Assessment of Water Quality of Bhivapur Lake, in Pohara-Malkhed Reserve Forest, Maharashtra (India) With Reference to Some Physico-Chemical Properties

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ABSTRACT *The present investigation accounts for the status of Bhivapur Lake in Pohara-Malkhed Reserve Forest District Amravati, Maharashtra (India) with reference to physico-chemical properties of water during the June 2012 to May 2013. The purpose of this study is to check the status water quality of Bhivapur Lake. Bhivapur Lake is located in district Amravati (Maharashtra). This study was carried out for 12 months by taking monthly water samples from different stations of the lake. Water quality parameters like pH, Temperature, Total dissolved solids, Total Alkalinity, Total hardness, Phosphorus, Nitrate, Turbidity, Fluoride, chloride, Dissolved Oxygen, Ammonia, Iron, Turbidity and Conductivity analysis were done. This study indicates that Bhivapur Lake has normal physico-chemical parameters*

I. INTRODUCTION

This study provides useful information on the water quality of Bhivapur Lake. The present study has its own importance because we well-known that in India lake water is generally used for agriculture and domestic purposes. In India, about 70% of the existing water is contaminated, out of which 8-16% water is contaminated by industrialized pollution and 84-92 % by sewage pollution and other [1]. A lake is a in-dication of its watershed and as watershed landscape, the topography, soil, geology and vegetation shows the kinds of materials entering into the lake that in turn replicate on its water quality. The performance of an aquatic ecosystem and its strength to sustain life forms depend, to a great extent, on the physico-chemical character of its water.

Specifically, this study aims to determine the physico-chem-ical characteristics of the lake by analysing parameters like temperature, pH, turbidity, conductivity, nitrate, chloride, total hardness, iron, ammonia, Phosphorus, total dissolved solid, fluoride and total alkality.

II. MATERIAL AND METHODS
Study Area:

The Bhivapur Lake, is situated in Pohara-Malkhed Reserve Forest, district Amravati of Maharashtra state. Forest is lo-cated between $20^0 57'$ N and $77^0 57'$ E. Bhivapur Lake is an artificial lake built on local River. The main use of water is for agriculture. The lake is surrounded by hilly area in Pohara-Malkhed Reserve Forest.

INDIA

MAHARASHTRA

AMRAVATI

BHIVAPUR LAKE

Analysis of Water sample of lake:
Water samples were collected during each month from June 2012 to May 2013. Samplings were done in the morning hours between 7 am – 10 am. Surface water samples were collected in sterilized plastic bags. Preservation and transportation of the water samples to the laboratory were as per standard methods [2]. Water samples were analyzed for 14 different parameters like Oxygen, temperature and pH were analyzed in the field directly by using digital instruments. Conductance, pH, Total Dissolved Solids were analyzed by digital water analysis kit. Total alkality, Hardness, Dissolved O_2 Chloride were analyzed by Titration method and other parameters were analyzed by standard methods [3].

III. RESULT AND DISCUSSION:
Physico-chemical characteristics of water were analyzed to understand the variation of the various parameters amongst the lake and to understand the status of lake water. The results of Bhivapur Lake with reference to physicochemical parameters from June 2012 to May 2013 are listed below.

Temperature:
Temperature of water varies between 19^0C to $28\ ^0C$ in the throughout year. The highest temperature was in the month of May and the lowest was in the month of January and February. Variation in the temperature of lake water throughout the study period is illustrated in Figure no.1
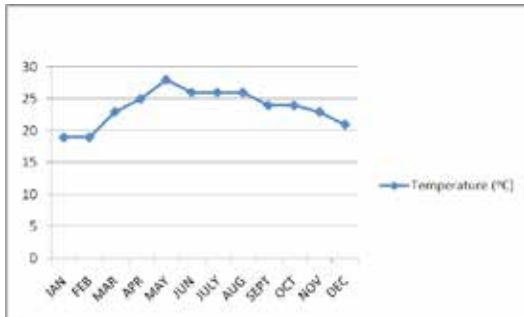

Fig 1: Variation in the temperature of water of Bhivapur Lake throughout the year. Y axis represents temperature in degree Celsius

Turbidity:
Water Turbidity is cause by clay, silt, organic matter, phytoplankon and other microscopic organisms etc. Turbidity in lake water restricts light penetration for photosynthesis [4]. In the proposed lake we observed that in the month of July there is maximum turbidity which is 35 NTU and there is minimum turbidity in the month of May. The average Turbidity was 19 NTU. Variation of the Turbidity of lake water throughout the study period is illustrated in Figure no.2
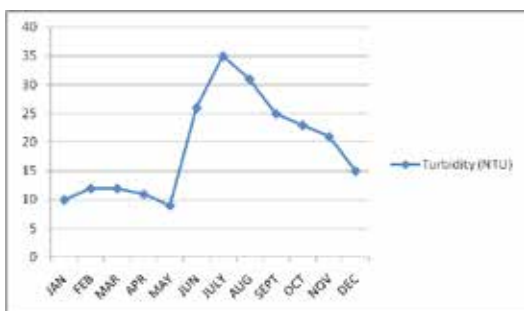

