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THE TIDAL LANDFORMS OF URAN–ALIBAG–MURUD COAST OF MAHARASHTRA, INDIA

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ABSTRACT : Tidal landforms, especially the mud flats, are very conspicuous coastal features of northern coast of Maharashtra. Although such landforms are also found along rest of the Maharashtra coast, the northern coast, between Uran and Alibag is known for exceptionally wider mud flats. The formation of woder and thicker mud flats is associated, generally with the high tidal range, greater than 3 meters. It is also a well known fact that they are developed usually in areas sheltered from the effects of wind driven waves.

The area is characterised by a medium to high tidal range. The mud flats, in addition to sheltered areas, are also seen to be occupying the open stretches of shoreline.

An attempt is made here to correlate the factors of tidal environment and size and occurrence of tidal landforms seen along this shoreline.

INTRODUCTION

The tidal landforms of west coast of India are found to be associated with the specific factors of tidal environment existing along the coastline. (Ahmed, E.). The factors like tidal range, duration, limit of tidal water penetration in to the creeks and estuaries, nature of substratum are reported to be the major factors determining the occurrence and extent of tidal landforms world over. (Davies, J. L., Pethick John).

The Maharashtra coast is characterised by a medium to high tidal range, that varies from 2.8 to 3.5. In addition to the spring and neap tides, daily diurnal tides, seem to have more impact on the tidal estuaries and creeks. The coastline is indented, with numerous coastal inlets like bays, estuaries and creeks. (Dikshit, Karlekar). Tidal waters in almost all of the major rivers draining the Konkan hinterland, penetrate to a distance of about 15 km. inland at high tide. The shoreline is flanked by a hinterland which is lateritic, and basaltic. The mean annual rainfall of the region is about 2800 mm. The environment is thus singularly favourable for the creation of muddy and clayey substratum in the estuarine and creek inlets.

One can therefore expect a wide occurrence of tidal landforms, at many sheltered places along the said coastline. This expectation is however not fulfilled, and one surprisingly finds the development of significant tidal landforms restricted only to the northern part of coastline, especially north of Alibag.

Mud flats and salt marshes are the main two tidal landoforms found along the Maharashtra coast. To the south of Alibag (18°. 39' N) the landforms are nowhere conspicuous. The inconspicuousness lies in their limited extent and thinness of the substratum. To the north of Alibag, although this general tendency of being narrow and thin is maintained, one finds extensive mud flats, disposing different sedimentary zones near Uran (Karanja island) and Revas and Avas.

MORPHOLOGY OF THE MUD FLATS

The mud flats near Uran, Revas and Avas (Fig. 1) are not completely flat and have a gentle slope seaward. At mid tidal level (1.1 meters) they exhibit a slight change gradient below which the flat slopes relatively steeply towards the low water mark.

The position of the change in gradient at mid tide is generally, attributed to the level of maximum tidal velocity (Pethick,J). The sedimentary material above this level progressively becomes more coarser. At an average distance of 2800 meters and material is purely sandy (Fig. 2). This sandy material cordens the slit-clay deposits of mud flat. The land ward limit of this sandy deposit is demarcated by thin, sparse, salt marshes.

The extent of these mud flats, and the maximum drying heights observed, do not suggest that they are caused merely due to the transportation and deposition of sediments by sea waves in the quiet tidal areas of Dharamatar creek.

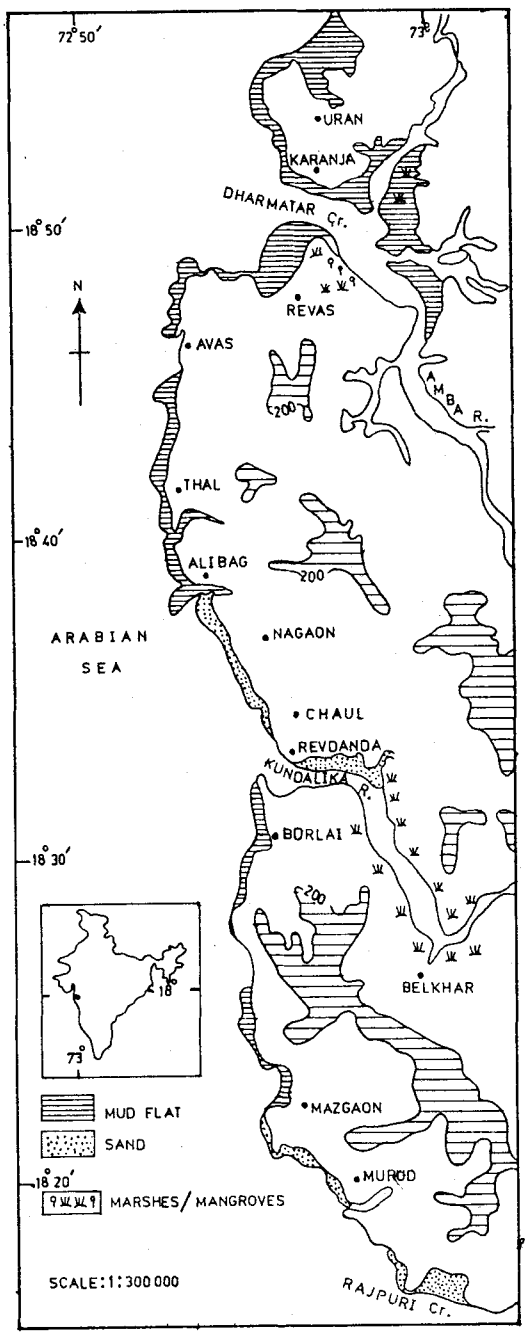

Fig. 1

It seems more logical to think of huge amount of silt-clay material brought down by the river and deposited 'around the corner' by tidal waves.

