UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
166 Water Street
Woods Hole, MA 02543

December 15, 2000

CRUISE RESULTS

NOAA Fisheries Research Vessel DELAWARE II
Cruise DE 00-08 (Parts I – IV)

Atlantic Herring Hydroacoustic Survey

CRUISE PERIOD AND AREA

The 2000 Fall Herring Acoustic Survey was conducted in four parts between September 5 and October 11, 2000. Areas of operation were the continental shelf (depths to 300 m) in the Gulf of Maine and Georges Bank regions, including the Canadian Exclusive Economic Zone on eastern Georges Bank. The FRV Delaware II spent the first day conducting acoustic calibrations dockside in Woods Hole. Shakedown and survey operations during Part I were conducted in the Jeffreys Ledge area during September 6 - 9 (Fig. 1). An overnight portcall in Portland, Maine was made during September 9 - 10 to exchange scientific staff. Survey operations continued during Part II on September 10 - 16 on offshore banks in the Gulf of Maine and northern Georges bank regions (Fig. 1). During part III, the systematic survey along the northern flank of Georges Bank was repeated using different survey designs on September 18 - 29 (Fig. 2). During Part IV, the systematic survey along northern Georges Bank was replicated two additional times on October 3 - 11 (Fig. 3). The FRV Delaware departed a day later and arrived two days early than the original Part IV schedule due to adverse weather conditions.

OBJECTIVES

Cruise objectives were to (1) shakedown instrumentation and gear, including EK500 echosounder calibrations, (2) conduct acoustic surveys of Atlantic herring (*Clupea harengus*) stocks in the Gulf of Maine and Georges Bank regions to provide fisheries independent abundance estimates, (3) ground-truth species-specific acoustic estimates using mid-water trawls and underwater video, (4) conduct an acoustic survey design experiment, (5) conduct an *in-situ* multi-frequency target strength (TS) experiment on herring, and (6) test and evaluate advanced technologies (broad-band acoustics) for improving fisheries acoustics estimates.

METHODS

Standardized NEFSC Fisheries Acoustics Survey Operations:

Fall fisheries acoustic surveys are conducted annually by the Northeast Fisheries Science Center (NEFSC) with the primary goal of estimating the abundance and biomass of selected spawning stocks of Atlantic herring in the Gulf of Maine and Georges Bank regions. Standardized NEFSC procedures for fisheries acoustic survey operations were implemented during the Fall 2000 Herring Acoustic Survey. The first day was devoted to EK500 calibrations, and the transceiver test menu was routinely checked before, during, and after each cruise to ensure the EK500 system was operating properly during survey operations. After EK500 calibrations were completed, systematic surveys along predetermined transects were conducted on selected offshore banks in the Gulf of Maine and Georges Bank regions.

Survey operations included continuous data collection along a series of systematic transects using the EK500 echo-integration, omni-directional sonar, and Scientific Computer System (SCS) throughout the cruise track and during gear deployments. Systematic surveys were conducted on historical spawning grounds of Atlantic herring in the Gulf of Maine and Georges Bank regions Midwater trawling, underwater video, and CTD deployments were routinely conducted to identify acoustic backscatter and obtain biological and oceanographic data. Biological and oceanographic samples were collected and processed according to standard NEFSC procedures. EK500 acoustic data were routinely processed at sea using the BI500 post-processor. Continuous and deployment data are linked and managed using the SCS Event Logger program throughout the cruise. If time permits, *in-situ* acoustic experiments are typically conducted to investigate the variability of the acoustic measurements in an effort to improve our population estimates. During this year's survey, the northern Georges Bank region was surveyed several times using various survey designs to determine the optimum design to adopt for future NEFSC fisheries acoustic surveys.

EK500 Calibration:

The multifrequency Simrad EK500 (v.5.30) Scientific Sounder system is the primary instrumentation used to estimate the abundance of Atlantic herring and other species of pelagic fish and squid. Calibrations of the EK500 are critical to ensure that the echo-integration system is operating properly and to obtain high precision of acoustic measurements. The FR/V Delaware's EK500 operates three downward looking hull-mounted transducers (one single-beam transducer operating at 12 kHz, and two split-beam transducers at 38 and 120 kHz). The 38 and 120 kHz split-beam transducers were successfully calibrated using the standard sphere technique. For each frequency, a calibration sphere of known target strength was suspended under each transducer. Each sphere was moved throughout the beam pattern using four remotely controlled downriggers. Due to windy conditions, calibrations were conducted alongside the Woods hole Oceanographic Institution's pier rather than in Cape Cod Bay. Gain and angle offset parameters for the 38 and 120 kHz transducers were derived using the Simrad Lobe (v.95-01-17) program, however existing survey parameters for the transducers remained unchanged given the high precision and agreements of the calibration results. The Sv gain for the 120 kHz was modified slightly from last year's settings based on the calibration tests using the integration tables. The single-beam 12 kHz transducer could not be calibrated, therefore the existing 12 kHz transducer settings were not changed. Ambient noise tests were conducted to ensure there were no cross-interference between acoustical instrumentation, and amplitude measurements from the test menu verified that the EK500 system was working properly. The EK500 operations were synchronized with the external trigger of the omni-directional sonar to eliminate acoustic cross-interference during survey operations.

EK500 Sampling Operations

The EK500 was operated continuously along the cruise tracks and during gear deployments throughout the cruise. EK500 data were collected simultaneously from three frequencies at a ping rate of every 2 seconds. The EK500 echo-integrator vertically integrates volume backscatter (Sv in units of m^2/m^3) into 0.5 m depth increments. Volume backscatter were converted to cross-sectional backscatter (Sa in units of m^2/nm^2) as a relative index of abundance along the cruise track. Individual target strength (TS) measurements are also collected by the EK500. The EK500 data were logged to the Simrad BI500 Bergen Integrator (release 1.9.1996) via TCP/IP ETHERNET line. The EK500 received its navigational input from the vessel's Scientific Computer System (SCS) PCODE output. A SUN Sparc-10 workstation operated the BI500 which logged, processed, and archived EK500 data as binary files into the UNIX-based INGRES relational database. During the cruise, the BI500 post-processor was used to filter unwanted noise and partition acoustic backscatter by species composition.

High Speed Midwater Rope Trawl (HSMRT) Sampling Operations:

The High Speed Midwater Rope Trawl (HSMRT, Gourock design R2028825A) was the main sampling gear used to verify fish backscatter identified by the EK500. The HSMRT is a four seam pelagic trawl designed with 53.1 m headrope, footrope, and breastlines. The HSMRT was rigged to 1.8 m^2 double-foiled Suberkrub-type doors with 62.4 m of upper and lower bridles/legs. The optimum tow configuration (2.5 m setback, 227 kg tomweights, intermediate door spread with two shoe weights per door) was implemented during survey operations (refer to Cruise Results DE 98-09 for further details). The mouth opening of the HSMRT is approximately 13 ± 3 m vertical and 27 ± 5 m horizontal. HSMRT deployments were targeted on selected fish backscatter along the cruise track, and HSMRT deployments were generally conducted about once per watch (i.e., every 6 hours). Deployments served to verify species composition comprising acoustic backscatter based on scattering patterns observed in acoustic echograms. Our goal was to deploy the midwater trawl about four times per 24 hour period to provide evenly spaced catch data for each area and selected backscatter layers. The HSMRT was towed at an average speed of 4.5 knots typically for 30 minutes in duration. However, tow duration often varied between 10 to 40 minutes depending on acoustic fish signals observed during the tow. Tow duration is defined as the time between setting the doors and when doors are hauled out of the water. The tow profile of the trawl was typically dropped incrementally through the water column to the desired depth of the scattering layer or about 10 m off the bottom, held at that depth for the duration depending on the fish targets observed by the trawl monitoring system, and then retrieved back to the surface.

Trawl duration, tow depths, and tow speeds were not standardized or consistent between trawls and catch data should not be used for abundance estimates. We are currently utilizing trawl catch information to verify acoustic backscatter, thus the mid-water trawl was often targeted at specific aggregations or layers in the water column. Tow depths were chosen by observing EK500 echograms and bridge real time displays for aggregation and layer depths, and also by incorporating the real time display of the FS900. Typical trawl duration was 30 minutes, however the trawl was often “dipped” into the aggregation for as little as a minute when subsampling large herring aggregations.

