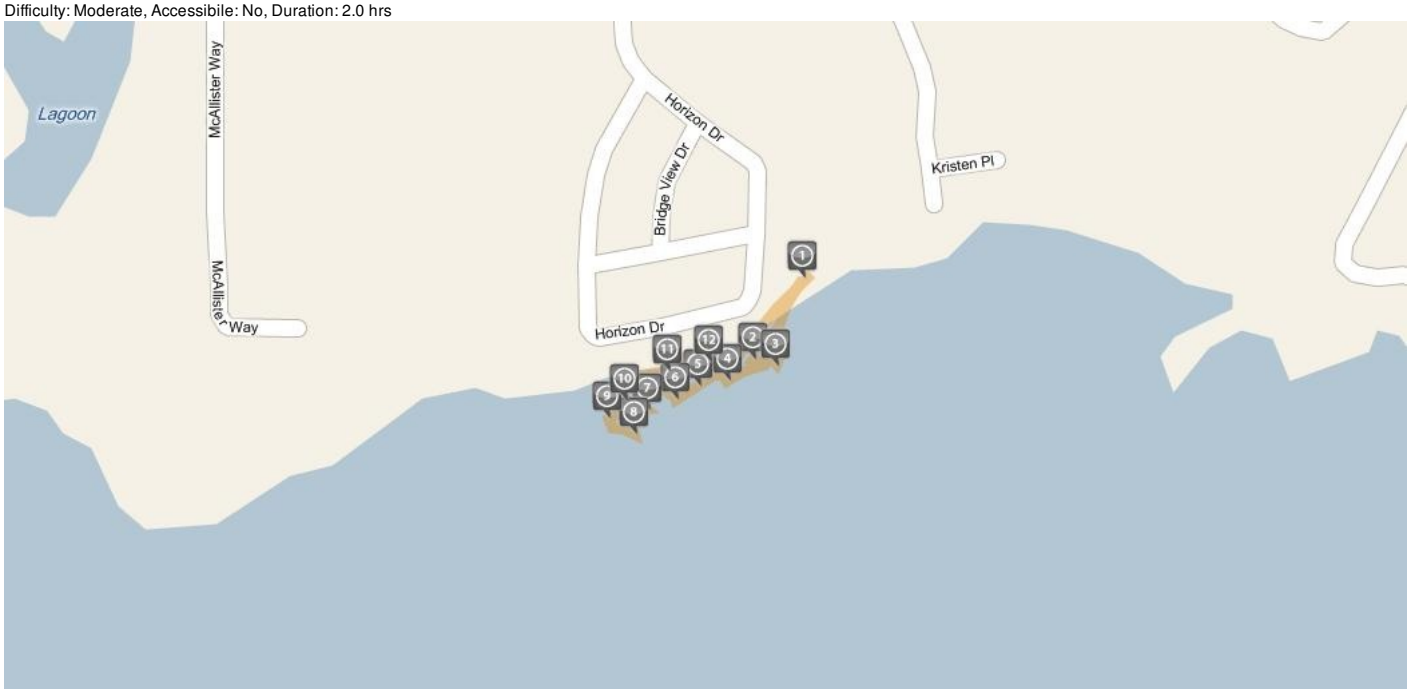
NATURAL BRIDGES SB TIDEPOOLS EXPLORATION

http://www.kqed.org/quest/exploration/natural-bridges-sb-tidepools-exploration

Difficulty: Moderate, Accessibile: No, Duration: 2.0 hrs



Natural Bridges SB Tidepools

The intertidal rocks at Natural Bridges State Beach are covered in life: sea stars, seaweeds, urchins, and crabs are just some of the area's intertidal inhabitants. Visit them in their tidepool homes down in Santa Cruz, California.

Planning Your Visit

2531 West Cliff Drive Santa Cruz, CA 95060 (831) 423-4609 Open 8:00 to sunset Wi-Fi access available with wireless enabled laptop computers or personal digital assistants (PDAs) to access the Internet. Park visitors will be able to gain Wi-Fi access when they use a wireless device within about 150 to 200 feet of the Visitor Center in the park.

