International Journal of Zoology and Applied Biosciences **ISSN: 2455-9571**
Volume 3, Issue 4, pp: 312-317, 2018
https://doi.org/10.5281/zenodo.1322893
http://www.ijzab.com

Research Article

STUDIES ON PHYSICO-CHEMICAL PARAMETERS OF KAMBE LAKE, KAMBE, BHIWANDI DISTRICT, THANE (M.S.) IN RELATION TO AQUACULTURE

Amte, G.K., *Shinde, P.P. and Ansari Gulista, R.

Department of Zoology, B.N.N. College, Bhiwandi, Thane-421305, Maharashtra, India

Article History: Received 16th April 2018; Accepted 23rd April 2018; Published 27th July 2018

ABSTRACT

The paper deals with physico-chemical analysis of Kambe Lake, Kambe, Bhiwandi, Dist. Thane. The investigation was carried out for the period of one year (Jan'14-Dec'14), representing pre-monsoon, monsoon and post monsoon studies. In all 21 physico-chemical parameter were studied. However, parameters like Dissolved Oxygen, Hardness, Nitrate, Silicate, Phosphate, etc. which are considered as significant for aquaculture are included in the present paper. On the basis of finding from present study, it can be concluded that lake is beneficial for the community and can be important source of livelihood if composite fish culture is practiced.

Keywords: Kambe lake, Physico-chemical parameters, Seasonal changes, Composite fish culture.

INTRODUCTION

India is rich in lentic and lotic ecosystems comprise several thousand lakes and ponds of varying extent. These are distributed all over the country. In view of increasing population of the country, intensification of the efforts for tapping alternative methods of food production is signposted. Aquaculture is one of the methods that hold many promises and goes well with abundance of aquatic ecosystem in the country. It has added importance in view of the global fishing industry becoming depleted due to intensive fishing. Maharashtra state is having more than 3 lakhs. Open water for fish culture in the form of lakes and reservoirs. Near about 80,000 tonnes of fish production is expected from these water bodies.

Thane district is one of the districts of Maharashtra state for fish production and natural water reservoirs. There are about 300 water bodies in Thane district, most of which are located in rural and semi-urban areas. Most of these water bodies can be utilized for the development of inland fisheries, if utilized successfully for practicing aquaculture. It is with this view is mind the present work was undertaken during the study period (Jan 2014 – Dec 2015). The paper deals with the study of Physico-chemical parameters of the lake under investigation in relationto aquaculture. Voluminous work has been carried out on Lakes located in the vicinity of Thane city by Ansari *et al*. (2014), Koliyar & Rokade (2008), Pejaver *et al*. (2004) and Somani & Pejaver (2007). But very little work has been carried out in rural and semi-urban of Thane district (Amte & Gore Tejali, 2012; Dalvie, 2014, Gupte & Shaikh, 2014, Kakavipure & Yeragi, 2007; Lendhe & Yeragi, 2004).

MATERIAL AND METHODS

Collection of water samples

Water samples from two pre-decided sites were collected in clean polythene bottles by taking necessary precautions. The bottles were rinsed before sampling and sealed after collection and labeled in the field.

Analysis of water samples

Analysis was carried out for various water quality parameters in the field and laboratory. The surface water was collected from Kambe lake Kambe, Bhiwandi,

*Corresponding Author: Dr. P. Pramod Shinde, HOD of Zoology, B.N.N. College, Bhiwandi, Thane- 421305, Maharashtra, India, Email: balamte@rediffmail.com, Mobile: 9833949759

Disttrict, Thane, Maharastra State (Figure 1) every month during early morning between 8.00 am to 10.00 am, throughout the study period i.e. from January 2014 to December 2015. However, observations recorded during the first year of study period i.e. January 2014 to December 2014 are discussed in the present paper. Air and water temperatures were recorded on the spot. Similarly, samples for estimation of Dissolved Oxygen were fixed by adding Winkler's A and B in the BOD bottles in the field. The entire analysis was completed within 24 hrs of collection by methods mentioned in APHA (2004), Trivedy & Goel (1984) and Mishra (1993). The study was divided into three marked season's viz. Pre-Monsoon, Monsoon and Post-Monsoon.

