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MULTIMODAL CHARACTERISTICS OF MATERIAL IN COASTAL SEDIMENTARY ENVIRONMENT

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ABSTRACT :

The coastal studies from Indian sub continents are still fewer and some of them are very general in nature. Present study is an attempt to understand the coastal sedimentary environment particularly the sedimentary processes responsible for the building of beaches and their modification in course of time. The intensity magnitude and frequency forced operating can be reflected to the size and distribution of beach material present study is related to the mechanical.

KEYWORDS : *Denudation, Geomorphic Backshore, Processes.*

INTRODUCTION

Coastal landscape is controlled by marine processes. Coast is a contact zone between land and sea. Subarial and marine both processes are opering in coastal area zone and a variety of landforms were formed. Beaches are always been an area of attraction for a layman or number of scholar from different fields of discipline and scientists. The work on coastal geomorphology of India (Ahmed 1973) gives the general background of Indian coast V. Krishnaswamy (1954) Sawbha Shivarao (1955), K. R. Dixit (1971) Karlekar (1981) Anargha Dharade (2013)

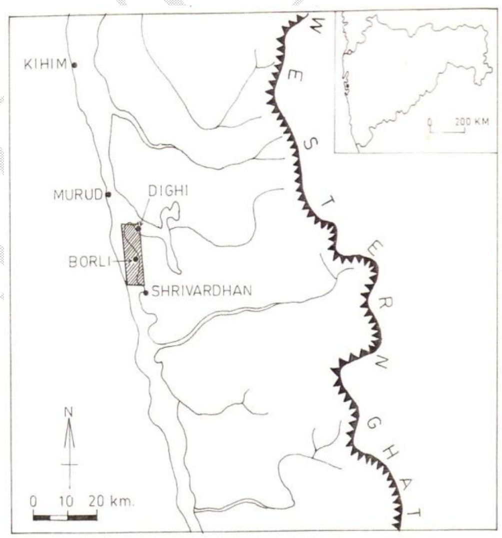
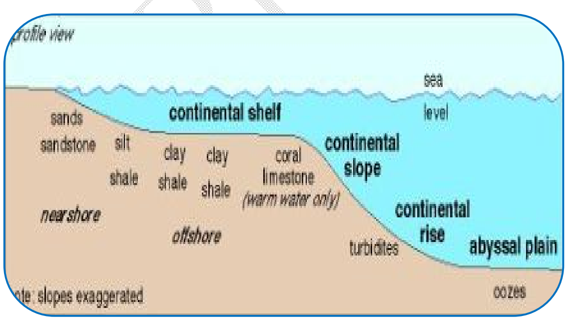


Fig.1: Location Map

Marine processes are different from subarial and glacial in their rate and intensity coastal changes are relatively rapid beaches and sand dunes are the most dynamic factors. The temporal and spatial variability of beach are also depend on the nature and abundance of beach material



AIM AND OBJECTIVE:

The concept of characteristic size need to be considered in the content of the location of material from its place of origin and the extent to which it has transported.

STUDY AREA:

The study area is narrow strip of coastal land extending between 18° 3' N to 18° 18' N Latitude and 72° 5' to 73° 58' Longitude the length of the study area is about 25 km and width varies from 5 to 10 km.(Fig. 1: Location map)

METHODOLOGY:

The methodology used for the study of the material and chemical analysis of beach material is divided into five parts.

1) Field work- collection of sample
2) Survey – Dumpy level survey for beach profiles.
3) Morphometric analyses
4) Laboratory analyses
5) Data processing
6) Cartographic work.

Fieldworks consist of observation of coastal landforms and their forming processes. Samples are collected from major three beaches sketch maps, geomorphic maps, were prepared during field work.

Morphometric analysis includes cross profile and longitudinal profiles and block diagrams. Grain size analysis is done with the help of sevieing machine, percentages of calcium is calculated by chemical analysis.

Material Analysis:

The material analysis is getting increasing importance in geomorphic study in recent years. The inability to directly observe the processes operating in the field makes it essential to analyse the surface and the material forming these surfaces which have been subjected to various denudational processes in coastal geomorphic studies. It become all more essential for a simple reason that the material is been produced, moved and deposited by different processes such as wave, wind and stream action. The variations in the intensity, magnitude and frequency of the forces operating can also be reflected to size distributions of this material. Thus the beach bacterial predominantly subjected to wave action may not necessarily have the same size in berm zone of the inshore areas.

