CRUISE RESULTS

UNOLS R/V Hugh R. Sharp Cruise
No. S1 17-01 (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 16 May – 21 June 2017 and was conducted in three parts: Part I was from 16 – 24 May, Part II was from May 26 – 4 June, Part IIIa was from 6- 13 June and Part IIIb was from 13 - 21 June, 2017. The area surveyed was from the Mid-Atlantic Bight to Georges Bank, and average sampling depths ranged from approximately 33 to 134 meters (18 to 65 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 V 4); and 2) collect biological samples.

METHODS

Operations and gear for cruise S1 17-01 Parts I – III conformed with the Cruise Instructions for the Sea Scallop Survey, dated May 12, 2017.

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 instrument.

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 128 dredge stations, with 2, 34 and 92 dredge hauls made on Parts I, II and III, respectively; 118 of those stations were representative. The dredge flipped once during this survey. Bottom temperatures were collected at 34 stations using the CTD system, while bottom water samples for CTD calibration were taken at 12 stations. A total of 1,615 samples were collected to support seven 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 captured images along a cruise track of approximately 1.6k km in the Mid-Atlantic Bight (MAB) and 4.2k km on Georges Bank. The HabCam track is shown in Figures 3 and 4. A total of 5.8 million images were collected; 1.6 million images in the MAB, while 4.2 million images 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
Larry Brady, Chief Scientist [3a]
Sue Brown [3]
Jonathan Duquette, Chief Scientist [1, 3b]
Joseph Godlewski [2]
Dvora Hart [1, 3b]
Paul Kostovick [2]
Nancy McHugh [3a]
Burton Shank, Chief Scientist [2]

Contractors, Integrated Statistics, Woods Hole, MA
Michael Bergman [1, 2, 3]
Glenn Chamberlain [3]
Jui-Han Chang [3]
Nicole Charriere [2, 3]
Corinne Endres [2]
Aris-Aja Horsey [3b]
Tasha O'Hara [2]
Jill Price [3]

Coonamesset Farm Foundation	Falmouth, MA
Jason Claremont [1]	
WHOI, HabCam Group, Woods Hole, MA	
John Cummings [3]	
Michael Saminsky [1, 2, 3]	
Scott Gallager [1]	
Steve Lerner [1]	
NOAA Teacher at Sea	
Terry Maxwell [3]	Seneca High School, Seneca, IL
Volunteers	
Dylan Benoit[2]	University of Maine, Southbury, CT
Adriane Buckenmeyer[1]	Connecticut College, Seattle, WA
John Ceccolini[2]	Falmouth, MA
Richie Corrado[1]	S. Boston, MA
Erica Donato[1]	Endicott College, Danvers, MA
Massimo DiStefano[2]	University of NH, Durham, NH
Cameron Fairclough[1]	Roger Williams Univ., New Bedford, MA
Bryce Kadis[2]	Canton, MA
Thomas Kaupelis[3b]	University of ME, Fort Kent, ME
Kiera Lawlor[1]	Endicott College, Danvers, MA
John Marcone[2]	Newark, DE
Kristin Mastropole[1]	Great Falls, VA
Lauren Mott[3]	Cornell Univ., Columbia, MO
Michael Nguyen[2]	Stockton University, Cape May, NJ
Kyle Runion[2]	Annapolis, MD

[1] 16 – 24 May, 2017
[2] 26 May – 4 June, 2017
[3] 6 – 21 June, 2017
[3a] 6 – 13 June, 2017
[3b] 17 – 21 June, 2017

For further information, contact Peter Chase, National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, MA 02543. Phone (508) 495-2348; FAX (508) 495-2115; Peter.Chase@noaa.gov. The Resource Survey Report for this survey and the Cruise Results can be viewed at: NEFSC Ecosystems Survey Branch website.

Table 1. Special samples obtained for various investigators on UNOLS R/V *Hugh R. Sharp* Sea Scallop Survey, during 16 May- 21 June 2017.

