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# TEXTURAL CHARACTERISTICS OF THREE BEACHES OF DAKSHINA KANNADA

K. T. CHANNESHAPPA AND V. HARIHARAN

*College of Fisheries, University of Agricultural Sciences, Mangalore - 575 002*

ABSTRACT

Granulometric analyses of sand samples collected at the low and high water marks at three beaches namely Panambur, Thannirbhavi and Bengre near Mangalore for one year from May 1986 to April 1987 have revealed that the median grain size were 221, 231 and 470 μm respectively. The sand samples were well sorted during most of the year. Although erosion is reported at Bengre particularly during southwest monsoon season, the sediments appear to be well sorted, perhaps due to the lesser sediment input by the river flow in comparison to that to southern side of the confluence.

## INTRODUCTION

STUDIES on the textural characteristics of beach sediments have gained importance not only because of their role in erosion and sedimentation of beaches, but also in the ecological characterisation of the beaches. Sufficient documented literature is available on the morphological changes and related studies on the grain size of beaches such as those of Veerayya (1972); Rajan and Nair (1979); Murthy and Varadachari (1980); Narayanaswamy and Varadachari (1981); Murthy *et al.* (1982) and Sanilkumar *et al.* (1986). However, there is practically no work pertaining to the textural characteristics of the beaches of Dakshina Kannada except that of Hariharan *et al.* (1984 a) and Sahoo (1985). The present study is a part of the investigation on the ecology of three selected beaches of Dakshina Kannada.

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## MATERIALS AND METHODS

### *Physiography of the area*

The area selected for the study is a 10 km stretch of the coastline near Mangalore just north of the confluence of Netravathi-Gurpur Estuary with the Arabian Sea. Three distinct locations are chosen for monthly observations. One at Bengre (12°51' N; 74°49'E) just north of the estuarine mouth and thus under the influence of the esturary; the other at Thannirbhavi (12°55' N, 74°48' E) where 7800 $m^3$/day of nitrogenous effluents are being discharged by the Mangalore Chemicals and Fertilizers and a third at Panambur (12°57' N; 74°48' E) which is an ideal marine beach of aesthetic importance (Fig. 1). The coastline along this area is rather straight and extends in an almost north – south direction facing the Arabian Sea. The bottom topography off this strip of beach is rather smooth and is without much relief as evidenced

by the isobaths. During the period of investigation the area has received about 1891.6 mm rainfall of which about 85% was during southwest monsoon period of June to September with the highest monthly rainfall of 1007.9 mm during June 1986. The air temperature fluctuated between 26.5°C (Sept. 1986) and 33.0°C (April 1987). It is also observed that in general Panambur and Thannirbhavi Beaches had lesser slope than Bengre Beach which was also less wide among the three.

The winds were generally observed to blow from west – southwest – west during the southwest monsoon period and during the rest of the period the direction varied from NNW and NE. Deep water waves approaching the coast was from SW, WSW and west during southwest monsoon and during rest of the year from WNW and NW directions. The wave period visually observed was found to be varying between 5 and 14 seconds. Maximum height of the breakers was between 3 and 4 m during monsoon and between 2 and 2.5 m during the rest of the year. Littoral currents from wave refraction studies have been reported to be directed towards south during the period November to April when waves approach this area from WNW and NW. During rest of the period it is directed towards north when waves approach the coast from SW and WSW (Reddy *et al.*, 1977).

*Sampling*

Sand samples were collected by using a clean plastic cylinder from the upper few metres of the surface at the low and high water lines at the three beaches at Panambur, Thannirbhavi and Bengre. For the textural analysis of sand, coned and quartered samples (100 gm) was washed free of salt and oven dried. The sand samples were then subjected to granulometric analysis following conventional seiving procedure. Mean grain size, sorting coefficient and skewness were calculated by Krumbein's method (Krumbien, 1968).

Meteorological and other environmental characteristics were also observed. The speed and direction of wind at each station was estimated by making use of a hand held "Casella" type of wind anemometer. Breaker heights and angle of approach of waves were estimated visually and at times the heights of breakers were measured by using a graduated pole held at the surf zone.

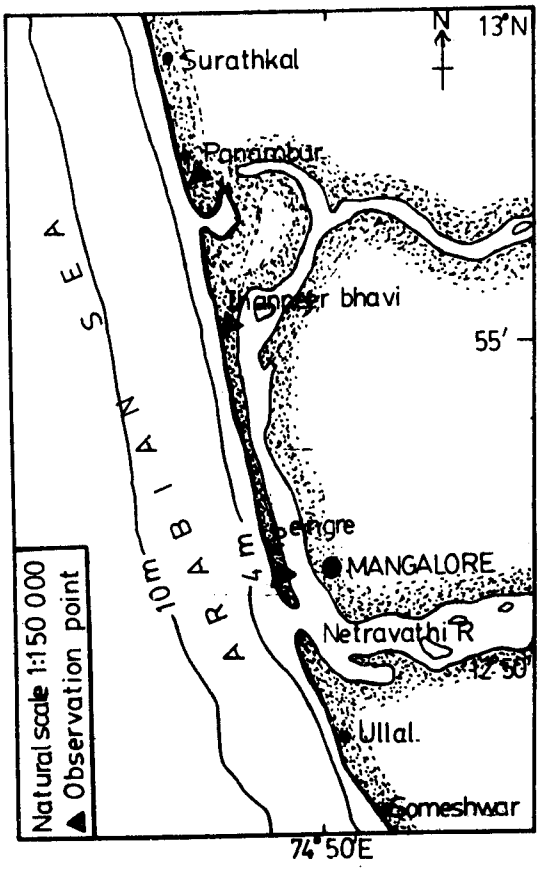


Fig. 1. Location of three stations studied near Mangalore.

