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Results of 1979 Spring and Fall Bottom-trawl Surveys with the R/V Anton Dohrn in Subareas 5 and 6 with special emphasis on pelagic species

by

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INTRODUCTION

Based on minimal catches by the international fleet in ICNAF Subareas (SA) 4 and 5 and Statistical Area (SA) 6 and because of the total ban on any directed Foreign Atlantic herring fishery in 1978 and 1979, no biological information on the status of the different fish stocks--especially Atlantic herring and Atlantic mackerel -- would be available from commercial catches in the Georges Bank area. The German Scientific Commission for Marine Research decided, therefore, to detail the R/V "Anton Dohrn" to the above-mentioned area from February 10 to March 20 and September 27 to October 19, 1979 to obtain necessary biological and hydrographic parameters.

MATERIALS AND METHODS

The R/V "Anton Dohrn" departed Woods Hole, Massachusetts, for the spring cruise on February 10 and returned March 10, and for the fall cruise departed Woods Hole on September 27 and returned October 19. The areas of investigation are shown in Figure 1. During the spring cruise 125 stations were completed; during the fall cruise 93 stations were completed. On all stations the net used was a 180-ft. (55-m) herring bottom trawl rigged with rollers, a kite

(0.9 x 1.2 m), a temperature net sonde and a small-meshed cod end. Tows were normally 30 minutes long and were done mostly during daylight. The nets were towed at approximately 3.5 knots (ship's speed). The echosounder was monitored constantly both during tows and when steaming.

The total catch was sorted to species, weighed and measured individually. Subsamples were taken from larger catches. Length measurements were made to the nearest whole centimeter below actual length, except for Atlantic herring which were measured to the nearest whole half centimeter below actual length. Otoliths were extracted from Atlantic cod, haddock and silver hake for future age determinations at the Hamburg laboratory. On each station hydrographic data (i.e., temperature and salinity) were obtained by means of CTD (Kiel-Multisonde) and Nansen bottles. On selected stations XBT casts were made to obtain additional hydrographic information.

RESULTS

Catches of the most important commercial species are shown in Tables 1 and 2.

Atlantic Herring (Clupea harengus L.)

During the spring cruise 1,863.5 kg (12,596 specimens) were obtained compared to only 8.8 kg (32 specimens) in the fall of 1979. Length measurements and age determinations of herring caught in Divisions 5Y, 5Z and 6A in spring indicate the predominance of the 1976 and 1975 year class (Tables 3 and 4; Figures 2 and 3). Fish of 24 to 27 cm in length were dominant in the samples. Maturity observations indicated that the fish were mostly in stage II of gonadal development (juveniles); there were some fish in stage VIII of gonadal development (Table 5).

Due to limited catches during the fall survey, no basic conclusions on the population dynamics of herring can be made from the available data. Most of the 32 herring obtained, however, were ready to spawn; the lengths ranged from 27 to 35 cm.

Atlantic Mackerel (Scomber scombrus)

Mackerel were collected almost exlusively in SA 5. Length measurements

(Figure 4) indicated that fish of about 20 cm prevailed in the spring catches, whereas almost all specimens were longer than 30 cm in the fall catches. In the spring the largest catch amounted to 135 kg (2,260 specimens); in the fall only 82 kg (295 specimens).

Atlantic cod (Gadus morhua L.)

A total of 3,537.6 kg (1,009 specimens) of cod was taken during the spring cruise, mostly in SA 5; a total of 1,596.2 kg (1,076 specimens) was taken during the fall cruise. The largest catches in the spring were 442 kg (194 specimens), and in the fall 265 kg (380 specimens). Sizes ranged from 15 to 130 cm in the spring, and from 20 to 142 cm in the fall. More detailed information about the status of the stock will be available after age determination of the 1,365 otoliths collected during both cruises are "read".

Haddock (Melanogrammus aeglefinus L.)

Catches in SA 5 amounted to 5,882.0 kg (24,360 specimens) in the spring and to 996.6 kg (4,562 specimens) in the fall. No catches were observed in SA 6. The biggest catches in the spring were 880 kg (317 specimens); and in the fall 543 kg (1,510 specimens). The fish ranged in length from 11 to 90 cm in the spring, and from 7 to 93 cm in the fall. A detailed description of the status of the haddock stock will be published in the future and will include the results of age determination of 1,930 otoliths.

Pollock (Pollachius virens L.)

The catches of pollock amount to 2,705.9 kg (2,731 specimens) in the spring and only 251.9 kg (52 specimens) in the fall. Most of the fish were taken in SA 5. Sizes ranged from 19 to 114 cm in the spring, and from 33 to 105 cm in the fall.

Silver hake (Merluccius bilinearis M.)

A total of 1,103.8 kg (19,242 specimens) was taken in the spring compared to 3,072.4 kg (19,415 specimens) in the fall. Additional information on the species will be published in a special paper after completion of final age determinations from 405 otoliths.

Squid (Illex illecebrosus and Loligo pealei)

Catches of squid were quite different during the two cruises: in the spring only 261.0 kg (8,208 specimens) were taken; in the fall 11,436.7 kg (55,260 specimens) were taken.

Hydrography

A brief view on the hydrographic situation both in spring and fall 1979 is shown in Figures 5-16. A more detailed description of the conditions (i.e., density, salinity, and temperature) will be presented in a special NAFO paper to be published in the near future.

DISCUSSION

The herring catches varied considerably between the two cruises. Whereas, 12,600 herring were collected in 125 hauls in the spring, only 32 specimens were collected from 93 hauls in the fall in almost the same area of investigation. Catches in previous years during fall months were of the same low level (Azarovitz, Dornheim, and Wegner 1979; Dornheim and Azarovitz 1978), evidently due to extremely depleted stocks. However, larger catches by the R/V "Anton Dohrn" in the spring of 1979 indicated improved stocks, but extremely low catches in the fall present contrary results. There is evidence, however, that a substantial part of the herring biomass could have been in an area in which the R/V "Anton Dohrn" did not fish; this specific area (Northeast Peak of Georges Bank) historically has been regarded as a "well-known" spawning site. During the later half of October large number of herring schools were observed on the Northeast Peak by the Aerial Fisheries Survey System. In addition, some commercial herring catches were made in these waters by commercial vessels (personal communication, W. Rathjen, National Marine Fisheries Service, Gloucester, Massachusetts). The status of the herring stocks may not be as depleted as indicated by the catches obtained by the R/V "Anton Dohrn". There may be an indication that the herring stocks have improved in numbers during the past few years.

A comparison of catches between the fall and spring and for different years, suggests that in the fall of 1979 the entire fauna had shifted to some extent, as indicated by substantial catches of butterfish (Poronotus triancanthus--an average of 34.7 kg per 30-minute tow), bluefish (Pomatomus saltatrix--an average

of 10.7 kg per 30-minute tow), and squid (an average of 123 kg per 30-minute tow) in all tows.

The status of the mackerel stocks, as indicated by the catches of the R/V "Anton Dohrn", has not changed considerably either in spring or autumn, or from former years. Though water temperatures were comparably higher, especially in fall 1979, in contrast to former years, no larger quantities of mackerel were detected or caught as might have been expected. In addition, comparably large catches of squid during the fall cruise indicate the presence of warm water masses in the area of investigation.

As mentioned above, more detailed information of the gadoid catches, especially haddock and silver hake, will be presented in a special publication later this year. In contrast to former years, however, an abundance of one-year-old haddock were detected in the catches, especially during the spring cruise.

REFERENCES

AZAROVITZ, T. R., H. DORNHEIM, and G. WEGNER. 1979. Results of the joint FRG-US bottom trawl survey, R/V "Anton Dohrn", 1-28 October 1978, in ICNAF Subareas 4 and 5, ICNAF Res. Doc. 79/VI/83.

DORNHEIM, H., and T. R. AZAROVITZ. 1978. Results of the joint FRG-US bottom trawl survey R/V "Anton Dohrn" 11-28 October 1977 in ICNAF subareas 4 and 5. ICNAF Res. Doc. 78/VI/69.

Table 1. Catches of selected species on R/V "Anton Dohrn", February 10 to March 10, 1979, in different NAFO divisions.

