

# CRUISE RESULTS

NOAA FRV DELAWARE II  
Cruise No. DE 03-03 Parts (I-IV)  
Spring Bottom Trawl Survey

**Submitted to:** NOAA, NEFSC

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### **CRUISE PERIOD AND AREA**

The cruise period was from 5 March to 27 April 2003. The cruise was conducted in four parts: Part I was from 5-14 March; Part II, 17-28 March; Part III, April 1-11; and Part IV, 15-27 April. The area of operations was from Cape Hatteras to the Western Scotian Shelf, including the Gulf of Maine. Station locations are shown in Figures 1 and 2.

### **OBJECTIVES**

The objectives of the cruise were to: (1) determine the seasonal distribution, relative abundance and biodiversity of fish and invertebrate species found on the continental shelf; (2) collect biological samples for studies of age determinations and growth studies, fecundity, maturity, and feeding ecology; (3) collect hydrographic and meteorological data; (4) collect samples of ichthyoplankton and zooplankton for relative abundance and distribution studies; (5) collect data and samples for cooperative researchers and programs; and (6) conduct a hydroacoustic survey between stations.

### **METHODS**

Operations and gear used during Parts I-IV conformed with the Cruise Instructions for the Spring Bottom Trawl Survey dated 31 December 2002 and Addendum 1 dated 24 Addendum 4 dated 15 April with the following exceptions: The ship left one day late (5 March) due to mechanical problems. The ship returned the same day to Woods Hole due to additional mechanical problems and then departed later in the afternoon to resume the survey. During Part II of the survey a scientist was dropped off at Cape May, NJ (19 March) and picked up by the Coast Guard due to illness. During Part IV of the survey, a scientist was dropped off in Gloucester, MA (23 April) and replaced by another scientist.

A 30-minute tow was made at each station with a Northeast Fisheries Science Center (NEFSC) standardized number 36 Yankee otter trawl rigged with 41 centimeter (cm) diameter rubber rollers, 36 floats, and 9 meter (m) bridles. NEFSC standardized 450 kilogram (kg) polyvalent trawl doors rigged with chain backstraps were used. The trawl was fished at a scope of 4:1 in depths between 18 and 27 m, 3:1 in depths between 28 and 183 m deep, and 2.5:1 in depths of 184 m and greater. Towing speed was maintained at approximately 3.8 knots using DGPS instrumentation. Direction of the tow was generally toward the next station. Throughout the cruise, a hydroacoustic survey was conducted during transit between bottom trawl stations using the Simrad EK-500 system.

After each tow, the catch was sorted by species and weighed to the nearest 0.001 kg using motion-compensated digital scales. Representative length frequencies were collected for all species caught. All catch and biological data were recorded using shipboard automated data entry systems. The Fisheries Scientific Computing System (FSCS) was used to record all biological data. This system uses digital scales, electronic measuring boards, touch screen displays and barcode scanners to record data on deck and archives the data on the ship's computer network.

Sampled fish were assigned individual identification numbers, measured, weighed to the nearest 0.001 kilogram, and further sampled for age and growth and feeding ecology studies. Bony fish were measured to the nearest centimeter to the end of the central caudal ray; biological samples were collected concurrently with measuring operations. Sharks and skates were measured to the end of the caudal fin (total length). Rays were measured for disk width. Lobsters were measured in millimeters from the posterior edge of the eye socket to the end of the carapace; the presence or absence of a V-notch was also noted. Crabs were measured across the carapace width in centimeters. Shell height was measured in centimeters for selected bivalves. Additional collections were obtained for various scientists (Table 2). The remainder of the catch (miscellaneous invertebrates, shells, substrate, etc) was described by volume.

Surface temperatures were measured using the hull-mounted temperature sensor at a depth of 3 meters. Temperature and conductivity profiles were recorded using a conductivity, temperature, and depth (CTD) instrument (CTD) at every station. A bottom salinity sample was obtained twice each day to calibrate the CTD. Water samples were also taken for fluorometer calibrations.

Samples of fish eggs and larvae were collected at selected stations. Plankton sampling gear consisted of a 61 cm bongo frame fitted with 0.333 mm mesh nets. Digital flow meters were suspended within the mouths of the bongo frame to estimate water volume filtered. The net was towed at 2.8-3.8 kilometers/hour (1.5-2.0 knots). A CTD was deployed at each plankton station.

