

Physico-chemical Study on Extent of Water Quality Deterioration in the Lakes of Mangaluru City

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Abstract— This study involves the analysis on extent of deterioration of lake water quality in the selected lakes of Mangaluru city. The water quality analysis shows that there is no such variation in the pH, acidity and alkalinity. But the other parameters like DO and BOD having significant importance because dissolved oxygen is very less than that of permissible limits of BIS standards and also there is high BOD or organic load in all most all the lakes and hence the water quality in the lakes is not suitable for the survival of aquatic organisms and also for drinking purposes. So that the results are helpful in the policy making decision of the rejuvenation of lakes.

Keywords—lake, deterioration, water quality, pollution load

I. INTRODUCTION

Many civilizations that flourished after developing reliable water supply collapsed when the supply was exhausted or its quality deteriorated. Early human civilizations were centered on spring and streams. Water is vital to the human's existence. The fast growth of urban areas has affected the water quality of the surface water due to over-exploitation of resources and improper waste disposal practices. The catchment area is important for water resource conservation, both in terms of quality and quantity [1].

Generally, the status of water quality can provide information on land activities within and surrounding catchment area. Water quality index is one of the most effective tools to communicate information on the water quality to the concerned citizens and policy makers. It becomes a very important parameter for the assessment and management of surface water [1].

Lakes and ponds are significant freshwater habitats throughout many regions of the world, although the quantity of water in them constitutes only a minute fraction of the total freshwater resource on the earth. A large proportion of the fresh water is stored as ice and snow at very high altitudes and around the poles or in the form of groundwater as and less than 0.5% is available for use by organisms, including humans. Water availability is a cornerstone for modern human civilization but increasing human populations have resulted in raising demands on water supplies for drinking, hygiene, processes of industries and agriculture (like irrigation) [2].

The varying biodiversity of lake and pond ecosystems is currently threatened by a number of human disturbances, of which the most important include increased nutrient load, contamination, acid rain and exotic species invasion. Analysis of trends suggests that older, well known threats to biodiversity such as acidification, eutrophication and contamination by heavy metals and of organochlorines may become less of a problem in developed countries in the future [2].

This study involves the analysis of extent of water quality deterioration in the major lakes of Mangaluru city due to the entry of pollution load like sewage, industrial effluents, construction debris, etc. Mangaluru is one of the major city in Karnataka and due to its rapid urbanization and haphazard growth of the city, leading to deterioration of water quality in the lakes within the city of Mangaluru thereby making water in the lakes unfit for drinking and for the purposes and also it may be difficult to survive for the aquatic organisms in such a lakes.

II. METHODOLOGY

A. Study Area

The present study was conducted by selecting the lakes within the Mangaluru city. Considering about ten lakes for the analysis of quality of water in the city of Mangaluru. Following are the lakes considered;

- Byradi Kere
- Shanthinagar Lake
- Niddel Lake
- Jeppinamogaru Daivasthana Lake
- Jeppinmogaru Daivasthana Fisheries Lake
- Kadri Math Lake
- Gujjarakere Lake
- Kadri Doctor's Colony Lake
- Pilikula Lake (Big)
- Pilikula Lake (Small)

While physically all the selected lakes water quality is deteriorated except Pilikula lakes (Rejuvenated). In some lakes sewage pollution load also entered into the lakes.

B. Sample Collection

Water samples are collected from every lake. About two samples from each lake are collected at different depths of lakes and by considering sample frequency as two analysis period. The collected samples are analyzed for its water quality parameters in the laboratory.

C. Experimental Analysis

Collected water samples from the lakes are analyzed for its physico-chemical characteristics such as Acidity, Alkalinity, pH, Chloride, Dissolved Oxygen, and Biochemical Oxygen Demand. The water sample analysis is carried out in accordance to standard analytical methods.

D. Results and Analysis

The following results and analysis reveals the physico-chemical characteristics of water samples from the selected lakes of Mangaluru city.

