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Expendable Bathythermograph Observations from the NMFS/Ship of Opportunity Program for 1990

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Abstract

This report presents the results of the 21st year of operation of the NMFS MARMAP Ship of Opportunity Program. The data are presented in the form of plots of surface temperature and salinity and vertical sections of water column temperature. Operational procedures and data management are discussed.

INTRODUCTION

In mid-year 1970, a cooperative expendable bathythermograph (XBT) program was initiated between the National Marine Fisheries Service (NMFS) and the Maritime Administration (MARAD) of the U.S. Department of Commerce. This program, conducted in support of the MARMAP (Marine Resources Monitoring, Assessment and Prediction) Program of NMFS, involved the use of maritime cadets from Kings Point Maritime Academy to gather XBT data on board merchant ships along the East and Gulf coasts of the United States.

Objectives of this cooperative program were to identify and describe seasonal and year-to-year variations of temperature, salinity, and circulation in major currents of the Gulf of Mexico and the western North Atlantic, using merchant ships as inexpensive platforms for the collection of oceanographic data. In the mid-1970s the objectives of the program were revised to concentrate on water masses, circulation, and planktonic biota of the Middle Atlantic Bight, Gulf of Maine, and eastern Gulf of Mexico, with particular interest in the continental shelf and slope waters in the Middle Atlantic Bight. Coverage in the Gulf of Mexico ended in 1987.

AREAS OF STUDY

Ship routes were selected to foster regular sampling coverage in the most dynamic or diagnostic areas. Repeated coverage is important for comparative analyses, so ships with the most regular schedules have been chosen whenever possible.

Expendable bathythermograph (XBT) and meteorological data were collected in 1990 by the vessels *Oleander* and *Yankee Clipper.* Continous plankton records were also collected on the *Oleander* and *Yankee Clipper* cruises but resulting data are not given here.

The *Oleander* transits from Newark, NJ to Bermuda on a weekly basis, with (approximately) weekly to monthly collections of data between Ambrose Light and the vicinity of the Gulf Stream's North Wall in either an easterly or westerly direction (Fig. 4).

The *Yankee Clipper* transits weekly from Boston, MA to Halifax, Nova Scotia making monthly data collections from approximately the 20 fm line off Boston to Cape Sable (Fig. 36).

Operational Procedures

Physical Data

On both vessels, XBT and weather data were recorded and logged using the Bathy Systems data acquisition system. This system consists of the Bathy Systems model SA810 XBT controller, a Hewlett-Packard desk top computer, a Synergetics Geostationary Operational Environmental Satellite (GOES) data transmitter and antenna, Sippican XBT probes, and software from Bathy Systems. The XBT and meteorological data were sent via GOES transmitter (Fig. 1) to the Command and Data

Shipboard XBT and Weather Data In Real-Time via GOES Satellite

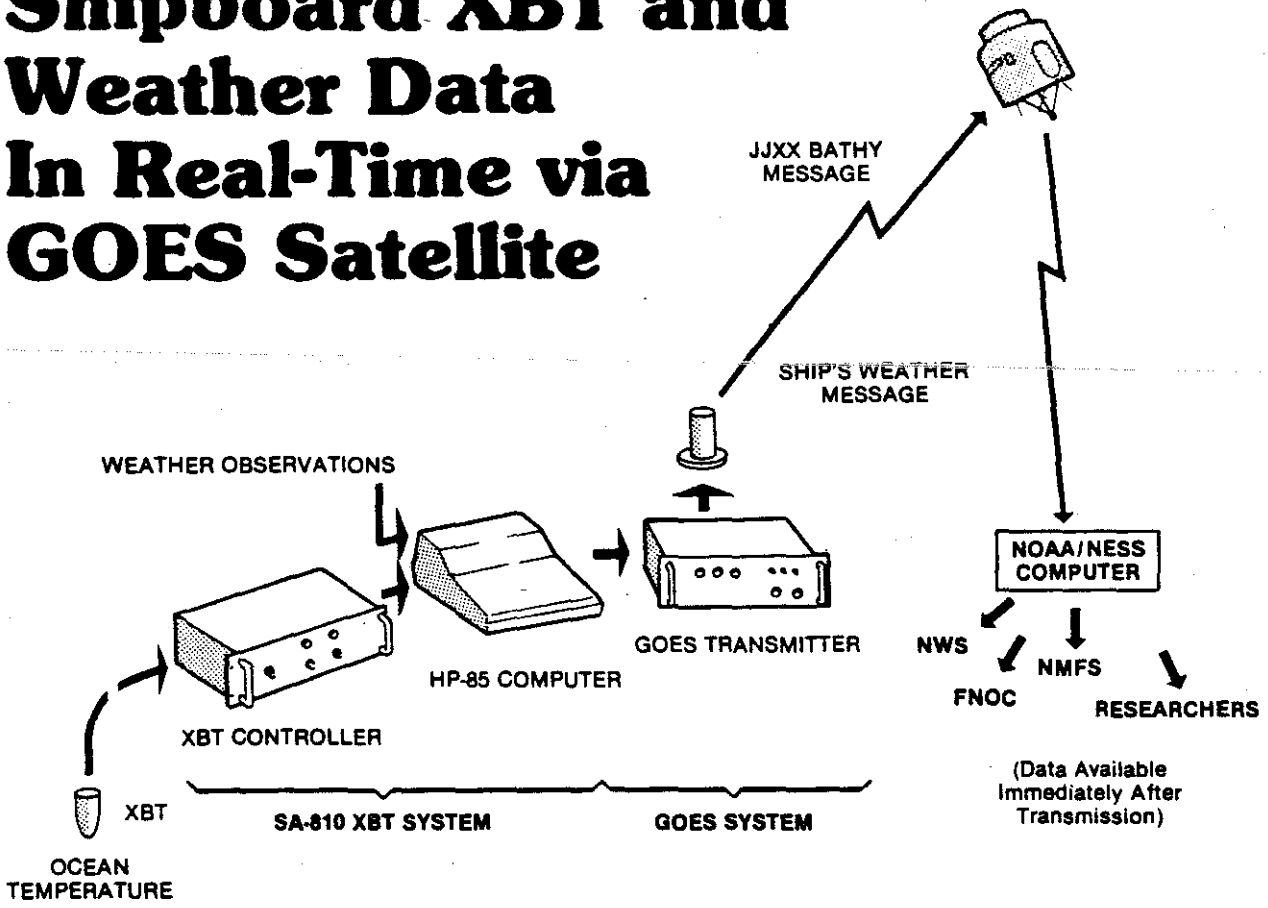


Figure 1. System presently in use onboard the Northeast Fisheries Center Ships of Opportunity.

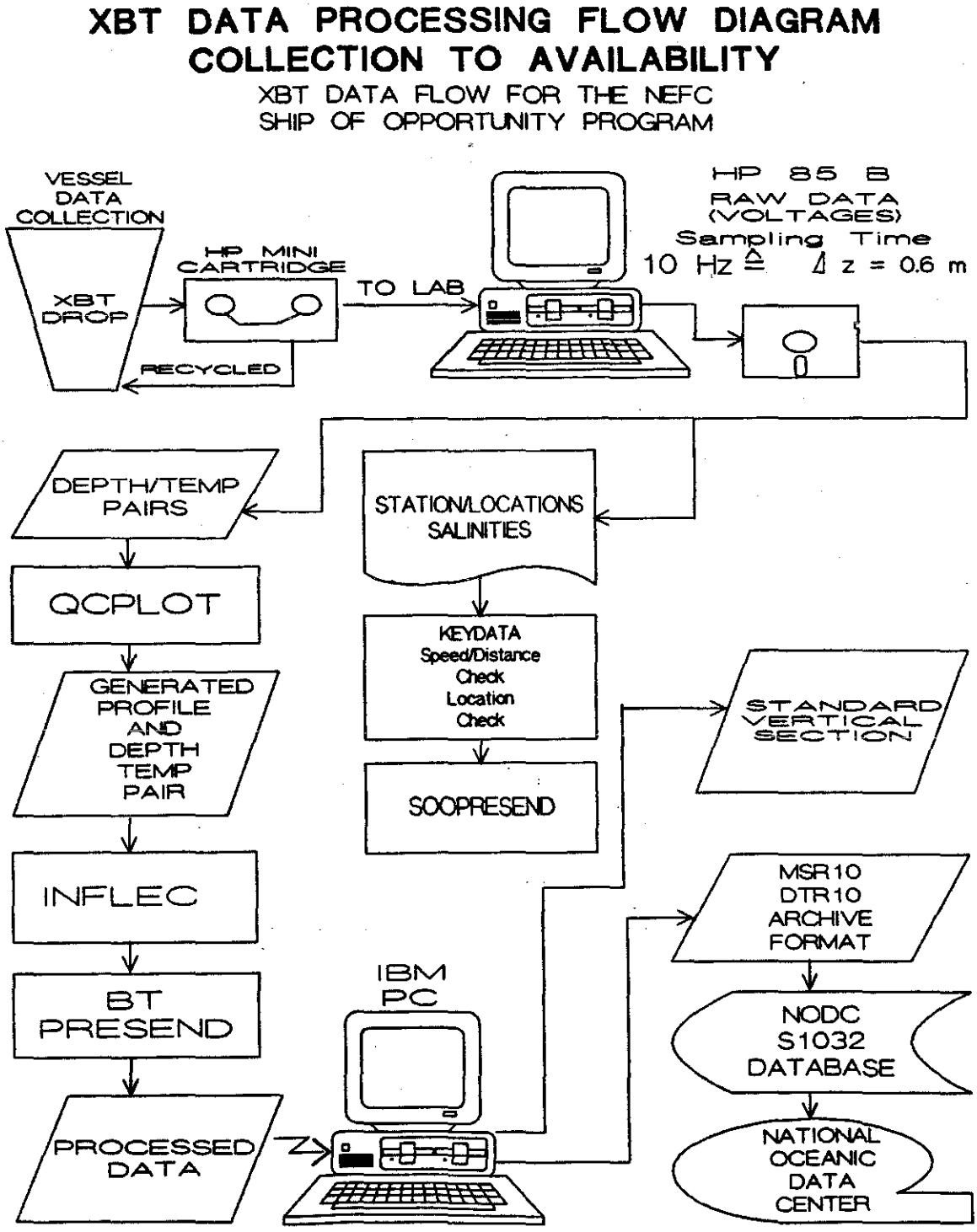


Figure 2. XBT data processing flow diagram.

Acquisition System (CDA) ground station at Wallops Island, VA and relayed to the National Environmental Satellite, Data, and Information Service (NESDIS) computer in Washington D.C. for distribution to outside users. Temperature and weather data were transmitted via GOES every three and six hours, respectively. The temperature data transmitted via GOES therefore were considered "real-time".

Data Processing

An Autosal model 8400 Salinometer was used for salinity determinations. Temperature/depth data collected aboard ship on computer cassette tapes were processed and quality controlled by personnel at the NMFS Narragansett Labratory. Figure 2 shows an overview of data processing procedures, from collection to their availability to the scientific community.

RESULTS

Middle Atlantic Bight

Observations made from the M/V *Oleander* (Fig. 3) throughout the year are presented as monthly vertical sections (Figs. 5 through 35). These portrayals consist of a cruise track, surface parameter plot, and temperature section in two scales. Each transect is identified by a cruise number and date of collection. Table 1 lists all cruises for 1990 along with the data collected, including continuous plankton records (CPR) acquired on the cruises.

Gulf of Maine

Observations made from the M/V *Yankee* Clipper throughout the year are presented as monthly vertical sections (Figs. 37 through 48). These portrayals consist of a cruise track, surface parameter plot , and temperature section in two scales. Each transect is identified by a cruise number and date of collection. Table 2 lists all cruises for 1990 along with the data type collected, including continuous plankton records (CPR) acquired on the cruises.

Data for any transect are available from NODC in a variety of forms. Requests for, or inquiries about Ship of Opportunity XBT data held by NODC, as well as data products, should be directed to:

National Oceanographic Data Center
(D761)
National Environmental Satellite
Data and Information Service, NOAA
Washington DC 20235

Data can also be requested through:
Director, Science and Research
U.S. Department of Commerce
National Oceanic and Atmospheric Admin.
National Marine Fisheries Service
Northeast Fisheries Center
Woods Hole, MA 02543

ACKNOWLEDGEMENTS

My appreciation is extended to the officers and crews of the *Oleander*, Bermuda Container Lines, and *Yankee Clipper*, Claus Spect, Hamburg Germany, for their generous cooperation in this program, whose success is dependent on them. Appreciation is also extended to all the volunteers who collected data on cruises of the *Oleander*. Special thanks is also given to the National Ocean Service, Office of Ocean Observations for their continued support.

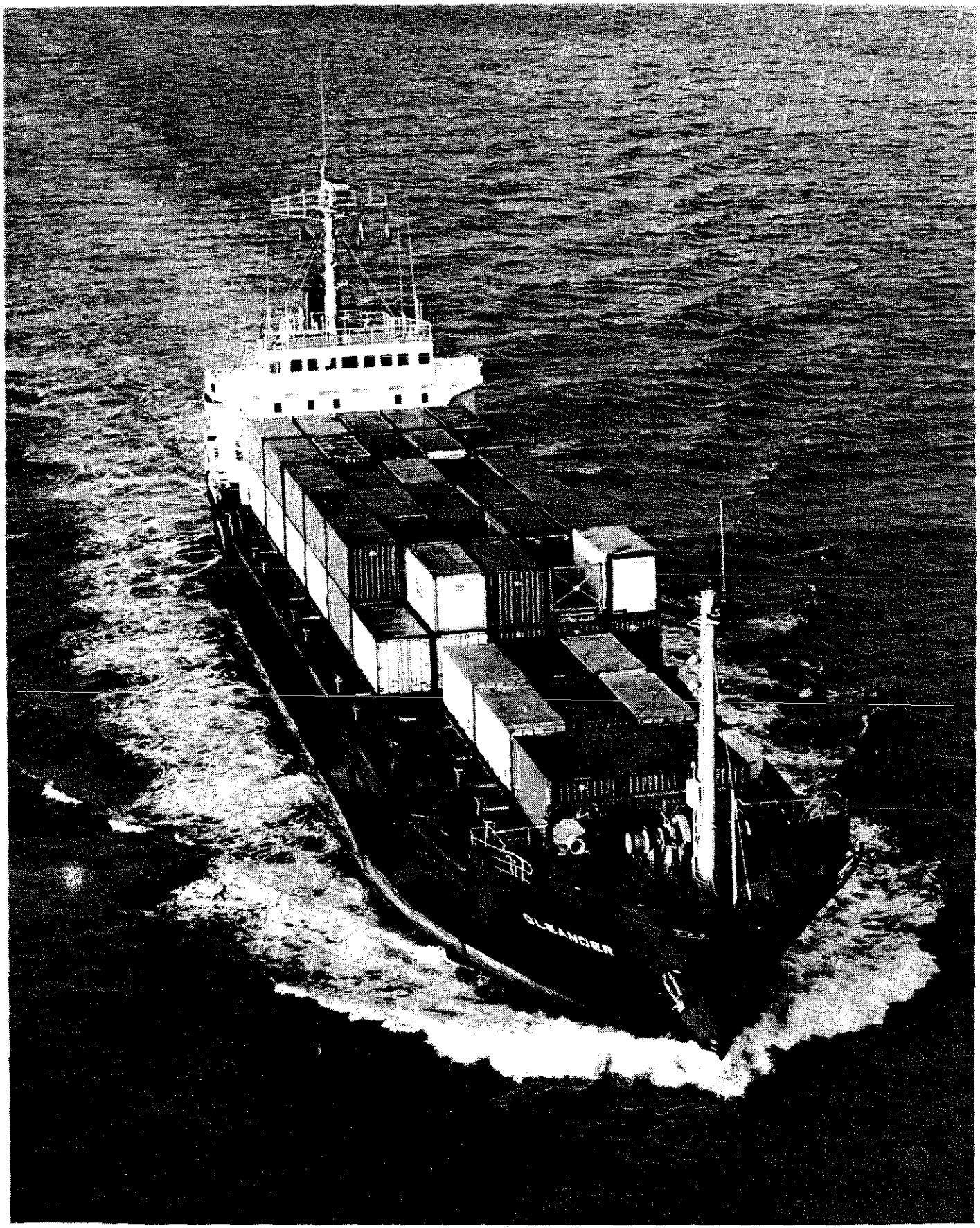


Figure 3. M/V *Oleander* (Bermuda Container Line)

Table 1. 1990 Middle Atlantic Bight transect data from the vessel *Oleander*

Cruise Number	Dates	XBT	CPR	Surf T	Surf S
90-01	January 05	X	X	X	X
90-02	February 02	X	X	X	X
90-03	March 02-03	X	X	X	X
90-04	April 06	X	X	X	X
90-05	April 20	X		X	X
90-06	April 25-26	X		X	X
90-07	May 04	X		X	X
90-08	May 09-10	X		X	X
90-09	May 30-31	X	X	X	X
90-10	June 08	X	X	X	X
90-11	June 13-14	X		X	X
90-12	June 22	X		X	X
90-13	June 27-28	X		X	X
90-14	July 06	X	X	X	X
90-15	July 11-12	X		X	X
90-16	July 20	X		X	X
90-17	July 25-26	X		X	X
90-18	August 03		X		
90-19	August 08-09	X		X	X
90-20	August 17	X		X	X
90-21	August 22-23	X		X	X
90-22	September 14	X	X	X	X
90-23	September 19-20	X		X	X
90-24	October 05-06	X	X	X	X
90-25	October10-11	X		X	X
90-26	October 26-27	X		X	X
90-27	Oct/Nov 31-01	X		X	X
90-28	November 09-10	X	X	X	X
90-29	November 15-16	X		X	X
90-30	November 23-24	X		X	X
90-31	November 28-29	X		X	X
90-32	December 07-08		X		
90-33	December 13	X		X	X

Table 2. 1990 Gulf of Maine transect data from the vessel *Yankee Clipper*

Cruise Number	Dates	XBT	CPR	Surf T	Surf S
90-01	January 01	X	X	X	X
90-02	February 12-13	X	X	X	X
90-03	March 05-06	X	X	X	X
90-04	April 20-21	X	X	X	X
90-05	May 11-12	X		X	X
90-06	May 19		X		
90-07	June 08-09	X	X	X	X
90-08	July 06-07	X	X	X	X
90-09	August 03-04	X	X	X	X
90-10	September 08-09	X	X	X	X
90-11	October 05-06	X	X	X	X
90-12	November 09-10	X	X	X	X
90-13	December 08	X	X	X	X

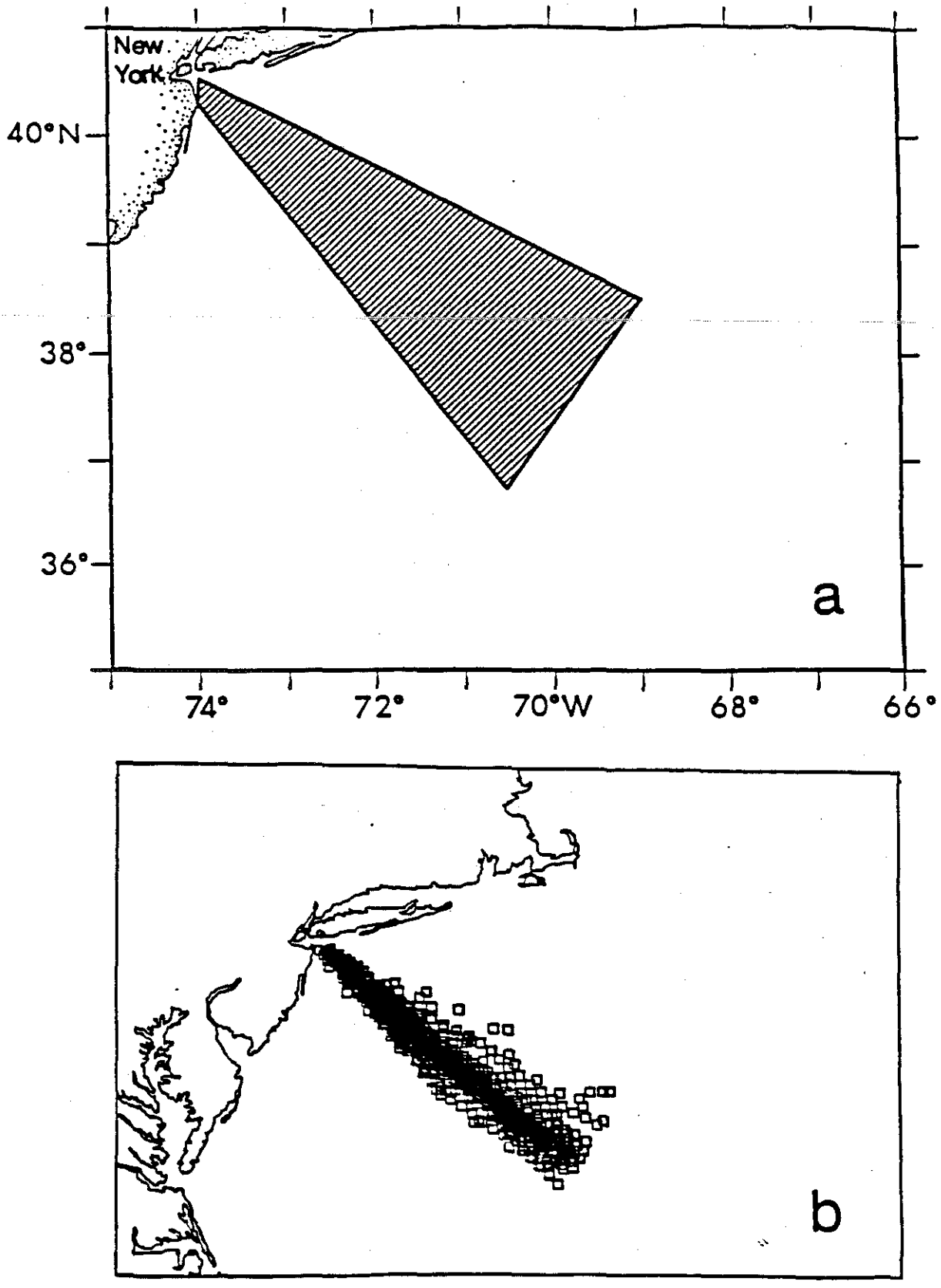


Figure 4. Transect envelope (a) and data density plot (b) from NMFS Ship of Opportunity Program, Route MB (Middle Atlantic Bight), 1971-present.

