

Ecology of Cladocera, Copepoda and Ostracoda of a lentic ecosystem of Chapra Bihar

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ABSTRACT

During present investigation, the primary peak of zooplankton population was observed in summer and secondary peak during winter at site 2, while at site 1, where the primary maxima was recorded in monsoon and winter months while the secondary maxima was in winter and summer during both the annual cycles, respectively. The maximum number of rotifer species was recorded during summer months which coincided with the period of high temperature agreeing with the findings of Michael(1963). Summer periodicity of rotifers in tropical ponds has also been recorded by George(1966).

1. Introduction

The study of zooplankton forms an important aspect of freshwater ecology, because of their significant role in the food web of the aquatic ecosystem where it constitutes an intermediate link between the primary producers, phytoplankton and nekton. An extremely diverse assemblage of organism represented by numerous groups mostly of invertebrates, constitute the zooplankton community, which are an integral component of freshwater ecosystems. Seasonal population densities of zooplankton showed a high degree of seasonality within and between the groups. Some species were present throughout the year while others make sporadic appearance. During the present study only four major groups of zooplankton were taken into consideration. Generally zooplankton community of two lentic water bodies consisting of cladocera, copepoda and ostracoda. Microcrustaceans have a wide distribution in freshwater habitats. In the present study the microcrustaceans consisted mainly of order cladocera, sub class-copepod, Ostracoda and their families. The Population density of the zooplankton consisted mainly of cladoceran in the entire sample of both the lentic water bodies. Generally, cladocerans was represented by family sididae Daphnidae, Moinidae and Bosminidae.

2. Results and discussion

At site I, The peak of total cladoceran population (58 u/L) was recorded in August, 2012 and the lowest (4 u/L) in May, 2012 during the first year. In the second year, the peak (68 u/L) was observed in February, 2013 and minimum (12 u/L) in more than one months. While, the total cladocerans population density at site 2, was more abundant in comparison to site I. At this site the cladoceran showed their peak (78 and 116 u/L) in December, 2011 and February, 2013 during both the annual cycles, whereas, the lowest (12 u/L) was recorded in October, 2011 and May, 2013 respectively. Family : Sididae Diaphanosoma sp. was the only representative of sididae, their occurrence was noticed at repeated intervals during both the annual cycles at site 1, whereas, Diaphanosoma, Daphnidae was represented by 4 species. At site I, only 3 species were collected in which D. carinata showed their maximum population density (26 and 32 u/L) during February, 2012 and 2013 in both annual cycles. Whereas, the minimum (2u/L) was

recorded on several occasions. The other species, Daphnia lumholzi showed their maximum occurrence (18 and 24u/L) in February of both the year. Ceriodaphnia sp. was thinly populated and interruptedly encountered during the entire study period. At site 2, Daphniae was represented by a single species D, carinata which showed their peak population (26 u/L) in April,2012 and in September, 2013 (56 u/L) during the first and second annual cycles, usually their higher numbers were showed in summer months. Family: Bosminidae *Bosmia longirostris* was the only representative of Bosminidae which was present at all sites. At site I, B. longirostris was scarcely and sparsely present in all samples, the lowest number (2 u/L) was recorded in more than one month, whereas the highest (12 and 84u/L) was collected during October, 2011 and December, 2012 in both the years. At site2, B. longirostris showed a slight rise in population as compared to site I. The lowest population density (2u/L) was collected in October, 2011 during the first annual cycle whereas, in the second year, the lowest (64u/L) was recorded in more than one month. The highest population (28 and 46u/L) was recorded in December, 2011 and January, 2013 during both the annual cycles. Copepad was commonly present in both the lentic environments and was represented by many families and their nauplii. At site 1, seasonal variations in abundance showed their population (32 and 14 u/L) in October, 2011 and November, 2012; while, the highest (110 and 82 u/ L) in August, 2012 and February, 2013 during both the annual cycles respectively. At site2, the minimum population (24 and 18u/L) was observed in October, 2011 and February, 2013 and peak (88 and 66 u/L) in August, 2012 and July, 2013 in both the annual cycles. Diptomidae was represented by Diaptomus sp., Neodiaptomus, Diaphorous and Diaptomid nauplius at site , out of their species Diaptomus sp. was noticed in many samples. The minimum population Cyclopidae of site I was represented by Cyclops sp., Mesocyclops sp., cyclopoid nauplius and their nauplii. Out of these, Cyclops sp. was the dominant species encountered in a large number of samples, their lowest numbers (10u/L) was recorded on February, 2012 and the highest (34u/L) in December, 2011 during the first annual cycles. Cyclops sp. , cyclopoid nauplius, and nauplii were the representative of cylopidae at site 2. Similarly site 1, Cyclops sp. was the dominant species present throughout the year round. The lowest number (6 and u/L) was collected in May, 2012 and July, 2013 and highest (48 and 42

