3 March 2011

CRUISE RESULTS
NOAA Fisheries Research Vessel *Delaware II*
Cruise No. DE 10-12
Ecosystems Monitoring Survey, NASA Ground Truth Measurements and Fish Egg and Larvae Survey

CRUISE PERIOD AND AREA

The cruise period was from 5 November to 5 December 2010. The cruise was originally due to sail on 4 November but was delayed a day due to bad weather. The cruise was divided into two legs. The first leg was devoted to the Ecosystem Monitoring Survey and NASA Ground Truth Measurements and covered almost all of the Gulf of Maine (the northernmost station was missed), part of Georges Bank and the Southern New England and Mid-Atlantic Bight areas (the southernmost station was missed). The second leg was devoted to completing unfinished stations on Georges Bank from the first leg and conducting a survey of fish eggs and larvae from the Georges Bank, Nantucket Shoals and western Gulf of Maine areas.

OBJECTIVES

This cruise was the fifth in a series of multiple-objective cruises that are being done in collaboration with NASA and Old Dominion University. As always, the primary objective of the cruise was to assess changing biological and physical properties that influence the sustainable productivity of the living marine resources of the northeast continental shelf ecosystem. Key parameters measured for the Ecosystem Monitoring Program included ichthyoplankton and zooplankton composition, abundance and distribution, plus water column temperature and salinity. However, we worked with our colleagues from NASA and Old Dominion University to enhance the application of ocean color remote sensing to coastal ecosystems by "ground truthing" SeaWiFS and MODIS-Aqua data with ship-based water column measurements. This field data was also used to derive region-independent ocean color algorithms for primary productivity, particulate organic carbon and dissolved organic carbon.

Secondary objectives of this cruise included:

- Vertical CTD casts to within 5 meters of the bottom in Gulf of Maine deep basin areas to provide hydrographic data detailing the incursion of Labrador Current water into this region.
- Collection of zooplankton for the Census of Marine Zooplankton Project (CMarZ), based at University of Connecticut, Avery Point.
- Identifications and counts of marine birds and mammals along the cruise track by observer Mike Sylvia, from the Graduate Center of the City University of New York (CUNY).
- Collection of nutrient samples from the various depths sampled with the Niskin bottle rosette for University of Maine researcher Dave Townsend.
- Collection of zooplankton samples for carbon and nitrogen isotope analysis from the four regions surveyed, using the 20-cm bongo sampler for NASA researcher Antonio Mannino.
- Filtering seawater at selected stations for nitrogen isotope mapping study with researchers Autumn Oczkowski and Courtney Schmidt from EPA and URI-GSO.

METHODS

The survey consisted of 175 stations (Figure 1) at which the vessel stopped to lower instruments over the side. All ecosystem monitoring stations sampled were at randomly stratified locations except for five stations in the GOM that are routinely visited on all Ecosystem Monitoring cruises. These stations were Wilkinson Basin, Georges Basin, Jordan Basin, the Northeast Channel, and the Boston Harbor Liquefied Natural Gas (LNG) terminal.

Plankton and hydrographic sampling was conducted at most stations by making double oblique tows using the 61-cm bongo sampler and a Seabird CTD. The tows were made to approximately 5 m above the bottom, or to a maximum depth of 200 m. All plankton tows were conducted at a ship speed of 1.5 – 2.0 knots. Plankton sampling gear consisted of a 61-cm diameter aluminum bongo frame with two 335-micron nylon mesh nets. At the randomly designated CMarZ stations a 20-cm diameter PVC bongo frame fitted with paired 165-micron nylon mesh nets was put on the towing wire one half meter above the Seabird CTD with a wire stop (Figure 2). The 20 cm bongo sampler was also used to collect samples for biomass analysis from the different regions surveyed. A bell-shaped 45-kg lead weight was attached by an 80-cm length of 3/8-inch diameter chain below the aluminum bongo frame to depress the sampler. The flat-bottomed configuration of the depressor weight made for safer deployment and retrieval of the sampling gear when the boat was rolling in rough seas. A digital flowmeter was suspended within the mouth of each 61-cm sampler to determine the amount of water filtered by each net. No flowmeters were used in the 20-cm bongos. The plankton sampling gear was deployed off the starboard stern quarter of the vessel using an A-frame and a Sea-Mac winch that was placed on the aft deck specifically for this cruise. After retrieval, the bongo frames were carried to the covered work area for washing the plankton samples into sieves.

A small container (11 ½ ft L x 7 ½ ft W x 7 ½ ft H) was brought on board, which was set up as a plankton lab, complete with a fume hood for sample preservation, a sink with running seawater, stainless steel worktables, a small space heater and ventilation fan for the fume hood and the container inside area. This was secured to the port side of the stern deck, just aft of the covered work area (Figure 3). This freed up space in the Delaware II wet-lab area for the filtration equipment of NASA and Old Dominion University.

The 61-cm bongo plankton samples were preserved in a 5% solution of formalin in seawater. The CMarZ samples from the 20-cm diameter bongos were preserved in 95% ethanol, which was changed once at 24 hours after the initial preservation.

