Oceanography Branch Cruise Report
Late Summer Ecosystem Monitoring
Survey/EPA National Coastal
Assessment Survey - AL0607

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CRUISE RESULTS
NOAA Fisheries Research Vessel ALBATROSS IV
Cruise No. AL 06-07
Late Summer Ecosystem Monitoring Survey/EPA National Coastal Assessment Survey

CRUISE PERIOD AND AREA

The cruise period was 15 to 30 August 2006. The NOAA fisheries research vessel ALBATROSS IV sampled a total of 138 stations located in the mid-Atlantic Bight, southern New England, Georges Bank and Gulf of Maine areas.

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. A secondary objective of this cruise was to extend sampling for the EPA National Coastal Assessment (NCA) Program beyond coastal waters offshore onto the continental shelf.
Key parameters measured for the Ecosystem Monitoring Program included water column temperature, salinity, and chlorophyll-a fluorescence, and ichthyoplankton and zooplankton composition, abundance and distribution. Key parameters measured for the EPA/NCA Program included concentrations of organics, metals, and total organic content, benthic infaunal assemblages in sediments, and nutrient levels, chlorophyll-a and total suspended solids in the water column.

Other secondary objectives of this cruise involved the following:

- Test and compare a new Video Plankton Recorder (VPR) with catches from a Bongo net sampler.
- Make plankton tows and CTD casts at 3 deep basin stations in the Gulf of Maine and the Northeast Channel to provide data detailing the incursion of Labrador Current water into the Gulf of Maine.
- Sampling at the site of a proposed Liquefied Natural Gas (LNG) terminal east of Boston Harbor, to collect baseline plankton, hydrographic and benthic data.
- Collection of samples for zooplankton genetics (genome) studies.
- Examination of plankton samples for concentrations of Calanus finmarchicus to correlate with right whale sightings.

- Deployment of a drifter buoy to provide current movement and sea surface data for a NOAA Drifter Buoy database and website.
- Sampling for the pennate diatom *Pseudo-nitzschia australi,* for the Harmful Algal Bloom Monitoring Project of the Woods Hole Oceanographic Institute.
- Collection of zooplankton samples for a comparison of stable nitrogen isotopes between zooplankton and right whale baleen samples.
- Neuston tows to collect lobster larvae from the southern and northern Gulf of Maine
- Collection of microbial genetics samples from U.S. waters in the Gulf of Maine and Georges Bank for the J. Craig Venter Institute.

METHODS

The survey consisted of 138 stations at which the vessel stopped to lower instruments over the side (Figure 1). One hundred twenty randomly stratified stations were planned for the cruise, with 30 in each of four regions mid-Atlantic Bight, Southern New England, Georges Bank, and the Gulf of Maine. Four additional non-random stations were completed in the Georges, Jordan and Wilkinson basins and the Northeast Channel in the Gulf of Maine to document the incursion of Labrador Current water. A fifth non-random station east of Boston Harbor provided baseline environmental data at the site of a proposed offshore LNG terminal. Three additional non-random stations were added in the Gulf of Maine to improve coverage of that area. Ten additional non-random stations were sited in offshore stratum 74 in the offshore northern portion of the mid-Atlantic bight.

Double oblique tows using the 61-cm Bongo sampler and a Seabird CTD with a fluorometer were made at 138 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. These flowmeters were calibrated at the end of the cruise by towing the Bongo frame with the nets attached but the cod ends open for 5 minutes at 1.5 knots. Three runs were made (Table 2). After each run, the flowmeters were read, the nets rinsed off to prevent clogging, and the distance towed noted on the bridge, using the Global Positioning System (GPS). 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 large sampling nets, and when a 20 cm bongo frame was deployed, it was carried forward to the sheltered work area so 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. CTD casts below 200 m were made in the Wilkinson, Jordan, and Georges Basins.

A Video Plankton Recorder (VPR) was used in stratum 74 after receiving salinity data from 3 Rutgers University autonomous gliders. This data provided a means of defining the shelf-slope boundary in this area. After determining the position of the boundary, 10 Video Plankton Recorder (VPR)/bongo comparison tows were made: five on the shelf-water side (low salinity) and five on the slope-water side (high salinity) of the boundary. The bongo net sampling array was attached to the towing wire approximately one meter above the VPR by means of a PMI single-grip termination for 0.322 inch diameter wire (Figure 2).

