



Zooplankton abundance and its correlations with physico-chemical parameters from urban lake Wani, Dist. Yeotmal, Maharashtra.

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Abstract

Some physico-chemical and biological parameters were studied from urban lake Wani, dist Yeotmal to assess the pollution status. The parameters were studied for the period of one year i.e. from July 2006 to June 2007. The sample analysis showed great diversity in zooplankton, consisting 65 genera belonging to five groups. The seasonal succession of zooplankton was in the order of summer>winter>monsoon. The physico-chemical parameter such as temperature, pH, CO₂, TDS, DO, Sulphate, phosphate have been studied. The correlation analysis was also made between zooplankton and physico-chemical parameter.

Keywords: Correlation, domestic waste, physico-chemical parameter, seasonal distribution, urban lake Wani, zooplankton

Introduction

The total environment is a complex entity, of which water is an essential component for the survival of living being (Bobdey *et al.*, 2009). But unfortunately most of our water bodies including rivers, streams and lakes have become polluted and unfit for human use. The physico-chemical and biological characters of reservoir and lake water can be used to assess the ecological nature of lake and reservoir. Among the biological parameters plankton are considered as the bio-indicators of water quality and are therefore are much important from limnological point of view (Chhaya *et al.*, 2007). The plankton are largely grouped into phytoplankton and zooplankton. Phytoplankton constitute major fraction of primary producer in water bodies. They play important role in biosynthesis of organic matter in all ecosystems. Zooplankton occupy a central position between autotrophs and other heterotrophs and are important link between food web of freshwater ecosystem. The occurrence of zooplankton depends on its productivity which intern is influenced by physico-chemical parameter and level of nutrients in water (Sawane *et al.*, 2009).

The relevant studies on various physico-chemical aspect and zooplankton characteristics were made by Sinha and Islam, (2003), Sankaran and James (2006), Gupta and Sharma, (2007), Sawane *et al.*, (2006, 2009), Ramu *et al.*, (2009), Fule *et al.*, (2009), and Khanna *et al.*, (2009). But in Wani Lake, studies on the physico-chemical aspect and zooplankton characteristics are very less. Thus the present study was undertaken to investigate the relative abundance of zooplankton population in relation to various physico-chemical parameter of Wani lake.

Material and Methods

For the analysis of various abiotic and biotic parameters, water samples were collected on every month between 8.00 am to 11.00 am for the period of 12 months (July 2006 to June 2007) from Wani Lake. The water samples were collected from surface about 5 meters away from the shore in clean plastic bottle as per the standard procedure. Collected samples were analyzed in the laboratory as per the methods described by NEERI (1986), Ramesh and Anbu (1996). For zooplankton analysis the plankton net made up of silk blotting cloth No 25 was used for collecting samples and collected samples were for collecting samples and collected samples were preserved in 5% formalin solution.

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Quantitative and qualitative analysis of zooplankton were also carried out and expresses in organism/liter. Identification of zooplankton species were carried out using key by Edmondson (1959), Dhanpati (2004).

Results and Discussion

The results of various physico-chemical characteristics of water, for a period of 12 months have been tabulated in Table-1 and depicted in Figure-1. Zooplankton diversity is given in Table-2 and depicted in Figure 2. While, correlation coefficient ('r' values) between each pair of parameters for all possible correlation is computed and listed in Table-3. Among the physico-chemical parameters, temperature is one of the most important physical parameter which affects the chemical and biological reaction in water. Shukla *et al.*, (1991) and George (1962) stated that temperature affects not only metabolic activities of plankton but also their proliferation. In present investigation temperature values of Wani Lake water ranges between 27.2° C -23° C. Minerals and some organic substances present in water are referred to the total dissolved solids (TDS). The TDS content varied according to season as well as with increasing load of pollution (Sawane *et al.*, 2009). The CO₂ content of any aquatic body is the best single index to decode the suitability of water for animal and other living being. It may be present in the form of gas or in combined form with other substances (Tamrulkar and Ambore, 2006). On the basis of data collected and study carried out it is observed that increase level of CO₂ observed during monsoon. pH considered as an important ecological factor and is the result of interaction of various substances in the water and also of various biological phenomenon (Tamrulkar and Ambhore, 2006). In present investigation the pH of Wani Lake was alkaline except winter season. Dissolved oxygen play an important role in supporting life in aquatic habitat, but is susceptible to slight environmental change (Sawane *et al.*, 2009). Present study reveals that, concentration of dissolved oxygen was found to be maximum in winter followed by summer and monsoon. Salt present in water and the organic and inorganic pollutants are the source of phosphate concentration (Bobdey *et al.*, 2009). Maximum concentration of

phosphate in Wani Lake was found during summer followed by monsoon and winter.

