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## **POPULATION DYNAMICS OF ROTIFER FAUNA IN TWO EUTROPHIC PONDS OF BAHRAICH DISTRICT UTTAR PRADESH**

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### **ABSTRACT**

Rotifers are small, mostly freshwater animals, and are amongst the smallest members of the Metazoa, that group of multicellular animals which includes humans, and whose bodies are organized into systems of organs. Most rotifers are about 0.5mm in length or less, and their bodies have a total of around a thousand cells. This means that their organ systems are a greatly simplified distillation of the organ systems found in the bodies of the higher animals. Rotifers are highly nutritious food for the larvae of aquatic crustaceans and fish, aquaculture technologies have been producing enormous quantities of rotifers in very large culture systems for more than 30 year. In this regard, rotifers can be seen as living nutrients that is tiny, free swimming, food for crustaceans and fishes. Considering all the data of two sampling ponds, a total 37 genera of rotifers were reported. In Guthiya pond, 17 species of rotifers were recorded belongs to 6 genera, while in Dahaura pond 20 species were recorded belongs to 10 genera during the study period. In the present study total 16 genera were recorded among them the most abundant genera were *Brachionus* and *Keratella*. The maximum diversity of rotifers was observed in the monsoon season. In conclusion, variety of rotifers that were observed in Guthiya pond and Dahaura pond including *Brachionus* and *Keratella* species are inhabitants of moderately clean waters. However, more and more knowledge regarding morphological variations and physiological conditions of rotifers should be studied and then they can be used as better indicators of environmental quality.

**Keywords:** *Rotifers, Dahaura Pond, Guthiya Pond, Bahraich, Brachionus sp, Keratella sp*

### **INTRODUCTION**

The occurrence and abundance of zooplankton depend on productivity of water body which in turn is influenced by biotic and abiotic factors. They link the primary producer, phytoplankton with higher large trophic level organisms. Zooplankton community responds to a wide variety of disturbances including nutrient overloading (Dodson, 1992). Zooplankton also plays a key role in aquatic food chain (Sharma, 1998). Owing to this they have attracted the attention of a large number of researchers throughout the world (Havel and Shurin, 2004; Israi *et al.*, 2006). Rotifers are generally present, in great numbers and with high species richness, in tropical zooplankton colonizing a wide variety of habitats from flooded areas (Martinez *et al.*, 2000; Lansac-Toha *et al.*, 2009) to large rivers, lakes and reservoirs (Sendacz *et al.*, 2006; Almeida *et al.*, 2009; Borges and Pedrozo, 2009).

Rotifers are highly nutritious food for the larvae of aquatic crustaceans and fish, aquaculture technologies have been producing enormous quantities of rotifers in very large culture systems for more than 30 year. In this regard, rotifers may be seen as living nutrients that is tiny, free swimming food for crustaceans and fishes. Some rotifers are highly specialized but most are opportunistic feeders since they consume and assimilate different types of food (Wallace *et al.*, 2006 and Wallace and Snell, 2010) reaching high population densities and diversities, as well as high tolerances to environmental conditions, thus making them among the most diverse group in environment. Rotifers are good pollution indicators (Sladeczek, 1983 and Chergui *et al.*, 2013). Besides, rotifers are used as indicators for pollution and eutrophication because of their high reproduction rate and sensitivity to any ecological change in water bodies (Lucinda *et al.*, 2004 and Yeole *et al.*, 2008). Work on rotifers in India is very limited and scattered (Vanjare,

### **Research Article**

2008). Studies in India are concentrated largely in the North and North-eastern states (Sharma and Sharma, 2005).

According to a conservative estimate, there are over 500 species of rotifers in Indian waters, although only 330 species belonging to 63 genera and 25 families have so far been authenticated (Sharma 1998). More recently, Segers and Babu (1999) and Sharma and Sharma (2001) have added 5 new taxa to the Indian checklist. Although taxonomic studies of Indian rotifers began more than a century ago, information on rotifer biodiversity in Indian waters is still incomplete. Most investigations carried out on this group in India have usually been restricted to planktonic species collected from the pelagic zone, whereas the importance of littoral-periphytic habitats has generally been overlooked. There is an urgent need to conduct faunal surveys on a variety of aquatic habitats in this country.

