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OREGON STATE UNIVERSITY

Vertical Distributions of
Temperature, Salinity and Sigma-t
from Observations from R/V Yaquina
during Coastal Upwelling Experiment
1972

by
Adriana Huyer

International Decade of Ocean Exploration
NSF Grant GX 28746

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SCHOOL OF OCEANOGRAPHY.
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INTRODUCTION

This report is an intermediate step in analyzing part of the hydrographic data from the 1972 Coastal Upwelling Experiment (CUE) off the coast of Oregon. It presents the author's interpretation of the vertical distribution of temperature, salinity and sigma-t along lines occupied on hydrographic cruises by *R/V Yaquina* during CUE. Hydrographic observations collected from *R/V Oceanographer* during CUE (Halpern and Holbrook, 1972) are not included in this report.

Data reports for each of the CUE hydrographic cruises have been published (Anon., 1972 a-e; 1973 a-c; Halpern and Holbrook, 1972). The diagrams presented here will be of interest to the other CUE participants and also to other oceanographers studying Oregon coastal waters.

SUMMARY OF THE OBSERVATIONS

Hydrographic observations during the Coastal Upwelling Experiment were made mainly from two ships, *R/V Yaquina* and *R/V Oceanographer*, and by two groups, one at Oregon State University and one at NOAA's Pacific Oceanographic Laboratory, respectively. Although observations from *Oceanographer* are not presented in this report, it is appropriate to include them in the Summary of Observations.

Almost all of the observations from *Yaquina* were made with a Geodyne conductivity-temperature-depth (CTD) system; *Oceanographer* observations were made with a Bissett-Berman salinity-temperature-depth system. The observational and data processing procedures are described in the data reports. Both ships occupied stations in a grid adjacent to the coast of Oregon. In all, there were nine hydrographic cruises on *Yaquina* and three on *Oceanographer* during CUE. Dates for each of the cruises are shown in Table 1. A portion of the grid was occupied on each cruise. On some of the cruises, one or more lines of stations were occupied more than once. Normally, stations in the grid were occupied sequentially along lines approximately normal to the shore. Most of these lines were spaced at intervals of five minutes of latitude between 44°35'N and 45°00'N (Figure 1); stations were at intervals of six minutes of longitude. *Oceanographer* lines extended from the shore to 125°W; *Yaquina* did not usually go out beyond 124°42'. On the later cruises station density was increased near shore.

METHOD OF PREPARATION AND PRESENTATION

The distributions of temperature, salinity and sigma-t in this report were hand-contoured by the author from computer listings of CTD data. The listings resulted from the processing of the CTD data as described in the

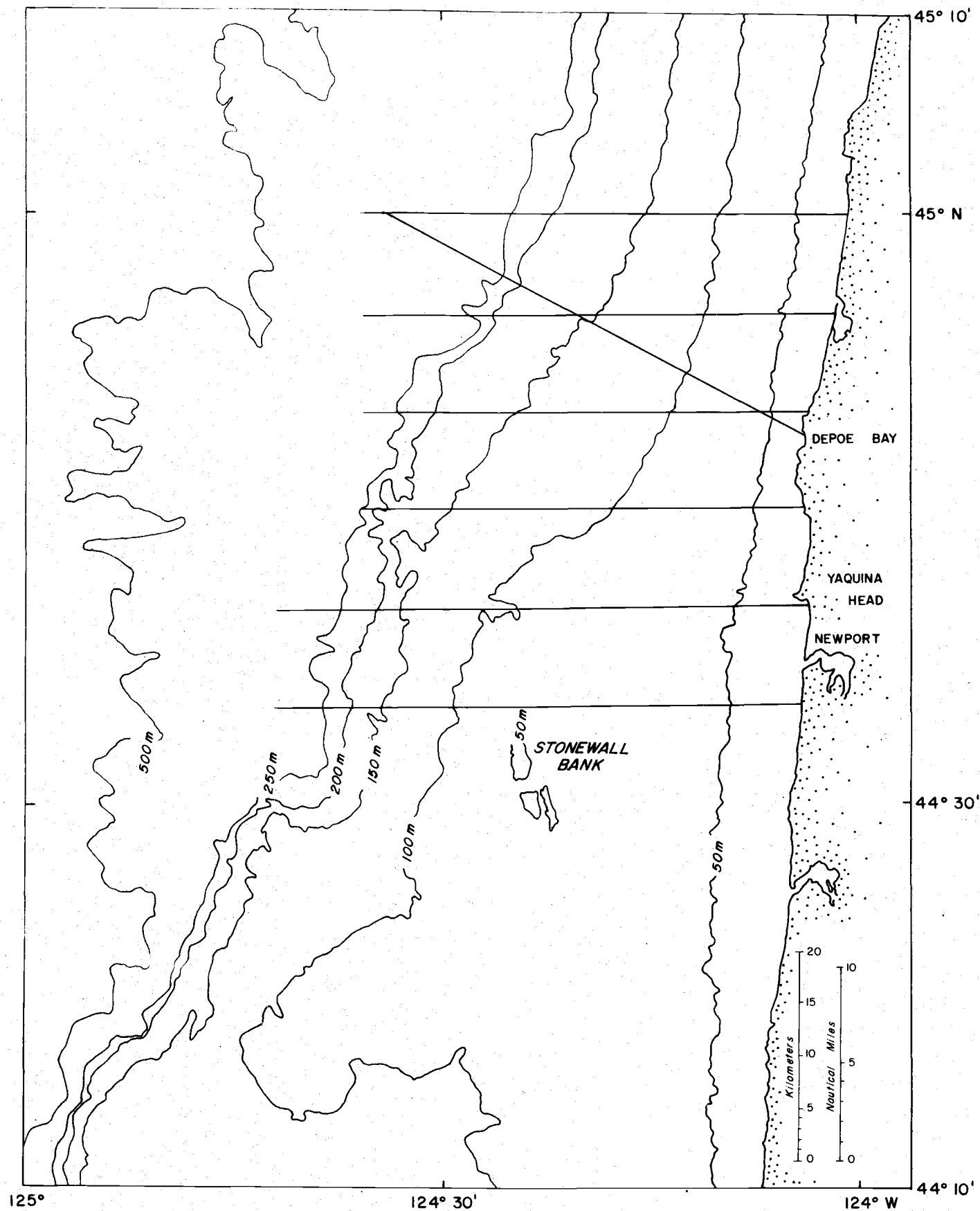


Figure 1. Positions of sections occupied by *R/V Yaquina* during the coastal upwelling experiment.

data reports. The depth interval between observations was always less than five meters.

For each line of stations, three tables were constructed, showing the depths of particular isotherms, isohalines and isopycnals, respectively. All sections were plotted on a common scale. The salinity or sigma-t section was normally drawn first, as these parameters almost always increased monotonically with depth. The depths of a particular isogram were plotted on the section; these points were then connected by a smooth curve. In other words, the depths of isograms at station locations is as observed. Only between stations is there any interpolation from the data. After the distributions of salinity and sigma-t had been drawn for a section, the depths of isotherms were plotted. Temperature inversions were frequent, and ambiguities were normally resolved by consideration of the T-S properties of the water, and the general tendency for isotherms to be parallel to isohalines. In some cases, there was very little evidence to choose one interpretation over another. In almost all of these cases, differences were small enough that a qualitative description of the distributions would not distinguish between the alternate versions. Distributions of sigma-t were plotted from the listings of sigma-t for each station, not from the contoured distributions of temperature and salinity.

When the plotted distributions were finalized, they were traced onto printed sections showing the standard bottom profile along the line of stations. The deepest observation of each CTD cast is shown by $\perp$. Contours at the specified contour intervals are shown as solid lines. Dashed lines indicate an extra contour. Dotted lines show there is more uncertainty than usual in part of a contour. Station numbers are given along the top of the section; these allow easy reference back to the data reports. On some sections, the deepest observation occurs at depths greater than the standard bottom profile. In these instances, navigation error resulted in the station being located in deeper water. We did not attempt to redraw the bottom profile for every occupation of the same line, but used the standard bottom profile.

Aliasing due to internal waves and tides is present in the distributions presented here. Our knowledge of these phenomena is not adequate to warrant attempting to remove such aliasing. Also, it is believed that such aliasing does not result in gross distortion of the distributions.

Vertical distributions of temperature, salinity and sigma-t are shown for eight different lines. Seven of these are along parallels of latitude - namely 44°35'N, 44°40'N, 44°45'N, 44°50'N, 44°55'N, 45°00'N, and 45°12'N. The other runs seaward from Depoe Bay; Oregon, it is the Depoe Bay Line that has traditionally been occupied on hydrographic cruises of Oregon State University. The line along 44°40'N nearly coincides with the traditional Newport Hydrographic Line. Most of these lines were occupied on more than one occasion.

The vertical distributions are presented in order of the cruises, and within each cruise (with one exception) in chronological order. This has the advantage of making it easier to see the effect of location. Some users may be more interested in repeated occupations of the same line. For their benefit, Table 2 shows the page numbers of distributions by location as well as by cruise.

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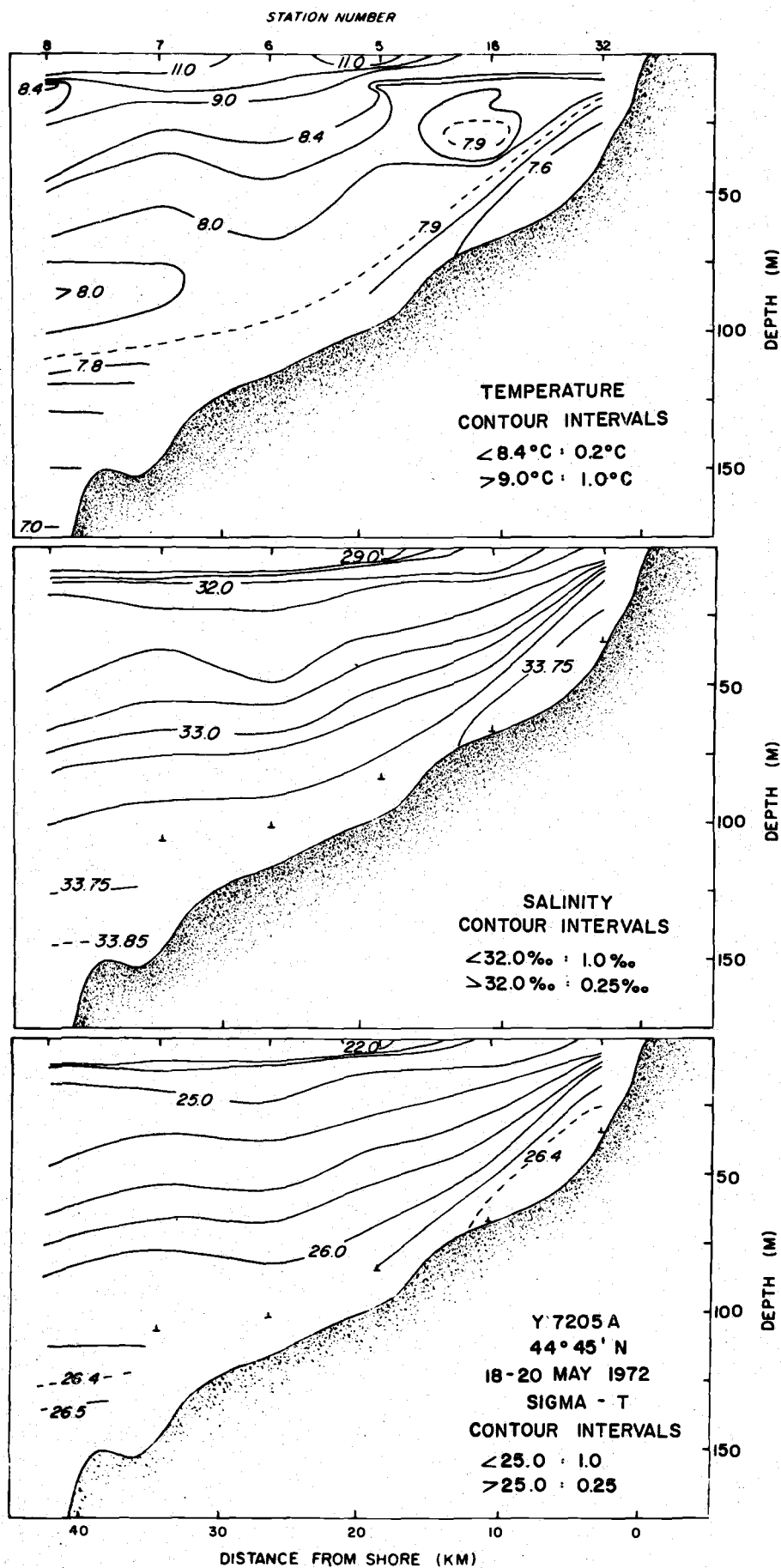
Table 1. Hydrographic cruises by *Yaquina*
and *Oceanographer* during the Coastal
Upwelling Experiment, 1972

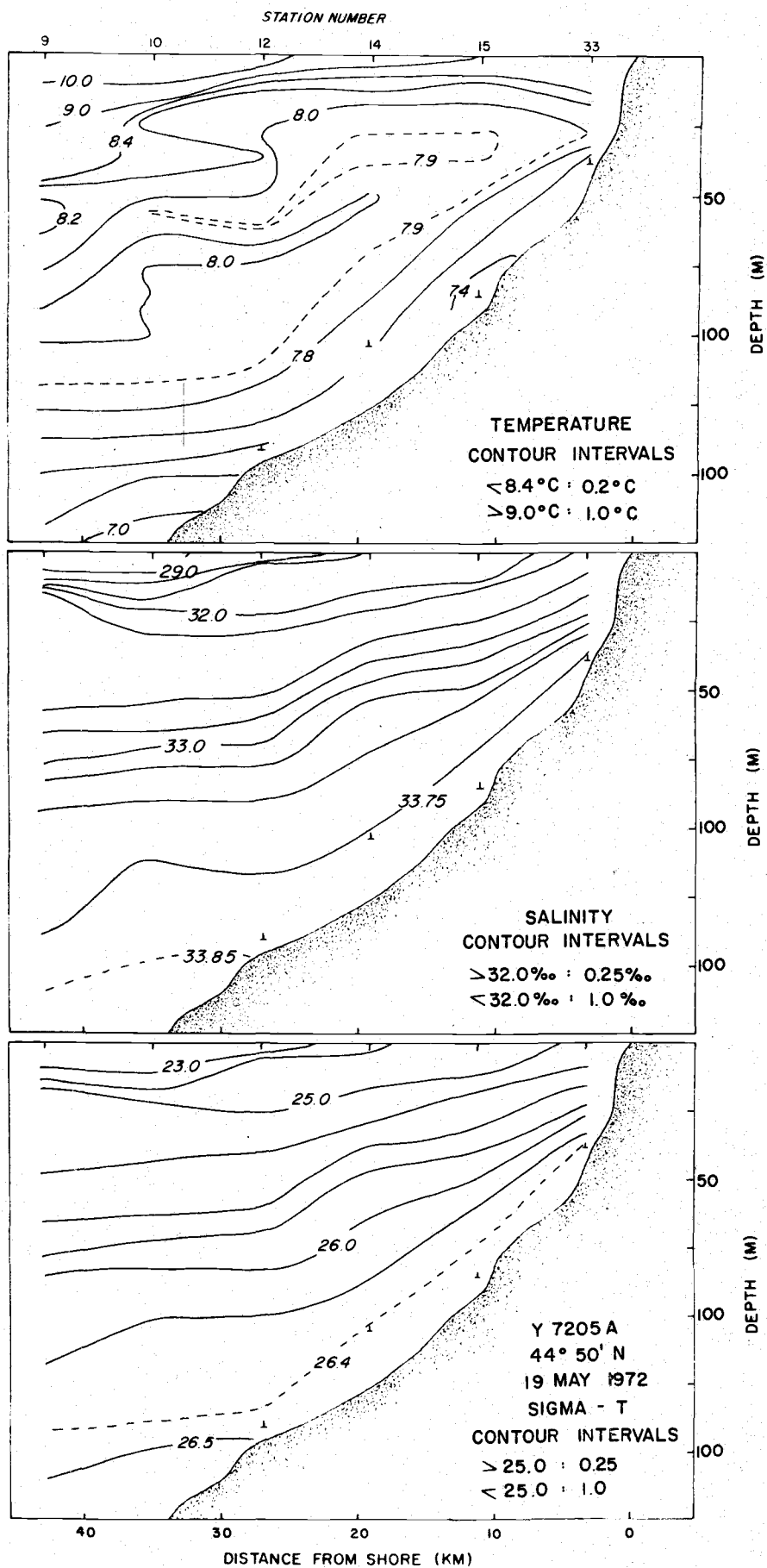
Date	Ship	Cruise Designation
17 - 22 May	<i>Yaquina</i>	Y7205A
19 - 23 June	<i>Yaquina</i>	Y7206C
5 - 9 July	<i>Yaquina</i>	Y7205A
8 - 14 July	<i>Oceanographer</i>	
10 - 18 July	<i>Yaquina</i>	Y7210B
30 July - 6 August	<i>Oceanographer</i>	
31 July - 6 August	<i>Yaquina</i>	Y7207E
19 - 26 August	<i>Oceanographer</i>	
22 - 23 August	<i>Yaquina</i>	Y7208C
26 - 30 August	<i>Yaquina</i>	Y7208E
11 - 13 September	<i>Yaquina</i>	Y7209A
28 - 30 October	<i>Yaquina</i>	Y7210B

