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Study on Zooplanktonic Community of River Deorania at Bareilly District (U.P.) and its Relation to Seasonal Variation

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ABSTRACT: The Deorania river is the water source for irrigation in Bareilly district. It is highly polluted in bareilly district due to effluents discharged from Parsakhera industrial area. Quantitative and quantitative analysis of zooplanktonic community of river water Deorania were carried out during extreme months of summer winter and rainy season. Seasonal variations in zooplankton population densities were studied. The results revealed that a total of 13 species belonging to five major groups viz. Rotifera, Cladocera, Copepods, Cilliates and Mesomycetozoea were found in this river. The study of season wise zooplankton analysis showed an average abundance of species in rainy season, lower in winter and maximum occurrence in summer season due to different environmental condition of river system.

Key words: Zooplankton, Deorania river, population density, Seasonal variation

I. INTRODUCTION

Bareilly is the part of Rohilkhand division which lies on the north-west of Uttar Pradesh. It is located approximately between latitudes 28°55′ N to 79°60′E. The elevation ranges between 160m-200m above the sea level. It is bounded by distt. Pilibhit, Shahjahanpur, Rampur and Budaun. Bareilly district occupies a sound position among the industrial cities of Uttar Pradesh. About 90 big industries and 1094 small scale industries are operating in the district. The river Deorania is a tributary of river Ram Ganga. It is a small river but contain sufficient water throughout the year. About 8km of its stretch passes through the thickly populated area of Bareilly City (Mazhar and Kapoor, 1992)[12] and joins river Ram Ganga near Unchagaon and thus pours tons of organic and inorganic wastes into this river.

The zooplankton in water, belong to following main taxonomic groups such as rotrifera, cladocera, cyclonoid and copepoda. The knowledge of their abundance, species diversity and their special distribution is important in understanding proof dynamics and trophic progression of water bodies are pointed out by Mathew (1997), Verma and Datta Munshi (1987) [11, 23].

The part of food chain zooplanktons are consumed by variety of secondary consumers including commercially important groups of crustaceans, fishes and prawns. The zooplanktons which play a role of converting phytoplanktons into food, suitable for fish and aquatic animals have acquired important in fishery research. The zooplanktons can also play an important role in indicating the presence or absence of certain species of fishes or in determining the population densities.

Various ecological aspects of zooplankton have been a subject of study by several workers such as Verma and Datta (1987), Chandrasekhar and Kodarkar (1994), Chandrasekhar (1996) Rekha Sharma and Diwan (1997), Balamwrugan *et. al.* (1999) [2, 4, 5, 17, 23]. In present paper, on the basis of qualitative and quantitative analysis of plankton and the total population densityof zooplanktons has been described at three sites in extreme month of the seasons.

II. MATERIAL AND METHODS

This data on which the present communication is based were collected from three selected sites, sampling was done on partingly basis in different extreme months of different seasons. The water samples from respective depth were obtained by Van Dorn type samples and sieved through or standard net having 270 mesh/linear cm. and the plankton thus by obtained were fixed in 4% formaline. Identification on various sp. was done with the help of standard taxonomic works (Smirror, 1974) [21]. Counting of the plankton was done by a sedgewickraftor cell.

$$\text{Number of Plankton /ml} = \frac{\text{Number of organisms counted}}{\text{Number of replicates taken}}$$

For convenience the cell could be divided into horizontal strips. Each strip was counted separately and several such strips counted. Number of Looplankton in the cell derived from the following formula:

$$\text{Number of plankton/ml} = \frac{C}{LxDxWxS} + 1000mm$$

Where:

C	=	Number of organism
L	=	Length of strip
D	=	Depth of strip
W	=	Width of strip
S	=	Number of strips counted