Zooplankton genetics (zoogen) samples were collected at five randomly designated stations in each of the four regions, (and an extra one in the Gulf of Maine) yielding a total of 21 samples. 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 m above the Seabird CTD with a wire stop. This sampling apparatus was also used to collect 3 samples for WHOI researcher Nadine Lysiak. These samples were frozen for shore-side analysis of carbon, nitrogen, oxygen and hydrogen stable isotope ratios to correlate with the ratios of these same elements within right whale baleen tissue.

A 0.5 m x 1 m neuston frame equipped with a 505 micron mesh net was towed at 4 stations, 3 located in the Gulf of Maine and 1 in the eastern part of the southern New England area. Tows were made at a speed of 1.5 knots for 10 minutes and samples were preserved in 5% formalin. These samples were used to locate concentrations of lobster larvae. They were originally planned to be preserved in 95% ethanol, but large quantities of floating algae were captured, so formalin was used instead to ensure adequate preservation.

Microbial genetics samples were collected at 4 stations within U.S. territorial waters, 2 in the Gulf of Maine and 2 on Georges Bank. These samples were collected by pumping up 200 liters of surface water with a ship's electric de-watering pump, passing it through a 25 micron pre-filter and storing it in a 240 liter container on deck. Water was then pumped from this container into the wet lab using a peristaltic pump and size-fractionated by filtering through membrane filters of increasingly fine mesh: 3 microns, 0.8 microns and 0.1 microns (Figure 6). Viruses were concentrated from the 0.1 micron filtrate by tangential flow filtration. The filtered microbial and viral components were frozen in liquid nitrogen for analysis by high throughput DNA sequencing and whole genome shotgun assembly techniques ashore at the Venter Institute. This work is part of a larger program to evaluate marine microbial biodiversity throughout the world's oceans (www.sorcerer2expedition.org).

Near-surface along-track chlorophyll-a fluorescence, water temperature and salinity were measured while underway with the vessel's flow-through sampling system.

Water taken from the flow-through sampling system was also filtered through a 15 micron mesh sieve to test for the presence of the pennate diatom *Pseudo-nitzschia australis*. Nineteen of these samples were collected and kept refrigerated for analysis ashore.

A drifter buoy equipped with a thermistor and GPS unit was deployed in the Northeast Channel as part of the NOAA Adopt-a-Drifter Program (Figure 4). This program is designed to provide teachers an

opportunity for incorporating marine environmental data into their curriculum. NOAA Teachers-at-Sea volunteering on NOAA cruises are able to deploy these buoys, and then have their students track their movement from a website. The buoys in this program are equipped with a sub-surface drogue, and a float housing a thermistor to record surface water temperature, a transmitter for relaying their position and temperature data, and a battery pack to power the unit for approximately 400 days.

The EPA sampled at every fifth station, depending on time constraints and/or conditions, for a total of 28 sites (see Table 1). The sequence of events on the NOAA/EPA stations was to do a standard Ecosystem Monitoring bongo tow first, then use the power boom to do a bottle cast involving two 5-liter Niskin bottles, one just above the CTD unit (which was lowered to 5 meters above the bottom) and a second at a mid-water depth. A near-surface water sample was collected simultaneously from the salt-water hose. The bongo nets were washed down and the plankton samples removed and preserved in 5% formalin during the water cast. The water samples from all three depths of the bottle cast were filtered using low vacuum pressure, through 47mm diameter Whatman GFF filters which were subsequently frozen for shore-side analysis of total suspended solids, chlorophyll a, and dissolved and particulate forms of nitrogen and phosphorus. After completion of the bottle cast, a single-bucket Van Veen Grab was deployed from the starboard side of the vessel, using the J-frame (Figure 5). The grab was deployed and retrieved twice to provide two samples for separate analyses. One sample had the top 2 cm of sediment removed, homogenized and refrigerated for shore-side analysis to detect PCB's, PAH's, pesticides, trace and major elements, organic carbon content and grain size determination. The entire contents of the second grab sample were removed, sieved through a 0.5 mm sieve and preserved in Rose Bengal 10% formalin for benthic infaunal analysis ashore.

