17 November 2003

CRUISE RESULTS
NOAA Fisheries Research Vessel ALBATROSS IV
Cruise No. AL 03-06
Ecosystems Monitoring Survey

CRUISE PERIOD AND AREA

The cruise period was 3-12 November 2003. The NOAA fisheries research vessel ALBATROSS IV covered the southern New England and Georges Bank regions (Figure 1) for the Late Fall 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 southern New England and Georges Bank 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 the bottom.
- collection of samples at pre-determined, non-random positions for comparison with previous years (LOOPS program).
- 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.

METHODS

The survey consisted of 60 randomly distributed stations at which the vessel stopped to lower instruments over the side. An additional non-random station was added in the Georges Bank area to improve

coverage of a portion of the southern flank. A non-random station was added to the Northeast Channel at which a CTD cast was made to document characteristics of the Gulf of Maine outbound water column, and 7 stations were sampled in the Gulf of Maine region, giving a total of 69 stations sampled.
Key parameters measured included water column temperature, salinity, ichthyoplankton and zooplankton composition, abundance and distribution, and along-track chlorophyll-a fluorescence.

A double oblique tow using the 61-centimeter Bongo sampler and a Seabird CTD was made at 66 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 Gulf of Maine deep basin stations, additional tows to below 200 meters were made immediately after the 200 meter tows, with the ship returning to the same position that the 200 meter tow had started at. These special tows brought the sampling nets to within 5 meters of the bottom for comparison of the zooplankton volume and composition between the 200 meter and deeper tows in the same area. In addition, two stations had bongo tows made at fixed, non-random positions (as per the LOOPS program) to compare zooplankton volumes and composition with those from previous years. The towing protocol for these LOOPS stations was the same as on the randomly selected ecosystems monitoring stations. 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 percent 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.

Eight phytoplankton samples for nitrogen-stable isotope ratio analysis were collected from the discharge water of the near-surface flow-through system. Samples of one thousand 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.

Zooplankton genetics samples were collected at five randomly selected stations within each of the 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.

After the cruise stations with large amounts of Calanus finmarchicus were measured for settled volumes and the data forwarded to Pat Gerrior, the Regional Right Whale Sighting Coordinator.

Continuous monitoring of the seawater salinity, and chlorophyll-a level, was done at a depth of 3.7 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 1030 hours EST on Monday 3 November from the NEFSC, Woods Hole Massachusetts. Weather condition were favorable with clear sunny skies and light winds. The vessel transited through the Great Round Shoal Channel to begin survey operations in the eastern portion of the southern New England region and arrived at the first station at 1300 hours. It was decided to take advantage of the good weather and sample the offshore stations first. The ALBATROSS IV worked its way along the outer shelf in a southwesterly direction, then looped back, heading northeast, to pick up the mid-shelf and inshore samples of the southern New England region

On 6 November sampling of the southern New England region was completed and the vessel crossed the Great South Channel to commence operations in the Georges Bank region. After completion of three Georges Bank stations, a call was received for one of the crewmen to return home to attend to a family emergency. Accordingly, the vessel changed course, and headed on a northwesterly course, picking up 4 more Georges Bank stations prior to returning to Woods Hole. The ALBATROSS IV docked in Woods Hole at 1400 hours on 7 November and remained at the dock until 1600 hours on 8 November 2003. This time in port allowed for the procurement of a replacement crew-member, and time for another crewman to have a medical appointment. In addition it allowed time for the passage of a front with strong gusty winds so that when the vessel sailed at 1600 EST on 8 November it was headed into diminishing, rather than growing, seas. In spite of this, the seas were still so large that the vessel was forced to tack to avoid excessive rolling on an easterly course for returning to Georges Bank. A full lunar eclipse was observed at 2000 hours EST while enroute to Georges Bank. Sampling commenced on 9 November 2003. Moderating weather allowed for improved progress, so that Georges Bank sampling was completed early on 11 November. With insufficient time remaining for the vessel to attempt adequate coverage of the Gulf of Maine area, a decision was made to do comparative bongo tows in several Gulf of Maine basins to test the hypothesis that standard 200 meter depth Ecosystem Monitoring bongo tows miss a significant portion of the Calanus finmarchicus population in these deep areas. Accordingly, comparative tows were made in the Georges, Franklin, Rodgers and Wilkinson Basins, following the protocol outlined in the Methods section. Examination of the samples at sea revealed a dramatic difference in the amount of Calanus finmarchicus between the 200 m and 354 m tows in Georges Basin, while comparative tows in the other basins showed very little difference. Post-cruise settled volumes of these tows are reported in Table 1.

