Indian J.L.Sci 2 (1): 169-173, 2012

STUDY OF ZOOPLANKTONS IN RELATION TO BIO-PHYSICO-CHEMICAL PARAMETERS OF LONY DAM

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ABSTRACT

Zooplanktons form an important intermediary step in the grazing food chain in aquatic ecosystem. The qualitative analysis of zooplankton has shown that the rotifers, protozoans, cladocerans and copepodes were the major components of its total bulk in Lony dam. The maximum magnitude of zooplanktens abundance was found in summer months and minimum was noted in early monsoon months. The study include 28 species of zooplanktons which shows its moderate bio-diversity. The remarkable seasonal changes of total zooplanktons at present water body were registered. The littoral stations had high zooplanktonic density than limnetic sites. The quantitative variability of zooplankton has high-lighted their mesotrophic nature. The mean maximum and minimum values of zooplanktons were recorded.

KEYWORDS: Biodiversity, Food Chain, Littoral and Limnetic Sites, Mesotrophic

Zooplanktons usually act as primary consumers and constitutes an important link between primary producers and higher consumers in aquatic food chain. Zooplanktans are used as fish food and other macrofauna. They are very common in pelagic and littoral regions of the water.

The present study includes zooplanktons protozoa, rotifera, cladocerans, copepodes and ostracodes. The protozoan zooplancton includes flagellates, cilliates and sarcodines. The flagellates are the most aboundant among protozoan zooplankton. They include dinoflagellates, chrysomonads, euglenoids, volvocids, choanoflagellates and large group of heterotrophic flagellates. The cilliates include oligotriches, hypotrichids and tintinnids. Sacrodines are poorly found in freshwater. Rotifers are minute animals. They form the most important metazoans among planktons. Cladocerans form the most useful nutritive group of crustaceans for higher member of fishes in the food chain. They are covered by chitinous covering and have two large antennae. The copepodes also considered as fish food. The ostracodes are bivalve organisms of phylum arthopoda. They are also consumed by fishes and benthic macroinvertebrates.

MATERIALS AND METHODS

The study was carried out at loni dam which is situated near suti village, teonthar tehsil, Rewa M. P. This site is located at the Allahabad to Rewa road at national hiway no. 27.Water sample for zooplankton study was collected from four sampling sites. Site A and B from littoral zone and site C and D from limnetic zone were selected. The samples were collected in clean and dried bottles in every month from July to June in 2009-10 and 2010-11. The samples were collected in 200 ml plastic bottles and were preserved by 2.5 ml of 4% formalin. Now the preserved sample was kept for 24 hours for sedimentation. After decanting the water carefully the samples were centrifuged and about 50 ml was collected for every sample. The samples from different stations were mixed and again centrifuged to get the total volume about 10 ml.

The quantitative analysis of zooplankton was done with the help of Sedgwick rafter counting cell and lackeys drop method. One drop of the

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sample was taken and transferred it on the slide. The whole drop was covered with the cover slip. Now all the zooplankton was counted in the drop.

To calculate the number of organisms per liter the following formula was used (**Sedgwick-rafter cell Method**).

$$\text{Organism per liter (N)} = \frac{R \times 1000\ mm^3 \times 10^3}{L \times D \times W \times S}$$

Where R = number of organisms counted per subsample

L = Depth of a strip, mm

W = width of a strip, mm

S = number of strips counted

Therefore, Total organisms per litre = N x 1/C

$$\text{Where concentration factor C} = \frac{\text{Volume of original sample (ml)}}{\text{Volume of concentrated sample (ml)}}$$

For **Lackey's drop method:**

$$\text{Organism per litre (N)} = \frac{R \times At \times 10^3}{As \times S \times V}$$

Where R = Number of organisms counted per subsample

A t = Area of cover slip, mm^2

A s = Number of one strip, mm^2

S = Number of strips counted, and

V = Volume of sample under the cover slip, ml

Therefore, Total organisms per litre = N x 1/C

$$\text{Where concentration factor C} = \frac{\text{Volume of original sample (ml)}}{\text{Volume of concentrated sample (ml)}}$$

RESULTS AND DISSCUSSION

Species composition of zooplankton at different experimental sites of Lony dam are given in table 1 during 2009 –10 and 2010 – 11. 28 species of zooplanktons belonging to four taxonomic groups Protozoa, Rotifera, Cladocera and Copepoda were observed in Lony dam . Out of 28 species 6 belongs to Protozoa, 11 to Rotifera, 6 to Cladocera and 5 to Copepoda.

