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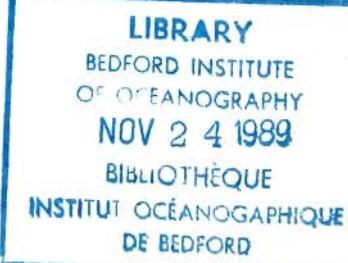
Atlas of Physical Oceanographic Data for Current Surge Studies Near the Gully, Scotian Shelf: 1984

H. Sandstrom and J.A. Elliott

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September 1989

Canadian Technical Report of Hydrography and Ocean Sciences No. 117



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Canadian Technical Report of Hydrography and Ocean Sciences

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Rapport technique canadien sur l'hydrographie et les sciences océaniques

Les rapports techniques contiennent des renseignements scientifiques et techniques qui constituent une contribution aux connaissances actuelles, mais qui ne sont pas normalement appropriés pour la publication dans un journal scientifique. Le sujet est généralement lié aux programmes et intérêts du service des Sciences et levés océaniques (SLO) du ministère des Pêches et des Océans.

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Les rapports techniques sont produits à l'échelon régional, mais numérotés à l'échelon national. Les demandes de rapports seront satisfaites par l'établissement auteur dont le nom figure sur la couverture et la page du titre. Les rapports épuisés seront fournis contre rétribution par des agents commerciaux.

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FOR CURRENT SURGE STUDIES NEAR THE GULLY, SCOTIAN SHELF: 1984

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Acknowledgements

Presentation of an extensive data set collected by BATFISH forms a major part of this report. The software packages to process and display this data were developed through a contract with Wycove Systems Ltd. Metrology Division assisted with the BATFISH system and the work was completed through the continued professional support from the staff of AOL and the *CSS Dawson*. The work is supported in part by the Federal Panel on Energy, Research and Development (PERD).

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ABSTRACT

Sandstrom, H. and J.A. Elliott. 1989. Atlas of physical oceanographic data for current surge studies near The Gully, Scotian Shelf: 1984. Can. Tech. Rep. Hydrogr. Ocean Sci. No. 117: iv + 304 pp.

Physical oceanographic data are presented for *CSS DAWSON* cruise 84-034. Included are the results of CTD casts, moored current meters, BATFISH tows, and acoustic backscattering charts. The area of the cruise is in the vicinity of The Gully, Scotia Shelf near 59°W.

RÉSUMÉ

Sandstrom, H. and J.A. Elliott. 1989. Atlas of physical oceanographic data for current surge studies near The Gully, Scotian Shelf: 1984. Can. Tech. Rep. Hydrogr. Ocean Sci. No. 117: iv + 304 pp.

On présente des données d'océanographie physique recueillies lors de la mission 84-034 du *NSC DAWSON*. Les résultats fournis proviennent de sondes CTP, de courantomètres, de remorquages du BATFISH et de cartes de rétrodiffusion acoustique. La mission en question se déroulait sur la plate-forme néo-écossaise, aux alentours de l'endroit nommé le Gully, près de 59° de longitude ouest.

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1.0 INTRODUCTION

This is the third in a series of atlases prepared for a program supported by PERD funding to study the incidence of large amplitude tidally generated internal waves along east coast continental shelves (Sandstrom & Elliott, 1986, 1989). It covers CSS *Dawson* cruise 84-034. This cruise collected field data in the vicinity of The Gully east of and adjacent to Sable Island near 59°W (see figure).

The program was completed during the period of August 15 to September 1, 1984. Two moorings were deployed for the duration of the cruise. The bulk of the data reported in this atlas were collected with a CTD, BATFISH and 12 kHz Raytheon Sounder. The site was chosen to provide detailed observations of soliton-like features present in SLAR images of the area. Also this region has been the site of numerous exploratory wells and therefore of special interest to the oil industry. The principal objectives of this cruise were (a) to collect additional data for modelling the internal waves or solitons at east coast sites and (b) to obtain detailed observations on individual wave packets.

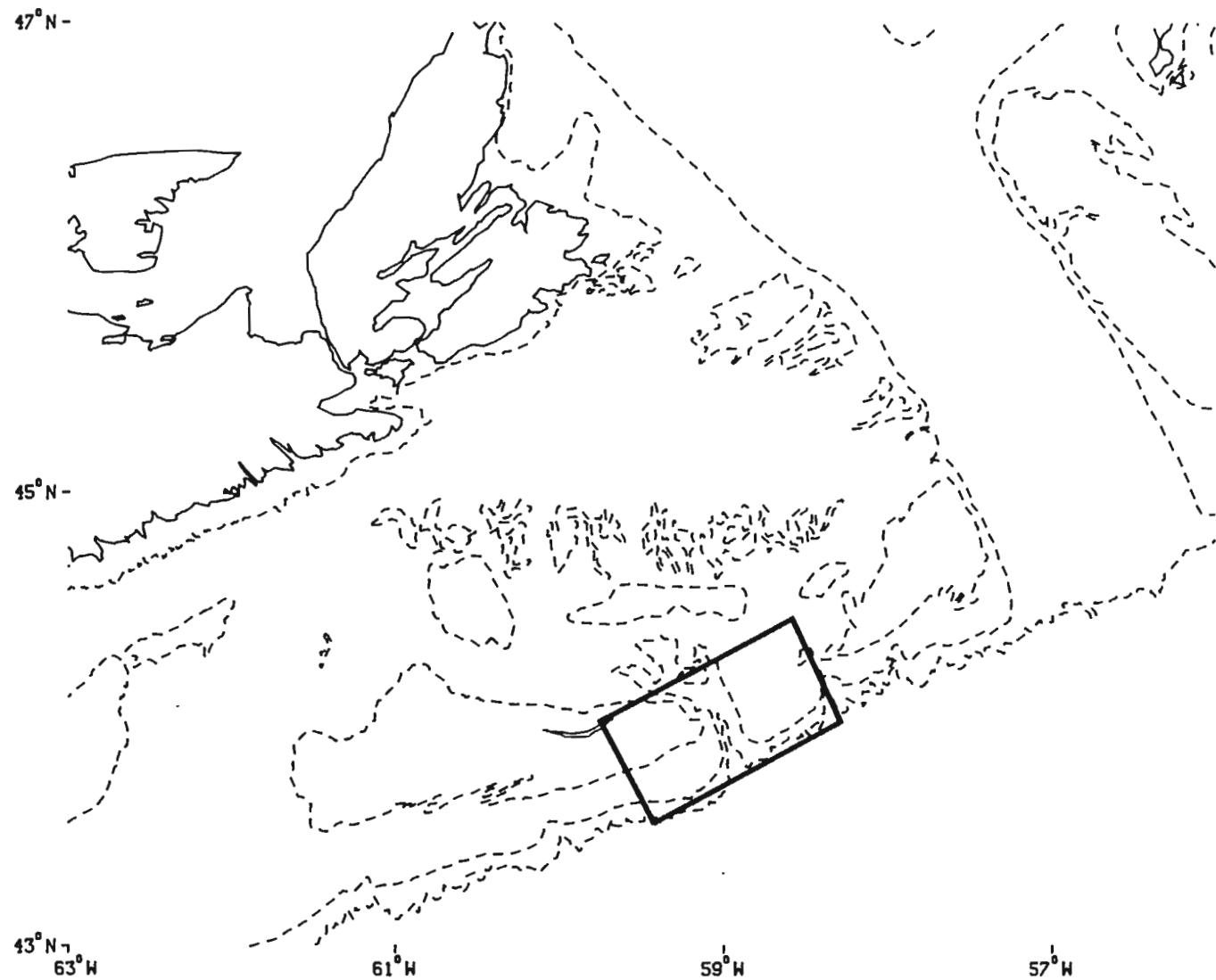
2.0 INSTRUMENTATION AND DATA REDUCTION

All data are presented in GMT and Julian calendar.

2.1 CTD

The instrument used was a Guildline Digital CTD mounted on a rosette. Two bottle samples from a number of casts were used to monitor salinity and temperature calibrations. Standard deviations were 0.014‰ and 0.017°C. Standard processing using STPIN converted the raw CTD data into decimated form at 1 db bins by pressure sorting. In addition to conversion to physical units, STPIN performed range checks and despiked the data. Adjusted calibrations, using STPROC, were salinity -0.016‰, temperature + 0.009°C and pressure + 5.61db. Expected accuracy is $\pm 0.005^\circ\text{C}$, $\pm 0.01\%$, $\pm 1\text{db}$ and $\pm 0.01\sigma_t$.

'THE GULLY' STUDY AREA



2.2 Current Meters

Two fairey floats were used at the top of the two moorings, each with upper Aanderaa current meters placed at approximately 15 m depth and a lower meter at approximately 67 m. Since no significant wave fields were encountered, contamination by wave motion should be small. Aanderaa data were translated on a PDP-8E for processing on the Cyber. Speed calibrations are those of the manufacturer applied to first differences of rotor count; threshold velocity is assumed to be 0.015m/s. Accuracy is approximately $\pm 2\%$ of speed. Compass calibrations performed in the laboratory just prior to the cruise were applied to direction data taken as the mean of successive readings (Boyce, 1982). Direction errors are about $\pm 5^\circ$. Standard sampling rate was five minutes. All time series are checked for correct time base; data spikes are deleted by linear interpolation.

2.3 BATFISH

The system consisted of the standard version with a Digital CTD. Typical operating procedure was a ship speed of about 8 kts (15 km/hr), and a climb-dive rate of 2 m/s. The depth range was adjusted depending on local depth of bottom, however all observations were in the upper 100 m. On some tows we attempted to collect data at a rate to maximize sampling detail of the soliton groups. Data processing was undertaken on the Cyber and proceeded in a sequence similar to the CTD analysis. Final contoured plots were generated by an automated contouring routine. The program used is a modified version of SECCON (Section Contouring). This is a part of the CONMAP (Contour Mapping) System used at MEDS. Changes were made so that the routine could read the CM format. Standard accuracy for the instrument is $S = \pm 0.05\%$, $T = \pm 0.02^\circ\text{C}$, $P = \pm 2 \text{ db}$, and $\sigma_t = \pm 0.05$ (A. Bennett, personal comm.). The expected scalar resolution is about $\pm 1 \text{ m}$ (Bennett and Huaide, 1986).

2.4 Acoustics

Data presented are reproductions of the original dry paper field recordings of acoustic backscattering observed by the standard configuration of the 12 kHz Raytheon PTR Sounder. For the majority of the data, the recorder operated with automatic gain control.

3.0 CRUISE 84-034 OVERVIEW

The program was planned to intensively study the internal wave process around The Gully, a major canyon-like feature on the Scotian Shelf east of Sable Island near 59°W. Two moorings were placed for the duration of the cruise, one on either side of The Gully. Mooring #659 was located at 43°43.07'N, 59°30.40'W; #660 at 44°1.15'N, 58°51.64'W. A general survey of the large scale density field was obtained by occupying three near N-S lines across the shelf edge and east of, west of and through The Gully. See inset on BATFISH data display for a plan view. The majority of the cruise focussed on various BATFISH tows with backscattering acoustics to identify the presence of soliton features, to establish their occurrence in relation to the local tide, and to map the detail of some of the groups of waves. Two modes of operation were employed: 1) a routine survey over a fixed path by repeated transects of approximately one hour duration lasting over 12 hr period, and 2) tracking a given feature as it propagated shoreward by repeated crossings while following the feature.

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- Cruise Report 84-034, CSS DAWSON, August 15 - September 1, 1984. BIO, AOL, Dartmouth, N.S.

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Sandstrom, H. and J.A. Elliott. 1989. Atlas of physical oceanographic data for current surge studies on the Scotian Shelf: 1983. Can. Tech. Rep. Hyd. and Ocean Sci. No. 114: iv + 379 pp.

Figures 1-3

North-south CTD sections of Temperature, Salinity and Sigma-t for 84-034. An inset in the BATFISH data plots shows the station locations.

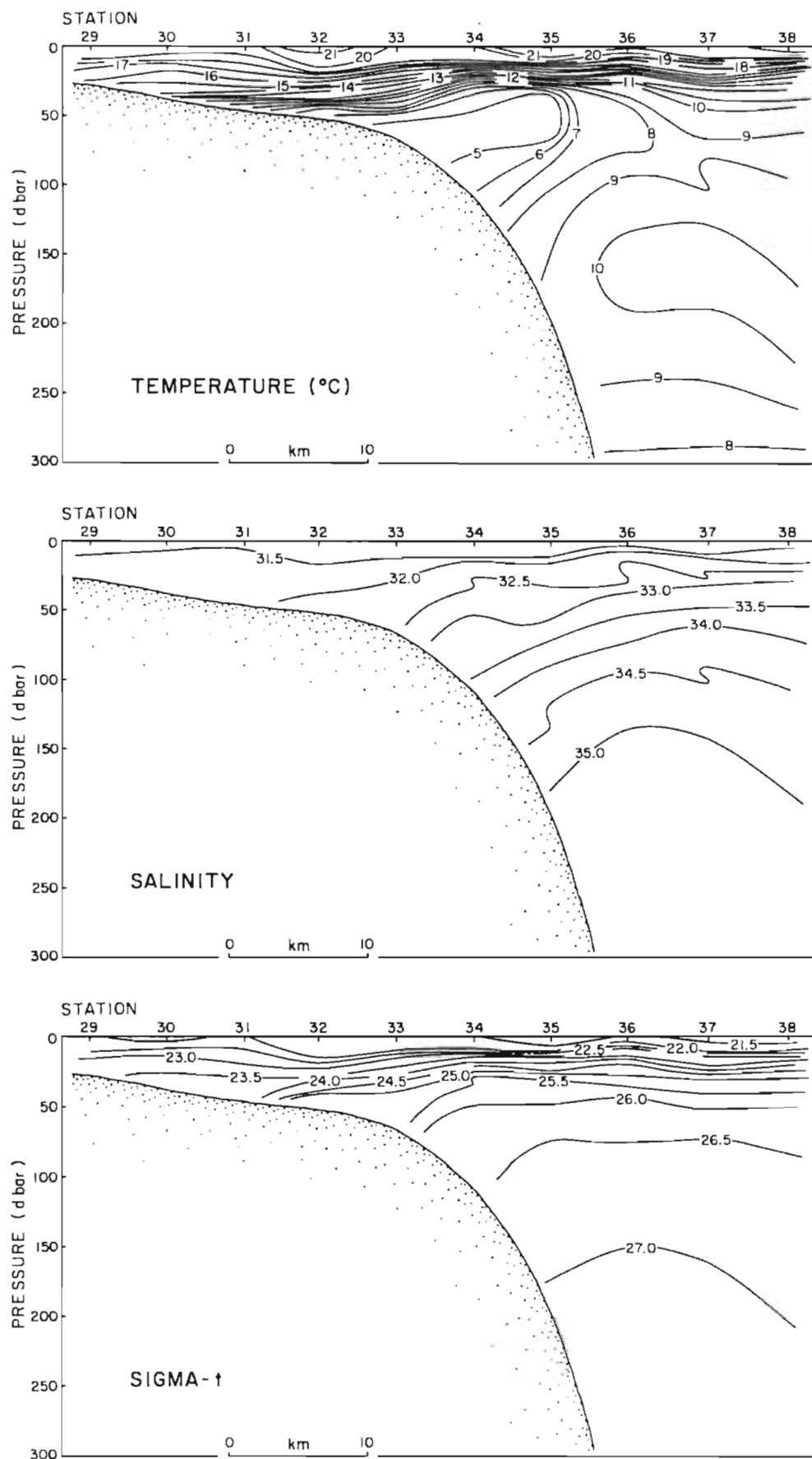


Fig. 1

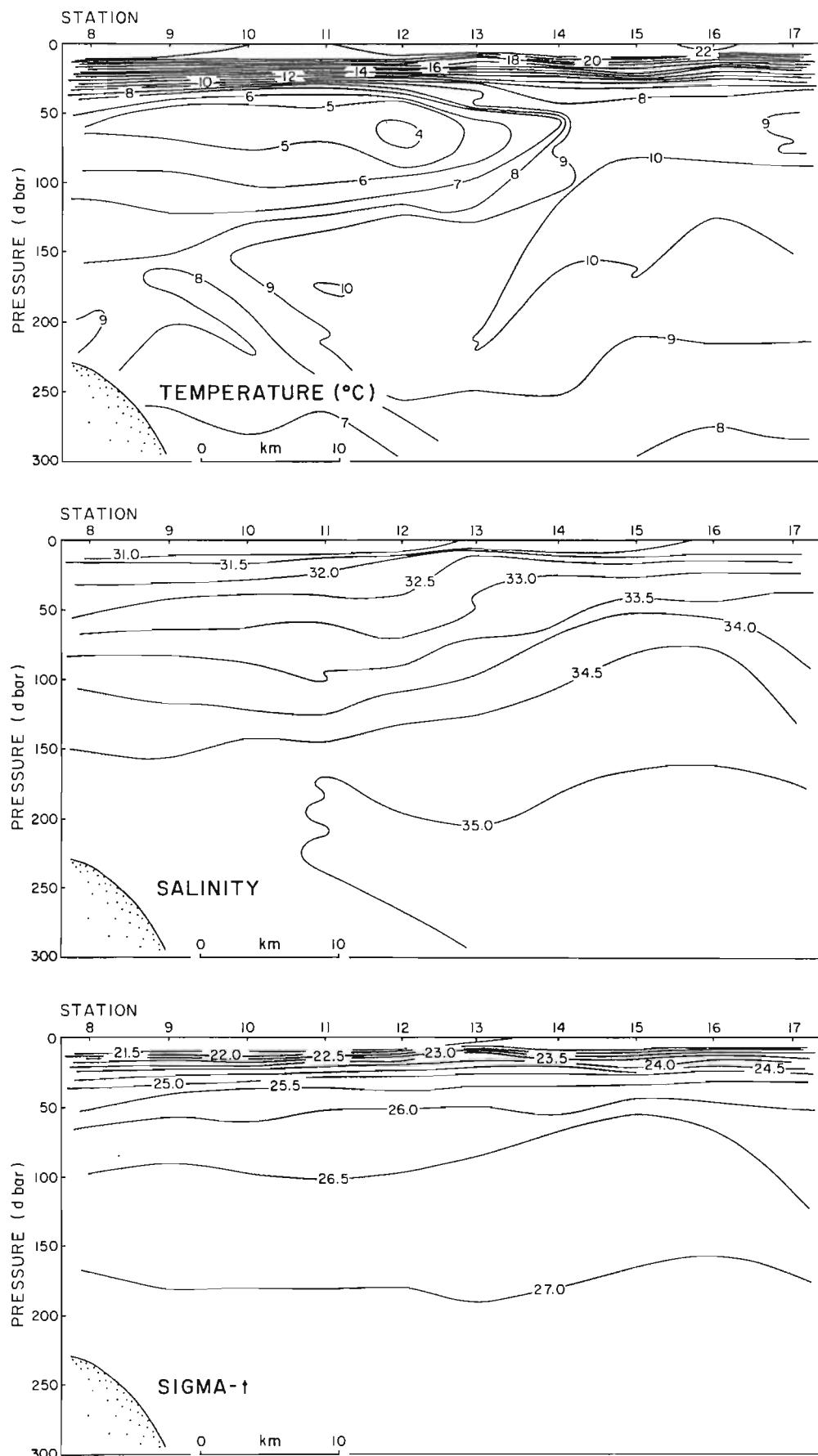


Fig. 2

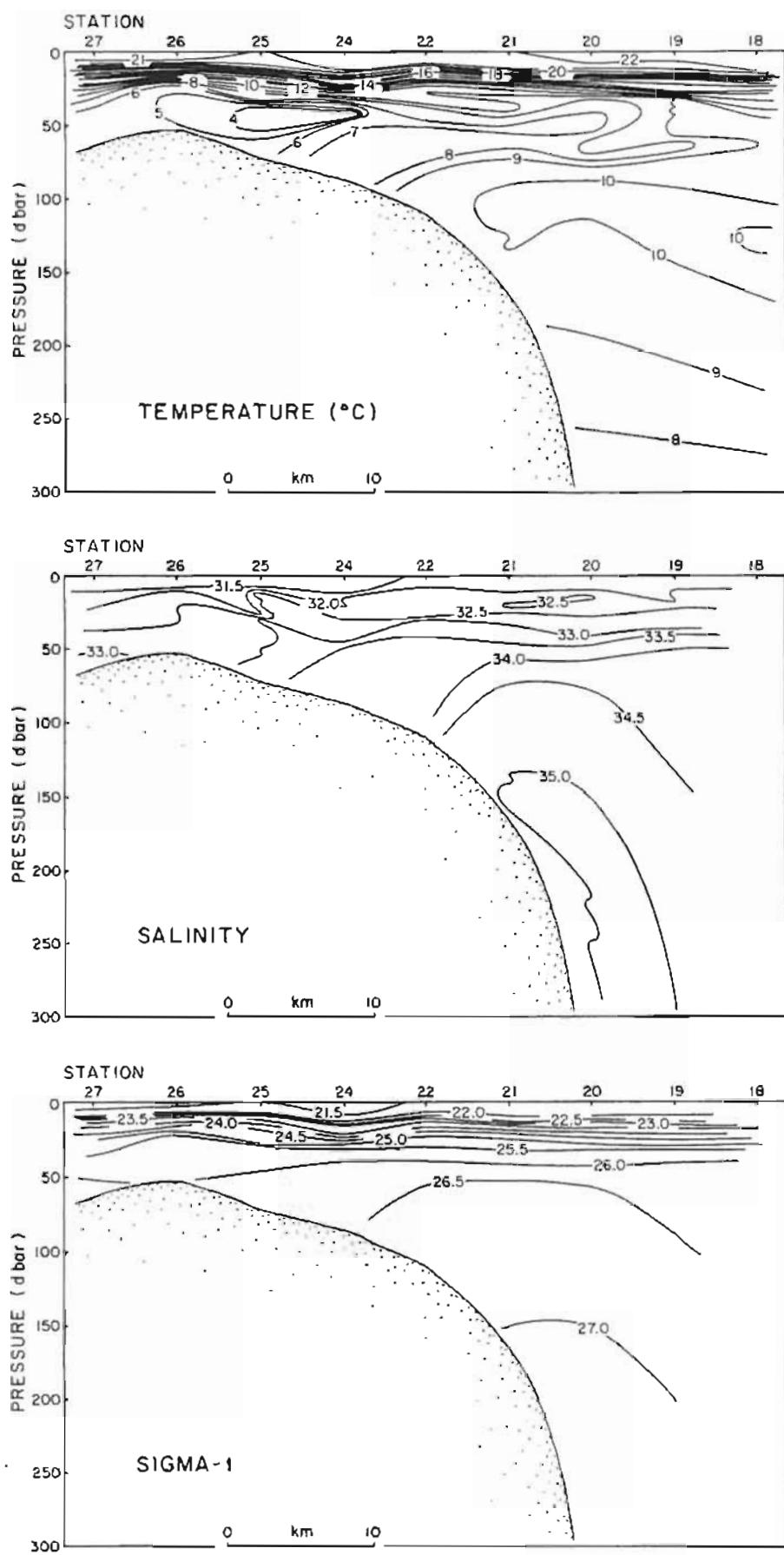


Fig. 3

Figures 4-15.

R(ate), (D)irection, U (east component), V (north component) of current, progressive vector and current vector plots for current meter moorings, #659 ($43^{\circ}43.07'N$, $59^{\circ}30.40'W$) and #660 ($44^{\circ}1.15'N$, $58^{\circ}51.64'W$).

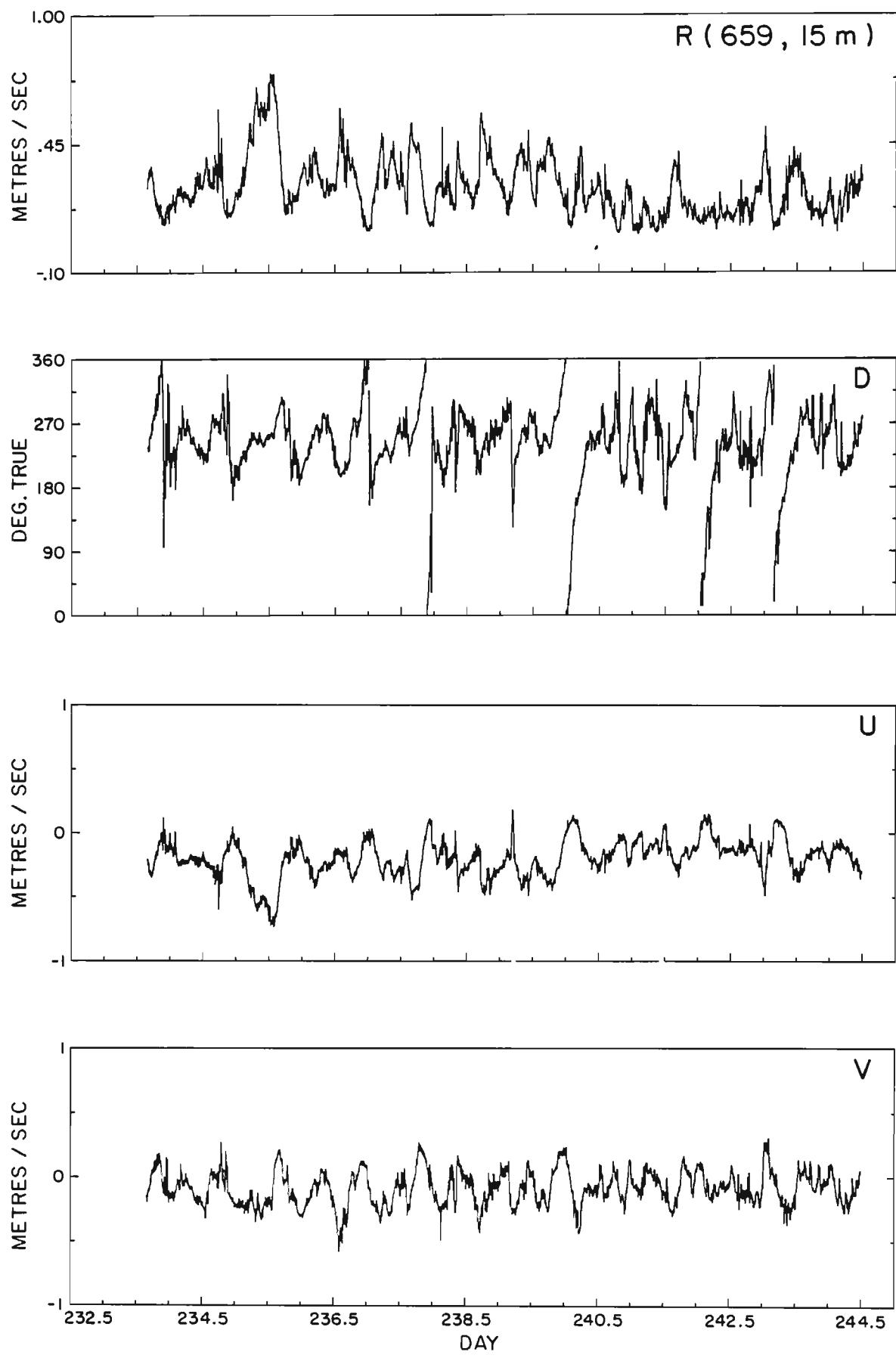


Fig. 4

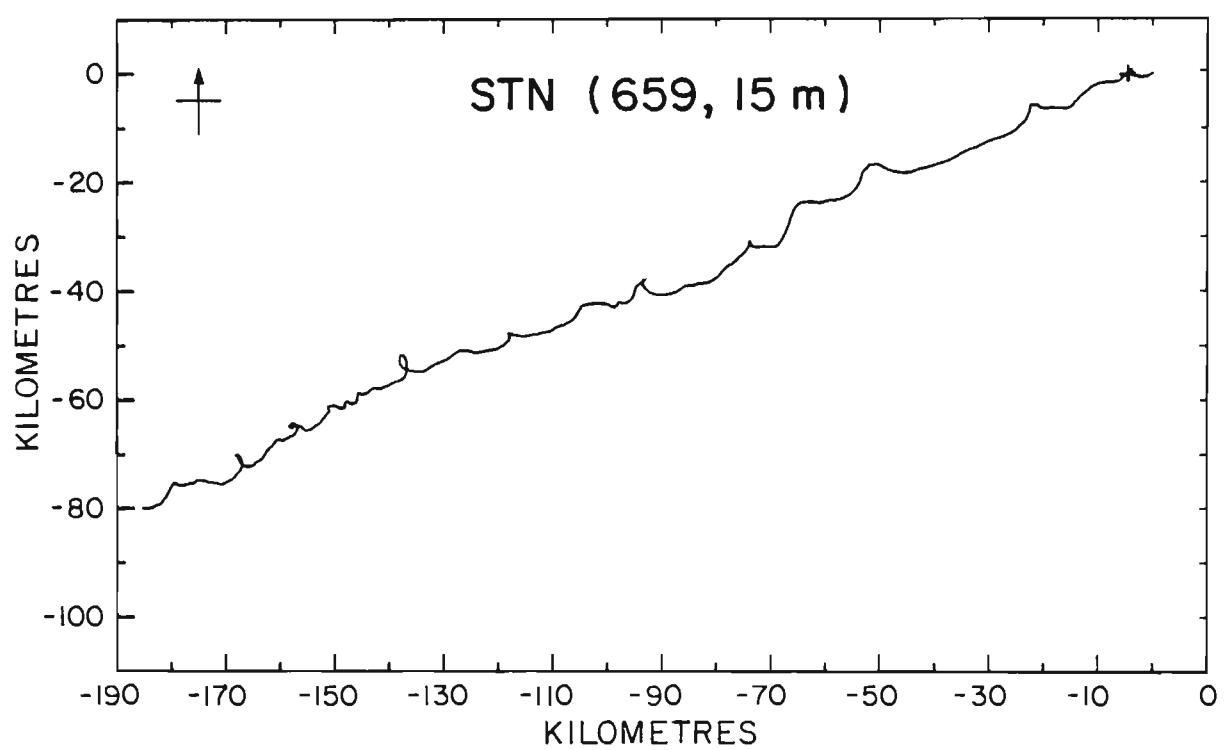


Fig. 5

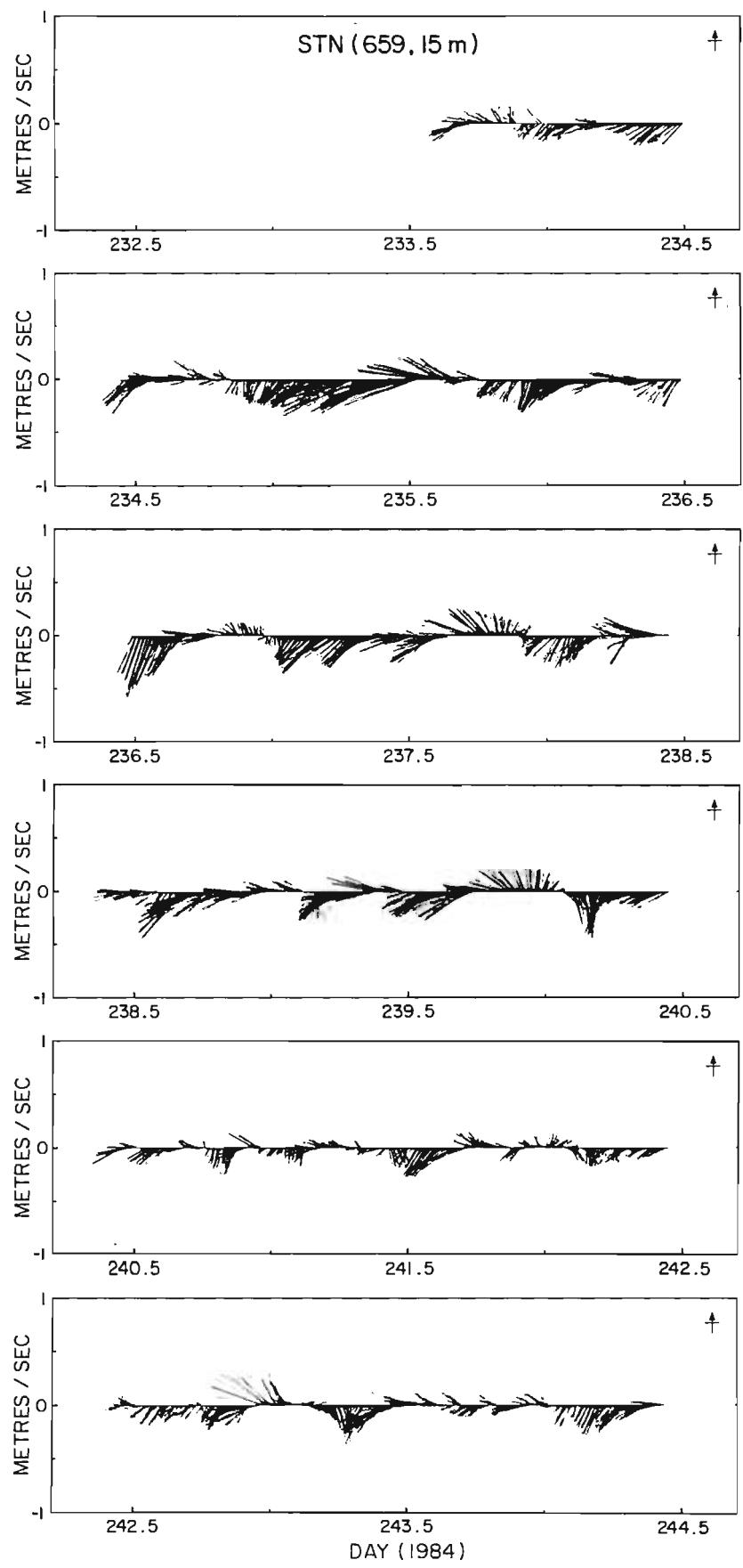


Fig. 6

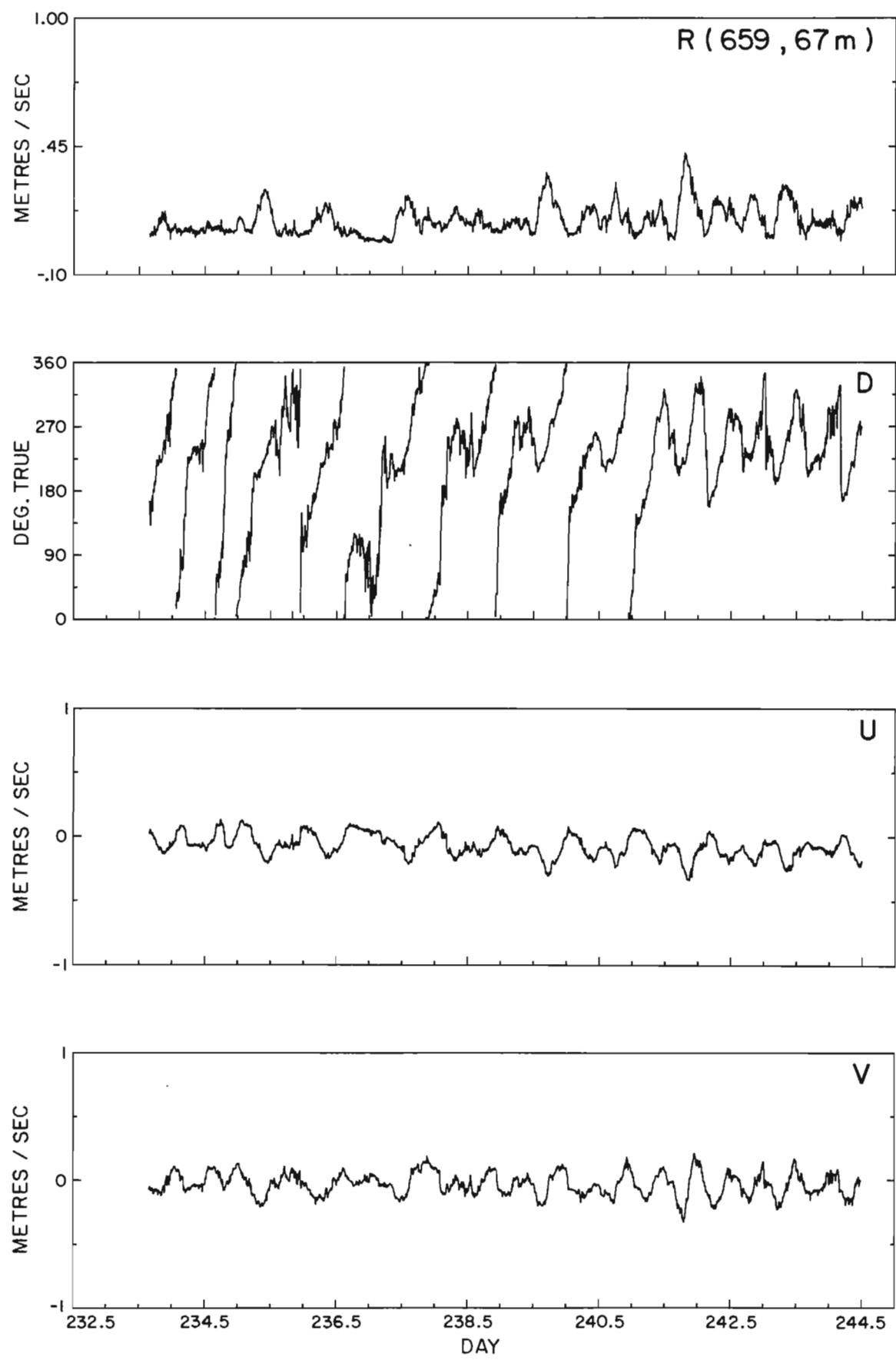


Fig. 7

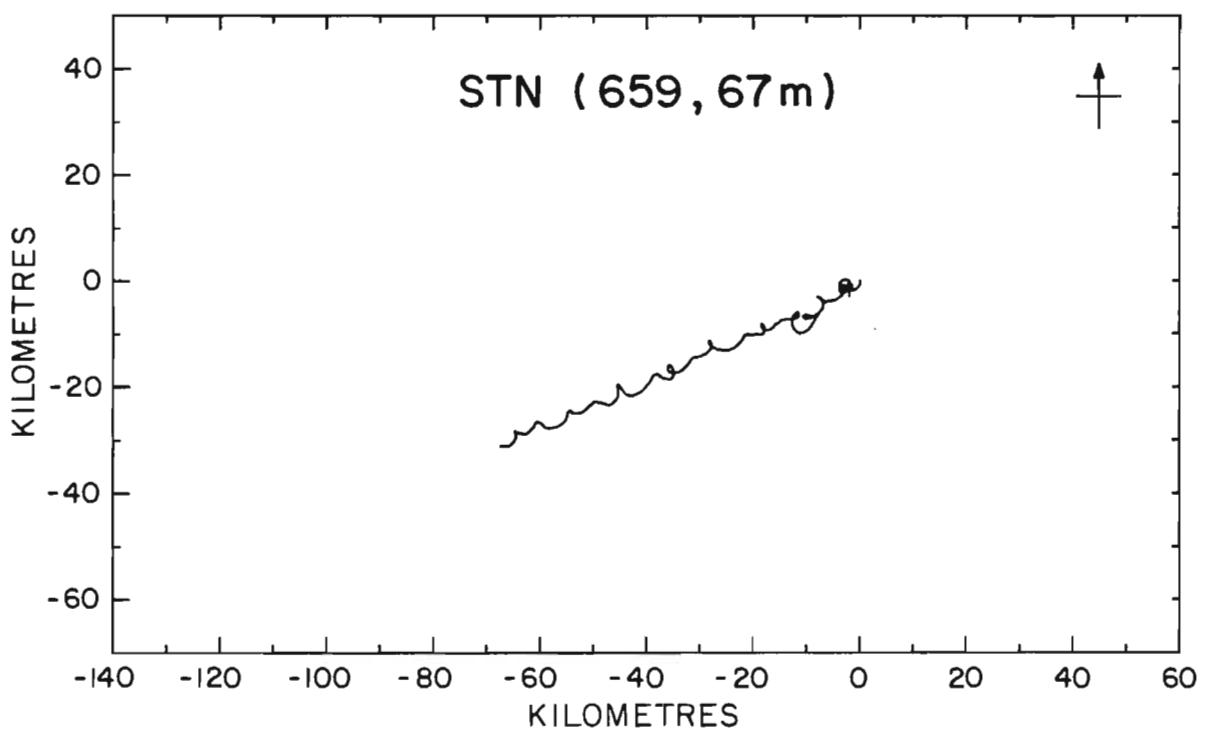


Fig. 8

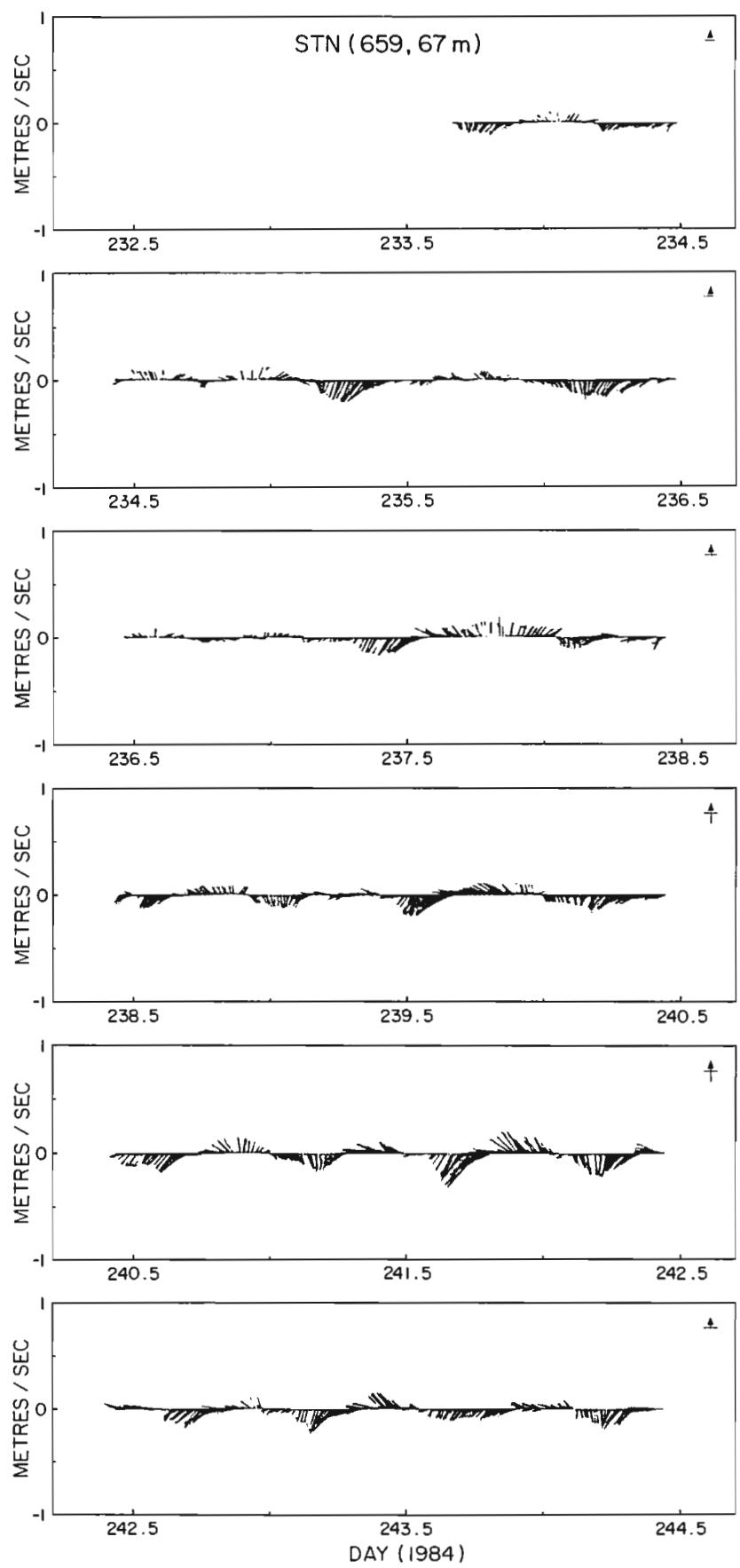


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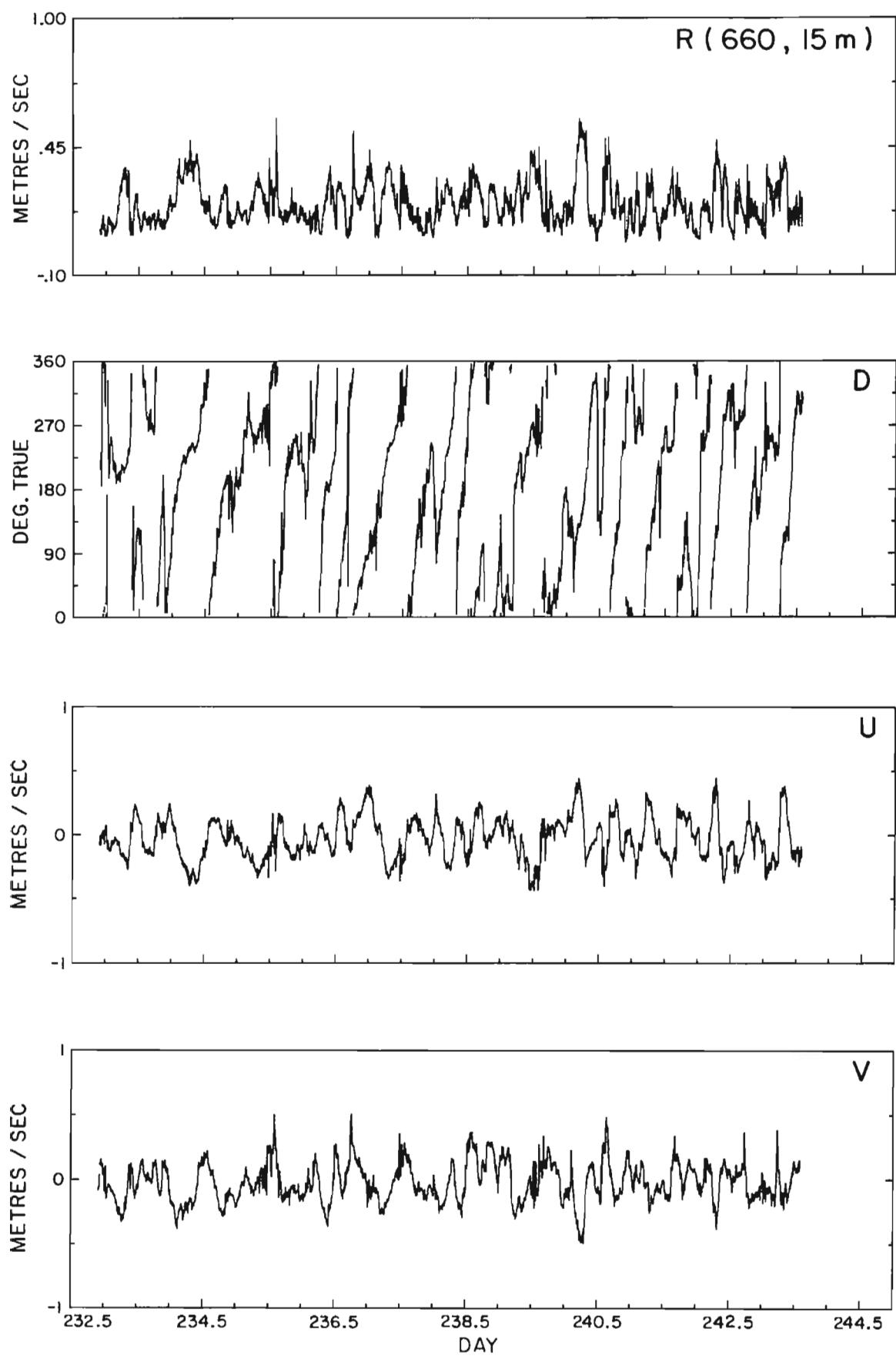


Fig. 10

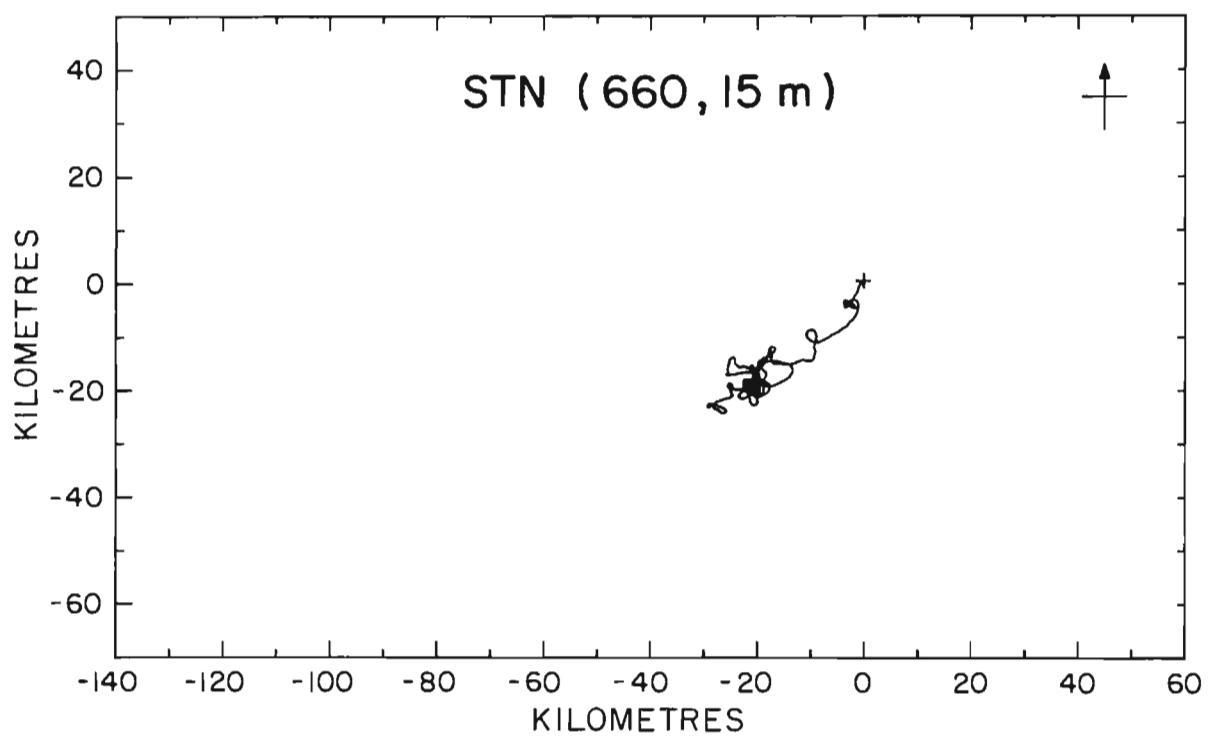


Fig. 11

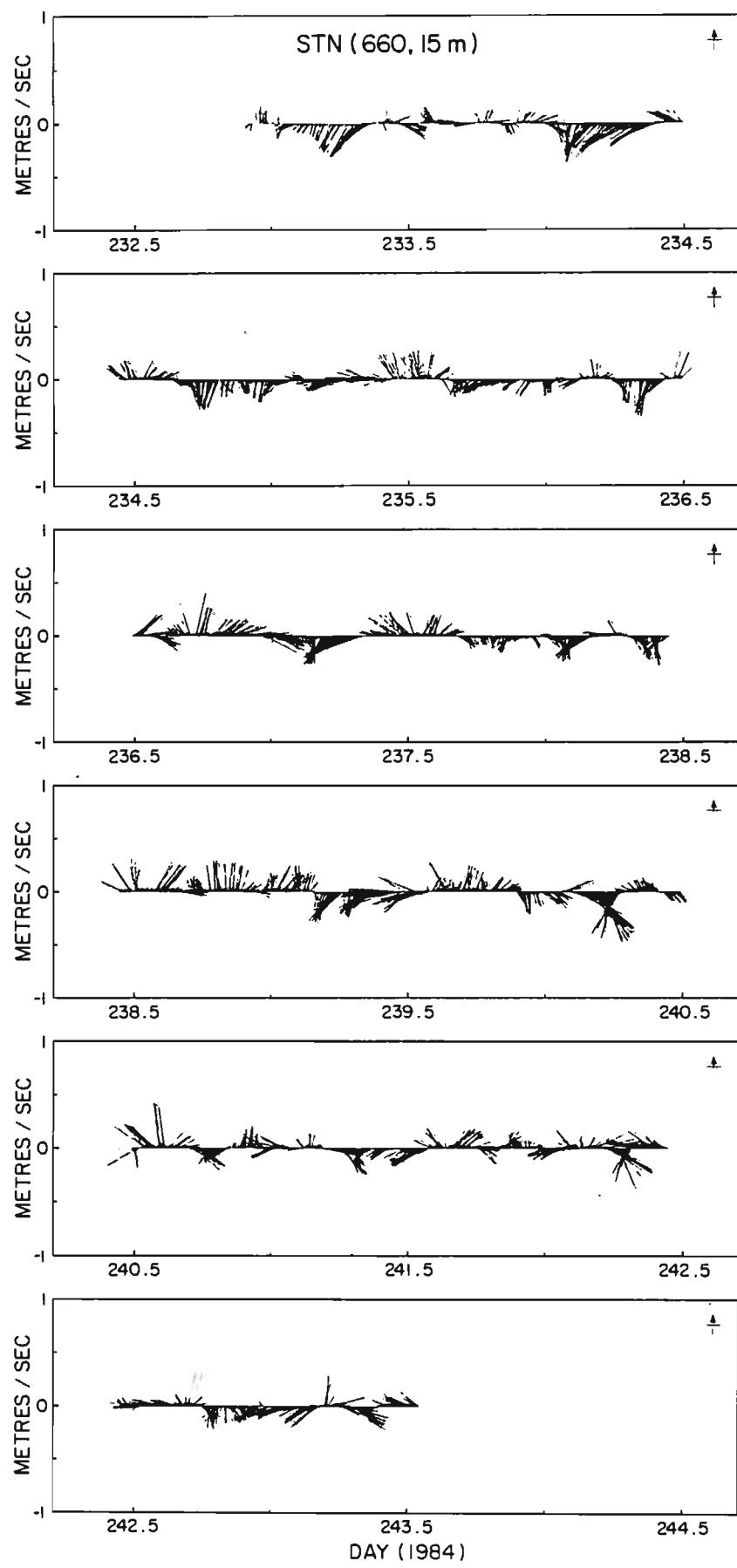


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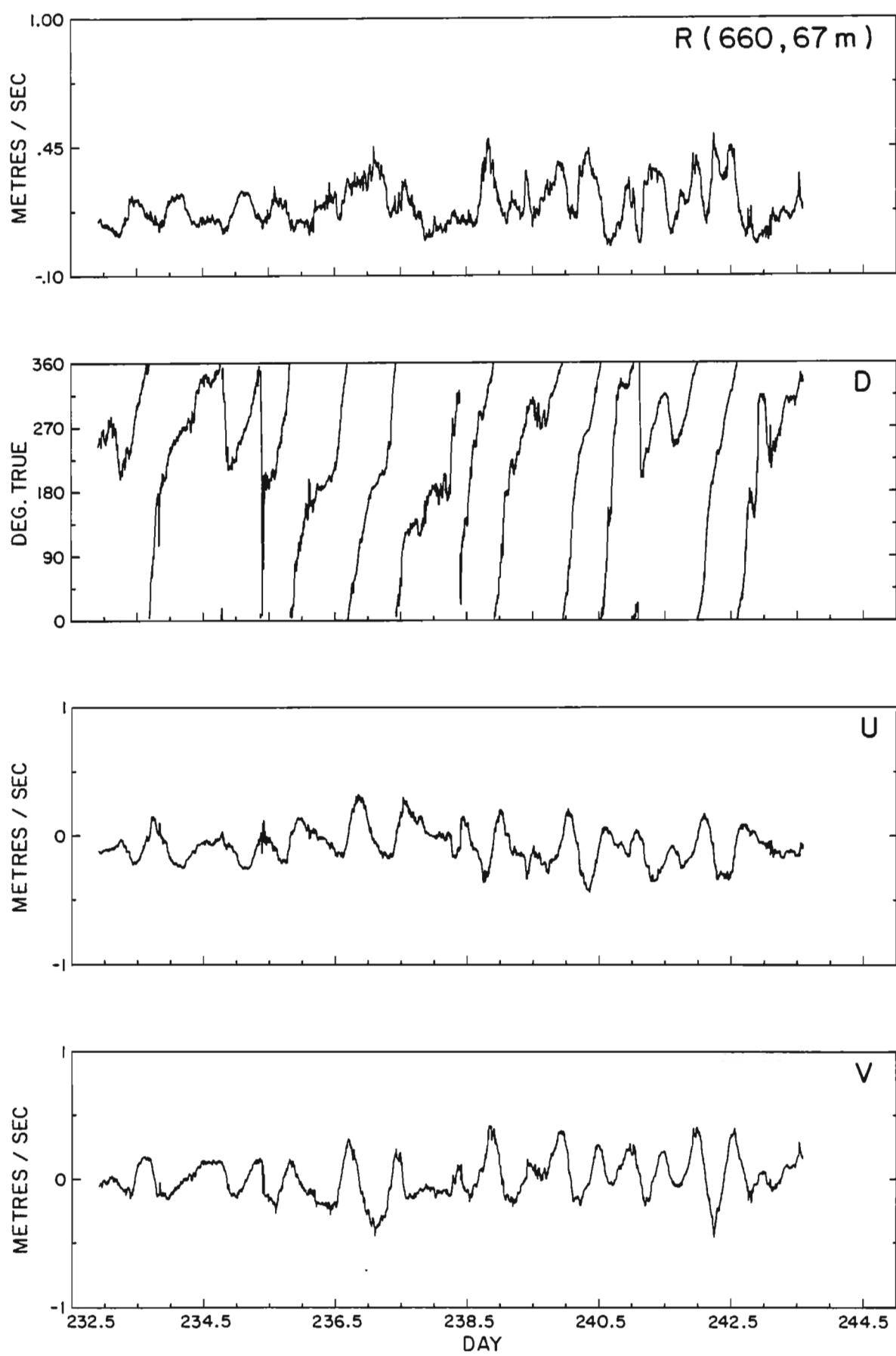


Fig. 13

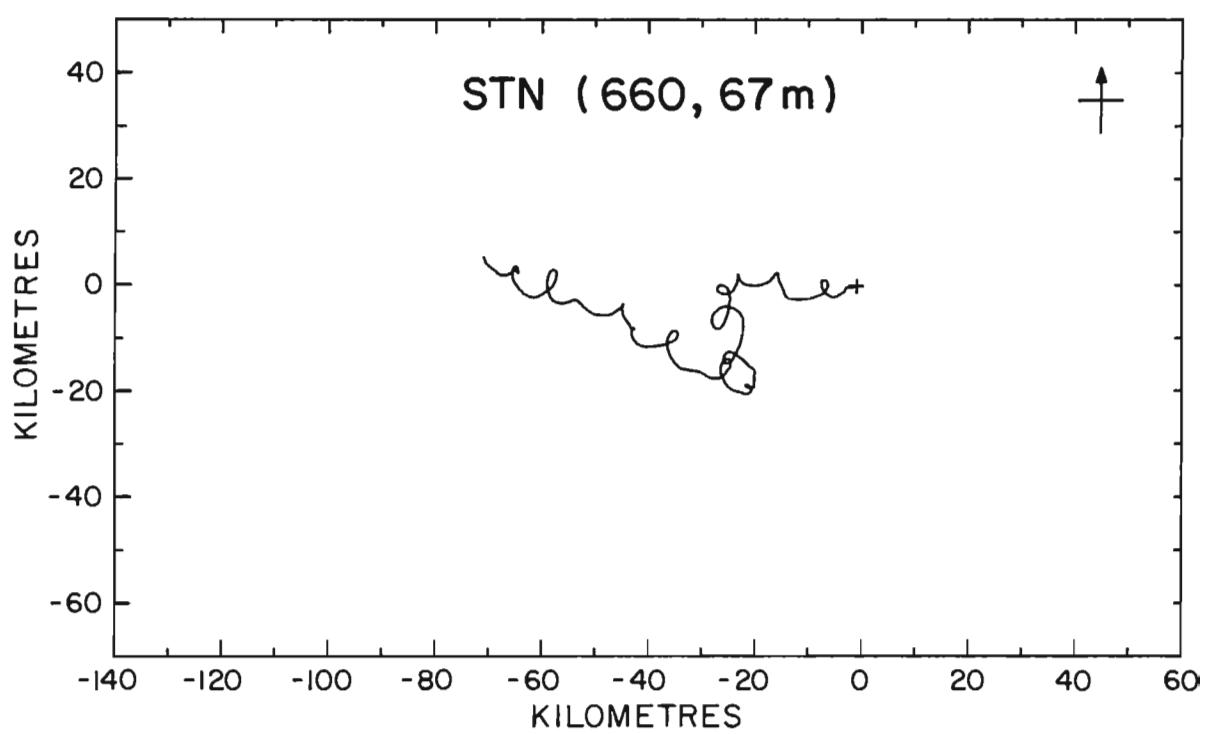


Fig. 14

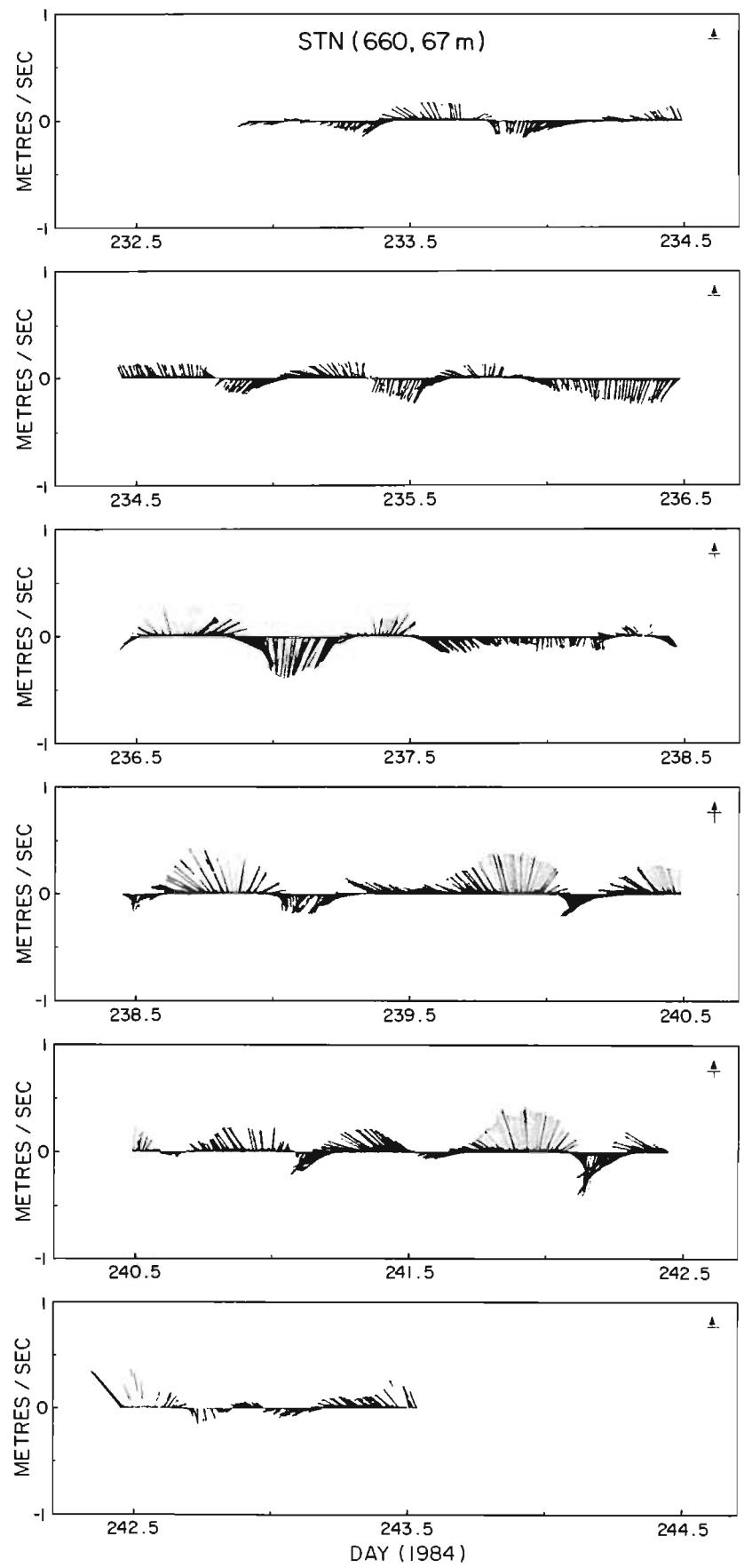


Fig. 15

Figures 16-28.

BATFISH station 40; 13 sections of Temperature, Salinity and Sigma-t vs. pressure,
location map and latitude vs. time plot.

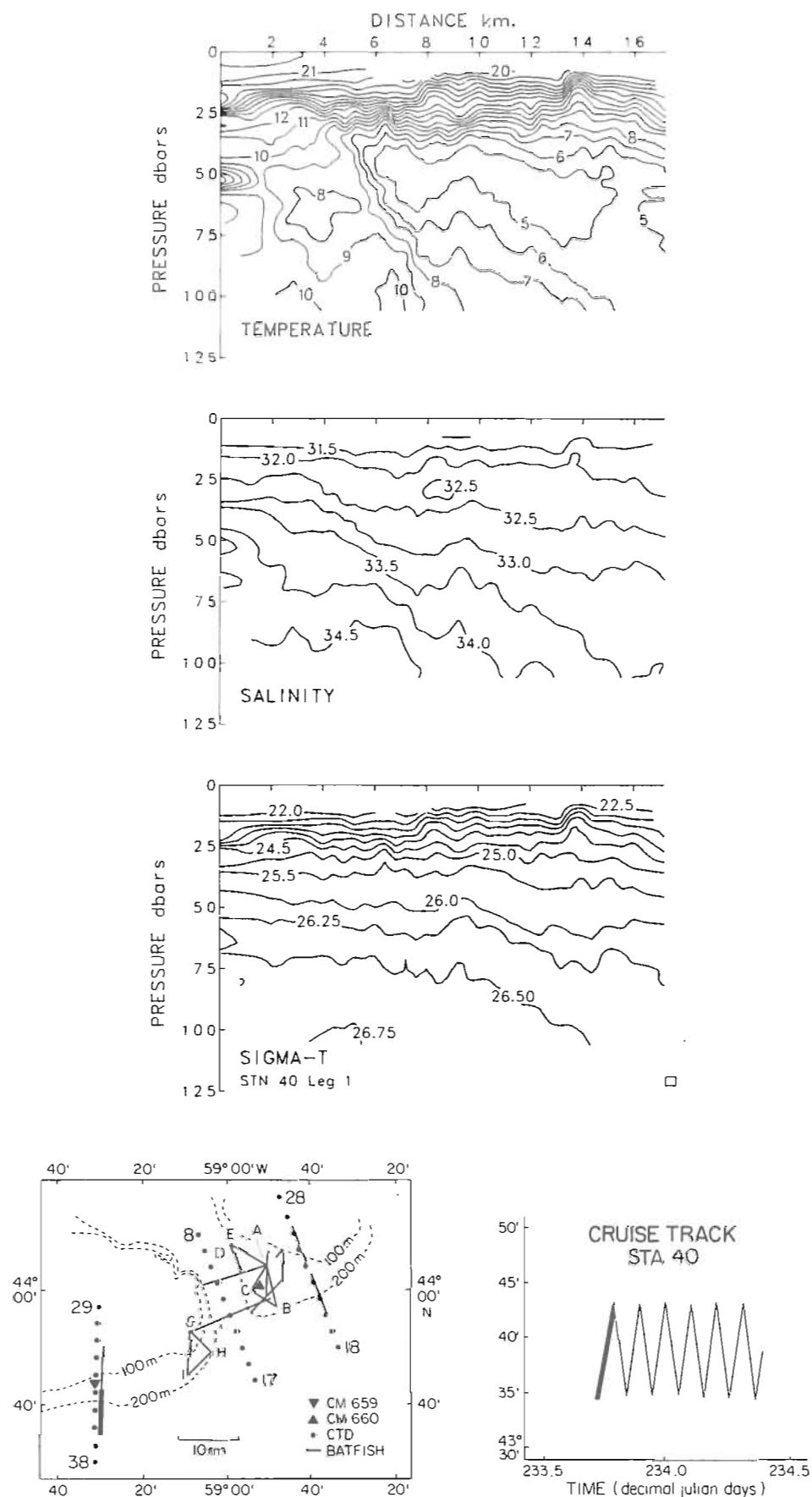


Fig. 16

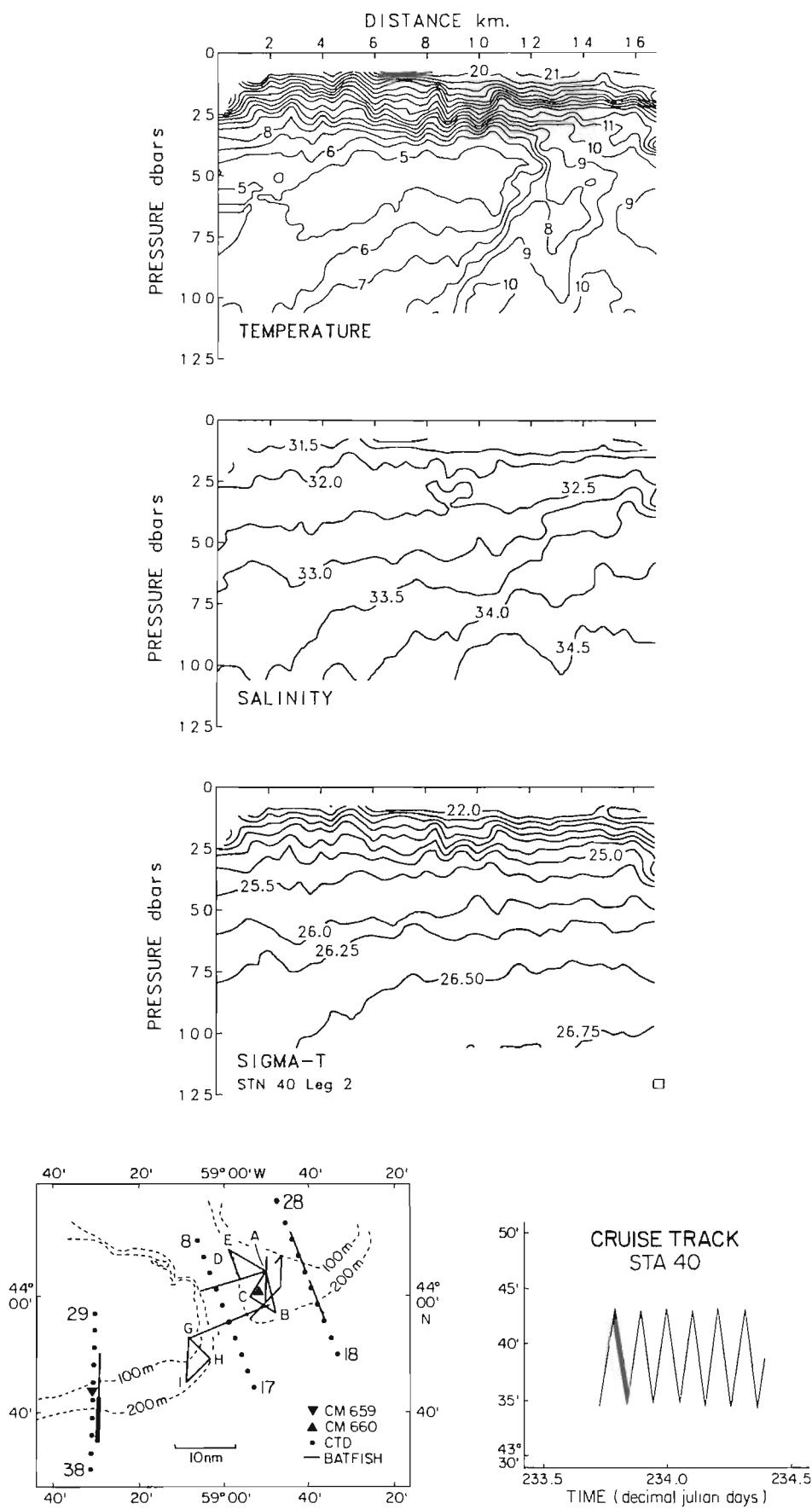


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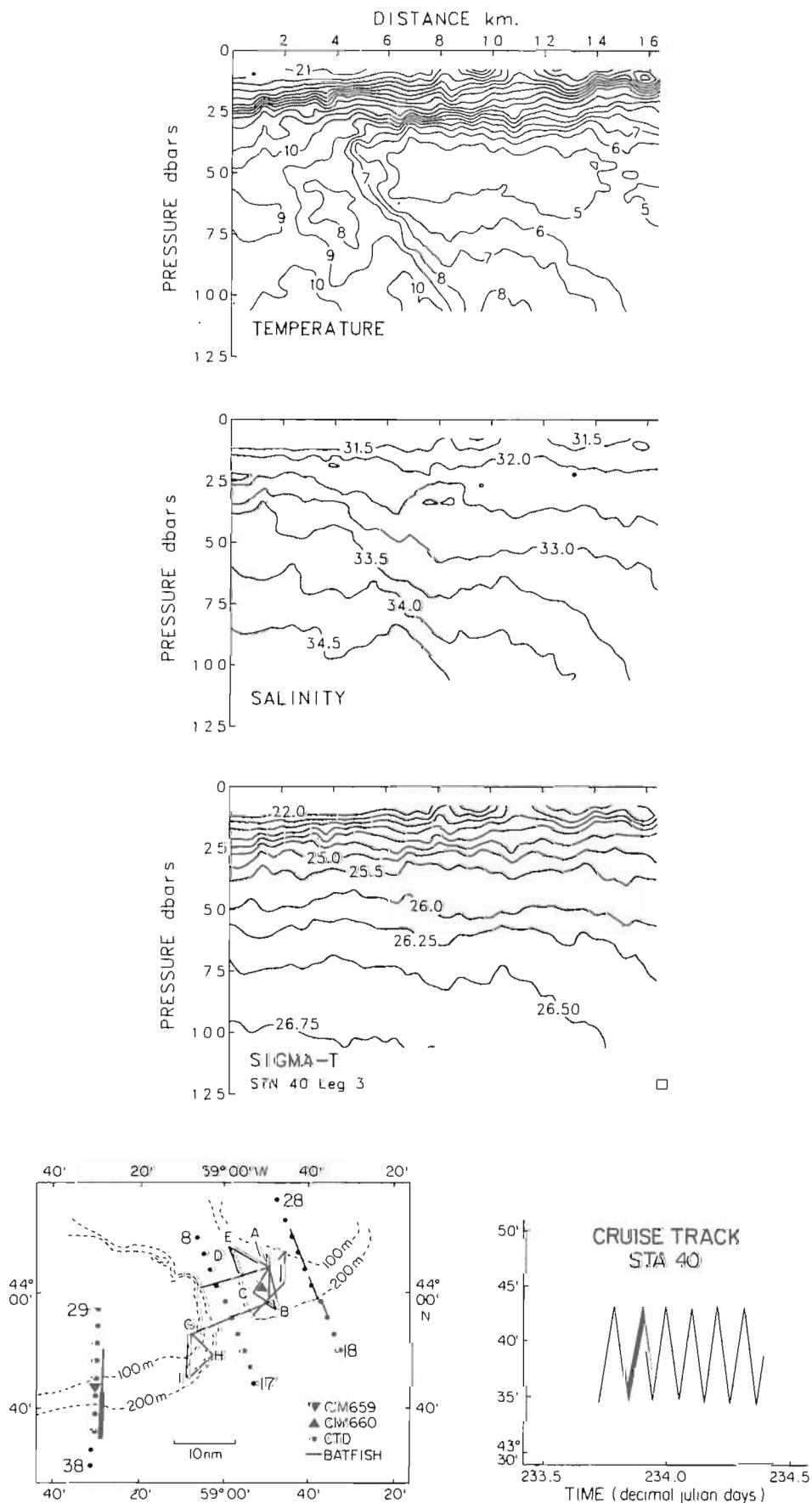


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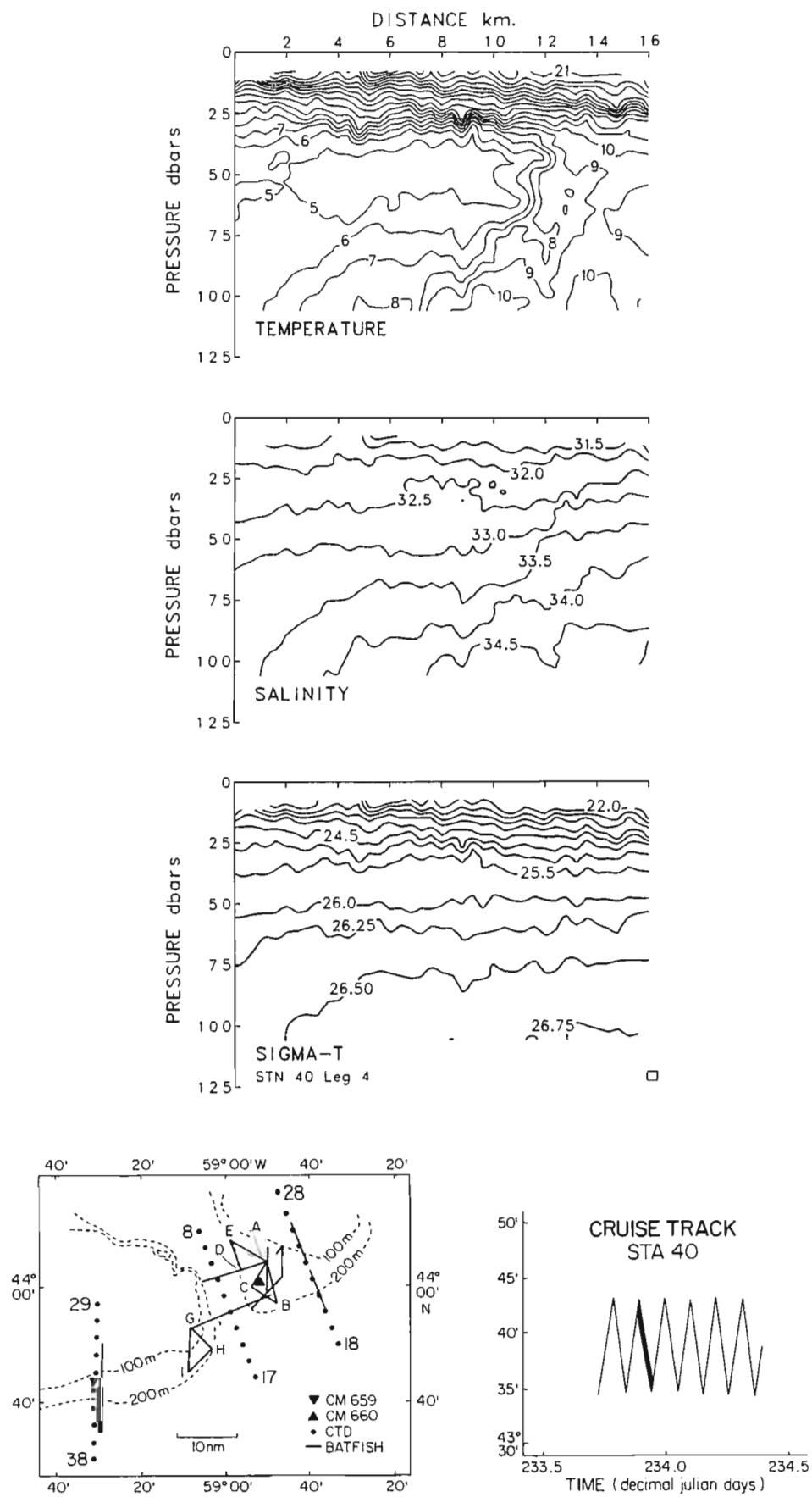


Fig. 19

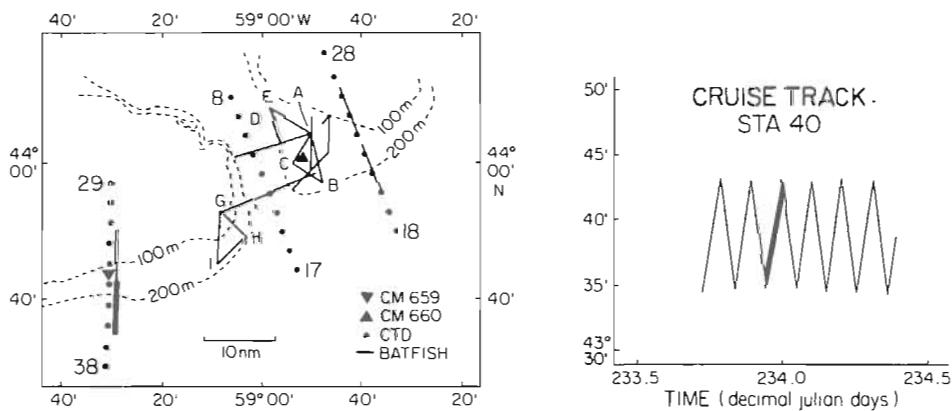
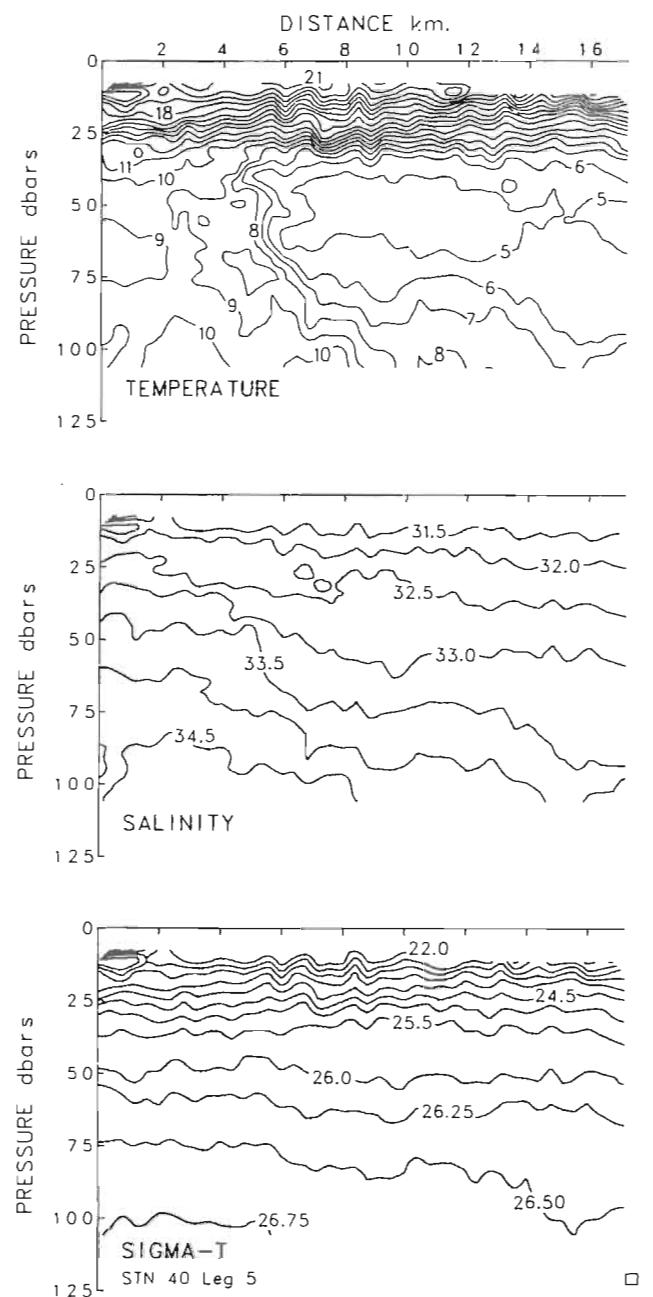


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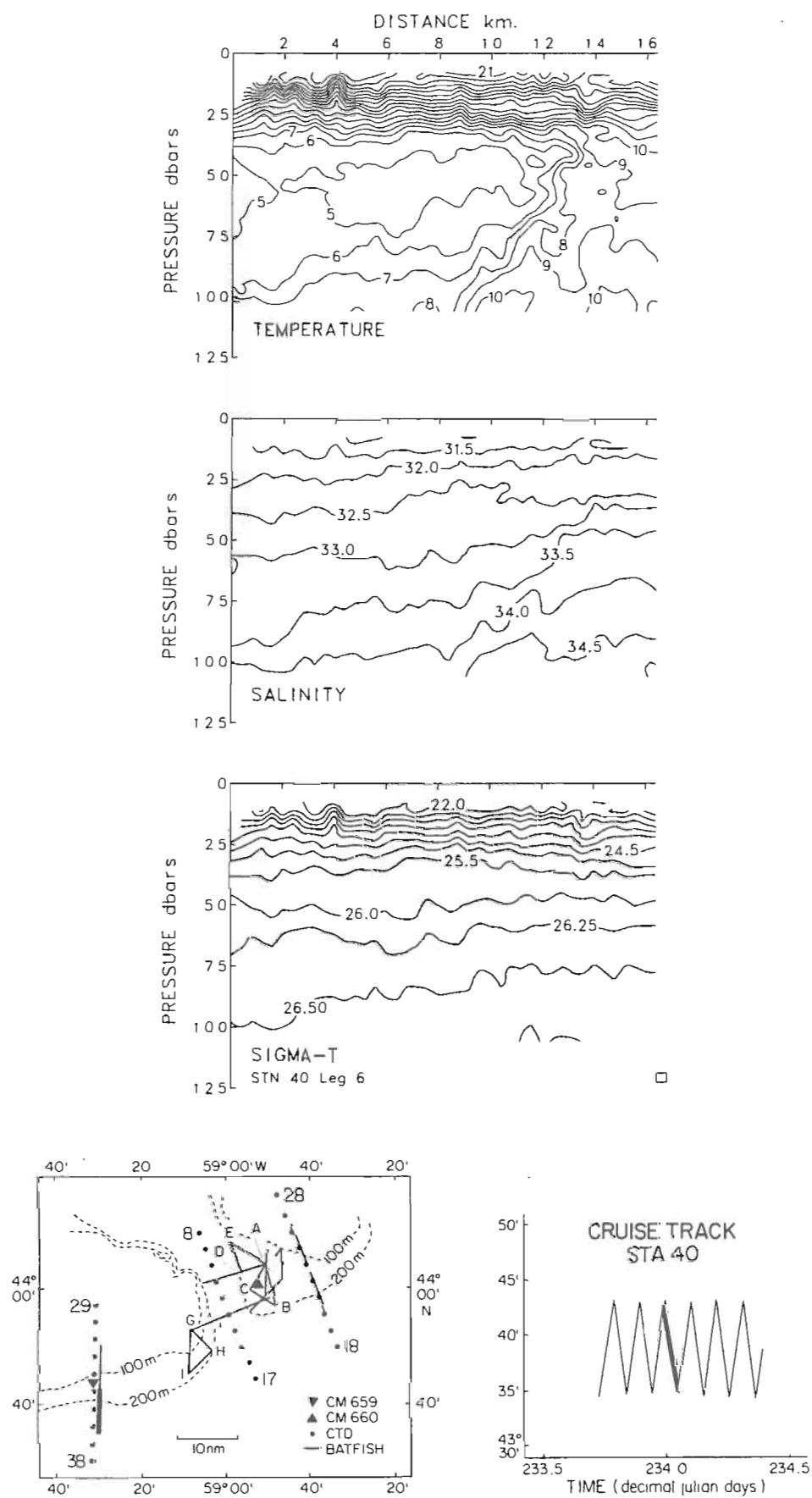


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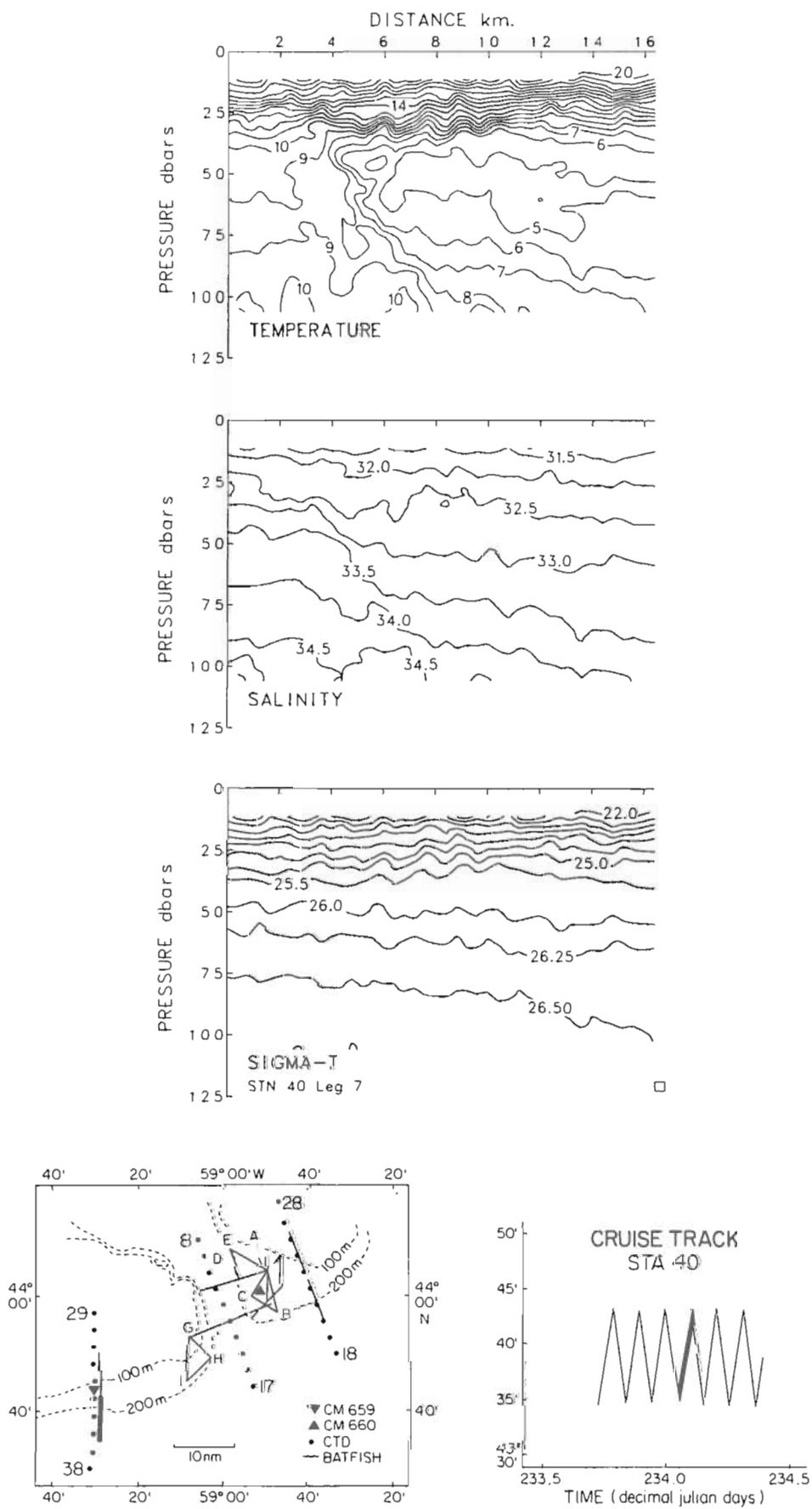


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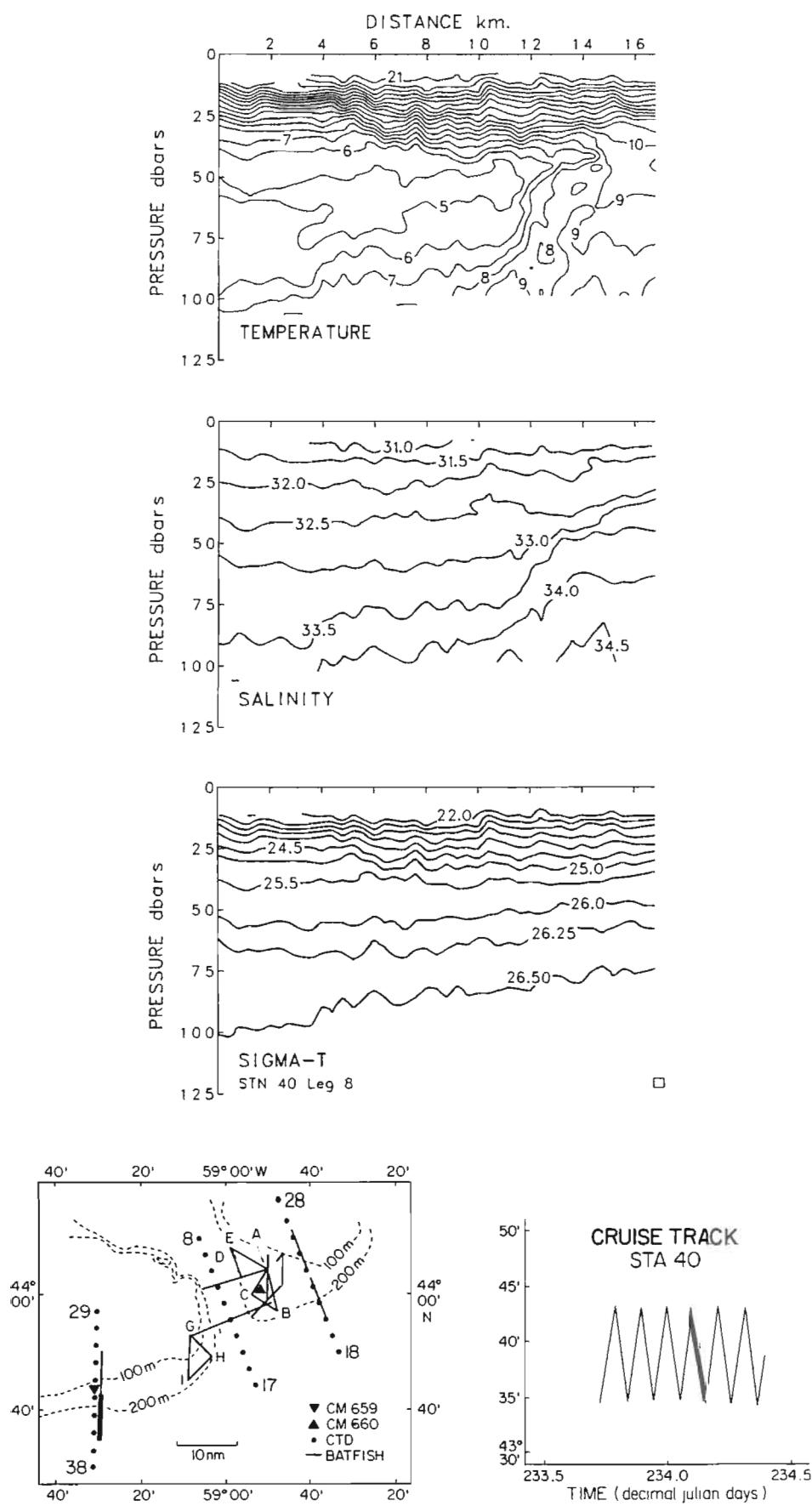


Fig. 23

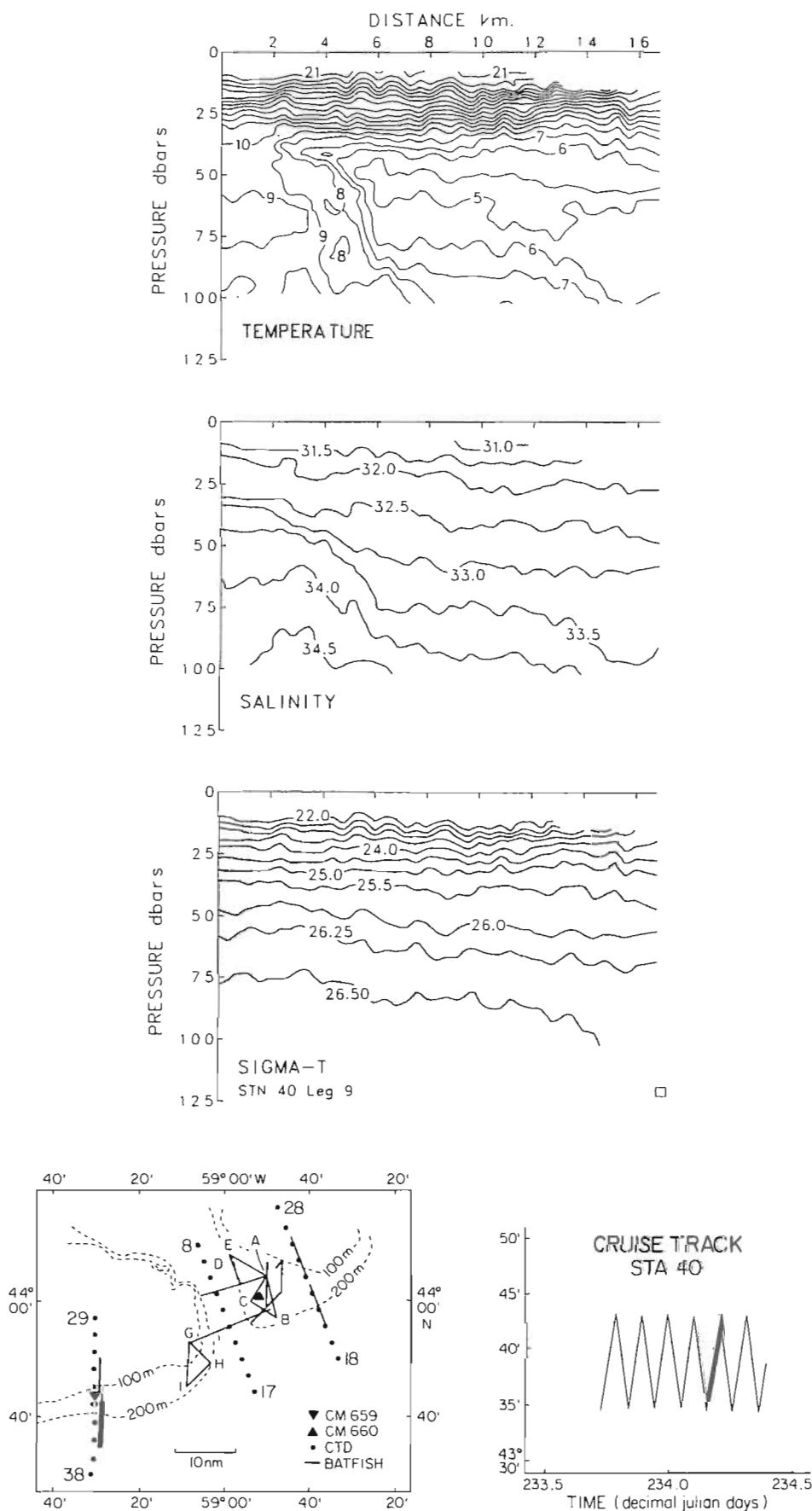


Fig. 24

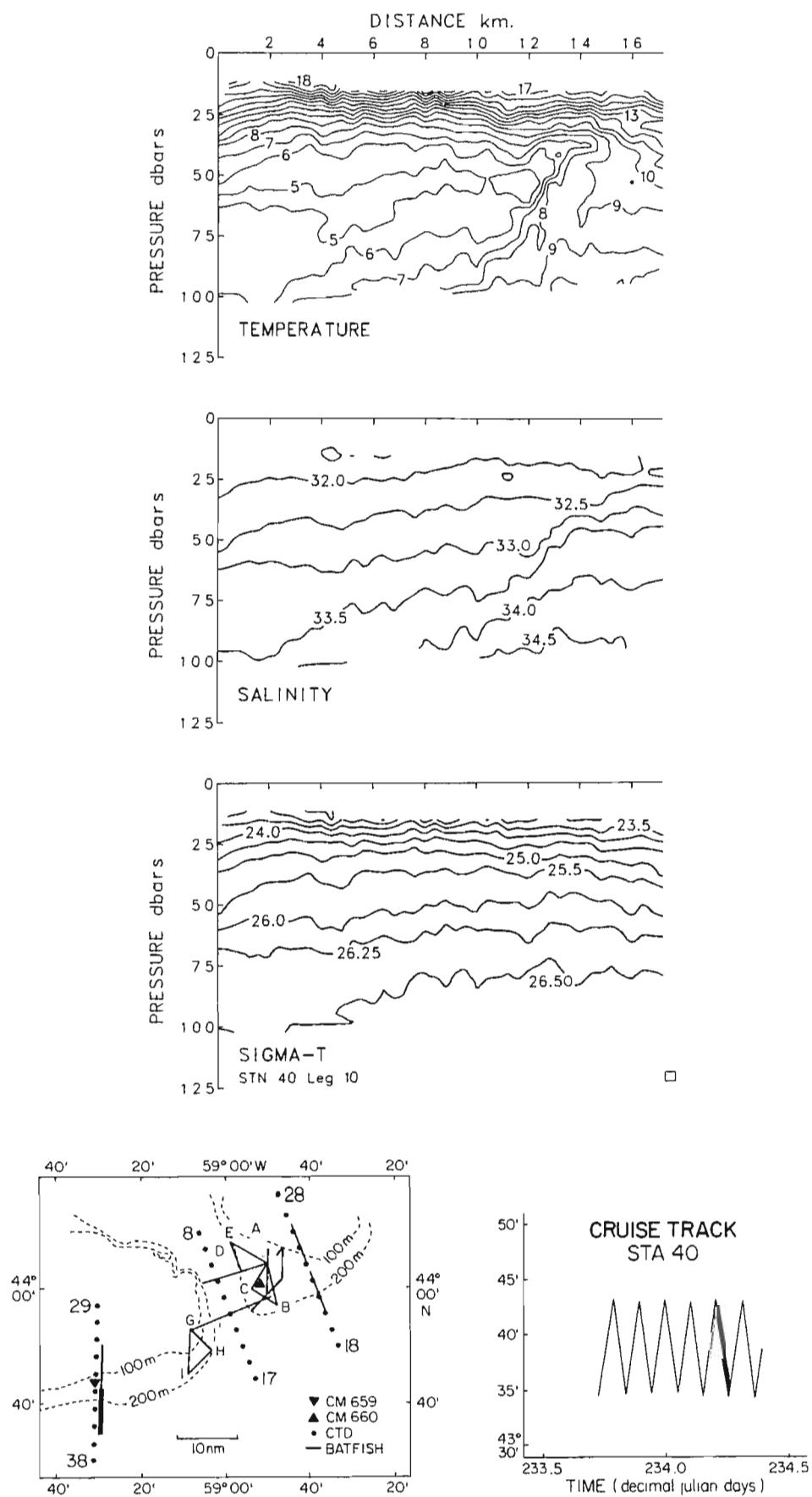


Fig. 25

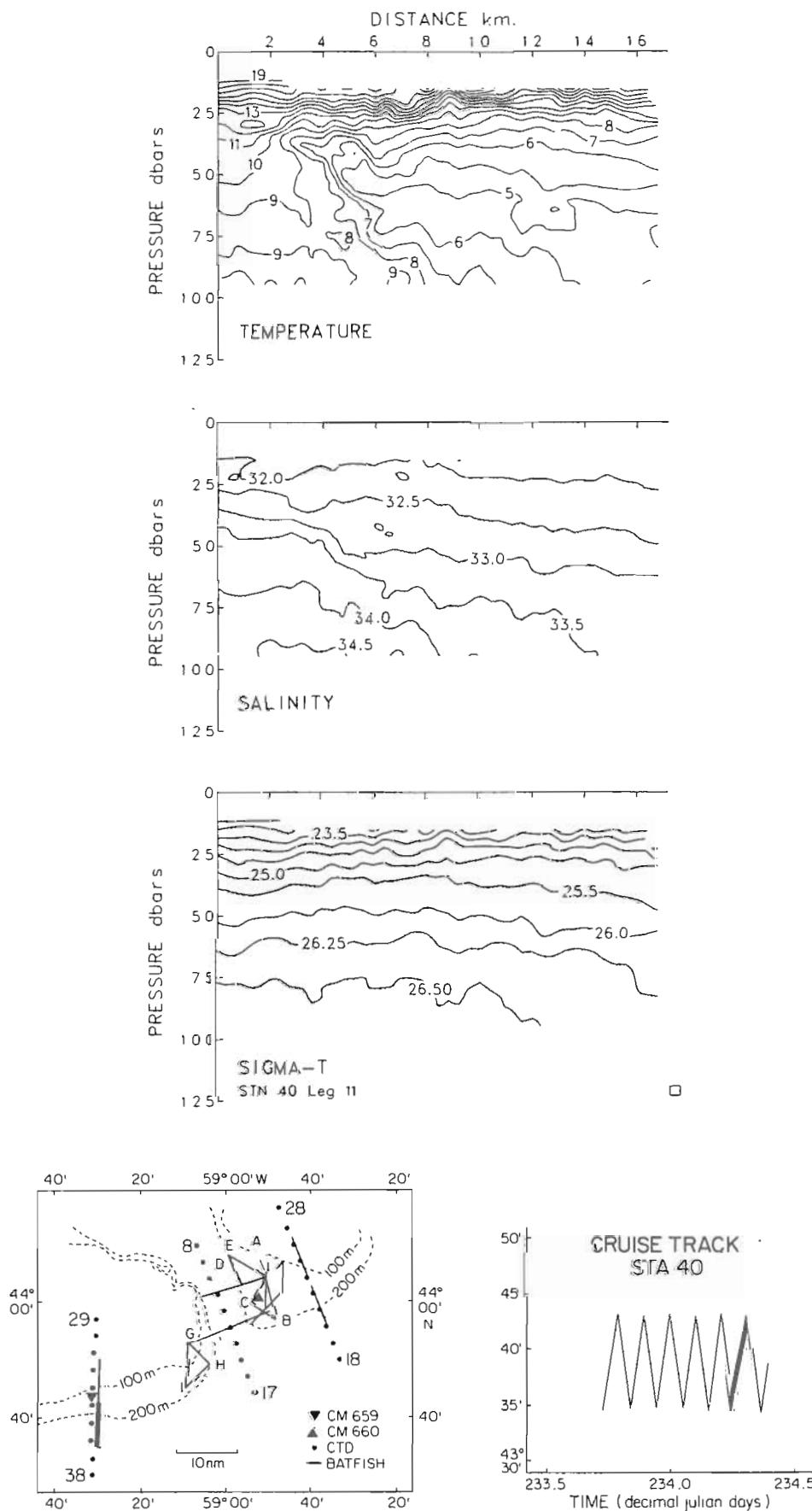


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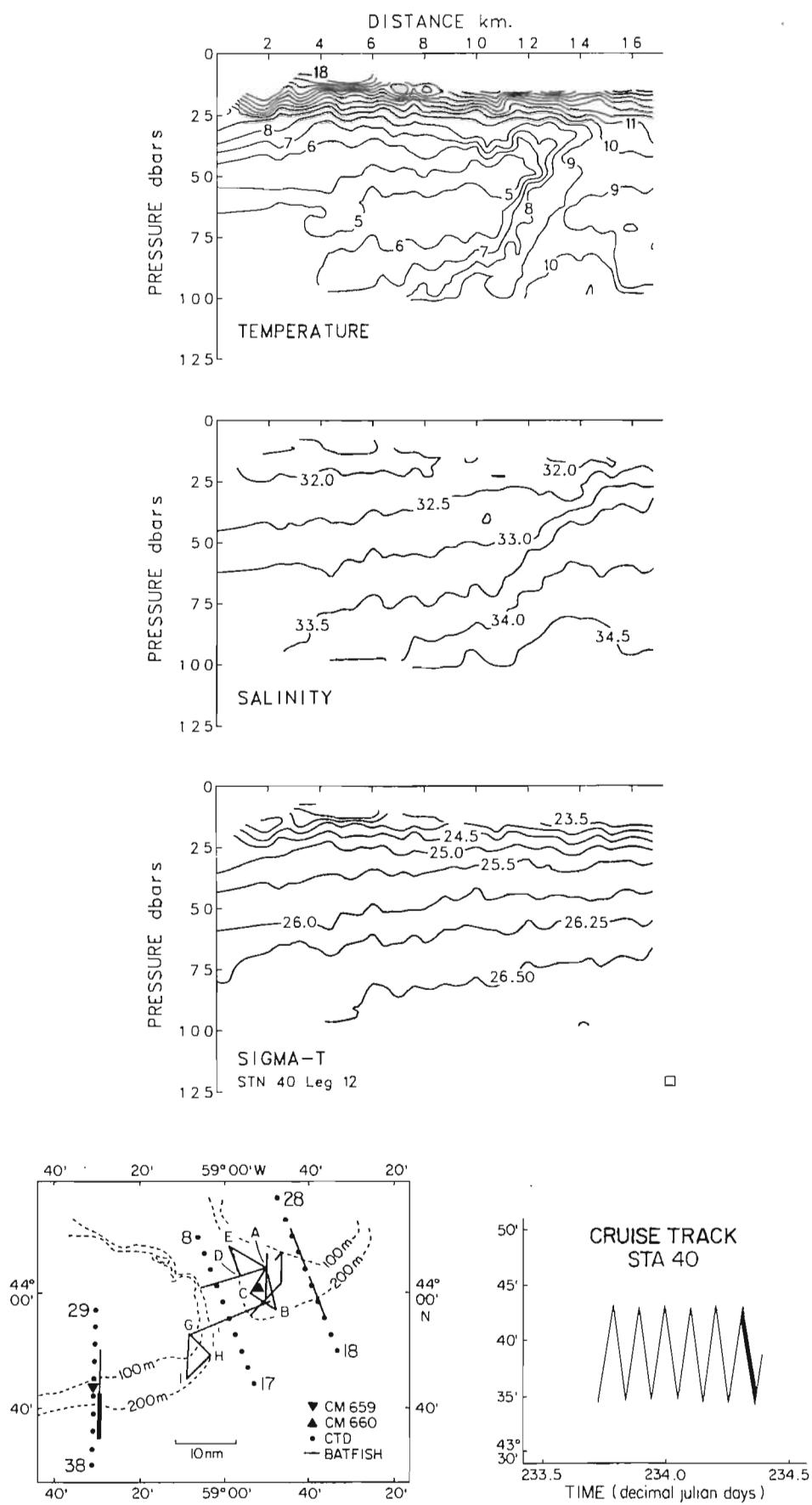


Fig. 27

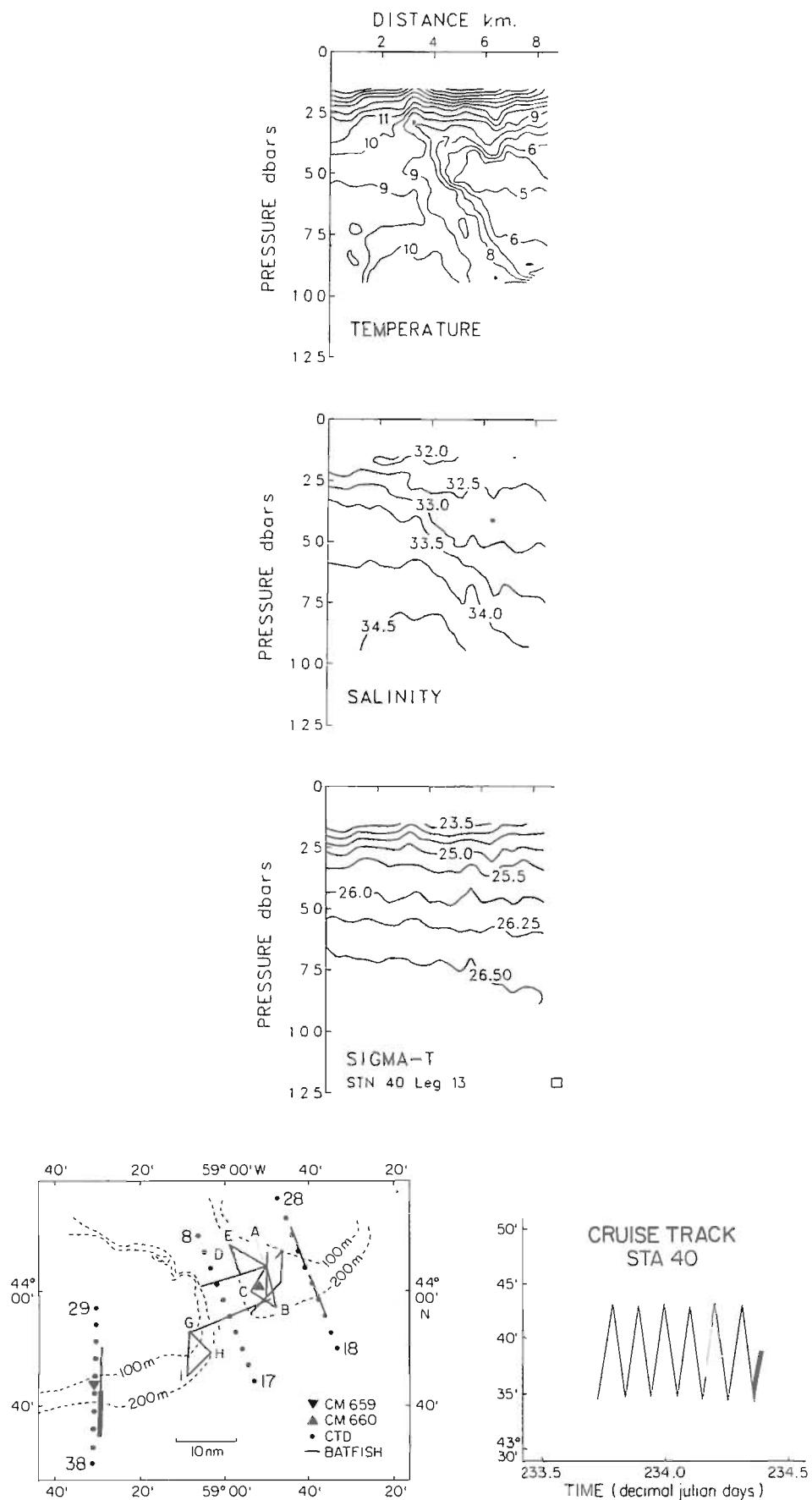


Fig. 28

Figures 29-45.

BATFISH stations 41: 17 sections of Temperature, Salinity and Sigma-t vs. pressure, location map and latitude vs. time plot. Leg 14 is the last transect along the predetermined line. Legs 15, 16 and 17 are from the transit between the south end of station 41 and the beginning or west end of station 42. Leg 15 is mainly E-W, Leg 16 and 17 are more N-S.

