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SEASONAL ZOOPLANKTON COMMUNITY STRUCTURE OF SHATIYA WETLAND IN GOPALGANJ DISTRICT OF BIHAR

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ABSTRACT

The selected sites of Shatiya wetland were studied for a period of one year for regular physico-chemical parameters and zooplankton community structure. This study is related to seasonal variation in zooplankton populations. There community consist of 08 Cladocera, 03 Copepoda and 02 rotifera and 01 ostracoda species in which cladocerans were dominant throughout the study period. There changes in quantitative and qualitative community structure were found directly correlated with abiotic factors during study period.

Keywords: Physico-chemical parameter, zooplankton, Correlation, biodiversity and Shannon-Wiener index.

INTRODUCTION

Zooplankton plays an important role in aquatic ecosystem. They link the primary producers, phytoplankton with higher trophic level organisms. These crustacean populations respond to variety of anthropogenic disturbances including nutrient budget and play a role in the wetland ecosystem (Sharma, 1998). The fishes are completely or partially depend on zooplankton for their body requirements.

The importance of zooplankton as fish food both for adults and fry has been stressed by different workers (Fontaine and Revera, 1986). The presence and dominance of zooplankton species play a significant role in the functioning of freshwater ecosystems. Therefore, zooplanktons are considered indicators of water quality (Geiger, 1983). Zooplankton responds quickly to aquatic environmental changes (e.g., water quality characteristics, such as pH, colour, odour and taste,

etc.) for their short life cycle and is therefore used as indicators of overall health or condition.

This study was performed to analyze zooplankton population both qualitatively and quantitatively and the results are correlated with physico-chemical factors to get vital information for future references and better understanding of the structure and function of this important aquatic ecosystem.

MATERIALS AND METHODS

The selected sites of Shatiya wetland were mostly infested with weeds. This wetland was selected for study of zooplanktons with four sites due to different morphometric and aquatic weeds availability, and, samples were collected between 9.00 to 11.00 AM in consequent months from June 2011. The sub-surface water was collected with the help of bucket. Zooplankton samples were taken by 50 liter water filtered with nylon bolting conical sampler and lower end of net were transferred to separate polyethylene tubes for 30 ml sub-sample after sedimentation.

The zooplanktons were preserved in 4% formalin and 4-5 drops of glycerene. Then, zooplanktons were identified with help of microscope and systematic literature (Edmondson, 1992 and APHA, 1998) for qualitative study. The quantitative study was carried with help of Sidgwick rafter cell (50 mm long, 20 mm wide and 1mm deep) and each sample was counted at least five times for average value. Then number of each zooplankton species was calculated following Welch (1948) and total number with the help of formula as:

$$N(\text{org L}^{-1}) = a \times b \times V$$

Where N= Number of zooplankton per liter, a= Average number of zooplankton in all counts in a counting cell of 1 ml capacity, b= The volume of original concentrate in ml (30 ml), V= Volume of original water filtered (50 litres).

Diversity index H (Shannon and Reid, 2003) was calculated for zooplankton using the following formulae-

Shannon-Wiener index: $H = -\sum p_i \ln p_i$
 $P_i = n/N$, n = diversity of individual and
 N = total density

RESULTS AND OBSERVATION

This wetland presents a total of 18 zooplankton species belonging to zooplanktons as Cladocera (08), Copepoda (03), Rotifera (02) and Ostracoda (01) during the study period. The species rich class Crustacea was represented by eleven species of large, medium and small-sized Cladocera, three species of Copepoda viz. *Cyclops scutifera* and *C. bicuspidatus*, two species as *Brachionus bidentata* and *Keratella valga* and only one species of Ostracoda i.e. *Cypris subglobosa*. Although 18 species have been identified at various sites in the Shatiya wetland, but *Centropyxis aculeata*, *Keratella cochlearis*, *K. Valga*, *Alona affinis*, *Daphnia magna*, *Chydorous sphaericus*, *Macrothrix rosea* and *Cyclops bicuspidatus* were common species at all sites.