The following table 1 represents the water quality analysis of pH, Chloride and Dissolved Oxygen.

Table 1: pH, Chloride and Dissolved Oxygen content of Water Samples

SL NO.	Name of the Lake	Parameters		
		pH	Chloride (mg/l)	Dissolved Oxygen (mg/l)
1	Byradi kere (BL)	7.2	17	6
2	Shanthinagar lake (SL)	6.8	18	3.5
3	Niddel Lake (NL)	6.9	8	7.8
4	Daivasthana lake (DL), Jeppinamogaru	7.2	57	5.6
5	Daivasthana Fisheries Lake (DFL), Jeppinamogaru	7.6	19	6.4
6	Kadri Math Lake (KML)	6.8	17	6
7	Gujjarakere Lake (GL)	7.4	24	2.8
8	Kadri Doctors Colony Lake (KDL)	7.6	17	6.3
9	Pilikula Big Lke (PBL)	7.5	16	5.3
10	Pilikula Small Lake (PSL)	9.7	14	4.8

The following table 2 represents the water quality analysis of acidity, alkalinity and Biochemical oxygen demand (BOD).

Table 2: Acidity, Alkalinity and BOD of water Samples

SL NO.	Name of the Lake	Parameters		
		Acidity (mg/l as CaCO ₃)	Alkalinity (mg/l as CaCO ₃)	Biochemical Oxygen Demand (BOD in mg/l)
1	Byradi kere (BL)	12	8	5.8
2	Shanthinagar lake (SL)	50	28	92.3
3	Niddel Lake (NL)		6	3.3
4	Daivasthana lake (DL), Jeppinamogaru	12	12	40
5	Daivasthana Fisheries Lake (DFL), Jeppinamogaru	20	10	36
6	Kadri Math Lake (KML)	12	8	17
7	Gujjarakere Lake (GL)	30	12	20
8	Kadri Doctors Colony Lake (KDL)	12	8	9.6
9	Pilikula Big Lke (PBL)	16	14	6.3
10	Pilikula Small Lake (PSL)	0	42	10

Following figures showing the graphical representation of various physico-chemical characteristics.

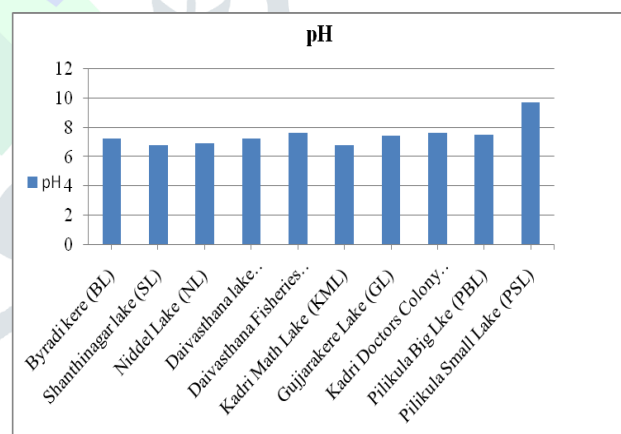


Fig 1: pH of water samples collected at various lakes

The pH of water samples collected from various lakes is almost within the lakes. As per the BIS standards pH of drinking permissible limit should be 6.5 to 8.5. The pH of water samples from all the various lakes is within the limits.

