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RESEARCH ARTICLE

Sedimentological study of soil along the estuarine area of Bhayander and Naigaon, Thane, Maharashtra

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ABSTRACT

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. Estuary is an integral part of the coastal environment. Estuaries have been the focal point of the maritime studies and activities. The health status and the biological diversity of the Indian estuarine ecosystem are deteriorating day by day through anthropogenic activities and dumping of enormous quantities of wastes. The present research work has been carried out to determine the status of soil along the estuarine area of Bhayander and Naigaon of Thane district. The soil along the estuarine area of Bhayander and Naigaon is silty in texture and the percentage of organic matter is more during monsoon and less during the post and pre monsoon period. Alkalinity is found to be less in monsoon and more during post and pre monsoon possibly due to washing away of the carbonates and bicarbonate substances by the rainwater. Similar condition is exhibited for Chlorides in the soil samples of both the stations. The percentage of organic matter in the soil sample of estuarine area of Bhayander and Naigaon was found to be high which indicates slight soil pollution in the estuarine area. This estuarine soil pollution may be because of dumping of religious refuges and also of wastes such as paper, household waste etc.

KEYWORDS: Organic matter, Soil Texture, Total Alkalinity, Chlorides, Ulhas river estuary, 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 (Venkataraman *et al*., 2005).

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 (Balasubramanian *et al*., 2002).

The health status and the biological diversity of the Indian estuarine ecosystem are deteriorating day by day through anthropogenic activities and dumping of enormous quantities of sewage into the estuary has decreased population of the fishes. It has also caused considerable ecological imbalance and resulted in large-scale disappearance of 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. (Baskara *et al*., 2004).

Estuarine sediments are characterized by specific and complex physical, chemical and microbiological properties. These properties depend and interact with each other and collectively constitute a unique environment to the organism. The study of sediments represents a useful tool for determining the actual state of environmental pollution of a water body. It is well recognized that the primary productivity in shallow marine environment depends on nutrients economy which is known to be governed by the sediment nutrient level. Knowledge on the role of sediments in this is useful in determining the sediment water interactions which eventually affect the productivity of the overlying water body (Bragadeeswaran et al. 2007)

The present research work deals with the study of various sedimentological parameters and soil quality of the Ulhas river estuary along the Vasai coastal area of the Thane district.

MATERIALS AND METHODS

The sedimentological 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. Soil samples were collected from both stations once every month during the low tide mark with the help of a metal scoop corer of about 10 cm x 10 cm. The soil sample collected was then transferred into a clean dry polythene container and the samples were brought to the laboratory for further analysis. The analysis for various parameters was carried out using standard methods (Marc *et al*., 2004; Walkley and Black, 1934; Trivedy and Goel, 1986; Carney and Pandey, 2001), (APHA, AWWA, WPCF 2005).

Table 1: Different method use for analysis

Sr. No.	Parameters analyzed	Method
1	Organic matter %	Walkley and Black Method.
2	Soil Texture %	Buchnans Method.
3	Total Alkalinity meq/100g	Soil water extract titration method.
4	Chlorides mg/100g	Silver Nitrate Method.

RESULTS

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

Table 2: Sedimentological results of Station No.1 Bhayander.

Sr. No.	Parameters analyzed		Monsoon	Post Monsoon	Pre Monsoon
1	Organic matter %		37.06 ± 18.05	20.25 ± 4.31	14.01 ± 2.93
2	Soil Texture %	Sand	36.96 ± 12.72	41.15 ± 10.47	32.7 ± 5.99
		Silt	56.22 ± 16.56	51.67 ± 7.78	62.09 ± 3.92
		Clay	6.82 ± 4.22	7.17 ± 6.30	5.20 ± 2.35
3	Total Alkalinity meq/100g		1.21 ± 0.96	2.46 ± 0.41	4.31 ± 0.86
4	Chlorides mg/100g		21.83 ± 10.73	25.38 ± 3.94	46.86 ± 6.29

Table 3: Sedimentological results of Station No.2 Naigaon Jetty

Sr. No.	Parameters analyzed		Monsoon	Post Monsoon	Pre Monsoon
1	Organic matter %		36.63 ± 15.89	25.43 ± 5.86	10.98 ± 4.18
2	Soil Texture %	Sand	38.37 ± 2.17	36.71 ± 2.81	29.88 ± 7.21
		Silt	51.78 ± 7.94	50.34 ± 1.58	45.12 ± 17.7
		Clay	9.85 ± 7.85	12.95 ± 2.66	25 ± 14.52
3	Total Alkalinity meq/100g		1.43 ± 0.94	2.8 ± 0.40	4.37 ± 0.83
4	Chlorides mg/100g		22.54 ± 11.57	26.62 ± 6.09	45.08 ± 6.59

DISCUSSION AND CONCLUSION

The present research work reveals that the soil along the estuarine area of Bhayander and Naigaon is silty in texture and the percentage of organic matter is more during monsoon and less during the post and pre monsoon period. This may be due to continuous flux of organic matter brought by the flow of fresh water from the Ulhas river. The total Alkalinity is actually the amount of carbonates and bicarbonates present in a particular soil sample. The same is found to be less in monsoon and more during post and pre monsoon which may be because of washing away of the carbonates and bicarbonate substances by the rainwater. Similar condition is exhibited by Chlorides in the soil samples from both the stations. Sedimentological studies have been earlier carried out in Poonthura estuary by Anila Kumary *et al*. (2001) Arasalar estuary by Bragadeeswaran *et al*. (2007) and in Sharavati estuary by Hegde *et al*. (2004) where similar trends were observed. Athalye and Quadros (2002) carried out studies in the intertidal sediments of Thane creek and Ulhas river estuary. They observed silty sediment texture in Ulhas river estuary and Thane creek. This has resulted due to increasing sewage load, solid waste dumping and hindrance in flushing has adversely affected fishery especially prawns and mudskipper. The percentage of organic matter in the soil sample of estuarine area of Bhayander and Naigaon was found to be high when compared with the values in the above mentioned studies. This clearly indicates slight soil pollution in the estuarine area. This estuarine soil pollution may be because of dumping of religious refuges and also of wastes such as paper, household waste etc. It may be suggested that reclamation construction, dumping along the creek should be stopped and mangrove plantation should be done along the creek to increase the mangrove belt.

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