

*CRUISE RESULTS*  
*Fisheries Research Vessel ALBATROSS IV*  
*Cruise No. AL 01-09*  
*Ecosystems Monitoring Survey*

**For further information, contact Jerry Prezioso National Marine Fisheries Service,  
Northeast Fisheries Science Center, Woods Hole, Massachusetts 02543-1097.  
Jerry.Prezioso@noaa.gov.**

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CRUISE PERIOD AND AREA

The cruise period was from 20 to 28 August 2001, representing Late Summer coverage for the Ecosystems Monitoring Survey. The survey area included the Georges Bank and Gulf of Maine regions (Figure 1). This cruise was originally scheduled to cover all four regions of the Ecosystems Monitoring Survey: Middle Atlantic Bight, Southern New England, Georges Bank and Gulf of Maine, but coverage was scaled back when maintenance work done on the vessel earlier in the year took longer than anticipated, and the cruise schedule was adjusted accordingly.

OBJECTIVES

The primary objective of the cruise was to collect standardized samples and data to monitor changing biological and physical properties that influence the sustainable productivity of the living marine resources of the Georges Bank and Gulf of Maine portions of the Northeast Continental Shelf ecosystem. Four secondary objectives of the cruise included:

1. An investigation of overwintering populations of Calanus finmarchicus in the Gulf of Maine to determine their metabolic state and lipid reserves, and to ascertain whether this population is augmented by sources from outside this region.
2. Analysis of phytoplankton samples for nitrogen and carbon stable isotope ratios by filtering the discharge water of the flow-through instrumentation at 12 locations on this leg of the survey.
3. Examination of sample jars for the presence of large numbers of Calanus finmarchicus to correlate with right whale sightings received by the Right Whale Sighting Network Coordinator in Woods Hole.

4. Analysis of zooplankton spatial and temporal variability in the variation of gene frequency in copepods and euphausiids from ten stations selected randomly from the 61 stations of the survey.

#### METHODS

The survey consisted of 61 randomly distributed stations at which the vessel stopped to lower instrumented arrays over the side.

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.

A double oblique tow using the 61-centimeter Bongo sampler and a CTD was made at all stations with the exception of station 26, a deep, slope-water station east of the northeast peak of Georges Bank. Only a vertical cast and a single tow using a 1-meter MOCNESS sampler were made at this station. Bongo tows were 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 stern quarter of the vessel by means of a conducting-cable winch mounted on a powered boom. 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, 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 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 Office of Marine and Aviation Operations 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 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 at every fifth or sixth station. 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, in review, pp 61-68.

## SUMMARY OF SPECIAL ACTIVITIES

- Phytoplankton samples for nitrogen and carbon 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 300 micron mesh nitex gauze to remove most zooplankton, then filtered through a Whatman, glass-fiber filter (GFF) and immediately frozen, for analysis ashore.
- Sample jars from all stations were examined during the cruise for the presence of large quantities of Calanus finmarchicus. At stations where it was determined that this species comprised more than 75% of the sample visible to the eye through the glass sides of the jar, the settled height of the zooplankton was measured in centimeters. These settled zooplankton heights of >75% Calanus finmarchicus were multiplied by the cross-sectional area of the quart sample jars (52.8 cm<sup>2</sup>) to produce an estimate of settled volume in cm<sup>3</sup> of this species for comparison between stations that were sampled on the cruise.
- Plankton tows using a 1-meter MOCNESS sampler were made at four stations in the Gulf of Maine area and one station in the slope water east of the Northeast Peak of Georges Bank, for the Calanus finmarchicus studies conducted by Edward Durbin and Whitley Saumweber. The MOCNESS was deployed from the same port-side powered boom that was used for the bongo and CTD. Switching between the different gear types was accomplished easily, with no problems. It was towed at 1.5 knots to within 5 meters of the bottom. Four opening and closing nets of 300 micron mesh were used for sampling. Analysis of the samples was conducted on board the vessel immediately after retrieving the MOCNESS.
- At ten randomly selected stations, five on Georges Bank and five in the Gulf of Maine, a 20 cm bongo frame was attached to the towing wire one half meter above the CTD unit. This frame was equipped with two 165 micron mesh nets, but no flowmeters. These samples were preserved in 95% ethanol which was changed after 24 hours. These samples were collected for a study of variation in gene frequency being conducted in support of the National Oceans Partnership Program. The principal investigators in this study include Ann Bucklin of the University of New Hampshire, Peter Wiebe of Woods Hole Oceanographic Institute, Mike Fogarty of NMFS and Bruce Frost of the University of Washington.

