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RESEARCH ARTICLE

DISTRIBUTION AND DIVERSITY OF ZOOPLANKTON IN RIVER NARMADA MADHYA PRADESH

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ABSTRACT

Zooplankton diversity is one of the most important ecological parameters in water quality assessment. Zooplankton is good indicator of the changes in water quality because they are strongly affected by environmental conditions and due to their short life cycle, these communities often respond quickly to environmental change and water quality. They occupy an intermediate link between phytoplankton and fish. Hence qualitative and quantitative studies of zooplanktons are of great importance. Zooplankton formed important quantitative component of net plankton of the four parts; Copepoda dominantly contributed to their abundance while Rotifera > Cladocera > Protozoan were sub-dominant groups. Samples were collected during January 2014 to December 2014 from three sampling sites of river Narmada. A total of 42 species were found in sampling stations. Among these, Copepods comprise of 14 species (33%), Rotifera of 12 species (29%), Cladocera of 9 species (21%) and 7 Protozoan species (17%). The study aims to conserve the zooplanktons which are declining day by day.

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INTRODUCTION

Rivers directly or indirectly have an enormous ecological, commercial and socio-economic importance. Majority of the water bodies in India are temporary, shallow or exhibit such large water level changes annually that a large proportion of the basin is exposed to drying. The river Narmada is the largest west-flowing river of the peninsula rises near Amarkantak, in the Shahdol district of Madhya Pradesh and flows through Mandla, Jabalpur, Narsinghpur, Hoshangabad, Raisen, Nimar, Dewas and Dhar District. The survival strategies of the zooplankton have been reported in a few studies and examined in some detail recently by Battish (1992), similarly seed banks and seasonal cycles of macrophytes were commented up on by Gopal (1998). Zooplankton communities have been investigated in numerous reservoirs, lakes, and shallow water bodies. The dominance of zooplankton in shallow water bodies by rotifers, cladocera or copepods varies according to the degree of organic pollution. In most of the studies, two or more peaks of zooplankton densities have been recorded which in is generally during the early winter season and the second peak is variable for different groups.

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Within rotifers and copepods different taxa obtain their peak population at different times, the year, thus keeping the zooplankton diversity relatively high throughout there year. Zooplanktons are microscopic free swimming heterogeneous assemblage of minute floating animal forms found in aquatic systems, are represented by wide array of taxonomic groups (Protozoa, Rotifera, Cladocera, Crustacea and Copepoda). These are most common and often dominate the entire consumer communities. They are endowed with many remarkable features and are often armored with pines, which hamper their predation by higher organisms.

The zooplankton which play a role of converting phytoplankton into food, suitable for fish and aquatic animals have acquired importance in fishery research. The zooplanktons can also play an important role in indicating the presence or absence of certain species of fishes on in determining the population densities. Zooplankton plays major role in the food web of an aquatic ecosystem and forms an intermediate link between primary and tertiary production. These metals may be passed on and concentrated at higher trophic levels through the food chain. Thus it is necessary to understand whether the mortality is due to biomagnifications of heavy metals or pollutants. The fishery potential is fully

related to the presence of zooplankton (Kesharwani *et al*., 2006). Nutrients mainly nitrogen and phosphorus act as bio-stimulants causing eutrophication or enhancement of the growth of zooplankton and phytoplankton. This can lead to luxuriant growth of unusual plankton blooms, that may or may not be toxic, but which on decay use up oxygen from the water which also cause deoxygenation. Phytoplankton's are representing the microscopic algal communities at primary level, whereas zooplankton at secondary level. They react quickly to limnological change of aquatic environment. They can be listed and used as pollution indicators (Telkhade *et al*., 2008). Uncontrolled domestic waste water discharge into the pond has resulted in the eutrophication of the pond as evidenced by substantial algal blooms, dissolved oxygen depletion in the subsurface waters, large fish kill and malodor generation. These conditions continued unabated and give rise to monoculture of water hyacinth (Eichhornia crassipes) which covered almost the entire pond area.

MATERIAL AND METHOD

Sampling Station

The study sites include towns or cities situated at the bank of river Narmada. Samples were collected from selected sites of river for one year from January 2014 to December 2014 to calculate diversity of Zooplankton in three sampling sites namely Jabalpur, Barman and Omkareshwar.

