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Interdisciplinary Study of Warm Core Ring Physics, Chemistry and Biology

CRUISE REPORTS

RV / ENDEAVOR - RV / KNORR - RV / OCEANUS
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CRUISE REPORT

ENDEAVOR CRUISE NO. 83, 4/17/82 - 5/8/82

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WARM CORE RINGS CRUISE REPORT: ENDEAVOR 83

This report will summarize the shipboard activity aboard the RV/ENDEAVOR on cruise #83, 17 April-8 May 1982. This cruise was the first of four ENDEAVOR cruises to be made in 1982 as part of the Warm Core Rings (WCR) experiment. The report will be presented in a topical manner following an overall cruise narrative. It is meant to serve as an informative and useful document to those investigators within the WCR program - not as a publication for circulation to the general scientific community.

CRUISE NARRATIVE

The ENDEAVOR departed from Woods Hole shortly before 11 am EST (1600Z) on 17 April with a scientific party of 15 and T. Joyce as chief scientist. A list of the scientists and their institutional affiliations can be found in a later section. A meeting of the chief scientists aboard the ENDEAVOR was held prior to departure to plan on the strategy to be used in ring selection. A newly forming ring, 82-D, was to be quickly surveyed by ENDEAVOR, and if suitably detached from the Gulf Stream the other three ships (KNORR, OCEANUS, & ALBATROSS IV) would converge on that ring as a study site. If 82-D was not a viable ring, the NSF-funded ships would study the backup ring 82-B. The ALBATROSS IV group was not certain whether the interests of the National Marine Fisheries would be in the study of a ring which was already west of Georges Bank (i.e. 82-B). The plan for ENDEAVOR was to steam directly to the center of 82-D, based upon satellite data, make our first test station in the center followed by a quick XBT survey.

We began taking XBT's at 2 hourly intervals at 0800Z on day 108 (18 April) and arrived at the center location at 1630Z that day. The remote sensing people were quite accurate in their estimate of ring center position: at the site of our station (38 35.2N, 67 11.4W) the depth of the 10 deg C isotherm was 763 m, in contrast to 200 m outside, and the ring currents, which reached 3 kts to the NW of the center, had decreased to only .3 kts. The CTD-02 cast in the center revealed no 18 deg C core of Sargasso Sea water but rather water of Gulf Stream origin. Further mapping with XBT's and our doppler current profiler revealed the ring 82-D to be, in large part, attached to the Gulf Stream. In order to avoid the rapidly changing conditions encountered in our previous WCR cruise due to Gulf Stream interaction we recommended that ring 82-B be selected for study. After a consensus decision was reached that WCR work at 82-D be stopped, the ENDEAVOR departed to the west at 1618Z, day 109, for 82-B.

At 0400Z, day 110, we began the first XBT star survey of 82-B with XBT #17. Later that same day the NASA/Wallops P-3 aircraft flew its first WCR mission in the shape of a five-pointed star. The aircraft made two passes over ENDEAVOR

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while we were on the second leg of our star on a course of 019T. At the end of this leg, the ship was stopped for a shallow BOPS (Bio-Optical Profiling System) cast at the northern-most point of the star. At 1100Z, day 111, the survey was completed, and ENDEAVOR headed to 38 32N, 70 19W, where the first cast of our asterisk-shaped CTD-02/BOPS series was to be made.

The first cross-ring transect began at 1446Z, day 111, with station 3 and ended at 1100Z, day 113, with station 13. Each station consisted of a deep (to the bottom) CTD cast and a shallow (to 200 m) cast with the BOPS. The station spacing for this and the subsequent two transects was 10 nm. The second ring transect was from 1500Z, day 113 (station 14) to 1457Z, day 115 (sta 24). The final transect started at 1930Z, day 115, with sta 25 and ended at 0356Z, day 118, with completion of sta 35. During the first transect the LORAN-C drifter was launched near the ring center.

The LORAN drifter was a compound drifter which consisted of a WHOI radar reflecting buoy under which a LDGO sediment trap was suspended at the end of 100 m of line, which acted as a distributed drogue and located the sediment trap at the base of the euphotic zone. This drifter was tethered to a RSMAS LORAN-C buoy that internally recorded its LORAN position and telemetered the results at a fixed schedule to the ship. The "drifter" was deployed at 1515Z, day 112, at 38 54.6N, 71 16.7W. During the course of our asterisk pattern the ring drifted to the west. New updates of the satellite-inferred center location enabled the station pattern to be modified slightly so that each of the three transects was centered on the drifting ring. While ENDEAVOR was within range of the LORAN telemetry of the drifter we were able to monitor the drifter track as it rotated at a radius of 5-8 nm about the ring center.

While on station 19 the signal was lost from the CTD fish as we were hauling in the instrument. It was later discovered that the new piece of approximately 7000 m of conducting cable on the CTD winch was shorted between the center conductor and the armored shield. Thereafter all station work had to be done on the aft winch. The shallow BOPS casts were not affected, but time was lost during the deep CTD casts because this winch did not level-wind properly. Approximately 15 hours of station time was lost because of level-winding problems.

Upon completion of the asterisk survey ENDEAVOR steamed for a dead-reckoned estimate of the drifter position. Without receiving any further telemetry (LORAN transmission had in fact stopped due to low battery voltage) the drifter was sighted and recovered at 1024Z, day 118, at 39 00.4N, 71 36.1W. This sighting was indeed fortunate as either the

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drifter or a considerable amount of ship time could have been lost! Three of the four PVC sediment traps were recovered as well. Following this recovery ENDEAVOR steamed another hour to join KNORR and OCEANUS for the first multi-ship experiment in the ring center.

At this point the wind was picking up and it was decided not to deploy one of our drifters in the ring center. Instead the three ships were to maneuver relative to a geographical location. Upon reaching the location for the experiment ENDEAVOR hove to near KNORR for a deep CTD cast at 38 54.9N, 71 42.4W, 1136Z. After this, a BOPS cast was made followed by a combined BOPS/XBT survey in the shape of an X. This was centered 9 nm SW of the KNORR with the site of the deep cast as the center of the pattern and the KNORR's position as the endpoint of one of the two orthogonal legs. Along each leg, XBT's were launched at ten minute intervals. At the end of each leg, a BOPS cast was made. Due to worsening weather we cancelled the final BOPS cast (#5) at the SE corner of the pattern. We finished our work in the 1st multi-ship experiment at 2340Z, day 118.

The chief scientists conferred on VHF and decided that the second MS experiment was to be in the NW quadrant of the ring at the frontal boundary. It was also decided that each of the vessels would head to the NW along a different track so as to obtain a good spatial picture of the ring structure in the region of the 2nd MS experiment. At 1232Z, day 119, a rejuvenated LORAN drifter was launched at 39 21.4N, 71 54.5W. KNORR was to spend most of her time during the course of the day 'hove to' near the drifter location while OCEANUS and ENDEAVOR were to work relative to the drifter. The drifter consisted of the LORAN buoy tethered to a large, radar transponding, plank-on-edge buoy which had a window shade drogue at a depth of 100 m. The drifter was recovered at the end of the experiment 39 17.7N, 71 12.5W at 1230Z after a drift of nearly 24 hours. During the 2nd MS experiment the CTD package was towed at a speed of 2 kts while the instrument was raised and lowered repeatedly in a yo-yo manner. This 'tow-yo' was switched from the starboard J-frame to the aft A-frame to prevent the cable from chafing against the hull of the ship. At the corners of the bow-tie-shaped pattern, BOPS casts were made. The maximum range to the radar transponding drifter during the survey was 3 nm. The second NASA mission was flown at this time under improving weather and clearing skies. A package containing two boxes of floppy disks was air dropped to R. Smith on the ENDEAVOR to help alleviate a severe shortage of disks for the bio-optical program. One of the boxes flooded but the other one was later put to good use. An AXBT pattern was made to map out the frontal structure in the sub-surface thermal field as well as the surface color, fluorescence, and infrared temperature. We anticipate this data to be of great value to the slower

moving ships.

As the ENDEAVOR departed for the Sargasso Sea to begin a section to the west of the ring, hourly XBT's were taken through the ring center to the southwest. At the SW edge of 82-B, we turned to a southerly heading shooting 2-hrly XBT's until the Gulf Stream was crossed. A CTD/BOPS section was begun with sta 38, 35 39.3N, 72 08.6W at 1309Z on day 121. The section consisted of 10 stations across the Gulf Stream and Slope Water with 20 nm spacing. The section was completed at 1505Z, day 123 at which time ENDEAVOR returned to 82-B for the second XBT star survey.

The second and final XBT star began with XBT #101 at 1900Z, day 123 and ended with XBT #148 at 2000 on day 125. The fourth leg of the star was broken and a final CTD/BOPS station (#48) was made in the ring center at 0231Z on day 125. This second star pattern was larger than the first one in order to get outside the region of strong ring currents to the slower moving Slope Water surrounding the ring.

The final CTD/BOPS section was begun in the Sargasso Sea with sta 49 at 0917Z on day 126. This section consisted of only 7 stations spanning the Gulf Stream and Slope Water along 70 W with 30 nm spacing. The time lost due to problems with the level-wind on the aft winch required us to cut out three stations along this line. We were able to begin our section in the Sargasso and filled our remaining nutrient sample bottles in western boundary undercurrent water flowing to the west along the continental rise. This 'upstream' section to the east of 82-B ended with sta 55 at 0324Z, day 128. We then steamed to Woods Hole arriving around 1430Z later that same day (8 May). The unloading of the vessel was accomplished in about three hours and the ENDEAVOR (as well as the scientific party) headed for home.

A chronological summary or event log for the cruise EN-83 can be found in Table 1.

CTD/02 PROGRAM

A total of 55 casts were made with two different CTD underwater units during the cruise. Table 2 contains a summary, or extract, from the event log of the CTD stations. Initially CTD#7 was modified to digitize and transmit data from a two-channel transmissometer provided by J. Bishop from LDGO. On its first cast, station 2, the unit functioned on the way down to the bottom, but as it was coming back to the surface, the signal from the transmissometer dropped to values much below those on the down trace. After discussion over the radio with Bishop, it was decided to remove the unit from the underwater package, check outputs in the lab, and set it aside so that it could be shipped back to Oregon for

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repair (it was brand new and still under warranty). Both CTD fish included Beckman dissolved oxygen sensors and a 24 Bottle, 1.2 liter General Oceanics Rosette. We experienced problems with the O2 sensor and had to replace it in CTD#7 after sta 11. Other problems encountered were :

- * no water samples on sta 18 (Niskin bottle valves were left open)

- * a short in the conducting wire on sta 19 which allowed us to take only four water samples

- * a switch to CTD#3 after sta 26 because battery voltage on CTD#7 had dropped too low. CTD#7 was again used during and after the multi-cast tow-yo sta 37

- * CTD#7 was replaced by CTD#3 after sta 51, although the O2 cell from #7 was used

Some of the O2 sensor problems arose because CTD#7 drew excessive current from the deck unit and did not charge its internal battery. With low battery voltage, the oxygen cell became noisy. A few stations have perhaps irrecoverable continuous oxygen data.

The three CTD sections through WCR 82-B were taken at 10 nm intervals and consisted of eleven stas/section. Data from these stations (3-36) should provide the best available CTD coverage to date of a warm core ring. A full set of nutrient samples were collected and frozen for analysis ashore. In order to limit the number of samples to a manageable (& funded) level, the nutrient sampling was selective at stations other than 3-36. At each station we obtained as many as 20 bottle samples for salinity and oxygen analysis at sea. On two of the Niskin bottle frames reversing thermometers were mounted in order to check the temperature calibration of the CTD's.

An experimental platinum temperature probe was added to CTD#7. It is manufactured by Rosemount with specification for a faster time response than the standard Rosemount sensor. A cursory examination of the data indicated that it was at least 100 milliseconds faster than the standard platinum sensor, its calibration was stable, and its noise level low and of the order of 1 mdeg C. We are hopeful that this new sensor will go a long way towards bridging the gap between the slow temperature and fast conductivity sensors which causes problems when salinity is calculated.

XBT PROGRAM

All 177 XBT's taken on the cruise were of the T7 type, and all were digitally recorded on a Bathysystems recorder. Data files of selected isotherms were transmitted via SDAT (see communications) to other WCR investigators in a quasi-real-time basis. A table of XBT positions (Table 3) can be broken down into several tasks:

1) 1-15	XBT survey of WCR 82-D
2) 16-47	XBT star #1 WCR 82-B
3) 48,49	in ring center during first CTD section
4) 50-77	1st MS expt in ring center
5) 78-84	pre-survey for 2nd MS expt
6) 85-98	x-ring survey to Sargasso & CTD section
7) 101-148	XBT star #2 WCR 82-B
8) 149-162	run to Sargasso & last CTD section
9) 163-177	northward along 70 W, in between CTD's

ACOUSTIC PROFILING SYSTEM (APOC)

A doppler acoustic current profiling system was operating during the entire cruise logging data onto 9T digital tapes and giving real-time printouts of currents to aid in our underway mapping program. This system was essentially the same as that on the previous WCR cruise (ENDEAVOR-74) with the addition of several new underway sensors. A SAIL module was built so the we could monitor the temperature from a platinum thermometer mounted in the transducer well and belonging to URI. This provided us with a digital record (every 30 seconds) of the "bucket" temperature. At the same time data from a WHOI-built thermosalinograph was recorded. This unit was constructed following an OSU design and consisted of SEABIRD sensors for conductivity and temperature. While underway we collected seawater samples from the uncontaminated seawater line for salinity determination and later calibration of the thermo-salinograph salts. The unit functioned with only minor attention for the entire cruise. The conductivity cell drifted, however, and it will not be possible to calibrate the system with a single offset for the entire cruise. A total of 45, 1200 ft., 9T digital tapes were filled with data. While at sea, some of the real-time printout was transmitted to SDAT and Miami along with the corresponding XBT or CTD data.

BIO-OPTICAL MEASUREMENTS

R. Smith and his co-workers collected data for the purpose of descriptively and predictively modeling the photoenvironment of a WCR. This effort should provide a basis for the dynamical modeling of phytoplankton in rings and their environs as well as providing complementary surface data for

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aircraft and satellite remote sensing research. This program was funded by NASA, which also supported the APOC work described above and the aircraft studies.

The along-track data, recorded once per minute, included:

- 1) time and LORAN-C location
- 2) sea surface temperature and conductivity
- 3) air temperature, wind speed & direction
- 4) total solar irradiance (0.3-3.0 microns)
- 5) ultra-violet irradiance (320-360 nm)
- 6) fluorescence measurements of chlor, phyco, & fucozanthin
- 7) hourly discrete samples for extracted chlorophyll

All sampling was from the same uncontaminated seawater line used for the above APOC measurements.

Vertical profiles were made with the Bio Optical Profiling System (BOPS) at each of the 55 stations to a maximum depth of 200 m. In addition to conductivity, temperature, and pressure, measurements were made of upwelling and downwelling irradiance in 12 bands of the visible spectrum, downwelling irradiance at 380 nm, upwelling radiance at four wavelengths corresponding to those on the CZCS visible channels, and fluorescence. The pressure case which leaked on the first WCR cruise (EN-74), had been replaced. Continuous data were collected at all of the casts although some data loss was experienced in the early stations. Finally, a 12 l. 1.7 liter Rosette (loaned from WHOI) was attached to the BOPS and discrete bottle samples were collected for chlorophyll determination and the study of phytoplankton species composition.

PHYTOPLANKTON SPECIES COMPOSITION & STANDING CROP

P. Blackwelder collected 1 liter water samples from the BOPS Rosette for an assessment of phytoplankton species composition and standing crop in 82-B and its surrounding waters. Five depths were routinely sampled (150m, 75m, 40m, 20m, surface). A total of over 300 samples were filtered at sea using a four port Gelman filtration setup, and the mineralized cells were collected on 25 mm Millepore filters having a pore size of 0.8 microns. Nine underway surface samples were taken as a test of the feasibility of simultaneous chlorophyll/community structure assessment. An evaluation of this technique will be made ashore.

During each of the three ring transects, a full nine bottle profile down to 150m was taken when ENDEAVOR was in the center of the ring. Similar profiles were also made at selected stations in the high velocity region, Slope Water, Gulf Stream, and Sargasso Sea. Microscopic examination of samples from several ring transect stations was also accomplished on board ship.

LORAN DRIFTER STUDIES

R. Evans was in charge of U. Miami LORAN-C drifter operations during the cruise. During the first deployment near the center of 82-B, the LORAN drifter was tethered at the lifting harness to a WHOI radar buoy. A tag line with a float was also attached at this point. A high gain (3db) vertical antenna was used for both LORAN reception and data telemetry. LORAN reception was excellent and compared favorably with the regular antenna/coupler on the ship. All mooring gear for the deployment was attached to the radar buoy. A 2 m section of chain was shackled to the buoy. Under this came a 10 m section of coated wire followed by 100 m of hydro wire and finally 20 m of nylon. On the first deployment two distributed temperature sensors were attached to the mooring line: one near the surface placed in-line between the chain and coated wire and the second between the hydro wire and the nylon. The LDGO sediment trap was placed near the bottom, 5 m above a 60 pound lead weight. A wire clamp secured the trap to the nylon. This latter was a mistake as the wire clamp chafed through the nylon with subsequent loss of the lead weight. The trap was saved by a knot that was placed in the nylon as a safety. Three of the four traps were recovered. How the fourth was lost is a mystery since the rubber strap securing it to the frame was still in place.

The telemetry range varied from less than 23 nm when the wind was brisk and the air dry to greater than 65 nm with light winds and high humidity. As the telemetry data was received the drifter location was plotted. After a deployment of six days the drifter was recovered. As noted in the cruise narrative, the recovery was a combination of good luck and (some) planning. At the time that the CTD asterisk pattern was completed we had received no drifter telemetry for 14 hours. Based upon the recent drift history, a dead reckoned position was estimated and the ship vectored to an intercept position. As the distance decreased the telemetry signal was again received, but the data were all nulls (low battery voltage). Using the strength of the telemetry signal together with astute vision, the flashing light was sighted through the dawn mist and the drifter recovered with 2+ meters of swell running. The LORAN-C reception during deployment was good and the resulting trajectory obtained from the magnetic tape record was smooth with only a few recorded frames having bit errors.

A second deployment was made during the 2nd MS experiment. During this time the LORAN drifter was tethered to the radar transponding plank-on-edge buoy under which a window shade drogue was suspended at the end of 100 m of hydro wire. No sediment traps or temperature sensors were included during this 24 hour deployment.

COMMUNICATION

As on the first WCR cruise last year (EN-74), an LSI computer with a Winchester disk was the intermediary device for text and data communication with other vessels and ashore via the ATS satellite communication link. Data either went out onto Telemail to a user group SDAT, or went directly to the U. Miami, RSMAS VAX computer. The primary use for the latter route was for: transmittal of all of the underway bio-optical observations to Miami where shore-based processing of the data took place, with some results transmitted back to ENDEAVOR; transmittal to the ENDEAVOR of thermal IR satellite data and processed results on frontal boundaries and ring center position; and sending of XBT, CTD, and APOC data from ENDEAVOR to Miami. The Telemail link was used for data transferral to other vessels and to NASA so that they could plan their two aircraft missions. We were also able to receive some XBT data and text from the OCEANUS. The ALBATROSS IV and KNORR were noticably silent on Telemail. We also received telecopy data from URI during the voice schedule. This was set for three, one hour periods during the day (starting at 1200Z, 1700Z, and 2200Z). The 2200Z schedule was arranged through P. Eden exclusively for Warm Core Rings. Because of this extra hour and due to the frequent use of VHF radio when the vessels were operating in close proximity, the HF sideband was not used except for communication with Wallops Plot on Wallops Island. Unlike the first WCR cruise, the ATS hardware, once working, remained fully functional for the entire cruise without constant maintenance.

PARTICIPANTS IN THE SCIENTIFIC PARTY

The members of the scientific party aboard cruise 83 of the R/V ENDEAVOR, their institutional affiliation and principal tasks are listed below.

Terrence Joyce	WHOI	Ch. Scientist
Raymond Schmitt	WHOI	WCR physics
Marvel Stalcup	WHOI	hydro, drifters
Robert Mcdevitt	WHOI	CTD hardware
Jane Dunworth	WHOI	CTD processing
Cleo Zani	WHOI	APOC hardware
Lorraine Barbour	WHOI	APOC processing
Cynthia Tynan	WHOI	Autosal, CTD
Raymond Smith	UCSB	Bio-optics
Jeffrey Star	Scripps	Bio-ops hdwre
Charleen Epstein	UCSB	Bio-ops proces.
Patricia Blackwelder	Nova U.	Phytoplankton
Robert Evans	RSMAS, Miami	drifter, commo
Stanford Hooker	RSMAS	drifter, plots
David Nelson	URI	marine tech

ACKNOWLEDGEMENTS

The scientific party aboard the ENDEAVOR gratefully thanks captain Adrian Lane, relief master, and all the officers and crew for their cooperation and competence. The Research program WARM CORE RINGS is funded by the Ocean Sciences Division of the National Science Foundation. We also acknowledge support of the bio-optical and acoustic current profiling research by the Oceanic Processes branch of the National Aeronautics and Space Administration.

INDEX TO TABLES AND FIGURES

In what follows various data have been tabulated and four figures attached. The contents of these are as follows:

TABLE 1	Event log for cruise
TABLE 2	CTD station locations
TABLE 3	XBT station locations
TABLE 4	BOPS station locations
TABLE 5	Meteorological observations
FIGURE 1	Ship track, 30 m current vectors & 10 deg isotherm depth (meters) for XBT survey of 82-D and star #1
FIGURE 2	Same as above for CTD survey of 82-B with CTD stations numbered.
FIGURE 3	Same as above for XBT star #2 and Slope Water sections, XBT's and CTD's. CTD's are numbered.
FIGURE 4	Selected along-track meteorological data

TABLE 1: EN83 EVENT LOG

10	DATE	GMT	YEAR	LAT.	LONG.	EVENT	COMMENTS AND
20	DAY	TIME	DAY	DEG MIN.	DEG MIN.	CBXO	OBSERVATIONS
30							
40	170482	1545	107			0001	DEPART WOODS HOLE, HEAD FOR 82-D
50	180482	0333	108	39 54.00	-69 01.70	0001	APOC ALIGNMENT RUN, C/C180
60	180482	0413	108	39 46.68	-69 00.83	0001	C/C 000
70	180482	0444	108	39 52.80	-69 00.60	0001	C/C 135, RESUME COURSE TO 82-D
80	180482	0800	108	39 26.15	-68 24.13	0010	XBT #1 ,APOC LOGGER MESSED UP- #1 NOT LOGGED TILL 0815
90	180482	1000	108	39 12.90	-68 03.10	0010	XBT #2
100	180482	1200	108	38 58.90	-67 43.00	0010	XBT #3
110	180482	1400	108	38 58.90	-67 43.00	0010	XBT #4
120	180482	1500	108	38 43.40	-67 22.30	0001	H/T STA 1 CTD TEST
130	180482	1630	108	38 36.10	-67 12.20	1000	CTD #1 IN WATER (CTD3), 82-D CENTER
140	180482	1840	108	38 35.20	-67 11.40	0001	CTD #1 ABOARD
150	180482	1942	108	38 33.80	-67 09.70	0100	BOPS #1 IN WATER
160	180482	2014	108	38 32.00	-67 10.80	0001	BOPS ABOARD
170	180482	2020	108	38 31.84	-67 11.06	0001	BOPS SECURE, U/W COURSE 225T
180	180482	2200	108	38 22.86	-67 22.91	0010	XBT #5 (SA-G1)
190	190482	0005	109	38 22.90	-67 23.00	0010	XBT #6 (G2)
200	190482	0200	109	38 06.30	-67 41.70	0010	XBT #7 (G3)
210	190482	0239	109	37 53.90	-67 57.40	0001	C/C 232 TO AVOID ANOTHER VESSEL
220	190482	0258	109	37 48.43	-68 04.05	0001	C/C 225 (G4)
230	190482	0400	109	37 41.00	-68 12.90	0010	XBT #8 (G5)
240	190482	0405	109	37 41.00	-68 12.46	0001	C/C 090 (G6)
250	190482	0600	109	37 40.58	-67 41.53	0010	XBT #9 (G7) LORAN PROBLEMS
260	190482	0800	109	37 40.30	-67 12.60	0010	XBT #10 (G8)
270	190482	0815	109	37 40.46	-67 09.00	0001	C/C 315
280	190482	1000	109	37 55.70	-67 18.00	0010	XBT #11 (G9)
290	190482	1200	109	38 12.60	-67 38.70	0010	XBT #12 (G10)
300	190482	1400	109	38 31.60	-67 01.70	0010	XBT #13 (G11)
310	190482	1610	109	38 51.70	-68 27.80	0010	XBT #15 (G12), #14 DUD
320	190482	1618	109	38 53.21	-68 29.78	0001	C/C 280 TO 82-B
330	190482	1925	109	38 59.90	-69 15.50	0001	SMALL BOAT HULL SIGHTED, INVESTIGATING
340	190482	1940	109	38 58.84	-69 17.41	0000	TURNED OUT TO BE OVERTURNED DEAD RIGHT WHALE
350	190482	1952	109	38 58.00	-69 16.00	0100	BOPS #2.1 IN WATER, SUNNY
360	190482	2027	109	38 58.18	-69 16.70	0001	BOPS OUT (BOPS #2.1)
370	190482	2058	109	38 57.90	-69 16.90	0001	U/W TO 39,10N-79,18W, CTD#7 NOT READY
380	190482	2130	109	38 58.90	-69 22.60	1000	CTD #2 IN WATER, INST 7 W/ NEPH
390	200482	0019	110	38 59.79	-69 21.34	0001	CTD OUT, U/W AT 285
400	200482	0200	110	39 04.30	-69 45.70	0010	XBT #16 (G13)
410	200482	0400	110	39 09.70	-70 16.50	0011	XBT #17 (G14), C/C 234, XBT STAR 1
420	200482	0500	110	39 02.80	-70 29.00	0010	XBT #18 (G15)
430	200482	0600	110	38 55.40	-70 41.40	0010	XBT #19 (G16)
440	200482	0700	110	38 48.00	-70 54.90	0010	XBT #20 (G17)
450	200482	0800	110	38 40.70	-71 08.50	0010	XBT #21 (G18)
460	200482	0900	110	38 32.70	-71 23.20	0010	XBT #22 (G19)
470	200482	1000	110	38 25.20	-71 36.20	0010	XBT #23 (G20)
480	200482	1007	110	38 24.80	-71 37.20	0001	C/C 019, LEG 2 STAR 1
490	200482	1100	110	38 34.30	-71 33.30	0010	XBT #24 (G21)
500	200482	1200	110	38 46.10	-71 28.90	0010	XBT #25 (G22)
510	200482	1300	110	38 58.40	-71 22.40	0010	XBT #26 (G23)
520	200482	1400	110	39 09.80	-71 17.10	0010	XBT #27 (G24)
530	200482	1505	110	39 22.90	-71 11.30	0011	XBT #28 (G25), NASA P-3 OVERFLIGHT
540	200482	1600	110	39 33.20	-71 06.60	0010	XBT #29 (G26)
550	200482	1615	110	39 36.15	-71 05.30	0001	C/C 162, LEG 3 XBT STAR 1
560	200482	1700	110	39 29.50	-71 01.40	0011	XBT #30, STOP FOR BOPS
570	200482	1710	110	39 28.55	-71 00.77	0100	BOPS #2.2 IN WATER
580	200482	1755	110	39 28.96	-70 59.73	0001	BOPS OUT OF WATER
590	200482	1800	110	39 28.90	-70 54.50	0001	BACK TO STAR, HDG 167
600	200482	1900	110	39 17.20	-70 54.60	0010	XBT #31
610	200482	2000	110	39 05.20	-70 49.80	0010	XBT #32

TABLE 1: EN83 EVENT LOG

(Cont.)

