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Seasonality and biological characteristics of Freshwater Lake Kudla Near Umri dist Nanded (Maharashtra), India

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ABSTRACT

Freshwater is important to human life and large amount of wastewater is extracted from industries, farms cities. Our freshwater demands caused us to overlook the important benefits of water that remain essential to sustain healthy aquatic ecosystem. Surface waters are the most transforming water systems on earth. These systems are transformed by many things like use of chemical fertilizers, climate change, chemical inputs, industrial wastes etc. and it affects the hydrobiology of water. For many years we are using surface water for dumping sewage and garbage. Runoff from social life puts pesticides and toxic sediments to freshwater. This is changing the biogeochemistry of surface water systems day by day. And it will affect the biotic and abiotic components of the systems. All of these toxic substances kill the organisms in the water and make the water unsuitable for drinking purpose, it will also increase the eutrophication i.e. increase in the amount of nutrients in an aquatic ecosystems. The water from Kudla Lake is used for agriculture purpose, drinking, washing, and fishery management. During the study period Jan 2016 to Dec. 2016, samples were collected monthly from 7 to 9 am and analyzed, for the physico-chemical parameters, study of phytoplankton and zooplanktons.

Keywords: Phytoplankton, Zooplankton, Fish, Physico-chemical Parameters, Ambona Lake.

INTRODUCTION

The subject of freshwater biology is of great importance not only as a branch of hydrobiology but also for its applications. The interrelationship between physicochemical parameters in relation with planktons relation with growth of fishes is of great importance and basically essential in fish culture. Fishes are dependent on physico-chemical parameters. A small change in these parameters can affect the overall growth of fish, Jhingran, (1985).

The fresh water of world is experiencing accelerating rates of degradation. Plant nutrients particularly phosphors and nitrogen can lead to increased organic productivity of fresh waters. This eutrophication rate leads to enhanced rates of decomposition or eliminate suitable habitat for many species of plants and animals. Aquatic organisms depend on the flow of nutrients through the food chain. Nutrients can enter the system either by photosynthesis occurring in green plants growing in the Lake (e.g. Algae) or by decomposition of organic material from outside the stream. Some toxins such as heavy metals accumulate in the tissues leading to gradual deterioration in the health of the fish. Alterations to water temp dissolved oxygen concentrations, pH, suspended sediments, salinity and other chemicals may have, subtle but crucial effects on the fish populations and the aquatic ecosystems.

The important contribution to the science of aquatic biology in India, include those of Gonzalves and Joshi (1946) who worked on the seasonal accession of algae in tank Bandra Bombay; Rao (1953) investigated on the distribution of algae in a group of six small ponds. Krishna Murthy (1954) worked on diatomic flora of South Indian Lakes; Philipose (1960) worked on the fresh water phytoplankton of Inland fisheries; Singh (1960) recorded the phytoplankton ecology of inland waters of Utterpradesh; Zafar (1967) worked on the ecology of algae in cetain fish ponds of Hyderabad. Hydro biological studies of temple tank, Devi Kund in Deoband by Verma and Shukla (1970) was breakthrough in the study of lentic water bodies for the ecological characteristics. This encouraged Vyas (1968) for phytoplankton study of Picchola Lake.

The other noteworthy publication on Indian limnological studies include those of Goel *et al.*(1980) on the impact of sewage on the fresh water ecosystem, Singh and Rai (1986) on the ecology of Jabalpur lake (Madhya Pradesh).

MATERIALS AND METHODS

Water Samples for physico-chemical parameters and planktons were collected monthly at 7 to 9 am on the day of sampling. The physico-Chemical parameters of waters studied were water temperature, transparency, turbidity, pH, Dissolved oxygen, alkalinity, free CO_2, nitrogen and chloride. The analysis of water samples was done according to APHA (1998). The chemical parameters except pH (Units) were expressed in mg/lit. Planktons were collected using plankton net made up of bolting silk cloth (Trivedy and Goel, 1986). Filtered samples were fixed and preserved by adding Lugol's Iodine for phytoplankton and 4% formalin for the zooplanktons.

Identification of phytoplanktons was done with the help of keys of APHA and Kodarkar's methodology. For zooplankton identification, the methods described by Sehgal (1983), Battish (1992), Dhanapathi (2000) was used.

RESULTS AND DISCUSSION

The quality of a water body is defined by its physical chemical and biological characteristics. A number of physical and chemical and biological factors act simultaneously (Davis 1955). The correlation between different parameters can be employed as an effective index of water quality. During the present study the Co-efficient correlation was studied between physico-chemical parameters and biological parameters. Water temperature shows an inverse relation with dissolved oxygen and positive correlation was noticed with pH, alkalinity and chloride.

