

**Expendable Bathythermograph
Observations and Continuous
Plankton Records
from the NMFS/Ship of
Opportunity Program for 1988**

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ABSTRACT

Results of the nineteenth year of operation of the NMFS Ship of Opportunity Program are presented in the form of sample vertical sections of water column temperature, surface temperature and salinity, 10 m plankton along the cruise track, and lists of available data . Operational procedures and data management also are discussed.

INTRODUCTION

In mid-year of 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. The program, conducted in support of the MARMAP (Marine Resources Monitoring Assessment and Prediction) Program of NMFS, involved the use of maritime cadets from the Kings Point Maritime Academy to gather XBT data on board merchant ships along the east and Gulf coasts of the United States.

In 1972 NMFS began a program of cooperation with the Oceanographic Laboratory, Edinburgh, Scotland (now a part of the United Kingdom's Institute of Marine Environmental Research (IMER) for the extension of their long-term Continuous Plankton Recorder (CPR) survey into additional areas of the western North Atlantic.

The objectives of these cooperative programs were to identify and describe seasonal and year-to-year variations of temperature salinity, circulation, and plankton in major currents of the Gulf of Mexico and western North Atlantic, using merchant ships as inexpensive platforms for collection of 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 obtain regular sampling 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), meteorological, and continuous plankton records data were collected in 1988 by the vessels *Oleander* and *Yankee Clipper*.

The *Oleander* transits from Newark, NJ to Bermuda on a weekly basis, with approximately monthly collections of data between Ambrose Light and the vicinity of the Gulf Stream's North Wall in either an easterly or westerly direction (Figure 1).

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 (Figure 4).

OPERATIONAL PROCEDURES

PHYSICAL DATA

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

the Command and Data 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, for distribution to other users. Thus, much of the temperature data transmitted via GOES was considered "real time."

On the *Oleander*, XBTs were dropped at least once per hour and on the *Yankee Clipper*, once every two hours. On both vessels, meteorological observations were taken every six hours at standard synoptic hours. At the time of each XBT drop, surface water samples were collected with a bucket for later analysis to determine salinity.

PLANKTON DATA

On the above transects a continuous record of the plankton retained by the CPR was obtained along the track of the ship at a depth of 10 m. Water passing through the CPR was filtered with bolting silk having mean aperture dimensions of 225 X 234 microns.

DATA PROCESSING

An Autosal model 8400 Salinometer was used for salinity determinations. Temperature/depth data collected on HP 85 cassette tapes were processed and quality controlled by NMFS personnel. The CPR record was returned to Narragansett, RI where it was cut into segments corresponding to 18.5 km (10 nm) of coverage with times, dates, and positions calculated for their center points. Specimens were identified, enumerated, and their abundance calculated.

RESULTS

NEW YORK BIGHT

A sample vertical temperature section of observations made from the *Oleander* during May 1988 is presented in Figure 2. Each transect is identified by a cruise number and date of collection. Table 1 lists all cruises for 1988 along with the type of data obtained. Data for any transect are available from NODC in a variety of forms. Requests for, and 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

Figure 3 shows the abundance (number of organisms per 100 m³ of water filtered) of total Copepoda at a 10 m depth, as well as surface temperatures and salinities taken in the New York Bight, May 1988.

Inquiries about these data should be directed to:

Science and Research Director
U. S. Department of Commerce
National Oceanic & Atmospheric Admin.
National Marine Fisheries Service
Woods Hole, MA 02543

GULF OF MAINE

Table 2 lists all cruises for 1988 along with the type of data obtained. Each transect is identified by a cruise number and date of collection.

A sample vertical temperature section (Figure 5) of observations made from the

Table 1. 1988 New York Bight transect data from the vessel *Oleander*

Cruise Number	Dates	XBT	CPR	Surf T	Surf S
88-01	January 08	X	X	X	X
88-02	February 05	X	X	X	X
88-03	March 18	X	X	X	X
88-04	April 08	X	X	X	X
88-05	April 13-14	X		X	X
88-06	May 06-07	X	X	X	X
88-07	June 10	X	X	X	X
88-08	June 11-12	X		X	X
88-09	July 08-09	X	X	X	X
88-10	August 19-20	X			
88-11	August 24-25	X	X	X	X
88-12	September 09-10	X	X	X	X
88-13	October 14	X	X	X	X
88-14	October 19-20	X		X	X
88-15	November 04	X	X	X	X
88-16	December 02-03	X	X	X	X