Species	Division 5 Z Total catch Kg	5 Z Total catch No.	5 Z Total samples Length	5 Z Total samples Age	5 Y Total catch Kg	5 Y Total catch No.	5 Y Total samples Length	5 Y Total samples Age	6 A Total catch Kg	6 A Total catch No.	6 A Total samples Length	6 A Total samples Age
Atlantic herring	377.1	2680	2118	756	877.5	4982	1311	300	608.9	4934	2127	200
Atlantic mackerel	355.0	5997	558	-	-	-	-	-	0.5	6	6	-
Atlantic cod	2318.6	610	610	587	1138.0	391	391	256	81.0	8	8	5
Haddock	5661.6	24284	5661	1049	166.4	76	76	72	-	-	-	-
Pollock	1361.6	525	358	-	1290.0	2201	300	-	54.3	5	5	-
Silver hake	554.8	16872	2091	-	24.8	1159	155	-	524.2	1211	284	-
Illex squid	32.8	576	-	-	-	-	-		-	-	-	
Loligo squid	228.2	7632	-		-	-	-		-	-	-	

Table 2. Catches of selected species on R/V "Anton Dohrn", September 27 to October 19, 1979, in different NAFO divisions

Species	Division 5 Z Total catch Kg	5 Z Total catch No.	5 Z Total samples Length	5 Z Total samples Age	5 Y Total catch Kg	5 Y Total catch No.	5 Y Total samples Length	5 Y Total samples Age	6A Total catch Kg	6A Total catch No.	6A Total samples Length	6A Total samples Age
Atlantic herring	7.0	25	25	-	1.8	7	7	-	-	-	-	-
Atlantic mackerel	267.0	772	772	-	3.6	7	7	-	10.2	20	20	-
Atlantic cod	1311.9	998	822	442	284.3	78	78	75	-	-	-	-
Haddock	1782.6	4303	2813	660	214.0	259	259	149	-	-	-	-
Pollock	219.4	44	44	-	32.5	8	8	-	-	-	-	-
Silver hake	2764.2	17150	4156	288	191.5	1595	1173	117	116.7	670	670	-
Illex	7492.8	23070	-		1550.0	5409	-		124.6	430	-	
Loligo	498.3	21561	-		-	-	-		1771.0	4790	-	

Table 3. Mean lengths of R/V "Anton Dohrn" herring catches, February-March 1979. in Divisions 5Y, 5Z, and 6A.

	5Z		5Y		6A
	February	March	February	March	March
Mean length (cm):	26.50	24.96	25.17	28.91	25.31
Sample. variance:	7.223	12.403	9.264	9.391	5.561
Sample size:	1478	640	593	718	2127

Table 4. Percent age composition of R/V "Anton Dohrn" herring catches, February-March 1979, in Divisions 5Y, 5Z, and 6A.

		5Z		5Y		6A
Year	Age	February	March	February	March	March
1978	1	-	-	-	-	-
1977	2	0.3	3.4	-	-	-
1976	3	44.1	57.7	49.0	21.0	73.5
1975	4	44.9	30.2	37.0	38.0	22.5
1974	5	5.1	2.8	4.5	19.0	1.5
1973	6	4.8	5.6	5.5	18.0	2.5
1972	7	-	-	2.0	1.0	-
1971	8	-	-	-	1.0	-
1970	9	8.0	3.0	2.0	2.0	-
1970	9	-	-	-	-	-
Specimens:		392	357	200	100	200

Table 5. Percent maturity stage composition of R/V "Anton Dohrn" herring catches, February-March 1979, in Divisions 5Y, 5Z, and 6A.

	5Z		5Y		6A
Stage	February	March	February	March	March
1	-	2.8	-	-	-
2	76.8	76.9	73.0	49.0	86.0
3	-	-	-	-	-
4	-	-	-	-	-
5	-	-	-	-	-
6	-	-	-	-	-
7	-	-	-	-	-
8	23.2	20.3	27.0	51.0	14.0
Specimens:	397	359	200	100	200

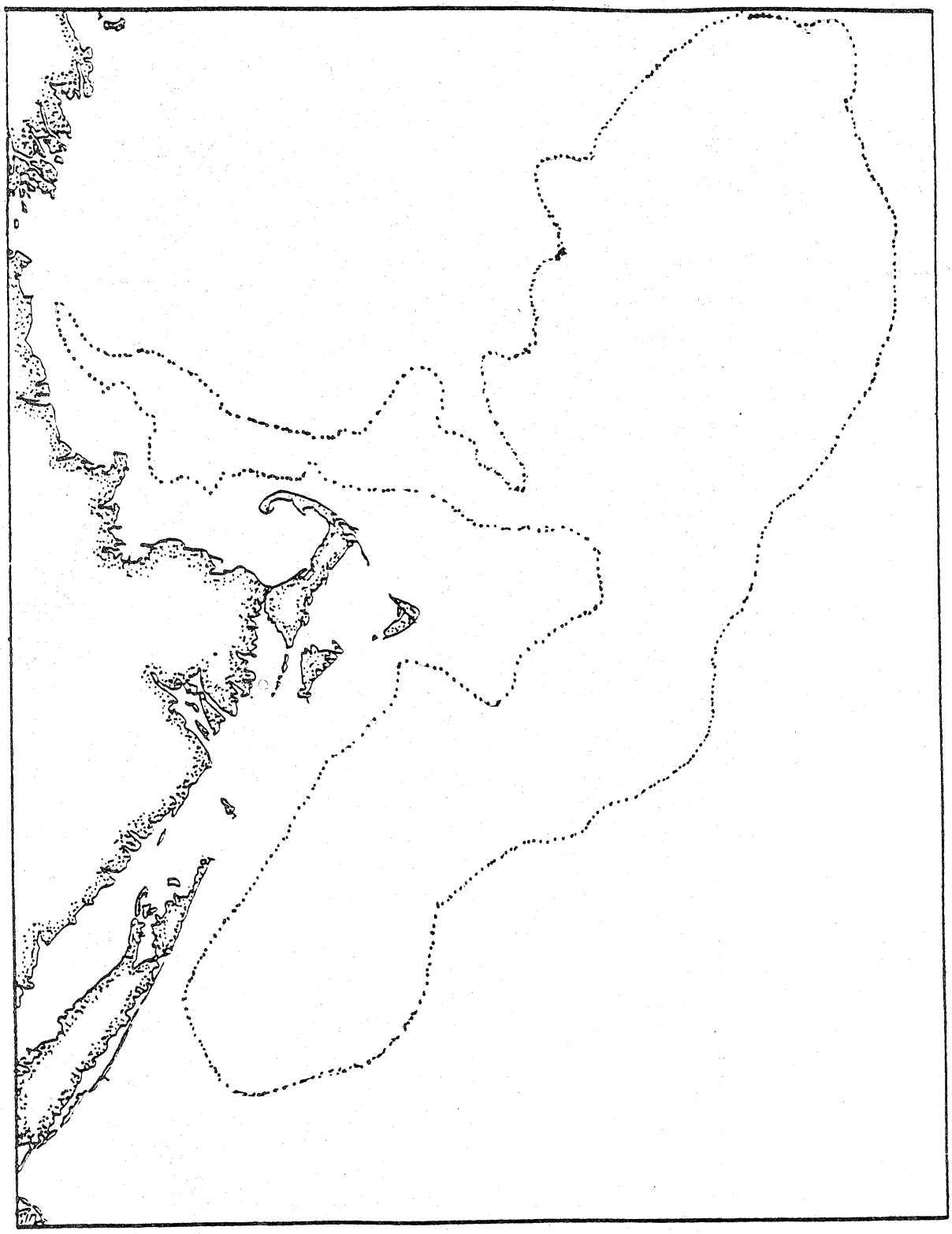

Figure 1. General area of study for R/V "Anton Dohrn" 1979 Spring and Fall Bottom Trawl Survey ICNAF subarea 5 and Statistical Area 6.

