

## Assessment of some selected water quality parameters of Bay of Bengal at Mohana of Digha, West Bengal, India



### Home Science

**KEYWORDS:** Sea water, Digha Mohana, Physicochemical parameters, Marine creatures, Ecosystem

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### ABSTRACT

Digha is one of the seaside resort town and tourist spot in the state of West Bengal, India. The present investigation was carried out to assess sea water quality of Digha Mohana. Water sample was collected on January, 2016. Various physicochemical parameters such as pH, total suspended solid (TSS), Oil and Grease, Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Lead, Cadmium and Polynuclear Aromatic Hydrocarbons (as PAH) were measured as per standard method. Among all parameters, concentration of pH, TSS, Oil and Grease, COD, BOD and Cadmium were below the limit where as Lead and PAH were above the standard limit. This study revealed that coastal water health at Digha Mohana was at verge of pollution. Proper precautions should be taken by pollution controlling authority to avoid further pollution of Digha Mohana coast and to conserve the marine creatures for maintaining the ecosystem.

### INTRODUCTION

Seawater resources, one of the most important components of environmental resources, are now a days under threaten condition either from over exploitation or pollution, both caused by human activities (Efe, 2001). Urbanization is the root cause of water pollution. An ecosystem of coastal area is most dynamic and productive and is also affected by human settlements, industry and tourism. Several activities like disposal of municipal wastes, industrial wastes and numerous recreational and commercial activities may degrade the coastal water quality and also pose a severe health hazard to marine biotas and human (Rama Devi et al., 1996). According to Sankpal and Naikwade, 2012 domestic sewage and industrial effluents discharged into the water courses may add a variety of pollutants which include certain toxic heavy metals and metalloids. Currently marine water quality has become serious concern because of its effects on human health and aquatic ecosystems including marine life (Gupta et al., 2009). Physico chemical characteristics are certainly fundamental water quality parameters for monitoring because of their instability (Efe et al., 2005) and its significant variations may influence the water resource quality. Several studies (Ackroyd et al., 1986; Saager et al., 1997) reported that fluxes of trace elements in estuaries and coastal waters had been modified biogeochemically and transported to the open ocean and the original composition of seawater was changed.

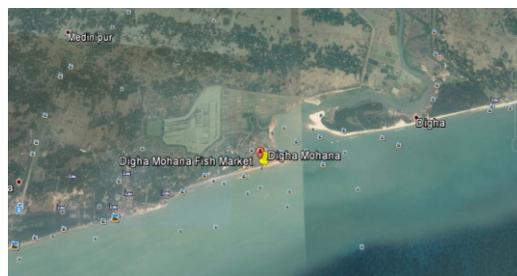
Digha is the popular seaside resort town and tourist spot in the state of West Bengal, India. It is in East Midnapore district and at the northern end of the Bay of Bengal. River Hoogly merges into the Bay of Bengal over here. It has low gradient shallow sand beach with calm waves. Digha-Mohana is one of the fish landing centre. In tidal zone of seacoast region of Purba Medinipur of West Bengal, the vegetations are under threatened condition due to immense and unscientific use of chemicals in dry fish industries and pollution due to the fishing harbor (Das et al., 2015). The present study was undertaken to assess various physicochemical parameters and their impact on coastal water quality at Digha Mohana.

### METHODOLOGY

**Sampling Station:** Water sample from Digha Mohana was collected for the study. The sampling station is shown in Figure-1. The latitude and longitude of the sampling location is 21°37'43.12"N and 87°32'36.37"E.

**Collection of the water samples and analysis:** Water samples for determination of physical and chemical parameters were collected

from the sampling station with the help of clean plastic container. The container was well cleaned with non-ionic detergent followed by rinsing with tap water and finally washed with deionized water prior to usage it. The sample was collected on January, 2016 in high tide condition. During collection of sample, contamination of the sample with any foreign material should be avoided carefully. Collected samples were brought to laboratory and stored to the refrigerator at 4°C temperature. Selected physicochemical parameters such as pH, Total Suspended Solid (TSS), Oil and Grease, Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Lead, Cadmium and Polynuclear Aromatic Hydrocarbons (as PAH) were analyzed according to APHA, 1998.



**Figure-1:** Sampling Location

### RESULTS AND DISCUSSION

Results of physico-chemical analysis of Digha Mohana water are shown in Table 1. Among all parameters, concentration of pH, TSS, Oil and Grease, COD, BOD and Cadmium were below the limit where as Lead and PAH were above the standard limit.

**pH:** Some factors like decomposition of organic matter, dissolved carbon dioxide concentration, alkalinity, hydrogen ion concentration, temperature may affect the pH of coastal sea water (Sankpal et al., 2015). In this study, showed pH value 6.88 was within permissible range. Similar observation was reported by Moharana and Patra, 2014. The recorded high pH value might be due to high biological activity (Balasubramanian and Kannan, 2005). Health of marine biota may be affected by variation of pH. According to Boyd, 1990 most marine animals cannot tolerate wide range of pH, thus the optimum pH varies usually between pH 7.5 and 8.5. Slow growth of species may occur at a pH below 6.5 and at lower pH, the organism's capability for maintaining salt balance is affected and reproduction may be ceased (Lloyd, 1992).

