

23 September 2002

CRUISE RESULTS
Fisheries Research Vessel Albatross IV
Cruise No. AL 02-06
Ecosystems Monitoring Survey

CRUISE PERIOD AND AREA

The cruise period was from 22 May to 6 June 2002. The research vessel Albatross IV covered the Mid-Atlantic Bight, Southern New England, Georges Bank and Gulf of Maine regions (Figure 1) for the Late Spring Survey Period.

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, Georges Bank and Gulf of Maine portions of the northeast continental shelf ecosystem. Secondary objectives of this cruise were the collection of phytoplankton samples for nitrogen and carbon stable isotope ratios, the examination of plankton samples at sea for concentrations of Calanus finmarchicus to correlate with right whale sightings, and making special bongo tows to 75 meters in selected stations deeper than 100 meters in the Gulf of Maine.

METHODS

The survey consisted of 120 randomly distributed standard stations at which the vessel stopped to lower instruments over the side and 6 additional stations added to improve areal coverage or to look for Calanus finmarchicus at a site frequented by right whales .

Key parameters which were measured included water column temperature and salinity; ichthyo and zooplankton composition, abundance and distribution; along-track temperature, salinity, chlorophyll-a fluorescence and standard weather observations.

Double oblique tows using the bongo sampler and a CTD were made at all stations. The tow was made to approximately 5 meters above the bottom, or to a maximum depth of 200 meters, at a ship speed of 1.5 knots. At stations deeper than 100 meters in the Gulf of Maine special tows were made down to 75 meters to compare plankton volumes with the standard near-bottom or 200 meters tows done at the same location. At any stations equal to or deeper than 220 meters a vertical cast to within 5 meters of the bottom was made with the CTD unit to provide complete water column hydrographic data for the Fisheries Oceanography Investigation's database. Plankton sampling gear consisted of a 61-centimeter mouth diameter aluminum bongo frame

with two conical 333-micron nylon mesh nets. 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 record the amount of water filtered by each net. At 20 randomly selected zoogen sampling stations a 20-centimeter mouth diameter PVC bongo frame equipped with 2 conical 165-micron nylon mesh nets but no flowmeters was mounted on the towing wire one half meter above the large bongo frame. The plankton sampling gear was deployed over the port stern quarter of the vessel by means of a conducting-cable winch and a boom. Plankton samples from the 61 cm bongos were preserved in a 5 percent solution of formalin in seawater. Plankton samples from the 20 cm bongos were preserved in 95% ethanol which was changed once after 24 hours. Tow depth was monitored in real time with a Seabird CTD profiler, which was hard-wired to the conductive towing cable, providing simultaneous depth, temperature and salinity data for each plankton tow.

Continuous monitoring of the seawater temperature, salinity, and chlorophyll-a level, at a depth of 2 meters was done along all of the cruise track by means of a thermosalinograph, and a flow-through fluorometer.

The thermosalinograph and flow-through fluorometer were connected to the Scientific Computing System installed in the laboratory area of the vessel by Atlantic Marine Center personnel. This system recorded output from the thermosalinograph, and the fluorometer every ten seconds, and gave the data records a time-date stamp from the GPS unit.

Samples for Seabird CTD salinity data calibration were obtained on the 12-6 watch by taking a water sample from 30 or more meters depth using a 1.7 liter Niskin bottle. Calibration of the thermosalinograph and fluorometer from the surface flow-through system was undertaken on the 6-12 watch following the protocol outlined in the Ecosystem Monitoring Program Operations Manual. This protocol requires twice-daily sampling of the discharge water from the flow-through system, with 120 milliliters of seawater being saved for salinity analysis ashore, and 200 milliliters of seawater being filtered through a Whatman GFF glass-fiber filter for extraction in 90% acetone and reading in a discrete-sample fluorometer aboard ship.

Phytoplankton samples for nitrogen stable isotope ratio analysis were collected from the discharge water of the near-surface flow-through system. Six hundred to one thousand milliliters of seawater were pre-filtered through 333 micron mesh nitex gauze to remove most zooplankton, then filtered through a Whatman GFF glass-fiber filter and immediately frozen, for analysis ashore.

RESULTS

A summary of routine survey activities is presented in Table 1.

Areal coverage for the cruise are in Figure 1.

