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RESEARCH ARTICLE

PHYSICO-CHEMICAL CHARACTERISTICS OF MARINE WATER SAMPLES FROM PAZHAYAR KOLLIDAM TALUK, SOUTH EAST COAST OF NAGAPATTINAM DISTRICT, TAMIL NADU, INDIA

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ABSTRACT

Monthly fluctuations of physico-chemical characteristics marine water samples were carried out in Pazhayar, Kollidam Taluk, Nagapattinam 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 26.12 to 28.97°C, Dissolved oxygen content varied between 4.53 to 5.53 mg/L, salinity (27.09 to 28.53 ppt), pH ranged from 6.33 to 7.82. Phosphate varied 6.38 to 7.73mg/L, Nitrate (0.74 to 1.87 mg/L), silicate (10.27 to 11.78), calcium (407.75 to 678.78 mg/L), magnesium was from 217.5 to 482.97 mg/L, and chloride (12.60 to 14.91 mg/L) also varied independently.

Key words: Physico-chemical characteristics, Monthly variations, Marine water.

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INTRODUCTION

Ocean is the treasure houses of wealth both for sustenanee of life and for academic researches. The researches on the marine biota of Indian are being intensitied in the recent years because of the numerous opportunities, offers and potentialities the oceans have provide. Such areas are subjected to variety of socio-economic drivers producing increased pressure and impact, this can lead to environmental stress or even affect public health (Cave, 2003; Sundaramanickam, 2008). Costal ecosystem is the most essential commodity for fauna and flora consumption and the most important renewable resources, which must be prevented from deterioration in quality of coastal waters which provides significant information about the available resources for supporting life. The entire life of the world depends going on water and therefore the hydrological study is very greatly essential to comprehend relationship among its diverse trophic levels and food webs. In Indian estuaries and seas the physical-chemical characteristics had been carried out by many workers (Gowda, 2001 and Rajasegar, 2003). Marine habitat plays a major role in forecasting, localizing, and manipulating the marine resources (Asha and Diwakar, 2007). The coastal hydrography is much complicated due to the dynamic nature of the ecosystem.

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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). 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 (PoonamBhadja and Rahul Kundu, 2012). In the present study attempts to provide such vital information for future references. All the physico-chemical parameters were studied from Pazhayar, Kollidam Taluk, Nagapattinam District, Tamil Nadu India for a period of January 2017 to December 2017.

MATERIALS AND METHODS

Water samples were collected from Pazhayar, Kollidam Taluk, Nagapattinam District, Tamil Nadu India, which is located at latitude 110º 05´ North South and longitude 79 º 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 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 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. The other parameters like, calcium estimated by EDTA Titrimetric method, The nitrate, silicate, phosphate were determined by the Strickland and parsons (1972) and magnesium also measured by complex metric titration with standard solution of EDTA using Eriochrome black T as indicator under the buffer conditions of pH 10.0. Chloride was determined by APHA, (1998).

RESULTS

In the present study, the water temperature fluctuated from 28.97 to 26.12ºC in Pazhayar, Kollidam Taluk, Nagapattinam District, Tamil Nadu India. It was found to be low (26.12ºC) in the month of January 2017 and high (28.97ºC) in May 2017 (Table 1 and Fig. 1). The dissolved oxygen is important biological factor. The dissolved oxygen content in marine water ranged from 4.53 to 5.53 mg/L. It was found to be low (4.53 mg/L) in April 2017 and high (5.53 mg/L) in December 2017 (Fig. 2). The salinity content ranged from 27.09 to 28.53 ppt. It was found to be high (28.53 ppt) in the month of October 2017 and low (27.09 ppt) was recorded in December 2017 (Fig. 3). pH is another important biological parameter. The pH of the marine water showed alkaline ranges throughout the study period. It varied from 6.33 to 7.82. It was found to be minimum (6.33) in April 2017 and maximum (7.82) in the month of December 2017 (Fig. 4).