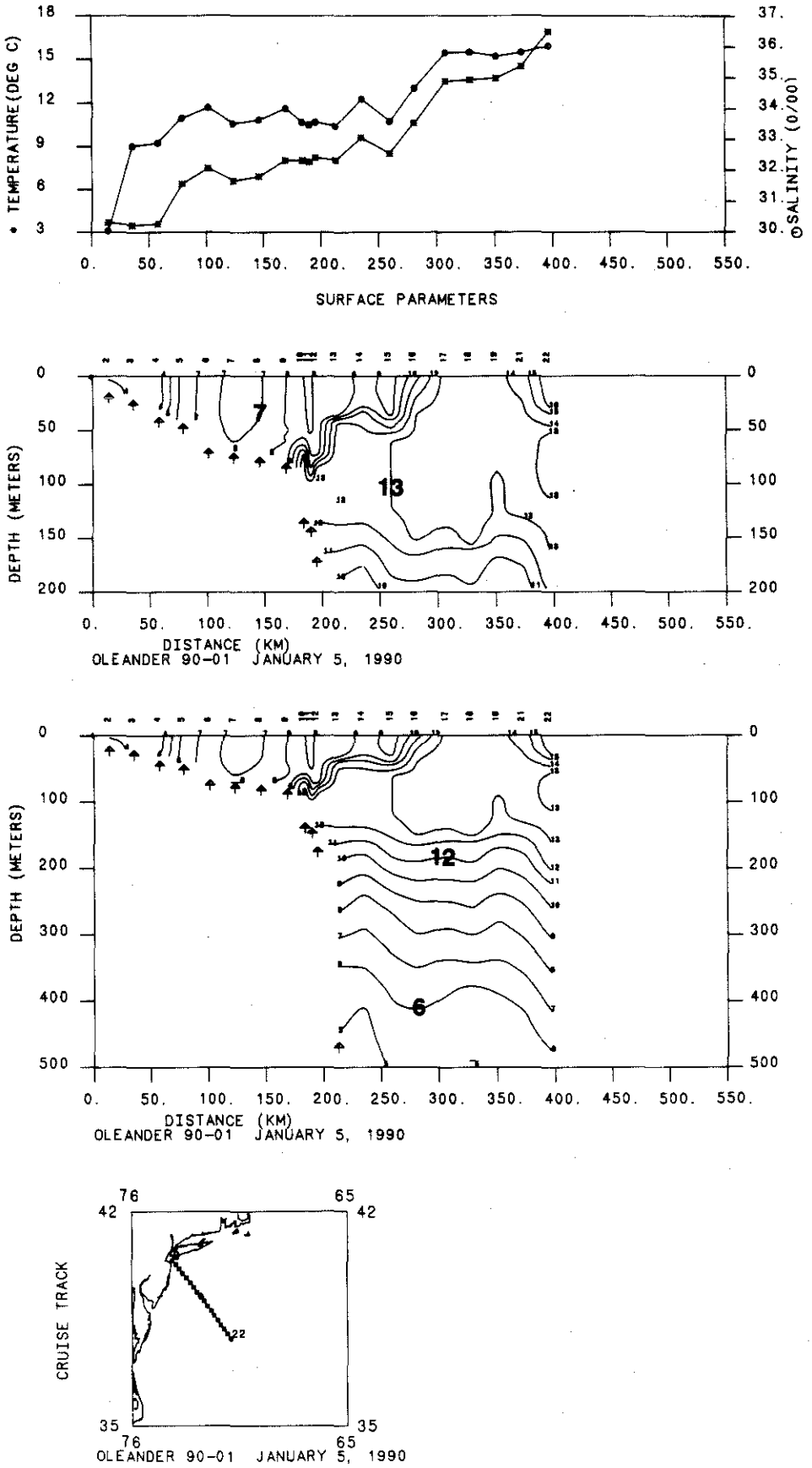


Figure 5. Vertical distribution of temperature in °C within the Middle Atlantic Bight, January 5, 1990.

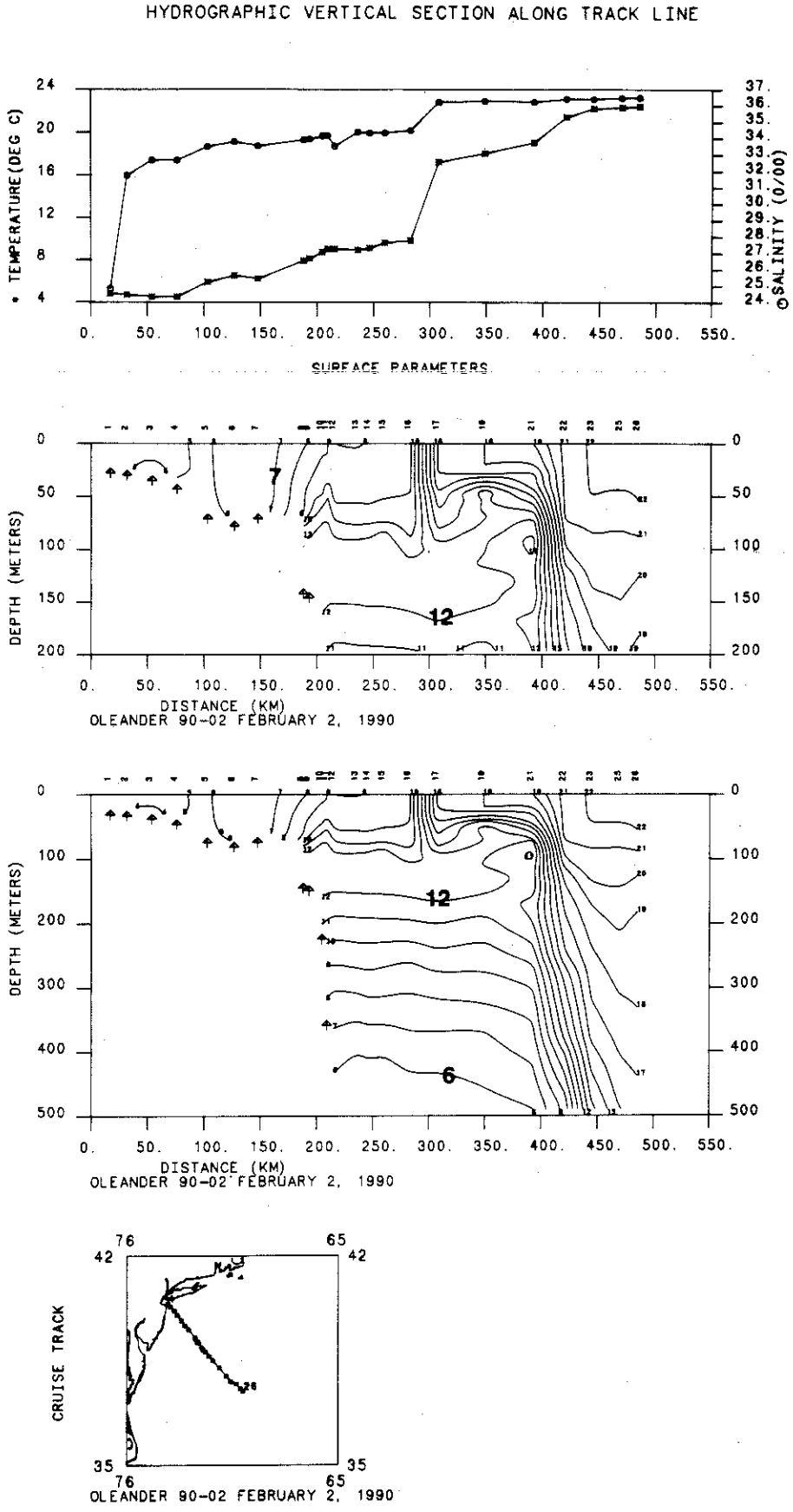


Figure 6. Vertical distribution of temperature in °C within the Middle Atlantic Bight, February 2, 1990.

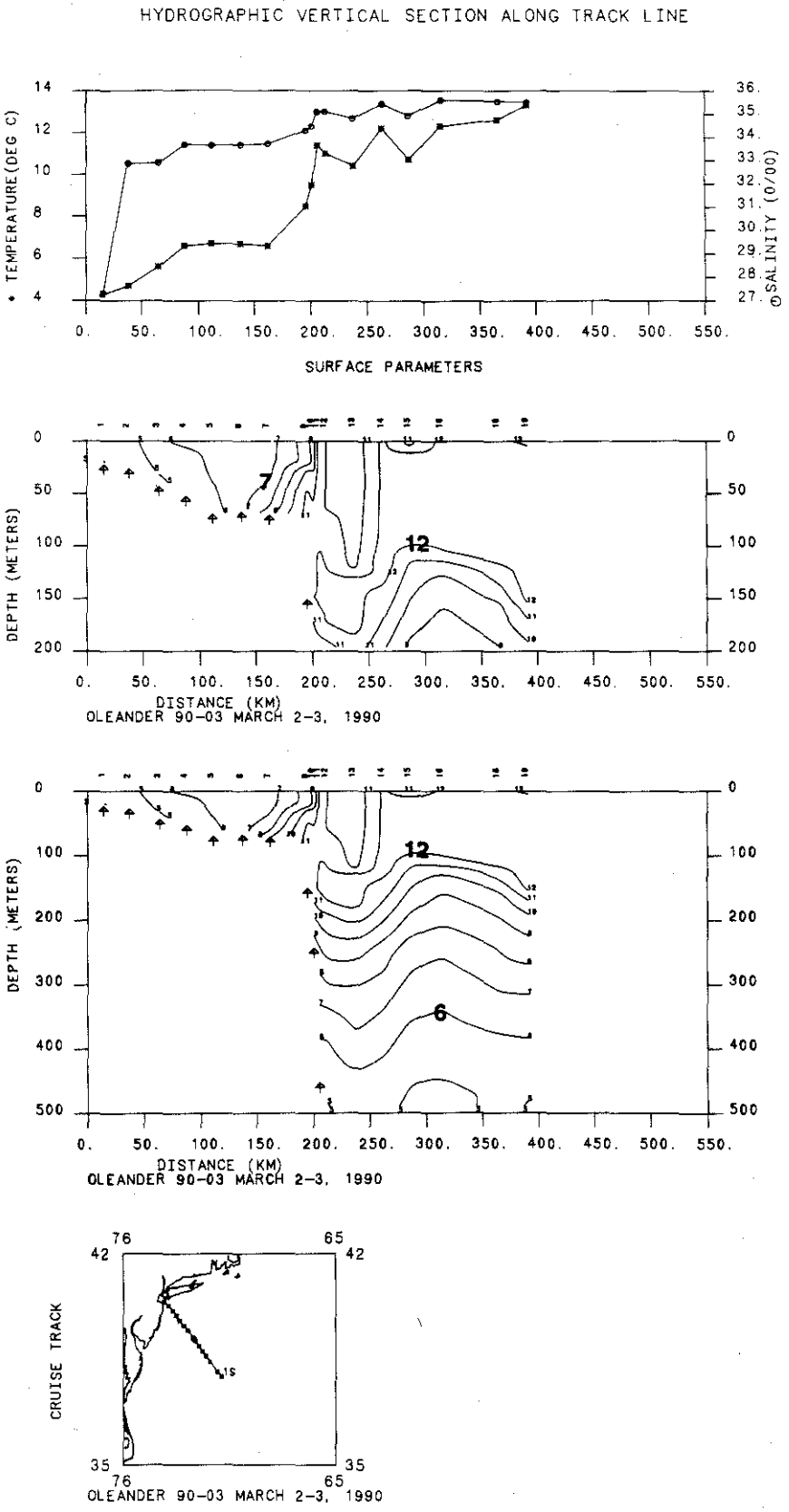


Figure 7. Vertical distribution of temperature in °C within the Middle Atlantic Bight, March 2-3, 1990.

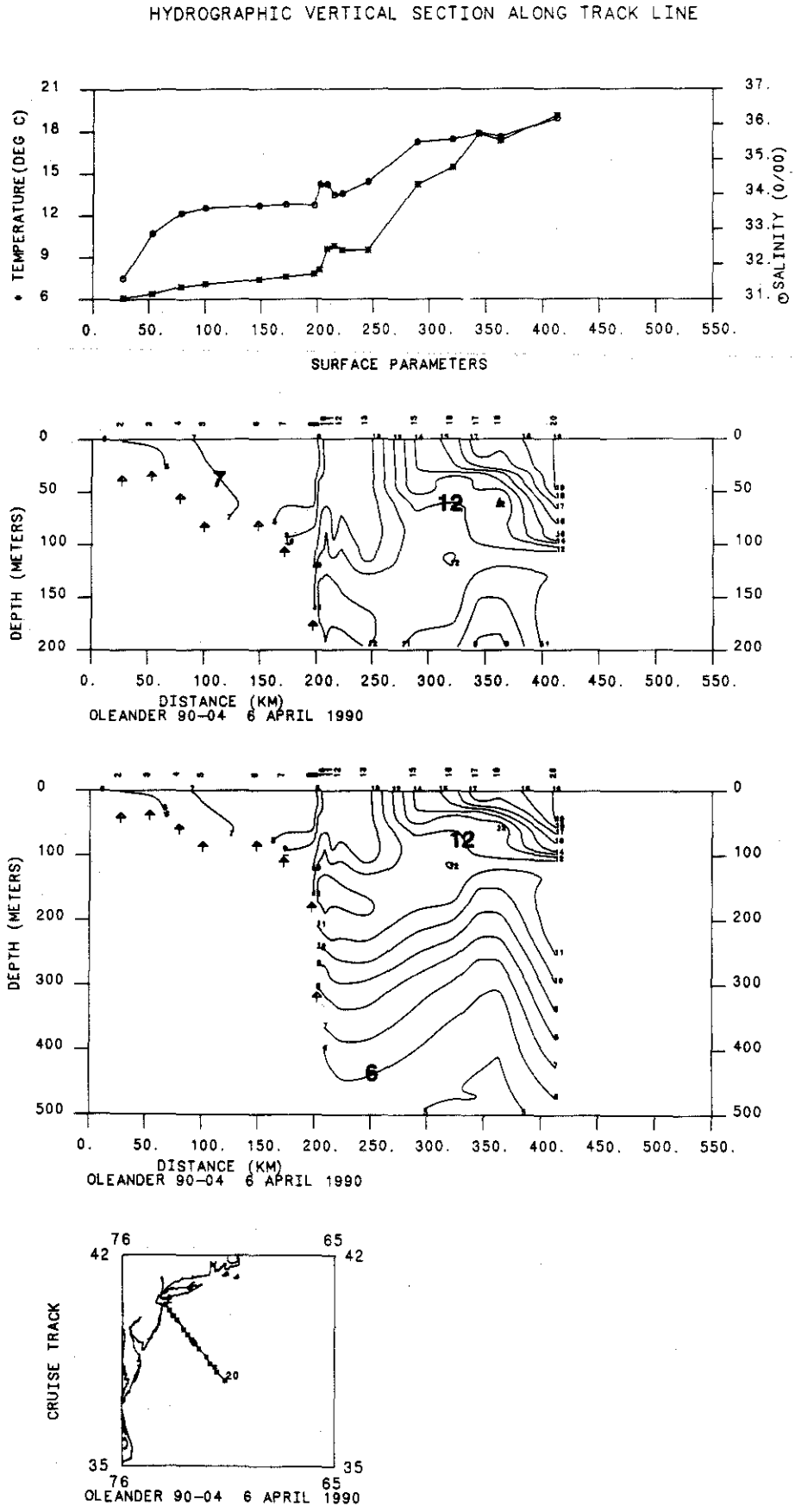


Figure 8. Vertical distribution of temperature in °C within the Middle Atlantic Bight, April 6, 1990.

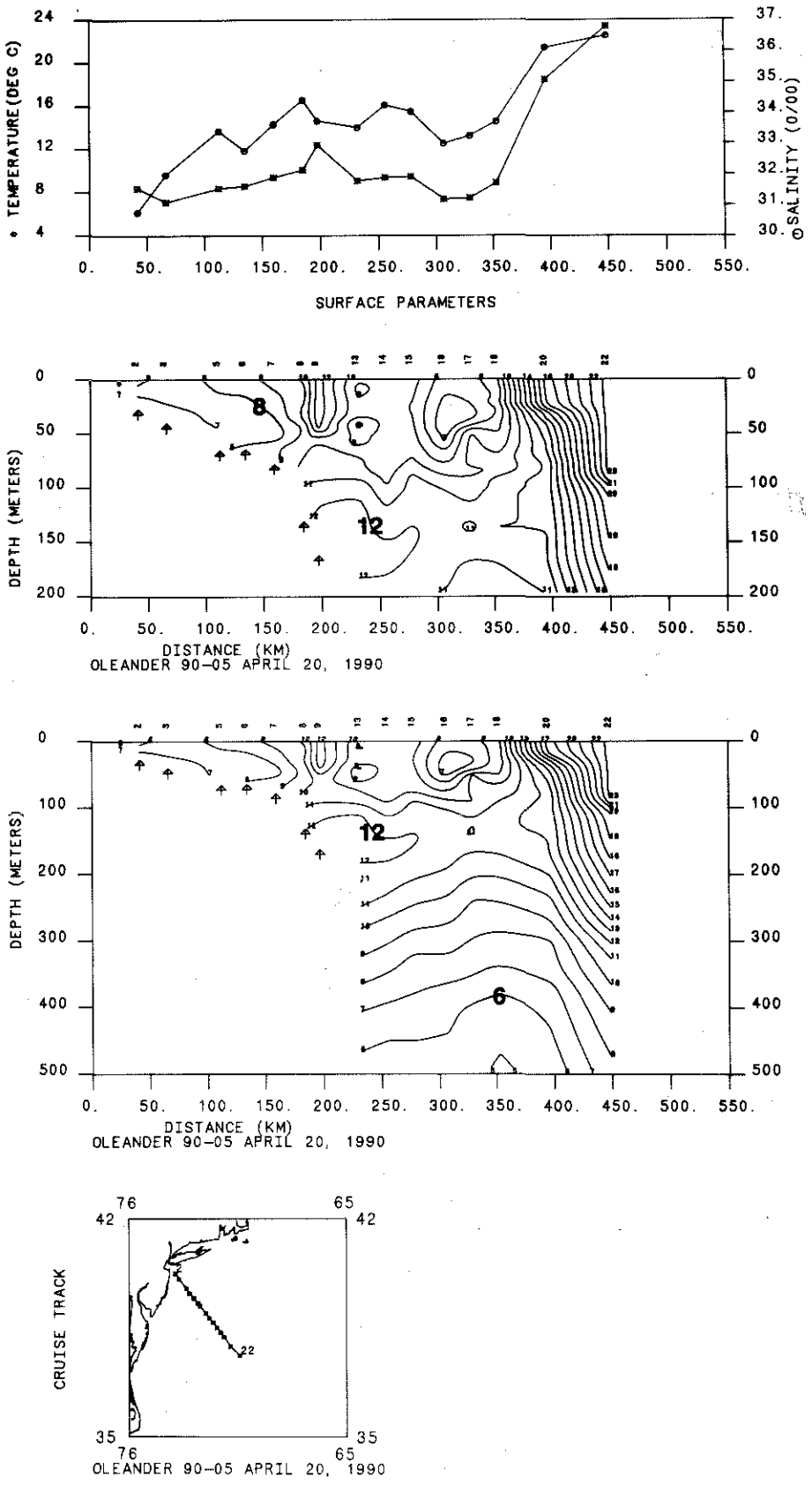


Figure 9. Vertical distribution of temperature in °C within the Middle Atlantic Bight, April 20, 1990.

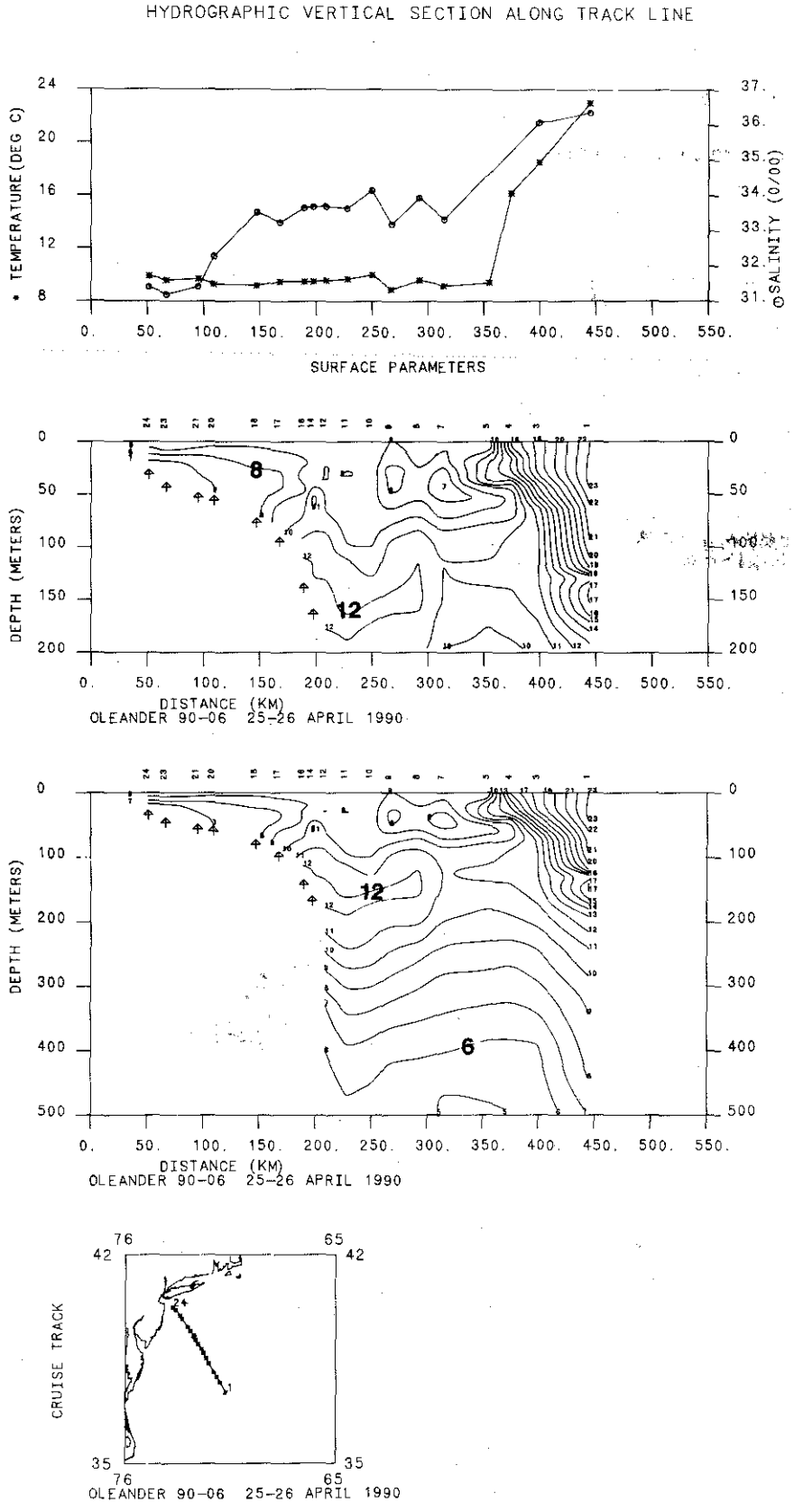


Figure 10. Vertical distribution of temperature in °C within the Middle Atlantic Bight, April 25-26, 1990.

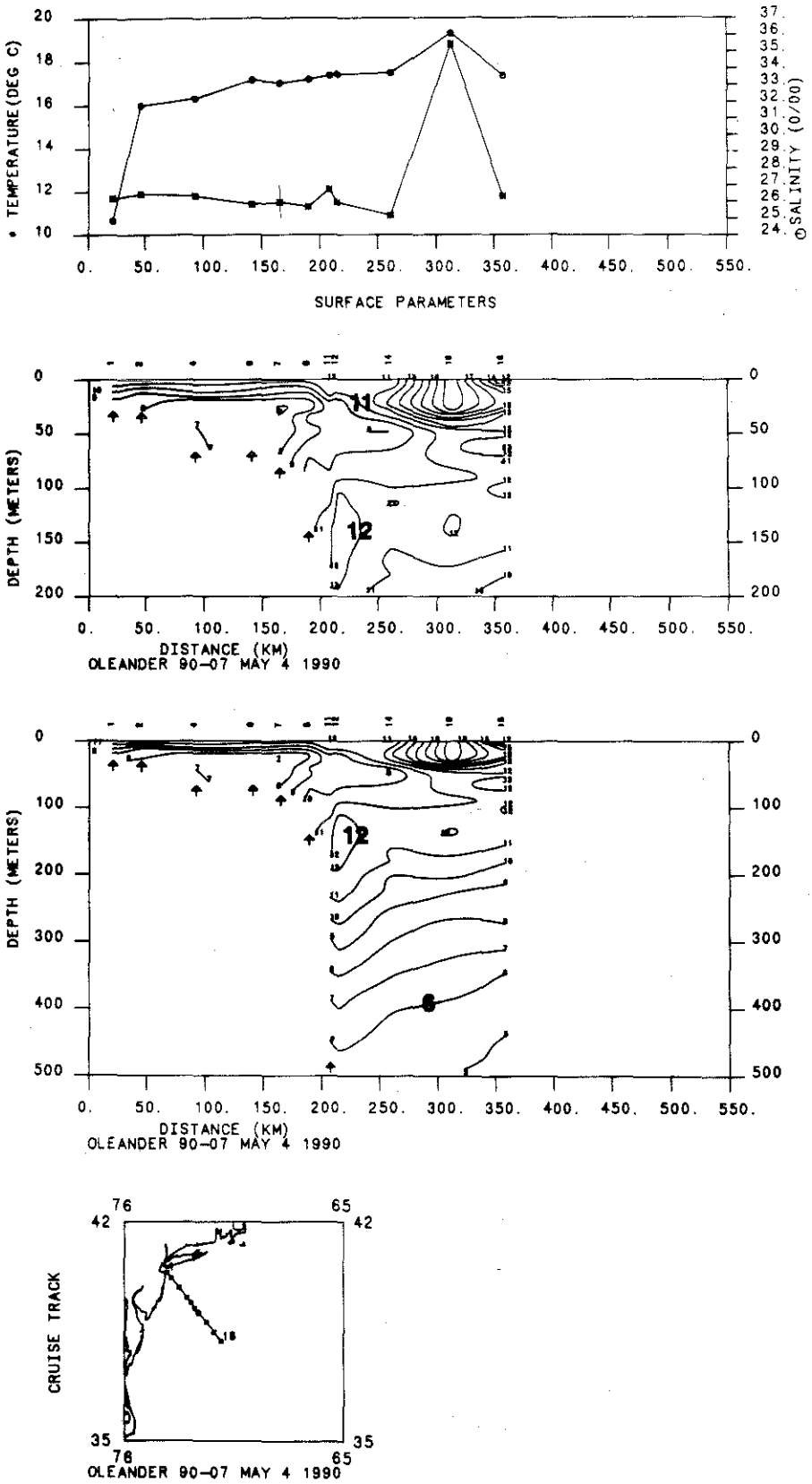


Figure 11. Vertical distribution of temperature in °C within the Middle Atlantic Bight, May 4, 1990.

