



Seasonal trends in physico-chemical parameters and zooplankton in a freshwater reservoir of Dejala Dewada, Khargone, M.P.

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Abstract

Seasonal variation in physico-chemical and zooplankton communities of Dejala Dewada Reservoir (D.D.R.), West Nimar district (Khargone) was studied during October 2009 to September 2010. Protozoa, Rotifera, Copepoda, Cladocera and Ostracoda were found dominated zooplanktonic groups. The total zooplankton density ranged between 879 unit/L to 2980 unit/L. The composition of zooplankton was found as Protozoa > Rotifera > Copepoda > Cladocera > Ostracoda.

Keywords: Dejala Dewada Reservoir, physico-chemical parameters, zooplankton

Introduction

Limnologists have been examining and describing the pattern of several successions of zooplankton species, since the turn of the century (Hutchinson, 1967). The phagotrophs and saprophytes composed mostly zooplankton, micro-invertebrates and fishes etc. The aquatic ecosystems have a great diversity in their form, distribution, adaptation and seasonal variation. The zooplanktonic population serves as natural food for macro-invertebrates, culturable fishes and aquatic birds. The zooplankton form a major link in the energy transfer at secondary level in aquatic biotops. They occupy an intermediate position in the food webs between autotrophs and heterotrophs. The distribution and diversity of zooplankton in aquatic ecosystems depend mainly on the physicochemical properties of water. The several zooplankton species have been classified as indicator of polluted conditions. The present paper deals with the Seasonal trends in physico-chemical parameters and zooplankton in a freshwater reservoir of Dejala Dewada, Khargone, M.P.

Material and Methods

The Dejala Dewada Reservoir, of West Nimar district (Khargone) is irrigation water body having a length of about 1640 meters with a catchment area of about 335.40 Sq. Km. The gross storage capacity is about 56.35 M cum. The Dejala Dewada

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reservoir (Fig.1) is situated on the river Kunda, a tributary of Narmada basin near village Bhagwanpura (about 35 Kms away from the district head quarter of West Nima). Geographically location this reservoir located at latitude 21°36'45" and longitude 75°37'-30". This water body was constructed in 1986-87 with the help of World Bank. It is situated 369.56 meter above the mean sea level. The Physico-chemical parameters such as water temperature, pH, free CO₂, dissolved oxygen, chloride, total alkalinity, total hardness, potassium, sulphate were estimated according to APHA (1989), Khanna and Bhutiani (2008) and Chattopadhyay, (1998). For estimation of zooplankton the samples were collected at monthly interval by filtering 50 litres of water through plankton net made up of bolting silk cloth no. 20. The samples were preserved in 5% formalin solution and stored in 50 ml. glass vials. The qualitative and quantitative enumeration of zooplankton was made according to Tonapi, (1960), Needham & Needham (1962) and Pennak (1972).

Results and Discussion

The results of various Physico-chemical parameters obtained during course of study are presented in table-1. In the present study temperature fluctuated between 17.6⁰ C (December, 2009) and 29.7⁰ C (June, 2010). The fluctuation of temperature was well within the limit for survival of fishes.



Fig.1- Satellite View of Dejala Dewada Reservoir

Table 1 – Showing monthly variations in physico-chemical parameters in Dejala Dewada reservoir

Months/Year	Water Temp. (°C)	pH	Free Co ₂ (mg/l)	DO (mg/l)	Chloride (mg/l)	Total alkalinity (mg/l)	Total hardness (mg/l)	Potassium (mg/l)	Sulphate (mg/l)
October 09	27.9	8.25	2.26	6.15	18.67	127.37	123.85	1.25	22.11
November 09	21.5	8.23	1.28	8.35	16.81	133.50	119.62	1.22	20.65
December 09	17.6	8.23	1.78	8.91	17.25	141.82	120.91	1.19	15.12
January 10	19.4	8.21	1.39	8.12	19.31	134.55	121.47	1.15	16.07
February 10	22.4	8.22	1.64	7.61	21.77	108.60	123.21	1.17	18.21
March 10	25.8	8.24	2.25	6.71	24.45	107.65	126.47	1.19	19.95
April 10	28.3	8.27	2.76	5.57	26.76	127.87	134.01	1.21	21.07
May 10	29.6	8.31	3.24	5.12	28.37	142.75	144.51	1.25	26.52
June 10	29.7	8.28	2.61	5.37	31.94	135.85	153.21	1.27	31.57
July 10	29.6	7.87	2.46	5.51	25.15	113.22	104.21	1.01	33.95
August 10	27.5	7.79	2.59	5.52	22.12	109.47	96.32	0.98	29.75
September 10	28.8	8.17	2.05	6.12	20.47	105.27	92.95	1.21	24.77

