Cruise Report

# R/V ENDEAVOR Cruise 276 to Georges Bank

US GLOBEC

NW ATLANTIC/GEORGES BANK STUDY

10 - 22 January 1996

## Acknowledgements

The scientific party benefitted from the leadership of Captain Tyler, particularly in getting us ashore during the storm of 19 January. Bridge watches were alert and helpful, winch operators cooperative, and engineers quick off the mark to make needed repairs. The food was great. Thanks to the entire ENDEAVOR crew. We are particularly grateful to URI marine technician David Nelson for his excellent work.

This report was prepared by Charles B. Miller, Maureen Taylor, Marie Kalidis, Pilar Heredia, Jim Gibson, Theresa Rotunno, Antonie Chute, Rebecca Jones, Amy Tesolin, Alyse Weiner, Peter Wiebe and Mark Benfield. This cruise was sponsored by the National Science Foundation and the National Oceanographic and Atmospheric Administration.

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**Chief Scientist's Report - ENDEAVOR-276: GLOBEC Georges Bank Program**

BroadScale Survey Cruise for January 1996.

Charles B. Miller, Oregon State University, Corvallis, OR 97331-5503

We sailed at 1800 on Wednesday,10 January to sample the BroadScale Survey station grid. Departure was delayed to late in the day by a combination of weather, delayed preparation of the ship, and delayed loading by the scientific party. It seemed difficult to convince all parties that we actually intended to make this cruise. However, we did sail on the appointed day. By the time we reached Station 1, we were essentially ready to work with the exception of the wire termination on the MOC-10 net. There had been misunderstandings about who would supply the termination, what kind it would be, etc. That was an example of the sort of improvement we need in cruise planning communications for BroadScale surveys. Some of the problem came from my arrival from a distance, expecting both a ship ready to load and upscale scientific organization to meet me as I came aboard. Absentee leadership is not likely to be very effective. Having our main Narragansett cruise organizer on federal furlough also damaged our exchange of information, particularly establishment of time lines for preparation. A blizzard during the night of 7-8 January, which paralyzed all New England traffic on the 8th, caused more chaos to result from inadequate precruise planning and gear preparation than would otherwise have been the case. We lost the day in which everyone had planned to do the bulk of their work. The crew and I also lost the morning of the 9th to pounding ice off the fantail.

We sailed despite a forecast of gales on Georges Bank. However, Captain Tyler felt we had good chance of getting in some work within a day or two. I felt that so long as the ship was not endangered, we might as well wait at sea as at the dock, cutting down the time to station when work became possible. This worked out well enough and we lost only 5 hours, getting to Stn.1 at noon on 11 January. During our first bongo net haul, the wire parted inside the traction winch used for bongo and CTD. The problem was inadequate level winding and loose wraps near the cheeks of the drum. Some time was lost to this. By 1600 the weather had moderated enough to allow a MOC-1 haul. The science team needed MOCNESS practice and we got most of that during this first station. After the MOCNESS was aboard the retermination was complete on the CTD winch, and we obtained both bongos and a Mark-5 CTD. Total station time just under 8 hours! After Stn. 1 we put Peter Wiebe's BIOMAPER into the water, but it produced no acoustic data and was retrieved before midnight. Further adventures from the BIOMAPER saga are reported below by Dr. Wiebe.

At this point, station keeping went well through Stn. 4, after which a second gale (30 kts) produced high waves and difficult working conditions at Stn. 5. For awhile stations were reduced to the fisheries bongo, a bongo to replace (albeit with larger mesh size) MOC-1, and a Mk5-CTD. For a time we waited near Stn. 7, hoping to get a MOC-1 series in slope water to examine its *Calanus* content. On January 13, we finally managed a bongo at Stn. 45, then proceeded to a point west of Stn. 7 accessible from Stn. 45. The direct route to Stn. 7 was too much in the trough. We again got two bongo tows, to 200 and 500 meters. Double bongos and Mk5-CTD became standard for a time then, with three net setters harnessed to the bulkhead so that waves mounting the starboard quarter could not carry them off. Because of weather, we were unable to deploy the MOC-1 again until Station 10 on the 14th. The window of good weather carried us through Stn. 12. We finally had the MOC-10 termination finished and weather in which to tow that net at Stn. 12. Two nets were ripped beyond repair aboard; we replaced one and reduced to four nets. We obtained some BIOMAPER acoustic data from Stn. 11 to Stn. 13. Before Stn. 13, the winds returned, our third gale, and we were again reduced to double bongos/MK5-CTD. The CTD winch parted the cable internally (episode 2) during a CTD lowering at Stn. 58 (after Stn. 19). We sacrificed that CTD cast to gain time while reterminating. The winter game appears to be to ride the gales, then sample like crazy. You have to be willing to rock and roll, ready to work the weather windows with determination.

We got another good series of stations with all gear but MOC-10 starting at Stn. 20 and running until Stn. 28. Our only loss in this interval was the MOC-1 cast at Stn. 23 which was brought back on board because of excessive ship pitch on large waves. We managed a second MOC-10 haul at Stn.27, tearing another net to shreds. The nets apparently did not hold up well in winter storage. During Stn. 28, the CTD winch again broke the cable internally for the third time. The traction heads held the Mk5-CTD. A more aggressive rewinding was undertaken on the way to Stn. 29, reeling out 700 m cable with a milk crate for drogue, then rewinding it with some care.

We did not immediately get to test whether this worked. Underway to Stn 29 at 16:00 on 19 January, Captain Tyler brought the following to the lab:

> National Weather Service marine forecast at 15:28 on 18 January
>
> George Bank : NE Channel to G. S. Channel
> **Storm Warning**
> Tonight - S wind 20 to 30 kts. Seas 6 to 15 feet.
> Friday - S wind to 25 to 35 kts, increasing to 45-55 kts late, seas building to 20-30 ft.
> Friday night - SW wind 45-55 kts. becoming NW and diminishing to 30-40 kts late. Seas 20 to 30 ft.
> Saturday - NW wind 30-40 kts., diminishing to 25 to 35 kts. Seas subsiding to 10-20 ft.

Prediction in hand, Capt. Tyler decided to head for Cape Cod Bay after Stn. 28, altering course toward Portland, Maine, in late evening. Cape Cod Bay was also predicted to be in the storm track and very rough. I pointed out in the daily bulkhead newspaper (*Stern View*) that "a few of the younger scientists may never have seen 30 ft. seas. Those aboard who have are glad you won't get the chance now."

We arrived in Portland, Maine on the morning of 19 January. The storm we saw from Portland made us glad to be tied up in a quiet harbor. We stayed there until noon of 20 January (including a delay of several hours due to failure of the air starters for the engine). On the route back to the grid we stopped over Wilkinson Basin for a MOC-1 haul. The object of this was to examine the copepod resting stocks believed to be highest in the deep basins of the Gulf of

Maine. We then steamed to Stn. 33 on the northwest edge of Georges Bank and completed all sampling, except MOC-10, at Stns. 33, 34, 36 and 38. Sampling at Stn. 38 included some ring net tows for zooplankton to return live to URI. Sampling was complete by 20:00 hr on 21 January and we arrived at the URI dock in Narragansett at 0900 on 22 January.

This report includes chapters on hydrography (with a map of completed stations), observed plankton biology over and around Georges Bank, on larval fish seen in the bongo samples, and on acoustical biomass estimation, It also includes a statistical summary of profiles and samples. The hydrographic summary states that sea surface temperatures were cold this year, relative to the MARMAP average for the month and almost 2°C colder than last year. The plankton summary states that plankton were sparse at all stations sampled. It offers several hypotheses regarding the seasonal sequence of events on Georges Bank and fits the observations of EN276 into them. The larval fish summary is brief; we only saw a few unidentified eggs and a few clupeid and ammodytid larvae. The story of BIOMAPER's operation and problems is extensive.

A mid-cruise issue of *Stern View* assayed an explanation of why it is important for the GLOBEC Georges Bank Program to run the BroadScale Survey in January. The paper's answer (abridged here) was as follows:

## The Real Zeros Cruise
by Charlie Miller

One of the late professors at Scripps Institution of Oceanography, Edgar William Fager, was an important intellectual figure in the marine ecology of the 1960's. Fager taught two courses: marine ecology and statistics. The statistics course was rigorous, and unusual for its time (and might be still) for its emphasis on nonparametric techniques. Both of these courses included an emphasis on including "real zeros" in data sets. Suppose you want to know the range of *Pseudocalanus moultoni*. It is not enough to wander around in its territory, making notes of where it is present in your samples. You must also move across the boundaries of the range, making equally ardent attempts to find it where it does not live. You must find zeros from actual sampling of the same quality as your positive results. The same is true for determining time sequences of events. For example, to know when spawning of cod begins, you must tow your bongos in mid-January *before* spawning begins to get some real zeros. Then you are assured that spawning started after the time of the real zero.

That is exactly what we are doing on EN276. We are trying to start our sampling before things begin, before *Calanus* matures out of its diapause phase, before cod spawn, before the spring bloom of diatoms. You may think the science team are real zeros; they think they are finding real zeros. At least plankton are sparse.

Statistical theory also provides methods, which Fager taught (although he was only unique in his emphasis on this subject), of deciding when a zero really is a zero The answer is that you can never be sure about zeros. As the density of a target entity goes down, the sample size required to catch one goes up. A zero from a small sample may not be good enough. The sophisticated methods tell you how great the density could be and still give you zeros most of the time at your sample size. Then a 'real' zero only sets an upper limit on the likely density. If you want to learn these techniques, consult Peter Wiebe.

During the night of 18-19 January, it seemed likely that the storm from which we were running would end the cruise. So, the morning issue of *Stern View* on 19 January asked the following question (as a headline):

## Was EN276 Worth the Trouble?

Were we nuts to sample George Bank in January, or did we learn something of value? Probably we were nuts. We did learn something of value.

The George Bank program has an emerging hypothesis, explaining the interaction of the Bank's advective pattern, the life history timing of *Calanus finmarchicus*, and the spawning timing and locality of Codfish and Haddock. The regional repository of *Calanus* is the Gulf of Maine (GOM) basins. The stock matures there in January and begins to reproduce. Divergent flow in the GOM moves these animals toward the northern edge of the bank where they are concentrated in the eastward current jet flowing along that steep submarine escarpment. As the current turns onto the NE Peak, it spreads and slows down, generating there a huge and annually recurring stock of reproducing *Calanus*.

Dense masses of spawning *Calanus* over relatively shallow bottoms make this site an ideal spawning center for cod and haddock. Newly hatched fish larvae find themselves in naupliar soup. The 1995 data from the Durbin group show huge numbers of nauplii all across the Peak and in the outflow to the SW along the southern flank of the bank. The outflow also keeps the well fed fish larvae over shallow bottoms and adjacent to the bank. Thus, when they have developed sufficiently to settle, they have usually arrived in a suitable place.

Because of the reliable food and reliable flow pattern for larval transport, there would be enhanced reproductive success for cod and haddock that spawn on the peak. We know that lineages have been selected and perpetuated that consistently move to NE peak to spawn. If the rest of our hypothesis is correct, we now see clearly why.

On EN276 we did manage to get out over the NE Peak <u>before</u> any elevated concentration of *Calanus* appeared there. A few females were found (a teaspoonful in 50 $m^3$), but very few, and essentially no nauplii [we should wait to count the pump samples before concluding that; there were no older nauplii]. Thus, we have one of the **real zeros** most urgently needed for the comprehensive testing of our theory by the renewed sampling of 1996. A zero may not seem like a great product for a cruise as difficult as this, but actually it is what our science needed most.

**Acknowledgement** - The scientific party benefitted from the leadership of Captain Tyler, particularly in getting us ashore during the storm of 19 January. Bridge watches were alert and helpful, winch operators cooperative, and engineers quick off the mark to make needed repairs. The food was great. Thanks to the entire ENDEAVOR crew. We are particularly grateful to URI marine technician David Nelson for service beyond the call of duty. He worked long, hard hours to get us going before Stn. 1. He rose from his bunk repeatedly to deal with broken winch videos, to reterminate broken cables, on and on. Thanks, Dave. Finally, we thank the people of the United States for supporting this research through the National Science Foundation and National Oceanic and Atmospheric Administration.

## Scientific Participants in GLOBEC Georges Bank BroadScale Survey Cruise EN276
## R/V ENDEAVOR, January 10-22 1996

| | | |
|---|---|---|
| Charles B. Miller | Oregon State | Ch. Sci. |
| Peter Wiebe | Woods Hole Oceanogr. | Sci. |
| Mark Benfield | Woods Hole Oceanogr. | Sci. |
| Antonie Chute | NOAA Narragansett | Tech. |
| James Gibson | Univ. Rhode Island | Tech. |
| Maria Pilar Heredia | Univ. Rhode Island | Tech. |
| Alyce Jacquet | Univ. Rhode Island | Tech. |
| Rebecca Jones | NOAA Narragansett | Tech. |
| Marie Kiladis | NOAA Woods Hole | Tech. |
| Janice Peterson | Univ. Rhode Island | Tech. |
| Theresa Rotunno | Univ. Rhode Island | Tech. |
| Maureen Taylor | NOAA Woods Hole | Tech. |
| Amy Tesolin | NOAA Woods Hole | Tech. |
| Alyse Weiner | Univ. Rhode Island | Tech. |
| James Pierson | Univ. New Hampshire | Undergrad. |

**Hydrography** by Maureen Taylor and Marie Kalidis (NOAA, Woods Hole)

The primary hydrographic data presented here were collected using a Neil Brown Mark V CTD instrument (MK5), which provides measurements of pressure, temperature, conductivity, fluorescence and light transmission. The MK5 records at a rate of 16 observations per second, and is equipped with a rosette for collecting water samples at selected depths.

Bongo hauls were made at each of the stations occupied. A Seabird Electronics Seacat model 19 profiling instrument (SBE19 Profiler) was used on each bongo tow to provide depth information during the tow. Pressure, temperature, and salinity observations are recorded twice per second by the Profiler. The Profiler was also deployed during plankton pump operations, again to provide depth information. On a number of occasions during this cruise, weather conditions were not suitable for the deployment of the MOC-1. Instead, a second bongo haul was made. When weather did not allow for the deployment of the MK5 (standard station #7) or when there were winch problems (standard station #28), the Profiler data was used as the primary hydrographic data for that station. These have been numbered by incrementing the cast number by 100 to indicate the different source of this data.

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

| **Instrument** | **# Casts** |
|---|---|
| MK5 | 32 |
| MK5 calibration | 31 |
| SBE19/Bongo | 75 |
| SBE19/Pump | 13 |
| SBE19 calibration | 3 |

The MK5 was deployed with 6 bottles on the rosette and samples were collected for various investigators. On each MK5 cast, samples were to be collected for oxygen isotope analysis at selected depths for R. Houghton (LDGO) and a sample was taken at the bottom for calibrating the instrument's conductivity data. On stations which included pump operations, rosette samples for nutrient analysis were collected at selected depths for J. Bisagni and J. O'Reilly (NMFS), and samples for chlorophyll analysis were collected from the bottom, 20 meters, and surface. Chlorophyll samples (three, 50 ml replicates) were filtered for three size fractions: total, < 20 microns, and < 5 microns. Total chlorophyll filtration results were also used for comparing the data from the MK5 fluorometer. Surface samples for phytoplankton species composition were collected for J. O'Reilly (NMFS) at only eight of the full stations occupied during this cruise. The chlorophyll analysis was conducted at sea using an acetone extraction method and results were read 24 hours later on a calibrated fluorometer.

| Parameter | # samples taken |
|---|---|
| Oxygen isotope | 109 |
| Nutrients | 58 |
| Chlorophyll | 135 |
| Species composition | 8 |

**Data:**

The SBE19 Profiler and the MK5 data were post-processed at sea. The Profiler data were processed using the Seabird manufactured software: DATCNV, ALIGNCTD, BINAVG, DERIVE, ASCIIOUT to produce 1 decibar averaged ascii files. The raw MK5 data files were processed using the manufacturer's software CTDPOST in order to identify bad data scans by "first differencing." The latter program flags any data where the difference between sequential scans of each variable exceed some preset limit. The "Smart Editor" within CTDPOST was then used to interpolate over the flagged values. The cleaned raw data were converted into pressure averaged, pressure centered 1 decibar files using algorithms provided by R. Millard of WHOI, which had been adapted for use with the MK5.

We experienced a fair amount of difficulty with the hydrographic winch during this cruise. At standard station #9, we began to observe sync errors and data "spiking" during the MK5 and bongo/Profiler casts. When a test cable was used to by-pass the sea-cable/slip ring assembly, the data from both the MK5 and Profiler appeared clean and stable. Marine Technician David Nelson located a short in one of the center conductors of the sea cable and the repair was made. It was also discovered that the MK5 performed better when two of the center conductors (wrapped together) were used for its "signal" wire. However, we continued to experience signal "noise" during the bongo/Profiler hauls.

On three separate occasions (standard stations 1, 58, & 28), the sea cable jumped the winch sheave and parted. Fortunately, the Bosun and deck crew were able to retrieve our equipment, but there were resulting delays because it was necessary to cut and re-splice the terminations each time. At standard station #28, the MK5 cast was not repeated because time was running short in the cruise and the decision was made to continue on our course. It was also after this station that the Captain decided to head for port because of an impending storm. Seabird data (cast 71) was used as the primary hydrographic data for standard station 28.

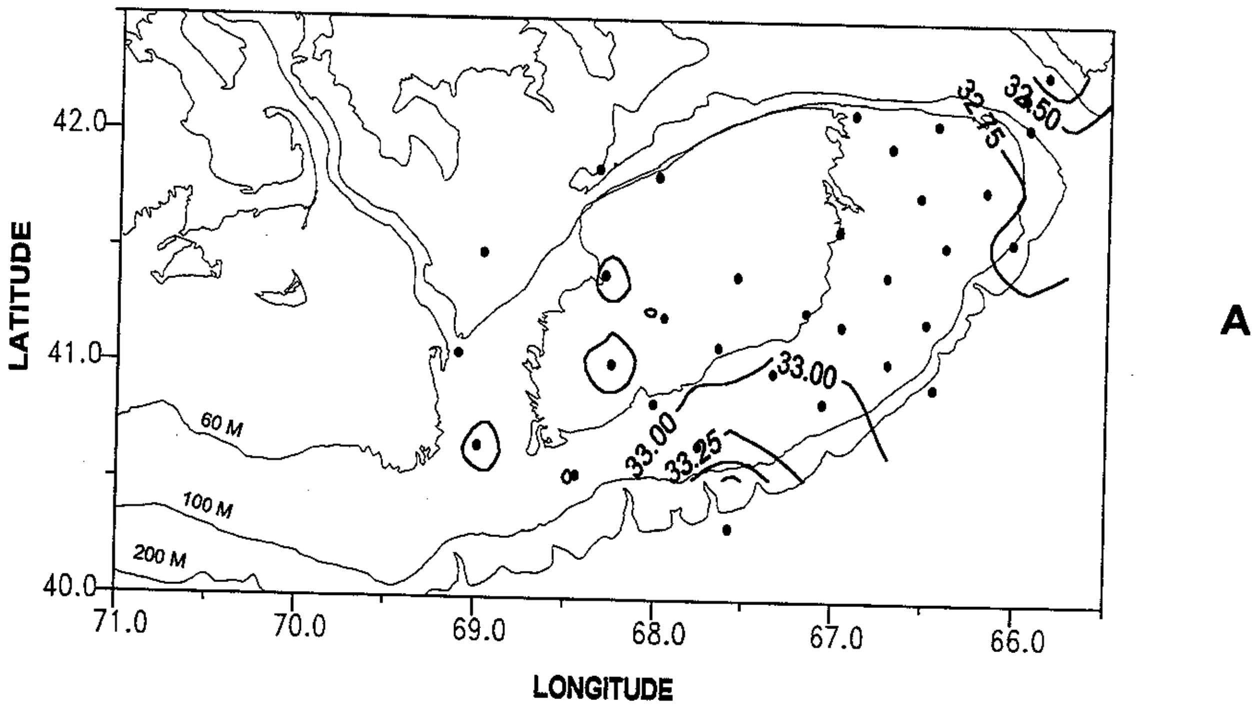
Because of our break in sampling operations, we were unable to occupy all 39 of the standard broad scale stations. Upon leaving Portland Maine, it was decided to head for standard station #33 to resume operations.

Throughout much of our bongo/Profiler work during this cruise, we observed data "spiking" during the casts. We tried three separate Profilers, but the problem continued. Data downloaded from the Profiler's memory after such casts were clean indicating that the problem was originating somewhere between the connections on the sea cable/slip ring assembly but not in the Profilers themselves. After tossing around numerous theories as to the cause of this, David Nelson came to believe that the problem was caused by the winch wire not being laid on the drum properly and causing "slapping" during the haul which resulted in interference with the signal coming up the wire. As a result, the data from these Seabird/bongo hauls will require more extensive processing upon our return to port.

Figure 1 shows the standard station locations occupied during the bank - wide survey. The surface and bottom temperature and salinity distributions are shown in Figures 2 - 3. Surface and bottom anomalies of temperature and salinity as well as a stratification index (sigma-t difference from the surface to 30 meters) were calculated using the NMFS MARMAP hydrographic data set as a reference. The anomaly distributions are shown in figures 4-6. Profiles of each MK5 CTD cast with a compressed listing of the data are shown in appendix 1.

Very little stratification was observed during the survey and the Bank as a whole was well mixed. The surface and bottom temperature anomaly distributions (Figure 4) showed that the Bank was 0.5 - 2.0°C colder than the MARMAP reference. Scotian shelf water was observed at only one station (standard station 25, MK5 cast #24) with the top 20 meters having salinity less than 32 psu and temperature less than 4°C. The volume average temperature and salinity of the upper 30 meters were calculated for the Bank as a whole and for the four sub-regions shown in Figure 7. These values are compared with characteristic values that have been calculated from the MARMAP data set for the same areas and calendar days. The volume of Georges Bank water (salinity < 34 psu) was also calculated and compared against the expected values. All four regions of the Bank showed temperatures of approximately 0.5 - 1.0°C colder than the expected values for mid-January.

A preliminary comparison of the MK5 fluorescence data (in volts) with the total chlorophyll-a (mg/m$^3$) was done at sea. Fluorescence values (and extracted chlorophyll-a concentrations) were relatively low over the entire Bank. The $R^2$ for the data that had been analyzed by cruise completion was about .55.



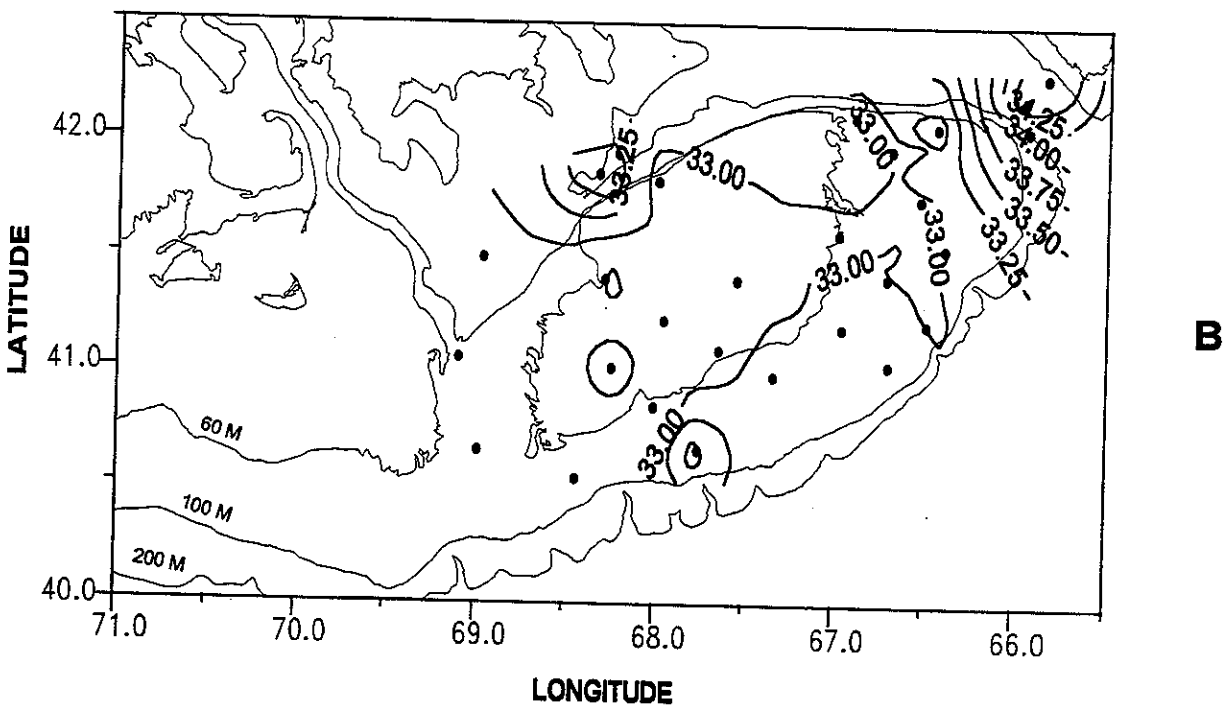




Figure 3. Surface (A) and bottom (B) salinity distributions during broad-scale survey EN276.

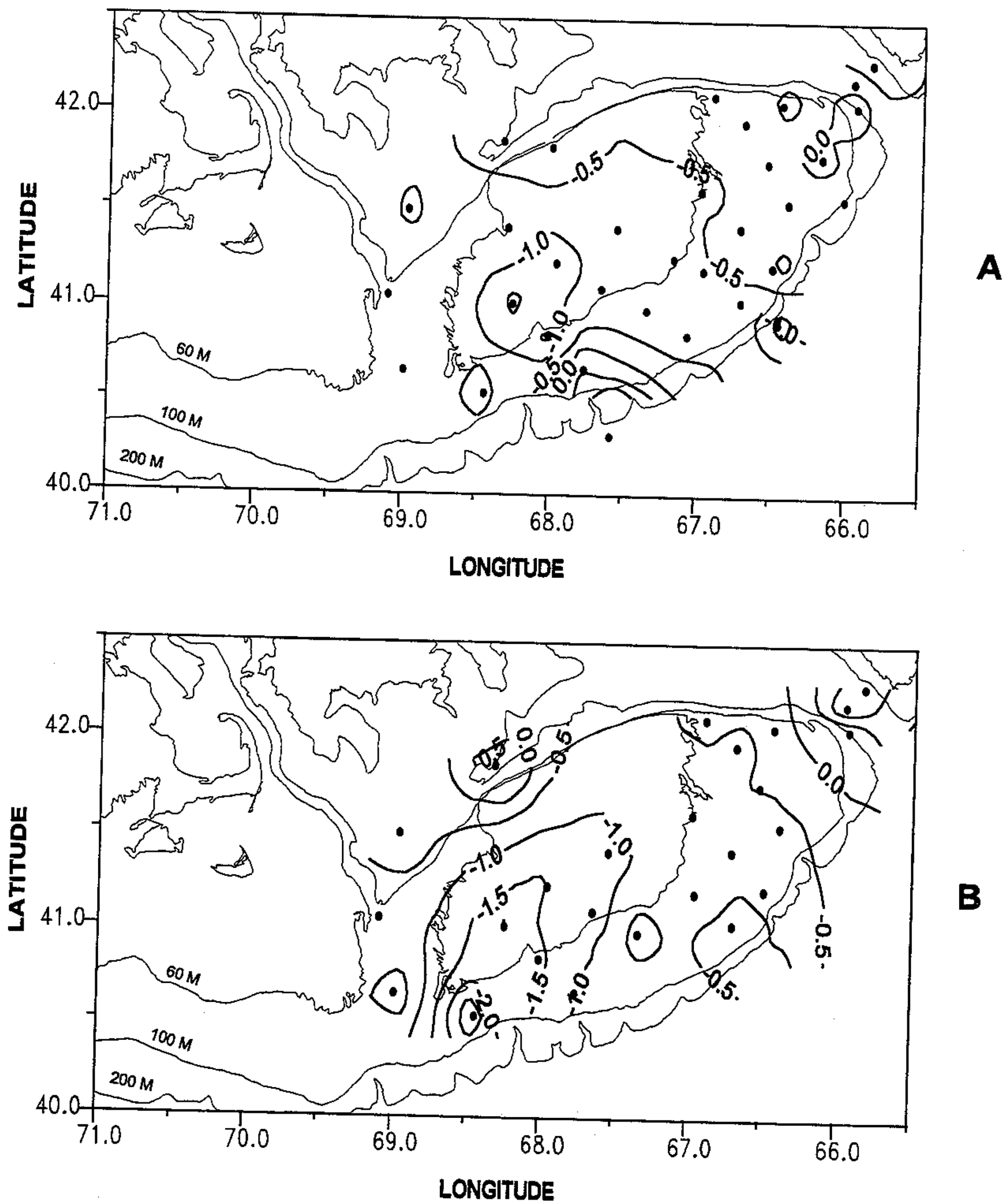
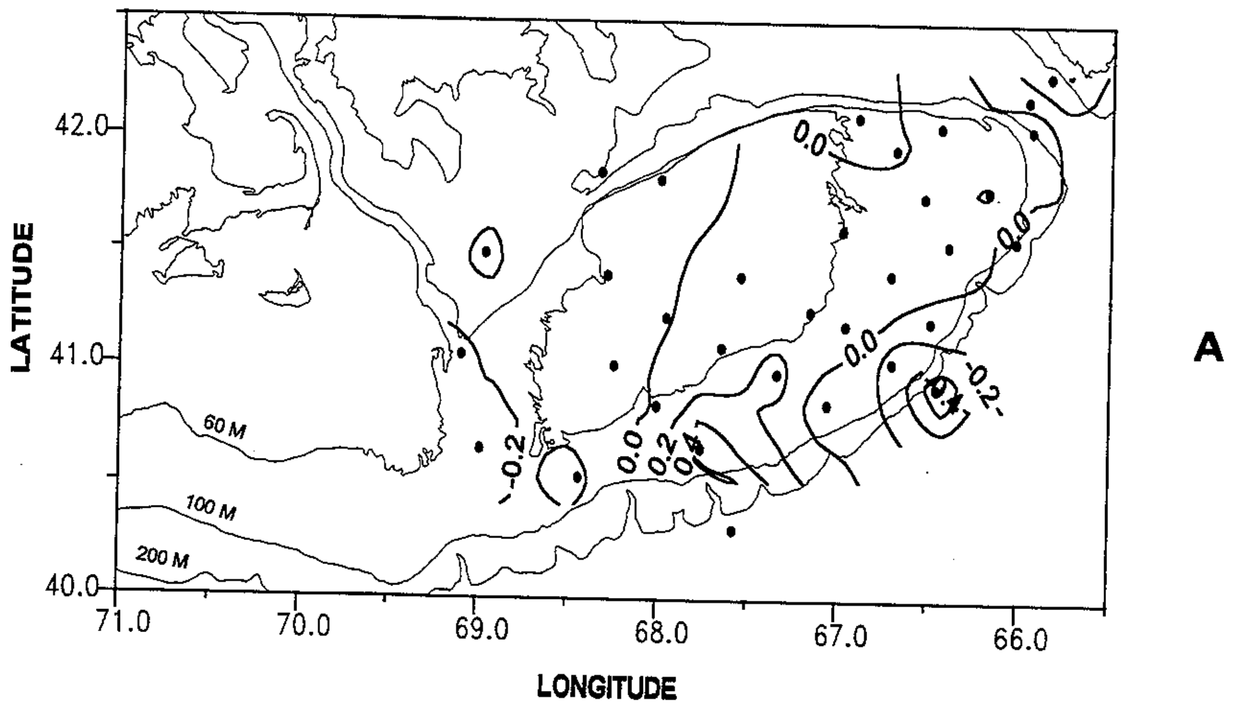



Figure 4. Surface (A) and bottom (B) temperature anomaly distributions during broad scale survey EN276.