The values of species composition were comparatively higher during summer season as compared to rainy and winter season at all sampling sites of Lony dam. Among Protozoa *paramecium* showed maximum species composition while *Euglypha* showed minimum species composition at all sampling sites of Lony dam. Among Rotifers *Brachionus angularis* showed maximum species composition at all sampling sites while *Asplanchna* sp. showed minimum species composition at most sampling sites. Among Cladocera *Daphnia* sp. showed maximum species composition at all sampling sites during all seasons. The *Pleuroxus* sp. showed minimum species composition approximately all the sampling sites. Among Copepode *Cyclops* sp. showed maximum species composition at most sampling sites during all the season. *Daptomus* sp. showed minimum species composition at most sampling sites during all the seasons.

Table : 1

Seasonal mean values of two years- 2009-10 and 2010-11 of Zooplanktonic species of Loni Dam at different sites												
Sl No.	Name of species	A			B			C			D		
		Rainy	Winter	Summer	Rainy	Winter	Summer	Rainy	Winter	Summer	Rainy	Winter	Summer
	PROTOZOA												
1	*Euglypha sp*	10.5	7.5	15	10	6.5	13.5	5	5.5	7	7	6.5	6
2	*Diffugia sp*	20	15.5	28.5	21.5	15	26	17.5	13.5	18	15.5	11.5	15
3	*Actinophrys sp*	10	7.5	12.5	13	16	12.5	8	8	12.5	8	8	13.5
4	*Paramecium sp*	27	28.5	37	25	24.5	31	20.5	17.5	21.5	18.5	15	23
5	*Vorticella sp*	21.5	18	29.5	17.5	17	29	19	14	17.5	18	13	15.5
6	*Arcella*	18	13.5	20.5	19	10	20.5	9	10	13	9	8.5	11.5
	ROTIFERA												
7	*Brachionus quadridentatus*	19.5	9	17.5	22	9	24.5	12.5	8	16.5	12	8.5	15.5
8	*B. patulus*	19	11	18.5	17	9.5	16.5	12	8.5	18.5	11.5	7.5	16
9	*B. rubens*	18	9	21.5	20.5	9	19.5	20.5	10.5	30	26	10	28
10	*B. caudatus*	45	17.5	32.5	49	17	30.5	23	10	22.5	30	11.5	19
11	*B. angularis*	37	22	43.5	39.5	21	43.5	24.5	16	33.5	16.5	14.5	26.5
12	*Polyarthra sp*	26	20.5	35	24	21	37	15.5	9	16	18	9.5	15
13	*Trichocera sp*	16	12	25.5	15	12	28.5	18	8.5	11.5	19	10.5	15
14	*Asplanchna sp*	11	8	19.5	14.5	8	20	15.5	10.5	13.5	14.5	12	13
15	*Keratella sp*	21	13.5	25	22.5	11.5	25	16	9.5	17	15.5	9.5	18
16	*Rotaria sp*	11.5	10	15	12.5	9	13.5	26.5	9	13.5	21.5	10	11.5
17	*Monostyla sp*	17	12.5	28	19	12.5	26.5	16	9	15.5	15.5	8.5	11.5
	CLADOCERA												
18	*Alona sp*	14	10	22.5	14.5	6	21	4.5	5	11	6	4.5	8
19	*Chydorus sp*	14	9	18	14	7.5	18.5	5.5	6	11.5	7	5	10
20	*Moina sp*	18.5	12	20.5	19	9	18.5	13	10.5	10	13	8.5	10
21	*Daphnia sp*	19	12.5	26	18	12.5	28	22.5	8	16.5	21.5	9.5	`14
22	*Moinodaphnia*	18	12.5	22.5	17	11.5	21	4	12.5	26	4	21	31.5
23	*Pleuroxus sp*	11.5	8	20.5	12	6.5	19	6	5.5	4.5	4.5	5	8.5
	COPEPODA												
24	*Cyclops*	11.5	9	12	10.5	7	11.5	6	4	6	4	4.5	7
25	*Paracyclops*	7	8	13.5	7	7	10.5	3	4	5	4	5	5
26	*Daptomus sp*	7	8	11	6	7.5	10.5	2.5	3.5	3.5	3.5	4.5	4.5
27	*Clenoid sp*	8.5	7.5	11	8	6	11	5.5	4	4.5	3.5	4.5	5.5
28	*Nauplius larvae*	9.5	8.5	9.5	12	8.5	8.5	11	7.5	6.5	9.5	7	7.5

The planktonic populations in freshwater systems have been realized to have their indispensable participation in energy flow system. The planktonic communities consisting of phytoplankton and zooplankton usually represent the functioning of primary producers and consumers .The qualitative and quantitative changes in phytoplankton and zooplankton are usually affected by a number of physicochemical and biotic factors. Singh and Rai (1984) reported that freshwater temperature affects the movements of zooplankton to great extent. It is also evident from present investigation that physico chemical and biological factors govern the seasonal and spatial abundance of zoobiota. The sudden abruptness of zooplankton during early mansoon and gradual rise in summer months that were documented in present water body further have supported the above statement.

