

CRUISE RESULTS
Chartered Fisheries Research Vessel
ARGO MAINE
Cruise No. AM 03-01
Ecosystems Monitoring Survey

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CRUISE PERIOD AND AREA

The cruise period was 19-28 August 2003. The chartered fisheries research vessel ARGO MAINE covered Georges Bank and Gulf of Maine regions (Figure 1) for the Late Summer 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 Georges Bank and Gulf of Maine portions of the northeast continental shelf ecosystem.

A secondary objective of this cruise involved the following sampling:

- collection of phytoplankton samples for nitrogen stable isotope ratios,
- collection of samples for zooplankton genetics (genome) studies,
- examination of plankton samples at sea 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. One additional non-random station was added in the Northeast Peak area at which a CTD cast was made to document the characteristics of the water column, giving a total of 61 stations sampled.

Key parameters measured included water column temperature, salinity and chlorophyll-a fluorescence, 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 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. 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 an A-frame. 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 with a fluorometer sensor attached. 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.

At a selected station in the Gulf of Maine a second double oblique Bongo tow was made to a depth greater than 200 meters but approximately 5 meters above the bottom. Both samples from the tow were preserved in a 5 percent solution of formalin in seawater. One sample will be analyzed for zooplankton composition; the other sample was retained for educational purposes.

Zooplankton genetics samples were collected at five randomly selected stations within each of the 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 phytoplankton samples for nitrogen-stable isotope ratio analysis were collected from the discharge water of the near-surface flow-through system. Samples of either eight hundred or 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 immediately frozen for analysis ashore.

Stations with large amounts of Calanus finmarchicus and one whale carcass observation were forwarded to Pat Gerrior, the Regional Right Whale Sighting Coordinator, by satellite phone communications.

Continuous monitoring of the seawater salinity, and chlorophyll-a level, was done at a depth of 2 meters 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 (SCS) installed in the laboratory area. 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. Since there was no hull-mounted thermistor to determine surface temperature at each station, as there is on NOAA vessels, a bucket thermometer was lowered over the side at the beginning of every Bongo tow, to provide this data.

Samples for Seabird CTD salinity and fluorometer sensor data calibration were obtained on the 12-6 watch by taking a water sample from 35 or more meters depth using a 1.7 liter Niskin bottle. Calibration of the fluorometer from the surface flow-through system was undertaken on the 6-12 watch. Sample analysis for the calibration of both the CTD and flow-through fluorometer 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 are shown in Figure 1. The ARGO MAINE sailed at 1327 hours EDT on Tuesday August 19 from NEFSC, Woods Hole Massachusetts. Weather condition were favorable with clear sunny skies and a southerly breeze. A ship's meeting was held at this time to discuss survey operations and vessel safety procedures for the cruise. A scientific computer software problem occurred shortly after departure. As this problem could not be resolved and the vessel was still close to Woods Hole, a decision was made to return to port. The ARGO MAINE arrived at the NEFSC dock at 1846 hours. The necessary computer software information was obtained and the ARGO MAINE again departed at 1920 hours from NEFSC, Woods Hole Massachusetts. The vessel transited through the Great Round Shoal Channel to begin survey operations in the western portion of Georges Bank. The predetermined cruise track was selected to survey Georges Bank in a zig-zag pattern from west to east and then to survey the Gulf of Maine in a similar pattern from east to west, with the last station to be occupied in Cape Cod Bay. The ship arrived on the first station at 0400 hours on August 20. During the time period from August 20 through the 22 the weather conditions were favorable with partly sunny skies and light winds during the day and fog at night. The ARGO MAINE quickly adapted to the required work procedures and survey operations progressed on an efficient routine basis. It was noted that the SCS computer time was set ahead incorrectly by one hour; but no adjustment to the computer was made so as to maintain a constant error for data recorded during the cruise. A correction will be made during data analysis ashore. Weather conditions during the weekend of August 23 - 24 deteriorated with an increase in winds and accompanying sea state. This was the result of several fast moving frontal systems crossing the survey waters. Vessel speed was reduced between stations during this time and survey operations were suspended for about eight hours (0415 - 1220 hours) when en route to station #28 on August 23. On the afternoon of August 23, the carcass of a dead whale was seen and photographed floating between stations 30 and 31 at position 41°50.4' N, 66°24.7'W. ARGO MAINE completed the last Georges Bank station (34/796GB) at 0010 hours on Sunday and commenced operations in the eastern portion of the Gulf of Maine. On Monday August 25, weather conditions improved with a decrease in wind and accompanying sea state, and weather conditions remained generally favorable to the end of the cruise. During this time, the days were pleasant with skies clear to partly cloudy, however, at night fog would generally develop, and then clear during the morning hours. On Wednesday, August 27 the wind increased to "breezy conditions", but this did not hamper survey work. The last station was completed on Thursday at 1103 hours and the ship proceeded through the Cape Cod Canal to Woods Hole. R/V ARGO MAINE arrived at the NEFSC Woods Hole , Massachusetts, dock at 1516 hours on Thursday, August 28 to complete cruise AM 0301.