Midwater Trawl Monitoring:

Trawl performance was measured with a FS903 system, ITI system, and a pair of Vemco temperature-depth Minilog sensors. The Simrad FS903 Trawl Monitoring System is a third-wire device that provided real-time sonar images of the trawl opening and performance. The FS903 sonar display also showed whether fish were falling into or around the trawl opening, thus allowed the tow duration to be minimized to capture only the necessary amount of herring required for scientific samples. The Simrad ITI wireless trawl sensors were used to obtain point measurements of the trawl depth, wing spread, and door spread. Minilog depth-temperature probes were attached to the trawl headrope and footrope to provide continuous depth-temperature and trawl performance profile data for each deployment.

Biological Sampling:

The catch from each trawl was sorted by species, weighed, and measured (fork length to the nearest cm) according to standard NEFSC procedures. Additional biological sampling for Atlantic herring included individual weights (to nearest 0.1 g), fork lengths (nearest mm), stomach content analyses, and otolith samples for aging.

Furuno CSH-5 Omni-directional Sonar:

A 55-64 kHz Furuno CSH-5 Omni-directional Sonar was used during survey operations for locating fish aggregations and documenting the horizontal spatial patterns of herring schools along the transects. The CSH-5 sonar simultaneously scanned a full 360^0 with a cone-shaped receiving beam. Its beam can be tilted at various angles from the surface, and the center of its beam was usually angled 7^0 from the surface during calm weather. During rough weather, the beam tilt angle was set at 10^0 to eliminate surface noise. The vertical width of the receiving beam is 15^0 resulting in a horizontal search radius of 800 m in waters with bottom depths of around 200 m. The search radius on the display was set to 400 m during most of the survey operations. In shallow waters of less than 80 m depth, the search radius was lowered to 250 m. The omni-directional sonar operating at 55-64 kHz was identified as a source of acoustical interference with the EK500 operations during previous cruises, however this problem has been eliminated by wiring the external trigger of the omni-directional sonar to the EK500 to synchronize its ping rate. Analog images from the omni-directional sonar were obtained using a video capture-board every 30 seconds, and the files were merged with the SCS navigational data and archived.

Static Underwater Stereo Video System:

The Static Underwater Stereo Video System (SUSVS) was designed by the NEFSC Fisheries Acoustics Research Group to directly verify acoustic targets within the EK500 beam. The SUSVS was deployed midship from the forward A-frame along-side the acoustic beam of the EK500 while the FRV Delaware drifted over selected backscatter aggregations. A pair of matched underwater video cameras (DSP&L MicroSea B&W 1050) were mounted in the array to obtain stereo imagery of targets. The cameras have a low light (0.05 lux) auto adjusting iris with a 77^0 horizontal and 59^0 vertical view field. A pair of DSP&L SeaLasers 100-15 were mounted in parallel (54 mm off center) for measuring target size. Two DSP&L SeaLites provided illumination that were dimmed remotely using a 120 v voltage regulator. The real-time depth profile, temperature, compass bearing, and three-dimensional orientation of the camera system were recorded every 10 seconds using the JASCO Attitude Sensor. Real-time dual video and environmental data were recorded from the SUSVS through a 300 m multi-conductor cable to a PC computer and SVHS video recorders. Video images were transmitted through a conductor cable via portable winch system to two (one for each camera) video taping machines. Each frame was time-stamped with a time-code generator so that images from each camera can be coordinated with each other and in time. Data from the Jasco sensor were transmitted for real-time monitoring of the towbody and the data were recorded to a PC computer.

Scientific Computer System (SCS):

The FRV Delaware's Scientific Computer System (SCS) continuously collected navigational, oceanographic, and meteorological data at a rate of every 30 seconds throughout the cruise track. The SCS Event Logger program was used throughout the cruise to develop a detailed Eventlog file of start and end points of times and positions of each transect and deployment. The Eventlog also contains operational and observational comments. The Eventlog was critical for managing and linking our continuous and deployment type data. All computers, instrumentation, acoustic data collection, and data recording were synchronized according to the SCS master clock.

Survey Design Experiment:

An experiment was conducted on northern Georges Bank to examine the variability in the acoustic populations estimates for herring using various survey designs. A stratified evenly spaced transect survey design was conducted during Part II (Fig. 1). An adaptive approach was implemented to ensure that the length of the transects included the herring aggregation (i.e., a transect did not end in an area of high fish concentration). Transects (lengths and distances between transects) were chosen to cover the bathymetric features which delimit each area. Each transect was sequentially numbered and defined as a continuous cruise track with a single heading and constant ship speed. Parallel transects were defined as a series of parallel coordinated vessel tracks within a specified area. Cross-over transects were tracks perpendicular to parallel transects for traveling between parallel transects, and were generally not used for abundance estimates. Midwater trawl and CTD deployments were conducted intermittently along transects to identify acoustic backscatter and oceanographic parameters. Upon completion of a deployment, the previous transect number was resumed if the vessel continued along the track at approximately the same location and heading of the previous transect. If the vessel heading changed or the vessel did not resume near the end of the previous track, the transect number was incremented. Vessel speed during all surveys was designated at 10 knots, while actual survey speeds ranged from 8-12 knots depending on weather conditions and currents.

During Part III, a randomly selected parallel transect design was conducted in the same survey area on northern Georges Bank (Fig. 2). The next survey design implemented was a zig-zag design (Fig 2). A zig-zag design was typically used to survey an elongated area aligned with a shoreline or bathymetric contours. A zig-zag survey consists of a series of coordinated transects where the ending of the previous track and the beginning of the next track occur in the same location and the angle between transects is consistent. An advantage of a zig-zag design is the more efficient cruise track from eliminating cross-over transects, however the nodes where transects intersect must be eliminated from the population estimates.

Acoustic Data Collection and Post-Processing:

The primary acoustic data used for population estimates of Atlantic herring were collected with the Simrad EK500 scientific echosounder (v.5.30) operating three hull mounted transducers (a 12 kHz single-beam and 38 and 120 kHz split-beam transducers). The three frequencies were transmitted simultaneously at a ping rate of one ping per two seconds. EK500 data were simultaneously transmitted to a Sun Sparc 5 workstation and a PC computer for storage and post-processing. EK500 data consist of echogram data (binary files with acoustic signals vertically integrated into 0.5 m bins) and a relational INGRES database. EK500 data were post-processed on the Sun workstation using Simrad's BI500 (v.1.9.1996) post-processing package during the cruise. Post-processing included removing bottom interference from the water column signal and apportioning acoustic backscatter to species composition. Data for all three frequencies were post-processed and apportioned to herring backscatter while at sea based on midwater trawl catches, target strength distributions, and backscattering patterns of aggregations. The 38 kHz data was the primary data used for post-processing and deriving population estimates, and the 12 and 120 kHz data were post-processed identically for multifrequency analyses. After post-processing the data at sea, the EK500 data (echogram files and the INGRES database) were downloaded to a shore-based computer at NEFSC for archiving upon the completion of each cruise part. These data will be further processed at the laboratory and loaded into the NEFSC Oracle data management system. EK500 data was also logged and post-processed at sea using the SonarData EchoLog and EchoView software packages (v.1.2), and evaluate the future implementation of this new acoustic post-processor.

The EK500 processed each acoustic signal (ping) by correcting for beam pattern effects, calibration constants, and hardware gains, and then vertically integrated the data into 0.5 m bins (echogram data). Each half-meter bin is volume backscatter (s_v) with units of m^2/m^3 and is a quantitative measure of relative density. The minimum volume backscatter threshold of -66 dB (dB = 10 $\log_{10}(s_v)$ was used to remove acoustic scattering by non-swimbladdered fish, invertebrates, and zooplankton from the backscatter by swimbladdered fish (e.g., herring). For preliminary data analysis and diagnostics, volume backscatter was vertically integrated from a specified depth below the surface ("bubble layer") to 0.5 m above the bottom. Data between the surface and the bubble layer were not included in the analysis to eliminate scattering by surface bubbles and noise. The bubble layer was set to 10 m for the 38 and 120 kHz data. The bubble layer was set to 32 m for the 12 kHz data as the upper 32 m of the 12 kHz data have significant noise from the "ring-down" of the transducer. Vertical integration of volume backscatter from the bubble layer to the bottom gives areal density estimates (s_a) with units of m^2/m^2 for all scatterers in the water column. The BI500 then scales these density estimates from m^2/m^2 to nautical mile squared ($m^2/nm^2 = s_a * 1852\ m^2/nm^2$). We calculate s_a at 0.5 nautical mile intervals. s_a values are an index of relative areal density, and further analysis is required to produce numeric abundance and biomass estimates for a survey area.

