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Another world

A UVic marine biologist explores the strange world of undersea volcanoes

Tunnicliffe, against a backdrop of sea lilies, corals and basket stars at the Ruby Seamount on the Mariana Volcanic Arc.

by Peigi McGillivray

Deep-sea volcanoes that emit clouds of molten sulfur and droplets of liquid carbon dioxide. Hydrothermal vents that spew plumes of super-heated water and dissolved minerals. Neither sounds like an ideal place to set up house, does it?

But an astonishing range of marine organisms call these hostile and toxic environments home, says Dr. Verena Tunnicliffe, a marine biologist at the University of Victoria and an internationally renowned expert on the unusual sea life found at hydrothermal vents, sub-sea volcanoes and low-oxygen zones.

This spring, Tunnicliffe participated in a 34-person, multidisciplinary scientific expedition to the Mariana Arc near Guam, where a remotely operated submersible was used to gather samples, record sounds and view real time, deep-sea volcanic eruptions and strange new ecosystems.

"We found surprisingly rich populations of organisms that have adapted to life in the very challenging conditions on active, deep-sea volcanoes," says Tunnicliffe, who is the Canada Research Chair in Deep Ocean Research. "These populations have grown substantially in complexity and size since our last visit to the area in 2006, despite a very intense cycle of eruptions."

Tunnicliffe's research focuses on the biology and ecology of deep-ocean organisms living in extremely stressful conditions, shedding light on how communities and animals adapt.

"Learning about adaptations in these harsh conditions will help us understand the limits of life, and enable us to better protect the ocean's biodiversity in the face of climate change," she says.

Deep-sea research is extremely challenging. Oceanographers have to compete for a small number of research ships during the summer months, when the weather is stable. Much of their allotted time at sea is spent travelling to a research site, waiting for good weather, and preparing and launching tethered sensors, subs or moorings.

It's difficult to collect comprehensive data in this way, which is why our oceans have remained mysterious and invisible to most of us.

"When we clearcut a forest, we can see the results easily and study them over time," says Tunnicliffe, "But the damage that is occurring to our oceans through ocean change and fishing practices is much more insidious and almost entirely invisible. We see only the surface of a problem that goes very, very deep."

Tunnicliffe and her team—including UVic undergraduate and graduate students—are working to break down the barrier between us and everything that lies beneath the surface of our oceans.

Key to this effort is VENUS, a UVic-led cabled seafloor observatory located near Victoria and Vancouver that transmits live data to researchers around the world through the Internet.

VENUS overcomes many of the difficulties of accessing the ocean by providing real-time, ongoing and archival information about currents, temperature and chemical conditions, as well as sound and visual images of animals in their natural habitat.

"I'm constantly surprised, and thrilled, by life in the ocean," says Tunnicliffe. "There is so much to explore and discover, so much to learn about marine animals and how they fit into their world. I'd like everyone to experience the amazement and wonder I feel, so we can all work together for the better health of our oceans."

EDGEwise

Verena Tunnicliffe has made more than 120 manned submersible dives and led or joined over 50 deep-sea exploration missions around the world. In the process she has discovered more than 60 new species and several previously unknown seafloor communities.

This spring, Tunnicliffe went on an expedition to the NW Rota-1 volcano on the Mariana Volcanic Arc, 100 km north of Guam in the Pacific Ocean. To read the trip's blog visit *nwrota2009.blogspot.com/*.

Tunnicliffe is project director of the cabled ocean observatory VENUS. You can enter the ocean online at *www.venus.uvic.ca*.

Major funding for Tunnicliffe's work comes from the Natural Sciences and Engineering Research Council of Canada, the Canada Foundation for Innovation, BC Knowledge Development Fund and the National Oceanic and Atmospheric Administration.

UVic researchers were awarded more than $106 million in outside research grants and contracts in 2007/08. This more than doubles the research support of five years ago.