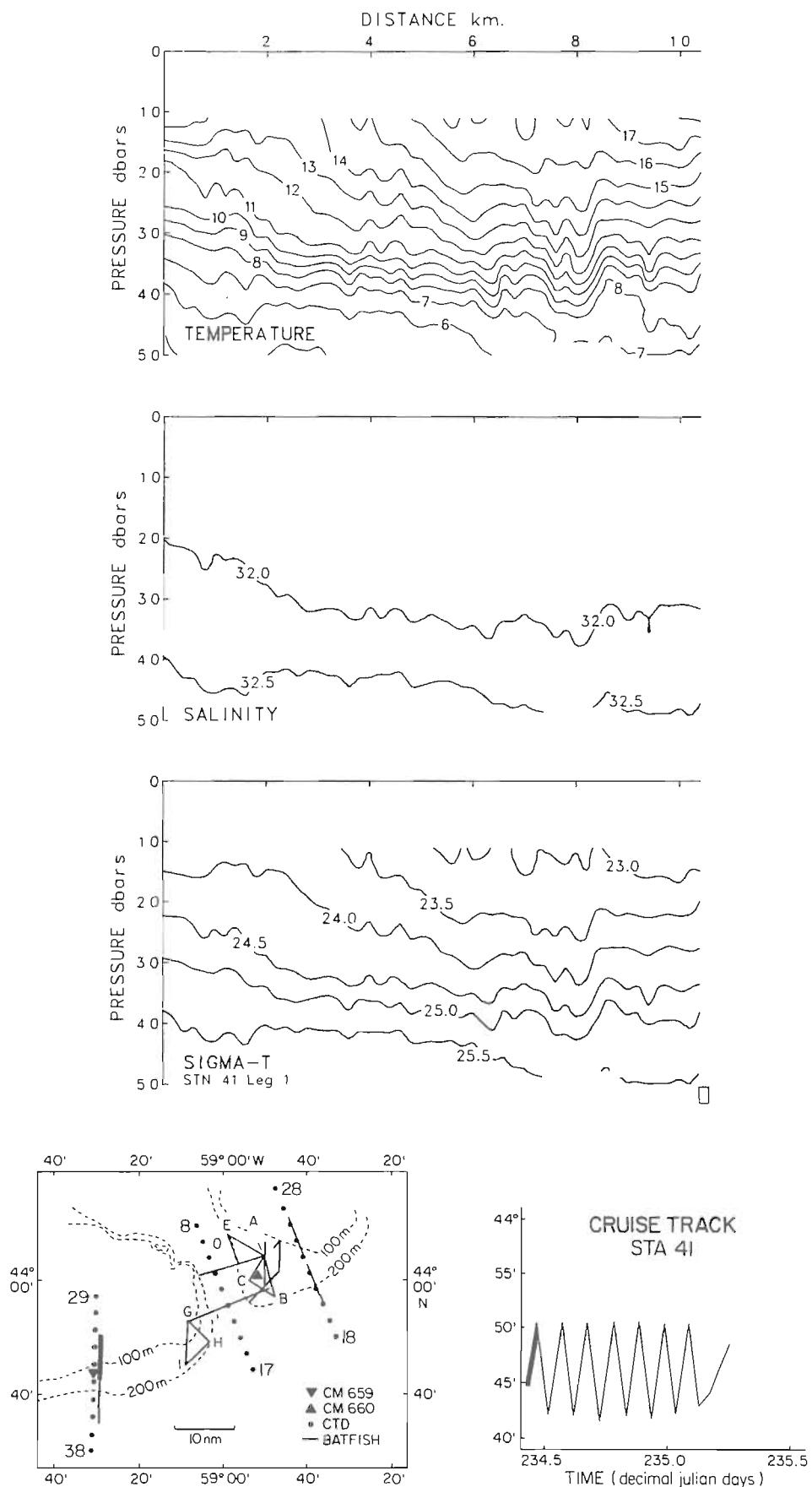


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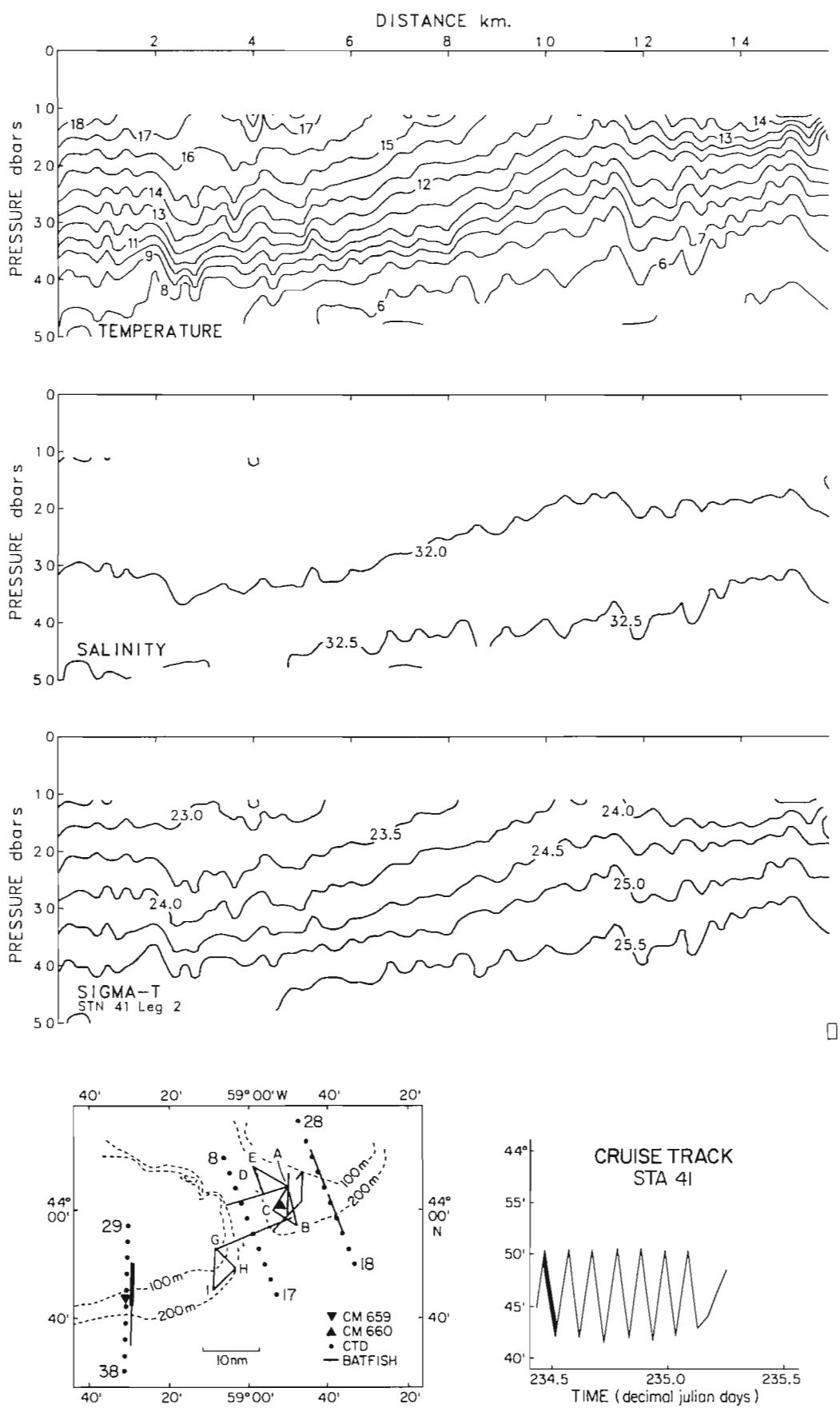


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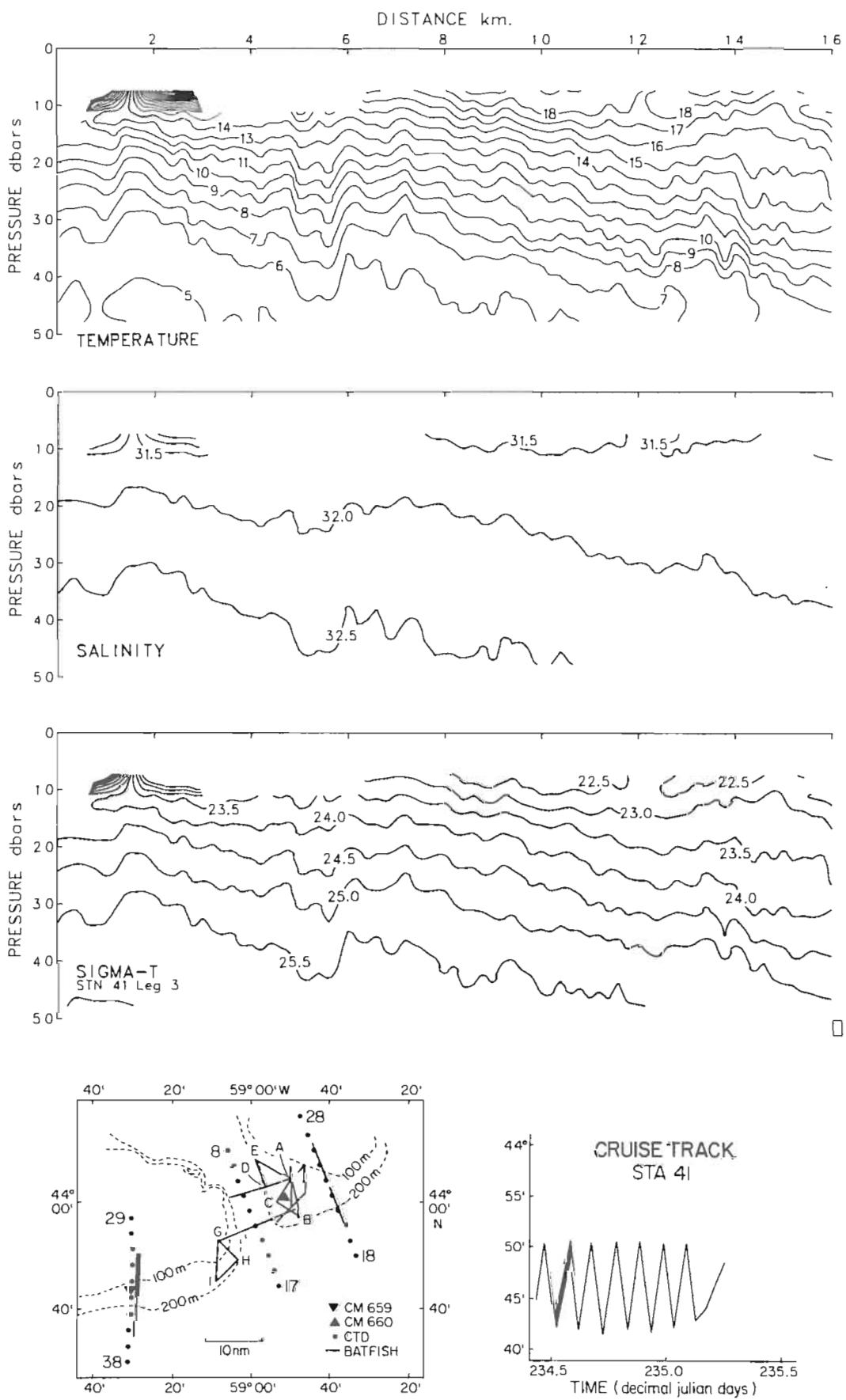


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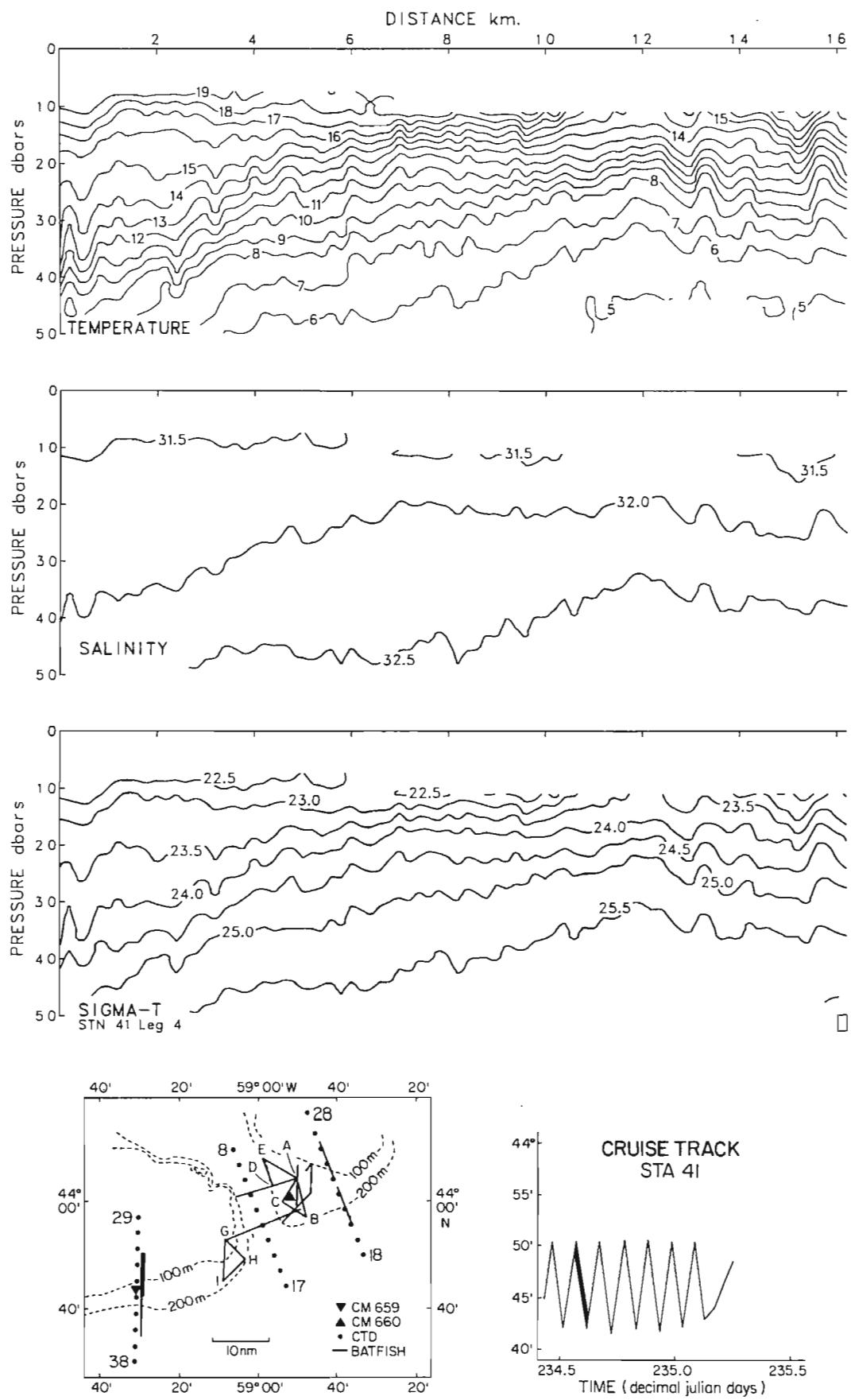


Fig. 32

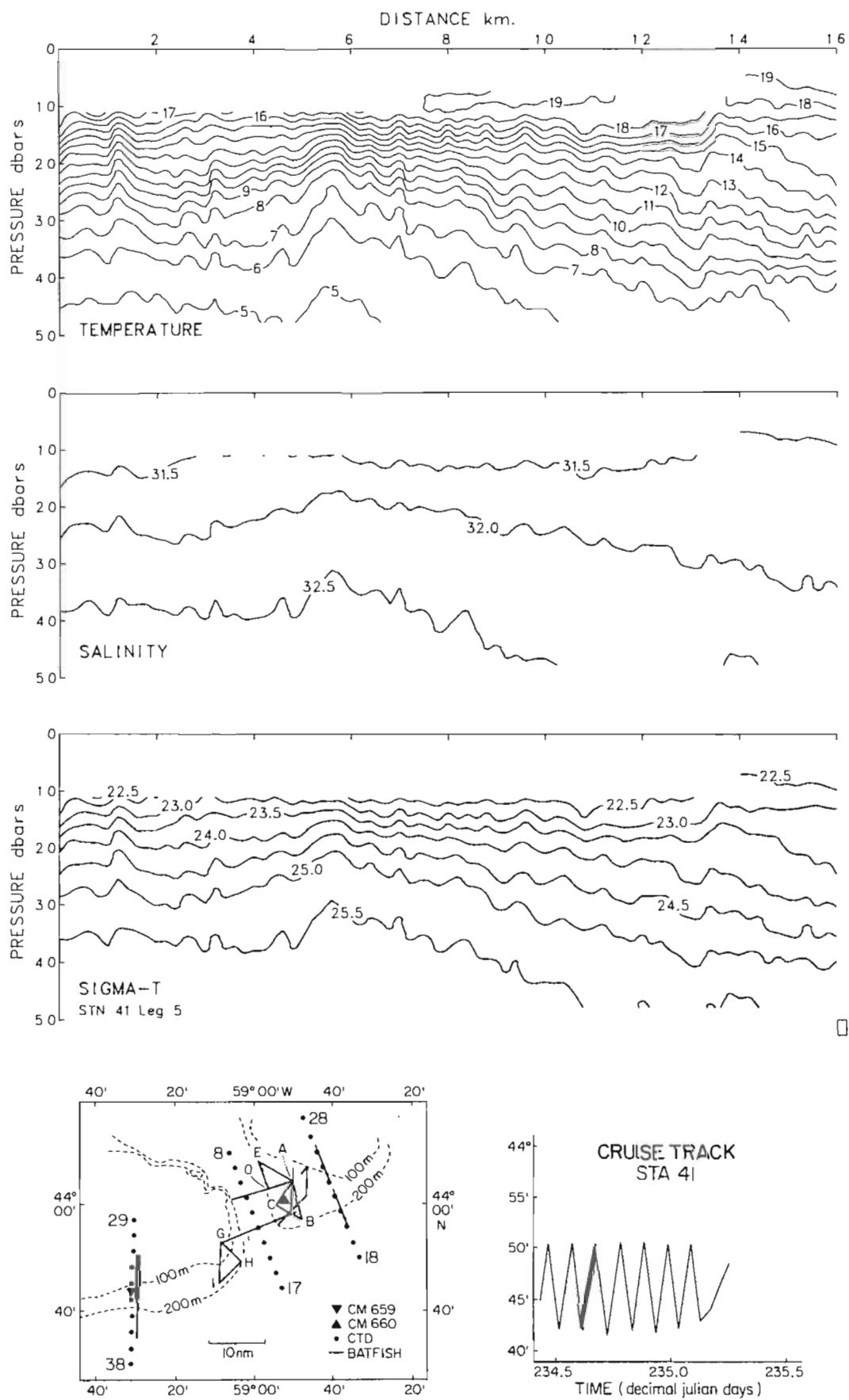


Fig. 33

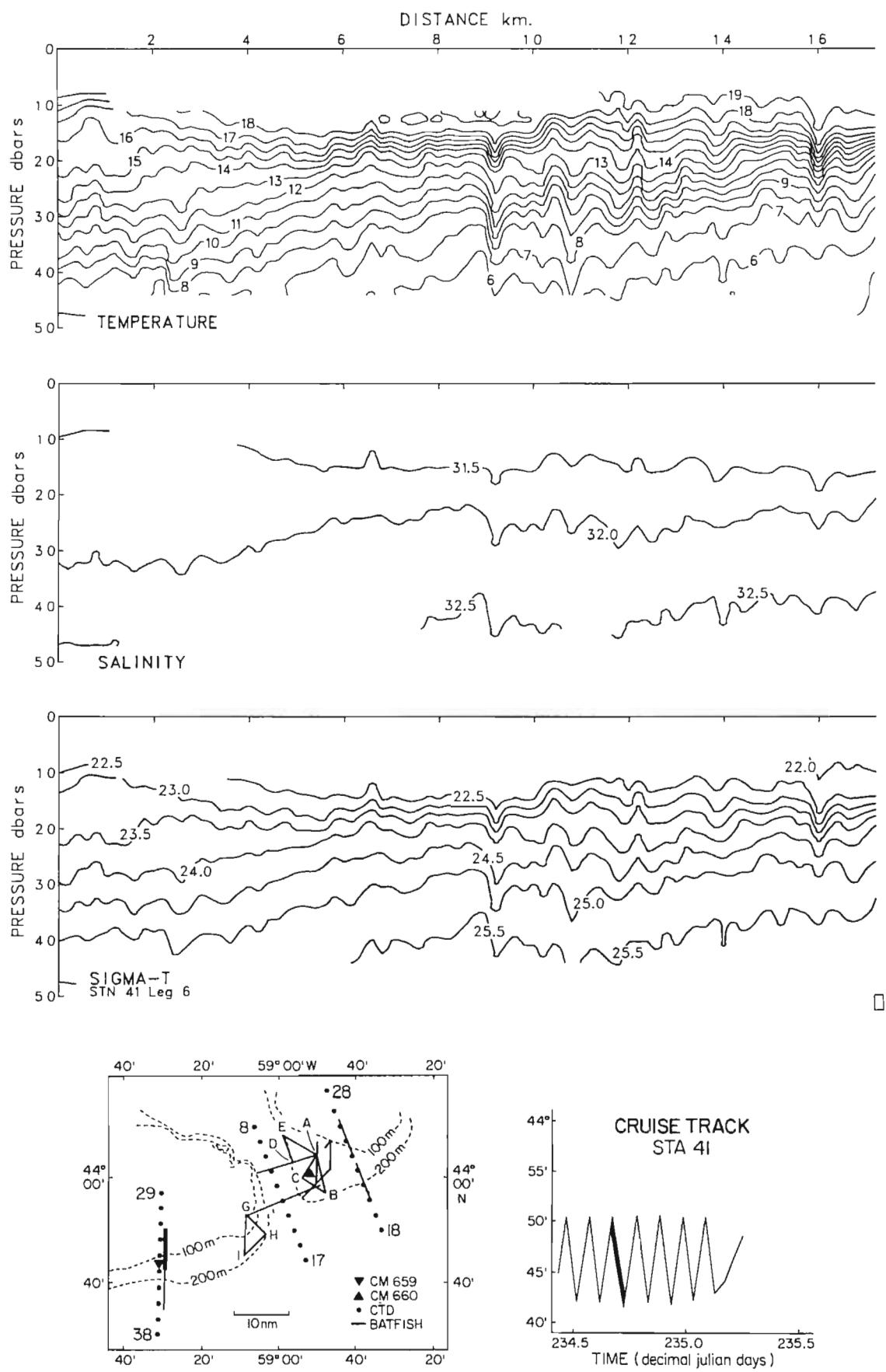


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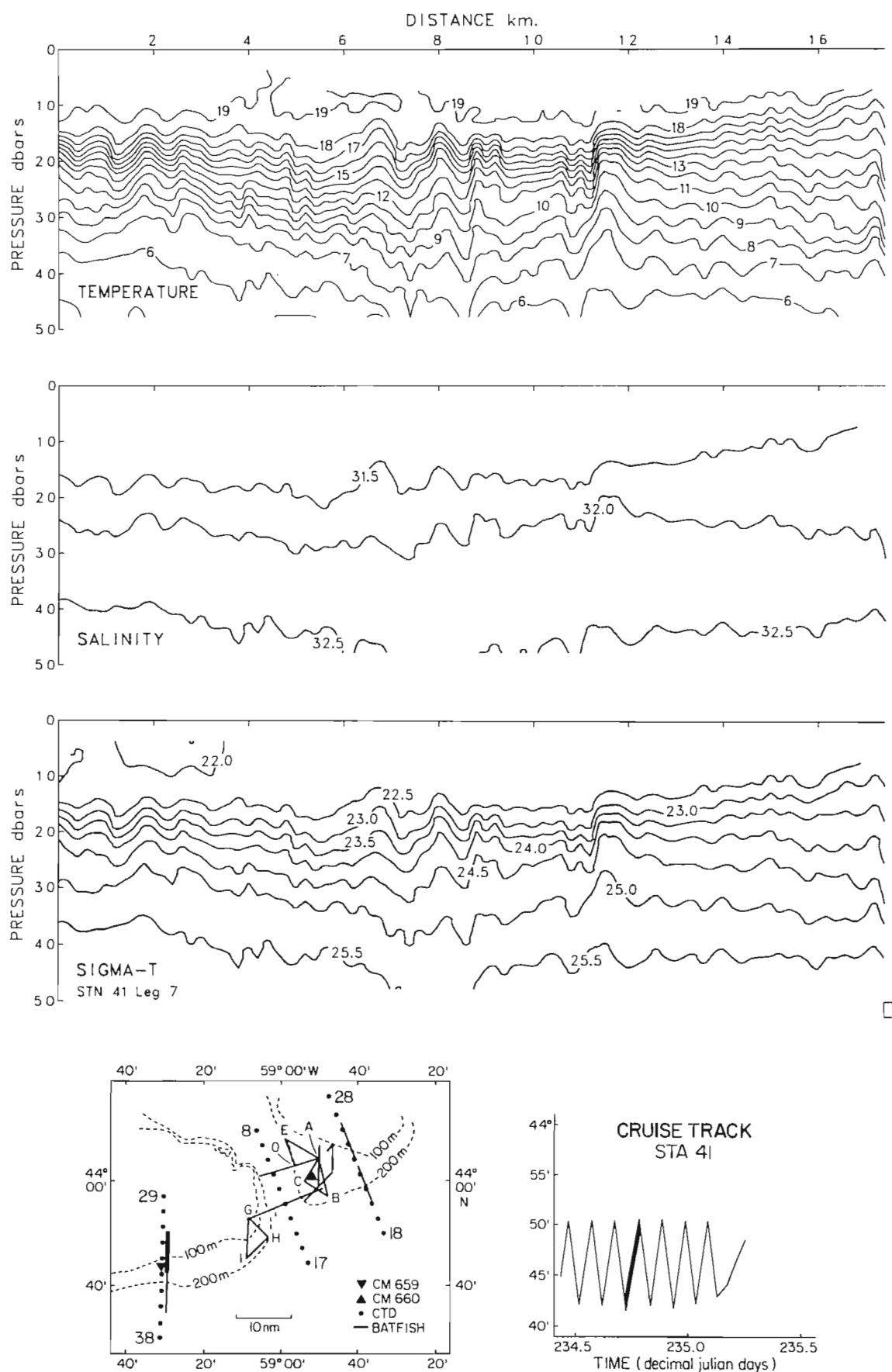


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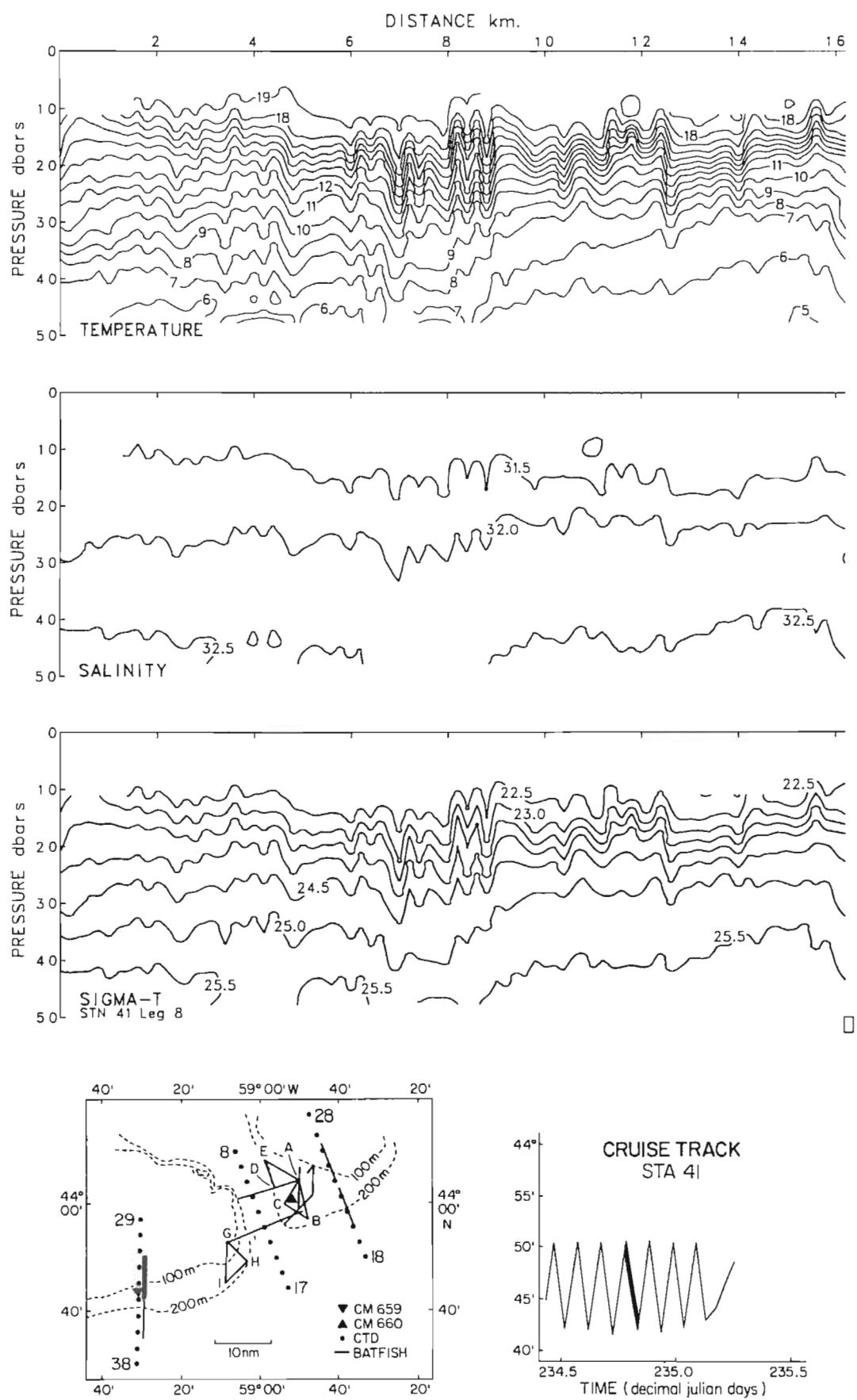


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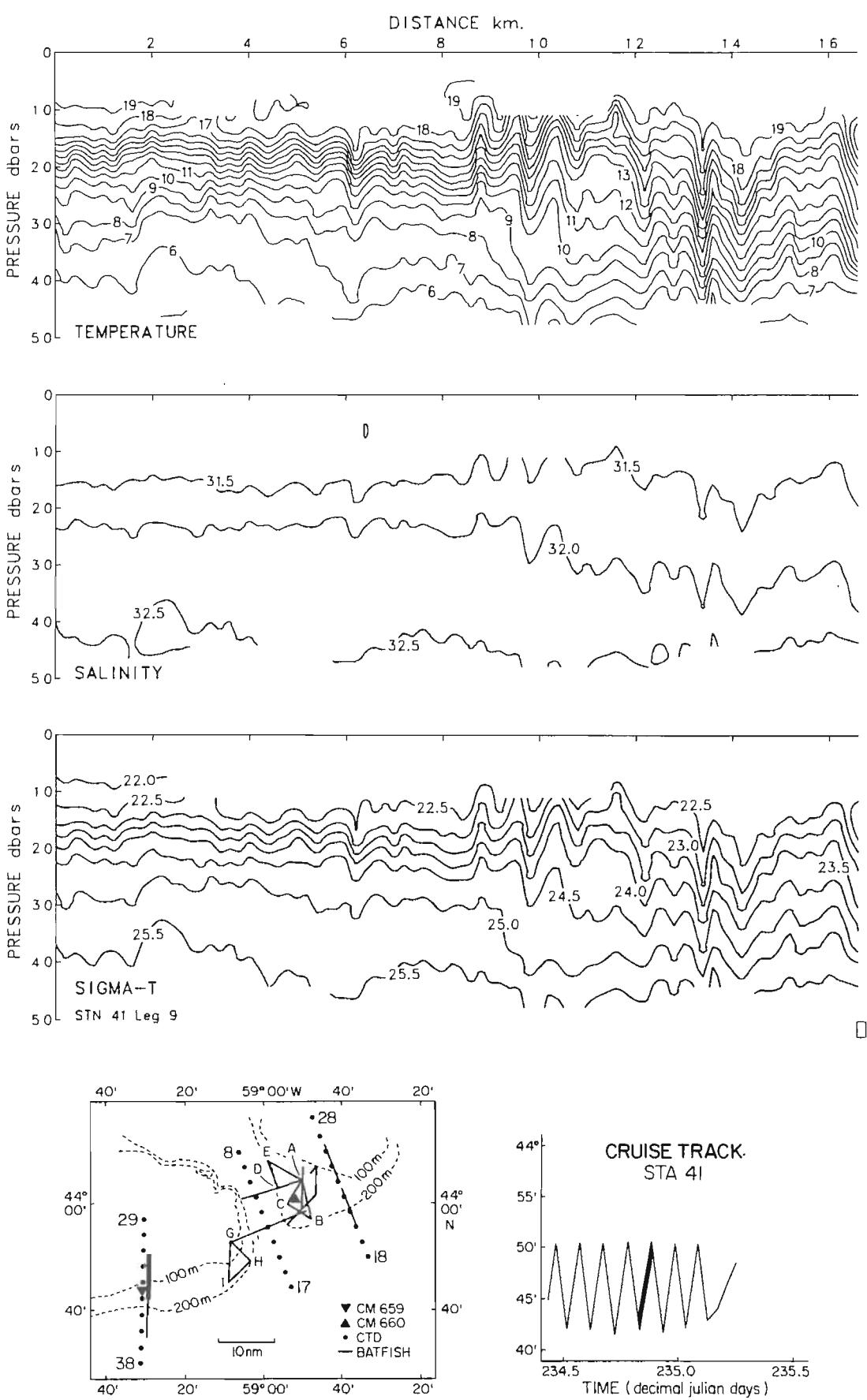


Fig. 37

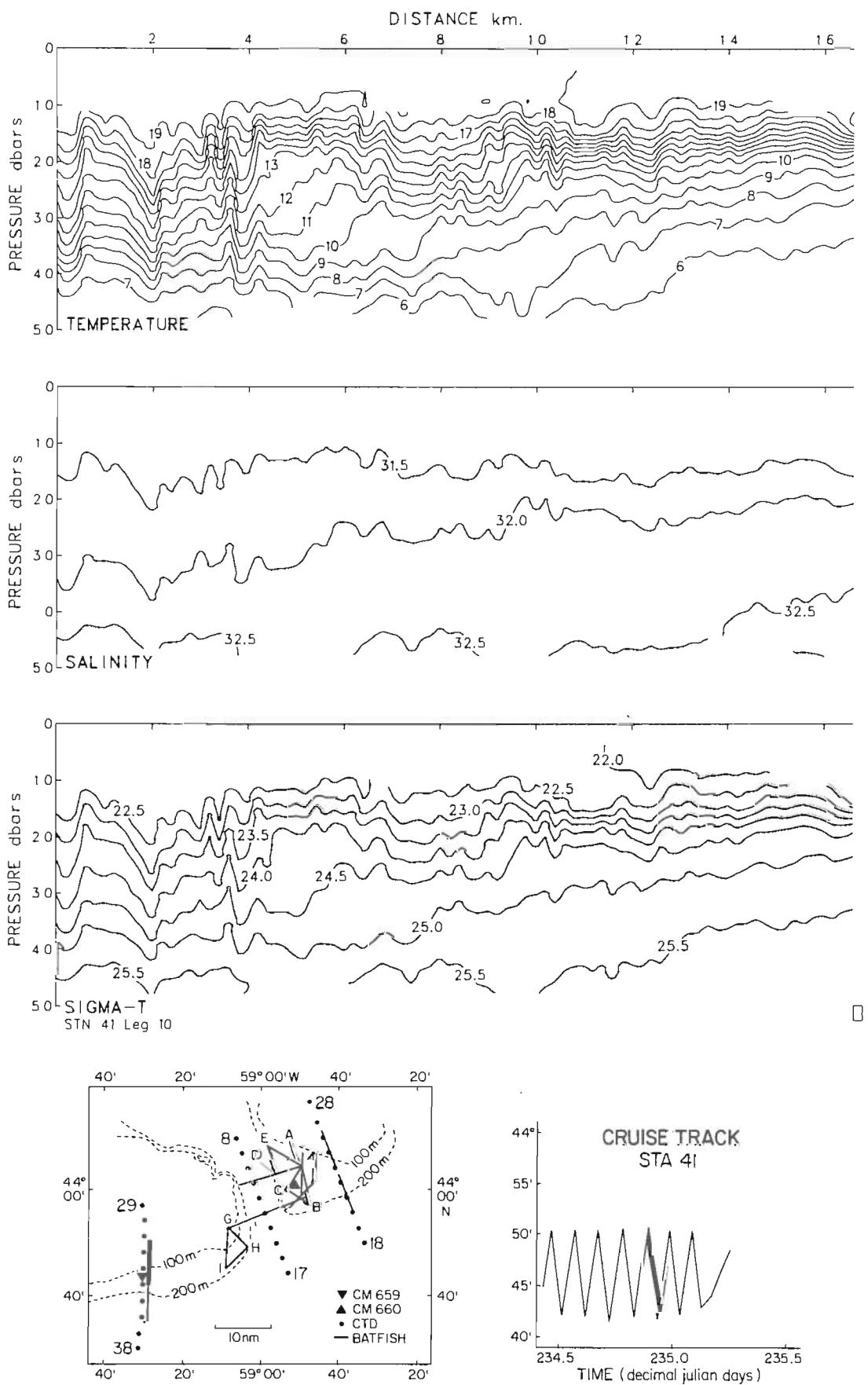


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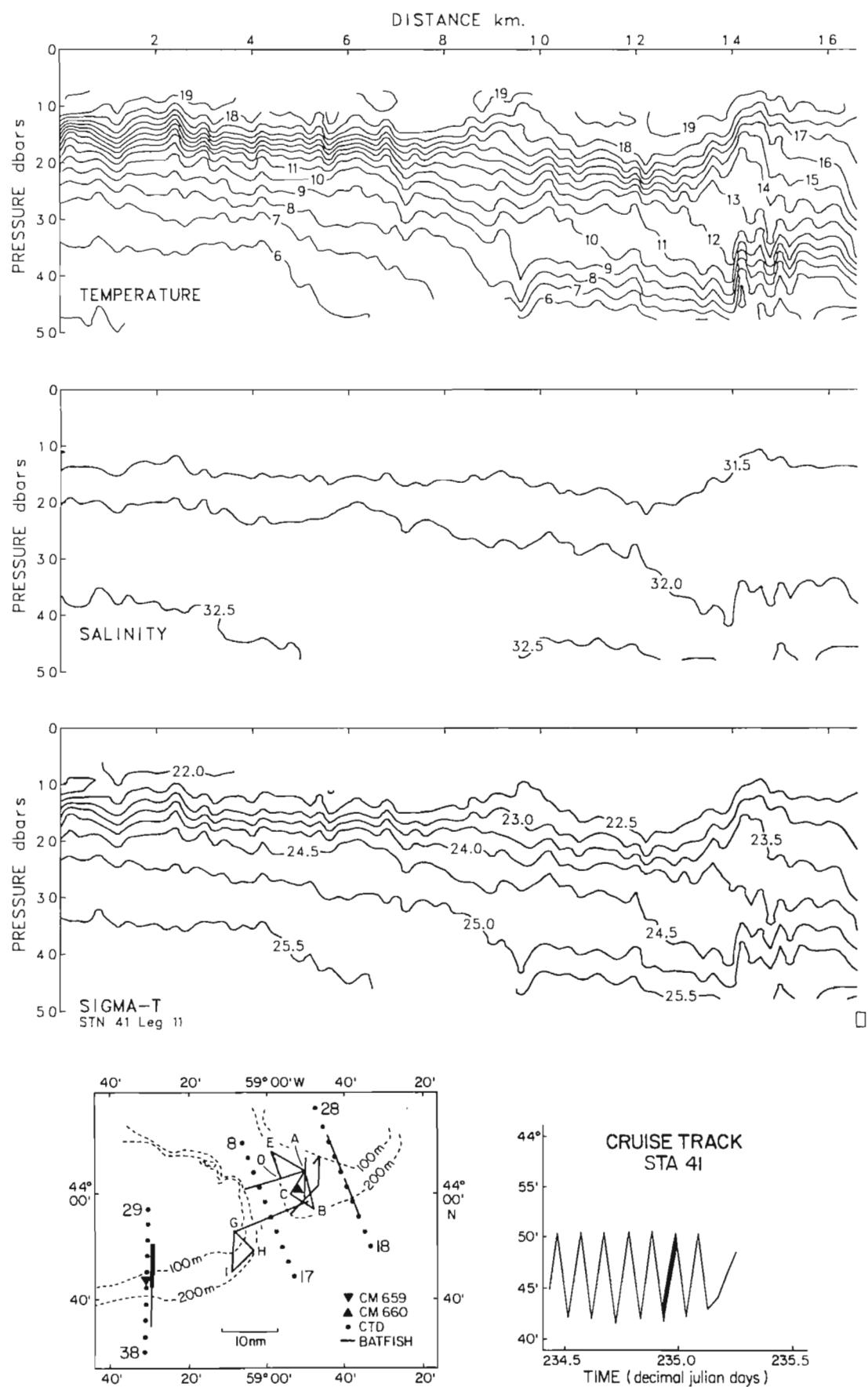


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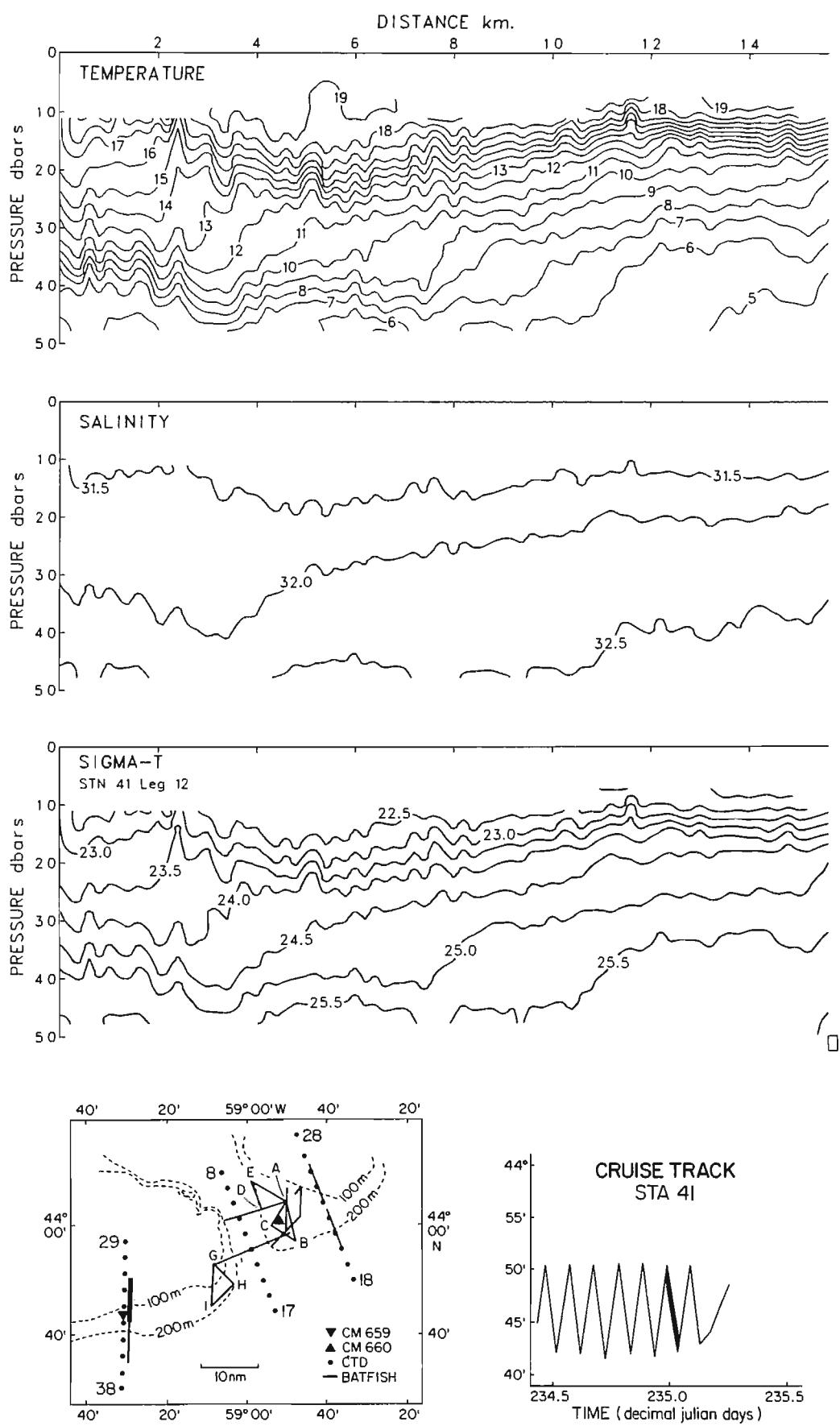


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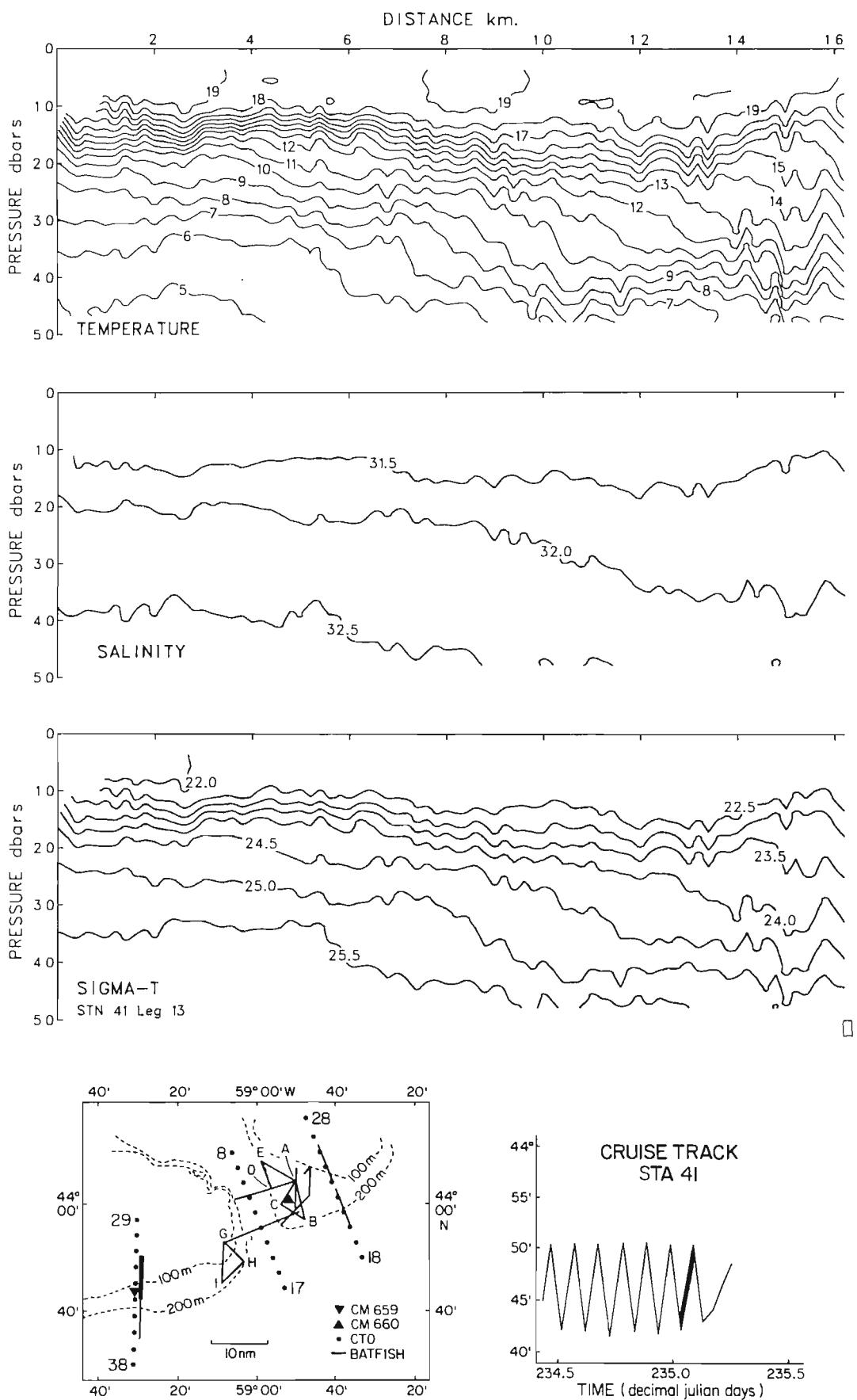


Fig. 41

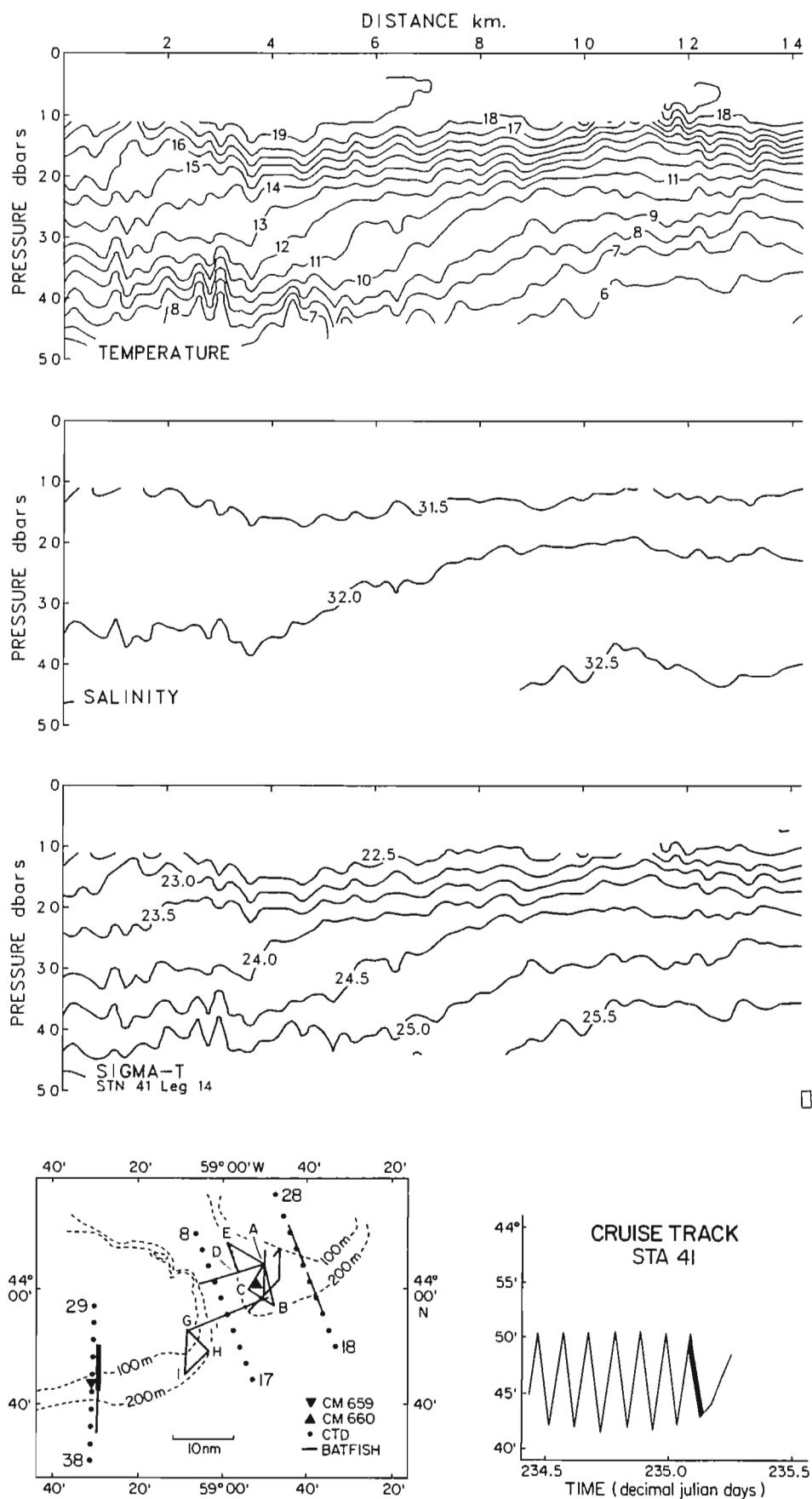


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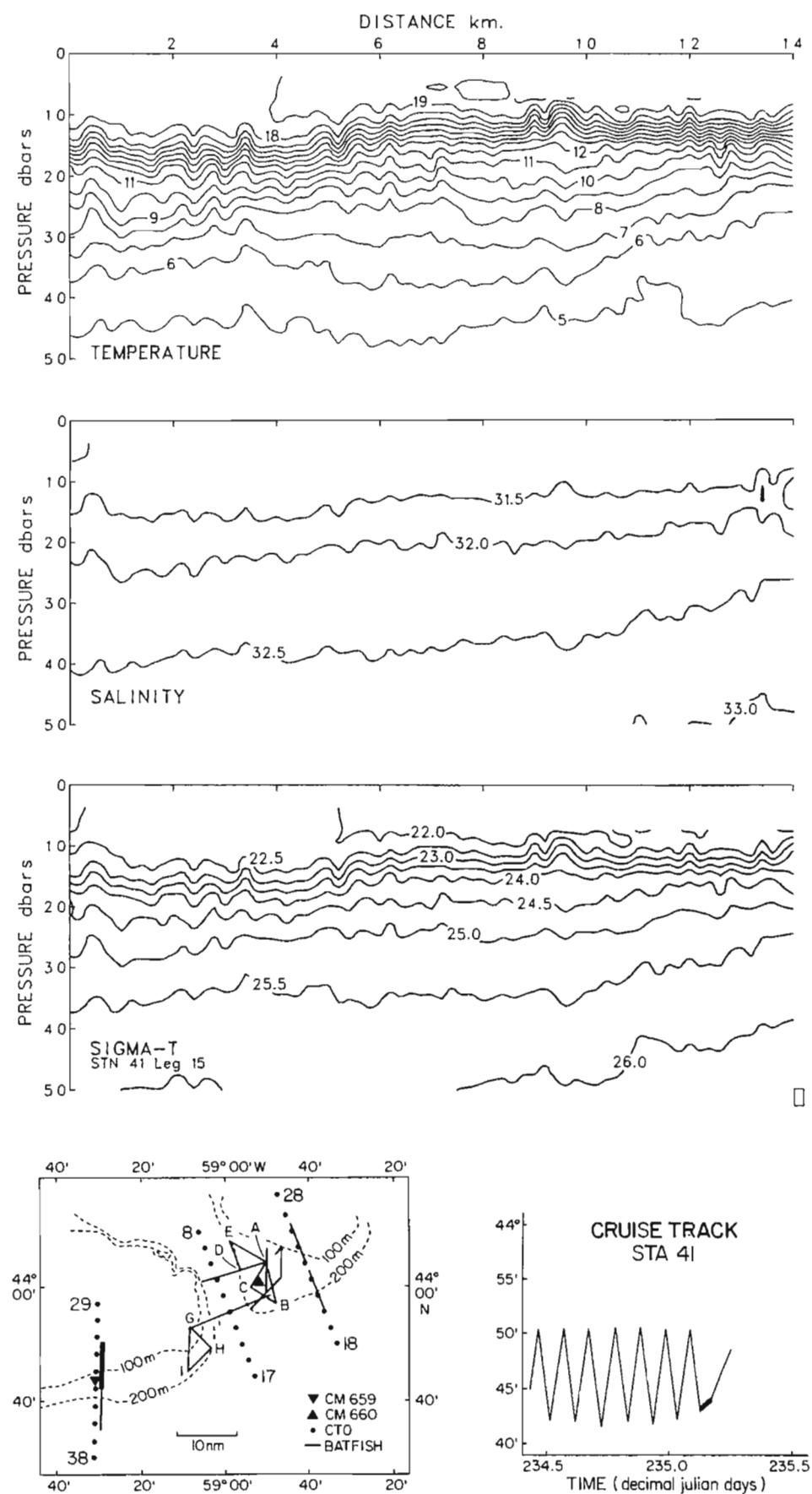


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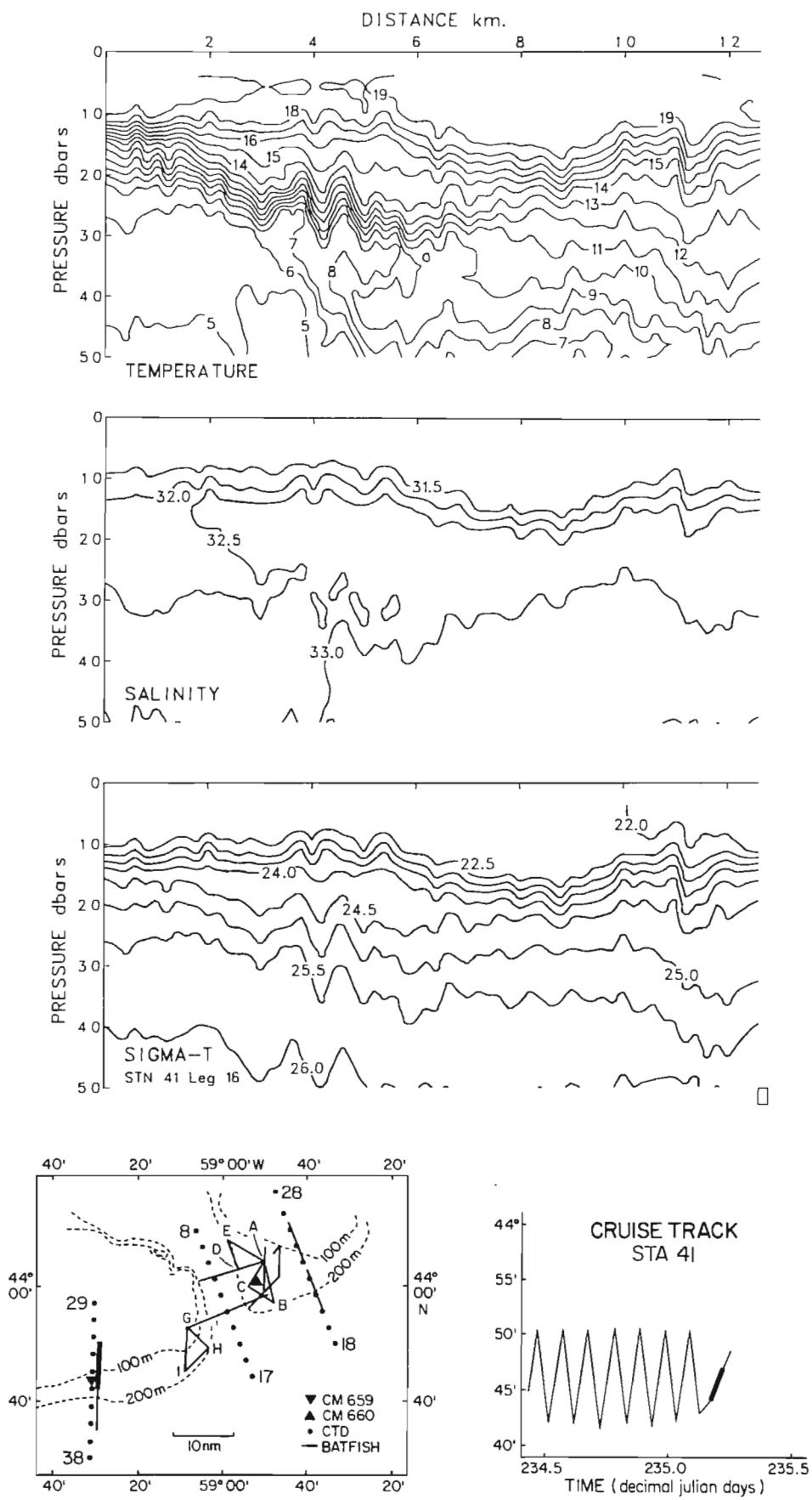


Fig. 44

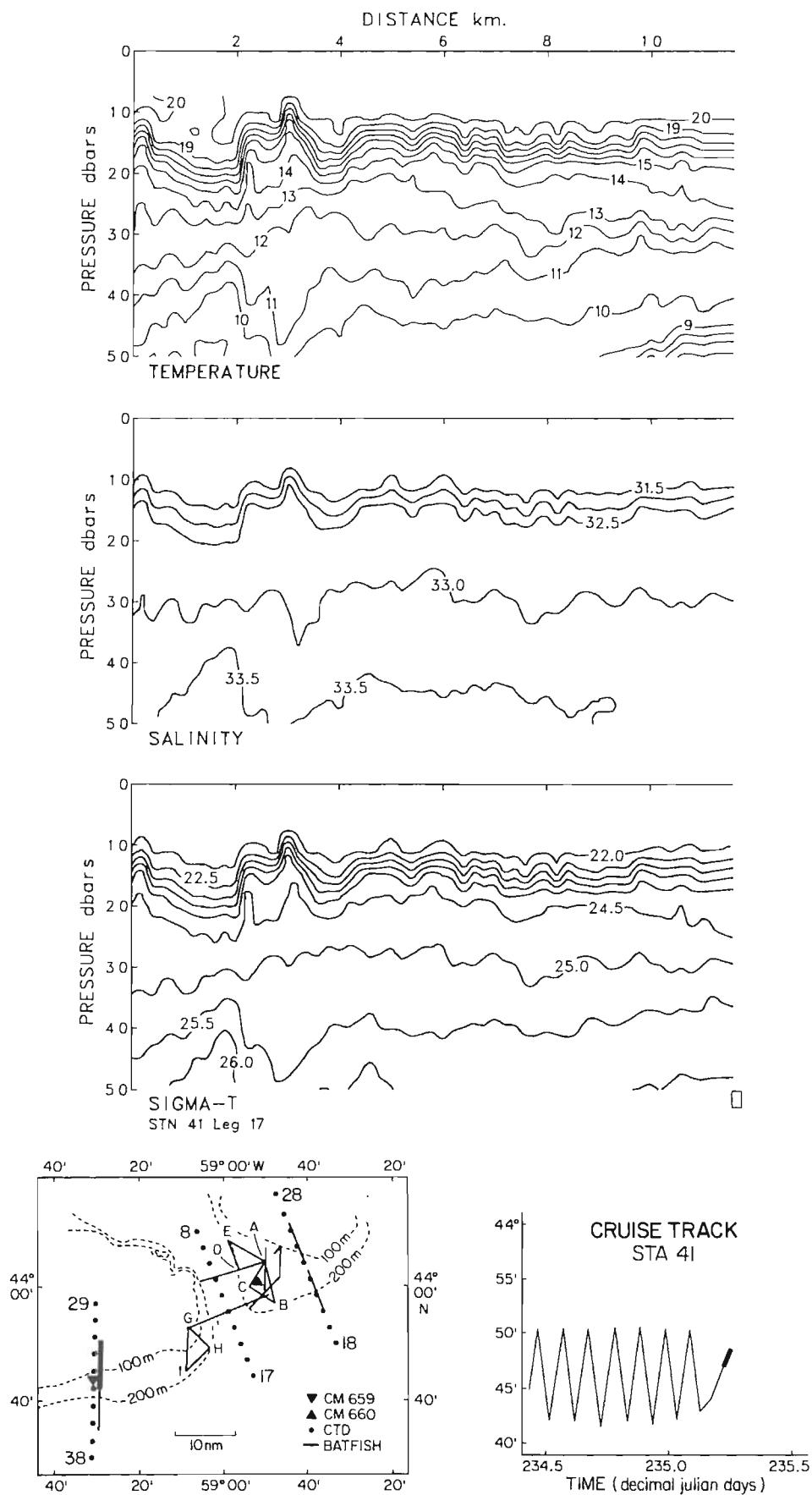


Fig. 45

Figures 46-60.

BATFISH station 42: 15 sections of Temperature, Salinity and Sigma-t vs. pressure, location maps and longitude vs. time plot.

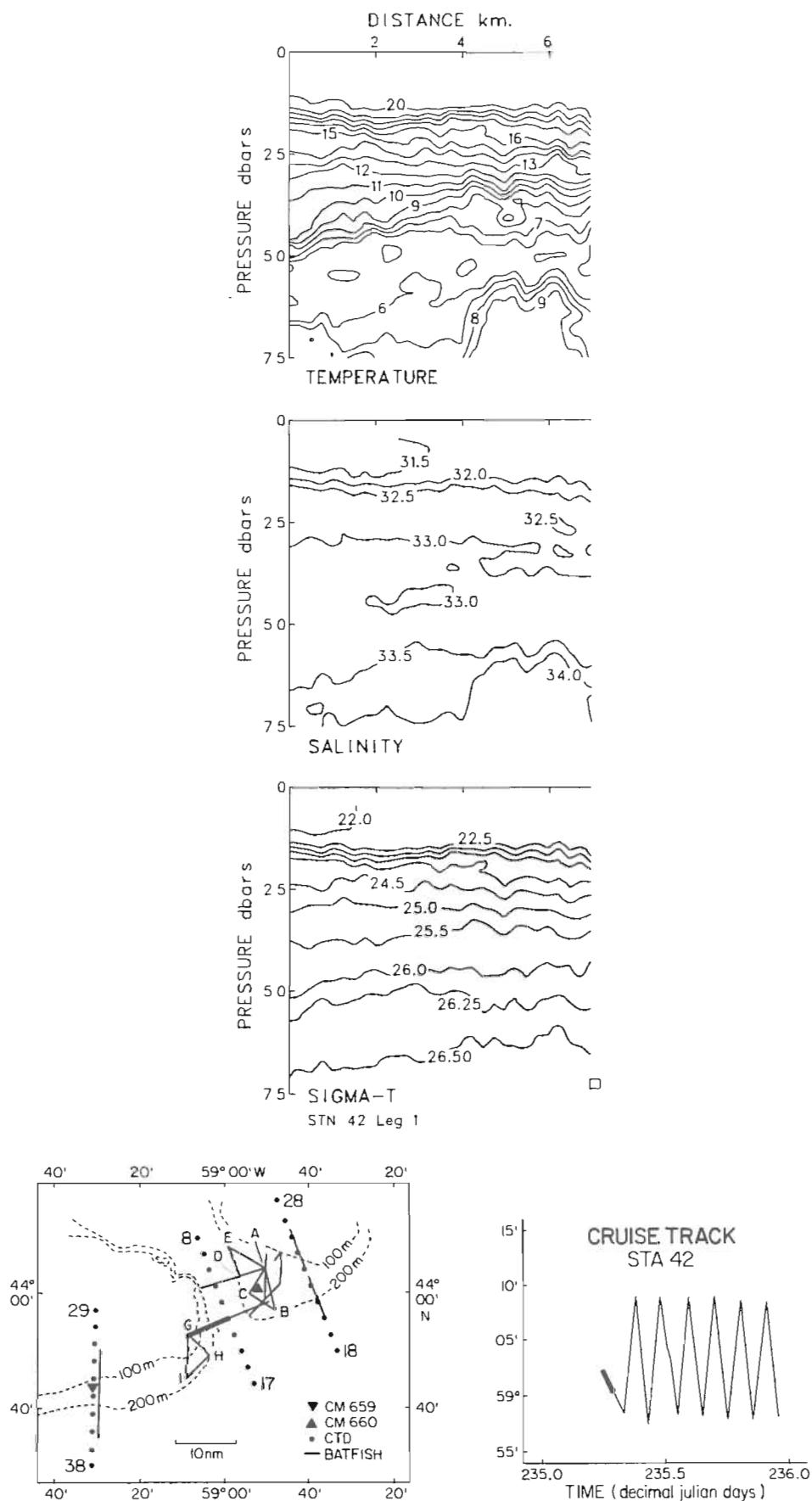


Fig. 46

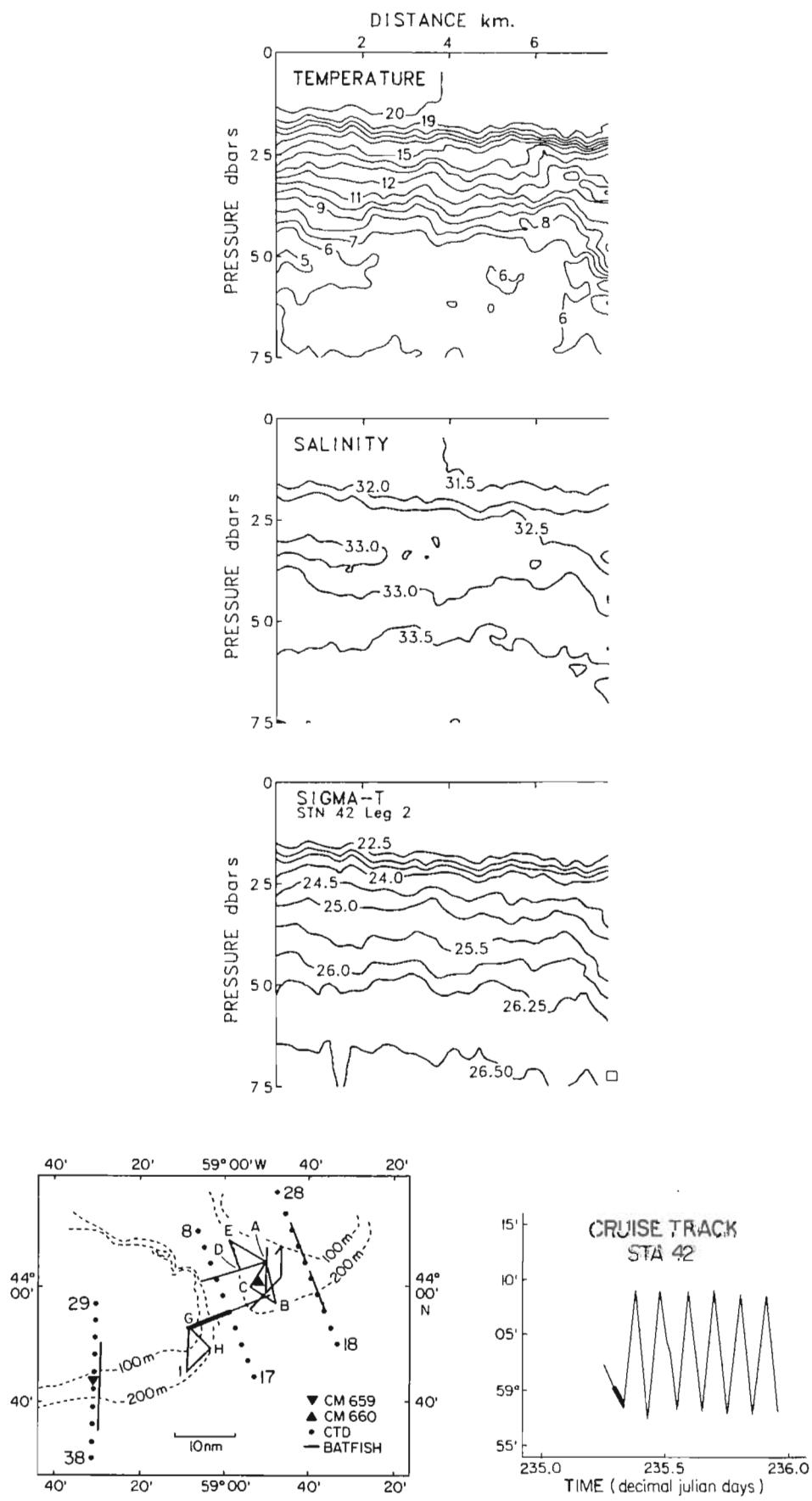


Fig. 47

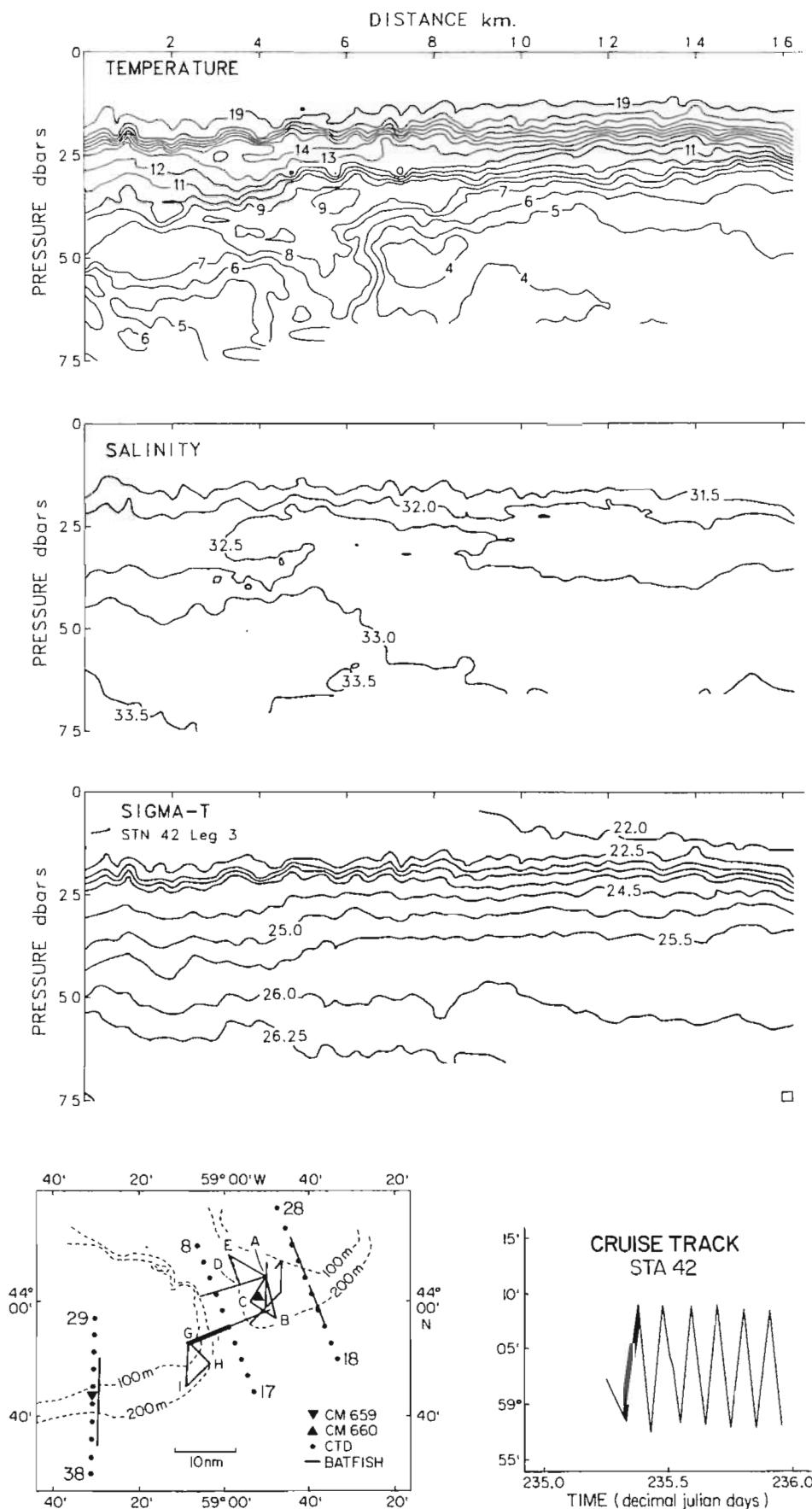


Fig. 48

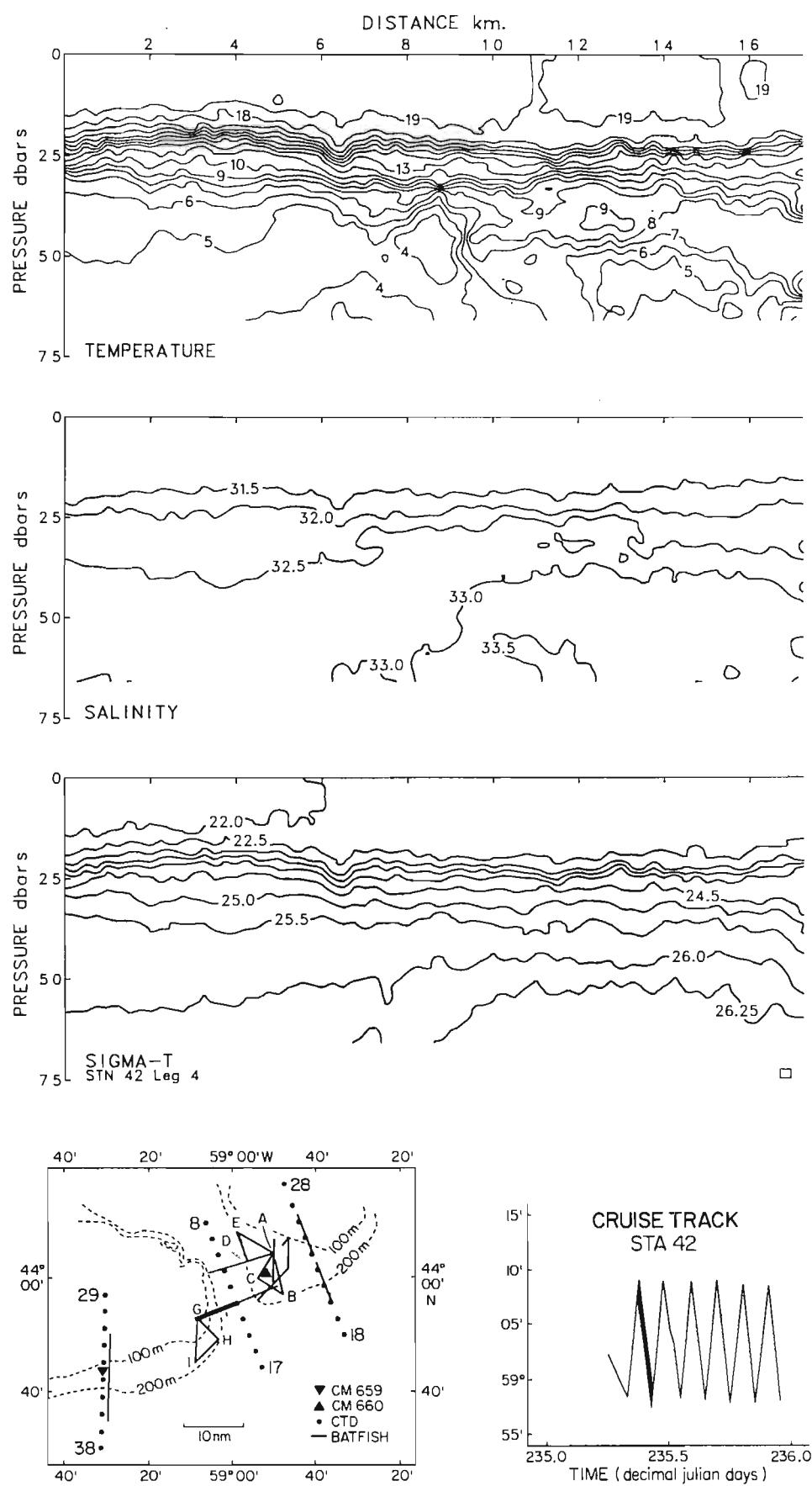


Fig. 49

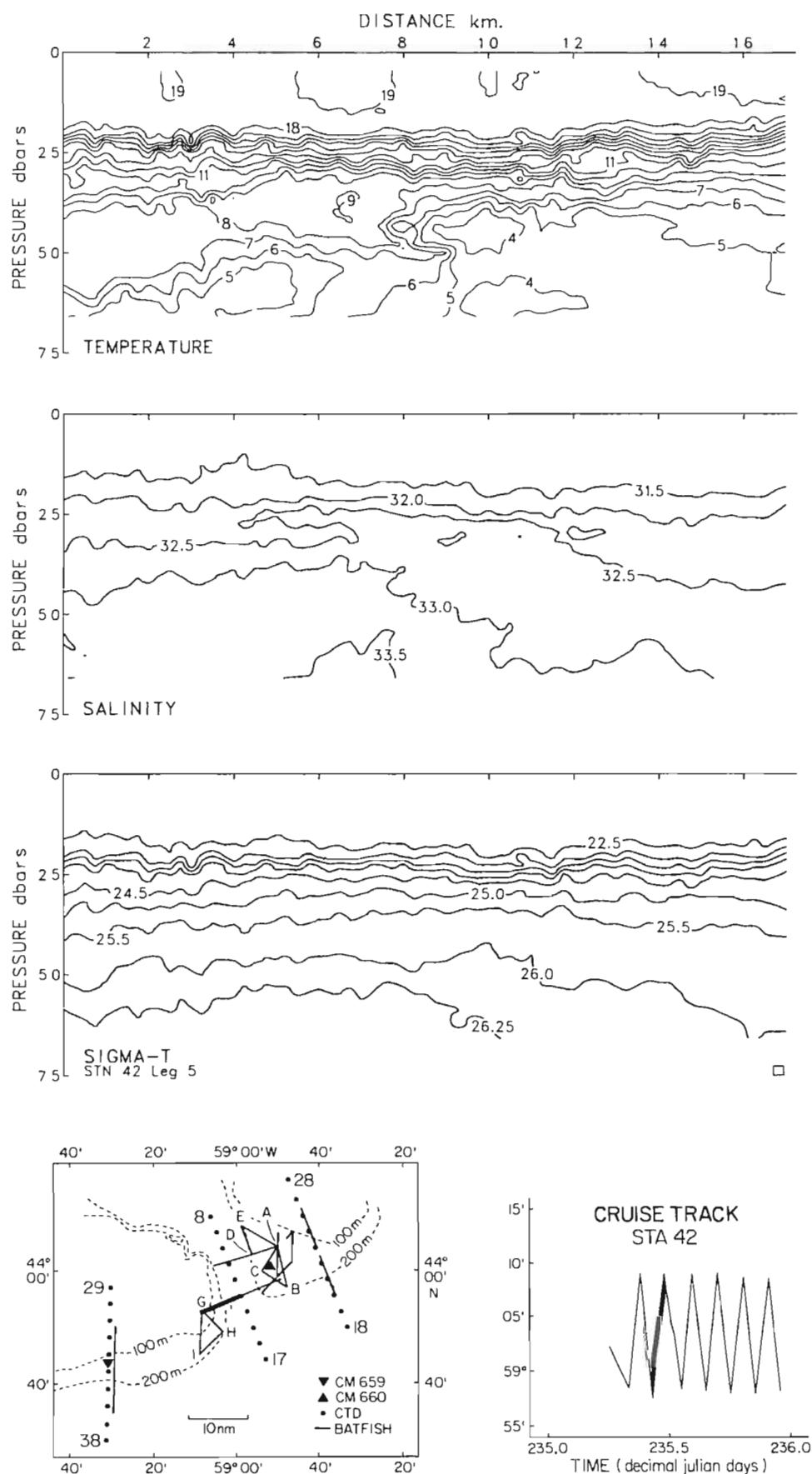


Fig. 50

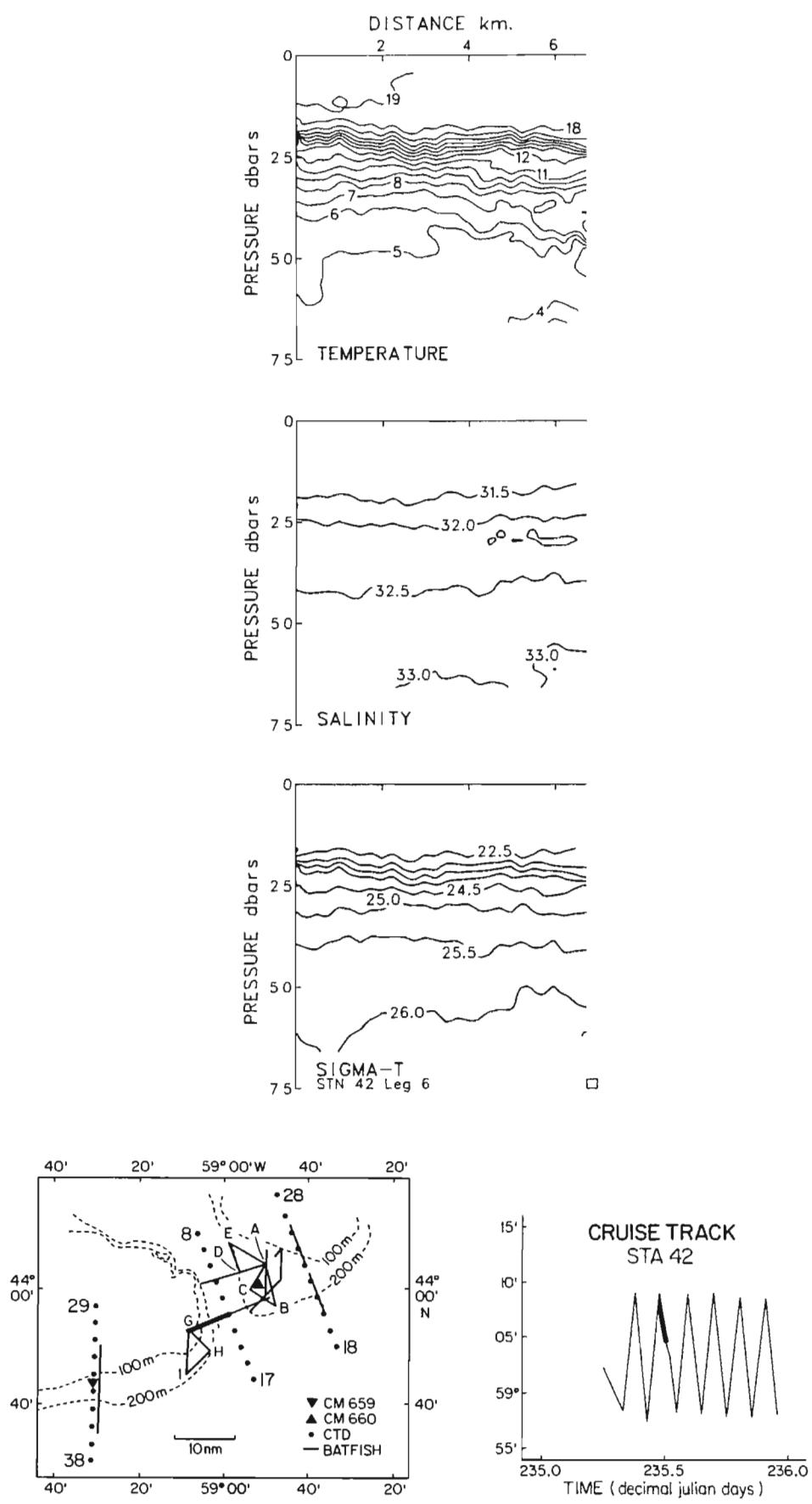


Fig. 51

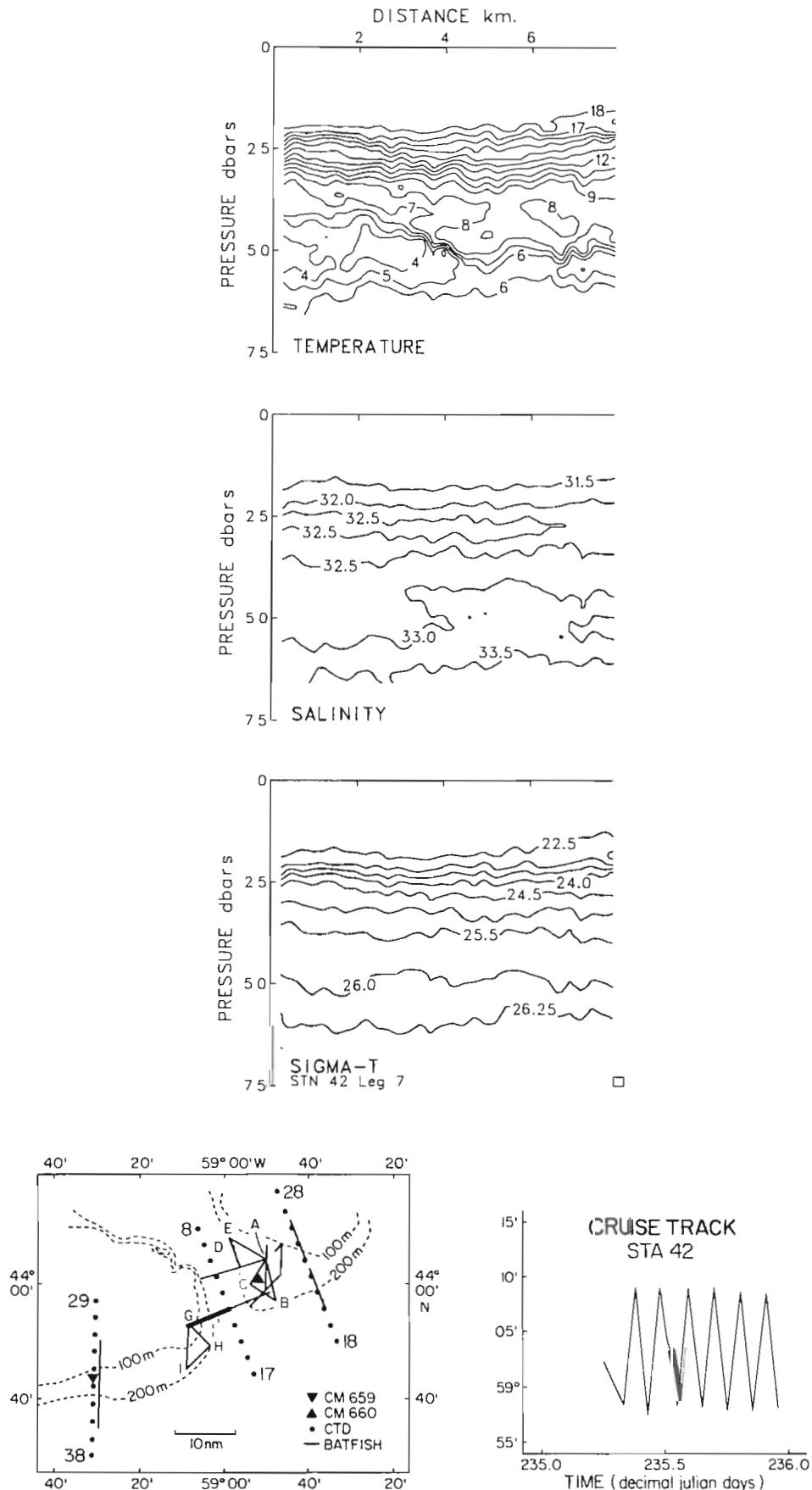


Fig. 52

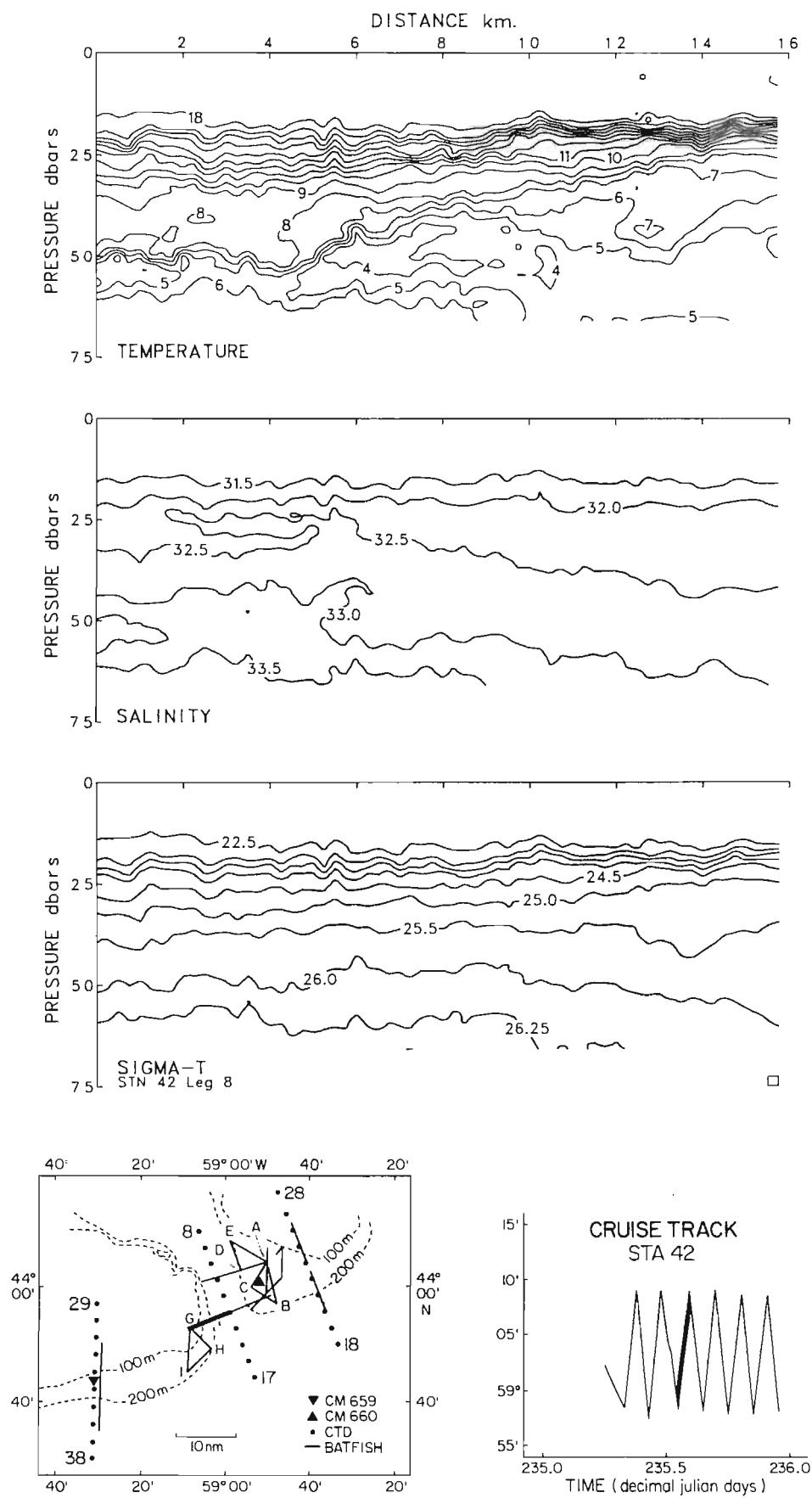


Fig. 53

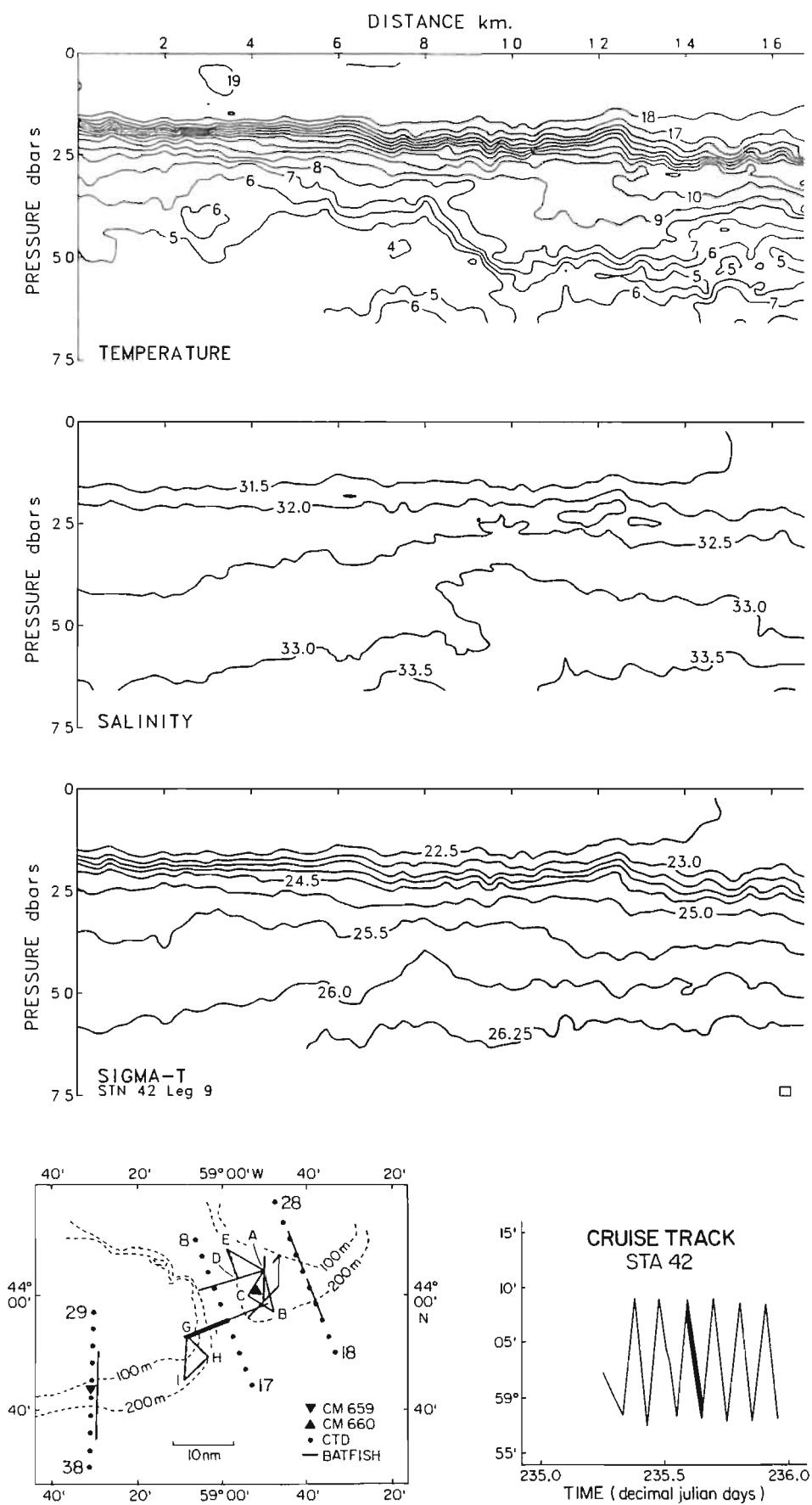


Fig. 54

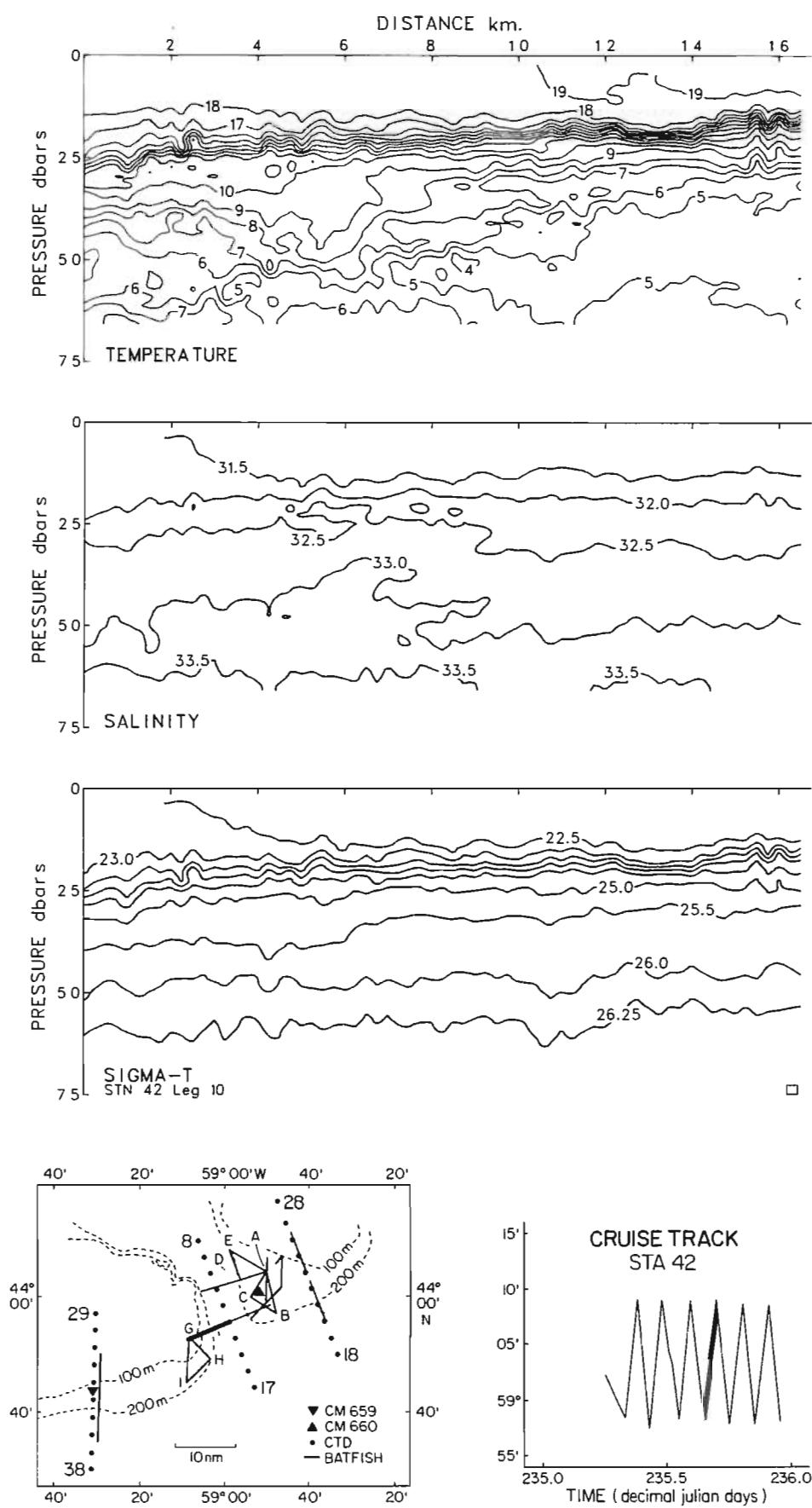


Fig. 55

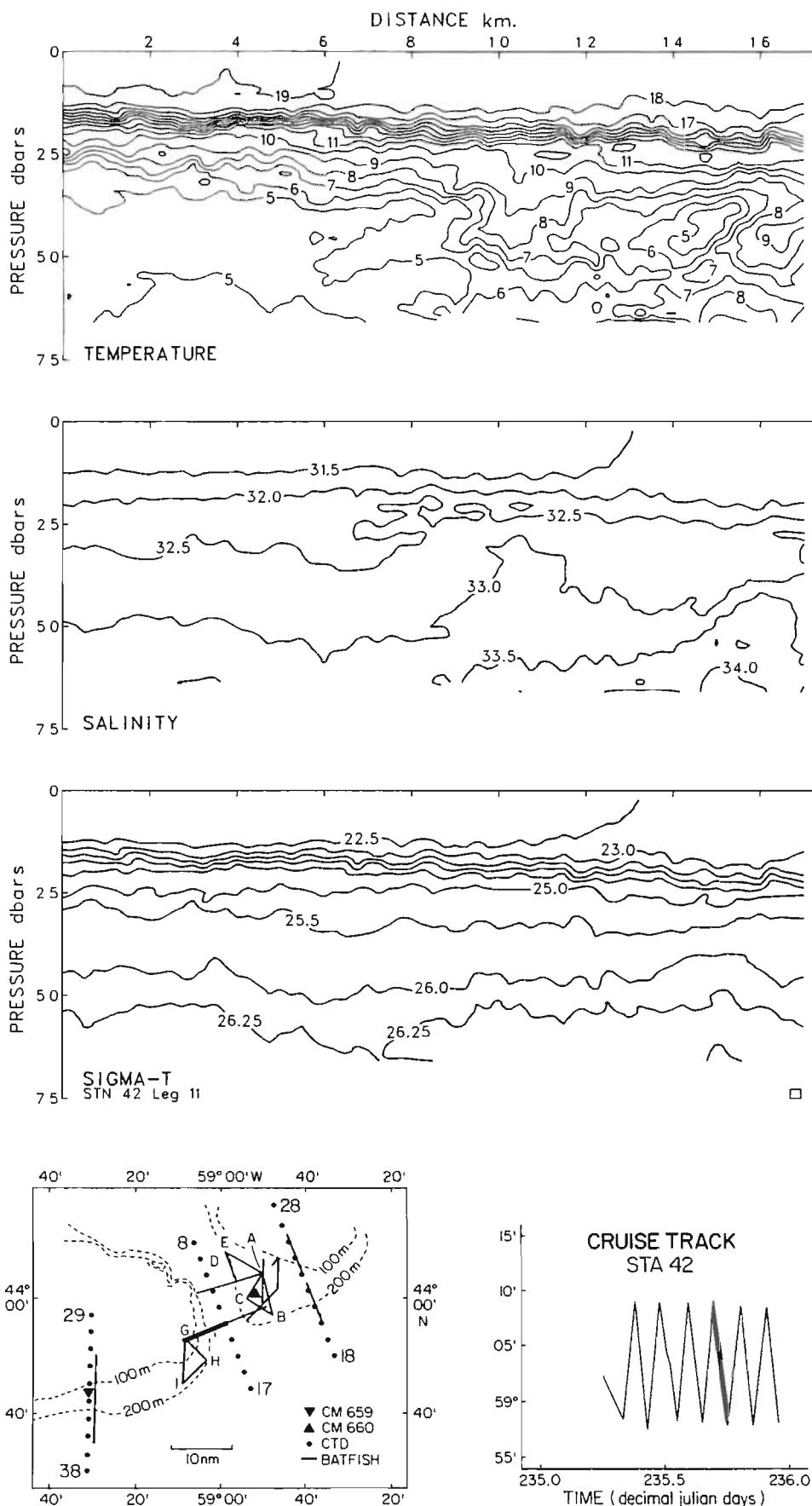


Fig. 56

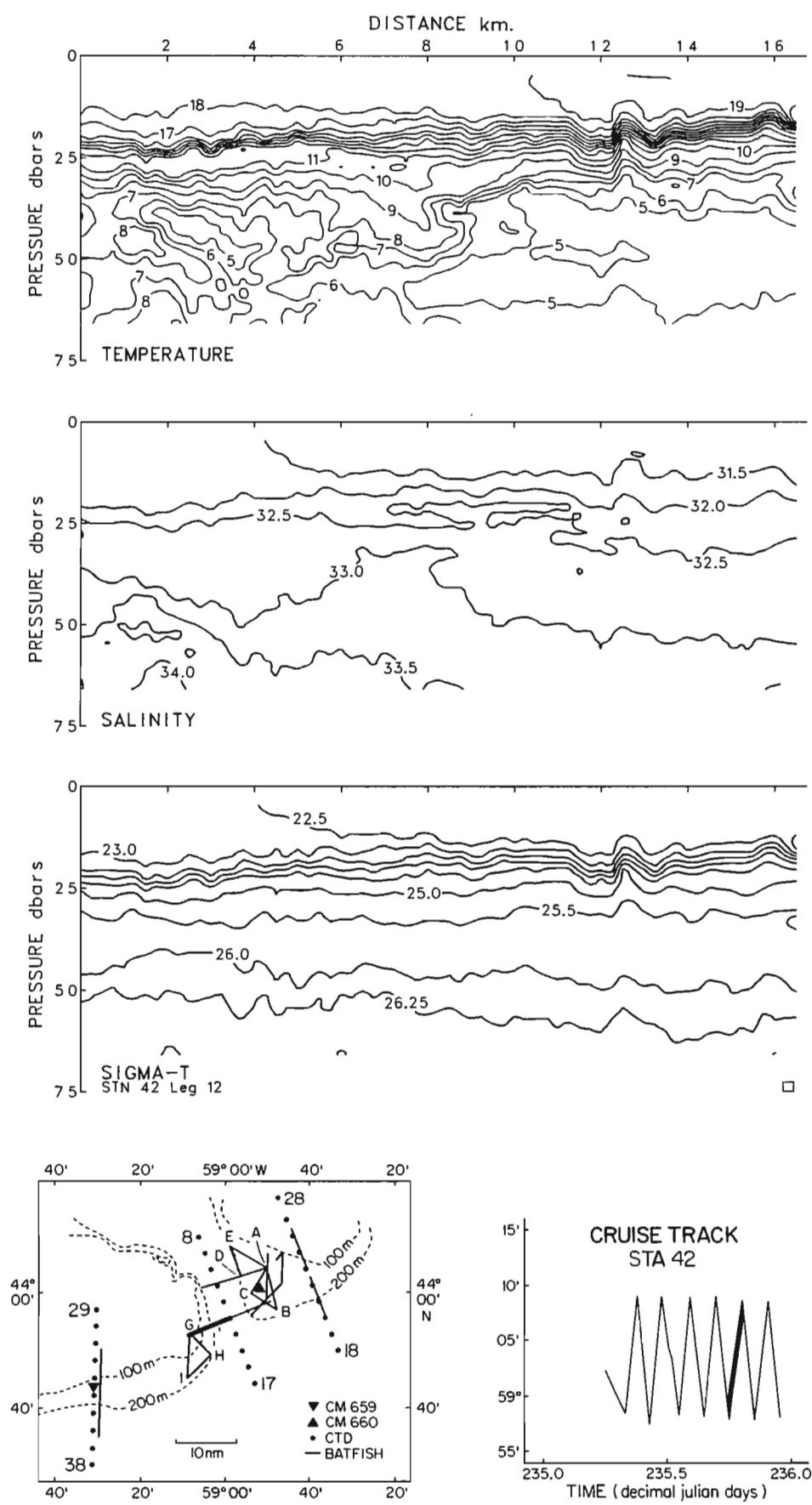


Fig. 57

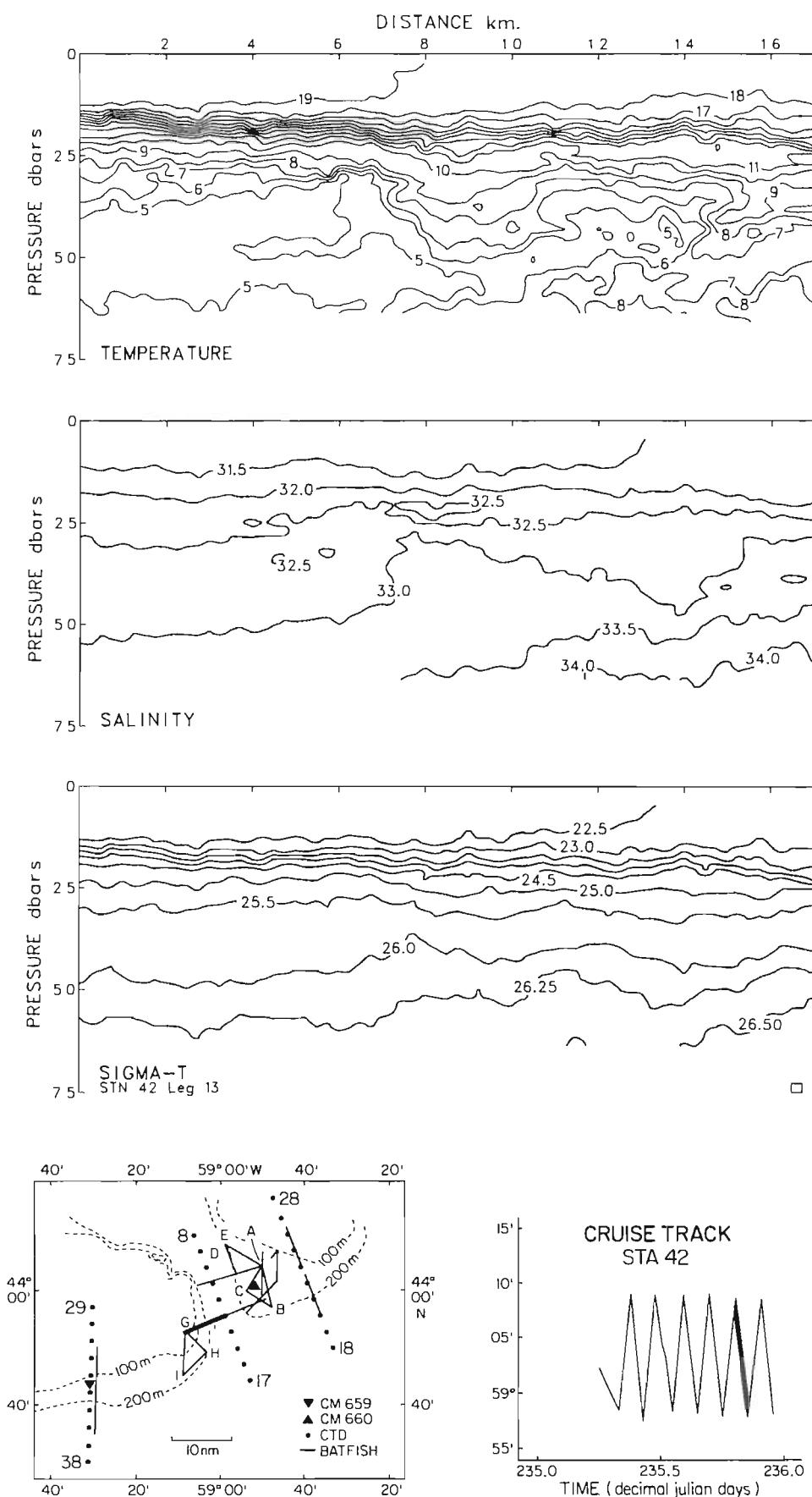


Fig. 58

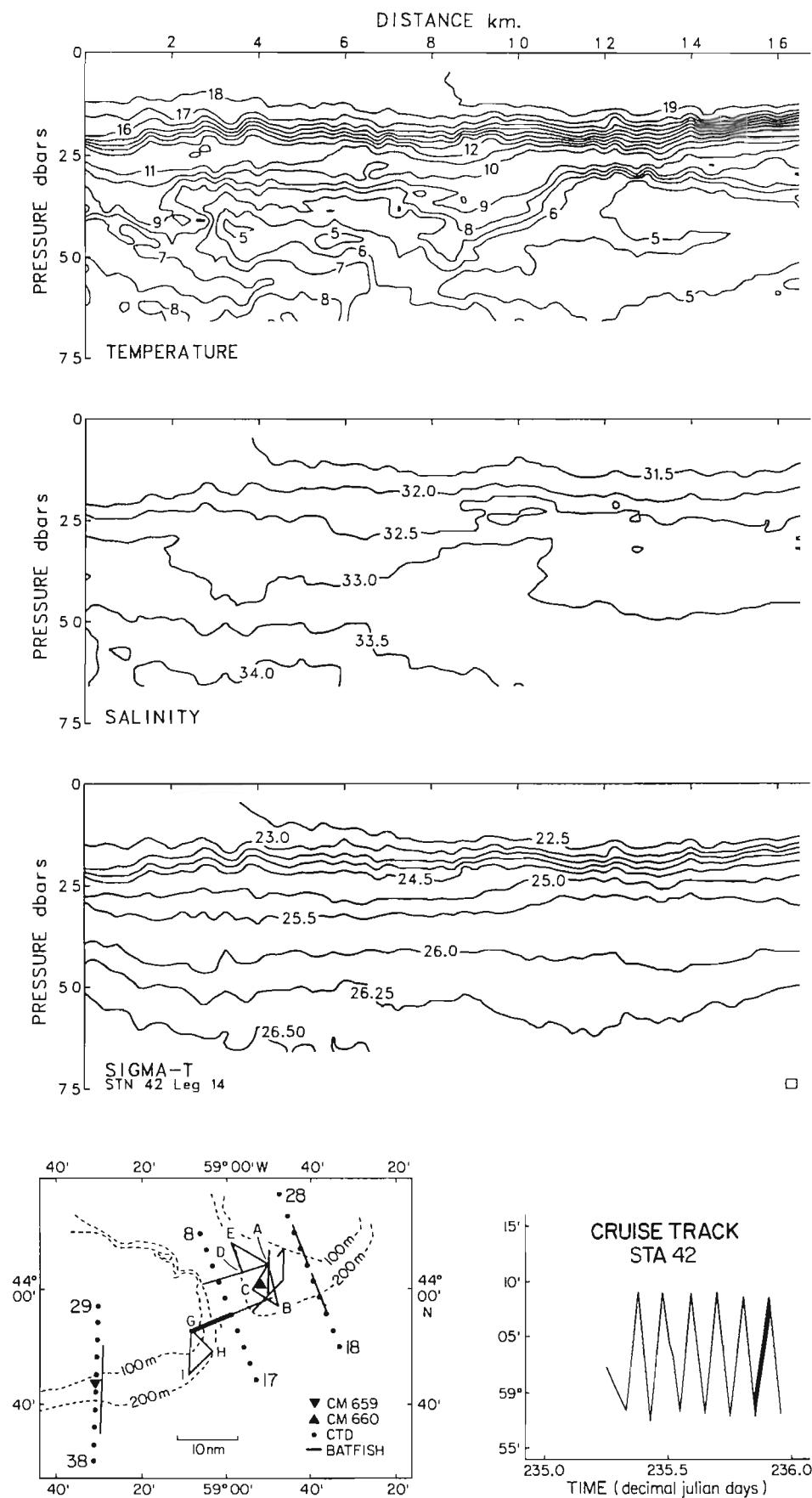


Fig. 59

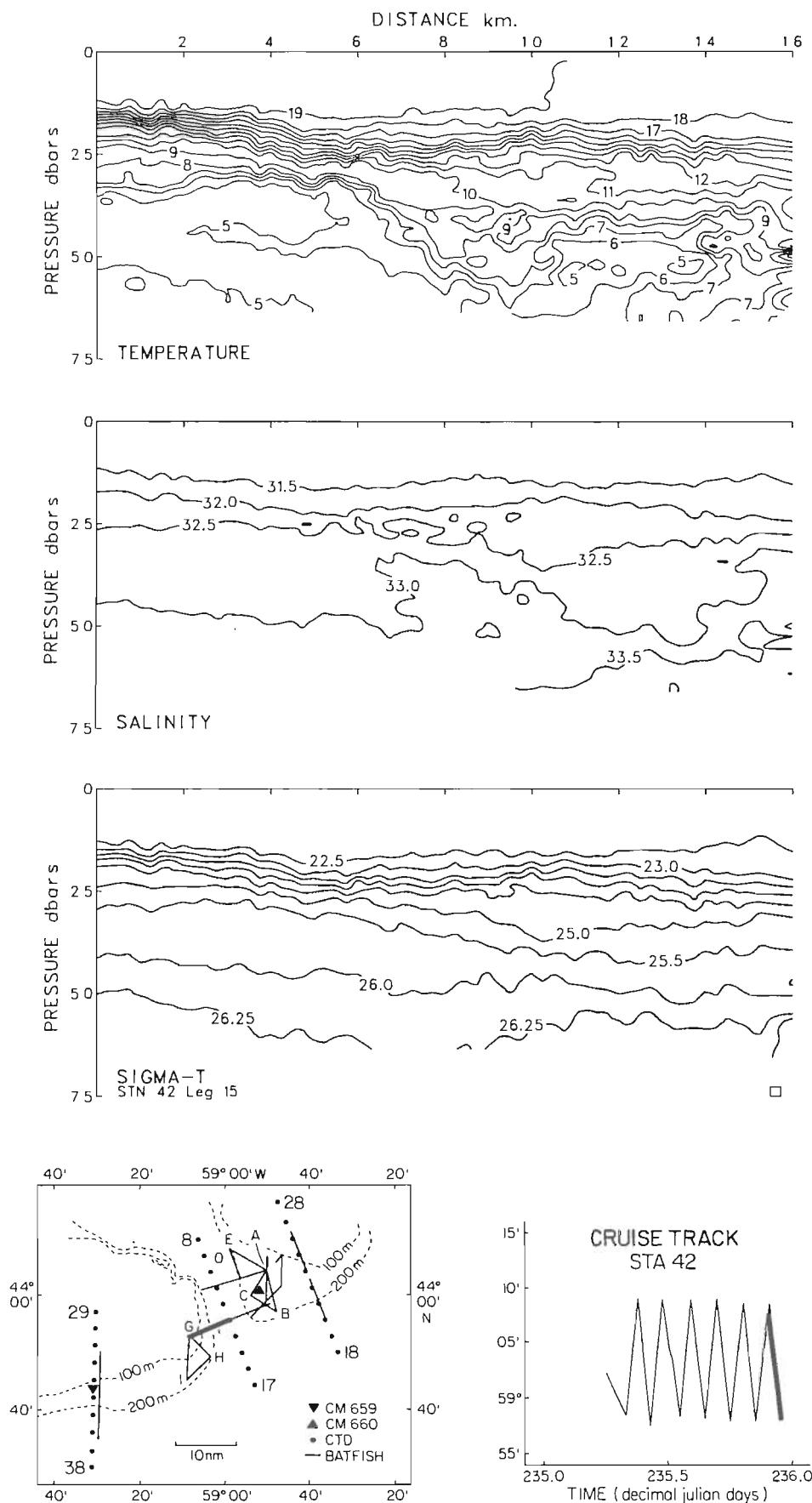


Fig. 60

Figures 61-64.

BATFISH station 43: 4 sections of Temperature, Salinity and Sigma-t vs. pressure, location maps and longitude vs. time plot.

