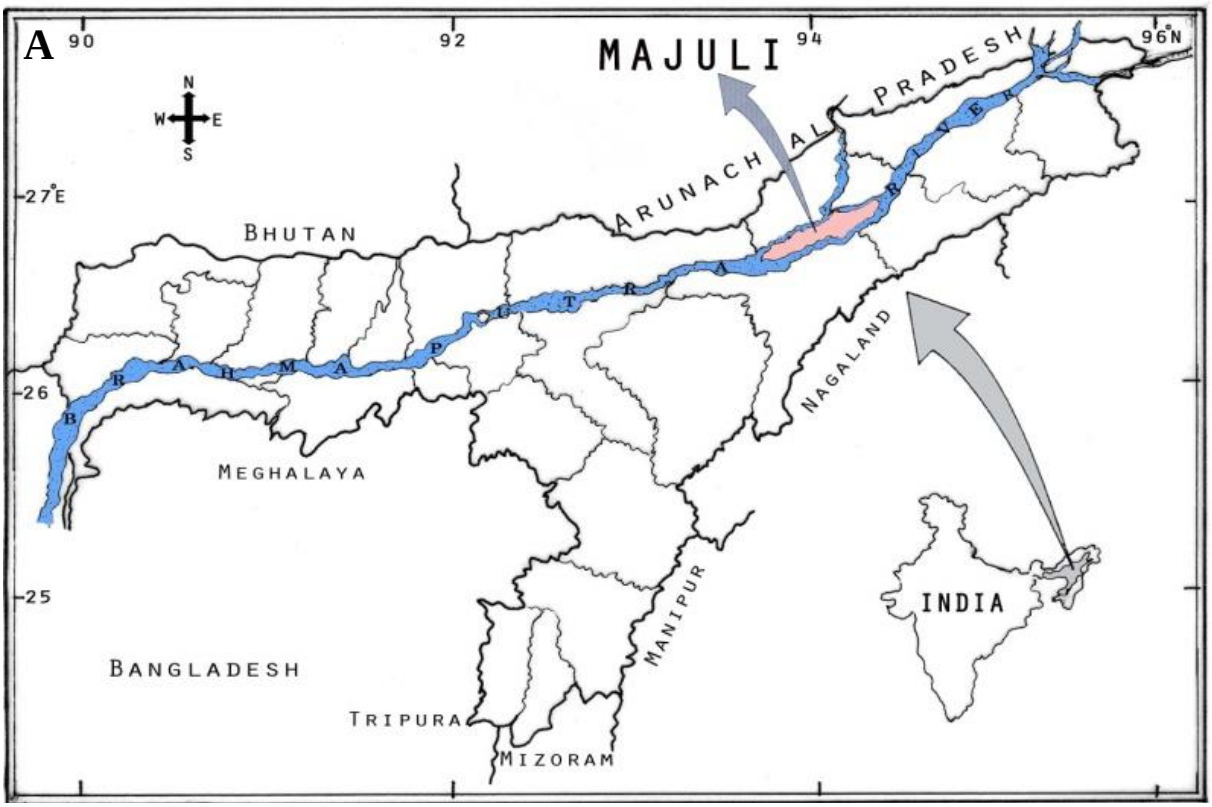


Figure 1: A, District map of Assam state indicating the location of the Majuli River Island (Insert, map of India indicating Assam state of northeast India) (Source: Sharma, 2014); B, Majuli Aerial View (Google photo).

Table 1: Composition of Rotifer known from Majuli, NEI and Assam.

Families↓	Species			Genera		
	NEI*	Assam#	Majuli	NEI*	Assam#	Majuli
			Subclass: Monogononta			
Order: Ploima						
1. Family: Brachionidae	42	36	19	6	5	5
2. Family: Epiphanidae	02	02	0	1	1	0
3. Family: Euchlanidae	10	09	07	4	4	3
4. Family: Mytilinidae	08	07	06	2	2	2
5. Family: Trichotriidae	07	06	05	3	3	3
6. Family: Lepadellidae	41	35	28	3	3	3
7. Family: Lecanidae	75	69	**55**	1	1	1
8. Family: Notommatidae	14	11	07	4	4	3
9. Family: Scaridiidae	01	01	01	1	1	1
10. Family: Gastropodidae	04	02	02	2	1	1
11. Family: Trichocercidae	32	28	21	1	1	1
12. Family: Asplanchnidae	02	02	01	1	1	1
13. Family: Synchaetidae	05	04	02	3	3	2
14. Family: Dicranophoridae	02	02	02	2	2	2
Order: Floscullariaceae						
15. Family: Flosculariidae	11	06	02	6	4	1
16. Family: Conochilidae	01	01	01	1	1	1
17. Family: Hexarthridae	02	02	01	1	1	1
18. Family: Testudinellidae	12	11	10	2	2	2
19. Family: Trochosphaeridae	09	09	03	3	3	2
Order: Collothecaceae						
20. Family: Atrochidae	01	0	0	1	0	0
21. Family: Collothecidae	06	01	0	1	1	0
			Subclass: Bdelloidea			
22. Family: Adinetidae	02	0	0	1	0	0
23. Family: Habrotrochidae	05	0	0	1	0	0
24. Family: Philodinidae	09	06	3	4	2	2
Total Rotifer taxa	303	250	175	56	46	37

