



ISSN Print: 2394-7500
 ISSN Online: 2394-5869
 Impact Factor: 5.2
 IJAR 2016; 2(12): 99-102
 www.allresearchjournal.com
 Received: 18-10-2016
 Accepted: 19-11-2016

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Study of Rotifer Communities in Upper Morna Reservoir, Medshi, District- Washim, Maharashtra

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Abstract

The Upper Morna reservoir is located at Medshi, Malegaon Taluka in Washim district of Maharashtra. From this reservoir study of different zooplankton were taken, especially Rotifer were analyzed because of their abundance and dominance. During the study year 2012 and 2013 in which 18 species of Rotifer were recorded from 6 genera and 5 families in which 11 *Brachionus species*, 3 *Asplanchna species*, 2 *Filinia species* and 1 *Lecane*, 1 *esophora species* are recorded. Maximum number of rotifer obtained in winter than summer and monsoon season in which the *Brachionus sp.* and *Keratella sp.* are found dominant species.

Keywords: Rotifer, zooplankton, Medshi, upper Morna reservoir, Washim

1. Introduction

The Upper Morna reservoir is located in a small village called Medshi, until now the study on that reservoir is not done, which is use mainly for irrigation purpose, fishery purposes and some people use that reservoir for drinking and domestic use, therefore as the Rotifer is use as pollution indicator and indicating food chain therefore it is necessary to study them. The qualitative and quantitative study of rotifer analyzed the species diversity and abundance of rotifer in that reservoir. The Rotifers also called as Rotaria or wheel animalcules are the small Aschelminthes or separate phylum. Rotifer became familiar to biologist ever since the discovery of microscope. 1880 to 1930 are called as "Golden period of Rotifer studies" with maximum contribution to Rotifer taxonomy (Dhanapathi, 2000) [5]. They are characterized by presence of corona with transparent bodies and ciliated area or funnel shape structure at anterior end with mastax i.e. a specialized pharynx with its cuticular lining. It shows variety of forms with amazing alacrity in movements. Rotifer's found in waters of all kinds hence its show great abundance due to frequently occurrence with striking beauty of some species it make attraction. Out of recorded 18 species of rotifer Family brachionidae made dominance including 11species followed by family asplanchna (3), filinidae (2), lucanidae (1), notommatidae (1) species. Tayade and Dabhade (2015) [14] revealed 52 taxa (49species) belonging 14 families and 22genera are recorded in Ephemeral ponds in Washim region of Maharashtra, India. Sontakke and Mokashe (2014) [13] studied diversity of zooplankton from Dekhu Reservoir, Aurangabad, Maharashtra, in which they recorded 11 species of rotifer. Dede and Deshmukh (2015) [4] revealed 9 species of rotifer from the total 21 species of zooplankton in Bhima River in Ramvadi village, Solapur District, Maharashtra.

2. Materials and Method

2.1 Site description: The Upper Morna reservoir is located (18°36'44"N and 76°56'33.61"E) at Medshi, Malegaon Taluka in Washim district of Maharashtra. It is constructed on the Upper stretch of the Morna River, one of the minor river of Vidarbha region of Maharashtra and one of the tributary of the Purna River.

2.2 Qualitative analysis: Samples collected monthly from four different sites of reservoir during two yeas study 2012 and 2013 by towing Nylon plankton Net of mesh size 25u. This net used repeatedly operated to get concentrated samples. Large common organisms like aquatic insects, crustacean larva and tadpole larva were removed by forceps. Concentration of samples was done by using a bore cut wide syringe with fine mesh size netting fitted on

mouth. The water sieved inside the tube of syringe without piston is dipped in the inserting the piston in the tube of syringe is poured away so as to prepare a data searching was done for identification of new species. These concentrated samples were collected in sampling bottles indicating name of the sampling site i.e. S1, S2, S3, S4 date and time of sampling.