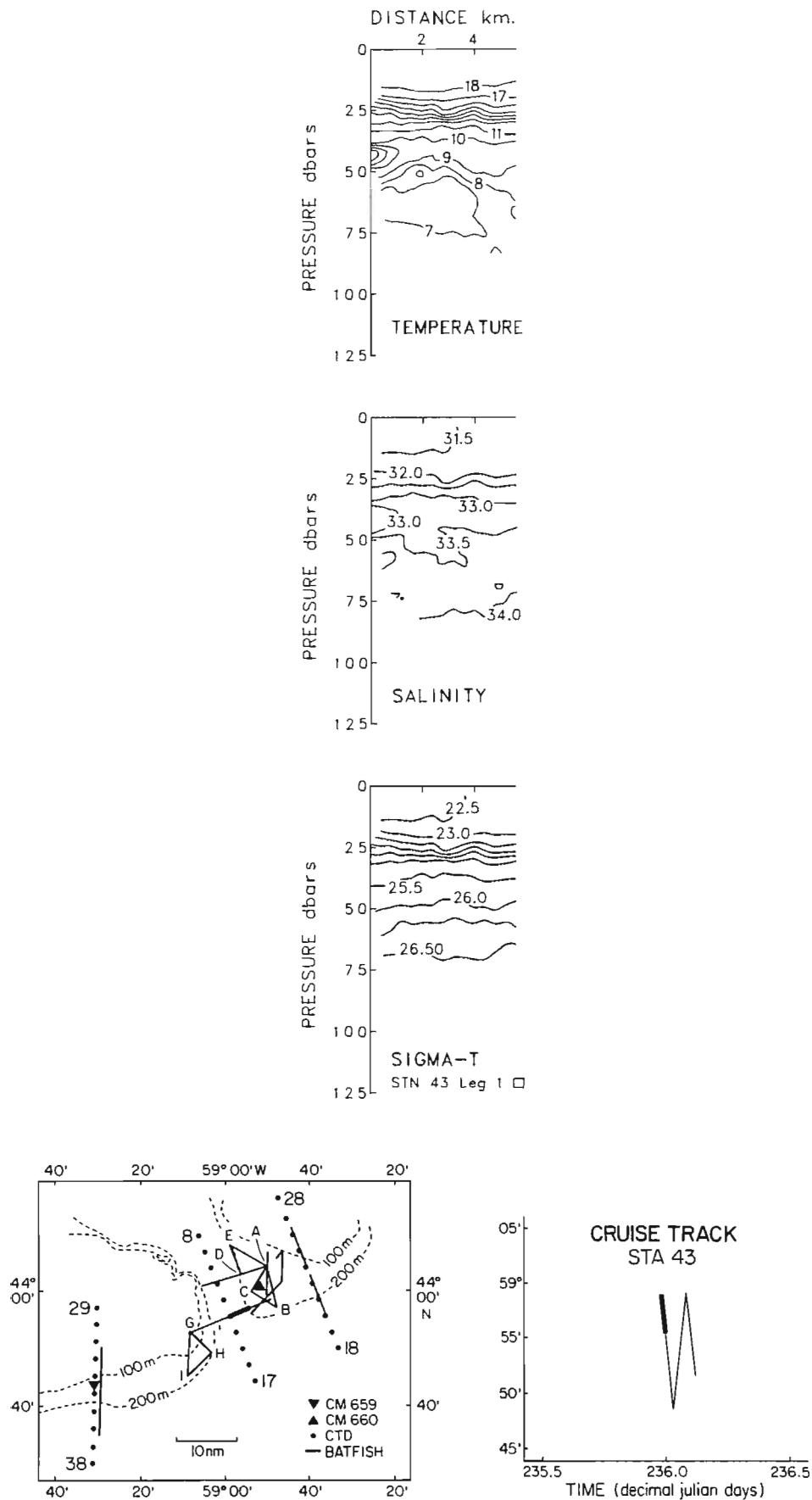


Fig. 61

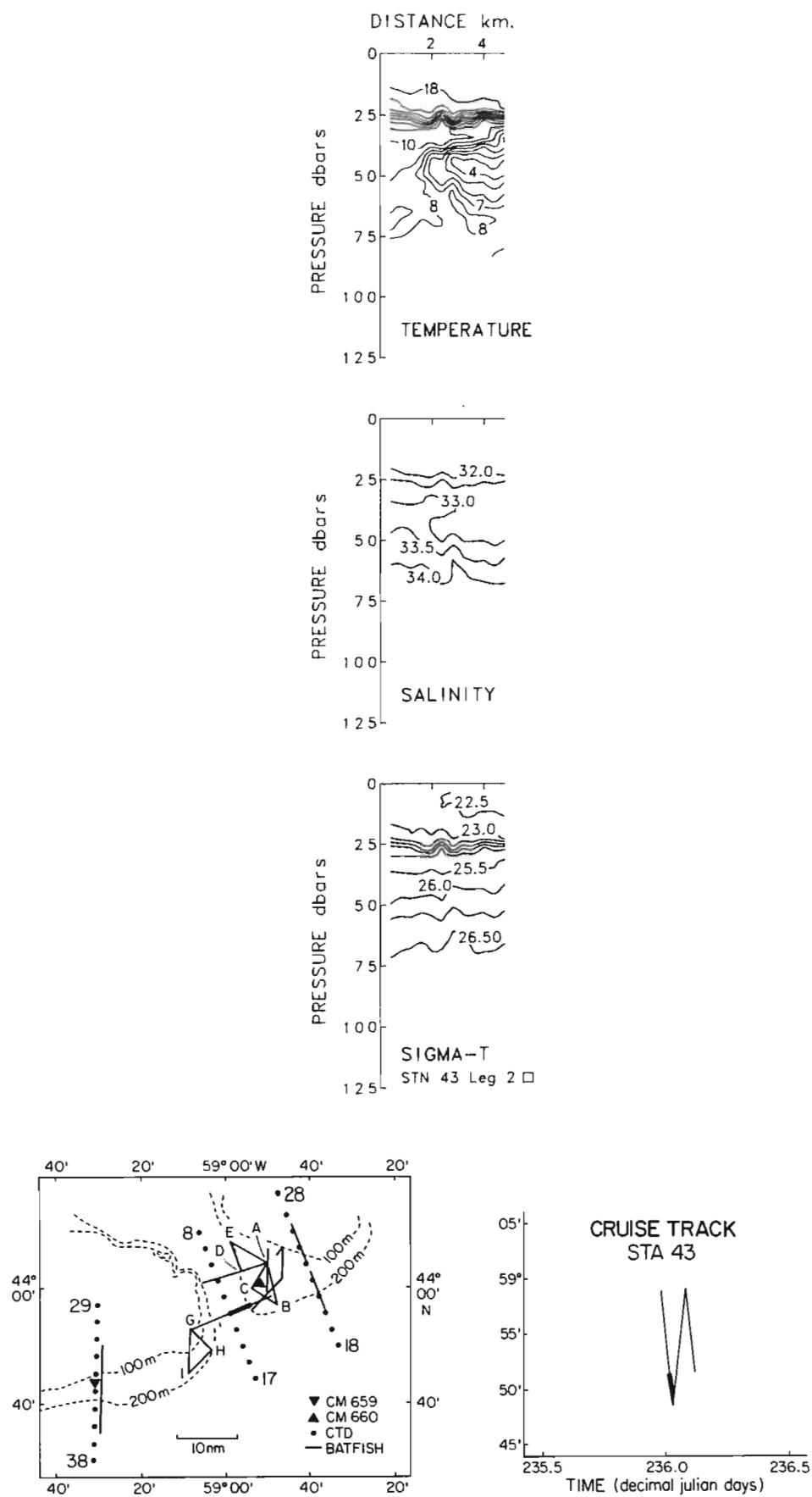


Fig. 62

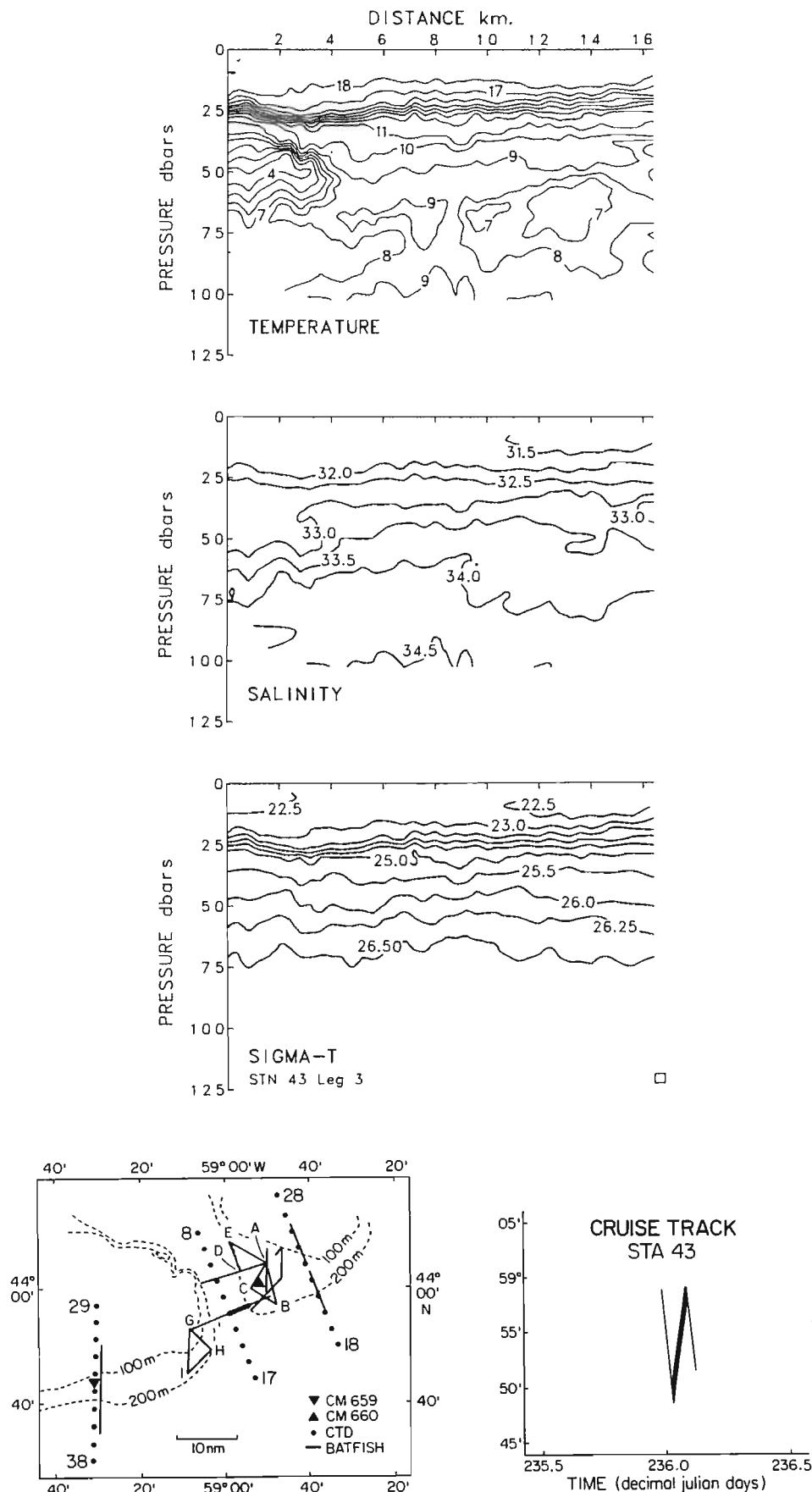


Fig. 63

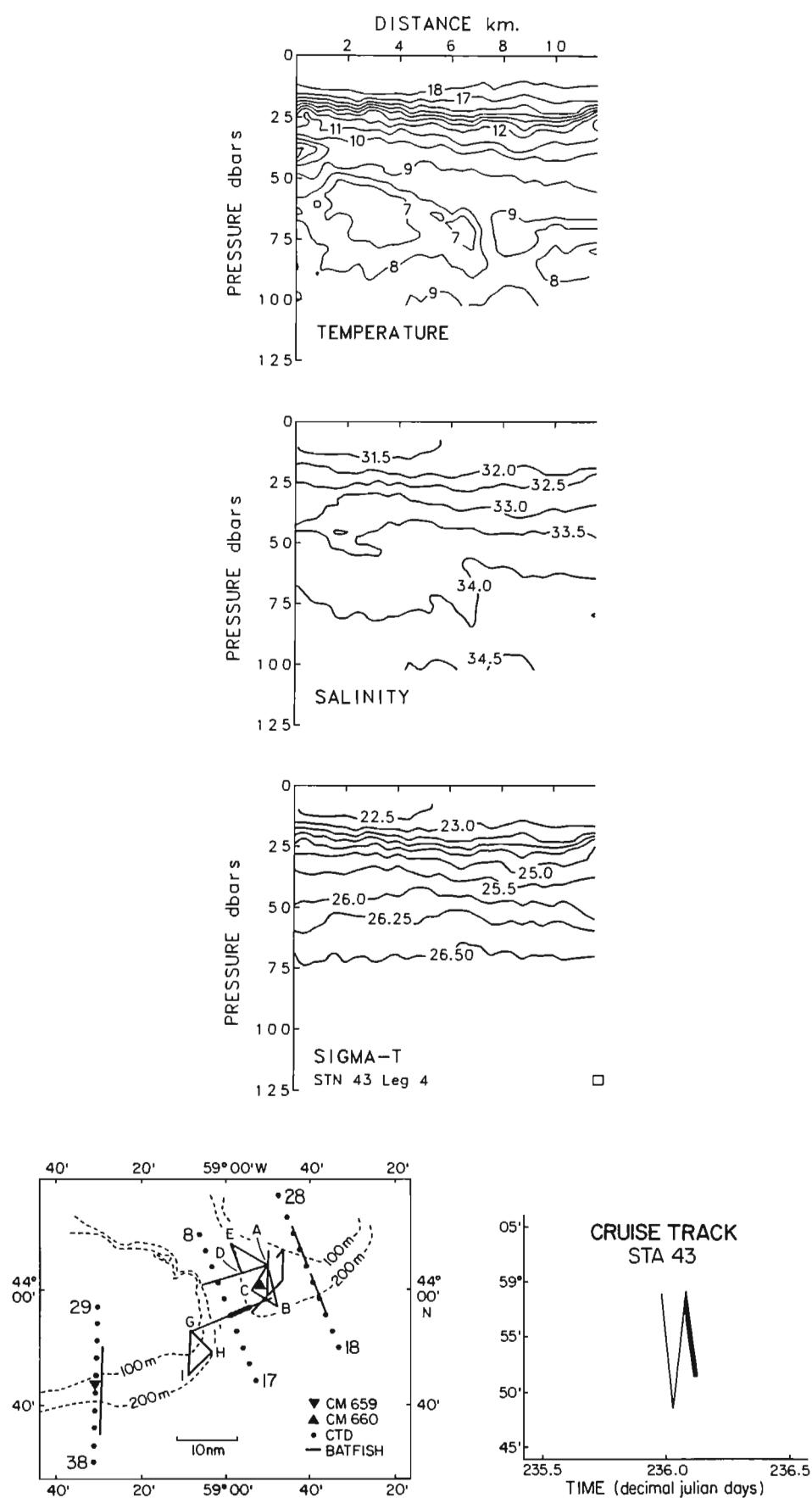


Fig. 64

Figures 65-77.

BATFISH station 44: 13 sections of Temperature, Salinity and Sigma-t vs. pressure,
location maps and longitude vs. time plot.

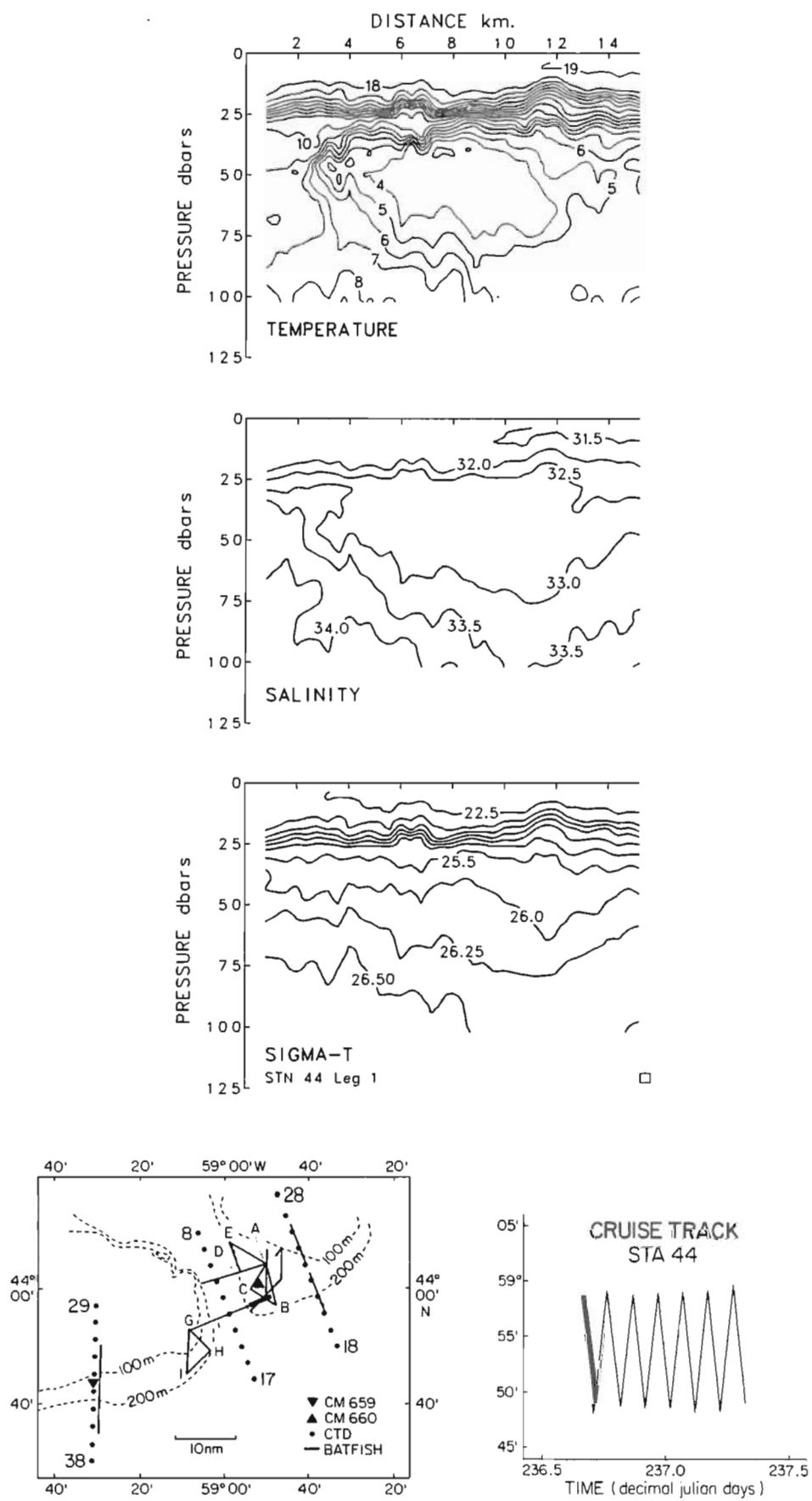


Fig. 65

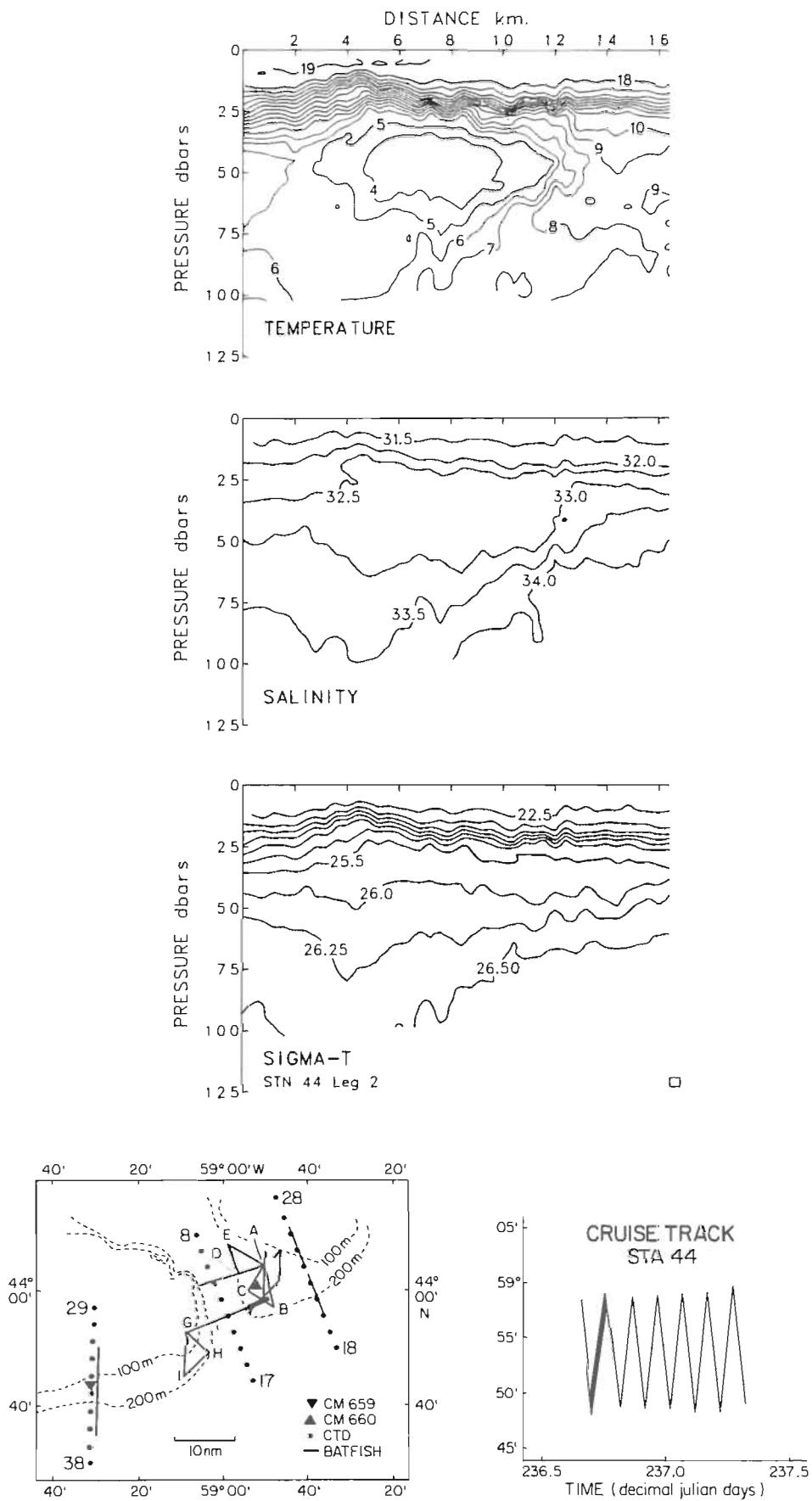


Fig. 66

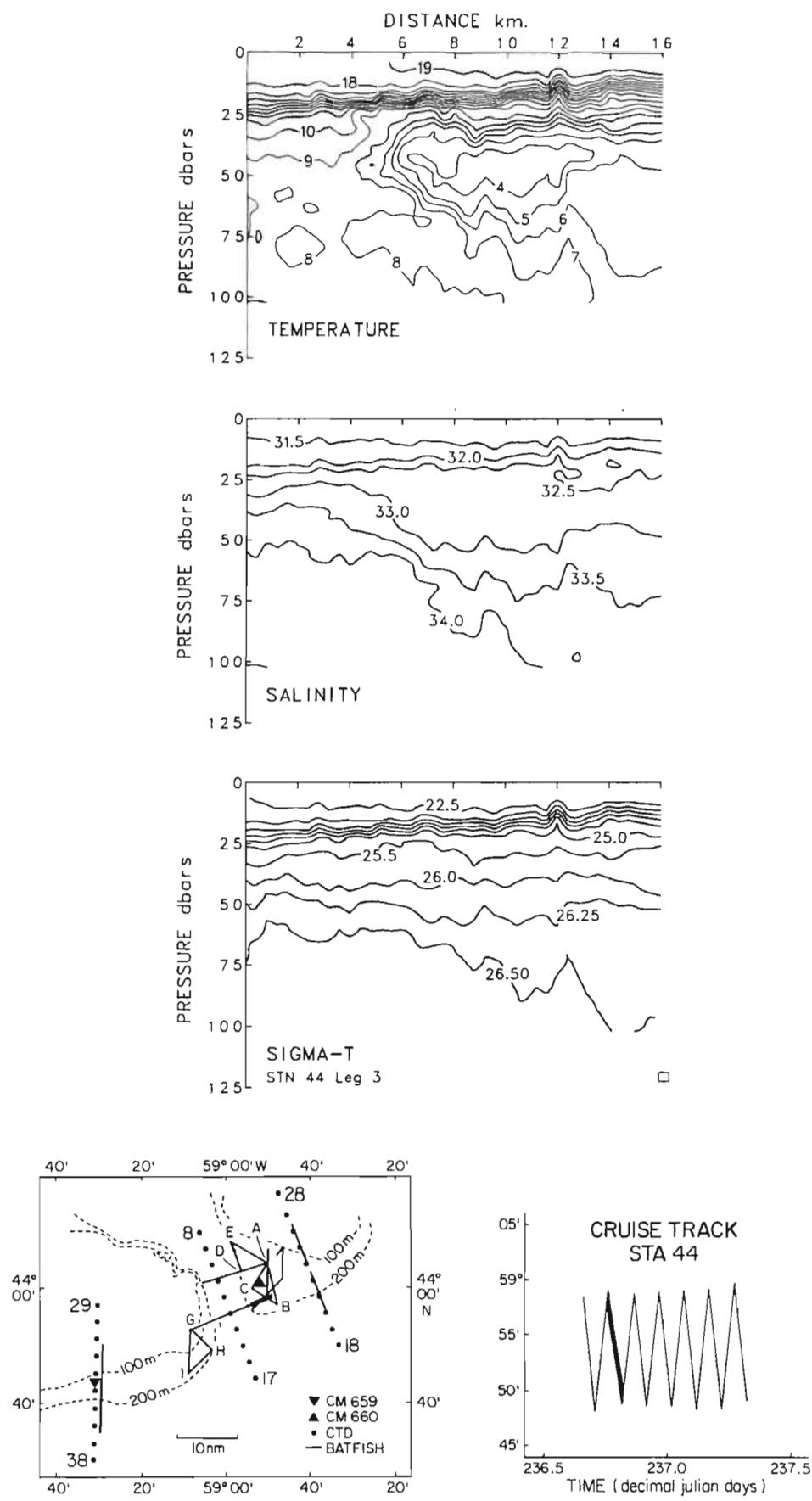


Fig. 67

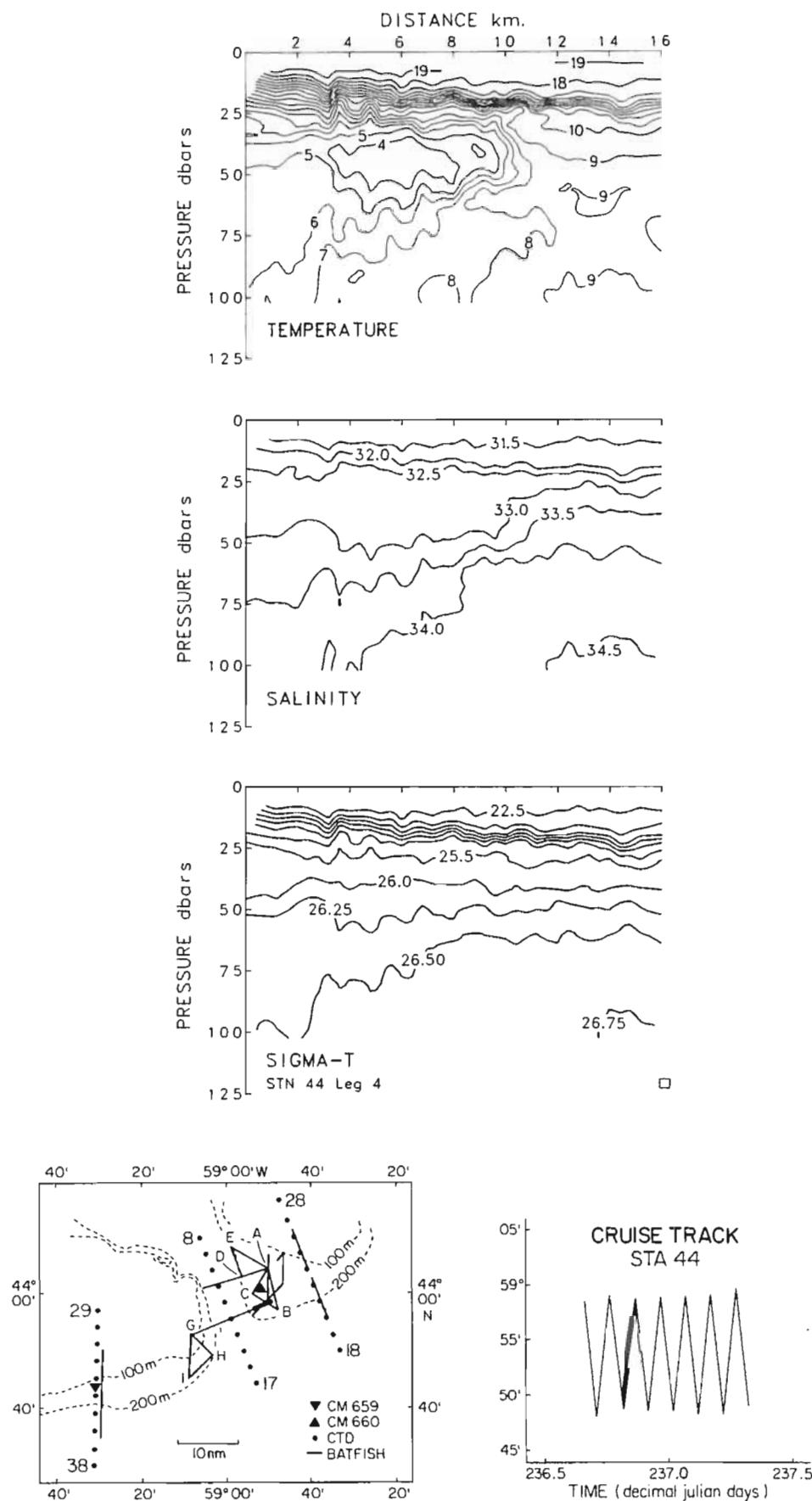


Fig. 68

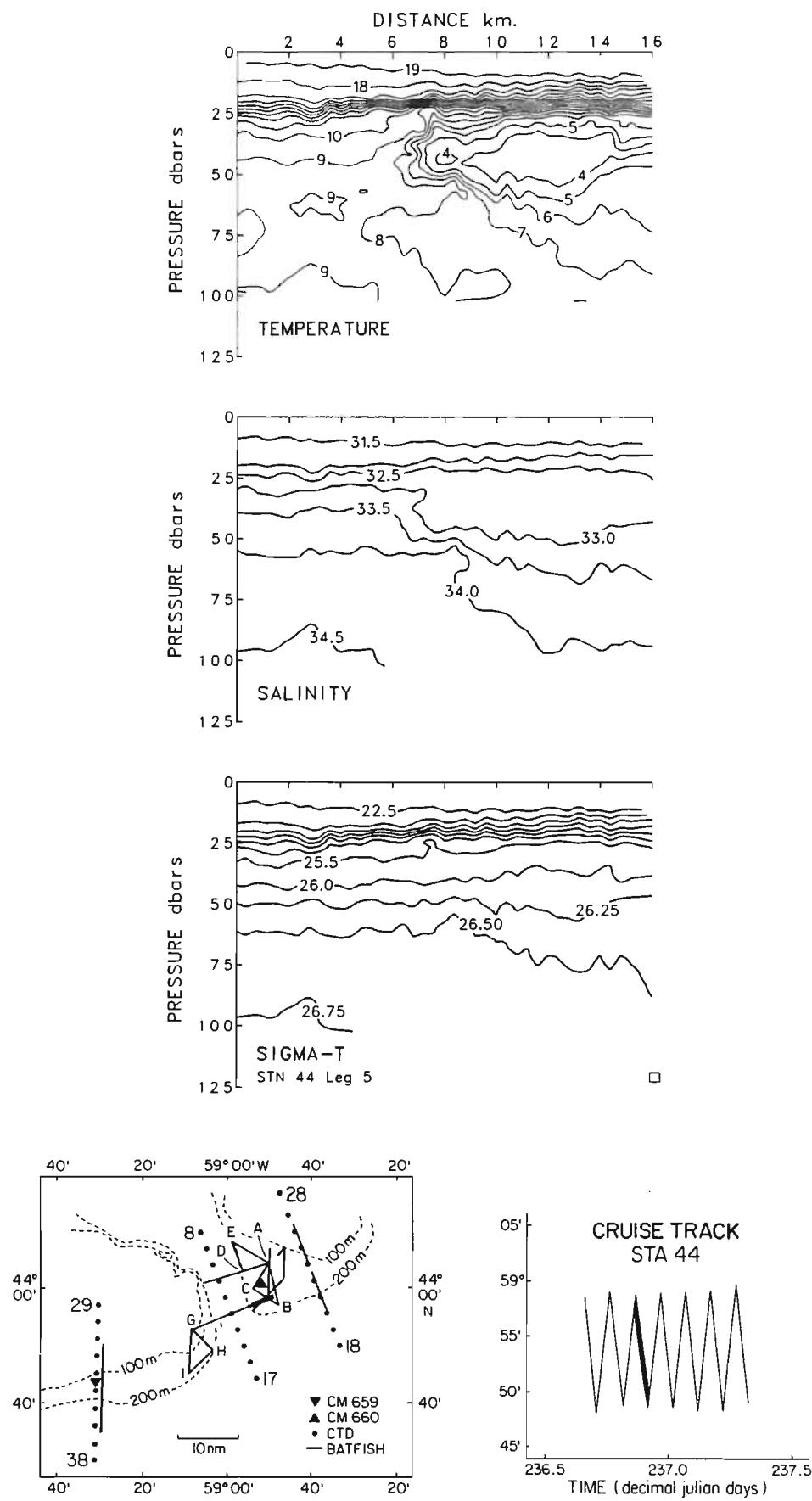


Fig. 69

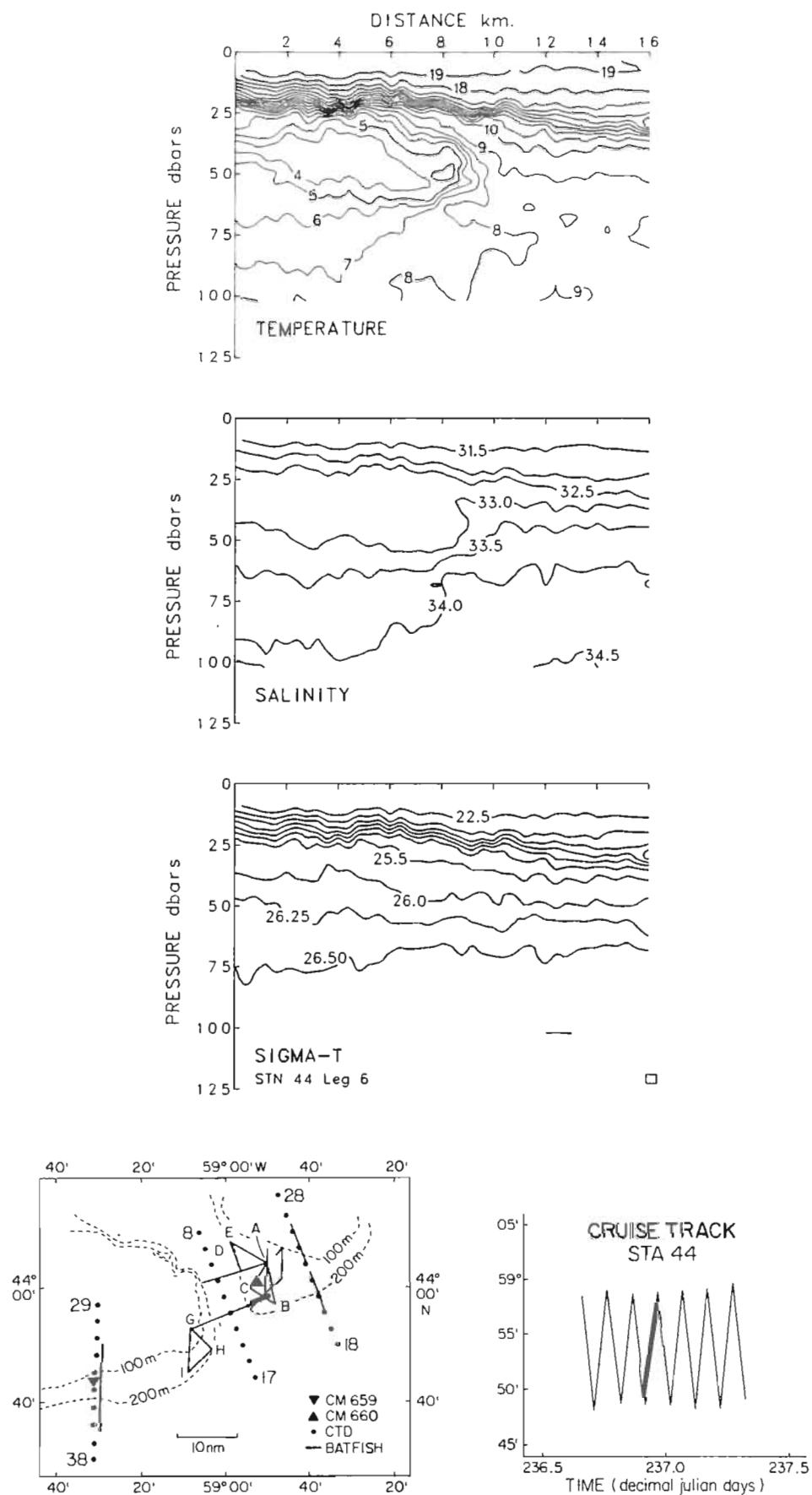


Fig. 70

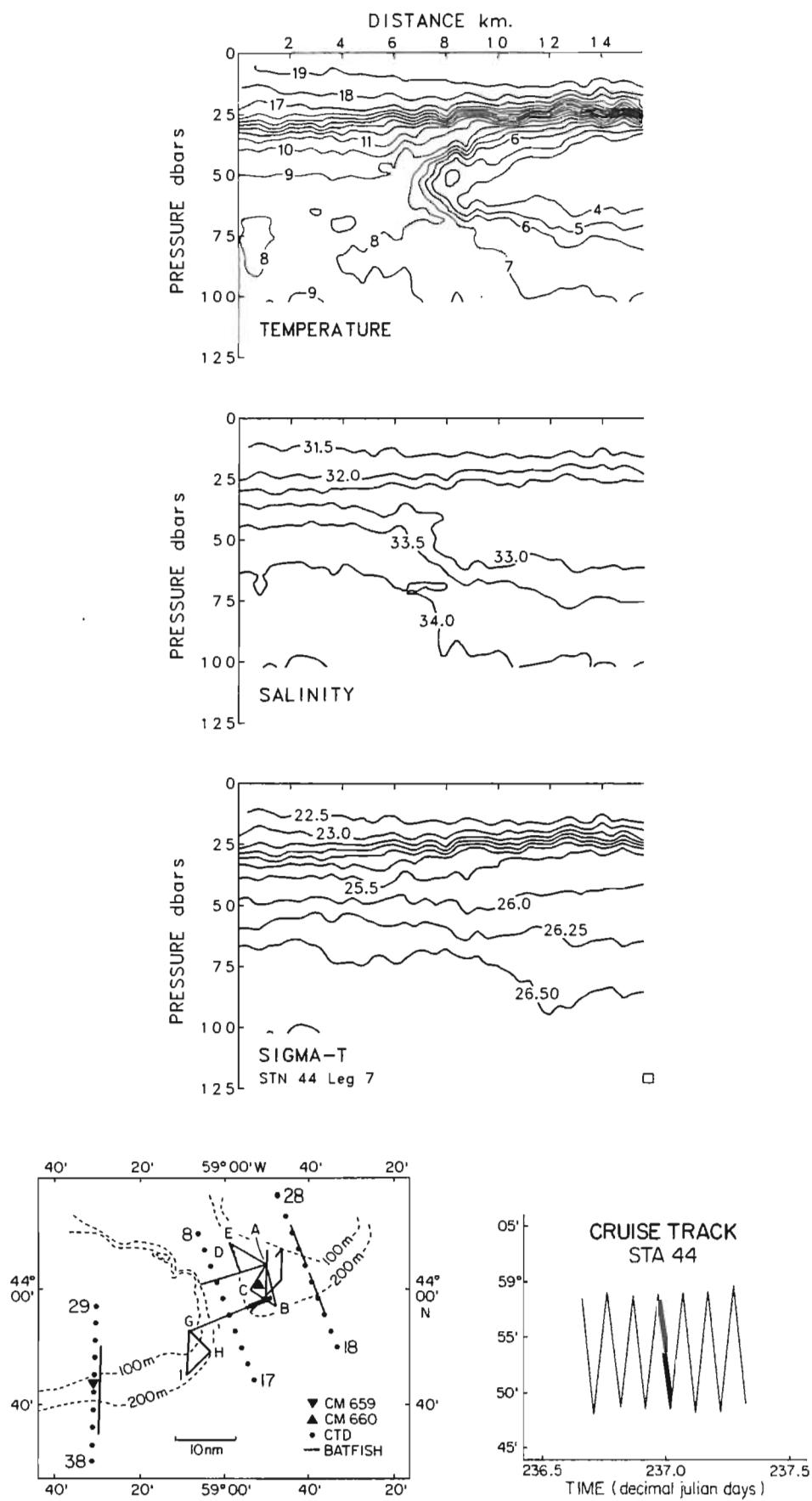


Fig. 71

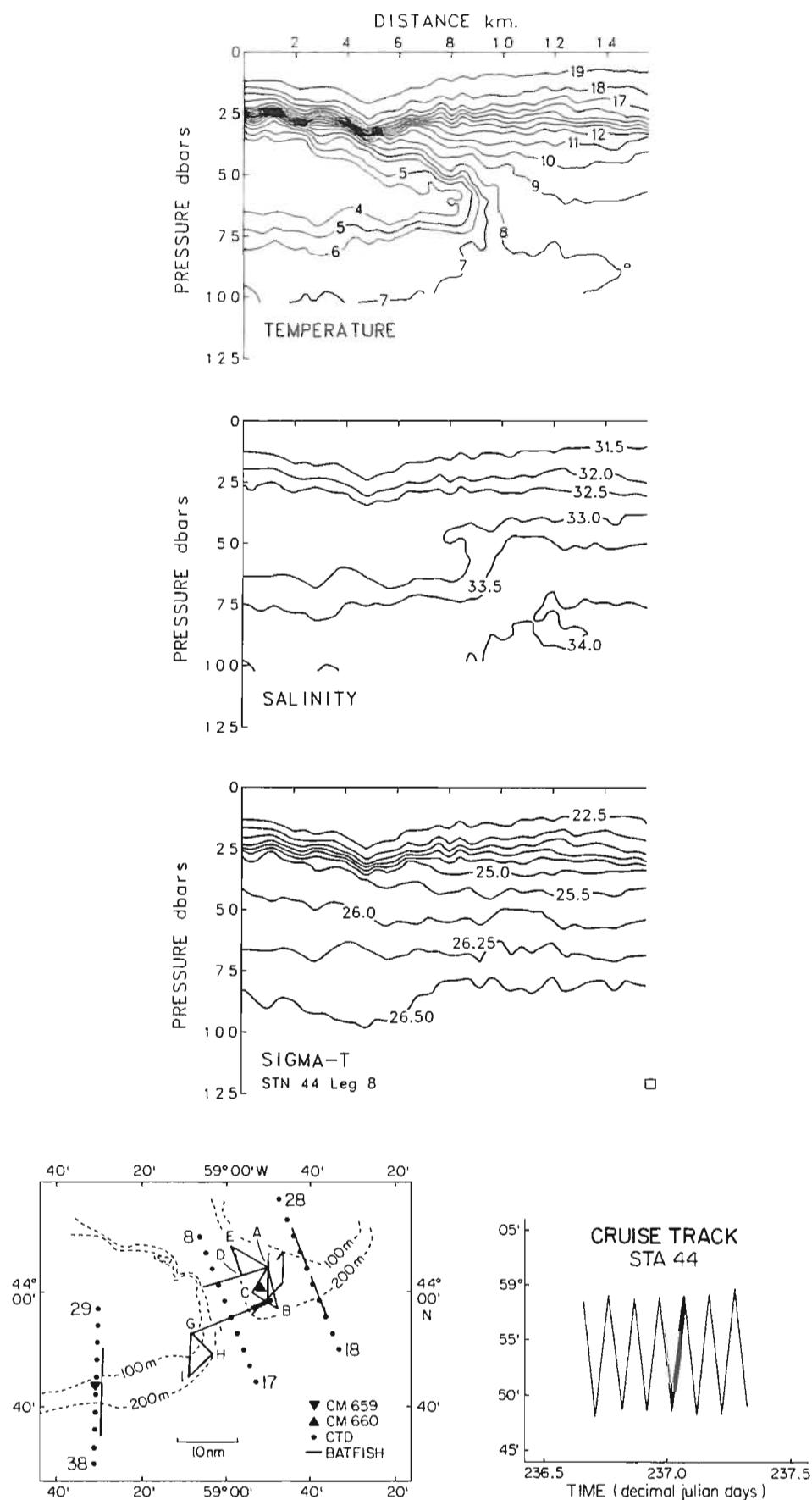


Fig. 72

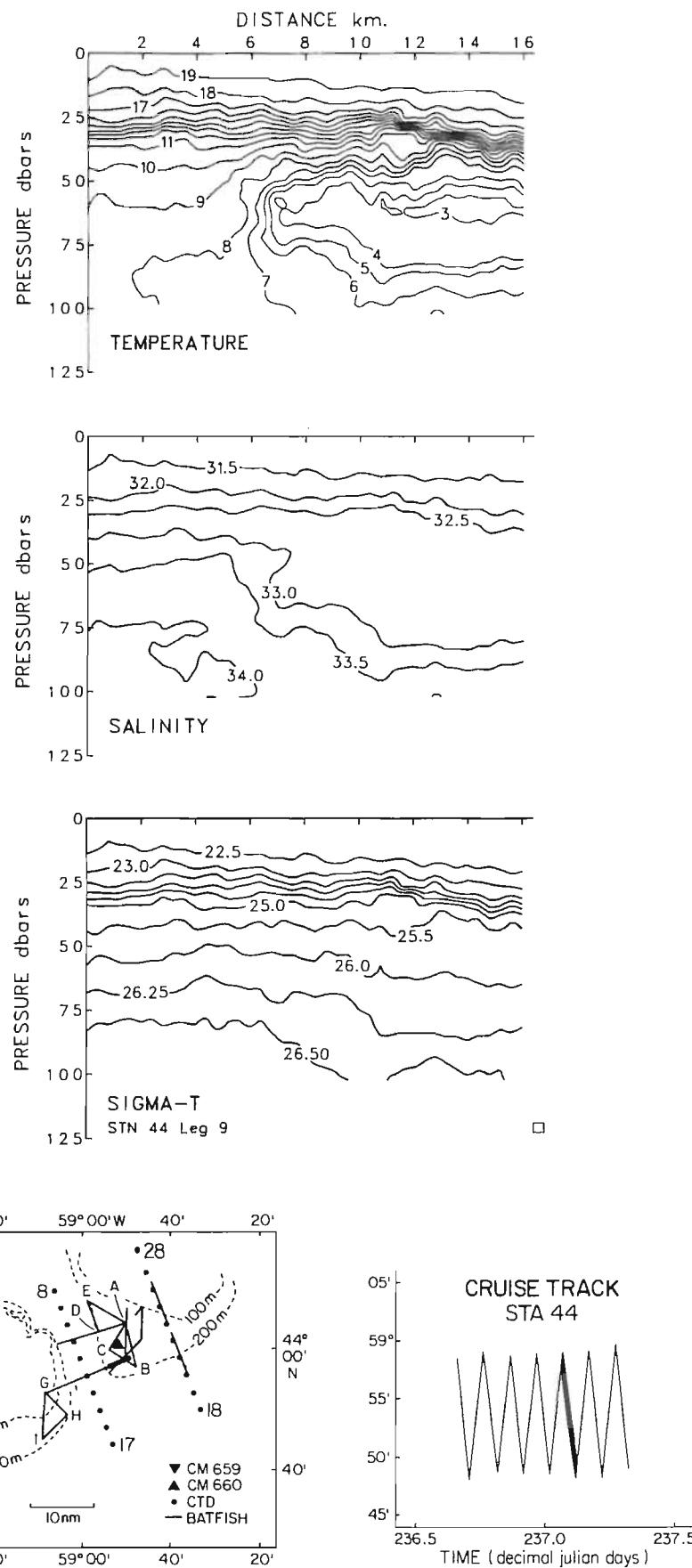


Fig. 73

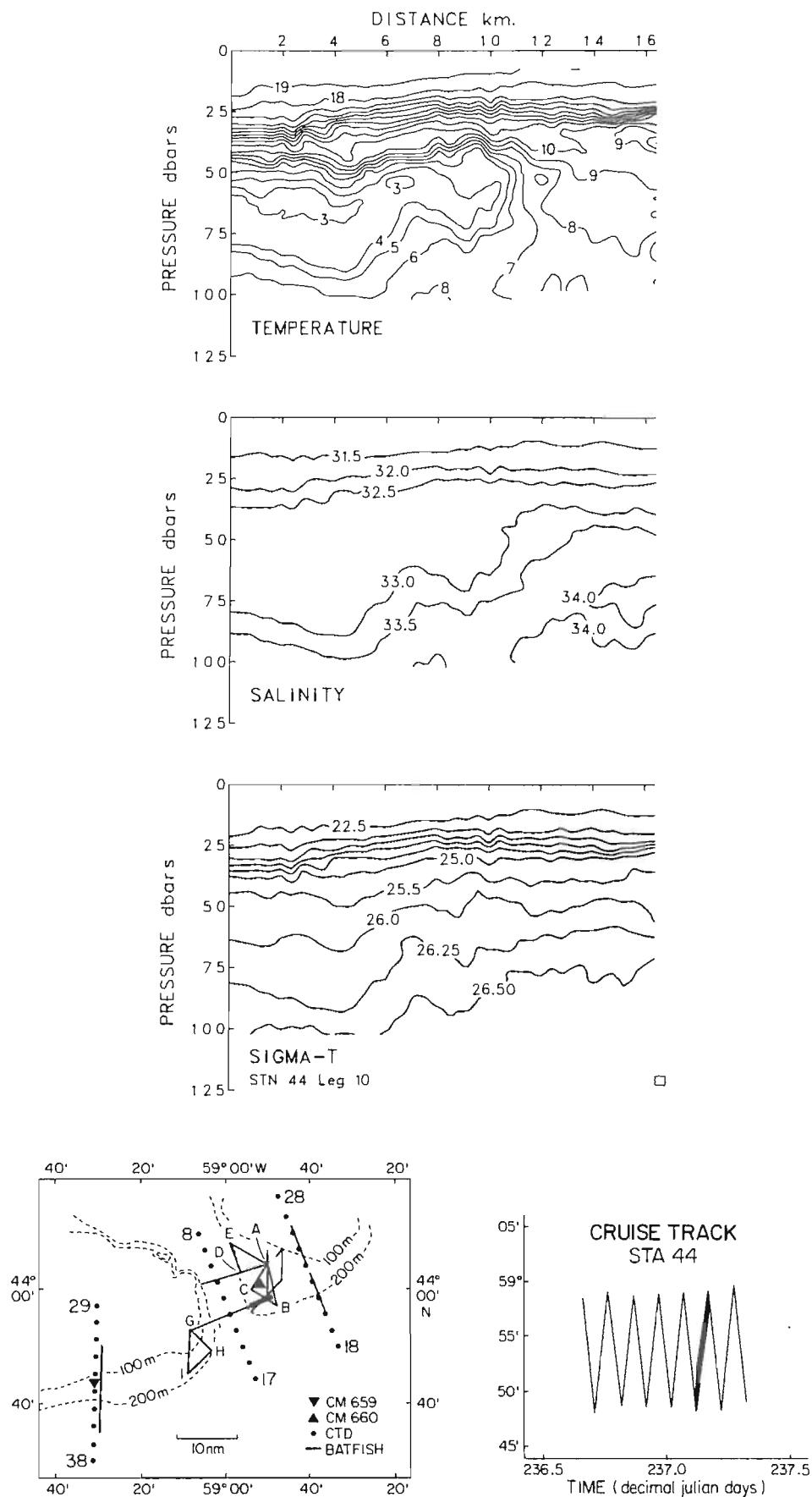


Fig. 74

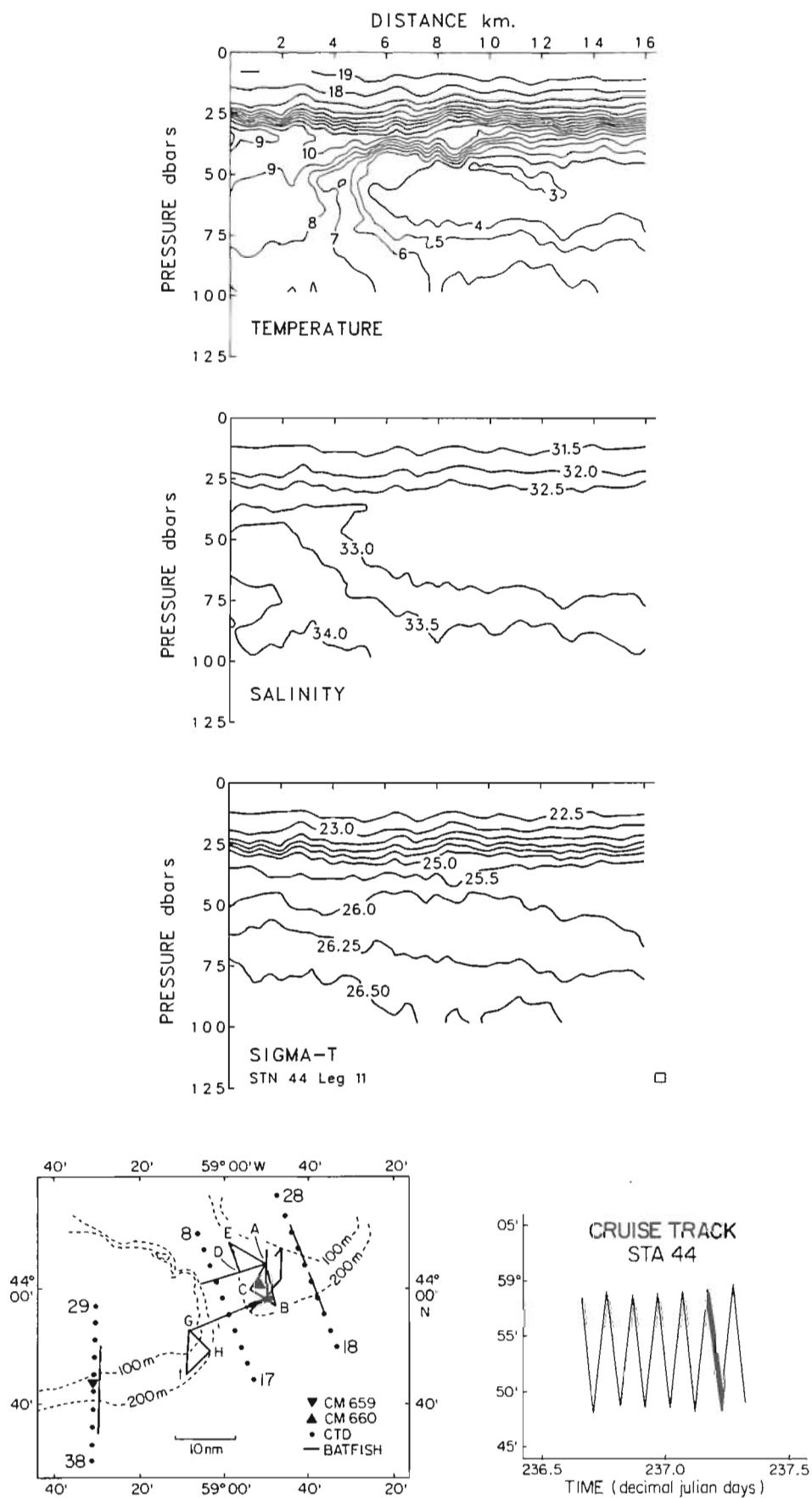


Fig. 75

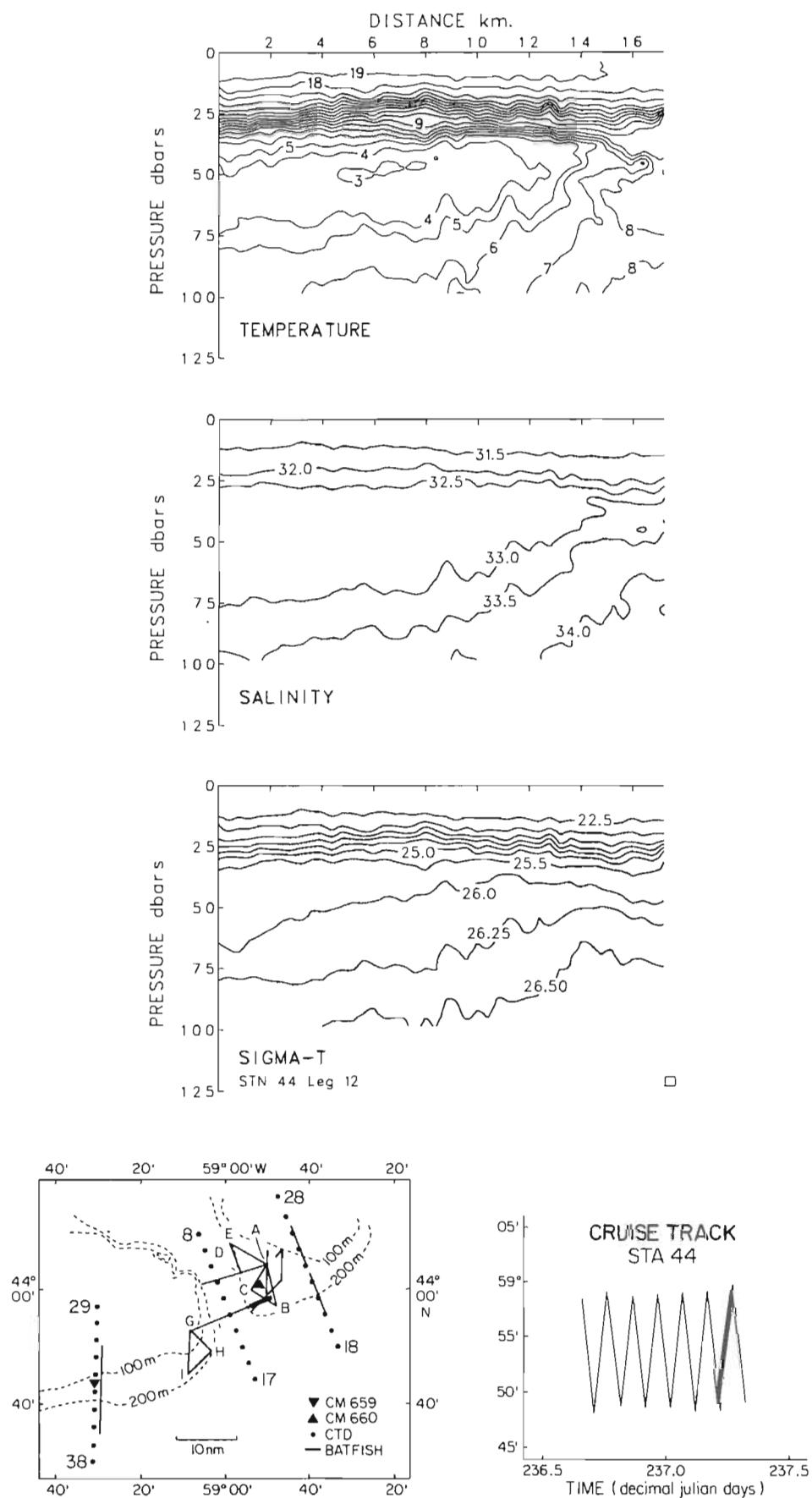


Fig. 76

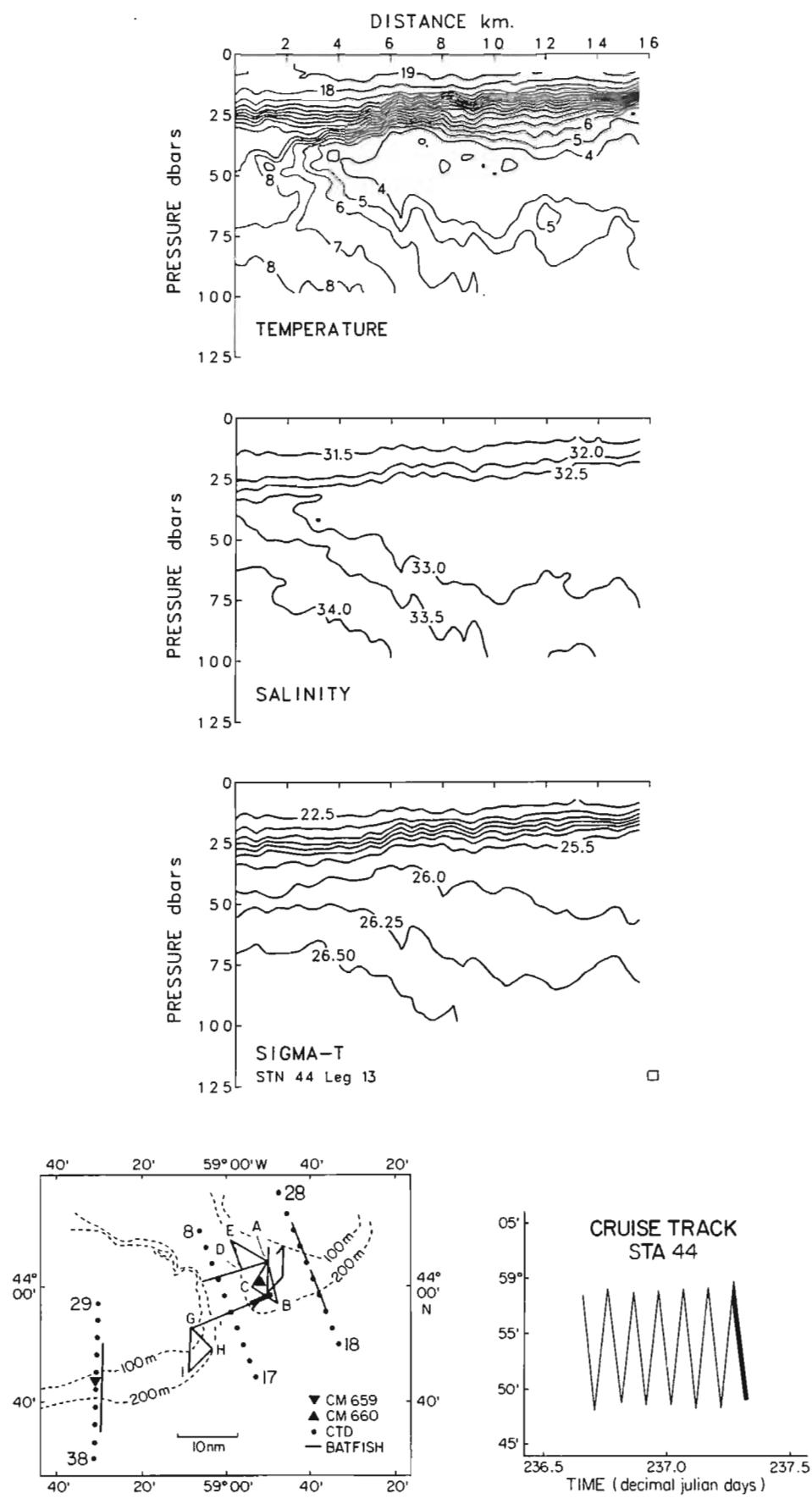


Fig. 77

Figures 78-92.

BATFISH station 45: 15 sections of Temperature, Salinity and Sigma-t vs. pressure,
location maps and latitude vs. time plot.

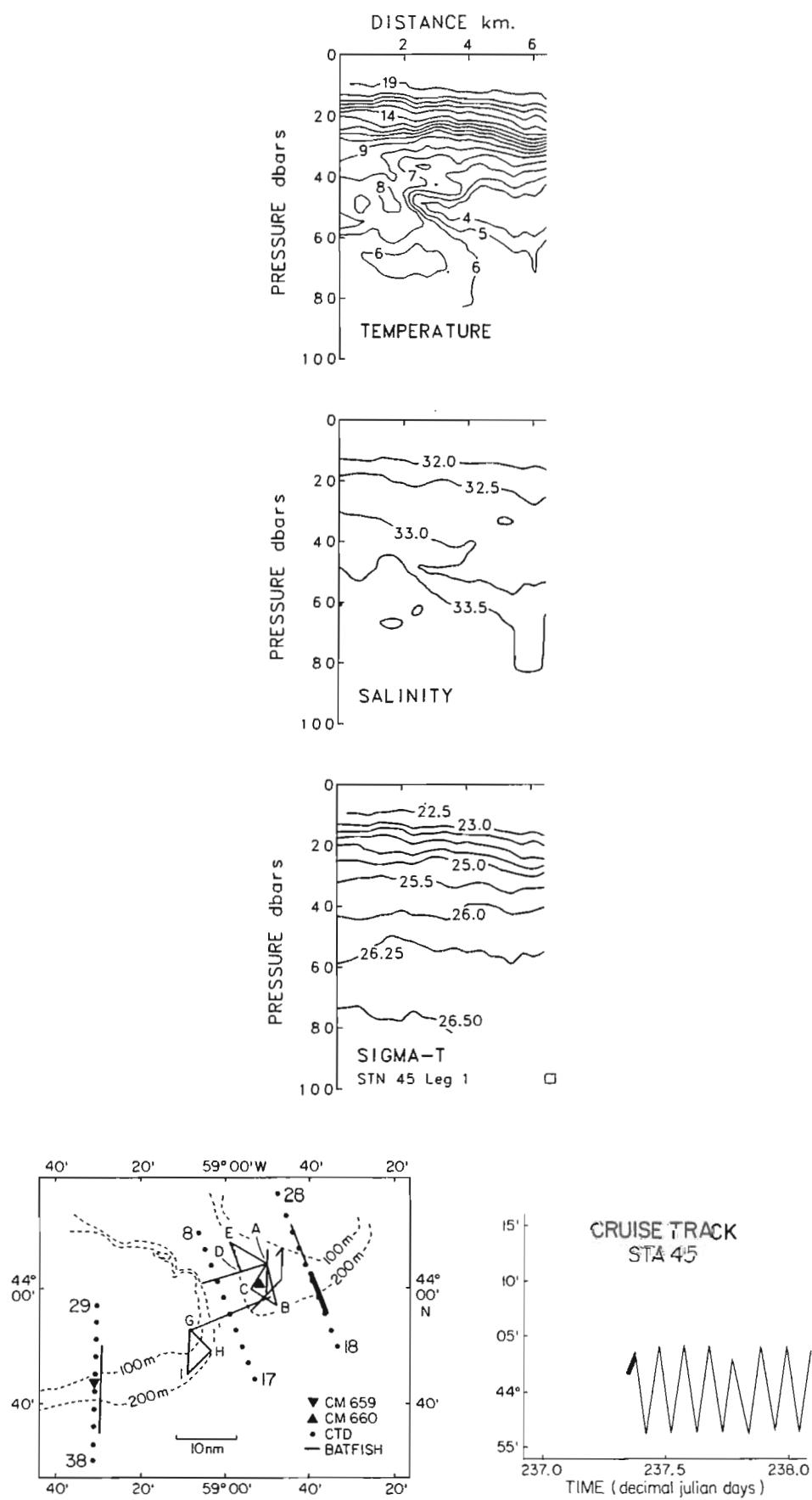


Fig. 78

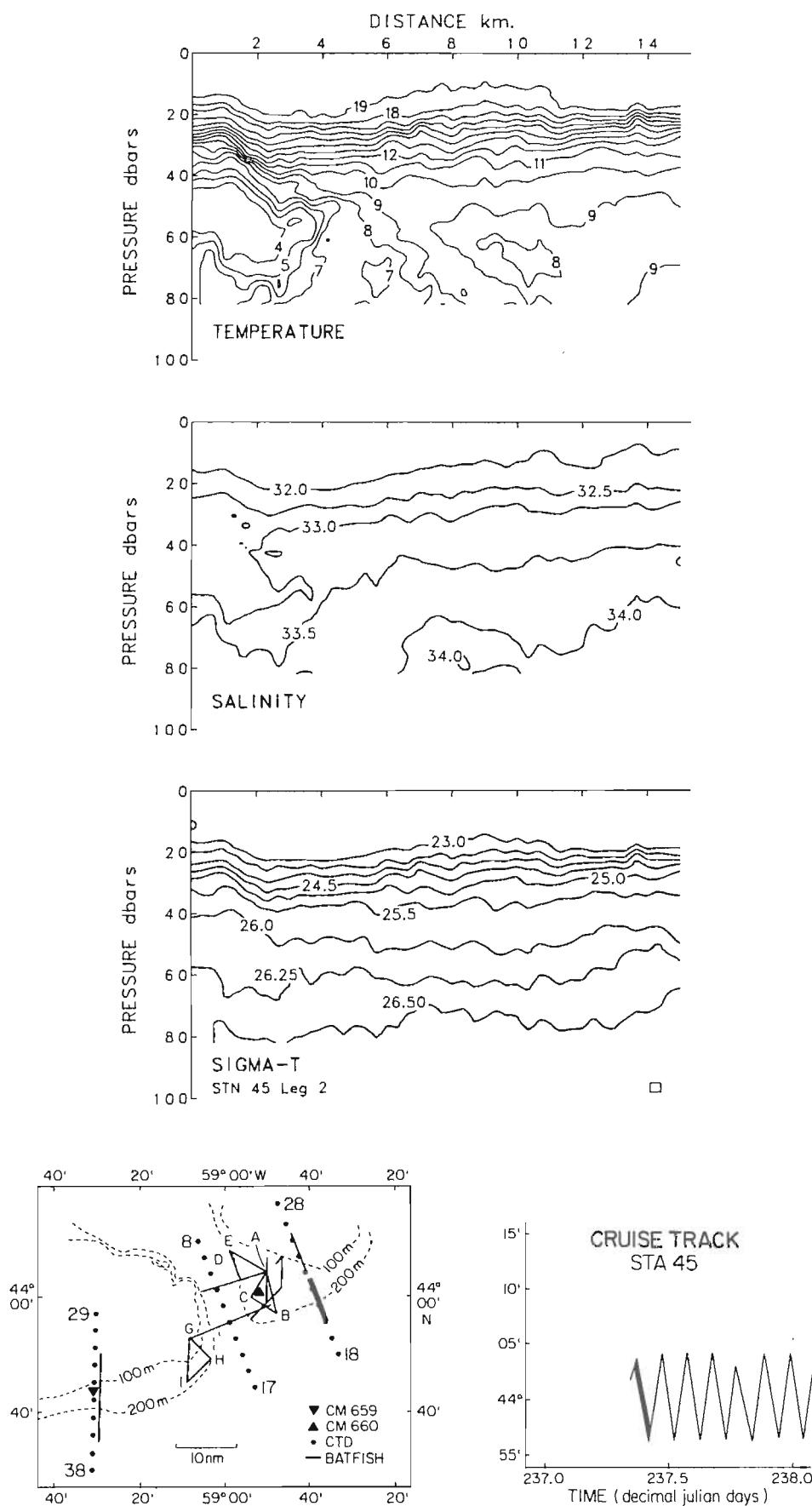


Fig. 79

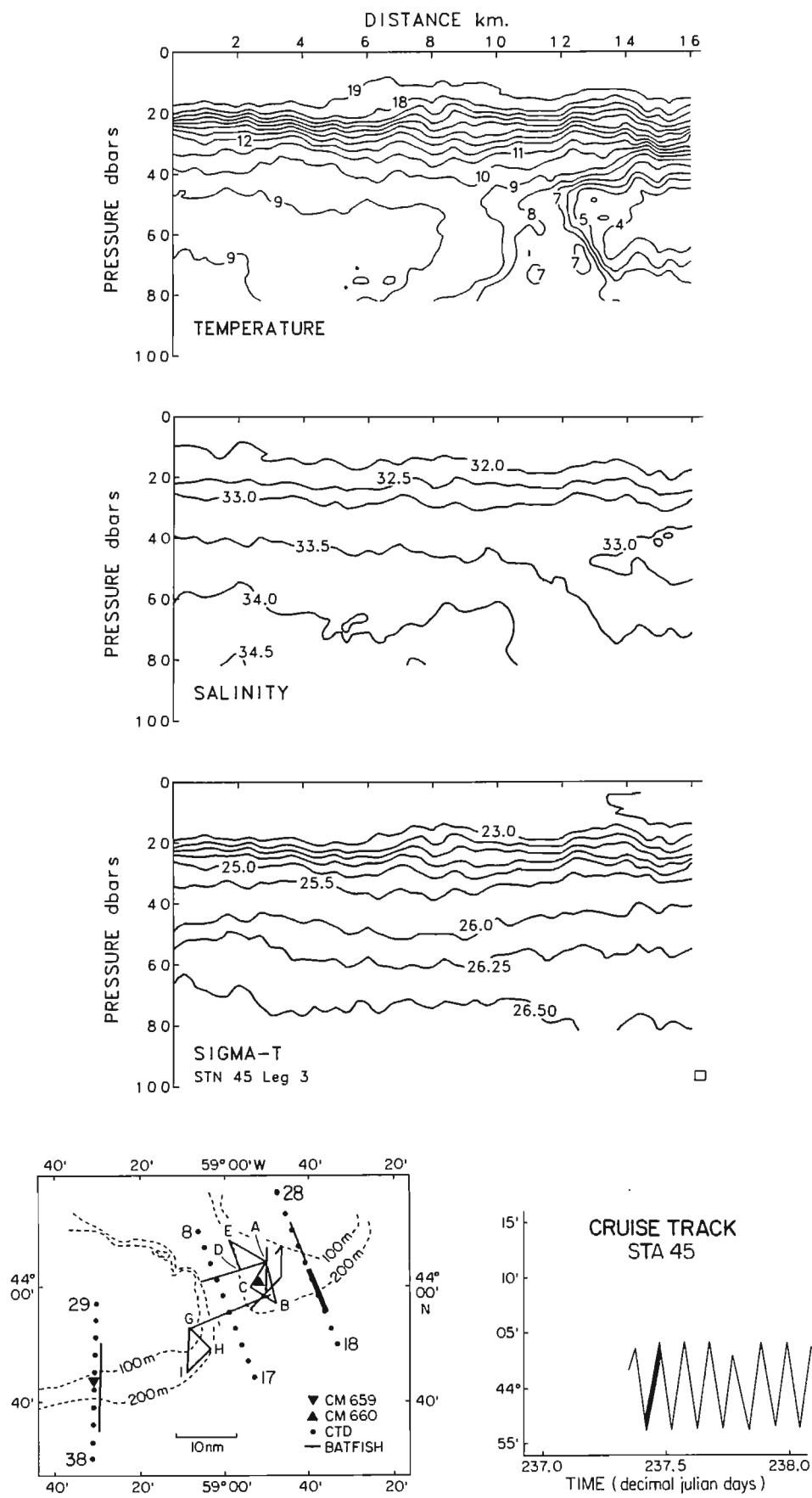


Fig. 80

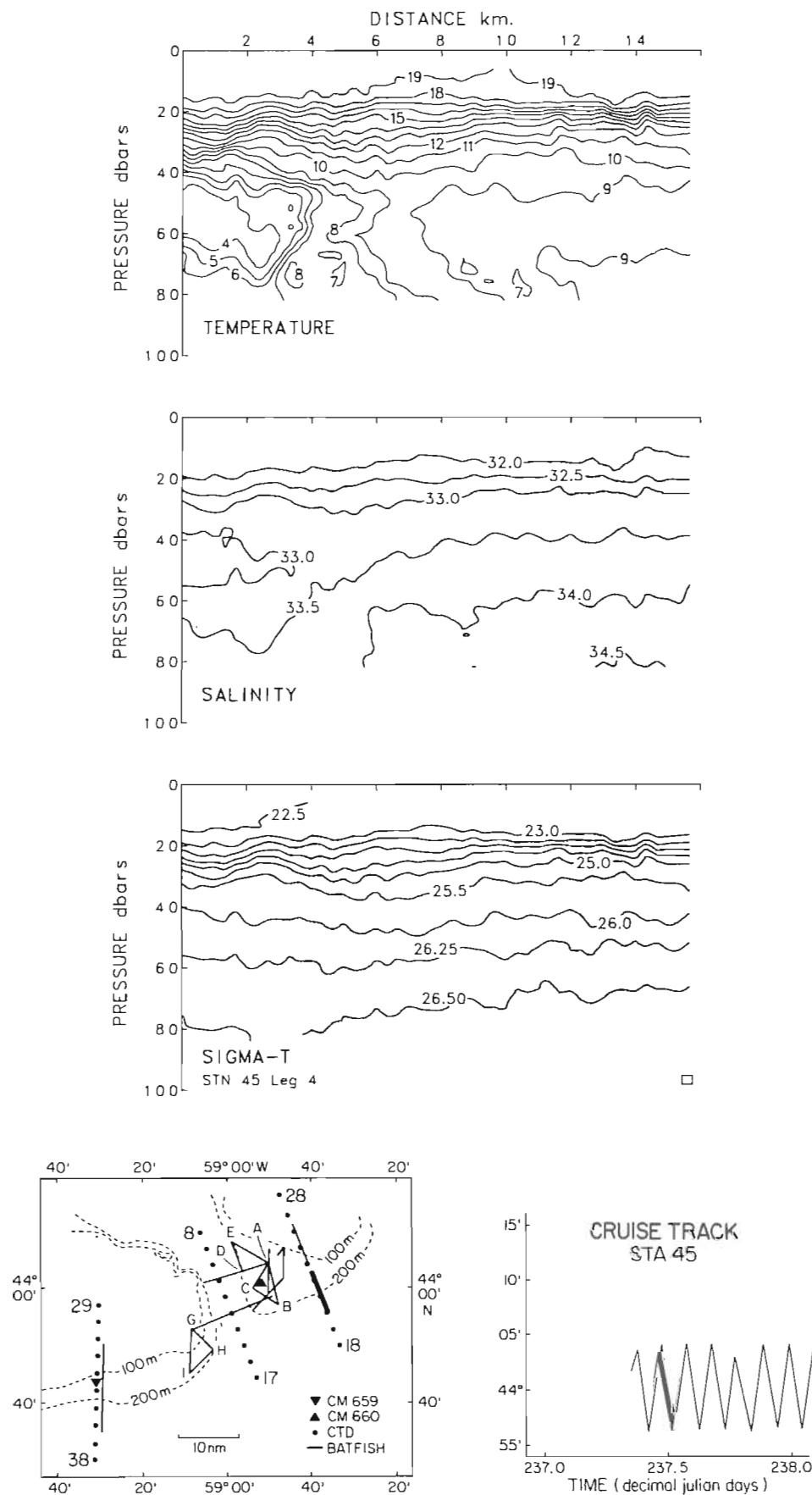


Fig. 81

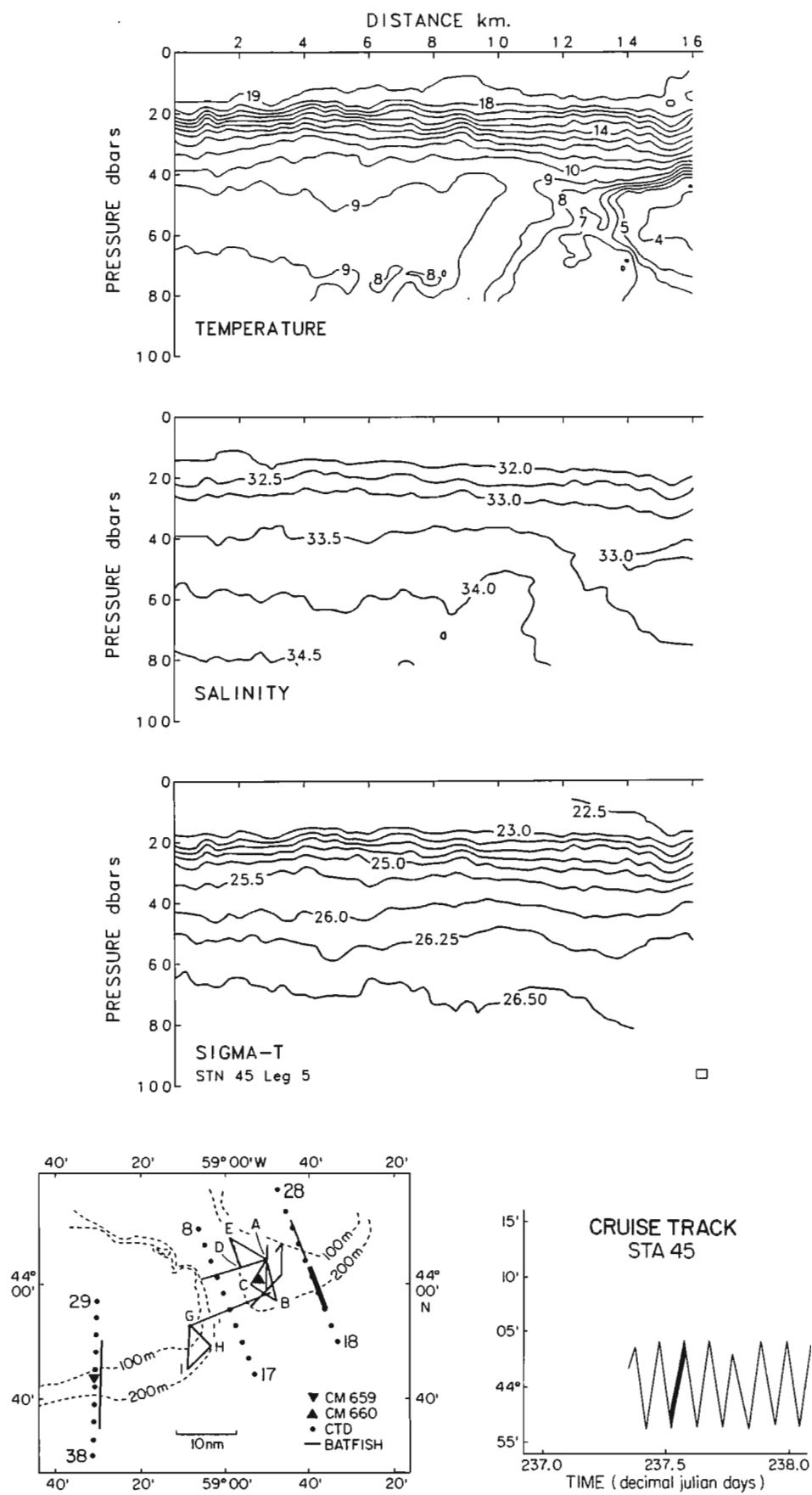


Fig. 82

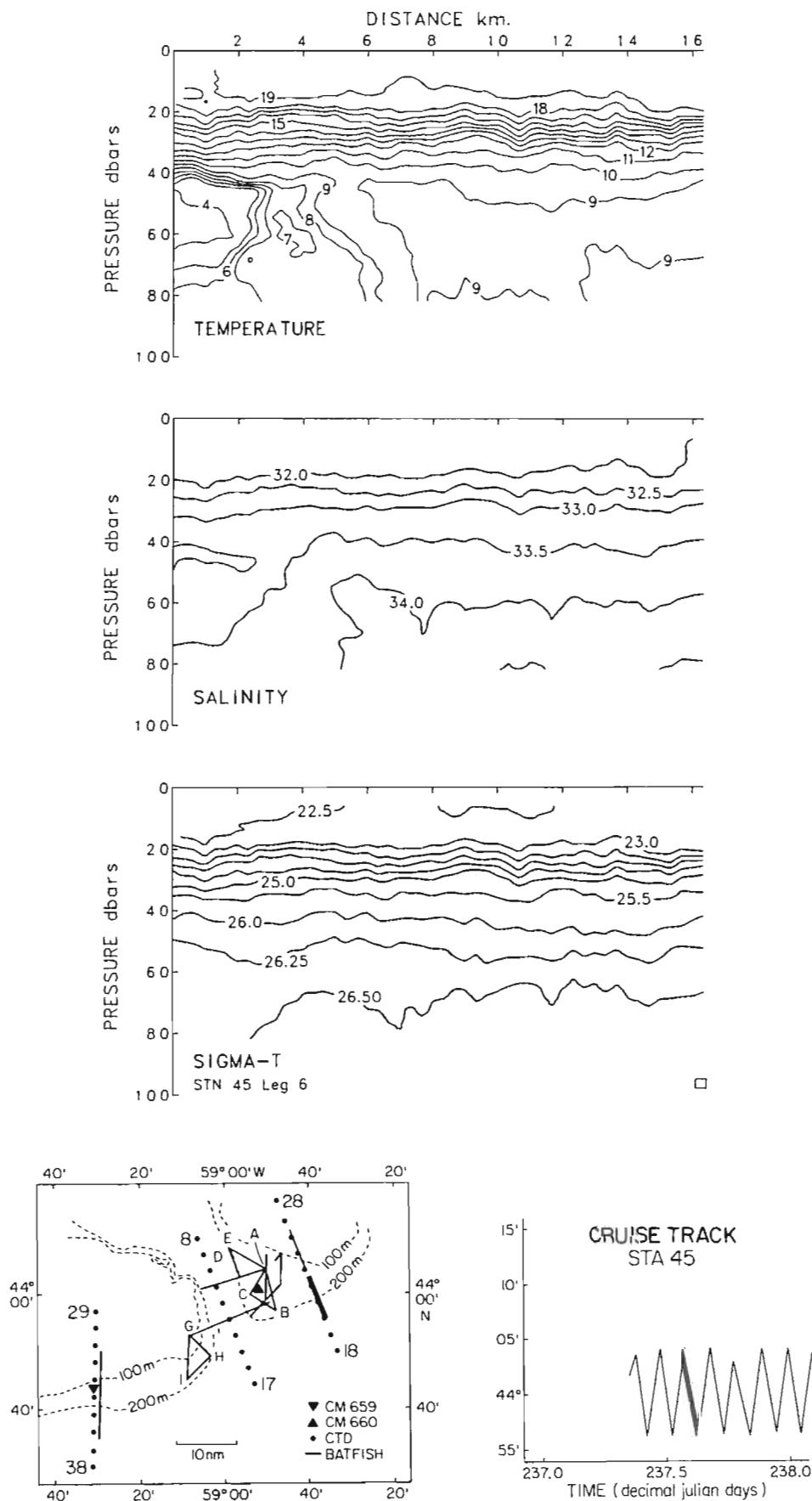


Fig. 83

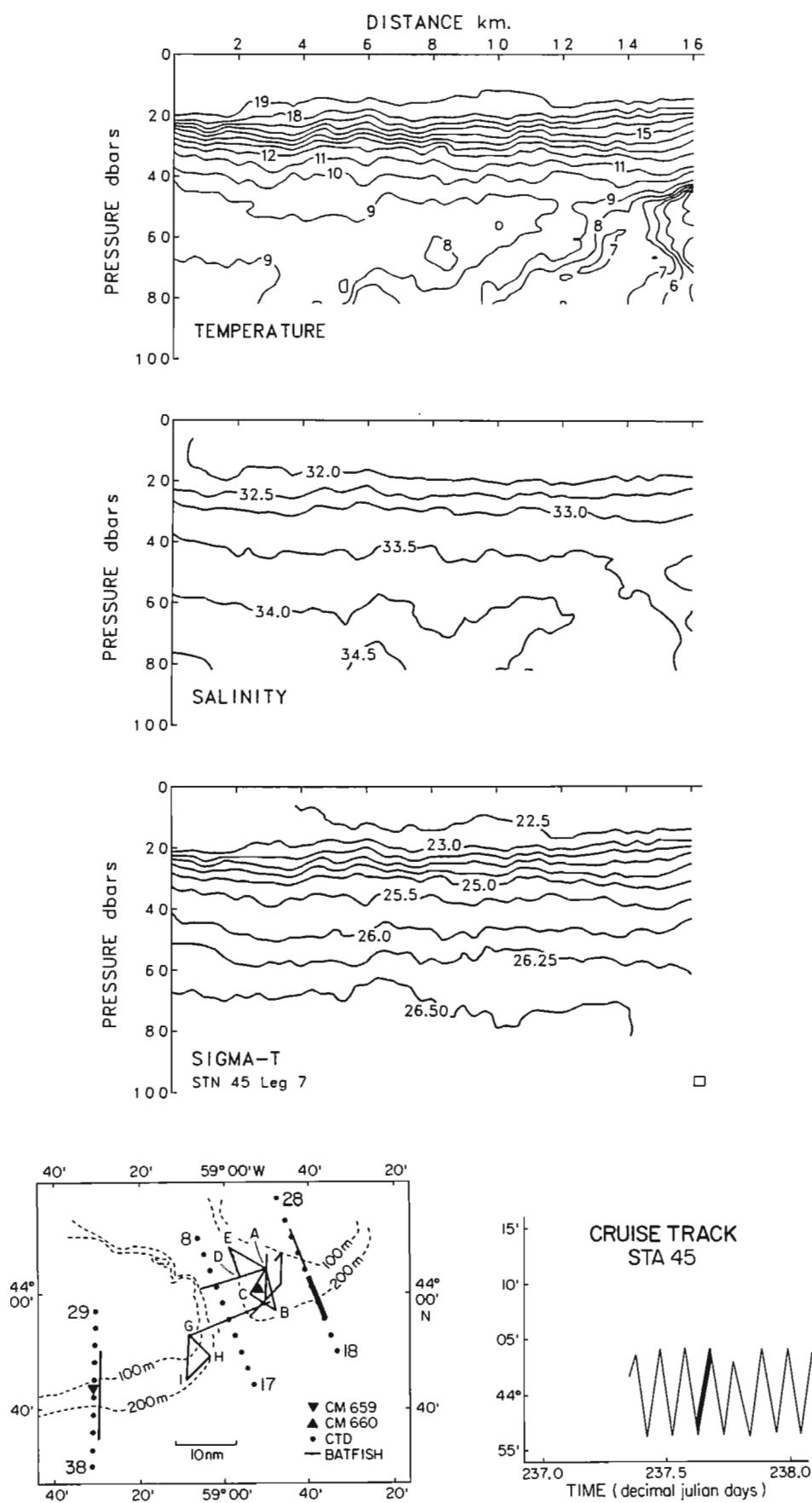


Fig. 84

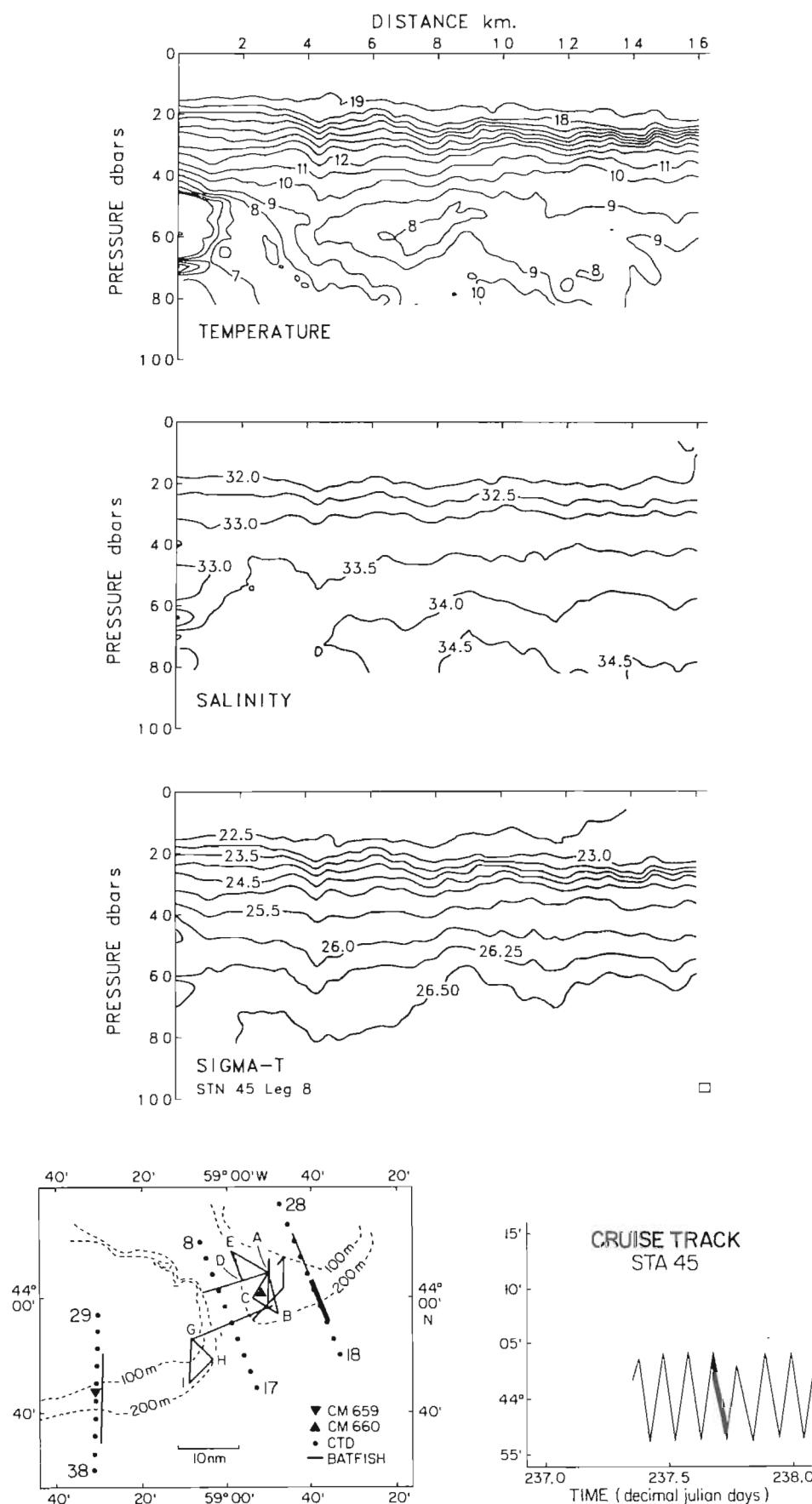


Fig. 85

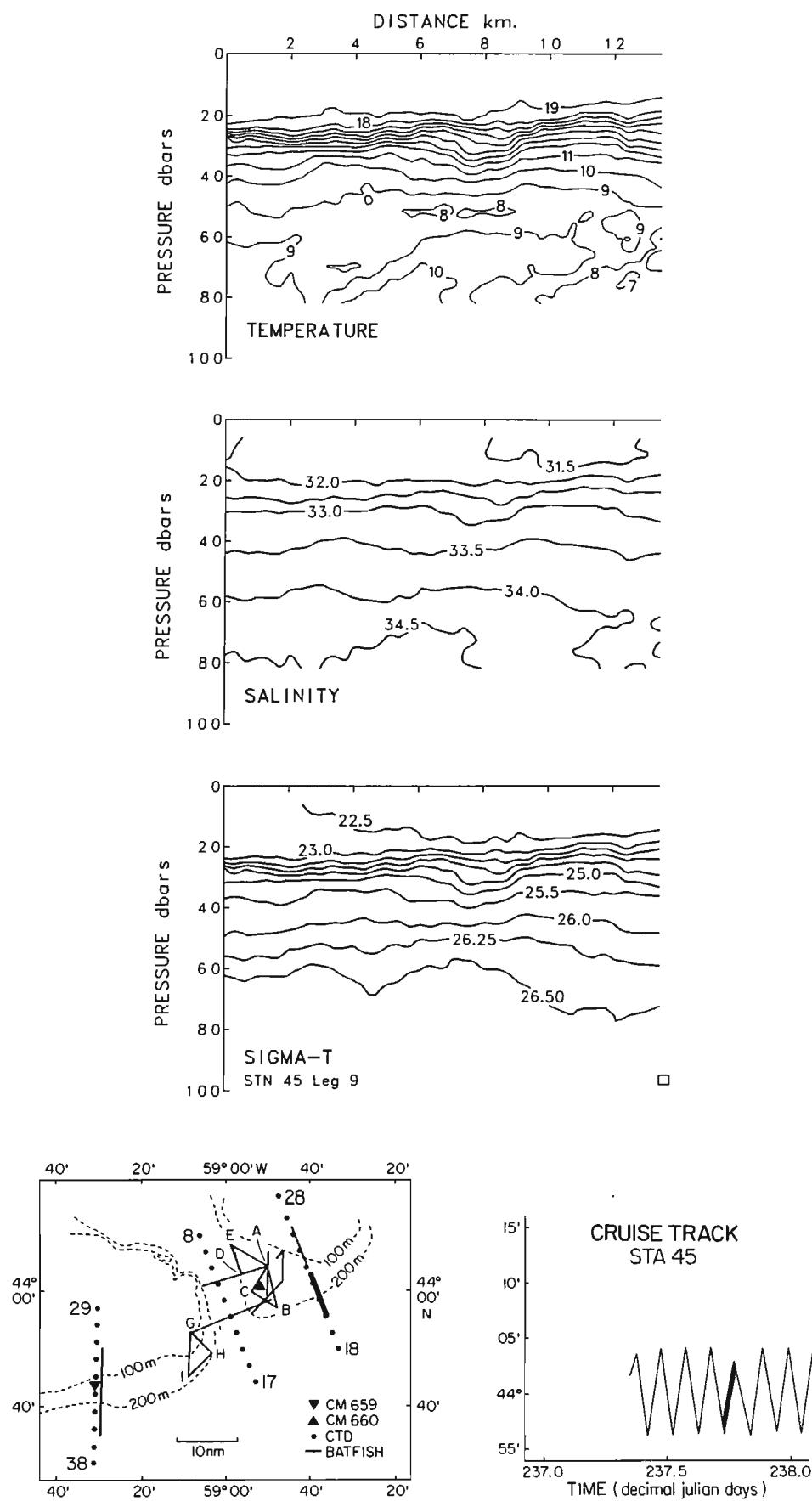


Fig. 86

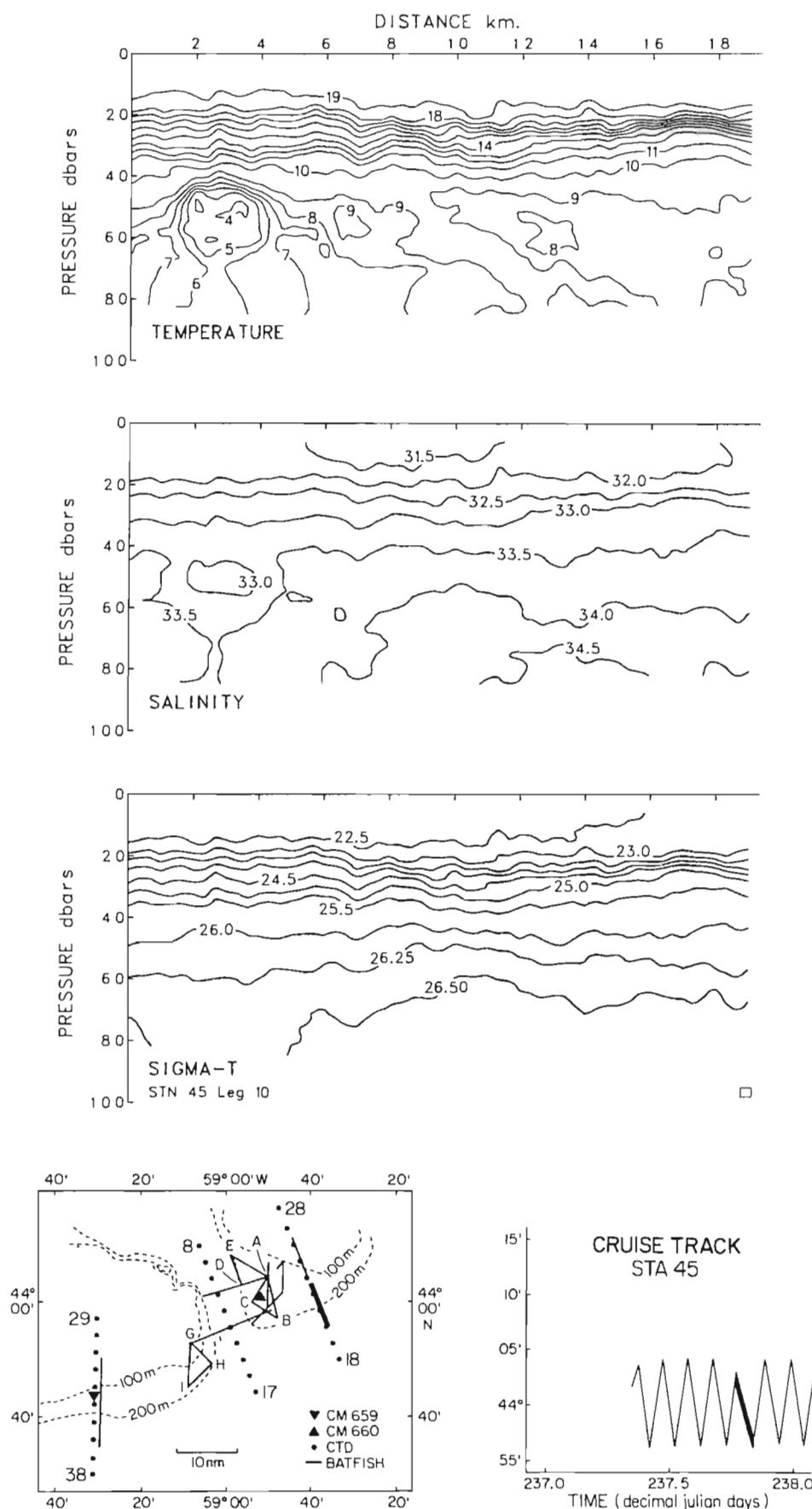


Fig. 87

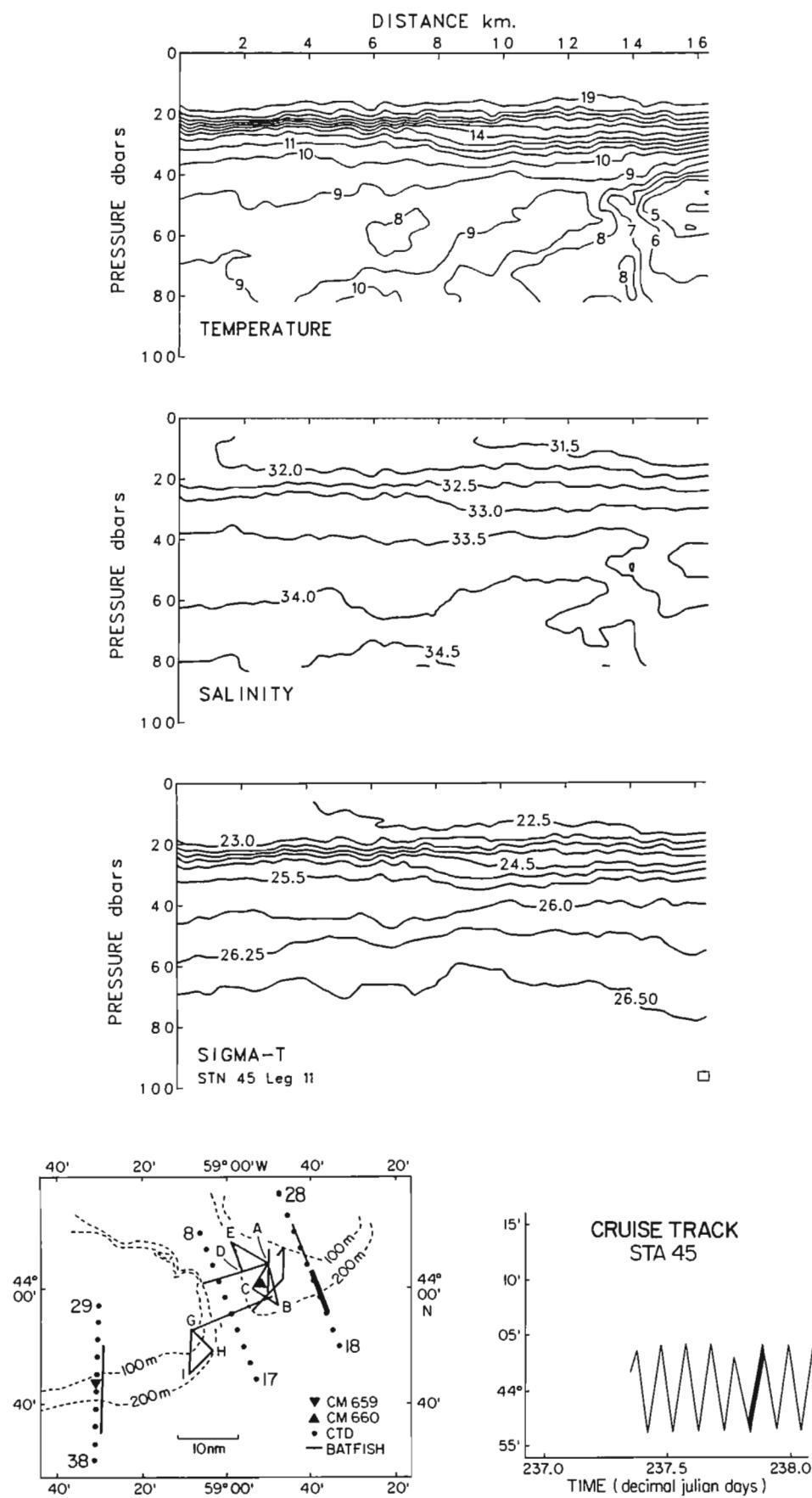


Fig. 88

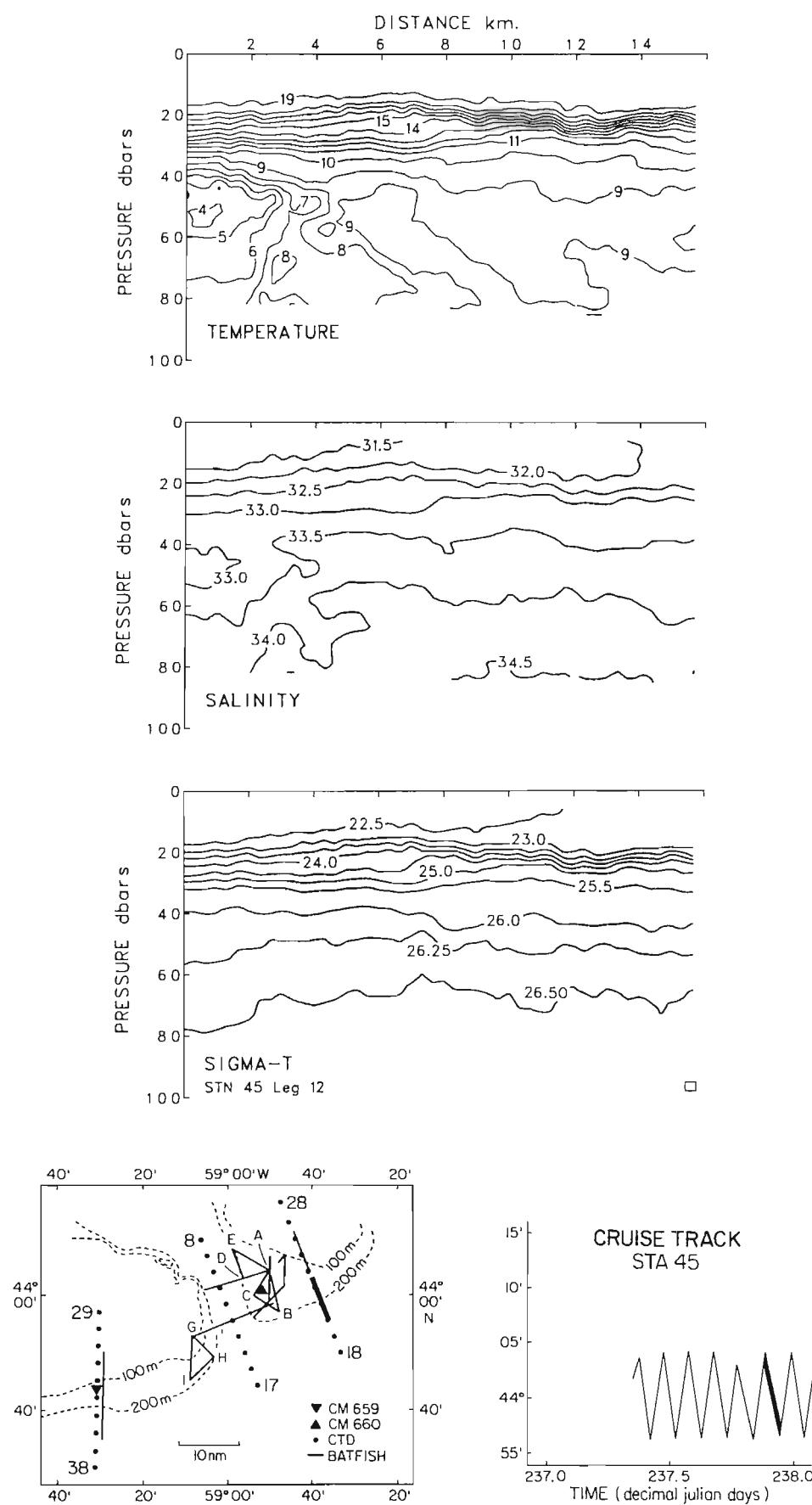


Fig. 89

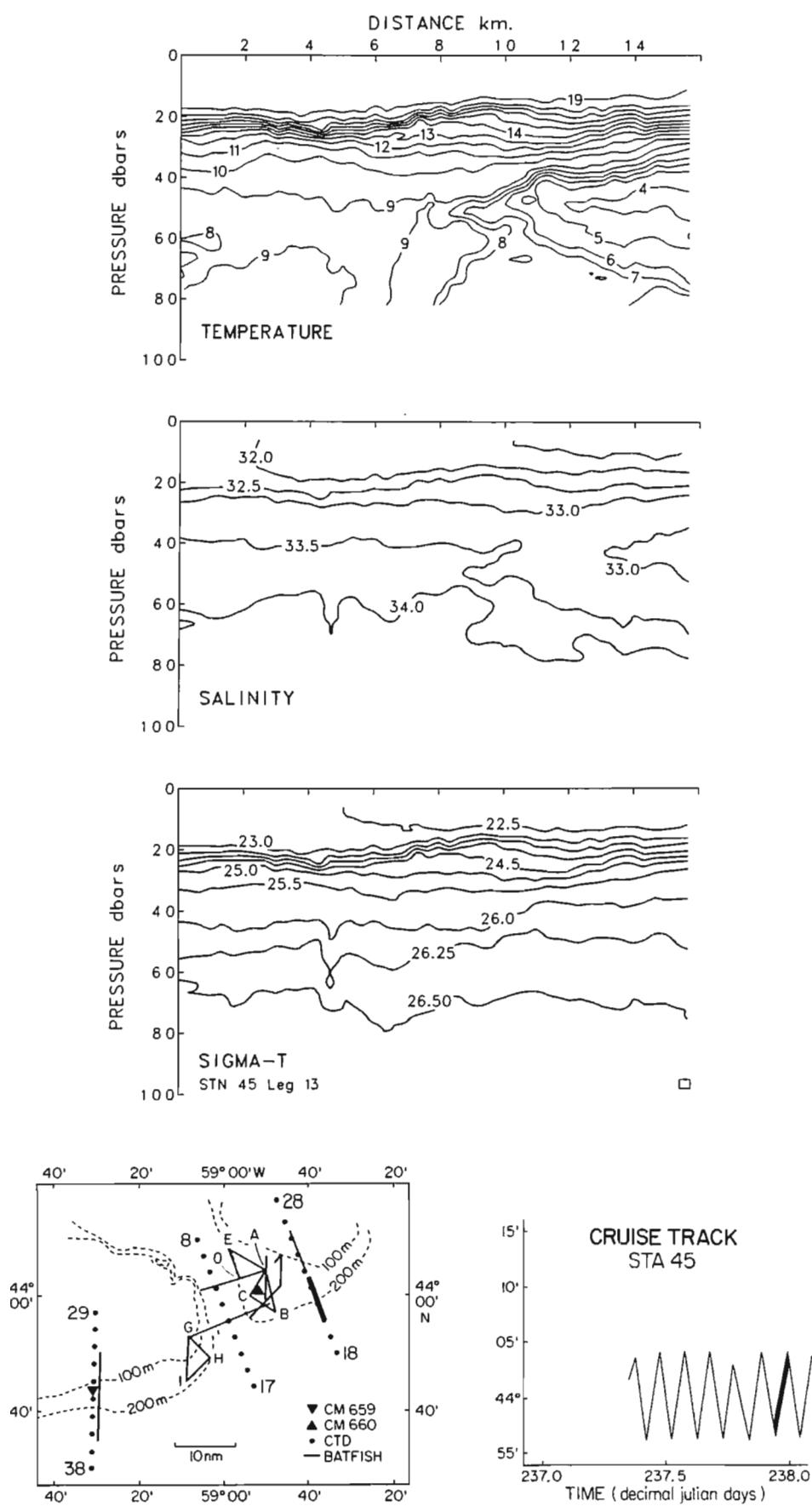


Fig. 90

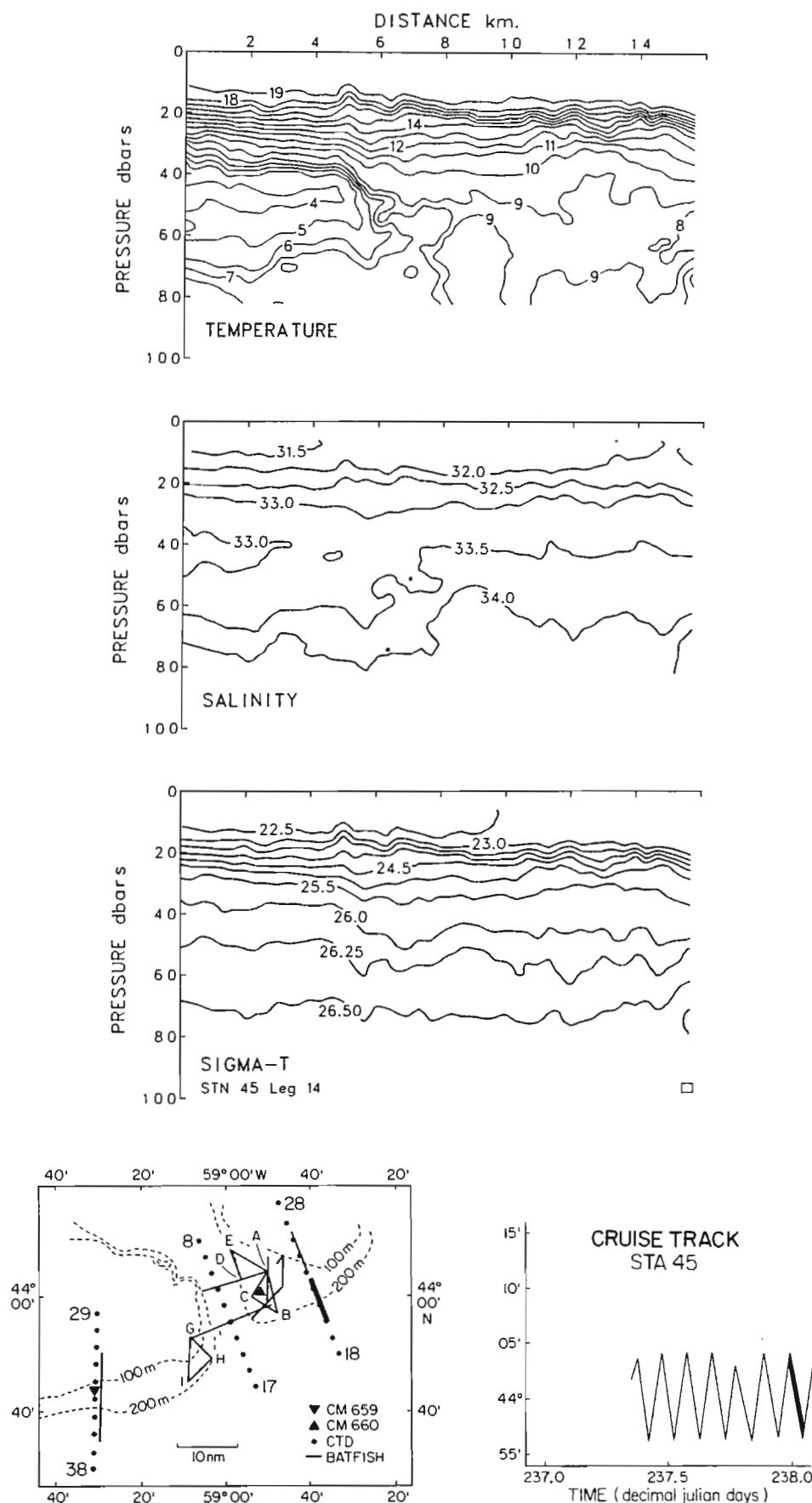


Fig. 91

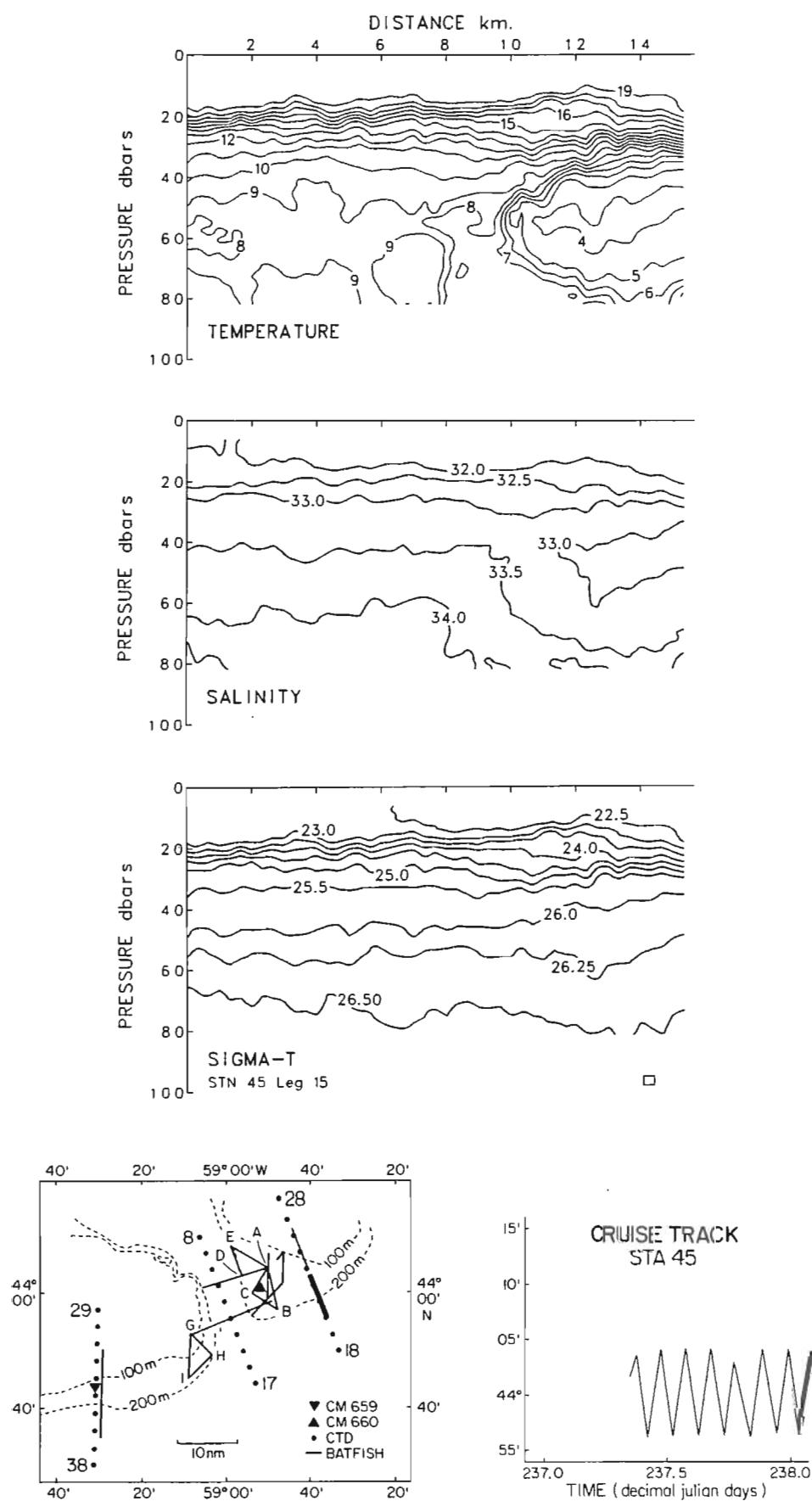


Fig. 92

Figures 93-106.