Phosphate content in the marine water varied from 6.38 to 7.73 mg/L. It was found to be low (6.38 mg/L) in the month of May 2017 and high (7.73 mg/L) in Janiary 2017 (Fig. 5). Nitrate content was fluctuated from 0.73 to 1.88 mg/L. It was found to be low (0.74 mg/L) in the month of April 2017 and high (1.87 mg/L) in December 2017 (Fig. 6). Silicate content in the marine water varied from 10.27 to 11.78 mg/L. It was found to be low (10.28 mg/L) in the month of June 2017 and high (11.78 mg/L) in January 2017 (Fig. 7). Calcium content in the marine water fluctuated from 407.75 to 678.78 mg/L. It was found to be low (407.75 mg/L) in the month of April 2017 and high (678.78 mg/L) in December 2017 (Fig. 8). The magnesium content ranged from 217.5 to 482.97 mg/L. It was found to be low (217.5 mg/L) in the month of May 2017 and high (482.97 mg/L) in November 2017 (Fig. 9). Chloride content in the marine water varied from 12.60 to 14.91 mg/L. It was found to be low (12.60 mg/L) in the month of July 2017 and high (14.91 mg/L) in December 2017 (Fig. 10).
Each value is the mean ± S.D. of four observations

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 (Sampathkumar and Kannan, 1998 and 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. 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). Dissolved oxygen is one of the most important parameter. Less amount of dissolved oxygen was recorded during the monsoon and the highest in the summer season due to increased photo synthetic activity in the water body (Shiddamallayya and Pratima, 2008). The high DO in summer is due to increase in temperature and duration of bright sunlight has influence on the % of soluble gases (O_2 and CO_2). During summer the long days and intense sunlight seem to accelerate photosynthesis by phytoplankton, utilizing CO_2 and giving off oxygen. This possibility accounts for the greater qualities of O_2 recorded during summer (Patil *et al.,* 2012).

Salinity is regarded as the second important physical characteristic of the marine environment. This salinity factor has high influence on the fauna. It was found to be low in the post monsoon season and high in the summer season of second year. Less wave and tidal action with decreased freshwater inflow and land drainage may also be considered fluctuations in salinity (Sampathkumar and Kannan, 1998). Drop in salinity during monsoon season 31.54 (‰) at Mandapam is related to heavy showers and consecutive floodwater from up streams (Mitra *et al*., 1990 and Sundaramanickam, 2004). Organic phosphate concentration was recorded 4.31 and 14.72 mgl-1 minimum value was recorded during the pre monsoon season and the maximum value during post monsoon season at Tranquebar (Kamalkanth *et al*., 2112). The recorded high concentration of inorganic phosphate during post monsoon season might possibly be due to intrusion of upwelling seawater into the creek, which in turn increased the level of phosphate (Nair.1999).

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. According to Patra *et al*. (2010) silicate content of water varies with salinity of water and higher silicate content was recorded in low salinity area. The high value of calcium noticed during monsoon season and low value was recorded during summer (Sridhar *et al,* 2006). Lowest value of calcium recorded during monsoon season and calcium varies from 3.20 mg/L. to 408 mg/L. during monsoon season and 22.40 to 656 mg/L. during winter season (Francis Andrade *et al*., 2011). 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). Magnesium levels vary between 9.74 mg/l to 38.85 mg/l (Thenral and Anbu Srinivasan, 2016). The present basic information of the physico-chemical characteristics would form a useful tool for further ecological assessment and further monitoring the anthropogenic levels and evaluate the health of the coastal ecosystems.

Table 1. Physico-chemical characteristics of Pazhayar, Kollidam Taluk, Nagapattinam District (January 2017 to December 2017)

