Zooplankton population in four different stations of river Thamiraparani, Kanyakumari District, Tamilnadu, India

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Abstract : Zooplankton has great importance as biological indictors of freshwater ecosystem. The present study was made to evaluate the zooplankton population of Thamiraparani river, Kanyakumari District, Tamilndu from February 2009 to January 2010. Results revealed the presence of various zooplanktons at large numbers in all four selected stations. Five groups of zooplankton namely rotifer, cladocera, copecoda, ostracoda and ciliata were predominant in all four stations.

Keywords: Zooplankton, population, Thamiraparani river

I. INTRODUCTION

Zooplanktons are very minute aquatic organisms that are weak swimmers or non motile and they drift in water column of seas, ocean, or fresh water bodies to move great distance. These play significant role in food web by linking the primary producers and higher trophic levels. Zooplankton consumes phytoplankton and transfer > 50% of carbon fixed by primary production to the higher trophic levels [1]. The zooplankton in freshwater environment comprises Rotifers, Protozoa and Arthropoda (Copepods, Cladocerans and Ostracods). Among the groups, rotifers are the very important soft-bodied metazoans having a short life span among the plankton. These are also called as "pioneer organisms" because rotifers first appear in newly created water bodies [2]. More than 100 rotifer species are planktonic forms and their life cycles are significantly influenced by food, temperature and photoperiod. They reproduce in large numbers under favourable environmental conditions [3]. Availability of nutrients is the predominance of copepods and rotifers [4]. In inland waters, rotifers, mainly *Brachionus* sp. constitute an important link in the food chain. Rotifers are considered preferred food for many fish larvae. These were represented by many species of *Brachionus* and others, indicating eutrophicated status in the particular ecosystem [5]. In freshwater ecosystem, zooplankton population play vital role in food web and transfer of organic matter from primary producers to secondary consumers like fishes. Zooplankton also helps to determine the quantum of fish stock and the failure of fishery resources is mainly attributed to the low copepod population [6]. Species diversity indices of zooplankton communities are very much used to evaluate water quality with respect to municipal, domestic and industrial pollution [7].

II. MATERIALS AND METHODS

Zooplankton collection

Zoooplankton samples were collected monthly from the four stations of the river Tambraparani for a period of one year, February 2009 to January 2010. The collections were made early morning by using a standard plankton net with 30 cm mouth diameter and length of 1 M. 100 litre of water was filtered and the filtrate was put into a clean labelled plastic containers. The volume of the concentrate was adjusted to 100 ml and it was preserved immediately with 4% formalin for zooplankton analysis.

Analysis of Zooplankton

Zooplankton species identification was carried out using standard protocol and guidelines.

Sample collection

Samples were collected from four different stations. The first sampling station is Pechiparari (8º 26′ 52.3″N and 77º 18′30.4″E). The second sampling station is Moovatumugam (8°33′387″N and 77°28′511″). The third sampling station is Kuzhithurai (8.31′29° N, 77.20′41° E) and the fourth sampling station is Parakani (8.32′29° N, 77.22′41° E).

III. RESULTS

In this study, the zooplankton from the order, copepod, rotifer, cladocera, ciliate and ostracoda were oserved. In this station, five groups of zooplankton namely rotifer, cladocera, copecoda, ostracoda and ciliata were obtained. In this station, rotifer population varied from 8 ± 1 to 64 ± 11 and cladocera population varies from 33 ± 4 to 72 ± 9 individuals. The copepod population varies from 12 ± 2 to 47 ± 33 individuals. The ostrocoda population varies from 3 ± 1 to 17 ± 2 individuals and the ciliates ranged from 7 ± 1 to 22 ± 1. Rotifers population was high in the month of September (64 ± 11) and cladoceran population was found to be high in the month of August (72 ± 9). The copepodans population was high in November 2009 (47 ± 3) and was low in June 2009 (17 ± 2). The population of ciliates was high in the month of August 2009 (12 ± 1). The total zooplankton population was 162 ± 13, 180 ± 11 and 156 ± 12, respectively in the month of August, September and October. Among the zooplankton species, the total individuals of zooplankton were 322 ± 28, 509 ± 41, 355 ± 33, 117 ± 18 and 176 ± 12, for rotifera, cladocera, copepoda, ostracoda and ciliata, respectively. A sum of 1479 ± 61 zooplankton individuals was registered in station I.

