

Voyager

F o r k i d s o f a l l a g e s

It's a marine jungle out there—filled with lush and exotic life—dotted along the California coast.

These jungles, or “tide pools,” are rocky areas on the edge of the ocean that are covered and uncovered daily by the ocean. The creatures that call tide pools home are hardy animals that are able to endure the extreme conditions created by the changing tides each day. Twice a day plants and animals are covered with water at high tide; twice a day they are exposed to the air at low tide.

When the curtain of waves pulls back at low tide, this is the best time to sneak a peek into this amazing marine jungle. It's packed with more life than the underside of the best rock you've ever turned over, but it's somehow less creepy.

TIDE POOLS

A Rocky Life at the Edge of the Sea

By Memorie Yasuda

high tide

Colorful inhabitants of the tide pools—an orange brittle star, the brightly colored sea slug, and the emerald-green surf grass.

A Vertical Pattern To It All

Tide pools can be subdivided into three vertical zones. Different kinds of organisms tend to live in each zone. Those that live in the highest zone are able to survive the greatest exposure to air, while those that live lower down must face nearly constant flooding and beatings by waves. In all zones, living things must constantly battle each other for space and food.

Supratidal Zone

The supratidal zone is moistened by the splash and spray from the waves below on most days. It is flooded only a few days of the year during the very highest tides. This is a tough environment whose inhabitants must withstand both the challenges of the sea, like salt water and waves, and the challenges of the land, like freshwater, and the drying effects of wind, air, and sun. Dime-sized periwinkles, acorn barnacles, and limpets are common creatures here.

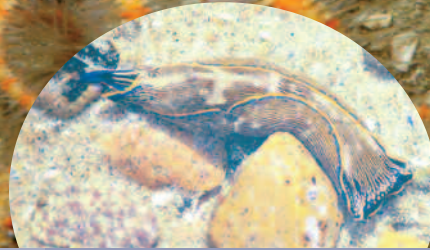
Intertidal Zone

The intertidal zone is covered twice a day by the high tides. Many different types of organisms live here, and some of their complex interactions have only recently become known. Gooseneck barnacles and mussels live toward the top of the zone, where it is the driest; sea anemones live in the middle; and sea stars stay toward the bottom.

Within the intertidal zone, many different microenvironments exist: small depressions or larger crevices between rocks, shadier or sunnier places, protected pools of water, and even pockets of sand. Each provides a special niche for the less common organisms you may see. Regular disturbance by waves and increased competition are special challenges in this zone.

Subtidal Zone

The subtidal zone lies underwater most of the time, except on the few days of the year during the very lowest tides. At this time, this area is accessible and you can see large solitary anemones, sea stars, and sea urchins. Surfgrass—stringy, bright emerald-green marine grass—is found in this zone as well as algae and seaweed. Waves and keen competition are still challenges in this zone, but it also faces the threats common to more open marine environments.



TIDE-POOL SURVIVAL GUIDE



Protection from the Surf

No matter which zone a plant or animal lives in, they are continually pounded by incoming waves. To protect themselves, some animals such as barnacles and mussels need a strong shell and may attach themselves to the sturdy surfaces of rocks. Animals like the crab cram themselves into cracks or flatten themselves underneath rocks. The clever blue-banded hermit crab scouts around for the discarded shells of turban snails to claim as its own. Some animals such as sea urchins and chitons can dig depressions in solid rock.



Protection from the Drying Air

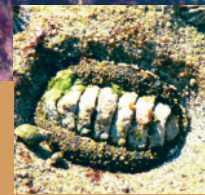
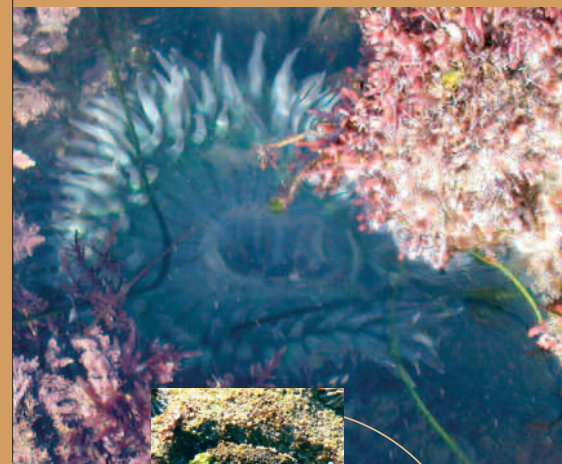
Creatures that live in the zones exposed to the sun and wind during low tide must keep from drying out. Mussels close up, barnacles retreat into their shells, limpets go home to their favorite-fitting depression, and periwinkles close the entrances to their shells. For an extra seal, the periwinkle adds glue to the edge of its shell where it meets the rock of the tide pool.