u/L) was encountered in March, 2012 and January, 2013 in both the years. Their dominance was found during winter and summer months in the first annual cycle and slightly different trends was observed in the second year. Cyclopoid nauplius was thinly populated, less abundant and occurs only a few samples. While the nauplii seasonal trends, the minimum (2u/L) was recorded in January, and October, 2012. Whereas, the maximum (28 and 22 u/L) in September, 2012 and June, 2013 in both the annual cycles. Ostracods of lentic ecosystem was represented by a single species Cypris sp. which was found occasionally at site 2 and encountered at interrupted intervals throughout the study period. The zooplankton species of Indian freshwater bodies were reported by several workers which was quite comparable. Sewell(1934) recorded 10 rotifera, 15 cladocera and 10 copepoda from a freshwater tank of Bengal. Nasar (1973, 77) recorded 16 rotifera and 11 cladocera from Bhagalpur ponds. Nasar(1977) recorded 12 rotifera, 8 cladocera, 3 copepoda and 3 ostracoda from other ponds of Bhagalpur. Laal(1984) found 10 rotifers from a freshwater pond at Patna. Balkhi (1984) recorded 33 rotifers from the Anchar lake. Sharma and Pant (1985) recorded 66 rotifera, 15 cladocera and 7 copepods from two kumayun Himalyan lakes. During the present investigation, the author

recorded 22 species of rotifera, 7 cladocera, 7 copepoda and 1 ostracod from the lentic environments. During the present investigation, the rotifera occupied the first place among the zooplankton population in both sites. According to Alikuhni et.al, (1955), Michael(1968), Saha et.al, (1971); Nasar; Balkhi et. al. (1984); Sharma and pant (1985), rotifera constituted the most abundant group of zooplankton, with rhythmic appearance and disappearance. The present investigations, conducted continuously for two years corroborates the finding of the above workers. The number of species and their differences gives general information about the stability of the environment. During present investigation, the primary peak of zooplankton population was observed in summer and secondary peak during winter at site 2, while at site 1, where the primary maxima was recorded in monsoon and winter months while the secondary maxima was in winter and summer during both the annual cycles, respectively. The maximum number of rotifer species was recorded during summer months which coincided with the period of high temperature agreeing with the findings of Michael(1963). Summer periodicity of rotifers in tropical ponds has also been recorded by George(1966).

Table; 1 showing the variation in cladocera, copepoda and ostracoda. Microcrustaceans of lentic site 1

Oct .Nov. Dec. Jan. Feb. March April May June July Aug. Sept. Oct.Nov. Dec. Jan . Feb. March April May June July Aug.Sept

