

Assessment Of Biodiversity Of Rotifers In Ambazari Lake Of Nagpur City With Respect To Water Quality

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Abstract

Rotifers are the connecting link organisms between primary producers and consumers in aquatic ecosystems. Rotifers are residing in inland water bodies and their diversity refers to varieties of species within their community.

Ambazari lake of Nagpur city is a beautiful perennial natural lake having a large water spread area. In order to know the biodiversity of rotifers in this perennial lake of Nagpur city studies were undertaken on monthly basis and qualitative as well as quantitative analysis of rotifers was done for year's span.

During the study period total 15 rotifer species belonging to 11 genera were found in lake water. The *Brachionus* was represented by 4 different species. The seasonal rotifer biodiversity showed peak in density and diversity during summer season, while lower values were recorded in rainy season. Thirteen species were recorded in winter, 14 species in summer while lowest 08 species were recorded in monsoon months. The lake was slowly enriching as man-made activities are burdening this beautiful lake through activities like bathing, throwing the garbage, and religious offerings throughout the year in the lake and its catchment. If suitable measures are not adopted this lake will be degraded through anthropogenic activities and its water quality will deteriorate further making it unfit for human utilization.

KEYWORDS: Ambazari Lake, Biodiversity, Rotifers, Water quality.

INTRODUCTION

Rotifers occur almost everywhere in aquatic ecosystems and constitute an important group of zooplankton community in aquatic ecosystems of the world. The abundance of rotifers is more or less governed by the interaction of number of physical, chemical and biological properties of lake waters and is related to the suitable conditions for their survival in the lake.

The zooplanktons are important organisms in aquatic ecosystems for their role in the tropho-dynamics and in energy transfer in an aquatic ecosystem. They provide food to fishes in freshwater ponds and lakes and play a major role in fish production. The occurrence and abundance of zooplankton depends on its productivity which in turn is

influenced by abiotic factors of nature and the level of nutrients in the lake water. The freshwater zooplankton form an important group as most of them feed upon and incorporate the primary producers into their bodies and make themselves available to higher organisms in food chain. With the global loss of thousands of species as a result of over population and habitat disturbance, assessment of species diversity and richness are needed (May, 1986).

Keeping this in mind the present investigation an qualitative as well as quantitative assessment of rotifers has been undertaken from the Ambazari lake of western Nagpur in 3 different seasons i.e. summer, winter and monsoon.

MATERIALS AND METHODS

Water samples from 3 different sampling sites of Ambazari lake viz. east, south and north were collected on monthly basis for a period of one year i.e. from October 2007 to September 2008 for qualitative and quantitative estimation of rotifer fauna. From each sampling spot 50 Liter of water was filtered through plankton net of bolting silk (mesh size 64 μm). Filtered water sample was preserved in 4% formalin. Concentrated sample was observed under binocular microscope for qualitative and quantitative estimation by using Sedgewick Rafter Cell Method (APHA, 1998). Rotifers were identified using standard literature like Edmondson (1959), Chandrashekhar and Kodarkar (1995) and other regional publications (Dhanpathi, 1974; Kodarkar, 1995, Dhanpathi, 2000). The physico-chemical parameters of lake water were analyzed using (APHA, 1998) to show its relation with density and diversity of rotifers.

OBSERVATIONS AND RESULTS

The water samples of Ambazari Lake were examined for a period of one year in order to analyze the physico-chemical parameters and density and diversity of rotifers. Table 1 shows the seasonal variations in physico-chemical parameters of Ambazari Lake during the study period. Parameters like water temperature, total dissolved solids, conductivity, pH, total alkalinity, chlorides, total hardness, sulphates, total phosphate and nitrates were maximum during summer season while dissolved oxygen showed its peak in winter season.

In the present study total 15 species of rotiera were recorded belonging to 11 diferent genera. The most diversified genera was *Brachionus*, represented by 4 species namely *Brachionus angularis*, *Brachionus forficula*, *Brachionus falcatus*, and *Brachionus calyciflorus*. The least dominant genera which were represented by a single species were *Filinia*, *Asplanchna*, *Keratella*, *Notommata* and *tedtudinella*. (Table2). Monthly population density of rotifer showed its peak during March 2008 while least density was recorded in July 2008 (Table 3)

Parameters like water temperature (25.05 $^{\circ}\text{C}$), total dissolved solids (760.50 mg/lit), Conductivity (188.20 mho/cm), pH (8.8), total alkalinity (158.0 mg/litre) Chlorides (60.20 mg/l), total hardness (92.00 mg/lit), Sulphate (0.27 mg/litre), total phosphorus (0.25 mg/litre) and nitrate (0.30 mg/litre) were maximum during summer while dissolved oxygen (8.5 mg/litre) showed its peak in winter season.