620	200482	2100	110	38	52.90	-70	44.80	0010	XBT #33
630	200482	2200	110	38	39.70	-70	39.40	0010	XBT #34
640	200482	2300	110	38	27.10	-70	34.30	0010	XBT #35
650	200482	2310	110	38	26.11	-70	33.97	0001	C/C 306T
660	210482	0000	111	38	30.90	-70	43.80	0010	XBT #36
670	210482	0100	111	38	37.80	-70	55.90	0010	XBT #37
680	210482	0200	111	38	44.80	-71	08.20	0010	XBT #38 (G35)
690	210482	0300	111	38	52.40	-71	21.40	0010	XBT #39 (G36)
700	210482	0400	111	38	59.80	-71	34.80	0010	XBT #40 (G37)
710	210482	0500	111	39	06.90	-71	47.10	0010	XBT #41 (G38) 40 ON THE BATHY SYSTEMS
720	210482	0530	111	39	10.60	-71	53.80	0001	C/C 090
730	210482	0600	111	39	11.80	-71	49.00	0010	XBT #42 (G39)
740	210482	0700	111	39	11.70	-71	32.80	0010	XBT #43 (G40), NOTE: EST. RING CENTER POS.
750	210482	0800	111	39	11.50	-71	16.20	0010	XBT #44 (G1) 38, 57.6N 71, 13.2W
760	210482	0900	111	39	11.40	-70	59.10	0010	XBT #45 (G2)
770	210482	1000	111	39	11.50	-70	43.40	0010	XBT #46 (G3)
780	210482	1100	111	39	11.60	-70	27.90	0010	XBT #47 (G4)
790	210482	1106	111	39	11.58	-70	25.67	0001	C/C 172
800	210482	1446	111	38	31.97	-70	19.02	1000	CTD #3 IN WATER
810	210482	1710	111	38	32.24	-70	19.03	0001	CTD OUT OF WATER
820	210482	1715	111	38	32.23	-70	19.03	0100	BOPS #3 IN WATER
830	210482	1745	111	38	32.18	-70	19.13	0001	BOPS OUT
840	210482	1755	111	38	32.49	-70	19.55	0001	U/W
850	210482	1836	111	38	36.80	-70	28.60	0001	H/T STA #4
860	210482	1853	111	38	36.94	-70	29.54	0100	BOPS #4 IN WATER
870	210482	1930	111	38	36.56	-70	29.59	0001	BOPS OUT
880	210482	1936	111	38	36.40	-70	29.50	1000	CTD #4 IN WATER
890	210482	2140	111	38	35.21	-70	29.87	0001	CTD OUT, U/W
900	210482	2252	111	38	42.17	-70	41.21	0100	BOPS #5 IN WATER
910	210482	2313	111	38	41.70	-70	41.45	0001	BOPS OUT
920	210482	2317	111	38	42.30	-70	41.00	1000	CTD #5 IN WATER
930	220482	0153	112	38	38.30	-70	41.90	0001	CTD ABT, U/W
940	220482	0310	112	38	47.10	-70	51.65	0100	BOPS #6 IN WATER
950	220482	0336	112	38	46.25	-70	51.70	0001	BOPS OUT
960	220482	0350	112	38	45.90	-70	50.70	1000	CTD #6 IN WATER
970	220482	0700	112	38	40.70	-70	50.10	0001	CTD OUT, U/W
980	220482	0842	112	38	52.20	-71	02.10	0010	XBT #48
990	220482	0856	112	38	51.26	-71	02.24	0100	BOPS #7 IN WATER
1000	220482	0915	112	38	50.60	-71	02.40	0001	BOPS OUT
1010	220482	0923	112	38	50.36	-71	02.47	0001	CTD #7 IN WATER
1020	220482	0940	112	38	49.50	-71	02.70	1000	CTD #7 RESTART
1030	220482	1229	112	38	46.00	-71	05.00	0001	CTD ON BOARD
1040	220482	1235	112	38	47.05	-71	04.99	0001	U/W
1050	220482	1346	112	38	57.20	-71	13.30	0010	XBT #49
1060	220482	1352	112	38	57.23	-71	13.38	0001	H/T STA 8, RING CENTER?
1070	220482	1403	112	38	57.29	-71	13.37	0100	BOPS #8 IN WATER
1080	220482	1426	112	38	55.88	-71	14.13	0001	BOPS OUT
1090	220482	1437	112	38	55.15	-71	16.15	0001	U/W FOR DRIFTER DEPLOYMENT
1100	220482	1456	112	38	54.69	-71	16.73	0001	H/T
1110	220482	1515	112	38	54.60	-71	17.60	0001	DRIFTER LAUNCHED W/ SEDIMENT TRAPS
1120	220482	1537	112	38	54.20	-71	17.70	1000	CTD #8 IN WATER
1130	220482	1545	112	38	53.93	-71	17.90	0000	LORAN C DATA CASSETTE TO SIDE 2
1140	220482	1740	112	38	52.30	-71	18.10	0001	CTD ON DECK, BRIDGE LOG
1150	220482	1745	112	38	52.09	-71	18.34	0001	U/W, BRIDGE LOG
1160	220482	1853	112	38	59.50	-71	28.70	0100	BOPS #9 IN WATER
1170	220482	1916	112	38	59.42	-71	28.42	0001	BOPS OUT
1180	220482	1924	112	38	59.37	-71	28.40	1000	CTD #9 IN WATER
1190	220482	2122	112	38	58.60	-71	26.50	0001	CTD OUT, U/W
1200	220482	2243	112	38	59.24	-71	28.18	0100	BOPS #10 IN WATER
1210	220482	2304	112	39	05.10	-71	39.50	0001	BOPS OUT
1220	220482	2304	112	39	05.10	-71	39.50	1000	CTD #10 IN WATER

(Cont.)

Time	CTD #	Depth (m)	Temp (°C)	Salinity (PSU)	Pressure (dbar)	Event
1230	230482	0055	113	39	05.50	-71 39.20 0001 CTD ABD, LOST XMISSION FROM DRIFTER
1240	230482	0130	113	39	06.94	-71 42.79 0001 U/W
1250	230482	0218	113	39	10.20	-71 51.80 0100 BOPS #11 IN WATER
1260	230482	0245	113	39	10.20	-71 51.30 0001 BOPS OUT
1270	230482	0252	113	39	10.20	-71 51.30 1000 CTD #11 IN WATER
1280	230482	0433	113	39	10.20	-71 49.80 0001 CTD OUT
1290	230482	0505	113	39	10.30	-71 49.40 0001 U/W NEXT STATION
1300	230482	0610	113	39	15.50	-72 03.20 0001 H/T
1310	230482	0623	113	39	15.48	-72 03.34 0100 BOPS #12 IN WATER
1320	230482	0646	113	39	15.41	-72 03.40 0001 BOPS OUT
1330	230482	0657	113	39	15.34	-72 03.37 1000 CTD #12 IN WATER
1340	230482	0815	113	39	15.40	-72 03.10 0001 CTD OUT
1350	230482	0838	113	39	15.40	-72 03.00 0001 U/W
1360	230482	1003	113	39	21.00	-72 15.00 0100 BOPS #13 IN WATER
1370	230482	1043	113	39	21.94	-72 15.94 0001 BOPS OUT
1380	230482	1045	113	39	22.16	-72 15.96 1000 CTD #13 IN WATER
1390	230482	1100	113	39	22.60	-72 16.20 0001 CTD OUT, U/W
1400	230482	1500	113	39	46.12	-71 23.98 0100 BOPS #14 IN WATER
1410	230482	1534	113	39	46.00	-71 23.40 0001 BOPS OUT
1420	230482	1534	113	39	46.00	-71 23.60 1000 CTD #14 IN WATER
1430	230482	1640	113	39	45.40	-71 22.10 0001 CTD ON DECK
1440	230482	1700	113	39	45.20	-71 21.50 0001 U/W
1450	230482	1750	113	39	36.98	-71 24.09 0001 H/T
1460	230482	1803	113	39	36.87	-71 23.80 0100 BOPS #15 IN WATER
1470	230482	1825	113	39	36.83	-71 22.70 0001 BOPS ABOARD
1480	230482	1830	113	39	36.80	-71 22.50 1000 CTD #15 IN WATER
1490	230482	2015	113	39	36.00	-71 18.50 0001 CTD OUT
1500	230482	2043	113	39	35.60	-71 17.29 0001 U/W
1510	230482	2140	113	39	27.22	-71 23.90 0100 BOPS #16 IN WATER
1520	230482	2205	113	39	27.00	-71 22.50 0001 BOPS OUT
1530	230482	2210	113	39	27.00	-71 22.50 1000 CTD #16 IN WATER
1540	240482	0000	114	39	26.20	-71 20.80 0001 CTD ON DECK
1550	240482	0021	114	39	25.44	-71 20.57 0001 U/W
1560	240482	0100	114	39	19.40	-71 23.30 0001 H/T
1570	240482	0113	114	39	17.88	-71 23.98 0100 BOPS #17 IN WATER
1580	240482	0137	114	39	17.79	-71 22.55 0001 BOPS OUT
1590	240482	0138	114	39	17.80	-71 23.00 1000 CTD #17 IN WATER
1600	240482	0409	114	39	17.30	-71 15.90 0001 CTD ABD
1610	240482	0446	114	39	15.93	-71 16.21 0001 U/W
1620	240482	0600	114	39	08.11	-71 24.03 0001 H/T
1630	240482	0607	114	39	08.10	-71 23.61 0100 BOPS #18 IN WATER
1640	240482	0640	114	39	07.80	-71 22.30 0001 BOPS OUT
1650	240482	0641	114	39	07.80	-71 22.30 1000 CTD #18 IN WATER, WIRE LEVEL WIND PROBLEMS
1660	240482	1115	114	39	04.80	-71 17.60 0001 CTD OUT, U/W
1670	240482	1212	114	39	57.70	-71 24.30 1000 CTD #19 IN WATER
1680	240482	1155	114	39	00.41	-71 21.25 0000 DRIFTER HEARD, 71,45.7 38,49.9 HDG NNE
1690	240482	1340	114	38	56.40	-71 26.00 0001 END LOWERING, CTD CABLE SHORTED
1700	240482	1411	114	38	56.04	-71 26.82 0001 CTD ABD, FISH PRBLMS, BOPS CABLE JUMPED SHIEVE
1710	240482	1523	114	38	56.67	-71 26.94 0100 BOPS #19 IN WATER, CABLE FIXED
1720	240482	1607	114	38	56.16	-71 25.64 0001 BOPS OUT, U/W
1730	240482	1717	114	38	47.76	-71 23.94 0001 H/T
1740	240482	1730	114	38	47.60	-71 24.00 1000 CTD #20 IN WATER, AFT WINCH
1750	240482	1820	114	38	45.92	-71 25.02 0000 COM W/ B. HAHN, CAN CUT, CANNOT SWITCH REELS
1760	240482	2145	114	38	43.50	-71 30.90 0001 CTD OUT, SWITCH CABLE TO BOPS
1770	240482	2149	114	38	43.50	-71 30.90 0100 BOPS #20 IN WATER
1780	240482	2220	114	38	43.16	-71 31.29 0001 BOPS OUT?
1790	240482	2330	114	38	38.50	-71 24.50 0100 BOPS #21 IN WATER
1800	250482	0005	115	38	37.80	-71 25.40 0001 BOPS OUT?
1810	250482	0010	115	38	37.80	-71 25.40 1000 CTD #21 IN WATER
1820	250482	0153	115	38	36.48	-71 27.24 0000 LEVEL WIND PRBLMS AT 1951m, FIXED AT 0223 GMT
1830	250482	0316	115	38	36.10	-71 28.70 0001 CTD OUT

(Cont.)

1840	250482	0350	115	38	35.99	-71	29.47	0001	U/W
1850	250482	0445	115	38	28.90	-71	24.00	1000	CTD #22 IN WATER
1860	250482	0701	115	38	29.00	-71	25.20	0001	CTD ABOARD
1970	250482	0711	115	38	27.93	-71	25.26	0100	BOPS #22 IN WATER
1880	250582	0745	115	38	27.00	-71	25.51	0001	BOPS OUT, U/W
1890	250482	0826	115	38	19.00	-71	24.07	0001	H/T
1900	250482	0831	115	38	19.04	-71	24.10	0100	BOPS #23 IN WATER
1910	250482	0900	115	38	18.74	-71	24.25	0001	BOPS OUT?
1920	250482	0904	115	38	18.70	-71	24.20	1000	CTD #23 IN WATER
1930	250482	1115	115	38	18.10	-71	24.30	0001	CTD OUT
1940	250482	1217	115	38	09.60	-71	23.90	1000	CTD #24 IN WATER
1950	250482	1415	115	38	08.90	-71	24.40	0001	CTD OUT
1960	250482	1428	115	38	08.87	-71	24.66	0100	BOPS #24 IN WATER
1970	250482	1457	115	38	09.28	-71	25.12	0001	BOPS OUT, U/W
1980	250482	1813	115	38	26.40	-72	09.70	0001	FISHING BOATS SIGHTED
1990	250482	1930	115	38	28.10	-72	29.10	0100	BOPS #25 IN WATER
2000	250482	1955	115	38	28.70	-72	29.20	0001	BOPS OUT?
2010	250482	2000	115	38	28.70	-72	29.20	1000	CTD #25 IN WATER
2020	250482	2228	115	38	29.40	-72	29.20	0001	CTD ABOARD
2030	250482	2730	115	38	31.20	-72	28.70	0001	U/W
2040	250482	2317	115	38	33.15	-72	18.92	0001	H/T, INTERMITTANT PROBLEMS W/ CTD
2050	260482	0005	116	38	34.00	-72	19.00	1000	CTD #26 IN WATER, CHANGE SLIP RINGS
2060	260482	0325	116	38	37.90	-72	18.50	0001	CTD ABOARD
2070	260482	0341	116	38	38.35	-72	18.39	0100	BOPS #26 IN WATER
2080	260482	0412	116	38	39.00	-72	18.24	0001	BOPS ABOARD
2090	260482	0426	116	38	39.28	-72	17.15	0001	U/W
2100	260482	0515	116	38	38.00	-72	08.10	0001	H/T
2110	260482	0524	116	38	38.30	-72	08.00	0100	BOPS #27 IN WATER
2120	260482	0630	116	38	39.64	-72	08.23	0001	BOPS OUT?
2130	260482	0635	116	38	39.00	-72	08.10	0001	U/W TO GET BACK TO ORIGINAL POSITION
2140	260482	0644	116	38	38.30	-72	07.95	0001	H/T
2150	260482	0651	116	38	37.90	-72	07.80	1000	CTD #27 IN WATER (CTD FISH #3)
2160	260482	0900	116	38	41.10	-72	08.40	0001	CTD OUT
2170	260482	0915	116	38	41.30	-72	07.90	0001	U/W
2180	260482	1010	116	38	43.00	-71	56.90	1000	CTD #28 IN WATER
2190	260482	1227	116	38	46.10	-71	58.20	0001	CTD ON DECK
2200	260482	1235	116	38	46.10	-71	58.20	0100	BOPS #28 IN WATER?
2210	260482	1305	116	38	47.10	-71	58.47	0001	BOPS ABOARD, U/W
2220	260482	1412	116	38	47.20	-71	46.20	0100	BOPS #29 IN WATER
2230	260482	1640	116	38	49.90	-71	47.80	0001	BOPS OUT
2240	260482	1645	116	38	49.90	-71	47.80	1000	CTD #29 IN WATER
2250	260482	1716	116	38	50.60	-71	48.00	0001	CTD OUT, U/W
2260	260482	1812	116	38	52.19	-71	35.27	0001	H/T
2270	260482	1817	116	38	52.10	-71	35.10	1000	CTD #30 IN WATER
2280	260482	1940	116	38	51.97	-71	34.14	0000	NEW CASSETTE IN LORAN C RECORDER
2290	260482	2052	116	38	51.80	-71	33.20	0001	CTD ABOARD
2300	270482	0000	117	39	00.07	-71	28.58	0000	BAD FACTORY LAY AT 3700m IN WIRE ON AFT WINCH
2310	270482	0220	117	38	57.20	-71	24.80	0001	H/T
2320	270482	0228	117	38	57.19	-71	24.84	0100	BOPS #31 IN WATER
2330	270482	0255	117	38	57.13	-71	24.69	0001	BOPS OUT
2340	270482	0302	117	38	56.90	-71	24.40	1000	CTD #31 IN WATER
2350	270482	0535	117	38	57.10	-71	23.90	0001	CTD ABOARD
2360	270482	0612	117	38	56.12	-71	24.20	0001	U/W
2370	270482	0710	117	39	02.14	-71	13.67	0001	H/T
2380	270482	0729	117	39	01.40	-71	12.70	1000	CTD #32 IN WATER
2390	270482	1034	117	38	58.50	-71	14.00	0001	CTD ABOARD
2400	270482	1055	117	38	57.90	-71	13.45	0100	BOPS #32 IN WATER
2410	270482	1150	117	38	56.26	-71	12.82	0001	BOPS ABOARD, U/W
2420	270482	1308	117	39	07.10	-71	02.20	0100	BOPS #33 IN WATER
2430	270482	1325	117	39	07.10	-71	02.00	0001	BOPS ABOARD
2440	270482	1330	117	39	07.10	-71	02.00	1000	CTD #33 IN WATER

(Cont.)

2450	270482	1705	117	39	04.40	-71	00.20	0001	CTD ABOARD
2460	270482	1830	117	39	11.82	-70	50.84	0000	RETERMINATING CTD CABLE, U/W
2470	270482	2042	117	39	11.80	-70	50.80	1000	CTD #34 IN WATER
2480	270482	2310	117	39	09.30	-70	50.40	0001	CTD OUT
2490	270482	2322	117	39	09.12	-70	50.45	0100	BOPS #34 IN WATER
2500	270482	2347	117	39	08.51	-70	50.45	0001	BOPS OUT
2510	280482	0110	118	39	17.10	-70	40.20	0100	BOPS #35 IN WATER
2520	280482	0140	118	39	17.20	-70	40.20	0001	BOPS OUT
2530	280482	0145	118	39	17.20	-70	40.20	0001	CTD #35 IN WATER
2540	280482	0356	118	39	17.60	-70	40.10	0001	CTD ABOARD
2550	280482	0432	118	39	17.91	-70	40.02	0001	U/W TO DRIFTER FOR M-S EXPT. #1
2560	280482	0930	118	39	00.18	-71	36.95	0000	LORAN DRIFTER SIGHTED (DR & VISUAL ONLY)
2570	280482	1024	118	39	00.40	-71	36.10	0001	DRIFTER, DT RECORDERS, & SEDIMENT TRAPS RECOVERED
2580	280482	1045	118	39	00.10	-71	36.60	0001	U/W TO JOIN KNORR (~8 MI SOUTH)
2590	280482	1136	118	38	54.90	-71	42.40	1000	CTD #36 IN WATER, CENTER STATION
2600	280482	1338	118	38	55.27	-71	44.23	0001	CTD OUT
2610	280482	1350	118	38	55.20	-71	44.50	0100	BOPS #36.1 IN WATER
2620	280482	1413	118	38	55.32	-71	45.19	0001	BOPS OUT
2630	280482	1440	118	38	55.68	-71	46.08	0001	U/W TO KNORR POSITION, BEGIN M-S #1 SURVEY
2640	280482	1530	118	38	52.40	-71	39.60	0100	BOPS #36.2 IN WATER
2650	280482	1600	118	38	52.76	-71	39.93	0001	BOPS OUT?
2660	280482	1610	118	38	52.70	-71	40.30	0010	XBT #50
2670	280482	1620	118	38	51.50	-71	41.40	0010	XBT #51
2680	280482	1630	118	38	50.30	-71	42.40	0010	XBT #52
2690	280482	1640	118	38	49.10	-71	43.50	0010	XBT #53
2700	280482	1650	118	38	47.90	-71	44.60	0010	XBT #54
2710	280482	1700	118	38	46.70	-71	45.70	0010	XBT #55
2720	280482	1710	118	38	45.40	-71	46.80	0010	XBT #56
2730	280482	1720	118	38	44.20	-71	48.00	0010	XBT #57
2740	280482	1730	118	38	43.00	-71	49.00	0010	XBT #58
2750	280482	1740	118	38	41.80	-71	50.10	0010	XBT #59
2760	280482	1750	118	38	40.50	-71	51.10	0010	XBT #60
2770	280482	1800	118	38	39.20	-71	52.30	0011	XBT #61, H/T
2780	280482	1811	118	38	39.06	-71	52.92	0100	BOPS #36.3 IN WATER
2790	280482	1839	118	38	39.57	-71	53.60	0001	BOPS ABOARD
2800	280482	1845	118	38	39.90	-71	53.80	0001	U/W, STA 4 OF XBT CROSS
2810	280482	2033	118	38	50.64	-71	54.54	0001	H/T
2820	280482	2035	118	38	50.60	-71	54.50	0100	BOPS #36.4 IN WATER
2830	280482	2100	118	38	51.70	-71	54.80	0001	BOPS OUT
2840	280482	2110	118	38	51.90	-71	54.70	0010	XBT #62, U/W
2850	280482	2120	118	38	51.10	-71	53.50	0010	XBT #63
2860	280482	2130	118	38	50.40	-71	52.40	0010	XBT #64, 063 IN TAPE
2870	280482	2140	118	38	49.70	-71	51.30	0010	XBT #65
2880	280482	2150	118	38	48.90	-71	50.00	0010	XBT #66
2890	280482	2200	118	38	47.90	-71	48.90	0010	XBT #67
2900	280482	2210	118	38	47.00	-71	47.50	0010	XBT #68
2910	280482	2220	118	38	46.00	-71	45.90	0010	XBT #69
2920	280482	2230	118	38	45.30	-71	44.40	0010	XBT #70
2930	280482	2240	118	38	44.40	-71	43.10	0010	XBT #71
2940	280482	2250	118	38	44.00	-71	42.50	0010	XBT #72
2950	280482	2300	118	38	43.00	-71	41.00	0010	XBT #73
2960	280482	2310	118	38	42.50	-71	40.20	0010	XBT #74
2970	280482	2320	118	38	41.80	-71	39.00	0010	XBT #75
2980	280482	2330	118	38	41.20	-71	38.00	0010	XBT #76
2990	280482	2340	118	38	40.90	-71	37.50	0010	XBT #77, END OF M-S #1, NO BOPS (WEATHER)
3000	290482	0200	119	38	51.30	-71	44.60	0010	XBT #78, RUN TO 2ND M-S
3010	290482	0300	119	38	58.90	-71	46.60	0010	XBT #79
3020	290482	0400	119	39	06.90	-71	49.90	0010	XBT #80
3030	290482	0500	119	39	11.80	-71	52.00	0010	XBT #81
3040	290482	0600	119	39	17.40	-71	54.20	0010	XBT #82
3050	290482	0700	119	39	22.80	-71	56.80	0010	XBT #83