Fig 2: Variation in the turbidity of water of Bhivapur Lake throughout the year. Y axis represents turbidity in NTU

Electrical Conductivity:
Conductivity measures the capacity of water to conduct electric current. It determines the amount of dissolved solids present in the water to conduct electricity. In our study case,

we analyzed that the Electrical conductivity of Bhivapur Lake varies from month to month in the year 2012. The maximum Electrical conductivity was found in the month of July and August and the list in the month of January and April. Electrical conductivity of lake water throughout the study period is illustrated in Figure no.3
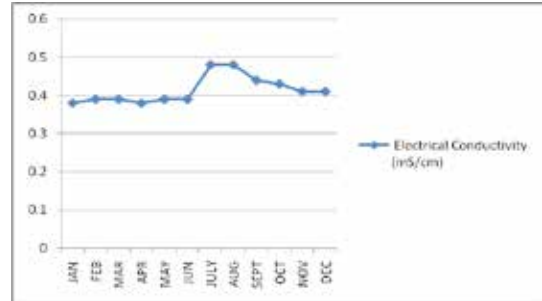

Fig 3: Variation in the Electrical conductivity of water Bhivapur lake throughout the year. Y axis represents Electrical Conductivity in mS/cm

pH:
In our study, we measured the varied values of pH from different months of the year. We observed that in both winter and summer season the pH of lake water is slightly alkaline as compared to in rainy season. The highest alkaline pH was 8.28 in the month of April and the lowest pH was 7.44 in the month of July. Variation in pH of lake water throughout the study period is illustrated in Figure no.4

Fig 4: Variation in the pH of water of Bhivapur Lake throughout the year. Y axis represents pH

Dissolved O_2:
The amount of oxygen present in the water in the dissolved form can be measured by means o Dissolved O_2. The dissolved oxygen is affected by many factors affects dissolved oxygen like climate, season, riparian vegetation, suspended solids, amount of nutrients in water and organic wastes [5]. In our study we observed that maximum value of Dissolved O_2 was recorded   in the month of May and June and the minimum value in September month of the year. Variation in Dissolved O_2 of lake water throughout the study period is shown in Figure no.5

Fig 5: Variation in the Dissolved O_2 of water of Bhivapur Lake throughout the year. Y axis represents Dissolved O_2

in mg/L

Total alkality:

Alkalinity of the water is the power to neutralize strong acids that give mainly a function of carbonate, bicarbonate and hydroxide content and formed due to the dissolution of carbon dioxide in water [6]. In our present work we calculated that the values of Total alkalinity are in the normal range throughout the year. The list values are seen in the months of July and August and in other months the values are in average more or less similar to each others. Difference in Dissolved O_2 of lake water throughout the study period is shown in Figure no.6
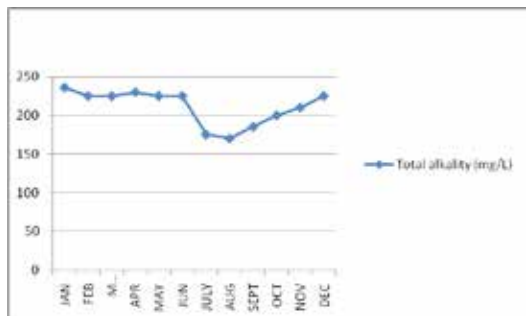
Fig 6: Variation in the Total alkality of water of Bhivapur Lake throughout the year. Y axis represents Total alkality in mg/L

Total hardness:

Waters having more than 60.0 ppm hardness are the 'nutrient rich' waters [7]. Water of desired lake contains Total hardness of more than 150 ppm in each months of the year and hence the water of Bhivapur lake is classified as nutrient rich water. Difference in Total hardness of lake water throughout the study period is shown in Figure no.7

Fig 7: Variation in the Total hardness of water of Bhivapur Lake throughout the year. Y axis represents Total hardness in mg/L

Chloride:

The elevated concentration of Cl⁻ is known to be an indicator of higher contamination due to higher organic waste of animal source [8]. In the present investigation the elevated level of Chloride is recorded in the summer season in the month of April and May. This elevated level is may be due to higher organic waste of animal sources, sewage mixing and higher temperature. The variation of chloride in all months is shown in figure below (Fig 8).
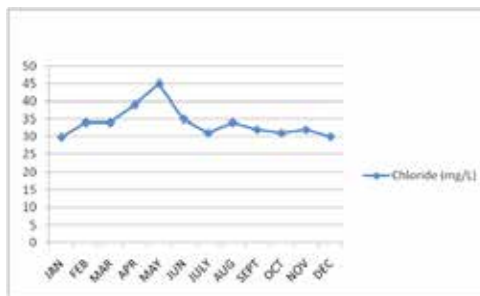

Fig 8: Variation in the Chloride of water of Bhivapur Lake throughout the year. Y axis represents Chloride in mg/L

Nitrate:

High values of nitrate during rainy season is recorded by Badge and Verma [9] which is due to entry of nitrogen rich flood water that carries large amount of polluted sewage water. But in our study area we were not got such results. Because there is not any source of nitrogen rich flood water to this lake due to forest to all sides of the lake. The variation of nitrate in all months of study period is shown in figure below (Fig 9).
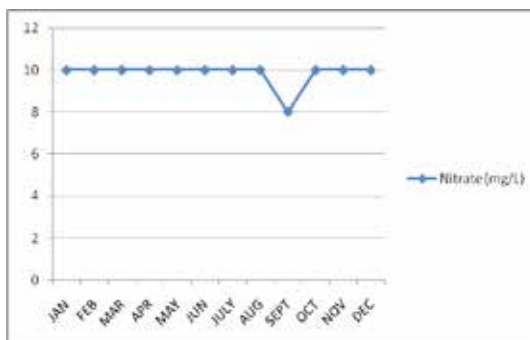

Fig 9: Variation in the Nitrate of water of Bhivapur Lake throughout the year. Y axis represents Nitrate in mg/L

Iron:

In the present lake water the values of iron is in the values normal range. The higher iron concentration may be harmful to the body system of all animals. The value of Iron in the present lake ranges from 0.1mg/L to 0.3mg/L. The list value is observed in the month of September and December. Difference in Iron of lake water throughout the study period is shown in Figure no.10
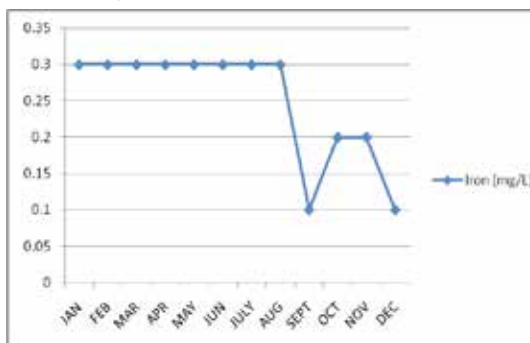

Fig 10: Variation in the Iron of water of Bhivapur Lake throughout the year. Y axis represents Iron in mg/L

Fluoride:

Fluoride is helpful for human healthiness, if it taken in controlled quantity. The tolerable limit for fluoride in drinking water is 1.0 mg/l [10]. Present lake has the normal level of fluoride which is in the range of 0.6 to 1 mg/l.
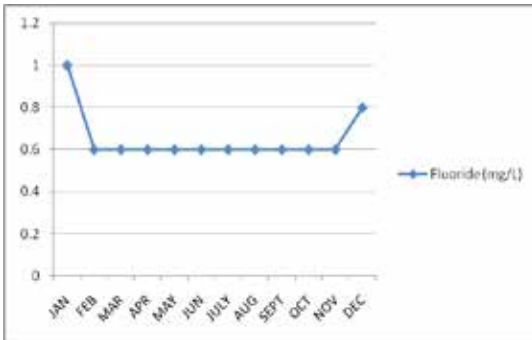
Fig 11: Variation in the Fluoride of water of Bhivapur Lake throughout the year. Y axis represents Fluoride in mg/L
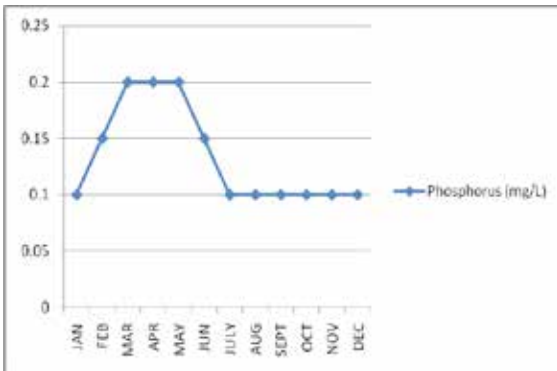
Phosphorus:

Fig 12: Variation in the Phosphorus of water of Bhivapur Lake throughout the year. Y axis represents Phosphorus in mg/L

