

Ultrasounds proven an effective, hands-off way to help spawn endangered abalone

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Sara Boles of UC Davis' Bodega Marine Laboratory gives an ultrasound to an abalone as part of efforts to help abalone more successfully spawn for aquaculture and conservation. Credit: Jackson Gross/UC Davis

The world's abalone are threatened, endangered or otherwise vulnerable in nearly every corner of the planet. While captive breeding efforts are underway for some species, these giant sea snails are notoriously difficult to spawn. If only we could wave a magic wand to know when

abalone are ready to reproduce, without even touching them.

Scientists from the University of California, Davis, found that wand—although it isn't magic, and it only looks like a wand. It's an [ultrasound transducer](#), and it can be used to quickly and noninvasively detect when abalone are ready to spawn, according to a study published in the journal *Frontiers in Marine Science*.

The technique is expected to help abalone farmers and captive breeding managers produce more abalone, with minimal stress to the animal.

Increasing abalone welfare

Abalone suction onto surfaces and typically have to be pried off for gonad inspection before spawning. For these animals—particularly endangered abalone—the less they are handled, the less opportunity for stress or physical harm.

"There are not a lot of animal welfare methods applied to invertebrate animals, let alone for aquatic species," said corresponding author Jackson Gross, an assistant professor of Cooperative Extension in Aquaculture with the UC Davis Department of Animal Science. "Here's a way to increase the welfare of an abalone without bringing added stress to them."

The United States Navy's Pacific Fleet funded the research as part of its efforts to conserve federally endangered black abalone and find better ways to assess their reproductive health. Because of black abalones' low numbers and high vulnerability, the authors used closely related farmed red abalone to test the effectiveness of ultrasounds on abalone.

Gross had used the technique for gonad assessments on sturgeon and catfish, but it had never been tested for sea snails until this study. When

Gross saw a video of a veterinarian in Scotland conducting an ultrasound on a large land snail, he felt certain it would work for abalone.

Testing the tech

With Gross' background, the extensive knowledge of the white abalone captive breeding program at the UC Davis Bodega Marine Laboratory, and first author Sara Boles' experience studying red abalone, the authors tested the method on 12 farm-raised red abalone and about 100 red abalone raised at Bodega Marine Lab. They monitored the lab-raised abalone for seven weeks to detect seasonal changes in their gonad size.

They found that ultrasounds could differentiate reproductive tissues from digestive tissues. They were then able to create a gonad index score ranging from 1 to 5 that indicates the abalones' readiness to reproduce. Abalone measuring in the 3 to 5 range could be ideal candidates for spawning. They also found the technology was sensitive enough to detect changes both before and after spawning.

"This is very helpful for broodstock managers when trying to select individuals for a spawning season, whether for production aquaculture or conservation," said Boles, a postdoctoral researcher with the UC Davis Coastal and Marine Sciences Institute at the Bodega Marine Laboratory.



Farmed and captive-raised red abalone served as a proxy for endangered black abalone in UC Davis experiments to test if ultrasounds could be an effective, noninvasive means of assessing abalone's reproductive health. Credit: Jackson Gross/UC Davis

How to give abalone an ultrasound

So how do you ultrasound an abalone? It's fairly straightforward.

You submerge the abalone underwater in its tank and place the ultrasound transducer on the outside of the tank by the [abalone's](#) foot. The sound passes through the tank and transmits the image.

Routine assessments using ultrasounds can be conducted without

touching the animal at all. Abalone do still have to be handled for spawning events, but ultrasounds can minimize the handling involved.

Abalone are an ecologically and culturally important keystone species for California's coastal ecosystem. They face multiple, often intertwining threats—from warming ocean temperatures and disease to crashing [kelp forests](#) and habitat degradation.

"We're excited to see how much faster we can use this technology to assess the health of these animals, especially in a world where climate change is making an impact," Gross said.

More information: Sara E. Boles et al, Evaluation of Gonad Reproductive Condition Using Non-invasive Ultrasonography in Red Abalone (*Haliotis rufescens*), *Frontiers in Marine Science* (2022). [DOI: 10.3389/fmars.2022.784481](#)

Provided by UC Davis

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