3060	290482	0710	119	39	23.80	-71	57.39	0001	C/C 141, BACK TO POSITION
3070	290482	0750	119	39	20.10	-71	55.90	0011	XBT #84, H/T
3080	290482	0810	119	39	20.05	-71	55.67	0000	RADIO CONTACT W/ OCEANUS & KNORR, RELAYED POSITION
3090	290482	1232	119	39	21.40	-71	54.50	0001	DRIFTER LAUNCHED
3100	290482	1311	119	39	18.78	-71	52.51	0100	BOPS #37.1 ON WATER
3110	290482	1345	119	39	19.37	-71	52.52	0001	BOPS OUT?
3120	290482	1352	119	39	19.40	-71	52.50	1000	CTD #37 IN WATER, TOW YO LEG 1
3130	290482	1635	119	39	24.30	-71	45.70	0001	CTD OUT, END LEG 1
3140	290482	1648	119	39	24.89	-71	44.55	0100	BOPS #37.2 IN WATER
3150	290482	1720	119	39	25.34	-71	44.13	0001	BOPS OUT?
3160	290482	1738	119	39	25.70	-71	45.20	1000	CTD #37 IN WATER, TOW YO LEG 2
3170	290482	1845	119	39	23.50	-71	44.90	0001	CTD OUT, WIRE UNDER HULL, TOW YO NOT WORKING
3180	290482	1900	119	39	23.14	-71	45.10	0001	NASA AIR-DROP, APPROX TIME
3190	290482	1955	119	39	25.80	-71	41.20	1000	CTD IN, RESTART LINE 2, WIRE OVER STERN A-FRAME
3200	300482	0241	120	39	23.53	-71	24.39	0001	CTD OUT
3210	300482	0241	120	39	23.53	-71	24.39	0100	BOPS #37.3 IN WATER
3220	300482	0320	120	39	23.45	-71	23.65	0001	BOPS OUT?
3230	300482	0354	120	39	22.80	-71	22.30	1000	CTD #37 IN WATER, RESUME TOW YO
3240	300482	0400	120	39	22.79	-71	22.33	0000	BEGIN FRONT 11 SECTION, HDG 270
3250	300482	0700	120	39	21.80	-71	24.70	0001	CTD OUT
3260	300482	0707	120	39	21.60	-71	24.43	0100	BOPS #37.4 IN WATER, CORNER #4 OF M-S #2
3270	300482	0730	120	39	21.46	-71	23.86	0001	BOPS OUT
3280	300482	0740	120	39	21.50	-71	23.70	1000	CTD #37 IN WATER, TOW YO
3290	300482	1030	120	39	22.03	-71	14.79	0000	C/C TO 195, STM TOWARD BUOY, TOW YO RT 46
3300	300482	1135	120	39	19.80	-71	14.10	0001	CTD OUT, END TOW YO
3310	300482	1230	120	39	17.40	-71	12.50	0101	BOPS #37.5, RECOVERING BUOYS
3320	300482	1254	120	39	17.40	-71	12.20	0001	BUOYS SECURE
3330	300482	1330	120	39	16.51	-71	11.21	0001	U/W, HDG 224T
3340	300482	1402	120	39	12.40	-71	16.60	0010	XBT #85 (G2)
3350	300482	1500	120	39	04.30	-71	26.50	0010	XBT #86 (G3)
3360	300482	1600	120	38	55.10	-71	37.90	0010	XBT #87 (G4)
3370	300482	1700	120	38	46.00	-71	49.50	0010	XBT #88 (G5)
3380	300482	1800	120	38	37.70	-72	00.30	0010	XBT #89 (G6)
3390	300482	1900	120	38	28.40	-72	11.50	0010	XBT #90 (G7)
3400	300482	1910	120	38	26.86	-72	13.37	0001	C/C 176
3410	300482	2010	120	38	15.10	-72	13.10	0010	XBT #92
3420	300482	2200	120	37	52.70	-72	12.30	0010	XBT #93, SPERM WHALES SIGHTED
3430	300482	2335	120	37	37.50	-72	11.74	0001	10 DEG STRBDR COURSE CORREC. FOR ATS/FAX
3440	010482	0000	121	37	31.60	-72	11.50	0010	XBT #94 (G9)
3450	010582	0200	121	37	06.20	-72	08.40	0010	XBT #95 (G10)
3460	010582	0500	121	36	31.10	-72	03.50	0000	NW OF GULF STREAM, COLD WALL DETECTED ON RADAR
3470	010582	0600	121	36	20.80	-72	02.90	0010	XBT #97
3480	010582	0800	121	35	59.30	-72	01.10	0010	XBT #98
3490	010582	0815	121	35	59.00	-72	00.87	0001	SLOW TO STREAM CTD WIRE
3500	010582	1230	121	35	39.00	-72	07.20	0010	XBT #99, WIRE ABD
3510	010582	1309	121	35	39.30	-72	08.60	1000	CTD #38 IN WATER, .5 KT WEST CUR/EDGE OF CCRV SECTION #4
3520	010582	1605	121	35	39.31	-72	06.68	0001	CTD OUT
3530	010582	1611	121	35	39.31	-72	06.68	0100	BOPS #38 IN WATER
3540	010582	1644	121	35	39.42	-72	06.26	0001	BOPS OUT, U/W
3550	010582	1820	121	35	57.90	-72	12.20	0100	BOPS #39 IN WATER
3560	010582	1855	121	35	57.80	-72	11.30	0001	BOPS OUT?
3570	010582	1900	121	35	57.80	-72	11.30	1000	CTD #39 IN WATER
3580	010582	2205	121	35	58.40	-72	07.10	0001	CTD OUT, U/W
3590	020582	0014	122	36	16.48	-72	19.48	0100	BOPS #40 IN WATER
3600	020582	0045	122	36	16.76	-72	17.00	0001	BOPS OUT
3610	020582	0047	122	36	16.72	-72	16.83	1000	CTD #40 IN WATER (GULF STR) 4.5 KTS TO EAST
3620	020582	0405	122	36	16.90	-72	10.80	0001	CTD ON DECK
3630	020582	0630	122	36	35.10	-72	26.80	1000	CTD #41 IN WATER
3640	020582	0913	122	36	36.00	-72	23.80	0001	CTD ON DECK
3650	020582	0936	122	36	36.11	-72	23.02	0100	BOPS #41 IN WATER
3660	020582	1000	122	36	36.16	-72	22.54	0001	BOPS OUT?

TABLE 1: EN83 EVENT LOG

(Cont.)

3670	020582	1217	122	36	53.80	-72	33.60	0100	BOPS #42 IN WATER
3680	020582	1250	122	36	53.80	-72	32.90	0001	BOPS OUT
3690	020582	1252	122	36	53.80	-72	32.90	1000	CTD #42 IN WATER
3700	020582	1454	122	36	54.02	-72	31.55	0000	UNCONTAMINATED SEA WATER OFF
3710	020582	1605	122	36	53.90	-72	29.94	0000	UNCONTAMINATED SEA WATER BACK ON
3720	020582	1735	122	36	54.50	-72	29.00	0001	CTD OUT, U/W
3730	020582	1930	122	37	12.30	-72	41.92	0100	BOPS #43 IN WATER
3740	020582	1957	122	37	12.32	-72	42.02	0001	BOPS OUT
3750	020582	2000	122	37	12.30	-72	42.00	1000	CTD #43 IN WATER
3760	020582	2210	122	37	12.10	-72	42.20	0001	CTD ON DECK
3770	020582	2357	122	37	30.72	-72	49.02	0100	BOPS #44 IN WATER
3780	030582	0022	123	37	30.72	-72	49.03	0001	BOPS ABOARD
3790	030582	0031	123	37	30.70	-72	49.20	1000	CTD #44 IN WATER
3800	030582	0226	123	37	30.40	-72	49.20	0001	CTD A80
3810	030582	0417	123	37	49.40	-72	56.00	1000	CTD #45 IN WATER
3820	030582	0605	123	37	49.80	-72	55.80	0001	CTD OUT
3830	030582	0610	123	37	49.78	-72	55.77	0100	BOPS #45 IN WATER
3840	030582	0640	123	37	49.65	-72	55.72	0001	BOPS OUT, U/W
3850	030582	0828	123	38	08.39	-73	03.99	0100	BOPS #46 IN WATER
3860	030582	0855	123	38	08.20	-73	04.00	0001	BOPS OUT?
3870	030582	0858	123	38	08.20	-73	04.00	1000	CTD #46 IN WATER
3880	030582	1038	123	38	07.80	-73	04.50	0001	CTD OUT
3890	030582	1040	123	38	07.75	-73	04.49	0001	U/W
3900	030582	1230	123	38	27.70	-73	11.20	1000	CTD #47 IN WATER
3910	030582	1413	123	38	26.60	-73	11.30	0001	CTD A80
3920	030582	1415	123	38	26.52	-73	11.33	0100	BOPS #47 IN WATER?
3930	030582	1505	123	38	26.16	-73	10.96	0001	BOPS A80
3940	030582	1507	123	38	26.12	-73	10.86	0001	U/W TO 2ND XBT STAR
3950	030582	1833	123	38	09.30	-72	26.39	0001	C/C 018
3960	030582	1900	123	38	13.40	-72	23.50	0010	XBT #101, BEGIN LEG 1
3970	030582	2000	123	38	25.00	-72	18.50	0010	XBT #102
3980	030582	2100	123	38	36.90	-72	13.40	0010	XBT #103
3990	030582	2200	123	38	47.90	-72	08.80	0010	XBT #104
4000	030582	2302	123	39	00.20	-72	03.70	0010	XBT #105 (G5)
4010	040582	0000	124	39	11.80	-71	58.80	0010	XBT #106 (G6)
4020	040582	0105	124	39	25.10	-71	53.20	0010	XBT #107 (G7)
4030	040582	0159	124	39	34.50	-71	49.30	0010	XBT #108 (G8)
4040	040582	0300	124	39	45.20	-71	44.80	0011	XBT #109 (G9), C/C 090 (AMID FISH BUOYS)
4050	040582	0400	124	39	46.40	-71	33.30	0011	XBT #110 (G10), C/C 162, BEGIN LEG 2
4060	040582	0500	124	39	35.80	-71	28.10	0010	XBT #111
4070	040582	0600	124	39	24.10	-71	23.60	0010	XBT #112
4080	040582	0700	124	39	12.20	-71	18.70	0010	XBT #113
4090	040582	0800	124	38	59.90	-71	13.40	0010	XBT #114
4100	040582	0900	124	38	47.00	-71	08.40	0010	XBT #115
4110	040582	1000	124	38	34.90	-71	03.60	0010	XBT #116
4120	040582	1100	124	38	23.90	-70	58.90	0010	XBT #117
4130	040582	1200	124	38	13.30	-70	54.60	0010	XBT #118
4140	040582	1205	124	38	12.88	-70	55.10	0001	C/C 305T, BEGIN LEG 3
4150	040582	1300	124	38	18.50	-71	06.60	0010	XBT #119
4160	040582	1400	124	38	25.80	-71	19.90	0010	XBT #120 (G20)
4170	040582	1500	124	38	31.90	-71	32.80	0010	XBT #121 (G21)
4180	040582	1600	124	38	38.30	-71	46.80	0010	XBT #122 (G22)
4190	040582	1700	124	38	46.00	-72	00.60	0010	XBT #123 (G23)
4200	040582	1800	124	38	53.50	-72	13.80	0010	XBT #124
4210	040582	1900	124	39	00.70	-72	26.90	0010	XBT #125 (G25)
4220	040582	2000	124	39	08.10	-72	39.70	0010	XBT #126 (G26)
4230	040582	2003	124	39	08.70	-72	40.70	0010	XBT #127
4240	040582	2045	124	39	13.60	-72	48.00	0001	C/C 090, BEGIN LEG 4
4250	040582	2100	124	39	14.10	-72	45.30	0010	XBT #128
4260	040582	2200	124	39	14.10	-72	29.50	0010	XBT #129
4270	040582	2300	124	39	14.20	-72	13.20	0010	XBT #130

TABLE 1: EN83 EVENT LOG

(Cont.)

4280	050582	0000	125	39	14.20	-71	56.90	0010	XBT #131
4290	050582	0010	125	39	14.23	-71	53.93	0001	C/C 055T, HEAD FOR RING CENTER
4300	050582	0100	125	39	05.40	-71	47.70	0010	XBT #132
4310	050582	0200	125	38	54.70	-71	40.90	0010	XBT #133 (G32)
4320	050582	0231	125	38	49.80	-71	37.50	0100	BOPS #48 IN WATER
4330	050582	0300	125	38	49.61	-71	37.45	0001	BOPS OUT
4340	050582	0306	125	38	49.80	-71	37.50	1000	CTD #48 IN WATER
4350	050582	0500	125	38	49.80	-71	37.50	0001	CTD OUT, U/W
4360	050582	0600	125	38	56.60	-71	32.70	0010	XBT #134 (G33)
4370	050582	0700	125	38	07.40	-71	25.30	0010	XBT #135 (G34)
4380	050582	0745	125	39	15.50	-71	20.00	0001	C/C 090
4390	050582	0800	125	39	15.10	-71	16.20	0010	XBT #136 (G35), COMPLETE LEG 4
4400	050582	0900	125	39	15.20	-70	59.40	0010	XBT #137
4410	050582	1000	125	39	15.30	-70	43.90	0010	XBT #138
4420	050582	1100	125	39	15.30	-70	28.50	0010	XBT #139, NO WS
4430	050582	1120	125	39	15.19	-70	23.77	0001	C/C 236, BEGIN LEG 5
4440	050582	1200	125	39	10.40	-70	32.00	0010	XBT #140
4450	050582	1300	125	39	03.70	-70	44.60	0010	XBT #141
4460	050582	1400	125	38	57.00	-70	56.60	0010	XBT #142 (G40)
4470	050582	1500	125	38	50.20	-71	09.10	0010	XBT #143 (H1)
4480	050582	1600	125	38	43.00	-71	22.20	0010	XBT #144 (H2)
4490	050582	1700	125	38	35.70	-71	35.70	0010	XBT #145 (H3)
4500	050582	1800	125	38	28.40	-71	49.40	0010	XBT #146 (H4)
4510	050582	1900	125	38	21.20	-72	03.00	0010	XBT #147 (H5)
4520	050582	2000	125	38	13.80	-72	16.00	0010	XBT #148 (H6)
4530	050582	2016	125	38	12.10	-72	19.00	0001	C/C 132, END XBT STAR #2, HEAD FOR STA 49
4540	050582	2100	125	38	06.50	-72	12.80	0010	XBT #149 (H7)
4550	050582	2200	125	37	58.90	-72	01.70	0010	XBT #150 (H8)
4560	050582	2300	125	37	51.30	-71	50.20	0010	XBT #151 (H9)
4570	060582	0000	126	37	43.40	-71	39.60	0010	XBT #152 (H10)
4580	060582	0100	126	37	35.40	-71	28.40	0010	XBT #153 (H11)
4590	060582	0200	126	37	27.40	-71	17.50	0010	XBT #154 (H12)
4600	060582	0300	126	37	19.40	-71	06.80	0010	XBT #155 (H13)
4610	060582	0358	126	37	11.50	-70	56.20	0010	XBT #156 NOT ALIGNED, NO SURF TEMP
4620	060582	0402	126	37	11.50	-70	56.20	0010	XBT #157
4630	060582	0500	126	37	02.90	-70	44.40	0010	XBT #158 (H14)
4640	060582	0600	126	36	54.40	-70	33.30	0010	XBT #159 (H15)
4650	060582	0700	126	36	46.20	-70	22.50	0010	XBT #160 (H16)
4660	060582	0800	126	36	38.60	-70	11.90	0010	XBT #161 (H17)
4670	060582	0900	126	36	30.00	-70	00.00	0010	XBT #162 (H18)
4680	060582	0917	126	36	31.16	-70	01.99	1000	CTD #49 IN WATER, SARGASSO SEA
4690	060582	1416	126	36	32.70	-70	02.30	0001	CTD OUT
4700	060582	1429	126	36	32.86	-70	02.20	0100	BOPS #49 IN WATER
4710	060582	1459	126	36	33.27	-70	02.29	0001	BOPS OUT, U/W
4720	060582	1600	126	36	45.30	-70	02.00	0010	XBT #163 (H19)
4730	060582	1700	126	36	56.50	-70	00.90	0010	XBT #164 (H20)
4740	060582	1715	126	36	59.30	-70	00.25	0001	H/T
4750	060582	1724	126	37	00.08	-69	59.96	0100	BOPS #50 IN WATER
4760	060582	1745	126	37	00.82	-69	58.73	0001	BOPS OUT
4770	060582	1750	126	37	00.90	-69	58.50	1000	CTD #50 IN WATER
4780	060582	2124	126	37	03.50	-69	51.80	0001	CTD OUT
4790	060582	2130	126	37	03.77	-69	51.58	0001	U/W
4800	060582	2300	126	37	19.50	-69	56.80	0010	XBT #165
4810	070582	0000	127	37	30.10	-70	00.00	0100	BOPS #51 IN WATER
4820	070582	0020	127	37	31.40	-69	58.50	0010	XBT #166 (H22)
4830	070582	0045	127	37	32.70	-69	56.20	0001	BOPS OUT
4840	070582	0054	127	37	33.00	-69	56.30	1000	CTD #51 IN WATER
4850	070582	0457	127	37	36.00	-69	50.70	0001	CTD OUT
4860	070582	0510	127	37	36.75	-69	49.74	0001	U/W SLOW
4870	070582	0540	127	37	39.66	-69	50.73	0001	U/W FULL
4880	070582	0600	127	37	43.00	-69	52.50	0010	XBT #167 (H23)

TABLE 1: EN83 EVENT LOG

(Cont.)

4890	070582	0700	127	37	54.00	-69	57.40	0010	XBT #168 (H24)
4900	070582	0810	127	37	60.00	-70	00.00	1000	CTD #52 IN WATER
4910	070582	1000	127	38	01.00	-69	59.70	0010	XBT #169 NO WS
4920	070582	1106	127	38	01.80	-69	59.20	0001	CTD OUT
4930	070582	1115	127	38	01.97	-69	59.09	0100	BOPS #52 IN WATER
4940	070582	1150	127	38	02.79	-69	59.51	0001	BOPS OUT, U/W
4950	070582	1254	127	38	15.70	-69	59.30	0010	XBT #170
4950	070582	1409	127	38	30.20	-70	00.10	0010	XBT #171
4970	070582	1410	127	38	30.20	-70	00.10	0100	BOPS #53 IN WATER
4980	070582	1440	127	38	30.81	-70	00.44	0001	BOPS OUT
4990	070582	1445	127	38	31.00	-70	00.50	1000	CTD #53 IN WATER
5000	070582	1724	127	38	31.40	-70	00.10	0001	CTD OUT
5010	070582	1735	127	38	32.05	-69	59.95	0001	U/W
5020	070582	1800	127	38	35.80	-69	59.90	0010	XBT #172 (G3)
5030	070582	1900	127	38	48.00	-70	00.10	0010	XBT #173 (G5)
5040	070582	2000	127	39	00.10	-70	00.20	0011	XBT #174 (G6), H/T
5050	070582	2017	127	39	01.43	-70	00.62	0100	BOPS #54 IN WATER
5060	070582	2035	127	39	01.34	-70	01.85	0001	BOPS OUT
5070	070582	2040	127	39	01.20	-70	01.30	1000	CTD #54 IN WATER
5080	070582	2245	127	39	01.30	-70	01.80	0001	CTD OUT
5090	080582	0000	128	39	16.10	-70	00.80	0010	XBT #175
5100	080582	0100	128	39	28.40	-70	00.0	0010	XBT #176
5110	080582	0110	128	39	30.03	-70	00.04	0001	H/T
5120	080582	0114	128	39	30.00	-70	00.00	1000	CTD #55 IN WATER
5130	080582	0248	128	39	30.00	-70	00.10	0001	CTD OUT
5140	080582	0255	128	39	30.01	-70	00.97	0100	BOPS #55 IN WATER
5150	080582	0324	128	39	30.00	-70	01.20	0001	BOPS OUT, U/W HOME
5160	080582	0430	128	39	41.20	-70	06.60	0010	XBT #177
5170	080582	1430	128	41	17.41	-70	52.14	0001	SECURED AT WHOI DOCK (+/- MIN)

TABLE 2: CTD STATION LOCATIONS

SHIP: ENOCHAVOR CRUISE: 83 DATES: APRIL 17 - MAY 8, 1982

DATE DAY MOS.	GMT TIME	JULIAN DAY	LATITUDE DEG. MIN.	LONGITUDE DEG. MIN.	EVENT	
18	4	1630	108	38 36.10	-67 12.20	CTD #1
19	4	2130	109	38 58.90	-69 22.60	CTD #2
21	4	1446	111	38 31.97	-70 19.02	CTD #3
21	4	1936	111	38 36.40	-70 29.50	CTD #4
21	4	2317	111	38 42.30	-70 41.00	CTD #5
22	4	350	112	38 45.90	-70 50.70	CTD #6
22	4	940	112	38 49.50	-71 2.70	CTD #7
22	4	1537	112	38 54.20	-71 17.70	CTD #8
22	4	1924	112	38 59.37	-71 28.40	CTD #9
22	4	2304	112	39 5.10	-71 39.50	CTD #10
23	4	252	113	39 10.20	-71 51.30	CTD #11
23	4	657	113	39 15.34	-72 3.37	CTD #12
23	4	1045	113	39 22.16	-72 15.96	CTD #13
23	4	1534	113	39 46.00	-71 23.60	CTD #14
23	4	1830	113	39 36.80	-71 22.50	CTD #15
23	4	2210	113	39 27.00	-71 22.50	CTD #16
24	4	138	114	39 17.80	-71 23.00	CTD #17
24	4	641	114	39 7.80	-71 22.30	CTD #18
24	4	1212	114	38 57.70	-71 24.30	CTD #19
24	4	1730	114	38 47.60	-71 24.00	CTD #20
25	4	10	115	38 37.80	-71 25.40	CTD #21
25	4	445	115	38 28.90	-71 24.00	CTD #22
25	4	904	115	38 18.70	-71 24.20	CTD #23
25	4	1217	115	38 9.60	-71 23.90	CTD #24
25	4	2000	115	38 28.70	-72 29.20	CTD #25
26	4	5	116	38 34.00	-72 19.00	CTD #26
26	4	651	116	38 37.90	-72 7.80	CTD #27
26	4	1010	116	38 43.00	-71 56.90	CTD #28
26	4	1645	116	38 49.90	-71 47.80	CTD #29
26	4	1817	116	38 52.10	-71 35.10	CTD #30
27	4	302	117	38 56.90	-71 24.40	CTD #31
27	4	729	117	39 1.40	-71 12.70	CTD #32
27	4	1330	117	39 7.10	-71 2.00	CTD #33
27	4	2042	117	39 11.80	-70 50.80	CTD #34
28	4	145	118	39 17.20	-70 40.20	CTD #35
28	4	1136	118	38 54.90	-71 42.40	CTD #36
29	4	1352	119	39 19.40	-71 52.50	CTD #37
29	4	1738	119	39 25.70	-71 45.20	CTD #37
29	4	1955	119	39 25.80	-71 41.20	CTD #37
30	4	354	120	39 22.80	-71 22.30	CTD #37
30	4	740	120	39 21.50	-71 23.70	CTD #37
1	5	1309	121	35 39.30	-72 8.60	CTD #38
1	5	1900	121	35 57.80	-72 11.30	CTD #39
2	5	47	122	36 16.72	-72 15.83	CTD #40
2	5	630	122	36 35.10	-72 25.80	CTD #41
2	5	1252	122	36 53.80	-72 32.90	CTD #42
2	5	2000	122	37 12.30	-72 42.00	CTD #43
3	5	31	123	37 30.70	-72 49.20	CTD #44
3	5	417	123	37 49.40	-72 56.00	CTD #45
3	5	858	123	38 8.20	-73 4.00	CTD #46
3	5	1230	123	38 27.70	-73 11.20	CTD #47
5	5	306	125	38 49.80	-71 37.50	CTD #48
6	5	917	126	36 31.16	-70 1.99	CTD #49
6	5	1750	126	37 0.90	-69 58.50	CTD #50
7	5	54	127	37 33.00	-69 55.30	CTD #51
7	5	810	127	37 60.00	-70 0.00	CTD #52
7	5	1445	127	38 31.00	-70 0.50	CTD #53
7	5	2040	127	39 1.20	-70 1.30	CTD #54
8	5	114	128	39 30.00	-70 0.00	CTD #55