Table 2. 1988 Gulf of Maine transect data from the vessel *Yankee Clipper*

Cruise Number	Dates	XBT	CPR	Surf T	Surf S
88-01	January 21-22	X	X	X	X
88-02	February 15-16	X	X	X	X
88-03	March 19-20	X	X	X	X
88-04	April 15-16	X	X	X	X
88-05	May 10-11	X	X	X	X
88-06	June 10-11	X	X	X	X
88-07	July 08-09	X	X	X	X
88-08	August 12-13	X	X	X	X
88-09	September 09-10	X	X	X	X
88-10	October 24-25	X	X	X	X
88-11	November 19	X	X	X	X
88-12	December 10	X	X	X	X

Yankee Clipper during May 1988 is presented. Data for any transect are available from NODC in a variety of forms. Requests for, and 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

Figure 6 shows the abundance (number of organisms per 100 m³ of water filtered) of total Copepoda at a 10 meter depth, as well as surface temperatures and salinities taken in the Gulf of Maine, May 1988.

Inquiries about these data should be directed to:

Science and Research Director
U. S. Department of Commerce
National Oceanic & Atmospheric Admin.
National Marine Fisheries Service
Woods Hole, MA 02543

ACKNOWLEDGEMENTS

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 Harvey Thurm of the National Weather Service whose volunteers ride monthly on board the *Oleander* collecting data.

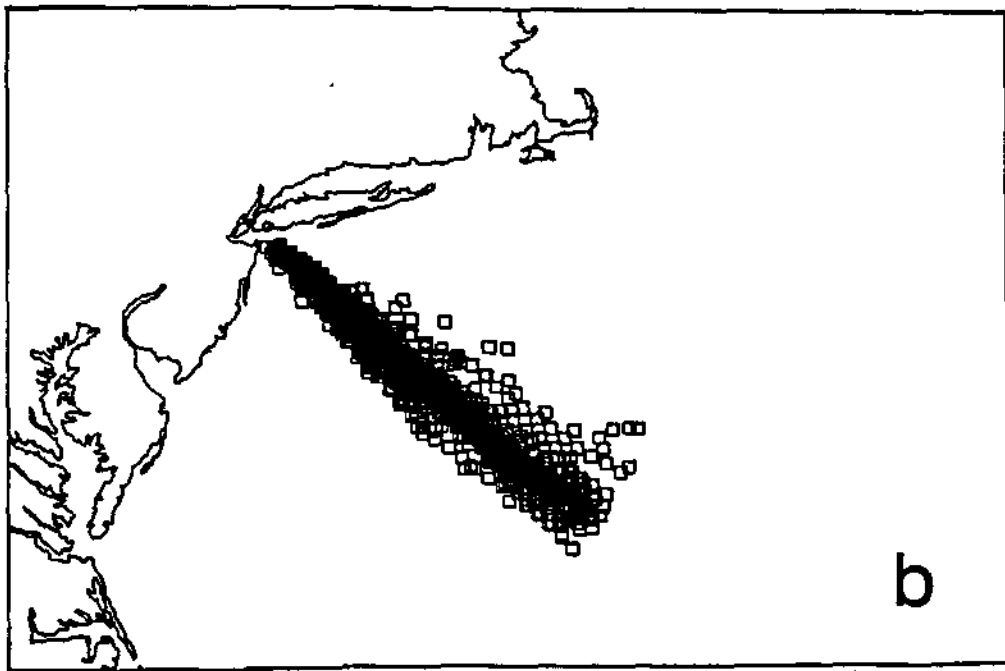
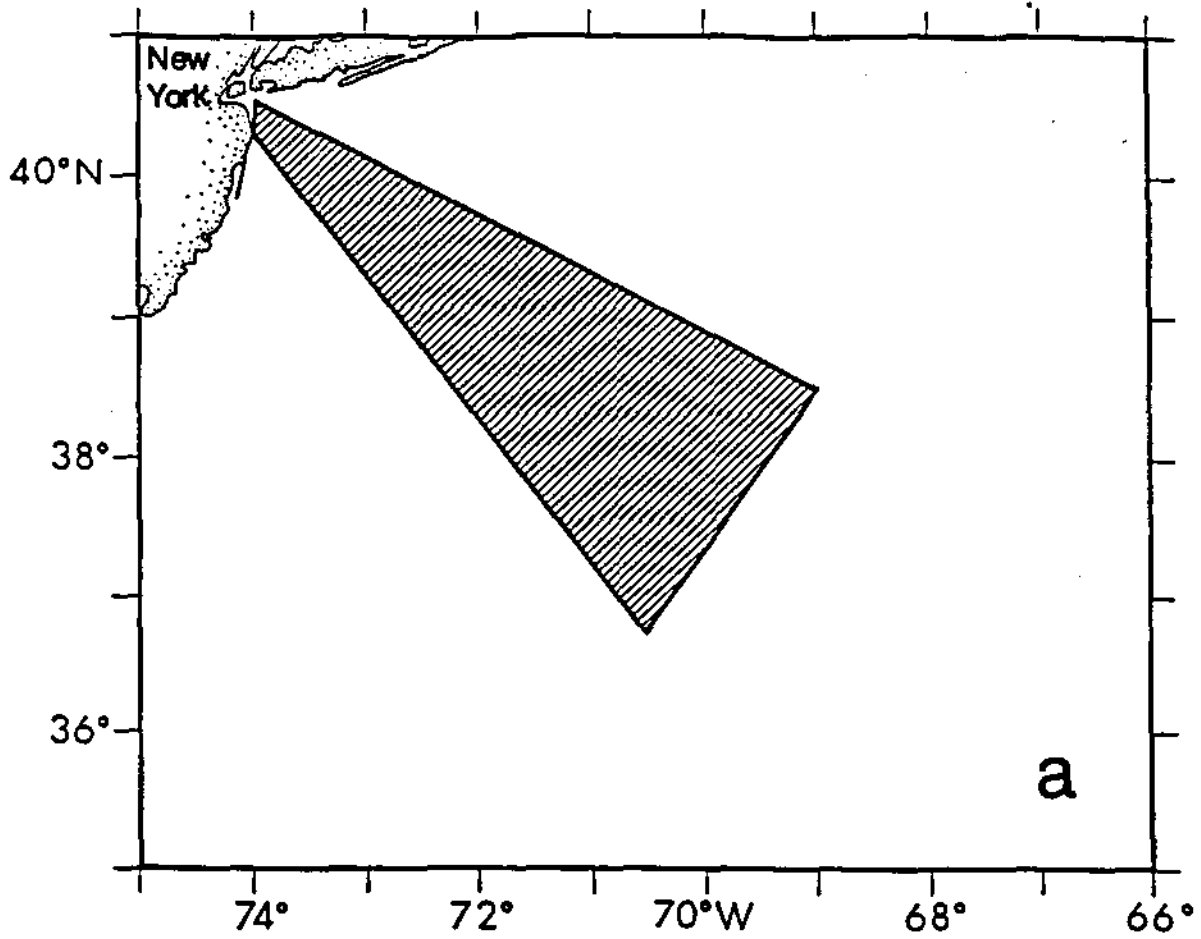