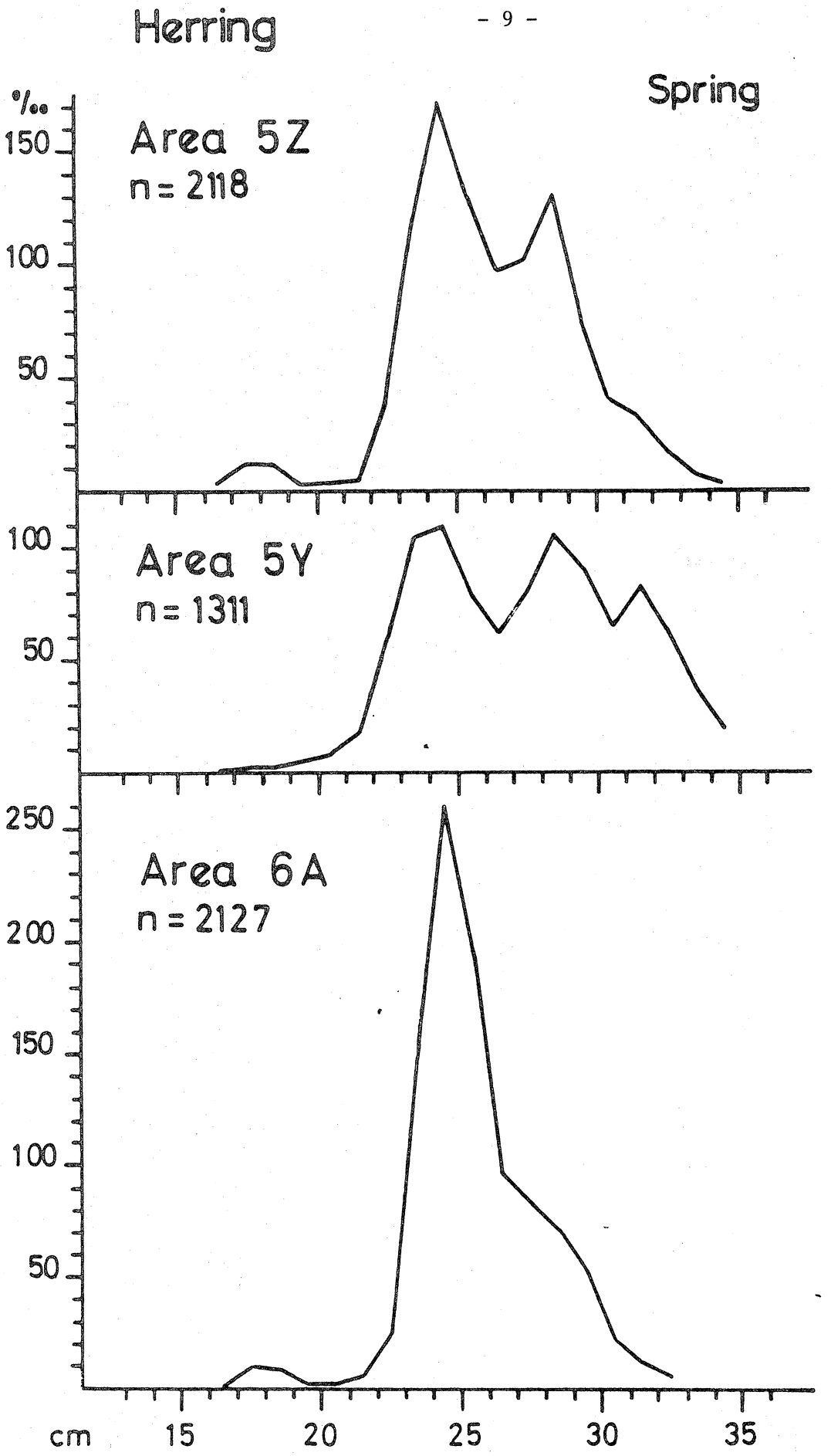

Figure 2. Length distribution of herring catches made by R/V "Anton Dohrn" in SA 5 and 6, spring 1979.

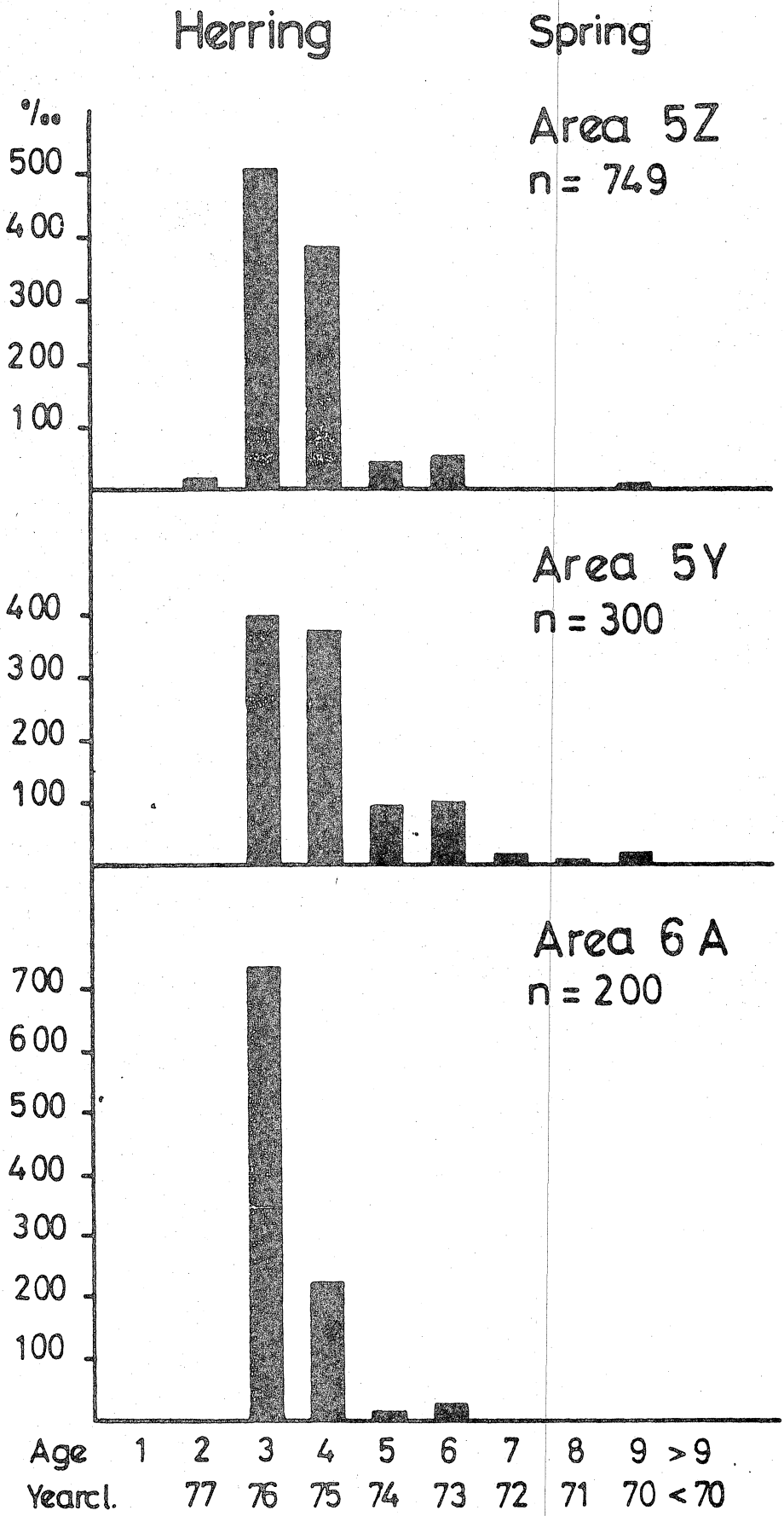

Figure 3. Age composition of herring catches made by R/V "Anton Dohrn" in SA 5 and 6, spring 1979.