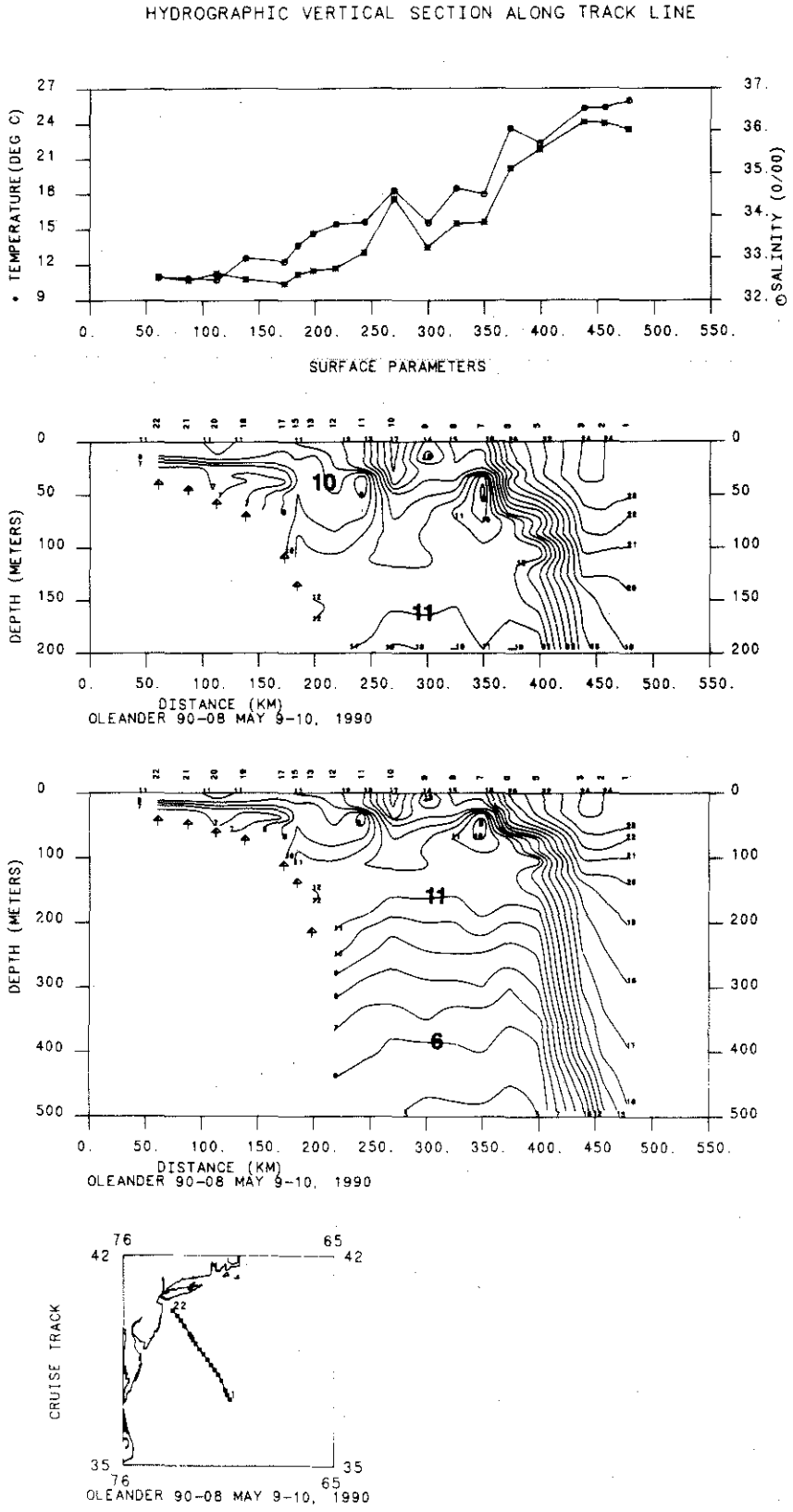


Figure 12. Vertical distribution of temperature in °C within the Middle Atlantic Bight, May 9-10, 1990.

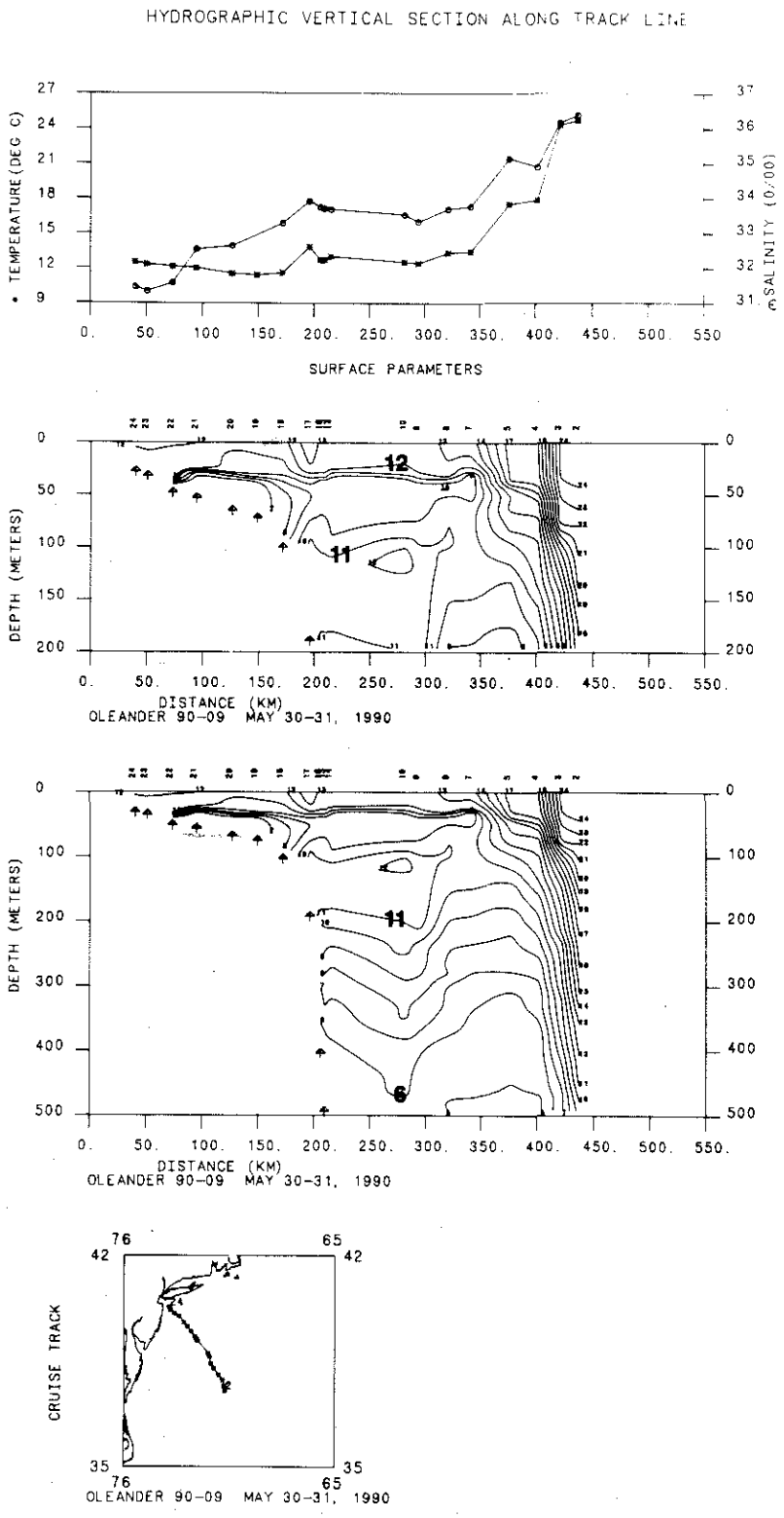


Figure 13. Vertical distribution of temperature in °C within the Middle Atlantic Bight, May 30-31, 1990.

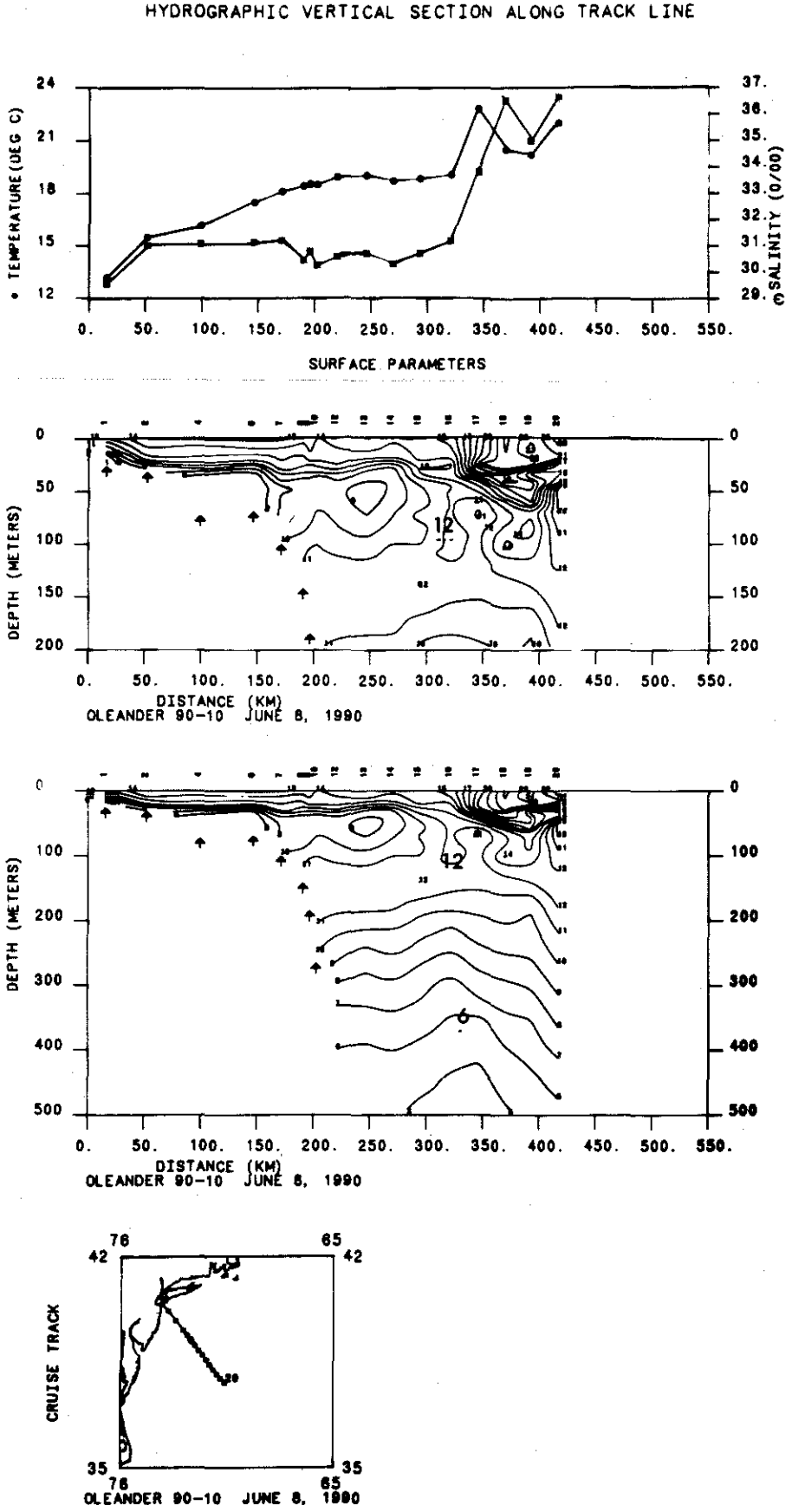


Figure 14. Vertical distribution of temperature in °C within the Middle Atlantic Bight, June 8, 1990.

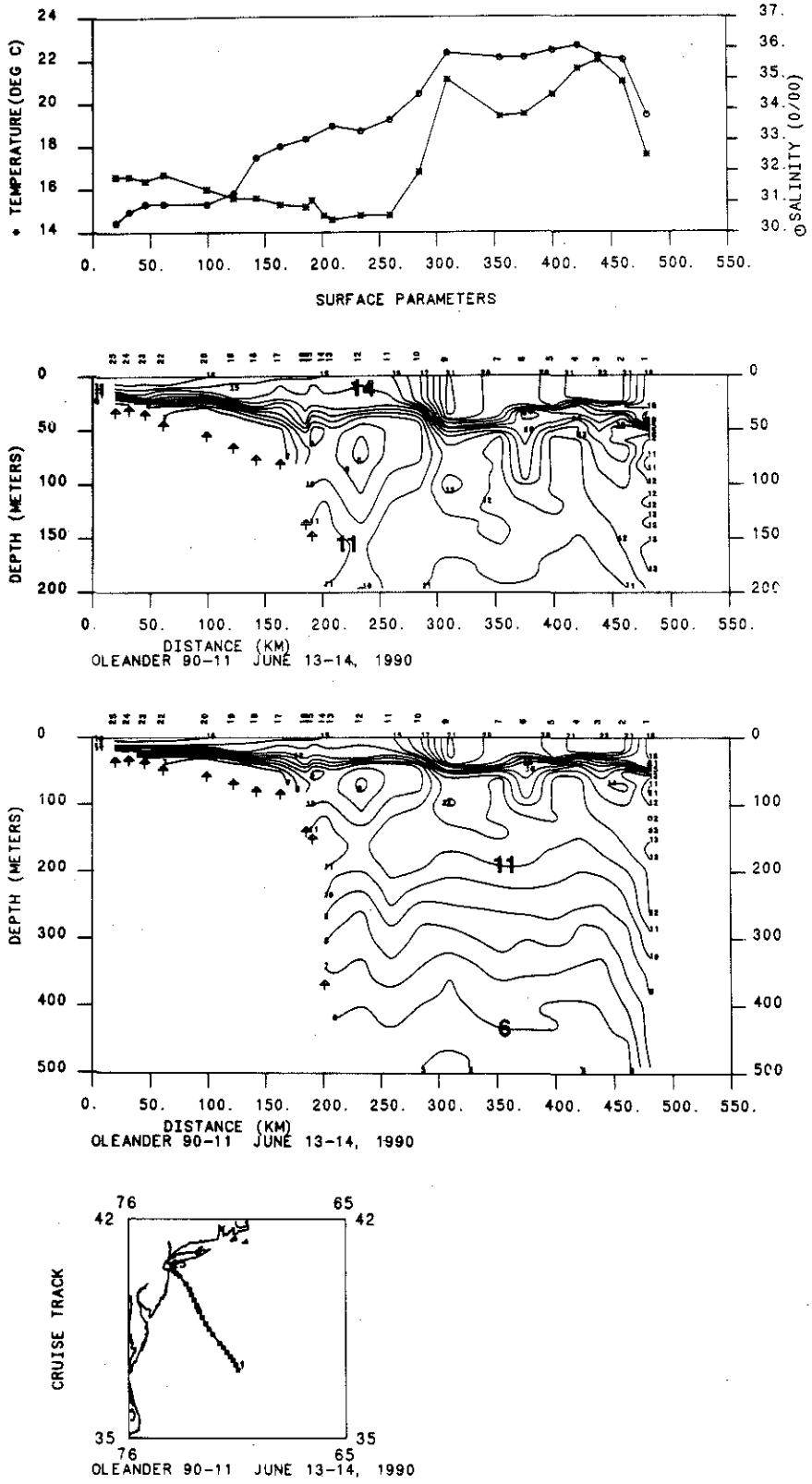


Figure 15. Vertical distribution of temperature in °C within the Middle Atlantic Bight, June 13-14, 1990.

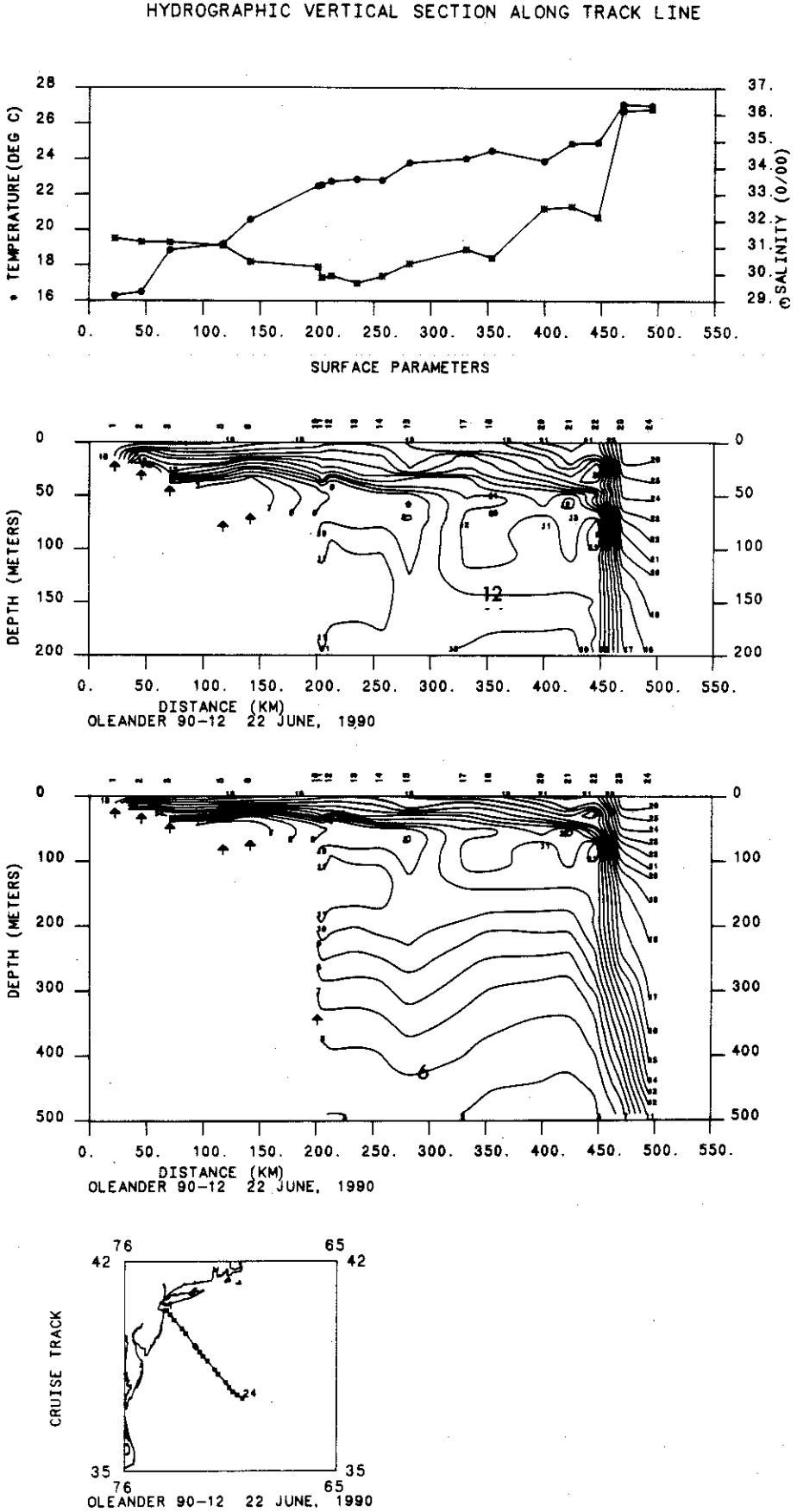


Figure 16. Vertical distribution of temperature in °C within the Middle Atlantic Bight, June 22, 1990.

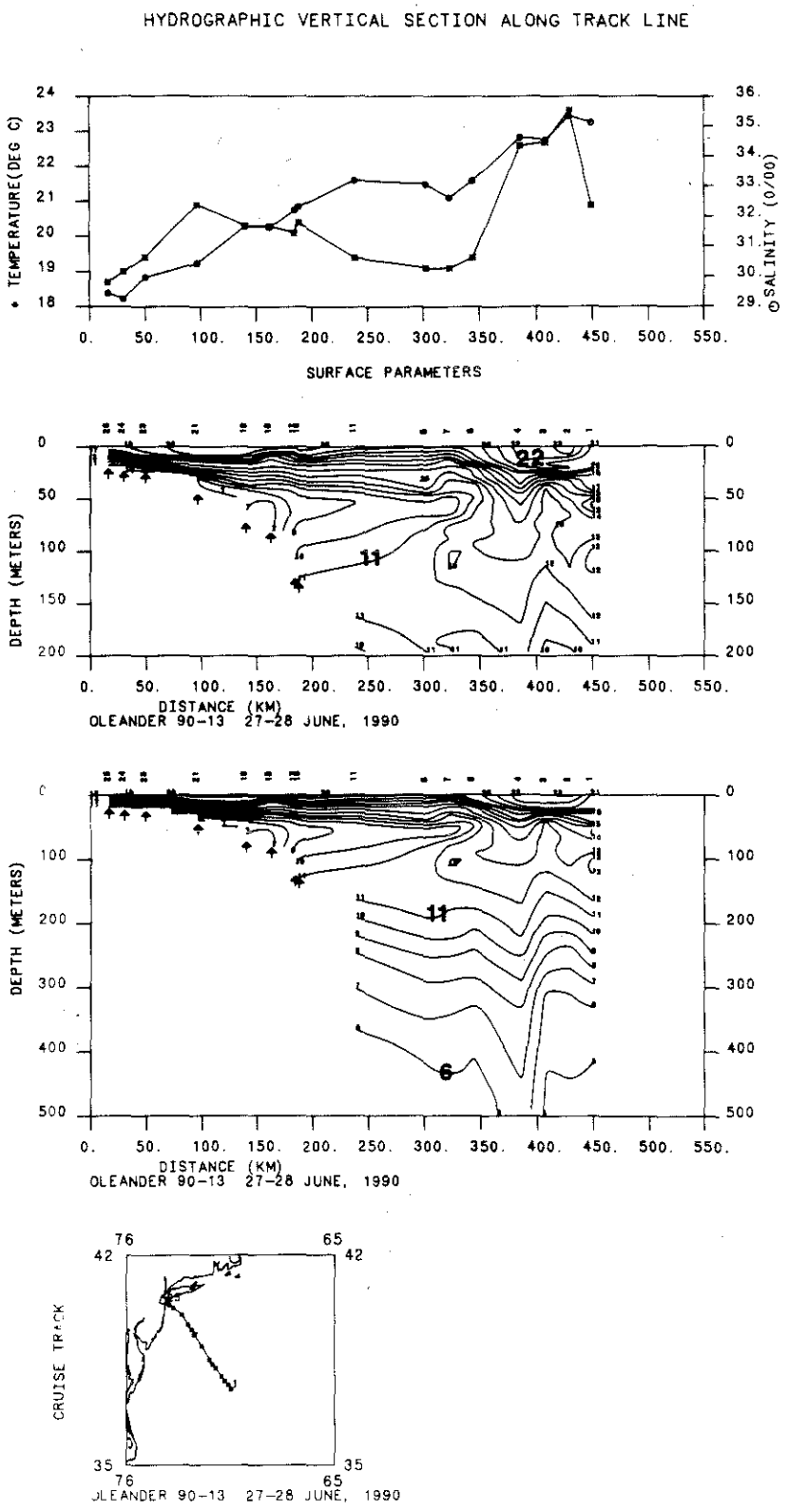


Figure 17. Vertical distribution of temperature in °C within the Middle Atlantic Bight, June 27-28, 1990.

