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By

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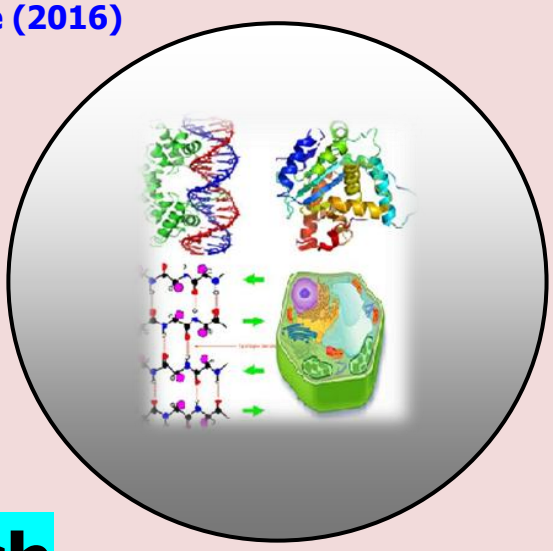

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Monthly Variations in Physico-Chemical Characteristics of Odathangal Lake Ayyangarkulam in Kanchipuram District, Tamil Nadu, India

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ABSTRACT

Monthly variations of physico-chemical characteristics were carried out in Ogathangal Lake Ayyangarkulam in Kanchipuram District, Tamil Nadu, India, for a period of twelve months (January 2017 to December 2017). Eight various physico-chemical parameters were analyzed by using standard methods (APHA, 1998). Water temperature varied from 26.67 to 33.23ºC, pH ranged from 7.10 to 8.50. Turbidity was from 24.33 to 45.00 cm, Dissolved oxygen content varied between 3.75 to 5.69 mg/L, salinity (0.04 to 0.14 ppt), calcium (24.00 to 69.67 mg/L, Nitrate (0.16 to 0.38 mg/L) and ammonia (0.22 to 0.63 mg/L) also varied independently.
Key words: Physico-chemical characteristics, Monthly variations, Freshwater, Water quality.

INTRODUCTION

Water is one of the most important and abundant compounds of the ecosystem. All living organisms on the earth need water for their survival and growth. As of now only earth is the planet having about 70 % of water. But due to increased human population, industrialization, use of fertilizers in the agriculture and man-made activity it is highly polluted with different harmful contaminants. Therefore it is necessary that the quality of drinking water should be checked at regular time interval, because due to use of contaminated drinking water, human population suffers from varied of water borne diseases. It is difficult to understand the biological phenomenon fully because the chemistry of water revels much about the metabolism of the ecosystem and explain the general hydro-biological relationship (Basavaraja Simpi *et al*., 2011). Limnological studies are supportive in interaction between the climate, neighboring environmental situation and biological processes in the water. In recent year several studies have been made on the limnology of fresh water bodies (Yeole and Patil, 2005; Mushini, 2012).

Water quality regulates biotic diversity and biomass, energy and material cycles, tropical levels and rate of succession. In turns, it helps in planning exploitation, anti pollution or conservation strategies. The environment monitoring through water quality assessment should be a continuous process and regularly undertaken for a variety of purpose like testing suitability of water for agriculture, industrial, aquaculture, recreational and domestic purpose. Several studies have been conducted so for to understand the physio-chemical properties of rivers in India (Bhalerao, 2012; Pradeep *et al*., 2012; Wan Mohd Khalik *et al*., 2015).

Freshwater resources need special care and attention to make its available sustainably for present and future generations. Water is a vital role in agriculture, aquaculture, industries and almost all other human activities. Ensuring uninterrupted fresh water supply is a greater challenge and the world should manage to face during

upcoming deeds (Pankaj Malviya *et al*., 2015). In the present study attempts to provide such vital information for future references. All the physico-chemical parameters were studied from Ogathangal Lake Ayyangarkulam in Kanchipuram District, Tamil Nadu, India for a period of January 2017 to December 2017.

