

**Environmental Monitors on Lobster Traps
Phase VI: Bottom Currents
Annual Report 2009**

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Project objectives and scientific hypotheses:

The objective of this research is to provide lobstermen with low cost means for monitoring near bottom currents as an alternative to prohibitively expensive commercial current meters. The solution is based on the use of a tethered buoyant cylinder equipped with \$75 ONSET accelerometers and data loggers. Our hypothesis is that this will give a simple, robust, elegant, and reliable way for estimating near bottom currents. If the concept works, we will subsequently propose to secure these accelerometers to dozens of lobster traps throughout the Gulf of Maine.

Methods and work plan:

We tested these new bottom-current-indicators in a series of steps. We conducted deployments alongside the traditional acoustic current meters: Sontek Argonaut-MD, Nortek vector in order to obtain calibration curves for conversion between the tilt angle and current magnitude. Then we designed, manufactured from PVC pipe and tested an instrument that could be mounted on a lobster trap. Ten instruments then were mailed to volunteer lobstermen to try on their lobster traps for a period of one month. Results from these deployments were analyzed and further improvements have been implemented.

Work completed to date:

During the last 12 months we conducted calibration deployments of a new instrument alongside with acoustic current meters (made by Sontek, Nortek, FSI) at several sites with substantial tidal currents (the Woods Hole Oceanographic Institution dock, the Little River Boat Yard in Waquoit Bay, Bournes Pond Inlet in Falmouth). These deployments allowed us to obtain calibration curves for

conversion between the tilt angle and the current magnitude. We also obtained experience in deploying the instruments in different environments and by different means: by diver on Stellwagen Bank, from a small boat in Waquoit Bay.

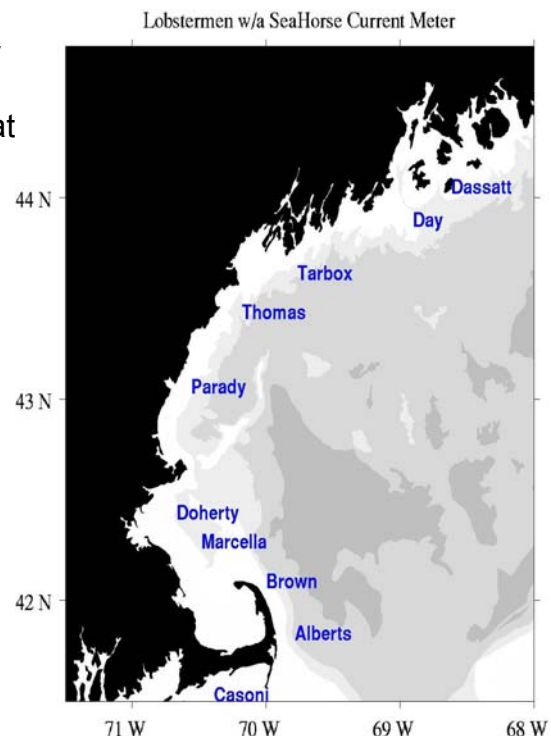
We designed a prototype tilt current meter that could be used on a lobster trap. We chose to make it from 1 inch PVC pipe 25cm long. We compromised between the accuracy, sensitivity of the instrument and its length. The instrument should not interfere with the fishing activity.



Ten instruments (shown in the photo above) along with an instructions letter then were mailed to volunteer lobstermen (shown in map below) to try on their lobster traps throughout the Gulf of Maine for a period of one month. They were deployed at depths from 5 to 25m. Most of the deployments went fine. Only in one case a lobsterman did not read the instructions carefully and missed the preprogrammed deployment window. Results from these deployments as well as the feedback from the lobstermen were analyzed and further improvements to the design have been implemented.

Results to date:

The main result of the work is confirmation that this simple and inexpensive method works well. It offers accuracy in velocity estimation about 2.5 cm/s



and about 5 degrees in direction. The typical velocities near bottom were found to be around 10-15 cm/s at most sites. One of the byproducts of our deployments is the realization of the fact that many lobster traps do land on the bottom upside down or on their side which prevents normal fishing. We also found that such landings may cause damages to the current meters.

Future work:

We plan to test the model ballasted for weaker flows and equipped with the sensor with a digital compass for recording the orientation of the trap. We also plan to publish the results and make conference presentations.

Impacts and applications:

The most impact of this work is on aquaculture and fishing applications. Knowledge of the near bottom currents is important for planning and monitoring ecological systems. These instruments may also be used in sediment resuspension studies. Plans are underway to deploy units later this year in a tidal power assessment of Cape Cod Canal.

Related projects:

If this project was conducted in association with, or leveraged by, other research, outreach, or education projects; explain the nature of the collaboration and identify the source(s) of funding.

Partnerships:

The instruments were deployed by 10 volunteer lobstermen. Jim Manning maintains active contacts with a network of fishermen belonging to the various lobstermen associations around New England. Erin Pelletier, executive director of Gulf of Maine Lobster Foundation helped in identifying the volunteers for the project. The lobstermen deployed and recovered the instruments as well as provided the notes on the conditions during the experiment. In turn the data were made available to them via a website. We also communicated the data to scientists at the University of New Hampshire, University of Rhode Island, University of Massachusetts at Dartmouth, and Woods Hole Oceanographic Institution. One of the units deployed in Massachusetts Bay provided data for the Mass Division of Marine Fisheries researchers who were designing fish traps and were interested in the current speeds at a certain location.

Presentations:

1. Sheremet V. and J. Manning. Locally-developed instrumentation for validating ocean models. *7th Informal Workshop on Coastal Circulation Modeling Around New England* 29 May 2008 ~9:30am-4pm at Stephen Clark Conference room in NMFS Aquarium building in Woods Hole.
2. Manning J. and V. Sheremet. Building a Low-Cost Observing System with Help from Lobstermen. *MABPOM 2008 Meeting*. September 22-23 - *5th Floor Clark Laboratory, Quissett Campus WHOI*.
3. Sheremet, V. Tidal Observations in Waquoit Bay with Low Cost SeaHorse Tilt Current Meters. *MABPOM 2008 Meeting*. September 22-23 - *5th Floor Clark Laboratory, Quissett Campus WHOI*.

Published reports and papers:

The up to date information about the project is available online at <http://www.nefsc.noaa.gov/epd/ocean/MainPage/tilt/shtcm.html> including the data from the deployments and interpretations. Peer reviewed publications in the scientific journals are in preparation.

Data:

The data are available online at <http://www.nefsc.noaa.gov/epd/ocean/MainPage/tilt/shtcm.html> Upon completion of analysis the data will be submitted to Northeast Consortium Fisheries & Ocean Database with the final report.

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