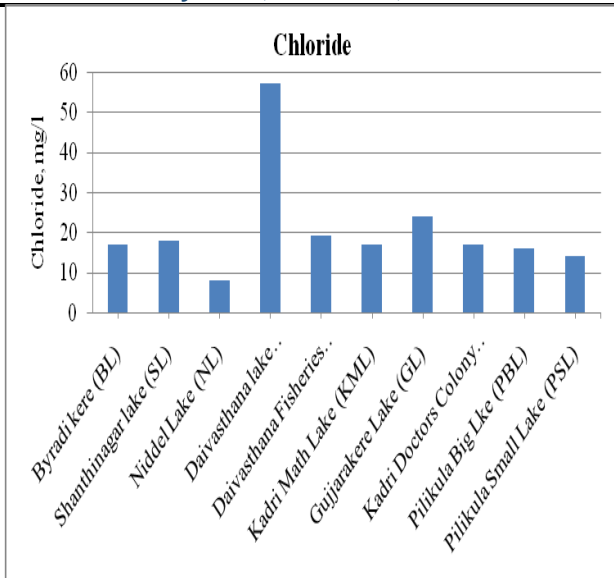


Fig 2: Chloride content in the water sample of lakes

The Chloride content of water samples in all the lakes are within the BIS standards. But one of the lake that is Daivasthana lake in Jeppinamogaru showing chlorides high about more than 50 mg/l but even though it is within the BIS standards for permissible limit, as chloride content is about 250 mg/l.

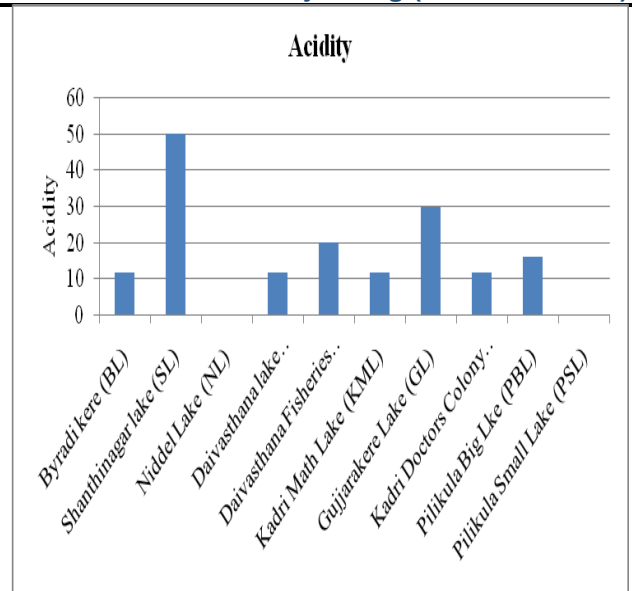


Fig 4: Acidity of water samples of different lakes

The above graph represents the acidity presence in the water samples collected from the lakes and there is no such acidic water present in any lakes.

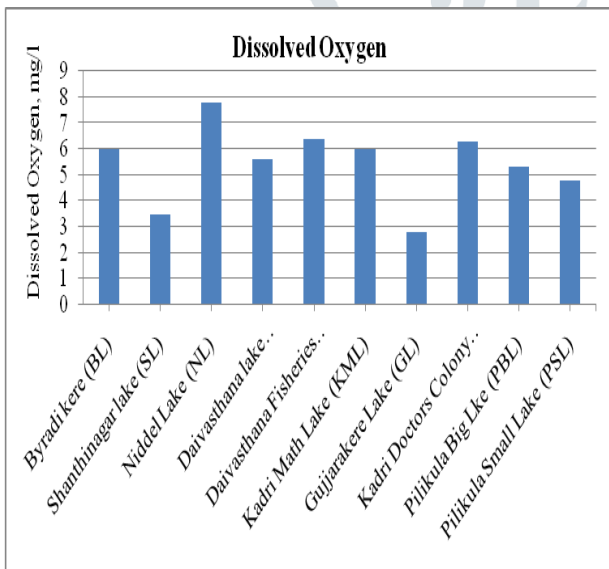


Fig 3: Dissolved Oxygen of water samples of lakes

Dissolved Oxygen content is one of the important parameter for the aquatic living organisms in the lakes and ponds and permissible limit according to BIS standards, it should be more than 4 mg/l. In the present study Shanthinagar lake and Gujjarakere lake showing very less dissolved oxygen content that is very hazardous to aquatic organisms, and other lakes having dissolved oxygen content more than 4 mg/l, hence water safe in other lakes.