## RESULTS

A summary of routine survey activities is presented in Table 1. Figure 1 shows the areal coverage achieved during the cruise. After sailing from the NMFS dock in Woods Hole at 1400 EDT on Monday 20 August 2001, the ALBATROSS IV commenced sampling operations the next day on Georges Bank, just east of the Great South Channel. The vessel proceeded to sample the remainder of Georges Bank except for the shoal area on the northern flank. A deepwater station was done for the URI scientists east of the northeast peak of Georges Bank. No Ecosystems Monitoring samples were collected here as it was outside of the survey area, but a 500 meter CTD cast was done to collect slope-water temperature and salinity data for Dave Mountain. The vessel proceeded onto Browns Bank and Georges Basin in the Gulf of Maine, then returned to the shoal portion of Georges Bank. Upon completion of the Georges Bank region, sampling of the Gulf of Maine was done by sailing northwest across the Gulf of Maine into the Bay of Fundy, then southeast, zigzagging inshore and offshore off the coasts of Maine, New Hampshire and Massachusetts. The cruise completed coverage of the Gulf of Maine with stations on Cashes Ledge, Wilkinson Basin, and off of Boston Harbor and Race Point. Sampling operations were completed on the morning of Tuesday, 28 August. The vessel returned to Woods Hole via the Cape Cod Canal and docked at the NMFS pier at 1300 EDT that same day. Excellent weather prevailed throughout the entire cruise, enabling the ALBATROSS to make over 12 knots between most stations. This, coupled with absolutely no problems either with the vessel or any of the sampling equipment, enabled the mission to be accomplished ahead of schedule. A total of five URI Graduate School of Oceanography (GSO), MOCNESS stations were visited and all sampling and subsequent analysis operations were easily carried out under the excellent weather conditions. Throughout the cruise, jars of plankton samples that had a visible abundance of Calanus finmarchicus had their zooplankton volumes estimated according to the protocol listed under the Summary of Special Activities, and this information was forwarded by email to Patricia Gerrior, the Right Whale Sighting Network Coordinator in Woods Hole. Samples with visibly high concentrations of Calanus finmarchicus appeared in the Gulf of Maine, with the highest concentration in the Bay of Fundy, somewhat lower concentrations southwest of the Bay of Fundy and lower concentrations in the middle of the Gulf of Maine in the vicinity of the Crowell Basin. Two to three right whales were sighted just southwest of the Bay of Fundy on Sunday 26 August at position 4401.2 N 6716.9 W. This information was communicated to Pat Gerrior that same day via cell phone.

## DISPOSITION OF SAMPLES AND DATA

All 61 cm bongo samples and associated data, except the CTD data and the GSO bongo sample, were delivered to the Ecosystems Monitoring Group of the NEFSC, Narragansett, RI, for quality control processing and further analysis. The 20 cm bongo samples

were taken from the vessel by Nancy Copley of the Woods Hole Oceanographic Institute for analysis by staff of the Zooplankton Genome Project. The CTD data was delivered to the Oceanography Branch of the NEFSC, Woods Hole, MA. The MOCNESS and GSO bongo samples and data were taken by the GSO scientists to the Graduate School of Oceanography in Rhode Island. The nitrogen and carbon isotope samples and data were delivered to Rick McKinney of the US Environmental Protection Agency Marine Laboratory, in Narragansett, RI.