## RESULTS AND DISCUSSION

It can be observed that the median grain size at Thannirbhavi was greater than that at Panambur, while that at Bengre exceeded that of both Panambur and Thannirbhavi. Median size at Thannirbhavi, Panambur and Bengre

averaged over the year taking into account the observations of low water and high water marks (Table 1) were 231, 221 and 470 μm respectively. The higher values at Bengre and Thannirbhavi in contrast to that at Panambur could be related to the wave energy impact at the breaker zone (Veerayya, 1972) which is directly related to the inclination of beach. It is also noted that the mean size at the low water value. Generally higher values of grain size was observed during monsoon and post-monsoon months which is again related to the higher wave energy of the steep monsoon waves.

Sorting coefficient at all the stations were less than 2.5 indicating that the beach sands at these locations were well sorted. The sorting coefficient at all the stations do not show appreciable variations showing thereby that the

TABLE 1. *Gramulometric analyses of sediments at respective tidal levels of Thannirbhavi, Panambur and Bengre*

| Station | Period / Parameter | 1986 | | | | | | | | 1987 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | May | June | July | Aug | Sep. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. |
| THWM | Median size | 290 | 250 | 240 | 220 | 250 | 215 | 250 | 200 | 200 | 200 | 200 | 210 |
| | Skewness | 0.82 | 0.98 | 1.20 | 1.12 | 0.99 | 1.12 | 1.11 | 0.91 | 0.91 | 0.89 | 0.77 | 0.98 |
| | Sorting Coefficient | 0.79 | 0.72 | 0.79 | 0.85 | 0.80 | 0.78 | 0.68 | 0.76 | 0.73 | 0.78 | 0.79 | 0.86 |
| TLWM | Median size | 220 | 250 | 230 | 210 | 300 | 220 | 210 | 220 | 230 | 290 | 220 | 220 |
| | Skewness | 1.26 | 1.10 | 1.18 | 1.15 | 0.95 | 1.08 | 1.20 | 1.23 | 1.21 | 1.00 | 1.23 | 1.26 |
| | Sorting Coefficient | 0.68 | 0.68 | 0.69 | 0.78 | 0.69 | 0.79 | 0.82 | 0.69 | 0.72 | 0.72 | 0.69 | 0.71 |
| PHWM | Median size | 200 | 240 | 220 | 220 | 300 | 200 | 190 | 240 | 190 | 200 | 210 | 200 |
| | Skewness | 1.02 | 0.93 | 1.14 | 1.07 | 0.89 | 1.06 | 1.03 | 1.06 | 0.96 | 0.95 | 1.01 | 1.03 |
| | Sorting Coefficient | 0.88 | 0.80 | 0.71 | 0.67 | 0.74 | 0.85 | 0.81 | 0.70 | 0.76 | 0.83 | 0.84 | 0.86 |
| PLWM | Median size | 210 | 200 | 220 | 200 | 280 | 200 | 200 | 230 | 230 | 280 | 210 | 210 |
| | Skewness | 1.12 | 1.06 | 1.15 | 1.03 | 0.97 | 1.06 | 1.00 | 1.16 | 1.13 | 0.75 | 1.19 | 1.09 |
| | Sorting Coefficient | 0.76 | 0.84 | 0.74 | 0.79 | 0.70 | 0.84 | 0.83 | 0.70 | 0.75 | 0.69 | 0.71 | 0.82 |

| | | Monsoon | Postmonsoon | Premonsoon |
|---|---|---|---|---|
| BHWM | Median size | 380 | 420 | 200 |
| | Skewness | 0.94 | 1.11 | 1.08 |
| | Sorting coefficient | 0.78 | 0.60 | 0.83 |
| BLWM | Median size | 740 | 870 | 190 |
| | Skewness | 1.09 | 1.04 | 1.15 |
| | Sorting coefficient | 0.63 | 0.59 | 0.60 |

influence of waves is constant and that the sediments are derived from the same source. However the relatively higher sorting coefficients during monsoon season is perhaps due to the prevalance of a mixture of coarse and fine grained sands. Similar observations have been made by Hariharan *et al.* (1984) at Someshwar. Higher values of sorting coefficient during monsoon season has been attributed to higher energy of steeper southwest monsoon waves. Veerayya (1972) has reported that during times of higher energy input at the coastal areas by waves the sediment grains are assorted in size and lower sized grains are kept in suspension in the surf zone.

The influence of estuary on the sediment budget of the beaches on its either side is clearly brought about in the present investigation. Hariharan *et al.* (1984) have reported higher mean grain size and higher sorting coefficient at the stations just south of estuarine mouth and this has been thought to be partly due to the assorted material brought by the river during the southwest monsoon season. The relatively lesser values of sorting coefficient in the station at Bengre in the present study perhaps confirms that the river borne sediments have little role in the material balance in the beaches on the northern side of the estuarine mouth, confirming the southerly discharge of the Netravathi-Gurpur Estuary atleast during monsoon months reported by Sahu (1982).

In conclusion, the beaches at Thannirbhavi and Panambur are relatively more stable in contrast to that at Bengre which is subjected to the effect of river flow as far as the erosion is concernedd and confirms the observations of Reddy *et al.* (1977). However, the sediments eroded from the Bengre side of the confluence, particularly during southwest monsoon season are being transported to the southern side of the estuary.

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