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Comparative Study of Aquatic Micro Flora of Upper Lake and Shahpura Lake, Bhopal

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ABSTRACT

Phytoplanktonic diversity plays a vital role in aquatic environment as food for zooplankton, crustacean's larvae and fish. The present study was aimed to study the ecological habitat quality on the basis of phytoplankton species richness in Upper Lake and Shahpura Lake, Bhopal. The results composed of 42 species belonged to the following five categories viz., Chlorophyceae (19 species) which account 47% in Upper Lake and 37% in Shahpura Lake and found dominated in both the lakes. Cyanophyceae (6 species), Bacillariophyceae (8 species), Euglenophyceae (7 species), Pyrophyceae and Zygnematophyceae were found in low numbers with 1 species each.

Keywords: Biomonitoring, phytoplankton, diversity, ecology.

INTRODUCTION

Phytoplankton are most important components as a primary producer community in aquatic ecosystem and play a major role in food chain and maintaining water quality (Verma *et al.,* 2016) through global biogeochemical cycling of carbon, nitrogen, phosphorus, silicon and many other elements and production of carbohydrates (Thirunavukkarasu *et al.,* 2013). The consumers of higher tropic levels ultimately depend on photosynthesis and primary production in any ecosystem. Biological monitoring of any aquatic body is an integral part for the management of the total ecological health (Bajpai *et al.,* 2001). Upper Lake and Shahpura Lake are located in Bhopal, Madhya Pradesh which lies between latitude 23º15'N 77 º 25'E (Carpenter *et al.,* 2018). The Upper Lake is shallow, oligotrophic lake and highly stratified also known as a Bhoj Wetland (Verma *et al.,* 2009) and Shahpura Lake is deep and eutrophic lake. Wetlands are also called as "biological supermarkets" because of extensive food chain and rich biodiversity that they support. They play major roles in the landscape by providing unique habitats for a wide range of flora and fauna (Karthi, 2014). Eutrophication is a global phenomenon associated with nutrient enrichment and physicochemical parameter of aquatic ecosystem (Dhanam *et al.,* 2016) Physicochemical characteristic of lentic ecosystem can be significantly altered by anthropogenic activities due to contamination of chemicals as well as fertilizers which come from industries and agricultural areas as well as from domestic effluents (Carpenter *et al.,* 2018). The present study was conducted to investigate diversity of phytoplankton of Upper Lake and Shahpura Lake, Bhopal.

METHODS

Study area

The study was conducted on two lakes of Bhopal (Fig. 1) *i.e.,* Upper Lake and Shahpura Lake. Depending upon the approachability and lake morphology three sampling stations (S-1, S-2, and S-3) Kamala park, Prempura ghat, Boat club at Upper Lake and near Narewa academy, Manisha market and Bansal hospital at Shahpura Lake were selected in both lakes.

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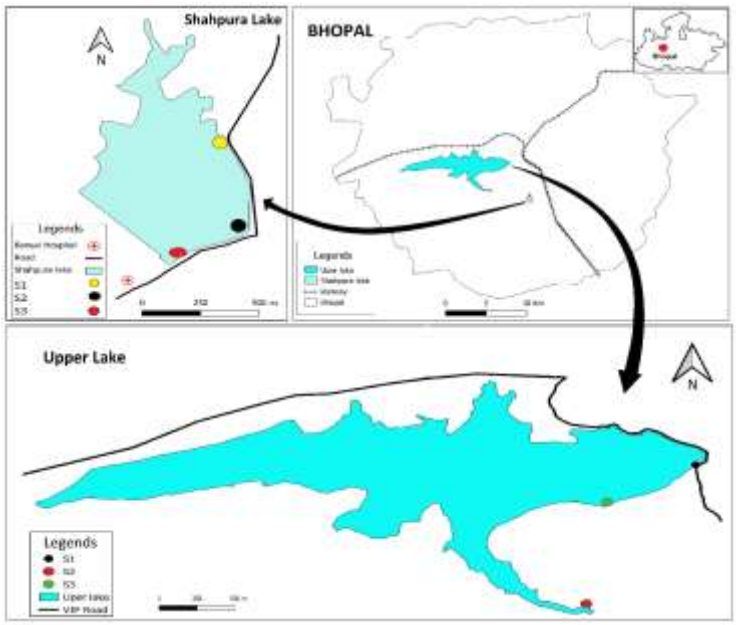
Methodology