TABLE 3: XBT STATION LOCATIONS

SHIP: ENDEAVOR

CRUISE: 83

DATES: APRIL 17 - MAY 8, 1982

DATE DAY MOS.	GMT TIME	JULIAN DAY	LATITUDE DEG. MIN.	LONGITUDE DEG. MIN.	EVENT	
18	4	800	108	39 26.15	-68 24.13	XBT #1
18	4	1000	108	39 12.90	-68 3.10	XBT #2
18	4	1200	108	38 58.90	-67 43.00	XBT #3
18	4	1400	108	38 58.90	-67 43.00	XBT #4
18	4	2200	108	38 22.86	-67 22.91	XBT #5
19	4	5	109	38 22.90	-67 23.00	XBT #6
19	4	200	109	38 6.30	-67 41.70	XBT #7
19	4	400	109	37 41.00	-68 12.90	XBT #8
19	4	600	109	37 40.58	-67 41.53	XBT #9
19	4	800	109	37 40.30	-67 12.60	XBT #10
19	4	1000	109	37 55.70	-67 18.00	XBT #11
19	4	1200	109	38 12.60	-67 38.70	XBT #12
19	4	1400	109	38 31.60	-67 1.70	XBT #13
19	4	1610	109	38 51.70	-68 27.80	XBT #15
20	4	200	110	39 4.30	-69 45.70	XBT #16
20	4	400	110	39 9.70	-70 16.50	XBT #17
20	4	500	110	39 2.80	-70 29.00	XBT #18
20	4	600	110	38 55.40	-70 41.40	XBT #19
20	4	700	110	38 48.00	-70 54.90	XBT #20
20	4	800	110	38 40.70	-71 8.50	XBT #21
20	4	900	110	38 32.70	-71 23.20	XBT #22
20	4	1000	110	38 25.20	-71 36.20	XBT #23
20	4	1100	110	38 34.30	-71 33.30	XBT #24
20	4	1200	110	38 46.10	-71 28.90	XBT #25
20	4	1300	110	38 58.40	-71 22.40	XBT #26
20	4	1400	110	39 9.80	-71 17.10	XBT #27
20	4	1505	110	39 22.90	-71 11.30	XBT #28
20	4	1600	110	39 33.20	-71 6.60	XBT #29
20	4	1700	110	39 29.50	-71 1.40	XBT #30
20	4	1900	110	39 17.20	-70 54.60	XBT #31
20	4	2000	110	39 5.20	-70 49.80	XBT #32
20	4	2100	110	38 52.90	-70 44.80	XBT #33
20	4	2200	110	38 39.70	-70 39.40	XBT #34
20	4	2300	110	38 27.10	-70 34.30	XBT #35
21	4	0	111	38 30.90	-70 43.80	XBT #36
21	4	100	111	38 37.80	-70 55.90	XBT #37
21	4	200	111	38 44.80	-71 8.20	XBT #38
21	4	300	111	38 52.40	-71 21.40	XBT #39
21	4	400	111	38 59.80	-71 34.80	XBT #40
21	4	500	111	39 6.90	-71 47.10	XBT #41
21	4	600	111	39 11.80	-71 49.00	XBT #42
21	4	700	111	39 11.70	-71 32.80	XBT #43
21	4	800	111	39 11.50	-71 16.20	XBT #44
21	4	900	111	39 11.40	-70 59.10	XBT #45
21	4	1000	111	39 11.50	-70 43.40	XBT #46
21	4	1100	111	39 11.60	-70 27.90	XBT #47
22	4	842	112	38 52.20	-71 2.10	XBT #48
22	4	1346	112	38 57.20	-71 13.30	XBT #49
28	4	1610	118	38 52.70	-71 40.30	XBT #50
28	4	1620	118	38 51.50	-71 41.40	XBT #51
28	4	1630	118	38 50.30	-71 42.40	XBT #52
28	4	1640	118	38 49.10	-71 43.50	XBT #53
28	4	1650	118	38 47.90	-71 44.60	XBT #54
28	4	1700	118	38 46.70	-71 45.70	XBT #55
28	4	1710	118	38 45.40	-71 46.80	XBT #56
28	4	1720	118	38 44.20	-71 48.00	XBT #57

TABLE 3: XBT STATION LOCATIONS
(Cont.)

4	5	1600	124	38	38.30	-71	46.80	XBT #122
4	5	1700	124	38	46.00	-72	0.60	XBT #123
4	5	1800	124	38	53.50	-72	13.80	XBT #124
4	5	1900	124	39	0.70	-72	26.90	XBT #125
4	5	2000	124	39	8.10	-72	39.70	XBT #126
4	5	2003	124	39	8.70	-72	40.70	XBT #127
4	5	2100	124	39	14.10	-72	45.30	XBT #128
4	5	2200	124	39	14.10	-72	29.50	XBT #129
4	5	2300	124	39	14.20	-72	13.20	XBT #130
5	5	0	125	39	14.20	-71	56.90	XBT #131
5	5	100	125	39	5.40	-71	47.70	XBT #132
5	5	200	125	38	54.70	-71	40.90	XBT #133
5	5	600	125	38	56.60	-71	32.70	XBT #134
5	5	700	125	38	7.40	-71	25.30	XBT #135
5	5	800	125	39	15.10	-71	16.20	XBT #136
5	5	900	125	39	15.20	-70	59.40	XBT #137
5	5	1000	125	39	15.30	-70	43.80	XBT #138
5	5	1100	125	39	15.30	-70	28.50	XBT #139
5	5	1200	125	39	10.40	-70	32.00	XBT #140
5	5	1300	125	39	3.70	-70	44.60	XBT #141
5	5	1400	125	38	57.00	-70	56.60	XBT #142
5	5	1500	125	38	50.20	-71	9.10	XBT #143
5	5	1600	125	38	43.00	-71	22.20	XBT #144
5	5	1700	125	38	35.70	-71	35.70	XBT #145
5	5	1800	125	38	28.40	-71	49.40	XBT #146
5	5	1900	125	38	21.20	-72	3.00	XBT #147
5	5	2000	125	38	13.80	-72	16.00	XBT #148
5	5	2100	125	38	6.50	-72	12.80	XBT #149
5	5	2200	125	37	58.90	-72	1.70	XBT #150
5	5	2300	125	37	51.30	-71	50.20	XBT #151
6	5	0	126	37	43.40	-71	39.60	XBT #152
6	5	100	126	37	35.40	-71	28.40	XBT #153
6	5	200	126	37	27.40	-71	17.50	XBT #154
6	5	300	126	37	19.40	-71	6.80	XBT #155
6	5	358	126	37	11.50	-70	56.20	XBT #156
6	5	402	126	37	11.50	-70	56.20	XBT #157
6	5	500	126	37	2.90	-70	44.40	XBT #158
6	5	600	126	36	54.40	-70	33.30	XBT #159
6	5	700	126	36	46.20	-70	22.50	XBT #160
6	5	800	126	36	38.60	-70	11.90	XBT #161
6	5	900	126	36	30.00	-70	0.00	XBT #162
6	5	1600	126	36	45.30	-70	2.00	XBT #163
6	5	1700	126	36	56.50	-70	0.90	XBT #164
6	5	2300	126	37	19.50	-69	56.80	XBT #165
7	5	20	127	37	31.40	-69	58.50	XBT #166
7	5	600	127	37	43.00	-69	52.50	XBT #167
7	5	700	127	37	54.00	-69	57.40	XBT #168
7	5	1000	127	38	1.00	-69	59.70	XBT #169
7	5	1254	127	38	15.70	-69	59.30	XBT #170
7	5	1409	127	38	30.20	-70	0.10	XBT #171
7	5	1800	127	38	35.80	-69	59.90	XBT #172
7	5	1900	127	38	48.00	-70	0.10	XBT #173
7	5	2000	127	39	0.10	-70	0.20	XBT #174
8	5	0	128	39	16.10	-70	0.80	XBT #175
8	5	100	128	39	28.40	-70	0.00	XBT #176
8	5	430	128	39	41.20	-70	6.60	XBT #177

TABLE 4: BOPS STATION LOCATIONS

SHIP: ENDEAVOR

CRUISE: 83

DATES: APRIL 17 - MAY 8, 1982

DATE DAY MOS.		GMT TIME	JULIAN DAY	LATITUDE DEG. MIN.	LONGITUDE DEG. MIN.	EVENT
18	4	1942	108	38 33.80	-67 9.70	BOPS #1
19	4	1952	109	38 58.00	-69 16.00	BOPS #2.1
20	4	1710	110	39 28.55	-71 0.77	BOPS #2.2
21	4	1715	111	38 32.23	-70 19.03	BOPS #3
21	4	1853	111	38 36.94	-70 29.54	BOPS #4
21	4	2252	111	38 42.17	-70 41.21	BOPS #5
22	4	310	112	38 47.10	-70 51.65	BOPS #6
22	4	856	112	38 51.26	-71 2.24	BOPS #7
22	4	1403	112	38 57.29	-71 13.37	BOPS #8
22	4	1853	112	38 59.50	-71 28.70	BOPS #9
22	4	2243	112	38 59.24	-71 28.18	BOPS #10
23	4	218	113	39 10.70	-71 51.80	BOPS #11
23	4	623	113	39 15.48	-72 3.34	BOPS #12
23	4	1003	113	39 21.00	-72 15.00	BOPS #13
23	4	1500	113	39 46.12	-71 23.98	BOPS #14
23	4	1803	113	39 36.87	-71 23.80	BOPS #15
23	4	2140	113	39 27.22	-71 23.90	BOPS #16
24	4	113	114	39 17.88	-71 23.98	BOPS #17
24	4	607	114	39 8.10	-71 23.61	BOPS #18
24	4	1523	114	38 56.67	-71 26.94	BOPS #19
24	4	2149	114	38 43.50	-71 30.90	BOPS #20
24	4	2330	114	38 38.50	-71 24.50	BOPS #21
25	4	711	115	38 27.93	-71 25.26	BOPS #22
25	4	831	115	38 19.04	-71 24.10	BOPS #23
25	4	1428	115	38 8.87	-71 24.66	BOPS #24
25	4	1930	115	38 28.10	-72 29.10	BOPS #25
26	4	341	116	38 38.35	-72 18.39	BOPS #26
26	4	524	116	38 38.30	-72 8.00	BOPS #27
26	4	1235	116	38 46.10	-71 58.20	BOPS #28
26	4	1412	116	38 47.20	-71 46.20	BOPS #29
27	4	228	117	38 57.19	-71 24.84	BOPS #31
27	4	1055	117	38 57.90	-71 13.65	BOPS #32
27	4	1308	117	39 7.10	-71 2.20	BOPS #33
27	4	2322	117	39 9.12	-70 50.45	BOPS #34
28	4	110	118	39 17.10	-70 40.20	BOPS #35
28	4	1350	118	38 55.20	-71 44.50	BOPS #36.1
28	4	1530	118	38 52.40	-71 39.60	BOPS #36.2
28	4	1811	118	38 39.06	-71 52.92	BOPS #36.3
28	4	2035	118	38 50.60	-71 54.50	BOPS #36.4
29	4	1311	119	39 18.78	-71 52.51	BOPS #37
29	4	1648	119	39 24.89	-71 44.55	BOPS #37.2
30	4	241	120	39 23.53	-71 24.39	BOPS #37.3
30	4	707	120	39 21.60	-71 24.43	BOPS #37.4
30	4	1230	120	39 17.40	-71 12.50	BOPS #37.5
1	5	1611	121	35 39.31	-72 6.68	BOPS #38
1	5	1820	121	35 57.90	-72 12.20	BOPS #39
2	5	14	122	36 16.48	-72 19.48	BOPS #40
2	5	936	122	36 36.11	-72 23.02	BOPS #41
2	5	1217	122	36 53.80	-72 33.60	BOPS #42
2	5	1930	122	37 12.30	-72 41.92	BOPS #43
2	5	2357	122	37 30.72	-72 49.02	BOPS #44
3	5	610	123	37 49.78	-72 55.77	BOPS #45
3	5	828	123	38 8.39	-73 3.99	BOPS #46
3	5	1415	123	38 26.52	-73 11.33	BOPS #47
5	5	231	125	38 49.80	-71 37.50	BOPS #48
6	5	1429	126	36 32.86	-70 2.20	BOPS #49
6	5	1724	126	37 0.08	-69 59.96	BOPS #50
7	5	0	127	37 30.10	-70 0.00	BOPS #51
7	5	1115	127	38 1.97	-69 59.09	BOPS #52
7	5	1410	127	38 30.20	-70 0.10	BOPS #53
7	5	2017	127	39 1.43	-70 0.62	BOPS #54
8	5	255	128	39 30.01	-70 0.97	BOPS #55

TABLE 3: XBT STATION LOCATIONS

(Cont.)

28	4	1730	118	38	43.00	-71	49.00	XBT #58
28	4	1740	118	38	41.80	-71	50.10	XBT #59
28	4	1750	118	38	40.50	-71	51.10	XBT #60
28	4	1800	118	38	39.20	-71	52.30	XBT #61
28	4	2110	118	38	51.90	-71	54.70	XBT #62
28	4	2120	118	38	51.10	-71	53.50	XBT #63
28	4	2130	118	38	50.40	-71	52.40	XBT #64
28	4	2140	118	38	49.70	-71	51.30	XBT #65
28	4	2150	118	38	48.90	-71	50.00	XBT #66
28	4	2200	118	38	47.90	-71	48.90	XBT #67
28	4	2210	118	38	47.00	-71	47.50	XBT #68
28	4	2220	118	38	46.00	-71	46.90	XBT #69
28	4	2230	118	38	45.30	-71	44.40	XBT #70
28	4	2240	118	38	44.40	-71	43.10	XBT #71
28	4	2250	118	38	44.00	-71	42.50	XBT #72
28	4	2300	118	38	43.00	-71	41.00	XBT #73
28	4	2310	118	38	42.50	-71	40.20	XBT #74
28	4	2320	118	38	41.80	-71	39.00	XBT #75
28	4	2330	118	38	41.20	-71	38.00	XBT #76
28	4	2340	118	38	40.90	-71	37.50	XBT #77
29	4	200	119	38	51.30	-71	44.60	XBT #78
29	4	300	119	38	58.90	-71	46.60	XBT #79
29	4	400	119	39	6.90	-71	49.90	XBT #80
29	4	500	119	39	11.80	-71	52.00	XBT #81
29	4	600	119	39	17.40	-71	54.20	XBT #82
29	4	700	119	39	22.80	-71	56.80	XBT #83
29	4	750	119	39	20.10	-71	55.90	XBT #84
30	4	1402	120	39	12.40	-71	16.60	XBT #85
30	4	1500	120	39	4.30	-71	26.50	XBT #86
30	4	1600	120	38	55.10	-71	37.90	XBT #87
30	4	1700	120	38	46.00	-71	49.50	XBT #88
30	4	1800	120	38	37.70	-72	0.30	XBT #89
30	4	1900	120	38	28.40	-72	11.50	XBT #90
30	4	2010	120	38	15.10	-72	13.10	XBT #92
30	4	2200	120	37	52.70	-72	12.30	XBT #93
1	4	0	121	37	31.60	-72	11.50	XBT #94
1	5	200	121	37	6.20	-72	8.40	XBT #95
1	5	600	121	36	20.80	-72	2.90	XBT #97
1	5	800	121	35	59.30	-72	1.10	XBT #98
1	5	1230	121	35	39.00	-72	7.20	XBT #99
3	5	1900	123	38	13.40	-72	23.50	XBT #101
3	5	2000	123	38	25.00	-72	18.50	XBT #102
3	5	2100	123	38	36.90	-72	13.40	XBT #103
3	5	2200	123	38	47.90	-72	8.80	XBT #104
3	5	2302	123	39	0.20	-72	3.70	XBT #105
4	5	0	124	39	11.80	-71	58.80	XBT #106
4	5	105	124	39	25.10	-71	53.20	XBT #107
4	5	159	124	39	34.50	-71	49.30	XBT #108
4	5	300	124	39	45.20	-71	44.80	XBT #109
4	5	400	124	39	46.40	-71	33.30	XBT #110
4	5	500	124	39	35.80	-71	28.10	XBT #111
4	5	600	124	39	24.10	-71	23.60	XBT #112
4	5	700	124	39	12.20	-71	18.70	XBT #113
4	5	800	124	38	59.90	-71	13.40	XBT #114
4	5	900	124	38	47.00	-71	8.40	XBT #115
4	5	1000	124	38	34.90	-71	3.60	XBT #116
4	5	1100	124	38	23.90	-70	58.90	XBT #117
4	5	1200	124	38	13.30	-70	54.60	XBT #118
4	5	1300	124	38	18.50	-71	6.60	XBT #119
4	5	1400	124	38	25.80	-71	19.90	XBT #120
4	5	1500	124	38	31.90	-71	32.80	XBT #121

TABLE 5: METEOROLOGICAL OBSERVATIONS

WARM CORE RINGS METEOROLOGICAL LOG																
SHIP: ENDEAVOR CRUISE: 83 CHIEF SCIENTIST: T. JOYCE DATES: 17 APR. '82-R MAY '82																
	DAY	GMT TIME	WIND SPD	WIND DIR.	SHIP SPD	SHIP HOG	BAR. PRS.	DPY BULB	WET BULB	SEA SURF	SWELL AMP(M)	SWELL DIREC	OKTAS	WIND WAVE	PRES. WEATHR	POSITION
80	108	0510	30	030	11.7	135	1017	14.0	12.5	10.1	2.0	165	1	1	0	39,52.90 -68,59.60
90	108	0905	27	040	9.1	135	1016	17.7	16.2	16.1	2.0	170	1	1	4	39,19.00 -68,12.00
100	108	1300	37	040	12.0	140	1016	20.0	18.8	20.5	2.0	180	1	1	1	38,50.40 -67,32.00
110	108	1700	33	020	1.2	185	1016	20.0	19.0	19.9	2.0	180	8	.5	5	38,34.90 -67,10.00
120	108	2100	20	060	8.3	225	1017	14.3	11.8	19.9	2.0	180	8	1	2	38,27.00 -67,16.00
130	109	0100	19	064	11.5	226	1021	16.0	12.5	23.2	2.0	190	5	1	5	38,00.90 -67,98.00
140	109	0500	18	300	11.7	090	1021	17.0	11.5	23.3	2.0	030	4	1	2	37,40.80 -67,58.00
150	109	0900	20	020	11.3	330	1021	17.5	10.5	19.2	2.0	030	2	1	1	37,46.00 -67,17.60
160	109	1300	22	040	11.5	305	1023	17.5	12.0	23.1	1.0	340	1	.5	5	38,22.10 -67,50.10
170	109	1700	16	025	12.3	282	1025	13.5	9.0	14.1	.5	310	0	.25	0	38,54.80 -68,40.20
180	109	2135	3	095	0.7	345	1024	11.5	8.2	7.8	.25	125	0	.1	0	38,59.00 -69,22.60
190	110	0100	8	005	12.2	283	1025	10.5	8.4	10.5	.25	313	0	.1	1	39,01.30 -69,28.70
200	110	0400	11	320	12.0	236	1025	10.3	8.4	8.7	.25	196	0	.1	1	39,09.70 -70,16.50
210	110	0500	10	325	11.9	239	1025	9.7	8.3	8.4	.25	210	0	.1	1	39,02.80 -70,29.00
220	110	0600	10	325	11.9	238	1024	12.0	8.5	13.3	.25	200	0	.1	0	38,55.40 -70,41.40
230	110	0700	11	320	11.9	236	1024	13.6	10.3	15.3	.25	190	0	.1	0	38,48.00 -70,54.90
240	110	0800	11	320	12.0	235	1024	14.5	11.5	15.8	.2	190	0	.1	0	38,40.70 -71,08.50
250	110	0900	12	320	12.0	226	1023	14.7	10.5	15.5	.2	090	0	.1	0	38,32.70 -71,23.20
260	110	1000	11	310	12.0	230	1023	13.6	11.3	12.2	.3	090	0	.2	0	38,25.20 -71,36.20
270	110	1100	12	040	12.0	026	1024	16.3	10.8	12.9	.4	090	0	.1	0	38,34.30 -71,33.30
280	110	1200	13	045	11.9	022	1024	16.5	11.0	15.7	.4	090	0	.2	0	38,46.10 -71,28.90
290	110	1300	14	045	11.9	022	1024	16.4	11.4	16.0	.4	090	2	.1	1	38,58.40 -71,22.40
300	110	1400	10	040	12.2	015	1025	15.8	11.7	15.9	.5	175	1	.2	1	39,09.80 -71,17.10
310	110	1505	10	060	12.3	019	1025	15.0	12.0	13.7	.5	155	2	.2	1	39,22.90 -71,11.30
320	110	1600	12	055	12.4	014	1025	14.5	11.8	12.4	.5	160	2	.2	1	39,33.20 -71,06.60
330	110	1700	16	340	5.8	166	1024	15.6	12.7	13.3	.5	130	1	.2	1	39,29.54 -71,01.39
340	110	1900	23	345	11.8	165	1025	16.1	12.6	15.1	.5	140	2	.5	1	39,17.20 -70,54.60
350	110	2000	20	345	11.9	160	1024	16.6	12.7	15.0	.5	140	4	.5	2	39,05.20 -71,49.80
360	110	2100	19	335	12.0	162	1024	15.5	12.0	16.1	.3	140	4	.2	2	38,52.50 -70,44.60
370	110	2200	17	330	12.0	157	1024	14.0	11.5	12.7	.6	135	4	.2	2	38,39.70 -70,39.40
380	110	2300	16	315	11.9	156	1023	14.0	11.8	10.5	.5	135	4	.2	2	38,27.10 -70,34.30
390	111	0000	4	075	12.3	309	1023	15.0	12.4	13.0	.3	130	4	.1	2	38,30.90 -70,43.80
400	111	0100	2	060	12.3	312	1024	15.3	12.8	12.4	.5	100	6	.1	1	38,37.80 -70,55.90
410	111	0200	4	140	12.2	311	1023	17.0	14.0	16.1	.3	180	6	.1	1	38,44.80 -71,08.20
420	111	0300	4	180	12.3	304	1021	17.1	14.6	16.1	.3	170	6	.1	1	38,52.40 -71,21.40
430	111	0400	3	285	12.1	301	1022	16.3	15.1	15.5	.3	270	6	.1	1	38,59.80 -71,34.80
440	111	0500	5	295	12.4	299	1022	16.1	14.0	12.4	.2	260	4	.1	1	39,06.90 -71,47.10
450	111	0600	15	025	12.2	095	1023	16.8	14.5	12.7	.2	120	4	.1	1	39,11.80 -71,49.00
460	111	0700	17	025	12.2	094	1021	17.6	15.5	15.7	.3	120	6	.2	2	39,11.70 -71,32.80
470	111	0800	18	030	12.0	092	1021	17.7	15.6	15.9	.3	120	7	.2	2	39,11.50 -71,16.20
480	111	0900	17	040	12.3	084	1020	16.7	15.0	15.7	.5	120	7	.1	2	39,11.40 -70,59.10
490	111	1000	16	038	12.3	084	1020	14.5	12.6	12.7	.4	130	7	.2	2	39,11.50 -70,43.40
500	111	1100	22	359	12.0	084	1020	12.4	10.6	8.3	.3	130	7	.1	1	39,11.60 -70,27.90
510	111	1200	24	355	12.3	168	1020	13.3	11.6	9.9	.2	140	0	.1	1	39,00.80 -70,23.90
520	111	1300	21	350	12.1	170	1021	13.1	12.2	9.2	.1	150	6	.1	0	38,50.00 -70,23.00
530	112	0500	22	110	0.0	209	1021	14.3	8.8	13.8	.3	300	4	.1	1	38,43.59 -70,51.57
540	112	0923	19	115	0.0	253	1021	11.0	7.5	15.7	.8	000	-	.2	0	38,50.00 -71,02.50
550	112	1910	12	060	0.6	210	1020	12.6	6.4	16.0	.2	270	4	.1	1	39,59.50 -71,28.60
560	112	2107	13	065	0.5	065	1019	12.2	7.5	16.0	.9	270	4	.2	2	38,58.70 -71,26.70
570	113	0000	24	100	0.0	249	1022	8.0	5.0	14.2	.5	350	1	.2	1	39,10.30 -71,49.40
580	113	0905	27	050	8.4	050	1022	7.6	4.0	10.8	.8	340	-	.3	0	39,17.40 -72,07.20
590	113	1345	15	295	12.2	061	1023	7.7	4.1	10.6	1.0	030	1	.3	4	39,38.60 -71,41.10
600	113	1700	16	060	12.2	194	1022	10.4	5.6	10.1	.3	325	0	.1	0	39,45.20 -71,21.50
610	113	2100	26	015	12.2	220	1020	11.9	7.3	11.4	.5	270	-	.1	0	39,32.20 -71,19.90

TABLE 5: METEOROLOGICAL OBSERVATIONS (Cont.)