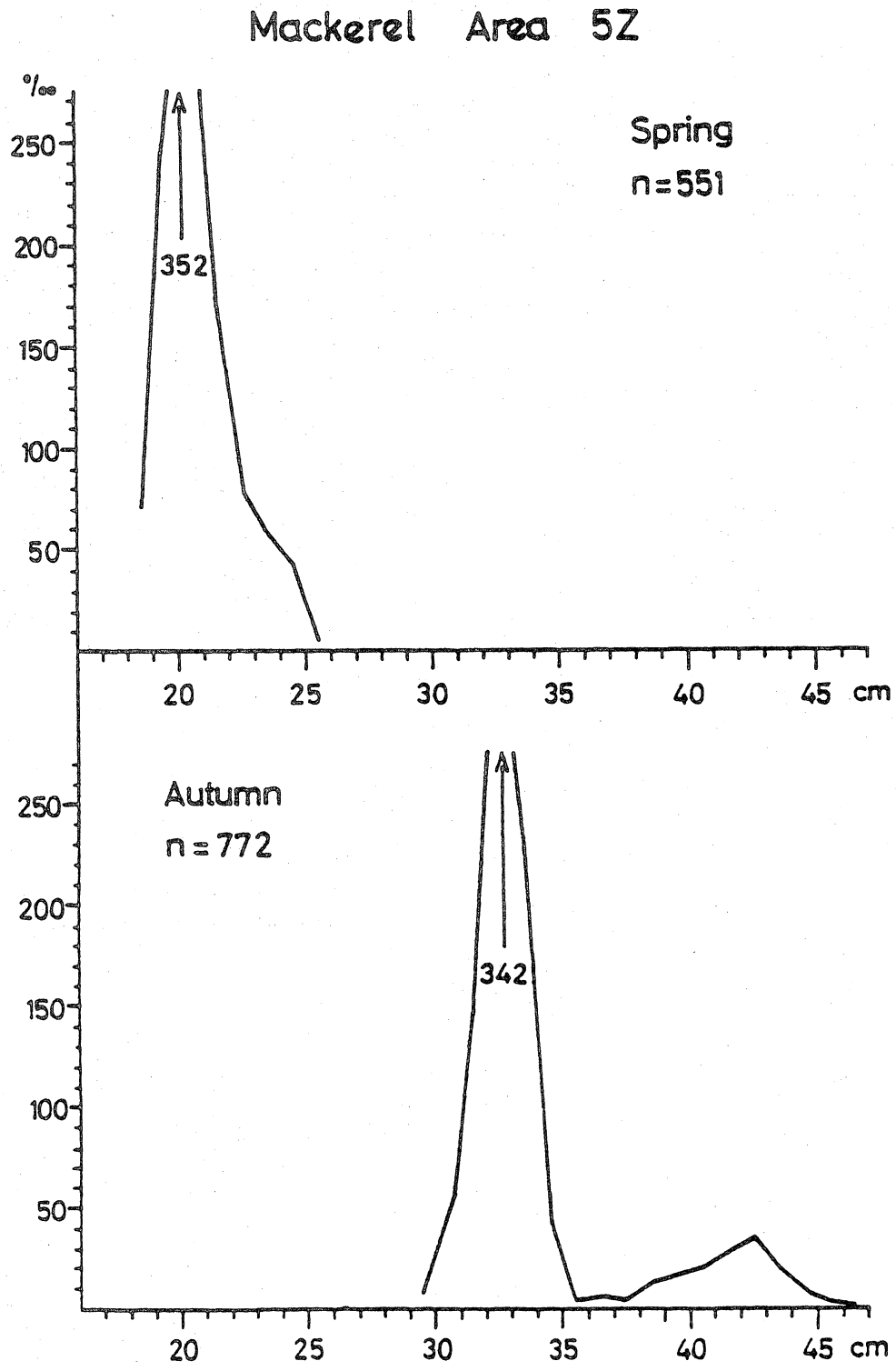

Figure 4. Length distribution of mackerel catches made by R/V "Anton Dohrn" in SA 5, spring 1979.

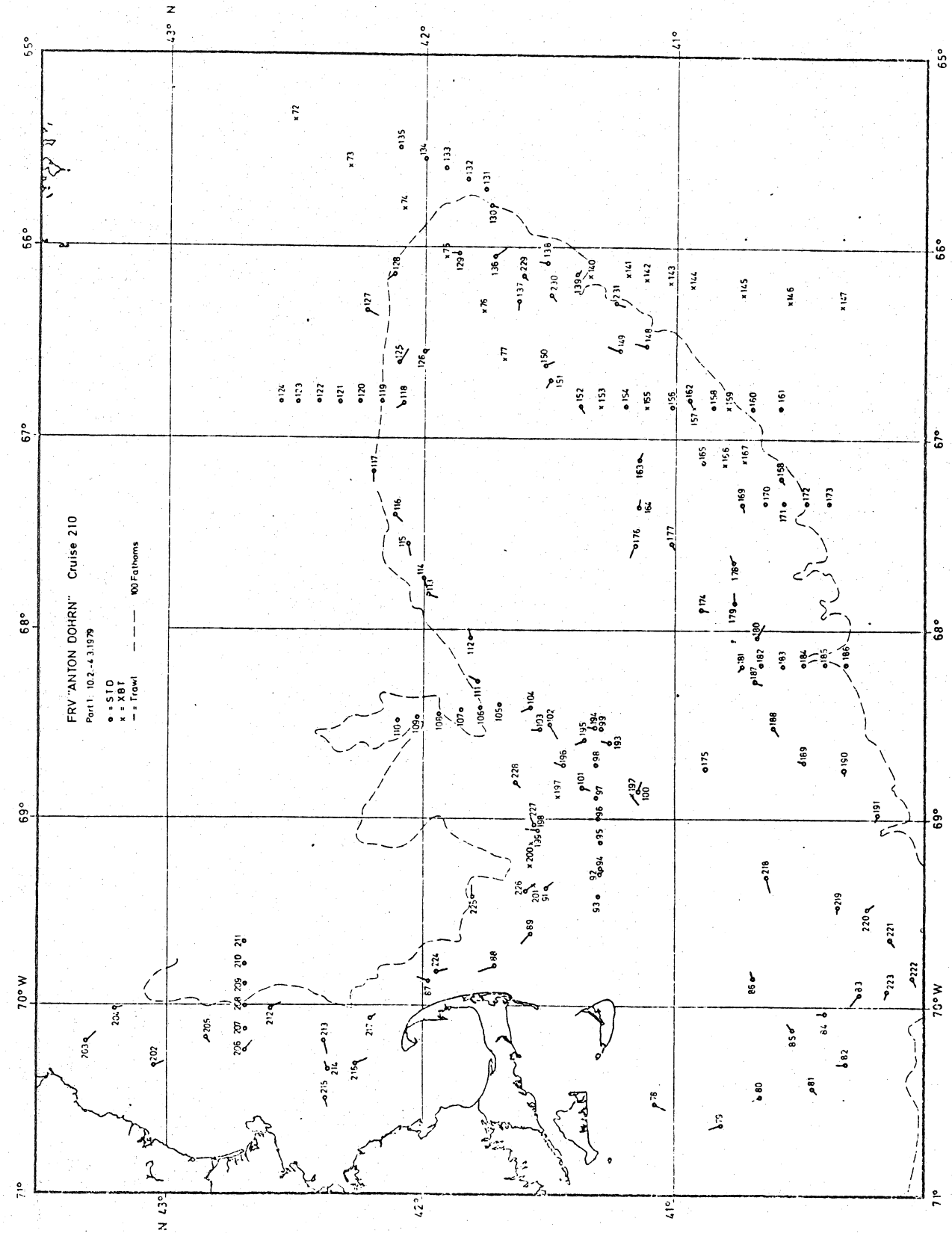

Figure 5. Maps of stations of R/V "Anton Dohrn" Cruise No. 210, Part I, February 10-March 4, 1979.

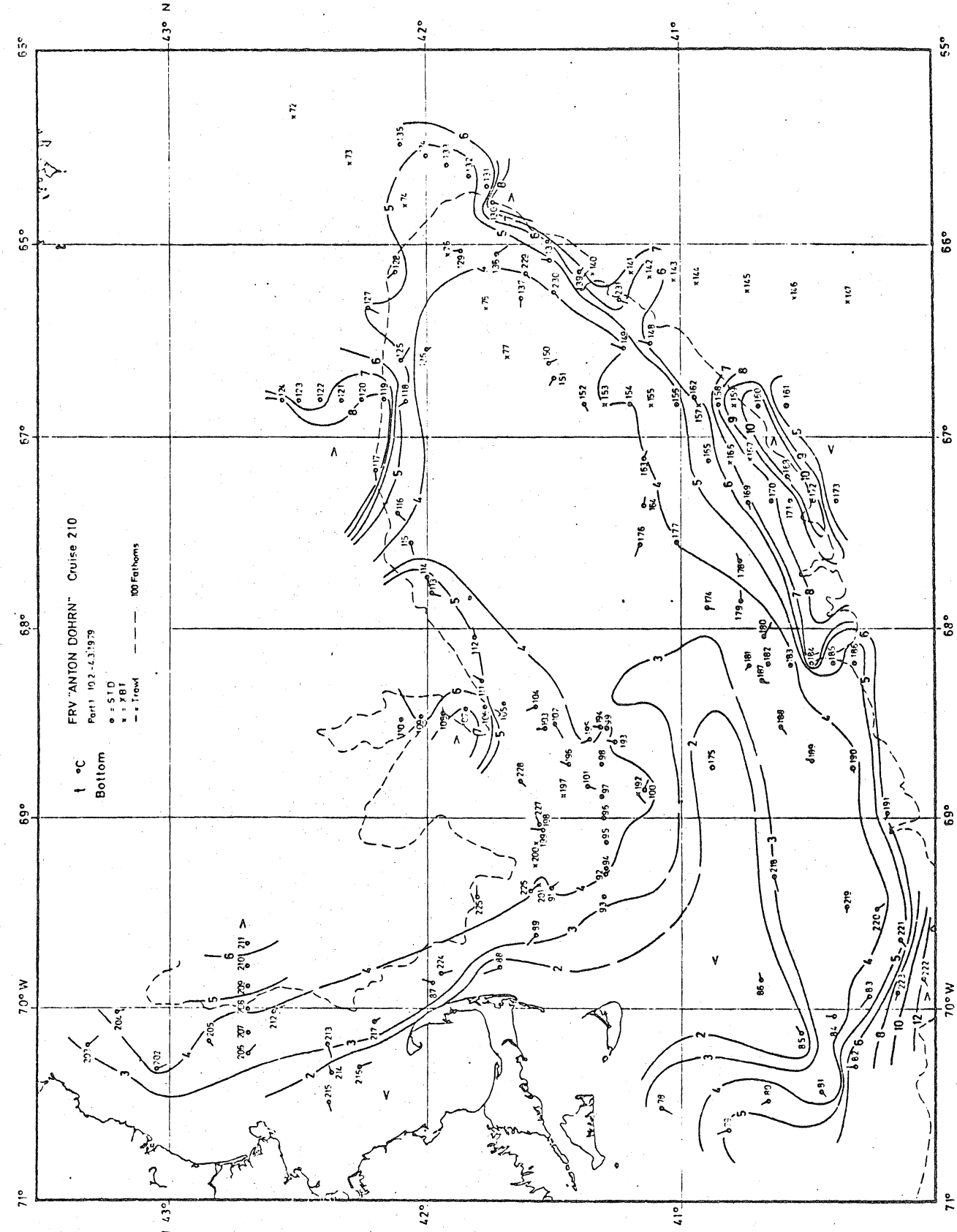

Figure 6. Bottom temperature on R/V "Anton Dohrn" Cruise No. 210, Part 1, February 10-March 4, 1979.