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 noon to midnight watch using a 1.7 liter Niskin bottle taking a water sample from an isohaline portion of the water column. Calibration of the CTD salinities and chlorophyll from the surface flow-through system was undertaken on the midnight to noon 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 on Tuesday, 15 August 2006, after being delayed for 24 hours to allow the galley department to pass a NOAA Fleet Inspection. The vessel sailed southwest and started working in the southern New England area, then proceeded south along the offshore part of the Middle Atlantic Bight. At every fifth random station, EPA sampling was conducted. While off the coast of New Jersey a video plankton recorder (VPR) was deployed at ten stations in offshore stratum 74, for the shelf-water/slope water bongo/VPR comparison study. After completion of

this study, the vessel continued south along the offshore part of the Mid-Atlantic Bight, then back north picking up the inshore stations. After completing all Mid-Atlantic and all but 2 of the easternmost Southern New England stations, the ALBATROSS IV returned to Woods Hole at 1500 hours Tuesday 22 August. After exchanging some scientific personnel and taking on additional fuel, the vessel returned to sea on the following day, Wednesday, 23 August at 1100 hours. The ALBATROSS resumed operations in the Gulf of Maine after proceeding through the Great Round Shoal Channel. In addition to bongo net sampling, a ten minute neuston tow was made at each of the first three Gulf of Maine stations, using a 0.5 m x 1 m neuston frame equipped with a 505 micron mesh net to locate distributions of lobster larvae for NEFSC researcher Alicia Long. The vessel then turned south to complete sampling at the remaining 2 southern New England stations before proceeding east onto Georges Bank. Three stations that were in close proximity to Closed Area 1 were sampled for zooplankton with a 20 cm bongo net array simultaneously with the 61 cm bongo net sampler. These smaller nets yielded zooplankton samples for stable isotope analysis ashore by WHOI researcher Nadine Lysiak. Excellent weather, with calm winds and virtually no seas, allowed work to progress quickly, despite the addition of the 10 VPR stations, and the fact that EPA stations required 2 deployments of the Van Veen Grab.

Work was conducted across Georges Bank in an easterly direction for the next three days, with the vessel crossing the Hague Line on August 26. On August 27, as the ALBATROSS IV reached the Northeast Channel station, the NOAA GPS-equipped drifter buoy was deployed by two teachers, one from the NOAA Teacher-at Sea program and one from the University of Rhode Island ARMADA program. Karen Meyers, from the Garrison Forest School in Owings Mills, MD, and Tamara Browning, from the Tenafly Middle School in Tenafly, NJ put their schools' names on the buoys and deployed it over the port side of the vessel shortly after dawn, approximately 75 nautical miles west of Cape Sable, NS. The buoy, whose World Meteorological Organization (WMO; # 44843), can be tracked online at: http://osmc.noaa.gov/OSMC/adopt_a_drifter.html.

After launching the buoy the ALBATROSS IV worked its way across the Gulf of Maine, from east to west. Three non-random stations were added to the cruise track to fill in areal gaps when it became apparent that the vessel was ahead of schedule to the exceptional weather. When the vessel reached the LNG position, sampling was done just slightly to the west of where it had been on previous cruises. This permitted bottom sampling in an area free of explosives. The new LNG sampling site was at 4225.008 N 70 36.800 W.

The last station of the cruise was in Cape Cod Bay, and was completed on the morning of 30 August 2006. Immediately after sampling was completed the flowmeters that had been used in the 61 cm bongo samplers for every tow were calibrated. This procedure went very smoothly in Cape Cod Bay, where the conditions were flat calm, however the calibration factors obtained were approximately double what they had been on a previous Ecosystem Monitoring cruise in June, (see Table 2) or in a tow tank. This procedure will be re-evaluated on a subsequent cruise.

After completing flowmeter calibrations, the ALBATROSS IV returned to Woods Hole via the Cape Cod Canal. The vessel docked at the NMFS pier in Woods Hole at 1630 EDT on Wednesday, 30 August 2006, having fully completed all objectives of the Late Summer Ecosystem Monitoring Cruise AL0607.