Special Thanks

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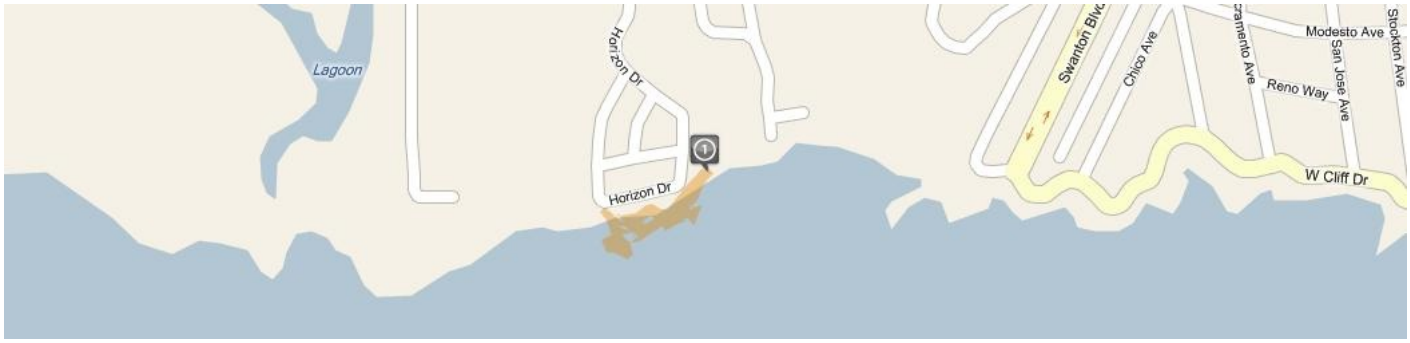
Craig Rosa, Jennifer Skene and Lauren Sommer of KQED contributed to this Exploration.



Marker 1 latitude 36.9497277 longitude -122.0607191

1a. Intertidal Landscape

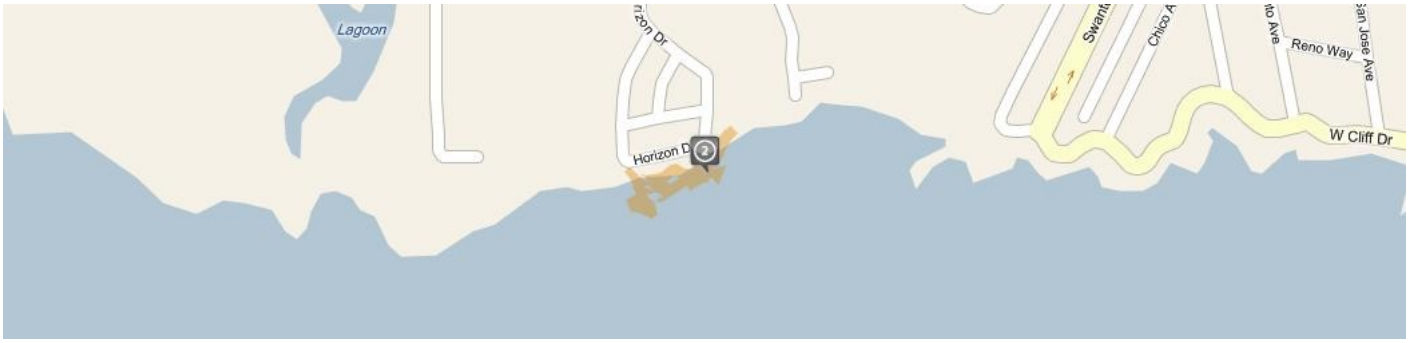
As you walk towards the ocean, there are dozens of tidepools. Let's explore this intertidal landscape.

1b. Humans Are Giants

Intertidal inhabitants are tiny compared to us humans. Standing above the tidepools in our rubber boots, we are giants. We can look at the intertidal community from above, the same way we look at our own terrestrial landscape through the window of an airplane.

1c. Intertidal Zones

The bottom of these rocks is always underwater, even during low tide. The top of the rocks is often exposed to air, and is only underwater when the tide is high. This creates a gradient in the physical conditions on the rocks: the bottom is wetter, and the top is drier. This gradient is the reason why there are different zones in the intertidal. Low-, mid-, and high-tide zones are home to different species, each adapted to living in that particular zone.