<u>Other Data</u>: Conductivity-temperature-depth (CTD) were conducted throughout the cruise, generally at the transect nodes and locations of gear deployment. During part II of the cruise, Gerald Denny of Scientific Fisheries Incorporated (Anchorage, Alaska), conducted acoustic measurements with a broadband acoustic system. His towbody was suspended from the forward A-frame while the FR/V Delaware was drifting. Acoustic data from the broadband system was collected and analyzed using a Scientific Fisheries software package.

RESULTS

Departure was delayed one day due to northerly winds, therefore EK500 calibrations were conducted dockside along the Woods Hole Oceanographic Institution pier between September 5th at 23:00 and September 6th at 06:00 (all times herein are GMT). The 120 and 38 kHz split-beam transducers were accurately calibrated, but the 12 kHz single-beam transducer could not be calibrated. Transceiver settings for gains and offset parameters remained unchanged from previous surveys except for a slight modification to the Sv gain of the 120 kHz. The FR/V Delaware departed Woods Hole, MA on September 6th at 13:15 to begin Part I of the Fall 2000 Herring Acoustic Survey.

<u>Part I Operations</u>:

Shakedown operations and systematic surveys were conducted in the Gulf of Maine region during Part I (Fig. 1). Midwater trawl and acoustic shakedown operations were completed in the Wilkinson Basin area (around 42^{0}45'N 69^{0}52'W) between September 6 at 22:34 and September 7 at 03:12. The Jeffreys Ledge survey (transects 1 - 31) was completed between September 7 at 04:53 and September 8 at 12:24. The Platts Bank survey (transects 33 - 43) was completed between September 8 at 14:29 and 23:45. The last survey to be completed during Part I was Fippennies Ledge (transects 45 - 53) during September 9 at 01:41 - 07:49. The first four midwater trawl deployments (consecutive deployment numbers 1 - 4) were aborted due to harness and cable connection problems of the FS903 trawl monitoring system. A midwater trawl was successfully completed on Jeffreys Ledge (deployment 5) and Platts Bank (deployment 6). Some Atlantic herring were observed on Jeffreys Ledge, while aggregations of herring were not observed in the Platts Bank and Fippennies Ledge regions. An underwater video deployment (deployment 7) on Fippennies Ledge was unsuccessful due to cable wiring problems. The FRV Delaware arrived in Portland, ME on September 9 at 16:00 to exchange scientific staff.

Part II Operations:

Part II began when the FRV Delaware departed Portland, ME on September 10th at 14:00. Cashes Ledge was surveyed (transects 54 - 70) from September 10 at 22:51 to September 11 at 10:06. Midwater trawl deployment 8 on Cashes Ledge captured mostly silver hake. Some potential herring backscatter was observed on Cashes Ledge. Trawl deployment 9 was aborted due to FS903 disconnection, and trawl deployment 10 was a test tow to ensure the FS903 was operational. The Cashes Ledge survey (transects 54 - 70) was completed on September 11 at 10:07. The first systematic survey of evenly spaced parallel transects along the northern flank of Georges Bank began on September 11 at 23:19. EK500 settings were changed from a depth range of 250 m to 500 m with 1.0 m resolution. Trawl deployment 12 captured mainly silver hake and juvenile butterfish, while trawl deployment 11 was aborted due to the FS903 connection problems. The vessel intermittently stopped and drifted on aggregations of herring to collect acoustic target strength measurements with the EK500 (deployments 13, 20, 25, 29, and 33) and broadband acoustic measurements (deployments 14, 21, 26, and 30). An underwater video (deployment 15) was attempted, but aborted due to pigtail wiring problems. Conductivity-Temperature-Depth (CTD) profiles (deployments 16, 19, 22, 23, 27, and 31) were conducted at the end of selected transects and deployment sites. Midwater trawling (deployments 17, 18, 24, 28, 32, 34) confirmed that Atlantic herring was the predominant pelagic fish species in the Georges Bank survey area. The first evenly spaced parallel transect survey (transects 72 - 105) was completed on September 16 at 04:28 ending Part II.

Part III Operations:

Part III began upon departing Woods Hole, MA on September 18, and the second survey on Georges Bank using a random stratified parallel design began on September 19 at 03:06. During this survey, 33 CTD profiles (deployments 37-37, 39, 40, 42, 44-47, 49-53, 55, 56, 59-61, 63-67, 69-70, 72-74, 76-79) and 12 midwater trawls (deployments 38, 41, 43, 46, 48, 54, 57, 58, 62, 68, 71, 75) were successfully completed. The random stratified parallel survey (transects 106 - 132) was completed on September 24 at 00:16. The FRV Delaware began a zig-zag transect survey (transects 133 - 155) on September 24 at 00:50. The zig-zag survey design was completed on September 29 at 03:31.

Part IV Operations:

The FRV Delaware departed Woods Hole on October 3 to begin part IV. A systematic survey of evenly spaced parallel transects (transects 156 - 168) was repeated beginning on October 4 at 02:21 to compare intra-variability within the evenly spaced parallel transect survey design. This second survey using the evenly spaced parallel design was completed on October 6 at 17:02, and a third replicate survey (transects 169 - 181) using the same design began at 17:08. The third survey using the evenly spaced parallel transects ended on October 8 at 20:59. We began a series of night/day comparisons along an experimental transect (184 - 187) on northern Georges Bank on September 9 at 02:47. Operations were curtailed for about 20 m hours due to rough seas exceeding 2 m. The night/day comparisons (188-189) resumed on October 10 at 14:45. Rough seas once again stopped acoustic operations on October 11 at 00:40, and the FRV Delaware slowly (5 kts) worked towards Woods Hole by conducting the final transects (190 - 191) along the 150 m contour of northern Georges Bank. The FRV Delaware arrived in Woods Hole on October 11 at 22:00, approximately 1½ days earlier than originally scheduled.

In summary, the Fall 2000 Herring Acoustic Survey successfully completed the primary objectives. Approximately 4,876 nautical miles of acoustic transects were completed in the Gulf of Maine and Georges Bank regions. Preliminary abundance estimates indicate a large biomass of herring were present along northern Georges Bank throughout the cruise period, while a relatively low biomass of herring were observed in the Gulf of Maine along our cruise track. A total of 164 gear deployments were conducted throughout the cruise, with 49 midwater trawl deployments (Table 1). The predominant pelagic fish captured was Atlantic herring, particularly in the northern Georges Bank region. Additional effort was made this year to collect salinity-temperature-depth profiles with 103 CTD deployments. More routine CTD deployments will be implemented during future acoustic surveys to investigate interannual variability in the density distributions of herring and other pelagic fish and squid in relation to environmental anomalies. Underwater video operations were unsuccessful this year due to cable/pig-tail wiring problems resulting from modifications of the platform to meet multiple objectives. The main problem occurred from a Pan-tilt AC and JASCO Attitude Sensor DC ground sharing the same conductor which caused NEMA and video interference. This wiring problem will be resolved in time for the next cruise by adopting a universal pigtail that can be used for fisheries acoustic, habitat assessment, and gear selectivity operations. There was excellent progress with experimental work with broadband acoustics during the second leg. Broadband acoustical data was collected on a variety of aggregations, including Atlantic herring. Broadband acoustics is an advanced technology under development which has the potential for increased capability to classify species-specific backscatter.

Considerable effort was devoted this year to repeating the northern Georges Bank survey using various survey designs (i.e., stratified evenly spaced parallel transects, randomly selected parallel transects, and zig-zag transects) in an effort to determine an optimal design. Preliminary results suggested that the random selected transect design had less variability than the other designs. The evenly spaced design was also repeated three times to investigate the intra-variability with a given design. The successful completion of this survey design experiment will help to provide us with confidence intervals on our future acoustic population estimates.