Sources: *Sharma and Sharma (2019a); # Sharma and Sharma (2021c)

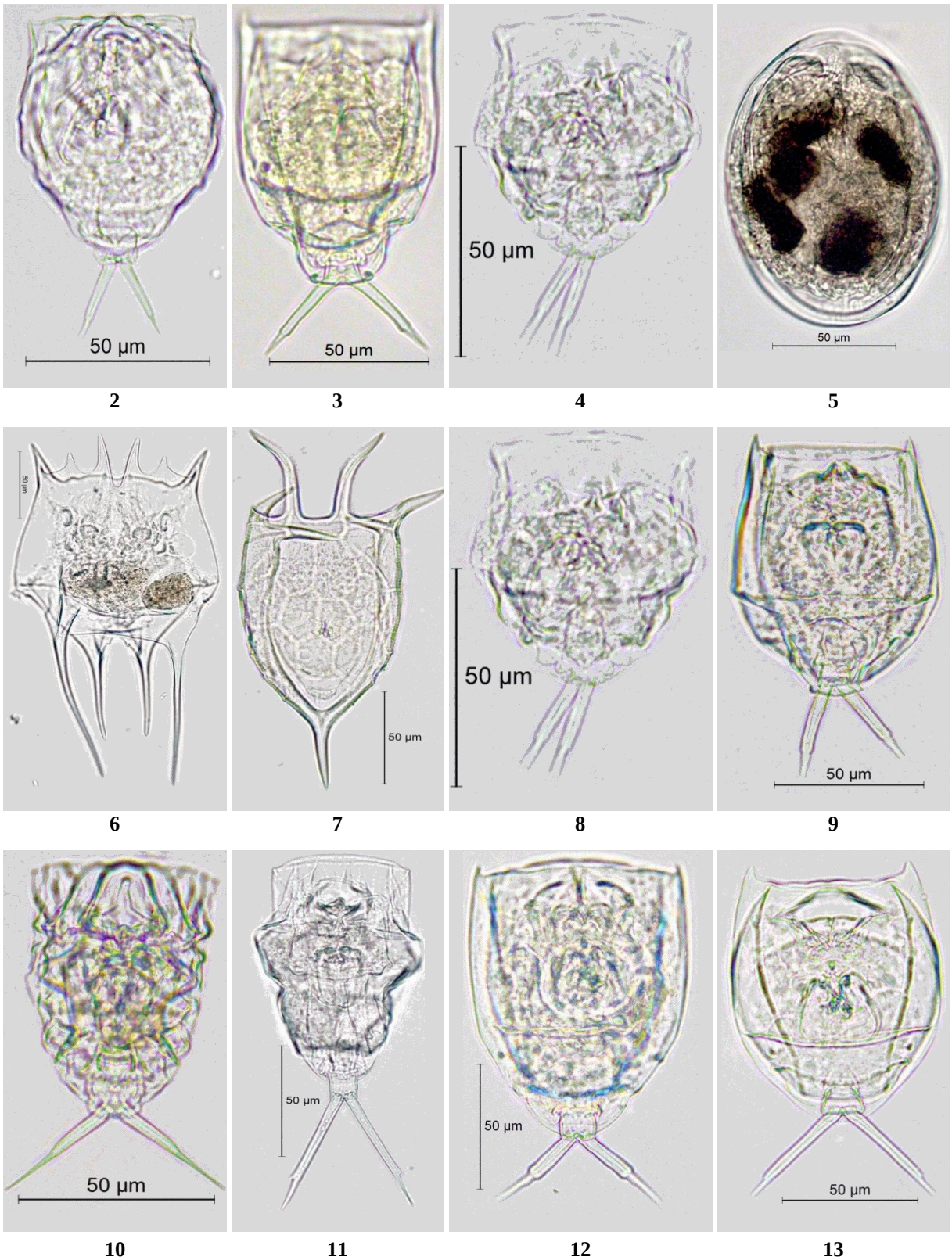
The cosmopolitan *Lecane subtilis* Harring and Myers (Fig. 2) is known elsewhere from the Oriental region from Thailand (Sa-Ardrit et al., 2013), and the present report extends its distribution to the Indian sub-region. The paleotropical *Lecane eswari* Dhanapathi (Fig. 3), described from Andhra Pradesh (Dhanapathi, 1976), was known from a single additional validated Indian report from Tamil Nadu (Sharma and Sharma, 2009), but the present report extends its distribution to NEI. *Ascomorpha ovalis* (Bergendal) (Fig. 4), *Brachionus mirabilis* Daday (Fig. 5), *Cephalodella trigona* (Rousselet) (Fig. 6), *Keratella javana* Hauer (Fig. 7), *Lecane aeganea* Harring (Fig. 8), *L. bifastigata* Hauer (Fig. 9), *L. dorysimilis* Trinh Dang, Segers and Sanoamuang (Fig. 10), *L. elegans* Harring (Fig. 11), *L. hastata* (Murray) (Fig. 12), *L. rhenana* Hauer (Fig. 13), *L. stichoclysta* Segers (Fig. 14), *L. superaculeata* Sanoamuang and Segers (Fig. 15), *Platyias leloupi* (Gillard) (Fig. 16), *Testudinella brevicaudata* Yamamoto (Fig. 17), *Testudinella dendradena* de Beauchamp (Fig. 18), *T greeni* Koste (Fig. 19), *T. parva* (Ternetz) (Fig. 20), *T.* sp. Sharma and Sharma (Fig. 21), *Trichocerca edmondsoni* (Myers) (Fig. 22), *T. hollaerti* De Smet (Fig. 23), *T. maior* Hauer (Fig. 24) and *Wolga spinifera* (Western) (Fig. 25) are notable additions to the Majuli fauna vis-à-vis the Indian Rotifera. *Cephalodella mucronata* Myers, *Colurella sulcata* (Stenroos), *Lecane syngenes* (Hauer), *Mytilina brevispina* (Ehrenberg), *Trichocerca bidens* (Lucks), *T. capucina* (Wierzejski and Zacharias) and *T. longiseta* (Schrank) are other new additions to the Majuli Rotifera.