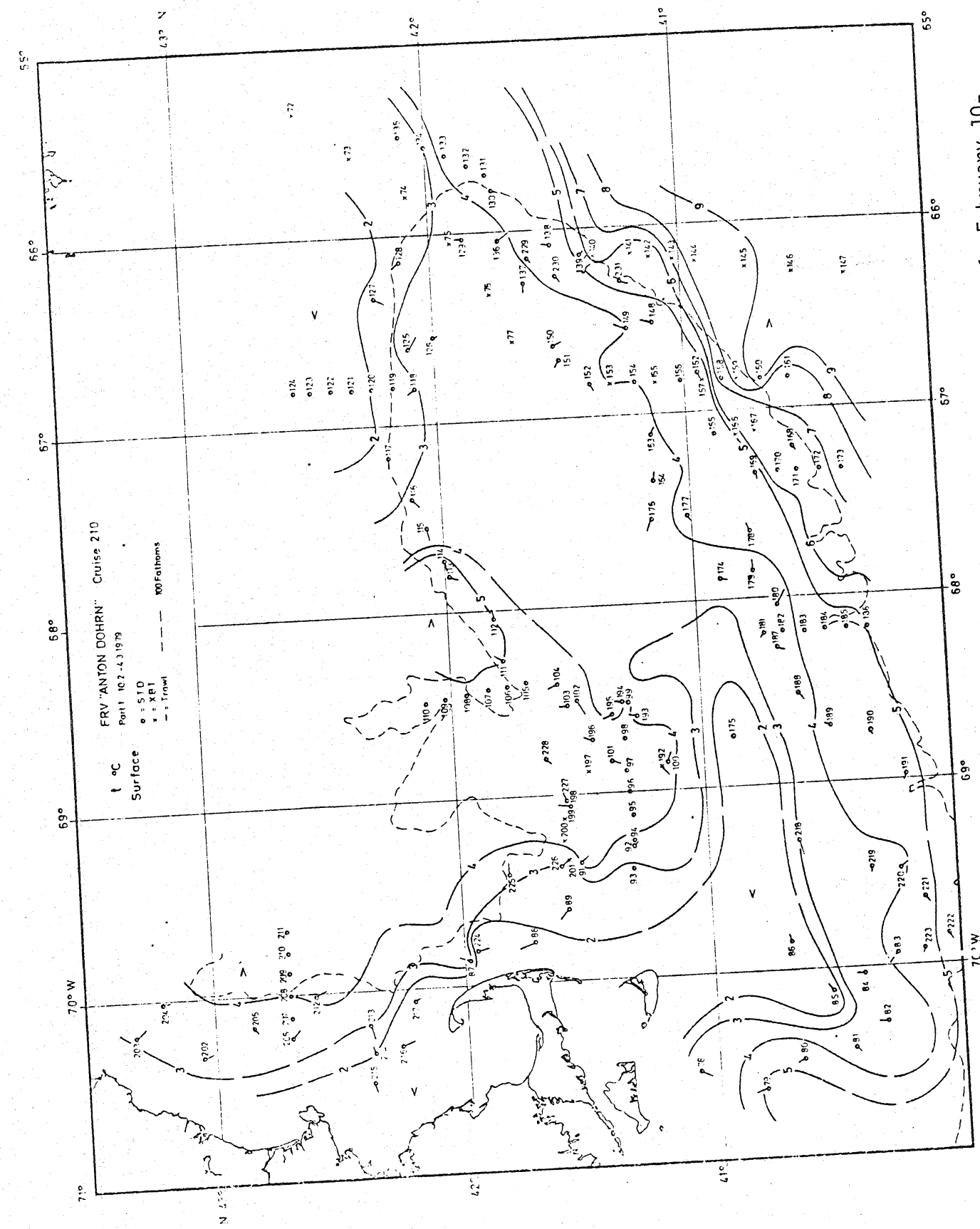

Figure 7. Surface temperatures on R/V "Anton Dohrn" Cruise No. 210, Part 1, February 10-March 4, 1979

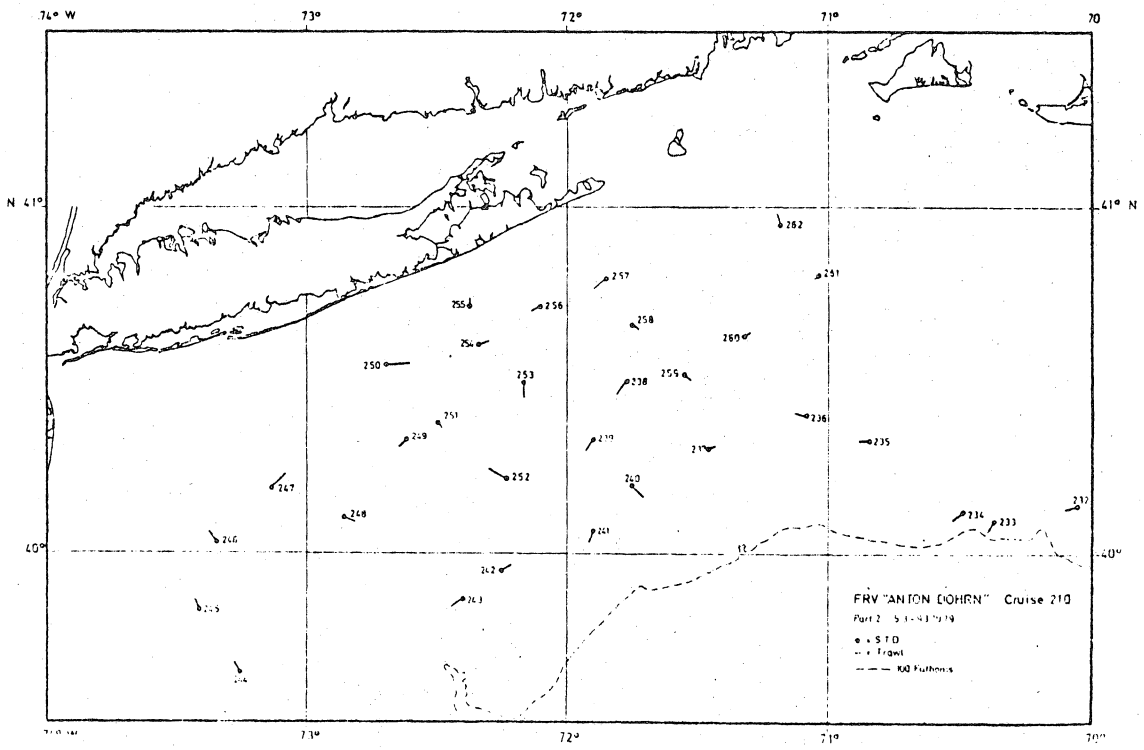

Figure 8. Map of stations of R/V "Anton Dohrn" Cruise 210, Part 2, March 5-9, 1979.

