



Impact of physico-chemical parameters on zooplankton diversity of freshwater reservoirs around Amravati District, Maharashtra

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Abstract

Impact assessment was carried out on the zooplankton diversity of Pohra, Wadali and Chhatri surface water reservoirs around Amravati with respect to their physico-chemical characteristics. During course of study zooplankton were represented by five major groups i.e. Ostracoda, Rotifera, Cladocera, Protozoa and Copepoda. High value of physico-chemical parameters and low zooplankton diversity were recorded in Chhatri reservoir, moderate in Wadali lake and low value of physico-chemical parameters and high zooplankton diversity were recorded in Pohara lake. The Chhatri reservoir was found to contain most of the pollution indicator species. Wadali reservoir also exhibited few pollution tolerant species. Prominent among them were *Ceratodaphnia*, *Lepadella*, *Monostyla*, *Rotaria*, *Cyclops*, *Diaptomus* and *Ectocyclops*. The water in all the reservoirs was found to be eutrophic in the order of Pohra > Wadali > Chhatri.

Keywords: Physico-chemical parameters, Zooplankton diversity, fresh water reservoirs

Introduction

Fresh water is one of the most precious commodities for the human beings. In the global perspective, only 0.009% of the water resources of the earth are stored as fresh water lakes. Amravati is surrounded by a large number of lakes like Wadali, Chhatri, Pohra, Basalapur, Malkhed, Sawangee, Kekatpur, Kondeshwar and many more small and large lakes and reservoirs in the aerials radius of 25 kilometers. The water of these reservoirs is also used for drinking purposes, agriculture and fishery activities. But recently, due to increasing human activities and grazing activities of animals in it, the water is becoming polluted. (Sachidanandmurthy and Yajurvedi, 2006; Parasher *et al.* 2008). Plankton are the important biotic components of aquatic habitat. They do determine the trophic status and the quality of water and it may affect the fish production.

Material and Methods

The three reservoirs selected for the present study were "Pohra", "Wadali" and "Chhatri". They all are situated towards the East of Amravati city, India. Reservoir Wadali is situated at 77° 48' E longitudes and 20° 55' N latitude, reservoir Chhatri

is situated at 77° 46' E longitude and 20° 54' N latitude and reservoir Pohra is situated at 77° 54' E longitudes and 20° 54' N latitude. Water samples for physico-chemical and biological analysis were collected at monthly intervals during January 1996 to December 1996 in between 8 to 10 a.m. Parameters like water temperature (°C), pH, turbidity (NTU), dissolved Oxygen (mg/l) and free CO₂ (mg/l) were measured immediately after collection of samples at the sites by using portable battery operated water analysis kit. Estimation of total alkalinity (mg/l), total hardness (mg/l), chlorides (mg/l), nitrates (mg/l), phosphates (mg/l), sulphates (mg/l), silicates (mg/l) in collected water samples were carried out in the laboratory within six hours following the standard methods as recommended by APHA (1985). For biological analysis of plankton fifty liter of water samples were filtered through the plankton net of number 25 bottling silk with mesh size 64 µm and divided into two parts; one part was fixed with 4% formalin while other part with Lugol's solution. The identification of phytoplankton was done with the help of keys given by Welch (1948), Trivedi and Goel (1986), APHA (1998) and Khanna and Bhutiani (2003) for physico-chemical parameters. Similarly identification of zooplankton was carried

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out by using key and monographs of Adoni (1985) and APHA (1998).

The Pohra reservoir was quite cool (12.6 to 20.4 °C) in winter season while Chhatri reservoir water was more warm (26.5 to 39.4 °C) in summer season in comparison to Wadali reservoir. The Pohra reservoir water was more transparent (510.6 to 620.2 cm) during winter season and Wadali reservoir water was found highly turbid (62 – 80 NTU) during winter season. The increasing order of turbidity was observed to be Pohra reservoir < Chhatri reservoir < Wadali reservoir the pH was found to be in the order of Chhatri > Wadali > Pohra. In the Chhatri reservoir the pH was found to

Results and Discussion

be more alkaline (8.4 to 8.9) during summer season. It is favourable for the growth of plankton, aquatic plants and fishes. Alkalinity of Wadali reservoir water was found as 188.40 -218.60 mg/l while for Chhatri reservoir it was found as 110.72 -140.25 mg/l. Sulphate contents in the Chhatri reservoir exhibited 24.62 -34.46 mg/l while a lower range was observed in Pohra 6.84 -8.52 mg/l and Wadali reservoir exhibited high sulphate content i.e. 24.51 -30.12mg/l. Phosphate content (5.6 mg/l) in Chhatri, Pohra 0.002 to 0.027, 0.004 to 0.015 and 0.009 to 0.018 mg/l (table-1).

Table - 1: Physico-chemical characteristics of Reservoir

Sr. No.	Parameters	Pohra	Wadali	Chhatri
1	Water Temperature (°C)	24.2 – 36.2	25.2 – 37.6	26.5 – 39.4
2	Transparency (cm)	510.6 – 620.2	13.6 – 18.9	48.6 – 56.9
3	Turbidity (NTU)	60 – 76	62 – 80	60 – 78
4	pH	8.2 – 8.5	8.5 – 8.7	8.4 – 8.9
5	D. O. (mg/l)	4.6 – 8.4	4.3 – 7.8	4.2 – 7.6
6	Free CO ₂ (mg/l)	Nil – 28.18	Nil –21.6	Nil – 6.3
7	Total alkalinity (mg/l)	139.12 – 189.35	188.4 – 218.6	110.72 – 140.25
8	Total Hardness (mg/l)	168.3 – 205.4	206.6 – 295.3	208.95 – 248.50
9	Chlorides (mg/l)	46.2 – 67.5	108.36 – 145.32	128.65 – 262.81
10	Sulphates (mg/l)	6.84 – 8.52	24.62 – 34.46	24.51 – 30.12
11	Phosphates (mg/l)	0.009 – 0.018	0.98 – 1.80	2.5 – 5.6
12	Silicates (mg/l)	0.065 – 0.186	17.82 – 19.15	22.25 – 26.52

The present investigation was carried out to know the physico-chemical status and its impact on the zooplankton.

