CRUISE RESULTS
NOAA Fisheries Research Vessel Delaware II
Cruise No. DE 11-02
Ecosystems Monitoring Survey, and Fish Egg, Larvae and Juvenile Survey

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DATE: March 29, 2011

15 March 2011

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CRUISE PERIOD AND AREA

The cruise period was from 1 to 18 February 2011. The cruise was originally due to sail on 31 January but was delayed one day to replace an injured crewman. The cruise was done all in one leg and covered the entire survey area from Cape Hatteras to Georges Bank and the Gulf of Maine including the Bay of Fundy. Thanks to generally good weather conditions and a lack of any vessel problems the *Delaware II* completed all the designated ecosystem monitoring stations and was able to sample at sixteen additional stations in the western Gulf of Maine for fish eggs, larvae and juveniles, within the time allotted.

OBJECTIVES

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. Near the end of the cruise additional stations were sampled to look for fish eggs, larvae and juveniles.

Secondary objectives of this cruise included:

- Deployment of a Laser In-Situ Scattering and Transmissometry (LISST) instrument for measuring the size spectrum of suspended particles (i.e. plankton) in the water column.
- 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 observers Marie Martin and Megan Oberg, 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.
- Filtering seawater at selected stations for nitrogen isotope mapping study with researcher Autumn Oczkowski from EPA.
- Collection of *Calanus finmarchicus* copepods for stress analysis by Elaine Calderone and Christopher Taylor at the Narragansett Lab.
- Collection of *Pseudocalanus minutes* copepods for a URI GSO student research project with Professor Ted Durbin.

METHODS

The survey consisted of a total of 139 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. Sixteen additional stations were added in the western Gulf of Maine area to locate concentrations of fish eggs, larvae and juveniles.

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). This small bongo frame was also used at another eight stations spread between Southern New England, Georges Bank and the Gulf of Maine to capture samples of *Pseudocalanus minutus* for Ted Durbin at URI/GSO. A bell-shaped 45-kg lead weight was attached by a 35-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 and 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 for a microscope plus a copepod preservation area and three Dewar's flasks for liquid nitrogen freezing of some of the samples.

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.

A Niskin bottle rosette equipped with a Seabird 911 CTD unit, fluorometer, oxygen and PAR sensors and ten 10-liter Niskin bottles was brought along to capture hydrographic, chlorophyll, light and oxygen data from the water column., along with nutrient samples from several water column depths.

Initially a Laser In-Situ Scattering and Transmissometry (LISST) unit was attached to the rosette (Figure 3) for providing suspended particle size spectrum data, but this was removed and attached directly to the tow wire alongside the Seabird 19+ CTD unit about halfway through the cruise when it became apparent that rosette casts (Figure 4), were too difficult given the prevalent sea conditions. The combination of the LISST and CTD units above the bongo frame (Figure 5) did not appear to affect tow performance.

Census of Marine Zooplankton (CmarZ) samples were collected using the 20-cm diameter bongos described above at 5 randomly designated stations in each of three regions sampled: Mid-Atlantic Bight, Southern New England and Georges Bank. Six Census of Marine Zooplankton samples were collected in the Gulf of Maine for a total of 21 CMarZ samples altogether.

An additional fifteen 20-cm bongo tows were made by Chris Taylor to secure quantities of *Calanus finmarchicus* from the Georges Bank and Gulf of Maine areas (Figure 6). Some of these were flash-frozen in liquid nitrogen, while others were preserved in 90% ethanol.

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 in the ship's scientific freezer (Figure 7).

The sampling protocol was changed slightly on the last nineteen stations of the cruise done in the western Gulf of Maine. These were fish egg and larvae exploration stations, and a second tow was done at each of these stations using a bongo frame equipped with a 335 micron mesh net on one side and a 505 micron mesh net on the other side, for comparison with tows done on MARMAP-era surveys with a similar 335 and 505 micron mesh net arrangement. Other than this net change all other parameters of the last nineteen sampling tows were kept the same.