DISPOSITION OF DATA

All data and results are archived at the Northeast Fisheries Science Center. Results will be presented and data distribution on CD-ROM at an annual Northwest Atlantic Herring Acoustic Workshop in conjunction with scientists from the Canadian Department of Fisheries and Oceans.

SCIENTIFIC PERSONNEL

National Marine Fisheries Service, NEFSC, Woods Hole, MA

William Michaels	Chief Scientist	Parts I, IV
Michael Jech	Research Fisheries Biologist (Chief Scientist - II, III)	Parts I, II, III, IV
William Overholtz	Research Fisheries Biologist	Part III
Amy Williams	Research Fisheries Biologist	Part III
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Bruce Burns	Fisheries Biologist	Part IV

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Kara Dwyer	Bioacoustical Technician	Parts I, II, III, IV
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Matt Beaton	Student Volunteer	Part III
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John Hone	Student Volunteer	Part IV

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Part I	September 5-9, 2000
Part II	September 10-16, 2000
Part III	September 18-29, 2000
Part IV	October 3-11, 2000

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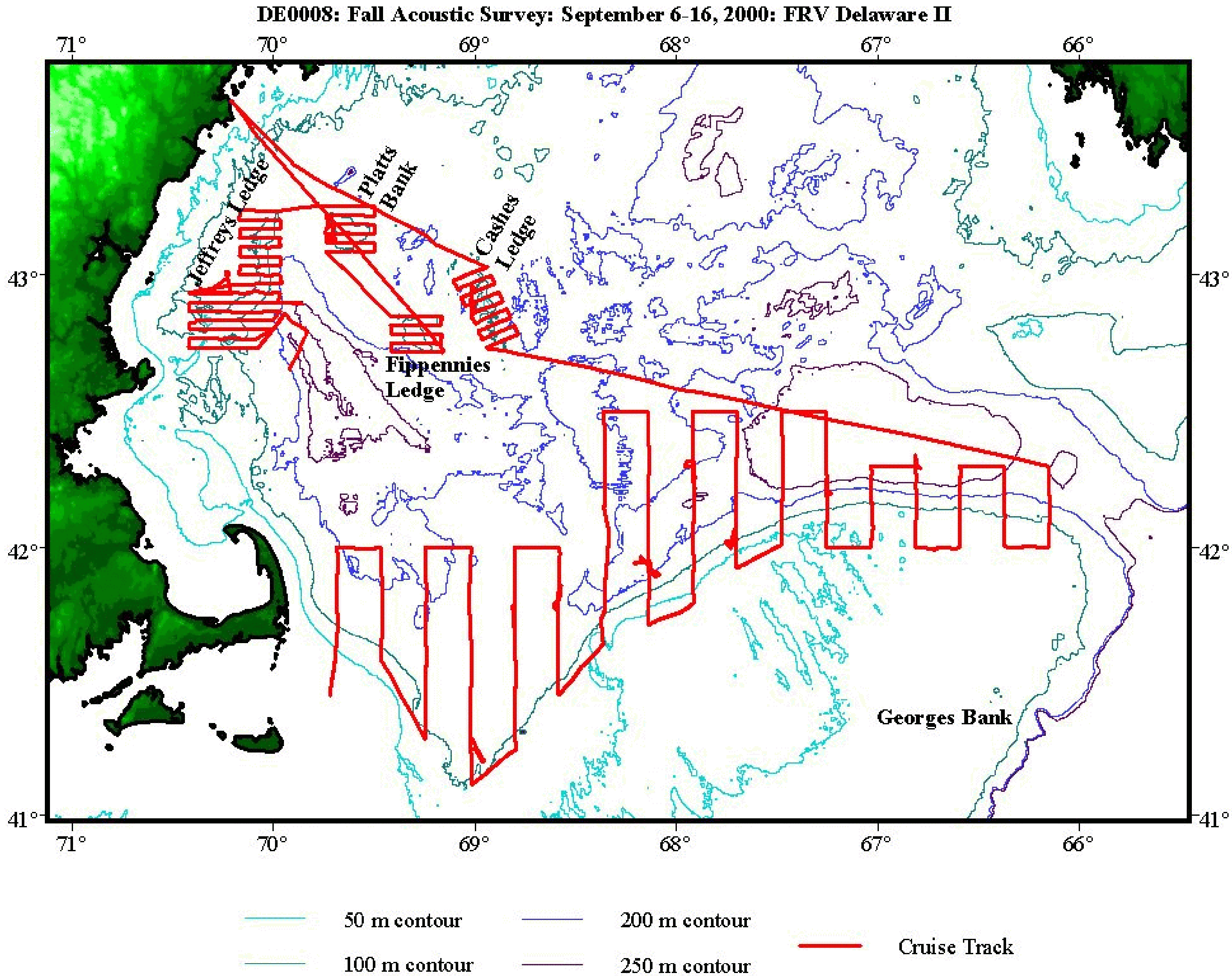

Figure 1. Cruise track for Parts I and II of the Fall 2000 Atlantic Herring Hydroacoustic Survey cruise DE 00-08 during September 5 - 16, 2000.

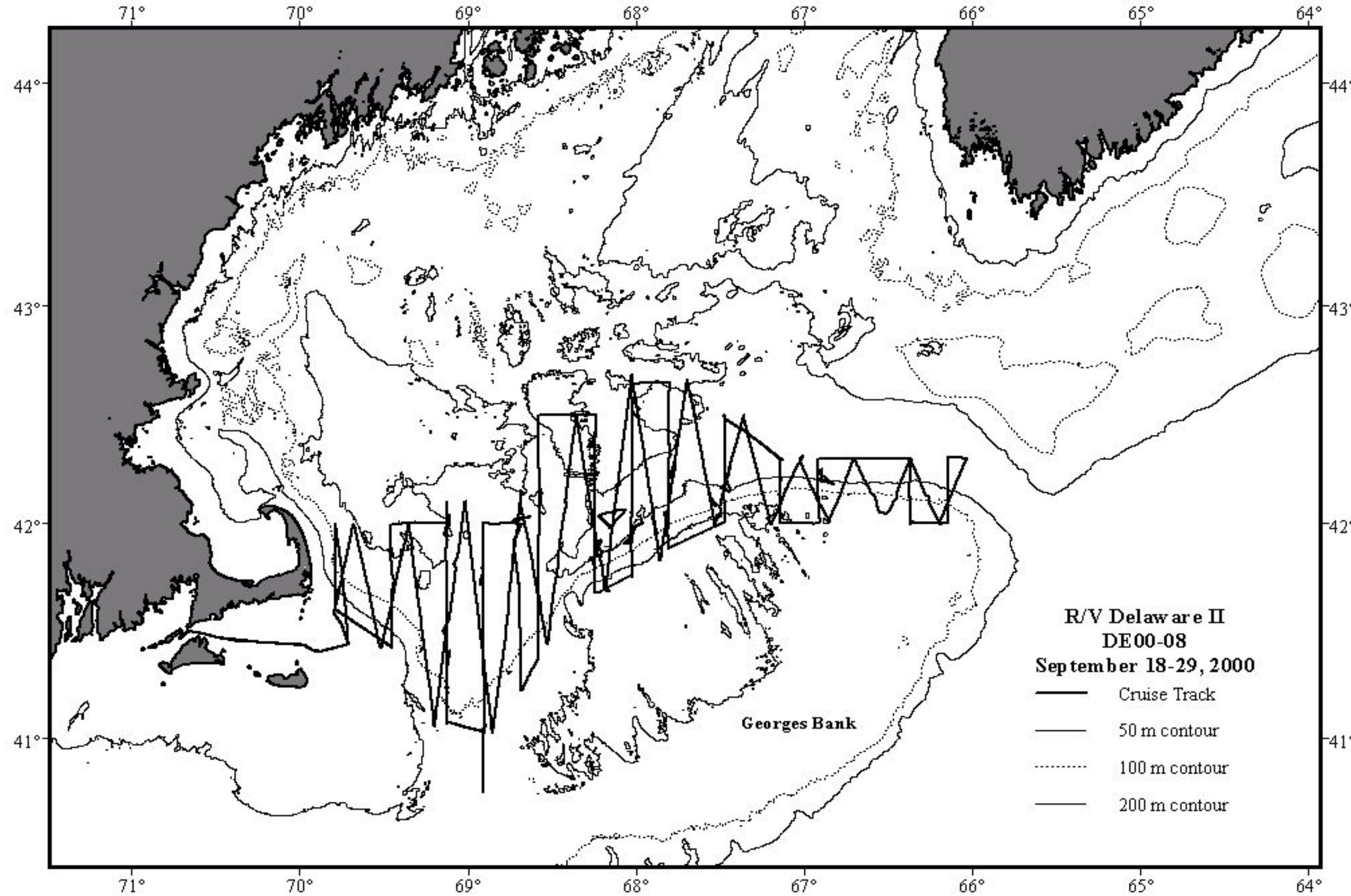

Figure 2. Cruise track for Part III of the Fall 2000 Atlantic Herring Hydroacoustic Survey cruise DE 00-08 during September 18 - 29, 2000.

