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An Assessment of Zooplankton Population and Seasonal Variation in Lendi River, District Nanded, Maharashtra, India

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Abstract: The Zooplankton fauna of Lendi River was collected at regular intervals of one month at 3 stations from July 2010 to June 2011. A total of 16 species of zooplankton were recorded during the present study period. Out of these 9 species belongs to Rotifera, 4 species to Cladocera and 3 species to Copepoda. Most of the zooplankton species were belonged to Rotifera. Lendi River is one of the tributary of river Manar, originates at Malkapur district Latur and joins to river Manar at Degloor, district Nanded. Water of this Semi-perennial river is used to perform various activities such as industrial, irrigation, fisheries and human activities.

Keywords: Zooplankton, Seasonal Variation, Population, Lendi, River, Nanded.

1. Introduction

Plankton of rivers varies according to chemistry of the water (including gases and nutrients), temperature and amount of suspended matter, all of which are related to elevation gradient, surface wind and current affect the horizontal distribution of plankton. Zooplankton dynamics have been studied extensively in lentic fresh waters (lakes and reservoirs), yet comparatively little research has focused on lotic waters (rivers). The investigations in river planktons are scanty due to practical difficulties in the survey and sampling of flowing water. Rotifers, Cladocerans and Copepods are the main groups of zooplankton. These groups are characteristic indicators of water quality and pollution levels and they are an important source of food chain. In the present study zooplankton population and seasonal variations in Lendi River are reported.

Several investigators worked on zooplankton population viz., Tash (1971) studied Crustacean Zooplankton of the Noatak river, Northern Alaska. 26 species of Cladocera and 13 species of Copepoda were collected from the Noatak river of Northern Alaska. Saunders et.al., (1988) studied zooplankton abundance in the Caura river, Venezuela and recorded total 72 species. Modenutti (1998) studied rotifer fauna of the River Samborombon and its tributaries (La Plata river basin) and identified 47 species of monogonont rotifers. Zarfdjian et.al., (2000) described the seasonal and spatial distribution of zooplankton in the river Aliakmon, as well as the possible influence of environmental parameters on the zooplankton community. Seventy nine different taxa were recorded, including a possible new species (Pleurotrochan. sp.). Frutos et.al., (2006) observed changes in the abundance, species richness and species diversity of zooplankton in the Paraguay river. Surveys found 196 taxa in the Paraguay river. Thadeus and Lekinson (2010) worked on zooplankton-based assessment of the tropic state of a tropical forest river. The zooplankton composition was typical of a tropical freshwater river, with a total of 40 species made up of 16 Rotifers, 12 Cladocerans and 12 Copepods and their developing stages in the following order of dominance; Rotifera > Cladocera > Cylopoida >

Calanoida. **Ude** *et.al.*, (2011) evaluated of zooplankton diversity in Echara river, Nigeria. Four groups (Protozoans, Rotifers, Cladocerans and Copepods) and 21 species were recorded.

Vaidya and Yadav (2008) analysed physico- chemical parameters of the Bagmati river, Taudha lake, Nag pokhari, Siddha pokhari and Godavari fish pond of Kathmandu Valley and to make Qualitative and Quantitative study of zooplankton collected from these water bodies. Only three groups of zooplankton viz: Rotifera, Cladocera and Copepoda were collected from the lotic and lentic water bodies. A total of seventy one species of zooplankton were recorded during that period. Jose and Sanalkumar (2012) studied Seasonal Variations in the Zooplankton Diversity of river Achencovil. Zooplankton community of Achencovil river comprised of 28 species belonging to Cladocera (11species), Copepoda (9 species) and Rotifera (8 species). Kolhe et.al., (2013) estimated plankton population of Godavari river with reference to pollution. At station-I (Gangapur Dam) total 21 number of species were recorded from this station, of which 13 species belongs to Rotifer, 6 species belongs to Cladocera and 2 species of Copepoda. Station II (Ramkund Downstream) a total 18 species encounter from this station of which 12 to Rotifera, 4 belongs to Cladocera, 2 belongs to Copepoda. Kamble and Sakhare (2013) investigated zooplankton population and diversity from fresh water bodies of Gadhinglaj. Zooplankton diversity observed namely, Rotifera (10 genera), Cladocera (8 genera), Copepoda (5 genera) and Ostracoda (2 genera).