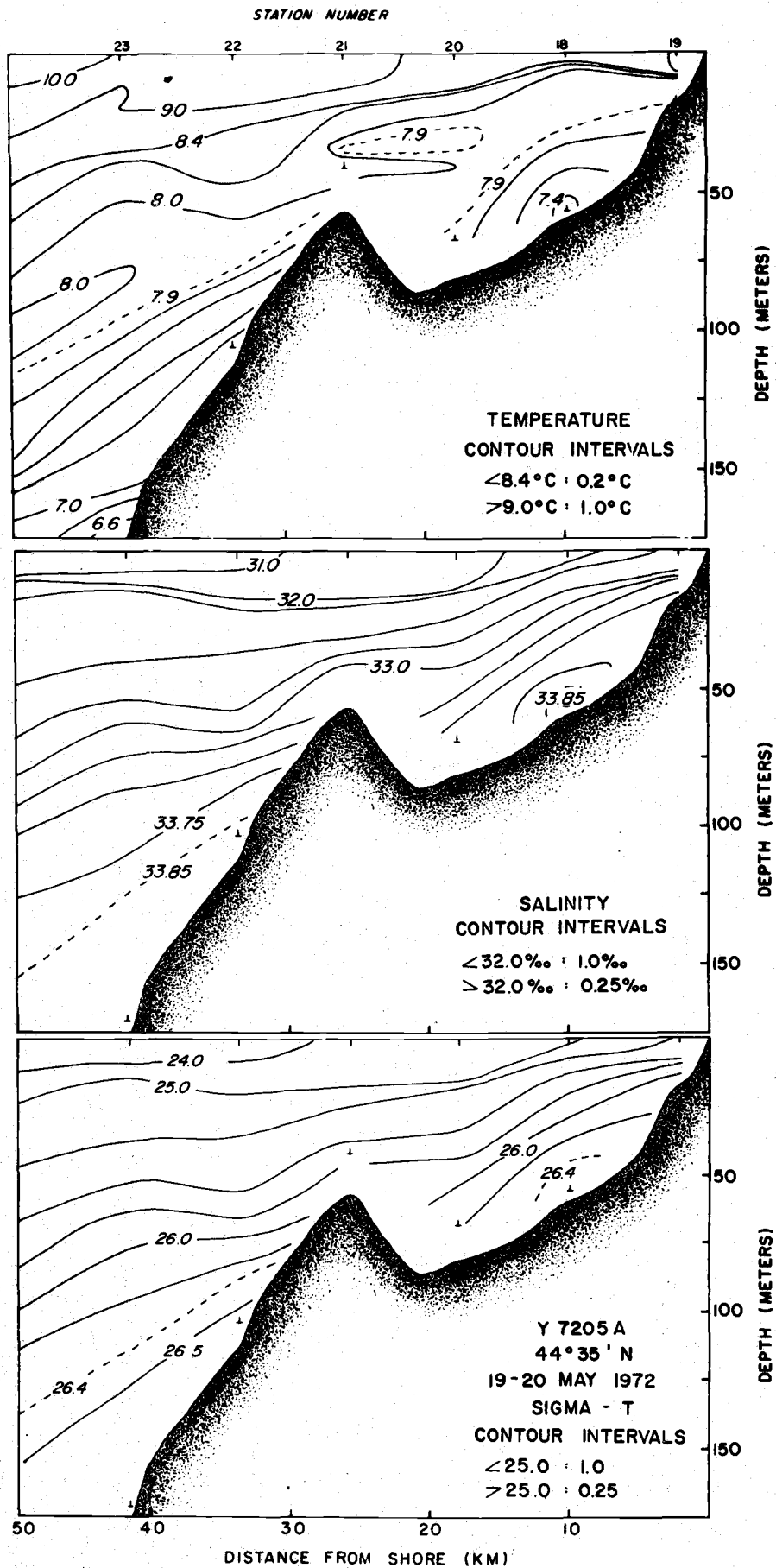
Table 2. Index of page numbers of the vertical
distributions by cruise and location

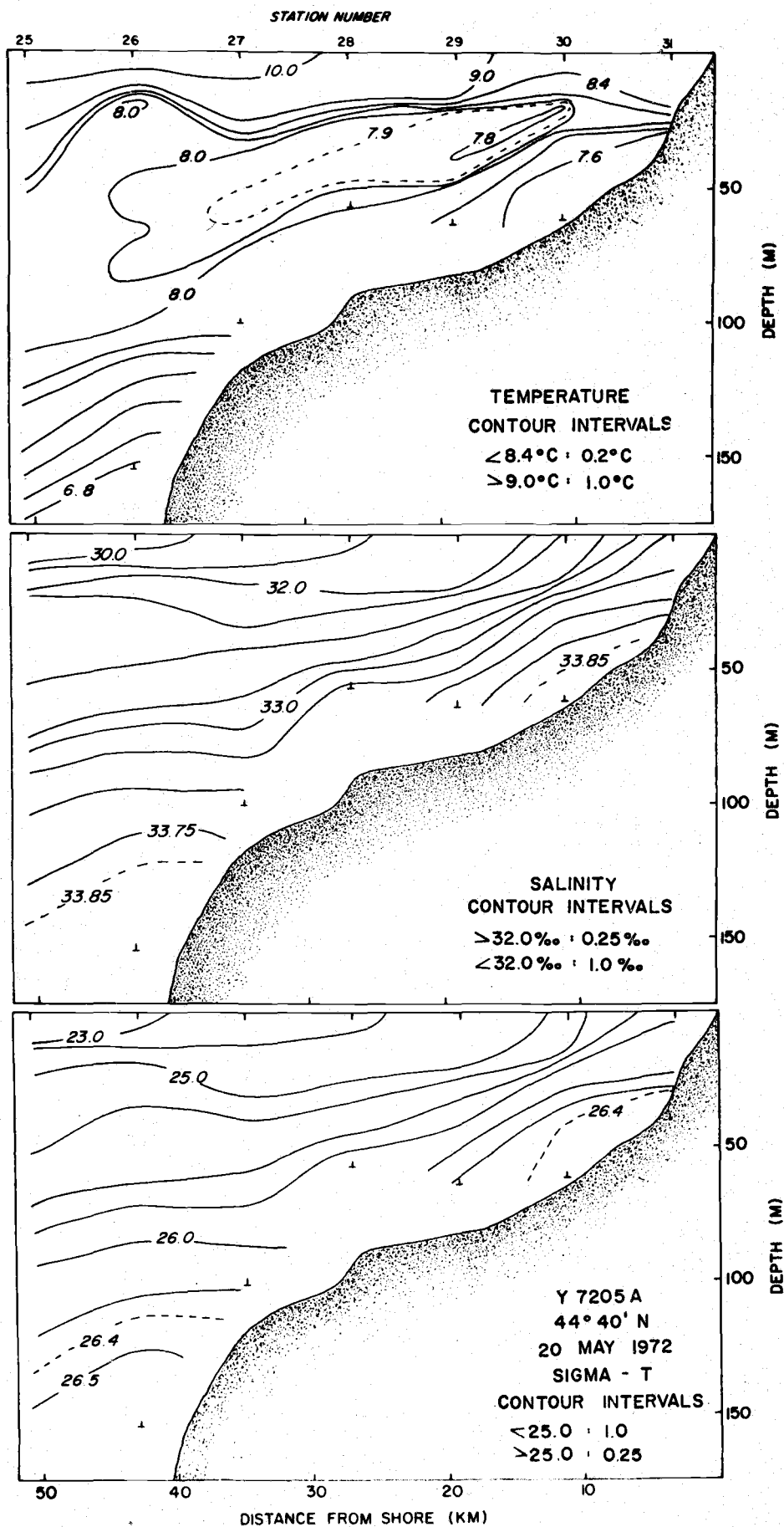
Cruise	Location						Depoe Bay Line	
	44°35'N	44°40'N	44°45'N	44°50'N	44°55'N	45°00'N	45°12'N	
Y7205A	10	11,14	8	9,15	13	12		
Y7206C	17	16,18,23	19	20	21	22	24	
Y7207A	25	26,32	27	28	29,31	30		
Y7207B		33-36					37	
Y7207E	38	39,45,46	40	41	42	43	44	
Y7208C		47					48	
Y7208E		54	53	52	51	50	49	55
Y7209A		57			56			
Y7210B		58			59			

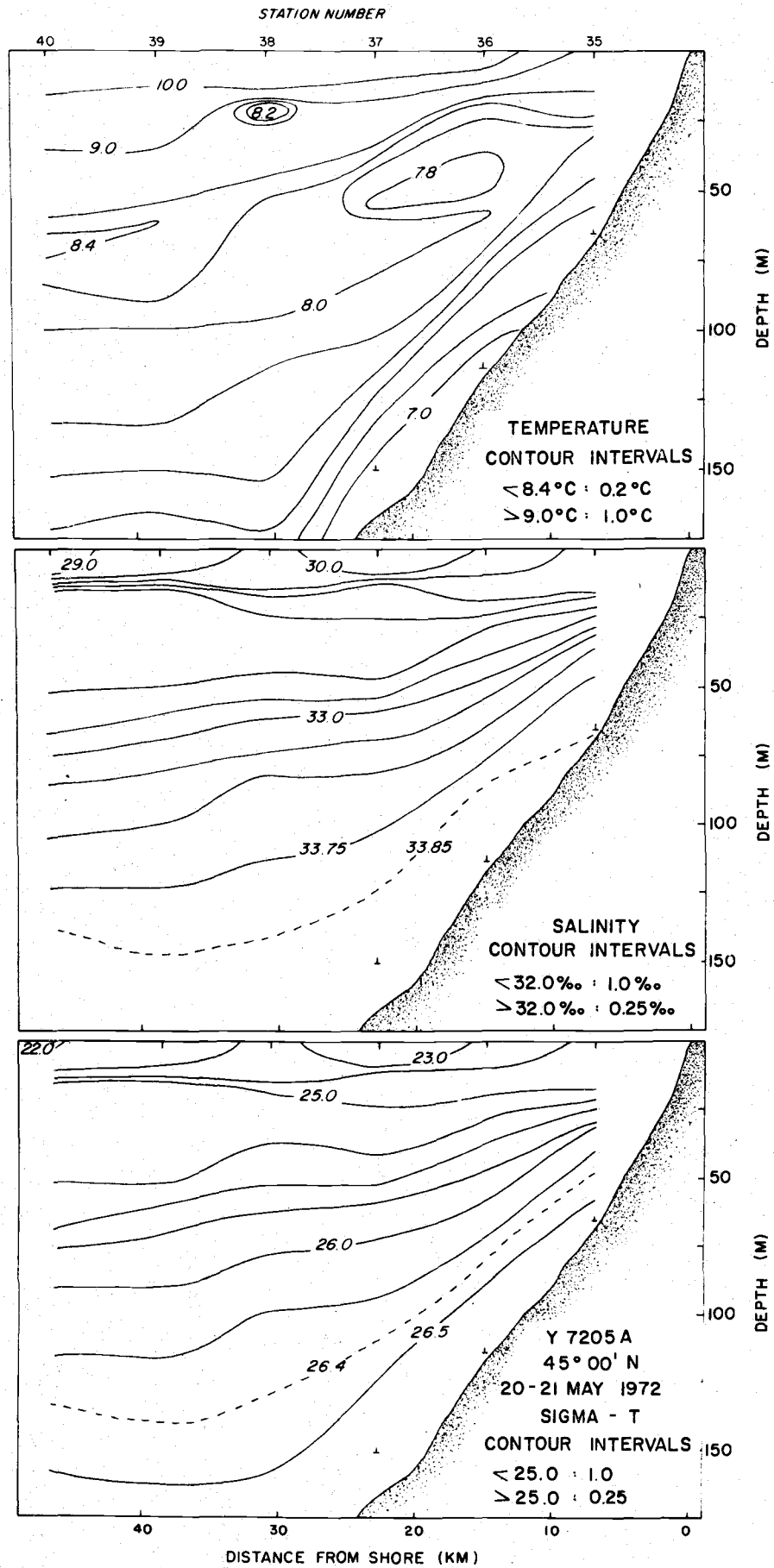
VERTICAL DISTRIBUTIONS
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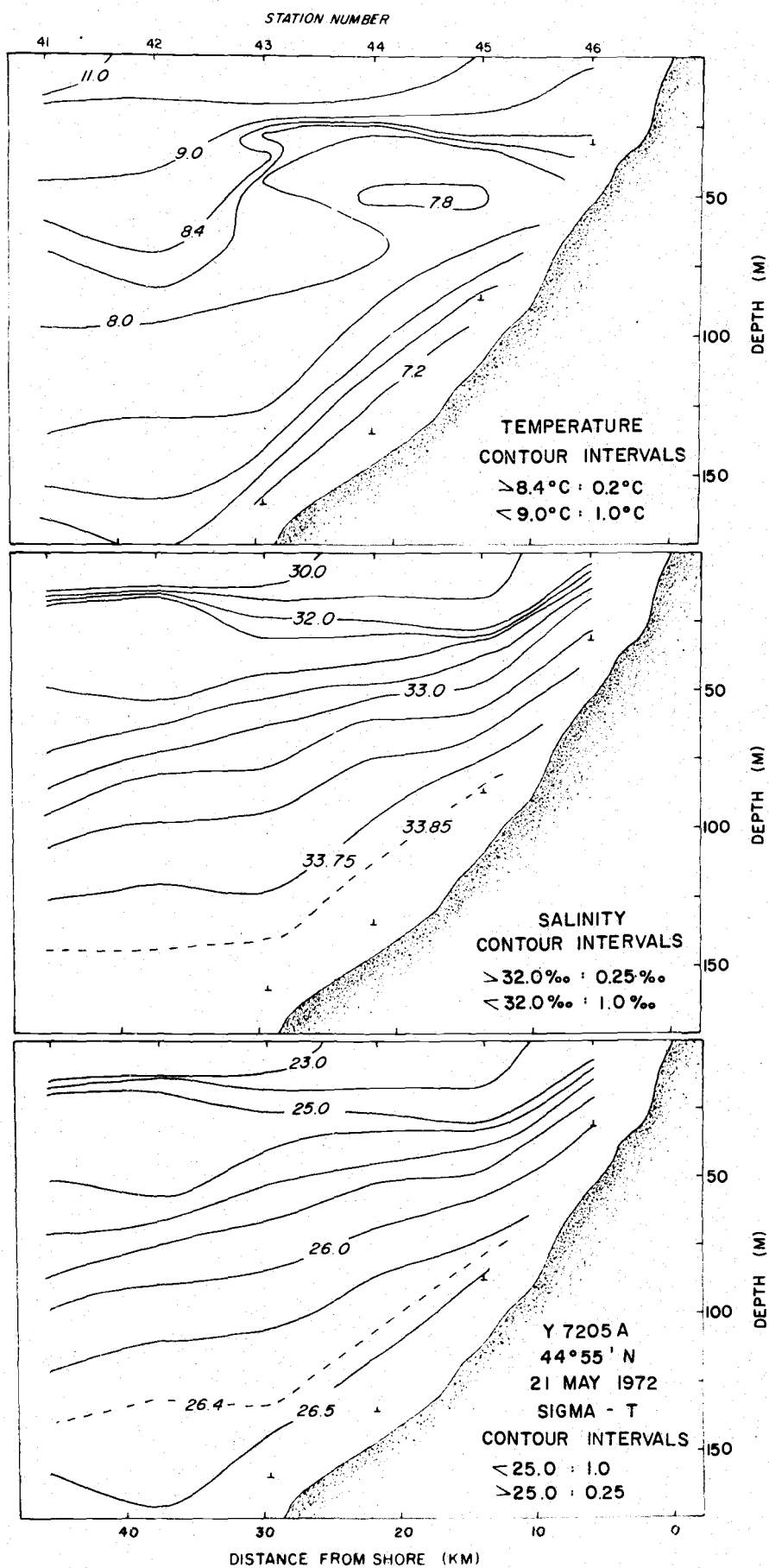