Jabalpur

Jabalpur is one of the important destinations of the country. It has some of the best places of the country. Jabalpur is located between 23°10'N latitude and 79°56'E longitude. This city is well industrialized and influenced by pollution.

Barman

Barman is situated at Mani Sagar, NH-26 on the bank of river Narmada in Narsinghpur district of M.P. It coordinates between 23°2'7" N Latitude and 79°1'36" E Longitude. Barman is surrounded by Bitliki Pahadi, one of the major hills in Narsinghpur district.

Omkareshwar

Omkareshwar is a famous place of pilgrimages, situated 77 km from Indore in Khandwa District. Madhya Pradesh shaped like the holy Hindu Symbol. 'OM', this sacred island, on theconflux of the river Narmada and Kaveri is visited by pilgrims from all over the country to seek blessing at the temple of Shri Omkar Mandhata. It's Latitude 22°15' 1" N and Longitude 76°8' 48" E

Sampling method

Collection and preservation of plankton was done at the study site while method of identification of plankton was applied in the laboratory. Samples were collected every month during morning hours between 9.00 and 11.00 a.m. The plankton samples were collected by following the guidelines of (Lind, 1979; Welch, 1953), Wetzel (1983), by filtering 20 Liters of water through plankton net having pore size 64 µm. The concentration plankton samples were fixed in 4% formalin and Lugal's solution for zooplankton and phytoplankton study respectively. Zooplanktons were identified with the help of keys' provided by Needham and Needham (1962), Tonapi (1962), APHA (2002). Data on diversity status of zooplankton species was expressed regionally as Jabalpur, Barman (Narsinghpur) and Omkareshwar.

RESULTS

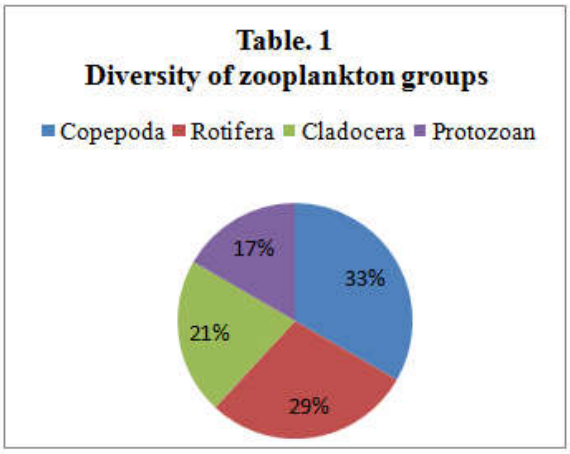
A total of 42 species were found in all three sampling stations. Among these, Copepods are dominating group comprise of 14 species (33%), Rotifera comprise of 12 species (29%), Cladocera of 9 species (21%) while Protozoan is least diverse group comprise of only 7 species (17%) (Table 1).

Table A: List of Zooplankton recorded during the study

S.No.	Name of Species	Jabalpur	Barman (Narsinghpur)	Omkareshwar
ROTIFERS				
1.	*Asplanchna brightwelli*	+	+	+
2.	*Brachionue angularis*	+	+	+
3.	*Branchinecta ferox*	+	+	+
4.	*Chromogaster ovalis*	+	-	-
5.	*Cyclops bicuspidatus*	+	+	+
6.	*Keratella cochlearis*	-	+	+
7.	*Mytilina mucronate*	-	+	-
8.	*Notholca acuninata*	+	-	+
9.	*Polyarthra vulgaris*	+	+	+
10.	*Synchacta pectinata*	-	-	+
11.	*Scaridium longicaudum*	+	+	+
12.	*Trichocerca similes*	+	+	+
CLADOCERA				
13.	*Alona sps*	+	+	+
14.	*Ceriodaphnia sps*	-	+	+
15.	*Daphnia lumholtizi*	-	-	+
16.	*Daphnia carinata*	+	+	+
17.	*Diaphanosoma sps.*	-	+	-
18.	*Leydigia sps*	-	+	+
19.	*Monia sps*	+	+	-
20.	*Nauplii larva*	-	+	+
21.	*Macrothrix*	+	+	+

Continue…….

