CRUISE RESULTS

UNOLS R/V *Hugh R. Sharp*
Cruise No. S1 11-01 (Parts I – III)
Sea Scallop Survey

Submitted to: NOAA, NEFSC

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northeast Fisheries Science Center
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CRUISE PERIOD AND AREA

The cruise period was 11 May - 30 June 2011 and was conducted in three parts: Part I was from 11 - 21 May, Part II was from 8 -18 June, and Part III was from 20 - 30 June. The area surveyed was from the Middle Atlantic Bight to Georges Bank, including waters within Canada's Exclusive Economic Zone. Sampling depths ranged from 24 to 152 meters (13 to 83 fathoms). Approximate station locations are shown in Figures 1 and 2.

OBJECTIVES

The objectives of the survey were to: 1) determine the distribution and relative abundance of the sea scallop, *Placopecten magellanicus*; 2) collect biological samples; 3) conduct a prototype visual-based survey, using a towed vehicle (HabCam) equipped with a camera system, to compare those results with traditional dredge-based survey technology.

METHODS

Operations and gear for cruise S1 11-01 Parts I – III conformed with the Cruise Instructions for the Sea Scallop Survey, dated 19 April 2011; Addendum I, dated 26 April; Addendum II, dated 31 May; and Addendum III, dated 20 June.

Pre-selected, random stations were sampled using a modified 2.44 m (8 feet) wide New Bedford type scallop dredge rigged with 5.1 cm (2 inch) diameter rings and lined with at 3.8 cm (1½ inch) polyethylene stretched mesh liner. Tow duration was 15 minutes, tow speed was 3.8 knots, and the dredge was fished using a 3.5:1 wire out to depth scope. Tow distance was recorded using differential GPS, and a recording inclinometer was mounted on the dredge to collect bottom contact time data.

All catch and biological data were recorded using the shipboard automated data entry system, Fisheries Scientific Computing System (FSCS). This system uses digital scales, electronic measuring boards, and touch screen displays to record data on deck; FSCS also archives the data on the ship's computer network.

After each dredge tow of the scallop survey, the entire catch was sorted into biological and habitat components. Live whole and clapper shells of various scallop species, including sea and Icelandic, were weighed using the motion compensated digital scales. Representative length frequencies for all scallop species were collected to the nearest millimeter using electronic measuring boards (Limnoterra and Icthystick); selected fish species incidentally caught in the dredge were also measured to the nearest millimeter. Weights and total numbers were recorded for all other fish species at each station. Furthermore, the weights and total numbers of cancer crabs and starfish were recorded at every third station. Habitat portions were estimated by bushel volume, converted into number of liters (where 1 bushel = 32 liters), recorded into the FSCS system, and then finally discarded.

Surface temperatures were measured using the R/V *Hugh R. Sharp*'s hull-mounted temperature sensor and logged by the Scientific Computer System (SCS) at all stations. Temperature and conductivity profiles were made at approximately every third station using a conductivity, temperature, and depth instrument (CTD). A bottom salinity sample was obtained twice a day to calibrate the CTD. Water samples were also taken for fluorometer calibrations.

Additionally, cooperative work was conducted during Part III of the sea scallop survey to reoccupy dredge tows from Part II and for testing the feasibility of utilizing the HABitat mapping CAMera system (HabCam) as a surveying tool, or part of the suite of survey tools, for future NOAA scallop surveys. Developed by a group of researchers associated with Woods Hole Oceanographic Institute, as well as in conjunction with particular members of the commercial fishing industry, HabCam is a towed, seafloor-imaging camera system with the following capabilities: 1) acquisition of optical and acoustic imagery, which can be viewed in "real time", 2) the ability to count and measure scallops and groundfish, 3) measurement of biodiversity and community structure, 4) characterization of substrate, and 5) measurement of oceanic properties (salinity, temperature, nutrients).

The system is designed to operate over the range of the continental shelf, between depths of 20 to 250 meters, and is able to image a track of roughly 100 nautical miles each 24 hour day, while at sea. The current Northeast Fisheries Science Center's 8' wide dredge makes approximately 24, 15 minute tows at 3.8 knots per day, covering about 4,500 square meters (m^2) per tow and 106,704 m^2 per day. Continuous operation with HabCam towing at five knots covers 259,200 m^2 per day. Thus, the spatial coverage of HabCam is nearly 2.5 times the area covered by the survey dredge.