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 on a snowy Tuesday, February1, shortly before noon, after the arrival of a new crewmember. The vessel headed south sampling at inshore stations along the Southern New England area due to the large seas offshore and reached the southernmost station by Friday, 4 February. Sea conditions had improved by that time and the vessel had no trouble sampling at the offshore stations as it looped back north until a squall on Sunday 6 Feb forced the dropping of two stations due to very large seas at 70 nautical miles off the coast of New Jersey. This storm passed quickly and the vessel continued working northeast towards Hydrographer Canyon. While on this line of stations some herring and sand lance larvae were found south of Long Island, and pollock larvae (Figure 8) and a juvenile windowpane flounder ((Figure 9) were caught south of Martha's Vineyard. The forecast of another large storm led to a change in course, northwest towards Cape Cod, where after sampling at several more stations the Delaware II anchored at 1500 EST on Tuesday 8 February, in the Provincetown anchorage area. While at anchor Jon Hare and the other scientists

took the LISST unit off the rosette and clamped it directly onto the tow wire, adjacent to the Seabird 19+ unit in an attempt to get more deployments with it. Sea conditions to that point had been such that after a week at sea there had only been one deployment of the rosette. Less than 24 hours later the vessel left the anchorage and returned to work off of Boston harbor, and then proceeded offshore, sampling its way across the Gulf of Maine, including Wilkinson Basin, towards Georges Bank as sea conditions improved. Modest amounts of Calanus finmarchicus were caught at several stations, and moderate numbers of euphausiids during night tows. A few *Pleurobranchia* comb jellies were caught, but almost no fish larvae. The LISST unit was used on all of these tows, and all subsequent tows, and worked well with no apparent effect on the bongo operations, even in moderately rough seas. Data was downloaded every 12 hours from the unit, since it was used in a data archive mode. Plankton catches on Georges Bank were light, with very few fish eggs or larvae, and moderate amounts of *Phaeocystis* except on the northeast peak where there was none. Every station on Georges Bank was completed by Saturday, 12 February, after which the vessel commenced work in the Gulf of Maine, starting at the Northeast Channel and working its way eastward in a counter clockwise loop for the remainder of the allotted cruise time. Weather near the Bay of Fundy on Tuesday, 15 February, was problematic with strong winds and low temperatures which caused icing of the vessel, necessitating removal by the deck crew, (Figure 10), but fortunately temperatures came up and winds dropped down after a couple of days, so sampling was continued without interruption. The Georges Basin sample had large shrimp, but no fish eggs or larvae.

On Wednesday, 16 February, the western Gulf of Maine exploratory fish larvae and egg area with sixteen supplemental and three random Ecomon stations was reached. At this point in the cruise a second plankton tow was made at each of these stations using a separate bongo frame equipped with 335 and 505 micron mesh nets. The LISST unit was removed from the wire for each of these redundant second tows to observe if any differences could be noted in the sampling performance with it on or off the wire. None were apparent from a shipboard perspective.

The Delaware II docked in Woods Hole on late Friday morning 18 February 2011, marking the end of the 2011 Winter Ecosystem Monitoring Survey. All scientists debarked at this time, and all equipment and samples were removed in anticipation of dockside maintenance to be performed on the vessel the following week.

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

National Marine Fisheries Service, NEFSC, Narragansett, RI

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Table 1. STATION OPERATION REPORT FOR CRUISE DE1102

