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1993 Georges Bank Stratification Study

by

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INTRODUCTION

During 18 - 28 May 1993, a cruise was conducted on Georges Bank as part of a pilot project for the U.S. GLOBEC Northwest Atlantic Study entitled: stratification variability on Georges Bank and its effect on larval fish survival. The objectives of the cruise were to: 1) acquire information on the abundance and distribution of ichthyoplankton and zooplankton on the southern flank of Georges Bank in relation to water column conditions; 2) deploy and recover a mooring to measure the physical conditions at a fixed site; 3) make repeated observations of the plankton at the fixed site and within a drifting patch of water tagged by a transmitting buoy; and 4) make these observations in close cooperation with the R/V COLUMBUS ISELIN which was working in the same area as part of the same study.

The intent of this report is to document data collected by the Woods Hole National Marine Fisheries Service scientists during the R/V ALBATROSS IV cruise ALB9306. The sampling systems are described and the data are summarized in the form of basic tables and figures.

SAMPLING SYSTEMS

Shipboard

The primary shipboard sampling systems used during this cruise to accomplish the above objectives were:

MOCNESS: Multiple Opening/Closing Net and Environmental

Sensing System with 1 m^2 (0.333 mm mesh nets) and 1/4 m^2 (0.064 mm mesh nets) mouth openings. They are identified as MOC1 MOC1/4, respectively. Both were equipped with 9 nets and conductivity/temperature/depth measuring packages. The MOCNESS systems were deployed on the port side of the ship using the boom.

Seabird Electronics Seacat Model 19 CTD (Profiler): a conductivity, temperature, and depth measuring instrument with a sampling rate of 2 observations per second. During a bongo haul, the Profiler was attached above the bongo frame and was towed double - obliquely through the water.

Neil Brown Mark V CTD (MK5): a conductivity/temperature/depth measuring system equipped with a fluorometer and rosette water sampler. The MK5 was deployed from the starboard hydrographic A-frame for both vertical profiles while the vessel was stationary and for "tow-yo" sampling while the vessel steamed at 2.5 knots.

Near real time satellite imagery: Satellite derived SST data were sent to the ship via INMARSAT C from the NMFS Narragansett R.I. Laboratory.

Moored

A physical oceanographic mooring with instruments to measure the temperature, salinity, and current in the upper 45 meters was deployed to monitor the vertical structure of the water column during the sampling period.

VMCM: Vector Measuring Current Meters were attached at 15m and 45m to record current velocity and temperature 16 times per hour.

RBR Temperature Loggers (TPODS): Single channel temperature loggers (model series XL-105) were used in fixed mode of operation as part of the moored array. Temperature observations were recorded every 2 minutes of their deployment. Instruments were attached at 5, 25, and 35 meters.

Seabird Electronics Seacat Model 16: Internally recording temperature / conductivity instruments, intended for fixed mooring operations, recorded temperature and conductivity observations every 2 minutes of their deployment. Instruments were attached at 1, 10, 20, 30, and 40 meters.

Drifting

Loran-C Marker Buoy: This instrument, manufactured by Seimac Limited and loaned to us by Art Allen of USCG Research and Development Lab, received Loran radio signals at a user defined setting (30 minutes was chosen) and transmitted the time delays via VHF radio to the ship.

CRUISE NARRATIVE

During the first three days of the cruise (19 - 21 May) a bongo survey of the southern flank of Georges Bank was conducted to locate cod and haddock larvae and to provide an indication of the hydrographic conditions in the region (Figures 1a and 1b). A bongo net (61-cm diameter, 0.333-mm and 0.505-mm mesh nets) equipped with a Seabird CTD Profiler was used on 47 stations between the 50 and 100 meter isobaths.

Based on the survey information, a site was chosen for the deployment of the physical oceanographic mooring. This site was selected to be in the region of the bank which would characteristically have a stratified water column and where larval cod and haddock would be found. The mooring was deployed on May 21 at 40 38.96'N 67 37.42'W. After deployment of the mooring, MOCNESS tows did not find cod and haddock larvae in the area in sufficient numbers to warrant continued sampling at that site. A second site was sampled further to the west but, again, larval catches were low. An acceptable site was located at 40° 43'N, 68° 02'W and became the "stratified site" for the study.

Another site was selected to the north in the characteristically well-mixed, shallow portion of Georges Bank, and where the bongo survey indicated a high concentration of cod and haddock larvae. This site is referred to as the "Mixed" site (M) and was located at 40° 59′N, 68° 02′W (Figure 2).

At the stratified site, a drifting Loran-C buoy was deployed to indicate the water movement during the sampling operations. The buoy had a 6 m long "holey sock" drogue tethered at 10m depth. An initial 6 hour time series of CTD casts and MOCNESS tows were conducted from 18:34 GMT May 22 - 00:42 GMT May 23, using the buoy as a reference. MOCNESS operations included both the 1 m and 1/4m systems, with a tow (using either of the two systems) every 2 - 3 hours. Fish larvae were removed from the MOC1 nets and were preserved in alcohol or frozen for further analyses. Samples from the MOC1/4 were preserved in formalin. A CTD cast was done before each tow.

During 02:30 - 06:45 GMT May 23, CTD tow-yo #1 was conducted from the stratified site toward the mixed site. The ship steamed at 2.5 knots and the CTD was lowered every 8 minutes to give a spatial resolution of about 0.7 km between casts. The termination on the sea cable failed during this transect and the section could not be completed before a previously scheduled rendezvous with the R/V COLUMBUS ISELIN at the mixed site at 10:00 GMT on May 23.

At the mixed site, a high-flyer drifter (without a Loran-C buoy) was deployed with a holey sock as a reference marker for sampling. A 24 hour time series of CTD casts and MOCNESS tows began at 10:52 GMT on May 23. The drifter moved into an area of large sand ridges northwest of the original site, making MOCNESS operations difficult. The remainder of the operations at the mixed site were conducted at the original site location. The drifter was recovered at 23:30 GMT May 23, after a full tidal cycle had brought it back to near its original deployment site. The CTD and MOCNESS time series were continued until 14:00 GMT on May 24.

The R/V COLUMBUS ISELIN profiled the water column with a plankton pump and an acoustic profiling system (TAPS - Tracor acoustic Profiling System) in the vicinity of the 1/4m MOCNESS tows made by the ALBATROSS IV. These systems each measure the size spectrum of the larval prey organisms. The data collected will allow for a comparison of the results from the different systems.

The ALBATROSS IV then returned to the stratified site to conduct a second CTD and MOCNESS time series. No Signals were received from the Loran-C buoy that had earlier been deployed there. The time series was conducted at the stratified site from 16:20 GMT May 24 to 23:00 GMT May 25. The R/V Columbus Iselin worked closely with the ALBATROSS IV until 03:00 GMT May 25.

From 01:00 - 05:00 GMT May 26, a search was conducted for the Loran-C drifter. The search involved steaming a trackline which the buoy was expected to have followed, given its initial drift and the subsequent forcing by winds and tidal currents. No signal was received. Since the buoy's signal had previously been received at a range of up to 15 miles, it was concluded that the buoy had either been lost or had been picked up by another vessel.

At 07:55 GMT May 26, a CTD cast was made next to the mooring. The purpose of this cast was to compare the data from the CTD with that being recorded by the instruments on the mooring.

From 10:08 - 14:00 GMT May 26, CTD tow-yo #2 was conducted from near the stratified site to the mixed site. From 16:00 - 20:00 GMT May 26, CTD tow-yo #3 was conducted from the mixed site toward the stratified site. From 23:20 GMT May 26 - 01:30 GMT May 27, CTD tow-yo #4 was conducted from the stratified site toward the mixed site. The tow-yo's were timed to sample at either the on-bank (tow-yo #2 and #4) or off-bank (tow-yo #1 and #3) extreme of the tidal ellipse. From 04:00 - 07:48 GMT May 27, a series of CTD casts were made between the stratified site and the shelf/slope front to determine the water properties to the southeast of the study area.

The mooring was recovered 11:00 - 13:00 GMT on May 27. All instruments were recovered and appeared in good condition.

During 14:37 GMT May 27 - 03:00 GMT May 28, a final series of CTD and MOCNESS tows were made at the stratified site. During a 1/4m MOCNESS tow (#1048), the nets were caught by the ship's propeller. The nets and cod-ends were lost and the instrument suffered modest damage. Tow-yo #5 was conducted during 06:00 - 07:00 GMT May 28, on the eastern side of Great South Channel.

A chronological listing of the operations conducted during this cruise, with time and position information is provided in Table 1.

RESULTS

Biology

1) Bongo Survey:

A total of 47 bongo hauls were made during the first three days of the cruise (Figure 1a and 1b). The distributions of larval cod and haddock (number per 100m^3) from the initial bongo survey are shown in Figure 3a & b. Both species had higher numbers in depths shallower than 75m.

2) MOCNESS

41 MOCNESS hauls were acomplished on the cruise and a summary of these is found in Table 2. Approximately 1200 samples of larval fish and *Calanus* were collected for RNA/DNA ratio studies and other molecular analyses to be conducted at the Northeast Fisheries Science Center, Narragansett, Rhode Island (L. Buckley and E. Calderone). Approximately 1400 samples of larval fish and zooplankton were collected for enzyme analysis. Eighty time series of respiration rates were made on *Calanus* samples. Enzyme analysis of larval fish and zooplankton samples will be conducted at the University of Miami, Florida (E. Clarke). Measurements of the respiration rates of zooplankton will be analyzed at the University of South Florida, St. Petersburg, Florida (J. Torres).

Vertical distributions of cod, haddock and eggs from the MOCNESS (1m) hauls are presented in Figures 4 - 12. Length frequency distributions of the cod and haddock larvae sorted from the MOCNESS (1m) hauls are shown in Figures 13 - 14. A summary of the MOCNESS data is found in Table 3.

Physical Oceanography:

The physical oceanographic program consisted of 1) using a Seabird Profiler during the initial bongo survey, 2) deploying a mooring to measure the water column structure during the study period, 3) making MK5 CTD profiles to measure the water column structure in connection with the other sampling programs of the cruise, 4) deploying drifters to track during repeated sampling of the same water parcel and 5) collecting data using the Shipboard Computing System (SCS) aboard the ALBATROSS IV. Results are presented in that order.

1) Seabird Profiler

Contoured horizontal sections of temperature and salinity during the initial bongo survey are presented in Figures 15 - 17. In the case of temperature, anomalies are relative to MARMAP observations (Mountain and Holzwarth, 1989). The vertical sections are labelled as either cross bank (C.B.) or along-bank (A.B.) and are shown in Figures 18 - 23. An influx of Scotion Shelf water along the outer edge of the bank had been observed in satellite imagery before and during the period of this study and was present during a few of the CTD casts (Profiler) made during the bongo survey.

2) Mooring

The physical oceanographic mooring consisted of 2 VMCM current meters, 5 SEACAT conductivity / temperature recorders and 3 Branker temperature recorders (Figure 24). The deployment and recovery of the mooring were accomplished without problems and all instruments collected good data.

The initial processing of the VMCM records was done by Fran Hotchkiss at USGS. This included the standard WHOI editting and checking routines (Tarbell et al., 1988). The output was stored in BUOY format on the VAX. The data were transferred to ascii format and post-processed using UNIX based MATLAB routines. Low-pass filtering was done using a 33-hr (pl33) filter (Flagg, 1979). The five SEACAT records and the three Branker temperature probe records were hourly averaged. The hourly averaged time series of temperature, salinity, and sigma - t are shown in Figures 25 - 27.

Observations at the mooring showed that changes in water properties occured during a tidal period. Most of this variability is believed to be due to the strong horizontal gradient associated with the shelf/slope front being advected past the observation location with the tidal oscillations.

3) MK5 CTD

A total of 332 MK5 profiles (167 down casts, 165 up casts) were successfully completed during ALB9306. The 4 vertical sections of the tow-yo operations between the mixed and stratified sites are shown in Figures 28 - 31. The tow-yo sections suggest that the highest fluorescence values are found within the tidal front (Mountain and Taylor, submitted). This finding is similar to conditions observed during the May 1992 Marine Ecosystem Response study (Manning et al., 1995).

4) Loran - C

The Loran-C buoy data received on the vessel was automatically (every 30 minutes) stored on disk at sea using Procomm software. This file was used to monitor the drifter track. However, since the record was less than half of a full tidal cycle, further processing and analysis was not necessary.

5) Shipboard Computing System

A data acquisition system called the Scientific Computing System (SCS), developed by the engineers at the NOAA Atlantic Marine Center (AMC), was in its second year of operation on the ALBATROSS IV. It provides the scientists with continuous records of position, ship speed and direction, wind speed and direction, air temperature, and several other variables (Figure 32). This dataset was processed back at the Lab. Wind speed was converted to wind stress using the method of Large and Pond (1981). A log-layer correction of anemometer height to 10 meters above the sea surface was first made. Figure 33 shows the time series of this wind record (top panels) along with the de-tided current data measured by the VMCMs on the mooring. Figures 34a & b show air and sea surface temperature records from NOAA buoys 44008 (40°30′ N, 69°24′ W) and 44011 (41°06′ N, 66°36′) during the cruise period.

Acknowlegements

The authors would like to acknowledge the Officers and Crew of the R/V Albatross IV for their helpful assistance and cooperation throughout the cruise.

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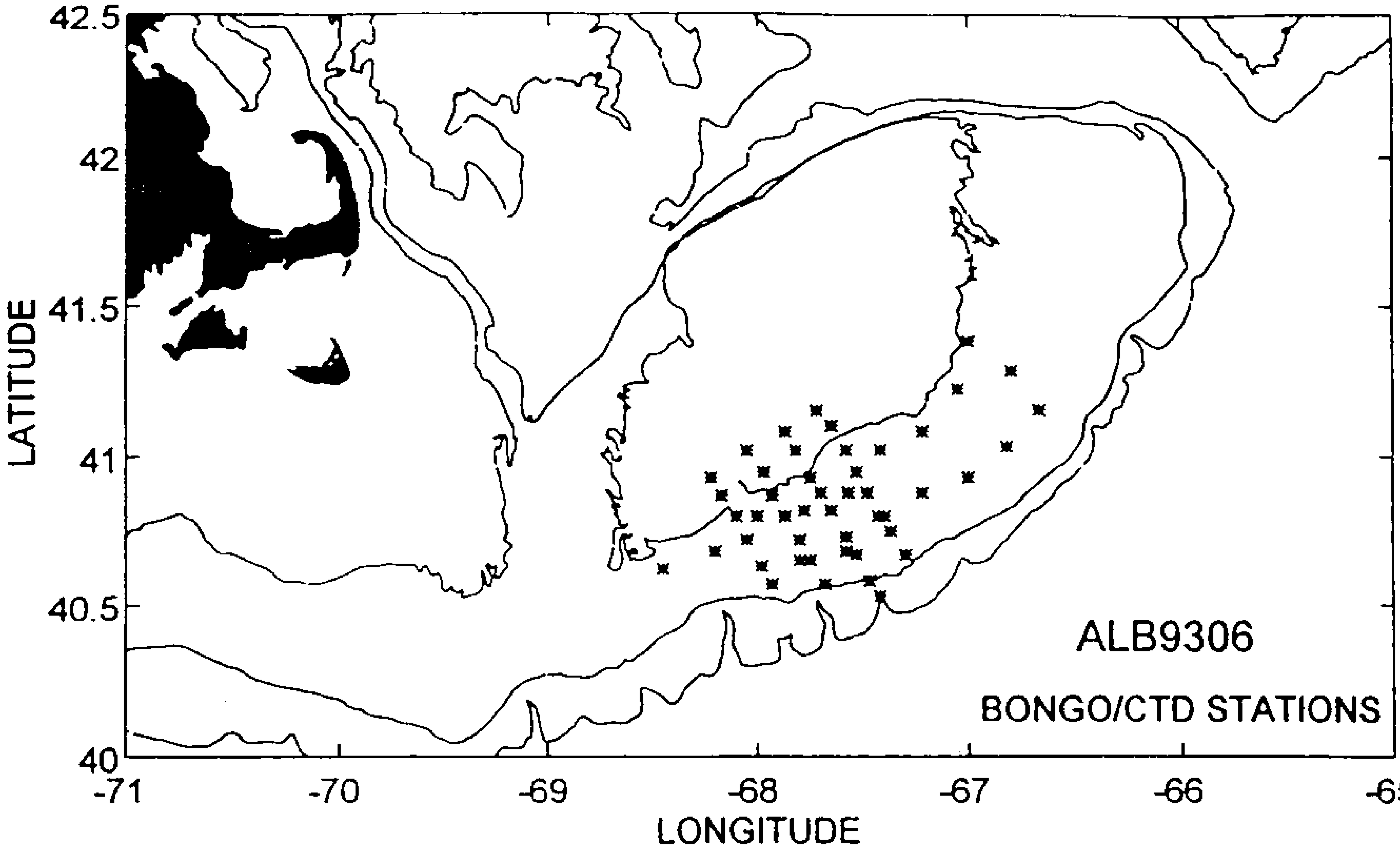
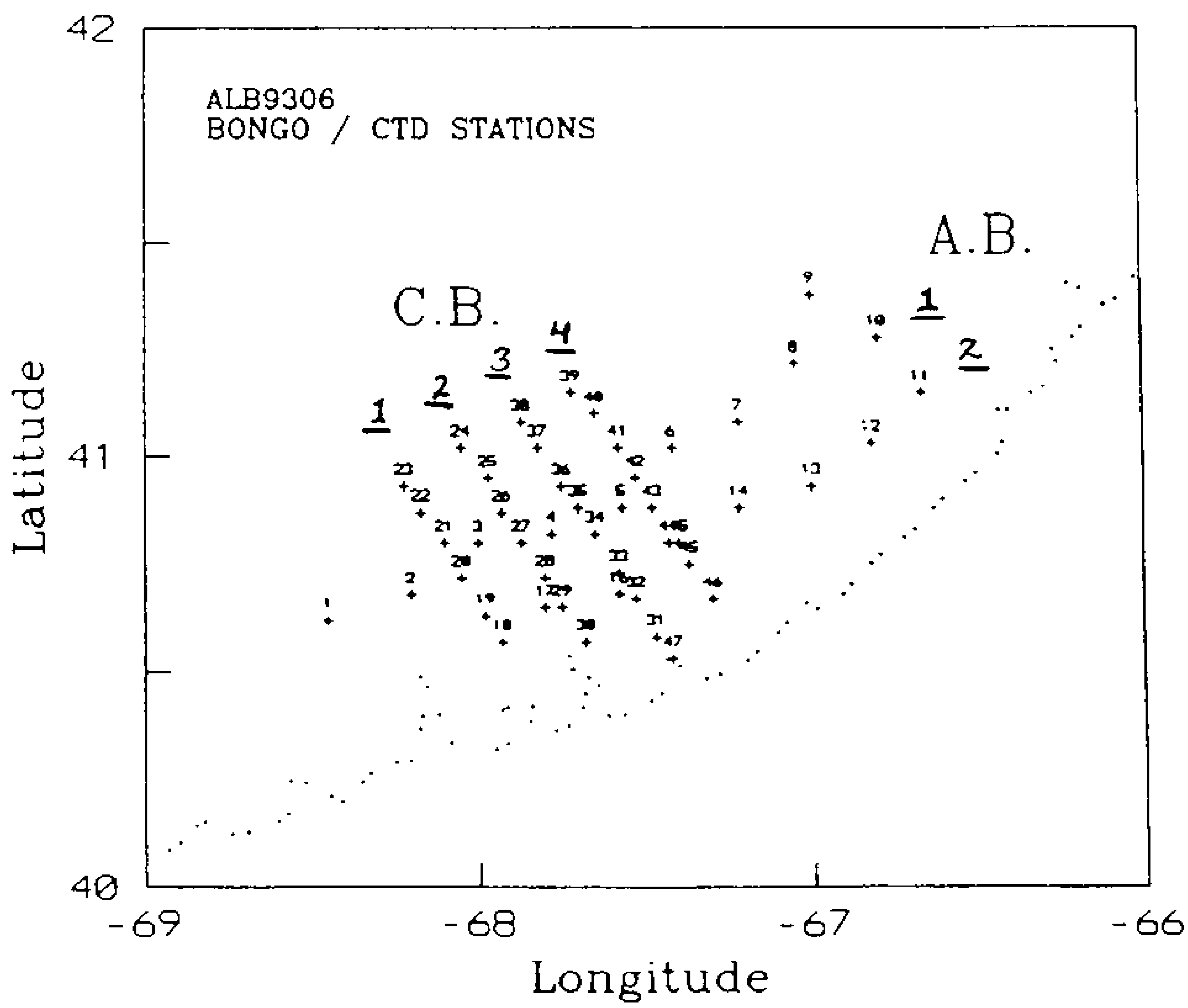


A



B

Figure 1a & 1b. Station maps of the initial bongo survey.