Rotifera was represented by 16 species during winter and summer while in monsoon *Filinia longiseta*, *Testudinella patina*, *Notomata* and *trichocerca tigris* were absent from the lake.

DISCUSSION

The year round rotifer biodiversity study of Ambazari lake of Nagpur city showed the peak in density and diversity during summer season indicating the influence of various physico-chemical factors which was supported by positive correlation between summer temperature, high PH, alkalinity nutrients and rotifer population. P^H and temperature are the main factors in the appearance and abundance of different rotifers (Banik and Datta, 1991). Rotifers are chiefly freshwater forms and presence of these organisms in abundance is related to suitable conditions for their survival (Dhanpathi, 2000). Kaushik and Saxena (1995) have also reported abundance of *Brachionus* in various water bodies of central India. An abundance of *Brachionus* in tropical region has been registered and various species of this genus dominate plankton community in warmer part of peninsular India (Fernando, 1980; Sharma, 1983). Occurrence of *Keratella* with *Brachionus* is indicative of nutrient rich status of the water body (Berzins and Pejler, 1987). In Ambazari lake maximum density of rotifers was noticed at pH range of 8.80 in summer season. According to Dhanpathi (2000) many species of rotifers are having preference for more alkaline water. The species like *Brachionus*, *Keratella*, *Mytilina* and *Platyias* build higher population during period when alkalinity is high. In the present investigation nutrients like sulphate, phosphate and nitrate were higher in summer due to decreased water level by evaporation and more organic load due to anthropogenic activities. Rotifers utilize nutrients more rapidly to build up their population (Saboor and Altaf, 1995). Our results are well in agreement with above findings.

Lower values of rotifer population density and diversity was observed during monsoon which could be due to dilution of water resulting in less nutrients or could be due to depletion of important factors such as transparency, dissolved oxygen or PH (Kumar, 2001). Similar trend was also recorded by Kedar and Patil (2002) in Rishi lake of Maharashtra, by Jeelani et al (2005) in Dal lake of Kashmir. According to Dhanpathi (2000) succession rhythm of rotifer population may be disturbed by seasonal flooding of the ponds in monsoon. The seasonal succession among the plankton plays an important role in depicting the trophic status of the aquatic habitat in relation to environmental factors.

Brachionus formed the dominant and diversified genus among the rotifers throughout the study period in ambazari lake of Nagpur city. Sunkad (2004) and Pawar and Pulley (2005) also observed the dominance of *Brachionus* in Rakaskoppa reservoir of Belgaum, North Karnataka and Pethwadaj dam of nanded District in Maharashtra state. The Diversified rotifer fauna of lake can be linked to favorable conditions and availability of abundant food in the form of bacteria, nanoplankton and suspended detritus in the lake water (Edmondson, 1965, Baker, 1979 and Dhanpathi, 2000). The zooplankton population is the result of complex variations in numerous factors the most important being quality and quantity of available food, temperature and chemical factors. Edmondson (1965) showed dependence of rotifer production rates on temperature and

food conditions. Increased concentration of nitrate and orthophosphate in summer season seem to be regulators of higher rotifer population.

CONCLUSION

The present studies indicate the bio diverse nature of rotifers of Ambazari lake waters during three different seasons in which physico-chemical and environmental factors play a crucial role in determining the diversity and density of rotifers.

REFERENCES

- APHA, (1998). *Standard Methods for Examination of Water and Wastewater*, 20th Edition, American Public Health Association, Washington, D.C.
- Banik, S. and N.C.Datta (1991). Ecology of Sessile rotifer on artificial substrate in a freshwater lake, Calcutta. *Environ and Ecol.*, 9(1): 29-32.
- Baker, R.L.(1979). Specific status of *Keratella cochlearis* (gosse) and *K.earlinare*, Ahlstrom (Rotifera: Brachionidae), Morphological and ecological consideration. *Can.J.Zool.*, 57(9): 1719-1722.
- Berzins, S.L.(1979). Specific status of *Keratella cochlearis* (Gosse) and *K.Ahlastrar* (rotifer: Brachionidae): Ecological Considerations, *Can.J.Zool.* Vol. 7(9): 1719-1722.
- Chandrashekhar S.V.A. and M.S.Kodarkar (1995). Studies on *Brachionus* from Saroornagar lake, Hyderabad. *J.Aqua.Biol.* 19(1): 48-52.
- Dumont H.J.(1983). Biogeography of rotifers, *Hydrobiologia.*, 104: 19-30.
- Dhanpathi, M.V.S.S.S. (1974). Rotifers from Andhra Pradesh Part : I, *Hydrobiol.* 45 (4): 357-72.
- Dhanpathi, M.V.S.S.S (2000) Taxonomic notes on the rotifers from India, IAAB, Hyderabad, 1-78.
- Edmondson, W.T.(1959). *Freshwater Biology*, John Wiley and Sons Inc. N.Y.
- Edmondson, W.T.(1965). Reproductive rate of plank tonic rotifers as related to food and temperature. *Ecol Manoir.*, 35: 61-111.
- Fernando, C.H. (1980). The freshwater zooplankton of Sri Lanka with a discussion of topical freshwater zooplankton composition. *Hydrobiologia*, Vol. 65: 85-129.
- Jeelani, M., H Kaur and S.G.Sarwar (2005). Population dynamics of rotifers in the Anchar lake Kashmir (India). In *Ecology of Plankton*, Arvind Kumar (Ed.) Daya Publishing House, Delhi, 55-60.
- Kaushik S. and D.N.Saxena (1995). Trophic status of rotifer fauna of certain water bodies in central India. *J.Environ.Biol.* Vol.16(4): 283-291.

