That's amore, ocean drone first to identify grouper mating calls in spawning season

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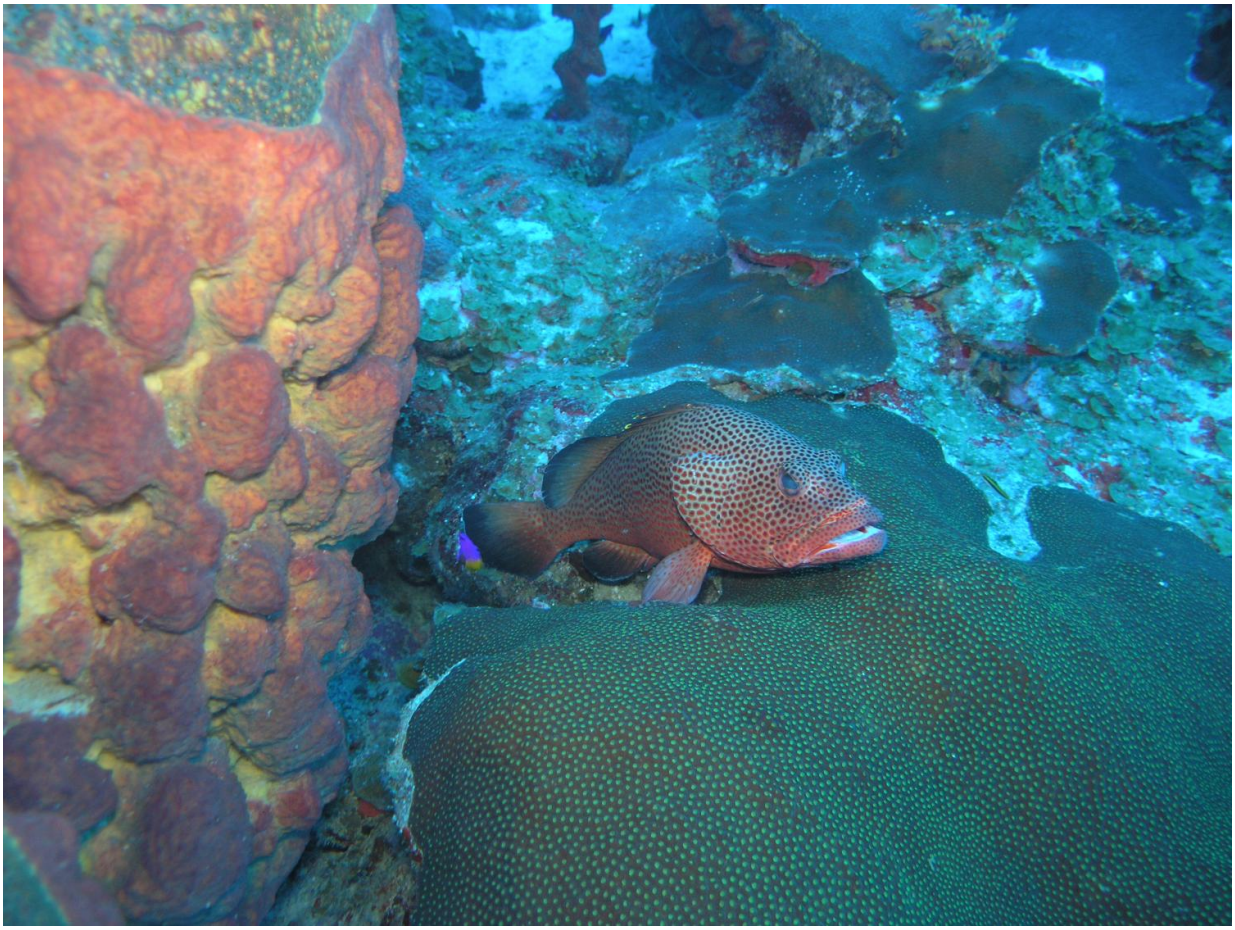

Spawning season for many commercially important groupers including the Nassau, Warsaw, black, yellowfin and red hind groupers are concentrated within a couple of months each year. Credit: Florida Atlantic University, Harbor Branch Oceanographic Institute

Just as the sun begins to set, for just a couple of months, hundreds to thousands of groupers gather at their favorite hangouts along the shelf breaks in the southeast United States, Gulf of Mexico and the Caribbean Basin to spawn - and luckily they're pretty vocal about it, providing vital data on their reproductive behaviors as well as their favorite mating spots.

