

CRUISE RESULTS

UNOLS R/V *Hugh R. Sharp*
Cruise No. S1 13-01 (Parts I – III)
Sea Scallop Survey

Submitted to: NOAA, NEFSC

For further information, contact Robert Johnston, National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA 02543. Phone (508) 495-2061; FAX (508) 495-2115; Robert.Johnston@noaa.gov.

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UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northeast Fisheries Science Center
166 Water Street
Woods Hole, MA 02543-1026

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CRUISE PERIOD AND AREA

The cruise period was 15 June – 20 July 2013 and was conducted in three parts: Part I was from 15 - 24 June, Part II was from 26 – 28 June and 1 – 7 July, and Part III was from 9 – 20 July 2013. The area surveyed was from the Mid-Atlantic Bight to Georges Bank, and average sampling depths ranged from approximately 30 to 105 meters (16 to 57 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 sea scallops (*Placopecten magellanicus*) and associated fauna utilizing two sampling devices: the 8-foot wide, standardized sea scallop dredge and the stereo-optic towed camera array (HabCam V4); 2) collect biological samples; 3) determine the most economical and valid methodology for consecutive sampling of the dredge and HabCam.

METHODS

Operations and gear for cruise S1 13-01 Parts I – III conformed with the Cruise Instructions for the Sea Scallop Survey, dated 18 March 2013. Exceptions to the Cruise Instructions were that Part I was delayed two days due to mechanical issues with the vessel, and Part II was interrupted due to inclement weather. Additionally, the vessel came in three days early on Part III for a change in scientific personnel before continuing on with the survey.

Pre-selected, random stations were sampled using a modified 2.44 m (8-foot) 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 monitors to record data on deck.

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 (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 selected stations. Habitat portions were estimated by basket volume, converted into number of liters (where one basket = 46 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 fourth dredge station using a conductivity, temperature, and depth instrument (CTD). A bottom salinity sample was obtained twice a day, when applicable, to calibrate the CTD.

Additionally, cooperative work was conducted throughout all legs of the sea scallop survey to determine the most economical and valid methodology for consecutive sampling of the dredge and the Habitat 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 (WHOI), 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 stereo-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 and, while at sea, is able to image a track of over 100 nautical miles each 24 hour day. The current Northeast Fisheries Science Center's 8-foot wide scallop dredge can make 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 about six knots covers over 260,000 m^2 per day. Thus, the spatial coverage of HabCam is over 2.5 times the area covered by the survey dredge.

The HabCam system was mounted in a ten-foot long by three-foot wide steel frame and towed one to three meters off the ocean floor at a speed of approximately six 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 192 dredge stations, with 53, 66, and 73 dredge hauls made on Parts I, II, and III, respectively; 182 of those stations were representative. The dredge flipped six times and stations were re-towed in almost all flip cases. Bottom temperatures were collected at 79 stations using the CTD system, while bottom water samples for CTD calibration were taken at 24 stations.

A total of 1,418 samples were collected to support four internal and external investigations (Table 1).

During the three legs of the survey, NOAA HabCam V4 was deployed concurrently throughout the scallop strata. HabCam V4 was towed for approximately 15 days over the course of the survey, capturing images along a cruise track of approximately 1,345 nm in the Mid-Atlantic Bight (MAB) and 841 nm on Georges Bank, including the Great South Channel. The HabCam track is show in Figure 3. The total production of paired images was approximately 16 terabytes (TB) for raw tiff paired images. This translates into 7,267,485 image pairs; 4,470,775 image pairs were collected in the MAB and south, while 2,796,710 image pairs were collected 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

Jonathan Duquette, Chief Scientist³

Victor Nordahl³, Chief Scientist¹

Larry Brady²

Joseph Godlewski²

Dvora Hart¹

Robert Johnston¹

Charles Keith²

Erin Kupcha³

Sean Lucey³

Adam Poquette³

National Marine Fisheries Service, NSL, Washington D.C.
LaShaun Willis¹

Contractors, Integrated Statistics, Woods Hole, MA
Nicole Charriere¹, Chief Scientist²
Jillian Price³
Geoffrey Shook¹
Christopher Tholke^{1,2}
Jui-Han Chang⁴

WHOI, HabCam Group, Woods Hole, MA
Scott Gallager¹
Jared Schwartz³
Amber York^{1,2}

Massachusetts Maritime Academy, Buzzards Bay, MA
Rachel Simpson^{2,3}

New England Fishery Management Council, Newburyport, MA
Deirdre Bolke³

NOAA Teacher -at-Sea Program
Sherie Gee² San Antonio, TX
Eric Velarde¹ Greenville, NC
Virginia Warren³ Theodore, AL

