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IMPACT OF SEASONEL VARIATIONS ON ZOOPLANKTON BIODIVERSITY IN POHARA LAKE, AMRAVATI, MAHARASHTRA

[1]R. L. Rahatgaonkar
Department of Zoology,
Shri RLT College of Science, Akola

Abstract: Zooplankton biodiversity serves as an important ecological indicator of aquatic environment as they are rapid reactive and responsive according to environmental changes. The present study mainly focus on the impact of seasonal variations on zooplankton biodiversity was carried out in Pohara Lake near Amravati district, Maharashtra. The geographical location of lake is located at 20° 54′ N and 77° 53′ E and the is covered by Pohara – Malkhed dense forest and few villages. The zooplankton are the important ecological indicator of fresh water bodies serve as a major component of aquatic food chain and play vital role to maintain the proper equilibrium between biotic and abiotic components of the aquatic ecosystem. The present work was carried out for one year i.e December 2014 to November 2015. The zooplankton diversity of lake water was represented by 6 different groups i.e protozoa, rotifera, cladocera, copepoda and ostracoda.

Key words: Zooplankton, Biodiversity ,Pohara Lake, Seasonal Variations.

INTRODUCTION

Zooplankton biodiversity is one of the important ecological indicators of the aquatic environment. Biodiversity of zooplankton is essential because they maintain the aquatic ecosystem healthy and each species plays a specific role as they recycle the water nutrients, food and maintaining of soil fertility in the ecosystem and some species may allow natural ecosystem to function in a healthy manner (Jeelani, Kaur, & Kumar, 2008). Zooplankton are small, microscopic animal lives in water column and crucial elements of freshwater ecosystems as they hold the very important position in aquatic food web and being as an important food for almost all freshwater fish species at some stage in their life history (Lampert & Sommer, 1997). Zooplankton are very important components of fauna of freshwater bodies and are highly sensitive to manmade activities, there study may be useful to understand the long-term effects on the water ecosystem as these communities are highly reactive and sensitive to environment fluctuations, Jeppesen et al., (2011). The freshwater zooplankton form an important group as most of them feed upon and incorporate the primary producers into their bodies and make themselves available to higher organisms in food chain Michael(1973);Santos-Wisniewski *et al.* (2006)).

The increasing human population in India leads to creates the problems of disposal of waste water products. An undesirable substance is regularly discharged into the lake water through surface runoff that degrades the water quality. The water quality is defined in terms of the chemical, physical and biological contents of water, Lawson, (2011); Shukla, Preeti, & Singh, (2013).

Zooplankton diversity and their ecology greatly contribute to as understanding of the basic nature and general economy of aquatic habitats. Physico-chemical factors also regulate zooplankton population in water body. Various researchers carried out work to study the zooplanktons of different fresh water bodies. Jayabhaye (2010), studied zooplankton diversity of river Kayadhu, near Hingoli city Maharashtra. Tayade and Dabhade (2011) studied the rotifer community around Washim region and prepared a checklist of Rotifers in Washim region. The occurrence and presence of zooplankton species played a very significant role in the functioning of freshwater ecosystem, but due to the human interference, fluctuation in atmospheric temperature, water temperature deforestation, the healthy water sources becoming polluted. Therefore, present study was undertaken to investigatethe impact seasonal variations on zooplanktons biodiversity in Pohara Lake in Amravati, Maharashtra.

Fig.1: Photo of Pohara Lake

MATERIAL AND METHODS

Study Area :

The present study was carried out on Pohara lake which is located at 20° 54′ N and 77° 53′ E and the is covered by Pohara – Malkhed dense forest surrounded by hills, shrubs, mix heighted trees and agricultural land.