Correlation studies between water temperature and phytoplankton indicated negative correlation between water temperature and Euglenophyceae. Temperature and zooplanktons indicated negative correlation between water temp. And total cladocera. Ostracoda exhibited negative correlation with water temperature at all the stations.

A high negative correlation between water temperature and dissolved oxygen were observed during the period of study i.e. from Jan 2016 to dec 2016. As the water temperature decreases the level of dissolved oxygen in the water increases. An inverse relation between water temperature and dissolved oxygen was also noticed by various workers such as, Bahura (1998), Singh *et al*. (2000), Das, (2000). Temperature showed negative correlation with dissolved oxygen which may be due to more dissolved oxygen holding capacity at low temperature.

During the study period pH shows positive correlation with alkalinity. Bahura (1998) observed a positive correlation between pH and alkalinity, whereas negative correlation was recorded with dissolved oxygen.

Table 1: Range of Physico- chemical parameters and planktons observed at Kudla Lake

	Mean	SD	SE	CV	Range	Max.	Min.
WT	26.750	3.557	1.027	7.521		32.500	21.500
Turbidity	14.583	4.122	1.190	3.538		21.000	9.000
Transap.	52.713	14.691	4.241	3.588		73.000	30.000
pH	7.264	0.196	0.057	36.996		7.700	7.080
DO(mg/L)	6.800	1.805	0.521	3.768		10.200	4.200
CO2(mg/L)	0.421	0.425	0.123	0.990		1.200	0.000
Alk.(mg/L)	61.958	17.915	5.171	3.459		91.000	40.000
Chlor.(mg/L)	60.083	11.016	3.180	5.454		78.000	41.000
Nitr..(mg/L)	0.447	0.066	0.019	6.757		0.510	0.310
Chlorophyceae	61.500	13.194	3.809	4.661		80.000	40.000
Bacillariophyceae	28.833	7.371	2.128	3.912		40.000	14.000
Cyanophyceae	19.083	5.334	1.540	3.578		30.000	10.000
Euglenophyceae	10.417	12.602	3.638	0.827		50.000	4.000
Total.Phy. Plankton	119.833	20.657	5.963	5.801		148.000	81.000
Rotifera	10.917	2.999	0.866	3.640		15.000	5.000
Copepoda	7.333	2.270	0.655	3.231		12.000	3.000
Cladocera	5.500	2.468	0.712	2.229		10.000	1.000
Ostracoda	4.833	2.725	0.787	1.774		9.000	1.000
Total Zoo Plankton	28.583	6.557	1.893	4.359		39.000	19.000

At station B pH shows positive correlation with total phytoplankton while it shows negative correlation with total zooplankton. Among the phytoplanktons, chlorophyceae, Bacillariophyceae and Cynaophyceae exhibited a positive correlation with transparency. Similarly, significant positive correlation was observed between Rotifera and copepoda at station A and B.

During the study period dissolved oxygen showed negative correlation with water temperature, pH, alkalinity and chloride. While it shows moderately significant positive correlation with nitrates. Correlation studies between dissolved oxygen and phytoplnakton exhibited positive correlation with Bacillariophyceae and Euglenophyceae at station A. Correlation studies between dissolved oxygen and zooplanktons exhibited a positive correlation with ostracoda at all the stations and copepoda at station B & D. Also, the phytoplankton analysis in lake reveals the dominance of Chlorophyceae members, which indicate organic pollution. The Chlorophyceae members dominated by *spirogyra sp*., *Pediastrum sp.,* and Euglena sp. which is an indication of organic pollution. Among the zooplanktons three species Cyclopes, *moniodaphnia, branchionus, bosmania* and *rotararia* are pollution indicator species which are found in eutrophic waters. The abundance and distribution of zooplankton was influenced by variety parameters such as temperature, light, pH, organic and inorganic constituents and the inter relationship with their organisms play an important role in determining the nature and pattern of fluctuations of population densities of zooplankton in an population densities of zooplankton in an environment. The importance of these factors has been stressed by several workers including Arora (1966), John *et al.* (1980), Kumar and Dutta (1994), Kodarkar (1992) and Basis and Agrawal (1995). These parameters are extremly variable from place and time. These parameters also interact with each other in a variety of ways. Therefore, it is difficult to conclude the individual effect of these parameters on the population densities of zooplanktons. But it can be expressed in generally that the fluctuating patterns of physico-chemical conditions of water affects the distribution of zooplankton.

Conflicts of interest: Not declared

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