

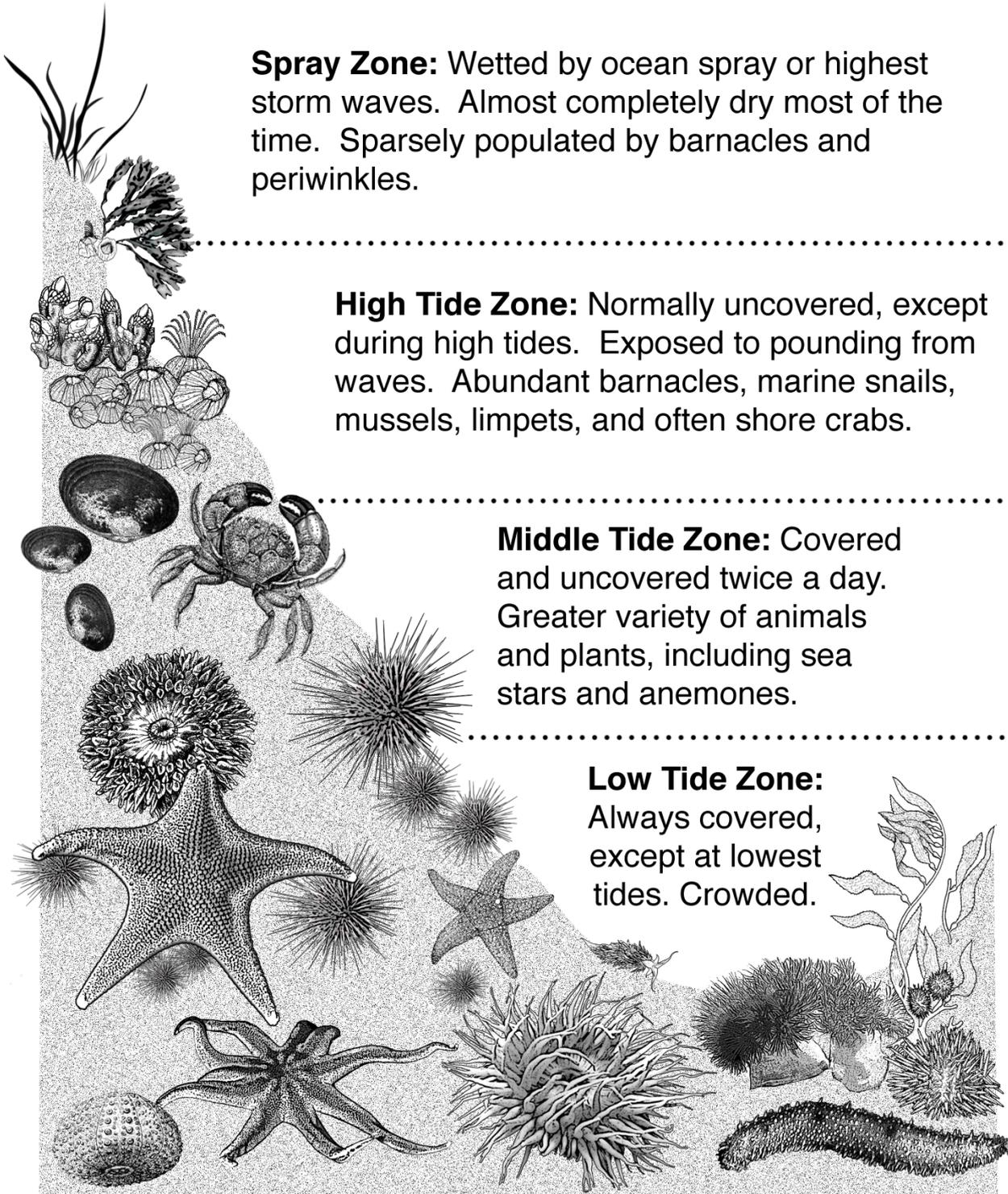
## Intertidal Zones

**Spray Zone:** Wetted by ocean spray or highest storm waves. Almost completely dry most of the time. Sparsely populated by barnacles and periwinkles.

**High Tide Zone:** Normally uncovered, except during high tides. Exposed to pounding from waves. Abundant barnacles, marine snails, mussels, limpets, and often shore crabs.

**Middle Tide Zone:** Covered and uncovered twice a day. Greater variety of animals and plants, including sea stars and anemones.

**Low Tide Zone:** Always covered, except at lowest tides. Crowded.



## Cnidaria (stinging animals)



### **Green anemone** (*Anthopleura anthogrammica*)

The green anemone is mainly an outer-coast species. Microscopic algae live symbiotically inside this anemone, give the anemone its green color, and provide it with food from photosynthesis. The green anemone can be solitary or live in groups, and are often found in tidepools. This anemone only reproduces sexually. Touch the anemone very gently with one wet finger and see how it feels!