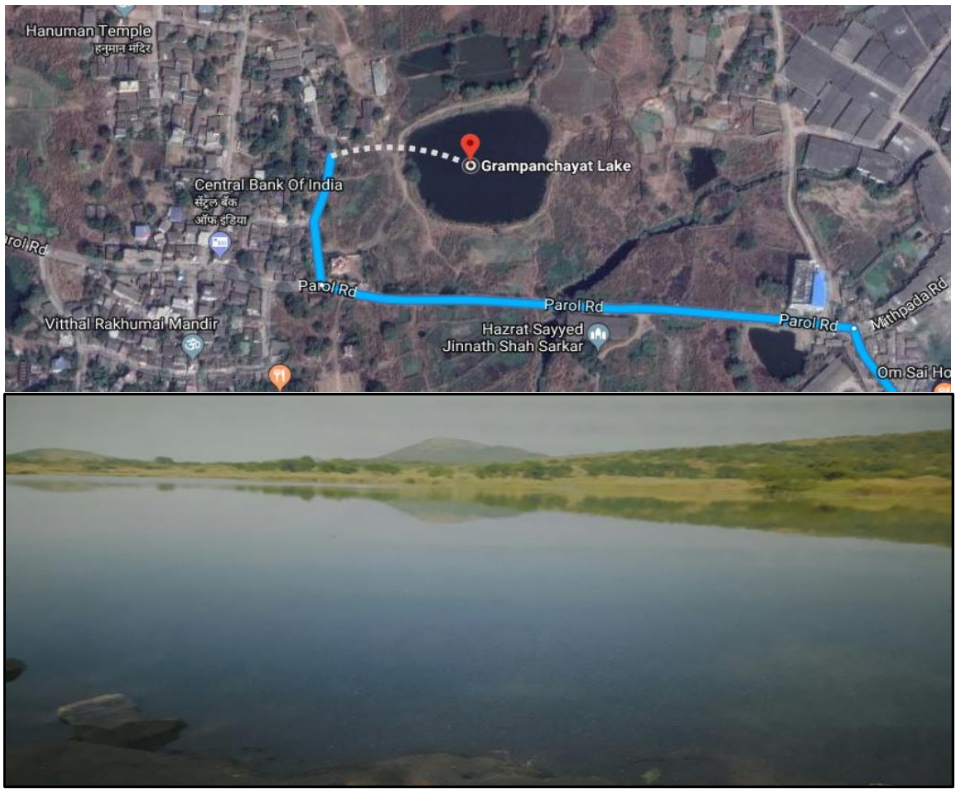

Figure 1. Satellite Map and Photograph of Kambe lake, Kambe.

METHODOLOGY

Temperature: Air temperature and Surface water temperature both were measured by using mercury thermometer.

pH: The pH was determined by Lovibond comparator at the investigating centre. Thereafter the observed pH was confirmed with pH meter.

Dissolved Oxygen: Dissolved Oxygen was measured by Winkler's method.

Hardness: Hardness was measured by EDTA method.

Chlorides: The Chlorides were estimated by Argentometric method.

Alkalinity: Alkalinity was determined by Titrimetric method. Two indicators namely phenolphthalein and methyl orange were used.

Phosphates: Phosphates was estimated colorimetrically by using ascorbic acid.

Nitrate-Nitrogen: It was estimated by complexing with sulphanilamide and NEDD (N-napthyl ethylene diamine dichloride).

Silicate: It was estimated by Molybdosilicate method by using ammonium molybdate solution, hydrochloric acid and oxalic acid.