The Albatross IV proceeded south towards Cape Hatteras, NC, sampling along the outer part of the continental shelf and covering the inshore areas when returning north. Since winds remained calm for the entire first part of the cruise period, the shortest route between stations was chosen, without regard for the weather. Due to the absence of any adverse weather or mechanical problems, the vessel was able to completely sample the Mid-Atlantic Bight area, and most of the Southern New England area, before returning to Woods Hole at 1700 hours Eastern Daylight Time on Monday, May 27. Thirteen stations remaining on the eastern portion of the Southern New England area were picked up on the second part of the Ecosystems Monitoring Survey. The ALBATROSS IV returned to sea the following day (May 28) at 1400 hours Eastern Daylight time. In addition to the 13 southern New England stations an additional non-standard station was visited at the request of the Regional Right Whale Sighting Coordinator. Foggy conditions precluded any whale observations, but a plankton tow in the area showed the presence of a dense concentration of the copepod, Calanus finmarchicus, an important prey item of right whales. After completion of the southern New England stations, the vessel sampled the Georges Bank area and then proceeded into the western Gulf of Maine. Here the first strong winds, gusting to 30 knots were encountered. Although work was slowed, the vessel was able to keep working since the wind diminished after 24 hours. Extra tows to a depth of 75 meters were done whenever water over 100 meters in depth was encountered. These special tows for Joe Kane, (NMFS, Narragansett Laboratory) were done immediately after a standard monitoring tow at the same station to compare sample volumes from each haul. It required about 40 minutes to complete both hauls, and 60 minutes if a deep vertical cast or a water bottle cast had to be made at the same station. On June 2, 6 right whales were sighted 20 nautical miles west of Cultivator Shoals at 4144.1 N 6852.0 W. This was between stations 100 and 101 in the Gulf of Maine. Both stations had large amounts of Calanus finmarchicus in the plankton samples taken. (Table 1). Since time permitted, 5 stations were added in the Gulf of Maine area to fill gaps in the areal coverage left by the computer-generated random station location process. The ALBATROSS IV finished working off the coast of Provincetown on Thursday, June 6 and docked at the NMFS pier in Woods Hole, MA, later that same day at 1400 hours.

DISPOSITION OF SAMPLES AND DATA

All samples and data, except for the Joe Kane 75 meter samples, nitrogen isotope samples, the zoogen samples and the CTD data, were delivered to the Ecosystems Monitoring Group of the NEFSC, Narragansett, RI, for quality control processing and further analysis. The 75 meter samples were delivered to Joe Kane at the NMFS Lab in Narragansett, RI. The nitrogen isotope samples were kept frozen and delivered to Rick McKinney at the US EPA Lab in Narragansett, RI. The zoogen samples were taken off the vessel by Nancy Copley from the Woods Hole Oceanographic Institute for analysis at that facility, and

the CTD data was delivered to the Oceanography Branch of the NEFSC, Woods Hole, MA.

SCIENTIFIC PERSONNEL

National Marine Fisheries Service, NEFSC, Narragansett, RI

Jerome Prezioso^{1,2}, Chief Scientist
 Jacquelyn Anderson^{1,2}
 Joseph Kane²

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¹/Personnel on the first leg 22-27 May

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Table 1. STATION OPERATION REPORT FOR CRUISE AL0206

CAST	STA.	Date (GMT)		TIME (GMT)		LAT	LONG	DEPTH	OPERATION
		mm	dd	yy	hr				
1	1	5	23	02	5 56	3921.3	7311.6	61	B, Z1
2	2	5	23	02	7 46	3910.3	7253	86	B
3	3	5	23	02	10 8	3910.4	7322.8	53	B, CO(106)
4	4	5	23	02	13 41	3842.3	7352.1	47	B, CO(158)
5	5	5	23	02	15 37	3832	7410	52	W1
6	5	5	23	02	15 48	3832.1	7410	53	B
7	6	5	23	02	18 12	3823.3	7343.4	92	B
8	7	5	23	02	20 6	3817.2	7404.1	62	B
9	8	5	23	02	22 21	3809.7	7432.8	35	B
10	9	5	24	02	0 4	3758.5	7419.1	62	B
11	10	5	24	02	1 21	3753.9	7431	53	W2

