Assessment Of Physico-Chemical Characters In Samantha Pettai Beach East Coast Sea Water Of Tamil Nadu

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ABSTRACT

A study has been undertaken to sea water quality parameters of Samantha pettai beach, East coast sea water, Nagappattinum district, Tamil Nadu was selected as the reference site. The concentration of water quality parameters like temperature, pH, dissolved oxygen, chloride, sulphate, nitrate, fluoride, total hardness, total alkalinity, electrical conductivity, biological oxygen demand (BOD) and chemical oxygen demand (COD) were done triplicate in the laboratory as per the standard methods. The reason for chosen the coastal water level due to the continuous discharge of domestic sewage and industrial effluent.

Keywords: *Physicochemical parameters, Biological Oxygen Demand and Chemical Oxygen Demand.*

INTRODUCTION

Coastal areas are complex and dynamic aquatic environment. India has a long coastline of 8,129 km and of this 6,000 km is rich in estuaries, creeks, brackish water, lagoons and lakes. The southeast coast of India is an important stretch of coastline, where many major rivers drain into the Bay of Bengal and they are also richer in marine fauna and flora (Rajkumar *et al*., 2011). Agricultural, industrial and urban activities are considered to be major sources of addition of nutrients to aquatic ecosystems posing a big threat to fish stocks (Kucuksezgin *et al*., 2006). Eutrophication is of great environmental distress, leading to diverse problems such as toxic algal blooms, loss of oxygen, fish mortalities and eventually loss of biodiversity (Yadav *et al*., 2007; Zaggia *et al*., 2007). The impacts vary relatively minor to major disruptions due to bioaccumulation and biomagnifications processes (Unlu *et al*., 2007; Altun *et al*., 2008). Paramisivam and Kannan (2005) reported that factors related to water quality such as temperature, pH, salinity, dissolved oxygen, total organic carbon and nutrients are particularly important for determining the biota and ecosystem functions in coastal waters. Hence, the present study was therefore undertaken with a view to provide much needed information on the water quality parameters in the Samantha pettai beach, East coast sea water, Nagappattinum, district, Tamil Nadu was selected as the reference site.

MATERIALS AND METHODS

Nagappattinam (Lat. 10°45'55.80"N; Long. 79°53'43.40"E) is one of the important fish landing centers of Tamil Nadu and various tributaries of river Cauvery such as river of Vellaiaru, Kaduviaru, Odampokkiaru and Vettaruare passing through the surrounding areas of this region. The study area is a major domestic disposing site where the wastes from the town directly disposed into the sea. Apart from this, agricultural drainages and few industries situated in the vicinity of river Cauvery might have are carried into the Bay of Bengal through channels resulted in the contamination of the coastal biota of this region. The water sample used in this study was collected July 2018, November 2018 and January 2019 directly from Samantha pettai beach, East coast sea water, Nagappattinum, District, Tamil Nadu (India). Samples were protected from direct sunlight and immediately transported to the laboratory of Department of Zoology, A.D.M. College, Nagappattinam.

Physico-chemical parameters

The methods used for the analysis of various physic-chemical parameters were the same as given in Standard Methods for the Examination of water (APHA, 1985, 1989, 1998, Gloterman *et al.*, (1978) and National Environmental Engineering Research Institute (NEERI, 1986).

Colour and odour: The colour is examined by visually and odour of the water is investigated by sensibly.

Determination of Temperature

The water temperature was recorded at the sampling area by using digital thermometer. Surface water temperature was recorded by dipping thermometer directly into water in a container, taking care not to expose it to hear or direct solar radiation.

Determination of pH

The glass electrode was standardized against buffer solutions of known pH values of (pH 4 and pH 9.2) at 25^{o}C. About 100mL of sample was taken in a beaker and the electrode was kept immersed in the sample and measured

Determination for Conductivity

The conductivity test was carried out using conductivity meter. The conductivity of water was carried out. The water was obtained in beakers where the electrode of the conductivity meter was rinsed in distilled water and placed in the water sample. The read button on the meter was pressed which displayed the conductivity of the water sample. It is expressed in µmos/cm.

