International Journal of Global Science Research **ISSN: 2348-8344 (Online)**
Vol. 5, Issue. 1, April 2018, pp. 628-634 **DOI**: 10.26540/ijgsr.v5.i1.2018.87
***Available Online* at www.ijgsr.com**

Review Paper

A Review on the studies of Zooplankton in the lotic water of India

Vaishno Devi Karra, Jyoti Sharma*, Anamika Malav, and Prahlad Dube**
Department of Basic and Applied Sciences, CPU University, Kota, Rajasthan, India
* Department of Zoology, Government College, Kota, Rajasthan, India
** Corresponding author Email: dube.prahlad@gmail.com

Received: 28/07/2017
Revised: 06/08/2017
Accepted: 20/08/2017

Abstract: Zooplanktons are microscopic free floating animals which play a vital role in aquatic ecosystem zooplanktons are highly sensitive to environment variation, as a result change in abudance species diversity or community composition can provide important indication of environmental health.in the present paper an extensive review of the literature available on zooplanktons in lotic water of India have been made which is a long felt necessity in this field.
Keywords: Zooplankton, lotic water, environment .

INTRODUCTION

Lotic refers to flowing water that includes river, spring, streams etc. In lotic water flow is unidirectional and there is a state of continuous physical change and the biota is specialized to live with flow condition. Rivers are important system of biodiversity and are among the most productive ecosystems on the earth because of the favourable conditions that supports number of flora and fauna.

Planktons are diverse group of organism that live in the water column of large bodies of water that cannot swim against a current. The plankton study is very useful tool for the assessment of biotic potential and contributes to overall estimation of biotic nature and general economic potential of water bodies.

Zooplankton: Zooplankton plays an important role in aquatic ecosystem. They link the primary producers, phytoplankton with higher larger trophic level organisms. Zooplankton communities respond to a wide variety of disturbances including nutrient loading and also play a key role in the aquatic food chain. The zooplankton plays an integral role and serves as bioindicator and it is a well suited tool for understanding water pollution status. So this paper deals with the studies of zooplankton in lotic water of India.

Odum (1971) discussed zooplankton is also sensitive to their environment and a change in zooplanktons concentration can indicate a suitable environmental change. The diversity of species, amount of biomass and

ISSN: 2348-8344 (Online)
DOI: 10.26540/ijgsr.v5.i1.2018.87

abundance of zooplanktons communities can be used to determine the health of an ecosystem.

Saldeek (1983) reported that among zooplanktons Crustaceans, Cladocerans and Copepods can be used as indicators of aquatic environment.

Allan and Dall (1991) reported zooplankton to be rich in essential amino acid and fatty acids docosahexacnoic acid and elcosaptaenoic acid. Guy (1992) studied ecology of the fish pond ecosystem with special reference to Africa. He discussed zooplanktons provides fish with nutrients since fish require proteins, fats, carobohydrates, mineral salts and water in the right proportion. Zooplanktons study is of necessity in fisheries, aquaculture and paleolimnological research. Bisht (1993) Reported maximum zooplanktons diversity in the month of September and minimum in the month of January. Dobriyan *et al.,* (1993) observed that the highest planktonic diversity was in the winter months when the water temperature is low, water current is low and the water is clear without turbidity.

Rosenberg and Resh (1993) discussed bio monitoring is the systematic use of living organisms or their responses to determine the quality of the environment. Brett *et al* (1994) investigated fresh water diversity of California and observed the species dependent effect of zoopanktons on the phytoplanktonic ecosystem and concluded that the presence of predaceous cladocerans and copepods have a direct effect on the presence of a several algae species, dissolved nutrients and the ciliate microzooplanktons. Bonner *et al* (1997) stated that most of the zooplanktons prefer either the steady or the low water current habitat. During monsoon season very less zooplanktons were observed because of high turbidity and fast water current.

Kobayash *et. al.,* (1998) reported the zooplankton density was negatively correlated with turbidity, conductivity, temperature and amount of phosphorus present.

