R/V ALBATROSS IV Cruise AL9901 Cruise Report

Acknowledgments

The scientific personnel respectively thank the officers and crew of R/V ALBATROSS IV.

Their cooperation and professional approach to duty helped ensure a successful cruise.

This report was prepared by John Sibunka, Maureen Taylor, Peter Wiebe, Maria Casas, Charles Miller, Rebecca Jones, Stephen Brownell and Keska Kemper with assistance from colleagues in the scientific party. This cruise was sponsored by the National Science Foundation and the National Oceanographic and Atmospheric Administration.

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Purpose of the Cruise

Six broad-scale surveys are part of the 1999 U.S. GLOBEC Georges Bank Program. These six broad-scale surveys are conducted monthly from January to June to monitor the changing biological and physical status in the Georges Bank ecosystem. The first cruise in this series was aboard R/V ALBATROSS IV (AL 99-01, 12-24 January 1999). The principle objectives of the cruise were to:

(1) Determine the distribution and abundance of the ichthyoplankton and zooplankton community on the Bank and in adjacent Gulf of Maine and slope waters. Emphasis was on target fish (eggs, larval and juvenile cod and haddock) and copepod species (all stages of *Calanus finmarchicus* and *Pseudocalanus* sp.) and their predators and prey.

(2) Provide systematic collections of larval and juvenile cod and haddock for age and growth estimates.

(3) Collect individuals of *Calanus* and the euphausiid, *Meganyctiphanes norvegica*, for population genetics studies.

(4) Conduct lipid biochemical and morphological studies of *Calanus finmarchicus*.

- Collect larger gelatinous predators.

(6) Conduct a hydrographic survey of the Bank.

(7) Conduct acoustic mapping of the plankton along the track lines between stations using a high frequency echo sounder deployed in body.

(8) Collect chlorophyll and nutrient data to characterize the potential for primary production and to calibrate the fluorometer on the CTD.

(9) Map the Bank wide velocity field using an Acoustic Doppler Current Profiler (ADCP).

(10) Deploy drifting buoys to make Lagrangian measurements of the currents.

In order to obtain uniform bank-wide coverage, 41 predetermined "standard" stations and 40 "intermediate bongo" stations were scheduled for this survey. During this cruise 41 standard stations were occupied and 38 bongo stations completed. The entire Bank was surveyed, including the portion in Canadian waters (Figure 1).

The 41 standard stations were assigned a priority code number (from 1-4) which reflected the equipment used on a given station. Priority stations assigned code 1 or 2 were "full stations" with "high priority" , and stations assigned code 3 or 4 were "partial stations" and designated "low priority". The intermediate bongo stations were considered to have a lower priority (i.e. priority code number 5) than the 41 standard stations.

Survey operations were a combination of both underway and station activities. The ship's ADCP unit was used to make continuous measurements of the water current profile under the ship, in order to construct the current field over the whole Bank. This data will be used to help in the interpretation of all the other observations made on the cruise. The along track operation consisted of high frequency acoustic measurements of the volume backscatter and nekton throughout the water column and surface measurements of temperature and fluorescence.

Figure 1

Navigation information, meteorological data, and sea surface salinity and temperature were recorded by the vessel's computer system.

At full stations an oblique plankton tow from surface to near bottom was made with a bongo sampler along with a real-time CTD attached to the towing wire. A large volume zooplankton pumping system was use to sample the water column. A Seabird 911 CTD-fluorometer unit was used to characterize the water column. Niskin bottles attached to a rosette were used to collect water samples at selected depths for biological and chemical analysis. Water was also drawn for microzooplankton analysis, salinity determination and $H_2{}^{18}O/H_2{}^{16}O$ isotope concentration analysis. A 1-m^2 MOCNESS (Multiple Opening Closing Net Environmental Sampling System) was towed obliquely from surface to near bottom cycling twice to make vertically stratified collections of zooplankton with both 335 �m mesh and 150 �m mesh nets, and to make collections of fish larvae with 335 �m mesh nets. A 10-m^2 MOCNESS fitted with 3.0-mm mesh nets was towed obliquely from surface to near bottom to make vertically stratified collections of larger predators on target species. A 1.5-m^2 Jelnet fitted with a 5-mm mesh net was towed vertically to collect fragile gelatinous zooplankton at priority #1 stations. At partial stations, a bongo tow, a Seabird 911 CTD cast, and 1-m^2 MOCNESS tow were made. At the intermediate bongo stations, a bongo sampler and real-time CTD were towed obliquely from surface to near bottom. At selected stations, the real-time CTD and a Niskin bottle cast were made for calibration purposes. A summary of sampling events that occurred during this cruise is in Appendix 1.

Cruise Narrative

In this section, reference made to station numbers refers to standard station number. The intermediate bongo tows between stations were generally completed. Bongo tows that were not done were noted in the narrative. Vessel speed did not exceed 7.5 kts while towing the acoustic fish between stations.

11 January

The cruise was initially scheduled to depart at 1400 hrs. Sailing was canceled and rescheduled for 1000 hrs on 12 January. The reasons for the rescheduled sailing time were that the ship had just completed an in-port dockside repair period and some of the contract work for the ship was not completed on time. Also, several items of the scientific equipment needed for the survey were not ready for sea; and the offshore waters where the vessel was to conduct survey operations were experiencing gale force weather conditions. The weather conditions on this day were cloudy with intermittent snow flurries in the morning, then clearing and windy in the afternoon. The air temperature throughout the day was below freezing. The scientific party used the dockside time for setting up, securing and checking out scientific equipment and stowing supplies.

12 January

The scheduled sailing time of 1000 hrs was changed to 1400 hrs based on the weather forecast of continued gale force northeast winds of 30-40 kts in the morning. These winds were predicted to diminish during the afternoon hours. Departure was delayed again and rescheduled from 1400 to 1600 hrs. The reason for the rescheduled 1400 hr departure time was that a flowmeter system for the scientific pumping operation was not on board the ship. This flowmeter had to be delivered from Rhode Island. During this waiting period, meetings for both vessel indoctrination and scientific protocol and survey operations were conducted for the scientific party. The *R/V ALBATROSS IV* departed

NEFSC Woods Hole, Massachusetts, at 1633 hrs. Running time to the first station was estimated to be about eight hours. Weather conditions during the afternoon had improved with east winds of about 10 kts, and a subsiding sea state. The air temperatures during the day had risen to above freezing.

13 January

Stations completed were 1, 2(no Seabird-CTD cast), 41, and 3(no 10-m^2 MOCNESS tow or Jelnet cast). Survey operations began at 0035 hrs on station 1. The inclinometer on the 1-m^2 MOCNESS needed to be reset prior to deployment. The acoustic fish (Greene Bomber) was deployed at this station. On station 2, the Seabird-CTD (SB911) stopped working during the cast. The cause of this problem could not be quickly resolved and a vertical cast with the Seabird profiler was substituted. A 1.7 liter Niskin bottle was attached to the wire above the Seabird Profiler to obtain a water sample at maximum wire out during the cast. This protocol was followed on subsequent stations until the SB911 was repaired and used. Later in the cruise this protocol was also used if adverse weather conditions were such that the SB911 could not be safely deployed. The ship conducted a fire and a abandon ship drill while en route to the intermediate bongo between station 41 and 3. On the intermediate bongo station between stations 41 and 3, the SB Profiler would not at first communicate with the computer used in operating the Profiler program. The problem was finally traced to a locked comport on the computer and rectified by re-booting the computer. On station 3, the SB911 was carried from its storage area on the starboard side of the ship and deployed off the port side using the main boom and its conductor wire. At the completion of the cast it was returned to its storage area. This procedure was cumbersome as several personal on watch were required to move the SB911 across the deck and over the towing wires used for the acoustic fish and for the 10-m^2 MOCNESS sampler. Weather conditions during the morning were pleasant with light winds, partly sunny skies and air temperatures ranging from 10 to 11C. Due to deteriorating weather conditions with an increase in wind and sea state, no Jelnet cast or 10-m^2 MOCNESS tow was made at this station. During the evening hours, the winds had shifted to the northeast and increased to 25-30 kts with an accompanying rise in sea state.

14 January

Stations completed were 4(no intermediate bongo tow made between station 3 and 4; no pump profile or 10-m^2 MOCNESS tow), 5, and 6. The ship proceeded at a reduced speed to station 4 because of gale force weather conditions. The winds at this time were northeast at 25-35 kts and the air temperature was around the freezing point. Due to adverse weather conditions on station 4, survey operations were limited. No pump cast or 10-m^2 MOCNESS tow were made. A cod end collection bucket was lost during the 1-m^2 MOCNESS tow from net #3. Station 5 was completed without incident. Weather conditions had moderated slightly by station 6. A case of formalin preserved 1-m^2 MOCNESS samples accidentally fell to the deck of the main laboratory with the loss of four jars. The clean up of these broken samples was done quickly by both the scientific personnel and members of the deck crew on the night watch at the time of the mishap. By the evening when the ship commenced station operations on station 7, the weather conditions had improved. The winds from the northeast had subsided to 20-30 kts, and this was accompanied with a decrease in sea state. During the sampling tows on station 7, for the bongo, 1-m^2 MOCNESS and 10-m^2 MOCNESS, each of the respective samplers fouled longline fishing gear. This longline gear had to be cleared prior to retrieval of these samplers back on board the ship. No damage occurred to any of the samplers as a result of the entanglement of the fixed fishing gear. At the completion of the pumping operation the intake portion of the pump hose broke free of the winch wire. The failure of the pump intake hose is attributed to both material fatigue and stress due to current sea state. While personnel on deck began retrieving the sections of pump hose that had been deployed for the cast, the hose separated from its end fitting joining the adjacent section of hose already back on board the ship. As a result of this hose/fitting separation, 90 meters of hose were lost. This loss would now limit pump operations on subsequent stations to a maximum sampling depth of 50 meters. By late evening, the wind had shifted to the east and decreased to about 20 kts.

15 January

Stations completed were 7(no Jelnet cast), 8, 9(no pump or Jelnet cast, no 10-m^2 MOCNESS tow) and 10. The weather forecast for the morning hours was for the wind to veer to the southeast at 20-25 kts. The air temperature during the morning hours had risen to about 7C. Sea state was still high and now confused as a result of shifting winds. Scientific personnel with the assistance of the deck crew repaired the damaged pump hose and constructed a new sea water intake assembly for the end of the pump hose to replace to the one lost at station 7. Station 8 completed without incident. Because of the large ground swell that was present while the ship was conducting survey operations on station 9, no pump cast or Jelnet cast were made. The 10-m^2 MOCNESS was deployed, but the tow was aborted early in the cast due to excessive surging of the towing wire as the ship pitched heavily into the large ground swells. At the completion of the 1-m^2 MOCNESS tow at station 10, number 4 net was found to be damaged and replaced. The net mesh had separated from the fabric collar on the top section of the net. Weather conditions during the afternoon and evening hours were cloudy skies with periods of rain followed by light fog. Air temperatures ranged from 10 to 12C. The winds had shifted to the south at about 20 kts, then to the west-southwest by midnight, with an increase in velocity to 30 kts. Sea conditions changed from a heavy southerly ground swell in the afternoon and early evening to a confused sea state by late evening.

16 January

Stations completed were 11, 12(no pump or Jelnet cast, no 1-m^2 MOCNESS or 10-m^2 MOCNESS tow; a second bongo tow was made) and 13(no 10-m^2 MOCNESS tow). A strong weather system with westerly gale force winds of 25-30 kts, with wind gusts to 40 kts limited station operations in the early morning hours. A drifter buoy was deployed at the end of station 11. On the arrival of the ship at station 13 the weather conditions had deteriorated such that the Greene Bomber was brought on deck. The ship was secured for adverse weather conditions and began jogging until weather conditions improved to commence survey operation again. By 1700 hrs the weather conditions had improved to resume survey operations on station 13. The west wind had diminished to 20-25 kts with an accompanying decrease in sea state. The night sky was clear and the air temperature during the evening hours ranged from 5.5 to 8.3C.

17 January

Stations completed were 14, 15, 16 and 17. Survey operations went smoothly this day. The problem with the SB911 CTD was traced to a faulty electric wire splice on a pig tail connection. The splice was redone and the CTD unit was deployed on station 16. The recoil spring on the manual pull starter cord of the centrifugal pump motor broke while trying to start the motor on this station. As a result the starter cord had to be rewound manually by rotating the fly wheel assembly on the motor in a counter-rotational direction. This procedure for rewinding the starter pull cord had to be done every time this motor was used for the remainder of the cruise. Weather conditions improved greatly as the day progressed. The west wind by late evening had diminished to light and variable with an accompanying calm sea state. The air temperature during the day had reached a high of 10C, and had decreased to about 4C by the change of the watch at midnight.

18 January

Stations completed were 18, 19, 20, 21, 22, and 23. On station 19 the Greene Bomber stopped recording and was retrieved on board the ship for repair. Until the repairs to the acoustic fish were completed the ship ran at full speed between stations. En route to station 20 the ship crossed the Exclusive Economic Zone boundary line between the United States and Canada and entered Canadian waters. Repairs to the Greene Bomber were completed and the acoustic fish was again deployed on station 22. Weather conditions during the day were spring like with winds light and variable during the early hours of the day and becoming southeast less than 15 kts through mid-afternoon. The air temperature during this time was about 6.5C. By late evening the southeast winds had increased to 25-30 kts. The weather forecast predicted that a strong weather front was to pass across the survey area during the night and the frontal passage would be accompanied with gale winds and possible thunder storms.

19 January

Stations completed were 24(no SB911 cast, no intermediate bongo tow made between station 24 and 25), 25, 39 and 26. While on station 24, at approximate 0230 hrs, a severe weather front accompanied with thunder, lightning and heavy rain squalls passed the area of operation. The southeastly winds abruptly veered to the south and increased rapidly to 40+ kts. The air temperature dropped from 11.5 to 9.5C. This occurred during the completion of the first tow cycle of the 1-m^2 MOCNESS tow. The sudden force of this squall system pushed the ship over the towing wire of the 1-m^2 MOCNESS system. The ship was quickly cleared of the towing wire and brought back under control. Because of the existing weather conditions it was decided to abort the second cast cycle of the 1-m^2 MOCNESS tow and bring the system back aboard the ship. While crew members of the deck department and scientists on watch were waiting for the 1-m^2 MOCNESS to clear the sea surface, a very large sea hit the ship and this wave broke across the trawl deck flooding the entire stern area of the vessel. No injuries occurred and the 1-m^2 MOCNESS was finally retrieved and secured on board the ship. The chief scientist was summoned. The Greene Bomber was also brought on board the ship and secured on deck. Survey operations were suspended and the ship slowly jogged toward station 25. No intermediate bongo tow was made between station 24 and 25. While en route to station 25, the winds moderated and the seas subsided enough so as to allow deployment of the Greene Bomber. By the time the ship arrived at station 25, the wind had shifted to the northwest and decreased to about 15 kts. However, the sea state while working this station was confused. By mid-day the sky had cleared and sunny conditions finally prevailed. The air temperature ranged from 6 to 7C. Survey operations for the rest of the day were routine and without incident.

20 January

Stations completed were 27, 28(no SB911 cast) and 29. The weather conditions during the morning hours were clear to partly cloudy skies with northwest winds of 20-30 kts. Air temperature during this time stayed steady at 6.3C. Two drifter buoys were deployed at the end of station 27. On station 28 the SB911 CTD was not deployed because of sea state. A vertical cast with the Seabird Profiler and Niskin bottle was made instead. At station 29, the SB911 was deployed off the main boom. The ship conducted a fire and a abandon ship drill between survey operations on station 29. At the completion of the intermediate bongo after station 29, the ship retrieved the Greene Bomber and broke off survey operations. The reason for this break in the cruise was to rendezvous with a U. S. Coast Guard cutter off Chatham, Massachusetts, to debark two crew members. The ship began its estimated twelve hour run at full speed at 2005 hrs. The weather conditions during the evening hours were partly cloudy skies, with a northwest wind of 15-20 kts. Air temperatures ranged from 4 to 5C.

