

OSU leads effort to expand ocean oxygen monitoring sensor use in fishing industry

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Oregon State University (OSU) researchers are leading an effort to refine the design and expand use of oxygen monitoring sensors.

The sensors can be deployed in fishing pots to relay critical information to the fishing industry about changing ocean conditions

The new project, a collaboration with industry and Tribal partners, is funded by a three-year, \$1.2 million Ocean Technology Transition grant from the National Oceanic and Atmospheric Administration.

Effective tool

The dissolved oxygen sensors, initially developed by Oregon State researchers to learn more about how hypoxia, or low oxygen, is affecting crabbing in the Pacific Northwest, have shown to be an effective tool for crabbers and fisheries managers. Versions of the sensors have drawn interest from other fisheries and are now used by the lobster industry on the East Coast.

“This sensor has proven to be a vital and innovative tool for collecting important data about changing ocean conditions in areas that matter most to our local partners,” said Jessica Garwood, an assistant professor in Oregon State’s College of Earth, Ocean, and Atmospheric Sciences and the project’s principal investigator. “This project is really about scaling up this technology so that it can be implemented and adopted more widely across the region and potentially globally.”

Under the grant, the researchers seek to refine the sensor design and expand its capabilities to provide intuitive, near real-time information to the fishing community and fisheries managers to guide decisions about where and when to place pots or pull them up.

Hypoxia is a low-oxygen condition that poses a significant threat to a wide range of marine animals, with major impacts on the ecosystem and the economy, including tourism and the seafood industry.

The Dungeness crab fishery is an important economic driver across the West Coast of the United States. In Oregon, it is considered the most valuable single-species fishery, bringing in \$33 million to \$75 million a year, according to the Oregon Dungeness Crab Commission.

Sensor history

Oregon now has a “hypoxia season,” much like the wildfire season, that takes place in late summer. When oxygen levels get low enough, crabs and other marine organisms that are place-bound, or cannot move away rapidly enough, die of oxygen starvation.

Oregon State researchers first developed the sensor concept more than a decade ago in response to concerns from local crabbers who were pulling up pots full of dead crabs that had been caught in hypoxic dead zones and wanted advice on where they might have better success.

“It was a really effective research tool, and it gave the crabbers information they wouldn’t have had otherwise, but the process was slower than we wanted it to be. The fishing community had to wait for me to compile the data to get an overall picture of the region,” said Francis Chan, a marine ecologist and director of the Cooperative Institute for Marine Ecosystem and Resources Studies at OSU’s Hatfield Marine Science Center in Newport. He is a co-investigator on the new effort.

“Now we’re in a position to turn this tool into something that could be as commonplace as a fish finder. We can put it into the hands of the people out working in the ocean, while also collecting important ocean data every day.”

Opportunities ahead

Wide adoption of the sensors by fishers and fisheries management groups also presents an opportunity to glean a significant amount of new information, over a larger area, about changing ocean conditions, said Jack Barth, a co-investigator on the project and special advisor to OSU's Marine and Coastal Opportunities program. Barth and Chan worked together with local fishers to launch the initial sensor project.

"What we really want are weekly or even daily underwater maps, where you can start to see patterns of how hypoxic areas grow and move around in the ocean," Barth said. "From a sensor attached to a crab pot that travels through the water column and rests on the seafloor, you can gain a vast amount of information. That information is multiplied when more and more sensors are in use."

NOAA's Integrated Ocean Observing System Ocean Technology Transition program supports the transition of emerging marine observation technology from research to operation. With funds from the program, the OSU team will work with its industry, Tribal and government partners to develop a low-cost sensor that collects and shares data in an automated and easy to use way, such as an app with notifications.

"People are really good at interpreting data when they have exposure to that data, and this is information they want," Garwood said. "If the fishing community has access to data about ocean conditions, they will develop a sense of, 'Oh, when I see this, that means it's fine to drop my pots here.' And we will be grateful for what they teach us in the process."

Data also will be collected and made available to researchers through the Northwest Association of Networked Ocean Observing Systems or NANOOS, where it will augment other coastal ocean data already being collected and be made available to researchers across the globe.

The team is working with the Salem-based Sexton Co. to manufacture up to three rounds of prototypes of the sensor for testing by the fishing community. Jeremy Childress, the company's CEO, originally worked on the sensor project as a graduate student at Oregon State.

The team

The project's research team includes Kipp Shearman of Oregon State and Jan Newton and Roxanne Carini of the NANOOS team at the University of Washington. Fishing industry partners include commercial and charter fishermen in Port Orford, Newport; and Brookings; and the Tulalip Tribe in Washington.

Also providing input on the project is an advisory group with members from Quinault Indian Nation; the Quileute Tribe; the Oregon Dungeness Crab Commission; the Pacific States Marine Fisheries Commission; and the Environmental Monitors on Lobster Traps and Large Trawlers program at the NOAA Northeast Fisheries Science Center.

Project leaders are also open to working with additional ocean users who are interested in getting involved with the sensor project.

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