

14 July 2005

CRUISE RESULTS
NOAA Fisheries Research Vessel ALBATROSS IV
Cruise No. AL 05-05
Late Spring Ecosystem Monitoring Survey

CRUISE PERIOD AND AREA

The cruise period was 23 May to 8 June 2005. The NOAA fisheries research vessel ALBATROSS IV sampled 126 stratified random ecosystem monitoring stations located in the mid-Atlantic Bight, southern New England, Georges Bank and Gulf of Maine, plus four hydrographic (CTD only) fixed stations in the Wilkinson, Jordan and Georges basins and the Northeast Channel in the Gulf of Maine, (Figure 1) for the Late Spring Ecosystem Monitoring Survey.

OBJECTIVES

The primary objective of the cruise was to assess changing biological and physical properties which influence the sustainable productivity of the living marine resources of the mid-Atlantic Bight, southern New England, Gulf of Maine and Georges Bank portions of the northeast continental shelf ecosystem. Key parameters measured included water column temperature, salinity, and chlorophyll-*a* fluorescence, and ichthyoplankton and zooplankton composition, abundance and distribution.

Secondary objectives of this cruise involved the following sampling:

- Hydrographic CTD casts in deep basin areas and the Northeast Channel of the Gulf of Maine to provide hydrographic data detailing the incursion of Labrador Current Water into the Gulf of Maine.
- collection of samples for zooplankton genetics (genome) studies,
- examination of plankton samples for concentrations of Calanus finmarchicus to correlate with right whale sightings.

METHODS

The survey consisted of 126 stations at which the vessel stopped to lower instruments over the side. One hundred twenty randomly stratified stations were planned for the cruise, with 30 in the Mid-Atlantic Bight, 30 in Southern New England, 30 on Georges Bank, and 30 in the Gulf of Maine. Six additional non-random stations were completed in the Gulf of Maine area to improve coverage of this large region, and CTD casts were made at four fixed stations to document characteristics of deep basin water transported in by the Labrador Current. A total of one hundred thirty stations were sampled on the cruise. Near-surface along-track chlorophyll-*a* fluorescence, water temperature and salinity were measured while underway with the vessel's flow-through sampling system. Zooplankton genetics (zoogen) samples were collected at five randomly designated stations in each of the four regions.

Double oblique tows using the 61-centimeter Bongo sampler and a Seabird CTD with a fluorometer were made at 126 stations. The tows were made to approximately 5 meters above the bottom, or to a maximum depth of 200 meters. All plankton tows were conducted at a ship speed of 1.5 knots. Plankton sampling gear consisted of a 61-centimeter diameter aluminum Bongo frame with two 335-micron nylon mesh nets. At the randomly designated zoogen 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. A 45-kilogram lead ball was attached by an 80-centimeter length of 3/8-inch diameter chain below the aluminum Bongo frame to depress the sampler. A digital flowmeter was suspended within the mouth of each 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 over the port side of the vessel by means of a power boom. Upon retrieval, the bongo frame was placed in the checker, a wooden table used to hold the fish catch from trawl surveys. The checker allowed for easier wash-down of the sampling nets, and, if the weather was bad, the bongo frame could be carried forward so the nets could be washed down under the protection of the sheltered work area near the entrance to the wet lab. When zoogen samples were collected with the 20-centimeter bongo frames, both sampling arrays could be washed down simultaneously after retrieval by placing the large frame in the checker and the small frame in the protected work area. The 61-centimeter bongo plankton samples were preserved in a 5 % solution of formalin in seawater. The zooplankton genetics samples were preserved in 95 % ethanol, which was changed once 24 hours after the initial preservation. 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, salinity and chlorophyll-*a* fluorescence data for each plankton tow. A CTD cast was made in Wilkinson, Jordan, and Georges Basins and near the northern wall of the Northeast Channel.

After the cruise, stations with large amounts of Calanus finmarchicus were measured for settled volumes (Table 1.) and the data forwarded to Tim Cole, of the NEFSC Protected Species Branch, Large Whale Group.

