



INVESTIGATION OF ZOOPLANKTON ABUNDANCE IN SAWANGI NULLAH DAM WATER, BORGAON NEAR HINGNA, MAHARASHTRA.

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Abstract

Zooplanktons are the smallest organisms present in almost all the water body. They invariably form an integral component for fresh water communities and contribute significant to biological productivity. They are the grazers on the phytoplankton and food base for the carnivorous as well as omnivorous fishes, have been reported in percentage composition of different groups. The diversity of various types of zooplankton was studied of dam water of Sawangi Nullah Dam, Nagpur, Maharashtra. The planktonic forms were collected from the surface of the lake water with plankton net of 20 μ mesh size nylon cloth. The plankton samples were preserved for laboratory analysis. The collected samples were identified using standard references. The result revealed that the zooplanktons were represented by various phyla like, *Protozoa*, *Rotifera*, *Cladocera* and *Copepoda*.

The zooplankton constitutes an important component of the freshwater biodiversity on which a large number of organisms depend throughout the year. Freshwater zooplankton is an important component in aquatic ecosystem whose main function is to act as primary and secondary link in the food chain.

Our present work focused on the taxonomic composition and abundance of zooplankton in dam water of Sawangi Nullah Dam, Nagpur. The total zooplankton composition is significantly changed in the water body due to ecological variables.

From the studies it is noted that a large number of diverse zooplanktonic forms with

rich biodiversity is supporting this ecosystem in summer and winter seasons.

A study was carried out to examine the diversity and density of zooplankton in dam water of Sawangi Nullah Dam, Nagpur.

Keywords: Sawangi Nullah Dam, zooplanktons, Rotifer, Cladocera, Copepoda, biodiversity

Introduction:

Zooplanktons are microscopic organisms that formulate the base of food chains and food webs in all aquatic eco-system. They are mostly small, many of them are minute and their structure can only be seen clearly with the aid of a binocular or compound microscope. Diversity is the variety of organisms considered at all levels and includes genetic and ecosystem variants, which comprise arrays of species, genera, and families, as well as communities of organisms within particular habitats and the physical conditions under which they live. Because of intensive exchange of nutrients between their water columns. The study shows that the dominant plankton and their seasonality are highly variable in different water bodies according to their nutrient status, age, morphometry and other locational factors. However, Zooplankton was investigated in Indian lentic ecosystems. These studies reveal different groups of zooplankton have their own peak periods of density, which is also affected by local environmental conditions prevailing at the time. Zooplankton acts as main sources of food for many fishes and also brood fishes' productivity. It plays an important role in early detection and monitoring the pollution of water. Zooplankton is good indicators of the changes in water quality because they are strongly

affected by environmental conditions and respond quickly to changes in water quality. The zooplankton constitute an important component of secondary production in aquatic ecosystems that play a key role in energy transfer from primary to higher level in the ecosystem (Wang *et al.*, 2010; Sharma and Tiwari, 2011). The most significant feature of zooplankton is its immense diversity over space and time. Thus, similar aquatic systems may have dissimilar assemblage of organisms varying in species composition and biomass.

Zooplankton diversity is one of the most important ecological parameters in water quality assessment. Zooplankton is the intermediate link between phytoplankton and fish. Hence qualitative and quantitative studies of zooplankton are of great importance in Reservoir water body. In the present study an attempt has been made to study zooplankton diversity and populations density from selected reservoir (Adeyemi *et al.*, 2009, Ahmad *et al.*, 2011; Mola, 2011). The main purpose of this paper is to outline the zooplankton diversity and abundance from water body.

Material and Methods:

Study Site: This dam site is situated at 34 Kms. away from Nagpur city and lies between 21°04'58"N latitude and 78°85' 08"E longitude. The main source of this dam water is from nullah and runoff from nearby hilly forest areas. Water is used for industrial sector, irrigation and domestic purpose.

The water samples for biodiversity of Zooplankton analyzed were collected once in a month during the period of June 2015 to May 2016. The surface water samples were collected from the collection site between 6.00 am to 8.00 am in plastic bottles. In order to study the

zooplankton biodiversity samples were collected from surface water by filtering 50 litres of dam (nullah) water through nylon bolting silk cloth. The samples were fixed using 4% formaline and the identification of zooplankton was done in laboratory Tonapi (1980), Sudha S. (2012). Numerical assessment was done by Sedgewick-Rafter counting cell. They were identified with the help of compound microscope and by following the keys given by Ward and Whipple (1959).