CAST	STA.	Date(GMT)			TIME(GMT)		LAT	LONG	DEPTH	OPERATION B=bongo W=water Z=CMarZ N=Nitrogen D=Durbin sample
		mm	did	yy	hr	min			m	
1	1	2	1	2007	18	15	4124.1	7109.1	23	B, N
2	2	2	1	2007	19	25	4116.4	7118.9	38	B, N
3	3	2	1	2007	21	18	4103.8	7114.8	39	B, Z1, N
4	4	2	1	2007	22	48	4101.3	7130.9	49	B
5	5	2	2	2007	0	42	4046.2	7128.9	63	B
6	6	2	2	2007	2	46	4038.6	7112.6	65	B
7	7	2	2	2007	5	34	4041.1	7146.7	58	B
8	8	2	2	2007	6	58	4033.8	7158.8	61	B
9	9	2	2	2007	9	7	4032.1	7224.9	48	B
10	10	2	2	2007	11	4	4021.1	7234.9	51	B
11	11	2	2	2007	14	12	4016.2	7312.8	40	B, Z2
12	12	2	2	2007	16	34	4008.4	7313.9	43	B
13	12	2	2	2007	16	46	4008.3	7313.9	43	W1
14	13	2	2	2007	17	56	3959.3	7312.6	58	B
15	14	2	2	2007	22	16	3948.6	7400.6	22	B
16	14	2	2	2007	22	24	3948.5	7400.8	22	W2
17	15	2	3	2007	0	47	3941.2	7334.5	38	B
18	16	2	3	2007	3	22	3918.4	7330.8	48	B
19	17	2	3	2007	5	34	3921.2	7346.3	38	B, N
20	18	2	3	2007	8	21	3911.4	7414.5	20	B
21	19	2	3	2007	9	40	3908.7	7428.8	17	B
22	20	2	3	2007	10	46	3901.2	7424.6	28	B
23	21	2	3	2007	11	57	3853.7	7432.8	26	B, Z3
24	22	2	3	2007	14	37	3828.8	7422.5	46	B, N
25	23	2	3	2007	16	57	3806.6	7426.6	44	B, Z4
26	24	2	3	2007	21	29	3743.7	7516.9	24	B, N
27	25	2	3	2007	22	36	3733.6	7514.6	28	B
28	25	2	3	2007	22	43	3733.6	7514.9	28	W3
29	26	2	4	2007	1	22	3713.9	7536.8	21	B, Z5
30	27	2	4	2007	3	43	3656.3	7522.9	29	B
31	27	2	4	2007	3	54	3656.6	7522.9	31	W4
32	28	2	4	2007	6	15	3648.7	7548.7	17	B, N
33	29	2	4	2007	8	31	3628.9	7540.6	23	B
34	30	2	4	2007	12	33	3623.9	7520.8	33	B, Z6
35	31	2	4	2007	15	40	3556.6	7534.5	20	B

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36	32	2	4	2007	19	4	3534	7503.3	42	B, N
--	33	2	4	2007	21	23	3548.5	7453.5	85	L1,Rosette+Nutrients
37	34	2	4	2007	23	51	3604.4	7442.2	346	B, Z7, N
38	35	2	5	2007	5	18	3651.2	7443	85	B, N
39	35	2	5	2007	5	30	3651.4	7443	85	W5
40	36	2	5	2007	8	38	3716.2	7502.9	37	B
41	37	2	5	2007	10	35	3733.8	7454.5	33	B, N
42	38	2	5	2007	11	53	3743.7	7446.8	45	B
43	39	2	5	2007	17	23	3809	7348.6	120	B
44	39	2	5	2007	17	40	3809.3	7348.2	119	W6
45	40	2	5	2007	18	44	3816.1	7341	133	B, N
46	41	2	5	2007	23	1	3856.5	7344.6	49	B
47	41	2	5	2007	23	11	3856.4	7344.5	49	W7
48	42	2	6	2007	2	42	3850.9	7302.8	93	B
49	43	2	6	2007	12	41	3948.9	7234.5	60	B
50	44	2	6	2007	14	44	4001.2	7240.7	60	B
51	45	2	6	2007	17	20	4011.1	7210.8	70	B
52	46	2	6	2007	20	26	3946.3	7151.1	235	B, Z8, N
53	46	2	6	2007	20	56	3945.9	7152	226	B
54	46	2	6	2007	21	11	3945.9	7152	225	W8
55	47	2	7	2007	2	34	4006.3	7051	145	B
56	48	2	7	2007	4	45	4023.6	7042.7	90	B, Z9
57	49	2	7	2007	10	1	4111	7029	37	B
58	50	2	7	2007	14	12	4043.8	6955.1	43	B, Z10
59	51	2	7	2007	16	25	4031.2	7016.5	65	B
60	52	2	7	2007	18	25	4016.4	7000.9	92	B, N
61	53	2	7	2007	22	11	4018.7	6913.8	9999	B
62	54	2	8	2007	0	3	4009	6849.6	165	B, N
63	55	2	8	2007	3	0	4029.2	6846.8	76	B, T1
64	56	2	8	2007	5	59	4041.5	6918.8	57	B
65	57	2	8	2007	7	3	4046.2	6907.1	74	B, Z11
66	57	2	8	2007	7	15	4046.4	6906.9	73	W9
67	58	2	8	2007	8	11	4056.1	6906.8	76	B, D1
68	59	2	8	2007	13	54	4133.9	6948.9	22	B
69	60	2	8	2007	14	48	4141.1	6948.9	36	B
70	61	2	9	2007	20	29	4224.4	7052.4	31	B, L2, N

