International Journal of Current Research in Life Sciences
Vol. 05, Issue 03, pp.496-500, March 2016

www.ijcrls.com

Full Length Research Article

MONTHLY VARIATIONS OF PHYSICO-CHEMICAL PARAMETERS IN POOMPUHAR MARINE WATER SAMPLES, SOUTH EAST COAST OF TAMIL NADU, INDIA

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Accepted 12th February 2016; Published Online 30th March 2016

ABSTRACT

Monthly variations of physico-chemical characteristics were carried out in Poompuhar marine water samples, South east coast of Tamil Nadu, India, for a period of twelve months (January 2015 to December 2015). Eight various physico-chemical parameters were analyzed by using standard methods (APHA, 1998). Water temperature varied from 22.75 to 35.25°C, turbidity was from 43.75 to 71.12 cm, pH ranged from 7.2 to 8.67, salinity (21.27 to 34.5 ppt), dissolved oxygen content varied between 3.49 to 5.33 mg/L, calcium (123.25 to 252.5 mg/L), nitrate (0.52 to 0.86 mg/L) and ammonia (0.12 to 0.33 mg/L) also varied independently. The maximum and minimum were noted during the study period January 2015 to December 2015.

Key words: Physico-chemical parameters, Monthly variations, Maximum and minimum, Water quality.

INTRODUCTION

The coastal hydrography is much complicated due to the dynamic nature of the ecosystem. Changes in the hydrographical parameters such as salinity, dissolved oxygen, dissolved carbon dioxide; nutrients affect the activities and growth of the organisms in the ecosystem (Sridhar *et al*., 2008). The nature and distribution of flora and fauna in an aquatic system are mainly controlled by the fluctuations in the hydrographical parameters of the water body (Damotharan *et al*., 2010). Coastal zone offers an important buffer zone and filtering system for the ecosystem. Generally Marine environment is a complex system and mainly influenced by various physical chemical and biological process. The open ocean is more stable compare to the near shore waters where the interaction with terrestrial and makes the variations in hydrographical properties (Poonam Bhadja and Rahul Kundu, 2012). James Balgan Anand *et al*. (2015) were noted the environmental factors of coastal areas are very important, because the variations in the physico-chemical properties, such as temperature, salinity, pH, dissolved oxygen and nutrients will impact the life span of the fauna and flora in the sea. It regulates the species richness in the coastal area. The variations in the nutrients load along the coastal waters are due to the natural weathering, riverine, land and anthropogenic input. However, the natural seasonal changes keep the coastal waters well mixed and aerated, which help to scatter the nutrients useful for the Biota.

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The data suggests that during the monsoon period, a significant increase of fresh water and land side input into the coastal area and have elevated nutrient concentration compared with other seasons. In the present observation attempts to provide such vital information for future references. All the physico-chemical parameters were studied from Poombukar marine water samples, south east coast of Tamil nadu, India for a period of January 2015 to December 2015.

MATERIALS AND METHODS

Water samples were collected from Poompuhar marine water samples, south east coast of Tamil Nadu, India, which is located at latitude 11.15º 05´ North South and longitude 79 .84º 5´ 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 2015 to December 2015. The various physico-chemical parameters were analyzed by using standard methods (APHA, 1998).

Temperature: In the present study water temperature of the pond 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.

Table 1. Physico-chemical parameters of Poompuhar coastal area water samples (January 2015 to December 2015)