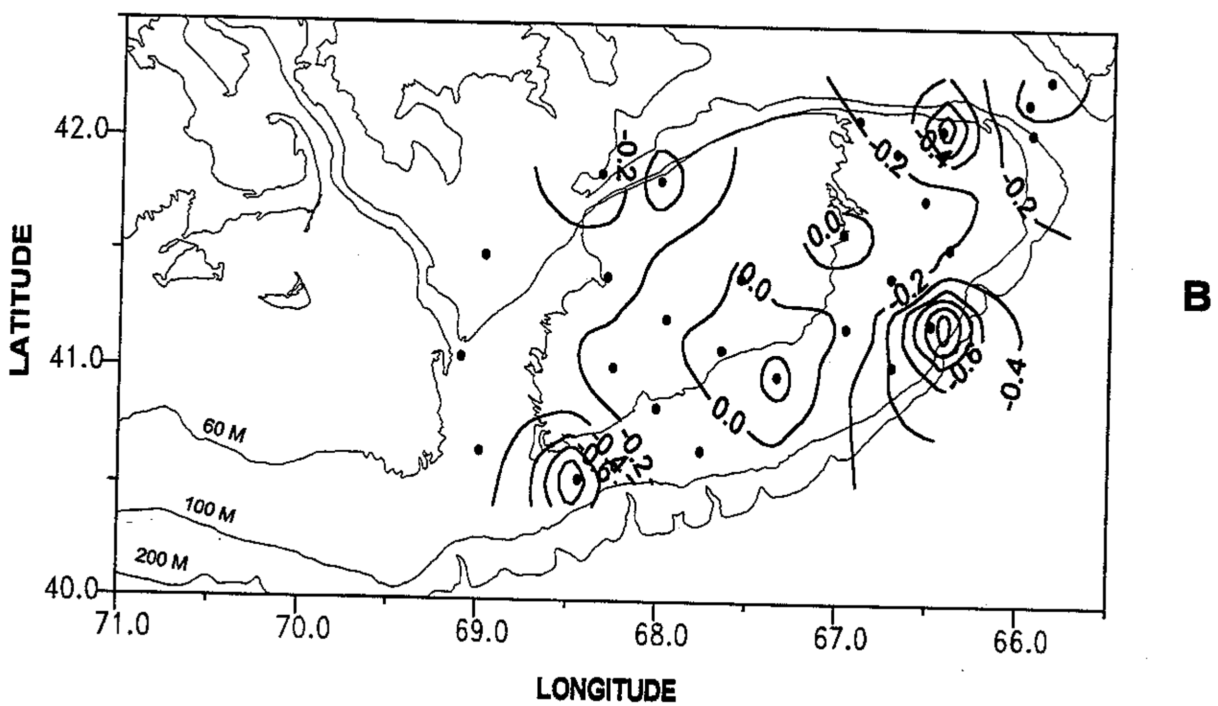




Figure 5. Surface (A) and bottom (B) salinity anomaly distributions during broad scale survey EN276.

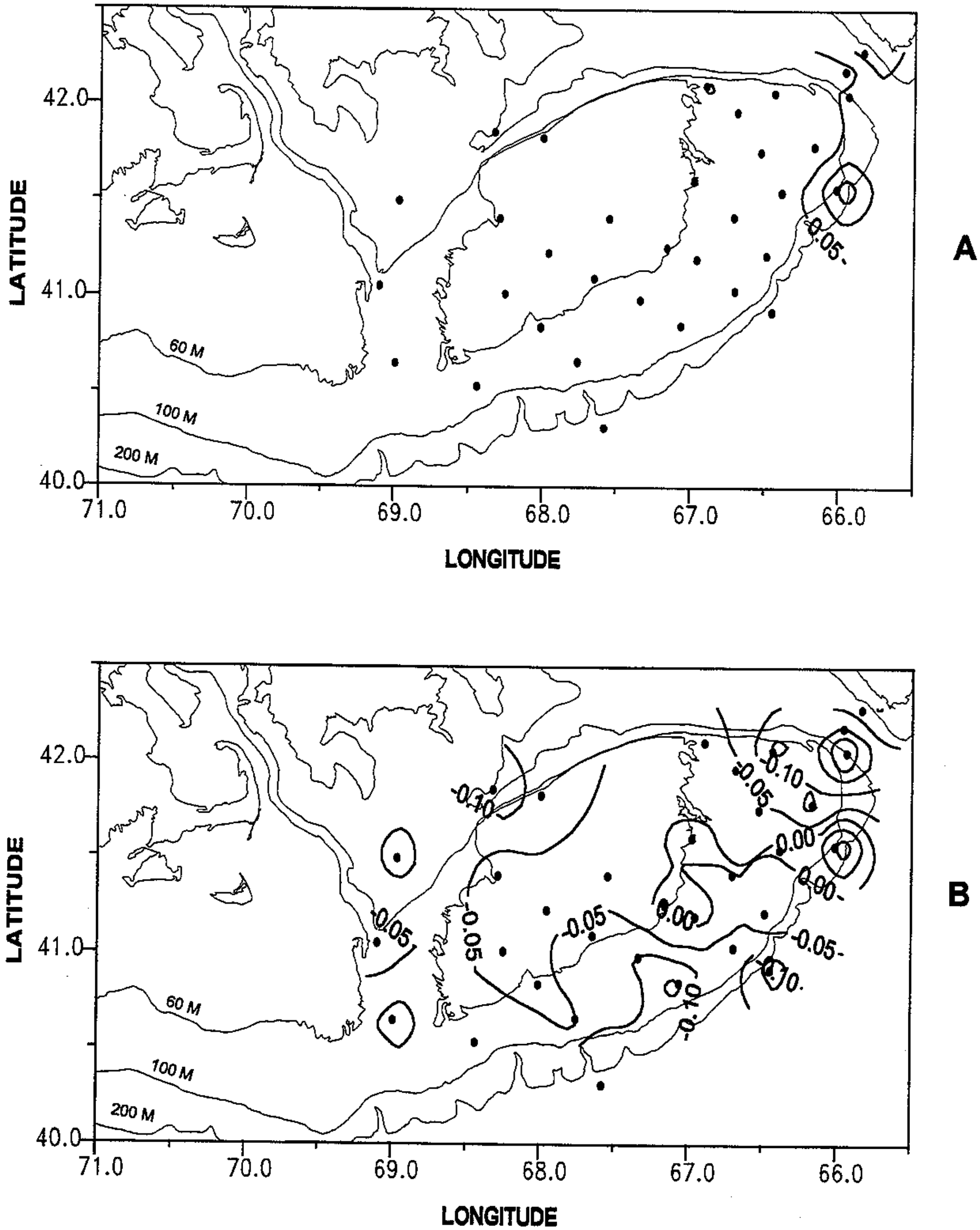
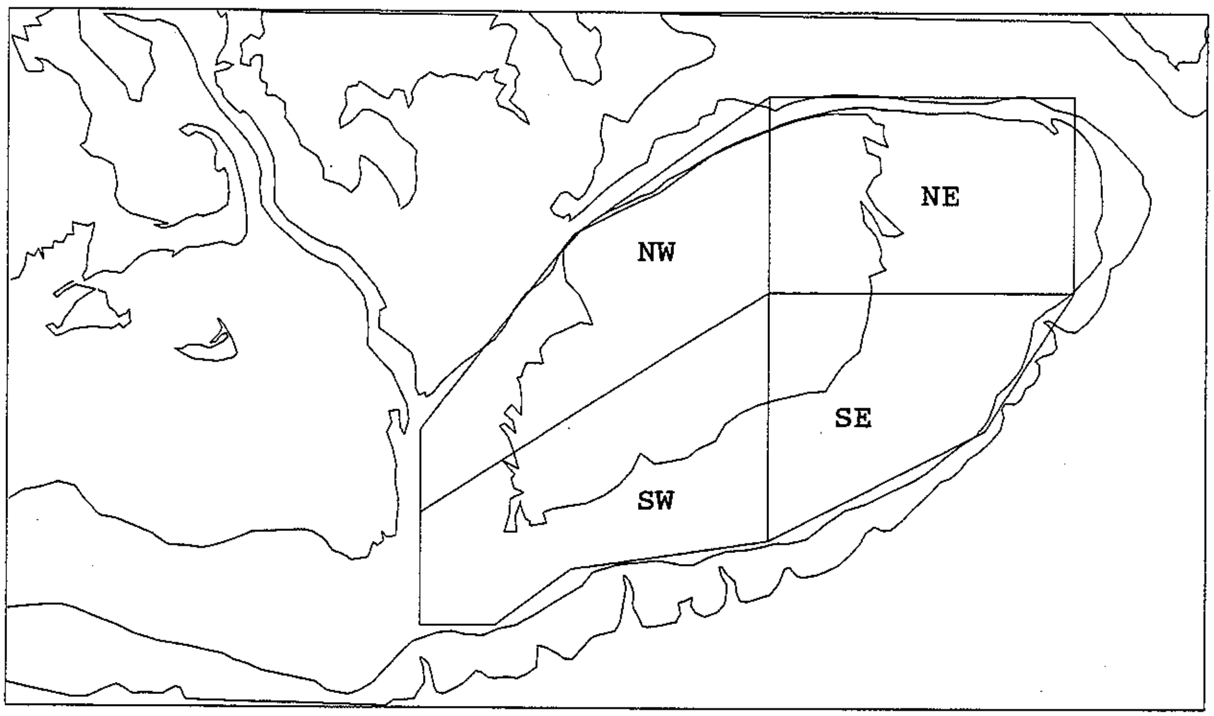



Figure 6. (A) Stratification (0 - 30 m) and stratification anomaly distributions observed during broad - scale survey EN276.

Figure 7. Volume Average Water Properties (0-30m depth)

Temperature, Salinity and Volume of Georges Bank Water (<34 PSU)




| Area | Day | Temp | Anom | Salt | Anom | Volume | Anom |
|---|---|---|---|---|---|---|---|
| Bank | 15. | 5.88 | -0.72 | 32.87 | 0.08 | 1037. | 8.3 |
| NW | 17. | 5.19 | -1.11 | 32.70 | -0.24 | 240. | 0.0 |
| NE | 16. | 5.83 | -0.56 | 32.91 | 0.07 | 280. | 0.0 |
| SE | 15. | 6.45 | -0.57 | 33.01 | 0.26 | 250. | 5.8 |
| SW | 13. | 6.27 | -0.83 | 32.86 | 0.03 | 260. | 1.9 |

[ preliminary data ]

**Plankton Notes - EN276 (GLOBEC Georges Bank BroadScale Survey) - January 1996**

by Charles Miller (Oregon State University), Pilar Heredia (URI),
Jim Gibson (URI) and Theresa Rotunno (URI)

Introduction and Summary - Plankton were extremely sparse all across Georges Bank, to the south in slope water and in NE Channel. Plankton over the shallower portions of the bank were dominated by *Centropages typicus*, with little admixture of other forms. *Pseudocalanus* was present at a few stations on the south flank, but in only a very few of them (i.e., both infrequent and low density when present). Very few *Calanus* (a few per tow) were found in shallow bank stations. Some *Oithona similis* were present in all habitats, but never constituting much biomass. There were essentially none of the hydroids (*Clytia* sp.) and very few of the *Sagitta elegans* so abundant in spring and early summer samples over the bank.

*Calanus* were present at Stns. 1 and 2 in Great South Channel. There was a stock in some layer in the slope water to the south of the bank at Stn. 7. Unfortunately, we could not take a stratified sample and don't know their depth distribution.. The C5's in that stock consistently had very thin (remnant) oil sacs. *Calanus* were a dominant constituent of the plankton sampled in NE Channel, closely followed by *Metridia*. *Calanus* were found at all depths. At the surface, females, mostly carrying eggs, outnumbered C5's and males substantially. At depth there were relatively more C5's, but adults including many males were a majority of specimens. The C5's had substantial oil reserves, but none could be characterized as fully packed. Many, probably most, showed active gonadal development. All that I checked were growing ovaries. Clearly, diapause is broken at all sites checked. *Metridia* seem to be up at night, down in the day; not a surprise.

Over the northern side of NE peak, *Centropages typicus* was again dominant in very sparse plankton, a few ml/100 $m^3$. There was a small number of *Calanus* present, a few C5 and males, more females. However, this stock definitely is not sufficient to account for any very large number of eggs. One nauplius was seen among the smaller plankton, which were dominated by *Oithona similis*. Rarer forms present included some *Microcalanus* and one female *Clausocalanus*.

In deeper waters to the east and north of the bank the most abundant predator was *Meganyctiphanes* sp., and *Euphausia* spp. were present off the south edge of the bank.

Because of departure to Portland, Maine, to avoid a storm we obtained no samples from Stns. 29-33, a bad loss.

The following station-by-station observation notes add a few points to the summary above:

Station 1 - *Centropages typicus* were dominant, *Metridia lucens* was moderately abundant, and there were considerable numbers of large *Calanus* (C5, C6). Adults are already a substantial fraction of the total stock. *Oithona similis* were present in low numbers in the bottom net. Siphonophores were present here making up a substantial part of the biomass.

Station 2 - *Centropages typicus* dominant. Upper sample was *Centropages* only. A few *Calanus* present in deeper two samples. The number of C5 and C6-females were about equal; males and C4 were present.

Station 3 resembled Stn. 2 quite exactly. *Centropages* dominant from top to bottom. Very few *Calanus.*

After Stn. 4 we were restricted to bongos by weather. They did not catch much. Typical shallow tows caught a few teaspoons of settled volume. The bulk of plankton at Stns. 4, 5 and 6 was *Centropages typicus* adults and copepodites.

Station 7 - Deep tow to 430 m over a 700-775 m bottom. Plankton sparse, but it contained a variety of slope water stuff: *Pleuromamma, Cal. tenuicornis, Euphausia krohnii,* etc. In 9/80 of the sample, there were quite a few *Calanus finmarchicus* in the sample with females just a little less abundant than C5. There were a few males and one (only) C4.

Station 9 - bongo - Very sparse plankton. *Centropages typicus* dominant, no sign of *C. hamatus.* I found only 4 *Calanus* C5 in 1/4 of the sample, but there were about 50 females in that fraction. Males about as abundant as C5 (i.e., I saw a few). I have yet to see *Pseudocalanus* in any sample.

Stn. 10 - finally calm enough for a MOC-1. Examined nets 1 & 3 carefully. Very *Calanus* in 9/60 of each (4 & 3 C5, a few females). *Centropages typicus* was dominant, again, but not very abundant. There were quite a large number of nice mysids in all levels of the Moc-1, a few appendicularians.

Stns. 12-13 up on the bank - these were strongly dominated by *Centropages typicus*. Sample sizes were very small. Essentially no *Calanus.*

Stn. 52 (between 15 and 16) - the bongo produced about 2 teaspoons per side, dominated by *Metridia,* mostly females, all with dark (blackish green) guts. There were modest numbers of *Calanus finmarchicus,* mostly females but some C5. *Centropages typicus* was also present, as were a few chaetognaths.

Stn. 16 (bongo over the slope) - *Pleuromamma* spp. was most abundant. *Euchaeta* spp. and *Metridia lucens* were present in large numbers. *Calanus finmarchicus* males and C1 and C5's were also present ,but not in large amounts. The predominant predators here were the euphausiids (*Meganyctiphanes norvegica*, and *Euphausia krohnii*).

Stn. 17 - *Centropages* spp. was the dominant copepod, some *Metridia* and *Calanus* females.

Stn. 19 - on the NE Peak, depth=66 m - MOC-1 samples very poor. A very few *Centropages typicus*, mostly adult and late copepodites. A few *Calanus*, but most looked DOA; just one lively female in one fifth of net 1. A few *Pseudocalanus*, again, but basically not much plankton.

Same light dusting of *Cosinodiscus* seen all across the Bank, with the exception of offshore stations (7, 16).

Stn. 20 - Strongly dominated by *Centropages typicus* at all depths.

Stations surrounding NE Channel (24,25,39) - MOC-1 hauls to 180+m. These were all very similar. The deeper nets showed for *Calanus* a mix of C5 and C6 (both sexes) with adults dominant. At station 39, there were many *Calanus* C5 molts below 100 meters. Clearly maturation out of the resting phase was well advanced by mid-January. Deep nets included many *Metridia* not found at shoaler levels. Other important plankton were *Limacina retroversa*, *Meganyctiphanes*, *Euchaeta* spp. (adults and copepodites), *Centropages typicus* and *Metridia*. Abundances were higher than we have seen elsewhere, but quite low for the volumes filtered. Settled volumes from the deeper samples were perhaps 150 ml. The surface nets were less than half that. Not impressive compared to the "strawberry daiquiris" expected later in the season.

At stations along the northern edge of the NE Peak (26,27,28) and off the bank along the western end (34 and 38), *Calanus finmarchicus* numbers were greater than along the south flank, with adult females constituting the largest proportion. However, *Calanus* abundance was much less than in the NE Channel, and the dominant animals numerically at Stn. 27 were *Centropages typicus*, which were completely absent in the NE channel samples. *Metridia* spp. were present at all of these stations, possibly dominant at Stn. 28. *Calanus* nauplii began to appear, as did *Metridia* nauplii, but numbers were low.

The MOC-1 samples from Wilkinson Basin were dominated by *C. finmarchicus*, followed by *Metridia lucens*. Most of the *Calanus* were adult females. As elsewhere, total zooplankton biomass was very low. It is fair to conclude that the mortality imposed on resting stage *Calanus finmarchicus* is very severe, with survivorship to maturation on the order of 0.2%.

Written for *Stern View* (the bulkhead newspaper) after examining Station 27:

## *Calanus* Not At Real Zero

Recall that this is the "Real Zeros Cruise". For *Calanus finmarchicus* the real zero we seek is a time when essentially none of the resting stock has begun to mature. Let's review the life history. This mid-size (3.0 mm) copepod first appears as an egg, which hatches as a nauplius. Nauplii are about 60 μm long, shaped like four armed rugby balls. They grow and molt through six naupliar stages and six copepodite stages. Copepodites look like rice grains with lots of feet. In copepodologist code:

E⇒N1...N6⇒C1...C5⇒C6(adult)

At each generation a large fraction of individuals pause in development ("enter diapause") at the C4 or C5 stage, the pause lasting as long as 8 months. By August the entire stock is in diapause and located in deep water layers. They don't eat and they hang suspended in the water doing absolutely nothing. They are not unresponsive, however. Their sensory system stays on alert, and they will make mighty escape leaps when attacked. On our November 1994 and 1995 cruises the whole stock was found in diapause.

Tradition has it that diapause ends for *C. finmarchicus* all over the North Atlantic in February. The C5's molt to C6, males usually appearing first. So, a real zero would have the entire stock in C4-C5 now. However, we are not finding this particular real zero on EN276. Rather, maturation is well along. The tradition is clearly wrong, at least, for the Gulf of Maine and Slope Water diapause stocks that feed onto Georges Bank. We have found substantial majorities of individuals already matured both along the south flank (where abundances were low) and in NE channel (where abundance was higher). We got good MOC-1 casts in NE channel. The mix at depth was about 2 adults per C5. At the surface, it was closer to 10:1, and the females were ripe for spawning. Pilar Heredia found masses of empty C5 skins in the sample from below 100 m, which implies the molting is active now. If we didn't find real zero, at least we are only at phase 1.

## Preliminary Summary of Ichthyoplankton Findings

by Antonie Chute (NOAA, Narragansett), Rebecca Jones (NOAA, Narragansett), Amy Tesolin (NOAA, Woods Hole) and Alyse Weiner (NOAA, Sandy Hook)

The tiny size (in terms of biomass) of the zooplankton samples from EN276 facilitated their observation through (1) sieve searching as the samples came out of the nets and (2) bottle-swirling after preservation. Ichthyoplankton were sparse during the cruise, yet typical of this time of year. *Ammodytes* were the dominant larvae. Cod spawning had commenced.

Shipboard observation of bongo net samples indicated there were very few fish larvae on the Bank, with 31 of 59 samples appearing to contain no larvae at all. Individual samples rarely contained more than 10 larvae. Species of fish larvae observed were Atlantic herring (*Clupea harengus*), sand lance (*Ammodytes* sp.), winter flounder (*Pseudopleuronectes americanus*), cod (*Gadus morhua*), unidentified leptocephali and unidentified Stomiatids. The one apparent cod larva was from Standard Stn. 40, a bongo-only station with no MOCNESS samples to check for others. Small fish larvae were removed for identification in some cases, but that was not possible for some samples and the larvae observed may be herring, sand lance or winter flounder. The long, thin shape and pigment spots along the gut of these species make them difficult to distinguish in the jar at their January size.

Samples from the start of the cruise (Std. Stns. 2 through 5 and 40 through 43) contained some large (>20 mm) Atlantic herring larvae in low densities (<10 per sample). As we moved along the south side of the bank, the large herring were no longer seen and many samples were devoid of ichthyoplankton. When fish larvae or eggs were observed, there were consistently less than 10 larvae and/or eggs of various sizes. Leptocephalus larvae were collected at both Stns. 45 and 46, toward the edge of the bank. Stn. 11 appeared to be the location of a patch of *Ammodytes* larvae, with thousands (all <10mm) present in the samples. Toward the Northeast Peak, cod-sized eggs were observed with increasing frequency, but larvae continued to be sparse.

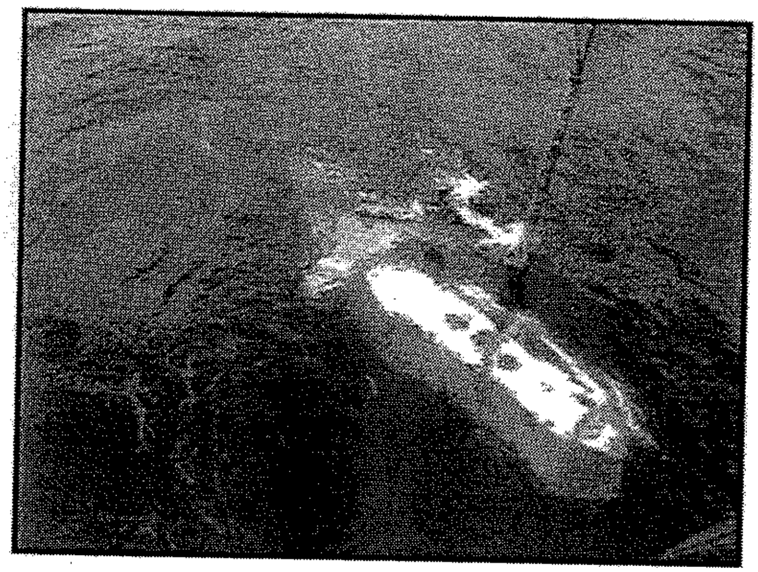
Samples taken after the storm break along the west end of the Bank, contained few cod-sized eggs, and the number of larvae in the samples remained low. Tiny (<10 mm) *Ammodytes* larvae were observed in the catches from Stns. 33 and 36. The proximity of these stations to Stn. 11, where these larvae appeared to be concentrated implied that there was a large, continuous patch in that area.

Fish eggs were found in 30 out of 59 samples, and many of them were large enough to be Gadid eggs. The developing embryo within these eggs was clearly visible and well pigmented in several cases. The incidence of these eggs (although not in large numbers) and the lack of Gadid larvae indicates that the cod and/or haddock may have just begun to spawn and the results of this activity will be more clearly seen in the February BroadScale samples. Substantial numbers of eggs were found at Std. Stns. 65, 66, 27 and 67. These stations are located on the Northeast Peak, a known spawning ground of cod and haddock.

**High Frequency Acoustics**
(Peter Wiebe and Mark Benfield)

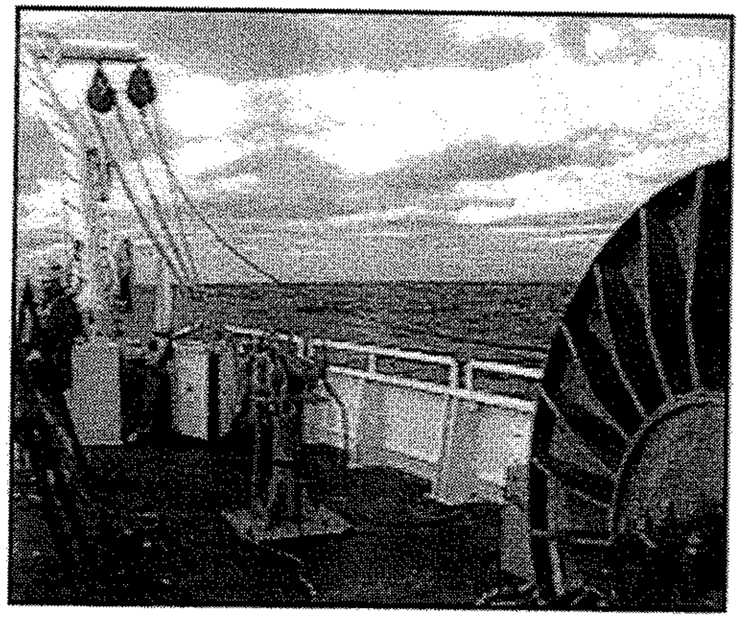
The bioacoustical endeavor on this cruise was a continuation of efforts to make high resolution volume backscattering measurements of plankton and nekton throughout the Georges Bank region. The goal is to acquire acoustical data that can be used to provide estimates of the spatial distribution of biomass of acoustical targets which span the size range of the target species (cod, haddock, *Calanus*, and *Pseudocalanus*) and their predators. The spatial acoustical map can also provide a link between the physical oceanographic conditions on the Bank and the biological distributions of the species as determined from the net collections at the stations distributed throughout the Georges Bank region. Work on this cruise was intended to obtain continuous acoustic sampling along all the shipboard survey tracklines covering the entire Georges Bank region. However, as described below, this effort was obviated by failure of the acoustic equipment.

System Description and Operation: The system used to make the acoustics measurement was a proto-type instrument package dubbed the Bio-Optical Multifrequency Acoustical and Physical Environmental Recorder (BIOMAPER). The towbody assembly is a simple aluminum weldment consisting of the framework necessary to mount all of the required sensors and exterior panels to reduce drag and flow noise at high speeds. The framework of the system has dimensions of 3 m length x 1.8 m height x 0.6 m width, and weighed approximately 730 kg in air. A tail section adds another 1.5 m to the length and 0.5 m to the height. On this cruise, there were two acoustic sensors (120 kHz and 420 kHz), and an environmental sensing system with temperature, conductivity, fluorescence, beam transmittance, and downwelling irradiance sensors. The transducers were operated in a down-looking mode.



BIOMAPER being towed behind the stern of R/V ENDEAVOR.

The tow-body was deployed from the port stern quarter of ENDEAVOR. The bullwork at the stern port quarter was removed and a plywood chute with aluminum braces and plastic lining was installed to make launch and recovery as constraining as possible while the fish was on or above the deck of the vessel. The chute was only a few inches wider than the width of the fish, nearly as long as the fish, and about 2' (60 cm) tall (about two-thirds the height of the fish). The outboard end of the chute was flared to make it easier to get the fish into the chute when bringing it on board. A TSE winch (loaned by the WHOI rigging shop) was equipped for launching, recovering, and towing BIOMAPER with a hundred+ meters of black polypropyline covered 1/2" steel cable (breaking strength of approximately 24,000 lbs). A cable termination was fitted to the end of the cable and attached to the towing bail of BIOMAPER. Also attached to BIOMAPER was a separate cable for power and data telemetry and a safety line (1" [2.5 cm] diameter braided nylon line - breaking strength ~15,000 lbs). The tow cable and the other two lines were wrapped with a short piece (~8' [2.44 m]) of three-inch canvas fire hose starting at the towing bail. The hose was secured with clothes-line rope and "duct" tape. The tow cable was led through a wide-cheeked block hanging shackled to a pad-eye on the outer margin (port side) of the A-frame, and the power/telemetry cable and safety line were led through a second block shackled to the nearest in-board pad-eye. The safety line ended with an eye that was shackled to a cleat bolted to the deck. The TSE winch was located on the port side of the main deck about 30' (9.14 m) forward of the chute. About 15' (4.58 m) in front of the chute was an air-tugger which was used in the recovery of the fish. It had ~3/8" Dacron line and was terminated with a steel snap hook.



BIOMAPER in the chute on the port quarter of R/V Endeavor. Note the position of the winch, tugger, and blocks.

The procedure for launching was to have the A-frame positioned with the block directly over the tow bar. Tension was taken up on the tow cable, and then the A-frame was moved outboard, lifting and moving the fish out the chute. A line through the nose-bail was used to steady the fish and to control to some extent the swinging motion of the fish as it cleared the fan-tail. The winch operator would lower the cable as appropriate to keep the fish constrained by the chute and then, once clear of the fan-tail, down into the water. The nose line was released as the fish entered the water. Recovery was essentially the reverse. When underway between stations, the cable was deployed so that the fish was between 2 and 4 meters below the surface. On station, the cable was shortened so that the fish remained in this depth range.

The power/telemetry cable was led into the main lab and the individual conductors were hooked to either a bank of three power supplies or to two data acquisition 80486 computers (one for the acoustics data and the other for the environmental sensor data). Two programs, developed at WHOI, were used to acquire, process, store, and display the data. Some postprocessing was done at sea on a Pentium computer.

Synopsis of Results: Acoustical data were obtained along two sections of cruise track, between standard stations 11-13 and stations 19-22 (Table 1) The distance traveled alone the trackline where acoustical data were collected was 148.8 km (80.4 nm). This is far short of the 1300 to 1500 km of trackline that is usual for a complete sampling of the Bank and substantially less than weather would have permitted had the gear operated properly.