DISPOSITION OF SAMPLES AND DATA

All the 61 cm bongo plankton samples and data were delivered to the Ecosystem Monitoring Group of the NEFSC, Narragansett, RI, for quality control processing and further analysis. The zooplankton

genetics samples and harmful algal bloom samples were taken from the vessel by David Kulis of the Woods Hole Oceanographic Institute. The EPA samples, gear and data were taken to the US Environmental Protection Agency, Atlantic Ecology Division, located in Narragansett, Rhode Island by Don Cobb and Tracy Jamula. The CTD data were delivered to the Oceanography Branch of the NEFSC, Woods Hole, MA for analysis. Copies of the CTD logs were retained by the Ecosystems Monitoring Group in Narragansett. The CTD and Flow Through System salinity samples were taken to Narragansett for processing. Calanus volume information was forwarded to Tim Cole after the cruise report was completed. Microbial genetics samples, data and equipment were sent to the J. Craig Venter Institute by Karla Heidelberg. Nadine Lysiak from WHOI took the zooplankton stable isotope samples from the vessel. Alicia Long from the NEFSC took the neuston samples from the vessel.

SCIENTIFIC PERSONNEL

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Table 1. STATION OPERATION REPORT FOR CRUISE AL0607

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

		mm	dd	yy	hr	min			m	B=bongo W=water Z=zoogen E=EPA V=vertical cast (CTD only) MG=microbial genetics NEU=neuston CO=Calanus observed/vol
1	1	8	15	2006	23	25	4108.7	7057	28	B
2	2	8	16	2006	0	40	4111.1	7114.1	47	B
3	3	8	16	2006	2	50	4106	7138.7	30	B
4	4	8	16	2006	5	21	4044	7149.9	53	W
5	4	8	16	2006	5	33	4044.2	7150.2	53	B
6	5	8	16	2006	6	33	4039.6	7142.9	66	B
7	5	8	16	2006	6	49	4039.3	7142.7	66	W, E1
8	6	8	16	2006	8	48	4031	7130.2	69	B
9	7	8	16	2006	9	40	4031.4	7121.5	67	B
10	8	8	16	2006	12	1	4011.5	7131.1	85	B, CO/456cc
11	9	8	16	2006	14	18	4011.2	7158.7	66	B, Z1, CO/333cc
12	10	8	16	2006	15	18	4003.3	7152.9	80	B
13	10	8	16	2006	15	30	4003.3	7152.9	79	W, E2
14	11	8	16	2006	20	40	3921.6	7222.9	139	B
15	12	8	16	2006	23	31	3901.6	7248.4	118	B
16	12	8	16	2006	23	55	3901.7	7247.5	170	W
17	13	8	17	2006	2	44	3838.9	7312.8	125	B, CO/494cc
18	14	8	17	2006	4	42	3841.3	7335	62	B, Z2, CO/407cc
19	15	8	17	2006	6	58	3903.9	7332.7	52	B, E3
21	26	8	17	2006	23	59	3823.2	7352.6	66	B
22	27	8	18	2006	2	24	3758.4	7356.6	195	B
23	28	8	18	2006	5	56	3738.7	7432.9	59	B, Z3
24	29	8	18	2006	9	5	3711.2	7456.2	41	B, Z4
25	30	8	18	2006	12	7	3648.5	7520.8	24	B
26	30	8	18	2006	12	23	3648.3	7520.6	24	W, E4
27	31	8	18	2006	13	31	3641	7524.5	25	B
28	32	8	18	2006	17	1	3606.2	7512.8	32	B
29	33	8	18	2006	17	48	3558.9	7512.6	32	B
30	34	8	18	2006	20	11	3544.4	7450.6	128	B
31	35	8	18	2006	23	30	3523.9	7519.9	24	B
32	35	8	18	2006	23	45	3523.9	7519.8	24	W, E5
33	36	8	19	2006	5	28	3618.6	7534.8	24	B, Z5
34	37	8	19	2006	8	22	3646	7546.3	18	B
35	38	8	19	2006	12	2	3718.7	7532.6	16	B
36	39	8	19	2006	13	35	3718.8	7514.6	25	B, Z6
37	40	8	19	2006	16	39	3746	7457.1	26	B
38	40	8	19	2006	16	51	3745.9	7456.8	27	W, E6
39	40	8	19	2006	16	59	3745.8	7456.9	27	W
40	41	8	19	2006	19	58	3814.7	7505.5	15	B
41	42	8	19	2006	22	2	3823.4	7445.1	29	B
42	43	8	19	2006	23	7	3831	7450.9	22	B
43	44	8	20	2006	0	22	3838.6	7442.7	26	B
44	45	8	20	2006	1	47	3848.9	7434.4	22	B
45	45	8	20	2006	1	59	3848.7	7434.6	21	W, E7
46	46	8	20	2006	4	24	3848.7	7404.8	44	B

