

## **Oceanographic and Fisheries Data Collection and Telemetry From Commercial Fishing Vessels**

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## **LONG-TERM GOALS**

This partnership will work toward building full cooperation among the commercial fish harvesting community, federal and state coastal resource managers, private industry, and the ocean research community for the collection, distribution, analysis, and assimilation of environmental data collected by commercial fishing vessels.

## **OBJECTIVES**

**Objective 1:** To develop a collaboration between commercial fishermen, private marine industries, oceanographers, and coastal resource managers for the collection, real-time telemetry, analysis, assimilation, distribution, and use of environmental and fisheries data from coastal regions off the northeastern US.

**Objective 2:** To design and produce an integrated sensor system (including navigational, hydrographic, and meteorological components) for use onboard commercial fishing vessels; to assemble, integrate, and test prototype versions of the system on a small number of vessels; and to establish land-based centers for collection, analysis and assimilation of data.

**Objective 3:** To demonstrate system feasibility and function by means of sea trials involving one- to three-day trips by two commercial fishing vessels in Gloucester, MA and Portland, ME.

## **APPROACH**

**Objective 1:** UNH/UM Sea Grant Extension will hold a series of meetings to inform members of the fishing industry about the scope and goals of the proposal effort. Input from the industry will be sought on all aspects of the work, including design of the sensor system and user interface, types of data to be collected, and uses of environmental and catch data for improvement of fishing practices and product marketing. UNH Sea Grant will also host a series of one-day workshops, seminars, and symposia for federal and state agency and program representatives involved in environmental assessment, coastal resource management, marine policy, navigation and public safety, and regulatory and/or enforcement aspects of resource management.

**Objective 2:** The on-board subsystem, Land Earth F/V sensor data satellite reporting and Navigational Aid (LENA), will provide enhanced navigation functions, make continuous meteorological and oceanographic measurements, and allow entry and transmission of confidential fisheries catch data. The LENA subsystems will be developed from "off the shelf" products and subassemblies. The project will also develop a rugged sensor unit to facilitate subsurface measurements for deployment on fishing gear. The data telemetry and data serving hardware and software required for data collection and dissemination will be designed and implemented. Two prototype sensor systems (i.e., on-board LENA subsystem, gear-based sensor package, and software) will be fabricated, bench-tested, and installed on two commercial fishing vessels.

**Objective 3.** The demonstration will include performance of the entire system, including integration with standard vessel navigation and electronic functions, coordination with the NMFS Vessel Monitoring System (VMS or "black box"), telemetry of environmental data to the U.S. GLOBEC

Program Service and Data Management Office, and exchange of confidential fisheries catch data between the vessels and their home ports, the Gloucester Fish Auction and the Portland Fish Exchange. Follow-up outreach efforts will evaluate the responses of the vessel captains and the personnel of the Auction and Exchange who oversee product marketing efforts. Additional interviews will be conducted as needed to explore uses of real-time telemetered catch and market data to improve fishing practices and optimize marketing strategies.

## **WORK COMPLETED**

**Coordination of the project:** Regular meetings among all partners have been held since June 1998. Meetings have been held at MIT Sea Grant (June 10 and August 21) and at Clearwater Instrumentation (July 7). The next meeting is planned for November 24. In addition to email traffic and communication via the private website, these meetings have been crucial to developing a working partnership characterized by mutual respect and shared goals.

**Partnership building with federal agencies and programs:** During our Partnership meetings, we have worked to identify individuals, agencies, and programs that have missions consistent with Partnership goals, in fisheries management and regulation, coastal monitoring and prediction, climate research, or other concerns. We are maintaining a database of people and organizations, who may become partners in this effort or customers for its products. We have contacted a number of them, and are engaging them through exchange of information and updates on progress, and/or through invitations to our Partnership meetings. At the August 21st Partnership meeting, Charlie Anderson (from the Massachusetts Division of Marine Fisheries) reported on the Atlantic Coastal Cooperative Statistics Program (ACCSP) and David McCarron (also from the Massachusetts Division of Marine Fisheries) discussed the Massachusetts Fish Auction Project.

**Outreach to commercial fishing community:** We decided that formal workshops were not going to provide the necessary information on fishermen's needs. Instead, NOPP outreach workers met fishermen "on their turf" - individually, in small groups, informally on the docks, and at scheduled fishermen's meetings. We also designed a questionnaire for distribution by leaders in the commercial fishing community, concentrating on ports with large, "trip" boats. We learned that fishermen are most interested in bottom water temperature; telemetry of oceanographic and weather information to WHOI (and getting that information back) are also appealing. Some fishermen were concerned about telemetry of catch data. The results will be tabulated and analyzed this winter.