The material forming beach is derived partly from the erosive action of the waves along the headlands and promotories. A considerable proportion of material is also supplied by the stream bringing the large volume of material from the catchment. The material is moved along the shore and settled in the areas wherever some kind of protection is available. These are mostly available at the locations such as the mouth of the creeks. In order to get an idea regarding the development of depositional landforms, beach materials from three major beaches within the study area was collected and analysed. The samples collected vary in number as regarding to either the width of the beach or the number of these facet of slopes along the beach profiles. Hence the number of samples collected from different beaches is not necessary the same. Besides the beaches a few samples from leeward and windward side of well developed dunes from the backshore zone of Dive Agar beach were also analysed.

The material was analysed for textural characteristics. However before using the sieves, the material was treated for calcium content and percentage of clay. The result of the analysis have boon tabulated.

The size distribution is graphically represented in the form of 'histogram' and 'ogive' curves. The ogive curves are plotted on probability graph papers which directly give the idea about the normality of the distribution. The histogram is drawn for identifying the characteristics and limiting size groups of the material and facilitates the comparison of different samples with respect to the variation in the gap in the distribution of material.

When a particular size group shows a concentration of material and the adjoining size groups record either complete absence or very low percentage, one is tempted to consider that such size groups for characteristic size groups of material. The characteristic size group will depend on the textural character of parent rock (such as fine grained, coarse grained rock), type of weathering, energy conditions of agents of erosion. The size groups which record very small proportion in the midest of concentrated groups can be considered limiting size groups. The low percentage of material in a size group indicates two possibilities.

1) Either the material of the group has been transported beyond the present location, or

2) Such material has not produced at all and whatever the proportion is essentially out of the networking of coarser material.

The first possibility may be ruled out of the material from still finest size exists in a sample with sizable proportion. The existence of material finest in size then the size group where the gap occurs, then there is no reason why the transporting agent should have any selective tendency is to carry away material from a given size groups.

It may be argued that change is size groups (selecting particular sieves) can bring about change in the characteristics of the distribution. However the fact that the material from a given group is totally absent need not be just set aside.

Hence the size groups containing higher proportions of the material could be considered as the characteristic size groups with the limiting once defined by the gaps needs to be considered more seriously and the multimodality of the distribution one of the factor which is not represented by number of indices calculated while analyzing the frequency curve. The concentration of the particles in a particular size group should possibly representing either selective size of rock pieces, which get deposited in a particular environmental condition.

BEACH MATERIAL ANALYSIS OF ARAVI:

Five samples between the high tide lines up to the low tide line were collected from Aravi beach. After getting the size distribution five different parameter, such as mean, median, sorting index, skewness and kcurtos is were calculated. The Aravi beach extends in north south direction and is backed by a lithified sand dune, which has been relatively planned off and is now occupied by settlements. The width of the dune is about 10.15 mts. At two locations the beach profiles have been surveyed with the help of dumpy level to get details of variations of slope along the beach. Fig. 2

There is considerable variation in mean, median, size of this distribution. In case of all the five samples is greater than the median size on phi scale. The values of mean size vary from 0.2 to 1.3. The existence of mean towards finer size of the material than median clearly indicates that almost all the samples are positively skewed with varying degree of skewness, The Sorting index varies from 0.8 to 2.28 and indicate a poorly sorted condition. The calcium percentage is at its lowest 30% and it increases to 47% (Table).