21 January

Stations completed were 32 and 30. The weather during the morning hours and throughout the day were spring like with mild air temperatures, sunny skies, light north winds and calm sea conditions. The rendezvous with a U. S. Coast Guard launch off Chatham was made at 0818-0825 hrs with the transfer of personnel and scientific supplies. Three thirty-meter sections of submersible pump hose were taken aboard the R/V ALBATROSS IV from the CG launch. Arrangements with the Coast Guard had been made by the port office at the NEFSC, Woods Hole, Massachusetts, and the NEFSC Laboratory at Narragansett, Rhode Island for the transportation and transfer of the needed pump hose. Upon completion of the transfer, the ship proceeded full speed to resume survey operations at station 32. It was decided to begin survey operations at station 32 and then proceed to station 30 in an effort to make up for lost survey time. The ship was on station 32 at 1745 hrs. Weather conditions during the evening and night hours were still mild with calm winds and seas.

22 January

Stations completed were 40, 31(no SB911 cast) and 33. Spring like weather conditions still prevailed during the morning hours with calm winds and seas. The air temperatures during this time ranged from 5 to 6C. At station 31 the SB911 CTD did not respond to the "power up" command. Vertical casts with the Seabird profiler and Niskin bottles were made(refer to the "Hydrography" section in this report for details on profiler cast protocol). The problem was traced to a blown fuse which was replaced. A series of replicate pump casts were made at this station(refer to the "Zooplankton and Ichthyoplankton studies based on bongo and MOCNESS tows" section of this report). During the late afternoon and evening hours the weather conditions began to deteriorate as northeast winds increased to 20-30 kts and the seas began to build.

23 January

Stations completed were 34(no SB911 cast or 10-m^2 MOCNESS tow), 35, 36 and 37. The weather conditions during the late night and early morning hours were easterly winds at 20-25 kts gradually shifting to the southeast at the same speed. By mid morning the southeast winds began to diminish to 15 kts and less, with a accompanying decrease in sea state. The air temperature at this time was mild, centering around 7C. The weather forecast predicted strong southerly gales of 40-45 kts with higher gusts for late in the evening and continuing onto tomorrow, Sunday, 24 January.

A series of replicate pump casts were completed at station 34. The centrifugal pump motor was difficult to start as a result of dampness effecting the electrical system and the engine being worn and "tired". However, through efforts of both the scientific party and deck department the motor was started for each of the pump comparison casts. Because of adverse weather conditions at station 34, the 10-m^2 MOCNESS was not deployed. Survey operations were routine for stations 35 to 37. During the initial tow at station 36, the seabird profiler stopped recording early in the cast and the tow was aborted. Prior to arriving on station, the batteries for the profiler were changed. The various possibilities for the cause of the problem were perused including the new batteries. The cause for the failure was the result of a new battery manufactured with reverse polarity. The defective battery was replaced and a subsequent bongo tow was completed on station. The ship arrived on station 38 at 1730 hrs, the last station for the survey. In an attempt to accommodate a request for live zooplankton organisms(refer to the "Zooplankton and Ichthyoplankton studies based on bongo and MOCNESS tows" section of this report), a "live tow" was to be made at this station. Gear deployment on this station was changed from the normal protocol in that the 1-m^2 MOCNESS was towed first so as to examine the resultant samples for the presence of requested organisms. A retow was then to be made after the completion of the pumping operation on this station. The pumping operation entailed the last of the series of replicate pump casts. The Greene Bomber was recovered and secured on deck. The weather conditions during the evening hours were southerly winds of about 15 kts, subsiding seas, and fog. The air temperature increased to 10.3C by midnight.

24 January

Completed station 38. At 0032 hrs, with the deployment of the second of the two drifters released at this station, the ship began its estimated 8-9 hour run to port at full speed. The scientific party began dismantling and packing scientific gear and equipment. The southerly winds began to increase in velocity in the late night and early morning hours. By sunrise the predicted gale force winds of 40 and higher knots had arrived in the survey area to accompany the ship to port. The *R/V ALBATROSS IV* arrived at the NEFSC Woods Hole, Massachusetts, dock at 0809 hrs and completed cruise AL9901. The docking operation was done quickly and smoothly by the bridge officers in spite of the high winds of 40-50 kts.

Individual Reports

Hydrography

(Maureen Taylor and Cristina Bascuñán)

The primary hydrographic data presented here were collected with Seabird CTD systems. The Seabird 911^+ CTD (SBE911^+) provides measurements of pressure, temperature, conductivity, and fluorescence and records at a rate of 24 observations per second. This CTD is equipped with a rosette (Seabird 32 carousel) for collecting water samples at selected depths. Bongo hauls were made at each of the stations occupied. A Seabird model 19 profiling CTD (SBE19 Profiler) was used on each bongo tow to provide depth information during the tow. Pressure, temperature, and salinity observations are recorded twice per second by the Profiler.

The following is a list of the CTD data collected with each of the sampling systems used on the cruise:

Instrument # casts

SBE911^+ 23

SBE911^+ calibration 23

SBE19/ Bongo 80

SBE19/ calibration 18

The SBE911^+ was deployed with 9 bottles on the rosette and samples were collected for various investigators. At priority 1 and 2 stations, 400 mls were immediately siphoned out of two Niskin (bottom and mid-depth) for observations of micro-zooplankton swimming behavior (S. Gallagher, WHOI). Samples were collected for oxygen isotope analysis at selected depths (R. Houghton, LEDO) and a sample was taken at the bottom for calibrating the instrument's conductivity data (D. Mountain, NMFS). Samples for chlorophyll and nutrient analysis were taken from multiple depths at each of the standard stations (D. Townsend, Univ. of Maine).

Parameter # samples

oxygen isotope 127

Species composition 17

Data:

Preliminary processing of the SBE Profiler and 911 data was completed at sea using the Seabird manufactured software routines to produce 1 decibar averaged ASCII files. This was the first cruise using the SBE911$^+$ CTD system with the Seabird carousel. At station 2, a broken conductor in the pigtail of the sea cable caused the fuse to blow in the CTD deck box. We were unable to find a replacement .5 amp fuse (until a few days later) but were able to successfully collect data (off the boom winch) with a .25 amp fuse. Unfortunately, weather prevented the CTD from being deployed safely until stn station 15. Niskin bottles were hung in line with the Profiler at stations where conditions were too rough for the larger CTD package to be deployed. These operations are referred to as "ASBCAL" in the event log. After the termination on the hydro winch was repaired and weather improved, operations resumed from this winch without any problems. Dive weights (50+ lbs) were strapped to the CTD to dampen the swinging motion during deployment and recovery.

The CTD package is a bit tall for use from the hydro winch. It is difficult for the crew members to release and attach the support shackle because there is only approximately a 2" clearance from the roller track that holds the CTD. Modifications to either the CTD track or to the CTD frame are recommended by the bosun before the next GLOBEC cruise in May. The easiest solution is to deploy off the boom during the May and June cruises.

Results:

The surface and bottom temperature and salinity distributions are shown in Figure 2. Temperature and salinity anomalies (using the MARMAP reference) are shown in Figure 3. The distribution of fluorescence (expressed in volts) are shown in Figure 4 (left). Fluorescence data were only collected at stations where the SBE911$^+$ was deployed. The Seacat Profilers are not equipped with a fluorometer. Stratification in the upper 30 meters of the water column and the stratification anomalies were calculated using the MARMAP hydrographic data as the reference. These distributions, expressed in sigma-t units, are shown in Figure 4 (right).

The volume average temperature and salinity of the upper 30 meters were calculated for the four sub-regions shown in Figure 5. These values are compared with characteristic values that have been calculated from the MARMAP data set for the same areas and calendar days. The volume of Georges Bank water (salinity < 34 psu) was also calculated and compared against the expected values. A CTD profile (from either the Seacat Profiler or SBE911$^+$ system) are provided for each standard station with a compressed listing of the preliminary data in Appendix 2. Note that the cast numbers are not necessarily in sequential order in Appendix 2 because of the use of the different CTD systems.

All four regions of the Bank exhibited relatively fresher conditions. Three stations in the center portion of the Bank (stn stations 4, 10 and 11) showed salinities < 32 psu. The western regions were warmer while the eastern regions were slightly colder than the expected properties. Deep stations on the southwestern flank of the Bank may show the influence of a Gulf Stream meander although imagery during the cruise period was mostly cloud covered (see Figure 2).

Little stratification was observed except along the southern flank and the Northeast Peak where the presence of Scotian shelf water creates a low density layer.

Figure 2

Figure 3

Figure 4

Figure 5

Zooplankton and Ichthyoplankton studies based on Bongo and MOCNESS tows.

(John Sibunka, Maria Casas, James Pierson, Stephen Brownell, Rebecca Jones, Neile Mottola and Joshua Fredrickson)

Objectives:

(1) Principle objectives of the ichthyoplankton group in the broad-scale part of the U.S. GLOBEC Georges Bank Program were to study the composition of the larval fish community on Georges Bank, to define larval fish distribution across the Bank and within the water column, to determine those factors which influence their vertical distribution, and to determine bank-wide versus "Patch-Study" mortality and growth rates. Emphasis in this study is on cod and haddock larvae along with their predators and prey. This study also includes larval distribution and abundance, and age and growth determination. These objectives were implemented through use of bongo net and 1-m^2 MOCNESS to make the zooplankton and ichthyoplankton collections. A 10-m^2 MOCNESS was used to collect larger pelagic invertebrates and juvenile fish.

(2) The primary objective of the zooplankton group was to complete a bank-wide survey of Georges Bank to determine the distribution,

abundance, and stage composition of the target species *Calanus finmarchicus* and *Pseudocalanus* spp. A second objective was to identify, quantify, and describe the occurrence of abundant non-target species in order to provide a description of the environment occupied by the target species. These objectives were implemented by using the 1-m^2 MOCNESS for sampling copepods and larger zooplankton. A 1.5-m^2 Jelnet cast was made to collect gelatinous predators and a submersible pump was deployed for sampling the small copepod naupliar stages.

In addition to these objectives, the zooplankton group was responsible for obtaining

subsamples from the 1-m^2 MOCNESS hauls for population genetic studies of *Pseudocalanus* spp. to be completed by Dr. A. Bucklin at the University of New Hampshire.

Methods:

Bongo tows were made with a 0.61-m frame fitted with paired 335 �m mesh nets. A 45 kg ball was attached beneath the bongo frame to depress the sampler. Digital flow meters were suspended in the mouth of each net to determine the volume of water filtered. Tows were made according to standard MARMAP procedures, (i.e., oblique from surface to within five meters of bottom or to a maximum depth of 200 m while maintaining a constant wire angle throughout the tow). Wire payout and retrieval rates were 50 m/min and 20 m/min respectively. These rates were reduced in shallow water (<60 m) to obtain a minimum of a five minute tow or reduced due to adverse weather and sea conditions. A Seabird profiler CTD was attached to the towing wire above the frame to monitor sampling depth in real time mode and to measure and record temperature and salinity. Once back on board, the 335 �m mesh nets were rinsed with seawater into a 330 �m mesh sieve. The contents of one sieve were preserved in 5% formalin and kept for ichthyoplankton species composition, abundance and distribution. The other sample was preserved in 95% ethanol and kept for age and growth analysis of larval fish. The same preservation procedure was followed as for the 1-m^2 MOCNESS.

At stations where the 1-m^2 MOCNESS system could not be used due to adverse weather conditions, a second bongo tow was made. This frame was fitted with both 335 �m mesh and 200 �m mesh nets. Digital flow meters were suspended in the mouth of each net to determine the volume of water filtered. Tows were made according to standard MARMAP procedures except maximum tow depth was 500 m. Wire payout and retrieval rates were 50 m/min and 20 m/min respectively. The nets were each rinsed with seawater into a corresponding mesh sieve. The 200 �m mesh sample was retained for zooplankton species composition, abundance and distribution, and preserved in 10% formalin. The other sample (335 �m mesh) was kept for molecular population genetic analysis of the copepod, *Calanus finmarchicus*, and preserved in 95% ethanol. After 24 h of initial preservation, the alcohol was changed.

The 1-m^2 MOCNESS sampler was loaded with ten nets. Nets 1-4 were fitted with 150 �m mesh for the collection of older and larger copepodite and adult stages of the zooplankton. Nets 0, and 5-9 were fitted with 335 �m mesh for zooplankton (nets 0 and 5) and ichthyoplankton (nets 6-9) collection. Tows were double oblique from the surface to within 5 m from the bottom. The maximum tow depth for nets 0, 1 and 5 was 484 m, and for net 6 was 200 m (if net 5 was sampled deeper than 200 m, it was returned up to 200 m and closed). Winch rates for nets 0-5 were 15 m/min and for nets 6-9, 10 m/min. The depth strata sampled were 0-15 m, 15-40 m, 40-100 m, and >100 m. The first (#0) and sixth (#5) nets were integrated hauls. For shallow stations, with only 2 or 3 of the depth strata, not all nets were fished. The contents of nets 0-4 were sieved through 150 �m mesh sieve, subsampled using a 2-L plankton sample splitter if the final biomass volume was too large for one quart jar, and then preserved in 10% formalin. Samples from nets 5-9 were sieved through 330 �m mesh sieve and preserved in 95% ethanol. After 24 h of initial preservation, the alcohol was changed. The used ethanol was retained for disposal or recycling ashore. At priority 1 and 2 stations and at station 40, 100-ml subsamples from the bottom and surface 150 �m mesh nets were removed and preserved in 10% formalin for Dr. C. Miller (OSU). At priority 1 and 2 stations, 100-ml subsamples from nets 2, 3, and 4 were removed and preserved in 95% ethanol. These samples were collected for Dr. A. Bucklin for population genetic studies to distinguish the *Pseudocalanus* species found on Georges Bank.

The 10-m^2 MOCNESS was loaded with five 3.0 mm mesh nets. Tows were oblique from surface to ~10 m from bottom or a maximum depth of 500 m. The same depth strata were sampled as with the 1-m^2 MOCNESS. The winch rate for retrieval varied between 5 and 20 m/min depending on the depth stratum. The slow winch rates were used in order to filter at least 4,000-5,000 m^3 of water per depth stratum sampled. A stepped oblique tow profile during retrieval was used to achieve this, if needed. Catches were sieved through a 330 �m mesh, and preserved in 10% formalin.

Zooplankton Pump Sampling: In order to collect nauplii and younger, smaller copepodite stages of zooplankton, a gasoline powered diaphragm pump was used at all priority 1 and 2 standard stations. A centrifugal Pacer pump was used at all priority 1 standard stations in addition to the gasoline powered diaphragm pump. At stations 31, 34 and 38 a comparison pump was made between the diaphragm pump and the centrifugal Pacer pump which had been in use in previous Broad-scale cruises. Analysis of the pump samples from previous years suggested the possibility that the youngest developmental stages of *Calanus finmarchicus* (the first nauplius stage, N1, and possibly the second, N2), were being lost during the process of sampling with the centrifugal pump. In an earlier test with a diaphragm pump during February of 1998, we collected more N1s than with the centrifugal pump, and the series of comparisons between the two pumps carried out during this cruise should provide us with more conclusive evidence.

The same general procedure for deploying the pump hose was followed at both standard and comparison pump stations. The intake hose was used for both pumps and was deployed off the main boom by connecting the intake end, fitted with a 1.7-L Niskin bottle cut in half lengthwise, to the winch wire. The boom winch meter block was zeroed at the surface and the wire out reading was used to determine the depth of the cast. Two 45 kg weights were used to depress the array. Two, three or four 30-m sections of 7 cm diameter hose were connected to the pump (depending on the depth of the station), allowing the intake hose to attain a maximum depth of approximately 100 m. At shallow stations, the intake hose nozzle was lowered to 3 meters off the bottom. With the centrifugal pump water went directly to the flow meter and then into the 35 �m mesh collection net, while with the diaphragm pump the output was diverted to a surge dampener and then to the collection net. This caused the flow to be more laminar as it passed the flow meter and into the net, allowing a more accurate measurement of flow rate. Once the hose had been deployed to the desired depth it was raised at a constant rate and samples collected. Wire retrieval rate was approximately 4 m/min which provided volumes of about 200 L per 5 m depth interval with the diaphragm pump. After raising of the hose had begun, an interval was allowed for the hose to flush before collection began. Similarly, once the hose had reached the surface the hose was allowed to flush before collection was completed. Flushing time was a calculated time depending on the length of hose used at a station and on which of the two pump systems were used. At regular pump stations with a maximum sampling depth of more than 85 m, samples were taken from the maximum depth to 75 m, 75-40 m, 40-15 m, and from 15 m to surface. At stations with a maximum sampling depth of less than 85 m, samples were taken from the maximum depth to 40 m, 40-15 m, and 15 m to surface. The depth at which nets were switched at the top of each depth interval was adjusted depending on the wire retrieval rate and the hose flushing time to allow water to be flushed through the hose.

