Diversity and Seasonal Variations of Zooplankton in Dudhiya Talab of Sirohi, India

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ABSTRACT

In this study, the seasonal fluctuations of zooplankton and specific physico-chemical parameters were examined in Dudhiya Talab, a significant artificial reservoir located in Sirohi, Rajasthan. During the research period, a total of 41 zooplankton species were identified, comprising 12 species of Rotifera, 14 species of Cladocera, 5 species of Ostracoda, and 4 species of Copepoda. Among these, Rotifera emerged as the predominant group, with a peak abundance of 689 individuals per liter recorded in the summer, while the lowest numbers were noted during the winter season. Additionally, the zooplankton community exhibited correlations with various physico-chemical parameters. The findings of this research suggest that the distribution and density of zooplankton species are significantly affected by the prevailing physical and chemical conditions of the aquatic environment.

Key words: Zooplankton, Physico-chemical factors,P Cladocera, Rotifera.

INTRODUCTION

Production of planktonic biomass including zooplankton is directly governed by physico-chemical factors, trophic state, and nutrient status of any water body. Zooplanktons are heterotrophic planktonic animals floating in water which constitute important food source for fish and other aquatic organisms (Haberman, *et al*. 2002). Physico-chemical parameters of different water bodies along with various planktonic resources have been studied by several workers Verma (2011), Balakrishna, *et al.* (2013), Jagadeeshappa (2013), Singh (2015). Correlation between physico-chemical factors and population density of cladocerans in the Tigris and Diyala rivers were reported by Mangal and Akbar (1988). Hossain, *et al.* (2015) reported seasonal variations and correlation of zooplankton with cultivable fishes of fresh water pond of Noakhali district, Bangladesh. Summarwar (2012) studied the composition and distribution of plankton in Bisalpur reservoir.

TABLE 1: Physico-chemical properties of Dudhiya Talab.

Parameters	May-June 2019	July-Aug 2019	Sep-Oct 2019	Nov-Dec 2019	Jan-Feb 2020	March-Apr 2020	Pooled Mean ± SE
Water temperature (°C)	31.4	27.4	25.4	24.7	19.5	24.8	25.53 ± 1.58
Air temperature (oC)	42.2	34.2	32.7	27.6	23.5	33.4	32.27 + 2.59
Transparency (cm)	191	183	187	201	198	168	188 ± 4.84
pH	8.6.	7.8	8.2	8.2	8.4	8.4	8.2 ± 0.11
Dissoved Oxygen (mg/l)	10.7	9.4	9.9	9.7	9.5	11.2	10.07 ± 0.29
Silicate (mg/l)	9.2	10.3	10.3	10.6	9.2	8.7	9.72 ± 0.32
EC (iS/cm)	440	530	480	440	380	430	450 ± 20.65
Nitrate-nitrogen (mg/l)	0.14	0.19	0.21	0.28	0.37	0.44	0.27 ± 0.04
Carbonate alkalinity (mg/l)	49	50	48	51	32	36	44.33 ± 3.33
Bicarbonate alkalinity (mg/l)	173	178	171	162	153	159	166 ± 3.89

Total alkalinity (mg/l)	227	232	224	212	198	204	216.17 ± 5.55
Orthophosphate (mg/l)	0.14	0.21	0.33	0.37	0.48	0.31	0.31 ± 0.04

TABLE 2: Bimonthly distribution of different groups of zooplankton (No/l).

Study Period	Zooplankton group					
	Protozoa	Rotifera	Cladocera	Copepoda	Ostracoda	Total
May-June 2019	13	126	128	11	4	282
July-Aug 2019	17	164	138	7	5	331
Sep-Oct 2019	8	106	89	7	4	214
Nov-Dec 2019	12	67	77	4	5	165
Jan-Feb 2020	15	138	78	29	8	268
Marh-Apr 2020	5	88	102	7	2	204
Pooled Data	70	689	612	65	28	1464

TABLE 3: Important groups and species of zooplankton in Dudhyia Talab.