We report 30 Rotifera species (~17%) of global biogeography interest (Appendix 1). These comprise notable fractions (~27%, ~39% and ~54%) of such species known from India (Sharma and Sharma, 2021a), NEI (Sharma and Sharma, 2019a) and Assam (Sharma and Sharma, 2021b) respectively. Amongst these, 27 species including two Australasian, five Oriental, eleven Paleotropical, one Holarctic, two Palaearctic, one Indo-Chinese, one cosmo(sub)tropical and three other important species, and one Indian endemic are observed in the 2016–17 collections (Appendix 1); and two paleotropical, and one Holarctic species were observed from the 2011–12 samples. Nevertheless, 13 globally interesting species added during the present study (Appendix 1) distinctly enhance (~43%) the richness tally of this category than earlier surveys (Sharma, 2014; Sharma et al., 2015). We hypothesize the incursion of various interesting species in general, and the Australasian, Oriental, Indo-Chinese and Paleotropical species in particular, through the 'Assam gateway'– a unique biogeographic corridor of India (Sharma and Sharma, 2019a; 2021a). The tropical-latitude Majuli populations of the Holarctic and Palaearctic species are hypothesized as glacial relicts following Segers (1996), while we also hypothesize the occurrence of these species as the result of likely invasion from the eastern Himalayas (Sharma and Sharma, 2021a) through the 'Assam gateway'. Furthermore, our report of 29 species (~16%) that depict Indian distribution restricted to NEI (Sharma and Sharma, 2019a; 2021a) imparts notable regional biogeography interest to the Majuli Rotifera. Interestingly, these represent a large fraction (~80%) of species of this category known from Assam (Sharma and Sharma, 2021b).