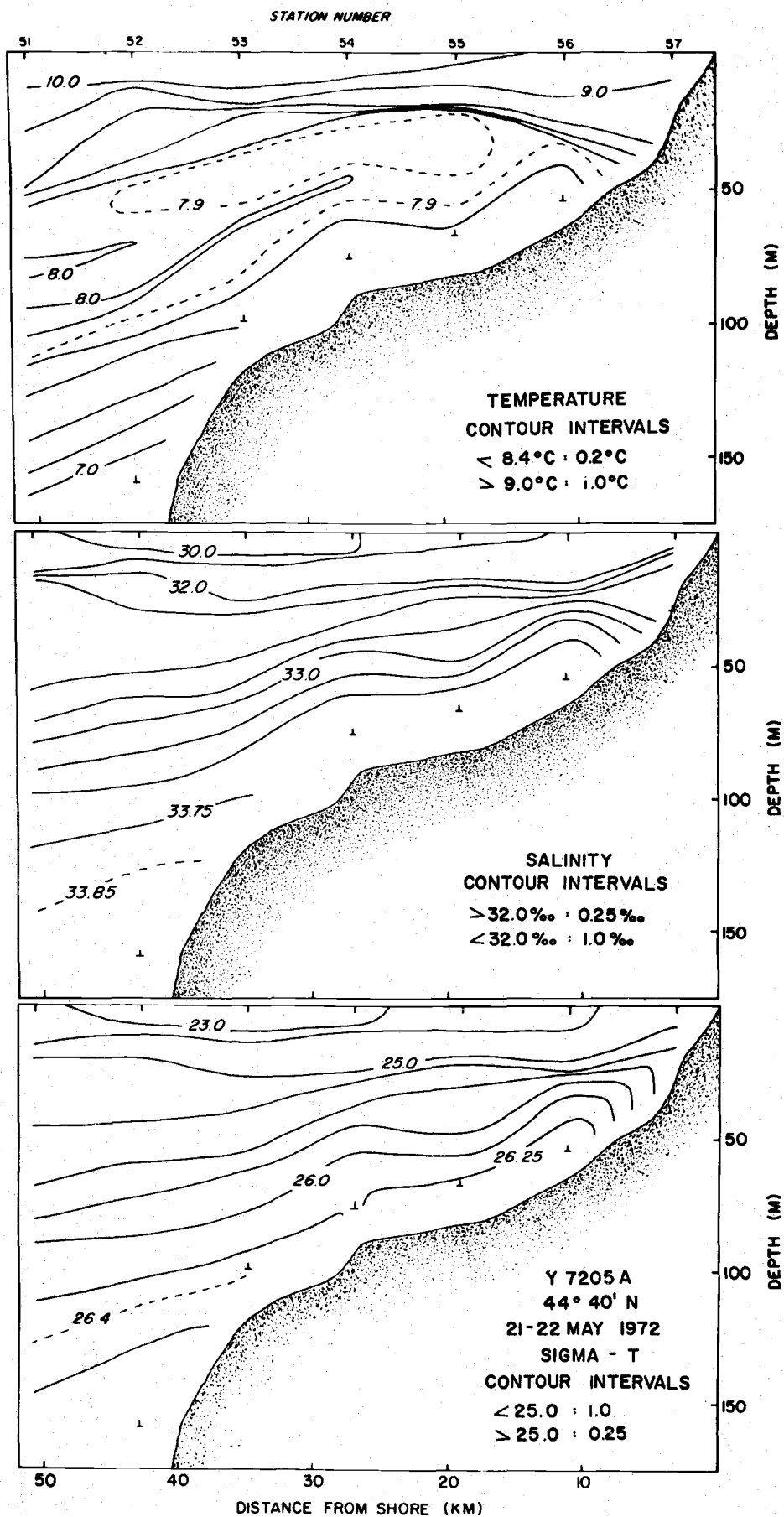


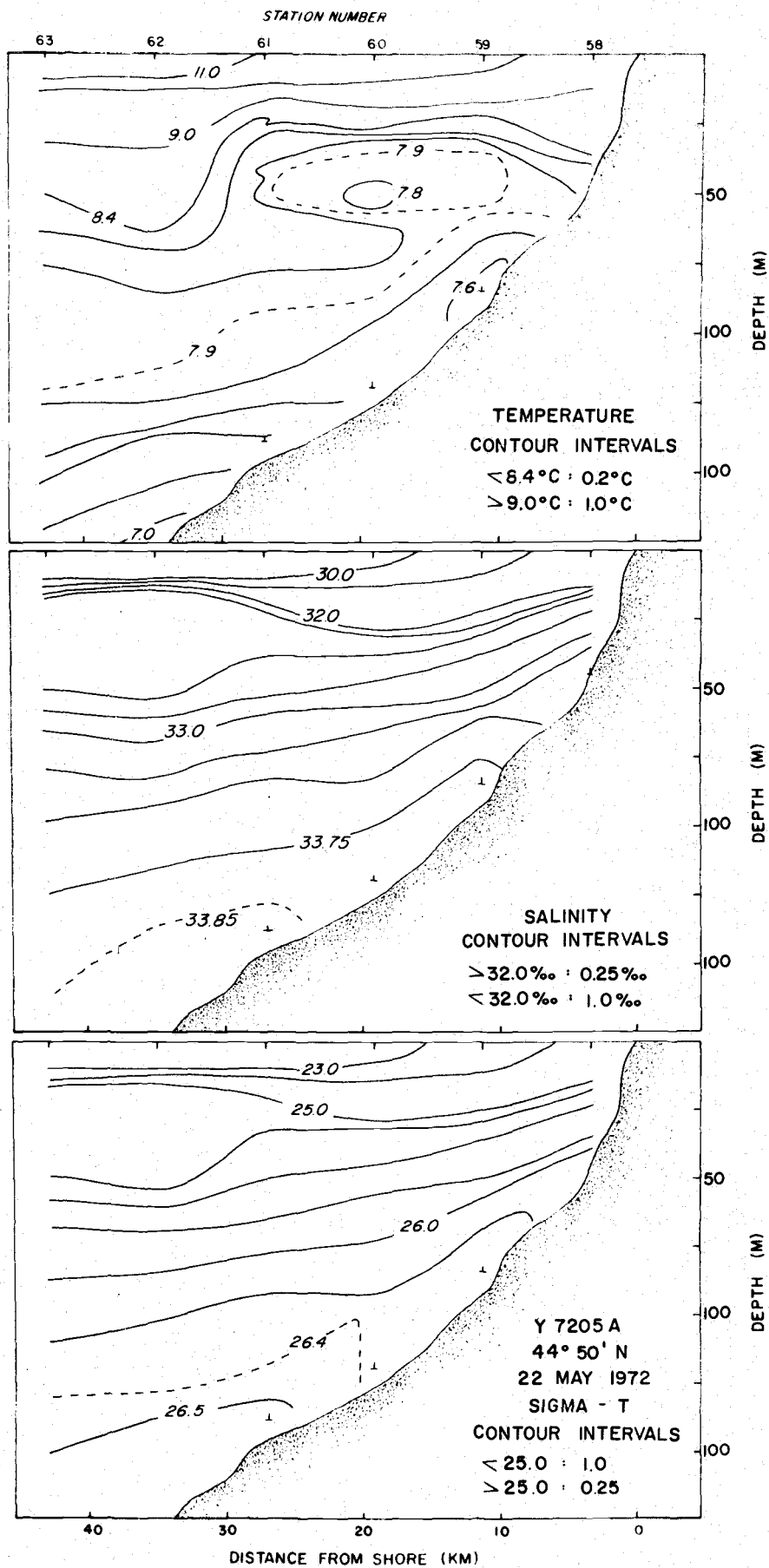


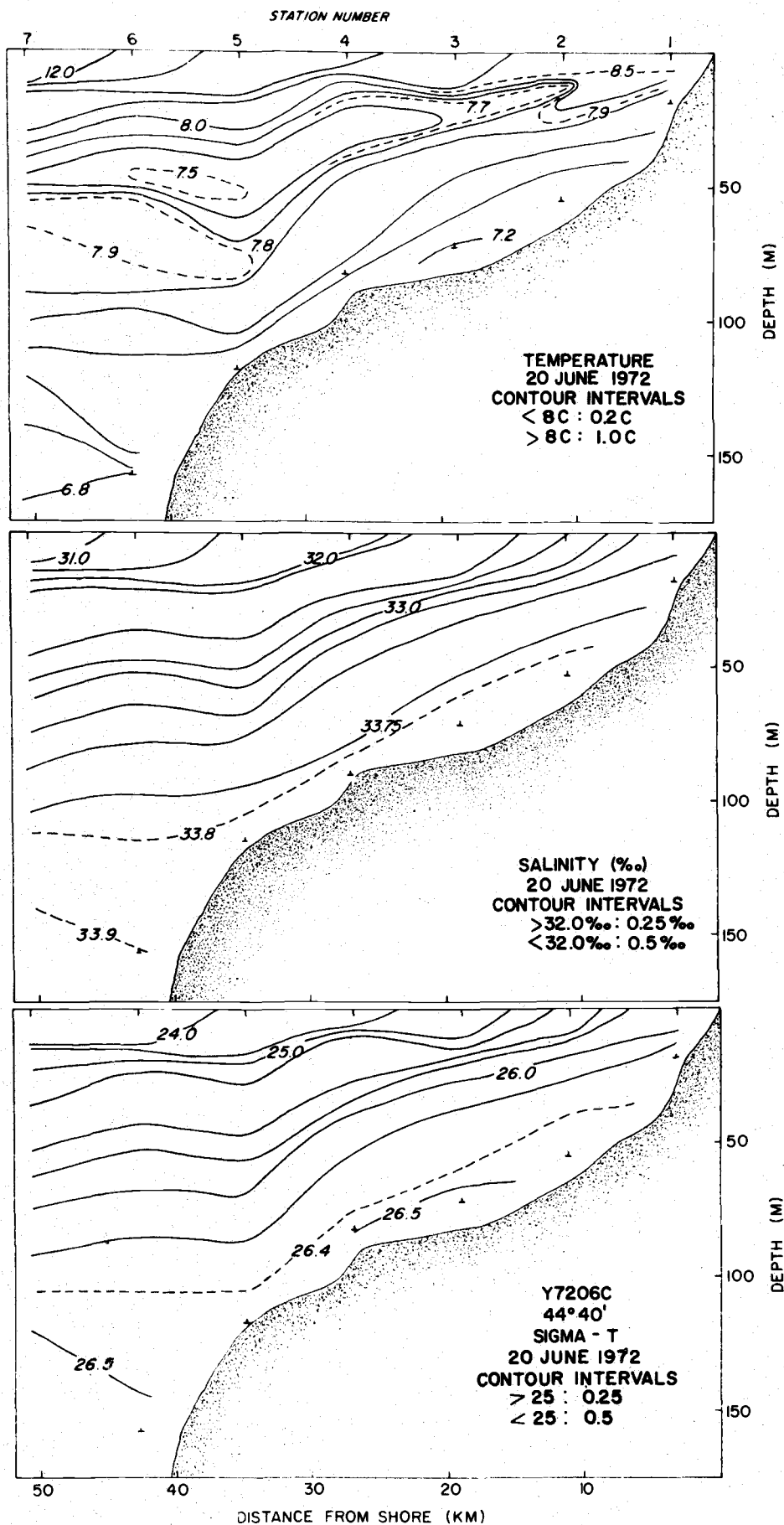


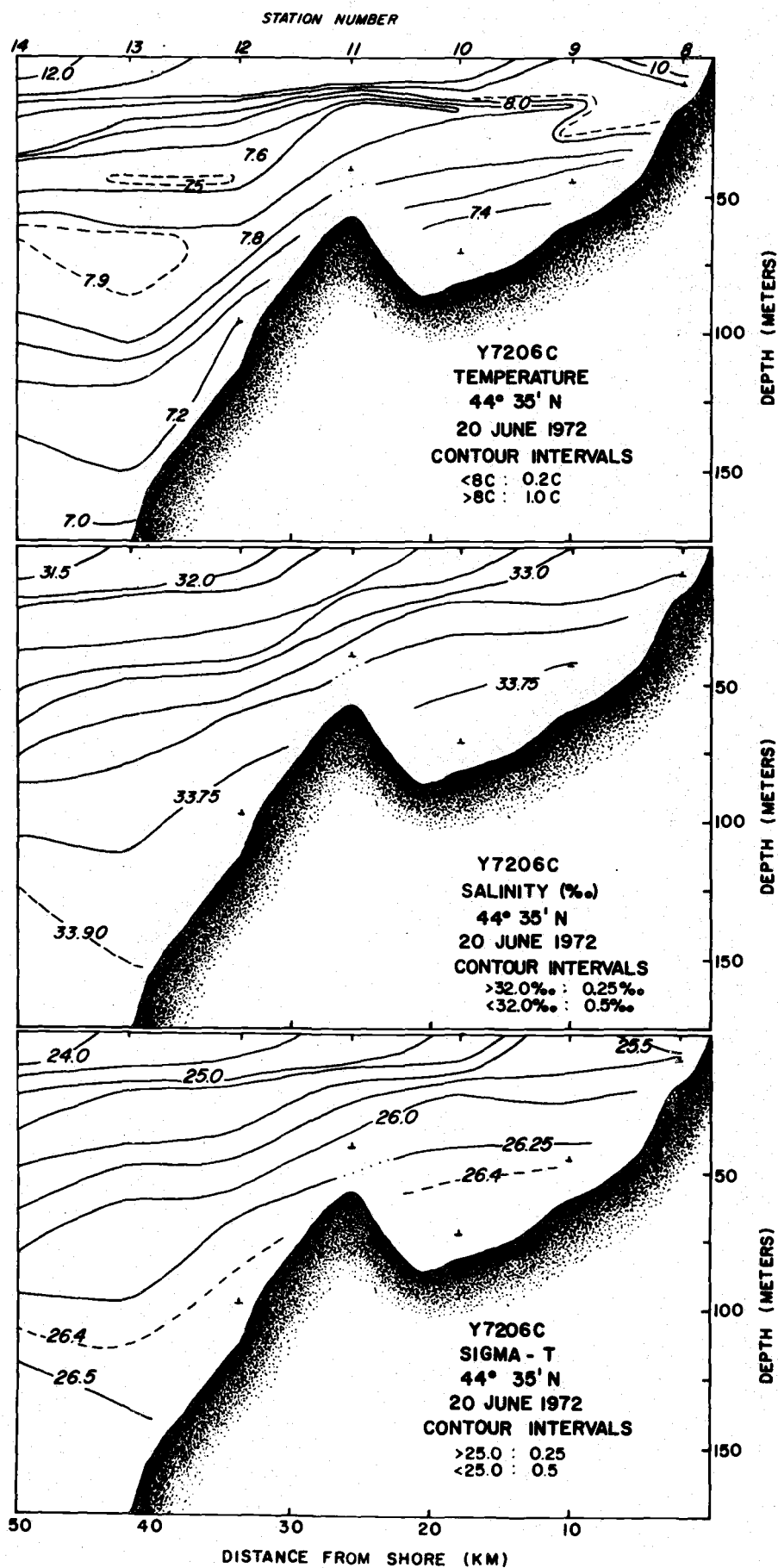


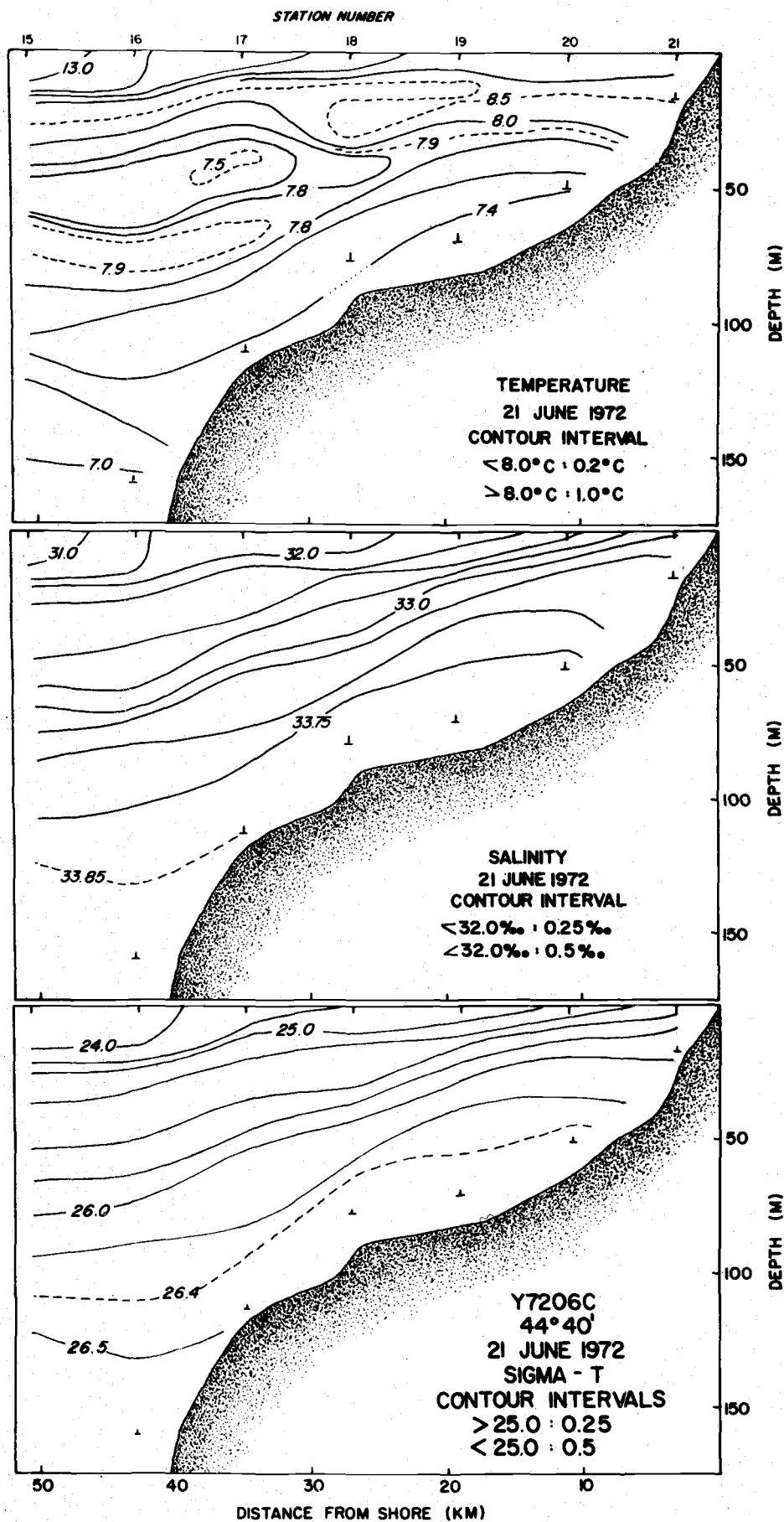