RESULTS AND DISCUSSION

Temperature is one of the essential physical parameter which decides the quality of water, because it influences the quality of life by altering the D/O concentration in the water, making less availability of dissolved oxygen for respiration and activities of aquatic organisms (Jalal & Sanalkumar, 2012; Tank & Chippa, 2009). According to Metcalf & Eddy (2003), water temperature is an effective factor to control the chemical reaction and its rate within the water body that determine the usefulness of the water. The physico-chemical parameters of Kambe Lake is given in the Table 1. In the present investigation, Air temperature

ranged between 27.63 to 32.25°C (Figure 2). The maximum temperature was recorded in Monsoon season whereas minimum temperature was recorded in Post-Monsoon season. Water temperature ranged between 24.63 to 29.63°C. The minimum water temperature was recorded in Post-monsoon whereas maximum temperature was recorded in Monsoon. The prescribed limit for aquaculture is 25 to 32°C (Figure 3).

In aquatic eco-system, pH is a function of Dissolved CO_2 content; hence the estimation of pH can illustrate the metabolism of CO_2 and Oxygen in water. The effect of pH on the chemical and biological properties of liquids makes its determination very important. The water of Kambe Lake was found to be near neutral. The pH values of water samples varied between 7.05 to 7.10 (Figure 4). Maximum pH was recorded in Pre-monsoon and Post-Monsoon whereas minimum was recorded in Monsoon. The prescribed limit for aquaculture is 6.5 to 9.5. Dissolved Oxygen specifies the health of the aquatic ecosystem. It refers to the concentration of oxygen present in the water body. It is one of the important parameters in water quality assessment. The DO in the water depends on the temperature, light and salinity. In the present study, dissolved oxygen was found in the range of 6.26 to 8.155 mg/lit (Figure 5). The concentration of DO was maximum in Post monsoon and minimum in Monsoon. The prescribed limit for aquaculture is 5-10 mg/lit.

The total hardness of water is the sum total of alkaline metal cations present in it. In the present study, the total hardness ranged from the minimum of 62.25 mg/lit in Monsoon and maximum of 81.00 mg/lit in Post monsoon indicating that it may be due to high rate of evaporation (Figure 6). The prescribed limit for aquaculture is 20-180 mg/lit. Chloride is an omnipresent aqueous anion occurring naturally in all types of water. In the present study, chlorides varied between 25.205 to 41.89 mg/lit (Figure 7). Maximum value was recorded in Pre monsoon whereas minimum value in Post monsoon. High values are associated with high rate of evaporation. The prescribed limit for aquaculture is 31-180 mg/lit. Alkalinity of water is primarily a function of carbonate, hydroxide content and also due to borates, phosphates, silicates and other bases. In the present investigation, lowest value recorded was 157.5 mg/lit in Monsoon whereas highest value recorded was 221.88 mg/lit in Premonsoon (Figure 8). The prescribed limit for aquaculture is 50-300 mg/lit.

Phosphates are one of the most important nutrients essential for the growth of phytoplankton in fresh water bodies. Phytoplankton forms a major food material for most of the commercially important fishes. In the present study, Phosphates ranged between 0.0040 mg/lit in the Post monsoon and 0.0161 mg/lit in Pre monsoon (Figure 9). The prescribed limit for aquaculture is 0.3 – 0.5 mg/lit. It is a transitional form during de-nitrification and nitrification reactions in nitrogen cycle. It is very unstable ion and gets converted in to either ammonia or nitrate according to the water conditions. In the present study, nitrite ranged between 0.0498 mg/lit to 0.05260 mg/lit in Monsoon and Post monsoon respectively (Figure 10). The prescribed limit for aquaculture is 0.0-0.5 mg/lit. Nitrate is one of the essential nutrients for better productivity in water. In the present study, nitrate ranged between 0.02583 mg/lit to 0.05967 mg/lit in Monsoon and Post monsoon respectively. (Figure 11). Low values of nitrate were associated with dilution of lake water by rainfall. The prescribed limit for aquaculture is 0.1-405 mg/lit.

Silicates occur in water in colloidal particulate state or as dissolved silicates. Silica is a major component of algal forms in many lakes. It is a constituent of diatom cell wall, radiolarians and some sponge spicules. In the present study, silicate varied between 0.277 to 0.473 mg/lit (Figure 12). Maximum value was recorded in Monsoon whereas minimum value in Pre monsoon. High values are associated with high rate of evaporation. The prescribed limit for aquaculture is 4.0 – 16.0 mg/lit.