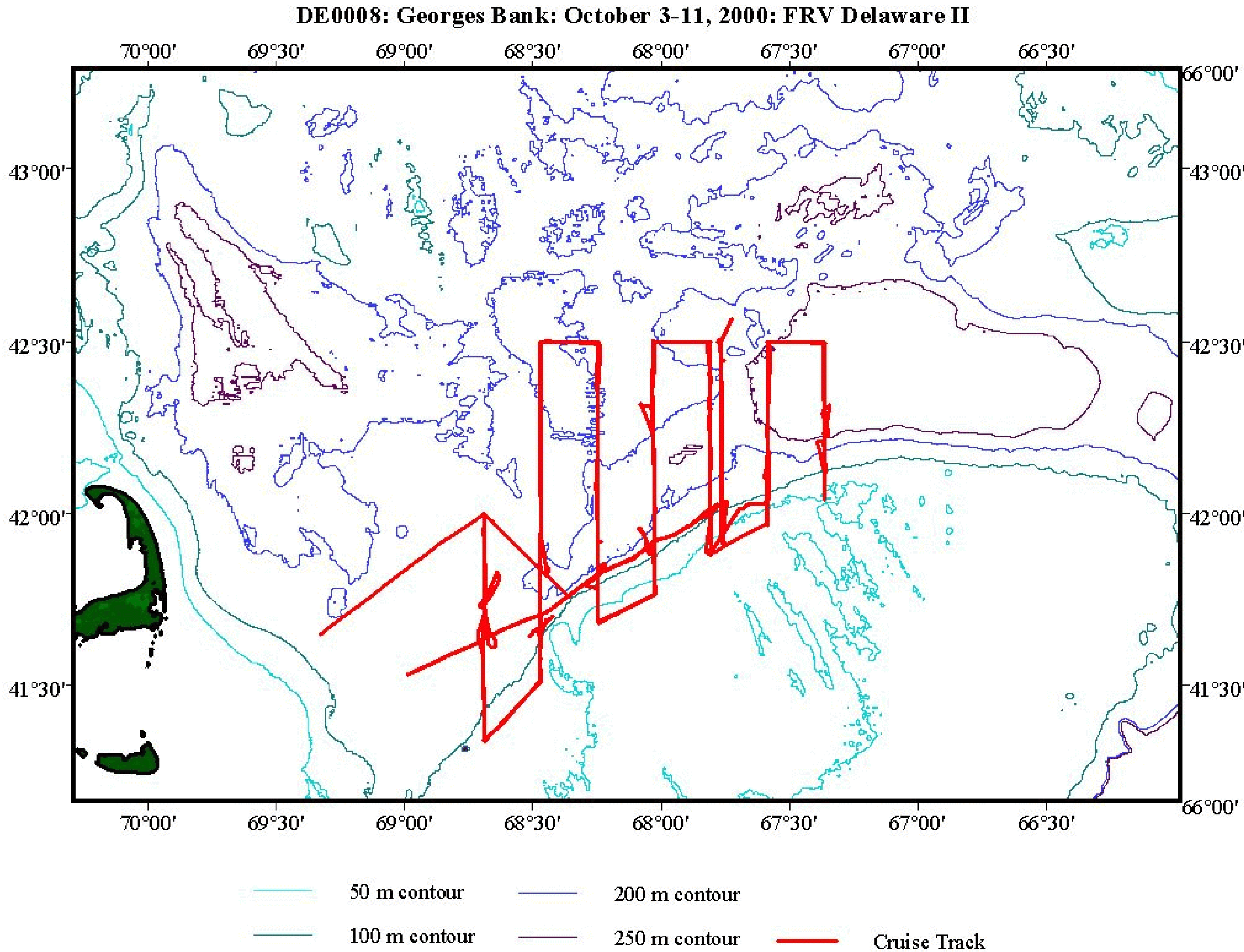

Figure 3. Cruise track for Part IV of the Fall 2000 Atlantic Herring Hydroacoustic Survey cruise DE 00-08 during October 3 - 11, 2000.

Table 1. Deployment table for the Fall 2000 Atlantic Herring Hydroacoustic Survey