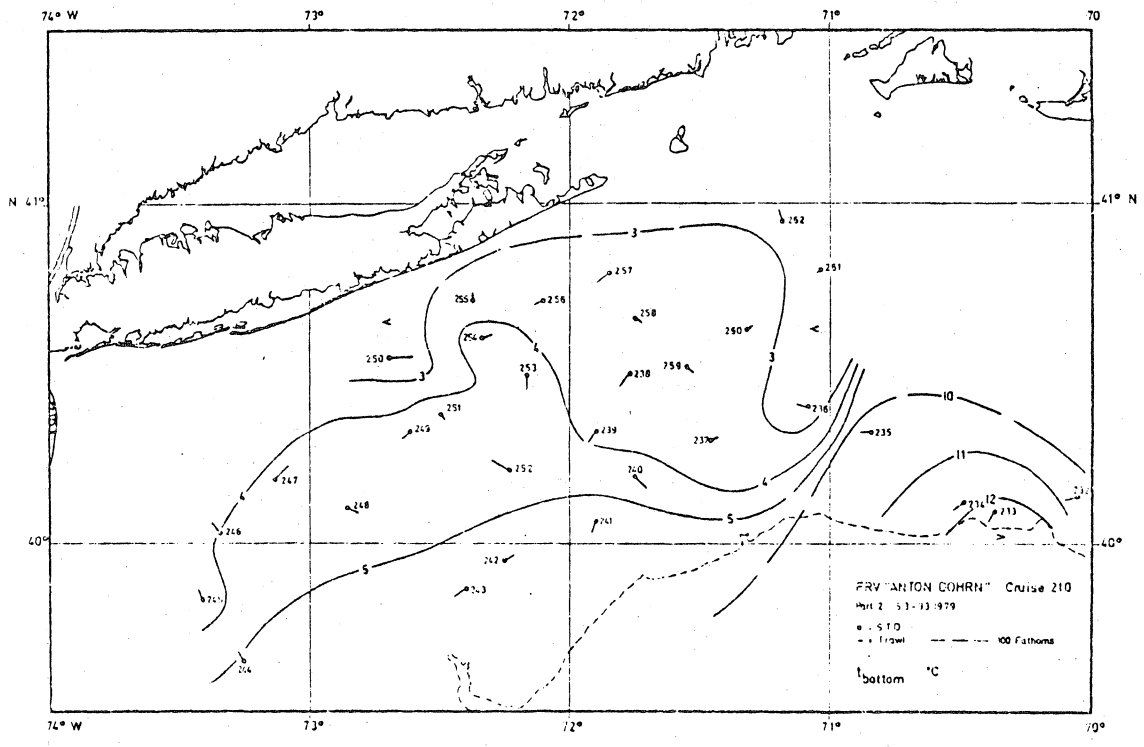

Figure 9. Bottom temperatures on R/V "Anton Dohrn" Cruise No 210, Part 2, March 5-9, 1979.

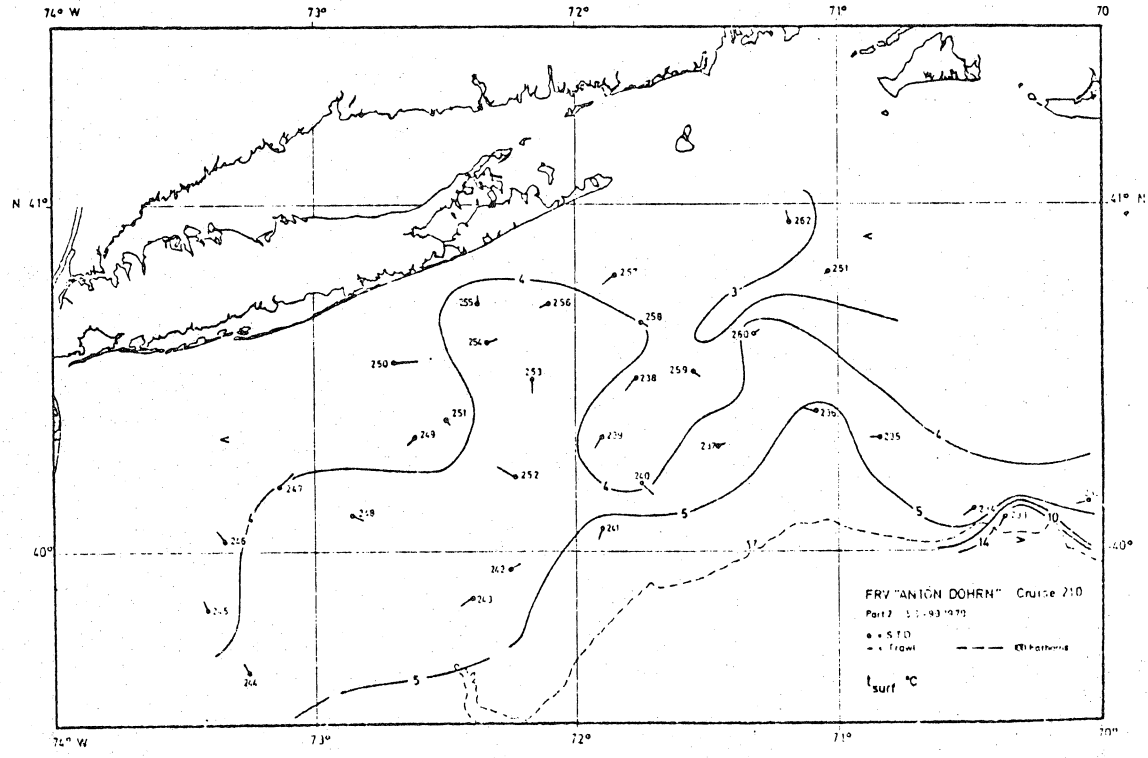

Figure 10. Surface temperatures on R/V "Anton Dohrn" Cruise No. 210, Part 2, March 5-9, 1979.

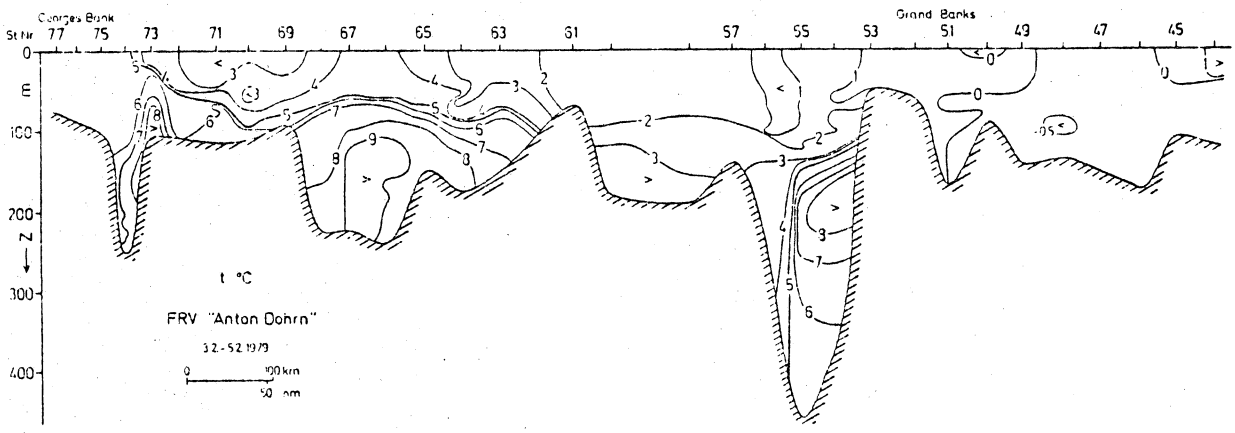

Figure 11. Temperature profile from Georges Bank to Grand Banks taken on R/V "Anton Dohrn" during February 3-5, 1979.