MATERIALS AND METHODS

Water samples were collected from Ogathangal Lake Ayyangarkulam in Kanchipuram District, Tamil Nadu, India which is located at latitude 12° 83' North South, 79° 70' East West on Southern part of India. 2 litre capacity of plastic cans for physico-chemical samples were used to collect surface water samples and kept immediately in an ice box and transported to the laboratory. The samples were analyzed every month during January 2017 to December 2017. The various physico-chemical parameters were analyzed by using standard methods (APHA, 1998). Temperature: In the present study water temperature of the lake water recorded by using Mercury field celcious thermometer. pH: The pH was determined by using Elico, model LI. 120 Digital pH meter. Turbidity: It can be determined by using turbidity meter. Dissolved oxygen: The Dissolved oxygen was determined by the modified Winkler's method (1888). Salinity: The salinity content was determined by Mohr's titration method. The other parameters like, calcium estimated by EDTA Titrimetric method, the nitrate was determined by the Brucine method and ammonia was determined by the Nesslerization method (APHA, 1998).

RESULT

In the present study, the water temperature fluctuated from 26.67 to 33.23ºC in Ogathangal Lake Ayyangarkulam. It was found to be low (26.67ºC) in the month of November 2017 and high (33.23ºC) in May 2017 (Table 1 and Figure 1).Turbidity of the water samples depends on availability of either zooplankton or phytoplankton and suspended soiled particles. The transparency of the estuary varied from 24.33 to 45.00 cm. It was found to be low (24.33 cm) in the month of December 2017 and high (45.00 cm) in the month of May 2017 (Figure 2). pH is another important biological parameter. The pH of the water samples showed alkaline ranges throughout the study period. It varied from 7.10 to 8.50. It was found to be minimum (7.10) in November 2017 and maximum (8.50) in the month of May 2017 (Figure 3).The salinity content ranged from 0.04 to 0.14 ppt. It was found to be high (0.14 ppt) in the month of April 2017 and low (0.04 ppt) was recorded in December 2017 (Figure 4).

The dissolved oxygen is important biological factor. The dissolved oxygen content ranged from 3.75 to 5.69 mg/L. It was found to be low (3.75 mg/L) in May 2017 and high (5.69 mg/L) in January 2017 (Figure 5). Calcium content fluctuated from 24.00 to 69.67 mg/L. It was found to be low (24.00 mg/L) in the month of December 2017 and high (69.67 mg/L) in May 2017 (Figure 6). Nitrate content was fluctuated from 0.16 to 0.38 mg/L. It was found to be low (0.16 mg/L) in the month of August 2017 and high (0.38 mg/L) in May 2017 (Figure 7).The ammonia content ranged from 0.22 to 0.63 mg/L. It was found to be low (0.22 mg/L) in the month of August 2017 and high (0.63 mg/L) in June 2017 (Figure 8).

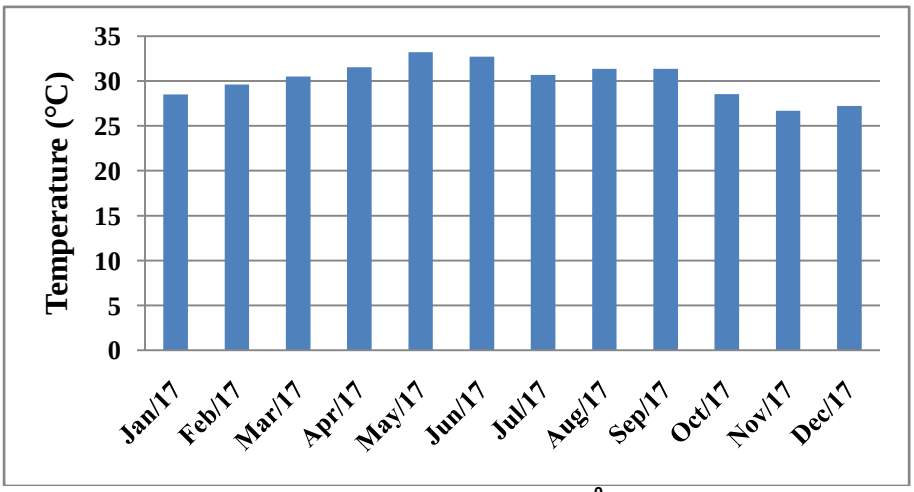

Figure 1. Monthly variations of water temperature (^{0}C) in the Ogathangal Lake.