Continuous monitoring of the seawater salinity, temperature and chlorophyll-*a* level, was done at a depth of 2.1 meters along the entire cruise track by means of a thermosalinograph, and a flow-through fluorometer. The Scientific Computer System (SCS) recorded the output from both the thermosalinograph, and the fluorometer at 10 second intervals. The data records were given a time-date

stamp by the GPS unit.

Samples for Seabird CTD salinity data and fluorometer chlorophyll-a calibration were obtained on the 12-6 watch using a 1.7 liter Niskin bottle taking a water sample from 30 or more meters depth at an isohaline portion of the water column. Calibration of the CTD salinities and chlorophyll from the surface flow-through system was undertaken on the 6-12 watch. Sample analysis for these calibrations followed the protocol outlined in the Ecosystem Monitoring Program Operations Manual

RESULTS

A summary of routine survey activities is presented in Table 1. Areal coverage for the cruise is shown in Figure 1. The ALBATROSS IV sailed punctually at 1400 hours on Monday, 23 May 2005, and steamed south towards the mid-Atlantic Bight, avoiding a large low-pressure area that was forming off the New England coast. Although winds reached 30 knots the next day, the ALBATROSS was able to keep working in inshore waters as it proceeded southward and eventually was far enough south to be beyond the influence of the storm system. The southernmost station was reached on 25 May, and fortunately by that time the weather had improved enough to permit the vessel to cruise at top speed between the offshore stations as it worked its way back north towards the southern New England area. The ALBATROSS IV reached the southern New England area on 27 May, and worked its way around the region in a counter-clockwise loop, picking up 6 Georges Bank stations and completing almost all the southern New England stations before returning to Woods Hole at 0900 EDT on 31 May 2005. After exchanging scientific personnel and taking on fuel, the vessel departed the next day at 12 noon. It headed east, picking up the remaining 2 SNE stations, some GOM stations and then sampled Georges Bank from west to east. Light winds and calm seas made operations go smoothly and transit times between stations were rapid. Fog banks prevented any whale sightings however. After completing sampling operations on Georges Bank on 4 June, the ALBATROSS IV crossed the Northeast Channel and headed into Gulf of Maine waters. In addition to the 30 random stations planned for this region, 6 non-random stations were added on several long steams as time permitted to improve areal coverage. Four stations in the Gulf of Maine were at non-random fixed positions visited on every dedicated Ecosystem Monitoring cruise. Three of these were in the Wilkinson, Jordan and Georges basins, and one was in the Northeast Channel. Typically, the basin stations would be sampled with bongo nets to 200 meters, and then sampled again down to within 5 meters of the bottom, to compare zooplankton volumes between these two towing protocols and to assess whether the 200 meter sampling missed a significant portion of the zooplankton biomass at these deep stations. This was not done on this particular cruise due to last-minute cancellations that reduced the scientific staff to only one person per watch to handle all the data and sample collection. No other sampling on the second leg was affected, but for safety and efficiency, there should be no less than two scientists per watch on Ecosystem Monitoring Cruises. At the basin stations CTD vertical casts down to within 5 meters of the bottom were made, similar to what is always done on the Northeast Channel station. This provided water column hydrographic data detailing the incursion of Labrador Current Water into the Gulf of Maine.

After sampling operations were completed in Cape Cod Bay in the early morning on 8 June, the ALBATROSS IV returned to Woods Hole via the Cape Cod Canal. It tied up at the NMFS dock in Woods Hole at 1100 hours on Wednesday, 8 June 2005, marking the end of the Late Spring Ecosystem Monitoring Cruise AL0505.

