UTTAR PRADESH JOURNAL OF ZOOLOGY

43(23): 37-43, 2022
ISSN: 0256-971X (P)

STATUS AND DIVERSITY OF ZOOPLANKTON POPULATION IN THE BUDKI DAM OF SHIRPUR, DHULE DISTRICT, MAHARASHTRA, INDIA

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AUTHOR'S CONTRIBUTION

The sole author designed, analysed, interpreted and prepared the manuscript.

Article Information

DOI: 10.56557/UPJOZ/2022/v43i233249

Editor(s):
(1) Dr. Md. Aminur Rahman, Jashore University of Science and Technology, Bangladesh.
Reviewers:
(1) Nita Rukminasari, Universitas Hasanuddin, Indonesia.
(2) H. B. Jayasiri, Ocean University of Sri Lanka, Sri Lanka.

Received: 02 June 2022
Accepted: 05 August 2022
Published: 12 December 2022

Original Research Article

ABSTRACT

Zooplanktons are microscopic heterotropic organisms usually too small, present in aquatic environment. They are present at various depths in their own niches in every type of water bodies.The present investigation deals with the study of monthly changes of diversity and density of Zooplankton in Budki Dam of Shirpur in Maharashtra. The work was carried out for a period of two year from January 2009 to December 2010. The population status of Zooplankton at Budki dam consisted total 51 species of Zooplankton belonging to 30 genera, belong to four groups: Rotifera (28 species), Cladocera (12 species), Copepoda (7 species) and Ostracoda (4 Species). Quantitatively and qualitatively these four groups administered same sequence as: Rotifera>Cladocera>Copepoda>Ostracoda.

Keywords: Budki dam; zooplankton; rotifera; density; population.

1. INTRODUCTION

"Zooplankton comprises an important constituent of fresh water ecosystems and their central place in food chain and webs. They transfer energy and matter from primary producers (algal biomass) to higher trophic levels such as fish" [1-3]. "Moreover, by grazing on phytoplankton and bacteria they help in improving water quality" [4]. According to Verma and Munshi [5] and Howick and Wilhm [6] "Zooplankton are the main food substance of fishes and can be used as indicators of the trophic condition of a water body. Zooplankton are identified to maintain the economically important fish population and are the major mode of energy transfer between phytoplankton and fish" Howick and Wilhm, [6]. "Therefore, they are the outstanding indicators of the status of a study site and occupy a fundamental position in the food

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web and top down feedback mechanisms" [7,8]. "Limnatic waterzooplankton communities belong to four main taxonomic groups that are Rotifera, Cladocera, Copepoda and Ostracoda. Most of the zooplankton depends to a large scale on various bacterioplankton and phytoplankton for food. Many of the bigger forms feed on smaller zooplankton, forming secondary consumer, while some of them are detritivore feeders, browsing and feeding on the organic substance attached to substrate or lying on the bottom sediment". Ali et al. [9] and "many other studies have highlighted significance of Zooplankton studies of any water body to establish health status.Many studies have been conducted globally with reference to the richness of species, distribution of copepods and Cladocerans and their relation to hydro period" [10]. "Comparison of zooplankton diversity of two fresh water wetland ecosystems of Goa was done" by Das et al. [11]. "Seasonal distribution of the population structure of zooplankton in connection with physicochemical parameters was studied" by Sarkar and Chaudhary [12]. Therefore, in the present study of Budki Medium Irrigation tank (BMIT), to establish a food chain/web and situation of the dam, zooplanktons are also considered and their qualitative and quantitative seasonal variations and correlation with other biotic and abiotic parameters are evaluated in the present chapter. The Zooplankton families were represented at Budki Medium Irrigation tank (BMIT).

