

SANTA MONICA BAY'S ROCKY SHORE HABITAT

The Rocky Shore Habitat is the intertidal zone that makes up tidepools and other rocky borders of the ocean. Depending on the day and how high the tide is, the rocky shore may either be completely covered with water or completely exposed to the air. Rocky Shore Habitat can be broken down into three zones—depending on how much time each area spends underwater.

First, you have the **splash/spray zone**. While this area is never completely submerged, it is kept moist by splashing waves. The plants and animals found here are adapted to withstand exposure to air, high temperatures, and direct sunlight. Lichens thrive here and can absorb water to survive through the long dry periods. Small tufts of filamentous green algae and small clumps of brown algae create pastures, which are grazed on by periwinkles, limpets, and some shore crabs. The Periwinkles (*Littorina* sp.) that live in the splash zone can breathe air like land snails, so they can live out of the water for months at a time. Many terrestrial predators such as raccoons, rats, and shorebirds visit this area.

Next comes the **middle intertidal** zone. This habitat is submerged and uncovered by the tides on a regular basis. The highest parts of this zone may only be under water during extremely high tides. You can identify the uppermost border of the middle intertidal zone by looking for a group of acorn barnacles (*Balanus* sp. and *Chthamalus* sp.). These species are more resistant to drying out and can tolerate more sun and air exposure than other middle intertidal species. In the lower range of the middle intertidal, acorn barnacles are preyed upon by whelks (whelks can't tolerate the air and sun as well as acorn barnacles, so they can't travel as high up in the middle intertidal zone to feed). Where the barnacles taper off, mussels begin. Like the barnacles, the lower reaches of their range is dictated by how far up their predators can travel – in this case, the sea stars (*Pisaster*). Factors such as pattern of tides, steepness of the shore, wave exposure, predation, competition for space, and larval settlement all dictate how organisms will distribute themselves throughout this zone.

The **lower intertidal** zone is immersed most of the time, so there isn't as great of a risk of drying out. This makes it easy for the whelks and sea stars to feed, resulting in very few mussels and barnacles. The lower intertidal is dominated by seaweeds. There are thick mats of red, brown and green algae. Green sea anemones (*Anthopleura* sp.), crabs, fish, snails, and sea urchins are also abundant.

There are specific adaptations animals have developed to withstand some of the harsh realities of life in the Rocky Shore habitat. Withstanding the tidal changes, and accompanying air and sun exposure, the force of crashing waves, variations in salinity and competition for space means that these animals must be able to adapt. Some animals can drill down into the rock, thus creating holes that protect them from exposure, but most attach themselves to the rocks themselves. Barnacles secrete a special cement, mussels use byssal threads (strong threads comprised of proteins secreted by the foot), and sea stars will use their suction cup tube feet to adhere to the rock.

PROTECTING THE ROCKY SHORE

Unfortunately, while these animals have adapted withstand the forces of nature, they are not able to protect themselves from us. Tidepools are magical, and many of us have fond memories of watching the animals in them for hours as children. But too many people accidentally step on small organisms, or collect them for food or as souvenirs. Many rocky shore habitats have been severely impacted by these practices and therefore regulations by Department of Fish and Game make it illegal to collect organisms from this habitat without a valid collection permit. However, even though laws protect the tidepools, there is very little enforcement.

ROCKY SHORE ANIMALS

Bat Star (*Asterina miniata*) - Echinoderm

Habitat: Usually found on rocks or on gravel/sandy bottoms near rocks. Low intertidal to 300m.

Size: 20cm

Food: Feeds on microorganisms on rocks and algae. Omnivore often found scavenging for dead material.

Interesting Facts:

- At times this star is seen with its stomach extended as it walks, “sweeping” the substrate
- There is a type of (polychaete) worm (*Ophiodromus pugettensis*) that often lives in the grooves by a bat star's mouth. The worm feeds on scraps that the bat star leaves behind while feeding
- Many sea stars (including the bat star) can regenerate a lost arm. Sometimes, if enough of the body is left with the arm, the arm will grow into a whole new sea star.

Purple Sea Urchin (*Strongylocentrotus purpuratus*) - Echinoderm

Habitat: Usually found on rocky reefs and rocky intertidal zones. subtidal to 160m.

Size: 5-10cm

Food: Feeds on red and brown algae, including Giant Kelp (*Macrocystis*).

Interesting Facts:

- Due to lack of predators the purple sea urchin seriously impacts kelp bed populations by devouring holdfasts and creating urchin barrens.
- Horn sharks that feed on a diet that contains a significant number of sea urchins will eventually grow purple horns and teeth.
- Urchins have 5 teeth called Aristotle's Lantern

California Mussel (*Mytilus californianus*) - Mollusk

Habitat: Attached in massive beds on surf-exposed rocks and wharf piles, mainly in uppermiddle intertidal zone

Size: Shell up to 130 mm

Food: Suspended food particles filtered out of the water

Interesting Facts:

- Mussels filter on average 2-3 liters of water per hour when feeding and is also one of the most common invertebrates on surf-swept rocks along California shores
- These animals are firmly “rooted” to rocks and each other by “byssal threads” which are secreted by the byssal gland
- Medical and dental researchers, seeking an effective underwater cement, have looked at byssal fiber formation

Ochre Star (*Pisaster ochraceus*) - Echinoderm

Habitat: Middle & low intertidal zone on rocky shores

Size: Arm radius to 14 cm

Food: mussels, snails, limpets and chitons

Interesting facts:

- Among the various mollusks eaten by the ochre sea star, numerous species have evolved avoidance responses or escape responses that reduce predation on them. The animals move away when they are touched by the sea star, but some animals detect a scent given off by the ochre star & are stimulated to move away.
- The ochre sea star inserts its stomach into mussel shells or into slits as narrow as 0.1mm between the shells of bivalves

Striped Shore Crab (*Pachygrapsus crissipes*) – Arthropod

Habitat: Crevices, tidepools, and mussel beds, high and middle intertidal zones on rocky shores

Size: Carapace up to 47 mm

Food: Feed on algae and diatoms growing on rocks in higher pools and crevices and also dead animal matter and detritus.

Interesting Facts:

- This crab is adapted to living outside of water for long periods of time. Water is retained in the gills when the crabs are above the surface.
- These crabs have been observed catching flies
- Predators include sea gulls, rats, raccoons, and humans
- These crabs have excellent vision

Green Abalone (*Haliotis fulgens*) - Mollusk

Habitat: Usually found on rocky reefs. Subtidal to 10m.

Size: 20-25cm

Food: Feeds on brown and red drift algae (pieces of *Macrocystis* and *Eisenia*)

Interesting Facts:

- All abalone species are protected by the state of California by strict regulations of take/possession.
- The abalone is actually a type of giant snail
- Green abalone and many other algae eating snails have what is called a “radula” or rasping tongue with little teeth-like structures that help it scrape algae off rocks
- On average, female abalones lay 2-3.5 million eggs per year.
- The main predator (other than humans) is the octopus.