Southern Maine Community College, South Portland, ME
Jessica Mayhew³

United States Coast Guard Academy, New London, CT
Alyssa Turner¹

University of Maine, Orono, ME
Sam Truesdell¹

University of Massachusetts, SMAST, New Bedford, MA
Brooke Wright²

University of Miami, Rosenstiel School of Marine and Atmospheric Science, Miami, FL
Elizabeth Council²

University of Rhode Island, Graduate School of Oceanography, Narragansett, RI
Sarah Blackstock²

Volunteers

Michelle Curtis¹
Jean-Carlos Lopez²
Robert LaFrance³
Tasha O'Hara²

Ocean View, NJ
Brooklyn, NY
Canton, MA
Jamestown, RI

¹ 15 - 24 June 2013

² 26 – 28 June, 1 – 7 July 2013

³ 9 – 20 July 2013

For further information contact Robert Johnston, National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA 02543. Phone (508) 495-2061; FAX (508) 495-2115; Robert.Johnston@noaa.gov. The Resource Survey Report for this survey and the cruise results can be viewed at: [NOAA NEFSC Ecosystems Survey Branch main web page](#).

Table 1. Special samples obtained for various investigators on UNOLS R/V *Hugh R. Sharp* Sea Scallop Survey, during 15 June – 20 July 2013.

Investigator and Affiliation	Samples Saved	Approximate Number
DiBacco, Claudio BIO DFO, Dartmouth, NS, Canada	sea scallop muscle	173 preserved
Galbraith, John NMFS, NEFSC, Woods Hole, MA	unidentified fish	4 individuals
Guest	various species	8 individuals
Hart, Dvora NMFS, NEFSC, Woods Hole, MA	sea scallop shells	562 shells
	scallop meat weights	564 weights
	sea scallop, diseased	4 individuals
	<i>Asterias</i> sea stars	103 examined
TOTAL		1,418 samples