The individual clay grains by sticking together have formed cohesive surface, which is not easily eroded by the low velocity tidal currents in the area. Higher drying heights are not only restricted to wider mud flats. It can be seen from the accompanying table that the drying heights of about 2.2 meters are recorded in the narrow, elongatee mud flats of Avas. It can be said that the increase in drying height is a reflection of vertical growth of mud flat by accretion off clay particles. (Fig. 2).

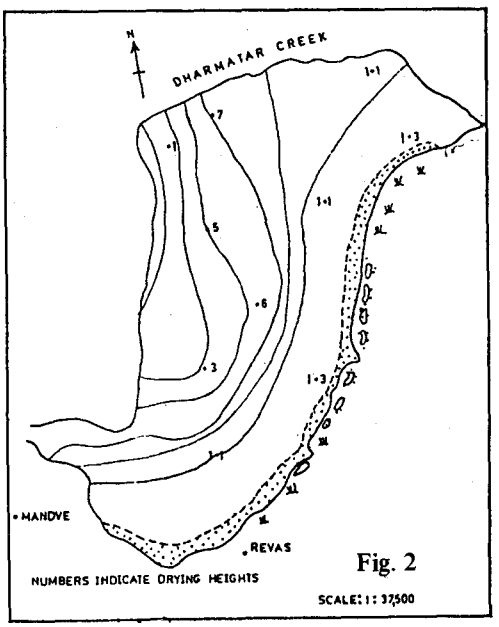

Fig. 2

One can even attribute, the higher drying heights to a spring tide current, causing considerable coastward movement of fine grained particles. The slow ebb tide is ineffective in the removal of clay particles deposited by flood tide. The daily flood tide may have induced a definate pattern in sediment deposition due to variation in tidal velocity. High velocities on the middle portion and low velocities on the higher shore ward portion are apparent in the central break in profile and upper flatness of mud flats respectively. Increase in drying heights therefore could be only attributed to spring tide currents.

MORPHOLOGY OF MUD FLATS

	Location	Drying Heights (ASL) Maximum	Minimum	Maximum Length	Maximum Width
1.	Karanja (Uran)	2.4	.4	4200	3000
2.	Revas	1.3	.1	2960	2220
3.	Avas	2.2	.4	3000	900
4.	Thal	1.6	.8	6000	680

All readings in metres

TIDAL LEVELS (IN METRES) ABOVE DATUM SEA LEVEL

	Location	MHHW	MLHW	MHLW	MLLW
1.	Karanja	4.3	3.4	1.8	.8
2.	Revdanda	3.7	2.9	1.6	.8
3.	Murud	3.3	3.0	1.6	.8

An important aspect of higher parts of these mud flats is the presence of tidal channels. The tidal currents which flow over the higher surfaces of these mud flats are weaker, a fact indicating reducing impact of tidal velocities. Increase in height of mud flat generally initiates the growth of marshes however, in this area marsh growth is megre and does not occupy a continuous region. The salt marshes are patchy in nature and without any definate pattern. The megre growth of salt marshes, is found to be balanced by mangrove swamps, along many tropical shorelines. The mangrove growth, however, in the said area cannot be called as significant.

In the light of the near absence of either salt marshes or mangroves, the silt clay accretion over the wider areas of mud flats can be attributed to a regression of sea level.

After the last fall of sea level and the emergence of littoral platforms a moderate erosion that may have followed, probably lowered the area bordening the river mouths. These then became the areas of tidal incission during high tides. In due course of time, balance between removal of silt and clay during low tide and its deposition during high tide, especially at mid tide, must have been achieved. This was responsible for the increase in the width of these flat.

The mud flats, at Avas and Thal, which are elongated are completely under the influence of daily tides. These flats show near horizontal, silt covered surfaces at low tides. The tidal channels on these elongated narrow flats are relatively fewer in number and poorly developed. Since the tidal range in the area is medium, the limited development of channels can be only attributed to the nature of substratum. The major sediments on these flats are silts, which are less conducive to the development of well defined channels. Substratum of northern flats like Uran and Revas is relatively more clayey, where more conspicuous channels could be developed.

The tidal, mud flats which are poorly sheltered, have a limited width. This is mainly because the tidal water moving in the small concavities is more effective in carrying the sediments landward than the water moving through the small streams carrying the sediments seaward.

CONCLUSION

The tidal mud flats of northern Maharashtra coast, are thus strongly associated with the daily tidal range. The highest high tidal currents are responsible for relatively drier upper parts. The mid tide velocity drop is inferred from the break in slope in the central part of these mud flats.

The channel development is a function of nature of substratum and the exceptionally higher widths a result of recent fall of sea level.

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