BATFISH station 46: 14 sections of Temperature, Salinity and Sigma-t vs. pressure,
location maps and latitude vs. time plot.

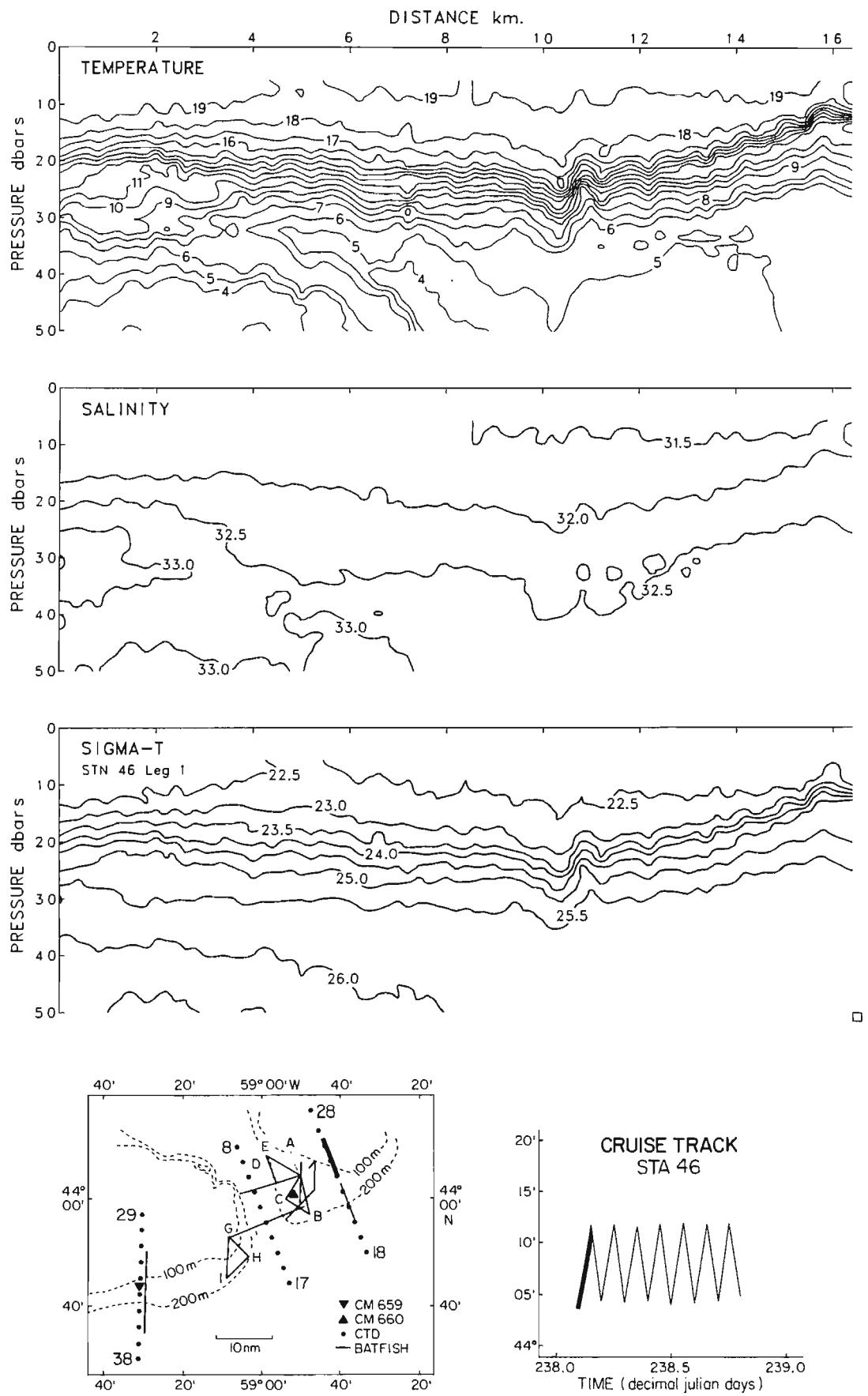


Fig. 93

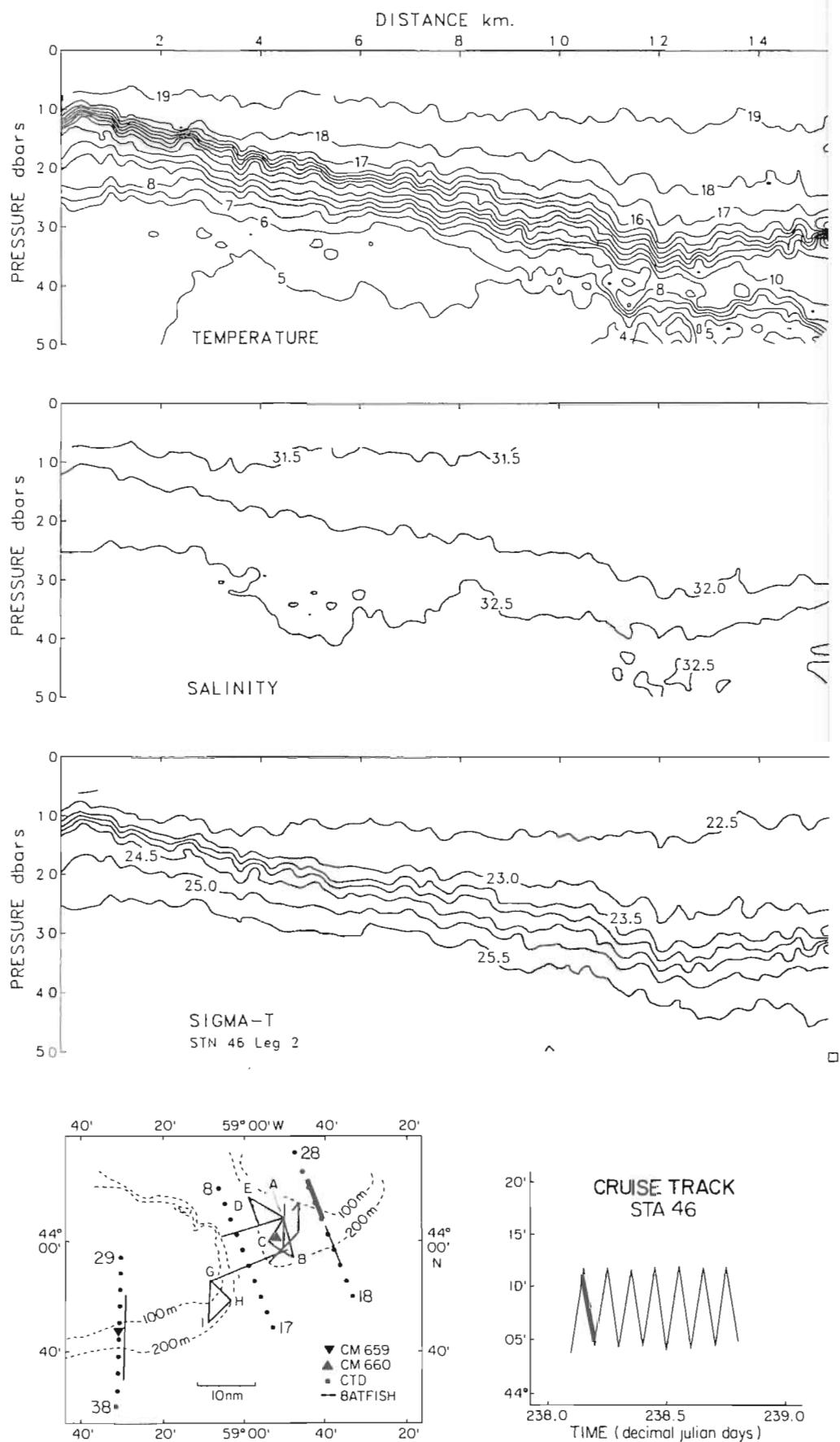


Fig. 94

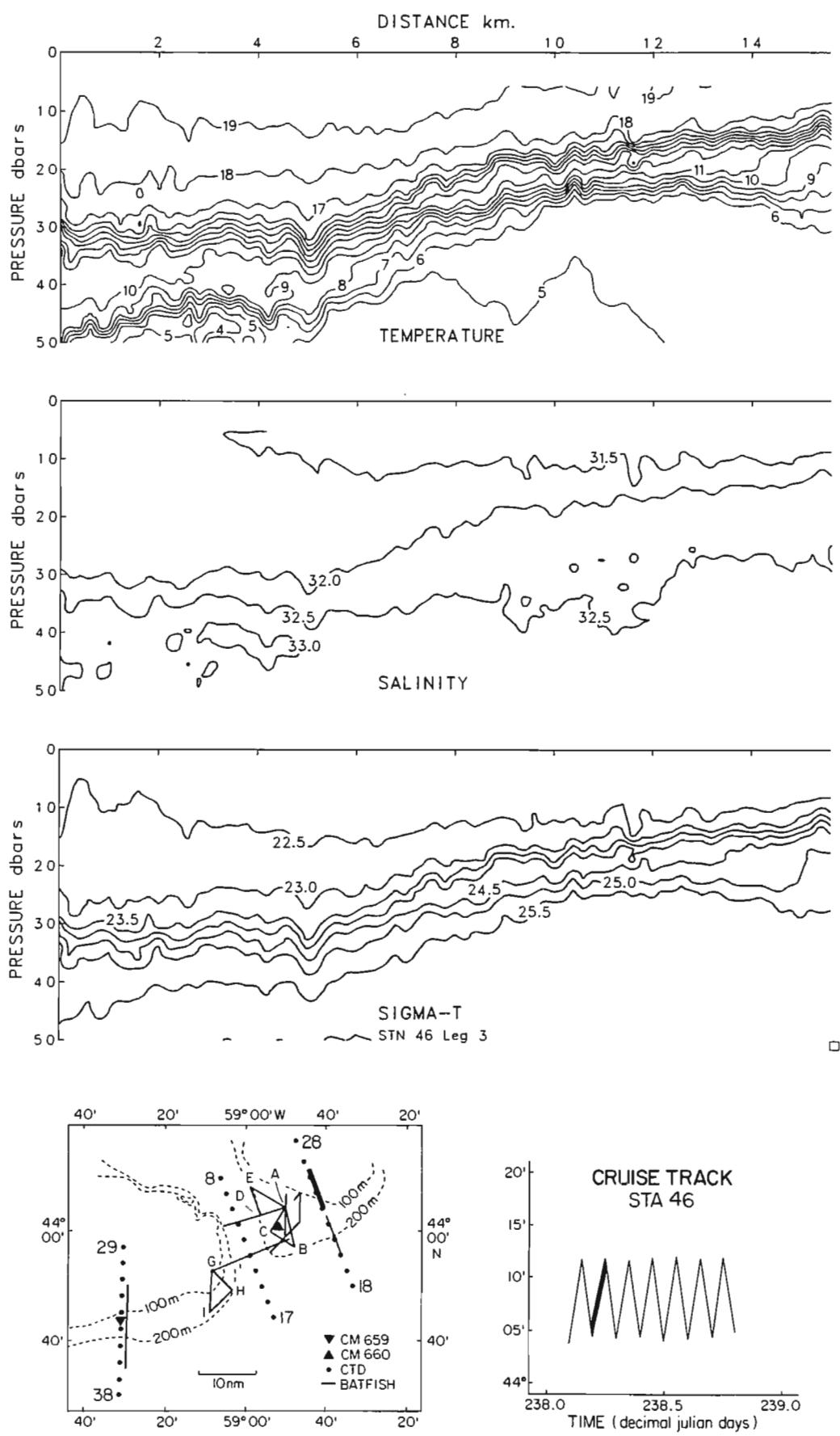


Fig. 95

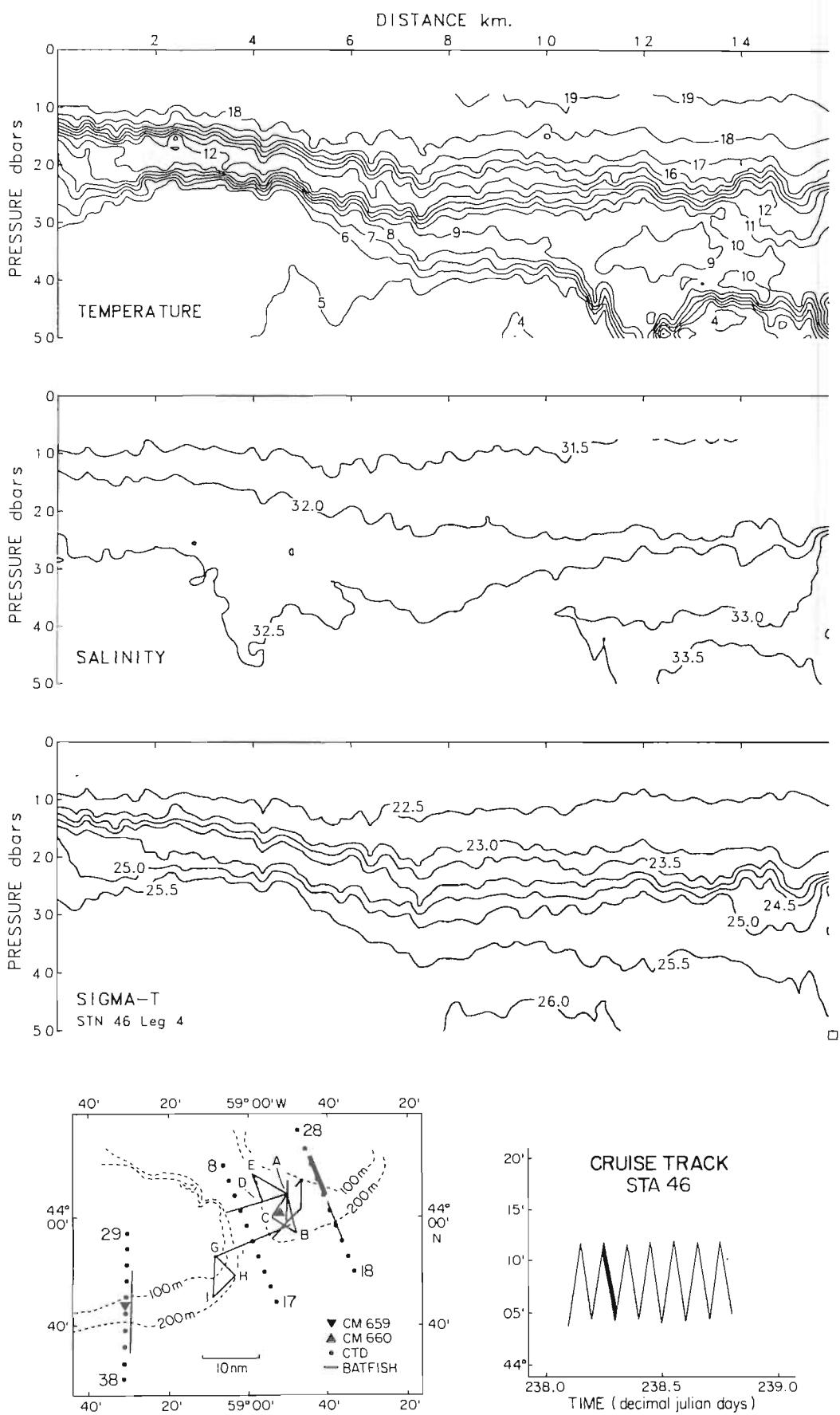


Fig. 96

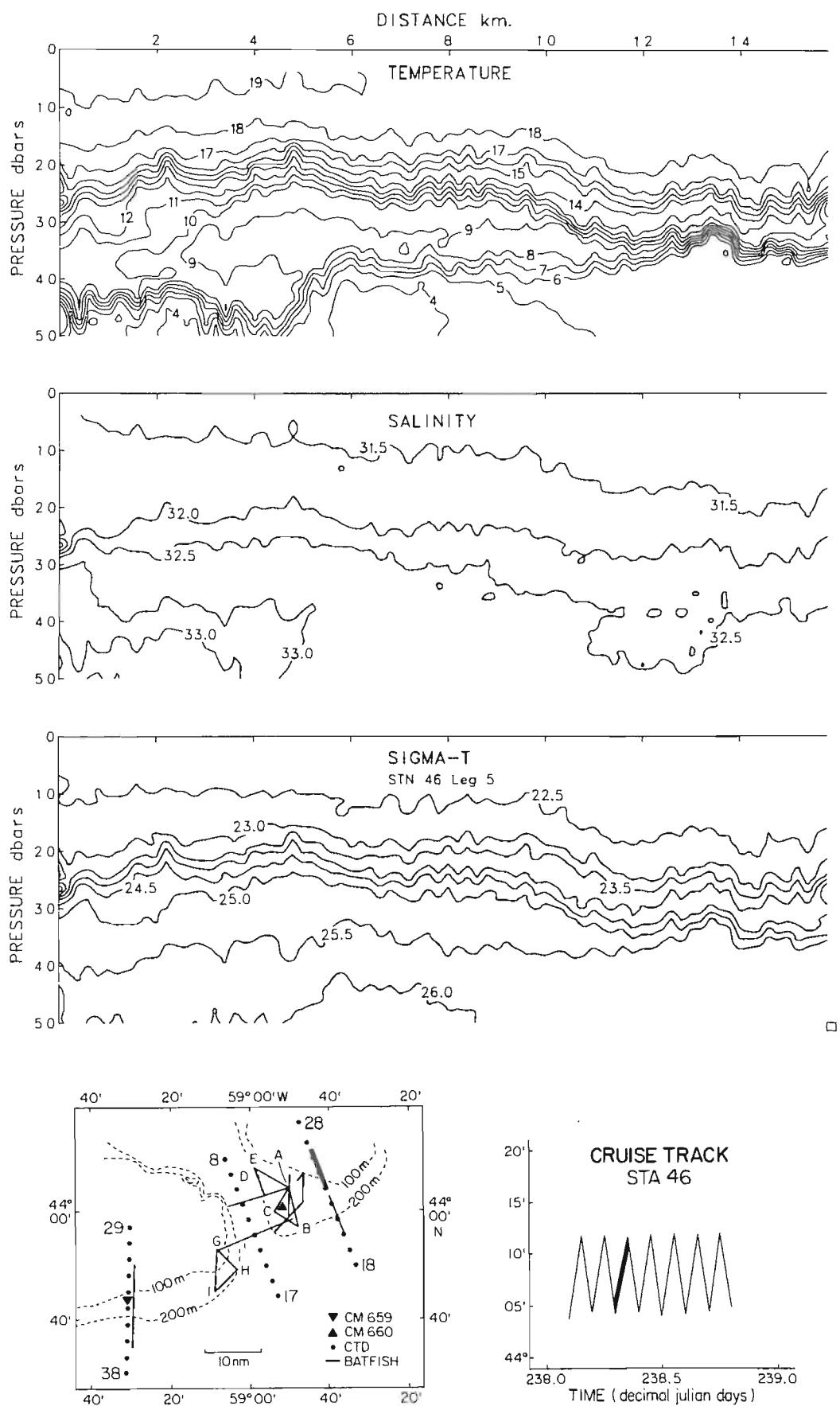


Fig. 97

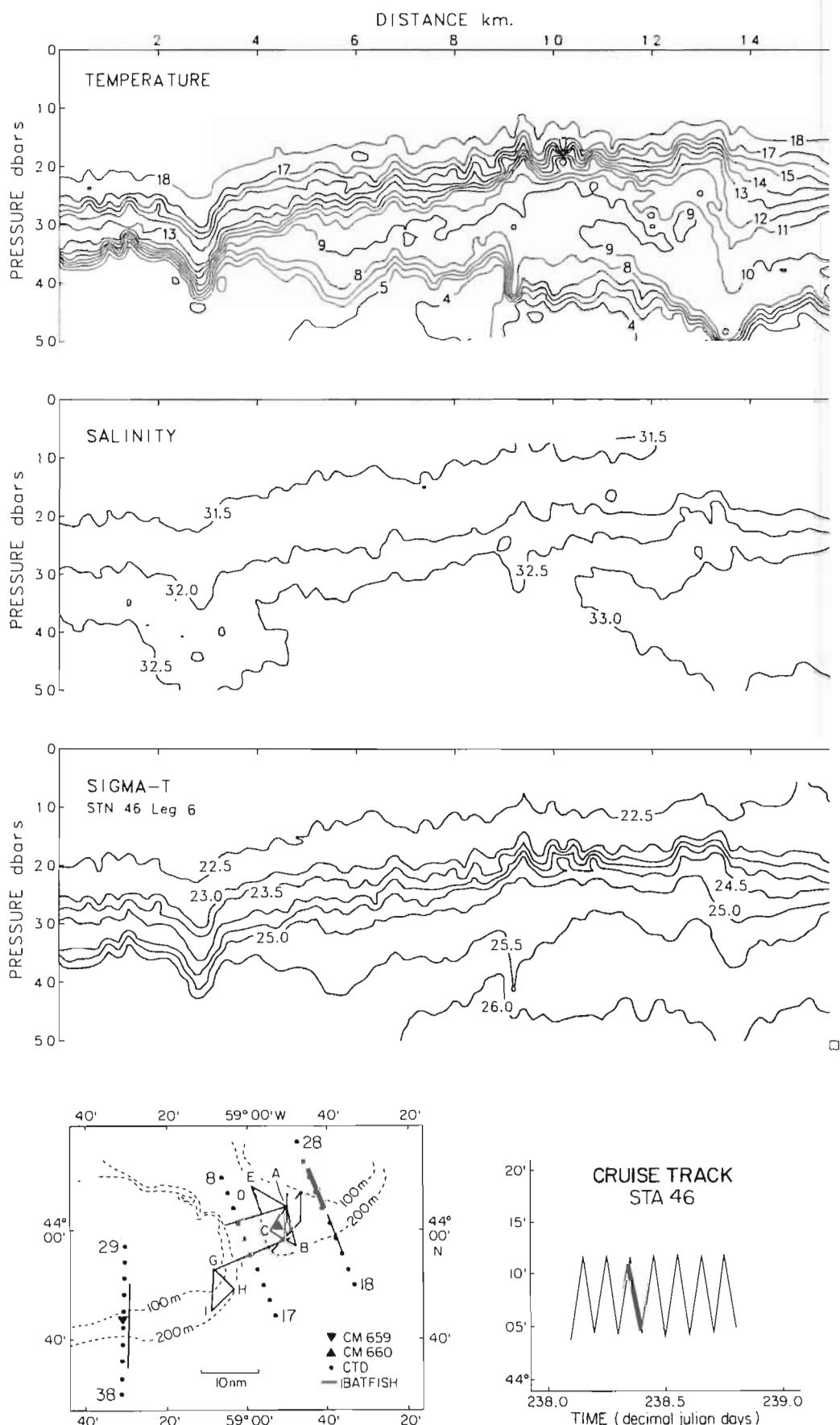


Fig. 98

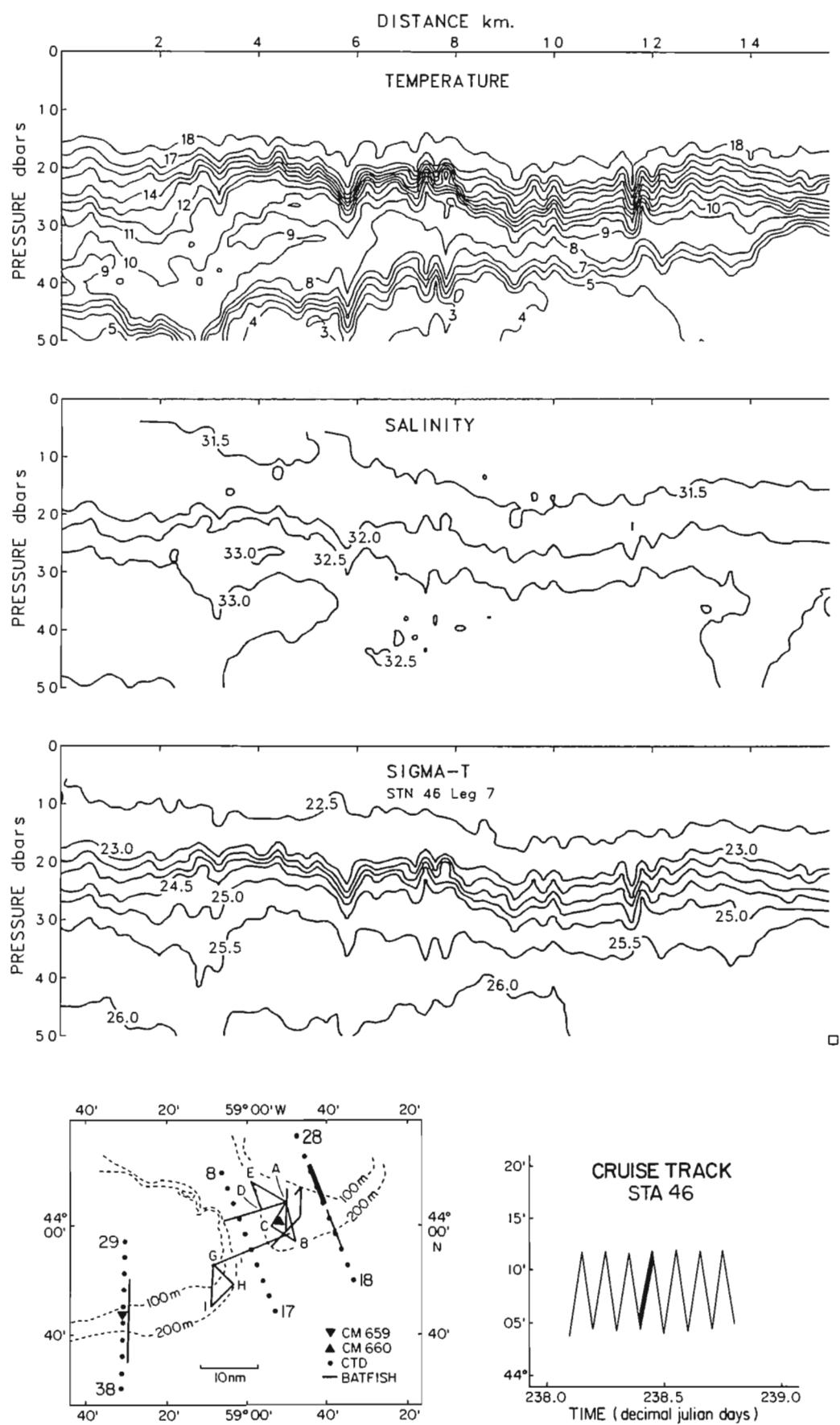


Fig. 99

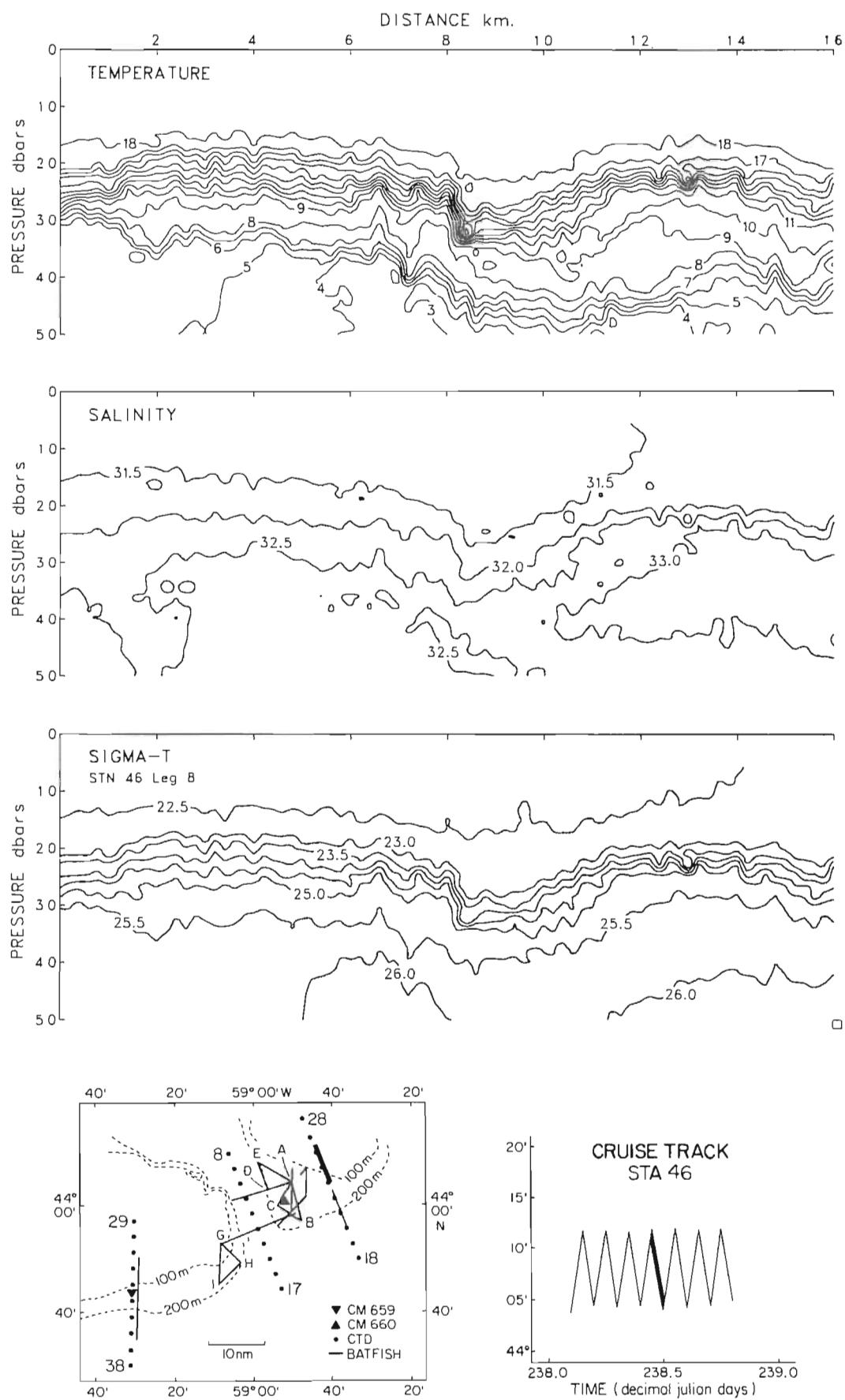


Fig. 100

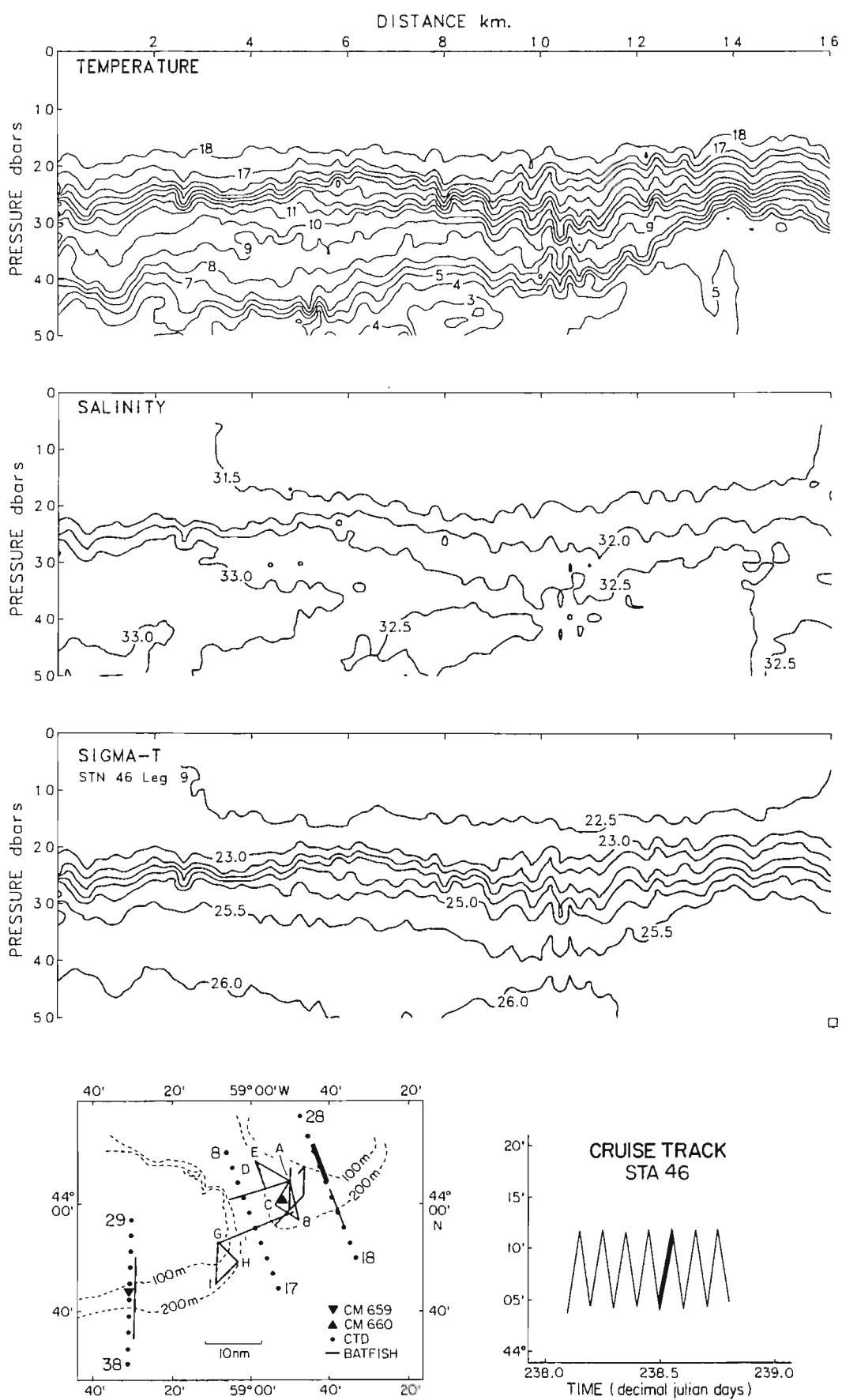


Fig. 101

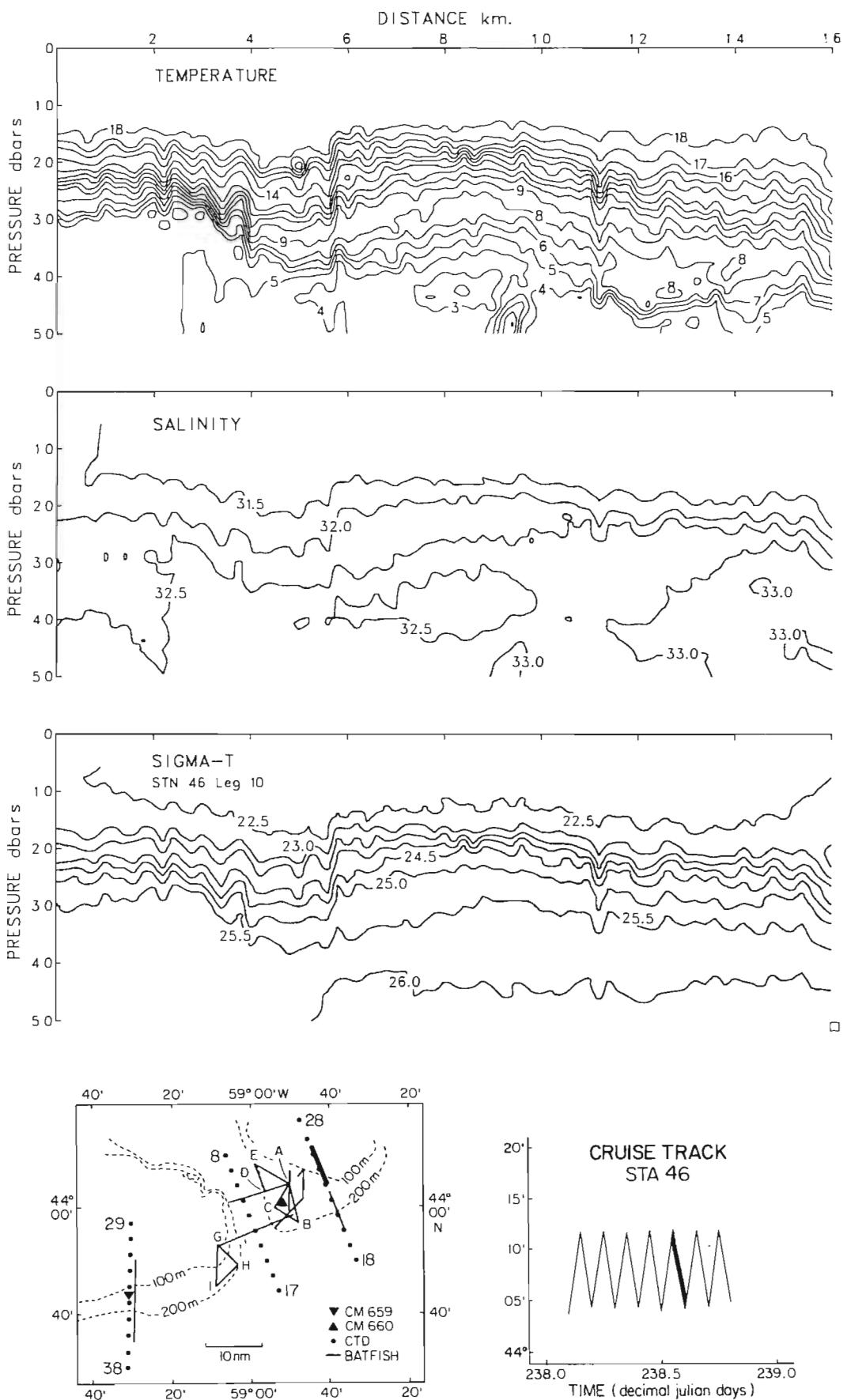


Fig. 102

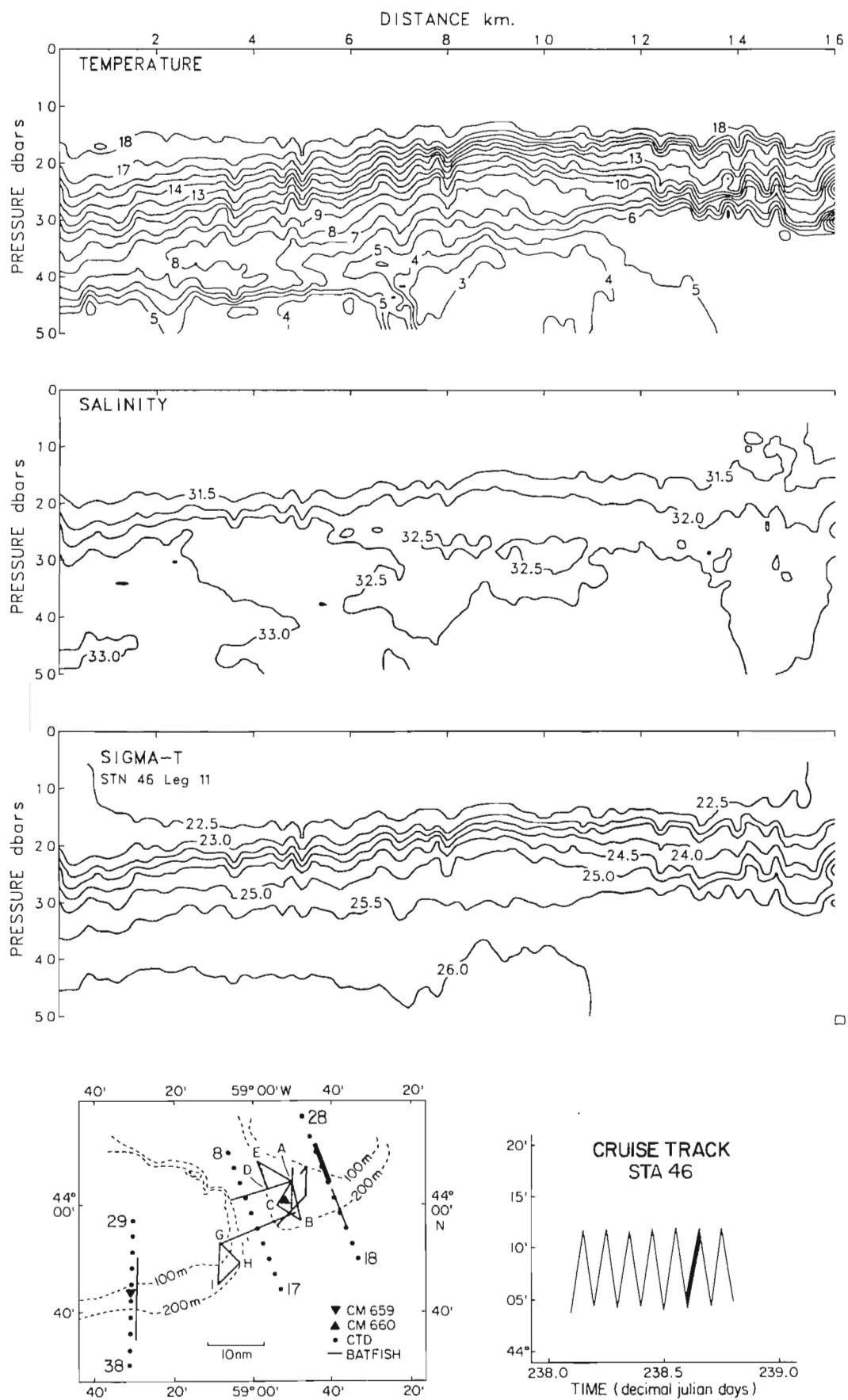


Fig. 103

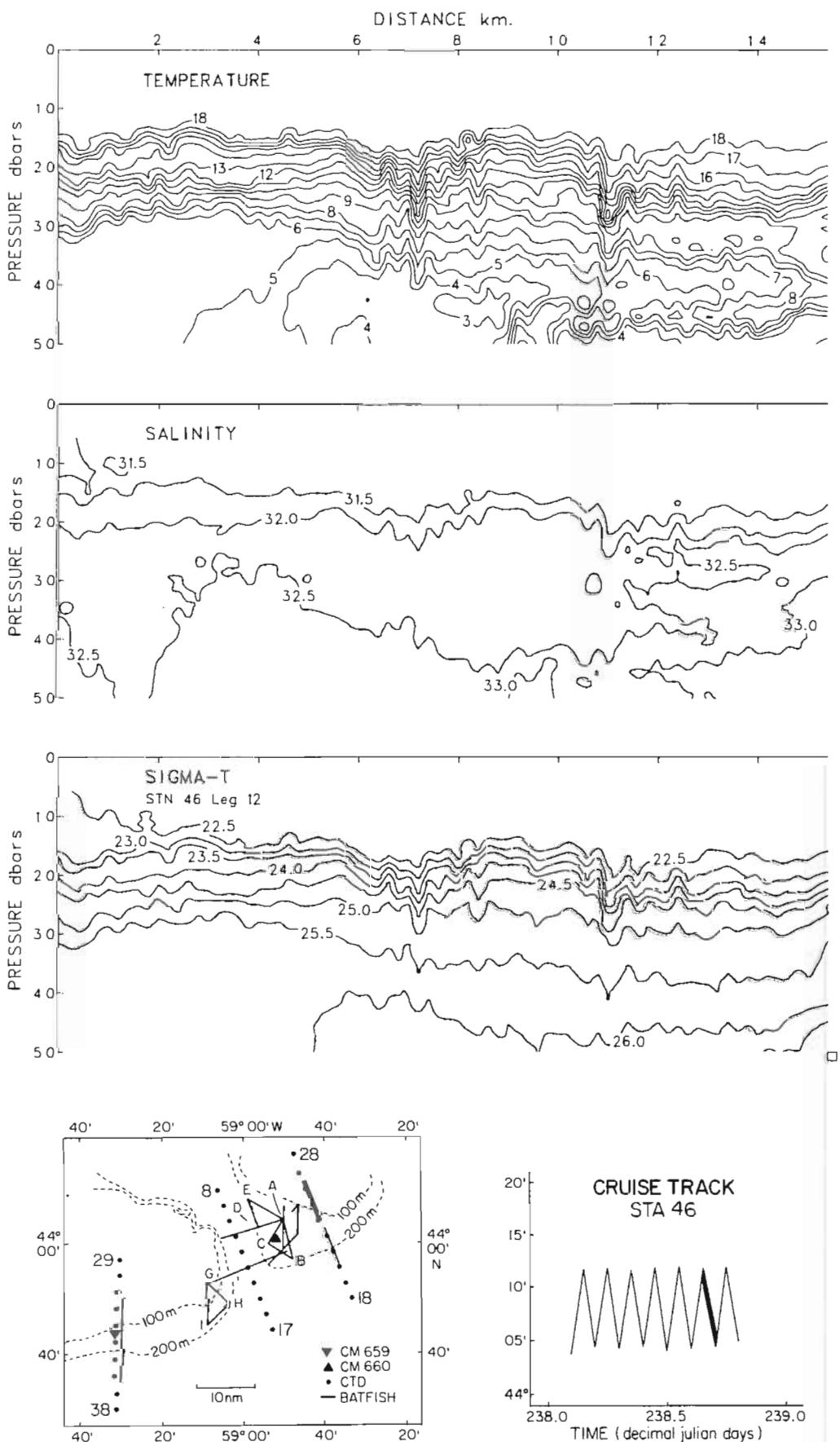


Fig. 104

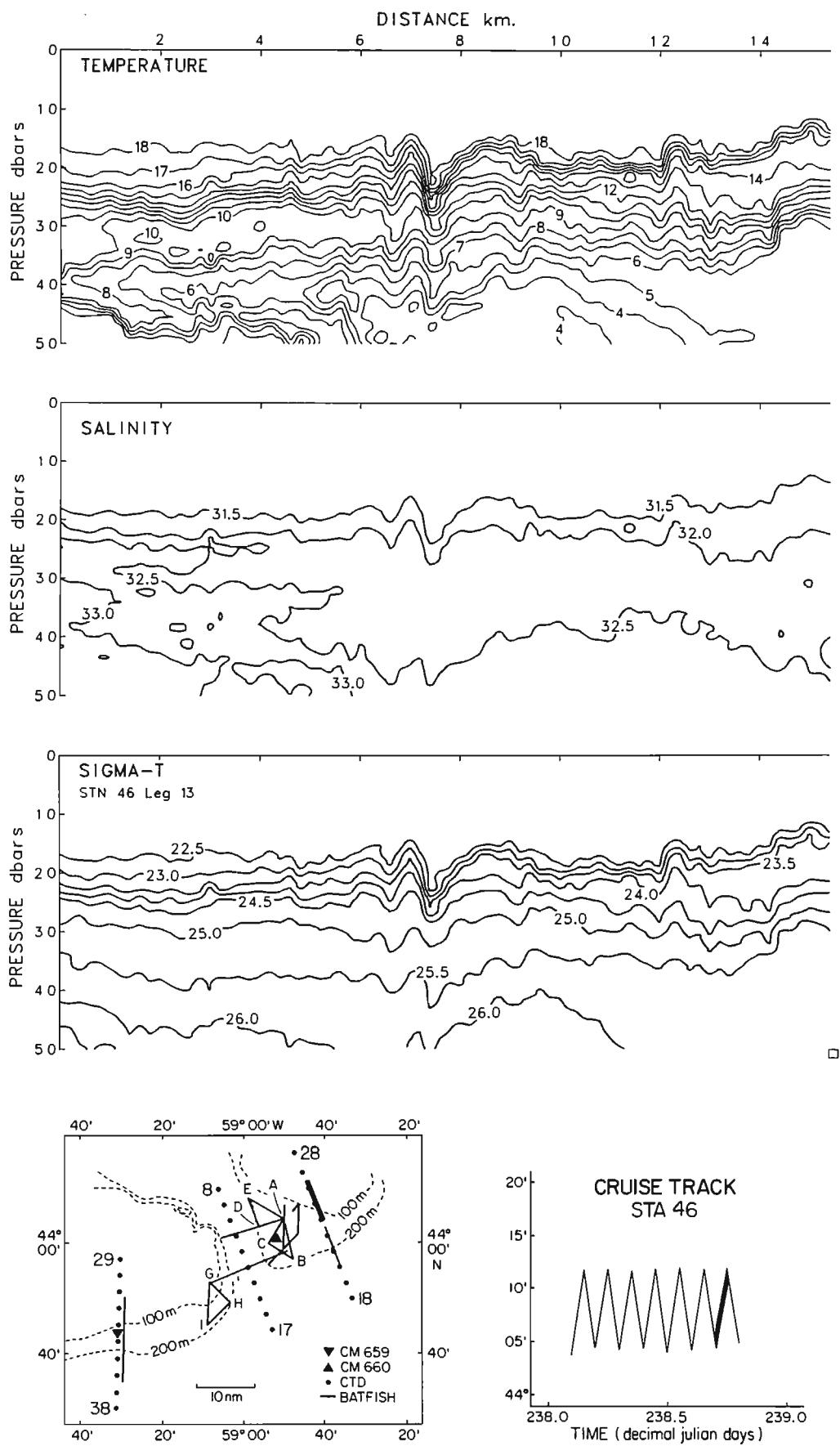


Fig. 105

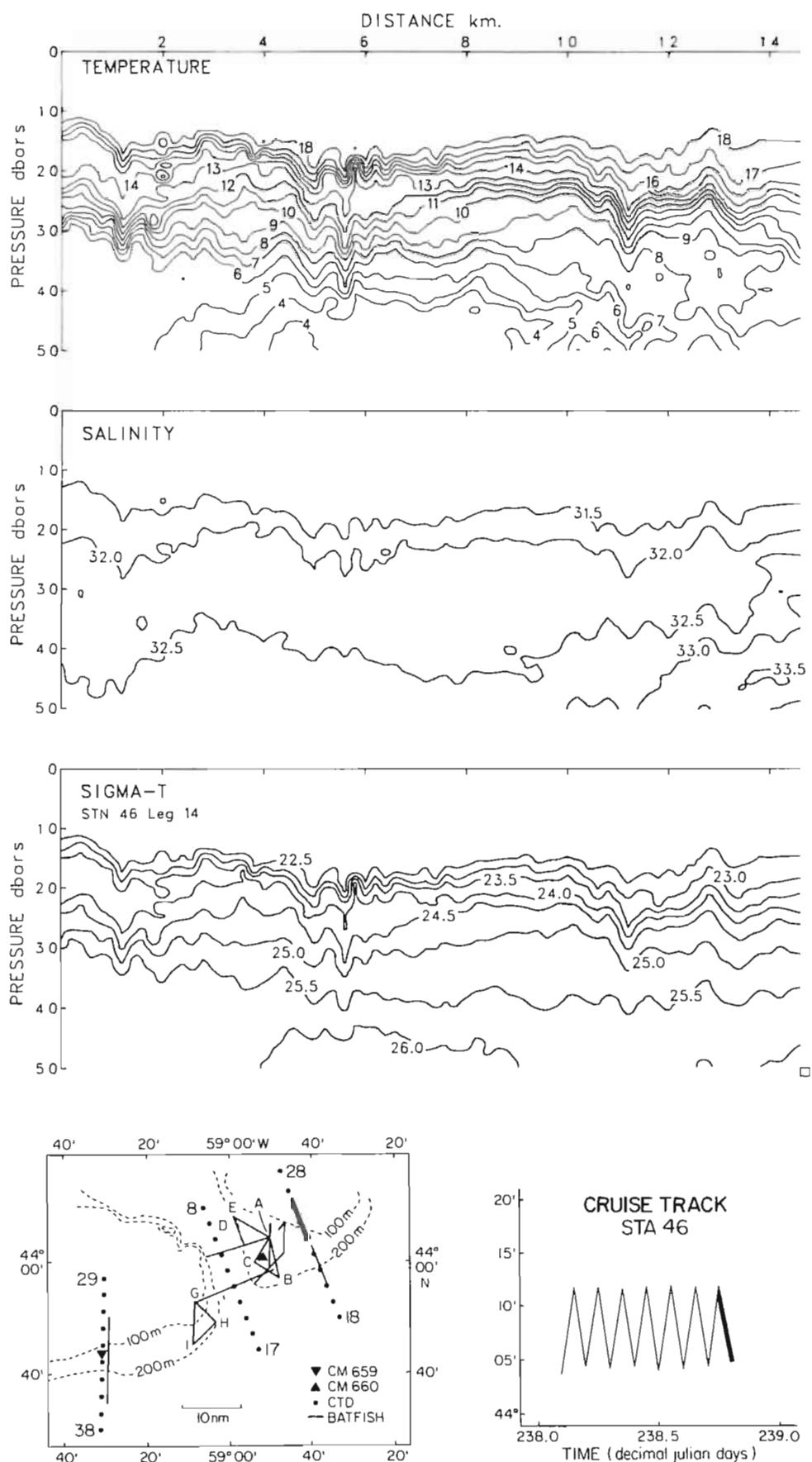


Fig. 106

Figures 107-120.

BATFISH station 47: 14 sections of Temperature, Salinity and Sigma-t vs. pressure,
location maps and latitude vs. time plot.

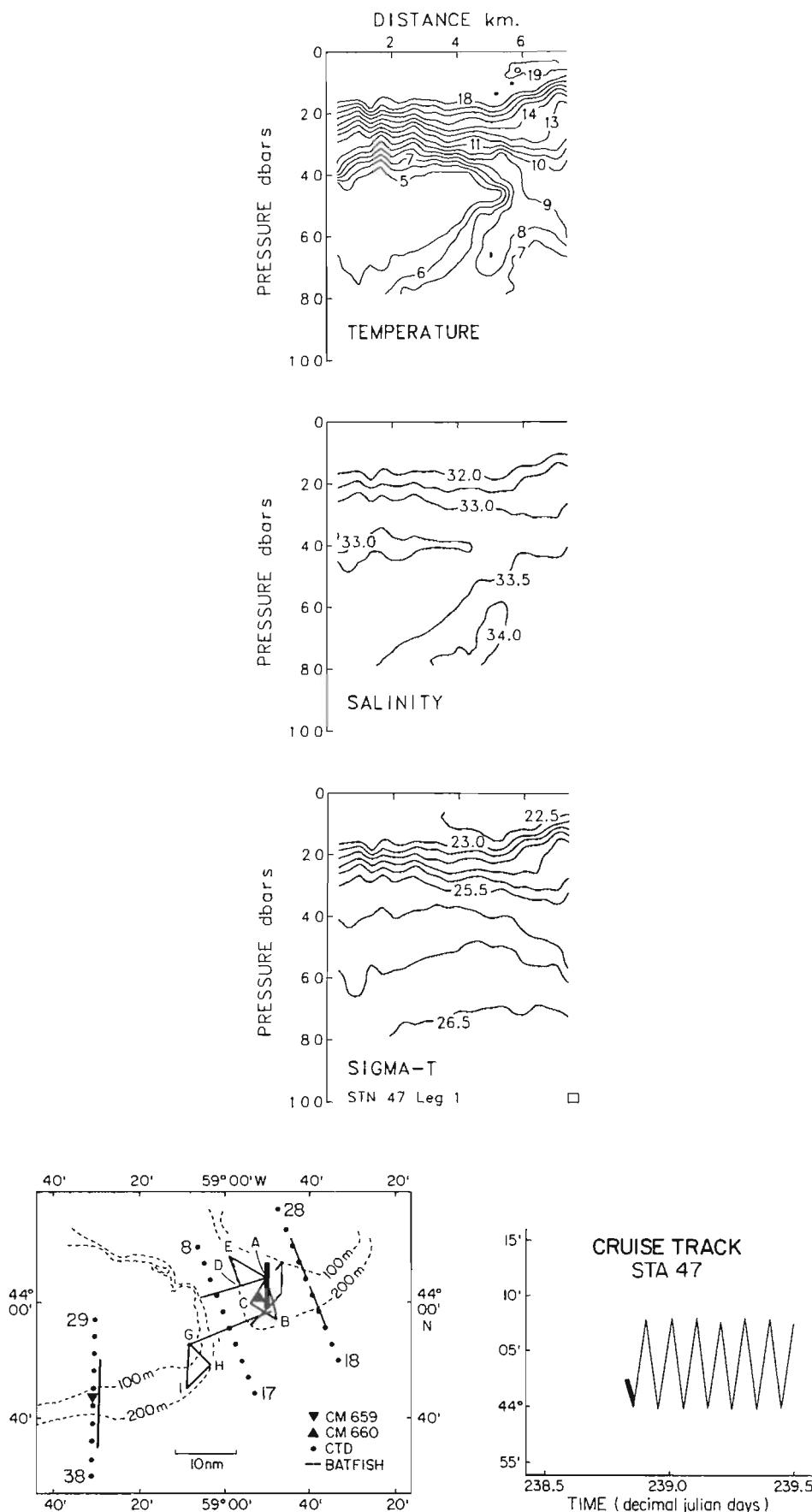


Fig. 107

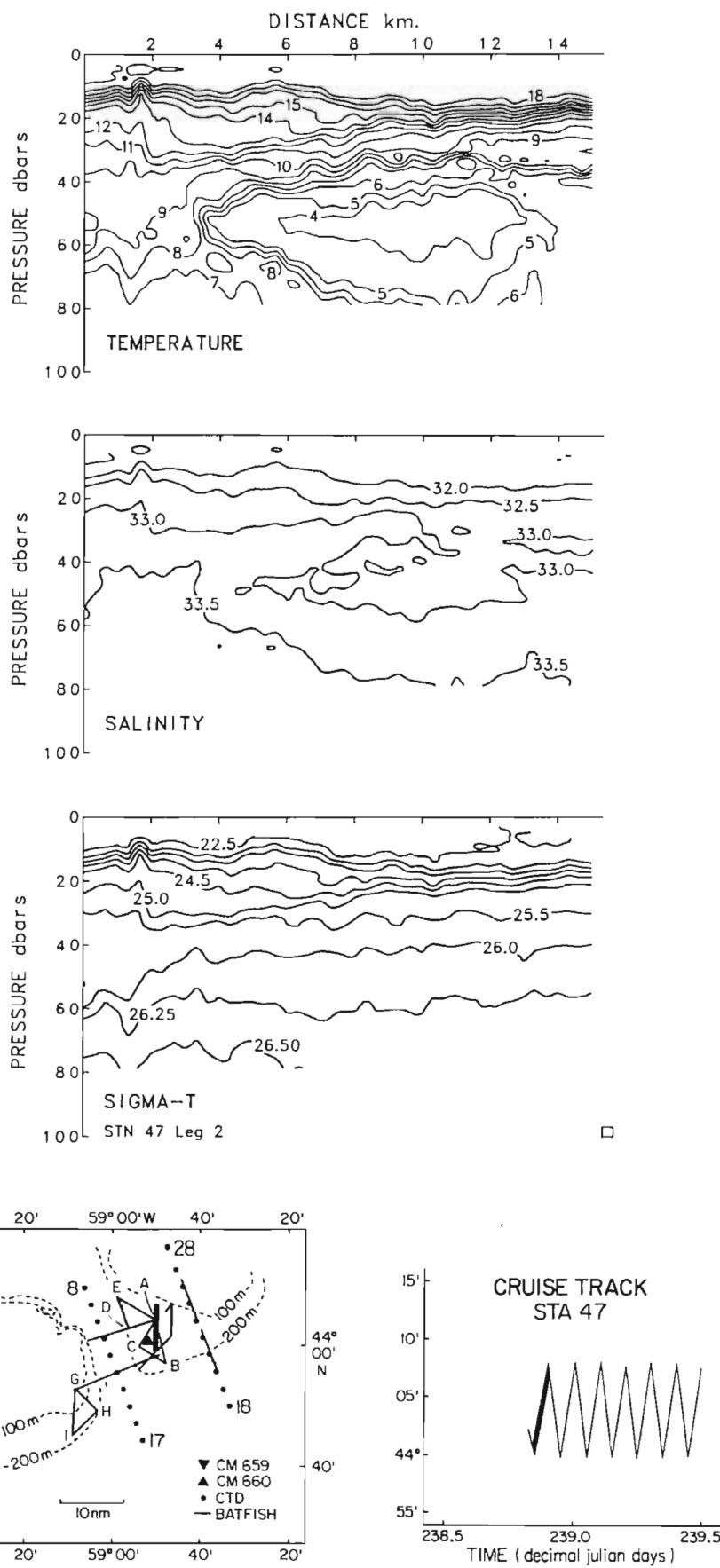


Fig. 108

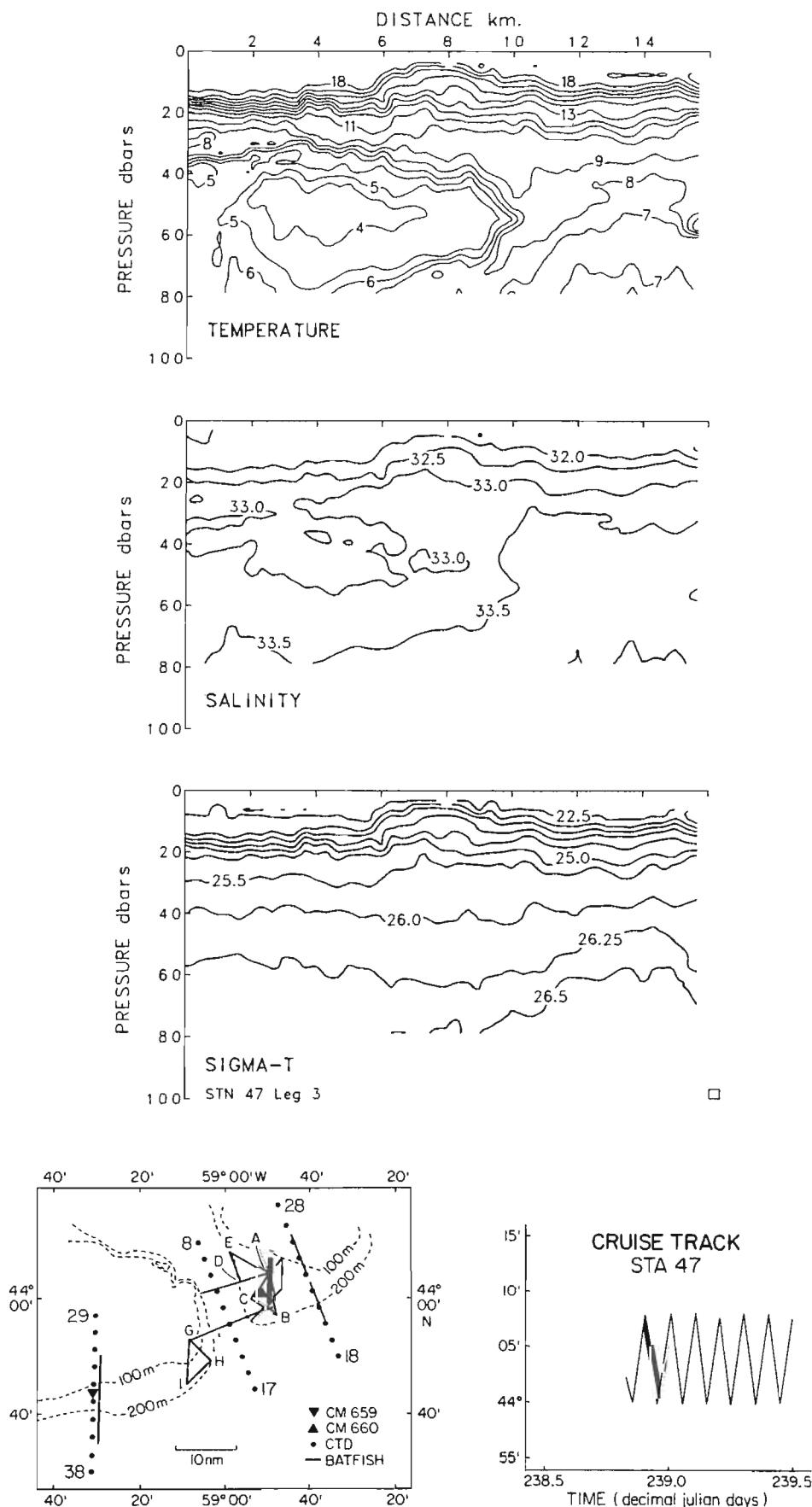


Fig. 109

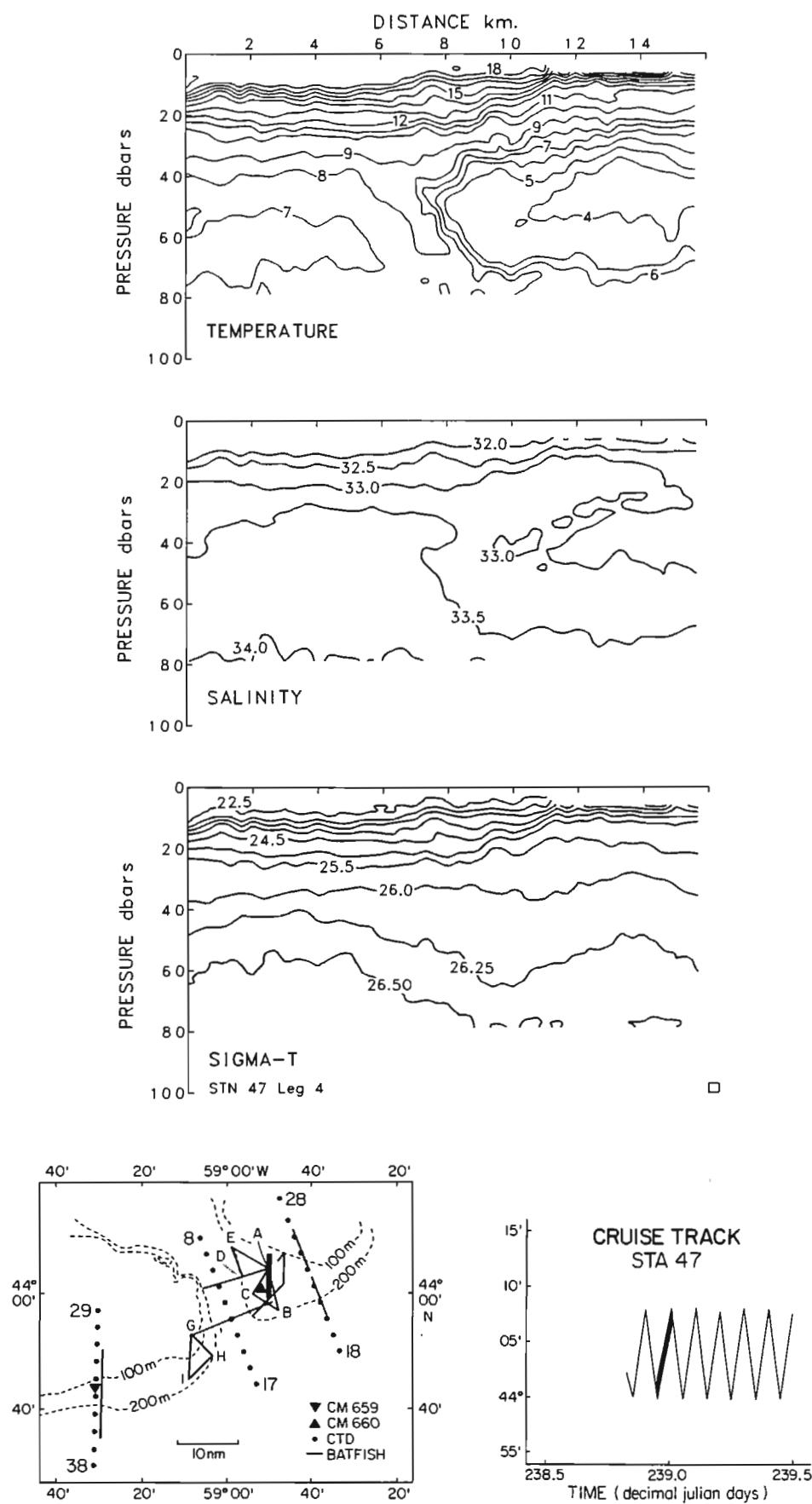


Fig. 110

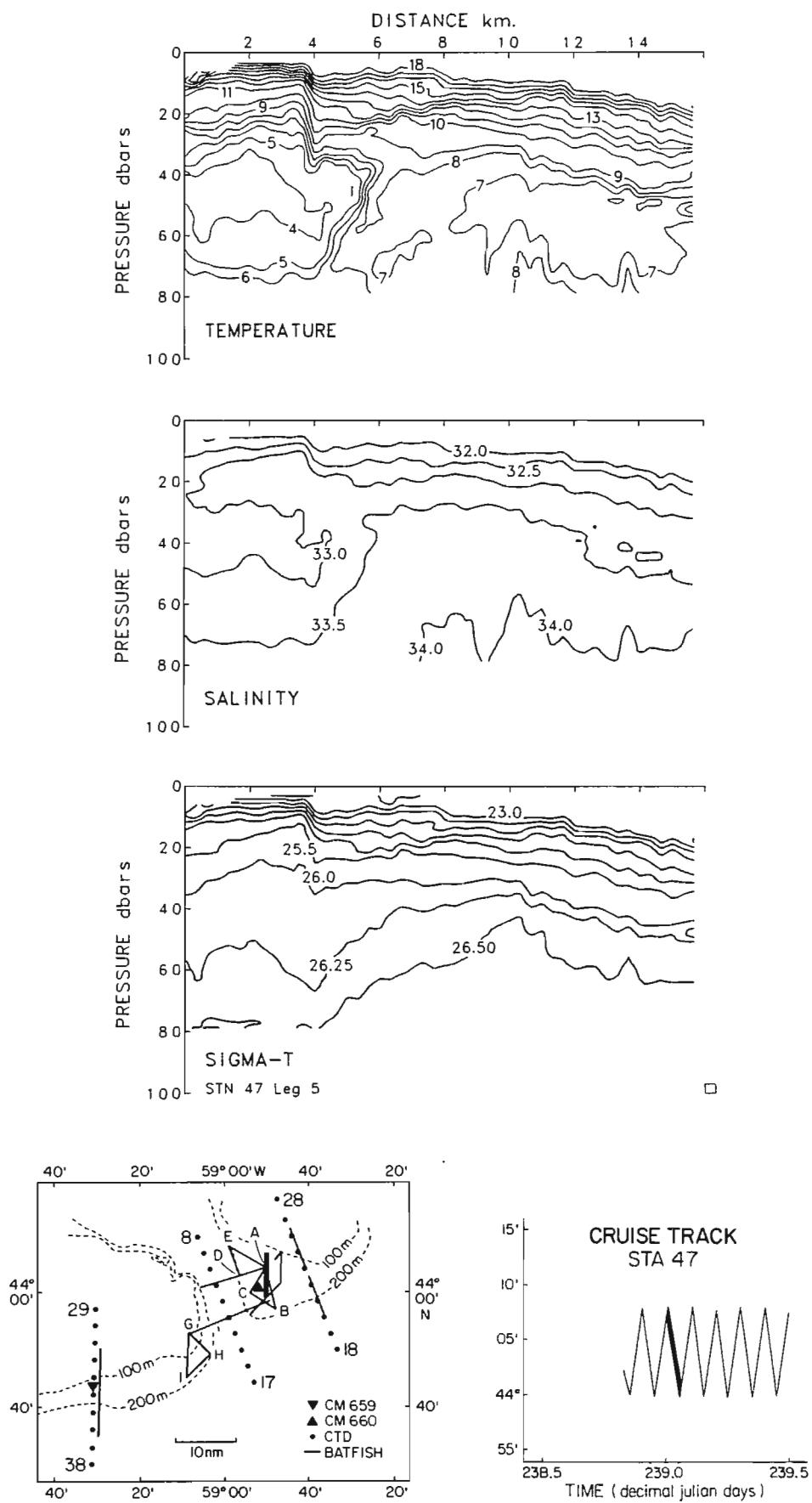


Fig. 111

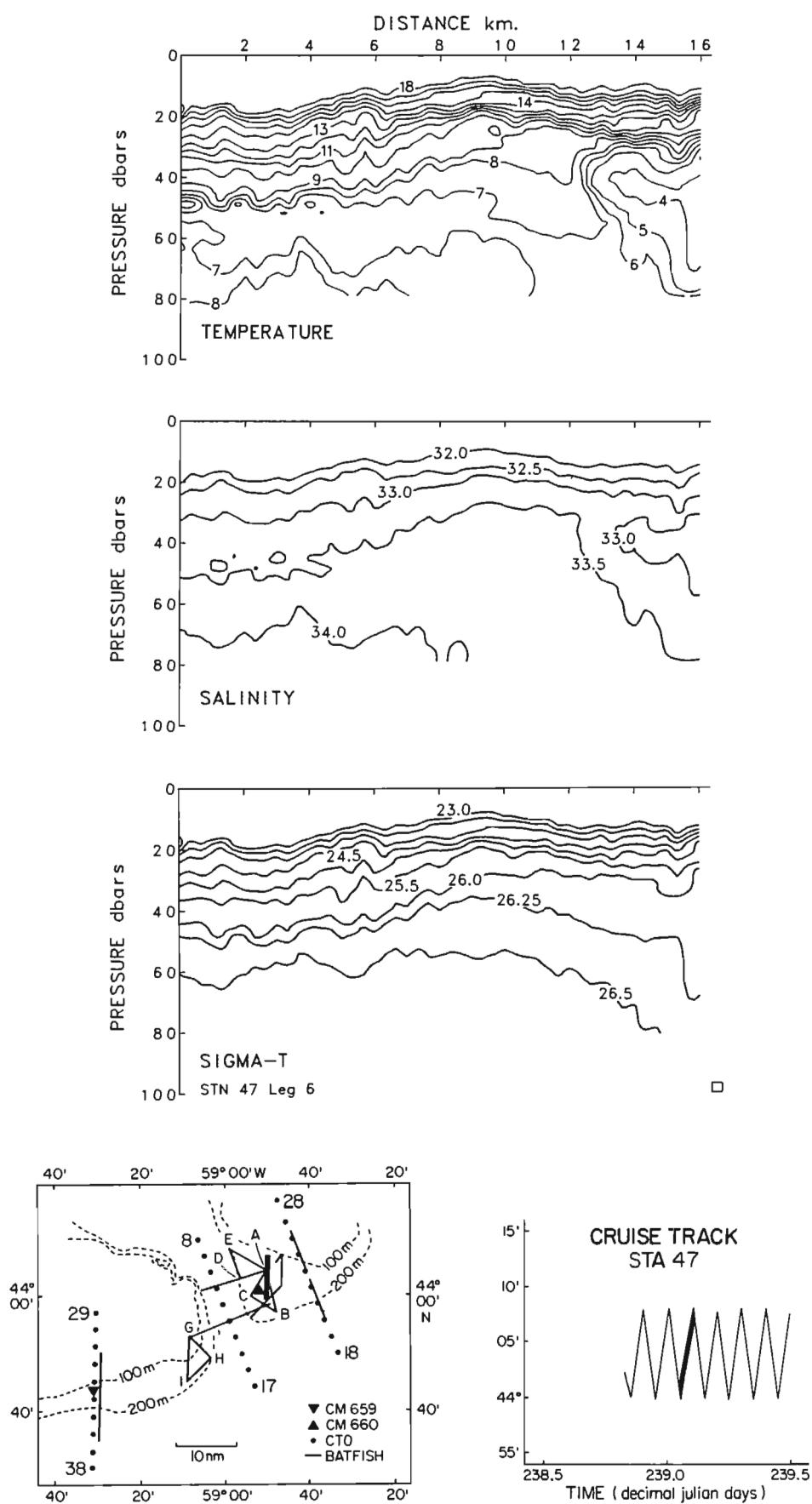


Fig. 112

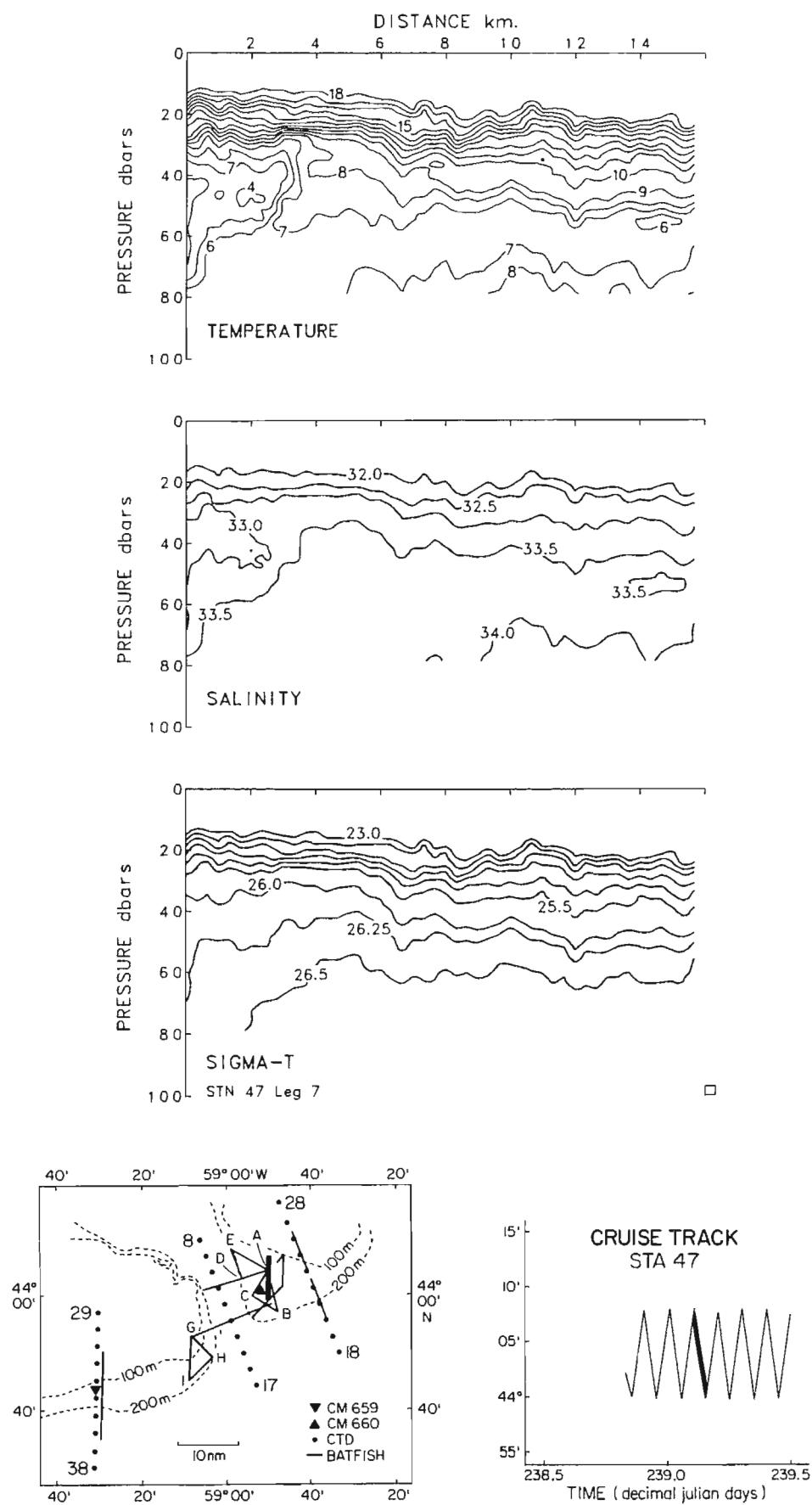


Fig. 113

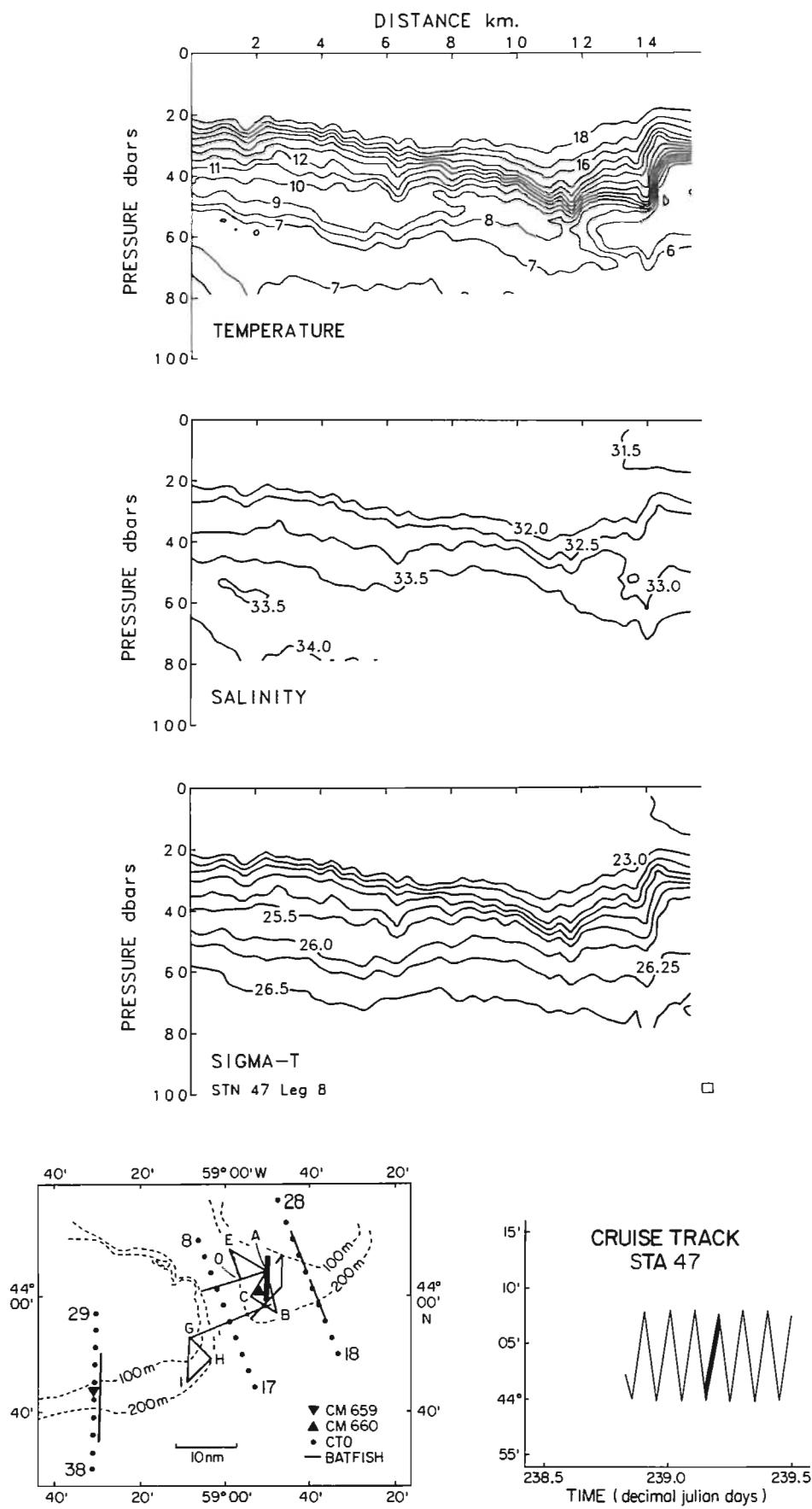


Fig. 114

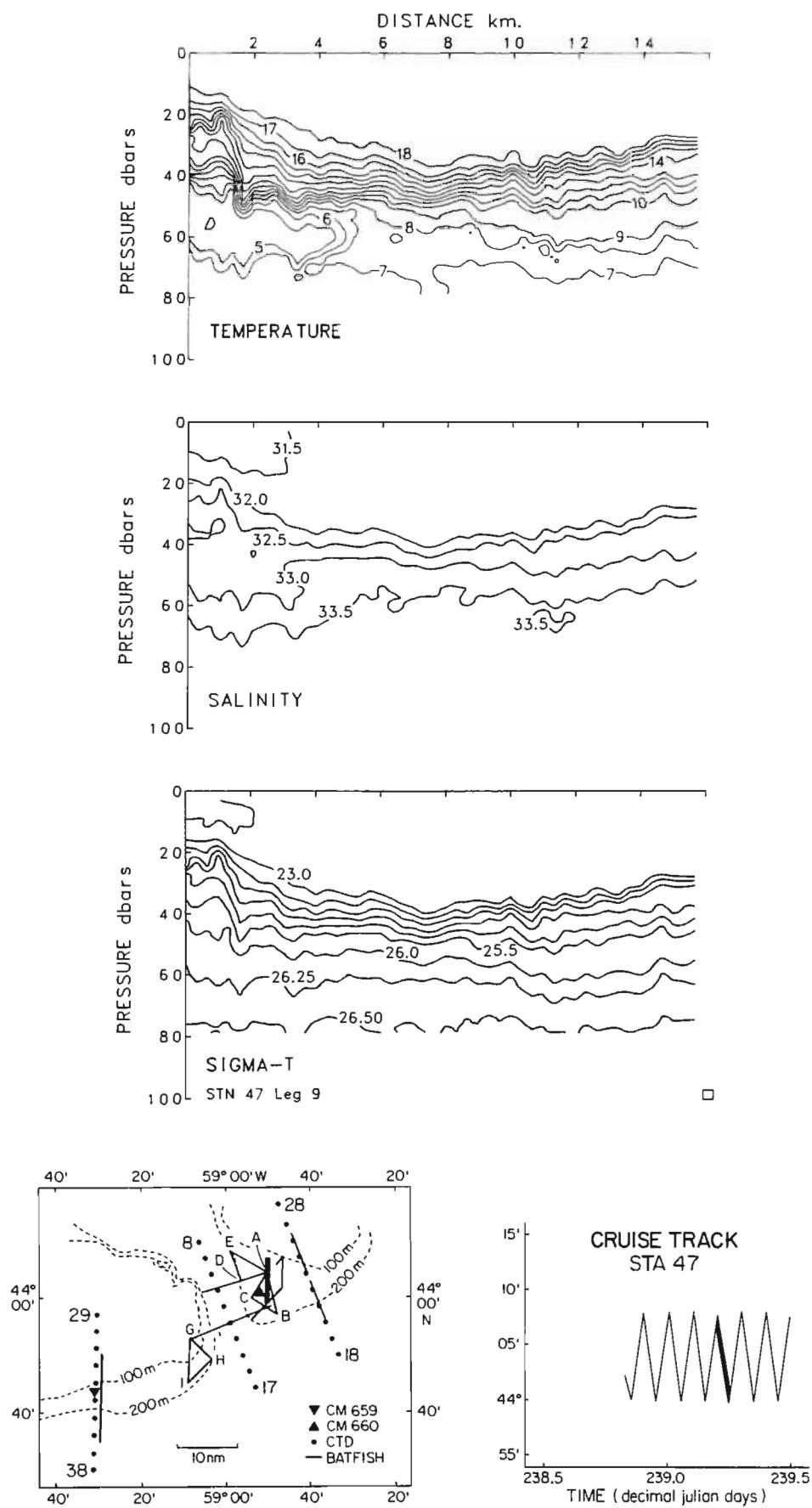


Fig. 115

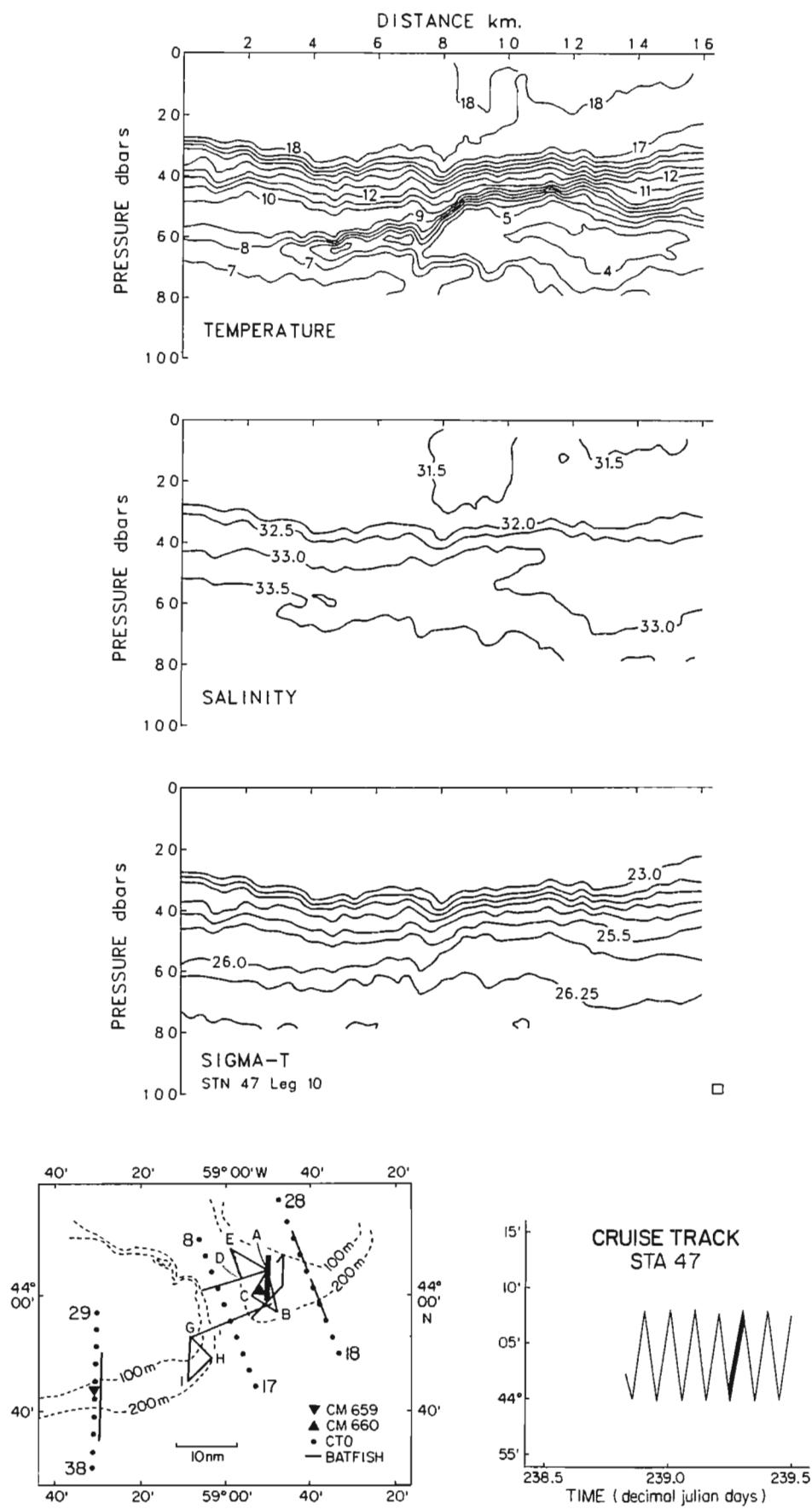


Fig. 116

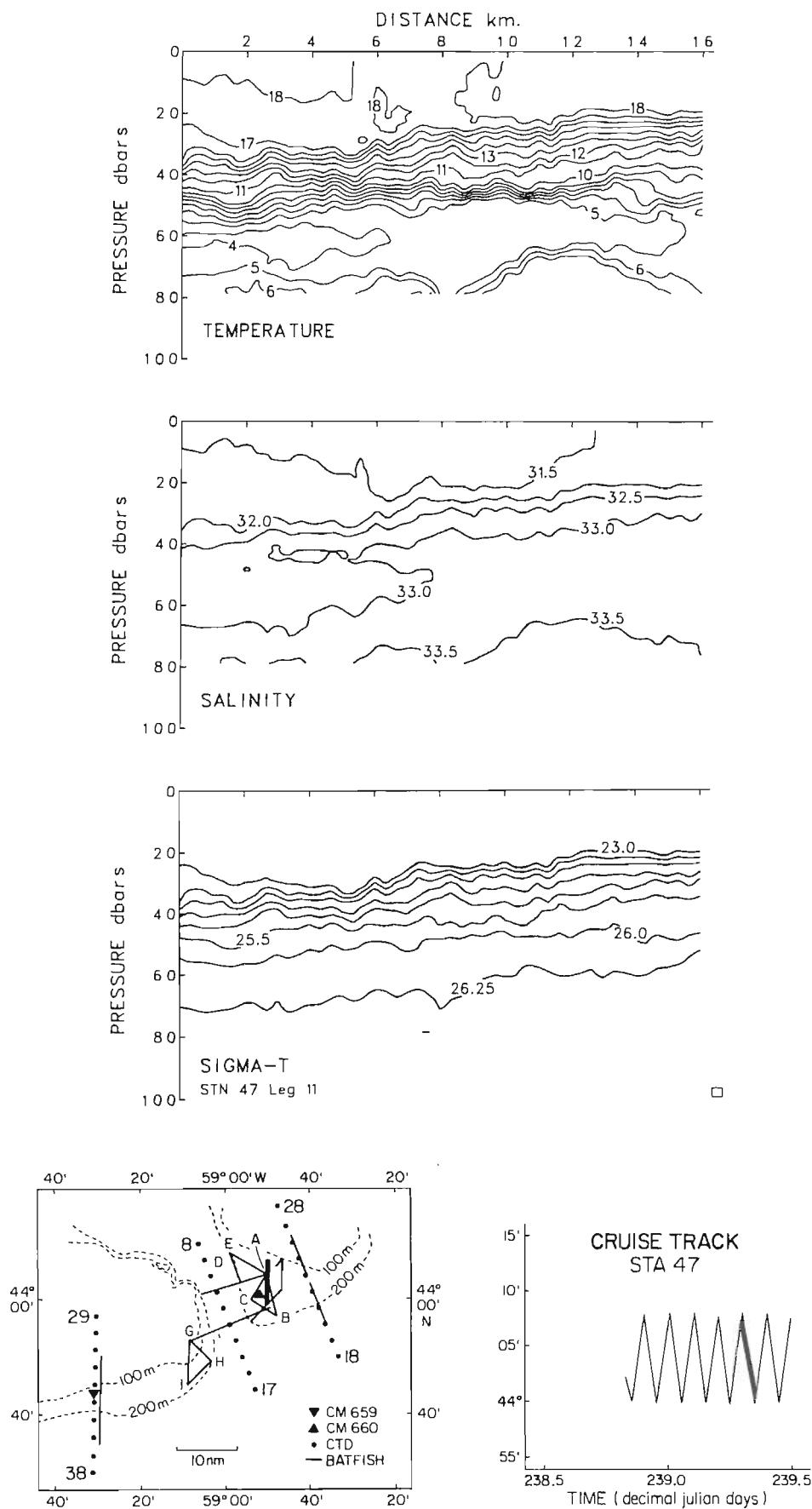


Fig. 117

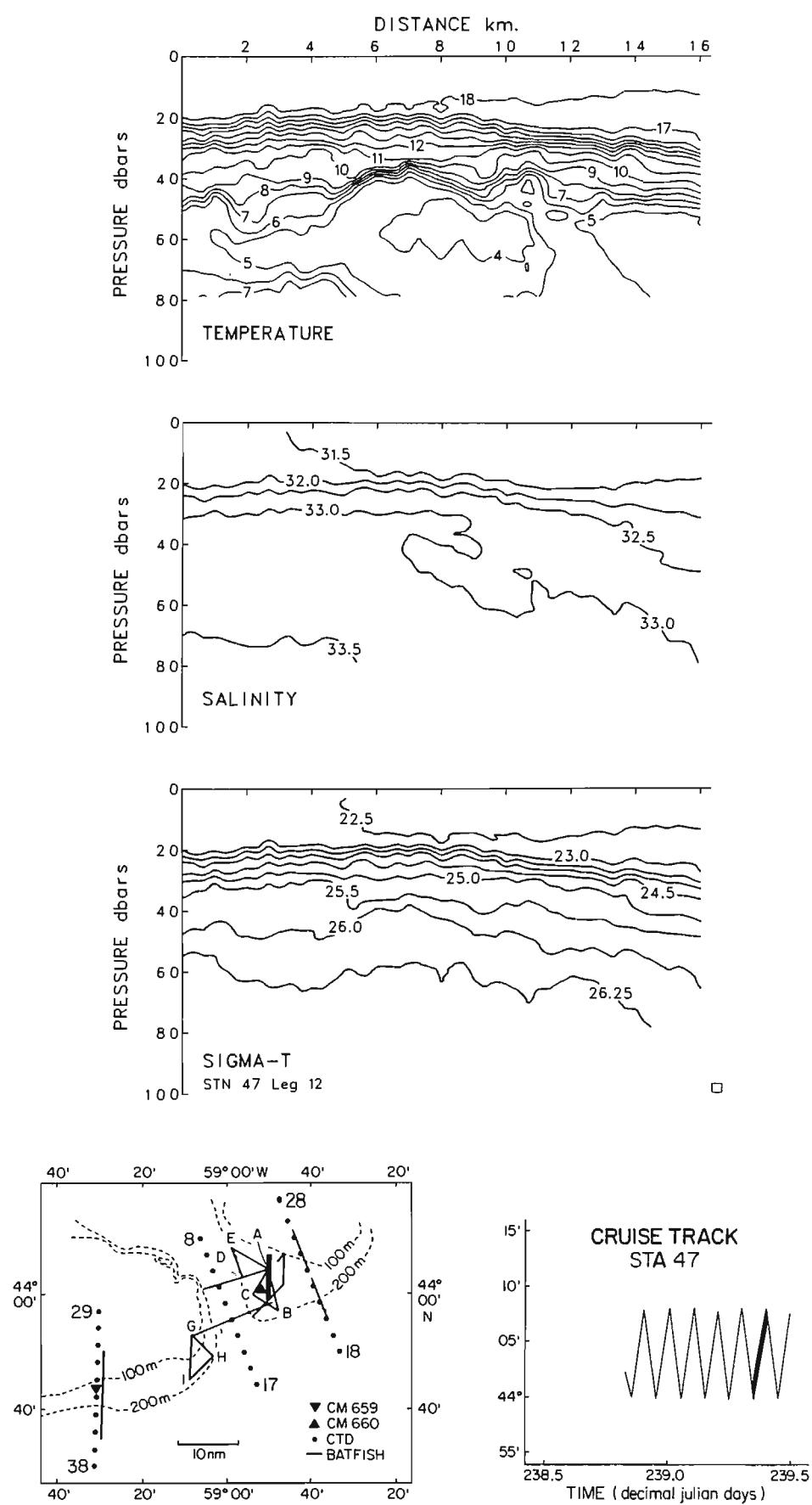


Fig. 118

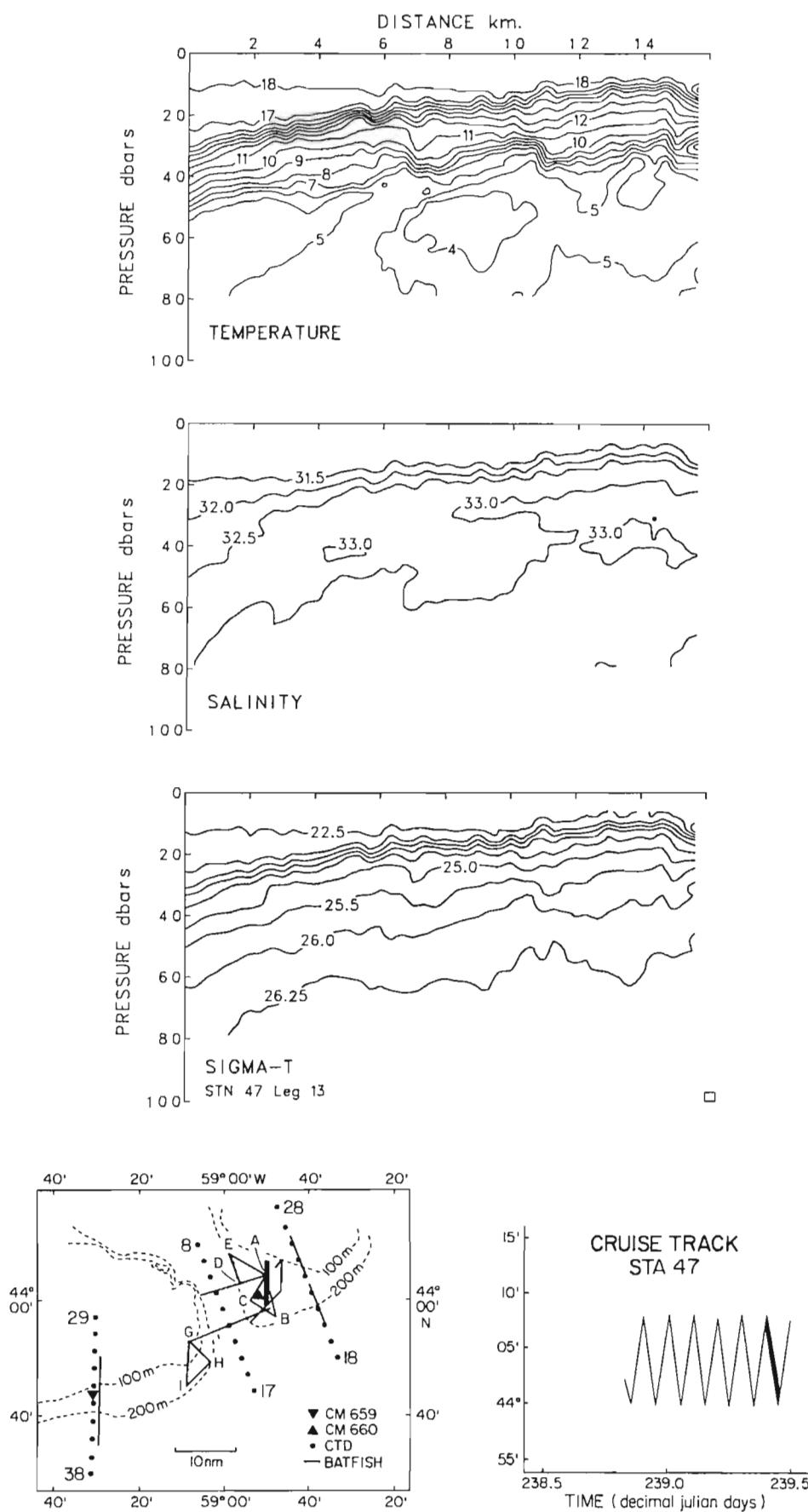


Fig. 119

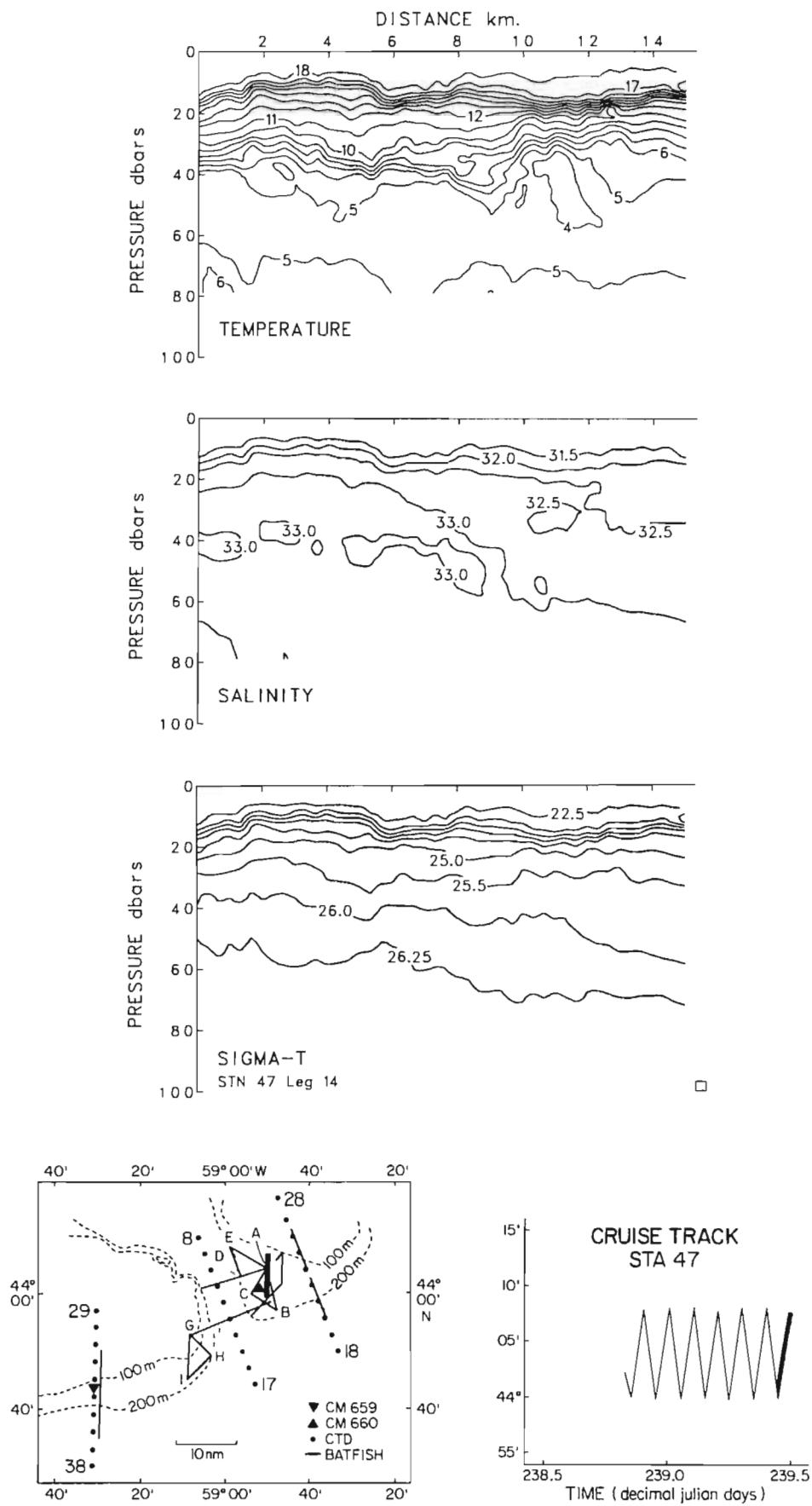


Fig. 120

Figures 121-142.

BATFISH station 48: 15 sections of Temperature, Salinity and Sigma-t vs. pressure,
location map and latitude vs. time plot. Acoustic backscatter plots for selected sections.

