Deep sea expedition sets sail

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A view of a hydrothermal vent from the submersible Alvin's portal. Credit: UD Photo

Setting sail on the Pacific, a University of Delaware-led research team has embarked on an extreme adventure that will find several of its members plunging deep into the sea to study hydrothermal vents on the ocean floor.

The team, which will be conducting research in environments that include scalding heat, high pressure, toxic chemicals and total darkness, is part of the National Science Foundation-funded "Extreme 2008: A Deep-Sea Adventure."

The scientists are being joined by students from around the world on dry land who have signed up for an exciting virtual field trip. More than

20,000 students from 350 schools in the United States, Aruba, Australia, Canada, Costa Rica, Great Britain and New Zealand are participating.

The expedition, led by Craig Cary, professor of marine biosciences in the University of Delaware's College of Marine and Earth Studies, left Monday, Nov. 10, aboard the research ship Atlantis from a port in Manzanillo, Mexico, with an expected return date of Dec. 1. For those interested in following the scientists, they will blog regularly about the voyage at the Extreme 2008 Web site [www.expeditions.udel.edu/extreme08].

Team members – researchers and graduate students – are from the University of Delaware, the University of Colorado, University of North Carolina, University of Southern California, J. Craig Venter Institute, Universidad Nacional Autónoma de México and the University of Waikato, New Zealand.

The team is heading to destinations at two hydrothermal hot spots: Guaymas Basin in the Gulf of California and a group of vents in the eastern Pacific Ocean about nine degrees north of the equator.

Once above the vents, the researchers will take the submersible Alvin down from one to nearly two miles below the surface. Built to withstand crushing pressures and to pierce the utter blackness of the deep, Alvin will let the scientists observe life around the steaming vents and collect samples for analysis. Both Atlantis and Alvin are owned by the U.S. Navy and operated by the Woods Hole Oceanographic Institution.

The scientists' focus will be marine viruses and other tiny life called protists. These organisms prey on bacteria, the primary food for vent dwellers ranging from ghost-white vent crabs to bizarre-looking tubeworms.

"For many years, the vents have been explored with little to no attention to viruses and protists," Cary says. "Yet because these organisms eat bacteria, they have the most dramatic effect on the bacterial communities that support the vent system. Our research programs are among the first to focus on these remarkable scavengers."

Eric Wommack, an associate professor with joint appointments in both the College of Agriculture and Natural Resources and the College of Marine and Earth Studies, will join Cary in leading the UD contingent.

Wommack, who is based at the Delaware Biotechnology Institute, is an expert on marine viruses and will be deploying specialized equipment to capture them for analysis in the shipboard lab.

Wommack says hydrothermal vents, although characterized by caustic chemistry, hot temperatures and high pressure, are oases of life in the deep sea. The vents provide an ecosystem for ancient and unusual microbes that are capable of extracting energy from volcanic rather than solar energy, and are home to viruses.

"As a group, viruses are the most abundant biological entities on Earth and contain its largest reservoir of unknown genes," Wommack says. "We know that bacteria at the deep-sea hydrothermal vents are intimately associated with relatively abundant populations of viruses. Our goal is to explore the wilderness of viral genes existing at the vents."

David Caron, professor of biological sciences in the Wrigley Institute for Environmental Studies at the University of Southern California, will be studying protozoa, a class of protists that feed on other organisms and that may form a crucial bridge between bacteria and animal life.

If Caron is correct, the samples from the deep will show that protozoa feed on bacteria or on the products of bacterial activity and are in turn

eaten by larger life forms. The most surprising thing about the theory may be the lack of evidence for it. While other studies have found a protozoan-animal link in surface waters, the analogous middle step in the deep ocean has been overlooked.

"Protozoa are everywhere and they're in virtually every environment. They play this intermediate food web role in a number of these environments, and there's no reason to believe that they aren't doing the same thing in the vents. It simply hasn't been looked at to any degree," Caron said.

As the scientists work at sea, they will be connected to students via an interactive Web site, where blogs, dive logs, video clips, photos and interviews will be posted daily. Students also will be able to write to the scientists, design experiments and participate in a virtual science fair.

A capstone experience for selected schools will be a "Phone Call to the Deep," linking classrooms with researchers working live in the submersible Alvin on the seafloor.

Source: University of Delaware