In the Bahraich district, this group escapes the attention of the researchers for a long time and less work has been carried on rotifer ecology and distribution. Hence; it is proposed to make a survey of water bodies in and around Bahraich district, and to analyze the nature based on the presence or absence of indicator organisms.

### **MATERIALS AND METHODS**

Samples were collected from different stations in these two ponds (Guthiya pond and Dahaura pond) by using horizontal sampling with plankton net (105µm mesh size). Samples were collected on a period of four months extending from December 2011 to March 2012. Rotifer samples were collected by filtering 5 lit of water from a particular site. Water samples at a site were collected from various depths instead of a particular point to avoid sampling errors. In the present study, the sampling were done in evening time between 3 to 5 pm, as rotifers have the tendency to migrate vertically for grazing on nutrient rich phytoplankton in the upper water column. Plankton was preserved in 5% neutral formalin. Fixed samples were carried to the laboratory for further analysis. From this rotifers were separated and temporary mounts were made using glycerin. Rotifer species were examined under the binocular microscope (Olympus CX 21 IFS1). The samples were thoroughly analyzed for the presence of various rotifer species. The rotifers were identified using various keys (Anitha *et al.*, 2006; Francis *et al.*, 2003; Pontin, 1978; Koste and Shiel, 1990 and Segers, 1995a) as well as image based identification provided by various websites (<http://rotifer.acnatsci.org/science>; <http://cfb.unh.edu>; [www.glerl.noaa.gov/seagrant/GLWL/zooplankton/rotifers](http://www.glerl.noaa.gov/seagrant/GLWL/zooplankton/rotifers)).

### **RESULTS AND DISCUSSION**

Rotifers are pseudocoelmate animals with a size ranging 50-2000µm and commonly known as “Wheel animalcules” because of their characteristic ‘wheel organ’. They are ubiquitous, occurring in all types of fresh and brackish water habitats. About 95% species of rotifer are recorded from fresh water and remaining 5% are from marine water environment (Sharma, 1996; Karuthapandi *et al.*, 2013).

In the present study 37 species of rotifer have been reported from two different eutrophic ponds of Bahraich district belonging to 16 genera (Table) which comprises 10.88% of the known 340 species of Indian rotifer, out of 25 families and 63 genera of eurotoria so far known from India (Sharma, 1998). *Brachionus*, *Lecane* and *Keratella* are the dominant genera of this study which are represented by 7, 6 and 3 species respectively. The species richness of these three genera may be attributed to the general tropical character. Our results are in conformity with the other workers (Kumar and Senraj, 2013; Tayade and Dabhade, 2011; Sharma and Sharma, 2011).

There are number of minor reservoir, river, stream, community pond and lakes are present in the district Bahriach which has a great heterogeneity. These water bodies may pass a varied rotifer fauna, therefore littoral area along with limnetic area of these water bodies require more studies of rotifer fauna, because of that, there is an urgent need to conduct extensive surveys on the different aquatic ecosystems which will uncover many new, rare and endemic species.

**Research Article**

**Table: Rotifer Fauna of Dhahura Pond and Guthiya Pond**

	<b>Name of Rotifer</b>
1	<i>Brachionus angularis</i>
2	<i>Brachionus quadrates</i>
3	<i>Brachionus caudatus</i>
4	<i>Brachionus falcatus</i>
5	<i>Brachionus forficula</i>
6	<i>Brachionus bidendus</i>
7	<i>Brachionus quadridentatus</i>
8	<i>Keratella quadrata</i>
9	<i>Keratella tropica</i>
10	<i>Keratella vulga</i>
11	<i>Lecane (Monostyla) bulla</i>
12	<i>Lecane (Monostyla) Lunaris lunaris</i>
13	<i>Lecane hastate</i>
14	<i>Lecane quadridentata</i>
15	<i>Lecane obtusa</i>
16	<i>Lecane bidentata</i>
17	<i>Hydatina senta</i>
18	<i>Notops sp.</i>
19	<i>Chetonotus sp.</i>
20	<i>Colurus caudatus</i>
21	<i>Colurus rotandus</i>
22	<i>Colurus dicentrus</i>
23	<i>Rattulus sp</i>
24	<i>Rattulus longiseta</i>
25	<i>Collotheca ambigua</i>
26	<i>Collotheca pelagic</i>
27	<i>Filinia longiseta</i>
28	<i>Filinia termanilis</i>
29	<i>Mytilina ventralis</i>
30	<i>Philodina flaviceps</i>
31	<i>Philodina rosealla</i>
32	<i>Roteria neptunia</i>
33	<i>Roteria rotaria</i>
34	<i>Trichocerca cylindrical</i>
35	<i>Trichocerca tetractis</i>
36	<i>Gastropus minor</i>
37	<i>Gastropus stylifer</i>