SCIENTIFIC PERSONNEL

National Marine Fisheries Service, NEFSC, Narragansett, RI

Jerome Prezioso, Chief Scientist

Roger Williams University, Bristol, RI

Andrea Boudrow  
Jason Breves

University of Rhode Island, Graduate School of Oceanography,  
Narragansett, RI

Maria Casas  
Niele DiNitto  
Whitely Saumweber

Marine Academy of Science and Technology, Sandy Hook, NJ

Christine Burger

North Kingstown, RI

Julien Goulet

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For further information contact:  
Sharon MacLean, Group Leader, Ecosystem Monitoring Group,  
National Marine Fisheries Service, Northeast Fisheries Science  
Center, Narragansett, RI 02882.  
Tel (401) 782-3258 FAX (401) 782-3201; INTERNET  
"sharon.maclea@noaa.gov".  
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Table 1. Station data for NOAA FRV ALBATROSS IV cruise 01-09,  
Ecosystems Monitoring Survey, conducted during 20 to 28 August 2001.

CAST	STA.	Date(GMT)			TIME(GMT)		LAT	LONG	DEPTH	OPERATION
		mm	dd	yy	hr	min				
										b=bongo w=water (m) CO=Calanus Observed/vol N=nitrogen z=zoogen c=carbon M=mocness
001	001	8	21	01	06	00	4044.0	6852.1	59	b
002	002	8	21	01	06	51	4037.8	6847.1	63	b
003	003	8	21	01	09	42	4019.0	6816.8	150	b
004	004	8	21	01	11	19	4022.1	6800.4	143	b (failed tow)
005	004	8	21	01	11	42	4022.3	6800.7	143	b, N#1
006	005	8	21	01	13	07	4023.3	6747.4	148	b
007	006	8	21	01	15	16	4041.2	6758.3	81	b, z #1
008	007	8	21	01	16	29	4050.4	6805.6	62	b, z #2
009	008	8	21	01	18	31	4100.6	6822.2	49	w
010	008	8	21	01	18	41	4100.3	6822.2	48	b
011	009	8	21	01	20	10	4107.4	6833.3	48	b, z #3
012	010	8	21	01	22	09	4121.4	6839.5	87	b
013	011	8	21	01	23	45	4116.3	6819.6	51	b
014	012	8	22	01	01	48	4114.9	6758.7	45	b
015	013	8	22	01	03	10	4119.2	6745.0	40	b
016	014	8	22	01	06	47	4047.7	6737.9	73	w
017	014	8	22	01	06	55	4047.8	6738.1	72	b
018	015	8	22	01	08	35	4051.5	6719.0	86	b
019	016	8	22	01	10	20	4101.8	6706.8	68	b, N#2, c #1
020	017	8	22	01	12	05	4115.0	6717.5	51	b
021	018	8	22	01	14	27	4136.4	6705.8	57	b
022	019	8	22	01	17	50	4110.8	6649.9	71	w
023	019	8	22	01	17	58	4110.8	6650.0	71	b
024	020	8	22	01	19	39	4118.6	6630.9	92	b
025	021	8	22	01	21	20	4120.5	6609.4	567	b
026	022	8	23	01	00	07	4133.2	6634.2	82	b, z #4
027	023	8	23	01	02	02	4147.4	6648.9	64	b
028	024	8	23	01	03	48	4203.1	6641.5	74	w
029	024	8	23	01	03	58	4203.5	6641.8	76	b, z #5, N#3
030	025	8	23	01	07	08	4148.7	6608.7	87	b
031	026	8	23	01	12	38	4143.2	6527.7	1918	v, M
032	027	8	23	01	17	59	4211.8	6623.1	203	w
033	027	8	23	01	18	13	4212.0	6622.9	205	b,CO/106cc
034	028	8	23	01	20	26	4232.0	6624.8	220	v
035	028	8	23	01	20	42	4232.1	6624.8	216	b, M
036	029	8	24	01	01	41	4303.7	6559.8	108	b,CO/158cc
037	029	8	24	01	02	13	4303.6	6602.1	98	b
038	030	8	24	01	04	00	4306.3	6626.9	95	w
039	030	8	24	01	04	11	4306.4	6627.5	94	b,z#6,N#4,CO/211cc
040	031	8	24	01	06	30	4246.2	6635.7	154	b, z #7

Table 1. (Continued) Station data for NOAA FRV ALBATROSS IV cruise 01-09,  
Ecosystems Monitoring Survey, conducted during 20 to 28 AUGUST 2001.