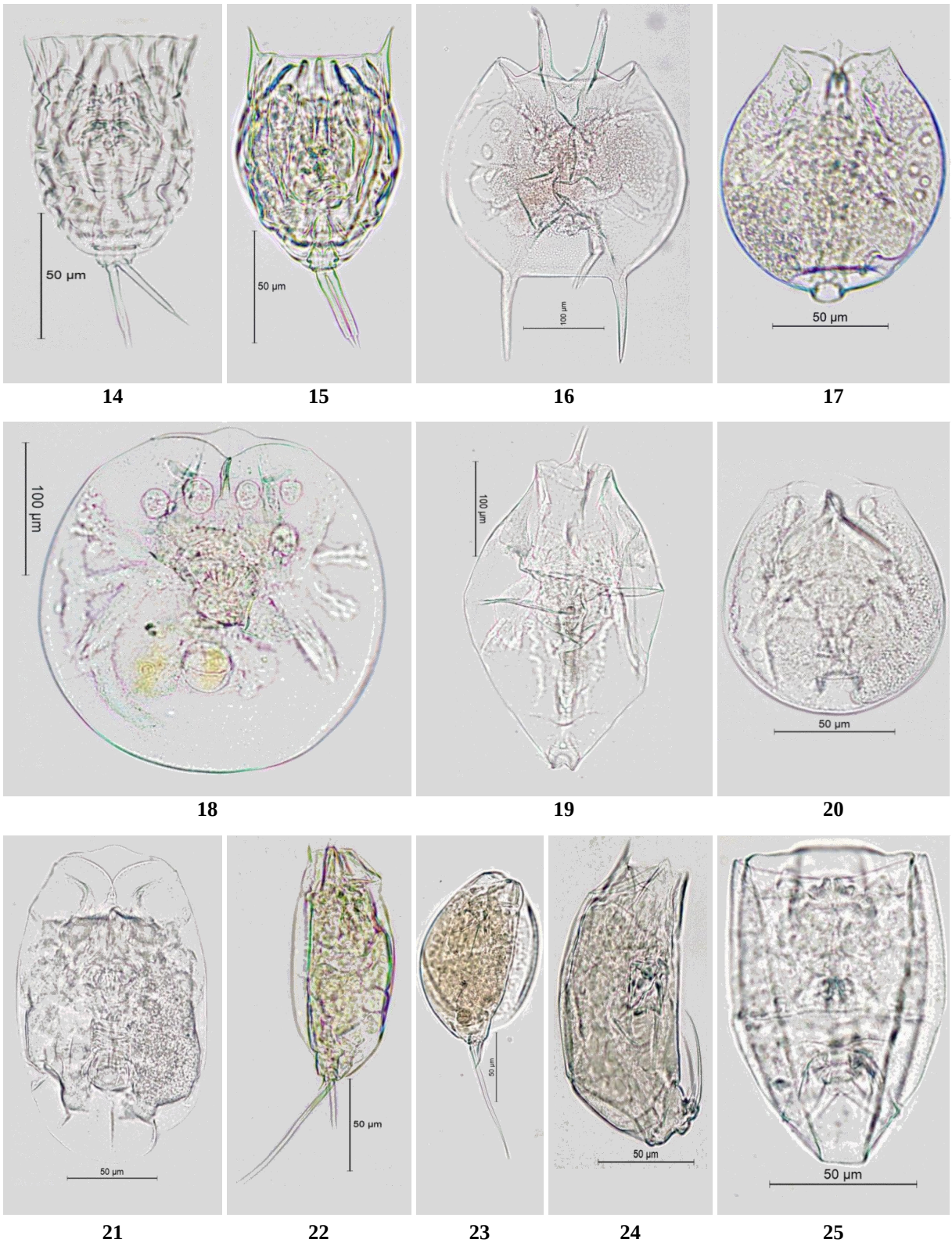
Lecanidae forms a significant fraction (~31%) of the Majuli Rotifera. The lecanid importance concurs with reports from NEI and Assam (Sharma and Sharma, 2019a; 2021b), India (Sharma and Sharma, 2021a) and Southeast Asia (Segers, 2001; Sa-Ardrit et al., 2013). Lepadellidae > Trichocercidae > Brachionidae collectively includes ~39% of documented species, while Testudinellidae > Euchlanidae = Notommatidae ≥ Mytilinidae collectively comprises ~17% of the reported species. The notably higher richness of Lecanidae and Trichocercidae compared with an earlier report (Sharma, 2014) highlights more heterogeneity of the rotifer assemblages attributed to micro-habitat diversity of the presently sampled Majuli wetlands. The monogonont genera *Lecane* (55 species) > *Lepadella* (22 species) ≥ *Trichocerca* (21 species) collectively comprise a significant fraction (~56%) of the Majuli Rotifera. The qualitative importance of these genera corresponds with reports from NEI and Assam (Sharma and Sharma, 2019a; 2021b). Additionally, *Testudinella* (9 species) deserves attention with reference to its species known from India and NEI (Sharma and Sharma, 2018a). The overall importance of the stated families and genera in wetlands of this alluvial floodplain, attributed to various aquatic macrophytes, characterizes the littoral-periphytic nature of the Majuli Rotifera is concurrent with the reports from India (Sharma and Sharma, 2017; 2021a), NEI (Sharma and Sharma, 2019a) and Southeast Asia (Segers, 2001; Sa-Ardrit et al., 2013). The notable paucity of *Brachionus* (9 species) is attributed to a lack of limnetic conditions in the Majuli wetlands. This feature is in accordance with reports from upper Assam (Sharma et al., 2017) and Meghalaya (Sharma and Sharma, 2021c) wetlands, but marks a distinct contrast to the higher richness of *Brachionus* reported from south Assam (Sharma and Sharma, 2019b), and lower and central Assam (Sharma and Sharma, 2019c) floodplains.