Table 1. (cont.) STATION OPERATION REPORT FOR CRUISE AL0607

CAST	STA.	Date(GMT)			TIME(GMT)		LAT	LONG	DEPTH	OPERATION
		mm	dd	yy	hr	min			m	B=bongo W=water Z=zoogen E=EPA V=vertical cast (CTD only) CO=Calanus observed/vol NEU=neuston NL=Nadine Lysiak
47	47	8	20	2006	7	36	3918.7	7417.1	19	B
48	47	8	20	2006	7	55	3918.3	7417.6	18	B
49	48	8	20	2006	10	18	3913.5	7349.1	37	B
50	49	8	20	2006	11	20	3921.3	7345.2	36	B
51	50	8	20	2006	13	49	3943.9	7336.9	34	B
52	50	8	20	2006	14	8	3943.8	7337.2	34	W, E8
53	51	8	20	2006	16	49	3956.2	7402.5	19	B
54	52	8	20	2006	20	42	4023.1	7327.2	27	B, Z 7
55	53	8	20	2006	23	4	4001.3	7323.4	73	B
56	53	8	20	2006	23	21	4001.1	7324.1	76	V
57	54	8	20	2006	23	49	3959.2	7322.5	64	B, CO/487cc
58	55	8	21	2006	2	0	3951.2	7258.4	72	B
59	55	8	21	2006	2	16	3951.4	7258.6	72	W, E9
60	56	8	21	2006	3	10	3954.2	7253	52	B
61	57	8	21	2006	6	39	4028.5	7241.1	44	B
62	58	8	21	2006	7	37	4034.4	7233.2	41	B
63	59	8	21	2006	15	8	4013.7	7059	120	B, Z 8
64	60	8	21	2006	18	10	4036.2	7035.1	63	B, E10
65	60	8	21	2006	18	20	4036.5	7035.1	63	W
66	60	8	21	2006	18	28	4036.5	7035.1	63	W
67	61	8	21	2006	20	49	4041.5	7017.3	48	B
68	62	8	21	2006	22	54	4039.2	6953.2	53	B, CO/252cc
69	63	8	22	2006	1	41	4013.9	6941.1	81	B, CO/308cc
70	64	8	22	2006	3	32	3958.9	6932.9	139	B, Z 9
71	65	8	22	2006	7	2	4028.8	6915	72	B
72	65	8	22	2006	7	22	4029	6915.4	71	W, E11
73	66	8	22	2006	9	21	4039	6933.2	48	B, Z 10
74	67	8	22	2006	11	34	4054.4	6957.1	21	B
75	68	8	22	2006	13	24	4106.1	7013	25	B
76	69	8	23	2006	22	23	4153.8	6956.4	19	B, NEU1
77	70	8	24	2006	0	10	4153.8	6936.5	198	B, CO/568cc, NEU2
78	70	8	24	2006	0	58	4153.8	6935	203	W, E12
79	71	8	24	2006	3	21	4150.9	6920.8	193	B, CO/605cc, NEU3
80	72	8	24	2006	7	19	4156.3	6835.1	167	B, Z 11
81	73	8	24	2006	11	51	4111.1	6828.9	55	B, NL1
82	74	8	24	2006	12	34	4106.7	6825.8	50	B, NL2
83	75	8	24	2006	15	37	4051.4	6858.5	71	B, NL3
84	75	8	24	2006	15	54	4051.4	6858.7	78	W, E13
85	76	8	24	2006	18	0	4036.5	6854.8	67	B, CO/364cc
86	77	8	24	2006	19	45	4028.8	6832.5	88	B, CO/357cc
87	78	8	24	2006	21	38	4021.3	6812	146	B
88	79	8	24	2006	23	49	4041.1	6812.6	76	B
89	80	8	25	2006	0	44	4049.0	6813.3	52	B