Plankton bongo tow depth was monitored in real time with a Seabird CTD profiler. The Seabird CTD profiler was hard-wired to the conductive towing cable, providing simultaneous depth, temperature, and salinity for each plankton tow. A CTD cast to within 5 m of the bottom was made in the Wilkinson, Jordan and Georges basins and the Northeast Channel to provide hydrographic data from below the 200 m limit set for bongo tows.

Continuous monitoring of the seawater salinity, temperature and chlorophyll-*a* level, from a depth of 3.7 meters along the entire cruise track was done by means of a thermosalinograph, and a flow-through fluorometer hooked up to the ship's flow-through seawater system.. The Scientific Computer System (SCS) recorded the output from the thermosalinograph at 10-second intervals. The data records were given a time-date stamp by the GPS unit.

Samples for Seabird CTD salinity data calibration were obtained at intervals using a 1.7 liter Niskin

bottle taking a water sample from an isohaline portion of the water column.

Census of Marine Zooplankton (CmarZ) samples were collected using the 20-cm diameter bongos described above at 5 randomly designated stations in each of the three regions sampled: Southern New England, Georges Bank and Gulf of Maine.

Nitrogen stable isotope ratio samples were collected at 25 stations by filtering 400 ml of seawater from the flow-through seawater system and freezing both the filtered material and the filtrate.

On leg 2 of the cruise the sampling protocol was changed. A second haul with a one meter square frame equipped with a 947 micron mesh net was made after each of the bongo tows on the remaining Ecosystem Monitoring stations. Once these were completed a 61 cm bongo frame equipped with 505 and 335 micron nets was towed, followed by a second haul with the meter net. These meter net tows and 505 micron bongo tows were designed to capture fish larvae, juvenile fish and fish eggs from Georges Bank, the western Gulf of Maine and the Nantucket Shoals areas.

RESULTS

A summary of routine survey activities is presented in Table 1. Areal coverage for the cruise is shown in Figure 1.

The *Delaware II* sailed at 0900 hours EDT on Friday, 5 November 2010. The vessel headed south sampling at inshore stations along the Southern New England area due to the large seas offshore. As conditions improved the vessel moved to the offshore waters of the Mid-Atlantic Bight area, and completed sampling that area, except for the southernmost station, by early Wednesday 10 November. Surface seawater was collected at a special station off of Wachapreague Inlet, Virginia, to coordinate sampling with researchers who were working inshore in that area. High winds and seas forced the vessel to anchor off of Fire Island later that same day, where it remained until the morning of Friday 12 November, when conditions improved enough to continue sampling. From that point, the Delaware II worked its way east across Southern New England, the southern portion of Georges Bank and then north across the Northeast Channel, up towards the Bay of Fundy, and then westward across the Gulf of Maine where sampling was completed by early Monday morning, 22 November. While in the Gulf of Maine a collection of styrofoam cups, decorated by students from the Lisbon Community School in Lisbon, Maine, was attached to the rosette sampler at a 400 m deep station to demonstrate to students the effects of compression from water pressure at depth (Figures 4 and 5).

The Delaware II docked in Woods Hole on Monday morning, 22 November at 0800 EST. All scientists debarked at this time, and the NASA and ODU groups unloaded all their scientific gear and samples. The NOAA people unloaded all their own samples, but left their sampling gear on board for the second leg, which sailed from Woods Hole on Monday, 29 November at 1400 EST. The second leg sailed out the Great Round Shoal Channel out to Georges Bank under flat calm conditions. Six unsampled stations from the first leg were fished with the standard configuration 61 cm bongo frame equipped with 335 micron mesh nets, then a second tow was made at each of these stations with a meter net, fished in an identical double oblique tow to within five meters of the bottom (Figure 6). The meter net frame was equipped with a 947 micron mesh net to filter large amounts of water to obtain greater numbers of fish larvae and juveniles. After completing the Georges Bank stations work was next carried out in the western Gulf of Maine area, where 16 stations were sampled, again with a bongo net first, and a meter net second. One difference here was that the bongo tows were made with a frame equipped with a 335 micron mesh net on one side and a 505 micron mesh net on the other. These stations were done specifically to locate concentrations of fish larvae and eggs.

When this area was finished, twenty additional stations were sampled in the Nantucket Shoals area. This area was sampled using the same protocol as on the western Gulf of Maine station, again to target concentrations of ichthyoplankton. The greatest numbers of fish eggs and larvae were found in the western Gulf of Maine, particularly around Jeffrey's Ledge (Figures 7 and 8). Water samples from the seawater flow-through system were also collected at selected stations for a nitrogen stable isotope mapping study (Figure 9).

On Sunday morning at 0930 EST the Delaware II docked at the NEFSC dock in Woods Hole, marking the end of the second leg of the Winter Ecosystem Monitoring Survey. All remaining scientific gear and samples were removed from the vessel at this time.

DISPOSITION OF SAMPLES AND DATA

The plankton samples and data were delivered to the Ecosystem Monitoring Group of the NEFSC, Narragansett, RI for quality control processing and further analysis. The nitrogen stable isotope samples and nutrient samples were also taken to Narragansett, RI. The Census of Marine Zooplankton samples were retrieved from the vessel by Woods Hole Oceanographic Institute researcher Nancy Copley. The Fisheries Oceanography Investigation of the NEFSC, Woods Hole, retained the CTD data and original log sheets. The NASA samples and data were taken by Mike Novak and Veronica Lance to Greenbelt, MD. The ODU samples and data were taken by Cory Staryk and Christopher Schweitzer to Norfolk, VA. The Ecosystems Monitoring Laboratory Container was stored in the Woods Hole NEFSC parking lot.