Rotifers play vital role in interlinking the aquatic food chain, nutrient recycling and considered as a bioindicators of the habitats, Sharma (1996) and Segers (2008). They also serve as valuable indicators of water quality (Sladeczek, 1983; Yeole *et al.*, 2008).

Karuthapandi *et al.*, (2013) reported 114 species of fresh water rotifers of Andhra Pradesh with valid nomenclature. According to him family *Lecanidae* and family *Brachionidae* have occupied high species richness. They reported 24 species of *Brachionus* and 26 species of *Lecane*. Our results are in agreement with the findings of these workers.

The notable feature of higher species diversity with relatively lower numbers of a large number of species noticed in the present study may be ascribed to fine niche portioning amongst rotifer species in combination with high micro and macro-scale habitat heterogeneity especially in littoral environments as

### **Research Article**

suggested by Segers (2008). Specific observations are however desired to support this hypothesis. The generalizations on higher evenness and lower dominance concur with the results of Sharma and Sharma (2005) and Sharma and Sharma (2011) and appear to be salient features of the rotifer communities of the lentic ecosystem of North India.

Sitre and Zade (2012) identified 17 rotifer species belonging to 12 genera during the year span. The *Brachionus* was represented by 4 different species. Our results are well in agreement with above findings. Similar trend was also recorded in Rishi lake of Maharashtra (Kedar and Patil 2002) and Dal lake of Kashmir (Jeelani et al. 2005).

Vanjare and Pai (2010) recorded 13 species of rotifer including 5 new records to the Maharashtra state. Among the recorded species of rotifer, *Ptygura pedunculata* (Edmondson, 1939) is reported first time in India and the Oriental region.

Many authors have noted that *Lecane*, *Brachionus* are often present in large no of tropical aquatic body, community ponds and lakes also (Segers, 2001; Medina-Junior, 2000 and Hamaidi-Chegui et al. 2013). These same types were also collected in the present study. Occurrence of *Keratella* with *Brachionus* is indicative of nutrient rich status of the water body (Berzins, 1979). *Brachionus* formed the dominant and diversified genus among the rotifers throughout the study period from the Dahaura and Guthiya ponds of Bahraich district. Sunkad (2004) and Pawar and Pulley (2005) also observed the dominance of *Brachionus* in the Rakaskappa reservoir of Belgaum, North Karnataka and Pethwadaj Dam of Nanded District in Maharashtra state.

From the present study it is suggested that diversified rotifer fauna of Dahaura pond and Guthiya pond of Bahraich district can be linked with favourable conditions and availability of abundant food in the form of bacteria, nanoplankton, macrophytoplankton, animal waste and suspended detritus in the lake water.

Dahaura and Guthiya ponds are nutrient rich and contain diversified rotifer fauna. The above results are an effort of arbitrary and limited sampling for a short period. Detailed work in the future will ensure to yield new insight into the actual status of rotifer fauna in India.

