

ISCA Journal of Biological Sciences Vol. **1(1)**, 30-34, May (**2012**)

Study on Zooplankton of Fresh Water Reservoir Nyari – II Rajkot district, Gujarat, India

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Available online at: <u>www.isca.in</u>

(Received 10th April 2012, revised 18th April 2012, accepted 20th April 2012)

Abstract

Zooplankton are the grazers on the phytoplankton and a 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 fresh water reservoir Nyari – II Rajkot district, Gujarat. The planktonic forms were collected from the surface of the reservoir water with plankton net of 20μ 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 zooplankton were represented by various phyla like, protozoa, helminthes, rotifera, annelida, arthropoda etc. Arthropods have been reported maximum in number of varieties and percentage amount in the total zooplankton followed by Rotifer in general. The range of zooplankton between 174 to 769 n/l, and average was 378.42 n/l, the minimum zooplankton was in March and maximum were in the month of October. The annual percentage composition of various representative groups of zooplankton revealed 7.90% protozoa, 35.32% Rotifer, 5.41% Arthropoda and Miscellaneous 2.64%. The detailed aspect of monthly variation, percentage composition and diversity of zooplankton is discussed herein.

Keywords: Zooplankton, Nyari reservoir.

Introduction

Gujarat state is the 7th largest state of India and comprises three distinct geographic regions. Larger area of this state is semi arid and water scarcity prone zone¹⁻². Few big and several small rivers form their basin in this state. This network of small rivers and undulating terrain creates ideal conditions for water resource development projects and thus, five districts of Saurashtra region among themselves share nearly half of the reservoirs in the state. Planktonic forms are the producers in an aquatic ecosystem and also primary food base for nektons like fishes and other fishable organisms. In the tropical country like India, highly seasonal rainfall and heavy discharge of water during monsoons results in high flushing rate in the most of the reservoirs. Therefore, the consistency and productiveness of biotic component is variable. Plankton by virtue of drifting habit and short turnover period constitutes major link in the trophic structure and events in the reservoir ecosystem³⁻⁴. A rich plankton community is the hallmark of Indian reservoirs that can be attributed to abiotic factors and nutrient load variability⁵. It is found that nitrates and phosphates are lacking in south Indian reservoirs this has relation with high numerical abundance of plankton in this reservoir. pH has positive relation with abundance of zooplankton⁶. Zooplankton was represented by three different group viz., protozoa, rotifera and arthropoda. Percentage compositions of these planktonic forms were indicative of its richness and possible contribution in organic productivity as well as trophic status maintenance. It is usually observed that the greater population of the rotifers appeared in

waters with eutrophication state of the reservoir. The presence of copepods is indicative of pray – predator relationship among zooplankton 7 .

Material and Methods

Study Site: Study site fresh water reservoir Nyari – II is located in Rajkot district Latitude: $22^0 - 21' - 45''$ N and Longitude: $70^0 - 40' - 15$ E. This perennial reservoir is rain fed as well as receives flood water through Nyari River. Primarily the water resource is identified to be utilized for irrigation and community water supply to RUDA (Rajkot Urban Development Area). This long seasonal reservoir has the catchment area of 314 sq km and water storage capacity of 88.94 FRL, which is used for capture fisheries as well as stocking of Indian Major Carps.

The surface water samples were collected from different locations of the reservoir randomly from June 2008 to May 2009 and such samples were pooled together to consider final sample for analysis. All samples were collected at trice in month during morning hours. The samples were collected by filtering 10L of water through plankton net of 20μ 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 literature⁸⁻¹⁰. The quantitative estimation was done by

using Sedgewick – Rafter Cell and expressed as numbers per liter.

Results and discussion

The range of zooplankton between 174 to 769 n/l, and average was 378.42 n/l, the minimum zooplankton was in March and maximum were in the month of October, (table-1). The zooplankton forms were represented in the phylum like Protozoa, Rotifera and Arthropoda, wherein Arthropoda was dominating two different sub classes of Arthropoda, i.e. Copepods (73.43%) and Cladocera (26.56%) were abundantly present in the water of this reservoir (table-2). Correlation of physico-chemical properties with zooplankton abundance indicates positive relationship. All the types of zooplanktonic forms indicates marginal declined trend from June to May with no significant relationship with monthly variations (figure-1 A-E).

