

Local

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Shedding light on deep sea mysteries

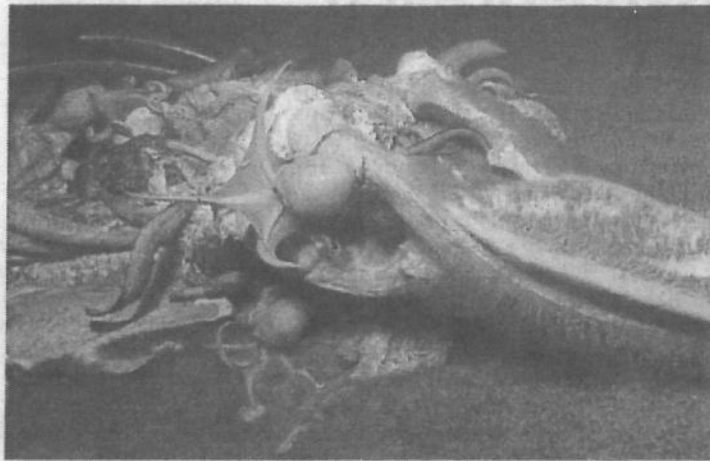


There is an incredible amount of biodiversity on the soft sediment seafloor in the sanctuary. Use the QR code in the upper left corner to identify the organisms. **ART AND DESIGN BY KELLY LANCE**

By Andrew DeVogelaere
MONTEREY BAY NATIONAL
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For locals and tourists alike, the beach is a popular destination. Sitting on the soft sand and watching the waves, shorebirds and marine mammals is good for the soul. Inquisitive beachgoers may find beach hopper insects near drift kelp or may dig up a few sand crabs at the water's edge. But what is happening on the seafloor beyond the waves? There may be more sand, a rocky reef, deep canyons or spectacular undersea mountains. Much of Earth's habitable space lies in the dark, cold deep sea, where the seafloor is soft, flat and muddy.

Few people have direct access to the seafloor at thousands of feet below the surface. Jim Barry, a senior scientist at Monterey Bay Aquarium Research Institute, has studied this habitat for the past 35 years using remotely operated vehicles. "It's a fascinating place with surprising biological diversity," Barry said.



A whale fall makes a good habitat for so many deep-sea dwelling organisms. COURTESY OCEAN EXPLORATION TRUST/NOAA

"Last month, we observed the rare bigfin squid drifting just above the seafloor. It was the first live sighting of this animal in the Northeast Pacific."

Erica Burton, a research ecologist for Monterey Bay National Marine Sanctuary, has co-authored taxonomic guides to deep-sea organisms. "My favorite is the giant cusk eel. I enjoy watching how it slowly swims

above the seafloor near other species in this ecosystem that we know relatively little about," she said.

Until the 1870s, many scientists believed that deep-sea areas were devoid of life. This idea, known as the azoic theory, proved dramatically wrong. The soft seafloor of the deep sea supports a surprisingly rich community of animals, far more

diverse than the life we see on coastal beaches.

Some have wonderfully descriptive names: pom pom anemone, flapjack octopus, king crab, acorn worm, ghost shrimp, sea spider, spotted ratfish, Pacific hagfish and sleeper shark. Before one species of swimming sea slug was formally named, researchers simply called it "mystery mollusc." In some areas, the abundance of animals is astonishing — tens of thousands of brittle star arms may rise from the seafloor, filtering food from the water above.

There is a strong connection between the surface water above and the deep seafloor thousands of feet below. It's surprising that detached pieces of our local kelps and intertidal seagrasses are found at depths of 11,000 feet and nearly 50 miles offshore.

As these plants drift and sink, they become welcome meals for deep-sea urchins and other animals that quickly locate and consume them. Plankton blooms

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at the sea surface, along with gelatinous body parts and other organic material, also slowly drift into the abyss.

In this way, the deep ocean experiences seasons, even in perpetual darkness.

Astoundingly, we've seen evidence that whales such as the goose-beaked whale can feed at depths of 11,000 feet, hunting squid and large fishes. When a whale dies, its body may sink to the seafloor. This begins a process called succession, in which different communities of animals cluster on the carcass as it decomposes. One of the last animals to feast on the whale is the recently discovered bone-eating worm, *Osedax*.

There is a less pleasant connection between humans and the deep sea. Researchers have found buckets, brooms, aluminum cans, nets, plastic bags on the seafloor — objects tossed from boats

or carried from rivers and beaches.

Sometimes, huge items such as lost shipping containers appear.

More insidiously, scientists have learned that microplastics are now common in the deep sea and are being eaten by animals.

As technology allows us to explore the soft seafloor more closely, we are discovering a place of beauty and complexity. The deep sea also provides what scientists call ecosystem services: benefits to society, including food, climate regulation and natural resources that support our economy.

To protect those benefits for future generations, we first need to understand the world beneath the waves. The soft, muddy seafloor is often "out of sight, out of mind," but it is one of the planet's largest and least explored living landscapes.

Andrew DeVogelaere is a research ecologist with the Monterey Bay National Marine Sanctuary.