ISSN: 0976-3031

Available Online at http://www.recentscientific.com

International Journal of Recent Scientific Research
Vol. 7, Issue, 11, pp. 14431-14434, November, 2016

International Journal of Recent Scientific Research

Research Article

STUDIES ON ZOOPLANKTON POPULATION OF CAUVERY RIVER BASIN WITH REFERENCE TO POLLUTION AT NAGORE COASTAL REGION, SOUTHEAST COAST OF TAMILNADU

Bhuvaneswari R and Serfoji P*

Department of Zoology, Government Arts College (Autonomous), Kumbakonam, India

ARTICLE INFO

Article History:

Received 10th August, 2016
Received in revised form 14th September, 2016
Accepted 08th October, 2016
Published online 28th November, 2016

Key Words:

Rotifer, Cladocera, Zooplankton population, Pollution and Aquatic ecosystem.

ABSTRACT

Zooplanktons are heterotrophic planktonic animals floating in water. They serve as good indicators of changes in water quality. Studies on zooplankton of Cauvery river basin Nagore, Nagapattinam District, Tamilnadu. To assess the zooplankton population in pollution water from October 2015 to September 2016. The qualitative and quantitative evaluation of the variation in Cauvery river basin water showed high quantity of zooplankton population throughout the study period, the rotifer species formed dominated group over other groups of organisms. The present study revealed that the water of Cauvery river basin is highly polluted by direct contamination of sewage and other industrial effluents. Hence, the present study has been undertaken to examine the effect of pollutants and to assess the zooplankton population in Nagore Cauvery river basin at Station I and Station II Nagore Pattanachcheri village.

Copyright © Bhuvaneswari R and Serfoji P., 2016, this is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Zooplanktons are very sensitive to the aquatic environment they live in any alteration in the environment leads to the change in the plankton communities in terms of tolerance, abundance, diversity and dominance in the habitat. Therefore, zooplankton population observation may be used as a reliable tool for biomonitoring studies to assess the pollution status of aquatic bodies. The study of zooplankton as an index of water quality with respect to industrial, municipal and domestic pollution has been reported earlier. The present investigation was carried out on the surface zooplankton population in the aquatic ecosystem of Cauvery river water. The industrial effluents from fiber boat industry, dry fish form issue in and around Nagore coastal region contain numerous toxic substances once entered into the river Cauvery affecting the water quality. As a consequence, the zooplankton populations of the Cauvery river basin have been affected in terms of abundance and diversity. The present study is aimed at evaluating the zooplankton index as the water quality criteria with reference to Brackish water bodies polluted by various industries at Nagore coastal region.

Coastal marine environments are reported to have greater biodiversity than open ocean regions and majority of world's most productive marine ecosystems are found within coastal environments and owe their productivity, diversity and wealth of life to their terrestrial adjacency. Therefore marine water quality plays an important part in the conservation of marine resources, which contribute to the stability of the marine ecosystem. However, Pollution from land-based sources as well as from the sea can be detrimental to these invaluable resources. In recent years, coastal environment including estuaries are subjected to increased pollution stresses originating mainly from land-based human activities such as disposal of agricultural, industrial, municipal, domestic and other wastes/ in substantial quantities. The impacts of pollution changes in coastal regions are seriously degrading them, decreasing their aesthetic and economic value and in many cases, endangering public health and safety, as well as threatening the living resources. Therefore, it is important to monitor the various physico-chemical parameters as a preliminary step to assess the pollutants and their impact because water quality criteria have key roles to play in the management and protection of marine community from the ill effects of pollutants. A well planned and executed water quality monitoring system is required to predict the changes in the quality of any particular water bodies so that, curative or preventive measures can be taken to restore and maintain ecological balance in that water body.

