

Seasonal Variations in Zooplankton of Gomti River at Sultanpur, U.P.

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Abstract- During the 12-month period from July 2019 to June 2020, a study was conducted to assess the seasonal fluctuations of zooplankton along the Gomti river stretch in Sultanpur, Uttar Pradesh. In all three seasons, the zooplankton population was represented by 25 genera belonging to four different groups: Protozoa (6 genera), Copepoda (4 genera), Cladocera (8 genera), and Rotifera (8 genera) (7 genera). The highest density was found in the current study during the summer season, followed by the winter and rainy seasons. During the whole study period, Rotifer's population was dominant among documented zooplankton.

Indexed Terms- Zooplankton, Density, Gomti river.

I. INTRODUCTION

Zooplankton is a microscopic animal that swims freely. They play a significant role in energy transmission in an aquatic ecosystem's various trophic structures. They make an excellent bioindicator for water pollution. They are crucial in turning phytoplankton into food for fish and other aquatic creatures. Primary and secondary consumers make up the zooplankton communities. They serve as a direct link between primary producers and trophic levels higher up. Biodiversity of zooplankton is important for sustaining the health of the aquatic environment since each species has a specific role in the ecosystem (nutrient recycling, food for others, and soil fertility maintenance), and some species may allow the natural ecosystem to function properly (Anita et al., 2019). For a long time, zooplankton research has been a fascinating topic. Due to their important role in rapidly emerging concepts in environmental management such as Environmental Impact Assessment (EIA), bio indication of pollution, and biological monitoring, much attention has been paid in tropical countries in the last two decades to the study of zooplankton biology, ecology, and toxicology (Salve and Hiware,

2010). The majority of zooplankton are filter feeders that strain bacteria, algae, and other tiny particles from the water using their appendages (Sarwade and Kamble,2014).

Lotic systems are flow regime found to be one of the important factors associated with zooplankton diversity. So, the present study is an effort to assess the seasonal changes in zooplanktonic diversity and density at three sites of Gomti river along the Sultanpur stretch.

II. MATERIALS AND METHODS

The present study was carried out at Sultanpur stretch of the Gomti river for a period of twelve months from July,2019 – June,2020 for this purpose three different stations, were selected for sampling purpose. To investigate the seasonal variations in zooplankton diversity plankton sample were collected fortnightly between 8.30 to 9.30 AM from all the three stations of river. Plankton net of bolting silk no.25 was used for collecting the zooplankton. Zooplankton was collected from mid-stream 0.5 to 1.0 m below the surface of water by sieving a 50-liter volume of water sample. Collected concentrated zooplankton samples (10 ml) were fixed and preserved in 5% formalin. Plankton samples were examined under high power microscope and identified by using keys by using standard key. Plankton productivity was measured by using Sedwick Rafter Plankton counting cell and calculated by using formula,

$$\text{No. of zooplankton / lit} = a \times c / \ell$$

Where, a= No. of zooplankton counted in 1 ml, c = ml. of zooplankton concentrates. l= Volume of original water sample taken.

III. RESULT AND DISCUSSION

The Seasonal variations of zooplankton of Gomti river at Sultanpur are given in table 1 and 2. The zooplankton population in three seasons were represented by 25 genera belonging to four different groups viz. Protozoa (6 genera), Copepoda (4 genera), Cladocera (8 genera) and Rotifera (7 genera) (Table 1.). In the present investigation maximum density was recorded in summer season (670 individuals /L) followed by winter season (458 individuals / L) and monsoon season (285 individuals / L) (Table 2). Zooplankton abundance was increases gradually in winter reaching maximum in summer. This finding is in similar pattern reported by Sharma (2018). Among recorded zooplankton Rotifer’s population was dominant during entire study period.

Protozoans constitute important links in the food webs, are employed in biological and medical research act as an indicator of pollution and petroleum deposits and also acts as the natural enemies of harmful bacteria, thus aiding in soil fertility (Gharpure and Bhatkulkar, 2015). In the present study Protozoans are represented by six genera viz, *Arcella*, *Centropyxis*, *Diffugia*, *Paramecium*, *Volvox* and *Vorticella* species. Density of Protozoans varies from 30-95 individuals/ L. Highest density of Protozoans was found in summer

season while lowest density of Protozoans was observed in the monsoon season.