Investigator and Affiliation	**Samples Saved**	**Approximate Number**
Galbraith, John NMFS, NEFSC, Woods Hole, MA	various species	57 frozen
Hart, Dvora NMFS, NEFSC, Woods Hole, MA	sea scallop shells sea scallop meat weights sea scallop gonad weights sea scallop shell widths	332 shells frozen 341 weights 341 weights 341 examined
Froelich, Tara Cornell Cooperative Extension Marine Program, Riverhead, NY	goosefish finclips	77 frozen
Gallager, Scott WHOI, Woods Hole, MA	sea scallop meats	136 frozen

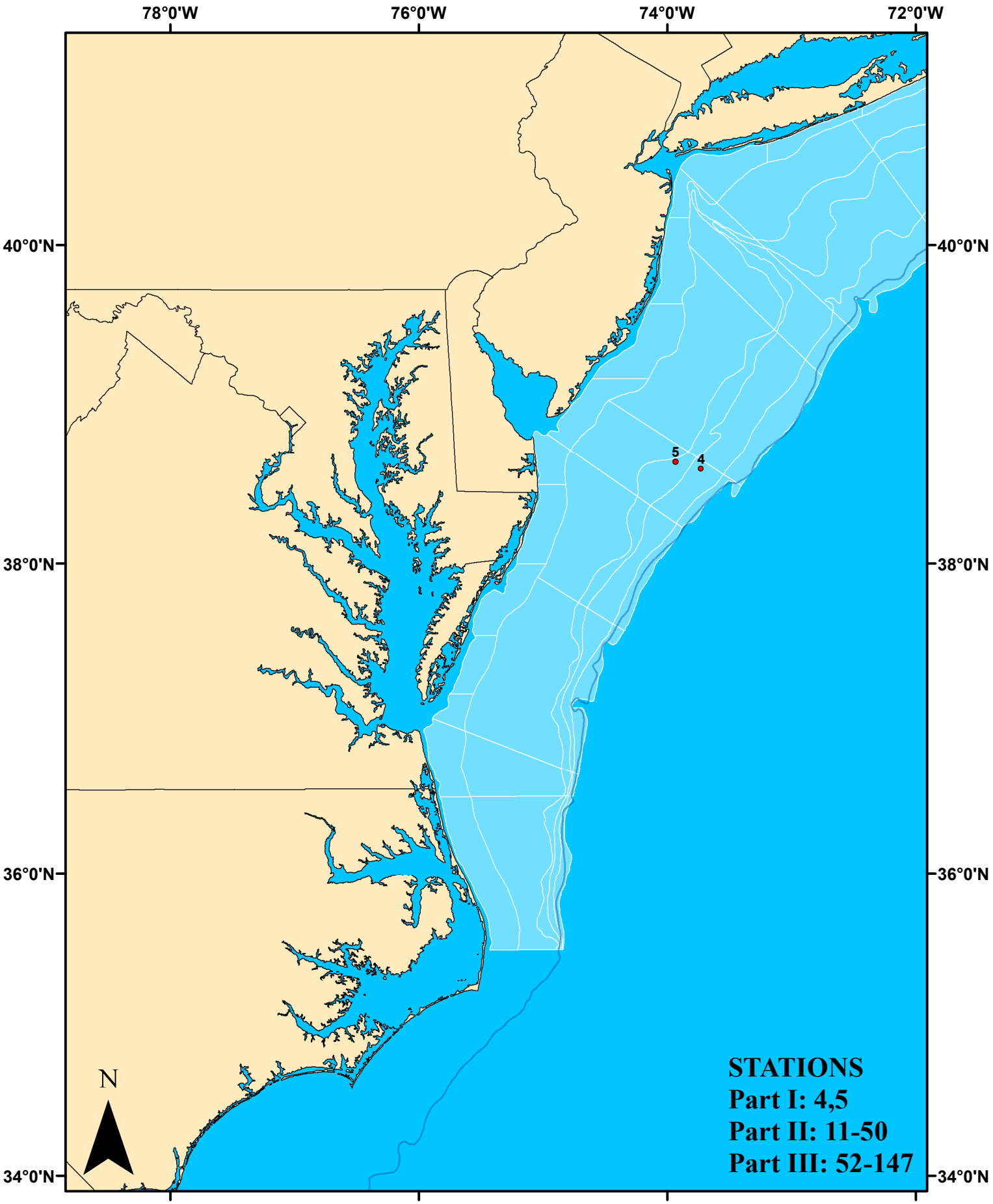

Figure 1. Dredge tows made from UNOLS R/V *Hugh R. Sharp* during NOAA National Marine Fisheries Service, Northeast Fisheries Science Center's summer sea scallop survey, 16 May - 21 June 2017