Figure 1. Transect envelope (a) and data density plot (b) from NMFS Ship of Opportunity Program, Route MB (New York Bight), 1971-present.

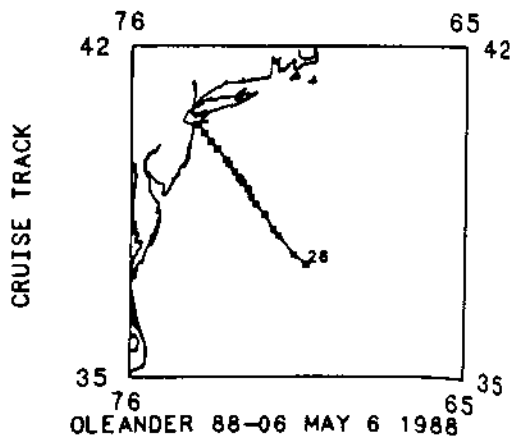
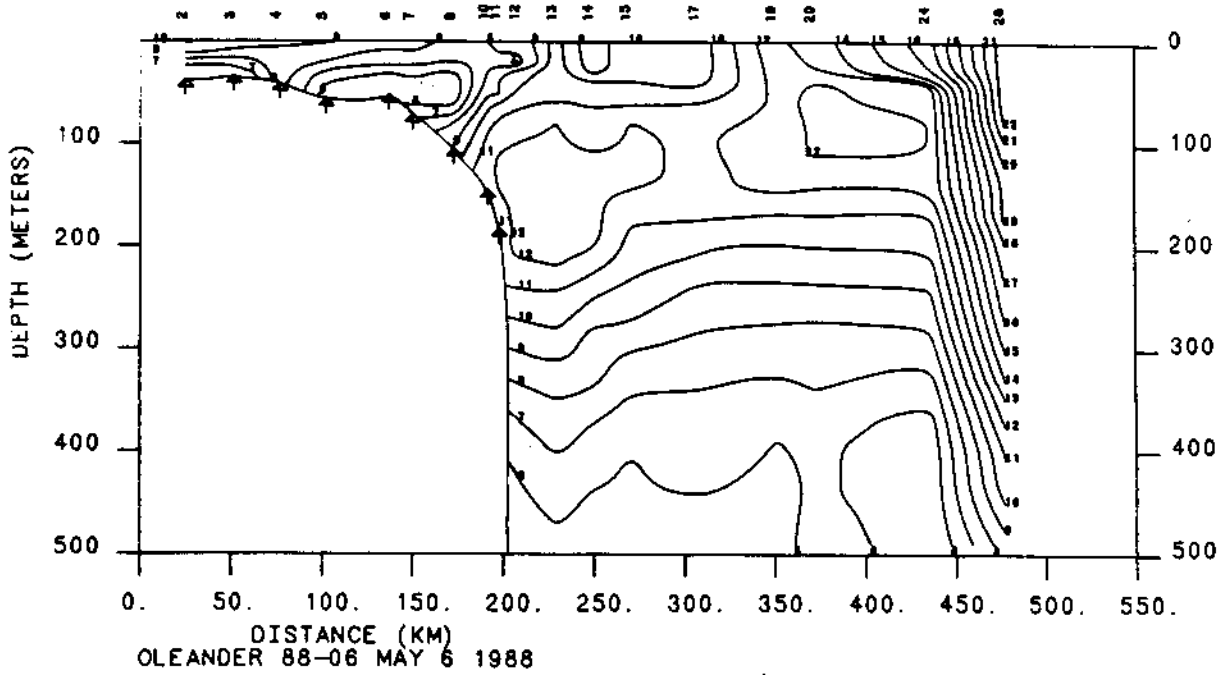
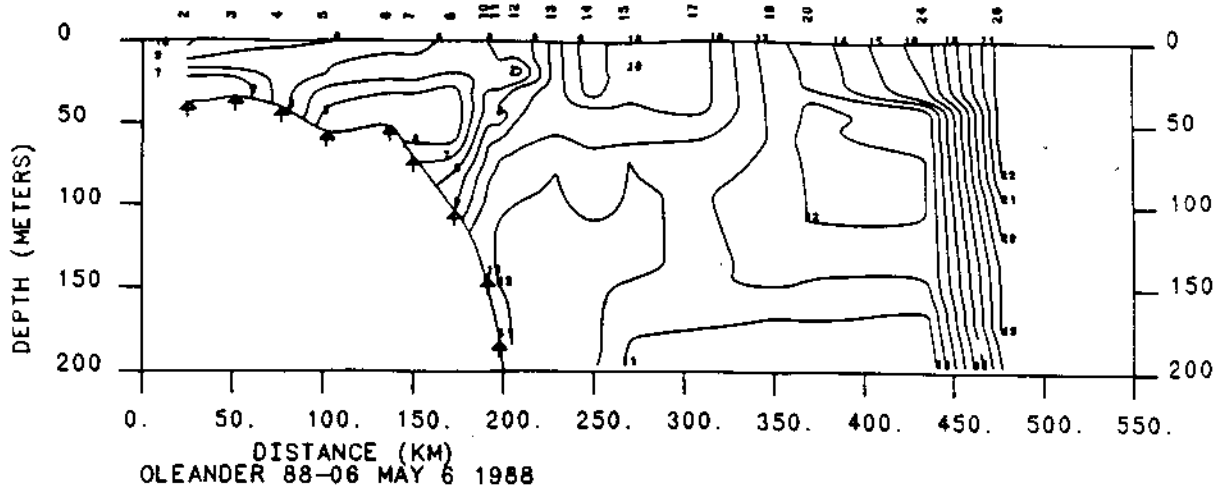


Figure 2. Sample of computer generated vertical temperature ($^{\circ}\text{C}$) section from the New York Bight in 1988.