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71	62	2	9	2007	21	52	4224.9	7036.8	86	B, L3, N
72	63	2	9	2007	0	9	4236.2	7018.6	80	B, L4
73	64	2	10	2007	0	9	4229.5	6940.5	261	B, L5, T2
74	64	2	10	2007	4	1	4229.5	6940.5	261	W10, L6
75	65	2	10	2007	7	51	4204	6913	199	B, L7
76	66	2	10	2007	10	40	4203.6	6842.8	164	B, L8
77	67	2	10	2007	12	22	4155	6833	173	B, L9
78	68	2	10	2007	14	17	4155	6833	94	B, L10
79	69	2	10	2007	15	14	4141.4	6815	22	B, D2, L11, T3
80	70	2	10	2007	15	47	4141.3	6820.6	58	B, L112
81	71	2	10	2007	16	54	4134.1	6826.8	68	B, Z12, L13
82	72	2	10	2007	19	59	4121.3	6858.3	148	B, Z13, L14
83	73	2	10	2007	23	58	4103.7	6818.9	42	B, Z14, L15
84	74	2	11	2007	1	19	4056.2	6806.8	45	B, L16
85	75	2	11	2007	2	48	4048.7	6820.8	55	B, L17
86	76	2	11	2007	5	0	4034	6805.1	100	B, D3, L18, T4
87	77	2	11	2007	7	37	4048.9	6743.1	70	B, L19
88	78	2	11	2007	10	4	4026.3	6736.8	152	B, L20
89	79	2	11	2007	11	17	4026.2	6727.7	198	B, L21, N
90	80	2	11	2007	13	43	4041.5	6716.6	97	B, L22
91	81	2	11	2007	14	29	4043.7	6718.7	98	B, L23
92	82	2	11	2007	15	23	4048.8	6716.8	94	B, Z15, L24
93	82	2	11	2007	15	39	4048.2	6717.1	95	W11, L25
94	83	2	11	2007	19	26	4111.3	6641.1	80	B, D4, L26, T5
95	84	2	11	2007	22	21	4121	6704.4	63	B, L27
96	85	2	11	2007	23	12	4126.1	6706.7	58	B, L28
97	86	2	12	2007	0	39	4133.6	6714.7	47	B, L29
98	87	2	12	2007	3	32	4123.7	6744.5	42	B, L30
99	87	2	12	2007	3	42	4123.4	6744.7	41	W12, L31
100	88	2	12	2007	4	26	4128.7	6744.9	36	B, L32
101	89	2	12	2007	5	23	4128.6	6754.9	40	B, L33, T6
102	90	2	12	2007	8	26	4156	6742.8	43	B, L34, N
103	91	2	12	2007	12	3	4211.1	6702.6	143	B, L35
104	92	2	12	2007	14	15	4203.7	6636.8	78	B, Z16, L36
105	93	2	12	2007	15	52	4151.3	6624.8	83	B, L37