For the comparison pump a series of three profiles of the entire water column were collected with each pump. Each pump was alternately deployed, collecting a single sample from the bottom (to 100 m maximum depth) to the surface. The samples were collected only while the hose was being raised as in the standard protocol.

All samples were sieved through a 30 �m mesh sieve and preserved in 10% formalin.

Modified Pump Protocol: Due to a mishap at standard station 7, the above described protocol was modified. The 1.7-L Niskin bottle hose intake attached to the winch wire broke as the hose was being retrieved after the pump cast. The extra added stress of the hose full of water resulted in one of the fittings pulling out from the hose on deck sending three sections to the bottom. A modified intake system was assembled by the R/V Albatross IV crew and scientists. This was attached to the remaining 30 m section of hose left on deck and several other pieces which were joined together for a total hose length of 47 m. After station 7, the maximum sampling depth was about 40 m. Due to personal emergencies of two crew members, the ship had to steam to Chatham, Massachusetts, to offload the crew members; at which point three 30 m lengths of new hose were transferred on board. As a result, from standard station 30 onwards, we were able to sample to a maximum depth of 100 m again.

Collection of live zooplankton: To collect live specimens of zooplankton, an additional 1-m^2 MOCNESS cast was made at standard station 38 using the #0 and #1 nets only (335�m and 150�m mesh size). Vessel speed was 1.5 kts; wire payout was ~40m/min and the retrieval rate was <5 m/min.

The zooplankton collected in the cod end buckets were allowed to settle for several minutes. The top portion of the zooplankton, mostly *Centropages typicus* and *Metridia lucens* were gently released into 30-gallon plastic cans previously filled with seawater using the diaphragm pump system. These animals were to be used by Dr. William Macy III at the University of Rhode Island for ongoing herring feeding experiments. The settled part of the collection, mostly the pteropod *Limacina retroversa* were also released into similar 30-gallon containers and returned to Woods Hole to be used by Dr. Scott Gallager for both rearing and behavior experiments.

Samples Collected by the Zooplankton and Ichthyoplankton Groups:

Gear Tows Number of Samples

1. Bongo nets, 0.61-m 80 tows 79 preserved, 5% formalin

335-�m mesh 80 preserved, EtOH

200-�m mesh 1 preserved,10% formalin

2. MOCNESS, 1-m^2 40 tows

150-�m mesh(Nets 1-4) 118 preserved, 10% formalin

335-�m mesh(Net 0) 38 preserved, 10% formalin

335-�m mesh(Nets 5-9) 155 preserved, EtOH

3. MOCNESS, 10-m^2 15 tows

3.0-mm mesh 122 preserved, 10% formalin

4. Pump

35-�m mesh (centrifugal) 17 profiles 31 preserved, 10% formalin

35-�m mesh (diaphragm) 25 profiles 51 preserved, 10% formalin

5. Jelnet 6 tows

1.5-mm mesh 3 preserved, 10% formalin

Preliminary Summary of Zooplankton Findings.

(Maria Casas, James Pierson, Neile Mottola and Joshua Fredrickson)

Preliminary observations were made from the samples collected using the 1-m^2 MOCNESS after preservation. As in last year's January cruise, AL 98-01, the dominant copepod of all the Georges Bank region was *Centropages typicus*. Numbers were abundant at almost all stations sampled. Similarly, numbers of *Cajanus finmarchicus* were low throughout most of the Bank. Where they were present in moderate numbers along the northeast peak and the deeper slope stations north of the Bank, their developmental stage was mostly C5, implying that their life cycle was somewhat delayed for the time of year.

The shelled pteropod, *Limacina retroversa*, was again abundant throughout the sampling grid. The diatom, *Coscinodiscus*, was also present at most of the stations, but their numbers hadn't reached "bloom" proportions yet.

Brief descriptions of zooplankton species composition appear below. Observations were made at most standard stations sampled during this cruise from the net #0 samples (335 �m mesh) 1-m^2 MOCNESS, unless otherwise stated.

Station 1 and 2 *Centropages typicus* made us the majority of the copepod component of the zooplankton. *Cajanus finmarchicus* was absent but there were a small number of *Pseudocalanus* spp. and *Metridia lucens*. Chaetognaths, hyperid amphipods, bryozoans, pteropods, and a few hydroids made up the balance of the zooplankton.

Station 41 and 3 Some *C. finmarchicus* were present at these stations, mostly stage C5. But again *C. typicus* and *Oithona* spp. were extrelely abundant as was *M. lucens*. Pteropods and chaetognaths were abundant.

Station 4 *C. typicus* most abundant with some *Temora longicornis* also in the sample. *No C. finmarchicus* here. Chaetognaths and ctenophores made up the balance of the plankton.

Station 6 *Pseudocalanus* were present in moderate numbers, in addition to many *C. typicus*, young *M. lucens* and *Oithona* spp. Gastropods extremely abundant.

Station 7 This deep station was made up mostly of *M. lucens*, *C. typicus* and such off bank species as *Euchaeta norvegica* and *Pleuromamma* spp. Euphausiids were also present in large numbers.

Station 8 *C. typicus* was again abundant at this station with much lesser numbers of *M. lucens*, *Pseudocalanus* spp., and *C. finmarchicus*. Larvaceans, pteropods and chaetognaths were other zooplankton.

Station 9, 10, 11, 12, and 13 The copepod component at these stations were made up of *C.typicus*, *M. lucens*, and *T. longicornis*. *Cajanus* appeared to be absent. The balance of the plankton was made up of chaetognaths, hydroids, and mysids.

Station 17 and 19 The copepod component was similar to the previous stations. In addition, gammerid amphipods, bryozoans, *Limacina*, medusae, chaetognaths, and the diatom *Coscinodiscus* were abundant.

Station 22 Few *C. finmarchicus* were present at this station. *C. typicus*, *Oithona* spp. and *M. lucens* were the most abundant copepods. The diatom, *Rhizosolenia*, was present in large numbers, as were pteropods, gastropods, bivalve larvae, and ctenophores.

Station 23 and 24 A mix of *M. lucens*, *C. typicus* and some *C. finmarchicus* were the copepod component of the plankton. The balance was made up of *Rhizosolenia*, larvaceans, pteropods and bryozoans.

Station 25 and 39 *C. finmarchicus* were present here in greater numbers, mostly C5 and older stages. *M. lucens*, *Pseudocalanus* spp., *C. typicus*, and *Oithona* spp. were also present. *Rhizosolenia*, *Coscinodiscus* and *Ceratium* very abundant.

Station 27 *M. lucens*, *C. finmarchicus*, *C. typicus* and *T. longicornis* were at this station. Other plankton present were gammerid amphipods, chaetognaths, hydroids and *Coscinodiscus*.

Station 29 At this off bank station there was a mix of *C. typicus, M. lucens and C. finmarchicus* (mostly C5, some adult females and males). *Candacia armata* was also present in moderate numbers. Pteropods, chaetognaths and siphonophores made up the balance of the plankton.

Station 30 Huge numbers of *C. typicus* were present at this station with some *T. longicornis* mixed in. No *Cajanus*.

Station 40 Similar zooplankton component as at station 29.

Station 35 A mix of *C. hamatus*, *C. typicus* and *Pseudocalanus* spp. No *Cajanus*.

Station 36 The copepod component was mostly made up of *C. hamatus*. There were also some numbers of *C. typicus*, and *Pseudocalanus*. No *Cajanus*.

Station 38 *C. finmarchicus* was present at this station in the deeper layers. Closer to the surface were *M. lucens* and *C. typicus*.

Preliminary Summary of Ichthyoplankton Findings.

(Rebecca Jones and John Sibunka)

All samples from the Bongo net B were subjected to a preliminary examination for eggs and larvae while on ship. The samples were preserved in 5% formalin, and observed while in the jar with the aid of a magnifying glass. The following qualitative observations of the larval size, abundance and egg abundance were made in the jars after preservation. The formalin-preserved samples are clearer, and delicate eggs are less likely to collapse as those preserved in ethanol.

See cruise reports EN276 (January 1996), AL9701 (January 1997), and AL9801 (January 1998) for the following references to ichthyoplankton findings during 1996-1998.

Sand lance (*Ammodytes sp.*)

There were two species that were abundant: sand lance and Atlantic herring respectively. Sand lance were ubiquitous with the exception that none were collected along the southern edge of the Bank. Concentrations were highest on the central portion with number of specimens estimated between 50-60 larva/station. Their sizes ranged from 7mm to 35mm with the largest fish occurring in the northwestern region and smallest fish on the southeastern third of the Bank (see Figure 6). In the past three years of sampling on Georges Bank in January (no January cruise in 1995), there was a greater abundance of larvae on the Bank. However, these larvae were more localized in that they were concentrated in the central portion of the Bank. It is possibly that this years sand lance spawning event had already been underway for several weeks, and that the hatched larvae were advected away from their spawning region(s).

Atlantic herring (*Clupea harengus*)

The greatest larval herring concentrations found during this survey occurred on the mid to eastern third portion of the Bank. The samples examined from stations 13(~60 larvae), 54(~50 larvae) and 32(~40 larvae) had the largest number of specimens collected during this January cruise. Most fish collected were within the size range between 15-45mm length. The smallest herring larvae collected (size range 5-20mm length) were collected at stations 43 and 41. The largest larva (size ~70mm length) was captured at station 59(Figure 7). Most of the larvae collected on this cruise were smaller than 25mm length, which was the minimum size of larvae collected in 1998. Herring larvae collected in January of 1997 ranged in size from 17-50mm length. The smaller sizes of herring larvae collected on this survey may be the result of either a late start in the 1998/1998 spawning season or a more protracted spawning event occurred this year. Results from the January survey in 1998 indicate that herring larvae were primarily located on the western portion of the survey area. Herring larvae collected in January of 1997 were mainly concentrated on the central part of the Georges Bank. When compared to the catch results from the 1997 and 1998 January surveys, herring larvae collected during this survey were more wide spread over the Bank.

Figure 6

Figure 7

Figure 8

Figure 9

Cod (*Gadus morhua*)

Very few cod larvae were caught this month. The greatest occurrences of larvae were along the southern-southwestern edge of the Bank. The collections made at stations 9 (~2 larvae at 7mm) and 50 (~3 larvae at 5mm) contained the most fish. The rest of the larval occurrences in the survey area were found along the northwestern edge at stations 60, 28, 30, 76 and 34 (one larva at each station). Samples collected at other stations occupied along the northwestern edge of the Bank contained herring larval of approximately 5-8mm length. The largest fish collected (10mm length) was at station 28(Figure 8). Cod larvae collected on this January survey closely resemble the 1996 and 1998 survey results in both larval abundance in that very few larvae were present.

Gadid Eggs (cod/haddock/pollock eggs)

There were more gadid eggs collected on Georges Bank during this January survey than during any of the previous three January cruises. The largest concentrations (~6-50/station) of gadid eggs were found on the Northeast Peak, across the northern channel at station 25, and along the northern edge of the Bank. Gadid eggs were also found at three stations in the Great South Channel(Figure 9). The greatest concentrations of eggs were collected on the Northeast Peak area of the Bank, with some isolated patches of gadid eggs occurring in the Great South Channel and on the northwestern portion of the survey area. The collection results from the January 1998 broad-scale survey closely resemble the catch results from this month.

Miscellaneous Fish Larvae:

The following miscellaneous fish larvae were also identified in the ichthyoplankton samples collected during this broad-scale survey.

Gonostomatidae

Small numbers of these fish were found only at the deep water stations 56, 16 and 57. Station 16 had the greatest estimated number of fish at 5 individuals.

Pollock (*Pollachius virens*)

Three pollock larvae were seen in the samples examined during this survey. Two specimens were collected along the northern edge of the Bank; one larva (size~10mm) at station 30 and one (size~15mm) at station 74. One other specimen (size ~20mm) was observed at station 79 which is located along the northwestern edge of the Bank(Figure 8).

Hake (Urophysics sp.)

One *Urophysics sp.* was sampled at station 73 (on the northern edge of the Bank) at a length of 15 mm.

Preliminary Summary of the 10-m^2 MOCNESS samples.

(Maria Casas and Stephen Brownell)

The samples collected from 10-m^2 MOCNESS were examined on shipboard for a qualitative estimate of abundance, distribution, and size range of both the invertebrate and the fish community at station. The following observations are based on examination of the samples following preservation.

Station 7, Haul 1

euphausiids (lots)

ctenophores

hyperiid amphipods

naked pteropods, *Clione* spp.

3 medusa (bell size 3cm.)

Station 16, Haul 2

euphausiids

ctenophores

small medusa

2 squid (2cm.)

1 octopus (3cm.)

lantern fish

hake larvae

Station 17 Haul 3

ctenophores

Station 20 Haul 5

12 jars of ctenophores and

pleurobrachia

Station 23 Haul 6

Crangon

pleurobrachia

hyperiid amphipods

Clione

medusa (5 cm.)

herring larvae

windowpane flounder

Station 25 Haul 7

ctenophores

euphausiids

medusa

Station 39 Haul 8

pleurobrachia (lots)

euphausiids

Clione

gammarids

lantern fish (4)

Station 27 Haul 9

pleurobrachia (lots)

euphausiids

Clione

gammarids

Station 29 Haul 10

euphausiids

ctenophores

hyperiid amphipods

large shrimp (6cm)

Clione (lots in the 100 to 40 m net)

lantern fish

Station 32 haul 11

ctenophores (6 jars for net one)

hyperiid amphipods

Clione

Crangon

isopods

Station 40 Haul 13

ctenophores

euphausiids

hyperiid amphipods

Clione

medusa (5 cm)

sand lance larvae

herring larvae

Observations of Zooplankton Collected

(Charles Miller)

Non-quantitative stereomicroscope observations were made of zooplankton collected by the 150 �m mesh nets on the 1 m^2 MOCNESS(MOC-1) and by other nets during the cruise. All around Georges Bank the total drained volume of the collections was comparable to or greater than in previous January broad-scale studies. We caught less than 300 ml (a teacupful) in all nets, everywhere, but not less than usual. My subjective impression was that we caught somewhat larger amounts than in this month in 1998.

At **Station 1** we saw a mixture of species typical around the entire south flank seaward of 100 m. The dominant animal, constituting over half the biomass, was *Centropages typicus*. These were mature specimens, both males and females. Few copepodites were present. The deeper nets in the MOC-1 profile included abundant *Sagitta elegans* and epibenthic amphipods (gammarid types). There were substantial numbers of very small *Limacina "retroversa"*. These have been seen everywhere on this cruise, including deep waters at the edge of the Gulf of Maine and right up over Georges Bank. *Calanus finmarchicus* were present, but very few (3 to 5 in 1/12th examined of each MOC-1 level). *Coscinodiscus* and *Rhizosolenia* were present in the sample, but not in massive amounts. They are enough to make the samples appear green in bulk.

Metridia lucens in all copepodite stages was dominant in the deepest haul at **Station 41**, in deeper water. There were very small numbers of *C. finmarchicus* at all depths, and Net 1 (90-40m) caught a few *C. helgolandicus*. I do not recall seeing those on Georges Bank before, and did not see them again this cruise. All nets caught large numbers of mixed small copepods: *Oithona, Microcalanus,* etc. *Pseudocalanus*, if present at all, was only small copepodites. Net 2 (40-15m) captured some large adults of *Candacia armata*, and some *Aglantha*-like hydromedusae. The catch was sharply distinct from that in Net 1. The surface net included few zooplankton, except the mixture of very small copepod species. Phytoplankton were abundant, producing a very green sample.