Month and Year	Temp. (°C)	pH	DO (mg/L)	Salinity (ppt)	Phosphate (mg/L)	Nitrate (mg/L)	Silicate (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Chloride (mg/L)
Jan-17	26.13 ± 0.03	7.37 ± 0.10	5.08 ± 0.08	27.12 ± 0.05	7.73 ± 0.09	1.18 ± 0.03	11.78 ± 0.04	571.25 ± 4.92	358.75 ± 4.35	14.38 ± 0.13
Feb-17	26.75 ± 0.10	7.39 ± 0.13	5.11 ± 0.06	27.35 ± 0.24	7.61 ± 0.14	1.08 ± 0.04	11.69 ± 0.06	581.25 ± 3.30	282.75 ± 5.31	14.49 ± 0.11
Mar-17	27.36 ± 0.12	7.55 ± 0.10	5.23 ± 0.13	27.76 ± 0.11	7.52 ± 0.13	0.84 ± 0.09	11.13 ± 0.09	517.25 ± 4.03	290.25 ± 5.5	13.54 ± 0.09
Apr-17	27.13 ± 0.09	6.33 ± 0.12	4.53 ± 0.08	27.81 ± 0.13	6.37 ± 0.10	0.74 ± 0.07	10.55 ± 0.08	407.75 ± 5.70	218.25 ± 2.21	13.14 ± 0.07
May-17	28.97 ± 0.18	6.39 ± 0.12	4.58 ± 0.12	27.69 ± 0.05	6.38 ± 0.10	0.84 ± 0.08	10.39 ± 0.15	424.02 ± 4.68	217.5 ± 1.29	12.85 ± 0.17
Jun-17	27.20 ± 0.03	6.63 ± 0.08	4.77 ± 0.17	27.55 ± 0.05	6.66 ± 0.07	0.85 ± 0.08	10.27 ± 0.05	438.25 ± 2.61	218.75 ± 2.5	12.86 ± 0.19
Jul-17	27.57 ± 0.18	6.69 ± 0.09	4.59 ± 0.13	27.09 ± 0.09	6.74 ± 0.08	0.91 ± 0.03	10.32 ± 0.05	467.51 ± 1.59	330.15 ± 3.93	12.60 ± 0.06
Aug-17	27.74 ± 0.09	6.69 ± 0.09	4.56 ± 0.12	27.24 ± 0.12	6.81 ± 0.09	1.62 ± 0.04	10.59 ± 0.17	543.75 ± 4.26	344.65 ± 3.51	13.33 ± 0.15
Sep-17	27.40 ± 0.09	7.13 ± 0.08	5.12 ± 0.06	27.34 ± 0.08	7.22 ± 0.04	1.64 ± 0.08	10.75 ± 0.08	578.51 ± 2.61	353.02 ± 2.89	13.55 ± 0.11
Oct-17	27.13 ± 0.07	7.48 ± 0.12	5.13 ± 0.04	28.53 ± 0.06	7.23 ± 0.04	1.71 ± 0.03	10.76 ± 0.07	555.26 ± 4.97	386.72 ± 2.92	13.67 ± 0.03
Nov-17	26.39 ± 0.10	7.79 ± 0.06	4.73 ± 0.05	28.31 ± 0.05	7.45 ± 0.09	1.80 ± 0.05	10.81 ± 0.03	630.02 ± 1.56	482.97 ± 5.39	14.62 ± 0.08
Dec-17	26.29 ± 0.03	7.82 ± 0.09	5.53 ± 0.09	27.09 ± 0.18	7.48 ± 0.09	1.87 ± 0.07	11.37 ± 0.07	678.78 ± 0.52	476.39 ± 2.82	14.91 ± 0.07

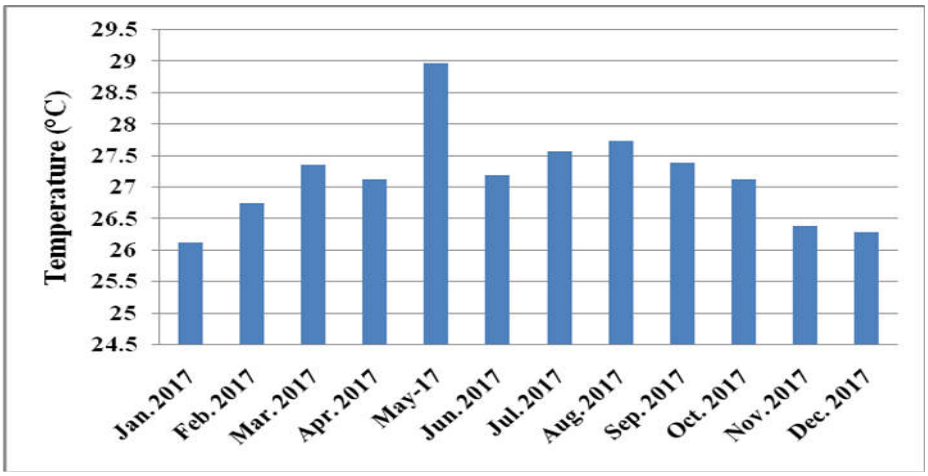

Fig. 1. Monthly variations of water temperature (^{0}C) in the marine water samples