Crutacea

Cladocera

<i>Diaphanosoma sp</i>	-	-	-	-	-	-	4	2	-	-	-	-	-	-	-	2	6	-	-	-	2	2	-
<i>Moina dubia</i>	-	2	4	4	10	18	6	4	14	2	-	-	-	2	8	4	6	10	14	8	2	-	-
<i>Ceriodaphnia sp</i>	2	6	10	12	8	4	2	10	8	2	-	8	4	8	4	-	4	12	4	2	-	2	-
<i>Sinocephalus sp</i>	-	-	4	2	2	-	-	-	-	-	-	-	-	-	2	4	-	-	-	-	-	-	-
<i>Bosmia longirostris</i>	-	-	-	4	8	6	4	4	-	-	-	2	4	6	4	12	2	-	-	2	-	-	-
Total	2	8	14	20	22	32	18	20	26	4	-	2	4	12	18	16	12	30	28	12	6	4	4

Copepoda

<i>Diaptomus sp</i>	-	-	4	2	10	6	4	12	4	-	2	2	4	6	4	2	-	4	4	2	-	-	-	
<i>Neo diaptomus sp</i>	-	-	-	-	-	2	4	2	-	-	2	2	-	-	-	6	12	6	4	-	-	-	-	
<i>Cyclops Muller</i>	2	4	6	14	4	4	2	6	12	-	2	4	-	4	10	6	4	2	4	12	4	2	4	
<i>Cyclopoid naupius</i>	-	2	4	2	-	-	2	6	2	-	-	-	2	2	8	-	-	-	-	2	2	-	-	
<i>Nauplii</i>	2	8	4	4	18	12	10	20	8	4	-	-	2	4	8	20	16	6	6	8	-	-	2	
Total	4	14	18	22	34	24	20	42	30	6	2	6	4	6	16	24	36	26	22	20	28	6	4	8

Table; 2 showing the variation in cladocera, copepoda and ostracoda. Microcrustaceans of lentic site 2

Oct .Nov. Dec. Jan. Feb. March April May June July Aug. Sept. Oct.Nov. Dec. Jan . Feb. March April May June July Aug.Sept

Crutacea

Cladocera

<i>Daphnia carinata</i>	-	-	4	10	12	10	26	16	2	4	-	-	-	2	16	34	8	12	-	-	4	20	56		
<i>Moina brachiata</i>	14	10	46	28	18	22	48	38	12	18	24	42	18	24	20	32	54	20	44	12	14	16	-		
<i>Bosmia longirostris</i>	2	12	28	4	8	-	-	-	-	6	22	16	6	12	2	6	46	28	6	-	-	10	8	14	20
Total	12	22	78	42	38	32	74	54	14	28	46	58	24	32	52	94	116	34	56	12	24	28	34	76	

Copepoda

<i>Diaptomus sp</i>	-	-	-	-	-	6	14	22	26	48	16	-	2	14	2	-	10	22	14	28	10	6	-	
<i>Diaptomid nauplius</i>	-	-	8	12	2	-	-	6	2	10	2	-	-	-	-	-	8	16	10	8	-	-	-	
<i>Cyclops Muller</i>	18	34	16	22	54	48	32	6	-	-	4	10	20	26	42	16	22	12	-	8	20	16	-	
<i>Cyclopoid naupius</i>	6	2	6	2	-	-	-	4	12	16	2	-	-	-	-	-	8	10	4	-	-	-	-	
<i>Nauplii</i>	-	-	2	2	8	24	18	16	8	14	26	28	2	-	-	6	4	8	22	12	8	4	-	
Total	24	36	32	38	64	72	56	42	32	54	88	64	14	20	28	56	18	28	34	46	54	66	42	26

OSTRACODA

<i>Cypris sp</i>	-	4	2	2	-	-	-	-	-	-	-	-	6	12	6	2	-	-	-	-	-	-	-	-
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References