DISPOSITION OF SAMPLES AND DATA

All samples and data, except for the zooplankton genetics samples, the nitrogen isotope samples and the Seabird CTD data, were delivered to the Ecosystem Monitoring Group of the NEFSC, Narragansett, RI, for quality control processing and further analysis. The zooplankton genetics samples were taken from the vessel by Nancy Copley of the Woods Hole Oceanographic Institute. The CTD data were delivered to the Oceanography Branch of the NEFSC, Woods Hole, MA. Copies of the CTD logs were retained by the Ecosystems Monitoring Group in Narragansett. Calanus volume information was forwarded to Tim Cole after the cruise report was completed.

SCIENTIFIC PERSONNEL

National Marine Fisheries Service, NEFSC, Narragansett, RI

Jerome Prezioso^{1,2} Chief Scientist
Carolyn Griswold²
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Karen Tougas¹

Pittsfield, Massachusetts

Carmine Joe DeStefano¹

Two other people were scheduled for the second leg, but at the last minute were unable to come, leaving no time for scheduling replacements.

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Table 1. STATION OPERATION REPORT FOR CRUISE AL0505

CAST	STA.	Date (GMT)			TIME (GMT)		LAT LONG		DEPTH	OPERATION
		mm	dd	yy	hr	min			m	B=bongo W=water Z=zoogen N=nitrogen V=vertical cast (CTD only) D=deep tow CO=Calanus observed/vol
1	1	5	24	2005	10	40	3938.5	7322.3	35	B Z1
2	1	5	24	2005	11	39	3938.7	7322.6	35	B
3	2	5	24	2005	14	29	3926.3	7358.6	24	B
4	2	5	24	2005	14	40	3926.2	7358.4	24	W
5	3	5	24	2005	16	41	3907.1	7354.7	33	W
6	3	5	24	2005	16	52	3906.9	7354.5	37	B CO/302cc
7	4	5	24	2005	18	31	3854.1	7345.2	44	B
8	5	5	24	2005	19	22	3853.7	7352.7	35	B
9	6	5	24	2005	21	5	3853.8	7412.8	41	B CO/370cc
10	7	5	25	2005	1	44	3844.0	7458.5	20	B N1
11	8	5	25	2005	3	49	3826.5	7454.5	13	B
12	9	5	25	2005	8	8	3751.2	7456.6	26	B
13	10	5	25	2005	9	44	3743.9	7510.8	22	B
14	11	5	25	2005	11	17	3731.3	7512.5	29	B
15	12	5	25	2005	12	53	3728.6	7528.5	18	B
16	13	5	25	2005	15	51	3703.9	7548.1	11	B N2
17	14	5	25	2005	19	51	3621.2	7546.5	15	B
18	15	5	25	2005	21	26	3621.3	7528.6	26	W
19	15	5	25	2005	21	34	3621.2	7528.6	27	B
20	16	5	25	2005	22	47	3611.2	7528.6	25	B Z2 N3
21	17	5	26	2005	2	2	3546.2	7502.4	47	B CO/593cc
22	18	5	26	2005	2	55	3540.9	7456.8	53	B N4
23	19	5	26	2005	9	35	3638.7	7514.8	28	W
24	19	5	26	2005	9	44	3638.7	7514.8	28	B Z3
25	20	5	26	2005	12	38	3701.2	7502.9	45	B N5
26	21	5	26	2005	16	40	3730.7	7434.6	65	W
27	21	5	26	2005	16	48	3730.7	7434.5	65	B CO/364cc
28	22	5	26	2005	19	3	3738.4	7413.6	280	V
29	22	5	26	2005	19	25	3738.2	7413.8	275	B CO/178cc
30	23	5	26	2005	20	18	3738.9	7418.9	102	B CO/333cc
31	24	5	26	2005	22	22	3751.4	7434.9	52	B CO/413cc Z4
32	25	5	27	2005	0	41	3810.8	7428.8	41	B
33	26	5	27	2005	5	15	3841.0	7346.9	53	W
34	26	5	27	2005	5	27	3841.0	7347.0	53	B CO/357cc
35	27	5	27	2005	7	33	3840.8	7323.3	75	B CO/378cc
36	28	5	27	2005	8	52	3841.2	7311.0	123	B CO/562cc N6
37	29	5	27	2005	11	59	3901.2	7249.0	117	B Z5 N7
38	30	5	27	2005	16	54	3948.5	7238.8	57	W
39	30	5	27	2005	17	4	3948.5	7238.9	57	B CO/494cc
40	31	5	27	2005	18	3	3950.9	7230.9	66	B CO/667cc Z6
41	32	5	27	2005	19	26	3958.1	7239.2	57	B
42	33	5	27	2005	20	57	3958.6	7256.9	51	B CO/469cc
43	34	5	27	2005	23	32	4011.1	7325.1	37	B CO/308cc Z7
44	35	5	28	2005	2	12	4008.9	7356.3	19	B N8
45	36	5	28	2005	6	16	4031.2	7312.7	23	W