## RESULTS

The survey sampled at 332 stations with 59, 106, 80, and 87 stations completed on parts I-IV, respectively. A total of 134 vessel comparison paired tows were completed with the Delaware II on parts III and IV.

Standard plankton tows were made at 117 stations. Bottom temperatures were collected at all stations using the CTD system. Bottom water samples for CTD calibration were taken at 36 stations. Catch data was simultaneously recorded on traditional paper logs and electronically

using the FSCS data collection system.

Tables 1 and 2 list the major samples collected for various studies.

#### DISPOSITION OF SAMPLES AND DATA

Age and growth samples, feeding ecology data and samples, maturity data, trawl catch data, and hydrographic data will be analyzed at the NEFSC Woods Hole, Massachusetts Laboratory. The various collections were forwarded to the individuals listed in Table 2. Resulting data will be audited, edited, and entered into the NEFSC trawl survey database.

#### SCIENTIFIC PERSONNEL

##### National Marine Fisheries Service, NEFSC, Woods Hole, MA

John Galbraith, Chief Scientist<sup>1,4</sup>

Peter Chase, Chief Scientist<sup>2</sup>

Linda Despres, Chief Scientist<sup>3</sup>

Lawrence Brady<sup>2,3</sup>

Jon Brodziak<sup>4</sup>

Jason Link<sup>3</sup>

Nancy McHugh<sup>2</sup>

Paul Nitschke<sup>1</sup>

William Overholtz<sup>4</sup>

Stacy Rowe<sup>2,4</sup>

Nina Shepherd<sup>4</sup> (4/23-28)

Vaughn Silva<sup>3</sup>

Katherine Sosebee<sup>1</sup>

Sandy Sutherland<sup>4</sup>

##### National Marine Fisheries Service, NEFSC, Highlands, NJ

Vincent Guida<sup>2</sup>

##### National Marine Fisheries Service, NEFSC, Milford, CT

Steven Pitchford<sup>3</sup>

##### National Marine Fisheries Service, NWFSC, Newport, OR

Keith Bosley<sup>3</sup>

Daniel Kamikawa<sup>2</sup>

##### National Marine Fisheries Service, NEFSC, Beaufort, NC

David Gloeckner<sup>2</sup> (3/17-19)

##### National Marine Fisheries Service, HQ, Silver Spring, MD

Margaret Toner<sup>2</sup>

##### National Marine Fisheries Service, NERO, Gloucester, MA

Douglas Christel<sup>4</sup>

NOAA, NMAO, Woods Hole, MA

Eric Bohaboy<sup>1</sup>

University of Massachusetts, Amherst, MA

Arne Christiansen<sup>3</sup>

Joseph Kunkel<sup>4</sup>

Robert Zimmermann<sup>3</sup>

Stony Brook University, Stony Brook, NY

Michelle Staudinger<sup>2</sup>

University of Rhode Island, Narragansett, RI

Steven Gavlik<sup>1</sup>

Contractors

Robert Alexander<sup>3</sup>

Laurel Col<sup>4</sup>

Robert Gamble<sup>1</sup>

Ellen Johnson<sup>1,3,4</sup>

James Lovegren<sup>1</sup>

Sean Lucey<sup>2,3</sup>

Kevin McIntosh<sup>1,3</sup>

Ralph Meekins, Jr<sup>2</sup>

Joshua Moser<sup>1</sup>

Sarah Pregracke<sup>4</sup>

Christopher Petrucelli<sup>1</sup>

Azure Westwood<sup>3</sup>

Catherine Tadema-Wielandt<sup>4</sup> (4/15-23)

Woods Hole, MA

Woods Hole, MA

Woods Hole, MA

Robbinston, ME

Brick, NJ

Hyannis, MA

Woods Hole, MA

Wanchese, NC

Woods Hole, MA

Woods Hole, MA

Cape May, NJ

Woods Hole, MA

Sagamore, MA

Volunteers

Cesario Cerna<sup>4</sup>

John Hawkins<sup>4</sup>

Forrest Kennedy<sup>1</sup>

Robert Kennedy<sup>1</sup>

Paul Ketchum<sup>2</sup>

Amy Poe<sup>2</sup>

Karen Saur<sup>2</sup>

Tiffany Vidal<sup>3</sup>

San Antonio, TX

North Brookfield, MA

Nantucket, MA

Nantucket, MA

Falmouth, MA

Portland, OR

Bayside, NY

Falmouth, MA

<sup>1</sup>5-14 March

<sup>2</sup>17-28 March

<sup>3</sup>1-11 April

<sup>4</sup>15-27 April

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Table 1. Field observations and samples collected for feeding ecology, and age and growth studies on FRV DELAWARE II, Cruise 03-03 (I-IV), Spring Bottom Trawl Survey, during 5 March - 27 April 2003.