Our study records a sizable fraction of cosmopolitan (~66%) species and registers the collective importance of pantropical and tropicopolitan species (~17%). This generalization, along with high richness of the 'tropic centered' *Lecane*, imparts 'tropical character' to the Majuli Rotifera concurrent with the remarks of Fernando (1980), De Ridder (1981), Dussart et al. (1984), Segers (1996, 2001), Green (2003) and Sharma and Sharma (2021a). Furthermore, the Rotifera assemblages of the Majuli wetlands reveal several small-sized species belonging to *Colurella*, *Lecane*, *Lepadella* and *Trichocerca*, concurrent with reports from the floodplains of Assam (Sharma and Sharma, 2008; 2014a; 2019a). This feature, together with lower abundance of such species, is hypothesized (Sharma and Sharma, 2014a) to conditions of low concentrations of food (Papinski, 1990) and predation by fish and invertebrates (Baumgartner et al., 1997). The former aspect is endorsed by low phytoplankton abundance of the Majuli wetlands of the Majuli (BKS, unpublished), while studies on the impact of invertebrate and fish predation are yet needed in order to confirm this hypothesis.

Interestingly, all 175 Rotifera species examined from the Majuli floodplain lakes (*beels*) deserve biodiversity interest as ~70% of the species are known to-date from *beels* of Assam state (Sharma and Sharma, 2021a; 2021b) of NEI. The species tally is well comparable with the reports (Sharma and Sharma, 2021a) from the selected *beels* of Barpeta (176 species), Dibrugarh (179 species) and Tinsukia (169 species) districts of Assam. The tally is marginally higher than the 162 species reported from the *beels* of the Dibru-Saikhowa Biosphere Reserve of upper Assam, and registers higher richness than the reports from the floodplain lakes of the Kashmir Himalayas (140 species: Sharma and Sharma 2018b) and the Gangetic West Bengal (152 species: Sharma and Sharma, 2021a), and the river Yamuna floodplain (110 species; Arora and Mehra, 2003). On the other hand, the Rotifera tally from the Majuli floodplain lakes is marginally lower than the 184 species known from the relatively well sampled the Upper Paraná floodplain of Brazil (Bonecker et al., 2005), but is distinctly higher than the 117 species examined from the 50 floodplain lakes situated in the upper portion of the Paraguay River basin of the central region of Brazil (Brito et al., 2020). These comparisons highlight the biodiverse rotifer assemblages of the Majuli floodplain lakes and thus corroborate the hypothesis of Segers et al. (1993) and Sharma and Sharma (2019a) on the tropical and subtropical floodplain lakes as globally interesting rotifer habitats.



Figures 2–13: New records of Rotifera. 2, *Lecane subtilis* Harring and Myers (dorsal view); 3, *Lecane eswari* Dhanapathi (dorsal view); 4, *Ascomorpha ovalis* (Bergendal) (dorsal view); 5, *Cephalodella trigona* (Rousselet) (lateral view); 6, *Brachionus mirabilis* Daday (ventral view); 7, *Keratella javana* Hauer (Ventral view); 8, *Lecane aeganea* Harring (ventral view); 9, *Lecane bifastigata* Hauer (ventral view); 10, *Lecane dorysimilis* Trinh Dang, Segers and Sanoamuang (ventral view); 11, *Lecane elegans* Harring (dorsal view); 12, *Lecane hastata* (Murray) (ventral view); 13, *Lecane rhenana* Hauer (ventral view).



14 **15** **16** **17**

18 **19** **20**

21 **22** **23** **24** **25**

Figures 14–25: New records of Rotifera. 14, *Lecane stichoclysta* Segers (dorsal view); 15, *Lecane superaculeata* Sanoamuang and Segers (ventral view); 16, *Platyias leloupi* (Gillard) (ventral view); 17, *Testudinella brevicaudata* Yamamoto (ventral view); 18, *Testudinella dendradena* de Beauchamp (ventral view); 19, *Testudinella greeni* Koste (ventral view); 20, *Testudinella parva* (Ternetz) (ventral view); 21, *Testudinella* sp. Sharma and Sharma (ventral view); 22, *Trichocerca edmondsoni* (Myers) (lateral view); 23, *Trichocerca hollaerti* De Smet (lateral view); 24, *Trichocerca maior* Hauer (lateral view); 25, *Wolga spinifera* (Western) (ventral view).