Cruise	Date	Time-GMT	Duration	Latitude	Longitude	Gear-deployment	Deploy#	EK-vlog	Region	Survey_design
DE0008-1	9/7/00	1:15:25	0:23:58	4245.84	-6951.04	HSMRT Trawl	1	19.46	Wilkinson_Basin	Shakedown
DE0008-1	9/7/00	2:33:53	0:38:32	4249.05	-6952.76	HSMRT Trawl	2	23.95	Wilkinson_Basin	Shakedown
DE0008-1	9/7/00	17:18:31	0:14:02	4253.81	-6951.96	HSMRT Trawl	3	161.28	Jeffreys_Ledge	Even-parallel
DE0008-1	9/7/00	20:42:19	0:06:12	4256.10	-7016.33	HSMRT Trawl	4	193.01	Jeffreys_Ledge	Even-parallel
DE0008-1	9/7/00	23:01:55	0:47:34	4257.42	-7017.37	HSMRT Trawl	5	201.25	Jeffreys_Ledge	Even-parallel
DE0008-1	9/8/00	19:56:36	0:37:04	4310.67	-6941.87	HSMRT Trawl	6	390.10	Platts_Bank	Even-parallel
DE0008-1	9/9/00	8:20:36	0:14:41	4243.27	-6909.42	Underwater Video	7	504.93	Fippennies_Ledge	Even-parallel
DE0008-2	9/11/00	2:53:10	0:25:03	4256.39	-6900.61	HSMRT Trawl	8	666.81	Cashes_Ledge	Even-parallel
DE0008-2	9/11/00	3:45:16	0:17:24	4253.29	-6900.79	HSMRT Trawl	9	670.03	Cashes_Ledge	Even-parallel
DE0008-2	9/11/00	15:39:22	0:15:00	4234.38	-6754.64	HSMRT Trawl	10	777.62	Gulf_of_Maine	Shakedown
DE0008-2	9/12/00	9:55:13	0:00:04	4218.82	-6648.45	HSMRT Trawl	11	963.58	Georges_Bank	Stratified-parallel
DE0008-2	9/12/00	16:23:43	0:32:24	4214.20	-6715.22	HSMRT Trawl	12	1021.95	Georges_Bank	Stratified-parallel
DE0008-2	9/13/00	0:51:21	0:15:46	4201.03	-6743.64	TS Measurements	13	1106.01	Georges_Bank	Stratified-parallel
DE0008-2	9/13/00	1:33:49	1:18:49	4200.88	-6743.54	Broadband Acoustics	14	1107.70	Georges_Bank	Stratified-parallel
DE0008-2	9/13/00	3:01:04	0:23:22	4201.09	-6743.45	Underwater Video	15	1109.72	Georges_Bank	Stratified-parallel
DE0008-2	9/13/00	3:32:15	0:13:25	4201.38	-6743.18	CTD Profile	16	1110.24	Georges_Bank	Stratified-parallel
DE0008-2	9/13/00	4:29:59	0:42:54	4201.71	-6742.73	HSMRT Trawl	17	1113.34	Georges_Bank	Stratified-parallel
DE0008-2	9/13/00	12:21:32	0:43:15	4215.72	-6754.45	HSMRT Trawl	18	1179.52	Georges_Bank	Stratified-parallel
DE0008-2	9/13/00	14:12:50	0:16:30	4218.06	-6755.13	CTD Profile	19	1186.90	Georges_Bank	Stratified-parallel
DE0008-2	9/13/00	20:26:23	0:13:26	4156.95	-6808.04	TS Measurements	20	1244.51	Georges_Bank	Stratified-parallel
DE0008-2	9/13/00	21:03:11	0:44:47	4155.50	-6807.65	Broadband Acoustics	21	1246.37	Georges_Bank	Stratified-parallel
DE0008-2	9/13/00	22:05:45	0:17:33	4153.56	-6806.22	CTD Profile	22	1248.71	Georges_Bank	Stratified-parallel
DE0008-2	9/13/00	23:11:44	0:23:13	4155.75	-6808.02	CTD Profile	23	1253.61	Georges_Bank	Stratified-parallel
DE0008-2	9/14/00	0:24:11	1:15:07	4156.84	-6809.50	HSMRT Trawl	24	1258.56	Georges_Bank	Stratified-parallel
DE0008-2	9/14/00	15:24:39	0:20:08	4147.70	-6835.08	TS Measurements	25	1404.26	Georges_Bank	Stratified-parallel
DE0008-2	9/14/00	16:23:27	0:49:22	4146.35	-6835.45	Broadband Acoustics	26	1407.53	Georges_Bank	Stratified-parallel
DE0008-2	9/14/00	17:27:45	0:14:36	4145.94	-6835.73	CTD Profile	27	1408.73	Georges_Bank	Stratified-parallel
DE0008-2	9/14/00	18:10:44	0:52:58	4147.56	-6835.24	HSMRT Trawl	28	1410.52	Georges_Bank	Stratified-parallel
DE0008-2	9/14/00	23:03:51	0:16:50	4144.38	-6848.13	TS Measurements	29	1452.59	Georges_Bank	Stratified-parallel
DE0008-2	9/14/00	23:35:03	0:18:05	4144.85	-6848.12	Broadband Acoustics	30	1453.44	Georges_Bank	Stratified-parallel
DE0008-2	9/15/00	0:00:20	0:16:41	4145.20	-6848.21	CTD Profile	31	1453.93	Georges_Bank	Stratified-parallel
DE0008-2	9/15/00	1:14:50	0:19:57	4143.99	-6848.42	HSMRT Trawl	32	1459.85	Georges_Bank	Stratified-parallel
DE0008-2	9/15/00	8:12:15	0:18:06	4117.60	-6901.28	TS Measurements	33	1518.69	Georges_Bank	Stratified-parallel
DE0008-2	9/15/00	9:29:40	0:25:55	4114.44	-6859.49	HSMRT Trawl	34	1523.16	Georges_Bank	Stratified-parallel
DE0008-3	9/19/00	3:24:59	0:00:26	4200.06	-6947.55	CTD Profile	35	1729.60	Georges_Bank	Random-parallel
DE0008-3	9/19/00	6:22:51	0:00:06	4135.99	-6947.20	CTD Profile	36	1754.30	Georges_Bank	Random-parallel
DE0008-3	9/19/00	8:11:26	0:12:28	4125.68	-6927.41	CTD Profile	37	1772.42	Georges_Bank	Random-parallel
DE0008-3	9/19/00	11:11:03	0:14:33	4153.59	-6927.64	HSMRT Trawl	38	1801.01	Georges_Bank	Random-parallel
DE0008-3	9/19/00	12:53:43	0:22:29	4159.88	-6927.85	CTD Profile	39	1812.72	Georges_Bank	Random-parallel
DE0008-3	9/19/00	15:17:58	0:22:04	4205.86	-6907.66	CTD Profile	40	1833.86	Georges_Bank	Random-parallel

Cruise	Date	Time-GMT	Duration	Latitude	Longitude	Gear-deployment	Deploy#	EK-vlog	Region	Survey_design
DE0008-3	9/19/00	17:01:07	0:46:00	4158.08	-6907.93	HSMRT Trawl	41	1844.98	Georges_Bank	Random-parallel
DE0008-3	9/19/00	22:37:54	0:15:13	4119.14	-6907.51	CTD Profile	42	1893.23	Georges_Bank	Random-parallel
DE0008-3	9/19/00	23:26:50	1:09:23	4120.31	-6907.38	HSMRT Trawl	43	1894.87	Georges_Bank	Random-parallel
DE0008-3	9/20/00	2:58:11	0:14:42	4104.32	-6907.65	CTD Profile	44	1920.33	Georges_Bank	Random-parallel
DE0008-3	9/20/00	6:42:15	0:06:37	4045.30	-6854.83	CTD Profile	45	1948.87	Georges_Bank	Random-parallel
DE0008-3	9/20/00	8:31:27	0:14:46	4101.61	-6854.39	HSMRT Trawl	46	1965.20	Georges_Bank	Random-parallel
DE0008-3	9/20/00	14:27:00	0:21:24	4148.16	-6854.77	CTD Profile	47	2017.39	Georges_Bank	Random-parallel
DE0008-3	9/20/00	15:07:38	0:51:15	4146.95	-6854.84	HSMRT Trawl	48	2018.99	Georges_Bank	Random-parallel
DE0008-3	9/20/00	18:10:28	0:07:35	4200.07	-6854.91	CTD Profile	49	2040.40	Georges_Bank	Random-parallel
DE0008-3	9/20/00	19:30:03	0:10:32	4159.92	-6841.15	CTD Profile	50	2051.02	Georges_Bank	Random-parallel
DE0008-3	9/21/00	0:27:16	0:10:14	4113.74	-6841.11	CTD Profile	51	2098.89	Georges_Bank	Random-parallel
DE0008-3	9/21/00	1:50:18	0:07:19	4122.93	-6834.90	CTD Profile	52	2110.06	Georges_Bank	Random-parallel
DE0008-3	9/21/00	3:44:43	0:18:26	4139.88	-6834.81	CTD Profile	53	2127.40	Georges_Bank	Random-parallel
DE0008-3	9/21/00	4:33:38	0:26:54	4138.59	-6834.75	HSMRT Trawl	54	2129.32	Georges_Bank	Random-parallel
DE0008-3	9/21/00	10:39:40	0:19:33	4230.03	-6834.66	CTD Profile	55	2185.51	Georges_Bank	Random-parallel
DE0008-3	9/21/00	12:31:57	0:19:33	4229.96	-6814.68	CTD Profile	56	2200.86	Georges_Bank	Random-parallel
DE0008-3	9/21/00	14:22:28	0:43:50	4220.89	-6814.64	HSMRT Trawl	57	2213.41	Georges_Bank	Random-parallel
DE0008-3	9/21/00	20:07:44	0:49:48	4151.34	-6814.64	HSMRT Trawl	58	2256.89	Georges_Bank	Random-parallel
DE0008-3	9/21/00	23:05:25	0:12:14	4140.89	-6814.62	CTD Profile	59	2276.83	Georges_Bank	Random-parallel
DE0008-3	9/22/00	0:28:05	0:12:10	4145.75	-6801.73	CTD Profile	60	2288.04	Georges_Bank	Random-parallel
DE0008-3	9/22/00	2:15:30	0:28:06	4159.24	-6801.67	CTD Profile	61	2302.61	Georges_Bank	Random-parallel
DE0008-3	9/22/00	5:52:28	0:36:01	4157.01	-6801.75	HSMRT Trawl	62	2312.29	Georges_Bank	Random-parallel
DE0008-3	9/22/00	12:20:20	0:23:26	4238.82	-6801.65	CTD Profile	63	2360.91	Georges_Bank	Random-parallel
DE0008-3	9/22/00	13:44:17	0:20:34	4238.82	-6748.61	CTD Profile	64	2371.02	Georges_Bank	Random-parallel
DE0008-3	9/22/00	18:45:13	0:03:56	4153.02	-6748.64	CTD Profile	65	2417.84	Georges_Bank	Random-parallel
DE0008-3	9/22/00	20:37:16	0:04:13	4200.77	-6728.40	CTD Profile	66	2435.14	Georges_Bank	Random-parallel
DE0008-3	9/22/00	22:04:50	0:32:03	4214.38	-6728.51	CTD Profile	67	2448.93	Georges_Bank	Random-parallel
DE0008-3	9/22/00	23:22:36	0:35:45	4211.84	-6728.38	HSMRT Trawl	68	2451.83	Georges_Bank	Random-parallel
DE0008-3	9/23/00	2:42:36	0:27:10	4229.75	-6728.58	CTD Profile	69	2477.07	Georges_Bank	Random-parallel
DE0008-3	9/23/00	5:00:10	0:20:59	4217.85	-6708.35	CTD Profile	70	2496.39	Georges_Bank	Random-parallel
DE0008-3	9/23/00	6:53:08	0:24:10	4209.80	-6708.60	HSMRT Trawl	71	2508.47	Georges_Bank	Random-parallel
DE0008-3	9/23/00	9:21:21	0:00:10	4200.05	-6708.60	CTD Profile	72	2524.07	Georges_Bank	Random-parallel
DE0008-3	9/23/00	10:30:02	0:21:33	4200.09	-6655.03	CTD Profile	73	2533.49	Georges_Bank	Random-parallel
DE0008-3	9/23/00	12:18:34	0:33:33	4214.59	-6655.32	CTD Profile	74	2547.60	Georges_Bank	Random-parallel
DE0008-3	9/23/00	13:30:35	0:33:24	4213.35	-6653.66	HSMRT Trawl	75	2550.56	Georges_Bank	Random-parallel
DE0008-3	9/23/00	15:41:31	0:32:23	4217.92	-6655.22	CTD Profile	76	2564.37	Georges_Bank	Random-parallel
DE0008-3	9/23/00	20:40:18	0:06:12	4200.05	-6622.16	CTD Profile	77	2605.06	Georges_Bank	Random-parallel
DE0008-3	9/23/00	21:55:41	0:10:03	4200.15	-6608.70	CTD Profile	78	2615.29	Georges_Bank	Random-parallel
DE0008-3	9/23/00	23:46:18	0:28:46	4218.02	-6608.77	CTD Profile	79	2632.50	Georges_Bank	Random-parallel
DE0008-3	9/24/00	2:42:53	0:10:21	4159.96	-6611.67	CTD Profile	80	2657.48	Georges_Bank	Zig-zag
DE0008-3	9/24/00	5:14:21	0:20:05	4218.19	-6622.22	CTD Profile	81	2678.65	Georges_Bank	Zig-zag
DE0008-3	9/24/00	7:23:52	0:06:10	4202.72	-6631.08	CTD Profile	82	2696.51	Georges_Bank	Zig-zag
DE0008-3	9/24/00	9:24:46	0:16:26	4218.06	-6641.98	CTD Profile	83	2714.78	Georges_Bank	Zig-zag
DE0008-3	9/24/00	12:03:41	0:07:54	4200.24	-6651.26	CTD Profile	84	2735.04	Georges_Bank	Zig-zag

