Lobster Traps Going High Tech

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Close-up of drifter after deployment. Instructions are provided if the instrument washes ashore. (Credit: NOAA Fisheries)

(PhysOrg.com) -- New England lobstermen have gone high tech by adding low-cost instruments to their lobster pots that record bottom temperature and provide data that could help improve ocean circulation models in the Gulf of Maine.

Environmental Monitors on Lobster Traps, or eMOLT, is a partnership involving NOAA, the Maine, Massachusetts, Downeast and Atlantic Offshore Lobstermen's Associations, the Gulf of Maine Lobster Foundation, and the Marine Science Department at Southern Maine Community College (SMCC) in Portland, Maine.

The data collected from temperature sensors on the lobster pots and

from GPS surface drifters deployed as part of the eMOLT program help ocean circulation modelers better understand processes in the Gulf of Maine, such as how lobster larvae and other planktonic animals and plants, including those that cause harmful algal blooms, drift and settle. This information may also help determine how ocean currents disperse, condense and transport pollutants, invasive species, and food for whales in portions of the Gulf of Maine.

"Local fishermen already spend their days at sea, have the biggest stake in preserving our coastal marine resources, and are the most knowledgeable of the local waters," said Jim Manning, an oceanographer at the Woods Hole Laboratory of the Northeast Fisheries Science Center (NEFSC), part of NOAA's Fisheries Service. "They are interested, curious and enthusiastic to learn more about lobster science and the environment. It seemed like a natural fit, a win-win situation."

Manning got the idea for eMOLT while conducting research on Georges Bank in the 1990s and seeing many lobster boats in the area. In 1995, he deployed some large moorings to collect oceanographic data, but soon recognized that this was a very expensive effort in terms of time and money. He realized lobstermen had many moorings of their own in the area at fixed locations and depths which could provide needed time-series data at more sites and at far less cost.

With the help of NEFSC port agent John Mahoney, Manning approached some local lobstermen in Sandwich and Hyannis, Mass. to see if they were interested in helping collect bottom environmental data, whenever their lobster pots were out. They agreed. The pilot project started with three lobstermen who each took the temperature-measuring devices and attached them via a plastic tie-wrap to one or two of their pots.

The devices, which cost about $150 each, internally record temperature

every hour around the clock while the pots are in the water. At the end of the season when the pots are hauled out, the instruments are removed and shipped back to Manning in an envelope he provides. He downloads and processes the data and then puts the temperature information on the eMOLT web site. Each lobsterman has his/her own personal web page to see the data from their own pots, while everyone including the general public can see the overall data collected each year.

By 2000, results from the pilot study were encouraging enough for Manning to apply for funding from the Northeast Consortium to formally establish eMOLT. The Consortium has funded the project since. Each year, more lobstermen participate in the program and new instruments are tried, some with success and others that need further development.

One of the program's successes has been low-cost surface drifters equipped with Global Positioning System (GPS) chips, developed by Manning and since 2004 built by students in the marine science program at Southern Maine Community College (SMCC). The students build about 50 drifters a year, each costing about one third that of commercially-made instruments.

"About half of the cost goes to pay the students to build the drifters, so it gives them practical working experience plus the knowledge they are participating in marine research, and the other half is used for parts and other related expenses," Manning said. The drifters have been deployed by students and researchers in studies by a number of colleges and universities, including Bowdoin College, the University of Southern Maine, University of New Hampshire, University of New England, Endicott College, and the University of Massachusetts Dartmouth.

The Woods Hole Oceanographic Institution has deployed some of the drifters for NOAA-funded studies on harmful algal blooms, commonly

called red tides, in the Gulf of Maine. Other researchers have used the drifters for oceanographic studies ranging from where coastal currents in the Gulf of Maine could spread pollutants and invasive species to the distribution of plankton and zooplankton that serve as a major food for whales and other marine life.

Manning and colleagues published drifter observations in the journal Continental Shelf Research in January 2009. The temperature observations will be published in the March 2009 issue of the *Journal of Operational Oceanography*.

Close to 100 lobstermen have provided sensor data since the program started, and about 60 lobstermen have been long-term active participants. Manning says he is a bit surprised but very pleased so many lobstermen are interested in the project. The eMOLT partners have contributed to a database with more than three million hourly temperature records, 80,000 salinity records, and 260,000 satellite drifter fixes (locations).

Lobsterman Jason Day of Vinalhaven, Maine heard about eMOLT from his father, Walter Day, also a lobsterman and program participant. A year-round lobsterman, Jason Day puts his traps in the water in late April or early May and hauls them out in December. He became involved with eMOLT three years ago and has one trap equipped with a temperature sensor in shallow water near Vinalhaven.

"I'm interested in what is happening on the bottom, and eMOLT helps me keep up," Day said. "The program covers a large area and provides a lot of data at a reasonable cost." Day says he looks at the program's web site, and although the data has been pretty much what he expected, he occasionally sees a change that he can relate to his catch.

What's next? Manning says the partners are working on a real-time bottom temperature sensor attached to the traps that would wirelessly

transmit data via satellite once the trap is hauled on deck. They are also working on a combined tilt meter-bottom current meter with digital compass to measure both bottom currents and the angle at which the trap rests on the seafloor. The information collected should provide insight in whether bottom currents affect how lobsters move, and whether currents influence lobsters to enter a trap. In the near future, Manning would like to add sensors to measure oxygen, nutrients, and pH to determine ocean acidification levels in the region.

"There used to be a debate on the docks about whether it was cold or warm on the bottom," Manning said of the lobstermen, whom he meets regularly at their annual meetings and who send in updates. "Now there is no debate. The lobstermen see the data for themselves over time, and can take note of trends or changes that might affect their catches. It is a baseline that helps both lobster science and the scientists and ocean circulation modelers in the Gulf of Maine who, in partnership with the eMOLT lobstermen, constitute part of our nation's integrated ocean observing systems."

Provided by NOAA National Marine Fisheries Service