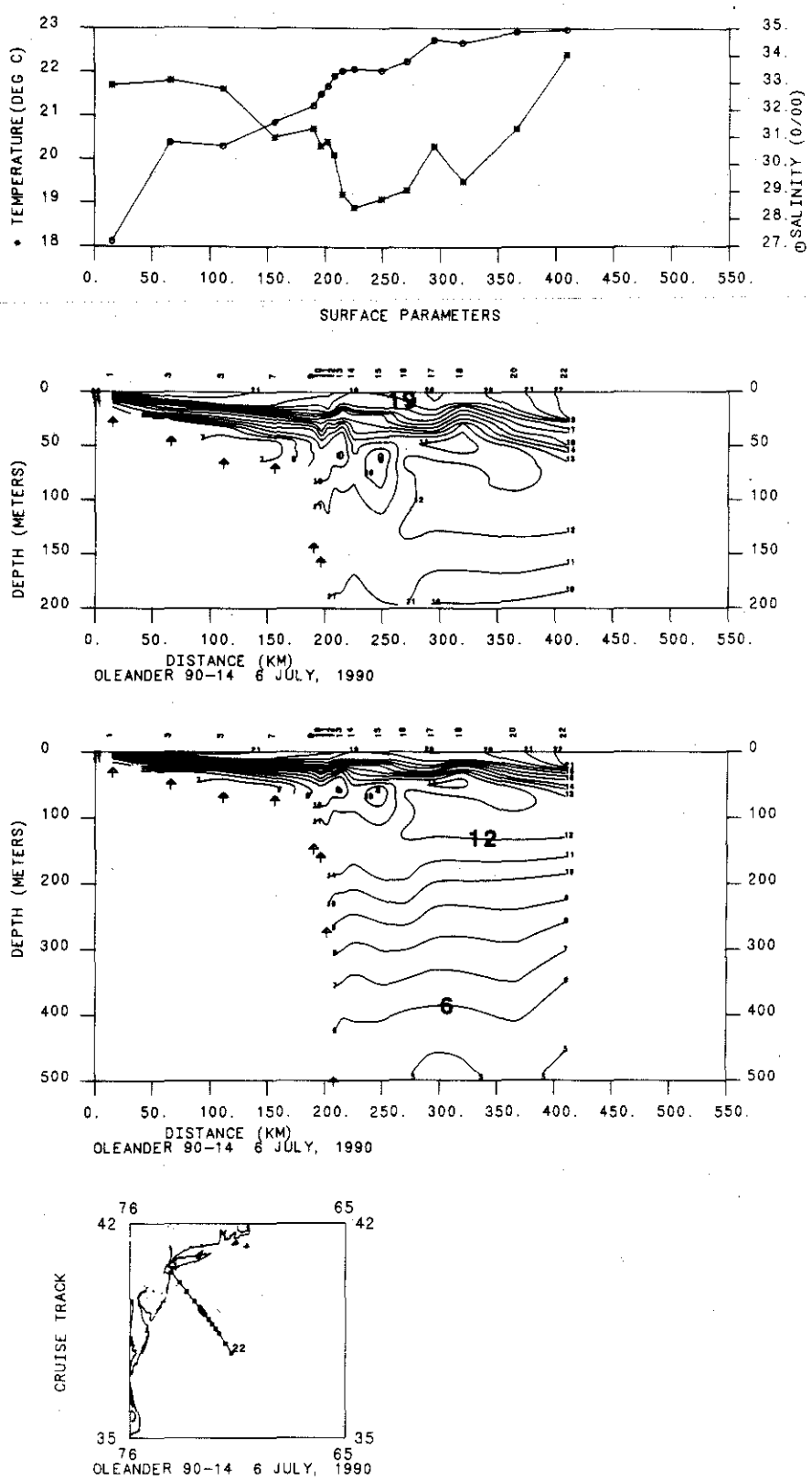


Figure 18. Vertical distribution of temperature in °C within the Middle Atlantic Bight, July 6, 1990.

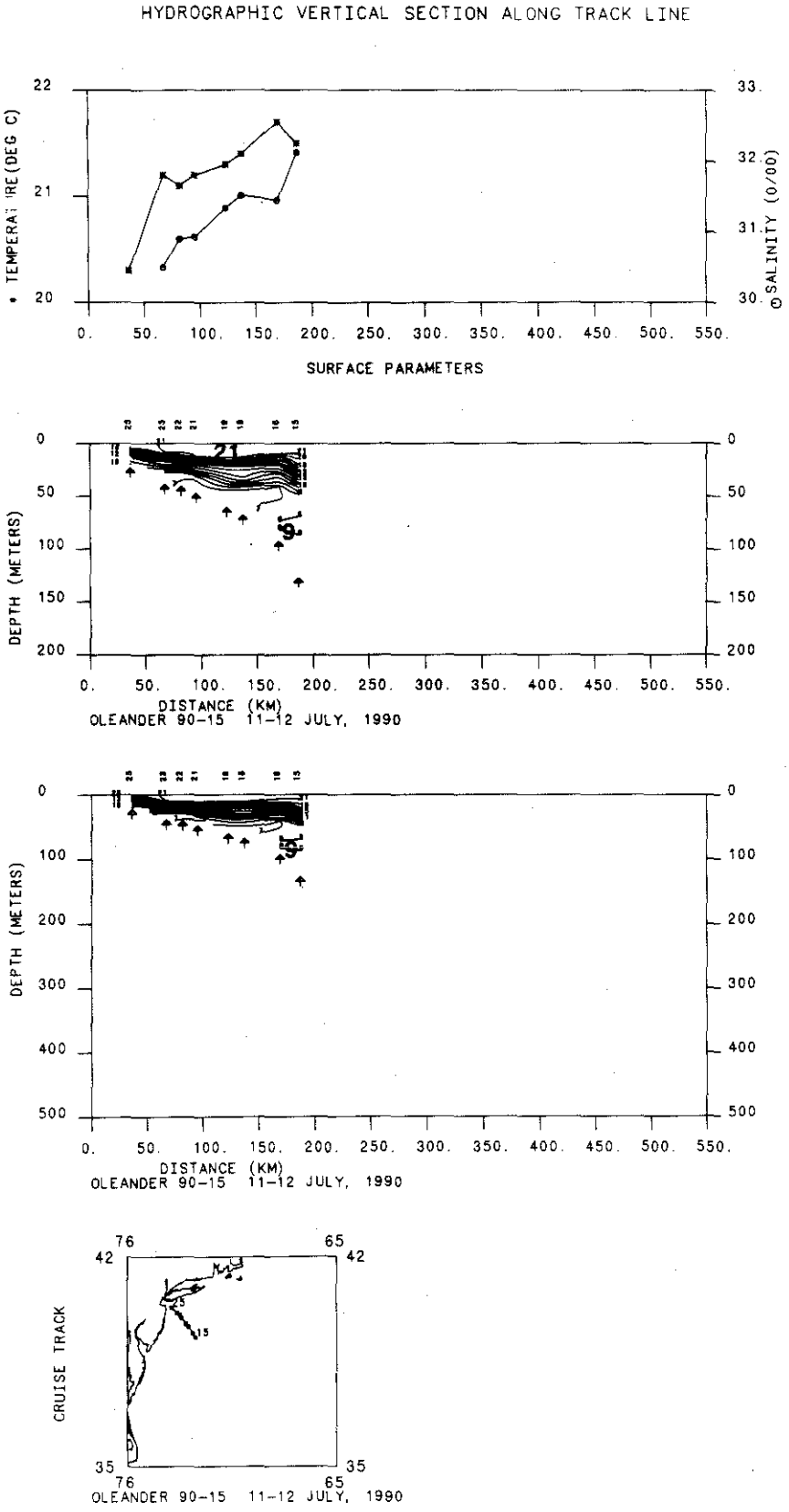


Figure 19. Vertical distribution of temperature in °C within the Middle Atlantic Bight, July 11-12, 1990.

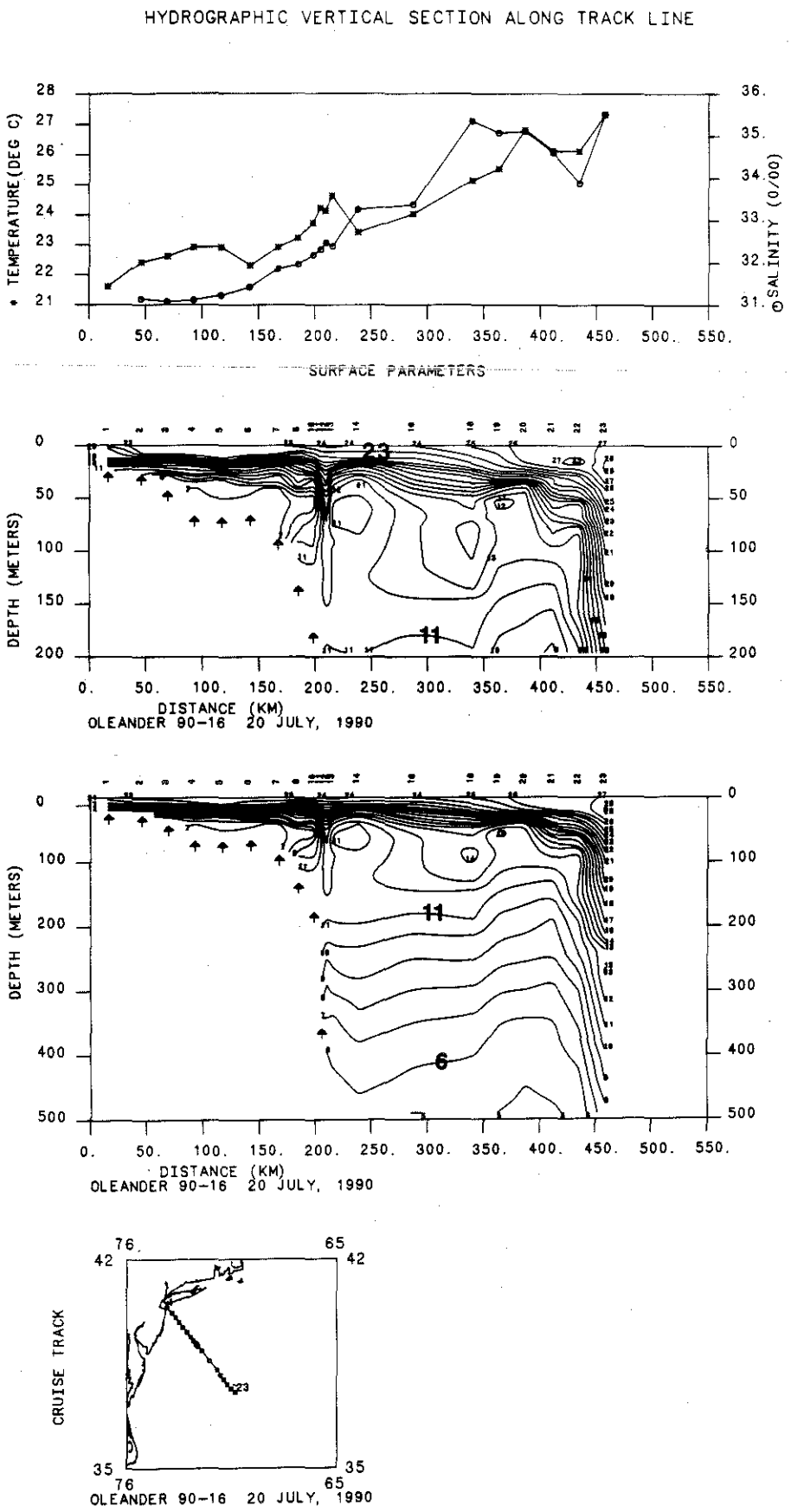


Figure 20. Vertical distribution of temperature in °C within the Middle Atlantic Bight, July 20, 1990.

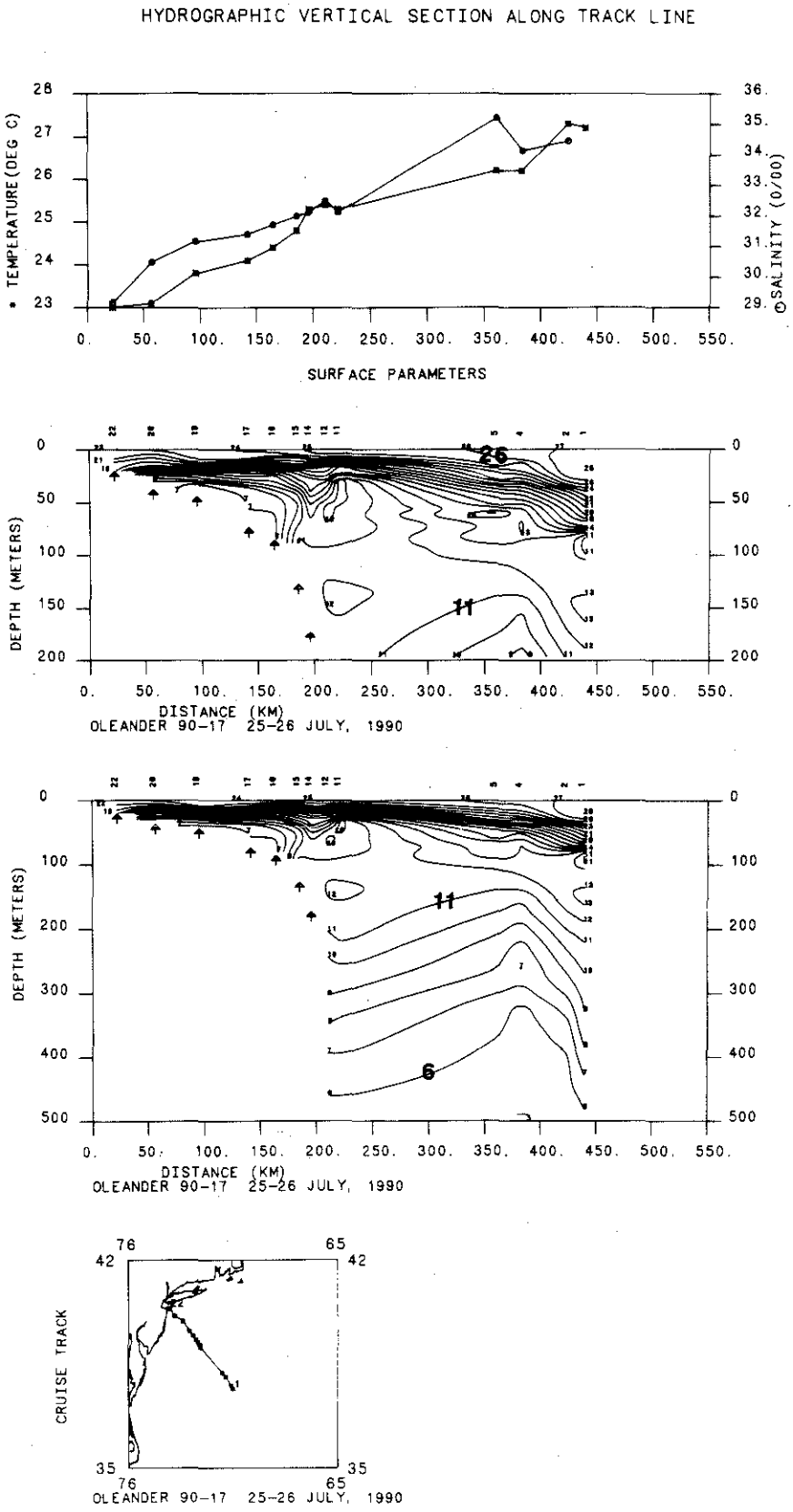


Figure 21. Vertical distribution of temperature in °C within the Middle Atlantic Bight, July 25-26, 1990.

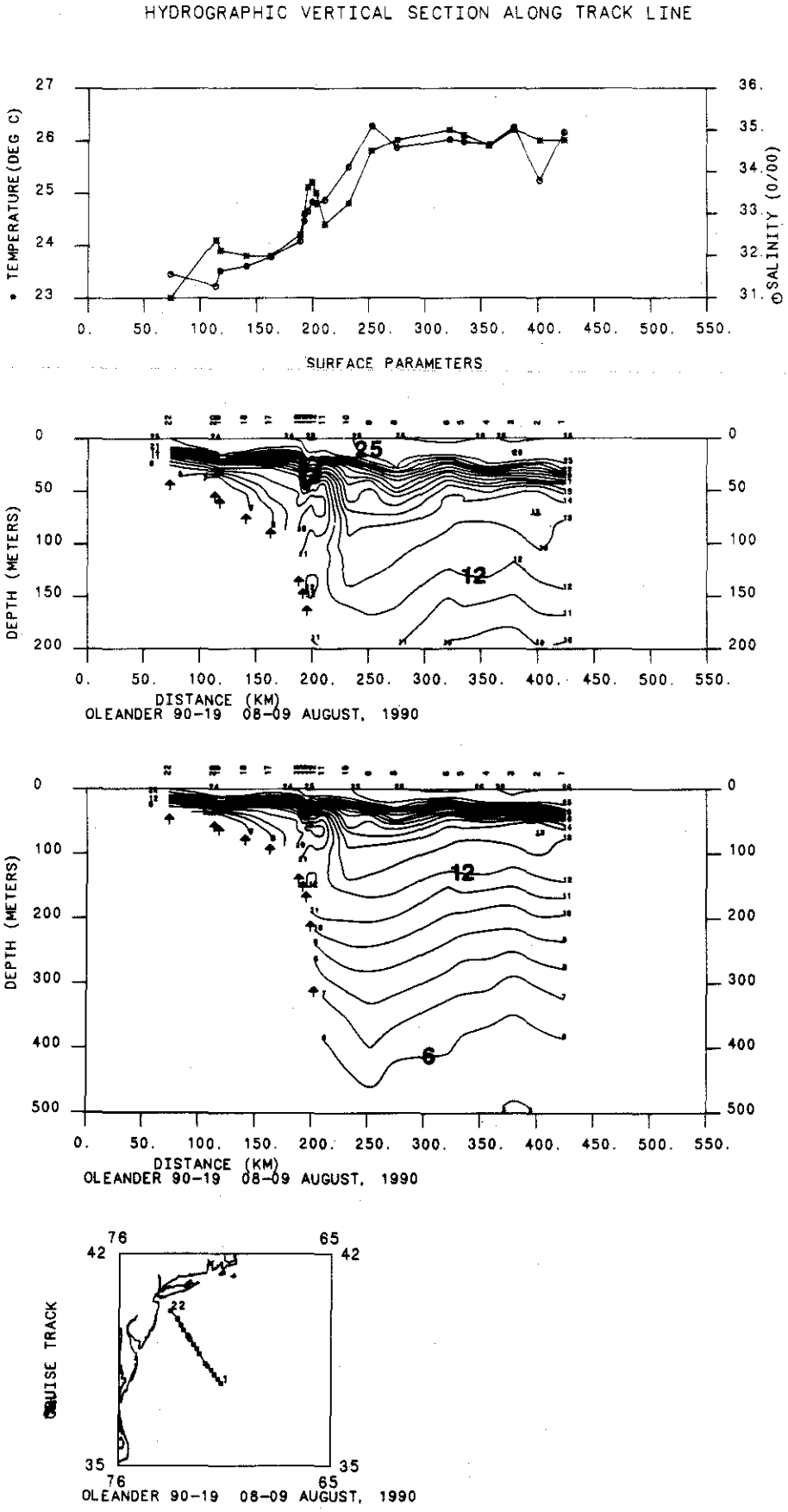


Figure 22. Vertical distribution of temperature in °C within the Middle Atlantic Bight, August 8-9, 1990.

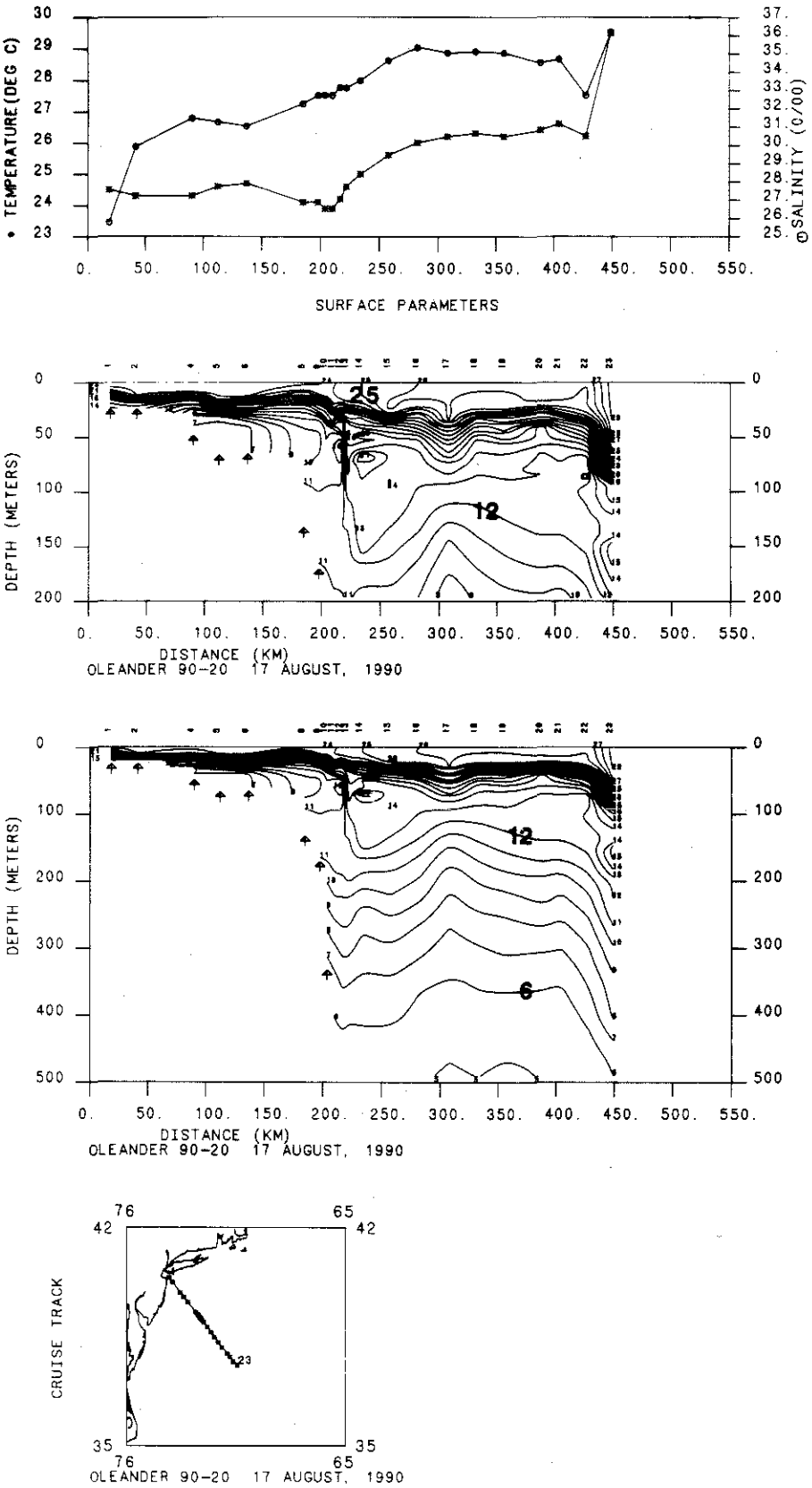


Figure 23. Vertical distribution of temperature in °C within the Middle Atlantic Bight, August 17, 1990.