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 and whale carcass photos were forwarded to Pat Gerrior after the cruise

SCIENTIFIC PERSONNEL

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Table 1. STATION OPERATION REPORT FOR CRUISE AM0301

CAST	STA.	Date (GMT)			TIME (GMT)		LAT	LONG	DEPTH (m)	OPER.
		mm	dd	yy	hr	min				
1	1	8	20	2003	8	26	4108.8	6924.4	41	B
2	2	8	20	2003	10	12	4101.7	6903.2	84	B
3	2	8	20	2003	10	14	4102.6	6903.1	83	B
4	3	8	20	2003	13	17	4112.6	6846.8	69	B
5	4	8	20	2003	14	50	4105	6832.3	56	B
6	4	8	20	2003	15	4	4105	6832.6	57	V
7	5	8	20	2003	17	11	4049.4	6823.4	51	B
8	6	8	20	2003	19	49	4042.2	6850	66	B
9	7	8	20	2003	21	20	4036.2	6837.4	63	B
10	8	8	21	2003	0	0	4017.5	6821.5	149	B, N1
11	9	8	21	2003	4	40	4039.5	6746.8	80	B
12	10	8	21	2003	6	7	4041.8	6801.5	81	W,chl
13	10	8	21	2003	6	18	4041.9	6801.6	81	B
14	11	8	21	2003	8	49	4101.5	6752.3	50	B
15	12	8	21	2003	10	41	4108.3	6810.4	46	B, Z1
16	13	8	21	2003	12	12	4119.5	6807.3	38	B, Z2
17	14	8	21	2003	16	41	4146.7	6839.2	180	W
18	14	8	21	2003	16	48	4146.7	6839.1	182	W,chl
19	14	8	21	2003	16	56	4146.8	6839.1	182	B, CO 158cc
20	15	8	21	2003	20	17	4147.1	6802.4	41	B
21	16	8	21	2003	22	38	4150	6735.8	55	B, Z3
22	17	8	22	2003	0	50	4131.6	6724.7	42	B
23	17	8	22	2003	1	9	4131.3	6724.9	42	B
24	18	8	22	2003	3	15	4125	6744.9	38	B, N2
25	19	8	22	2003	6	38	4102.2	6725.6	65	W,chl
26	19	8	22	2003	6	49	4102.1	6725.6	66	B
27	20	8	22	2003	10	16	4039.9	6703.6	168	B
28	20	8	22	2003	11	10	4030.9	6704	163	B, Z4
29	21	8	22	2003	14	22	4057.9	6644.2	86	B
30	22	8	22	2003	17	38	4113	6616.3	177	W,chl