Kedar, G.T. and G.P.Patil (2002) Studies on the biodiversity and physico-chemical status of Rishi lake Karanja (Lad) M.S., Ph.D.Thesis, Amravati University, Amravati.

Kodarkar, M.S.(1992). Methodology for water analysis, physico-chemical biological and micro-biological. Indian Association of Aquatic Biologists, Hydeabad, Publ. 2: pp.50.

Kaushik,S and D.N.Saksena (1995). Trophic status and rotifer fauna of certain water bodies in central India.*J. Environ. Biol.* 16(1&2): 285-291.

Kumar,K.S.(2001)Studies on freshwater copepods and cladocera of Dharmapuri Dist. Tamil Nadu. *J.Aqua.Biol.* 16 (1 &2): 5-10.

May, R.M. (1986). How many species are there? *Nature*, Vol. 324: 514 - 515.

Pawar S.K. and J.S.Pulley (2005). Qualitative and quantitative analysis of zooplankton in Pethwadj Dam Nanded District (Maharashtra). *J.Aqua.Biol.* Vol. 20(2): 53-57.

Saboor, A and K.Altaf (1995). Qualitative and quantitative analysis of zooplankton population of a tropical pond during summer and rainy season. *J.Ecobiol.* 7(4): 269-275.

Sharma, B.K.(1983). The Indian Species of the genus *Brachionus* (Eurotatoria, Monogonata, Brachionidae), *Hydrobiologia*, Vol.104: 31-39.

Sunkad, B.N.(2004). Diversity of zooplankton in rakaakoppa reservoir of Belgaum of North Karnataka,India.*J. Environ. & Ecoplan*, 8(2): 399-404.