Month and Year	Temp. (°C)	Turbidity (cm)	pH	Salinity (ppt)	DO (mg/L)	Calcium (mg/L)	Nitrate (mg/L)	Ammonia (mg/L)
Jan-15	22.75 ± 1.71	46.25 ± 0.96	7.52 ± 0.25	21.27 ±0.49	4.48± 0.69	128.62 ± 1.49	0.52 ± 0.17	0.15 ± 0.02
Feb-15	23.87 ± 1.93	47.17 ± 2.19	7.61 ± 0.31	21.92 ± 1.07	4.17 ± 0.40	131.73 ± 2.73	0.64 ± 0.13	0.14 ± 0.02
Mar-15	32.22 ± 1.57	64.25 ± 0.96	8.4 ± 0.08	29.85 ± 0.89	3.66 ± 0.34	190.25 ± 1.26	0.76 ± 0.03	0.21 ± 0.02
Apr-15	33.12 ± 1.76	66.52 ± 1.29	8.47 ± 0.12	31.47 ± 1.15	3.49 ± 0.19	252.5 ± 3.51	0.79 ± 0.02	0.24 ± 0.02
May-15	35.25 ± 0.96	71.12 ± 0.85	8.6 ± 0.18	34.50 ± 0.49	3.55 ± 0.36	222.75 ± 1.71	0.80 ± 0.03	0.33 ± 0.10
Jun-15	31.22 ± 0.63	57.37 ± 1.25	8.45 ± 0.06	32.3 ± 1.62	4.33 ± 0.26	226.12 ± 1.31	0.86 ± 0.03	0.28 ± 0.03
Jul-15	31.07 ± 0.79	44.54 ± 2.64	8.22 ± 0.09	28.8 ± 0.49	4.10 ± 0.88	215.25 ± 1.71	0.81 ± 0.02	0.26 ± 0.02
Aug-15	31.67 ± 0.69	59.62 ± 0.48	8.4 ± 0.12	33.05 ± 0.39	4.32 ± 0.22	155.25 ± 1.71	0.69 ± 0.03	0.13 ± 0.01
Sep-15	30.32 ± 0.57	62.12 ± 0.85	8.5 ± 0.16	31.15 ± 1.56	4.73 ± 0.05	160.75 ± 4.35	0.76 ± 0.05	0.14 ± 0.02
Oct-15	28.45 ± 0.88	51.32 ± 0.79	8.67 ± 0.12	32.67 ± 0.46	5.33 ± 0.52	154.5 ± 2.08	0.68 ± 0.03	0.15 ± 0.02
Nov-15	25.97 ± 1.41	43.75 ± 1.71	7.9 ± 0.1	26.92 ± 1.47	5.27 ± 0.25	148.75 ± 1.5	0.65 ± 0.05	0.12 ± 0.02
Dec-15	26.25 ± 0.64	41.17 ± 0.89	7.2 ± 0.08	23.37 ± 0.41	4.43 ± 0.32	123.25 ± 1.71	0.55 ± 0.05	0.16 ± 0.02