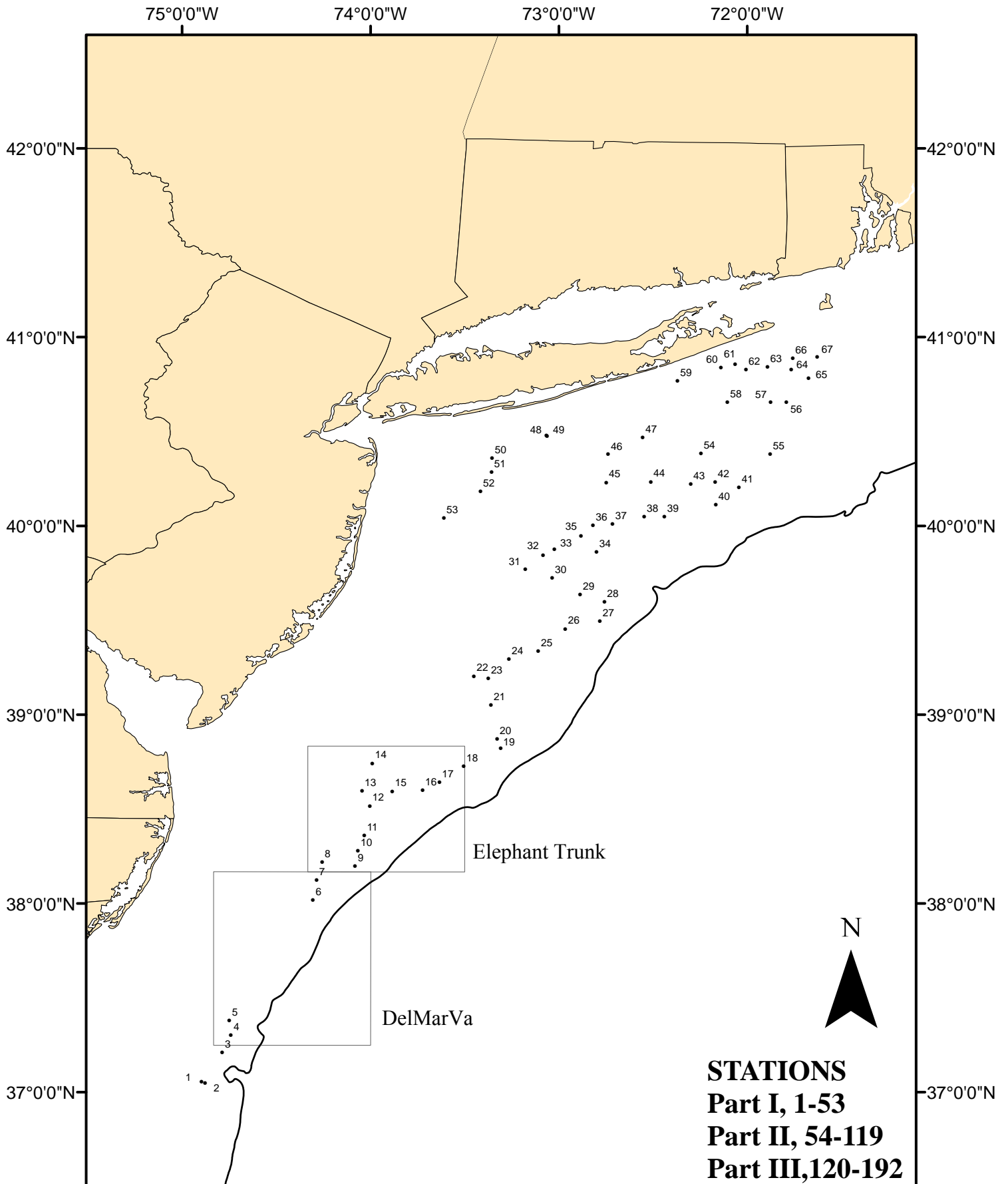


Figure 1. Dredge tows made from UNOLS R/V *Hugh R. Sharp* (13-01), during NOAA Fisheries Service, Northeast Fisheries Center Sea Scallop Survey, 15 June - 20 July 2013

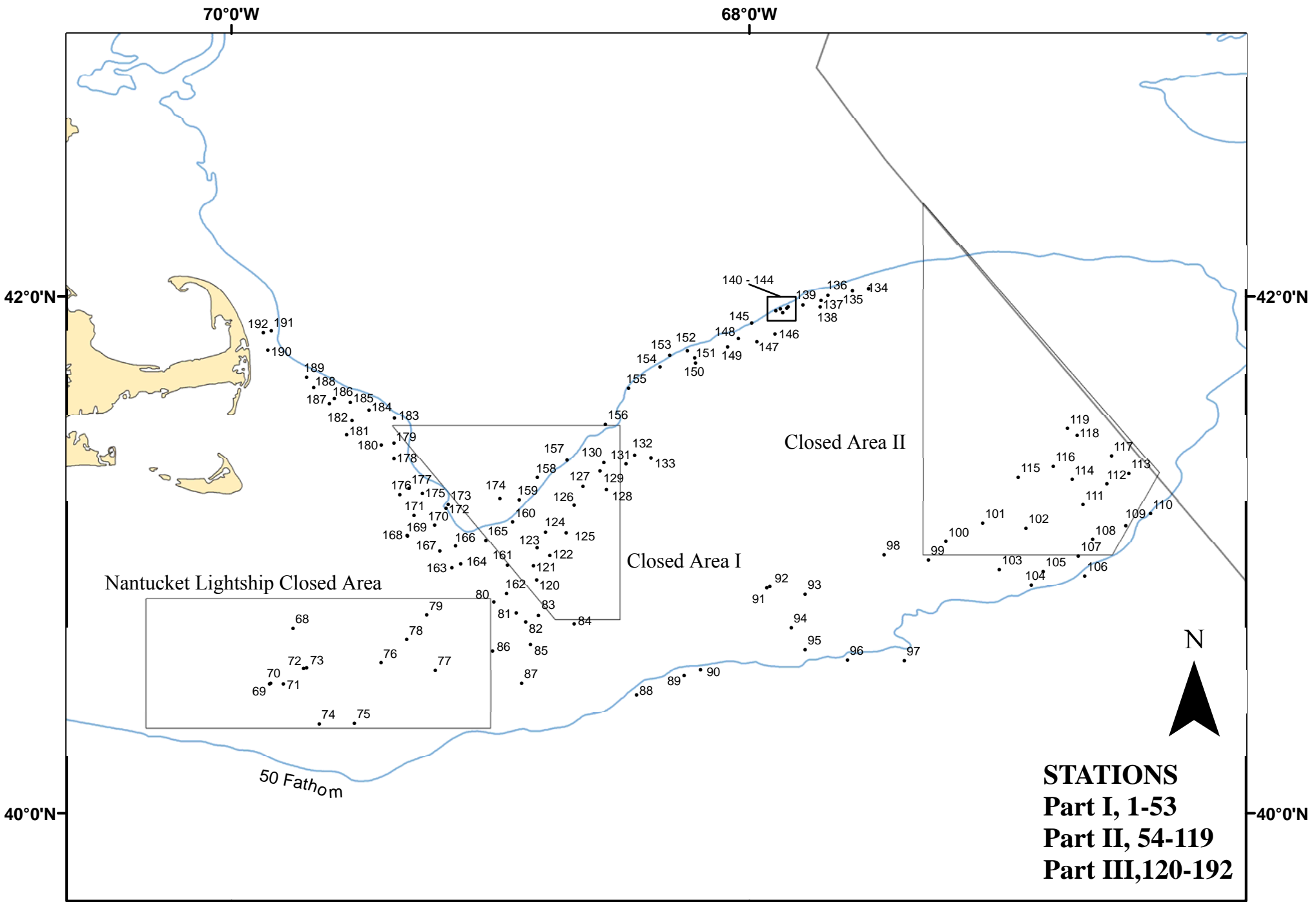


Figure 2. Dredge tows made from UNOLS R/V *Hugh R. Sharp* (13-01), during NOAA Fisheries Service, Northeast Fisheries Center Sea Scallop Survey, 15 June - 20 July 2013