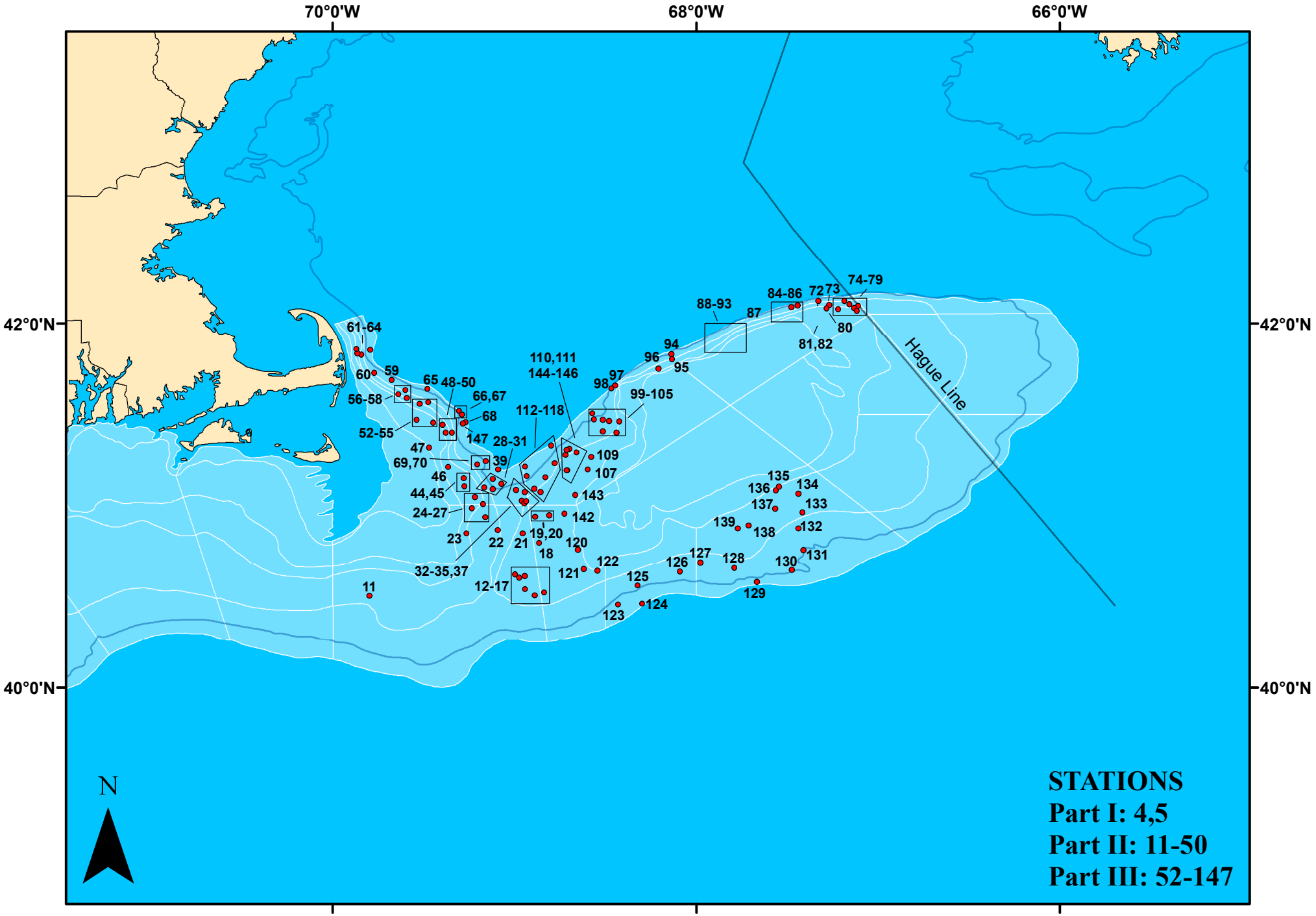

Figure 2. Dredge tows made from UNOLS R/V *Hugh R. Sharp* during NOAA National Marine Fisheries Service, Northeast Fisheries Science Center's summer sea scallop survey, 16 May - 21 June 2017