	COPEPODA			
22	*Cyclops scutifer*	+	+	+
23	*Mesocyclops sps.*	+	+	+
24	*Macrocyclops sps.*	+	+	+
25	*Microcyclops sps.*	+	+	+
26	*Bosmia cornuta*	-	-	+
27	*Bosmia coregoni*	-	+	+
28	*Cypris sp.*	+	+	+
29	*Cyclops viridis*	+	+	+
30	*Gammarus pulex*	-	+	-
31	*Lathonura sp.*	-	+	-
32	*Macroblachium*	+	+	+
33	*Moinodaphnia sp.*	-	+	+
34	*Neodiaptomus*	+	+	+
35	*Pseudosida bidantata*	-	+	+
	PROTOZOA			
36	*Arcella vulagris*	+	+	+
37	*Amoeba proteus*	+	+	+
38	*Diffusia sps*	+	+	+
39	*Euglena viridis*	+	+	+
40	*Pramaecium cardatum*	+	+	+
41	*Vorticella nebulifera*	+	-	+
42	*Vorticella convallaria*	+	-	-



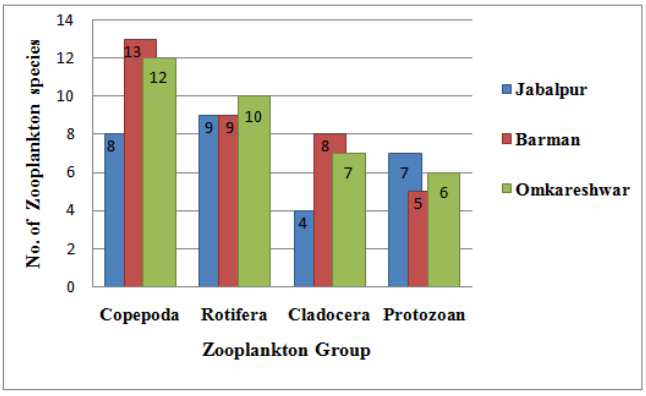


Figure 2. Regional Distribution and Diversity of Zooplankton Groups in three Study Sites

DISCUSSION

Zooplankton organisms occupy a central position in the food webs of aquatic ecosystem. They do not only form an integral part of the lentic community but also contribute significantly, the biological productivity of the fresh water ecosystem (Wetzel, 1983).

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. In Narmada River the total Zooplankton comprises of four groups Protozoa, Rotifera, Cladocera and Copepoda. These groups are represented in order of dominance as Copepod >Rotifera>Cladocera> Protozoa.

Copepoda

Copepoda was considered as the most dominating group in compiling species of all three sampling stations (33%). Copepoda was more abundant in Barman (13 species) as compared to Omkareshwar (12 species). The living copepods constitute an essential link in the aquatic food chain. Though they are not as important element in fish diet as the Cladoceran Species however they are in intermediate trophic level among bacteria, algae and protozoa on one hand and small and large plankton predators on the other.

Rotifera

The Rotifers are microscopic soft bodies' fresh water invertebrates. Their distribution and ecology have interesting evolutionary implications (Krishnamoorthy and Sakhivel, 2007). Rotifers have often been used to indicate trophic status of a water body. Rotifer showed second most diverse group having 12 species among zooplankton during study. Rotifer diversity was higher in Omkareshwar (10 species) than Jabalpur (9 species) and Barman (9 species). Mangeed (2008), Ahamed *et al*. (2011) and Mola (2011), mentioned that the high number of Brachionus species indicates eutrophication in water body and this genus has ability to tolerate pollution but its only one species was found in all three sampling stations that indicate less pollution in river Narmada.

Cladocera

Cladocera constitute of only 4 species of total 28 zooplankton species in Jabalpur region of river Narmada while highest in Barman (8 species) than Omkareshwar (7 species). The highest abundance of Cladocera in Barman might be attributed

to Macrophytes vegetation. This observation was coincided with Bozkurt and Guven, (2009) who stated that the abundance of Cladocera in the vegetation area was higher that unvegetated areas.