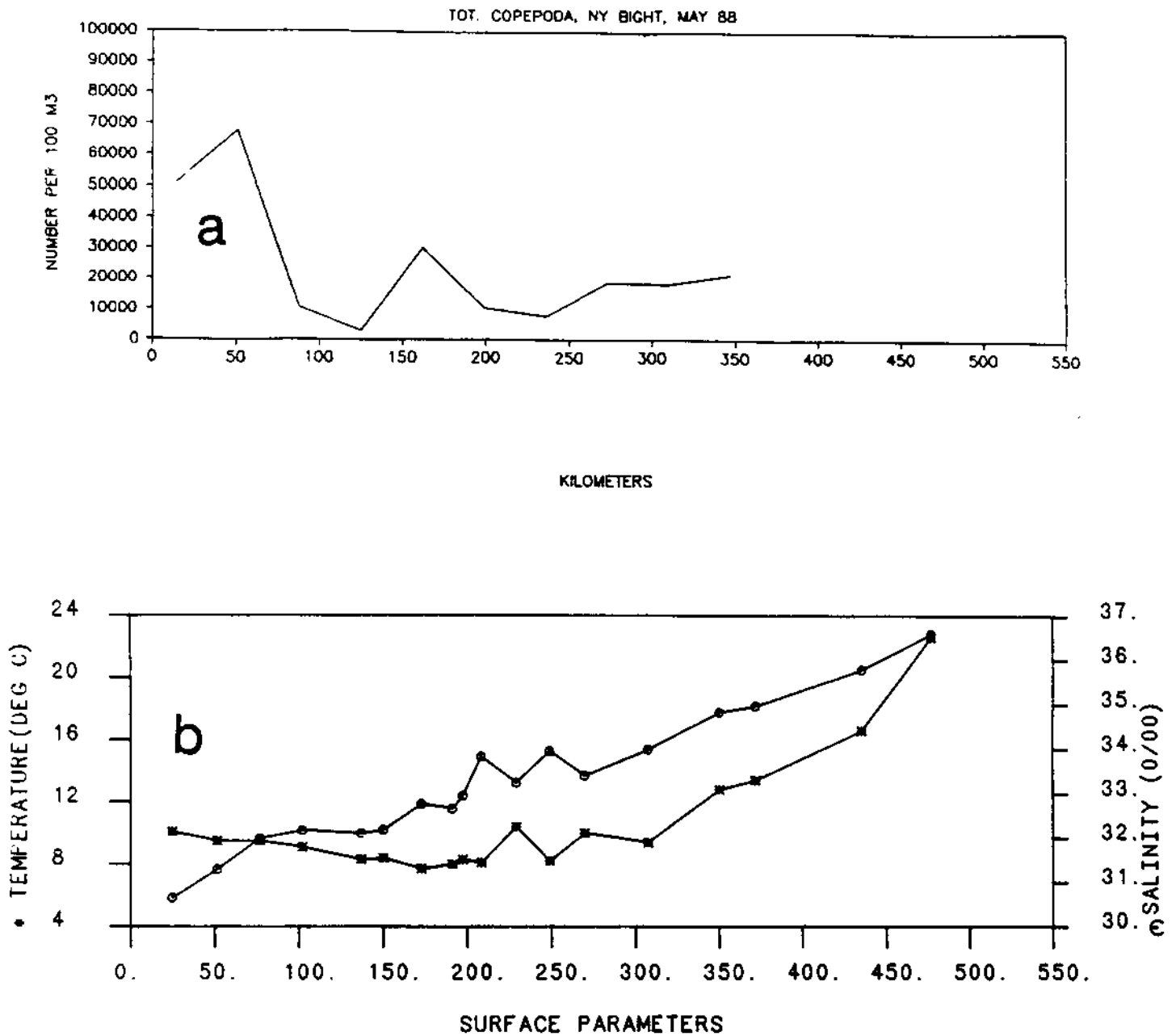


Figure 3. (a) Abundance in number of organisms per 100 m³ of water filtered of total Copepoda along the New York Bight transect in May 1988, (b) surface parameter plot of temperature (°C) and salinity (o/oo) along the New York Bight transect in May 1988.