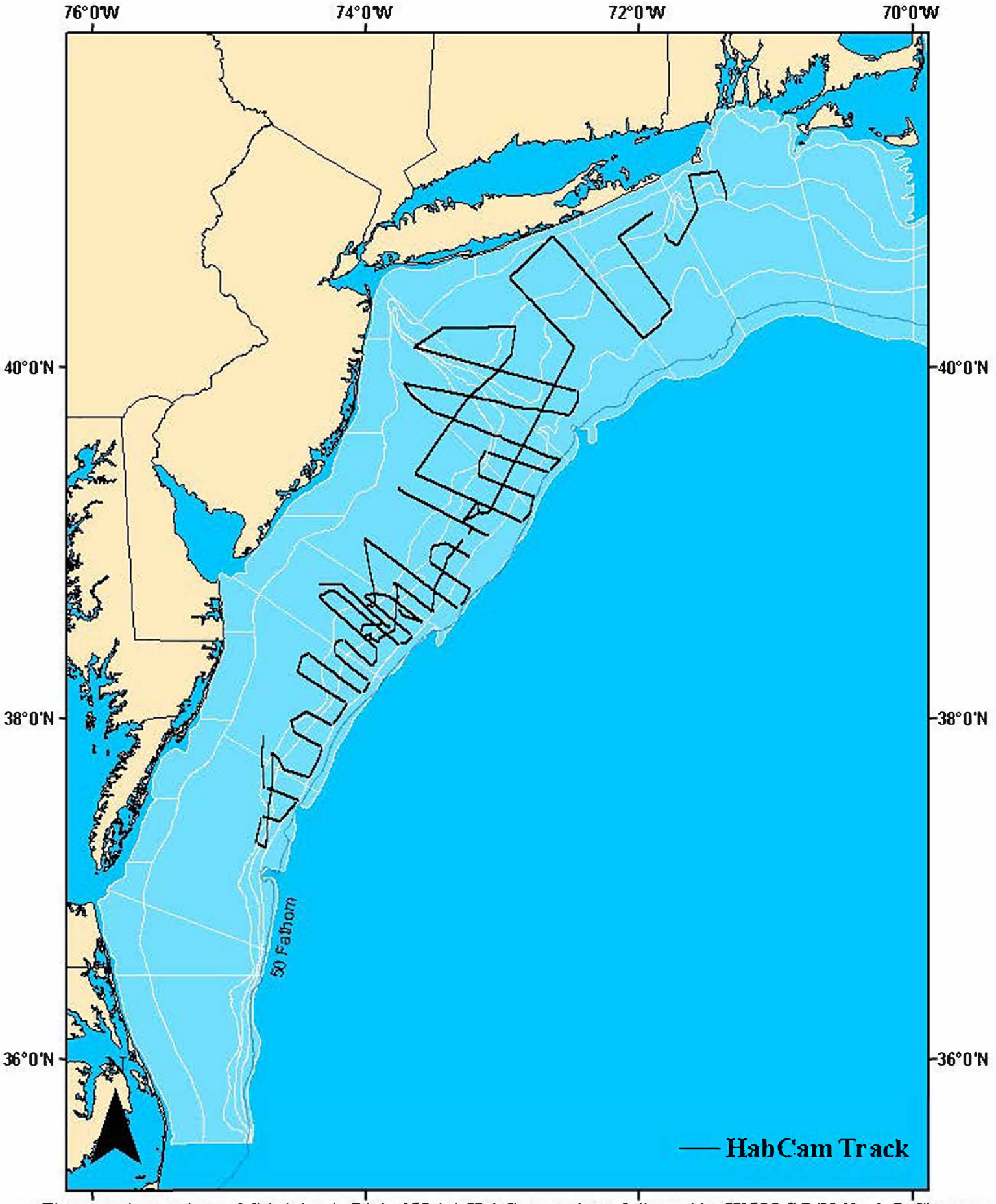

Figure 3. Approximate Mid-Atlantic Bight NOAA HabCam track, as followed by UNOLS R/V *Hugh R. Sharp* during NOAA National Marine Fisheries Service, Northeast Fisheries Science Center's summer sea scallop survey, 16 May - 21 June 2017