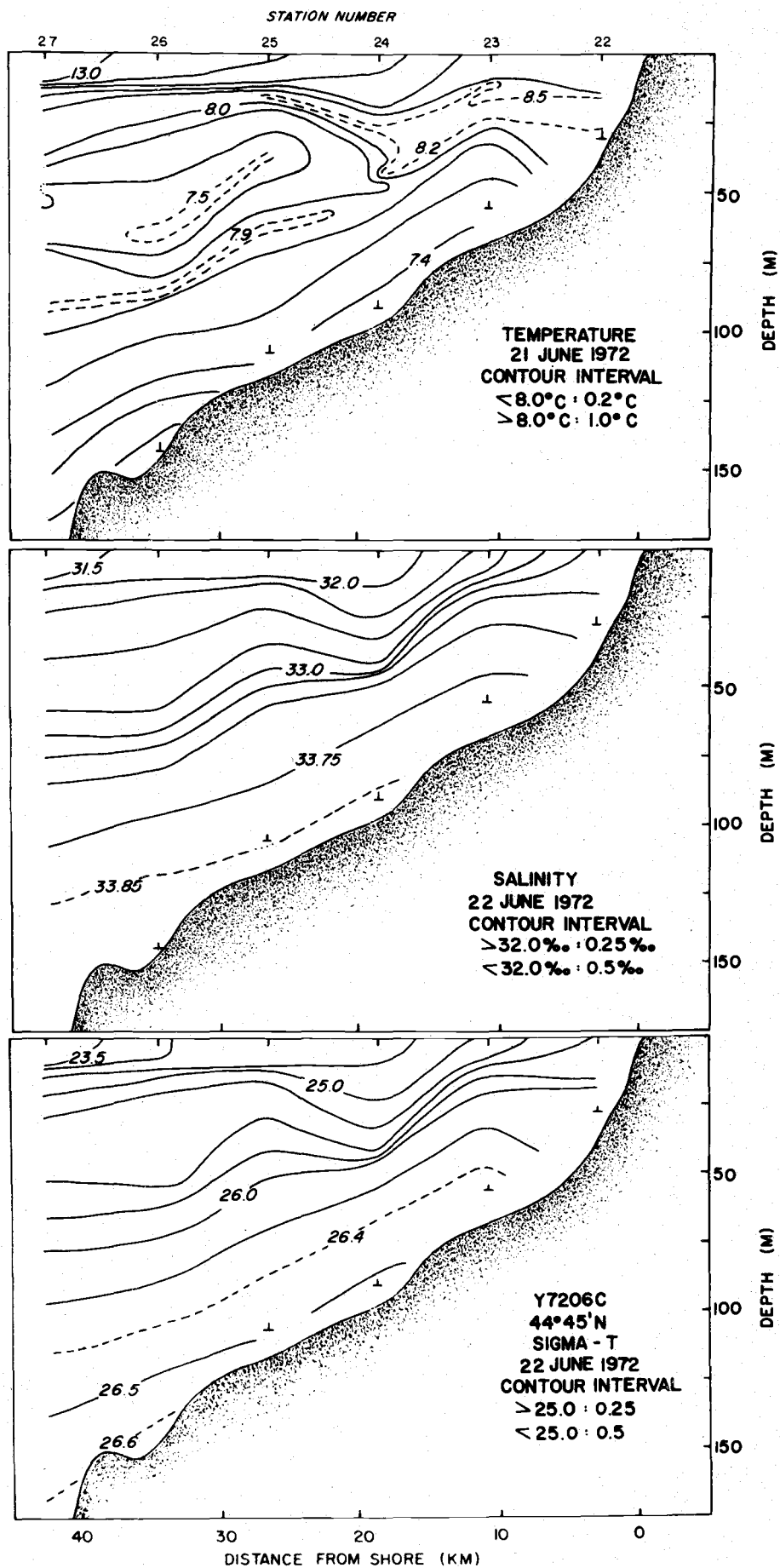


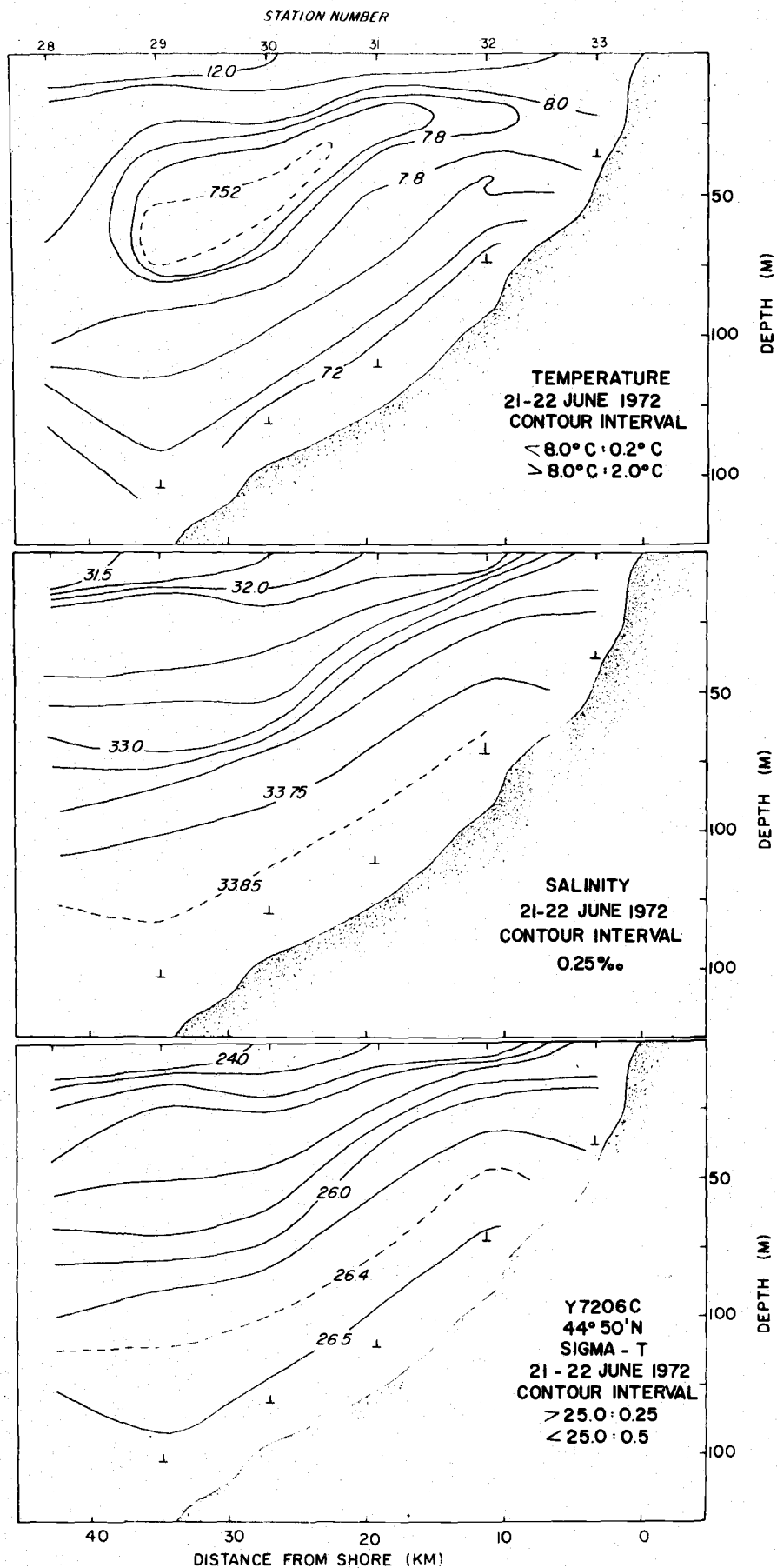


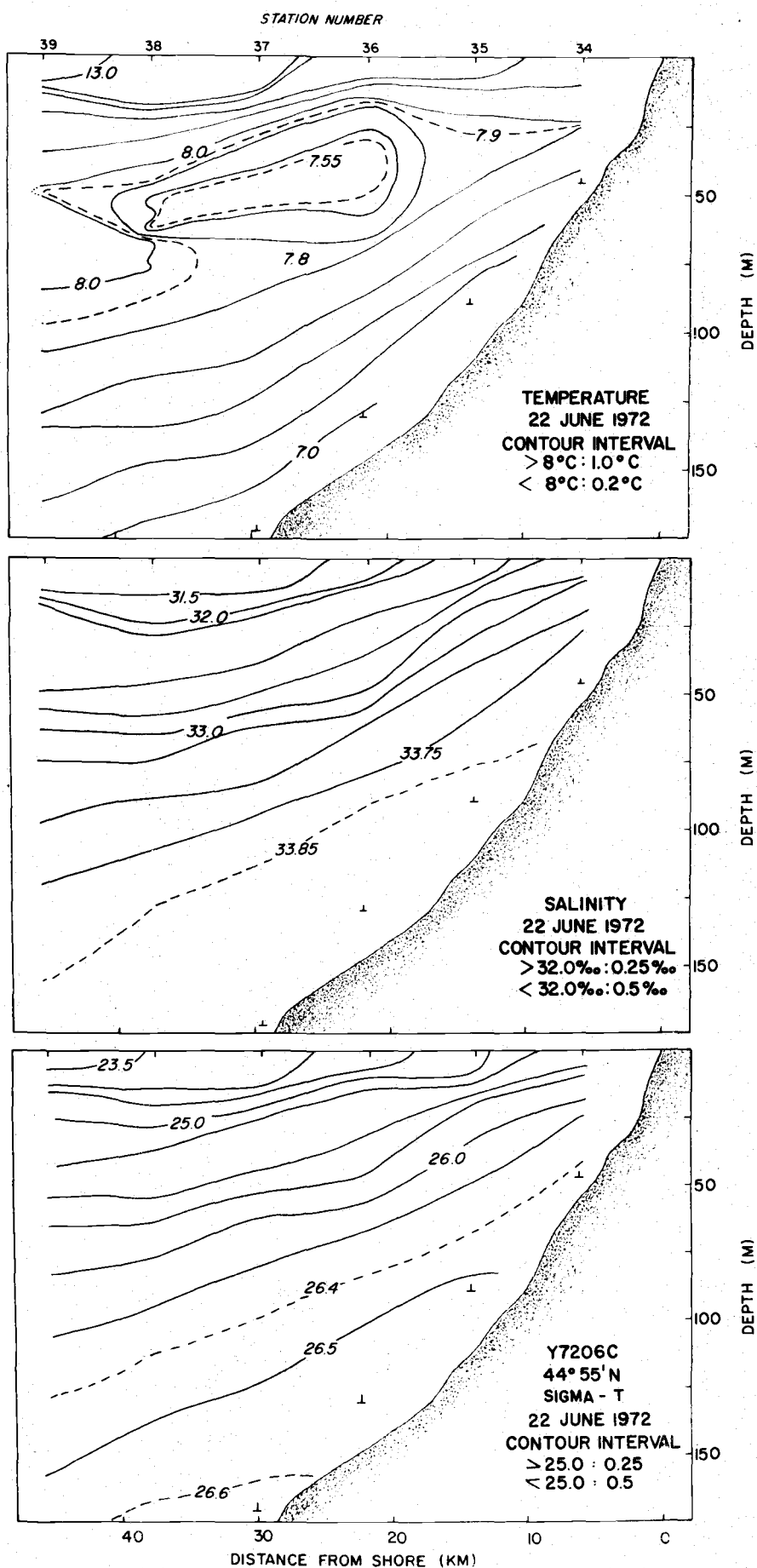


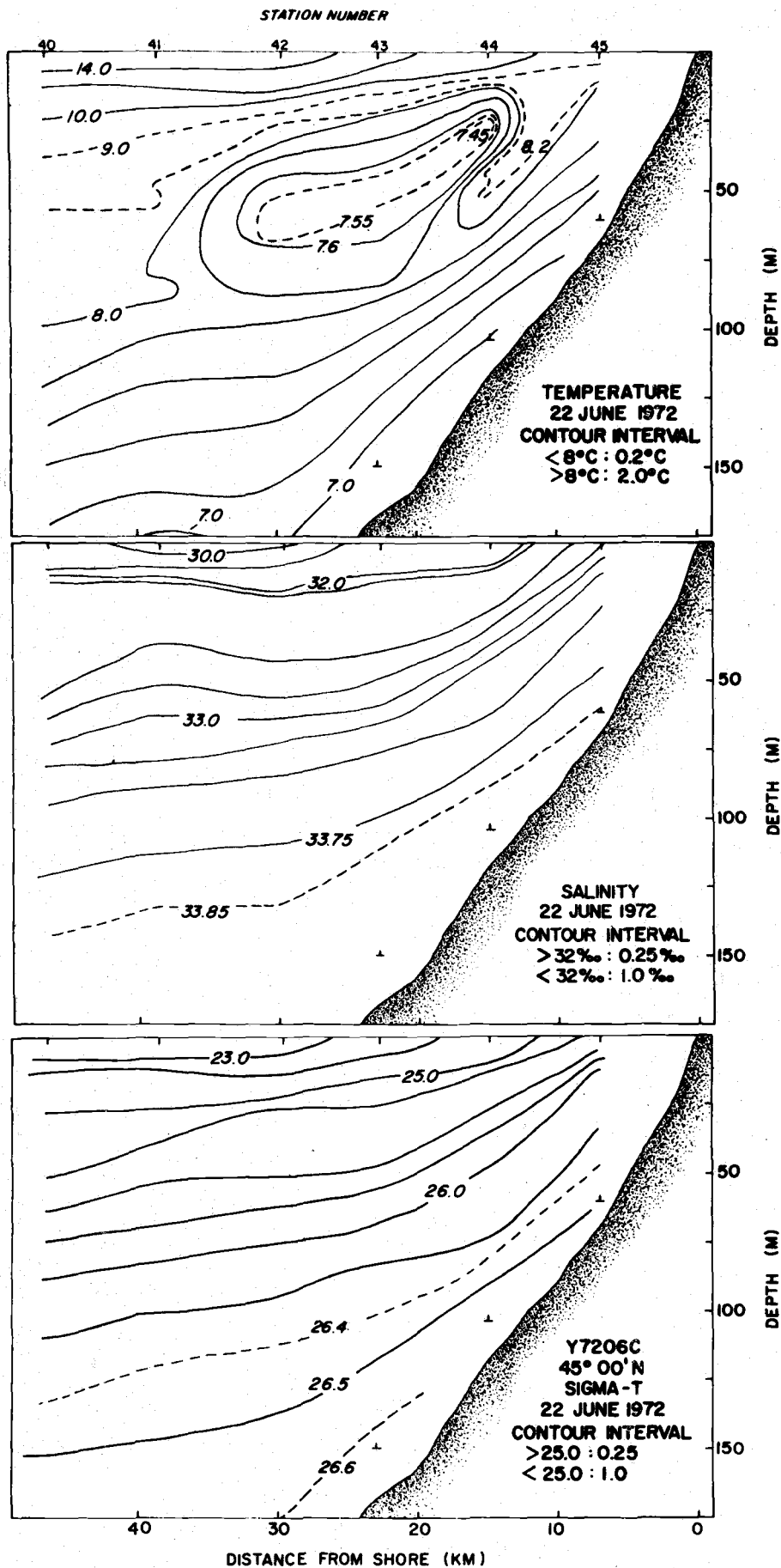


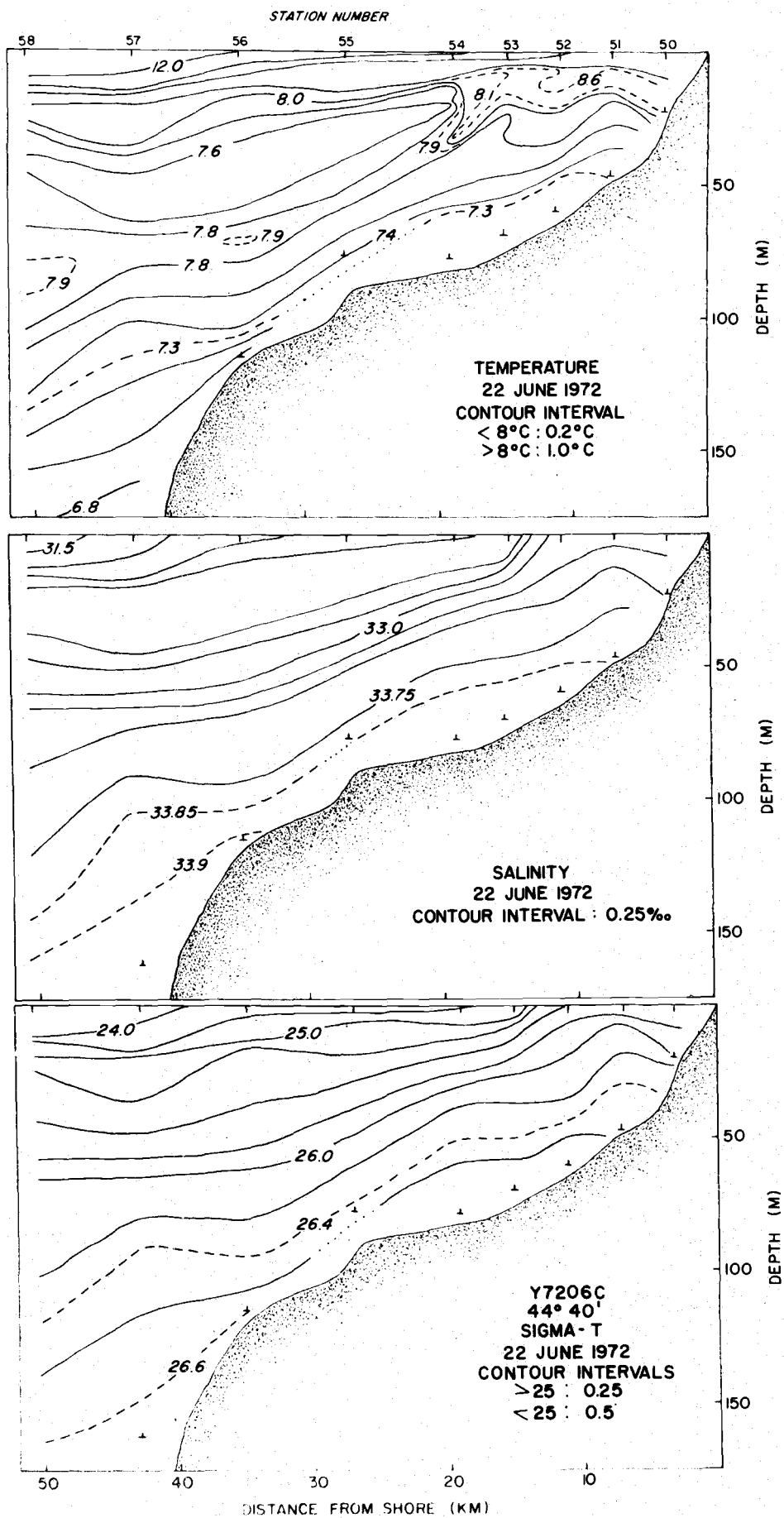