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CAST	STA.	Date(GMT) mm	did	TIME(GMT) yy	hr	min	LAT	LONG	DEPTH m	OPERATION N=Nitrogen B=bongo W=water Z=CMarZ V=Vertical cast D=Durbin sample
106	94	2	12	2007	16	26	4148.8	6620.1	83	B, L38
107	95	2	12	2007	17	32	4143.8	6630.5	74	B, L39
108	95	2	12	2007	17	45	4144.1	6630.3	75	W13, L40
109	96	2	12	2007	19	19	4136.4	6616.9	90	B, L41
110	97	2	12	2007	21	28	4123.9	6600.7	284	B, L42, N
111	97	2	12	2007	22	24	4124.4	6600.8	266	V1, L43
112	98	2	12	2007	23	40	4133.6	6600.7	119	B, L44, T7
113	99	2	13	2007	4	42	4213.6	6545.6	229	B, L45
114	100	2	13	2007	7	18	4223.6	6604.6	258	B, L46
115	100	2	13	2007	7	51	4223.9	6606.4	257	V2, L47
116	101	2	13	2007	13	9	4225	6659.3	366	B, L48
117	101	2	13	2007	13	45	4224.3	6700.6	366	W14
118	102	2	13	2007	15	0	4231.5	6654.3	290	B, L49
119	102	2	13	2007	15	28	4231.5	6655.3	291	V3, L50
120	103	2	13	2007	17	2	4241	6704.8	267	B, Z17, L51
121	103	2	13	2007	17	30	4240.2	6705.5	273	V4, L52
122	104	2	13	2007	22	18	4226.4	6750	201	B, L53, T8
123	105	2	14	2007	2	22	4233.7	6828.5	217	B, L54
124	106	2	14	2007	7	22	4251.1	6733.2	170	B, L55
125	107	2	14	2007	11	7	4318.5	6740.8	250	B, L56
126	107	2	14	2007	11	46	4318	6741.2	250	V5, L57
127	108	2	14	2007	14	31	4321.6	6812.9	196	B, Z18, L58
128	109	2	14	2007	17	13	4323.5	6741.2	250	B, L59, N
129	109	2	14	2007	17	38	4323.5	6741.2	246	W15, L60
130	110	2	14	2007	19	39	4341.1	6738.7	238	B, Z19, L61
131	110	2	14	2007	20	6	4340.6	6738.3	238	V6, L62
132	111	2	14	2007	21	17	4348.7	6742.8	227	B, L63, T9
133	111	2	14	2007	21	46	4348	6742.8	230	V7, L64
134	112	2	15	2007	0	6	4401.3	6720.8	174	B, L65
135	113	2	15	2007	1	56	4406.5	6705	139	B, L66
136	113	2	15	2007	2	17	4405.7	6705.1	148	W no sample, L67
137	113	2	15	2007	2	23	4405.7	6705.1	147	W16, L68
138	114	2	15	2007	4	42	4413.7	6640.2	189	B, L69
139	115	2	15	2007	8	58	4426.1	6728.8	100	B, L70
140	116	2	15	2007	14	5	4353.3	6816.9	150	B, L71

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CAST	STA.	Date(GMT) mm	did	TIME(GMT) yy	hr	min	LAT	LONG	DEPTH m	OPERATION B=bongo W=water Z=CMarZ L=LISST N=Nitrogen NEB-NonEco Bongo D=Durbin sample
141	117	2	15	2007	14	52	4351.1	6820.8	118	B, L72
142	118	2	15	2007	19	21	4343.6	6906.5	91	B, N
143	119	2	15	2007	22	12	4326.4	6930.5	167	B
144	120	2	15	2007	23	56	4316.3	6920.8	165	B
145	121	2	16	2007	4	10	4314.8	7012.2	113	B, L73
146	121	2	16	2007	4	39	4314.8	7012.1	114	NEB
147	122	2	16	2007	7	3	4305	7037.5	18	B, L74
148	122	2	16	2007	7	12	4304.8	7037.6	16	NEB
149	123	2	16	2007	7	56	4304.7	7032.4	51	B, L75
150	123	2	16	2007	8	5	4304.8	7032.8	52	NEB, D5, T10
151	124	2	16	2007	11	17	4258.9	6952.7	225	B, Z20, L76
152	124	2	16	2007	11	46	4259.2	6953.7	231	NEB
153	124	2	16	2007	12	17	4258.8	6953.7	233	W17
154	125	2	16	2007	13	38	4256.4	6939	172	B, L77
155	125	2	16	2007	14	3	4256	6938.2	155	NEB, T11
156	125	2	16	2007	14	32	4255.5	6938.9	151	W18
157	126	2	16	2007	16	39	4241.4	6958.9	174	B, Z21, L78
158	126	2	16	2007	17	8	4241.3	6958.7	173	NEB
159	126	2	16	2007	17	30	4240.9	6958.2	171	W19
160	127	2	16	2007	19	41	4252.3	7005.4	114	B, L79
161	127	2	16	2007	19	56	4252	7004.9	126	NEB
162	128	2	16	2007	20	56	4246.6	7009.9	71	B, L80
163	128	2	16	2007	21	6	4246.4	7009.9	74	NEB
164	128	2	16	2007	21	15	4246.2	7009.8	80	W20
165	129	2	16	2007	22	19	4241.6	7019.9	93	B, L81
166	129	2	16	2007	22	31	4241.3	7019.8	95	NEB
167	130	2	16	2007	23	11	4236.8	7020.1	87	B, L82
168	130	2	16	2007	23	23	4236.5	7020.0	86	NEB, D6, T12
169	131	2	17	2007	1	46	4230.5	7047.1	32	B, L83
170	131	2	17	2007	1	53	4230.3	7047.1	31	NEB, D7, T13
171	131	2	17	2007	1	59	4230.2	7047.1	32	W21
172	132	2	17	2007	3	57	4216.2	7032	69	B, L84
173	132	2	17	2007	4	7	4215.9	7032	68	NEB
174	132	2	17	2007	4	15	4215.7	7032.1	67	W22
175	133	2	17	2007	5	20	4207	7027.3	58	B, L85