In recent studies, biodiversity of zooplankton of nine different water bodies of South Rajasthan is studied by Sharma *et al.,* (2002) total 144 zooplanktonic forms were reported belonging to 3 phyla, 27 families, 64 genera and 105 species. Protozoa, Rotifera, Copepoda, Cladocera and ostracoda were represented by 13, 39, 22 and 6 forms respectively. Biodiversity in the zooplankton has been calculated in the Menhinick's index and values have been discussed in relation to physico-chemical characteristics and primary productivity. Dutta *et al.,*(2004) investigated fresh water diversity of Jammu and collected 51 species of zooplanktons belonging to 35 species of Protozoa, 8 species and 2 larvae of Crustaceae, 5 species of Rotifera, 1 species of Porifera, 1 species of Platyhelminthes and 1 species of Annelida. Zafar and Sultana., (2005) studied the river Ganga at Kanpur reported the zooplanktons and macroinvertebrate diversity and observed that the quality of the water was responsible for quantitative and qualitative variations in zooplanktons. Mathivanan *et al.,* (2007) studied plankton of River Cauvery water (Tamil Nadu) The qualitative and quantitative evaluation of the variation in river water showed high quantity of zooplankton population throughout the study period and rotifers formed dominated group over other groups organism. This study revealed that the water of River Cauvery is highly polluted by direct contamination of sewage and other industrial effluents.. Uttah *et. al,.* (2008) studied Biosurvey of planktons as indicators of water quality in River Calabar, Nigeria. They reported zooplanktons belonging to Copepods,

ISSN: 2348-8344 (Online)
DOI: 10.26540/ijgsr.v5.i1.2018.87

Protozoa, Polychaetalarvae, Cyclopodia, Cladocera, Arthrotoda, Ostracoda, Rotifera, Malacostraca and Foraminiferada. The Copepods were the most abundant group. Vanjare, *et al.,* (2010) studied zooplankton from a river Mula, Pune, Maharashtra. Rotifera and Cladocera are free living zooplankton elements known to dominate freshwater habitats. 18 Rotifers and 10 Cladocerans were recorded during this study. This study showed an attempt to monitor a polluted habitat for zooplankton.

Khanna *et al.,* (2012) studied the analysis of water samples for plankton diversity of river Ganga, In this study of river Ganga, among the zooplankton, Protozoa, Rotifera, Cladocera, Copepoda, Ostracods constitute the main component. Jos *et al.,* (2012) studied seasonal fluctuations in diversity of Zooplanktons of Achencovil River, Kerala. This study showed zooplankton community comprised of 28 species belonging to Cladocera 11species, Copepoda 9 species and Rotifera 8 species.This study also revealed that different groups of zooplankton have their own peak periods of density, which is affected by local environmental conditions Sharma *et al.,* (2012) studied fresh water Cladocera of South Rajasthan, India. This study shows cladocera are an important component of the crustacean zooplankton. Zooplankton samples from 77 different water bodies of South Rajasthan were analyzed to investigate the cladocera inhabiting these water bodies. During this study 54 species of cladocerans were reported, belonging to 6 families i.e. the Sididae, Daphinidae, Moinindae, Bosminidae, Macrothricidae and chydoridae. It was noticed that rich nutrients, the presence of weeds and shallow waters favoured rich diversities of cladocerans Sudha Summarwar (2012) investigated the plankton diversity in Thadoli area of Bisalpur reservoir.During this study the most pollution tolerant species of Oscillatoria, Euglena and Navicula were recorded. Rotifers of genus Brachionus and keratella are abundant in water of the reservoir. Their occurrence in eutrophic water is well documental. Tidame and Shinde (2012) studied the zooplankton diversity of Nasik District. Different Zooplanktons were noticed during the study period, amongst them rotifers are more dominant. Total 17 genera were recorded from rotifers and genus Brachionus in abundant and more common to both the ponds. In Amrutkund 21 species of rotifers were recorded belonging to 15 genera while in pond Ramkund 23 species to 14 genera. The maximum diversity of rotifers was observed in the monsoon season in both Amritkund and Ramkund Pond. Dubey *et. al.,* (2012) Limnological studies on khop niwari tank with special reference to phytoplanktons.

Kohle *et al.,* (2013) studied qualitative and quantitative evaluation of the variation in Godavari River Nasik district. Rotifers formed dominated group over other group of organism. This study revealed that the water of river Godavari is contaminated of sewage and other industrial effluents. Komala *et al.,* (2013) studied plankton diversity and abundance of Arkavathi River before and after pollution. Plankton diversity and abundance varied during different seasons, both at non-polluted and polluted sites. A total of 27 species of Zooplanktons were recorded belonging to Protozoa 6 species, Rotifera 8 species, Crustacea 8 species and Insecta 5 species.Nutrient enrichment of the river due to silk industries effluents has altered the structure of plankton community.