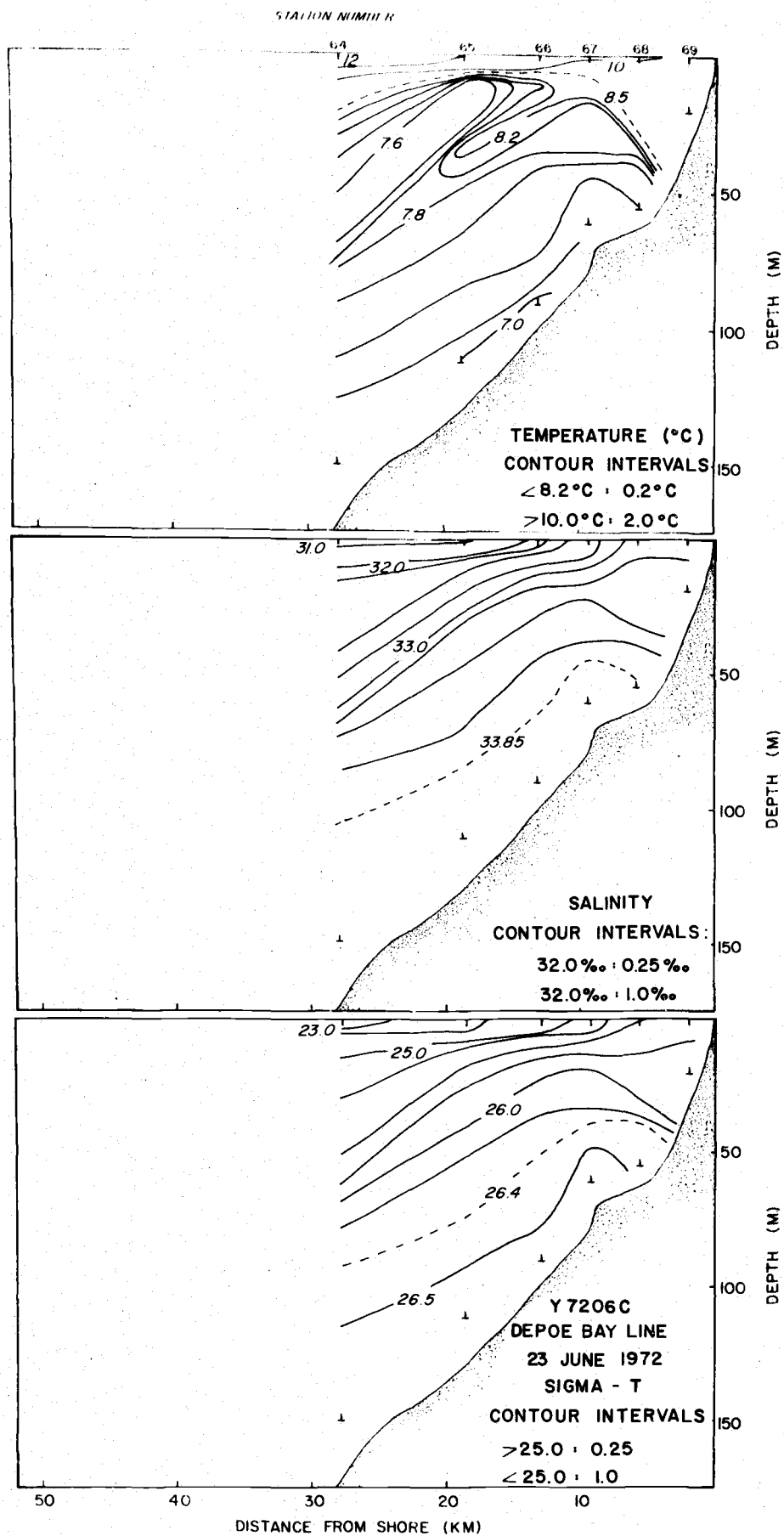


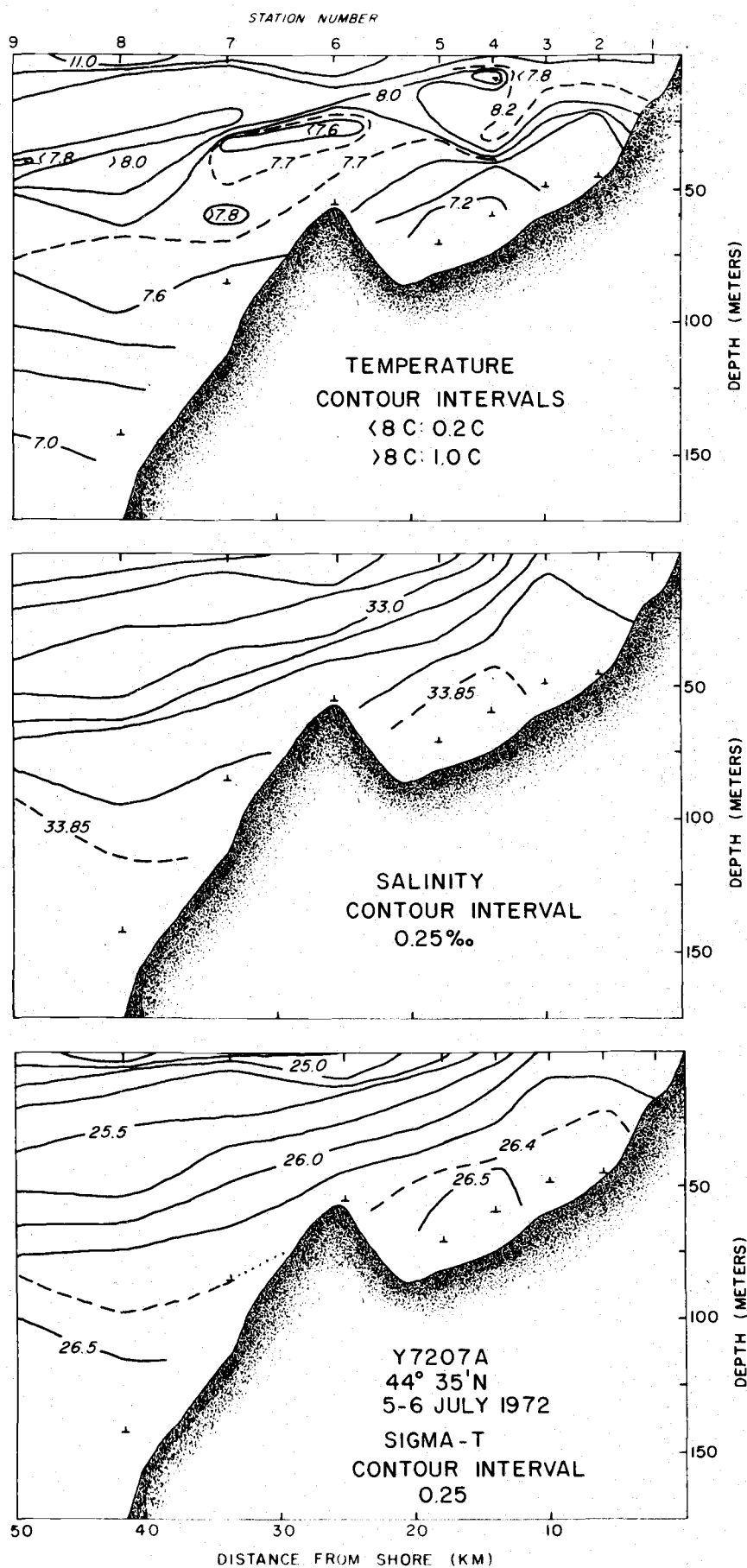




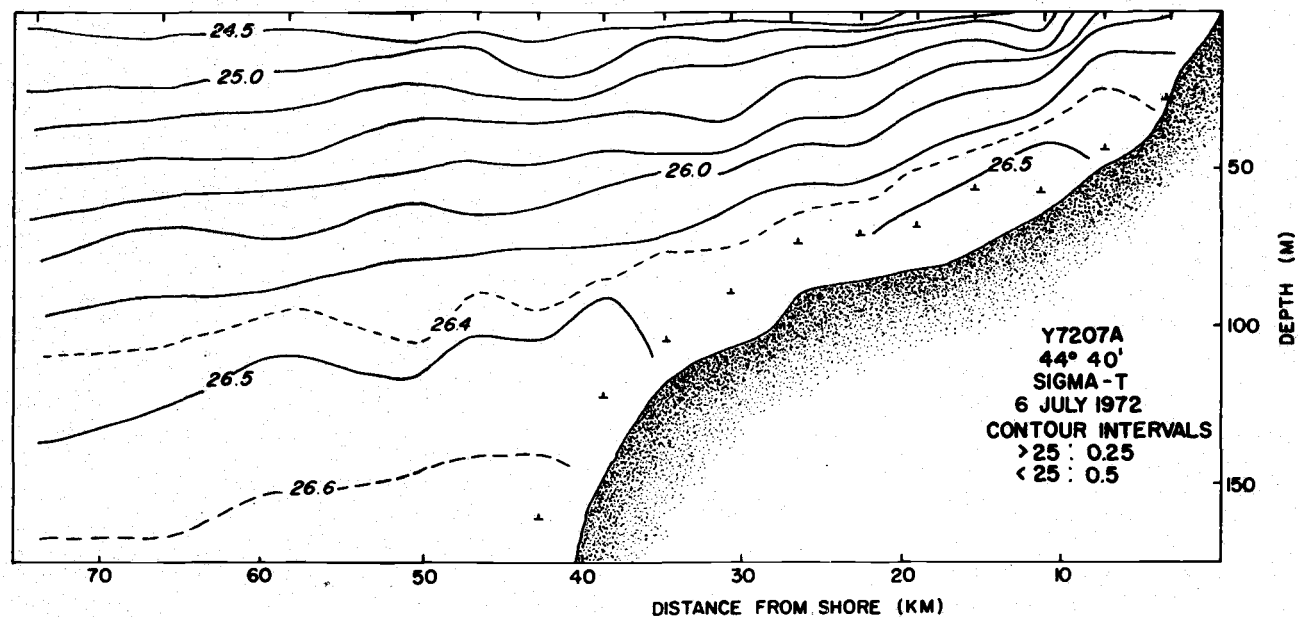
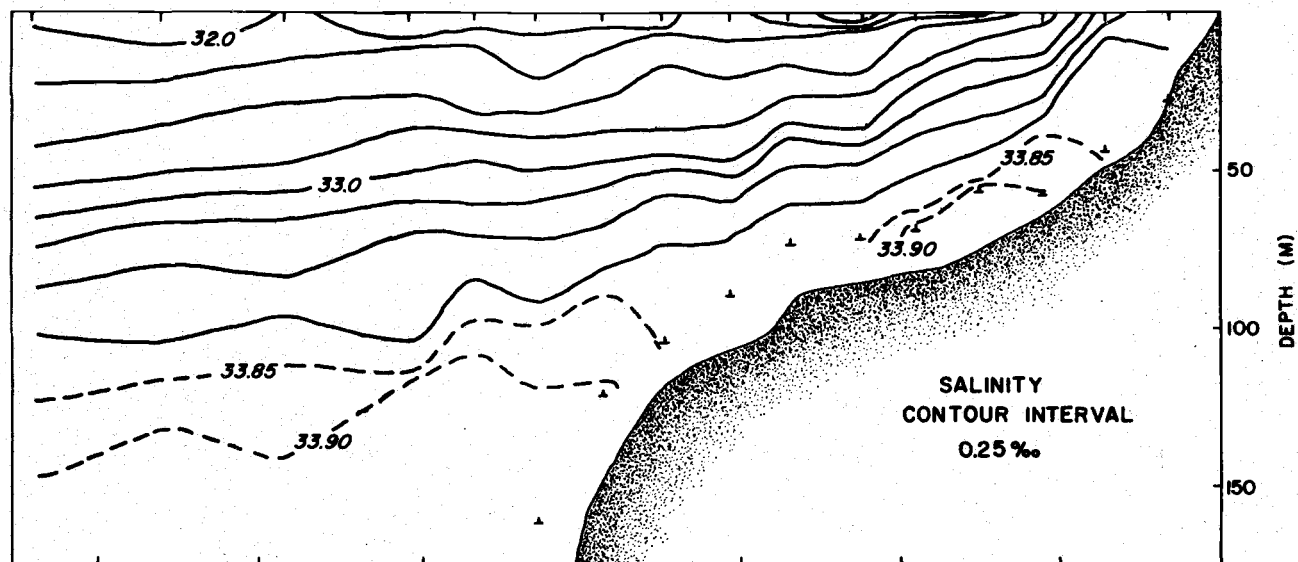
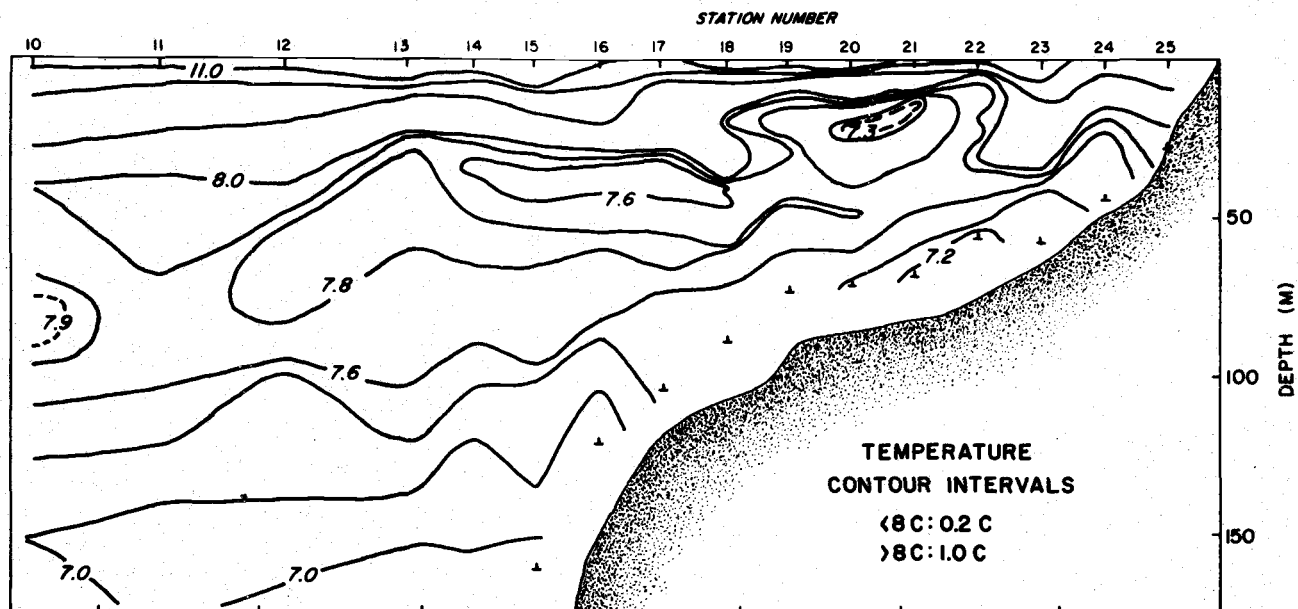


