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QUANTITATIVE ANALYSIS OF ZOOPLANKTONS OF FRESH WATER ECOSYSTEM IN WASHIM TOWN, **MAHARASHATRA, INDIA**



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ABSTRACT

ooplanktons are the grazers on the phytoplankton and a food base for the carnivorous as well as omnivorous fishes. Zooplankton diversity reflects the quality of water also they are good indicators of the changes in water quality because they are strongly affected by environmental conditions and respond quickly to changes in water quality. Hence quantitative studies of zooplankton are of great importance. In the present research work, quantitative studies of zooplanktons in Washim town were carried out to provide quantitative information on the monthly variations of

zooplankton of the pond in the Washim town. In the present study 29 species of zooplanktons were recorded of which, 9 species belongs to rotifera, 9 species belongs to cladocera, 10 species belongs to copepoda and 1 species of ostracoda. The values of number of zooplankton species indicating the pattern of biodiversity have exhibited a different dominating trend of its major subgroups as rotifera>cladocera>copepoda>Ostracoda.

KEYWORDS: Washim, Zooplanktons, fresh water, ecosystem.

INTRODUCTION

Aquatic ecosystem is the most diverse ecosystem in the world. The first life originated in the water and first organisms were also aquatic where water was the principal external as well as internal medium for organism. Water is an essential component for survival of life on earth which important for humans as well as an aquatic life. Fresh water are used for domestic and irrigation purposes, and provide ecosystem for aquatic life especially fish thereby functioning as a source of essential significant elements of the world's biological diversity. The quality of surface water largely affected by natural processes as well as anthropogenic inputs. The anthropogenic discharges represent a constant polluting source. The fate and transport of many anthropogenic pollutants are determined by not only hydrological cycles but also physiochemical and characteristics of water which have been the subject of several investigations. Pollution is considered as it affect plankton community and by day at the faster rate of deterioration.

Quantitative study of zooplankton was carried out by many researchers worldwide. Bhat et al (2014), Chatterjee et al (2014), Koli and Muley (2012), Kulkarni and Surwase (2013), Patole (2015), Pradhan (2014), Sehgal et al (2013), Watkar and Barbate (2013) studied zooplanktons quantitatively to a large extent from Indian continent. The importance of the Zooplankton is well recognized as these have vital part in food chain and play a key role in cycling of organic matter in an aquatic ecosystem Sharma et al (2010). These organisms have been little studied in aquatic ecosystems of Washim Maharashtra region. Therefore, their potential value as indicators of alterations in the water quality of ponds and dams in these regions needs to be assessed. Also, there is an increasing demand by environmental monitoring programms for bioindicators of water quality. This study is an attempt to investigate the quantitative changes in the diversity of the zooplankton in this region.

MATERIAL AND METHODS:

For the present study, water sample was collected from four different sampling sites namely Deotalav, Padmatirtha talav, Ekburji dam and Aquarium pond from Washim town. For zooplankton collection water samples were collected in early morning hours from all the sampling stations by towing the plankton collecting net of mesh size 25 µ and preserved in 4% formalin; 2-3 drops of glycerin added to it. A pinch of detergent powder was also added to avoid the aggregation of zooplankton. Samples were collected in separate glass phials with label containing name of site, date of sampling, time of sampling etc. The preserved zooplankton samples were kept stored at low temperature, below 20°C until analysis. Identification of the zooplankton in the respective samples was done separately with the help of the available standard reference materials Shiel (1945). For the enumeration of zooplanktons, Coslab Inverted Microscope and Compound microscope were used. The quantitative analysis of zooplankton was carried out by using Sedgwick-Rafter cell. The species belonging to each group were noted down and number of individuals in each species was counted. Species diversity of zooplankton of Washim town was determined by Shannon Weaver index Shannon C.E. and Weaver (1949) (H) which reads as follows.

Shannon Index (H) = $\sum pi \ln pi$

Where, i=1, Pi= Proportional importance of each species (n1/N), S=number of species.

RESULT AND DISCUSSION:

The zooplankton community in Washim town is comprised of rotifer, cladocera, copepoda and ostracoda. Total of 29 species of zooplankton were reported during the present study which belongs to four taxonomic groups that includes Rotifer (9), Cladocera (9), Copepoda (10) and Ostracoda (1). Total number of zooplankton recorded from the Deo talav was 39.05, Padmatirtha was 29.37, Ekburji dam was 36.22 and Aquarium pond 36.42. Rotifer species reported in the present work are also obtained in the similar work of Dede and Deshmukh (2015), Gayathri et al., (2014) that includes Brachinous calcyflorus, Keratella tropica, Asplanchna brightwelli, Brachizonus plicatilis, Filinia longiseta,

Brachionus falcutus, Lecane leontina, Brachionus durgae, Asplancha sieboldi. Nine species of cladocera were reported during the present study that includes Daphnia scolder, Chydorus herrmanni, Allona affinis, Moina micrura, Dunhevedia crassa, Chydorus ovalis, Bosmina fatalis, Alona quadrangularis, Diaphanosoma brachyuram. Similar findings were also reported by Sharma (2013).

The present work also reported ten species of copepoda including Mesocyclops leuckarti, Copepode cyclopes, Calanus copepode, Macrocyclopes albidus, Diaptomus, Microcyclops varicans, Tropocyclops prassinus Mexicanus, Tropocyclops spec., Orthocyclops modestus, Eucyclops prionophorus and one species of ostracoda i.e. Paracondona euplectella. Gayathri et al., (2014) and Manoharan et al., (2015) also reported the same from freshwater ecosystem.

Monthly mean values of zooplankton species of Washim town at four different sampling sites are given in table No.1. The results of present study shows that group of Rotifer are reported highest in September, Cladocera in December, Copepoda in December and Ostracoda in November at all sampling station.

