

9 December 2004

CRUISE RESULTS  
NOAA Fisheries Research Vessel ALBATROSS IV  
Cruise No. AL 04-10  
Ecosystems Monitoring Survey

CRUISE PERIOD AND AREA

The cruise period was 1-18 November 2004. The NOAA fisheries research vessel ALBATROSS IV covered the Mid-Atlantic Bight, Southern New England, Georges Bank, and Gulf of Maine regions (Figure 1) for the Late Autumn Ecosystems 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, Southern New England, Georges Bank and Gulf of Maine portions of the northeast continental shelf ecosystem.

Secondary objectives of this cruise involved the following sampling:

- comparison plankton tows in deep basin areas of the Gulf of Maine to assess the difference in zooplankton volumes and composition between tows to 200 m and tows to within 5 meters of the bottom. These deep tows also provide hydrographic data detailing incursions of Labrador Current Water into the Gulf of Maine.
- collection of phytoplankton samples for nitrogen stable isotope ratios,
- collection of samples for zooplankton genetics (genome) studies,
- examination of plankton samples for concentrations of Calanus finmarchicus to correlate with right whale sightings,
- collection of neuston samples to be analyzed for the presence of squid eggs and larvae.

METHODS

The survey consisted of 118 randomly distributed stations at which the vessel stopped to lower instruments over the side. One non-random station was added at the Northeast Channel where a CTD cast was made to document characteristics of the Gulf of Maine outbound water column, 6 non-random stations were sampled in the Gulf of Maine region and 2 non-random stations were sampled in the Southern New England region, giving a total of 127 stations sampled. Key parameters measured included water column temperature, salinity, ichthyoplankton and zooplankton composition, abundance and distribution, and along-track chlorophyll-a fluorescence.

Plankton sampling gear consisted of a 61-centimeter mouth diameter aluminum Bongo frame with two 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 determine the amount of water filtered by each net. The plankton sampling gear was deployed over the port side of the vessel by means of a conducting-cable winch and a powered boom. The 61-centimeter Bongo plankton samples were preserved in a 5 % solution of formalin in seawater. 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 data for each plankton tow.

A double oblique tow using the 61-centimeter Bongo sampler and a Seabird CTD was made at 125 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. On the three Gulf of Maine deep basin stations, an initial tow to within 5 meters of the bottom was made, with the ship immediately returning to the starting position and making a second tow to 200 meters for comparison. These special two- tow deep basin stations gave comparisons of the zooplankton volume and composition between the top 200 meters and the entire water column from the same area.

Twenty-one phytoplankton samples for nitrogen-stable isotope ratio analysis were collected from the discharge water of the near-surface flow-through system. Samples of 600 to 1000 milliliters of seawater were pre-filtered through 300 micron mesh nitex gauze to remove most zooplankton, then filtered through a Whatman GFF glass-fiber filter and flash frozen for analysis ashore.

A total of twenty zooplankton genetics samples were collected at five randomly selected stations within each of the Mid-Atlantic, Southern New England, Georges Bank and Gulf of Maine regions. These samples were collected with a 20 cm Bongo frame fitted with paired 165 micron mesh nets and this array was attached to the towing wire above the Seabird CTD with a wire stop. The samples were preserved in 95% ethanol. After 24 hours of initial preservation, the alcohol was changed.

Nine neuston samples were collected in the Middle Atlantic Bight region using a 0.5 x 1.0 m neuston frame equipped with a 500-micron mesh net. These were examined for the presence of squid eggs and larvae after the samples were delivered to William Macy at the URI Graduate School of Oceanography. The sampler was initially deployed by hand from the port stern quarter of the vessel while the bongo sampler was in the water, but retrieval proved nearly impossible in the prevailing sea conditions. Use of the power boom after the bongo tow was completed made deployment and retrieval much easier, and actually ended up saving time even though it entailed a separate ten minute tow.