620	114	0300	25	250	0.0	-	1021	16.7	11.5	15.4	1.0	275	0	.5	0	39,17.50	-71,19.50
630	114	0551	30	030	7.6	226	1020	16.0	11.5	15.0	1.0	270	0	.5	0	39,09.00	-71,23.00
640	114	0930	25	035	2.1	240	1020	15.5	11.0	15.7	1.0	240	-	.3	0	39,05.50	-71,16.20
650	114	1700	14	070	11.7	165	1022	17.4	12.2	15.9	1.0	270	0	.2	0	38,50.40	-71,24.40
660	114	2102	14	320	0.2	301	1022	17.0	12.3	16.0	1.2	270	-	.3	0	38,43.70	-71,29.40
670	115	0127	13	225	-	335	1026	15.5	12.0	15.3	.5	300	0	.2	0	38,36.60	-71,21.80
680	115	0500	8	070	0.3	148	1024	15.0	12.2	13.1	.5	270	0	.1	0	38,28.90	-71,24.00
690	115	0900	4	075	0.3	150	1025	12.0	10.0	10.0	.3	230	-	.1	0	38,18.70	-71,24.20
700	115	1310	6	070	-	135	1026	12.5	10.0	8.8	.2	235	0	.1	0	38,09.20	-71,24.10
710	115	1710	6	250	11.9	299	1026	15.0	12.1	14.6	1.1	250	0	.1	0	38,22.20	-71,55.00
720	115	2230	10	060	12.4	084	1025	14.7	12.5	11.6	.7	200	0	.1	1	38,31.40	-72,27.20
730	116	0110	13	060	-	132	1026	15.1	12.5	13.0	.5	270	0	.1	1	38,35.40	-72,19.00
740	116	0539	6	070	0	110	1026	18.0	14.7	15.3	.2	180	0	.1	0	38,38.20	-72,08.00
750	116	0912	17	050	11.2	082	1027	16.7	14.8	15.4	.2	080	-	.1	0	38,41.40	-72,08.60
760	116	1355	22	045	11.9	092	1025	18.3	15.4	16.0	1.0	130	7	.5	2	38,47.20	-71,49.50
770	116	1720	25	060	12.0	084	1025	18.6	15.5	15.8	1.0	160	8	.5	2	38,50.80	-71,47.50
780	116	2122	27	135	1.0	138	1023	17.6	15.2	15.0	1.5	230	4	.3	2	38,51.40	-71,32.70
790	117	0150	33	345	7.5	190	1022	17.3	15.2	15.8	1.5	220	8	.5	2	39,01.80	-71,23.90
800	117	0500	12	090	0.4	085	1020	18.3	16.0	15.8	1.5	180	8	.5	2	38,57.00	-71,24.10
810	117	0910	26	105	0.3	310	1010	16.5	15.8	14.8	4.0	180	7	.6	2	38,59.80	-71,13.40
820	117	1300	27	010	0.3	170	1019	17.3	16.9	15.7	3.0	180	7	.5	2	39,06.70	-71,01.00
830	117	1830	20	140	4.2	033	1018	17.8	15.5	13.9	3.0	180	8	.5	2	39,09.40	-70,54.90
840	117	2100	10	025	0.0	185	1017	15.3	14.5	13.5	3.0	190	7	.4	2	39,10.90	-70,50.70
850	118	0145	2	-	0.0	083	1015	15.3	14.0	11.9	1.5	130	7	.1	1	39,17.10	-70,40.20
860	118	0520	24	320	11.6	252	1015	17.6	16.5	12.7	1.5	180	8	.5	6	39,15.00	-70,50.80
870	118	1521	25	350	1.7	027	1014	10.7	9.6	15.8	2	320	8	.5	6	38,52.40	-71,39.70
880	118	1930	38	010	6.0	010	1016	13.5	11.1	15.8	2.5	360	8	1.1	6	38,44.30	-71,54.30
890	118	2100	33	360	1.7	020	1017	10.6	8.6	15.8	2	360	7	.3	2	38,51.60	-71,54.70
900	119	0156	38	020	6.3	355	1015	8.0	7.0	15.8	2.5	360	7	.5	7	38,51.90	-71,44.20
910	119	0900	17	360	1.1	020	1021	11.0	7.3	13.0	1.5	030	-	.5	0	39,21.20	-71,53.40
920	119	1700	20	360	1.3	016	1024	11.0	7.2	13.2	1.0	360	0	.2	0	39,25.10	-71,44.30
930	119	2200	5	280	1.8	143	1024	11.5	6.5	14.0	1.0	045	-	.1	0	39,23.50	-71,36.50
940	120	0540	0	-	2.0	040	1025	11.8	6.0	14.5	.5	270	0	.1	0	39,22.22	-71,23.81
950	120	0715	11	245	0.1	026	1024	12.6	9.5	14.3	1.25	270	0	.1	0	39,21.60	-71,24.50
960	120	0915	15	225	2.1	050	1024	12.5	8.8	13.3	.3	290	-	.1	0	39,22.80	-71,18.50
970	120	1510	17	030	11.8	230	1024	14.0	9.5	15.7	.5	270	0	.1	1	39,02.80	-71,28.30
980	120	1900	19	030	12.3	217	1023	15.0	12.0	14.7	.5	270	0	.1	0	38,37.70	-72,00.30
990	120	2100	19	040	12.5	178	1023	12.3	10.0	10.2	.5	270	-	.1	0	38,05.30	-72,11.90
1000	121	0120	14	040	12.5	173	1024	14.2	11.4	12.8	.2	300	0	.1	0	37,15.20	-72,09.40
1010	121	0500	9	030	12.2	183	1024	16.4	12.5	20.2	.2	270	0	.1	0	36,31.10	-72,03.50
1020	121	0920	0	080	6.0	182	1022	19.5	11.8	23.4	.2	090	-	.1	0	35,51.30	-71,59.80
1030	121	1538	0	260	-	087	1024	20.0	12.5	21.2	.2	060	0	-	0	35,39.20	-72,07.20
1040	121	1700	12	360	12.1	348	1023	20.3	11.8	21.9	.1	360	0	0	0	35,42.10	-72,06.90
1050	121	2110	0	125	-2	117	1022	22.0	13.5	24.0	.1	120	0	.1	1	35,58.30	-72,08.20
1060	122	0122	0	030	2.5	260	1022	21.3	14.0	24.8	.1	045	1	.1	1	36,16.90	-72,14.80
1070	122	0450	15	310	12.1	305	1022	21.5	15.5	24.7	.1	135	1	.1	1	36,22.00	-72,14.90
1080	122	0930	4	075	0	185	1021	18.5	14.5	17.4	.2	200	-	.1	0	36,36.10	-72,23.30
1090	122	1319	9	232	0	132	1022	16.6	14.0	13.8	.1	120	1	.1	0	36,53.60	-72,32.30
1100	122	1713	9	110	.2	135	1021	18.5	15.0	14.4	.1	120	1	.1	1	36,54.30	-72,29.20
1110	122	2107	10	090	.3	155	1020	15.4	13.1	12.0	.4	220	1	.1	4	37,12.30	-72,42.10
1120	123	0100	5	060	.4	168	1021	14.0	12.4	10.8	.1	-	3	.1	0	37,30.50	-72,49.10
1130	123	0643	10	320	12.0	342	1020	14.0	12.0	11.0	.1	-	1	.1	0	37,49.70	-72,55.70
1140	123	1046	11	100	12.0	342	1020	13.5	11.5	11.0	.3	270	8	.1	1	38,07.80	-73,04.80
1150	123	1326	9	090	0.2	175	1021	14.4	11.6	12.2	.1	190	6	.1	0	38,27.10	-73,11.40
1160	123	1700	2	060	12.1	110	1021	15.0	13.7	12.8	.1	190	8	.1	2	38,17.00	-72,36.20
1170	123	2100	11	305	11.9	021	1020	14.0	11.5	13.8	.3	300	-	.2	0	38,36.30	-72,13.70
1180	124	0110	8	000	12.1	015	1020	12.0	10.4	9.0	.1	320	2	.1	0	39,23.10	-71,54.10
1190	124	0500	12	020	12.1	160	1020	12.0	10.0	9.3	.1	-	0	0	0	39,35.80	-71,28.10
1200	124	0900	12	030	11.9	158	1020	15.3	12.2	15.8	.1	170	-	0	0	38,46.10	-71,07.90
1210	124	1314	20	030	12.0	305	1022	14.5	11.9	12.2	.1	320	5	.1	0	38,20.70	-71,10.40
1220	124	1730	21	020	12.1	305	1023	16.0	11.5	15.4	.1	325	0	.1	0	38,49.80	-72,07.30

TABLE 5: METEOROLOGICAL OBSERVATIONS (Cont.)

1230	124	2200	13	345	12.1	090	1022	14.5	11.0	11.6	.1	360	-	.1	0	39.14.10	-72.28.80
1240	125	0110	08	310	12.1	154	1022	13.5	10.3	15.6	.2	360	-	.1	0	39.03.60	-71.46.60
1250	125	0500	5	080	0.1	306	1022	15.0	11.4	15.8	.1	360	0	.1	0	38.49.00	-71.38.00
1260	125	1435	9	040	12.1	240	1025	12.2	10.0	15.5	.1	045	6	.1	0	38.53.10	-71.03.90
1270	125	1730	5	065	12.0	233	1025	18.0	12.5	15.7	.1	-	1	.1	1	38.33.30	-71.40.30
1280	125	2100	5	315	12.2	134	1024	13.3	10.8	10.1	.6	080	-	.2	0	38.06.20	-72.11.80
1290	126	0110	11	290	12.2	130	1023	15.4	11.3	15.8	.8	040	0	.2	1	37.34.20	-71.26.80
1300	126	0500	15	270	11.4	150	1021	16.6	13.3	25.1	.8	040	2	.2	1	37.02.90	-70.44.40
1310	126	0920	25	010	1.2	000	1019	18.0	12.0	22.5	1.0	090	8	.2	1	36.31.10	-70.01.90
1320	126	1317	20	330	1.4	055	1021	21.5	14.5	22.5	1.2	025	4	.2	1	36.32.30	-70.02.50
1330	126	2100	13	240	.9	113	1019	20.5	13.2	24.3	1.0	040	1	.2	1	37.03.40	-69.52.40
1340	127	0215	13	300	-	236	1017	18.6	13.2	24.9	1.0	300	5	.1	1	37.34.90	-69.53.30
1350	127	0550	34	360	11.8	320	1016	17.6	14.1	23.6	1.0	320	5	.5	1	37.43.00	-69.52.50
1360	127	0930	15	360	1.2	035	1015	15.5	11.0	18.9	1.0	030	0	.3	0	38.00.60	-69.59.90
1370	127	1420	11	040	0.5	020	1018	17.0	12.0	18.4	.5	060	1	.1	0	38.30.20	-70.00.10
1380	127	1950	23	030	12.0	002	1018	16.1	11.4	15.1	.8	030	1	.5	0	38.45.90	-70.00.10
1390	127	2106	10	230	0.9	030	1018	12.0	10.1	12.3	.6	050	0	.2	0	39.01.60	-70.01.80
1400	128	0209	7	040	-	350	1020	11.0	9.5	9.5	.4	070	0	.2	0	39.30.00	-70.00.60

FIGURE 1

FIGURE 2

FIGURE 3

TRUE WIND SPEED KTS

TRUE WIND DIR. DEG.

WIND WAVES (M)

SWELL AMP (M)

FIGURE 4

CRUISE REPORT

KNORR CRUISE No. 93, 4/19/82 - 5/6/82

Dana R. Kester

University of Rhode Island

Narragansett, Rhode Island

KN-093 CRUISE REPORT

I. Objective of the Cruise

This cruise was the first in a series of four during 1982 to investigate the physics, chemistry, and biology in Warm Core Rings north and west of the Gulf Stream in the Northwest Atlantic Ocean. This interdisciplinary investigation is a cooperative research program by more than 25 investigators funded by the National Science Foundation and by the National Aeronautics and Space Administration and by investigators with the National Marine Fisheries Service of NOAA.

The R/V KNORR was one of four vessels in this study. The other vessels were R/V ENDEAVOR, R/V OCEANUS, and the R/V ALBATROSS IV. At two times during this experiment a NASA P-3 aircraft flew over the region of study using remote sensors for sea surface temperature and spectral properties which could be related to similar shipboard measurements.

The activities aboard the R/V KNORR consisted of water column light intensity and quality and pigment analyses (Yentsch), phytoplankton species analysis (Fryxell), phytoplankton physiology and productivity (Smayda and Hitchcock), bacterial biomass and production (Ducklow), zooplankton grazing (Roman), zooplankton feeding and reproduction (Cowles), nutrient metabolism (McCarthy), silicon cycling (Nelson), nutrient distributions and CTD-oxygen profiling (Kester and Brown), and trace metal studies (Hanson and Kester).

II. Cruise Itinerary

19 April Depart Woods Hole, Massachusetts at 1130 am
 20 April Arrive at Slope Water Station
 22 April Arrive at Ring 81-B Center Station
 24 April Conduct radial transect of ring
 25 April Ring Center Station
 28 April Ring Center Multi-Ship Experiment
 29 April High Velocity Region Multi-Ship Experiment
 30 April Gulf Stream Station
 1 May Sargasso Sea Station
 2 May Gulf Stream Station
 4 May Ring Center Station
 5 May Slope Water Station
 6 May Arrive at Woods Hole, Massachusetts at 1000 am

III. Summary of Funded Investigations

Investigator	Agency Grant
Cowles	NSF OCE-80-17271
Ducklow	NSF OCE-81-17713

Fryxell	NSF OCE-81-01785
Hanson/Kester	NSF OCE-81-17848
Kester/Brown	NSF OCE-80-22989
McCarthy	NSF OCE-80-22990
Nelson	NSF OCE-80-17269-01
Roman	NSF OCE-81-17562
Smayda/Hitchcock	NSF OCE-80-17272
Yentsch	NASA grant NAG 6-17, Suppl. 1 from Wallops Flight Center

IV. Scientific Party

Ms. Cara Adler	Harvard University
Mr. Mark Altabet	Harvard University
Mr. Peter Bates	University of Rhode Island
Mr. Mark Brzezinski	Oregon State University
Dr. Mimi Brown	University of Rhode Island
Ms. Nancy Copley	Woods Hole Oceanographic Institution
Dr. Tim Cowles	Woods Hole Oceanographic Institution
Mr. Tom Crook	Woods Hole Oceanographic Institution
Dr. Hugh Ducklow	Lamont-Doherty Geological Observatory
Dr. Greta Fryxell	Texas A. & M. University
Dr. Miles Furnas	University of Rhode Island
Ms. Anne Gauzens	University of Maryland
Dr. Alfred Hanson	University of Rhode Island
Ms. Suzanne Hill	Lamont-Doherty Geological Observatory
Dr. Gary Hitchcock	University of Rhode Island
Dr. Dana Kester	University of Rhode Island, Chief Scientist
Mr. Ron Kroll	Woods Hole Oceanographic Institution
Mr. Chris Langdon	University of Rhode Island
Dr. James McCarthy	Harvard University
Dr. David Nelson	Oregon State University
Mr. John Nevins	Harvard University
Mr. David Phinney	Bigelow Laboratory
Mr. Frank Pickles	University of Rhode Island
Dr. Michael Roman	University of Maryland
Dr. Theodore Smayda	University of Rhode Island
Dr. Charles Yentsch	Bigelow Laboratory

V. Ship's Officers and Crew

Richard J. Bowen,	Master	Lawrence T. Moore,	Chief Engineer
Donald A. Moller,	Chief Mate	Glenn L. Cox,	1st Asst Engr
John K. Sweet, Jr.,	2nd Mate	David S. Hayden,	2nd Asst Engr
David H. Megathlin,	3rd Mate	John Hurder,	3rd Asst Engr
Ernest G. Smith,	Radio Officer	Harry Rougas,	Electrician
Jerome M. Cotter,	Bosun	Harry F. Clinton,	Oiler
Edward R. Brodrick,	AB	Herman Wagner,	Oiler
Frank D. Tibbetts,	AB	Peter D. O'Reilly,	Oiler

John P. Kamataris, AB	John M. Gassert, Steward
Peter M. Flaherty, AB	Gilberto R. Garcia Cook
Edward F. Graham OS	Mitchell G. Barros Messman
Tomas M. Macedo OS	Stephen F. Bates, Messman
Stephen W. Cotter, OS/Dayman	

VI. Scientific Narrative

Seventeen stations were occupied during this cruise. A station consisted of various types of sampling at a particular geographical or hydrographic location. Some of these stations required up to 48 hours to complete. The various sampling operations are summarized in Table 1, the operation log. An operation number was assigned to each sampling. This number had the form KNmmdd.ss, where KN designates KNORR, mm is the month (04), dd is the day (20), and ss is a sequence number which begins at 01 each day. Also given in Table 1 are the local times (hours and minutes) which were Eastern Standard Time prior to 25 April, and Eastern Daylight Time after 24 April. The station number and general location are given with CTR=Center, EDG=Edge of the core, HI VELOC=the high velocity region of the ring, STM=Stream, and SARG=Sargasso. The latitude and longitude are given in degrees and minutes. An investigator is identified with each operation, but in most cases several investigators were involved with each operation. The descriptor and comment columns are abbreviated items whose meaning is known principally to the investigators.

XBT's were taken during several periods of the cruise to define the temperature structure of the Ring. These are summarized in Table 2. All XBT's were Sippican T-7's giving profiles to greater than 750 meters. Table 2 gives the time, month and day (GMT) position, surface bucket temperature, and the depths in meters of three selected isotherms, 15, 10 and 6 degrees Celcius.

Yentsch and Phinney obtained 18 days of underway measurements of surface temperature, conductivity, chlorophyll, fucoxanthin, phycoerythrin, and light transmission. Vertical profiles of these properties were obtained at 11 locations by pumping to depths of 110 meters. Each vertical profile was accompanied by measurements of downwelling and upwelling sunlight in the upper 100 meters. Fifty discrete samples were measured for spectral and attenuation properties. There were 200 discrete chlorophyll analyses to calibrate the continuous fluorometer measurements.

Ducklow and Hill collected samples for bacterial abundance and growth rate estimates from all of the productivity casts and from several silica deep and radial section casts. The preliminary results indicate a bacterial abundance maximum in the high velocity region. The bacterial abundance and thymidine uptake were constant with depth in the upper 100 meters at the ring center.

Fryxell collected a series of samples through the water column to at least the 0.1% surface light intensity. These samples will be used to characterize the early spring flora from the Slope Water, Ring Center, High Velocity Region, and the Sargasso Sea. The 1/4 meter MOCNESS sampling system was equipped with 37 μ m mesh nets to obtain depth specific samples for phytoplankton analysis at six locations. Net tows (10 vertical and 5 horizontal) were taken to provide living material and material for light and electron microscopy. These samples showed the presence of gelatinous colonies of the diatom *Thalassiosira*. Dinoflagellates dominated the Slope Water station and they were well represented during the initial sampling of ring center; large chain-forming diatoms were also present. The Sargasso Sea station showed the chain-forming diatom *Chaetoceros*. During the last visit to ring center there was an increased number of diatoms and gelatinous colonies, which is usually associated with upwelling areas.

Smayda, Hitchcock, Langdon, and Furnas carried out work to establish the rates of phytoplankton primary production, euphotic zone abundance of phytoplankton carbon, growth rate measurements of key species, and the vertical distribution, composition, and abundance of various filtration defined size classes of phytoplankton. These studies were carried out at nine primary productivity stations at nine depths between the 100% and 0.1% isolumes. The chlorophyll and ATP carbon content of these populations were determined. Preliminary data analysis reveals predominance of the < 10 μ m size class with a variable contribution of the > 64 μ m size class. Six growth rate experiments were conducted for periods of 24 to 48 hours, evaluating the responses of key species. Eleven 1/4 meter MOCNESS tows using the 64 μ m net provided samples at 25 m intervals in the upper 200 m. The shipboard analysis revealed considerable populations of phytoplankton below the euphotic zone with a dramatic patch of the large diatom *Coscinodiscus wailesii*, heavily infected by the fungus *Lagenidium*.

Nelson and Brzezinski collected a series of samples and performed incubations to assess silicon cycling. Profiles were obtained for total and amorphous particulate silica from 0 to 600 m. Samples were obtained to determine biogenic silica production rates, and silica dissolution rates. Day-night station pairs were obtained in the Slope Water (20-21 April), at ring center (22-23 April, 26-27 April and 3-4 May), in the high velocity region (29-30 April) and in the Sargasso Sea (1-2 May). A series of radial stations from ring center to the high velocity region were obtained and one cast was made in the Gulf Stream.

McCarthy and coworkers measured phosphorus and nitrogen incorporation rates using N-15 and P-33 labelled substrates of nitrate, ammonium, urea, and phosphate. These experiments were conducted at six depths from 100% to 3% surface light intensity at first light (FL), mid-day (MD), and night-time (NT). This work was performed at the Slope Water, the Ring Center, the high velocity region and in the Sargasso Sea.

Roman carried out a series of zooplankton studies using the 1/4 meter MOCNESS sampling system, net tows, and in situ incubations. These measurements provided information on zooplankton grazing, size fractionation, and chemical composition of particulate material (carbon, nitrogen, chlorophyll, protein, carbohydrate, and lipids). This work was conducted in the Slope Water, Ring Center, High Velocity Region, and in the Sargasso Sea. There were 10 1/4 MOCNESS tows to 200 m; 1 tow to 1000 m; and 2 tows to 100 m. Fourteen shipboard grazing experiments were conducted and seven in situ grazing experiments were performed. There were about 50 particulate chlorophyll, organic carbon, and nitrogen measurements. There were 36 measurements of protein, carbohydrates and lipids, and 28 bacterial counts.

Kester and Brown carried out water column CTD-oxygen profiling and nutrient sampling. Two CTD rosette sampling systems were used: a 5L 24 bottle rosette, and a 30L 12 bottle rosette. There were four types of CTD casts: deep, which covered most or all of the water column; pump, which went to about 110 m with Yentsch's pump hose and fluorescence profiling; productivity casts to selected light intensity levels in the euphotic zone; and silica deep casts to 600 m. There were 12 deep CTD's with the 24 bottle rosette and 6 deep CTD's with the 30L rosette. Nutrient samples were analyzed onboard for nitrate, nitrite, phosphate, and silicate from the deep CTD's, the silica deep casts, the productivity casts, and from selected pump profiling casts. About 650 nutrient samples were analyzed, and another 60 analyses were performed on samples from experiments of various investigators.

Kester and Hanson conducted a series of trace metal investigations. A clean portable laboratory was used aboard the ship for nearly real-time analyses of trace metals by atomic absorption spectroscopy. An automated preconcentration system was used to extract copper, cadmium and nickel from seawater. Particular attention was given to copper and its speciation. Several different chemical fractions of copper were isolated and analyzed. These included total (particulate, dissolved, organic and inorganic), dissolved, and organically complexed copper. The pH and alkalinity were measured to permit thermodynamic calculations of copper speciation based on our laboratory studies. Samples were obtained from 14 productivity casts and 9 deep CTD casts. There were 273 measurements of organically complexed copper and 63 analyses of dissolved copper completed onboard ship. Other samples (447) were preserved for analysis onshore.

Tim Cowles carried out measurements of feeding response and reproductive potential of large copepods within and around the ring. He also collected zooplankton samples with the 1/4 MOCNESS

for microzooplankton analysis in collaboration with Mike Roman. Seven water column particle profiles were obtained; fifteen feeding experiments and egg production experiments were conducted; and 12 1/4 MOCNESS tows were completed. The center of Ring 82-B contained a mixture of warm and cold water macrozooplankton. The surface waters contained *Calanus finmarchicus* during the day, while night tows revealed the cold water species of the genus *Pleuromamma*, that are not usually found in the Sargasso Sea. The ring center fauna were similar during collections on April 23, 26, and 28, but the May 2-3 sampling indicated a shift in copepod species composition. The data will be analyzed to determine if the animals are exploiting the available particulate matter in the ring so that both cold and warm water species have adequate food and maintain population recruitment rates.