Zooplankton consist of Protozoans, Cladocera, Copepod, Rotifers, etc. which may serve as indicators of water quality. The zooplanktons play an important tropic level in the aquatic ecosystem as they constitute the most import link in the energy

**Corresponding author: Serfoji P*
Department of Zoology, Government Arts College (Autonomous), Kumbakonam, India

transfer between phytoplankton and higher aquatic fauna (Iloba, 2002). In ecologically zooplankton is one of the most important biotic components influencing all the functional aspects of an aquatic ecosystem such as food chains, food webs, energy flow and cycling of matter (Park and Shin, 2007). Zooplankton diversity responds rapidly to changes in the aquatic environment. Several zooplankton species are served as bio indicators (Ahmad *et al*., 2011, Mola, 2011). Among the zooplankton, rotifers respond more quickly to environmental changes and used as changes in water quality. Cladocerans are tiny aquatic crustaceans and are also known as water fleas. They are highly responsive against pollutants and hence serve as good biological indicators of water pollution. Copepods have been known to the most abundant zooplankton in the river systems. They dominate most aquatic ecosystems because of their resilience and adaptability to changing environmental conditions and ability to withstand varying environmental stresses. They are high in stable environmental conditions and disappear as pollution level increases.

MATERIALS AND METHODS

The study area (Figure-1) is located Cauvery river basin region at Nagore Pattanachcheri village the southern part of Bay of Bengal in South East coast of Tamilnadu, India. It is extending from 10º 30' to 10º 55'N latitude and 79º 45' to 79º 55' E longitude and medium tropical transition climate, characterized by monthly average temperature of above 27º C. The relative humidity ranges from 70 – 77%. The Nagore brackish water is situated near Nagapattinam on the east coast of India. The Nagore brackish water has its source in the Cauvery river basin of Tamil Nadu. It has a year - round connection with the sea.

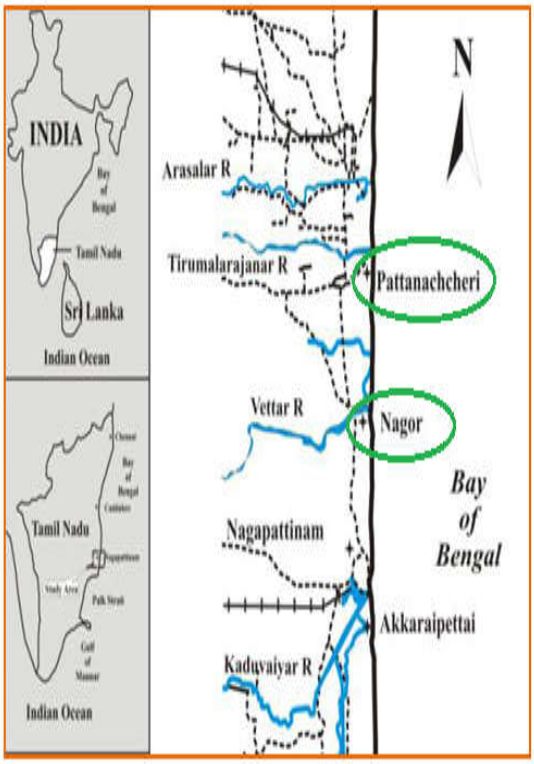

Figure 1 Study area map

This river flows in to the Bay of Bengal, near Nagapattinam of Tamil Nadu. In the harbor at Nagore, there are about many hundreds of mechanized boats and catamarans, employed for fishing. In the fishing vessels they are using paints and fuels from it the waste materials are released in to the harbor area. The domestic sewages agricultural drainages and the other sewage effluents are carried out into the Bay of Bengal through the small canals and rivers. No paper has been published on the zooplankton population in pollution water in Nagore coastal region. Hence, the present study has been undertaken to examine the effect of pollutants and to assess the zooplankton population in Nagore. Station I is Nagore Cauvary river basin and Nagore Pattanachcheri village is Station II. Monthly samplings were made during forenoon from October 2015 to September 2016 for four seasons viz. monsoon (October-December), post-monsoon (January-March), summer (April-June) and pre-monsoon (July-September).