Outreach activities have included:

July 22 (Gloucester, MA): Meeting with 12 fishermen regarding their fisheries, oceanographic, and weather data needs, and their computer literacy; also met with the Manager of the Gloucester Fish Auction, who enthusiastically agreed to be part of the project.

July 2 (Portland, ME): Presentation on NOPP to the Northwest Atlantic Marine Alliance Board of Directors.

August 19 and 20 (New Bedford, MA): Discussion with fishermen and three leaders; distribution of questionnaires.

September 5 (Gloucester, MA): Presentation to Gloucester Fishermen's Forum on collaborations between fishermen and scientists, including NOPP.

October 22 (Portland, ME): NOPP presentation to the Portland Fish Exchange Board of Directors.

**Sensor system design concept:** Partnership meetings to date have focused primarily on design of the sensor system. The goal is to design a flexible, customizable sensor system that may be used for simple environmental measurements (e.g., just water temperature) or for more complicated sensor packages for collection of climate-quality data. We are in the final stages of system controller specification and selection. We continue to refine our design to ensure integration with related programs.

*Selection of sensors:* We have agreed that the vessel-based system will be designed for the following sensors: wind speed; wind direction; barometric pressure; humidity; air temperature; short wave radiation (visible); long wave radiation (IR); precipitation; sea surface temperature; ships position (GPS); time of observation; and ship heading (compass bearing). The sensors will interface with shipboard vessel controller. The gear-based sensors will detect pressure and subsurface temperature.

*Telemetry:* Several options for data and information telemetry have been reviewed. We recognized that we need to transmit digital and binary data. Our current working model is to use the Inmarsat-C system which supports an e-mail like data transmission protocol, enabling us to transmit information to and from the fishing vessel on an hourly basis. We also recognized that our architecture and implementation should be flexible, since there are suitable alternative systems just on the horizon.

*Data Management:* There was general agreement that the JGOFS Data Management System will be used ashore to store and provide on-line access to data collected during the project. We established a temporary website at <http://lena.who.edu:8180> for public access to Project LENA information. A password-restricted website was created to support P.I. communication needs.

## **RESULTS**

This NOPP effort will result in better, largely automatic, and near real-time method of reporting offshore meteorological and sea conditions for use by a wide variety of communities, and for reporting catch records to local cooperatives. It will also result in the bringing together elements of society, oceanographers, private entrepreneurs, commercial fish harvesters, and federal agency representatives, that have rarely worked together cooperatively in the past. There is a pressing need for better environmental data from coastal and offshore marine waters in order to effectively monitor the health of the ecosystem, and to more effectively manage marine resources. This project will significantly enhance the methodology for obtaining the data and for providing a new working environment in which the data can be utilized for the benefit of all of the partners.

## **IMPACT**

This Partnership provides a mechanism for bringing together those involved in the fishing industry, the oceanographic community, and the federal agencies responsible for resource assessment and management. Successful completion will entail broad cooperation among coastal resource managers in programs and agencies across the Departments of Commerce, Defense, and Transportation. The environmental and fisheries data that will be collected will be available to all stakeholders for their individual missions: management, marketing, assessment, prediction, modeling, regulation, enforcement, and research. We expect that the acquisition of biological and physical information - available in real

time - regarding the immediate status and dynamics of the ocean environment will create new opportunities and useful new products for the oceanographic and fisheries communities.

## **TRANSITIONS**

Mike Curran, of the Naval Oceanographic Office, has offered to help coordinate the proposed NOPP effort and the operational Navy programs and entities who require and use real-time environmental data from the coastal ocean. Curran reported that NAVOCEAN is currently running a similar program in the Gulf of Mexico. We have also spoken with Elizabeth Horton of NAVOCEAN, who is interested in possible transitions to NAVOCEAN's drifting buoy operations. We expect that NAVOCEAN and other Navy programs will be interested in high-quality near-realtime information from coastal waters off the Northeastern US.

## **RELATED PROJECTS**

We are compiling a list of people and projects on related topics, of which there are a large number. A few of the most closely related projects are: Atlantic Coastal Cooperative Statistics Program (ACCSP), which is a cooperative effort among federal and state fisheries managers, scientists, and commercial and recreational fishermen to coordinate and improve data collection and data management activities on Atlantic coast; Massachusetts Fish Auction Project, which is directed at setting up standards to be used by fish auction houses to standardized prices; North Atlantic Marine Alliance (NAMA), which is conducting surveys of the attitudes and goals of Northeast commercial fishermen; International Society for Ocean Monitoring and Research (ISOMAR), which seeks to place ocean sensors on ocean-going yachts; and NMFS Northwest Fisheries Center, which is sponsoring an electronic fish-catch log book for commercial fishermen.