2.3 Quantitative analysis: From all sampling stations Zooplanktons sample were collected monthly by filtering 200 liters of water through the plankton mesh size 25 μ . These samples were collected in separate sampling bottles of 30ml capacity. This quantitative water samples bottle is also labeled indicating name site, date and time of sampling. Estimation of zooplankton density was made by counting 1ml sub-sample of the well mixed standard sample in a Sedgwick Rafter counting chamber; the counts were converted to number of organism per liter of water. Analysis of zooplankton was done by two methods that was qualitative and quantitative estimation including different sub methods such as 'Sedgwick rafter cell' as per standard method APHA (1998) [1]. Rotifer were fixed in 4% formalin, Dabhade (2006) [2], to preserve illoricate form of samples were fixed by adding equal volume of hot water followed by 4% formalin. Few drops of glycerin added for better preservation and prevent evaporation of samples; few drops of detergents were added to prevent clumping of zooplankton Damodare (2004) [3].

2.4 Sedgwick- Rafter Cell Method: Sedgwick –Rafter cell slide is having cavity of 1cc or 1ml capacity with dimension of 50mm x 20 x10 mm. exactly 1ml of sample was taken on the slide; a special cover slip (supplied with Cell) was kept on the cavity (cell). If the sample is too concentrated, plankton sample was suitably diluted to avoid inaccurate results. All zooplankton present in the cavity i.e. 1ml sample, were then counted from one corner of the counting cell. The rafter was moved horizontally along the first row of squares and the organism in each square of row was thus counted, the next consecutive row was adjusted using the mechanical device on stage. The procedure was repeated by taking another 1ml sample and till about 10 replicates were counted (Trivedi *et al.*, 1987) [16]. In this way, total number rotifers present in sample were counted by using the formula,

$$N = n \times v / V$$

Where, N = Total number of planktons, n = Average number of plankton in 1ml of sample, v = Volume of plankton concentrate, V = Volume of total water filtered (ml).

To calculate species diversity following methods were used,

Shannon- Weiner diversity Index calculated as,

$$H = \sum \left(\frac{n_i}{N} \right) \log \left(\frac{n_i}{N} \right) \text{ or } - \sum p_i \ln p_i$$

Where, n_i = importance value for each species

N = total of importance value, P_i = importance probability for each species

Evenness of species (E): $e = H / \log_e S$

Where, H = Shannon- Weaver Index, S = Number of species

$$\text{Richness of species (R): } R = \frac{S}{\sqrt{N}}$$

Where, S = Number of species, N = Number of individuals

Identification of zooplankton species was carried out by

standard literature of Edmonson (1959) [6], Dhanpati (2000) [5]

3. Result and Discussion

In rotifer total 6 genera and 5 families were recorded including 18 species. In which 11 *Brachionus species*, 3 *Asplanchna species*, 2 *Filinia species* and 1 *Lecane*, 1 *esophora species* are recorded. These species found mostly in Upper Morna reservoir are *Brachionus caudatus*, *Brachionus diversicornis*, *Brachionus durga*, *Brachionus falcatus*, *Brachionus plicatilis*, *Brachionus calyciflorus*, *Brachionus calyciflorus f. amphiceros*, *Brachionus calyciflorus var hymani*, *Brachionus calyciflorus f. borgerti*, *Brachionus forficula f. typicus-urawensis*, *Keratella tropica*, *Asplanchna sp.*, *Asplanchna sieboldi*, *Asplanchna brightwelli*, *Filinia opoliensis*, *contracted*, *Filinia longiseta*, *contracted*. *Lecane (M) cornuta*, *Esophora najas*.

Maximum number of rotifer found in the month of Octobers and January in both the years 2012 and 2013 and minimum in May 2012, August 2013. Rotifera species were recorded more in winter season than monsoon and summer.

In rotifers species *Keratella sp.* and *Brachionus sp.* were found dominant similar result obtained by Kedar *et al.*, (2008) [9] in Rishi Lake, Karanja. In various water bodies of Central India Kaushik and Sexena (1995) [10] have also reported genus *Brachionus* in abundance. According to Goel and Charan (1991) [8] *Keratella tropica* and *Brachionus Calyciflorus* are the pollution tolerant species and indicate accumulation of organic matter and these species reported dominant in polluted fresh water Lake of Kolhapur. Rotifers are chiefly fresh water forms and presence of rotifer in abundance is indicating suitable condition for their survival (Dhanapati, 2000) [5]. Rotifer population found high in winter that attributed with the favorable temperature and availability of abundant food in the form of bacteria, detritus and nanoplankton this observation supported by Edmonson (1965) [7].