Céréghino et al. (2014), Vad et al. (2017) and Oertli (2018) highlighted the role of small water bodies as keystone systems for biodiversity considerations. These biotopes were largely neglected for rotifer diversity assessment in India until the reports of Sharma et al. (2016; 2017) and Sharma and Sharma (2019b; 2019c; 2021c). Our report of a total of 148 Rotifera species from small wetlands of the Majuli indicates their speciose nature. Comparatively, 154 and 150 species are known from these wetlands in lower and central Assam (Sharma and Sharma, 2021a), and 167 and 159 species were reported from small wetlands in the Brahmaputra and Barak river basins of Assam (Sharma and Sharma, 2019b; 2019c) respectively, while the richness is marginally higher than 135 species examined from small wetlands of the upper Assam (Sharma and Sharma, 2021a). These comparisons affirm the biodiverse rotifer assemblages of small wetlands (*dobas* or *dubies*) of the Majuli River Island.

Various Rotifera species, namely *Brachionus angularis*, *B. quadridentatus*, *Colurella uncinata*, *Euchlanis dilatata*, *Keratella cochlearis*, *Lecane bulla*, *L. closterocerca*, *L. curvicornis*, *L. hamata*, *L. inermis*, *L. leontina*, *L. luna*, *L. lunaris*, *L. ludwigii*, *L. quadridentata*, *L. signifera*, *L. ungulata*, *L. unguitata*, *Lepadella acuminata*, *L. ovalis*, *L. patella*, *L. rhomboides*, *Plationus patulus*, *Testudinella emarginula*, *T. patina*, *Trichocerca rattus* and *T. similis*, examined from the Majuli depict notable morphological variations. Cryptic diversity analyses of these taxa, which likely represent species complexes, are desired with the use of 'integrative taxonomic approaches', as suggested by Sharma and Sharma (2021a). Our plankton and semi-plankton collections record the limnetic and littoral-periphytic species, but depict paucity of the sessile and bdelloid rotifers; the latter need to be studied with the involvement of specific sampling methods.

Conclusions

The species-rich and diverse assemblage, hypothesized to result from the micro-habitat diversity and environmental heterogeneity of wetlands and 'the Rotiferologist effect', imparts biodiversity importance to the Majuli Rotifera. The reports of a notable fraction of species of global and regional distribution interest merit attention to biogeography, with the occurrence of the Australasian, Oriental, Paleotropical and the Indo-Chinese species in particular, is hypothesized to be a consequence of invasion of these noteworthy elements through the 'Assam-gateway'. The predominance of lecanids, the relative importance of Testudinellidae > Euchlanidae = Notommatidae ≥ Mytilinidae, and the species-rich *Lepadella* ≥ *Trichocerca* affirm the littoral-periphytic nature of the Majuli Rotifera, while the relative paucity of *Brachionus* species is noteworthy. Our reports of 175 species from floodplain lakes and 148 species from small wetlands indicate biodiverse Rotifera of wetlands of the two categories with regard to habitat diversity. Analysis of cryptic diversity in certain species complexes and adequate analyses of the sessile and bdelloid species are likely to increase the Rotifera richness status of the Majuli to 225+ species.

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Conflict of interest

All the authors declare that there are no conflicting issues related to this research article.

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Appendix 1: Systematic list of Rotifera species recorded from the Majuli River Island.

Phylum: Rotifera
Class: Eurotatoria

Subclass: Monogononta
Order: Ploima

Family: Brachionidae
1. *Anuraeopsis fissa* Gosse, 1851
2. *Brachionus angularis* Gosse, 1851
3. *B. calyciflorus* Pallas, 1766
4. *B. dichotomus reductus* Koste and Shiel, 1980 AUS
5. *B. diversicornis* (Daday, 1883)
6. *B. durgae* Dhanapathi, 1974 CST
7. *B. falcatus* Zacharias, 1898
8. *B. kostei* Shiel, 1983 AUS
9. *B. mirabilis* Daday, 1897 **
10. *B. quadridentatus* Hermann, 1783
11. *Keratella cochlearis* (Gosse, 1851) C
12. *K. edmondsoni* Ahlstrom, 1943 OR
13. *K. javana* Hauer, 1937 ** PT
14. *K. lenzi* Hauer, 1953
15. *K. tecta* (Gosse, 1851)
16. *K. tropica* (Apstein, 1907)
17. *Platyias leloupi* (Gillard, 1967) **
18. *P. quadricornis* (Ehrenberg, 1832)
19. *Plationus patulus* (O.F. Muller, 1786)

Family: Euchlanidae
20. *Beauchampiella eudactylota* (Gosse, 1886)
21. *Dipleuchlanis ornata* Segers, 1993 ## PT
22. *D. propatula* (Gosse, 1886)
23. *Euchlanis dilatata* Ehrenberg, 1832
24. *E. incisa* Carlin, 1939
25. *E. triquetra* Ehrenberg, 1838
26. *Tripleuchlanis plicata* (Levander, 1894)