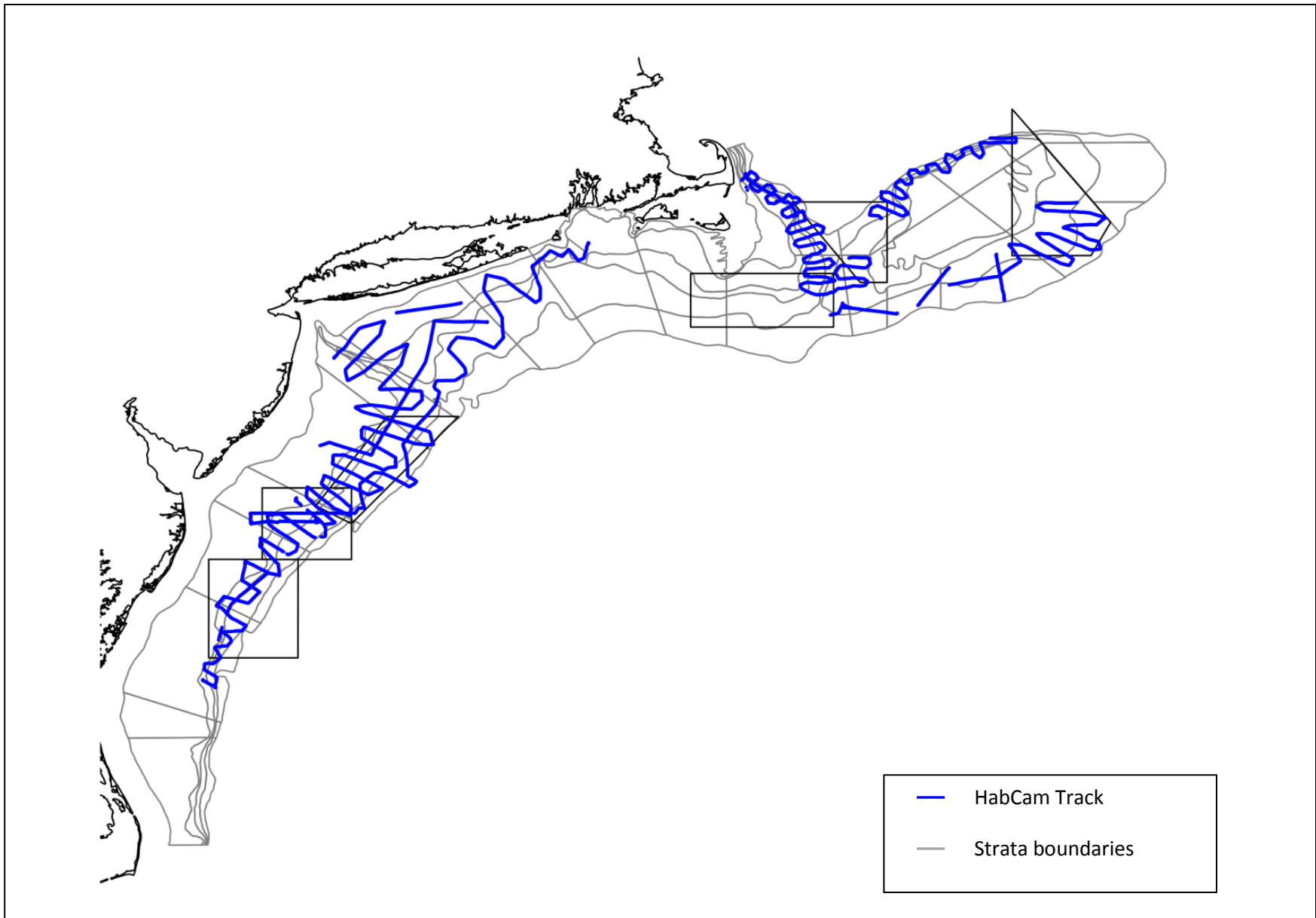


Figure 3: NOAA HabCam track from Mid-Atlantic Bight to Georges Bank, as followed by UNOLS R/V *Hugh R. Sharp* during NOAA Fisheries Service, Northeast Fisheries Science Center Sea Scallop Survey, June 15 – July 20, 2013.