

KEYWOR

Study of Coastal Sand Spits in Devbag and Kolamb of Malvan, Maharashtra

DS		Sar	nd spit	ts, Wav	e energy,	Littoral	currents,	Longsh	iore drif
* Jagd	lish B.	Sapkale					Madhu	uri M.	Mane
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Assistant Professor, Department of Geography, Shivaji University, Kolhapur, Maharashtra, India * Corresponding Author

Ph.D Student, Department of Geography, Shivaji University, Kolhapur, Maharashtra, India

ABSTRACT The coastline of Maharashtra is specifically marked with a diversity of geomorphological features with differentiates coastal landforms. Coastal landforms are produced due to equilibrium condition of erosional and depositional processes which are influenced by the sea waves and tidal energy. The beaches, sand dunes, sand-spits, bars are the depositional landforms of the shoreline. Among them sand spit is a linear accretion of mixed sediments that is attached to land at one end and entered into sea or in the estuary at the mouth. Sand spits significantly protects the mudflats, coastal settlements and estuarine environments from the sea storms and attacking sea waves. But it has observed that the sand spits are degraded at many places in the study area, Therefore, attempted to study the coastal sand spits in the coastal areas of Malvan in Sindhudurg district of Maharashtra.

INTRODUCTION

The coastal landforms are continuously attacked by sea waves and destructive tidal currents, leads to change the shoreline. Coastline of Maharashtra is noticeable with headlands, steep cliffs, sand bars, beaches, spits, tombolo and much other coastal landscape. This shoreline is also under threats due to uncontrolled anthropogenic disturbances too. Sand spits in Kolamb and Devbag of Malvan coast have considered for the study (Fig. 1). Numerous research works have been done on sand spits and their significance by many authors. A spit is a part of sand accumulation with one end joins to the shore and other end free where it tops with a hook like shape. The spit extends in the direction of longshore sediment drift and can be associated across the direction of prevailing winds and waves. These spits developed across the bay/creek or estuaries mouth and extend in the direction of the littoral drift (Thomson, 1981).

Generally sand spits form where obliquely incident waves are dominant and a large amount of sediment is supplied from rivers or coastal cliffs to the channel or the bay/ creek (Uda and Yamamoto, 1992). The formation process of sand spits and their changing characteristics in terms of morphological change in shoreline landforms have documented by Johnson (1919) and Zenkovich (1967). The sand spit occurs at the mercy of tidal currents and winds. Longshore and tidal currents supply the sand,



and westerly and southwesterly winds spread it over the spit (Heyligers, 2006). In view of this, the south-western winds are more dominant and influenced on the aggradation and degradation of sand spits in the study area. In the study sites mudflat, salt marshes etc are protected by the sand spits and sand bars. Mudflats are the temporary accumulations of thick fine-sediment with organic matter, clay and silt that form subcircular depositional areas along the estuaries and at the mouth of the estuaries extended upto the offshore zone (Sapkale, 2011). Therefore in view of sand spit's significant role to protect the wetlands and estuarine environment the present research has attempted.

METHODOLOGY

The field investigation consisting of observation and interviews for collecting information/identification of sand spits have carried out in the study area. Data regarding variation in sand spits for past years have generated by using Remote



Figure 2 : Yearwise Images of Sand spits

RESEARCH PAPER

Sensing data and Remote Sensing images i.e. IRS LISS – III, and Google earth images. The collected data and information has analyzed with statistical and GIS software's like Global mapper. Surveying was also carried out using Transit Theodolite and GPS to assess the variation in sand spit area and its extension.



Figure 3 : Sand Spit of Kolamb-Chivla



Figure 4 : Sand spit of Devbag

TABLE 1: EXTENT OF SAND SPITS

Year	Area (sq.metre) of Sand Spits				
	Kolamb	Devbag			
2003 (2004*)	14197	27534*			
2011	7912	31200			
2013	14806	21409			
Average à	12305	26714			

Source: Computed from google images and Field Surveying

RESULTS AND DISCUSSIONS

Table No.1 shows the different period and year wise extension of sand spits at Kolamb and Devbag (Fig 2). The area of sand spits towards estuarine side and its tip have measured and it reveals that the sand spit of Kolamb is smaller than the spit of Devbag, as it is located near the mouth of small tidal inlet/estuary, kolamb (Fig 3). During Dec 2003 the area of

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Kolamb's spit was 14197 square metres which was reduced to 7912 square metres during March 2011. The spit washed out due to longshore currents and sea waves at this site. Inner side of the spit's tip was more or less eroded by the currents of the estuary. But after next two years the area was increased to 14806 square metres during Dec 2013 and appears like a spoon shape. The spit of Devbag is located at the mouth of Karli estuary which carries tremendous load from its upstream side and pours the heavy discharge into the sea at Devbag. Uneven size of material also deposited at this location with fine and coarser sand. Table 1 indicates that during March 2004 the area of Devbag's sand spit was 27534 square metres that has increased to 31200 square metres during May 2011. This also shows the continuous growth of the sand spit. But during Dec 2013 the area of sand spit was decreased to 21409 square metres. The material is drifted from the inner side of spit due to littoral currents moving like a bullet and eroding the base of spit in terms of lateral erosion (Fig 4). The foremost destruction and erosion of sand spit at Devbag occurs due to attacking powerful sea waves and currents that generated due to south western wind. Manmade intervention is also one of the causes for the destruction of sand spit. Now there is a threat to spit and other estuarine



Figure 5 : Giant Sand Bags reduced erosion

environment at this location due to newly introduced water sports activities that have started at the small island of Karli estuary, just few metres in upstream side of the mouth. The sediments and sea waves are disturbed due to this activity and influenced on the erosional and depositional processes at the site. The large-Giant Sand bags of different sizes with insitu sand are used to protect the sand spit and beaches from the active wave action and minimize the erosion in the study area. As a result of these artificial protective sand bags, the accumulation of sand on the sand spit have also seen at this site (Fig 5).

CONCLUSIONS

Erosion and deposition are combined processes that take place in the study area. The decreased area of Devbag's sand spit during Dec 2013 as compare to May 2011 in terms of its extension shows its endangered condition. Such reduced size of the sand spit at Devbag due to natural erosion and human interruptions has produced challenges to protect the sand dune in the study area. Inventive practices should be undertaken for the conservation of such coastal landform.

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