Table 1. (cont.) STATION OPERATION REPORT FOR CRUISE AL0505

CAST	STA.	Date(GMT)			TIME(GMT)		LAT	LONG	DEPTH	OPERATION
		mm	dd	yy	hr	min				
										B=bongo W=water Z=zoogen N=nitrogen V=vertical cast (CTD only) D=deep tow CO=Calanus observed/vol
46	36	5	28	2005	6	26	4031.3	7312.8	23	B
47	37	5	28	2005	7	33	4028.5	7303.4	28	B
48	38	5	28	2005	9	46	4024.0	7239.1	46	B
49	39	5	28	2005	12	42	4033.7	7206.8	53	B Z8
50	40	5	28	2005	14	7	4021.3	7206.7	62	B
51	41	5	28	2005	15	50	4006.5	7201.1	75	W
52	41	5	28	2005	16	2	4006.4	7201.3	75	B
53	42	5	28	2005	17	50	3951.2	7153.1	144	B CO/574cc
54	43	5	28	2005	22	32	4020.9	7116.9	80	B CO/233cc Z9 N9
55	44	5	28	2005	23	57	4023.5	7102.9	85	B
56	45	5	29	2005	2	46	4028.6	7028.9	71	B
57	46	5	29	2005	5	52	3959.1	7041.1	284	W
58	46	5	29	2005	6	31	3959.3	7041.4	276	B
59	47	5	29	2005	8	43	4008.8	7022.8	118	B
60	48	5	29	2005	12	34	4026.2	6942.8	71	B CO/543cc
61	49	5	29	2005	13	16	4028.8	6938.9	69	B CO/283cc Z10
62	50	5	29	2005	16	7	4006.6	6921.0	94	W
63	50	5	29	2005	16	20	4006.7	6921.2	94	B
66	51	5	29	2005	23	5	4011.5	6822.7	191	B
67	52	5	30	2005	0	9	4016.2	6826.8	144	B
68	53	5	30	2005	2	33	4033.7	6814.7	94	B CO/517cc
69	54	5	30	2005	3	29	4033.6	6807.1	98	B CO/320cc
70	55	5	30	2005	4	9	4036.1	6803.2	90	W
71	55	5	30	2005	4	19	4036.2	6803.2	90	B CO/326cc
72	56	5	30	2005	6	13	4046.0	6824.6	53	B
73	57	5	30	2005	11	31	4040.5	6933.5	48	B
74	58	5	30	2005	13	39	4043.7	7002.5	39	B
75	59	5	30	2005	15	24	4058.9	7014.8	32	B CO/745cc
76	60	5	30	2005	19	59	4043.6	7040.8	60	W
77	60	5	30	2005	20	10	4043.8	7040.7	60	B CO/246cc
78	61	5	30	2005	23	29	4058.9	7107.1	48	B
79	62	5	31	2005	0	45	4108.7	7102.7	34	B
80	63	5	31	2005	3	59	4103.4	7142.7	37	W
81	63	5	31	2005	4	9	4103.3	7142.9	36	B
82	64	5	31	2005	7	3	4118.5	7123.3	36	B
83	65	6	1	2005	22	39	4133.4	6945.0	27	W
84	65	6	1	2005	22	45	4133.3	6944.8	27	B
85	66	6	2	2005	0	8	4141.1	6952.6	23	B
86	67	6	2	2005	2	7	4153.8	6938.8	180	B CO/190cc
87	68	6	2	2005	7	40	4116.3	6840.9	71	W
88	68	6	2	2005	7	49	4116.3	6841.1	72	B CO/326cc
89	69	6	2	2005	11	36	4058.8	6806.6	41	B Z11
90	70	6	2	2005	13	46	4054.0	6738.8	69	B CO/326cc Z12