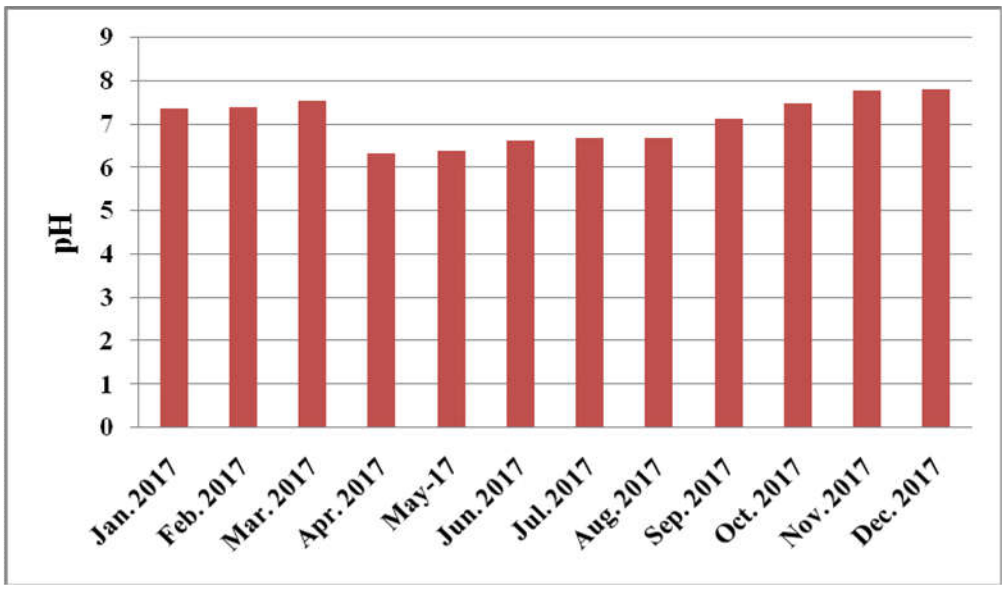

Fig. 2. Monthly variations of water pH in the marine water samples

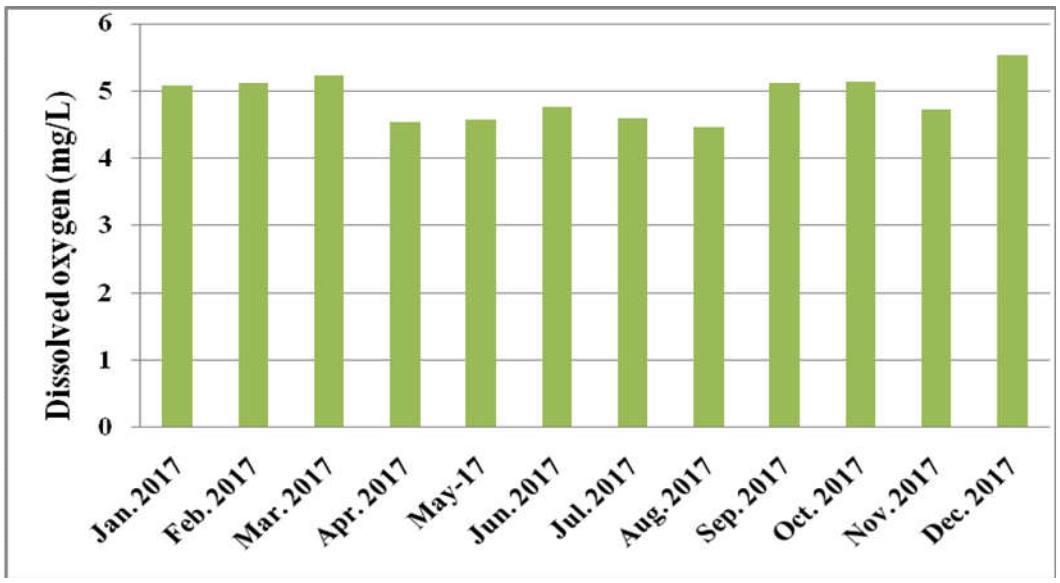

Fig. 3. Monthly variations of water dissolved oxygen (mg/L) in the marine water samples