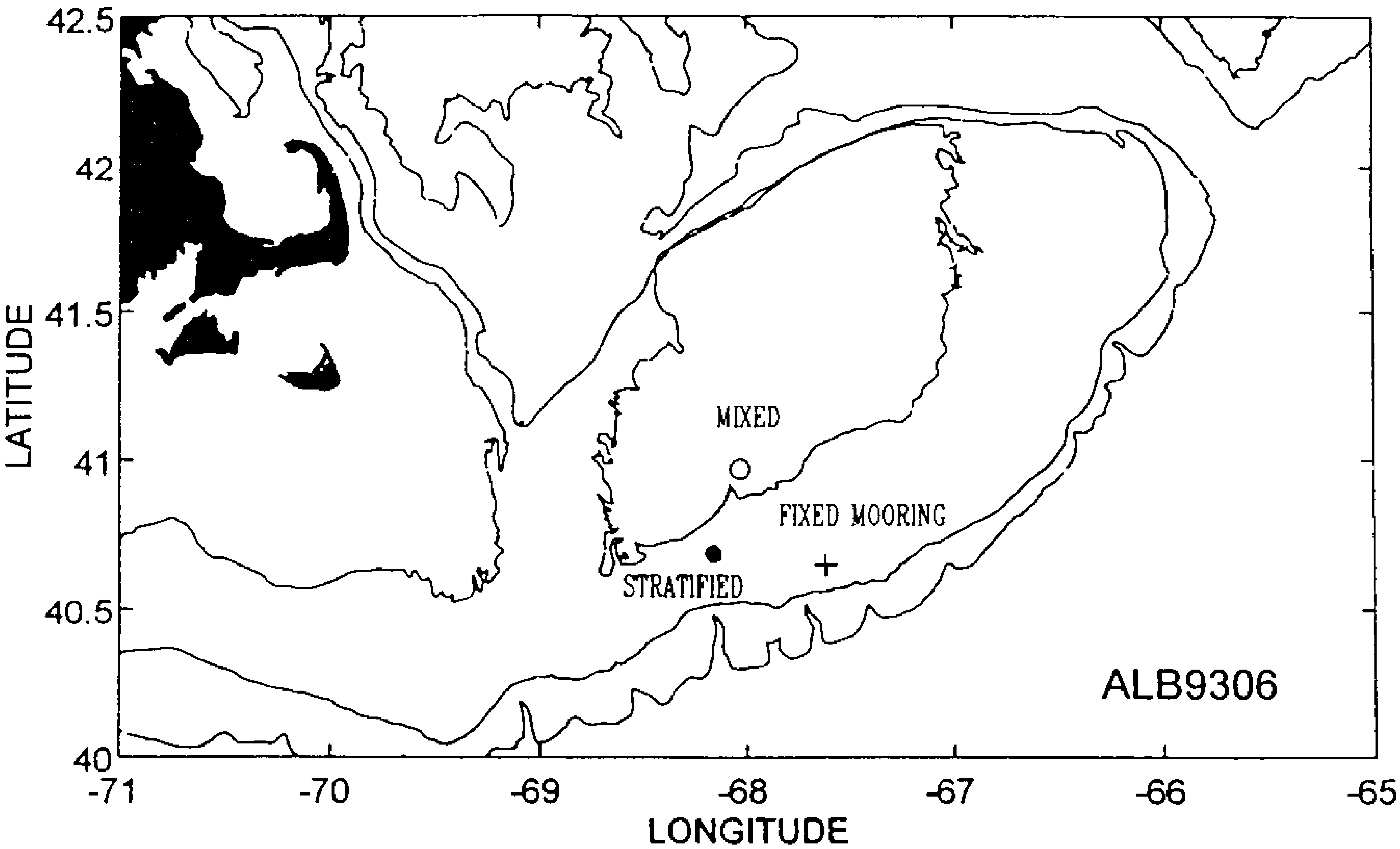
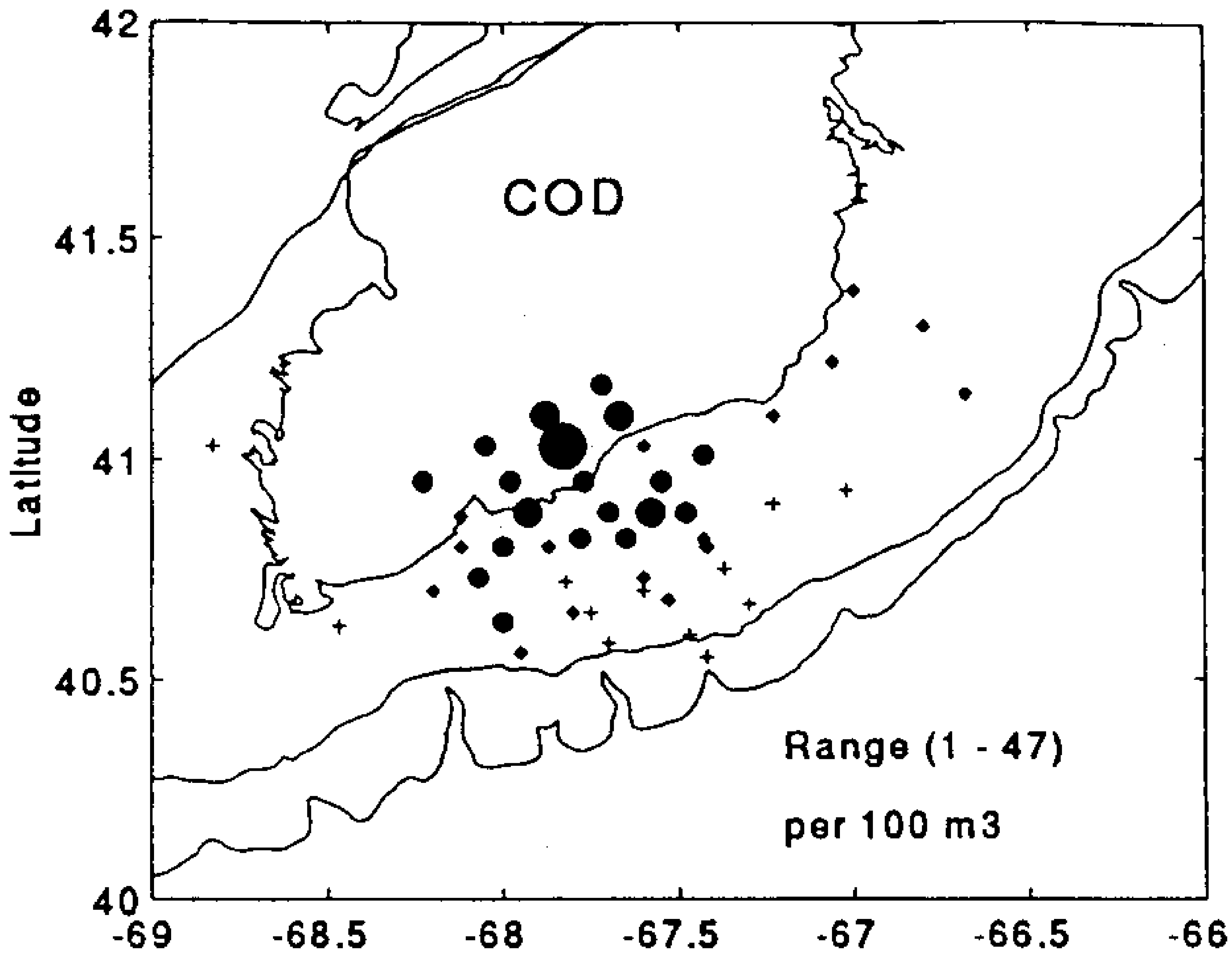


Figure 2. Location of the stratified, mixed and fixed mooring sites for the cruise period.



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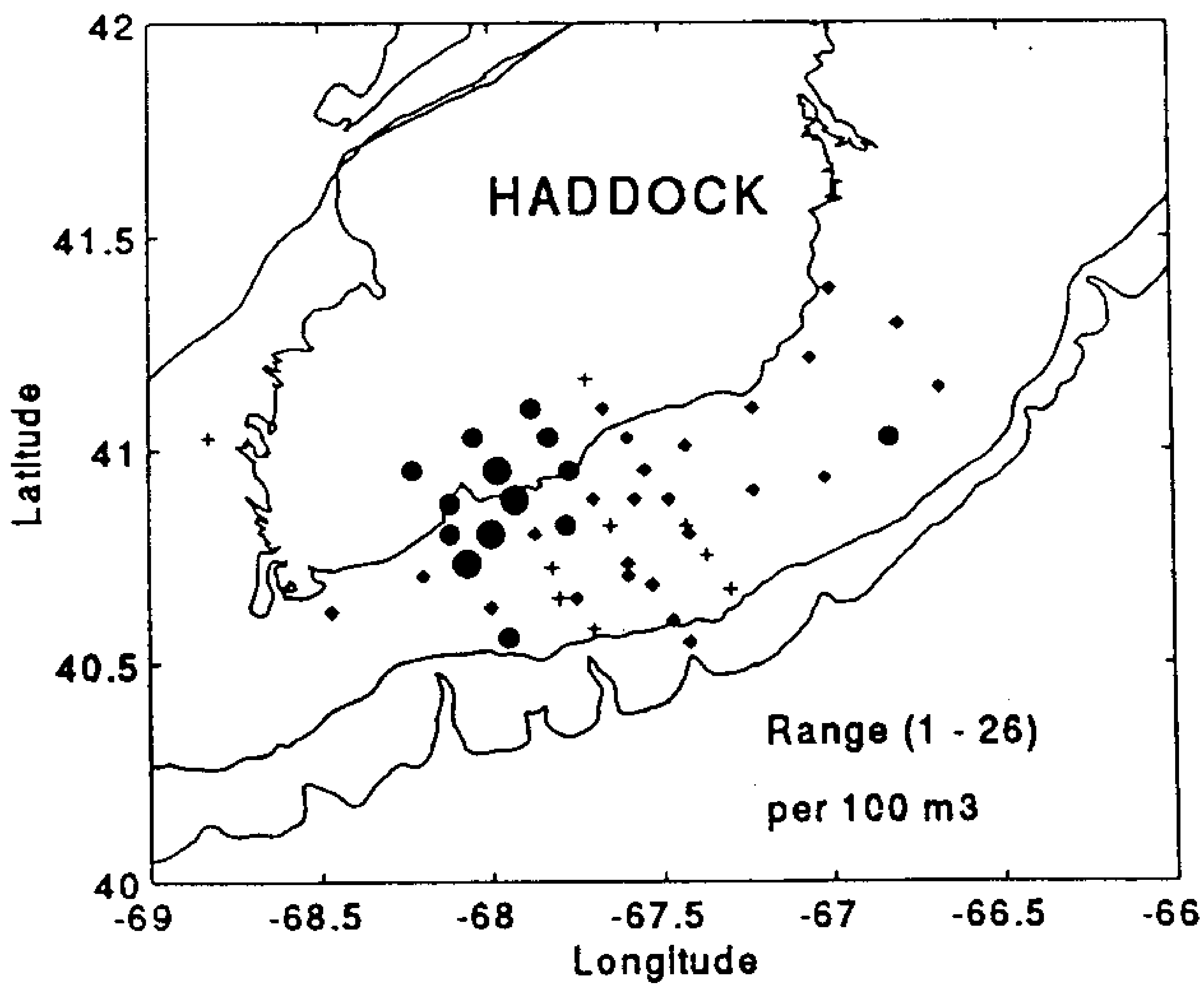

B

Figure 3. Larval cod (a) and haddock (b) distributions from the initial bongo survey (standardized to number of fish per 100m$^{3)}$

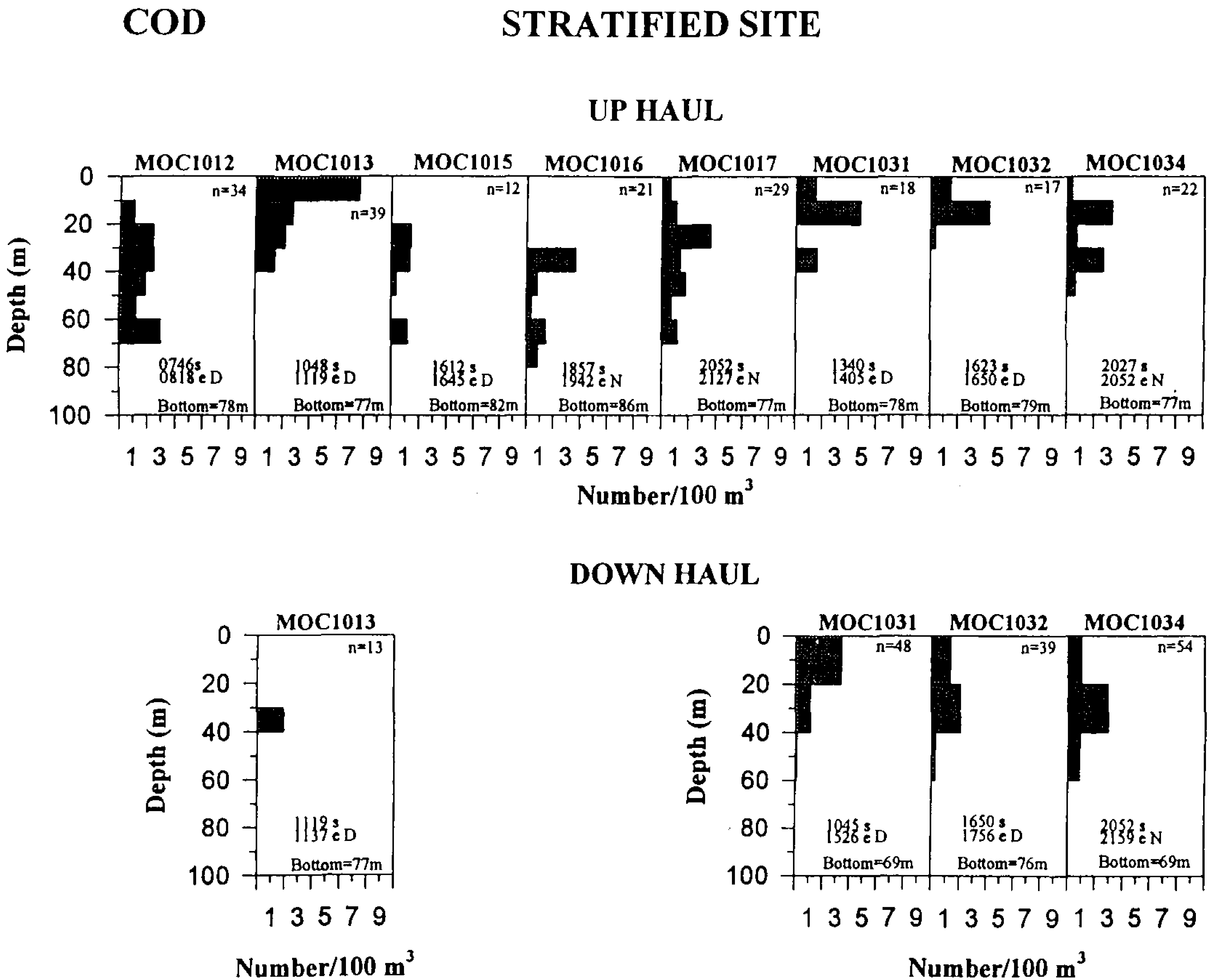

Figure 4. Vertical distribution of cod at the stratified site for MOCNESS hauls 1012 - 1034. Start and end times are indicated "s" and "e", D=day haul, N=night haul.

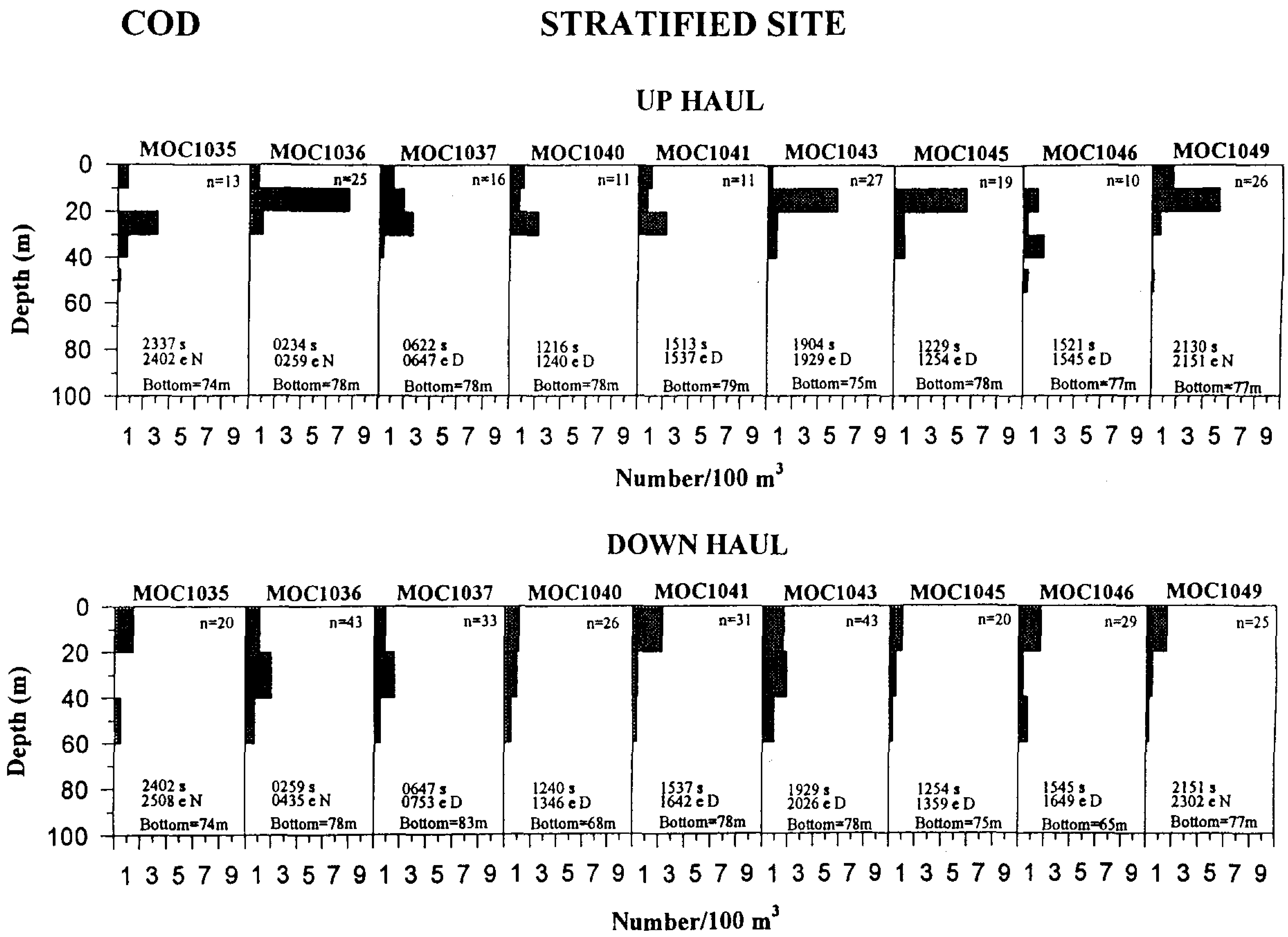

Figure 5. Vertical distribution of cod at the stratified site for MOCNESS hauls 1035 - 1049. Start and end times are indicated "s" and "e", D=day haul, N=night haul.

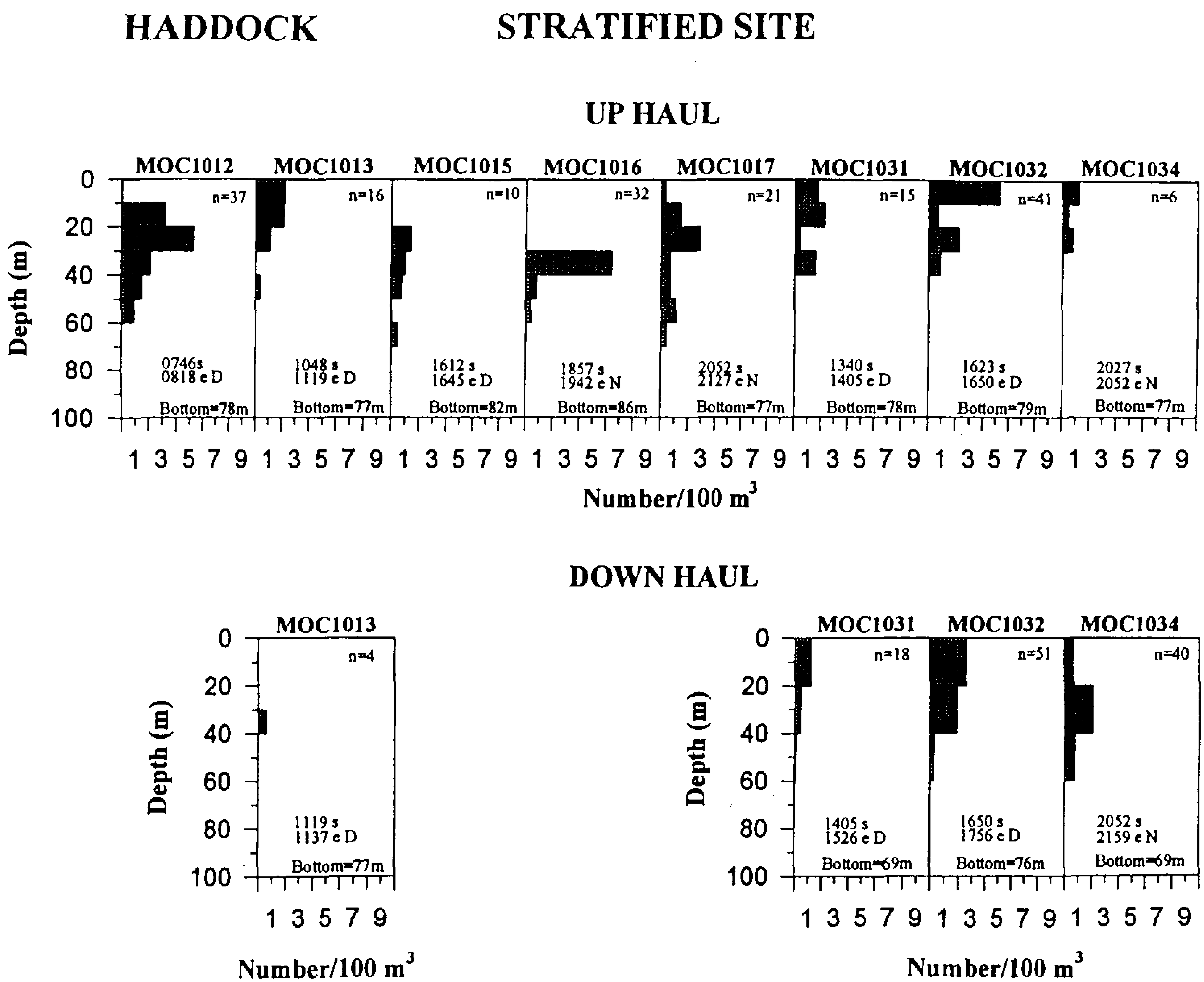

Figure 6. Vertical distribution of haddock at the stratified site for MOCNESS hauls 1012 - 1034. Start and end times are indicated "s" and "e", D=day haul, N=night haul.

HADDOCK STRATIFIED SITE

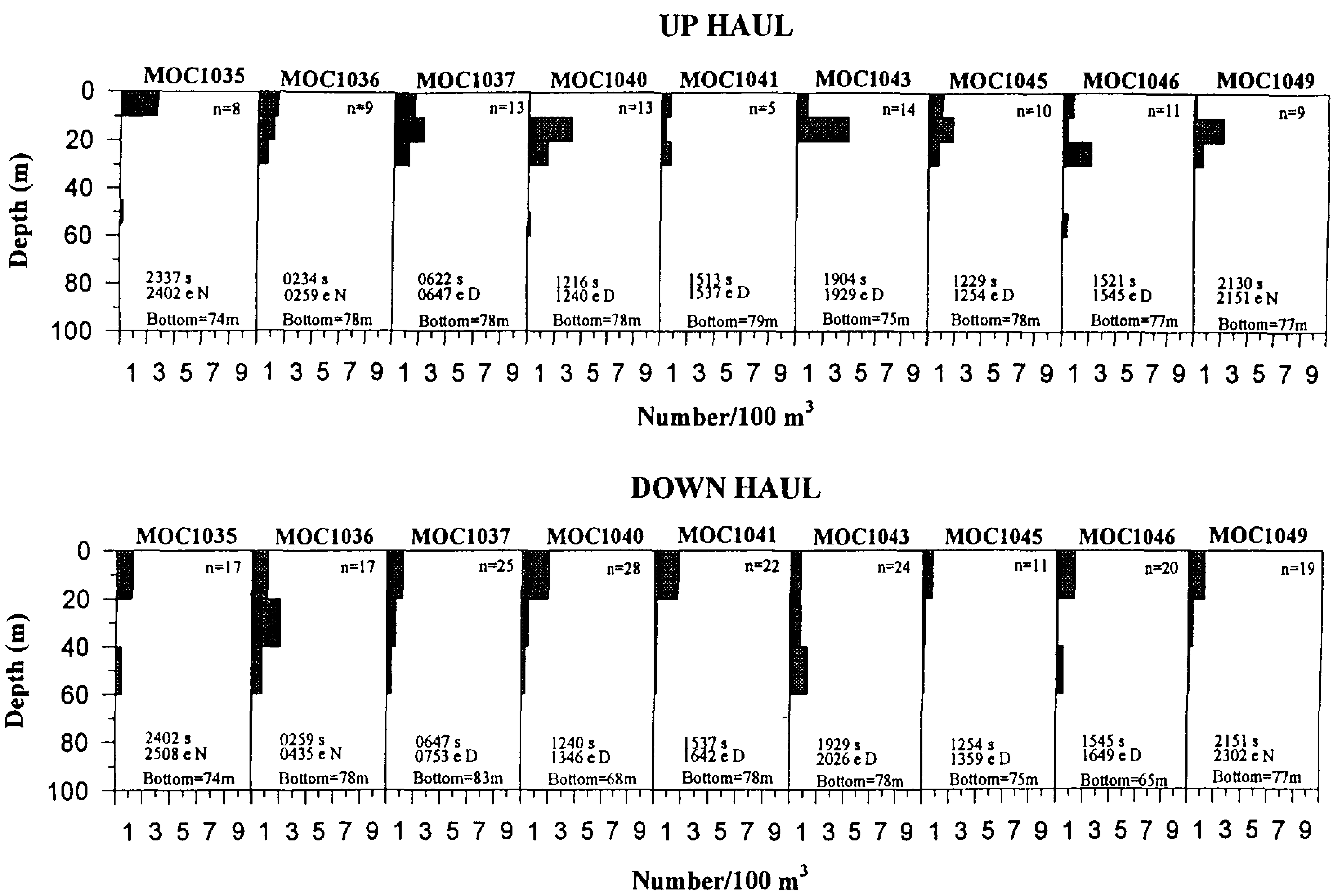

Figure 7. Vertical distribution of haddock at the stratified site for MOCNESS hauls 1035 - 1049. Start and end times are indicated "s" and "e", D=day haul, N=night haul.