Table 1. STATION OPERATION REPORT FOR CRUISE DE1102

CAST	STA.	Date(GMT) mm	did	TIME(GMT) yy	hr	min	LAT	LONG	DEPTH m	OPERATION L=LISST B=bongo W=water Z=CMarZ NEB=NonEcoBongo D=Durbin sample
176	133	2	17	2007	5	29	4206.7	7027.3	58	NEB
177	133	2	17	2007	5	38	4206.4	7027.3	56	W23
178	134	2	17	2007	7	18	4151.7	7027.3	27	B, L86
179	134	2	17	2007	7	28	4151.4	7027.3	26	NEB
180	134	2	17	2007	7	36	4151.1	7027.2	26	W24
181	135	2	17	2007	10	19	4211.9	7009.8	40	B, L87
182	135	2	17	2007	10	28	4211.6	7010.1	40	NEB
183	135	2	17	2007	10	38	4211.3	7010.4	40	W no sample
184	136	2	17	2007	11	33	4217	7005	92	B, L88
185	136	2	17	2007	11	45	4216.7	7005.3	92	NEB
186	136	2	17	2007	11	57	4216.4	7005.5	92	W25
187	137	2	17	2007	12	35	4217.1	7000	195	B, L89
188	137	2	17	2007	12	57	4216.5	7000.4	193	NEB
189	137	2	17	2007	13	18	4216	7000.7	184	W26
190	138	2	17	2007	20	32	4124.9	6917.8	103	B, L78
191	138	2	17	2007	20	51	4124.3	6917.4	96	NEB, D8, T14
192	138	2	17	2007	21	11	4124.3	6917.4	97	W27
193	139	2	17	2007	0	32	4105.5	6847.1	67	B, L79
194	139	2	17	2007	0	40	4105.6	6847.2	69	NEB, T15
195	139	2	17	2007	0	48	4105.7	6847.3	69	W28

TOTALS:

ECOMON Bongo 6B3Z Samples = 137
ECOMON Bongo 6B3I Samples = 138
NON-ECOMON Bongo 6B5I Samples = 19
NON-ECOMON Bongo 6B3Z Samples = 19
Bongo 2B1 CMarZ Samples = 21
Bongo 2B1 Durbin Samples = 8
Bongo 2B1 Taylor Samples = 15
LISST Casts = 89
CTD 19 Water Samples = 28
Vertical CTD 19 Casts = 7
CTD 19 Casts = 195
CTD 911 Rosette Casts = 1
Nutrient Samples (from 1 sta) = 9
Nitrogen Isotope Samples = 25 (includes 2 samples not listed in table, OFFSTA 1 & OFFSTA 2)