The HabCam camera system was mounted in a 10-foot steel frame, and towed one to three meters off the ocean floor at a speed of approximately five knots. An operator controlled the system by means of the R/V *Hugh R. Sharp*'s winch-driven, fiber optic cable, which allowed for real-time data collection and provided power to the unit.

RESULTS

The survey sampled at 307 stations, with 155 and 152 dredge hauls made on Parts I and II, respectively. The dredge flipped 6 times; stations were re-towed in most cases. Bottom temperatures were collected at 86 stations using the CTD system, while bottom water samples for CTD calibration were taken at 25 stations.

A total of 2,543 samples were collected to support five internal and external investigations (Table 1).

During Part III of the scallop survey, the HabCam vehicle obtained 3,017,949 images over the course of a 949 nm cruise track, resulting in approximately 1.25×10^6 m^2 covered on Georges Bank.

DISPOSITION OF DATA

Catch data and hydrographic data will be analyzed at the NEFSC Laboratory in Woods Hole, Massachusetts. The various collections were forwarded to researchers listed in Table 1. Resulting data will be audited, edited, and archived in an Oracle database.

HabCam images will be further analyzed for biological data both at the Woods Hole Oceanographic Institute and at NOAA's NMFS Woods Hole Lab.

SCIENTIFIC PERSONNEL

National Marine Fisheries Service, NEFSC, Woods Hole, MA
Kevin McIntosh, Chief Scientist[2]
Victor Nordahl, Chief Scientist[1]
David Chevrier[3]
William Duffy[1]
Nathan Keith[2]

National Marine Fisheries Service, NEFSC, Sandy Hook, NJ
Richard Langton[3]

National Marine Fisheries Service, NERO, Gloucester, MA
Christopher Walker[1]

National Marine Fisheries Service, NERO, Hampton, VA
Steven Ellis[1]

National Marine Fisheries Service, NSL, Washington, D.C.
LaShaun Willis[2]

Connecticut College, New London, CT
Seana Siekman[2]
Justine Rooney[2]

State University of New York, Brewster, NY
Darcy Balcarce[2]

Teacher-at-Sea Program
Channa Comer[1] Bronx, NY
Kathleen Brown[2] Windham, ME

University of Maine, Orono, ME
Sam Truesdell[2]

University of South Florida, St. Petersburg, FL
Aaron Burnham[2]

US Coast Guard Academy, New London, CT
Jonas Miller[3]
Christopher Shivock[3]

Woods Hole Oceanographic Institution, Woods Hole, MA
Karen Bolles[3]
Scott Gallager[3]
Richard Taylor[3]
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Contractors, ITS, Woods Hole, MA
Geoff Shook[1], Chief Scientist[3]
Nicole Charriere[1,3]
Farrell Davis[2]
Kara Gibbons[2]
Jakub Kircun[1,2]
Adam Poquette[1]
Sarah Simons[1]

Volunteers

Brian Farless[1]	Somerville, MA
Joseph Gattozi[2]	Bridgton, ME
James Logie[1]	Silver Spring, MD
Kevin Staples[1]	Mt. Desert, ME

[1] 11-21 May 2011
[2] 8-18 June 2011
[3] 20-30 June 2011

For further information contact Russell Brown, National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA 02543. Phone (508) 495-2380; FAX (508) 495-2115; Russell.Brown@noaa.gov. The Resource Survey Report and Cruise Results for this survey can be viewed at: NEFSC Ecosystems Surveys Branch webpage/.

Table 1. Special samples obtained for various investigators on UNOLS R/V *Hugh R. Sharp* Sea Scallop Survey, during 11 May – June 30 2011.

Investigator and Affiliation	**Samples Saved**	**Approximate Number**
Ceriani, Simona, Univ. of Central FL, Orlando, FL	various species	88 indiv.
Galbraith, John, NMFS, NEFSC, Woods Hole, MA	unidentified fish	37 indiv.
Hart, Dvora, NMFS, NEFSC, Woods Hole, MA	sea scallop shells scallop meat weights sea scallop, diseased sea scallop, tagged sea scallop clapper shells sea stars	729 indiv. 660 indiv. 2 indiv. 6 indiv. 3 indiv. 754 examined
O'Brien, Loretta, NMFS, NEFSC, Woods Hole, MA	Atlantic cod	2 examined
Shank, Burton, NMFS, NEFSC, Woods Hole, MA	various species	262 indiv.