The surface water samples were collected from different locations of the reservoir randomly from June 2015 to May 2016 and such samples were pooled together to consider final sample for analysis. The samples were collected by filtering 50L of water through plankton net of 20 μ pore size filtering cloth and concentrated up to 100 ml. The concentrated zooplankton sample was preserved immediately with the help of 4% formalin. The samples were analyzed qualitatively under the microscope for different types of zooplanktons. The identification of zooplanktons was carried out by using keys and published literature. The quantitative estimation was done by using Sedgewick – Rafter Cell and expressed as numbers per litre. The variation in plankton community has been recorded for fresh water. Thus it is evident from the observations recorded in this work as well as other documented literature that water quality of aquatic reservoirs play significant role in ecological variations in diversity and density of different planktonic forms. The result indicates that the maximum number of genera occurred during winter season than summer season similar observations recorded by (Abuds S. and Altaff, Kumar K.S.)

Table: Monthly variation of zooplankton density (No./lit)

Month	<i>Protozoa</i>	<i>Rotifers</i>	<i>Cladocerans</i>	<i>Copepods</i>	Total
June	14	68	40	78	200
July	28	92	65	93	278
August	30	95	47	97	269
September	32	98	105	107	342
October	71	105	130	128	434
November	40	87	81	130	338
December	18	69	38	73	198
January	22	77	41	93	233
February	25	107	21	87	240
March	18	88	18	59	183

April	20	92	46	68	226
May	38	98	35	97	268
Total	356	1076	667	1110	3209
%	11.45%	34.60%	21.45%	34.59%