### **REFERENCES**

- Almeida VLS, Dantas ÊW, Melo-Júnior M, Bittencourt-Oliveira MC and Moura AN (2009).** Zooplanktonic community of six reservoirs in northeast Brazil. *Brazilian Journal of Biology* **69**(1) 57-65.
- Anitha PS, George RM and George JP (2006).** Brachionid rotifers of Kerala-A manual for identification 106.
- Berzins SL (1979).** Specific status of *Keratella cochlearis* (Gosse) and *K. ahastrar* (Rotifer: Brachionidae): Ecological considerations. *Canadian Journal of Zoology* **7**(9) 1719-1722.
- Borges MG and Pedrozo CS (2009).** Zooplankton (Cladocera, Copepoda and Rotifera) richness, diversity and abundance variations in the Jacuí Delta, RS, Brazil, in response to the fluviometric level. *Acta Limnologica Brasiliensia* **21**(1) 101-110
- Chergui-Hamaidi F, Hamaidi MS, Errahman MB and Benouaklil F (2013).** Studies on biodiversity of rotifera in five artificial lake in Algeria: Systematical and Zoogeographical remarks. *Kragujevac Journal of Science* **35** 115-138.
- Dodson S (1992).** Predicting crustacean zooplankton species richness. *Limnology and Oceanography* **37**(4) 848-856.
- Edmondson WT (1939).** New species of Rotatoria, with notes on heterogonic growth transactions of the American Microscopical Society **58** 459-472.
- Francis T, Ramanathan N, Athithan S, Rosalind P, Daisy R and Padmavathy P (2003).** Rotifer diversity of fish ponds manured with live-stock waste. *Indian Journal of Fisheries* **50**(2) 203-209.
- Havel JE and Shurin JB (2004).** Mechanisms effects and seals of dispersal in fresh water zooplankton. *Limnology and Oceanography* **49** (4) 1229-1238.
- Israi S, Ramfos A, Somrakis S, Koutsikopoulos C, Kallianiotis A and Fragopoulou N (2006).** Mesozooplankton distribution in relation to hydrology of Northeastern Aegean Sea, Eastern Mediterranean. *Journal of Plankton Research* **28**(3) 241-255.