In station II, rotifer population varies from 19 ± 2 to 99 ± 4. The Cladocerans population varies from 22 ± 1 to 64 ± 2 and the copepods were ranging from 23 ± 3 to 66 ± 4. Ostracoda was found to be maximum (24 ± 3) in December and was low in September (2 ± 1). The ciliate population was maximum in April – 2009 (17 ± 2) and was low in October 2009 (6 ± 1). The total individual of rotifer, cladocera, copepod, ostrcoda and ciliata were 578 ± 28, 544 ± 15, 560 ± 29, 126 ± 44, and 133 ± 28 respectively. A total of 194 ± 18 individuals were reported in this station. In station III, rotifera population ranged from 16 ± 1 to 62 ± 5. The cladocerans population ranges from 14 ± 2 to 56 ± 3. The copepods ostacodens and Ciliates population varied from 36 ± 1 to 97 ± 6, 10 ± 2 to 41 ± 4, 11 ± 3 to 44 ± 3, respectively. In this station, 408 ± 13 individuals of rotifers, 407 ± 14 number of cladocerans, 698 ± 9 numbers of copepodans, 296 ± 18 number of Ostracodan and 303 ± 21 number of ciliata were registered. A total of 2121 ± 47 individuals of zooplankton were registered in this station during the study period. In station IV, the rotifera population varied from 13 ± 2 to 41 ± 4. The cladocera, copepoda, ostrcoda and ciliata population varies from 4 ± 1 to 18 ± 3, 32 ± 4 to 128 ± 7, 2 ± 1 to 18 ± 3 and 12 ± 2 to 50 ± 4, respectively. The total rotifer population was 286 ± 13 and 116 ± 9 individuals of cladocerans were observed. A total number of copepods, ostracodans and ciliates were 982 ± 21, 123 ± 12 and 344 ± 10 individual during the study period in station IV.

IV. DISCUSSION

Zooplankton has great importance as biological indictors of freshwater body. The pattern of zooplankton distribution, abundance, periodicity, and growth in various aquatic habitats has been great interest for many researchers in India [8]. Zooplanktons move from bottom to the surface water at the approach of darkness [9]. Light intensity is considered as the one of the critical factor in addition to the pressure, temperature, predation and gravity on zooplankton population [10]. Copepods, cladocerans, rotifers and ostracods constitute the significant groups of zooplankton, which occupy an important position in the food web and mediate the transfer of energy from lower trophic level to higher trophic levels. Rotifers are the very important metazoans having a short life span among the zooplankton. In India, only 100 species were reported among rotifers. Rotifers are plankton feeder and their life cycles are greatly influenced by food, temperature, and photoperiod. Among zooplankton, cladocerans are a crucial group and it plays significant role in food chain. These zooplanktons are highly sensitive against even lower concentration of contaminants. Copepods have strong exoskeleton among zooplankton, follow omnivorous or carnivorous mode of nutrition they feed on bacteria, algae, detritus and rotifers. Hence the variation of these zooplankton populations because of bacterial flora, microalgae and detritus matters. The variation in the population of zooplankton population appears to be significantly influenced by various physico-chemical factors [8]. Ahangar et al. [11] reported that the crustacean group showed maximum numerical surge during summer seasons and minimum during post-monsoon season. Venkatraman [12] recorded a diversity of zooplankton species from freshwater Wetlands and found more than 70 species. In the present investigation Copepoda were the most dominant group in the study area of river Thambraparani. The species of copepoda group was represented by 2 families 10 genera and 15 species. The biodiversity of copepod was found to be maximum in station V (982 ± 21) than in other stations. In station I, Cladocera population was found to be high in pre-monsoon season (136 ± 12) and it was also found to be high in monsoon season (209 ± 13) and in post monsoon season (164 ± 17), respectively. Lewis [13] analysed cyclopida population in a river and observed a peak of cyclopida production was associated with abundance of blue green algae and diatoms. The phytoplankton groups are highly important nutrient source for the developmental stages of copepod organisms. Similar observations are made by Somani and Pejavar [14]. Mustapha [15] reported low copepod during monsoon season. In this study, no significance variation of copepod population as a function of between seasons and between stations.