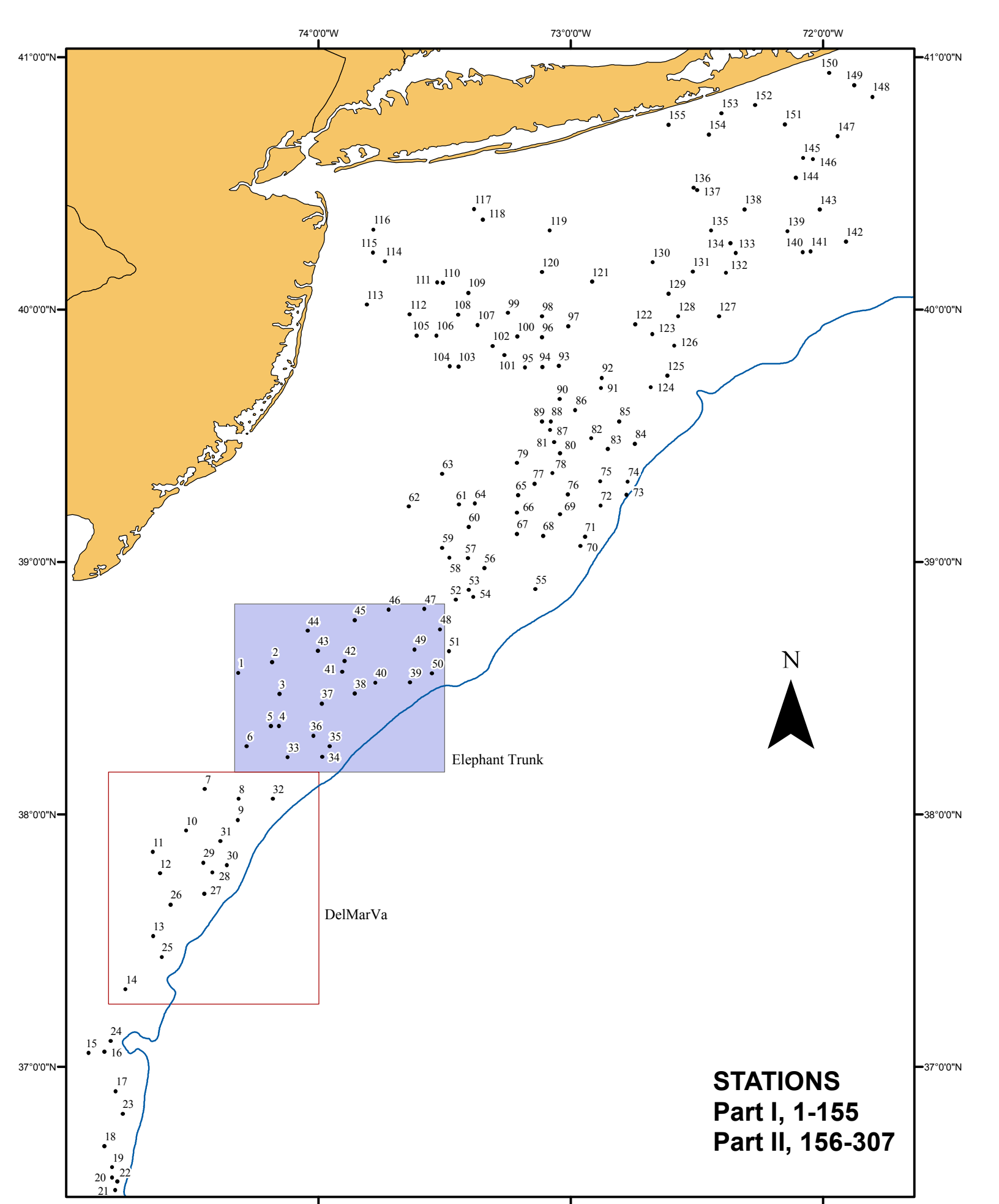

Figure 1. Dredge tows made from UNOLS R/V *Hugh R Sharp* (11-1), during NOAA Fisheries Service, Northeast Fisheries Science Center sea scallop survey, May 11 - Julne 30, 2011.