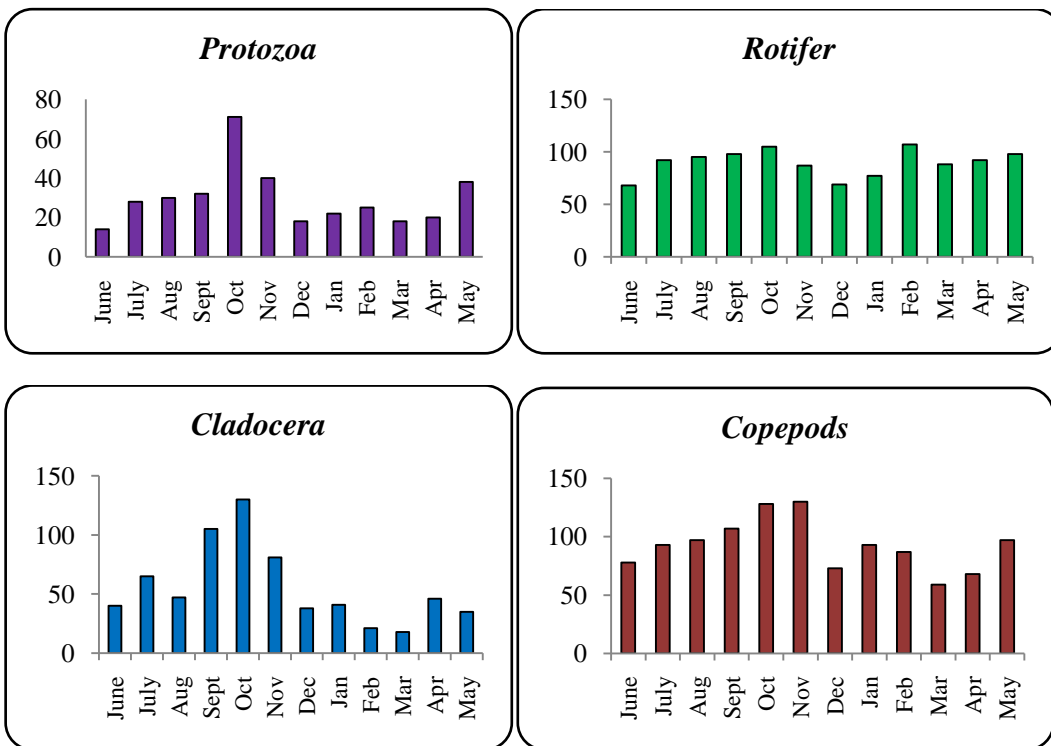


Figure-1 Monthly variation for various zooplankton forms

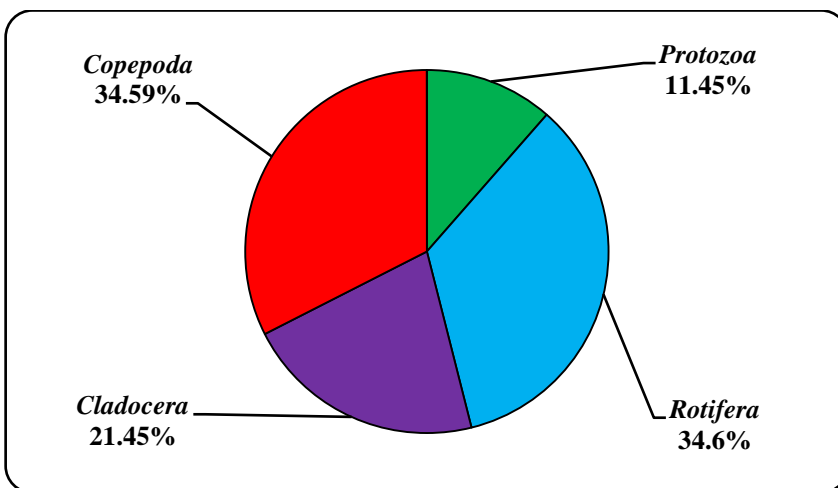


Figure 2- Diversity of zooplankton in Sawangi Nullah in percentage

Results and Discussion:

The range of zooplankton between 183 to 434 n/l, and average was 267.42 n/l, the minimum zooplankton was in March and maximum were in the month of October, (Table). The zooplankton forms were represented in the phylum like *Protozoa*, *Rotifera*, *Cladocera* and *Copepoda*, wherein Arthropoda was dominating two different sub classes of Arthropoda, i.e.

Copepods (32.48%) and *Cladocera* (21.45%) were abundantly present in the water of this reservoir (Table). All the types of zooplanktonic forms indicates marginal marginal variations from June to May with significant relationship with monthly variations and diversity (Figure-1 & 2). However, during month of September, October and November comparatively plankton density was high that coincides with the similar

condition for nutrients as well as some physico-chemical property of water (Bhandarkar S.V. and Gaupale D.T.) The annual percentage composition of various representative groups of zooplankton revealed 11.45% *Protozoa*, 34.60% *Rotifer*, 21.45% *Cladocera* and *Copepoda* 32.48% (Figure-1 & 2). Annual average percentage of zooplankton from reservoir revealed different forms in their density attributed to water quality. *Protozoan* and *Rotifers* were less numerically however, *Arthropods* were comparatively more. *Arthropods* were represented by variety of *Copepods* and *Cladocerans*. Larvae and nymphs of several insects were observed specific seasonal variation. During post monsoon such stages were abundant. The density and diversity of zooplankton certainly get influenced by the physico-chemical properties of water (Oshore M.K.W., Tackyx M.L.M. and Daro M.H.) Further, it is a fact that the diversity of zooplankton is always fluctuate in the flowing fresh water like that of reservoirs. The presence of variety of *Branchionus* sp. and *copepods* are the indicator of influence of pollutants as well as domestic sewage discharges (Kulshreshtha S.K., Saxena K.L. and Kulkarni V. Sharma K.N. and Mankodi P.C.). The similar pattern of presence of such *Rotifers* and *Arthropods* has been observed from the study area. The result indicates that the maximum number of genera occurred during winter season than summer and monsoon seasons similar observations recorded by (Abuds S., Altaff and Kumar K.S.). The zooplankton communities, very sensitive to environmental modifications, are important indicators for evaluating the ecological status of these ecosystems (Magadza). 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). The presence and the relative predominance of various *Copepod* species have been used to characterize the status of aquatic ecosystems (Park and Marshall, Bonecker et.al.). Herbivorous zooplankton is recognized as the main agent for the top-down control of phytoplankton, and the grazing pressure exerted by *Cladocerans* and *Copepods* on algae and cyanobacteria is sometimes an important controlling factor of harmful algal blooms (Boon et.al.).

Study reveals that zooplankton species richness was high in winter season compared to summer season. The ecological factors contribute for high species diversity in that season. The study throws light on the rich fauna present in this water body by ecological variations.

Conclusion:

Zooplankton assessment is an important indicator of aquatic community structuring and water conditions. Zooplankton is directly or indirectly influenced by seasonal variation of complex limnological factors. The annual quantitative and abundance study of zooplankton population depends on the succession, appearance and disappearance of component species. Periods of quantitative increase and decrease of individuals coincide with seasonal minima and maxima of the total zooplankton. Four main zooplankton groups were identified in the study (*Protozoa*, *Rotifers*, *Cladocera* and *Copepoda*) constitute the zooplankton population and contributed significantly to secondary production of the wetland. The rapid modification of the planktonic communities in response to environmental stress confirms the strong instability of plankton forms with their ecological variations. Particularly for wetland they have multipurpose and potentially conflicting uses (drinking water, irrigated agriculture and fishing).

The present study reveals seasonal variation in the diversity and distribution of zooplanktons in nullah water. All groups of zooplanktons were recorded throughout the study period. The number was highest during winter and lowest during summer. Zooplankton is one of the necessities to evaluate fresh water reservoir in respect to their ecological and fisheries status.

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