Following the cruise, samples with large numbers of Calanus finmarchicus were measured for settled volumes and the data forwarded to Pat Gerrior, the Regional Right Whale Sighting Coordinator, and to Tim Cole of the Protected Species Branch.

Continuous monitoring of the seawater salinity, and chlorophyll-a level, was done at a depth of 2.1 meters along all of the cruise track by means of a thermosalinograph, and a flow-through

fluorometer. The SCS system recorded the output from both the thermosalinograph, and the fluorometer at ten seconds intervals. The data records were given a time-date stamp from the GPS unit.

Samples for Seabird CTD salinity and fluorometer sensor 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 fluorometer and CTD salinities 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 at 1400 hours EST on Monday 1 November from the NEFSC, Woods Hole Massachusetts. Weather conditions were moderate, with 20 knot winds and white capped seas, but the vessel was able to travel at full speed as it headed south to start working in the southwest portion of the Southern New England area.. An improving weather pattern made it possible to sample all the offshore stations first as the vessel headed southward into the Mid-Atlantic Bight. The southernmost station off of Cape Hatteras was reached by mid-morning on Thursday, 4 November. Shortly after that cruise activities were halted briefly while a crew member was evacuated from the vessel by the Oregon Inlet Coast Guard for medical observation. The weather deteriorated by Friday, 5 November to the point where a station at the mouth of Delaware Bay was skipped due to high seas and strong winds, but work continued on subsequent stations to the north since these were inshore in sheltered waters. By Saturday the vessel had reached the Southern New England region, and continued working there until all stations in that region were completed. On Monday morning, 8 November, the ALBATROSS IV steamed into New York harbor to rendezvous with a launch ferrying out a group of NOAA Corps cadets from the Kings Point Academy. While on board they were given a tour of the vessel by the Captain and officers of the Albatross IV, and observed and participated in sorting the catch from two tows that were made using the Yankee 36 Otter Trawl under the supervision of John Galbraith from the NEFSC Woods Hole Lab. John prefaced their trawl experience with a Powerpoint presentation on Fisheries Survey work. The Ecosystems Monitoring staff conducted a neuston tow and presented the live plankton catch under a microscope for the cadets to observe. All demonstrations were completed during the afternoon to permit the cadets to depart aboard their launch prior to sunset that same day. The Albatross IV left NY harbor that evening and steamed east along the southern shore of Long Island, picking up two remaining inshore stations plus one non-random station, prior to docking at the NMFS lab on Tuesday, 9 November at 0930 hours. After exchanging two scientists and re-fueling in the afternoon, the vessel departed Woods Hole that same day at 1640 EST, heading east via the Great Round Shoal Channel, towards Georges Bank, which was reached the next day. Coverage of Georges Bank was done from west to east, with the vessel zig-zagging between the northern and southern flanks. This continued until Friday, 12 November when winds picked up, forcing the ALBATROSS IV to leave Georges Bank and proceed westward across the Gulf of Maine towards the coast of Massachusetts in order to continue working in more sheltered waters. The vessel continued working as it headed west, picking up stations that were in the middle of the Gulf of Maine, such as Wilkinson Basin, thus avoiding having to return

there later in the cruise. By the time the ALBATROSS IV reached Massachusetts waters, weather conditions had deteriorated to the point where travel between stations was slowed considerably. Once the vessel reached the inshore stations, sampling continued, with the exception of one station located in stratum 37, which was too far offshore to be sampled safely under the prevailing conditions, and was dropped. Another non-random station was added to this stratum later in the cruise, when conditions improved. The ALBATROSS IV continued working in steady 35 knot winds and seas between 9 and 12 feet, proceeding towards the Bay of Fundy, and along the coast of Nova Scotia, until the wind and seas diminished on the morning of Monday, 15 November, allowing the last of the offshore Gulf of Maine stations to be sampled at a faster pace. In addition to the predetermined survey stations, four additional non-random stations were occupied. A CTD cast was made in the Northeast Channel to provide hydrographic data detailing the incursion of Labrador Current Water into the Gulf on Maine. Two bongo casts were made in Wilkinson Basin, Georges Basin and Jordans Basin. The first bongo tow in each basin was made to within 5 meters of the bottom, while the second tow was made to 200 m. These tows were done to assess the difference in zooplankton volumes and composition between the 200 m tows and the tows to within 5 m of the basin bottom. The last area to be sampled was the northeast peak of Georges Bank, which was visited on 17 November. After completing these stations the vessel steamed west across Georges Bank and returned to Woods Hole via the Great Round Shoal Channel. The ALBATROSS IV docked at the NEFSC in Woods Hole at 1500 EST, on 18 November 2004, completing cruise AL0410.