Collection and Analysis of Samples:

The water samples were collected for a period of one year from December 2014 to November 2015 at four different sitesto assess the fauna prevailing in this water body The surface water samples were taken from the study site once in a month between 8.30 am to 10.30 am in wide mouth plastic bottles. The spot parameters like pH, Humidity, Water temperature, Air temperature was recorded at sampling spot by using Thermometer and Pocket digital pH meter and other physicochemical parameters like TDS, Dissolved oxygenwas estimated as per standard methods prescribed by APHA(1998), Kodarkar (1992). To study the zooplankton diversity from each sampling spot 50 Litre water was filtered through plankton net made of silk bolting cloth. Filtered water sample was preserved in 4% formalin and by adding a few drops of glycerine. The zooplankton was segregated groupwise like Rotifera, Cladocera, Copepoda and Ostracoda. They were separated under a binocular microscope using Sedgewick Rafter Cell Method APHA, (1998), The identification of zooplankton was performed in laboratory using standard manuals and textbooks Idris(1983), Adoni (1985)Sharma and Michael (1987), Chandrasekhar and Kodarkar (1995), Shiel (1995) and Altaff (2004)

RESULTS AND DISCUSSION

Physico-chemical parameters and water nutrient quantity of lake water play a significant role in the distribution patterns and species composition of plankton, Horne & Goldman, (1994). In aquatic ecosystem, environmental factors including various physical properties like gases and solids, intensity of light, temperature, density, and chemical properties i.e salinity, pH, hardness, phosphates etc of water play an important role in growth and dispersal of phytoplankton on which zooplankton totally survives. Zooplankton are considered as one of the most important food sources to the aquatic organisms particularly to planktivorous fish and crabs. Most of the fishes during their larval mode of life were dependent zooplankton. Monthly variation of zooplankton species was presented in Table.1. The population of zooplankton fauna of lake water represent by Protozoa, Rotifera, Copepods, Cladocera and Ostracods. In the present study the population of zooplankton like Rotifera holds the top rank in over all count followed by Protozoan, Cladocera Copepoda and Ostracoda and exhibit mix variations in their populations reached at maximum level during the months of summer and winter and minimum during the rainy season. Similar findings were recorded by Adoni (1985).

The density of protozoa was observed maximum during the month of May and minimum in the month of November it might be due to the rain water which dilutes the water of lake and maximum density is due to decay of organic matter. Some important species of protozoan found in lake water are Urocentrum, Coleps, Sarcodina and Vorticella. Rotifers occur in almost all kinds of fresh water bodies and have attracted global attention as an indicator of water quality plays an important role as suspension feeders among the zooplankton community. They exhibit marked differences in their tolerance and adaptability to changes in the physicochemical and biological factors Manickam et.al (2014). Several studies indicated that rotifer abundance generally increase during summer. In the present study Rotifer species exhibiting the highest species richness and their abundance during the month of April and lowest in the month of December. Similar findings were recorded by Contreras et al. (2009) also observed lowest density of rotifers during winter and highest during summer. Higher rotifer number in summer can be attributed to the hyper-tropical conditions of the water body with high temperature and low water level. Dominance and abundance of rotifers are associated with the increase in trophic conditions due to their capability to ingest smaller organisms like bacteria and other organic detritus, which are abundant in eutrophic ecosystem.

Asplanchna, Brachionusdurgae, B. angularis, B. bidentata, B. falcatus, F.longiseta are some species recorded in lake water. In the present study the high density numbers of rotifers in summer season is due to the eutrophic condition of lake, similar findings were stated by Cajander (1983).