Table 1. (cont.) STATION OPERATION REPORT FOR CRUISE AL0505

CAST	STA.	Date(GMT)			TIME(GMT)		LAT	LONG	DEPTH	OPERATION
		mm	dd	yy	hr	min			m	
										B=bongo W=water Z=zoogen N=nitrogen V=vertical cast (CTD only) D=deep tow CO=Calanus observed/vol
91	71	6	2	2005	15	29	4106.2	6750.7	49	B
92	72	6	2	2005	17	42	4123.9	6801.0	38	W
93	72	6	2	2005	17	52	4123.8	6801.2	32	B
94	73	6	2	2005	20	33	4140.2	6822.1	49	B
95	74	6	2	2005	21	14	4143.8	6818.7	71	B
96	75	6	2	2005	22	22	4151.2	6820.8	205	B CO/265cc
97	76	6	3	2005	1	10	4203.7	6757.1	192	B CO/450cc Z13
98	77	6	3	2005	3	21	4221.2	6802.7	182	B CO/370cc
99	78	6	3	2005	4	35	4226.0	6756.4	190	W
100	78	6	3	2005	4	42	4226.1	6756.3	191	B CO/432cc
101	79	6	3	2005	7	45	4221.1	6718.1	305	V
102	79	6	3	2005	8	5	4221.1	6718.0	307	B CO/333
103	80	6	3	2005	10	4	4225.0	6700.0	360	V
104	81	6	3	2005	12	57	4203.8	6712.9	48	B Z14 N10
105	82	6	3	2005	14	31	4201.1	6728.8	47	B
106	83	6	3	2005	17	22	4143.5	6659.0	61	W
107	83	6	3	2005	17	28	4143.2	6659.2	58	B
108	84	6	3	2005	18	55	4138.6	6718.5	49	B
109	85	6	3	2005	19	41	4138.2	6728.5	49	B
110	86	6	3	2005	21	38	4124.1	6723.3	32	B N11
111	87	6	3	2005	23	27	4109.0	6720.9	57	B Z15
112	88	6	4	2005	0	27	4108.6	6710.8	63	B
113	89	6	4	2005	1	9	4103.6	6712.6	66	B
114	90	6	4	2005	3	3	4053.5	6652.8	91	B N12
115	91	6	4	2005	5	29	4106.2	6631.0	91	W
116	91	6	4	2005	5	37	4105.9	6631.0	89	B
117	92	6	4	2005	8	6	4126.2	6634.8	86	B
118	93	6	4	2005	9	30	4136.3	6628.9	84	B
119	94	6	4	2005	12	44	4149.1	6554.9	114	B N13
120	95	6	4	2005	13	39	4156.4	6553.0	126	B CO/345cc
121	96	6	4	2005	14	29	4156.4	6600.7	93	B CO/215cc
122	97	6	4	2005	15	25	4201.4	6552.9	201	B CO/333cc
123	98	6	4	2005	17	11	4213.1	6546.5	223	W
124	99	6	4	2005	19	26	4225.9	6530.9	100	B CO/234cc
125	100	6	4	2005	22	44	4243.7	6612.6	63	B
126	101	6	4	2005	23	33	4248.7	6608.8	57	B Z16
127	102	6	5	2005	1	29	4303.6	6624.8	107	B CO/221cc
128	103	6	5	2005	4	33	4326.2	6648.9	205	W N14
129	103	6	5	2005	4	40	4326.0	6649.0	207	B CO/438cc
130	104	6	5	2005	7	58	4328.7	6730.8	218	V