**Table 1. Acoustic Data Summary and concomitant observations.**

| Run # | LAT N<br>LON W | Local<br>Date<br>Time in<br>Time out | GMT<br>Date<br>Time in<br>Time out | Data files | Concurrent or overlapping measurments | Remarks |
|---|---|---|---|---|---|---|
| 1 | 40 02.56<br>40 49.70<br><br>69 06.67<br>68 59.30 | Jan. 11<br>2145<br>2347 | Jan. 11<br>0245<br>0447 | En276_01.pro<br>En276_01.raw | None | Only ESS data acquired; no Acoustics data acquired. Tow started at end of Sta. #1. Distance traveled 25.9 km; 14.0 nm. |
| 2 | 41 13.10<br>41 14.60<br><br>67 58.90<br>67 10.10 | Jan. 14<br>0831<br>2200 | Jan. 14/15<br>1331<br>0300 | En276_02.pro<br>En276_03.pro<br>En276_04.pro<br>En276_02.raw<br>En276_03.raw<br>En276_04.raw | Pump, Bongo, CTD, MOC1, MOC10, ADCP | This tow overlapped work at stations 50, 12, 51, and 13. Distance traveled 68.3 km; 36.9 nm. |
| 3 | 41 37.05<br>41 33.20<br><br>66 59.90<br>61 01.82 | Jan. 16<br>0030<br>1651 | Jan. 16<br>0530<br>2151 | En276_05.pro<br>En276_06.pro<br>En276_07.pro<br>En276_05.raw<br>En276_06.raw<br>En276_07.raw | Pump, Bongo, MOC 1 and ADCP | This tow overlapped work at stations 58, 20, 59, 21, and 60. Distance traveled 80.6 km; 43.5 nm. |

The acoustical records showed relatively low volume backscattering compared to those obtained during the previous July cruise in the same regions sampled. In July, substantial amounts of sand as well as animals were collected in net and pump samples in the well-mixed areas of the Bank. It was not the case on this cruise and may help to explain the difference in backscattering levels between the two cruises. In the small area surveyed, highest backscattering values were in the shallowest portions of the Bank. Here the water columns were well-mixed hydrographically and this was reflected in the acoustical record; vertically the volume backscattering had a uniform distribution (See Figure of 420 kHz data). As in essentially all the acoustical records we have taken in the well-mixed regions of the Bank, there were vertical bands or striations of alternating high and low backscattering which may be related to vertical circulation cells caused by tidal flow over a rough bottom.

Equipment Notes: We had BIOMAPER in the water on three occasions. The first was shortly after we finished work at Station#1. The deck checkout to look at noise levels on each channel showed the system was working OK (in the non-transmit mode), but once in the water, we could not get it to work even in the non-transmit (listen) mode; all we got were error messages indicating no communication between the computer and the transmit bottle. After several hours, we hauled BIOMAPER back on deck. In the wee hours, we cleaned and greased all the connectors going into the transmit bottle and both transducers. This did not help the situation. Even on the deck, the error messages came flying across the display when the 420 or 120 kHz systems were turned on (in listen mode), but not always.

On 14 January (0920), we put BIOMAPER in the water for a second time because subsequent deck tests indicated that communication between the computer and transmit bottle were working again. But in the water, we had the same problem - lots of error messages and no data. While working with the RS485 adapter, the acoustic system suddenly started working, but in retrospect, this appears coincidental. The system ran continuously for about 9 hours with only a couple of glitches where we saw the data stop coming in for a minute or so and then, on its own, start coming in again. Then, the error messages returned and the system could not be re-booted successfully, in spite of repeated attempts. BIOMAPER was brought back on board, we removed the transmit bottle and opened it for inspection. We found two cooked resistors on one of the circuit boards. We were not able to determine what caused the failure, Dave Nelson, the Endeavor resident technician, replaced the resistors that were blown. A deck test in the listen mode was successful.

We put BIOMAPER into the water just after midnight on 16 January, but the system failed to function properly and the familiar stream of error messages began. Repeated re-starts had no effect, but we left the fish in the water anyway to get roll and pitch data. Six hours later, another attempt was made to start the system and it worked. It ran until about 1300 when it spontaneously went into error mode. Attempts to re-boot it were successful. An hour later, it again went into error mode and we were again able to re-boot successfully. Twenty minutes later, it died. No re-boot was possible. We again brought BIOMAPER on board, removed the transmit bottle, and opened it up. And again we were greeted with the smell of cooked electronics. Not only did the resistors that cooked last time get fried, but other circuitry failed as well. No repairs were possible this time because parts were not available. This failure ended the acoustic data acquisition.

Another technical problem encountered on this cruise had to do with the contamination of our 120 kHz signal caused by the ADCP operating at 150 kHz. This kind of contamination is caused by the fact that the ADCP is emitting acoustic energy over a frequency band that includes 120 kHz. This contamination was clearly evident in tests done while we were on station where the ADCP was turned off for some minutes. The 120 kHz acoustic records during periods when the ADCP was off were much, much cleaner than when the ADCP was on. In fact, none of the 120 kHz data collected on this cruise can be used in quantitative analyses. By the same token, our 120 kHz system must be having some effect on the ADCP data. A solution to this problem is needed and will probably involve getting a master clock and coordinating the pinging of the two systems so that they do not overlap.

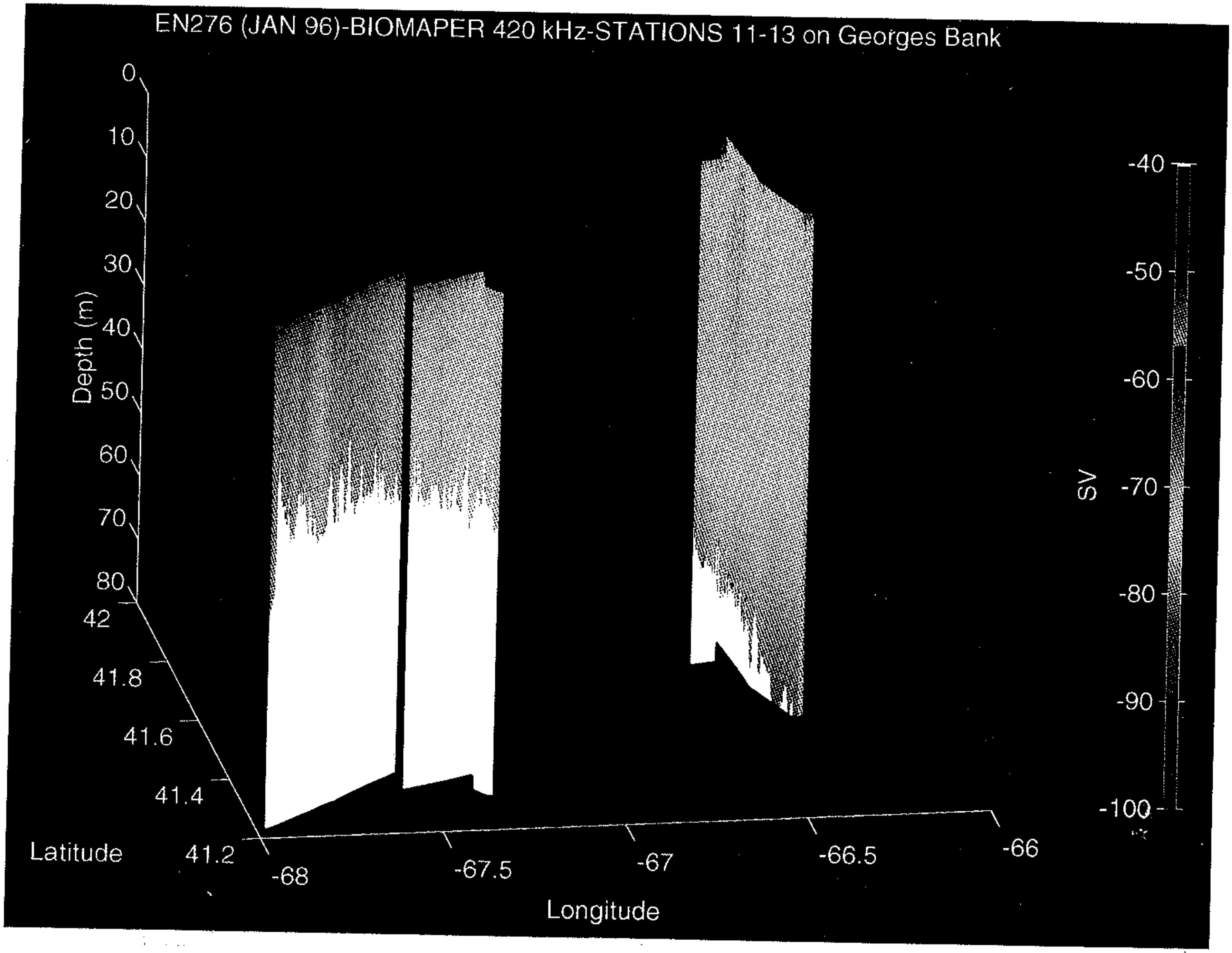



Figure A curtain plot of the volume backscattering at 420 kHz along tracklines between standard stations 9-14 and 18-22. The echograms portray vertically mixed regions with fine-scale vertical banding of high and low backscattering which may result from an interaction between secondary vertical circulation cells set-up by tidal flow over an irregular seafloor and the behavior of the organisms attempting to swim toward the sea surface or the seafloor.

## Event Log

Methods Explanation - The GLOBEC Georges Bank BroadScale Survey samples zooplankton and fish larvae with several net systems and takes hydrographic profiles with a CTD system. Samplers are as follows:

| Code Name | Apparatus - sample disposition |
|---|---|
| BongoSB | This is a 60 cm bongo net hauled below a SeaBird CTD system that provides depth control and temperature-salinity data. Mesh size is 0.333. Principal target animals are fish larvae. Preservation is in formalin. Samples go to NOAA. |
| MOC-1 | One meter MOCNESS sampling system equipped with 10 nets. Nets 1-4 are 0.150 mm mesh and constitute a first deep to shallow series. These fine mesh samples are primarily for zooplankton studies and go to the Durbin laboratory at URI. Nets 5-10 are 0.333 mm. Net 5 is a down net; the sample is preserved in alcohol for molecular biological study at the Bucklin laboratory at UNH. Nets 6-10 are a second up series primarily for fish larvae. The samples are preserved in alcohol and go to NOAA. |
| MOC-10 | A 10-meter MOCNESS sampler with five nets. All nets are ca. 5 mm stretch. Samples are preserved in formalin and go to the Madin-Bollens laboratory at Woods Hole. |
| Pump | A gasoline driven centrifugal pump that samples water through a 3-inch hose to be filtered on deck through 50 μm mesh screen for copepod nauplii. Samples are preserved in formalin for study at the Durbin laboratory, URI. |
| Mk5CTD | This is a Neil Brown Mark-5 CTD. It is equipped with a fluorometer. Data go to the Mountain laboratory at NOAA Woods Hole. |
| Drifter | Holely sock drifters with 10 m tethers to Argos-reporting floats. Data to be gathered via Argos by the Limeburner laboratory at WHOI. |

Station locations sampled on EN276 are shown in Fig. 1 of the Hydrography section (page 9). The following numbers of deployments of each sampler type were accomplished:

| | |
|---|---|
| BongoSB | 71 casts |
| MOC-1 | 23 casts |
| MOC-10 | 2 casts |
| Pump | 13 casts |
| Mk5CTD | 32 casts |
| Drifters | 5 releases |

Positions and times of all sampling events are listed on the sheets that follow.

| Event # | Instr | cast# | Sta# | Sta_std | L Mth | O Day | C A L hhmm | s/e | Lat | Lon | Water Depth | Cast Depth | PI | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BongoSB | 1 | 1 | 1 | 1 | 11 | 1400 | s | 4101.80 | 68.58.9 | 74 | 34 | Sibunka | Aborted, wire parted in winch |
| 2 | moc1 | 1 | 1 | 1 | 1 | 11 | 1812 | s | 4101.80 | 6901.80 | 86 | 77 | Durbin | |
| 3 | moc1 | 1 | 1 | 1 | 1 | 11 | 1903 | e | 4102.60 | 6903.20 | 76 | 67.6 | Durbin | |
| 4 | BongoSB | 2 | 1 | 1 | 1 | 11 | 1953 | s | 4103.20 | 6904.60 | 85 | 82 | Sibunka | |
| 5 | BongoSB | 2 | 1 | 1 | 1 | 11 | 2000 | e | 4103.20 | 6905.00 | 85 | 82 | Sibunka | |
| 6 | Mk5CTD | 1 | 1 | 1 | 1 | 11 | 2045 | s | 4102.70 | 6905.80 | 83 | 75 | Mountain | |
| 7 | biomappe | 1 | 1 | 1 | 1 | 11 | 2145 | s | | | 80 | 3 | Wiebe | acoustics not working |
| 8 | biomappe | 1 | 2 | 40 | 1 | 11 | 2347 | e | 4049.70 | 6859.30 | 80 | 3 | Wiebe | |
| 9 | BongoSB | 3 | 2 | 40 | 1 | 11 | 2350 | s | 4047.70 | 6859.20 | 80 | 72 | Sibunka | fine cast on fine, windless evening |
| 10 | BongoSB | 3 | 2 | 40 | 1 | 12 | 3 | e | 4049.60 | 6859.70 | 80 | 72 | | |
| 11 | BongoSB | 4 | 3 | 2 | 1 | 12 | 125 | s | 4039.30 | 6859.40 | 67 | 64 | Sibunka | |
| 12 | BongoSB | 4 | 3 | 2 | 1 | 12 | 132 | e | 4038.90 | 6859.40 | 68 | | Sibunka | |
| 13 | Mk5CTD | 2 | 3 | 2 | 1 | 12 | 145 | s | 4039.10 | 6859.50 | 67 | 61 | Mountain | |
| 14 | moc1 | 2 | 3 | 2 | 1 | 12 | 200 | s | 4039.90 | 6859.10 | 68 | 63 | Durbin | |
| 15 | moc1 | 2 | 3 | 2 | 1 | 12 | 244 | e | lost | | | | | |
| 16 | BongoSB | 5 | 4 | 41 | 1 | 12 | 429 | s | 4035.40 | 6843.20 | 63 | 60 | Sibunka | |
| 17 | BongoSB | 5 | 4 | 41 | 1 | 12 | 435 | e | 4035.50 | 6842.90 | 64 | | Sibunka | |
| 18 | BongoSB | 6 | 5 | 3 | 1 | 12 | 609 | s | 4031.80 | 6826.80 | 90 | 84 | Sibunka | |
| 19 | BongoSB | 6 | 5 | 3 | 1 | 12 | 616 | e | 4031.80 | 6826.60 | 91 | | Sibunka | |
| 20 | Mk5CTD | 3 | 5 | 3 | 1 | 12 | 627 | s | 4031.70 | 6826.50 | 92 | 85 | Mountain | |
| 21 | Pump | 1 | 5 | 3 | 1 | 12 | 710 | s | 4031.00 | 6826.90 | 93 | 62 | Durbin | |
| 22 | moc1 | 3 | 5 | 3 | 1 | 12 | 746 | s | 4030.10 | 6827.70 | 96 | 87.9 | Durbin | |
| 23 | moc1 | 3 | 5 | 3 | 1 | 12 | 839 | e | 4029.50 | 6825.90 | 97 | 87 | Durbin | |
| 24 | BongoSB | 7 | 6 | 41 | 1 | 12 | 1229 | s | 4045.70 | 6820.50 | 45 | 41 | Sibunka | |
| 25 | BongoSB | 7 | 6 | 41 | 1 | 12 | 1235 | e | 4046.20 | 6820.40 | 50 | | Sibunka | |
| 26 | BongoSB | 8 | 7 | 4 | 1 | 12 | 1410 | s | 4059.40 | 6815.20 | 54 | 50 | Sibunka | |
| 27 | BongoSB | 8 | 7 | 4 | 1 | 12 | 1416 | e | 4059.40 | 6814.80 | 54 | | Sibunka | |
| 28 | Mk5CTD | 4 | 7 | 4 | 1 | 12 | 1430 | s | 4100.40 | 6814.60 | 55 | 48 | Mountain | |
| 29 | Pump | 4 | 7 | 4 | 1 | 12 | 1458 | s | 4101.20 | 6814.30 | 42 | 36 | Durbin | |
| 30 | Moc-1 | 4 | 7 | 4 | 1 | 12 | 1551 | s | 4059.20 | 6814.40 | 58 | 45 | Durbin | |
| 31 | Moc-1 | 4 | 7 | 4 | 1 | 12 | 1551 | e | 4059.20 | 6813.00 | 58 | | Durbin | |
| 32 | BongoSB | 9 | 8 | 43 | 1 | 12 | 1819 | s | 4055.40 | 6807.40 | 60 | 56 | Sibunka | |
| 33 | BongoSB | 9 | 8 | 43 | 1 | 12 | 1825 | e | 4055.50 | 6807.30 | 60 | 56 | Sibunka | |
| 34 | Water cas | 1 | 9 | 5 | 1 | 12 | 1929 | e | 4050.90 | 6800.20 | 66 | 61 | Mountain | |
| 35 | BongoSB | 10 | 9 | 5 | 1 | 12 | 1939 | s | 4050.90 | 6800.30 | 66 | 60 | Sibunka | |
| 36 | BongoSB | 10 | 9 | 5 | 1 | 12 | 1945 | e | 4050.70 | 6800.40 | 66 | 60 | Sibunka | |
| 37 | BongoSB | 11 | 9 | 5 | 1 | 12 | 1957 | s | 4050.70 | 6800.30 | 66 | 59 | Durbin | To replace MOC-1 |
| 38 | BongoSB | 11 | 9 | 5 | 1 | 12 | 2003 | e | 4050.80 | 6800.50 | 66 | 59 | Durbin | |
| 39 | Mk5CTD | 5 | 9 | 5 | 1 | 12 | 2020 | e | 4050.70 | 6800.50 | 66 | 57 | Mountain | |
| 40 | BongoSB | 12 | 10 | 44 | 1 | 12 | 2317 | s | 4045.60 | 6753.10 | 75 | 68 | Sibunka | |
| 41 | BongoSB | 12 | 10 | 44 | 1 | 12 | 2323 | e | 4045.80 | 6752.90 | 75 | 68 | Sibunka | |
| 42 | BongoSB | 13 | 11 | 6 | 1 | 13 | 155 | s | 4040.00 | 6746.30 | 72 | 68 | Sibunka | |
| 43 | BongoSB | 13 | 11 | 6 | 1 | 13 | 201 | e | 4039.90 | 6746.20 | 72 | | Sibunka | |
| 44 | BongoSB | 14 | 11 | 6 | 1 | 13 | 212 | s | 4039.80 | 6746.10 | 72 | 65 | Durbin | |
| 45 | BongoSB | 14 | 11 | 6 | 1 | 13 | 219 | e | 4039.70 | 6745.50 | 73 | | Durbin | |

| | | | | | L | O | C A L | | | | Water | Cast | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Event # | Instr | cast# | Sta# | Sta_std | Mth | Day | hhmm | s/e | Lat | Lon | Depth | Depth | PI | Comments |
| 46 | Mk5CTD | 6 | 11 | 6 | 1 | 13 | 230 | s | 4039.60 | 6745.50 | 72 | 65 | Mountain | |
| 47 | BongoSB | 15 | 12 | 45 | 1 | 13 | 832 | s | 4027.90 | 6732.00 | 137 | 131 | Sibunka | |
| 48 | BongoSB | 15 | 12 | 45 | 1 | 13 | 845 | e | 4027.00 | 6732.10 | 132 | 131 | Sibunka | |
| 49 | BongoSB | 16 | 13 | 7 | 1 | 13 | 1205 | s | 4019.60 | 6733.90 | 850 | 201 | Sibunka | |
| 50 | BongoSB | 16 | 13 | 7 | 1 | 13 | 1225 | e | 4019.00 | 6734.50 | 700 | | Sibunka | |
| 51 | BongoSB | 17 | 13 | 7 | 1 | 13 | 1235 | s | 4018.70 | 6734.80 | 775 | 430 | Sibunka | |
| 52 | BongoSB | 17 | 13 | 7 | 1 | 13 | 1330 | e | 4017.40 | 6736.60 | 900 | | Sibunka | |
| 53 | BongoSB | 18 | 14 | 46 | 1 | 13 | 1709 | s | 4039.50 | 6710.80 | 110 | 106 | Sibunka | |
| 54 | BongoSB | 18 | 14 | 46 | 1 | 13 | 1718 | e | 4039.40 | 6711.10 | 110 | 106 | Sibunka | |
| 55 | BongoSB | 19 | 15 | 8 | 1 | 13 | 1914 | s | 4052.00 | 6703.10 | 92 | 87 | Sibunka | |
| 56 | BongoSB | 19 | 15 | 8 | 1 | 13 | 1922 | e | 4051.80 | 6703.40 | 92 | 87 | Sibunka | |
| 57 | BongoSB | 20 | 15 | 8 | 1 | 13 | 1931 | s | 4051.50 | 6703.50 | 92 | 89 | Durbin | |
| 58 | BongoSB | 20 | 15 | 8 | 1 | 13 | 1939 | e | 4051.10 | 6703.60 | 92 | 89 | Sibunka | |
| 59 | Mk5CTD | 7 | 15 | 8 | 1 | 13 | 2002 | e | 4051.20 | 6703.90 | 92 | 81 | Mountain | |
| 60 | BongoSB | 21 | 16 | 47 | 1 | 13 | 2138 | s | 4055.00 | 6711.10 | 87 | 83 | Sibunka | |
| 61 | BongoSB | 21 | 16 | 47 | 1 | 13 | 2145 | e | 4054.90 | 6711.60 | 87 | 83 | Sibunka | |
| 62 | BongoSB | 22 | 17 | 9 | 1 | 13 | 2310 | s | 4058.40 | 6719.60 | 79 | 73 | Sibunka | |
| 63 | BongoSB | 22 | 17 | 9 | 1 | 13 | 2315 | e | 4058.40 | 6719.80 | 79 | 73 | Sibunka | |
| 64 | BongoSB | 23 | 17 | 9 | 1 | 13 | 2326 | s | 4058.40 | 6719.90 | 79 | 75 | Durbin | |
| 65 | BongoSB | 23 | 17 | 9 | 1 | 13 | 2332 | e | 4058.60 | 6720.30 | 79 | | Durbin | |
| 66 | Mk5CTD | 8 | 17 | 9 | 1 | 13 | 2355 | e | 4058.80 | 6720.20 | 79 | 69 | Mountain | |
| 67 | BongoSB | 24 | 18 | 48 | 1 | 14 | 105 | s | 4101.50 | 6729.10 | 65 | 62 | Sibunka | |
| 68 | BongoSB | 24 | 18 | 48 | 1 | 14 | 110 | e | 4101.60 | 6729.30 | 67 | | Sibunka | |
| 69 | BongoSB | 25 | 19 | 10 | 1 | 14 | 220 | s | 4104.90 | 6738.70 | 58 | 52 | Sibunka | |
| 70 | BongoSB | 25 | 19 | 10 | 1 | 14 | 227 | e | 4105.10 | 6738.90 | 59 | | Sibunka | |
| 71 | Mk5CTD | 9 | 19 | 10 | 1 | 14 | 235 | s | 4105.30 | 6739.10 | 58 | 51 | Mountain | |
| 72 | Moc1 | 5 | 19 | 10 | 1 | 14 | 316 | s | 4106.10 | 6739.30 | 58 | 51 | Durbin | |
| 73 | Moc1 | 5 | 19 | 10 | 1 | 14 | 340 | e | 4107.80 | 6739.40 | 58 | | Durbin | |
| 74 | BongoSB | 26 | 20 | 49 | 1 | 14 | 518 | s | 4109.40 | 6748.30 | 45 | 41 | Durbin | |
| 75 | BongoSB | 26 | 20 | 49 | 1 | 14 | 525 | e | 4109.40 | 6748.60 | 41 | | Durbin | |
| 76 | BongoSB | 27 | 21 | 11 | 1 | 14 | 643 | s | 4113.70 | 6757.60 | 50 | 46 | Durbin | |
| 77 | BongoSB | 27 | 21 | 11 | 1 | 14 | 652 | e | 4113.30 | 6757.60 | 51 | | Durbin | |
| 78 | Mk5CTD | 10 | 21 | 11 | 1 | 14 | 700 | s | 4113.20 | 6757.70 | 50 | 45 | Mountain | |
| 79 | Moc1 | 6 | 21 | 11 | 1 | 14 | 730 | s | 4112.70 | 6757.80 | 56 | 47 | Durbin | |
| 80 | Moc1 | 6 | 21 | 11 | 1 | 14 | 802 | e | 4113.10 | 6758.90 | 50 | | Durbin | |
| 81 | Biomaper | 2 | 21 | 11 | 1 | 14 | 831 | s | 4113.10 | 6758.90 | 50 | 2.5 | Wiebe | |
| 82 | BongoSB | 28 | 22 | 50 | 1 | 14 | 1051 | s | 4119.00 | 6745.20 | 44 | 41 | Sibunka | |
| 83 | BongoSB | 28 | 22 | 50 | 1 | 14 | 1056 | e | 4119.00 | 6745.00 | 44 | 41 | Sibunka | |
| 84 | BongoSB | 29 | 23 | 12 | 1 | 14 | 1245 | s | 4124.30 | 6732.70 | 42 | 40 | Sibunka | |
| 85 | BongoSB | 29 | 23 | 12 | 1 | 14 | 1252 | e | 4124.20 | 6732.80 | 44 | | Sibunka | |
| 86 | Mk5CTD | 11 | 23 | 12 | 1 | 14 | 1307 | s | 4124.10 | 6732.90 | 43 | 37 | Mountain | |
| 87 | Pump | 3 | 23 | 12 | 1 | 14 | 1330 | s | 4123.80 | 6733.10 | 41 | 36 | Durbin | |
| 88 | Moc10 | 1 | 23 | 12 | 1 | 14 | 1434 | s | 4123.80 | 6733.60 | 45.1 | 35 | Madin | |
| 89 | Moc10 | 1 | 23 | 12 | 1 | 14 | 1520 | e | 4122.90 | 6734.10 | 44.2 | | Madin | |
| 90 | Moc1 | 7 | 23 | 12 | 1 | 14 | 1604 | s | 4122.80 | 6733.60 | 47 | 39 | Durbin | |
| 91 | Moc1 | 7 | 23 | 12 | 1 | 14 | 1631 | e | 4121.70 | 6734.00 | 45 | | Durbin | |

| Event # | Instr | cast# | Sta# | Sta_std | L<br>Mth | O<br>Day | C A L<br>hhmm | s/e | Lat | Lon | Water<br>Depth | Cast<br>Depth | PI | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 92 | BongoSB | 30 | 24 | 51 | 1 | 14 | 1916 | s | 4120.20 | 6721.20 | 44 | 40 | Sibunka | |
| 93 | BongoSB | 30 | 24 | 51 | 1 | 14 | 1920 | e | 4119.80 | 6720.70 | 44 | 40 | Sibunka | |
| 94 | BongoSB | 31 | 25 | 13 | 1 | 14 | 2105 | s | 4115.90 | 6710.00 | 59 | 55 | Sibunka | |
| 95 | BongoSB | 31 | 25 | 13 | 1 | 14 | 2110 | e | 4115.70 | 6709.70 | 59 | 55 | Sibunka | |
| 96 | BongoSB | 32 | 25 | 13 | 1 | 14 | 2117 | s | 4115.60 | 6709.70 | 59 | 56 | Durbin | |
| 97 | BongoSB | 32 | 25 | 13 | 1 | 14 | 2122 | e | 4115.40 | 6709.50 | 59 | 56 | Durbin | |
| 98 | Mk5CTD | 12 | 25 | 13 | 1 | 14 | 214 | e | 4115.00 | 6709.40 | 64 | 54 | Mountain | |
| 99 | Biomaper | 2 | 25 | 13 | 1 | 14 | 2200 | e | 414.60 | 6710.10 | 64 | 2-4 | Wiebe | |
| 100 | water cast | 2 | 26 | 52 | 1 | 14 | 2253 | e | 4114.10 | 6703.50 | 68 | | Mountain | |
| 101 | BongoSB | 33 | 26 | 52 | 1 | 14 | 2303 | s | 4114.10 | 6703.50 | 68 | 65 | Sibunka | |
| 102 | BongoSB | 33 | 26 | 52 | 1 | 14 | 2308 | e | 4113.70 | 6703.50 | 68 | 65 | Sibunka | |
| 103 | BongoSB | 34 | 27 | 14 | 1 | 15 | 20 | s | 4111.90 | 6657.20 | 69 | 65 | Sibunka | |
| 104 | BongoSB | 34 | 27 | 14 | 1 | 15 | 26 | e | 4111.60 | 6657.30 | 70 | | Sibunka | |
| 105 | BongoSB | 35 | 27 | 14 | 1 | 15 | 30 | s | 4111.50 | 6657.30 | 70 | 66 | Durbin | |
| 106 | BongoSB | 35 | 27 | 14 | 1 | 15 | 37 | e | 4111.40 | 6657.40 | 70 | | Durbin | |
| 107 | Mk5CTD | 13 | 27 | 14 | 1 | 15 | 50 | s | 4111.30 | 6657.50 | 68 | 62 | Mountain | |
| 108 | BongoSB | 36 | 28 | 53 | 1 | 15 | 205 | s | 4107.10 | 6649.70 | 71 | 67 | Sibunka | |
| 109 | BongoSB | 36 | 28 | 53 | 1 | 15 | 212 | e | 4106.90 | 6649.80 | 73 | | Sibunka | |
| 110 | BongoSB | 37 | 29 | 15 | 1 | 15 | 324 | s | 4102.20 | 6642.20 | 79 | 75 | Sibunka | |
| 111 | BongoSB | 37 | 29 | 15 | 1 | 15 | 330 | e | 4101.90 | 6642.20 | 79 | | Sibunka | |
| 112 | BongoSB | 38 | 29 | 15 | 1 | 15 | 338 | s | 4101.80 | 6642.20 | 78 | 74 | Durbin | |
| 113 | BongoSB | 38 | 29 | 15 | 1 | 15 | 346 | e | 4101.60 | 6642.30 | 78 | | Durbin | |
| 114 | Mk5CTD | 14 | 29 | 15 | 1 | 15 | 355 | s | 4101.50 | 6642.30 | 76 | 70 | Mountain | |
| 115 | BongoSB | 39 | 30 | 54 | 1 | 15 | 510 | s | 4058.40 | 6634.30 | 105 | 102 | Sibunka | |
| 116 | BongoSB | 39 | 30 | 54 | 1 | 15 | 524 | e | 4057.90 | 6633.90 | 107 | | Sibunka | |
| 117 | BongoSB | 40 | 31 | 16 | 1 | 15 | 627 | s | 4055.10 | 6626.90 | 800 | 200 | Sibunka | |
| 118 | BongoSB | 40 | 31 | 16 | 1 | 15 | 656 | e | 4054.30 | 6627.00 | 800 | | Sibunka | |
| 119 | Mk5CTD | 15 | 31 | 16 | 1 | 15 | 716 | s | 4055.30 | 6627.10 | 800 | 280 | Mountain | |
| 120 | Pump | 4 | 31 | 16 | 1 | 15 | 755 | s | 4055.00 | 6627.00 | 800 | 32 | Durbin | |
| 121 | BongoSB | 41 | 31 | 16 | 1 | 15 | 913 | s | 4054.80 | 6630.70 | 383 | 372 | Durbin | |
| 122 | BongoSB | 41 | 31 | 16 | 1 | 15 | 950 | e | 4054.60 | 6632.30 | 383 | 372 | Durbin | |
| 123 | BongoSB | 42 | 32 | 55 | 1 | 15 | 1116 | s | 4103.30 | 6627.10 | 143 | 136 | Sibunka | |
| 124 | BongoSB | 42 | 32 | 55 | 1 | 15 | 1127 | e | 4103.30 | 6627.30 | 143 | 136 | Sibunka | |
| 125 | BongoSB | 43 | 33 | 17 | 1 | 15 | 1242 | s | 4111.70 | 6627.00 | 98 | 94 | Sibunka | |
| 126 | BongoSB | 43 | 33 | 17 | 1 | 15 | 1250 | e | 4111.90 | 6627.60 | 97 | | Sibunka | |
| 127 | BongoSB | 44 | 33 | 17 | 1 | 15 | 1300 | s | 4111.90 | 6627.80 | 97 | 93 | Durbin | cod-end untied, retow |
| 128 | BongoSB | 44 | 33 | 17 | 1 | 15 | 1307 | e | 4112.10 | 6628.20 | 97 | | Durbin | |
| 129 | BongoSB | 45 | 33 | 17 | 1 | 15 | 1316 | s | 4112.10 | 6628.40 | 97 | 93 | Durbin | |
| 130 | BongoSB | 45 | 33 | 17 | 1 | 15 | 1324 | e | 4112.40 | 6629.10 | 97 | | Durbin | |
| 131 | Mk5CTD | 16 | 33 | 17 | 1 | 15 | 1337 | s | 4112.40 | 6629.40 | 96 | 91 | Mountain | |
| 132 | Pump | 5 | 33 | 17 | 1 | 15 | 1410 | s | 4112.60 | 6630.60 | 96 | 70 | Durbin | |
| 133 | BongoSB | 46 | 34 | 56 | 1 | 15 | 1545 | s | 4118.10 | 6634.50 | 91 | 88 | Sibunka | |
| 134 | BongoSB | 46 | 34 | 56 | 1 | 15 | 1554 | e | 4118.30 | 6634.80 | 90 | | Sibunka | |
| 135 | BongoSB | 47 | 35 | 18 | 1 | 15 | 1736 | s | 4124.70 | 6642.20 | 87 | 83 | Sibunka | |
| 136 | BongoSB | 47 | 35 | 18 | 1 | 15 | 1744 | e | 4124.80 | 6642.00 | 87 | 83 | Sibunka | |
| 137 | BongoSB | 48 | 35 | 18 | 1 | 15 | 1749 | s | 4124.80 | 6642.00 | 87 | 84 | Durbin | |