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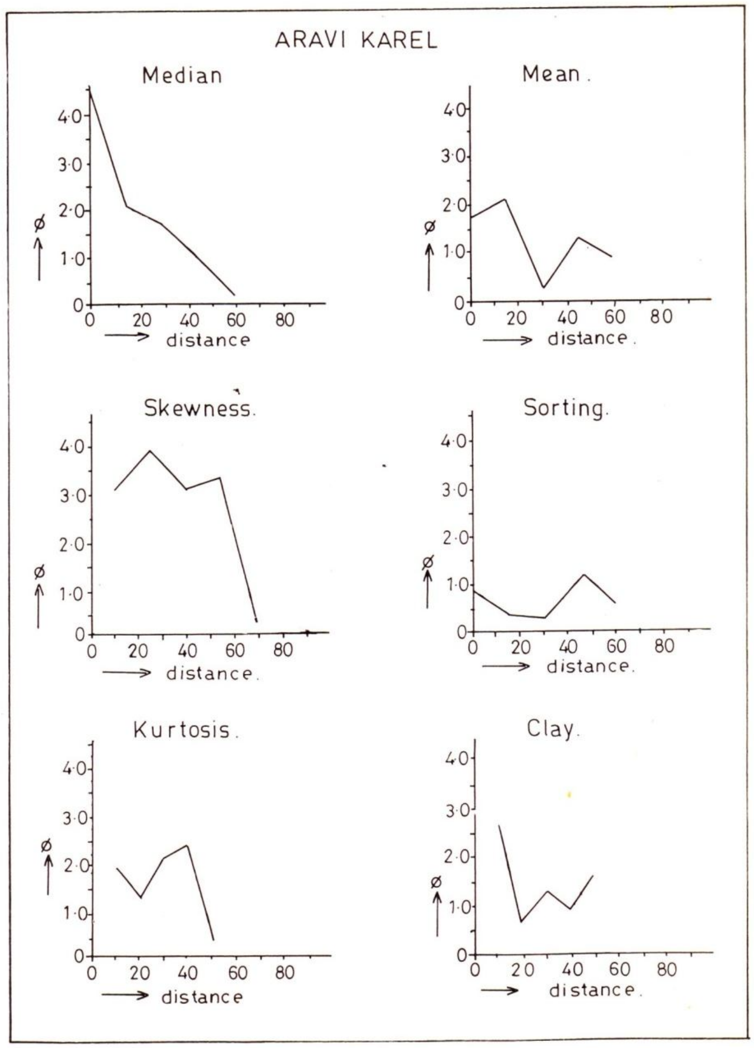

Fig. 2

The frequency distribution curve records a number of gaps and it is interesting to note that the gaps are not essentially same in different samples. e.g. sample I records 40% of the weight in the size group between ø 1.5 to ø 1.73 and 25% in ø 2,2 to ø 2.2 followed by 18% in ø 2.3 to ø 2.5 (Fig. 3).

A group beach rock ø 1.73 to ø 2 records just 0.7% of weight whereas ø 2.2 to ø 273 have 0.3% of weight. The limiting size groups for a characteristics zone between ø 2 to ø 2.5 which together with accounts for almost 40% of total weight. Similar gap though of Louis order are also observed in the size group.

The numbers of such gaps are found in different samples of Aravi beach. It is interesting to note that these concentrations are not always the same along the same beach at in different location. However the size group ø 1.73 to ø 2 which forms a limiting group and represents a gap has a considerable concentration of material for other four samples, located in the direction towards low tide line.

The frequency distribution curve, a histogram or polygon records these gaps. It is quite possible wave which deposited these materials from different size groups had variable in nature with respect to their energy environment. The material should go on other continually increasing or decreasing mainly depends on the temporal variation in the energy environment of waves or and variations in the caliber of the material supplied to the wave.

Aravi Beach							
Aravi	Median	Mean	Skewness	Sorting	Kurtosis	Clay in %	Calcium in %
S1	1.3	2.24	0.338	0.8	-1.157	0.36	40.0
S2	0.2	1.53	0.13	1.375	-2.98	5.2	47.8
S3	1.15	2.06	0.079	0.89	0.96	0.78	30.0
S4	0.75	1.213	0.39	1.025	1.55	1.6	30.4
S5	0.95	2.196	0.39	2.28	1.0	2.6	42.8

Velas Beach							
S1	0.95	2.91	0.43	0.875	0.78	3.0	20.0
S2	0.9	2.73	0.69	0.96	1.074	1.7	24.0
S3	1.05	2.89	0.65	0.775	0.79	2.5	32.0
S4	1.2	2.53	0.512	0.925	1.078	1.15	45.0
S5	1.4	2.69	0.06	0.96	3.4	3.4	20.2
S6	1.1	2.29	0.317	0.875	0.814	1.2	18.2
S7	1.65	2.8	0.019	0.73	0.64	2.05	29.02

Dive Agar Beach							
S1	0.1	1.9	0.185	1.026	2.006	1.5	42.0
S2	0.06	2.93	0.64	0.785	0.92	1.2	48.8