RESULTS AND DISCUSSION

Pollution of the aquatic environment and its effects on the living resources, especially the fishery resources, has assumed considerable interest as well as importance in the recent times. Most of the rivers which discharge large quantities of water into the coastal marine environment are polluted and these pollutants obviously end up in .the inshore coastal waters. The vast marine environment has long been used as a site for the disposal of wastes. In some cases the polluted material is discharged directly into the sea and in other cases the pollutant reaches the rivers and estuaries and finally ends up in the sea. Estuaries, the important

contributors of fisheries in India, suffer from severe loss of fish production due to increased industrialization and urbanization along the coastal zone by continuous discharge of industrial effluents (Padmini *et al*., 2004).

Under the influence of a variety of inter-related biotic and abiotic structural compounds and intensive chemical, physical and biological processes, estuaries are highly variable systems (Madhupratap, 1987). Data on the range of like temperature, pH, dissolved oxygen, chloride, sulphate, nitrate, fluoride, total hardness, total alkalinity, electrical conductivity, biological oxygen demand (BOD) and chemical oxygen demand (COD) are given in the Table 1 and 2.

Physical characters of water sample

The physical character of sea water sample similar to the standard while pH and electrical conductively was higher than standard. Among the month of July and November 2018, November month of sea water showed the highest pH and electrical conductivity (Table 1).

Temperature is an important limiting factor, which regulates the biogeochemical activities in the aquatic environment. Generally water temperature correspond with air temperature indicating that the samples collected from shallow zones has a direct relevance with air temperature, shallow water reacts quickly with changes in atmospheric temperature (Rajkumar *et al.,* 2011). Temperature controls behavioral characteristics of organisms, solubility of gases and salts in water (Vincy *et al*., 2012).

pH of water is an important environmental factor, the fluctuation of pH is linked with chemical changes, species composition and life processes. It is generally considered as an index for suitability of the environment (Rani *et al*., 2012). Ellis (1937) has observed that a pH range of 6.7 to 8.4 is suitable for the growth of Aquatic biota.

Table.1: Physical characters of water sample

S.NO.	Parameters	Standard	Sea water (July 2018)	Sea water (November 2018)	Sea water (January 2019)
1.	Clarity	Transparent	Clearness	Clearness	Clearness
2.	Nature of sample	Liquid	Liquid	Liquid	Liquid
3.	Colour	Colourless	Colourless	Colourless	Colourless
4.	Odour	No Characteristic	No Characteristic	No Characteristic	No Characteristic
5.	Taste	No Characteristic	Salty	Salty	Salty
6.	pH	7.08	7.73	8.32	7.74
7.	Temperature (^{o}C)	25.6	35°C	35°C	35°C
8.	Electrical conductivity (mmhos/l)	0.52	2.54	3.56	2.85

The highest value of electrical conductivitay may be due to the Industrial Effluent because it contained many chemicals, salts and dissolved solids (Mishra and Saksena, 1993). Higher EC indicates the presence of high amount of dissolved inorganic substances in ionized form (Murhekar, 2011). Domestic Effluent also showed moderate to high value of EC. Electrical Conductance in monsoon was found below detection limit because it is distilled water and in distilled water presence of ions and chemicals is in minute quantity so; EC is found below the detection limit.

Chemical characters of water sample

The chemical characters such as dissolved oxygen, chloride, sulphate, nitrate, fluoride, total hardness, total alkalinity, electrical conductivity, biological oxygen demand (BOD) and chemical oxygen demand (COD) of sea water sample is higher than that of standard. Among the month of July and November 2018, November month of sea water showed the highest chemical compositions (Table 2).

Table.2: Chemical characters of water sample

S.NO.	Parameters	WHO Standard	Sea water (July 2018)	Sea water (November 2018)	Sea water (January 2019)
1.	Free carbon dioxide as $CaCO_3$ (mg/L)	16	54	68	60
2.	Total Dissolved Substances (mg/L)	158	488	532	510
3.	Calcium Harness (mg/L)	130.2	237.3	237.3	198.32
4.	Phenolphthalein alkalinity (mg/L)	68	130	187	136
5.	Total alkalinity (mg/L)	68.56	116	132	118
6.	Chloride (mg/L)	64.33	263.28	303.56	270.20
7.	Sulphates (mg/L)	150	260	286	265
8.	Nitrates (mg/L)	50	200	189	210
9.	Fluoride (mg/L)	0.922	2.92	3.54	3.04
10.	Phosphate (mg/L)	0.266	1.06	1.32	1.11
11.	BOD (mg/L)	6	12.35	14.56	13.65
12.	COD (mg/L)	10	22.60	27.82	23.32