PROTOZOA	**C**	**CLADOCERA**
Amoeba radiosa	1	Alonella sp.
Centropyxis hemisphaerica	2	Bosmina coregoni
Centrophysix ecomis	3	Daphnia longiremis
Diffugia spp.	4	Daphnia pulex
Trinema spp.	5	Ceridaphnia reticulata
Actinolophus spp.	6	Chydorus ovalis
ROTIFERA	7	Holopedium gibberum
Filina longiseta	8	Simocephalus spp.
Keratella spp.	9	Bosmina longirostris
Keratella valga	10	Macrothrix spp.
Keratella canadensis	11	Alona spp.
Kertella tropica	12	Pluroxus trigonelius
Brachionus plicatilis	13	Alona spp.
Brachionus falcatus	14	Scapholeberis kingi
Monostyla closterocerca	**E.**	**COPEPODA**
Monostyla quadridentata	1	Diaptomus spp.
Mytilina sp.	2	Mesocyclops spp.
Platyias sp.	3	Halicyclops spp.
Notholca sp.	4	Eucyclops spp.
OSTRACODA		
Cyprinotus spp.		
Stenocypris spp.		
Cypris spp.		
Cyclocypria spp.		
Entocythere spp.		

RESULTS AND DISCUSSION

The data collected on physico-chemical parameters showed that the range of atmospheric and water temperature varied between 23.5-42.2 (32.27 ± 2.59) ºC and 19.5-31.4 (25.53 ± 1.58) ºC respectively throughout the study period. The transparency, however, fluctuated between 168 – 201 (188 ± 4.84) cm whereas the dissolved oxygen varied from 9.4 – 11.2 (10.07 ± 0.29) mg/l, carbonate from 32-50 (44.33 ± 3.33) mg/l, bicarbonate from 153-178 (166 ± 3.89) mg/l, pH from 7.8 – 8.6 (8.2 + 0.11) mg/l, total alkalinity from 198 – 232 (216.17 + 5.55) mg/l. The electric conductivity in the Dudhiya Talab water during the study period showed variations from 380-530 (450.00 ± 20.65) iS/cm. The concentration of nitrate-nitrogen was limited to 0.14-0.44 (0.27 ± 0.04) mg per litre. Similarly, orthophosphate exhibited variations between 0.14-0.48 (0.31 ± 0.04) mg/l. (Table-1).

In the studied water body, it was observed that zooplankton fauna comprised mainly protozoans, rotifers, cladocerans, ostracods and copepods. All these groups were represented by 41 species in which Rotifera 12, Cladocera 14, Protozoa 6, Ostracoda 5 and Copepoda 4 species (Table 2). The pooled data showed that zooplankton community was contributed primarily by Cladocera (35.15%), Rotifera (29.27%), Protozoa (14.63%), Ostracoda (12.19%), Copepoda (9.75%) in order of dominance in Dudhiya Lake (Fig 1).

The seasonal variation in zooplankton density further revealed that it was high (331 No/l) during pre-monsoon and low (165 No/l) during post-monsoon season. Rotifera was the dominant group among the zooplankton and high population density was observed during summer and post monsoon while during winter season, it was relatively low. The zooplankton group Cladocera ranked second in abundance and the density was high during summer and low during winter season. Copepods emerged as the third largest group and depicted the highest density during monsoon and post-monsoon while the lowest number was found in winter. Protozoan occupied fourth place in the these were observed to attain the highest population whereas during summer lowest population was evident. Ostracods were observed lowest in population density among the zooplankton of Dudhiya Talab. Being producers and consumers, plankton play important role in the transformation of energy from one trophic to the higher trophic levels ultimately leading to fish production which is the final product of aquatic environment. The minute variation in the zooplankton may be associated with prevailing water quality conditions of this reservoir. It appears from this study that winter season is the most favorable period for growth and multiplication of zooplankton. In present study, it was observed that during September to February population density of zooplankton was high which may be due to increase of phytoplankton population thus providing better grazing opportunities to zooplankton. Similar finding was reported by Khalifa, *et al*. (2015) and El-SHerbiny, *et al*. (2011). There are some studies indicating the importance of nutrients (phosphate and nitrate) in controlling the abundance of plankton including zooplankton (Pomeroy, *et al*. (1963), Perry, and Eppley (1981).

The present study is proved present status of physico-chemical characteristics *i.e.*, pH, temperature, dissolved oxygen, transparency, and seasonal abundance of zooplankton. Similarly, the present study reported that the increase in alkalinity and silicate of water enhance the zooplankton population.

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