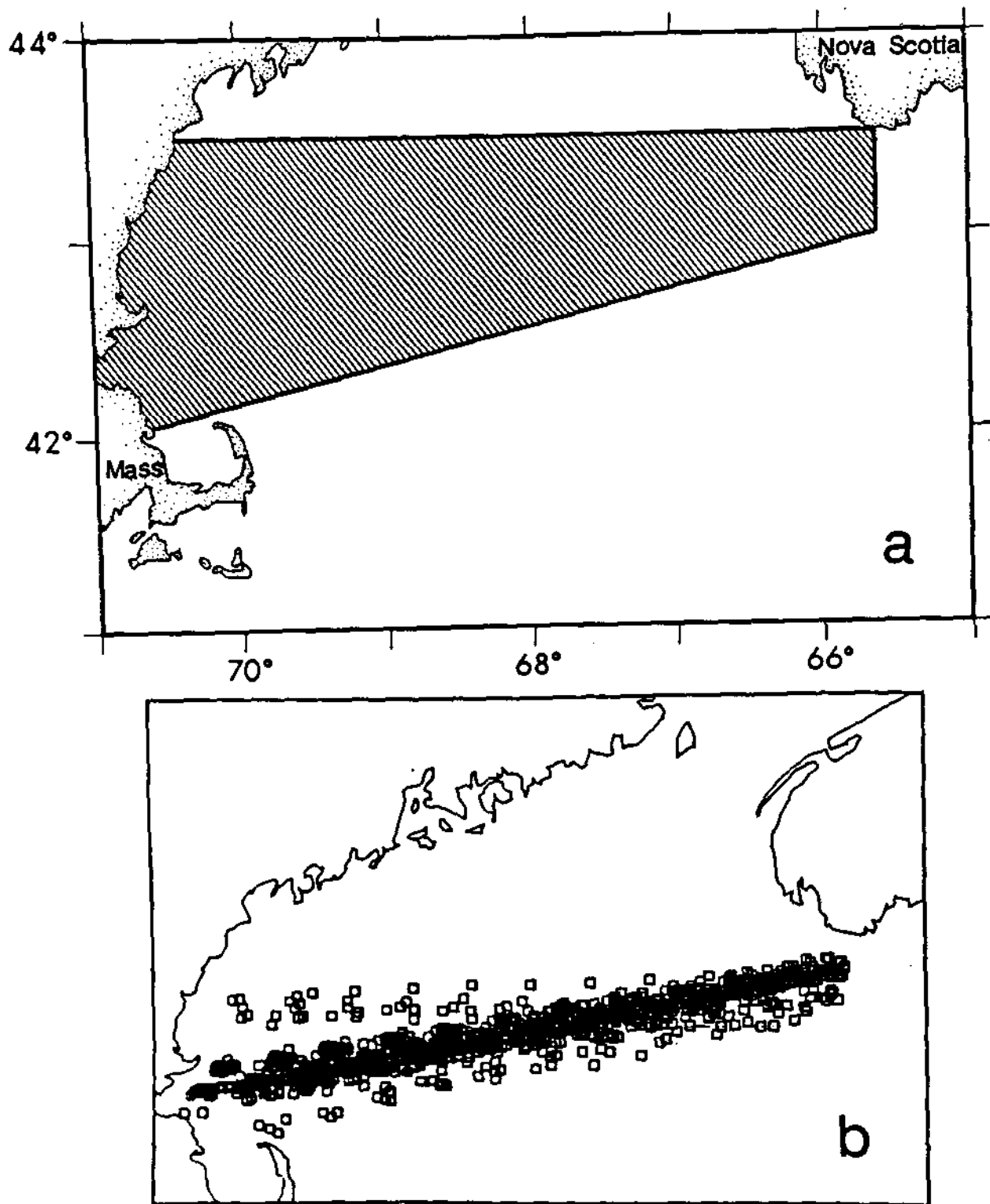


Figure 4. Transect Envelope (a) and density plot (b) from the NMFS Ship of Opportunity program, Route MC (Gulf of Maine), 1961-present.