#### DISPOSITION OF SAMPLES AND DATA

All 61 cm bongo plankton samples and data were delivered to the Ecosystems Monitoring Group of the NEFSC, Narragansett, RI, for quality control processing and further analysis. The nitrogen isotope samples were delivered to Rick McKinney at the US EPA Lab in Narragansett, RI. The zooplankton genetics samples taken with the 20 cm bongo sampler were deposited at the Woods Hole Oceanographic Institute. The neuston samples were delivered to William Macy at the URI Graduate School of Oceanography. The CTD data was delivered to the Oceanography Branch of the NEFSC, Woods Hole, MA. Calanus volume information was forwarded to Pat Gerrior and Tim Cole after the cruise.

SCIENTIFIC PERSONNEL

National Marine Fisheries Service, NEFSC, Narragansett, RI

Jerome Prezioso, Chief Scientist

Carolyn Griswold<sup>2</sup>

Joseph Kane

National Marine Fisheries Service, NEFSC, Woods Hole, MA

Maureen Taylor<sup>1</sup>

<sup>1</sup>/Personnel on the first leg 1 - 9 November.

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CAST	STA.	Date (GMT)			TIME (GMT)		LAT	LONG	DEPTH (m)	OPER. B=bongo W=water Z=zoogen N=nitrogen V=vertical cast (CTD only) D=deep tow CO=Calanus observed/vol
		mm	dd	yy	hr	min				
1	1	11	2	2004	5	9	3956.1	7204.8	79	B
2	2	11	2	2004	6	40	3941.5	7200.8	165	B
3	3	11	2	2004	10	6	3946.5	7245.8	64	B
4	4	11	2	2004	11	44	3933.7	7238.7	76	B
5	5	11	2	2004	14	52	3931.1	7320.3	35	B
6	6	11	2	2004	16	48	3913.8	7330.5	46	B,Z1
7	7	11	2	2004	19	49	3903.7	7253.1	89	W
8	7	11	2	2004	19	55	3903.5	7253.1	91	B,N1
9	8	11	2	2004	22	11	3841.8	7304.7	215	B
10	9	11	2	2004	23	22	3844.8	7315.3	77	B
11	10	11	3	2004	1	38	3848.4	7342.6	51	B,Z2
12	11	11	3	2004	5	16	3831.4	7424.4	40	W
13	11	11	3	2004	5	23	3831.4	7424.4	41	B
14	12	11	3	2004	6	26	3823.8	7418.6	40	B
15	13	11	3	2004	8	18	3819.2	7354.7	67	B
16	14	11	3	2004	9	56	3808.6	7344.4	386	B,N2
17	15	11	3	2004	13	47	3753.8	7428.6	55	B
18	16	11	3	2004	17	10	3731.2	7502.4	32	W
19	16	11	3	2004	17	15	3731	7502.4	32	B,Z3
20	17	11	3	2004	20	2	3711.4	7437	90	B
21	18	11	3	2004	22	9	3708.6	7503.7	35	B
22	19	11	3	2004	23	29	3658.8	7508.7	36	B
23	20	11	4	2004	1	1	3653.8	7454.9	39	B,N3
24	21	11	4	2004	4	4	3621.4	7502.3	37	B
25	22	11	4	2004	6	10	3601.4	7454.7	72	W
26	22	11	4	2004	6	16	3601.3	7454.8	74	B,N4
27	23	11	4	2004	10	28	3523.7	7524.8	18	B
28	24	11	4	2004	16	54	3608.7	7538.3	23	W
29	24	11	4	2004	16	59	3608.6	7538.3	22	B,N5,Z4
30	25	11	4	2004	18	18	3616.3	7527.1	31	B
31	26	11	4	2004	21	0	3638.9	7542.9	15	B,N6
32	27	11	4	2004	22	13	3648.9	7537	19	B
33	28	11	5	2004	1	22	3718.6	7529.2	21	B,Z5
34	29	11	5	2004	5	45	3800.9	7510.7	13	W
35	29	11	5	2004	5	51	3800.9	7510.7	11	B