Marker 2 latitude 36.9492054 longitude -122.0611257

2a. Petrocelis

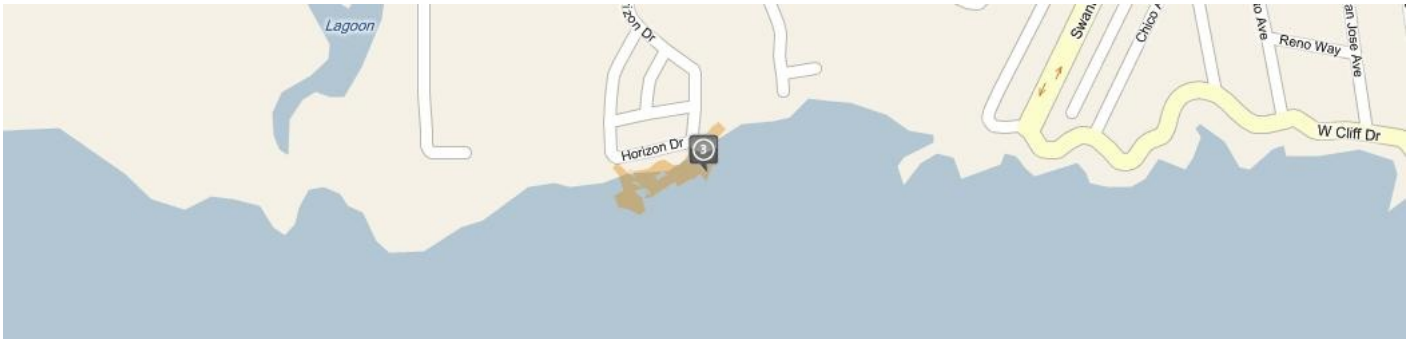
This sure looks like tar stuck to the rock. But it is actually seaweed! This is the encrusting phase of the seaweed called Turkish Washcloth (Mastocarpus papillatus). People used to think the encrusting phase and the upright phase were two separate species. The encrusting phase was called Petrocelis.

2b. Turkish Washcloth

This is the upright phase of Turkish Washcloth (Mastocarpus papillatus), which sprouts from the encrusting phase. Eventually, the fronds of the seaweed will die back or get ripped off by waves. But the tar-like encrusting phase sticks around for years, and the upright phase will re-sprout.

2c. Papillae Close Up

The surface of this female Turkish Washcloth is covered in little papillae, where fertilization occurs. These papillae give it the texture of terrycloth - hence the name, Turkish Washcloth. Another species, Chondracanthus exasperatus, is larger, and is called Turkish Towel.



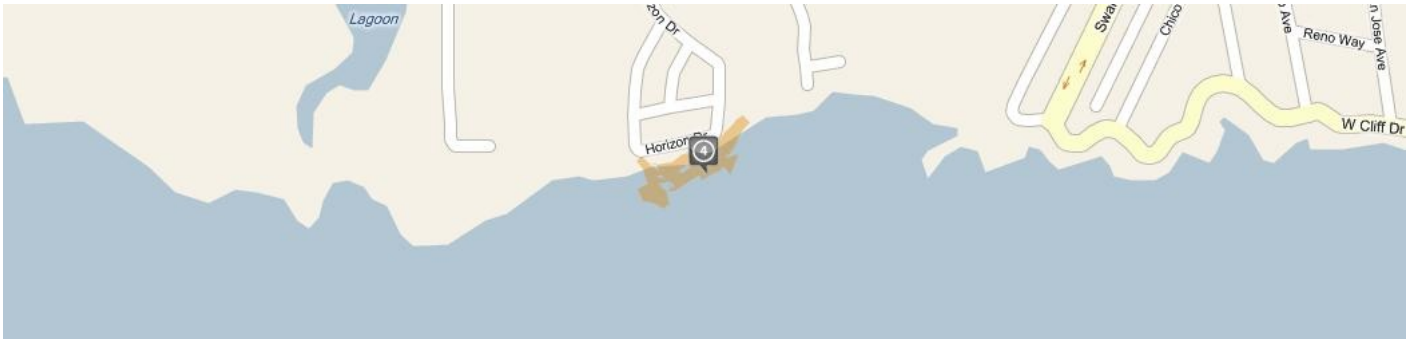
Marker 3 latitude 36.9491693 longitude -122.0609332

3a. Gooseneck Barnacles

Barnacles are crustaceans that live in shells stuck to the rock. They are more closely related to shrimp than to other shell-dwelling animals, like mussels and clams. During high tide, when these Gooseneck barnacles (Pollicipes polymerus) are covered in water, they extend feather-like legs called cirri into the water, in order to feed on plankton.