2. Material & Methods

Study Area: For the study of zooplankton population and seasonal variation in river Lendi three sampling stations (S-I Mukramabad, S-II Gonegaon & S-III Bahegaon road) were selected on the right bank of river Lendi, out of them two stations are in Mukhed taluka and one station is in Degloor taluka, district Nanded. Station-I: Mukramabad: This station is located at the height of 394 meter above M.S.L. in between the latitude 18° 28' & 44.33"N and longitude 77° 21' & 58.20"E. Station-II: Gonegaon: This station is located at the height of 384 meter above M.S.L.

in between latitude 18° 31' & 13.63"N and longitude 77° 25' & 5.38"E. Station is 6 to 7 km away from station-I. Station-III: Bahegaon Road (Degloor): This station is located at the height of 363 meter above M.S.L. in between latitude 18° 32' & 41.32"N and longitude 77° 33' & 28.07"E. It is 10 km away from station-II.

and **Identification** Collection, Preservation of Zooplankton samples: Plankton net was made by using nylon bolting cloth having mesh size of 60 micro meters used for the collection of plankton samples. 50 litres of water was sieved every time through the net. Samples were collected and preserved in 5% formalin for microscopic identification as per Trivedy & Goel, (1986). In the laboratory plankton slides were prepared for identification under compound microscope. The identified zooplanktons were photographed with the help of 5 megapixel digital camera. The planktons were identified to species level as per the guidelines given by Dhanapathi (2000), Murugan et.al., (1998) and Kodakar (1992).

Detailed analysis of zooplankton population was done by estimating the number of each species. Preserved samples were mixed uniformly by gentle inversion and then exactly 1 ml of the sample was pipette out into the S-R cell for analysis. The *Sedgwick-Rafter cell* of 50 x 20 x 1 mm is used for plankton counting. It is covered by a relatively thick cover slip and is calibrated to contain exactly 1.0 ml.

3. Results & Discussion

In Lendi river zooplanktons at three stations were recorded Rotifera, Cladocera and Copepoda. Rotifera were recorded from 3 families' viz. Brachionidae, Filinidae and Philodinidae. Brachionidae is the largest family from which 7 species were identified. Zooplankton in Cladocera were recorded viz. Daphnidae, Bosminidae, Moinidae and Chydoridae. From Copepoda zooplankton was recorded from Cyclopidae (Plate No. I).

Station-I

The identified zooplanktons at this station were belonging to Class Rotifera, Cladocera and Copepoda. In the class Rotifera 7 species were recorded from family Brachionidae of (5 sp.), Filinidae of (1 sp.) and Philodinidae of (1 sp.). In class Cladocera total 3 species were identified from Daphnidae (1 sp.), Bosminidae (1 sp.) and Moinidae (1 sp.) and from class Copepoda 3 species were identified from family Cyclopidae (3 sp.) (Table No. 1).

The zooplankton species encountered at Station-I are presented in Table No. 2 & Figure No. 1. A total of 13 species recorded from this station of which 7 species belonged to Rotifera, 3 species to Cladocera and 3 species to Copepoda. The maximum population density (59) was observed in April, May and June and minimum (26) in July. The annual average percentage composition of different groups of zooplankton showed that Rotifera contributed 54%, Cladocera 23% and Copepoda 23%.

Station-II

The identified zooplankton at this station belongs to Class, Rotifera, Cladocera and Copepoda. In Rotifera 3 species were identified from Brachionidae. In Cladocera 3 species identified from 3 families viz. Daphnidae (1 sp.), Bosminidae (1 sp.) and Moinidae (1 sp.). From class Copepoda 1 species was identified from family Cyclopidae (Table No. 1).

A total number of 7 species of zooplanktons belonging to Rotifera (3), Cladocera (3) and Copepoda (1) were identified and are presented in Table 3.11. The changes in the total population density of different zooplankton groups and their month wise percentage composition were depicted in Table No. 3 & Figure No. 2. The maximum density of 35 organisms/ml was observed during March, 2011 where as the minimum of 24 organisms/ml was observed during September, 2010. The annual average percentage composition of different groups of zooplanktons revealed to contribute nearly 43% of Rotifera, 43% of Cladocera and 14% of Copepoda.

Station-III

The identified zooplanktons at this station belong to Class Rotifera, Cladocera and Copepoda. In Rotifera from family Brachionidae (6 sp.), Filinidae of (1 sp.) and Philodinidae of (1 sp.) 8 species identified. In class Cladocera 4 species identified from Daphnidae (1 sp.), Bosminidae (1 sp.), Moinidae (1 sp.) and Chydoridae (1 sp.). From the Copepoda 3 species identified from Cyclopidae (3 sp.) (Table No. 1).