Table 1. (continued) STATION OPERATION REPORT FOR CRUISE AL0405

CAST	STA.	Date (GMT)			TIME (GMT)		LAT	LONG	DEPTH	OPER. B=bongo W=water Z=zoogen N=nitrogen V=vertical cast (CTD only)
		mm	dd	yy	hr	min				

mm dd yy hr min (m) D=deep tow  
CO=Calanus observed/vol

36	30	11	5	2004	13	28	3858.7	7432.9	10	B,N7
37	31	11	5	2004	17	14	3921.4	7416.4	17	W
38	31	11	5	2004	17	23	3921.8	7416.5	15	B
39	32	11	5	2004	19	16	3931.3	7354.7	25	B
40	33	11	5	2004	20	45	3941.3	7346.6	20	B
41	34	11	5	2004	22	21	3948.6	7330.9	32	B
42	35	11	5	2004	23	4	3951.1	7332.6	33	B
43	36	11	6	2004	0	57	4003.6	7344.7	30	B,N8
44	37	11	6	2004	4	43	4011.2	7254.9	49	B
45	38	11	6	2004	7	41	4018.8	7214.7	56	B
46	38	11	6	2004	7	50	4018.9	7214.6	55	W
47	39	11	6	2004	9	40	4023.8	7150.6	67	B
48	40	11	6	2004	12	5	4016.3	7122.9	84	B
49	41	11	6	2004	13	42	4031	7120.7	68	B,N9,Z6
50	42	11	6	2004	15	54	4021.3	7101.4	90	B
51	43	11	6	2004	18	40	4011.2	7100.9	133	B,N10
52	44	11	7	2004	1	22	3956.4	6958.4	290	B,Z7
53	45	11	7	2004	5	27	4016.3	6922.7	78	B
54	46	11	7	2004	6	7	4018.8	6918.9	78	B
55	47	11	7	2004	7	8	4021.2	6909.8	81	B
56	48	11	7	2004	8	17	4031.2	6906.9	75	B
57	49	11	7	2004	11	37	4033.7	6936.4	62	B
58	50	11	7	2004	14	11	4056.1	6939	40	B,Z8
59	51	11	7	2004	17	17	4051.2	7016.5	43	W
60	51	11	7	2004	17	22	4051.2	7016.6	43	B
61	52	11	7	2004	18	33	4051.2	7030.8	53	B
62	53	11	8	2004	0	49	4048.9	7152.5	40	B,Z9
63	54	11	8	2004	2	25	4036.7	7159.5	53	B
64	55	11	8	2004	4	1	4031.6	7216.3	53	B
65	56	11	8	2004	17	24	4031.7	7352.7	11	V
66	57	11	9	2004	2	57	4041.3	7252.7	21	B,Z10
67	58	11	9	2004	7	8	4056.2	7158.9	27	W
68	58	11	9	2004	7	15	4056.2	7158.8	27	B
69	59	11	9	2004	11	29	4113.4	7104.8	35	B
70	60	11	10	2004	1	4	4124.5	6952.1	25	B

Table 1. (continued) STATION OPERATION REPORT FOR CRUISE AL0405

CAST	STA.	Date (GMT)	TIME (GMT)	LAT	LONG	DEPTH	OPER.
		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