Table 1. (cont.) STATION OPERATION REPORT FOR CRUISE AL0607

CAST	STA.	Date(GMT)			TIME(GMT)		LAT	LONG	DEPTH	OPERATION
		mm	dd	yy	hr	min			m	B=bongo W=water Z=zoogen E=EPA V=vertical cast (CTD only) CO=Calanus observed/vol MG=microbial genetics
90	80	8	25	2006	0	57	4049	6813.1	48	W, E14, MG1
91	81	8	25	2006	3	16	4101.1	6751.2	50	B
92	82	8	25	2006	3	54	4103.7	6744.8	53	B
93	83	8	25	2006	6	4	4041.5	6748.6	79	B
94	84	8	25	2006	8	36	4043.9	6717.9	95	B
95	85	8	25	2006	9	14	4046.1	6712.9	95	B
96	85	8	25	2006	9	32	4046.2	6712.7	95	W, E15
97	86	8	25	2006	11	17	4034.2	6704.5	238	B, Z12
98	86	8	25	2006	11	49	4034.7	6704	244	V
99	87	8	25	2006	13	53	4053.5	6700.9	87	B
100	88	8	25	2006	15	24	4058.4	6643.3	83	B
101	89	8	25	2006	16	20	4101.9	6649.2	72	B, Z13
102	90	8	25	2006	17	30	4108.6	6653.3	69	W, E16, MG2
103	90	8	25	2006	17	36	4108.6	6653.4	69	B
104	91	8	25	2006	19	17	4116	6635.2	85	B, Z14
105	92	8	25	2006	21	25	4121	6658.6	65	B
106	93	8	25	2006	22	13	4126.1	6654.8	67	B
107	94	8	25	2006	23	20	4133.6	6700.2	61	B
108	95	8	26	2006	0	41	4141.3	6714.1	55	B
109	95	8	26	2006	0	53	4141.6	6714	54	W, E17
110	96	8	26	2006	2	4	4138.7	6724.2	45	B
111	97	8	26	2006	3	20	4136.1	6738.4	36	B
112	98	8	26	2006	4	49	4148.6	6726.8	43	B
113	99	8	26	2006	5	41	4156	6720.9	48	B
114	100	8	26	2006	6	49	4206.1	6718.6	55	B, E18
115	100	8	26	2006	7	4	4205.8	6718	49	W
116	101	8	26	2006	10	57	4228.7	6756.3	212	B, Z15
117	102	8	26	2006	13	41	4235.9	6723.6	265	B, CO/196cc
118	102	8	26	2006	14	6	4236.4	6723	264	V
119	103	8	26	2006	16	15	4225.1	6659.8	360	B, CO/246cc
120	103	8	26	2006	16	47	4224.7	6659	366	W, E19
121	103	8	26	2006	17	20	4224.8	6659.4	359	W
122	104	8	26	2006	19	51	4219.3	6640.4	293	B
123	104	8	26	2006	20	22	4220.4	6639.4	299	V
124	105	8	26	2006	22	22	4229.2	6617.1	236	B, E20
125	105	8	26	2006	22	58	4230	6618.6	229	W
126	106	8	27	2006	2	47	4206.6	6602.9	185	B, Z16
127	107	8	27	2006	5	18	4144.2	6600.8	98	B, Z17
128	108	8	27	2006	6	35	4153.3	6552.8	118	B
129	109	8	27	2006	7	33	4200.7	6550.7	216	B
130	110	8	27	2006	9	26	4214	6546.4	219	B