SCIENTIFIC PERSONNEL

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Table 1. STATION OPERATION REPORT FOR CRUISE DE1012

CAST	STA.	Date(GMT)			TIME(GMT)		LAT	LONG	DEPTH	OPERATION
										B=bongo W=water C=CMarZ V=vertical cast(CTD only) R=rosette cast
		mm	did	yy	hr	min			m	
1	1	11	5	2010	17	38	4119.1	7107.4	29	B
2	2	11	5	2010	23	50	4046.1	7206.5	46	B
3	3	11	6	2010	1	14	4053.5	7214.6	22	B
4	4	11	6	2010	4	27	4036.3	7244.7	37	B
5	5	11	6	2010	7	11	4028.8	7316.7	29	B
6	6	11	6	2010	9	18	4018.7	7338.9	26	B
7	7	11	6	2010	11	46	3958.4	7353.3	27	B, R1
8	8	11	6	2010	15	35	3943.9	7316.6	42	B, C1
9	9	11	6	2010	17	35	3943.2	7254.1	71	B, R2
10	10	11	6	2010	20	52	3941.2	7226.7	88	B, R3
11	11	11	7	2010	0	45	3918.6	7240.6	119	B
12	12	11	7	2010	1	55	3911.2	7247	99	B
13	13	11	7	2010	5	10	3843.4	7302.7	223	B
14	14	11	7	2010	7	48	3836.2	7330.7	73	B
15	15	11	7	2010	9	40	3836.2	7352.8	54	B, C2
16	16	11	7	2010	11	5	3838.8	7408.8	52	B
17	17	11	7	2010	12	42	3833.6	7426.7	43	B
18	18	11	7	2010	18	1	3746.1	7446.6	39	B, C3
19	19	11	7	2010	20	40	3741.1	7418.9	101	B
20	20	11	7	2010	22	1	3735.1	7410.2	318	B
21	21	11	8	2010	0	49	3723.6	7437.5	64	B
22	22	11	8	2010	4	7	3716.2	7514	28	B
23	23	11	8	2010	5	49	3706.2	7459.3	41	B
24	24	11	8	2010	8	9	3651.2	7518.9	30	B
25	25	11	8	2010	9	16	3643.7	7524.9	24	B
26	26	11	8	2010	11	43	3628.7	7504.8	44	B, C4
27	27	11	8	2010	13	4	3621.3	7454.7	46	B
28	28	11	8	2010	16	52	3608.8	7534.6	23	B, R4
29	29	11	8	2010	18	36	3616.4	7544.7	17	B
30	29	11	8	2010	18	48	3615.9	7544.6	15	W1
										STA 30 R5 ONLY
31	31	11	8	2010	23	44	3656.2	7556.8	21	B, C5
32	32	11	9	2010	3	24	3721.4	7535	15	B
33	32	11	9	2010	3	32	3721.4	7535.2	14	W2
										STA 33 R6 ONLY
34	34	11	9	2010	10	27	3813.8	7504.7	13	B
										STA 35 R7 ONLY
35	36	11	9	2010	15	16	3846.3	7442.8	26	B, R8
37	37	11	9	2010	18	25	3906.1	7430.8	19	B, C6
38	38	11	9	2010	20	10	3913.7	7414.8	24	B
39	38	11	9	2010	20	22	3913.9	7415.2	22	W3
										STA 39 R8 ONLY
40	40	11	9	2010	22	35	3901.2	7358.9	43	B