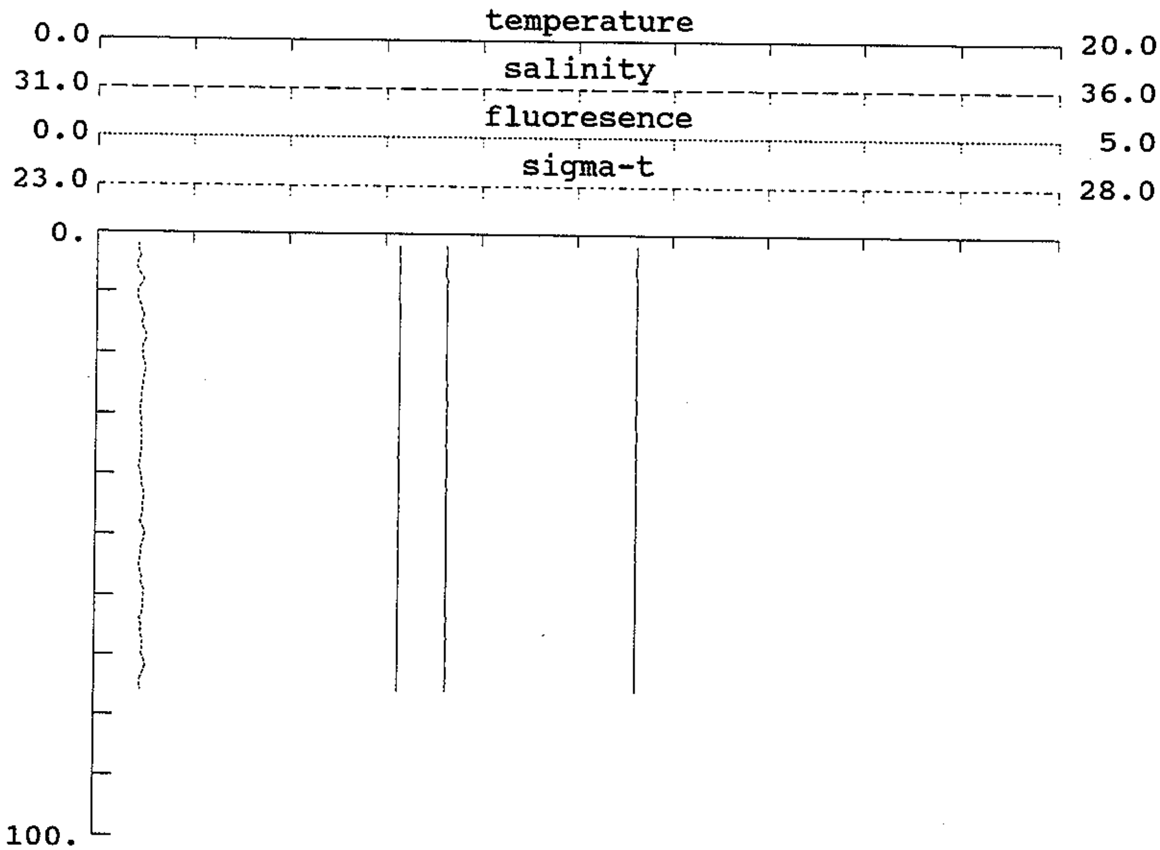
| | | | | | L | O | C A L | | | | Water | Cast | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Event # | Instr | cast# | Sta# | Sta_std | Mth | Day | hhmm | s/e | Lat | Lon | Depth | Depth | PI | Comments |
| 138 | BongoSB | 48 | 35 | 18 | 1 | 15 | 1758 | e | 4124.60 | 6642.30 | 87 | 84 | Durbin | |
| 139 | Mk5CTD | 17 | 35 | 18 | 1 | 15 | 1819 | e | 4124.60 | 6642.60 | 807 | 77 | Mountain | |
| 140 | BongoSB | 49 | 36 | 57 | 1 | 15 | 2024 | s | 4130.10 | 6650.20 | 74 | 68 | Sibunka | |
| 141 | BongoSB | 49 | 36 | 57 | 1 | 15 | 2031 | e | 4130.10 | 6650.70 | 74 | 68 | Sibunka | |
| 142 | BongoSB | 50 | 37 | 19 | 1 | 15 | 2225 | s | 4135.90 | 6658.70 | 66 | 62 | Sibunka | |
| 143 | BongoSB | 50 | 37 | 19 | 1 | 15 | 2229 | e | 4135.70 | 6659.00 | 66 | 62 | Sibunka | |
| 144 | Mk5CTD | 18 | 37 | 19 | 1 | 15 | 2247 | e | 4135.80 | 6658.90 | 66 | 56 | Mountain | |
| 145 | MOC-1 | 8 | 37 | 19 | 1 | 15 | 2313 | s | 4135.90 | 6659.70 | 66 | 53 | Durbin | |
| 146 | MOC-1 | 8 | 37 | 19 | 1 | 15 | 2347 | e | 4136.90 | 6659.80 | 66 | 53 | Durbin | |
| 147 | Biomaper | 3 | 37 | 19 | 1 | 16 | 30 | s | 4137.05 | 6659.90 | 66 | 2-4 | Wiebe | |
| 148 | BongoSB | 51 | 38 | 58 | 1 | 16 | 248 | s | 4140.20 | 6645.70 | 75 | | Sibunka | aborted,cable parted |
| 149 | BongoSB | 52 | 38 | 58 | 1 | 16 | 640 | s | 4144.20 | 6631.80 | 75 | 71 | Sibunka | |
| 150 | BongoSB | 52 | 39 | 20 | 1 | 16 | 648 | e | 4144.50 | 6632.00 | 75 | | Sibunka | |
| 151 | Mk5CTD | 19 | 39 | 20 | 1 | 16 | 700 | s | 4144.70 | 6631.90 | 75 | 70 | Mountain | |
| 152 | Pump | 6 | 39 | 20 | 1 | 16 | 722 | s | 4145.30 | 6631.70 | 73 | 57 | Durbin | |
| 153 | Moc-1 | 9 | 39 | 20 | 1 | 16 | 812 | s | 4145.80 | 6631.00 | 80 | 78 | Durbin | |
| 154 | Moc-1 | 9 | 39 | 20 | 1 | 16 | 858 | e | 4147.60 | 6630.40 | 80 | | Durbin | |
| 155 | BongoSB | 53 | 40 | 59 | 1 | 16 | 1103 | s | 4138.10 | 6627.80 | 82 | 76 | Sibunka | |
| 156 | BongoSB | 53 | 40 | 59 | 1 | 16 | 1111 | e | 4138.30 | 6627.80 | 82 | 76 | Sibunka | |
| 157 | BongoSB | 54 | 41 | 21 | 1 | 16 | 1225 | s | 4132.60 | 6624.10 | 90 | 85 | Sibunka | |
| 158 | BongoSB | 54 | 41 | 21 | 1 | 16 | 1232 | e | 4132.40 | 6623.50 | 90 | | Sibunka | |
| 159 | Mk5CTD | 20 | 41 | 21 | 1 | 16 | 1247 | s | 4132.30 | 6623.40 | 90 | 84 | Mountain | |
| 160 | Moc1 | 10 | 41 | 21 | 1 | 16 | 1308 | s | 4132.30 | 6623.30 | 91 | 81 | Durbin | |
| 161 | Moc1 | 10 | 41 | 21 | 1 | 16 | 1400 | e | 4132.30 | 6623.30 | 91 | | Durbin | |
| 162 | BongoSB | 55 | 42 | 60 | 1 | 16 | 1517 | s | 4132.70 | 6613.30 | 92 | 88 | Sibunka | |
| 163 | BongoSB | 55 | 42 | 60 | 1 | 16 | 1526 | e | 4132.70 | 6612.90 | 93 | | Sibunka | |
| 164 | Biomaper | 3 | 43 | 22 | 1 | 16 | 1651 | e | 4133.20 | 660.70 | 116 | 2-4 | Wiebe | |
| 165 | BongoSB | 56 | 43 | 22 | 1 | 16 | 1707 | s | 4133.20 | 6601.70 | 116 | 111 | Sibunka | |
| 166 | BongoSB | 56 | 43 | 22 | 1 | 16 | 1717 | e | 4133.50 | 6601.40 | 116 | 111 | Sibunka | |
| 167 | Mk5CTD | 21 | 43 | 22 | 1 | 16 | 1729 | e | 4133.60 | 6601.30 | 116 | 96 | Mountain | |
| 168 | Moc1 | 11 | 43 | 22 | 1 | 16 | 1822 | s | 4134.20 | 6602.90 | 111 | 105 | Durbin | |
| 169 | Moc1 | 11 | 43 | 22 | 1 | 16 | 1930 | e | 4133.10 | 6558.60 | 146 | 119 | Durbin | |
| 170 | watercast | 3 | 44 | 61 | 1 | 16 | 2103 | e | 4140.50 | 6606.50 | 99 | 93 | Mountain | |
| 171 | BongoSB | 57 | 44 | 61 | 1 | 16 | 2117 | s | 4140.50 | 6606.50 | 99 | 95 | Sibunka | |
| 172 | BongoSB | 57 | 44 | 61 | 1 | 16 | 2125 | e | 4140.60 | 6605.70 | 99 | 95 | Sibunka | |
| 173 | BongoSB | 58 | 45 | 23 | 1 | 16 | 2255 | s | 4147.90 | 6611.20 | 87 | 79 | Sibunka | |
| 174 | BongoSB | 58 | 45 | 23 | 1 | 16 | 2302 | e | 4147.40 | 6610.50 | 87 | 79 | Sibunka | |
| 175 | Mk5CTD | 22 | 45 | 23 | 1 | 16 | 2315 | e | 4147.00 | 6610.30 | 89 | 79 | Mountain | |
| 176 | Pump | 7 | 45 | 23 | 1 | 16 | 2341 | e | 4146.00 | 6610.00 | 89 | 37 | Durbin | |
| 177 | MOC-1 | 12 | 45 | 23 | 1 | 16 | not recorded | | | | | | | aborted by bridge-plunging |
| 178 | BongoSB | 59 | 46 | 62 | 1 | 17 | 237 | s | 4155.40 | 6604.30 | 95 | 92 | Sibunka | |
| 179 | BongoSB | 59 | 46 | 62 | 1 | 17 | 249 | e | 4135.10 | 6604.00 | 95 | | Sibunka | |
| 180 | BongoSB | 60 | 47 | 24 | 1 | 17 | 422 | s | 4203.10 | 6556.90 | 189 | 186 | Sibunka | |
| 181 | BongoSB | 60 | 47 | 24 | 1 | 17 | 452 | e | 4203.90 | 6556.90 | 195 | | Sibunka | |
| 182 | BongoSB | 61 | 47 | 24 | 1 | 17 | 502 | s | 4204.00 | 6555.60 | 210 | 204 | Sibunka | |
| 183 | BongoSB | 61 | 47 | 24 | 1 | 17 | 530 | e | 4204.60 | 6554.30 | 230 | | Sibunka | |

| | | | | | L | O | C A L | | | | Water | Cast | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Event # | Instr | cast# | Sta# | Sta_std | Mth | Day | hhmm | s/e | Lat | Lon | Depth | Depth | PI | Comments |
| 184 | Mk5CTD | 23 | 47 | 24 | 1 | 17 | 600 | s | 4203.00 | 6556.80 | 185 | 180 | Mountain | |
| 185 | MOC-1 | 13 | 47 | 24 | 1 | 17 | 620 | s | 4202.90 | 6556.50 | 188 | 171 | Durbin | |
| 186 | MOC-1 | 13 | 47 | 24 | 1 | 17 | 755 | e | 4159.50 | 6552.90 | 177 | | Durbin | |
| 187 | BongoSB | 62 | 48 | 63 | 1 | 17 | 1022 | s | 4210.20 | 6553.20 | 241 | 201 | Sibunka | |
| 188 | BongoSB | 62 | 48 | 63 | 1 | 17 | 1040 | e | 4209.50 | 6552.70 | 241 | 201 | Sibunka | |
| 189 | BongoSB | 63 | 49 | 25 | 1 | 17 | 1218 | s | 4217.80 | 6550.90 | 217 | 200 | Sibunka | |
| 190 | BongoSB | 63 | 49 | 25 | 1 | 17 | 1237 | e | 4217.20 | 6550.30 | 220 | | Sibunka | |
| 191 | Mk5CTD | 24 | 49 | 25 | 1 | 17 | 1245 | s | 4216.90 | 6550.20 | 220 | 213 | Mountain | |
| 192 | Moc1 | 14 | 49 | 25 | 1 | 17 | 1350 | s | 4216.10 | 6548.90 | 222 | | Durbin | |
| 193 | Moc1 | 14 | 49 | 25 | 1 | 17 | 1409 | e | 4214.00 | 6551.00 | 237.1 | 211 | Durbin | |
| 194 | Pump | 8 | 49 | 25 | 1 | 17 | 1558 | s | 4213.10 | 6551.50 | 245 | 50 | Durbin | |
| 195 | BongoSB | 64 | 50 | 64 | 1 | 17 | 1720 | s | 4212.70 | 6555.40 | 234 | 203 | Sibunka | |
| 196 | BongoSB | 64 | 50 | 64 | 1 | 17 | 1738 | e | 4212.40 | 6555.50 | 234 | 203 | Sibunka | |
| 197 | BongoSB | 65 | 51 | 39 | 1 | 17 | 1832 | s | 421.01 | 6555.90 | 227 | 202 | Sibunka | |
| 198 | BongoSB | 65 | 51 | 39 | 1 | 17 | 1843 | e | 4209.90 | 6559.10 | 227 | 202 | Sibunka | |
| 199 | Pump | 9 | 51 | 39 | 1 | 17 | 1901 | e | 4209.90 | 6559.10 | 227 | 66 | Durbin | |
| 200 | Mk5CTD | 25 | 51 | 39 | 1 | 17 | 1955 | e | 4210.50 | 6557.90 | 227 | 200 | Mountain | |
| 201 | Moc-1 | 15 | 51 | 39 | 1 | 17 | 2037 | s | 4210.70 | 6557.20 | 227 | 216 | Durbin | |
| 202 | Moc-1 | 15 | 51 | 39 | 1 | 17 | 2307 | e | 4206.70 | 6603.50 | 187 | 207 | Durbin | |
| 203 | BongoSB | 66 | 52 | 65 | 1 | 18 | 33 | s | 4205.90 | 6613.10 | 100 | 95 | Sibunka | |
| 204 | BongoSB | 66 | 52 | 65 | 1 | 18 | 42 | e | 4205.90 | 6613.20 | 101 | | Sibunka | |
| 205 | BongoSB | 67 | 53 | 26 | 1 | 18 | 201 | s | 4204.00 | 6625.60 | 87 | 83 | Sibunka | |
| 206 | BongoSB | 67 | 53 | 26 | 1 | 18 | 210 | e | 4203.70 | 6626.20 | 87 | | Sibunka | |
| 207 | Mk5CTD | 26 | 53 | 26 | 1 | 18 | 224 | s | 4203.400 | 6626.50 | 87 | | Mountain | |
| 208 | MOC-1 | 16 | 53 | 26 | 1 | 18 | 249 | s | 4203.300 | 6626.70 | 93 | 83 | Durbin | |
| 209 | MOC-1 | 16 | 53 | 26 | 1 | 18 | 325 | e | 4202.300 | 6629.60 | 93 | 83 | Durbin | |
| 210 | BongoSB | 68 | 54 | 66 | 1 | 18 | 420 | s | 4200.200 | 6634.10 | 80 | 77 | Sibunka | |
| 211 | BongoSB | 68 | 54 | 66 | 1 | 18 | 432 | e | 4159.900 | 6634.40 | 82 | | Sibunka | |
| 212 | Drifter | 2 | 54 | 66 | 1 | 18 | 436 | s | 4159.820 | 6634.46 | 82 | | Limburner | |
| 213 | BongoSB | 69 | 55 | 27 | 1 | 18 | 537 | s | 4156.400 | 6641.90 | 70 | 65 | Sibunka | |
| 214 | BongoSB | 69 | 55 | 27 | 1 | 18 | 537 | e | 4156.400 | 6641.30 | 70 | | Sibunka | |
| 215 | Pump | 10 | 55 | 27 | 1 | 18 | 551 | s | 4156.400 | 6641.30 | 71 | 31 | Durbin | |
| 216 | Mk5CTD | 27 | 55 | 27 | 1 | 18 | 630 | s | 4157.400 | 6641.20 | 67 | 60 | Mountain | |
| 217 | MOC-1 | 17 | 55 | 27 | 1 | 18 | 640 | s | 4157.700 | 6641.10 | 72 | 62 | Durbin | |
| 218 | MOC-1 | 17 | 55 | 27 | 1 | 18 | 720 | e | 4157.400 | 6642.60 | 73 | 62 | Durbin | |
| 219 | MOC-10 | 2 | 55 | 27 | 1 | 18 | 841 | S | 4156.000 | 6642.00 | 75 | 65 | Madin | |
| 220 | MOC-10 | 2 | 55 | 27 | 1 | 18 | 937 | e | 4154.500 | 6641.50 | 75 | 65 | Madin | |
| 221 | BongoSB | 70 | 56 | 67 | 1 | 18 | 1203 | s | 4200.900 | 6647.80 | 67 | 62 | Sibunka | |
| 222 | BongoSB | 70 | 56 | 67 | 1 | 18 | 1209 | e | 4200.500 | 6647.90 | 67 | | Sibunka | |
| 223 | BongoSB | 71 | 57 | 28 | 1 | 18 | 1312 | s | 4205.800 | 6653.90 | 67 | 62 | Sibunka | |
| 224 | BongoSB | 71 | 57 | 28 | 1 | 18 | 1320 | e | 4205.400 | 6653.70 | 67 | | Sibunka | |
| 225 | Mk5CTD | 28 | 57 | 28 | 1 | 18 | 1330 | s | 4205.100 | 6653.70 | 67 | nr | Mountain | Aborted - wire broke in winch; SB data use |
| 226 | MOC-1 | 18 | 57 | 28 | 1 | 18 | 1350 | s | 4204.800 | 6653.60 | 69 | 56 | Durbin | |
| 227 | MOC-1 | 18 | 57 | 28 | 1 | 18 | 1504 | e | 4204.200 | 6652.70 | 67 | 56 | Durbin | |
| 228 | We left the Georges Bank at 1600 on 19 January to avoid a storm. We went to Portland, ME. The storm was indeed ferocious. | | | | | | | | | | | | | |
| 229 | Depart Portland Maine, 1230 hr 20 Janua | | | | | | First stop to be a MOC-1 in Wilkinson Basin | | | | | | | |

| | | | | | L | O | C A L | | | | Water | Cast | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Event # | Instr | cast# | Sta# | Sta_std | Mth | Day | hhmm | s/e | Lat | Lon | Depth | Depth | PI | Comments |
| 230 | MOC-1 | 19 | 58 | WB | 1 | 20 | 2139 | s | 4224.100 | 6845.500 | 208 | 198 | Durbin | Wilkinson Basin sample |
| 231 | MOC-1 | 19 | 58 | WB | 1 | 20 | 2229 | e | 4226.900 | 6854.400 | 214 | | Durbin | Nets 1 to 4 only to save time. |
| 232 | BongoSB | 72 | 59 | 33 | 1 | 21 | 243 | s | 4150.000 | 6800.200 | 59 | 54 | Sibunka | |
| 233 | BongoSB | 72 | 59 | 33 | 1 | 21 | 250 | e | 4149.900 | 6759.900 | 59 | | Sibunka | |
| 234 | Pump | 11 | 59 | 33 | 1 | 21 | 300 | s | 4149.800 | 6759.800 | 59 | 50 | Durbin | |
| 235 | MK5CTD | 29 | 59 | 33 | 1 | 21 | 330 | s | 4149.200 | 6800.100 | 53 | 48 | Mountain | |
| 236 | MOC-1 | 20 | 59 | 33 | 1 | 21 | 340 | s | 4149.000 | 6800.200 | 55 | 52 | Durbin | |
| 237 | MOC-1 | 20 | 59 | 33 | 1 | 21 | 420 | e | 4149.400 | 6759.600 | 57.5 | 52 | Durbin | |
| 238 | Drifter | 3 | 59 | 33 | 1 | 21 | 517 | s | 4149.220 | 6759.740 | 52 | | Limeburner | |
| 239 | BongoSB | 73 | 60 | 34 | 1 | 21 | 550 | s | 4151.000 | 6818.000 | 214 | 200 | Sibunka | |
| 240 | BongoSB | 73 | 60 | 34 | 1 | 21 | 610 | e | 4151.400 | 6818.800 | 223 | | Sibunka | |
| 241 | Pump | 12 | 60 | 34 | 1 | 21 | 618 | s | 4151.400 | 6819.000 | 222 | 72 | Durbin | |
| 242 | Mk5CTD | 30 | 60 | 34 | 1 | 21 | 655 | s | 4151.300 | 6819.500 | 217 | 210 | Mountain | |
| 243 | MOC-1 | 21 | 60 | 34 | 1 | 21 | 720 | s | 4151.300 | 6820.000 | 217 | 212 | Durbin | |
| 244 | MOC-1 | 21 | 60 | 34 | 1 | 21 | 928 | e | 4155.000 | 6814.000 | 225 | 212 | Durbin | |
| 245 | BongoSB | 74 | 61 | 36 | 1 | 21 | 1227 | s | 4124.100 | 6818.000 | 53 | 49 | Sibunka | |
| 246 | BongoSB | 74 | 61 | 36 | 1 | 21 | 1234 | e | 4124.000 | 6817.600 | 54 | | Sibunka | |
| 247 | Mk5CTD | 31 | 61 | 36 | 1 | 21 | 1243 | s | 4124.000 | 6817.500 | 49 | 42 | Mountain | |
| 248 | MOC-1 | 22 | 61 | 36 | 1 | 21 | 1249 | s | 4124.000 | 6817.400 | 56 | 51 | Durbin | |
| 249 | MOC-1 | 22 | 61 | 36 | 1 | 21 | 1340 | e | 4123.300 | 6818.900 | 57 | 51 | Durbin | |
| 250 | Drifter | 4 | 61 | 36 | 1 | 21 | 1345 | s | 4150.400 | 6749.900 | 57 | | Limeburner | |
| 251 | BongoSB | 75 | 62 | 38 | 1 | 21 | 1634 | s | 4129.400 | 6857.100 | 156 | 147 | Sibunka | |
| 252 | BongoSB | 75 | 62 | 38 | 1 | 21 | 1650 | e | 4129.800 | 6857.500 | 156 | | Sibunka | |
| 253 | Pump | 13 | 62 | 38 | 1 | 21 | 1705 | s | 4129.800 | 6857.500 | 155 | 61 | Durbin | |
| 254 | Mk5CTD | 32 | 62 | 38 | 1 | 21 | 1805 | s | 4129.500 | 6858.300 | 155 | 145 | Mountain | |
| 255 | MOC-1 | 23 | 62 | 38 | 1 | 21 | 1833 | s | 4129.700 | 6857.100 | 156 | 144 | Durbin | |
| 256 | MOC-1 | 23 | 62 | 38 | 1 | 21 | 1945 | e | 4130.900 | 6853.700 | 156 | 144 | Durbin | |
| 255 | Live tow | 1 | 62 | 38 | 1 | 21 | 2005 | s | not recorded | | 158 | | Durbin | |
| 256 | Drifter | 5 | 62 | 38 | 1 | 21 | 2023 | s | 4132.100 | 6855.300 | 158 | | Limeburner | |

EN276
Cast #: 001
Lat: 41 2.7 N
Lon: 69 5.7 W

Standard Sta #: 1
Date(y\m\d): 96\1\12
Hour (GMT): 1.7
Bottom depth: 83

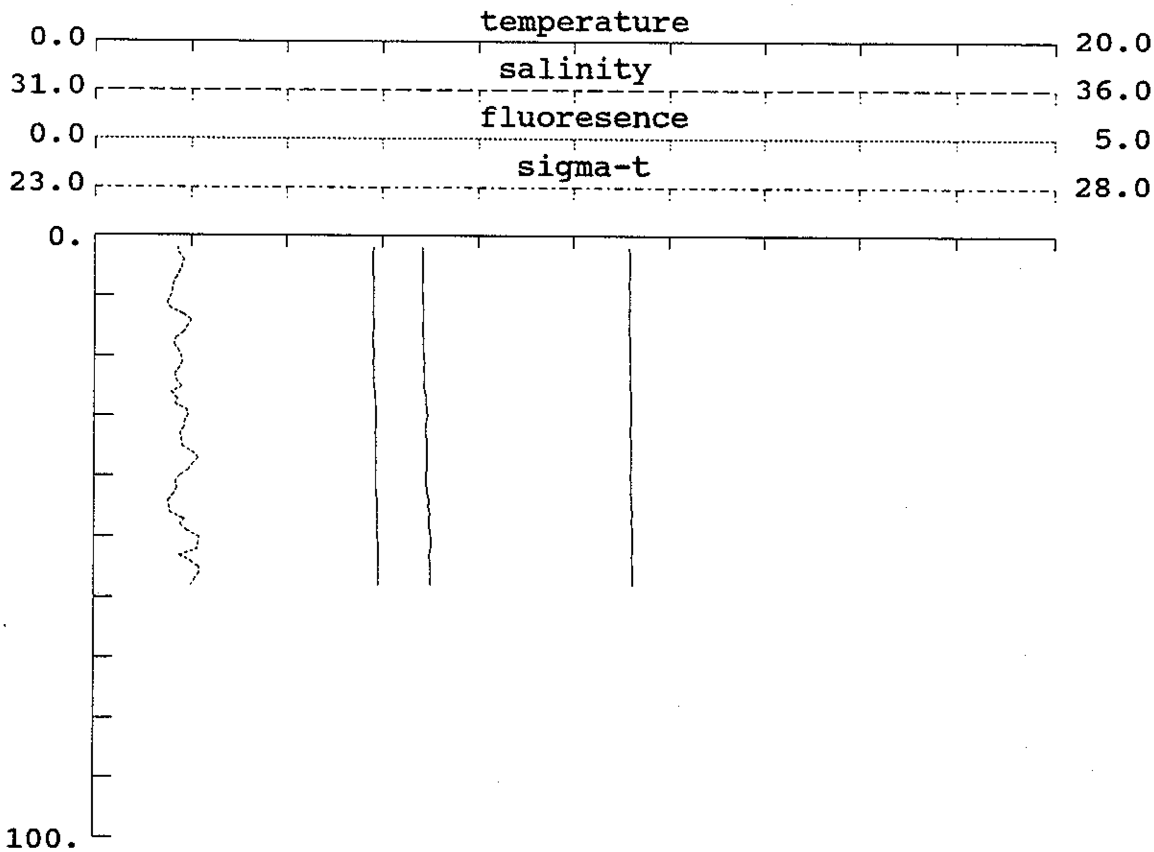



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 2.00 | 6.30 | 32.82 | 0.22 | 25.81 |
| 5.00 | 6.30 | 32.82 | 0.21 | 25.82 |
| 10.00 | 6.30 | 32.82 | 0.21 | 25.82 |
| 15.00 | 6.31 | 32.82 | 0.24 | 25.82 |
| 20.00 | 6.31 | 32.82 | 0.24 | 25.82 |
| 25.00 | 6.31 | 32.82 | 0.24 | 25.82 |
| 30.00 | 6.31 | 32.82 | 0.23 | 25.82 |
| 40.00 | 6.30 | 32.82 | 0.23 | 25.82 |
| 50.00 | 6.30 | 32.82 | 0.26 | 25.82 |
| 75.00 | 6.31 | 32.82 | 0.24 | 25.82 |
| 76.00 | 6.31 | 32.82 | 0.24 | 25.82 |

[** Note: this is uncorrected data **]

