

# Scientists team up to work on coral reef recovery, resilience

By **SUZANNE CARLSON**  
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Scientists and engineers from the Woods Hole Oceanographic Institute's Reef Solutions Initiative are doing research on St. John reefs and honing cutting-edge technology to help coral and other marine species withstand threats including disease, pollution, and global warming.

"Coral reefs are the most complicated ecosystem," said Yogesh Girdhar, a computer scientist at WHOI who is developing a new portable, autonomous robot capable of independently maneuvering over reefs and collecting data.

Girdhar and other scientists from WHOI are taking an interdisciplinary approach to finding new ways to study coral reefs and monitor their health, and recently traveled from Massachusetts to conduct field research at the University of the Virgin Islands Lab in Lameshur Bay on St. John in the V.I. National Park.

Dubbed "CUREE," the "Curious Underwater Robot for Ecosystem Exploration," Girdhar said the robot is equipped with visual video equipment and hydrophones to record the sounds of the reef, including the crackling of shrimp and fish grunts.

WHOI sensory biologist Aran Mooney is also deploying hydrophones to various sites, and has been recording reef sounds around St. John for a decade.

"We've been doing this enough now where we can tell you if it's a healthy reef or an impacted reef," Mooney said.

Mooney's team is also deploying "RAPS," or "Reef Acoustic Playback System," which broadcast the sounds of a healthy, biodiverse reef underwater.

The team is still analyzing their findings, but Mooney said they're hopeful the RAPS encourage larval settlement and regrowth of impacted reefs.

For habitat restoration to be successful, the reef "has to look right, smell right, and sound right," Mooney said.

WHOI Microbial ecologist Amy Apprill has been collecting water samples from reef sites, which are then filtered to collect the "incredibly abundant" organisms within.

There are 10 million microbes in only 20 drops of seawater, and Apprill said she's working to analyze the samples and use them to help shed light on the health of reefs around the world.

DNA sequencing has shown that each reef habitat has its own microbial signatures, and "within that, there's so much more for us to learn," Apprill said.

WHOI physical oceanographer Gordon Zhang has been using com-



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Research has shown surprising differences even around a small land mass like St. John, and Zhang said that for example, the north shore has stronger currents and much higher salinity levels.

"There is a dramatic difference just in the north and south of this tiny island," Zhang said.



Daily News Photo/by SUZANNE CARLSON

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Knowing where best to place coral larvae will help ensure those efforts are a success, and Zhang said they're working to test the model's predictions with field research to increase its accuracy.

One of the ways scientists are trying to help coral colonies recover is by providing new places for larvae to settle and grow, and WHOI engineer Jeff Coogan explained that they constructed grooved tiles with con-

crete, aragonite, and trace metals.

The tiles are placed at various sites and then recovered, and graduate student Nadege Aoki has been carefully examining each under a microscope for signs of new life.

The value of goods and services provided by shallow coral reefs is estimated at \$2.7 trillion per year, including \$36 billion in coral reef tourism, but reefs "are among the most vulnerable ecosystems on the

planet to human activity, including global threats from ocean warming, climate change, and ocean acidification, as well as local threats from disease, land-based pollution (including nutrient and sediment runoff), fishing, and development," according to information from WHOI.

"Shallow corals are extremely sensitive to temperature changes—even a small amount of warming can cause corals to expel their symbiotic algae, a phenomenon known as coral bleaching. Nearly 8% of hard corals worldwide bleached after a widespread warming event in 1998; although many of the affected areas grew back by 2009, reefs have declined steadily worldwide since then, losing nearly 15% of their previous coverage," according to WHOI, and an increase in water temperature of 1.5 degrees Celsius "could lead to a loss of 70% to 90% of reef areas."

In recent years, corals have been dying from Stony Coral Tissue Loss Disease, and scientists are still studying other threats to reef health, like a massive urchin die-off throughout the Caribbean.

Dr. Marilyn Brandt, a coral disease specialist and research associate professor of marine and environmental science at UVI, said the urchin die-off was first detected in the Virgin Islands by a commercial dive shop, thanks to a robust reporting network originally set up for Stony Coral Tissue Loss Disease. She encouraged anyone who sees anything unusual on local reefs to report the sighting through VI-CoralDisease.org.

Brandt said UVI has taken over administration of a \$740,000 disaster relief grant from the Department of Fish and Wildlife to create an artificial reef, and will be working with WHOI scientists to develop best practices for such projects.

"It's not that we're saying the artificial reefs should replace natural reefs," said Brandt.

Rather, artificial reefs might help "jump start" recovery of corals and the other organisms that rely on them, and "could serve as sort of havens while the natural reefs are recovering," she said. "They could never replace the natural reefs."

"There's so much reef research going on on these islands," Apprill said.

"It's needed because we're seeing all these changes that are happening," said Dr. Paul Jobsis, director of the Center for Marine and Environmental Studies at the University of the Virgin Islands.

"UVI is really happy the Woods Hole group is down here," Jobsis added.

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