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		mm	did	yy	hr	min			m	
41	41	11	10	2010	1	1	3903.9	7334.9	50	B
42	42	11	10	2010	4	9	3925.9	7336.8	37	B
43	43	11	10	2010	6	28	3926.2	7313.3	52	B
44	44	11	10	2010	11	34	3953.8	7254.8	56	B
45	45	11	10	2010	18	1	4023.5	7221.4	54	B
46	46	11	12	2010	17	15	4029	7210.9	58	B
47	47	11	12	2010	18	54	4031.3	7159.1	62	B, C7
48	48	11	12	2010	20	4	4038.7	7154.9	53	B
49	49	11	12	2010	22	28	4026.2	7136.8	78	B
50	50	11	13	2010	1	23	4001.4	7130.5	97	B
51	51	11	13	2010	3	39	4003.9	7114.8	161	B, C8
52	52	11	13	2010	10	36	4052.9	7055	56	B
53	53	11	13	2010	12	51	4041.3	7036.6	60	B, C9
54	54	11	13	2010	18	4	4001.6	7008.8	182	B
55	55	11	13	2010	21	19	4021.5	6959.3	83	B
56	56	11	13	2010	22	56	4018.6	6946.8	79	B
57	57	11	13	2010	23	59	4026.3	6946.8	75	B, C10
58	58	11	14	2010	0	51	4031.5	6950.9	69	B
59	59	11	14	2010	3	12	4048.8	6943	33	B
60	60	11	14	2010	6	36	4106.3	7016.7	33	B
61	61	11	14	2010	7	36	4113.6	7011	17	B
62	62	11	14	2010	12	50	4103.2	6936.1	47	B
63	63	11	14	2010	15	6	4046.2	6918.7	53	B
67	64	11	14	2010	19	55	4103.9	6905.3	87	W4
68	64	11	14	2010	20	13	4103.9	6904.5	87	B, C11
										STA 65 R10 ONLY
69	66	11	14	2010	23	29	4101.3	6834.6	54	B
70	67	11	15	2010	0	42	4056.3	6822.6	57	B
71	68	11	15	2010	2	52	4043.7	6806.7	75	B
72	69	11	15	2010	5	18	4028.7	6831	91	B
73	70	11	15	2010	6	10	4026.2	6838.7	87	B
74	71	11	15	2010	8	20	4011.6	6829	340	B, C12, R11
										STA 72 R12 ONLY
75	73	11	15	2010	14	30	4023.9	6746.7	146	B, C13
76	74	11	15	2010	17	2	4035.6	6726.2	101	B, R13
77	75	11	15	2010	19	35	4043.9	6709.1	100	B, C14
										STA 76 R14 ONLY
78	77	11	15	2010	22	48	4056.3	6644.6	92	B
79	78	11	16	2010	0	4	4058.9	6656.7	71	B
80	79	11	16	2010	1	55	4101.3	6716.7	71	B

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		mm	did	yy	hr	min			m	B=bongo W=water C=CMarZ V=vertical cast(CTD only) R=rosette cast
81	80	11	16	2010	3	3	4106.2	6706.6	66	B
82	81	11	16	2010	3	52	4111.2	6708.6	62	B
83	82	11	16	2010	6	4	4128.6	6714.7	48	B
84	82	11	16	2010	6	14	4128.7	6714.7	47	W5
85	83	11	16	2010	9	37	4136.4	6636.4	81	B, C15
86	84	11	16	2010	10	37	4138.7	6626.9	81	B
87	85	11	16	2010	12	22	4138.9	6610.3	97	B, R15
88	86	11	16	2010	13	5	4138.8	6602.8	92	B casts 89 90 tests
91	87	11	16	2010	16	7	4141.2	6546.2	585	V
92	87	11	16	2010	16	29	4141	6546.6	600	B, R16
93	88	11	16	2010	20	0	4158.7	6554.4	130	B, R17
94	89	11	16	2010	22	50	4213.6	6545.9	224	B
95	89	11	16	2010	23	20	4213.2	6546.5	225	W6
96	90	11	17	2010	1	27	4231.2	6549	91	B
97	91	11	17	2010	3	20	4241.6	6535.6	92	B
98	91	11	17	2010	3	36	4241	6536.3	92	W no sample
99	92	11	17	2010	7	4	4256	6616.6	128	B
100	93	11	17	2010	9	59	4236.2	6638.8	185	B
101	94	11	17	2010	11	11	4231.8	6632.1	247	B, R18, R19
102	95	11	17	2010	14	43	4211.2	6644.7	207	B, C16
103	96	11	17	2010	17	19	4225.4	6659.3	363	B, R20
104	97	11	17	2010	19	47	4236.4	6706.8	295	B, R21
106	98	11	18	2010	0	10	4313.4	6709.3	209	B
107	99	11	18	2010	3	46	4343.5	6702.6	168	B
108	100	11	18	2010	4	59	4343.8	6652.4	156	B
109	101	11	18	2010	8	14	4403.9	6626.5	71	B
110	102	11	18	2010	19	9	4418.3	6742.6	86	B
111	103	11	18	2010	20	39	4406.3	6744.8	159	B
112	104	11	19	2010	2	16	4343.8	6845	97	B
113	105	11	19	2010	7	24	4324.1	6742.4	253	B
114	105	11	19	2010	7	48	4324.1	6743	254	W7
115	106	11	19	2010	10	23	4313.7	6808.8	205	B, C17
116	107	11	19	2010	12	1	4306.3	6820.7	212	B
117	108	11	19	2010	13	55	4256.1	6808.6	175	B
118	109	11	19	2010	16	0	4251.4	6746.6	213	B, R22
119	109	11	19	2010	17	20	4250.6	6745.7	193	B
120	110	11	19	2010	21	28	4233.8	6826.8	214	B