EN276
Cast #: 002
Lat: 40 39.1 N
Lon: 68 59.5 W

Standard Sta #: 2
Date(y\m\d): 96\1\12
Hour (GMT): 6.7
Bottom depth: 67

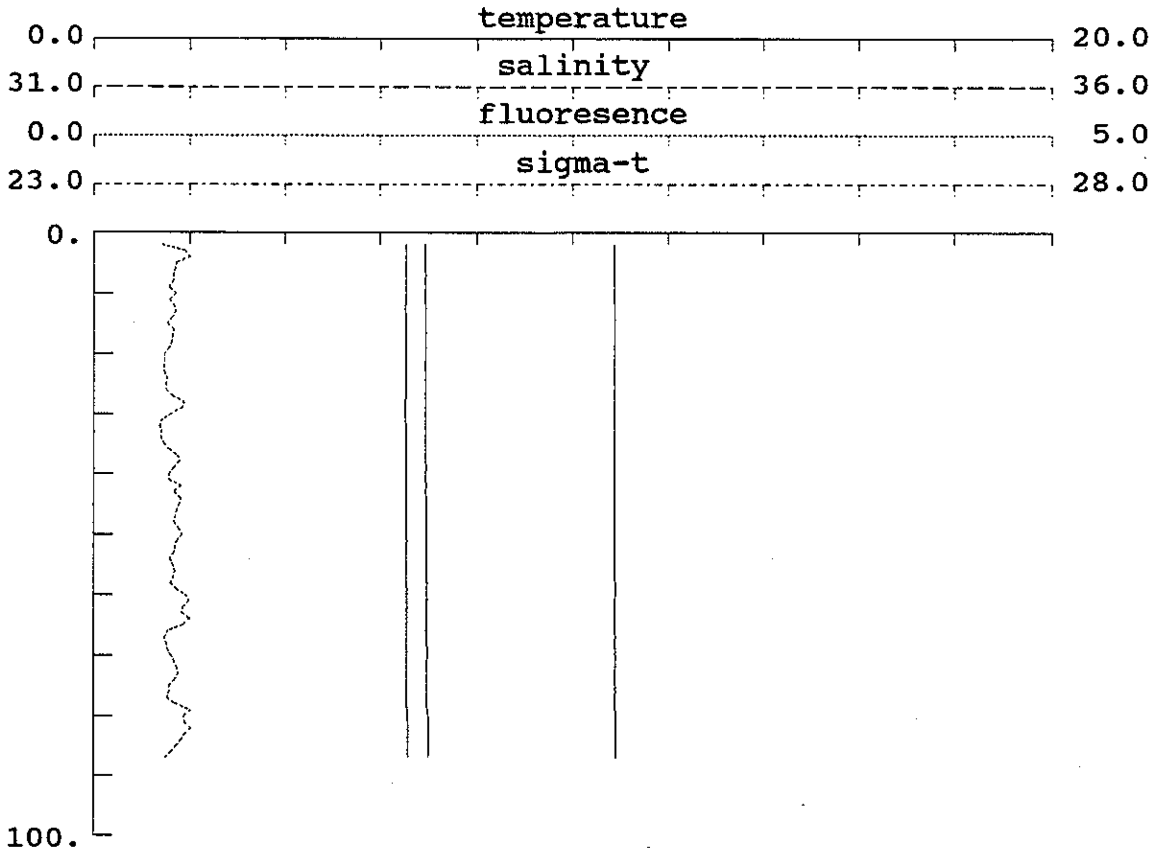



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 1.00 | 5.81 | 32.71 | 0.42 | 25.79 |
| 5.00 | 5.80 | 32.71 | 0.45 | 25.79 |
| 10.00 | 5.81 | 32.71 | 0.39 | 25.79 |
| 15.00 | 5.82 | 32.71 | 0.48 | 25.79 |
| 20.00 | 5.82 | 32.72 | 0.45 | 25.80 |
| 25.00 | 5.84 | 32.72 | 0.45 | 25.80 |
| 30.00 | 5.88 | 32.74 | 0.48 | 25.81 |
| 40.00 | 5.88 | 32.73 | 0.44 | 25.80 |
| 50.00 | 5.92 | 32.76 | 0.54 | 25.81 |
| 58.00 | 5.93 | 32.76 | 0.50 | 25.81 |

[** Note: this is uncorrected data **]

EN276
Cast #: 003
Lat: 40 31.6 N
Lon: 68 26.5 W

Standard Sta #: 3
Date(y\m\d): 96\1\12
Hour (GMT): 11.4
Bottom depth: 92

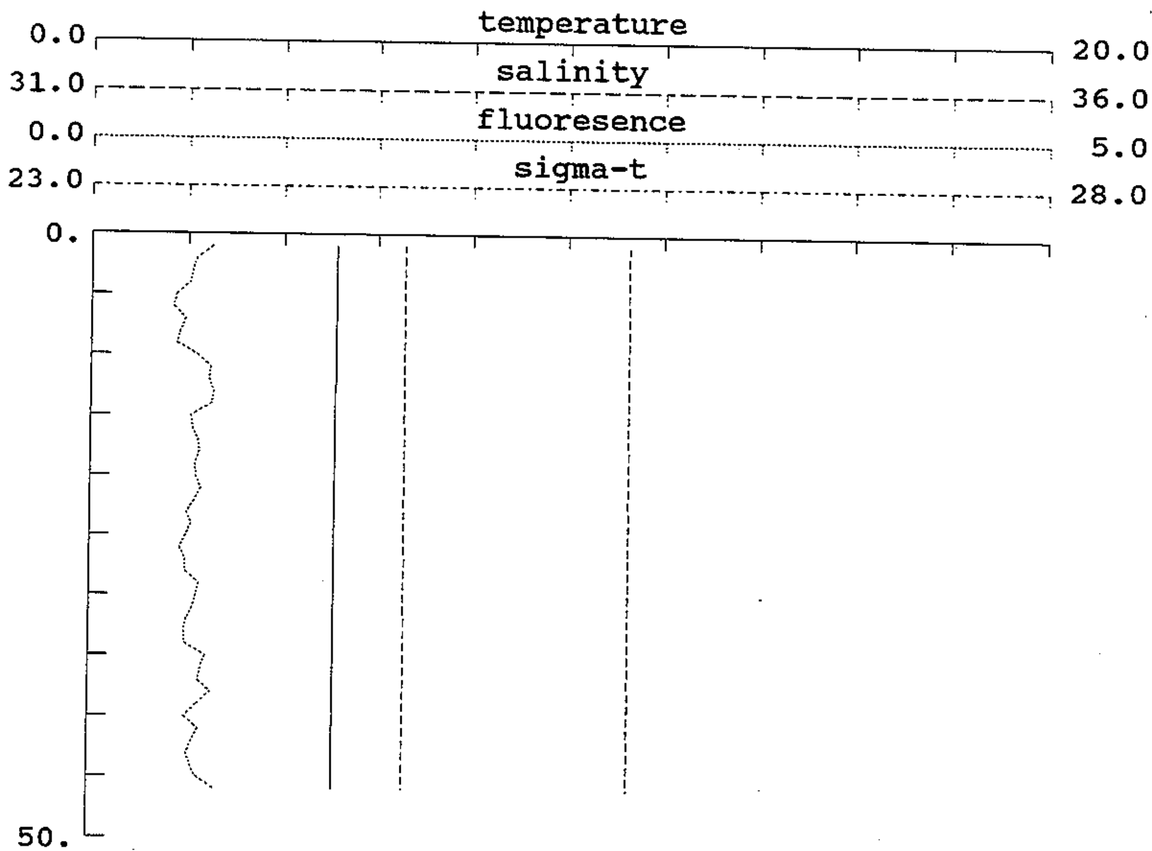



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 1.00 | 6.53 | 32.73 | 0.37 | 25.72 |
| 5.00 | 6.53 | 32.73 | 0.43 | 25.72 |
| 10.00 | 6.53 | 32.73 | 0.43 | 25.72 |
| 15.00 | 6.53 | 32.73 | 0.38 | 25.72 |
| 20.00 | 6.53 | 32.73 | 0.37 | 25.72 |
| 25.00 | 6.53 | 32.73 | 0.37 | 25.72 |
| 30.00 | 6.52 | 32.73 | 0.40 | 25.72 |
| 40.00 | 6.54 | 32.73 | 0.39 | 25.72 |
| 50.00 | 6.54 | 32.74 | 0.46 | 25.72 |
| 75.00 | 6.55 | 32.74 | 0.39 | 25.72 |
| 87.00 | 6.57 | 32.75 | 0.37 | 25.73 |

[** Note: this is uncorrected data **]

EN276
Cast #: 004
Lat: 41 .3 N
Lon: 68 14.7 W

Standard Sta #: 4
Date(y\m\d): 96\1\12
Hour (GMT): 19.5
Bottom depth: 55

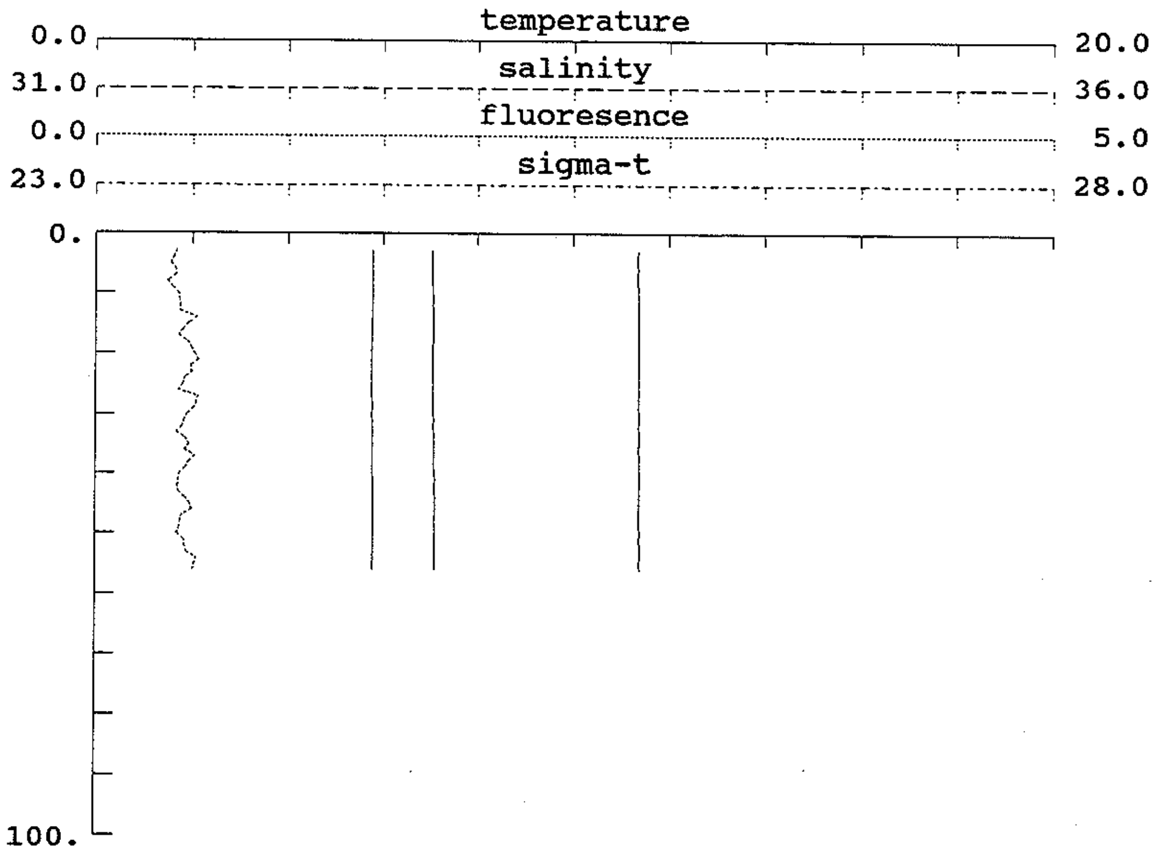



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 1.00 | 5.11 | 32.64 | 0.63 | 25.82 |
| 5.00 | 5.12 | 32.64 | 0.44 | 25.82 |
| 10.00 | 5.12 | 32.64 | 0.55 | 25.82 |
| 15.00 | 5.11 | 32.64 | 0.52 | 25.82 |
| 20.00 | 5.11 | 32.65 | 0.55 | 25.82 |
| 25.00 | 5.11 | 32.65 | 0.50 | 25.82 |
| 30.00 | 5.11 | 32.65 | 0.55 | 25.82 |
| 40.00 | 5.11 | 32.65 | 0.50 | 25.82 |
| 46.00 | 5.10 | 32.65 | 0.66 | 25.83 |

[** Note: this is uncorrected data **]

EN276
Cast #: 005
Lat: 40 50.6 N
Lon: 68 .5 W

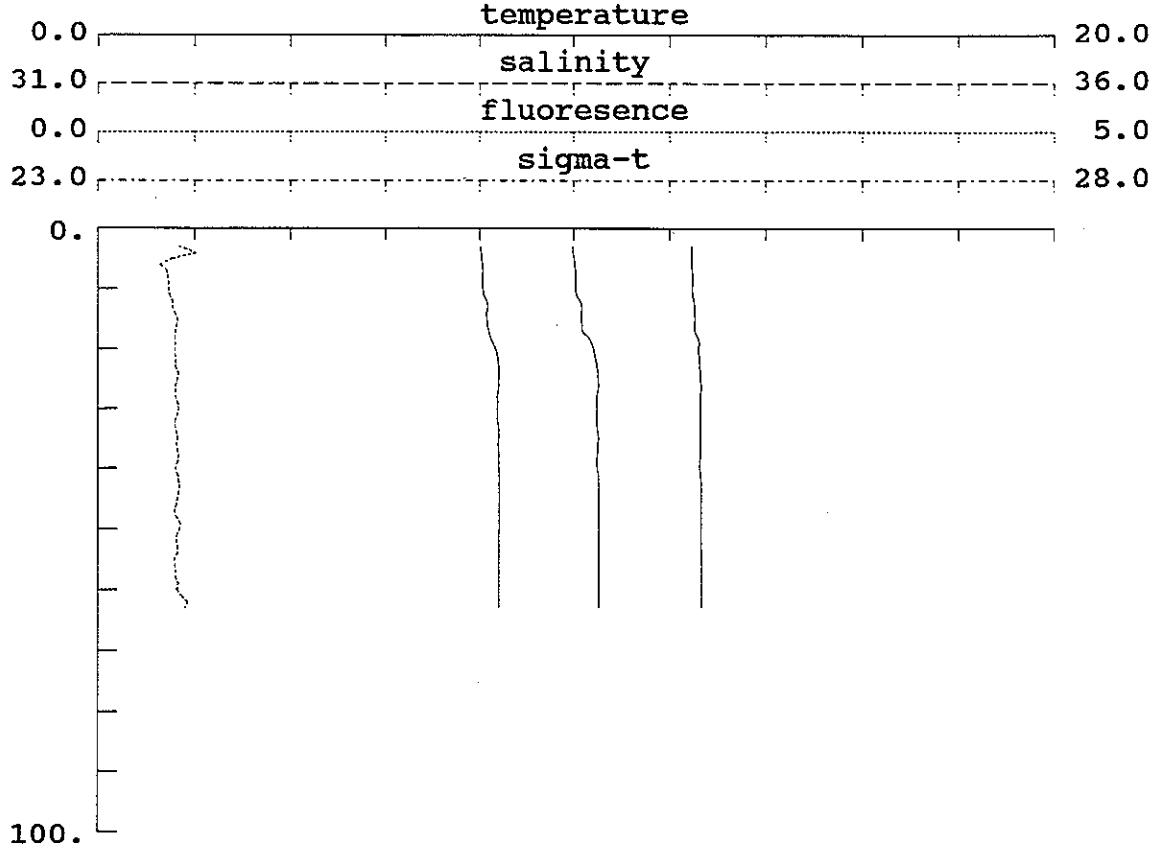
Standard Sta #: 5
Date(y\m\d): 96\1\13
Hour (GMT): 1.3
Bottom depth: 66




| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 3.00 | 5.77 | 32.76 | 0.42 | 25.84 |
| 5.00 | 5.77 | 32.76 | 0.39 | 25.83 |
| 10.00 | 5.77 | 32.76 | 0.43 | 25.84 |
| 15.00 | 5.77 | 32.77 | 0.48 | 25.84 |
| 20.00 | 5.76 | 32.76 | 0.51 | 25.84 |
| 25.00 | 5.76 | 32.77 | 0.45 | 25.84 |
| 30.00 | 5.76 | 32.77 | 0.47 | 25.84 |
| 40.00 | 5.78 | 32.77 | 0.43 | 25.84 |
| 50.00 | 5.79 | 32.78 | 0.42 | 25.85 |
| 56.00 | 5.79 | 32.78 | 0.50 | 25.85 |

[** Note: this is uncorrected data **]

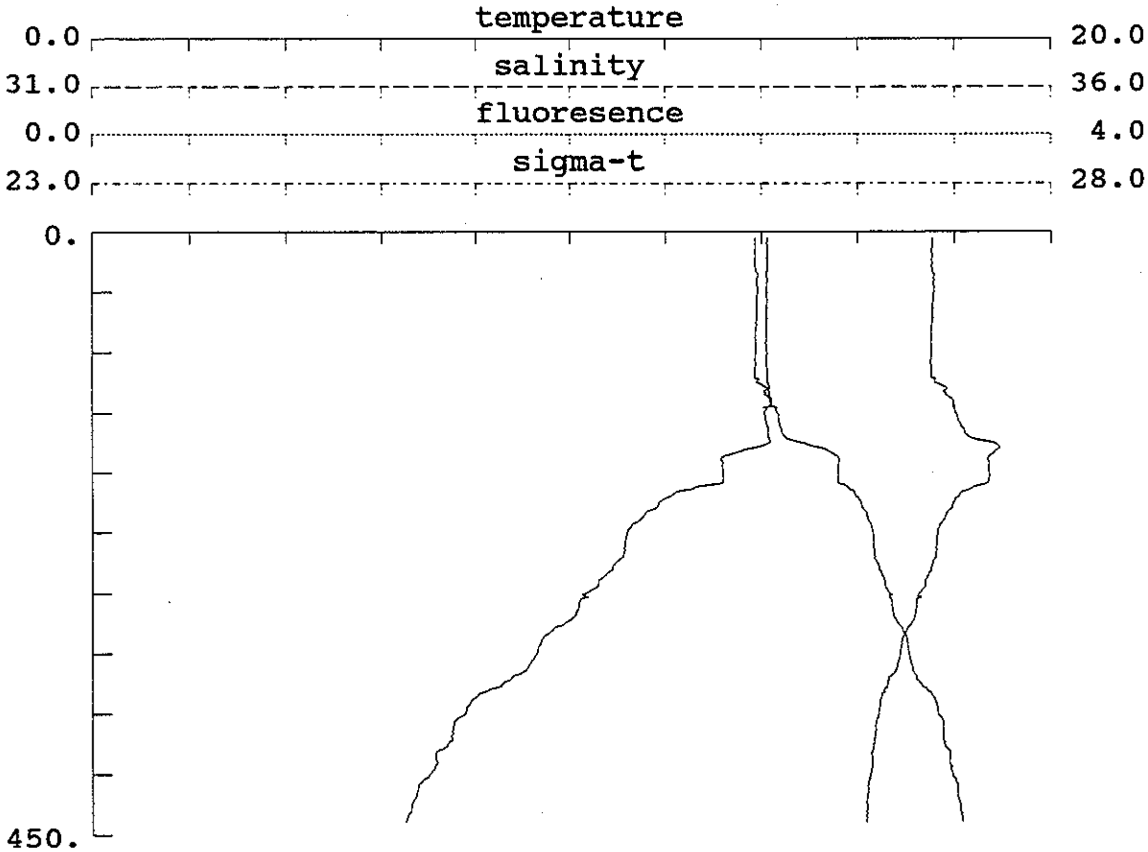
| | |
|---|---|
| EN276 | Standard Sta #: 6 |
| Cast #: 006 | Date(y\m\d): 96\1\13 |
| Lat: 40 39.6 N | Hour (GMT): 7.5 |
| Lon: 67 45.5 W | Bottom depth: 72 |




| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 3.00 | 8.02 | 33.50 | 0.42 | 26.11 |
| 5.00 | 8.04 | 33.50 | 0.39 | 26.11 |
| 10.00 | 8.06 | 33.51 | 0.37 | 26.12 |
| 15.00 | 8.14 | 33.54 | 0.41 | 26.13 |
| 20.00 | 8.33 | 33.61 | 0.40 | 26.15 |
| 25.00 | 8.40 | 33.63 | 0.41 | 26.16 |
| 30.00 | 8.37 | 33.63 | 0.42 | 26.16 |
| 40.00 | 8.40 | 33.63 | 0.40 | 26.16 |
| 50.00 | 8.41 | 33.64 | 0.42 | 26.16 |
| 63.00 | 8.40 | 33.64 | 0.45 | 26.17 |

[** Note: this is uncorrected data **]

| EN276 | | Standard Sta #: | 7 |
|---|---|---|---|
| Cast #: | 117 | Date(y\m\d): | 96\1\13 |
| Lat: | 40 18.6 N | Hour (GMT): | 17.5 |
| Lon: | 67 34.7 W | Bottom depth: | 775 |

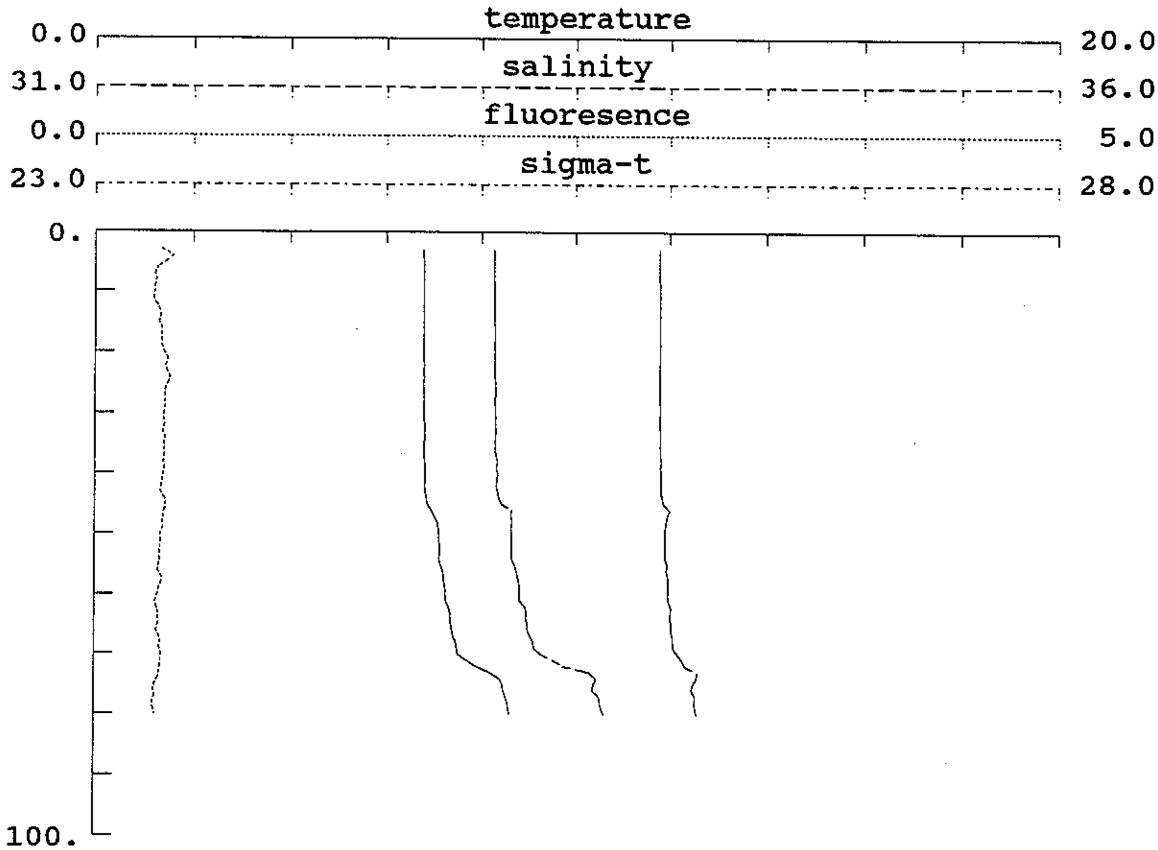



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 1.00 | 13.87 | 35.38 | 0.00 | 26.53 |
| 5.00 | 13.87 | 35.38 | 0.00 | 26.53 |
| 10.00 | 13.87 | 35.38 | 0.00 | 26.53 |
| 15.00 | 13.86 | 35.38 | 0.00 | 26.53 |
| 20.00 | 13.87 | 35.38 | 0.00 | 26.53 |
| 25.00 | 13.86 | 35.38 | 0.00 | 26.53 |
| 30.00 | 13.89 | 35.39 | 0.00 | 26.53 |
| 40.00 | 13.91 | 35.39 | 0.00 | 26.53 |
| 50.00 | 13.89 | 35.39 | 0.00 | 26.53 |
| 75.00 | 13.87 | 35.38 | 0.00 | 26.52 |
| 100.00 | 13.87 | 35.38 | 0.00 | 26.52 |
| 150.00 | 14.11 | 35.55 | 0.00 | 26.61 |
| 200.00 | 11.96 | 35.50 | 0.00 | 27.00 |
| 250.00 | 10.90 | 35.38 | 0.00 | 27.11 |
| 300.00 | 9.56 | 35.24 | 0.00 | 27.23 |
| 441.00 | 6.51 | 35.04 | 0.00 | 27.54 |

[** Note: this is uncorrected data **]

EN276
Cast #: 007
Lat: 40 51.1 N
Lon: 67 3.8 W

Standard Sta #: 8
Date(y\m\d): 96\1\14
Hour (GMT): 1.
Bottom depth: 92

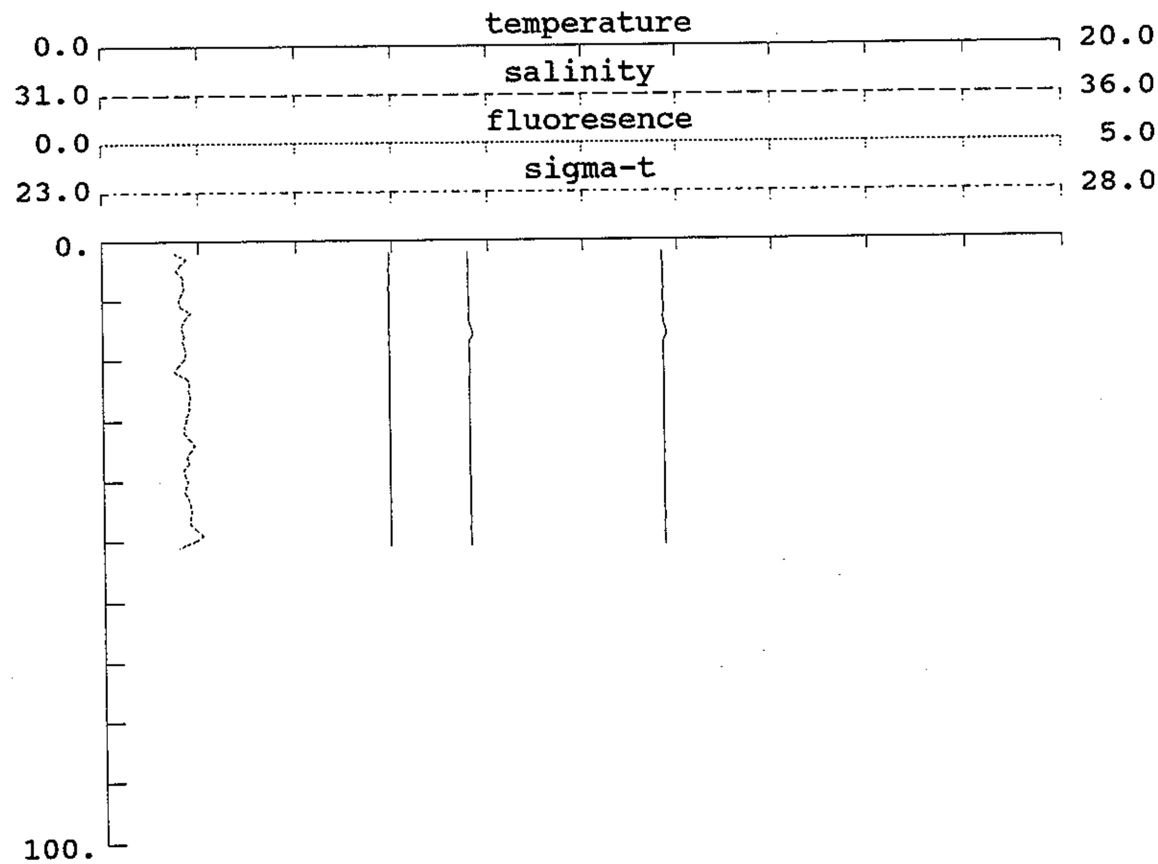



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 3.00 | 6.79 | 33.07 | 0.34 | 25.95 |
| 5.00 | 6.79 | 33.07 | 0.37 | 25.95 |
| 10.00 | 6.80 | 33.07 | 0.31 | 25.95 |
| 15.00 | 6.80 | 33.07 | 0.33 | 25.95 |
| 20.00 | 6.80 | 33.07 | 0.35 | 25.95 |
| 25.00 | 6.81 | 33.07 | 0.37 | 25.95 |
| 30.00 | 6.81 | 33.08 | 0.35 | 25.95 |
| 40.00 | 6.84 | 33.09 | 0.35 | 25.96 |
| 50.00 | 7.13 | 33.17 | 0.34 | 25.98 |
| 75.00 | 8.48 | 33.61 | 0.31 | 26.13 |
| 80.00 | 8.62 | 33.66 | 0.31 | 26.15 |

[** Note: this is uncorrected data **]

EN276
Cast #: 009
Lat: 41 5.2 N
Lon: 67 39.1 W

Standard Sta #: 10
Date(y\m\d): 96\1\14
Hour (GMT): 7.5
Bottom depth: 58

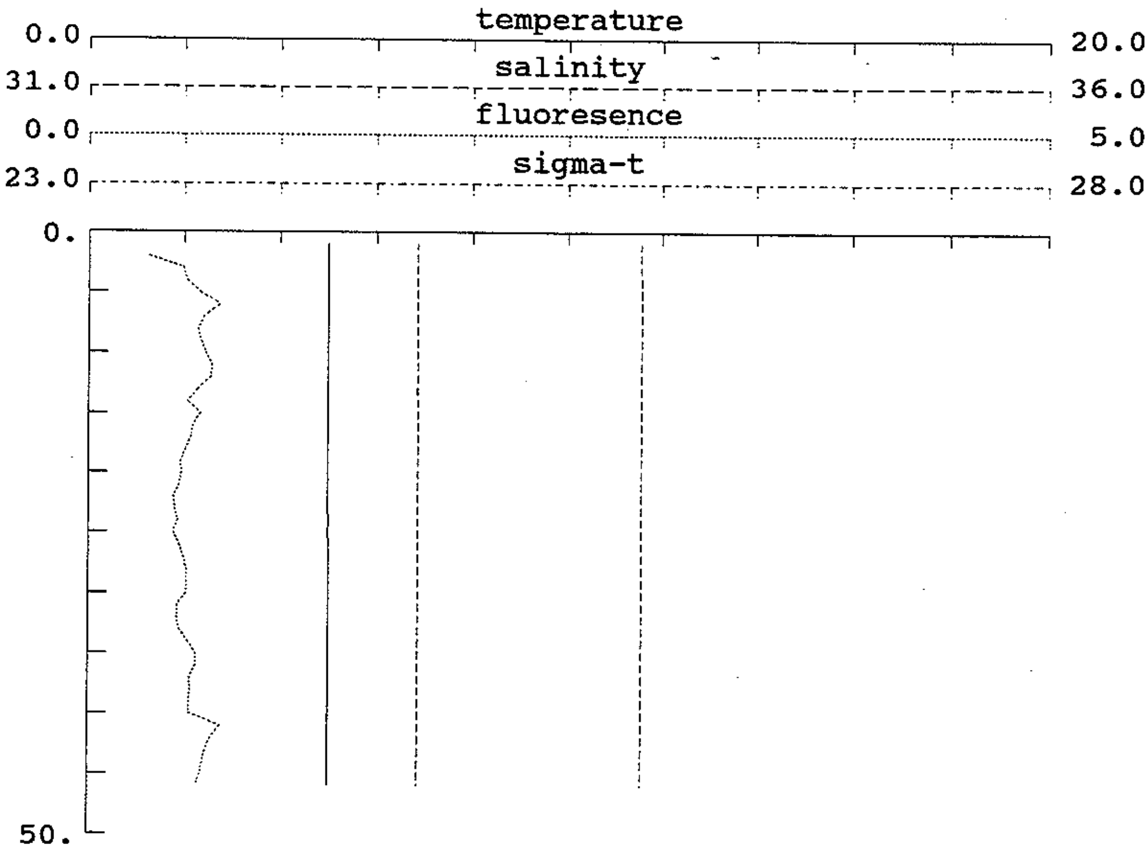



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 1.00 | 5.93 | 32.89 | 0.34 | 25.92 |
| 5.00 | 5.93 | 32.90 | 0.38 | 25.92 |
| 10.00 | 5.93 | 32.90 | 0.40 | 25.92 |
| 15.00 | 5.92 | 32.91 | 0.41 | 25.94 |
| 20.00 | 5.93 | 32.90 | 0.42 | 25.93 |
| 25.00 | 5.93 | 32.90 | 0.44 | 25.93 |
| 30.00 | 5.93 | 32.90 | 0.43 | 25.93 |
| 40.00 | 5.93 | 32.90 | 0.44 | 25.93 |
| 50.00 | 5.93 | 32.90 | 0.47 | 25.93 |
| 51.00 | 5.93 | 32.90 | 0.39 | 25.93 |