2. MATERIALS AND METHODS

2.1 Study Area

The study area BMIT was visited at monthly interval during the two years period (2009 to 2010).The water sample containing Zooplankton were collected at the surface of study site at three stations namely BMIT A, BMIT B and BMIT C. in between 8 to 10 AM. According to Edmonson [13] ten liters of water were filtered through the plankton net No. 25 of bolting silk with mesh size 64 micron. Net was washed with the water by inverting it to collect the plankton attached to the net and the volume of sample was made to 100 ml. The collected samples were taken in separate vials and preserved by 1 ml of 4 % formalin and 1 ml of Lugol's Iodine at the BMIT site. Ten ml of sample from each station was further concentrated by centrifuging at 2000 RPM for 10 minutes. For quantitative estimation of plankton, one ml well mixed sample was taken on 'Sedgewick Rafter Cell'. To calculate density of plankton the averages of 5 to 10 counts were made for each sample and the results we expressed as number of organisms per liter of collected sample. Qualitative study of Zooplankton was carried out up to the genus/species level using the standard keys given by APHA [14]; Sarode and Kamat [15]; Philipose [16]; Tonapi [17] and Edmondson [13]. The two year study data were pooled for four months and three seasons and analyzed for seasonal changes, with respect to summer (February to May), Monsoon (June to September), Winter (October to January). Further, the mean, standard error of mean (SEM) were calculated for each season and One Way ANOVA for various parameters for four seasons was performed using Graph Pad Prism version 3.00 for Windows (Graph Pad Software, San Diego California USA). The correlation between the physicochemical parameters and the plankton density was calculated. The Pearson Correlation was calculated by keeping plankton as dependent variable and other abiotic and biotic factors as independent variables with the help of SPSS 7.5 for Windows. The P value for ANOVA is non significant if $P > 0.05$ (ns), Significant if $P< 0.05$ (*), Significantly significant (**) if $P < 0.001$ and highly significant if $P < 0.0001$.

The number of species present in an area may be considered as its 'species richness' a frequently used measure [18]. Species richness can be correlated positively with some measures of ecological diversity. The zooplankton study includes four major groups such as Rotifera, Cladocera, Copepoda and Ostracoda.

3. RESULTS AND DISCUSSION

During the investigation at BMIT seasonal variations are considered as total zooplankton, and then further divided in four groups. The total 51species of zooplankton were recorded belonging to 30 genera. (Annexture I) which belong to four groups: Rotifera (28 species), Cladocera (12 species), Copepoda (7 species) and Ostracoda (4 Species). Quantitatively and qualitatively these four groups administered same sequence as: Rotifera> Cladocera> Copepoda> Ostracoda.

The abundance of total zooplankton includes four quantitative components and their abundance show significant seasonal variations. The sequence of abundance of various zooplankton groups in decreasing order were recorded as Rotifera (37%)>Cladocera (32%) >Copepodes (26 %) >Ostracoda (5%), (Fig. 1). The density of total zooplankton administered significant seasonal variations ($P <0.0001$). The species composition of total zooplankton occurred in decreasing order of dominance with average two years species richness as Rotifera 49 % >Cladocera 27 % >Copepoda 16 % >Ostracoda 8 % (Fig. 2) and administered significant seasonal variations ($P < 0.0001$).

Image 1. Location of Map

Image 2. Budki M. I. Tank –Panoramic View

Image 3. Google Satellite image of Budki Medium Irrigation Tank (21^{0}32’36N 74^{0}51$^{'}$41E)

