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Research Article

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Present Status of Water Quality of Ulhas River Estuary, Vasai Coastal Area, Thane, Maharashtra, India

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ABSTRACT

The present research work has been carried out to estimate the various Physico – chemical (hydrology) of the Ulhas river estuary along the Vasai coastal area of the Thane district. The hydrological studies were carried out at two stations viz. Bhayander and Naigaon jetty on monthly basis from June 2008 to May 2009. The present research study reveals that parameters like Temperature, Salinity, Conductivity, Total Hardness, Phosphate, Nitrates and Sulphates are in high concentration during the premonsoon period at both the stations. Turbidity and Total Suspended Solids has been found to be in higher concentration at both the station during the Monsoon period. Silicates concentration is found to be relatively high during the Monsoon period which may indicate presence of dinoflagellates. Presence of extremely high concentration of Phosphate and Nitrates is peculiarity of both the stations, may be due to release of high amount of untreated sewage. This study reveals that the water of Ulhas river estuary is proceeding towards deteriorating condition and the main causes may be release of industrial effluents, solid waste dumping, reclamation, construction activity and sand dredging.

Keywords: *Salinity, COD, BOD, Turbidity, Sulphate, Vasai Coastal Area.*

INTRODUCTION

India has a long coastline of over 8000 Km with associated continental shelf of 0.5 million Km^2 and an Exclusive Economic Zone of 2.04 X 10^6 Km^2. India is one among 12 mega biodiversity countries and 25 hotspots of the richest and highly endangered eco-regions of the world. Among the Asian countries, India is perhaps the only one that has a long mangroves, backwaters, salt marshes, rocky coasts, sandy stretches and coral reefs, which are characterized by unique biotic and abiotic properties and processes[1].

Estuary is an integral part of the coastal environment. It is the outfall region of the river, making the transitional zone between the fluvial and marine environs. Estuaries have been the focal point of the maritime studies and activities. As they are semi-enclosed they provide natural harbour for trade and commerce. They are also effective nutrient traps and provide a vital source of natural resources to man and are used for commercial, industrial and recreational purposes. Biodiversity in this ecosystem is very impressive. They are the best settling places for clams and oysters. They also act as nursery ground for a variety of shrimps and finfishes. Estuaries are in a state of constant flux. Such a dynamic environment provides many ecological niches for diverse biota[2].

The health status and the biological diversity of the Indian estuarine ecosystem are deteriorating day by day through man-made activities and dumping of enormous quantities of sewage into the estuary has drastically reduced the population of the fishes. It has also caused considerable ecological imbalance and resulted in large-scale disappearance of their flora and fauna. Further, introduction of untreated municipal waste-water and industrial effluents into these water bodies leads to serious water pollution including heavy metal pollution, which gets biomagnified and reaches man through food-chain implications[3].

Today good quality of water has become a very rare commodity and the ecotoxicological investigations of the aquatic ecosystems have now emerged as an important aspect of our social life. Hydrological investigations help us to understand the environmental conditions of the aquatic ecosystem[4].

Surface waters such as rivers, lakes and estuaries often serve as disposal systems for wastes coming from residential areas, industries, and manufacturing plants[5]. Elevated levels of organic wastes from these sources cause increased oxygen demand due to the contaminants increase in biological decomposition. The consequence of increased degradative processes is the consumption of Dissolved Oxygen (DO) and production of ammonia from the decomposition of organic nitrogen compounds leading to impaired metabolism in fish and invertebrate communities[6].

The present study deals with the various hydrological parameters and water quality of the Ulhas river estuary along the Vasai coastal area of the Thane district.

MATERIAL AND METHODS

The hydrological studies were carried out at two stations viz. Bhayander and Naigaon jetty on monthly basis from June 2008 to May 2009 which is divided into 3 seasons as Monsoon – June to September, Post Monsoon – October to January and Pre Monsoon – February to May. Surface water samples were collected every month during full tide and following parameters were analyzed using methods as per APHA, AWWA, WPCF[7,8].

S. No.	Parameters analyzed	Method
1	Temperature ^{o}C	Alcohol Thermometer
2	pH	Systronic pH meter
3	Turbidity NTU	Nephelometer
4	Salinity gm/L	Argentometric
5	BOD mg/L	Winkler's iodometric
6	Conductivity mS/cm	Conductivity meter
7	COD mg/L	Potassium dichromate
8	Total Hardness g/L	EDTA Titrimetric method
9	Phosphate mg/L	Stannous Chloride
10	Nitrates mg/L	Phenol disulfonic acid
11	Silicates mg/L	Molybdosilicates
12	Total Suspended Solid mg/L	Evaporation/ Oven
13	Sulphate mg/L	Turbidimetric method

RESULTS

Table 1 Hydrological results of Station No.1 Bhayander

S. No.	Parameters analyzed	Monsoon	Post Monsoon	Pre Monsoon
1	Temperature ^{o}C	30.25 ± 1.25	31.5 ± 2.51	33.5 ± 1.91
2	pH	7.23 ± 0.48	7.9 ± 0.28	7.66 ± 0.25
3	Turbidity NTU	15.63 ± 1.5	4.92 ± 3.94	2.57 ± 0.22
4	Salinity gm/L	20.23 ± 12.69	33.44 ± 4.27	52.17 ± 1.97
5	BOD mg/L	10.97 ± 14.24	8.37 ± 1.39	5.12 ± 4.52
6	Conductivity mS/cm	26.8 ± 13.93	43.08 ± 3.31	47.05 ± 1.76
7	COD mg/L	20.5 ± 21.33	49.25 ± 51.73	40 ± 15.6
8	Total Hardness g/L	0.77 ± 0.85	6.87 ± 1.06	6.87 ± 1.38
9	Phosphate mg/L	1.27 ± 0.68	0.52 ± 0.26	1.38 ± 0.36
10	Nitrates mg/L	0.81 ± 0.37	1.58 ± 0.82	3.74 ± 1.12
11	Silicates mg/L	102.2 ± 37.88	44.25 ± 19.82	45.75 ± 15.78
12	Total Suspended Solid mg/L	15.75 ± 1.23	6.01 ± 3.81	3.68 ± 0.25
13	Sulphate mg/L	58.53 ± 39.66	125.9 ± 15.31	148 ± 26.21