The forecast of another weather system with storm force winds in the 40-50+ knot range led to a decision to end the cruise early. After the completion of four comparative deep basin stations, the ALBATROSS IV returned to Woods Hole, picking up two stations labeled LOOPS 1 and 2 on Stellwagen Bank and outside of Boston Harbor, for comparison with samples taken in previous years at these sites. After

completion of these stations, the vessel proceeded through the Cape Cod Bay and Canal to dock in Woods Hole at the NEFSC dock at 1130 hours EST on Wednesday, 12 November 2003, completing cruise AL0306.

DISPOSITION OF SAMPLES AND DATA

All samples and data, except for the nitrogen isotope samples, the zooplankton genetics samples and the Seabird CTD data, were delivered to the Ecosystems Monitoring Group of the NEFSC, Narragansett, RI, for quality control processing and further analysis. The nitrogen and carbon isotope samples were delivered to Rick McKinney at the US EPA Lab in Narragansett, RI. The zooplankton genetics samples were deposited at the Woods Hole Oceanographic Institute. The CTD data was delivered to the Oceanography Branch of the NEFSC, Woods Hole, MA. Copies of the CTD logs and electronic data header files were retained by the Ecosystems Monitoring Group in Narragansett. Calanus volume information was forwarded to Pat Gerrior after the cruise

SCIENTIFIC PERSONNEL

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Table 1. STATION OPERATION REPORT FOR CRUISE AL0306

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
1	1	11	3	2003	18	6	4112.2	7038.6	29	B, N1
2	2	11	3	2003	20	5	4100.1	7016.6	36	W
3	2	11	3	2003	20	11	4100.1	7016.6	35	B
4	3	11	4	2003	00	58	4015.2	7052.4	119	B
5	4	11	4	2003	3	16	4006.4	7120.3	95	B
6	5	11	4	2003	4	28	3957.6	7130.1	123	B, N2
7	6	11	4	2003	6	29	4012.0	7144.5	78	W
8	6	11	4	2003	6	33	4012.1	7144.4	78	B
9	7	11	4	2003	9	10	3953.5	7210.9	82	B
10	8	11	4	2003	11	20	3934.8	7218.5	111	B, Z1
11	9	11	4	2003	13	4	3921.2	7219.7	162	B, N3, Z2
12	10	11	4	2003	17	55	3945.4	7308.0	47	W
13	10	11	4	2003	18	4	3945.4	7308.0	47	B
14	11	11	4	2003	20	24	4006.8	7323.9	42	B, N4
15	12	11	4	2003	22	24	4016.9	7308.9	38	B
16	13	11	5	2003	00	50	4004.7	7247.1	53	B
17	14	11	5	2003	1	52	3959.0	7238.7	57	B
18	15	11	5	2003	3	11	4005.4	7228.3	60	B
19	16	11	5	2003	5	18	4016.7	7209.8	61	W
20	16	11	5	2003	5	25	4016.5	7209.7	61	B
21	17	11	5	2003	6	50	4021.1	7225.1	52	B
22	18	11	5	2003	8	7	4031.0	7218.1	51	B
23	19	11	5	2003	9	22	4040.5	7213.1	46	B
24	20	11	5	2003	13	9	4037.9	7125.0	62	B, Z3
25	21	11	5	2003	14	50	4044.5	7106.8	59	B, Z4
26	22	11	5	2003	17	5	4054.2	7040.9	51	W
27	22	11	5	2003	17	12	4054.2	7041.1	53	B
28	23	11	5	2003	21	52	4059.0	6945.5	39	B
29	24	11	5	2003	23	0	4104.8	6936.8	42	B, Z5
30	25	11	6	2003	2	19	4037.2	6955.9	56	B
31	25	11	6	2003	2	46	4037.1	6955.9	56	V
32	26	11	6	2003	4	22	4022.2	6948.9	75	B
33	27	11	6	2003	6	16	4004.6	6939.8	105	W
34	27	11	6	2003	6	23	4004.6	6939.9	106	B
35	28	11	6	2003	9	34	4033.2	6921.6	56	B
36	29	11	6	2003	12	10	4051.3	6854.4	69	B
37	30	11	6	2003	14	39	4028.4	6855.5	75	B
38	31	11	6	2003	15	30	4030.2	6845.5	71	B, Z6
39	32	11	6	2003	16	50	4018.8	6838.7	100	W
40	32	11	6	2003	16	58	4018.9	6838.7	100	B