Cruise	Date	Time-GMT	Duration	Latitude	Longitude	Gear-deployment	Deploy#	EK-vlog	Region	Survey_design
DE0008-3	9/24/00	14:14:03	0:32:30	4217.99	-6701.74	CTD Profile	85	2754.72	Georges_Bank	Zig-zag
DE0008-3	9/24/00	22:09:10	0:33:19	4230.02	-6721.92	CTD Profile	86	2808.28	Georges_Bank	Zig-zag
DE0008-3	9/25/00	1:03:14	0:21:19	4210.36	-6728.48	CTD Profile	87	2829.29	Georges_Bank	Zig-zag
DE0008-3	9/25/00	2:03:53	0:56:47	4212.24	-6727.78	HSMRT Trawl	88	2831.80	Georges_Bank	Zig-zag
DE0008-3	9/25/00	5:29:34	0:04:31	4159.74	-6731.85	CTD Profile	89	2853.72	Georges_Bank	Zig-zag
DE0008-3	9/25/00	7:09:38	0:20:12	4206.76	-6733.27	HSMRT Trawl	90	2864.88	Georges_Bank	Zig-zag
DE0008-3	9/25/00	12:12:06	0:20:57	4239.90	-6741.86	CTD Profile	91	2903.37	Georges_Bank	Zig-zag
DE0008-3	9/25/00	15:25:27	0:23:03	4212.15	-6747.15	CTD Profile	92	2932.14	Georges_Bank	Zig-zag
DE0008-3	9/25/00	16:18:18	0:48:32	4213.29	-6746.65	HSMRT Trawl	93	2933.99	Georges_Bank	Zig-zag
DE0008-3	9/25/00	19:26:21	0:13:13	4200.32	-6749.32	CTD Profile	94	2956.36	Georges_Bank	Zig-zag
DE0008-3	9/25/00	20:06:08	0:37:01	4200.64	-6748.95	HSMRT Trawl	95	2957.66	Georges_Bank	Zig-zag
DE0008-3	9/25/00	22:32:27	0:07:09	4149.78	-6751.40	CTD Profile	96	2974.59	Georges_Bank	Zig-zag
DE0008-3	9/25/00	23:53:02	0:20:54	4202.17	-6753.83	CTD Profile	97	2987.30	Georges_Bank	Zig-zag
DE0008-3	9/26/00	0:48:04	0:31:46	4200.12	-6753.56	HSMRT Trawl	98	2989.89	Georges_Bank	Zig-zag
DE0008-3	9/26/00	6:18:02	0:13:38	4241.03	-6801.59	CTD Profile	99	3037.61	Georges_Bank	Zig-zag
DE0008-3	9/26/00	10:52:35	0:26:15	4158.54	-6808.49	CTD Profile	100	3080.62	Georges_Bank	Zig-zag
DE0008-3	9/26/00	13:09:02	0:33:21	4203.43	-6807.64	HSMRT Trawl	101	3091.43	Georges_Bank	Zig-zag
DE0008-3	9/26/00	17:16:11	0:02:48	4141.64	-6811.22	CTD Profile	102	3120.83	Georges_Bank	Zig-zag
DE0008-3	9/27/00	15:18:08	0:23:05	4202.05	-6837.99	CTD Profile	103	3288.56	Georges_Bank	Zig-zag
DE0008-3	9/27/00	16:12:27	0:46:55	4201.54	-6839.57	HSMRT Trawl	104	3290.44	Georges_Bank	Zig-zag
DE0008-3	9/27/00	23:20:42	0:12:53	4101.53	-6851.20	CTD Profile	105	3357.03	Georges_Bank	Zig-zag
DE0008-3	9/28/00	5:41:20	0:12:18	4206.21	-6900.96	CTD Profile	106	3422.61	Georges_Bank	Zig-zag
DE0008-3	9/28/00	20:03:49	0:02:30	4125.61	-6931.06	CTD Profile	107	3579.52	Georges_Bank	Zig-zag
DE0008-3	9/29/00	0:17:32	0:18:40	4159.94	-6940.95	CTD Profile	108	3614.91	Georges_Bank	Zig-zag
DE0008-3	9/29/00	2:59:59	0:26:05	4136.18	-6947.75	CTD Profile	109	3639.66	Georges_Bank	Zig-zag
DE0008-4	10/4/00	2:23:54	0:11:38	4159.74	-6841.33	CTD Profile	110	3677.17	Georges_Bank	Even-parallel-1
DE0008-4	10/4/00	4:25:45	0:20:07	4143.85	-6842.16	CTD Profile	111	3693.75	Georges_Bank	Even-parallel-1
DE0008-4	10/4/00	5:21:25	0:44:24	4145.33	-6840.11	HSMRT Trawl	112	3696.37	Georges_Bank	Even-parallel-1
DE0008-4	10/4/00	9:46:44	0:12:05	4120.15	-6841.42	CTD Profile	113	3732.17	Georges_Bank	Even-parallel-1
DE0008-4	10/4/00	11:26:13	0:08:35	4130.49	-6828.14	CTD Profile	114	3746.89	Georges_Bank	Even-parallel-1
DE0008-4	10/4/00	12:51:27	0:10:16	4142.16	-6825.32	CTD Profile	115	3759.70	Georges_Bank	Even-parallel-1
DE0008-4	10/4/00	13:31:28	0:30:33	4141.50	-6825.98	HSMRT Trawl	116	3760.82	Georges_Bank	Even-parallel-1
DE0008-4	10/4/00	15:46:05	0:30:46	4140.81	-6827.01	TS Measurements	117	3769.14	Georges_Bank	Even-parallel-1
DE0008-4	10/4/00	18:22:12	0:15:18	4156.29	-6828.26	CTD Profile	118	3791.32	Georges_Bank	Even-parallel-1
DE0008-4	10/4/00	19:12:23	0:54:06	4154.54	-6827.62	HSMRT Trawl	119	3793.56	Georges_Bank	Even-parallel-1
DE0008-4	10/5/00	0:43:59	0:16:32	4229.95	-6828.01	CTD Profile	120	3839.23	Georges_Bank	Even-parallel-1
DE0008-4	10/5/00	2:01:13	0:13:43	4229.91	-6814.73	CTD Profile	121	3849.30	Georges_Bank	Even-parallel-1
DE0008-4	10/5/00	6:47:18	0:11:56	4147.43	-6817.50	CTD Profile	122	3894.77	Georges_Bank	Even-parallel-1
DE0008-4	10/5/00	7:31:36	0:30:14	4148.84	-6815.32	HSMRT Trawl	123	3896.99	Georges_Bank	Even-parallel-1
DE0008-4	10/5/00	9:34:53	0:06:34	4140.94	-6814.66	CTD Profile	124	3911.10	Georges_Bank	Even-parallel-1
DE0008-4	10/5/00	10:45:12	0:04:05	4145.83	-6801.53	CTD Profile	125	3922.23	Georges_Bank	Even-parallel-1
DE0008-4	10/5/00	15:07:46	0:14:10	4230.15	-6801.64	CTD Profile	126	3966.98	Georges_Bank	Even-parallel-1
DE0008-4	10/5/00	16:25:33	0:23:13	4230.10	-6748.63	CTD Profile	127	3977.25	Georges_Bank	Even-parallel-1
DE0008-4	10/5/00	18:16:15	0:19:03	4218.42	-6748.48	CTD Profile	128	3989.63	Georges_Bank	Even-parallel-1

