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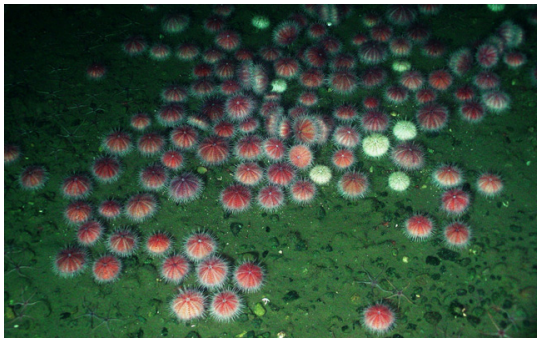
Tasty and Pink, Sea Urchin Species May Be a Climate-Tolerant Food Source

A hardy urchin species shows potential to relieve pressure on more vulnerable species, according to new research by California Sea Grant-funded scientists

Sea urchin is a delicacy in Asia, South America, Europe, and increasingly in California, where the uniquely flavored roe, or uni, is used in sushi, gourmet cuisine, and products such as sauces and flavorings. But the large red sea urchin (*Mesocentrotus franciscanus)* caught off the coast of Southern California—the primary urchin fishery in the U.S.—is vulnerable to increased water temperatures and ocean acidification.



Pink sea urchins on the seafloor. Credit: NOAA/Ed Bowlby

“The current sea urchin fishery is experiencing existential stressors of regional warming, ocean acidification, and hypoxia. The fishery saw unprecedented reductions in marketable wild-caught urchins after the 2014 warm blob and 2015 El Niño, which decimated kelp forests (the primary food source for urchins) throughout California,” explains Okinawa Institute of Science and Technology researcher Kirk Sato, lead author of a recent study exploring the viability of another species—the pink sea urchin (*Strongylocentrotus fragilis)*–as an alternative urchin fishery. Sato led the study as a doctoral student at Scripps Institution of Oceanography at the University of California San Diego.

Belying its name and delicate appearance, the fragile pink sea urchin is in fact hardier than its red cousins, thriving at greater depths, lower oxygen levels, and higher acidity levels than other urchin species, according to Sato’s research. (View photo gallery.)

In Sato's PhD research, which examined how deep-sea species were responding to climate change, he had noticed that the pink urchins were becoming increasingly widespread throughout southern California, even as other species were struggling with the variable environmental conditions.

"Throughout the course of my dissertation, I also learned that pink urchins were also commonly found as bycatch in spot prawn traps, but they needed to be released because there was no market for them," says Sato.

Sato wondered if there could indeed be a market for the pink urchin roe. To investigate, he and advisor Lisa Levin teamed up with Dave Rudie, owner of Catalina Offshore products, and proposed a research project on the topic to California Sea Grant. The project aimed to evaluate the feasibility of a fishery from a population and seasonality point of view, and to compare the food quality properties of the roe, including size, color, and texture. It built off work that Sato and Levin had done with Ken Schiff of the Southern California Coastal Water Research Project using several decades of data on pink urchins in bottom trawls (surveys from the ocean floor).

In the new study, the researchers analyzed years of trawl data to find out where and when fishers could expect to find the most pink urchins with edible roe. They found that the urchin species is most abundant at a depth of 250 to 300 meters (820 to 984 feet), similar depths where spot prawn fishers set their traps, and that winter was the primary time when the urchins produced edible roe. According to the study, the density, timing, and location of the urchins looked promising to support a viable fishery. In particular, legalizing the fishing of pink sea urchin as a bycatch to the prawn fishery could allow prawn fishers to sell the urchins they already catch, rather than throwing them back.

To start a new fishery, one key question is whether there is a market for the product. So as part of the study, Sato worked with summer student Jackson Powell to test some of the food qualities of the pink urchin uni. While some of the qualities, such as color and consistency, were a good match, they found that the pink urchin roe on average weighed 80% less than the red urchin.

Another urchin species, the purple sea urchin (*S. purpuratus)*, has been harvested on a limited and experimental basis to little success, in part because of smaller sized roe. But the purple urchin is also vulnerable to changing climatic conditions. If the red sea urchin fishery continues to struggle, the pink urchin could be a good fallback or supplemental fishery to help shore up the red urchin.

Before the pink sea urchin shows up on any sushi menu, a number of questions remain. Researchers need more information on growth rates, and processing trials and taste tests would be needed. On the regulatory side, establishing a new fishery requires state and local agencies to approve and establish regulations.

Rudie points out that while it is currently legal for urchin divers to harvest pink urchins, it's not practical to do so because they live at greater depths, in the same locations as spot prawns, and there is no proven market yet. If a culinary market does develop, he says, "an easier solution would be to allow spot prawn fishermen to simply keep any pink sea urchins they get and sell them as bycatch."

"We don't necessarily think pink urchins are a viable replacement for red urchins in the future given how much smaller their roe is on average," says Sato. "However, in light of recent increasing demands for sea urchin worldwide and the potential impacts of climate change on red urchins, aquaculture efforts or supplemental harvest of an underutilized species such as pink urchins may be a foreseeable next step."

With the impacts of climate change become more pronounced, identifying and facilitating potential climate tolerant fisheries will be important, adds Levin. She says, "As ocean oxygen content declines and acidity increases in California waters it will become increasingly important to incorporate these changes into fisheries management practices."

About California Sea Grant

NOAA's California Sea Grant College Program funds marine research, education and outreach throughout California. Our headquarters is at Scripps Institution of Oceanography, University of California, San Diego; we are one of 33 Sea Grant programs in the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce.

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