3b. Acorn Barnacles

As free-swimming larvae, these Acorn Barnacles settle on the rock, glue themselves down, and then build a shell around their shrimp-like bodies. You can see the bottom part of the shells of dead barnacles, still stuck to the rock.



Marker 4 latitude 36.949074 longitude -122.0613223

4a. Intertidal ID - Orange

Is it an orange rock? Or a sponge? And what are those white circles? Could they be eggs?

4b. Sea Stars

Sea stars (Pisaster ochraceus) have tiny white spines on them called pedicellariae, which prevent other organisms from growing on the sea stars' skin.

4c. Sea Star Feet

The sea star can move slowly, using its little tube feet. The feet use suction to stick to the rock. The sea star's mouth is in the center of its body.

4d. Sea Star Search

During low tide, sea stars can be hard to find. Look for them in the low tide zone, close to the water, and look in channels, on vertical rock walls, and underneath overhanging rock â€“ that's where these sea stars were found.

Marker 5 latitude 36.9490378 longitude -122.0615629

5a. Mussels

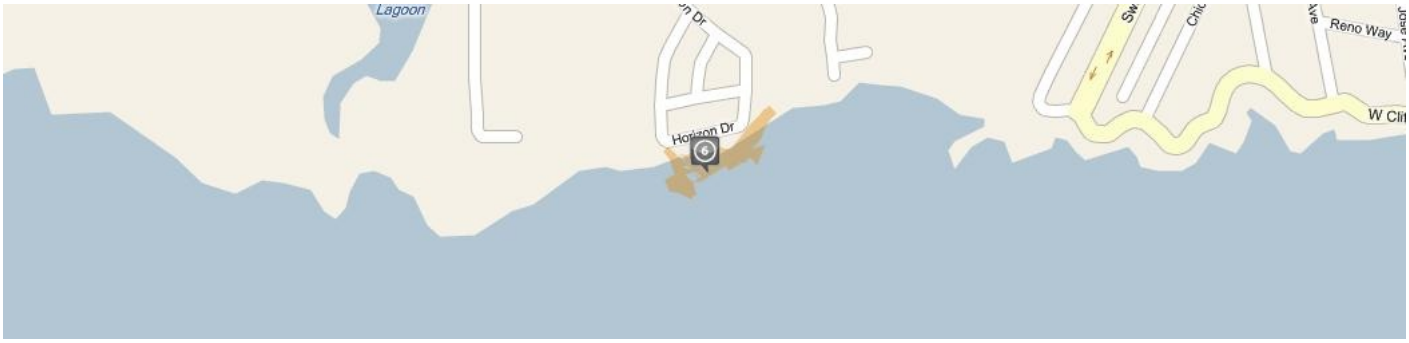
These California mussels (Mytilus californianus) are tightly packed in this mussel bed. They stick to the rock using bissel threads â€“ thin, super-strong threads that the mussels produce. Mussels can actually move themselves, very slowly, by putting down new bissel threads and pulling up the old ones.

5b. Space is Scarce

Space is limited in the intertidal, and there is often serious competition. Animals cover any available surface â€“ including the surface of other animals. Here, there are barnacles living on mussels, and limpets stuck onto an abalone.

5c. Cancer antennarius

This Pacific Crab (Cancer antennarius) scuttles across the mussels. It gets its species name from its long antennae.



Marker 6 latitude 36.9489492 longitude -122.0617475

6a. Intertidal ID - tentacles

What do you think this is? A plant? An animal? Octopus legs? Tentacles?