71	61	11	10	2004	3	26	4116.1	6930.5	23	B
72	62	11	10	2004	6	55	4146.7	6922.1	172	B, CO/232cc
73	62	11	10	2004	7	27	4146.7	6922.1	173	W
74	63	11	10	2004	11	25	4136.3	6830.6	122	B
75	64	11	10	2004	13	42	4119	6844.4	90	B,Z11
76	65	11	10	2004	15	44	4059.5	6836.6	50	B
77	66	11	10	2004	17	25	4041.2	6838.8	58	W
78	66	11	10	2004	17	52	4040.4	6838.6	63	B
79	67	11	10	2004	21	6	4006.4	6842.6	196	B
80	68	11	10	2004	23	50	4023.7	6821.1	111	B,Z12
81	69	11	11	2004	1	33	4038.2	6813.2	84	B
82	70	11	11	2004	2	31	4046	6809.3	63	B
83	71	11	11	2004	4	19	4050.8	6747.3	67	B
84	72	11	11	2004	6	38	4103.6	6810.6	43	W
85	72	11	11	2004	6	44	4103.5	6810.6	37	B
86	73	11	11	2004	7	42	4106.4	6800.8	50	B
87	74	11	11	2004	9	33	4119	6750.7	38	B
88	75	11	11	2004	10	6	4121.5	6752	43	B
89	76	11	11	2004	11	47	4139.1	6758.6	31	B,N11
90	77	11	11	2004	13	49	4158.4	6805.1	203	B,Z13, CO/137cc
91	78	11	11	2004	16	2	4148.8	6746.5	33	B
92	79	11	11	2004	16	54	4143.7	6738.8	42	W
93	79	11	11	2004	17	0	4143.7	6738.8	39	B
94	80	11	11	2004	19	9	4131	6713.1	51	B,N12
95	81	11	11	2004	21	37	4109	6730.2	53	B
96	82	11	12	2004	0	47	4046.4	6707.5	96	B,N13,Z14
97	83	11	12	2004	1	45	4053.3	6705.1	86	B
98	84	11	12	2004	4	57	4103.9	6624.9	436	B
99	85	11	12	2004	6	24	4106.1	6636.4	85	W
100	85	11	12	2004	6	29	4106.1	6636.4	85	B
101	86	11	12	2004	8	30	4121.1	6650.7	71	B
102	87	11	12	2004	12	56	4208.6	6712.2	94	B,N14,Z15
103	88	11	12	2004	20	2	4213.8	6852.4	195	W
104	88	11	12	2004	20	7	4213.7	6852.4	195	B, CO/396cc
105	89	11	12	2004	21	40	4221.2	6900.6	209	B, CO/60cc

Table 1. (continued) STATION OPERATION REPORT FOR CRUISE AL0405

CAST	STA.	Date (GMT)			TIME (GMT)		LAT	LONG	DEPTH	OPER.
		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