Table 1. (cont.) STATION OPERATION REPORT FOR CRUISE AL0607

CAST	STA.	Date(GMT) mm	dd	yy	TIME(GMT) hr	min	LAT	LONG	DEPTH m	OPERATION B=bongo W=water Z=zoogen E=EPA V=vertical cast (CTD only) CO=Calanus observed/vol MG=microbial genetics NEU=neuston
131	110	8	27	2006	9	57	4214.3	6545.6	218	W, E21, BUOY LAUNCH
132	111	8	27	2006	13	27	4233.7	6538.1	90	B, Z18
133	112	8	27	2006	15	14	4243.5	6518.9	98	B
134	113	8	27	2006	19	57	4301.1	6620.9	133	B
135	114	8	27	2006	22	5	4310.6	6638.4	122	B
136	115	8	27	2006	23	54	4254.3	6642.5	188	B, E22, CO/252cc
137	115	8	28	2006	0	21	4253.6	6642	213	W
138	116	8	28	2006	3	58	4258.8	6726.7	229	B, CO/221cc
139	116	8	28	2006	4	15	4258.6	6726.9	233	V
140	117	8	28	2006	5	1	4303.8	6726.8	196	B, CO/190cc
141	118	8	28	2006	7	24	4323.8	6741.9	247	B, CO/388cc
142	118	8	28	2006	7	52	4323.3	6741.9	247	W, E23, MG3
143	119	8	28	2006	12	1	4316.4	6658.8	175	B, CO/265cc
144	120	8	28	2006	14	11	4328.6	6636.7	98	B
145	121	8	28	2006	16	23	4351.7	6645.6	123	B, CO/289cc
146	122	8	28	2006	18	41	4413.6	6654.5	177	B, Z19, CO/630cc
147	122	8	28	2006	19	20	4413.6	6655	176	W, E24
148	123	8	28	2006	22	0	4429.9	6711.6	77	B
149	124	8	29	2006	0	46	4415.8	6745.7	91	B
150	125	8	29	2006	3	40	4401.2	6821.1	83	B
151	126	8	29	2006	6	45	4338.7	6848.6	124	B, NEU4
152	127	8	29	2006	8	17	4335.7	6900.6	117	B, Z 20
153	128	8	29	2006	10	31	4316.5	6852.3	135	B
154	128	8	29	2006	10	56	4316.8	6851.8	130	W, E25
155	129	8	29	2006	14	53	4256.2	6932.3	157	B, Z 21
156	130	8	29	2006	18	34	4221.4	6924.6	230	B
157	130	8	29	2006	18	56	4221.6	6923.8	230	V, MG4
158	131	8	29	2006	20	7	4226.4	6934.8	251	B, CO/506cc
159	131	8	29	2006	20	36	4226.7	6933.8	255	V
160	132	8	29	2006	21	30	4230	6940.2	254	B, CO/537cc
161	132	8	29	2006	21	55	4229.9	6939.4	244	W, E26
162	133	8	30	2006	1	54	4253.9	6958.5	174	B
163	134	8	30	2006	2	54	4258.9	7003	61	B
164	134	8	30	2006	3	4	4259	7002.8	56	W, E27
165	135	8	30	2006	5	52	4316.9	7027.9	26	B
166	136	8	30	2006	8	19	4251.2	7032.6	96	B
167	137	8	30	2006	11	19	4224.7	7037.8	80	B
168	137	8	30	2006	11	34	4224.9	7037.8	80	W, E28
169	138	8	30	2006	14	58	4154.7	7017	32	B, CO/754cc

TOTALS: Bongo Casts = 138
Bongo 6B3Z Samples = 135
Bongo 6B3I Samples = 136
Water Samples = 25
Vertical Casts = 7
EPA Stations = 28
CTD Casts = 169
Zoogen samples = 21
Calanus observations = 23

Table 2. Flowmeter Calibrations-at-sea Comparison between June and August 2006

	Flowmeter #	Start	End	Revs	Nautical Mi	Meters	M/Rev	Flowmeter #	avg M/Rev (cal factor) August	avg M/Rev (cal factor) June
Run 1	13609	3349	4432	1083	0.245	454	0.4192	13609	0.5602	0.2815
	2697	99905	100990	1085	0.245	454	0.4184	2697	0.5931	0.2739
Run 2	13609	4432	5150	718	0.220	407	0.5669			
	2697	990	1698	708	0.220	407	0.5749			
Run 3	13609	5150	5700	550	0.206	382	0.6945			
	2697	1698	2184	486	0.206	382	0.7860			

