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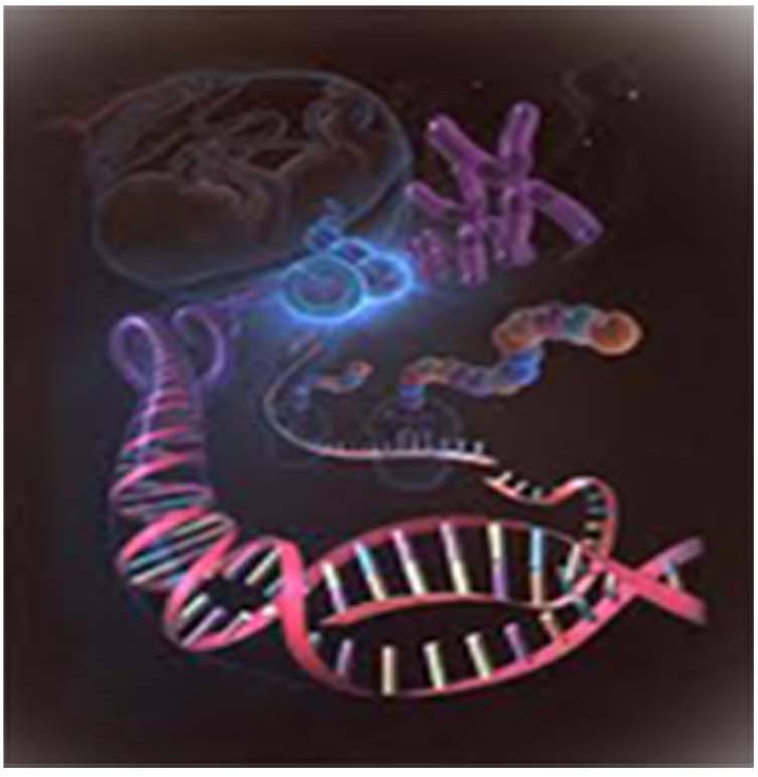

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Research Paper

STUDIES ON PLANKTON DIVERSITY IN BISALPUR RESERVOIR

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The productivity of an aquatic environment is directly correlated with the density of plankton. The plankton population in any aquatic system is biological wealth of water for fishes and constitutes a vital link in the food chain. Bisalpur reservoir has an ecosystem contain biodiversity of planktons and fishes. The present study was undertaken to investigate the plankton diversity in Thadoli area of Bisalpur reservoir having distance approximate 20-25 km., through different months during the period of February 2008 to January 2009. During the present study the most pollution tolerant species of *Oscillatoria, Euglena* and *Navicula* were recorded. Among the zooplanktons, Rotifers are good indicators of water quality. Rotifers of genus *Brachionus* and *Keratella* are abundant in water of the reservoir. Their occurance in eutrophic water is well documented . The species composition and species diversity study also points towards the polluted nature of reservoir water. There is no earlier study on the diversity of plankton of this lentic water resource and that is why present study was planned.

Keywords: Phytoplanktons, Zooplanktons, Water pollution, Algae

INTRODUCTION

Plankton is the most sensitive floating community which is being the first target of water pollution, thus any undesirable change in aquatic ecosystem affects diversity as well as biomass of this community. The measurement of planktons productivity helps to understand conservation ratio at various trophic level and resources as an essential input for proper management of reservoir. Some notable studies on phytoplankton and zooplankton diversity have been made by Rao and Choubey, 1990; Deorari, 1993; Ariyadej *et al*., 2004; Mishra *et al*., 2010; and Joseph and Yamakanamardi, 2011). According to Pawar *et.al.* (2006) the plankton study is very useful tool for the assessment of biotic potential and contributes to overall estimation of basic nature and general economic potential of water body. Use of variety of agrochemicals in the catchment and human pressure are causing depletion of aquatic biota due to water pollution in the case of lakes and reservoirs. During monsoon turbidity caused by agricultural and surface runoff and soil erosion

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severely affect the production of plankton (Akhtar, *et al.,* 2007).

Bisalpur reservoir has an ecosystem contain biodiversity of planktons and fishes. Planktons are used as a food by large number of animal species including fishes. Phytoplanktons and zooplanktons constitutes natural food of fish fry, fingerlings and adults and an adequate supply of these items are essential for proper growth of fishes.