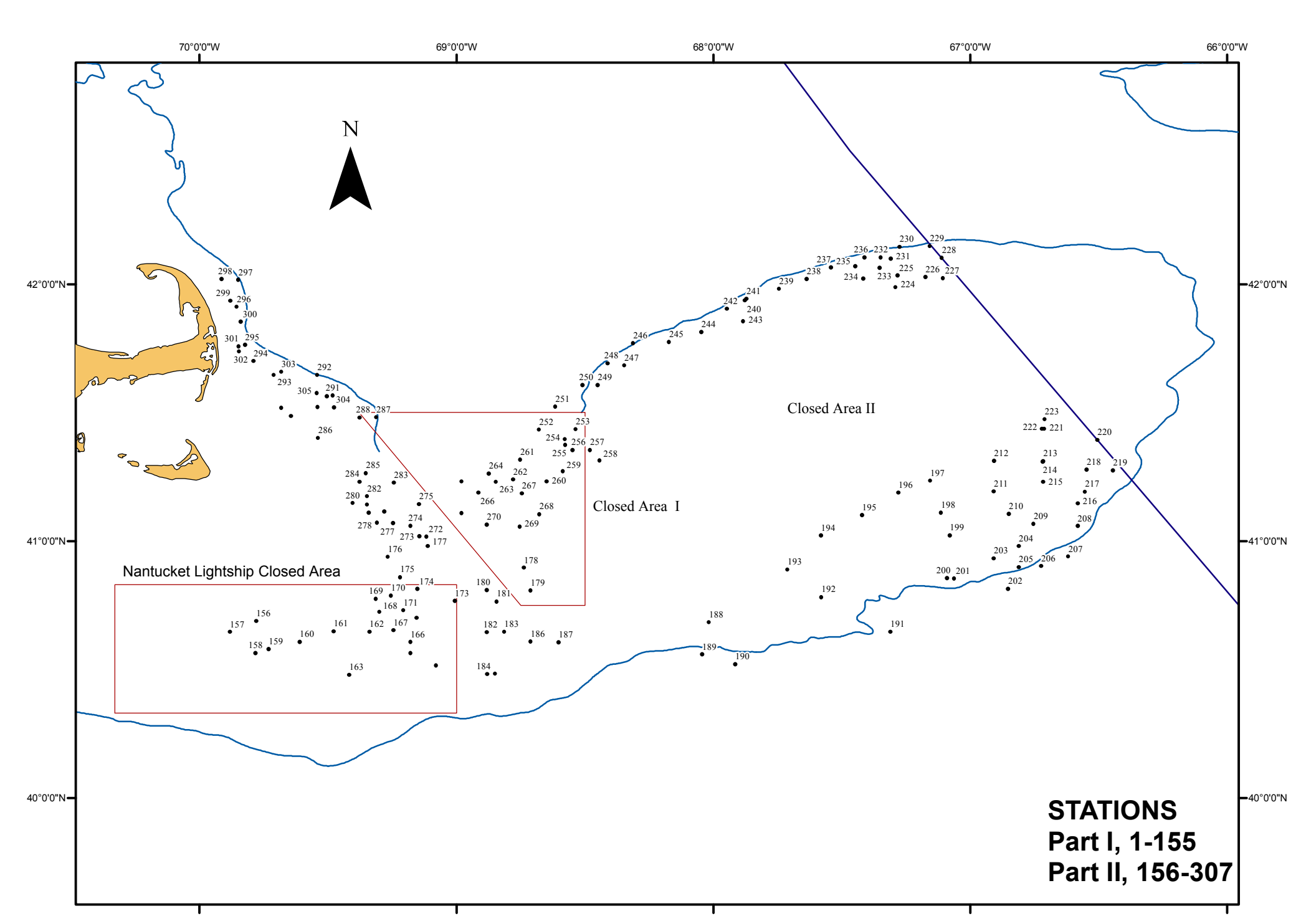

Figure 2. Dredge tows made from UNOLS R/V *Hugh R Sharp* (11-1), during NOAA Fisheries Service, Northeast Fisheries Science Center sea scallop survey, May 11 - June 30, 2011.