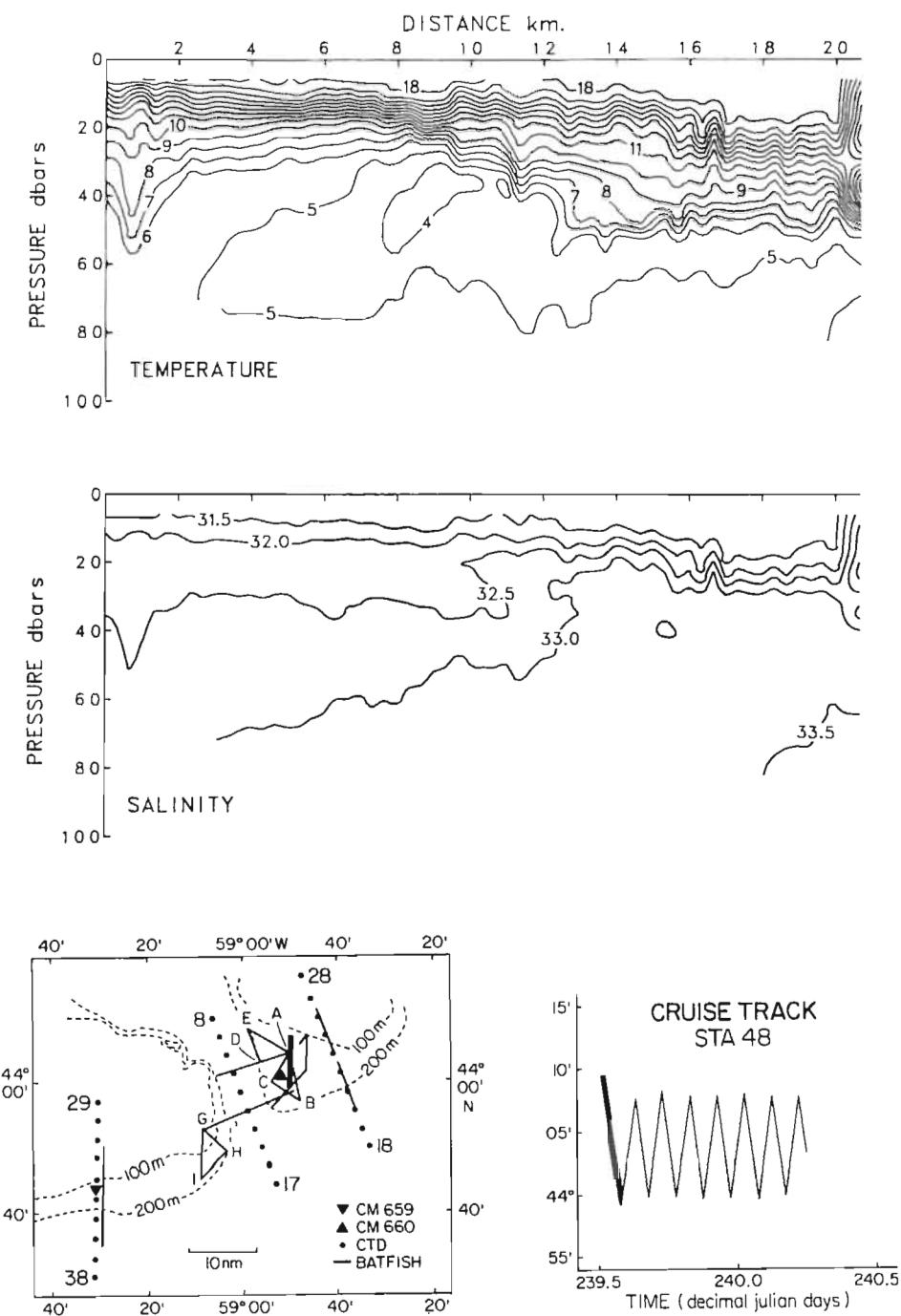


Fig. 121

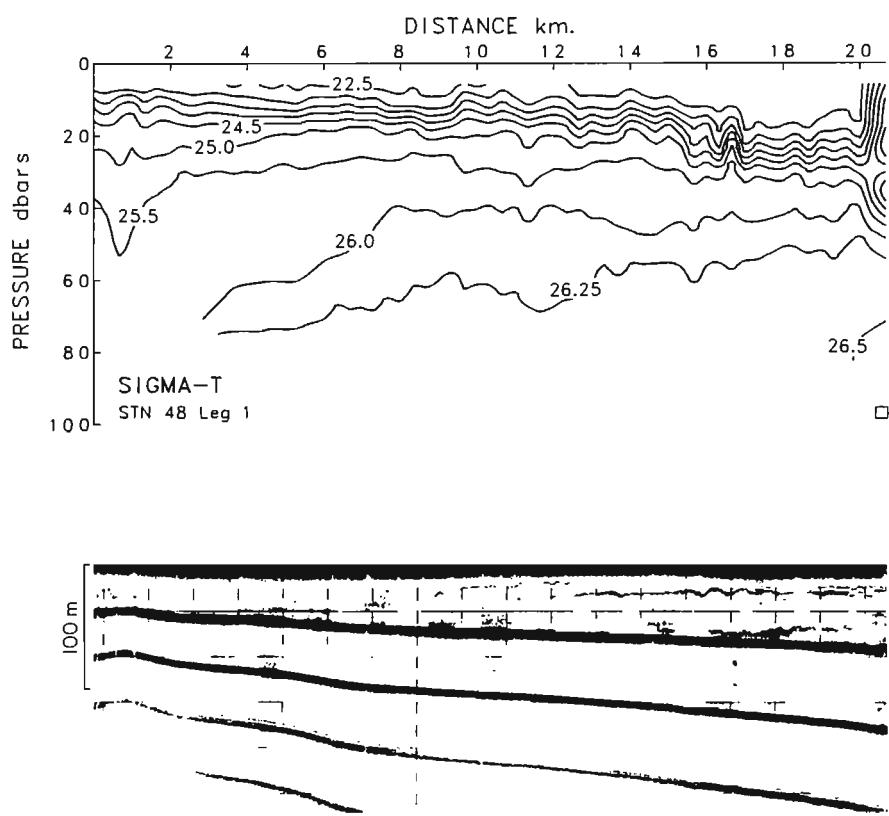


Fig. 122

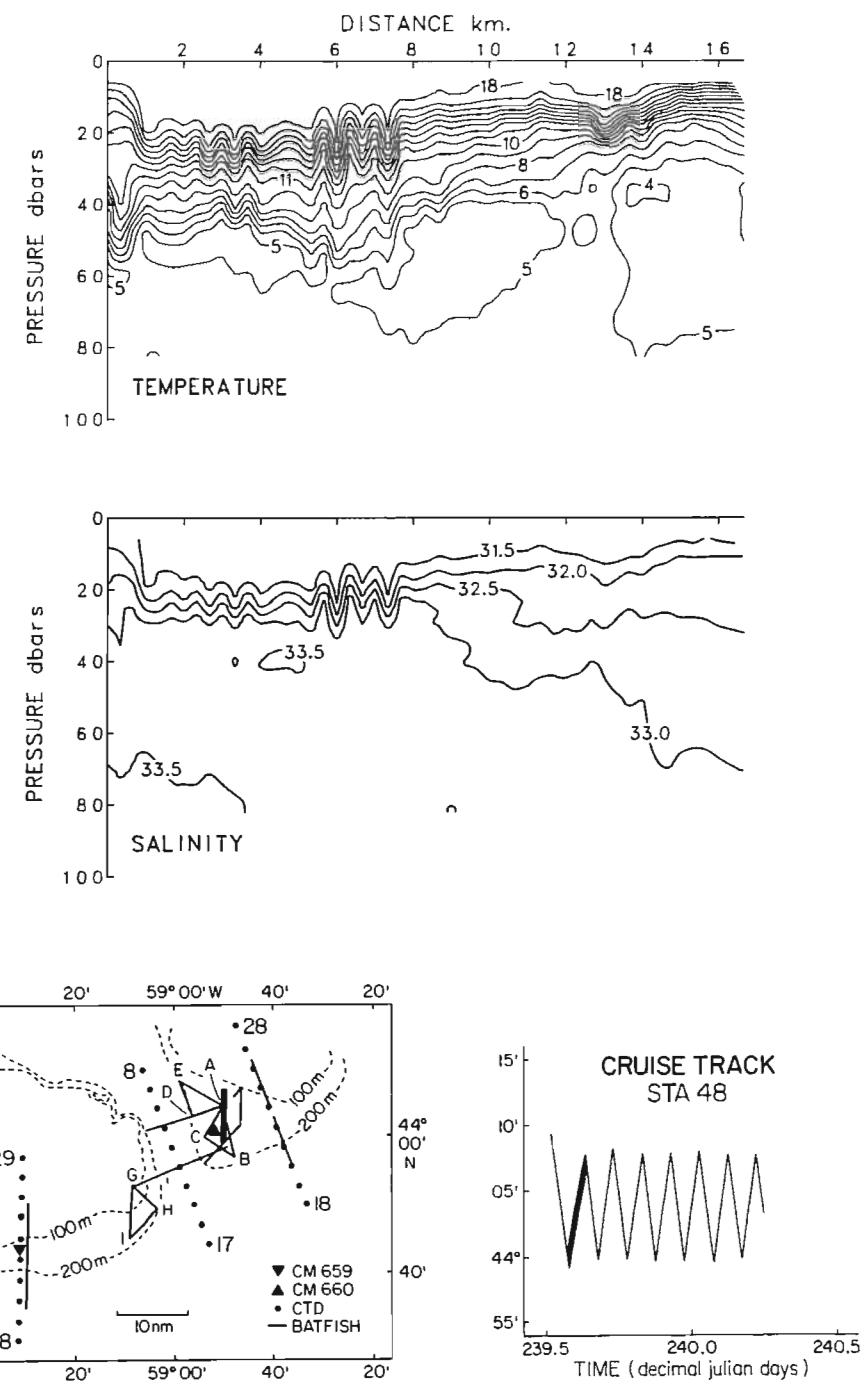


Fig. 123

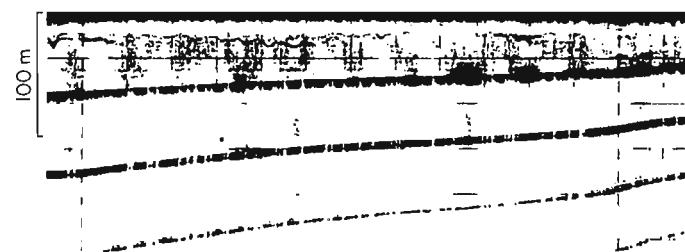
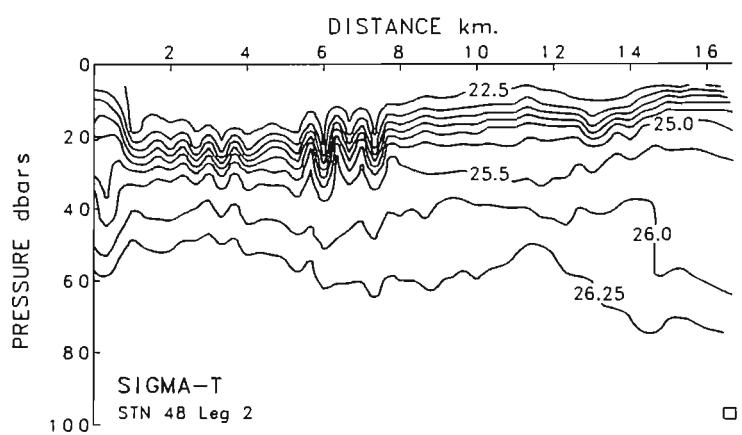


Fig. 124

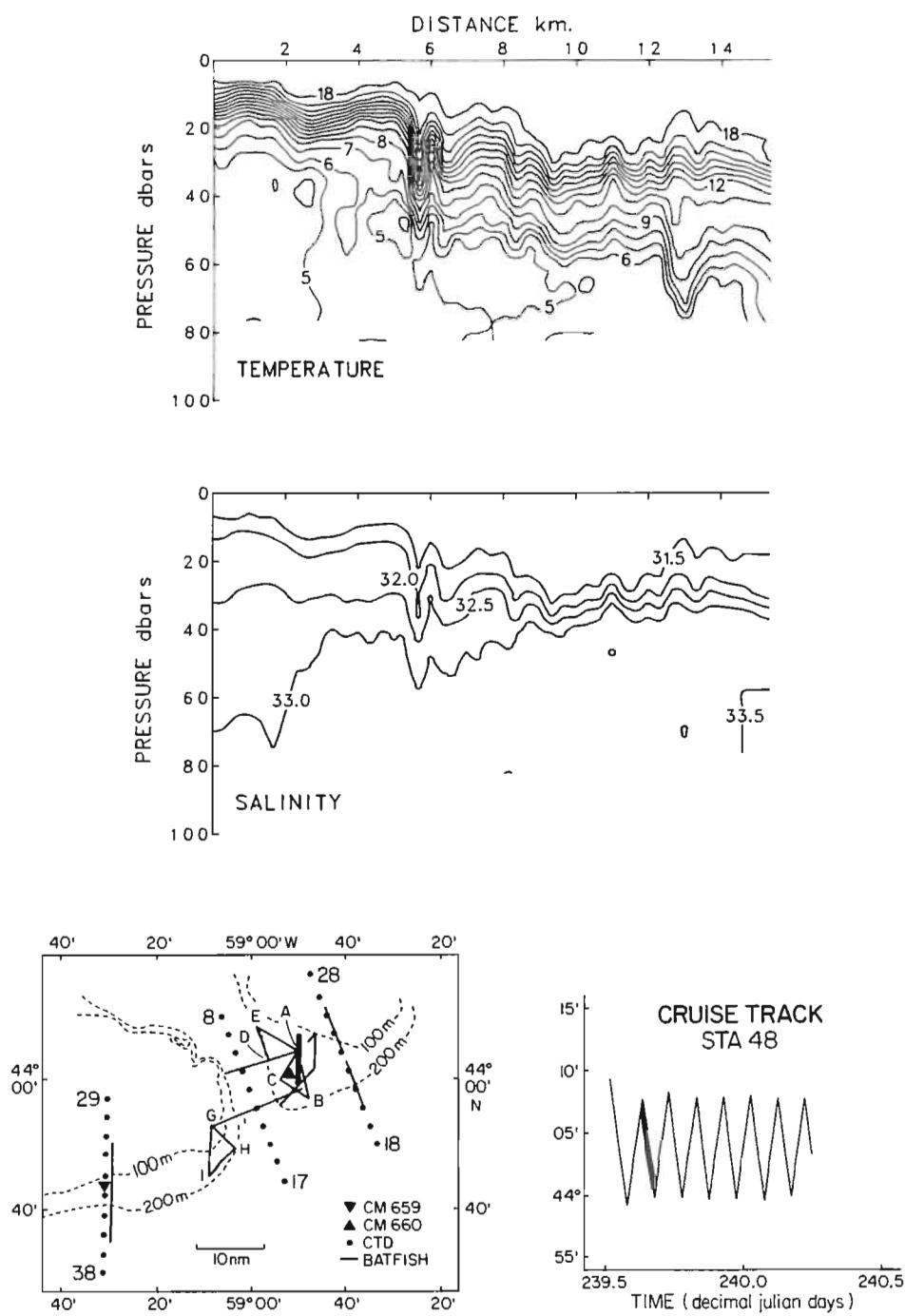


Fig. 125

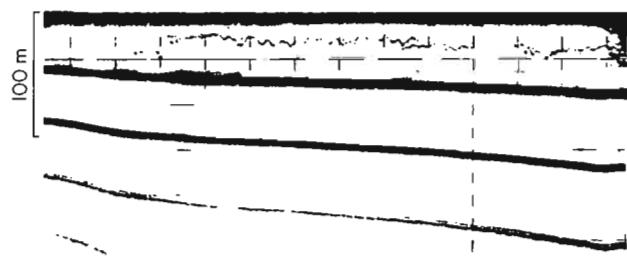
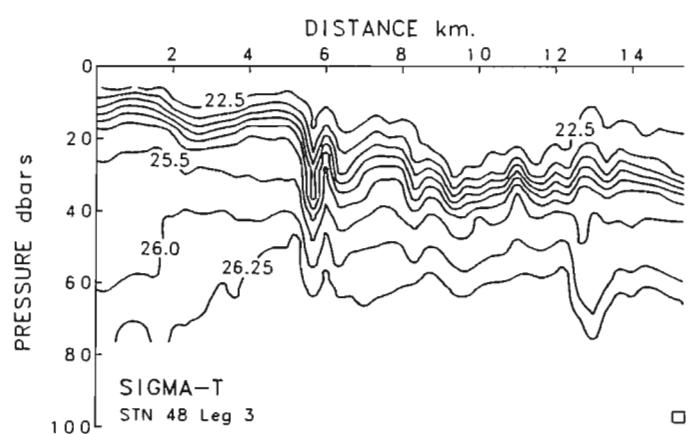


Fig. 126

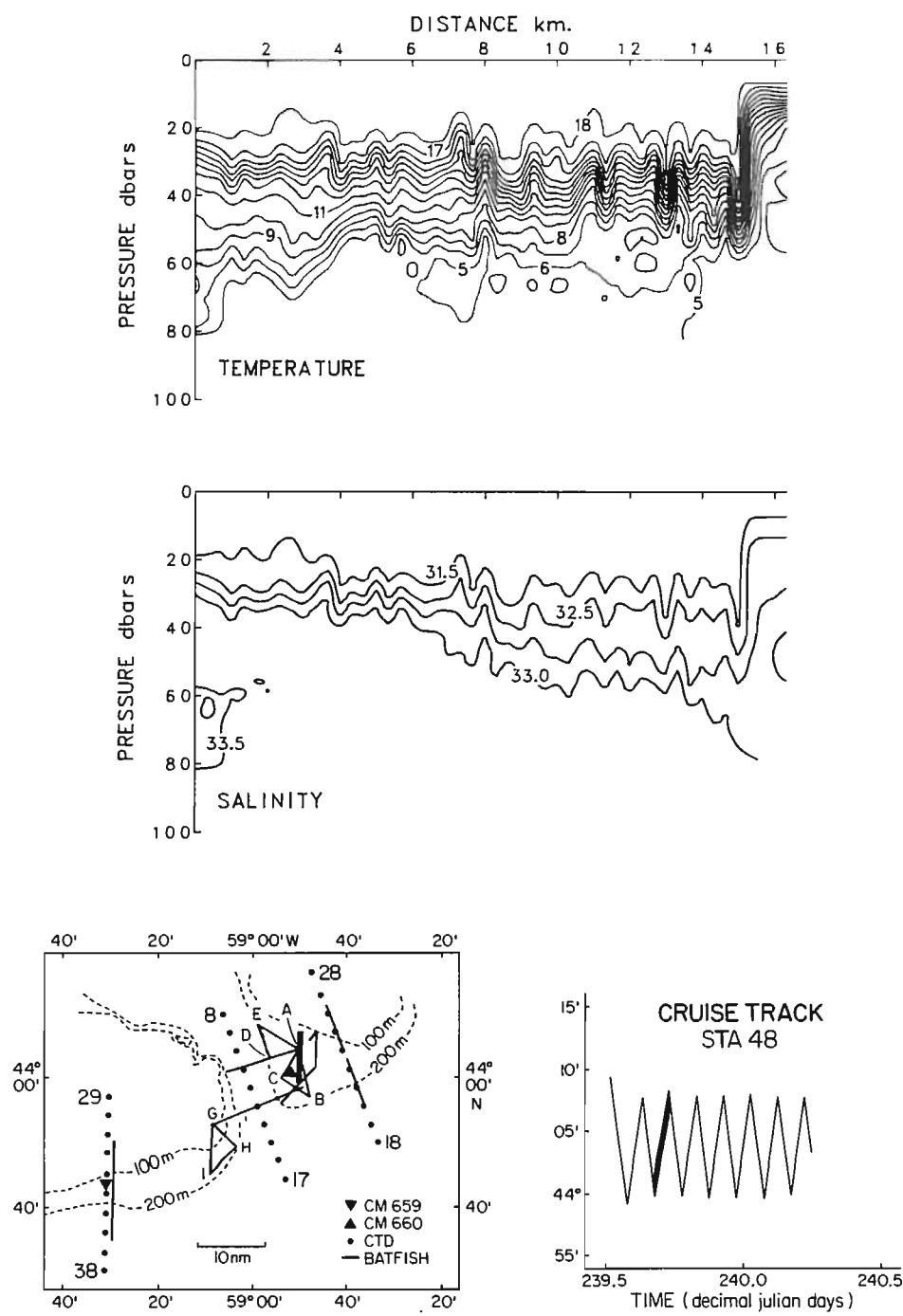


Fig. 127

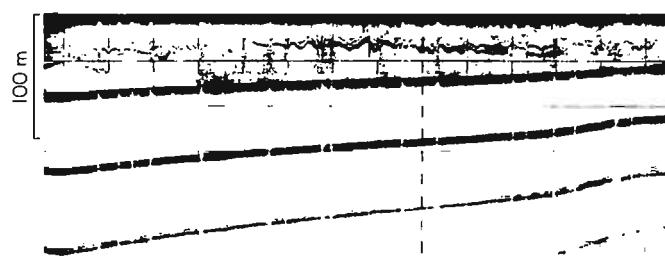
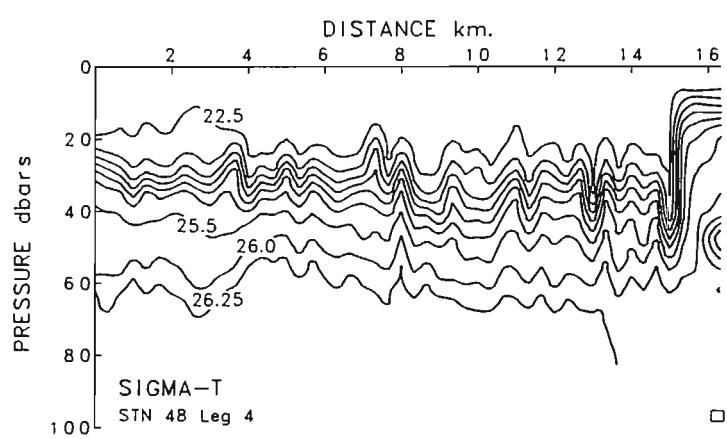


Fig. 128

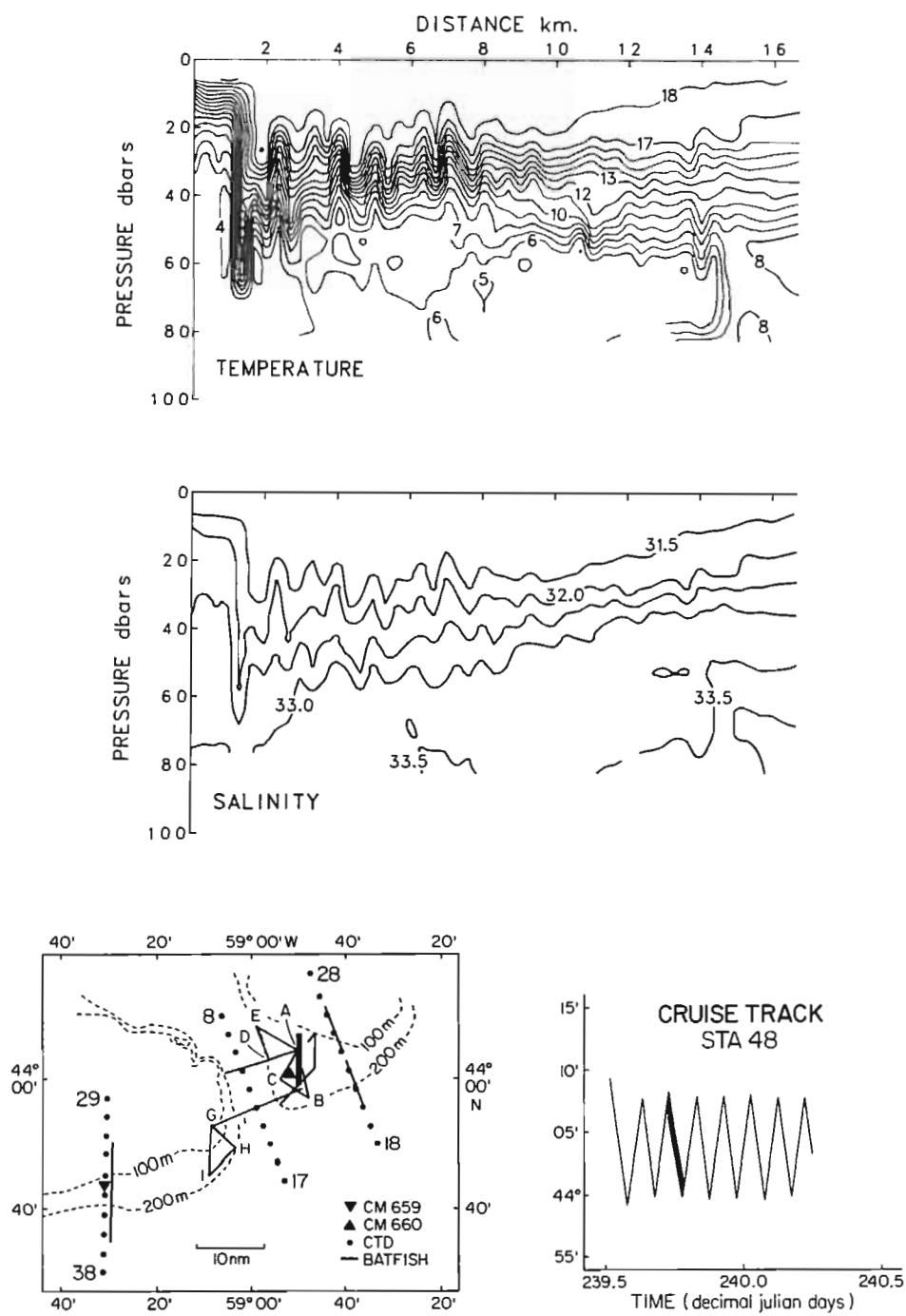


Fig. 129

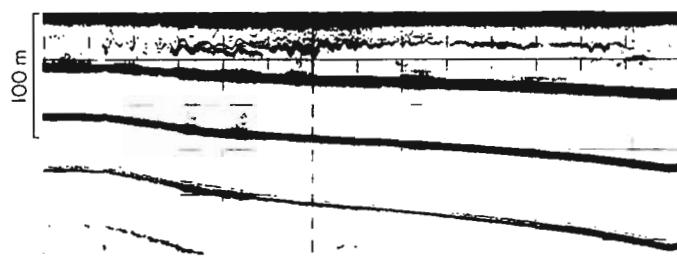
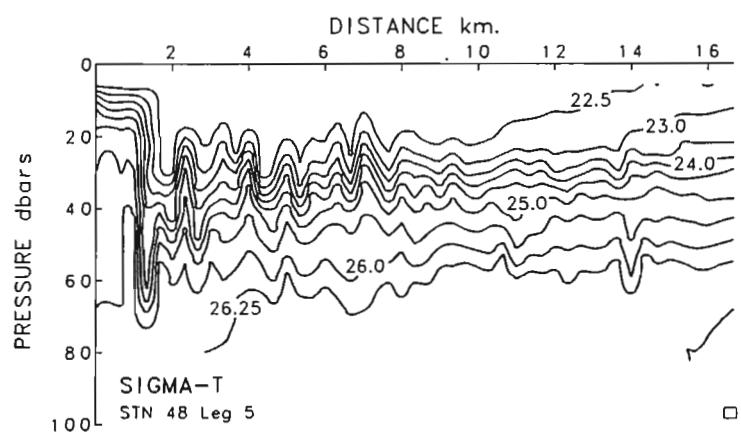


Fig. 130

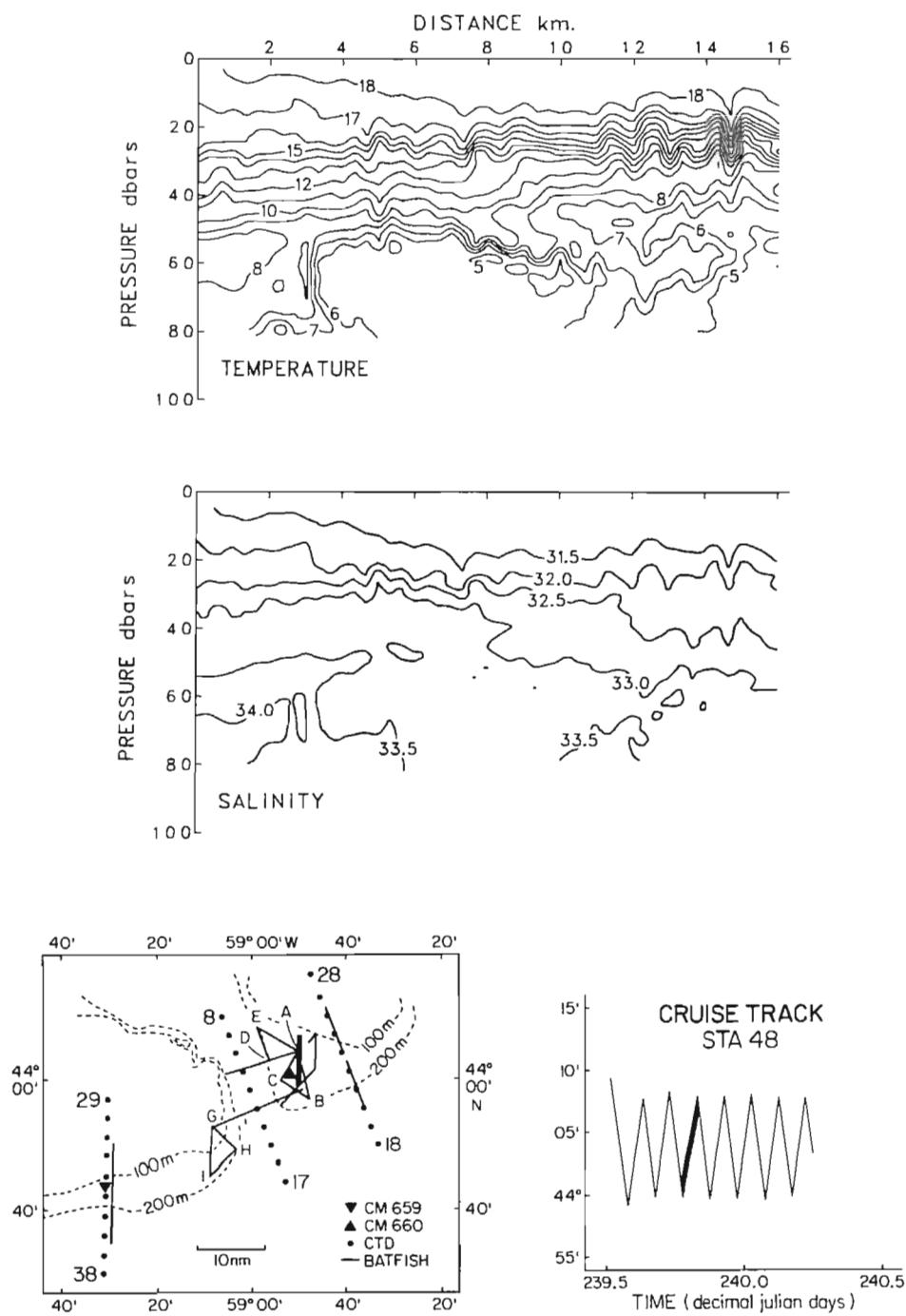


Fig. 131

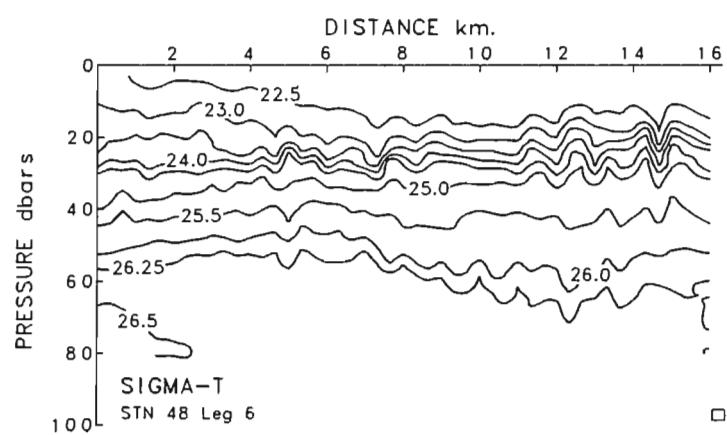


Fig. 132

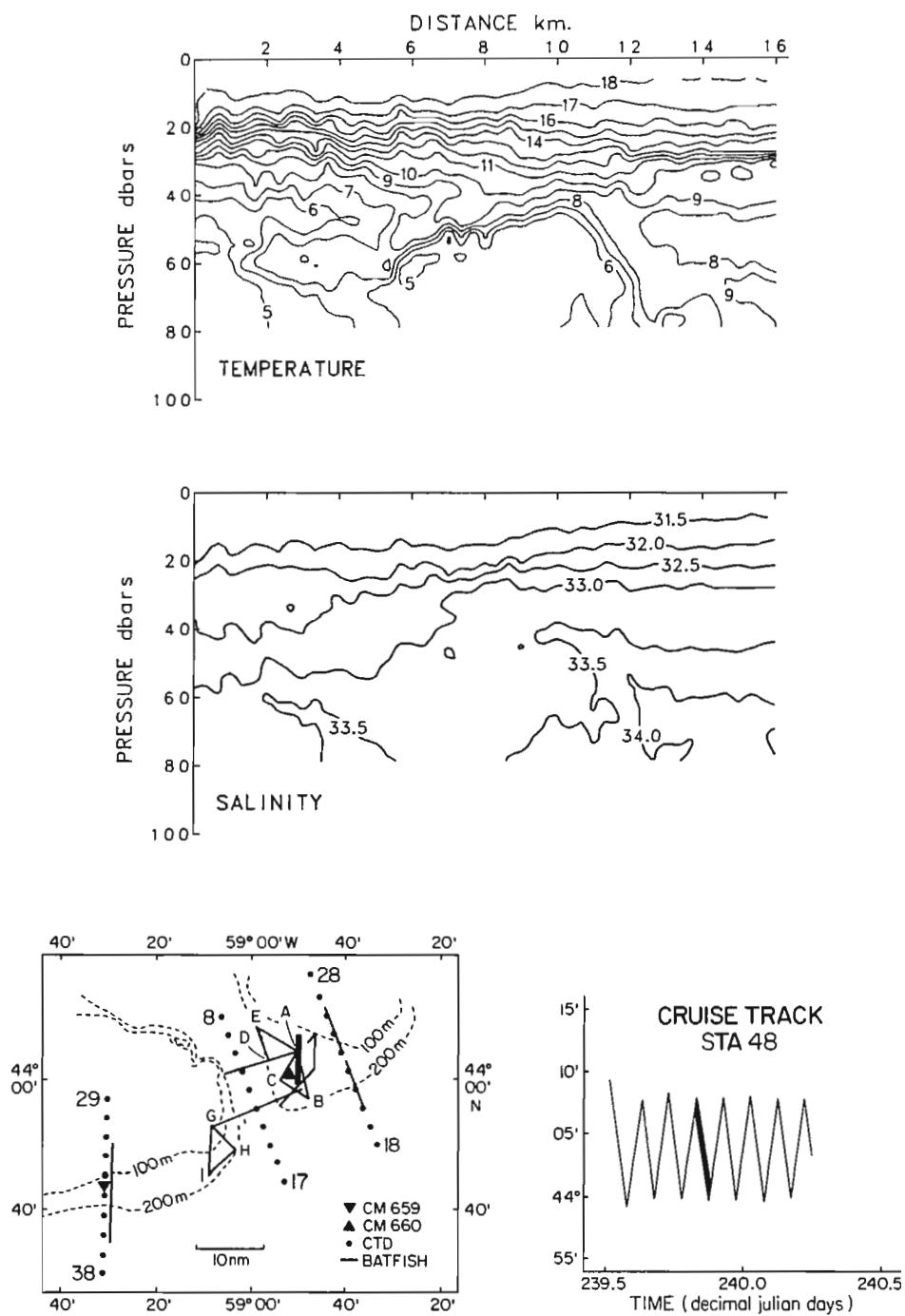


Fig. 133

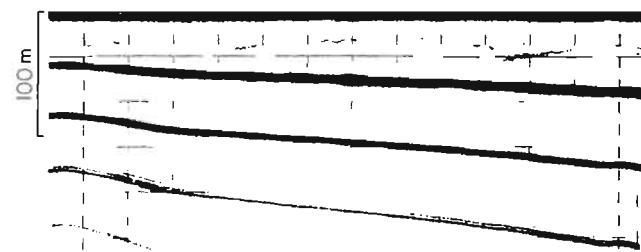
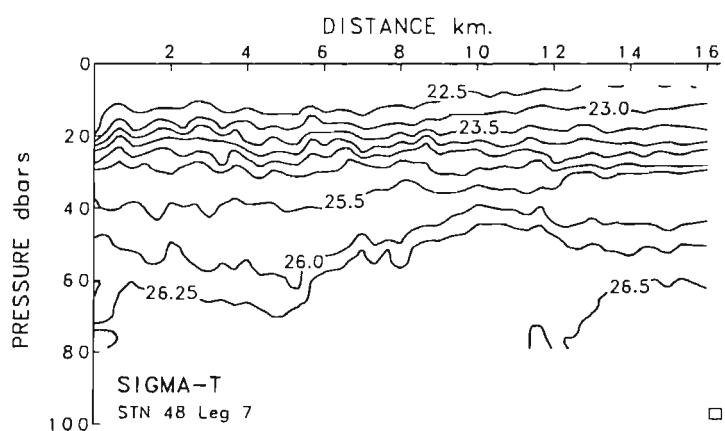


Fig. 134

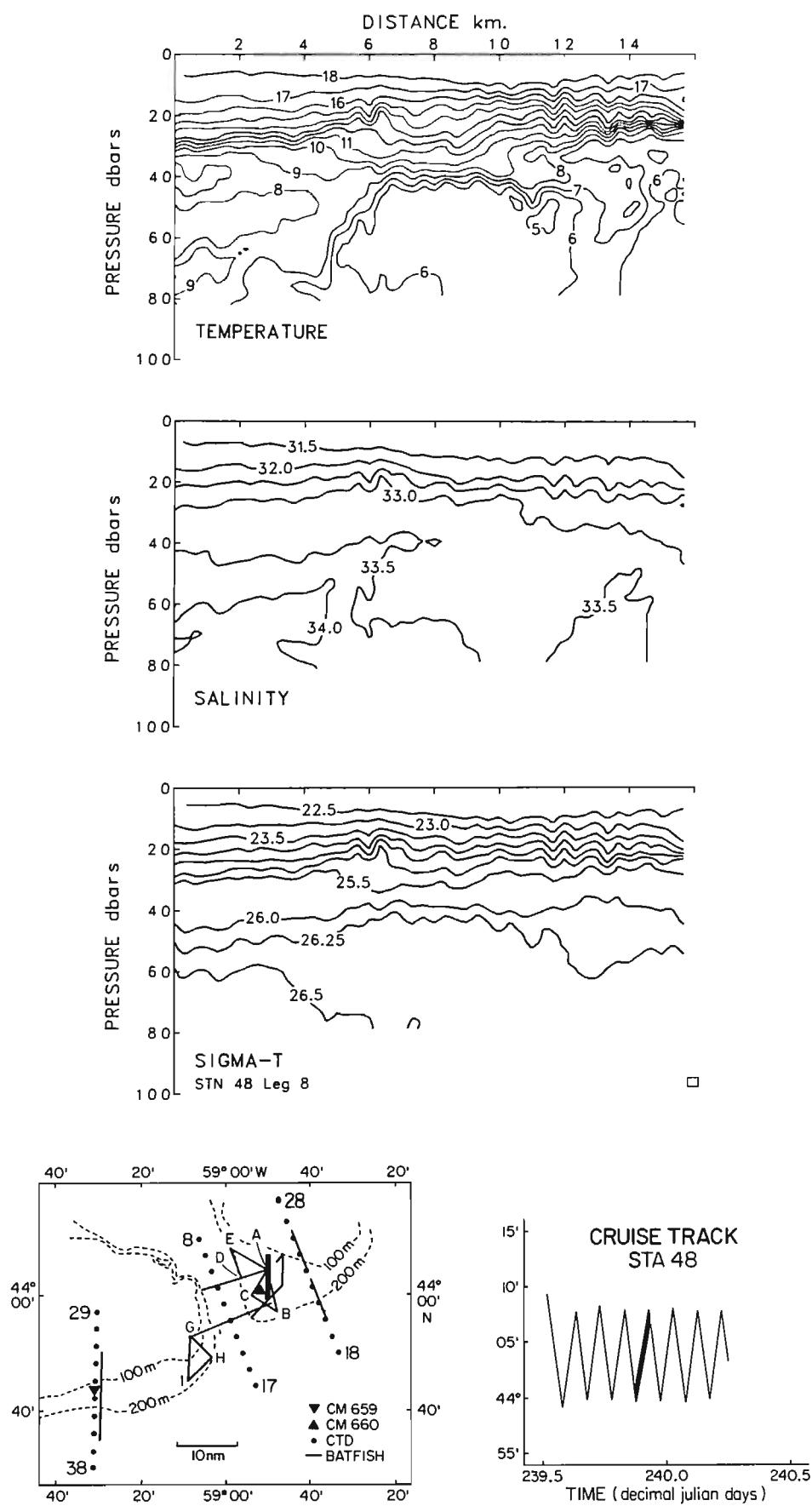


Fig. 135

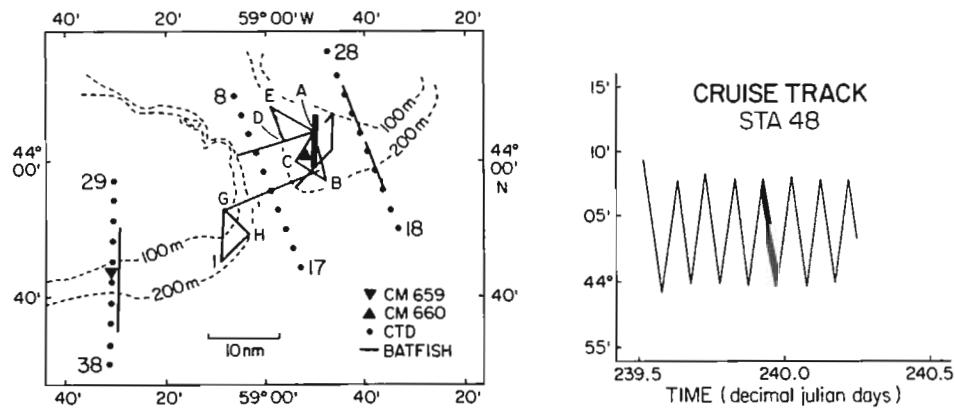
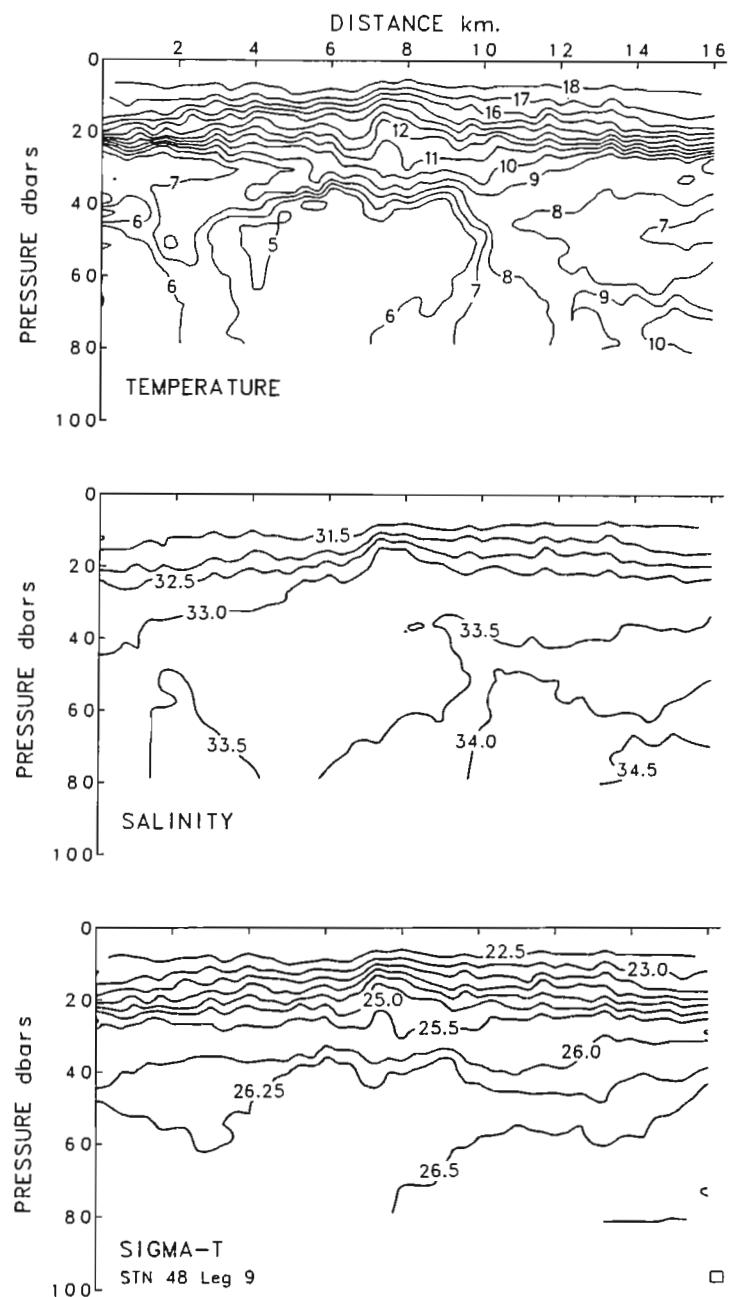


Fig. 136

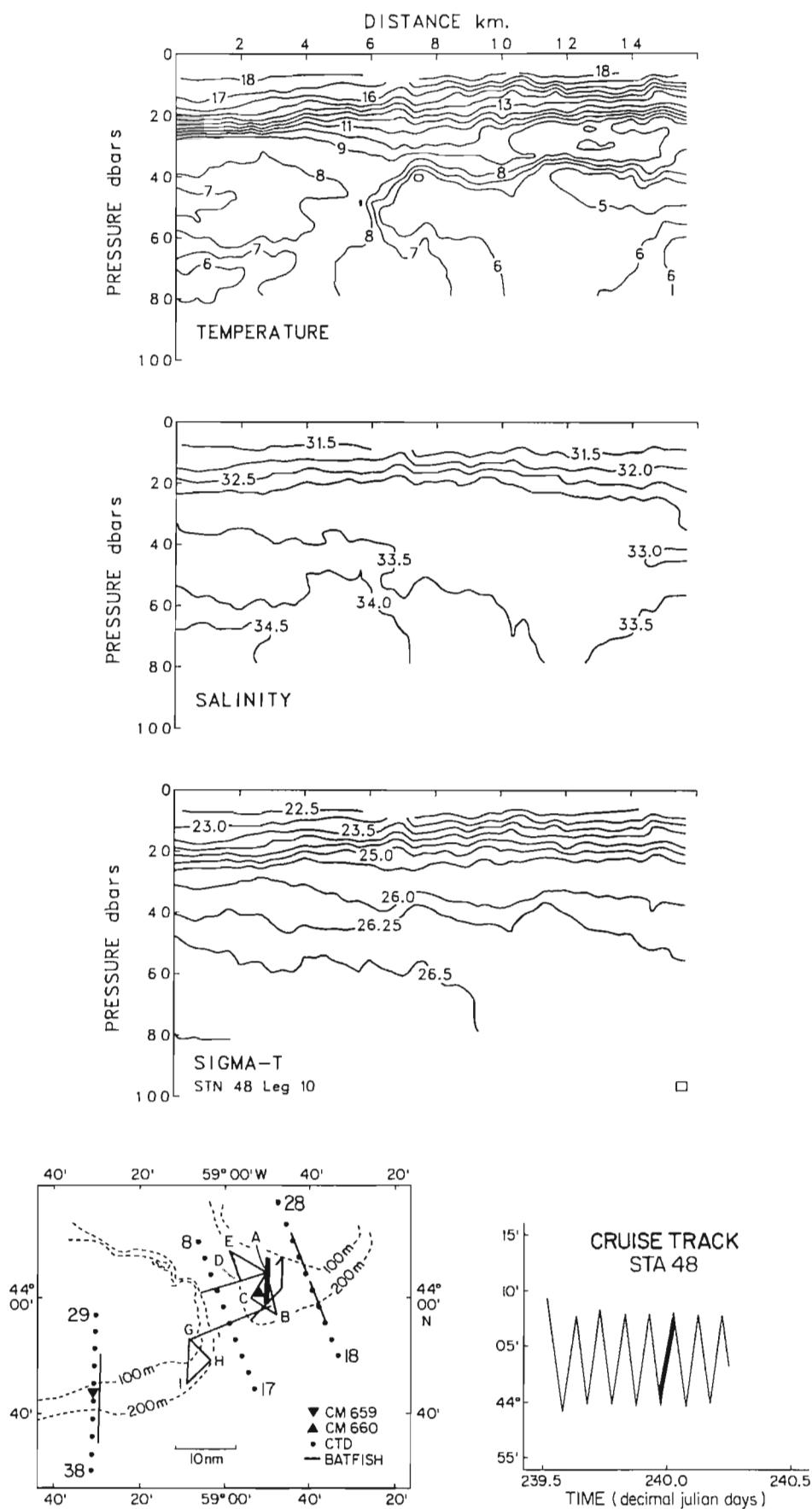


Fig. 137

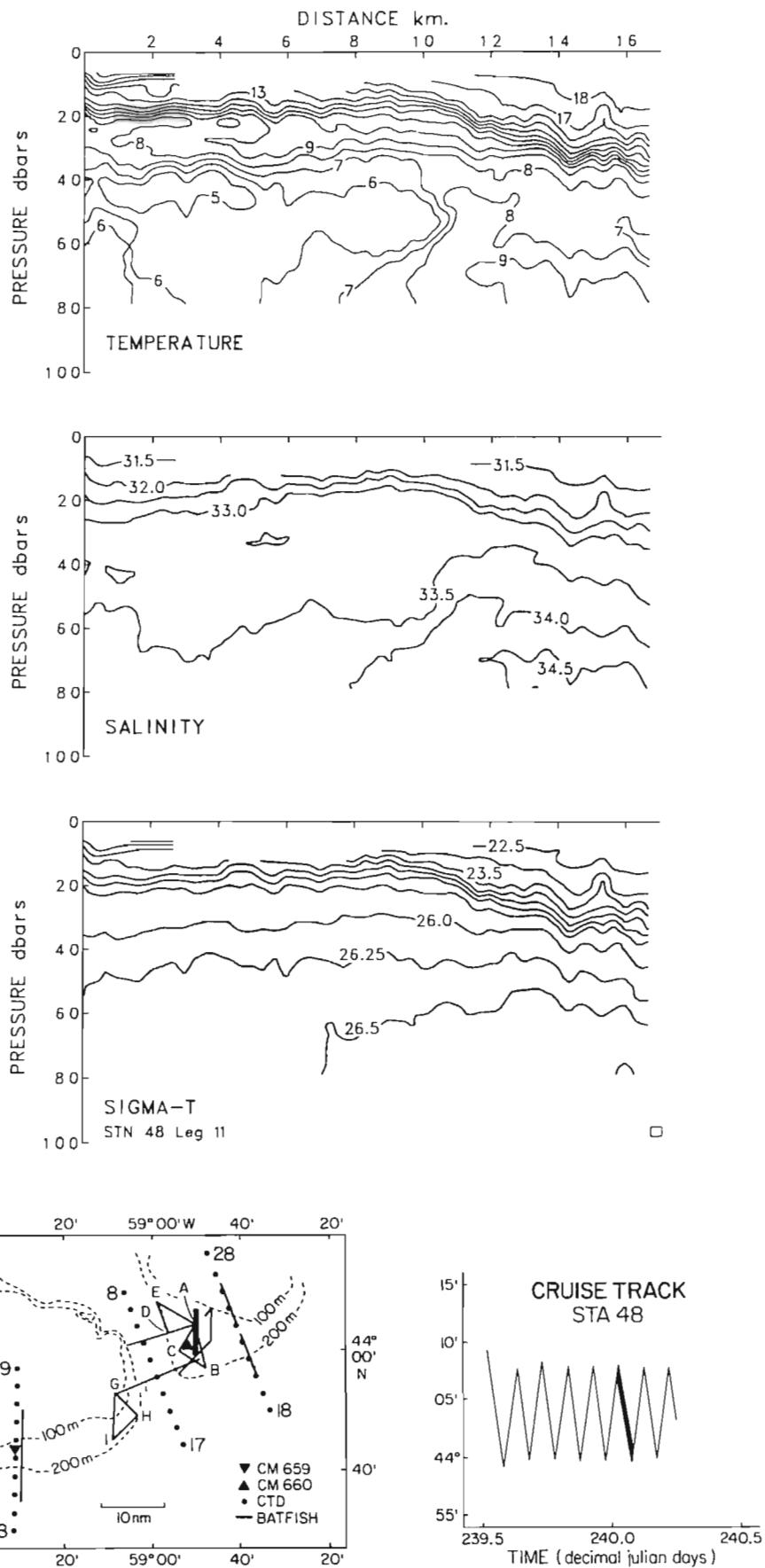


Fig. 138

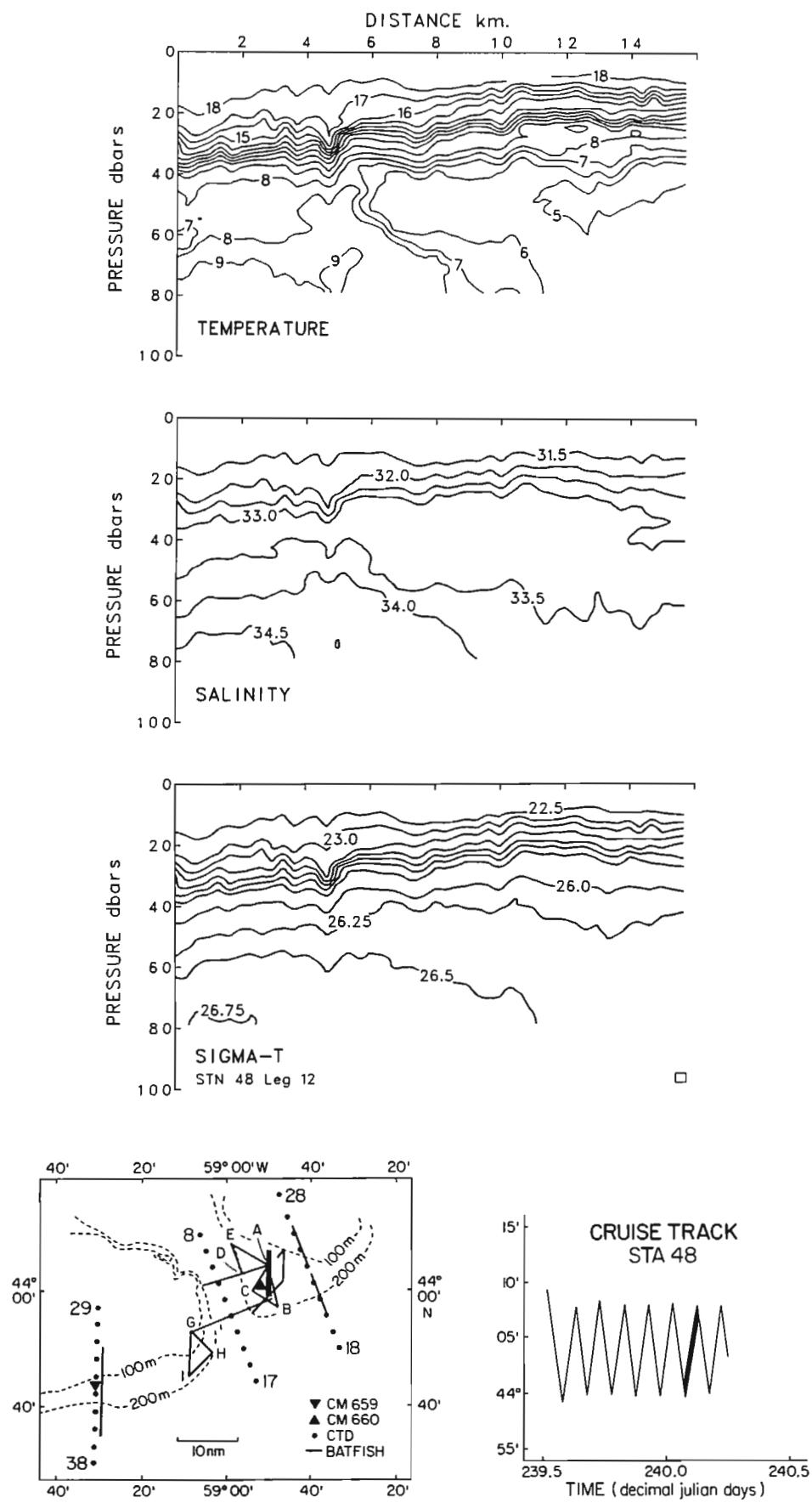
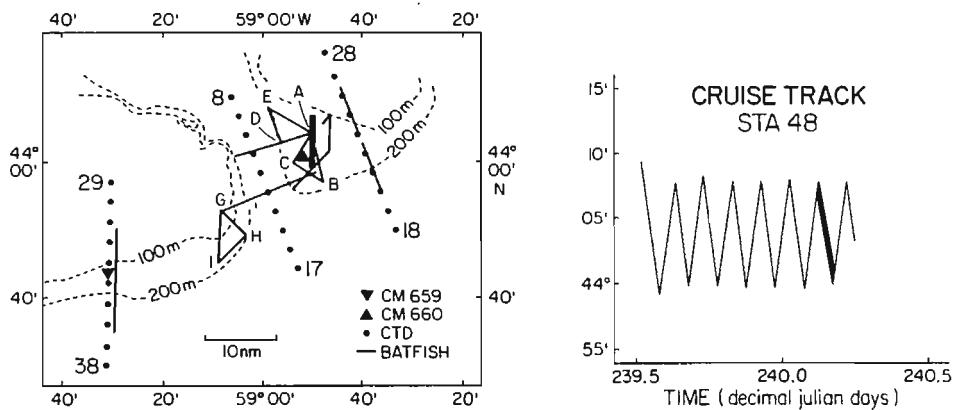
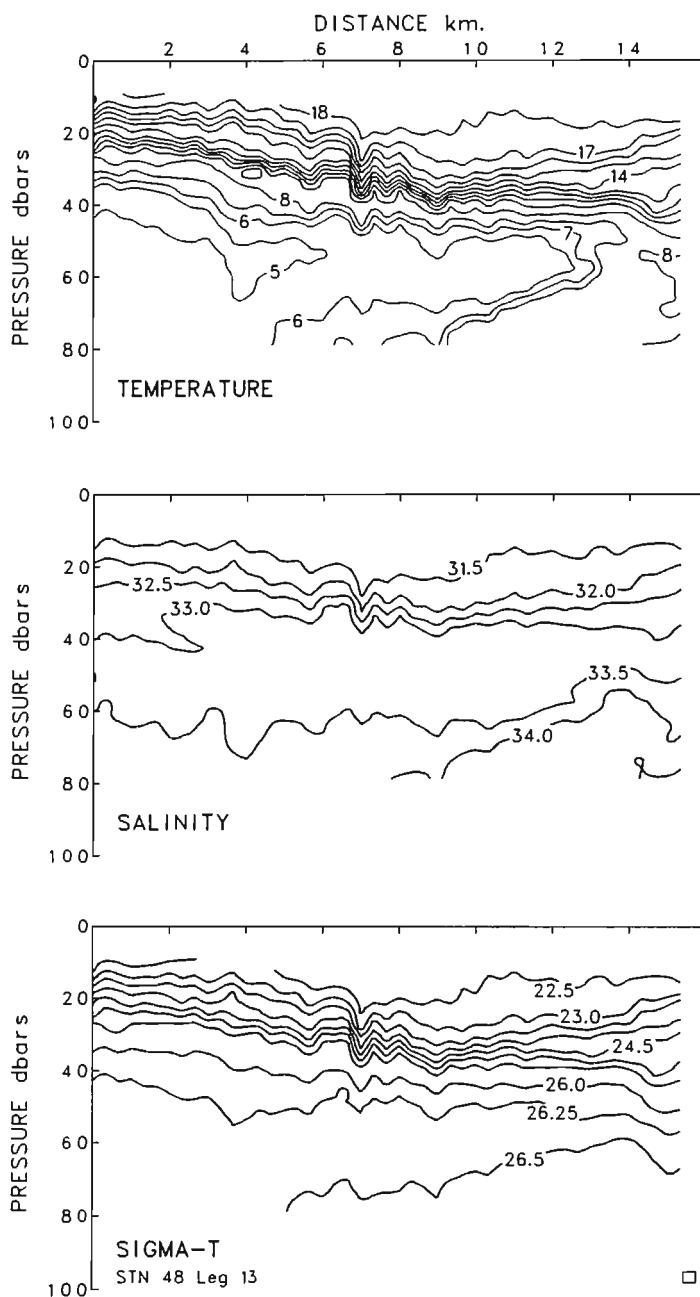


Fig. 139



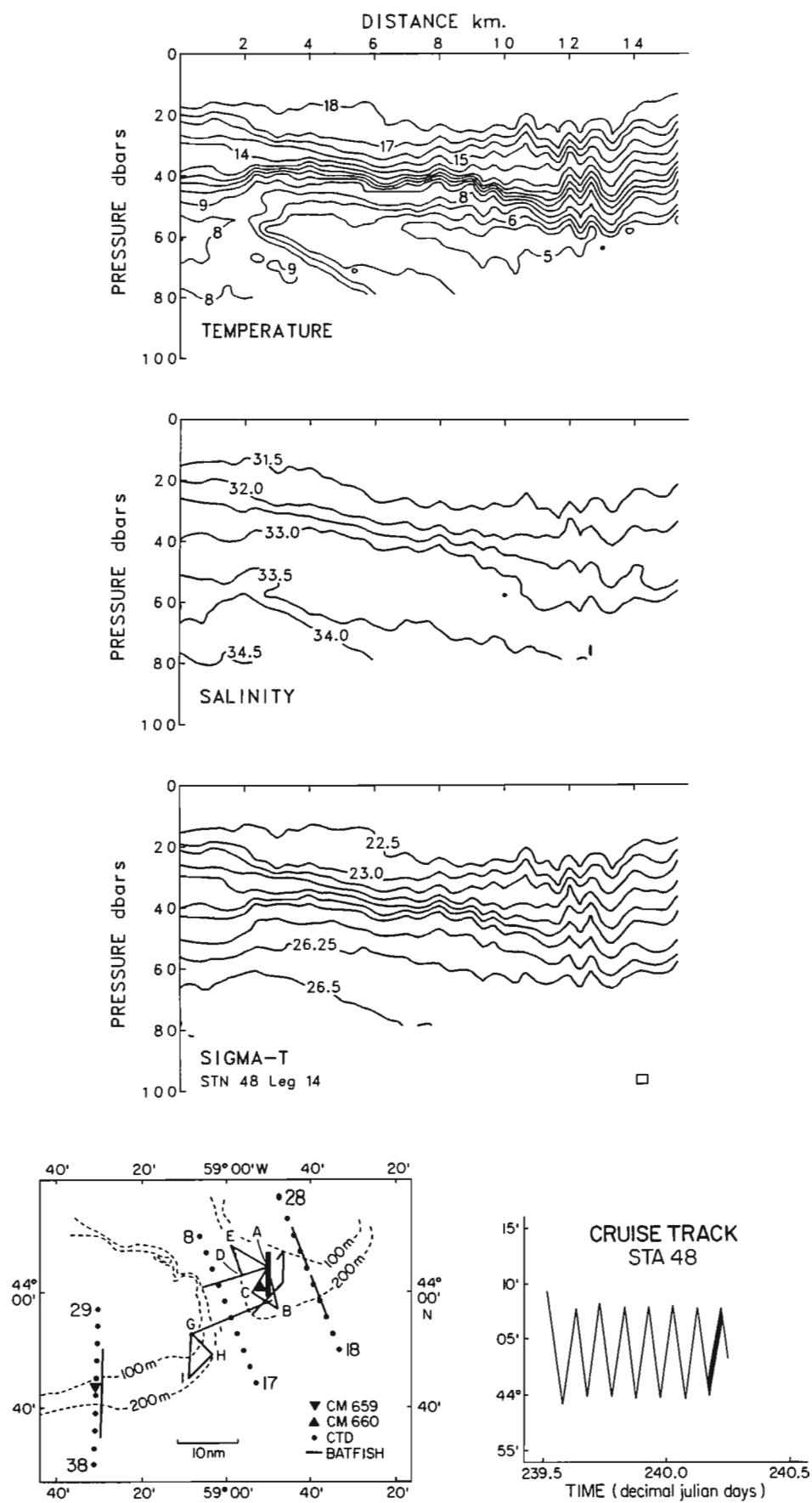


Fig. 141

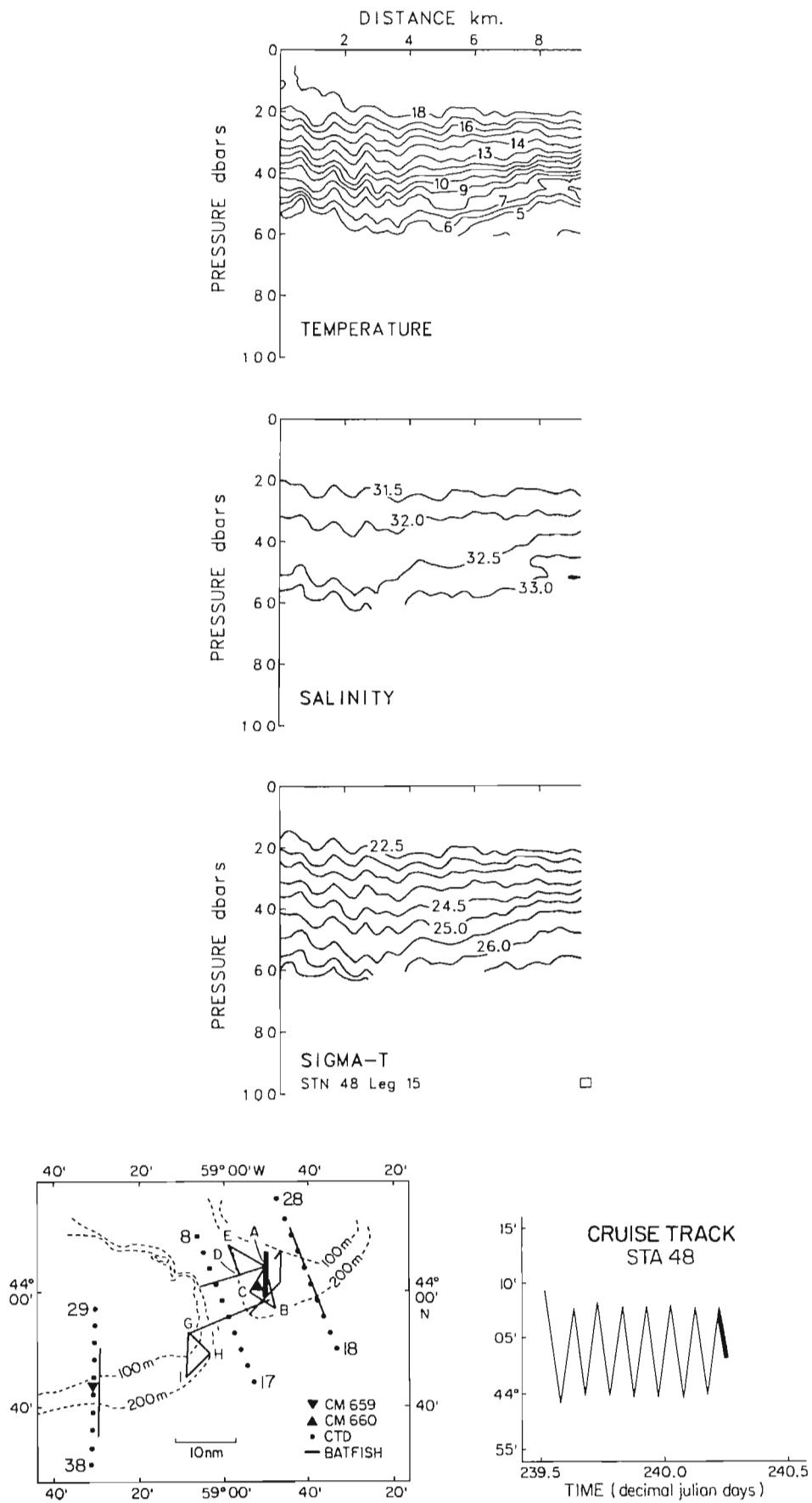


Fig. 142

Figures 143-157.

BATFISH station 49: 12 sections of Temperature, Salinity and Sigma-t vs. pressure, location map and latitude vs. time plot. Acoustic backscatter plots for selected sections.

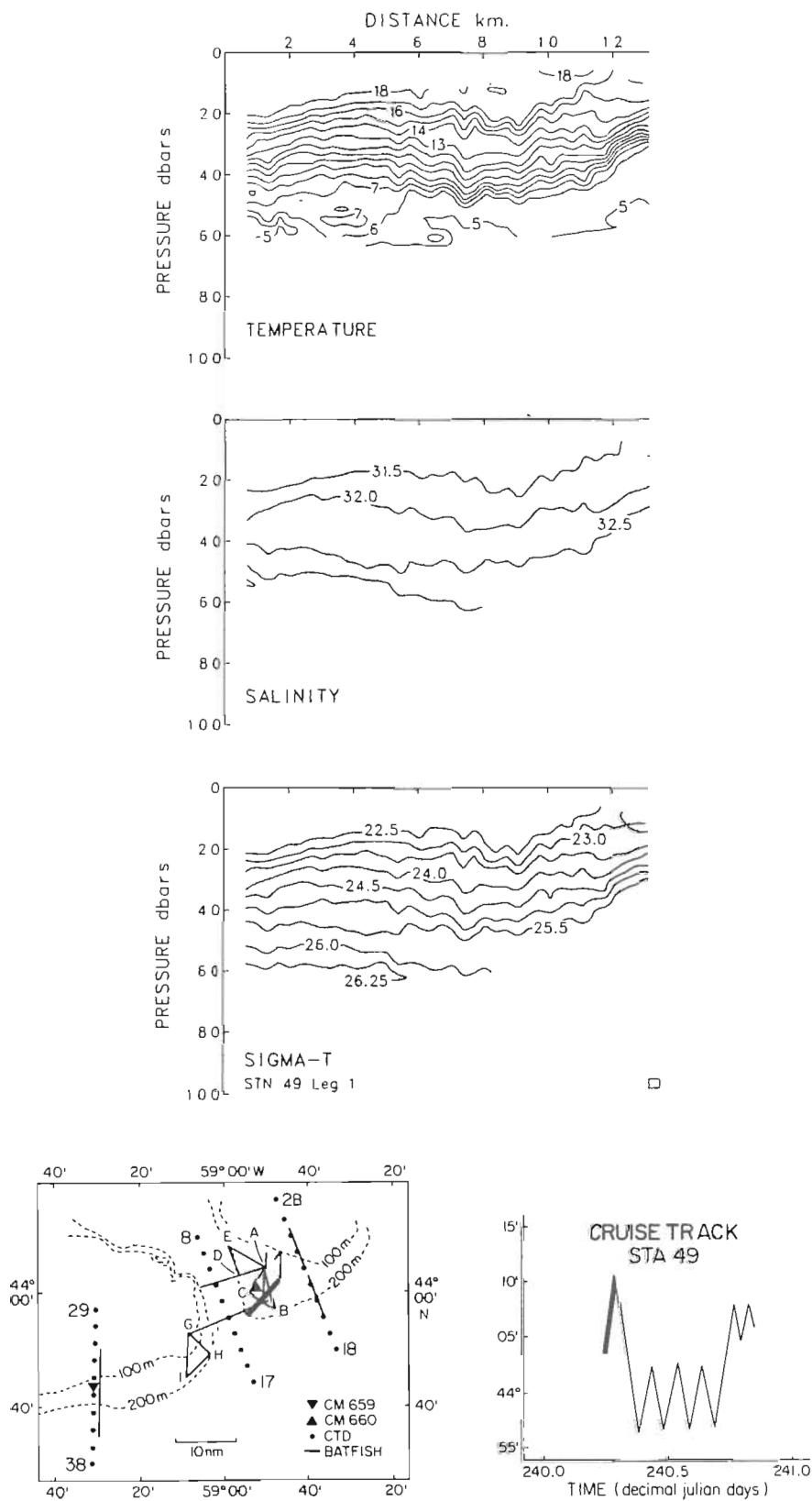


Fig. 143

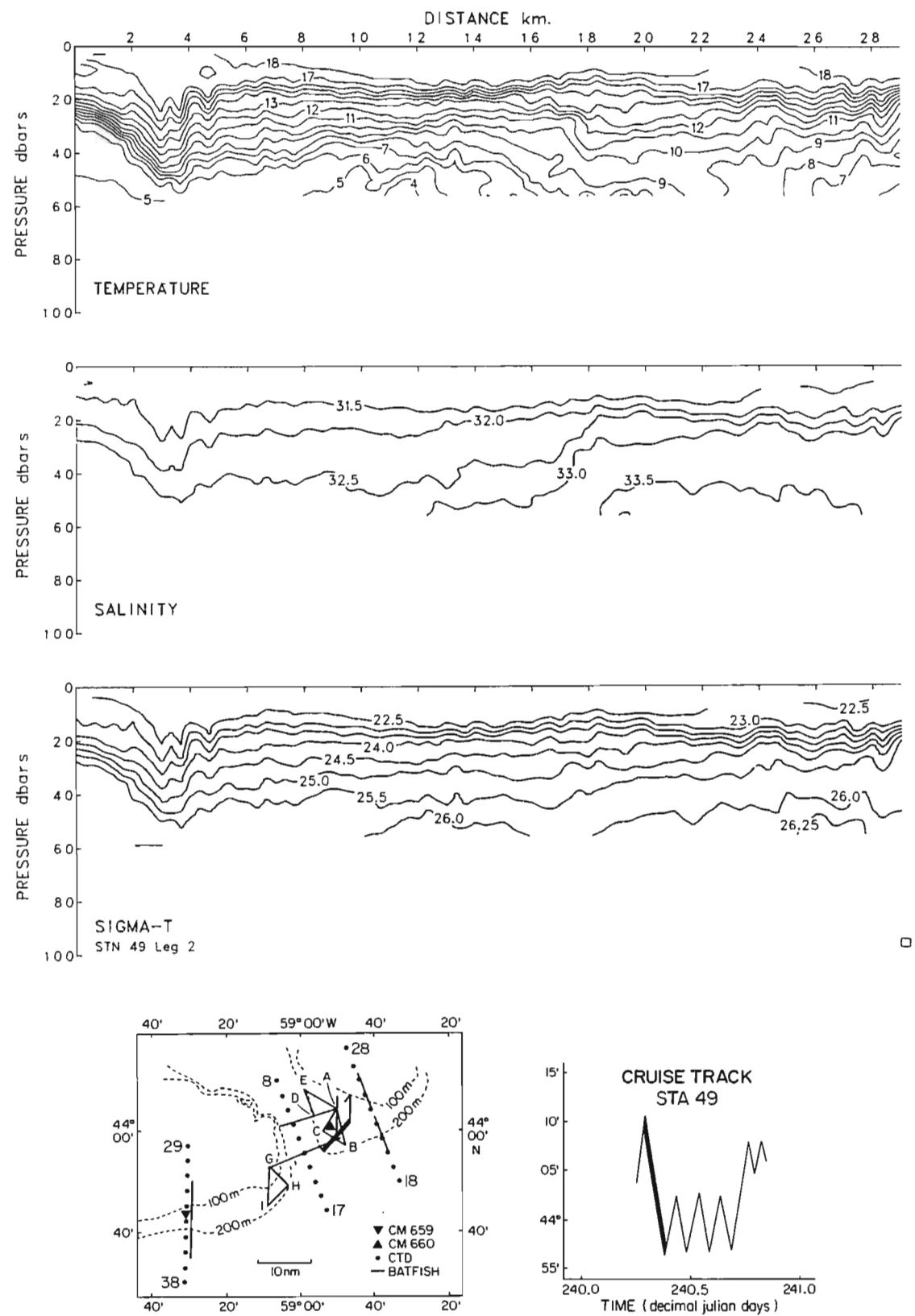


Fig. 144

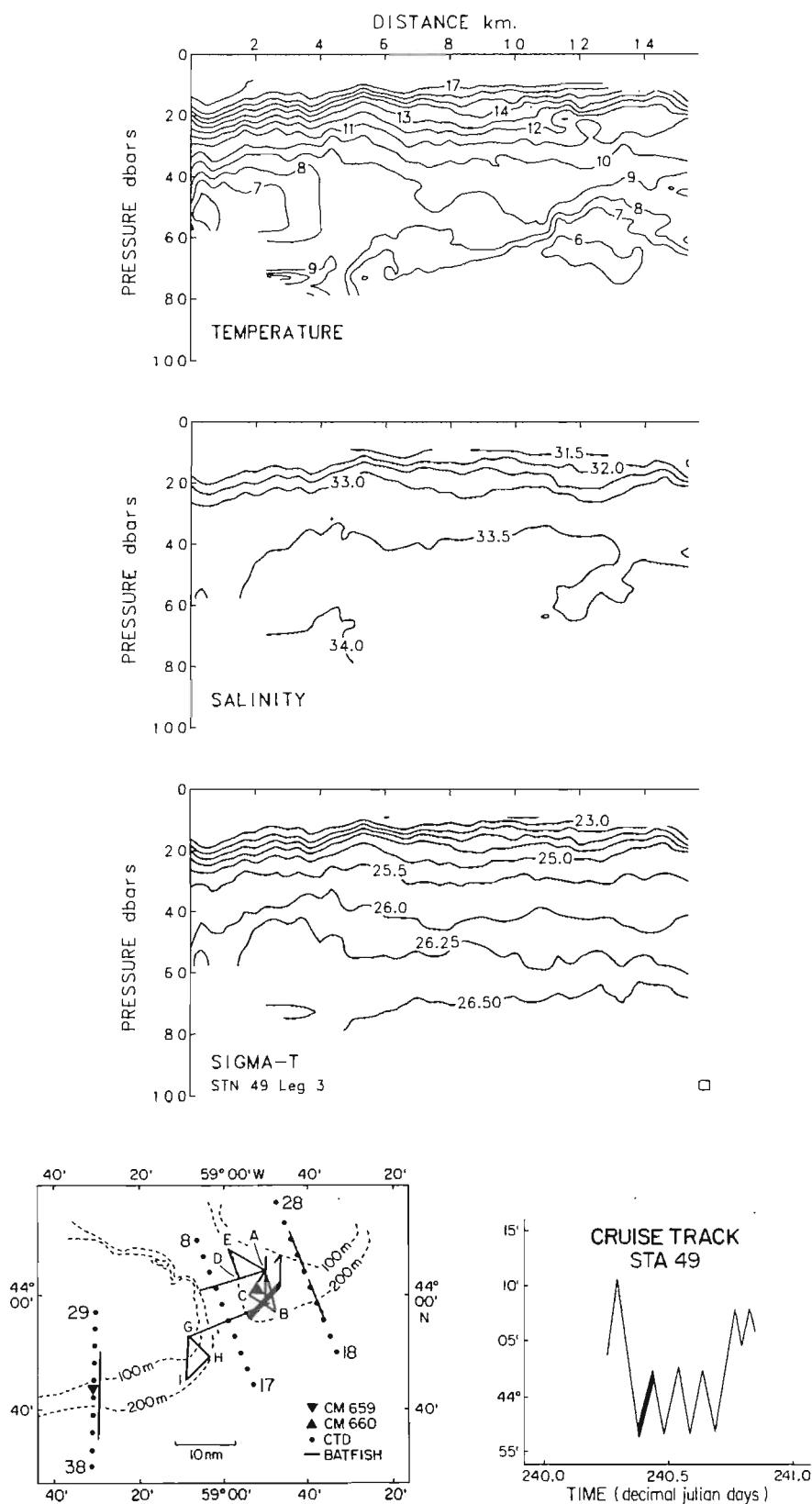


Fig. 145

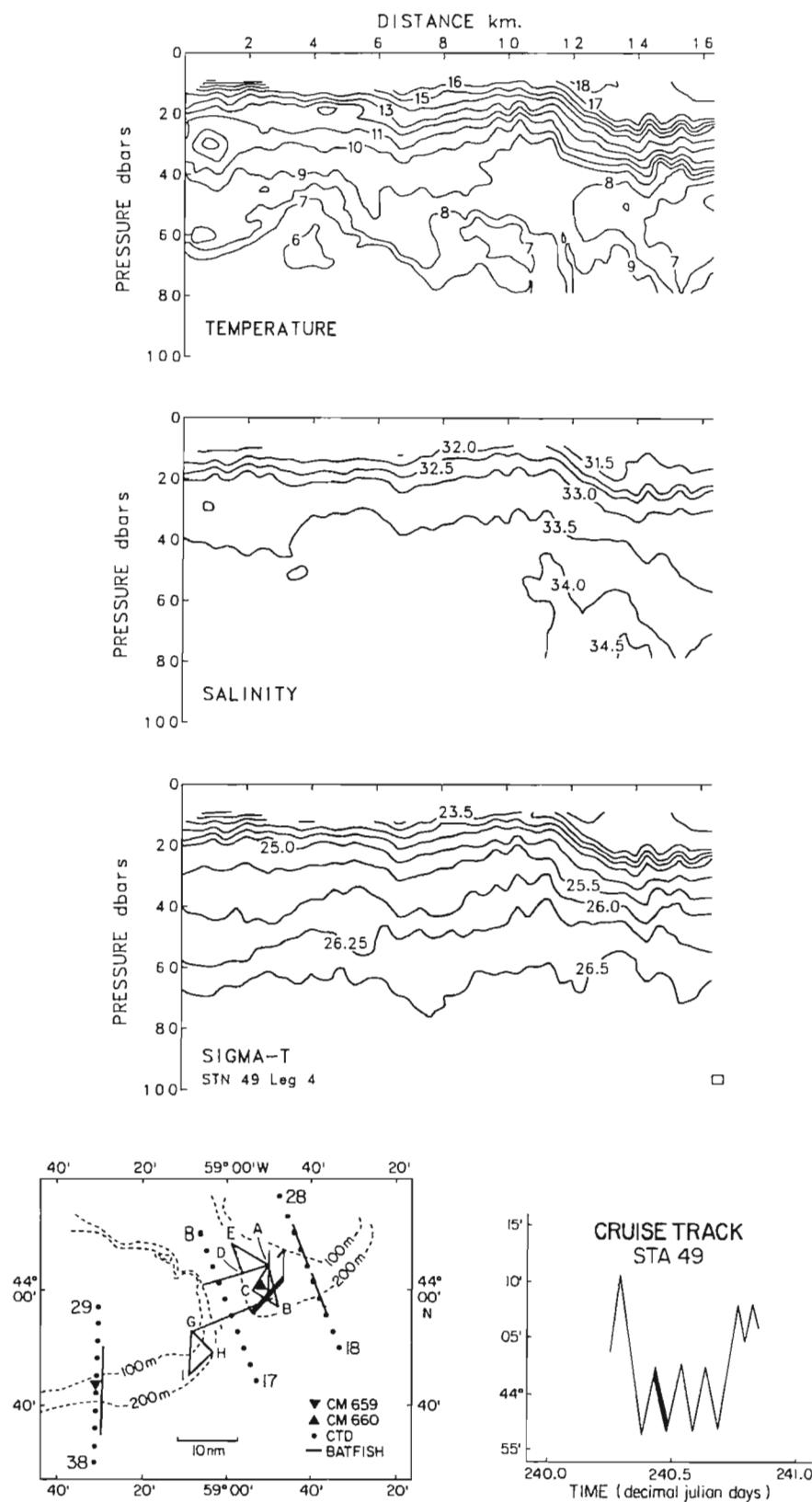


Fig. 146

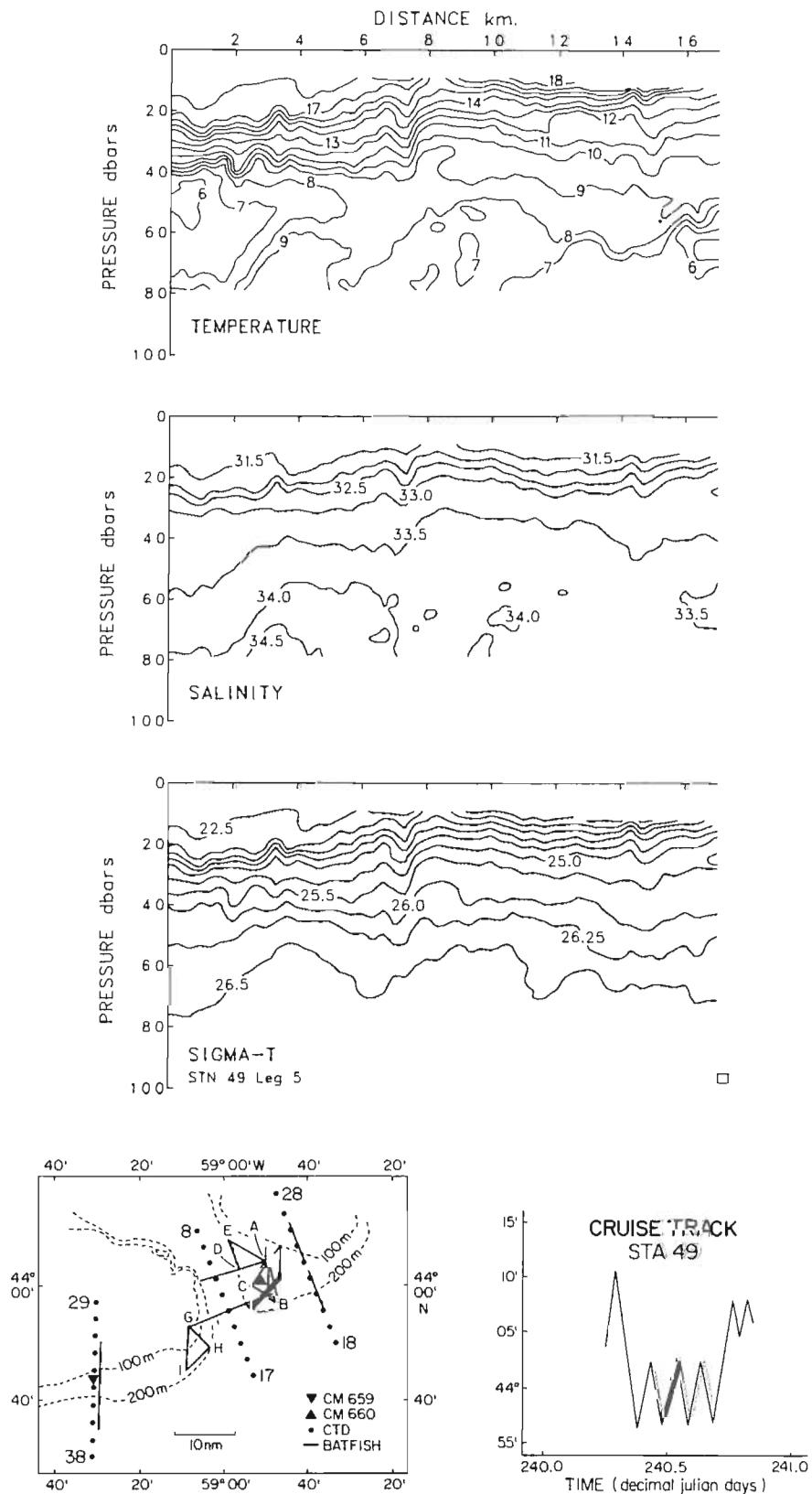


Fig. 147

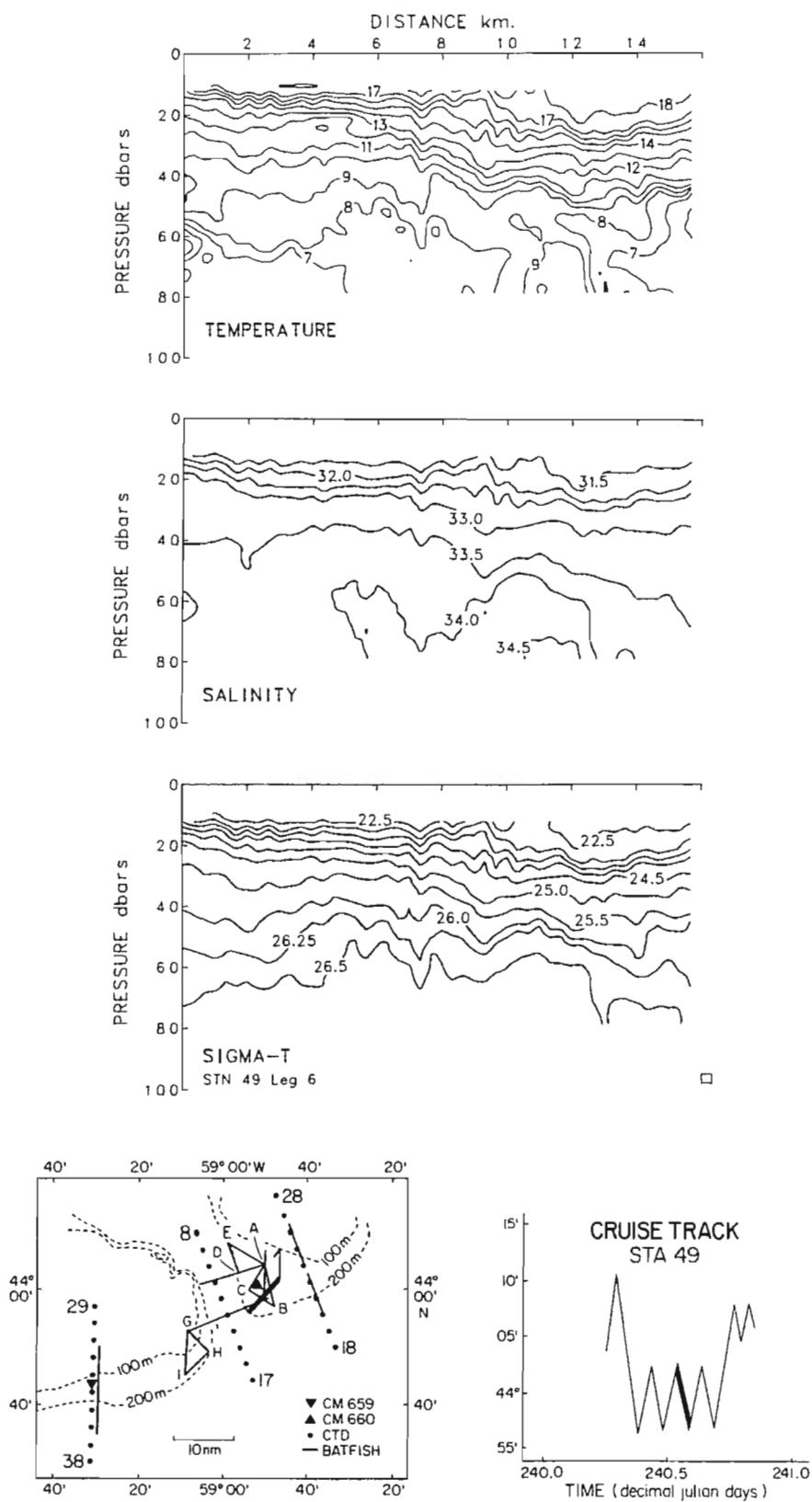


Fig. 148

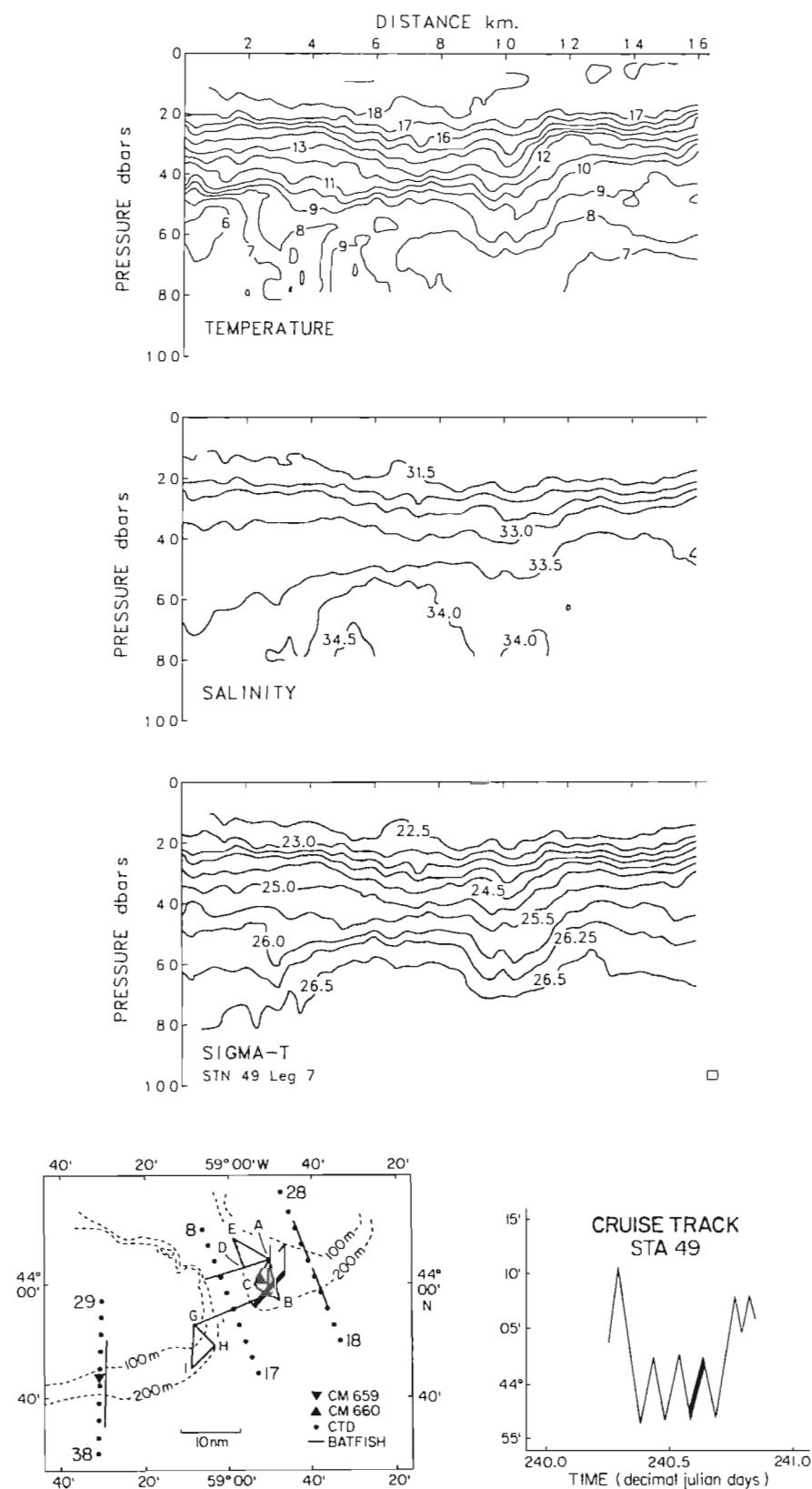


Fig. 149

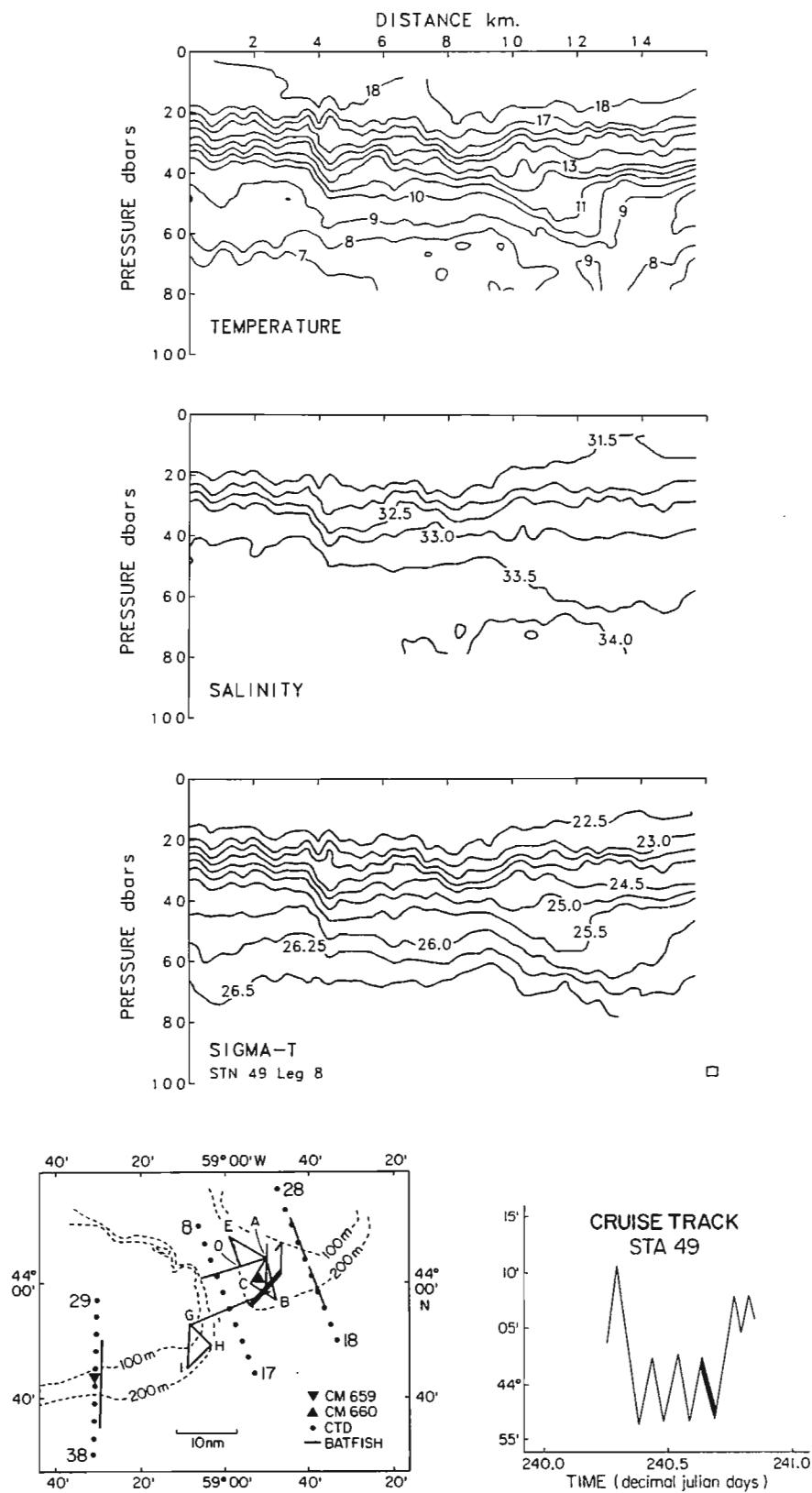


Fig. 150

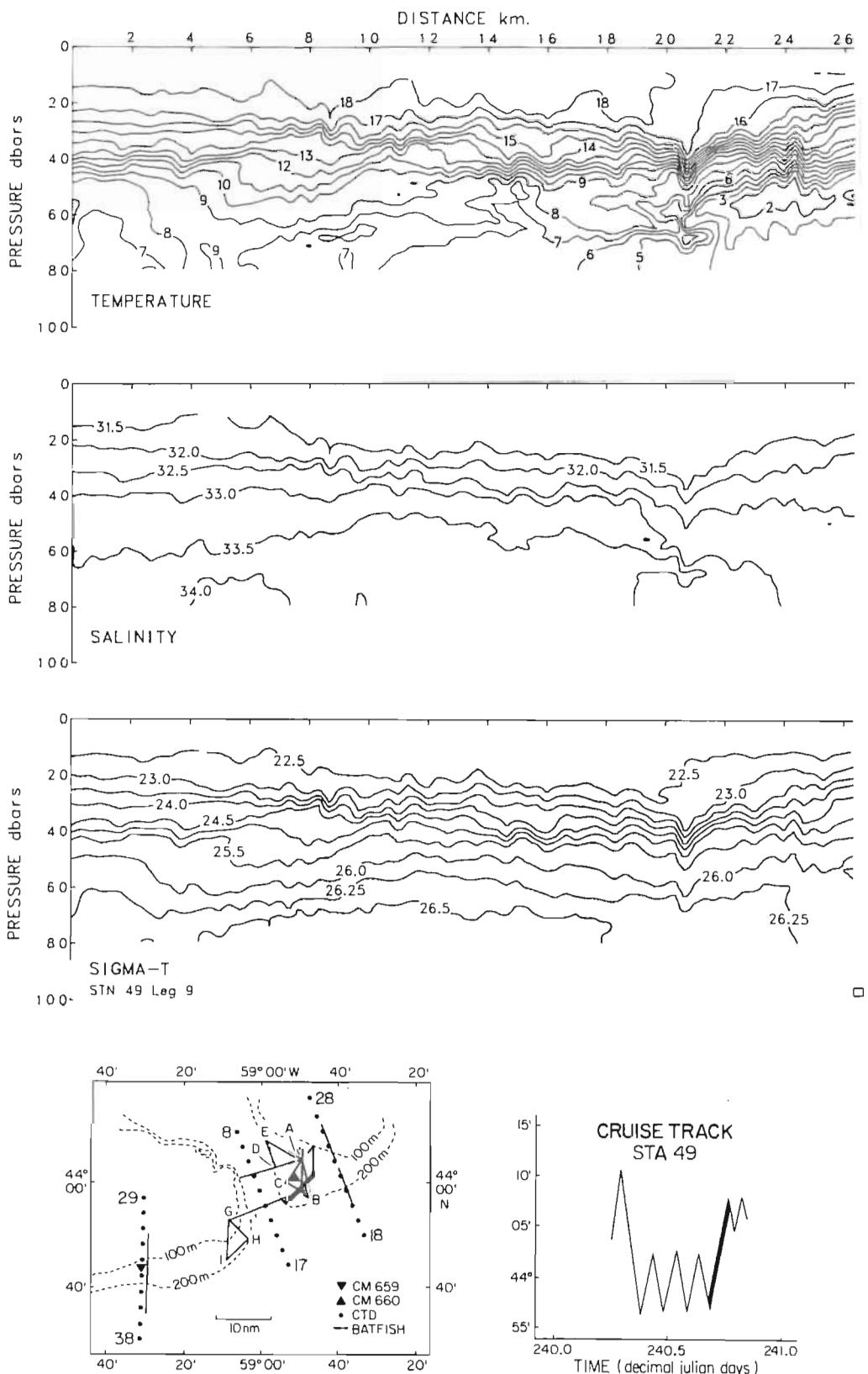


Fig. 151

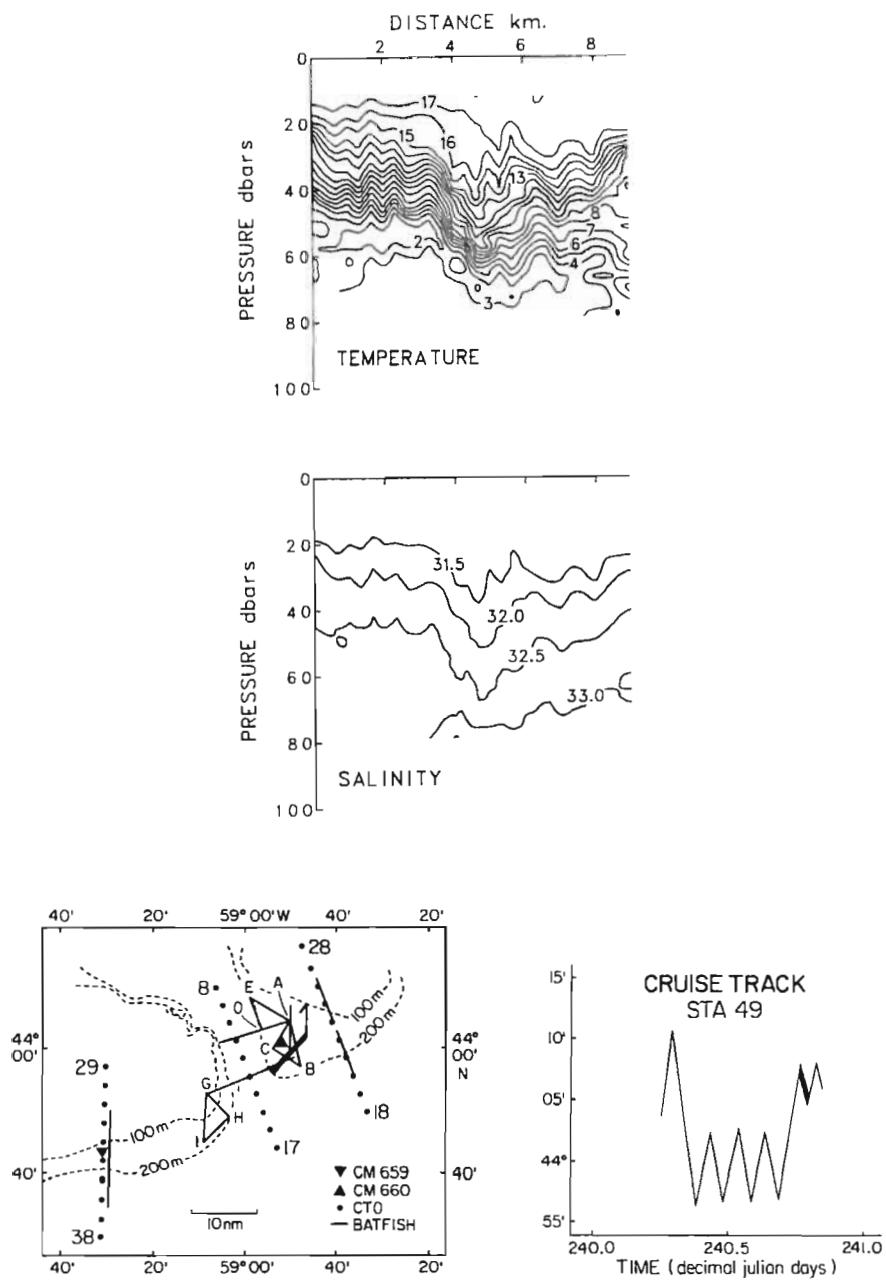


Fig. 152

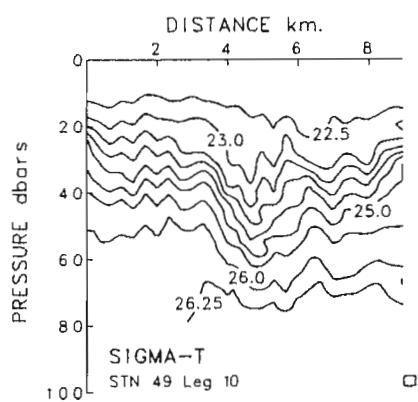


Fig. 153

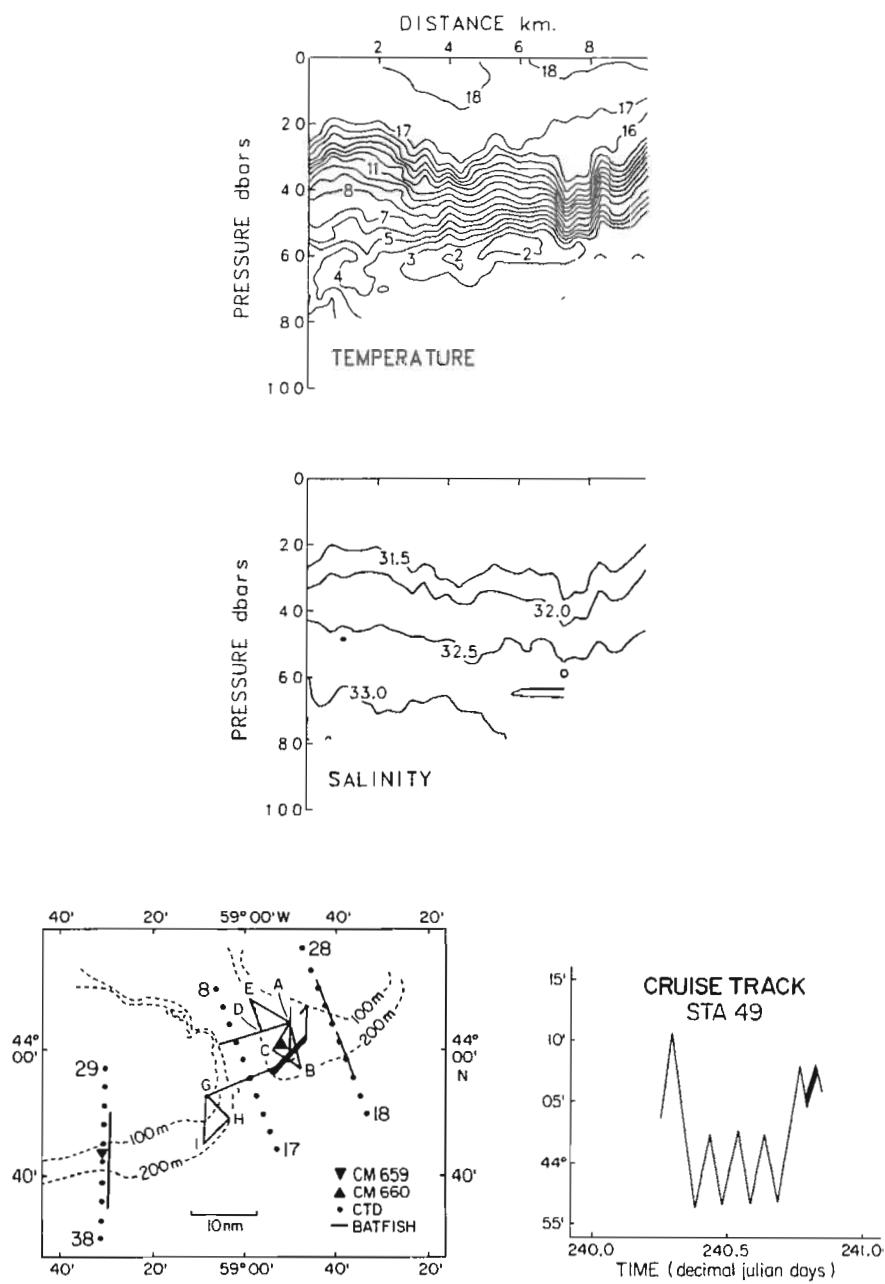


Fig. 154

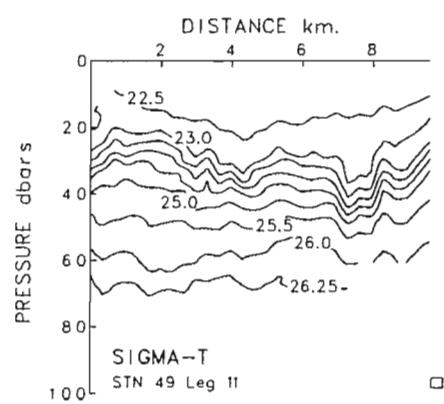


Fig. 155

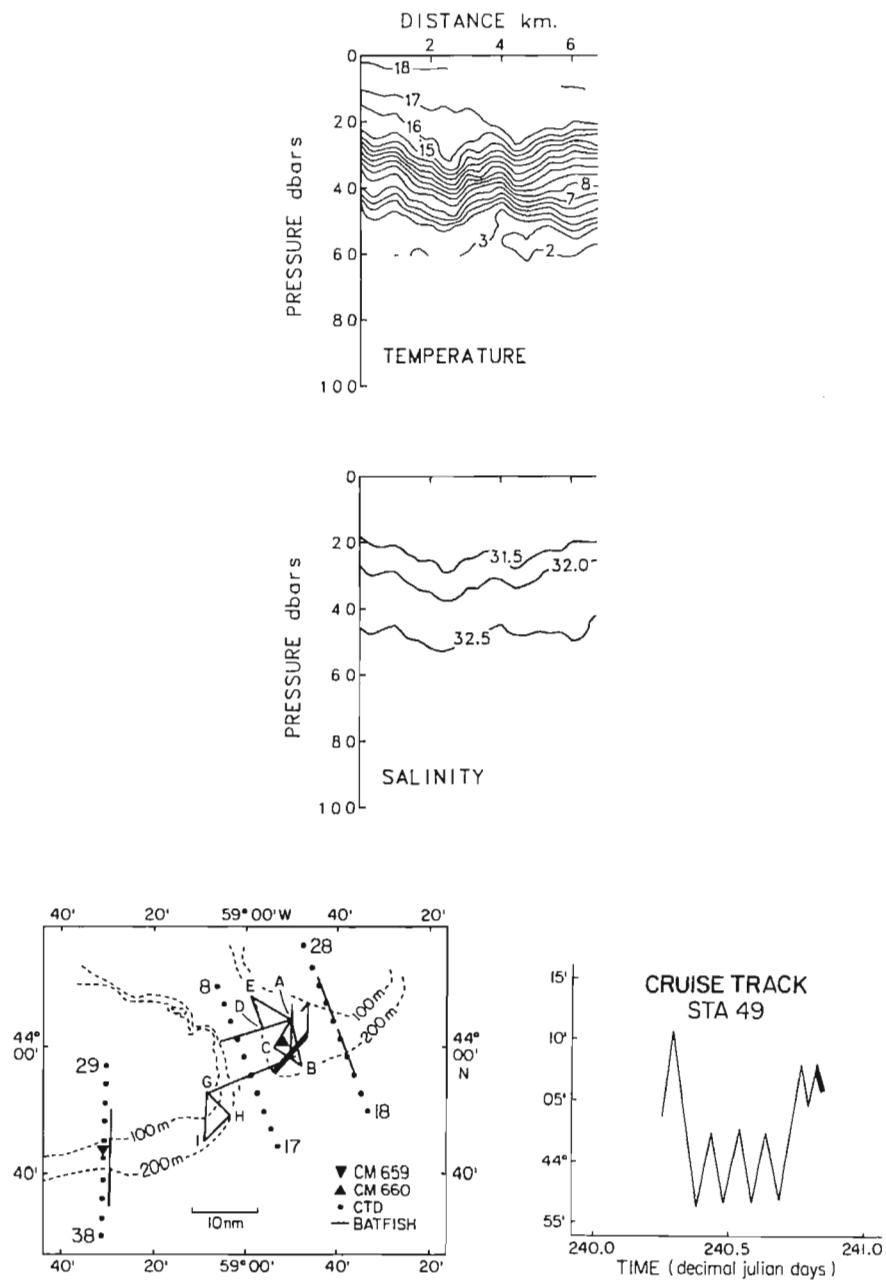


Fig. 156

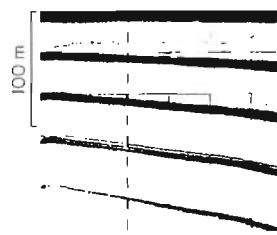
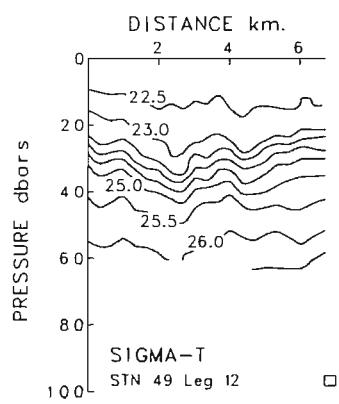


Fig. 157

Figures 158-174.

BATFISH station 50: 17 sections of Temperature, Salinity and Sigma-t vs. pressure,
location map and latitude vs. time plot.