Cruise	Date	Time-GMT	Duration	Latitude	Longitude	Gear-deployment	Deploy#	EK-vlog	Region	Survey_design
DE0008-4	10/5/00	18:59:10	1:00:28	4219.68	-6748.75	HSMRT Trawl	129	3991.23	Georges_Bank	Even-parallel-1
DE0008-4	10/5/00	22:57:21	0:07:57	4200.02	-6748.38	CTD Profile	130	4021.29	Georges_Bank	Even-parallel-1
DE0008-4	10/5/00	23:38:56	0:22:23	4159.95	-6749.32	HSMRT Trawl	131	4024.27	Georges_Bank	Even-parallel-1
DE0008-4	10/6/00	1:25:41	0:04:35	4152.91	-6748.53	CTD Profile	132	4036.48	Georges_Bank	Even-parallel-1
DE0008-4	10/6/00	2:48:03	0:04:14	4158.52	-6735.10	CTD Profile	133	4048.26	Georges_Bank	Even-parallel-1
DE0008-4	10/6/00	4:27:22	0:21:58	4213.13	-6734.92	CTD Profile	134	4063.08	Georges_Bank	Even-parallel-1
DE0008-4	10/6/00	5:16:13	1:06:01	4211.22	-6735.10	HSMRT Trawl	135	4065.09	Georges_Bank	Even-parallel-1
DE0008-4	10/6/00	9:32:02	0:17:28	4230.04	-6735.03	CTD Profile	136	4094.33	Georges_Bank	Even-parallel-1
DE0008-4	10/6/00	11:04:05	0:23:47	4229.95	-6721.84	CTD Profile	137	4104.63	Georges_Bank	Even-parallel-1
DE0008-4	10/6/00	13:16:00	0:18:41	4213.63	-6721.32	CTD Profile	138	4121.55	Georges_Bank	Even-parallel-1
DE0008-4	10/6/00	13:57:31	0:58:13	4214.79	-6721.00	HSMRT Trawl	139	4123.08	Georges_Bank	Even-parallel-1
DE0008-4	10/6/00	16:57:05	0:05:01	4202.49	-6721.67	CTD Profile	140	4144.82	Georges_Bank	Even-parallel-1
DE0008-4	10/6/00	17:37:43	0:08:06	4207.21	-6721.59	CTD Profile	141	4149.73	Georges_Bank	Even-parallel-2
DE0008-4	10/6/00	18:10:52	1:00:03	4208.47	-6721.56	HSMRT Trawl	142	4151.15	Georges_Bank	Even-parallel-2
DE0008-4	10/6/00	22:24:51	0:20:58	4230.00	-6721.70	CTD Profile	143	4183.80	Georges_Bank	Even-parallel-2
DE0008-4	10/6/00	23:54:13	0:15:27	4229.86	-6734.92	CTD Profile	144	4194.35	Georges_Bank	Even-parallel-2
DE0008-4	10/7/00	3:06:22	0:05:10	4158.15	-6735.03	CTD Profile	145	4226.27	Georges_Bank	Even-parallel-2
DE0008-4	10/7/00	3:49:11	0:09:42	4202.21	-6735.22	CTD Profile	146	4231.16	Georges_Bank	Even-parallel-2
DE0008-4	10/7/00	4:25:50	0:23:12	4201.89	-6737.72	HSMRT Trawl	147	4233.25	Georges_Bank	Even-parallel-2
DE0008-4	10/7/00	6:30:02	0:06:55	4153.17	-6749.07	CTD Profile	148	4246.59	Georges_Bank	Even-parallel-2
DE0008-4	10/7/00	10:16:30	0:18:43	4230.02	-6748.50	CTD Profile	149	4283.74	Georges_Bank	Even-parallel-2
DE0008-4	10/7/00	11:39:55	0:14:07	4230.01	-6801.82	CTD Profile	150	4294.05	Georges_Bank	Even-parallel-2
DE0008-4	10/7/00	13:30:25	0:16:26	4214.15	-6801.78	CTD Profile	151	4310.10	Georges_Bank	Even-parallel-2
DE0008-4	10/7/00	14:18:30	1:10:49	4214.48	-6801.83	HSMRT Trawl	152	4311.60	Georges_Bank	Even-parallel-2
DE0008-4	10/7/00	19:49:25	0:50:23	4153.35	-6803.07	HSMRT Trawl	153	4349.44	Georges_Bank	Even-parallel-2
DE0008-4	10/7/00	22:28:48	0:03:49	4145.83	-6801.69	CTD Profile	154	4366.92	Georges_Bank	Even-parallel-2
DE0008-4	10/7/00	23:45:39	0:02:29	4141.03	-6814.84	CTD Profile	155	4378.05	Georges_Bank	Even-parallel-2
DE0008-4	10/8/00	4:44:38	0:21:23	4229.88	-6815.02	CTD Profile	156	4427.23	Georges_Bank	Even-parallel-2
DE0008-4	10/8/00	6:11:27	0:19:50	4229.79	-6828.02	CTD Profile	157	4437.36	Georges_Bank	Even-parallel-2
DE0008-4	10/8/00	12:19:12	0:08:40	4130.55	-6828.28	CTD Profile	158	4496.92	Georges_Bank	Even-parallel-2
DE0008-4	10/8/00	13:58:25	0:05:53	4120.23	-6841.44	CTD Profile	159	4511.51	Georges_Bank	Even-parallel-2
DE0008-4	10/8/00	16:29:33	0:15:07	4143.40	-6841.49	CTD Profile	160	4535.07	Georges_Bank	Even-parallel-2
DE0008-4	10/8/00	17:12:47	0:38:18	4141.64	-6840.76	HSMRT Trawl	161	4537.13	Georges_Bank	Even-parallel-2
DE0008-4	10/8/00	20:45:58	0:12:47	4200.09	-6841.48	CTD Profile	162	4566.69	Georges_Bank	Even-parallel-2
DE0008-4	10/9/00	7:09:58	0:22:40	4230.16	-6745.99	CTD Profile	163	4663.50	Georges_Bank	Diel-experiment
DE0008-4	10/9/00	12:30:02	0:03:19	4155.17	-6745.69	CTD Profile	164	4699.95	Georges_Bank	Diel-experiment