Table 2. Physico-chemical parameters of Kambe Lake.

Seasons Parameters	Pre-Monsoon	Monsoon	Post-Monsoon	Recommended limits for Aquaculture
Atm. Temperature-°C	30.75	32.25	27.63	N.A.
Water Temperature-°C	27.63	29.63	24.63	25 - 32
pH	7.10	7.05	7.09	6.5 - 9.5
Dissolved O_2 – mg/lit	6.469	6.26	8.155	5 - 10
Hardness – mg/lit	76.50	62.25	81.00	20 - 180
Chloride – mg/lit	41.89	37.16	25.205	31 - 50
Alkalinity – mg/lit	221.88	157.5	158.13	50 - 300
Phosphate PO_4^{---}- mg/lit	0.0161	0.0087	0.0066	0.3 - 0.5
Nitrite – mg/lit	0.05158	0.0498	0.05260	0.0 - 0.5
Nitrate – mg/lit	0.04794	0.02583	0.05967	0.1 - 4.5
Silicate – mg/lit	0.277	0.473	0.339	4 - 16

N. A.: Not available.

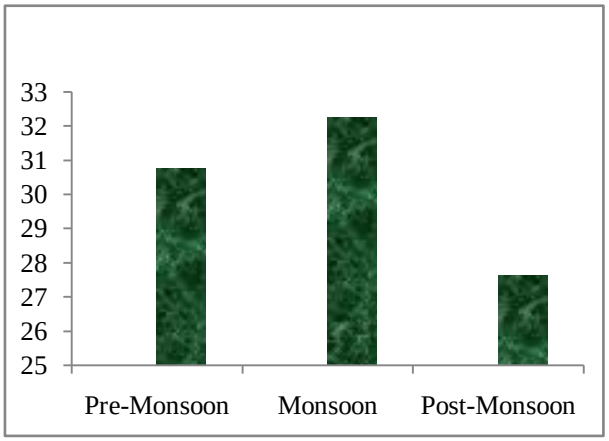

Figure 2. Bar diagram showing Air temperature℃.

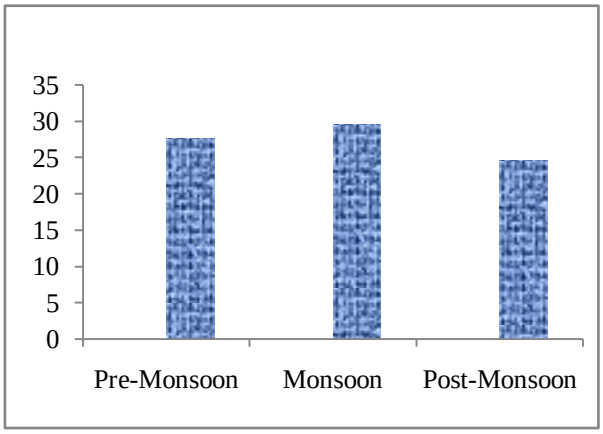

Figure 3. Bar diagram showing Water temperature℃.

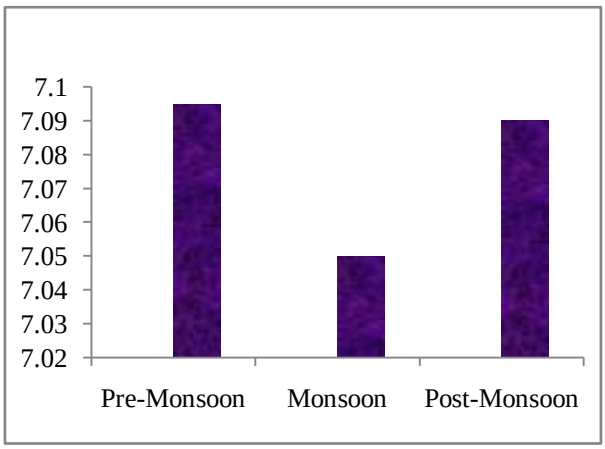

Figure 4. Bar diagram showing pH.