Family: Mytilinidae
27. *Lophocharis oxysternon* (Gosse, 1851) ##
28. *Mytilina acanthophora* Hauer, 1938
29. *M. bisulcata* (Lucks, 1912)
30. *M. brevispina* (Ehrenberg, 1830) **
31. *M. michelangellii* Reid and Turner
32. *M. ventralis* (Ehrenberg, 1830)

Family: Trichotriidae
33. *Macrochaetus collinsi* (Gosse, 1867)
34. *M. longipes* Myers, 1934
35. *M. sericus* (Thorpe, 1893)
36. *Trichotria tetractis* (Ehrenberg, 1830)
37. *Wolga spinifera* (Western, 1894) **

Family: Lepadellidae
38. *Colurella adriatica* Ehrenberg, 1831
39. C. *colurus* (Ehrenberg, 1830)
40. *C. obtusa* (Gosse, 1886)
41. *C. sulcata* (Stenroos, 1898)
42. *C. uncinata* (O.F. Muller, 1773)
43. *Lepadella acuminata* (Ehrenberg, 1834)
44. *L. apsida* Harring, 1916
45. *L. apsicora* Myers, 1934
46. *L. benjamini* Harring, 1916
47. *L. biloba* Hauer, 1958
48. *L. costatoides* Segers, 1992
49. *L. dactyliseta* (Stenroos, 1898)
50. *L. discoidea* Segers, 1993 PT
51. *L. ehrenbergi* (Perty, 1850)
52. *L. elongata* Koste, 1992 ## HOL
53. *L. eurysterna* Myers, 1942
54. *L. heterostyla* (Murray, 1913)
55. *L. latusinus* (Hilgendorf, 1899) ##
56. *L. lindaui* Koste, 1981
57. *L. minuta* (Weber and Montet, 1918)
58. *L. ovalis* (O. F. Muller, 1786)
59. *L. patella* (O. F. Muller, 1773)
60. *L. quinquecostata* (Lucks, 1912)
61. *L. rhomboides* (Gosse, 1886)
62. *L. triptera* Ehrenberg, 1832
63. *L. triba* Myers, 1934
64. *L. vandenbrandei* Gillard, 1952 PT
65. *Squatinella lamellaris* (O. F. Müller, 1786)

Family: Lecanidae
66. *Lecane aculeata* (Jakubski, 1912)
67. *L. aeganea* Harring, 1914 **
68. *L. arcula* Harring, 1914
69. *L. bifastigata* Hauer, 1938 ** PAL
70. *L. bifurca* (Bryce, 1892)
71. *L. blachei* Berzins, 1973 OR
72. *L. bulla* (Gosse, 1851)
73. *L. closterocerca* (Schmarda, 1859)
74. *L. crepida* Harring, 1914
75. *L. curvicornis* (Murray, 1913)
76. *L. decipiens* (Murray, 1913)
77. *L. doryssa* Harring, 1914
78. *L. dorysimilis* Trinh Dang, Segers and Sanoamuang, 2015** INC
79. *L. elegans* Harring, 1914 **
80. *L. elongata* Harring and Myers, 1926
81. *L. eswari* Dhanapathi, 1976 * PT
82. *L. flexilis* (Gosse, 1886)
83. *L. furcata* (Murray, 1913)
84. *L. haliclysta* Harring and Myers, 1926
85. *L. hamata* (Stokes, 1896)
86. *L. hastata* (Murray, 1913) **
87. *L. hornemanni* (Ehrenberg, 1834)
88. *L. inermis* (Bryce, 1892)
89. *L. inopinata* Harring and Myers, 1926
90. *L. lateralis* Sharma, 1978 PT
91. *L. leontina* (Turner, 1892)
92. *L. ludwigii* (Eckstein, 1883)
93. *L. luna* (O.F. Müller, 1776)
94. *L. lunaris* (Ehrenberg, 1832)
95. *L. monostyla* (Daday, 1897)
96. *L. nitida* (Murray, 1913)
97. *L. niwati* Segers, Kotethip and Sanoamuang, 2004 OR
98. *L. obtusa* (Murray, 1913)
99. *L. ohioensis* (Herrick, 1885)
100. *L. papuana* (Murray, 1913)
101. *L. paxiana* Hauer, 1940
102. *L. ploenensis* (Voigt, 1902)
103. *L. pusilla* Harring, 1914
104. *L. pyriformis* (Daday, 1905)
105. *L. quadridentata* (Ehrenberg, 1830)
106. *L. rhenana* Hauer, 1929 ** OIS
107. *L. rhytida* Harring and Myers, 1926
108. *L. signifera* (Jennings, 1896)
109. *L. simonneae* Segers, 1993 PT