The MOC-1 at **Station 3** filtered mostly "phytodetritus", a brown mixture of nondescript phytoplankton. Most copepods captured were *C. typicus.* Small *Limacina* were abundant in Net 2, replaced by clam larvae in Net 1.

Station 7 in deep water south of Georges Bank was not as exciting zoologically as on most cruises. There were relatively few copepods of any kind in Net 1, but the rank order of species was *M. lucens* >*C. finmarchicus* > *Euchaeta* sp. A few subtropical types were there, too. Few little copepods were captured at depth. *Pleuromamma* sp. was dominant in Net 2, joined by an abundant mixture of small copepods (*Oithona*, etc.). Net 3 had almost no sample, mostly tiny copepods and phytodetritus. One-twelfth of the Net 4 sample included about 20 *C. finmarchicus* (> > C5, the only predominantly matured sample of the cruise), a few *Candacia*,

Pleuromamma and phytodetritus. Overall, there were some *C. finmarchicus* in the slope water, but they did not amount to a large resting stock, dominant in the deep plankton.

Before **Station 9** no *Pseudocalanus* spp. were found at any station, but 9 produced "some", second to very much larger numbers of *C. typicus*. *Pseudocalanus* were not seen again until Station 18, where one (only) was spotted. This strong dominance by *C. typicus* was typical (the pun is accidental) all along the south flank. Station 9 included small amounts (compared to late spring) of *Clytia*-like hydroids. These were not seen elsewhere on the cruise. *Sagitta* were abundant in the bottom net.

Up on top of Georges Bank at **Stations 11** and **12** the bulk of the plankton was the copepods *Centropages hamatus* and *C. typicus*. The former way outnumbered the latter, so we have the typical arrangement usually seen in late spring and later, *C. hamatus* as the main player inside the well-mixed zone. Both species were present almost entirely as adults. *Sagitta* were also abundant in the bank-top samples. There was no difference between deep and shallow nets. This combination of two *Centropages* species and *Sagitta* is "bank mix". In late spring it will include variable amounts of *Clytia*, but that has not been seen up on the bank this cruise, only at Station 9. A few *Pseudocalanus* are usually included, although I didn't see them at 11 or 12.

Samples from **Station 16**, in deeper water to the south, were not examined in detail, but the deeper samples contained no significant numbers of *C. finmarchicus.* Again, the slope water does not seem to harbor a significant resting stock at this time.

Samples from **Station 18** at the east end of the south flank were mostly phytodetritus. There were a few *C. finmarchicus* and fewer *C. typicus*. That is a change, since the latter species was relatively numerous to the west. The deep sample included lots of gammarids-like amphipods and some annelids (long, errant types) and shrimp (*Crangon*-like). The amphipods remained in Net 2 and were joined by some *Parathemisto*, but there were none in Net 3. Net 3 had a few *Sagitta*.

Calanus finmarchicus showed up for the first time in substantial abundance in **Stations 25** and **39** on the Scotian Shelf and in Northeast Channel. They were the dominant animal in the deep nets (200+ to 100m). Fifth copepodites were most abundant, followed by males and females. Compared to other years, when 3/4 of the stock had matured by mid-January, all sites this year show less than 1/4 matured, with C5 strongly outnumbering them. Net 2 had few *Calanus*, but they showed up again in Nets 3 and 4. The three upper nets had numerous small copepods (*Oithona* mostly).

Station 26 was an oddity. All along up to that point we had caught a few to a few dozen *Pleurobrachia* in most samples, ranging in size from 0.3 to 2 cm. At 26 all nets (bongo, MOC-1 bottom to top) were loaded with them. Slime associated with them clogged the filter screens. They filled over a liter from every net. It was hard to get any other part of the sample (copepods) out of the slime. Microscope examination showed very little other plankton of any kind, but that may just be due to the separation problem. It was hard to remember working with the samples that these *Pleurobrachia* were spread through many 10's of cubic meters in the ocean, and thus did not totally occupy the water. At most later stations there were again some *Pleurobrachia*, but nothing like the 'bloom' at station 26.

Station 29 over Georges Basin had numerous *C. finmarchicus* in both bottom and top nets, with few between. Most were C5 with some females in the surface. Again, maturation is late compared to earlier years observed. The net wire carried strands from pink siphonophores, but these were only evident in the catch of Net 1 as badly abraded bracts. None were seen in higher nets. Net 1 had some *Metridia*, *Pleuromamma*, and *Euchaeta* with relative abundance in that order. Net 2 caught some *Pseudocalanus* and *C. typicus* in a mixture of phytodetritus that included large numbers of *Ceratium*. These *Ceratium* at 100-40 meters showed up in later stations at the edge of the Gulf. Net 3 included numerous small *Limacina* as did Net 4.

At **Station 40** *Calanus* were sparse in Net 1, accompanied by a few *Metridia*, however there were abundant *Calanus*, mostly C5 in Net 6. Males were more numerous than females. There were good amounts of *Calanus* in all the coarse mesh nets at shallower depths, too. Fine mesh Nets 2, 3, and 4 were all dense with green phytoplankton glop (the samples were preserved while I slept, so I could only examine the alcohol series microscopically). Peter Wiebe and I made the following comparison to the MARMAP results:

Carol Meise's Gulf of Maine average Calanus abundance chart here. It shows the Georges Basin area we sample at broad-scale Station 40 (west end of the basin at 183 meters, round to 200 m) in a zone with average January-February copepodite (C5 and adult, we think) abundances between 10^3 and 10^4 per m^2. Our MOC-1 sampled very close to 1000 m^3 over the water column, so at the average seasonal density we should have caught the number expected under about 5 m^2, or between 5000 and 50000. We can't count the samples, but we caught over 300 ml settled volume of mostly Calanus, mostly C5 (some males, very few females), mostly in the bottom net (180-100m), although there were significant numbers right to the surface. Chatting with Maria Casas, who has an experienced counting eye, allows us to guess. The number is on the high end of Meise's contouring range for station 40; the jars contain at least 25,000 and more likely 50,000 C5-C6. For at least this one station, the Gulf of Maine area just adjacent to the bank is not so far from normal (that is to say average). Station 34 in fairly deep water showed a comparable result the next day, at least for Nets 6 to 9. My observation in June 1998 that *Calanus* abundance in southern Gulf waters was less than other years observed still stands. We never had to split a sample in June 1998 in order to preserve, while in other years we were throwing out 3/4 to 15/16 of samples and still had as much as we saved in 1998. This does not seem to have led to a marked low in 1999 Go stocks in the southern Gulf. Perhaps there is strong density dependence to resting stock mortality.

At **Station 34** the Net 1 sample was pulped. Apparently the cod ends were tangled at the time it fished. Higher nets were loaded with phytoplankton, some of it the tiny *Ceratium* seen at earlier stations. This identification needs confirmation ashore, since the scope was shaking so badly

when I examined the sample that higher powers were useless. *Calanus* were similar in abundance and distribution to station 40. There were small *Limacina* well dispersed vertically.

Station 36 up on the Bank and **Station 37** at the edge had standard "bank mix", here including *Pseudocalanus* sp. as a distantly third ranked copepod. Samples were pretty clean, with only a little phytodetritus in those from 150 �m mesh.

Station 38 in the south corner of Wilkinson Basin has a substantial stock of large copepods, ca. 300 ml settled volume in 100 m^3 , more than 3/4 of which is *Metridia*, adults and older copepodites, the rest *Calanus*, mostly C5. Stations 29, 40, and 34 had *Metridia*, at 38 it was dominant. MOC-1/Net 1 (139-100m) and Net 2 (100- 40m) both have substantial amounts of tissue from siphonphores, badly torn up. Most of the copepod mass was captured well up off the bottom, above 100 m. At this station, I only examined the coarse mesh, ethanol preserved samples.

Summary: The recurring spatial division of zooplankton communities in the Georges Bank region seems to be fully established. That is, we have a *Centropages hamatus*-dominated "bank mix" inside roughly the 100 m line, and other plankton assemblages outside. This sharp division is a little surprising for January. I'm tempted to suggest they have lasted longer than usual because temperatures are 1-2ºC warmer than the mean for the month. Perhaps they have never been swept from the Bank by a strong, winter norwester. Plankton on the south flank are dominated by *Centropages typicus*, but south flank stations usually also showed a mixture of very small copepods, both calanoids and *Oithona*.

Calanus finmarchicus are essentially absent from over the Bank, and are a very minor constituent on the south flank. The *C. finmarchicus* resting stock offshore of the Bank (beyond the 200 m isobath) was minimal to the south, but was of approximately normal abundance in Northeast Channel and at all stations in the Gulf of Maine. A substantial majority of the 1999 Go individuals remained in C5, with less males and many less females. This contrasts with other years, when a majority of C5 had matured by mid-January. There's a clue in that of some kind. Wherever we found *Calanus,* we also found *Metridia lucens.* It was usually less numerous than *Calanus* in C5 and adult stages, but (unlike *Calanus)* younger copepodites were also present.

Pseudocalanus spp. were few everywhere, with largest numbers in shallow water over the northwest part of the Bank. Those recognized were all adults. *Limacina "retroversa"* were present in virtually all stations, occasionally very numerous but always very small. In samples they look and behave like sand. On the whole they were more abundant in mid-depth samples, not at depth and not in the 0-15 m samples.

Nutrients and Phytoplankton Studies

(Keska Kemper and Regina Pfistermeuller for David W. Townsend

University of Maine)

[see also: http://grampus.umeoce.maine.edu/globec/globec.html]

Overview:

We are collecting water samples on all six broad- scale cruises in 1999 (January to June) to analyze for a suite of nutrients and phytoplankton biomass. During this cruise, water samples were collected for analyses of:

- *dissolved inorganic nutrients* (NO_3+NO_2, NH_4, SiO_4, PO_4);
- *dissolved organic nitrogen and phosphorus;*
- *particulate organic carbon, nitrogen and phosphorus;*
- *phytoplankton chlorophyll* a *and phaeophytin*, and
- *phytoplankton species composition*

Methods:

Water collections were made at various depths at all of the regular hydrographic stations (Stations 1 - 41) sampled during the January 1999 broad scale survey cruise aboard *R/V Albatross IV* , using the 1.7 liter Niskin bottles mounted on the rosette sampler. At several stations, weather did not permit us to use the rosette package; in these cases Niskin bottles were hung on a wire off the boom (Stations 4, 7, 9, 12, 13, and 34). Additional near-surface water samples were collected at positions between the regular stations (Stations numbered >41) using the ship's underway flow-through sea water system.

Samples for dissolved inorganic nutrients (DIN) and chlorophyll were collected at all stations, 1-41, and at all the intermediate stations (near-surface). Water samples for DIN were filtered through 0.45 �m Millipore cellulose acetate membrane filters, and the samples were frozen in 20ml polyethylene scintillation vials by first placing the vials in a seawater-ice bath for about 10 minutes. Samples will be analyzed on shore following the cruise using a Technicon II Auto Analyzer. Water samples (50 mls) for dissolved organic nitrogen, and total dissolved phosphorus were collected at 2 depths (2 and 20m) at each of the main stations and frozen as described above. These samples will be analyzed ashore using a modification of the method of Valderrama (1981). Samples for particulate organic carbon and nitrogen were collected by filtering 500 mls from 2 depths (2 and 20m) at each of the main stations onto pre-combusted, pre-ashed GF/F glass fiber filters, which were frozen for analysis ashore. The filters will be fumed with HCl to remove inorganic carbon, and analyzed using a Control Equipment Model 240-XA CHN analyzer (Parsons et al., 1984). Samples for particulate phosphorus were collected as for PON (but 200 mls were filtered) and frozen at sea. Laboratory analyses will involve digesting the sample in acidic persulfate and then analyzing for dissolved orthophosphate.

Phytoplankton chlorophyll *a* and phaeopigments were measured on discrete water samples collected at all stations (see Table 1) and determined fluorometrically (Parsons et al., 1984). The extracted chlorophyll measurements involved collecting 100ml from bottle samples taken at various depths. Samples were filtered onto GF/F filters, extracted in 90% acetone in a freezer for at least 6 hours, and analyzed at sea using a Turner Model 10 fluorometer.

Samples for phytoplankton species composition were collected from the surface at stations 1-41 by preserving a volume of 125 mls in Lugol's solution. These samples will be available for analysis of the larger species using the Uttermohl inverted microscope method.

Preliminary Results:

The only data immediately available following the cruise are the CTD data (D. Mountain) and the chlorophyll data presented here (Table 1). Chlorophyll levels were low over the entire bank, with values not exceeding 3.8 µg/ L. The highest chlorophyll levels were near the southern edge of the 60 m isobath for both 2m (3.8 µg/ L) and 20m (3.4 µg/ L) chlorophyll measurements (Figure 10 and Figure11).

References:

Parsons, T.R., Y. Maita and C.M. Lalli. 1984. A Manual of Chemical and Biological Methods for

Seawater Analysis. Pergamon, Oxford. 173 pp.

Valderrama, J.C. 1981. The simultaneous analysis of total nitrogen and total phosphorus in

natural waters. Marine Chemistry 10: 109-122.

Microzooplankton Studies. The Importance of Microzooplankton Motility on Georges Bank.

(Keska Kemper and Regina Pfistermeuller for S. Gallager)

The objectives of this study are to observe, record and analyze seasonal changes in the prey field for newly hatched cod, specifically examining prey size spectra and prey motility patterns.

Purpose:

The motility and size spectra of available prey are examined at three regions of the water column. Samples are collected from near bottom, pycnocline or mid-depths, and the well-mixed surface layer, at Priority 1 and 2 stations, January through June.

General Procedure:

When weather permitted, water samples were collected using Niskin bottles attached to a rosette on the Seabird-911 CTD. However, this being a January cruise, we were forced on several occasions to hang 1.7 liter Niskin bottles from a wire deployed off the main boom (Stations 4, 7, 9, 12, 13, 34). Water was collected from three depths, near bottom, mid-depth, and surface. Once at the surface, water samples were siphoned from the top of the Niskins into tissue culture flasks. Siphoning is less disruptive to the microzooplankton than using the spigots at the base of the Niskins. The culture flasks were dipped in soapy water and immediately placed in cooler after filling to prevent fogging.

Each sample was then placed in turn in front of a B/W high resolution Pulnix camera fitted with a 50 mm macrolens. The sample was lighted from behind with a fiber optic ring illuminator fitted with at far-red filter. The entire filming system was suspended with bungee cords in order to reduce the effects of the ship's vibrations on the recording. Samples were recorded using a Panasonic AG1980 video monitor with SVHS formatted cassettes, and a Panasonic TR-124-MA Video Monitor. Each sample was filmed for 15 minutes. The field of view was calibrated by placing a ruler on the front side of the flask and focusing, and repeating for the back side of the flask. Samples were filmed at all Priority 1 and 2 stations. At Priority 1 stations, samples were preserved with 10% Lugol's solution.

Post Cruise Processing:

Particle size distribution and motility spectra will be determined using a Motion Analysis EV system by Dr. Scott Gallager and Phil Alatalo. Microzooplankton species composition of the Lugol's preserved samples will be compared with motility and size spectra data from the video recordings.

Gelatinous Zooplankton sampling.

(For L. Madin, S. Bollins and E. Horgan)

This was the first broad-scale cruise on which the new Jelnet was used to collect larger gelatinous predators. The net is 1.5m^2 at its opening and tapers to a shallow 50 cm deep flat bottom which has a zippered "sock" (facilitates collection) sewn into it along one of its edges. Mesh size of the net is 5mm(3/16"). The square net frame is 16mm (5/8") stainless steel and is bridled from each of the corners to a common point above by a 5mm(3/16") stainless steel wire with thimbles spliced into the wire ends. A 45-kg lead ball is attached to a 13mm(�") oblong stainless ring when the net is fished. Six vertical tows were made from surface to within 10-15 m of bottom, or to a maximum depth of 100 m. The net was deployed at a winch rate of 20 m/min and retrieved at a rate of 5 m/min. Depth of cast was determined by the actual wire out. The scientific party and deck crew agreed that the net was not be stopped at surface during retrieval, but rather quickly hauled clear of the water. This was done in an effort to eliminate any compromise of the catch due to the flushing of the net at surface as a result of the ship's rolling motion. The catch results for this cruise were the capture of the ctenophore *Pleurobrachia pileus* from four casts. Two casts did not capture any organisms.