The samples were collected by towing plankton net in 100 ml prewash polyethylene bottles. The algal samples were preserved by adding Lugol's iodine and brought to the laboratory for identification and microscopic study (Desikachary, 1959; Adoni *et al.*, 1985; APHA, 2005).



RESULTS

Plankton is the basis of many food webs and is the main food of aquatic trophic chains, it is also link between the abiotic factor (sun light, air and water) and biota of aquatic system (Khellou *et al.*, 2018). The major algal species which created problem in the water treatment as observed from the raw water of the sampling stations were s*yndera*, *spirogya*, *ulothrix* (Singh, 2008). In the present observation total 42 species belonging to 6 families of phytoplankton were observed (Table 1 and Fig. 2 & 3). The relative numbers of families in decreasing number of Upper Lake were Chlorophyceae (47%), Cyanophyceae (18%), Bacillariophyceae (12%), Euglenophyceae (15%), Pyrophyceae (3%) and Zygnematophyceae (3%). Similarly in Shahpura Lake families in decreasing number were Chlorophyceae (37%), Cyanophyceae (15%), Bacillariophyceae (22%), Euglenophyceae (22%) and Zygnematophyceae (4%). Similar results were recorded by Verma *et al.* (2009) in Upper Lake, Bhopal and Khellou *et al.* (2018) in Algerian Lake. The chlorophyceae are free living and planktonic, mostly confined to lake waters. It is also having their photosynthetic pigments localized in chromatophores (Dhanam *et al.*, 2016). The surrounding watershed of Upper Lake influenced the lake ecosystem with the entry of nutrients and organic substances due to human activities (Tamot and Sharma, 2006). During the present study, Bacillariophyceae were found 22% in Upper Lake and 12% in Shahpura Lake. Sarwada and Kamble (2014) reported similar results in Krishna River. Cyanophyceae found during the study period includes *spirulina*, *oscillatoria*, *rivularia* was also reported by Dhanam *et al.* (2016) in their study. In the present study, Cyanophyceae and Bacillariophyceae were shown to be correlated with the intensity of pollution (Singh, 2008). Euglenophyceae include 7 species of algae in the present study. Verma *et al.* (2016) considered that physicochemical factor regulate distribution of Euglenoids in fresh water bodies. Pyrophyceae include only one species in Upper Lake on Station-2. Zygnematophycae include only one species in present study period. Solanki and Shukla (2016) also found one species of zygnematophyceae during their study in Narmada River. Algal study is a useful tool for the examination of water quality in any type of water body and

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also contributes to an understanding of nature and general ecology of the lake (Tamot and Awasthi, 2012). In present study some algae like *euglena, microcystis, carteria* belong to polluted water indicator algal group were also found.