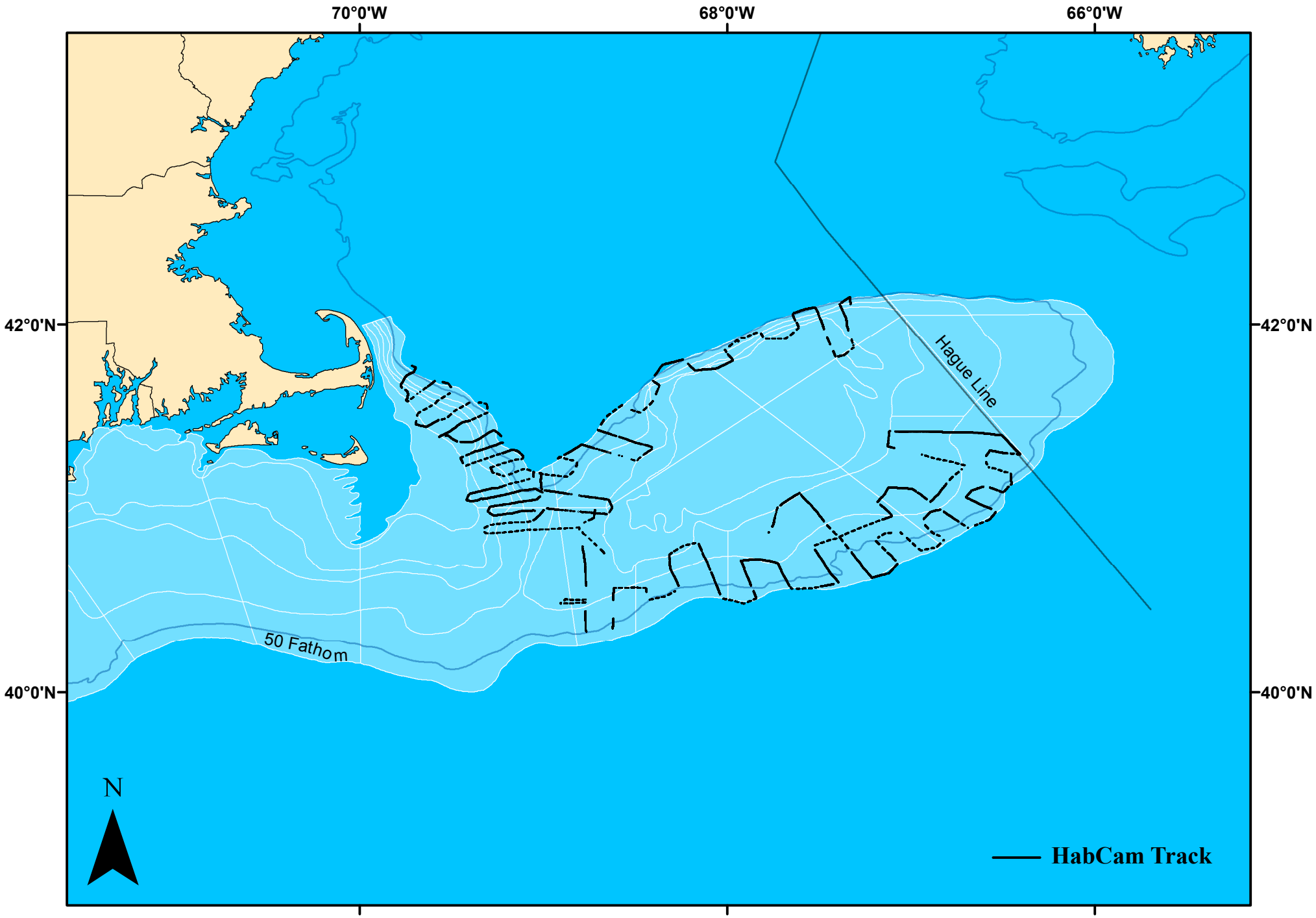

Figure 2. Approximate Georges Bank NOAA HabCam track, as followed by UNOLS R/V *Hugh R. Sharp* during NOAA National Marine Fisheries Service, Northeast Fisheries Science Center's summer sea scallop survey, 16 May - 21 June 2017