6b. Giant Green Anemone

Sea anemones, like this Giant Green Anemone (Anthopleura xanthogrammica), are animals, not plants. They are Cnidarians, related to corals and jellyfish. The green color in the center of the Giant Green Anemone comes from symbiotic algae. Notice that the tentacles of this species are green, right to the very tip.

6c. Solitary Anemone

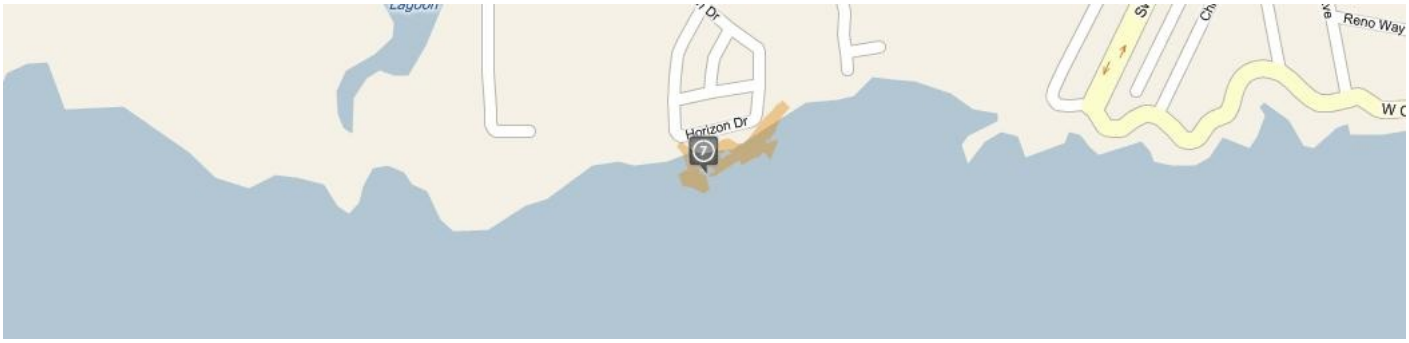
To distinguish between this Solitary Anemone (Anthopleura sola) and the Giant Green Anemone, pay close attention to the tentacles. In the Solitary Anemone, the tentacles are green at the base, and become pinkish at the tips. The tentacles of the Giant Green Anemone are entirely green. Anemones use their tentacles to sting their prey â€“ if you touch the tentacles, your fingers may feel numb.

6d. Aggregating Anemone

The Aggregating Anemone (Anthopleura elegantissima) is much smaller than both the Giant Green and the Solitary Anemones. And, true to their name, they aggregate; they're always found in groups.

6e. Anemones Exposed

When anemones are exposed to the air, they shrink up. This makes it easy to see that their bodies are shaped like columns.



Marker 7 latitude 36.9488834 longitude -122.061972

7a. Nudibranch

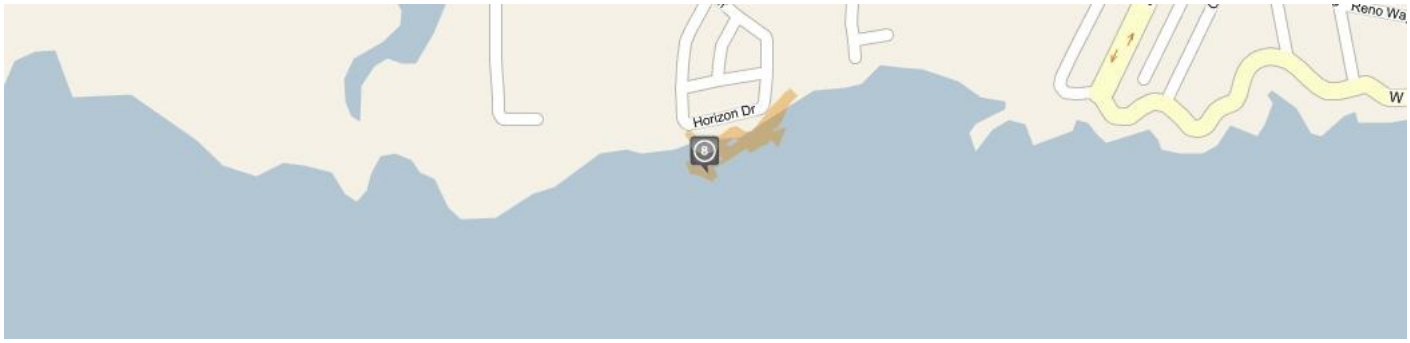
Nudibranchs are gastropod mollusks - they're related to snails and slugs. Unlike snails, they have no shell. The word nudibranch means "naked gills." The gills are those feathery-looking things on the nudibranch's back. These outgrowths of their bodies are called cerata - which means "horn." Nudibranchs breathe through the cerata. photo credit: John Albers-Mead