Modifications to the Jelnet for subsequent broad-scale cruises will include the replacement of the "collection sock" with a PVC collar to which a standard MOCNESS cod end bucket will attach.

Collections for Genetic Studies.

(for A. Bucklin)

It is essential for understanding variations in the winter production of zooplankton on the Bank as well a knowledge of the origin or sources of the target species *Calanus finmarchicus*, and *Pseudocalanus* sp. as well as the Spring zooplankton bloom. Individuals are believed to come onto the Bank from the Gulf of Maine, Gulf of St. Lawrence, Scotian Shelf, and possibility the Slope Water. However, it is impossible to define through the morphology of the individuals where zooplankton currently found on the Bank originated. Consequently, population genetics studies of *Calanus*, *Pseudocalanus*, and several other species (e.g. the euphausiid, *Meganyctiphanes norvegica*) are being conducted at the University of New Hampshire by A. Bucklin. This in an effort to identify viable genes to characterize dispersal patterns and to provide a genetic basis upon which to gauge Bank production as a function of recruitment source populations. An attempt to distinguish between the morphologically similar *Pseudocalanus* species found year round on the Bank (e.g. *molutoni* and *newmani*) is also being developed, as well as genetic based analysis of their Bank circulation patterns and dispersal pathways. The work mentioned above is tied directly to other efforts to identify water sources and losses for the Bank, as well as circulation and exchange processes across the Bank boundaries. On this cruise, samples were collected at every station for genetic studies with net #5 on the 1-m^2 MOCNESS. At selected stations, 90 ml subsamples from the bottom and surface 1-m^2 MOCNESS with 150-�m mesh nets were taken. All samples were preserved in 95% ethyl alcohol which was changed during the first 24 hr period after collection.

High Frequency Acoustics

(Peter Wiebe and Karen Fisher)

This is the first of three planned trips in 1999 to make high resolution volume backscattering measurements at 120 kHz and 420 kHz of plankton and nekton throughout the Georges Bank region on the GLOBEC broad-scale cruises. As on broad-scale cruises of previous years, work on this cruise was designed to provide intensive continuous acoustic sampling along all the shipboard survey track lines in order to cover the entire Georges Bank region. The data are intended to provide acoustical estimates of the spatial distribution of animals which span the size range of the target species (cod, haddock, *Calanus*, and *Pseudocalanus*) and their predators. The spatial acoustical map and the along track temperature, salinity, and fluorescence data are also intended to provide a link between the physical oceanographic conditions on the Bank and the biological distributions of the species as determined from the net collections at the stations distributed throughout the Georges Bank region. Continuous acoustic data between stations can be used to identify continuity or discontinuity in water column structure which can in turn be used to qualify the interpretation of biological and physical data based on the point source sampling.

Methods.

On this cruise, a portion of the R/V Albatross IV chem lab was the operations center for the high frequency acoustics work. The "acoustics system" consisted of the "Greene Bomber", a five-foot V-fin towed body, a Hydroacoustics Technology, Inc Digital Echo Sounder (HTI-DES), several computers for data acquisition, post processing, and logging of notes, plus some other gear. In the Greene Bomber, there were two down-looking transducers (120 and 420 kHz each with 3 degree beams), a multiplexor pressure case for multiplexing the data from the two transducers, and an Environmental Sensing System (ESS). The ESS was mounted inside the V-fin with temperature, conductivity, and fluorescence sensors attached to a stainless steel framework outside of the fiberglass housing. The fish was also carrying a transponder that would have proved useful in locating it if it had happened to break free of the towing cable.

In the lab (Figure 12), the data came in on a single 24 conductor cable with separate shielded groups of wires, one for each transducer and one for the ESS. The HTI-DES has its own computer (a PC104-80486 -100 MHz) and five digital Signal Processor boards (DSPs). It received the data from the transducers, did a series of complex processing steps, and then transferred the results to the Pentium PC over a local area network (LAN) where the data were logged to disk and displayed. The "raw" unprocessed data were also written to a DAT tape (each tape holds two gigabytes of data and we used about 98 tapes during this cruise - Table 2). Immense amounts of data were handled very quickly by this system. The environmental data came into a second PC and were processed, displayed, and logged to disk. Both systems required GPS navigation data and those data were being supplied by the ship's P-code GPS receiver which were logged as part of the E SS data stream. Periodically, the data were transferred to a third computer for post-processing. It was at this stage that we could visualize the acoustic records and begin to see the acoustic patterns which were characteristic of the Bank.

The tow-body was deployed from the starboard quarter of ALBATROSS and collected data both during and between stations. The general towing speed was about 6.5 kts. The echosounder collected data at two pings per second per frequency during most of the cruise. Conditions for conducting an echo sounder survey of the Bank were less than ideal during a good portion of this cruise. There were several periods of wind and the seas at the beginning, in the middle, and at the end of the cruise that significantly degraded the quality of the acoustic records.

Gear Problems

We also had some electrical problems which forced us to stop acquiring data until the problems could be fixed. On 13 January, between Standard Stations 1 and 2, the conductivity sensor on the Greene Bomber stopped providing good data. The towed body was brought on the deck at the beginning of Station # 2. We found that the conductivity cable had slipped down between the stainless steel bottom plate and the fiber glass body and was pinched. Once free, the cable was checked and tested, and the connectors cleaned and and re-connected. The Greene Bomber was put back in the ocean and the salinity values returned to normal.

The second problem came on 15 January about 1700 hours when in the course of turning on the Greene Bombers electronic systems after the towed body was pulled from the water to straighten out some tangled lines, the ESS modem box failed to turn on. The ship's electronic tech, Bobby Yates, provided essential assistance in determining that the switch on the front of the box was not working. There was no replacement available so jumpers were installed into the switch lead holes on the circuit board to wire the switch leads "on". Still after doing this, when we plugged the box in, it did not work. None of the operational lights came on. Testing the 120 power coming into the back of the box revealed that the filter associated with the unit where the AC power comes into the box was also faulty. The AC power unit and filter was by-passed by attaching the wire leads in the AC cord to the wall socket directly into the wires that brought the AC Power to the board. An in-line fuse was installed in the hot wire lead to protect the circuitry in the box from a power surge. These repairs resulted in an operational system which was put back into data acquisition mode by 2000 hours.

On 18 January, a show stopper happened around 2215. The 420 kHz portion of the DES stopped working properly. Symptoms included flashing red "over" light on the 420 kHz receive board and the red overload light on the 420 kHz power amplifier on each ping cycle. A call to HTI's Tom Torkelson provided the information that the red light meant that the transmitter was trying to send power to the transducer, but was not able to send it and was therefore overloading. He thought the problem was most likely in the cable or in the MUX bottle down in the Greene Bomber, but the cable was his first thought. He suggested various tests to try which we did, but none resulted in the 420 kHz system becoming operational. Early the next morning, the 120 kHz portion of the system died just as we were about to leave Station 19. So, there was nothing to do but to bring the fish on board and get ready to trouble shoot it. It took an hour or so to take the acoustics portion of the fish apart and get it into the Chem Lab for testing. After checking the MUX bottle and finding nothing wrong, we moved to checking the cable. A systematic check of the continuity and resistence on each of the 24 wires revealed that there were wires that should not have been connected to any other wire, but were shorted to one or more ground wires. It was clear that the cable had a number of shorts which had to be eliminated. The focus of attention then went to the previous cable splice that was near the underwater connector. Close inspection revealed that the potting material was not bonded very well to the outer sheath of the electrical conductor and droplets of water could be observed while working the splice back and forth, indicating that seawater had leaked into the splice. The conducting cable was cut to remove the splice and with that out of the way, the cables tested OK. The wires then were spliced back together and they tested OK. The Greene Bomber was ready to go about 1545 on the 19th just before we came up on Station 22. It was the first piece of gear to go into the water. Back in the Chem Lab, the various pieces of hardware were switched on and about the time the first bottom return was showing up on the echogram, someone came on the ship's loud speaker system and said

"Greene Bomber Lives!!".

Shortly after arriving at the last Station (#38) on Saturday (the 23rd of January), the 120 kHz portion of the DES failed again and the data acquisition ended with just the 420 kHz data being acquired. This time the system was allowed to run until the end of the 1-m2 MOCNESS tow and turned off and brought on board for the trip back to port.

In spite of the problems, overall the data are of reasonable quality and they provide an adequate base from which to compare the changes in the acoustic field on the Bank as viewed on subsequent cruises in March and June. We were able to collect acoustics data along nearly all of the cruise trackline. The length of trackline acoustically mapped was ~617 nm (1143 km - Figure 13).

Some Results.

This is the start of another year of in which the pteropod, *Limacina retroversa*, was very abundant around the outer margin of the Bank. Within the 60 meter isobath where the water was well-mixed it was lower in abundance. In the areas of the Bank that were stratified, *Limacina* was in substantial numbers in layers associated with the bottom of the mixed layer. Its abundances on this cruise were similar to those we saw in January of 1998 on Albatross IV 9801. This animal reflects sound back to the echosounder much more effectively than most other animals. Given the high numbers of individuals found in many of the net hauls in the same depths where the strong acoustic layers reside, we can begin to assume they were a major contributor to these layers.

The tidal mixing front.

The tidal mixing front which divides the well-mixed area on top of the Bank from the deeper stratified waters is the primary subject of the process oriented GLOBEC work this year. The volume backscattering data are particularly good at providing a visual display of the position and structure of the front. In the well-mixed water column, the vertical acoustic structure is essentially homogeneous from the sea surface to the ocean bottom, but there usually is a subtle horizontal variation that gives rise to a vertical lineation structure. This structure is in strong contrast to the vertically layered structure that accompanies a stratified water column. The tidal mixing front is a place where the well-mixed and the stratified regions meet during a good portion of the year. However, during the winter period, the processes controlling the well-mixed character of the water column hydrographic structure may be driven more by cooling at the surface, thermohaline convection, and wind mixing than tidal mixing in the deeper portions of the Bank. As a result, the position where the well-mixed region meets the stratified region may not coincide with the dynamical entity known as the tidal mixing front. The results presented here will focus on this frontal region as it stretches from the Great South Channel to the North East Peak along the southern flank. During this cruise, this front showed up acoustically as a less abrupt change in acoustic properties in each of the crossings along the southern flank (Figures 14, 15) than seen during cruises in 1998 (see sections in the cruise report for R/V ALBATROSS IV cruise 9808). In the four sections presented here, a more gradual transition between stratified and well-mixed conditions was evident. It took place over several kilometers rather than a few hundred meters (Figures 14, 15) as was the case in June 1998. The depth at which the last remnant of stratification was evident varied from one section to the next. Estimated depths were: Section 1 - 62 m; Section 2 - 75 m; Section 3 - 63 m; Section 4 - 80 m. Water depths of 70 or more meters represent places where tidal mixing was probably not the dominant force causing the well-mixed water column where the two regions met.

Solitons

Internal solitary waves or "solitons" were evident around the waters of the Bank that were still stratified. The solitons observed over the southern flank are usually waves of depression, that is, the density interface (pycnocline) separating the thinner surface mixed layer from the thicker lower layer moves downward from its equilibrium position as the wave passes. Nearly all of the solitons observed in the acoustic records collected during GLOBEC have been of this type. However, if the mixed layer is deep and the pcynocline is closer to the bottom than the surface, as it often was during this cruise, waves of elevation can be created i.e. the lower layer is displaced upward towards the surface. On this cruise, for the first time, it appears that we have two spectacular observations of waves of elevation propagating onto the Bank.

The first readily identifiable soliton was encountered at Standard Station # 6 (Figure 16). When plotted as a function of time, it appears as a regular series of wave crests with diminishing amplitude and wave length. The wave crests rise up from the layer just above the bottom, hence the term "wave of elevation". The problem with this plot is that it does not accurately reflect the horizontal dimensions of the wave because the ship was still jogging slowly (while the MOCNESS samples were being taken care of) during the first part of the echogram and then speeded up for the run to the next station. We do have GPS data and can compute the distance traveled by the ship as a function of time and correct for the change in ship speed. These distance data were also aliased by, we suspect, variations in the speed of the soliton at the sea surface affecting the ship's speed. The currents at the surface in the vicinity of a soliton are fast in the direction of soliton propagation in some portions of the wave (e.g. at the forward face of each wave crest) and slow in others (e.g., at the wave crest - Figure 17). So a plot of this wave as a function of distance is also mis-shaped. With aid of the ship's ADCP current data, we may be able to correct for the aliasing and produce an accurate image of the wave.

The second encounter of what appears to be another soliton in the form of a wave of elevation took place as we steamed from Station 7 to Station 8 (Figure 18). In this case, the ship's speed was fast relative to the wave's motion and the "aliasing" of the wave structure was at least uniform for the entire field. In both the 120 and 420 kHz echograms, there was a series of

spectacular spires (wave crests) of strong backscattering rising up out a bottom layer which itself had very intense backscattering. The crests reached 30 or more meters above the bottom layer.

Fluorescence patterns observed by Greene Bomber in January 1999 (Figure 19) were qualitatively similar to the pattern observed in January 1998. Highest values were found on top of the Bank, particularly on the transect through Standard Stations 10, 11, 12, and 13 in both years. Values in January 1999 seem slightly lower overall than values observed in January 1998. Peaks in the Gulf of Maine were observed (Stations 29 and 40) in both years; however, most values observed off the Bank were quite low. The major front in fluorescence on the southern side of Georges Bank appears to be located roughly between the 40 and 60 meter isobaths during both years. It will be interesting to see if the suggestion of a season pattern in the fluorescence values carries out in surface data from other broad-scale cruises in other seasons as well.

Table 2. Data Acquisition Log for ALBATROSS IV - GLOBEC Cruise 9901

HTI-244 Echosounder running 120 and 420 kHz Transducers, config file al9901.cfg

Sta/Leg	Date	DAT Tape #	Start DAT	Stop DAT	Acoustic File	Start ESS	End ESS	ESS File Name	Comments
1	99013	1	0148	0355	W0130146	0140	810	gb00001	Deploy Greene Bomber; sample duration 0.5 minutes
1-2	99013	1			W0130222				Took salinity tube off
2	99013	2	0355	0505	W0130814	0812	1820	gb00002	GB out to un-pinch salinity cable at start of station
2-41	99013	3	0814		W0130950				Redeployed GB; fixed the COND probe's pinched wire
2-41	99013								Stopped proc to set sampling duration to 0.2 min
2.5	99013	4	1020						TAPE 4
41	99013	5	1221	1430	W0131355				TAPE 5 (right on time)
41-3	99013								Tried again to change sequence to 0.2 seconds; got 0.1
41-3	99013				W0131359				SET INT TO 0.2 seconds !!!!
41-3	99013								Adjusted tail rope (lengthened it)
41-3	99013	6	1430						TAPE 6
41-3	99013	7	1629						TAPE 7 just after Bongo
3	99013	8	1829		W0131823	1820	0656	gb00003	TAPE 8 just before fire and boat drill
3	99013	9	2028	2228					TAPE 9
3	99013	10	2228	0031					TAPE 10
3-45	99014	11	0031	0237					TAPE 11; water tight doors closed.
3-45	99014	12	0239	0446	W0140239				TAPE 12; D:\hti_dep\AL9901 (139 mb open, vs 71 on c:)
45-4	99014	13	0446						TAPE 13
4	9901414	14	0645	0901					TAPE 14
4	99014				W0140700	0658	1259	gb00004	End ESS/start new acoustics and ESS
46-5	99014	15	0902	1109					TAPE 15 after Bongo Station between 4&5
5	99014	16	1109	1316	W0141111				TAPE 16 while MOC in water at sta 5 & changed acoustics
5-47	99014								1213 - Pause ESS for Bobby to check GPS and Radar
5-47	99014								1215 - Pause off - GPS back on
47-6	99014								End ESS and restart
47-6	99014	17	1317	1525					TAPE 17 while steaming to Sta 6 after Bongo
6	99014	18	1525	1732					
6-7	99014	19	1732	1938					
6-7	99014				W0141818				ended file right after bongo tow and restarted acoustics
6-7	99014	20	1938	2146					Tape 20
7	99014	21	2146	2253		2148		gb00006	Tape 21 and start new ESS file
7	99014	22	2253						
7	99015				W0150142				
7	99015	23	0205	0425					Tape 23 accidentally pput in instead oftape 25, so has 16 minutes of 25 recorded at the start.
7-8	99015	24	0425	0633					
7-8	99015	25	0650	0855	W0150635	0646		gb00007	Tape 25 change and acoustics and ESS. Note LOST OPTIONS CASE-- won't talk, same problem as on shore
									SHUTDOWN 0855 to bring GB on board
8	99015	26	1041	1248	W0151040	1040		gb00008	
8-9	99015	27	1249	1456					
9	99015	28	1456	1716	W01514554				
9-10	99015								SYSTEM SHUTDOWN tangled wires around fish 1550
9-10	99015				W0151619				ESS modem box not coming up; ACOUSTICS ONLY
9-10	99015	29	1716	1924	end2103				
10	99015	30	1924	2132					STATION 10: tail wire is tight for part of record; lots of swinging
10-11	99015					2202	~0913	gb00009	MOC BOX BACK 2001
10-11	99015				W0152105				end acoustics at 2103; computer lucked up during file transfer- RESTARTED
10-11	99015	31	2133	2342					tape 31 started on time
11	99015	32	2342	0149					
51	99016	33	0149	0355					
12	99016	34	0356		W0160358				Station 12
12-13	99016	35	0604	0811	end 0655				Tape 35 changed before Bongo on way to Station 13.
	99016								0655 out of disk space on c-drive. Started new file on d-drive.
12-13	99016				W0160717				Took time to do some file transfers before starting acoustics.
12-13	99016	36	0812		end 0912				