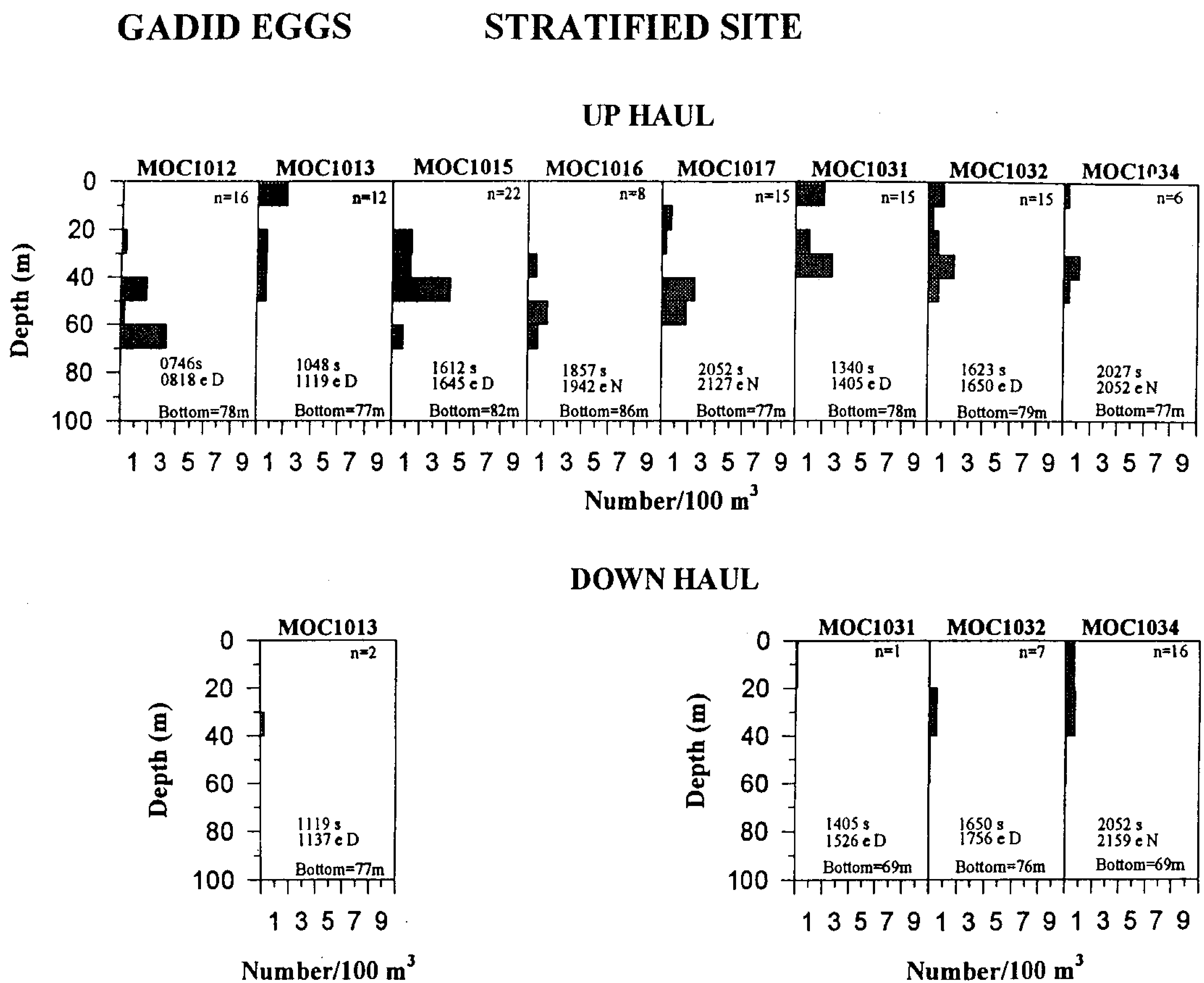

Figure 8. Vertical distribution of eggs at the stratified site for MOCNESS hauls 1012 - 1034. Start and end times are indicated "s" and "e", D=day haul, N=night haul.

GADID EGGS STRATIFIED SITE

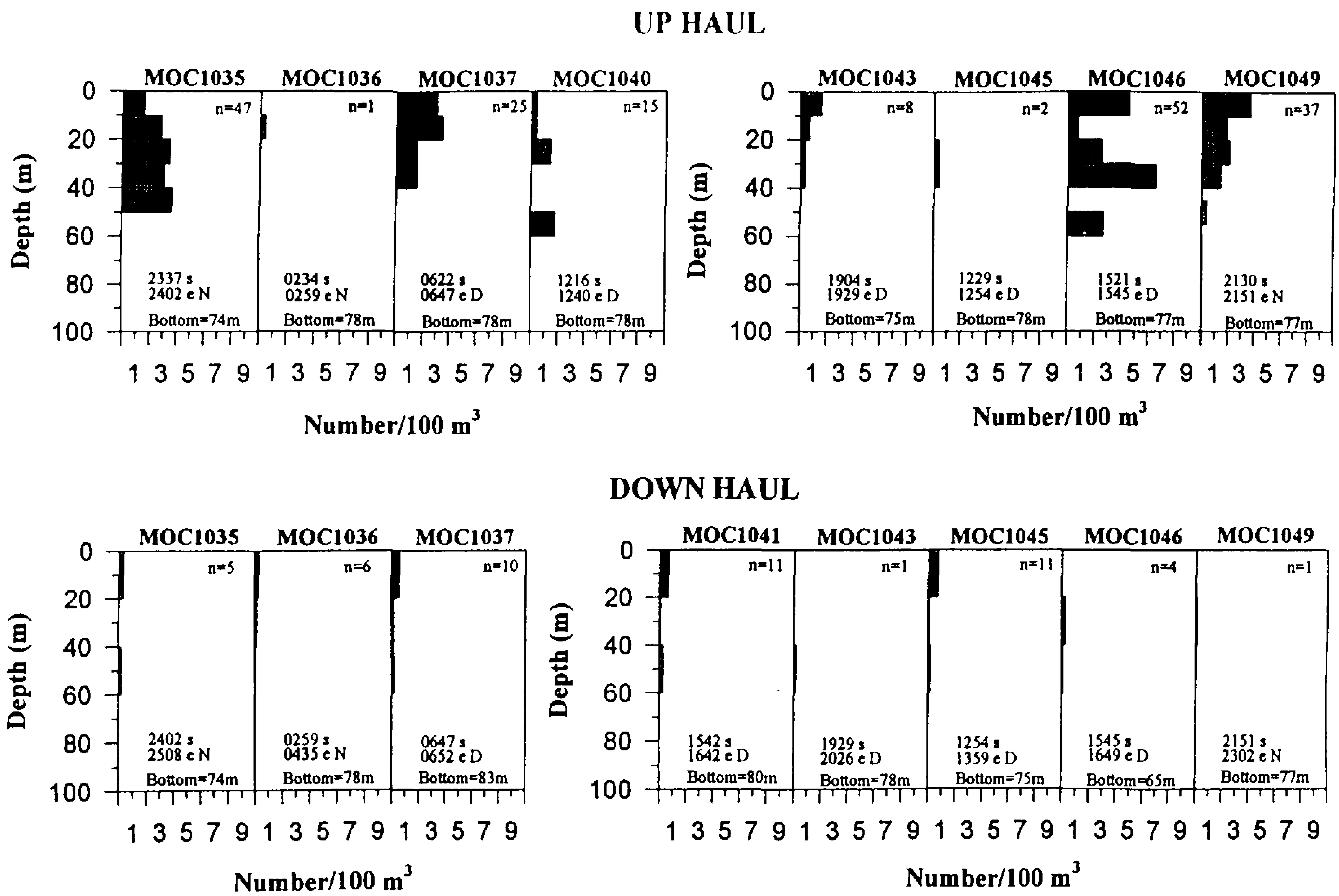

Figure 9. Vertical distribution of eggs at the stratified site for MOCNESS hauls 1035 - 1049. Start and end times are [illegible]

COD MIXED SITE

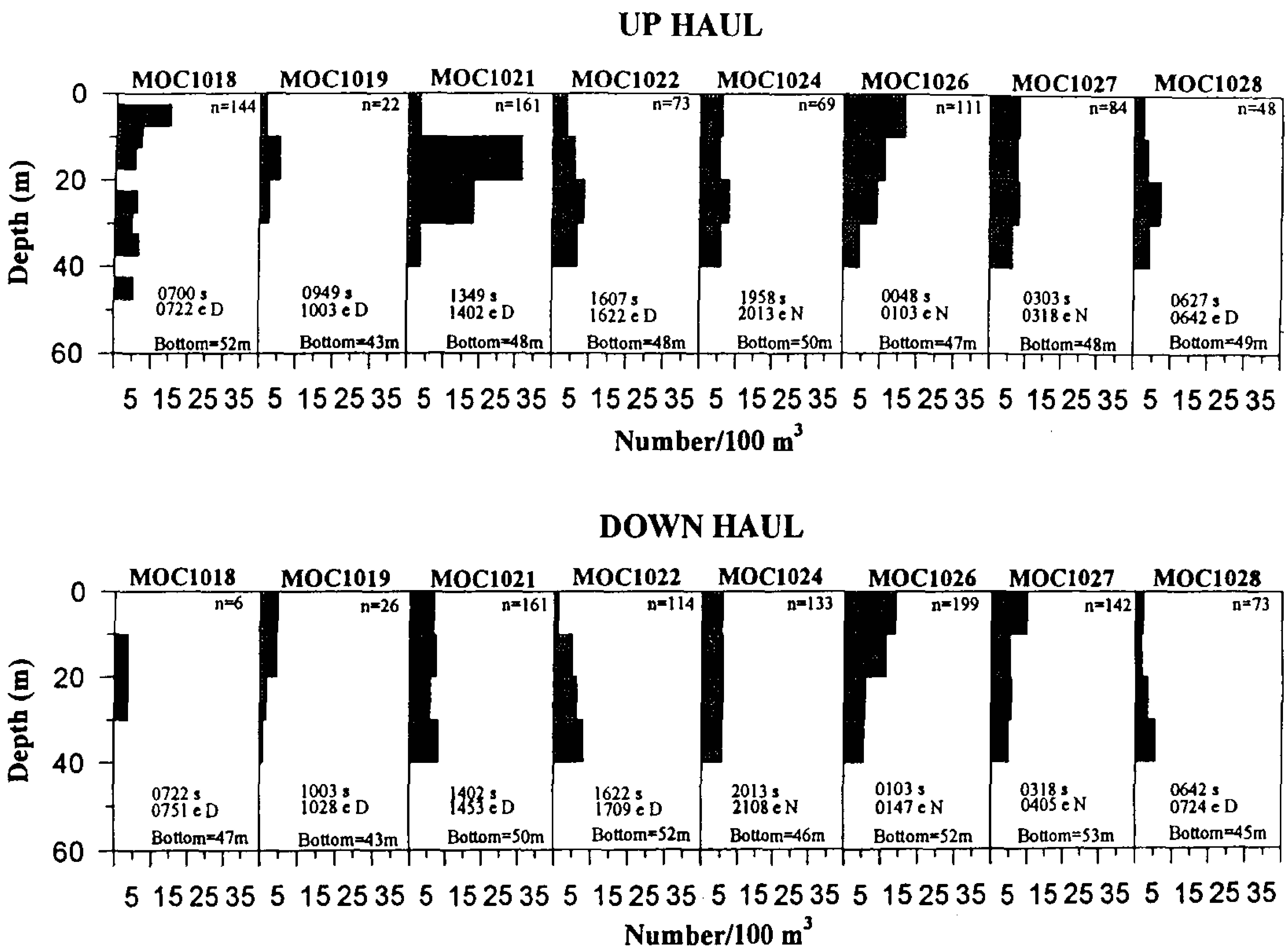

Figure 10. Vertical distribution of cod at the well-mixed site for MOCNESS hauls 1018 - 1028. Start and end times are indicated "s" and "e", D=day haul, N=night haul.

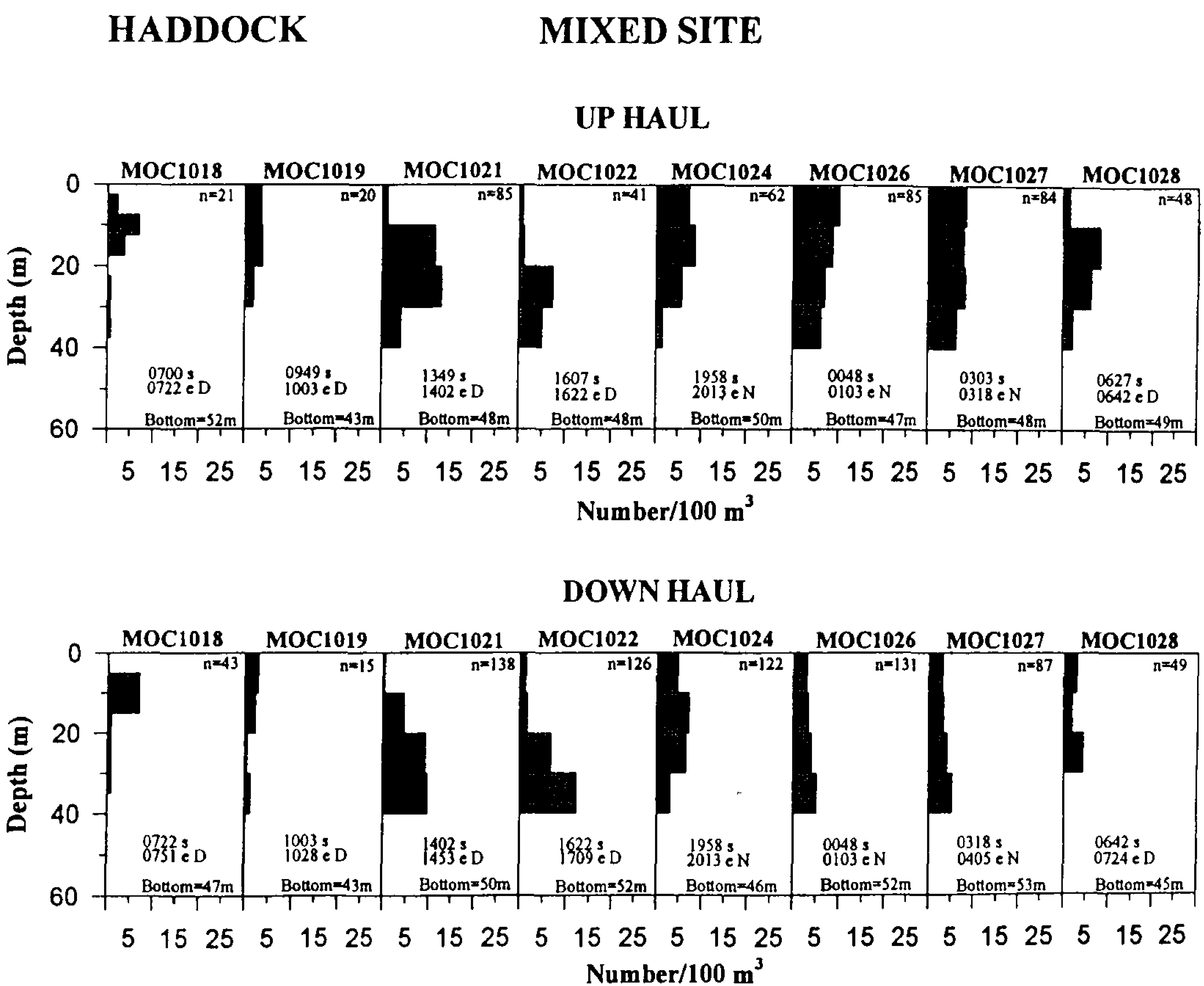

Figure 11. Vertical distribution of haddock at the well-mixed site for MOCNESS hauls 1018 - 1028. Start and end times are indicated "s" and "e", D=day haul, N=night haul.

GADID EGGS MIXED SITE

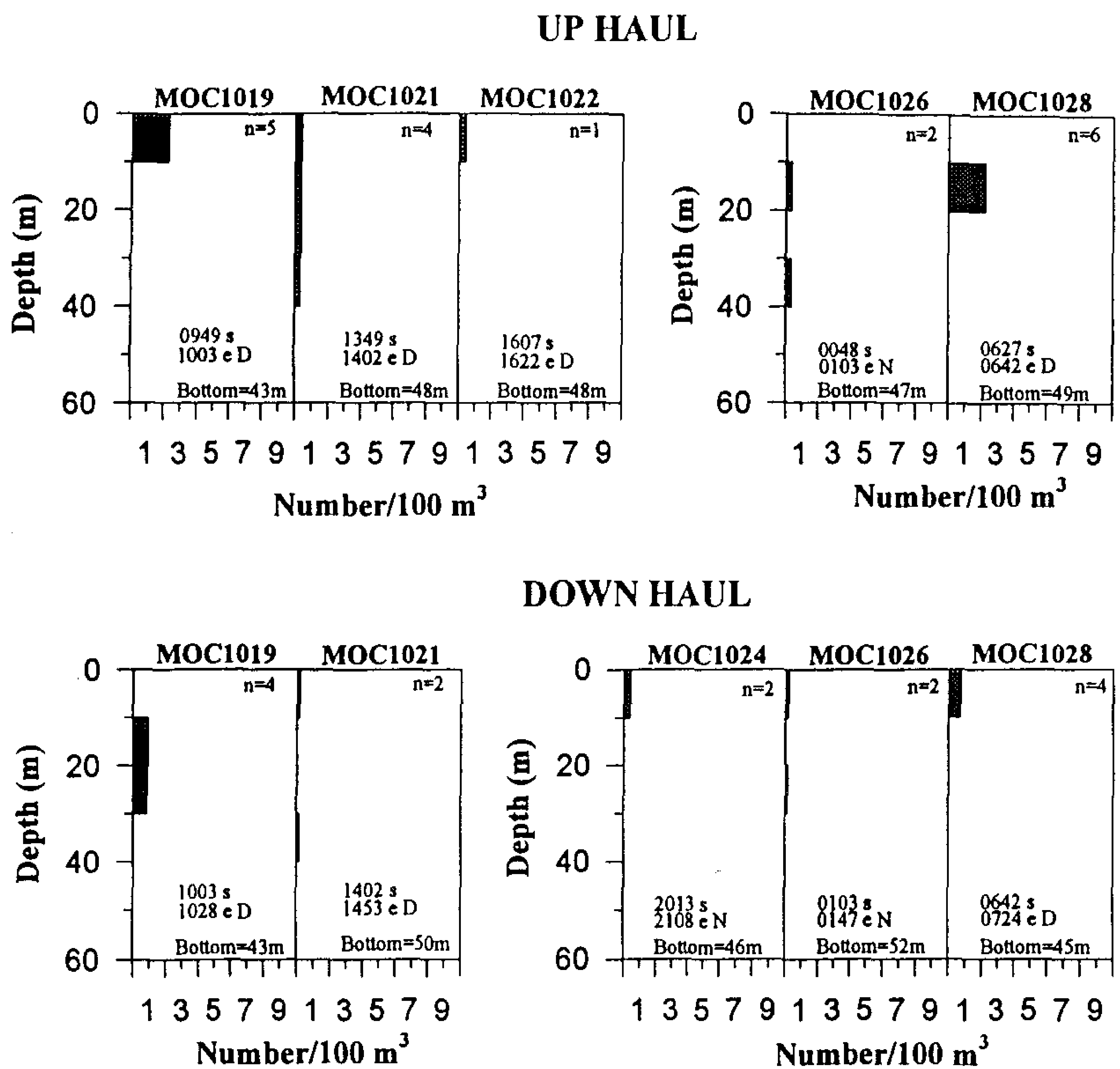

Figure 12. Vertical distribution of eggs at the well-mixed site for MOCNESS hauls 1019 - 1028. Start and end times are indicated "s" and "e", D=day haul, N=night haul.

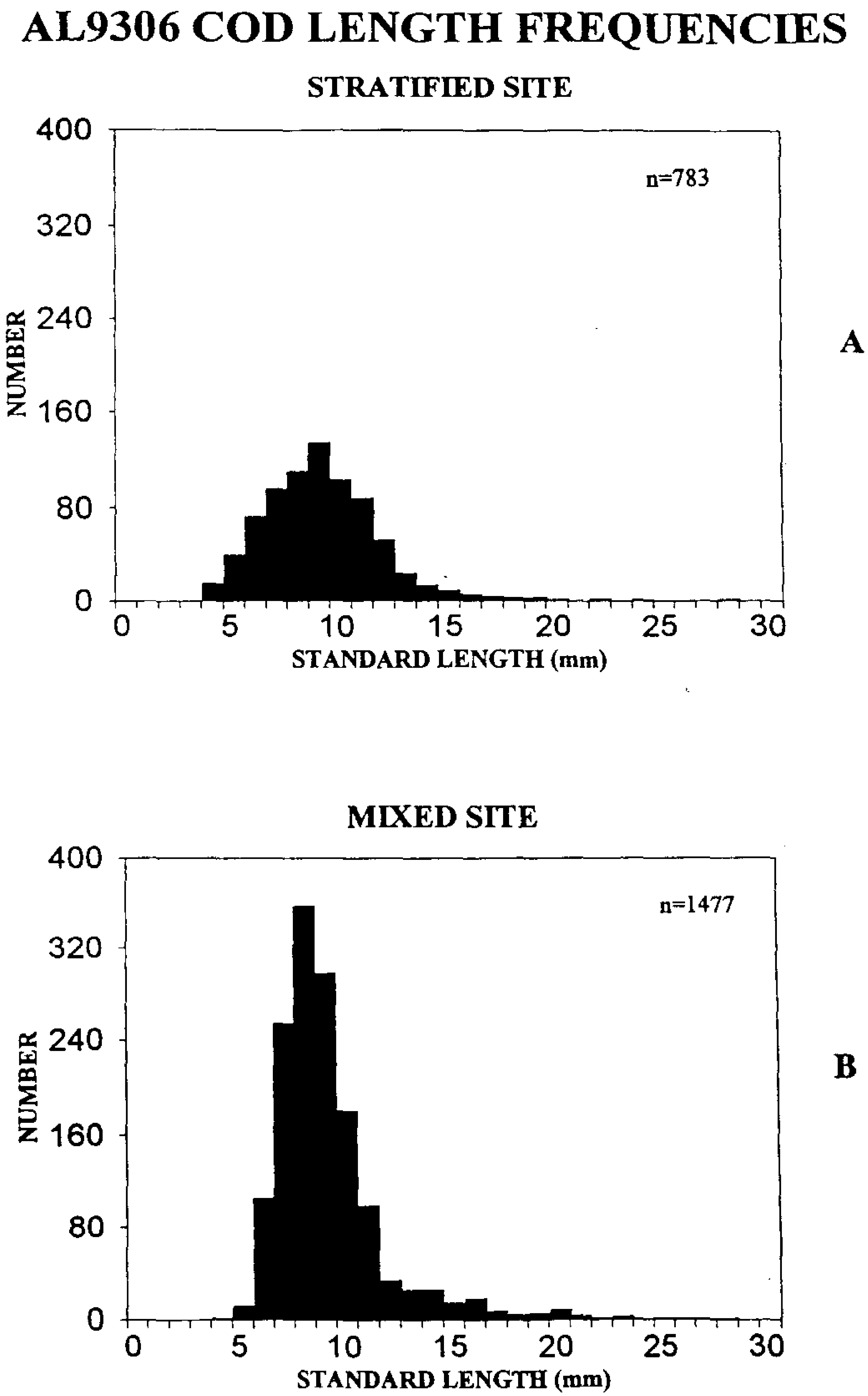

Figure 13. Length frequency distributions of cod larvae from the MOCNESS (1 meter) hauls at the stratified (a) and mixed (b) sites.

