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Environmental situation of Karla lake Maval, MS, India

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ABSTRACT

Karla is a bygone lake in Shankar temple. The lake supports biodiversity, aquaculture and is important as recreation centre for the locals. Measures are undertaken for cleaning and protection of this lake. The present paper discusses the environmental conditions of this lake including water quality and phytoplankton community. During this study, algal blooms were recorded especially in summer 2017, indicating the eutrophic status. wastes near the lake boundaries was also recorded. Depletion of Dissolved Oxygen and the shift of dominance from green algal members to cyanobacteria was recorded. There is further need for management of nutrients to conserve this fresh water ecosystem.

Key words- Environmental conditions, Karla Lake.

INTRODUCTION

Fresh water lakes in urban areas play a significant role as recreation areas for locals. These water bodies provide suitable habitats for aquatic organisms. Many of these lakes and ponds provide opportunity for fresh water aquaculture thus providing livelihood options for local community. However, the anthropogenic activities often influence the environmental status of these lakes.

Monitoring the impacts of climate change poses challenges because of the many responses within an ecosystem and the spatial variation within the landscape. A substantial body of research demonstrates the sensitivity of freshwater ecosystems to climate forcing and shows that physical, chemical, and biological lake properties respond rapidly to changes in this forcing (Rosenzweig 2007; Adrian *et al*. 2009; Tranvik *et al*. 2009; IPCC 2013). Fast turnover times from the scale of organisms to entire lake ecosystems are the prerequisite for these rapid changes. Studies of lake ecosystems have provided some of the earliest indications of the impact of current climate change on ecosystem structure and function (Adrian *et al*. 1995; Magnuson *et al*. 2000; Verburg *et al*. 2003).

Lake ecosystems are excellent sentinels for current climate change. In this context a sentinel is a lake ecosystem that provides indicators of climate change either directly or indirectly through the influence of climate on the catchment (Fig. 10.1; Carpenter *et al*. 2007; Adrian *et al*. 2009; Williamson *et al*. 2009). The indicators are measureable response variables, such as water temperature, dissolved organic carbon, or phytoplankton composition.

Karla lake is located at near lonavala. The Lake city in Maharashtra. The lake has an area about 89756 sq. ft. and is approximately at 200 mm distance from Karla village. It is a bygone water body and the area was reduced due to construction and development activities.

MATERIALS AND METHODS

The study was conducted during 2016-2017 covering monsoon, winter and summer seasons. This included observations about anthropogenic activities, collection and analysis of water samples with respect to physico-chemical parameters DURING the bloom phase (APHA, 1981). The samples for phytoplankton were separately collected and preserved using Lugols Iodine solution. (Trivedi and Goel, 1984) The identification were carried out using standard keys. (Fritsch, 1979; Bellinger, 1992). The sampling was carried out at various sites. This location shows discontinuous patches of aquatic macrophytes including Water lily. Both these locations have direct access to the lake water along the boundary walls road side.

RESULTS AND DISCUSSION

In temperature, longer photoperiod, increased concentration of nutrients and stagnancy of waters at the sides. The intense the lake is surrounded by a road from front the sides. Especially during evening hours heavy traffic is noted in this area. Small eateries surround the lake. The solid wastes were on higher side near road. This included religious refuse like flowers, leaves packed in paper or plastic bags, bottles, food waste and excreta were also recorded. Bathing and Washing activity were recorded up too little extent. The water always showed green colour lighter during monsoon and turning deep green especially during summer. The algal blooms appeared on the surface at the sides of the lake. However, the central regions did not exhibit such surface scum. Small fountains were operative at various locations in the lake to ensure aeration. The maintenance staff tried to clean up the solid waste floating in the water.

The lake water showed higher nutrients at station II which is close to the Nirmalya enclosure. Both the stations showed occurrence of algal blooms from winter, reaching highest abundance during the summer. This may be related to rise bloom formation resulted in depletion of Dissolved Oxygen. Higher levels of BOD as well as Phosphates were observed at Station. Comparison to earlier records (Somani *et al*,2003, 2015) indicated lower phytoplankton density and diversity. The phytoplankton exhibited clear dominance of Cyanobacteria. (Fig.2). Microcystis sp.dominated the phytoplankton community. *Merismopedia sp*. and *Spirulina sp*. also showed prominent presence.

