

Rutgers documenting Antarctic climate shift

By Kirk Moore • STAFF WRITER • March 4, 2009

A pair of New Jersey-built undersea probes and eight Rutgers University researchers are documenting a dramatic climate shift near the bottom of the world, where warming currents off west Antarctica are remaking the ocean ecosystem — and dealing a wild card for predictions of global sea level rise.

"It's the fastest-warming area on Earth," said Oscar Schofield, a professor at the Rutgers Institute of Marine and Coastal Sciences, who recently returned from weeks at sea off the Antarctic Peninsula.

Scientists reckon that average temperatures on that side of the continent have risen since 1950, and the Rutgers team took its underwater vehicles and sensor technology there "to see how the ecosystem responds," Schofield said.

"The heat source down there isn't the atmosphere. It's the ocean," he said. "There's warmer water coming off the Antarctic circumpolar current. This is where the current is closest to the ice sheet."

Previously, most of the warming was thought to occur only on the peninsula pointing toward South America, said Colin Summerhayes, executive director of the Britain-based Scientific Committee on Antarctic Research and a member of International Polar Year's steering committee.

But now the committee reports wider warming. The biggest west Antarctic glacier, the Pine Island Glacier, is moving 40 percent faster than it was in the 1970s, discharging water and ice more rapidly into the ocean, Summerhayes said.



Researchers from Rutgers University spent four weeks at sea on the 247-foot research vessel Laurence M. Gould, gathering data on the changing climate in west Antarctica. (PHOTO COURTESY OF RUTGERS UNIVERSITY)

"If the west Antarctica sheet collapses, then we're looking at a sea level rise of between 1 meter and 1.5 meters," Summerhayes said. That would be a rise of 3 feet 4 inches to nearly 5 feet.

"The people who go there year after year say they can see more glacier" as coastal ice dwindles, said Michael Garzio, 22, of Hamilton in Mercer County, a Rutgers senior who worked on the team assisting the Long-Term Ecological Research project. The project has been run for 17 years out of Palmer Station, one of three U.S. research outposts on the continent.

Ice there had thinned enough in the summer that the group was able to land on Charcot Island, an isolated rock only visited twice in the past century.



Seal and penguins in Antarctica, with research vessel Gould and Palmer Station in background. (Photo by Oscar Schofield/Rutgers University).

Penguins are one indicator of accelerating ecosystem changes, Schofield said.

Penguins on the move

"It's not like penguins are going to die of heat prostration," he said. But they are on the move. Adelaide penguins have moved south along the peninsula, leaving their niches filled by penguin species more suited to milder conditions, and "Adelaides will probably be gone from Palmer Station in five years," Schofield said.

At sea on the 247-foot research vessel Laurence M. Gould, the Rutgers crew spent four weeks gathering data and operating two Slocum electric gliders, autonomous underwater vehicles that slowly cruise the sea, diving and rising to read conditions at various depths. Compared with doing it manually from the deck of a ship, it's a vastly cheaper and more efficient way to do basic ocean surveys.

In 17 years of the Palmer Station study, "they've collected something on the order of 2,500 profiles, compared to 5,000 in three glider deployments," Schofield said.

"Because you're on a boat, people get close and make a lot of friendships," said Garzio, who as an undergraduate jumped at the rare chance to work on major research. "It was warmer there than it was here (in January). I don't believe it got below the mid-teens. . . . We got lucky. The Drake Passage is supposed to be some of

the worst seas in the world, up to 60 feet, but around 12 feet was the biggest we saw."

Changes under the sea

Below the surface, scientists found an ecosystem shift away from krill, tiny shrimp-like animals, and an increase in jellyfish-like salps in the now-warmer northern waters, Schofield said.

"When you hit a jelly bloom (with a sampling net), the cod end is just solid," he said, referring to the part of the net where the catch is held.

A forthcoming article in the journal *Science* will discuss how that means lower biological productivity.

"On the peninsula side, the sea ice has declined by thousands of kilometers," Schofield said. "The betting pool is on how long it will take birds to carry seeds there (in their droppings) and for plants to take root."

The work was funded by the National Science Foundation to the tune of \$5 million to \$6 million, including 40 days of ship time, and it's just the first of a five-year commitment of Rutgers technology, Schofield said. The university has \$1.3 million from the Gordon and Betty Moore Foundation to deploy a "glider swarm" of undersea robots next season, and a deepwater glider is being tested off Puerto Rico so it can explore Antarctica's submarine canyons, he said.

More glider missions

One glider launched from the ship was picked up by a team from the British Rothera Station on Adelaide Island. A goal is to have ongoing glider missions that can be supported with just small boats from the stations, and mission control at the Rutgers New Brunswick campus.

"With the gliders, if we can be down there 365 days a year, we can be there for these (ecosystem) events," Schofield said.

In January, the journal *Nature* published a paper showing that Antarctica as a whole has been warming at a rate comparable with the rest of the world, and at an accelerated pace near the western peninsula. For years, many climate experts had believed the continent was cooling — driven by a hole in atmospheric ozone — but the new analysis showed that's only happened in some areas, said lead author Eric Steig at the University of Washington.

Meanwhile, a British survey team reported that the Wilkins Ice Shelf, a Connecticut-sized sheet of ice, is on the verge of detaching from the continent. The continent's

ongoing loss of ice shelves does not have much affect on sea level — the shelves are already floating on the ocean — but scientists are also reporting faster movement of west Antarctica's land glaciers, which dump ice and meltwater into the Southern Ocean, which is on the side of the continent facing Africa.

If that acceleration continues, it could change the outlook for faster sea level rise.

"The west Antarctic ice sheet is as big as the Greenland ice sheet," Schofield noted.