TABLE 1

KN-093 OPERATION LOG

5/05/82

OP. NO.	TIME	STA	LOCATION	LAT.	LONG.	INVTGR	DESCRIPT	COMMENT
KN0420.01	0350	1	SLOPE	39 08.6	69 24.9	KESTER	5L DEEPCTD	CTD#1
KN0420.02	0630	1	SLOPE	39 08.9	69 25.8	KESTER	30L CTD	CTD#2
KN0420.04	0925	1	SLOPE	39 09.3	69 25.3	FRYXELL	VERTNET	
KN0420.05	1100	1	SLOPE	39 08.7	69 25.5	YENTSCH	TOTAL IRRAD	
KN0420.06	1150	1	SLOPE	39 08.7	69 26.0	YENTSCH	4 CHAN LITE	
KN0420.07	1301	1	SLOPE	39 08.7	69 25.7	COWLES	1/4 MOC TOW	
KN0420.08	1458	1	SLOPE	39 05.0	69 29.0	FRYXELL	1/4 MOC	37 UM NETS
KN0420.09	1630	1	SLOPE	39 09.0	69 26.0	YENTSCH	PUMP PROFILE	CTD#3
KN0420.10	1830	1	SLOPE	39 09.3	69 24.7	MCCARTHY	PMPROD	CTD#4
KN0420.11	1930	1	SLOPE	39 09.0	69 25.2	COWLES	LIVE NET TOW	64 UM NET
KN0420.12	2032	1	SLOPE	39 09.0	69 24.9	COWLES	1/4 MOC TOW	0-200 64 UM
KN0420.13	2135	1	SLOPE	39 08.8	69 22.1	FRYXELL	1/4 MOC TOW	0-22M 37 UM
KN0420.14	2230	1	SLOPE	39 09.0	69 25.2	MCCARTHY	NTPROD	CTD#5 & #6
KN0420.03	0900	1	SLOPE	39 09.2	69 25.5	YENTSCH	NASA FLYOVER	SURFACE CBS
KN0421.01	0000	1	SLOPE	39 08.8	69 24.4	ROMAN	LIVE NET TOW	
KN0421.02	0030	1	SLOPE	39 08.3	69 24.1	KESTER	5L DEEPCTD	CTD#7
KN0421.03	0510	1	SLOPE	39 08.2	69 24.0	MCCARTHY	FLPROD	CTD#8 & #9
KN0421.04	0556	1	SLOPE	39 08.3	69 24.1	MCCARTHY	FLPROD	CTD#9
KN0421.05	0700	1	SLOPE	39 08.1	69 24.2	NELSON	SIDEEP	CTD#10--NG
KN0421.06	0830	1	SLOPE	39 08.0	69 24.2	FRYXELL	VERTNET	
KN0421.07	0900	1	SLOPE	39 08.0	69 24.2	COWLES	LIVE NET TOW	64 UM NET
KN0421.08	1342	1	SLOPE	39 05.5	69 26.0	SMAYDA	MDPROD	30L HYDRO
KN0421.09	1430	1	SLOPE	39 06.6	69 26.0	FURNAS	LIVE NET TOW	0-100M 20UM
KN0422.01	0530	2	RING CTR	38 51.0	71 22.8	KESTER	5L DEEPCTD	CTD#11
KN0422.02	0800	2	RING CTR	38 52.4	71 25.0	FRYXELL	VERTNET	
KN0422.03	0835	2	RING CTR	38 52.4	71 25.0	COWLES	LIVE NET TOW	64 UM NET
KN0422.04	0915	2	RING CTR	38 53.3	71 25.1	COWLES	LIVE NET TOW	
KN0422.05	1100	2	RING CTR	38 54.8	71 16.5	YENTSCH	TOTAL IRRAD	AT BUOY
KN0422.06	1200	2	RING CTR	38 53.4	71 16.5	YENTSCH	4 CHAN LITE	AT BUOY
KN0422.07	1330	2	RING CTR	38 51.4	71 17.4	YENTSCH	PUMP PROFILE	CTD#12

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TABLE 1 (continued)

KN-093 OPERATION LOG

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OP. NO.	TIME	STA	LOCATION	LAT.	LONG.	INVTGR	DESCRIPT	COMMENT
KNO422.08	1510	2	RING CTR	38 49.7 71	18.5	COWLES	1/4 MOC TOW	0-200M 64UM
KNO422.09	1550	2	RING CTR	38 47.2 71	20.8	FRYXELL	1/4 MOC TOW	0-35M 37 UM
KNO422.10	1840	2	RING CTR	38 48.8 71	22.8	SMAYDA	1/2M NET TOW	200-OM 35UM
KNO422.11	2042	2	RING CTR	38 46.6 71	23.9	ROMAN	30L HYDRO	1 BOT 15M
KNO422.12	2054	2	RING CTR	38 46.6 71	24.1	COWLES	LIVE NET TOW	200M
KNO422.13	2200	2	RING CTR	38 47.0 71	25.5	MCCARTHY	NTPROD	CTD#13
KNO422.14	2245	2	RING CTR	38 46.6 71	27.0	NELSON	SIDEER	CTD#14
KNO422.15	2335	2	RING CTR	38 46.7 71	28.0	COWLES	1/4 MOC TOW	0-200M
KNO423.01	0650	2	RING CTR	38 42.7 71	34.6	MCCARTHY	FLPROD#1	CTD#15
KNO423.02	0723	2	RING CTR	38 42.7 71	34.6	MCCARTHY	FLPROD#2	CTD#16 & #17
KNO423.03	0810	2	RING CTR	38 42.8 71	35.1	NELSON	SIDEER	CTD#18
KNO423.04	0915	2	RING CTR	38 44.1 71	37.8	FRYXELL	1/2M NET	200-OM
KNO423.05	1032	2	RING CTR	38 42.1 71	37.4	ROMAN	IN SITU INCU	
KNO423.06	1300	2	RING CTR	38 42.8 71	38.8	MCCARTHY	MDPROD#1	
KNO423.07	1338	2	RING CTR	38 42.8 71	38.8	MCCARTHY	MDPROD#2	
KNO423.08	1400	2	RING CTR	38 43.1 71	40.1	ROMAN	OBLIQUE NET	
KNO423.09	1500	2	RING CTR	38 42.5 71	40.1	KESTER	5L DEEPCD	CTD#19
KNO423.10	2330	3	RADIAL	39 27.7 71	31.2	FRYXELL	SURF NET TOW	BIOLUMINESC
KNO424.01	0024	3	RADIAL	39 28.1 71	29.9	YENTSCH	PUMP PROFILE	CTD#20
KNO424.02	0300	3	RADIAL	39 27.8 71	30.9	BRZEZINSKI	SIDEER	CTD#21
KNO424.03	0523	4	RADIAL	39 42.2 71	28.0	BRZEZINSKI	SIDEER	CTD#22
KNO424.04	0630	4	RADIAL	39 42.6 71	27.9	FRYXELL	SURF NET TOW	LRG WIRE AGL
KNO424.05	0800	4	RADIAL	39 53.7 71	26.0	BRZEZINSKI	SIDEER	CTD#23
KNO424.06	1000	4	RADIAL	39 53.7 71	26.2	FRYXELL	VERTNET	0-200M
KNO424.07	1114	6	RADIAL	39 46.4 71	26.9	YENTSCH	PUMP PROFILE	CTD#24
KNO424.08	1608	6	RADIAL	39 17.8 71	31.0	NELSON	SIDEER	CTD#25 ABRTD
KNO424.10	1910	8	RADIAL	39 03.9 71	34.0	NELSON	SIDEER	CTD#26
KNO424.11	2200	8	RADIAL	39 03.9 71	34.0	ROMAN	VERTNET	
KNO424.12	2230	8	RADIAL	39 03.9 71	34.0	ROMAN	30L HYDRO	2 BOTTLES
KNO425.01	0804	9	RING CTR	39 00.0 71	30.0	ROMAN	LIVE NET TOW	

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TABLE 1 (continued)

KN-093 OPERATION LOG

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OP. NO.	TIME	STA	LOCATION	LAT.	LONG.	INVTGR	DESCRIPT	COMMENT
KN0425.02	0930	9	RING CTR	38 59.4	71 32.3	FRYXELL	HORZNET	10M
KN0425.03	1030	9	RING CTR	38 59.7	71 31.4	DUCKLOW	30L NISKIN	
KN0425.05	1150	9	RING CTR	38 59.4	71 31.4	COWLES	1/4 MOC TOW	TOYO
KN0425.06	1400	9	RING CTR	38 55.5	71 28.5	FURNAS	LIVE NET TOW	200M
KN0425.07	1430	9	RING CTR	38 54.9	71 29.0	ALTABET	LIVE NET TOW	15M
KN0425.08	1444	9	RING CTR	38 54.2	71 29.6	ALTABET	LIVE NET TOW	75M
KN0425.09	1600	9	RING CTR	39 00.2	71 29.8	YENTSCH	PUMP PROFILE	CTD#27
KN0425.10	1700	9	RING CTR	38 59.0	71 27.7	FURNAS	LIVE NET TOW	150M
KN0425.11	1804	9	RING CTR	39 00.0	71 30.1	KESTER	5L DEEPCTD	CTD#28
KN0425.12	2045	9	RING CTR	38 59.2	71 29.7	ROMAN	30L HYDRO	1 BOTTLE 5M
KN0425.13	2050	9	RING CTR	38 59.2	71 29.7	COWLES	LIVE NET TOW	OBLIQUE NET
KN0425.14	2230	9	RING CTR	38 58.6	71 29.7	BROWN	30L DEEPCTD	CTD#29
KN0426.01	0505	9	RING CTR	39 00.1	71 29.8	MCCARTHY	FLPROD	CTD#30 & #31
KN0426.02	0700	9	RING CTR	38 59.8	71 29.8	NELSON	SIDEEP	CTD#32
KN0426.03	0900	9	RING CTR	38 59.8	71 30.0	FRYXELL	VERTNET	200 TO 0M
KN0426.04	0950	9	RING CTR	38 59.8	71 30.0	ROMAN	INSITU INCUB	0 TO 68M
KN0426.06	1200	9	RING CTR	39 00.2	71 29.7	MCCARTHY	MDPROD	CTD#33 & #34
KN0426.07	1330	9	RING CTR	39 00.2	71 29.7	DUCKLOW	30L HYDRO	TO 110M
KN0426.08	1400	9	RING CTR	39 00.2	71 29.7	YENTSCH	TOTAL IRRAD	
KN0426.09	1500	9	RING CTR	39 00.2	71 29.7	ROMAN	1/4MOC TOW	TO 1000M
KN0426.10	1845	9	RING CTR	38 54.2	71 21.8	FRYXELL	1/4MOC TOW	PHYTO NETS
KN0426.11	2033	9	RING CTR	38 58.9	71 28.2	COWLES	30L HYDRO	5 & 7M
KN0426.12	2044	9	RING CTR	38 58.9	71 28.3	COWLES	LIVE NET TOW	TO 100M
KN0426.13	2200	9	RING CTR	38 59.1	71 28.6	MCCARTHY	NTPROD	CTD#35 & 36
KN0427.01	0510	10	RING EDG	28 41.8	71 06.8	KESTER	30L DEEPCTD	CTD#37
KN0427.02	0915	10	RING EDG	38 45.6	71 18.0	KESTER	5L DEEPCTD	CTD#38
KN0427.03	1225	10	RING EDG	38 42.0	71 20.5	COWLES	LIVE NET TOW	0 TO 100M
KN0427.04	1300	10	RING EDG	38 41.2	71 21.3	KESTER	5L CTD/YENCH	CTD#39
KN0427.05	1510	10	RING EDG	38 42.9	71 26.8	COWLES	1/4MOC TOW	TOYO
KN0427.06	2030	11	RING CTR	38 54.9	71 37.4	FURNAS	30L HYDRO	0 25 50M

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TABLE 1 (continued)

KN-093 OPERATION LOG

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OP. NO.	TIME	STA	LOCATION	LAT.	LONG.	INVTGR	DESCRIPT	COMMENT
KNO427.07	2115	11	RING CTR	38 54.7 71	37.6	COWLES	LIVE NET TOW	0 TO 100M
KNO427.08	2200	11	RING CTR	38 54.7 71	37.6	ROMAN	1/4MOC TOW	200 TO OM
KNO428.01	0230	11	RING CTR	38 52.7 71	39.6	BROWN	5L DEEPCD	CTD#40
KNO428.02	0630	11	RING CTR	38 53.0 71	41.0	MCCARTHY	FLPROD#1	CTD#41
KNO428.03	0712	11	RING CTR	38 53.0 71	41.0	MCCARTHY	FLPROD#2	CTD#42
KNO428.04	0822	11	RING CTR	38 52.8 71	42.4	YENTSCH	PUMP PROFILE	CTD#43
KNO428.05	1030	11	RING CTR	38 52.9 71	38.8	ROMAN	INSITU INCUB	0 TO 50M
KNO428.06	1225	11	RING CTR	38 52.0 71	39.8	MCCARTHY	MDPROD#1	CTD#44
KNO428.07	1437	11	RING CTR	38 53.2 71	39.6	MCCARTHY	MDPROD#2	CTD#45
KNO428.08	1514	11	RING CTR	38 53.2 71	40.4	FURNAS	LIVE NET TOW	0 TO 200M
KNO429.01	0615	12	HI VELOC	39 20.0 71	56.2	MCCARTHY	FLPROD#1	CTD#46
KNO429.02	0654	12	HI VELOC	39 20.0 71	56.2	MCCARTHY	FLPROD#2	CTD#47
KNO429.03	0751	12	HI VELOC	39 20.2 71	54.6	MCCARTHY	FLPROD#3	CTD#48
KNO429.04	0900	12	HI VELOC	39 20.8 71	53.1	NELSON	SIDEEP	CTD#49
KNO429.05	1030	12	HI VELOC	39 21.3 71	50.9	YENTSCH	PUMP PROFILE	CTD#50
KNO429.06	1200	12	HI VELOC	39 22.3 71	49.2	YENTSCH	4 CHAN LITE	
KNO429.07	1200	12	HI VELOC	39 22.3 71	49.2	ROMAN	INSITU INCUB	
KNO429.08	1330	12	HI VELOC	39 23.0 71	46.8	DUCKLOW	MDPROD	CTD#51
KNO429.09	1445	12	HI VELOC	39 22.0 71	42.5	ROMAN	30L HYDRO	
KNO429.10	1450	12	HI VELOC	39 22.0 71	42.5	COWLES	LIVE NET TOW	TO 100M
KNO429.11	1515	12	HI VELOC	39 22.6 71	41.2	FRYXELL	VERTNET	
KNO429.12	1710	12	HI VELOC	39 25.1 71	38.0	COWLES	1/4MOC TOW	
KNO429.13	1852	12	HI VELOC	39 22.5 71	35.7	HANSON	5L DEEPCD	CTD#52
KNO429.14	2115	12	HI VELOC	39 21.6 71	33.5	ROMAN	30L HYDRO	TO 25M
KNO429.15	2120	12	HI VELOC	39 21.5 71	33.4	COWLES	LIVE NET TOW	TO 100M
KNO429.16	2205	12	HI VELOC	39 20.5 71	33.2	COWLES	1/4MOC TOW	
KNO429.17	2330	12	HI VELOC	39 22.7 71	31.7	FRYXELL	1/4MOC TOW	0 TO 65M
KNO430.01	1345	13	GULF STM	37 26.7 69	56.7	YENTSCH	PUMP PROFILE	CTD#53
KNO430.03	1600	13	GULF STM	37 30.1 69	49.2	YENTSCH	4 CHAN LITE	
KNO430.04	1635	13	GULF STM	37 30.1 69	49.2	KESTER	5L DEEPCD	CTD#54

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TABLE 1 (continued)

KN-093 OPERATION LOG

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OP. NO.	TIME	STA	LOCATION	LAT.	LONG.	INVTGR	DESCRIPT	COMMENT
KN0501.01	0435	14	SARG SEA	36 41.7	69 25.3	FRYXELL	LIVE NET TOW	0 TO 100M
KN0501.02	0520	14	SARG SEA	36 42.5	69 24.7	DUCKLOW	FLPROD#1	CTD#57
KN0501.03	0625	14	SARG SEA	36 42.7	69 24.9	DUCKLOW	FLPROD#2	CTD#58
KN0501.04	0730	14	SARG SEA	36 42.7	69 24.1	NELSON	SIDEEP	CTD#59
KN0501.05	0852	14	SARG SEA	36 43.8	69 21.8	YENTSCH	PUMP PROFILE	CTD#60
KN0501.06	1045	14	SARG SEA	36 44.5	69 21.8	YENTSCH	4 CHAN LITE	
KN0501.07	1050	14	SARG SEA	36 45.7	69 20.0	ROMAN	INSITU INCUB	
KN0501.08	1210	14	SARG SEA	36 45.7	69 19.9	COWLES	LIVE NET TOW	0 TO 100M
KN0501.09	1249	14	SARG SEA	36 45.7	69 19.9	FRYXELL	VERTNET	
KN0501.10	1300	14	SARG SEA	36 47.3	69 19.0	MCCARTHY	MDPROD	CTD#61
KN0501.11	1305	14	SARG SEA	36 47.3	69 19.0	YENTSCH	TOTAL IRRAD	
KN0501.12	1412	14	SARG SEA	36 47.7	69 17.8	COWLES	1/4MOC TOW	0-200 64UM
KN0501.13	1542	14	SARG SEA	36 45.5	69 18.4	FRYXELL	1/4MOC TOW	0-80M 37UM
KN0501.14	1700	14	SARG SEA	36 42.7	69 24.4	KESTER	5L DEEPCD	CTD#62
KN0501.15	2215	14	SARG SEA	36 42.5	69 24.3	BRZEZINSKI	NTPROD	CTD#63
KN0501.16	2246	14	SARG SEA	36 42.5	69 24.3	KESTER	30L DEEPCD	CTD#64
KN0501.17	2340	14	SARG SEA	36 42.4	69 24.4	ROMAN	30L HYDRO	
KN0502.01	0015	14	SARG SEA	36 42.5	69 24.6	COWLES	LIVE NET TOW	0-100M
KN0502.02	0100	14	SARG SEA	36 42.5	69 25.7	COWLES	1/4MOC TOW	0-200M
KN0502.03	0800	15	GULF STM	37 14.3	70 31.9	KESTER	30L DEEPCD	CTD#65
KN0502.04	2030	16	RING CTR	38 57.5	71 40.1	COWLES	30L HYDRO	
KN0502.05	2040	16	RING CTR	38 57.4	71 40.2	COWLES	LIVE NET TOW	0 TO 100M
KN0502.06	2110	16	RING CTR	38 57.4	71 40.8	COWLES	1/4MOC TEST	0 TO 200M
KN0503.01	0600	16	RING CTR	38 57.8	71 40.0	FRYXELL	VERTNET	200 TO OM
KN0503.02	0630	16	RING CTR	38 58.2	71 40.2	FRYXELL	HORZNET	AT 10M 1KT
KN0503.03	0730	16	RING CTR	38 58.2	71 40.2	ROMAN	OBLIQUE TOW	200 TO OM
KN0503.04	0840	16	RING CTR	38 58.0	71 40.1	FURNAS	VERTNET	200 TO OM
KN0503.05	0945	16	RING CTR	38 58.1	71 40.1	YENTSCH	PUMP PROFILE	CTD#66
KN0503.06	1100	16	RING CTR	38 58.4	71 37.4	YENTSCH	4 CHAN LITE	
KN0503.07	1235	16	RING CTR	38 58.0	71 37.6	COWLES	1/4MOC TOW	0 TO 200M

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TABLE 1 (continued)

KN-093 OPERATION LOG

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OP. NO.	TIME	STA	LOCATION	LAT.	LONG.	INVTGR	DESCRIPT	COMMENT
KN0503.08	1413	16	RING CTR	38 55.4	71 39.6	FRYXELL	1/4MOC TOW	0 TO 90M
KN0503.09	1500	16	RING CTR	38 57.4	71 40.0	BROWN	5L DEEPCD	CTD#67
KN0503.10	2110	16	RING CTR	38 57.8	71 39.6	COWLES	30L HYDRO	24M
KN0503.12	2129	16	RING CTR	38 57.9	71 39.5	COWLES	LIVE NET TOW	0 TO 100M
KN0503.12	2200	16	RING CTR	38 58.3	71 39.2	MCCARTHY	NTPROD	CTD#68 & #69
KN0504.01	0500	16	RING CTR	38 57.3	71 39.8	MCCARTHY	FLPROD	CTD#70
KN0504.02	0540	16	RING CTR	38 57.3	71 39.8	MCCARTHY	FLPROD#2	CTD#71
KN0504.03	0637	16	RING CTR	38 57.6	71 40.0	BRZEZINSKI	SIDEEP	CTD#72
KN0504.04	0800	16	RING CTR	38 57.7	71 39.5	FRYXELL	VERTNET	200-OM 33UM
KN0504.05	0900	16	RING CTR	38 57.7	71 39.5	ROMAN	INSITU INCUB	0-36M
KN0504.06	1000	16	RING CTR	38 57.7	71 39.5	COWLES	LIVE NET TOW	
KN0504.07	1030	16	RING CTR	38 57.7	71 39.5	COWLES	1/4MOC TOW	200 TO OM
KN0504.08	1200	16	RING CTR	38 57.6	71 39.8	MCCARTHY	MDPROD#1	CTD#73
KN0504.09	1300	16	RING CTR	38 57.5	71 39.1	MCCARTHY	MDPROD#2	CTD#74
KN0504.10	1400	16	RING CTR	38 57.9	71 39.6	KESTER	30L DEEPCD	CTD#74
KN0504.11	1910	16	RING CTR	38 57.5	71 40.0	MCCARTHY	CTD TO 150M	CTD#76
KN0504.12	2050	16	RING CTR	38 57.5	71 40.0	COWLES	LIVE NET TOW	0 TO 100M
KN0504.13	2115	16	RING CTR	38 57.4	71 39.6	MCCARTHY	CTD TO 150M	CTD#77
KN0505.01	0510	17	SLOPE	39 20.1	70 37.8	BROWN	5L DEEPCD	CTD#78
KN0505.02	0750	17	SLOPE	39 20.3	70 38.6	ROMAN	LIVE NET TOW	0 TO 200M
KN0505.03	0832	17	SLOPE	39 21.1	70 38.2	ROMAN	INSITU INCUB	
KN0505.04	0900	17	SLOPE	39 20.2	70 38.2	YENTSCH	PUMP PROFILE	CTD#79
KN0505.05	1030	17	SLOPE	39 20.2	70 40.0	YENTSCH	4 CHAN LITE	
KN0505.06	1130	17	SLOPE	39 20.1	70 41.0	YENTSCH	TOTAL IRRAD	
KN0505.07	1215	17	SLOPE	39 20.1	70 39.8	BROWN	30L DEEPCD	CTD#80
KN0505.08	1434	17	SLOPE	39 21.9	70 40.3	COPLEY	LIVE NET TOW	
KN0430.02	1515	13	GULF STM	37 28.6	69 50.8	FRYXELL	LIVE NET TOW	65 TO OM
KN0424.09	1830	8	RADIAL	39 03.8	71 33.8	FRYXELL	HORZNET	35 UM
KN0425.04	1035	9	RING CTR	38 59.7	71 31.4	YENTSCH	4 CHAN LITE	
KN0426.05	1130	9	RING CTR	38 59.8	71 30.0	ROMAN	3/4M NET TOW	200 TO OM

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XBT#	TIME-GMT	DA/MO	LATITUDE	LONGITUDE	BUCKET T	Z-15	Z-10	Z-06
001	0412	19/04	39 46.2N	69 52.9W	07.2		225	412
002	0521	20/04	39 35.6N	69 44.7W	08.4		230	460
003	0708	20/04	39 20.2N	69 35.4W	07.5		235	460
004	2304	21/04	39 18.7N	69 59.7W	10.4		240	500
005	0005	22/04	39 24.8N	70 13.1W	10.0		240	480
006	0100	22/04	39 29.7N	70 23.7W	09.5		237	480
007	0200	22/04	39 26.9N	70 34.1W	11.6		290	485
008	0300	22/04	39 17.9N	70 44.0W	12.5		350	580
009	0400	22/04	39 11.9N	70 53.7W	13.7		420	570
010	0500	22/04	39 04.9N	70 02.7W	15.2	255	470	710
011	0607	22/04	38 57.0N	71 14.0W	15.6	408	551	780
012	0702	22/04	38 50.7N	71 22.6W	15.4	430	575	790
013	0803	22/04	38 57.6N	71 31.9W	15.7	432	565	755
014	0859	22/04	38 57.6N	71 19.8W	15.4	442	565	790
015	2000	23/04	38 55.7N	71 40.8W	15.0	350	570	750
016	2100	23/04	39 06.2N	71 37.5W	15.5	380	530	750
017	2200	23/04	39 16.6N	71 34.1W	15.3	325	500	
018	2300	23/04	39 27.6N	71 31.7W	13.0		370	560
019	0400	24/04	39 27.6N	71 31.8W			340	550
020	0700	25/04	38 49.8N	71 38.6W	13.0	420	550	750
021	0800	25/04	38 55.5N	71 34.1W	14.4	420	555	750
022	0830	25/04	38 59.9N	71 29.8W	14.7	430	565	740
023	0952	25/04	39 00.4N	71 43.3W	15.0	320	532	740
024	0117	27/04	38 56.9N	71 04.4W	15.8	243	438	640
025	0200	27/04	38 56.1N	70 55.8W	13.5	170	400	618
026	0312	27/04	38 49.8N	70 56.4W	13.3		365	590
027	0800	27/04	38 44.2N	71 03.3W	13.2		380	650
028	1432	28/04	38 53.0N	71 39.0W	15.7	410	535	750
029	1437	28/04	38 53.0N	71 39.0W	15.5	410	540	750
030	1447	28/04	38 53.0N	71 39.0W	15.5	405	530	740