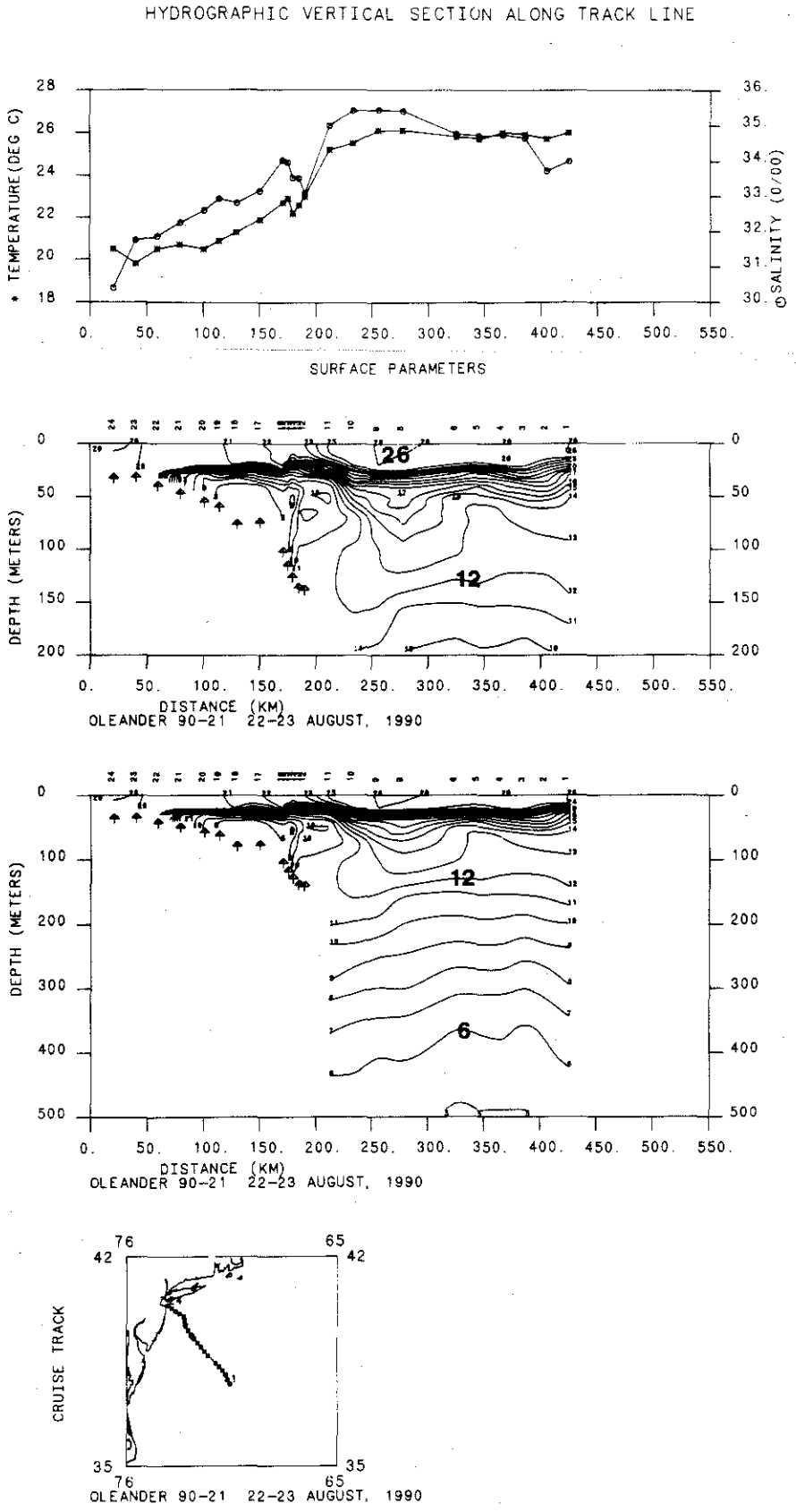


Figure 24. Vertical distribution of temperature in °C within the Middle Atlantic Bight, August 22-23, 1990.

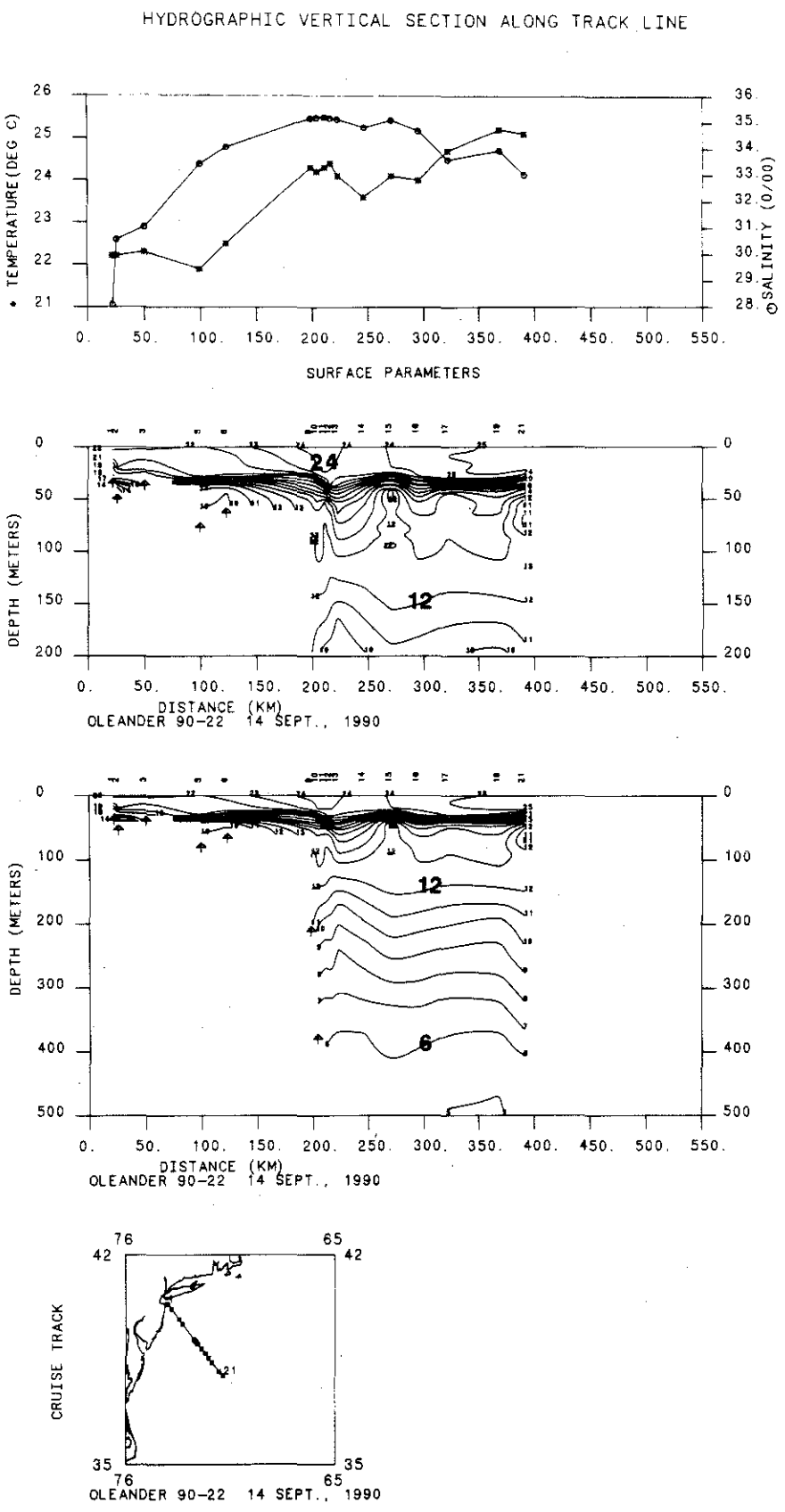


Figure 25. Vertical distribution of temperature in °C within the Middle Atlantic Bight, September 14, 1990.

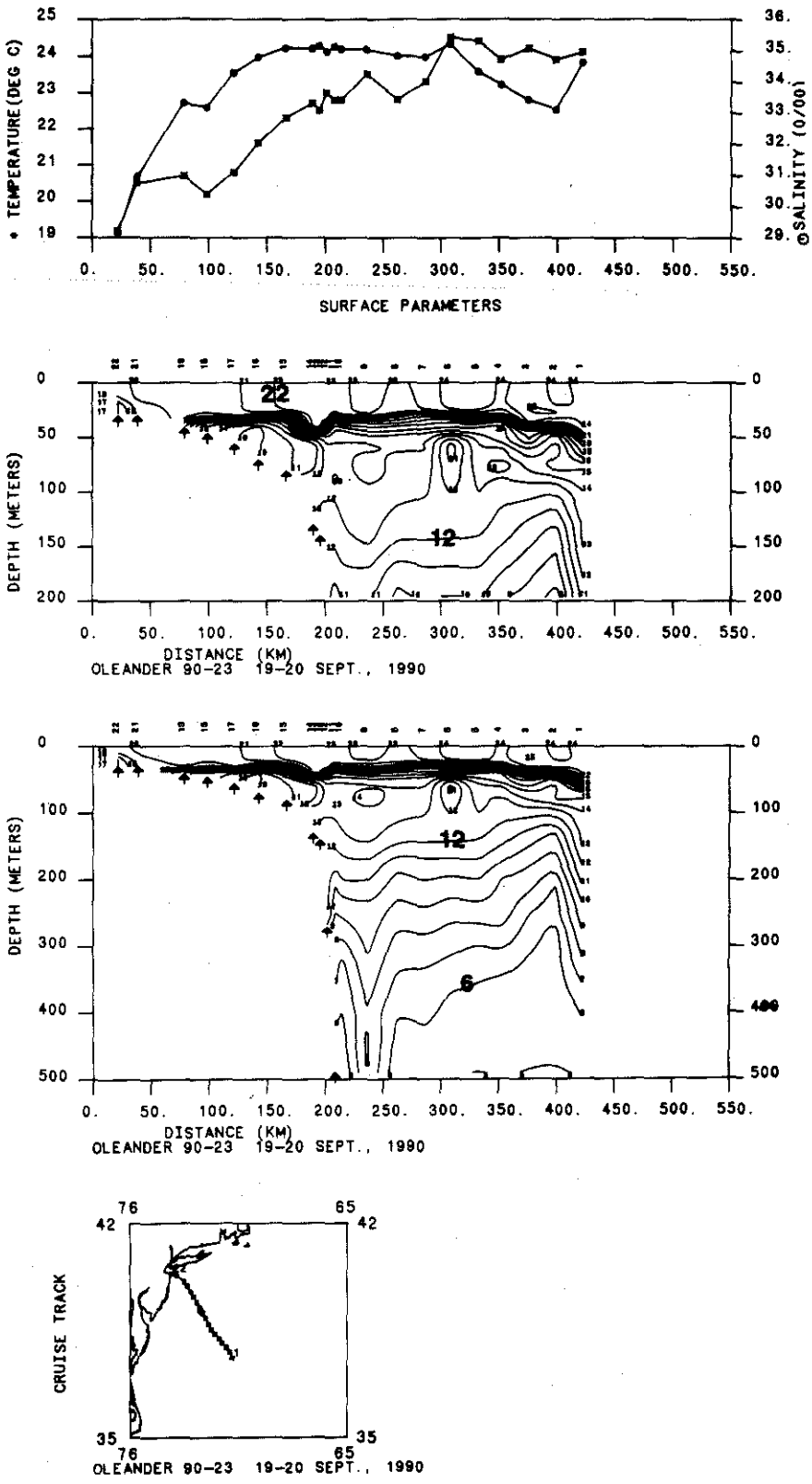


Figure 26. Vertical distribution of temperature in °C within the Middle Atlantic Bight, September 19-20, 1990.

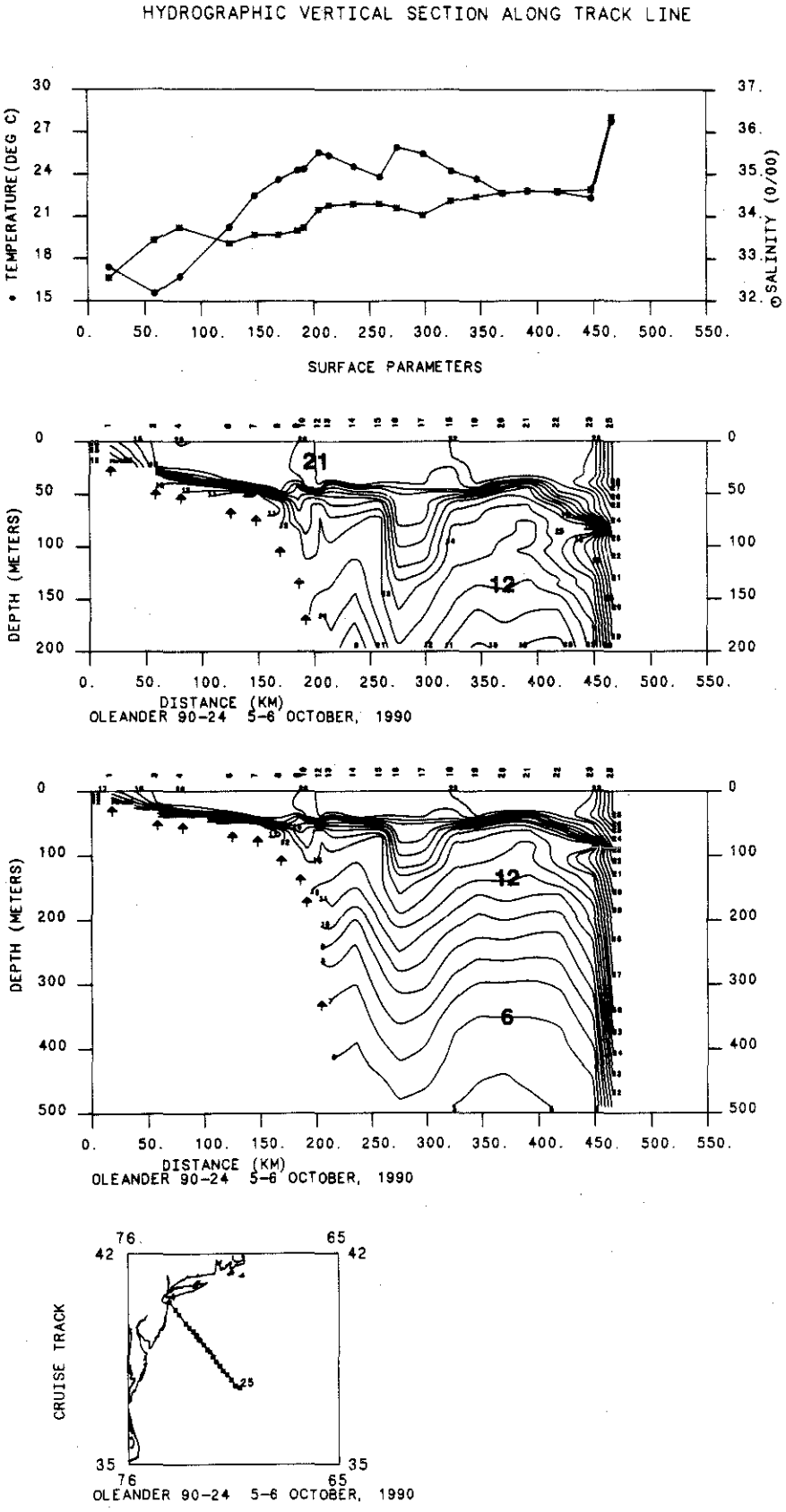


Figure 27. Vertical distribution of temperature in °C within the Middle Atlantic Bight, October 5-6, 1990.

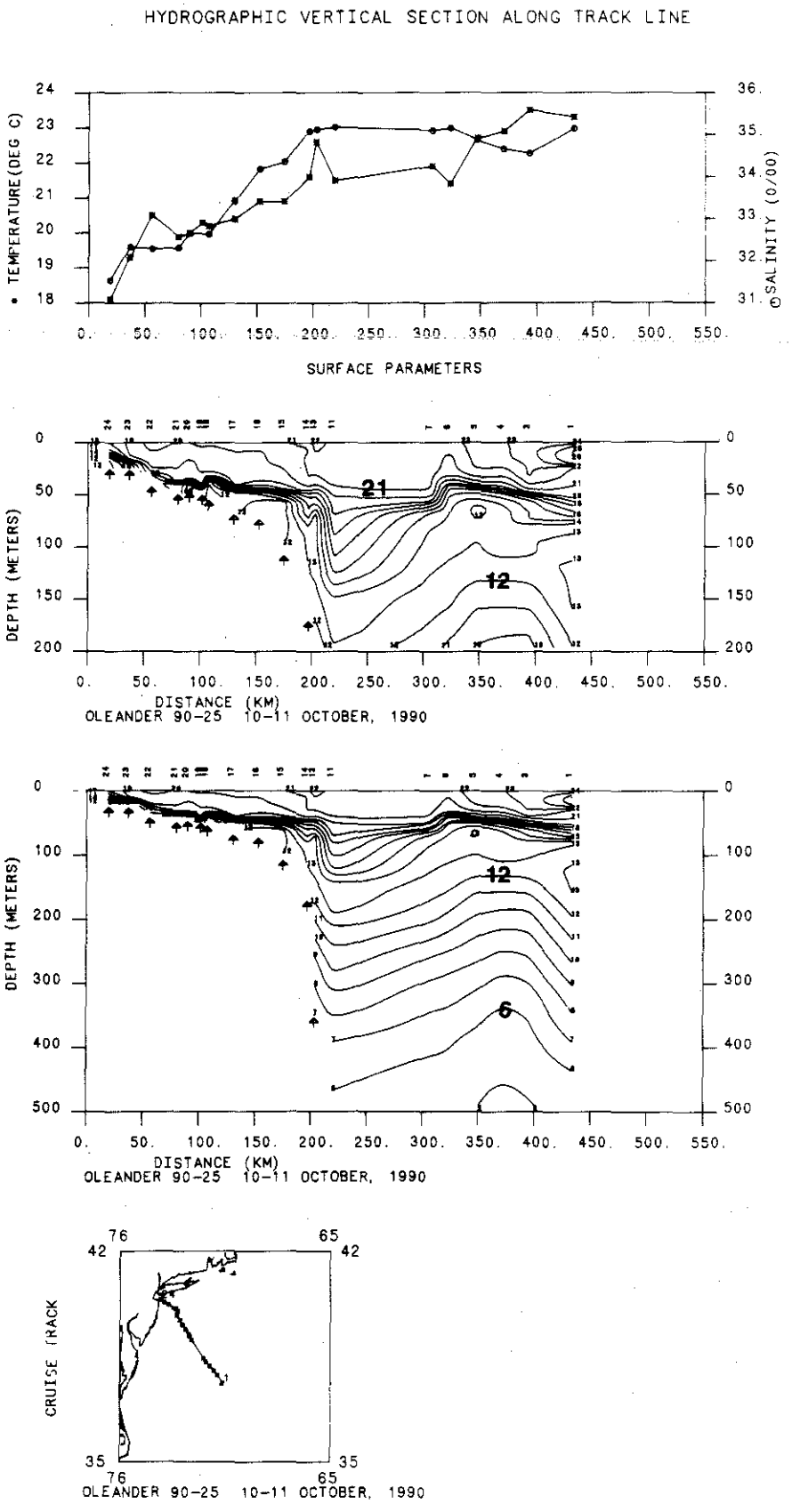


Figure 28. Vertical distribution of temperature in °C within the Middle Atlantic Bight, October 10-11, 1990.

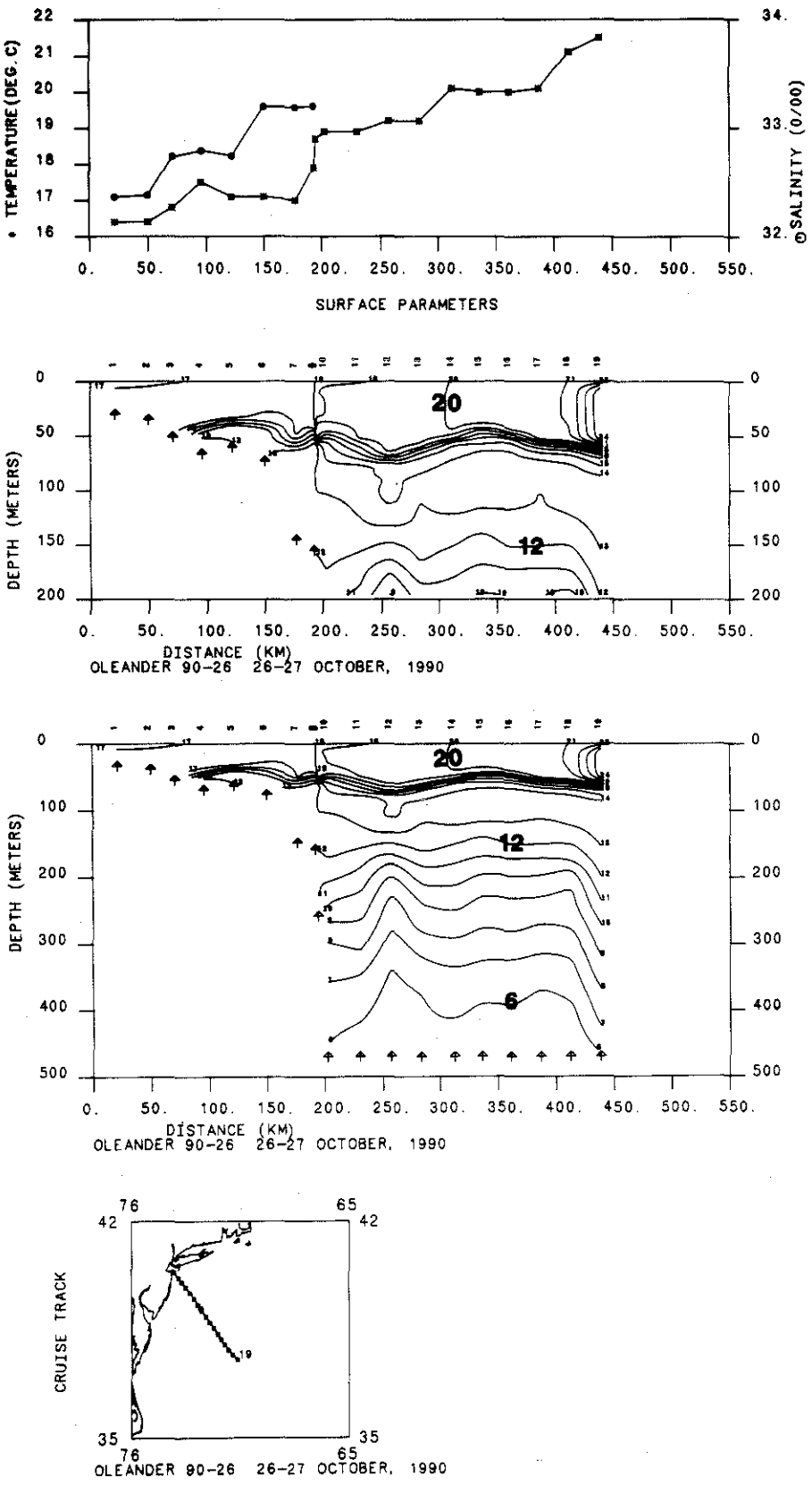


Figure 29. Vertical distribution of temperature in °C within the Middle Atlantic Bight, October 26-27, 1990.