During the course of study a total of five major groups of zooplankton i.e Ostracoda, Rotifera, Cladocera, Protozoa and Copepoda were found (table 2 to 6). Ostracods are represented by 2

genera (Table–2), Rotifers by 13 genera (Table–3), Cladocera by 5 genera (Table–4), Copepods by 3 genera (Table-5) and protozoa by 6 genera (Table-6) in the Pohra reservoir. However, Chhatri reservoir exhibited 4 species of ostracods, 18 species of rotifers, 3 species of cladocera, 5 species of copepods and 4 species of protozoans.

Table 2: Diversity of Ostracods in Pohra, Wadali and Chhatri reservoirs

Ostracods	POHRA	WADALI	CHHATRI
<i>Cyprinotus</i>	+	+	+
<i>Cypris</i>	+	+	+
<i>Stenocypris</i>	--	+	+
<i>Strandesia</i>	--	+	+

+: Present, --: Absent

Table 3: Diversity of Rotifers in Pohra, Wadali and Chhatri reservoirs

Rotifers	POHRA	WADALI	CHHATRI
<i>Asplanchna</i>	+	+	+
<i>Brachionus angularis</i>	+	+	+
<i>B. Calyciflorus</i>	--	+	+
<i>B. Candatus</i>	+	+	+
<i>B. Rubens</i>	--	+	+
<i>B. Forficula</i>	--	+	+
<i>B. falcatus</i>	--	+	+
<i>B. quadridentatus</i>	+	+	+
<i>B. bidentatus</i>	--	+	+
<i>Cephalodella</i>	--	--	+
<i>Filinia longiseta</i>	+	+	-
<i>F. opeliensis</i>	+	-	-
<i>F. ovalis</i>	+	-	-
<i>Keratella cochlearis</i>		-	-
<i>K. tropica</i>	+	+	+
<i>K. quadratus</i>	+	+	+
<i>Lecane luna</i>	+	-	+
<i>L. bulla*</i>	-	+	+
<i>Lepadella</i>	-	+	+
<i>Monostyla*</i>	-	+	+
<i>Mytilina</i>	+	+	-
<i>Notcholca</i>	+	+	+
<i>Rotarria*</i>	-	+	+
<i>Testudinella</i>	-	+	-
<i>Trichotria</i>	+	+	-

* - Pollution indicator species +: Present, --: Absent

Table 4: Diversity of Cladocerans in Pohra, Wadali and Chhatri reservoirs

Cladocerans	POHRA	WADALI	CHHATRI
<i>Alonella</i>	+	+	--
<i>Ceratodaphnia*</i>	--	+	+
<i>Daphnia</i>	+	+	--
<i>Diaphanosoma</i>	+	+	--
<i>Leydigia</i>	--	--	+
<i>Macrothrix</i>	+	+	--
<i>Moinodaphnia*</i>	--	+	+
<i>Simocephalus</i>	+	+	--

* : Pollution indicator species, + : Present, -- : Absent

Table 5: Diversity of Copepods in Pohra, Wadali and Chhatri reservoirs

Copepods	POHRA	WADALI	CHHATRI
<i>Cyclops</i> *	--	+	+
<i>Diaptomus</i> *	--	+	+
<i>Ectocyclops</i> *	--	+	+
<i>Mesocyclops</i>	--	+	+
<i>Nauplius</i>	+	+	+
<i>Neodiaptomus</i>	+	+	--
<i>Phyllodiaptomus</i>	+	+	--
<i>Thermocyclop</i>	--	+	--

* : Pollution indicator species + : Present -- : Absent

Table 6 : Diversity of Protozoans in Pohra, Wadali and Chhatri reservoirs

Protozoans	POHRA	WADALI	CHHATRI
<i>Arcella</i>	+	+	+
<i>Centropyxis</i>	+	+	--
<i>Diffugia</i>	+	+	+
<i>Euglena</i>	+	+	--
<i>Euglypha</i>	+	--	--
<i>Paramoecium</i>	--	--	+
<i>Vorticella</i>	+	+	+

+ : Present -- : Absent

The Chhatri reservoir exhibited the pollution tolerant rotifers like *Cephalodella*, *Lepadella*, *Monostyla* and *Rotarria*, pollution tolerant cladocerans like *Ceratodaphnia* and *Moinodaphnia*, pollution tolerant copepods like *Cyclops*, *Diaptomus* and *Ectocyclops*. Our results are well in agreement with that of Ganpati (1973), Bais and Agarwal (1995) and Cole (1979) who observed these zooplankton in various polluted water bodies. These observations indicate the presence of pollutants in Chhatri reservoir. Chhatri reservoir is situated very near to the MIDC area of the Amravati City, from where the toxic gases might be settling down in the reservoir water and polluting the same. Similarly few pollution indicator species are also recorded from Wadali reservoir (Tables 3 to 5). This could be because of the human activities

and entry of domestic sewage in Wadali lake. With respect to the degree of pollution the sequence of the three reservoirs can be given as Chhatri > Wadali > Pohra. However, the Pohra reservoir was found to be non-polluted.

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