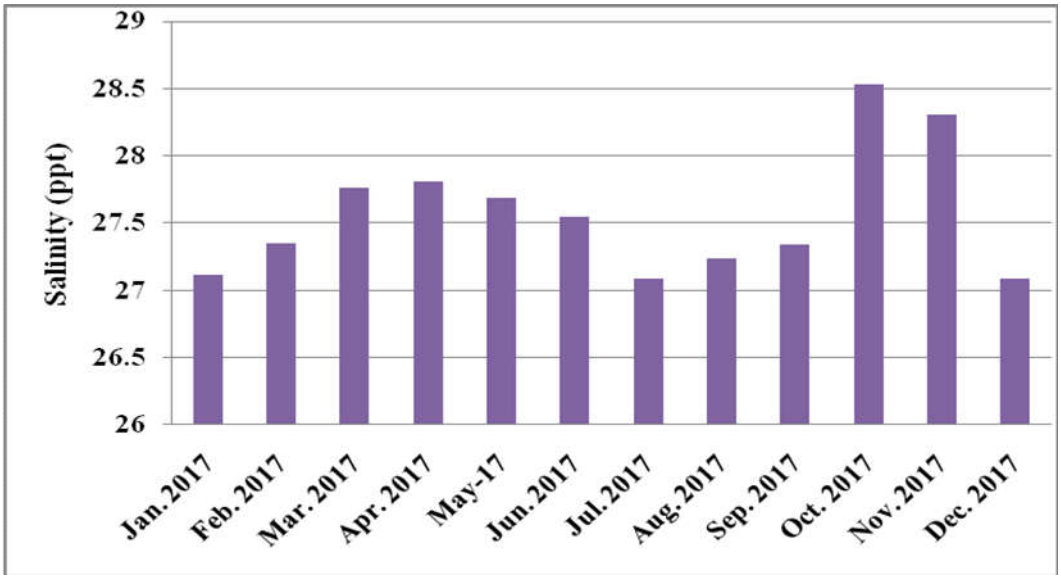

Fig. 4. Monthly variations of salinity (ppt) in the marine water samples

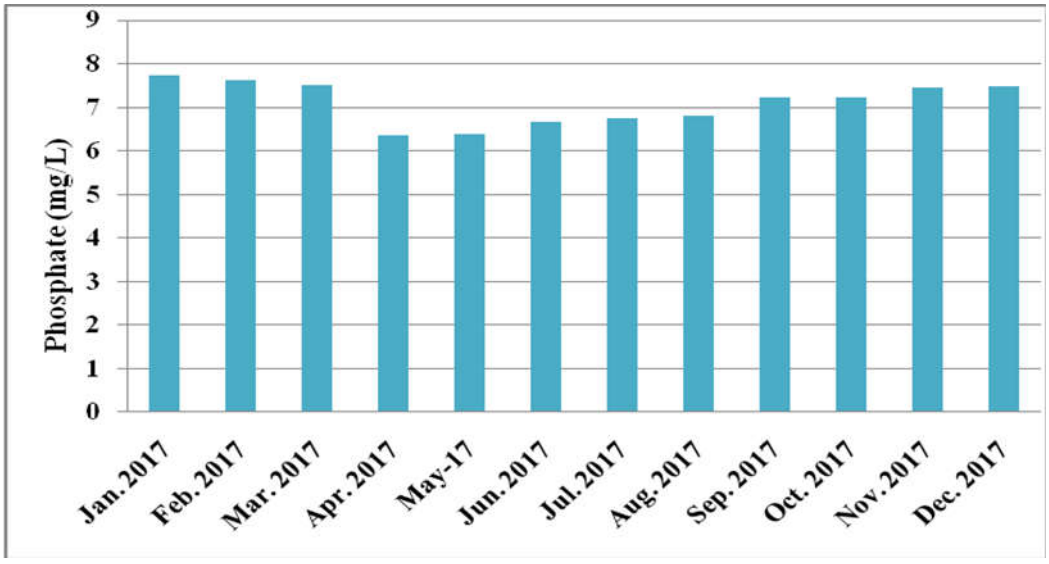

Fig. 5. Monthly variations of Phosphate (mg/L) in the marine water samples

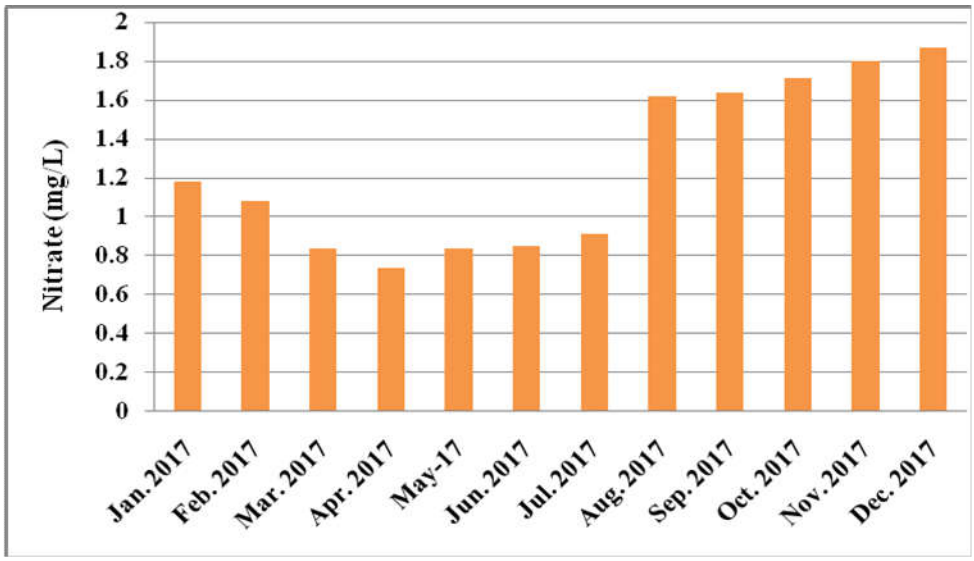

