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Original Research Paper

Planktonic Diversity in the Holy Lake of Pushkar, Ajmer

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ABSTRACT

Planktonic diversity in the holy lake of Pushkar was studied from January 2007 to September 2007. In all 48 genera of phytoplankton and 16 genera of zooplankton were identified. Maximum planktonic density corresponded with summer season, which declined with onset of monsoon. The planktonic diversity along with abundance of cyanophycean and chlorophycean phytoplanktons and the rotifers, copepods and cladocerans indicates the moderately polluted nature of the lake.

INTRODUCTION

Plankton is a heterogenous group of microscopic plants and animals that inhabit aquatic systems. Their type and density is a good indicator of the status of the water body and the quality of water. Plankton communities often exhibit dramatic change in response to different types of pollutants. Hence, the diversity and composition of planktons in aquatic ecosystems serve as a reliable index for biomonitoring of pollution load (Venkateshwarlu 1981). Study of planktonic diversity, hence, is of immense limnological importance. Planktons can be broadly grouped as phytoplanktons and zooplanktons. Phytoplanktons form a major section of primary producers in aquatic systems while zooplanktons occupy the position between autotrophs and other heterotrophs, forming a vital link in aquatic trophic system. The diversity in a community is composed mainly of two components: the number of species or species richness and evenness of suitability of a given species given by their relative abundance, both denoting single term heterogeneity (Lloyd & Gheraldi 1964). The degree of complexity of a community depends upon the number of species and the evenness with which individuals are distributed among species. The diversity maintains the flexibility of biological communities and also provides protection against catastrophes, both natural and human (Patrick 1988).

Study of diversity is of immense utility since quality of an aquatic ecosystem is dependent on the biological diversity of a system (Cairns & Dickson 1971). Quantitative indices of diversity, richness and evenness offer a critical appreciation of plankton population in space and time (Margalef 1968).

MATERIALS AND METHODS

Area of study: The holy lake of Pushkar is crescent shaped and is surrounded by magnificent 52 bathing ghats with an area of 389 sq. km. The vegetation around the lake is negligible, but it supports a few submerged hydrophytes and many phytoplanktons. Pushkar is 1580 feet above the sea level and the lake has a filling capacity of about 28 ft. The lake is situated at 29°29.13' N latitude and 74°33.46' E longitude.

Thousands of devotees throng the lake to take a holy dip around the full moon day of Kartik poornima in October-November. The lack of proper monitoring and increase in inflow of tourists has

led to pollution of this water body. The present work was carried out to study the species composition of planktons of Pushkar Lake. The study has been taken up with a view to assess the water quality and trophic status of the lake.

Collection of samples: Water for biological analysis was collected during early hours from four different sites along the banks of the lake: Jaipur Ghat, Bara Ghat, Gau Ghat and Chori pedi Ghat. Surface water was collected from the above sites at monthly intervals at fixed time from January 2007 to September 2007 and analysed.

Plankton study: Surface water samples were collected from the collection sites and 1 litre of surface water from each site was filtered through plankton net of bolting silk number 20 (76μm) and a concentrated sample of 200mL was prepared. 100 mL of sieved residue was transferred to a bottle and preserved in Lugol's solution and 4% formalin for identification using standard keys (Davis 1955, Phillipose 1959, Kudo 1960, Prescott 1962, Kamat 1985). The remaining concentrate (100 mL) was used for estimation of plankton density (APHA 1989).

Plankton density: The density of phytoplankton was determined at monthly intervals using the Lackey's drop method (Trivedy & Goel 1986). The density of zooplanktons was estimated at monthly intervals using the Sedgwick Rafter method for counting.

Plankton diversity: The diversity of planktons was calculated by the Shannon index.

RESULTS AND DISCUSSION

The occurrence of phytoplankton, zooplankton, and plankton density and plankton diversity are given in Tables 1, 2, 3 and 4 respectively. A total of 46 phytoplanktonic algal species belonging to 25 genera have been identified during the course of study which belongs to the four classes viz., Chlorophyceae, Euglenophyceae, Bacillariophyceae and Cyanophyceae. Their maximum density was observed during the summer months (April to June) which declined with the onset of monsoon.

However, maximum phytoplankton diversity in the lake was recorded during March, as the temperatures during the spring season are congenial for most of the genera, while the minimum diversity was recorded in May. The species composition of phytoplanktons exhibits seasonal variation. The members of Chlorophyceae and diatoms were most dominant throughout the study period, while

Table 1: Phytoplanktons in the lake.

Chlorophyceae	Euglenophyceae	Bacillariophyceae	Cyanophyceae
Chlamydomonas (1)	*Euglena* (3)	*Melosira* (1)	*Microcystis* (1)
Volvox (1)	*Phacus* (4)	*Nitzschia* (1)	*Anacystis* (1)
Chlorella (1)		*Surirella* (1)	*Merismopedia* (3)
Pediastrum (3)		*Navicula* (4)	*Anabaena* (1)
Chlorococcum (1)			*Spirulina* (2)
Oocystis (1)			*Oscillatoria* (4)
Ankistrodesmus (3)			
Selenastrum (2)			
Tetradeon (1)			
Scenedesmus (5)			
Tetradesmus (1)			
Cosmarium (1)			
Clostridium (1)			

Table 2: Zooplanktons in the lake.

Protozoa	Rotifera	Cladocera	Copepods
Paramecium	*Philodena*	*Moina*	*Diaptomus*
Arcella	*Brachionus*	*Daphnia*	*Encyclops*
	Keratella	*Cypris*	*Cyclops*
	Asplainchra	*Simocephalus*	*Mesocyclops*
	Filinia	*Ceriodaphnia*	

Table 3: Plankton density in the lake.

Plankton	January	February	March	April	May	June	July	August	September
Phytoplanktons (Cells/mL)	5330	6815	7550	8890	1290	9000	7325	6960	5480
Zooplanktons (No./L)	19	24	20	35	60	105	65	15	15

Table 4: Plankton diversity in the lake.

Plankton	January	February	March	April	May	June	July	August	September
Phytoplanktons	1.2016	1.2993	1.3048	1.2858	1.1871	1.2908	1.2406	1.2348	1.2003
Zooplanktons	1.1325	1.2014	1.2482	1.1771	1.1816	1.1762	1.1799	1.2400	1.1891

members of Cyanophyceae and Euglenophyceae were present in maximum number especially during summer months when light and temperature conditions are quite favourable for the development of algal blooms (Lund 1965).

High rotifer population corresponded with the dominance of cyanophytes, indicating poor water quality of the lake. Similar findings were also reported by Beaver et al. (1999) and Paulose & Maheshwari (2007). Furthermore, increased Cladocera and Copepoda densities were associated with increased Chlorophytes abundance, suggesting more favourable water quality (Beaver et al. 1999). Thus, the species composition of Rotifera, Cladocera and Copepoda along with phytoplankton in Pushkar lake indicates the moderately polluted nature of this water body. This is also supported by the plankton diversity which ranges from 1.1325 to 1.3048. The scale of relationship of diversity shows moderate pollution in the range of 1-2 .

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