Protozoan

The highest diversity of Protozoan was found in Jabalpur region (7 species). Protozoan planktons are the smallest in size essentially form a link in food chain in an aquatic ecosystem. Present study recorded the protozoan population with the least percentage contribution among total zooplankton. Ghosh (1997), observed that Zooplankton community dynamics is also altered with environmental degradation and presence of higher density of copepod and harpacticoid indicates their tolerance of higher salinity of water. Pahwa and Mehrotra, (1966) reported rotifer population from river Ganga, where they constituted 61.5 to 94.4% of population.

Conclusion

The overall view in this study reveals that the fluctuation of zooplankton occurs distinctly in the study area due to variable Macrophytes and several other factors that was not under the study. It would also give a preliminary knowledge on the diversity and productivity of zooplankton and the reasons for the variation in river Narmada. This information can be utilized during the formulation of management measures to improve the productivity the reservoir. This is in turn, helps in planning exploitation, antipollution or conservation strategies.

REFERENCE

Ahmad, U., Parveen, S., Khan, A.A., Kabir, H.A., Mola, H.R.A. and Ganai, A.H. 2011. Zooplankton population in relation to physicochemical factors of sewage fed Pond of Aligarh (UP), India. *Biology and Medicine*, 3: 336-341.

APHA, 2002. Standard methods for Examination of water and waste water American public health Association 20th Ec. APHA, New York.

Battish, S. K. 1992. Freshwater Zooplankton of India. Oxford and IBH Publication Co. New Delhi.

Bozkury, A. and Guven, S.E. 2009. Zooplankton composition and distribution in vegetated and unvegetated area in three reservoirs in Hatay, Turkey. *J. Animal Veter. Advan*., 8: 984-994.

Ghosh, A. and George, J.P. 1992. "Studies on the biotic factors and zooplankton in a polluted urban reservoir Hussain Sagar, Hyderabad: Impact on water quality and embryonic development in fishes". *Indian Journal Environment Health,* 31: 49-59.

Gopal, B. and Zutschi, D.P. 1998. Fifty years of hydro biological research in India, Hydrobiologia, 384: 267-290.

Kesharwani, S., Mandloi, A.K. and Dube, K.K. 2006. Diversity of zooplankton in Amkhera pond of Jabalpur (M. P.)" India. *Natural Journal of Life Sciences*, 3: 359-364.

Krishnamoorthy, G., Rajalakshmi, S. and Sakthivel, D. 2007. Diversity of Zooplankton in mangrove Areas of Puducherry, India, *J. Aqua. Bio.,* 22(1): 45-48.

Lind, O.T. 1979. Handbook of common methods in limnology. The C.V. Mosby Co. 2nd Ed. St. Louis, Missouri.

Mageed, A.A. 2008. Distribution and long-term historical changes of zooplankton assemblages in Lake Manzala (south Mediterranean sea, Egypt). *Egyptian J. Aqu. Res*., 33: 183-192.

Mola, H.R. 2011. Seasonal and spatial distribution of Brachionus(Pallas, 1966; Eurotatoria: Monogononanta: Brachionidae), a bioindicators of eutrophication in lake El-Manzalah, *Egypt. Biol. Medi*., 3: 60-69.

Needham, J.G. and Needham, P.R. 1962. A Guide to the study of freshwater biology. Holdend-day inc. Sanfrancisco, California, pp. 108.

Pahwa, D.V. and Mehrotra, S.N. 1966. Observations on fluctuations conditions of river Ganga. *Proc. Nat. Acad. Sci. India,* 36(2): 157-189.

Telkhade, P.M., Dahegaonkar, N.R., Zade, S.B. and Lonkar, A.N. 2008. Quantitative analysis of phytoplankton and zooplankton of Masala Lake, Masala, Distt. Chandrapur, Maharashtra. *Environment Conservation Journal*, 9: 37-40.

Tonapi, G.T. 1962. Fresh water animals of India an ecological approach. Head Department of Zoology, University of Poona. Ganesh khind Poona 411007.

Welch, 1953. Limnological methods: McGraw Hill Book Co. New York, pp. 199.

Wetzel, R.G. 1983. Limnology, W.B. Sunders Company Publications, Philadelphia, London, Toronto, pp. 740.

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