Table 1. (cont.) STATION OPERATION REPORT FOR CRUISE AL0505

CAST	STA.	Date(GMT)			TIME(GMT)		LAT	LONG	DEPTH	OPERATION
		mm	dd	yy	hr	min			m	
										B=bongo W=water Z=zoogen N=nitrogen V=vertical cast (CTD only) D=deep tow CO=Calanus observed/vol
131	104	6	5	2005	8	13	4328.8	6730.7	222	B CO/215cc
132	105	6	5	2005	9	46	4324.0	6741.9	245	V
133	106	6	5	2005	11	56	4313.7	6800.8	212	B CO/159cc Z17 N15
134	107	6	5	2005	15	4	4318.8	6832.3	190	B CO/178cc
135	108	6	5	2005	16	23	4318.8	6842.3	131	W
136	108	6	5	2005	16	29	4318.7	6842.2	138	B CO/221cc
137	109	6	5	2005	19	14	4330.1	6810.6	181	B CO/190cc
138	110	6	5	2005	22	3	4341.2	6741.0	236	V
139	110	6	5	2005	22	18	4341.2	6740.9	236	B CO/165cc
140	111	6	6	2005	0	34	4356.2	6722.9	218	B CO/234cc Z18
141	111	6	6	2005	0	57	4356.7	6721.7	214	V
142	112	6	6	2005	3	7	4413.6	6706.6	122	B CO/172cc N16
143	113	6	6	2005	6	36	4439.6	6703.1	79	W
144	113	6	6	2005	6	43	4439.4	6703.1	75	B
145	114	6	6	2005	10	6	4415.4	6742.2	87	B
146	115	6	6	2005	13	36	4356.8	6823.9	98	B Z19
147	116	6	6	2005	16	56	4342.0	6858.1	64	W
148	116	6	6	2005	17	5	4341.9	6858.3	78	B
149	117	6	6	2005	20	58	4340.5	6950.9	30	B
150	118	6	6	2005	23	56	4327.8	6921.1	157	B CO/240cc Z20
151	119	6	7	2005	2	39	4318.7	6953.0	169	B CO/215cc
152	120	6	7	2005	5	6	4308.9	7014.5	142	W N17
153	120	6	7	2005	5	11	4308.8	7014.5	145	B
154	121	6	7	2005	8	6	4303.7	6941.2	117	B
155	122	6	7	2005	11	40	4253.3	6902.8	185	B CO/122cc
156	123	6	7	2005	13	53	4235.0	6854.2	172	B CO/221cc
157	124	6	7	2005	16	6	4218.8	6845.0	205	W
158	124	6	7	2005	16	13	4218.9	6845.2	207	B CO/283cc
159	125	6	7	2005	18	30	4213.8	6910.1	204	B CO/394cc
160	126	6	7	2005	20	5	4211.3	6924.5	200	B CO/289cc
161	127	6	7	2005	22	5	4223.9	6936.7	239	V
162	127	6	7	2005	22	31	4224.2	6937.0	240	B CO/320cc
163	128	6	7	2005	23	35	4230.2	6940.0	244	V
164	129	6	8	2005	2	22	4223.7	7010.9	76	B
165	130	6	8	2005	5	10	4156.3	7017.1	38	B

TOTALS: Bongo Casts = 126
 Bongo 6B3Z Samples = 126
 Bongo 6B3I Samples = 125
 Water Samples = 27
 Vertical Casts = 9
 CTD Casts = 165
 Zoogen samples = 20
Calanus observations = 53

