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Assessment of the few Specific Parameters of Satpala Lake at Virar, Thane, Maharashtra

Mehta Gayatri U.[1], Deshbhratar Shantaj M.[2] and Singh Ankita J.[3]

[1] Shri Chandulal Nanavati Vinay Mandir, Vileparle (W,) Mumbai, (India)

[2] Zoology Dept., Bhavan's Somani College, Chowpatty, Mumbai,(India)

3 Shri Chandulal Nanavati Vinay Mandir, Vileparle (W) Mumbai,(India)

ABSTRACT

Satpala Lake is situated in Satpala village, 5-6 km away from Virar town, Palghar district, Maharashtra at 19°25'58"N and 72°46'41"E. It is a naturally originated lake having an area of about 90,000 m 2 . The lake waters are utilized for a variety of purposes including domestic, agricultural purposes as well as for cultural and religious processions and other programmes. Regular monitoring of these waters is of paramount importance as a relationship can been established between different parameters that can indicate the health status of a habitat.Water is the most important sources of all kinds of life on this planet. Water though important have been adversely affected both qualitatively and quantitatively by all kinds of human activities on land, water and air. Our present studies are carried out to analyse the specific parameters to examine and assess the quality & sustainability of water. The observations suggests that the lake is fairly contaminated by varied pollutants and by adopting and implementing modern scientific-cum-technological measures, the lake can be reconstituted for a variety of purposes including pisciculture and other activities.

Keywords: Satpala, pollutants, parameters, domestic, pisciculture

I.INTRODUCTION

The lakes are one of the most productive ecosystems. The free style way of disposal of agricultural, industrial and domestic effluents into natural water bodies may cause serious contamination. Run-off from agricultural land and saline seeps subject the most vulnerable water pollution to increased salinity, so the freshwater lakes are highly affected and does not remain potable. They are very important economically in fishing, agriculture, industrial, and tourism, educational and scientific researches. Therefore, the accurate determination of physicochemical parameters in aquatic environment is of ultimate importance for controlling pollution/contamination.A large number of parameters signify the quality of water. Regular monitoring of the physic chemical characteristics is very important in order to:

- Understand the ecology of the selected area.
- Prevention of diseases and hazards.

- Checking the water resources for being polluted.

Several parameters such as pH, salinity, dissolved solids, Biochemical oxygen demand, the chemical oxygen demand, carbon dioxide, acidity, Alkalinity, pH, hardness, Chloride, nitrate, nitrite, Phosphate, sulphate, silicates, salinity, Electric Conduction vary over a short period which can be correlated. According to Hubertz and Cahoon(1999), the variations in the parameters can be useful in finding the sources of pollution and help in effective management.

In the present study few parameters such as DO, BOD, COD, pH, hardness of the Satpala lake are assessed in order to understand the quality of the water body.

The Area of study Undertaken in the Endeavour:

In this study Satpala lake at Virar, Thane District, Maharashtra is selected for the observation. Satpala village is located about 5 -6 km from Virar Station. The latitude of Satpala Lake is 19.432907200000000000 and longitude is 72.778610699999940000. It has coordinates- 19°25'58"N 72°46'41"E. It is naturally originated having area about 90,000 m^2, approximately, 22 acres. Its length is 450m, breadth is 200m and height is 6-7 foot.Many years ago water never used to get accumulated in the lake. The water used to dry up during summer. At that time people used lake water for the domestic purpose, especially washing of buffaloes. When the water used to dry up then the people used that soil as the fertilizers for farming as the soil was very fertile containing dung of the buffaloes. But in 1998, the bed lake was dug up and since then water never dried up in the lake. Local people are very much fortunate to have ample of water for their domestic activities and otherwise for culture of fishery and aquatic resources.

II.MATERIAL AND METHOD

In the present study the assessment of varied parameters of water has been done by standard methods of examination and the ones prescribed by appropriate designated bodies. (BIS1992) APHA 1995; Water Pollution Control Federation, World Health Organization, etc.

Collection of water sample: Water samples are collected randomly at regular intervals of three months from 3 sites of Satpala Lake. The samples were collected in plastic cans of 5liters capacity without entrapping any air bubbles. The samples were kept in refrigerator and maintained at 4°C. Recent scientific instruments and procedures with high efficiency and efficacy were utilized for all practical purposes.