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Table 1 Physico-chemical characteristics of Ogathangal Lake Ayyangarkulam (January 2017 to December 2017).

Month and Year	Temp. (°C)	Turbidity (cm)	pH	Salinity (ppt)	DO (mg/L)	Calcium (mg/L)	Nitrate (mg/L)	Ammonia (mg/L)
Jan-17	28.50 ± 0.17	27.05 ± 0.58	7.16 ± 0.07	0.14 ± 0.00	5.69 ± 0.48	37.33 ± 0.88	0.20 ± 0.04	0.39 ± 0.01
Feb-17	29.60 ± 0.11	31.07 ± 0.58	7.37 ± 0.09	0.18 ± 0.00	4.79 ± 0.16	52.00 ± 0.58	0.35 ± 0.03	0.46 ± 0.01
Mar-17	30.5 ± 0.11	35.00 ± 0.58	7.73 ± 0.09	0.08 ± 0.01	5.17 ± 0.09	63.33 ± 0.88	0.25 ± 0.02	0.30 ± 0.01
Apr-17	31.53 ± 0.07	36.67 ± 0.88	8.37 ± 0.07	0.14 ± 0.01	4.70 ± 0.09	56.67 ± 0.88	0.31 ± 0.05	0.33 ± 0.01
May-17	33.23 ± 0.07	45.00 ± 0.58	8.50 ± 0.10	0.12 ± 0.00	3.75 ± 0.09	69.67 ± 0.88	0.38 ± 0.02	0.41 ± 0.01
Jun-17	32.73 ± 0.12	43.10 ± 0.58	8.10 ± 0.06	0.09 ± 0.00	4.32 ± 0.09	52.67 ± 0.67	0.33 ± 0.04	0.63 ± 0.01
Jul-17	30.67 ± 0.03	35.05 ± 0.58	7.70 ± 0.10	0.07 ± 0.00	4.60 ± 0.09	45.33 ± 0.66	0.32 ± 0.06	0.53 ± 0.00
Aug-17	31.37 ± 0.09	36.08 ± 0.58	7.33 ± 0.03	0.10 ± 0.00	5.27 ± 0.09	49.33 ± 0.88	0.16 ± 0.03	0.22 ± 0.01
Sep-17	31.37 ± 0.09	32.33 ± 0.88	7.30 ± 0.06	0.05 ± 0.00	5.17 ± 0.09	35.00 ± 0.58	0.28 ± 0.04	0.42 ± 0.01
Oct-17	28.53 ± 0.14	25.67 ± 0.33	7.13 ± 0.09	0.07 ± 0.00	4.60 ± 0.09	44.67 ± 0.67	0.26 ± 0.02	0.33 ± 0.01
Nov-17	26.67 ± 0.09	25.33 ± 0.67	7.10 ± 0.06	0.06 ± 0.00	5.55 ± 0.19	29.00 ± 0.58	0.21 ± 0.03	0.24 ± 0.01
Dec-17	27.23 ± 0.12	24.33 ± 1.20	7.47 ± 0.12	0.04 ± 0.00	6.20 ± 0.16	24.00 ± 0.58	0.17 ± 0.02	0.28 ± 0.00