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

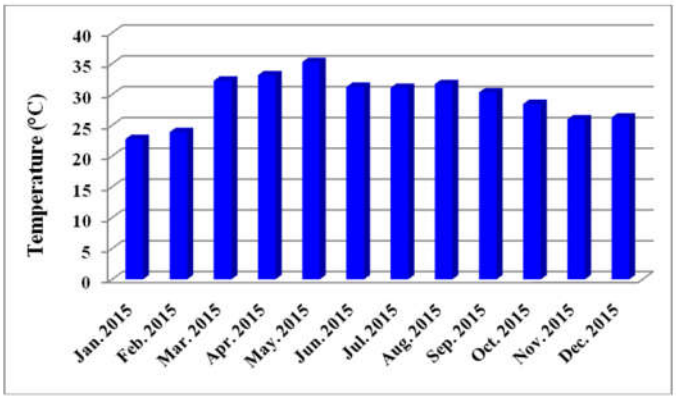

Fig. 1. Monthly variations of temperature (0C) in the marine water samples

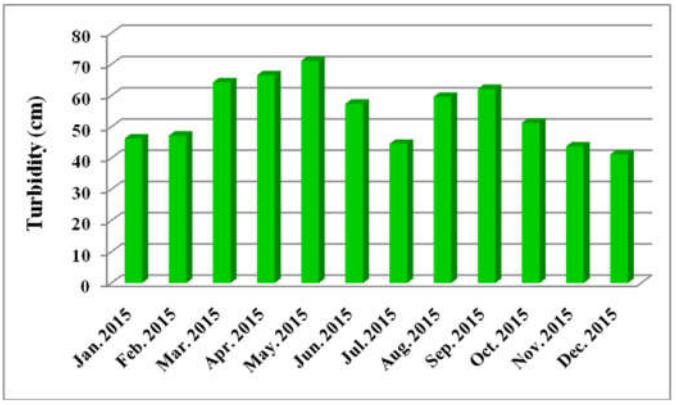

Fig. 2. Monthly variations of turbidity (cm) in the marine water samples

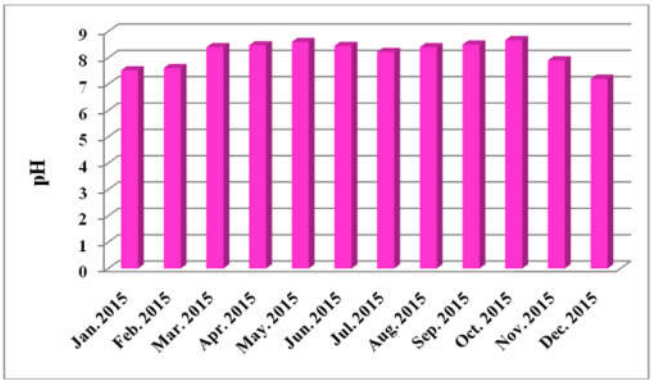

Fig. 3. Monthly variations of pH in the marine water samples

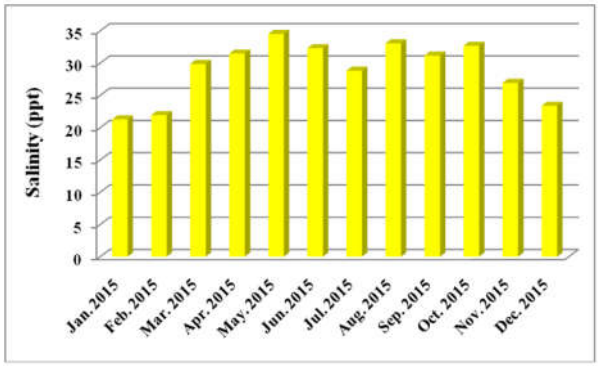

Fig. 4. Monthly variations of salinity (ppt) in the marine water samples

The other parameters like, calcium estimated by EDTA Titrimetric method, The phosphate and nitrate were determined by the Brucine method and ammonia was determined by the Nesslerization method (APHA, 1998).

RESULTS

In the present study, the water temperature fluctuated from 22.75 to 35.25ºC in marine water samples. It was found to be low (22.75ºC) in the month of January 2015 and high (35.25ºC) in May 2015 (Table 1 and Fig. 1).Turbidity of the marine water depends on availability of either zooplankton or phytoplankton and suspended soiled particles. The transparency of the water samples varied from 43.75 to 71.12 cm. It was found to be low (43.75 cm) in the month of November 2015 and high (71.12 cm) in the month of May 2015 (Fig. 2).

pH is another important biological parameter. The pH of the marine water showed alkaline ranges throughout the study period. It varied from 7.2 to 8.67. It was found to be minimum (7.2) in December 2015 and maximum (8.67) in the month of October 2015 (Fig. 3). The salinity content ranged from 21.27 to 34.5 ppt. It was found to be high (34.5 ppt) in the month of May 2015 and low (21.27 ppt) was recorded in January 2015 (Fig. 4). The dissolved oxygen is important biological factor. The dissolved oxygen content ranged from 3.49 to 5.33 mg/L. It was found to be minimum (3.49 mg/L) in April 2015 and maximum (5.33 mg/L) in the month of October 2016 (Fig. 5). Calcium content was fluctuated from 123.25 to 252.5 mg/L. It was found to be low (123.25 mg/L) in the month of December 2015 and high (252.5 mg/L) in April 2015 (Fig. 6). Nitrate content was fluctuated from 0.52 to 0.86 mg/L. It was found to be low (0.52 mg/L) in the month of January 2015 and high