A team of scientists from Florida Atlantic University's Harbor Branch Oceanographic Institute and the University of the Virgin Islands' Center for Marine and Environmental Studies have developed a novel sensing approach using a water drone or robot to listen in on groupers mating. The sensor package and grouper acoustic recognition computer algorithms, developed by FAU's Harbor Branch, have been installed on a Liquid Robotics Wave Glider, which is the first readily available ocean drone of its kind.

Spawning season for many commercially important groupers including the Nassau, Warsaw, black, yellowfin and red hind groupers are concentrated within a couple of months each year. The concentrated nature and short duration of their spawning season makes them especially vulnerable to heavy fishing and as a result, many of the spawning aggregations have disappeared or shrunk in the abundance of spawners. Overfishing at these sites can reduce grouper populations significantly, and findings from this study are helping to inform fisheries managers where protective measures are necessary.

"Each grouper species is identified through the unique sounds that are produced by muscles contracting against their swim bladder," said Laurent Cherubin, Ph.D., associate research professor at FAU's Harbor Branch. "These sounds can best be described like that of a boom on a beating drum. Often, the fish make these sounds in territorial defense or during courtship of females ready to spawn eggs."

The new robotic sensing technology is assisting researchers with important conservation measures and making data collection easier and less costly than ever before. The purchase of the Harbor Branch wave glider and their engineering efforts to develop and test the sensor package was funded by a generous grant from the Harbor Branch Oceanographic Institute Foundation (HBOIF).

The surface float of the wave glider, which is approximately 10 feet long, has a solar panel, cell phone and satellite communications antenna, GPS receiver and a weather station that monitors atmospheric conditions like wind speed, humidity and temperature. The glider can record sounds within a 1,000-meter distance under optimal conditions, and transmits real-time data to shore. Because the glider is solar powered and uses wave energy and not a motor to move around, it doesn't make much noise, making it minimally invasive to fish. It also can survey huge areas of the seafloor and potentially discover new grouper spawning sites. The most recent wave glider mission occurred in April in the U.S. Virgin Islands where sounds were recorded around three known grouper spawning sites. The wave glider also surveyed more than 100 kilometers of deep shelf-edge reef south of St. Thomas and St. John islands as well as Vieques island off Puerto Rico's eastern coast.

The researchers set out to better understand the relationship between vocalization frequency and fish abundances. Using an underwater listening device, or hydrophone, and a special software program to detect the very distinct sounds that groupers make, Cherubin and his colleagues keenly listened for reproductive activities at these sites in the Virgin Islands. They followed the wave glider in a boat during the day when weather conditions permitted, while it roved alone during the night. Underwater visual surveys with video cameras and laser calipers were used to estimate the density and length of the fish at the study sites, and will help to calibrate the acoustic data and eventually estimate the number of fish.

Since the wave glider transmits acoustic data in real-time, divers can be deployed to verify potential spawning sites as soon as the signals are detected at the various locations. Field testing the application of this technology in the Virgin Islands was funded by a Saltonstall-Kennedy grant from the National Oceanic and Atmospheric Administration (NOAA).

"We only know about 25 percent of the sounds that are made by organisms in the ocean," said Cherubin. "Once we have created a library of these different calls, we can use this type of technology to monitor the ocean's health and biodiversity. And, our grouper-listening glider is a very good start."

Provided by Florida Atlantic University