3.1 Species Diversity

To measure the dominancy, to measure the status of water quality we must know the species diversity indices such as Shannon-Weiner diversity index, species evenness and richness in any water body.

3.2 Shannon Weiner Diversity index (H'): In the first year of study period Shannon Weiner diversity index of rotifer ranged from 1.3229 to 1.4707 and in the second year it recorded 1.234 to 1.4679. The highest diversity was recorded in the month of January 2012 and lowest in April 2013. Shown in Graph plate I (fig no 1 and 2). For the seasonal fluctuations of zooplankton Shannon-Weiner diversity index (H') is used as important component (Sibel 2006) [11].

3.3 The rotifer diversity index evenness (e): It ranged from 0.8064 to 0.9465 during the first year of study period and 0.8189 to 0.9213 in second year of study period i.e. 2013. The highest evenness observed in the month of May 2012 and lowest in October 2012, shown in Graph plate II (fig no 3 and 4). Manikam *et al.*, (2014) [12] recoded similar findings in evenness in rotifer that was maximum in May and minimum in winter season.

3.4 Richness: Richness of rotifer ranged from 2.4148 to 4.8990 during the first year of study period and 2.0738 to 4.8711 in second year 2013. The highest diversity recorded in October 2012, lowest diversity recoded in the month of April, Richness of rotifer in the year 2012-2013 was shown in Graph plate III (fig no. 5 and 6). Thirupathaiiah *et al.*,

(2012) [15] recorded nearly similar results, that they recorded highest rotifer richness in October. Seasonal variation in Rotifer diversity in year 2012 and 2013 are shown also in Table no.1.

4. Conclusion

Abundance of Rotifer was found more in winter than summer and monsoon season in which the *Brachionus sp*

and *Keratella sp.* are dominant species found in upper Morna reservoir which is important bioindicator to analyze quality of water and maintaining food chain in reservoir, hence qualitative and quantitative analysis of rotifer is most important in zooplankton species during seasonal fluctuations

Table 1: Seasonal variation in Rotifer diversity showing Shannon Weiner diversity index (H'), evenness (E) and Richness (R) with mean and standard deviation of the year 2012 and 2013.

Rotifer	2012			2013		
	H	E	R	H	E	R
Summer	1.391±0.0635	0.912±0.033	3.123±0.836	1.374±0.105	0.894±0.021	3.130±0.938
Winter	1.452±0.0203	0.845±0.0271	4.244±0.472	1.462±0.003	0.8433±0.026	4.421±0.449
Monsoon	1.448±0.0244	0.0858±0.029	4.232±0.193	1.462±0.0073	0.8834±0.028	4.157±0.3165

Graph Plate I

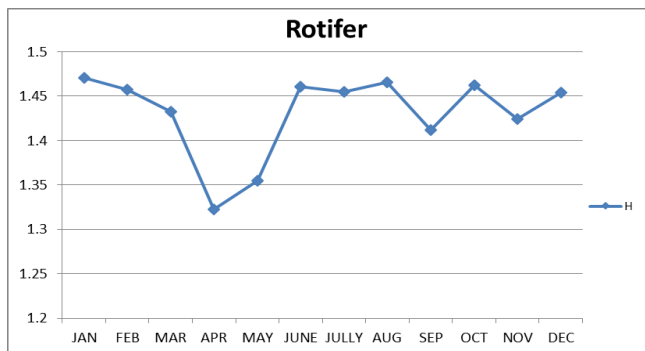


Fig 1: Monthly Variation in Shannon-Weiner Diversity Index (H') of Rotifer in 2012

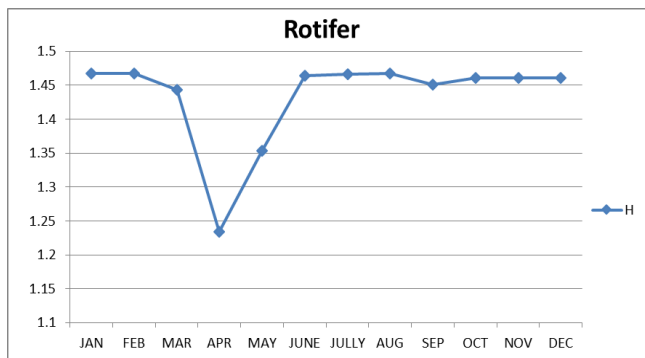


Fig 2: Monthly Variation in Shannon-Weiner Diversity Index (H') of Rotifer in 2013