12	10	5	24	02	1	27	3753.8	7431	53	B, salps
13	11	5	24	02	3	20	3734.9	7429.9	69	B, Z2
14	12	5	24	02	6	33	3702	7440.3	86	B, salps, Z3
15	13	5	24	02	8	59	3647.7	7504.7	32	B
16	14	5	24	02	10	42	3631.8	7508.3	27	B, Z4
17	15	5	24	02	12	46	3612.5	7501.9	41	B, salps
18	16	5	24	02	14	55	3552.7	7453.6	83	W3
19	16	5	24	02	15	4	3552.8	7453.3	83	B
20	17	5	24	02	16	20	3543.8	7500.8	45	B
21	18	5	24	02	17	36	3552.7	7510.3	30	B
22	19	5	24	02	20	13	3612.5	7530.5	28	B
23	20	5	24	02	22	48	3638.9	7526.8	20	B
24	21	5	25	02	1	16	3701.8	7537.6	20	B
25	22	5	25	02	3	21	3713.7	7516.1	25	B
26	23	5	25	02	4	56	3724.1	7505.3	30	B
27	24	5	25	02	6	50	3741.6	7514.8	24	B
28	25	5	25	02	8	34	3752.2	7459.3	24	B
29	26	5	25	02	12	8	3826.9	7446.6	26	B
30	27	5	25	02	15	50	3857.5	7422	25	B
31	28	5	25	02	17	11	3905.4	7411.9	34	V
32	28	5	25	02	17	17	3905.4	7411.9	32	W4
33	28	5	25	02	17	24	3905.4	7412	27	B
34	29	5	25	02	19	13	3911.6	7352.4	41	B
35	30	5	25	02	21	29	3924.9	7331.5	44	B, Z5
36	31	5	26	02	0	46	3927.3	7250	66	B, CO(211)
37	32	5	26	02	2	30	3932.5	7229.1	100	B, CO(449)
38	33	5	26	02	5	37	3949.9	7259.4	70	B, Z6
39	34	5	26	02	7	5	3959.5	7249.9	52	B, Z7
40	35	5	26	02	9	53	4013.6	7321.8	40	W5

Table 1. (continued)

CAST	STA.	Date (GMT)			TIME (GMT)		LAT	LONG	DEPTH	OPERATION
		mm	dd	yy	hr	min			meters	b=bongo w=water z=zoogen N=nitrogen C=carbon CO= Calanus observed (ml vol)

41	35	5	26	02	9	57	4013.6	7321.9	40	B
42	36	5	26	02	11	27	4011.3	7340.8	38	B, CO, Z8
43	37	5	26	02	12	59	4020.6	7352.9	20	B
44	38	5	26	02	16	51	4031.4	7301.8	29	B
45	39	5	26	02	19	42	4026.1	7225.3	49	B
46	40	5	26	02	23	53	3949.1	7203.1	106	W6
47	40	5	27	02	0	0	3949	7203.1	106	B
48	41	5	27	02	2	17	4000.9	7143.1	94	B, CO
49	42	5	27	02	4	37	4022.1	7149	71	B
50	43	5	27	02	6	52	4025.5	7122.4	74	B
51	44	5	27	02	10	40	4049	7203.9	40	W7

52	44	5	27	02	10	43	4048.9	7203.9	39	B
53	45	5	27	02	14	12	4046.7	7119.4	59	B
54	46	5	27	02	15	31	4058.3	7113.6	53	B, N8
55	47	5	27	02	16	43	4104.1	7101.3	33	B (to Woods Hole next)
56	48	5	28	02	21	33	4112.7	7047.8	27	B
57	49	5	28	02	23	0	4109.8	7032.2	38	B
58	50	5	29	02	1	30	4047.8	7021	48	B
59	51	5	29	02	3	0	4040.2	7037.3	60	B
60	52	5	29	02	5	4	4022.1	7048.5	92	B
61	53	5	29	02	6	31	4008.2	7050.4	135	B, Z10
62	54	5	29	02	9	26	4007.2	7014.8	121	B
63	55	5	29	02	11	24	4020.5	7008.5	83	W8
64	55	5	29	02	11	28	4020.5	7008.7	84	B
65	56	5	29	02	14	9	4044.9	6956.3	37	B
66	57	5	29	02	16	13	4047.1	6928.8	41	B
67	58	5	29	02	19	7	4114	6905.6	140	B, CO(425), (non-random sta)
68	59	5	29	02	22	32	4039.7	6913	59	B
69	59	5	29	02	22	46	4039.9	6912.8	57	W9
70	60	5	30	02	1	41	4012	6926.2	85	B
71	61	5	30	02	3	37	4011.2	6902.9	135	B
72	62	5	30	02	2	6	4030	6844.7	73	B
73	63	5	30	02	2	7	4023.3	6824.8	106	B, N9, C3
74	64	5	30	02	11	25	4053.9	6836.1	60	W10
75	64	5	30	02	11	30	4053.8	6836.1	54	B
76	65	5	30	02	12	46	4102.4	6841	53	B
77	66	5	30	02	15	15	4123.3	6821.9	62	B
78	67	5	30	02	16	5	4125.5	6814.2	43	B
79	68	5	30	02	18	9	4119.6	6749.6	42	B
80	69	5	30	02	20	12	4108.8	6808.6	34	B, N10

