

ORIGINAL RESEARCH ARTICLE

Diversity and Seasonal Variations of Zooplanktons in Pahuj Reservoir at Jhansi (U.P) India

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ABSTRACT

The main aim of the present study is to know the diversity of zooplankton groups and their seasonal variations. During the study 6 species belonging to the family Rotifera, 10 species to cladocerans, 4 species to copepods and 8 species belonging to the family protozoans were collected from different sites in Pahuj reservoir. Numerically Crustacea was the dominant Class throughout the study period. The study of zooplankton species diversity and abundance with respect to biotic factors may assist in future planning for the management of intensive fish culture in this reservoir.

Key words:-Zooplankton, Pahuj reservoir, Jhansi.

1. INTRODUCTION

The plankton simply means weakly swimming aquatic beings that are mostly minute in size and are at the mercy of water movement. They include phytoplankton as well as zooplankton and collectively known as helioplankton. According to Hensen(1887), plankton include all organic particles which float freely and involuntarily in the open water, independent of shores and bottom. Zooplanktons are also known as animal plankters. Zooplankton plays an important role in aquatic ecosystem. They link the primary producers, phytoplankton with higher trophic level organisms. Zooplankton communities respond to a wide variety of disturbances including nutrient loading (Dodson, 1992) and play a key role in the aquatic food chains (Sharma, 1998). Zooplanktons respond quickly to aquatic environmental changes (e.g., water quality characteristics, such as pH, colour, odour and taste, etc.) for their short life cycle and are therefore used as indicators of overall health or condition (Carriack and Schelskek, 1977). Again net planktons are those retained by low net, while nanoplankton will normally pass through.

Pahuj reservoir (23° 8' & 26° 3' N) latitude and (78° 11' & 81° 3' E) longitude, is a multipurpose small and shallow (maximum 10 meter depth) reservoir used primarily for irrigational purposes. It is a rain fed reservoir connected across the river

Pahuj, a small tributary of river Yamuna, located near Jhansi city under Bundelkhand region which is predominantly a drought prone area with an average rainfall of 879mm.

Zooplankton samples were collected from different locations for quantitative estimation. Results have been expressed numerically in units of per litre water volume. All together 18 species were collected and identified under three main groups. 1. rotifers 2. Cladocerans and 3. copepods. Number of eggs and nauplii of each species were clumped together. Cladocerans were found to be dominant group followed by Rotifers and copepods. Survival of zooplankton primarily depend on dissolved oxygen, P.H and temperature are secondary factors. Maximum number of Cladocerans are recorded in May 1996 and minimum in June 1996. Copepods were represented by three species namely Cyclops strenus, Cyclops viridis and Mesocyclops edeas. Among these Cyclops viridis is most common. It shows maxima in summer months and having a peak in July. Cyclops sternus was second dominant species. It exhibits summer maxima during winter and monsoon periods. Cyclops viridis is least abundant among Copepods. It also shows summer maxima and in rest of months it has negligible presence. Rotifers had the widest species diversity and contribute major portion of

total zooplankton biomass. Rotifers show two peaks (April and November). *Branchinusa calyciflora* was dominant species having 23.75% total Rotifer. It shows peak in November and December.

2. METHODOLOGY

The hydro-biological samples were collected from the different sites of the Pahuj reservoir and depth wise plankton samples were carried out through vertical hauls.

i) COLLECTION AND ESTIMATION:

Plankton samples were collected by plankton nets, water samplers and collecting bottles. All categories of planktons were collected by plankton nets except nanoplankton. Also many types of water samplers and collecting bottles were valuable for collecting planktons vertically as well as horizontally at the desired depth. Mayer's water sampler was used for this purpose. The plankton samples were further concentrated by sieving them through fine mesh or even through membrane, however for nanoplanktonic collection, samples were centrifuged.

Once the samples were collected, they were fixed (formalin with a concentration of 2 to 5% methanol / lugol's solution) and preserved at the earliest.