AL9306 HADDOCK LENGTH FREQUENCIES

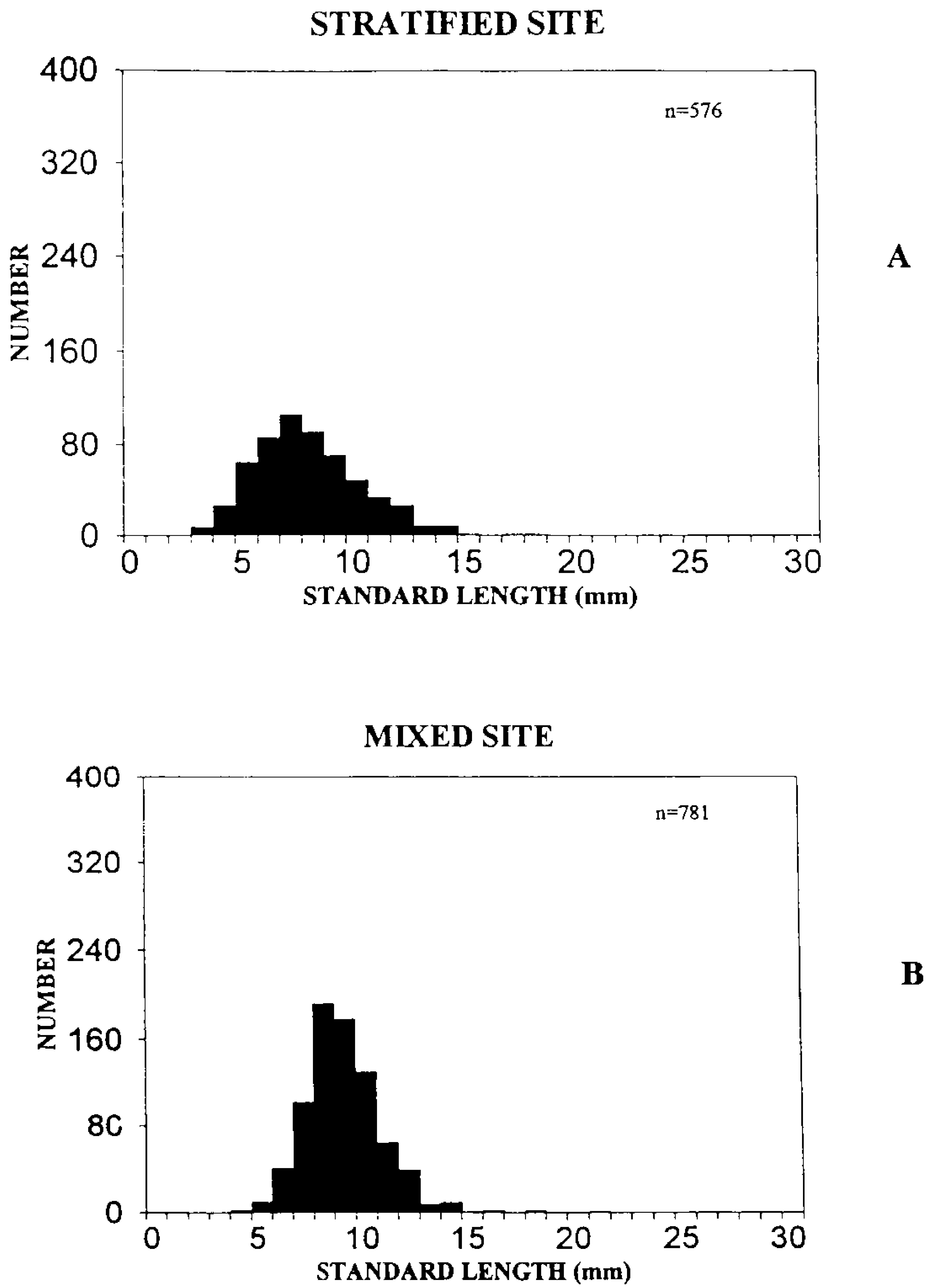

Figure 14. Length frequency distributions of haddock larvae from the MOCNESS (1 meter) hauls at the stratified (a) and mixed (b) sites.

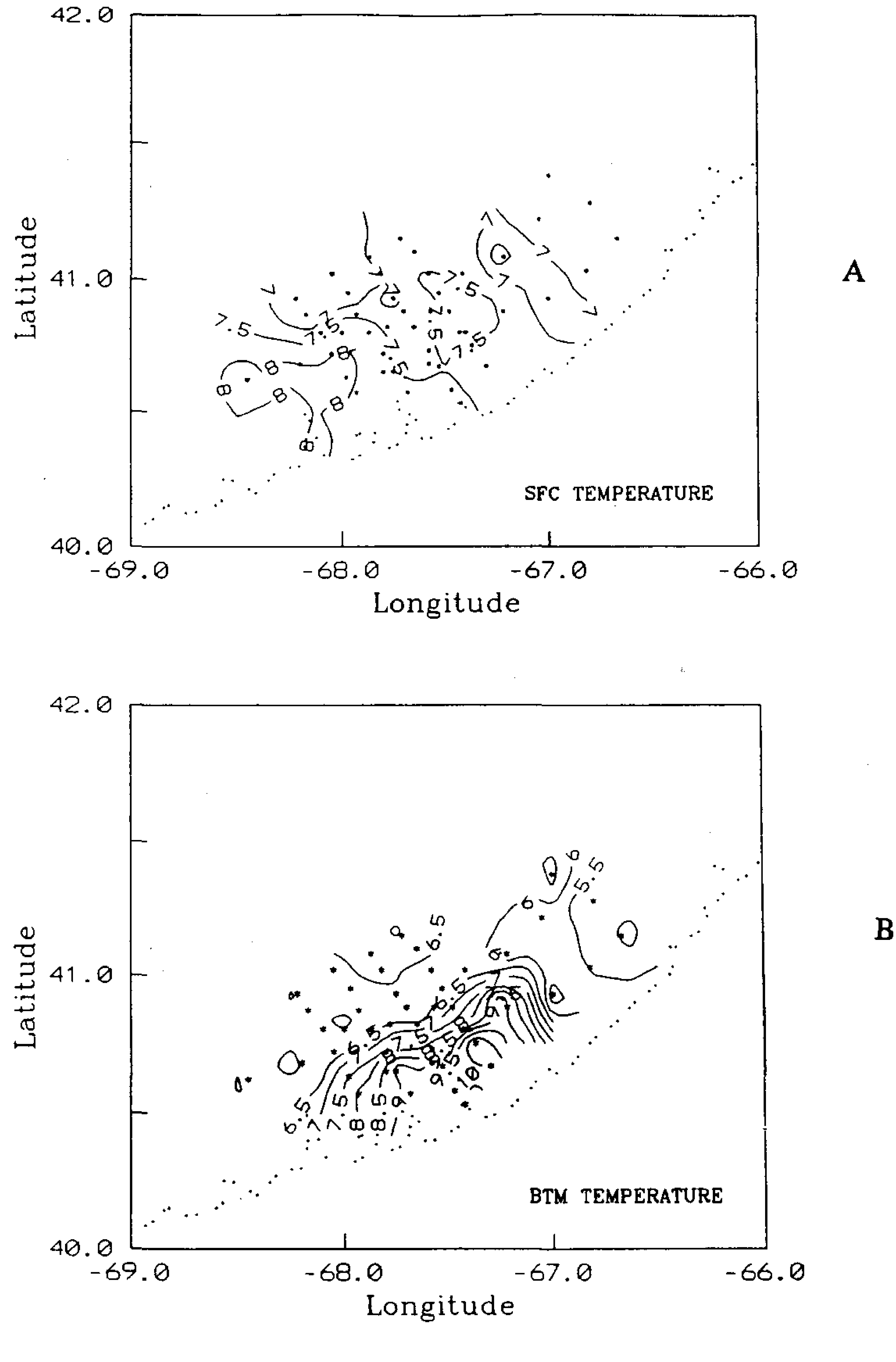

Figure 15. Surface (a) and bottom (b) temperature distibutions from the initial bongo survey.

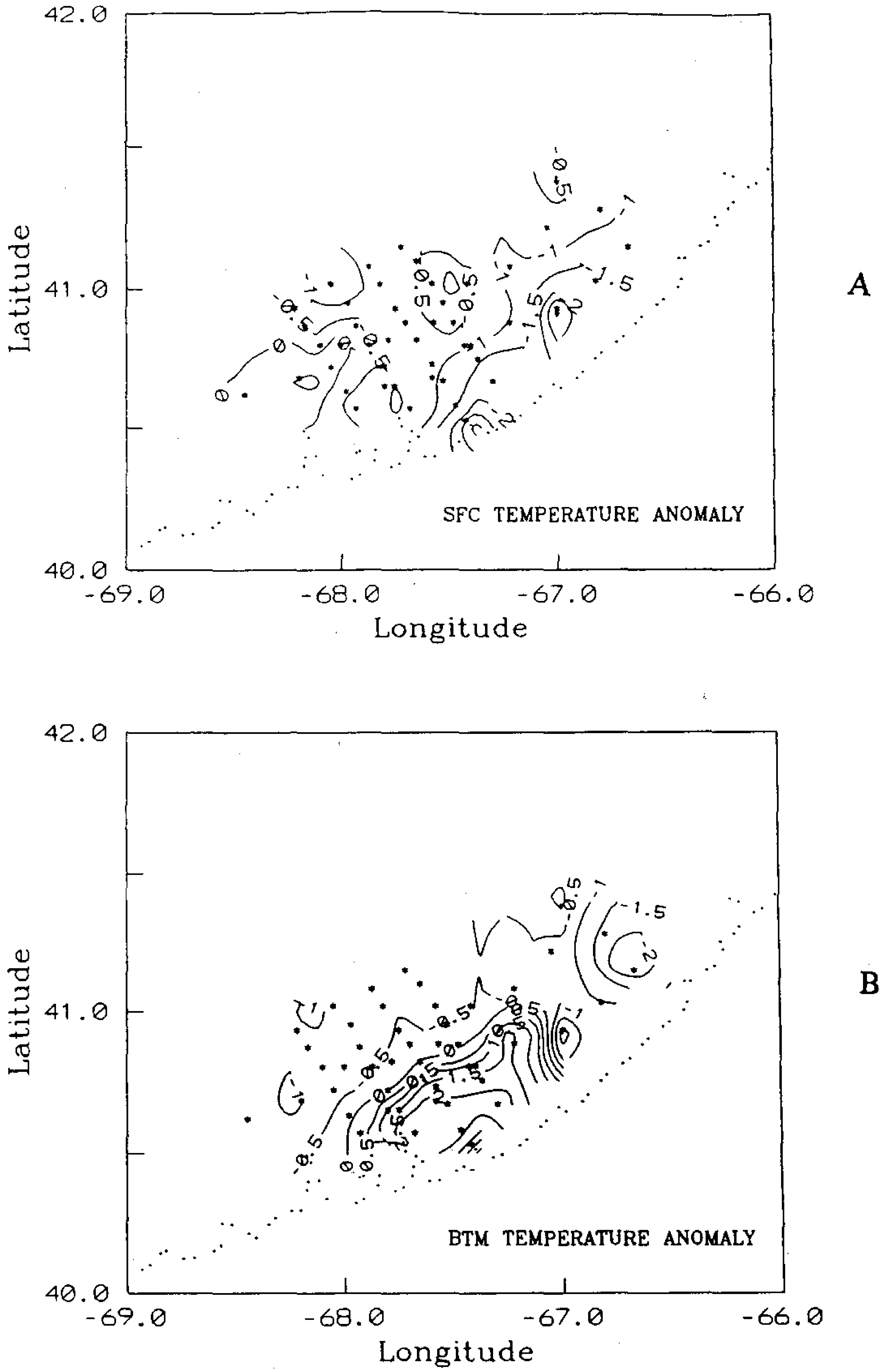

Figure 16. Surface (a) and bottom (b) temperature anomaly distributions (reference - observed) from the initial bongo survey.

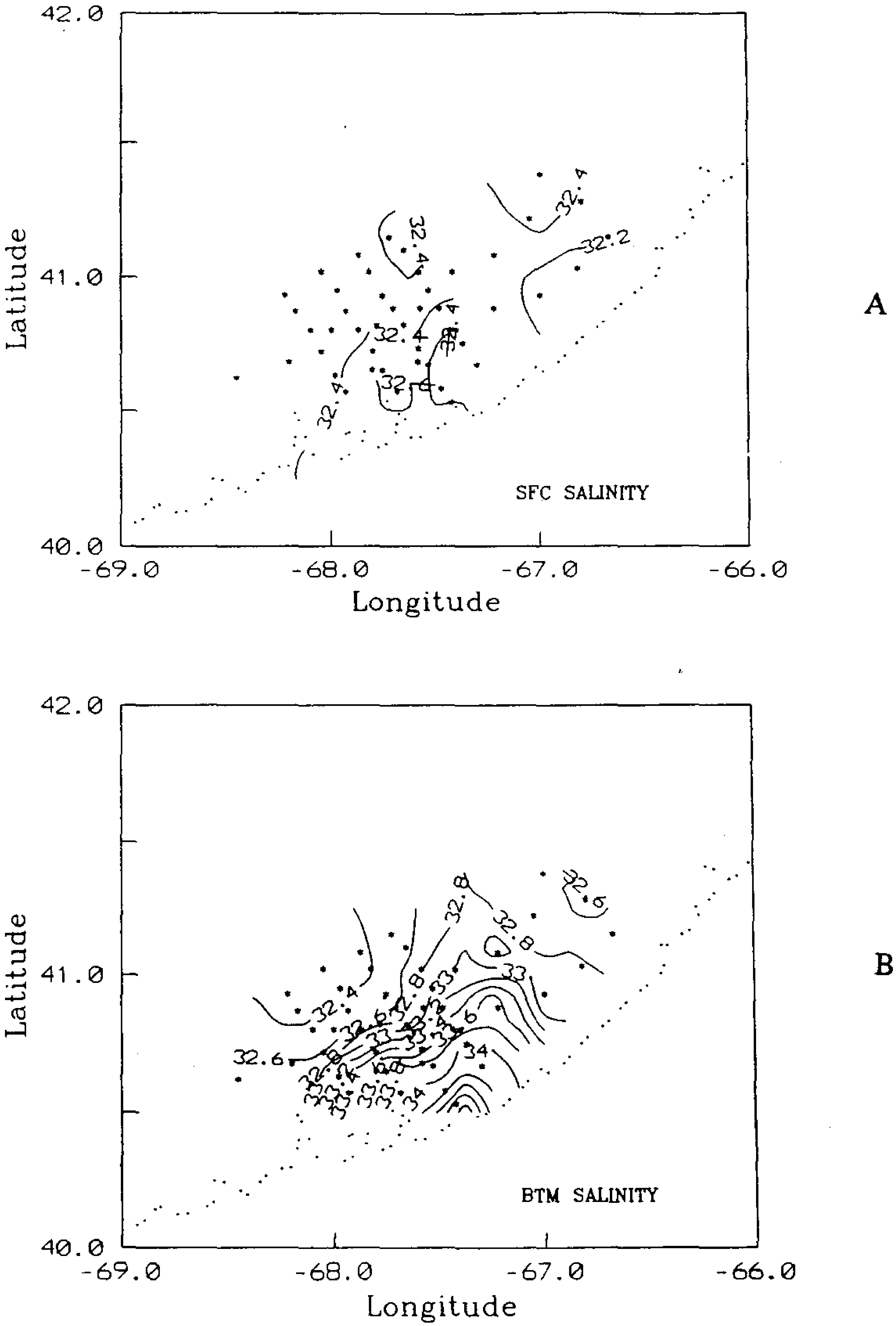

Figure 17. Surface (a) and bottom (b) salinity distributions from the initial bongo survey.

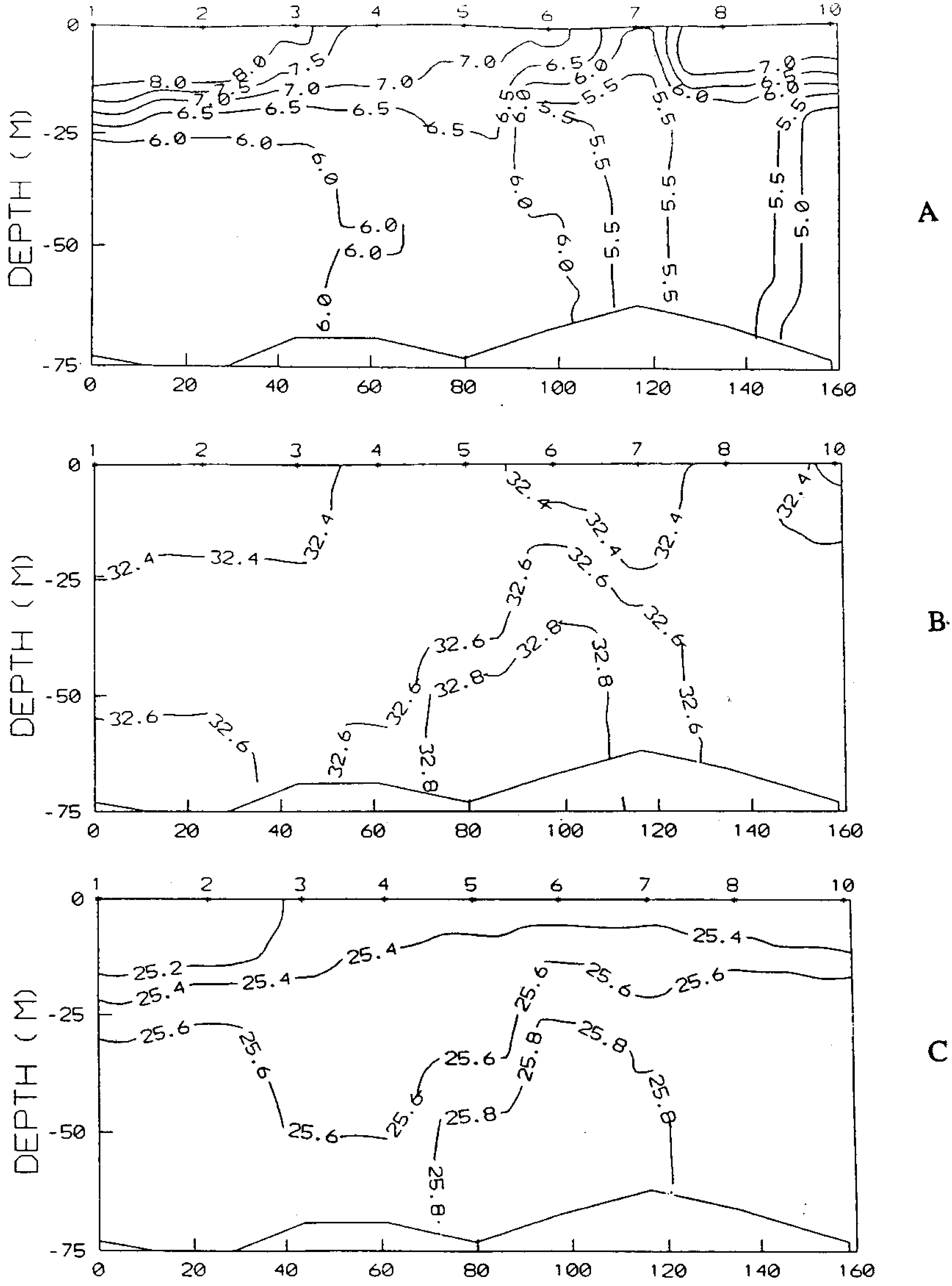

Figure 18. Vertical sections of temperature (a), salinity (b), and sigma-t (c) from along-bank section #1 from the initial bongo survey shown in figure 1.

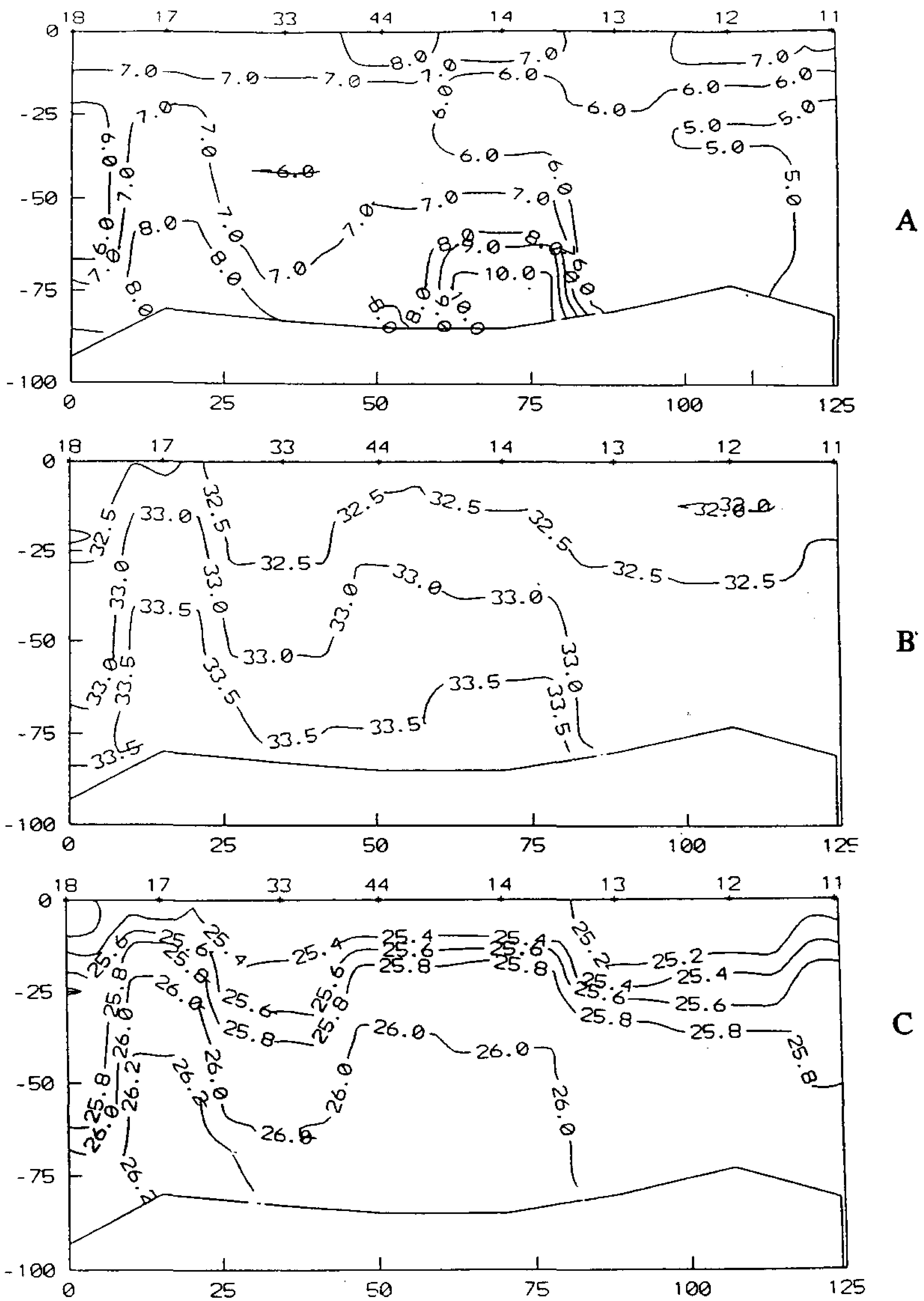

Figure 19. Vertical sections of temperature (a), salinity (b), and sigma-t (c) from along-bank section #2 from the initial bongo survey shown in figure 1.