Table 1. (continued)

CAST	STA.	Date (GMT)			TIME (GMT)		LAT	LONG	DEPTH	OPERATION
		mm	dd	yy	hr	min			meters	

b=bongo w=water z=zoogen
N=nitrogen C=carbon V=vertical cast
CO= Calanus observed (ml vol)

81	70	5	30	02	22	7	4050.3	6759.5	63	B
82	71	5	30	02	23	28	4044.6	6812.5	65	W11
83	71	5	30	02	23	35	4044.6	6812.3	66	B
84	72	5	31	02	1	54	4025.8	6755.6	208	B
85	73	5	31	02	4	30	4029.2	6726.7	169	B
86	74	5	31	02	6	39	4045.1	6715.3	97	B
87	75	5	31	02	8	33	4101.4	6722.4	68	B, Z11
88	76	5	31	02	10	14	4115.4	6720.5	48	B
89	77	5	31	02	12	47	4125.7	6653.2	70	W12

90	77	5	31	02	12	53	4125.4	6653.5	69	B
91	78	5	31	02	14	49	4104.7	6658.1	68	B, CO
92	79	5	31	02	16	44	4052.6	6642.8	106	B
93	80	5	31	02	18	58	4107	6623.8	133	B
94	81	5	31	02	21	38	4131.8	6626.4	89	B
95	82	5	31	02	23	21	4129.2	6605	114	W13
96	82	5	31	02	23	26	4129	6605.1	117	B
97	83	6	1	02	1	27	4144.7	6557.1	106	B, Z12, N11
98	84	6	1	02	3	28	4147.5	6623.2	79	B, Z13
99	85	6	1	02	5	3	4147.1	6645.7	62	B, Z14
100	86	6	1	02	6	48	4202.1	6635.1	77	B
101	87	6	1	02	7	50	4200	6624.3	83	B
102	88	6	1	02	10	29	4217.5	6557.7	234	W14
103	88	6	1	02	10	37	4217.7	6557.6	234	B
104	88	6	1	02	11	14	4217.7	6557.5	232	75 meter B
105	89	6	1	02	14	56	4250	6530.7	133	B
106	89	6	1	02	15	27	4250	6530.8	132	75 meter B
107	90	6	1	02	19	20	4302.4	6621.5	121	B
108	90	6	1	02	19	48	4302.4	6621.5	125	75 meter B
109	91	6	1	02	21	52	4250.6	6640.2	188	W15
110	91	6	1	02	21	57	4250.6	6640.4	192	B
111	91	6	1	02	22	40	4250.6	6640.4	189	75 meter B
112	92	6	2	02	2	5	4224.7	6708.8	360	V
113	92	6	2	02	2	31	4224.9	6708.4	359	B
114	92	6	2	02	3	5	4224.9	6708.3	358	75 meter B
115	93	6	2	02	6	0	4203.2	6725.9	55	B
116	94	6	2	02	8	50	4140	6723.9	44	B
117	95	6	2	02	11	9	4134.9	6744.8	44	W16
118	95	6	2	02	11	13	4134.8	6744.8	43	B
119	96	6	2	02	12	48	4142.8	6758.4	32	B
120	97	6	2	02	13	57	4152.2	6800.2	82	B

Table 1. (continued)

CAST STA. Date (GMT) TIME (GMT) LAT LONG DEPTH OPERATION
mm dd yy hr min meters
b=bongo w=water z=zoogen V=vertical cast
N=nitrogen C=carbon RW=right whales
CO= Calanus observed (ml vol)

