Monterey Bay

Monterey Bay National Marine Sanctuary

Much of the northern California coast is rocks and cliffs. The ocean water is very cold all year. During the winter and spring, huge waves from the Pacific Ocean crash on the rugged shore. Can anything live in this difficult environment?

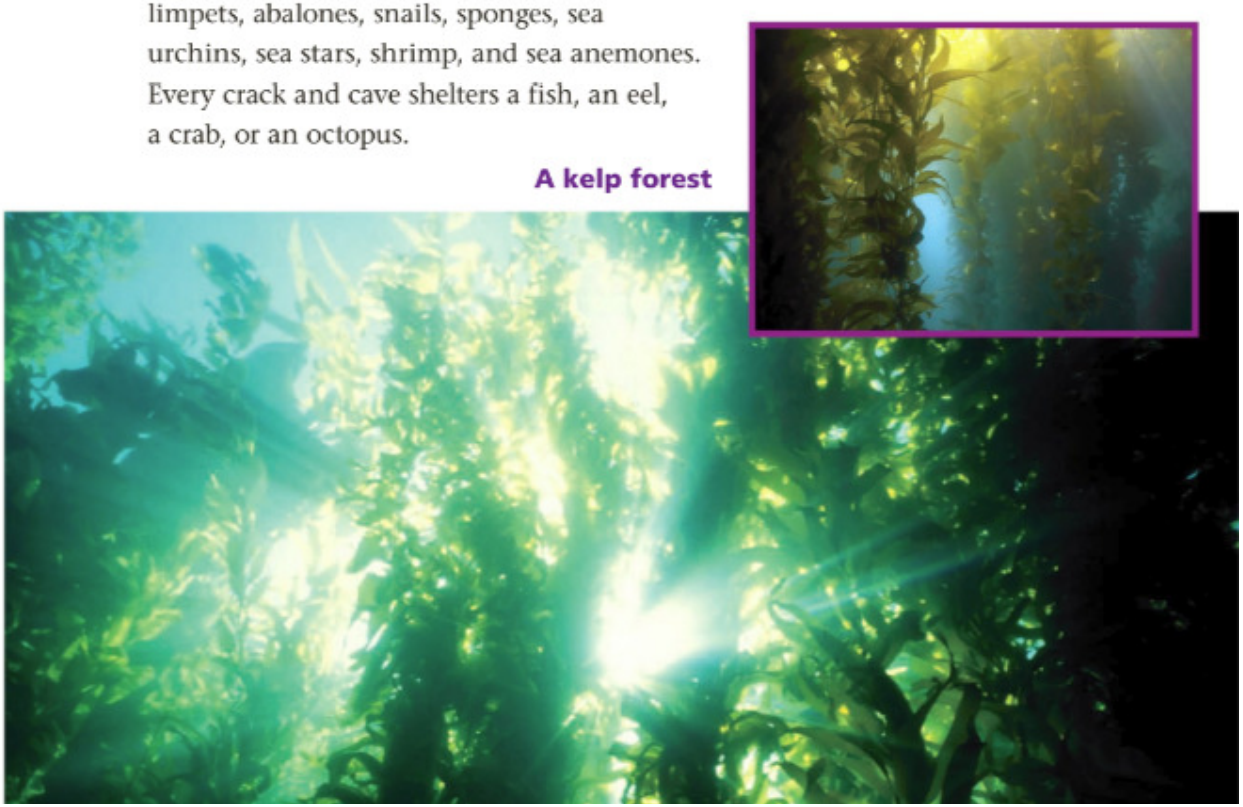
The answer is yes. The northern California coast is one of the most diverse and productive ecosystems on Earth. Thousands of different kinds of organisms live and interact in the cold ocean water. This ecosystem is protected in the Monterey Bay National Marine Sanctuary. *Marine* means "ocean" or "sea." A sanctuary is a protected place. This is one place where scientists can study the interactions between ocean organisms and their environment.