7b. Sea Lemon

The Sea Lemon (Archidoris pseudoargus) is a nudibranch. Nudibranchs have some great names, like Shag-Rug Nudibranch, Spanish Shawl, and Yellow-Gilled Sea Goddess. photo credit: John Albers-Mead

7c. Opalescent Sea Slug

The Opalescent Sea Slug (Hermissenda crassicornisis) lives in the low intertidal and subtidal. photo credit: John Albers-Mead



Marker 8 latitude 36.948729 longitude -122.0620803

8a. Seaweeds in the Surf

Looking out from the rocks towards the ocean, there is a tangle of seaweeds. The long skinny seaweed seen here is called Feather Boa Kelp (Egregia menziesii).

8b. Feather Boa Kelp

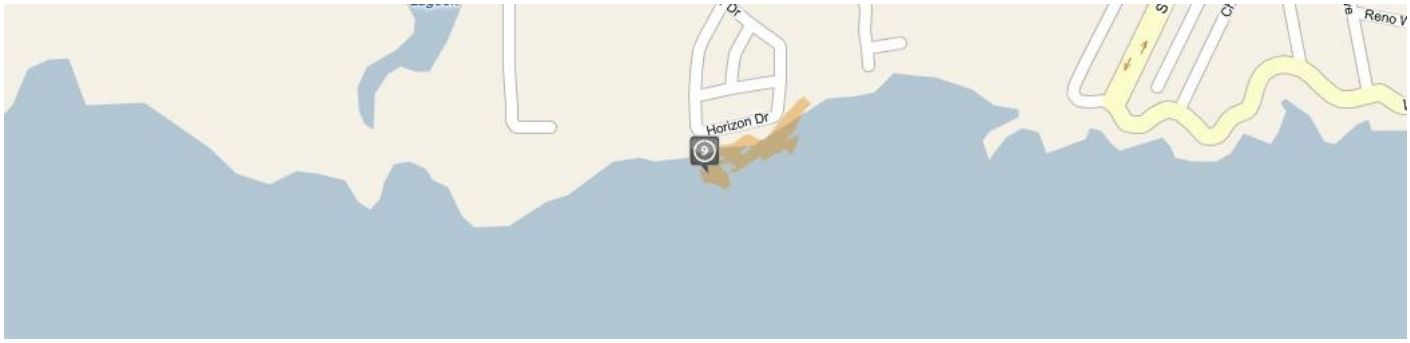
Here's a close-up of Feather Boa Kelp's "feathers." They are interspersed along the stipe with little balloon-like structures called pneumatocysts, which keep the algae floating at the surface of the water. This means the algae can absorb sunlight and photosynthesize, even during high tide.

8c. Feather Boa Holdfast

Seaweeds need to stick fast to the rocks, so they don't get ripped off by waves. Unlike plants, seaweeds don't have roots. Instead, they have holdfasts, which glue down to the surface of the rock, and can grow to be huge. The olive-green structure that looks like a brain is the holdfast of a Feather Boa Kelp (Egregia menziesii).

8d. Sea Lettuce

This green seaweed, called Sea Lettuce (Ulva spp.), is an opportunist. It quickly colonizes bare patches of rock. It is also fragile, and prone to being eaten by invertebrates â€“ look closely and you can see that this seaweed has been chomped!



Marker 9 latitude 36.9488275 longitude -122.0622849

9a. Red Algae

There are three taxonomic groups of seaweed: red, green and brown. It is easy to see that this one is a red.

9b. Porphyra

Do you want tuna with that? This seaweed is called Nori (Porphyra spp.), and is pressed into thin sheets that wrap up sushi. It looks green in color, but taxonomically Nori is in the red group.