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CAST	STA.	Date(GMT)			TIME(GMT)		LAT	LONG	DEPTH	OPERATION
		mm	did	yy	hr	min			m	B=bongo W=water C=CMarZ V=vertical cast(CTD only) M=Meter Net
121	111	11	19	2010	22	41	4231.2	6834.7	207	B
122	112	11	20	2010	0	29	4218.8	6836.8	171	B, C18
123	113	11	20	2010	2	58	4231.1	6856.9	205	B
124	113	11	20	2010	3	27	4230.7	6858.3	212	W8
125	114	11	20	2010	7	13	4301	6920.8	194	B
126	115	11	20	2010	9	7	4246.2	6928.8	176	B, C19
127	116	11	20	2010	11	6	4230.1	6932	268	B
128	117	11	20	2010	13	0	4230	6939.9	258	B, R23
129	118	11	20	2010	15	21	4231.3	6958.6	160	B
130	119	11	20	2010	18	16	4245.9	7014.8	103	B
131	120	11	20	2010	19	25	4246.4	7025.3	90	B
132	121	11	20	2010	20	44	4254.7	7032.9	83	B, R24
133	122	11	20	2010	21	59	4256.3	7040.8	42	B
134	123	11	20	2010	23	22	4243.6	7042.9	28	B
135	124	11	21	2010	1	11	4236.4	7025.2	122	B
136	125	11	21	2010	2	19	4228.6	7028.9	87	B
137	126	11	21	2010	3	15	4225	7037	85	B
138	127	11	21	2010	5	11	4211.6	7025.4	66	B
139	128	11	21	2010	6	48	4215	7007.6	73	B
140	129	11	21	2010	8	52	4206.6	6945.5	208	B
141	130	11	21	2010	10	28	4206.3	6931	213	B, C20
143	131	11	21	2010	13	46	4206	6906.6	184	B, R25
144	132	11	21	2010	17	15	4143.7	6846.7	168	B, R26
145	133	11	21	2010	20	14	4131.3	6824.9	45	B, R27
146	134	11	21	2010	21	54	4118.7	6824.7	58	B, C21
147	135	11	30	2010	0	55	4124.9	6926.8	42	B
148	135	11	30	2010	1	9	4124.7	6926.5	39	M
149	136	11	30	2010	4	32	4104.5	6850.3	70	B
150	136	11	30	2010	4	46	4104.3	6850	68	M
151	137	11	30	2010	6	12	4109.8	6842.7	67	B
152	137	11	30	2010	6	22	4110.2	6842.4	67	M
153	138	11	30	2010	10	3	4108.6	6755.4	47	B
154	138	11	30	2010	10	15	4108.7	6755.3	47	M
155	139	11	30	2010	11	32	4108.2	6739.2	52	B
156	139	11	30	2010	11	40	4108.3	6738.7	53	M
157	140	11	30	2010	15	44	4140.1	6720.1	49	B
158	140	11	30	2010	15	52	4140.2	6720.3	49	M
159	141	11	30	2010	16	44	4145.1	6725.4	40	B
160	141	11	30	2010	16	53	4145.2	6725.5	44	M

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CAST	STA.	Date(GMT)			TIME(GMT)		LAT	LONG	DEPTH	OPERATION
		mm	did	yy	hr	min			m	B5=505bongo W=water C=CMarZ V=vertical cast(CTD only) R=rosette cast
161	142	11	30	2010	18	14	4157.9	6728.7	44	B
162	142	11	30	2010	18	23	4158.4	6729	45	M
163	143	11	30	2010	20	55	4151.6	6758.2	65	B
164	143	11	30	2010	21	4	4151.6	6758.2	65	M
165	144	12	1	2010	1	5	4129.9	6836.9	108	B5
166	144	12	1	2010	1	21	4129.7	6836.1	103	M
167	144	12	1	2010	1	38	4129.6	6835.3	100	W9
168	145	12	1	2010	8	10	4207.1	6945.5	208	B5
170	145	12	1	2010	9	32	4206.4	6945.6	209	M cast 169 failed
171	146	12	1	2010	12	26	4230.5	6932.3	274	B5
172	146	12	1	2010	13	4	4230.7	6931.5	273	M
173	146	12	1	2010	13	33	4230.9	6930.3	276	W10
174	147	12	1	2010	17	37	4246.4	7015.3	47	B5
175	147	12	1	2010	17	46	4246.4	7014.9	52	M lost sample
176	147	12	1	2010	17	57	4246.4	7014.5	36	M
177	148	12	1	2010	19	37	4301.6	7015.5	146	B5
178	148	12	1	2010	20	1	4301.9	7014.4	163	M
179	149	12	1	2010	22	14	4315.1	7028.4	40	B5
180	149	12	1	2010	22	24	4315.1	7027.9	34	M
181	150	12	1	2010	23	16	4315.5	7033.2	29	B5
182	150	12	1	2010	23	26	4315.5	7032.7	36	M
183	151	12	2	2010	11	27	4246.6	7024.5	97	B5
184	151	12	2	2010	11	48	4246	7025	93	M
185	152	12	2	2010	13	6	4236.5	7024.4	124	B5
186	152	12	2	2010	13	24	4236	7025.1	96	M
187	153	12	2	2010	15	58	4231.6	7027.4	100	B5
188	153	12	2	2010	16	15	4231.2	7027	96	M
189	154	12	2	2010	17	20	4227.1	7019.6	67	B5
190	154	12	2	2010	17	31	4226.7	7019.8	65	M
191	155	12	2	2010	19	33	4215.4	7039.4	28	B5
192	155	12	2	2010	19	42	4215.1	7039.6	29	M
193	156	12	2	2010	20	53	4206.5	7032.4	33	B5
194	156	12	2	2010	21	3	4206.4	7032.8	35	M
195	157	12	2	2010	22	16	4212.4	7024.6	65	B5
196	157	12	2	2010	22	26	4212.1	7024.9	65	M
197	158	12	3	2010	0	10	4215.2	7007.1	82	B5
198	158	12	3	2010	0	22	4215	7007.6	75	M
199	159	12	3	2010	4	6	4139.9	6947	40	B5
200	159	12	3	2010	4	15	4139.9	6947.4	38	M