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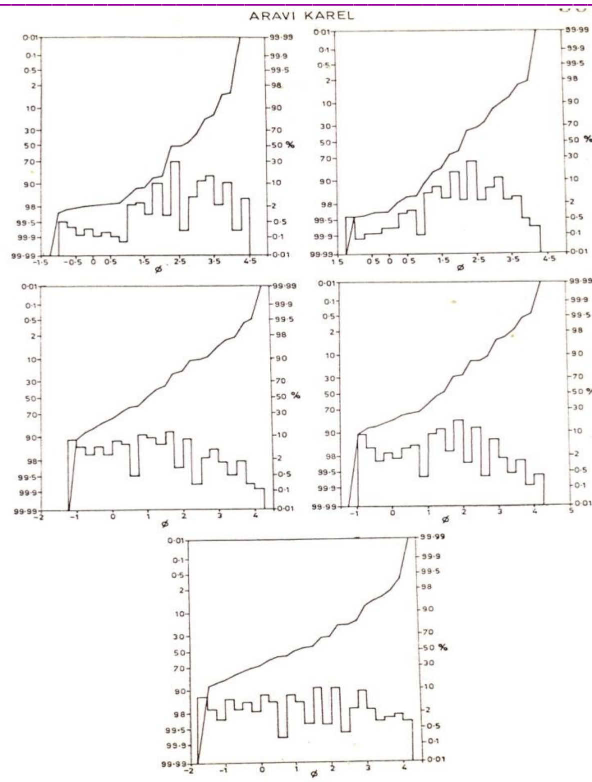

Fig. 3

The frequency distribution curve for the five samples (in. 4.2) indicates a more or less normal distribution. However with number of gaps, the tail end of the sediment distribution assumes considerably importance in the interpretation of sediment analysis. It may be observed that the course material up to ø 1 is contributed together with about 5% or less. However sample- II record about 25% of the weight of coarse material. Other samples have proportionately less percentage in same size group. Usually high proportion of the coarser material in size group ø 1.5 to ø 1.0 in sample second is rather anomalous and has caused the distribution to get shifted slightly to the negative side as compared to other four samples. However, in almost all the samples, one finds a clear gap around ø where percentage of material drops down considerably. A second major gap is located around ø 20 to ø 2. This separates the very fine material from the crest, and in some case contributes as much as 40% of the total weight. Thus almost all the samples have three clear cut groups. 1) Coarser material up to ø 1. 2) Group of finer material ø 2.5 3) group of fine material up to greater than ø 2.5. The variations in the proportion of the material in each group from the sample to other are not significant and the pattern is more or less similar.

VELAS BEACH MATERIAL ANALYSIS:

Seven samples were collected from velas beach. A significant variation in the values of mean and median size of the distributions is recorded in this group. In case of all the samples mean value is greater than the median value or phi scale. (Table2). Mean value is in range of 2 to 3 where as median values vary from 0.9 to 1.65. The values of Skewness indicate that all the samples are very positively skewed. Little different is noticed in the skewness values of all samples in this group. The sorting Index varies from 0.7 to 0.9 and show that the samples are moderately sorted it may be noticed that the sorting values do not very much difference (Fig.4.3). The probability curve is also smooth. The kurtosis values ranges between 0.64 to 1.074. The first six samples the distribution curve is mesokurtic and l sample the curve is platy kurtic. The percentage of clay is highest and it decreases toward the sea. Calcium percentage is higher in sample with maximum of 32%, and minimum of 18.2% other samples have nearly son percentage of calcium fig. 4.