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XBT#	TIME-GMT	DA/MO	LATITUDE	LONGITUDE	BUCKET T	Z-15	Z-10	Z-06
031	1517	28/04	38 53.0N	71 39.0W	15.5	400	540	750
032	1602	28/04	38 53.0N	71 39.0W	15.5	400	550	750
033	1837	28/04	38 53.3N	71 39.8W	15.8	400	515	730
034	2230	28/04	38 53.1N	71 39.5W	15.8	410	540	730
036	0005	29/04	38 52.9N	71 38.9W	15.7	410	540	760
037	0032	29/04	38 52.9N	71 38.9W	15.1	395	525	760
038	0042	29/04	38 52.9N	71 38.9W	15.1	410	525	760
039	0047	29/04	38 53.0N	71 38.9W	15.1	418	530	715
040	0052	29/04	38 53.0N	71 38.9W	15.1	410	530	760
041	0222	29/04	38 55.0N	71 48.8W	15.7	440	555	750
042	0314	29/04	38 57.7N	71 57.9W	15.0	400	542	705
043	0417	29/04	39 01.7N	72 08.0W		340	485	730
044	0450	29/04	39 05.2N	72 12.7W	13.7	200	430	625
045	0528	29/04	39 05.0N	72 06.5W	15.9	320	478	715
046	0552	29/04	39 04.7N	72 02.3W	15.8	308	498	700
047	0619	29/04	39 04.2N	71 57.2W	15.8	385	505	705
048	0656	29/04	39 08.6N	71 58.5W	16.5	270	460	700
049	0721	29/04	39 11.9N	72 00.0W	16.5	190	425	620
050	0743	29/04	39 14.8N	72 01.2W	16.5	200	405	635
051	0810	29/04	39 12.7N	71 55.4W	16.5	210	430	620
052	0834	29/04	39 10.5N	71 50.9W	16.5	305	480	685
053	1330	29/04	39 21.1N	71 52.4W	13.1		330	500
054	1340	29/04	39 21.1N	71 52.2W	13.1		325	500
055	1350	29/04	39 21.4N	71 51.9W	13.1	70	325	500
056	1420	29/04	39 21.3N	71 51.3W	13.2		315	500
057	1520	29/04	39 22.0N	71 50.0W	13.2		315	485
058	1656	29/04	39 22.6N	71 47.6W	13.2		325	490
059	1955	29/04	39 22.8N	71 32.9W	13.8		316	530
060	2320	29/04	39 22.6N	71 35.5W	14.3		355	570
061	0020	30/04	39 22.2N	71 34.4W	14.4		378	580

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XBT#	TIME-GMT	DA/MO	LATITUDE	LONGITUDE	BUCKET T	Z-15	Z-10	Z-06
062	0120	30/04	39 21.5N	71 33.4W	13.0		395	590
063	0210	30/04	39 20.4N	71 33.2W	14.4		388	590
064		30/04					336	575
065	1030	30/04	38 18.6N	70 39.4W	12.6		215	410
066	1226	30/04	38 00.8N	70 26.4W	17.6	20	193	415
067	1310	30/04	37 55.7N	70 22.2W	21.5	5	200	425
068	1405	30/04	37 47.6N	70 15.9W	20.5	25	200	380
069	1455	30/04	37 39.8N	70 10.2W	19.5	43	260	440
070	1605	30/04	37 31.5N	70 04.1W	23.5	122	346	541
071	1658	30/04	37 25.2N	69 59.9W	24.5	270		
072	1728	30/04	37 21.0N	69 57.5W	23.4	325	547	752
073	0200	02/05	37 20.2N	69 37.8W	23.4	540	707	
074	0400	02/05	37 01.6N	69 32.2W	18.9	627		
075	0603	02/05	36 42.2N	69 25.5W	21.0	645		
076	0700	02/05	36 46.7N	69 37.9W	19.0	605		
077	0813	02/05	36 56.1N	69 52.1W	22.5	617		
077	0813	02/05	36 56.1N	69 52.1W	22.5	617		
078	0900	02/05	36 56.4N	70 01.4W	22.5	570	750	
079	1003	02/05	37 03.0N	70 13.4W	25.0	490	650	
080	1100	02/05	37 08.4N	70 22.1W	25.0	355	485	700
081	1810	02/05	35 33.3N	71 15.8W	16.7	8	170	400
083	2005	02/05	37 11.7N	71 27.7W	15.5		270	505
084	2200	02/05	38 32.2N	71 34.4W	16.7	300	450	670
085	0000	03/05	38 54.4N	71 39.8W	16.7	455	575	
086	0200	05/05	38 59.3N	71 32.4W	16.6	365	507	718
087	0300	05/05	39 03.6N	71 21.4W	16.7	240	420	580
088	0400	05/05	39 08.3N	71 08.7W	9.5		303	450
089	0518	05/05	39 15.1N	70 52.5W	10.8		200	370
090	0610	05/05	39 19.5N	70 41.6W	11.7		227	407

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CRUISE REPORT

OCEANUS CRUISE NO. 118, 4/18/82 - 5/3/82

Peter H. Wiebe

Woods Hole Oceanographic Institution

Woods Hole, Massachusetts

Contents

- I. Cruise Narrative
- II. Individual Reports
- III. Scientific Observation Log
- IV. XBT Digitizing Log

I. CRUISE NARRATIVE

OCEANUS Cruise No. 118, 4/18/82 - 5/3/82

Peter H. Wiebe
Woods Hole Oceanographic Institution

R/V OCEANUS left port on 18 April as one of four ships participating in the first cruise of a time-series study of a Gulf Stream warm core ring. The other ships in this coordinated study were R/V ENDEAVOR, R/V KNORR and the R/V ALBATROSS IV. In addition, a NASA P-3 aircraft made two overflights of the ring while the research vessels were in the ring environs. The overall objective of the scientific research aboard the OCEANUS was to map the ring's horizontal and vertical distributions of zooplankton and micronekton, and to study the vertical distribution of size fractionated particulate matter, chlorophyll a, radon, radium²²⁸ and radium²²⁶.

As a result of time required to make major modifications to the trawl winch sheave train, to install the ATLANTIS II's A-frame on the OCEANUS, to construct a starboard support for the crane, to complete construction of two new towing blocks and to do a strength test on the trawl wire train, we left port three days late. These modifications were required to accommodate our large trawls (the MOCNESS-20 and the double MOCNESS-1), the large volume pumping system (LVFS), and the six-shooter (an STD/30 liter Rosette/radium pumping system).

We steamed from Woods Hole, stopped for an hour in Vineyard Sound for testing the launch and recovery procedure for the six-shooter, and then steamed out to a Slope Water station (39°20'N; 69°30'W) which was ~ 130 nautical miles northwest of ring 82D and ~ 80 miles northeast of ring 82B. This location was chosen for our first station to permit the ENDEAVOR, which left port 24 hours ahead of us, to complete an XBT survey designed to assess the feasibility of using ring 82D as opposed to 82B as the time-series study site and to exercise our gear in a relatively low current regime.

Based on the ENDEAVOR results, 82B was selected as the study ring. After completing work at the Slope Water station on 21 April, we steamed to the center of this ring, and over a two-day period, completed a major station (2) which included a day/night pair of tows with the double MOCNESS-1 and the MOCNESS-20, an 8-sample LVFS series from the surface to 700 meters, an 11-bottle chlorophyll cast to 100 meters, a shallow and deep radon cast, and a six-shooter lowering. Between the 24th and 26th of April, two stations (3 and 4) in the high velocity region of the southwest portion of the ring followed the center station. We intended to complete another set of observations in the ring center (station 5) on the 27th prior to the first joint ship experiment, but a storm with winds up to 50 knots forced us to curtail the net towing and some of the LVFS work. This storm also caused the cancellation of much of the work we intended to do during the joint ship experiment in the ring center on the 28th. Work was limited to hydro-wire casts with 5- and 30-liter bottles for analysis of chlorophyll and radon, respectively. The weather improved enough on the 29th to permit the second joint ship experiment

to be carried out in the high velocity region of the northeast sector of the ring. At this station (no. 6), we did a shallow radon cast, a chlorophyll cast, a day/night pair of MOCNESS-1 tows, and a shallow LVFS cast in the vicinity of the Loran drifter/plank-on-edge buoy combination set out early on the 29th by the scientific party aboard the R/V ENDEAVOR.

The OCEANUS returned to the ring center on the 30th to further characterize the biological and chemical characteristics of the ring core (station no. 7). After this work was completed on May 1, we steamed to a Slope Water location to the northeast of the ring center (39°30'N; 71°00'W) for our final station (no. 8) where a nearly complete set of observations was obtained; only a MOCNESS-20 daytime tow was omitted because of time lost (~ 5 hrs.) when the trawl wire unraveled on the drum as the trawl was being brought on board on the previous night tow

A summary of the placement of the net tows and radon, chlorophyll, LVFS, and six-shooter casts are graphically presented in Figure 1. Table 1 gives the ring center positions used to calculate distances of individual observations from the ring center. A summary of events is given in Section 3; XBT data are given in Section 4. Individual principal investigators reports follow.

In spite of the loss of two days of ship time caused by the delay in sailing and that lost to bad weather, and in spite of a variety of electronics problems afflicting the MOCNESS and the six-shooter, this cruise can be characterized as quite successful because of a full complement of data obtained at the various locations around the ring. Our success is in no small way due to the full and friendly cooperation of the officers and crew of the OCEANUS. Their hard work and assistance is greatly appreciated.

Table 1. Ring Center Positions

	<u>Julian Day</u>	<u>Calendar Day</u>	<u>Latitude</u>	<u>Longitude</u>
(a)	109	19 April	38.51.9°N	71.15.9°W
(a)	110	20 April	38.55.5°N	71.16.9°W
(b)	111	21 April	38.53.9°N	71.19.9°W
(a)	112	22 April	38.52.2°N	71.22.8°W
(a)	113	23 April	38.53.4°N	71.32.6°W
(a)	114	24 April	38.52.6°N	71.33.8°W
(a)	115	25 April	38.51.8°N	71.37.5°W
(b)	116	26 April	38.52.2°N	71.42.1°W
(b)	117	27 April	38.52.6°N	71.46.6°W
(b)	118	28 April	38.53.0°N	71.51.2°W
(a)	119	29 April	38.53.4°N	71°55.7°W
(c)	120	30 April	38.53.8°N	72.00.3°W
(c)	121	01 May	38.54.2°N	72.04.8°W
(c)	122	02 May	38.54.6°N	72.09.4°W

- (a) Data from Otis Brown, University of Miami
- (b) Interpolated
- (c) Extrapolated

Figure 1.

II. INDIVIDUAL REPORTS

PARTICULATE MATTER STUDIES

Principal Investigator: James K. B. Bishop

Cruise Participants: Robert Sherrell, Maureen Conte and James K. B. Bishop
Lamont-Doherty Geological Observatory

The objectives of large volume in situ filtration studies during OCEANUS cruise 118 were fourfold:

- 1) to obtain size fractionated particulate matter samples from various environments in warm core ring systems so that factors governing particulate matter chemistry, reactivity, and sedimentation rates may be understood.
- 2) to test the deployment of sediment traps on the LVFS.
- 3) to test new filter holder and modified prototype designs for the Multiple Unit Large Volume In Situ Filtration System (MULVFS).
- 4) to test Gelman microquartz filter material as a substitute for Mead 935-BJ glass fiber filters.

All these objectives were accomplished.

The deployments of the LVFS and MULVFS prototype were entirely successful, and 40 samples were collected from Slope Water, the high velocity region, and ring center stations from a depth range of 15 to 700 meters (Table 1). Not one component of either system malfunctioned in spite of occasional high sea state. The OCEANUS was an excellent sampling platform. Traps which were deployed on the LVFS on three casts (Table 2) returned material for gravimetric and chemical analysis. The new filter holder design appeared to be an improvement over the LVFS filter holders. The Gelman filters, although showing slightly slower filtration rates than the Mead filters, performed well. A decision on the suitability of the Gelman material will have to await the results of chemical analyses at Lamont-Doherty Geological Observatory.

Two additional experiments undertaken on the R/V ENDEAVOR were to deploy a 1-meter transmissometer on the CTD/Rosette to gain a high resolution view of the spatial variations of particulate matter and also to deploy Martin- and Knauer-style sediment traps on the Loran C navigated drifter deployed in the ring center and high velocity region. The transmissometer failed on the first lowering in the Slope Water, and attempts to repair the instrument were suspended as the instrument was under warranty. The sediment traps were deployed on the drifter in the ring center at 113 meters, and three of four traps were recovered. Traps could not be redeployed in the HVR due to excessive sea state conditions. The three samples were allowed to drain under gravity and were stored under refrigeration.

Continuous 12 KHz echo sounder recordings were made during the cruise except during deep radon casts (Figure 1). These records profiled the scattering layers to 750m, although the upper 50m were frequently obscured.

Figure 1. Hourly summary of maximum scattering depths from 12 KHz echo sounder recordings.

Figure 1 (Cont.)

Figure 1 (Cont.)

The majority of the scattering was confined to the upper 500m with some scattering layers present at 600m or greater in all three regions. The Slope water was dominated by scatters showing strong diurnal migration patterns. Maximum scattering was concentrated between 250 and 550m during mid-day and in the upper 300m at night. In contrast, the ring center waters exhibited a strong, non-migrating scattering layer between 350 and 500m in addition to diurnal migrators. The night-time water column contained many scattering layers throughout the 0 to 500m range. The ring center also exhibited patches between 100 and 200m and a greater number of individual signals during the day. The high velocity zone was distinct from either the Slope or ring center waters. Maximum scattering was generally confined above 400m and, unlike the Slope Water and ring core, strong scattering layers were present in the upper 250m during the day.

Bishop, et al.

Table 1. LVFS and MULVFS Cast Summary, 2 May 1982

<u>Date</u>	<u>Day</u>	<u>Cast</u>	<u>Sta</u>	<u>Time</u>	<u>Local</u>	<u>Depths</u> <u>Samp</u>	<u>Mean Position</u>	<u>Dist</u> <u>from</u> <u>R.C.</u>
4/19/82	109	1L	1	+5 1720	2103	15 30 60 100	39.13.0°N 69.36.8°W	79.7
4/20/82	110	2L	1	+5 2355	1030	150 250 405 605	39.08.6°N 69.38.6°W	80.2
4/22/82	112	3L	2	+5 1218	1707	20 60 112 200	38.51.1°N 71.20.0°W	2.8
4/23/82	113	4L	2	+5 0647	1137	112 112 112 112	38.49.9°N 71.33.2°W	3.2
4/23/82	113	5L	2	+5 2303	0856	200 350 500 707	38.43.6°N 71.42.6°W	11.3
4/25/82	115	6L	3	+4 0330	0744	21 62 112 200	38.34.9°N 72.07.2°W	28.5
4/28/82	118	7L	5	+4 0332	0914	20 60 112 200	38.49.3°N 71.43.9°W	6.4
4/29/82	119	8L	6	+4 1708	2152	21 50 110 200	39.23.1°N 71.37.3°W	32.9
5/01/82	121	9L	7	+4 0258	0855	310 610 blank	38.52.6°N 71.54.5°W	8.4
5/01/82	121	1M	7	+4 0944	1134	308	38.53.7°N 71.55.7°W	7.1
5/02/82	122	10L	8	+4 0147	0504	15 52 150 355	39.28.9°N 70.59.9°W	63.7

Key: Day, Julian Day; Cast, L=LVFS; M=MULVFS prototype; Time +n hours earlier than GMT; Depths sampled, meters; Distance, distance from ring center in nautical miles based on satellite data.

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Table 2. LVFS Sediment Trap Deployment Summary, 2 May 1982

<u>Date</u>	<u>Day</u>	<u>Cast</u>	<u>Sta</u>	<u>Time (Local)</u>	<u>Depth Range</u>	<u>Trap Numbers</u>
4/28/82	118	7L	5	+4 0300 0930	20 - 200 m	13, 14
4/29/82	119	8L	6	+4 1700 2210	20 - 200 m	15, 16
5/01/82	121	9L	7	+4 0200 0855	310 - 610 m	17, 18

Sediment traps were attached to filter holder No. 1 on LVFS.

RADON AND RADIUM IN WARM CORE RINGS

Principal Investigator: David R. Schink

Cruise Participants: Norman L. Guinasso, James Orr, and Patrick Setser
Texas A&M University

Our purpose was to measure radium²²⁶, radium²²⁸, and radon²²². The distribution of these isotopes should provide insight into horizontal and vertical mixing processes that affect the biology and chemistry of warm core rings.

we made three different kinds of casts to collect our samples.

Surface radon casts (SR) were made with 30 liter Niskin bottles on the hydrowire usually in the upper few hundred meters of the water column. Reversing thermometers were used to measure temperature; salinity and oxygen were measured on samples taken from these bottles. Radon was measured and counted aboard ship. Radium was extracted on treated manganese fiber and will be returned to our laboratory for analysis of radium²²⁶. Samples for nutrient determination were frozen for later analysis.

Deep radon casts (DR) were taken with 8, 30-liter Niskin bottles on the hydrowire. Bottles were positioned very near the bottom with the aid of a pinger. The bottom bottle typically was tripped about 5 meters off the bottom. Other bottles were generally within 300 meters of the bottom. Salinities and oxygen were determined on samples taken from these casts. Samples for nutrient determination were frozen for later analysis.

Six-shooter (SS) casts were taken to measure radium²²⁸. This device is an in situ pumping system which pumps six, 1000 liter samples through acrylic fiber filters treated with permanganate to permit the filters to adsorb radium. On this cruise, this system was lowered attached to a 9040 STD. The STD data was digitized and recorded for later analysis. Data on the salinity channel was somewhat noisy.

Our group also ran surface salinity samples for each XBT station and for each weather observation.

The table below gives a summary of our activities. SRa denotes a surface cast where the radon samples were not run, but radium samples were taken. Day denotes the Julian Day. Latitude and longitude are given in degrees.

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Table 1.

Day	Cast	Est. Ring Center	Station Position	Dist. RC. (NM)	
109	419.1	38.865°N; 71.265°W	39.140°N; 69.521°W	82.96	SR
110	420.1	38.925°N; 71.282°W	39.277°N; 69.558°W	82.97	SS
110	420.4	38.925°N; 71.282°W	39.263°N; 69.578°W	81.88	STD
111	421.3	38.898°N; 71.332°W	39.182°N; 69.645°W	80.42	SRa
112	422.2	38.870°N; 71.380°W	38.840°N; 71.385°W	1.82	SR
112	422.7	38.870°N; 71.380°W	38.907°N; 71.388°W	2.23	SS
113	423.1	38.890°N; 71.543°W	38.840°N; 71.437°W	5.82	STD
113	423.4	38.890°N; 71.543°W	38.842°N; 71.617°W	4.49	DR
114	424.3	38.877°N; 71.563°W	38.643°N; 72.032°W	26.00	SR
115	425.3	38.863°N; 71.625°W	38.593°N; 72.163°W	29.95	DR
Day	Cast	Est. Ring Center	Station Position	Dist. RC. (NM)	
115	425.5	38.863°N; 71.625°W	38.442°N; 72.510°W	48.58	SR
116	426.2	38.870°N; 71.702°W	38.538°N; 72.335°W	35.71	DR
116	426.5	38.870°N; 71.702°W	38.633°N; 72.450°W	37.79	SS
117	427.2	38.877°N; 71.777°W	38.847°N; 71.620°W	7.54	SR
118	428.2	38.883°N; 71.853°W	38.880°N; 71.680°W	8.16	SR
119	429.1	38.890°N; 71.928°W	39.347°N; 71.883°W	27.48	DR
120	430.1	38.897°N; 72.005°W	39.340°N; 71.513°W	35.09	SR
120	430.5	38.897°N; 72.005°W	39.833°N; 71.568°W	59.74	SR
121	501.3	38.903°N; 72.080°W	38.920°N; 71.957°W	5.86	SS
122	502.2	38.900°N; 72.080°W	39.510°N; 70.930°W	64.80	SR
122	502.3	38.900°N; 72.080°W	39.557°N; 70.885°W	68.10	DR
122	502.5	39.900°N; 72.080°W	39.495°N; 70.970°W	62.76	SR
122	502.7	38.900°N; 72.080°W	39.529°N; 70.813°W	69.95	SS

MIDWATER FISHES

Principal Investigator: Richard Backus
 Cruise Participants: James Craddock, Mary Ann Daher, John Pirie and
 Joseph Wroblewski
 Woods Hole Oceanographic Institution and Dalhousie University

During OCEANUS Cruise No. 118, the MOCNESS-20 trawl system was fished twelve times. Each lowering was to 1000 meters using 5 nets, the first net fishing 0-1000 meters and each successive net fishing at 250-meter intervals on the way back to the surface.

Four lowerings were made in Slope Water; four lowerings were made within 25 km of the center of warm core ring 82B; and four lowerings were made in the high velocity region of ring 82B (50-75 km from its center).

These collections are summarized in the accompanying Table 1.

Likewise, fifteen surface collections were made at night with a 1 meter neuston net at two Slope water stations and at two ring stations; specifically, 6 tows along the track of MOC-1D-163 (2 hrs); 4 along the track of MOC-20-13 (2 hrs); 2 along the track of MOC-1D-168 (1.45 hrs); and 3 along the track of MOC-20-18 (2.33 hrs).

ZOOPLANKTON SPATIAL PATTERNS

Principal Investigator: Peter H. Wiebe
Cruise Participants: Steven Boyd, Alfred Morton, Valerie Barber and
Peter H. Wiebe
Woods Hole Oceanographic Institution

Our objectives in this first of four time-series cruises to Gulf Stream warm core rings were to sample the macro-zooplankton at station locations placed from the center of ring 82B out into the adjacent Slope Water in order to provide a picture of the vertical structure in the upper 1000 meters across the ring for a variety of species, especially the euphausiids, and to characterize the diel vertical movements of these species as well as the total zooplankton biomass. In addition, we intended to collect individuals of a number of euphausiid species for biochemical analysis in order to study the effects of spatial and time-course changes in rings on their physiological and biochemical properties. During the joint ship experiments in the ring center and high velocity region, we intended to look at the coarse-scale spatial structure of the zooplankton in the upper 100 meters associated with intrusions at the ring boundary and with internal wave patterns in the ring core.

We used a double MUCNESS-1 to sample the zooplankton in the upper 1000 meters. On each 3-hour haul, we generally obtained 8 samples integrating 100 meter intervals from 1000 to 200 meters and 8 samples integrating 25 meter intervals from 200 to 0 meters. A total of 15 hauls were made, of which 13 will probably be suitable for documenting ring zooplankton structure. A total of 231 samples were collected on these tows. We were unable to take the tows to study the coarse-scale patterns of zooplankton primarily because of high winds and waves during both of the days set aside for the joint experiments. Table 1 presents details of times, dates, positions, etc., of the double MUCNESS tows; Table 2 gives the distance of each tow from the ring center using positions listed in narrative Table 1).

