

ORIGINAL ARTICLE

Soil Composition of Mirya sandy shore, Ratnagiri

S. S. Lokhande* and A. D. Adsul

Department of Fisheries Hydrography,
College of Fisheries, Ratnagiri-415629, Maharashtra

*E-mail: snehal.lokhande147@gmail.com

ABSTRACT

The variation in soil texture was carried out by the sieve analysis method described by USDA classification system. The monthly and seasonal variations in soil compositions mainly attributed due to the south-west monsoon and the variations in the waves and wind force along the coast. The Mirya sandy shore was recorded with the major composition of sand on the shore followed by silt and clay during the investigation period of April 2011 to March 2012.

Keywords: Intertidal area; Quadrate; Sandy shore; Soil texture, Transects

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INTRODUCTION

The sandy shore is not a hospitable place: nothing is stable and nothing grows there. All food on the sandy shore has to be imported, and is either washed in by the waves or blown in by the wind. Many crustaceans' animals use tidal, lunar or seasonal rhythms to help them survive by being active at night and to avoid both predators and the hot, drying sun. The exposed sandy beaches are mostly studied to understand the species richness and abundance. The diversity and abundance of the crustaceans vary greatly with beach morphodynamics. The organisms on sandy beach are migrating vertically to avoid desiccation and thus, the interesting benthic communities can be observed after digging [1]. Sand is a dynamic substrate that provides habitats for animals probably the biggest adaptation of sandy beach animals is their ability to burrow. The structures of interstitial environment play an important role on the morphology and the biology of the population inhabiting in it. Monitoring of macro-faunal distribution and abundance over time and space helps us to understand the changes in species diversity [2]. The main objective of the study is to determine seasonal changes in species composition and abundance of crustaceans in the exposed intertidal area of the sandy shore.

The study of textural characteristics of beach soil is used to categorize the sedimentary environments. The foreshore soil is generally influenced by coastal processes, especially wave action and beach morphology (beach-face slope and shoreline orientation). The grain size characteristics in intertidal zone are changing with soil transport especially deposal and removal of fine soil. In tide dominated beaches the tidal current can play an important role to change the textural characteristics of beach soil. To understand the life of benthic organisms, it is essential to gather information on the substratum in which they live. Depending on the type of substratum soil texture and physical chemical characteristics of environment, different types of fauna live on the substratum. Sandy shores, owing to the instability of substratum and to the absence of suitable firm object for attachment, their associated fauna are naturally scare [3].

MATERIALS AND METHODS

Study area

The monthly study of soil texture was carried out during April 2011 to March 2012 on the intertidal exposed sandy shore of Mirya, Ratnagiri. Ratnagiri is a coastal district of Maharashtra state along the west coast of India. Mirya sandy beach (Lat. 17°00'35.25"N Long.73°16'49.42" E) is located along the western side of Ratnagiri, which is having total stretch of nearly about four km. The geographical position of the Mirya sandy shore has been shown in Map 1.



Map 1: Sampling location at Mirya sandy shore, Ratnagiri

Sampling method

All samples were collected during lowest low tide of each month when maximum intertidal exposure prevailed. Monthly *in-situ* sampling was carried out during low tides, by fixing transects from lowest low tide to highest high tide mark perpendicular to the shoreline [4]. A total of seven transect lines were fixed with a distance of 400 m on the intertidal region of the exposed sandy shore. In each transect, three quadrates (each with 0.0625 m²) were selected with a distance of seven meter between two successive quadrates. The sampling in each quadrate was carried out by observing stratified random sampling. Quadrates were placed on transect lines and sediment samples upto a depth of 10 cm were collected and removed from sampling grid with the help of spade and collected in sampling bags. Soil texture was carried out by the sieve analysis method described by USDA classification system (United State of Department of Agriculture). The sieves with 2 mm, 1 mm, 0.5 mm, 0.25 mm, 0.10 mm and 0.05 mm meshes were used to obtain the percentage composition of soil samples. A receiver had been kept at the bottom of all the sieves to collect the silt and clay particles. A 100 gram of air dried soil free from any foreign material was poured on the top sieve and whole assembly was shaken well. The segregated sand particles that retained on the each sieve and the receiver were gathered carefully and weighed to determine the percentage composition.

RESULT AND DISCUSSION

Soil characteristics

Percentages composition of soil is presented in Table.2.0. In general, the Mirya sandy shore under the present investigation composed mainly of sand with low percentage of silt and clay. The major composition of soil on the shore was sand which varied throughout the year from 93.84 to 98.56 %. The lowest and highest percentage values of sand were recorded in the month of March (98.56) and