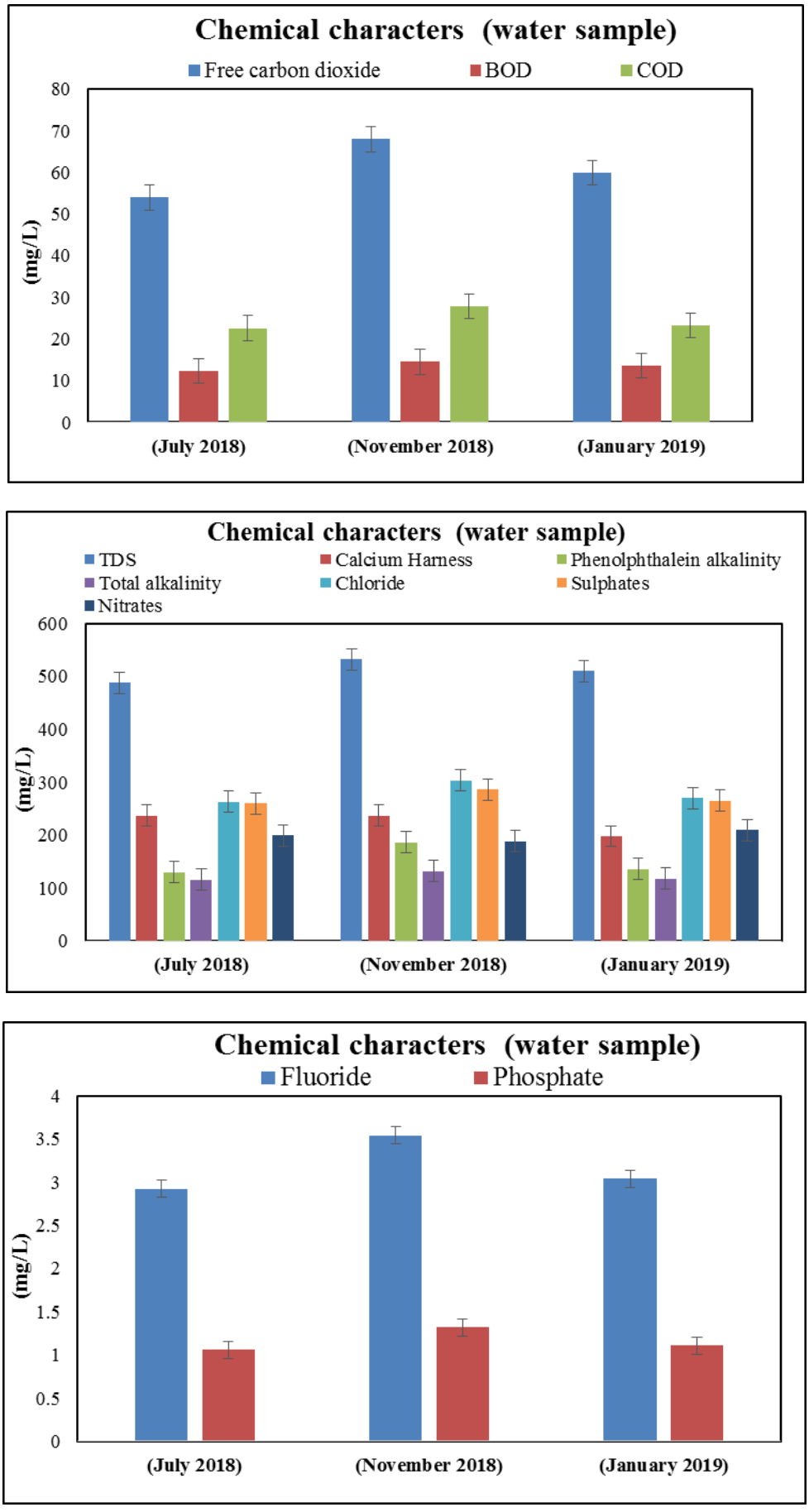

Figure 1: Chemical characters of water sample

Hardness is the parameter of water quality used to describe the effect of dissolved minerals (mostly Ca and Mg), determining suitability of water for domestic, industrial and drinking purpose attributed to presence of bicarbonates, sulphates, chloride and nitrates of calcium and magnesium. In the present study, hardness ish higher in both july and November compared with standard. Present finding is in agreement with Mohan Raj *et al*. (2013). High values of hardness are probably due to regular addition of large quantities of detergents used by the nearby residential localities into lakes which drains into estuaries.