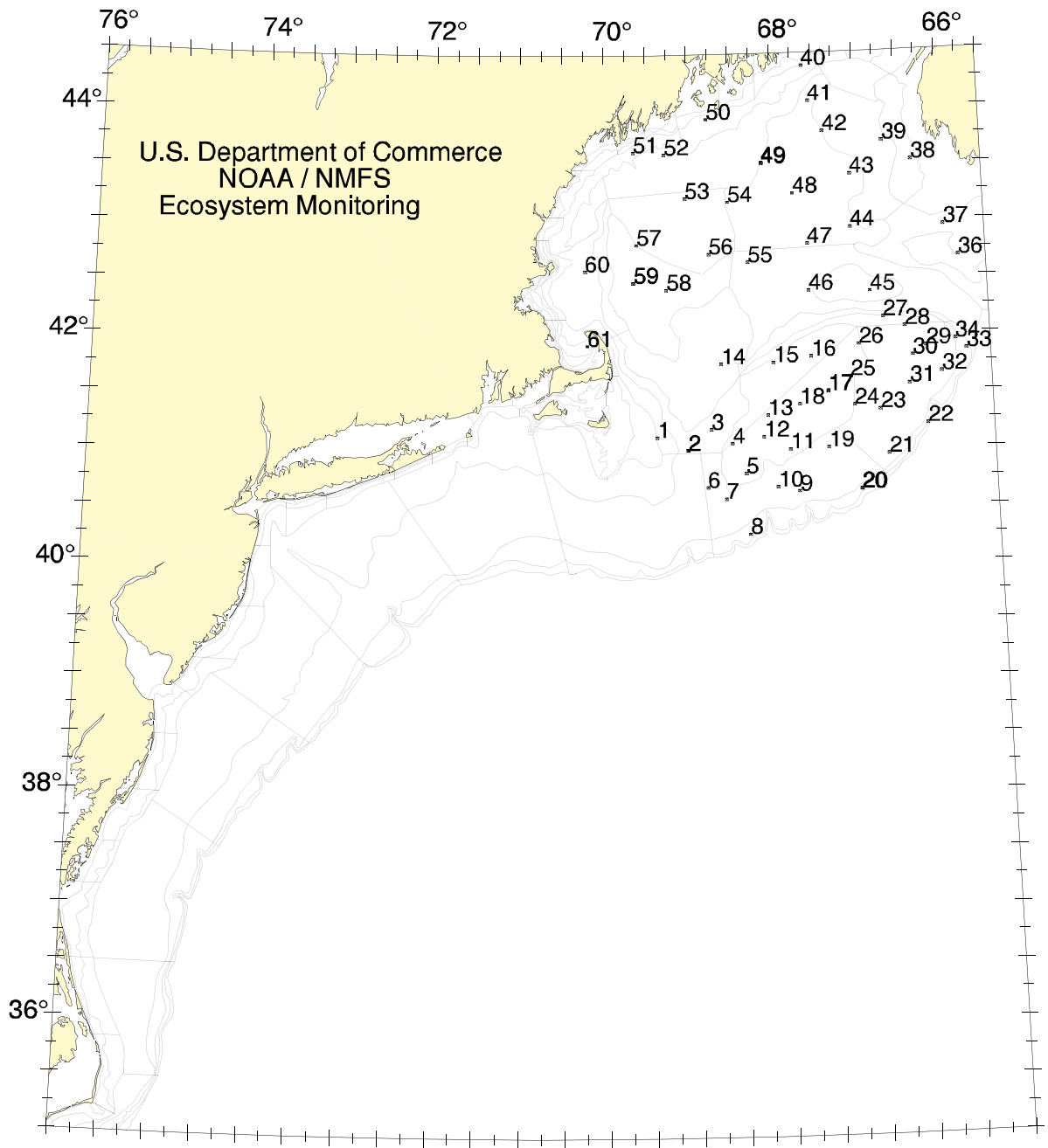
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CAST	STA.	Date (GMT)			TIME (GMT)		LAT	LONG	DEPTH (m)	OPER.
		mm	dd	yy	hr	min				
31	22	8	22	2003	17	47	4113	6616.3	168	B
32	23	8	22	2003	20	55	4121.4	6648.8	73	B
33	24	8	22	2003	22	40	4123.9	6706.8	58	B, Z5
34	25	8	23	2003	0	35	4138.9	6708.9	59	B
35	26	8	23	2003	3	0	4155.8	6702.3	60	B
36	27	8	23	2003	5	39	4209.5	6645	137	W,chl
37	27	8	23	2003	5	51	4209.5	6644.5	140	B
38	28	8	23	2003	16	25	4204.6	6629.6	81	W,chl
39	28	8	23	2003	16	33	4204.5	6629.4	80	B
40	29	8	23	2003	18	18	4153.8	6615.3	80	B
41	30	8	23	2003	19	24	4149	6624.8	83	B
		8	23	2003	13	15	4150.4	6624.7		Whale carcass sighted
42	31	8	23	2003	21	43	4134.4	6627.9	88	B
43	32	8	24	2003	0	1	4140	6605	101	B, N3
44	33	8	24	2003	2	7	4151.4	6547	147	B
45	34	8	24	2003	3	36	4156.7	6554.5	118	B, CO 211cc
46	35	8	24	2003	9	15	4218.3	6551	218	W,chl
47	36	8	24	2003	12	25	4240.5	6549.9	98	B, CO 185cc
48	37	8	24	2003	14	56	4257	6559.2	140	B, CO 792cc
49	38	8	24	2003	20	11	4331.8	6220	76	W,chl, N4
50	38	8	24	2003	20	19	4331.8	6220.1	77	B, CO 146cc
51	39	8	24	2003	22	55	4342.5	6640.4	124	B
52	40	8	25	2003	5	31	4422.9	6736.3	50	B
53	41	8	25	2003	7	52	4404.2	6732.7	210	W,chl
54	41	8	25	2003	7	58	4404.2	6732.5	218	B, CO 211cc
55	42	8	25	2003	10	19	4348.2	6722.9	209	B, Z6, CO 264cc
56	43	8	25	2003	14	13	4325.4	6704.4	222	B, CO 475 cc
57	43	8	25	2003	14	44	4326.2	6705.2	222	V
58	44	8	25	2003	18	0	4258	6705.1	237	W,chl
59	44	8	25	2003	18	24	4257.4	6705.3	242	B, CO 264cc