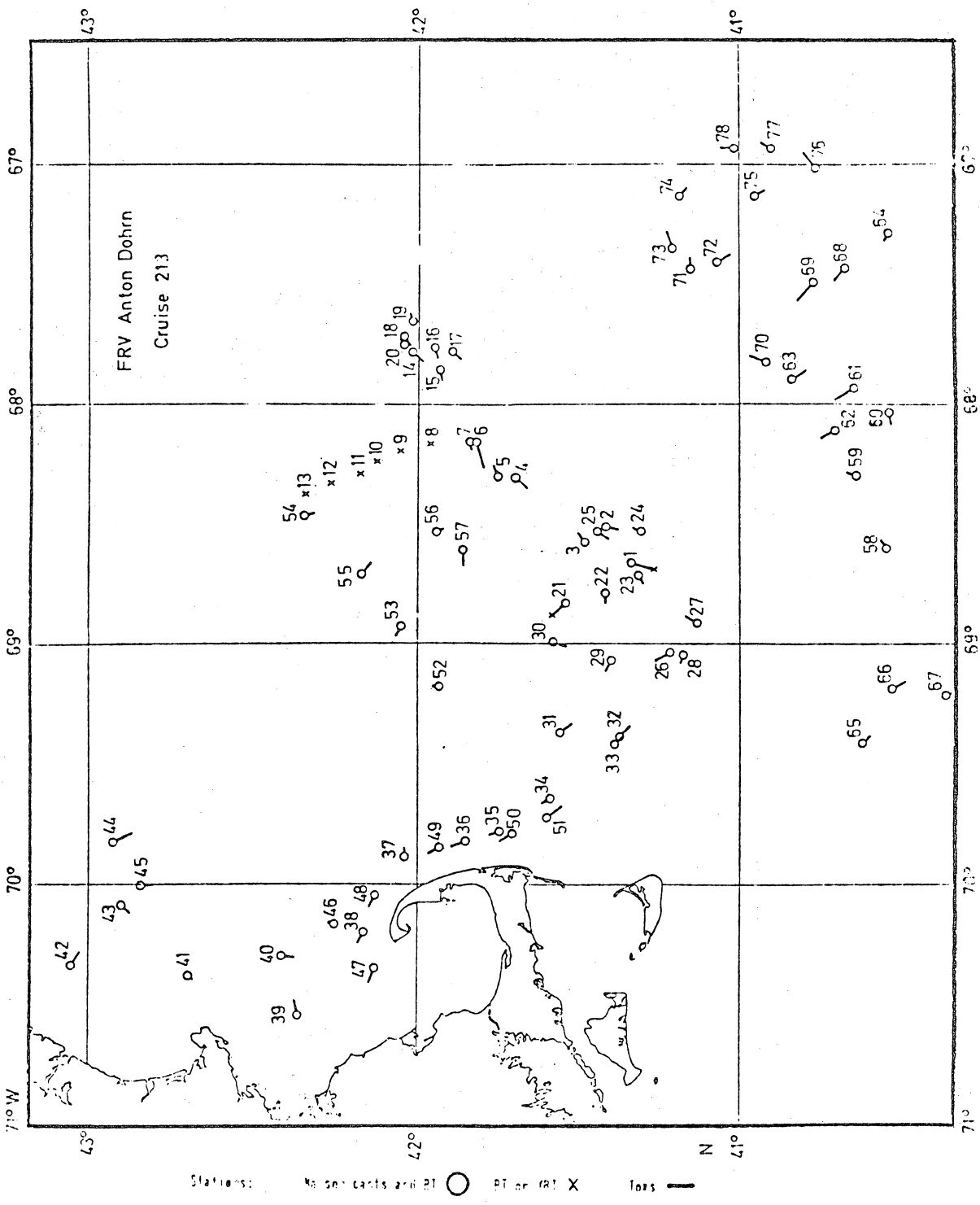

Figure 12. Map of stations of R/V "Anton Dohrn" Cruise No. 213, September 28-October 13, 1979.

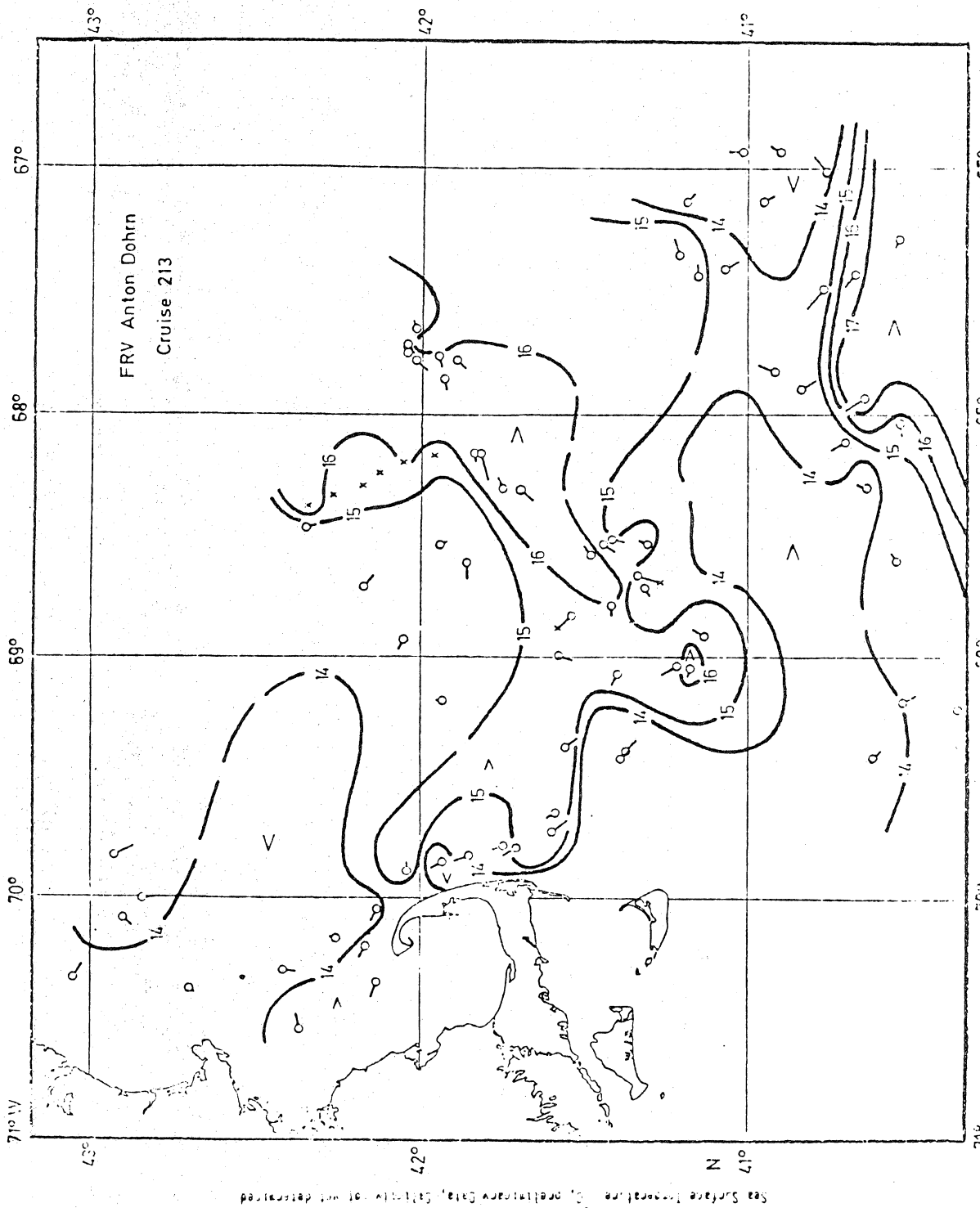

Figure 13. Surface temperatures on R/V "Anton Dohrn" Cruise No. 213, September 28-October 13, 1979.