	99016								End acqui at 0913 - Had to pull fish out of water - hove too
13	99016	37	1907		W0161907	1906	0613	gb00010	GB back in at 1900 Sta 13 data in d:\hti_dep\al9901
13-14	99016	38	2117	2324					Tape 38- started a couple of minutes late.
14	99016	39	2325	0131					
14-15	99017	40	0131	0339	W0170201				
15-16	99017	41	0341	0548	end 0612				
16	99017	42	0549	0758					
16	99017				W0170612	0615		gb00011	Change acoustics and ESS near start of Sta 16.
16	99017	43	0759	1005					Tape 43
16	99017	44	1006						Tape 44- allowed to run on although sounder off, only partial
16	99017								END ESS acquisition 1107; acoustics 1108
16	99017	45	1202	140?	W0171159	1158	gb00012		Fish back in water 1145 and turned on at 1157 after MOC10 deployed
16	99017	46	1410	1617					Tape 46
16-17	99017	47	1618	1815	W0171633				Tape 47
17	99017	48	1826	2053					Tape 48
17-18	99017	49	2033	2245					420 black 2216; disabled 420
17-18	99017				W0172324				shutdown 420 kHz at 2219
18	99017	50	2306	0114					Tape 50
18	99018	51	0122	0330					Tape 51 late; Moc10 in the water
18	99018	52	0333	0526					Dropouts begin as we come on station
19	99018				W0180419				New acoustics file
22	99018	53	1610	1817	W0181606				0516 SHUTDOWN
22	99018				W0181609	1610		gb00013	GB in water 1605; Transducers on 1608
22-23	99018	54	1818	2026					ALL ON22-23
22-23	99018	55	2027	2239					Tape 54
23	99018	56	2235	0042					Tape 55
23-24	99019	57	0042	0245					Tape 56
	99019								Tape 57 FISH OUT - SQUALL 0246
24-25	99019	58	0549	0752	W01905498	0545		gb00014	Tape 58 FISH IN 0545
24-25	99019	59	~0753	~0958	0934 end				Tape 59 - ran even though sounder off because of network
									problems. Rebooted the machine (the program was having sequence problems), then transferred data files
25	99019				W0191009				Started after file transfer - false start - 420 transmit off in program.
25	99019	60	1013	1220	W0191011				Restart with both frequency transmitters on
25	99019	61	1221	1429	1513 end				
25-39	99019	62	1429	1637					
25-39	99019				W0191528				Lost connection between computer & DES shutdown 1518
39	99019	63	1637	1845	W0191623				Echo sounder Sq not sync or problem sending next sample seq. Def.
39	99019	64	1846	2052					Tape 64
39-26	99019	65	2052	2259					Tape 65
26	99019	66	2301	0009					Tape 66
26-27		67	0110	0317					Tape 67
27		68	0317	0525	W0200230				Illegal op by program (Quit recording at 0452 - No data after that) - restart at 0230.
27		69	0529	0736					Tape 69
27-28	99020				W0200600				Had to restart - C-Drive out of disk space - Complete reboot needed - Writing to D-drive
27-28	99020	70	0737	0943	1159 end				Tape 70
28-29	99020	71	0944	1157					Tape 71
29	99020	72	1158	1405					Slow changing tapes by about 5-10 min.
29	99020				W0201200				
29	99020				1856 end				
29	99020	73	1406	1611					Tape 73
		74	1612	1818					Tape 74
		75	1819	1901					Bongo Sta pulled fish for Steam to Chatham.1856
32	99021	76	1812	2019	W0211810	1810	0614	gb00016	Back on Station after Steam to Chatham. Tape 76
32->30	99021	77	2020	2228					On new trackline from 32 to 30
30	99021	78	2229	0034					
30	99022	79	0035	0243	W0212239				
30-40	99022	80	0242	0451					
40	99022	81	0451	0659	W0220433				
40	99022				~0626 end				
40	99022				W0220630	0616	2001	gb00017	Restart ESS while doing Acoustics data transfer. Got sequence error problem when

									had problem transferring data to JAZ - rebooted computer and new start on DES data file.
40	99022	82	0659	0907	1727 end				Tape 82
40-31	99022	83	0908	1128					Tape 83, slow on change, was recording pump times, lat, lon. Late by about 10 min.
31	99022	84	1129	1337					Tape 84
31	99022								Start at the end of pump and before CTD
32-33	99022	85	1338	1545					Tape 85, before midway Bongo
31-33	99022	86	1546	1752					Tape 86
33-34	99022	87	1753	2000	w0221726	2002		gb00018	Changed while underway to Station 34 before Bongo
34	99022				w0222059				Lots of noise in file; START NOISE ONLY FILE (ducers off) 2058 STOP RECORDING went to receive only to record noise levels- end 2104
34	99022				w0222104				CALIBRATION FILE run with spaced pulses- made station34cal.bmp
34	99022	88	2001	2208	w0222114				DATA LOGGING BACK ON
34	99023	89	2209	0017					Tape 89
34	99023	90	0017	0225					Tape 90
34-35	99023				w0230209				New Acoustic File
34-35	99023	91	0225	0433					Tape 91
34-35	99023	92	0433						Tape 92 Nearly to station 35
35-36	99023	93	0642	0848	W0220646				Changed at midway bongo- file ends at 1312
36	99023	94	0849	1055					Tape94
36	99023	95	1056	1303		1058	1834	gb00019	Tape 95 and ESS file change
36-37	99023	96	1304	1511					
37-38	99023	97	1511	1719					started at start of station 37
37-38	99023	98	1719	1834					Just on station 38. 120 kHz out at 1730
38	99023								END ACQUISITION 1834

Drifter Deployments.

(for R. Beardsley and R. Limeburner)

As part of the physical oceanographic studies of the current structure and circulation on Georges Bank being conducted by R. Beardsley and R. Limeburner, GLOBEC Drifter Buoys are deployed at strategic locations periodically throughout the year to track the Lagrangian flow from the point of deployment. This drifter is constructed with a holey sock drogue (a Dacron cylinder 90 cm diameter by 3 m tall with 5 circular hoop stays) at the bottom connected by either a 10 m or a 40 m cable to a small float (18 cm diameter) which in turn is connected by about 2.6 m of cable to a larger spherical surface float (about 32 cm diameter). The surface float contains a sea surface temperature sensor, a GPS receiver, and an ARGOS satellite transmitter. Temperature, time, and position data are transmitted periodically to shore through the ARGOS telemetry system. On this cruise, one 10m drifter was deployed.

Shipboard ADCP (Acoustic Doppler Current Profiler) Measurements.

(for J. Candela and C. Flagg)

The flow field over Georges Bank is driven by a complex set of forces. A primary factor is the strong semidiurnal tides which dominate the high frequency variability (<1cpd) of the currents. Tidal rectification gives rise to a persistent subinertial clockwise circulation over the Bank. This circulation process can be substantially modified by the frequent storms common to the area, changes in the stratification of the Bank. and interactions with currents generated by offshore circulation features (i.e. Warm-Core Rings).

The Acoustic Doppler Current Profiler is one of the instruments being used to study the circulation process on the Bank by J. Candela and C. Flagg. Water current measurements were obtained using a 150 kHz RDI ADCP continuously during the entire cruise. The transducers were mounted on the hull of the ship (5 m below the surface with a heading offset (OH) of -1.5). The instrument was programmed to measure the current profile under the ship with a vertical resolution of 2 m, from 10 m depth to about 10 m from the bottom or up to a depth of about 120 m, which ever was shallower at a given location. The current profiles were generated by 60 s data averages. Transformation to geographical North and East current components was preformed using real time gyro information fed into the ADCP from the ship's navigation instrumentation. Also fed to the instrument was real time GPS positioning which was stored directly in the minute average profile data files. The ADCP measures currents with respect to the ship. To obtain the water current with respect to the ocean bottom, the ship's motion needs to be removed from the current observations. The ship's motion will be removed using the bottom track (BT) velocity measured by the ADCP. Depending upon sea conditions, the ADCP can preform this operation in water depths shallower than 200 to 230 m. When the BT is lost, accurate navigation will be used to remove the ship's velocity from the current.

The ADCP data collected on this cruise will be post-processed at Woods Hole Oceanographic Institution by Candela and Flagg.

Personnel List

Scientific

Name Title Organization

1. John Sibunka Chief Scientist NMFS/NEFSC, Sandy Hook, NJ
2. Maureen Taylor Phys. Sci. Tech. NMFS/NEFSC, Woods Hole, MA
3. Cristina Bascunan Phys. Sci. Tech. NMFS/NEFSC, Woods Hole, MA
4. Peter Wiebe Senior Scientist WHOI, Woods Hole, MA
5. Charles Miller Professor OSU, Corvallis, OR
6. Maria Casas Research Associate URI/GSO, Narragansett, RI
7. James Pierson Biol. Sci. Technician URI/GSO, Narragansett, RI
8. Neile Mottola Biol. Sci. Technician URI/GSO, Narragansett, RI
9. Joshua Fredrickson Biol. Sci. Technician URI/GSO, Narragansett, RI
10. Rebecca Jones Biol. Sci. Technician NMFS/NEFSC, Narragansett, RI
11. Stephen Brownell Biol. Sci. Technician NMFS/NEFSC, Narragansett, RI
12. Karen Fisher Grad. Student Cornell Univ. Ithaca, NY
13. Keska Kemper Grad. Student UME, Orono, ME
14. Regina Pfistermueller Grad. Student UME, Orono, ME

R/V ALBATROSS IV Officers and Crew

1. Jack Moakley Commanding Officer
2. Michael Abbot Executive Officer
3. Cecile Daniels Operations Officer
4. Kevin Cruse Chief Engineer
5. Chuck Hersey Second Assistant Engineer
6. Robert Wint Junior Engineer
7. Orlando Thompson Engine Utility Man
8. Theo Gibson Wiper
9. Kenneth Rondeau Chief Boatswain
10. Tony Alvernaz Lead Fisherman
11. William Amaro Skilled Fisherman
12. Tony Viera Skilled Fisherman
13. Jorge Barbosa Skilled Fisherman
14. Anthime Brunette Fisherman
15. Douglas Roberts Fisherman
16. Richard Whitehead Chief Steward
17. Jerome Nelson Chief Cook
18. Ernie Foster General Vessel Assistant
19. Robert Yates Electronics Technician

Appendix 1. Data inventory - List of Underway and station Activities.