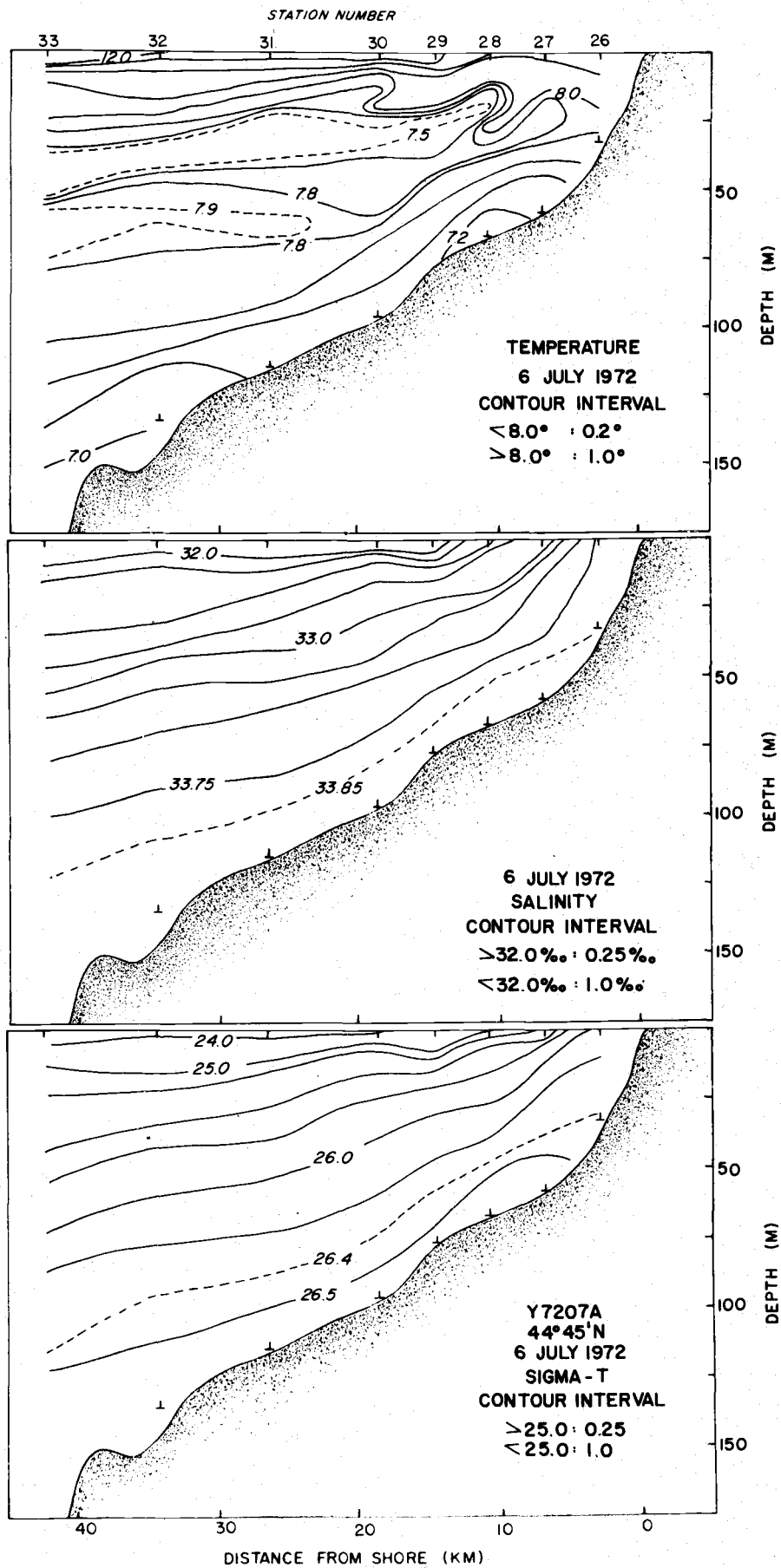


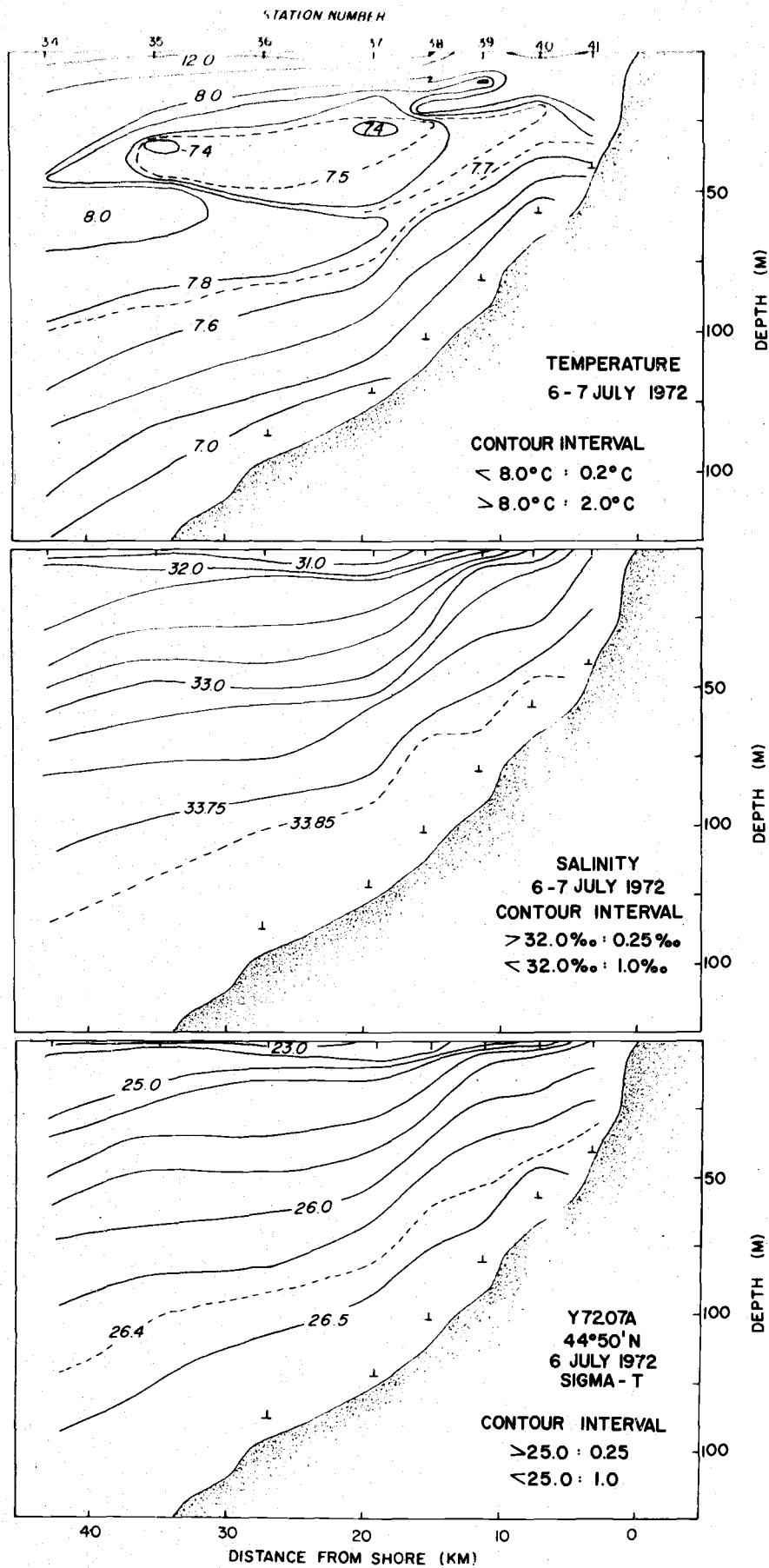


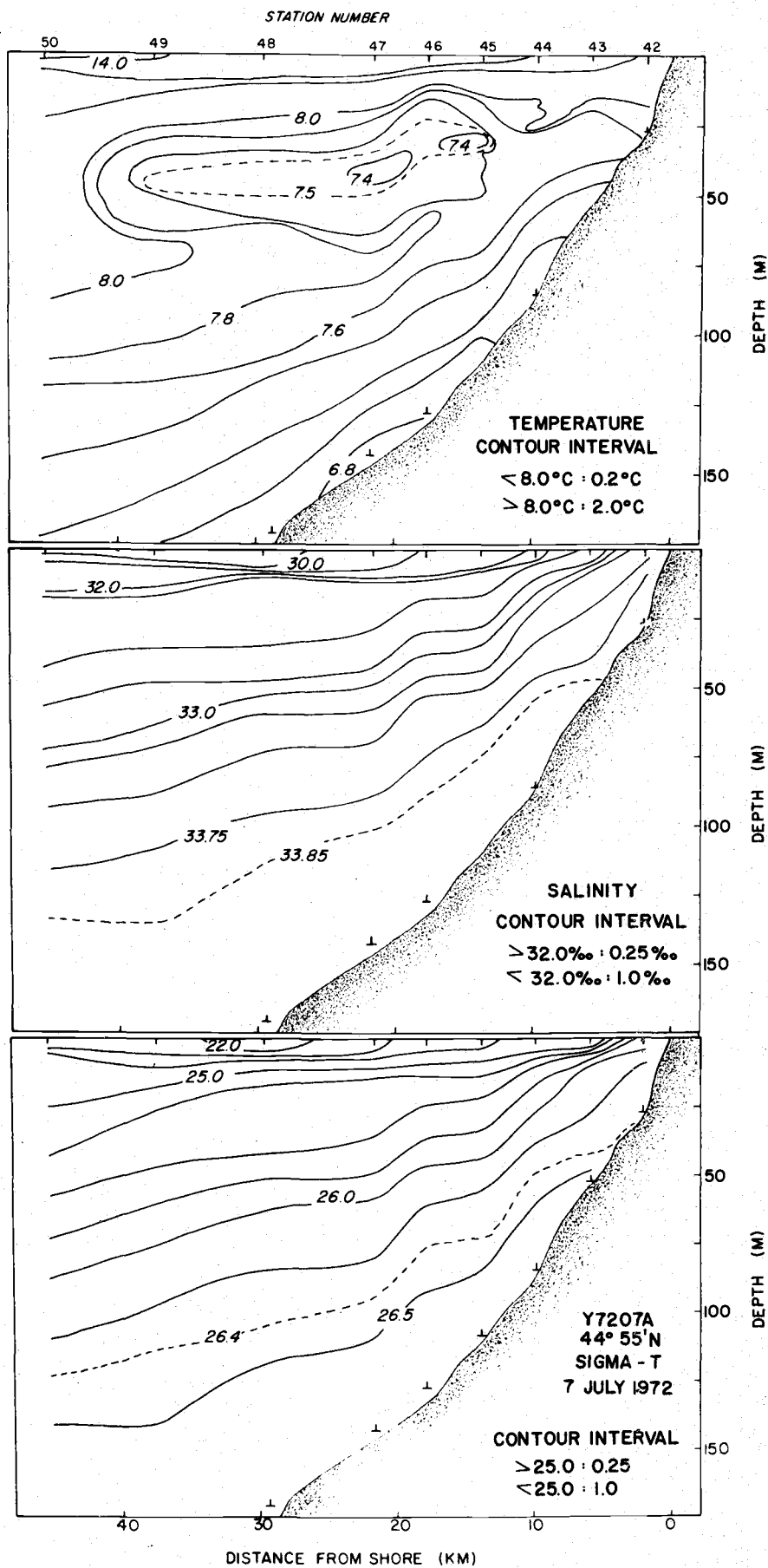


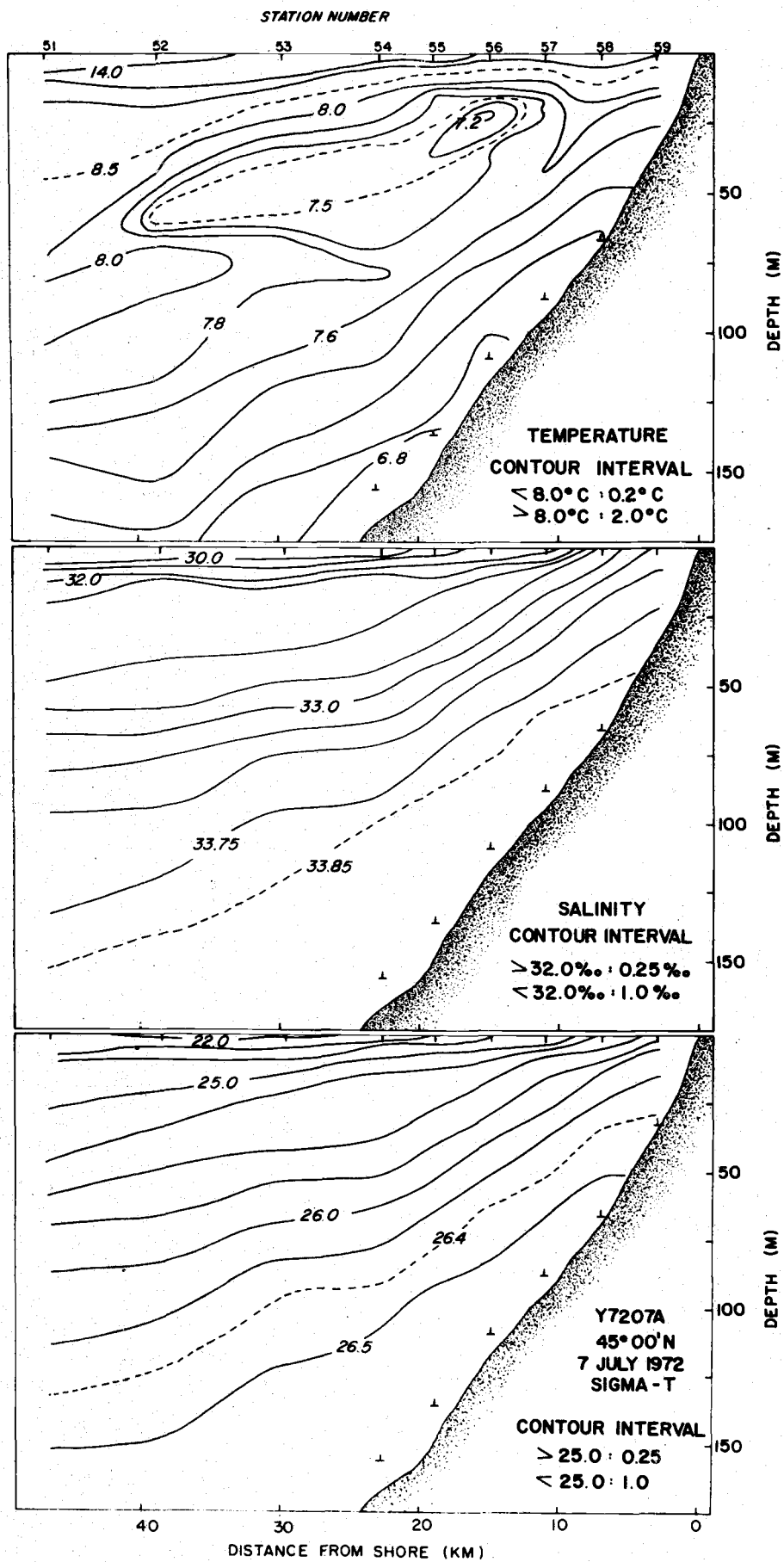
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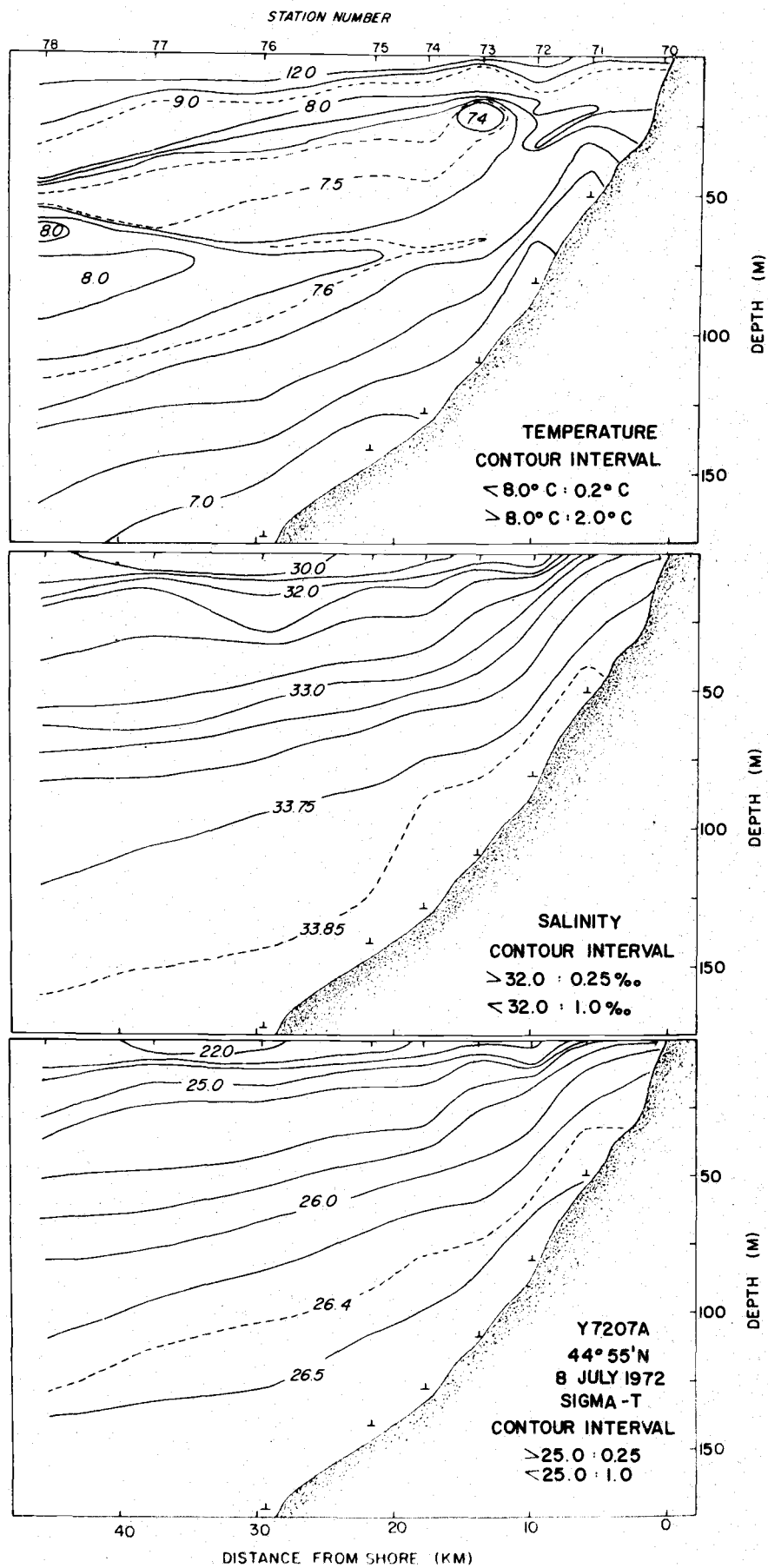