In the present study, 10 species of rotifers belonging to 6 families and 6 genera were recorded. More than 1700 species of rotifers have been reported from the different parts of the world and 500 species was described from Indian water bodies [16]. Sharma and Michael [17] reported that 21 species of genus *Brachionus* are well known from India. The species of *B. calyciflorus* was considered to be a good indicator of eutrophication. *B. calyciflorus* are one of the pollution tolerant species and their presences in the environment indicate accumulation of organic matter [18]. However, the river Tambraparani water is not polluted but *Brachionus* species were more abundant during the study period and this indicated the presence of organic matter in the particular station. However it could be noted that comparing to station II, III and IV, station I showed low population density of *Brachionus* sp. Rotifers play a critical role in the trophic tiers of freshwater impoundments and serve as living capsule of nutrition [19]. Taxonomic dominance of these *Brachionus* sp. has been reported in various water bodies. In the presnt study, rotifers population was found to be high during monsoon season in all stations. This result was according the observations made previously. The number of rotifers increased in summer which may be due to the higher population of bacteria and organic matter

of dead and decaying vegetation. The dominance of rotifer population in freshwater system which was due to its preference for warm waters. Since the rotifers have short life cycle they increase in abundance rapidly under favourable environmental conditions. Sinha and Sinha [20] reported high rotifer population in summers because of high temperature, higher values of chlorides, nitrates and phosphates in summer season. *Brachionus calciformis* was frequently observed during all stations and this species is considered to be the indicators of eutrophication. The large number of rotifer in the ecosystem may be attributed to its dependence on detritus matter and phytoplankton for it nutritional source. Dominance of Cladocerans among zooplankton as recorded in the present study is in accordance with earlier finding.

In the present study, cladocera represented by 5 families 5 genera and 5 species. Baig and Khan [21] earlier described the availability of four genera of Cladocera family. Manickam et al. [22] have recently reported the presence of seven species of Cladocera in the Haledharmapuri lake in Dharmapuri District, Tamilnadu. Sivakumar and Altaff [23] reported seven species of Cladocera from the fresh water environment, Dharmapuri District, Tamil Nadu. In the present study, cladocera population was found to be maximum during monsoon season. Manickam et al. [22] observed the variation of cladocerans population on the basis of food availability. The species *Ceriodaphnia cornuta* was found in almost all stations. In Thigra Reservoir in Gwalior (M. P.), cladocera was identified as the minor zooplankton group. In the present study, *Ceriodaphnia cornuta* was found to be high in this river. This result was in accordance the observation made with other freshwater systems. Balakrishna et al. [24] reported that the genus *Ceriodaphnia* was the most important zooplankton in oligotrophic lakes especially the species *Ceriodaphnia cornuta. Moina micrura*, *C. sphaericus*, *L. acanthocercoides* and *S. crystalline* were second, third, fourth and fifth dominant species respectively.