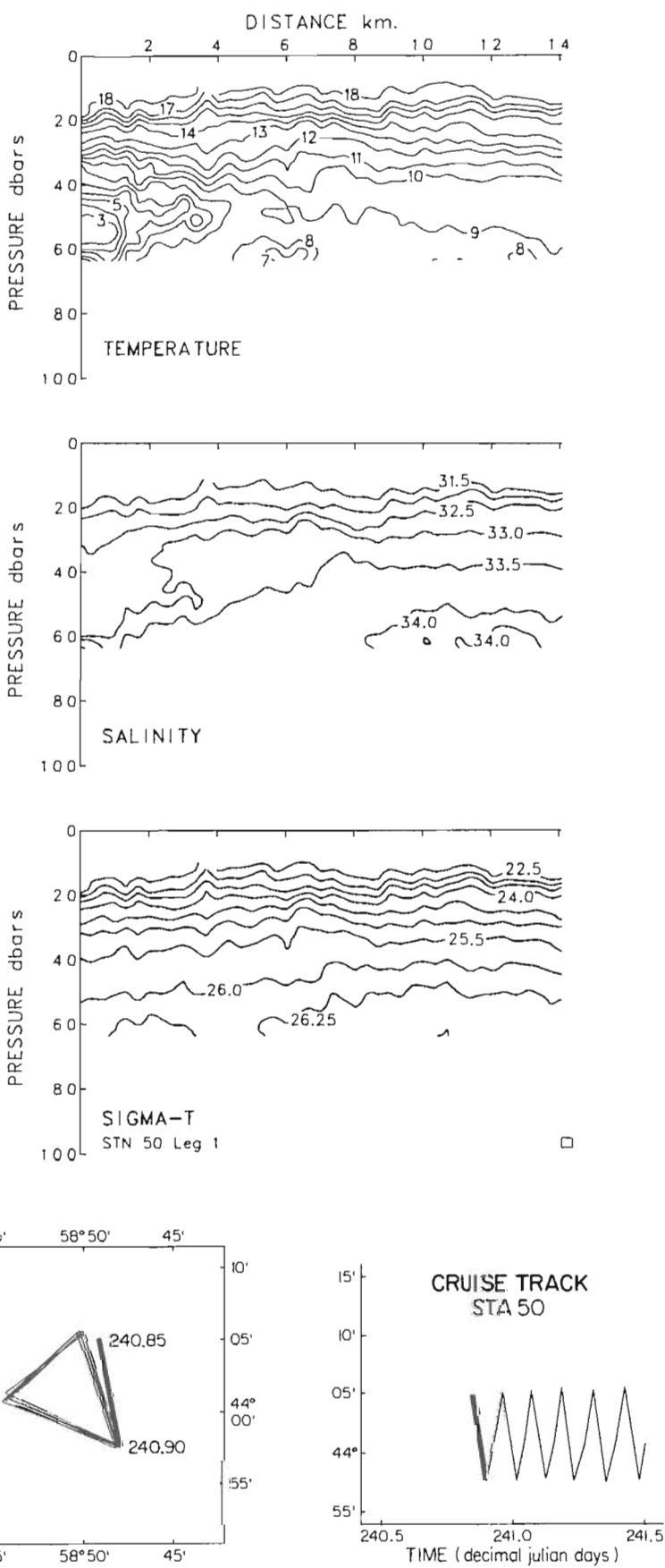


Fig. 158

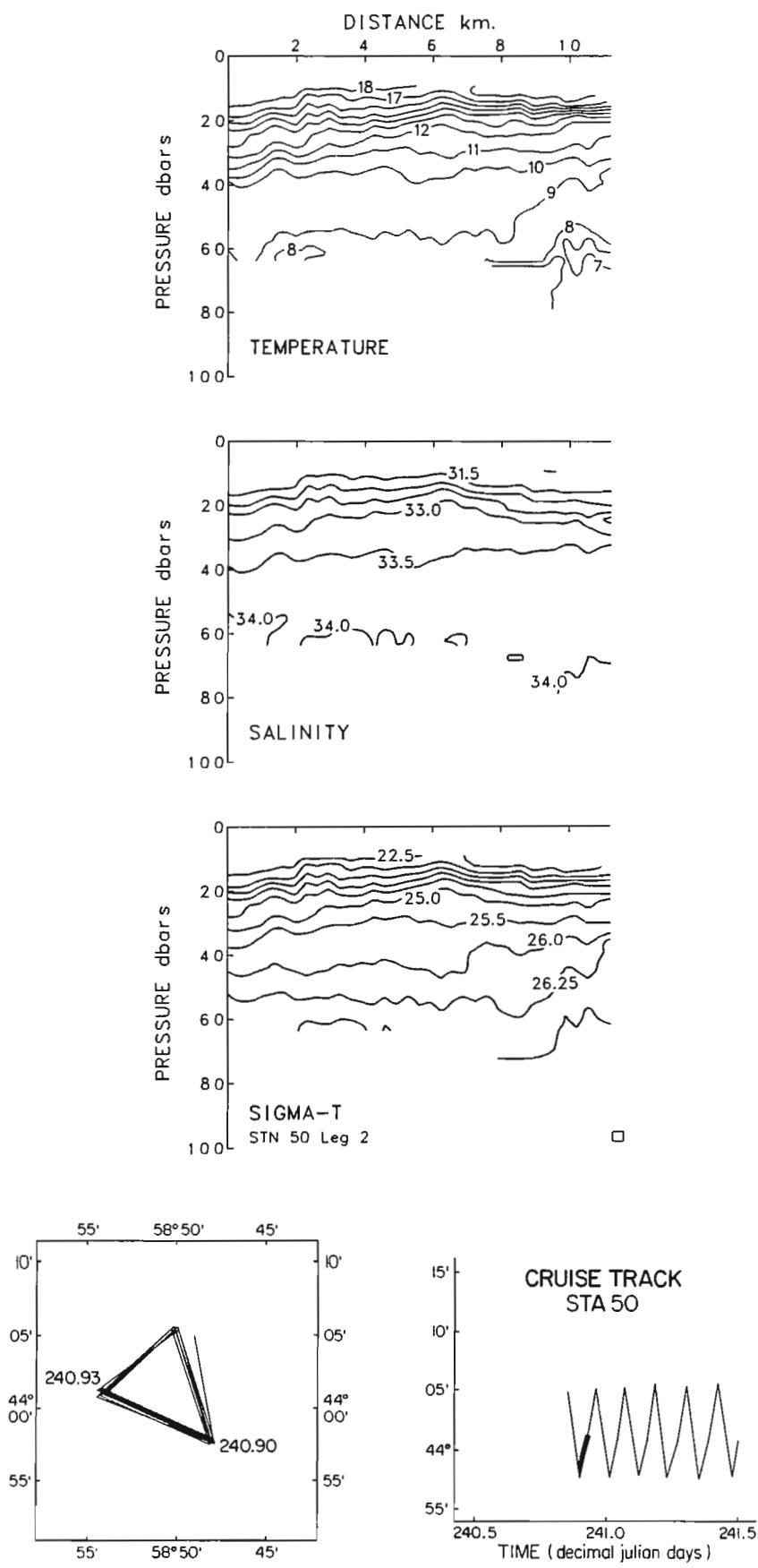


Fig. 159

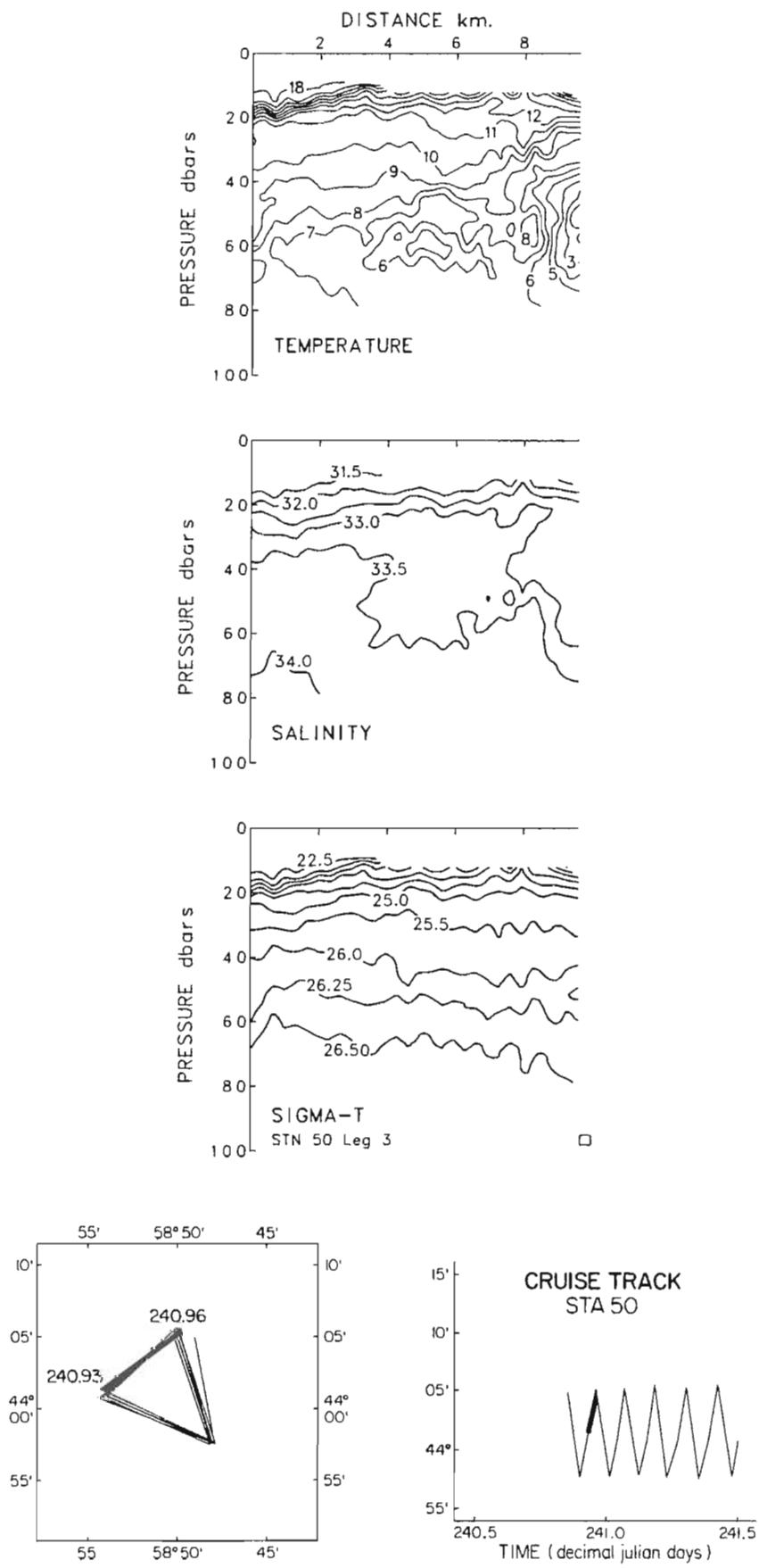


Fig. 160

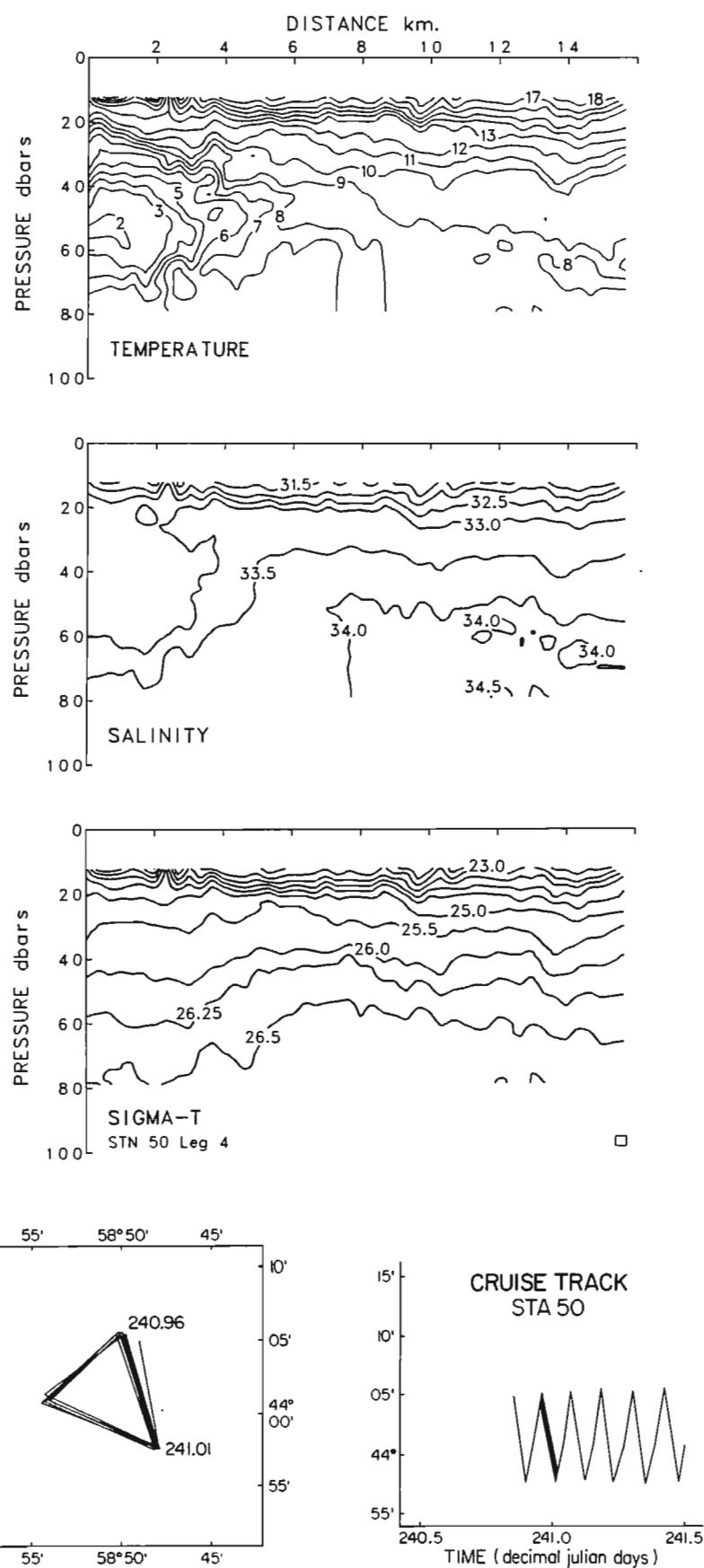


Fig. 161

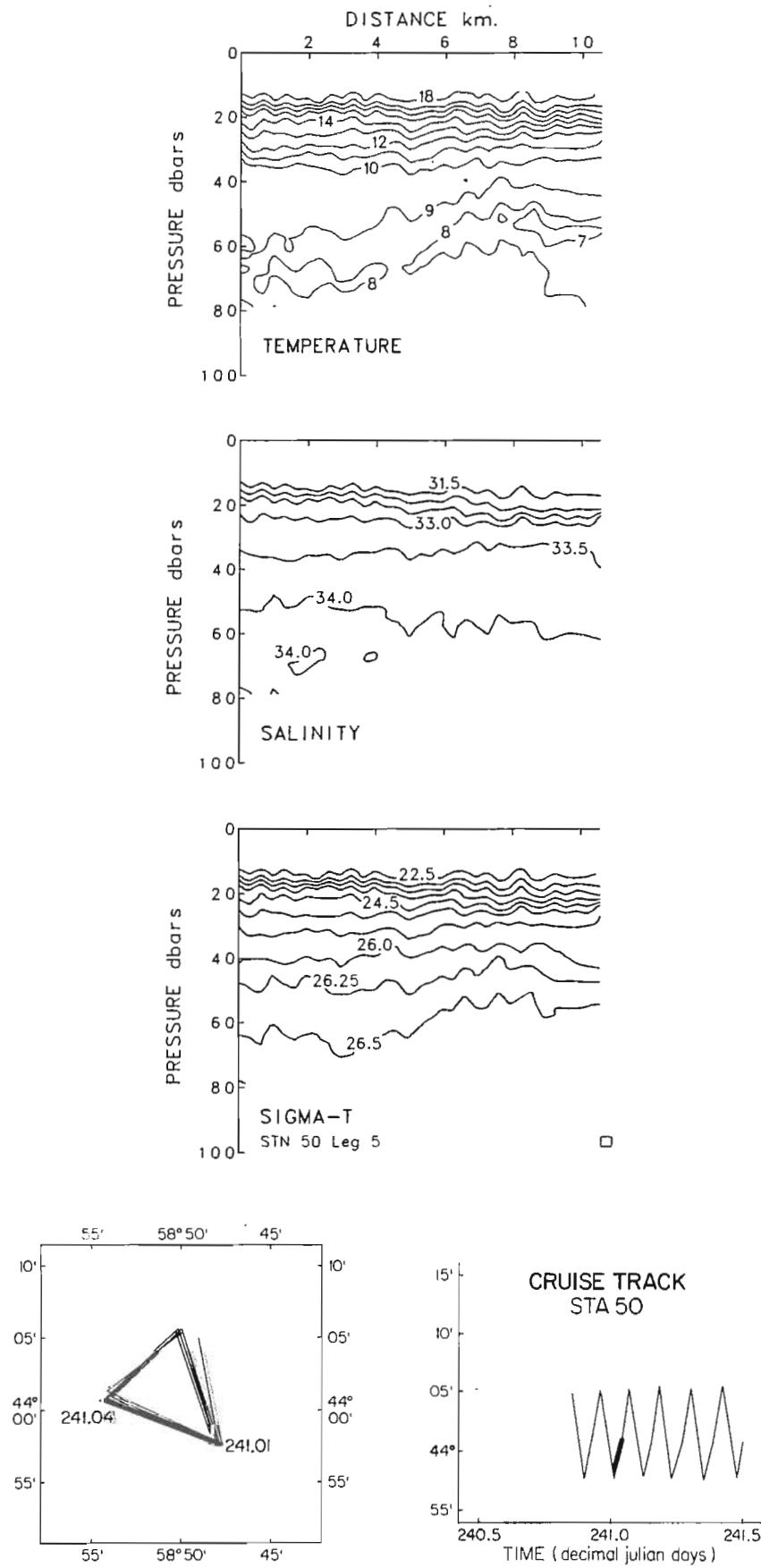


Fig. 162

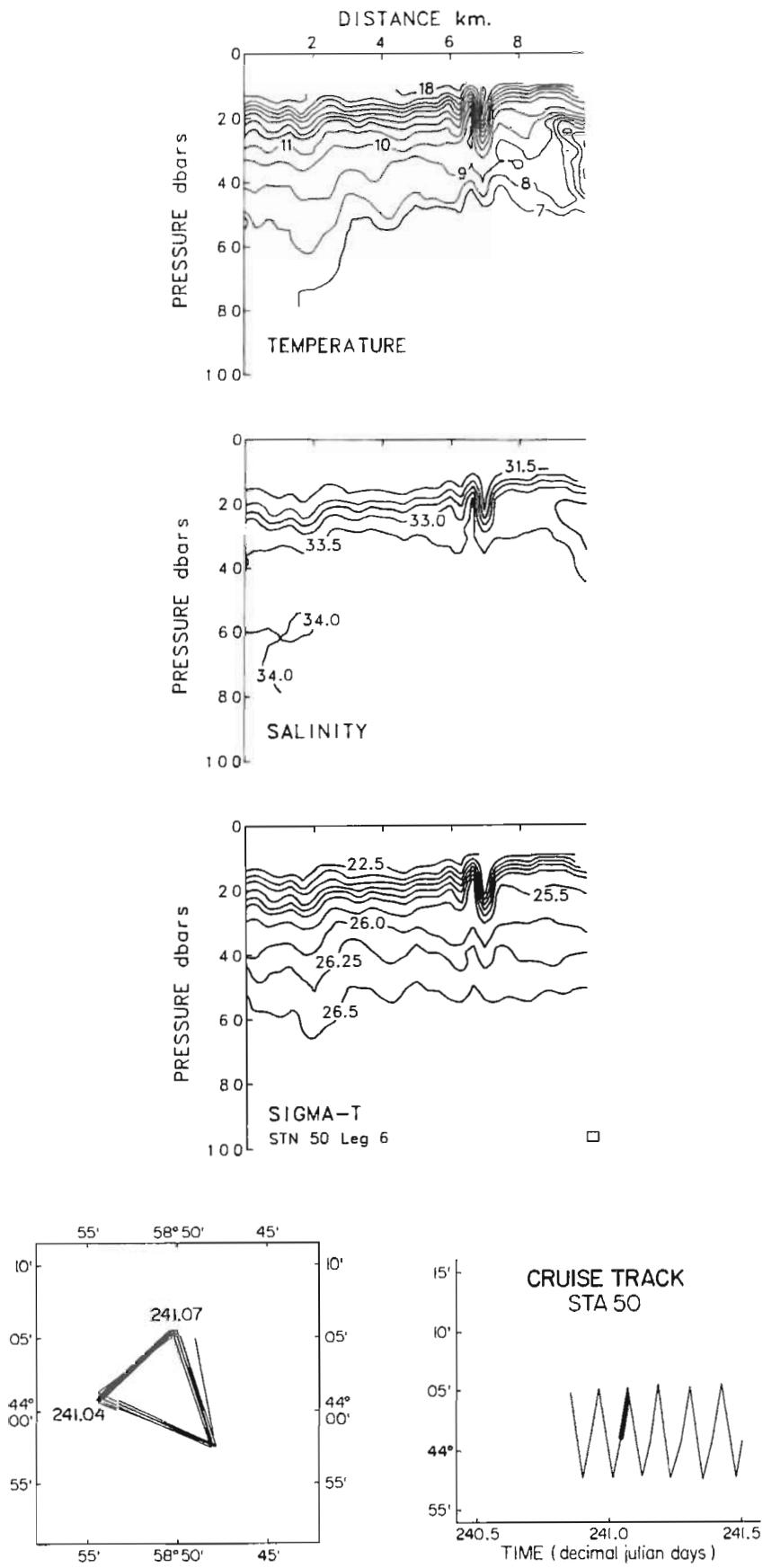
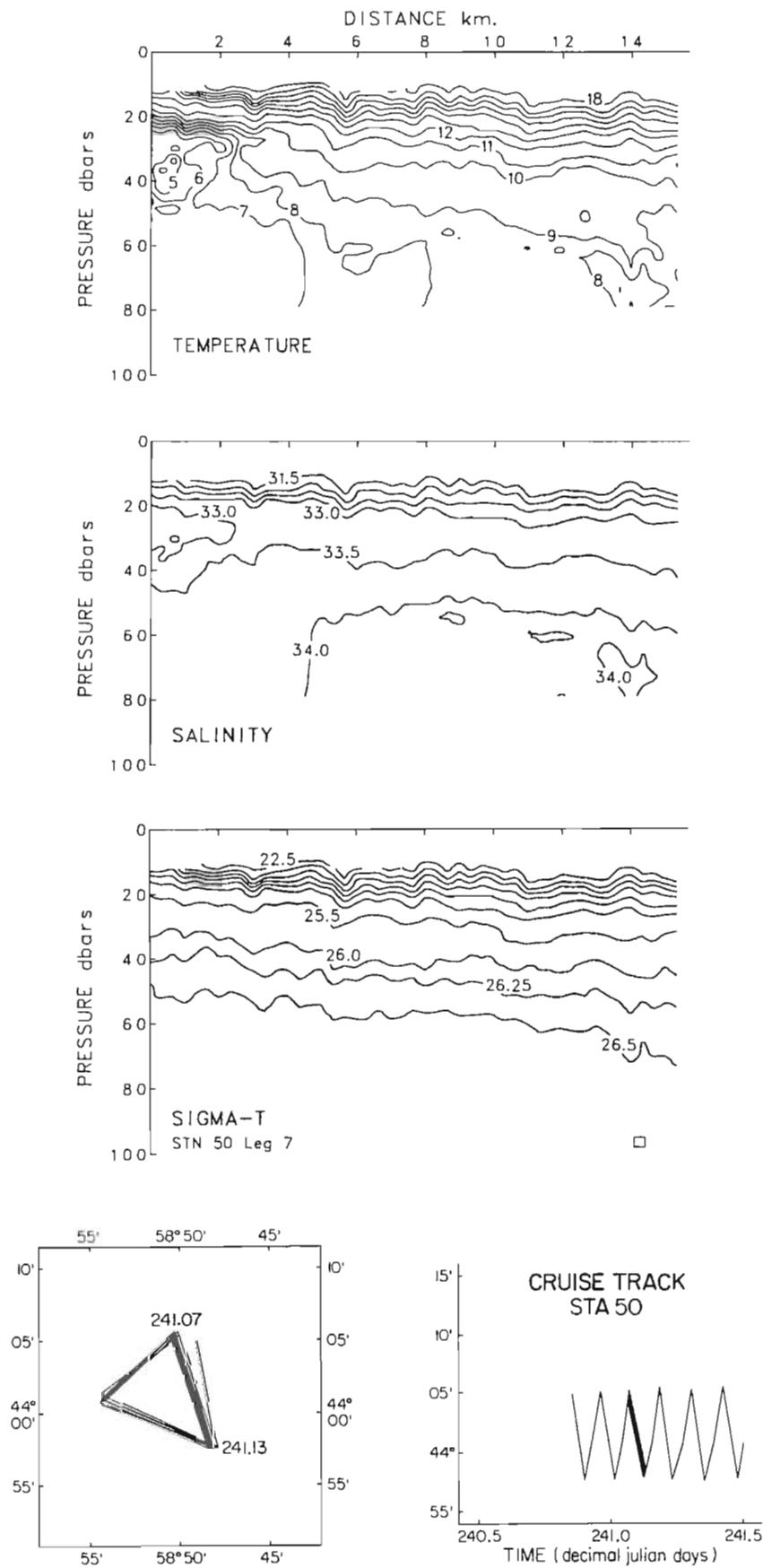


Fig. 163



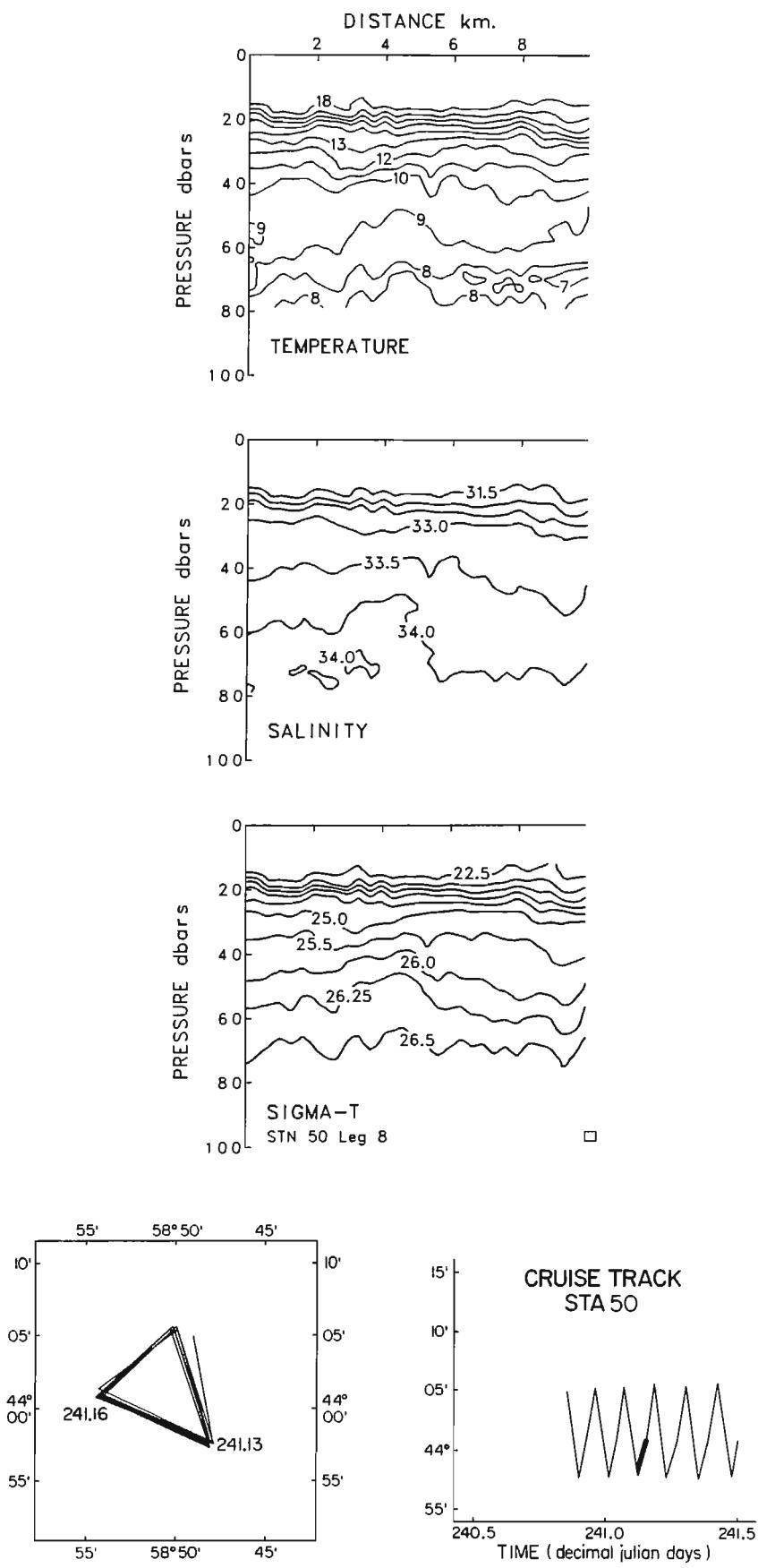


Fig. 165

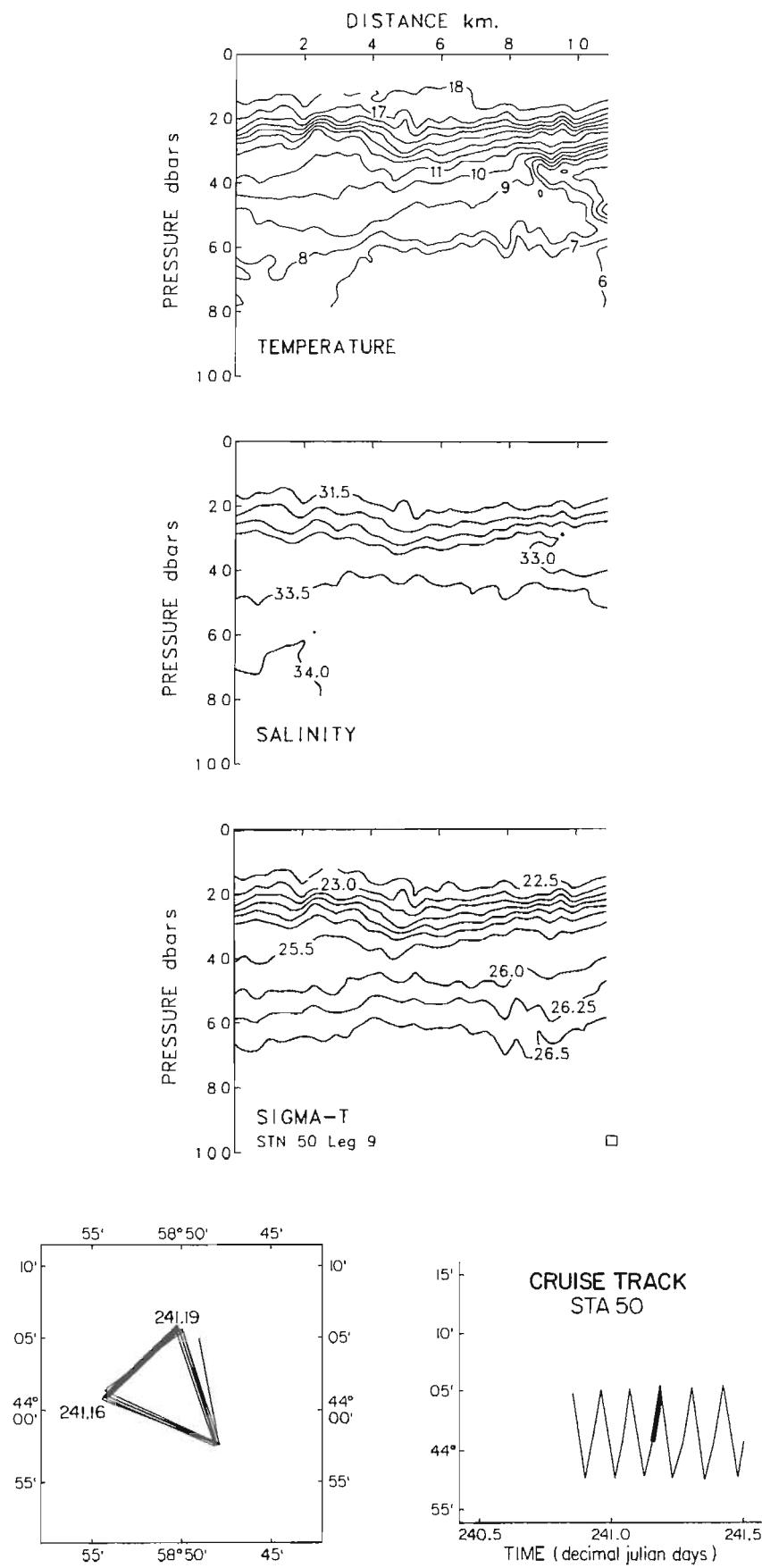


Fig. 166

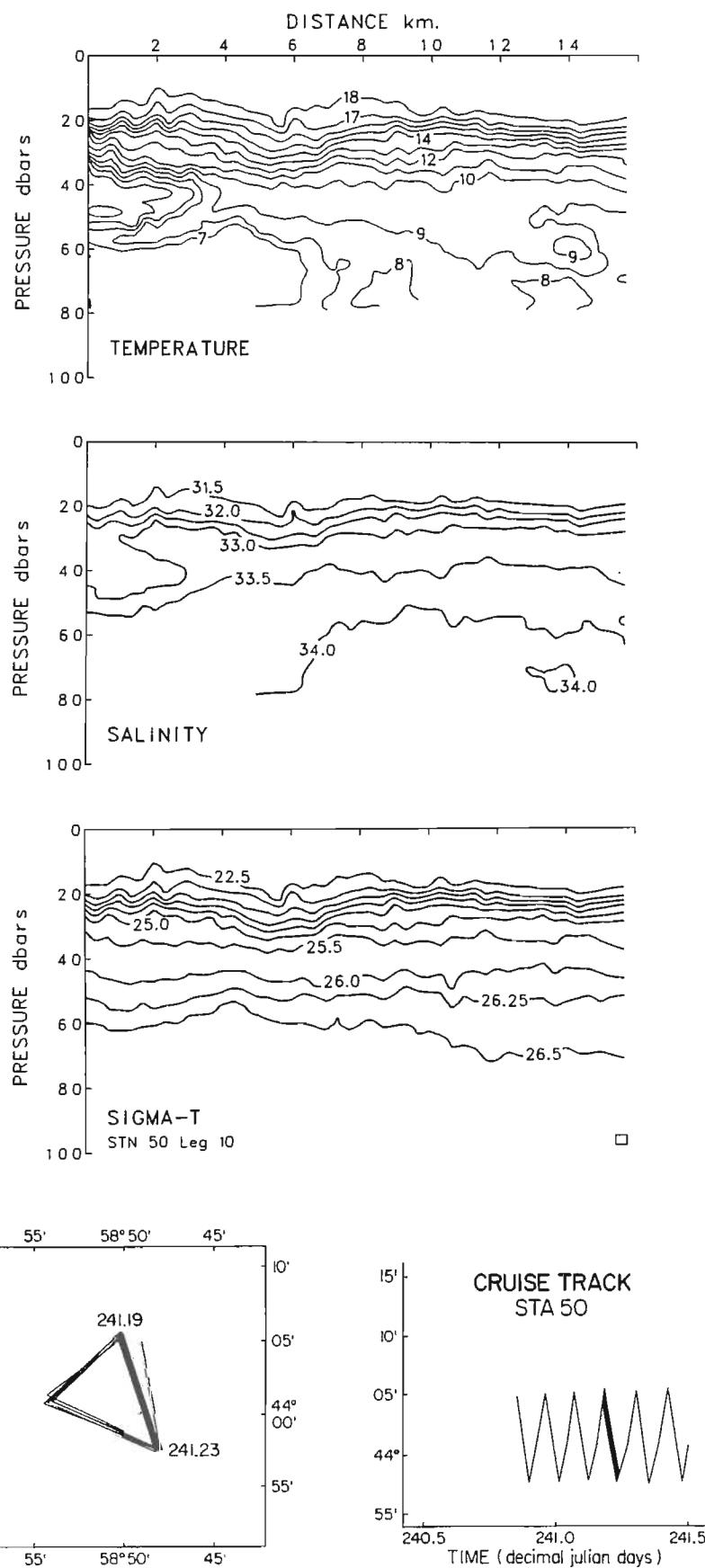
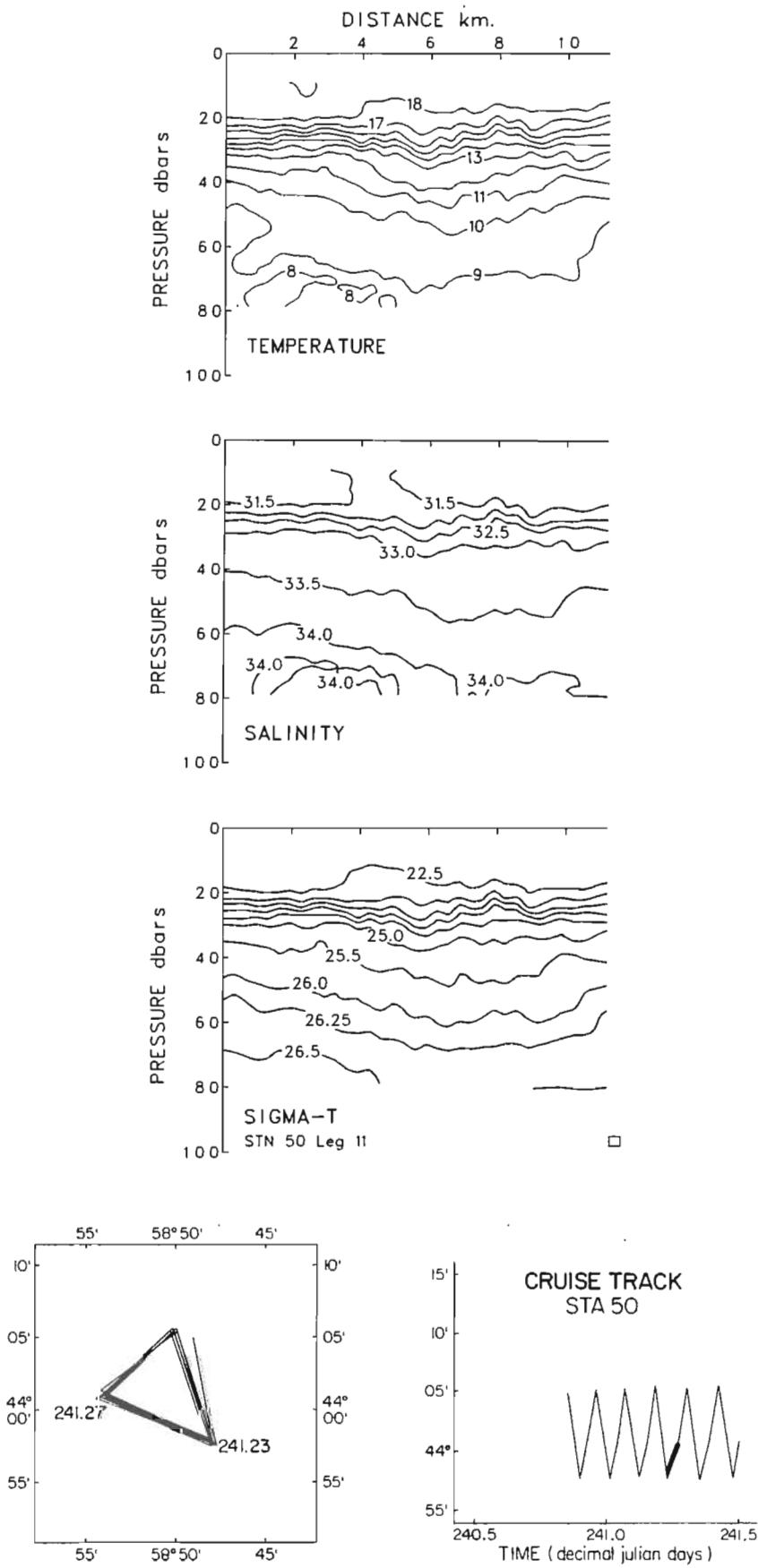


Fig. 167



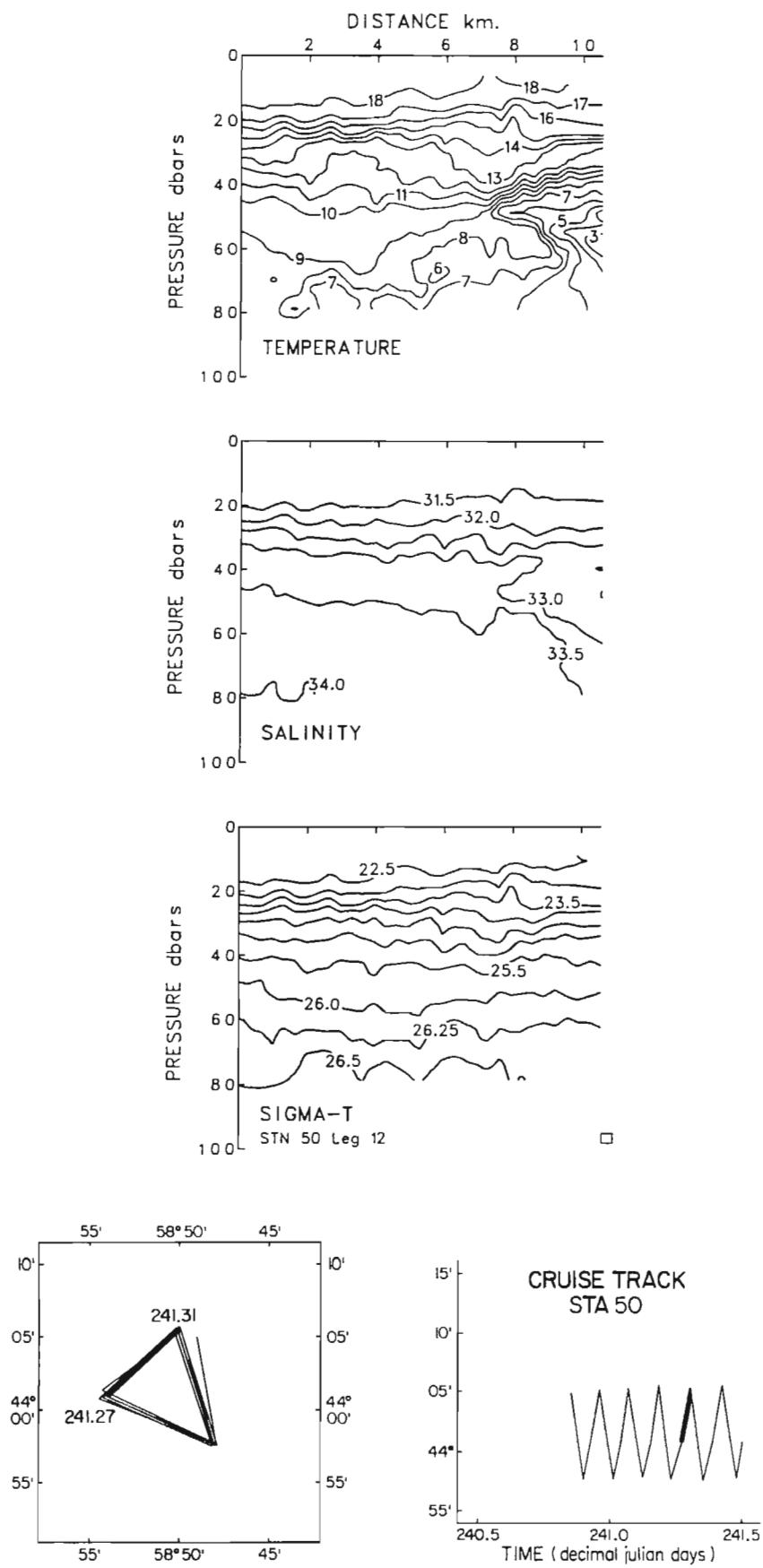


Fig. 169

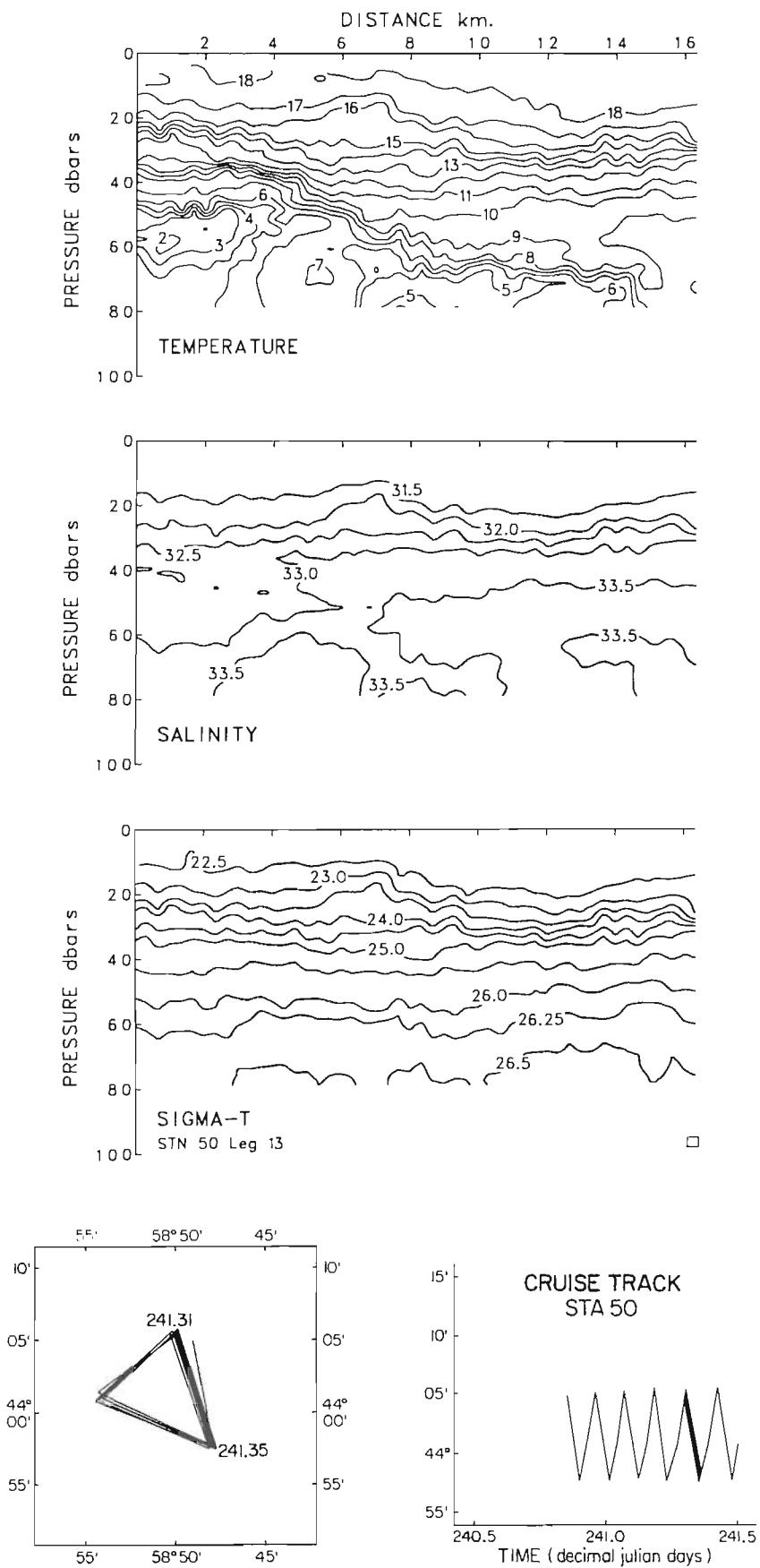


Fig. 170

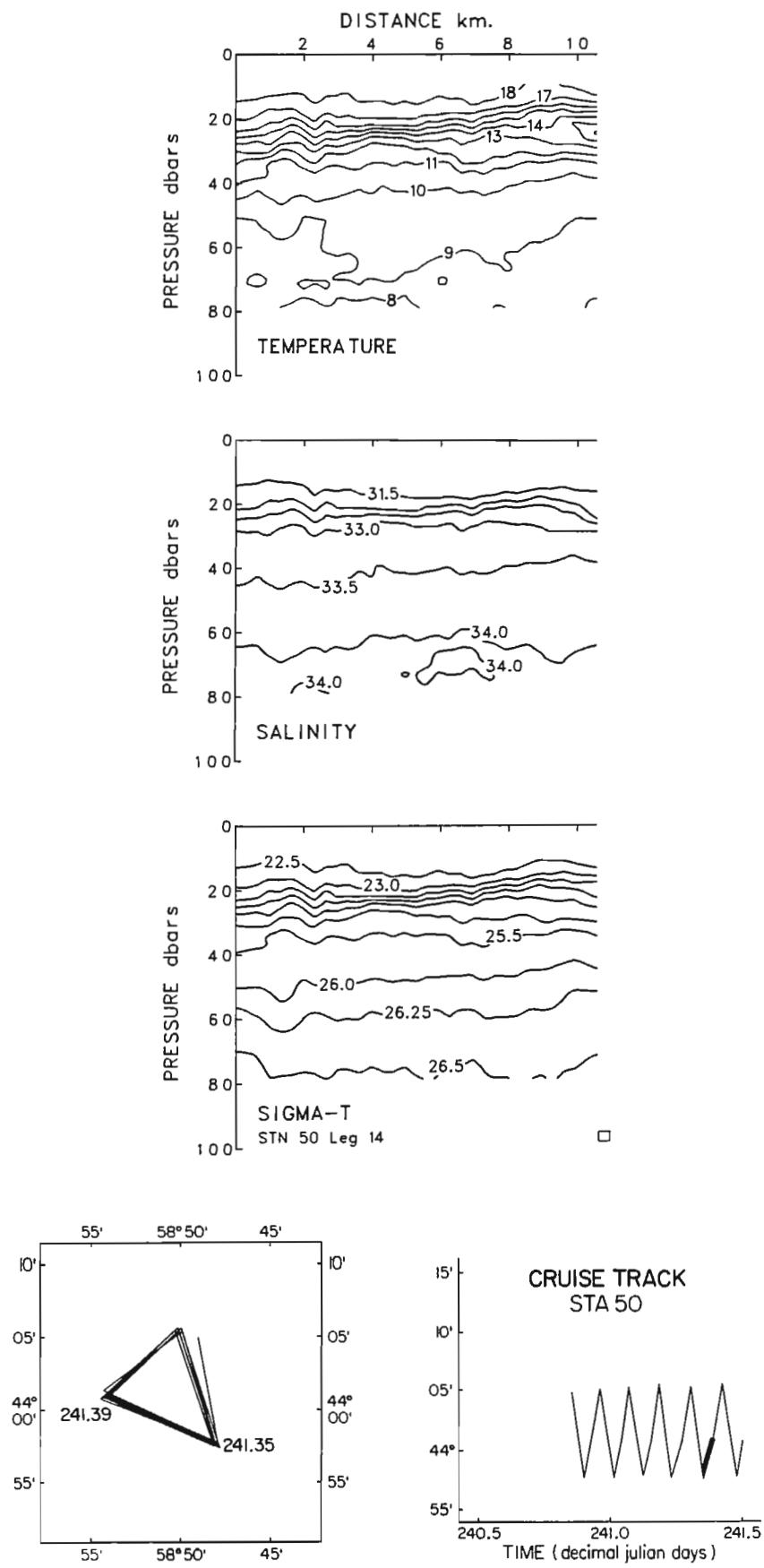


Fig. 171

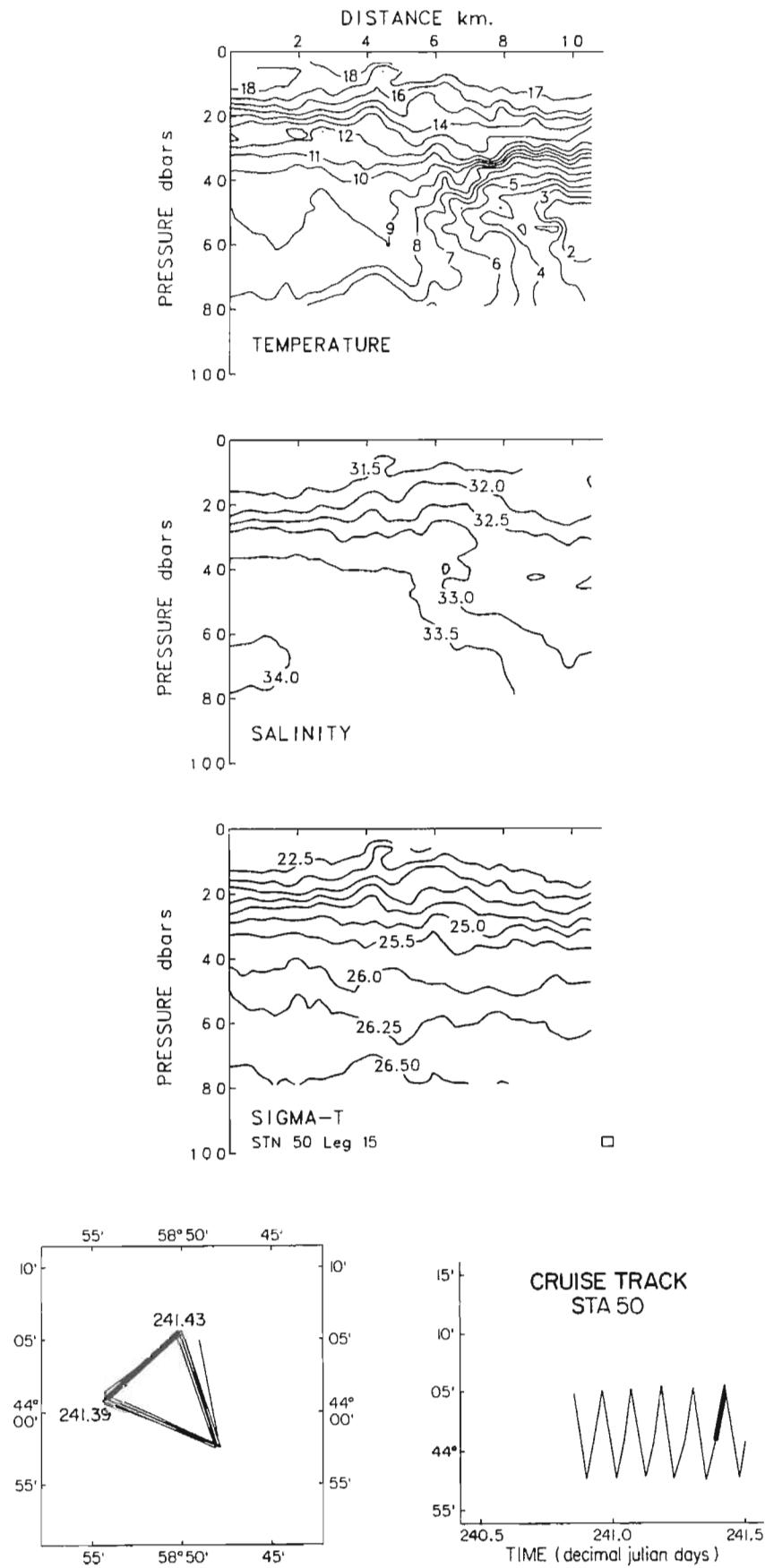


Fig. 172

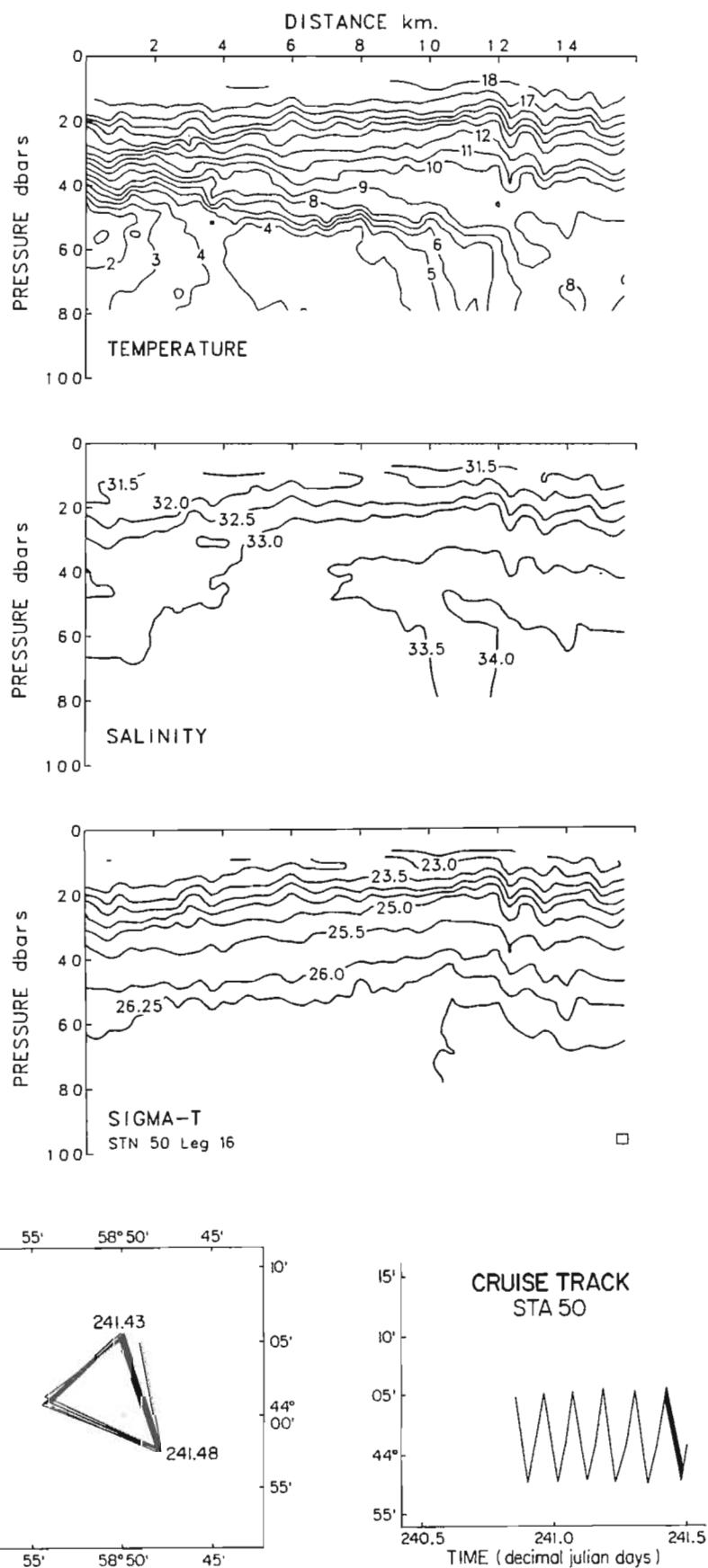


Fig. 173

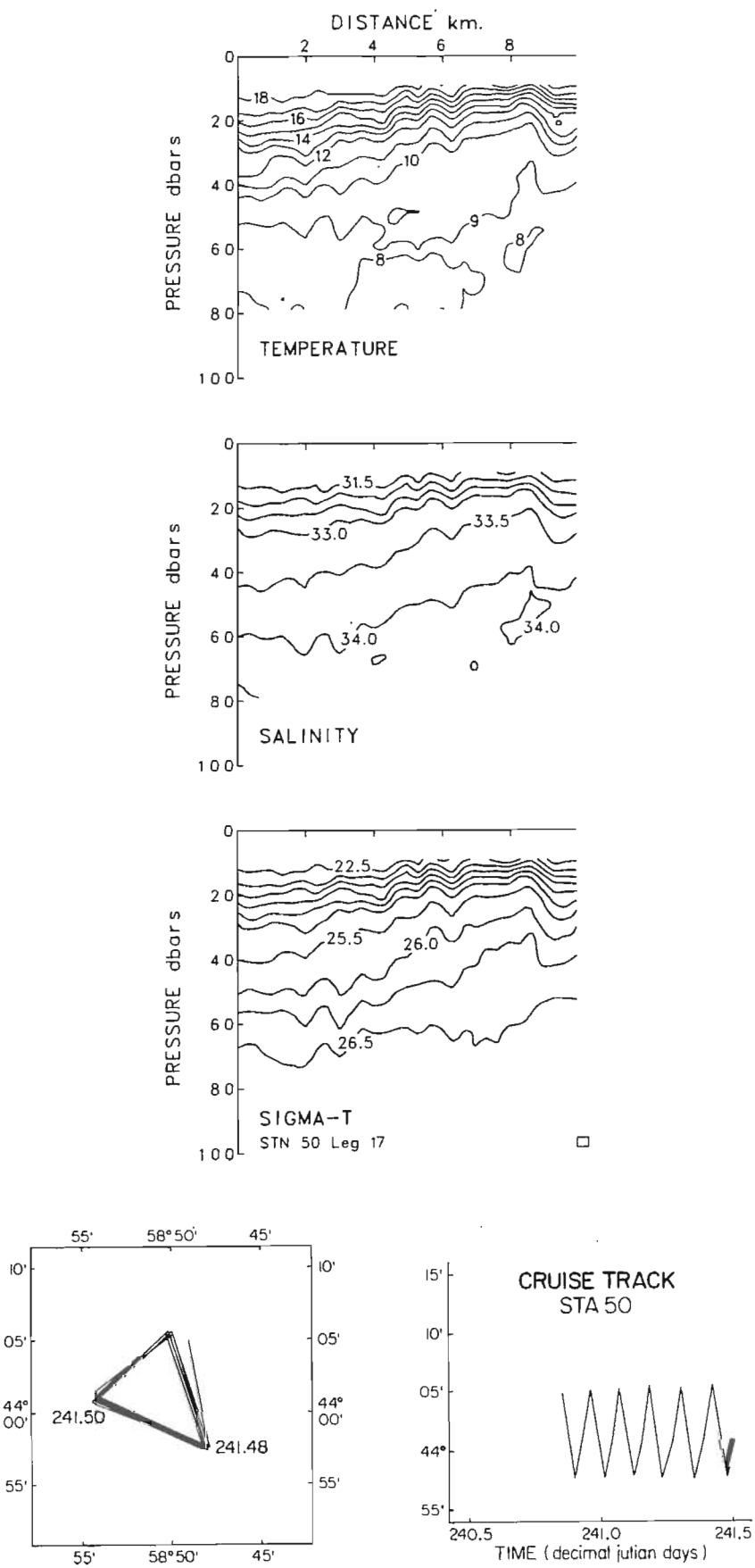


Fig. 174

Figures 175-188.

BATFISH station 51: 9 sections of Temperature, Salinity and Sigma-t vs. pressure,
location map and longitude vs. time plot. Acoustic backscatter plots for selected sections.

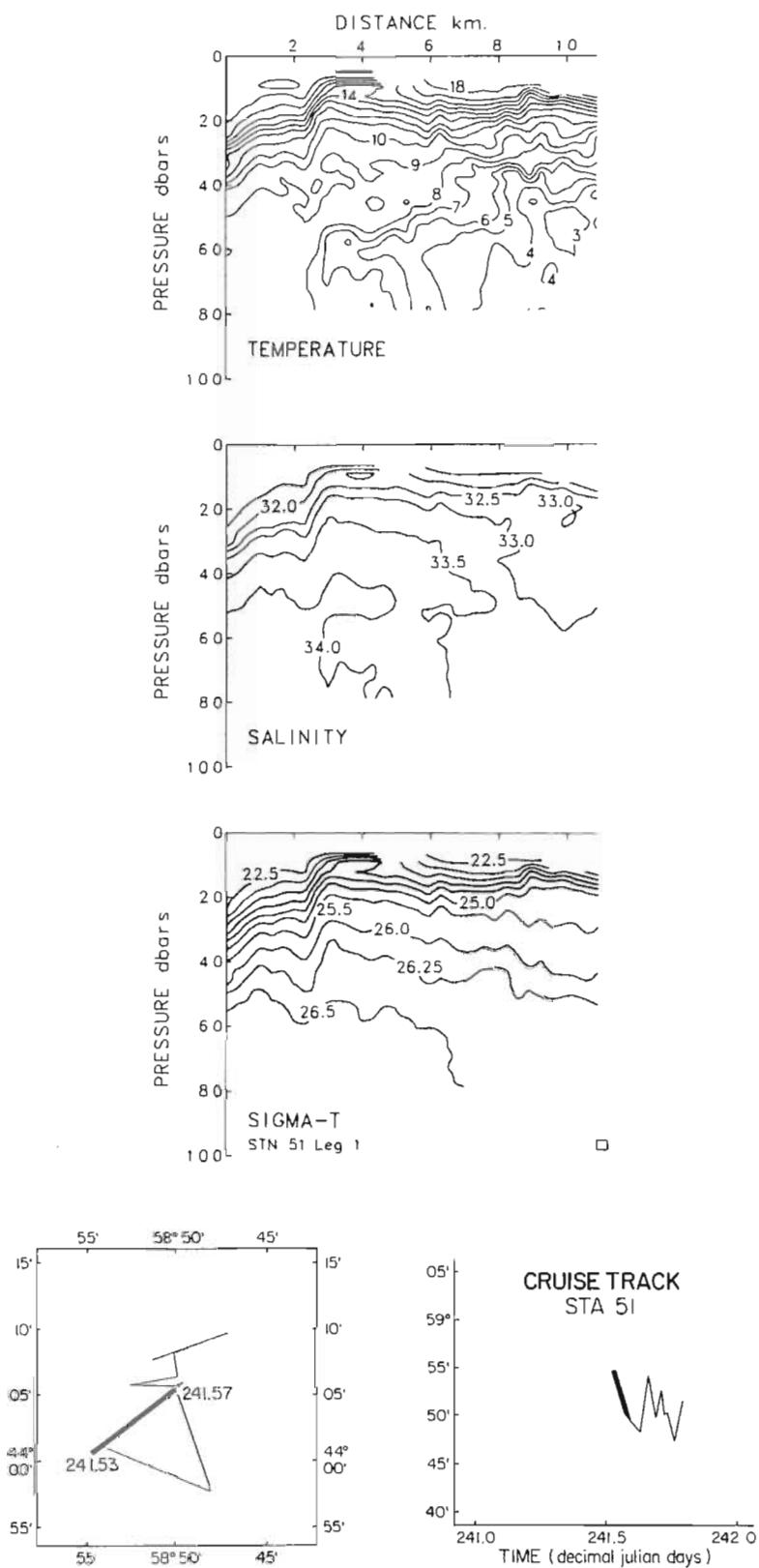


Fig. 175

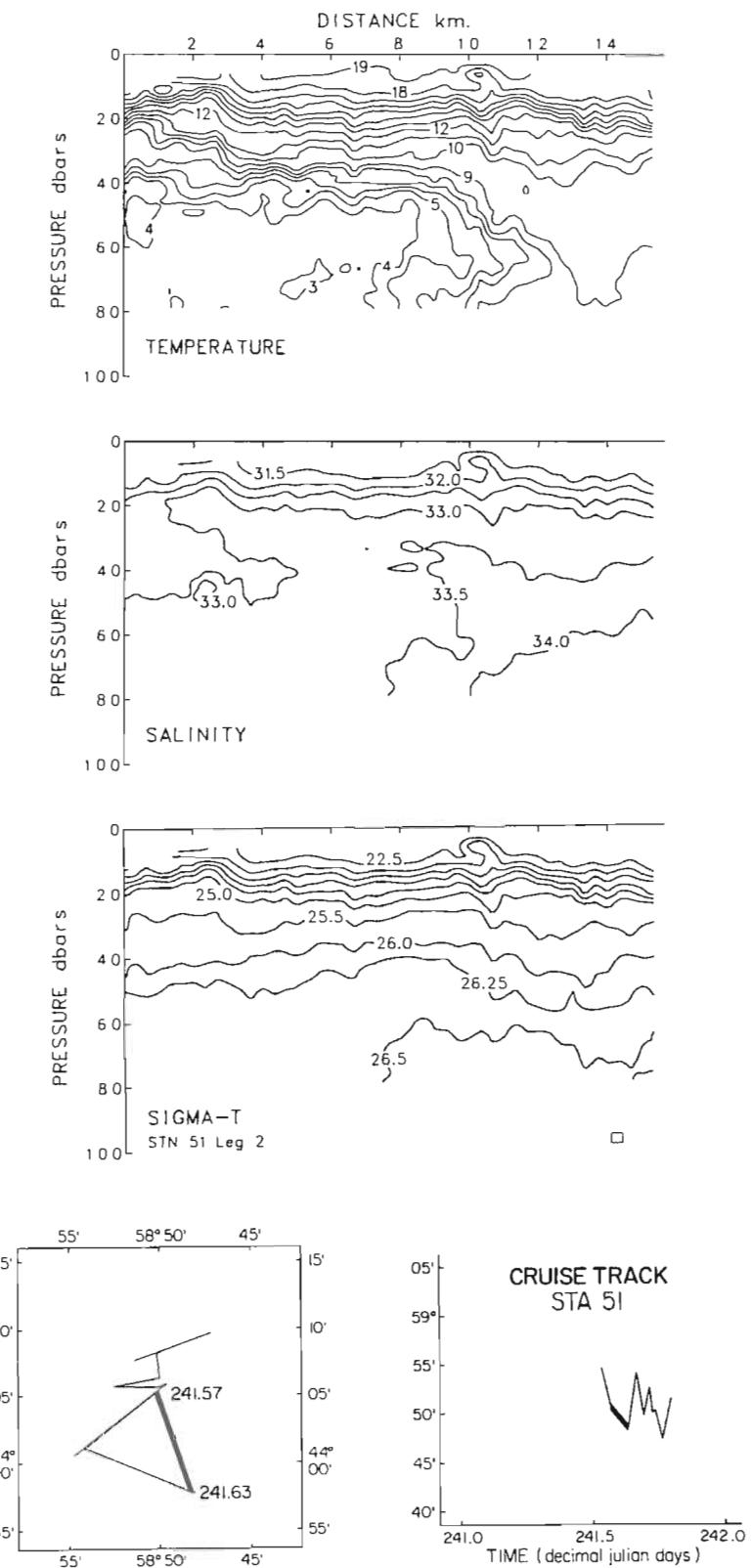


Fig. 176

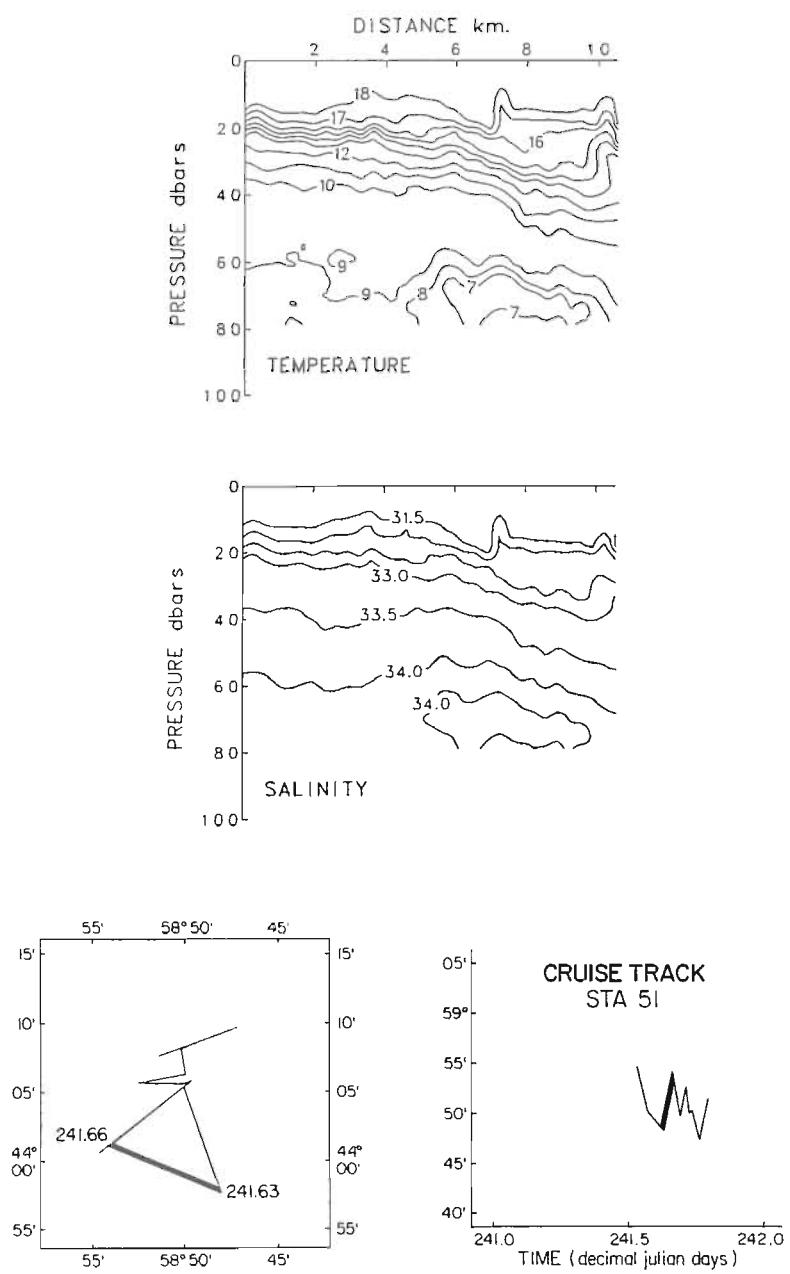


Fig. 177

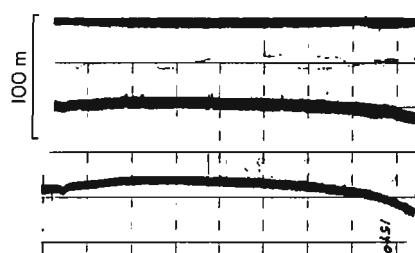
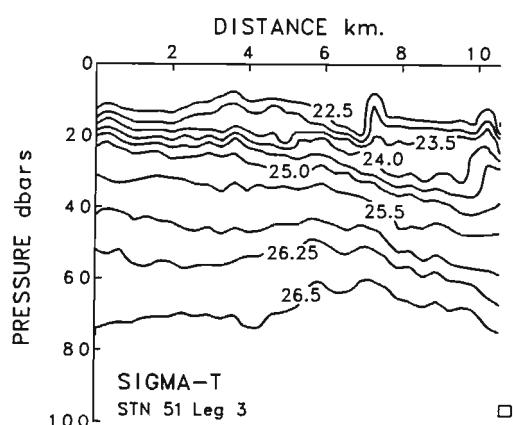


Fig. 178

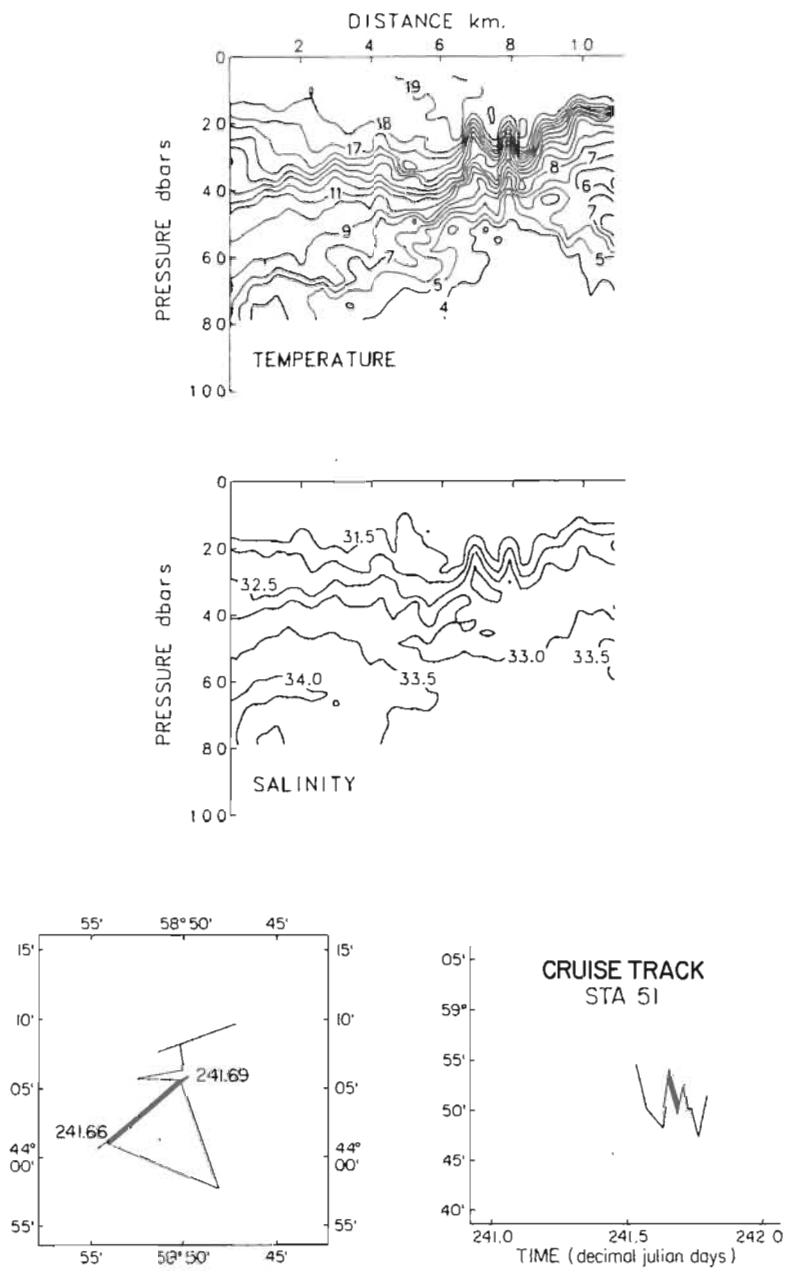


Fig. 179

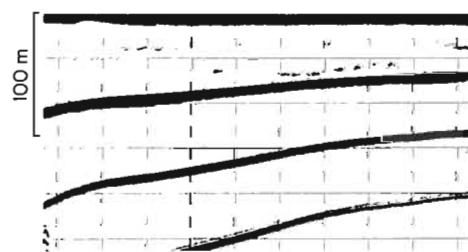
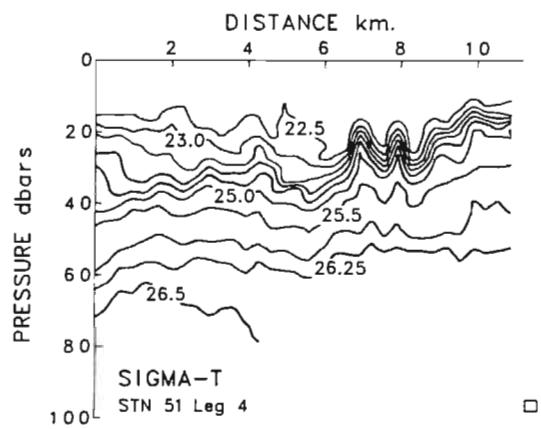


Fig. 180

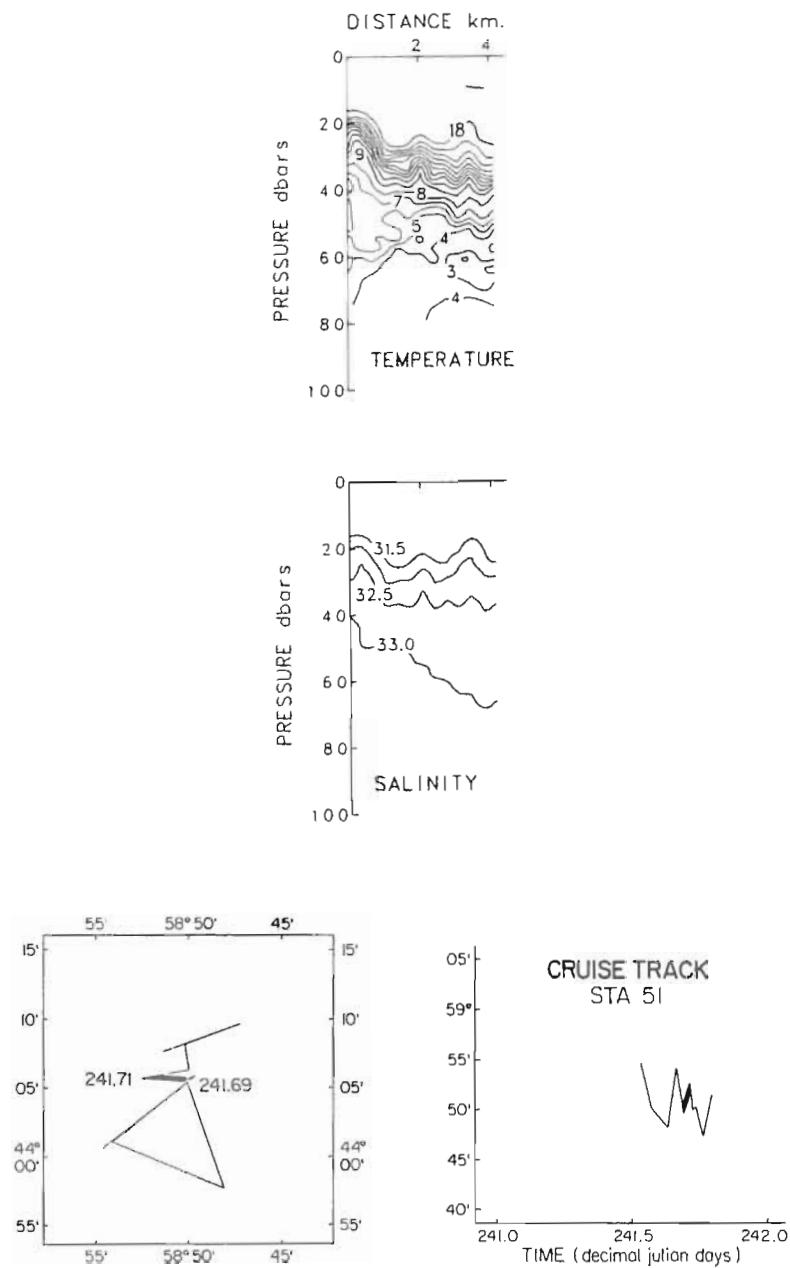


Fig. 181

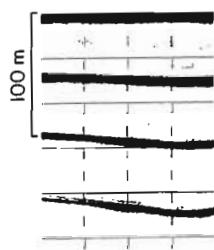
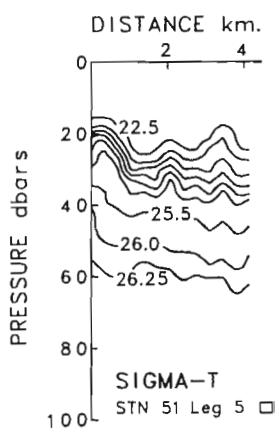


Fig. 182

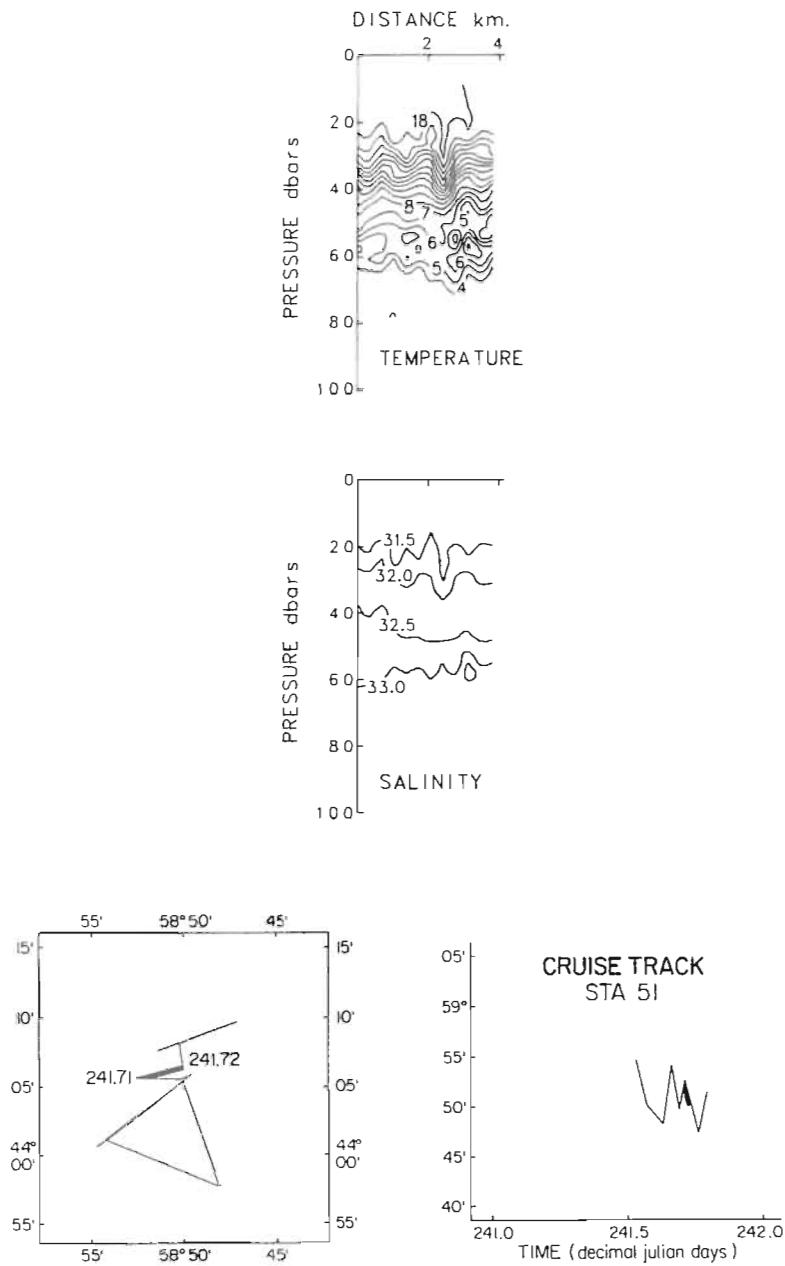


Fig. 183

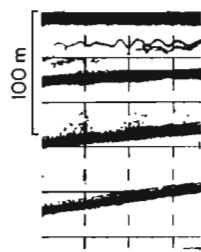
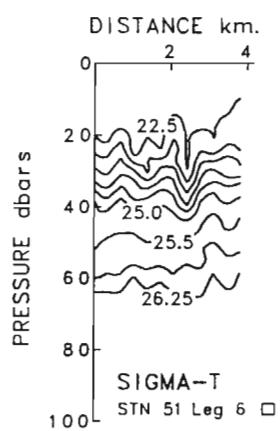


Fig. 184

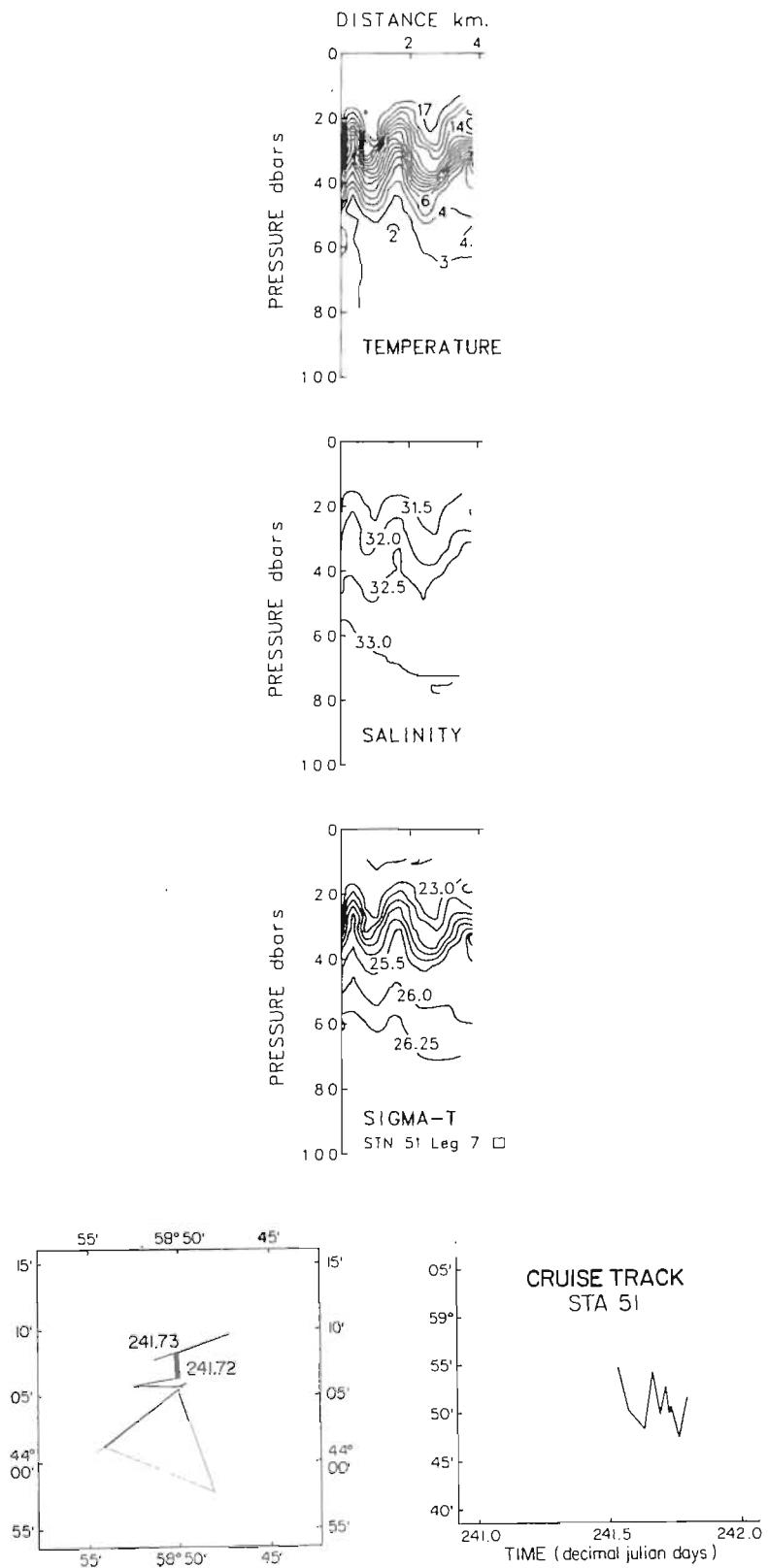


Fig. 185

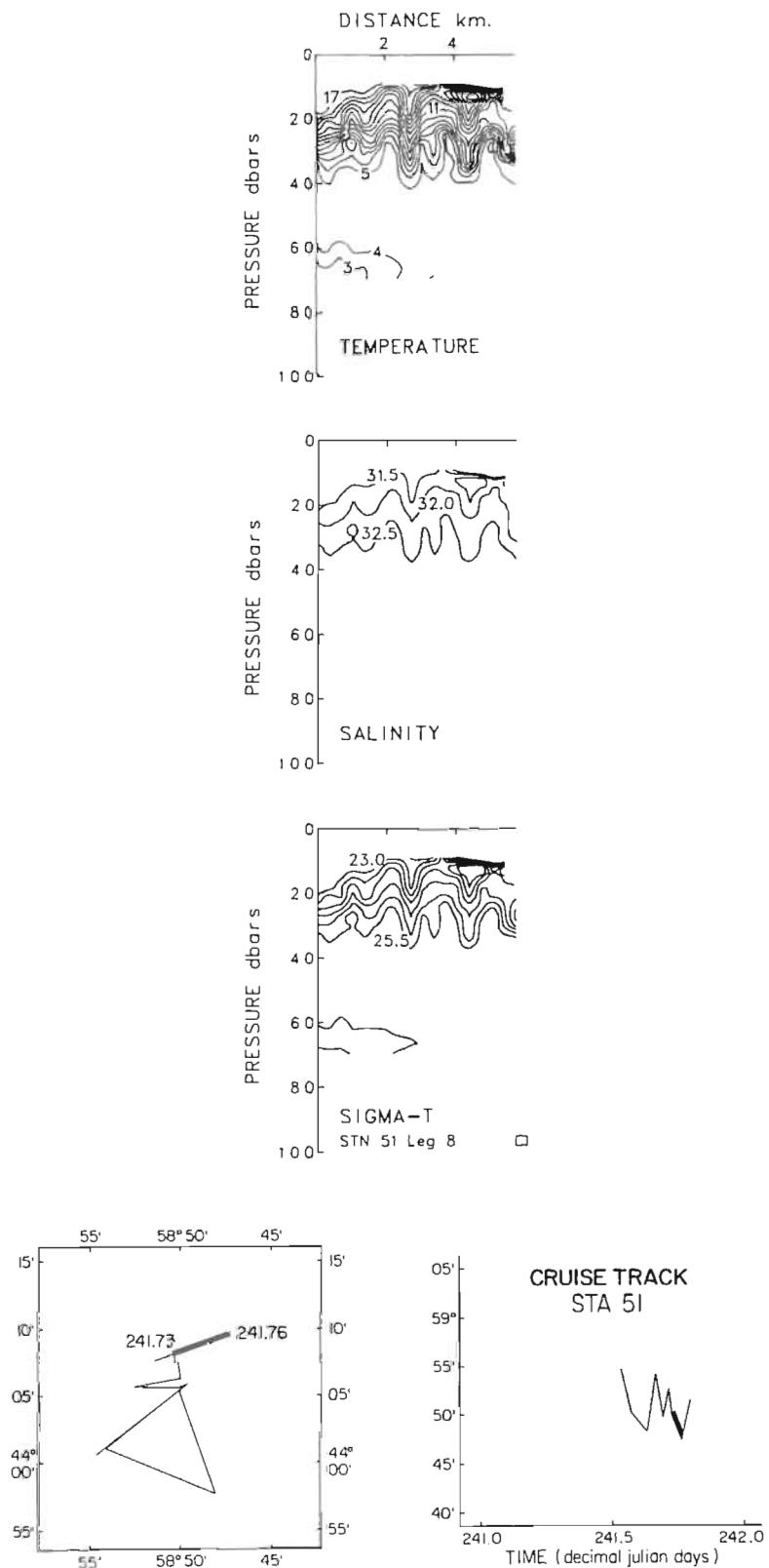


Fig. 186

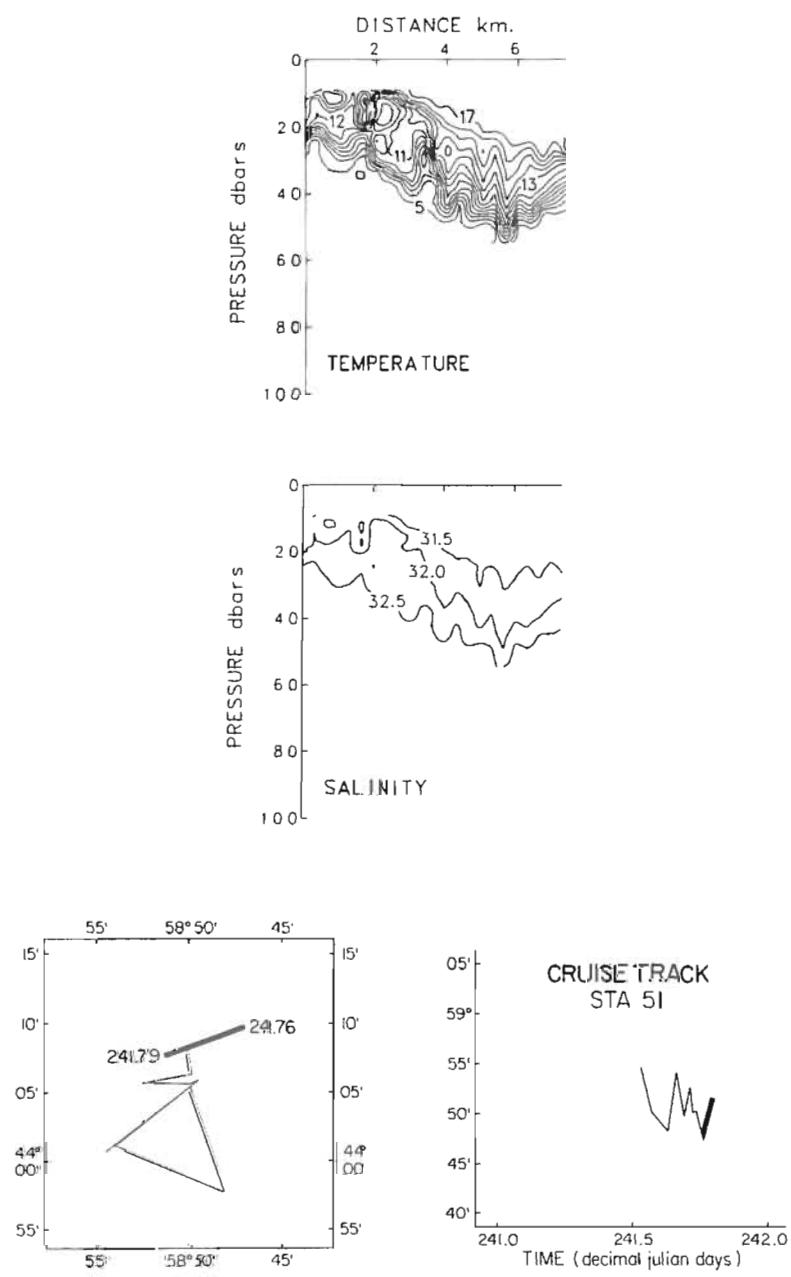


Fig. 187

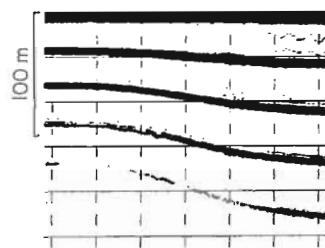
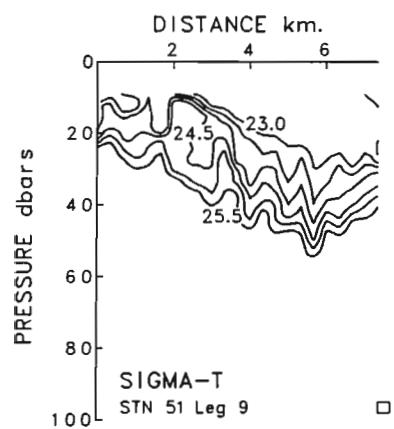


Fig. 188

Figures 189-223.

BATFISH station 52: 26 sections of Temperature, Salinity and Sigma-t vs. pressure,
location map and latitude vs. time plot. Acoustic backscatter plots for selected sections.

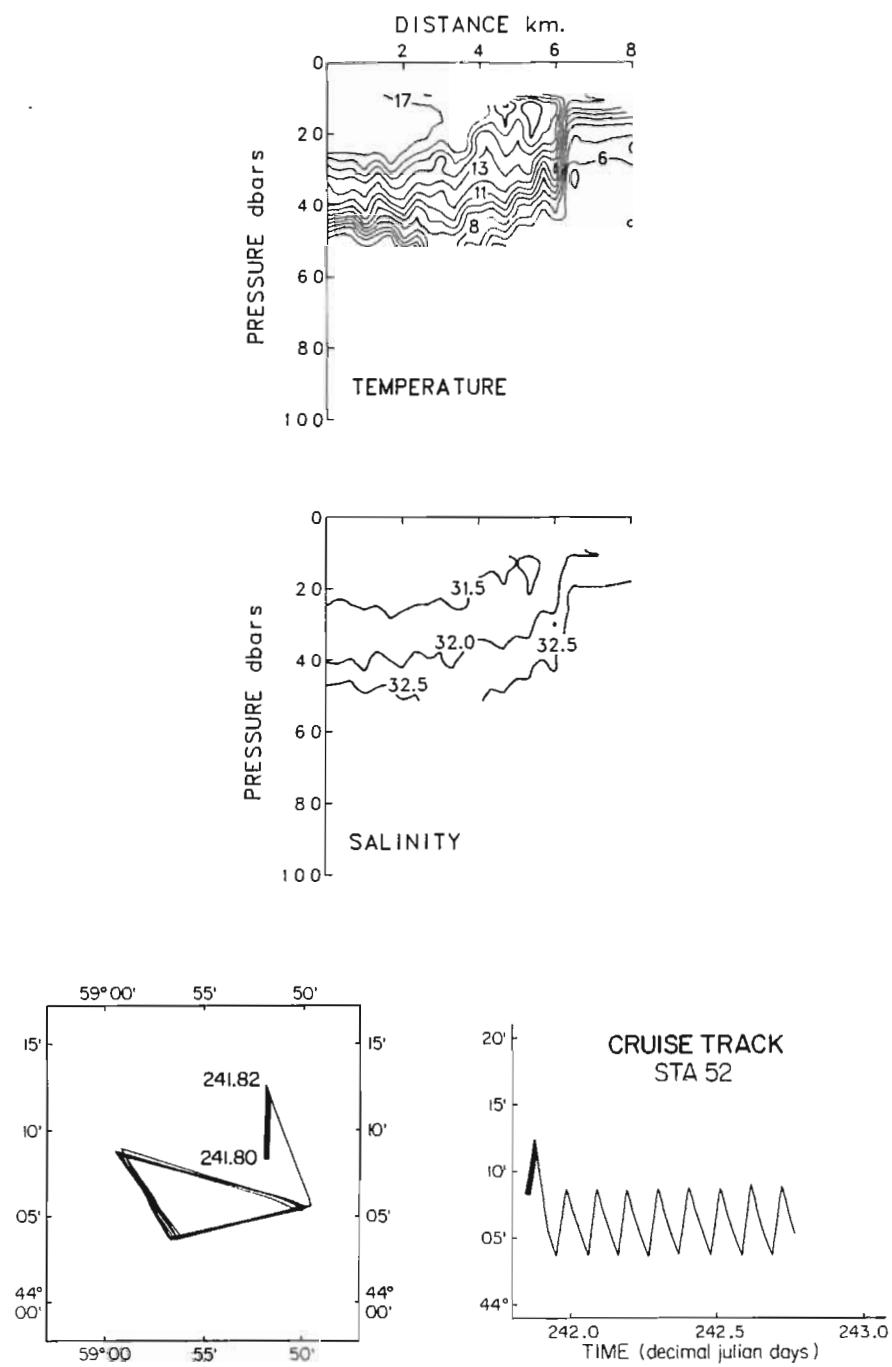


Fig. 189

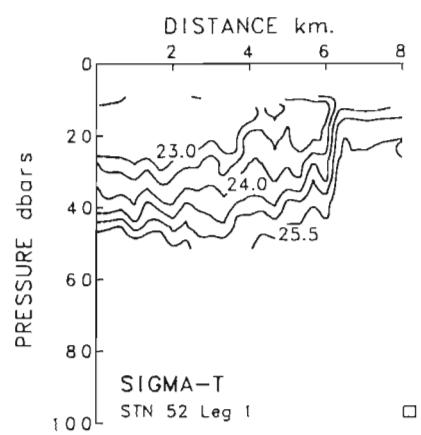
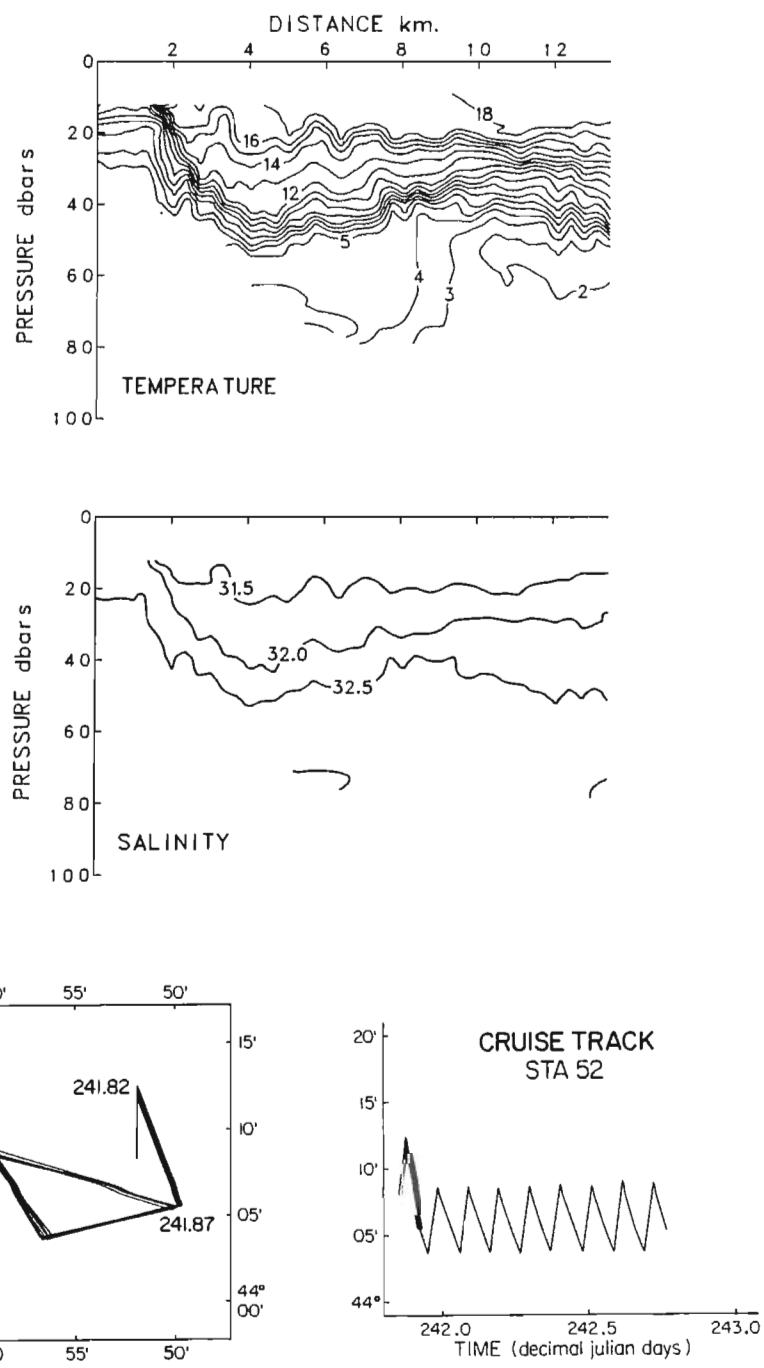


Fig. 190



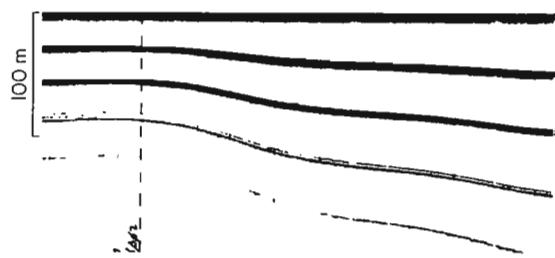
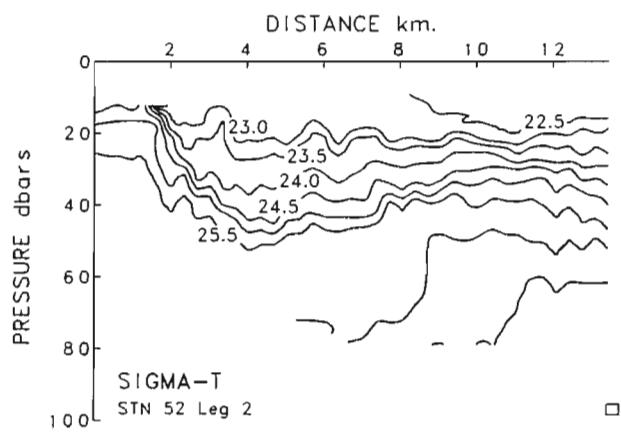


Fig. 192

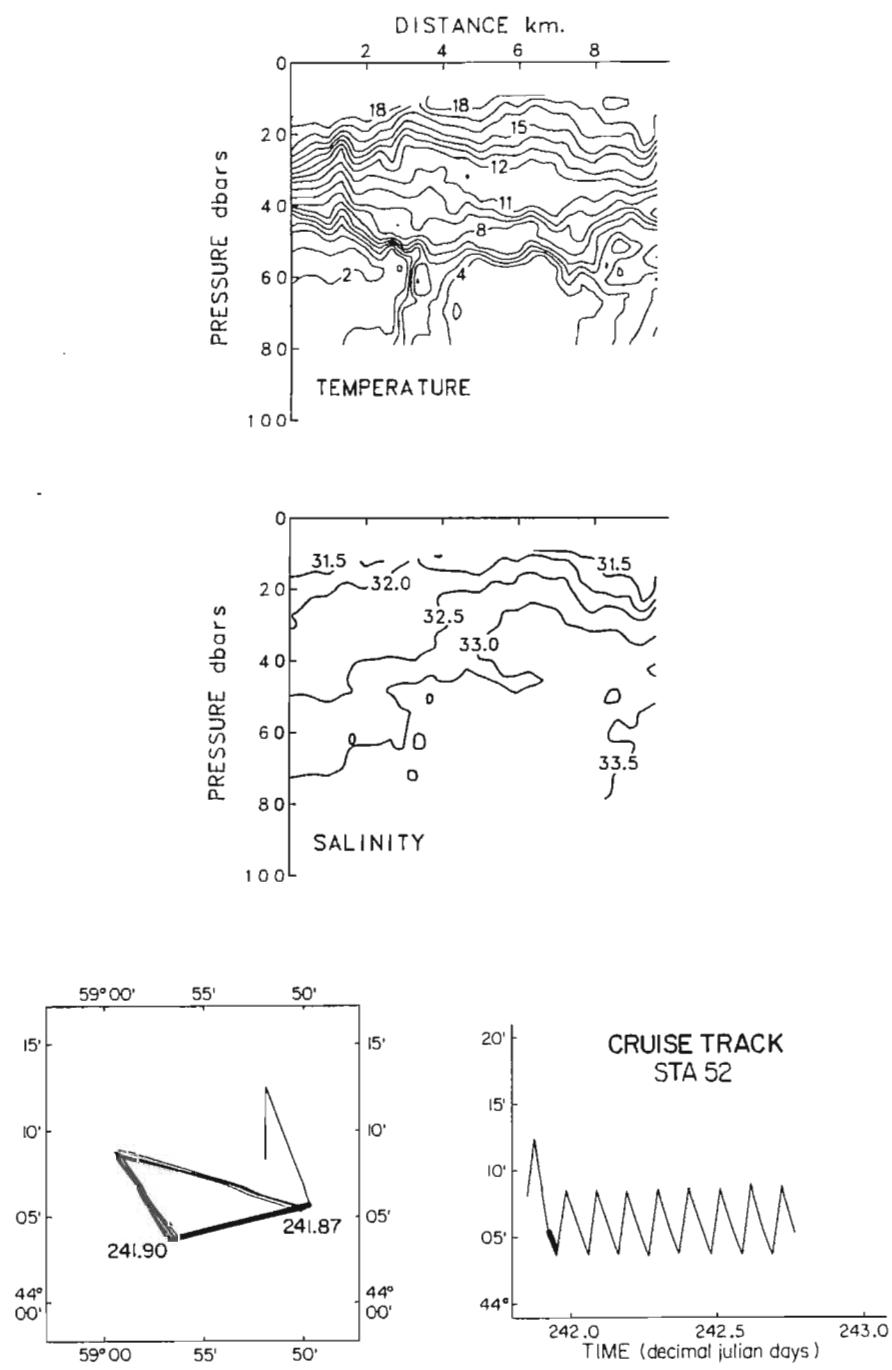


Fig. 193

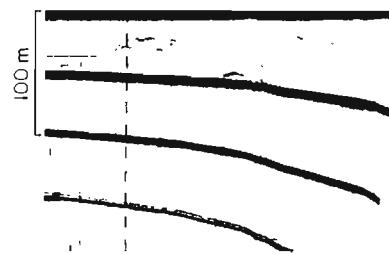
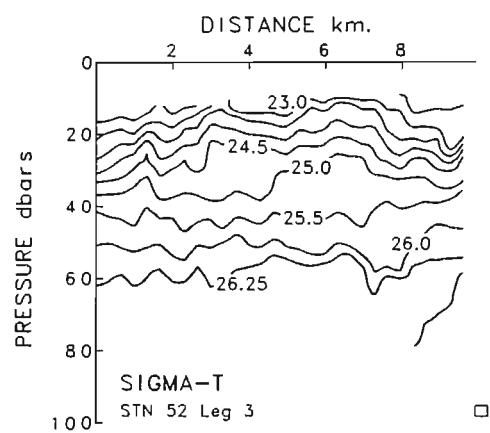


Fig. 194

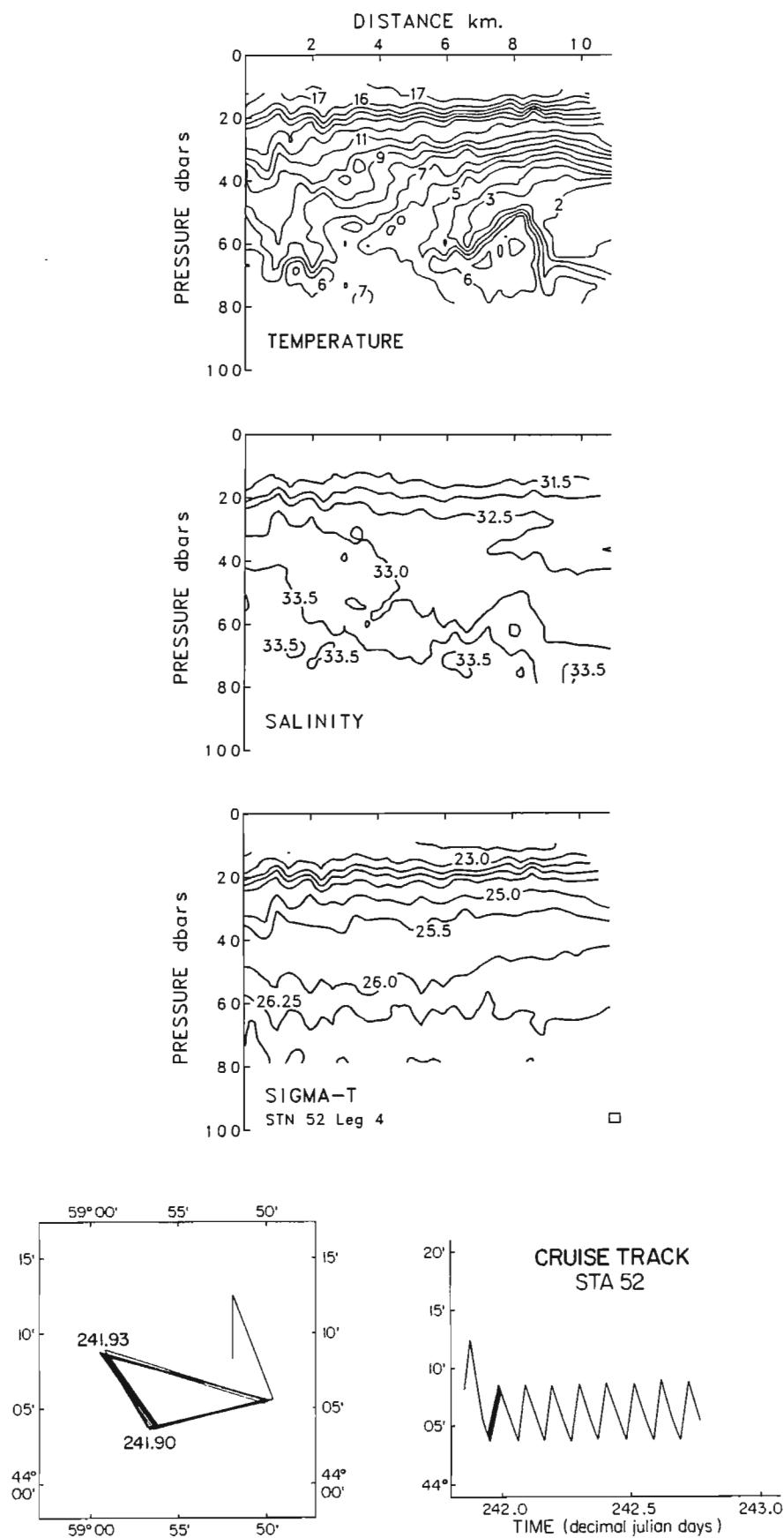


Fig. 195

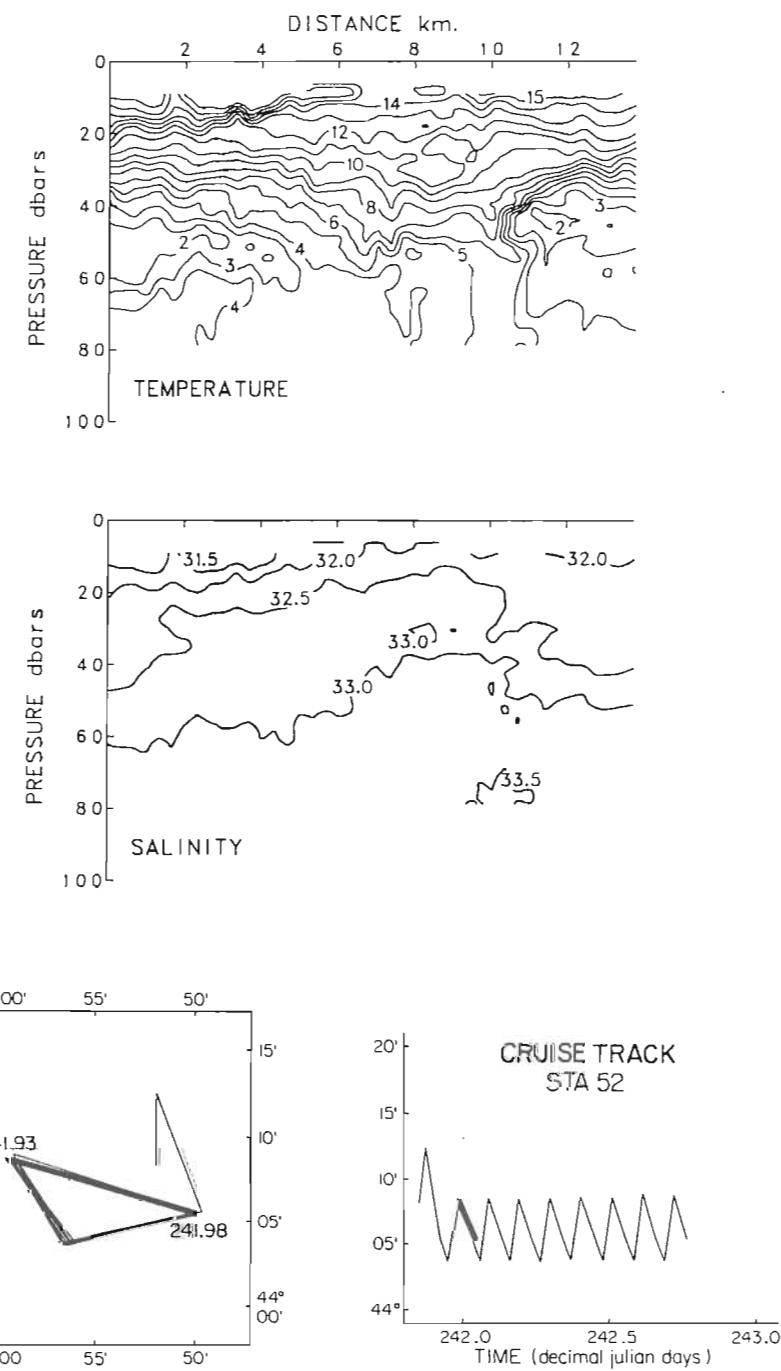


Fig. 196

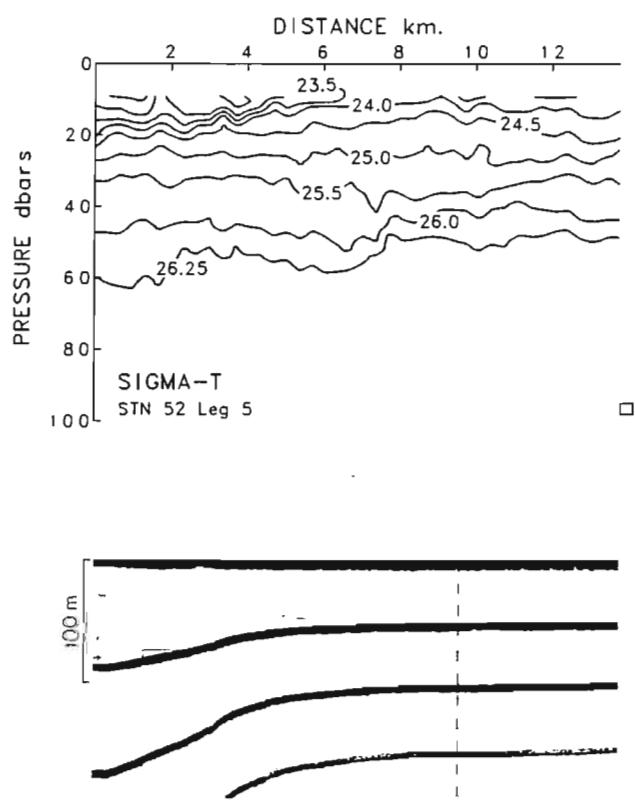


Fig. 197

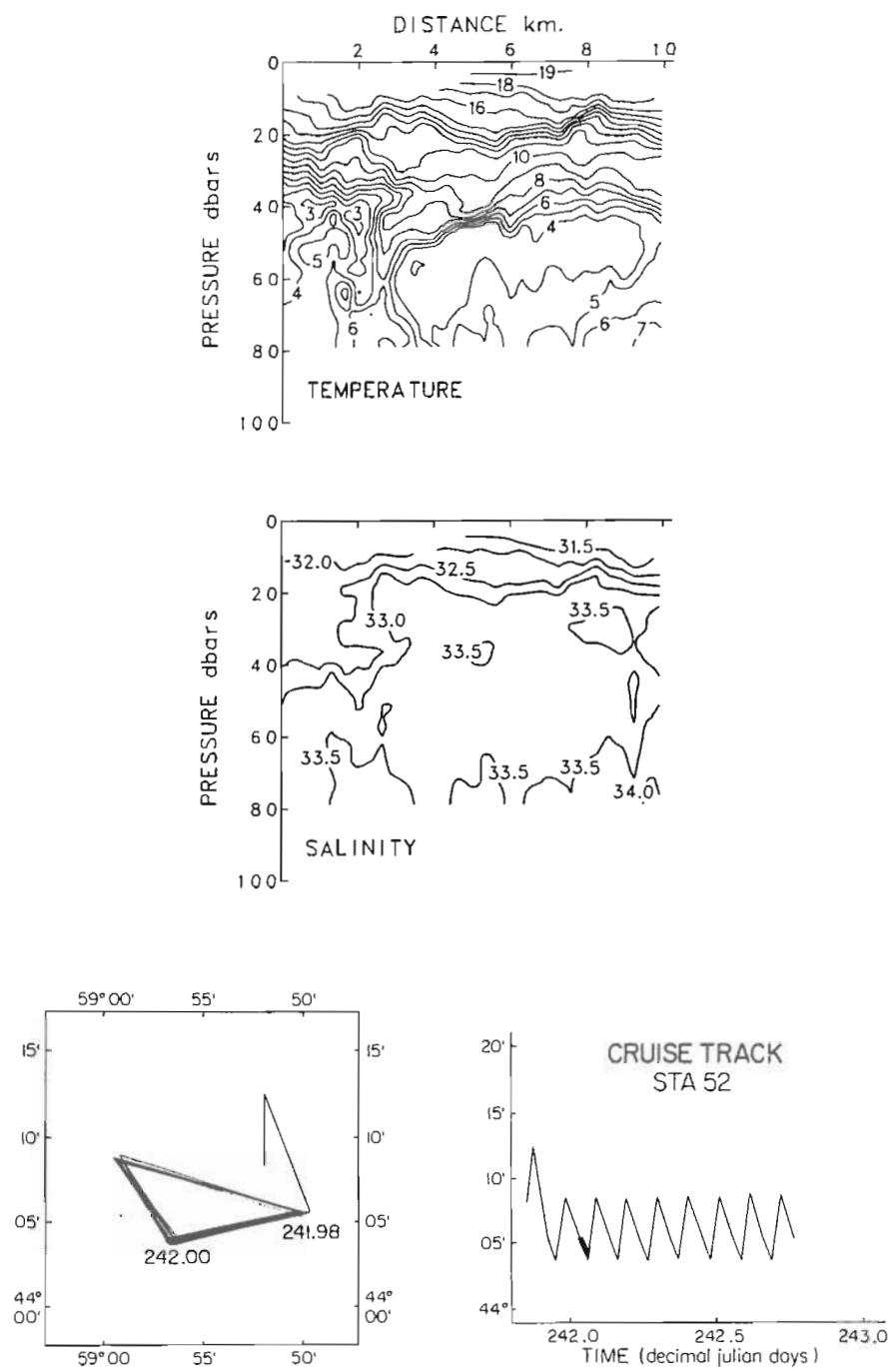


Fig. 198

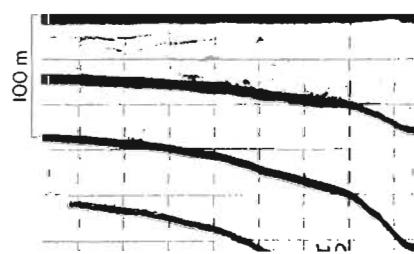
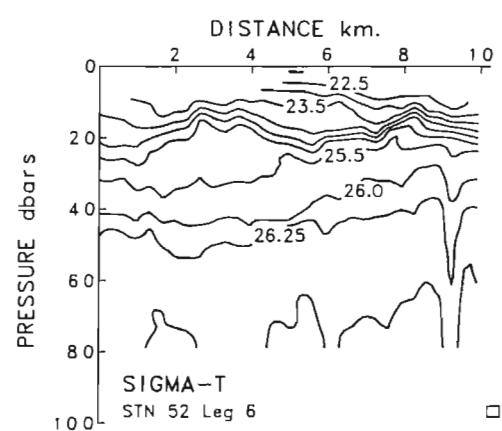


Fig. 199

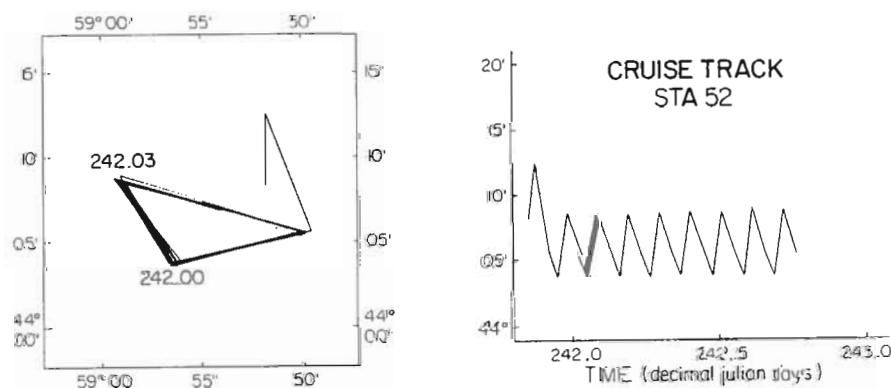
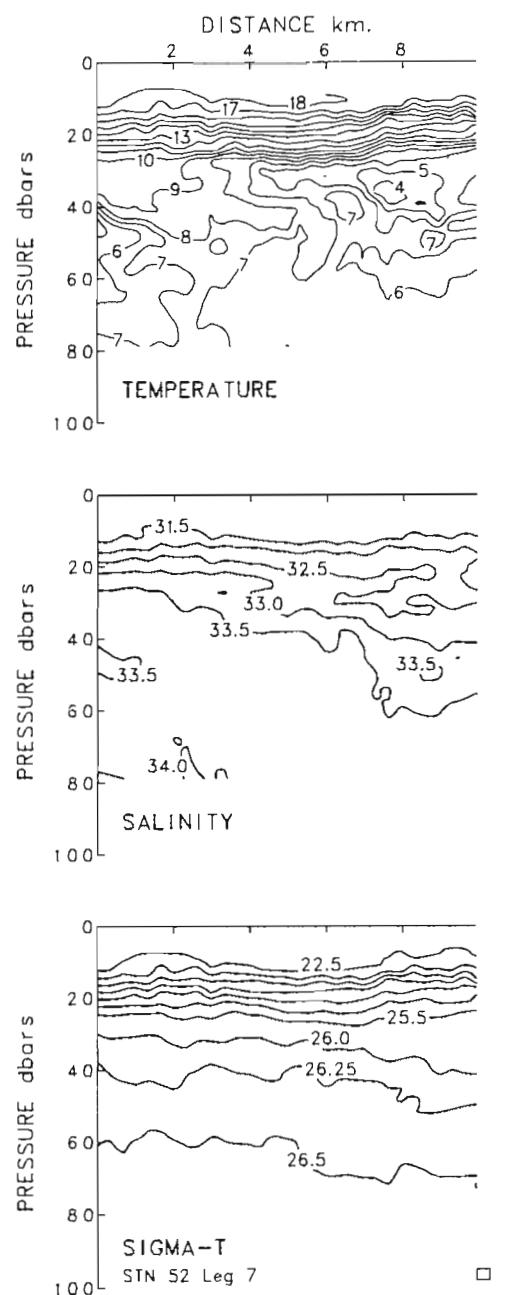