Nitrogen samples = 17

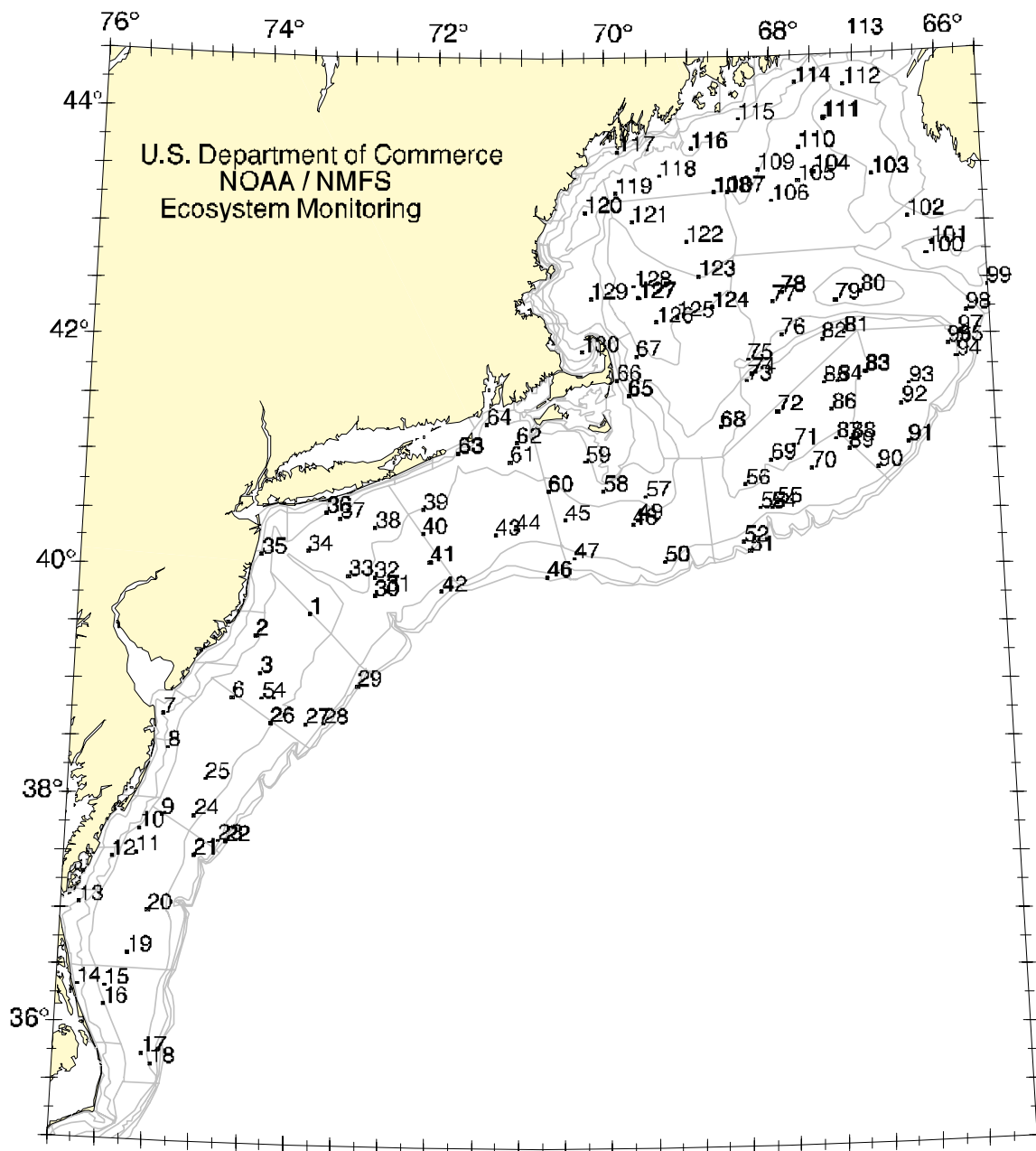


Figure 1. Station locations numbered consecutively for Late Spring

Ecosystem Monitoring Cruise AL0505, 23 May - 8 June 2005.