Zooplankton Analysis

Zooplankton samples were collected by standard methods from predetermined sampling sites from the point of effluent outfall along with the downstream water stretch, arbitrarily designed two stations from October 2015 to September 2016. The water is collected at the sampling site in bottles or water samplers of 5 to 20 litre capacity. The sterile bottles should be preferred. Surface water can be collected by scooping water into the bottle of suitable size. While collecting the water samples, there should be minimum disturbance of water to prevent avoide the reaction by zooplankton. The Von Dorn bottles or water samplers with closing mechanisms are commonly used for obtaining samples from the desired depths. The zooplankton are then concentrated by allowing them to settle, centrifuging or fine filtration. The advantage of this method is that it is easy to operate and sampling depths are accurately known. The disadvantage is that the amount of water filtered is less. The most common fixing and preserving reagent is (4-5%) formaldehyde (formalin) and brought to the laboratory for zooplankton analysis. It would be better to store the preserved zooplankton samples in well ventilated room at temperature less than 25°C. The samples should be kept in the wide mouth glass jars. A good quality preprinted labels, on which the collector's name, fixative and preservative used and other field information are written should be put into the jars for ready reference at the time of sample analysis. Species diversity index was obtained by following Shannon Weaver methodology.

RESULTS AND DISCUSSION

Zooplankton: zooplankton species were identified and are given in Table 1 and 2 for station I and II respectively. Zooplankton was represented by Rotifera, Cladocera, Protozoa and Copepods. Among the plankton Rotifer was dominated and followed by Copepods, Protozoa and Cladocerans. In the ecosystem, zooplankton plays a main role as they consume the primary producers (phytoplankton) and form a major food source for tertiary producers. Zooplankton considered as the basic principle natural fish food for young and some adults of organisms, which support fish production (El-Serafy *et al*., 2009). The zooplanktons often respond immediately to environmental changes because most of the species have short generation times. Epifanio and Garvine (2001) studied by the variations of their spatial distribution, based on different

factors. The higher population density of the zooplankton is during the both monsoon periods while low population density observed in the summer and post monsoon. Among the plankton Roitifera is dominated. The zooplankton populations dominated by Rotifers in the wet season. The high population density in the monsoon period may be as a result of abundant food sources from the runoff.

Station I (Nagore Cauvery river basin): The zooplankton species encountered at Station I (Fig. 2) and their month wise distribution are presented in Table 1 and Fig. 4. A total of 55 no. of species were recorded from this station, of which, 18 species belonged to cladocera, 14 species to rotifera, 13 species to copepoda and 11 species to protozoa. The maximum population density (86) was observed in August and minimum (29) in December. The annual mean percentage composition of different groups of zooplankton showed that rotifera contributed 26%, cladocera 32%, copepoda 22% and protoza 20% (Fig. 5).

Figure.2 Cauvery river basin (station-1)

Figure 3 Nagore Pattanachcheri village (Station II)

Station II (Nagore pattanachcheri village): A total of 51 species of zooplankton were identified from this station (Fig. 3) of which, 13 species belonged to cladocera, 14 to rotifera, 12 to copepoda and 12 to protoza. The monthly occurrence of various zooplankton species during the present study are shown in Table 2 and Fig. 4. The total zooplankton population density varied from 44 during February to 64 in August. The annual mean percentage composition of zooplankton groups showed that rotifera contributed 27%, cladocera 26%, copepoda 24% and protozoa 23% (Fig. 6).