Table-1: Seasonal mean values of different physico-chemical parameters from Wani Lake water during the year 2006-07

Parameter	Winter	Summer	Monsoon
Temp. (°C)	23	27.2	26.5
Phosphate (mg/l)	2.45	8.11	4.13
Nitrate (mg/l)	1.3	1.8	1.15
T.D.S (mg/l)	70	110	100
CO ₂ (mg/l)	39.5	23.5	39.37
pH	6.7	7.8	7.4
DO (mg/l)	6.44	4.64	2.83

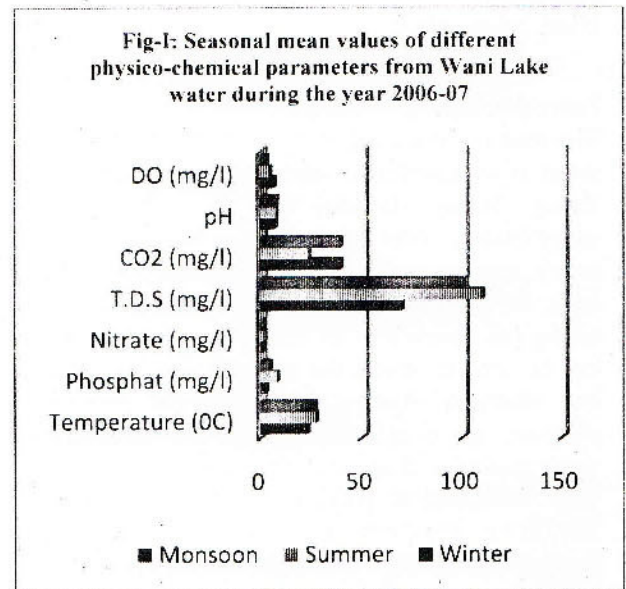


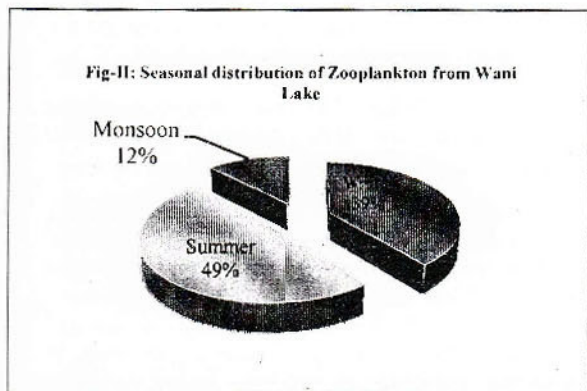
Table-2: Seasonal variation in zooplankton abundance in Wani Lake during the year 2006-07

Season	Protozoa	Rotifera	Cladocera	Copepods	Ostracods	Total
Monsoon	70	420	140	770	70	1470
Winter	700	1400	1330	560	770	4760
Summer	210	910	1400	2030	1750	5880
Total	980	2730	2870	3360	2590	12110

All figures are in unit/l



Nitrate is the highly oxidized form of nitrogenous compound, commonly present in natural water (Ajmal, 1985). The organic matter present in sewage and other organic waste, on decomposition result in to the formation of ammonia and nitrate (Bobdey, 2002). The main source of nitrogen in lentic water is the organic waste originated from runoff, animal wastes, human domestic activities (Bobdey et al., 2009). Nitrogen content in Wani Lake ranges between 1.8 mg/l to 1.1 mg/l. The number, type and distribution of zooplankton in any aquatic habitat provide a clue on the environmental condition prevailing in that particular habitat (Khanna et al., 2009). Several Workers Kesreet al., (2007), Sawane et al., (2006, 2009), Ramuet al., (2009), Fule et al., (2009), Khanna et al., (2009), Makode and Charjan (2009) have studied zooplankton of various reservoir and lakes and opined that limnological changes of any water body alter the zooplankton diversity. The microscopic examination of zooplankton carried out from Wani Lake under five group viz. Protozoa, Rotifer, Cladocera, Copepoda and Ostracoda.



In present investigation 7 species and 6 genera of protozoan recorded. While, seasonal succession of protozoan was in the order of winter>summer>monsoon. During monsoon protozoan density suddenly falls, might be due to influx of pollutant entering in the lake along with runoff and increased turbidity. Wani lake water is rich in rotifer population which is represented by 29 species from 21 genera. Among observed rotifers five species, *Brachionus fulcatus*, *Cephalodella*, *Rotaritia*, *Lepodella*, *Monostyla* were pollution indicator species (Sudzaki, 1964) and these species abundantly found in Wani Lake. 12 species of Cladocera were recorded during the study period

in Wani Lake water. Among total Cladocera, *Daphnia* was dominant over other species. Cladocera showed their peak in summer followed by winter. Chlorophyceae and bacillariophyceae were found to be favouring the abundance of cladocera. Copepods formed major bulk from the total zooplankton observed. Seasonal variation showed remarkable increase during summer.

Table-III: Simple correlation coefficient between zooplankton and physic-chemical parameters from Wani Lake water during the year 2006-07

	Temperature	Phosphate	Nitrate	T.D.S	CO ₂	pH	DO
Temp.		0.82					
Phosphate	0.82						
Nitrate	0.44	0.87					
T.D.S	0.99	0.87	0.51				
CO ₂	-0.63	-0.95	-0.97	-0.69			
pH	0.97	0.92	0.62	0.99	-0.78		
DO	-0.77	-0.28	0.22	-0.71	0.00	-0.62	
Zooplankton	-0.12	0.45	0.83	-0.03	-0.69	0.09	0.71

Five different species of ostracods were identified from Wani Lake. Seasonal variation in abundance of Ostracods was in the order of summer>winter>monsoon. In present study Zooplankton showed weak negative correlation with temperature and TDS. While, CO₂ shows moderate negative correlation, significant negative correlation was not observed with any physic-chemical parameter. Moderate positive correlation of zooplankton was observed with phosphate, while, DO and nitrate showed significant positive correlation.

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