Area of sampling:

Pahuj reservoir has been selected for analysis of zooplankton. Six sampling points were selected for this purpose from the six sites of the reservoir along the edge from the place of human activities. The outlets, inlets, morphometric characteristics and aquatic weeds etc were considered during the selection of the sites.

Sampling period:

The sampling was done in the first week of every month (March- Sept) in early hours of the day i.e. around 9:00 to 11: a.m.

ii) Estimation of volume of water sieved through plankton nets:

This was achieved by following methods given below:-

1. A mug of known volume (1-2 liter) was used to collect subsurface water. Collected water was sieved through the net and the concentrated plankton was collected from the tub fixed at the bottom of the net.

2. In case of vertical haul, following steps were taken and each step was followed with great care.

- Took reading for the depth of the sites chosen to take a vertical haul.
- Give allowance (i.e. subtract) for the length of the net and collecting bucket.

3. Pull the net surface wards at the rate of 0.3m/sec (approx.).

4. Transfer the sample from collecting bucket to graduated cylinder. Add 1ml formalin to every 20ml of plankton and water.

5. Allow the plankton concentrate finally as ml/cubic meter in the following manner.

Settled plankton volume (ml)

----- × length of haul (meters)

Area of net mouth (sq. mts)

iii) Quantitative estimation of total plankton:

1. **Setting volume:** Allow sufficient time (24hrs or more) for the plankton to settle in graduated cylinders and record its volume.

2. Displacement volume:

a) Record the volume of whole plankton sample water with plankters.

b) Filter off the plankton and determine the volume of plankton free water.

3. Displacement weight:

This was expressed on the basis of above by assuming that the specific gravity of plankton is unity.

iv) Quantitative estimation of plankters:

Plankton was estimated with the simple "drop method". An ordinary 4ml dropper was taken and some of its narrow tip was broken so that the diameter of the dropper mouth increases sufficiently for releasing easily the bigger zooplankton. Some samples were sucked in the dropper and 2-3 drops were taken on the slide for observation. Number of drops forming 1ml for the dropper was taken into consideration. The following formula was used.

$$N = abc / L$$

Where;

N= number of organisms/liter.

a=average number of individuals in one drop.

b=number of drops forming 1ml.

c=volume of concentrated.

L= original water sample (liter) sieved.

3. RESULTS AND DISCUSSION

The ecology of zooplankton diversity in aquatic bodies of different part of the country has been studied by a number of workers viz., (Pathak, 1989, 1990; Suganan, 1995, 1997; Jha, 1997; Kumar *et al.*, 2007; Tripathi *et al.*, 2008a, b). However, the studies are not so exhaustive. Present study has therefore; been undertaken to record the zooplankton diversity in Pahuj reservoir Jhansi (U.P) where no such study yet has been undertaken. In Pahuj reservoir, Jhansi a total of 28 zooplankton species belonging to Protozoa,

Rotifera and Crustacea were recorded during the investigation period. Cladocera (10), Protozoa (08), Rotifera (06) and Copepoda (04) in a decreasing order (Table 1). Very high values in zooplankton diversity have been reported by Murugesan *et al.* (2003) in reservoir of Tamilnadu which is an inductive of high level nutrient inflow. Kholi *et al.* (1998) reported the zooplankton

diversity in the range of 240-900 mg/L in Powai Lake, Mumbai. It was observed that zooplankton population enhanced during post monsoon month which are very close to our observation. A more or less similar trend of zooplankton diversity has been observed in the Ramgarh lake Gorakhpur by Srivastava *et al.* (2006) and Khanna *et al.* (2007).