### **Aggregating anemone** (*Anthopleura elegantissima*)

The aggregating anemone reproduces both sexually and asexually. It reproduces sexually by releasing eggs and sperm into the water. To reproduce asexually, it stretches itself into an oval column, and then keeps “walking away from itself” until it splits in half. The two “cut” edges of a half-anemone heal together, forming a complete, round column, and two clones instead of one. Aggregate anemone colonies are known for fighting with other colonies of these asexually-produced clones. When different clone colonies meet they will attack each other by releasing the stinging cells in their tentacles. This warfare usually results in an open space between two competing clone colonies known as “a neutral zone”. Aggregate anemones also house symbiotic algae that give the animal its green color. The rest of the food it needs comes from prey items captured by the stinging tentacles such as small crabs, shrimp, or fish. Genetically identical, clones can colonize and completely cover rocks. Be very careful when walking on the rocks...aggregating anemones are hard to spot at first and look like sandy blobs. Watch where you step so you don't crush anemone colonies.



## Arthropod (joint legged animals)



### Acorn barnacles (*Balanus glandula*)

Acorn barnacles are some of the most common in the Pacific Northwest. They are found in high and mid-intertidal zones. In most adult barnacles, the sides and back of the animal are protected by five or six calcareous plates. They also have an “operculum” or openable covering made of two movable shell plates. The modified legs (cirri) of the barnacle extend out of this opening to snag their tiny planktonic food. The operculum can be closed to protect the barnacle from predators, from fresh water, and the drying conditions of exposure at low tide. Although the shells are hard, you can destroy them by walking over barnacle patches—please avoid stepping on them if possible.



### Thatched barnacle (*Semibalanus cariosus*)

This is the largest of the three common intertidal barnacles, and usually taller than wide, and darker than the acorn barnacle. This is the dominant barnacle at the lower intertidal zone.



### Goose barnacle (*Pollicipes polymerus*)

Goose barnacles have gooseneck-like flexible stalks, and can withstand pounding surf. They are found on open ocean coasts in intertidal areas. This barnacle is found in association with the California mussel.

## Arthropod (joint legged animals) continued



### **Kelp isopods** (*Idotea wosnesenskii*)

Isopods are commonly found hiding in algae and kelp and under rocks. Isopods come in a variety of colors that often match their habitat and can often be hard to spot! Isopods (equal legs) are primarily marine, although backyard pill bugs are terrestrial isopods. All females have a pouch in which the eggs and young are carried. Some species can roll into a ball like a pill bug, while others like these, do not. Most isopods feed on decaying algal matter. Look carefully on seaweed where they often attach.



### **Purple shore crab** (*Hemigrapsus nudus*)

The purple shore crab is normally dark purple, but olive green or reddish brown animals are not uncommon. It is similar to the **hairy shore crab** (*hemigrapsus oregonensis*), but the hairy has small hairs on the legs, and the purple shore crab sometimes has purple or red spots on the claws. It is found under rocks and among seaweed in the intertidal zone, and can often be found with hairy shore crabs in rocky habitats. It feeds mainly on seaweed, but also eat barnacles. Its main predators are shorebirds, gulls, and other birds. Be very careful when turning over rocks, so you don't crush them or destroy their habitat.



## Arthropod (joint legged animals) continued



### **Dungeness crab** (*Cancer magister*)

The Dungeness crab is common in the Pacific Northwest. This large crab (to 20 cm or 8 in) is mainly a sub-tidal species that is an important Native food fishery, and popular as a recreational and commercial crab. This carnivorous crab feeds on at least 40 different species, including small bivalves, worms, fish, and shrimp. It has a red-brown to purple shell, with spines on the front edge. It also has a spine at each side of the widest spot on the carapace. Other predators include fish, other Dungeness crabs, and the sea otter. Please be careful where you step—they often hide under a thin layer or sand or in the seaweed.



### **Graceful Decorator Crab** (*Origonia Gracilis*)

The Graceful Decorator Crab is a small intertidal crustacean growing to about an inch and a half. This crab hides by attaching bits of its environment— usually pieces of kelp and sponge— to special hooked setae (hairs) on its back. When the crab molts, it takes its decorations off the old shell and adds them to the newly grown shell.



### **Hermit crab** (*Pagurus spp.*)

There are a number of hermit crab species that can be found along outer coast beaches. Most are small, between one and three centimeters (under 1 in. long). Food for hermit crabs includes non-living organic matter and some scavenging. Different species use different species of snail shells for protection. As a hermit crab grows, it moves to successively larger shells. The hermit crab is on the constant lookout for new shells, even those being used by other hermit crabs! Shell exchange and competition is part of everyday life for hermit crabs. Please leave all snail shells on the beach—they could be future homes for hermit crabs.

## Mollusks (soft bodied animals)



### Periwinkle and other marine snails

Marine snails are some of the most familiar Mollusks. There are two species of periwinkle snails in our area – the Sitka (*Littorina sitkana*) and checkered periwinkles (*Littorina scutulata*). Both are grazers on seaweeds. The Sitka lays eggs in a jelly mass attached to the rocks and the young are not planktonic. The checkered releases tiny Frisbee-like structures, each with a few eggs, into the sea and the young are planktonic. They are found on seaweed or on rocky shores in the high and middle intertidal zones. You will often find them high up on shore out of water.