<b>Species</b>	<b>Feeding Ecology Observations</b>	<b>Age and Growth Samples</b>
Acadian redfish	112	368
American plaice	343	448
American shad	47	-
Atlantic cod	168	525
Atlantic croaker	-	53
Atlantic halibut	18	20
Atlantic herring	355	1019
Atlantic mackerel	161	383
Atlantic wolffish	6	7
Barndoor skate	20	-
Blackbelly rosefish	39	1
Black sea bass	110	179
Blueback herring	142	1
Bluefish	19	34
Butterfish	120	230
Clearnose skate	1	-
Cusk	17	16
Fawn cusk-eel	20	-
Fourspot flounder	182	183
Goosefish	105	137
Haddock	247	542
Little skate	371	-
Longhorn sculpin	253	-
Ocean pout	152	150
Offshore hake	20	20
Pollock	61	114
Red hake	270	298
Rosette skate	13	-
Scup	32	73
Sea raven	181	-
Silver hake	400	1023
Smooth dogfish	73	-
Smooth skate	68	-
Spiny dogfish	469	-
Spot	9	1
Spotted hake	128	203
Striped bass	71	74
Summer flounder	179	258
Tautog	4	-
Thorny skate	51	-
Weakfish	7	15
White hake	123	301
Windowpane	232	349
Winter flounder	402	544
Winter skate	196	-
Witch flounder	230	281
Yellowtail flounder	218	306
<b>TOTALS</b>	<b>6445</b>	<b>8156</b>

Table 2. Miscellaneous scientific collections made on FRV DELAWARE II, Cruise 03-03 (I-IV), Spring Bottom Trawl Survey, during 5 March - 27 April 2003.

Investigator and Affiliation	Samples Saved	Approximate Number
Aquarium, NMFS, NEFSC, Woods Hole, MA	Atlantic herring	21 bags
	Shrimp	5 bags
	Misc. live species	14 indiv.
John Burnett, NMFS, NEFSC, Woods Hole, MA	Winter Flounder	58 indiv.
	Various species, maturity workshop	135 indiv.
Peter Chase, NMFS, NEFSC, Woods Hole, MA	Various species	19 indiv.
Bruce Collette, NMFS, Nat'l Systematics Lab, Washington, DC	Atlantic croaker	10 indiv.
Isaure de Buron, College of Charleston, Charleston, SC	Misc species	278 indiv.
John Galbraith, NMFS, NEFSC, Woods Hole, MA	Various species	30 indiv.
Vincent Guida, NMFS, NEFSC, Highlands, NJ	<i>Astropecten sp.</i>	4 bags
Devorah Hart, NMFS, NEFSC, Woods Hole, MA	Cusk	15 bags
Christine Helle, Institute of Marine Research, Bergen Norway	Shrimp	69 bags
Josef Idoine, NMFS, NEFSC, Woods Hole, MA	Hagfish	17 indiv.
Charles Keith, NMFS, NEFSC, Woods Hole, MA	Sharks tagged	1 indiv.
Nancy Kohler, NMFS, NEFSC, Narragansett, RI	Lobster	89 indiv.
Joseph Kunkel, Univ. of MASS, Amherst, MA	American shad	1 indiv.
Nancy McHugh, NMFS, NEFSC, Woods Hole, MA	Various species	171 indiv.
Joshua Moser, NMFS, NEFSC, Woods Hole, MA	Black sea bass	8 indiv.
William Muir, Purdue Univ., W. Lafayette, IN	Ocean pout	2 indiv.
Paul Nitschke, NMFS, NEFSC, Woods Hole, MA	Cunner	34 indiv.
Loretta O'Brien, NMFS, NEFSC, Woods Hole, MA	Atlantic cod	154 indiv.
	Various skates, spiny dogfish, rays	1312 indiv.
Katherine Sosebee, NMFS, NEFSC, Woods Hole, MA	Skate vertebrae	963 samples
Michael Tork, NMFS, NEFSC, Woods Hole, MA	Various species	149 indiv.
Fred Wenzel, NMFS, NEFSC, Woods Hole, MA	Various species	18 indiv.
Susan Wigley, NMFS, NEFSC, Woods Hole, MA	Witch flounder	3 indiv.
John Ziskowski, NMFS, NEFSC, Milford, CT	Summer Flounder	3 indiv.
	American plaice	4 indiv.