Fig. 6. Monthly variations of Nitrate (mg/L) in the marine water samples

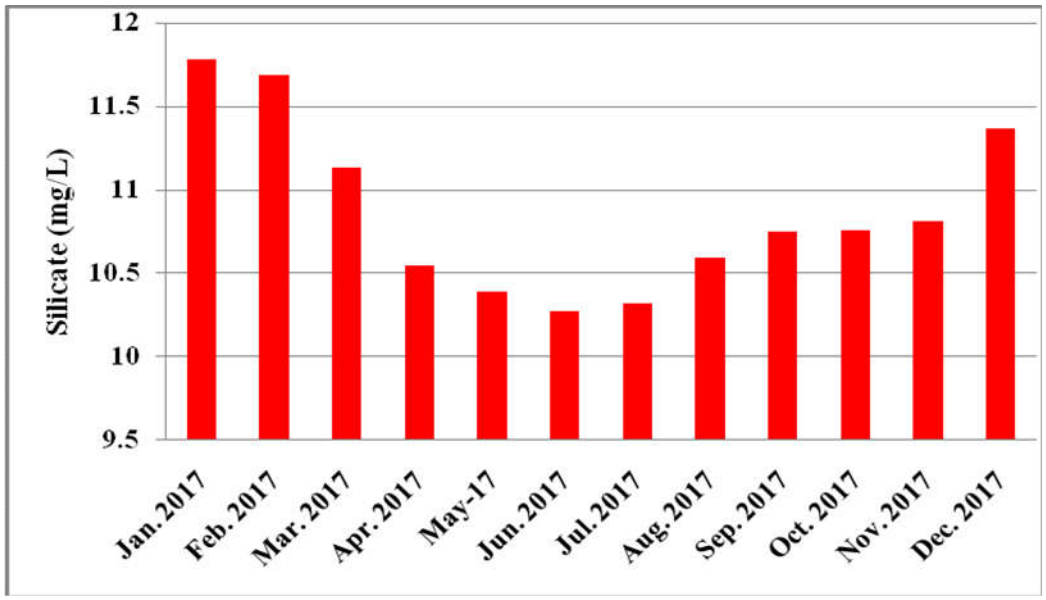

Fig.7. Monthly variations of silicate (mg/L) in the marine water samples

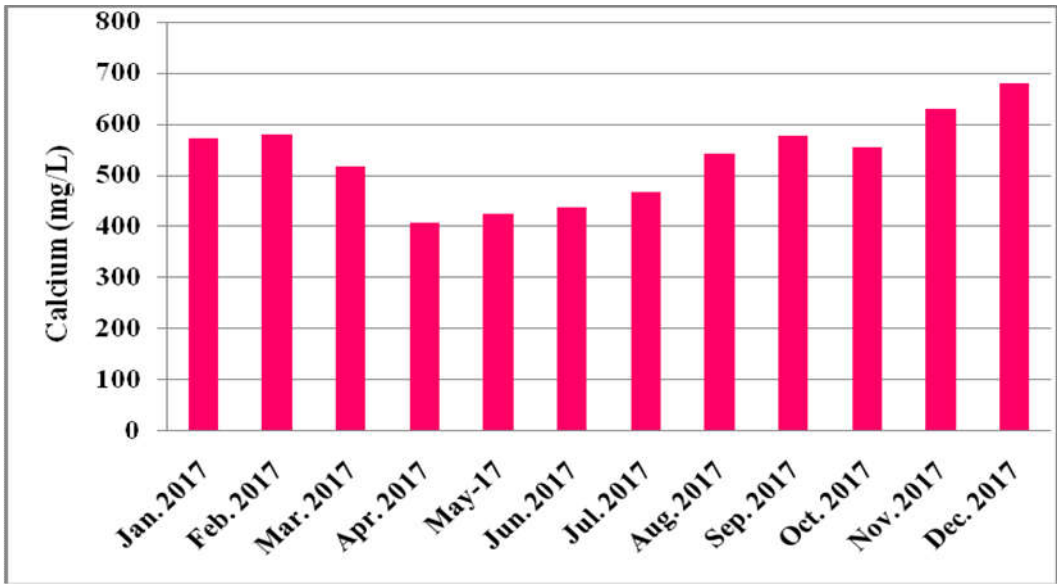

Fig.8. Monthly variations of calcium (mg/L) in the marine water samples