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 water⁶. The annual percentage composition of various representative groups of zooplankton revealed 7.90% protozoa, 35.32% Rotifer, 5.41% Arthropoda and Miscellaneous 2.64% (figure-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 ¹¹.

 Table – 1

 Monthly variation in zooplankton density (no/liter)

Month	Protozoa	Rotifer	Arthropoda	Miscellaneous	Total
Jun	16	71	160	11	258
Jul	32	126	239	12	409
Aug	34	160	246	7	447
Sep	44	239	341	16	640
Oct	82	241	437	9	769
Nov	34	171	258	8	471
Dec	12	79	96	6	193
Jan	17	88	143	3	251
Feb	19	131	127	21	298
Mar	12	52	103	7	174
Apr	22	81	111	10	224
May	35	165	197	10	407
Total	359	1604	2458	120	4541
%	7.90 %	35.32%	54.12 %	2.64%	



Arthropoda					
Months	Copepods	Cladocera			
Jun	120	40			
Jul	168	71			
Aug	189	57			
Sep	235	106			
Oct	304	133			
Nov	186	72			
Dec	76	20			
Jan	110	33			
Feb	102	25			
Mar	85	18			
Apr	69	42			
May	161	36			
Total	1805	653			
%	39.74%	14.38 %			





Figure – 1 (A-E): Monthly variation for various zooplankton forms



Figure - 2 Percentage composition of various groups of zooplankton

Further, it is a fact that the diversity of zooplankton is always less in the flowing fresh water compared to stagnant 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 12-14, the similar pattern of presence of such Rotifers and Arthropods has been observed from the study area. Spatial and temporal variability in the different forms of zooplankton and especially arthropods has been observed in the study site may be attributed to effluent and domestic discharges and fresh water inflow velocity¹⁵. The planktonic forms of insect fauna have been recorded as several larval or nymph form of Mayfly, Dragon fly, mosquitoes etc. From the entire sampling such insect fauna has been reported with variation in their abundance mainly dependent on seasonal conditions¹⁶. All the physico-chemical parameters favours growth of phytoplankton as well as aquatic weed in fresh water ponds is well established fact¹⁷. Similarly variation in plankton diversity and density in relation to limnological factors has been observed for urban ponds also which has direct influence on nutrient content and productivity¹⁸. The seasonal variation in plankton community has been recorded for fresh water ponds¹⁹. 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 seasonal variations in diversity and density of different planktonic forms. The result indicates that the maximum number of genera occurred during winter season than summer and monsoon seasons similar observations recorded by²⁰⁻²¹.

This might promote suitable food for the developmental stage hence a high density of zooplankton population was recorded in winter season. The higher density of plankton population in reservoir might be due to availability of suitable food and less predators. In the monsoon fall of zooplankton density of all the zooplankton components during the study period can be attributed to the dilution effect²²⁻²³. The rotifera and cladocera were higher in winter can be linked to favourable temperature and availability of abundant food in the form of bacteria and suspended detritus²⁴⁻²⁶. Larvae and nymphs of several insects were observed at different sites with specific seasonal variation. During post monsoon such stages were abundant.

Conclusion

The Nyari - II reservoir is rain fed as well as receives flood water through Nyari River. Primarily the water resource is identified to be utilized for irrigation and community water supply. The zooplankton study was carried out to understand its relation with water quality parameters. The range of zooplankton between 174 to 769 n/l, and average was 378.42 n/l, the minimum zooplankton was in March and maximum were in the month of October. The zooplankton forms were represented in the phylum like Protozoa, Rotifera and Arthropoda.

The Arthopods were dominated as two different sub classes i.e. Copepods (73.43%) and Cladocera (26.56%). 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. The annual percentage composition of various representative groups of zooplankton revealed 7.90% protozoa, 35.32% Rotifer, 5.41% Arthropoda and Miscellaneous 2.64%. Zooplankton is one of the necessities to evaluate fresh water reservoir in respect to their ecological and fisheries status.

Acknowledgement

Authors are thankful to the Head, Department of Zoology, Faculty of Science, The M. S. University of Baroda, Vadodara to provide necessary laboratory facility for this work. One of the authors Goswami A. P. is also thankful to The Principal, Shree M.V. Mahila Science and Home Science College, Rajkot for the permission to carry out this research work.

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