Environmental Monitors on Lobster Traps
Annual Report
2008

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Project objectives:

The objective of eMOLT Phase V is to demonstrate that New England lobstermen can contribute to the region's integrated ocean observing systems by deploying "realtime" temperature probes on their traps. Originally, the goal was to telemeter bottom-temperature readings via satellite communication each time the trap is hauled on deck. Given a previous grant from NOAA's Small Business Initiative Research Program (SBIR), a probe has been under development for a few years that wirelessly sends data to a base station in the wheelhouse where it is immediately relayed to a satellite. As noted in detail below, a few alternatives to the above scenario have been proposed by local engineers. They have made some progress in developing systems that could generate similar results. Whatever the method used in the end, data will ultimately be transmitted to a NOAA server and posted on the web.

Methods and work plan:

Since the technologies are still under development, much of the work involves testing the functionality of the various probes. While the probes undergo extensive evaluations in the laboratory, exposing them to the marine environment is the ultimate test. Lobstermen help in this regard by providing inexpensive platforms.

Work completed to date:

The real-time probe development has progressed on three fronts. The first is in collaboration with the Advanced Design Consulting Inc. from Lansing, NY, the company originally awarded the SBIR grant in 2004. They have generated and delivered at least three different prototypes that have each been tested both in their lab and at sea with the help of lobstermen. ADC has produced their own progress report fully documenting this development. In short, the first prototype was deployed by lobstermen John Carver and Phil Mason in Mass Bay in 2006. Both of their probes evidently failed due to leaky housing seal. Even after an attempt to completely seal a subsequent prototype, the instrument leaked again (this time deployed off the dock in Woods Hole) evidently due to a hair-line fracture in the plastic sealing material. Finally, in February of 2006, the first successful deployment was conducted in 70+ feet of water in Mass Bay. Progress stalled however at this point when the company reorganized and the technician assigned to the project was promoted to a management position. The company still promises to continue on the project.

Concurrent with the ADC development, Jim Valdes (an independent Woods Hole ocean engineer) has been devising an alternative solution where both the temperature sensor and the satellite transmitter are sealed together in a housing to be submerged as a package. The advantage of this strategy is that the entire system is contained in a single unit and does not need a shipboard base station. The disadvantage of this strategy is that the lobstermen do not get immediate

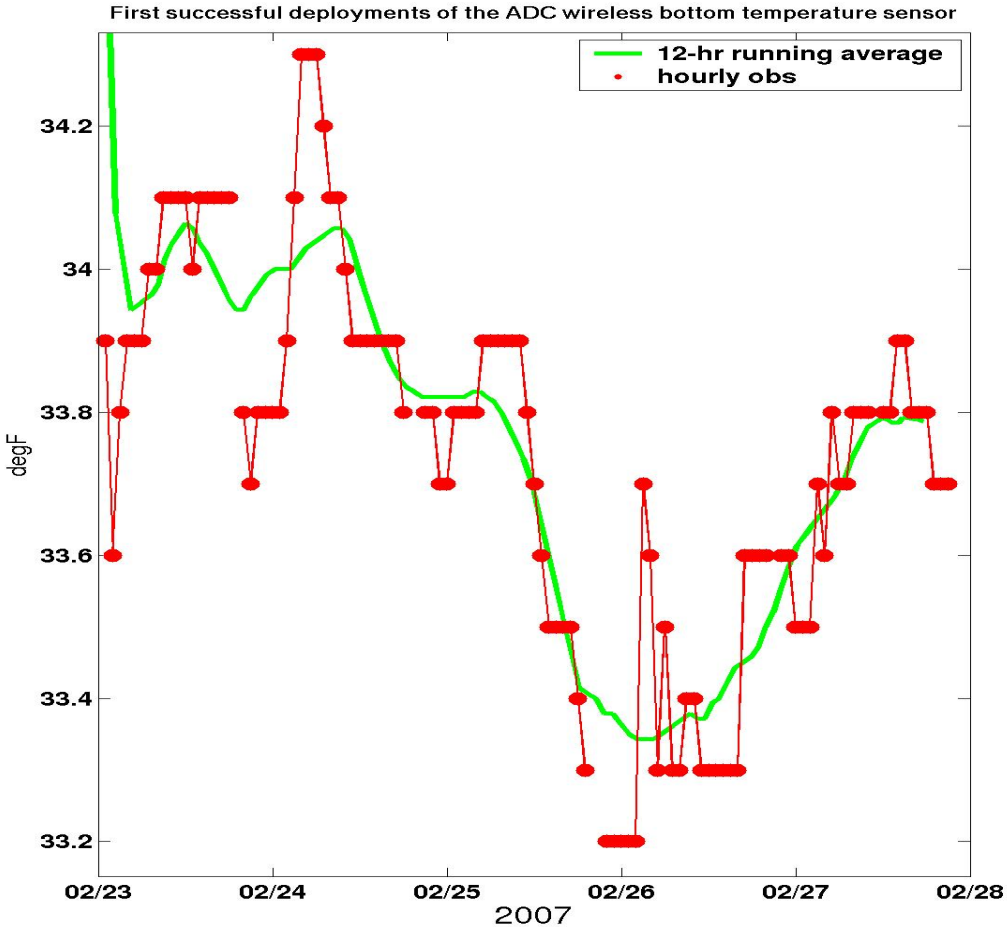
access to the readings and the expense of the satellite transmitter will prohibit lobstermen from deploying multiple units.