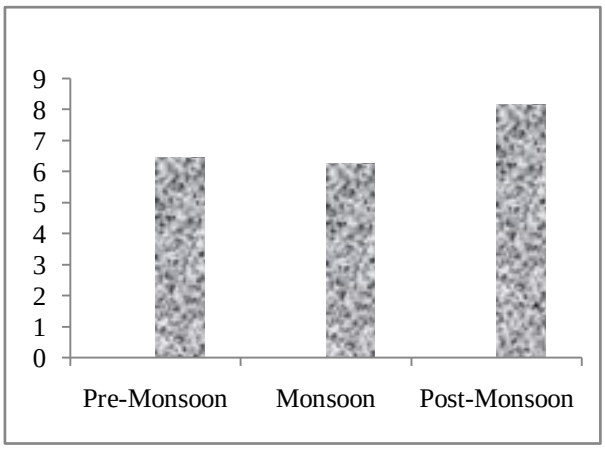

Figure 5. Bar diagram showing D.O. in mg/lit.

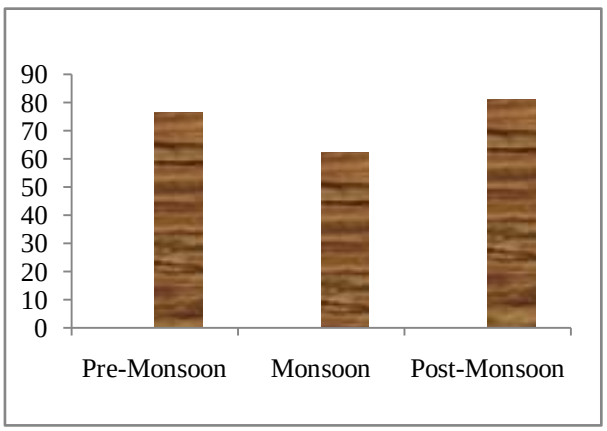

Figure 6. Bar diagram showing Hardness in mg/lit.

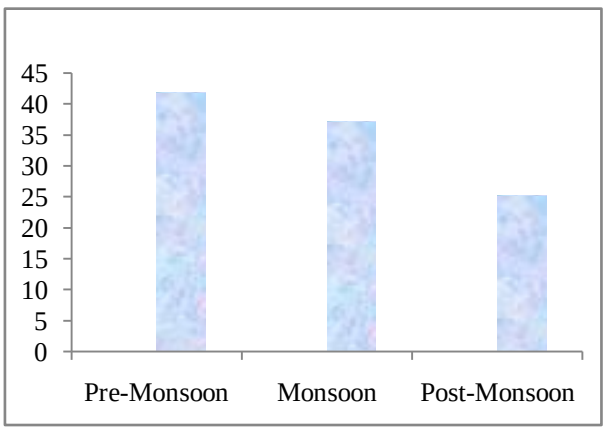

Figure 7. Bar diagram showing Chlorides in mg/lit.

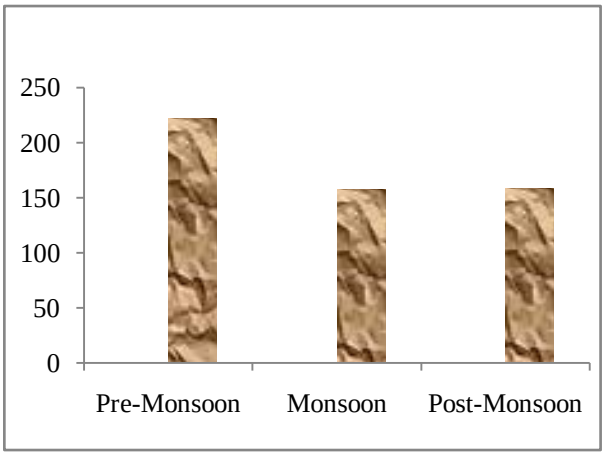

Figure 8. Bar diagram showing Alkalinity in mg/lit.