106	90	11	13	2004	1	7	4222.4	6940.2	250	B, D, CO/570cc
107	90	11	13	2004	1	59	4222.5	6940.4	250	B, CO/449cc
108	91	11	13	2004	3	30	4230.6	6948.4	252	V
109	91	11	13	2004	3	53	4230.4	6949	254	B, Z16, CO/507cc
110	92	11	13	2004	6	18	4228.5	7014.3	75	W
111	92	11	13	2004	6	25	4228.5	7014.3	68	B
112	93	11	13	2004	9	4	4221.1	7046.9	25	B, N15
113	94	11	13	2004	15	58	4255.5	7013.4	184	B, CO/591cc
114	95	11	14	2004	0	22	4331.1	7017.1	29	B
115	96	11	14	2004	2	33	4329.1	6951.1	118	B, N16
116	97	11	14	2004	8	1	4348.5	6850.9	62	B
117	98	11	14	2004	12	3	4356.6	6811.2	145	B, N17, CO/143cc
118	99	11	14	2004	17	44	4429	6723.2	55	W
119	99	11	14	2004	17	50	4429	6723.1	55	B
120	100	11	14	2004	23	43	4443.3	6622.8	148	B, CO/380cc
121	101	11	15	2004	4	16	4412.1	6654.4	181	B, CO/158cc
122	102	11	15	2004	7	56	4340.9	6639.1	138	B, CO/132cc
123	102	11	15	2004	8	16	4340.5	6638.3	130	W
124	103	11	15	2004	9	2	4333.4	6638.9	107	B
125	104	11	15	2004	12	7	4331.4	6614.5	52	B,N18
127	105	11	15	2004	17	35	4311.7	6706.5	201	B, CO/312cc
128	106	11	15	2004	20	56	4331.1	6728.7	220	B, CO/180cc
129	106	11	15	2004	21	22	4331.4	6727.9	220	W
130	107	11	15	2004	22	55	4323.8	6742.6	248	B, D, CO/491cc
131	107	11	15	2004	23	44	4323.8	6742.6	247	B, CO/264cc
132	108	11	16	2004	2	37	4316.6	6816.3	189	B, Z17, CO/296cc
133	109	11	16	2004	6	58	4306.7	6915.2	185	W
134	109	11	16	2004	7	5	4306.7	6915.2	172	B, CO/143cc
135	110	11	16	2004	10	21	4248.7	6836.9	193	B, CO/195cc
136	111	11	16	2004	13	54	4253.5	6753.4	211	B,N19,Z18, CO/143cc
137	112	11	16	2004	18	35	4228.3	6706.7	340	B
138	112	11	16	2004	18	56	4228.8	6706.2	342	W
139	113	11	16	2004	19	58	4225.1	6700	361	B, D, CO/280cc
140	113	11	16	2004	20	49	4225	6700	361	B

Table 1. (continued) STATION OPERATION REPORT FOR CRUISE AL0405

CAST	STA.	Date (GMT)	TIME (GMT)	LAT	LONG	DEPTH	OPER.
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B=bongo W=water  
Z=zoogen N=nitrogen  
V=vertical cast (CTD only)

mm dd yy hr min (m) D=deep tow  
CO=Calanus observed/vol

141	114	11	16	2004	22	42	4235.8	6655.2	275	V
142	114	11	16	2004	23	3	4235.4	6655.3	275	B, Z19, CO/143cc
143	115	11	17	2004	1	56	4243.9	6625.2	105	B,Z20
144	116	11	17	2004	6	9	4243.6	6539	100	W
145	116	11	17	2004	6	15	4243.6	6538.8	100	B, CO/121cc
146	117	11	17	2004	8	51	4218.7	6530.6	105	B
147	118	11	17	2004	10	19	4213.7	6545.7	224	V
148	119	11	17	2004	11	35	4215.9	6554.8	228	B, N20, CO/121cc
149	119	11	17	2004	11	59	4216.3	6553.7	227	V
150	120	11	17	2004	13	32	4214.1	6608.1	253	B, CO/454cc
151	120	11	17	2004	14	11	4214.7	6606.5	261	V
152	121	11	17	2004	15	52	4201.9	6612.8	88	B
153	122	11	17	2004	18	5	4156.1	6549.1	175	W
154	122	11	17	2004	18	11	4156.1	6549	177	B
155	123	11	17	2004	21	2	4136.1	6610.8	95	B,N21
156	124	11	17	2004	22	34	4131.2	6626.5	91	B
157	125	11	18	2004	0	5	4138.4	6636.8	66	B
158	126	11	18	2004	1	27	4148.3	6640.7	63	B
159	127	11	18	2004	2	25	4153.5	6648.2	63	B

TOTALS: Bongo Casts = 128 (3 were deep basin tows)  
 Bongo 6B3Z Samples = 128  
 Bongo 6B3I Samples = 127  
 Water Samples = 24  
 CTD Casts = 159  
 Nitrogen samples = 21  
 Zoogen samples = 20  
Calanus observations = 25