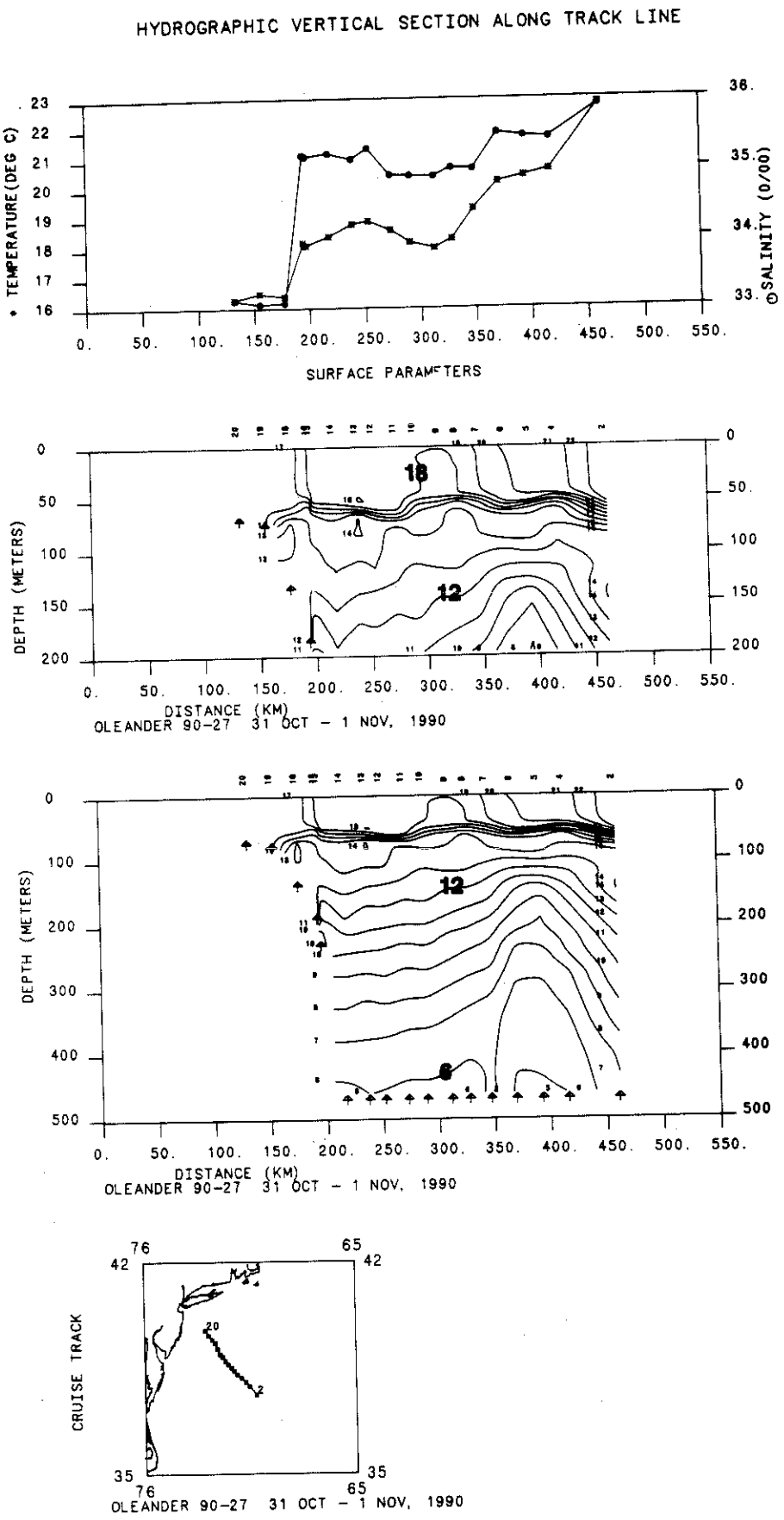


Figure 30. Vertical distribution of temperature in °C within the Middle Atlantic Bight, October 31-November 1, 1990.

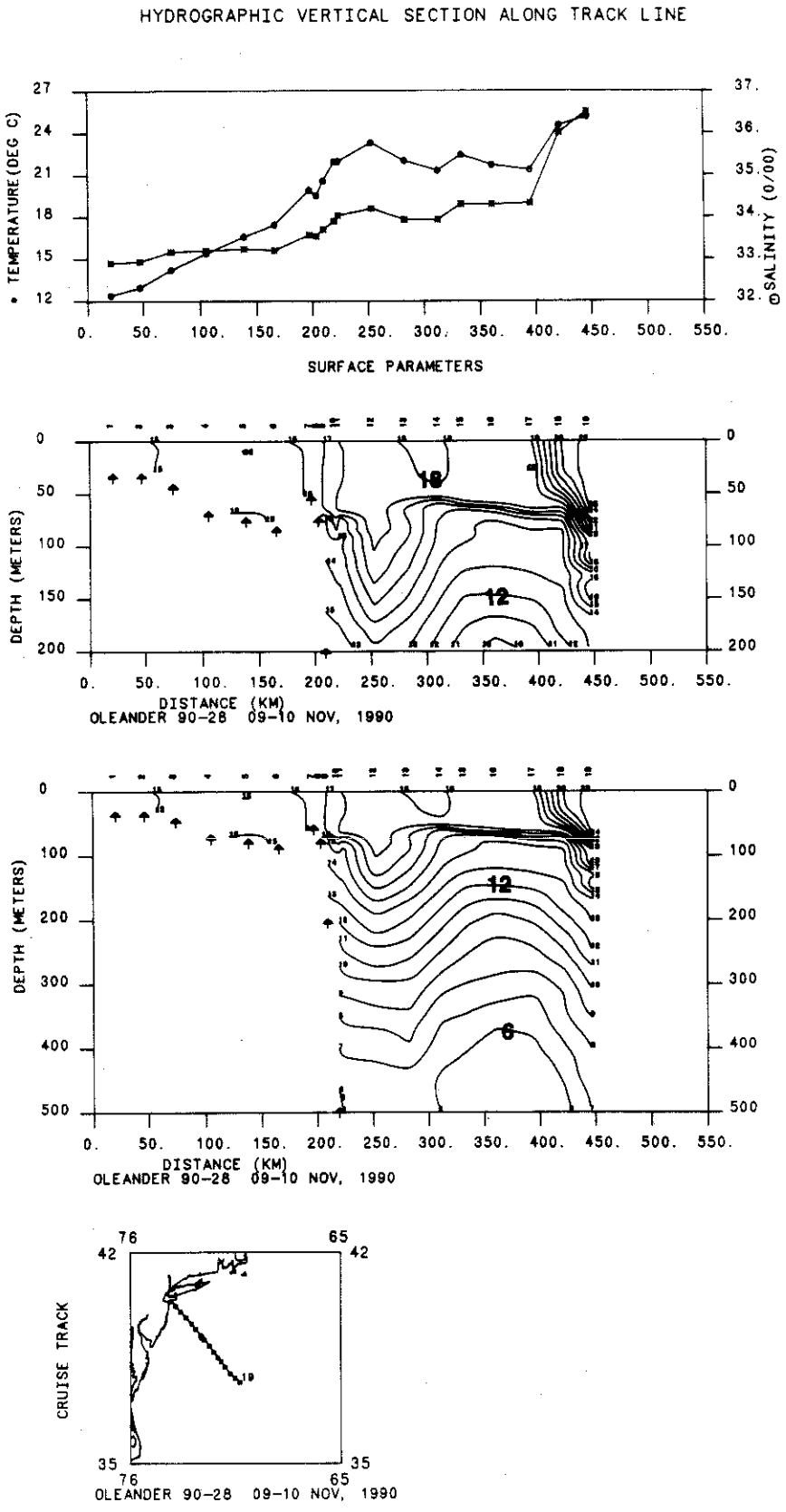


Figure 31. Vertical distribution of temperature in °C within the Middle Atlantic Bight, November 9-10, 1990.

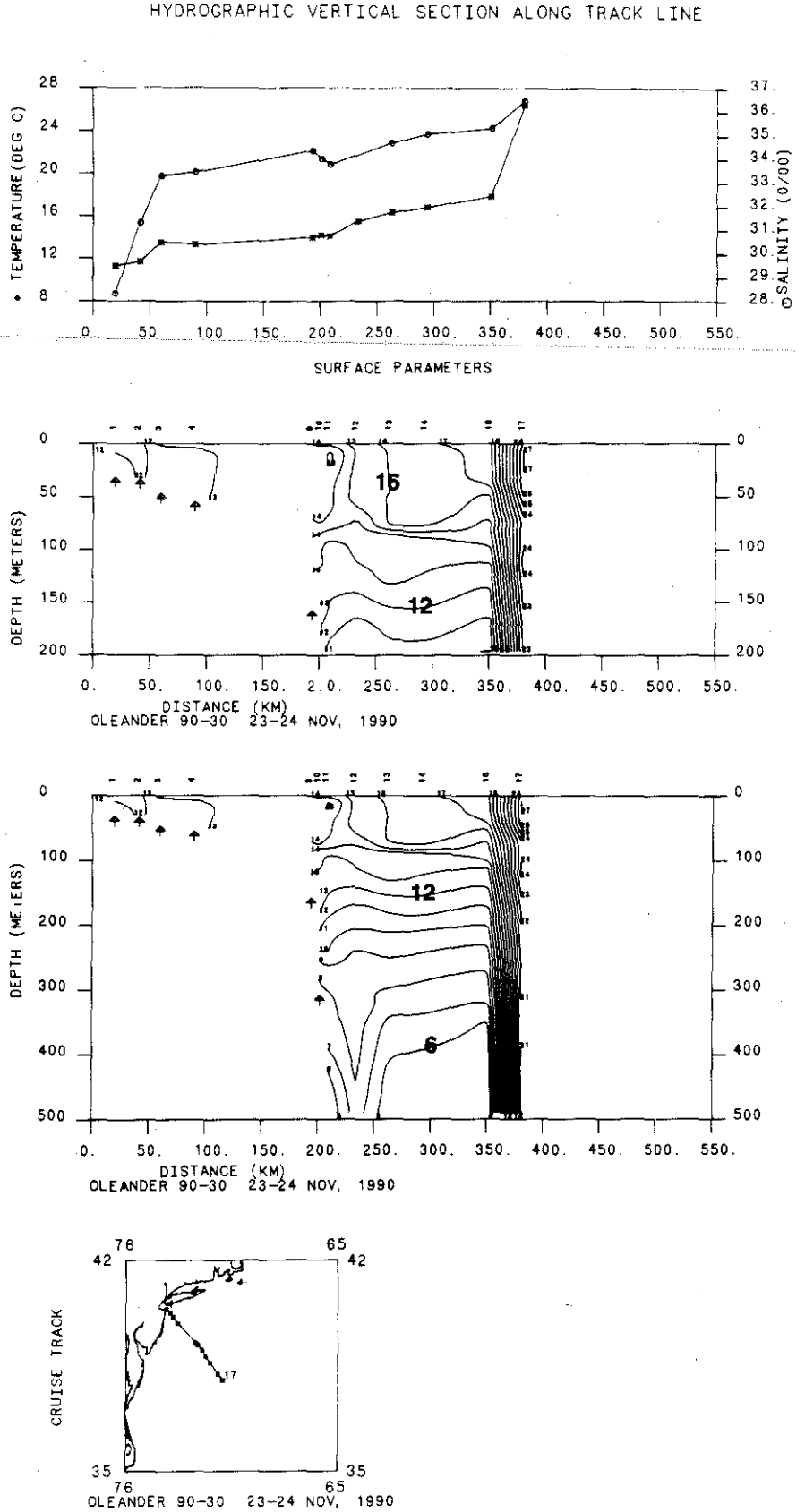


Figure 32. Vertical distribution of temperature in °C within the Middle Atlantic Bight, November 23-24, 1990.

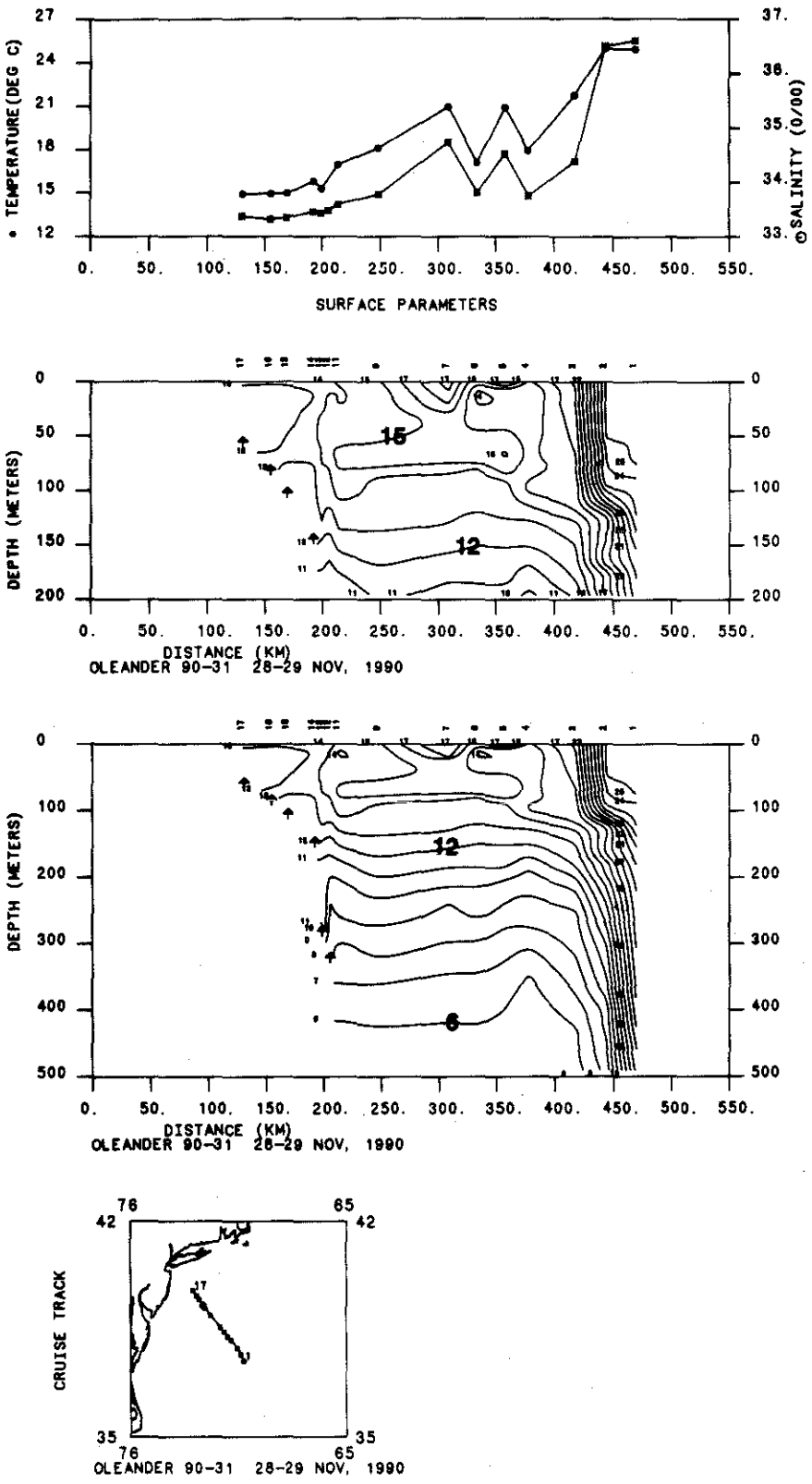


Figure 33. Vertical distribution of temperature in °C within the Middle Atlantic Bight, November 28-29, 1990.

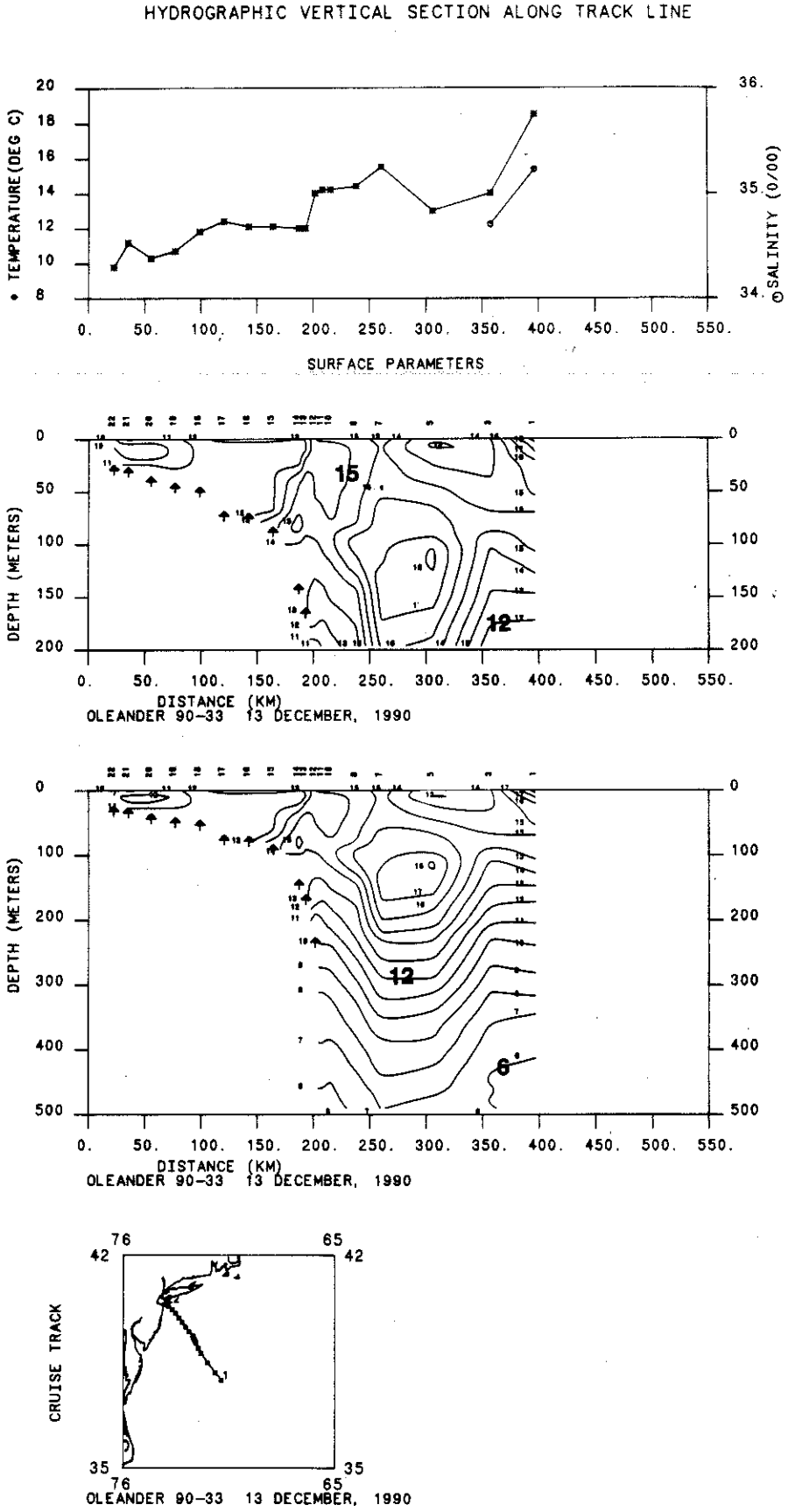


Figure 34. Vertical distribution of temperature in °C within the Middle Atlantic Bight, December 13, 1990.

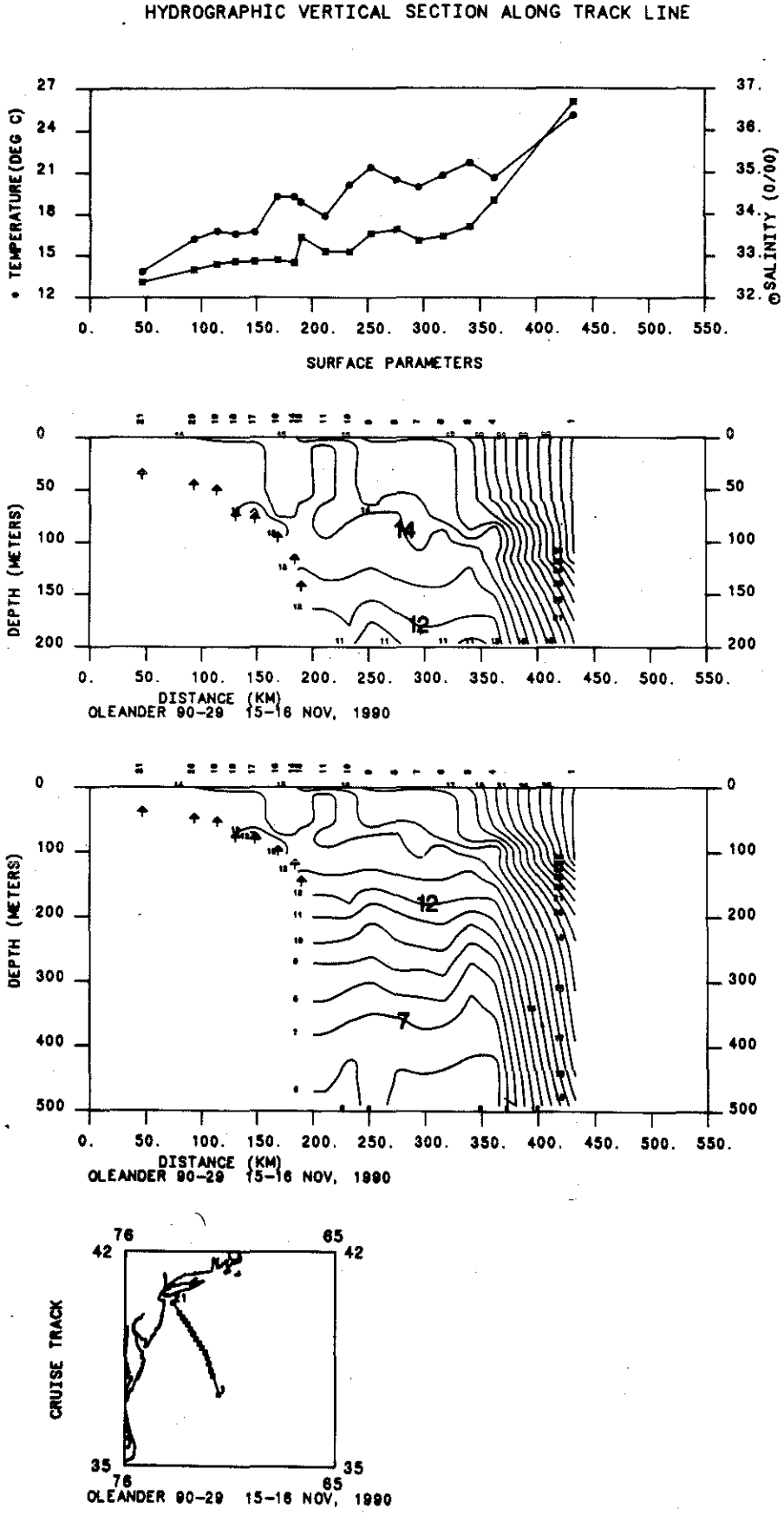


Figure 35. Vertical distribution of temperature in °C within the Middle Atlantic Bight, November 15-16, 1990.

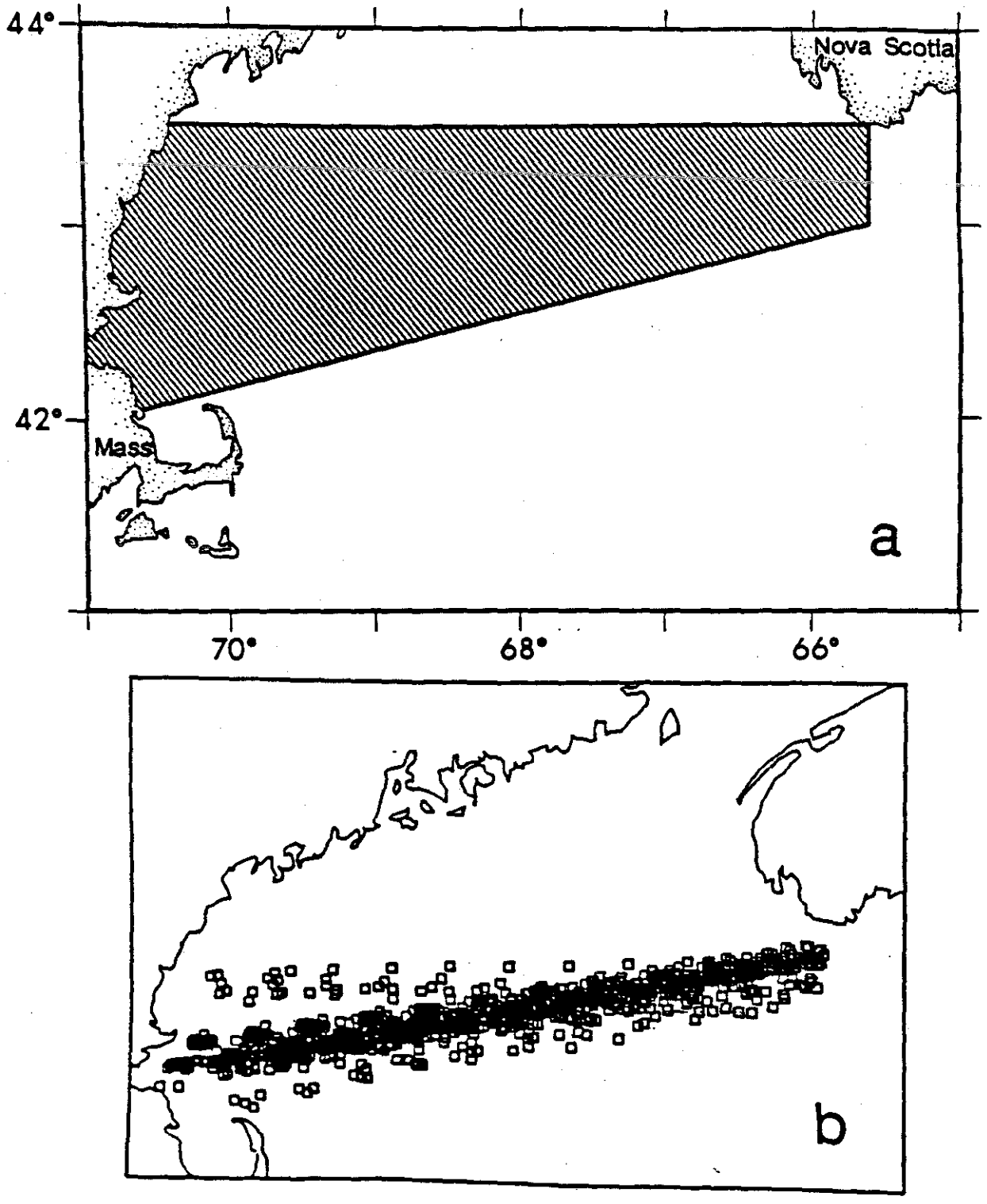


Figure 36. Transect envelope (a) and data density plot (b) from NMFS Ship of Opportunity Program, Route MC (Gulf of Maine), 1961-present.