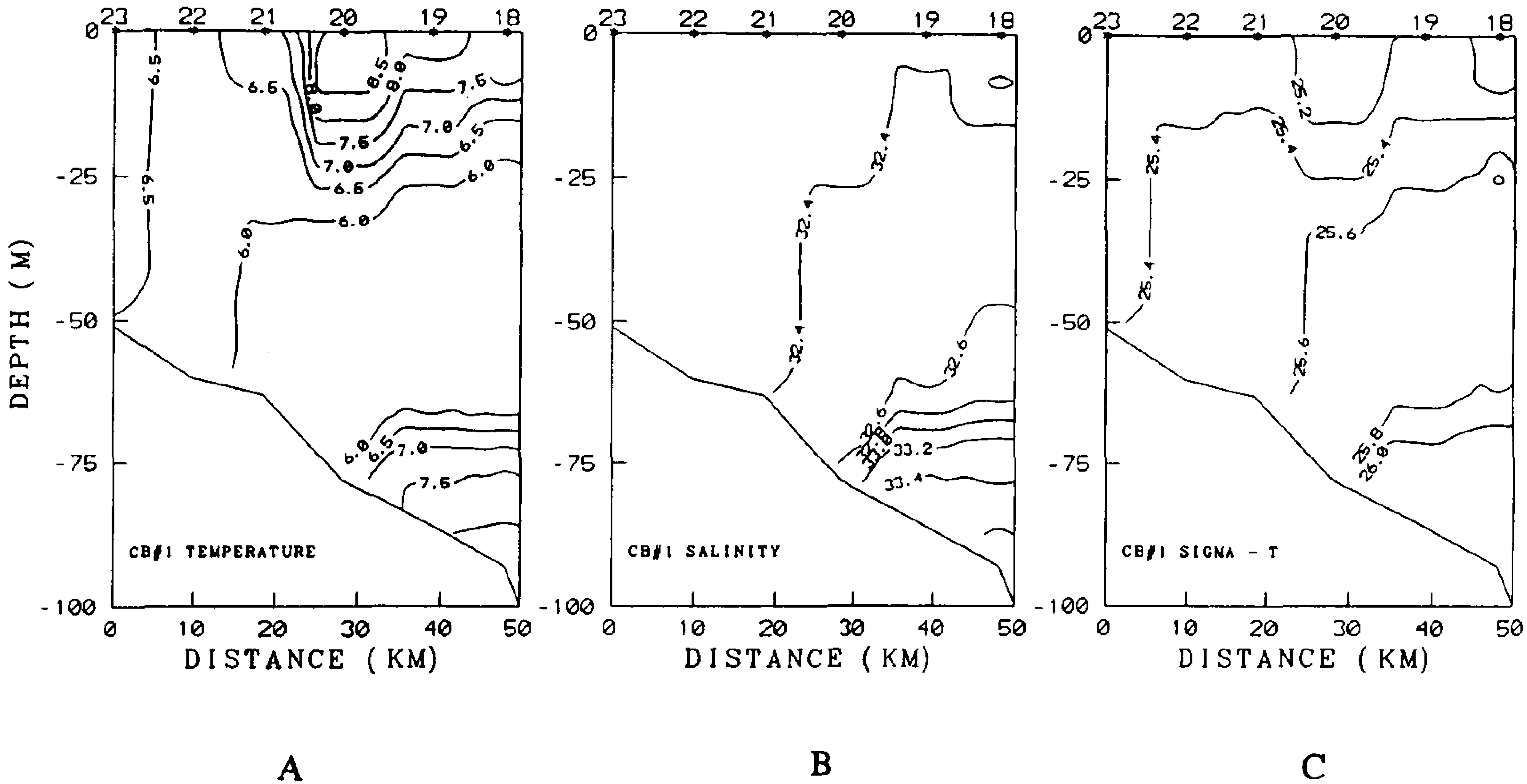

Figure 20. Vertical sections of temperature (a), salinity (b), and sigma-t (c) from cross-bank section #1 from the initial bongo survey shown in figure 1.

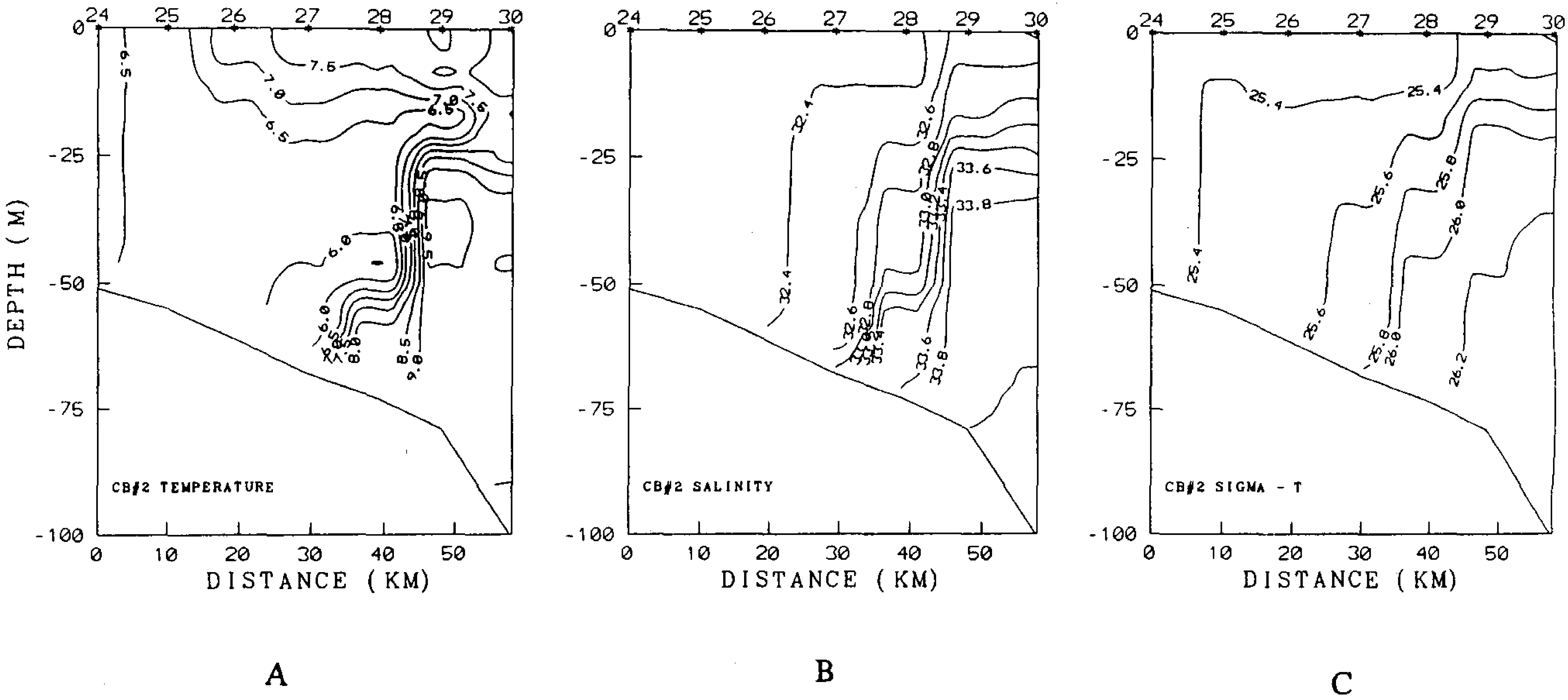

Figure 21. Vertical sections of temperature (a), salinity (b), and sigma-t (c) from cross-bank section #2 from the initial bongo survey shown in figure 1.

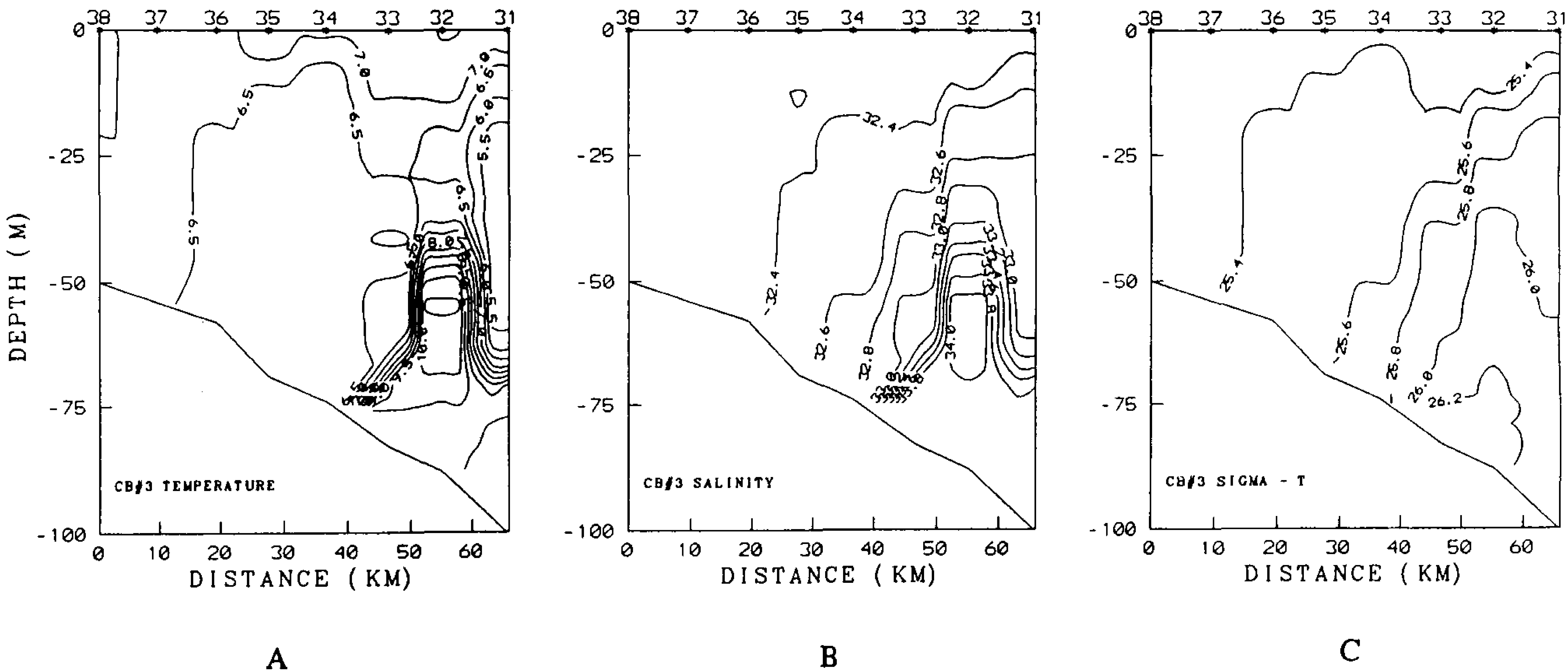

Figure 22. Vertical sections of temperature (a), salinity (b), and sigma-t (c) from cross-bank section #2 from the initial bongo survey shown in figure 1.

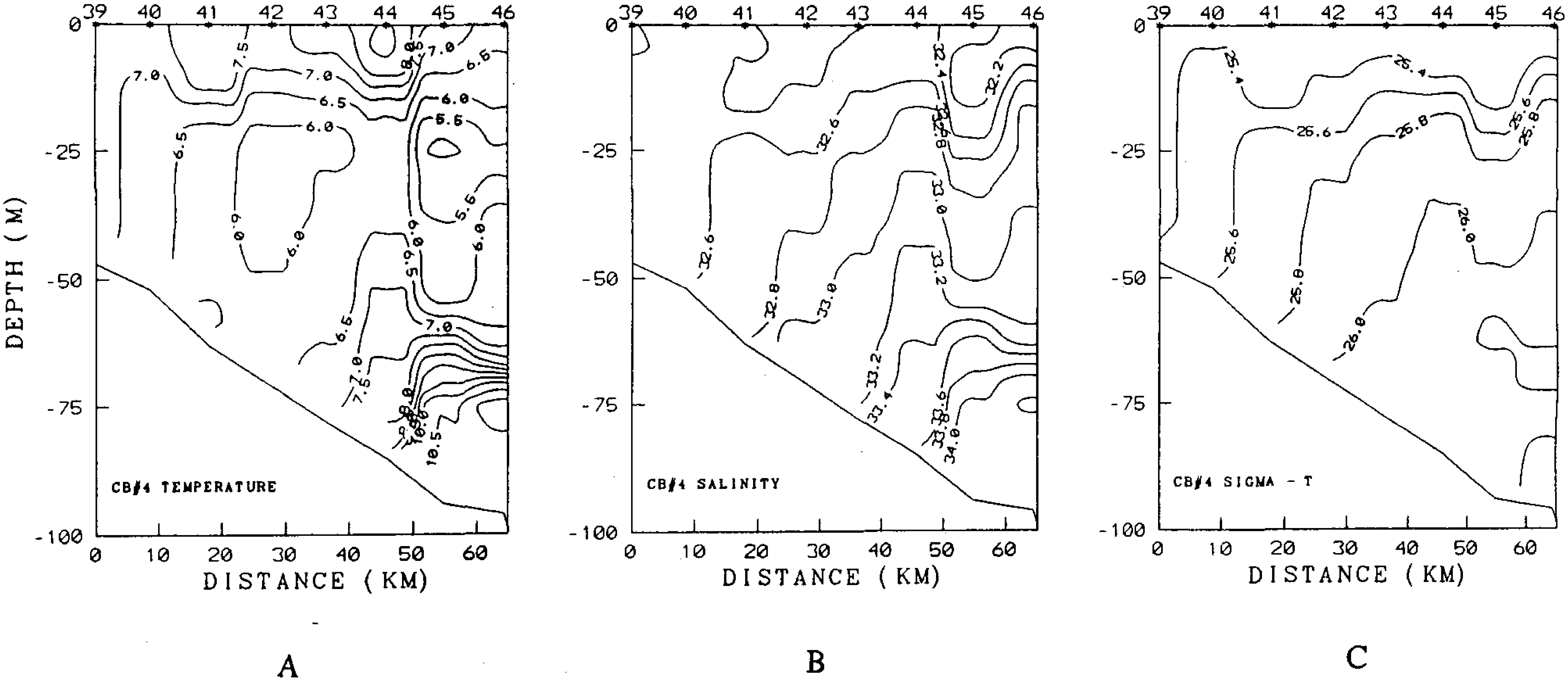

Figure 23. Vertical sections of temperature (a), salinity (b), and sigma-t (c) from cross bank section #4 from the initial bongo survey shown in figure 1.

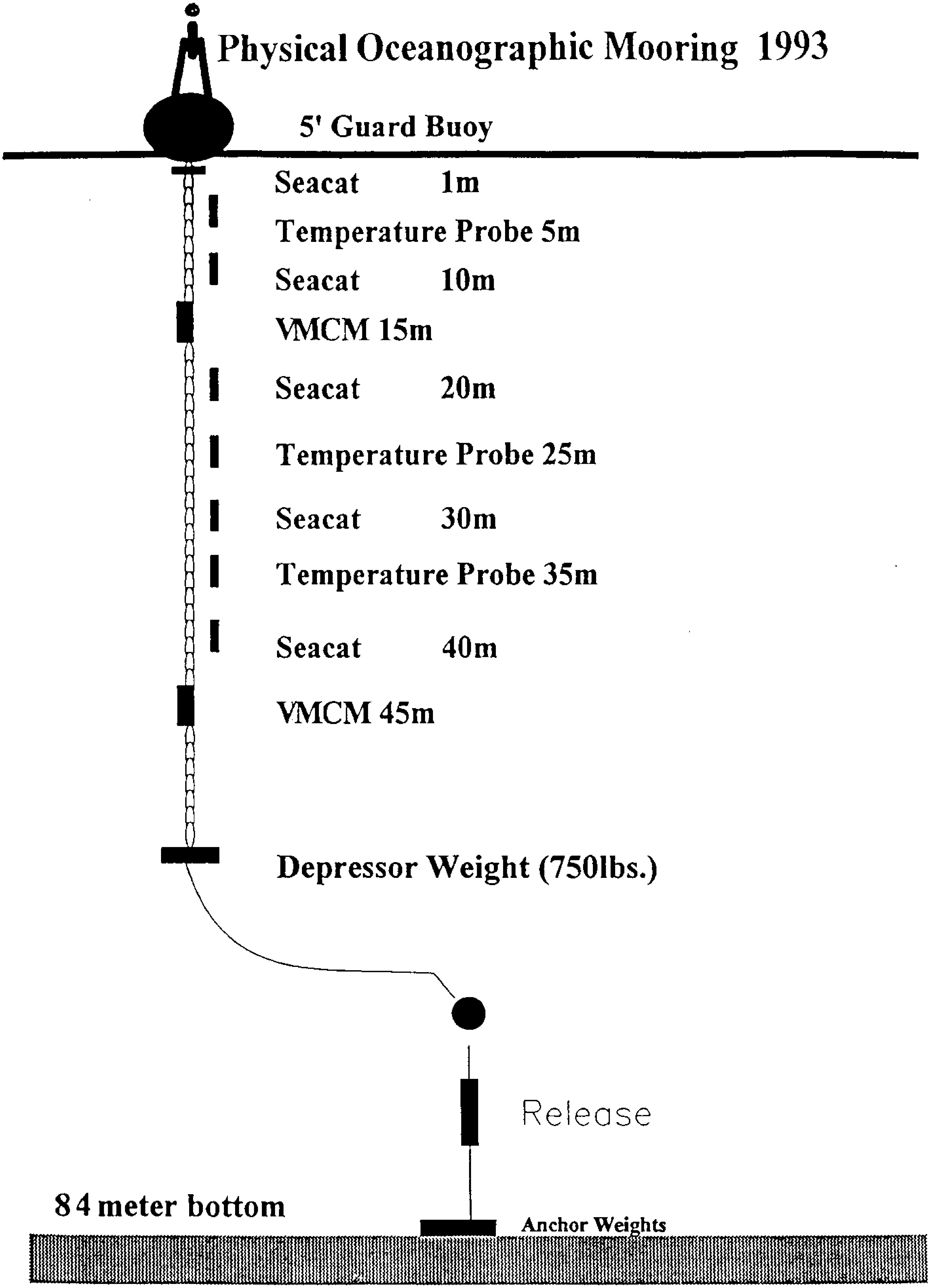

Figure 24. Mooring configuration used for cruise ALB9306.

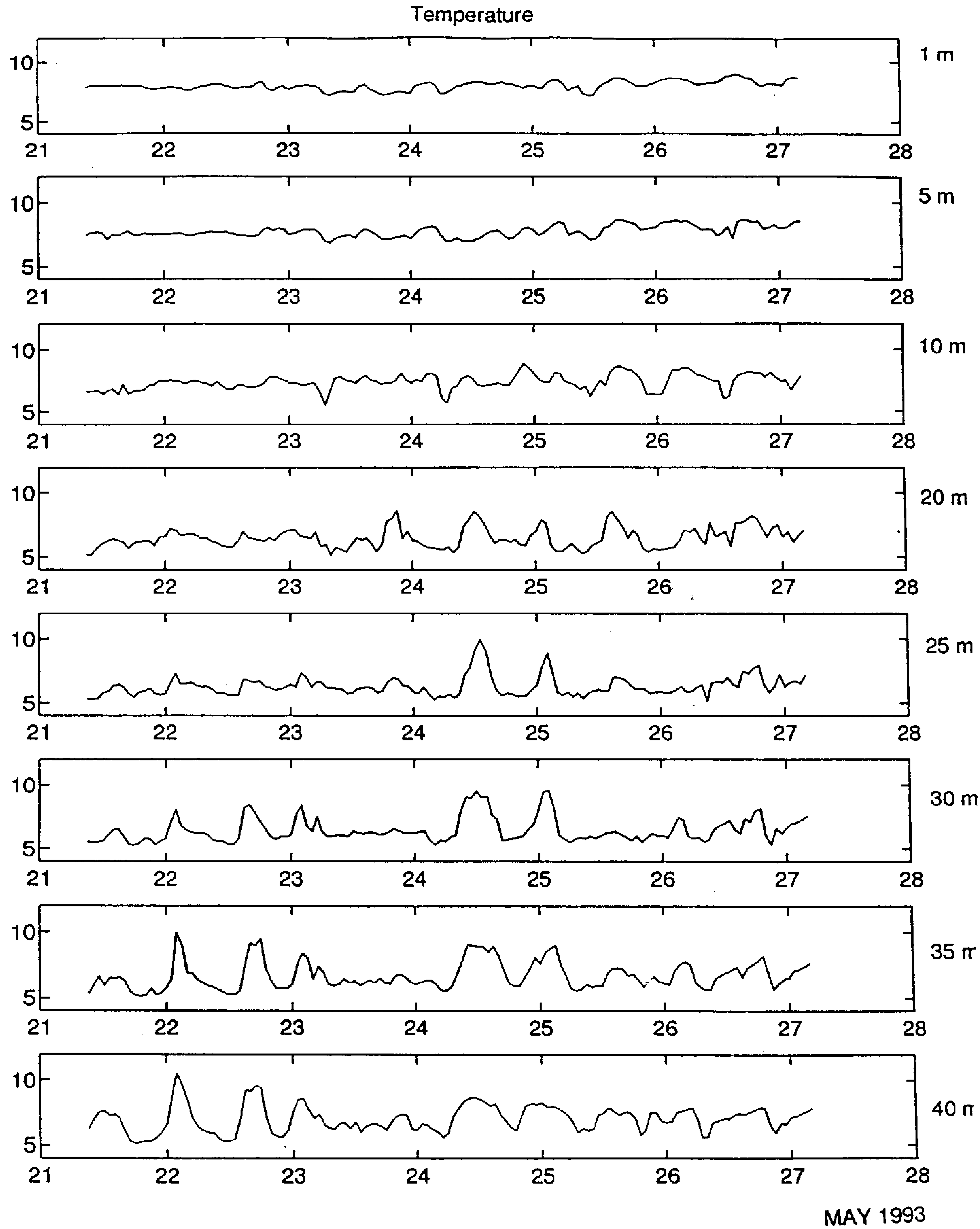

Figure 25. Temperature data recorded by the instuments on the mooring.