Table 1. STATION OPERATION REPORT FOR CRUISE DE1012

CAST	STA.	Date(GMT)			TIME(GMT)		LAT	LONG	DEPTH	OPERATION
		mm	did	yy	hr	min			m	B=bongo W=water C=CMarZ V=vertical cast(CTD only) M=rmeter net
201	160	12	3	2010	11	38	4040.6	6919.5	54	B5
202	160	12	3	2010	11	48	4040.7	6919.7	50	M
203	160	12	3	2010	11	59	4040.7	6919.8	52	W11
204	161	12	3	2010	15	8	4104.1	6933.9	33	B5
205	161	12	3	2010	15	16	4104.1	6934.4	37	M
206	162	12	3	2010	17	38	4040.2	6934.8	49	B5
207	162	12	3	2010	17	47	4039.9	6935.5	50	M
208	163	12	3	2010	20	19	4044.4	6910.4	72	B5
209	163	12	3	2010	20	39	4044.8	6910.3	75	M
210	164	12	3	2010	22	18	4050.3	6854.9	70	B5
211	164	12	3	2010	22	29	4050.3	6855.4	69	M
212	165	12	4	2010	0	0	4040.2	6850.1	65	B5
213	165	12	4	2010	0	12	4040.2	6850.5	65	M
214	166	12	4	2010	2	15	4034.9	6830	74	B5
215	166	12	4	2010	2	26	4034.8	6830.4	73	M
216	167	12	4	2010	3	1	4034.9	6835.3	69	B5
217	167	12	4	2010	3	13	4034.9	6835.6	68	M
218	168	12	4	2010	6	26	4010.1	6859.2	140	B5
219	168	12	4	2010	6	46	4009.6	6900	140	M
220	169	12	4	2010	10	51	4024.5	6939.1	70	B5
221	169	12	4	2010	11	0	4024.6	6939.5	70	M
222	169	12	4	2010	11	14	4024.7	6940	70	M
223	169	12	4	2010	11	23	4024.8	6940.1	70	W12
224	170	12	4	2010	12	9	4020.4	6944.3	76	B5
225	170	12	4	2010	12	22	4020.3	6944.7	76	M
226	171	12	4	2010	15	57	4005.3	7019.1	146	B5
227	171	12	4	2010	16	16	4004.9	7019.9	157	M
228	172	12	4	2010	20	17	4034.6	7034.4	66	B5
229	172	12	4	2010	20	25	4034.6	7034.8	66	M
230	172	12	4	2010	20	35	4034.6	7035.1	67	W13
231	173	12	4	2010	22	17	4045	7034.3	58	B5
232	173	12	4	2010	22	27	4044.9	7034.6	58	M
233	174	12	4	2010	23	56	4055.4	7024.5	45	B5
234	174	12	5	2010	0	6	4055.4	7024.8	46	M
235	175	12	5	2010	1	17	4059.9	7035	49	B5
236	175	12	5	2010	1	26	4100	7035.1	48	M

TOTALS:

ECOMON Bongo 6B3Z Samples	= 133
ECOMON Bongo 6B3I Samples	= 133
NON-ECOMON Bongo 6B5I Samples	= 35
NON-ECOMON Bongo 6B3Z Samples	= 35
Bongo 2B1 CMarZ Samples	= 21
CTD 19 Water Samples	= 13
Vertical CTD 19 Casts	= 1
CTD 19 Casts	= 236
CTD 911 Rosette Casts	= 27
Meter Net Samples	= 41