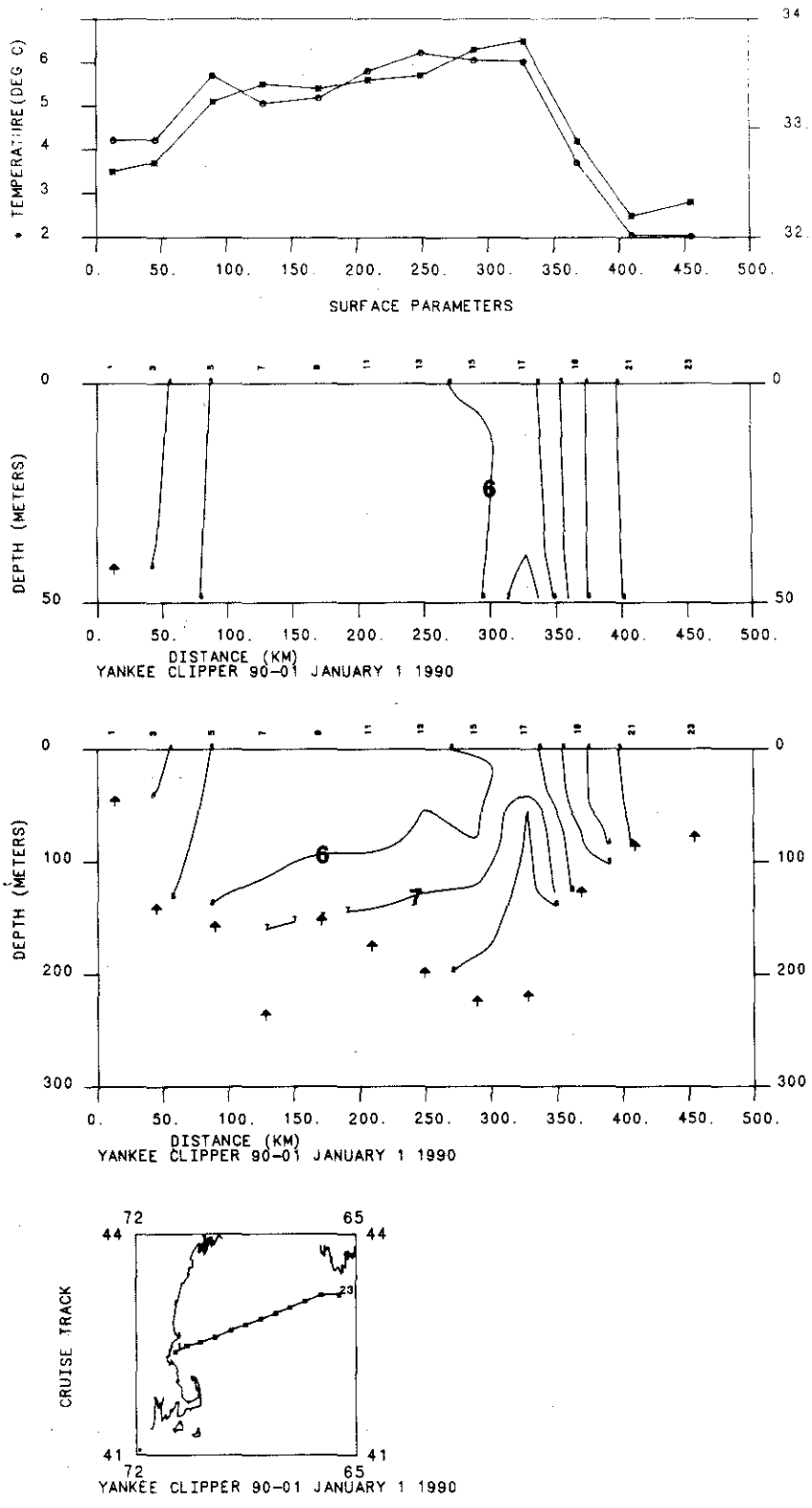


Figure 37. Vertical distribution of temperature in °C within the Gulf of Maine January 1, 1990.

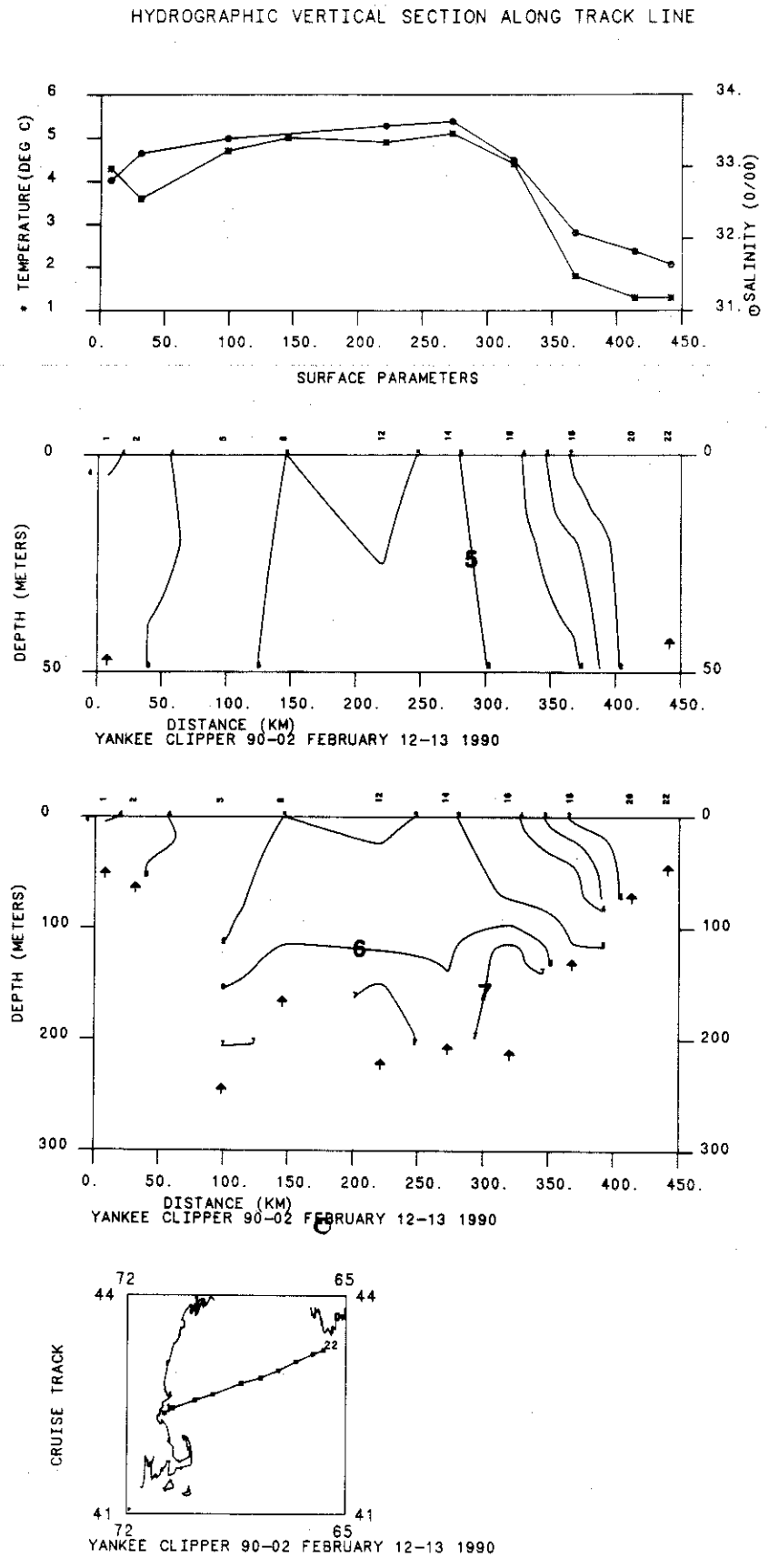


Figure 38. Vertical distribution of temperature in °C within the Gulf of Maine February 12-13, 1990.

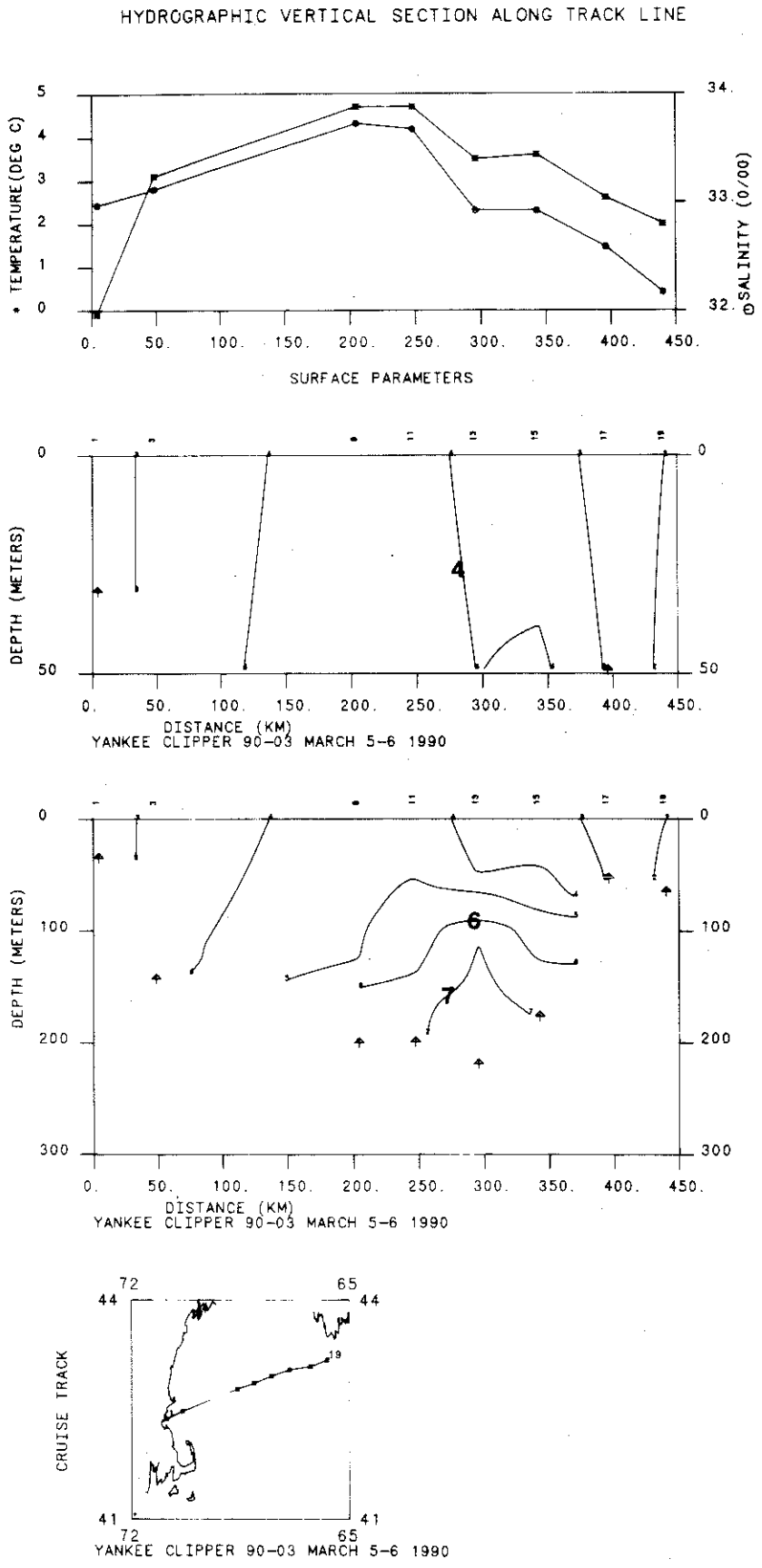


Figure 39. Vertical distribution of temperature in °C within the Gulf of Maine March 5-6, 1990.

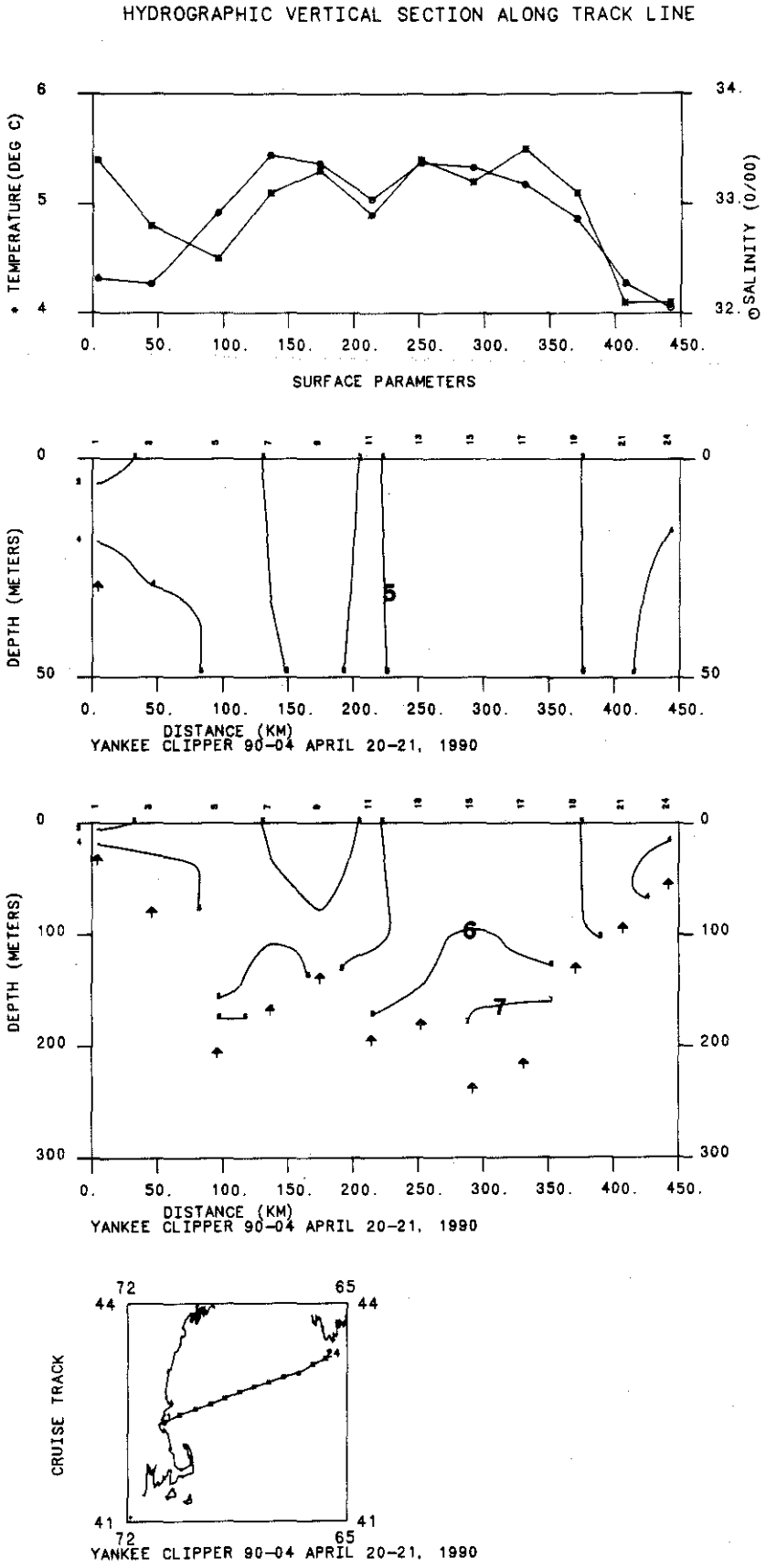
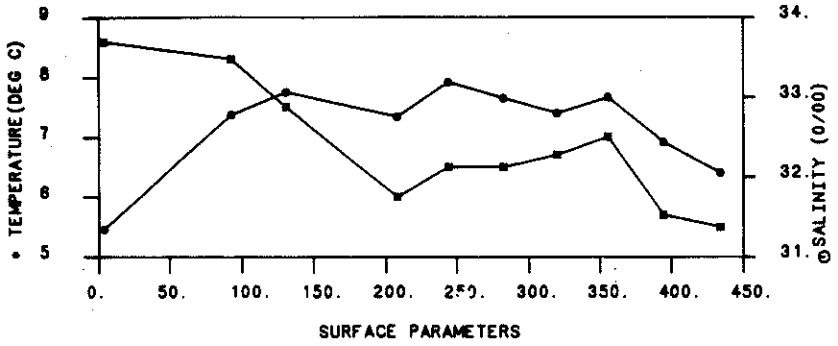
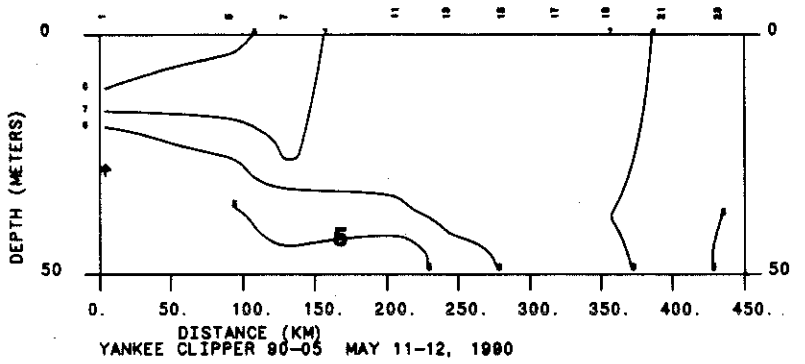
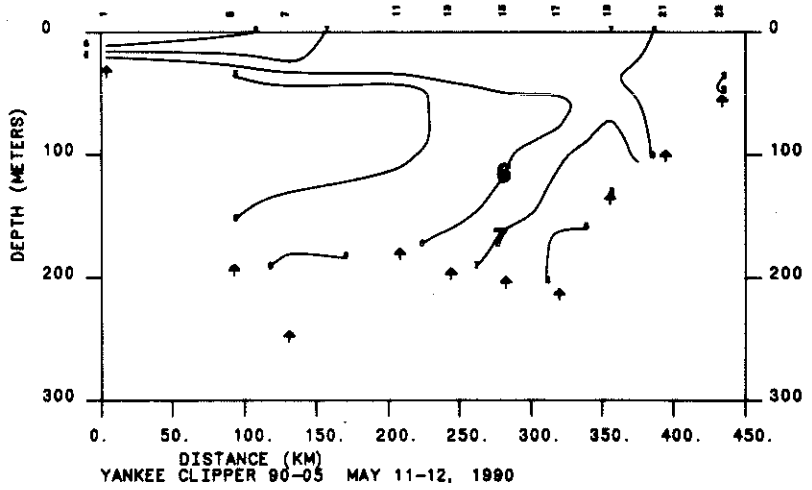


Figure 40. Vertical distribution of temperature in °C within the Gulf of Maine April 20-21, 1990.







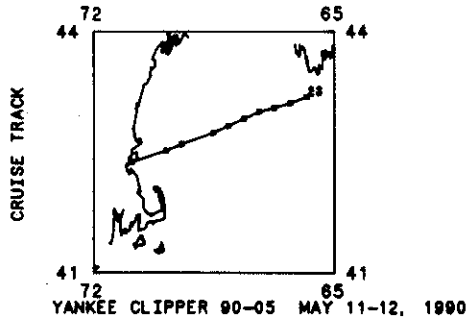


Figure 41. Vertical distribution of temperature in °C within the Gulf of Maine May 11-12, 1990.

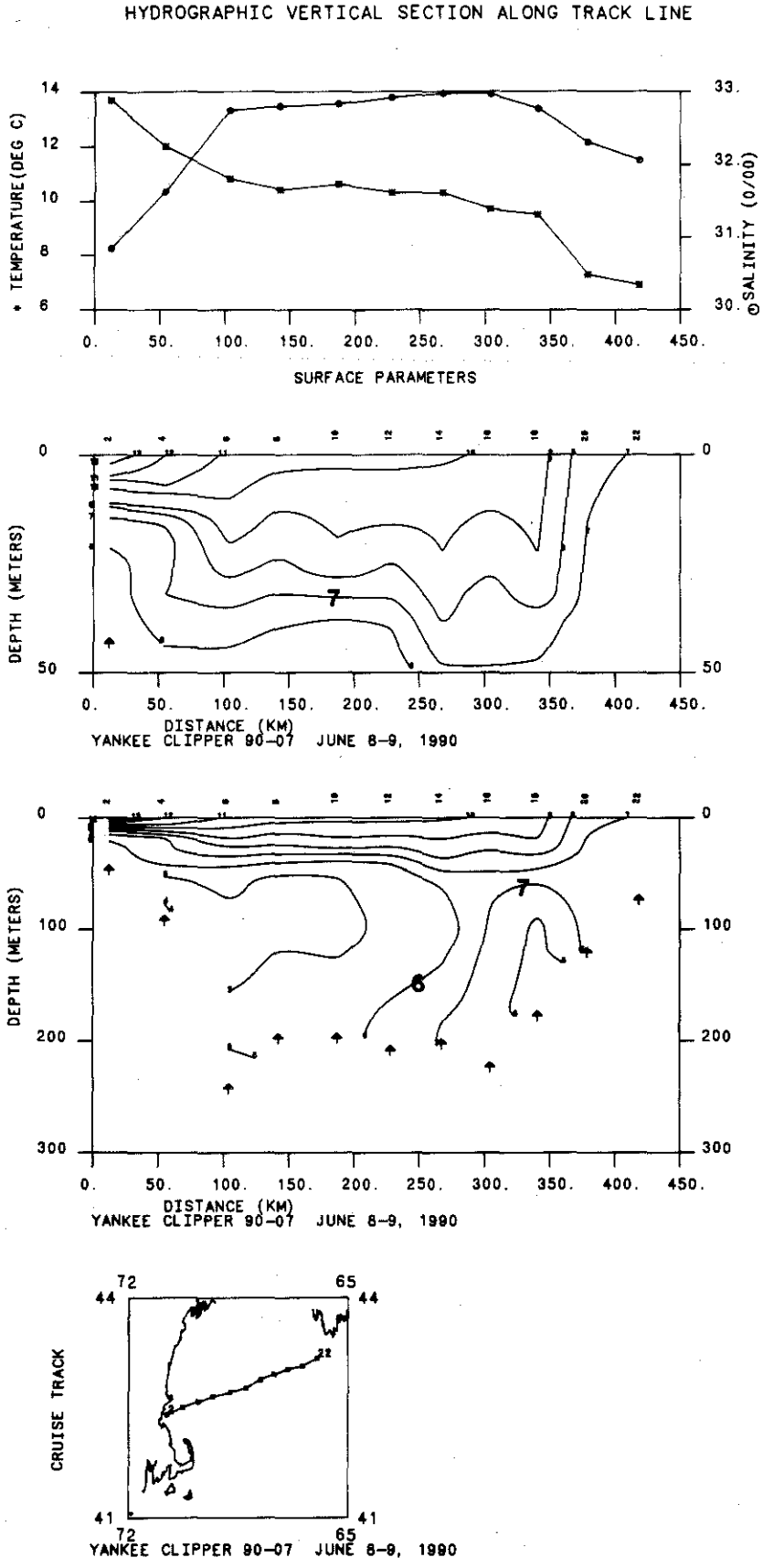


Figure 42. Vertical distribution of temperature in °C within the Gulf of Maine June 8-9, 1990.