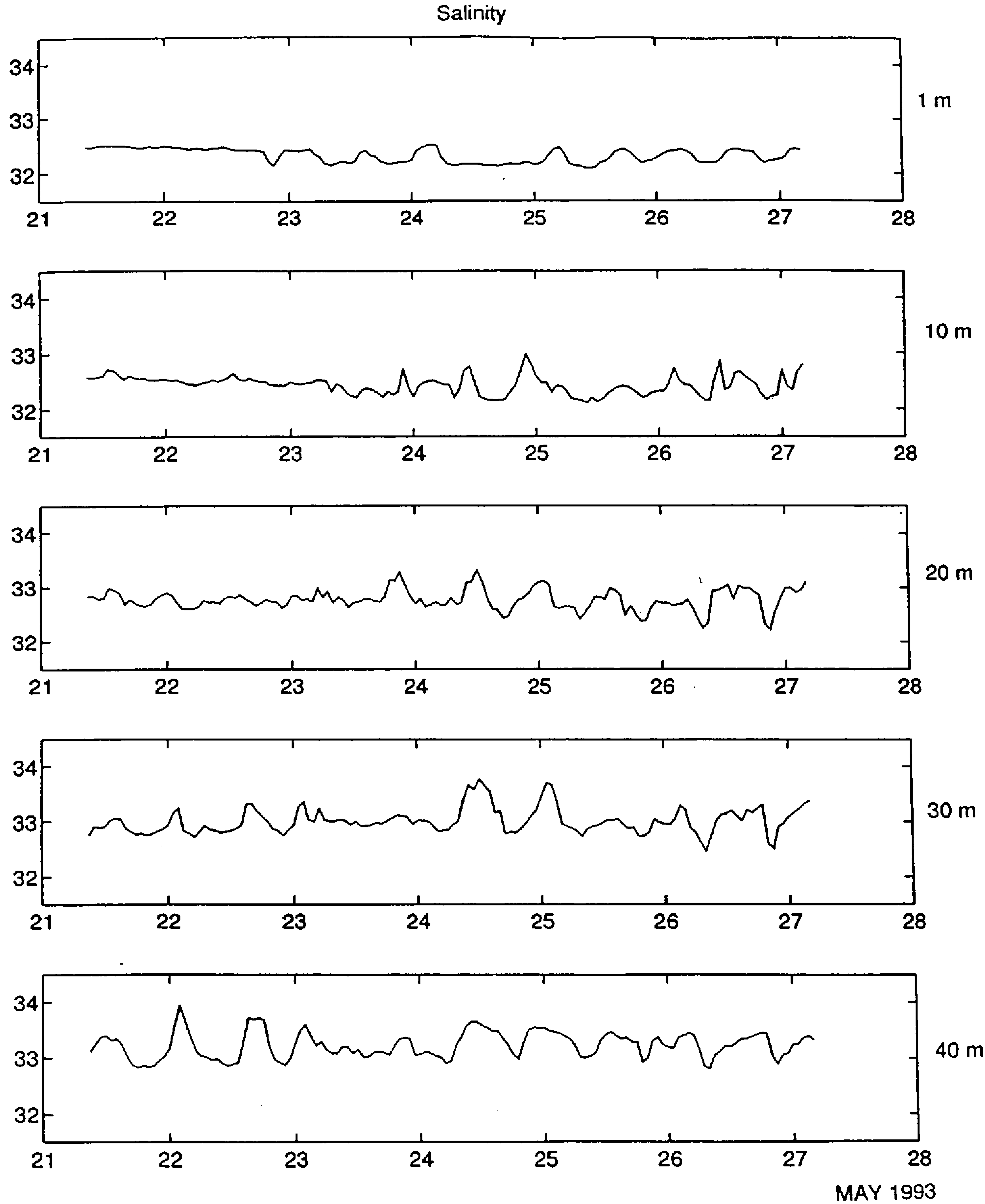

Figure 26. Salinity data recorded by the instruments on the mooring.

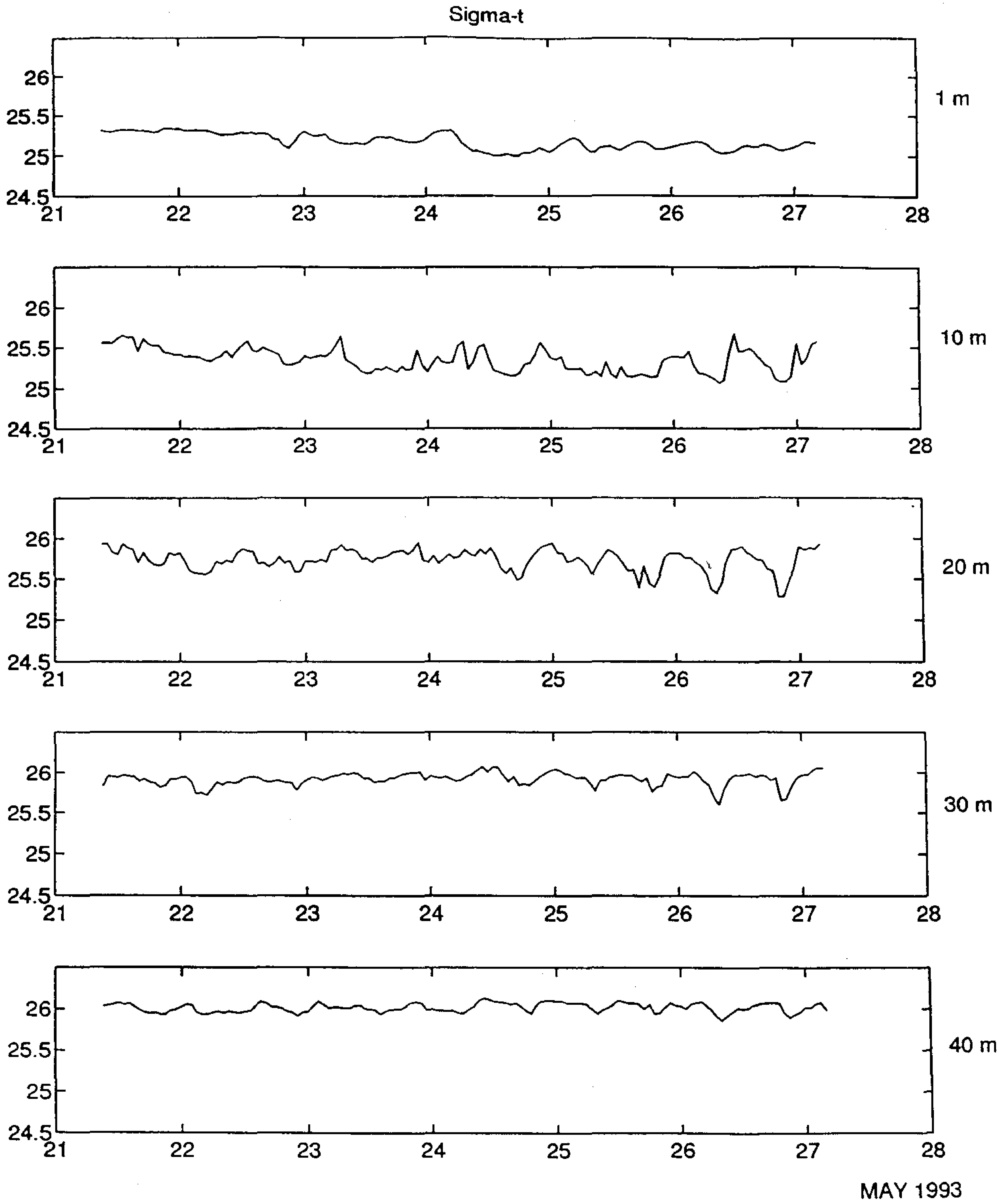

Figure 27. Sigma-t data recorded by the instruments on the mooring.

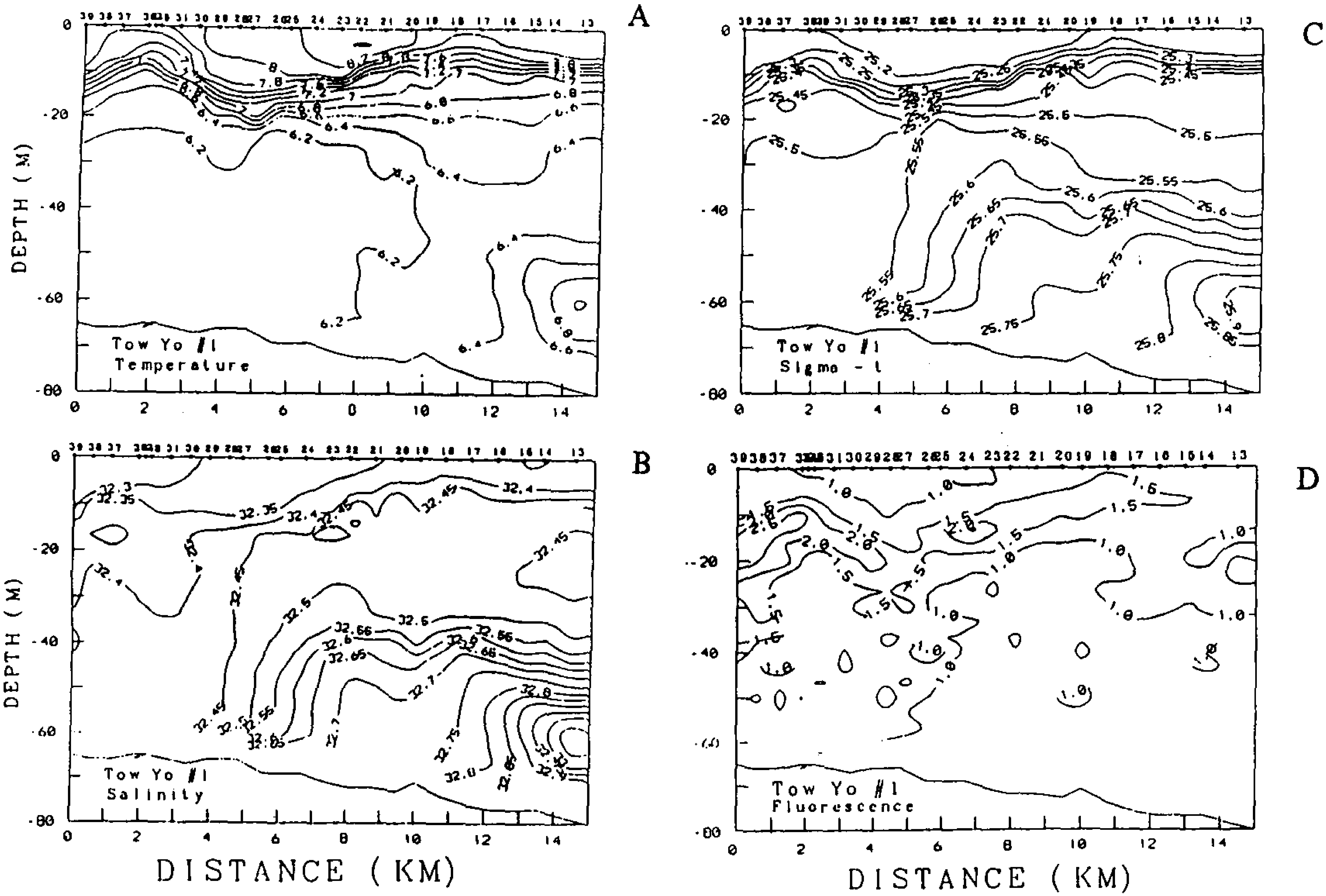

Figure 28. Vertical sections of Temperature (a), salinity (b), sigma-t (c), and fluorescence (d) from MK5 tow-yo #1.

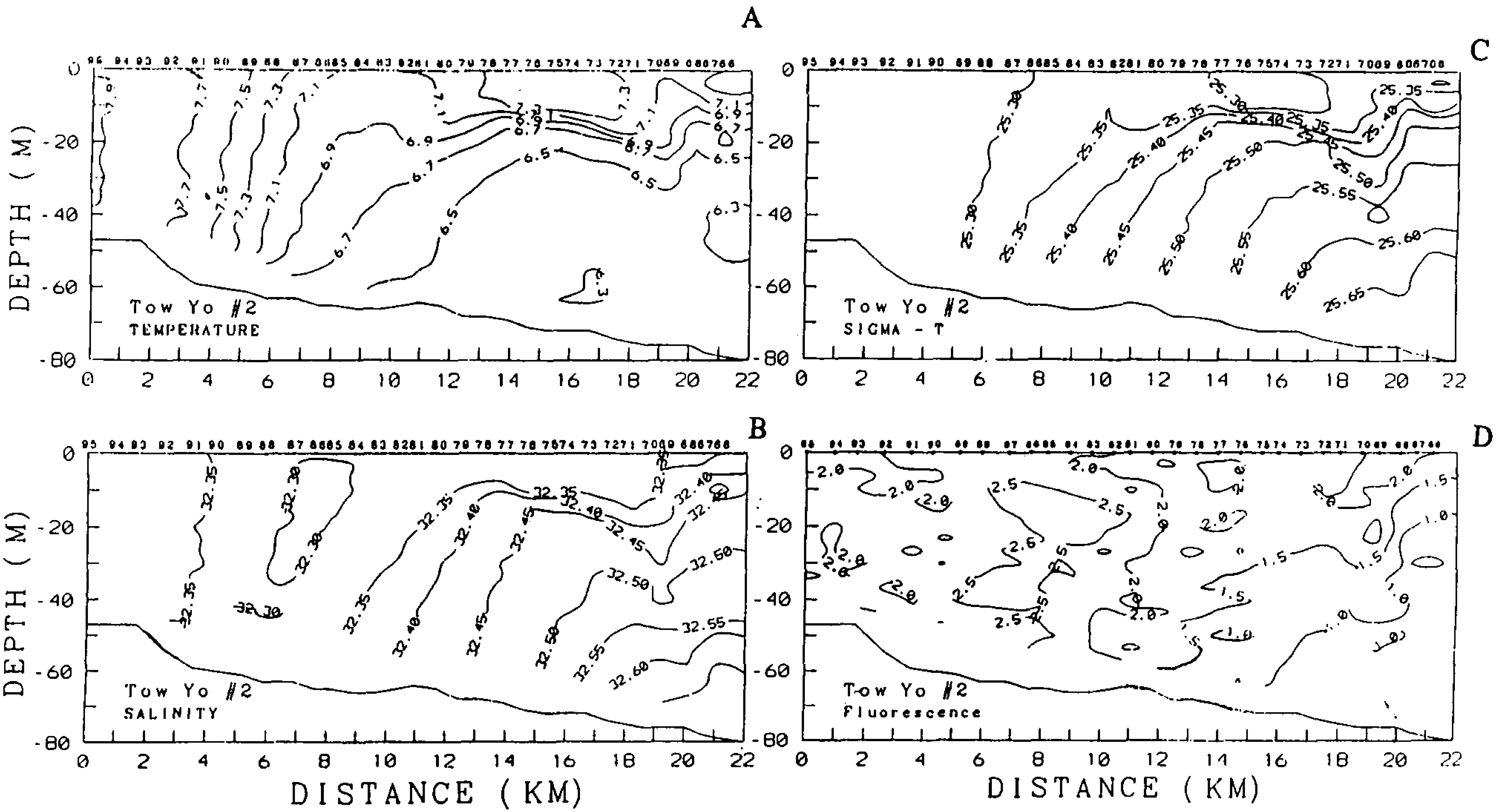

Figure 29. Vertical sections of Temperature (a), salinity (b), sigma-t (c), and fluorescence (d) from MK5 tow-yo #2.

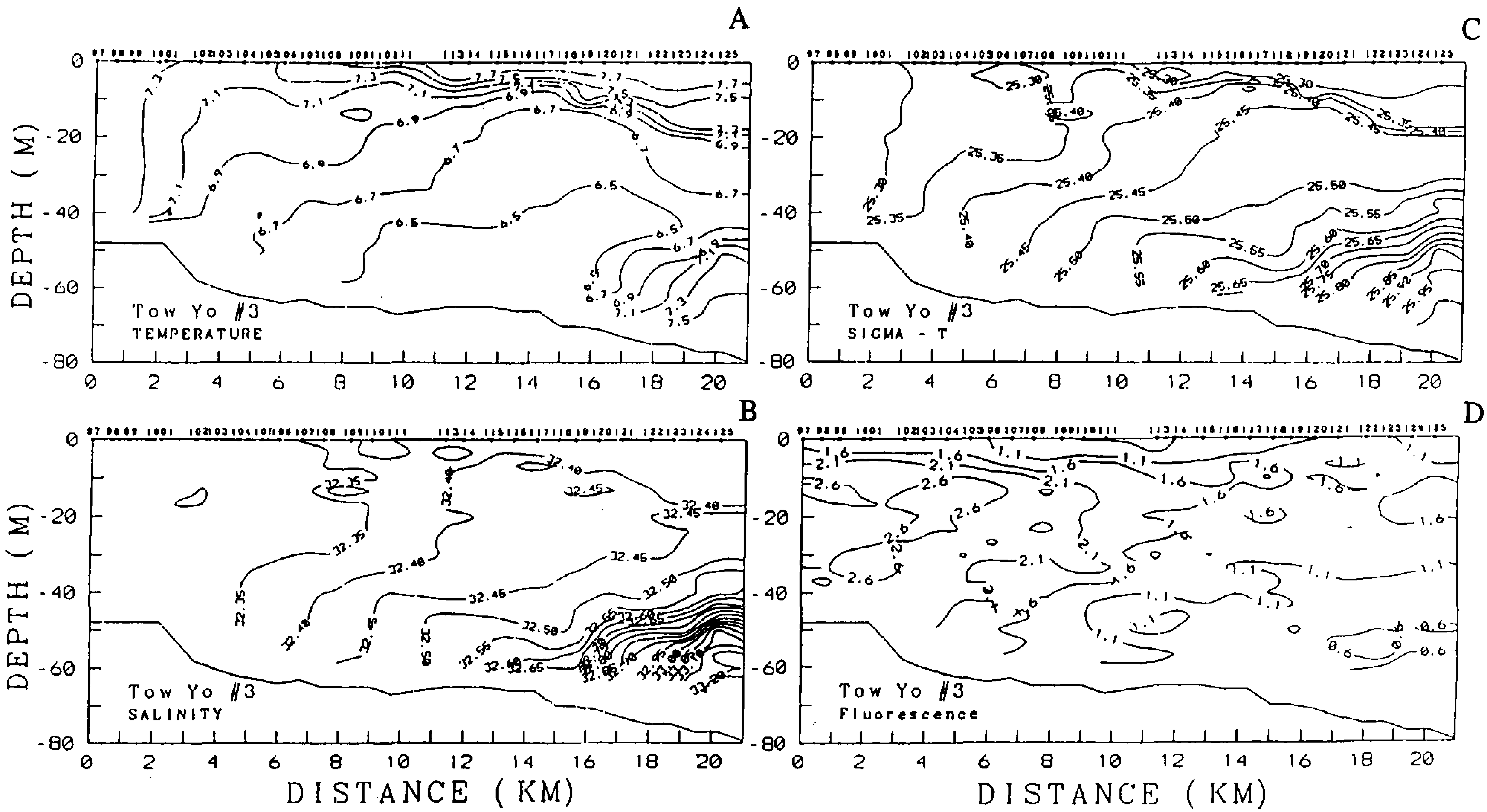

Figure 30. Vertical sections of Temperature (a), salinity (b), sigma-t (c), and fluorescence (d) from MK5 tow-yo #3.

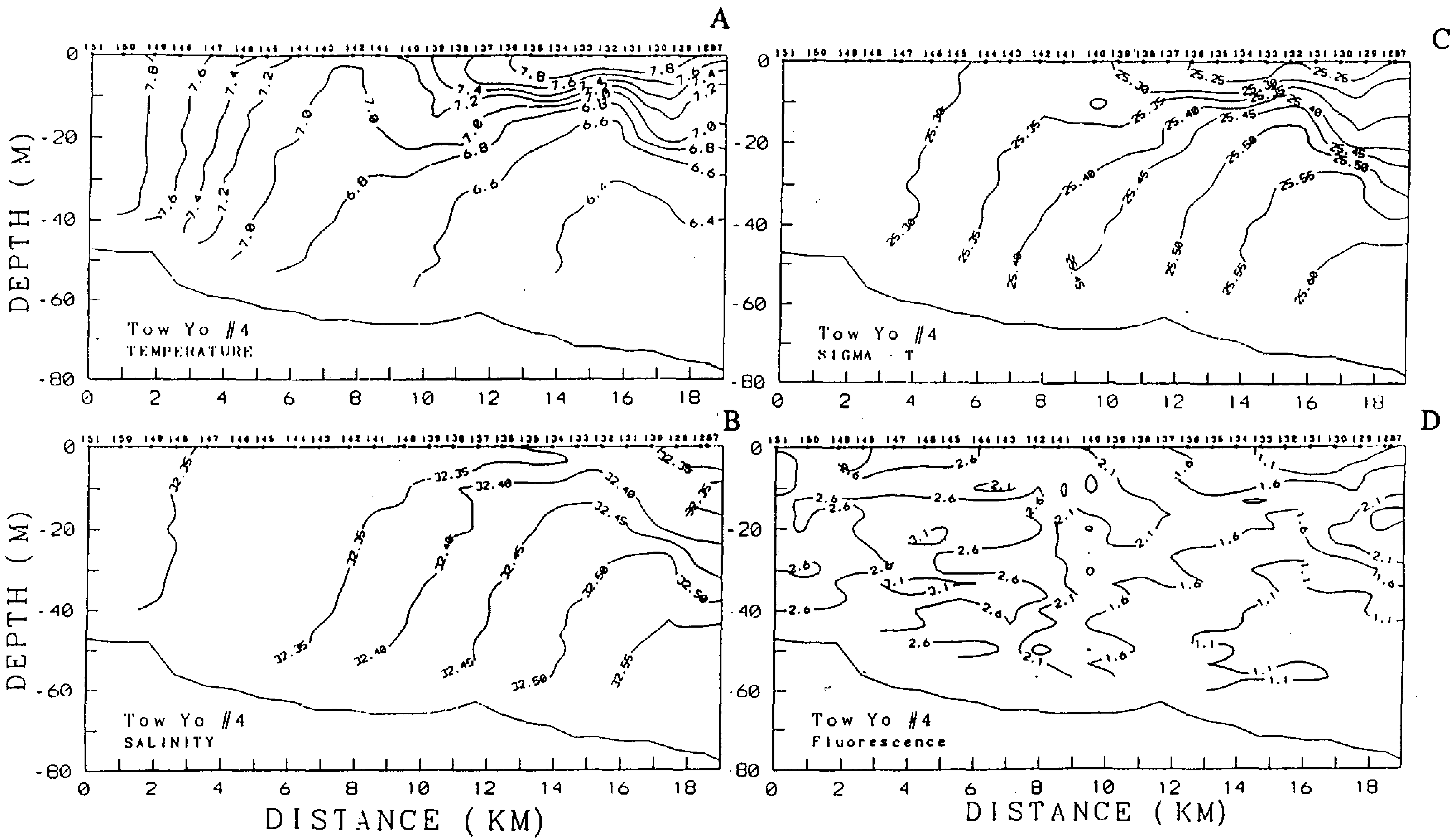

Figure 31. Vertical sections of Temperature (a), salinity (b), sigma-t (c), and fluorescence (d) from MK5 tow-yo #4.