Each value is the mean ± S.D. of four observations

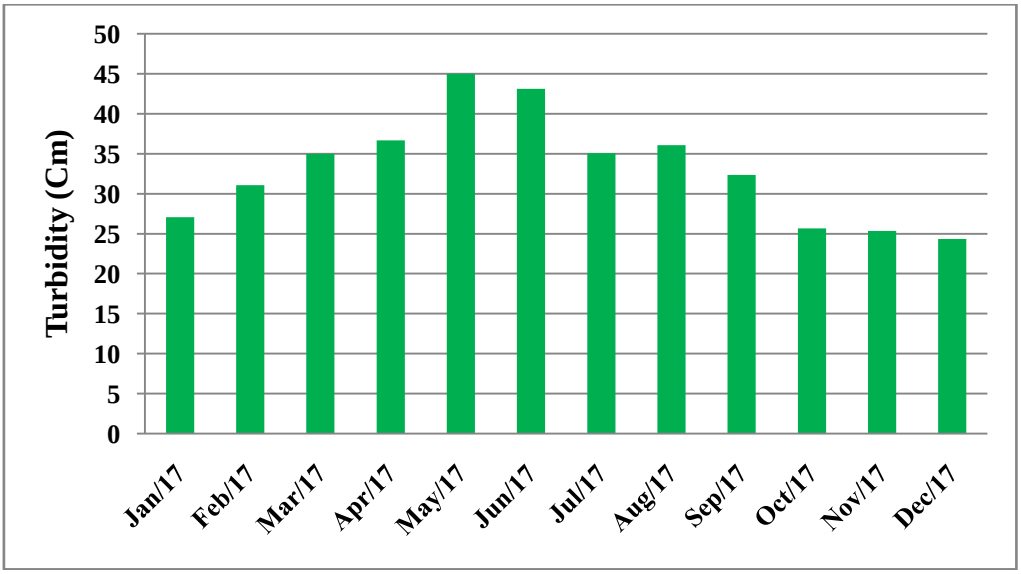

Figure 2. Monthly variations ofwater turbidity (cm) in the Ogathangal Lake.

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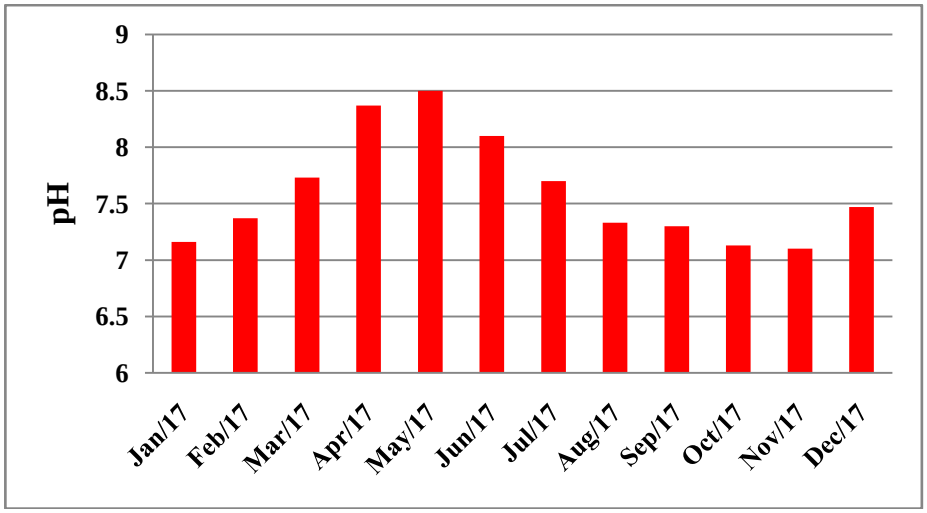

Figure 3. Monthly variations ofwater pHin the Ogathangal Lake.