Table 2 Hydrological results of Station No.2 Naigaon jetty

S. No.	Parameters analyzed	Monsoon	Post Monsoon	Pre Monsoon
1	Temperature ^{o}C	30.38 ± 1.60	31.5 ± 1.91	34 ± 1.15
2	pH	7.48 ± 0.25	8.16 ± 0.17	7.97 ± 0.36
3	Turbidity NTU	17.32 ± 3.78	6.87 ± 4.52	2.5 ± 0.21
4	Salinity gm/L	22.53 ± 9.56	36.51 ± 6.84	46.59 ± 1.90
5	BOD mg/L	6.02 ± 6.24	9 ± 2.19	5.34 ± 5.11
6	Conductivity mS/cm	32.72 ± 9.49	45.04 ± 2.26	48.96 ± 1.68
7	COD mg/L	18 ± 14.4	52.75 ± 46.25	55.25 ± 6.02
8	Total Hardness g/L	0.97 ± 1.01	7.75 ± 3.55	8.02 ± 0.68
9	Phosphate mg/L	1.11 ± 0.69	0.44 ± 0.19	1.49 ± 0.26
10	Nitrates mg/L	1.09 ± 0.69	1.34 ± 0.76	3.12 ± 0.56
11	Silicates mg/L	97.5 ± 45.38	55.5 ± 23.07	56 ± 19.97
12	Total Suspended Solid mg/L	17.06 ± 3.01	7.95 ± 4.13	3.59 ± 0.25
13	Sulphate mg/L	62.56 ± 32.34	123.3 ± 13.95	157.3 ± 7.84

All the values of results are represented as Mean ± S.D. The entire statistical calculations are done using statistical software Primer of Biostatistics version 6.0.

DISCUSSION AND CONCLUSION

Present study reveals that parameters like Temperature, Salinity, Conductivity, Total Hardness, Phosphate, Nitrates and Sulphates are exhibiting high concentration during the Premonsoon period at both the stations, 33.5 and 34^{o}C, 52.17 and 46.59 gm/L, 47.05 and 48.96 mS/cm, 6.87 and 8.02 g/L, 1.38 and 1.49 mg/L, 3.74 and 3.12 mg/L, 148 and 157.3 mg/L respectively. (Table 1 and 2) Turbidity and Total Suspended Solids has been found to be too high at both the station during the Monsoon period, 15.75 and 17.06 mg/L respectively. (Table 1 and 2) This may be because of the sediment particles brought by the flowing water during rains. Similarly Silicates concentration is found to be relatively high during the Monsoon period, 102.2 and 97.5 mg/L which may indicate the dominance of dinoflagellates in the coastal area. As far as COD and BOD is concerned where COD is a measure of organic compounds in water while BOD is a measure of dissolved oxygen required by aerobic biological organisms in water to break down organic material, both COD and BOD has a varying concentration in different seasons, this situation may have been arise because of the water body at both the station is being used as a dumping ground for religious refuge. (Table 1 and 2) Patil and Hande[9] observed Temperature and pH of Arabian sea and was found to be 29.4^{o}C and pH range of 6.5 – 8.5. They have also observed parameters like BOD, COD Phosphate, Nitrate and stated seasonal variation in them.

Phosphorus is a natural element found in rocks, soil and organic matter. In unpolluted waters the concentration of phosphorus is found to be relatively very low. Phosphorus is use extensively in preparation of chemicals and fertilizers. So many a times it is found in higher concentration in water bodies surrounded by areas of agricultural and industrial activities[4]. Both the stations under study have extensive industrial activities around the area hence this must have contributed to the high levels of phosphates in the water body in all the three seasons. The high concentration of Phosphate may have put forth the danger of eutrophication in water bodies of both the stations.

The Nitrate value recorded at both the stations is high above the normal value; this may be because of the organic material received from the catchment area during ebb tide. Another possible way of nitrate input could be through oxidation of ammonia in the water[4]. Nitrate and Nitrite is a common pollutant in aquatic ecosystems[10]. According to Prabhahar[11] high level of nitrite and nitrate in water is a potential factor triggering stress in aquatic organisms. Elevated environmental nitrite and nitrate has been reported to induce methaemoglobin formation, which could cause hypoxia in tissue, and impair the respiratory metabolism[12].

Similar variations in the hydrological parameters mentioned above have also been observed in the Palk Bay during comparative investigation on Physico – chemical properties of the coral reef and sea grass ecosystem in Palk Bay by R. Sridhar[13] and also by Muduli Bipra Prasanna[14] during their study on Physico

chemical properties of water from Dhamra estuary. The present study reveals that the status and quality of the estuarine water at both the stations under study may be under stress and indicates a slight pollution. Some constructive measures must be taken at public and governmental level so as to prevent further deterioration of the ecosystem.

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