					L	O	C A L				Water	Cast			
	Instr	cast#	Sta#	Sta_std	Mth	Day	hhmm	s/e	Lat	Lon	Depth	Depth	PI	Region	Comments
[redacted]	[redacted]	[redacted]			[redacted]	[redacted]	1633	s	4131.50	7040.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.01	[redacted]	1	1	1	[redacted]	13	41	s	4100.10	6900.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.02	[redacted]	[redacted]	[redacted]	1	[redacted]	13	48	e	4059.80	6900.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.03	[redacted]	[redacted]	[redacted]	1	[redacted]	13	[redacted]	s	4059.70	6900.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.04	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	13	103	e	4059.50	6900.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.05	[redacted]	[redacted]	[redacted]	1	[redacted]	13	137	s	4058.80	6901.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.06	MOC1	[redacted]	1	1	[redacted]	13	141	s	4058.70	6901.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.07	[redacted]	[redacted]	[redacted]	1	[redacted]	13	212	e	4058.30	6901.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.08	[redacted]	[redacted]	[redacted]	42	[redacted]	13	407	s	4048.70	6901.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.09	[redacted]	[redacted]	[redacted]	42	[redacted]	13	413	e	4048.60	6901.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.10	[redacted]	[redacted]	[redacted]	2	[redacted]	13	[redacted]	e	4039.20	6859.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.11	[redacted]	[redacted]	[redacted]	2	[redacted]	13	558	s	4039.20	6859.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.12	[redacted]	[redacted]	[redacted]	2	[redacted]	13	604	e	4038.90	6859.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.13	[redacted]	[redacted]	[redacted]	2	[redacted]	13	711	s	4039.20	6859.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.14	[redacted]	[redacted]	[redacted]	2	[redacted]	13	737	e	4038.80	6859.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL01399.15	[redacted]	[redacted]	[redacted]	2	[redacted]	13	757	s	4038.70	6859.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.16	[redacted]	[redacted]	[redacted]	2	[redacted]	13	802	e	4038.00	6858.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.17	[redacted]	[redacted]	[redacted]	2	[redacted]	13	809	s	4039.00	6858.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.18	[redacted]	[redacted]	[redacted]	43	[redacted]	13	1054	s	4025.90	6900.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.19	[redacted]	[redacted]	[redacted]	43	[redacted]	13	1101	e	4025.60	6900.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.20	[redacted]	[redacted]	[redacted]	41	[redacted]	13	1211	s	4018.60	6859.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.21	[redacted]	[redacted]	[redacted]	41	[redacted]	13	1219	e	4018.10	6859.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.22	[redacted]	[redacted]	[redacted]	41	[redacted]	13	1222	s	4018.60	6859.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.23	[redacted]	[redacted]	[redacted]	41	[redacted]	13	1229	e	4018.00	6859.80	89	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.24	[redacted]	[redacted]	[redacted]	41	[redacted]	13	1250	s	4017.80	6900.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.25	[redacted]	[redacted]	[redacted]	41	[redacted]	13	1328	e	4016.60	6902.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.26	[redacted]	[redacted]	[redacted]	44	[redacted]	13	1610	s	4025.30	6843.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.27	[redacted]	[redacted]	[redacted]	44	[redacted]	13	1620	e	4025.60	6844.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.28	[redacted]	[redacted]	[redacted]	3	[redacted]	13	1910	s	4031.10	6827.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.29	[redacted]	[redacted]	[redacted]	3	[redacted]	13	1918	e	4031.50	6827.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.30	[redacted]	[redacted]	[redacted]	3	[redacted]	13	1945	s	4031.50	6827.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.31	[redacted]	[redacted]	[redacted]	3	[redacted]	13	2015	e	4030.80	6827.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.32	[redacted]	[redacted]	[redacted]	3	[redacted]	13	2027	s	4030.60	6827.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.33	[redacted]	[redacted]	[redacted]	3	[redacted]	13	2100	e	4030.20	6826.80	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.34	[redacted]	[redacted]	[redacted]	3	[redacted]	13	2108	s	4030.20	6826.80	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
					L	O	C A L				Water	Cast			
	Instr	cast#	Sta#	Sta_std	Mth	Day	hhmm	s/e	Lat	Lon	Depth	Depth	PI	Region	Comments
AL01399.35	[redacted]	[redacted]	[redacted]	3	[redacted]	13	2121	e	4029.60	6826.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.36	[redacted]	[redacted]	[redacted]	3	[redacted]	13	2136	s	4029.40	6826.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01399.37	[redacted]	[redacted]	[redacted]	3	[redacted]	13	2217	e	4030.10	6824.80	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.01	[redacted]	[redacted]	[redacted]	4	[redacted]	14	558	s	4059.40	6815.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.02	[redacted]	[redacted]	[redacted]	4	[redacted]	14	605	e	4100.00	6814.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.03	[redacted]	[redacted]	[redacted]	4	[redacted]	14	609	s	4100.00	6814.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.04	[redacted]	[redacted]	[redacted]	4	[redacted]	14	613	e	4100.10	6814.80	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.05	[redacted]	[redacted]	[redacted]	4	[redacted]	14	623	s	4100.50	6814.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.06	[redacted]	[redacted]	[redacted]	4	[redacted]	14	640	e	4101.10	6814.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.07	[redacted]	[redacted]	[redacted]	45	[redacted]	14	845	s	4055.70	6807.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.08	[redacted]	[redacted]	[redacted]	45	[redacted]	14	850	e	4055.80	6807.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.09	[redacted]	[redacted]	[redacted]	5	[redacted]	14	1014	s	4050.90	6800.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.10	[redacted]	[redacted]	[redacted]	5	[redacted]	14	1021	e	4050.90	6759.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.11	[redacted]	[redacted]	[redacted]	5	[redacted]	14	1039	s	4050.60	6759.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.12	[redacted]	[redacted]	[redacted]	5	[redacted]	14	1043	e	4050.30	6759.80	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.13	[redacted]	[redacted]	[redacted]	5	[redacted]	14	1050	s	4050.20	6759.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.14	[redacted]	[redacted]	[redacted]	5	[redacted]	14	1113	e	4050.10	6758.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.15	[redacted]	[redacted]	[redacted]	46	[redacted]	14	1238	s	4046.00	6754.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.16	[redacted]	[redacted]	[redacted]	46	[redacted]	14	1244	e	4045.70	6753.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.17	[redacted]	[redacted]	[redacted]	6	[redacted]	14	1420	s	4040.30	6746.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.18	[redacted]	[redacted]	[redacted]	6	[redacted]	14	1427	e	4040.40	6746.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.19	[redacted]	[redacted]	[redacted]	6	[redacted]	14	1430	s	4040.40	6746.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.20	[redacted]	[redacted]	[redacted]	6	[redacted]	14	1440	e	4040.20	6746.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.21	[redacted]	[redacted]	[redacted]	6	[redacted]	14	1448	s	4040.10	6746.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.22	[redacted]	[redacted]	[redacted]	6	[redacted]	14	1520	e	4040.20	6746.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.23	[redacted]	[redacted]	[redacted]	47	[redacted]	14	1806	s	4033.70	6733.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.24	[redacted]	[redacted]	[redacted]	47	[redacted]	14	[redacted]	e	4033.90	6733.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.25	[redacted]	[redacted]	[redacted]	7	[redacted]	14	2050	s	4027.00	6717.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.26	[redacted]	[redacted]	[redacted]	7	[redacted]	14	2113	e	4027.20	6717.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.27	[redacted]	[redacted]	[redacted]	7	[redacted]	14	2116	s	4027.20	6717.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.28	[redacted]	[redacted]	[redacted]	7	[redacted]	14	[redacted]	e	4027.00	6717.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.29	[redacted]	[redacted]	[redacted]	7	[redacted]	14	2155	s	4026.90	6718.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.30	[redacted]	[redacted]	[redacted]	7	[redacted]	14	2226	e	4026.70	6719.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.31	[redacted]	[redacted]	[redacted]	7	[redacted]	14	2229	s	4026.70	6719.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
					L	O	C A L				Water	Cast			
	Instr	cast#	Sta#	Sta_std	Mth	Day	hhmm	s/e	Lat	Lon	Depth	Depth	PI	Region	Comments
AL01499.32	[redacted]	[redacted]	[redacted]	7	[redacted]	14	2252	e	4026.60	6719.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01499.33	[redacted]	[redacted]	[redacted]	7	[redacted]	14	2302	s	4026.50	6719.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

AL01599.01	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	139	e	4025.00	6716.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01599.02	[redacted]	[redacted]	[redacted]	7	[redacted]	15	203	s	4025.20	6716.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01599.04	[redacted]	[redacted]	[redacted]	48	[redacted]	15	619	s	4040.00	6713.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01599.05	[redacted]	[redacted]	[redacted]	48	[redacted]	15	627	e	4039.90	6713.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01599.06	[redacted]	[redacted]	[redacted]	8	[redacted]	15	855	e	4052.10	6702.80	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01599.07	[redacted]	[redacted]	[redacted]	8	[redacted]	15	[redacted]	s	4051.90	6702.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01599.08	[redacted]	[redacted]	[redacted]	8	[redacted]	15	915	e	4051.60	6702.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01599.09	[redacted]	7	[redacted]	8	[redacted]	15	919	s	4051.60	6702.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01599.12	[redacted]	[redacted]	[redacted]	8	[redacted]	15	1015	e	4050.30	6701.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01599.13	[redacted]	[redacted]	[redacted]	8	[redacted]	15	1029	s	4049.90	6701.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01599.19	[redacted]	8	[redacted]	9	1	15	1351	e	4056.90	6719.30	71	65	[redacted]	[redacted]	
AL01599.20	[redacted]	10	[redacted]	9	1	15	1404	s	4056.70	6719.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01599.21	[redacted]	10	[redacted]	9	1	15	1436	s	4055.30	6718.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01599.22	[redacted]	3	[redacted]	9	1	15	1550	e	4054.10	6719.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01599.24	[redacted]	19	[redacted]	50	1	15	1748	s	4100.80	6729.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01599.26	[redacted]	[redacted]	[redacted]	10	1	15	1909	s	4104.80	6738.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01599.27	[redacted]	20	[redacted]	10	1	15	1916	e	4104.60	6738.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01599.28	[redacted]	9	20	10	1	15	1920	s	4104.60	6738.60	50	46	[redacted]	[redacted]	
AL01599.29	[redacted]	9	20	10	1	15	1930	e	4104.90	6738.80	52	46	[redacted]	[redacted]	
AL01599.30	[redacted]	[redacted]	20	10	1	15	1939	s	4104.90	6739.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01599.31	[redacted]	[redacted]	20	10	1	15	1959	e	4104.60	6739.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01599.32	[redacted]	[redacted]	21	51	1	15	2122	s	4109.10	6747.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01599.34	[redacted]	[redacted]	22	11	1	15	2238	s	4113.70	6757.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01599.35	[redacted]	[redacted]	22	11	1	15	2245	e	4113.80	6758.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01599.37	[redacted]	[redacted]	22	11	1	15	2256	e	4113.80	6757.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01599.39	[redacted]	[redacted]	22	11	1	15	2326	e	4113.60	6758.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01599.40	[redacted]	[redacted]	22	11	1	15	2331	s	4113.60	6758.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.01	[redacted]	[redacted]	23	52	1	16	149	s	4118.10	6744.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.02	[redacted]	[redacted]	[redacted]	52	1	16	154	e	4118.10	6745.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.03	[redacted]	[redacted]	[redacted]	12	1	16	404	s	4124.40	6732.80	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.04	[redacted]	[redacted]	[redacted]	12	1	16	409	e	4124.50	6733.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.05	[redacted]	[redacted]	[redacted]	12	1	16	411	s	4124.60	6733.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.06	[redacted]	[redacted]	[redacted]	12	1	16	421	e	4124.60	6733.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.07	[redacted]	[redacted]	[redacted]	12	1	16	427	s	4124.60	6733.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.08	[redacted]	[redacted]	[redacted]	12	1	16	432	e	4124.90	6733.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.09	[redacted]	[redacted]	[redacted]	[redacted]	1	16	[redacted]	s	4120.60	6722.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01699.11	[redacted]	[redacted]	[redacted]		1	16	903	s	4116.50	6710.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.12	[redacted]	4	[redacted]		1	16	920	e	4116.00	6709.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.13	[redacted]	[redacted]	[redacted]		1	16	1701	e	4116.30	6710.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.14	[redacted]	[redacted]	[redacted]	13	1	16	1711	s	4116.10	6710.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.15	[redacted]	[redacted]	[redacted]	13	1	16	1718	e	4116.20	6710.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.16	[redacted]	[redacted]	[redacted]	13	1	16	1724	s	4116.20	6710.80	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.17	[redacted]	[redacted]	[redacted]	13	1	16	1733	e	4116.40	6711.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.18	[redacted]	[redacted]	[redacted]	13	1	16	1749	s	4116.70	6711.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.19	[redacted]	[redacted]	[redacted]	13	1	16	1805	e	4117.00	6711.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.20	[redacted]	[redacted]	[redacted]	13	1	16	1826	s	4117.30	6711.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.21	[redacted]	[redacted]	[redacted]	13	1	16	1846	e	4117.90	6713.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.22	[redacted]	[redacted]	[redacted]	13	1	16	1855	s	4118.20	6713.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.23	[redacted]	[redacted]	[redacted]	[redacted]	1	16	2114	s	4114.00	6703.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.24	[redacted]	[redacted]	[redacted]	[redacted]	1	16	2121	e	4113.90	6703.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.25	[redacted]	[redacted]	[redacted]	[redacted]	1	16	2221	s	4112.00	6657.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.26	[redacted]	[redacted]	[redacted]	[redacted]	1	16	2229	e	4111.80	6657.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
					L	O	C A L				Water	Cast			
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AL01699.27	[redacted]	[redacted]	[redacted]	[redacted]	1	16	2236	s	4111.80	6657.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.28	[redacted]	[redacted]	[redacted]	[redacted]	1	16	2247	e	4111.90	6656.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.29	[redacted]	[redacted]	[redacted]	[redacted]	1	16	2255	s	4112.60	6656.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01699.30	[redacted]	[redacted]	[redacted]	[redacted]	1	16	2320	e	4111.50	6656.80	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.01	[redacted]	[redacted]	[redacted]	[redacted]	1	17	30	s	4106.90	6650.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01799.03	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	17	147	s	4102.10	6642.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.04	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	17	154	e	4101.90	6642.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.05	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	17	200	s	4101.70	6642.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.06	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	17	215	e	4101.60	6642.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

AL01799.07	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	17	226	s	4101.50	6642.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.08	[redacted]	[redacted]	[redacted]	15	[redacted]	17	255	e	4100.30	6642.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.09	[redacted]	[redacted]	[redacted]	56	[redacted]	17	413	s	4057.70	6634.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01799.11	[redacted]	[redacted]	[redacted]	16	[redacted]	17	536	s	4055.40	6626.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.12	[redacted]	[redacted]	[redacted]	16	[redacted]	17	604	e	4055.10	6627.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01799.17	[redacted]	[redacted]	[redacted]	16	[redacted]	17	726	s	4054.90	6627.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01799.19	[redacted]	[redacted]	[redacted]	16	[redacted]	17	758	s	4054.40	6626.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01799.21	[redacted]	[redacted]	[redacted]	16	[redacted]	17	1111	e	4058.30	6623.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.22	[redacted]	[redacted]	[redacted]	16	[redacted]	17	1121	s	4058.30	6623.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.23	[redacted]	[redacted]	[redacted]	16	[redacted]	17	1139	e	4058.40	6623.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.24	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1144	s	4058.40	6623.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.25	[redacted]	[redacted]	[redacted]	16	[redacted]	17	1156	s	4058.40	6623.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.26	[redacted]	[redacted]	[redacted]	16	[redacted]	17	[redacted]	e	4056.40	6626.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.27	[redacted]	[redacted]	[redacted]	57	[redacted]	17	1452	s	4103.30	6626.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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					L	O	C A L				Water	Cast			
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AL01799.32	[redacted]	[redacted]	[redacted]	17	[redacted]	17	1716	e	4111.20	6627.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01799.35	[redacted]	[redacted]	[redacted]	17	[redacted]	17	1745	s	4111.10	6627.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.36	[redacted]	[redacted]	[redacted]	17	[redacted]	17	1819	e	4111.40	6629.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.37	[redacted]	[redacted]	[redacted]	17	[redacted]	17	1839	s	4111.80	6629.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.38	[redacted]	[redacted]	[redacted]	17	[redacted]	17	1925	e	4112.30	6628.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.39	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	17	2039	s	4118.10	6634.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	17	2048	e	4118.80	6634.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.41	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	17	2156	s	4124.30	6641.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.42	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	17	2207	e	4125.10	6642.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
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AL01799.45	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	17	2233	s	4125.70	6641.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.46	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	17	2240	e	4125.80	6641.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.47	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	17	2248	s	4125.80	6641.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.48	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	17	2301	e	4126.00	6641.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.49	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	17	2306	s	4126.00	6641.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	17	2320	e	4126.30	6640.80	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01799.51	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	17	2328	s	4126.30	6640.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.01	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	18	1	e	4126.30	6641.80	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.02	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	18	9	s	4126.30	6642.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.03	[redacted]	[redacted]	[redacted]	18	[redacted]	18	56	e	4126.00	6643.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.04	[redacted]	[redacted]	[redacted]	59	[redacted]	18	240	s	4130.40	6648.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.05	[redacted]	[redacted]	[redacted]	59	[redacted]	18	248	e	4130.40	6649.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.06	[redacted]	[redacted]	[redacted]	19	[redacted]	18	413	s	4135.30	6658.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.07	[redacted]	[redacted]	[redacted]	19	[redacted]	18	420	e	4135.30	6658.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.08	[redacted]	[redacted]	[redacted]	19	[redacted]	18	426	s	4135.30	6659.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.09	[redacted]	[redacted]	[redacted]	19	[redacted]	18	435	e	4135.50	6659.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.10	[redacted]	[redacted]	[redacted]	19	[redacted]	18	445	s	4135.20	6659.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.11	[redacted]	[redacted]	[redacted]	19	[redacted]	18	511	e	4134.10	6659.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.12	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	540	e	4135.80	6657.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.13	[redacted]	[redacted]	[redacted]	60	[redacted]	18	645	s	4139.50	6646.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.14	[redacted]	[redacted]	[redacted]	60	[redacted]	18	653	e	4139.20	6646.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.15	[redacted]	[redacted]	[redacted]	20	[redacted]	18	805	s	4143.10	6632.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
					L	O	C A L				Water	Cast			
	Instr	cast#	Sta#	Sta_std	Mth	Day	hhmm	s/e	Lat	Lon	Depth	Depth	PI	Region	Comments
AL01899.16	[redacted]	[redacted]	[redacted]	20	[redacted]	18	813	e	4143.00	6632.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.17	[redacted]	[redacted]	[redacted]	20	[redacted]	18	835	s	4143.10	6632.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.18	[redacted]	[redacted]	[redacted]	20	[redacted]	18	840	e	4143.40	6632.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.19	[redacted]	[redacted]	[redacted]	20	[redacted]	18	852	s	4143.70	6632.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.20	[redacted]	[redacted]	[redacted]	20	[redacted]	18	901	e	4143.90	6633.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.21	[redacted]	[redacted]	[redacted]	20	[redacted]	18	906	s	4144.00	6633.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.22	[redacted]	[redacted]	[redacted]	20	[redacted]	18	916	e	4144.20	6633.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.23	[redacted]	[redacted]	[redacted]	20	[redacted]	18	923	s	4143.90	6632.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.24	[redacted]	[redacted]	[redacted]	20	[redacted]	18	933	e	4144.80	6633.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.25	[redacted]	[redacted]	[redacted]	20	[redacted]	18	942	s	4144.70	6633.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.26	[redacted]	[redacted]	[redacted]	20	[redacted]	18	1008	e	4144.30	6633.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.27	[redacted]	[redacted]	[redacted]	20	[redacted]	18	1023	s	4144.00	6633.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.28	[redacted]	[redacted]	[redacted]	20	[redacted]	18	1110	e	4143.10	6633.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.29	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	18	1149	s	4138.70	6629.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	18	1156	e	4138.30	6628.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.31	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	18	1236	s	4132.90	6624.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