To help correlate our zooplankton data with the findings of phytoplankton investigators on ship 2 (R/V KNORR), we made a number of 5-liter Niskin bottle casts in the upper 100 to 200 meters for analysis of chlorophyll. This chlorophyll data will also be used in conjunction with pyranometer data

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Table 1. Summary of MOCNESS-20 collections, Oceanus Cruise 118

MOCNESS	Position		Date 1982	Time (+5)	Area
	N	W			
20-7	39°13.4' 39°16.2'	69°35.2' 69°34.5'	19 April	(1354-)-1501-1607	Slope Water
20-8	39°17.3' 39°21.3'	69°32.9' 69°30.0'	20 April	(0112-)-0250-0421	Slope Water
20-9	39°09.2' 39°11.3'	69°41.7' 69°38.9'	21 April	(1209-)-1345-1510	Slope Water
20-10	38°57.9' 39°00.7'	71°15.8' 71°15.7'	22 April	(0034-)-0229-0357	Ring 82B, Center
20-11	38°54.6' 38°50.5'	71°36.8' 71°35.1'	23 April	(1252-)-1420-1559	Ring 82B, Center
20-12	38°39.4' 38°38.4'	72°05.3' 72°01.8'	24 April	(1231-)-1407-1623	Ring 82B, HVR
20-13	38°36.0' 38°32.7'	72°03.8' 72°05.4'	24 April	(2255-)-0001-0137	Ring 82B, HVR
Time (+4)					
20-14	38°31.2' 38°30.1'	72°23.6' 72°19.5'	26 April	(0149-)-0318-0504	Ring 82B, HVR
20-15	38°34.6' 38°35.3'	72°31.7' 72°27.5'	26 April	(1358-)-1507-1650	Ring 82B, HVR
20-16	38°49.4' 38°50.0'	71°40.5' 71°49.8'	30 April	(0733-)-0920-1120	Ring 82B, Center
20-17	38°48.3' 38°51.0'	71°44.5' 71°53.0'	30 April	(2210-)-2341-0122	Ring 82B, Center
20-18	39°27.1' 39°28.0'	71°08.4' 71°01.7'	1 May	(2155-)-2308-0056	Slope Water

GULF STREAM RING TIME SERIES CRUISE

MOCNESS #	Lat. °N	Long. °W	Local			GMT			Isotherm Depths 15°C 10°C		Station Area Depth Interval, Remarks
			Date (Start Down)	Time Start Up	Time Up	Date (Start Down)	Time Start Up	Time Up			
MOC-D1-161	39 07.49 39 11.15	69 34.38 69 34.84	19 April (0840)	0950	1140	1340	1450	1640	23 193/ 27		SW - bet. 82D & 82B 10 samples; probable depths (M); 1000-750; 750- 670; 670-600; 600-400; 400- 300; 300-200; 176-150; 150- 100; 100-50; 50-0, No Sal.
MOC-D1-162	39 13.05 39 14.85	69 37.73 69 35.25	19 April (2233)	2208	0013	20 April (0333)	0308	0513	245/ 25		SW - bet. 82D & 82B 0-1000M oblique tow; 2 samp: w/T & Sal.
MOC-D1-163	39 13.85 39 08.23	69 38.75 69 36.21	20 April (1958)	2108	2324	21 April (0058)	0208	0424	32/ 229/ 241		SW - bet. 82D & 82B; 1000-850; 850-520; 520- 400; 400-300; 300-190; 190- 100; 100-50; 50-0; 200-175; 175-150; 150-125; 125-100; 100-75; 75-50; 50-25; 25-0; w/T & Sal.
MOC-D1-164	38 53.55 38 55.61	71 24.00 71 19.33	22 April (0917)	1012	1202	22 April (1417)	1512	1702	407/ 445	569/ 569	Cent. 82B; 1000-200 @ 100 M inter.; 200-0 @ 25m inter. w/T & Sal.
MOC-D1-165	38 48.43 38 53.33	71 20.23 71 23.02	22 April (1747)	1837	2106	22 April (2247)	2337	0206	419	564	Cent. 82B; 1000-200 @ 100 M inter.; 200-0 @ 25 m inter. w/T & Sal.
MOC-D1-166	38 39.91 38 36.37	72 02.75 72 03.58	24 April (1844)	1922	2203	24 April (2344)	0022	0303	472/ 456		Ring 82B SW; HVR; 1000- 200 @ 100M inter; 200-0 @ 25M inter; w/T & Sal. Sal. noisy
MOC-D1-167	38 38.9 38 34.9	72 08.23 72 09.38	25 April (0853)	1014	1251	25 April (1253)	1414	1651	241/ 226	470/ 448	Ring 82B SW; HVR; 1000- 200 @ 100m inter; 200-0 @ 25M inter; 75-40; 40- 20; 20-0 w/T. & Sal. (noisy)

WARM CORE

GULF STREAM RING TIME SERIES CRUISE

MOCNESS #	Lat. °N	Long. °W	Local			GMT			Isotherm Depths 15°C 10°C		Station Area Depth Interval, Remark
			Date (Start Down)	Time Start Up	Time Up	Date (Start Down)	Time Start Up	Time Up			
MOC-D1-168	38 26.78	72 30.89	26 April (2145)	2247	0106	27 April (0145)	0247	0506	15	287 344	Ring 82B SW; HVR; 1000-200 @ 100M inter; 200-0 @ 25M inter; ok w/T. & Sal.
MOC-D1-169	38 33.07 38 34.35	72 21.75 72 32.08	26 April (1004)	1113	1314	26 April (1404)	1513	1714	107	391/ 357	Ring 82B SW; HVR; 1000- 200 @ 100M inter; 200- 0 @ 25M inter.; 50-0 w/T. & Sal.
MOC-D1-170	39 22.6 39 21.5	71 52.6 71 53.5	29 April (1057)	1157	1447	29 April (1457)	1557	1947		330/ 347	Ring 82B NW; HVR; Joint Ship Exp.; 1000-200 @ 100M inter; 200-0 @ 25M inter; ok w/T & Sal.
MOC-D1-171	39 24.09 39 20.41	71 27.68 71 30.75	29 April (2256)	0017	0224	30 April (0256)	0417	0624		350/ 357	Ring 82B NW; HVR; Joint Ship Exp.; 1000-200 @ 100m inter; 200-0 @ 25m inter.; ok w/T. & Sal.
MOC-D1-172	38 55.7 38 51.25	71 39.8 71 31.48	30 April (1305)	1418	1622	30 April (1705)	1818	2022	458/ 427	579/ 556	Ring 82B Center; 1000- 200 @ 100m inter; 200- 0 @ 25m inter; ok w/ T & Sal.
MOC-D1-173	38 49.4 38 48.3	71 34.8 71 44.5	30 April (1830)	1928	2133	30 April (2230)	2328	0133	367/ 386	521/ 535	Ring 82B Center; 1000- 200 @ 100m inter; 200- 0 at 25m inter; 100-0 No T. or Sal.

Table 1 (cont.)

WARM CORE

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GULF STREAM RING TIME SERIES CRUISE

MOCNESS #	Lat. °N	Long. °W	Local			GMT			Isotherm Depths 15°C 10°C		Station Area Depth Interval, Remark
			Date (Start Down)	Time Start Up	Time Up	Date (Start Down)	Time Start Up	Time Up			
MOC-D1-174	39 32.9 39 29.9	70 53.3 70 58.3	2 May (1407)	1511	1723	2 May (1807)	1911	2123			Slope Water, NE of 82B; 1000-200 @ 100m inter.; 200-75; 75-0 No Sal.
MOC-D1-175	39 27.9 39 29.7	70 57.3 70 56.3	2 May (1945)	2047	2225	2 May (2345)	0047	0225			Slope Water, NE of 82B; 1000-200 @ 100M inter; 200-50 @ 25M inter; 50-0 (Because of failure); No Sal.

collected by us on the OCEANUS to calculate downwelling light levels in the upper 1000 meters. These light data were collected at 10-minute intervals for the duration of the cruise with an MR-5 pyranometer (Hollis Observatory product). During each station, a chlorocast was made in the euphotic zone to determine the standing stocks of chlorophyll a and phaeophytin. Generally, samples were taken in ten-meter intervals from the surface to 100 meters. On four separate occasions, samples were taken to 200 meters to establish changes below 100 meters. In addition, samples taken by the "radon group" were analyzed for chlorophyll on 3 occasions (Table 3). In general, chlorocast positions bracketed double MOCNESS tows and offered reasonable estimations of chlorophyll pigment standing stocks (see Narrative, Figure 1)

Euphausiids from ten MOCNESS-20 trawls and three neuston tows were preserved for carbon, nitrogen and hydrogen analysis, lipid fractionation or chlorophyll pigment levels. A total of eighteen species were processed with emphasis being placed on particular indicator species; i.e., Euphausia krohnii, Nematoscelis megalops, and Euphausia brevis. (Table 4).

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Table 2.

<u>MOC-1D</u>		Dist. to Ring Center <u>NM</u>	Dist. to Ring Center <u>KM</u>
161	S	80.4	149.0
	F	80.8	149.8
162	S	79.1	146.6
	F	81.5	150.9
163	S	78.4	145.2
	F	79.2	146.8
164	S	1.6	3.0
	F	4.3	8.1
165	S	4.3	7.9
	F	1.1	2.1
166	S	25.9	48.0
	F	28.3	52.5
167	S	27.2	50.4
	F	30.1	55.7
168	S	45.8	84.9
	F	39.6	73.3

<u>MOC-1D</u>		Dist. to Ring Center <u>NM</u>	Dist. to Ring Center <u>KM</u>
169	S	36.4	67.4
	F	42.9	79.5
170	S	29.3	54.3
	F	28.2	52.2
171	S	37.6	69.7
	F	33.2	61.6
172	S	16.1	29.8
	F	22.6	41.8
173	S	20.3	37.7
	F	13.5	25.0
174	S	70.3	130.3
	F	65.4	121.2
175	S	65.1	120.5
	F	~66.6	123.5

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Table 3. Chlorophyll Cast Data

<u>Cast NO.</u>	<u>Date</u>	<u>Time</u>	<u>Region</u>	<u>Lat.</u>	<u>Long.</u>	Dist. from R.C. <u>Km./Kt.</u>		<u>Depth</u>	<u>Int.</u>
1	4/19/82	0530	SW	39.07.5°N	69.33.3°W	150.5	81.3	140m	10m
2	4/20/82	1400	SW	39.16.1°N	69.34.2°W	152.5	82.3	100m	10m
3	4/21/82	1100	SW	39.09.0°N	69.42.0°W	143.7	77.5	200m	10m
4	4/22/82	0730	RC	38.51.5°N	71.22.9°W	1.3	0.7	200m	10m
5	4/23/82	1200	RC	38.53.4°N	71.36.5°W	5.6	3.0	200m	20m
6	4/24/82	1200	HVR	38.39.0°N	72.05.5°W	51.6	27.8	100m	10m
7	4/25/82	1721	HVR	38.26.0°N	72.30.3°W	91.1	48.6	100m	10m
8	4/26/82	0900	RE	38.33.0°N	72.21.0°W	66.6	35.9	100m	10m
9	4/27/82	1540	RC	38.51.0°N	71.37.0°W	14.2	7.6	100m	10m
10	4/28/82	1400	RC	38.53.0°N	71.41.0°W	14.7	7.9	200m	20m
11	4/29/82	0900	HVR	39.22.0°N	71.51.0°W	53.4	28.8	100m	10m
12	4/30/82	1630	RC	38.50.0°N	71.34.0°W	38.6	20.8	220m	10m*
13	5/1/82	2145	SW	39.27.0°N	71.08.4°W	101.3	54.7	100m	10m

*Additional radon samples

SW = Slope Water; RC = Ring Center; HVR = High Velocity Region; RE = Ring Edge

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Table 4. Number of Individuals Collected For Biochemical Analysis
According to Intended Treatment

<u>Species</u>	<u>Acetone</u>	<u>CHN</u>	<u>Chlor-Meth</u>
<u>E. krohnii</u>	19	72	44
<u>E. mutica</u>	1		
<u>E. brevis</u>	1	6	10
<u>E. hemigibba</u>	8	6	
<u>E. gibboides</u>	1		1
<u>E. americana</u>		2	
<u>N. megalops</u>	10	6	13
<u>N. microps</u>	2	4	2
<u>N. atlantica</u>	2		1
<u>N. tenella</u>	2	5	1
<u>T. monocantha</u>	1		
<u>T. aequalis</u>	4	10	3
<u>T. acutifrons</u>	1		
<u>T. obtusifrons</u>	1		
<u>T. gregaria</u>		2	
<u>N. flexipes</u>	4	6	3
<u>N. sexspinosus</u>			1
<u>S. elongatum</u>	1	5	2

III. SCIENTIFIC OBSERVATION LOG

<u>Sta.</u>	<u>Up. No.</u>	<u>Start Time</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Descriptor</u>	<u>Invest.</u>
1	0419.1	0400	39.08.41°N	69.31.28°W	Shallow Radon Cast	Orr; Setser
1	0419.2	0515	39.07.72°N	69.32.09°W	5-L Chlorophyll Cast No. 1	Boyd
1	0419.3	0840	39.07.49°N	69.34.38°W	MOC-1D-161	Wiebe
1	0419.4	1500	39.14.78°N	69.34.94°W	MOC-20-7	Craddock
1	0419.5	1714	39.15.56°N	69.34.76°W	LVFS No. 1	Bishop
1	0419.6	2210	39.13.05°N	69.37.73°W	MOC-1D-162	Wiebe
1	0419.7	0055	39.17.25°N	69.32.91°W	MOC-20-8	Craddock
1	0420.1	0900	39.16.6°N	69.33.5°W	Six Shooter to 1000M	Orr
1	0420.2	1346	39.16.6°N	69.33.5°W	5-L Chlorophyll Cast No. 2	Boyd
1	0420.3	1420	39.15.77°N	69.34.66°W	Net Tow	Boyd
1	0420.4	1526	39.15.2°N	69.36.1°W	STD/Rosette, 30L	Orr
1	0420.5	1945	39.13.85°N	69.38.75°W	MOC-1D-163	Wiebe
1	0420.6	2340	39.08.07°N	69.36.17°W	LVFS No. 2	Bishop
1	0421.1	1115	39.09.37°N	69.41.59°W	5-L Chlorophyll Cast No. 3	Boyd
1	0421.2	1200	39.09.13°N	69.41.62°W	MOC-20-9	Craddock
1	0421.3	1530	39.10.9°N	69.38.7°W	Radium, Radon Cast to 1000M	Orr
2	0422.1	0020	38.57.62°N	71.15.50°W	MOC-20-10	Craddock
2	0422.2	0600	38.50.4°N	71.23.1°W	500M Radon Hydrowire	Orr; Setser
2	0422.3	0745	38.51.52°N	71.22.93°W	5-L Chlorophyll Cast to 200M; No. 4	Boyd
2	0422.4	0915	38.53.55°N	71.24.0°W	MOC-1D-164	Wiebe

<u>Sta.</u>	<u>Op. No.</u>	<u>Start Time</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Descriptor</u>	<u>Invest.</u>
2	0422.5	1210	38.55.61°N	71.19.33°W	LVFS No. 3	Bishop
2	0422.6	1943	38.48.43°N	71.20.23°W	MOC-1D-165	Wiebe
2	0422.7	2223	38.54.39°N	71.23.26°W	Six Shooter/STD	Orr
2	0423.1	0300	38.50.37°N	71.26.24°W	STD Rosette	Orr
2	0423.2	0645	38.48.3°N	71.31.1°W	LVFS No. 4	Bishop
2	0423.3	1211	38.53.4°N	71.36.5°W	5-L Chlorophyll Cast No. 5	Boyd
2	0423.4	1250	38.54.22°N	71.36.63°W	MOC-20-11	Craddock
2	0423.5	1630	38.50.5°N	71.37.0°W	Deep Radon Cast to 2600M	Orr
2	0423.6	2100	38.42.57°N	71.42.7°W	Deep LVFS No. 5	Bishop
3	0424.1	1200	38.39.4°N	72.05.0°W	5-L Chlorophyll Cast No. 6	Boyd
3	0424.2	1230	38.38.4°N	72.05.0°W	MOC-20-12	Craddock
3	0424.3	1640	38.38.61°N	72.01.91°W	Shallow Radon Cast	Orr
3	0424.4	1820	38.39.91°N	72.02.75°W	MOC-1D-166	Wiebe
3	0424.5	2250	38.35.98°N	72.03.8°W	MOC-20-13	Craddock
3	0425.1	0324	38.33.16°N	72.06.71°W	Shallow LVFS No. 6	Bishop
3	0425.2	0853	38.38.8°N	72.08.3°W	MOC-1D-167	Wiebe
3	0425.3	1300	38.35.5°N	72.09.5°W	Deep Radon Cast	Orr
3	0425.4	1900	38.26.04°N	72.30.3°W	5-L Chlorophyll Cast No. 7	Boyd
3	0425.5	1940	40.26.04°N	72.30.3°W	Shallow Radon Cast	Orr
4	0425.6	2249	38.26.6°N	72.31.1°W	MOC-1D-168	Wiebe
4	0426.1	0149	38.31.2°N	72.23.6°W	MOC-20-14	Craddock
4	0426.2	0520	38.30.9°N	72.19.4°W	Deep Radon Cast	Orr
4	0426.3	0910	38.32.9°N	72.20.8°W	5-L Chlorophyll Cast No. 8	Boyd

<u>Sta.</u>	<u>Op. No.</u>	<u>Start Time</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Descriptor</u>	<u>Invest.</u>
4	0426.4	1005	38.31.3°N	72.21.5'W	MOC-1D-169	Wiebe
4	0426.5	1358	38.34.5°N	72.31.7'W	MOC-20-15	Craddock
4	0426.6	1800	38.38.0°N	72.27.0'W	Six-Shooter STD	Orr
5	0427.1	1521	38.51.6°N	71.37.1'W	5-L Chlorophyll Cast No. 9	Boyd
5	0427.2	1545	38.50.8°N	71.32.2'W	Shallow Radon Cast	Orr
5	0428.1	0317	38.50.5°N	71.40.9'W	LVFS No. 7	Bishop
5	0428.2	1200	38.52.8°N	71.40.8'W	Shallow Radon Cast	Orr
5	0428.3	1357	38.52.8°N	71.40.8'W	5-L Chlorophyll Cast No. 10	Boyd
6	0429.1	0535	38.52.65°N	71°39.15'W	Deep Radon Cast	Orr
6	0429.2	0838	38.52.8°N	71°40.8'W	5-L Chlorophyll Cast No. 11	Boyd
6	0429.3	1054	39.20.93°N	71°53.9'W	MOC-1D-170	Wiebe
6	0429.4	1704	39.22.3°N	71°39.7'W	LVFS No. 8	Bishop
6	0429.5	2254	39.24.1°N	71°27.7'W	MOC-1D-171	Wiebe
6	0430.1	0235	39.20.4°N	71°30.8'W	Shallow Radon Cast	Orr
7	0430.2	0730	38.49.4°N	71°40.5'W	MOC-20-16	Craddock
7	0430.3	1304	38.55.4°N	71°39.4'W	MOC-1D-172	Wiebe
7	0430.4	1645	38.50.7°N	71.33.6°W	5-L Chlorophyll Cast No. 12	Boyd
7	0430.5	1700	38.50.7°N	71.33.6°W	Shallow Radon Cast	Orr
7	0501.1	0200	38.51.1°N	71.53.4°W	LVFS No. 9	Bishop
7	0501.2	0915	38.53.5°N	71.55.8°W	MULVFS-1	Bishop
7	0501.3	1230	38.55.2°N	71.57.4°W	Six Shooter STD	Orr
8	0501.4	2128	39.27.0°N	71.09.2°W	5-L Chlorophyll Cast No. 13	Boyd

<u>Sta.</u>	<u>Op. No.</u>	<u>Start Time</u>	<u>Latitude</u>	<u>Longitude</u>	<u>Descriptor</u>	<u>Invest.</u>
8	0501.5	2153	39.27.1°N	71.08.5°W	MOC-20-18	Craddock
8	0502.1	0143	39.28.6°N	71.00.7°W	LFVS-10	Bishop
8	0502.2	0600	39.30.6°N	70.55.2°W	Shallow Radon Cast	Orr
8	0502.3	1030	39.33.4°N	70.53.1°W	Deep Radon Cast	Orr
8	0502.4	1413	39.32.9°N	70.53.2°W	MOC-1D-174	Wiebe
8	0502.5	1730	39.29.7°N	70.58.19°W	Shallow Radon Cast	Orr
8	0502.6	1932	39.29.6°N	70.57.1°W	MOC-1D-175	Wiebe
8	0502.7	2331	39.31.7°N	70.48.8°W	Six Shooter STD	Orr

IV. XBT DIGITIZING LOG

XBT	Date	Time (Local)	Latitude	Longitude	XBT Surface Temp (°C)	Depth (M)	
						15	10
13	4/19/82	0019	39.39.7°N	69.01.1°W	7.7	NP	65;222
14	4/19/82	0115	39.30.0°N	69.30.5°W	6.8	NP	58;225
15	4/19/82	0207	39.19.8°N	69.30.8°W	7.5	NP	32;215
16	4/19/82	0300	39.09.0°N	69.31.2°W	8.6	NP	7;210
17	4/19/82	1717	39.15.5°N	69.34.8°W	8.0	NP	32;235
18	4/20/82	0840	39.20.0°N	69.30.5°W	10.1	NP	2;222
19	4/21/82	0303	39.08.4°N	69.38.8°W	10.1	NP	2;220
20	4/21/82	1802	39.10.5°N	69.43.1°W	10.7	NP	241
21	4/21/82	1903	39.08.7°N	69.58.6°W	9.5	NP	66;226
22	4/21/82	2000	39.06.7°N	70.12.8°W	9.4	NP	80;240
23	4/21/82	2100	39.04.4°N	70.28.8°W	9.2	NP	80;253
24	4/21/82	2200	39.01.8°N	70.44.5°W	12.9	NP	364
25	4/21/82	2300	38.59.0°N	71.00.5°W	15.7	272	470
26	4/22/82	0000	38.57.8°N	71.15.5°W	15.9	421	566
27	NG						
28	4/22/82	1539	38.49.8°N	71.20.5°W	15.8	427	565
29	4/23/82	0549	38.47.5°N	71.29.8°W	15.8	425	560
30	4/23/82	1230	38.54.5°N	71.36.9°W	15.7	420	552
31	4/23/82	1950	38.50.7°N	71.38.2°W	15.9	410	533
32	4/23/82	2109	38.42.6°N	71.42.2°W	15.7	363	529
33	4/24/82	0417	38.44.0°N	71.46.7°W	15.6	386	510
34	NG						
35	4/24/82	0755	38.46.0°N	71.50.5°W	15.8	375	502
36	4/24/82	1015	38.46.9°N	71.52.4°W	15.8	340	489
37	4/24/82	1115	38.41.7°N	72.00.6°W	15.0	0;242	450
38	4/24/82	1138	38.39.0°N	72.04.9°W	14.4	97;238	431
39	4/24/82	1636	38.34.5°N	72.01.9°W	15.7	243	452
40	4/25/82	0233	38.33.6°N	72.06.8°W	14.9	60;80;112	430
41	4/25/82	0643	38.36.4°N	72.07.6°W	15.5	218	448
42	4/25/82	1535	38.36.1°N	72.10.9°W	15.0	230	426
43	4/25/82	1721	38.30.4°N	72.20.2°W	13.8	NP	355
44	4/25/82	1758	38.25.8°N	72.27.6°W	16.0	12	282
45	4/26/82	0938	38.33.1°N	72.21.1°W	13.6	45;189	385
46	4/26/82	2230	38.39.3°N	72.25.0°W	13.2	NP	393
47	4/26/82	2330	38.43.1°N	72.11.5°W	15.8	311	42
48	NG						
49	4/27/82	0030	38.46.9°N	71.58.4°W	16.5	415	521
50	4/27/82	0130	38.49.8°N	71.47.0°W	16.1		555
51	4/27/82	0605	38.46.4°N	71.79.2°W	16.0	385	529
52	4/27/82	1115	38.38.5°N	71.45.9°W	15.9	321	503
53	4/27/82	1345	38.43.1°N	71.42.9°W	16.2	373	535
54	4/27/82	1445	38.50.1°N	71.38.0°W	16.2	370	530
55	4/27/82	1835	38.49.6°N	71.46.0°W	16.1	423	545
56	4/28/82	0133	38.51.8°N	71.40.8°W	16.1	413	550
57	4/28/82	0635	38.48.5°N	71.45.7°W	15.9	405	538
58	4/28/82	1440	38.54.8°N	71.41.3°W	15.9	435	545

<u>XBT</u>	<u>Date</u>	<u>Time</u> <u>(Local)</u>	<u>Latitude</u>	<u>Longitude</u>	<u>XBT</u> <u>Surface</u> <u>Temp (°C)</u>	<u>Depth</u> <u>15</u>	<u>(M)</u> <u>10</u>
59	4/28/82	1836	38.57.4°N	71.39.5°W	16.0	411	535
60	4/28/82	2200	39.06.4°N	71.40.0°W	15.9	352	511
61	4/28/82	2300	39.13.4°N	71.40.9°W	15.2	162	432
62	4/29/82	0000	39.20.6°N	71.44.1°W	13.8	NP	376
63	4/29/82	0113	39.29.4°N	71.47.8°W	12.5	NP	269
64	4/29/82	0215	39.36.4°N	71.51.4°W	9.2	NP	20;42;62 200
65	4/29/82	0315	39.28.9°N	71.55.6°W	8.9	NP	85;215
66	4/29/82	0415	39.24.1°N	71.57.1°W	9.9	NP	12;303
67	4/29/82	0558	39.20.5°N	71.55.0°W	12.9	NP	353
68	4/29/82	1718	39.22.3°N	71.39.4°W	13.9	NP	340
69	4/30/82	0410	39.19.1°N	71.28.1°W	14.9	NP	392
70	4/30/82	0506	39.09.8°N	71.31.6°W	15.5	310	465
71	4/30/82	0600	38.59.7°N	71.36.0°W	15.9	381	530
72	4/30/82	1147	38.50.0°N	71.49.9°W	15.9	360	470
73	4/30/82	1257	38.55.6°N	71.39.6°W	16.6	431	543
74	5/01/82	0244	38.51.0°N	71.53.7°W	16.7	420	745
75	5/01/82	0630	38.52.2°N	71.54.7°W	15.8	410	525
76	5/01/82	1648	38.55.5°N	71.59.9°W	15.9	370	526
77	5/01/82	1802	39.04.5°N	71.48.3°W	15.7	351	508
78	5/01/82	1900	39.12.7°N	71.36.9°W	15.0	155	400
79	5/01/82	2000	39.23.0°N	71.25.8°W	9.2	NP	45;270
80	5/01/82	2103	39.27.0°N	71.13.3°W	9.5	NP	55;248
81	5/02/82	0312	39.29.4°N	70.58.8°W	10.3	NP	255
82	5/02/82	0548	39.30.3°N	70.56.4°W	8.6	NP	15;240
83	5/02/82	1342	39.33.5°N	70.53.1°W	9.0	NP	32;235
84	5/02/82	1948	39.29.7°N	70.56.3°W	12.0	NP	230
85	5/03/82	0215	39.40.6°N	70.48.2°W	9.7	NP	40;212
86	5/03/82	0300	39.49.8°N	70.48.4°W	8.7	NP	8;205

NP = Not present

NG = Probe no good