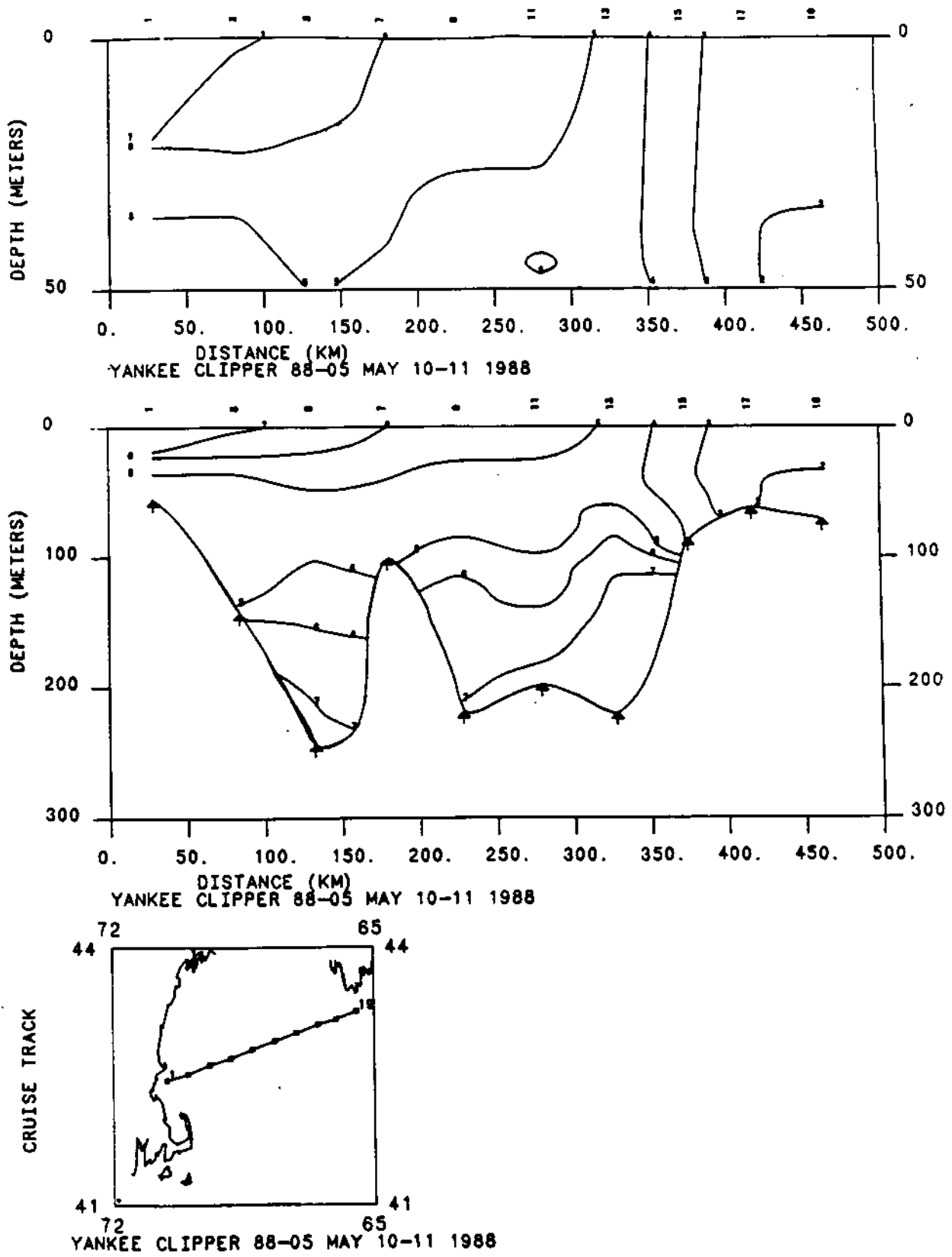


Figure 5. Sample of computer-generated vertical temperature ($^{\circ}\text{C}$) section from the Gulf of Maine in 1988.