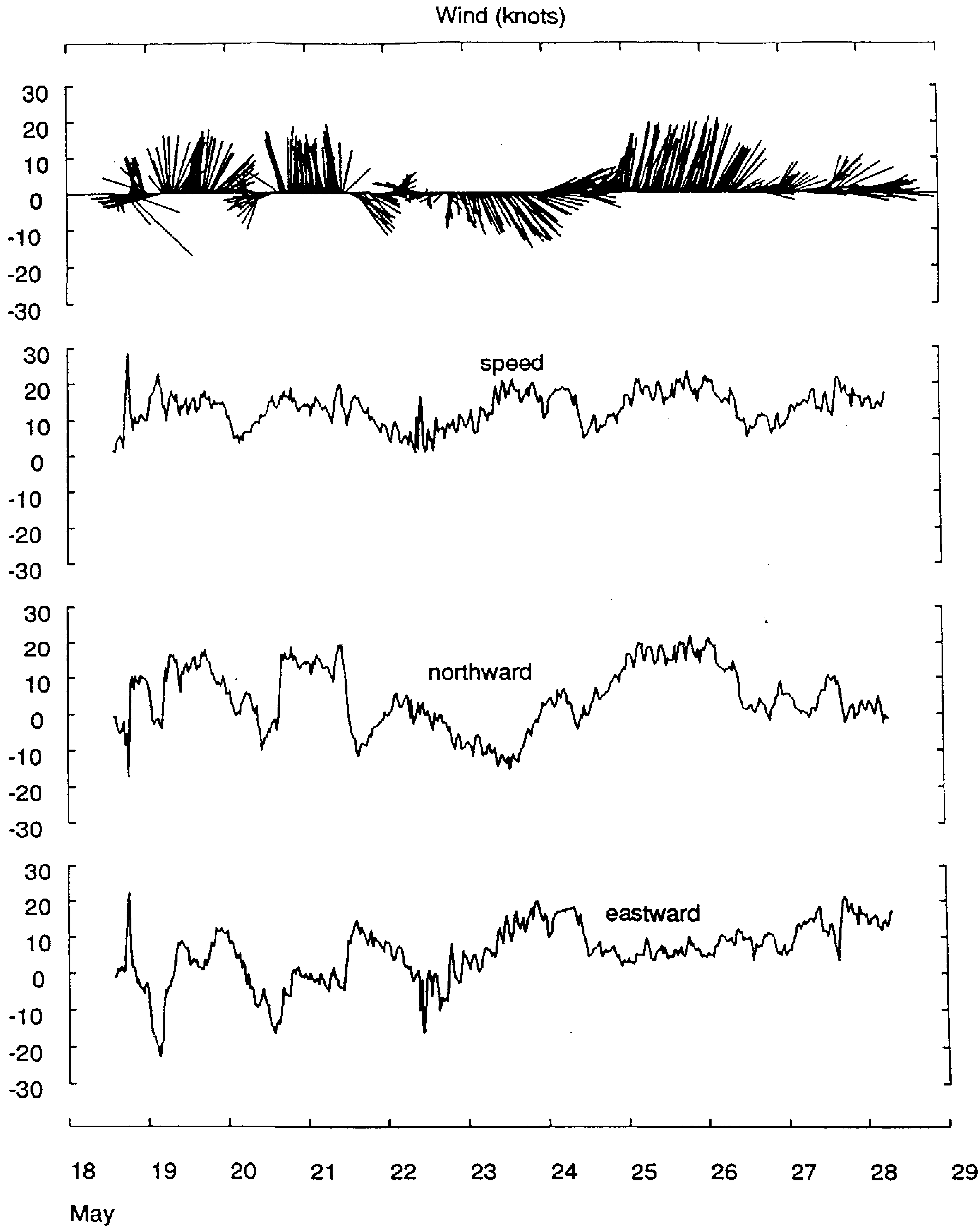

Figure 32. Wind data recorded by the SCS system aboard the ALBATROSS IV.

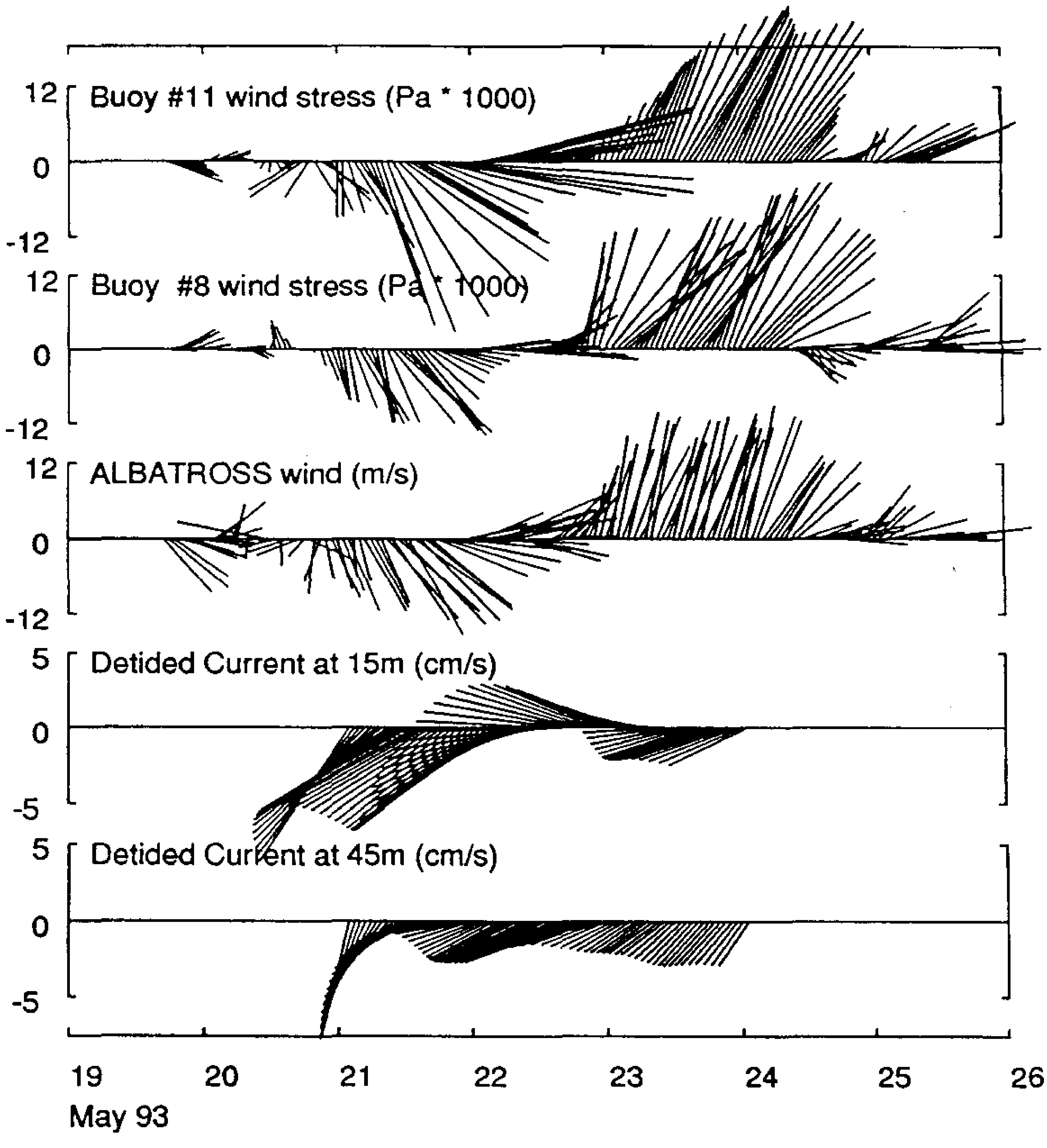

Figure 33. Wind data recorded by NOAA buoys 44011, 44008 and the Shipboard data acquisition system during the cruise period. The current data was recorded by the VMCMs on the mooring.

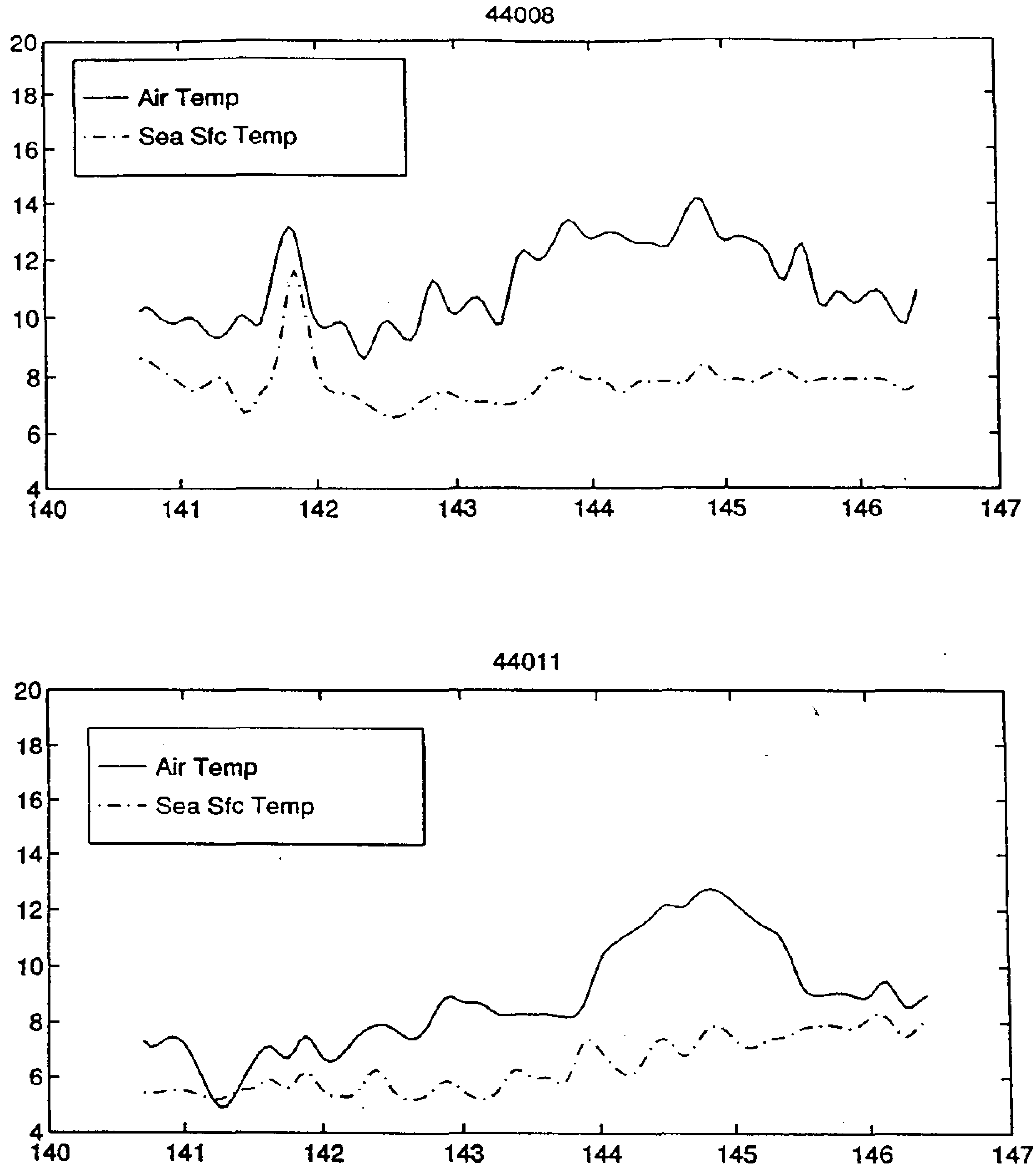

Figure 34. Air and sea surface temperature data from NOAA buoys 44008 and 44011 during cruise ALB9306.

Table 1. Event log for cruise ALB9306

EVENT	CTD #	OPER #	START GMT	LAT N	LON W	DESCRIPTION	PI
1	Pro. test	519.01	04:54	40 36.9	68 25.2	Profiler CTD	Lough
2	Pro. 001	519.02	08:30	40 37.1	68 77.7	Bongo	Lough
3	Pro. 002w	519.03	10:02	40 41.5	68 11.9	Calibration	Mountain
4	Pro. 002	519.04	10:10	40 41.6	68 12.2	Bongo	Lough
5	Pro. 003	519.05	11:28	40 47.9	68 00.1	Bongo	Lough
6	MK5 001	519.06	11:58	40 48.0	68 00.5	MK5 CTD test	Mountain
7	Moc. test	519.07	12:22	40 48.9	68 00.5	Mocness test	Lough
8	Pro. 004	519.08	13:32	40 48.9	67 47.0	Bongo	Lough
9	Pro. 005	519.09	14:38	40 53.0	67 34.9	Bongo	Lough
10	Pro 006w	519.10	15:50	41 01.5	67 25.9	Calibration	Mountain
11	Pro. 006	519.11	16:02	41 01.3	67 25.7	Bongo	Lough
12	Pro. 007	519.12	17:14	41 05.9	67 14.0	Bongo	Lough
13	Pro. 008	519.13	18:36	41 13.0	67 03.7	Bongo	Lough
14	Pro. 009	519.14	19:53	41 23.0	67 00.1	Bongo	Lough
15	Pro. 010	519.15	21:08	41 17.9	66 48.2	Bongo	Lough
16	Pro. 011w	519.16	22:25	41 09.1	66 40.5	Calibration	Mountain
17	Pro. 011	519.17	22:45	41 09.0	66 40.7	Bongo	Lough
18	Pro. 012	519.18	23:53	41 02.5	66 49.9	Bongo	Lough
1	Pro. 013	520.01	01:09	40 56.4	67 00.9	Bongo	Lough
2	Pro. 014	520.02	02:21	40 53.5	67 13.6	Bongo	Lough
3	Pro. 015	520.03	03:32	40 48.6	67 24.9	Bongo	Lough
4	Pro. 016	520.04	04:55	40 41.7	67 35.5	Bongo	Lough
5	Pro. 017	520.05	06:59	40 39.4	67 48.2	Bongo	Lough
6	Pro. 018	520.06	07:54	40 34.2	67 56.6	Bongo	Lough
7	Pro. 019	520.07	08:55	40 38.5	67 59.8	Bongo	Lough
8	Pro. 020w	520.08	09:55	40 43.5	68 03.5	Calibration	Mountain
9	Pro. 020	520.09	10:05	40 43.6	68 03.6	Bongo	Lough
10	Pro. 021	520.10	10:55	40 48.1	68 06.9	Bongo	Lough
11	Pro. 022	520.11	11:40	40 51.9	68 10.4	Bongo	Lough
12	Pro. 023	520.12	12:23	40 56.5	68 13.9	Bongo	Lough
13	Pro. 024	520.13	13:23	41 01.5	68 03.1	Bongo	Lough
14	Pro. 025	520.14	14:14	40 57.1	67 58.9	Bongo	Lough
15	Pro. 026	520.15	14:58	40 52.6	67 56.1	Bongo	Lough
16	Pro. 027	520.16	15:45	40 48.0	67 52.0	Bongo	Lough
17	Pro. 028w	520.17	16:30	40 43.5	67 48.6	Calibration	Mountain
18	Pro. 028	520.18	16:38	40 43.3	67 48.7	Bongo	Lough
19	Pro. 029	520.19	17:22	40 39.4	67 45.2	Bongo	Lough
20	Pro. 030	520.20	18:05	40 34.9	67 41.6	Bongo	Lough
21	Pro. 031	520.21	19:21	40 35.8	67 28.1	Bongo	Lough
22	Pro. 032	520.22	20:12	40 40.7	67 32.0	Bongo	Lough
23	Pro. 033	520.23	21:02	40 44.4	67 35.8	Bongo	Lough
24	Pro. 034w	520.24	21:57	40 48.9	67 39.0	Calibration	Mountain
25	Pro. 034	520.25	22:08	40 48.9	67 39.0	Bongo	Lough
26	Pro. 035	520.26	2258	40 53.4	67 42.2	Bongo	Lough
27	Pro. 036	520.27	23:43	40 56.9	67 45.9	Bongo	Lough
1	Pro. 037	521.01	00:30	41 01.6	67 49.2	Bongo	Lough
2	Pro. 038	521.02	01:20	41 05.9	67 52.9	Bongo	Lough
3	Pro. 039	521.03	02:27	41 09.9	67 43.1	Bongo	Lough
4	Pro. 040	521.04	03:12	41 06.1	67 39.6	Bongo	Lough
5	Pro. 041w	521.05	04:01	41 01.9	67 35.9	Calibration	Mountain
6	Pro. 041	521.06	04:12	41 01.7	67 35.7	Bongo	Lough
7	Pro. 042	521.07	04:58	40 57.2	67 32.5	Bongo	Lough
8	Pro. 043	521.08	05:42	40 43.4	67 29.1	Bongo	Lough
9	Pro. 044	521.09	06:33	40 48.8	67 26.1	Bongo	Lough
10	Pro. 045	521.10	07:24	40 45.0	67 22.0	Bongo	Lough
11	Pro. 046	521.11	08:19	40 45.5	67 18.6	Bongo	Lough
12	Pro. 047	521.12	09:45	40 32.4	67 25.0	Bongo	Lough
13	*****	521.13	15:25	40 38.96	67 37.42	Deploy Mooring	Mountain

14	*****	521.14	15:40	40 38.8	67 37.5	Hydrophone tst	Mountain
15	MK5 2	521.15	17:44	40 38.92	67 38.33	MK5 CTD	Mountain
16	Moc 1009	521.16	23:56	40 39.4	67 36.2	Mocness (1m)	Lough
1	MK5 3	522.01	01:38	40 39.0	67 37.4	MK5 CTD	Mountain
2	MK5 4	522.02	03:17	40 40.8	67 53.0	MK5 CTD	Mountain
3	MOC 1010	522.03	03:58	40 40.5	67 51.8	Mocness (1m)	Lough
4	MK5 5	522.04	07:46	40 40.6	67 53.1	MK5 CTD	Mountain
5	MOC 1011	522.05	08:03	40 40.3	67 53.1	Mocness (1m)	Lough
6	MK5 6	522.06	11:09	40 43.6	68 03.7	MK5 CTD	Mountain
7	MOC 1012	522.07	11:36	40 43.5	68 03.6	Mocness (1m)	Lough
8	MK5 -	522.08	13:08	40 43.7	68 04.1	MK5 CTD	Mountain
9	MK5 8	522.09	14:10	40 43.6	68 04.0	MK5 CTD	Mountain
10	MOC 1013	522.10	14:37	40 43.8	68 04.0	Mocness (1m)	Lough
11	MK5 9	522.11	16:09	40 42.9	68 04.2	MK5 CTD	Mountain
12	*****	522.12	17:38	40 42.93	68 02.67	Deploy Drifter	Manning
13	MOC 1014	522.13	18:34	40 42.57	68 02.25	Mocness (1/4m)	Lough
14	MK5 10	522.14	19:37	40 41.6	68 01.9	MK5 CTD	Mountain
15	MOC 1015	522.15	20:03	40 41.2	68 01.7	Mocness (1m)	Lough
16	MK5 11	522.16	21:41	40 40.0	68 02.4	MK5 CTD	Mountain
17	MOC 1016	522.17	22:34	40 39.7	68 02.9	Mocness (1m)	Lough
1	MK5 12	523.01	00:09	40 39.8	68 04.1	MK5 CTD	Mountain
2	MOC 1017	523.02	00:42	40 39.8	68 04.7	Mocness (1m)	Lough
3	MK5 13 - 39	523.03	02:29	40 43.0	68 02.1	MK5 Tow-yo 1	Mountain
4	*****	523.04	10:08	40 58.95	68 02.11	Deploy H. Fly	Manning
5	MOC 1018	523.05	10:52	40 58.3	68 03.13	Mocness (1m)	Lough
6	MK5 40	523.06	12:01	41 00.4	68 03.6	MK5 CTD	Mountain
7	MK5 41	523.07	13:29	40 58.4	68 06.7	MK5 CTD	Mountain
8	MOC 1019	523.08	13:41	40 58.4	68 06.8	Mocness (1m)	Lough
9	MK5 42	523.09	15:46	40 59.0	68 02.1	MK5 CTD	Mountain
10	MOC 1020	523.10	15:55	40 59.1	68 01.9	Mocness (1/4m)	Lough
11	MK5 43	523.11	17:23	40 58.9	68 01.9	MK5 CTD	Mountain
12	MOC 1021	523.12	17:39	40 59.0	68 01.8	Mocness (1m)	Lough
13	MK5 44	523.13	19:38	40 58.2	68 01.5	MK5 CTD	Mountain
14	MOC 1022	523.14	19:45	40 58.0	68 01.3	Mocness (1m)	Lough
15	MK5 45	523.15	22:20	40 58.7	68 01.9	MK5 CTD	Mountain
16	MOC 1023	523.16	22:34	40 58.5	68 02.03	Mocness (1/4m)	Lough
17	*****	523.17	23:30	40 57.95	68 02.03	Recover H. Fly.	Manning
18	MOC 1024	523.18	23:46	40 58.0	68 02.02	Mocness (1m)	Lough
1	MK5 46	524.01	01:13	40 01.6	68 02.3	MK5 CTD	Mountain
2	MK5 47	524.02	03:04	40 58.0	68 02.1	MK5 CTD	Mountain
3	MOC 1025	524.03	03:20	40 58.1	68 01.9	Mocness (1/4m	Lough
4	MK5 48	524.04	04:28	40 57.9	68 01.9	MK5 CTD	Mountain
5	MOC 1026	524.05	04:43	40 57.9	68 01.9	Mocness (1m)	Lough
6	MK5 49	524.06	06:40	40 57.9	68 01.8	MK5 CTD	Mountain
7	MOC 1027	524.07	06:50	40 57.7	68 01.5	Mocness (1m)	Lough
8	MK5 50	524.08	10:00	40 57.9	68 02.7	MK5 CTD	Mountain
9	MOC 1028	524.09	10:14	40 57.53	68 03.3	Mocness (1m)	Lough
10	MK5 51	524.10	13:03	40 57.9	68 01.9	MK5 CTD	Mountain
11	MOC 1029	524.11	13:14	40 58.2	68 01.9	Mocness (1/4m)	Lough
12	MOC 1030	524.12	15:51	40 43.1	68 03.5	Mocness (1/4m)	Lough
13	MK5 52	524.13	16:20	40 44.8	68 03.8	MK5 CTD	Mountain
14	MK5 53	524.14	17:15	40 42.6	68 03.5	MK5 CTD	Mountain
15	MOC 1031	524.15	17:30	40 42.6	68 03.5	Mocness (1m)	Lough
16	MK5 54	524.16	20:00	40 42.3	68 03.3	MK5 CTD	Mountain
17	MOC 1032	524.17	20:10	40 42.3	68 03.2	Mocness (1m)	Lough
18	MK5 55	524.18	22:41	40 42.6	68 03.3	MK5 CTD	Mountain
19	MOC 1033	524.19	23:00	40 42.9	68 02.8	Mocness (1/4m)	Lough
20	MK5 56	524.20	23:58	40 43.5	68 02.1	MK5 CTD	Mountain
1	MOC 1034	525.01	00:13	40 43.5	68 02.4	Mocness (1m)	Lough
2	MK5 57	525.02	03:12	40 43.6	68 02.3	MK5 CTD	Mountain
3	MOC 1035	525.03	03:26	40 43.6	68 02 4	Mocness (1m)	Lough
4	MK5 58	525.04	06:14	40 43.0	68 01.5	MK5 CTD	Mountain
5	MOC 1036	525.05	06:26	40 42.9	68 01.4	Mocness (1m)	Lough
6	MK5 59	525.06	09:52	40 43.3	68 01.2	MK5 CTD	Mountain