### Whelks or dogwinkles

Dogwinkles are predators on barnacles and mussels. Three species are common on the intertidal coast. The emarginate dogwhelk or rock whelk (*Nucella emarginata*) uses its radula to drill holes in barnacles, mussels, limpets, and other snails. Predators include the red rock crab and purple sea star. Their eggs are eaten by some isopods, fish, and purple shore crabs



### Pacific blue mussel (*Mytilus trossulus*)

These mussels are found in quiet, sheltered areas in the mid-intertidal to subtidal water to 40 meters (132 feet) deep. Mussels produce sticky threads called byssus, that attach to rock substrates. Mussels are filter feeders and eat plankton. Although they are called blue mussels, they also vary in color from tan to brown as shown here. By growing in these tight clusters, they create their own mini ecosystems that help reduce water loss at low tide. They are often found totally covering rocks where you walk, so please step carefully.

## Mollusks (soft bodied animals) continued



### Clams

Clams have two shells attached by a hinge and two siphons. They feed through a siphon by channeling water and plankton inside the clam where the gills filter out food and absorb oxygen. The filtered water is then passed out through the other siphon opening. The finger-like projections on this clam help to keep out unwanted objects; not all clams have these finger-like projections. Look carefully in the sand or gravelly areas, and you can often see the siphons sticking out from the surface.



### Limpets

Limpets are one-shelled, cone-shaped Mollusks. There are a number of intertidal limpets that look like shields. They are grazers on algae and most are found in the high intertidal area. They are known for their great homing skills. Predators include sea stars, birds, crabs and fish. They are often found along with barnacles, mussels, or whelks on rocks.



### Chitons

Chitons are oval, flattened animals that have eight overlapping shell plates bound together by a leathery girdle. The plates are jointed so that the chiton can roll up into a ball when disturbed. This likely makes it more difficult for predators such as the sea star to get a good hold of the chiton. Some chitons are also often covered with algae, barnacles, and other organisms that attach to the shells. This species is common in intertidal areas, and feeds on algae. You can damage chitons by removing them from rocks—enjoy looking at them and don't try to pry them off.

## Mollusks (soft bodied animals) continued



### **Sea Lemon** (*Anisodoris nobilis*)

This common nudibranch called sea lemon feeds on sponges, and is found in intertidal areas to 225 meters (750 feet) as well as on rocks and sponges. They look like a slice of lemon with small black spots. Two horn-like projections can be seen at the front, with a cluster of gills in the back. The sea lemon has a fruity odor—be sure to smell it when looking up close!



### **Giant Pacific Octopus** (*Octopus dofleini*)

The Giant Pacific Octopus is the largest species of octopus in the world, averaging 16 feet from arm tip to arm tip. Giant Pacific Octopus is generally associated with deeper water- it has been found at depths as great as 5,000ft, but it may come into the intertidal area to look for food. Capable of changing the color and texture of its skin, this animal is master of camouflage and can blend in with any background. Lucky beach goers may find one hiding in a tide pool in the low tide zone. Be careful and do not handle. Though the Giant Pacific Octopus is not considered an aggressive animal, it will defend itself. Each octopus has a sharp beak, capable of breaking crab shells (one of its many food sources). Once it bites, it releases an enzyme that dissolves tissue, including human skin and muscles.

## Echinoderms (spiny-skinned animals)



### **Purple Star or Ochre Star (*Pisaster ochraceus*)**

Purple or Ochre Stars are one of the most common sea stars found in the intertidal zones and a major predator. Once they detect their prey (usually a clam or mussel), the sea star attaches its tube feet to the shell, and positions itself to be able to pull on the shell with their tube feet from opposite sides. Once the shell is open, the sack-like stomach is extruded from its mouth, and enters the shell through a gap about the thickness of a credit card! The digestive juices from the stomach dissolve the flesh of the prey, in essence making a “bivalve shake” that is absorbed by the stomach.

You can gently touch a sea star to feel their spiny skin, but please never try to pull a sea star off any surface. Doing so can rip off their feet!



### **Purple sea urchin (*Stonglylocentrotus purpuratus*)**

Red, purple and green sea urchins are common in the low and sub tidal zones where wave action is less severe. During low tide, you can find them in tide pools or damp surfaces where they scrape off and eat algae, especially kelp. They also crawl into cup-like depressions in the rock made deeper by sea urchins over many generations. Sea urchins have a hard shell called a test, and spines that are attached by a ball and socket joint. This joint allows the spines to move in many directions which help the sea urchin defend itself. Sea urchins also have tube feet and pincer-like parts called pedicellaria. Be careful handling these animals. The tube feet will suction onto surfaces. Forcefully pulling a sea urchin off a rock could injure it, making life harder for the sea urchin.



## Fish



### **Tidepool sculpin** (*Oligocottus maculosus*)

As suggested by its name, the tidepool sculpin can commonly be found in tide pools at low tide. Its gray to brown coloring with the five dark saddles on its back allow the sculpin to hide amongst the rocks. Also, the tidepool sculpin can only grow up to 3 1/2". Its size along with its color make it a hard animal to spot. Some tidepool sculpin will use their sense of smell to return to the same tidepool each time the tide goes out.

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