Present study was carried out in the Thadoli area of Bisalpur reservoir. Bisalpur dam is constructed on the river Banas which originates from Gongunda area of Southern Rajasthan. It flows through eastern Aravali Ranges passing through Tonk and Swaimadhopur districts. Ultimately it merges in Chambel river. Being one of the largest water reservoir in Rajasthan, Bisalpur dam covers free catchment area of 8655 km2. It lies between latitude 26°55'50" N and longitude 75° 27'30" E. The dam is situated near village Bisalpur in Devli Tahsil of Tonk district. It is also a good source of drinking water supply. Besides this it is providing a good yield of fish specially major carps and cat fishes.

No systematic work has been carried out regarding potential of plankton in Thadoli area of Bisalpur reservoir.

MATERIALS AND METHODS

Study Area

To carry out investigative study in a phased and lucid manner Thadoli area were selected along the catchment area of Bisalpur reservoir having distance of approximate 20-25 km.

Sample Collection

The samples for plankton analysis were collected once in a month during the period of February 2008 to January 2009. Surface water samples were collected from the collection site and 100 liters of surface water from selected was filtered through a plankton net of bolting silk No 20 (76 μm mesh size) and a concentrate sample of 200 ml was prepared 100 ml of sieved residue was transferred to a bottle and preserved in Lugol's solution and 4%formaline for identification using standard keys (Tonapi, 1980; and APHA, 1995). The remaining concentrate (100 ml) was used for estimation of plankton density (APHA, 1995).

RESULTS

Plankton is one of the most important food items of the fishes and many other aquatic organisms. Almost all the fishes in their larval stages were dependent on it and some of them exclusively feed on plankton. Monthly variation of plankton species were presented in Table 1.

Phytoplankton

Phytoplankton collected from Thadoli area of Bisalpur reservoir were indentified upto generic and specific level wherever possible. The phyto planktons were mainly represented by algal qualitative composition and monthly distribution of algal was observed (Table 1).

Only four groups planktonic algal were reported from the area viz. Chlorophyceae, Euglenophyceae, Bacillariophyceae and Cyanophyceae.

Chlorophyceae

The class was represented by species of *Chlamydomonasm, Volvox, Ankistrodesmus, Selenastrum, Tetraedon, Closterium* and *Cosmarium.*

Chlamydomonas was represented by a single species, which was present through out the study period. *Volvox* species were more abundant in

Table 1: Monthly Distribution of Phytoplankton and Zooplankton

Phytoplankton	January	February	March	April	May	June	July	Augtust	September
Chlorophyceae									
Chlamydomonas.epiphytica	+	+	++	++	++	++	+	+	+
Volvox sp.	+	-	-	-	-	-	-	-	-
Chlorococcum sp.	+	+	+	+	++	++	++	++	++
Pediastrum tetras	+	+	++	++	++	++	++	+	+
P. tetras var. Tetraedon	+	+	++	++	++	++	+	+	+
P. duplex	+	+	+	+	-	-	-	-	-
Ankistrodesmus falcatus	+	+	+++	+++	+	+	+	+	+
A. falcatus var. acicularis	+	++	++	+	-	-	-	-	-
A. falcatus var mirabilis	+	++	++	+	+	-	-	-	-
Chlorella vulgaris	+	+	++	+	++	++	+	+	+
Oocystis solitaria	-	-	-	-	+	+	+	+	+
Selemastrum gracile	-	-	+	+	+	+	+	+	+
S.westii	-	-	-	-	-	-	+	+	-
Tetraedon regulare var. Incus	+	+	+	+	++	++	++	++	++
Scendesmus bijuga	++	++	++	++	++	+	+	+	+
S.acuminatus	++	++	++	++	++	++	++	++	++
S.dimorphus	+++	+++	+++	+++	+++	+++	++	++	++
S.quadricauda	+++	+++	+++	+++	+++	+++	++	++	++
S.obliquua	+	++	++	++	++	++	-	-	-
Tetrdesmus sp.	+	+	+	+	++	+	+	+	+
Cosmarium sp.	-	-	-	-	-	-	+	+	+
Closterium sp.	+++	++	++	++	+	+	+	+	+
Euglenophyceae			-						
Euglena acus	+	++	++	++	+++	+++	++	++	++
E.minuta	+	++	++	++	++	++	+	+	+
E.proxima	+	++	++	++	++	++	+	+	+
Phacus pleuronectes	-	-	-	+	+	+	+	+	+
P.acuminatus	+	+	+	+	+	+	+	+	+
P.curvicauda	-	+	+	+	+	+	+	+	+

Table 1 (Cont.)