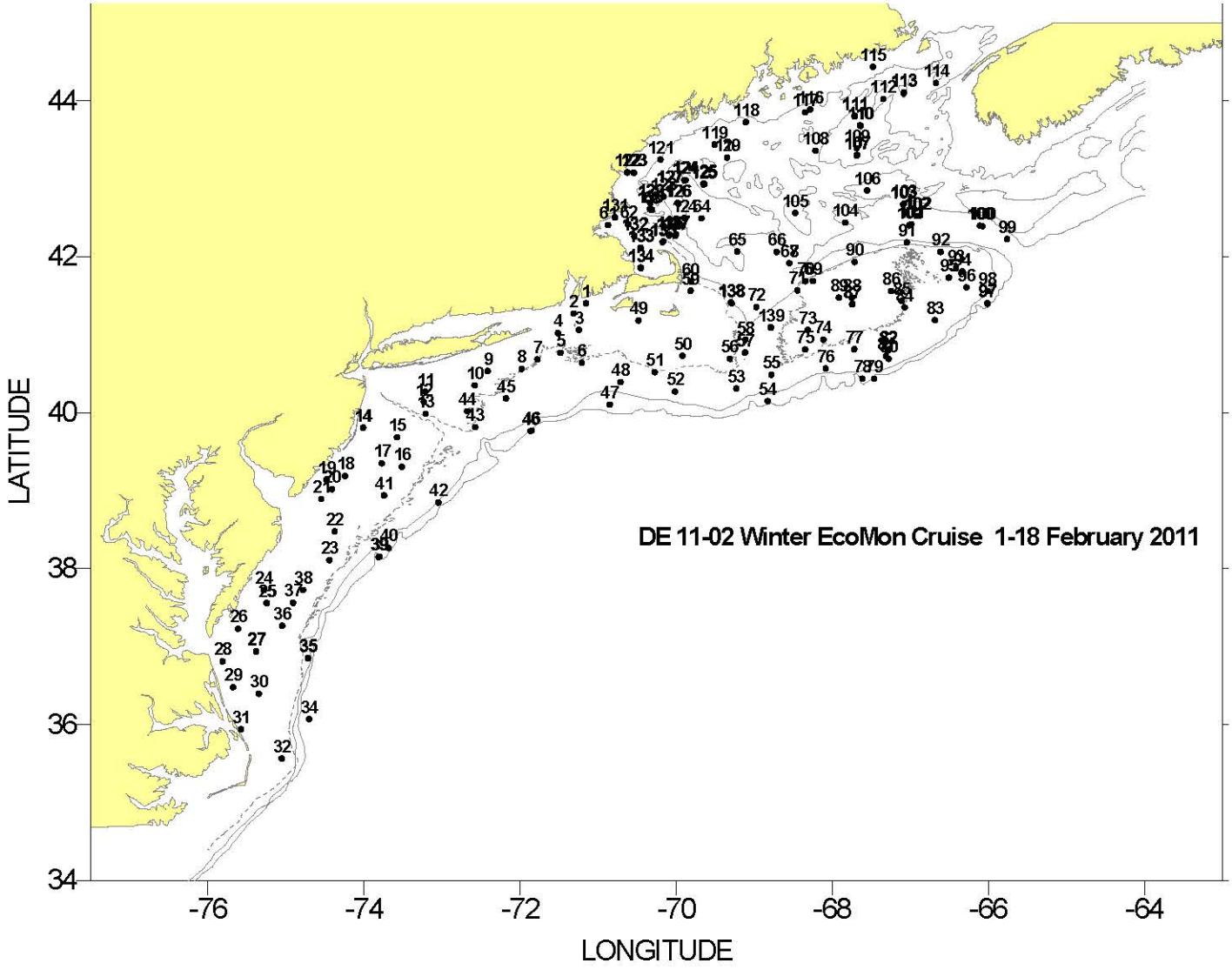

Figure 1. Station locations numbered consecutively for Ecosystems Monitoring Survey Cruise DE 11-02, 1 - 18 February 2011.

Figure 2. 20 cm + 61 cm bongo sampling array used for collecting CMarZ samples simultaneously with Ecosystem Monitoring samples on DE 11-02 Winter EcoMon cruise.