III. RESULTS AND DISCUSSION

A total of 13 zooplankton species belonging to five classes (Rotifera, Cladocera, Copepods, Cilliates and Mesomycetozoea) were quantified through the analysis of samples collected from 03 stations in summer, winter and rainy seasons. Zooplankton constitute the main food of carps under different stages of their rearing, maintenance of its optimum population ensures higher fish growth. During the period of investigation, zooplankton community in freshwaters is represented by Rotifera, Cladocera, Copepods, Cilliates and Mesomycetozoea. the population of zooplankton is largly depend on the phytoplankton density (Ansari and Singh, 2017) [1]. Majority of ratifera, cladocera and a population of copepoda feed on phytoplankton. Beside phytoplankton, the zooplankton invariably utilize organic particles. The data pertaining to the population dynamics of total zooplankton and its different components are given in Table 1. These data reveal that the population density of zooplankton in the river is a cyclic pattern, being lowest in winter at site B during January and then rising through summer. The maximum population density of different groups in Deoraniariver are depicted in Table 2. Saddozai *et al*. (2015) documented 85 species of rotifer species in the Manchar lake of Sindh, Pakistan [19]. Similar observation was made by Modassir and Ansari and Sawaikaer and Rodrigues (2017) in Syngenta Lake and Khandola Pond of South Goa [13, 18]. Zooplankton abundance throughout the study period is shown in Table (1, 2 and 3) and in figure (1, 2 and 3). The seasonal fluctuation of different species of zooplankton in the river showed varied pattern. Rotifers exhibited a typical bimodal pattern of fluctuation. The first peak was observed in the summer. There was observed a feeble winter peak also copepods showed a bimodal pattern in river water Deorania. Similar obserbation were reported by Singh *et al*. (2012) from Mahendranath pond Bihar [20], Tyor *et al.* (2014) from Shallow Lake of Sultanpur Nationasl Park [22]. A more or less similar observation was made by Wassie and Melese (2017) in Selameko Manmade Reservoir, Debre Tabor, South Gondar, Ethiopia [24].

Range of total population density was observed from 7.846×10^3 to 17.385×10^3 at sampling site A, 3.000×10^3 to 13.154×10^3 at sampling site B and 3.000×10^3 to 10.462×10^3 at sampling site C respectively. The maximum range of zooplanktons was investigated at site A in comparison site B and C. The present findings indicate that the population density of zooplanktons fluctuate in different extreme months of all the seasons. The finding of present study was supported by the observation of Joseph, 2017; and Bhatt *et al.,* 1999 [3,7]. In river water Deoraniahowever the annual cycle of five groups varied from place to place. It may be due to the fact that a definite cyclic pattern in the annual plankton proliferation is expected only in the water. Where as in which is very shallow and overgrown with macroplhytes the seasonal fluotutation very considerable. Khanna *et al*. (2012) also documented same genus from Ganga river from Devprayag to Rorkee [8]. While in contrast, Lusiana (2020) reported the high population densities of Tetramastixopoliensis and Trichotriatetractis from lotic and lentic water bodies [9]. Similar trend was also reported by Malik and Bharti (2012) from sahastadhara stream dehradoon [10].

The population density, composition and abundance of zooplanktons varies according to the season and type of freshwater body, its physicochemical parameters and biotic components was studied different worker (Patel *et al*. 2013; Negi and Negi, 2010 and Gaike *et al*. 2012) [6, 14, 15].