The Kelp Forest

Giant kelp grows in most of the 15,783-square-kilometer (km) sanctuary. Kelp looks like a plant, but it is actually algae. Like plants, algae make their own food.

Giant kelp are anchored to the seabed and reach clear to the ocean surface. In some places, the distance is more than 100 meters (m) to the surface. This makes the kelp taller than the tallest trees. For this reason, the California marine ecosystem is often called the kelp forest.

Like the rain forest, the kelp forest has a floor, an understory, and a large canopy. The canopy spreads across the water's surface. But, unlike the rain forest, most of the organisms do not live in the canopy. Most live in the understory and on the floor. Every bit of the rocky bottom has animals clinging to it. These include clams, scallops, mussels, barnacles, limpets, abalones, snails, sponges, sea urchins, sea stars, shrimp, and sea anemones. Every crack and cave shelters a fish, an eel, a crab, or an octopus.



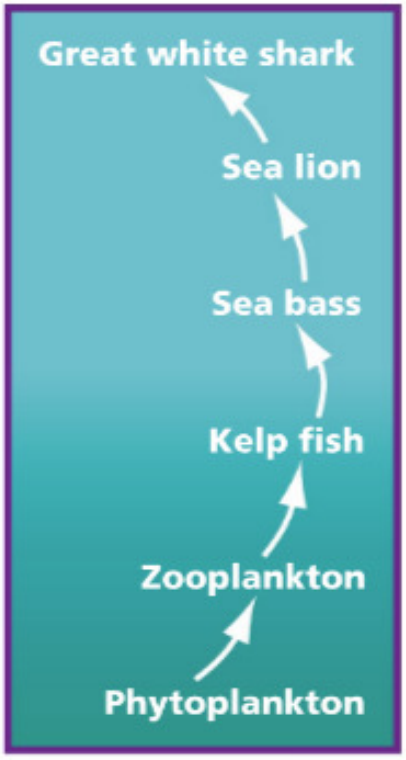
A kelp forest

Fish live in the understory. There are small fish such as anchovies and sardines, medium-sized fish such as sea bass, snappers, and perch, and large fish such as groupers and sharks. The California state marine fish is the bright orange garibaldi. It also lives here. Other animals found in the understory are squids, jellyfish, seals, sea lions, and gray whales.

The canopy provides shelter for a number of small animals that live on and around the kelp. These include snails, crabs, barnacles, and kelp fish. The canopy is a resting and hunting place for sea otters, seabirds, gulls, terns, ospreys, and ducks.

Where do all these animals get the food they need to survive? Like all ecosystems, the kelp forest depends on producers. The giant algae provide matter and energy to the ecosystem, but only a small amount. Microscopic phytoplankton are the most important producers in this ecosystem. These tiny producers (the grass of the sea) are eaten by **zooplankton**. Zooplankton are eaten by baby fish (kelp fish), clams, crabs, and thousands of other organisms. Small fish and crabs are eaten by larger fish (sea bass). The food produced by the phytoplankton eventually feeds the sea lions and sharks at the top of the food web. Marine bacteria decompose all the dead organisms in the ocean ecosystem.

An orange garibaldi



Monterey Bay food chain

Competition for Resources

There is a lot of competition for phytoplankton in the marine ecosystem. The zooplankton that have the best structures for catching phytoplankton will be most successful. This is one example of competition for food.

There is also competition for space. Waves and currents are very strong in the coastal environment. Many organisms must attach firmly to a solid surface or be washed away. The rocky bottom of the ocean is completely covered with organisms.

Kelp forest organisms compete for shelter. Caves, cracks, and old shells are used as hiding places. There is life-or-death competition for places to attach and hide.

This is a hermit crab. Hermit crabs live in empty snail shells. What kind of competition do you think they have in the ecosystem?

Thinking about Marine Ecosystems

1. What do you think happens to waste and dead animals in marine ecosystems?
2. What is the most important producer in both freshwater and marine ecosystems?
3. Identify three ways organisms compete in marine ecosystems.