Finding a Place to Live

Everyone wants to live at the shore on sturdy ground. For animals, tide pools offer fresh food, shelter, and oxygen; for plants, they provide rich chemical nutrients and sunlight. But even tide pools with all their nooks and crannies have a limited amount of space to offer their inhabitants. Finding an unoccupied place can be a battle for any young marine creature, such as floating larvae looking for a place to settle. Plants and animals live next to, above, beneath, inside, and oftentimes on top of one another. Inhabitants like neighboring colonies of sea anemones engage in constant battles with one another to defend their territory.



Left, top to bottom, Dark mussels and white gooseneck barnacles; blue-banded hermit crab living in the shell of turban snail; commercially harvested red sea urchin; and depressions scraped into rocks by tide-pool inhabitants. Right, top to bottom, Solitary green sea anemone; chiton inside a depression on a rock; and orange-colored encrusting sponge attached to a rock.



How Much Can You See In a Visit?

If you keep going back to a tide pool and look carefully, you'll see new things each time. Some things you'll only see once in a lifetime. As time goes by, you might see less and less because there may be fewer things left.

Abalone were once abundant in tide pools, although few remain today. They used to be easily accessible at low tide in the intertidal zone. People liked them for their beautiful pearly shells and their tasty meat. As people noticed they were disappearing, laws were created to protect them, but their recovery is still uncertain many years later.

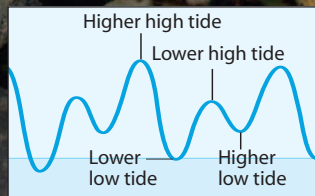
It's difficult to know whether the number of living things is changing over time, especially when the change is very gradual. For example, it would be very difficult to notice one missing jelly bean a day from a full candy jar. But even that slow loss is sure to result in an empty jar one day. Early on, the loss is hard to detect but easier to fix. Later on, the loss is obvious but much more difficult to fix. Unlike jelly beans, tide-pool inhabitants' populations must slowly be restored.

Scientists at Scripps monitor tide pools and other coastal environments to see how many "jelly beans" are being taken out of their "jar," the ocean.

Scripps scientist Paul Dayton has been monitoring tide pools for decades. As a result of his research and the work of others, many marine animals including abalone have been protected from exploitation by people. Entire populations of edible shell animals, such as mussels, clams, and abalones as well as gourmet favorites such as lobsters, crabs, and octopuses, are in danger of becoming scarce. Overfishing of these species can upset delicate food webs.