110. *L. stichoclysta* Segers, 1993** PT
111. *L. stenroosi* (Meissner, 1908)
112. *L. styrax* (Harring and Myers, 1926)
113. *L. subtilis* Harring and Myers, 1926 #
114. *L. superaculeata* Sanoamuang and Segers, 1997 ** OR
115. *L. syngenes* (Hauer, 1938) **
116. *L. tenuiseta* Harring, 1914
117. *L. thienemanni* (Hauer, 1938)
118. *L. undulata* Hauer, 1938
119. *L. unguitata* (Fadeev, 1925) PT
120. *L. ungulata* (Gosse, 1887)

Family: Notommatidae

121. *Cephalodella forficula* (Ehrenberg, 1830)
122. *C. gibba* (Ehrenberg, 1830)
123. *C. mucronata* Myers, 1924 **
124. *C. trigona* (Rousselet, 1895) ** PAL
125. *Monommata longiseta* (O. F. Müller, 1786)
126. *M. maculata* Harring and Myers, 1930
127. *Notommata pachyura* (Gosse, 1886)

Family: Scaridiidae

128. *Scaridium longicaudum* (O. F. Müller, 1786)

Family: Gastropodidae

129. *Ascomorpha ovalis* (Bergendal, 1892) **

Family: Trichocercidae

130. *Trichocerca abilioi* Segers and Sarma, 1993 ## PT
131. *T. bidens* (Lucks, 1912) **
132. *T. bicristata* (Gosse, 1887)
133. *T. capucina* (Wierzejski and Zacharias, 1893) **
134. *T. cylindrica* (Imhof, 1891)
135. *T. edmondsoni* (Myers, 1936) ** OIS
136. *T. elongata* (Gosse, 1886)
137. *T. hollaerti* De Smet, 1990** PT
138. *T insignis* (Herrick, 1885)
139. *T. insulana* (Hauer, 1937)
140. *T. longiseta* (Schrank, 1802) **
141. *T. maior* Hauer, 1936 **
142. *T. pusilla* (Jennings, 1903)
143. *T. rattus* (O. F. Müller, 1776)
144. *T. scipio* (Gosse, 1885)
145. *T. similis* (Wierzejski, 1893)
146. *T. tenuior* (Gosse, 1886)
147. *T. tigris* (O. F. Müller, 1786)
148. *T. uncinata* (Voigt, 1902) HOL
149. *T. voluta* (Murray, 1913)
150. *T. weberi* (Jennings, 1903)

Family: Asplanchnidae

151. *Asplanchna priodonta* Gosse, 1850

Family: Synchaetidae

152. *Pleosoma lenticulare* Herrick, 1885
153. *Polyarthra vulgaris* Carlin, 1943

Family: Dicranophoridae

154. *Dicranophoroides caudatus* (Ehrenberg, 1834)
155. *Dicranophorus forcipatus* (O. F. Müller, 1786)

Order: Floscullariaceae

Family: Conochilidae

156. *Conochilus unicornis* Rousselet, 1892

Family: Flosculariidae

157. *Sinantherina socialis* (Linne, 1758)
158. *S. spinosa* (Thorpe, 1893)

Family: Hexarthridae

159. *Hexarthra mira* (Hudson, 1871)

Family: Testudinellidae

160. *Testudinella amphora* Hauer, 1938 OIS
161. *T. brevicaudata* Yamamoto, 1951 ** PT
162. *T. emarginula* (Stenroos, 1898)
163. *T. dendradena* de Beauchamp, 1955 **
164. *T. greeni* Koste, 1981 ** PT
165. *T. parva* (Ternetz, 1892) **
166. *T. patina* (Hermann, 1783)
167. *T. tridentata* Smirnov, 1931
168. *T* sp 1 Sharma and Sharma 2018a ** END
169. *Pompholyx sulcata* Hudson,1885

Family: Trochosphaeridae

170. *Filinia camasecla* Myers, 1938 OR
171. *F. longiseta* (Ehrenberg, 1834)
172. *Trochosphaera aequatorialis* Semper, 1872

Subclass: Bdelloidea

Family: Philodinidae

173. *Philodina roseola* Ehrenberg, 1832
174. *Rotaria neptunia* (Ehrenberg, 1830)
175. *R. rotatoria* (Pallas, 1766)

AUS-Australasian; CST-Cosmo(sub)tropical; END-endemic; INC-Indo-Chinese; PAL-Palearctic; PT-Paleotropical; OIS-other interesting species; #new record from the Indian-sub-region; * new record from NEI; ** new records from the Majuli; ## observed in 2011–2012 collections.