Analysis of Water Sample: Analysis of the waters were carried out for various parameters such as pH, DO, BOD,COD, CO2, nitrate-nitrite, chlorides, sulphate, phosphates, alkalinity, acidity, total hardness etc. using standard methods. All the reagents used for the analysis were of AR Grade and double distilled water was used for preparation of solutions. All the available and calculated data is used for plotting the graph and subsequent calculation and calibration of Standard Error (SE).

Sr. No.	Parameters	Method	WHO Standard	ISI Standard
1.	Ph	pHmetery	7.0 – 8.0	6.5 – 8.5
2.	Dissolved Oxygen	Titrimetric method (Winkler's Method)		3 – 5 mg/lit
3.	Biochemical Oxygen Demand	Titrimetric method (Winkler's Method)		-
4.	Chemical Oxygen Demand	Titrimetric method		-
5.	Total Hardness	EDTA Titrimetric	100	300-600mg/l

Figure 1.

III.RESULT AND DISCUSSION:

3.1 Dissolved oxygen:

Dissolved oxygen is the most essential element for survival of aquatic flora and fauna. It effects the distribution of flora and fauna of the ecosystem.

In the present investigation, the maximum dissolve oxygen was recorded during the winter and monsoon and minimum during the summer season. In the present investigation the high values of dissolve oxygen during winter seasons was due to low temperature and high photosynthetic activities and low values of dissolve oxygen during summer is due to high temperature and high rate of oxidation of organic matter.

Purushottam J. Puri (2010) in his study in 2010 recorded similar findings. He recorded lowest value of dissolved oxygen during summer season and highest value during winter season. This could be due to several factors like the rise in temperature increased biological activity, respiration of organisms and increased rate of decomposition of organic matter. The decomposition of organic matter might be important factor for the consumption of dissolved oxygen which could be likely during warm weather. Sujata (2011) described as Dissolved oxygen is an important parameters to indicate the level of water quality. According to the researcher dissolved oxygen is related with BOD and CO2. In With the increase in the pollution BOD load due to

microorganisms is increased and in the process due to oxygen consumption by microorganisms. O2 content is decreased. This also increases CO2 content. The result of this research also shows that the content of dissolved oxygen is maximum in summer and minimum in winter.

3.2 Biological Oxygen Demand (BOD):

Biochemical Oxygen Demand (BOD) refers to the amount of oxygen that would be consumed if all the organics in one liter of water were oxidized by bacteria and protozoa (ReVelle and ReVelle, 1988).It is the measure of the amount of oxygen removed from aquatic environment by aerobic microorganisms for their metabolic requirements during the breakdown of organic matter.

In the present investigation, the maximum biochemical oxygen demand value is recorded during summer and minimum during the monsoon season. In the present investigations, the maximum biochemical oxygen demand in summer is probably due to high microbial activities during summer. A higher value of BOD indicates maximum consumption of oxygen and higher pollution load.The minimum BOD during the winter could be due todecrease in temperature which leads to decrease in microbial activity. (N. Shiddamallayya ,2008) Qureshimatva (2015) recorded the similar results showing lowest BOD level during monsoon which could be due to less vegetation. BOD is highest during summer. According to Tandel(2008) during summer, the water quality deteriorated on account of the increase in microbial activity as well as increase in pollutants concentration due water evaporation which leads to increase in BOD.

3.3 COD:

The chemical oxygen demand (COD) is also considered as the amount of oxygen consumed by the chemical breakdown of organic and inorganic matter and mainly serves to measure the ability of organic substances to consume oxygen in water.

In the present investigation, the maximum chemical oxygen demand and value is recorded during summer and minimum during the monsoon season. In present findings, the higher value of COD was recorded in the summer which might have been due to less water. The lower concentration of COD in the winter season was probably due to higher value of DO as low temperature promotes the concentration of DO in the lake water hence the requirement of oxygen of lake water is decreases. This indicates increased organic loads due to increased household waste water and waste discharges. N. Shiddamallayya (2008) recorded similar results where highest COD is recorded in summer season and lowest in monsoon season. Garg (2010) also observed similar result showing higher values during summer season and lower value during winter. Such a seasonal variation was also observed by many workers (Fokmare and Musaddiq, 2002).