Graph Plate II

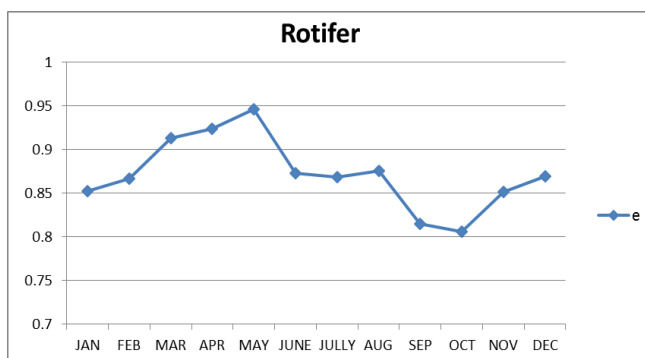


Fig 3: Monthly Variation in Evenness (e) of Rotifer in 2012

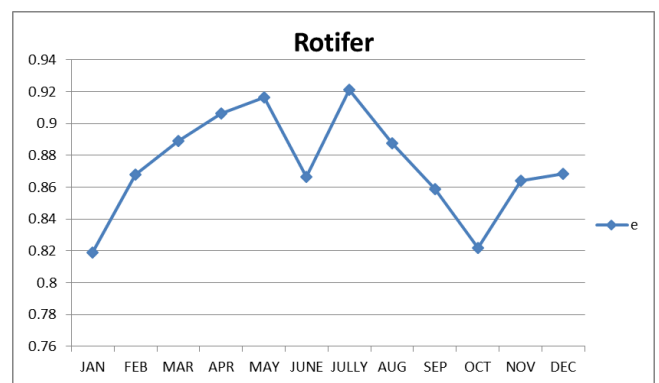


Fig 4: Monthly Variation in Evenness (e) of Rotifer in 2013

Graph Plate III

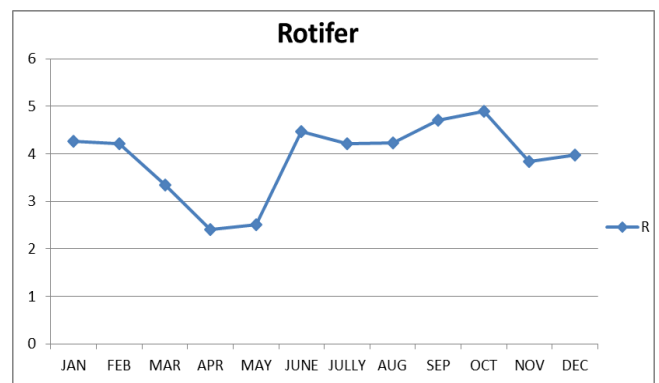


Fig 5: Monthly Variation in Richness (R) of Rotifer in year 2012.

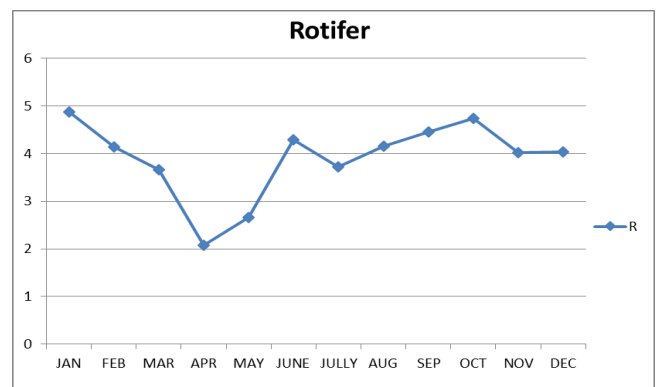


Fig 6: Monthly Variation in Richness (R) of Rotifer in year 2013

5. Acknowledgment: I express my sincere thanks towards Dr. M.M. Sancheti Principal, R. A. Mahavidyalaya, Washim as he gives all necessary facilities and sophisticated equipments in the Research Laboratory of Zoology department of our college. I also thankful to my guide Dr. D.S. Dabhade sir for his proper guidance and dedicated advice on limnological matter.

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