Phytoplankton	January	February	March	April	May	June	July	Augtust	September
P.orbicularis	-	+	+	+	+	+	+	+	+
Bacillariq Phyceae									
Malosira sp.	-	-	++	++	++	++	+	+	+
Navicula chandolensis	++	++	++	+++		++	+++	+++	+++
N.Pseudolagerheini	++	++	++	++	++	+	++	++	++
N.Simplex	++	++	++	++	+	+	+	+	+
N.Punctata	+	+	+	+	+	-	+	+	+
Nitszchea Palea	+	+	+	+	-	-	++	++	++
Surirella sp.	-	-	-	-	-	+	+	+	+
Cyanophyceae					+				
Anacystis sp.	+	+	++	++		+++	-	-	-
Merismopedia convolute	+	+	+	+	+++	+	+	+	+
M. minima	-	-	+	+	+	+	+	+	+
M. glauca	+	+	++	++	+	++	+		+
Mirocystis sp.	-	-	-	-	++	+	-	-	-
Spirulina laxa	-	-	+	+	+	+++	++	++	++
S. major	-	-	+	+	+++	+++	+	+	+
Oscillatoria obscure	++	++	++	++	+++	+	++	++	++
O. amphibian	++	++	+	+	+	+	++	++	++
O.amphigranulata	++	++	+	+	+	+	+	++	+
O. tenus	+++	+++	+++	+++	++	++	++	+	++
Anabaena constricta	-	-	+	+	++	++	+++	++	+++
Zooplankton								+++	
Protozoa									
Paramecium sp.	+	++	++	++	+	+	+	++	++
Arcella sp.	-	-	+	+	+	+	+	+	+
Rotifera									
Filinia sp.	-	-	-	-	-	-	+	+	+
Keratella sp.	+	+	++	++	+++	+++	+	+	+
Brachionus sp.	+	+	++	++	+++	+++	+	+	+

Table 1 (Cont.)

Phytoplankton	January	February	March	April	May	June	July	Augtust	September
Asplanchna sp.	+	+	+	+	++	++	+++	+++	+++
Philodina sp.	+	+	+	+	+	+	+	+	+
Caldocera									
Moina sp.	-	+	+	++	+++	+++	++	+	+
Cypris sp.	-	+	+	+	++	++	+	+	+
Simocephalus sp.	-	+	+	+	+	+	+	+	+
Ceriodaphnia sp.	-	-	+	+	-	-	-	-	-
Daphria sp.	+	+	+	++	++	++	+	+	+

January. *Chlorella* was represented by one species, which was present through out the project. *Pediastrum* was represented by there species of which two species were observed in all the months. *Ankistrodesmus* was represented by four species. *Selenastrum* species were observed through out the study period. *Scendesmus* was represented by five species. Almost all the species were seen through out the investigation period.

Euglenophyceae

The class was represented by species of *Euglena* and *Phacus*. *Euglena* consisted of there species all of which were abundant during the study period. *Phacus* was represented by four species. These were more abundant during the summer and monsoon months.

Bacillariophyceae

This class represented by species of *Melosia, Nitzschia, Surirella* and *Navicula, Melosira* species were more abundant during summer and monsoon months. *Nitzschia species* were present in all the months except in summers. *Surirella* species were abundant only in monsoon months.

Cyanophyceae

This class was represented by species of *Microcystis, Anacysitis, Merismopedia, Anabaena, Spirulina* and *Oscillatioria, Microcystis* species were observed in all the months. *Anacysitis* species were absent in monsoon months. *Spirulina* were represented by two species, which were abundant in summer months. *Oscillatoria* consisted of six species these were seen through out the period. *Anabaena* was represented by single species

Zooplankton

Zooplanktons were identified upto generic level. Their monthly distribution was been given in (Table 1). The Zooplankton population has been observed to be composed of *Protozoe, Rotifera, Cladocera and Copepods* (Table 1).

The Protozoans were represented by species of *Paramecium* and *Arcella*. *Paramecium* was observed through out the period, where as *Arcella* was rare in occurrence.

The Rotifers were represented by species of *Philodina, Brachionus, Keratella, Asplanchna* and *Filinia.* This group showed a pead in summers.

The Cladocerans were represented by species of *Moina, Daphnia, Cypris, Simocephalus, Ceriodaphnia*. This group had only one peak in summers. The copepods were represented by species of *diaptomus, Encyclops and Mesocyclops.* This group exhibited only one peak in summer. Encyclops dominated the Copepods during summers and Diaptomus species were dominant during winters.