9c. Mazzaella splendens

The blades of Splendid Iridescent Seaweed (Mazzaella splendens) are made up of multiple layers of cuticle â€“ the many layers refract light, making it shimmer beautifully when it's underwater.

9d. Chalk on the Inside

Seaweed on the outside, chalk on the inside: this seaweed has a skeleton made of calcium carbonate. Amazing!

Marker 10 latitude 36.948941 longitude -122.0621553

10a. Intertidal ID - Snail Trails

What do you think created this pattern? These are snail trails â€“ the olive-green stuff is algae, an the snails have grazed a trail, scraping algae off the rock with their mouthparts.

10b. Tegula

This Turban snail (Tegula funebralis) lives in the mid-intertidal, and has a black shell. Lower in the intertidal, it gives way to its relative (Tegula brunnea), which has a brown shell.

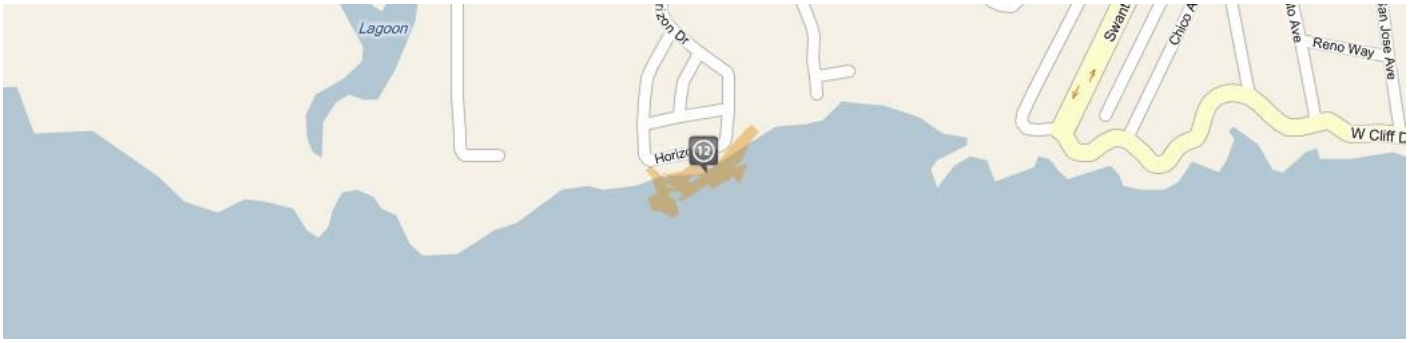
Marker 11 latitude 36.9491331 longitude -122.0618076

11a. Honeycomb Homes

What is this honeycomb of sand?

11b. Sandcastle Worms

The Sandcastle Worms (Phragmatopoma californica) are polychaetes â€“ segmented worms with little bristles on them. You can see the bristles of these lavender-colored worms as they poke out of their sand tubes to feed. Each worm is genetically distinct (they are not colonial organisms). When big waves break apart the sand tubes, thousands of eggs are released. The larvae live in the water for several months, before settling and building a new community of honeycomb homes.



Marker 12 latitude 36.949189 longitude -122.0614747

12a. Intertidal ID - Purple Spikes

What are these little purple feet?

12b. Purple Sea Urchin

Sea urchins, like this Purple Sea Urchin (Strongylocentrotus purpuratus), are echinoderms, related to Sea Stars. Urchins have spines and tube feet. They use the tube feet to move around, and also to breathe!

12c. Urchin Mouth

The mouth of the sea urchin is in the center. It is surrounded by five plates, which look a bit like teeth. These plates are called "Aristotle's lantern" â€“ when Aristotle (born in 384 BC!) described the mouth, in he likened it to a lantern. The sea urchin's body has just one opening â€“ so its mouth is also its back end!

12d. Urchin Searchin

Sea urchins can be hard to find in the intertidal. You need to visit during a very low tide, and search in tide pools and channels near the water. Purple Urchins often cover themselves in bits of algae â€“ maybe to prevent themselves from drying out at low tide, maybe to camouflage themselves from predators, like birds.