Negi and Mamgain,. (2013) studied zooplanktons diversity of Tons river of Uttarkhand. They reported 23 genera of zooplanktons belonging to 7 major groups viz. Ciliophore, Cladocera, Copepod,

ISSN: 2348-8344 (Online)
DOI: 10.26540/ijgsr.v5.i1.2018.87

Porifera, Rotifera, Ostracod and Zooflagellate. Singh, (2013) studied biodiversity of river Gomti is heavily affected by pollution. Planktons are important biological parameters to access the pollution level. This study shows biological productivity as ecological indicator to identify the ecological quality of river Gomti. . The zooplankton community comprised Protozoa 5 species, Rotifera 3 species, Cladocera 2 species and Copepoda 1 species. The zooplankton population was observed maximum during monsoon season but it was low in summer season.

Umadevi (2013) studied the abundance, composition and distribution of zooplankton in relation to water quality parameters in Karanja River in Karnataka. 36 species of zooplankton were identified as a total, which included 14 species of Rotifera 11 species of Cladocera 8 species of Copepoda and 3 species of Ostracoda. Watkar and Barbate (2013) studied zooplankton diversity of River Kolar, Saoner, District. Nagpur, Maharashtra. This study revealed 28 species of zooplankton belonging to five major group Janmoni *et al.,* (2014) studied zooplankton diversity of the two rivers Kaliani and Dhansiri receiving oil refinery effluent from NRL. A total of 11 genera of zooplankton belonging to 5 groups. Cladocera, Copepoda, Ostracoda, Protozoa and Rotifera. This study revealed seasonal variations of zooplankton abundance were pre monsoon (29%) Post Monsoon (25%), winter 25% and monsoon (21%). Sarwade and Kamble (2014) studied Quantitative assessment of plankton of the river Krishna, District, Sangli, Maharashtra. Diversity of Zooplankton included, Cladocera, Rotifera, Protozoa, Nematoda, Aostraca, Schizopyrenide and copepoda as major groups, with 25 genera. Rotiferans were found dominant with 9 species. Protozoans were second dominant group with 8 diversified species.Cladocerans included 2 species. Nematoda, Aostraca and Schizopyrenida each showed 1 type of species.Copepoda showed 3 types of species. Dede and Deshmukh (2015) studied the zooplankton composition and seasonal variation in Bhima river near Ramwadi Village, Sholapur District. A total of 21 species were found in this river. These belongs to Cladocera, rotifer, Copepoda and Ostracoda. Among these 9 species belongs to Rotifera, 5 species belongs to Copepoda, 5species belongs to Cladocera, 3 species belongs to Ostracoda.Rotifera was found dominant group. The study of season wise zooplankton analysis showed an average abundance of species in winter season, lower in monsoon season and maximum occurrence in summer season, due to different environmental condition of water bodies. Eyo and Paul, (2015) studied great KWA River, Nigeria. They astimeted a total of 23 species of zooplanktons belonging to 5 taxonomic groups viz. Rotifera, Arthropoda, Palaemonidae, Ciliophora and Annelida. Rotifera was the most abundant group and Annelida was least represented groups.

Kumar and Khare (2015) studied diversity of plankton and their seasonal variations of density in the Yamuna River at Kalpi This study revealed that zooplankton were belong to 22 species of genera, Cladocera 5 species of 5 genera, Copepoda 2 species of 2 genera.Among recorded zooplankton Rotifers population was dominant during entire study span. Bislab and Kar (2016) studied Diversity of zooplankton in river Siang of Arunachal Pradesh, India. They estimated 24 different genera of zooplanktons among which Protozoa were represented by 5 genera, Rotifera by 7 genera, Cladocera by 5 genera, Ostracoda by 1 genus, and Copepoda by 5 genera. Bishnoi and Sharma (2016) studied Planktonic variations in a lotic water body of shri