AL01899.32	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	18	1244	e	4132.30	6623.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.33	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	18	1251	s	4132.40	6623.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.34	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	18	1258	e	4132.20	6623.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.35	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	18	1331	s	4132.20	6623.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.36	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	18	1402	e	4129.40	6621.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.37	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1456	s	4131.20	6612.70	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.38	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1505	e	4131.00	6612.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.39	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1605	s	4132.30	6602.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1608	s	4132.20	6601.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.41	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1617	e	4131.80	6602.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.42	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1621	s	4131.60	6601.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.43	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1633	e	4131.50	6602.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.44	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1640	s	4131.30	6602.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.45	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1730	e	4129.00	6602.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.46	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1930	s	4140.50	6607.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.47	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1941	e	4140.70	6608.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.48	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2051	s	4147.60	6611.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.49	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2101	e	4147.80	6611.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2115	s	4147.80	6611.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
					L	O	C A L				Water	Cast			
	Instr	cast#	Sta#	Sta_std	Mth	Day	hhmm	s/e	Lat	Lon	Depth	Depth	PI	Region	Comments
AL01899.51	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2127	e	4147.80	6611.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.52	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2134	s	4148.70	6612.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.53	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2142	e	4149.30	6612.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.54	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2152	s	4149.50	6612.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.55	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2221	e	4149.30	6612.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.56	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2242	s	4149.00	6611.90	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01899.57	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2319	e	4148.70	6611.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01999.01	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	38	s	4149.90	6605.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01999.02	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	46	e	4149.70	6605.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01999.03	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	139	s	4152.10	6559.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL01999.04	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	148	e	4151.80	6559.20	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.05	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	156	s	4151.60	6558.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.06	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	204	e	4151.40	6558.50	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.07	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	213	s	4151.30	6558.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.08	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	235	e	4150.70	6556.00	[redacted]	[redacted]	[redacted]	[redacted]	Aborted half way due to weather
AL01999.09	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	245	e	4150.70	6556.00	[redacted]	[redacted]	[redacted]	[redacted]	Ship, gear secured….squall
AL01999.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	542	s	4204.10	6555.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	826	s	4217.20	6551.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.12	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	847	e	4217.00	6552.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.13	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	907	s	4217.00	6553.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.14	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	917	e	4217.40	6553.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.15	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	920	s	4217.40	6553.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.16	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	936	e	4217.60	6553.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.17	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	945	s	4217.50	6553.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.18	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1123	e	4217.50	6558.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.19	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1138	s	4217.30	6558.50	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1249	e	4216.60	6555.50	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.21	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1347	s	4213.10	6556.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.22	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1408	e	4212.30	6556.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.23	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1459	s	4207.80	6559.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.24	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1520	e	4207.80	6559.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.25	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1532	s	4207.70	6559.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.26	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1544	e	4207.70	6559.00	[redacted]	[redacted]	[redacted]	[redacted]	
					L	O	C A L				Water	Cast			
	Instr	cast#	Sta#	Sta_std	Mth	Day	hhmm	s/e	Lat	Lon	Depth	Depth	PI	Region	Comments
AL01999.27	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1554	s	4207.70	6558.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1609	e	4207.50	6558.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.29	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1620	s	4207.30	6558.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1757	e	4204.90	6600.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.31	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1813	s	4204.80	6600.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.32	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1944	e	4204.00	6603.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.33	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2105	s	4206.00	6613.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.34	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2114	e	4206.30	6614.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.35	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2304	s	4204.20	6625.50	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.36	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2312	e	4204.50	6625.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.37	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2317	s	4204.60	6626.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.38	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2327	e	4204.90	6625.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL01999.39	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2337	s	4204.90	6625.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.01	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	e	4205.80	6626.20	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.02	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	s	4200.80	6634.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.03	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	147	e	4200.90	6634.20	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.04	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	302	s	4156.60	6641.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.05	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	309	e	4156.50	6641.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.06	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	314	s	4156.00	6641.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.07	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	326	e	4156.10	6640.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.08	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	332	s	4156.00	6640.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.09	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	341	e	4155.70	6639.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	s	4155.20	6639.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	e	4154.60	6640.30	[redacted]	[redacted]	[redacted]	[redacted]	

AL02099.12	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	429	s	4154.60	6640.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.13	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	515	e	4155.00	6640.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.14	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	523	s	4155.10	6640.20	[redacted]	[redacted]	[redacted]	[redacted]	40m drifter; serial #23729
AL02099.15	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	524	s	4155.10	6640.20	[redacted]	[redacted]	[redacted]	[redacted]	10m drifter; serial #24960
AL02099.16	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	649	s	4201.30	6648.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.17	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	657	e	4201.50	6648.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.18	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	749	s	4205.70	6653.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.19	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	754	e	4206.00	6653.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	758	s	4206.00	6654.00	[redacted]	[redacted]	[redacted]	[redacted]	SB-Profiler sub for CTD due adverse
					L	O	C A L				Water	Cast			
	Instr	cast#	Sta#	Sta_std	Mth	Day	hhmm	s/e	Lat	Lon	Depth	Depth	PI	Region	Comments
AL02099.21	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	804	e	4206.10	6653.90	[redacted]	[redacted]	[redacted]	[redacted]	weather.
AL02099.22	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	813	s	4206.40	6654.10	[redacted]	[redacted]	[redacted]	[redacted]	
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AL02099.24	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	927	s	4210.70	6655.30	[redacted]	[redacted]	[redacted]	[redacted]	
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AL02099.26	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1055	s	4217.60	6654.20	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.27	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	e	4218.40	6655.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1128	s	4218.50	6655.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.29	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1143	e	4218.50	6655.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	s	4218.50	6655.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.31	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1212	e	4218.60	6655.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.32	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1217	s	4218.60	6655.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.33	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1229	e	4218.50	6655.50	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.34	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1300	s	4218.80	6654.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.35	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1328	e	4218.90	6654.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.36	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1338	s	4219.10	6654.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.37	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1538	e	4220.90	6657.00	306	295	[redacted]	[redacted]	
AL02099.38	[redacted]	10	[redacted]	[redacted]	[redacted]	[redacted]	1549	s	4220.70	6657.30	310	300	[redacted]	[redacted]	
AL02099.39	[redacted]	10	[redacted]	[redacted]	[redacted]	[redacted]	1701	e	4218.10	6656.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1954	s	4207.50	6703.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.41	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2001	e	4207.00	6704.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.42	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2004	e	4207.10	6704.50	[redacted]	[redacted]	[redacted]	[redacted]	
AL02099.43	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2005	s	4207.10	6705.50	[redacted]	[redacted]	[redacted]	[redacted]	Rendezvous with Coast Guard cutter
AL02199.01	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1743	e	4142.40	6739.30	[redacted]	[redacted]	[redacted]	[redacted]	off Chatam, MA.
AL02199.02	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1745	s	4142.40	6739.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02199.03	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1752	e	4142.50	6738.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02199.04	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1800	s	4142.50	6738.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02199.05	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1804	e	4142.40	6738.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02199.06	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1812	s	4142.60	6738.50	[redacted]	[redacted]	[redacted]	[redacted]	
AL02199.07	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1818	s	4142.50	6738.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02199.08	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1831	e	4142.70	6738.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02199.09	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1844	s	4143.00	6737.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02199.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1915	e	4143.20	6737.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02199.11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2045	s	4147.90	6727.50	[redacted]	[redacted]	[redacted]	[redacted]	
					L	O	C A L				Water	Cast			
	Instr	cast#	Sta#	Sta_std	Mth	Day	hhmm	s/e	Lat	Lon	Depth	Depth	PI	Region	Comments
AL02199.12	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2051	e	4147.70	6727.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02199.13	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2242	s	4154.80	6714.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL02199.14	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2251	e	4154.80	6714.50	[redacted]	[redacted]	[redacted]	[redacted]	
AL02199.15	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	s	4154.80	6714.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02199.16	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2309	e	4155.20	6715.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL02199.17	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2320	s	4155.30	6715.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL02199.18	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2329	e	4155.90	6714.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02199.19	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2339	s	4156.20	6715.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.01	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1	e	4156.20	6715.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.02	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	10	s	4156.10	6715.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.03	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	41	e	4156.00	6715.20	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.04	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	49	s	4155.90	6714.80	[redacted]	[redacted]	[redacted]	[redacted]	10m drifter; serial # 24967
AL02299.05	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	234	s	4202.20	6726.20	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.06	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	241	e	4202.40	6726.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.07	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	434	s	4210.10	6738.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.08	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	455	e	4210.70	6739.50	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.09	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	504	s	4210.80	6739.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	517	e	4210.80	6739.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	522	s	4210.70	6739.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.12	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	637	e	4208.50	6740.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.13	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	647	s	4208.20	6740.50	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.14	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	745	e	4209.10	6737.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.15	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	837	s	4205.50	6738.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.16	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	900	e	4205.20	6736.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.17	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	958	s	4200.00	6736.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.18	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1004	e	4200.20	6736.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.19	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1017	s	4200.50	6736.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1025	e	4200.70	6737.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.21	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1034	s	4200.90	6737.20	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.22	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1041	e	4201.00	6737.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.23	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1044	s	4201.10	6737.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.24	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1051	e	4201.20	6737.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.25	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1054	s	4201.30	6737.60	[redacted]	[redacted]	[redacted]	[redacted]	

AL02299.26	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1101	e	4201.40	6737.70	[redacted]	[redacted]	[redacted]	[redacted]	
					L	O	C A L				Water	Cast			
	Instr	cast#	Sta#	Sta_std	Mth	Day	hhmm	s/e	Lat	Lon	Depth	Depth	PI	Region	Comments
AL02299.27	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1104	s	4201.40	6737.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1111	e	4201.50	6737.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.29	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1118	s	4201.60	6738.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1126	e	4201.80	6738.20	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.31	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1209	s	4201.50	6737.50	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.32	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1216	e	4201.60	6737.50	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.33	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1224	s	4201.40	6737.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.34	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1243	e	4201.20	6736.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.35	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1432	s	4154.70	6749.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.36	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1438	e	4154.30	6749.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.37	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1603	s	4150.30	6758.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.38	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1611	e	4149.60	6759.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.39	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1617	s	4149.50	6759.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1623	e	4149.40	6759.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.41	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1635	s	4149.40	6759.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.42	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1655	e	4148.80	6757.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.43	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1659	s	4148.70	6757.70	[redacted]	[redacted]	[redacted]	[redacted]	10m drifter sn#20999
AL02299.44	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1823	s	4150.30	6808.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.45	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1839	e	4149.40	6809.80	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL02299.46	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1948	s	4151.70	6817.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.47	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2012	e	4150.60	6818.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.48	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2026	s	4150.60	6818.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.49	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2045	e	4150.50	6819.50	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2047	s	4150.50	6819.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.51	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2106	e	4150.50	6820.20	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.52	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2110	s	4150.50	6820.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.53	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2126	e	4150.50	6820.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.54	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2130	s	4150.50	6821.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.55	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2149	e	4150.50	6821.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.56	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2200	s	4150.50	6822.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.57	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2217	e	4150.60	6822.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.58	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2222	s	4150.60	6822.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.59	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2243	e	4150.60	6823.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2249	s	4150.80	6823.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02299.61	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2306	e	4150.90	6824.40	[redacted]	[redacted]	[redacted]	[redacted]	
					L	O	C A L				Water	Cast			
	Instr	cast#	Sta#	Sta_std	Mth	Day	hhmm	s/e	Lat	Lon	Depth	Depth	PI	Region	Comments
AL02299.62	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2324	s	4151.10	6825.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.01	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	11	e	4151.30	6826.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.02	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	18	s	4151.30	6826.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.03	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	147	e	4149.30	6829.50	[redacted]	[redacted]	[redacted]	[redacted]	Winds 30 knots, MOC-10 cancelled
AL02399.04	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	311	s	[redacted]	6824.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.05	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	326	e	4144.20	6824.20	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.06	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	452	s	4135.90	6827.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.07	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	458	e	4135.90	6827.50	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.08	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	504	s	4135.80	6827.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.09	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	511	e	4135.80	6827.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.10	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	519	s	4135.40	6827.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.11	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	539	e	4134.90	6826.20	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.12	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	645	s	4130.10	6822.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.13	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	651	e	4129.70	6822.50	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.14	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	817	s	4123.00	6818.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.15	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	826	e	4122.80	6819.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.16	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	847	s	4122.60	6819.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.17	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	854	e	4122.60	6819.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.18	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	901	s	4122.40	6819.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.19	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	907	e	4122.20	6819.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.20	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	s	4122.20	6819.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.21	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	920	e	4122.30	6820.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.22	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	931	s	4122.20	6819.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.23	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	938	e	4122.40	6820.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.24	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	951	s	4122.40	6820.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.25	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1014	e	4122.10	6820.30	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.26	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1028	s	4122.00	6820.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.27	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1102	e	4121.80	6819.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
AL02399.28	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1202	s	4120.50	6826.50	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.29	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1210	e	4120.30	6827.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.30	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1312	s	4118.40	6834.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.31	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1320	e	4118.20	6834.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.32	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	s	4118.20	6834.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.33	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	e	4118.50	6834.70	[redacted]	[redacted]	[redacted]	[redacted]	
					L	O	C A L				Water	Cast			
	Instr	cast#	Sta#	Sta_std	Mth	Day	hhmm	s/e	Lat	Lon	Depth	Depth	PI	Region	Comments
AL02399.34	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1339	s	4118.70	6834.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.35	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1402	e	4118.30	6834.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.36	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1540	s	4123.50	6845.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.37	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1554	e	4123.40	6846.40	[redacted]	[redacted]	[redacted]	[redacted]	

AL02399.38	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1733	s	4128.90	6855.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.39	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1828	e	4128.00	6858.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.40	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1834	e	4127.70	6858.20	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.41	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1838	s	4127.70	6858.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.42	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1851	e	4127.50	6858.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.43	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1900	s	4127.50	6858.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.44	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	1920	e	4128.30	6858.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.45	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2027	s	4128.40	6859.60	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.46	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2043	e	4128.30	6858.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.47	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2000	s	4128.10	6858.70	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.48	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2017	e	4128.00	6858.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.49	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2024	s	4128.00	6858.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.50	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2042	e	4128.00	6858.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.51	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2045	s	4128.00	6858.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.52	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2101	e	4128.00	6858.80	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.53	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2105	s	4128.00	6858.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.54	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2122	e	4128.00	6858.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.55	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2127	s	4128.00	6859.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.56	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2145	e	4128.10	6859.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.57	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2151	s	4128.10	6859.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.58	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2208	e	4128.20	6859.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.59	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2210	s	4128.20	6859.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.60	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2227	e	4128.30	6859.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.61	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2232	s	4128.40	6859.00	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.62	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2248	e	4128.60	6859.10	[redacted]	[redacted]	[redacted]	[redacted]	
AL02399.63	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2308	s	4128.30	6859.30	[redacted]	[redacted]	[redacted]	[redacted]	Live tow for Gallagher / Durbin
AL02399.64	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2324	e	4127.90	6859.40	[redacted]	[redacted]	[redacted]	[redacted]	
AL02499.01	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	2337	s	4127.60	6859.90	[redacted]	[redacted]	[redacted]	[redacted]	
AL02499.02	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	22	e	4127.00	6900.20	[redacted]	[redacted]	[redacted]	[redacted]	
AL02499.03	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	32	s	4126.90	6900.60	[redacted]	[redacted]	[redacted]	[redacted]	10m drifter sn#23730
					L	**O**	**C A L**				**Water**	**Cast**			
	Instr	**cast#**	**Sta#**	**Sta_std**	**Mth**	**Day**	**hhmm**	**s/e**	**Lat**	**Lon**	**Depth**	**Depth**	**PI**	**Region**	**Comments**
AL02499.04	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	33	s	4126.90	6900.50	[redacted]	[redacted]	[redacted]	[redacted]	40m drifter sn#24959
AL02499.05	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	809	e	4131.50	7040.50	[redacted]	[redacted]	[redacted]	[redacted]	Arrive Woods Hole, MA

Appendix 2. CTD Plots and Compressed Listings Of the Data.