The present study concluded Rotifera as the dominant group. Many researchers reported rotifer as dominant species that includes Verma et al (2013), Paulose and Maheshwari (2008), Kapoor (2015), Kozuharov et al (2013), Sharma and Tiwari (2011), Balai et al (2013), Annalakshmi and Amsath (2011) and the order of dominance is as Rotifera>Cladocera>Copepoda>Ostracoda, similar result was found Sharma et al (2010), Kulkarni and Surwase (2013). Mean values of Species diversity of zooplanktons, Eveness and Richness of zooplankton at different experimental sites of Washim town is given in table No.1 also shown in graphical presentation.

Series/Sites	Deotalav	Padmatirthatalav	Ekburji dam	Aquarium pond	Mean
					&Std.deviation
Total no. of	0.0608 ± 0.0068	0.0415±0.0076	0.04±0.0097	0.0486±0.0089	0.0477±0.0012
Roti fers					
Total no. of	0.0518±0.0067	0.0494±0.0051	0.056±0.0078	0.0397±0.0097	0.0492±0.0019
Cladocera					
Total no. of	0.0431±0.0056	0.0265±0.0072	0.0481±0.0077	0.0572±0.0084	0.0437±0.0011
Copepoda					
Total no. of	0.0005 ± 0.0004	0.0002±0.0003	0.0008±0.0006	0.0003±0.0005	0.0004±0.0001
Ostracoda					
Diversity	2.9561±0.0553	2.8250±0.0730	3.0497±0.2601	2.9665±0.0822	2.9493±0.0956
Eveness of	0.5419±0.0159	0.5794±0.0192	0.6024±0.0299	0.5735±0.0272	0.5743±0.0065
Roti fer					
Eveness of	0.5618±0.0182	0.5547±0.0068	0.5541±0.0135	0.6041±0.0416	0.5686±0.0151
Cladocera					
Eveness of	0.5859±0.0151	0.6531±0.0393	0.5736±0.0136	0.5518±0.0198	0.5911±0.0118
Copepoda					

Table 1: Mean and Standard deviation values of four different sampling sites in Washim townfrom Aug.2015 to Jan.2016 :-

Eveness	of	0.7205±1.6111	0	0.9931±1.5854	0.6116±1.4981	0.5813±0.7839
Ostracoda						
Richness	of	6.2751±0.4402	4.9220±0.5288	4.2611±0.7600	5.1658±0.5575	5.156±0.1351
Rotifer						
Richness	of	4.8201±1.2407	5.8884±0.1562	5.9662±0.4653	4.2044±0.7386	5.2197±0.4599
Cladocera						
Richness	of	4.4488±0.4136	3.1243±0.6227	5.1148±0.4407	6.0975±0.4333	4.6963±0.0974
Copepoda						
Richness	of	0.0512±0.0467	0.0116±0.0285	0.0831±0.0596	0.0238±0.0582	0.0424±0.0143
Ostracoda						

Note: - Measurements in per liter of water samples.



Graph 1:Total number of zooplanktons (per litre)







Graph 3: Eveness of zooplankton (per litre)



Graph 4: Richness of zooplankton (per litre)

SUMMARY AND CONCLUSION:

The present study reported Rotifera as the dominant group and the order of dominance is as Rotifera>Cladocera>Copepoda>Ostracoda. The highest number of Rotifer was found at Deo talav and lowest at Ekburji dam. The highest number of Cladocera was found in Ekburji dam and lowest found at Aquarium pond. The highest number of Copepoda was found at Aquarium pond and lowest found at Padmatirtha talav. The highest number of Ostracoda was found at Ekburji dam and lowest number at Padmatirtha talav. The maximum and minimum Eveness of Rotifer, Cladocera, Copepoda and

Ostracoda was recorded from Ekburji dam, Aquarium pond, Padmatirtha talav and Ekburji dam respectively while Deo talav, Ekburji dam, Aquarium pond and Padmatirtha talav. The maximum and minimum Richness of Rotifer, Cladocera, Copepoda and Ostracoda was recorded from Deo talav, Ekbji dam, Aquarium pond and Ekburji dam respectively Ekburji dam, Aquarium pond, Padmatirtha talav and Padmatirtha talav.

In conclusion, it can be opinion that, Rotifera are observed the most dominant community throughout the study period while Rotifera and Cladocera exhibited high species richness and diversity indicate slightly increased pollution level. The study of zooplankton diversity indices i.e. Shannon Weaver indices clearly show high zooplankton diversity in the Ekburji dam followed by Aquarium pond, Deo talay and padmatirta talay indicates the fact that these water bodies is neither highly polluted nor highly non-polluted which means that it is least polluted and suggested for prevalence of proper biogeochemical cycles, where all it explores a great number of species varieties and enrich the trophic level. Consequently, the diversity indices create a signal about the good health of aquatic environment. Monthly changes in the plankton community structure of the dam were contrary to expectation; the diversity and abundance of plankton communities in the dam was influenced by the seasons (raining and dry). The monthly study of Shannon Weaver Diversty index exhibits medium i.e. light to moderate pollution. The present water body has exhibited a significant monthly changes and species biodiversity of zooplankton species with their maximum values. Zooplankton is the intermediate link between phytoplankton and fish, which are the secondary producers in the aquatic environment. Zooplanktons are good indicators of changes in water quality, because they are strongly affected by environmental conditions and responds quickly to change in environmental quality. Hence, quantitative study of zooplanktons is of great importance. The information contributed by this investigation will be highly significant and useful in order to create a general awareness in the people to prevent further water pollution and improve aquaculture and other uses of such valuable water sources in the near future.

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