The Cladocera are small crustaceans commonly called water fleas plays an important role in in food chain and energy transformation. The density of Cladocera observed maximum in monsoon season, specially in the month of July and minimum in May i.e in summer due to increase level of salinity. Kiren et.al (2007) reported the same observation. Cladocera are highly sensitive to salinity and salinity concentration restricts the survival of most large bodied cladocerans compared to other zooplankton groups. Frey,D.G.(1993). Monsoon season may favour the cladoceran species due to low temperature and availability of microscopic algae and the fine particulate matter in the detritus thus influencing cycling of matter and energy in benthos, Jayabhaye and Madlapure, (2006). Copepoda, another group of zooplankton was observed throughout the study period. Their occurrence was highest in winter and declined gradually in summer to monsoon, it might be due to the temperature fluctuation of lake water and larger in size compare to other zooplanktons, especially rotifers. Planktivorous fish is probably a major factor for the decreasing density of copepods in the study sites. Ostracods are bivalve and have shape like small seeds and found in all type of water bodies and act as a good source of food for other aquatic organisms. Maximum density was recorded in March and April and minimum in July and August.

Table.1: Month-wise population density (No/Lit) of different Zooplankton Groups

Zooplankton Component	Months-wise population												Total
	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	
Protozoa	61	67	76	80	92	105	98	92	89	72	68	56	956
Rotifera	54	67	84	106	134	164	142	102	96	75	70	65	1159
Cladocera	45	48	42	36	24	24	14	56	51	51	49	47	487
Copepoda	91	94	108	99	84	65	59	48	42	61	98	85	934
Ostracoda	29	36	44	49	54	48	32	21	28	36	34	39	450
Total Zooplankton	280	312	354	370	388	406	345	319	306	295	319	292	3986

CONCLUSION

In the present study, the Pohara Lake showed seasonal variation in species composition, population density, species diversity, species evenness and species richness of different zooplankton is due to seasonal change in water temperature which can positively support the population diversity of zooplankton with the evidence from high degree of positive correlation between temperature, total dissolved solids, and plankton density.

REFERENCES

1. Adoni (1985) Workbook on Limnology (Ed). Department of Environment, Government of India, Bandona Printing Services, New Delhi.
2. Altaff, K (2004) A manual of Zooplankton University Grants commission, New Delhi. and management, 2004, 5:31-43.
3. APHA (1998) Standard Methods for Examination of Water and Wastewater, American Public Health Association, Washington. D.C.
4. Barrabin J.M. (2000) The rotifers of Spanish reservoirs: Ecological, systematical and zoogeographical remarks. Limnetica; 19:91–144.
5. Cajander.V(1983) Production of planktonic Rotatoria in Ormajarvi, an eutrophicated lake in southern Finland. Hydrobiologia.104(1):329–333.
6. Caroni,R & Irvine.K(2010) The potential of Zooplankton communities for ecological assessment of lakes ,Redundant concept or political oversight, Biology & Environment proceeding of Royal Academy;110(1) ,35-53
7. Chandrashekhar, S.V.A and Kodarkar(1995) Studies on Brachionus from Saroor nagar Lake, Hyderabad. J.Aqua.Biol. 10(1): 48-52.
8. Contreras J, Jimenez, Sarma S, Martin MI, Nandini S. (2009) Seasonal changes in the rotifer (Rotifera) diversity from a tropical high-altitude reservoir. *Journal of Environmental Biology*.30(2):191–195.)
9. Ferrara,O; Vagaggini,D & Margaritora, F.G (2002) Zooplankton abundance and diversity in lake Bracciano, Latiun, Italy, Journal of Limnology,61(2),169-175
10. Frey D.G. (1993) The penetration of cladocerans into saline waters. Saline Lakes V.p. 233–248.
11. Horne, A. J., & Goldman, C. R. (1994). Limnology, (2nd ed., pp. 1–576). New York: McGraw-Hill.
12. Idris,B.A.G (1983) Freshwater zooplankton of Malaysia (Crustacea: Cladocera). Malaysia: Universiti Pertanian Malaysia, Serdang, Selangor,pp. 10-151.