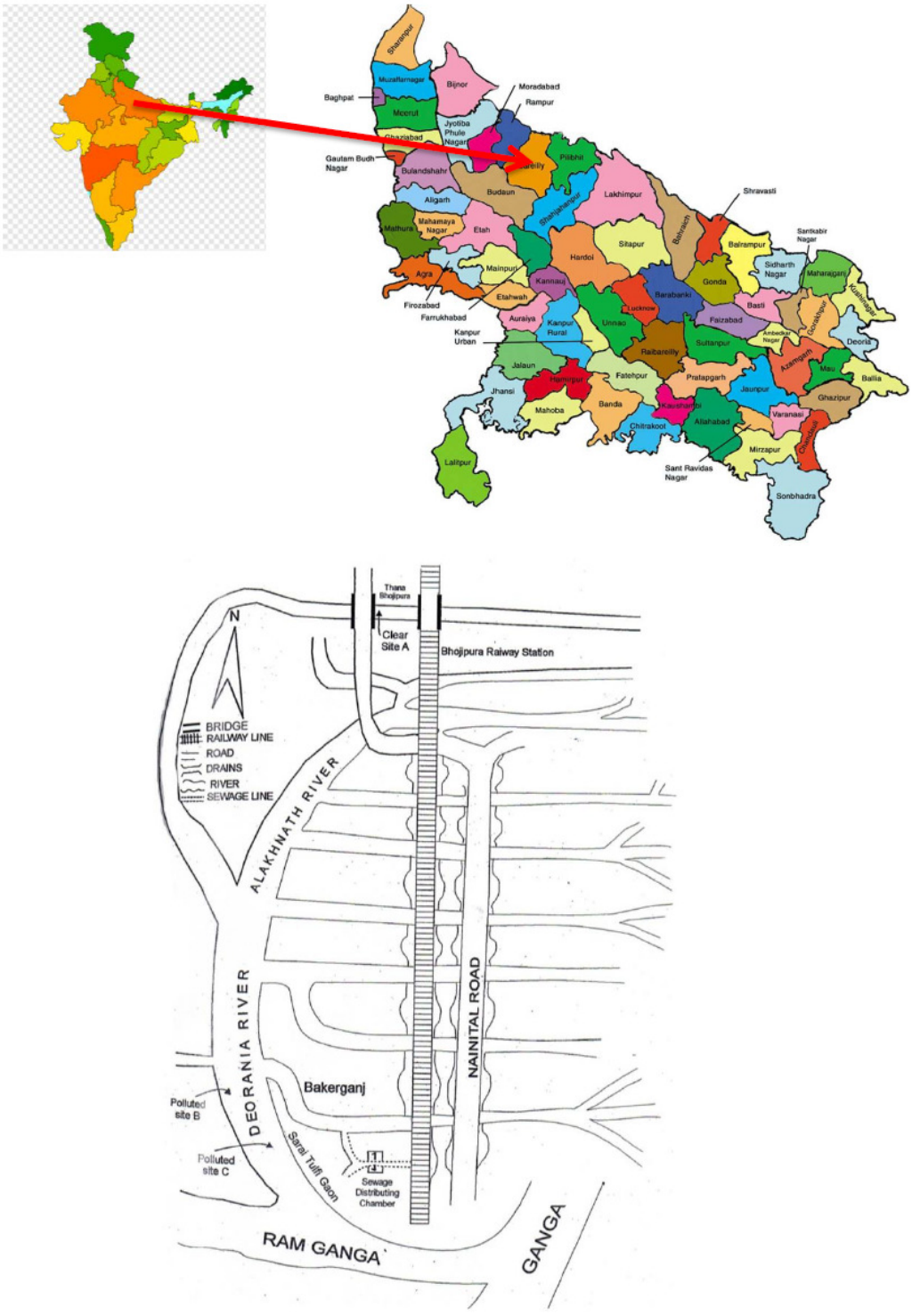

Plate 1: Map Showing all sampling site (Source : Municipal corporation).