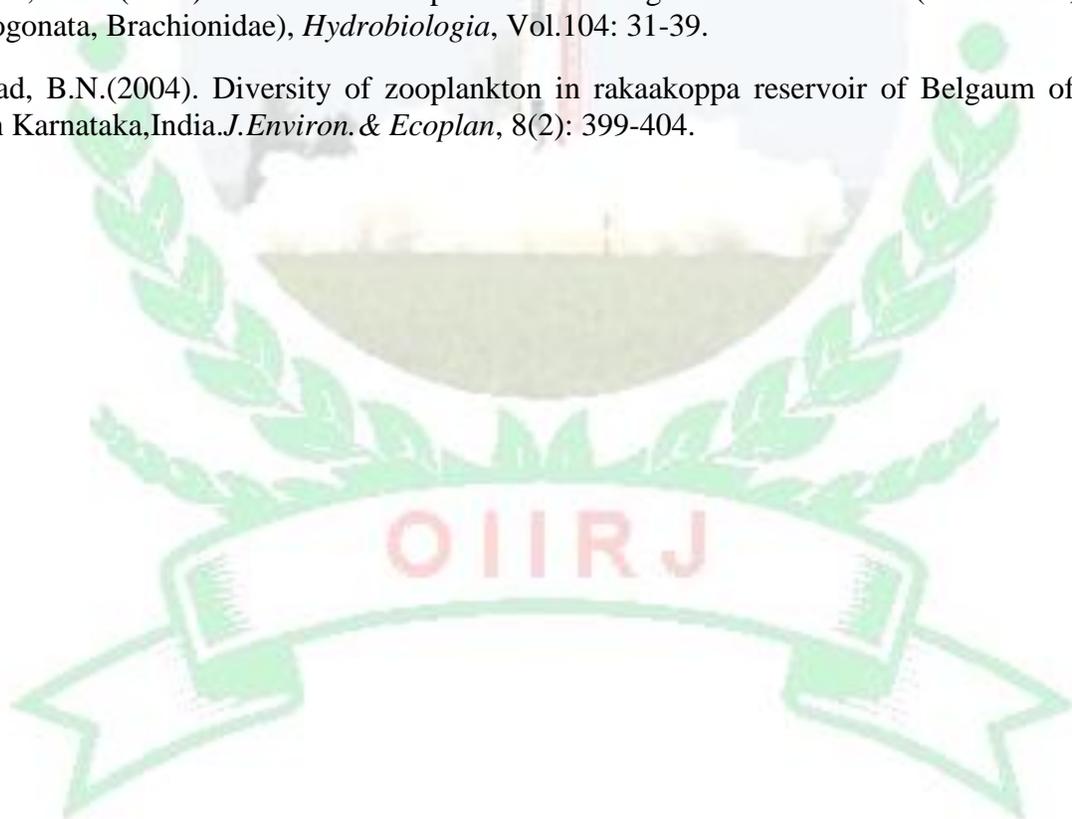


Table 1

Seasonal Variations of Water Quality Parameters* of Ambazari Lake during Three Seasons

| Sr. No. | Physico-chemical Parameters | Winter | Summer | Monsoon |
|---------|-----------------------------|---------------|---------------|--------------|
| 1 | Water Temperature °C | 19.9 ± 0.1 | 26.05 ± 0.1 | 22.8 ± 0.2 |
| 2. | Dissolved Oxygen | 8.5 ± 0.1 | 7.1 ± 0.12 | 6.4 ± 0.2 |
| 3 | pH | 8.20 ± 0.1 | 8.80 ± 0.16 | 7.45 ± 0.20 |
| 4 | Conductivity (ms/cm) | 118.00 ± 0.2 | 185.00 ± 0.29 | 110.00 ± 0.3 |
| 5 | Total Alkalinity | 125.00 ± 0.26 | 158.00 ± 0.32 | 87.00 ± 0.25 |
| 2 | TDS | 490 ± 0.3 | 760 ± 0.20 | 230 ± 0.28 |
| 7 | Chlorides | 51.6 ± 0.14 | 60.2 ± 0.19 | 38.00 ± 0.3 |
| 8 | Total Hardness | 85.00 ± 0.28 | 92.00 ± 0.25 | 65.00 ± 0.29 |
| 9 | Sulphate | 0.16 ± 0.003 | 0.21 ± 0.007 | 0.12 ± 0.11 |
| 10 | Total Phosphates | 0.17 ± 0.02 | 0.25 ± 0.02 | 0.14 ± 0.01 |
| 11 | Nitrate | 0.21 ± 0.03 | 0.50 ± 0.02 | 0.19 ± 0.03 |

* All the values are in mg/lit except temperature, pH and conductivity.

Table 2: Bio-Diversity of Rotifers in Ambazari Lake Waters

| Species Recorded | Winter Month | Summer Month | Monsoon Month |
|--------------------------------|--------------|--------------|---------------|
| <i>Tripleuchlanis plicata</i> | + | + | - |
| <i>Trichocerca tigris</i> | + | + | - |
| <i>Testudinella patina</i> | - | + | + |
| <i>Lepadella ovalis</i> | - | + | - |
| <i>Colurella adriatica</i> | + | - | + |
| <i>Filinia longiseta</i> | + | + | - |
| <i>Keratella tropica</i> | + | + | + |
| <i>Lecane luna</i> | + | + | + |
| <i>Monostyla bulla</i> | + | + | + |
| <i>Lepadella ovalis</i> | + | + | + |
| <i>Asplanchna sp.</i> | + | + | + |
| <i>Brachionus angularis</i> | + | + | - |
| <i>Brachionus falcatus</i> | + | + | - |
| <i>Brachionus calyciflorus</i> | + | + | + |
| <i>Brachionus forficula</i> | + | + | - |

+ = Present - = Absent

13

14

08

Table 3**Population Density of Rotifers in Ambazari Lake Waters**

| Sr. No. | Months | Density (No. /lit) |
|---------|----------------|-----------------------|
| 1 | October 2007 | 83.60 \pm 0.2 |
| 2 | November 2007 | 94.00 \pm 0.3 |
| 3 | December 2007 | 102.79 \pm 0.1 |
| 4. | January 2008 | 109.00 \pm 0.10 |
| 5 | February 2008 | 120.00 \pm 0.12 |
| 6 | March 2008 | 121.01 \pm 0.15 |
| 7 | April 2008 | 89.12 \pm 0.4 |
| 8 | May 2008 | 72.02 \pm 0.3 |
| 9 | June 2008 | 67.10 \pm 0.2 |
| 10 | July 2008 | 22.39 \pm 0.2 |
| 11 | August 2008 | 25.42 \pm 0.4 |
| 12 | September 2008 | 36.40 \pm 0.3 |