**Table-1: Concentration of Physico chemical Parameters**

PARAMETERS	RESULTS	LIMIT	
1.	pH	6.88	5.5-9.0*
2.	Total Suspended Solids (mg./l)	18.0	100.0*
3.	Oil and Grease (mg./l)	<1.0	10.0*
4.	COD (mg./l)	9.0	250.0*
5.	BOD [3 days, 270C] (mg./l)	<2.0	30.0*
6.	Lead (mg./l)	0.38	0.1*
7.	Cadmium (mg./l)	0.04	2.0*
8.	Polynuclear Aromatic Hydrocarbons (as PAH) (mg/l)	0.015	0.0001*

\*Schedule VI inserted by Rule 2(d) of the Environment (Protection) Second Amendment Rules, 1993 notified vide G.S.R. 422(E) dated 19.05.1993, published in the Gazette No. 174 dated 19.05.1993 for Effluent Water.

\*\*As per - IS 10500:2012 for Drinking Water

**Total Suspended Solids (TSS):** Concentration of TSS may be affected by high flow rate, soil erosion, urban run-off and wastewater effluents. Turbidity in coastal region is increased due to rise of river and flux from river is directly related to precipitation (Fukuda and Okami, 1975). High TSS may create several negative effects, like decreasing light penetration into the water, reduce photosynthetic processes, lower the production of dissolved oxygen and low visibility. It ultimately causes fish' ability to hunt for food and reduces development of egg and also larva. But our study showed much lower TSS value than the standard.

**Oil and Grease:** One of the most significant groups of contaminants of marine environment is Oil and grease. Moller et al., 1989 summarized the impact of oil on fisheries and aquaculture. Patin, 1982 reviewed toxicity data for oil and oil products to marine organisms. According to Enjuigha and Nwana, 2004 crude oil releases on aquatic environment causes unquantifiable damages to fishes and other economically important aquatic organisms, as well as the direct and indirect negative effects on the socioeconomic lives of human settlers who depends on products of aquatic environment. Although, in our study measured value of Oil and Grease was very much lower than the standard value.

**Chemical oxygen demand (COD) & Biochemical oxygen demand (BOD):** COD is important for estimating organic pollution (Kim et al., 2001) where as BOD can assess the biodegradability of dissolved organic matter in water (Simon et al., 2011) and depends on temperature, extent of biochemical activities, concentration of organic matter (Sankpal et al., 2015). But in our study both COD and BOD values were below the permissible limit which reveals that no intrusion of organic waste in that particular area.

**Lead & Cadmium:** Trace metals play significant roles in the ocean. One of the most toxic pollutants released into aquatic ecosystem is lead. Adverse effect of lead on aquatic biota was reported by Nacci et al., 2000 which includes reduction of survival capacity & growth along with impaired reproduction. Cadmium is essential for growth of marine phytoplankton and also can be toxic under some conditions (Leea et al., 2011). Larger aquatic animals have been exposed to heavy metals as a direct effect of biomagnifications (Ekwanyanwu et al., 2011). Our study showed much higher value of lead in sampling water than permissible limit. On the other hand cadmium value was below the limit.

**Polynuclear Aromatic Hydrocarbons (as PAH):** Marine environment is an easily sensible exposure site for pollutants like polycyclic aromatic hydrocarbon (PAH) compounds which has mutagenic and carcinogenic properties (Zhang et al., 2004). PAHs can come in marine environment from river discharges, urban runoff, refineries and other industrial wastewater (Neff, 1979) or from sea-based sources, like vessel discharge, nontank vessel spills, operational discharge, and aircraft dumping (NRC, 2003). In our

study total PAH concentration exceed the maximum admissible concentrations of PAHs (0.10 µg/L-1) for the water standard of IS 10500:2012.

Actually, water pollution causes enormous damage to marine life and the death of various land animals. Bioaccumulation is the accumulation of a chemical gradually in the living tissue of an animal. Mercury, leads are some of the heavy metals that can bioaccumulate in animals. When a predator consumes an animal affected by bioaccumulation, the toxin biomagnifies. On beaches, hundreds of fish are sometimes found dead. Large numbers of fish can abruptly start to die off. People and other animals become seriously ill after eating certain fish. Deadly toxins are often found in these sick or dead organisms. In our study, same scenario has been revealed in which dead fishes are scattered in sea coast area and birds become ill and are unable to fly (Figure 2).

## CONCLUSION

The coastal water health at Digha Mohana is at verge of pollution. Two parameters show high values which are toxic in nature. Proper precautions should be taken by pollution controlling authority to avoid further pollution of Digha Mohana coast. So, proper management strategies are required for sustainable development and management of coastal areas and their resources.



**Figure-2: Photographs of ill bird**

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