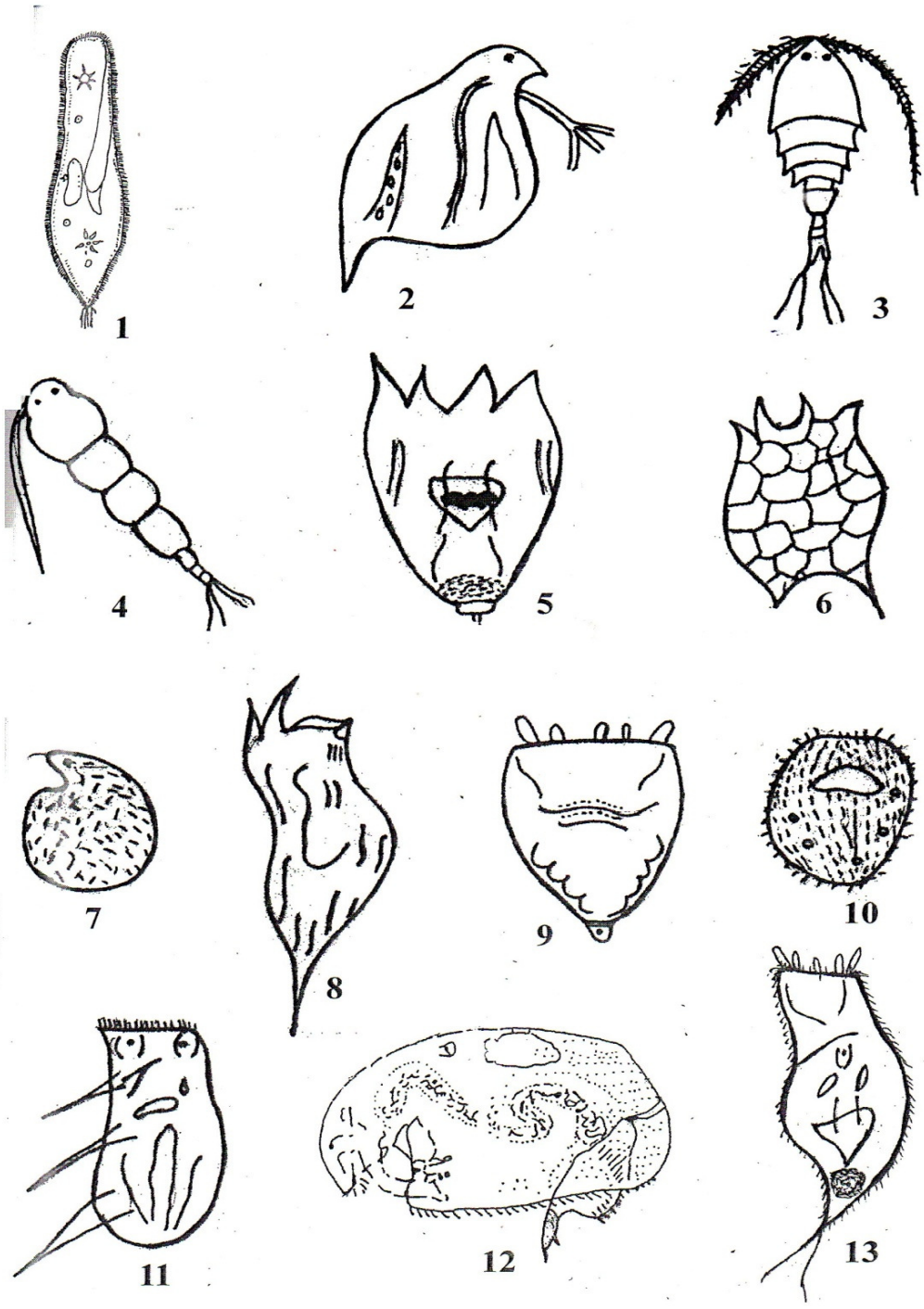

Plate 2: Showing all plankton species found in river Deorania 1. *Paramesium,* 2. *Daphnia*, 3. *Cyclops,* 4. *Diaptomus,* 5. *Branchionus,* 6. *Keratella,* 7. *Colpoda,* 8. *Trichocerca,* 9. *Ploesoma,* 10. *Icthyopthinu,* 11. *Filinia,* 12. *Alona,* 13. *Diphanosoma.*

Table 1: Qualitative and quantitative analysis of zooplanktons in river water Deorania at site A, B and C in different extreme months of winter, summar and rainy seasons.