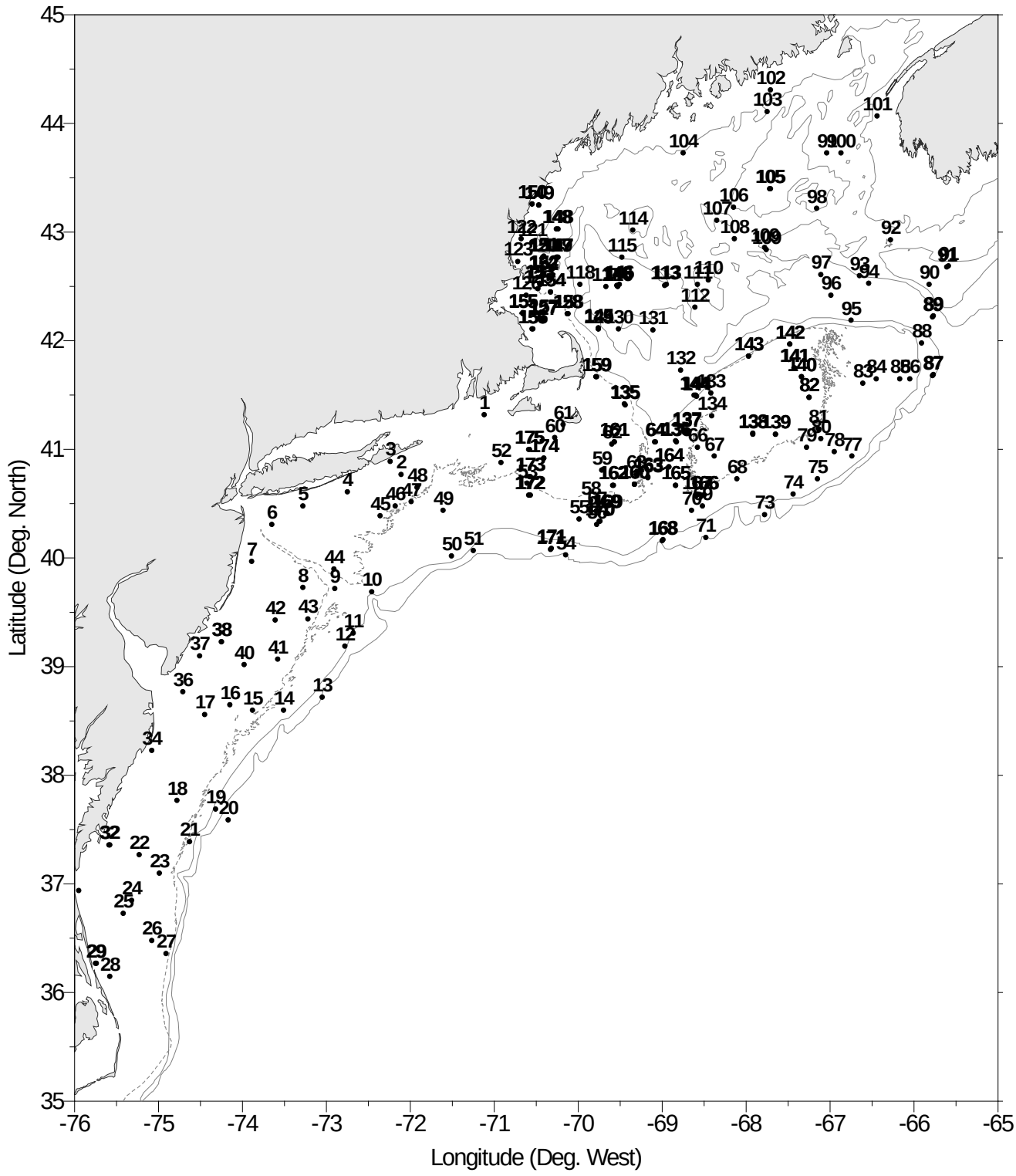

Figure 1. Station locations numbered consecutively for Ecosystems Monitoring Survey Cruise DE 10-12, 5 November – 5 December 2010.

Figure 2. 20 cm + 61 cm bongo sampling array used for collecting CMarZ samples simultaneously with Ecosystem Monitoring samples.

Figure 3. Container laboratory mounted on aft deck of the Delaware II.

