

# Research aims to restore kelp forest ecosystems via removal and farming of urchins

**K**elp forests have diminished off the northern California and southern Oregon coasts because of climate change, rising ocean temperatures, an increase in seaweed-grazing purple sea urchins, and a decrease in sea stars, which eat urchins. Bull kelp beds are particularly important because they are nurseries for commercially important rockfishes and salmonids and they create habitats that are biodiversity hotspots for fish, abalone, sea stars, marine mammals and tiny mysid shrimp, which gray whales eat.

Oregon Sea Grant has been working to restore and improve understanding of kelp forest ecosystems. We provided funding that supported the formation of the Oregon Kelp Alliance. Our effort leveraged funds to pilot a kelp restoration project that began with culling sea urchins. As part of this, more than 30 divers removed nearly 47,000 purple sea urchins from Nellies Cove in Port Orford in summer 2021. That's just a fraction of the estimated 350 million purple sea urchins found at nearby Orford Reef in surveys conducted by the Oregon Department of Fish and Wildlife in 2019, according to Scott Groth, a section leader in the agency's marine resources program. He added that roughly 1 billion purple sea urchins live in Oregon's nearshore waters.

We funded research in 2021 to see if urchin barrens were replacing Port



A gray whale swims through kelp off the Oregon coast. (photo by GEMM Lab/MMI/OSU)



Urchins graze on the remaining stalks of kelp at Drake Point. (photo by Tom Calvanese)

Orford's kelp forests. Scientists analyzed data collected off Port Orford by the lab of Leigh Torres, our marine mammals Extension specialist and an associate professor at Oregon State University. They found that urchins increased while kelp, mysid shrimp and sightings of gray whales decreased between 2016 and 2021. Researchers also documented extremely high densities of small urchins off Cape Arago.

"Our work indicates that changes in some of Oregon's key kelp forests are occurring," said Aaron Galloway, a scientist at the University of Oregon. "Given the importance of kelp forests as a key foundational habitat, our findings raise significant concerns about the state and resiliency of Oregon's coastal ecosystems. We need to better understand where kelp forests are declining and why."

After urchins bulldoze through their kelp forest food supply, they slow their metabolism and absorb their gonads. These now almost hollow urchins can survive lean times, but their gonads, which are served in restaurants as uni, shrink so much that they are not marketable. Red urchins are the main marketable species because they're larger and meatier than their purple cousins.

A project Oregon Sea Grant funded in 2022 and 2023, however, aimed to develop the aquaculture potential of purple urchins in land-based tanks and, in turn, benefit kelp forests. A dive crew collected emaciated purple urchins from the wild, then researchers put them in tanks and fed them farmed Pacific dulse seaweed to fatten them up to produce tasty uni. Researchers found that smaller urchins ate more than larger ones as a percentage of their weight. The largest urchins ate about 2% of their weight each day while the smallest consumed 6%. At one test site, urchins became marketable in two to three months.

"If the economics pan out on a commercial scale, this aquacultural setup could help to reduce pressure on struggling kelp forests because urchin farmers would remove some of these voracious grazers from the seafloor," said Ford Evans, the project lead.



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