The value of dissolved oxygen is remarkable in determining the water quality criteria of an aquatic ecosystem. The Dissolved oxygen is regulator of metabolic activities of organisms and thus governs metabolisms of the biological community as a whole and also acts as an indicator of trophic status of the water body (Saksena, 1994). Maximum dissolved oxygen was recorded during November month (532mg/l) followed by July (488mg/l which might be due to the cumulative effect of higher wind velocity coupled with heavy rainfall. This could also be because of freshwater mixing from river and low metabolic rate of organisms. Similar observation were drawn by Sahu *et al*., (2000). Dissolved oxygen is regulator of metabolic activities of organisms and thus governs metabolisms of the biological community as a whole and also acts as indicator of trophic status of the water body (Saksena and Kaushik, 1994).

The alkalinity of water is its capacity to neutralize acids. Alkalinity of water is a measure of weak acid present in it and of the cations balanced against them (Singh *et al*., 2010). Total alkalinity is the total concentration of bases in water usually bicarbonates and carbonates (Ouyang *et al*., 2006). Total alkalinity depends on the concentration of the substance which would raise the pH of the water. High levels of alkalinity indicate the presence of strongly alkaline industrial waste water and sewage in the estuary (Safari *et al*., 2012). The degradation of plants, living organism and organic waste in the estuary might also be one of the reasons for increase in carbonate and bicarbonate levels, shows an increase in alkalinity value (Wang *et al*., 2006). Our result agrees with the earlier report (Mohan Raj *et al*., 2013).

Tarzell (1957) has suggested that a minimum of 3 mgl^{-1} dissolved oxygen is necessary for healthy fish and other aquatic life. The present study showed minimum values of dissolved oxygen during post monsoon and pre monsoon which are not sufficient for most of the aquatic organisms. Interestingly even when DO was much below the optimum level, the rotifers were present in abundance indicating their wide range of tolerance. Dissolved oxygen is the most important indicator of the health of a water body and its capacity to support a balanced aquatic ecosystem of plants and animals. Waste water containing organic pollutants depletes the dissolved oxygen and may lead to impact benthic communities by producing acute changes in their distribution, abundance, and diversity of species (Raffaelli, 2000). The lower dissolved oxygen also implies that the estuaries were more polluted downstream.

Chemical Oxygen Demand (COD) is a measure of pollution in aquatic ecosystems. It estimates carbonaceous factor of organic matter. In present study obtained in the range of 4.20mg/Land above the permissible limit set by WHO (10mg/L). Biological Oxygen Demant (BOD) is the amount of oxygen required by the living organisms engaged in the utilization and ultimate destruction or stabilization of organic water. It is a very important indicator of the pollution status of a water body. In the conducted experiments, BOD was high in

Domestic and Industrial Effluent due to high organic load and excessive growth of total microorganisms (Kandhasamy, and Santhaguru, 1994). This may be as a result of escape of organic matter (organic) into the river mostly from faecal waste deposition by the surrounding urban area and human settlements. Control Sample revealed BOD value below detection limit, because it was distilled water and had no organic load. Highest COD values were found in Domestic Effluent which may be due to the incessant inflow of sewages from urban areas (Mishra *et al*., 1990). In the present study, COD was lowest in July month (22.60 mg/l) and highest during November (27.82 mg/l) while BOD was lowest in July month (12.35 mg/l) and highest during November (14.56mg/l).

Conclusion

The study reveals water quality parameters of Samantha pettai beach, East coast sea wate showed that concentrations of nutrients were above the coastal water level due to continuous discharge of domestic sewage and industrial effluents and the estuary is severely polluted. Water quality forms the basic intuition for the life sustaining medicine for propagation of aquatic organisms especially to juveniles. The continues discharge of effluents to the estuarine ecosystem s vulnerable to all compartments of the food web. Awareness has been created if not immediate, definitely block or alert the input from industrial area. Estuaries are extremely exploited ecosystems, due to their proximity to major civilization throughout the globe. There is an urgent need to control or restore the discharge of domestic sewage and other industrial effluents to restore breeding ground of finfish and shell fish, secondary and tertiary productivity in the estuarine water body for the benefit of Samantha pettai beach.

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