

Rutgers robotic glider wows oceanographers

Device returns a sea of Antarctic data

By Sandy Bauers

Inquirer Staff Writer

A submersible, robotic glider that took on the frigid waters of the Antarctic has wowed oceanographers by collecting in 24 days almost as much data as research vessels had gathered in 12 years.

The glider, operated from 7,000 miles away by a team of Rutgers researchers and their computer, was plucked from the water last week, its mission declared a resounding success.

The complex ecosystem of the extreme southern waters is largely unknown and difficult to study, but hugely important since this is where global warming's effects are most dramatic.

Researchers are just beginning to tease out the meaning of the new data, but already, they're discovering surprises about currents, microscopic plant life, and the feeding habits of penguins.

"My mind is just racing," said Columbia University oceanographer Douglas Martinson, who watched in amazement as data piled up on a Rutgers Web site. "I'm still coming to grips with the questions we'll be able to answer that we never even dreamed possible."

The yellow submersible, 6 feet long and 115 pounds, operates on a battery pack of 240 common C cells. Rather than using a propeller, it moves by taking in just enough water for its nose to start to sink. Wings provide the forward glide.

When it reaches a specified depth, it expels the water and begins to rise.

With each descent and ascent, sensors on the glider gather a "cast" of data about the water - its temperature, salinity, clarity and more.

At specified times, it stays on the surface, activates a satellite phone, and downloads its data to the computers at Rutgers' Coastal Ocean Observation Lab - R.U. COOL.

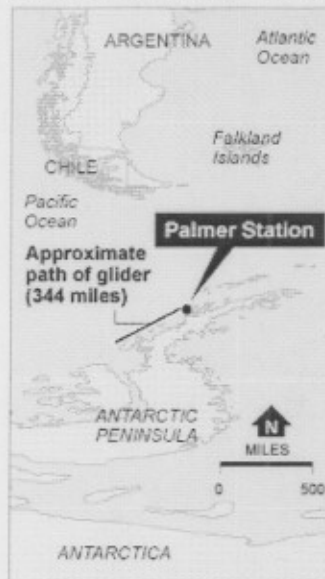
In less than a month, the glider, dubbed ru06, phoned home more than 1,300 casts. Twelve years of previous shipboard research in the area had produced 1,600 casts, said Martinson, who collaborated on an \$80,000 National Science Foundation grant for the glider test.

"It's just giving us data like there's no tomorrow," he said.

Among those mining the information is Bill Fraser, a Montana ecologist. For three decades he has studied the Antarctic peninsula's Adelie penguins - yes, like the "Amigos" in *Happy Feet*.

Rutgers' Glider

The robot was pulled from the water after being submerged for 24 days and traveling more than 340 miles.



SOURCES: Institute of Marine & Coastal Sciences, Rutgers University, ESRI
The Philadelphia Inquirer

Some of the penguins have been captured and outfitted with tiny transmitters that allow satellites to track their location. Fraser knew where they were diving, how deep they were going, and that they were eating krill - small, shrimp-like crustaceans that whales, seals and other marine life also eat.

Not long ago, he was struck as his computer flashed two streams of data: one from the penguins and one from ru06, whose sensors were mapping phytoplankton, microscopic plants that live in the ocean and are crucial to the marine food chain.

Fraser realized that the penguins were feeding just below the plant life. He figured the murky, green phytoplankton was driving the animals lower, where visibility was better.

"This is our first glimpse at these birds very clearly avoiding what's known as a 'chlorophyll maximum,'" he said.

Martinson, who studies the unique "signature" of different bodies of water, knew that the water near Palmer Station, a research center on the Antarctic peninsula, had characteristics different from the water offshore. For one thing, it was warmer. But he didn't know why.

Within 12 hours of ru06's launch, as it headed a few miles offshore beyond the "shadow" of land, he noticed that the data indicated the water current switched direction "dramatically," coming from the north instead of the east.

"It instantly told us, Ah, it's just a different water at the station," he said. "It's coming from behind the island."

Data from the glider will allow Rutgers associate professor Oscar Schofield to track the health of the phytoplankton by looking at its photosynthesis.

Submersible robots are seen as a valuable new tool in oceanography. They can stay out longer than research ships, go more places, gather more data, and endure harsher weather. Above all, they're cheaper.

The waters off Antarctica are the wildest, coldest, most hostile on the planet. Even though

other gliders had roamed other oceans and survived a multitude of storms, when ru06 slipped into the frigid southern waters in early January, researchers weren't positive it could survive.

Indeed, within hours the glider developed a leak. It sent an e-mail alarm, and a research vessel seven hours away raced to the rescue.

Even the glitch was declared a success. "It just shows how great this technology is," Martinson said. "It said: 'I'm sick. Help me.' "

After that, not only did it keep porpoising along, but when it got to its last waypoint, it still had plenty of battery life. "So we turned it inshore," Rutgers oceanographer Josh Kohut said.

It went an extra 60 miles, for a total of 344 miles.

"The robots are ready. That's what this proves," said Scott Glenn, a Rutgers professor of marine science.

Researchers say gliders will never replace ships. But they can be the eyes that tell ships where to go.

"I think it's time," said Schofield, "to think about how we're going to outfit that whole ocean with robots."

Track the glider's path and see data it has sent back via <http://go.philly.com/glider1>

Contact staff writer Sandy Bauers at 215-854-5147 or sbauers@phillynews.com.