



NOAA *Backgrounder*

New Fisheries Scientific Computer System Revolutionizes Data Collection

NOAA software engineers and scientists have developed a breakthrough, automated system for recording biological and oceanographic data during a trawl-based fishery resources survey. The Fisheries Scientific Computer System, or FSCS, is replacing manual data recording and shaving months off the time required to make cruise data available for use.

During a fisheries resource trawl survey aboard a NOAA ship, the sheer magnitude of information that must be collected can be overwhelming. For example, nearly 400 trawl tows are conducted at stations throughout

U.S. northeastern waters in the world's longest running survey of this kind. Fish and invertebrates from each tow are sorted on deck by species. The data about each fish, such as its sex, weight, length and stomach contents, are recorded. Oceanographic data are also collected by sensors, both shipboard and deployed. A typical fishery resource survey cruise takes about 45 sea days. Scientific and vessel operation crew work round-the-clock on alternating shifts.

Imagine the tedious task of hand-recording information about each fish in a catch of thousands. For nearly 40 years, that's the way data collection has been handled. The resulting information is used by scientists in various analyses and studies, including those that assess the abundance and health of a particular fish stock, and the environmental conditions in the ocean that may affect its distribution.

About ten years ago, NOAA survey scientists began to look seriously at ways of upgrading from manual to digital data collection, trying to adapt hardware and our other existing systems with limited success. In 1999 software engineers from NOAA's Office of Marine and Aviation Operations (OMAO) partnered with scientists from NOAA Fisheries' Northeast Fisheries Science Center to concentrate on developing FSCS, a system uniquely tailored to NOAA operations, capabilities and requirements. It replaces manual data recording, and in comparison is more cost effective, more descriptive (integrating biological with oceanographic data), and provides audited data to researchers and managers within weeks, rather than months.

A WORD ABOUT NOAA. . .

The National Oceanic and Atmospheric Administration (NOAA) conducts research and gathers data about the global oceans, atmosphere, space, and sun, and applies this knowledge to science and service that touch the lives of all Americans.

NOAA warns of dangerous weather, charts our seas and skies, guides our use and protection of ocean and coastal resources, and conducts research to improve our understanding and stewardship of the environment which sustains us all.

A Commerce Department agency, NOAA provides these services through five major organizations: the National Weather Service, the National Ocean Service, the National Marine Fisheries Service, the National Environmental Satellite, Data and Information Service, and Office of Oceanic and Atmospheric Research; and numerous special program units. In addition, NOAA research and operational activities are supported by the Nation's seventh uniformed service, the NOAA Corps, a commissioned officer corps of men and women who operate NOAA ships and aircraft, and serve in scientific and administrative posts.

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The Technology

FSCS was first deployed as the primary data-gathering system on the Spring 2001 Bottom Trawl Survey aboard the NOAA ship *Albatross IV*, beginning in March. Three sampling "locations" were set up on deck where the catch processing and recording were performed. All catch information, from species type to individual fish lengths and weights, was entered into the system.

The FSCS hardware suite consists of two redundant network servers and three each of the following at the sampling locations: PC with touch-screen terminal, digitized fish measuring board, label printer, bar code scanner, and digitized weight scale.

Touch screens are used to enter species type, gender, maturity stage, stomach contents, and so on. Fish boards are used to measure lengths; label printers to make samples for storage. The system performs self-audits to find data entry errors and other inconsistencies.

All primary FSCS software applications responsible for collecting and/or displaying crucial data are Windows 32-bit applications that have been developed using Microsoft Visual C++ v6.0 with Microsoft Foundation Classes. The system performs self audits to find data entry errors and other inconsistencies.

FSCS is an adaptation extension of the Scientific Computer System, which was developed about ten years ago by software engineers at NOAA's Office of Marine and Aviation Operations and installed on all NOAA research ships. SCS integrates oceanographic and atmospheric data from shipboard sensors into one system. Scientists find this data quite valuable in relating environmental conditions to biological data both for a particular survey and over time.

FSCS integrates the specific biological, oceanographic and SCS data. The SCS includes an event logger that starts up at the beginning of each trawl tow and runs for its duration. The event logger provides the station

number, which is then associated with all the subsequent biological and oceanographic data logged during and from that particular trawl tow. The logger also shows GPS positions, ship speed, depth, latitude and longitude, duration of tow, and other information essential to the overall picture.

Why Is This Important?

The data collected aboard NOAA fisheries research vessels is intrinsic to providing an accurate picture of marine fish stock abundance, condition and distribution over time—information that helps evaluate and support actions taken by the region's fishery managers. The FSCS significantly reduces lag time between data collection and availability, improves the depth of survey data, reduces opportunities for introducing error, and is more cost effective than manual data recording. The system may also eventually have applications for other kinds of shipboard data gathering, especially on commercial fishing operations, where improved data collection could significantly contribute to evaluation of fishery management actions.

Marine fisheries provide an important source of food as well as thousands of jobs and a traditional way of life for many coastal communities, all relying on productive fish stocks. NOAA Fisheries works with regional industry and managers to ensure stable, ecologically benign fish harvests, and promotes stewardship of the nation's living marine resources and their habitats.

A NOAA Partnership

The Office of Marine and Aviation Operations is responsible for operating and managing NOAA's fleet of research ships and aircraft and providing scientific support. The OMAO software engineers and the survey scientists were keenly aware of the potential improvements that would be realized with an efficient digital, automated collection system. In July 1999 personnel from OMAO's Systems development Branch and NOAA Fisheries' Northeast Fisheries Science Center's Resource Survey Unit began development of FSCS, using OMAO's Scientific Computer System as a foundation. ☺

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