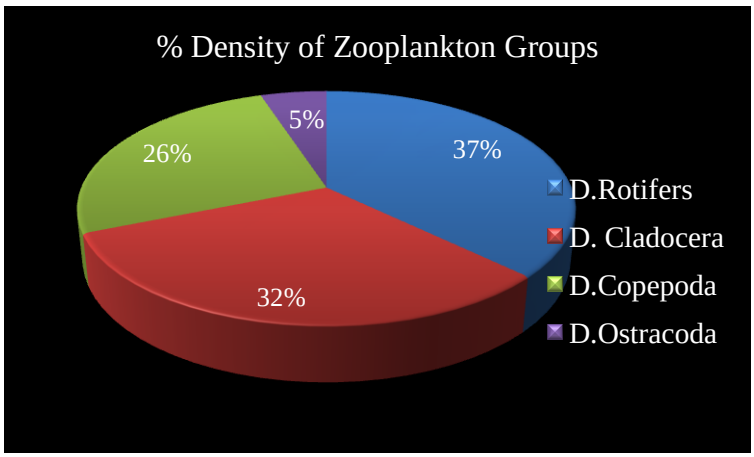

Fig. 1. Two year Percentage density of different groups of Zooplankton at Budki Dam during January 2009 to December 2010

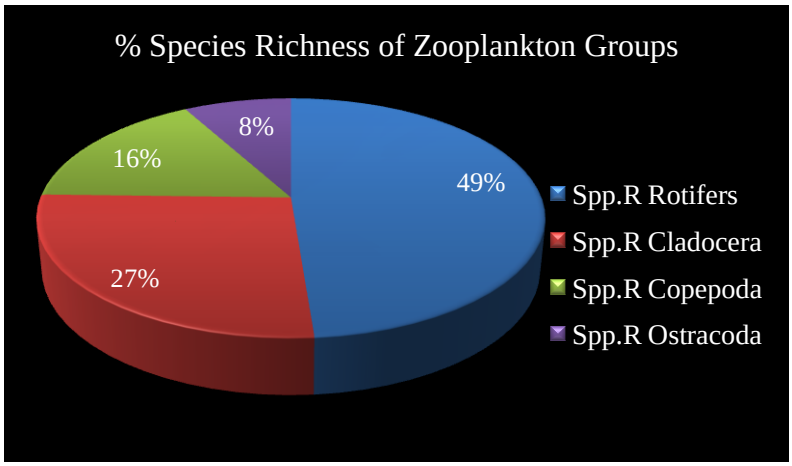

Fig. 2. Two year Percentage Species richness of different groups of Zooplankton at Budki Dam during January 2009 to December 2010

According to Hillbricht (1977), "zooplankton play a functionally significant role in aquatic systems by consuming phytoplankton, bacteria and then releasing nutrients back in the ecosystem or by serving as prey for transferring nutrients to higher trophic levels". "Zooplanktons, the heterotrophic animals floating in water, constitute an important food source for many species of aquatic organisms. This probably explains why there is so much fascination in the study of structure and dynamics of zooplankton populations of lakes" [19]. "The zooplankton community composition in shallow water systems are not only influenced by predation as per the observation" of Donald et al. [20]; Hampton and Gilbert [21] but also by, water chemistry and hydrology [22]. The hydroperiod and water cover are the major physical factors responsible for formation of the various ecological communities [23]. According to Pennak [24] and Bonecker and Lansac-Toha [25] plankton are abundant during the slow water current, while rise in water brings about a sharp decline in their density.

In the of BMIT in the Maharashtra, India, the water level and the resultant water cover have proven to be the important factors in regulating the density of the zooplankton. Here at BMIT, highest zooplankton density was noted during summer when the water level declined and the zooplankton got concentrated and vice versa moderate during monsoon when the water level was high and plankton get distributed and lowest recorded in winter season.

4. CONCLUSION

The present study on Budki Dam exhibits rich and diversified Zooplankton which is dominated by rotifera throughout the study period which reveals that the Dam is very much suitable for aquaculture as zooplankton particularly rotifer are known to be the best food for the fish larvae for aquaculture. Zooplanktons comprise an important constituent of fresh water ecosystems and their central place in food chain and webs. They transferring energy and matter from primary producers to higher trophic levels such as fish. At Budki dam maximum density and species richness of total zooplankton were recorded.