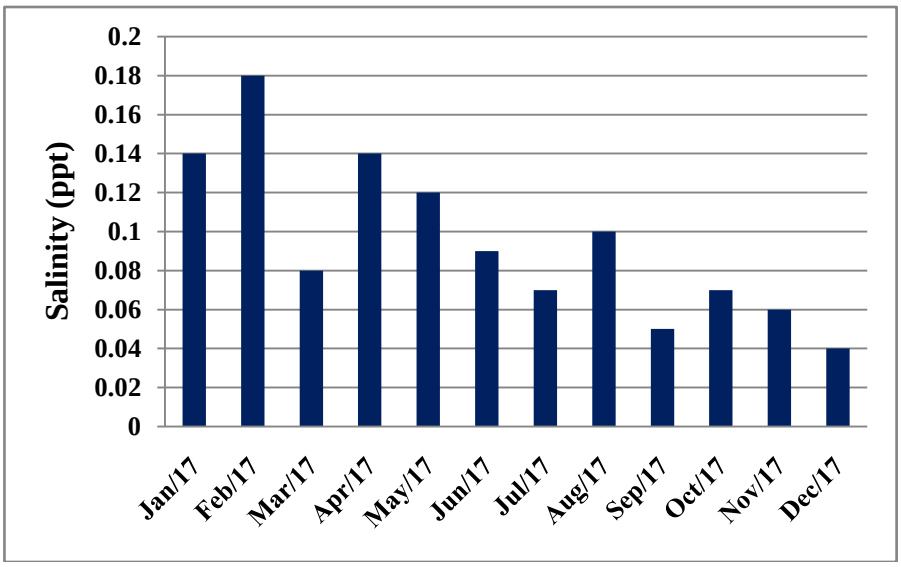

Figure 4. Monthly variations of salinity (ppt) in the Ogathangal Lake water samples.

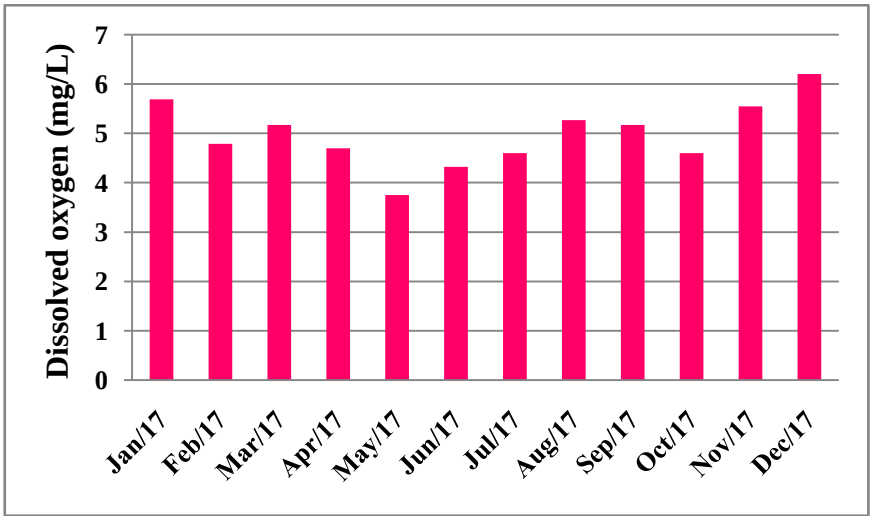

Figure 5. Monthly variations of dissolved oxygen (mg/L) in the Ogathangal Lake.

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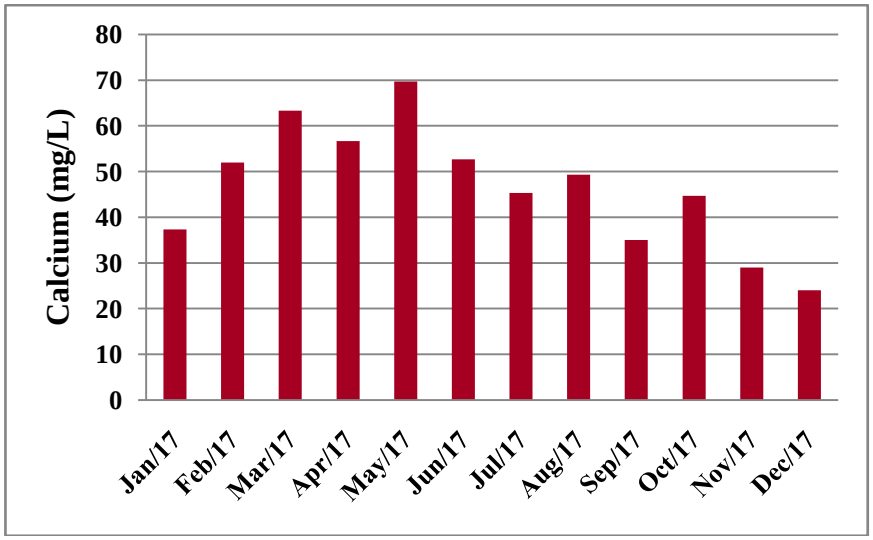

Figure 6. Monthly variations of calcium (mg/L) in the Ogathangal Lake water samples.