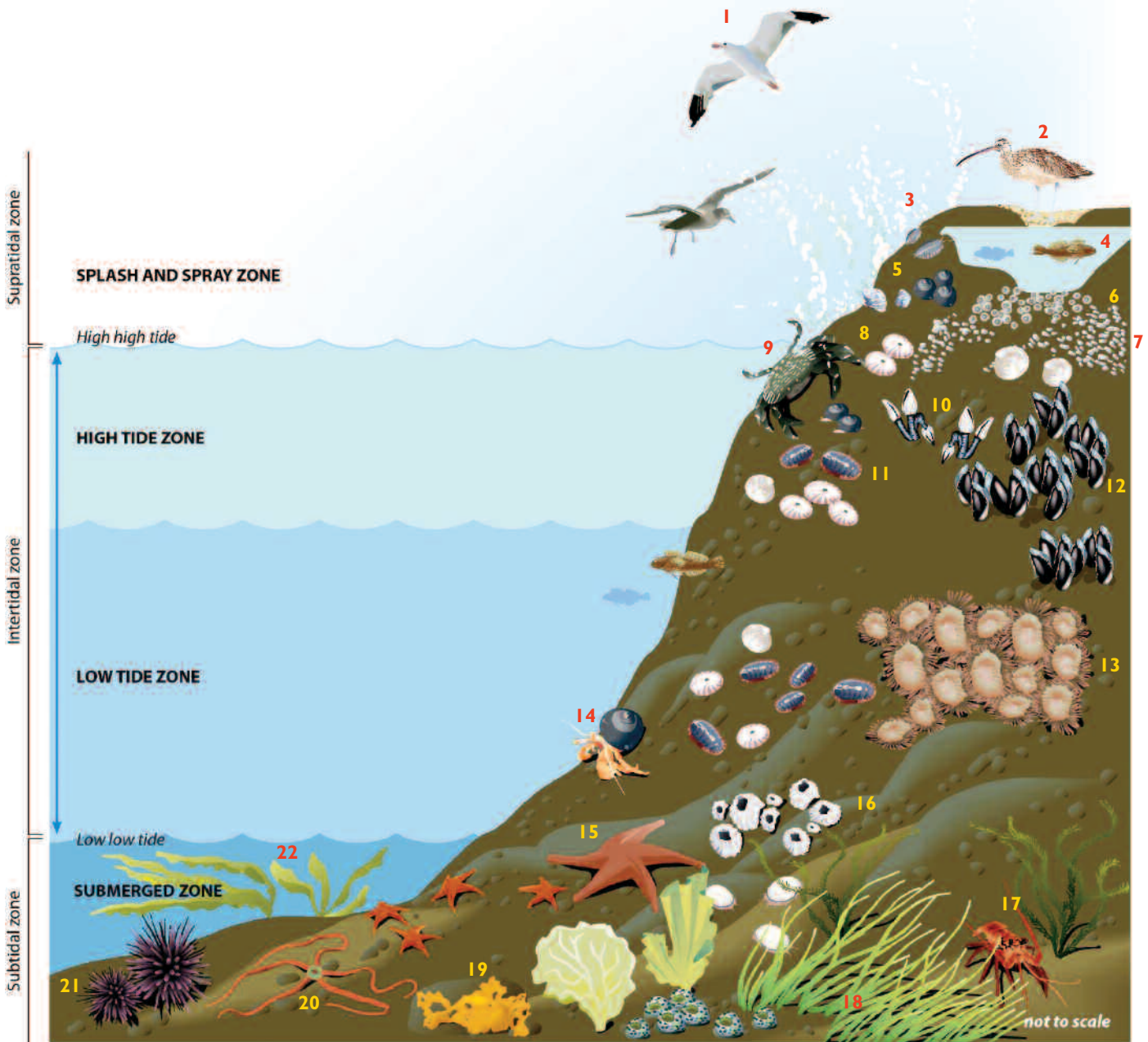
TIDE AT LOS ANGELES



Typical daily tide pattern in southern California consisting of two alternating highs and lows of unequal height every day.

0 6 12 18 24 30 36 42 48
Time (hours)

low tide



Inhabitants of a local tide pool: (1) sea gull, (2) marbled godwit, (3) rock louse, (4) tide-pool sculpin, (5) turban snail, (6) acorn barnacles, (7) periwinkles, (8) small limpets, (9) striped shore crab, (10) gooseneck barnacles, (11) chitons, (12) mussels, (13) aggregating sea anemones, (14) hermit crab in turban snail shell, (15) ochre sea star, (16) larger barnacles, (17) lobster, (18) surf grass, (19) encrusting sponge, (20) brittle star, (21) purple sea urchin, and (22) assorted seaweeds.

WHAT'S THE BEST TIME TO VIEW TIDE POOLS?

To find out when the tide will be lowest, you'll need to look for daily predictions in a tide book or calendar specific to the area you want to visit. You can also find this information on the Internet (go to www.tidesonline.com). When you're at the beach, take note of when the tide begins to rise. You don't want to get cut off by the rising water when you leave.



What's to Eat?

Although space is limited in a tide pool, food is abundant because waves bring a continual source of fresh nutrients and food. What you don't see at first is the abundance of microscopic plankton within each wave. A complex food web exists: from the microscopic plants that are eaten by the smallest animals to larger animals that eat smaller animals.

Many tide-pool inhabitants are filter feeders. As soon as the tide comes up, they come out of their shells and begin filtering food from the water. Barnacles and brittlestars extend feathery appendages to capture food and stuff it into their mouths.

Seaweeds make their own food using sunlight—captured by chlorophyll and other pigments in their leaflike blades—water, carbon dioxide, and other chemicals. As part of this process, photosynthetic organisms release oxygen into seawater, producing almost half of the earth's oxygen supply.

Like other coastal areas in California, the coastal tide-pool community ultimately relies on the rich nutrient supplies in the waters of the Pacific Ocean.



Where Are the Best Tide Pools to Visit In San Diego?

There are many terrific tide pools in San Diego. Right here at Scripps, there is the University of California Natural Reserve north of the Scripps Pier in La Jolla. The tide pools at Point Loma's Cabrillo National Monument are another great spot to see the wonderful marine inhabitants along the rocky shoreline. You can always visit the outdoor tide-pool exhibit at the Birch Aquarium at Scripps. There you can see and touch brilliant sea stars, hermit crabs, sea hares, and other tide-pool inhabitants. By visiting the aquarium, you have the benefit of learning about these animals from the knowledgeable staff who work there.

Marbled godwits spend part of the year at the tide pools.

Can I Collect Specimens?

No. This is not a good idea. In many areas, it's illegal to collect live specimens, or it requires a California fishing license.

Walk carefully. Walking over rocks can damage fragile sea plants and marine animals. Try not to touch things unless you have to. Picking up a sea star may not kill it, but if it's trying to hang on to a rock, you may rip off some of its small tubular feet. Turning over rocks exposes delicate creatures and may kill attached plants. Be a gentle giant and leave everything the way you found it. 🌐

What Do I Wear?

Beachwear is good, but be sure to wear sturdy, nonslippery shoes. The rocks are rough and slippery. Always be alert of incoming waves and be sure not to step on plants and animals on the rocks.