The quantitative monthly occurrences of zooplanktons species at Station-III are given in the Table No. 4 and Figure No. 3. Total number of species of zooplanktons counted from station-III is 15. Out of which 8 species from Rotifera, 4 species from Cladocera and 3 species from Copepoda. Population density of zooplankton ranged from 28 (September) to 57 (April). The annual average percentage composition of different groups of zooplanktons revealed to contribute 53% Rotifera, 27% Cladocera and 20% Copepoda.

The density of zooplankton in Lendi river during the period of study was generally low at all sampling stations. This trend of less abundance of zooplankton in river can be justified on the basis of reports from the other rivers such as **Negreiros** *et.al.*, (2010) from his studies of the Sapucai river pointed out that zooplankton is scanty. **Mathivanan** *et.al.*, (2007) in the study of river Cauvery observed the quantity of zooplankton of rivers is imported from stagnant water in permanent or temporary communication with the river (Sulehria, 2009).

Zarfdjian *et.al.*, (2000) in their study of zooplankton in river Aliakmon is characterized by low abundance in winter and high numbers in spring and summer. Water discharge, temperature & season affect abundance of zooplankton. Population density & abundance of zooplankton is also affected by invertebrate & fish predation. These conditions are also prevailing in river Lendi and also effect abundance and population of zooplankton.

In general at all the stations the quantity of zooplankton was very low from July to October. This may be due to heavy rain and flush of rain water in rainy season.

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Chydorus sphaericus

Cyclops Sp.

Cyclops sternuus

Mescyclops Sp.

Table 1: Shows List of Zooplankton identified during the study period 2010-2011

Sr. No.	Class/Family/Geneus/Species	Station-I	Station-II	Station-III
Ι	Rotifera			
Α	Brachionidae			
1	Brachionus calyciflorus	+	+	+
2	Brachionus calyciflorus amphiceros	+	-	+
3	Brachionus calyciflorus borgerti	+	-	-
4	Brachionus calycivlorus hymani	-	-	+
5	Brachionus falcatus typical	+	+	+
6	Keratella quadrata	+	+	+
7	Notholea Sp.	-	-	+
В	Filinidae			
8	Filinia longiseta	+	-	+
С	Philodinidae			
9	Rotaria rotatoria	+	-	+
II	Cladocera			
D	Daphnidae			
10	Daphnia Sp.	+	+	+
E	Bosminidae			
11	Bosmina Sp.	+	+	+
F	Moinidae			
12	Moina micrura	+	+	+
G	Chydoridae			
13	Chydorus sphaericus	-	-	+
III	Copepoda			
Н	Cyclopidae			
14	Cyclops Sp.	+	+	+
15	Cyclops sternuus	+	-	+
16	Mescyclops Sp.	+	-	+

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 Table 2: Shows Population composition and monthly fluctuation of zooplankton at station-I (organisms/ml) from July 2010 to June 2011

Month	Rotifera	Cladocera	Copepoda	Total Zooplankton
July	9	9	8	26
August	12	9	9	30
September	12	7	9	28
October	14	8	8	30
November	13	11	13	37
December	17	14	19	50
January	19	12	16	47
February	16	17	21	54
March	14	21	14	49
April	20	26	13	59
May	15	30	14	59
June	19	28	12	59
Average	15	16	13	44

Table 3: Shows Population composition and monthly fluctuation of zooplankton at station-II (organisms/ml) from July 2010to June 2011

Month	Rotifera	Cladocera	Copepoda	Total Zooplankton
July	8	12	6	26
August	7	12	7	26
September	8	10	6	24
October	8	12	8	28
November	7	13	9	29
December	10	15	8	33
January	9	13	8	30
February	11	12	11	34
March	13	13	9	35
April	-	-	-	-
May	-	-	-	-
June	-	-	_	-
Average	9	12	8	29

Table 4: Shows Population composition and monthly fluctuation of zooplankton at station-III (organisms/ml) from July 2010to June 2011

Month	Rotifera	Cladocera	Copepoda	Total Zooplankton
July	14	9	8	31
August	17	7	7	31
September	14	5	9	28
October	13	8	10	31
November	17	9	10	36
December	17	10	9	36
January	22	12	12	46
February	19	14	15	48
March	20	19	15	54
April	21	23	13	57
May	15	23	11	49
June	19	21	14	54
Average	17	13	11	41

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Figure 1: Monthly variation of Zooplankton at Station-I



Figure 2: Monthly variation of Zooplankton at Station-II



Figure 3: Shows Monthly variation of Zooplankton at Station-III