- [1]. American Public Health Association. 1985. Standard Methods for the Examination of Water and Waste Water. (16th ad), APHA, New York, 1268pp.
- [2]. Anandavalli, M. 1980. Biological and physico-chemical indicators of polluted waters in and around Madurai. Ph.D. Thesis Madurai Kamraj Univ., India.
- [3]. Anandavalli, M. and S. Krishnaswamy. 1983. A quality profile of River Vaigai (South Indian). Indian J. Environ. Hlth., 25(4): 288-299.
- [4]. Anandavalli, M. and S. Krishnaswamy. 1984. Chironomid larval population size and index of pollution in river Vaigai. Poll. Res., 3:35-38
- [5]. Bhatnagar, G.P. 1982. Limnology of lower lake Bhopal with reference to sewage pollution and eutrophication. Technical report submitted to Man and Biosphere programme, Department of Environment, Govt. of India, New Delhi, 78pp.
- [6]. Bhatt, S.D., Y. Bisht and U. Negi. 1985. Hydrology and phytoplankton population in river Koshi of the western Himalaya (Uttar Pradesh). Indian J. Eco., 12(1):141-146.
- [7]. Bhattacharya, T., R.K. Saha and I. Chakrabarty. 1988. Diel variations in the water quality, plankton population and primary production in a freshwater pond in Tripura. Environ. Ecol., 6(4):928-932.
- [8]. Bhowmick, B.N. and A.K. Singh. 1985. Phytoplankton population in relation to physico-chemical factors of River Ganga at Patna. Indian J. Eco., 12(2): 360-364.
- [9]. Bilgrami, K.S., J.S. Datta, Munshi, R.N. Yadava and B.N. Bhowmick. 1985. Limnological studies of thermal springs of Bihar, India. Proc. Natl. Sci. Acad., 51 B(1):70-77
- [10]. Chakrabarti, N.M. 1987. Macrobenthic fauna of a sewage fed fish pond. Environ. Ecol., 5(1):149-153.
- [11]. Chakrabarty, R.D., P. Roy and S.B. Singh. 1959. A quantitative study of the plankton and the physico-chemical conditions of the River Jamuna at Allahabad in 1954-55. Indian J. Fish., 6(1):186-203.
- [12]. Chandra Ravish. 1988. Riverine fisheries resources of the Ganga and the Brahmaputra. In: A.G. Jhingran and V.V. Sugunan (Eds.), Conservation and Management of Inland Capture Fishery Resources,
- [13]. Bulletin No. 57., Central Inland Capture Fisheries Research Institute (CICFRI), Barrackpore, West Bengal, India, 275 pp.
- [14]. Chapman, P.M., M.A. Farrel and R.O. Brinkhurst. 1982. Relative tolerances of selected aquatic oligochetes to individual pollutants and environmental factors. Aquat. Toxicol., 2:47-67.
- [15]. Chari, M.S. 1985. Aquatic pollution and its effects on the fauna and flora of a freshwater pond at Aligarh, India. Geobios, (Spl. vol.), 49 65.
- [16]. Evans, J.H. 1961. Growth of Lake Victoria phytoplankton in enriched cultures. Nature, 189-417.
- [17]. Eauvel, P. 1953. The fauna of India including Pakistan, Ceylon, Burma and Malaya, (Annelida, Polychaeta), Edited by R.B. Seymour sewell, The Indian Press Ltd. Allahabad, India, 507 pp.
- [18]. Fernando, C.H. 1974. A guide to the freshwater fauna of Sri Lanka, (Ceylon). Supplement 3 Bull. Fish. Res. Stn. Sri Lanka (Ceylon), 25:27-81.
- [19]. Goel, P.K., S.D. Khatavkar, A.Y. Kulkarni and R.K. Trivedy. 1986. Limnological studies of a few freshwater bodies in south western Maharashtra with special reference to their chemistry and phytoplankton. Poll. Res., 5(2):79-84.
- [20]. Goldman, C.R. 1960 Primary productivity and limiting factors in three lakes of the Alaska Peninsula. Ecol. Monor., 30:207-230