season (3.27 %) respectively. At Mandovi sandy beach the recorded sand fraction were ranged such as, very coarse sand from 0.03 to 2.85 %, coarse sand from 0.02 to 4.01 %, medium sand 0.43 to 34.25 %, fine sand from 51.50 to 69.80 % and very fine sand from 5.05 to 54.92 %. Along the sandy beach of Bhatkarwada sand fraction like very coarse sand ranged from 0.01 to 4.72 %, coarse sand ranged from 0.03 to 2.04 %, medium sand 1.31 to 14.59 %, fine sand ranged from 61.32 to 74.82, and very fine sand ranged from 17.00 to 30.85, while silt and clay ranged from 0.50 to 2.94 %. The very coarse sand ranged from 0.01 to 14.59 %, coarse sand ranged from 0.02 to 1.84 %, medium sand ranged from 2.07 to 88.70 %, fine sand ranged from 45.20 to 70.44 % and very fine sand ranged from 13.20 to 37.85 while silt and clay ranged from 0.96 to 9.19 % along sandy beach of Rajwada [5]. In sandy shore of Mirya, the very coarse sand ranged from 0.06 to 10.20 %, coarse sand ranged from 0.31 to 2.93 %, medium sand 3.10 to 22.11 %, fine sand ranged from 46 to 74.40 %, very fine sand ranged from 2.30 to 36.50 % [6]. From east coast of Tamil Nadu, observed sand fractions were ranged from very coarse sand (0.25 to 0.5 mm), medium sand (1.25 to 2 mm), fine sand (2.25 to 3 mm), very fine sand (3.25 to 4 mm) and coarse silt (4.06 to 5 mm) respectively [7].

Table.2.1 - Variations in percentage composition of different sand fraction in the Mirya, sandy shore during 2011-2012

| Composition | Pre- monsoon | Monsoon | | | | | Post- monsoon | | | | | |
|------------------|-----------------|---------|--------|--------|--------|--------|------------------|--------|--------|--------|--------|--------|
| | | Mar-12 | Apr-11 | May-11 | Jun-11 | Jul-11 | Aug-11 | Sep-11 | Oct-11 | Nov-11 | Dec-11 | Jan-12 |
| Very coarse sand | 0.92 | 0.51 | 0.89 | 0.90 | 1.39 | 1.64 | 1.60 | 1.34 | 0.65 | 0.68 | 0.60 | 0.65 |
| Coarse sand | 13.70 | 12.28 | 11.51 | 11.17 | 10.67 | 11.26 | 11.34 | 11.77 | 11.42 | 10.40 | 8.61 | 9.15 |
| Medium sand | 10.29 | 10.95 | 15.27 | 15.55 | 17.56 | 16.83 | 16.09 | 15.73 | 16.54 | 17.84 | 18.81 | 18.15 |
| Fine sand | 69.74 | 71.16 | 66.60 | 65.76 | 61.15 | 61.24 | 62.76 | 62.81 | 64.76 | 64.85 | 65.34 | 65.31 |
| Very fine sand | 3.11 | 2.82 | 3.06 | 3.74 | 3.44 | 2.85 | 3.07 | 3.92 | 4.73 | 4.76 | 3.84 | 4.37 |

In the investigation period, the monthly silt content varied from 6.09 to 1.42 %. The maximum and minimum percentage values of silt were recorded in the month of September (6.09) and March (1.42) respectively. Among the seasons, the maximum percentage of silt (4.31) was recorded during the monsoon season and minimum (1.92) during the pre-monsoon season respectively. The clay content on

the shore varied from 0.01 to 0.08 %. The maximum and minimum percentage values of clay were recorded during June (0.08) and January (0.01) respectively. The values ranged from 0.02 to 0.04 %, 0.02 to 0.08 % and 0.01 to 0.04 % during pre-monsoon, monsoon and post-monsoon season respectively. The maximum percentage of clay (0.04) was recorded during the monsoon period and the minimum (0.02) during the post-monsoon period. During investigation of Mandovi beach at Ratnagiri recorded the composition comprising 92.86 % of sand while silt and clay fraction of 0.24 and 5.00 % respectively [8]. In present study also the similar results were recorded. The variations in silt and clay composition showed may be due to the geographical different in study area. From the beaches between Ovari and Kanyakumari, Southern Tamilnadu coast, it was observed that the soil are medium grained at low tide and high tide and this was due to the high wave energy conditions, causing the finer soil to be removed away [9]. At Kalbadevi beach, the composition of sand, silt and clay varied according to seasons on the beach. In which the sand content varied from 95 to 98 % during post-monsoon, 95 to 99 % in pre-monsoon and 98 to 99 % during monsoon. Similarly, the silt content varied from 0.5 to 3 % during post-monsoon, 0.01 to 3 % during pre-monsoon and 0.04 to 0.9 % during monsoon and the clay content varied from 0.8 to 2.5 during post-monsoon, 0.2 to 1.7 % in pre-monsoon, while it was from 0 to 0.01 % in monsoon. And the result revealed that the maximum sand composition was recorded during the pre-monsoon and post-monsoon season [10]. Along a Ratnagiri bay, the variations in soil texture were recorded and it varied from sandy silt (predominant silt) during pre-monsoon to silty sand (predominant sand) in post-monsoon [11].

CONCLUSION

The variation in soil texture was mainly attributed due to the south-west monsoon during (June to September), seasonal variations in the waves and wind force along the coast. The major composition of soil on the shore was sand followed by silt and clay which can help to understand the soil characteristics and the different types of fauna live on the substrate of Mirya sandy shore.

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