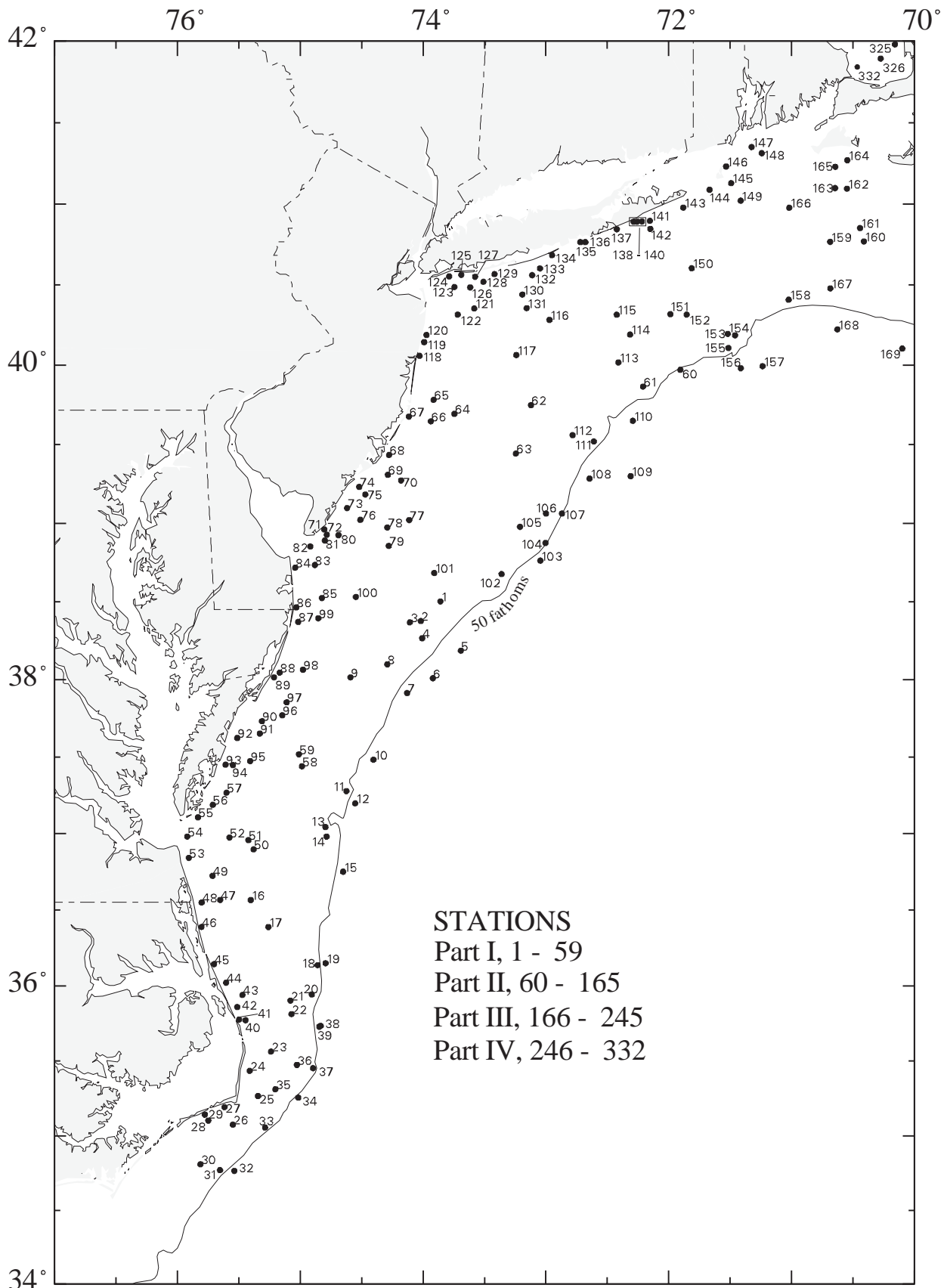


Figure 1. Trawl hauls made from FRV DELAWARE II (03 - 03), during National Marine Fisheries Service, Northeast Fisheries Science Center spring bottom trawl survey, March 5 - April 27, 2003.



