

7-18-2011

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Recommended Citation

Potier, Beth, "Graduate Student Dives Deep As Aquanaut On Undersea Research Station" (2011). *UNH Today*. 3708.
<https://scholars.unh.edu/news/3708>

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University of New Hampshire graduate student Cara Fiore conducts research on corals and sponges from the Aquarius Reef Base, an undersea habitat near the Florida Keys. Photo courtesy of Aquarius Reef Base.


DURHAM, N.H. – In the sweltering days of midsummer, the ocean beckons many of us to splash in her briny cool. For Cara Fiore, a doctoral student at the University of New Hampshire, that dip in the deep will last nearly two weeks, as she conducts research as an aquanaut on Aquarius Reef Base, a unique undersea research station in the coral reefs near the Florida Keys located at a depth of 63 feet.


During the mission, from July 12 – 21, 2011, Fiore will conduct research on coral reef landscape response to ocean acidification with a team from the University of Mississippi led by professor Marc Slattery. In addition, she will sample sponges for her own research, which looks at the microbial ecology of bacteria and archaea associated with the giant barrel sponge, *Xestospongia muta*.

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Aquarius, an 81-ton underwater laboratory measuring 43 by 20 by 16.5 feet, allows scientists to work out on the deep coral reefs of the Florida Keys National Marine Sanctuary for up to nine hours a day.

“We gain the bottom time needed to conduct these experiments,” Fiore writes in an e-mail from Aquarius. “On normal SCUBA dives you get maybe an hour of bottom time and often only two or three dives per day, so it is difficult logistically to conduct a long-term experiment. By saturating (so we don't have to worry about too much nitrogen in our blood) we can dive for six to nine hours per day, then at the end of the mission we do a 10-hour long decompression overnight and then swim to the surface in the morning.”

Inside Aquarius, Fiore and five fellow aquanauts (four scientists and two support personnel) enjoy all the comforts of home, albeit a small one. Aquarius boasts six bunks, a shower and toilet, instant hot water, a microwave, a refrigerator, air conditioning and even computers linked back to shore wirelessly. A webcam (<http://aquarius.uncw.edu/live/>) gives curious visitors a glimpse into their underwater world, and Fiore was surprised to learn she is accessible by telephone during the mission.

“The staff here are amazing,” she reports. “We have two technicians in the habitat with us who are constantly monitoring us and the habitat. There is also a doctor back on land on call for us. The four of us (scientists) have been able to focus on our work without any issues so far.”

The core science of this mission is to explore how coral reef ecosystems are adapting to ocean acidification, a response to increased uptake of carbon dioxide by seawater that results in lowered pH levels and stresses marine ecosystems.

“We have collected some common sponges and corals and will challenge them to a more acidified environment, a warmer environment, or both in order to examine how global warming and ocean acidification will affect the physiology of the organisms,” says Fiore, who is working with Slattery and University of Mississippi graduate student Cole Easson and Mauritius Bell, unit diving coordinator at the University of Hawaii at Hilo, on this project.

Fiore, who studies at UNH with research professor Michael Lesser in the department of molecular, cellular and biomedical sciences, is also spending some of her Aquarius time gathering data on nitrogen cycling and

microbes in the giant barrel sponge, *Xestopongia muta*, the subject of her dissertation. "Basically, I want to know 'who is there' and 'what they are doing,'" she says. "I am specifically interested in how these microbes influence nitrogen cycling in the sponge and on the reef, since nitrogen is a limiting nutrient on coral reefs. Due to the size and abundance of *X. muta* on Caribbean reefs (particularly in Florida Keys) any nitrogen cycling occurring in the sponges may have a large impact on nitrogen cycling on the reef."

Fiore detailed her research and her experience on the mission's blog yesterday (July 17, 2011):

By rigging up a fluorometer (measures fluorescence) and an oxygen sensor right above the sponge and then adding a bit of fluorescent dye to the sponge (non-toxic) (pictures of the setup are online), we can get an idea of the metabolism and activity of the sponges over time. The best part is that we can come inside, download our data, then go right back out for more- this living underwater thing sure makes science go much faster than back on land! ...

We have had several visits from our new aquatic friends are already feeling like they are old acquaintances of ours. The sea turtle that seems to swim by each evening, a large and impressive moray eel that we have seen out swimming about (quite a sight to see), the pair of crepuscular groupers, a curious lionfish that clearly views us as 'living in the aquarium', and the usual cluster of jacks, snapper, and angelfish- all of which seems comforting and familiar now.

Read more at <http://www.nurc.net/blog/july2011/71711-aquarius-mission-slattery-team>

The Aquarius undersea laboratory is owned by the National Oceanic and Atmospheric Administration (NOAA) and operated by the University of North Carolina Wilmington's Aquarius Reef Base program. Follow the mission online at <http://aquarius.uncw.edu> for live video feeds, pictures and aquanaut journals. Viewers may also join the Aquarius team for live broadcasts of habitat technician dives continuing through Tuesday, July 19, 2011 from 7 – 9 p.m. at <http://www.ustream.tv/aquariusreefbase>.

The University of New Hampshire, founded in 1866, is a world-class public research university with the feel of a New England liberal arts college. A land, sea, and space-grant university, UNH is the state's flagship public institution, enrolling 12,200 undergraduate and 2,300 graduate students.

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Photograph available to download: http://www.unh.edu/news/cj_nr/2011/jul/bp18aquanaut_01.jpg

Caption: University of New Hampshire graduate student Cara Fiore conducts research on corals and sponges from the Aquarius Reef Base, an undersea habitat near the Florida Keys.
Photo courtesy of Aquarius Reef Base.

Additional photographs from the mission are available on the Aquarius flickr photostream:

<http://www.flickr.com/photos/aquariusreefbase>

Reporters and editors: UNH graduate student Cara Fiore can be reached by e-mail during the mission at cfiore@gmail.com; she will respond during evenings. Contact Beth Potier to arrange an interview with her after the mission.

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