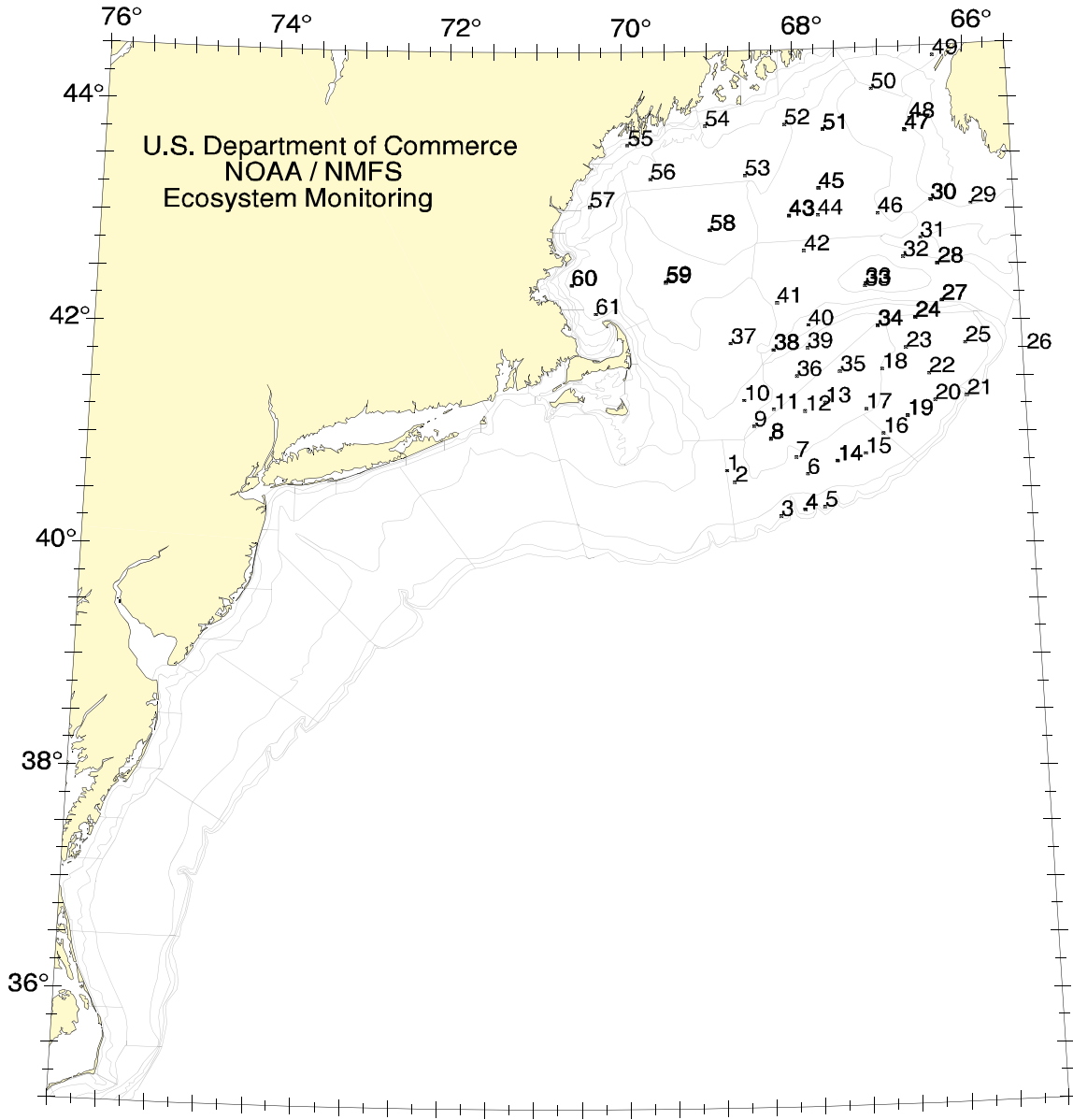
CAST	STA.	Date(GMT)			TIME(GMT)		LAT	LONG	DEPTH (m)	OPERATION b=bongo w=water CO= <u>Calanus</u> observed/vol N=nitrogen z=zoogen c=carbon M=mocness
		mm	dd	yy	hr	min				
041	032	8	24	01	08	09	4236.2	6648.1	227	b
042	033	8	24	01	11	11	4221.2	6715.1	305	b, M, CO/581cc
043	033	8	24	01	11	50	4222.6	6714.6	332	v
045	034	8	24	01	16	11	4159.4	6707.4	59	w
046	034	8	24	01	16	20	4159.8	6707.5	57	b
047	035	8	24	01	19	56	4135.7	6734.3	39	b
048	036	8	24	01	23	04	4133.7	6803.5	28	b
049	037	8	25	01	03	06	4152.0	6847.7	163	b, CO/370cc
050	038	8	25	01	05	34	4148.2	6818.8	168	w
051	038	8	25	01	05	47	4148.2	6818.6	162	b, CO/343cc
052	039	8	25	01	07	40	4148.7	6755.8	42	b
053	040	8	25	01	08	54	4201.1	6754.6	182	b, CO/211cc
054	041	8	25	01	11	10	4213.4	6815.5	196	b, N#5, CO/422cc
055	042	8	25	01	14	40	4241.2	6755.9	182	b, N#6, CO/475cc
056	043	8	25	01	16	51	4300.0	6805.4	190	w
057	043	8	25	01	17	06	4300.3	6805.6	199	b, N#7, c #2, CO/475cc
058	044	8	25	01	19	13	4300.2	6745.5	169	b, z #8, CO/290cc
059	045	8	25	01	21	02	4314.6	6744.5	234	v
060	045	8	25	01	21	20	4314.7	6744.4	231	b, CO/290cc
061	046	8	26	01	00	46	4300.3	6704.3	198	b, CO/106cc
062	047	8	26	01	05	24	4344.5	6643.1	99	w
063	047	8	26	01	05	34	4344.7	6643.2	101	b, CO/238cc
064	048	8	26	01	06	23	4350.6	6639.3	100	b, CO/158cc
065	049	8	26	01	09	42	4424.3	6621.2	177	b, CO/581cc
066	050	8	26	01	13	22	4407.3	6705.4	89	b, N#8, CO/106cc
