SANDY SHORE

INTRODUCTION

- 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

- As this area is highly influenced by the ceaseless incoming and outgoing tides with pounding forces of the breakers

- 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.

PHYSICAL FEATURES OF SANDY SHORES AND ADAPTATIONS OF ORGANISMS

1.SUBSTRATUM

- As most of the sandy shores are exposed to strong wave action, the substratum will naturally be unstable
- There will be more pronounced changes throughout the year due to the increased wave action which may remove most of the sand and thus these changes significantly modify the slope of the beach.
- Erosion of the beach causes the reduction of the width of the shores, which in turn affects the distribution of sandy shore animals.

- 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, Hippa, Emeritta and Albunea and Bullia melanoides are known to exhibit such tidal migration.

- size of the particle or sand grains on the shore also influences the profile of the sandy shore

- 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.

- 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 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.

- The newly formed particles with sharp edges are not the suitable substratum for burrowing animals as they create difficulties in the penetration into the sandy substratum.

- In sandy shores, the seaweeds and the sessile macro fauna are completely absent as the substratum is not stable and constantly shifting in nature.

- The fine sand particles offer good scope for the inhabitation of some macro fauna as well as in fauna called meiofauna or interstitial fauna.

2.Wave action

- Wave action is the important physical factor in the sandy shore environment.
- Strong wave action 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.

3.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.

- 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.

4.INSOLATION

- The effect of direct exposure of sandy beach to the sunlight may not create any problem as the surface sand particles act as an effective barrier to the temperature effect and deep layer of sandy substratum is not affected by high temperature.

- The sandy shore animals are able to burry deeply into the bottom, they are not affected by the problem of insolation, which lead to desiccation of the animals.

5.Salinity

- Salinity of the interstitial water usually approximates to that of the sea, except at the surface layers where the values may be high, owing to evaporation, or low as a result of freshwater influence.
- when a stream of freshwater passed over the surface of the intertidal sand, there would be a little effect on the salinity of the interstitial water at a depth of 25-30 cm, where it approaches the seawater.
- The animals living near the surface will have to burrow themselves to deeper levels to escape the adverse effects of lowered salinity.
- Many sandy shore organisms like the burrowing prawn Callianasa and Upogebia, which have only very narrow salinity tolerance (stenohaline)

6.OXYGEN

- Oxygen is never limiting in the water bathing the beach, because the turbulence of wave action ensures constant saturation.
- The water held in the beach changes in temperature and salinity and also contains oxygen, which is available to the organisms.
- This supply, however, is used up by the respiration of the organisms and must be replenished.
- In the fine-grained beaches and particularly protected sand flats, water interchange is slow and may result in reduced oxygen supplies.

ORGANISMS OF THE SANDY SHORE

THE SUPRALITTORAL FRINGE ZONE :

- It is populated by two main types of crustaceans, the ghost crabs (Ocypode spp.) in the tropics and the talitrid amphipods (beach hoppers) in the temperate regions
- sub littoral fringe, is occupied by anomuran crabs in the tropics and amphipod crustaceans in the temperate regions.
- The upper regions of almost all the sandy shores are occupied by the talitrid amphipods or ocypode crabs.

- Both these have much in common ecologically, being scavengers on animal or vegetable debris thrown by the tide and both are predaceous to some extent.

- Talitrus saltator of the temperate region can live an almost true terrestrial life like the littorines of the rocky shores.

- In India, crabs of the genus Ocypode viz. O. ceratophthalma, O. macrocera and O. platytarsis are very common.

- These crabs inhabit the dry sands just above the surf zone and lead an almost terrestrial life.

MID-LITTORAL REGION :

- This region possesses a dense fauna of amphipods such as Bathyporeia and Urothoe, and isopods like Eurydice.
- The amphipods, Bathyporea (Bathyporea pilosa , B. pelagica) and Urothoe are capable of both swimming and burrowing and they feed on minute particles of organic matter present in the intertidal water.
- The isopod, Eurydice is known to migrate shoreward when the erosion of beach occurs.
- Many polychaetes like Nephthys and Glycera are present in the mid-littoral zone.

- The sheltered sandy shores having some admixture of mud with sand is occupied by tubicolous polychaetes worms like Arenicola and Pectinaria. Arenicola .

- As Arenicola is a burrower consuming the deposit for food, the organic content and the particle size of the substrata are important factors governing their incidence.

- Pectinaria is another remarkable sandy shore form which builds a delicate, tusk-like tube, made of a single layer of fine sand grains cemented together.

- Lying buried upside down in the burrow, it excavates a conical depression in the sand with its head at the bottom and feeds on particles of food that slips into the depression, by picking them with the feeding tentacles.

- Besides these amphipods, isopods and polychaetes, the mid-littoral zone is occupied by a number of bivalve molluscs which are highly adapted for a life in sand.

- Of the many species known , the most important include Cardium, Donax, Tellina, Macoma, etc.

- They are all burrowers and are comparatively slim when compared to those in muddy shores.

- Tellina and Donax prefer clean sand while Macoma and Cardium live in more muddy sand.

SUB-LITTORAL :

- The most characteristic organisms of this region are anomuran crabs belonging to the hippidae (eg. Emerita) for the tropical shores and amphipods like Bathyporeia and Haustorius for the temperate seas
- Emerita holthuisi, E. asiatica and Albunea symnista are the anomurans, most common along the sandy shores of India, and they are all well-adapted to live in the wave-beaten shores.
- As the tide rises and falls, these crabs follow it so as to be located continuously in the region of the wave-wash.
- They burrow backwards facing the sea and lie buried, keeping only their plumose antennae outside.

- The sub-littoral fringe zone of the sandy shores is inhabited by a number of animals. These include many molluscs like Oliva, Harpa and Tonna.

- The characteristic mollusc of this zone is the razor clam, Ensis which is by far the most highly specialized of burrowing bivalves, having unique power of rapid downward movement

- The tubes of the sand-mason Lanice, a terebellid is a typical feature of the lower intertidal zone.

- The heart urchin, which is found near the low-tide level, is another burrower representing a unique instance of a sea-urchin adapting to burrowing life.

- Echinocardium is heart-shaped. With the help of the spines, they actively dig down straight to a depth of nearly 15-20 centimeters

- Other animals found in this zone include the worm-like sand cucumbers (Leptosynapta), enteropneusts (Saccoglossus, Ptychodera), sea-anemones (Peachia and Halicampa), the shrimp Crangon and shore fishes like Glossogobius.

- There are many other true marine animals which visit the intertidal sands mainly for breeding.

- E.g. king crabs, the grunion and the sea-turtles

- The female excavates a hole in the sand deposits the eggs which are soon fertilized by the males.

- These eggs are soon covered with sand by the action of waves.

- The grunion, Leuresthes tenuis of the California coast, visits the intertidal sandy shore for breeding.

- After breeding, the fish return to the sea. The eggs are covered with sand by the receding tide.

- It has been found that the breeding migration of this fish is well-correlated with the lunar cycle and that they lay the eggs only along the highest spring tide level, so that the developed eggs may be washed back into the sea by the next spring tide.

- The females of sea-turtles also perform such migration to the sandy shores to deposit their eggs.

- They excavate pits in the sand, bury their leathery-shelled eggs there and then return to the sea.

- The young after hatching crawl down and swim off.