The protozoan species of present water have shown a remarkable seasonal variation and biodiversity. Their spatial changes were also documented to be notable. Moreover the protozoan were recorded with a bimodal peak, the first peak in summer and second one in winter. A sudden decline was found in monsoon month.

The protozoa with 6 species have shown higher number in June and July months and lowest in monsoon season. Their densities were noted to be higher at littoral sites. The species of *paramecium*, *Vorticella* and *Euglypha* found to be contributing the main bulk of protozoans which had wide range of distribution. However *Actinophrys* was found to be rare.The rotiferan species have shown high magnitude of biodiversity in comparison to other subgroups with 11 species. The rotifera was mainly dominated by *Brachionus* species. The rotiferans were recorded to be most dominating, abundant and widely distributed species in present water. It is thus considered as an important bio-indicative in order to predict the polluted and deteriorating water conditions.The cladocerans were dominated by members of *Daphnia* sp and *Moinodaphnia* and *Moina*, While Copepode was dominated by *Cyclops*, *Clenoids* and *nauplius* larvae.

The rotiferan also exhibited bimodal peak, first peak in summer and second one in winter with 11 species. The continuous increases in Rotiferan population in summer months indicate the fact that high temperature and pH usually favour the growth of rotiferan forms. According to Michael (1968), Moitra and Bhownik (1968) most of the rotifers fluctuate with a bimodal peak which appear in post mansoon seasons with a distinct seasonal succession.

The rotiferan species Namely *Brachionus quadridentatus*, *B.patulus, B.rubens, B.caudatus, B.angularis, Polyarthra sp., Tricocera sp., Asplanchna sp, Keratella sp, Rotaria sp* and *Monostylla sp***,** were noted to be most common and dominating species in present water body. The species of *B. angularis, B. caudatus, Polyarthra* sp. and *Monostylla* sp. have contributed the major rotiferan population.

Most of the rotifers fluctuate with a bimodal peak which appear in post mansoon seasons with a distinct seasonal succession. The present study has revealed that Rotiferan densities depends on the quantitative changes of organic decaying materials and temperature.

Among cladoceran the members of *Daphnia* sp., *Moinodaphnia, Moina* sp, *Pleuroxus* sp, *Alona* sp, and *Chydorus* sp, was very common species. It was dominated by *Daphnia* sp., *Moinodaphnia* and *Moina* sp.Among copepode members Nauplius larvae, *Cenoid* sp, *Cyclops*, *Paracyclops* and *Daptomous* sp were found to be common appearance with a wide range of distribution in littoral and limnetic water of lony dam. Species diversity values were obtain higher for rotifera and it is followed by protozoa, cladocera and copepoda. All four groups showed

higher values of species diversity during summer season.

The qualitative analysis of zooplankton has shown that the rotifers, protozoans, cladocerans and copepods were the major components of its total bulk in Lony dam. The maximum magnitude of zooplanktons abundance was found in summer months and minimum was noted in early monsoon months. Chaurasia and Adoni (1985) have noted pH and water temperature as the most valuable factors affecting the zooplanktonic density at Sagar lake. It coincides with the present data. As the number of species concerned the major groups of zooplankton have shown the dominating trend indicating the pattern of biodiversity are Rotifera > Protozoa > Cladocera > Copepoda.

The mean maximum values of total zooplankton in 2009-10 and 2010-11 at Lony dam were recorded 225.0 units/L and 179.5 units/L respectively while minimum values were observed 78.0 units/L and 50.3 units/L in 2009-10 and 2010-11 respectively.

The Arthropods benthic forms are *cypris, Cyclops*, Dragonfly larvae, chiromonous larvae. May fly larvae, *Belostoma* and crabs are found in the dam. Molluscs and crustaceans dominated in the monsoon, oligochaetes dominated only during summer and the chironomids in the winter and early summer seasons. The qualitative assessment of zooplanktonic species and their seasonal abundance and distribution is not only indispensable in food chain mechanism but is also significant in bio-monitoring of fresh water bodies. According to Moitra and Bhattacharya (1965), the variability of zooplanktonic species with seasons and sampling sites are important bio-indicatives in predicting the trophic nature of water.

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