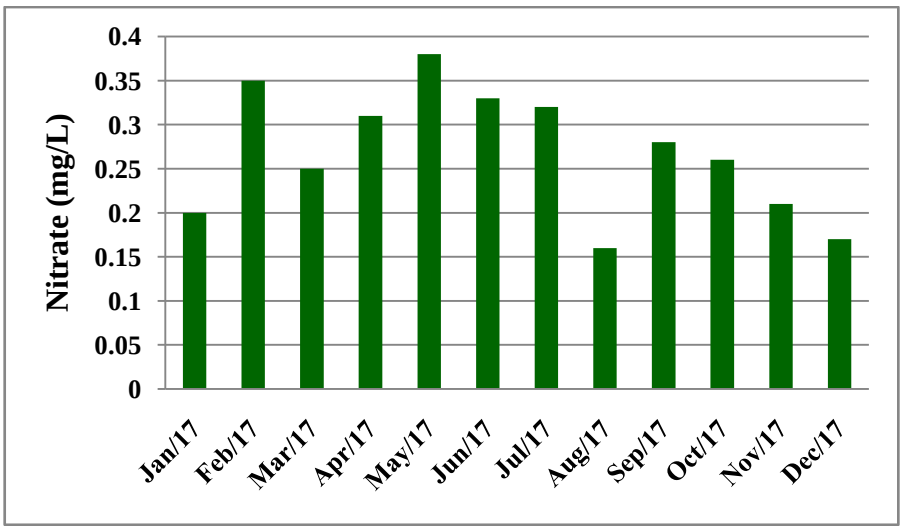

Figure 7. Monthly variations of nitrate (mg/L) in the Ogathangal Lake water samples.

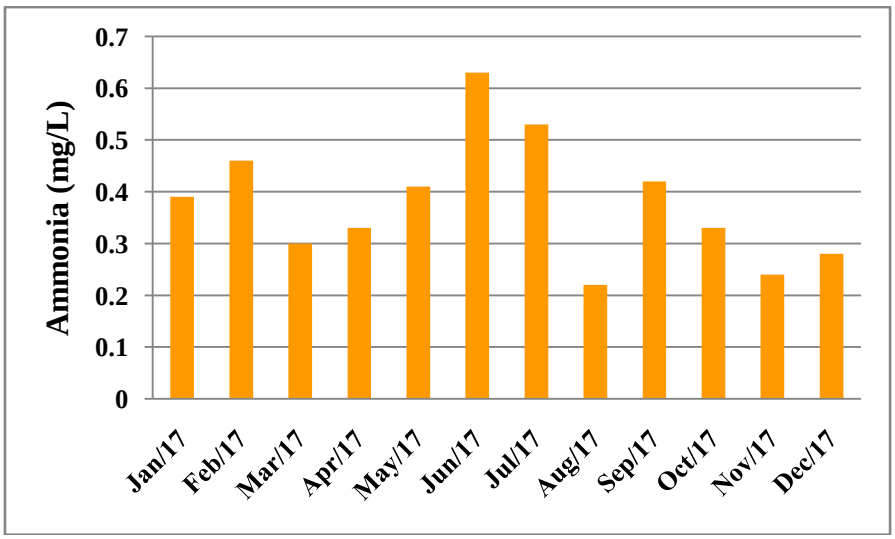

Figure 8. Monthly variations of ammonia (mg/L) in the Ogathangal Lake water samples.