121	98	6	2	02	15	59	4207.4	6807.4	211	B
122	98	6	2	02	16	20	4207.6	6807.3	211	75 meter B
123	99	6	2	02	18	53	4144.7	6814.8	62	B
124	100	6	2	02	20	31	4143.9	6834.1	175	B, CO(482)
125	100	6	2	02	21	7	4143.7	6834.3	174	75 meter B
126	101	6	2	02	23	53	4144.9	6908.4	179	W17
127	101	6	2	02	23	58	4144.9	6908.4	179	B, CO(680) RW-4144.1N 68 52 W
128	101	6	3	02	0	27	4145.1	6908.2	180	75 meter B
129	102	6	3	02	3	50	4217.3	6903	205	B, Z16
130	102	6	3	02	4	31	4217.2	6903	205	75 meter B

131	103	6	3	02	7	4	4232.7	6931.2	285	B
132	103	6	3	02	7	36	4232.3	6931.1	281	V
133	103	6	3	02	7	56	4232.5	6931.1	282	75 meter B
134	104	6	3	02	10	8	4252.4	6938.8	153	W18
135	104	6	3	02	10	13	4252.4	6938.6	157	B
136	104	6	3	02	10	43	4252.4	6938.6	156	75 meter B
137	105	6	3	02	13	59	4305.8	6857.8	149	B
138	105	6	3	02	14	47	4305.8	6857.6	155	75 meter B
139	106	6	3	02	17	52	4254.7	6817.6	168	B, C4
140	106	6	3	02	18	18	4254.8	6817.4	168	75 meter B
141	107	6	3	02	20	24	4314.7	6810.4	203	B
142	107	6	3	02	21	2	4314.8	6810.2	204	75 meter B
143	108	6	4	02	0	53	4300.8	6722.7	223	W19
144	108	6	4	02	1	0	4300.9	6722.9	224	B, Z17, N13
145	108	6	4	02	1	39	4300.8	6723	224	75 meter B
146	109	6	4	02	4	25	4328	6727.4	214	B
147	109	6	4	02	5	3	4328.1	6727.3	214	75 meter B
148	110	6	4	02	7	24	4329	6656.1	202	B
149	110	6	4	02	7	58	4329.4	6656.3	202	75 meter B
150	111	6	4	02	10	34	4343.9	6626.6	71	W20
151	111	6	4	02	10	39	4344	6626.5	74	B, N14, Z17
152	112	6	4	02	13	30	4407.9	6646.8	143	B, Z18
153	112	6	4	02	14	9	4408.1	6647	143	75 meter B
154	113	6	4	02	16	31	4405.8	6721.8	156	B, Z19
155	113	6	4	02	17	8	4405.8	6721.8	154	75 meter B
156	114	6	4	02	19	14	4425.8	6732.5	73	B
157	115	6	4	02	23	44	4345.5	6747.6	220	W21
158	115	6	4	02	23	50	4345.4	6747.8	218	B, (non-random sta)
159	115	6	5	02	0	27	4345.2	6747.9	218	75 meter B
160	116	6	5	02	2	58	4353.6	6820.7	95	B

Table 1. (continued)

CAST STA. Date (GMT) TIME (GMT) LAT LONG DEPTH OPER.
mm dd yy hr min meters
b=bongo w=water z=zoogen
N=nitrogen C=carbon
CO= Calanus observed (ml vol)

161	117	6	5	02	5	40	4328.8	6835.6	140	B, (non-random sta)
162	117	6	5	02	6	8	4328.9	6835.4	137	75 meter B
163	118	6	5	02	8	58	4349.4	6902.3	73	B
164	119	6	5	02	12	14	4320.9	6915.3	154	W22
165	119	6	5	02	12	19	4320.9	6915.4	156	B, (non-random sta)
166	119	6	5	02	12	52	4321	6915.4	156	75 meter B
167	120	6	5	02	16	2	4307.2	6947.3	164	B, (non-random sta)
168	120	6	5	02	16	33	4307.3	6947.3	166	75 meter B

169	121	6	5	02	18	59	4329.4	6955.2	124	B
170	121	6	5	02	19	25	4329.6	6955.2	123	75 meter B
171	122	6	5	02	21	25	4317.9	7013.2	93	B, Z20
172	122	6	5	02	21	39	4317.6	7013.3	102	W23
173	123	6	5	02	23	41	4259.7	7009.6	187	B, (non-random sta)
174	124	6	6	02	3	28	4228.4	7030.4	64	B, N15
175	125	6	6	02	5	56	4212.9	7038.3	20	B, N16
176	126	6	6	02	8	51	4212.9	7005.5	94	B (last station)