DISCUSSION

Phytoplanktons

The distribution of algae depends upon, besides many other environment factors, the nutrients and other organic and inorganic substance in the water and the relative adaptability of different species. The water quality parameters have a direct influence upon distribution and ecology of phytoplankton. The density of phytoplanktons were found to be highest in summers. This coincides with high value of alkalinity, hardness, chlorides, nitrates, phosphate, total dissolved solids, pH and transparency. The increase in concentration of phosphated and theration between phosphorus and nitrogen have important effects on the structure of phytoplankton community. The temperature and sunshine hours are also high during summer months. The dissolved oxygen content of water decreases during summer month. Hence, the oxygen concentration of water and plankton abundance exhibit and inverse relationship thus indication high photosynthetic activity. The phytoplankton communities in Thadoli area of Bisalpur reservoir are greatly influenced by various anthropogenic activities in the surrounding land area and algae may serve as good indicatiors of these activitiesl. The onducive condition for algal growth during summers result in blooms of algae. The phyto plankton of Thadoli area of Bisalpur reservoir exhibited maximum diversity during may as the temperotures during the spring season are congenial for plankton growth and minimum diversity was recorded in May. The species composition of phytoplanktons exhibit seasonal variations. The members of Chlorophyceae and diatoms were present in maximum number expecially diring summer month, resulting in bloom formation. The members of Euglenophyceae were also observed in maximum number during summer months. The high levels of phosphate and nitrated justifies the development of algal blooms at their peak preductive stages, especially when light and temperature conditions for their growth.

Zooplanktons

Density and composition of Zooplankton exhibit a monthly variation. In the present study the concentration of zooplankton was recorded to be minimum in January and maximum in June. On the whole zooplankton exhibited higher density in summer season. Similar summer maximam of zooplankton population was also reported by George (1970) and Adoni(1975) .

Zooplankton peaks of June coincide with low phytoplankton density. Temperature light and pH have a controlling influence on occurrence and distribution of zooplankton. Light indirectly controls zooplankton periodicity as they depend on the photosynthetic activity of plants for their nutritional requirements.

Monthly variation in the species diversity index of the major zooplankton population was also recoreded. Composition and abundance of each zooplankton group varied from time to time and season and depended on limnological characteristics of the water body. Planktons

consisted of spcies of Protozoe. Rotifera, Copepoda and Cladocera. The Rotifers in the present study were observed to show a numeric superiority over other group of Zooplanktons. Generally the Protozoans showed minimum density during winter months, while the Rotifers, Copepoda and Cladocerans exhibited higher density during summer month and lower during winter month.The predominance of eutrophic forms like *Keratella* species*, Brachionus* species*, Asplanchna* species, *Cyclops* species, *Daphina* species*,* and *Ceriodaphnia* species*,* beside Protozoa indicate te eutrophication of the reservoir. The Rotifers have attracted global attention as indicators of water quality. Among Zooplankton Rotifers were perhaps the most sensitive indicators of water properties, so that presence of certain species may be used as reference for physical and chemical characteristics of water. In Thadoli area of Bisalpur reservoir, Rotifers dominate among zooplanktons and this indicates the polluted nature of the lake water.

CONCLUSION

Plankton communities exhibit a major biotic component of an aquatic ecosystem an emphasis has been given to identify various plankton species as indicators of particular type of water pollution. Prasad and singh (1958) emphasized the importance of biological survey in monitoring water quality which is dependent on qualitative and quantitative composition of aquatic population. The most important effect of organic pollution in a water body is due to enrichment of nutrients and total number of algal species. There is a clear correlation between organic pollution and blue green algae and also with certain diatoms like melosira sp. (Palmer 1969). During the present study the most pollution tolerant species of *Oscillatoria, Euglena* and *Navicula* were recorede. Among the zooplanktons, Rotifers were good indicators of water quality. Rotifers of genus *Brachionus* and *Keratella* are abundant in water of the reservoir. Their occurance in eutrophic water was well documented. The species composition and species diversity study also points towards the polluted nature of lake water.

We conclude that there are several reasons for the deterioration of the Thadoli area of Bisalpur reservoir. These findings will help in the future studies for biomonitoring of these area.

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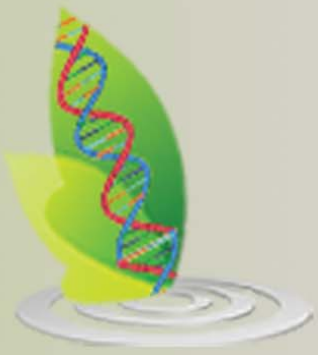

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