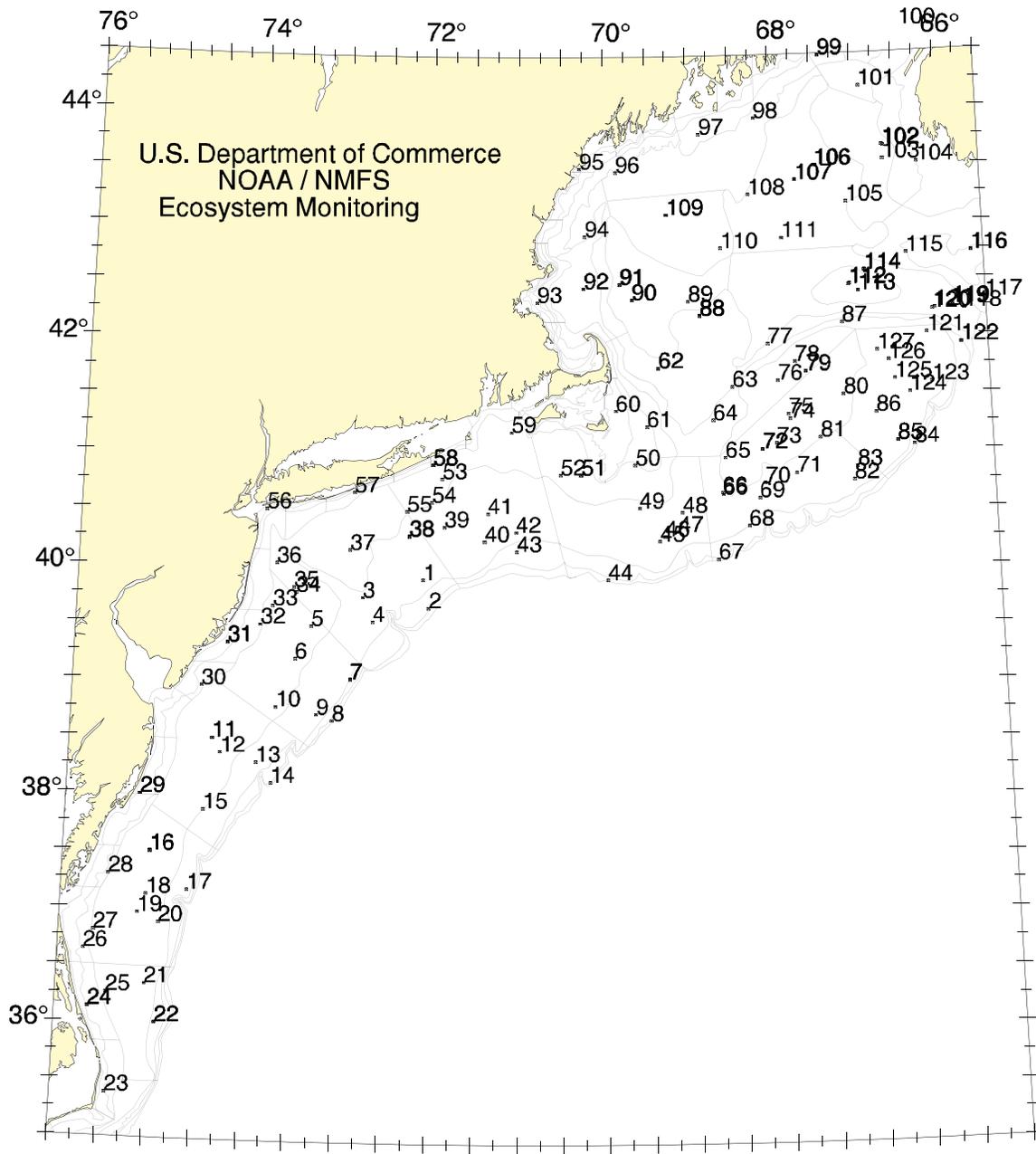


Figure 1. Station locations numbered consecutively for Late Autumn Ecosystems Monitoring

Cruise AL 04-10, 1 - 18 November 2004.