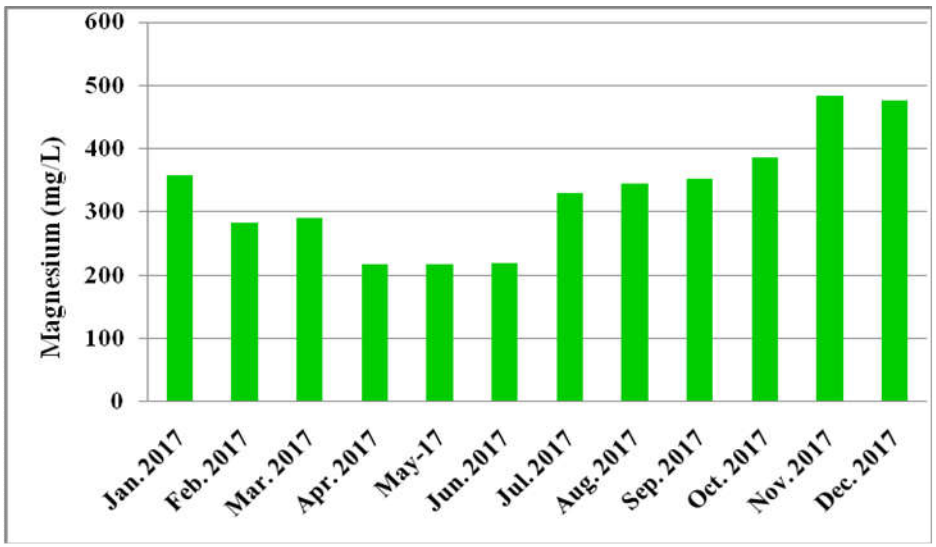

Fig.9. Monthly variations of magnesium (mg/L) in the marine water samples

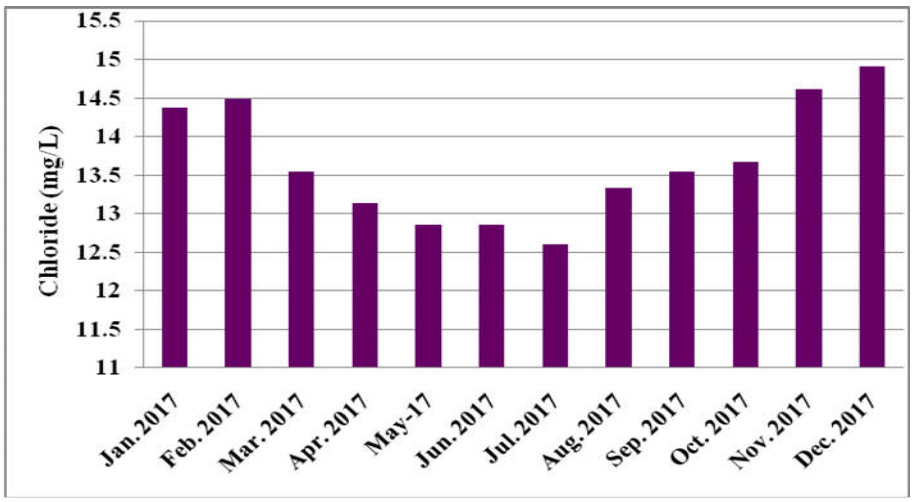

Fig.10. Monthly variations of calcium (mg/L) in the marine water samples

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