Figure 3. LISST (black cylinder) mounted on lower part of rosette frame.

Figure 4. LISST clamped to tow cable, adjacent to Seabird CTD 19+.

Figure 5. LISST + Seabird 19+ mounted on tow wire above bongo frame.

Figure 6. Chris Taylor picking *Calanus finmarchicus* from 20 cm bongo samples.

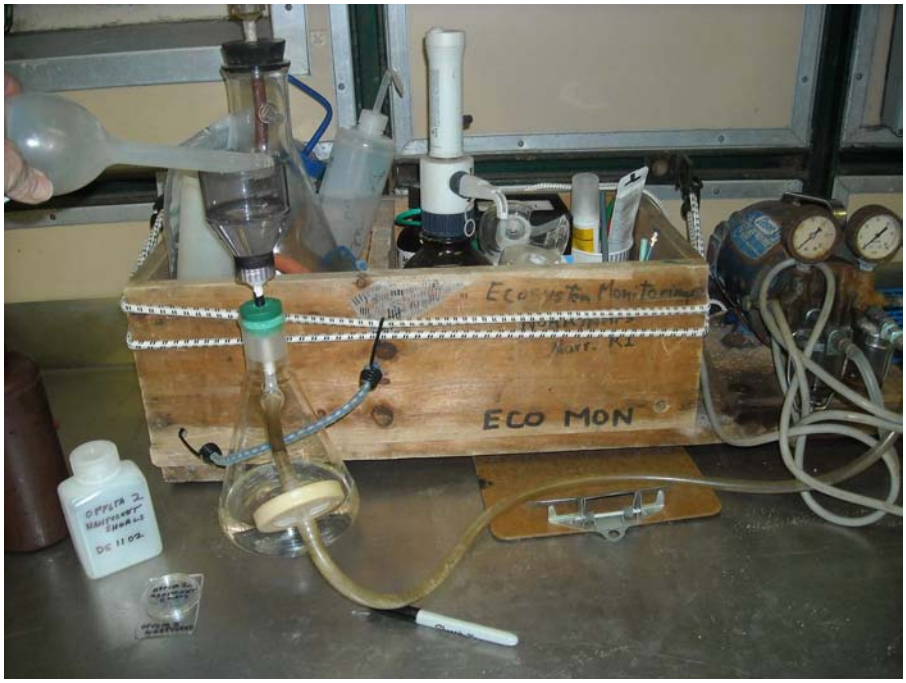

Figure 7. Filtering apparatus for nitrogen isotope and chlorophyll extraction.

Figure 8. Pollock larva captured at a station just south of Martha's Vineyard, MA.

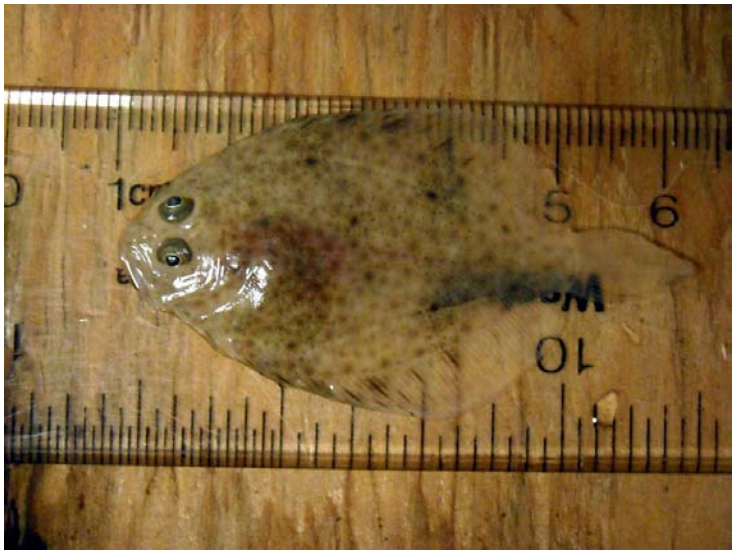

Figure 9. Windowpane flounder juvenile from a station just south of Martha's Vineyard, MA.