# Survey Sensor Package for NOAA-Fisheries Service Hydrodynamic Shellfish Dredge With Automatic Real-Time Data Telemetry

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**Project Characteristics:**

- *SeaTeam Data Acquisition System*
- *Survey Sensor Package*
- *Ambient Pressure and Temperature Data Collection*
- *Tilt and Heading Data Collection*
- *Spread-Spectrum Radio Telemetry*

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*NMFS Clam Dredge used during clam surveys*

In its work on shellfish population dynamics, NOAA /NOS/National Marine-Fisheries Service at the NEFSC in Woods Hole, MA, conducts a triennial Surf Clam and Ocean Quahog fishery survey using a special hydro-dynamic jet dredge designed and built by NMFS, equipped with a survey Sensor Package (SSP) designed and installed by Woods Hole Group. To monitor and document the operation of the dredge, the SSP collects data about the attitude of the dredge and its operating environment, and transfers the data to shipboard computers for immediate display and analysis after each tow.

Clam survey operations consist of a randomly selected series of short (5-minute duration) dredge hauls while the survey vessel is moving at 1.5 knots, punctuated by recovery of the dredge and emptying of its cage onto the counting deck aboard the vessel. Clam dredging is a very severe operating environment for an electronic data acquisition unit, as the dredge frequently encounters rocks and other obstacles and is subject to violent accelerations and shocks. Special design precautions were taken to ensure rigid mounting of all components, including a steel box to provide protection for the electronic units. The SSP has proven to be very successful and the data are of considerable importance to NMFS in analyzing and defending the population survey results.

The heart of the SSP is Woods Hole Group's *SeaTeam* data acquisition and telemetry unit. The *SeaTeam* collects data from ambient pressure and temperature sensors, tilt and heading sensors, and a differential pressure sensor that monitors the flow of water through the dredge's hydraulic cutter nozzles. The *SeaTeam* also monitors the electrical voltages at the pump that drives the hydraulic cutter nozzles. The data are sampled asynchronously on all channels at 1 Hz using frequency-counting digitizers that provide full averaging between samples to avoid aliasing. Data are buffered in ASCII on the *SeaTeam's* internal 1 MB RAM memory during each tow, and also stored on a high-capacity PCMCIA memory card for backup.
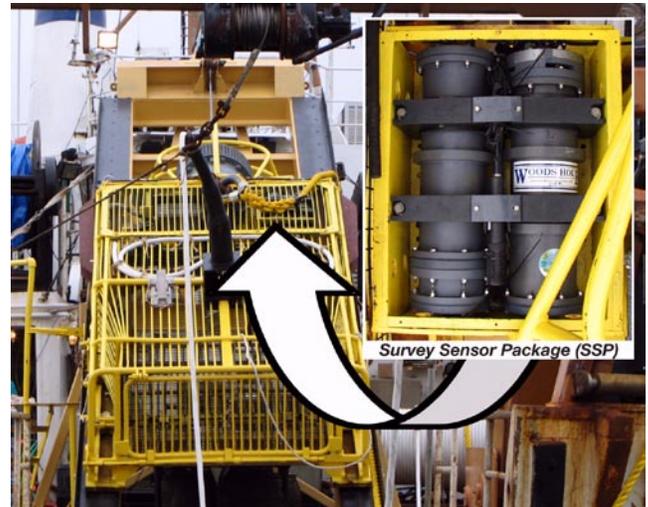
The SSP operates autonomously, as there is no electrical connection to the vessel. Radio telemetry is used to automatically transfer the collected data from the *SeaTeam's* memory to a base station PC on the survey vessel while the dredge is on deck. A spread-spectrum modem in the *SeaTeam* communicates with a modem on the vessel via a waterproof stub antenna on the *SeaTeam*. The radio is powered on at all time, but radio telemetry is not possible while the dredge is underwater. As soon as the *SeaTeam* breaks the surface, radio connection is automatically established and data are downloaded from the *SeaTeam*. The PC software performs high-level data checking and acknowledgement to ensure that the telemetry is accurate and complete, plots the data for inspection by NMFS survey personnel, and stores the data for later analysis. Two-way communication allows the operator to re-initialize the SSP for the next tow, and to start data collection.

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