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DISCUSSION

In the present investigation, physico–chemical parameters such as temperature, pH, turbidity, salinity, dissolved oxygen, calcium, nitrate and ammonia of the freshwater lake showed significant fluctuation. This may be due to seasonal changes and the flow of water. Freshwater habitats are mainly controlled by rainfall, humidity, direction of wind etc. A reflection of the health of an aquatic ecosystem is the physico-chemical parameters. After studing the physico-chemical parameters Hulyal and Kaliwal, (2011) proved that the water is suitable for irrigation and pisciculture. The results are coincides the present investigation. Generally, the surface water temperature is influenced by the intensity of solar radiation evaporation, freshwater influx and cooling and mix up with ebb and flow from adjoining neritic water (Govindasamy *et al*., 2000).The water temperature during January 2008 was low because of strong land breeze and precipitation and the recorded high summer value could be attributed to high solar radiation (Hanninen *et al*., 2000).

The variations in the turbidity may be due to the suspended particle nutrients and the abundance of phytoplankton. At the same time in the carp cultured ponds, turbidity level was observed in the optimum range. Higher values of turbidity in the wet season were also observed by Braide *et al*. (2004) and Allison *et al*. (2007) in their various studies in the Niger Delta. In general the pH values are alkaline in all stations and are close to the permissible limits. The pH changes may be due to the variation in photosynthetic activities of aquatic organisms which increases due to consumption of dissolved CO_2 process (Begum and Harikrishna, 2008). The value of pH remained in the range of 7.0 - 8.5 which was considered best for all fish species (Afzal *et al*., 2008). The present study is a similar range was obtained lowest pH value was found during winter due to heavy rainfall and dilution effect by Shiddamallayya and Pratima, (2008).

Salinity is considered to be the basic and prime factor which may influence the physico-chemical parameters and distribution of flora and fauna in estuarine environment (Soundarapandian *et al*., 2009). Manikannan *et al*. (2011) recorded a maximum salinity value during the summer and lower values during the wet (monsoon) season, which is a result of the heavy rainfall. Maximum salinity was recorded in summer especially in the months of May and June and minimum during monsoon particularly in the month of December for both the stations. In general the salinity was influenced by high temperatures of both atmospheric and water. During monsoon season, rainfall and freshwater inflow from the land were moderately reduced the salinity (Thirunavukkarasu *et al*., 2011; Ananthan *et al*., 2012; Balasubramanian and Kannan, 2005).

The dissolved oxygen values showed a general increasing trend during monsoon periods was reported (Sarma *et al*., 2002). Generally higher dissolved oxygen concentration observed during monsoon season might be due to the cumulative effect of the higher wind velocity coupled with heavy rainfall and the resultant freshwater mixing (Prabu *et al*., 2008; Prasanna and Ranjan, 2010). Calcium is generally present in soil as carbonate and most important environmental, divalent salt in fish culture water. Fish can absorb calcium either from the water or from food. In the present study, calcium content maximum was recorded in summer and minimum was recorded in monsoon season. Similar trend was reported (Patra *et al*., 2010). Calcium reached at peak in May and then show gradual decline was reported (Muhammad Naeem *et al*., 2011). The highest value of calcium was recorded in summer (Tidame and Shinde, 2012). Sankar Narayan Sinha and Mrinal Biswas, (2011) reported the nitrate content of lake water fluctuated between 0.80 and 1.82 mg/L with the mean value of 1.14 mg/L. The maximum and minimum concentrations were recorded during September and November respectively. Ammonia and nitrogen was observed maximum in the monsoon and post-monsoon seasons due to rainfall and the river runoff carrying large amount of detritus (Indirani *et al*., 2010). The highest ammonia concentration was recorded during the dry season (Kaniz Fatema *et al*., 2014) as a result of steaming from low precipitation. However, dilution of rainwater may be important in reducing the ammonium level in the estuary. A similar pattern of results was observed by Damotharan *et al*. (2010).

CONCLUSION

The present observation, the various physico-chemical parameters were noted Ogathangal Lake Ayyangarkulam in Kanchipuram District, Tamil Nadu, India. The data which showed that the physico-chemical properties of the freshwater zone were significantly vary when compared with study period. Thus, it can be concluded that the variations of water quality parameters determine in the Ogathangal Lake Ayyangarkulam in Kanchipuram District during the study period.

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