[** Note: this is uncorrected data **]

EN276
Cast #: 010
Lat: 41 13.2 N
Lon: 67 57.7 W

Standard Sta #: 11
Date(y\m\d): 96\1\14
Hour (GMT): 12.
Bottom depth: 50

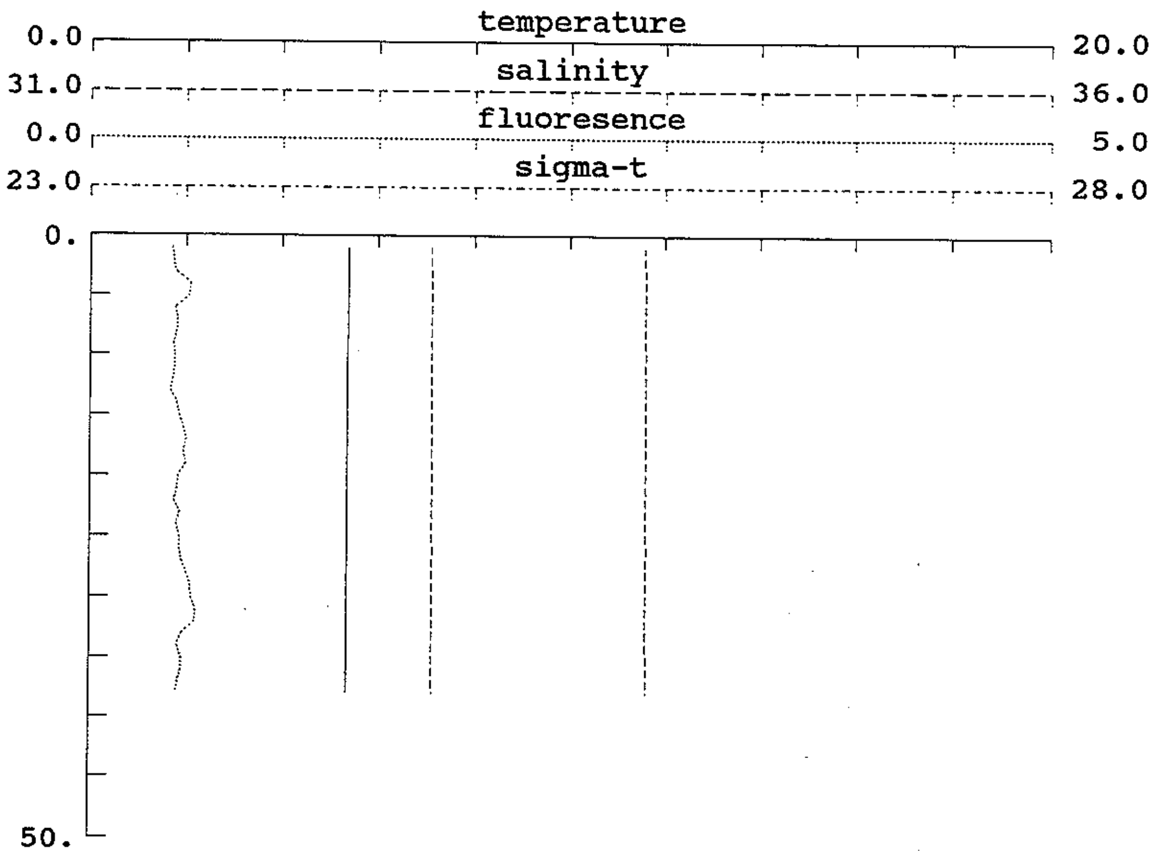



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 1.00 | 4.99 | 32.71 | 0.02 | 25.89 |
| 5.00 | 4.99 | 32.71 | 0.58 | 25.89 |
| 10.00 | 4.99 | 32.71 | 0.61 | 25.89 |
| 15.00 | 4.99 | 32.72 | 0.59 | 25.89 |
| 20.00 | 4.99 | 32.72 | 0.49 | 25.89 |
| 25.00 | 4.99 | 32.72 | 0.45 | 25.89 |
| 30.00 | 4.99 | 32.72 | 0.51 | 25.89 |
| 40.00 | 5.00 | 32.72 | 0.53 | 25.89 |
| 46.00 | 5.00 | 32.72 | 0.57 | 25.89 |

[** Note: this is uncorrected data **]

EN276
Cast #: 011
Lat: 41 24.1 N
Lon: 67 32.8 W

Standard Sta #: 12
Date(y\m\d): 96\1\14
Hour (GMT): 18.1
Bottom depth: 43

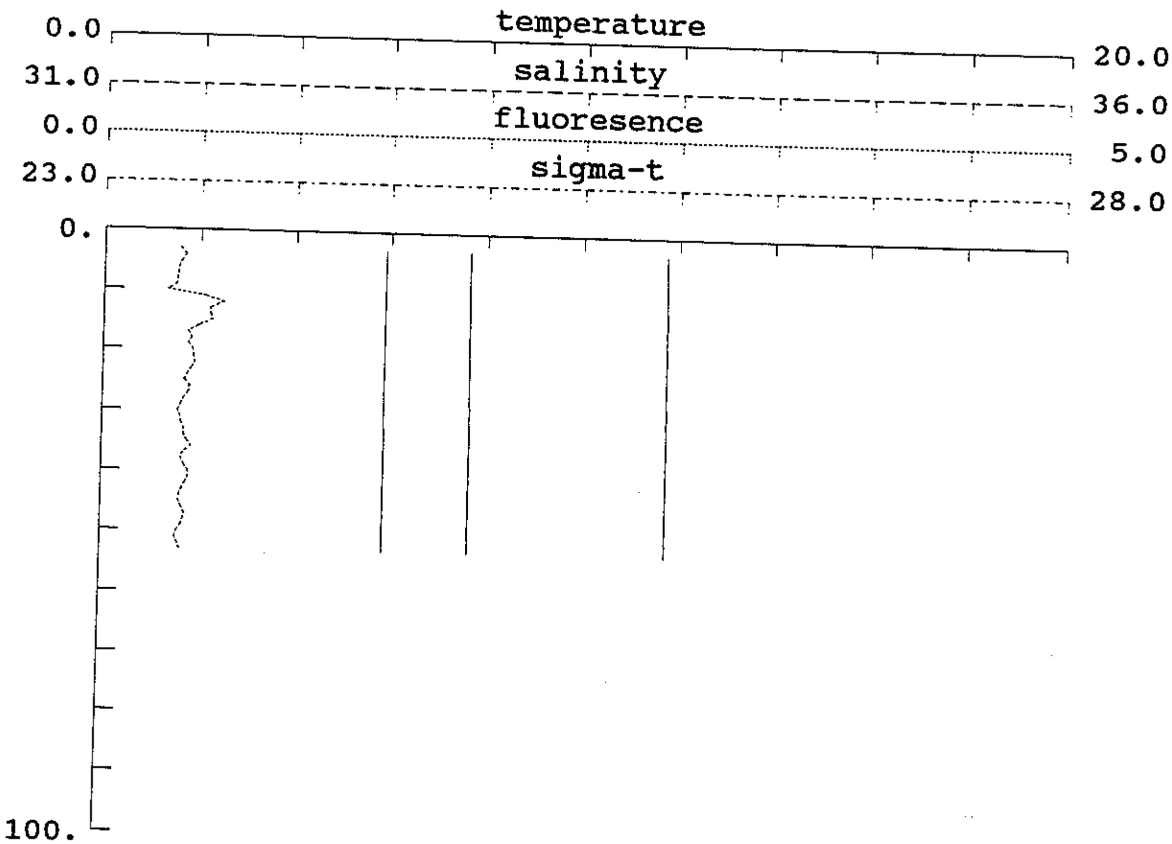



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 1.00 | 5.38 | 32.78 | 0.43 | 25.89 |
| 5.00 | 5.38 | 32.78 | 0.52 | 25.90 |
| 10.00 | 5.37 | 32.78 | 0.44 | 25.90 |
| 15.00 | 5.37 | 32.78 | 0.47 | 25.90 |
| 20.00 | 5.37 | 32.78 | 0.46 | 25.90 |
| 25.00 | 5.37 | 32.78 | 0.47 | 25.90 |
| 30.00 | 5.37 | 32.78 | 0.53 | 25.90 |
| 38.00 | 5.37 | 32.79 | 0.45 | 25.90 |

[** Note: this is uncorrected data **]

EN276
Cast #: 012
Lat: 41 15. N
Lon: 67 9.3 W

Standard Sta #: 13
Date(y\m\d): 96\1\15
Hour (GMT): 2.6
Bottom depth: 64

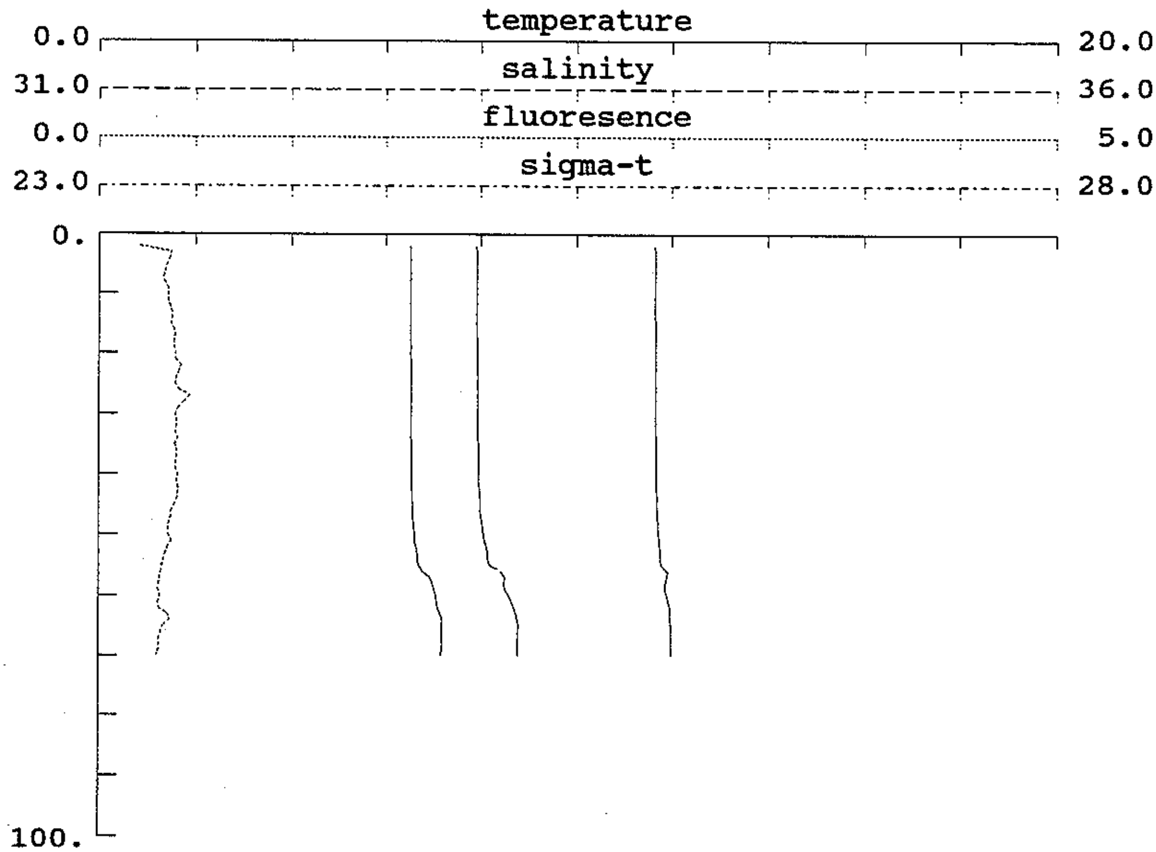



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 3.00 | 5.89 | 32.91 | 0.39 | 25.94 |
| 5.00 | 5.89 | 32.91 | 0.40 | 25.94 |
| 10.00 | 5.89 | 32.91 | 0.33 | 25.94 |
| 15.00 | 5.89 | 32.91 | 0.56 | 25.94 |
| 20.00 | 5.89 | 32.91 | 0.47 | 25.94 |
| 25.00 | 5.89 | 32.92 | 0.43 | 25.94 |
| 30.00 | 5.90 | 32.92 | 0.39 | 25.95 |
| 40.00 | 5.90 | 32.92 | 0.45 | 25.95 |
| 50.00 | 5.90 | 32.92 | 0.40 | 25.95 |
| 53.00 | 5.90 | 32.92 | 0.42 | 25.95 |

[** Note: this is uncorrected data **]

EN276
Cast #: 014
Lat: 41 1.5 N
Lon: 66 42.2 W

Standard Sta #: 15
Date(y\m\d): 96\1\15
Hour (GMT): 8.9
Bottom depth: 76

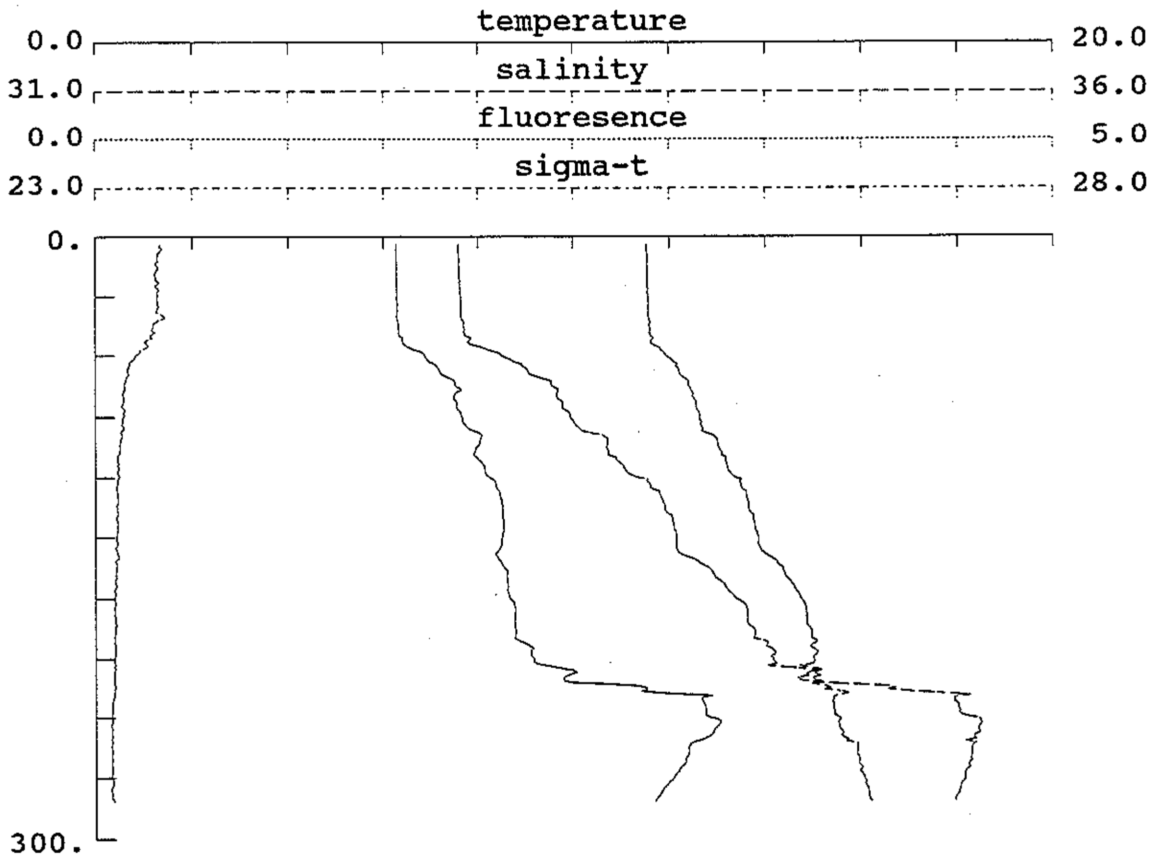



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 1.00 | 6.53 | 32.98 | -0.01 | 25.91 |
| 5.00 | 6.53 | 32.98 | 0.35 | 25.91 |
| 10.00 | 6.52 | 32.98 | 0.36 | 25.91 |
| 15.00 | 6.52 | 32.98 | 0.37 | 25.92 |
| 20.00 | 6.53 | 32.98 | 0.40 | 25.92 |
| 25.00 | 6.53 | 32.98 | 0.39 | 25.92 |
| 30.00 | 6.53 | 32.99 | 0.40 | 25.92 |
| 40.00 | 6.54 | 32.99 | 0.41 | 25.92 |
| 50.00 | 6.61 | 33.02 | 0.36 | 25.93 |
| 70.00 | 7.18 | 33.20 | 0.30 | 26.00 |

[** Note: this is uncorrected data **]

EN276
Cast #: 015
Lat: 40 55.3 N
Lon: 66 27.1 W

Standard Sta #: 16
Date(y\m\d): 96\1\15
Hour (GMT): 11.2
Bottom depth: 800

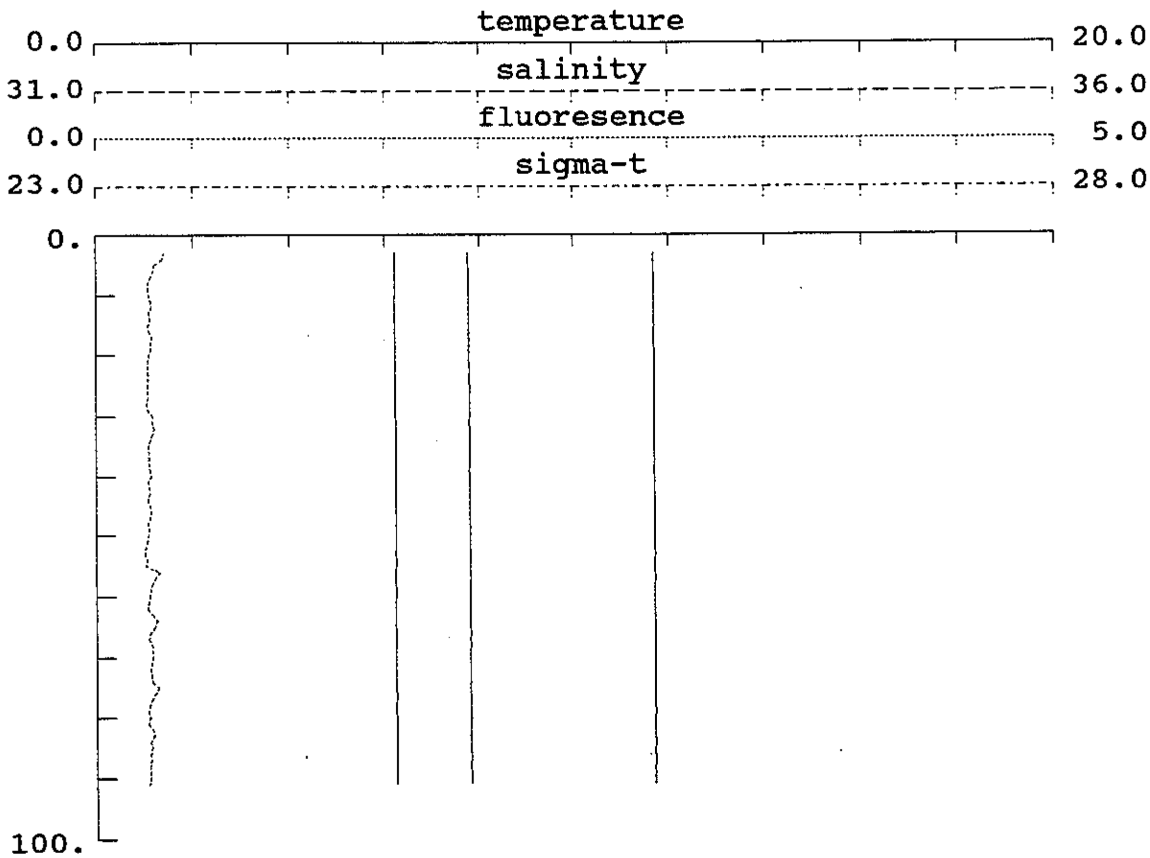



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 2.00 | 6.27 | 32.90 | 0.36 | 25.88 |
| 5.00 | 6.27 | 32.90 | 0.33 | 25.88 |
| 10.00 | 6.27 | 32.90 | 0.32 | 25.89 |
| 15.00 | 6.27 | 32.90 | 0.33 | 25.89 |
| 20.00 | 6.27 | 32.90 | 0.31 | 25.89 |
| 25.00 | 6.28 | 32.90 | 0.31 | 25.89 |
| 30.00 | 6.28 | 32.91 | 0.32 | 25.89 |
| 40.00 | 6.28 | 32.91 | 0.36 | 25.89 |
| 50.00 | 6.34 | 32.94 | 0.28 | 25.90 |
| 75.00 | 7.55 | 33.40 | 0.15 | 26.10 |
| 100.00 | 8.07 | 33.67 | 0.14 | 26.24 |
| 150.00 | 8.50 | 34.04 | 0.11 | 26.46 |
| 200.00 | 8.78 | 34.44 | 0.10 | 26.73 |
| 250.00 | 12.79 | 35.58 | 0.08 | 26.90 |
| 282.00 | 11.68 | 35.48 | 0.09 | 27.04 |

[** Note: this is uncorrected data **]

EN276
Cast #: 016
Lat: 41 12.3 N
Lon: 66 29.3 W

Standard Sta #: 17
Date(y\m\d): 96\1\15
Hour (GMT): 18.6
Bottom depth: 96

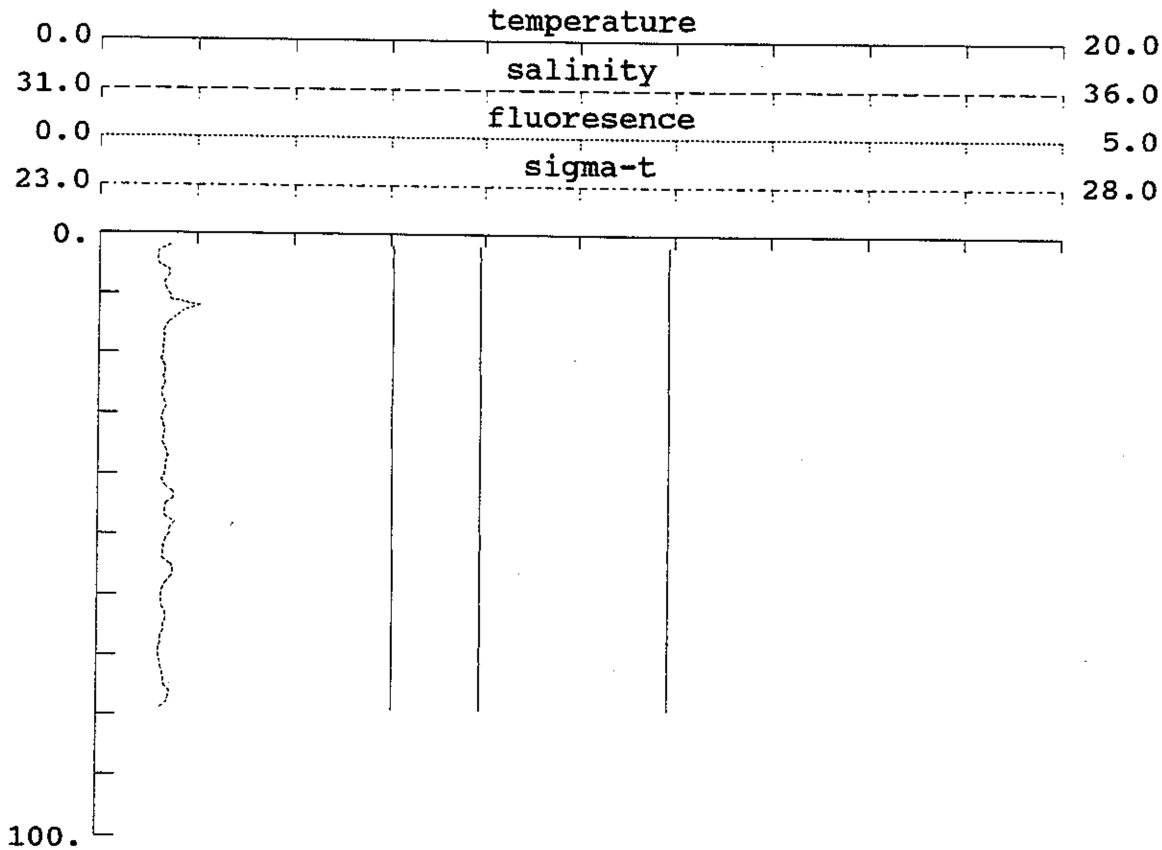



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 3.00 | 6.21 | 32.94 | 0.35 | 25.92 |
| 5.00 | 6.21 | 32.94 | 0.30 | 25.92 |
| 10.00 | 6.21 | 32.94 | 0.27 | 25.92 |
| 15.00 | 6.22 | 32.94 | 0.27 | 25.93 |
| 20.00 | 6.22 | 32.94 | 0.27 | 25.92 |
| 25.00 | 6.22 | 32.95 | 0.26 | 25.93 |
| 30.00 | 6.22 | 32.95 | 0.29 | 25.93 |
| 40.00 | 6.22 | 32.95 | 0.28 | 25.93 |
| 50.00 | 6.22 | 32.95 | 0.27 | 25.93 |
| 75.00 | 6.22 | 32.95 | 0.32 | 25.93 |
| 91.00 | 6.22 | 32.95 | 0.27 | 25.93 |

[** Note: this is uncorrected data **]

EN276
Cast #: 017
Lat: 41 24.6 N
Lon: 66 42.6 W

Standard Sta #: 18
Date(y\m\d): 96\1\15
Hour (GMT): 23.3
Bottom depth: 87

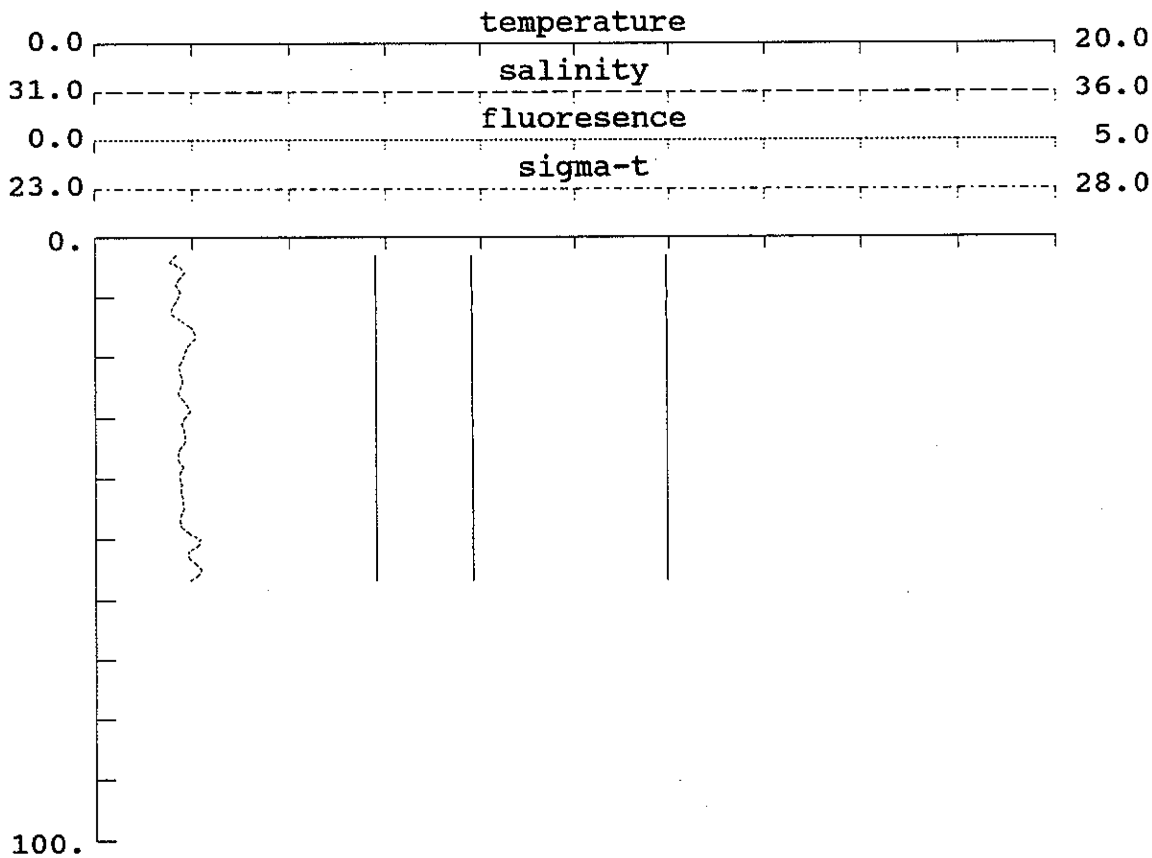



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 1.00 | 6.06 | 32.98 | 0.40 | 25.97 |
| 5.00 | 6.06 | 32.98 | 0.30 | 25.97 |
| 10.00 | 6.07 | 32.98 | 0.36 | 25.97 |
| 15.00 | 6.07 | 32.98 | 0.36 | 25.97 |
| 20.00 | 6.06 | 32.98 | 0.33 | 25.97 |
| 25.00 | 6.06 | 32.98 | 0.34 | 25.97 |
| 30.00 | 6.06 | 32.98 | 0.33 | 25.98 |
| 40.00 | 6.06 | 32.98 | 0.34 | 25.98 |
| 50.00 | 6.07 | 32.99 | 0.37 | 25.98 |
| 75.00 | 6.08 | 32.99 | 0.35 | 25.98 |
| 79.00 | 6.08 | 32.99 | 0.32 | 25.98 |