13. Jayabhaye, V.M. and V.R.Madlapure (2006). Studies on zooplankton diversity in Parola dam, Hingoli, Maharashtra, India. J.Aqua.Biol.Vol.21(2): 67-71.
14. Jayabhaye, U.M. (2010): Studies on zooplankton diversity of river Kayadhu, Near Hingoli city, Hingoli, Dist. Maharashtra. Int.Res.J.; 11(12): 47-49.
15. Jeppesen, E., Noges, P., Davidson, T. A., Haberman, J., Nõges, T., Blank, K. Amsinck, S. L. (2011). Zooplankton as indicators in lakes: A scientific based plea for including zooplankton in the ecological quality assessment of lakes according to the European water framework directive (WFD). Hydrobiologia, 676(1), 279–297
16. Jeelani, M., Kaur, H., & Kumar, R. (2008). Impact of climate warming on the biodiversity of freshwater ecosystem of Kashmir, India. In M. Sengupta, & R. Dalwani (Eds.), Proceedings of Taal 2007: The 12th World Lake Conference, (pp. 1103–1109).
17. Kiran BR, Puttaiah ET, Kamath D.(2007) Diversity and seasonal fluctuation of zooplankton in fish pond of Bhadra fish farm, Karnataka. Zoos' Print Journal.22(12):2935–2936.
18. Kodarkar M.S(1992): Methodology for water analysis, physico-chemical, Biological and Microbiological Indian Association of Aquatic Biologist. Hyderabad; pub,2- pp.50
19. Lampert,W & Sommer,U(1997) Limnoecology–the ecology of lakes and streams .p382,oxford, oxford university press.
20. Lawson, E. O. (2011). Physico-chemical parameters and heavy metal content of water from mangrove swamps of Lagos Lagoon, Lagos, Nigeria. Advances in Biological Research., 5(1), 08–21.
21. Manickam N, Bhavan PS, Santhanam P, Muralisankar T, Srinivasan V. (2014) Seasonal Variations of Zooplankton Diversity in a Perennial Reservoir at Thoppaiyar. *Austin Journal of Aquaculture and Marine Biology*.1(1):1–7.).
22. Michael R.G. (1973) A guide to the study of freshwater organisms. J. Madurai Kamaraj University, India (Suppl.). pp. 1-186
23. Preston,N.D & Rusak,J.A (2010)Homage to Hutchinson: Does inter-annual climate variability affect zooplankton density and diversity.Hydrobiologia,653,165-177
24. Rao N.G. and V.S. Durve (1992). Structure and dynamics of zooplankton community in Lake Rangasagar, Udaipur, India. J. Environ. Biol 13 (3), 343-355. Edmondson, W.T. (1992) Freshwater Biology, II nd Edition, John Wiley and Sons, Inc., New York.
25. Saler.S (2004)Observation on the seasonal variation of rotifer fauna of Keban Dam Lake. Science and Engineering Journal of Firat University.16(4):695–701.
26. Santos-Wisniewski (2006) Santos-Wisniewski M, Rocha O, Guntzel A, Matsumura-Tundisi T. Aspects of the life cycle of Chydorus pubescens Sars, 1901 (Cladocera, Chydoridae) Acta Limnologica Brasiliensia.18(3):305–310.
27. Sharma, B.K and Michael, R.G (1987) Review on taxonomic studies on freshwater cladocera with remark on biogeography, Hydrobiologia,145,29-33
28. Shiel,R.J (1995) A guide to identification of rotifers, cladocerans and copepods from Australian inland waters. Albury: Co-operative Research Centre for Freshwater Ecology, Murray-Darling Freshwater Research Centre, pp. 1-142.
29. Sinha,R.K,(1992) Rotifer Population of Ganga Near Paba, Bihar (India) Proc. Nat. Acad. India-B, vol. 2. pp. 313-332.
30. Shukla, P., Preeti, & Singh, A. (2013). A seasonal variations of plankton population of Maheshara Lake in Gorakhpur, India. World Journal of Zoology, 8(1), 09–16.
31. Tayade, S.N. Dabhade D.S. (2011) : Checklist of rotifers in Washim District of Maharashtra, India. International Journal of Innovations in Bio-Sciences; Vol. 1, 27- 31