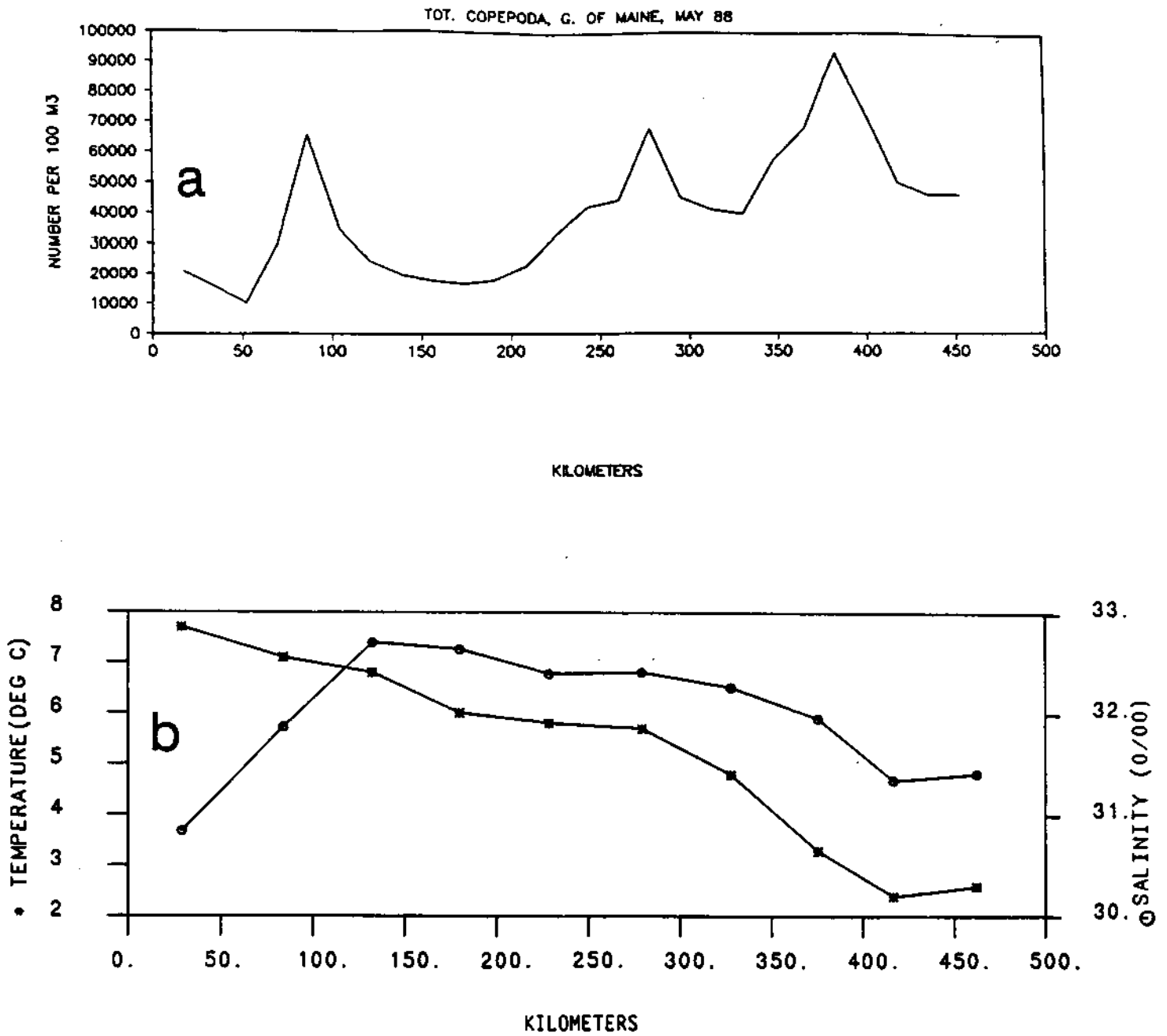


Figure 6. (a) Abundance in number of organisms per 100 m³ of water filtered of total copepoda along the Gulf of Maine transect in May 1988. (b) Surface