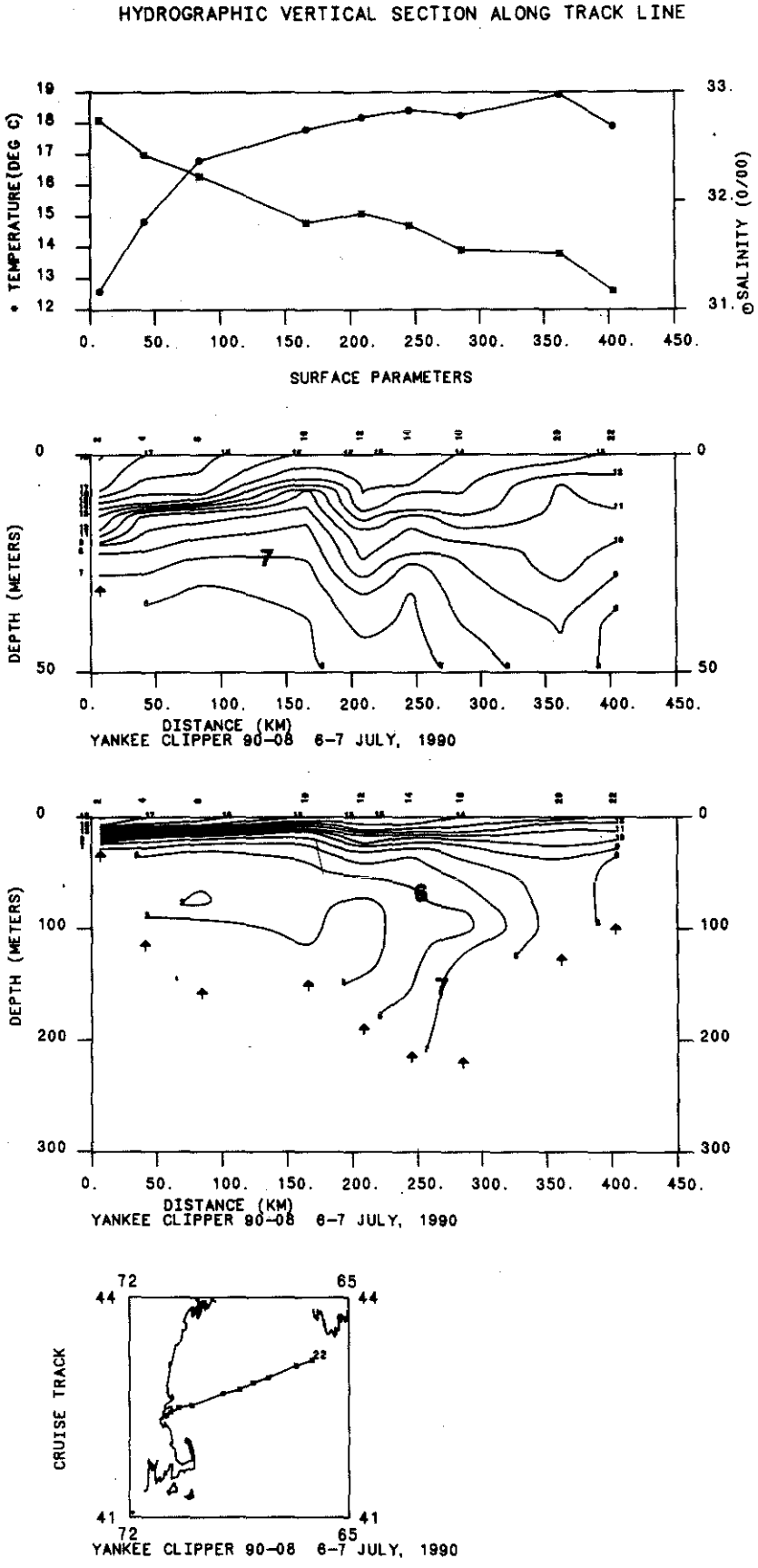


Figure 43. Vertical distribution of temperature in °C within the Gulf of Maine July 6-7, 1990.

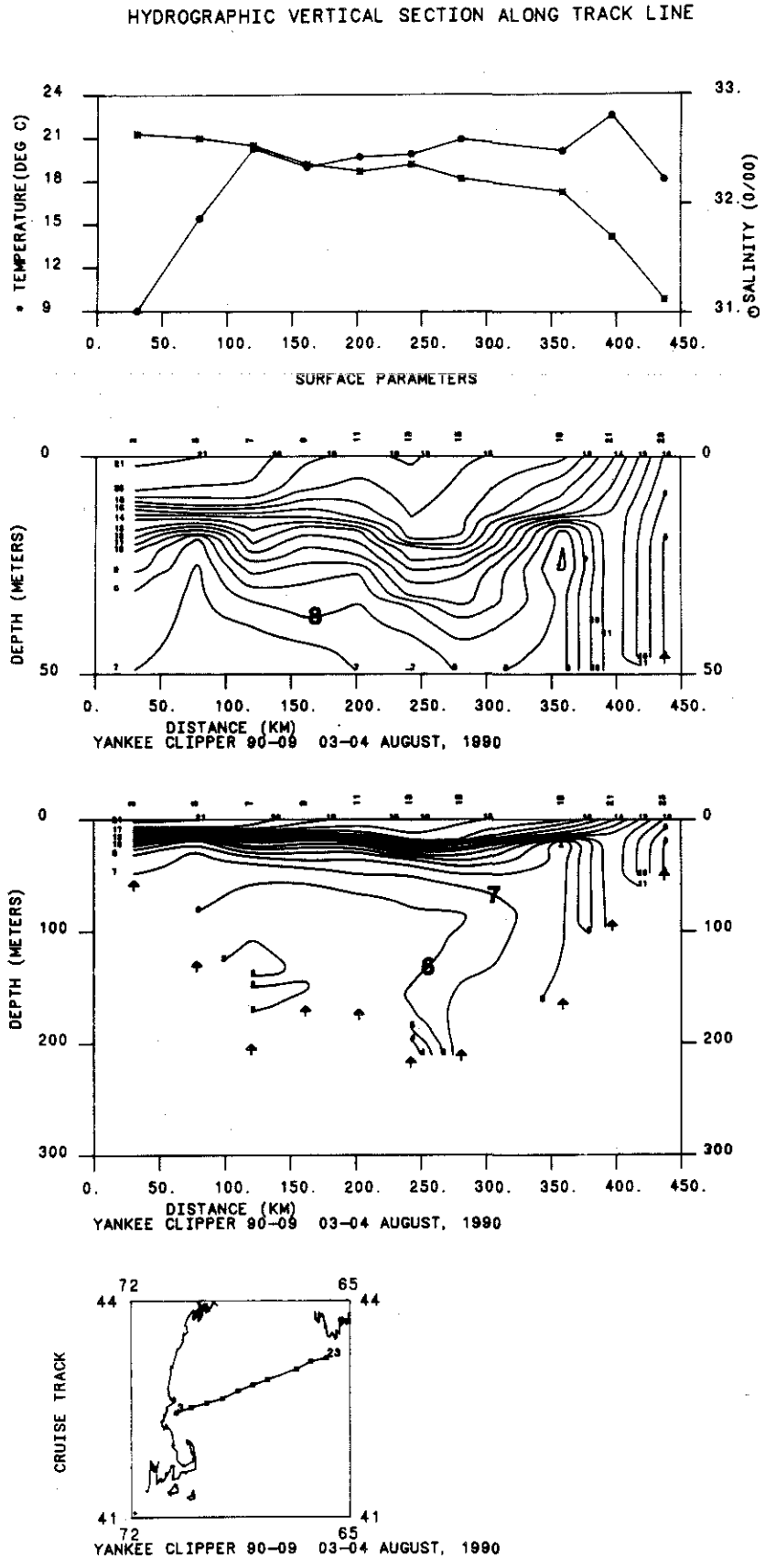


Figure 44. Vertical distribution of temperature in °C within the Gulf of Maine August 3-4, 1990.

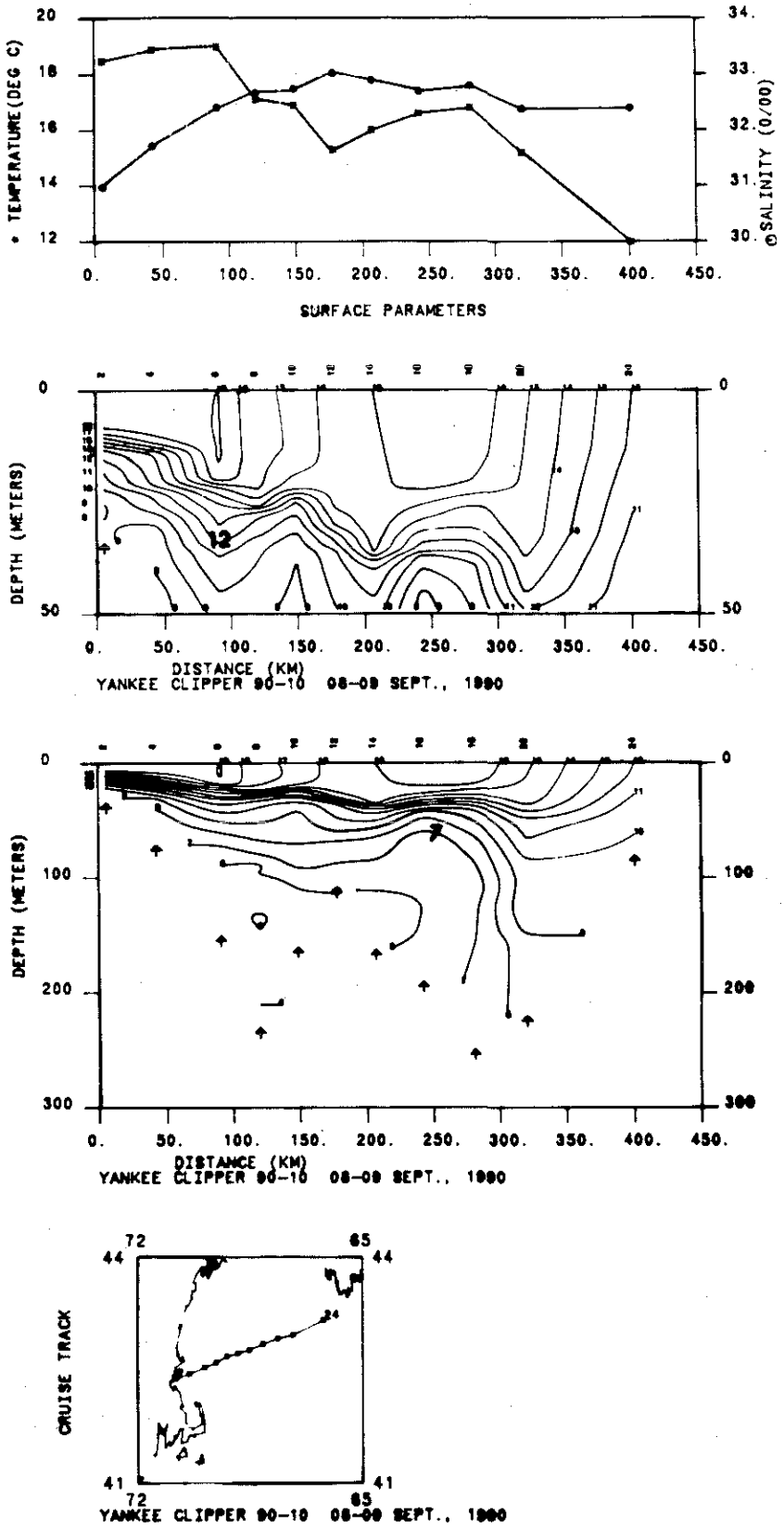


Figure 45. Vertical distribution of temperature in °C within the Gulf of Maine September 8-9, 1990.

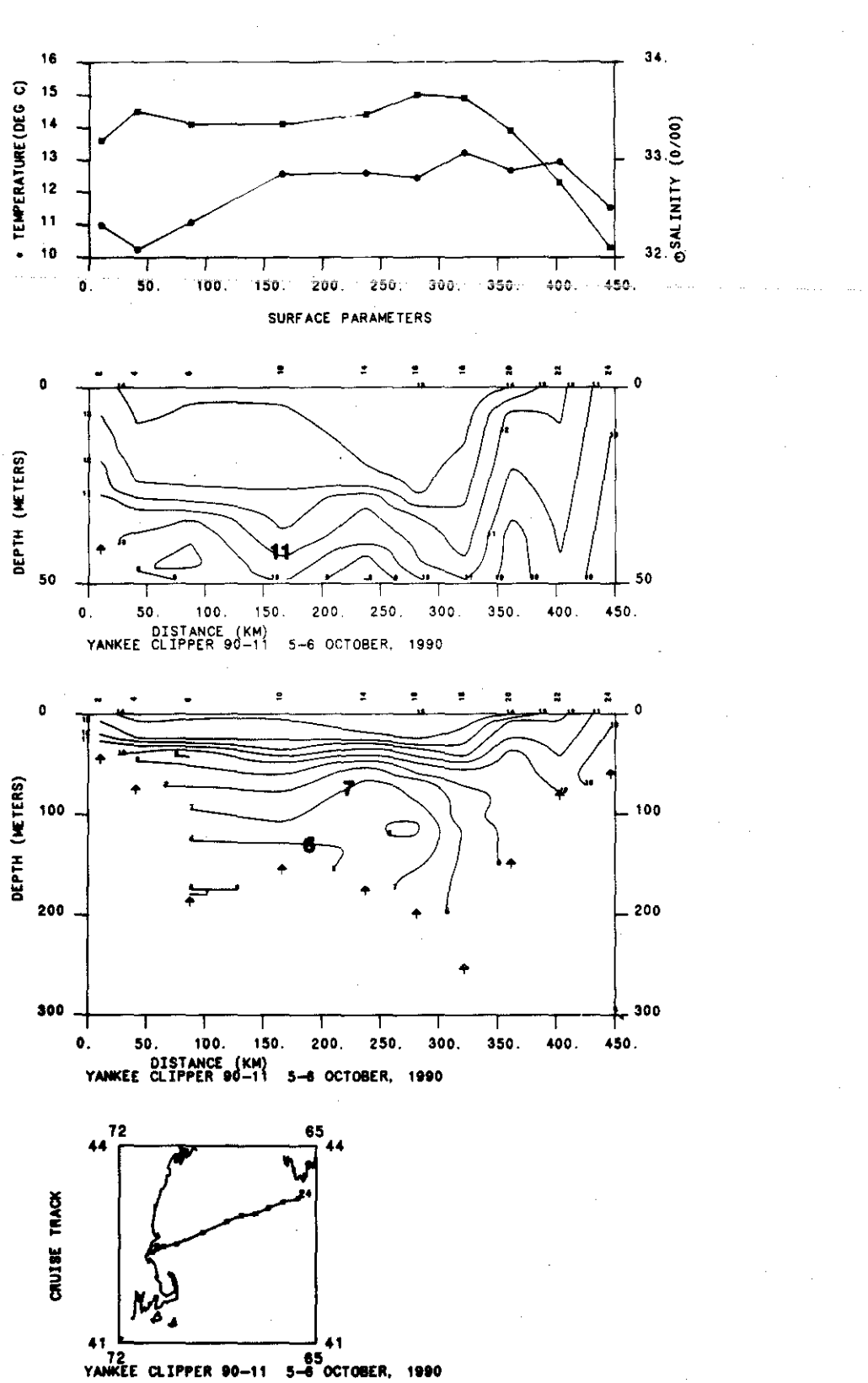


Figure 46. Vertical distribution of temperature in °C within the Gulf of Maine October 5-6, 1990.

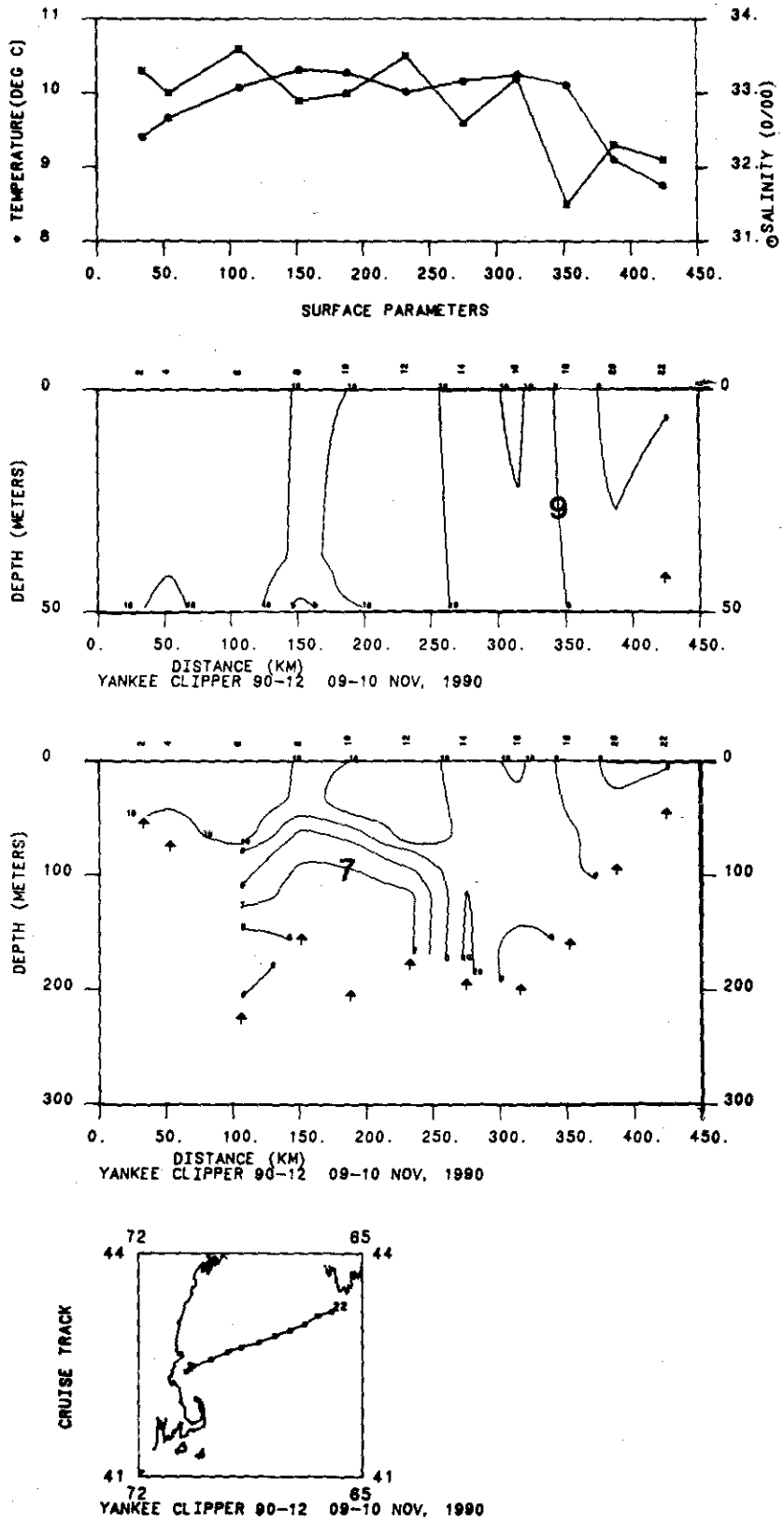


Figure 47. Vertical distribution of temperature in °C within the Gulf of Maine November 9-10, 1990.

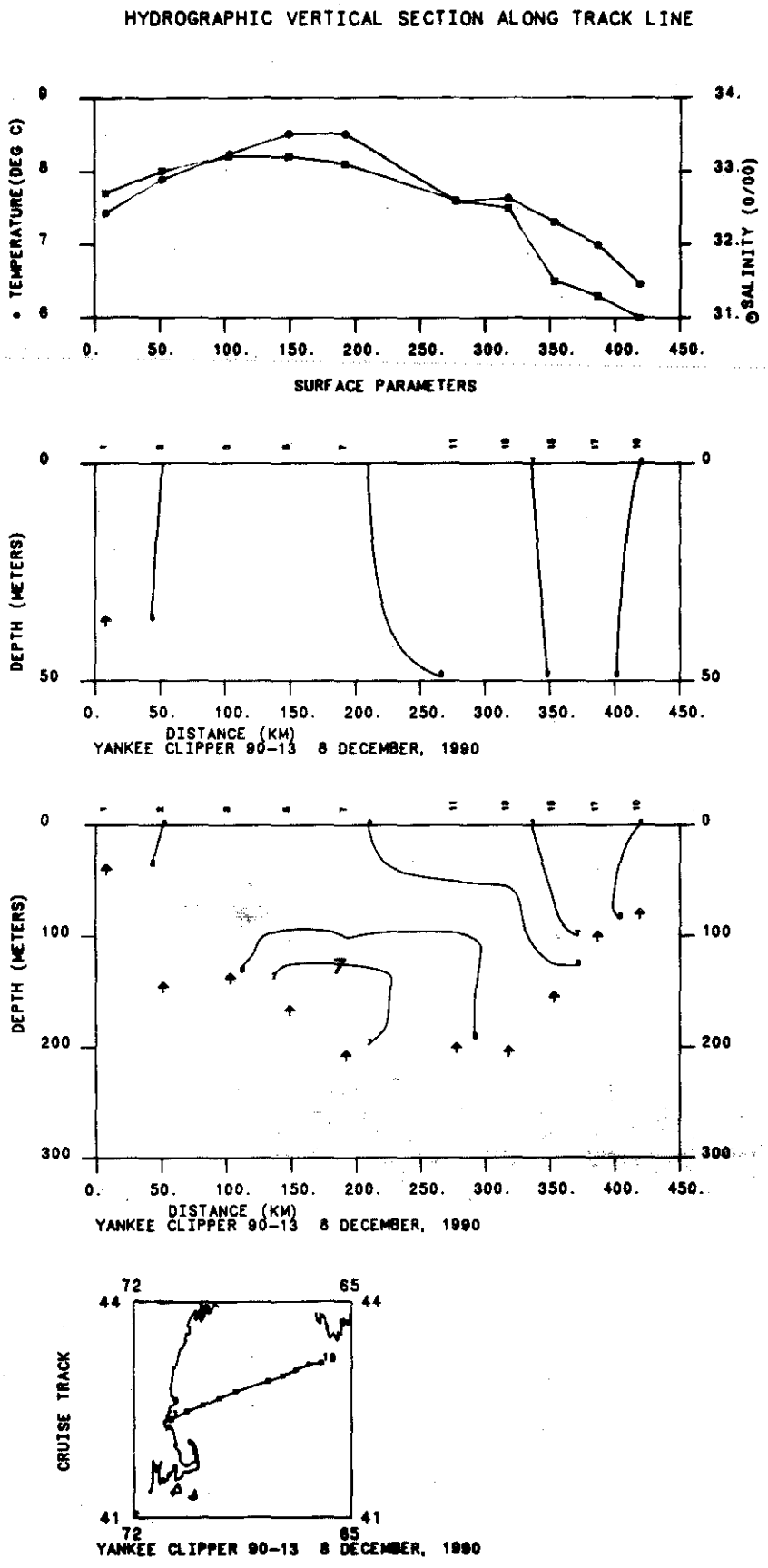


Figure 48. Vertical distribution of temperature in °C within the Gulf of Maine December 8, 1990.