Ammonia:

In the present study the minimum amount of ammonia found in August and September. This may be due to decomposition of organic matter which releases ammonia in the water. Also noted that the amount of ammonia seen to be constant in winter and summer season and greatly decreased in the rainy season. Variation in the Ammonia of lake water throughout the study period is shown in Figure no.13
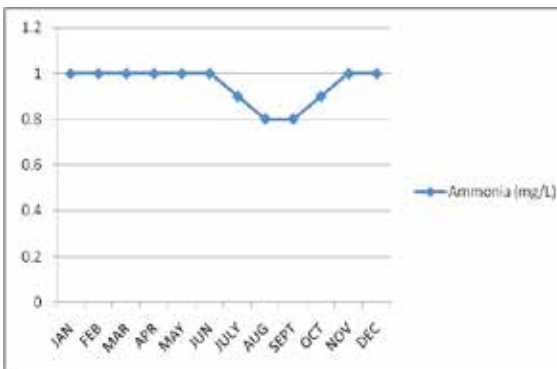

Fig 13: Variation in the Ammonia of water of Bhivapur Lake throughout the year. Y axis represents Ammonia in mg/L

Total Dissolved Solid:

The amount of Total Dissolved Solid in natural waters is determined by the geology of the drainage, rainfall and the water balance. In the present lake water the amount of Total Dissolved Solid is seen to be fluctuating between 0.23mg/L to 0.28mg/L and the maximum value is 0.28 in the February, May and June. The list value is reported in September and October. Difference in Total hardness of lake water throughout the study period is shown in Figure no.14
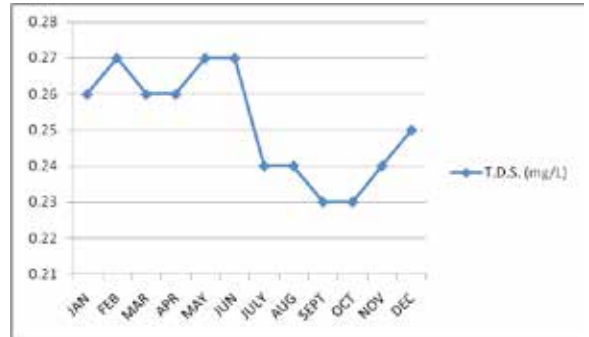

Fig 6: Variation in the Total Dissolved Solid of water of Bhivapur Lake throughout the year. Y axis represents Total Dissolved Solid in mg/L

IV.CONCLUSION

From the above investigation we conclude that nearly all parameters of Bhivapur lake are in normal range. This may be due to no enrichment of human activities in it. But certain action should be taken to increase natural habitats surrounding the lake. We also conclude that the Bhivapur lake is nutrient rich for flora and fauna diversity.

V. ACKNOWLEDGEMENT

REFERENCE [1] N . Chaudhary, Water and air quality control, The Indian context central board for the prevention and control of water pollution, New Delhi, India, 1982. | [2] APHA, Standard methods for examination of water and wastewater, American Public Health Association, New York, 1998. | [3] APHA. Standard methods for examination of water and waste water. Washington DC, USA, 21st Edition, 2000. | [4] M. Sengupta and R. Dalwani, Assessment of Physico-Chemical Characteristics and Suggested Restoration Measures for Pushkar Lake, Ajmer Rajasthan (India). Proceedings of Taal 2007: The World Lake Conference: 1518-1529 | [5] M.N. Sara, Site Assessment and remediation handbook (2nd Edition).Lewis Publishers, Washington, D.C., 2003. | [6] V. Wankhade, N. Manwar and A. Malu, Evaluation of status of ecosystem of Sawanga (Vithoba) Lake (Malkhed Talav), District Amravati, Maharashtra by assessment of Some Physicochemical Characteristics of water. International Journal of Scientific and Research Publications, Volume 2, Issue 8, August 2012 1 ISSN 2250-3153 | [7] D.H.N. Spence, The Macrophytic Vegetation of Freshwater Loch, In the Vegetation of Scotland. Ed. A.H. Burnell, Oliver and Boyd, Edinburg and London, 1964, 306-425 | [8] M. Munawar, A limnological studies of fresh water ponds of Hyderabad, India -1. Journal of the Biotype Hydrobiologia, 35, 1970, pp. 127-162 | [9] U.S. Badge and A.K, Verma, Limnological studies of J.N.U. lake., New Delhi. Proc. Nat. Symp. Pure and Applied Limnology (Ed. Adoni A. D.), Bull. Bot. Soc. Sagar. 32, 1985, 16-23. | [10] WHO, Guidelines for Drinking Water Quality. Geneva: World Health Organisation, 1996b. |