Table 1. STATION OPERATION REPORT FOR CRUISE AL0306 (continued)

CAST	STA.	Date(GMT) mm	dd	yy	TIME(GMT) hr	min	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
41	33	11	6	2003	20	10	4018.5	6756.2	233	B
42	33	11	6	2003	20	32	4018.4	6755.4	244	V
43	34	11	6	2003	22	43	4025.2	6728.3	220	B
44	34	11	6	2003	23	9	4025.0	6727.4	250	V
45	35	11	7	2003	00	54	4041.9	6730.3	89	B, Z7
46	36	11	7	2003	2	40	4045.7	6751.8	67	B, N5
47	37	11	7	2003	4	14	4051.7	6808.7	56	B
48	38	11	7	2003	8	2	4124.0	6814.2	48	W
49	38	11	7	2003	8	8	4124.1	6814.1	47	B, N6
50	39	11	9	2003	14	4	4126.6	6734.2	40	B
51	40	11	9	2003	15	38	4113.5	6734.4	42	B
52	41	11	9	2003	17	15	4057.9	6731.5	69	W
53	41	11	9	2003	17	24	4058.0	6731.3	70	B
54	42	11	9	2003	18	54	4107.7	6719.2	59	B
55	43	11	9	2003	21	59	4041.9	6651.9	198	B
56	44	11	10	2003	1	34	4112.3	6705.9	62	B
57	45	11	10	2003	3	2	4126.2	6712.5	50	B, Z8
58	46	11	10	2003	4	56	4144.5	6712.5	55	W
59	46	11	10	2003	5	2	4144.5	6712.2	56	B
60	47	11	10	2003	5	50	4145.1	6701.6	61	B
61	48	11	10	2003	7	19	4130.6	6649.5	69	B
62	49	11	10	2003	8	35	4119.9	6639.0	82	B, N7
63	50	11	10	2003	9	34	4126.4	6635.4	86	B
64	51	11	10	2003	12	15	4131.2	6601.4	128	B
65	52	11	10	2003	12	58	4134.9	6558.8	123	B
66	53	11	10	2003	15	27	4156.2	6615.2	79	B, Z9
67	54	11	10	2003	16	37	4202.4	6602.2	97	B
68	55	11	10	2003	17	53	4209.8	6555.8	227	W
69	56	11	10	2003	18	49	4217.2	6554.0	229	V
70	57	11	10	2003	20	53	4207.0	6615.8	102	B
71	58	11	10	2003	22	49	4209.7	6637.4	167	B, Z10
72	59	11	11	2003	1	9	4224.4	6659.6	360	B
73	59	11	11	2003	1	50	4224.4	6659.5	360	B, Z11, D, CO 581cc
74	60	11	11	2003	5	7	4156.9	6713.7	58	W
75	60	11	11	2003	5	13	4157.1	6713.5	58	B
76	61	11	11	2003	7	6	4153.1	6731.4	41	B
77	62	11	11	2003	8	58	4209.8	6731.6	188	B, CO 211cc
78	63	11	11	2003	10	55	4159.0	6745.8	67	B
79	64	11	11	2003	13	31	4136.9	6745.5	38	B, N8
80	65	11	11	2003	16	28	4210.8	6753.7	239	B, CO 264cc

Table 1. STATION OPERATION REPORT FOR CRUISE AL0306 (continued)

CAST	STA.	Date(GMT) mm	dd	yy	TIME(GMT) hr	min	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
81	65	11	11	2003	17	14	4210.9	6753.7	244	B, Z12, D, CO 317cc
82	66	11	11	2003	21	42	4220.2	6852.1	214	V
83	67	11	12	2003	00	23	4230.0	6925.5	263	B, CO 634cc
84	67	11	12	2003	1	11	4230.0	6925.5	263	B, Z13, D, CO 686cc
85	68	11	12	2003	2	31	4230.3	6938.9	247	B, CO 634cc
86	68	11	12	2003	3	19	4230.3	6938.9	247	B, Z14, D, CO 792cc
87	69	11	12	2003	6	36	4223.0	7021.8	30	W
88	69	11	12	2003	6	44	4223.1	7021.8	30	B, Z15
89	70	11	12	2003	7	55	4215.5	7030.8	67	B