	Zooplankton	Winter						Summer						Rainy					
		Site-A		Site-B		Site-C		Site-A		Site-B		Site-C		Site-A		Site-B		Site-C	
		Dec	Jan.	Dec	Jan.	Dec	Jan.	May	June	May	June	May	June	July	Aug.	July	Aug.	July	Aug.
1.	*Paramesium* sp.	04	06	08	-	02	-	06	08	04	02	04	03	12	16	18	08	04	06
2.	*Daphnia* sp.	12	11	16	05	07	03	26	14	16	30	12	31	02	-	-	-	-	-
3.	*Cyclops* sp.	10	20	02	03	-	05	30	12	36	03	27	-	-	04	10	18	05	12
4.	*Diaptomus* sp.	28	16	04	-	-	02	11	05	19	13	17	15	39	23	27	22	31	15
5.	*Branchionus* sp.	05	02	-	-	-	-	09	16	02	07	-	09	13	11	07	-	04	09
6.	*Keratella* sp.	22	09	19	13	15	-	31	23	17	06	20	05	03	11	09	16	03	08
7.	*Colpoda* sp.	12	14	21	03	23	10	04	15	03	09	02	07	-	05	-	02	-	-
8.	*Trichocerca* sp.	08	-	12	-	21	03	21	02	19	-	23	-	-	16	-	12	-	23
9.	*Ploesoma* sp.	09	12	05	09	-	08	-	05	-	08	-	11	16	18	06	07	11	15
10.	*Icthyopthinus* sp.	41	12	47	06	47	08	53	28	20	19	21	08	04	51	-	33	-	35
11.	*Filinia* sp.	-	-	-	-	-	-	07	-	05	-	03	-	03	21	13	16	07	11
12.	*Alona* sp.	06	-	03	-	-	-	11	06	03	-	01	-	12	27	03	11	-	02
13.	*Diphanosoma* sp.	07	-	-	-	01	-	17	11	27	06	03	-	-	-	-	-	-	-

Table 2: Range of total population density of zooplanktons in river water Deorania.

Site-A	Site-B	Site-C
7.846×10^3 to 17.385×10^3	3.000×10^3 to 13.154×10^3	3.000×10^3 to 10.462×10^3

Table 3: Total population density of zooplanktons ($X\times10^3$ units/1) in river water Deorania at site A, B and C in different extreme months of winter, summar and rainy seasons.

Seasons	Months	Total population density of zooplanktons		
		Site-A	Site-B	Site-C
Winter	Dec.	12.615×10^3	10.6159×10^3	8.923×10^3
	Jan.	7.846×10^3	3.000×10^3	3.000×10^3
Summer	May	17.385×10^3	13.154×10^3	10.231×10^3
	June	11.194×10^3	7.923×10^3	6.846×10^3
Rainy	July	8.000×10^3	7.154×10^3	5.000×10^3
	Aug.	15.615×10^3	11.154×10^3	10.462×10^3