Table 1 Population composition and monthly fluctuation of zooplankton at Station - I (organisms/ml) from October 2015 to September 2016

Month	Cladocera	Copepoda	Rotifera	Protozoa	Total zooplankton
October	24	10	06	12	52
November	12	05	11	13	41
December	09	07	06	07	29
January	18	13	12	16	59
February	21	22	13	09	65
March	10	09	08	09	36
April	09	10	13	06	38
May	08	07	09	08	32
June	15	09	16	22	62
July	23	14	24	11	72
August	31	22	26	07	86
September	29	20	24	09	82
Mean	**17.4**	**12.3**	**14**	**11**	**55**

Table 2 Population composition and monthly fluctuation of zooplankton at Station - II (organisms/ml) from October 2015 to September 2016

Month	Cladocera	Copepoda	Rotifera	Protozoa	Total zooplankton
October	14	12	12	11	49
November	11	13	15	13	52
December	19	13	16	12	60
January	13	13	12	13	51
February	11	10	13	10	44
March	13	12	16	10	51
April	12	13	12	11	48
May	11	10	15	12	48
June	12	11	12	11	46
July	13	13	12	12	50
August	15	12	18	19	64
September	17	14	10	12	53
Mean	**13.4**	**12.1**	**14**	**12.1**	**51.3**

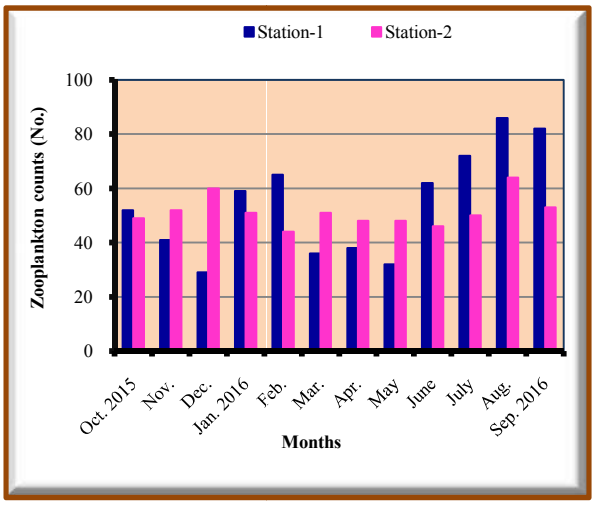

Figure 4 Total Zooplankton population in Cauvery river basin, Nagore during October 2015 to September 2016 (Station I and Station II)

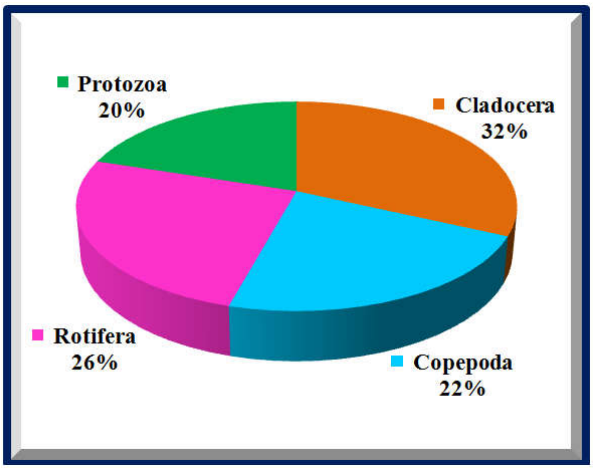

Figure 5 Annual mean percentage composition of Zooplanktons at Nagore Cauvery river basin during October 2015 to September 2016 (Station-I)

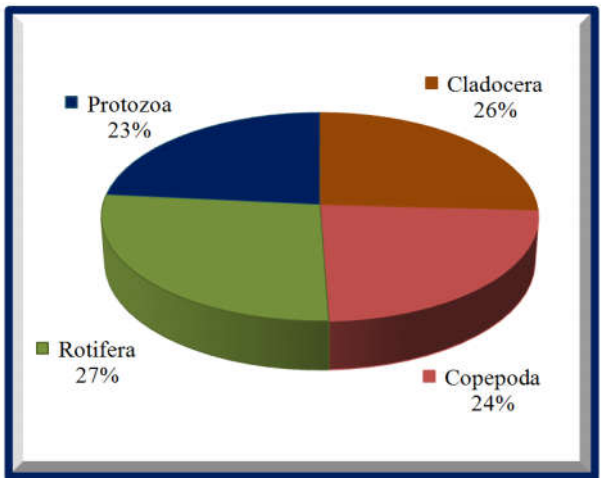

Figure 6 Annual mean percentage composition of Zooplanktons at Nagore Pattanachcheri village during October 2015 to September 2016 (Station-II)