A third party, DATIS Systems of Pocasett, Massachusetts have become involved in 2008. They have proposed a number of alternative solutions including deploying a cable to the ocean bottom that continually transmits to either a) a satellite-modem, b) a radio-transmitter or c) a cell-phone system mounted on a surface buoy. Either case does not require routine lobstermen intervention. The unit can be deployed on its own and left for months at a time. The advantage of option “a” is maximum range, the advantage of option “b” is reduced cost, and the advantage of option “c” is that a lobstermen may be able to call for data as needed.

Much of the DATIS effort has involved designing a surface buoy that is stable enough to transmit data. A couple prototypes are pictured below. DATIS have been in contact with Bill Lister, a Massachusetts Lobsterman who works out of nearby Barnstable Harbor and is interested in helping with actual deployments.

Results to date:

As noted in last year's report, the first successful deployment is presented in Figure 1. While the instrument did not function exactly as programmed and reported very little pressure/depth readings, it did transmit the hourly record of temperature and displayed the values on the handheld unit in the wheelhouse. The biggest hurtle of transmitting data by a triggered response to low pressure failed due to bad pressure records. Approximately 10% of the temperature readings were also bad. So, while the deployment was generally successful, there is obviously more work to be conducted. The unit has been returned to the lab for further development.



In September 2007, another prototype was tested on land that successfully transmitted data to a satellite and automatically emailed the result to the NOAA server. While the transmission was successful this one time, subsequent attempts have failed. So, at the time of this writing, we are still working with the engineers at ADC to make the system reliable enough to pass on to fisherman.
Much of our time now is spent in learning the ORBCOMM satellite system which is different from the GLOBALSTAR system used in our drifter work to date. The primary issue to be solved in this case is battery life.

Data:

Data from future deployments of ADC, Valdes, or DATIS units will obviously become part of the eMOLT server and accessible. The big difference in these cases, however, is the near-realtime postings. When the system is fully operational we expect the data to be available on the web within minutes of the lobstermen's haul and in the latter two cases, as frequent as the transmission. The data will be relayed through the ORBCOMM and GLOBALSTAR satellite network in the case of ADC and Valdes, respectively, processed on the NOAA server at Woods Hole, and, after some automated filtering/QC operations, posted for the general public. The data will be served through OPeNDAP system and documented through the Gulf of Maine Ocean Data Partnership and NASA's Global Change Master Directory. The data user interface for eMOLT data is at emolt.org under "Data Access".

Impacts and applications:

Lobstermen have been asking for more immediate (realtime) information since the eMOLT project began several years ago. Well before the eMOLT project began, in fact, many New England lobstermen have attempted to deploy thermometers of various kinds on the seafloor to obtain some indication of the thermal environment at depth. While some of these may have worked to some extent, the accuracy of the results were difficult to quantify. Now finally, in 2008, there is some hope that they may have a reliable means of determining temperature changes that may be important to the activity and movement of their prey (Drinkwater et al, 2006). A statistical relationship between catch and bottom-temperature is difficult to quantify however and has eluded some researchers to date (Worden, et al, 2007). Only with sustained record keeping of quality data in the years to come will it be possible to prove a significant relationship.

Related Projects:

A variety of related projects have sprung up in the last few years that are closely related to the goals and applications of eMOLT. In addition to the obvious relation to the Gulf of Maine Ocean Observing System, eMOLT has been collaborating with multiple "ventless trap" projects around the region. Since these projects are deploying traps at specific sites and depth zones and the intention is to continue monitoring the juvenile populations of lobster for multiple years, an effort has been made to equip these traps with temperature probes. The newly formed "ASFMC Regional Ventless Trap" project seems most promising as a funded mechanism to get lobster catch data concurrent with temperature records.

In addition to the ventless trap projects in both US and Canada, we are working with the lobster settlement studies of both Wahle (Bigelow Lab) and Cowan (Lobster Conservancy). Each of these projects now have a temperature probe component.

Partnerships:

As noted in the related projects section above, eMOLT is connected with a variety of projects around the gulf. A short list of them is provided in Table 1.

Project	**Contact**
GoMOOS/GoMODP	Tom Shyka
DMF Ventless	Bob Glenn
GoMLF VentTS	Erin Pelletier
FSRS monitoring	Carl McDonald
Lobster Conservancy	Diane Cowan
S Maine Comm. College	Brian Tarbox
ASFMC Ventless Trap	Carl Wilson
RIDEM	Tom Angel

Presentations:

eMOLT presentations this past year are posted in Table 2.

Table 2. eMOLT Presentations in 2008

Group	Location	Date
Mass Lobstermen Weekend	Hyannis, Ma	Feb 2008
Maine Fishermen Forum	Samoset Rockport, Me	Mar 2008

Student Participation:

As of this writing, there is no student participation specifically associated with phase V. However, we continue to involve students in the previous phase IV through our collaboration with local marine science departments at, for example, SMCC, Bowdoin, and Univ. of New England. Students continue to design, construct, and deploy drifters. Projects are now underway where students are actually involved with deployments and tracking themselves. In the Fall of 2007, a dozen or more drifter deployments were made by students in Casco Bay and reports were submitted on their experiences.

Images:

A collection of images are stored on the emolt.org website including an archive of maps, plots, and photographs. A gallery of images describing the development of technology, for example, is posted at:
http://www.nefsc.noaa.gov/epd/ocean/MainPage/lob/pic_links.html
The most up-to-date images of recent findings are posted under the “What’s New” page.

References:

Drinkwater,K.F., G.C. Harding, K.H.Mann, and N. Tanner, 1996,Temperature as a possible factor in the increased abundance of American lobster, Homarus americanus, during the 1980s and early 1990s., Fisheries Oceanography, 5:3/4,176-193.

Worden, M.K., J.Bahr, and J. Manning. 2007, Catch rate of the American lobster in the US fisheries is independent of water temperature. In Prep.