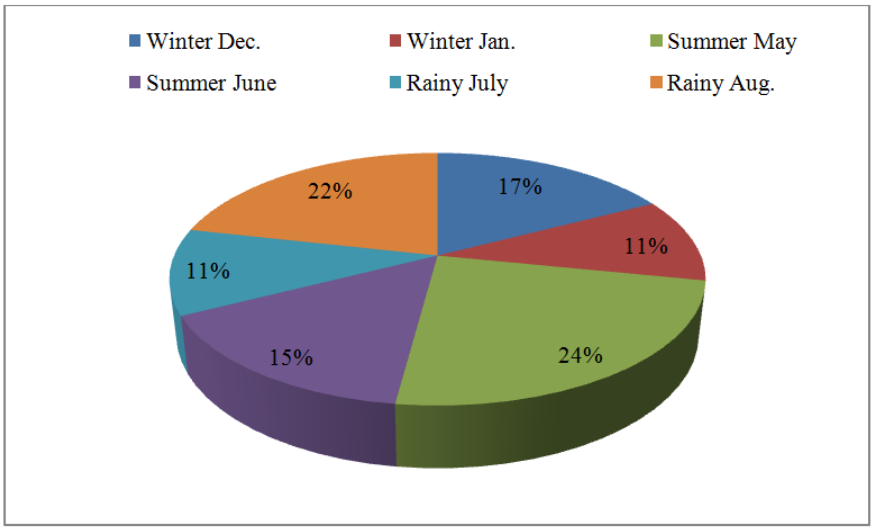

Fig. 1

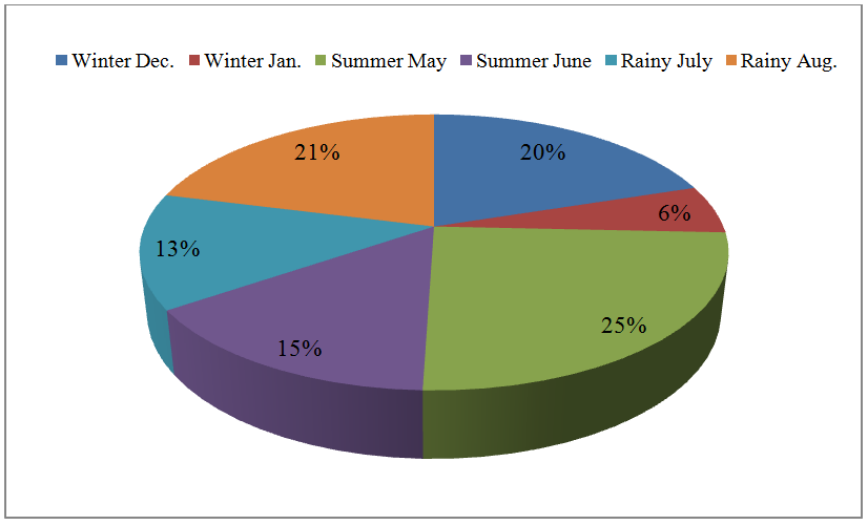

Fig. 2

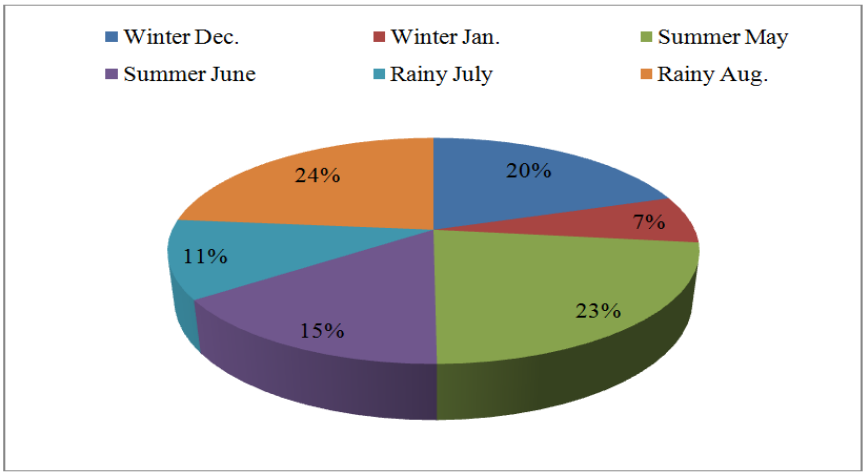

Fig. 3

Total population density of zooplanktons (X×10^3 units/1) in river water Deorania at site A, B and C in different months of winter, summer and rainy seasons.

IV. CONCLUSION

The freshwater zooplankton fauna of Deorania river is rich and highly diversified. This study showed that the zooplankton diversity was found average abundance of species in rainy season, lower in winter and maximum occurrence in summer season the diversity of species is likely to be affected by temporal changes in physical and chemical characteristics. So, the knowledge about the physico-chemical and biological factors of a river ecosystem becomes a prerequisite for better management of the ecosystem.

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