The knowledge of zooplankton species composition and distribution to time and space are of great value especially in any running water system. The present study reveals some aspects of zooplanktonic dynamics to explain their relations with the physicochemical parameters of Cauvery river basin, Nagore. The zooplankton population also fluctuates monthly (Biswas and Konar, 2001), productivity was high during August and low during December in this study area. The reason might be due to heavy rain as evidenced by (Sadguru *et al*., 2002). The predominance of rotifers and copepodes over the other groups of zooplankton observed in the present study has also been reported earlier in various rivers (Mukhopadhysay *et al*., 2000; Prakash and Srivastava, 2001). Thus, the influence of nutrients of water on the zooplankton population has been reduced in Station II as compared to Station I.

CONCLUSION

The present study was zooplankton population of Cauvery river basin at Nagore coastal region, Nagapattinam district. The study regions were highly polluted such as different industrial effluent, dry fish form issue, constriction of stream boat and domestic sewages. Even through the zooplanktonic population level is high and fluctuates in this region, like Cladoceran species high level in station I and Rotifers species high level in station II. We must protect of this region because of the very good medium for aquatic resources. In the present investigation, this observation clearly revealed that zooplankton represents a sensitive indicator of pollution.

References

Ahamad, V., Parveen, S., Khan, A.A., Kabir, H.A Mola, H.R.A. and Ganai, A.H. (2011): Zooplankton population in relation to physiochemical factors of the sewage fed pond of Aligarh (U.P) India. Biol. Medic., 3: 336-341.

Biswas, B.K. and S.K. Konar, (2001): Influence of hazardous industrial wastes on plankton in the river Damodar at Durgapur in West Bengal. Pollut. Res., 20(4), 583-588.

El-Serafy, S.S., Mageed, A.A. and EL-Enany, H.R.(2009): Impact of food, water on the distribution of zooplankton in the main channel of Lake Nasser, Egypt. J. Egypt. Acad. Soc. Environ. Delop, 10: 121-141.

Epifanio, C. E. and R.W. Garvine (2001): Larval transport on the Atlantic continental shelf of North America. Estu. Coast, Shelf. Sci., 52: 51-77.

Iloba, K. I. (2002): Vertical distribution of Rotifera in the Ikpoda reservoir in southern Nigeria. Tro. Fres. Bio, 11: 69-89.

Mola, H.R. (2011): Seasonal and Spatial distribution of Brachionus (Pallas, 1966; Eurotatoria: Monogoranta: Brachionidae), a bioindicator of eutrophication in Lake El-Manzalah, Egypt. Biol. Medi. 3: 60-69.

Mukhopadhysay, S.K., A. Gupta and R. Chattopadhyay, (2000): Rotiferan community structure of a tannery effluent stabilisation pond in east Culcutta wetland ecosystem. Chem. Eng. Res., 9, 85-91.

Park, K.S. and Shin, H.W. (2007): Studies on phyto- and-zooplankton composition and its relation to fish productivity in a west coast fish pond ecosystem. *J. Env. Biol*., 28: 415-422.

Prakash, S. and R.R. Srivastava, (2001): Effect of hydrological parameters on the population of cladoceran and copepods of Motisagar tal. Balrampur, UP. Acta Ecol. 23(1).

Sadguru, Prakash, K. Khalid and K. Ansari, (2002): Seasonal dynamics of zooplankton in a fresh water pond developed from the waste land of brick kiln. Pollute. Res., 21(1), 81-83.

****

How to cite this article:

Bhuvaneswari R and Serfoji P.2016, Studies on Zooplankton Population of Cauvery River Basin With Reference To Pollution At Nagore Coastal Region, Southeast Coast of Tamilnadu. *Int J Recent Sci Res.* 7(11), pp. 14431-14434.