- [21]. Hutchinson, G.E. 1944. Limnological studies in Connecticut VII. A critical examination of the supposed relationship between phytoplankton periodicity and chemical changes in lake waters. Ecology, 25:3-25.
- [22]. Hutchinson, G.E. 1957. A treatise on Limnology. Vol.1. Geography Physics, and Chemistry. John Wiley, New York, 1015 pp.
- [23]. Hutchinson, G.E. 1967. A Treatise on Limnology: Vol. II. Introduction to Lake biology and the limnoplankton. John Wiley and Sons, New York, 1115 pp.
- [24]. Khan A.A and A.G. Siddiqui 1971. Primary production in a tropical fish pond at Aligarh, India Hydrobiologia, 37(3-4):447-456.
- [25]. Khan, A.A. and A.Q. Siddiqui. 1974. Seasonal changes in the limnology of a perennial fish pond at Aligarh. Ind. J. Fish., 21(1):463-478.
- [26]. Khan, I.A. and A. Khan. 1985. Physico-chemical conditions in Seikha Jheel at Aligarh. Environ. Ecol., 3(2):269-274.
- [27]. Macirolek J.A 1966. Abundance and character of microseston in California mountain stream Verh Int Verein Theor Angew Limnol 16:639-45;49-433.
- [28]. Mandal B.K and S.K. Moitra 1975. Studies on the bottom fauna of a freshwater fish pond at Bardwan J. Inland Fish Soc. India 8:43-48.
- [29]. Mann K.H 1978. Estimating the food consumption of fish in nature pp. 250-273. In S.D Gerking (Ed) Ecology of freshwater Fish population Blackwell oxford.
- [30]. Nasar S.A.K 1973 The zooplankton fauna of Bhagalpur Rotifera J. Bh. U 6:55-62.
- [31]. Nasar, S.A.K. and J.S. Datta Munshi. 1974. Seasonal variations in physico-chemical and biological properties of a tropical low pond. Japanese J. Eco., 24:255-259.
- [32]. Nasar S.A.K and J.S. Datta Mushi 1975 Studies on primary production of freshwater pond Jap. J. Eco., 25:21-23
- [33]. Southwood T.R.E. 1978. Ecological Methods with Particular Reference to the study of Insect populations 2nd edition, (Revised). The University Printing House. Cambridge, Great Britain, 524 pp.
- [34]. Spence, D.H.N. 1964. The macrophytic vegetation of freshwater lakes, swamps and associated fans, p. 306-423. In J.H. Burnett (ed) the vegetation of Scotland. Oliver and Boyd, London.
- [35]. Sreekumarn C., K.I. Joseph and M. Parmeswaran. 1970. Occurrence of sodium potassium magnesium calcium and strontium in some Indian rivers. Cur. sci., 5:105-106.
- [36]. Talling J.F and I.B. Talling 1965. The photosynthetic activity of phytoplankton in East African Lakes Int. Rev. ges. Hydrobiol., 50:1-32.
- [37]. Talling J.F. and I.B. Talling 1965. The chemical composition of African lake water. Int. Revue. ges. Hydrobiol., 50(3):421-263.
- [38]. Talling J.F. 1966. Comparative problems in a tropical and temperate lake. IN: Primary productivity in Aquatic Environments. (Ed) C.R. Goldman Univ. Calif. Press, 401-424.
- [39]. Talling J.F. 1973. The application of some electrochemical methods of the measurement of photosynthesis and respiration of freshwater FreshWat. Biol., 3:335-362.
- [40]. Talling J.F. 1975. Primary production of freshwater microphytes In: J.P. Cooper (Ed), Photosynthesis and productivity in Different Environments Int. Biol. Progr., 3:225-247
- [41]. Wetzel, R.G., P.H. Rich, M.C. Miller and H.L. Allen. 1972. Metabolism of dissolved and particulate detrital carbon in a temperate hardwater Lake. Mem. Ist. Ital. Idrobiol., 29 Suppl, 185-243.
- [42]. Wetzel, R.G. 1982. Limnology. W.B. Saunders Company, Philadelphia. Whiteford, L.A. and G.J. Schumacher. 1968. Notes on the ecology of some species of freshwater algae. Ecology, 32: 223-236.