For bay oysters, protection plus restoration creates healthiest reefs

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Actively restoring oyster reefs—beyond simply protecting them from harvest—can create big payoffs for habitat quality and the other species that flock to them. A new study from the Smithsonian Environmental

Research Center (SERC), published June 3 in the journal *Marine Ecology Progress Series*, compared restored, protected and harvested areas using photos and video footage from roughly 200 sites.

Roughly a quarter of Maryland's oyster habitat lies protected in oyster sanctuaries. But only a small fraction of those sanctuaries have undergone full-scale restorations, with reconstructed reefs and new live oyster plantings. The new paper offers an easier way to determine if those restorations are paying off.

"You've got to actively restore something," said Keira Heggie, lead author of the study and a technician in SERC's Fisheries Conservation Lab. "But if you actively restore something and then let it go by its wayside, then you're not going to know exactly if it's still doing well."

The results also give a clear picture of restoration's benefits, which have seen hot debate in recent years.

"There are people who feel like the restoration's really working, and there's other people who feel like it's a lot of money that you're throwing in the water," said Matt Ogburn, co-author and SERC senior scientist. "Being able to have ways to collect the data to determine whichever of those outcomes happen, or something in the middle, is really important."

Reef scorecards

Getting good data on oyster habitats can be expensive and even destructive. Traditionally, scientists have relied on diving surveys, which can take hours to perform and process, or using claw-like patent tongs, which rake up parts of the reef for analysis.

Ogburn, Heggie and the Fisheries Conservation Lab came up with the video method while doing sonar surveys for fish. While their sonar

equipment could pick up fish movement, it could not tell them much about the underwater habitat.

"We couldn't see that very well with the sonar," Ogburn said. "So we just started sticking a GoPro camera on the bottom of the sonar frame and taking pictures."

When they discovered the footage was clear enough, the team decided to apply it to oyster habitat. They took their GoPro cameras to four tributaries of Maryland's Choptank River. Three are home to large-scale restorations: Harris Creek, Little Choptank and Tred Avon. The fourth, Broad Creek, is one of Maryland's most productive harvest areas.

The biologists collected at least two minutes of underwater video and photos from each of the approximately 200 sites they surveyed. They used the videos to assign each site a "habitat score," from zero to three. A score of zero meant the site had no hard surfaces for oysters to settle on. A one meant up to half of the area had hard surfaces, and two meant more than half of the area had hard surfaces but those surfaces were relatively flat. To get a top ranking of three, a site had to have both hard surface coverage greater than half and the complex, vertical structure that gives fish and other species plenty of spaces to live or hide.

They then compared their more qualitative, video method with a more data-intense photo method. Besides yielding more precise figures on hard surface cover, the team's photo analysis also revealed the different kinds of creatures living with the oysters.

But most importantly, the photos confirmed that Heggie and Ogburn's quick-and-dirty video method worked. Sites that got higher scores in their general video analyses also showed higher-quality habitat and more diverse species under the scrutiny of their photo analyses. And in a single day, the team could cover five or six times more sites with their

video cameras than divers or tong surveys could do.

"It's a really easy, fast method to go out and keep tally on how the reefs are doing," Heggie said.

When protection is not enough

Protected, restored reefs earned by far the highest scores for oyster habitat. In the Harris Creek sanctuary, where reef restorations were already two years old at the time of the study, 74% of the restored reefs earned a top ranking of "three" for hard surface coverage and vertical structure.

Harvest areas in Broad Creek and at the mouth of Harris Creek sometimes scored well for hard surface coverage (20-30% of the time), but they rarely had the taller, complex structures many underwater animals rely on. Meanwhile, protected but unrestored areas in Harris Creek did the poorest. Their top score was two, and only 8% received even that—meaning almost all the unrestored sanctuary reefs had no more than half their terrain covered with hard surfaces for oysters to grow on.

Ogburn views that last finding as a message: Oyster sanctuaries can support healthy reefs, but they often need some investment.

"There certainly are places where there just isn't good habitat for them," he said. "And until you create that through restoration, you're not going to have oysters there, or not have a lot."

But when sanctuaries do have plenty of oysters, he added, the benefits will likely spillover to help the men and women working on the water.

"The hope is that by creating these sanctuaries with really healthy oyster

reefs, they'll be self-sustaining, but also produce larvae that get carried out into the harvest areas and help supplement the harvest as well," he said.

More information: K Heggie et al, Rapid video assessment detects qualitative differences in oyster reef habitat, *Marine Ecology Progress Series* (2021). DOI: 10.3354/meps13708

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