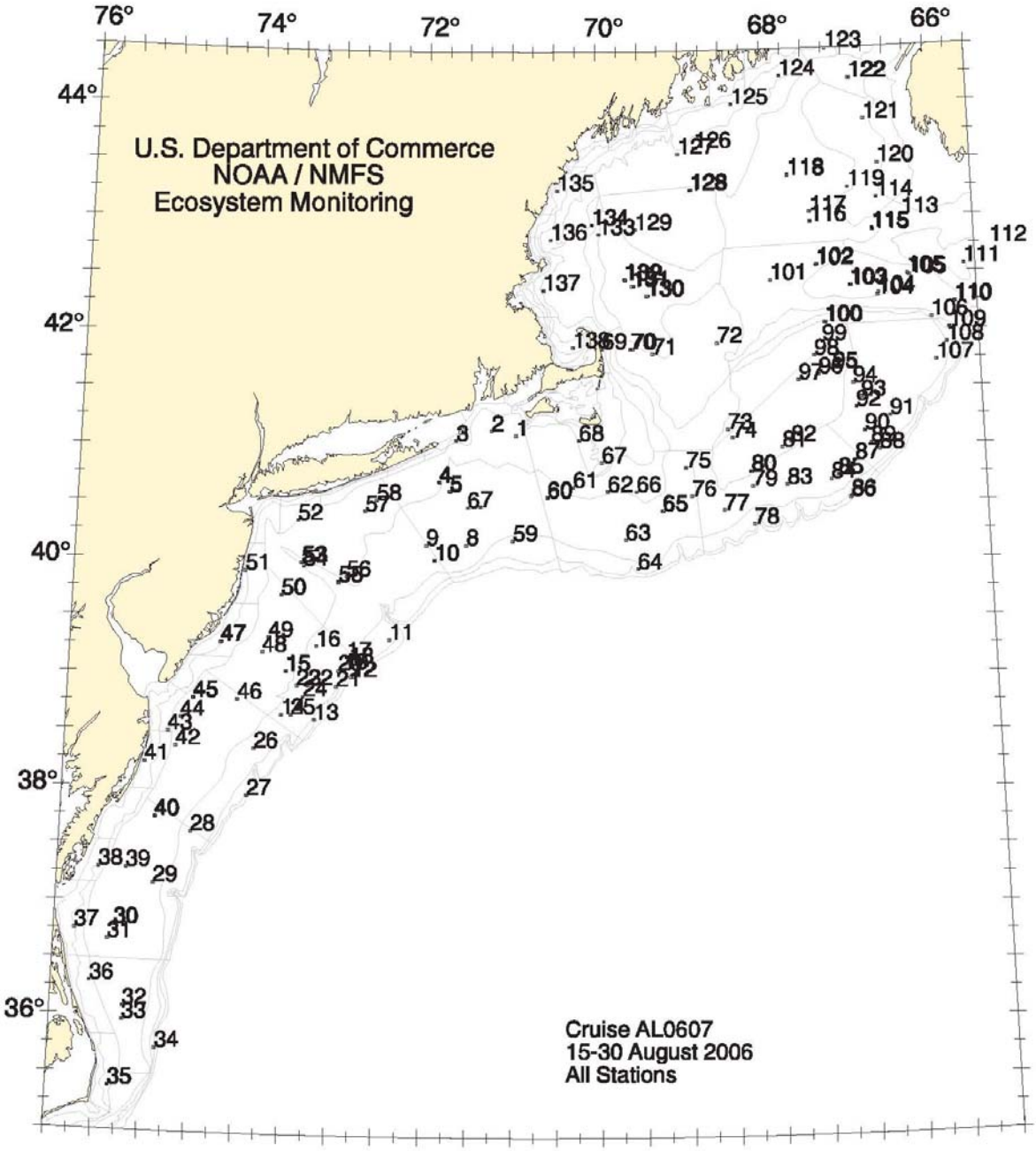

Figure 1. Station locations numbered consecutively for Late Summer Ecosystem Monitoring Cruise AL0607, 15 – 30 August 2006.

Figure 2. 20 cm Bongo Sampler mounted above a 61 cm Bongo Sampler.

Figure 3. Video Plankton Recorder & 61 cm Bongo Net Sampling Array.

Figure 4. EPA scientist Don Cobb removing a sediment sample from single bucket Van Veen Grab Sampler.

Figure 5. Teachers Tamara Browning and Karen Meyers prepare to deploy NOAA Drifter Buoy # 44843 from the ALBATROSS IV on Georges Bank for the Adopt-a-Drifter Program.

Figure 6. Researcher Karla Heidelberg filtering sea water to obtain microbial genetics samples.