067	051	8	26	01	17	03	4346.2	6740.1	230	w
068	051	8	26	01	17	22	4346.4	6740.0	230	b, M, CO/528cc
069	052	8	26	01	20	46	4349.3	6806.9	170	b, CO/528cc
070	053	8	27	01	00	19	4322.3	6835.4	153	b, CO/211cc
071	054	8	27	01	03	48	4349.3	6902.3	70	b
072	055	8	27	01	08	09	4339.4	6956.4	32	b
073	056	8	27	01	10	23	4321.0	6940.7	166	b, z #9, N#9, CO/317cc
074	057	8	27	01	14	01	4306.3	7023.0	89	b, N#10, c#3, CO/211cc
075	058	8	27	01	20	09	4253.2	6900.1	107	w
076	058	8	27	01	20	18	4253.3	6900.4	153	b, z #10, CO/211cc
078	059	8	28	01	00	05	4225.9	6930.9	255	b, M, CO/475cc
079	059	8	28	01	00	38	4225.2	6931.2	252	v
080	060	8	28	01	06	33	4224.0	7035.2	85	w
081	060	8	28	01	06	43	4224.0	7035.5	84	b, N#11, c#4, CO/264cc
082	061	8	28	01	08	52	4208.6	7019.1	51	b, N#12

-- End of Cruise --



Table 1. (Continued) Station data for NOAA FRV ALBATROSS IV cruise 01-09,  
Ecosystems Monitoring Survey, conducted during 20 to 28 AUGUST 2001.

TOTALS:	61 cm Bongo Casts	= 62
	20 cm Bongo Casts	= 10
	61 cm Bongo Samples	= 120
	20 cm Bongo(Zoogen samples)	= 20
	MOCNESS Tows	= 5
	Samples <u>Calanus</u> observed	= 25
	Nitrogen isotope samples	= 12
	Carbon isotope samples	= 4
	Water Samples	= 13
	CTD Casts	= 82
	Right Whale sightings	= 1 (at 44 01.2 N 67 16.9 W)



**Figure 1. Station locations numbered consecutively for Late Summer Ecosystems Monitoring Cruise AL 01-09, 20 - 28 August 2001.**