ISSN: 2348-8344 (Online)
DOI: 10.26540/ijgsr.v5.i1.2018.87

Ganganagar district, (Rajasthan) The zooplankton of gang canal comprises of 6 genera out of which 3 belong to the Rotifera, 2 to Cladocera and 1 to Protozoa. The zooplankton assemblage of the Gangcanal is contributed primarily by Cladocerans and Protozoans Rai *et al.,* (2016) Studied plankton composition, seasonal variation and diversity indices in river Narmada at Jabalpur region. Plankton diversity is one of the most important ecological parameters in water quality. The zooplankton comprises of Phylum Rotifera, Cladocera, Copepoda and Protozoa A total of 23 species of zooplanktons were recorded belonging to Rotifera 7 species, Cladocera 4 species, Copepoda 5 species and Protozoa 7 species. Chanchala *et al.,* (2017) studied zooplankton diveresty of river temari at Jabalpur district.They reported total 34 species of zooplanktons belonging to 6 species of Protozoa , 11 species of Rotifera, 6 species of Copepoda, 2 species of Ostracoda and 9 species of Cladocera. Robiul *et al.,* (2017) studied diversity indices of plankton communities in the river meghna of Bangladesh. Their study revealed zooplankton of Rotifer, Copepods, Cladocera, and Ostracoda as major groups. The highest number of genera was found in the family Copepoda and Cladocera

Conclusion: Above review of the literature on zooplankton showed that the Indian as well as foreign researches have made zooplanktons a subject for their studies and published both the good amount of research papers and books .The above description shows clearly that almost every part of the country has got perennial rivers and diversity of zooplanktons has been reported both taxonomically and ecologically. Even though the subject has been studied extensively yet many rivers and their accessory river are simply remain unstudied. This paper revels some of such pockets which should be studied and analyzed urgently.

REFERENCES

Odum E. P. (1971) Fundamentals of Ecology, 3rd ed. WB Saunders Co. Phil, USA, 574.

Saldeek V. (1983) Rotifers as indicators of water quality. Hydrobiologia, 100, 167-201.

In Allan G. I. and Dall W. (EDS) (1991) Proceedings of the Aquaculture Nutrition Workshop Salamander bay.

Guy D. (1992) The ecology of the fishpond ecosystem with special reference to Africa. Pergamon Press : 220-230.

Bisht K. L. (1993) Environmental parameters and sessional succession pannktonic biomass in the river Pinder of Garhwal Himalaya. In: Advances in limnology, (Ed) Singh, H.R. : 103-170.

Dobriyal A. K., Bahuguna A. K., Kumar N., and Kotmala C. B. (1993) Ecology and sessional diversity of planktons in a spring fed stream Khandagad in Garhwal Himalaya in : Advances in limnology (Ed) Singh, H.R.. Narendra publishing house, New Delhi : 175-180.

Rosenberg, D. M. and Resh V.H. (EDS) (1993) fresh water Biomonitoring and Benthic Macro Invertebrates. Chapman and hall, New York 488.

Brett, M. T., Elser J. J. and Goldman C. K. (1994) The species dependent effect of zooplankton on microplanktonic in the Castle Lake, California. Ecological Society of America, Ecology 8, 2443-2452.

Bonner, L.A., Walter W. J. M, and Alliz R. (1997) Physical, Chemical and Biological dynamics of five temporary dystrophic forest pools in central Mississippi. Hydrobiologia, 357, 77-89.

Kobayash T., Shiel R. J. Gibbs P. and Dixon P. I. (1998) Fresh water zooplankton in the Hawkesbury Nepean River: comparison of community structure with other rivers. Hydrobiologia. 377, 133-145.

Sharma M. S., Singh B., Sharma V. Malara H. and Sharma R. (2002) Diversity of Zooplankton in relation to specified hydrological conditions.

Dutta S. P. S., Mir, A. M, Kiran, Sharma K. (2004) Ecology of Plankton in some paddy fields of Miras Saheb, Jammu, Aquaculture. 5(1). 1-10.

Zafar A., and Sultana, N. (2005) Zooplankton and macroinvertebrata of river Ganga at Kanpur, Uttarpradesh. J. Zool., 25(1), 63-66

Mathivanan V., Vijayan P. Sabhanayakam S. and Jeyahitra, O. (2007) An Assessment of plankton population of cauvery river with reference to pollution. J. Environ. Biol., 28(2), 523-526.

Uttah E. C., Uttah C., Akpan P. A., Ikpeme E.M., Ogbeche J., Usip L. and Asor J. (2008) Bio-Survey of Plankton as indicators of water quality for recreational activities in Calabor river, Nigeria. J. App. Sci. Environ. Manage, 12(2), 35-42.

Vanjare A. I., Padhye S. M. and Pai K. (2010) Zooplankton from a polluted River, Mula (India), with record of Brachionus rubens epizoic on Moina Macrocopa. Opusc. Zool. Budapest, 41 (1), 89-92.

Khanna D. R., Bhutiani R., Matta G., Singh V. and Bhadauriya G. (2012) Study of Planktonic diversity of river Ganga from Dev Prayag to Roorkee, Uttarakhand (India). Environment Conservation Journal, 13 (1 and 2), 211-217.