[** Note: this is uncorrected data **]

EN276
Cast #: 018
Lat: 41 35.7 N
Lon: 66 58.8 W

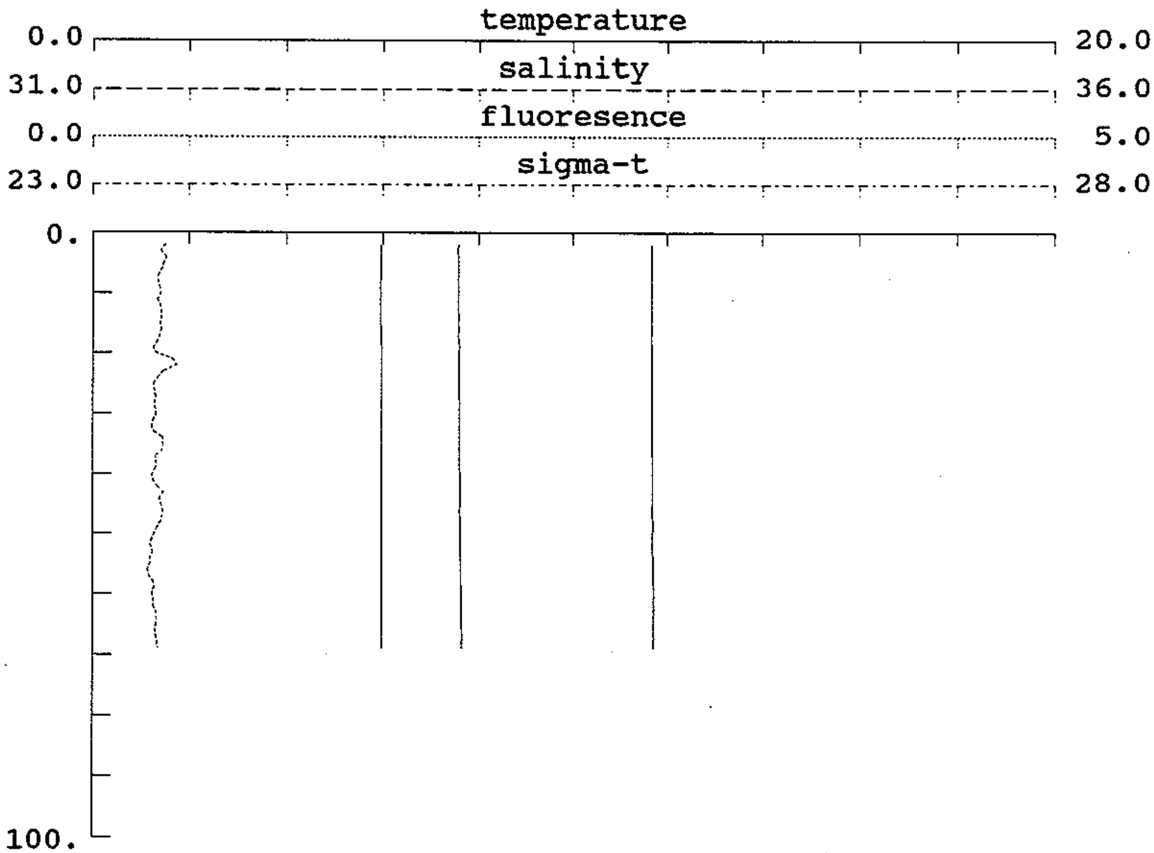
Standard Sta #: 19
Date(y\m\d): 96\1\16
Hour (GMT): 3.7
Bottom depth: 67




| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 3.00 | 5.77 | 32.95 | 0.42 | 25.98 |
| 5.00 | 5.78 | 32.95 | 0.44 | 25.98 |
| 10.00 | 5.78 | 32.95 | 0.43 | 25.99 |
| 15.00 | 5.78 | 32.95 | 0.49 | 25.99 |
| 20.00 | 5.79 | 32.95 | 0.45 | 25.99 |
| 25.00 | 5.79 | 32.95 | 0.44 | 25.99 |
| 30.00 | 5.79 | 32.96 | 0.46 | 25.99 |
| 40.00 | 5.79 | 32.96 | 0.43 | 25.99 |
| 50.00 | 5.79 | 32.96 | 0.53 | 25.99 |
| 57.00 | 5.79 | 32.96 | 0.48 | 25.99 |

[** Note: this is uncorrected data **]

| | | | |
|---|---|---|---|
| EN276 | | Standard Sta #: | 20 |
| Cast #: | 019 | Date(y\m\d): | 96\1\16 |
| Lat: | 41 45.2 N | Hour (GMT): | 12.3 |
| Lon: | 66 31.7 W | Bottom depth: | 73 |

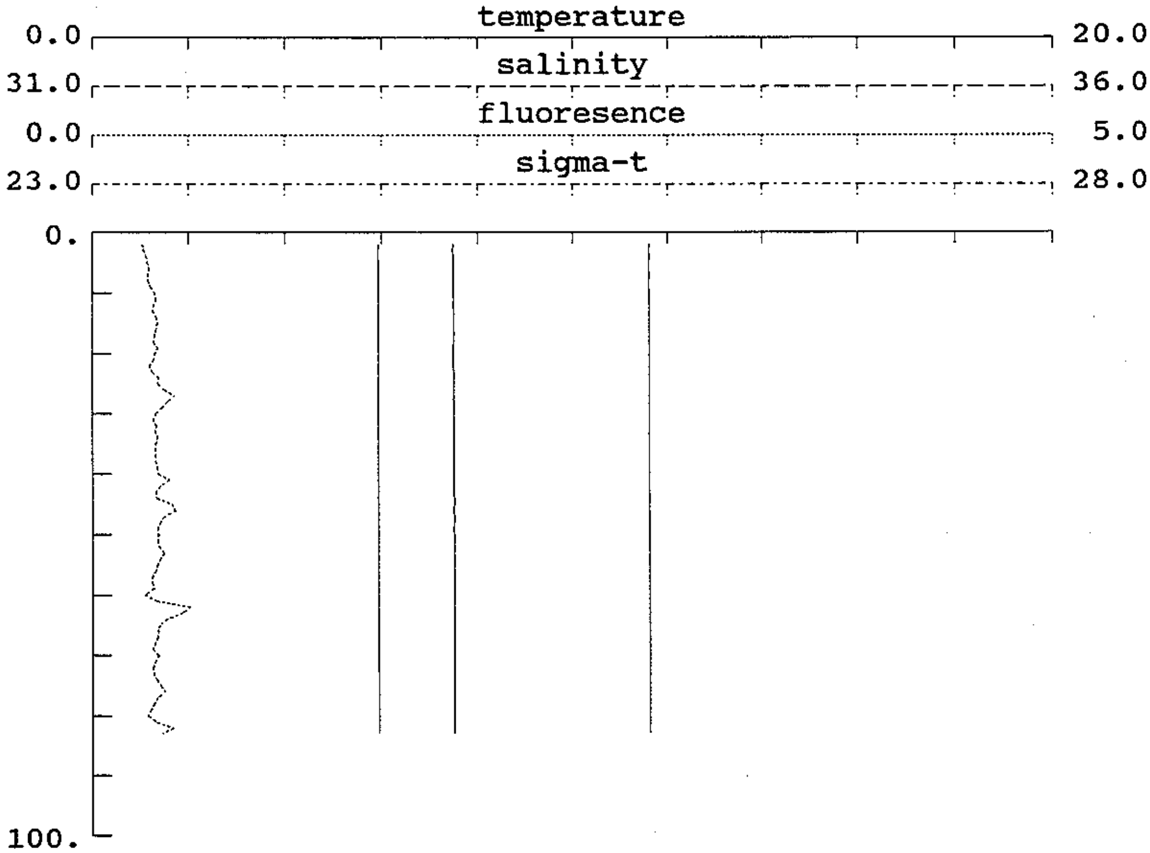



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 2.00 | 5.95 | 32.89 | 0.38 | 25.92 |
| 5.00 | 5.96 | 32.89 | 0.37 | 25.92 |
| 10.00 | 5.95 | 32.89 | 0.35 | 25.92 |
| 15.00 | 5.95 | 32.89 | 0.35 | 25.92 |
| 20.00 | 5.97 | 32.90 | 0.33 | 25.92 |
| 25.00 | 5.97 | 32.90 | 0.32 | 25.92 |
| 30.00 | 5.97 | 32.90 | 0.33 | 25.92 |
| 40.00 | 5.97 | 32.90 | 0.31 | 25.92 |
| 50.00 | 5.97 | 32.90 | 0.32 | 25.92 |
| 69.00 | 5.97 | 32.91 | 0.34 | 25.93 |

[** Note: this is uncorrected data **]

EN276
Cast #: 020
Lat: 41 32.2 N
Lon: 66 23.3 W

Standard Sta #: 21
Date(y\m\d): 96\1\16
Hour (GMT): 17.7
Bottom depth: 90

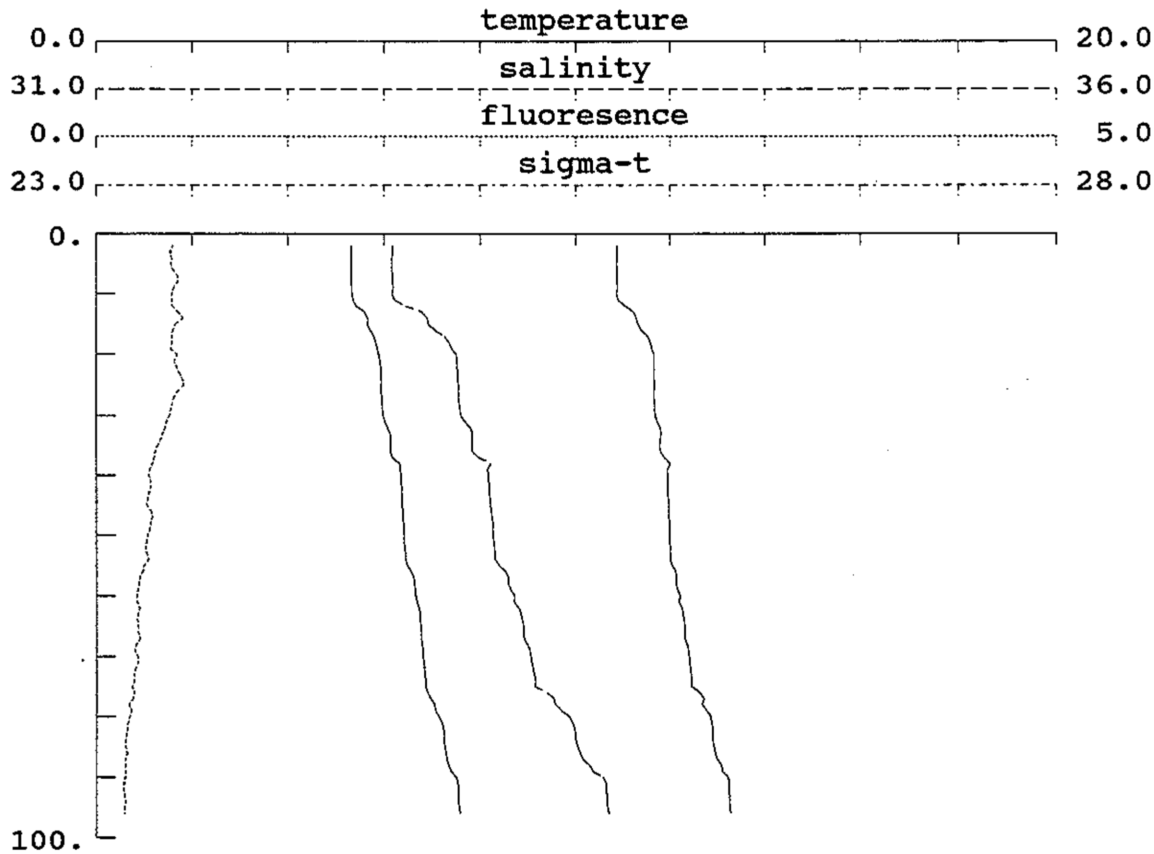



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 2.00 | 5.93 | 32.87 | 0.26 | 25.90 |
| 5.00 | 5.93 | 32.87 | 0.29 | 25.90 |
| 10.00 | 5.93 | 32.87 | 0.32 | 25.90 |
| 15.00 | 5.93 | 32.87 | 0.34 | 25.90 |
| 20.00 | 5.93 | 32.87 | 0.32 | 25.90 |
| 25.00 | 5.94 | 32.87 | 0.34 | 25.90 |
| 30.00 | 5.94 | 32.87 | 0.33 | 25.90 |
| 40.00 | 5.94 | 32.87 | 0.34 | 25.90 |
| 50.00 | 5.94 | 32.88 | 0.34 | 25.91 |
| 75.00 | 5.94 | 32.88 | 0.36 | 25.91 |
| 83.00 | 5.94 | 32.88 | 0.36 | 25.91 |

[** Note: this is uncorrected data **]

EN276
Cast #: 021
Lat: 41 33.6 N
Lon: 66 1.2 W

Standard Sta #: 22
Date(y\m\d): 96\1\15
Hour (GMT): 22.4
Bottom depth: 116

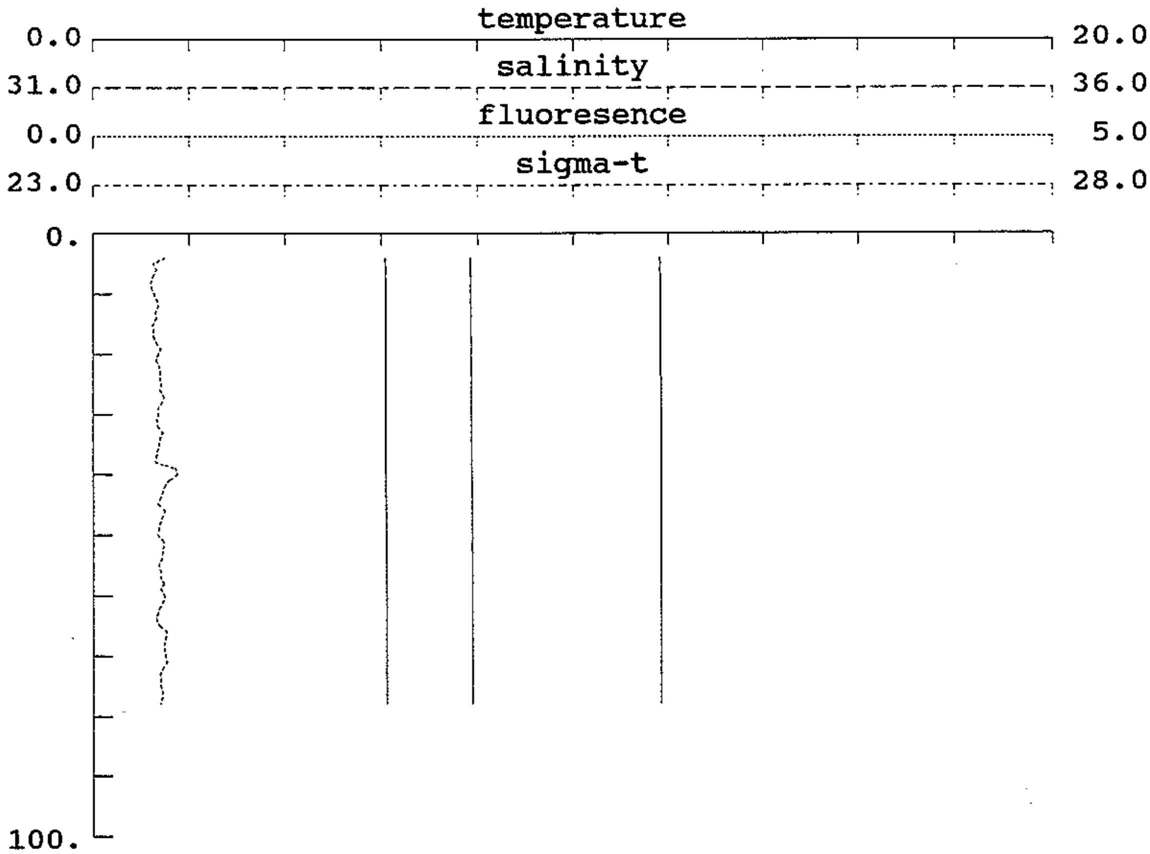



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 2.00 | 5.32 | 32.54 | 0.40 | 25.72 |
| 5.00 | 5.32 | 32.54 | 0.39 | 25.71 |
| 10.00 | 5.34 | 32.54 | 0.39 | 25.71 |
| 15.00 | 5.66 | 32.73 | 0.41 | 25.83 |
| 20.00 | 5.89 | 32.87 | 0.42 | 25.91 |
| 25.00 | 5.94 | 32.89 | 0.46 | 25.91 |
| 30.00 | 5.97 | 32.90 | 0.38 | 25.92 |
| 40.00 | 6.34 | 33.04 | 0.27 | 25.99 |
| 50.00 | 6.41 | 33.07 | 0.27 | 26.00 |
| 75.00 | 6.86 | 33.29 | 0.19 | 26.11 |
| 96.00 | 7.57 | 33.67 | 0.15 | 26.32 |

[** Note: this is uncorrected data **]

EN276
Cast #: 022
Lat: 41 47. N
Lon: 66 10.2 W

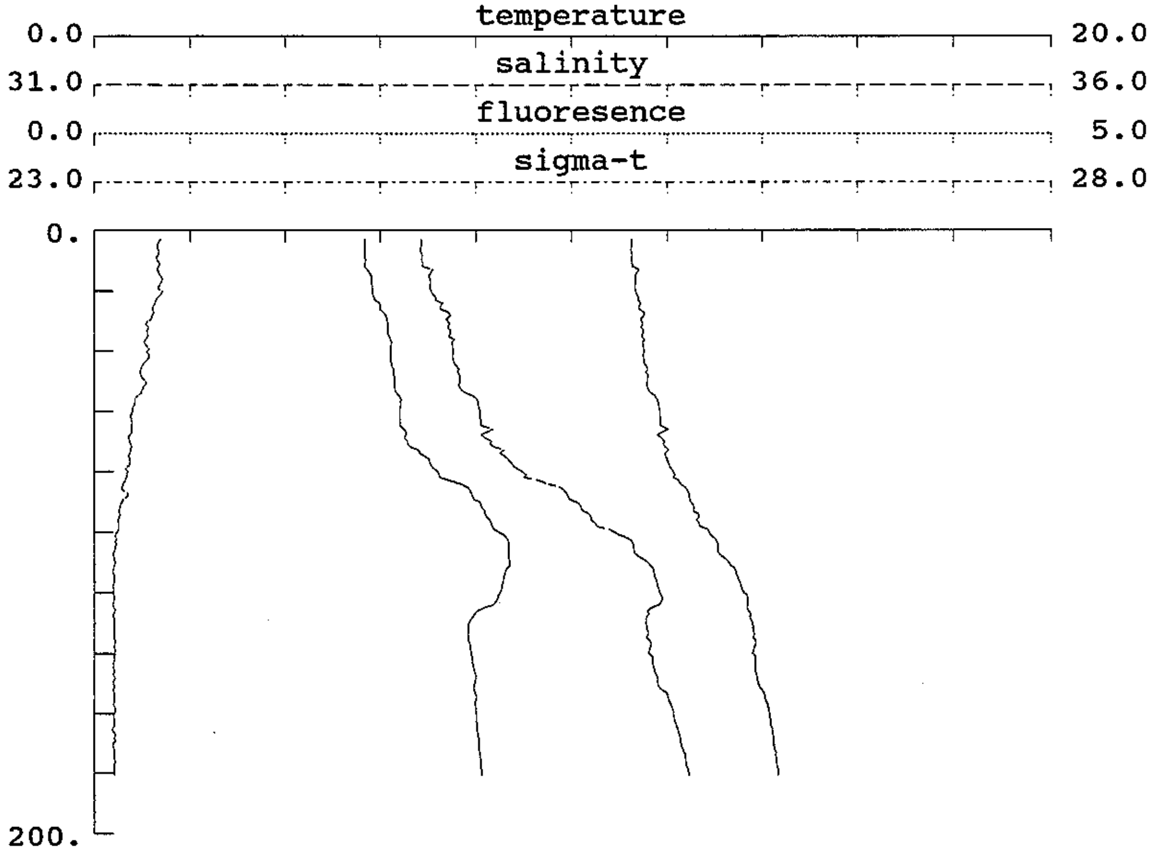
Standard Sta #: 23
Date(y\m\d): 96\1\17
Hour (GMT): 4.2
Bottom depth: 89




| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 4.00 | 6.09 | 32.96 | 0.37 | 25.95 |
| 5.00 | 6.09 | 32.96 | 0.31 | 25.96 |
| 10.00 | 6.09 | 32.96 | 0.32 | 25.96 |
| 15.00 | 6.09 | 32.96 | 0.31 | 25.96 |
| 20.00 | 6.09 | 32.96 | 0.34 | 25.96 |
| 25.00 | 6.09 | 32.97 | 0.35 | 25.96 |
| 30.00 | 6.09 | 32.97 | 0.34 | 25.96 |
| 40.00 | 6.09 | 32.97 | 0.44 | 25.96 |
| 50.00 | 6.10 | 32.97 | 0.33 | 25.96 |
| 75.00 | 6.10 | 32.97 | 0.35 | 25.96 |
| 78.00 | 6.10 | 32.97 | 0.34 | 25.96 |

[** Note: this is uncorrected data **]

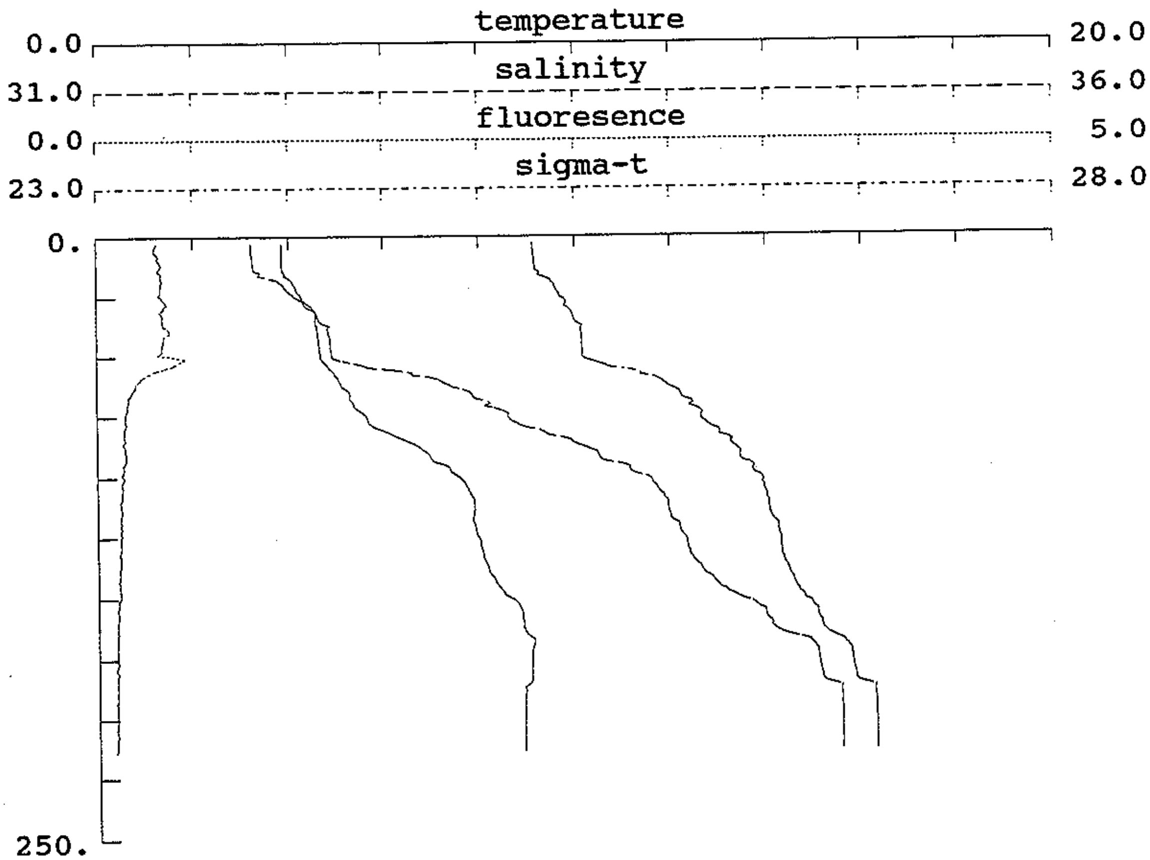
| EN276 | | Standard Sta #: | 24 |
|---|---|---|---|
| Cast #: | 023 | Date(y\m\d): | 96\1\17 |
| Lat: | 42 3. N | Hour (GMT): | 11. |
| Lon: | 65 56.7 W | Bottom depth: | 185 |




| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 2.00 | 5.68 | 32.72 | 0.35 | 25.81 |
| 5.00 | 5.68 | 32.72 | 0.33 | 25.81 |
| 10.00 | 5.69 | 32.72 | 0.33 | 25.81 |
| 15.00 | 5.81 | 32.76 | 0.35 | 25.83 |
| 20.00 | 5.83 | 32.77 | 0.36 | 25.83 |
| 25.00 | 6.01 | 32.82 | 0.31 | 25.85 |
| 30.00 | 6.15 | 32.86 | 0.28 | 25.87 |
| 40.00 | 6.22 | 32.88 | 0.28 | 25.88 |
| 50.00 | 6.30 | 32.92 | 0.27 | 25.89 |
| 75.00 | 6.93 | 33.14 | 0.18 | 25.99 |
| 100.00 | 8.47 | 33.72 | 0.12 | 26.22 |
| 150.00 | 7.96 | 33.95 | 0.10 | 26.48 |
| 181.00 | 8.11 | 34.11 | 0.11 | 26.58 |

[** Note: this is uncorrected data **]

| | | | |
|---|---|---|---|
| EN276 | | Standard Sta #: | 25 |
| Cast #: | 024 | Date(y\m\d): | 96\1\17 |
| Lat: | 42 16.8 N | Hour (GMT): | 17.7 |
| Lon: | 65 50.2 W | Bottom depth: | 220 |

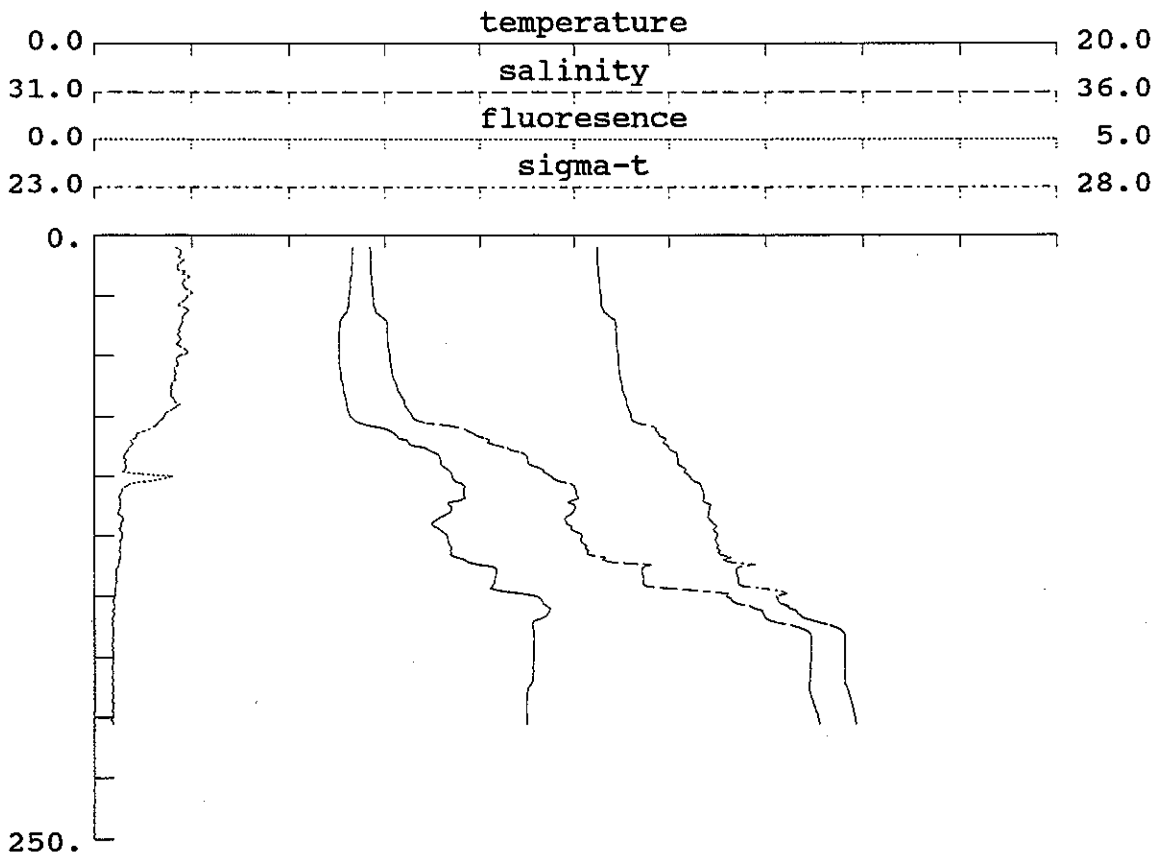



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 2.00 | 3.86 | 31.80 | 0.32 | 25.28 |
| 5.00 | 3.86 | 31.80 | 0.30 | 25.28 |
| 10.00 | 3.86 | 31.81 | 0.32 | 25.29 |
| 15.00 | 3.91 | 31.85 | 0.33 | 25.32 |
| 20.00 | 4.12 | 31.97 | 0.33 | 25.39 |
| 25.00 | 4.27 | 32.03 | 0.34 | 25.42 |
| 30.00 | 4.52 | 32.12 | 0.34 | 25.47 |
| 40.00 | 4.61 | 32.21 | 0.38 | 25.53 |
| 50.00 | 4.66 | 32.23 | 0.39 | 25.54 |
| 75.00 | 5.63 | 33.15 | 0.15 | 26.16 |
| 100.00 | 7.56 | 33.87 | 0.14 | 26.47 |
| 150.00 | 8.60 | 34.35 | 0.11 | 26.69 |
| 200.00 | 8.91 | 34.89 | 0.10 | 27.07 |
| 214.00 | 8.91 | 34.89 | 0.08 | 27.07 |

[** Note: this is uncorrected data **]