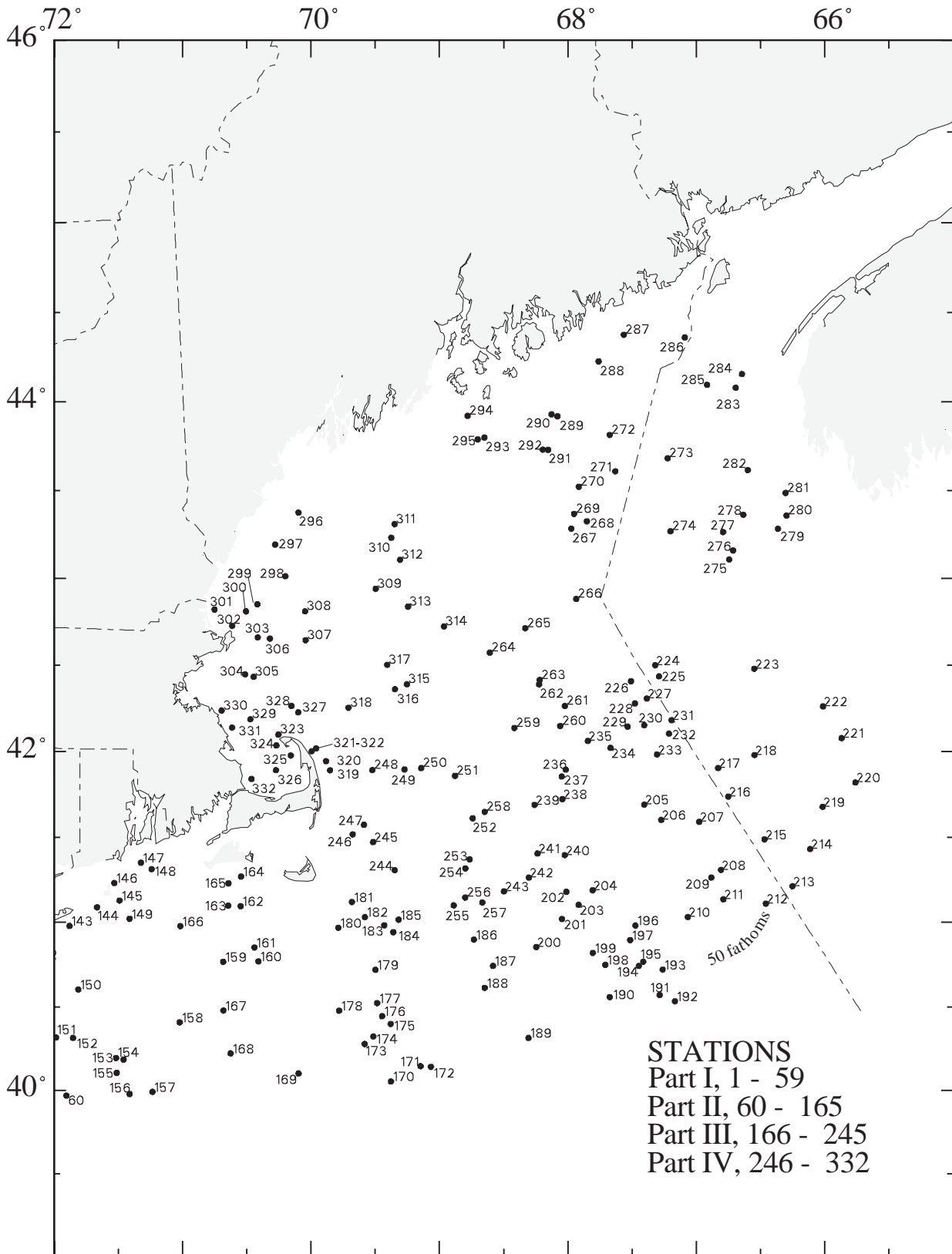


Figure 2. Trawl hauls made from FRV DELAWARE II (03 - 03), during National Marine Fisheries Service, Northeast Fisheries Science Center spring bottom trawl survey, March 5 - April 27, 2003.