Jose R. and Sanalkumar M. G. (2012) Seasonal Variations in the Zooplankton Diversity of River Achencovil, Kerala, India. International Journal of Scientific and Research Publications 2(1), 1-5.

Sharma V., Verma B. K., Sharma R., Sharma M. S. and Gaur K. S. (2012) A report on the freshwater cladocera (crustacea: Branchiopoda) of South Rajasthan, India. International Journal of Environmental Sciences, 3(1), 275-296

Tidame S. K. and Shinde S. S. (2012) Seasonal Variation in rotator diversity of temple ponds of Nasik District, (Maharastra), India. International Multi-disciplinary Research Journal, 2(5), 19-22

Dubey A. K., Shukla S. K.and Bharti M.D. (2012) Limnological studies on khop niwari tank with special reference to phytoplanktons. International Journal of Research in Pharmaceutical and Biomedical Sciences.3 (2) 631-636, ISSN 2229-3701.

Kohle B. G., Zambare S.P. and Rane M. S. (2013) An estimation of plankton population of Godawari River with Reference to Pollution. Bioscience Discovery, 4(1), 117-120.

Komala H. P., Nanjunadaswamy L. and Devi Prasad A.G. (2013) An assessment of plankton diversity and abundance of Arkavathi River with reference to pollution, Advances in Applied Science Research, 4(2), 320-324

Negi R. K., and Mamgain S. (2013) Zoopankton diversity of Tons river of Uttarkhand state, India. International Journal of Zoology and Research, 3(2), 1-8.

Singh P. (2013) Seasonal status of density of phytoplankton and zooplankton in Gomti River of Lucknow (U.P.) India. Journal of Applied and Natural Science, 5(1), 58-62.

Umadevi T., (2013) Limnological Investigation and Zooplankton Diversity of Karanja River, Karnataka. International Journal of Science and Research, 2(3), 134-136.

Watkar A. M. and Barbate M. P. (2013) Studies on Zooplankton Diversity of River Kolar, Saoner, District, Nagpur, Maharasthra. Journal of Life Sciences and Technologies 1(1), 26-28.

Janmoni M., Baruah D. and Biswas S.P. (2014) Study on Zooplankton Diversity of Rivers Kaliani and Dhansiri Receiving Petro chemical effluent from NRL, Assam, India International Journal of Advanced Technology in Engineering and Science. 2(9), 259-263.

Sarwade A. B. and Kamble N. A. (2014) Plankton diversity in Krishna River Sangli, Maharashtra. Journal of Ecology and the Natural Environment, 6 (4), 174-181.

Dede A. N. and Deshmukh A. L. (2015) Zooplankton composition and seasonal variation in Bhima River, Ramwadi Village, Solapur District, Maharastra, India. International Journal of current microbiology and applied sciences, 4(3), 297-300.

Ekpo Eyo, A., and Paul A. J. (2015) Planktonic Abudance and diversity in great KWA river, Cross river State, Nigeria. International Journal of Innovative Science Engineering and Technology, 2(9).

Kumar M. and Khare P. K. (2015) Diversity of Plankton and their Seasonal Variation of Density in the Yamuna River at Kalpi, Dist. Jalaun (U.P.) India. Journal of Global Biosciences, 4(7), 2720-2729.

Bislab K. D., Devashish Kar (2016) Diversity of zooplankton in river Siang of Arunachal Pradesh,India t. Fish and Ocean Opj.,1(2), 555-558.

Bishnoi R. K. and Sharma B. K. (2016) Planktonic Variations in a lotic water body of Shri Ganganagar District, (Raj.) International Journal of Fauna and Biological Studies, 3(1), 134-139.

Rai S., Shivani R., Shukla A. and Ahirwar B. K. (2016) Plankton Diversity, Seasonal Variation and population dynamics in River Narmada at Jabalpur Region (M.P.) International Journal of Current Agricultural Sciences, 6 (4), 11-16.

Chanchala Shiv, Shrivastava R. K., and Dube K. K. (2017) Studies on zooplankton diversity of river Temar district Jabalpur, M.P,India.International Journal of Interdisciplinary Research and Innovations 5(2), 29-33.

Robiul, A. H., Pramanik M. H. and Hasan M. (2017) Diversity indices of plankton communities in the river Meghna of Bangladesh. International Journal of Aquatic studies, 5(3), 330-334.