3.4. pH:

The concentration of acids and bases in the water determines its pH. A low pH is acidic and high pH is basic, a pH of 7 is neutral. pH is potential of hydrogen. It is a value expressed as the negative logarithm of hydrogen ion concentration. The pH of the water was found to be mostly alkaline due to presence of salt in water by mixing of

river and seawater to the lake. The value of pH is minimum in monsoon and maximum in summer. The low pH value, observed in the monsoon was owing to heavy inflow of fresh water in to the water body and due to dilution of water. The higher pH value in summer might be due to high photosynthetic activity. The alkaline pH might be due to the use of detergents for washing clothes and utensils.

Similar observations were recorded by Siddamallayya N (2008). The highest value of pH is seen in summer and lowest in monsoon. The lowest value in monsoon is due to heavy rainfall and dilution effect. Smitha (2014) also recorded similar result of pH being maximum in summer and minimum in monsoon. pH is one of the most important measurements commonly carried out in natural waters. pH of water is greatly dependent on the biological activity andtemperature changes of the ambient atmosphere.

3.5. Hardness:

Calcium and Magnesium ions comprise hardness. Tests procedures usually determine both ions as "total hardness,' expressed as ppm calcium carbonate. In the most water the concentrations of alkalinity and hardness are similar but they can differ vastly as alkalinity measures negative ions (carbonate, bicarbonate) and hardness measures positive ions (calcium, magnesium). Hardness is important especially in the culture of several commercial species such as striped bass and catfish. If hardness is deficient, these species do not grow not grow well. Hardness should be above 50 ppm, low hardness can be adjusted by addition of lime and calcium chloride. Hardness below 300 mg/l is considered potable but beyond limits cause gastro intestinal irritation (ICMR 1975). Normal water hardness does not pose any direct health problems.

Mohanta and Patra (2000) stated that addition of sewage, detergents and large human use might cause elevation of hardness of water. Total hardness in water is the sum of the concentrations of alkaline earth metals cations. Hardness is generally governed by calcium and magnesium salts which largely combines with bicarbonates and carbonates giving temporary hardness and with sulphates, chlorides and others anions of a minerals acids causing permanent hardness. Total hardness of water is due to the concentration of salts.

In the present investigation, the maximum value was recorded during summer and minimum value was recorded during monsoon season. Basavaraja, Simpi (2011) record similar results showing The maximum value in the summer and minimum value in winter. Hujare, M. S (2008): also reported total hardness was high during summer than monsoon and winter. High value of hardness during summer can be attributed to decrease in water volume and increase of rate of evaporation of water.

IV.CONCLUSION

In the present study, it is found that water quality problems associated with Satpala Lake includes severe dissolved oxygen depletion which leads to fish killing, poor water clarity and high level of algae growth and nuisance blue green algae blooms. The discharges of sewage, surface runoff resulting from rainfall, immersion of idols of God and Goddess during festival season and dumping of garbage, washing, recreational activities have contributed considerable pollution in Satpala Lake, therefore, serious steps should be taken to remove this pollution.There is therefore a need to properly manage wastes in the city and control as well as monitor human

activities in order to ensure that such activities have minimal negative effects on Satpalalake. Awareness, proper understanding, planning and management of environmental resources by scientific measures are essential to prevent environmental degradation of the Satpala lake water.The parameters of Satpala Lake indicate that by adopting and implementing technological measures, including chemical, biological, mechanical etc., the lake can be reconstituted and its water can be utilized for a variety of purposes.

	2014 - 2015															
	JAN				MAY				AUGUST				OCTOBER			
PARAMETERS	S1	S2	S3	Mean	S1	S2	S3	Mean	S1	S2	S3	Mean	S1	S2	S3	Mean
DO	11.4	10.02	9	10.14	2.202	2.446	1.821	2.156333	5.546	4.624	5.599	5.256333333	5.112	4.796	6.806	5.571333
BOD	3.4	3.5	3.9	3.6	5.2	6.1	6.1	5.8	2.4	2.6	2.9	2.633333333	3	2.8	3.9	3.233333
COD	79	82.5	86	82.5	101.3	104	106	103.7667	66.5	62	60	62.83333333	70.5	63	62.5	65.33333
CO_2	0.3	0.4	0.3	0.333333333	2.23	2.2	2.2	2.21	1.9	1.6	1.9	1.8	1.3	0.7	1.2	1.066667
pH	7.65	7.68	7.63	7.653333333	8.45	8.62	8.38	8.483333	7.11	7.2	7.03	7.113333333	7.63	7.7	7.3	7.543333
HARDNESS	174.27	99.173	105.3	126.2476667	174	181.1	179	178.0333	75.26	80.211	73.22	76.23033333	99.12	89.3	100.96	96.46