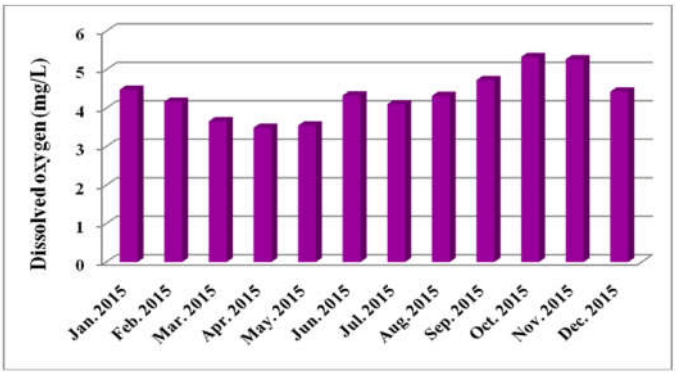

Fig. 5. Monthly variations of dissolved oxygen (mg/L) in the marine water samples

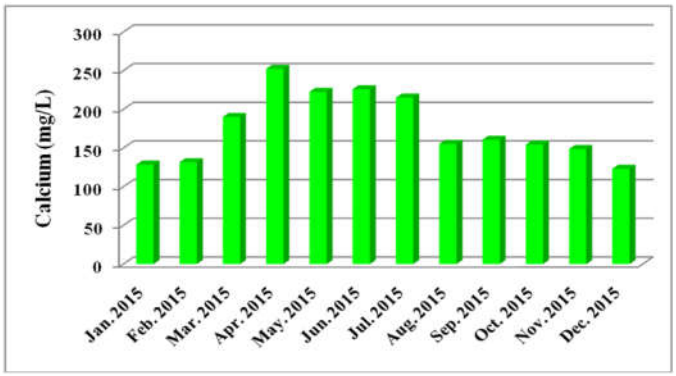

Fig. 6. Monthly variations of calcium (mg/L) in the marine water samples

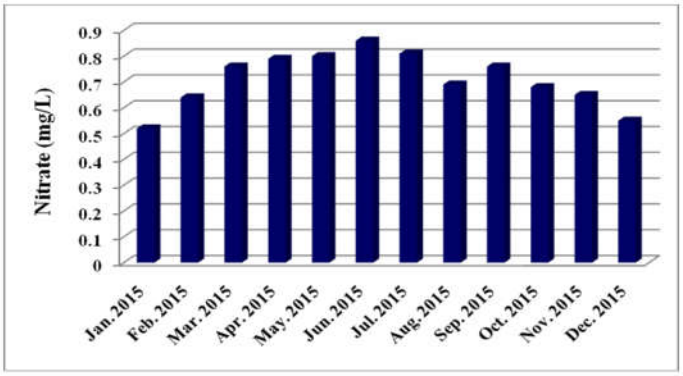

Fig. 7. Monthly variations of nitrate (mg/L) in the marine water samples

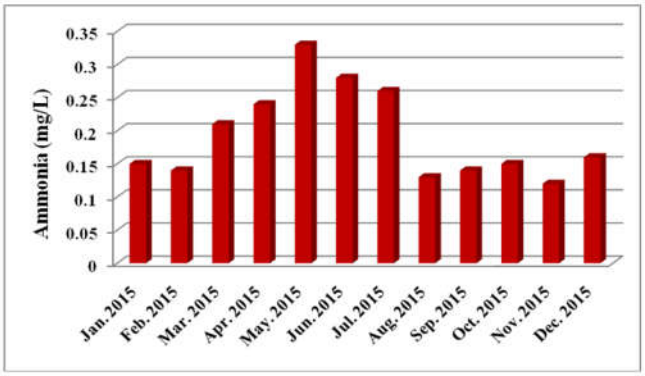

Fig. 8. Monthly variations of ammonia (mg/L) in the marine water samples

(0.86 mg/L) in June 2015 (Fig. 7).The ammonia content ranged from 0.12 to 0.33 mg/L. It was found to be minimum (0.12 mg/L) in the month of November 2015 and maximum (0.33 mg/L) in May 2015 (Fig. 8).