Fig. 200

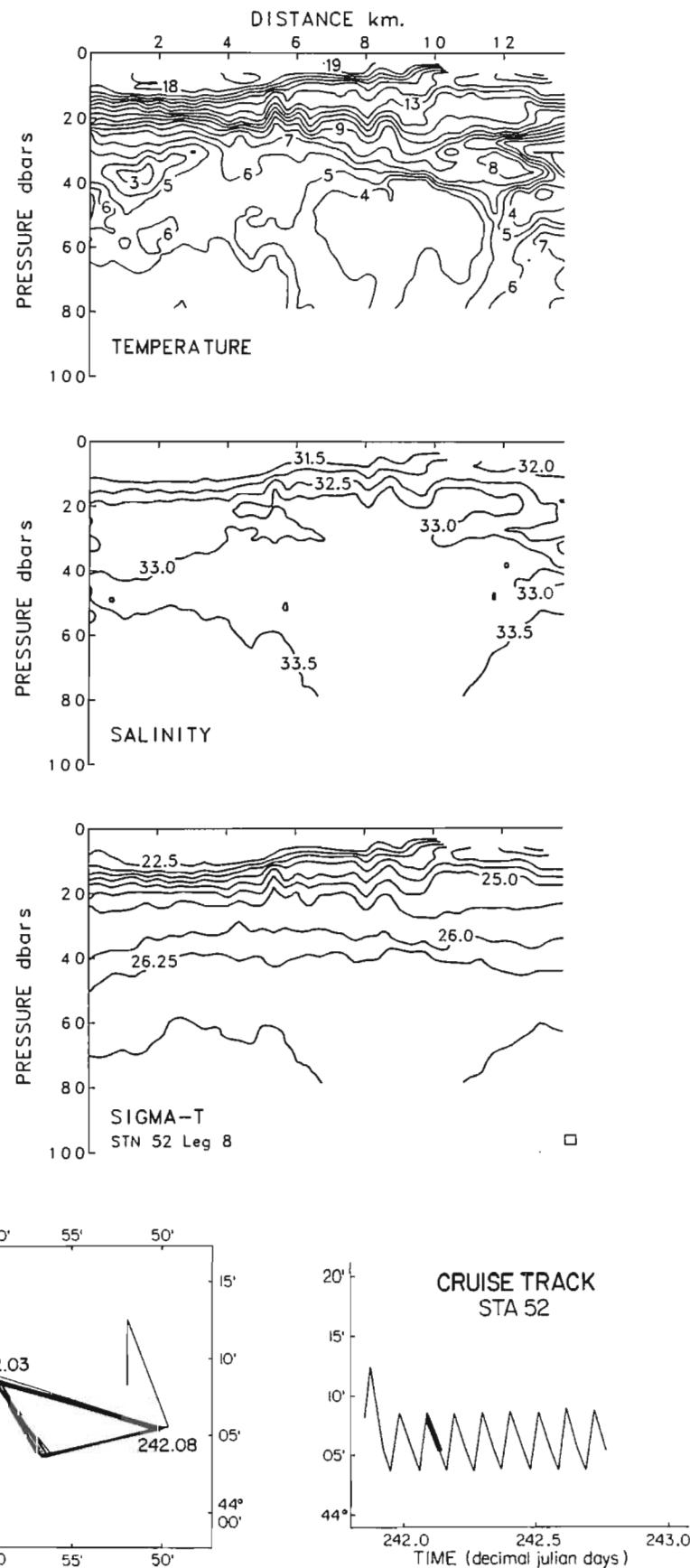


Fig. 201

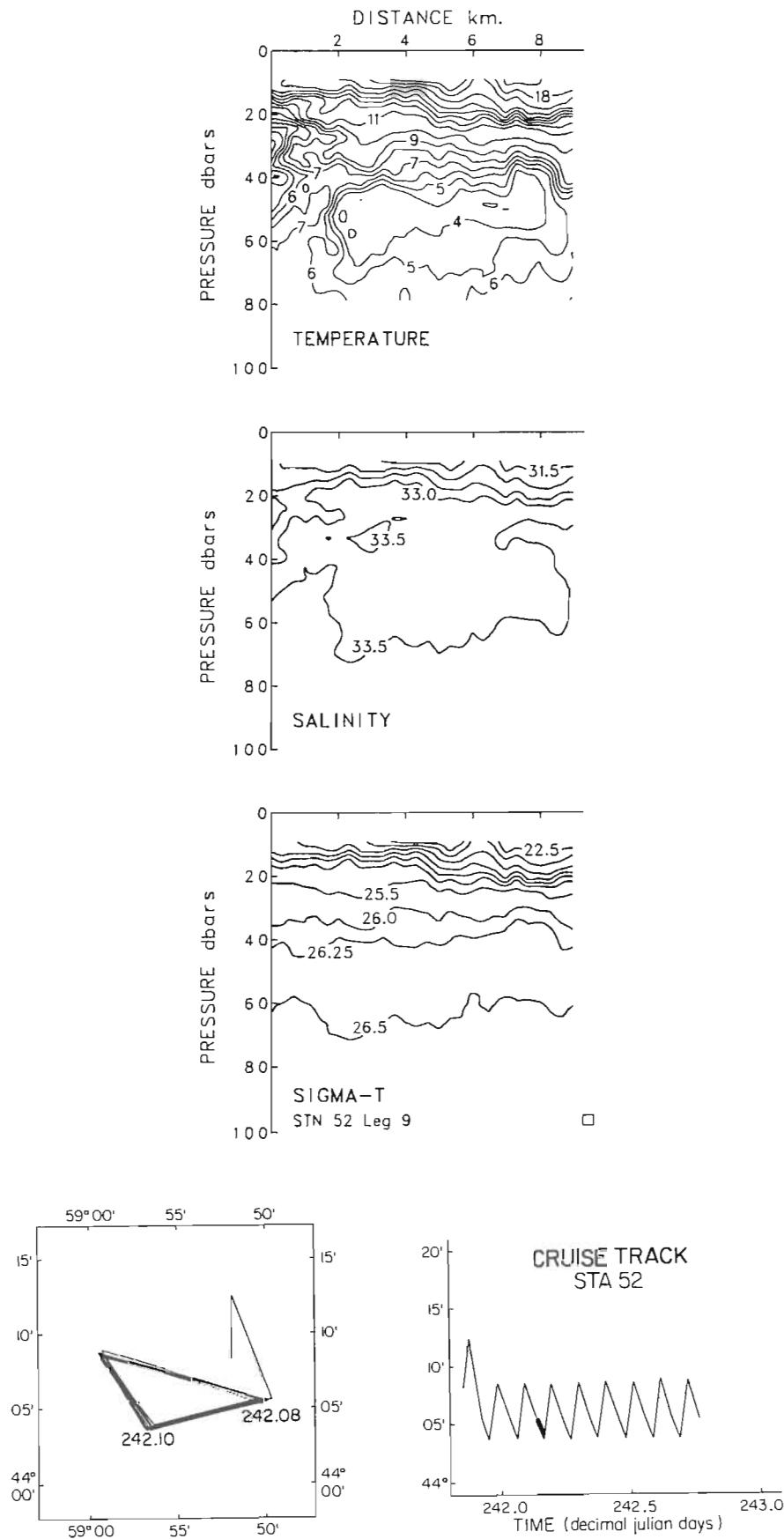


Fig. 202

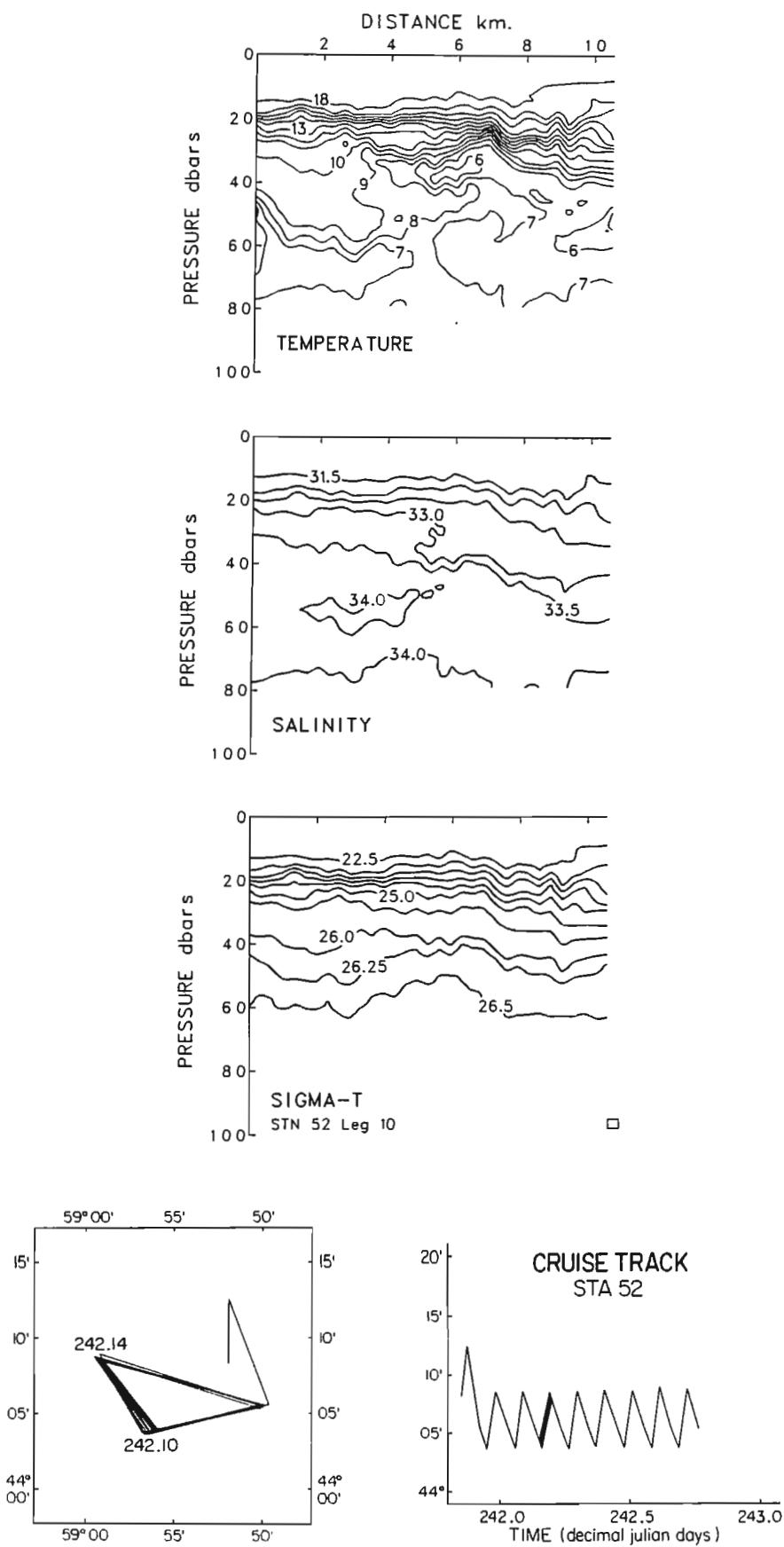


Fig. 203

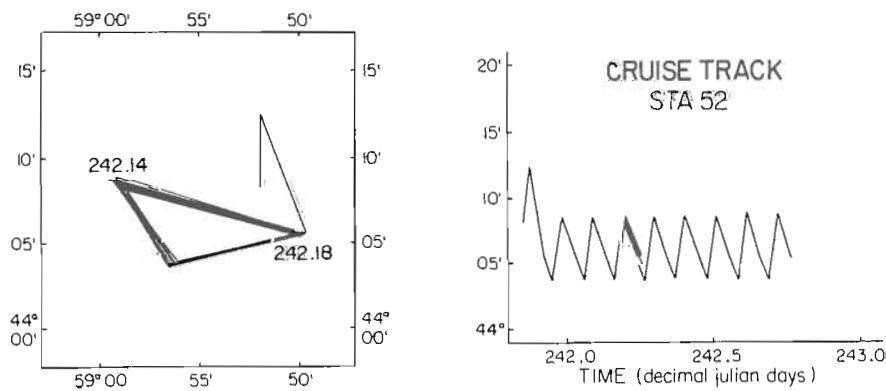
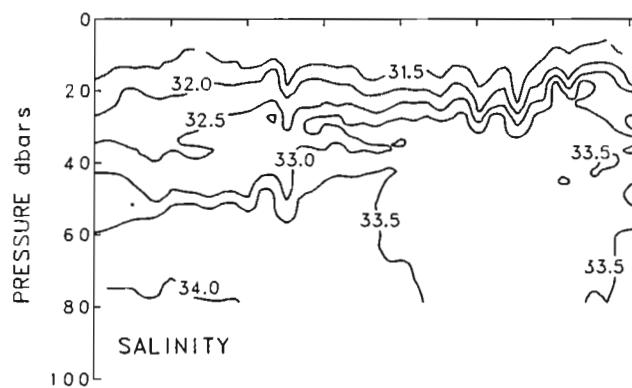
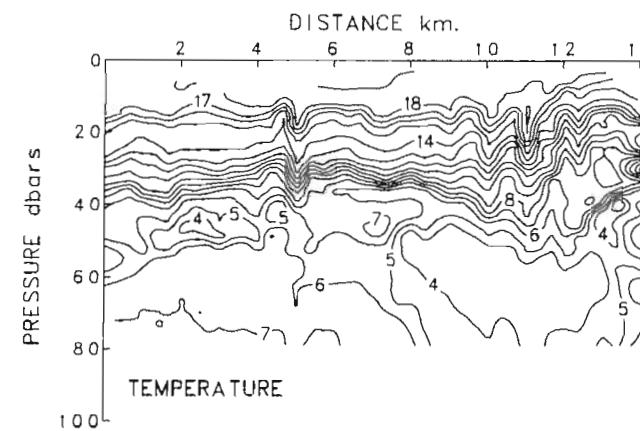


Fig. 204

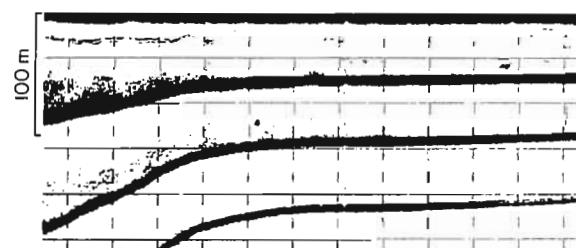
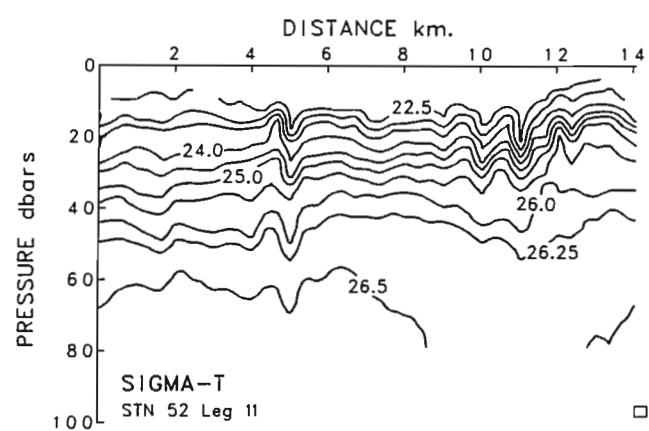


Fig. 205

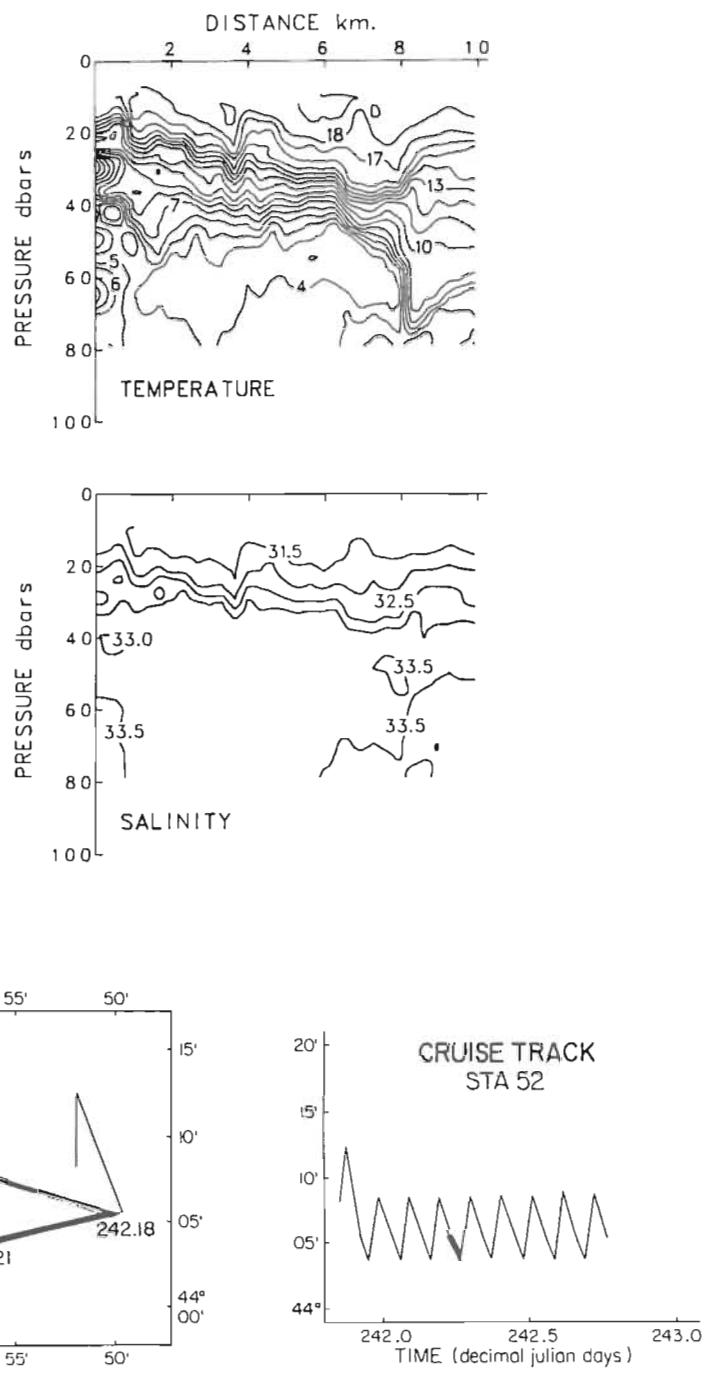


Fig. 206

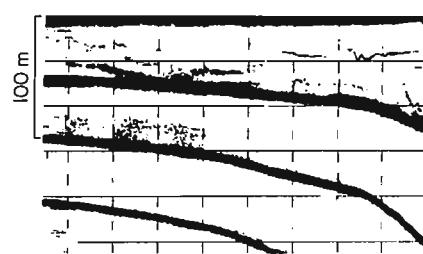
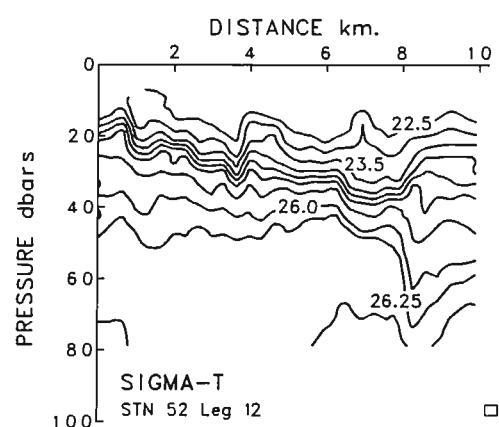
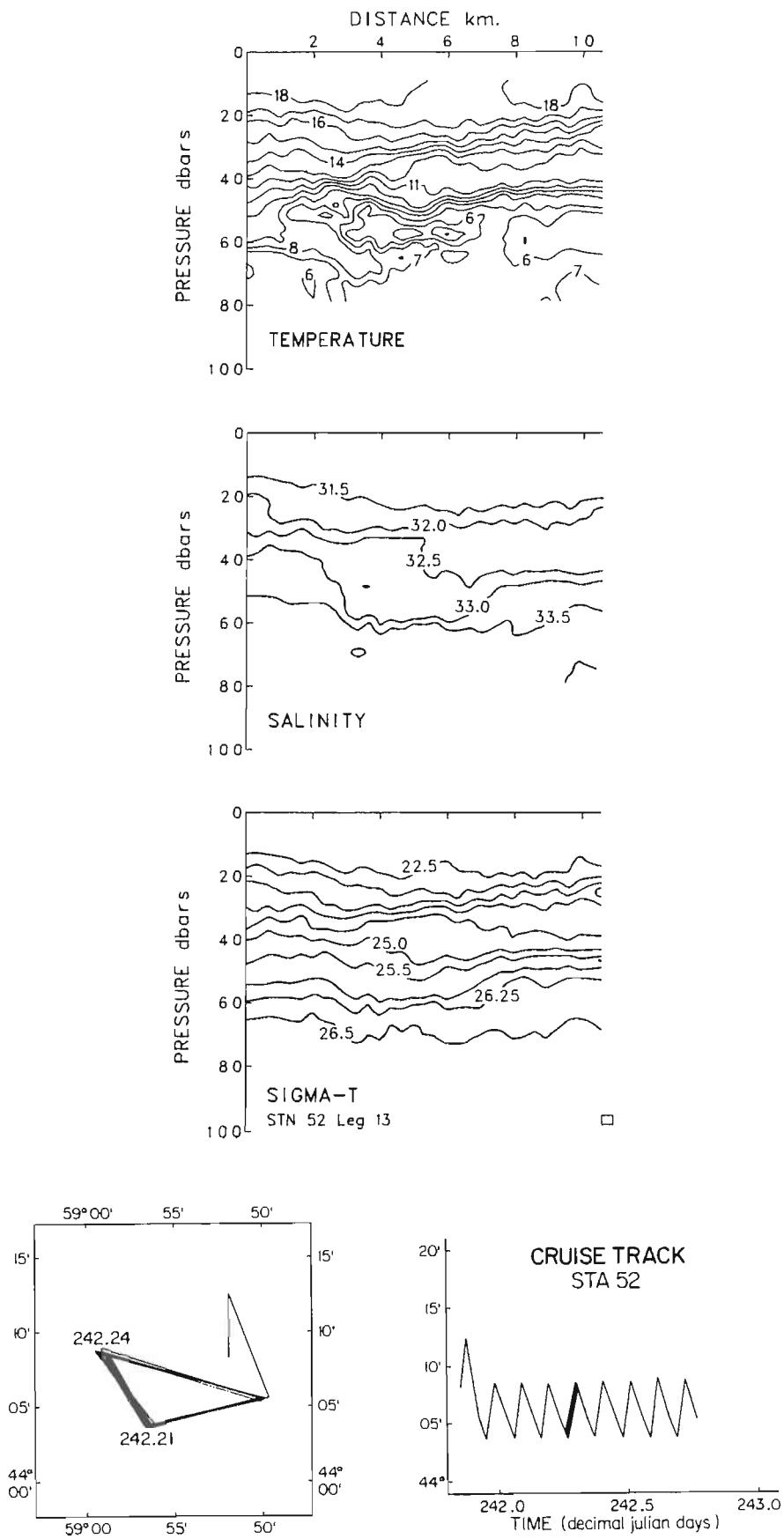


Fig. 207



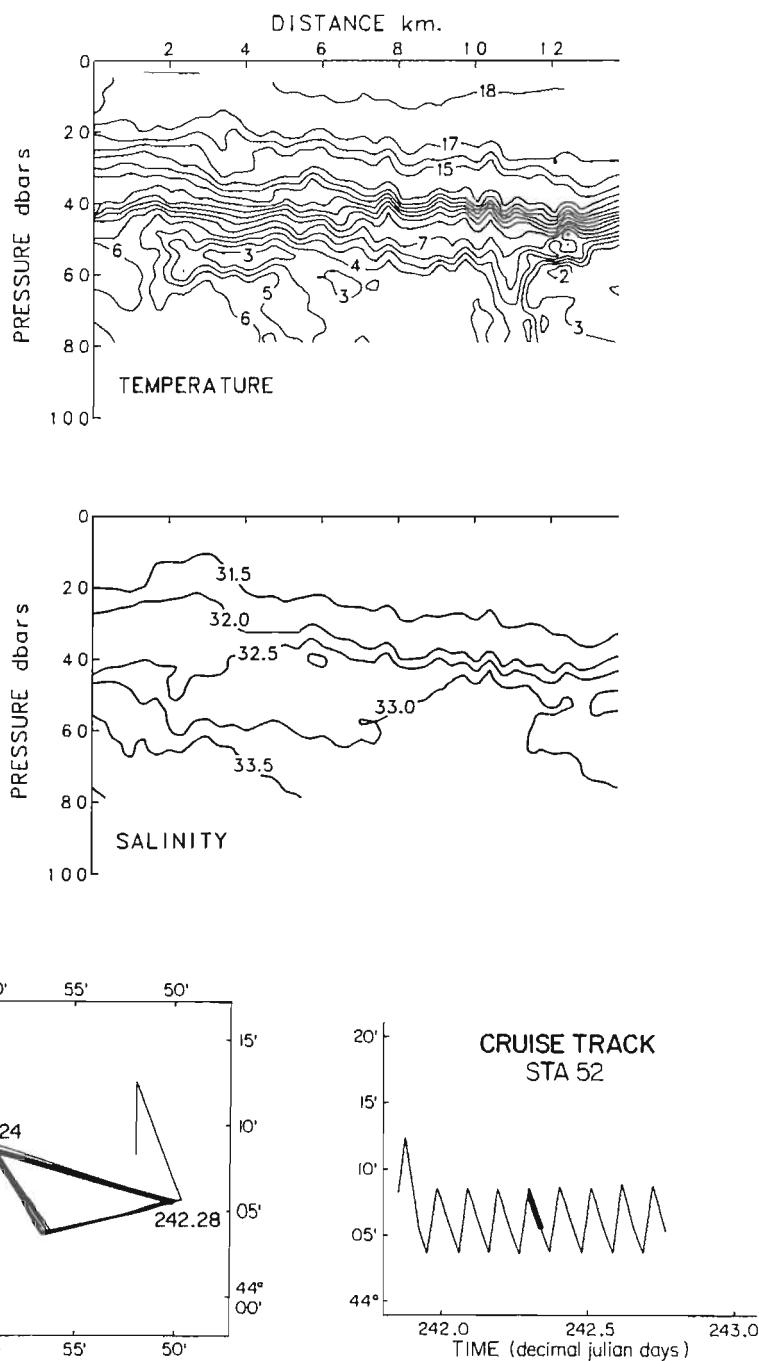


Fig. 209

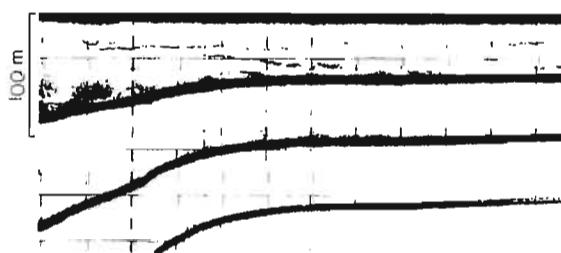
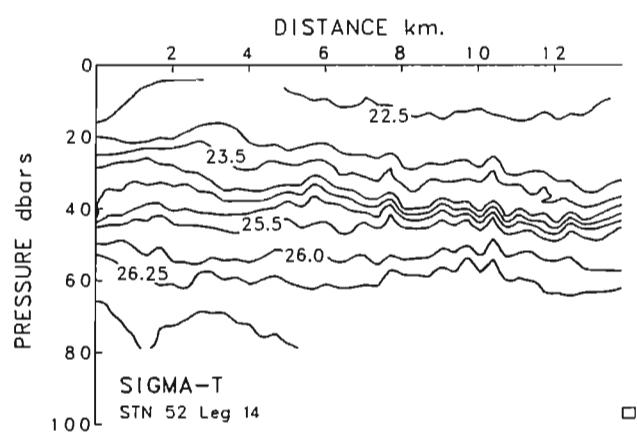


Fig. 210

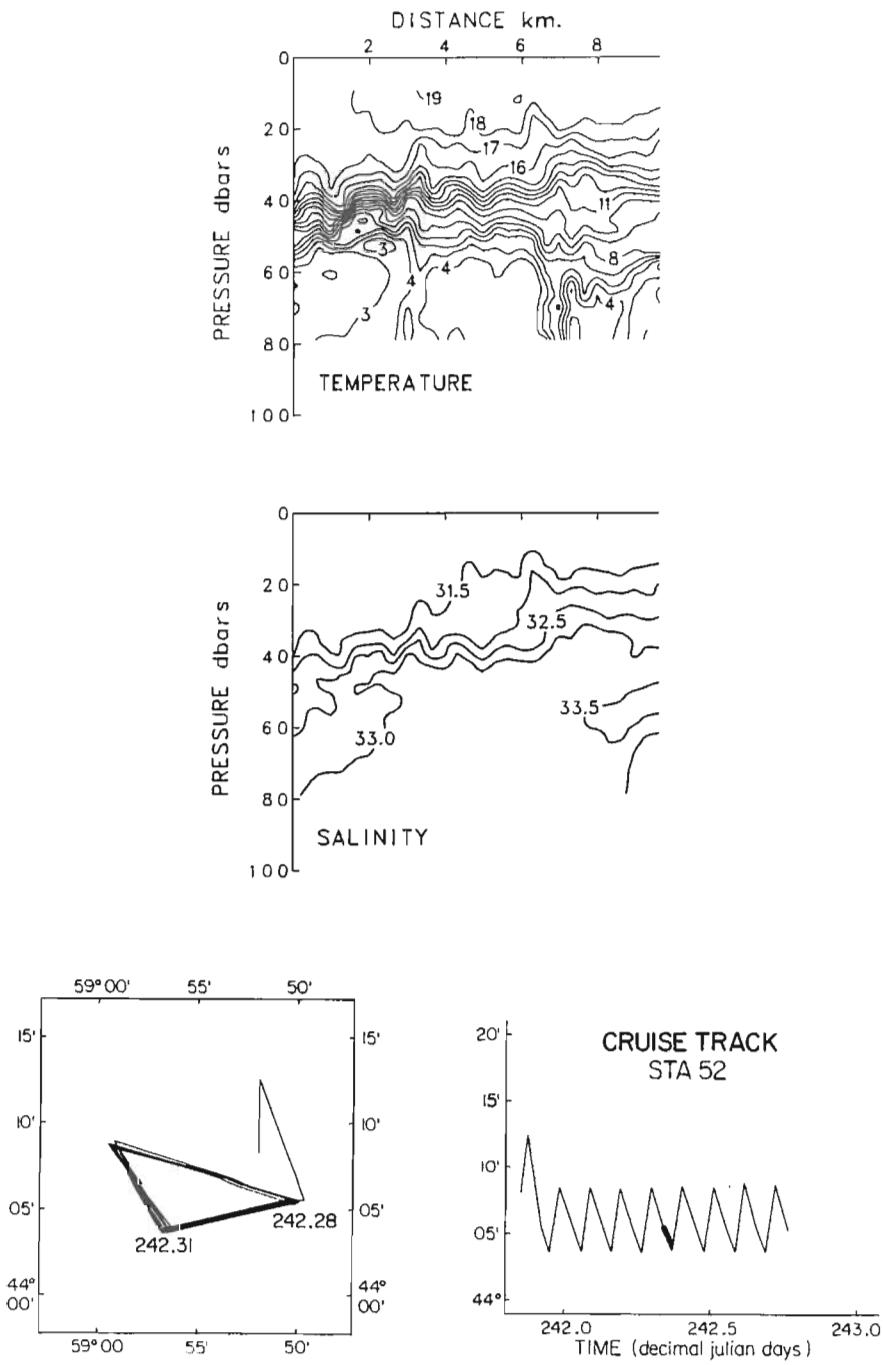


Fig. 211

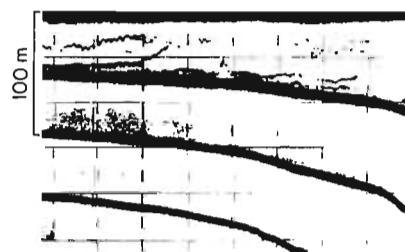
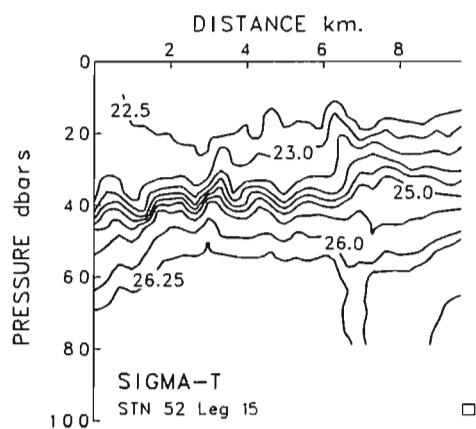


Fig. 212

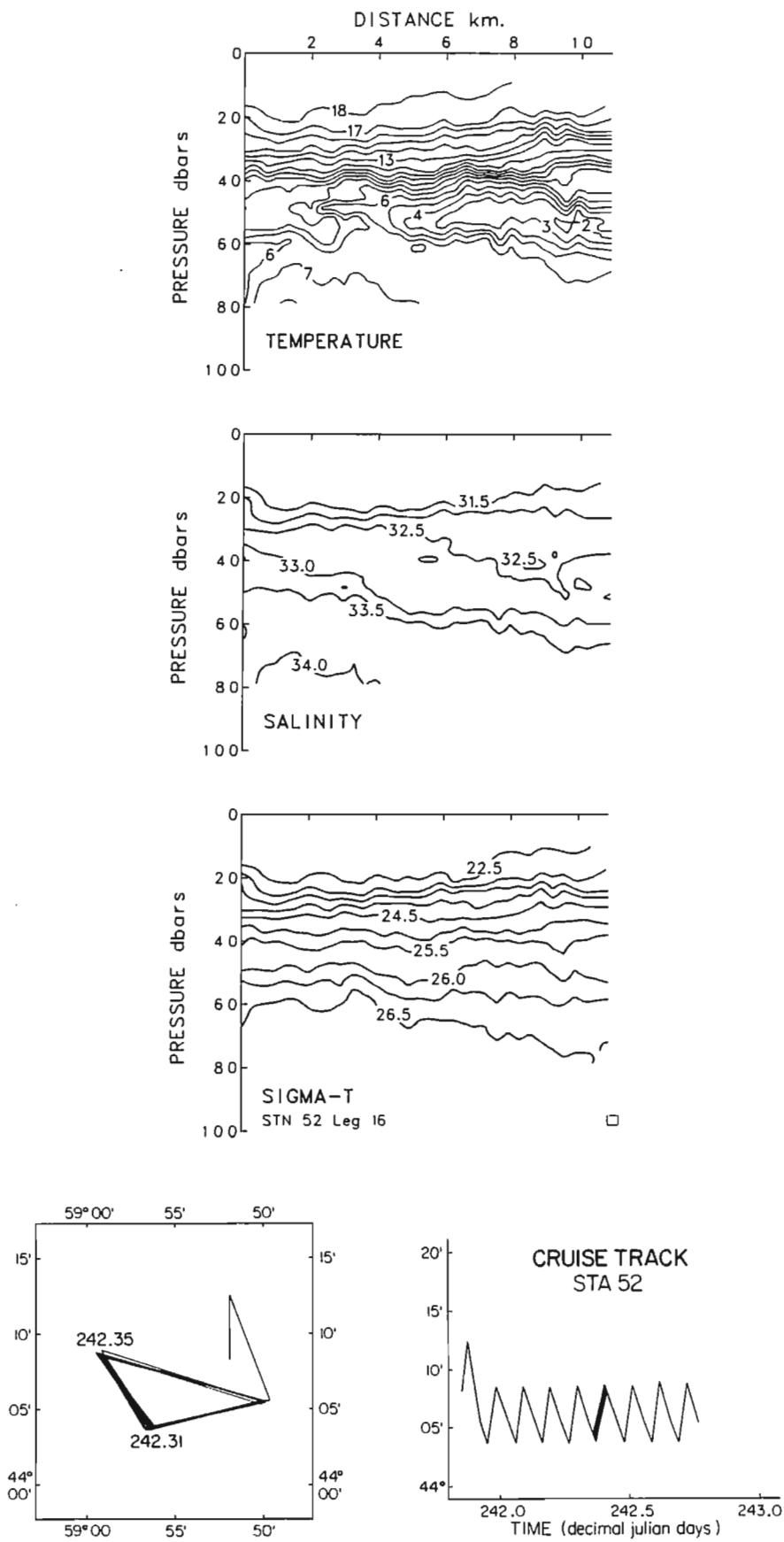


Fig. 213

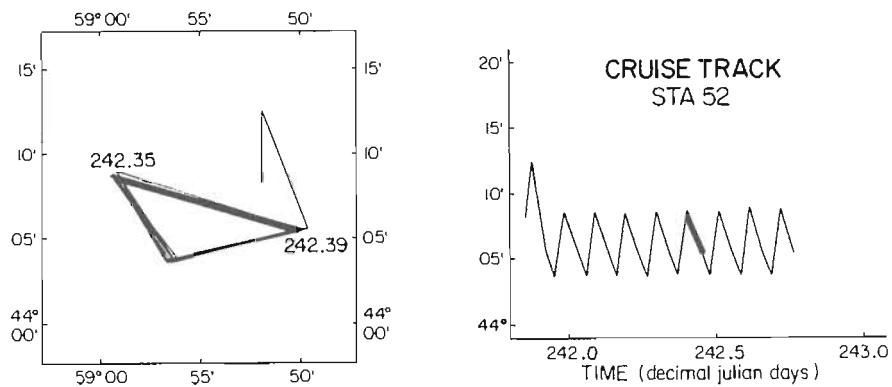
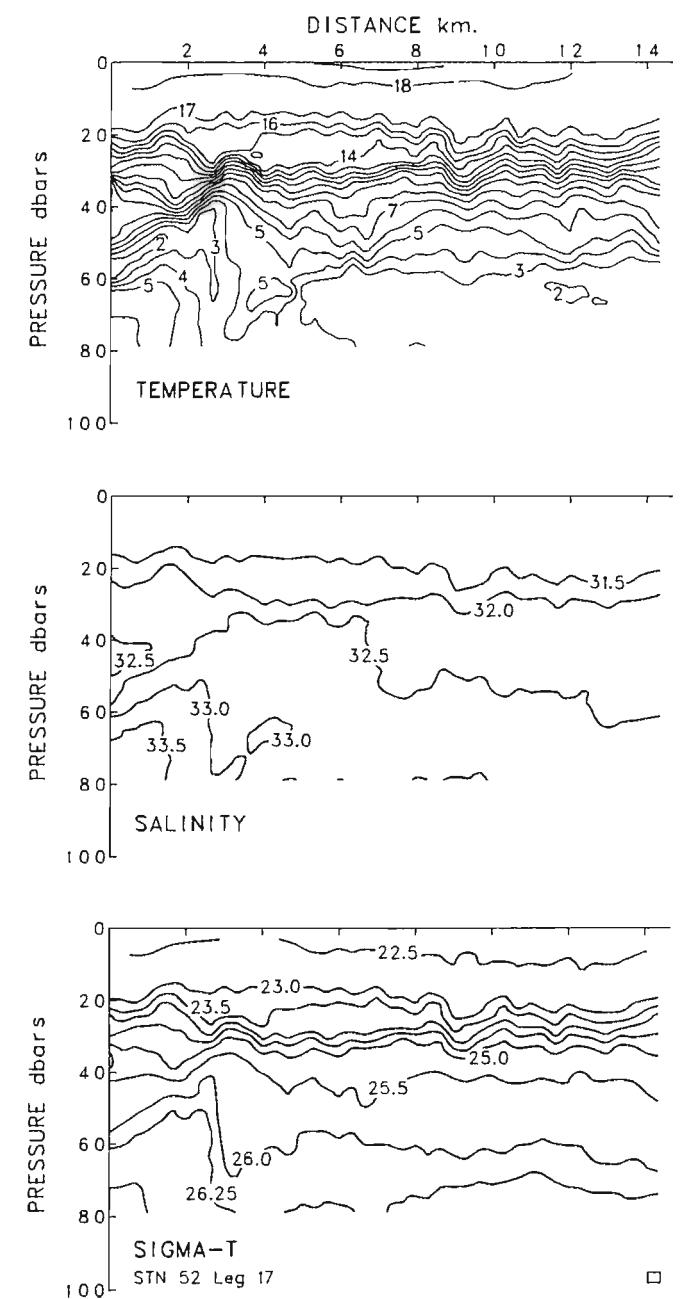


Fig. 214

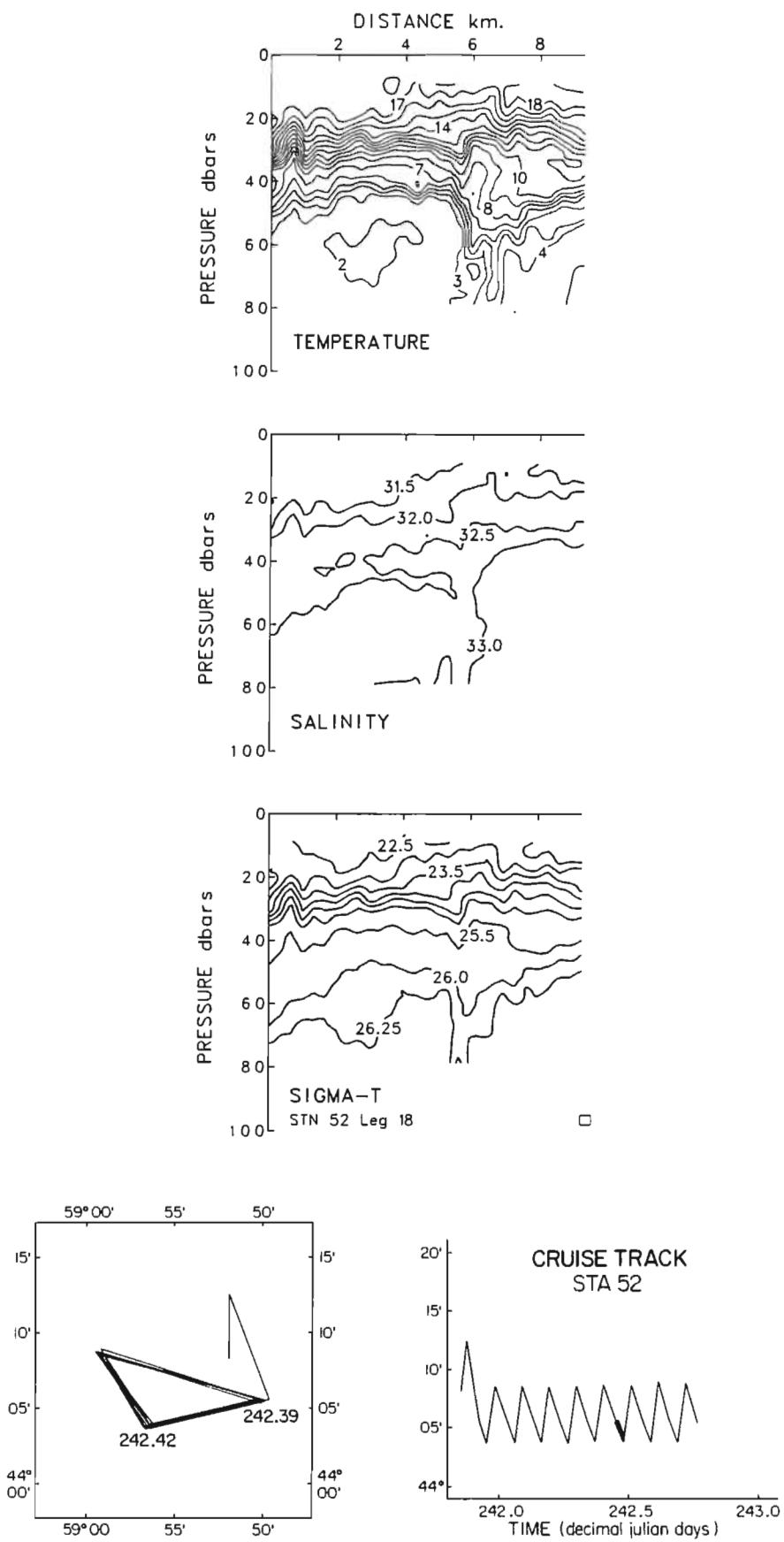


Fig. 215

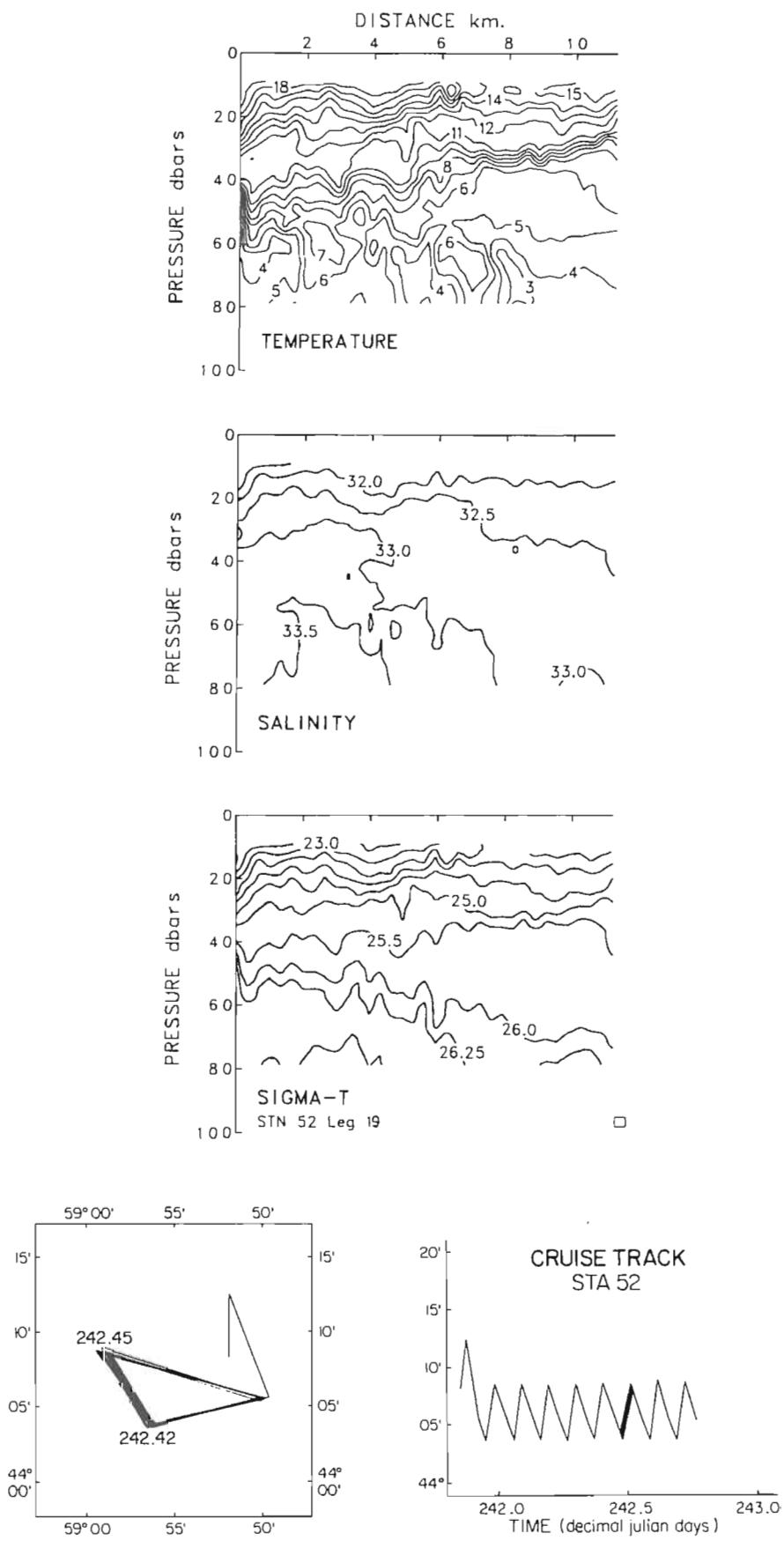


Fig. 216

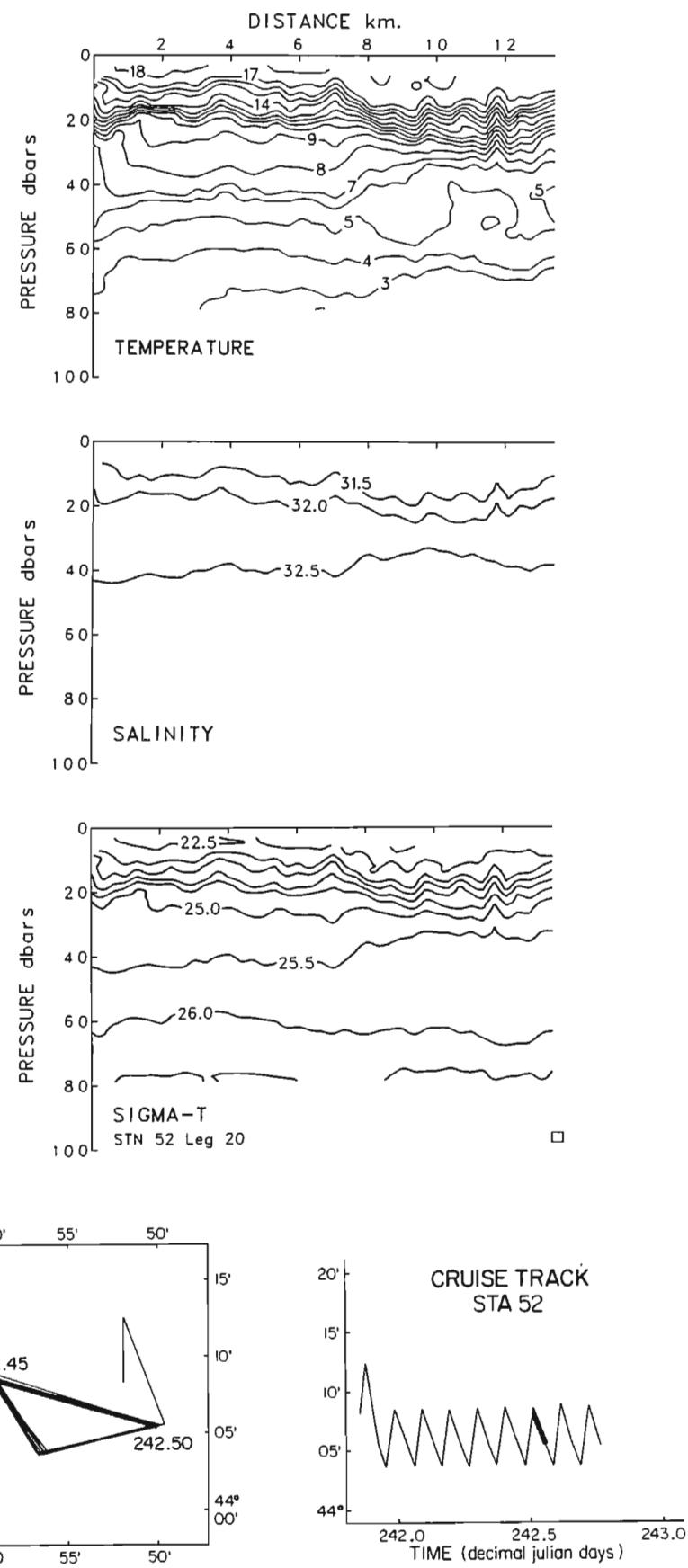


Fig. 217

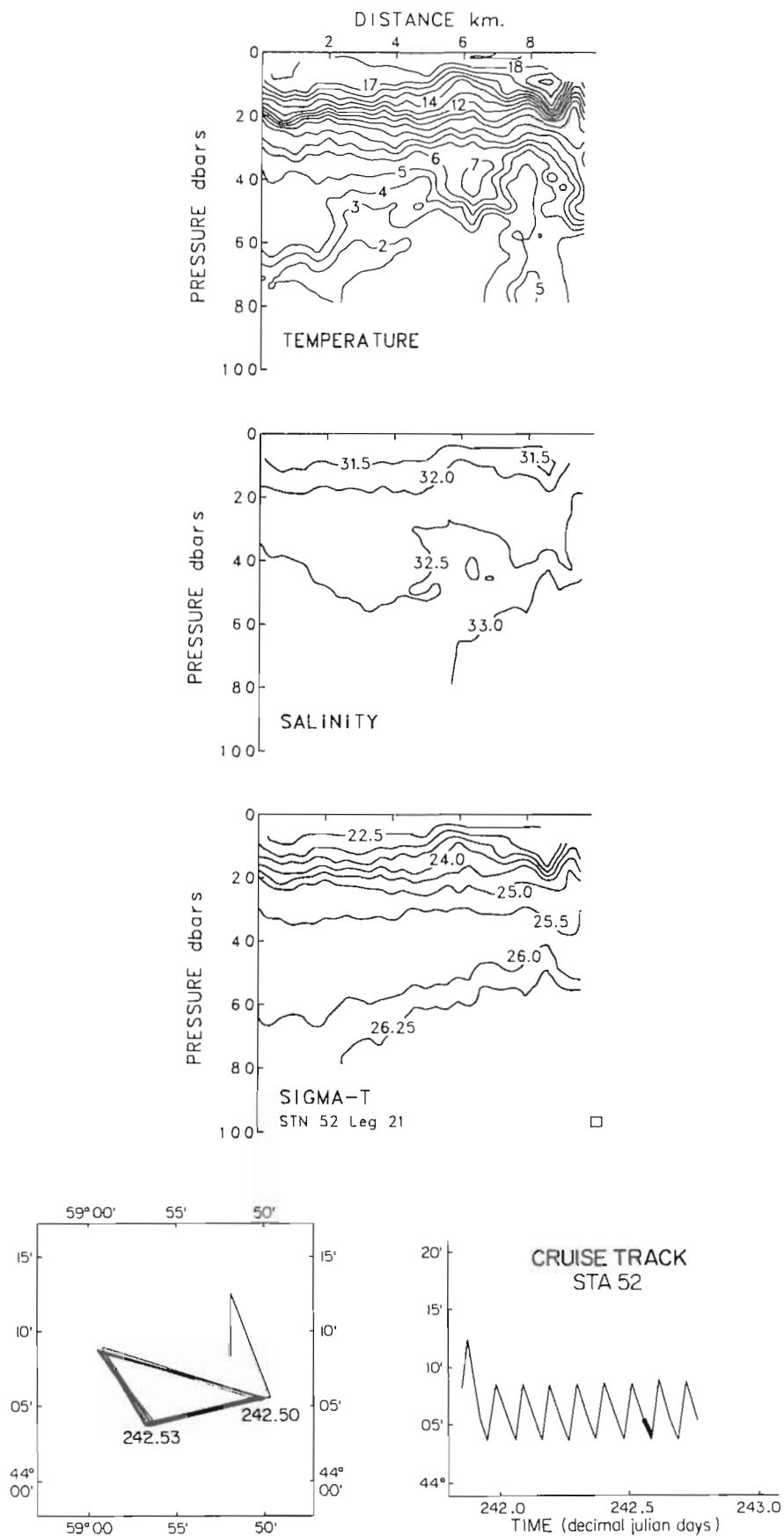


Fig. 218

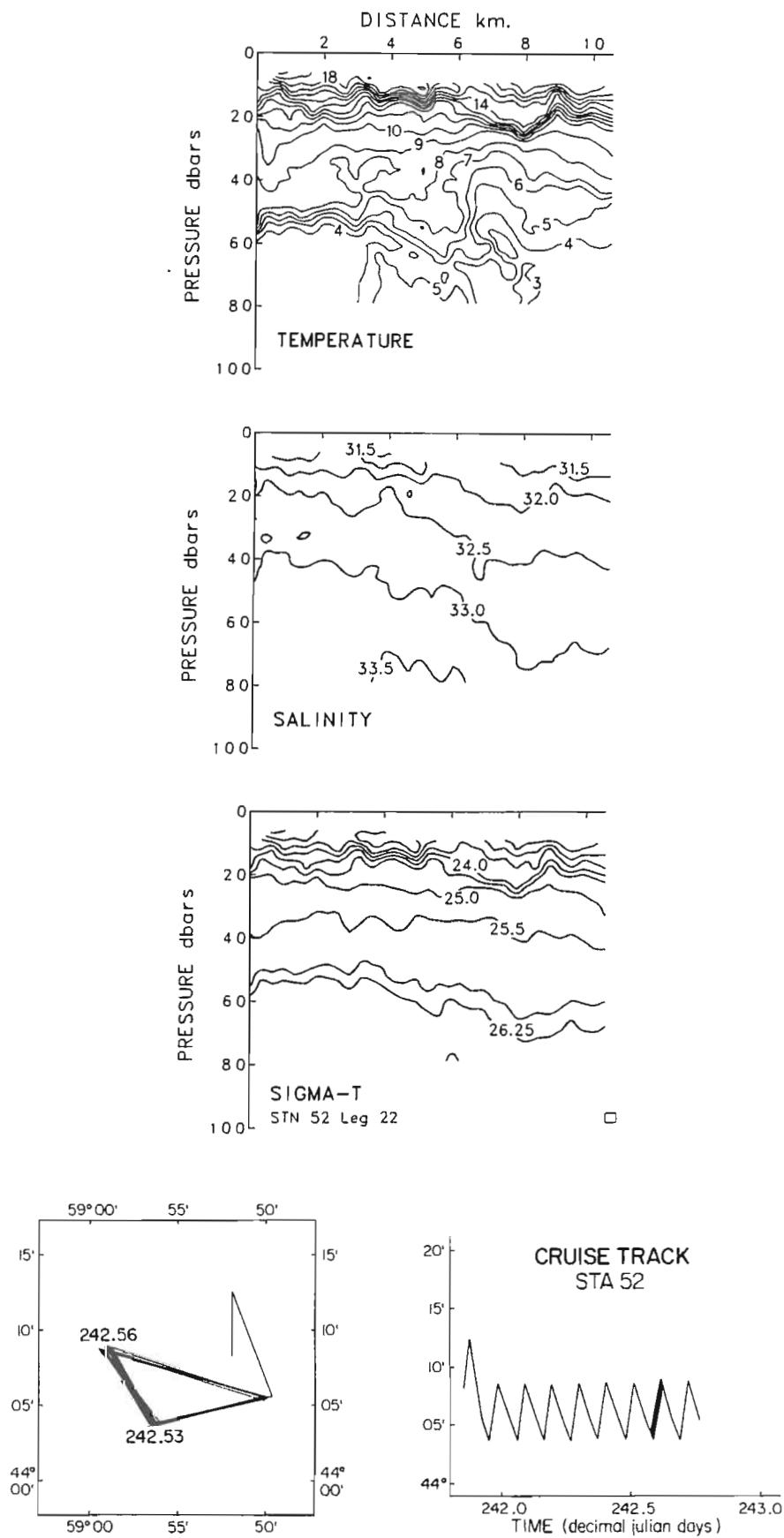


Fig. 219

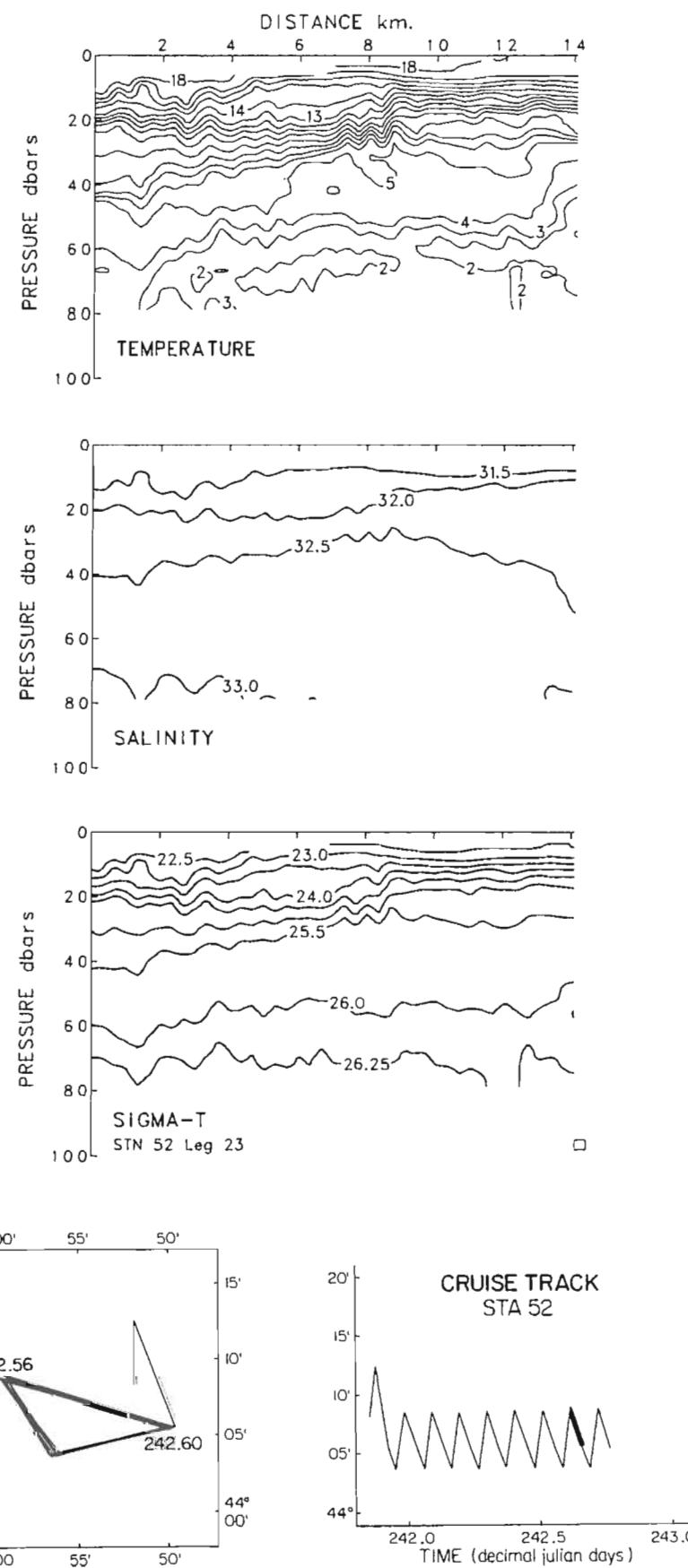


Fig. 220

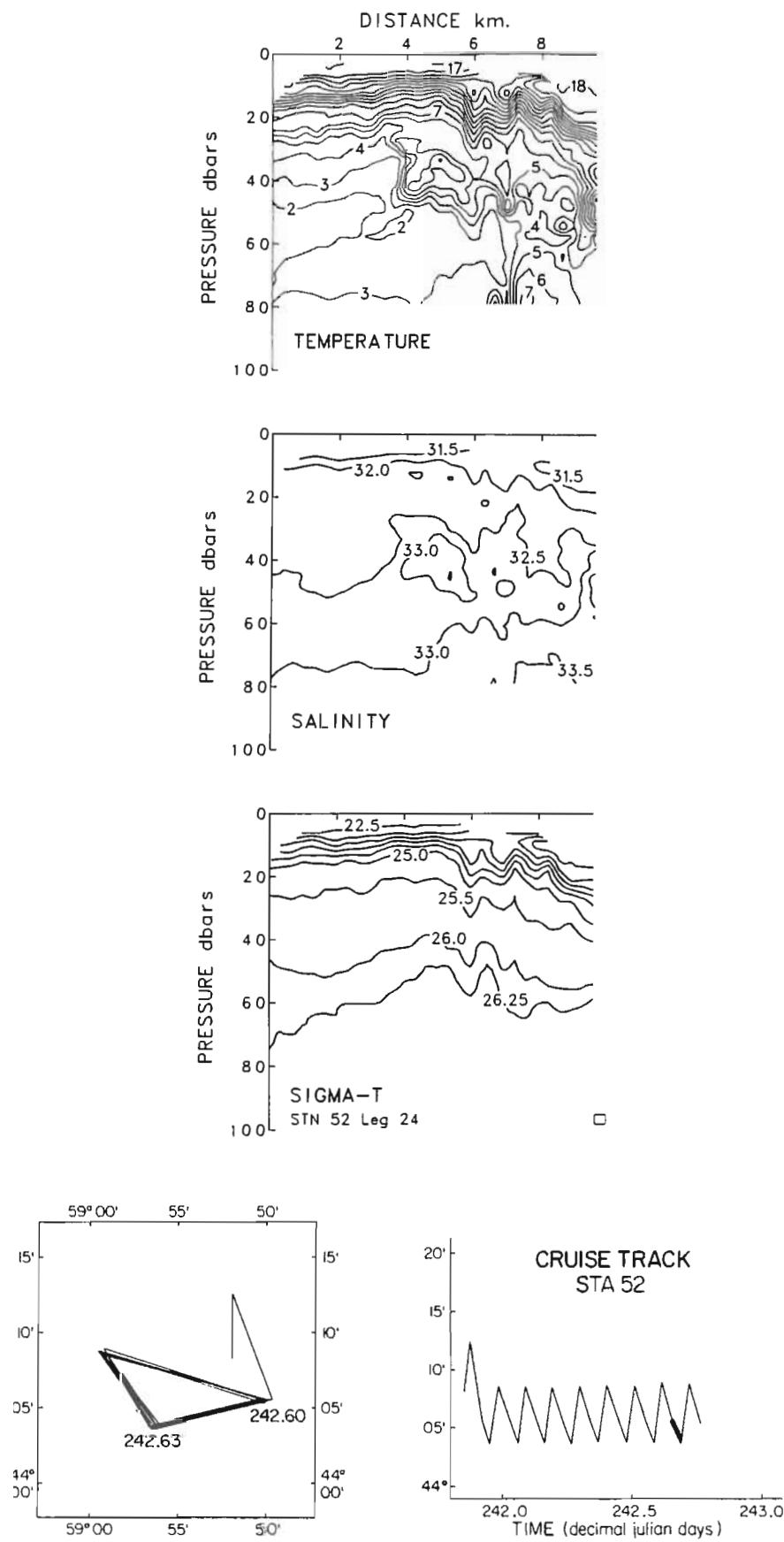


Fig. 221

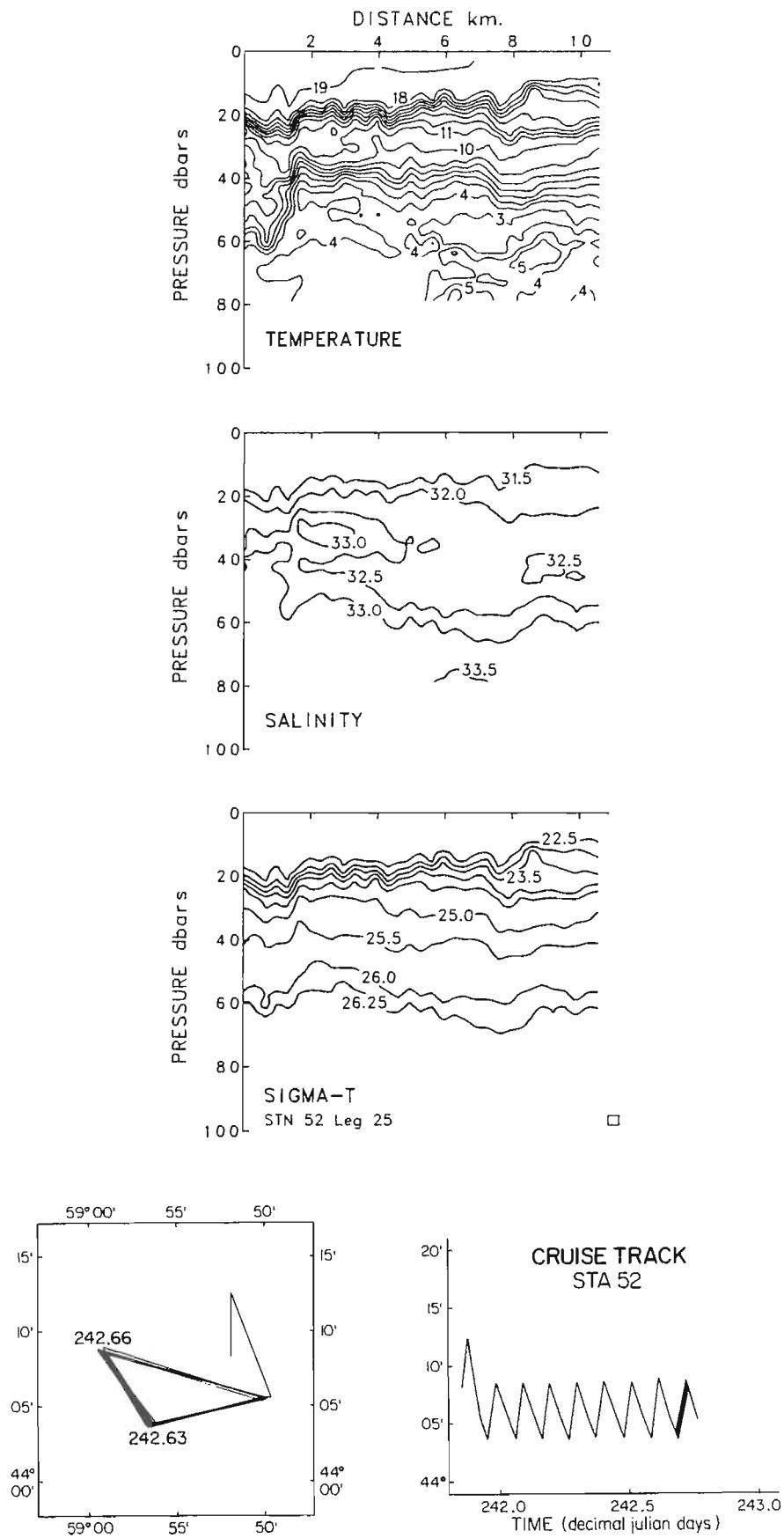


Fig. 222

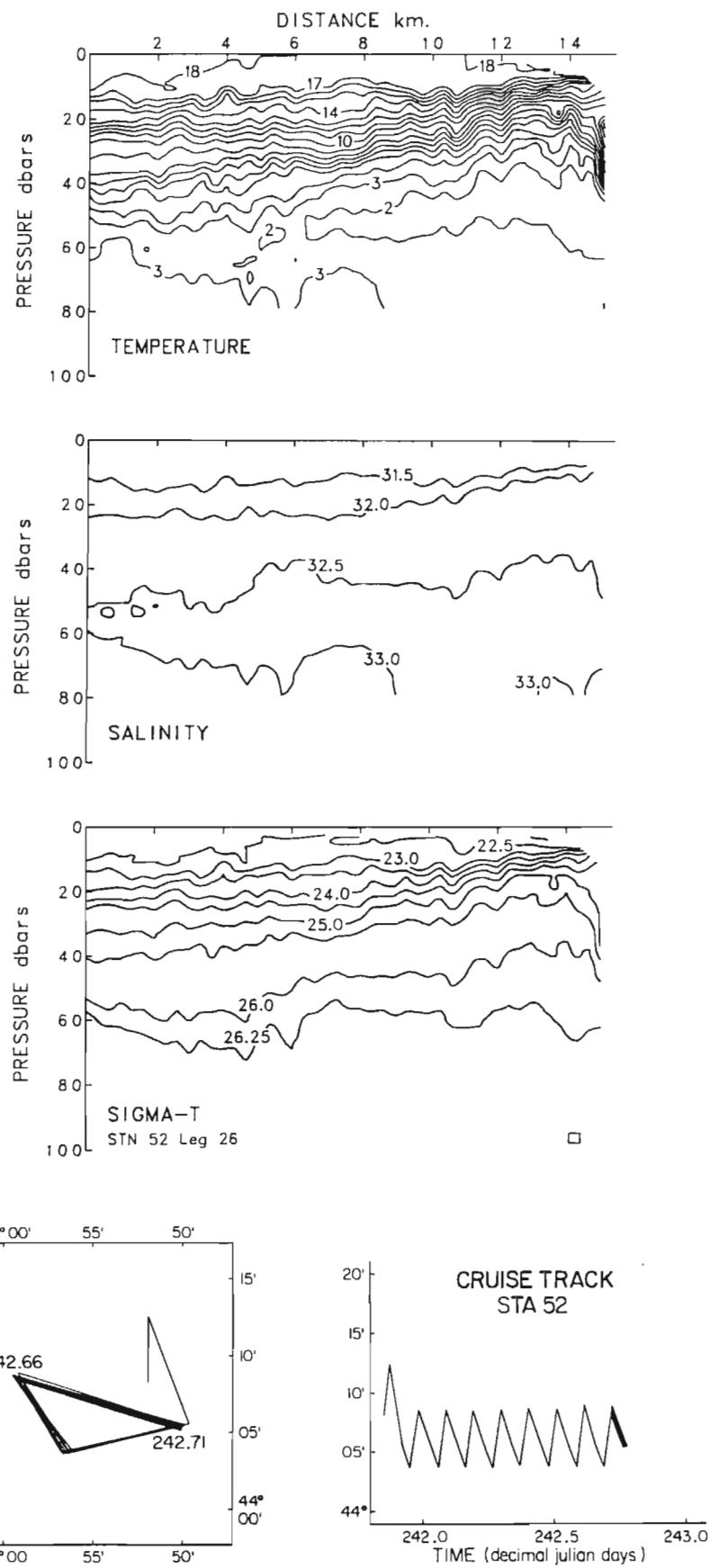


Fig. 223

Figures 224-247.

BATFISH station 53: 15 sections of Temperature, Salinity and Sigma-t vs. pressure, location map and latitude vs. time plot. Acoustic backscatter plots for selected sections.

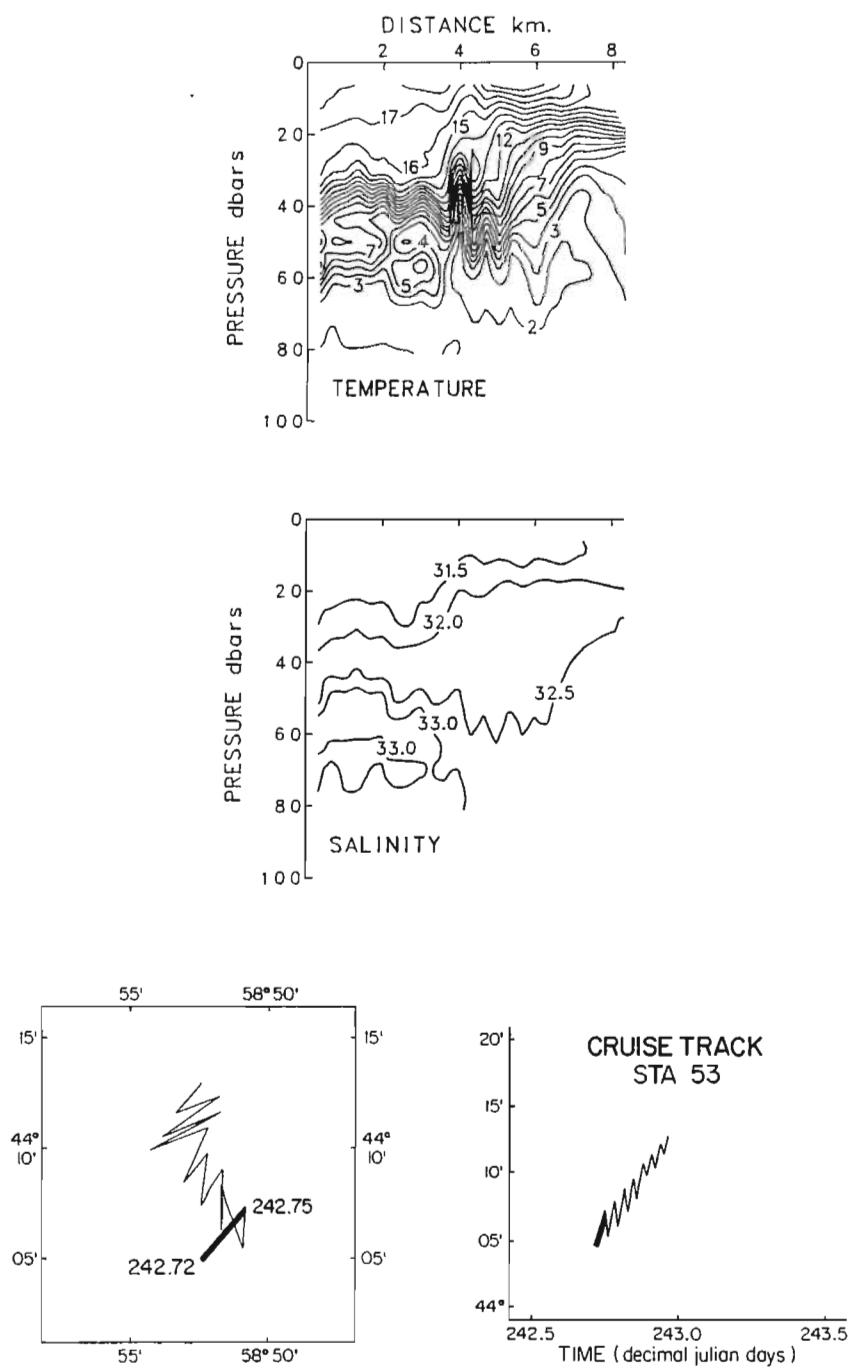


Fig. 224

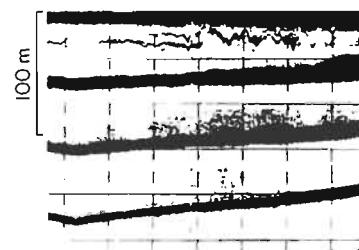
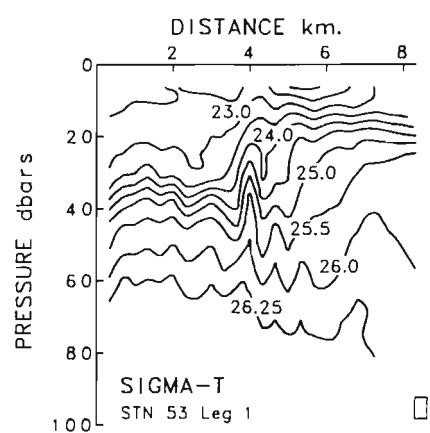


Fig. 225

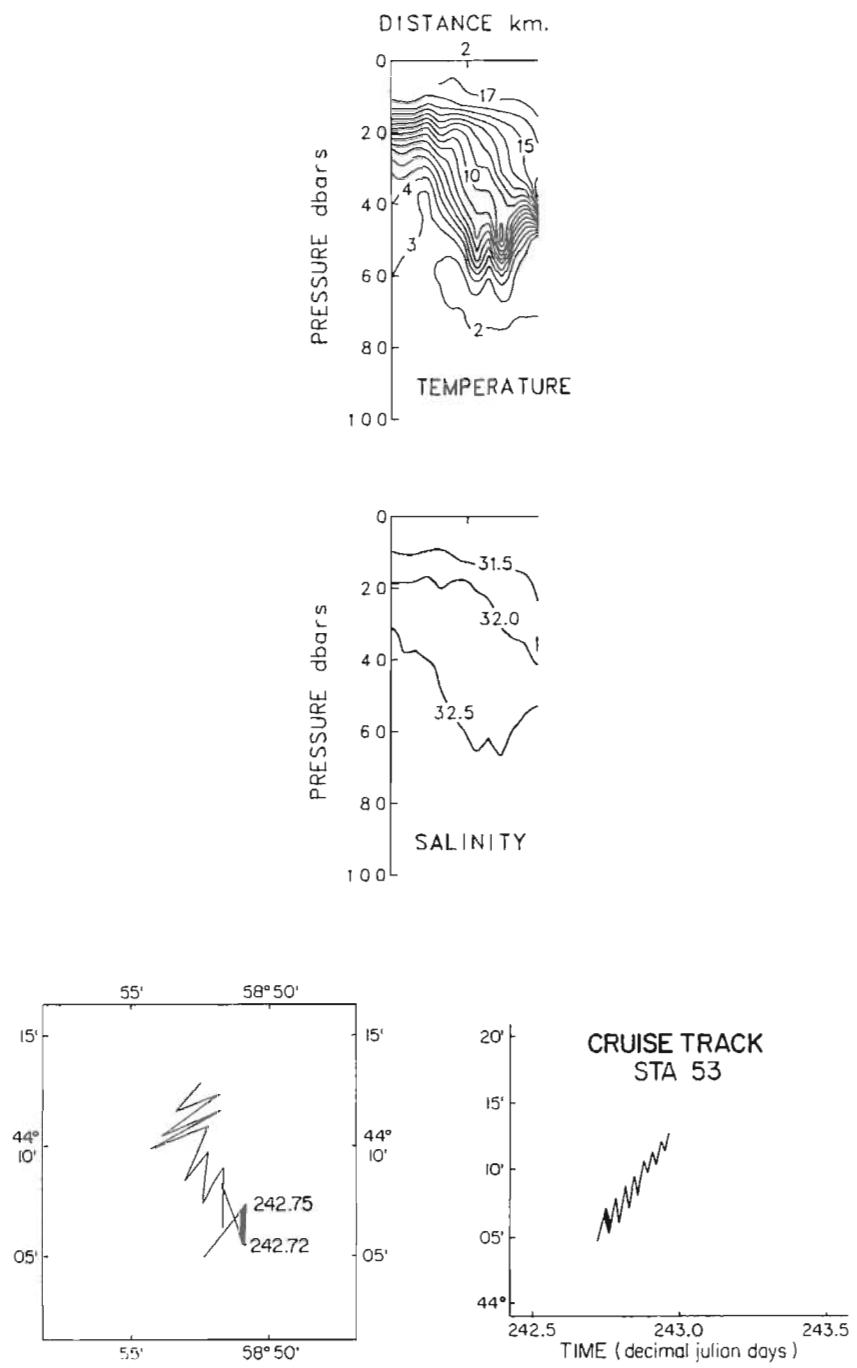


Fig. 226

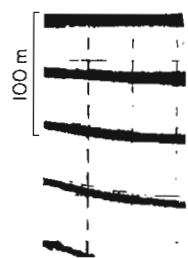
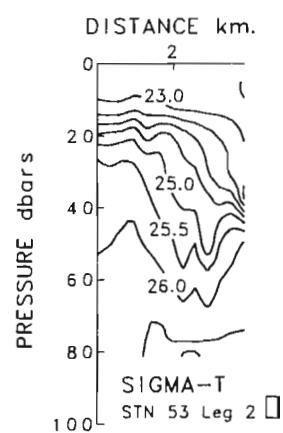
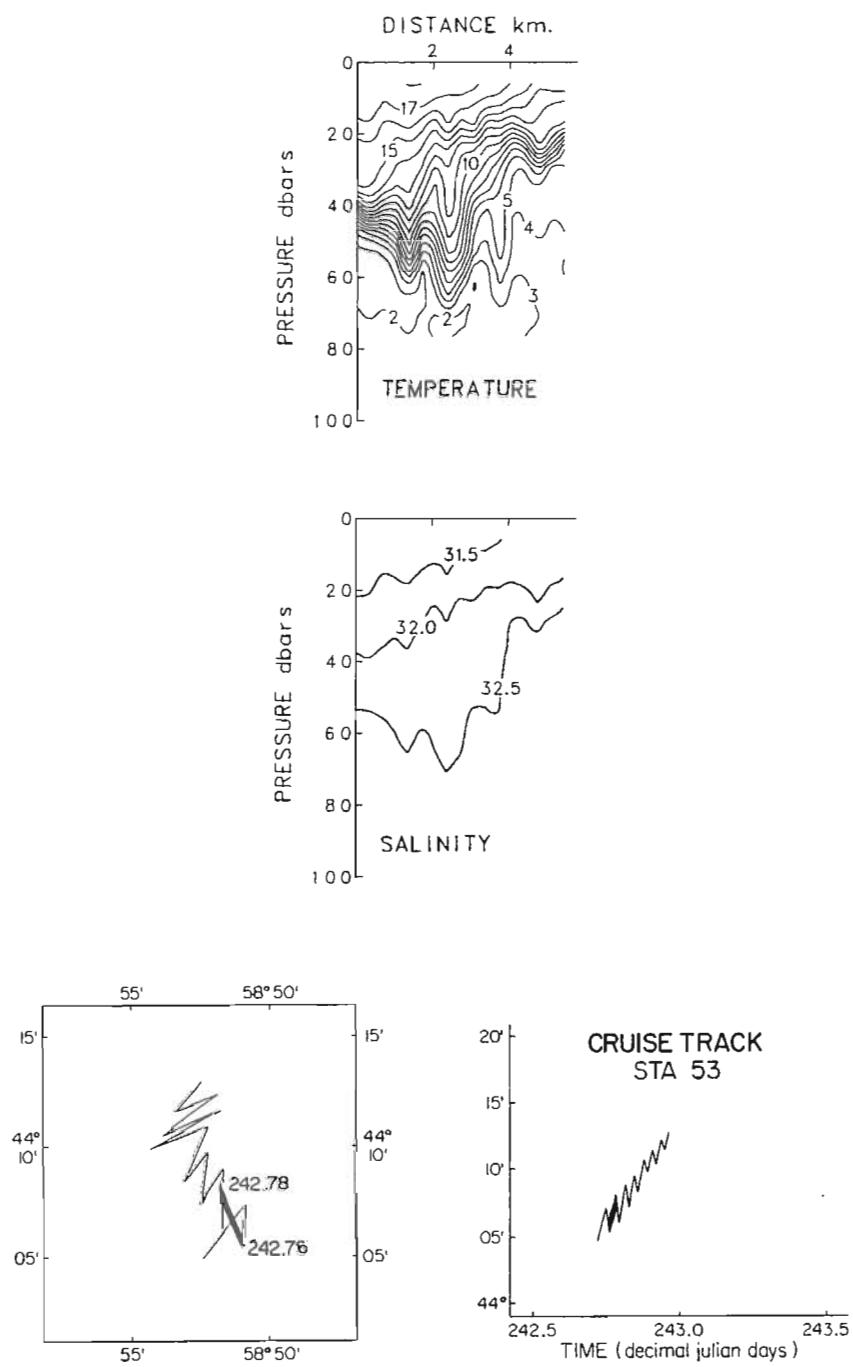


Fig. 227



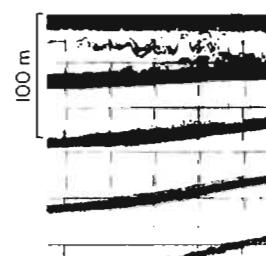
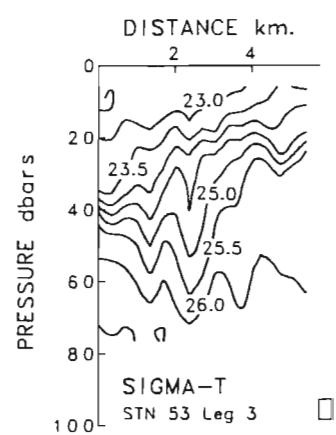


Fig. 229

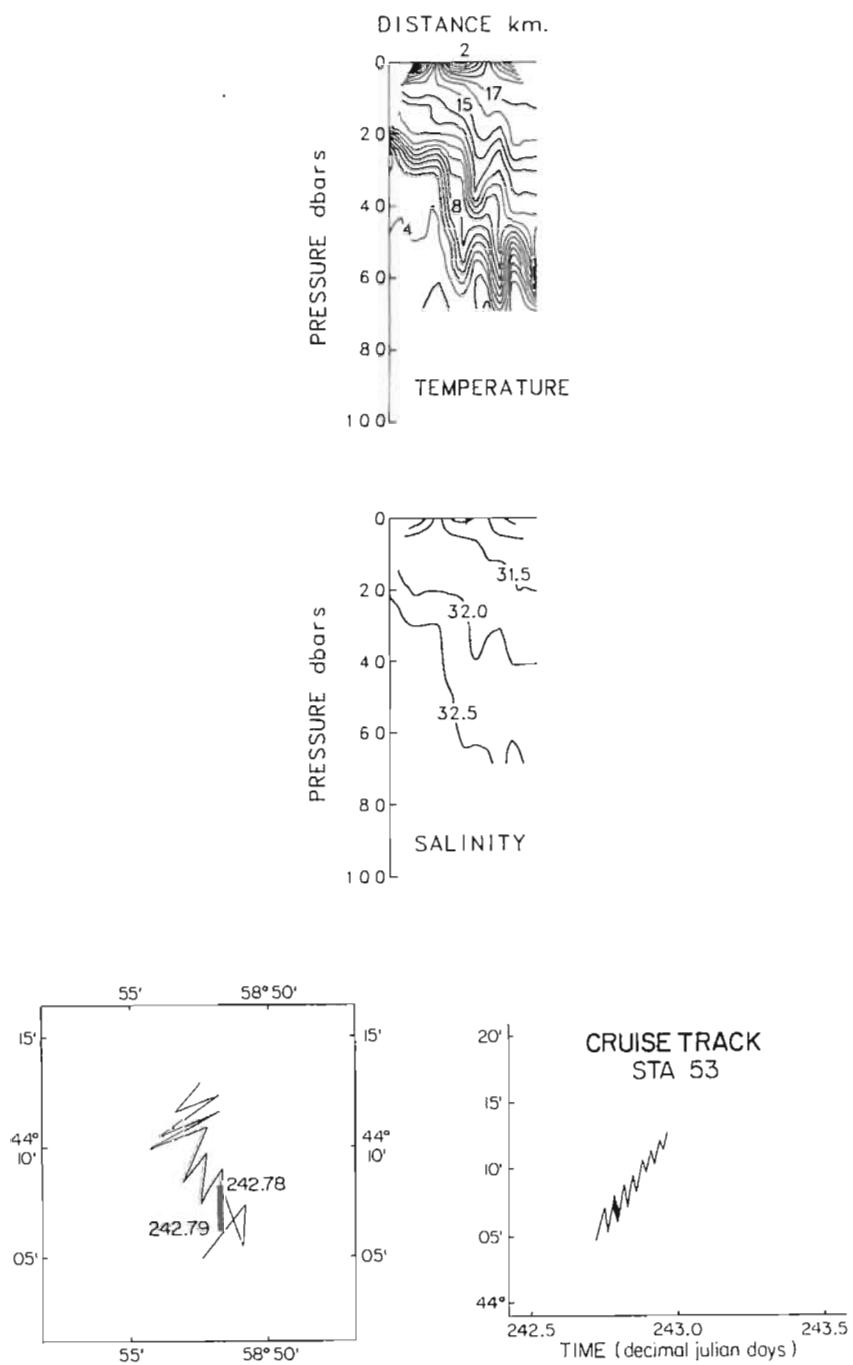


Fig. 230

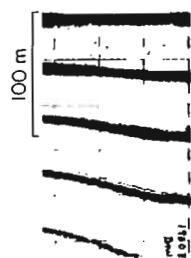
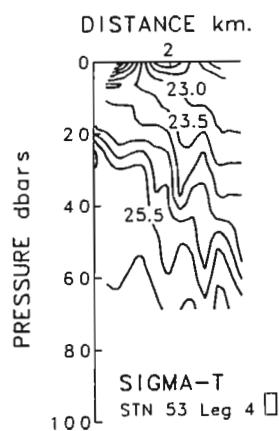


Fig. 231

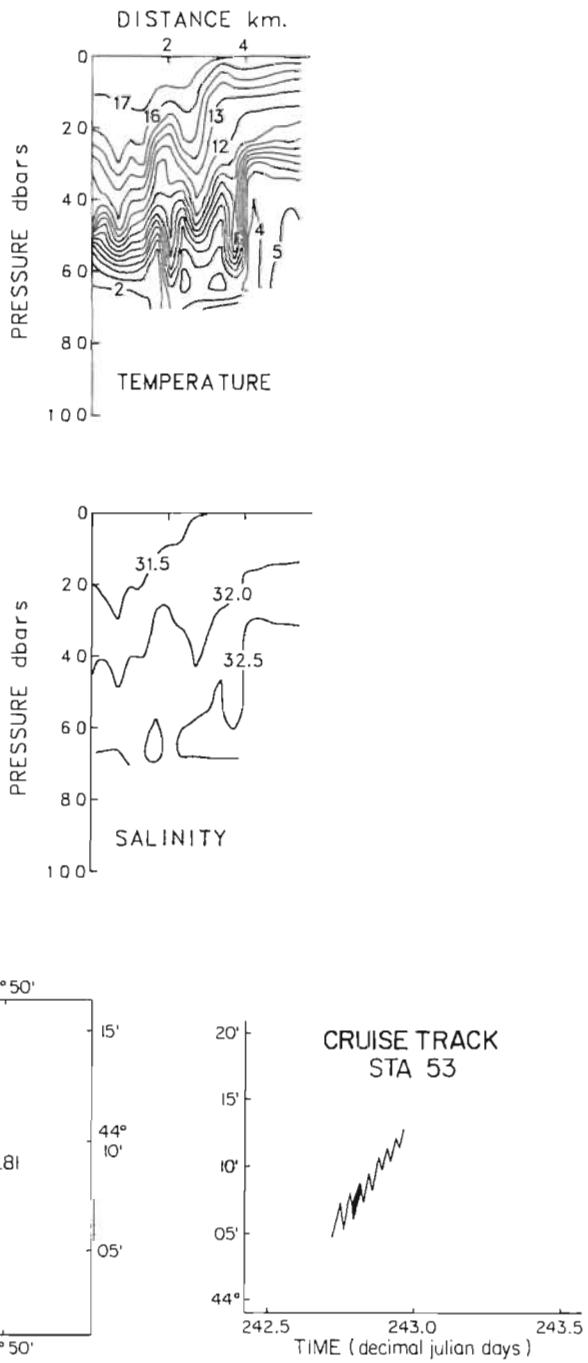


Fig. 232

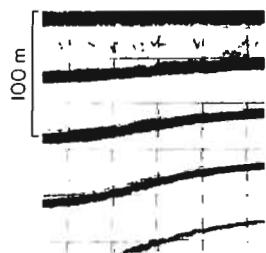
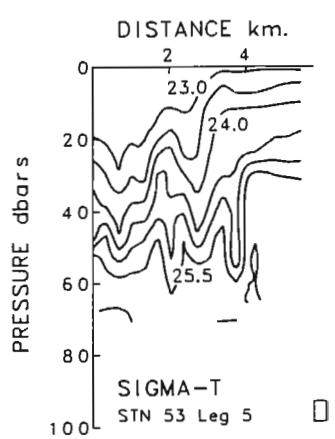


Fig. 233

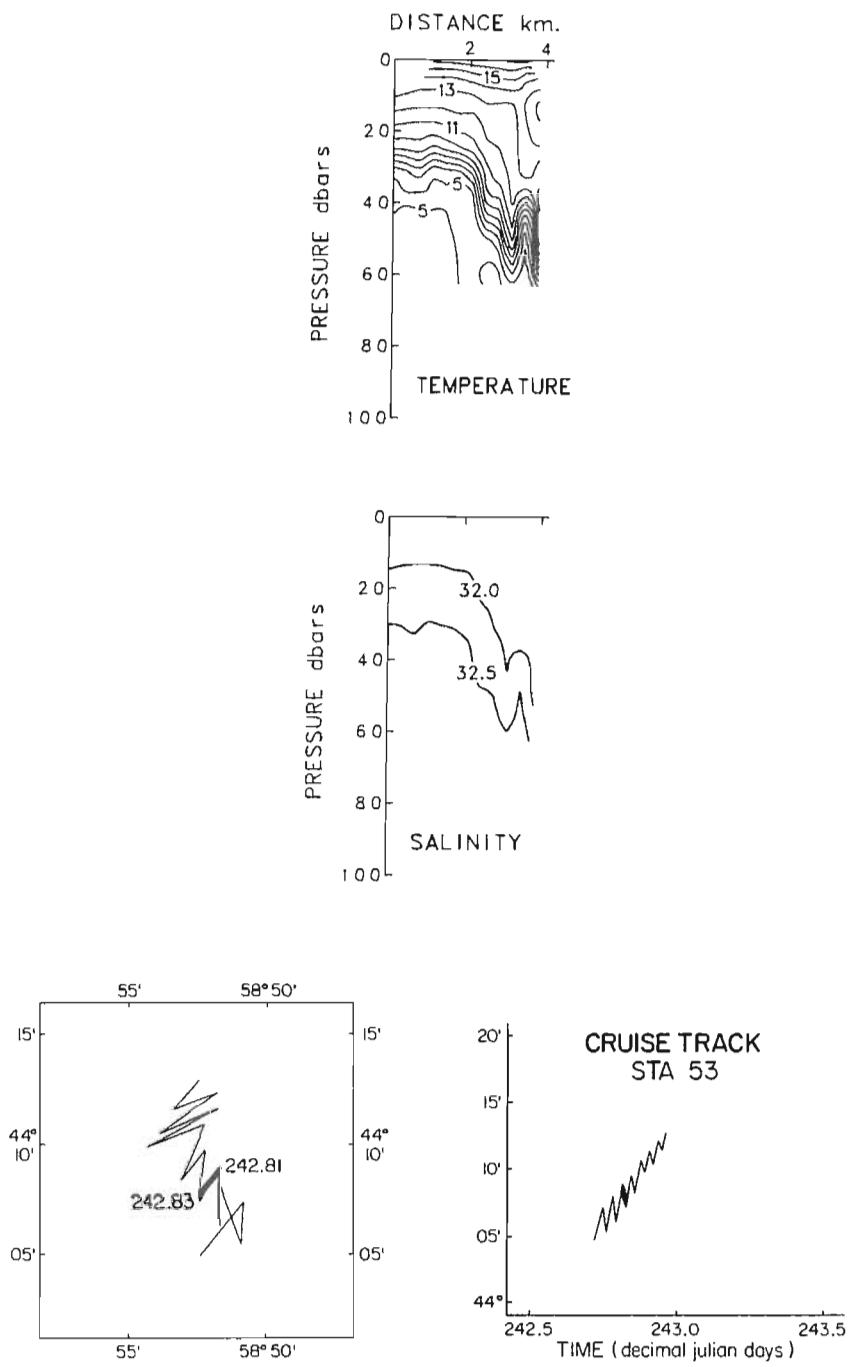


Fig. 234

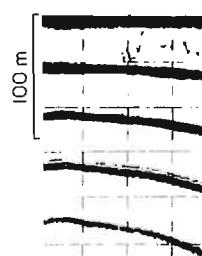
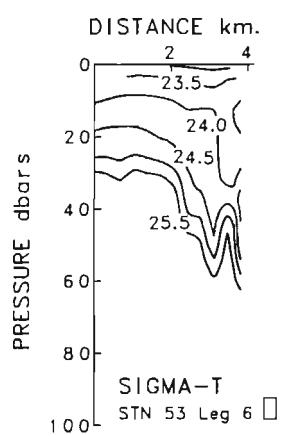


Fig. 235

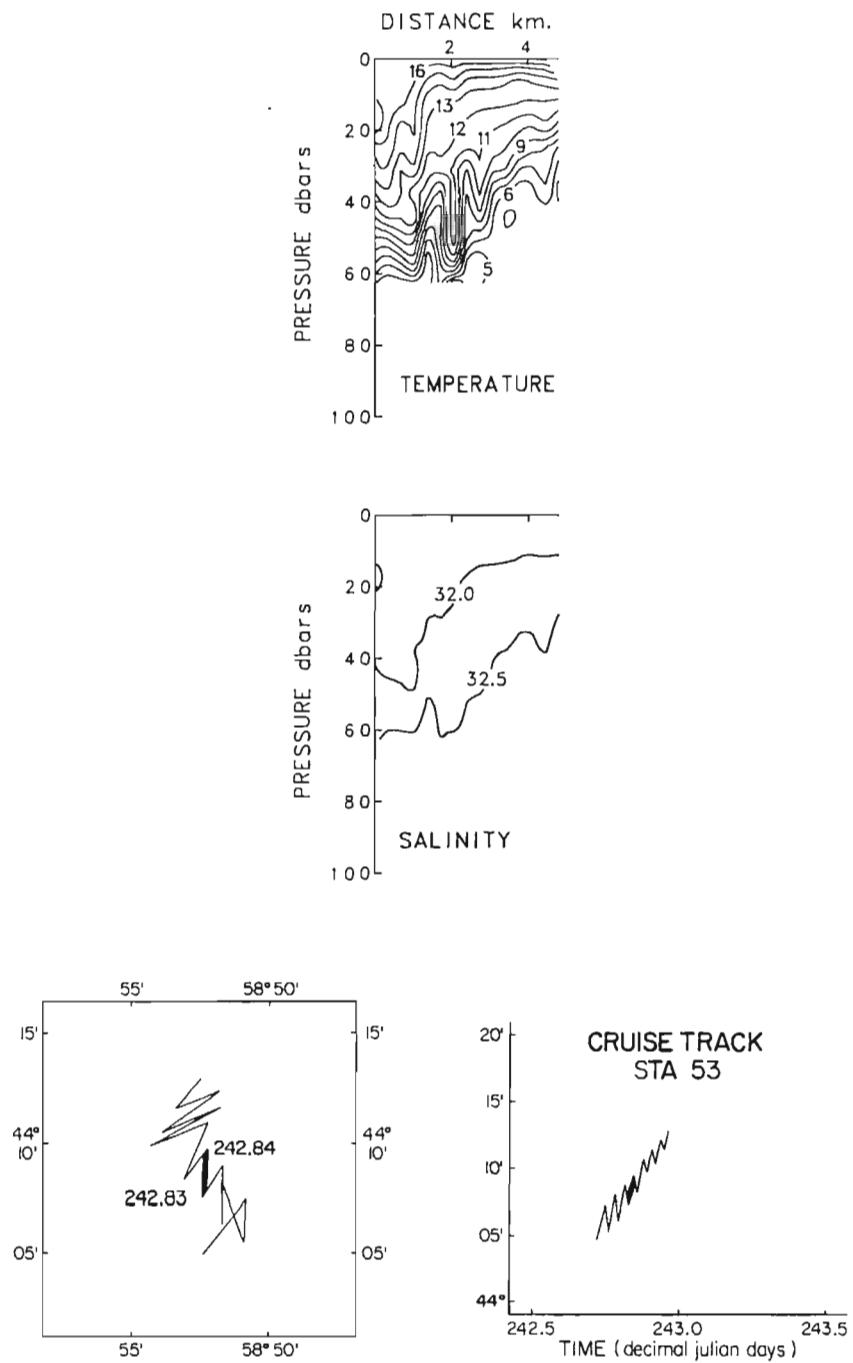


Fig. 236

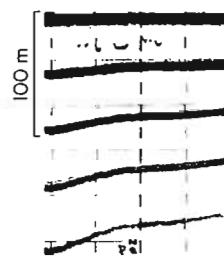
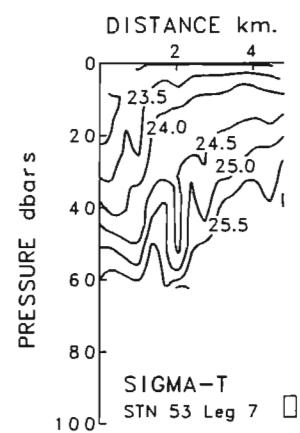


Fig. 237

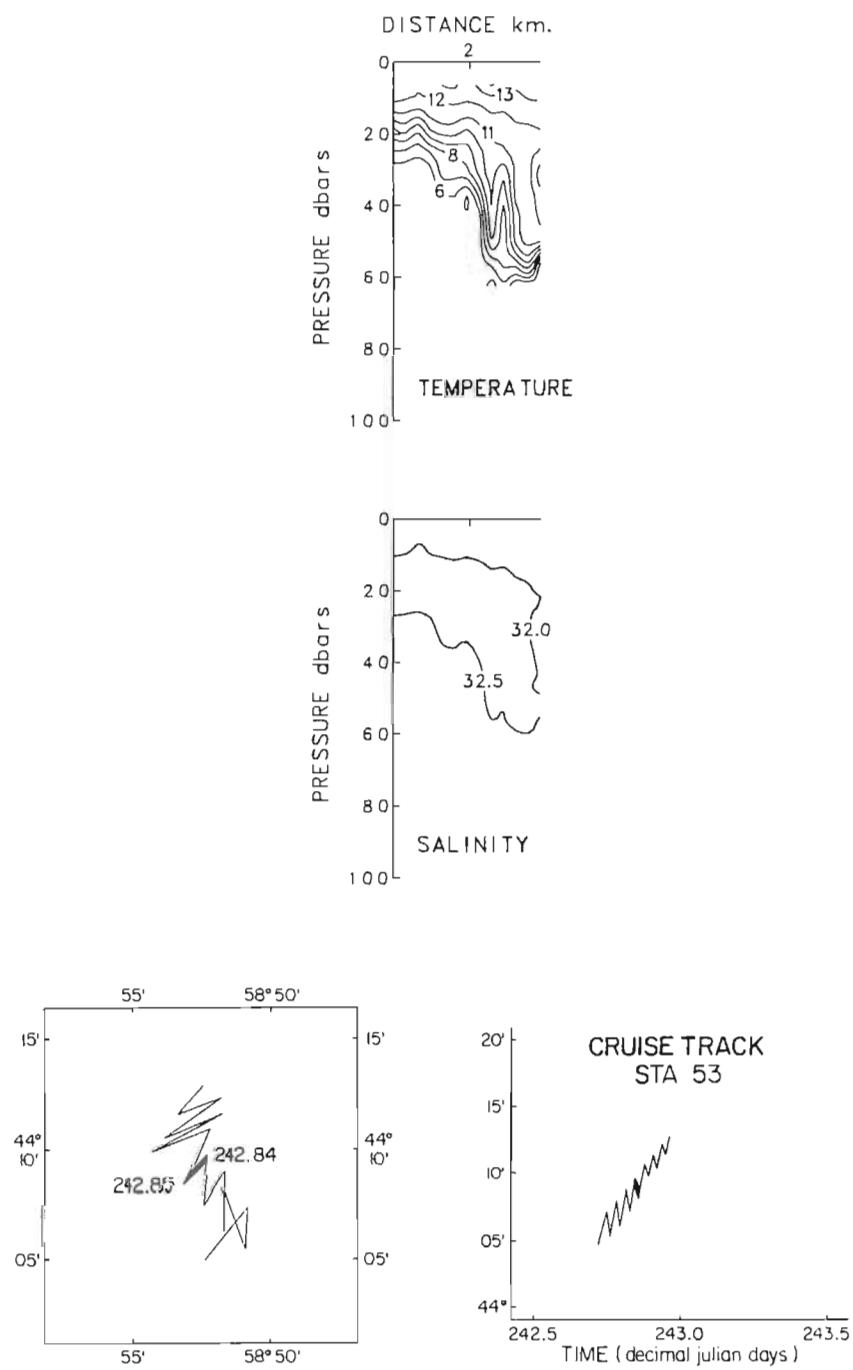


Fig. 238

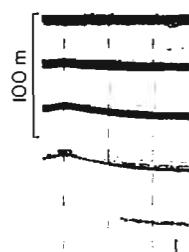
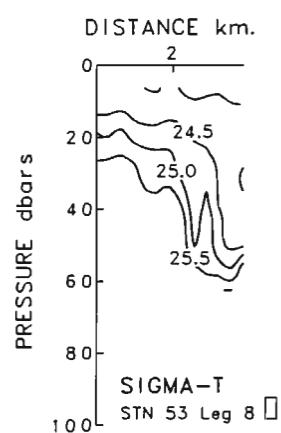


Fig. 239

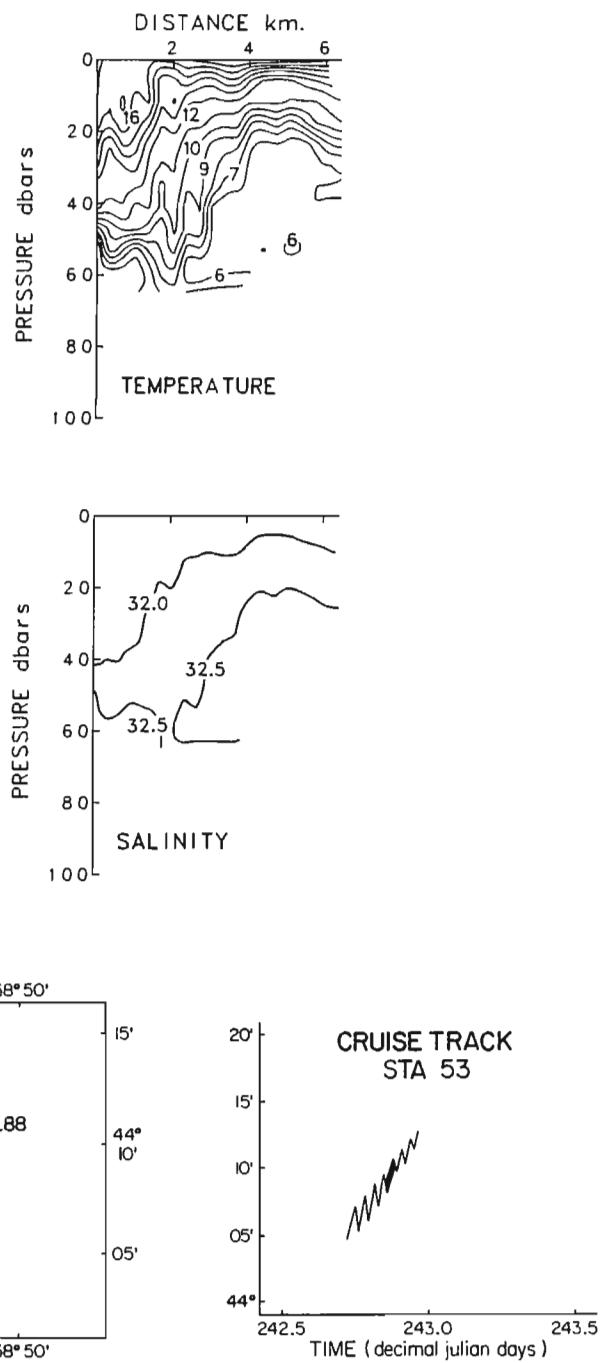


Fig. 240

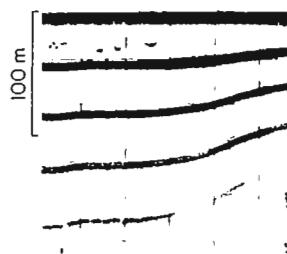
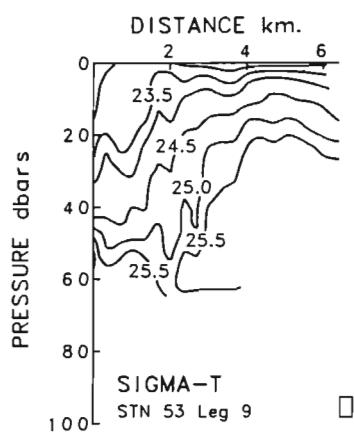


Fig. 241

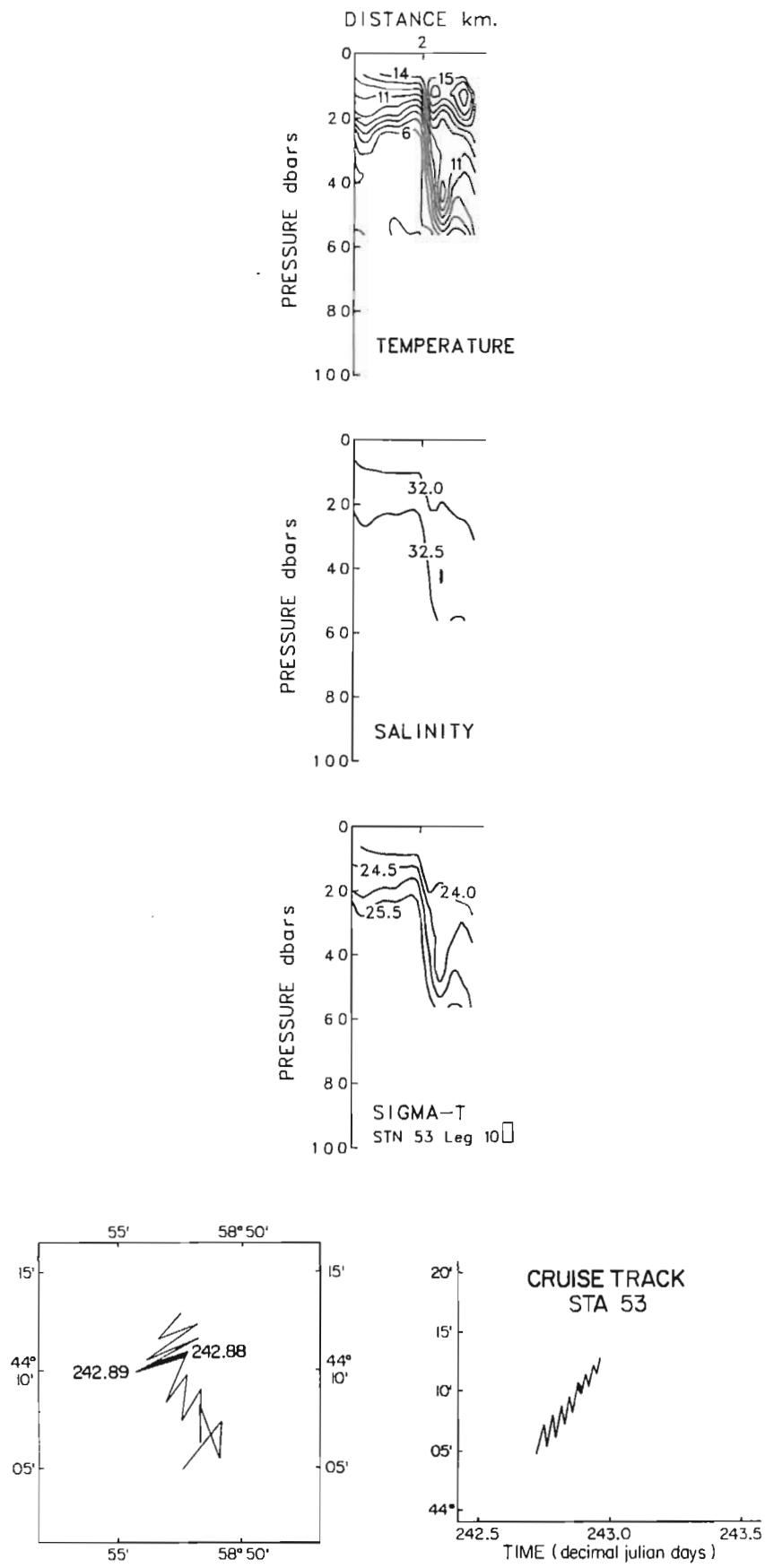


Fig. 242

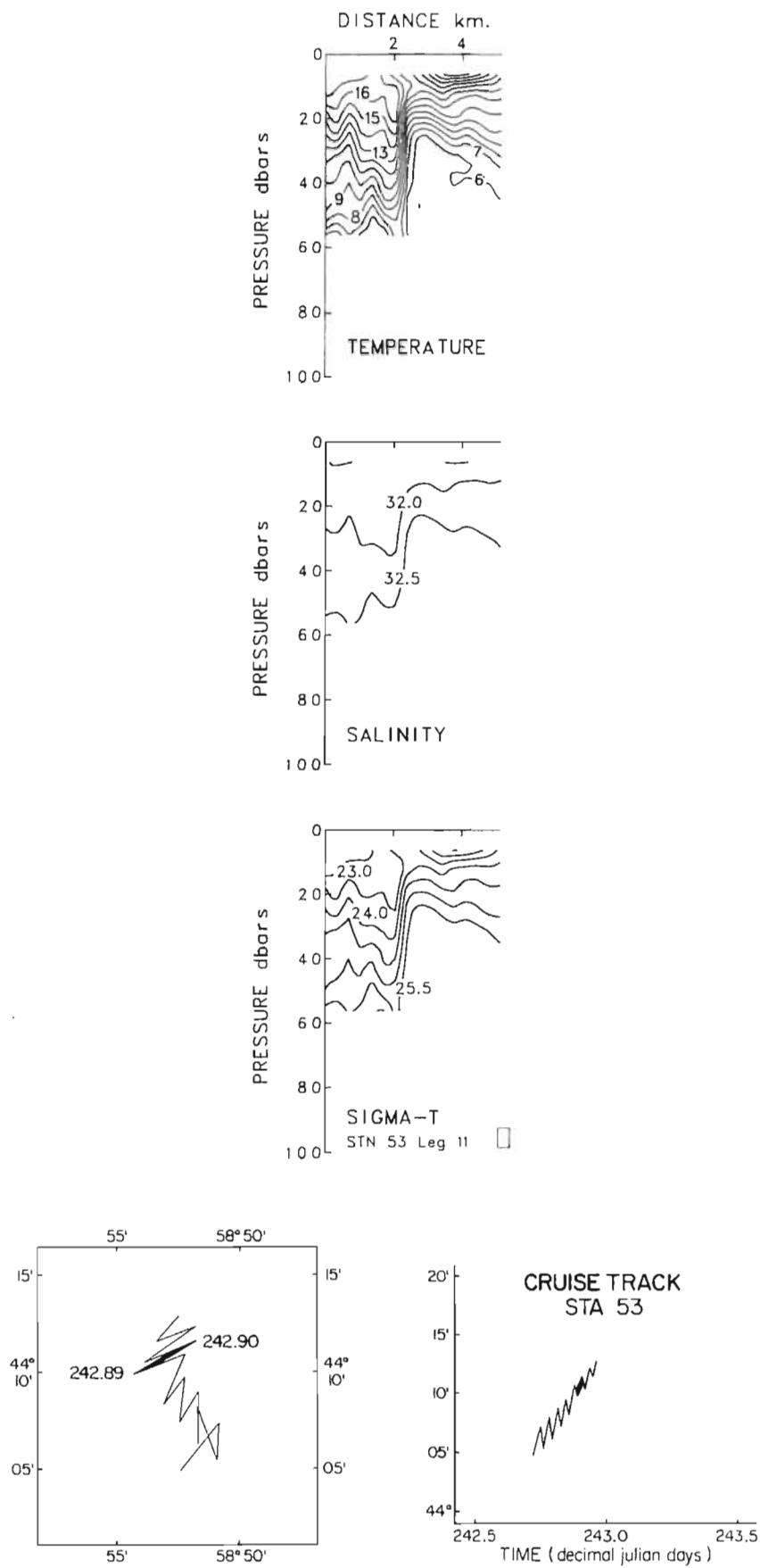


Fig. 243

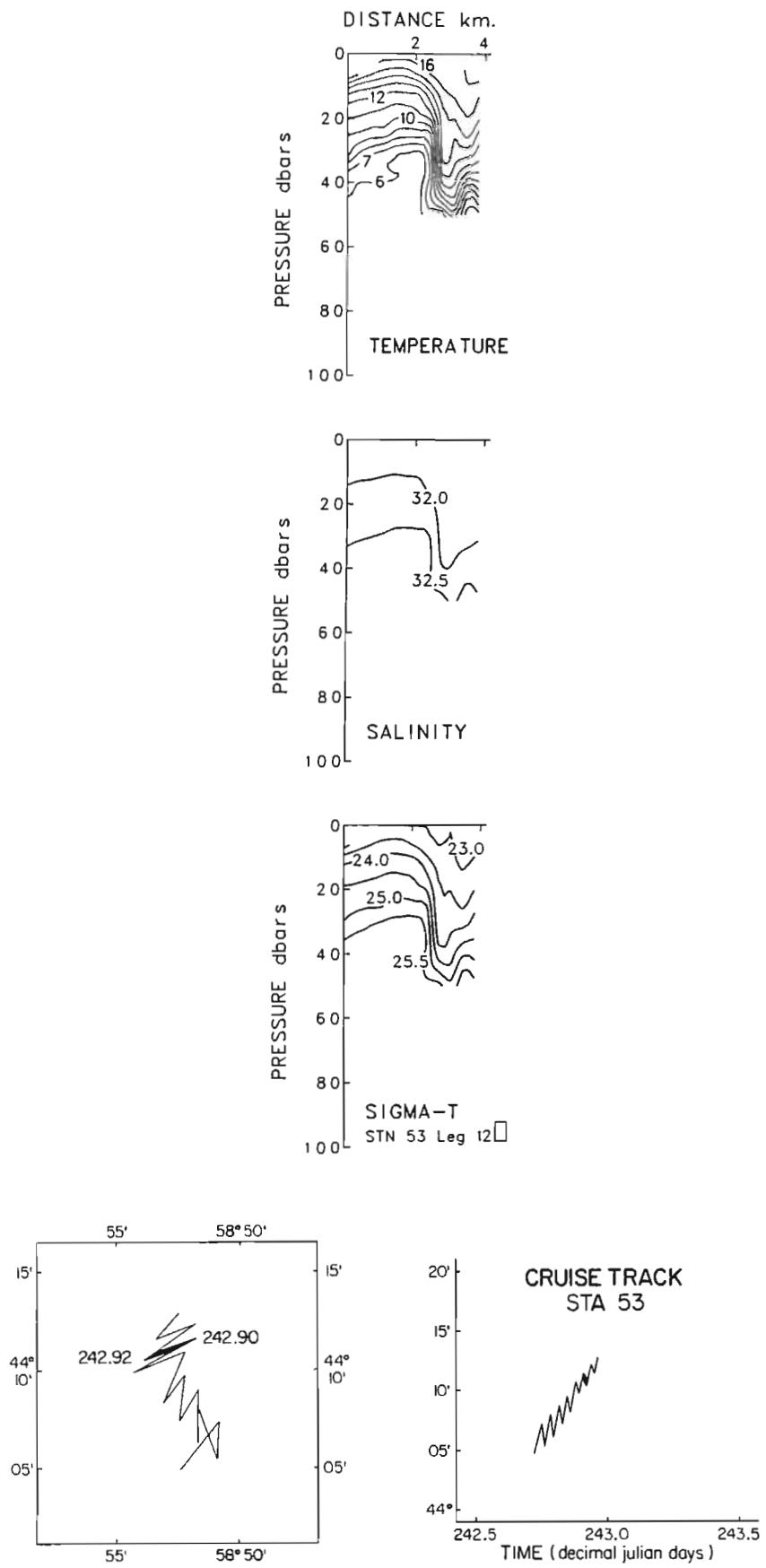


Fig. 244

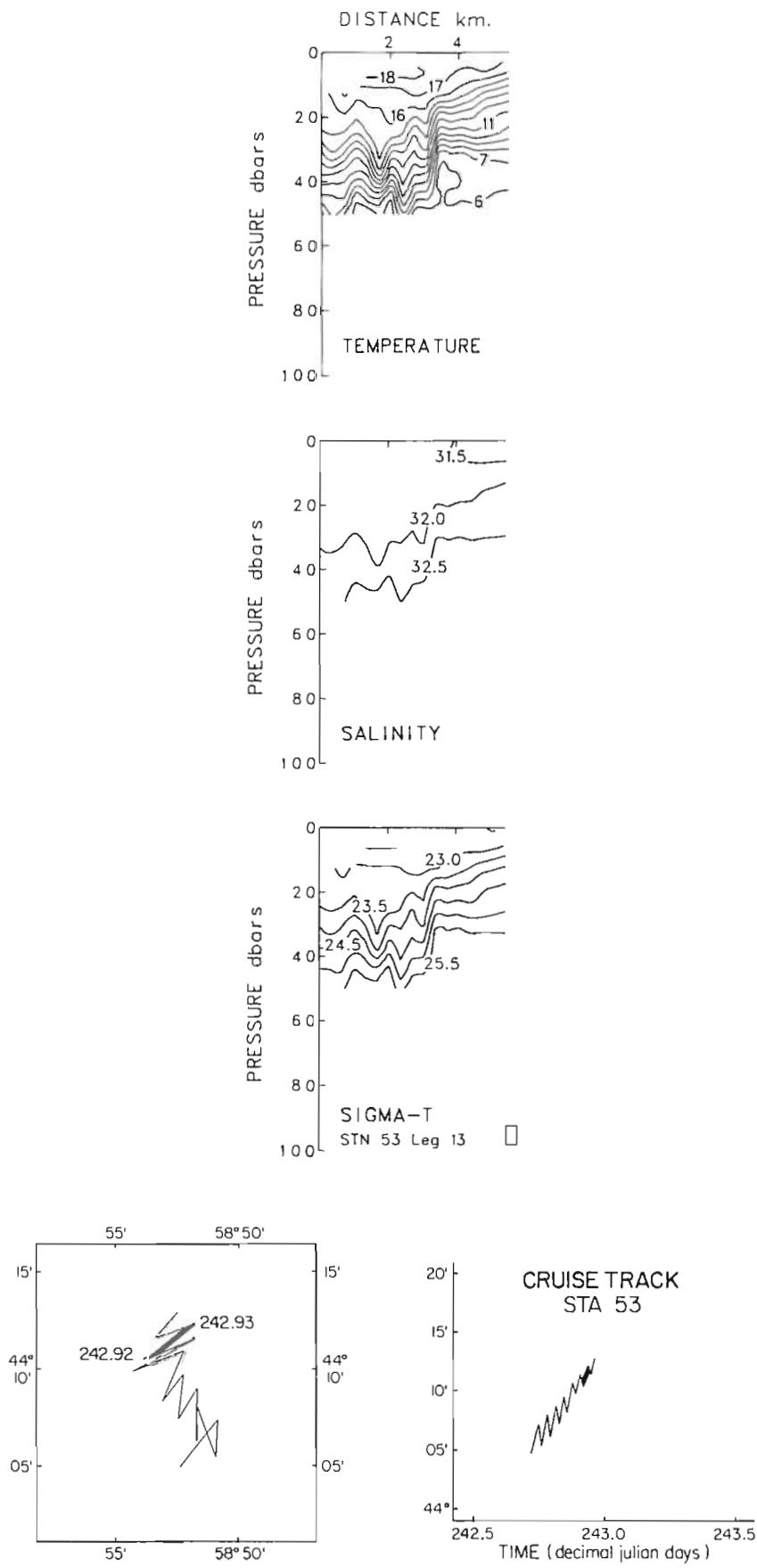


Fig. 245

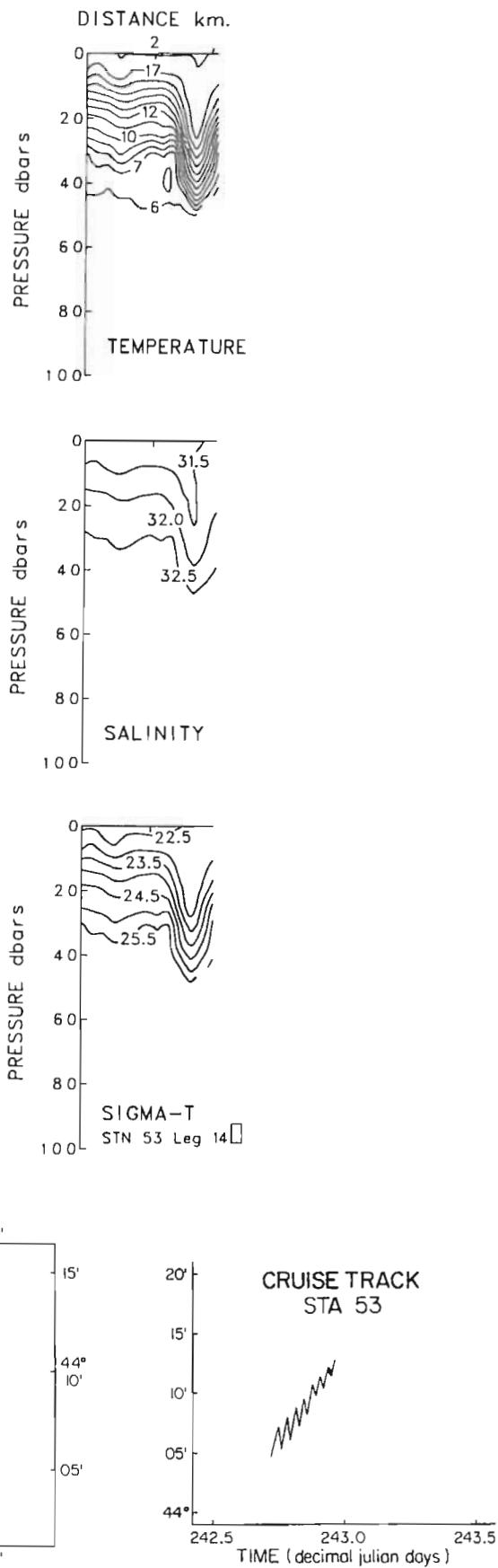


Fig. 246

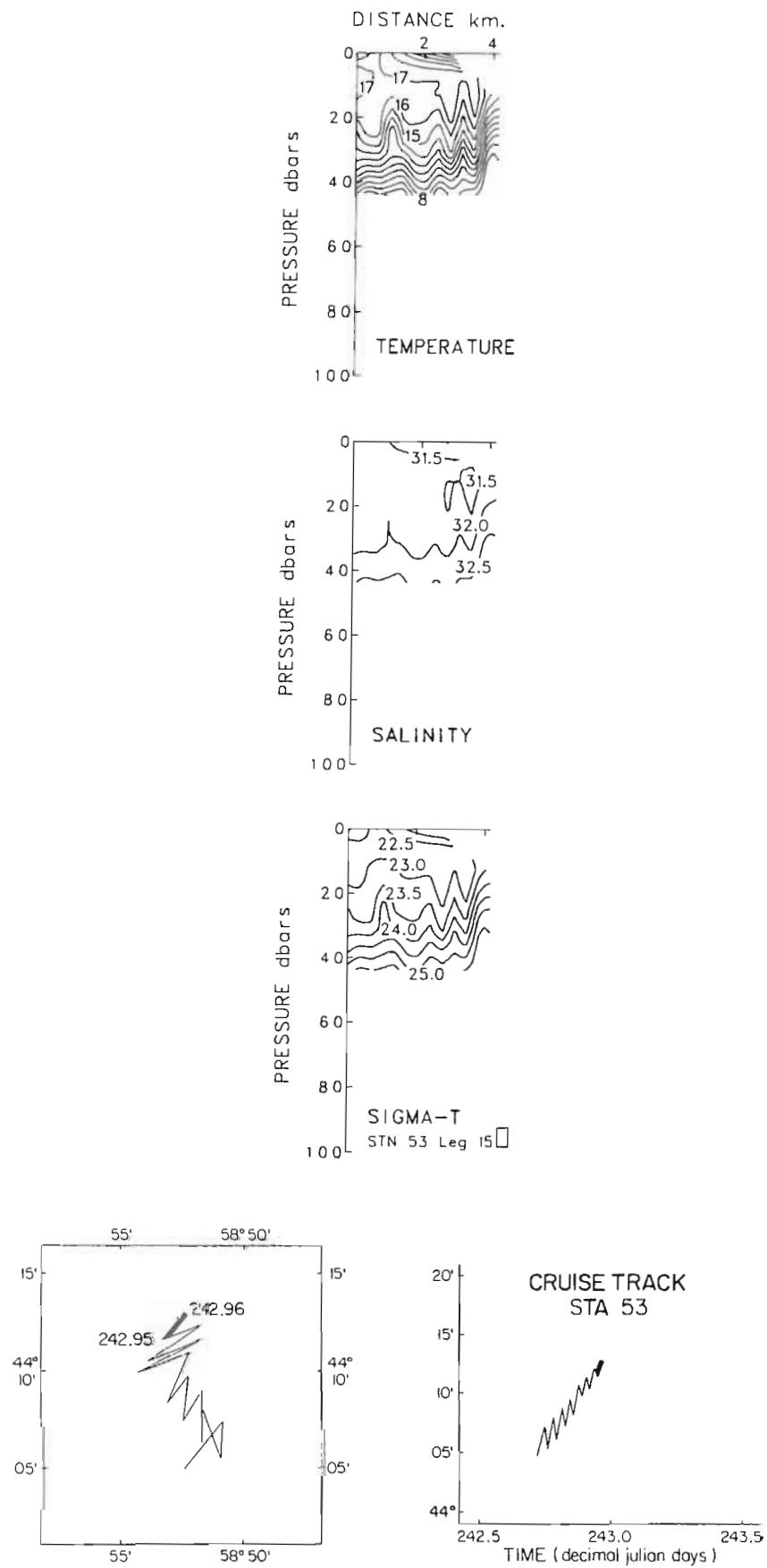


Fig. 247

Figures 248-258.