Similar types of fluctuations were reported by Dwivedi *et al.* (1995) in two ponds at Patna. A more or less similar trend has been observed in the river Yamuna by Chakrabarty *et al.* (1959) and in the Kallayi (John, 1976). Badola and Singh (1981) reported similar trend in river Alaknanda. pH represent the intensity of acidity or alkalinity of water. It plays a limiting role in the growth of flora and fauna of aquatic body. The pH of Dejala Dewda Reservoir was on alkaline scale (pH 7.79 to 8.31) with irregular trend of seasonal fluctuation. The D.O. ranged from 5.12mg/l to 8.9 mg/l with

maximum oxygen during winter season, which may be due to higher photosynthesis rate and dissolution of oxygen during winter season as suggested by Hutchinson (1967). Similar trend of D.O. was also observed by Badola and Singh (1981) for river Alaknanda, Khanna *et al.* (2009) and Chugh (2000) for the river Ganga. The free CO₂ ranged from 1.28mg/l to 3.24 mg/l. The presence of free CO₂ was may be due to more aquatic vegetation in the reservoir. However, it was found low in all seasons. An inverse relationship between free CO₂ and pH was observed by Singhal *et al.* (1985). The

chlorides ranged between 16.81 to 31.94 mg/l with narrow range of seasonal variation. The total alkalinity values in the D.D.R. was also fluctuated in a narrow range with minimum value of 105.27 mg/l and maximum value of 142.75 mg/l. This observation is similar to the findings of Venkateshwarlu and Jayanti (1968) for the river Sabarmati, Khanna *et al.* (2009) found similar trend in river Yamuna. The value of total hardness is governed by the contents of calcium and magnesium salts, largely combined with bicarbonate, carbonate, sulphate and chloride. The total hardness ranged from 92.95 mg/l to 153.21 mg/l. The sulphate was observed fluctuating throughout the year. However, it was found higher in summer season (33.95 mg/l). During the present investigation the minimum (0.98 mg/l) potassium content was recorded in the month of August 2010 and maximum (1.27 mg/l) in the month of June 2010. During the course of study the zooplankton population was represented by five groups viz. Protozoa, Rotifera, Copepoda, Cladocera and Ostracoda. A total of 20 zooplankton genera were

identified, out of which 6 genera belong to each Protozoa and Rotifera, 3 genera to each Cladocera and Copepoda and 2 genera to Ostracoda. The Protozoa genera recorded were *Arcella*, *Amoeba*, *Vorticella*, *Volvox*, *Euglena* and *Paramecium*. Rotifera genera observed were *Keratella*, *Philodina*, *Notholca*, *Elosa*, *Filina* and *Mytilina*. In Cladocera genera observed were *Daphnia*, *Bosmina* and *Alona*. Copepoda includes genera *Cyclops*, *Diaptomus* and *Eucyclops* and Ostracoda genera *Cypris* and *Candona*. Table 2 – represents monthly density and percentage composition (%) of various zooplanktonic groups in Dejala Dewada Reservoir.

The total zooplankton density of Dejala Dewda Reservoir ranged from 879 unit/ L in August, 2010 to 2980 unit /L in November 2009. Among the zooplankton, Protozoa and Rotifera were most dominant groups (Table-3). The Cladocera and Copepoda were found to be the second most dominant group. The Ostracoda was the least dominant group and their percentage composition ranged between 7.71% to 12.97%.

Table 2: Showing Monthly density and percentage composition (%) of various zooplanktonic groups in Dejala Dewada Reservoir

Months /Year	Water Temp. (°C)	pH	Free CO ₂ (mg/l)	DO (mg/l)	Chloride (mg/l)	Total alkalinity (mg/l)	Total hardness (mg/l)	Potassium (mg/l)	Sulphate (mg/l)
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September 10	28.8	8.17	2.05	6.12	20.47	105.27	92.95	1.21	24.77

Table 3 - Percentage composition of zooplankton

Group	Protozoa	Rotifera	Cladocera	Copepoda	Ostracoda
Percentage composition	22.53 - 36.69	21.77 - 33.24	11.72-18.22	12.16-18.57	7.71-12.97



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