Figure 2. Readings of the Specific Parameters of the Satpalalake of the year 2014 - 2015

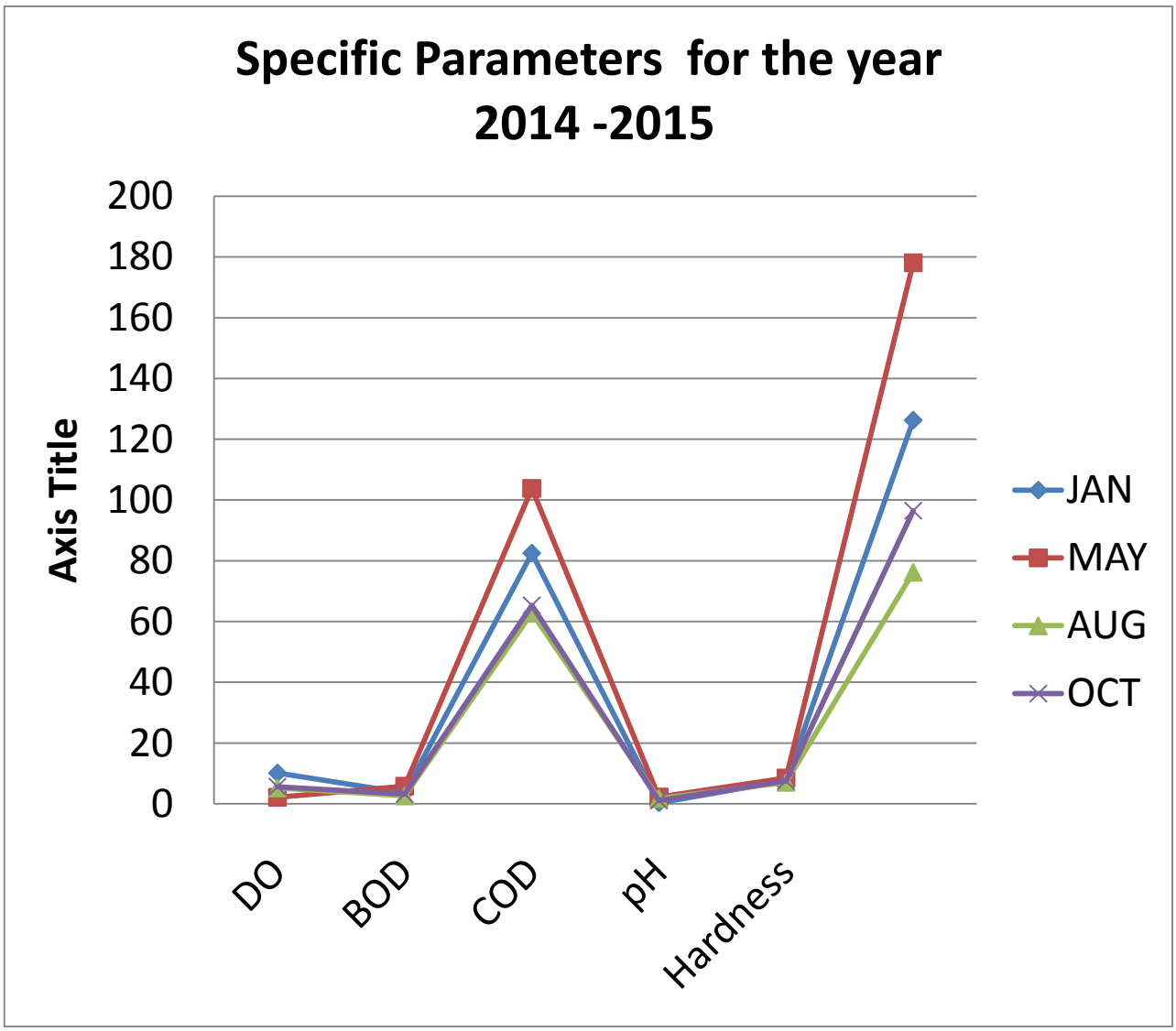

Figure 3. Mean Average values of Physico-Chemical parametes from 3 sites (S1,S2,S3) of Satpala lake during different seasons.

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