Table-1 Physico-chemical parameters of water during the peak bloom at Karla Lake

Sr.No.	Parameter (mg/L)	Sites A	Sites B
1	Temperature	26^0 C	28^0 C
2	pH	7.5	7.9
3	Free Carbon Dioxide	0	0
4	Dissolved Oxygen	1.4	0.9
5	Total Alkalinity	99	109
6	Reactive silica	1.2	1.09
7	Phosphate- phosphorus	0.47	2.3
8	Nitrate- Nitrogen	0.58	0.19
9	BOD	36	54

Table -2 Average Phytoplankton- No. of organisms ×10³ /L

Sr.No.	Name	Site A	Site B
1	**Bacillariophyta (Diatom**		
	Navicula sp	86	06
	Nitzchiasp	740	653
	Total	**826**	**659**
2	**Chlorophyta (Green Algae)**		
	Crucigenia sp	288	34
	Monoraphidium sp	212	274
	Scenedesmus sp	295	310
	Pediastrum sp	65	08
	Total	**860**	**626**
3	**Cyanophyta (Blue-Green Algae)**		
	Aphanocapsa sp	83	89
	Chroococcus sp	05	61
	Merismopedia sp	952	893
	Spirulina sp	744	135
	Microcystis sp	1623	1498
	Total	**3407**	**2676**
4	**Xanthophyta (Yellow-Green Algae)**		
	Anabena sp	78	02
	Goniochloris sp	68	452
	Staurastrum sp	63	215
	Total	**209**	**669**

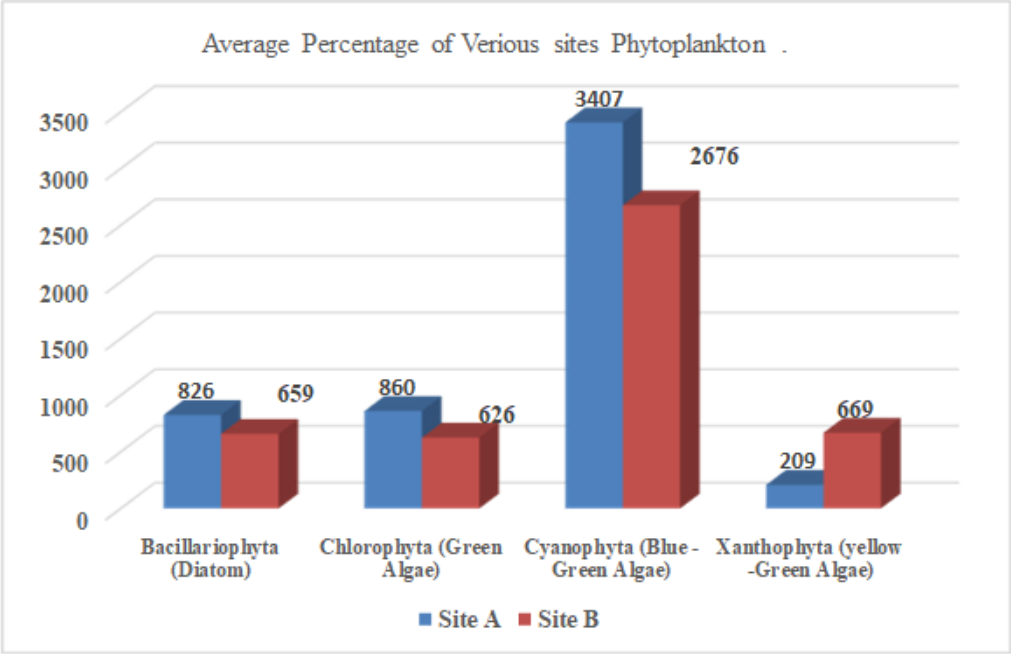

Fig. 1 : Graphical representation of Seasonal variation of Average Phytoplankton karla lake at various sites during year 16-17 is presented below

Somani *et al.* (2003) reported *Pediastrum sp*. as the most dominant genus of this lake. The present study recorded this genus in comparatively lower abundance. The green algal group was represented by only 6 genera, as compared to 14 genera reported earlier. Though these shallow lakes are dynamic in nature and shift in dominant communities is not uncommon, the significant abundance of *Microcystis sp* indicated the warning signs of deterioration of the health of the habitat. This bloom forming phytoplankton is considered as indicator of eutrophic status. (Niamien- Ebrottiej *et al*., 2015). This also posed threat for the aquaculture. This algae often proves harmful due to anoxic conditions produced by thick surface scums. Fish kills are reported from Jail Lake in Thane due to such algal blooms. Sarang and Somani, 2015).

Monsoon showers probably diluted the algal colonies and the turbulence created negative environment for further development of the blooms.

The local authorities have undertaken measures for cleaning and protection of this lake. Idol immersion is not carried out directly in the lake waters. However inadequate response was recorded from public with respect to conservation. Though direct access to the water is only available at two points, indirect entry of waste water is probably through the food stalls enveloping the sides of the lake. Nirmalya kalash are placed at definite locations to dispose religious material. 0.However, all types of solid wastes were recorded at these points.

There is an urgent need to monitor the direct and indirect entry of solid waste and sewage in this lake. Public participation should be enhanced for the protection of urban lakes. Regular monitoring of water quality and bloom development is required for effective conservation of Karla Lake.

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