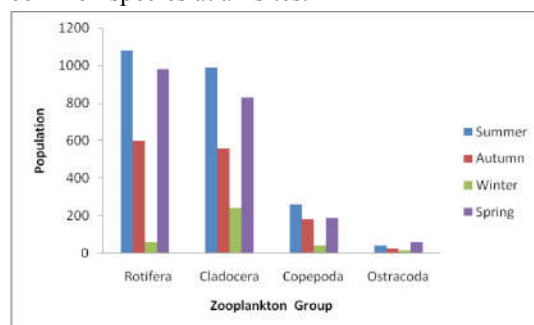


Fig.1: Seasonal variation of zooplanktons at selected sites of Shatiya wetland.

Averages of all sites taken together have shown a bimodal peak, bigger peak was observed in spring months and the other smaller one was observed in summer months. The abundance of zooplankton at various sites followed a sequence:

Site I:

Cladocera>Copepoda>Rotifera>Ostracoda

Site II:

Rotifera > Cladocera > Copepoda > Ostracoda

Site III:

Cladocera> Copepoda> Rotifera>Ostracoda

Site IV:

Cladocera > Rotifera > Copepoda > Ostracoda

The overall abundance of zooplankton in the river follows a sequence as under: **Rotifera > Cladocera > Protozoa > Copepoda >Ostracoda**. There, Rotifera showed peak density 1080 org l⁻¹

100 during the summer season, 600 org l⁻¹⁰⁰ during the autumn season, 60 org l⁻¹⁰⁰ during the winter season and 980 org l⁻¹⁰⁰ during spring season (Figure 1). Cladocera showed maximum density 990 org l⁻¹⁰⁰ during summer season, 560 org l⁻¹⁰⁰ during autumn season, 240 org l⁻¹⁰⁰ during winter season and 830 org l⁻¹⁰⁰ during spring season. Copepoda group exhibited maximum density 260 org l⁻¹⁰⁰ during summer season, 180 org l⁻¹⁰⁰ during autumn season, 40 org l⁻¹⁰⁰ during winter season and 190 org l⁻¹⁰⁰ during spring season. Ostracoda group showed maximum density 40 org l⁻¹⁰⁰ during summer season, 20 org l⁻¹⁰⁰ during autumn season, 15 org l⁻¹⁰⁰ during winter season and 50 org l⁻¹⁰⁰ during spring season in this study as a whole.

DISCUSSIONS

The trophic status of the system must be evaluated through zooplankton and other abiotic factors interact with organisms. There annual and seasonal cycle of zooplanktons is variable and plays functional response (Pennak, 1946). In general, zooplankton growth was registered during moderate temperature conditions, which may be due to regeneration and availability of minerals, being an outcome of decomposition of organic matter in sediments, and the algal food during this period are in consonance with Davis (1964).

The zooplankton population of Shatiya wetland was found to be composed of Rotifera, Copepoda, Cladocera and Ostracoda. The group Crustacea which included Cladocerans, Copepods and Ostracoda also showed uni-modal curve for their population though present study during moderate temperature conditions. The crustacean group showed maximum numerical surge during warm periods and minimum during colder periods. Zooplankton diversity of Shatiya wetland in village side with 08 species of rotifers and 04 species of each of protozoans cladocerans and copepods has been observed (Kumar *et al.*, 2007).

Temperature is the major factor related with freshwater zooplankton abundance where bottom layer exhibit fluctuations in temperature, especially during the summer season (Moitra and

Bhattacharya, 1965). In the present study, a positive correlation between zooplankton numbers and temperature was recorded. Temperature has been reported to affect zooplankton abundance in two ways. It acts directly to hasten growth rates resulted in the increase of population densities; secondly it stimulates the growth of phytoplankton populations by providing nutrients and adequate light in the environment (Taylor, 1974).

The rotifers were the most dominant group with (35%) followed by Cladocera (31%), Protozoa (24%), Copepods (8%) and Ostracods (2%) in this study. The abundance of rotifers in general and brachionids in particular has been attributed to hard and alkaline water (George, 1961). Previously in Gwalior region, Saksena and Sharma (1981) have reported thirty species of rotifers from different water bodies. Eutrophication also affects the species composition, biomass and structure of zooplankton. In Shatiya wetland, rotifers, cladocerans and copepods also showed moderate positive correlation with total hardness, free carbon dioxide and chlorides but high negative correlation was found with depth and electrical conductivity. The distribution of various species of zooplanktonic organisms was not homogenous at all the sites, and there was clear cut seasonal variation of zooplankton and various physico-chemical characteristics influenced their occurrence.

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