BATFISH station 54: 11 sections of Temperature, Salinity and Sigma-t vs. pressure, location map and Sigma-t vs. pressure, location map and longitude vs. time plot.

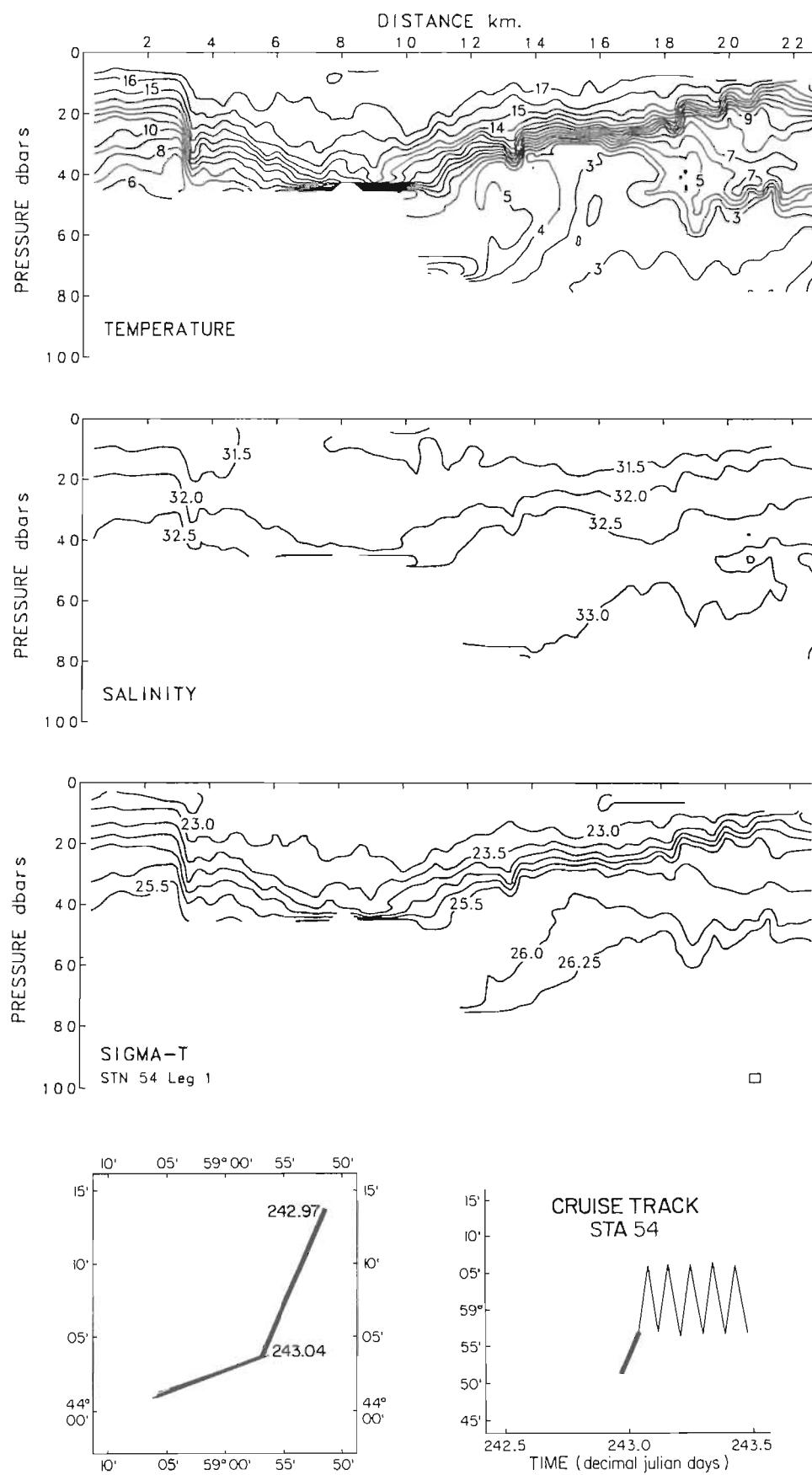


Fig. 248

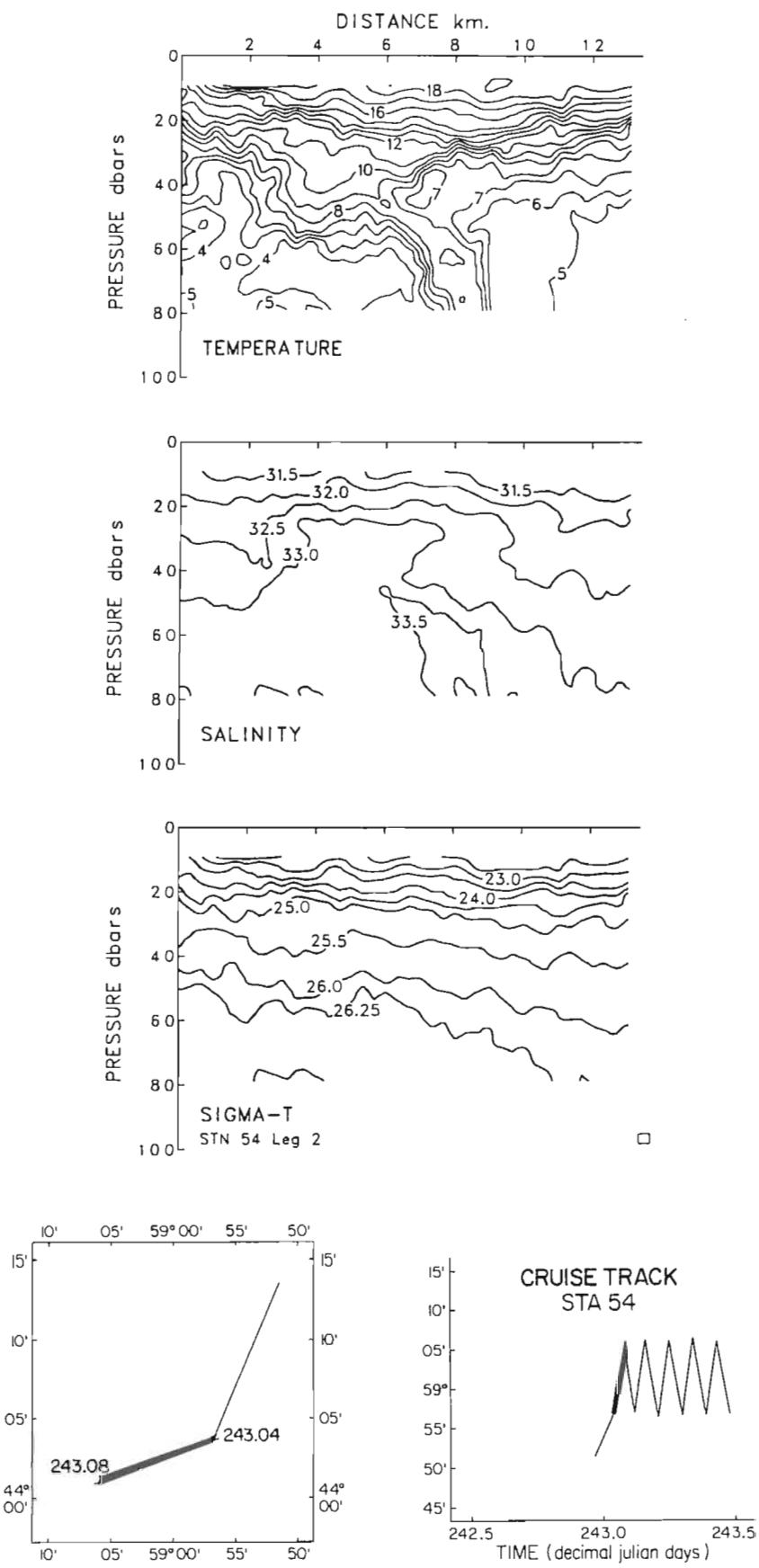


Fig. 249

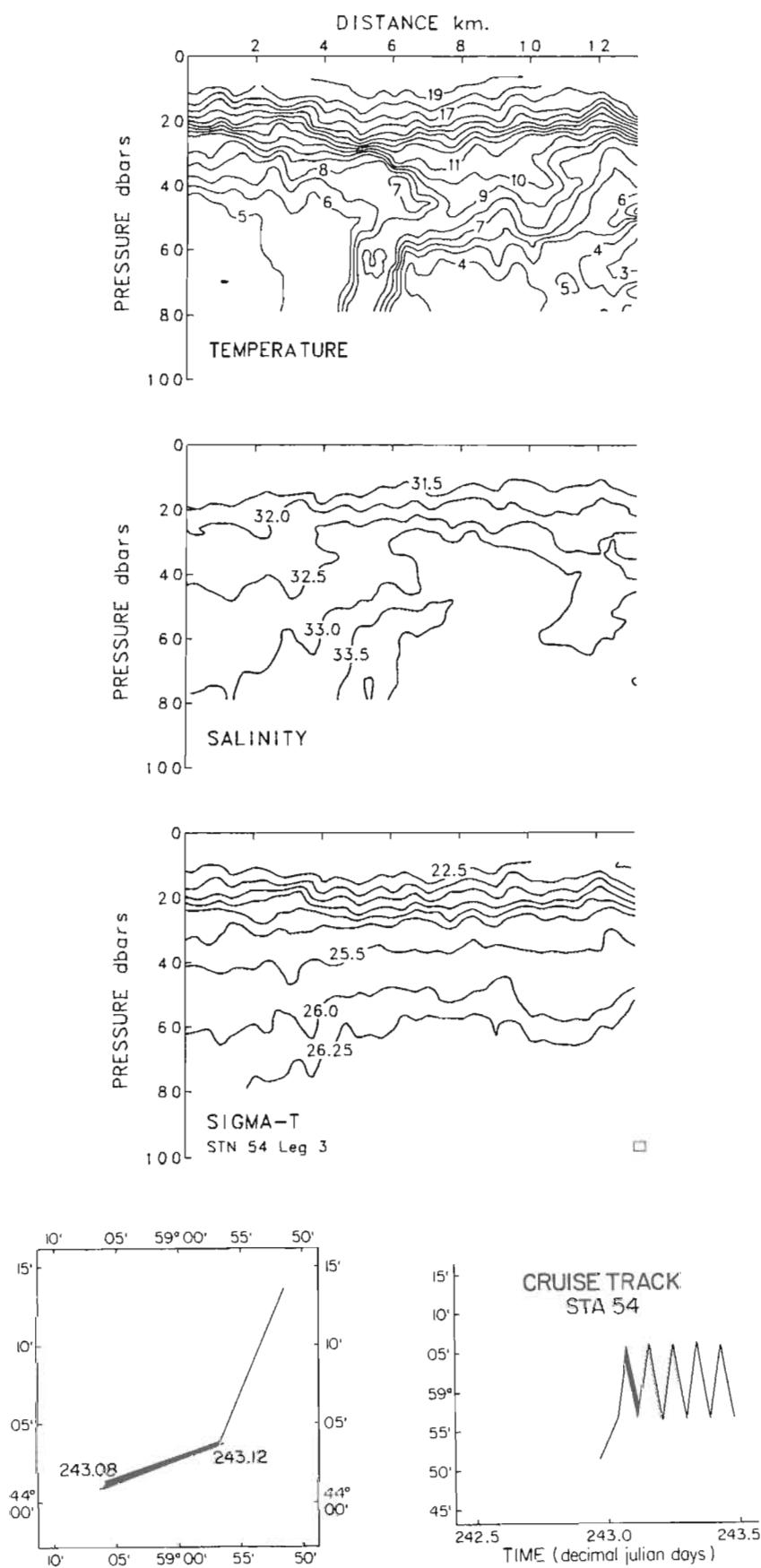


Fig. 250

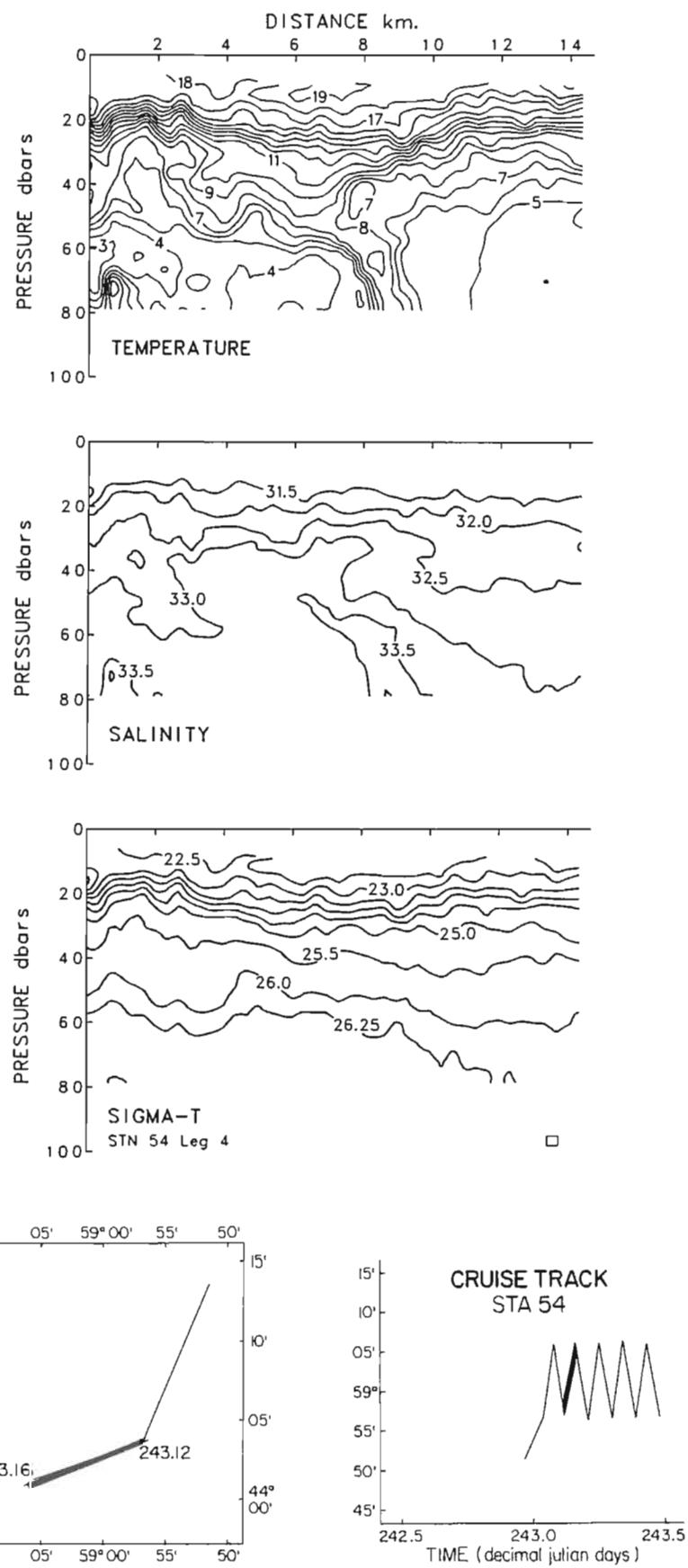


Fig. 251

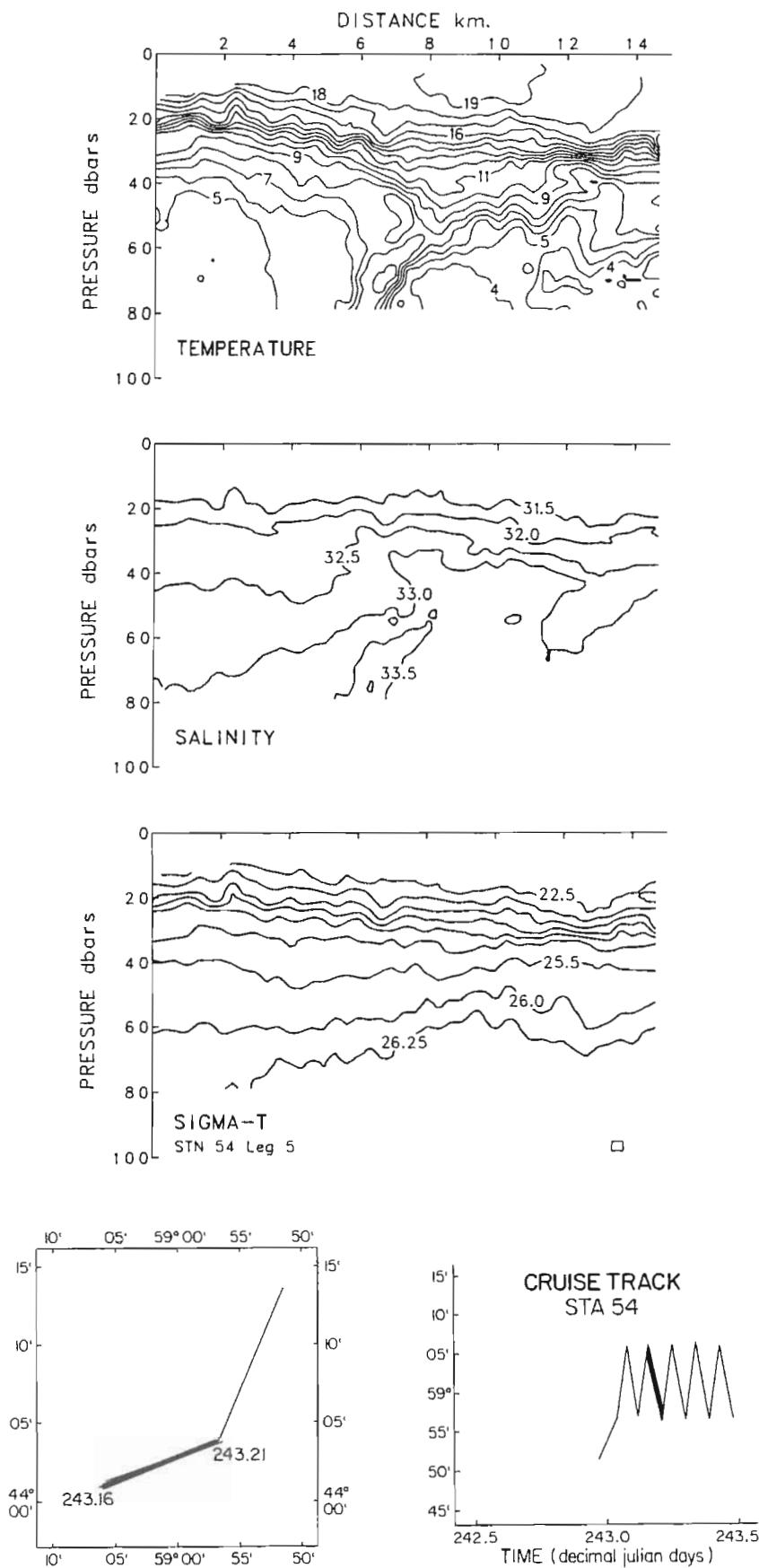


Fig. 252

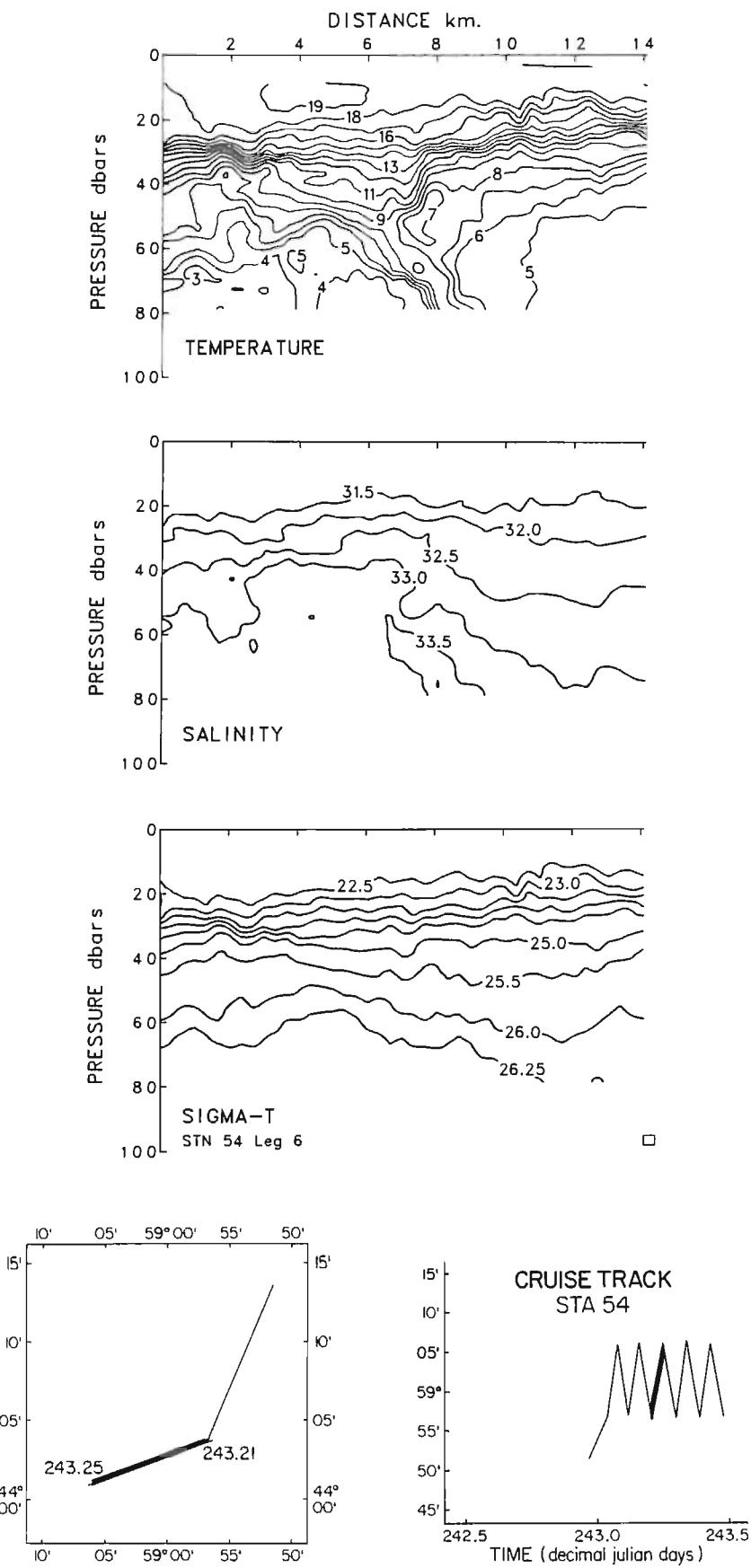


Fig. 253

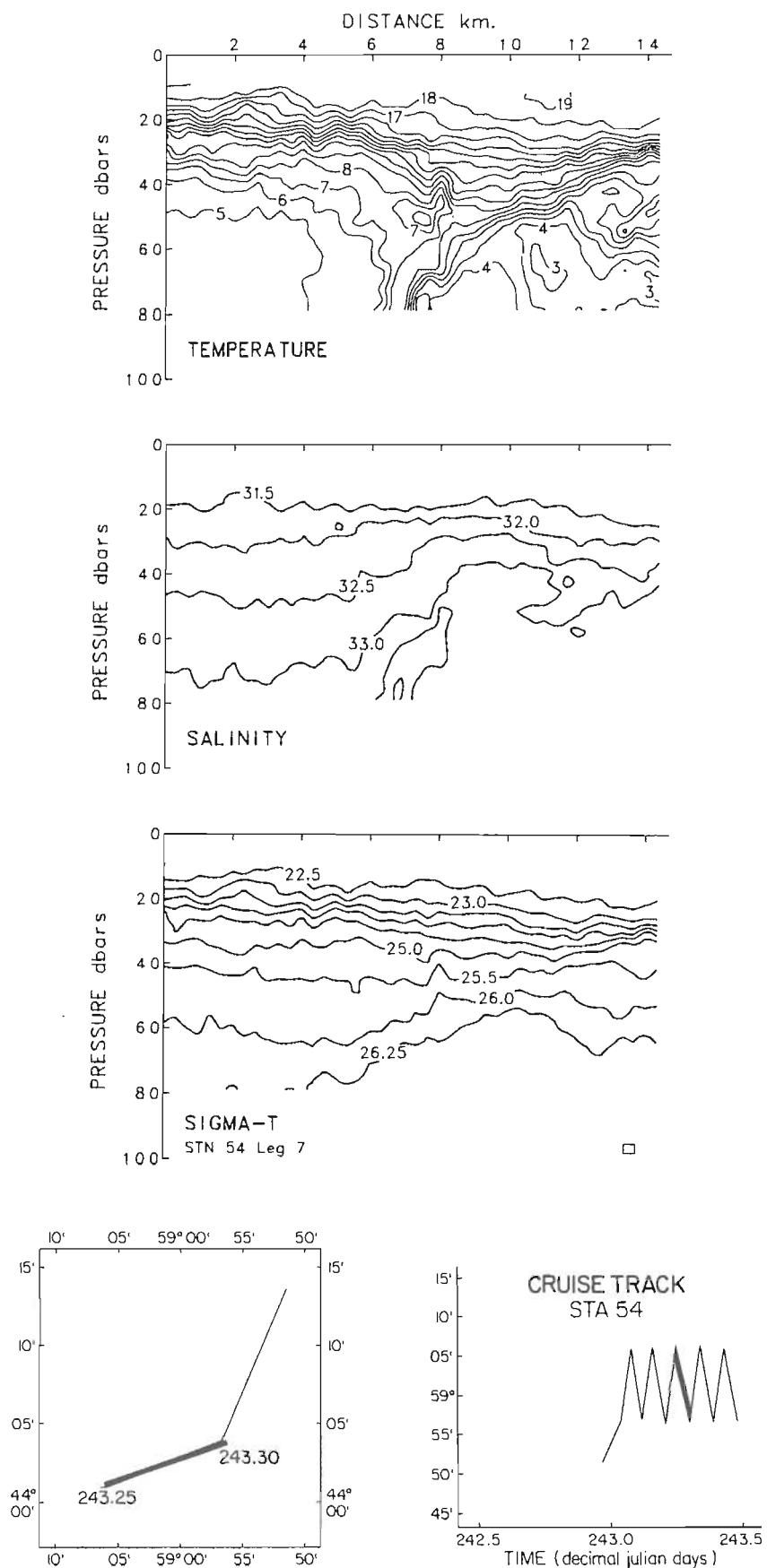


Fig. 254

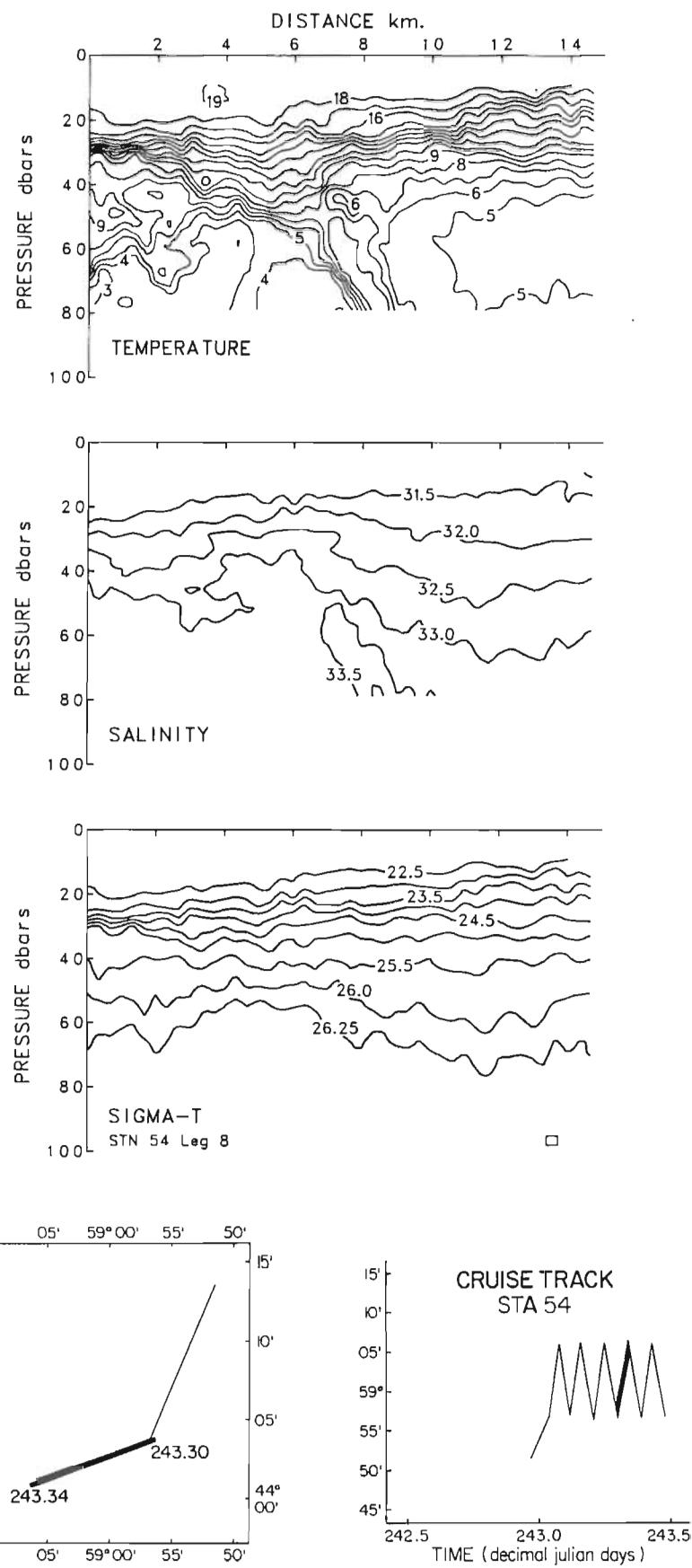


Fig. 255

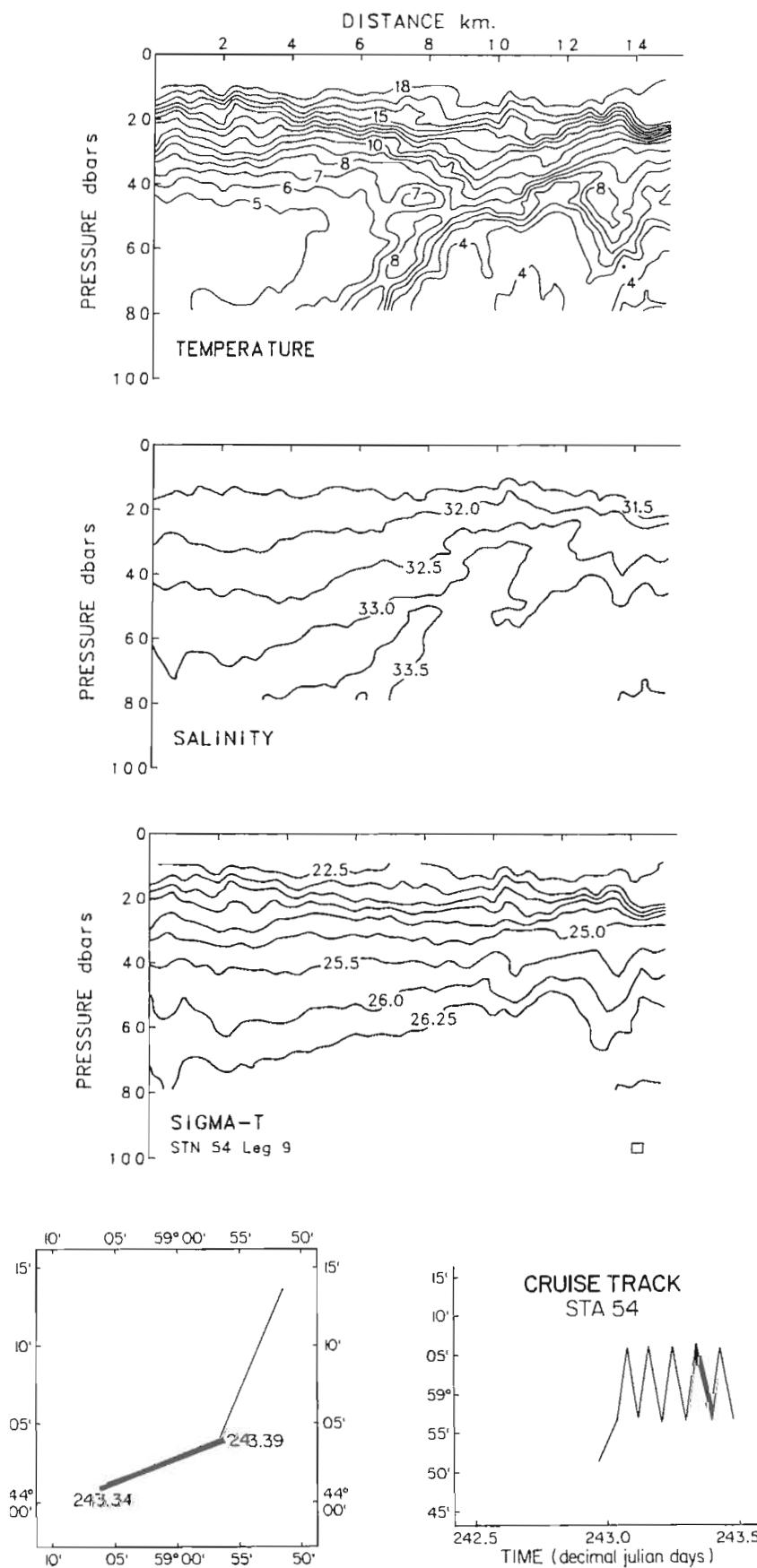


Fig. 256

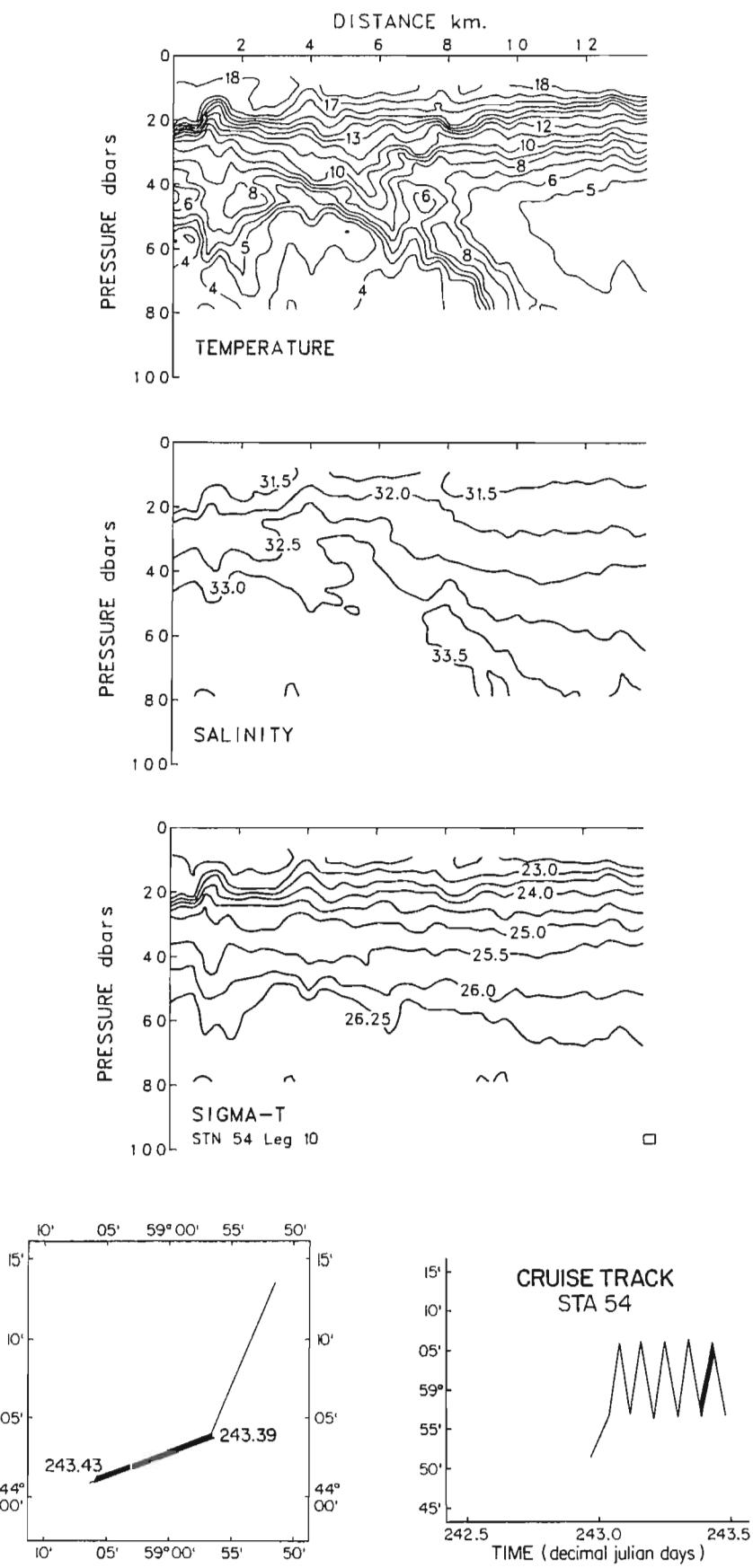


Fig. 257

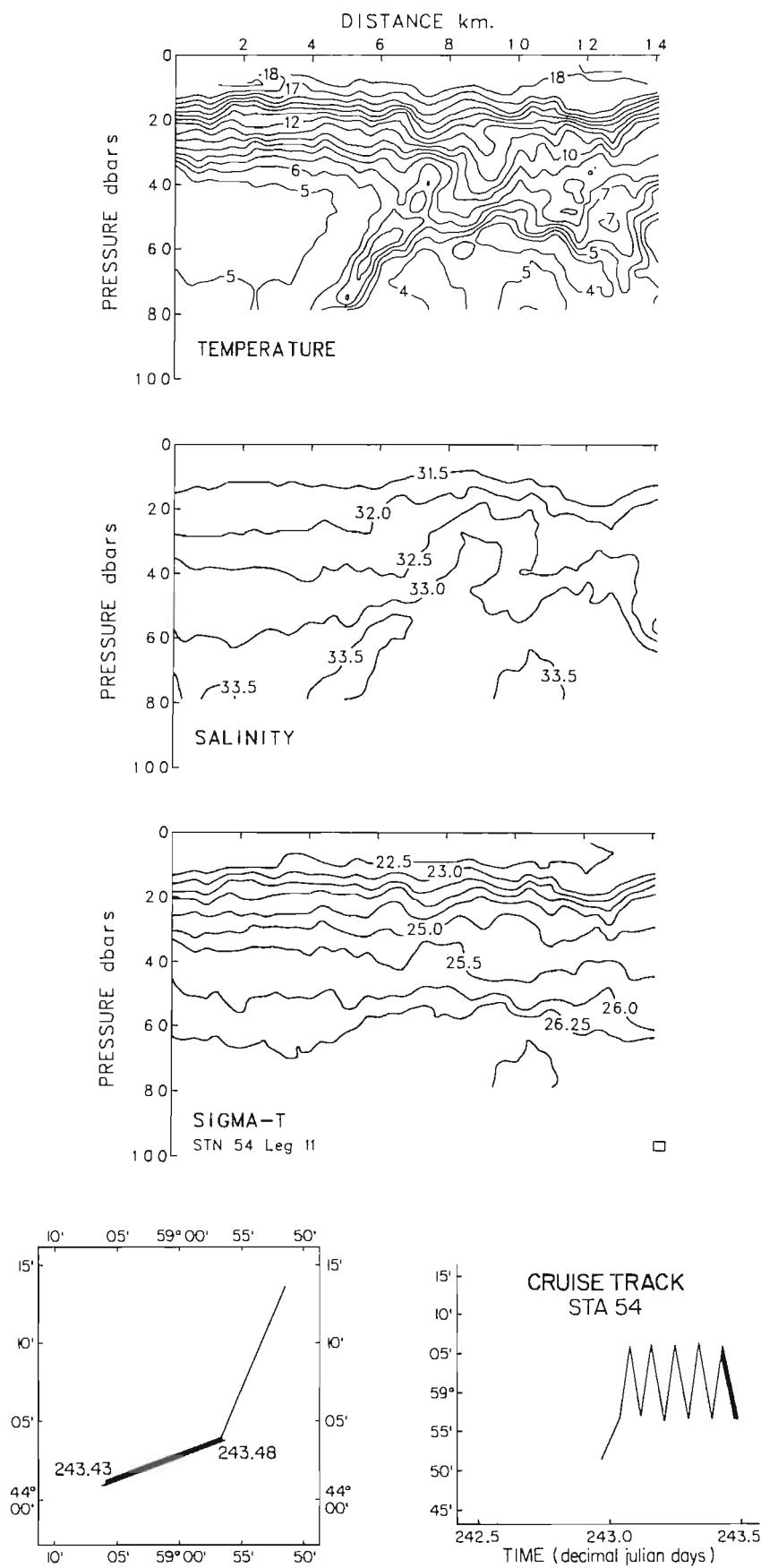


Fig. 258

Figure 259.

BATFISH station 55: 1 section of Temperature, Salinity and Sigma-t vs. pressure,
location map and latitude vs. time plot.

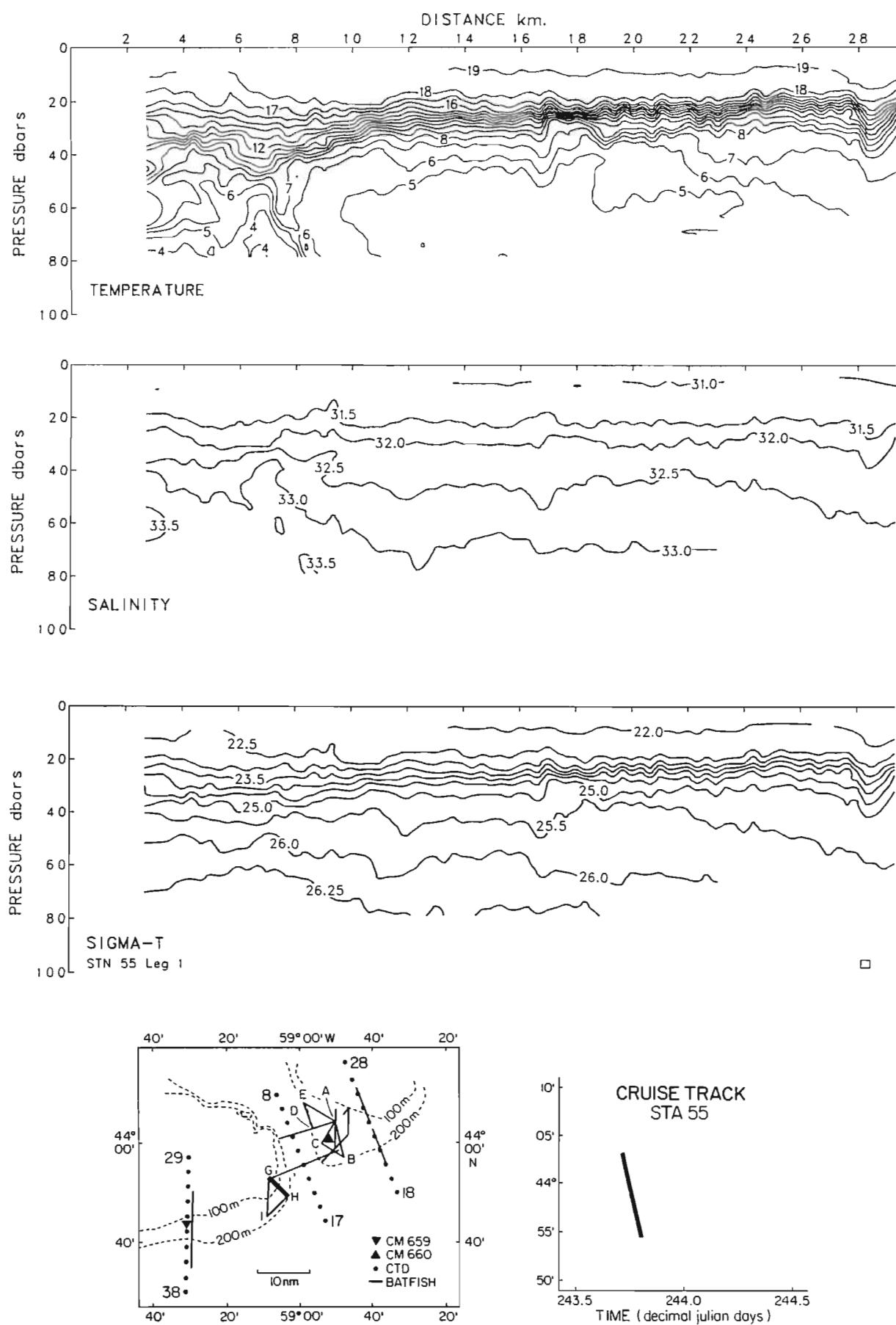


Fig. 259

Figures 260-266.

BATFISH station 56: 7 sections of Temperature, Salinity and Sigma-t vs. pressure,
location map and latitude vs. time plot.

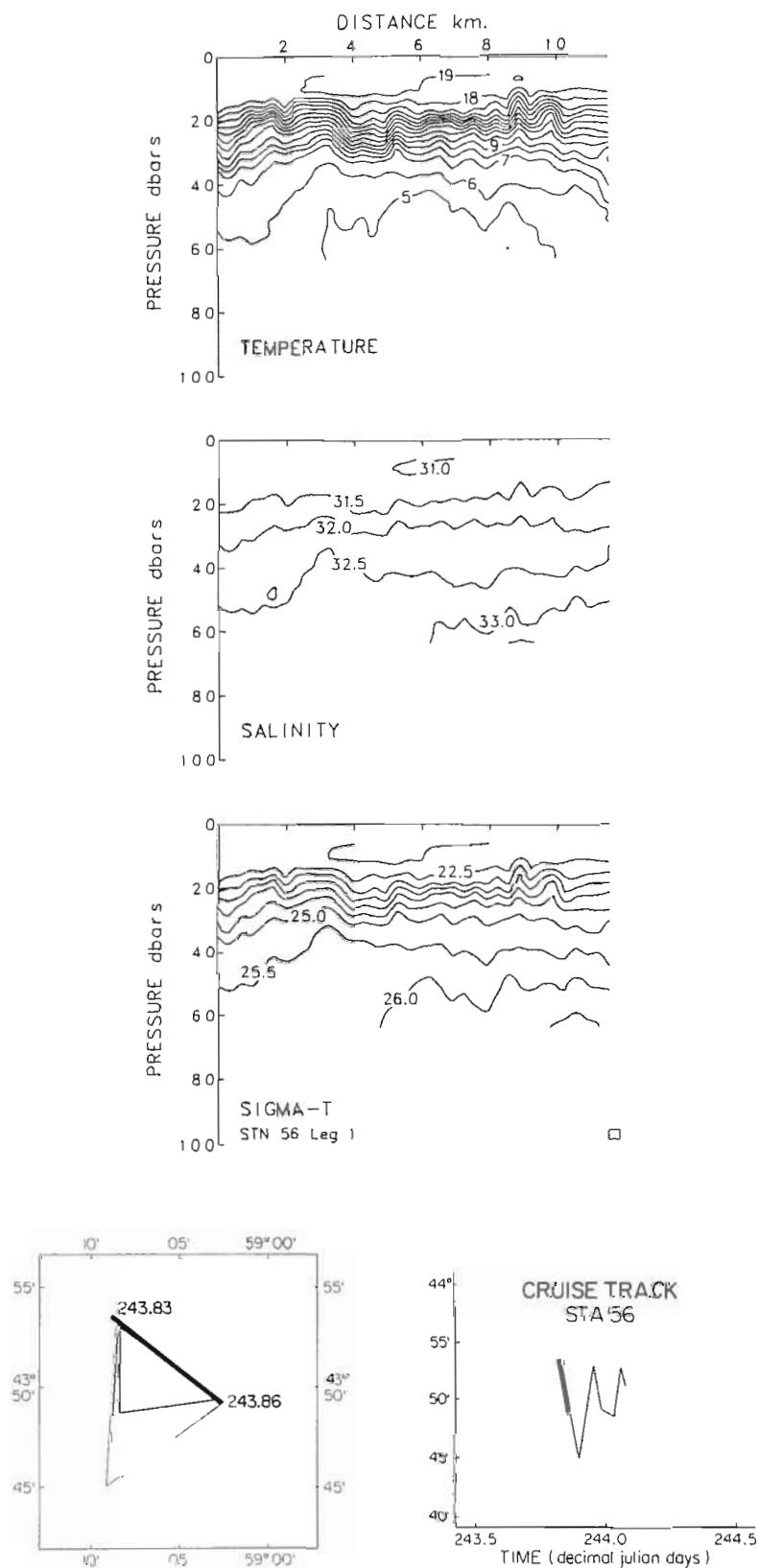


Fig. 260

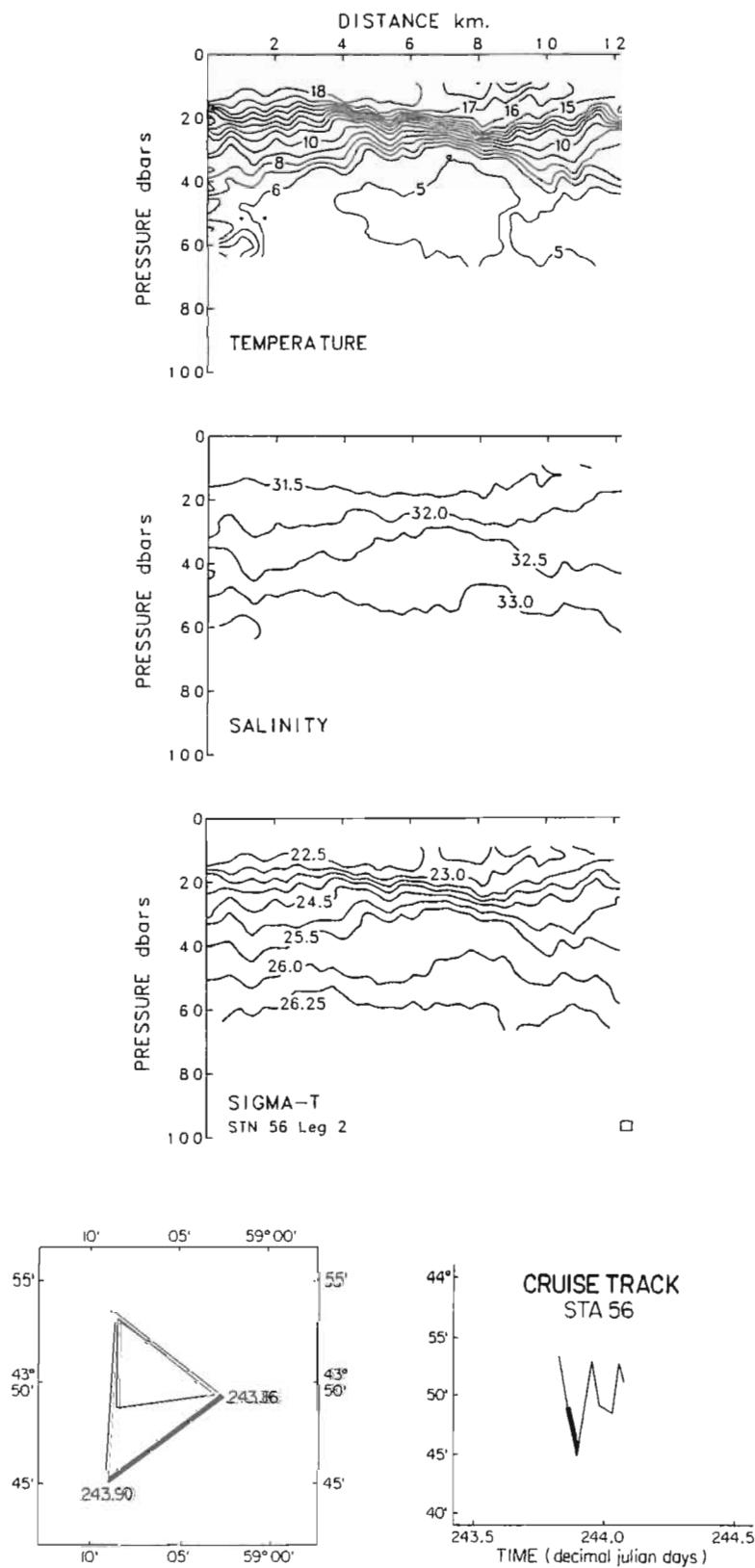


Fig. 261

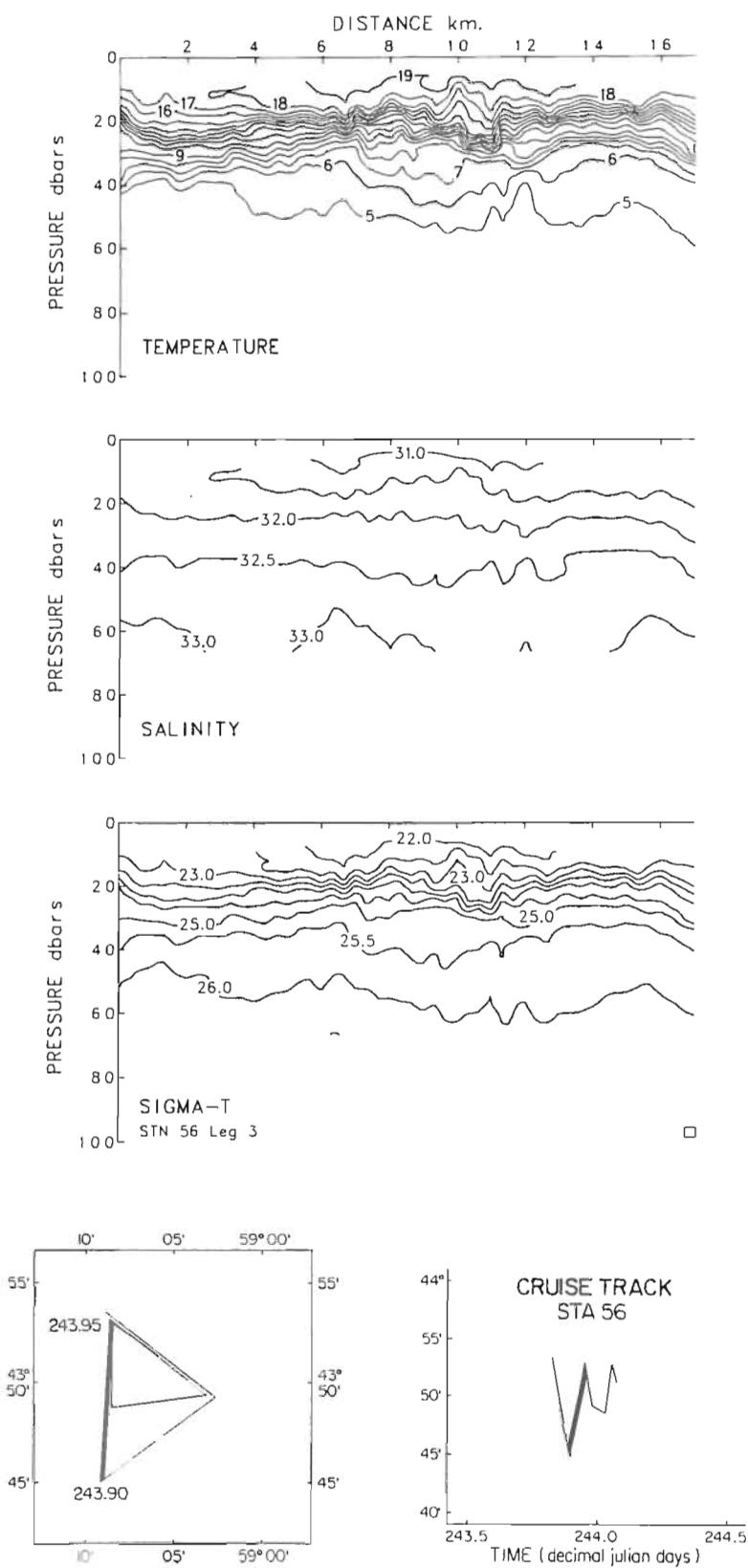


Fig. 262

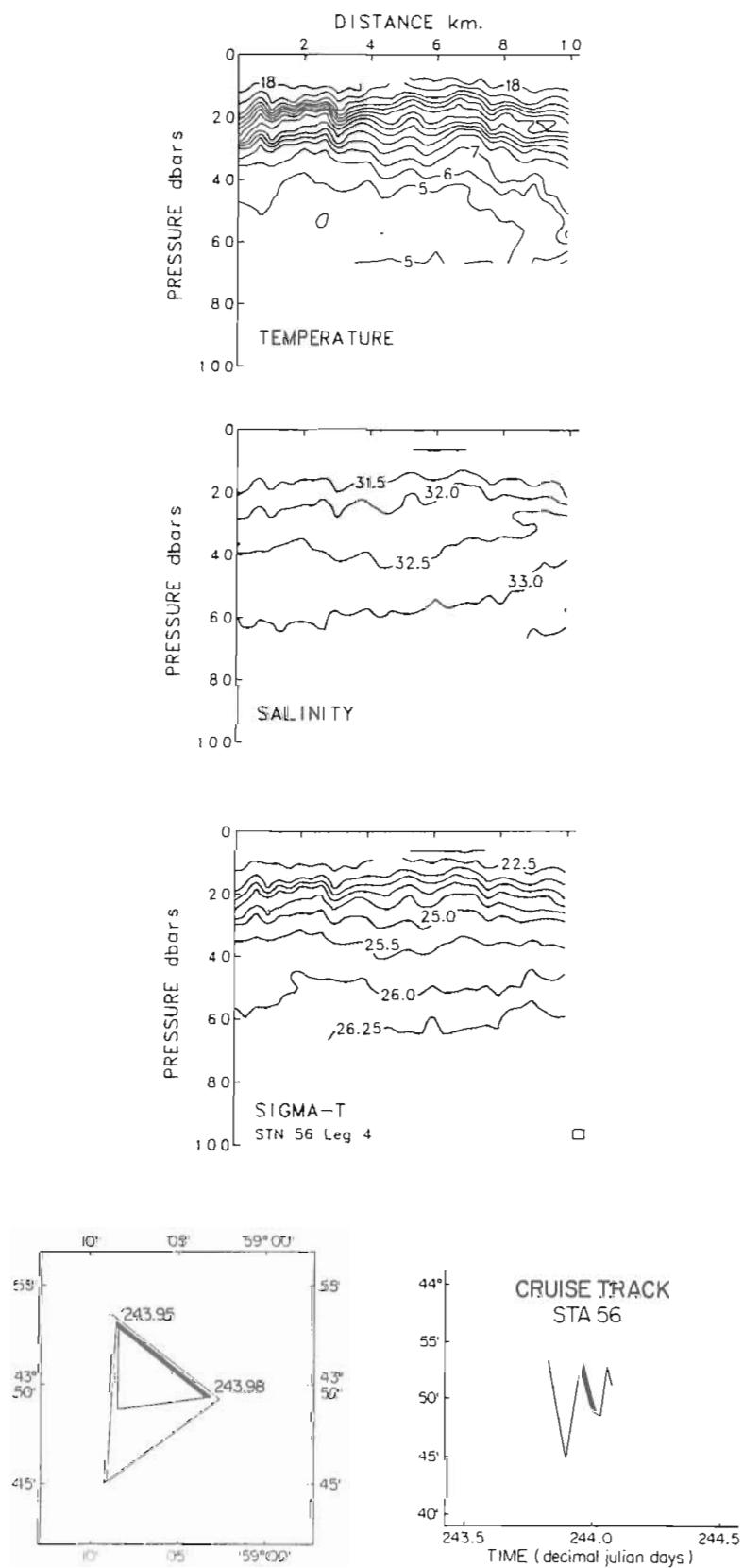


Fig. 263

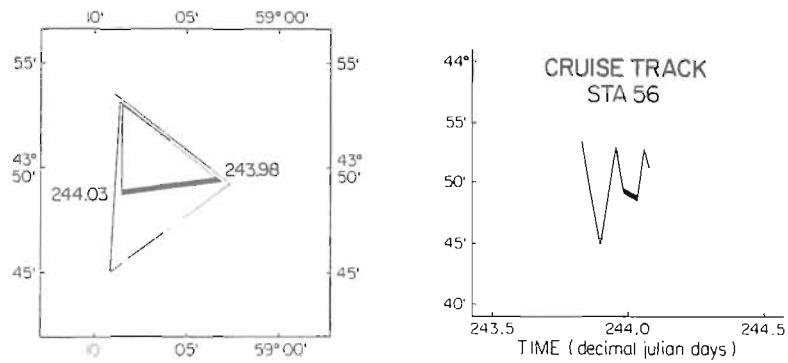
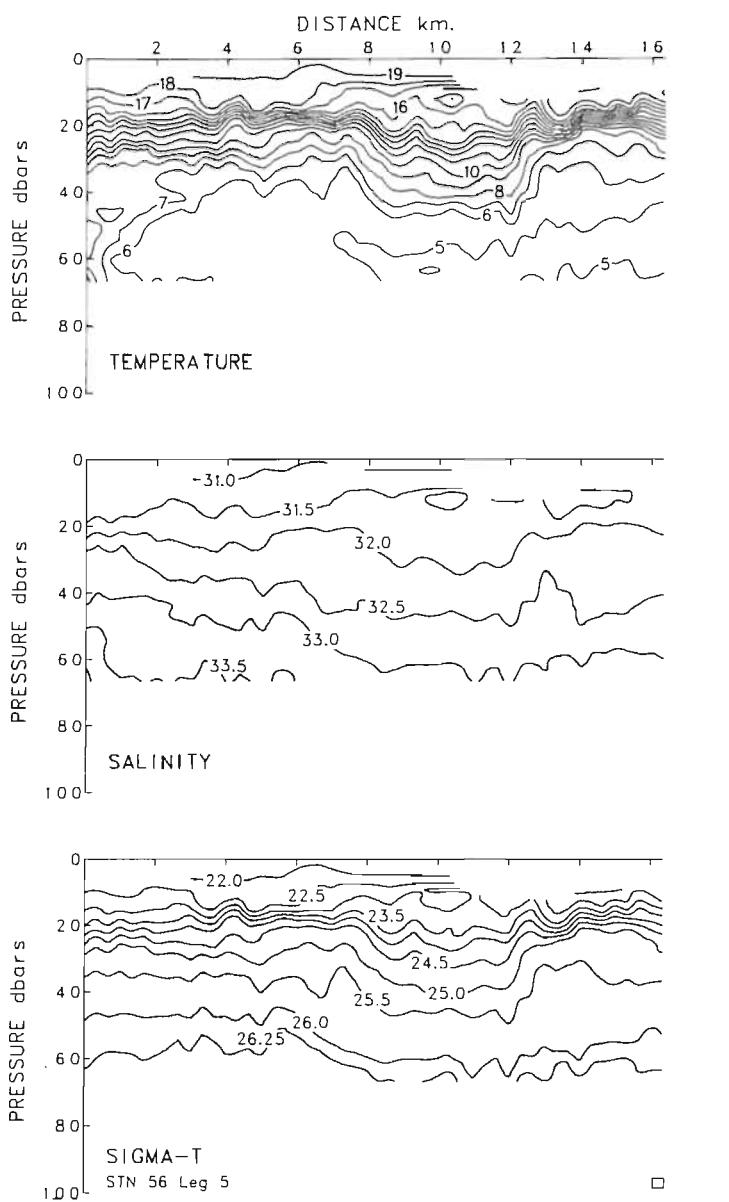


Fig. 264

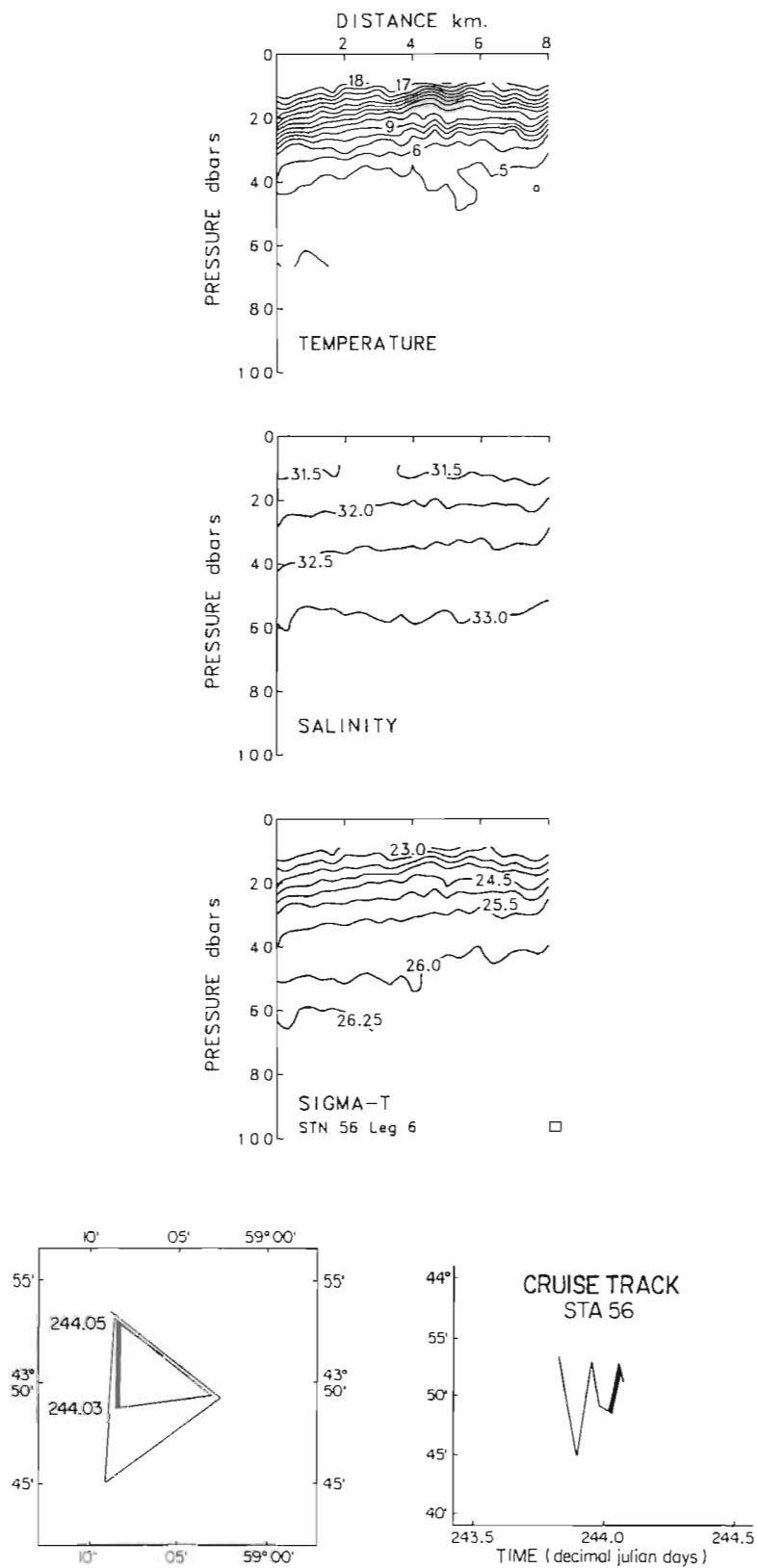


Fig. 265

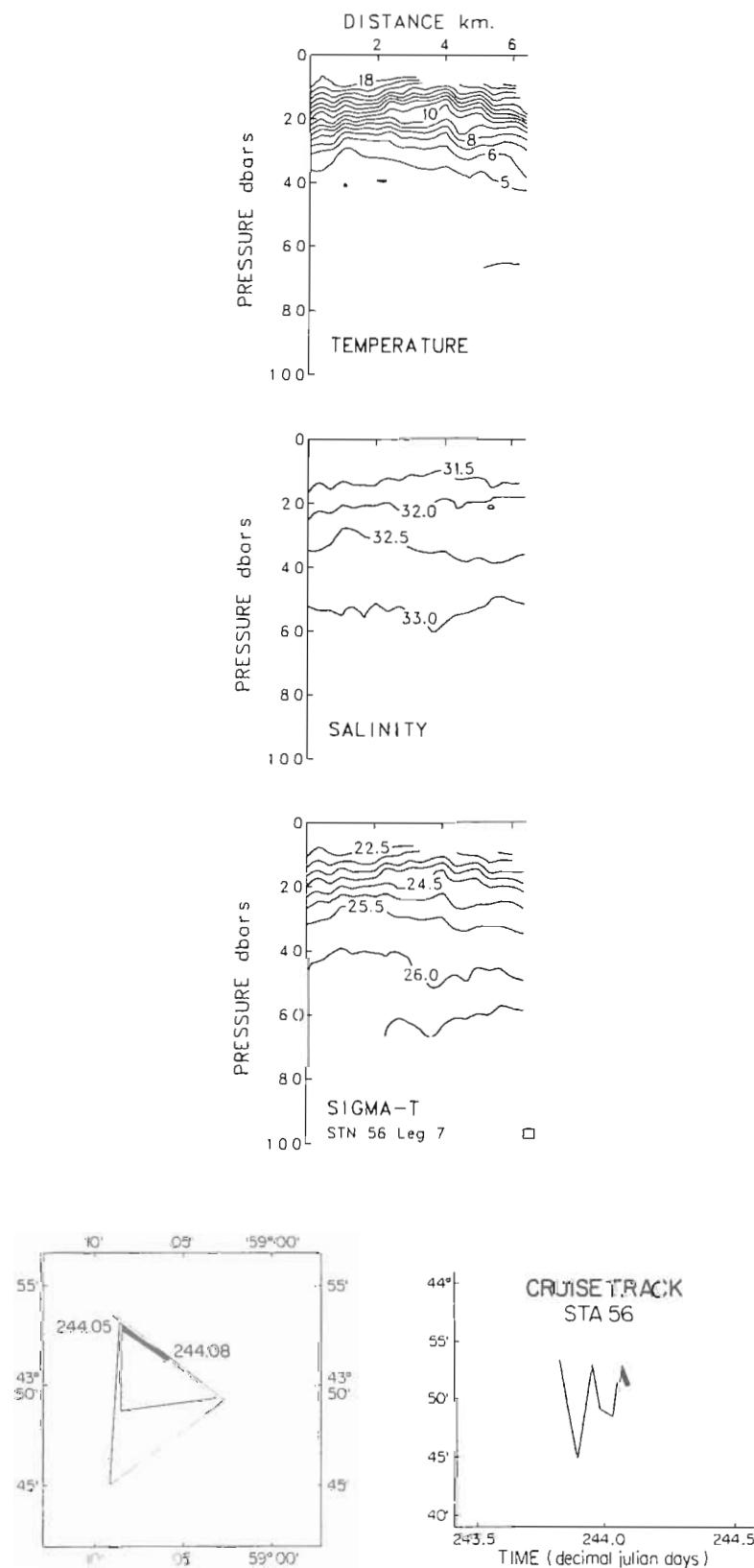


Fig. 266

Figures 267-279.

BATFISH station 57: 8 sections of Temperature, Salinity and Sigma-t vs. pressure,
location map and latitude vs. time plot. Acoustic backscatter plots for selected sections.

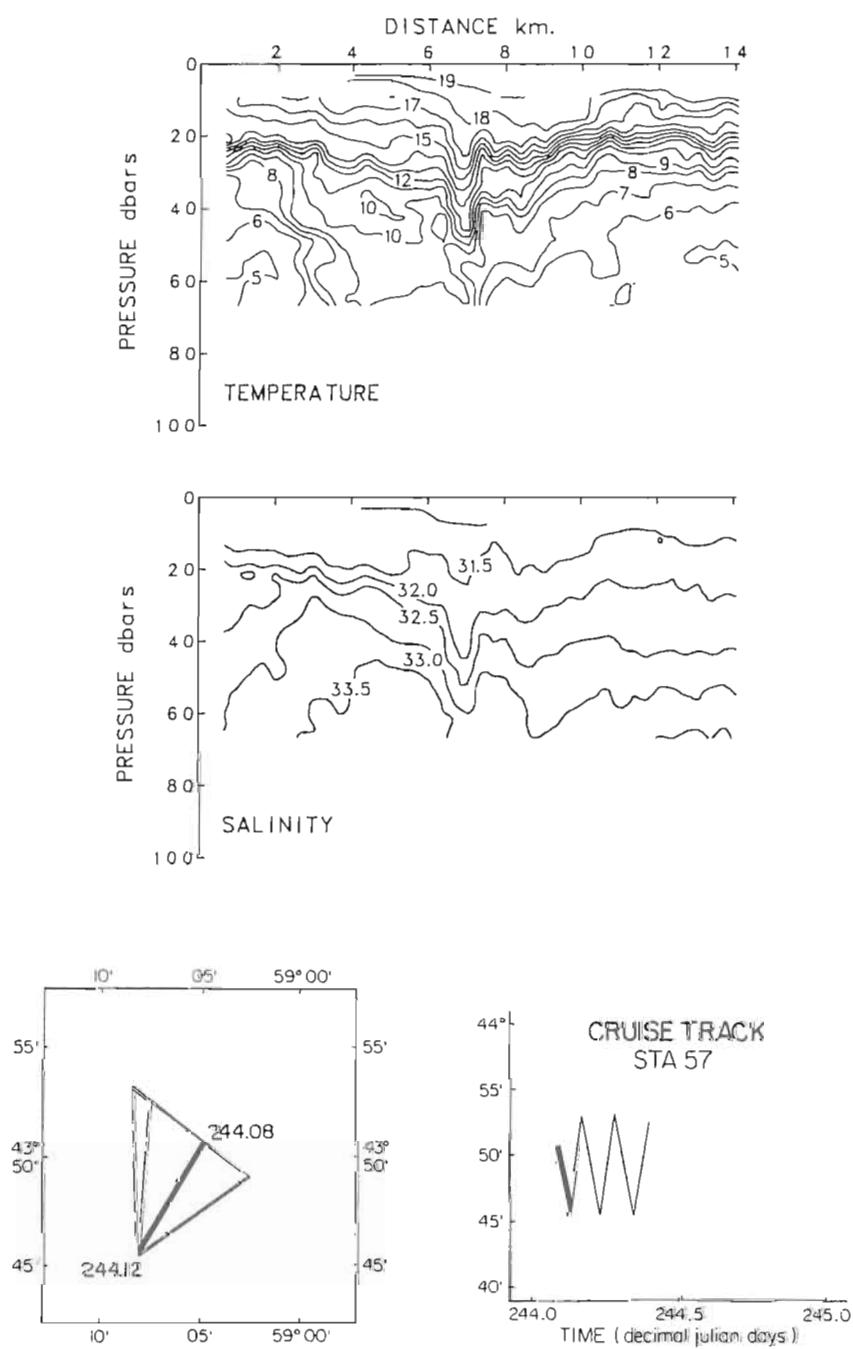


Fig. 267

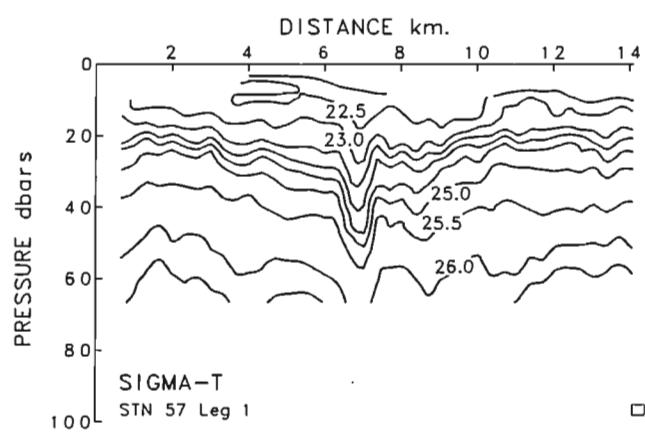


Fig. 268

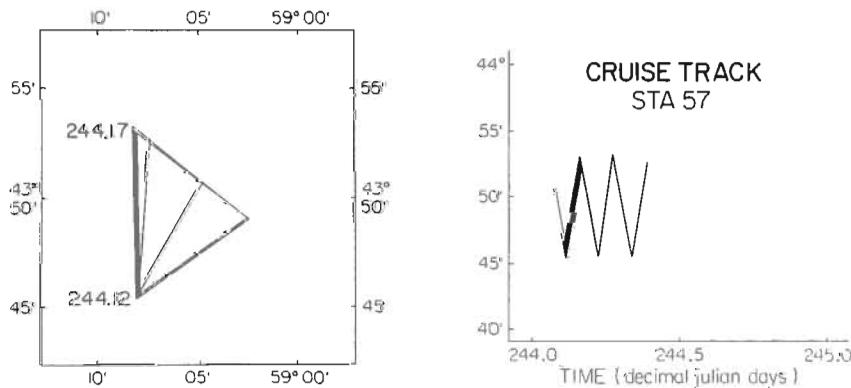
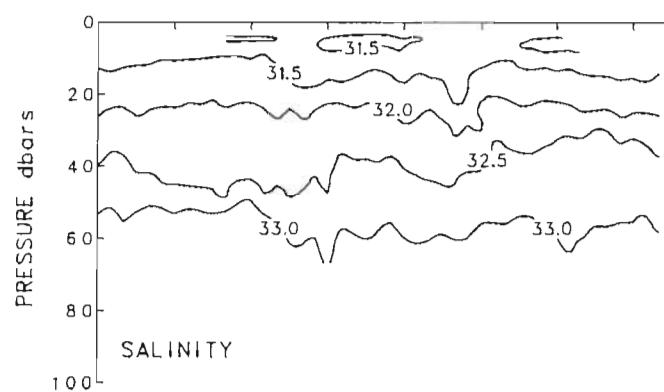
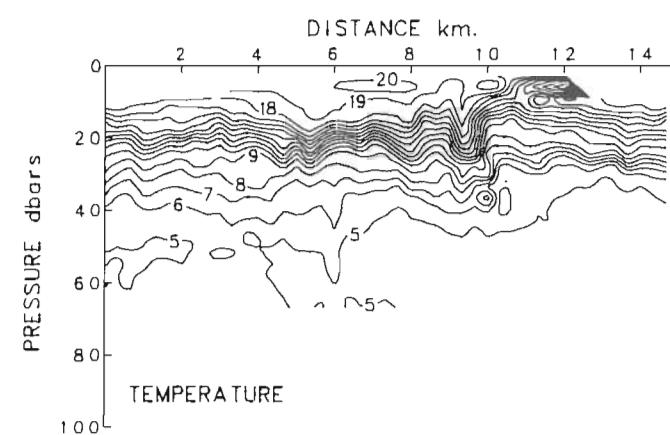


Fig. 269

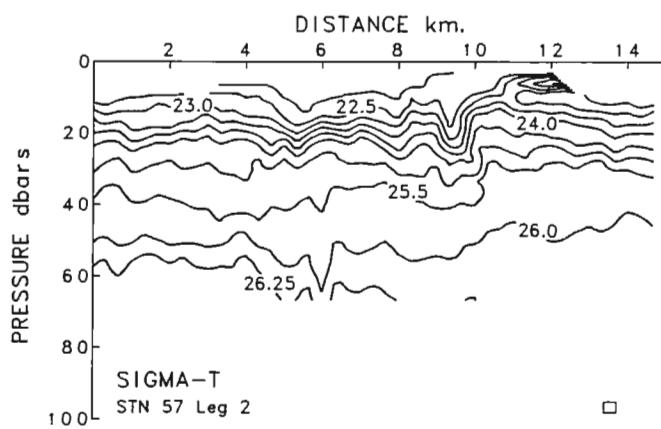


Fig. 270

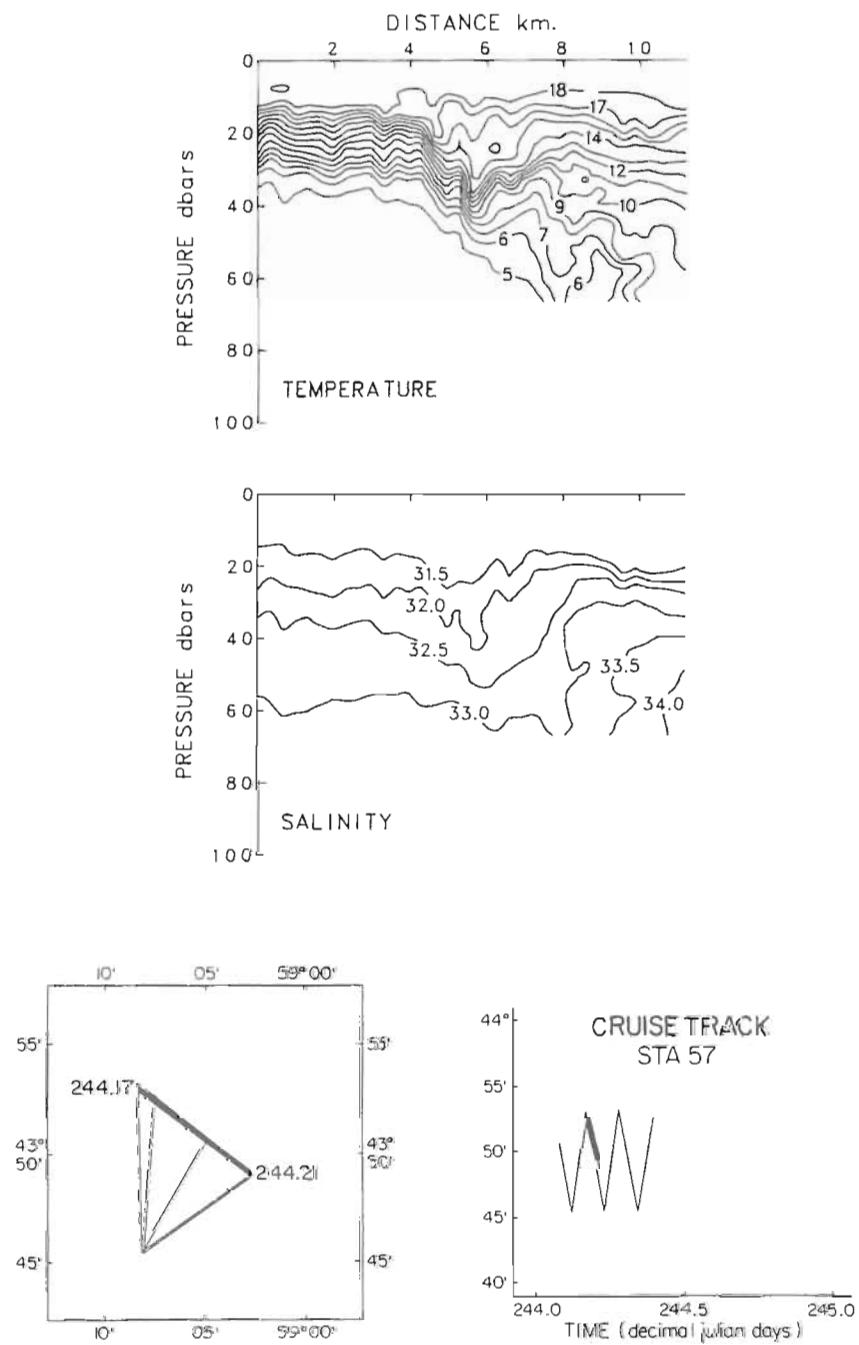


Fig. 271

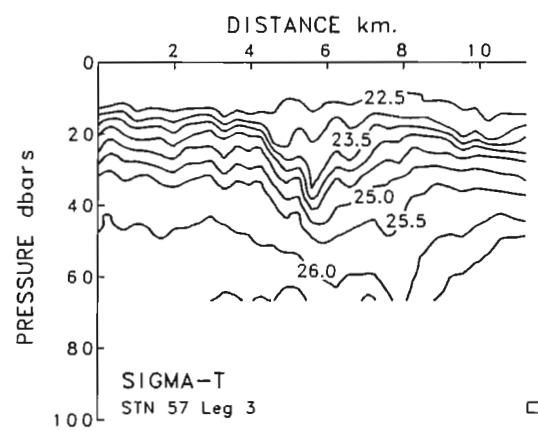


Fig. 272

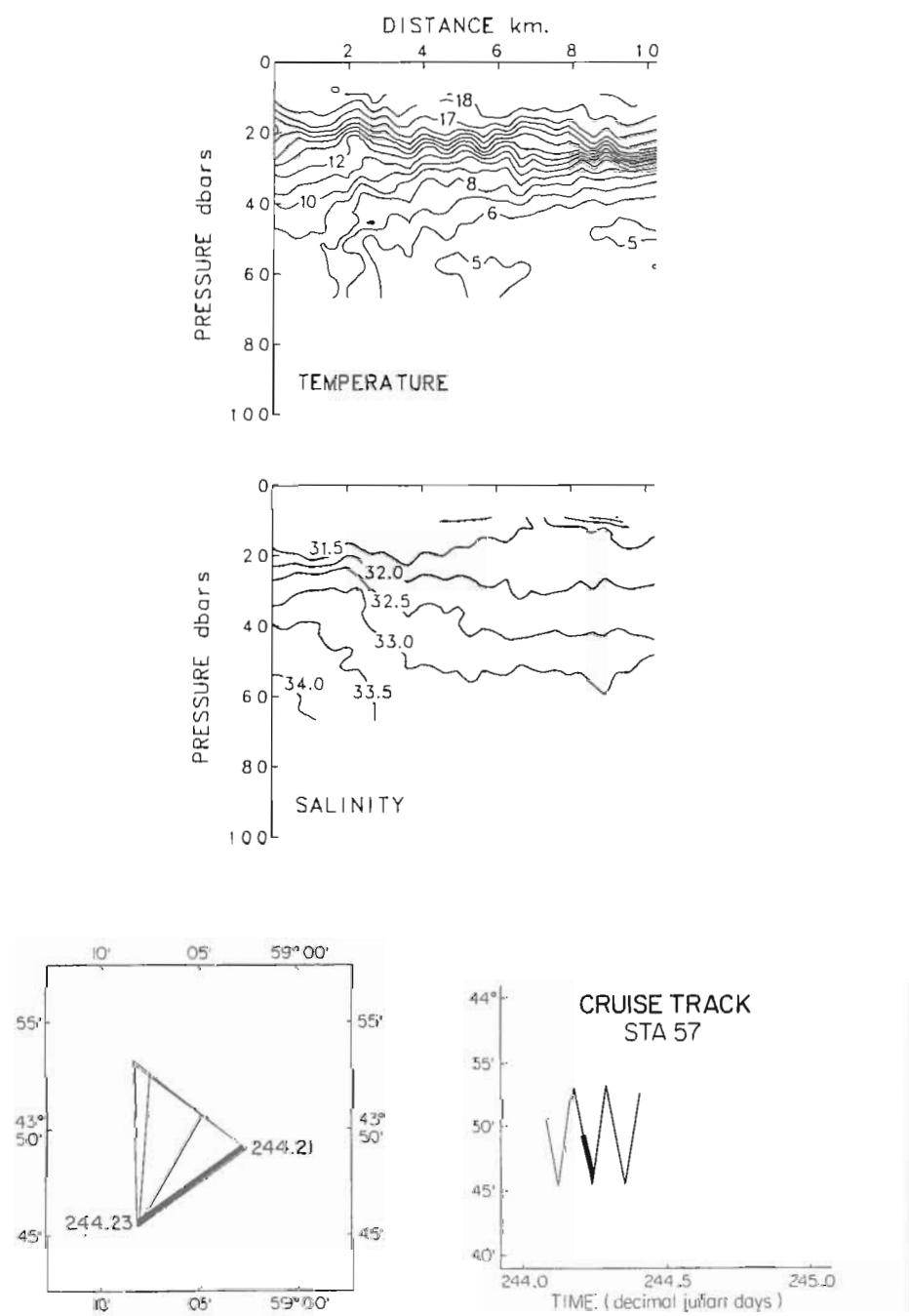


Fig. 273

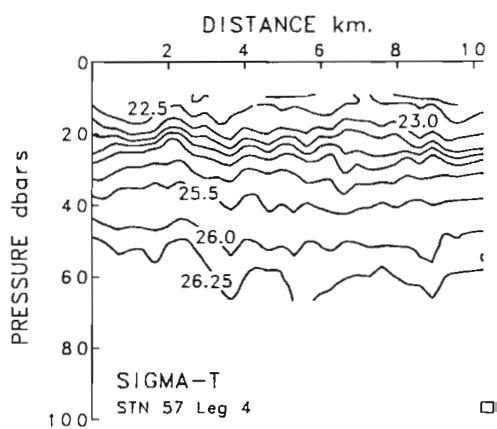


Fig. 274

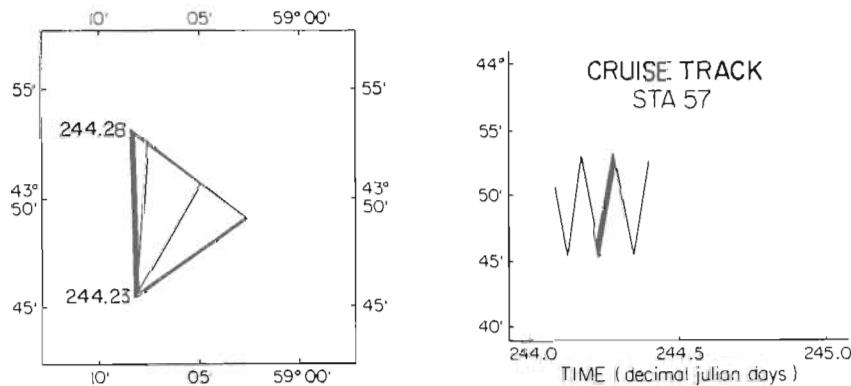
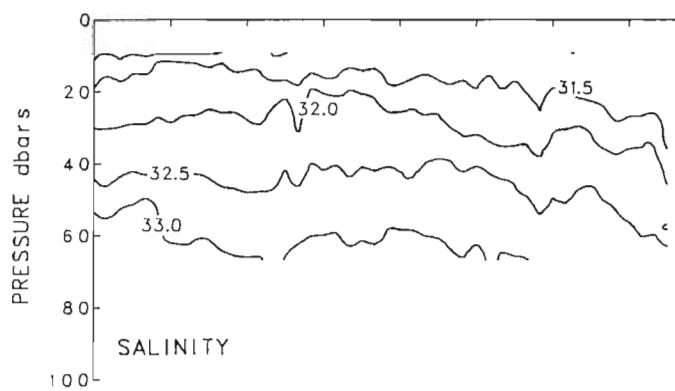
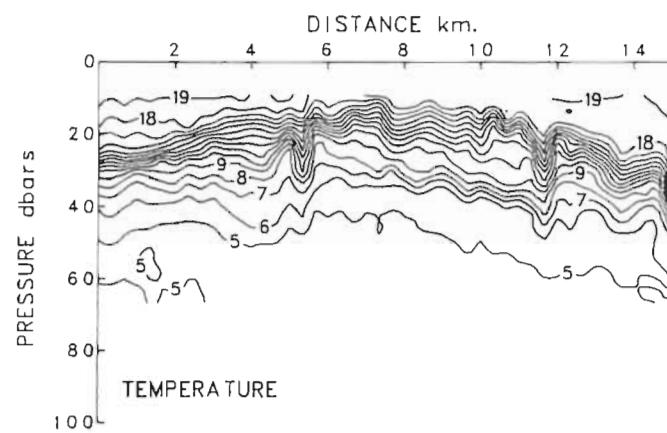


Fig. 275

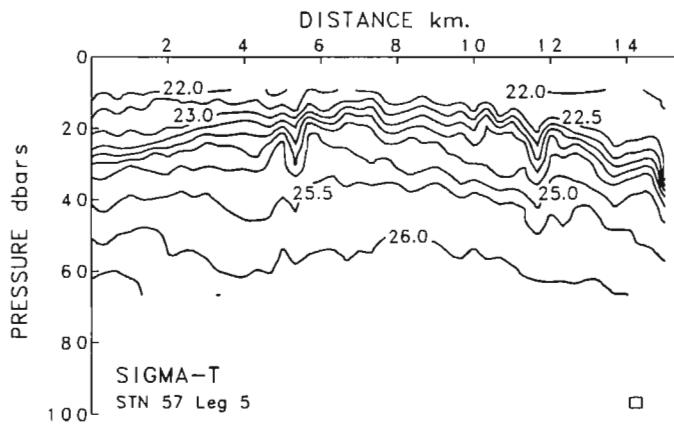


Fig. 276

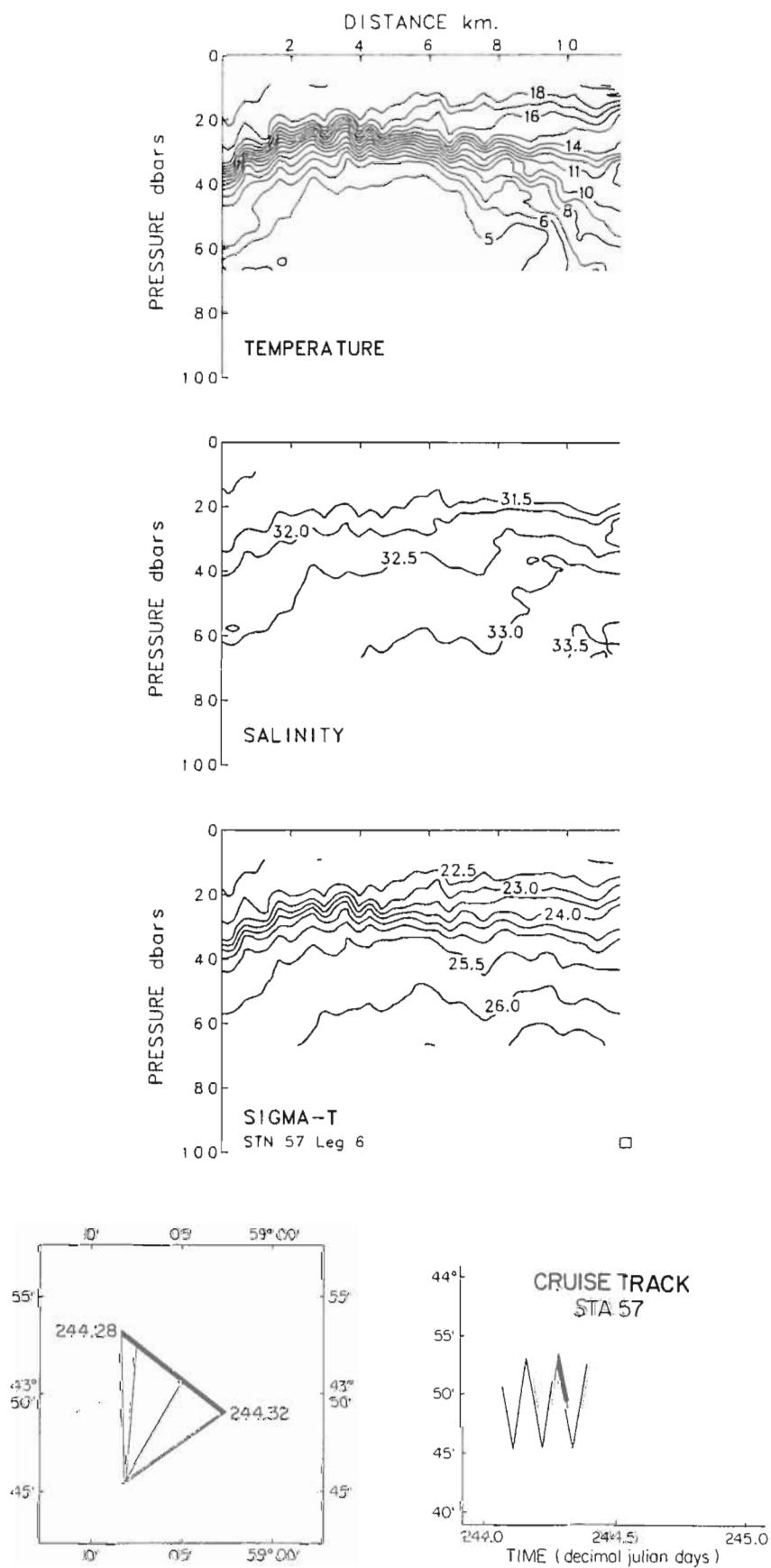


Fig. 277

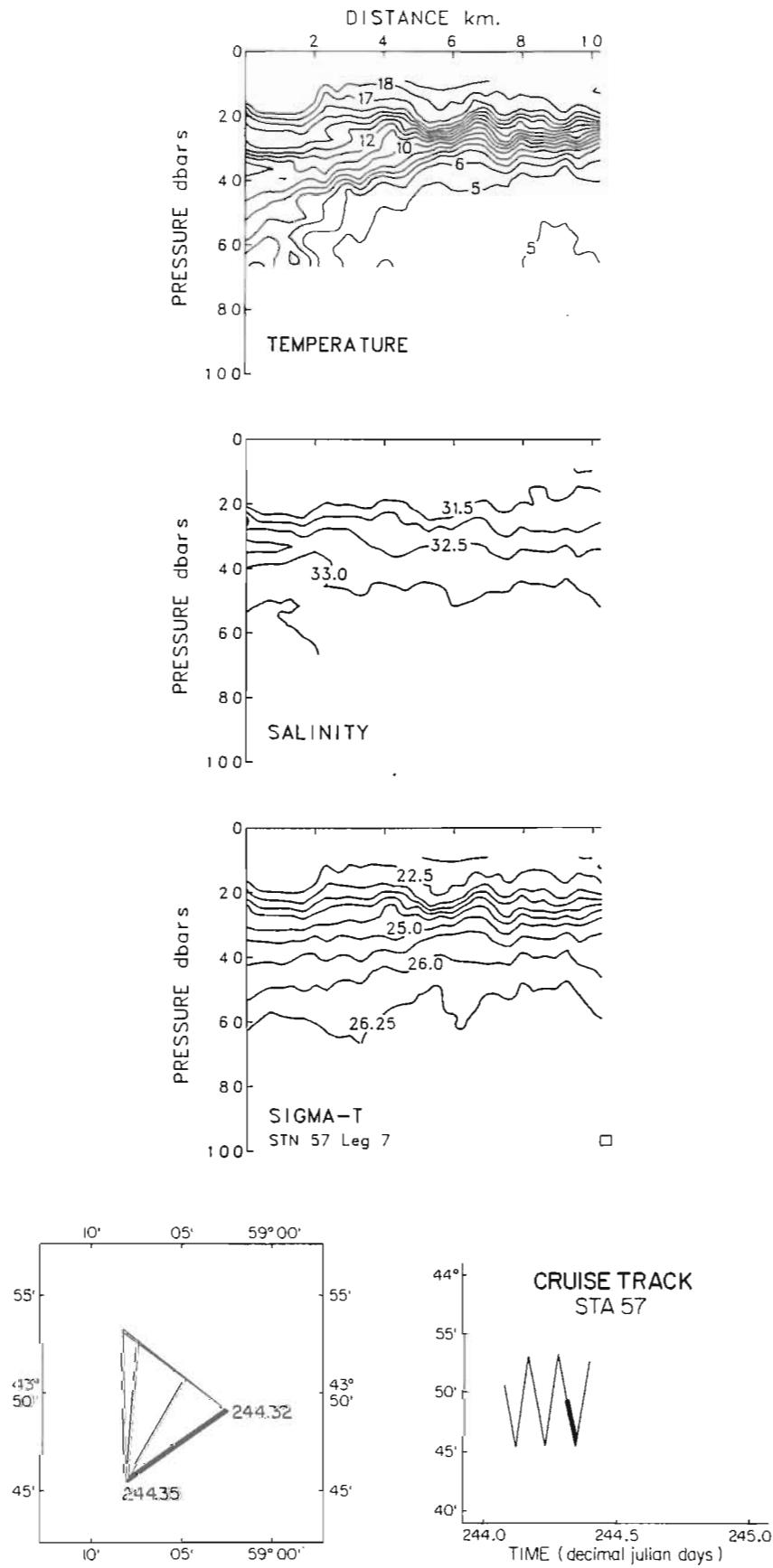


Fig. 278

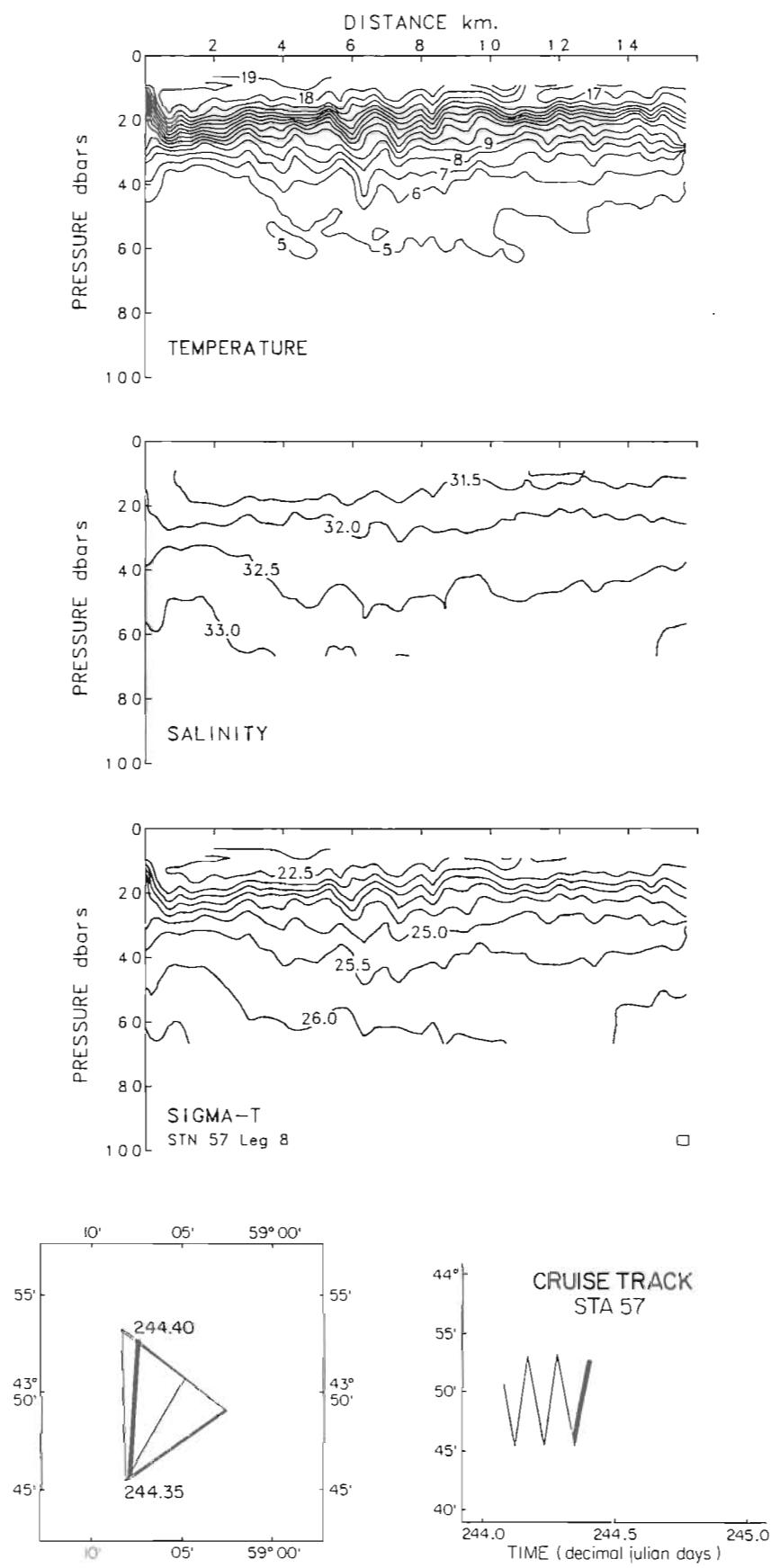


Fig. 279