REFERENCES

1. Scavia, D. (1980). An ecological model of Lake Ontario. *Ecol. Modell*., 8: 49–78.
2. Kippen, N.K. (2005). Impact of macrophyte substratum and season on the habitat choice of rotifer communities. *Hydrobiologia*, 593: 27-37.
3. Dhanapathi, M.V.S S.S. (2000). Taxonomic notes on the rotifers from India (from 1889-2000), Indian association of Aquatic Biologists' (IAAB), Hyderabad.
4. Kumar, A.S., Tripathi, S. and Ghosh, P. (2004). Status of Freshwater in 21 Century: A Review. In: Water Pollution: Assessment and Management, Kumar, A. and G. Tripathi (Eds.). Daya Publishers, Delhi, ISBN: 0- 09-01265409-3, pp: 520.
5. Guerguess. S.K. (1993). Distribution of some rotifers in the Egyptian inland waters. Bull. *Nat. Ins. Oceanograph. Fish. Egypt*, 19: 249-275.
6. Stottrup, J.G. (2000). The elusive copepods: Their production and suitability in marine aquaculture. *Aquacult. Res*., 31:703-711.
7. Acharjee, B., Dutta, A., Chaudhury, M. and Pathak, B. (1995). Phytoplankton species diversity indices in Dighali beel, Assam. India. *Environ*. *Ecol*., 13 (3): 660-662.
8. Jyothi, M. K. and Seghal, H. S. (1979). Ecology of rotifers of Surnisar a subtropical freshwater lake in Jammu (J&K), India. *Hydrobiology*, 65(5): 23-32.
9. Tidame, S.K. and Shinde, S.S. (2012). Zooplaton diversity of temperate pond prayagirth around Nasik. *Geobios*, 39(2): 117-120.
10. Rumana S.S., Satish S.S. and Kulkarni G.K. (2010). Zooplanton diversity in freshwater bodies around Aurangabad, Maharashtra. *Flora Fauna*, 16(5):249-256.
11. Ahangar, A., Saksena, D.N. and Mirz, M.F. (2012). Seasonal Variation in Zooplankton Community Structure of Anchar lake, Kashmir. *Univ. J. Env. Res. Technol*., 2(4): 305-310.
12. Venkataraman, K. Das, S. R. and Nandi, N. C. (2000). Icthyofauna of Jannapura pond, Bhadraawati, Karnataka. *Zoos' Print*, 20 (9): 1991-1993.
13. Lewis, W.M. Jr. (1978). Dynamics and succession of the phytoplankton in a tropical lake: Lake Lanao, Philippines. *J. Ecol*., 66: 849-880.
14. Somani, V. and Pejavar M. (2004). Crustacean zooplanktons of Lake Masunda, Thane, Maharashtra. *J. Aqua. Biol*., l(19): 57-60.
15. Mustapha, M.K. (2009). Zooplankton assemblage of Oyun reservoir, Offa, Nigeria. *Rev. Biol. Trop. Int. J. Trop. Biol*., 57 (4): 1027-1047.
16. Arora, J. and Mehra, N.K. (2003). Seasonal diversity of planktonic and epiphytic rotifers in the backwaters of the Delhi segment of the Yamuna River, with remarks on new records from India. *Zoo Studies*, 42: 239-249.
17. Sharma, B.K. and Michael, R.G. (1987). Reviews of taxonomic studies on freshwater Cladocera from India with remarks on biogeography. *Hydro*., 145: 29- 33.
18. Goel, P.K. and Charan, V.R. (1991). Studies on the limnology of polluted fresh water tank, B.Gopan, and V. Asthana (editors) In: Aquatic Sciences in India. *Ind Ass Lim Oce*., 51-64.
19. Kumar, S., Altaff, R.K. and Raghunathan, M.B. (1999). New record of a Chydorid Cladoceran, pleuroxuy Aduncus jurine (1920), from Chennai, South India, with the description of the Development stages. *Int. J. Aquat. Biol*., 14 (1 and 2): 7-10.
20. Sinha, K.K. and Sinha, D.K. (1983). Seasonal trends in physicochemical factors and zooplankton in a freshwater pond Munger. Bihar. *J. Ecobiol*., 5(4): 299-302.
21. Baig, N.A. and Khan, M.Y. (1976). Biological and chemical conditions of Manchar Lake (Distt. Dadu). Pakistan. *J. Sci*., 28: 33-40.

22. Manickam, N., Bhavan, S.P., Santhanam, P., Chitrarasu, P. and Jawahar Ali ,A. (2012). Zooplankton diversity in a perennial freshwater lake. Diversity and Physiological Processes: Ed. Desai PV, Roy R, Goa University, pp. 25-37.

23. Sivakumar, K. and Altaff, K. (2004). Ecological indices of freshwater copepods and Cladocerans from Dharmapuri District, Tamilnadu, India. *Zoo's Print Journal*, 19 (5): 1466-1468.
24. Balakrishna, D., Reddy, T.R., Reddy, K.V. and Samatha, D. (2013). Physico-chemical parameters and plankton diversity of Ghanpur lake, Warangal, A.P. India. *Inter. J. Zoo. Res*., 44-48.