ROCKY SHORE

INTRODUCTION

- Inter tidal areas having solid rocky bottom, large boulders and igneous rocks are called rocky coasts.
- Rocks provide a hard surface on which marine organisms can attach themselves.
- When the tide is out, the rocks are exposed and during this period large number of organisms such as seaweeds and other attached organisms are visible to the naked eye of the observer.
- A unique characteristic feature of the rocky inter tidal shore is the formation of zonation by various organisms with varying capacities to tolerate dessication and predation pressure.

ZONATION

SUPRATIDAL FRINGE ZONE

- This upper intertidal zone, also called wave splash or spray zone, is the area lying above the highest high-tide mark that gets moisture only by the ocean spray of crashing waves.
- This area is a transitional area lying between land and sea and is a harsh and inhospitable area where only a very few specialised organisms can inhabit.
- The organisms living in this zone include a few terrestrial animals that can tolerate salt spray and occasional immersion and also some marine organisms which can resist exposure and desiccation.

- E.g. gastropod snails (Littorina neritoides), encrusting black lichen (Verrucaria sp., Calothrix sp.,) crabs (Ocypode spp.,), sea-slater isopod (Ligia oceanica), acorn barnacle (Semibalanus balanoides) and occasionally flowering plants.

- The periwinkle snail (Littorina littorea) feeds on these algae in the upper intertidal zone.

- The snails scrape the algae off the rocks with their rasping teeth, called a radula.

- The scavenging sea-slater, Ligia oceanica is a nocturnal one and takes shelter in damp cracks and crevices during day time.

MID-INTERTIDAL ZONE

- Below the upper intertidal zone lies the mid-intertidal zone, which is the area between the high and low tide marks and also the largest of all the three intertidal zones.

- This area is occupied largely by barnacles, mussels, and seaweeds.

- Two common species of barnacles, the rock barnacle (Balanus balanoides) and the bay barnacle (B. improvisus), are found attached firmly on to the rocks by cementing or gluing so that the most powerful wave cannot dislodge them.

- At high tide, barnacles are covered by water. During this time, they filter feed on plankton and organic debris by rhythmically whipping their feathery cirri to capture food.

- When the tide goes out, the barnacles are exposed to air for several hours, so they shut their shells tight to prevent them from drying.

- The barnacle's sharp, overlapping shells also help to protect it from predators.

- Below the layer of barnacles lie seaweeds and a densely packed bed of mussels (Mytilus edulis, Perna viridis, P.indica etc.).

- Mussels attach to the rocks by means of byssal threads. The threads prevent the mussels from being dislodged by waves.
- The blue mussel (Mytilus edulis) is found along the Atlantic and Pacific coasts and is harvested and eaten by humans.
- The brown seaweed called rockweed (Pelvetia, Fucus) also lives in the mid-intertidal zone. When the tide is low, thick mats of rockweed can be seen hanging or draped over the rocks.
- The seaweed clings to the rocks by means of its holdfast pad.
- Rockweed provides cover for a variety of marine animals that live in and among the rocks, such as snails, limpets, small crabs, and worms.
- When the tide is high, rockweed floats near the surface, buoyed up by its gas-filled bladders.

ROCK POOLS

- Rock pools are found at all levels on the shore but the largest ones are generally found at the lower levels of the shore.
- The depth of rock pools ranges from a few centimetres to a few meters, but all must contain some permanent water to designate as rock pool.
- The environmental conditions are most suitable in the rocky pools in comparison to other habitats of littoral zone.
- The forms found in these pools are sponges, hydroids, sea anemones, bryozoans, copepods, snails, limpets, mussels and tunicates

LOWER INTERTIDAL ZONE

- Below the bed of mussels lies the lower intertidal zone, which is dominated by seaweeds.
- The red seaweed commonly known as Irish moss (Chondrus crispus) grows like a thick carpet over the rocks in this zone.
- When the tide is low, spaces between the rocks retain water, forming small habitats known as tide pools.
- Tide pools are like natural aquarium tanks that contain algae, invertebrates (such as snails and crabs), and small fish.

SUB-TIDAL ZONE

- Below the lower intertidal zone is the underwater sub-tidal zone.
- Sea urchins eat giant kelp, the biggest seaweed in the ocean, by feeding on its holdfasts.
- The movement of the sea stars is dictated by the tides. When the tide comes in, the sea stars move from the sub-tidal zone to the intertidal zone to feed on the mussels.
- There is also a variety of sea anemones, as well as crabs and lobsters, hiding in the rock crevices
- Predatory fishes that come from the open ocean, prey on the abundant invertebrates.

ADAPTATIONS OF ROCKY SHORE ORGANISMS

1. RESPIRATION AND DESICCATION

- Sessile organisms may select a suitable environment for attachment. This may include a tide pool, the underside of a rock, a depression in the rocks or sand, or under an algal canopy.
- Aggregation helps reduce exposed surface area (sea anemones) and helps retain a film of water to prevent desiccation.
- Using discarded shells and sediment as a cover to reduce exposure (sea anemones, sea urchins).
- Closing up the shell (bivalves, barnacles).

2. Wave action

- Moving out of the impact zone: Many organisms can move to positions between or under rocks, or even move into other areas to escape severe wave action
- Making depressions and burrows: Some organisms actually, by mechanical or chemical means, make depressions in rocks (chitons and sea urchins)
- Attaching to the substrate: many animals and plants use attachments to keep from being washed away with the waves
- Having a low, thin, streamlined profile: is adopted by many intertidal animals so that water will flow over their shells/bodies
- Bending with the waves: flexibility permits bending with the force as well as dispelling secondary drag currents.

3. PHYSIOLOGICAL ADAPTATIONS

- Temperature: Organisms exposed at low tide are subjected to a wider range of temperatures than they would be if continuously covered by water.

- Survival is enhanced by being physiologically able to withstand large temperature ranges (eurythermal) and by evaporating water to remove heat.

- Salinity: Organisms living in the intertidal region must withstand greater extremes of salinity than organisms from other environments; evaporation during warm summer days causes the tidal pools to become more salty, while precipitation decreases the salinity of a tide pool.

- Oxygen: Exposed tide pools may become depleted of oxygen.

- Similar physiological and behavioral adaptations discussed above allow for survival during long periods without new seawater.

- pH: Sea water has a phenomenal ability to continually absorb acid without changing pH.

- This is particularly helpful to tide pool organisms stranded for long periods without new ocean water

4. FEEDING ADAPTATIONS

- Intertidal organisms obtain food by the same means as other marine organisms (grazing, preying, filter - feeding, scavenging), but many of them have less time to get their food.

- An example of this would be the barnacles and other filter feeders, which feed only when covered by water.