Copepods form primary food source of plankton feeders fishes and hence constitute an essential link with food chain. In the present study copepods are represented by four genera viz *Cyclops*, *Mesocyclops*, *Heliodyptomus* and *Neodyptomus* species. Density of Copepods varies from 74-144 individuals/ L. Highest density of Copepodes was found in summer season while lowest density of Copepodes was observed in the rainy season. During present study, it was observed that these are absent at the polluted sites.

Cladocerans played an important role in limnetic and benthic food chain. Most of the cladoceran species are primary consumers of microscopic algae and fine particles of detritus. In the present study Cladocerans are represented by eight genera viz *Alona*, *Bosmina*, *Ceriodaphnia*, *Coronatella*, *daphnia*, *diaphanosoma*, *Indialona* and *Mmacrothrix* species. Density of Cladocerans varies from 60-219 individuals/ L. Highest density of Cladocerans was found in summer season while lowest density of Copepodes was observed in the rainy season. Presence of *Daphnia* at S1 indicates that this site is free from organic load.

Table 1. Seasonal variation of Zooplankton in Gomti River at Balrampur

S.N.	Genera	Monsoon Season	Winter Season	Summer Season
Protozoa				
1.	<i>Arcella</i>	+	+	++
2.	<i>Centropyxis</i>	-	-	+
3.	<i>Diffugia</i>	+	+	+
4.	<i>Paramecium</i>	+	++	+++
5.	<i>Volvox</i>	-	+	++
6.	<i>Vorticella</i>	++	++	++
Rotifera				
7.	<i>Asplanchna</i>	++	++	+++
8.	<i>Brachionus</i>	+	++	+++
9.	<i>Euchlanis</i>	-	-	+
10.	<i>Filinia</i>	-	+	+
11.	<i>Keratella</i>	+	++	++
12.	<i>Philodina</i>	-	-	+
13.	<i>Polyarthra</i>	-	+	+
Cladocera				

14.	<i>Alona</i>	++	+	+
15.	<i>Bosmina</i>	+	+	+
16.	<i>Ceriodaphnia</i>	-	-	+
17.	<i>Coronatella</i>	+	+	+
18.	<i>Daphnia</i>	-	+	++
19.	<i>Diaphanosoma</i>	-	+	-
20.	<i>Indialona</i>	-	+	+
21.	<i>Macrothrix</i>	+	++	++
Copepoda				
22.	<i>Cyclops</i>	+	++	++
23.	<i>Mesocyclops</i>	-	+	+
24.	<i>Heliodiaptomus</i>	+	-	++
25.	<i>Neodiaptomus</i>	-	++	+++
-, absent; +, rare; ++, common; +++, abundant				

Table 2. Seasonal variation in Zooplankton density (Individual / L) in Gomti river at Sultanpur

Season	Protozoa	Rotifera	Cladocera	Copepoda	Total
Monsoon	30	111	60	74	285
Winter Season	52	150	151	105	458
Summer Season	95	212	219	144	670
Grant Total	177	473	430	323	1403
Percentage (%) Contribution	12.61%	33.71%	30.65%	23.02%	-

Rotifers are the prominent groups among the zooplanktons of any water body irrespective of its trophic status. This is because of the less specialized food, high fecundity and parthenogenetic reproduction. Most of the rotifers are primary consumers feeding on phytoplankton and forms important links in food chain. Rotifers respond more quickly to changes in water quality so, these are used as bioindicator. In the present investigation are represented by seven genera viz *Asplanchna*, *Brachionus*, *Euchlanis*, *Filinia*, *Keratella*, *Philodina* and *Polyarthra* species. Density of Rotifers varies from 111-473 individuals/ L at sampling sites. Highest density of Rotifers was found in Summer season while

lowest density of Rotifers was observed in the rainy season.

CONCLUSION

The current study revealed that the Gomti river had a high diversity and density of zooplankton. Protozoa (6 genera), Copepoda (4 genera), Cladocera (8 genera), and Rotifera (8 genera) were among the 25 genera that made up the zooplankton diversity (7genera). The highest density was found in the current study during the summer season, followed by the winter and monsoon seasons.

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