### **Research Article**

- Jeelani M, Kaur H and Sarwar SG (2005).** Population dynamics of rotifers in the Anchar lake Kashmir (India). In: *Ecology of Plankton*, edited by Arvind Kumar (Daya Publishing House, Delhi) 55-60.
- Karuthapandi M, Rao DV and Innocent X (2013).** Fresh water rotifers of Andhra Pradesh-Checklist. *International Journal for Life Sciences and Educational Research* **1**(1) 1-13.
- Kedar GT and Patil GP (2002).** Studies on the biodiversity and physico-chemical status of Rishi lake, Karanja (Lad) M.S. Ph.D. Thesis Amravati University, Amravati.
- Koste W and Shiel RJ (1990).** Rotifera from Australian inland waters. V. Lecanidae (Rotifera: Monogononta). *Transactions of the Royal Society of South Australia* **114** 1-36.
- Kumar SR and Senraj M (2013).** Diversity of rotifers of Rajapalayam Taluk, Virudhunagar District, Tamil Nadu India. *IOSR- Journal of Environmental Science, Toxicology and Food Technology* **3**(2) 52-5.
- Lansac-Tôha FA, Bonecker CC, Velho LFM., Simões NR, Dias JD, Alves GM. and Takahashi EM (2009).** Biodiversity of zooplankton communities in the Upper Paraná River floodplain: Interannual variation from long-term studies. *Brazilian Journal of Biology* **69**(2) 539-549.
- Lucinda I, Moreno IH, Melao MGG and Mastsumura-Tundisi T (2004).** Rotifers in freshwater habitats in the upper Tiete river basin, Sao Paulo State, Brazil. *Acta Limnologica Brasiliensia* **16**(3) 203-24.
- Martínez JC, Canesin A. and Bonecker CC (2000).** Species composition of rotifers in different habitats of an artificial lake, Mato Grosso do Sul State, Brazil. *Acta Scientiarum* **22**(2) 343-346.
- Medina-Junior PB (2000).** Structure and diversity of the zooplankton community in natural lakes of the Pantanal of Nhecolândia-MS. Masters Thesis, School of Engineering at Sao Carlos University of Sao Paulo, Sao Carlos 122.
- Pawar SK and Pulley JS (2005).** Qualitative and Quantitative analysis of Zooplankton in Pethwad Dam Nanded District (Maharashtra). *Journal of Aquatic Biology* **20**(2) 53-57.
- Pontin RM (1978).** *A Key to the Freshwater Planktonic and Semiplanktonic Rotifera of British Isles* (Fresh Water Biological Association, Scientific Publication, New York).
- Segers H (2001).** *Zoogeography of the Southeast Asian Rotifera*. 446/447 233-246.
- Segers H (2008).** Global diversity of rotifers (Rotifera) in freshwater. *Hydrobiologia* **595** 49-59.
- Segers H and Babu S (1999).** Rotifera from a high-altitude lake in Southern India, with a note on the taxonomy of *Polyarthra* Ehrenberg, 1834. *Hydrobiologia* **405** 89-93.
- Segers H (1995a).** Rotifera 2 The Lecanidae (Monogononta). In: *Guides to the Identification of the Continental Waters of the World 6* edited by Dumont HJ and Nogrady T (SPB Academic, The Hague) 226.
- Sendacz S, Caleffi S and Santos-Soares J (2006).** Zooplankton biomass of reservoirs in different trophic conditions in the state of São Paulo, Brazil. *Brazilian Journal of Biology* **66** 337-350
- Sharma BK (1998).** In: *Faunal Diversity of India* edited by Alfred JRB, Das AK and Sanyal AK (Zoological survey of India, Environmental Centre) 57-70.
- Sharma BK and Sharma S (2001).** Biodiversity of Rotifera in some tropical floodplain lakes of the Brahmaputra River basin, Assam (N.E. India). *Hydrobiologia* **446/447** 305-313.
- Sharma BK and Sharma S (2011).** Deeper Beel revisited: new records of rotifers (Rotifera: Eurotatoria) with remarks on interesting species. *Journal of Threatened Taxa* **3**(1) 1437-1444.
- Sharma BK (1996).** Biodiversity of fresh water Rotifer in India. A status of report. *Proceedings of the Zoological Society* **49**(2) 73-85.
- Sharma BK and Sharma S (2005).** Biodiversity of fresh water rotifers (Rotifera, Eurotatoria) from North-Eastern India. *Mitt. Mus. Nat. Kd. Berl. Zool. Reihe*. **81** 81-88.
- Sitre SR and Zade SB (2012).** Studies on Biodiversity of rotifers in a fresh water lake of Nagpur city (M.S.) India during different seasons of the year. *International Journal of Innovations in Bio-Sciences* **2**(3) 109-111.
- Sladeczek V (1983).** Rotifers as indicators of water quality. *Hydrobiologia* **100** 169-171.
- Sunkad BN (2004).** Diversity of Zooplankton in Rakaakoppa Reservoir. *Indian Journal of Environment and Ecoplanning* **8**(2) 399-404.

**Research Article**

**Tayade SM and Dabhade DS (2011).** Checklist of rotifers in Washim District of Maharashtra, India. *International Journal of Innovations in Bio-Sciences* **1** 27-31.

**Vanjare AI and Pai K (2010).** Rotifer from a pond in Pune (India) with the record of *Ptygura pedunculata* (Edmondson, 1939) (Rotifera: Monogononta) from the Oriental region. *Turkish Journal of Zoology* **34** 417-419.

**Vanjare AI (2008).** Taxonomy and Ecology of fresh water Rotifers from Pune, Maharashtra, M.Phil Dissertation, University of Pune, Pune, India 76.

**Wallace RL and Snell TW (2010).** Rotifera. In: *Ecology and Classification Fresh Water Invertebrates* edited by Thorp JH and Covich AP (Elsevier, Oxford) 173-235.

**Wallace RL, Snell TW, Ricci C and Nogrady T (2006).** Rotifera: Biology, Ecology and Systematics. In: *Guides to the Identification of the Microinvertebrates of the Continental Waters of the World* edited by Segers H and Dumont HJ (23 Kenobi Productions, Ghent, Backhugs Publishers, Leiden). 299.

**Yeole SM, Patil GP and Kedar GT (2008).** Rotifer biodiversity of Yedshi Lake, Maharashtra *Proceedings of Taal 2007: The World Lake Conference* 477-479.