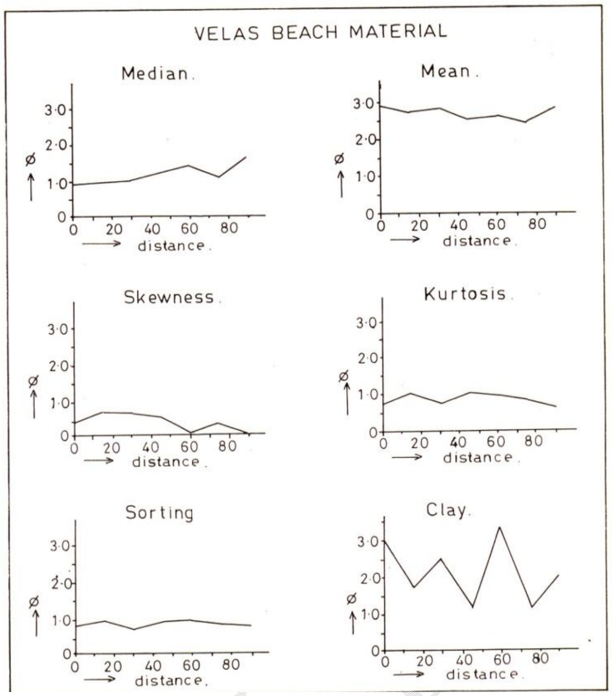

Fig. 4

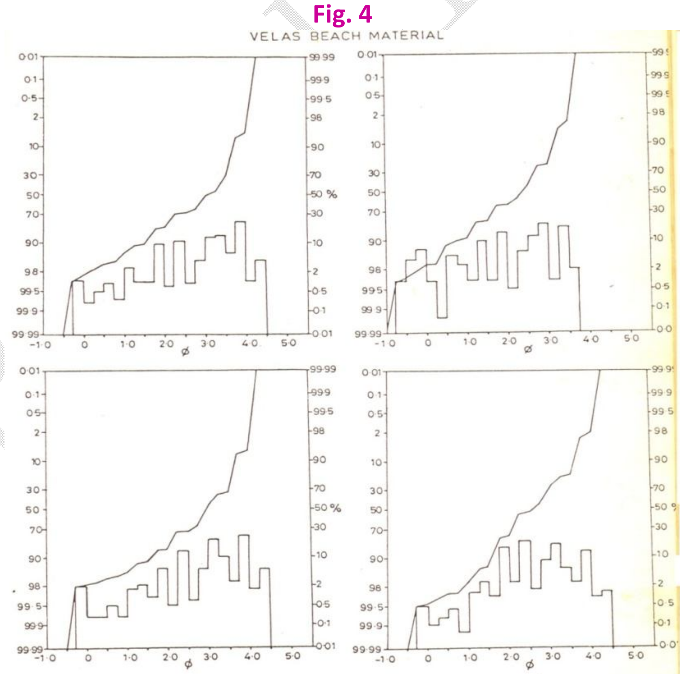

Fig. 5

The frequency distribution curve of oil samples were show the same gap in a particular size group, all sample records 70 to 80% of their total Weight - concentrated in the size group between ø1.73 to ø3.75

and 30% to 20% weight concentrated in size group of ø 0.23 to ø 1.5. Higher weight in all the samples are records in size group around ø1.73, ø2.23, ø3.0, ø3.2 and ø 3.75 (Fig. 4.4).

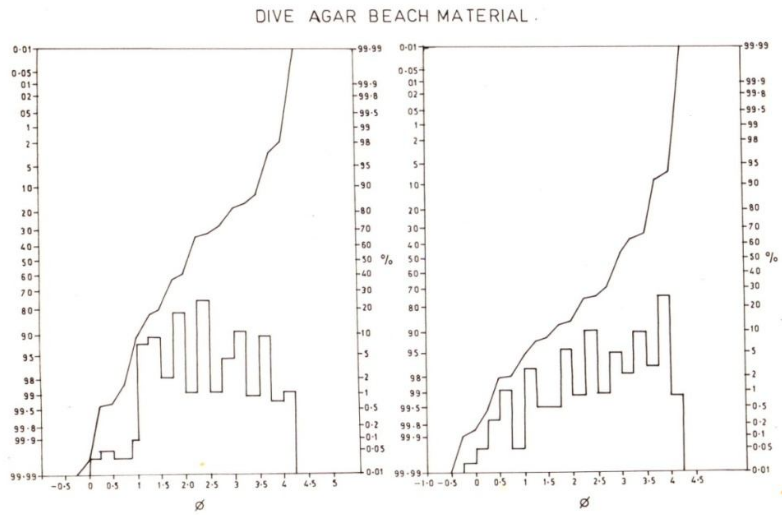

Fig. 6

DIVE AGAR BEACH MATERIAL ANALYSIS:

From Dive agar beach two samples are collected One from high tide line and other from low tide line Dive Agar beach is a fine sandy beach having a fragments of thin shells.

The sieving analysis of that sample shows that median value is ø0.1 and ø1.05. Mean value is 1.9 and 2.93. Clay percentage is very less 1.5 and 1.2 Calcium percentage is higher in second samples having 48.83.

In the first sample having 26% of their total weight is concentrated in the size group of 0 to 2.23 and remaining material concentrated in size group between ø 2.5 to ø 4.23. But in the second sample 75% of its total weight is concentrated between the size group ø 0 to ø 2.23 and remaining is concentrated in ø 2.5 to ø 4.23 size groups. It is clear that very fine material is concentrated near the high water line and slightly coarser material found near low tide line.

The frequency distribution curve is smooth and shows many gaps such as ø 0.5, ø 1.5, ø 2. In both samples the gap are similar and not shows a significant change in the material (Fig.6). Dive Agar beach is a major beach in the study area but only two samples are collected from that beach because the whole beach did not show any change in material or in slope.

CONCLUSIONS:

Dive Agar beach material did not show any change in size of material of in slope of beach The waves which depositated these material from different size groups are variable in nature with respect to their energy environment. The amount of material deposited on the beach is mainly depends on the temporal variations in the energy environment of the waves.

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