7	MOC 1037	525.07	10:07	40 42.9	68 01.1	Mocness (1m)	Lough
8	MK5 60	525.08	12:48	40 43.3	68 02.6	MK5 CTD	Mountain
9	MOC 1038	525.09	13:00	40 43.3	68 02.7	Mocness (1/4m)	Lough
10	MOC 1039	525.10	14:46	40 43.4	68 02.8	Mocness (1/4m)	Lough
11	MK5 61	525.11	15:52	40 43.6	68 02.0	MK5 CTD	Mountain
12	MOC 1040	525.12	16:04	40 43.7	68 02.0	Mocness (1m)	Lough
13	MK5 62	525.13	18:52	40 43.0	68 01.6	MK5 CTD	Mountain
14	MOC 1041	525.14	19:06	40 43.0	68 01.5	Mocness (1m)	Lough
15	MK5 63	525.15	21:24	40 43.6	68 02.4	MK5 CTD	Mountain
16	MOC 1042	525.16	21:29	40 43.5	68 02.3	Mocness (1/4m)	Lough
17	MK5 64	525.17	22:34	40 44.2	68 01.5	MK5 CTD	Mountain
18	MOC 1043	525.18	22:49	40 44.2	68 01.6	Mocness (1m)	Lough
1	*****	526.01	03:20	40 30.0	68 34.5	Drifter search	Manning
2	MK5 65	526.02	07:55	40 39.0	67 37.3	MK5 CTD	Mountain
3	MK5 66-95	526.03	10:08	40 42.9	68 02.1	MK5 Tow Yo 2	Mountain
4	MK5 96	526.04	14:07	40 54.74	68 02.46	MK5 30m tow	Mountain
5	MK5 97-126	526.05	16:00	40 54.6	68 02.7	MK5 Tow Yo 3	Mountain
6	MK5 127-51	526.06	23:10	40 44.0	68 02.3	MK5 Tow Yo 4	Mountain
1	MK5 152	527.01	04:00	40 43.1	68 04.0	MK5 CTD	Mountain
2	MK5 153	527.02	04:45	40 39.0	68 00.0	MK5 CTD	Mountain
3	MK5 154	527.03	05:29	40 35.0	67 56.4	MK5 CTD	Mountain
4	MK5 155	527.04	06:11	40 31.0	67 53.0	MK5 CTD	Mountain
5	MK5 156	527.05	06:56	40 26.0	67 49.5	MK5 CTD	Mountain
6	MK5 157	527.06	07:48	40 20.0	67 45.0	MK5 CTD	Mountain
7	MK5 158	527.07	10:21	40 38.7	67 37.3	MK5 CTD	Mountain
8	*****	527.08	12:04	40 38.82	67 37.4	Recover Mooring	Mountain
9	MK5 159	527.09	14:37	40 43.4	68 02.8	MK5 CTD	Mountain
10	MOC 1044	527.10	14:49	40 43.4	68 03.01	Mocness (1/4m)	Lough
11	MK5 160	527.11	16:01	40 43.5	68 02.4	MK5 CTD	Mountain
12	MOC 1045	527.12	16:25	40 42.9	68 02.8	Mocness (1m)	Lough
13	MK5 161	527.13	18:54	40 43.4	68 02.3	MK5 CTD	Mountain
14	MOC 1046	527.14	19:11	40 43.8	68 02.4	Mocness (1m)	Lough
15	MK5 162	527.15	21:34	40 43.4	68 03.5	MK5 CTD	Mountain
16	MOC 1047	527.16	21:45	40 43.4	68 03.3	Mocness (1/4m)	Lough
17	MOC 1048	527.17	23:09	40 43.6	68 03.4	Mocness (1/4m)	Lough
1	MK5 163	528.01	01:00	40 42.3	68 02.7	MK5 CTD	Mountain
2	MOC 1049	528.02	01:14	40 42.3	68 02.7	Mocness (1m)	Lough
3	MK5 164-67	528.03	06:00	40 50.0	68 42.2	Tow Yo #5	Mountain

Table 2. Listing of MOCNESS hauls by site.

MOORING	WEST OF MOORING	STRATIFIED	MIXED
1009	1010	1012	1018
	1011	1013	1019
		1014*	1020*
		1015	1021
		1016	1022
		1017	1023*
		1031	1024
		1032	1025*
		1034	1026
		1035	1027
		1036	1028
		1037	1029*
		1039*	
		1040	
		1041	
		1042*	
		1043	
		1044*	
		1045	
		1046	
		1049	

* indicates a 1/4 meter MOCNESS haul

Table 3. MOCNESS haul information summary table averages.

HAUL.NET	NET TIME (min)	RUNNING TIME	DEPTH (M)	BTM DEPTH	D/N	VOL m3	SITE
1009.1	1:32	20:05s	80-60	85	n	575	mooring
1009.2	5:12	20:06:32	60-50			283.1	(misc)
1009.3	5:28	20:11:44	50-40			310.9	
1009.4	5:12	20:17:12	40-30			295	
1009.5	5:20	20:22:24	30-20			301.9	
1009.6	5:12	20:27:44	20-10			283.3	
1009.7	5:20	20:32:56	10-0			298.3	
1009.8	15:12	20:38:16	0-70	74		835.6	
		20:53:28e					
1010.1	10:56	00:20s	75-60	81	n	566.1	west of
1010.2	5:36	00:30:56	60-50			290.6	mooring
1010.3	6:48	00:36:36	50-40			372.6	(misc)
1010.4	5:12	00:42:48	30-20			289.5	
1010.5	5:12	00:53:12	20-10			308.4	
1010.6	5:20	00:59:20	10-0			294.7	
		01:09:32e					
1011.1	8:00	04:14s	75-60	82	n-t	412.3	west of
1011.2	5:12	04:22:00	60-50			269.1	mooring
1011.3	5:28	04:27:12	50-40			299.1	(misc)
1011.4	5:12	04:32:28	40-30			272.9	
1011.5	5:04	04:38:12	30-20			282.8	
1011.6	5:36	04:43:04	20-10			305.2	
1011.7	5:28	04:48:36	10-0			313.1	
1011.8	13:36	04:53:28	0-75	84		717.6	
		05:08:36e					
1012.1	4:56	07:46s	70-60	78	d	266	stratified
1012.2	5:52	07:50:56	60-50			319.6	
1012.3	4:56	07:56:52	50-40			260.9	
1012.4	5:12	08:01:58	40-30			280.5	
1012.5	5:04	08:07:12	30-20			285.6	
1012.6	5:04	08:13:04	20-10			285.7	
1012.7	5:12	08:18:04	10-0			270.9	
1012.8	11:44	08:23:12	0-70	78		649.1	
		08:34:44e					
1013.1	5:28	10:48s	70-60	77	d	273.7	stratified
1013.2	4:56	10:53:28	60-50			266.8	
1013.3	5:04	10:58:56	50-40			287.4	
1013.4	5:12	11:04:04	40-30			282.9	
1013.5	5:04	11:09:12	30-20			278.9	
1013.6	5:20	11:14:04	20-10			291.1	
1013.7	5:12	11:19:20	10-0			275.9	
1013.8	3:32	11:25:12	0-70	77		678.8	
		11:37:32e					
1014.1	1:56	14:24s	70-60	78	d	30.8	stratified
1014.2	1:44	14:25:56	60-50			27.4	
1014.3	1:12	14:28:44	50-40			22.2	1/4m
1014.4	2:16	14:30:12	40-30			35.3	
1014.5	1:20	14:32:16	30-20			23.3	
1014.6	1:36	14:33:24	20-10			24.3	
1014.7	1:20	14:35:36	10-0			24.4	
		14:37:20e					
1015.1	5:12	16:12s	70-60	82	d	258.1	stratified
1015.2	5:12	16:17:12	60-50			259.7	
1015.3	5:28	16:22:20	50-40			284.2	

1015.4	5:36	16:27:29	40-30			301.1	
1015.5	5:28	16:32:36	30-20			286.6	
1015.6	5:20	16:39:28	20-10			289.6	
1015.7	5:28	16:45:20	10-0			288.7	
1015.8	5:36	16:50:28	70-0	83		865.7	
		17:06:36e					
1016.1	5:12	18:57s	80-70	86	d	248.9	stratified
1016.2	5:44	19:02:20	70-60			284.1	
1016.3	5:04	19:07:44	60-50			275.3	
1016.4	5:04	19:13:04	50-40			253.3	
1016.5	6:16	19:18:04	40-30			330.3	
1016.6	6:00	19:25:16	30-20			324.2	
1016.7	10:08	19:31:00	20-10				
1016.8		19:42:08e	10-0	81			
1017.1	5:12	20:52s	70-60	77	n	263.1	stratified
1017.2	4:56	20:57:12	60-50			271.4	
1017.3	5:04	21:01:08	50-40			285.8	
1017.4	5:12	21:06:12	40-30			296.6	
1017.5	5:12	21:11:24	30-20			280.3	
1017.6	5:04	21:16:36	20-10			278.1	
1017.7	6:00	21:21:40	10-0	80		329.3	
		21:27:40e					
1018.1	5:52	07:00s	46-40	52	d	291.4	well-mixed
1018.2	4:56	07:05:52	40-30			256.2	
1018.3	5:36	07:10:48	30-20			296.2	
1018.4	5:36	07:16:24	20-10			289.7	
1018.5	5:28	07:22:00	10-0			269.2	
1018.6	3:12	07:27:28	0-40			164	
1018.7	10:32	07:30:40	40-20			549.5	
1018.8	10:24	07:41:12	20-0	47		552.2	
		07:51:36e					
1019.1	3:52	09:49s	37-30	43	d	192.7	well-mixed
1019.2	5:04	09:52:52	30-20			222	
1019.3	5:04	09:57:56	20-10			218	
1019.4	5:12	10:03:00	10-0			229.1	
1019.5	5:12	10:08:12	0-10			216.4	
1019.6	5:04	10:13:24	10-20			227.4	
1019.7	5:04	10:18:28	20-30			239.1	
1019.8	5:04	10:23:32	30-38			250.7	
		10:28:36e					
1020.1	1:20	12:15s	40-30	48	d	25.3	well-mixed
1020.2	1:20	12:16:20	30-20			20.4	1/4m
1020.3	1:04	12:17:40	20-10			19	
1020.4	1:36	12:19:16	10-0	51		24.3	
		12:20:52e					
1021.1	5:28	13:49s	40-30	48	d	296.1	well-mixed
1021.2	5:28	13:54:28	30-20			292.4	
1021.3	5:04	13:59:56	20-10			280.4	
1021.4	5:12	14:05:00	10-0			286.2	
1021.5	11:04	14:10:12	0-10			595.9	
1021.6	10:16	14:21:16	10-20			540.6	
1021.7	11:24	14:31:32	20-30			570.4	
1021.8	10:40	14:42:56	30-40	50		595.2	
		14:53:36e					
1022.1	5:12	16:07s	40-30	48	d	283.3	well-mixed
1022.2	5:36	16:12:12	30-20			304.3	
1022.3	5:04	16:17:48	20-10			303.8	

1022.4	5:20	16:22:52	10-0			273.4	
1022.5	10:08	16:28:12	0-10			490.6	
1022.6	10:24	16:38:20	10-20			553.7	
1022.7	10:20	16:48:44	20-30			574.2	
1022.8	10:08	16:59:04	30-40	52		590.7	
		17:09:12e					
1023.1	1:20	18:48s	40-30	47	d	22.7	well-mixed
1023.2	1:20	18:49:20	30-20			23.6	1/4m
1023.3	1:28	18:50:40	20-10			25.4	
1023.4	1:28	18:52:08	10-0	51		24.1	
		18:53:36e					
1024.1	5:12	19:58s	40-30	50	n	273.9	well-mixed
1024.2	5:12	20:03:12	30-20			276.2	
1024.3	5:04	20:08:24	20-10			269.1	
1024.4	5:04	20:13:28	10-0			260.9	
1024.5	10:24	20:23:52	0-10			532.3	
1024.6	10:08	20:34:16	10-20			537.5	
1024.7	11:24	20:44:24	20-30			573.1	
1024.8	12:40	20:55:48	30-40	46		724.8	
		21:08:28e					
1025.1	1:20	23:30s	40-30	50	n	23.5	well-mixed
1025.2	1:20	23:31:20	30-20			21.2	1/4m
1025.3	1:36	23:32:40	20-10			27.6	
1025.4	2:16	23:34:16	10-0			35.4	
1025.5	2:00	23:36:16	0-10			32.3	
1025.6	1:20	23:38:16	10-20			21.2	
1025.7	1:36	23:39:36	20-30			28	
1025.8	1:36	23:41:12	30-40	49		25.8	
		23:42:48e					
1026.1	5:20	00:48s	40-30	47	n	271.1	well-mixed
1026.2	5:04	00:53:20	30-20			271.5	
1026.3	5:12	00:58:24	20-10			267.4	
1026.4	5:12	01:03:36	10-0			261.4	
1026.5	7:16	01:08:48	0-10			510.8	
1026.6	10:24	01:16:04	10-20			543.9	
1026.7	10:40	01:26:28	20-30			567.1	
1026.8	10:08	01:37:08	30-40	52		572.1	
		01:47:16e					
1027.1	5:12	03:03s	40-30	48	n	286.7	well-mixed
1027.2	5:12	03:08:12	30-20			268.4	
1027.3	5:12	03:13:24	20-10			283.1	
1027.4	5:12	03:18:36	10-0			266.1	
1027.5	10:06	03:23:48	0-10			511.9	
1027.6	10:48	03:33:54	10-20			553.1	
1027.7	10:08	03:44:42	20-30			547.3	
1027.8	10:48	03:54:50	30-40	53		620.3	
		04:05:38e					
1028.1	5:12	06:27s	40-30	49	d	279.3	well-mixed
1028.2	5:04	06:32:12	30-20			265.2	
1028.3	5:12	06:37:16	20-10			271.4	
1028.4	5:04	06:42:28	10-0			286.3	
1028.5	6:24	06:47:32	0-10			543.8	
1028.6	10:16	06:53:56	10-20			555	
1028.7	10:08	07:04:04	20-30			559.7	
1028.8	10:08	07:14:12	30-40	45		573	
		07:24:20e					
1029.1	1:36	09:22s	40-30	47	d	26	well-mixed

1029.2	1:28	09:23:36	30-20			23.3	1/4m
1029.3	1:44	09:25:04	20-10			29.4	
1029.4	1:20	09:26:48	10-0			22.6	
1029.5	1:05	09:28:08	0-10			18	
1029.6	1:20	09:29:13	10-20			22.5	
1029.7	1:28	09:30:33	20-30			25.2	
1029.8	1:20	09:32:01	30-40	47		25.2	
		09:33:21e					
1030.1	1:36	11:56s	70-60	79	d	24.9	stratified
1030.2	1:44	11:57:36	60-50			27.9	
1030.3	1:36	11:59:20	50-40			28.4	
1030.4	1:36	12:00:56	40-30			23	
1030.5	1:52	12:02:32	30-20			28.4	
1030.6	1:36	12:04:24	20-10			24.5	
1030.7	1:44	12:06:00	10-0			28.2	
		12:07:44e					
1031.1	10:08	13:40s	60-40	78	d	510.1	stratified
1031.2	5:20	13:50:08	40-30			255.7	
1031.3	5:12	13:55:28	30-20			282.4	
1031.4	5:12	14:00:40	20-10			270.6	
1031.5	5:04	14:05:52	10-0			235.3	
1031.6	20:08	14:26:00	0-20			1038.7	
1031.7	20:16	14:46:08	20-40			1113.5	
1031.8	20:08	15:06:24	40-60	69		1105.3	
		15:26:32e					
1032.1	11:00	16:23s	60-40	79	d	507	stratified
1032.2	5:00	16.34	40-30			267.9	
1032.3	5:00	16:39	30-20			271.7	
1032.4	6:00	16:44	20-10			281.6	
1032.5	5:00	16:50	10-0			269.1	
1032.6	20:00	16:55	0-20			1044.5	
1032.7	21:00	17:15	20-40			1092.8	
1032.8	20:00	17:36	40-60	76		1106.6	
		17:56e					
1033.1	1:36	19:06s	40-30	78	d	24.4	stratified 1/4m
1033.2	2:00	19:07:36	30-20			31.2	
1033.3	1:36	19:09:36	20-10			25.8	
1033.4	2:08	19:11:12	10-0			33.1	
1033.5	1:44	19:13:20	0-10			30.2	
1033.6	1:52	19:15:04	10-20			28.5	
1033.7	1:44	19:16:56	20-30			27.3	
1033.8	2:08	19:18:40	30-40	78		31.1	
		19:20:48e					
1034.1	9:52	20:27s	60-40	77	n	485.7	stratified
1034.2	5:12	20:36:52	40-30			258.4	
1034.3	5:12	20:42:04	30-20			286.6	
1034.4	5:20	20:47:16	20-10			277.6	
1034.5	5:04	20:52:36	10-0			266.5	
1034.6	20:20	20:57:40	0-20			1091.5	
1034.7	21:04	21:18:00	20-40			1137.4	
1034.8	20:24	21:39:04	40-60	69		1139	
		21:59:28e					
1035.1	10:00	23:37s	60-40	74.4	n	522.9	stratified
1035.2	5:04	23:47:00	40-30			263.3	
1035.3	5:04	23:52:04	30-20			259.4	
1035.4	5:04	23:57:08	20-10			248.8	
1035.5	5:12	24:02:20	10-0			261.8	
1035.6	20:14	24:07:32	0-20			1038.4	

1035.7	20:16	24:27:46	20-40			1066.1	
1035.8	20:08	24:48:02	40-60	74		1100.6	
		25:08:10e					
1036.1	10:00	02:34s	60-40	78	n	506.8	stratified
1036.2	5:04	02:44:00	40-30			266.8	
1036.3	5:04	02:49:04	30-20			276.7	
1036.4	5:04	02:54:08	20-10			262.8	
1036.5	5:20	02:59:12	10-0			284.3	
1036.6	20:16	03:04:32	0-20			1049.2	
1036.7	20:16	03:54:48	20-40			1114.9	
1036.8	20:00	04:15:04	40-60	78		1069.9	
		04:35:04e					
1037.1	10:00	06:22s	60-40	78	d	498.8	stratified
1037.2	4:56	06:32:00	40-30			269.9	
1037.3	5:04	06:36:56	30-20			271	
1037.4	5:04	06:42:00	20-10			264.7	
1037.5	5:12	06:47:04	10-0			266.7	
1037.6	20:48	06:52:16	0-20			1116.1	
1037.7	20:32	07:13:04	20-40			1153.3	
1037.8	20:08	07:33:36	40-60	83		1048.4	
		07:53:44e					
1038.1	aborted	09:17s	60-40	78	d		stratified 1/4m
1038.2							
1039.1	3:28	10:55s	60-40	77	d	50.8	stratified 1/4m
1039.2	1:28	10:58:28	40-30			23	
1039.3	1:52	10:59:56	30-20			27.6	
1039.4	1:44	11:01:48	20-10			27.5	
1039.5	2:08	11:03:32	10-0			30.3	
1039.6	1:36	11:05:40	0-10			26.3	
1039.7	2:16	11:07:16	10-20			35.8	
1039.8	3:04	11:09:32	20-40	77		47.1	
		11:12:36e					
1040.1	10:00	12:16s	60-40	78	d	494.6	stratified
1040.2	4:56	12:26:00	40-30			277.1	
1040.3	4:56	12:30:56	30-20			276.4	
1040.4	4:56	12:35:52	20-10			247	
1040.5	5:04	12:40:48	10-0			253.4	
1040.6	20:00	12:45:52	0-20			1016.2	
1040.7	20:04	13:05:52	20-40			1058.1	
1040.8	20:00	13:25:56	40-60	68		1068.8	
		13:45:56e					
1041.1	10:04	15:13s	60-40	79	d	526.1	stratified
1041.2	4:56	15:23:04	40-30			250	
1041.3	4:56	15:28:00	30-20			267.1	
1041.4	5:12	15:32:56	20-10			272.7	
1041.5	4:56	15:37:52	10-0			281.2	
1041.6	20:00	15:42:48	0-20			1038.7	
1041.7	20:08	16:02:48	20-40			1066.3	
1041.8	20:00	16:22:56	40-60	80		1101.9	
		16:42:56e					
1042.1	2:56	17:41s	60-40	78	d	51.8	stratified 1/4m
1042.2	2:40	17:43:56	40-20			45.8	
1042.3	1:36	17:46:36	20-10			32.6	
1042.4	1:28	17:48:12	10-0			24	
1042.5	1:36	17:49:40	0-10			28.4	
1042.6	1:12	17:51:16	10-20			25.3	
1042.7	1:44	17:52:28	20-30			28.6	

1042.8	1:28	17:54:12 17:55:40e	30-40	79		29.4	
1043.1	10:00	19:04s	60-40	75	d	496.3	stratified
1043.2	5:04	19:14:00	40-30			270.6	
1043.3	5:04	19:19:04	30-20			270	
1043.4	5:44	19:24:08	20-10			310.2	
1043.5	5:20	19:29:52	10-0			259.1	
1043.6	20:00	19:35:12	0-20			1017.5	
1043.7	21:04	19:55:12	20-40			1081.4	
1043.8	10:16	20:16:16 20:26:32e	40-50	78		543	
1044.1	4:02	11:02s	60-40	78	d	67.1	stratified
1044.2	2:48	11:06:02	40-20			47.2	1/4m
1044.3	1:28	11:08:50	20-10			23.8	
1044.4	1:36	11:10:18	10-0			28.8	
1044.5	1:20	11:11:54	0-10			22.4	
1044.6	1:28	11:13:14	10-20			26.1	
1044.7	1:44	11:14:52	20-30			30.8	
1044.8	1:18	11:16:36 11:17:54e	30-40	75		26.4	
1045.1	10:00	12:29s	60-40	78	d	524	stratified
1045.2	4:56	12:39:00	40-30			235	
1045.3	5:04	12:43:56	30-20			252.4	
1045.4	5:04	12:49:00	20-10			265.9	
1045.5	5:04	12:54:04	10-0			290	
1045.6	20:08	12:59:08	0-20			1117.5	
1045.7	20:16	13:19:16	20-40			1132.2	
1045.8	20:00	13:39:32 13:59:32e	40-60	75		1111.7	
1046.1	10:00	15:21s	60-40	77	d	527.2	stratified
1046.2	4:56	15:31:00	40-30			257.1	
1046.3	5:04	15:35:56	30-20			284.1	
1046.4	4:56	15:41:00	20-10			267.3	
1046.5	5:04	15:45:56	10-0			263.9	
1046.6	20:08	15:51:00	0-20			1035.1	
1046.7	20:00	16:11:08	20-40			1086.7	
1046.8	18:40	16:31:08 16:49:08e	40-59	65		998	
1047-aborted		17:53s					
1048-aborted							
1049.1	1:08	21:30s	60-40	77	n	538.5	stratified
1049.2	5:04	21:31:08	40-30			275.7	
1049.3	5:12	21:36:12	30-20			289.8	
1049.4	5:04	21:41:24	20-10			272.6	
1049.5	9:52	21:51:16	10-0			538.3	
1049.6	21:12	22:01:08	0-20			1129.8	
1049.7	20:24	22:22:20	20-40			1095.2	
1049.8	20:08	22:42:44 23:02:52e	40-60	77		1074	