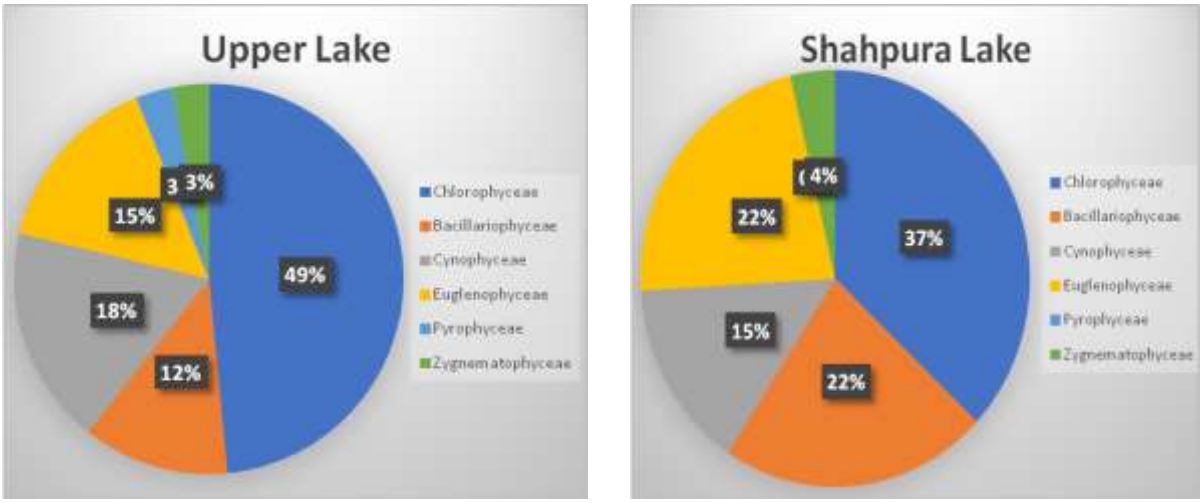

Fig. 2 Percentage composition of phytoplankton families at Upper Lake and Shahpura Lake

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Table 1 Phytoplankton diversity recorded during the study

Taxa	Upper Lake			Shahpura Lake		
	S1	S2	S3	S1	S2	S3
Chlorophyceae						
Actinastrum	+	+	-	+	-	-
Ankistrotrodesmus	+	-	-	+	-	+
Closterium acutum	-	+	+	+	+	+
Dictyosphacrium	+	-	+	-	-	+
Eudorina	+	-	-	+	+	-
Golenkinia	+	-	-	-	+	-
Gonium	+	+				
Micractiniumpusillume						+
Microspora	+		+			
Pediastrum	+		+	+		+
Pediastrum simplex		+				
Protococus				+	+	
S. Armatusbicaudatus	+	+				
S. Bicaudatus	+		+			
Scenedesmus	+	+		+	+	
Scenedesmus bijugatus				+		+
Scenedesmus quadricauda		+	+			
Volvox	+	+		+		
Westella botryoides	+					
Bacillariophyceae						
Cyclotella	+	-	-	+	-	+
Frustulia	-	+	-	-	-	-
Nitzschia	+	+	+	+	-	+
Navicula	-	+	-	-	-	-
Diatoma	-	-	-	+	+	-
Pinnularia	-	-	-	+	+	-
Synedra	-	-	-	+	-	-
Stauronesis	+	+	+	+	+	-
Cyanophyceae						

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O.amphigranulata	+	-	-	+	+	-
Spirulina major	+	-	-	+	-	-
Microcoleusvoginatus	-	+	-	+	+	-
Rivularia	-	+	+	-	-	-
Microcystis aeroginosa	+	-	+	-	-	-
Lyngbyaborgerti	+	+	-	-	+	-
Euglenophyceae						
Phacus	-	+	-	-	-	-
P. Longicauda	+	+	-	+	-	+
P. Tortus	-	+	+	+	+	-
E. Viridis	+	+	-	-	-	-
P. Pleuronectes	-	-	-	+	+	-
P. Mammilates	-	-	-	+	-	-
Trachelomonasarmata	+	-	+	-	-	-
Pyrophyceae						
Ceratium	-	+	-	-	-	-
Zygnematophyceae						
Closterium	-	-	-	+	+	-

CONCLUSIONS

The present study was conducted on Upper Lake and Shahpura Lake. Three stations at both the lakes were selected for study. The present study concludes that Station-1 (Kamala park) at Upper Lake report highest number of algal species while Station-3 (Boat club) report low species due to boating and various anthropogenic activity and Station-2 (Prempura ghat) report moderate species of algae. Station-1 at Shahpura Lake near Narewa academy recorded rich species while Station-3 near Bansal hospital reported low species due to human activity and result at Station-2 near Manisha market reported moderately polluted. Algal characteristics of Upper Lake indicate moderate pollution level and Shahpura Lake recorded nutrient enrichment also show high pollution level.

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