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CAST	STA.	Date (GMT)			TIME (GMT)		LAT	LONG	DEPTH (m)	OPER.
		mm	dd	yy	hr	min				
60	45	8	25	2003	22	55	4223.4	6653	354	B, CO 211cc
61	45	8	25	2003	23	25	4224.1	6654.3	365	V
62	46	8	26	2003	3	31	4224.5	6736.2	275	B, 238 cc
63	46	8	26	2003	3	52	4224.3	6735.5	284	W,chl
64	47	8	26	2003	7	49	4249.4	6736.1	230	V, N5
65	47	8	26	2003	8	4	4249.1	6736.1	242	B, CO 264cc
66	48	8	26	2003	11	45	4315.7	6745.8	240	B, CO 317cc
67	48	8	26	2003	12	33	4315.7	6745.8	240	V, N6
68	49	8	26	2003	15	19	4331.7	6807.4	196	B
69	49	8	26	2003	15	58	4332.2	6807.5	199	B, Z7, CO 211cc
70	50	8	26	2003	20	41	4355.4	6846.3	93	W,chl
71	50	8	26	2003	20	48	4355.5	6846.3	98	B
72	51	8	27	2003	1	47	4338.4	6939	80	B, Z8, N7
73	52	8	27	2003	4	10	4336.9	6916.9	138	W,chl
74	52	8	27	2003	4	21	4337	6917.1	135	B
75	53	8	27	2003	8	9	4314	6902.6	170	B, CO 185cc
76	54	8	27	2003	11	5	4311.9	6832.2	181	B, CO 264cc
77	55	8	27	2003	15	38	4240	6818.7	207	W,chl
78	55	8	27	2003	15	45	4240	6818.7	204	B, CO 317cc
79	56	8	27	2003	19	8	4244.5	6846.4	190	B
80	57	8	27	2003	23	28	4249.7	6937.4	171	B, Z9, CO 238cc
81	58	8	28	2003	3	30	4226	6916.6	227	B, CO 264cc
82	58	8	28	2003	3	49	4226.5	6916.3	220	W,chl
83	59	8	28	2003	6	17	4229.9	6939.8	250	B
84	59	8	28	2003	6	51	4229.9	6939.8	249	B, CO 290cc
85	60	8	28	2003	10	32	4236	7014.1	70	B, Z10, N8, CO 211
86	61	8	28	2003	14	57	4157	7012.6	33	B, N9, CO 422cc

TOTALS: Bongo Casts = 65
 Bongo 6B3Z Samples = 57
 Bongo 6B3I Samples = 60
 Water Samples = 16
 CTD Casts = 86
 Nitrogen samples = 9
 Zoogen samples = 10
 Chlorophyll samples = 15
 Calanus observations = 21
 Dead Whale Observations = 1



Figure

1. Station locations numbered consecutively for Late Summer Ecosystems Monitoring Cruise AM 03-01, 19 - 28 August 2003.