TOTALS:
Bongo Casts = 71(of these 4 were deep basin tows)
Bongo 6B3Z Samples = 71
Bongo 6B3I Samples = 71
Water Samples = 14
CTD Casts = 89
Nitrogen samples = 8
Zoogen samples = 15
Calanus observations = 8

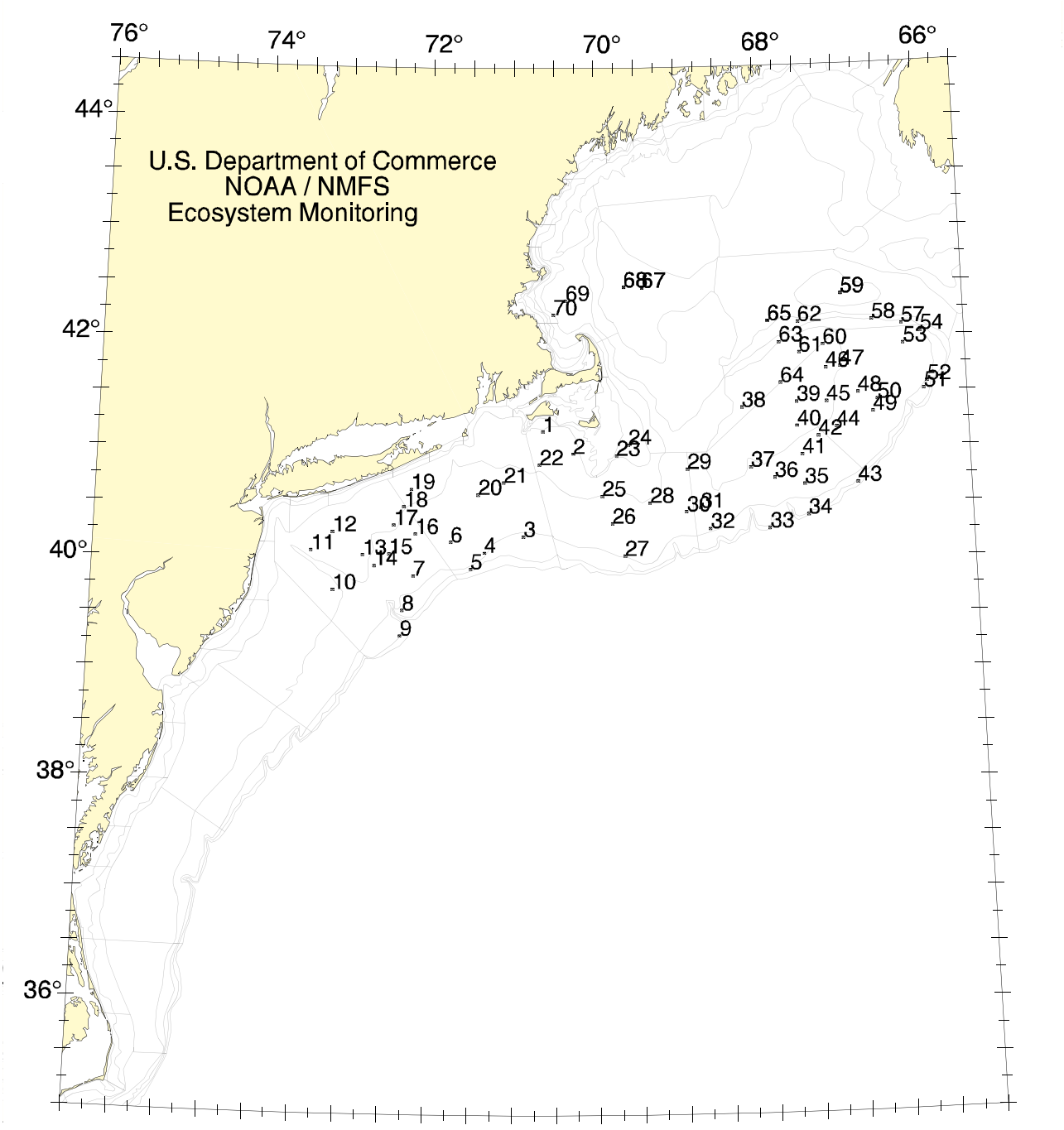

Figure 1. Station locations numbered consecutively for Late Autumn Ecosystems Monitoring Cruise AL 03-06, 3 - 12 November 2003.