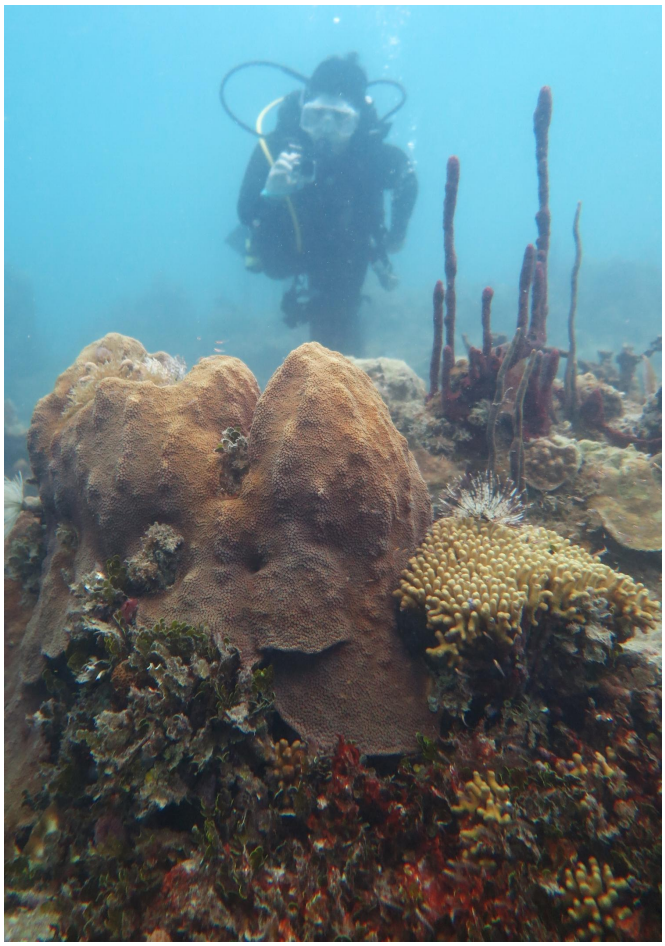
UTA quantifying coral species' disease susceptibility by examining immune traits

24 March 2017



Laura Mydlarz inspects corals at a reef off the coast of the US Virgin Islands in October 2016. Credit: Laura Mydlarz

A biologist from The University of Texas at Arlington is leading a new study aimed at quantifying how susceptible coral species are to disease by examining their immunity through a series of novel experiments and approaches.

Laura Mydlarz, associate professor of biology, is principal investigator of the project, titled "Immunity to Community: Can Quantifying Immune Traits Inform Reef Community Structure?" and funded by a two-year, $220,331 grant from the National Science Foundation's Division of Ocean Sciences. Co-principal investigators are Marilyn Brandt, research associate professor of marine and environmental science at the University of the Virgin Islands, and Erinn Muller, staff scientist at the Mote Marine Laboratory and Aquarium in Sarasota, Fla.

During the past three decades, environmental changes - including global warming - have likely led to the sharp increase in coral disease in reefs around the world. Unhealthy coral reefs cannot support the fish and other forms of life that make reefs such vibrant and diverse ecosystems. Coral reefs in the Caribbean Sea are disease hotspots and many reefs have experienced population collapses due to outbreaks of disease, Mydlarz explained. Coral species vary in their susceptibility to disease, but the reasons behind this variation are unknown.

"Coral diseases don't affect all coral species in a reef the same," Mydlarz said. "Some coral are more susceptible to certain diseases. A reef is made up of many different species of coral. If a disease kills off one species of coral in a reef, that's going to greatly affect the reef community as a whole. We want to learn why some coral species are more tolerant of certain diseases."

The project will focus on coral reefs in the Caribbean off the U.S. Virgin Islands. The site was chosen due to the high diversity of coral found there and the presence of "white plague" disease, which can cause rapid tissue loss in corals, affects many coral species and can cause partial or total colony mortality.

The project will use immune-challenge experiments that will quantify novel components of the innate immune system of corals, coupled with the application of a trait-based model, to fulfill three

goals, Mydlarz said.

The first is to determine variability of coral immune traits in seven common coral species found on Caribbean reefs; the second is to determine the variability in resistance to white plague disease transmission in the same coral species; and the third is to develop a predictive model of coral community assemblage that incorporates immune traits.

The coral species which will be examined differ in disease susceptibility, growth rates and reproductive strategies. Susceptibility to white plague disease will be measured by exposing the corals to active white plague and calculating disease transmission rates in a laboratory setting. The immune responses of each species will be measured by exposing samples to bacterial immune stimulators. Samples will be collected and injected with lipopolysaccharides, which are molecules that elicit strong immune responses in some organisms.

"We want to see the coral in its natural state and in an immune-stimulated state," Mydlarz said.

The immune response and disease transmission data for each coral species will be used to develop a predictive model to determine how different coral communities will respond to disease threats under climate change scenarios, she said.

Mydlarz traveled to the Virgin Islands in October to visit the site where the research will be done and to meet with Brandt. She plans to return in June along with some of the graduate students from her laboratory to collect samples and conduct experiments.

Clay Clark, professor and chair of the UTA Department of Biology, said the project is an example of the important work Mydlarz is doing to shed more light on the ties between climate change and the delicate ecosystems which have been adversely affected by that change. He noted that her research is a prime example of global environmental impact, which is one of the four pillars of the University's Strategic Plan 2020 Bold Solutions|Global Impact.

"Dr. Mydlarz has been studying how environmental changes are affecting the ability of coral to fight disease for years and has contributed a great deal to our knowledge of coral immunity," Clark said. "This research will add to that knowledge and help us to better inform and encourage conservation."

The research will be highlighted at outreach events in Texas, Florida and the Virgin Islands, including Earth Day Texas 2017, scheduled for April 22 at Fair Park in Dallas; the Living Reef Exhibit and Aquarium at Mote Marine Laboratory; and Reef Fest and agricultural fairs at Coral World Ocean Park in St. Thomas, U.S. Virgin Islands.

Mydlarz earned bachelor's and master's of science degrees in Marine Biology from Florida Atlantic University in 1996 and 1998, respectively, and received her doctorate in Marine Science from the University of California at Santa Barbara in 2004. She did postdoctoral work in ecology at Cornell University from 2004-06 before joining UTA in 2006. Much of the research in her lab focuses on coral immunity and disease.

Provided by University of Texas at Arlington