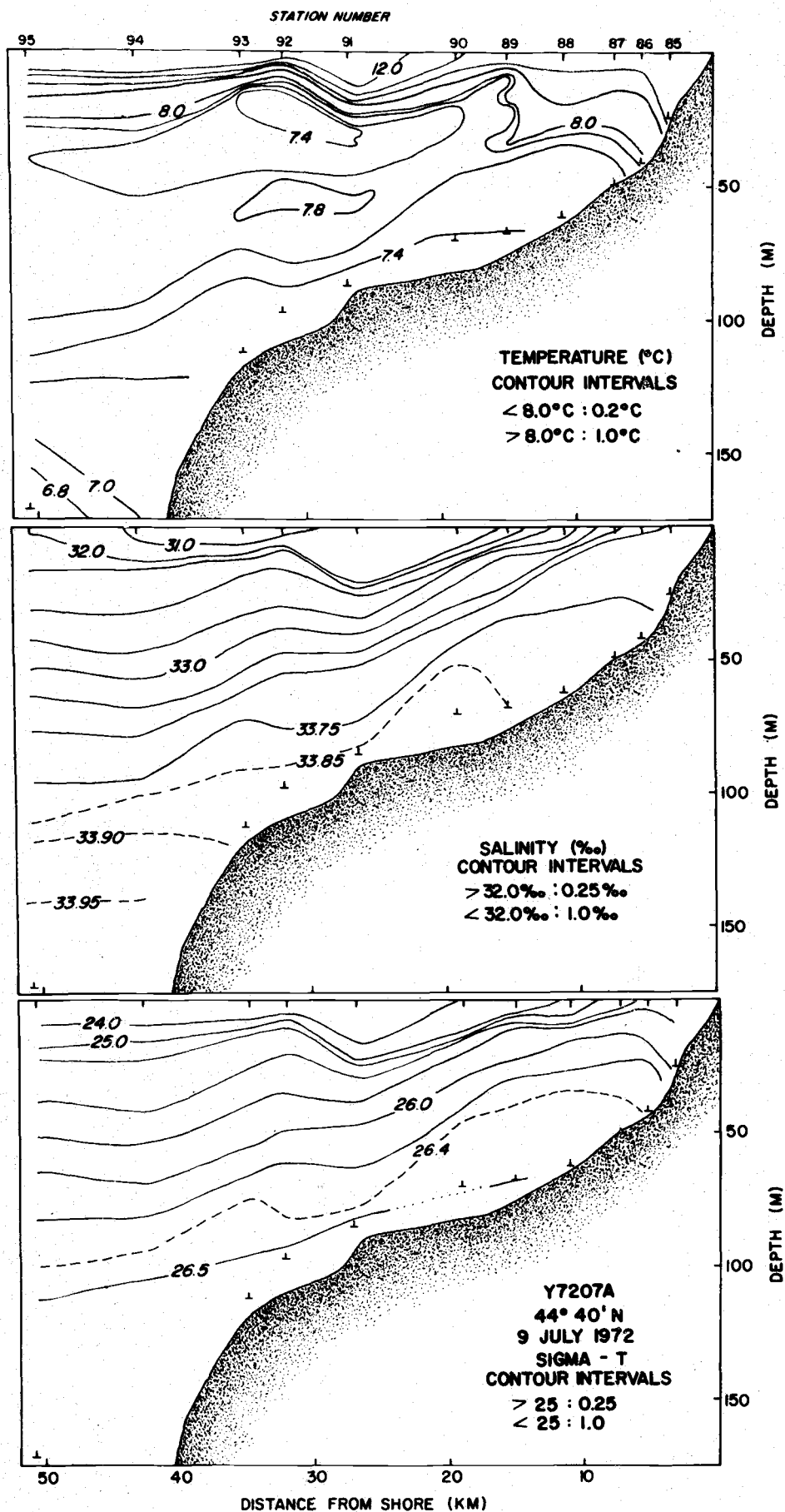


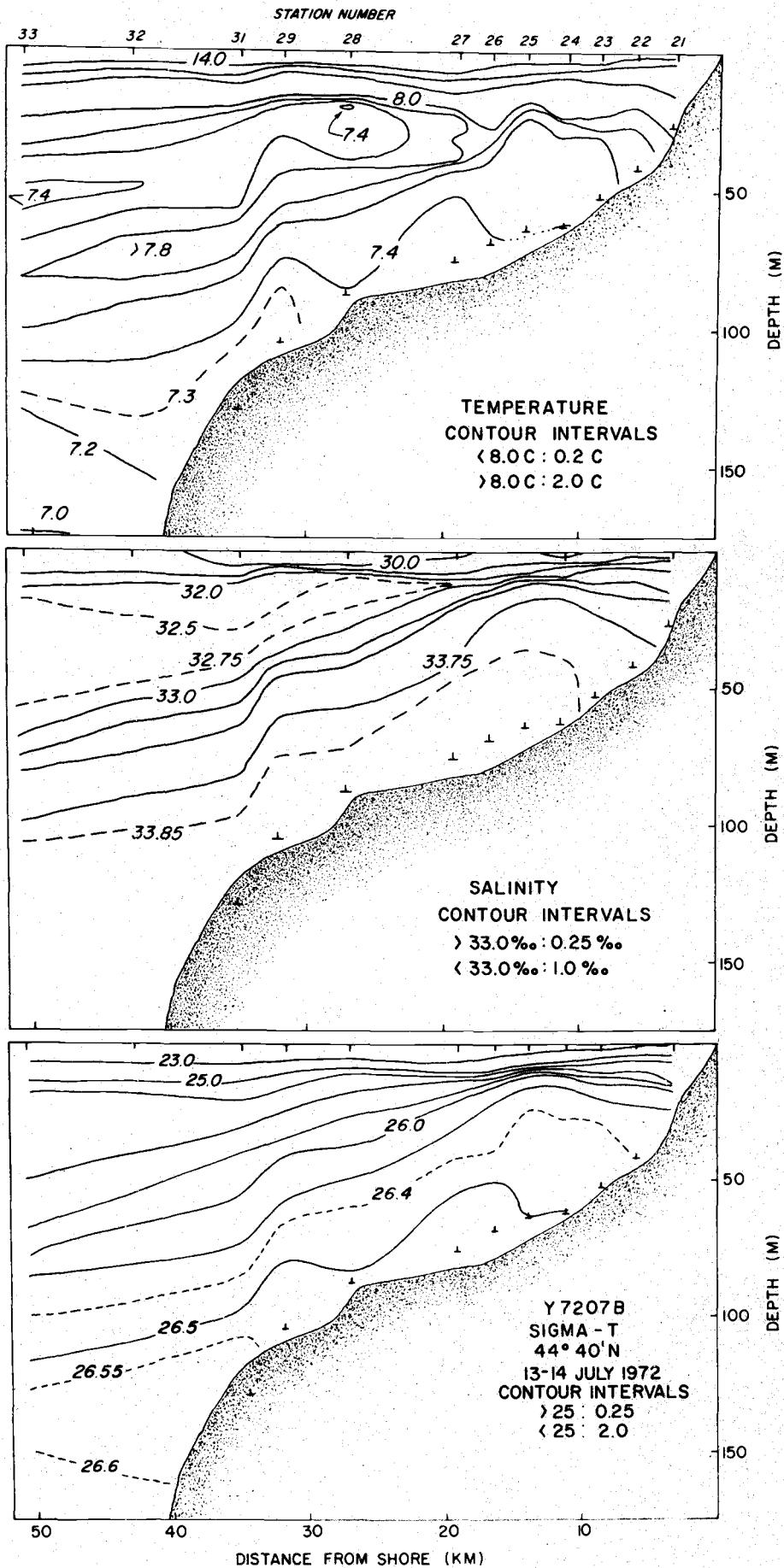


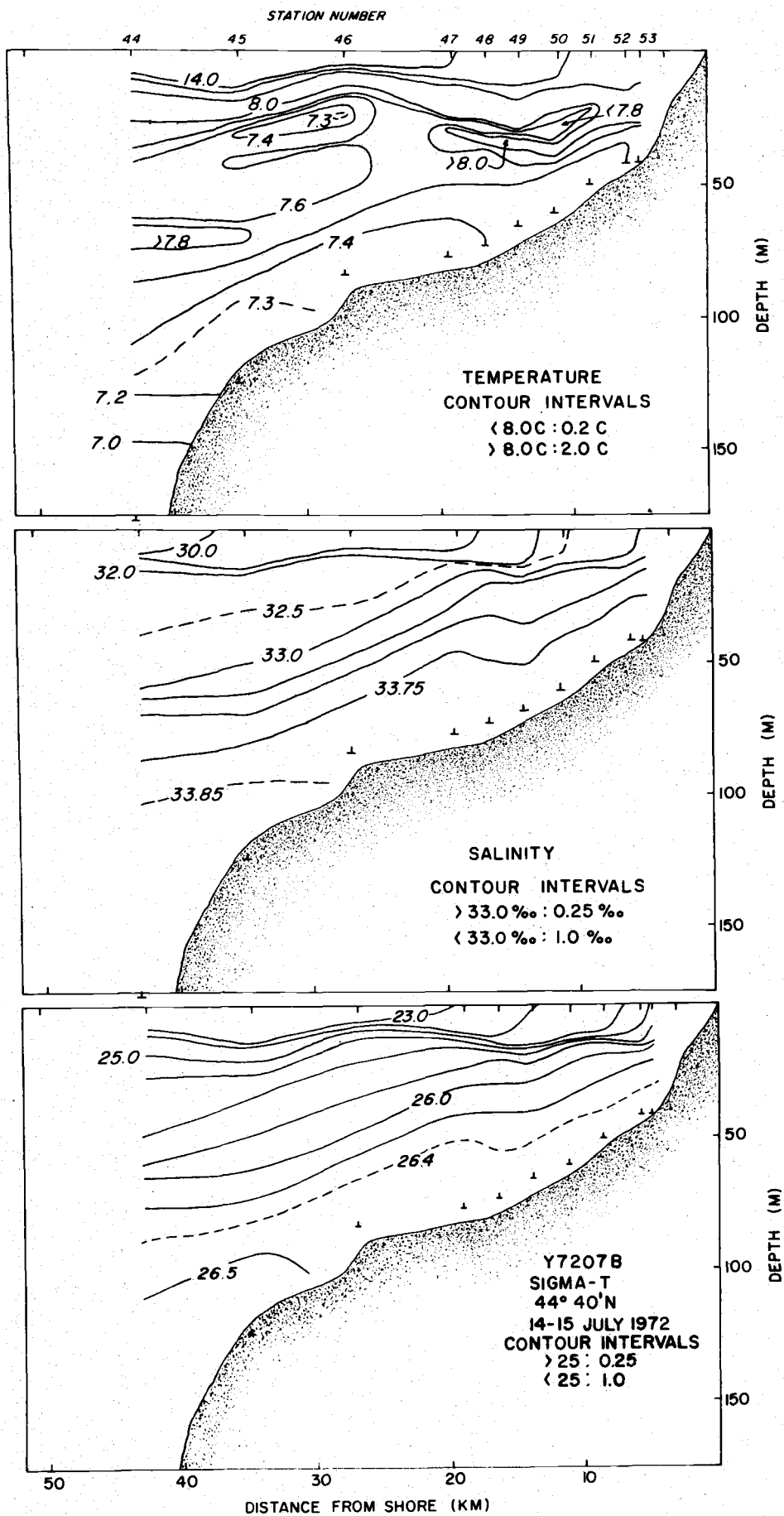


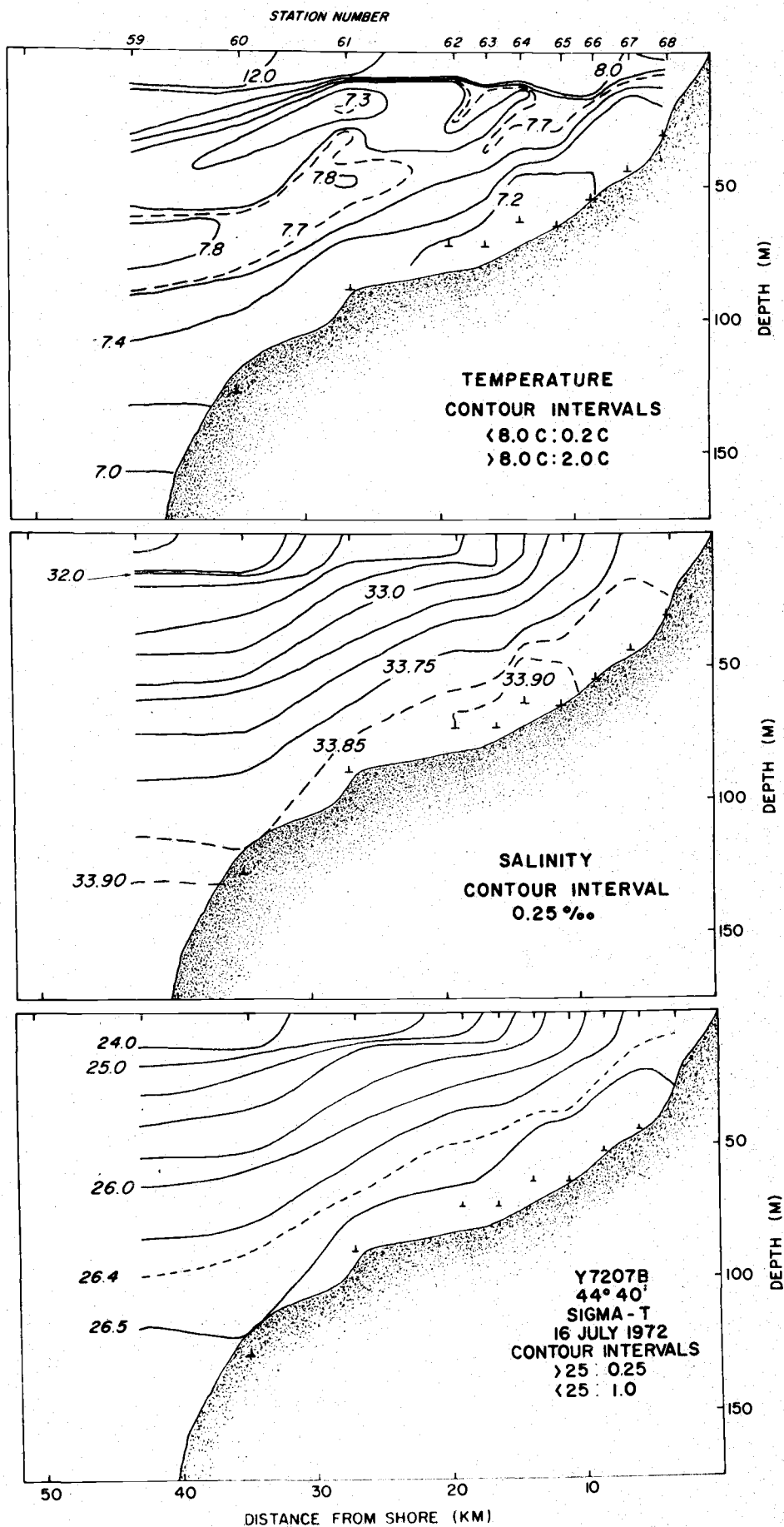


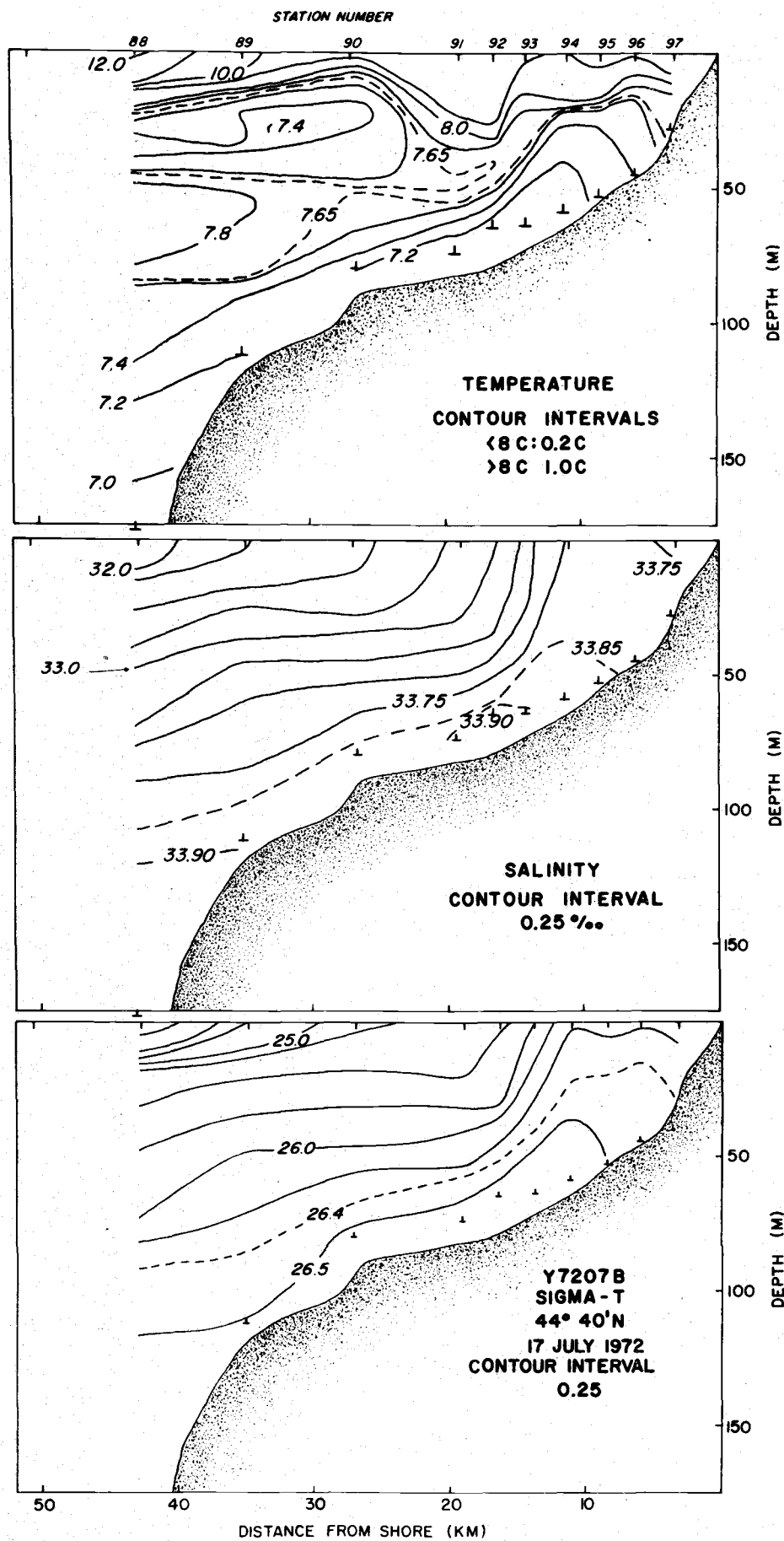


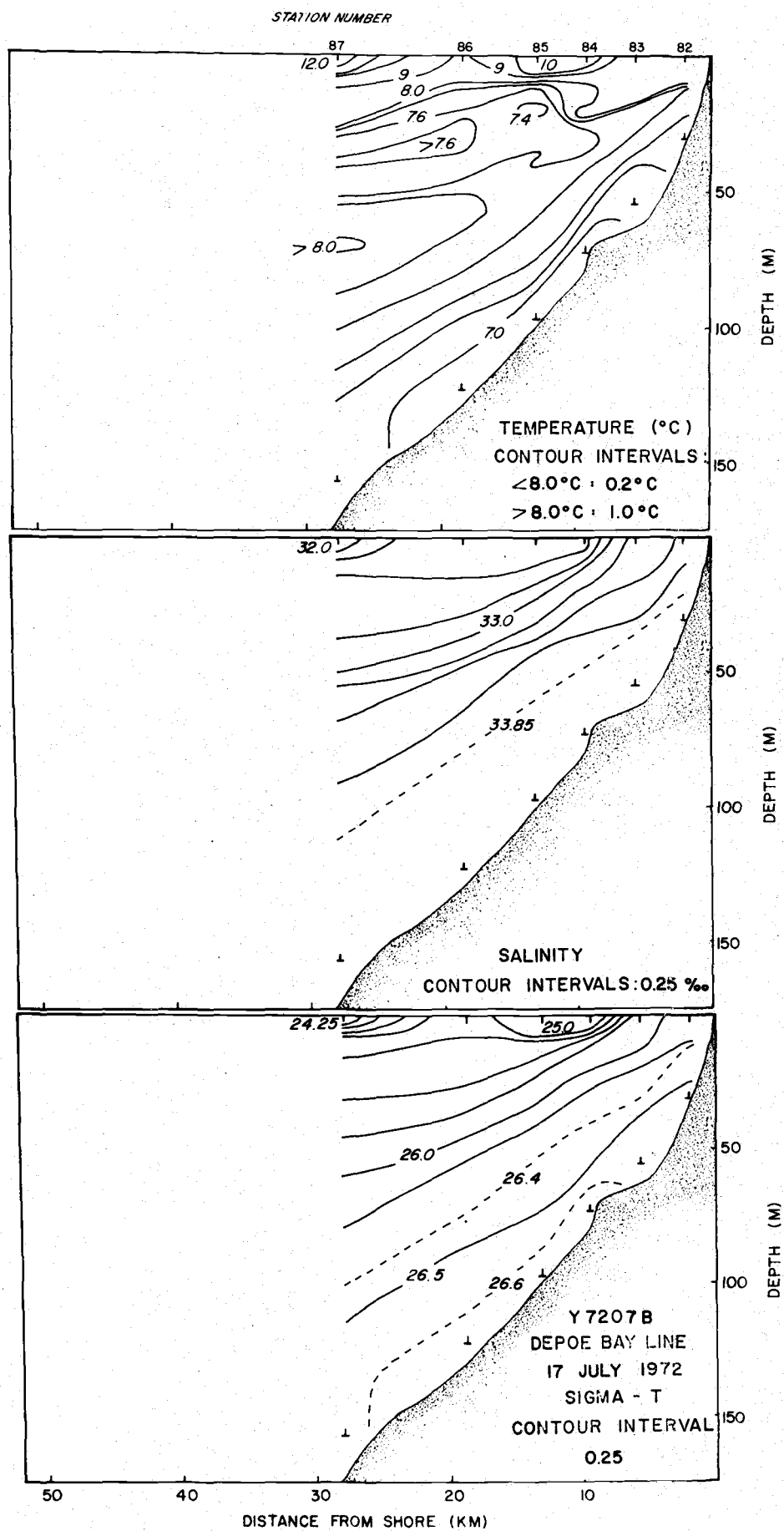


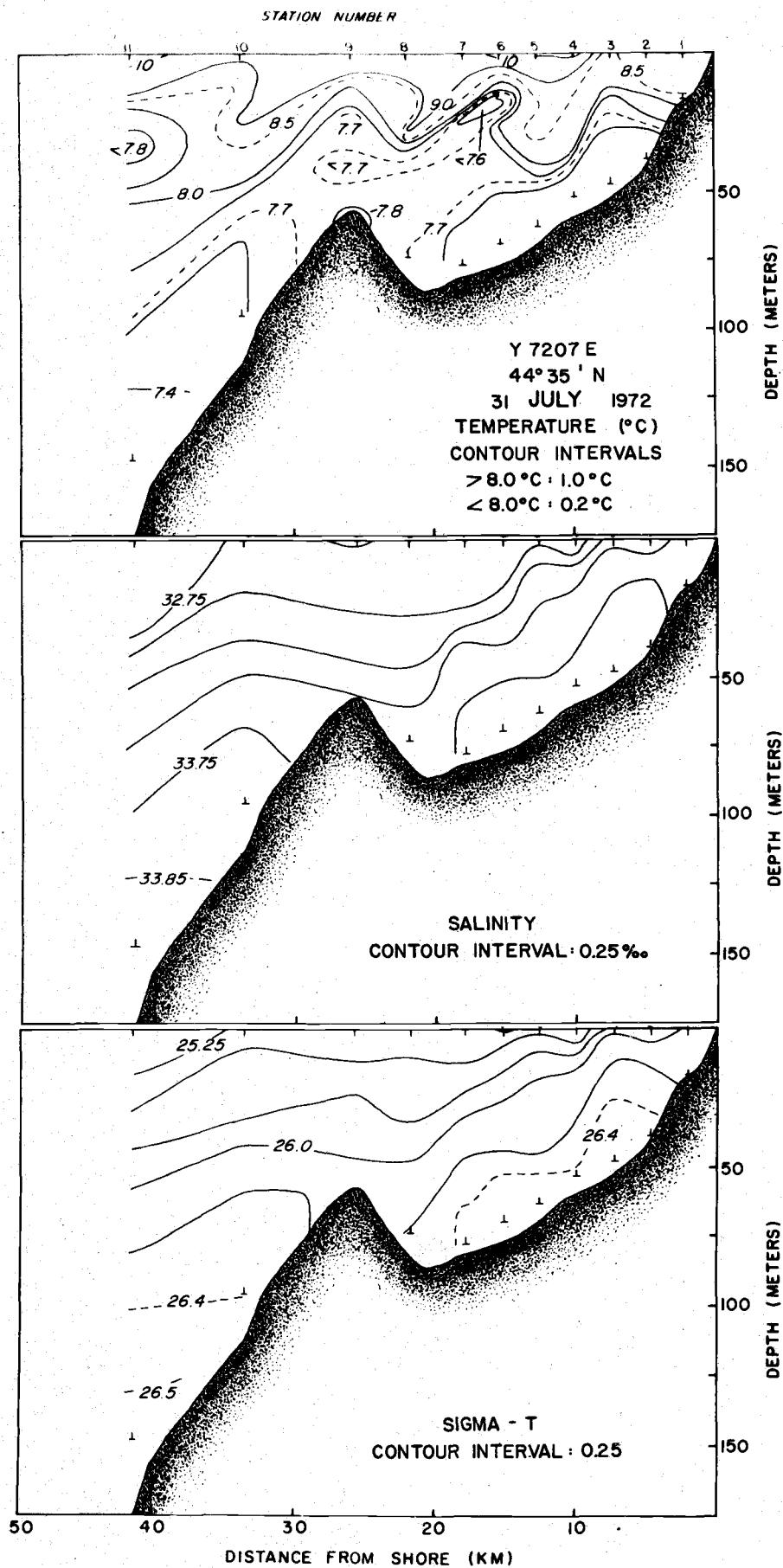