TOTALS: Bongo Casts = 151
61 cm Bongo Samples = 302
20 cm Bongo Samples = 40
Water Samples = 23
CTD Casts = 176
Nitrogen samples = 16
Carbon samples = 4
75 meter tows = 24
Non-random stations = 6

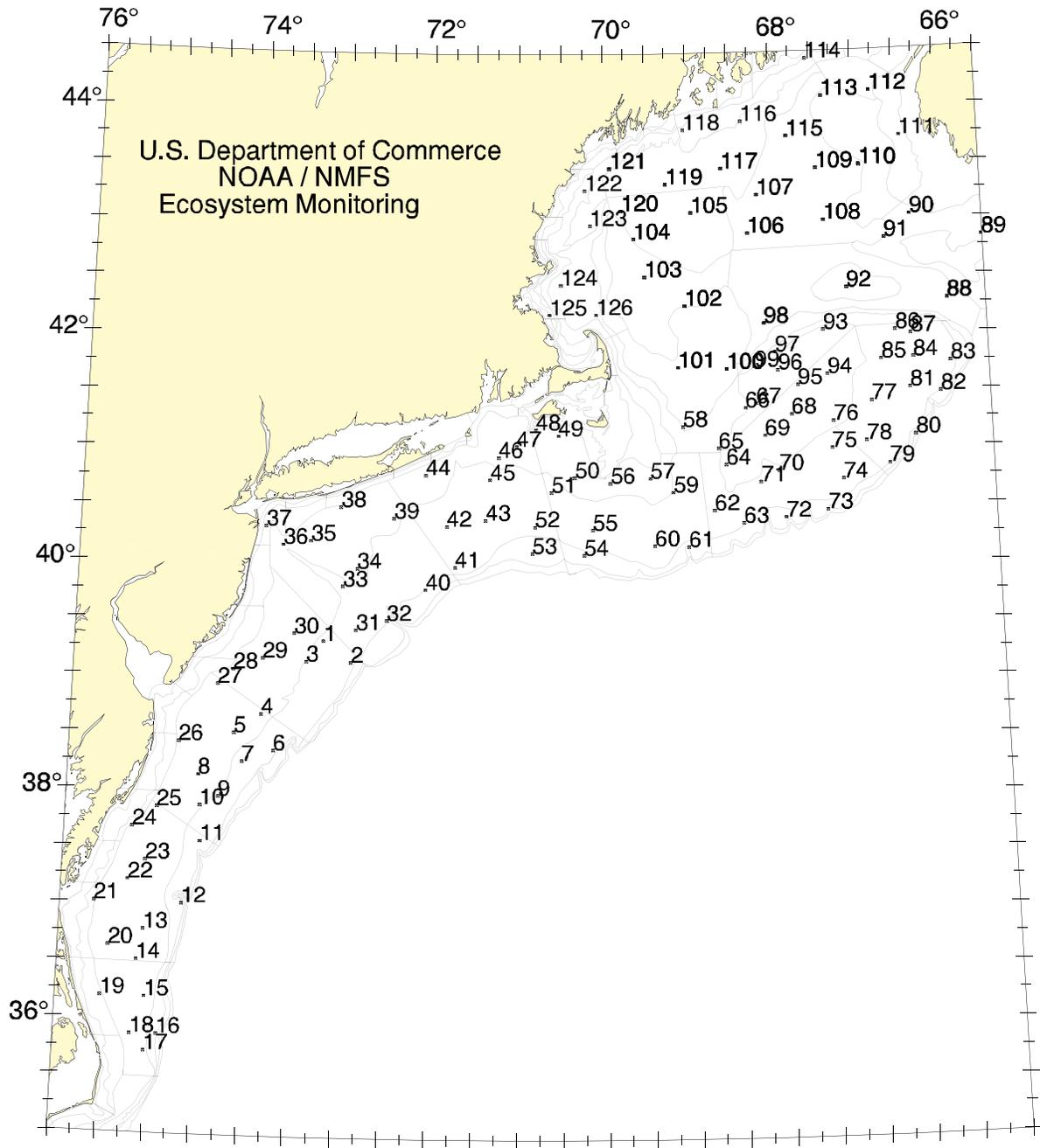


Figure 1. Station locations numbered consecutively for Late Spring Ecosystems Monitoring Cruise AL 02-06, 22 May - 6 June 2002.