The zooplanktons were recorded qualitatively and quantitatively in the decreasing sequence as rotifers, cladocerans, copepods and ostracodes. Total 51 species belonging to 30 genera of zooplankton were recorded at Budaki dam of which 28 species belonged to Rotifera, 12 to Cladocera, 7 to Copepoda and 4 to Ostracoda. The study indicates that Budaki Dam supports to good diversity of Phytoplankton and zooplankton and the water is also not polluted.

ACKNOWLEDGEMENT

I would like to thank University Grant Commission; WRO Pune, India for sanctioned the Minor Research Project (MRP) entitled "Assessment of Water Quality of Budaki Medium Irrigation Tank Shirpur, Dist. Dhulia (M.S.)" Authors also thankful to Principal, R.C. Patel, A.S.C. College, Shirpur for providing laboratory facilities.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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ANNEXTURE - I

Zooplankton of BudkiM.I.Tank observed during 2009 to 2010

A. Rotifera

1. *Brachionouscaudatuspersonatus (Ahlstrom 1940)*
2. *Brachionousplicatilis (Muller, 1786)*
3. *Brachionousbidentata (Anderson, 1889)*
4. *Brachionousqudridentatus (Hermann, 1783)*
5. *Brachionousfulcatus(Zacharias, 1898)*
6. *Brachionousdiversicornis (Daday, 1883)*
7. *Brachionousplicatilis (Muller, 1786)*
8. *Brachionousforficula (Wierzejski, 1891)*
9. *Brachionouscaliciflorus (Pallas, 1776)*
10. *Brachionoushavanaensis (Illinois)*
11. *Brachionousurceolaris (Muller, 1773)*
12. *Keratellacockleris (Gosse, 1851)*
13. *Keratellaprocurva (Thorpe, 1891)*
14. *Keratellatropica(Apstein, 1907)*
15. *15.Platyiasquadricorniz(Ehrb., 1832)*
16. *Lapadella patella (Muller, 1786)*
17. *17.Lapadellaovalis (Muller, 1786)*
18. *Lacanaluna (Muller, 1776)*
19. *Lacanaohioensis(Herrick, 1885)*
20. *Monostyla bulla (Gosse, 1851)*
21. *Monostylalunaris(Ehrb., 1832)*
22. *Trichocera cylindrical species*
23. *Asplanchnapriodonta (Gosse, 1850)*
24. *Filinaopaliensis (Zach, 1898)*
25. *Filinalogesita (Ehrb., 1834)*
26. *Filinapegleri (Hutchinson, 1964)*
27. *Testidunellamucranata (Gosse,1886)*
28. *Rotariarotatoria (pallas,1776)*

B. Cladocera

29. *Diphanosomasarsi (Richard,1895)*
30. *Ceriodaphniacornuta (Sars, 1888)*
31. *Ceriodaphnia reticulate* (Jurine,1820)
32. *Simocephalusexspinosus (Koch,1841)*
33. *Moinamicrura (Kurz., 1874)*
34. *Moinabrachiata (Jurine,1820)*
35. *Bosminalongirostris. (Muller, 1776)*
36. *Microthrixspinosa (King, 1853)*
37. *Chydorus spp.*
38. *Alonarectangula (Sars, 1862)*
39. *Acroperuspulchella (King,1853)*
40. *Indialonaganpati (Petkovaski, 1966)*

C. Copepoda

41. *Allodiaptomusraoimembranigera(Brehm,1953)*
42. *Diaptmus species (Westwood, 1836)*
43. *Ectocyclopsphaleratus (Koch,1838).*
44. *Cyclopsladakanus (Kiefer, 1936)*
45. *Mesocyclopshyalinus (Rehberg, 1880)*
46. *Mesocyclopsleuckarti (Claus, 1857)*
47. *Microcyclops bicolor (Sars, 1863)*

D. Ostracoda

48. *Cyprissubglobosa (Sowerby, 1840)*
49. Eucypris spp.
50. *Hemicyprisanomala (Klie, 1938)*
51. *Strandesialabiata*