Table 1: showing the number of zooplankton (unit/L) at different sites of Pahuj reservoir

Family/Group	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
ROTIFERA						
<i>Branchionus fulcatus</i> sps.	58	X	584	584	658	543
<i>Branchionus plicatilis</i> sps.	56	584	X	258	X	X
<i>Keratella quadrata</i> sps.	54	351	54	X	584	X
<i>Keratella cochlearis</i> sps.	26	76	98	54	X	58
<i>Asplanchna priodonia</i> sps.	323	431	1115	54	68	584
<i>Rotifer</i> sps.	108	X	229	X	284	658
TOTAL	625	1442	2080	950	1594	1843
CLADOCERANS						
<i>Polyphemus</i> sps.	134	279	33	254	352	54
<i>Polyphemus pediculus</i> sps.	54	254	X	548	352	254
<i>Moina</i> sps.	108	X	542	254	58	65
<i>Bosmina</i> sps.	254	50	X	54	254	352
<i>Bosmina longirostris</i> sps.	X	X	33	X	X	X
<i>Bosminopsis dieteri</i> sps.	X	X	X	X	X	X
<i>Ceriodaphnia</i> sps.	1828	1090	397	254	547	254
<i>Daphnia similis</i> sps.	645	634	654	254	584	254
<i>Cladocera</i> sps.	352	254	33	548	254	524
<i>Simocephalus vetulus</i>	25	58	33	50	254	52
TOTAL	3400	2619	1725	2216	2655	1809
COPEPODS						
<i>Cyclops</i> sps.	608	482	426	254	524	352
<i>Diatomus</i> sps.	699	380	98	X	352	X
<i>Nauplii</i> sps.	323	50	33	245	24	352
<i>Copepod</i> sps.	X	X	65	X	X	X
TOTAL	1630	912	622	499	900	704
PROTOZOANS						
<i>Phagus</i> sps.	X	X	X	X	X	X
<i>Euglena acus</i> sps.	325	254	33	142	25	25
<i>Euglena</i> sps.	X	X	33	254	25	52
<i>Eubranichius</i> sps.	80	228	131	254	52	625
<i>Diptereans</i> sps.	80	254	X	521	254	X
<i>Limnophra</i> sps.	76	X	X	X	X	325
<i>Phalacropera</i> sps.	156	254	X	521	254	325
TOTAL	717	990	197	1692	610	1352
TOTAL	6372	5963	4624	5357	5759	5708

X; indicate data not available

Table 2: showing group wise total number of phytoplankton forms (unit/liter) at six stations in Pahuj reservoir, Jhansi

Group	Site-1	Site-2	Site-3	Site-4	Site-5	Site-6
Rotifera	625	1442	2080	950	1594	1843
Chladocera	3400	2619	1725	2216	2655	1809
Copepoda	1630	912	622	499	900	704
Protozoa	4486	127	33	08	254	84

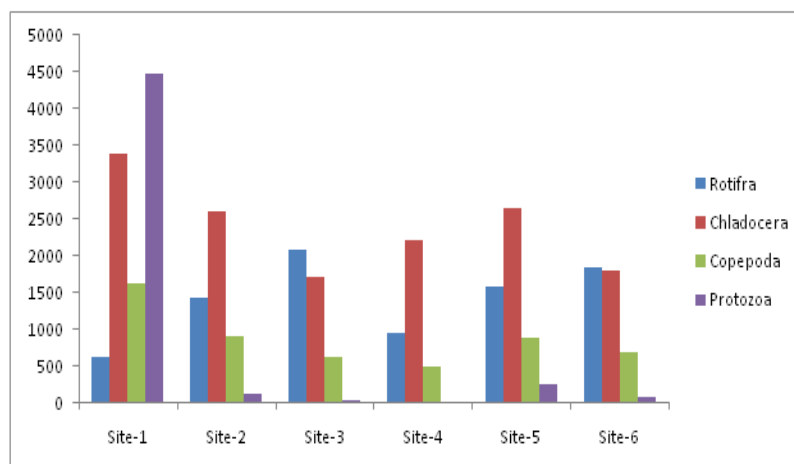


Fig 1: showing seasonal fluctuation of zooplanktons in Pahuj reservoir

CONCLUSION

The present study expressed that the diversity of phytoplankton and presence of these maintain and increase the productivity of Pahuj reservoir. During the study period seasonal fluctuation of zooplankton community have been observed. Then observation indicated the primary production. The study of zooplankton species diversity and abundance with respect to biotic factors may assist in future planning for the management of intensive fish culture in this reservoir.

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