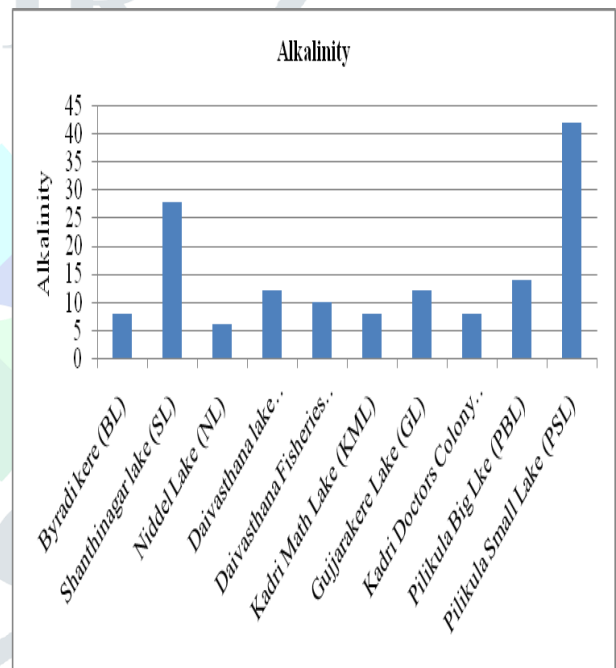


Fig 5: Alkalinity of collected water samples

The above graph showing the variation in the alkalinity of collected water samples and there is no such alkaline water present in any considered lakes.

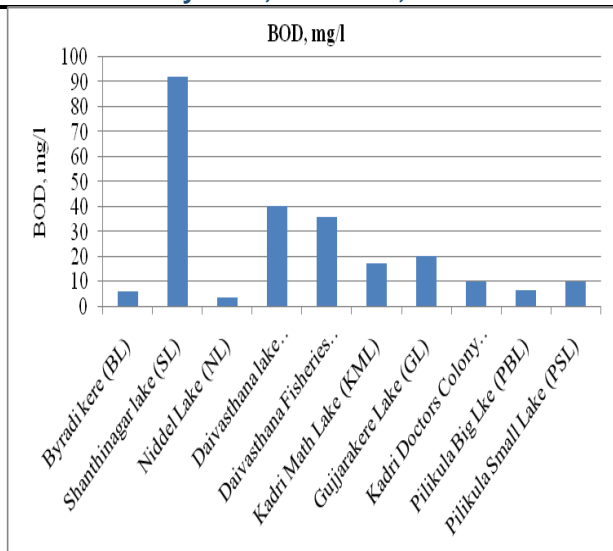


Fig 6: Biochemical Oxygen Demand of collected water samples

From the above figure, BOD of lakes considerably present in almost all the lakes and it in terms represents the presence of organic pollution load in the lakes and it is highly disastrous to the aquatic organisms in terms of depletion in the dissolved oxygen levels. Particularly, Shanthinagar lakes, lakes of Daivasthana at Jeppinamogaru and Gujarakere showing presence of considerable amount BOD that in turn organic load in the lake water.

The experimental analysis of all the water samples collected from different lakes showing that there will be depletion of dissolved oxygen in some of the lakes due to the presence of organic load and this is showing through the presence of BOD in all the lakes and also some lakes having considerable that is highly objectionable in the water of lakes regarding the survival of the aquatic organisms.

III. CONCLUSION

The present study reveals that the quality of lake in terms of quality of water is almost deteriorated and is not suitable for the survival of the aquatic organisms due to the depletion in the dissolved oxygen and high BOD or organic load in some of the considered lakes. The water in the lake is also not suitable for the drinking purpose due to its deteriorated quality. Hence this data will be very much helpful in regarding the policy making for rejuvenation of the lakes in Mangaluru city.

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