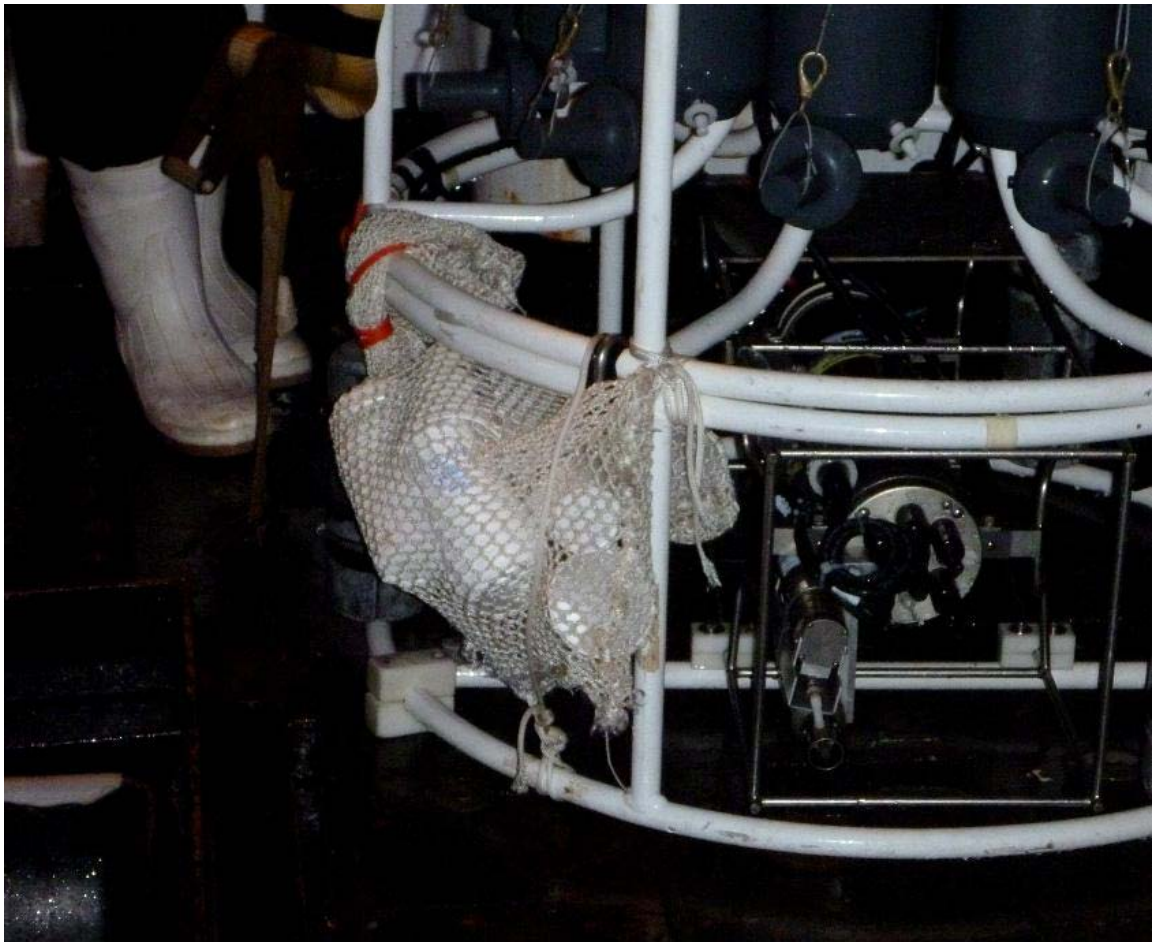

Figure 4. Styrofoam cups in mesh bag attached to rosette.

Figure 5. Depth-compressed styrofoam cups decorated by students from the Lisbon Community School, Lisbon Maine.

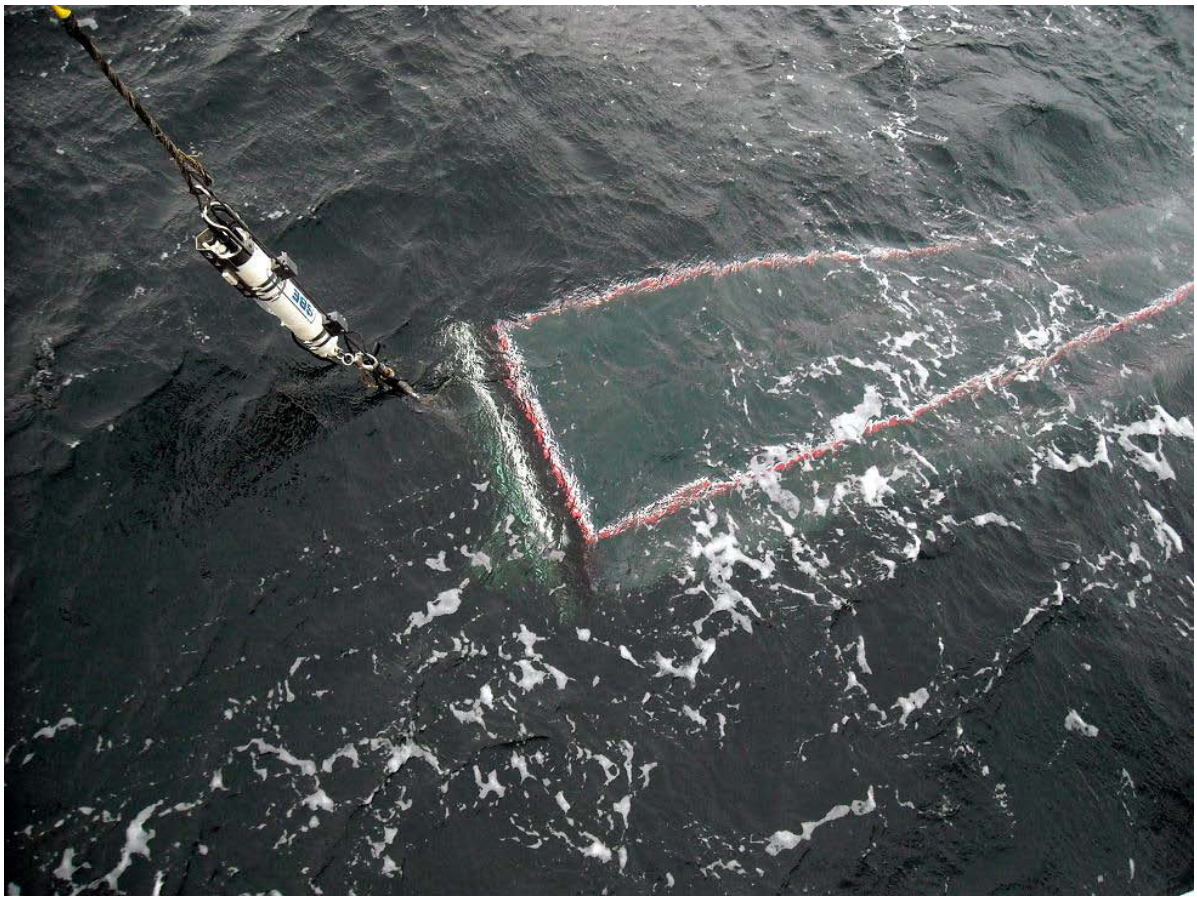

Figure 6. Meter net approaching the surface after completing double-oblique tow.

Figure 7. Juvenile hake captured in the western Gulf of Maine.

Figure 8. Fish eggs from the western Gulf of Maine.

Figure 9. Tamara Holzwarth-Davis filtering seawater for an EPA and URI Graduate School of Oceanography mapping study of nitrogen stable isotope ratios.