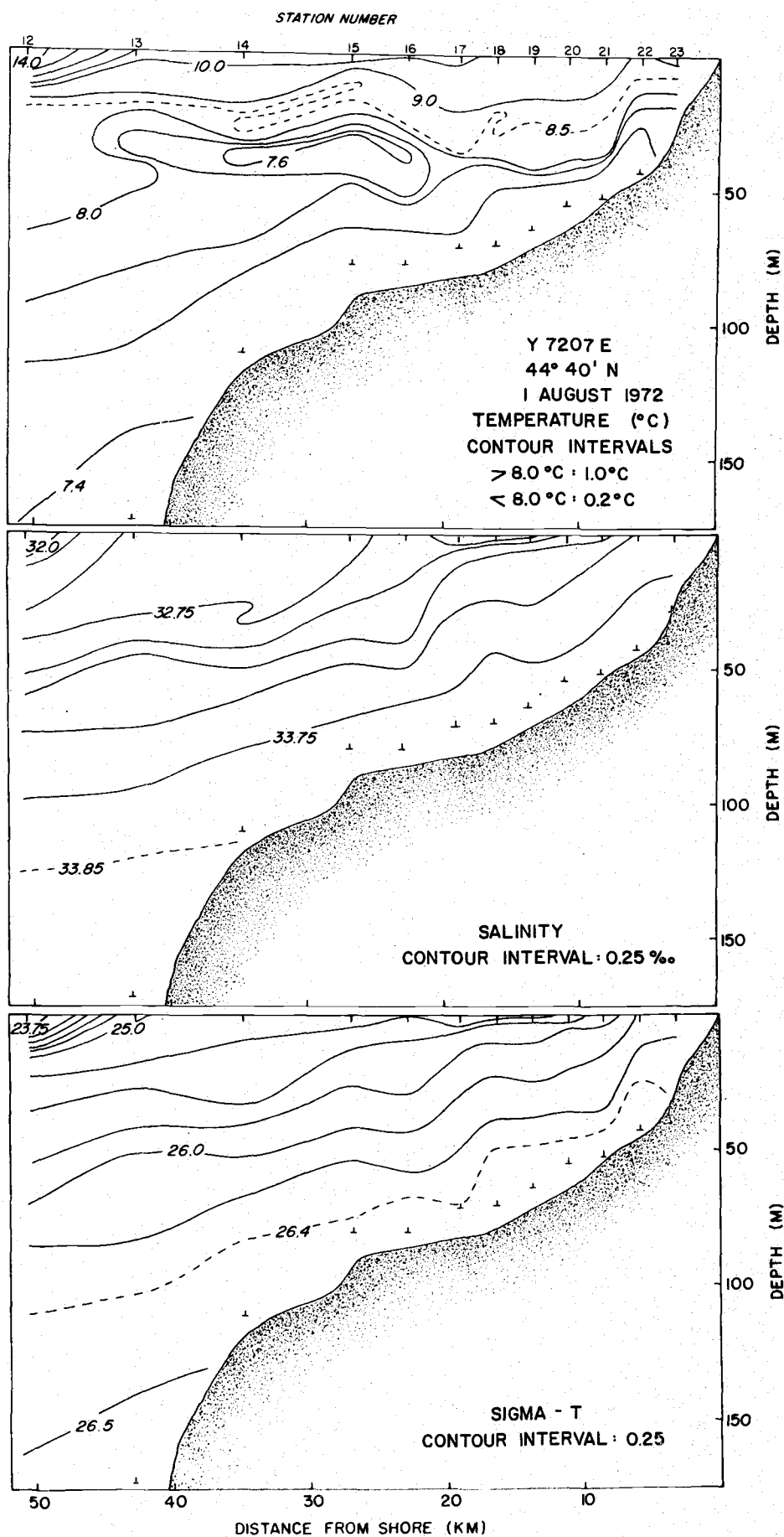


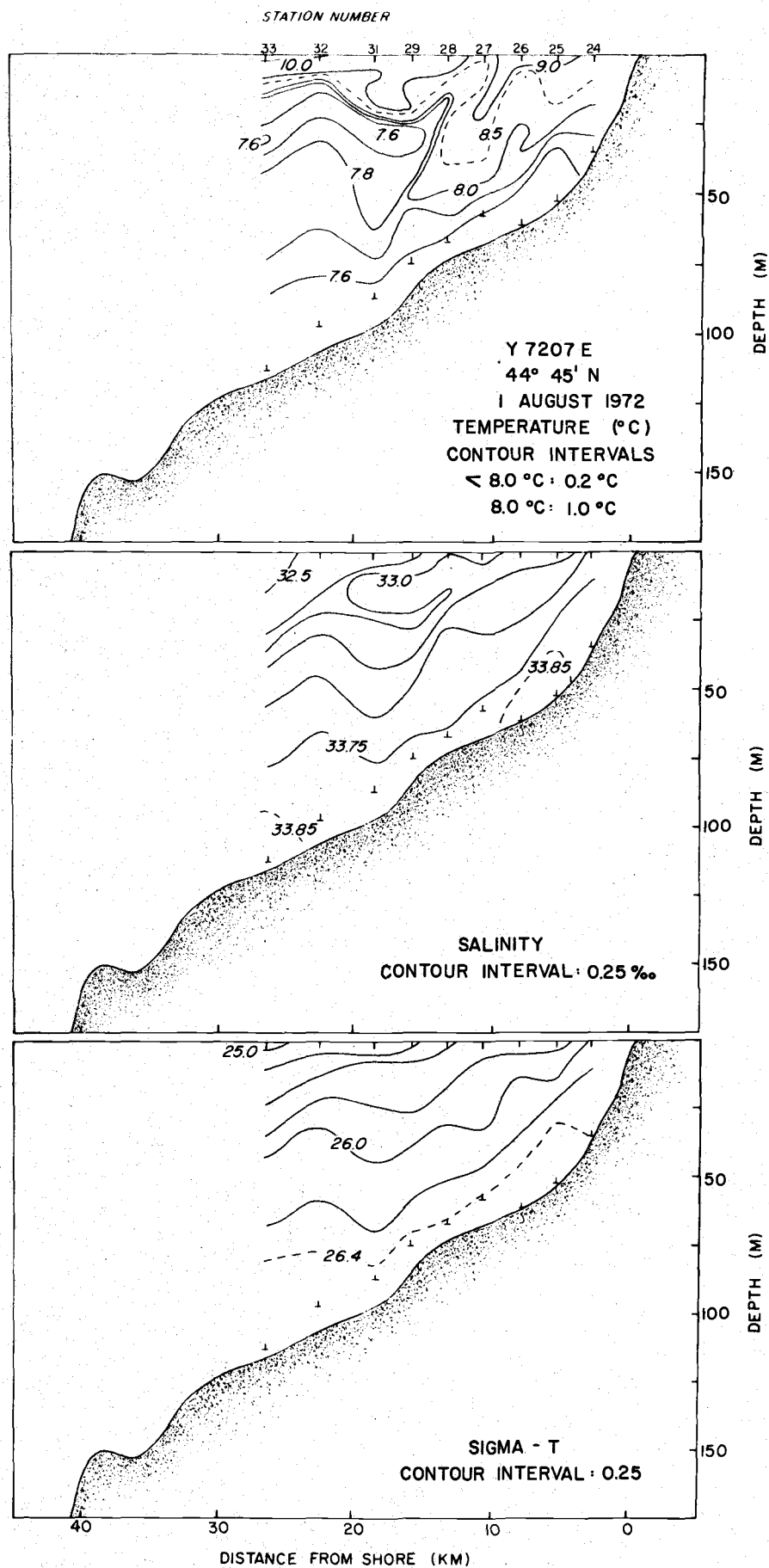


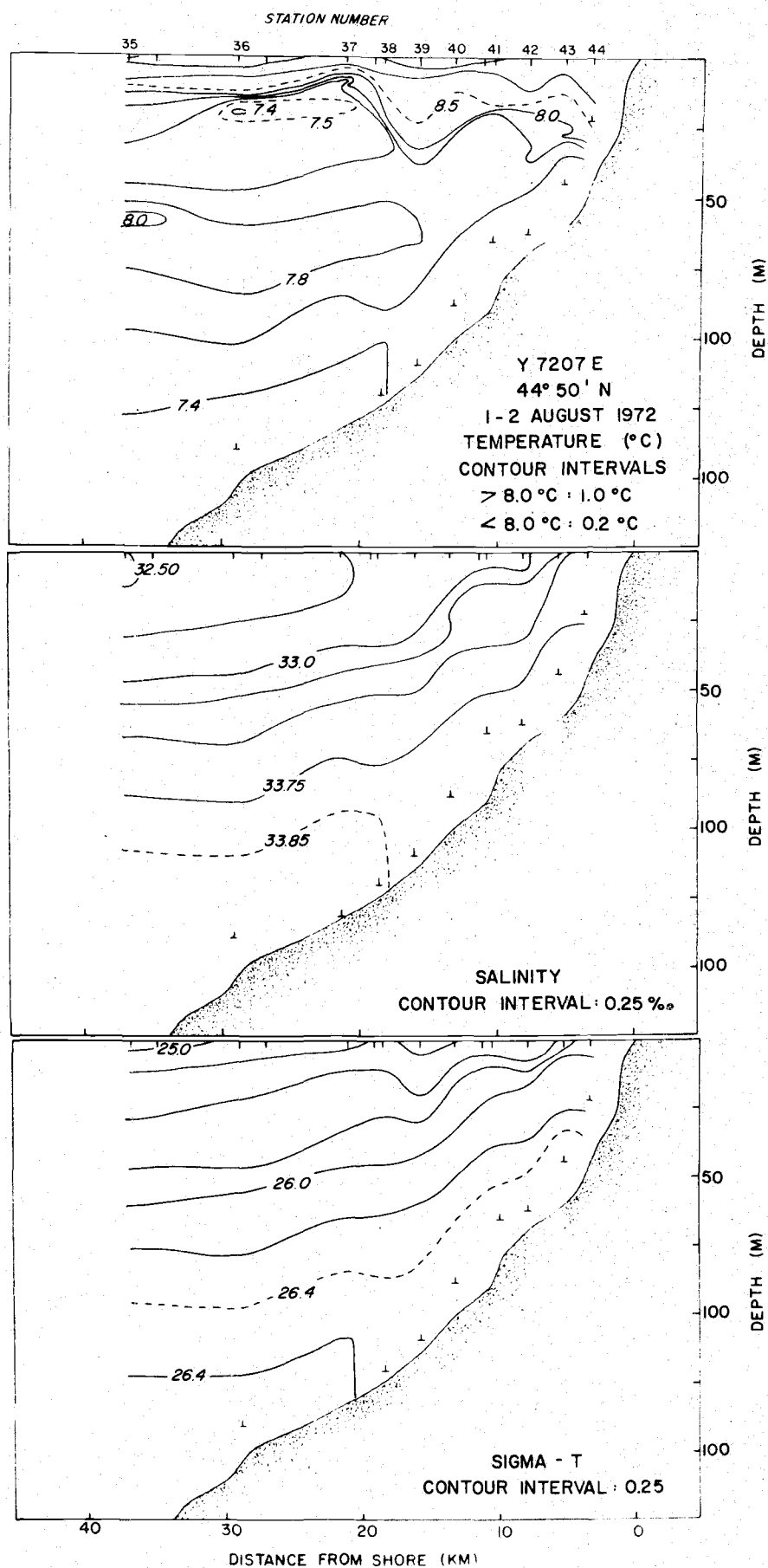


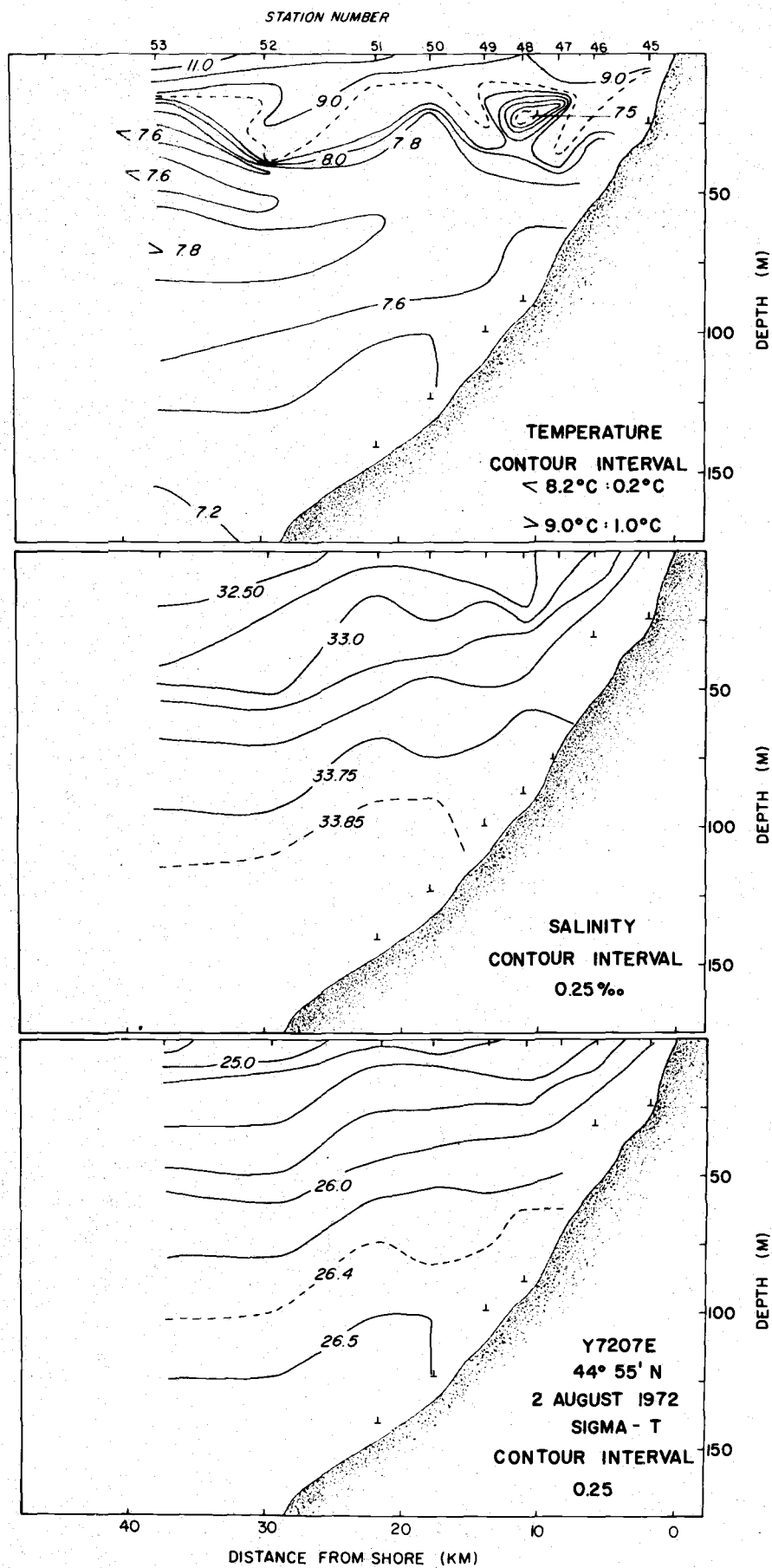


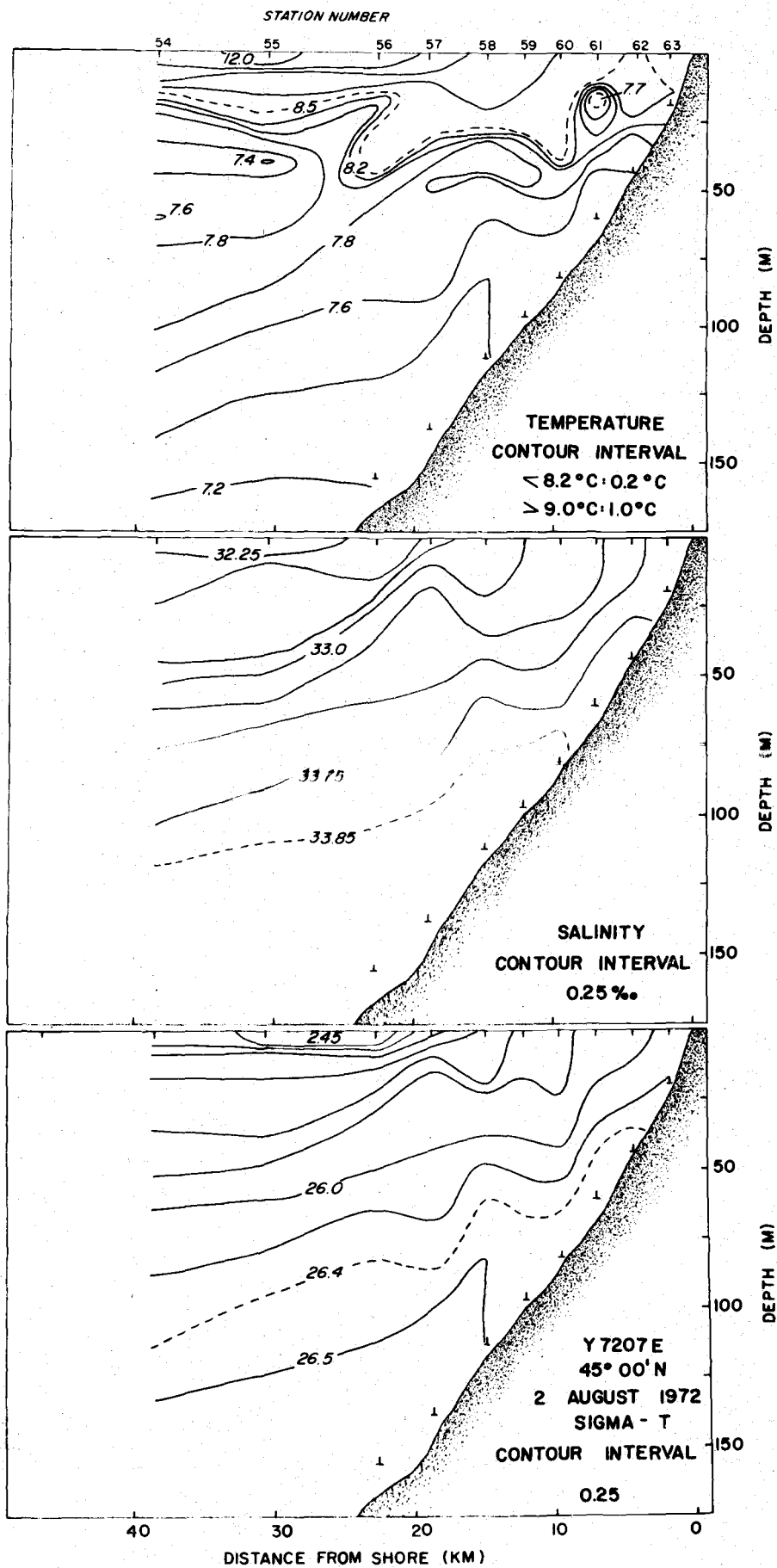












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