EN276
Cast #: 025
Lat: 42 10.5 N
Lon: 65 57.8 W

Standard Sta #: 039
Date(y\m\d): 96\1\18
Hour (GMT): .9
Bottom depth: 227

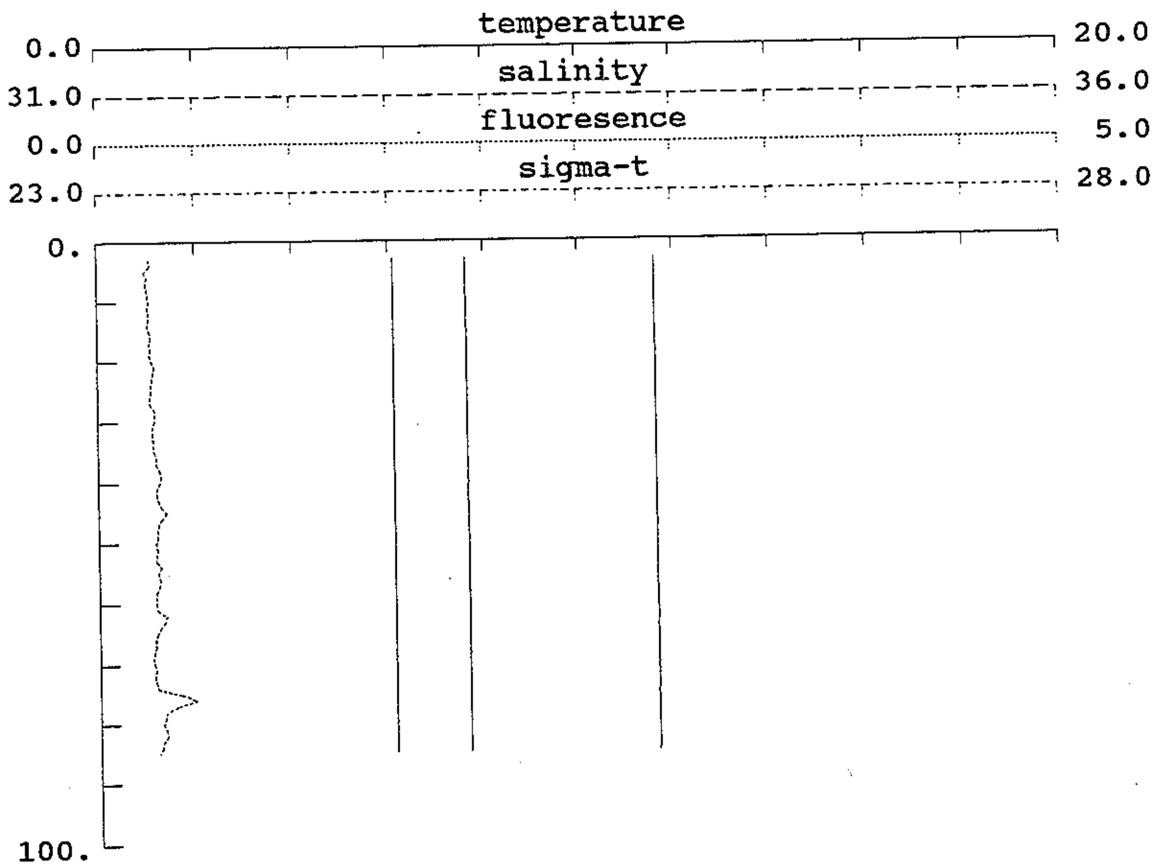



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 5.00 | 5.33 | 32.42 | 0.42 | 25.62 |
| 5.00 | 5.33 | 32.42 | 0.42 | 25.62 |
| 10.00 | 5.32 | 32.43 | 0.46 | 25.62 |
| 15.00 | 5.31 | 32.43 | 0.47 | 25.63 |
| 20.00 | 5.28 | 32.43 | 0.45 | 25.64 |
| 25.00 | 5.26 | 32.44 | 0.48 | 25.64 |
| 30.00 | 5.23 | 32.45 | 0.47 | 25.65 |
| 40.00 | 5.06 | 32.51 | 0.44 | 25.72 |
| 50.00 | 5.05 | 32.53 | 0.44 | 25.73 |
| 75.00 | 5.28 | 32.64 | 0.36 | 25.80 |
| 100.00 | 7.43 | 33.38 | 0.40 | 26.11 |
| 150.00 | 9.21 | 34.29 | 0.10 | 26.55 |
| 200.00 | 9.00 | 34.77 | 0.09 | 26.96 |
| 203.00 | 9.01 | 34.77 | 0.09 | 26.96 |

[** Note: this is uncorrected data **]

EN276
Cast #: 026
Lat: 42 3.3 N
Lon: 66 26.5 W

Standard Sta #: 026
Date(y\m\d): 96\1\18
Hour (GMT): 7.4
Bottom depth: 87

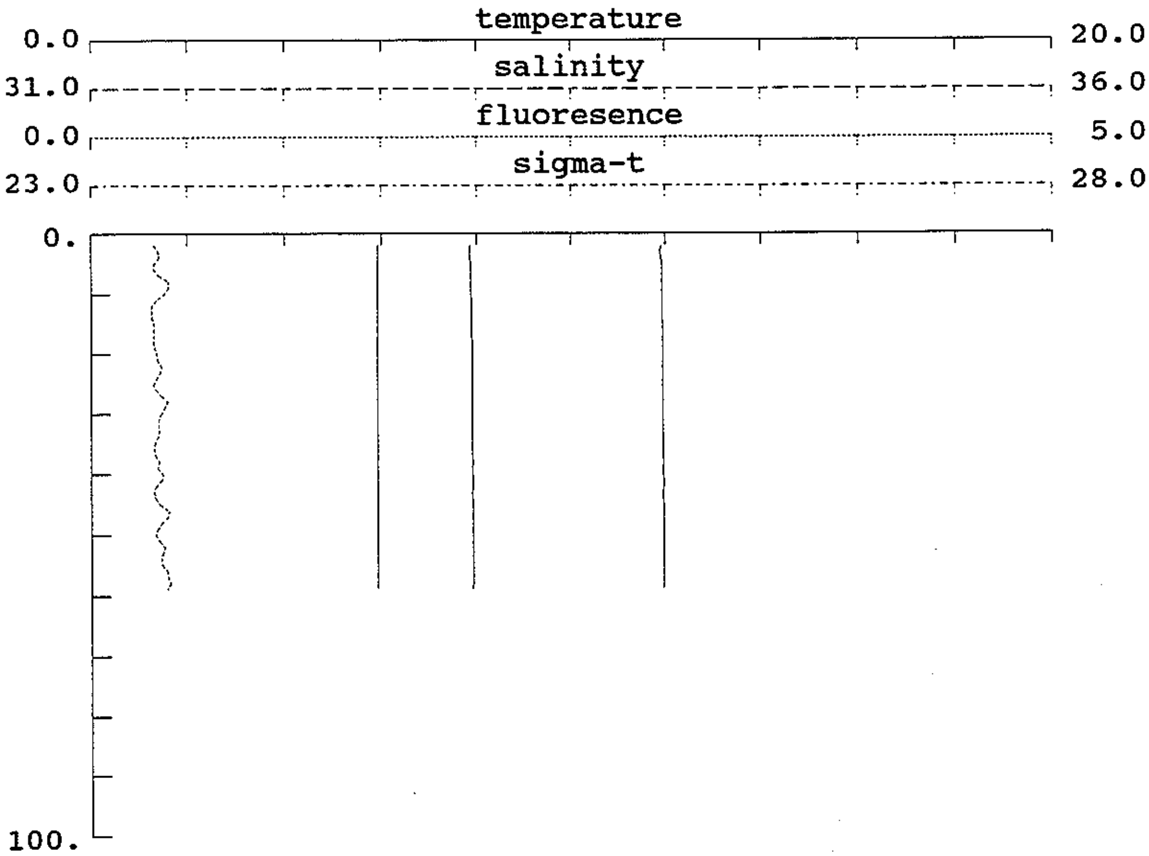



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 3.00 | 6.10 | 32.91 | 0.27 | 25.91 |
| 5.00 | 6.10 | 32.91 | 0.24 | 25.91 |
| 10.00 | 6.10 | 32.91 | 0.26 | 25.91 |
| 15.00 | 6.10 | 32.91 | 0.27 | 25.91 |
| 20.00 | 6.10 | 32.91 | 0.28 | 25.91 |
| 25.00 | 6.10 | 32.91 | 0.27 | 25.91 |
| 30.00 | 6.10 | 32.91 | 0.29 | 25.91 |
| 40.00 | 6.10 | 32.91 | 0.31 | 25.91 |
| 50.00 | 6.10 | 32.91 | 0.29 | 25.91 |
| 75.00 | 6.11 | 32.91 | 0.42 | 25.91 |
| 85.00 | 6.11 | 32.91 | 0.30 | 25.91 |

[** Note: this is uncorrected data **]

EN276
Cast #: 027
Lat: 41 57.7 N
Lon: 66 41.1 W

Standard Sta #: 027
Date(y\m\d): 96\1\18
Hour (GMT): 11.5
Bottom depth: 67

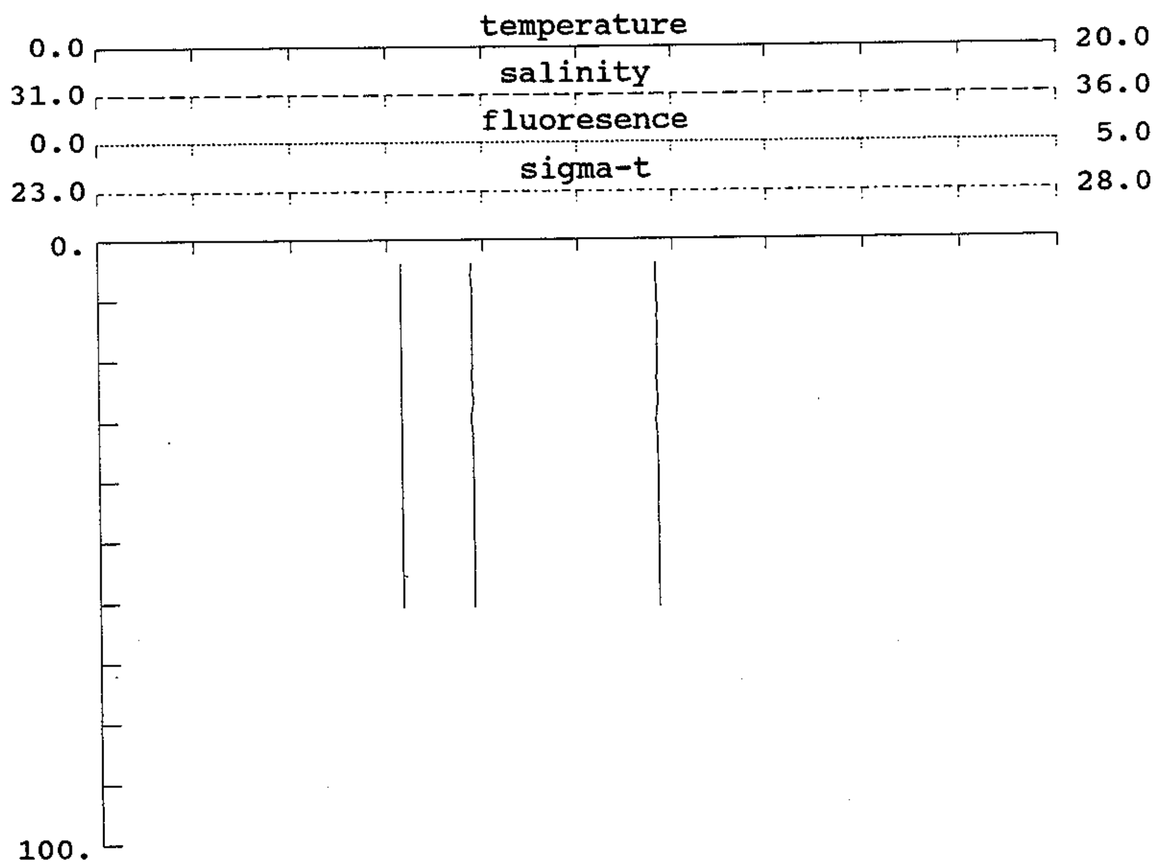



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 2.00 | 5.94 | 32.97 | 0.33 | 25.98 |
| 5.00 | 5.92 | 32.97 | 0.33 | 25.98 |
| 10.00 | 5.92 | 32.97 | 0.38 | 25.98 |
| 15.00 | 5.92 | 32.97 | 0.33 | 25.99 |
| 20.00 | 5.92 | 32.98 | 0.34 | 25.99 |
| 25.00 | 5.92 | 32.98 | 0.33 | 25.99 |
| 30.00 | 5.92 | 32.98 | 0.37 | 25.99 |
| 40.00 | 5.92 | 32.98 | 0.37 | 25.99 |
| 50.00 | 5.92 | 32.98 | 0.34 | 25.99 |
| 59.00 | 5.92 | 32.98 | 0.39 | 25.99 |

[** Note: this is uncorrected data **]

EN276
Cast #: 171
Lat: 42 5.7 N
Lon: 66 53.7 W

Standard Sta #: 028
Date(y\m\d): 96\1\18
Hour (GMT): 18.2
Bottom depth: 67

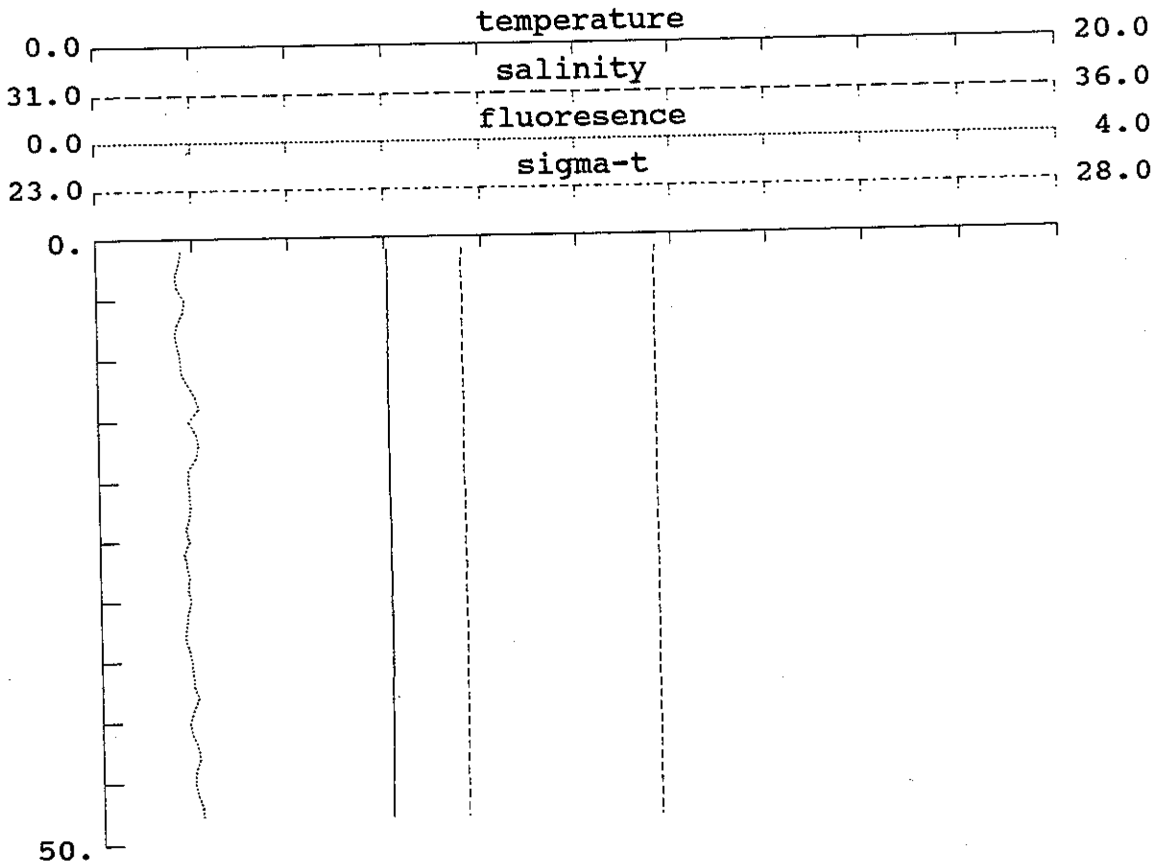



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 4.00 | 6.29 | 32.94 | 0.00 | 25.91 |
| 5.00 | 6.28 | 32.94 | 0.00 | 25.91 |
| 10.00 | 6.28 | 32.94 | 0.00 | 25.91 |
| 15.00 | 6.28 | 32.94 | 0.00 | 25.92 |
| 20.00 | 6.28 | 32.94 | 0.00 | 25.91 |
| 25.00 | 6.28 | 32.94 | 0.00 | 25.91 |
| 30.00 | 6.28 | 32.93 | 0.00 | 25.91 |
| 40.00 | 6.28 | 32.94 | 0.00 | 25.92 |
| 50.00 | 6.28 | 32.94 | 0.00 | 25.92 |
| 61.00 | 6.28 | 32.94 | 0.00 | 25.92 |

[** Note: this is uncorrected data **]

EN276
Cast #: 029
Lat: 41 49.2 N
Lon: 68 .1 W

Standard Sta #: 033
Date(y\m\d): 96\1\21
Hour (GMT): 8.5
Bottom depth: 53

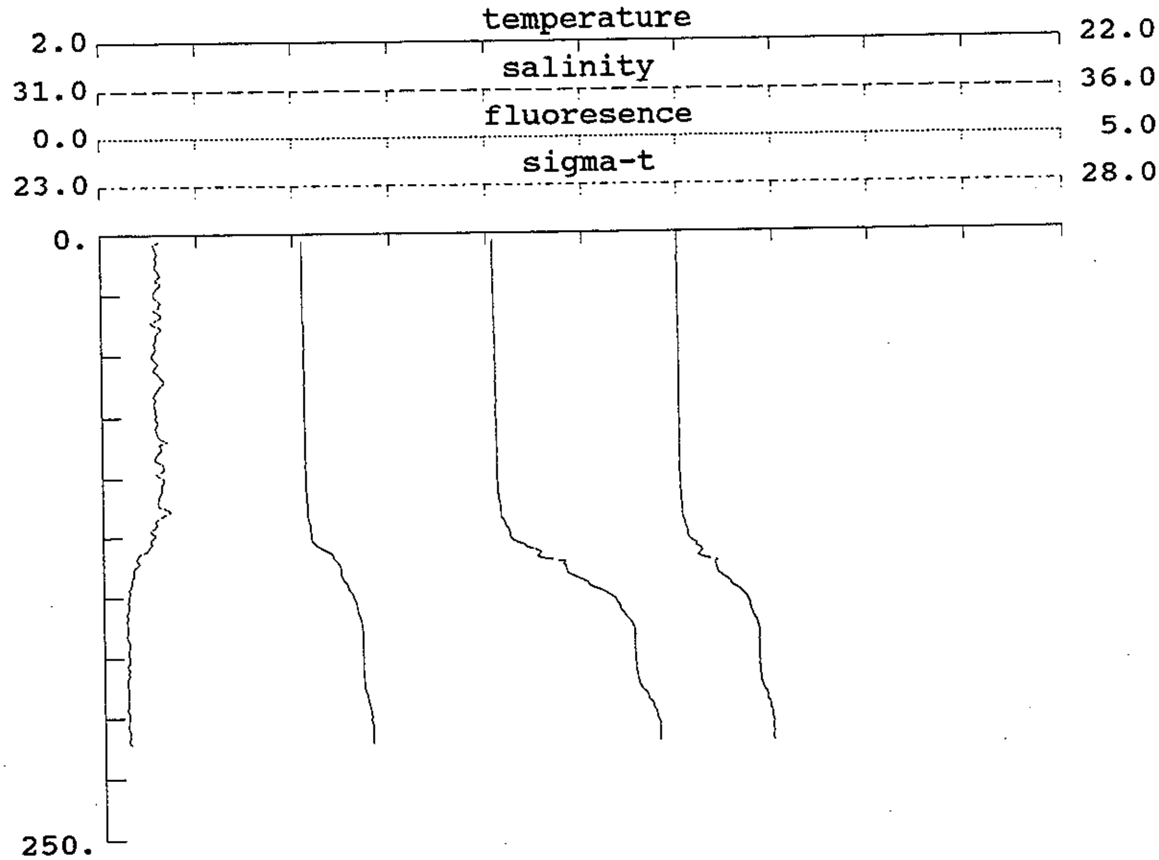



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 1.00 | 6.05 | 32.90 | 0.35 | 25.91 |
| 5.00 | 6.05 | 32.90 | 0.36 | 25.91 |
| 10.00 | 6.04 | 32.90 | 0.34 | 25.91 |
| 15.00 | 6.04 | 32.90 | 0.37 | 25.91 |
| 20.00 | 6.04 | 32.90 | 0.37 | 25.91 |
| 25.00 | 6.05 | 32.90 | 0.37 | 25.91 |
| 30.00 | 6.05 | 32.90 | 0.37 | 25.91 |
| 40.00 | 6.04 | 32.90 | 0.36 | 25.91 |
| 48.00 | 6.02 | 32.89 | 0.41 | 25.91 |

[** Note: this is uncorrected data **]

EN276
Cast #: 030
Lat: 41 51.2 N
Lon: 68 19.5 W

Standard Sta #: 034
Date(y\m\d): 96\1\21
Hour (GMT): 11.9
Bottom depth: 217

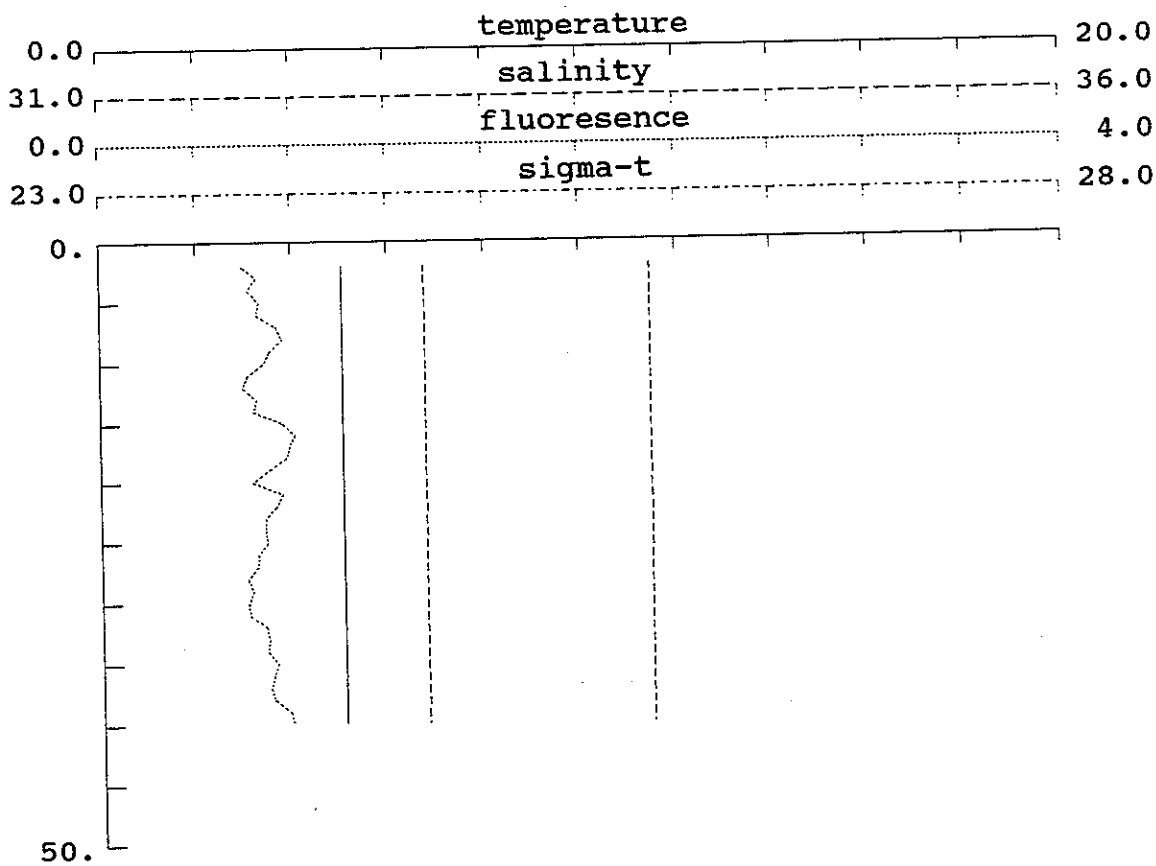



| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 2.00 | 6.19 | 33.03 | 0.29 | 26.00 |
| 5.00 | 6.18 | 33.03 | 0.27 | 26.00 |
| 10.00 | 6.19 | 33.03 | 0.28 | 26.00 |
| 15.00 | 6.19 | 33.03 | 0.29 | 26.00 |
| 20.00 | 6.19 | 33.04 | 0.30 | 26.00 |
| 25.00 | 6.19 | 33.04 | 0.27 | 26.00 |
| 30.00 | 6.19 | 33.04 | 0.30 | 26.00 |
| 40.00 | 6.20 | 33.04 | 0.29 | 26.00 |
| 50.00 | 6.21 | 33.04 | 0.26 | 26.00 |
| 75.00 | 6.22 | 33.04 | 0.27 | 26.00 |
| 100.00 | 6.22 | 33.05 | 0.31 | 26.01 |
| 150.00 | 7.17 | 33.62 | 0.13 | 26.33 |
| 200.00 | 7.54 | 33.87 | 0.13 | 26.48 |
| 211.00 | 7.56 | 33.89 | 0.14 | 26.49 |

[** Note: this is uncorrected data **]

EN276
Cast #: 031
Lat: 41 24. N
Lon: 68 17.5 W

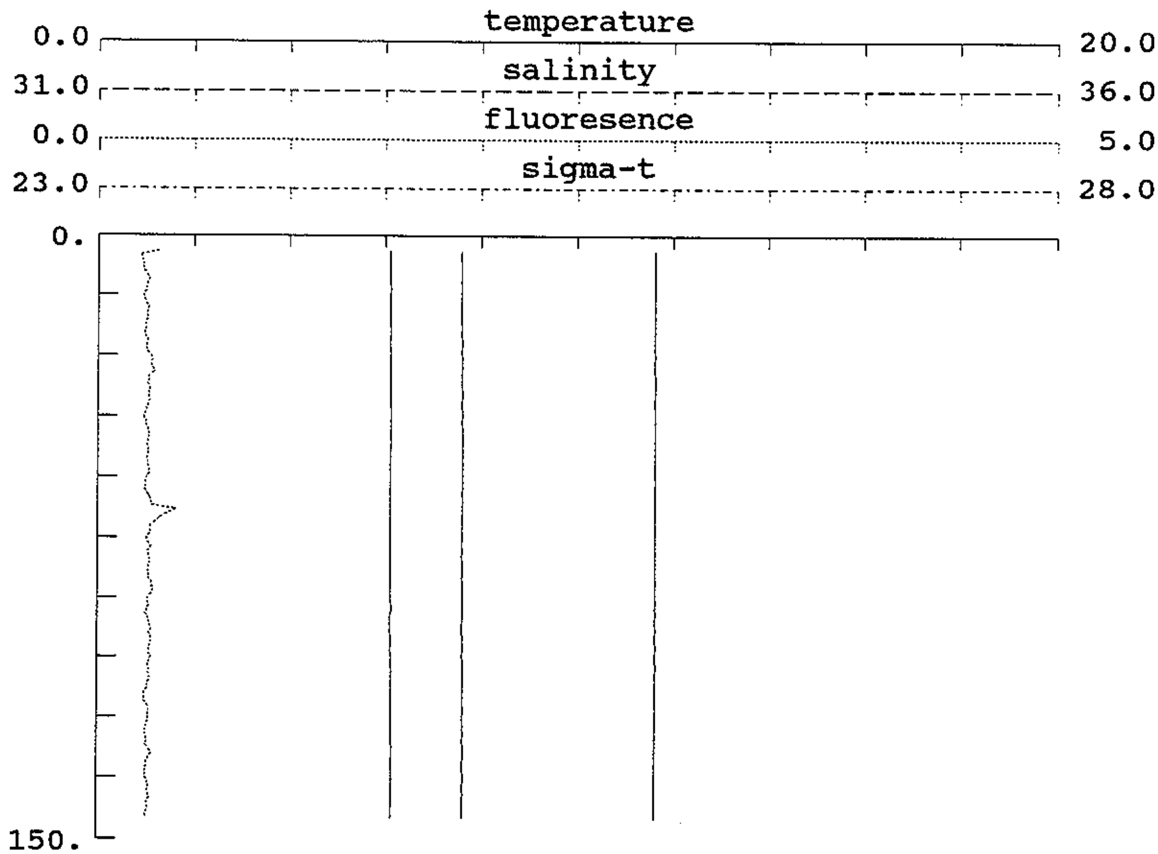
Standard Sta #: 036
Date(y\m\d): 96\1\21
Hour (GMT): 17.7
Bottom depth: 49




| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 2.00 | 5.06 | 32.69 | 0.59 | 25.86 |
| 5.00 | 5.06 | 32.70 | 0.66 | 25.87 |
| 10.00 | 5.06 | 32.70 | 0.68 | 25.87 |
| 15.00 | 5.06 | 32.70 | 0.76 | 25.87 |
| 20.00 | 5.06 | 32.70 | 0.63 | 25.87 |
| 25.00 | 5.06 | 32.70 | 0.69 | 25.87 |
| 30.00 | 5.06 | 32.70 | 0.61 | 25.87 |
| 40.00 | 5.07 | 32.70 | 0.79 | 25.87 |
| 40.00 | 5.07 | 32.70 | 0.79 | 25.87 |

[** Note: this is uncorrected data **]

| EN276 | | Standard Sta #: | 038 |
|---|---|---|---|
| Cast #: | 032 | Date(y\m\d): | 96\1\21 |
| Lat: | 41 29.5 N | Hour (GMT): | 23.1 |
| Lon: | 68 58.2 W | Bottom depth: | 155 |




| Depth | Temp | Salt | Flur | Sigma-t |
|---|---|---|---|---|
| 4.00 | 6.11 | 32.90 | 0.31 | 25.90 |
| 5.00 | 6.11 | 32.90 | 0.22 | 25.90 |
| 10.00 | 6.11 | 32.90 | 0.25 | 25.90 |
| 15.00 | 6.11 | 32.90 | 0.23 | 25.90 |
| 20.00 | 6.11 | 32.90 | 0.25 | 25.90 |
| 25.00 | 6.11 | 32.90 | 0.24 | 25.90 |
| 30.00 | 6.11 | 32.90 | 0.27 | 25.91 |
| 40.00 | 6.12 | 32.91 | 0.26 | 25.91 |
| 50.00 | 6.13 | 32.91 | 0.26 | 25.91 |
| 75.00 | 6.12 | 32.91 | 0.25 | 25.91 |
| 100.00 | 6.13 | 32.91 | 0.28 | 25.91 |
| 145.00 | 6.15 | 32.91 | 0.26 | 25.91 |

[** Note: this is uncorrected data **]