

SEASONAL VARIATION IN PHYSICO-CHEMICAL PARAMETER OF SEAWATER AT MITHIVIRDI COAST BHAVNAGAR - WEST COAST OF INDIA

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Abstract: The properties of pure water are unique in comparison with those of other liquids, and the nature of our physical environment—that is, the characteristics of the oceans, the atmosphere, and the land—is in many ways dependent upon the peculiar properties of water. The “fitness” of water for the manifold needs of living organisms has been pointed out by physiologists and ecologists (Henderson 1913, Bayliss 1927).

The physico-chemical parameters such as temperature, salinity and dissolved oxygen are of profound biological significance and are used as population indicators (Head, 1985). Temperature and light play an important role in the gonadal gametogenesis, spawning and initiation of gonadal development (Pandey and Shukla, 2005). It is believed that the morphology of fish is determined by genetic and environmental factors, with these being particularly important during the early developmental stages when individuals are influenced by the environment (Ihssen *et al.*, 1981).

Introduction: Usually in the near shore waters and estuaries, they exhibit considerable seasonal variations depending on the local conditions of rainfall, tidal incursions, various abiotic and biotic processes, quantum of fresh water inflow affecting the nutrient cycle of different coastal environments (Choudhury and Panigraphy, 1991).

The marine environment, as a complex system is mainly influenced by various physical, chemical and biological processes. The open ocean is more stable compared to the near shore waters, where the interaction with the terrestrial zone is more effective in bringing about variations in different physicochemical parameters. Hence a thorough knowledge of hydrography is indispensable to estimate the quality of the environment and its influence on biological fertility (Poonam *et al.* 2012).

Mithivirdi is a Village in Talaja Taluka of Bhavnagar District. *Mithivirdi* is 46.2 km southward from Bhavnagar City. *Mithivirdi* situated at 21°24'43" N to 72°12'10" E. *Mithivirdi* has a long sandy shore and intertidal zone is muddy and rocky. It is close to *Alang* ship breaking Yard but still it is a quite undisturbed and less polluted area. Long sandy coastal area with muddy intertidal zone attracts many waders. 2.3 km long seashore of *Mithivirdi* was selected as study site. *Mithivirdi* is a proposed site for nuclear power plant by Govt. of India.

Materials and Methods: Water samples were collected from the study site at monthly intervals and analyzed at the laboratory of Department of Marine Science, M.K. Bhavnagar University for important parameters like temperature, salinity, dissolved oxygen, biological oxygen demand, turbidity and pH. The study was carried out during August'2009 – July'2010. Surface water temperature was measured on the site with a mercury thermometer and the values are expressed as degree centigrade (°C). Dissolved oxygen (DO) and Biological Oxygen

Demand were estimated following the standard Winkler's method and the values are expressed in mg/ l. pH, salinity and turbidity were measured immediately in the field using a portable pH meter, salinometer and turbidometer.

Result and Discussion: Total six parameters were studied thoroughly and found out the following results.

Temperature: The temperature was varied from 16 °C to 28 °C. Minimum was recorded during January'10 and maximum during the month of May'10. The temperature variation is one of the factors in the coastal system, which may influence the physico – chemical characteristics and also influence the distribution and abundance of flora and fauna. In the present study, it has been observed that low temperature was noticed in the months of December to February at study site was due to cloudy sky. Cloudy sky brought down the temperature to the minimum (Kannan and Kannan, 1996).

Dissolved oxygen: Dissolved oxygen was varied from 7.21 mg/l to 7.89 mg/l. Minimum was recorded during the month of August'09 and maximum during the month of February'10. Dissolved oxygen concentration varies according to many factors; the main factors are due to photosynthesis and respiration by plants and animals in water. It has been observed from the present study that the amounts of dissolved oxygen content during different months (August'2009 to July'2010) have shown variation. Probably because of the oxygen consumption increased by the aquatic animals due to effluents stress.

Biological Oxygen Demand: The BOD was varied from 4.68 mg/l to 5.98 mg/l. Minimum was recorded during the month of February'10 and maximum was during the month of September'09. BOD represents the quantity of oxygen which is consumed in the source of aerobic processes of decomposition of

organic materials, performed by microorganisms. The BOD therefore provides information on the biologically-convertible proportion of the organic content of a sample of water. This leads to the consideration of these materials in terms of their susceptibility to oxidation by the use of oxygen. BOD is so defined that the quantity alone of the organic materials contained in a sample limits the growth of microorganisms - i.e., the greater the number of organic nutrients present, the greater the material-exchange activity of the bacteria and, therefore, the resultant BOD. The measured consumption of O₂ is the result of microbic conversion. In extremely anaerobic water sources, oxidation processes can also be detected in inorganic materials

pH: pH at upper reaches varied from 7.3 to 7.7. Minimum was recorded during the month of June'10 and maximum during the month of December'09. Generally, temporal fluctuation in pH could be attributed to factors like removal of CO₂ by photosynthesis though bicarbonate degradation, dilution of seawater by freshwater influx low primary productivity, reduction of salinity and temperature besides decomposition of organic matter (Rajasegar, 2003).

Salinity: The salinity was minimum 32 ppt during the month of August'09 and maximum 36 ppt during the month of November'09. Salinity is one of the

important factors which profoundly influence the abundance and distribution of the animals in estuarine environment and inshore waters. Generally, the maximum salinity value is recorded during summer may be describe to the higher degree of evaporation. The low values are found during July to September is due to heavy rainfall and large quantity of freshwater inflow. Similar trend in the salinity values was also observed from various parts in southeast coast of India (Seenivasan, 1998).

Turbidity: The turbidity was minimum 239 NTU during the month of May'10 and maximum 298 NTU during the month of June'10. Turbidity is a measure of water clarity how much the material suspended in water decreases the passage of light through the water. In the present study maximum turbidity is during monsoon season, while minimum value is during summer season. During monsoon season silt, clay and other suspended particles contribute to the turbidity values while during summer season settlement of silt, clay resulting low turbidity.

Conclusion: The present study summarizes the seasonal fluctuations of various physico-chemical parameters in the coastal waters of the Mithivirdi. The anthropogenic activities influenced the study area minimally and all parameters are within the acceptable range.

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Table No.1 Physico-chemical status of Mithivirdi study site per month during 2009-2010							
No.	Month	pH	Salinity (PPT)	Do (Mg/L)	BOD (Mg/L)	Temp. °C	Turbidity (NTU)
1	August'2009	7.5	32	7.21	5.26	26	256
2	September'2009	7.5	34	7.55	5.98	25	268
3	October'2009	7.6	35	7.66	4.98	25	275
4	November'2009	7.6	36	7.69	5.96	26	269
5	December'2009	7.7	34	7.77	5.78	20	289
6	January'2010	7.5	35	7.56	4.78	16	247
7	February'2010	7.5	34	7.89	4.68	18	256
8	March'2010	7.6	35	7.56	4.98	22	246
9	April'2010	7.6	34	7.68	5.78	25	278
10	May'2010	7.5	34	7.43	5.96	28	239
11	June'2010	7.3	34	7.46	5.89	26	273
12	July'2010	7.4	34	7.68	5.90	24	298

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