DISCUSSION

The water temperature during monsoon season (October to December) was low because of strong land sea breeze and precipitation and the recorded high value during summer season (April to June) could be attributed to high solar radiation (Ajithkumar *et al*., 2006). The seasonal variation in the water temperature depends upon the wind force, freshwater discharge influx of the inshore water and atmospheric temperature (James Balgan Anand and Mary Jelastin Kala, 2015). The results are coincides the present investigation. High temperature in summer and low temperature during monsoon season were evidenced by some earlier investigators Prabhahar *et al*. (2000). Vijayakumar *et al.* (2014); Arun prasath and Gomathinayagan (2015) and Vijaya pratap and Ramesh Babu (2015). Turbidity of the fresh water samples depends on availability of either zooplankton or phytoplankton and suspended soiled particles. Thommai Arockia Gaspar and Lakshman, (2014) reported that the monsoon time the level of turbidity is very high due to the estuary received rain water along with industrial waste and manmade waste. In summer, low level of turbidity was observed it may be due to the low level of inflow of fresh water. The present study shows similar range Lowest pH value was found during winter due to heavy rainfall and dilution effect (Shiddamallayya and Pratima, 2008). pH may be affected by total alkalinity and acidity, run off from surrounding rocks and water discharges (Velsamy *et al*., 2013). The pH values ranged from 7.96 to 8.30. The minimum was recorded December, monsoon season and the maximum was observed June, summer season (James Balgan Anand *et al*., 2015). 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. The changes in the salinity in the coastal waters are due to the influx of freshwater from river, by land runoff caused by monsoon, or by tidal variations. Higher values in summer season 36.07 (‰) at Kanyakumari could be attributed to high degree of evaporation with decreased freshwater inflow and land drainage (James Balgan Anand and Mary Jelastin Kala, 2015) this coincides the present investigation. Dissolved oxygen is one of the most important parameter. The dissolved oxygen is very essential for the respiratory metabolism of all aquatic animals. It favors the stability and availability of nutrients to the animals. Therefore, it increases the productivity of the ecosystems. 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 and Ananthan *et al*., 2012). Anand and Kumarasamy, (2013) noted that dissolved oxygen was varied between 3.5 and7.2 ml/L. The maximum calcium was observed in May and minimum value in March.

Calcium reached at peak in May and then show gradual decline was reported (Muhammad Naeem *et al.,* 2011). The recorded low post monsoon phosphate values could be attributed to the high utilization of phosphate by phytoplankton (Rajasegar, 2003).The variation may also be due to the processes like adsorption and desorption of phosphate and buffering action of sediment under varying environmental conditions (Govindasamy and Kannan,2000). Nitrate is one of the important nutrients in fish culture ponds and is the common form of nitrogen in natural water. Nitrate is oxidized to nitrate after entering an aerobic regime. The increasing nitrates level was due to the freshwater in flow, litter fall decomposition and terrestrial runoff water during the monsoon seasons (Mathivanan *et al.,* 2008). 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 nitrate content was maximum during post-monsoon and minimum during summer (Ravichelvan *et al*., 2015). The highest ammonia concentration was recorded during the dry season (Kaniz Fatema *et al*., 2014; Damotharan *et al.,* 2010; Pazhanisamy, 2014) as a result of steamming from low precipitation. However, dilution of rainwater may be important in reducing the ammonium level in the estuary.

Conclusion

The present observation, the various physico-chemical parameters were recorded in the Poompuhar marine water samples, south east coast of Tamil Nadu India. The data which showed that the physico-chemical properties of the marine zone were significantly varied when compared with study period. Thus, it can be concluded that the variations water quality parameters determine in the Poompuhar marine water samples, south east coast of Tamil Nadu India during the study period.

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