Sandy shore

Sandy shores or beaches occur along the margin of the coastal seas of the world having considerable wave action, where the sand particles are not allowed to settle by the action of tides and waves. Vast stretches of the shores of the seas are bordered by such beaches of sand, receiving full force of waves. As this area is highly influenced by the ceaseless incoming and outgoing tides with pounding forces of the breakers, and due to its continuous shifting nature of the bottom, this intertidal area becomes an unfavourable place for inhabitation by the marine benthos. Thus, a sandy beach, quite in contrast to the rocky shore, at first glance, do not show any life on the surface of the sand and almost barren in appearance during low tide period.

Substratum

While stability of the substratum is the most characteristic feature of the rocky shore, a labile substratum is typical of sandy shores. As most of the sandy shores are exposed to strong wave action, the substratum will naturally be unstable. Owing to this instability of the substratum, the beach varies in extent with the state of the tide, both from day to day, and in areas where the tidal cycle is very pronounced from fortnight to fortnight. Besides, there will be more pronounced changes throughout the year due to the increased wave action or with change in wave action which may remove most of the sand and thus these changes significantly modify the slope or profile of the beach.

During monsoon periods, extensive erosion of beach occurs due to the action of strong winds and waves. Such erosion of the beach causes the reduction of the width of the shores, which in turn affects the distribution of sandy shore animals. Due to the churning effects of waves, the infaunal organisms along with bottom sediments are disturbed and thrown into the upper levels of the beach or put them in suspension in the water. So, many of the forms are known to exhibit tidal migration and may move up and settle in the narrow beach. For example, bivalve species such as Donax incarnates, and D. cuneatus, the crustaceans such as the mole crabs of the genera Hippa, Emeritta and Albunea and the gastropods such as Bullia melanoides are known to exhibit such tidal migration. During the periods of calm weather, re-deposition of sand particles occur, which facilitate the re-establishment of fauna present at the normal period.

Besides the tides and waves, size of the particle or sand grains on the shore also influences the profile of the sandy shore; the larger the particle size, the greater will be the slope and finer the particle size, the lesser will be the slope. Thus, the steepest slopes are found on the shingle and coarse sandy beaches. Alternately, the sandy beaches with mild/moderate wave action will tend to have fine grains and slope of the beach will be gentle in nature and the width of the beach will be broader than the beach with steep slope.

The size of the sand grains also governs the amount of water that is retained by capillary action within the minute spaces between the individual grains of sand. In the coarse sandy beaches, the interstitial spaces of the grains are more, which cannot retain interstitial water in its spaces and

hence such beaches are devoid of any infaunal groups as there is not sufficient moisture inside the sand particles. In the case of fine grained beaches, the water is raised to a considerable height above the sea level due to the capillary action of the sand particles and thus more of infaunal organisms will be able to live as there is sufficient moisture in the sand particles even during the low tide period.

Apart from the size of the sand particles, its shape is also known to play a major role in the distribution of sandy shore fauna as it decides the suitability of the substratum for the burrowing forms. The newly formed particles with sharp edges are not the suitable substratum for burrowing animals as they create difficulties in the penetration or burrowing into the sandy substratum. The same is the case with the substratum with the particles of broken shells of molluscs and echinoid fragments.

In sandy shores, the seaweeds and the sessile macrofauna are completely absent as the substratum is not stable and constantly shifting in nature. However, the fine sand particles offer good scope for the inhabitation of some macrofauna as well as infauna called meiofauna or interstitial fauna as the soft sand particles are easy to penetrate and also allow good gaseous exchange, particularly oxygen, for the respiration of the animals.

Wave action

Wave action is the important physical factor in the sandy shore environment. Its role in the profile of the beach and sand grain size is of paramount importance as these factors are known to decide the suitability of the substratum for the inhabitation of the animals. Strong wave action also causes erosion of the beach, which leads not only to the reduction of width of the beach but also the dislodgement of the organisms from their original habitat. To prevent from being dislodgement, the sandy shore animals must either be adapted to burry rapidly or be adapted to burrow deeply. For example, while the former is possible, the fauna such as Donax cuneatus (wedge clam) and Emerita holthuisi (mole crab), are to known to live in the mid-littoral beach and possess the adaptation of burying rapidly into the sand to avoid desiccation due to exposure to air, when the incoming tides constantly stirring the bottom, most of the other animals are be able to burry themselves very deeply into the sand and live.

Temperature and desiccation

With regard to the effect of temperature, the conditions on sandy beaches are as similar as those on rocky shores. During the day time of low tide period, the broad area of the intertidal zone is exposed and the top surface of the sand gets heated up and this lead to the increase of temperature in the sand surface. This effect is there only up to a top few centimeters of the sand and below that depth the temperature of the interstitial water will be similar to that of the seawater in the sub-tidal belts. As most of the sandy shore organisms are good burrowers, they dig rapidly and penetrate deep into the sand when the surface becomes too warm. The problem

of desiccation is not felt by most organisms of the sandy shore because water is within their reach if they dig into the sand a little.