

A Study of Zooplankton Community Structure and Its Variations in a Fresh Water Canal

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Abstract The zooplankton are a very important constituent of the aquatic ecosystems. In the present study, analysis of zooplankton and physico-chemical parameters of water from the fresh water canal in Mawana region of district Meerut was done for a period of two years from Feb 2009 to Jan 2011. The study was designed to estimate zooplankton abundance, community structure and seasonal variation. The zooplankton community was found to be composed of 4 species of copepods, 5 species of rotifers and 2 species of cladocera. The dominance or peak of zooplankton was recorded during winter months. Numerically, copepoda was the most dominant group throughout the study period followed by rotifers and cladocerans. Various indices like Shannon-Wiener In-

dex and Percent Similarity Index have been used to analyse the zooplankton community.

Keywords Zooplankton, Density, Community structure, Physico-chemical parameters. Percent similarity.

Introduction

Zooplankton are minute aquatic organisms that mostly live in the surface water since they feed on the phytoplankton and on other zooplankton. Fresh water zooplankton are of utmost significance in aquatic ecosystems. Most fin-fish depend on zooplankton at some stage of their life. Zooplankton are valuable source of protein, amino acids, lipids, fatty acids, minerals and enzymes for fish. They are preferred over phytoplankton by fish fry due to their easy digestibility and high nutritional value. Zooplankton contain certain enzymes which play an important role in larval digestion. They also enhance metamorphosis of larvae.

These organisms also play important role in bio monitoring of water pollution [1]. The zooplankton community fluctuates according to physico-chemical parameters of their environment, especially rotifer species which change with biotic factors [2]. Zooplankton are important in assessing the nutrient level, temperature and pollution, all of which are used to determine the health of an ecosystem [3].

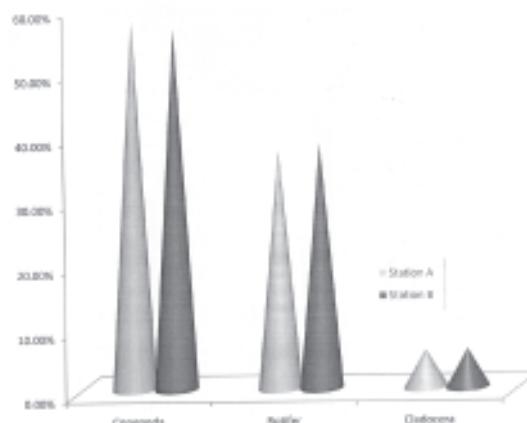
The present study was carried out in upper Ganga canal in Mawana town of District Meerut, lo-

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Table 1. List of zooplankton species recorded from study stations + Present, -Absent.

Name of species	Station A	Station B
Copepods		
<i>Diaptomus</i> sp.	+	+
<i>Cyclops</i>	+	+
<i>Atheyella</i> sp.	+	+
<i>Maraenobiotus</i> sp.	+	+
Rotifers		
<i>Brachionus</i>		
<i>Ascomorpha</i>	+	+
<i>Notholca</i> sp.	+	+
<i>Keratella</i> sp.	+	+
<i>Asplancha</i> sp.	+	+
Cladocerans		
<i>Daphnia magna</i>	+	+
<i>Alona</i> sp.	+	+

**Fig. 1.** Percent composition zooplankton at station A and B.

cated in Western plain zone of Uttar Pradesh. Two sampling stations (A and B) were selected for collecting samples.

Materials and Methods

The samples for the qualitative analysis of the zooplankton were collected monthly from both the sampling stations during the study period. Large volume of canal water was filtered through bolting silk cloth plankton net. Sample was collected in duplicate. One sample was fixed and preserved in 5% formalin, while the other was used for examining live specimens. Live samples were examined under microscope and identification was done using guidelines given earlier [4–6]. For the quantitative analysis of zooplankton, fifty

liters of water from each station was filtered through bolting silk cloth plankton net. The sample thus collected was centrifuged for about 15 minutes in order to concentrate the plankton population. The concentrated samples were preserved in formalin.

For numerical estimation the zooplankton samples were adjusted to known volume of water and counting was done using a Sedgwich Rafter counting cell, taking 1 ml aliquot. A minimum of three samples were counted. The density of zooplankton was calculated by Welch's equation [7]. Bray and Curtis coefficient was used to determine the similarity between the samples along the time gradient. Diversity indices were used for the community analysis of zooplankton. Shannon-Wiener Index was calcu-

Table 2. Percent similarity in zooplankton community at station (A) in year 2009–2010.

	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Feb	100	75.51	91.89	86.96	82.35	85.71	90.91	100	75.00	75.00	100	97.44
Mar		100	87.41	61.39	97.06	93.62	70.97	79.51	93.62	93.62	79.52	81.99
Apr			100	79.07	90.32	93.75	82.92	91.89	93.75	93.75	71.89	94.44
May				100	70.00	73.71	73.17	86.96	73.17	73.17	86.96	84.44
Jun					100	96.55	73.68	82.35	96.55	96.55	82.32	84.84
Jul						100	76.92	85.57	100	100	85.57	88.24
Aug							100	90.91	76.92	76.92	90.91	88.37
Sep								100	85.71	85.71	100	97.43
Oct									100	100	85.71	88.24
Nov										100	85.71	88.24

Table 5. Percent similarity in zooplankton community at station (B) in year 2010–2011.