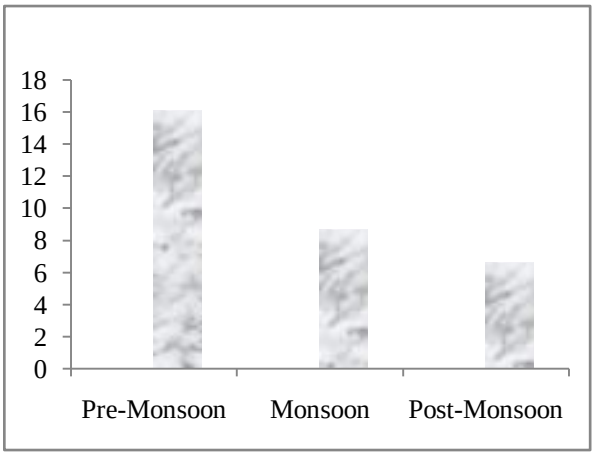

Figure 9. Bar diagram showing Phophate in mg/lit.

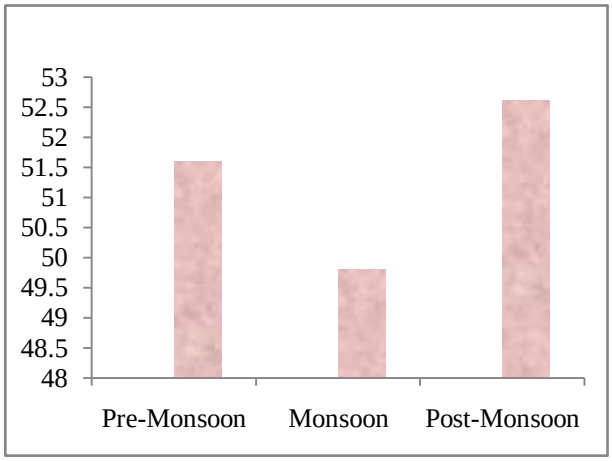

Figure 10. Bar diagram showing Nitrite in mg/lit.

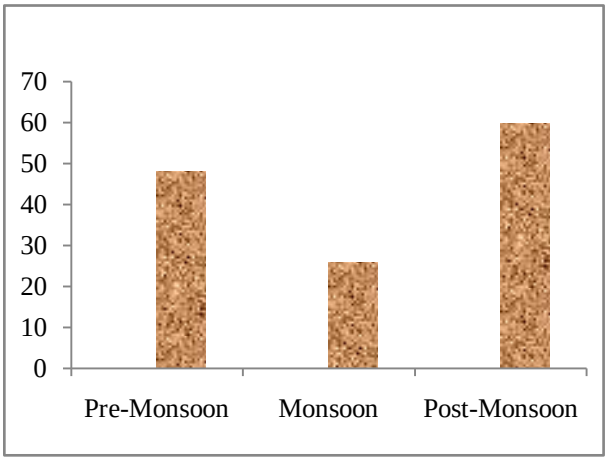

Figure 11. Bar diagram showing Nitrate in mg/lit.

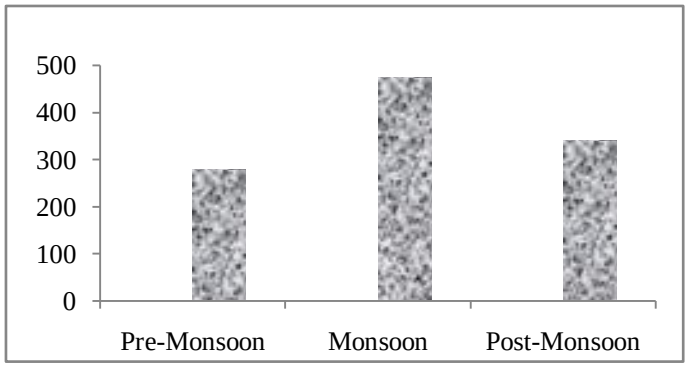

Figure 12. Bar diagram showing Silicate in mg/lit.

CONCLUSION

Most of the parameters required for establishing aquaculture in fresh water are well within permissible limits. Hence it can be concluded that, lake under investigation can be developed for practicing culture of fresh water fishes.

