

Grain Size Distribution of Some Beach Sediments from Goa, Kutch and Bhavanagar

by

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The textural and mineralogical analyses of the shore sediments are of prime importance for an objective evaluation of the bottom sediments of the adjoining water basin, since under changed physico-chemical conditions (e.g. pH, salinity) the original sediments, transported from the landmass, undergo many alterations.

This note deals with the grain size distribution of the beach and a few beach-dune sediments from Goa, Kutch and Bhavanagar. Grain size fractionation was effected by employing the sieving and Sabani's Sedimentation methods. Sorting coefficient ($S_o = Q_3/Q_1$), median and skewness were calculated (tables 1 and 2). Heavy mineral separation was made from two fractions (0.5-0.25 mm and 0.25-0.10 mm) to note their weight percentage distribution.

Goa: All samples studied mainly fall in the group of medium to fine-sand. Samples from Colva are silty-sand [silt percentage ranges from 33 (beach-dune) to 40 (sea beach)], whereas in Calangute, Miramar, Mobor and Colvale river medium sands are developed. Sediments from all above mentioned areas are good to very good sorted, while in Palolem and at Aguada Fort beach they are medium sorted. Good

sorting of sediments is also reflected on the roundness of grains. The Colva sands are best rounded amongst all the sediments studied. Skewness values indicate that the finer fraction predominates. Heavy mineral concentration is highest in the river sediment (Colvale river — 42%) and decreases sharply at other places—Miramar (19%), Aguada Fort Beach (16.2%), Calangute (0.8%), Colva Beach (0.5%), Colva Beach dune (0.4%), Mobor (0.8%), Palolem (1.2%). Mineral concentration increases in the finer fraction of all the samples studied. Minerals represented in our samples include garnet, tourmaline, staurolite, mica, anatase, rutile, monazite, magnetite, hematite, feldspars, quartz in various proportions along with the rock fragments of gneiss indicating a mixed nature of the source areas. The sediments of the Colva Beach and beach-dune and Aguada Fort Beach indicate their sources areas to be composed of reworked sediments.

Sediments collected from the two banks of river Mandovi at its mouth (Aguada Fort and Miramar) show large differences in their textural and mineralogical compositions. This could be, besides other factors, due to the difference in nature of the source areas. It seems probable that whereas the

TABLE 1

Size composition of beach and beach-dune (§) sediments from Goa (in weight percentages)

Samples	2-1 mm	1-0.5 mm	0.5-0.25 mm	0.25-0.1 mm	0.1-0.05 mm	0.05-0.01 mm	Md mm	So	Sk
Calangute	0.21	18.26	72.12	7.91	0.29	—	0.20	1.42	0.9
Mobor §	—	—	29.30	63.40	7.30	—	0.09	1.92	0.9
Benaulim §	—	0.72	19.08	62.84	17.40	—	0.08	1.10	0.9
Mobor	—	0.32	63.70	35.25	0.70	—	0.13	1.85	0.5
Palolem	0.46	3.34	37.90	47.28	10.86	—	0.11	2.48	0.9
Colva §	—	—	3.28	63.60	33.12	—	0.06	—	—
Colva	—	0.22	3.84	56.32	40.60	—	0.06	—	—
Colvale river	1.96	9.14	64.72	20.08	4.10	—	0.15	1.61	0.9
Aguada Fort	—	0.04	1.65	30.86	67.13	0.32	0.04	2.54	—
Miramar Beach	0.35	4.27	82.84	11.52	0.45	0.56	0.16	1.55	0.9

TABLE 2

Size composition of beach-dune (§) sediments from Kutçh and Bhavanagar (BHAVN) in weight percentages

Samples	2	2-1	1-0.5	0.5-0.25	0.25-0.1	0.1-0.05	0.05-0.01	Md	So	Sk
Kuda (W) BHAVN	0.33	0.75	8.40	62.0	22.60	5.90	—	0.19	1.1	0.4
Kuda (E) BHAVN	2.35	7.55	37.10	25.36	15.57	12.00	0.06	0.24	3.4	0.8
Gopinath Point (W) BHAVN	2.26	16.73	77.12	1.91	1.74	0.23	—	0.36	1.6	1.1
Gopinath Point (E) BHAVN	40.96	42.76	11.64	2.60	1.20	0.82	—	1.0	2.3	8
Mandvi Port KUTCH	—	0.86	43.40	26.86	18.88	9.98	—	0.23	2.8	0.8
Mandvi Port §	—	0.41	2.76	11.36	51.56	33.70	0.9	0.06	2.5	0.9

sediments of the Aguada Fort beach are derived from the sedimentary rocks of the Cuddappah age (?) developed there, the Miramar sediments owe their derivation from the areas drained by river Mandovi further upstream. The profound development of long-shore currents obstruct in the intermingling of the two type of sediments.

Bhavanagar and Kutch: Beach samples from Bhavanagar differ conspicuously from their counterparts in Kutch in having a large amount of gravel and angular grains. On the contrary, the beach sediments from Kutch are fine to coarse-grained sand the subrounded

grains predominate. The sorting coefficient ranges from very good (Kuda west and Gopinath Point west) to medium (Gopinath Point east) though poor in Kuda east. In Kutch the sediments are medium sorted. The heavy mineral concentration is also higher in Bhavanagar beaches (14.6%) than at Kutch (about 7%). At Bhavanagar the mother rocks of beach sediments are situated at the junction of sea-land interaction and are regularly exposed during the low tide. In Kutch the source areas lie away from the beach as evidenced by the roundness of the sand grains and the heavy mineral concentration.