parameter plot of temperature (°C) and salinity (o/oo) along the Gulf of Maine transect in May 1988.

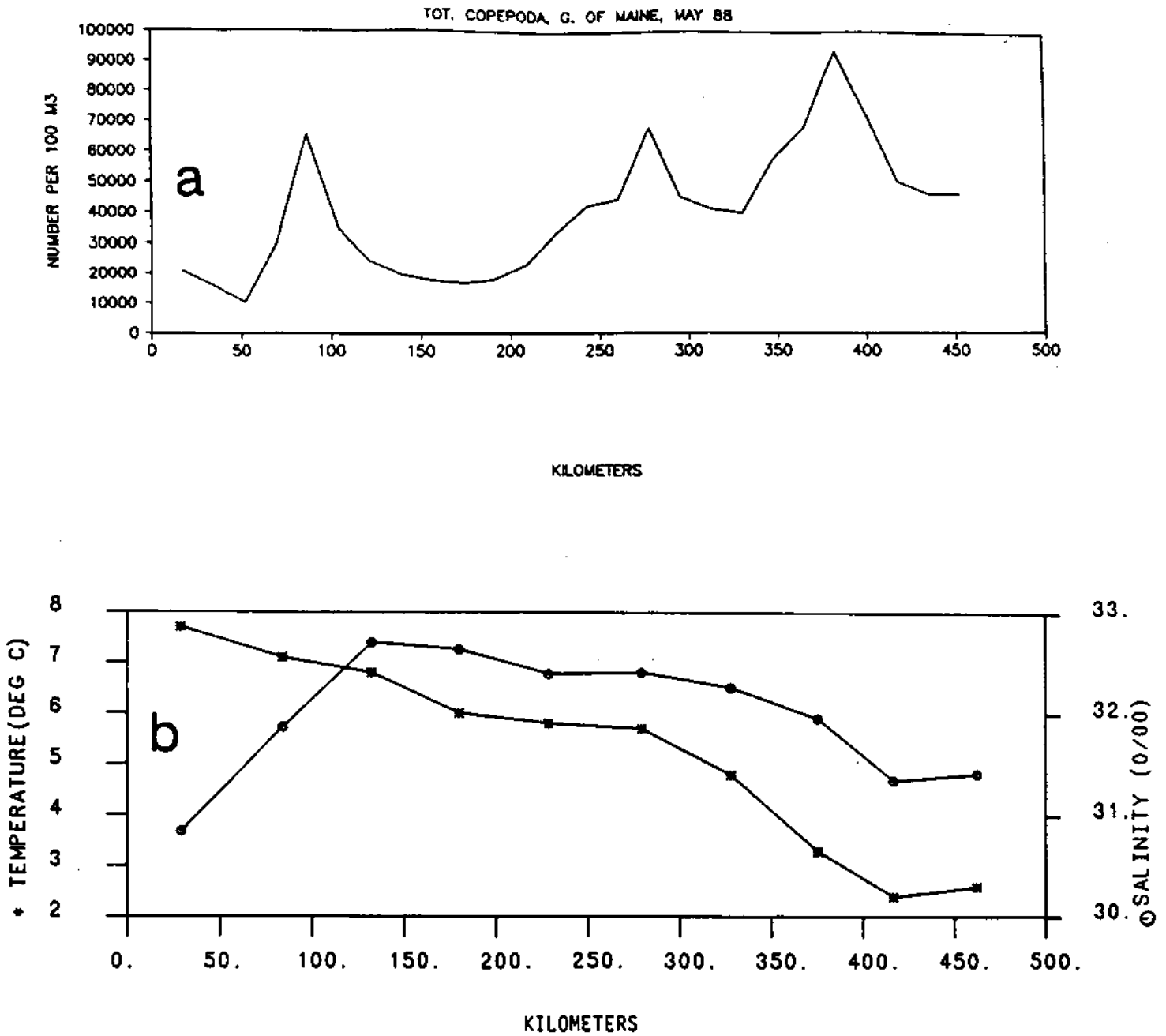


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