ACKNOWLEDGEMENT

The authors are thankful to Hon. Shri. Vijay Jadhav, President, Hon. Shri B.D. Kale, Executive President P.A.J.B.S.U. Mandal, Bhiwandi and Dr. Ashok D. Wagh, Principal, B.N.N. College, Bhiwandi for providing necessary laboratory facilities and support.

REFERENCES

Amte, G., & Gore Tejali, A. (2012). Physico-chemical status and primary productivity of Gauripada lake-Kalyan city. *Maharashtra, India Pollution Research, 31*(4), 671-674.

Ansari, S.P., Irani, S.D., & Prabhu, D. (2014). Study on some physico-chemical characteristics and heavy metal contamination of Powai lake, Mumbai (India). *Asian Journal of Chemistry, 26*, 222-224.

APHA, A.W.W., Federation, W.P.C., & Federation, W.E. (2004). *Standard Methods for the Examination of Water and Wastewater*, American Public Health Association Press, Washington D.C.

Dalvie, V.V., Amte G.K. and Shingadia, H.U. (2014). Variation in the Physico-chemical parameters of Kalkhadi lake, Kharbav (Dist. Thane), India. *Contemporary Research in India, 1*(5), 1-7.

Golterman H.L. Clymo R.S. and Ohnstad M.A.M. (1978). Methods for Physical and Chemical Analysis of Freshwaters. 1BP Handbook No 8, 2nd Edition. Blackwell Scientific Publications, Oxford, London Edinburgh, Melbourne.

Gupte, A., & Shaikh, N. (2014). Seasonal Variations in Physicochemical Parameters and Primary Productivity of Shelar lake Bhiwandi, Thane, Maharashtra, India. *Universal Journal of Environmental Research and Technology, 3*(4), 523-530.

Jalal, F.N., & Sanalkumar, M. (2012). Hydrology and Water Quality Assessment of Achencovil River in Relation to Pilgrimage Season. *International Journal of Scientific and Research Publications, 2*(12), 1-5.

Kakavipure, D., & Yeragi, S. (2007). Occurrence of fresh water sponge *Eunapius carteri* (Bowerbank, 1863) from Khativali-Vehloli Lake near Shahapur District, Thane, Maharashtra, India. Paper presented at the Proceedings of TAAL 2007. *The 12th World Lake Conference*, 500-505.

Kobayashi, J. (1967). Silica and fresh water and estuaries. In Golterman and Clymo (Ed.) q.v. 41-55

Koliyar, J., & Rokade, N. (2008). Water Quality in Powai Lake: Mumbai, Maharashtra. Paper presented at the Proceedings of Taal 2007, *The 12th World Lake Conference*, 1655-1659.

Lendhe, R., & Yeragi, S. (2004). Physico-chemical parameters and zooplankton diversity of Phirange Kharbav Lake. Dist. Thane, Maharastra. *Journal of Aquatic Biology, 19*(1), 49-54.

Metcalf, E.E., & Eddy, H. (2003). Wastewater engineer treatment disposal, reuse. McGRaw. New York, 1-1334.

Mishra, P.C. (1993). Ecology and pollution of Indian lakes and reservoirs, Ashish Publishing House, New Delhi. 317-337.

Pejaver, M., Somani, V., & Quadros, G. (2004). Physiochemical parameters of two quarry lakes near Thane city. *Journal of Aquatic Biology*, 19(1), 107-110.

Somani, V., & Pejaver, M. (2007). Evaluation of pollution in the lake Masunda, Thane, Maharashtra. *Journal of Ecobiology, 20*, 163-166.

Tank, S. K., & Chippa, R. (2009). Analysis of Water Quality of Halena Block in Bharatpur Area. *International Journal of Scientific and Research Publications*, 3(3), 57-59.

Trivedy, R., & Goel, P. (1984). Chemical and biological methods for water pollution studies. *Environmental Publications*, *5*, 1-22.

Winkler, L.W. (1888). Die Bestimmung des in Wasser gelosten Sauerstoffen. Berichte der Deutschen Chemischen Gesellschaft, 21, 2843-2855.