	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
Feb	100	93.33	90.90	94.11	95.65	90.90	80.00	90.90	82.33	97.96	90.97	88.89
Mar		100	97.67	87.50	97.67	97.57	86.48	97.56	89.47	91.30	84.00	82.35
Apr			100	85.10	95.24	100	88.88	100	91.85	88.8	81.63	80.00
May				100	89.79	85.11	74.42	85.11	77.27	96.15	96.42	94.74
Jun					100	95.24	84.21	94.24	87.18	93.62	86.28	84.62
Jul						100	80.00	90.90	82.93	97.96	90.97	88.80
Aug							100	88.89	96.96	78.05	71.11	69.57
Sep								100	82.93	97.96	90.97	88.89
Oct									100	80.95	73.91	72.34
Nov										100	92.69	90.90
Dec											100	98.30
Jan												100

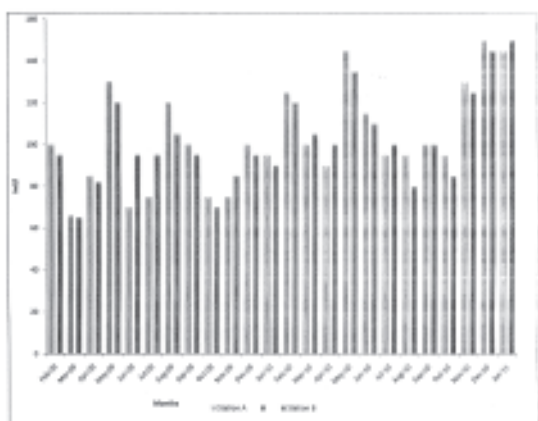
tober–November months. At station B, the percent similarity matrix revealed that the least similarity was between May–October months. The maximum similarity value was between June–September, July–September and September–December.

The percent similarity index of zooplankton for year 2010–2011 at both the study stations A and B are given in Tables 4 and 5. Least similarity was found between April and December months at station A (75.00%), while the maximum similarity was found to be 100% between March–September, May–January, July–October and August–October months. For station B, the percent similarity was lowest (69.57%) between August–January, while the highest similarity

(100%) was between April–July and April–September.

Shannon-Weiner index values of the zooplankton community of stations A and B are given in Table 6. The Shannon-Weiner index values were between 0.039 and 0.24 at station A and between 0.018 and 0.47 at station B, during the present study.

A total of 11 species were recorded from the Madhya Ganga canal in Mawana town of Uttar Pradesh, India. Similar results have been reported earlier [9], from South Central India. Total 20 species including rotifera, cladocera and copepoda have also been reported from Rajura of Buldhana in Maharashtra [10]. Dimowo [11] observed 16 zooplankton species from river Ogun, southwest Nigeria. In the present study, the class rotifera was the highest contributor to the number of species with 5 species, followed by copepods with 4 species and cladocerans with only 2 species. Dede and Deshmukh [12] also reported similar findings from a tropical river in Solapur, Maharashtra. It is clear from the data (Table 1) that copepods are most dominant at both the stations contributing an average population of 57.1% and 56.00% at stations A and B, respectively. The group cladocera contributed the least with average population of 5.86% at station A and 6.00% at station B. According to Mohsen et al. [13] copepods formed largest population of zooplankton in Timsah, Suez canal, Egypt.

**Fig. 2.** Variation in total density of zooplankton at station A and station B.

The total density of zooplankton was moderate

Table 6. Shannon-Wiener Index of zooplankton at station A and station B.

Months	Station A	Station B
Feb09	0.24	0.19
Mar09	0.23	0.19
Apr09	0.20	0.20
May09	0.15	0.47
Jun09	0.15	0.45
Jul09	0.12	0.20
Aug09	0.039	0.039
Sep09	0.14	0.14
Oct09	0.19	0.19
Nov09	0.19	0.11
Dec09	0.15	0.15
Jan10	0.20	0.20
Feb10	0.17	0.17
Mar10	0.16	0.17
Apr10	0.09	0.20
May10	0.15	0.17
Jun10	0.21	0.21
Jul10	0.12	0.14
Aug10	0.12	0.12
Sep10	0.15	0.15
Oct10	0.15	0.12
Nov10	0.14	0.14
Dec10	0.14	0.19
Jan11	0.045	0.018

ranging from 66.02 to 150.0 ind./l during the period of observation. Similar observations regarding the moderate population of zooplankton have also been earlier reported [14, 15]. The percent similarity index of zooplankton also indicated low variability of species. The percent similarity decreased with the increase in temporal distance and more similarity was observed between the consecutive months. The greatly lower values of the Shannon-Weiner index (from 0.018 to 0.47) during the present study show that the zooplankton community at both the stations is least diverse. The values of <3.0 for the Shannon-Weiner index are indicative of low diversity.

The population structure of zooplankton is quite stable and mixed population of rotifers, cladocerans and copepods is found, Numerically, copepods are the most abundant group in terms of number and percentage. The total population is apportioned among

only few species which are common at both the stations. There is no definite pattern of variations in the total zooplankton population. There is low species diversity and low variability of species. From the perusal of all the three indices, it can be inferred that zooplankton population was very less variable.

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