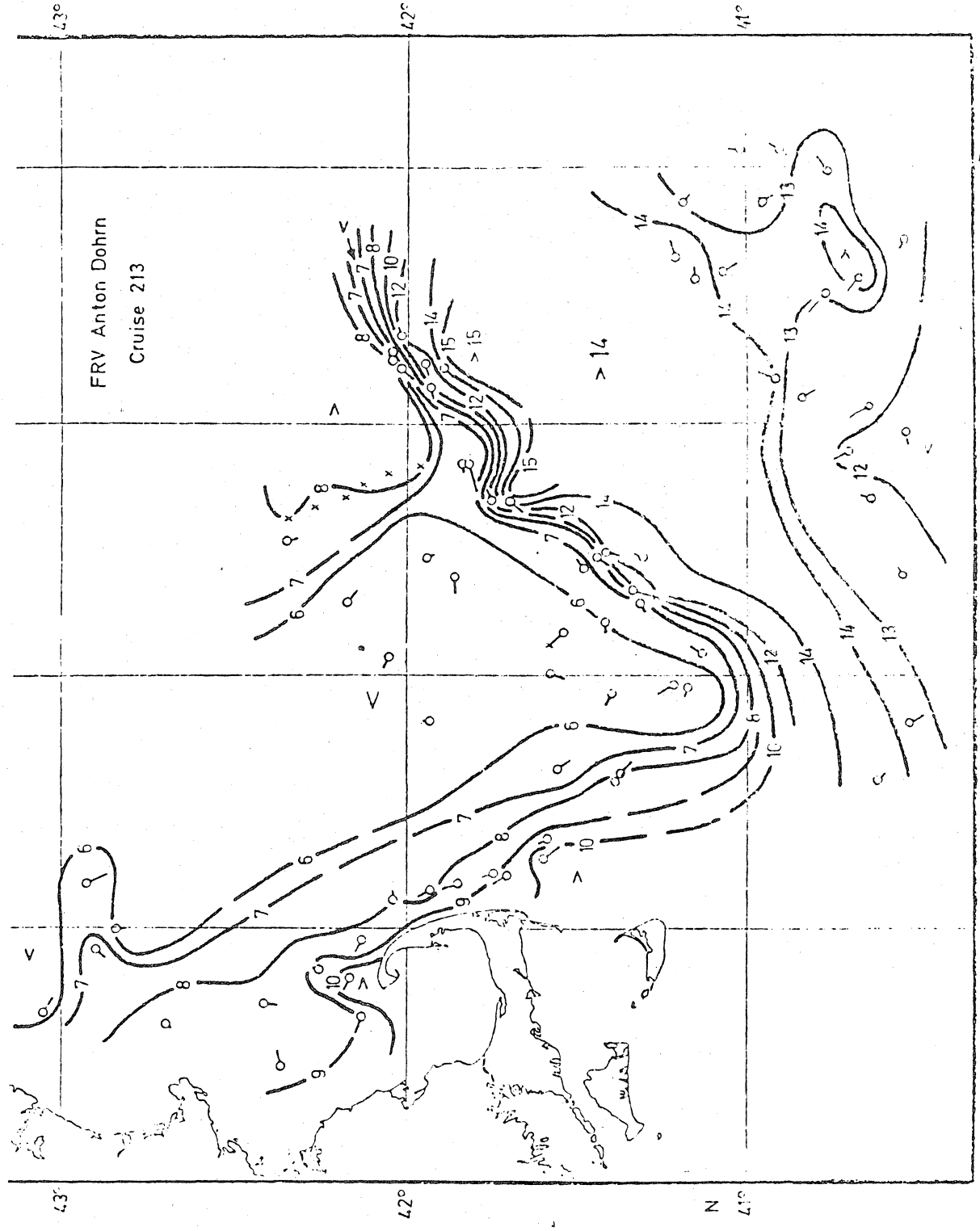

Figure 14. Bottom temperatures on R/V "Anton Dohrn" Cruise No. 213, September 28-October 13, 1979.

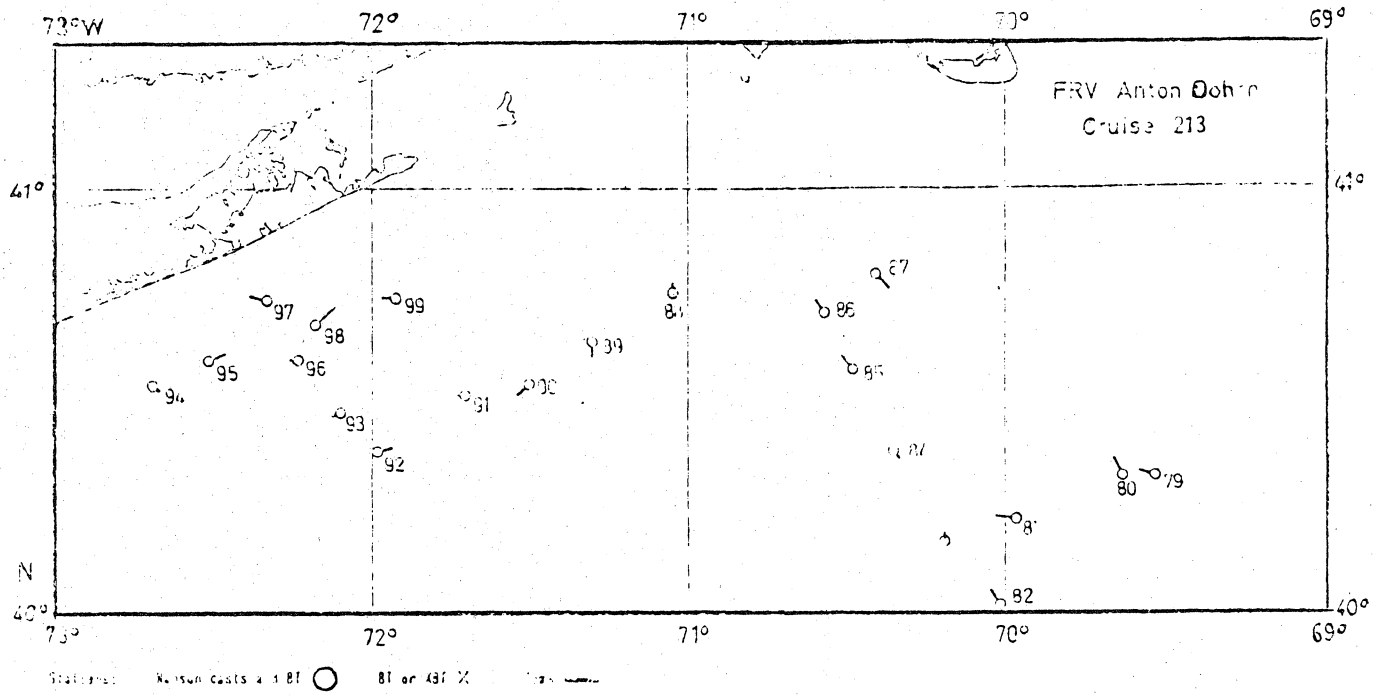

Figure 15. Map of stations of R/V "Anton Dohrn" Cruise No. 213, October 14-17, 1979.

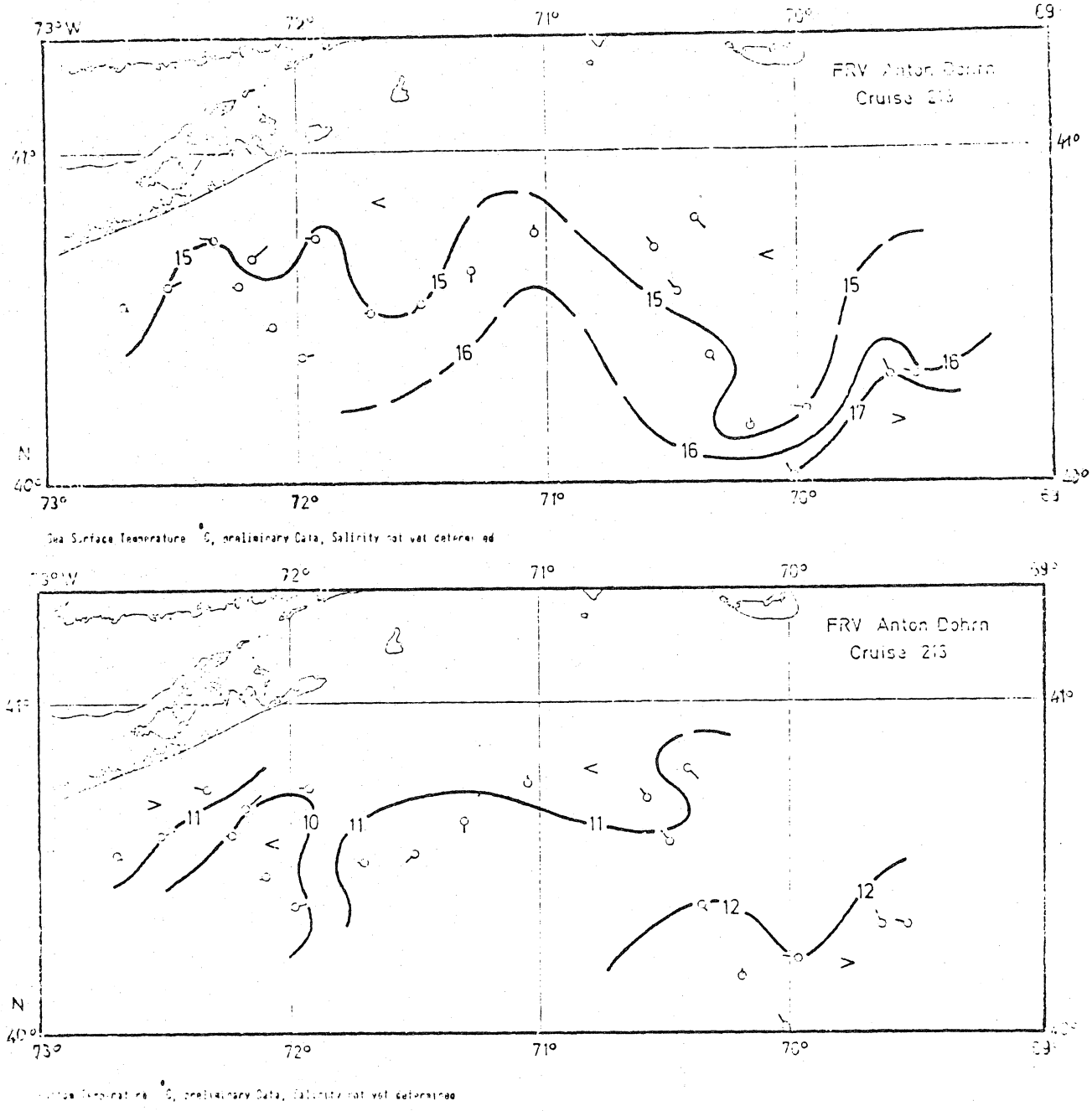

Figure 16. Surface and bottom temperatures on R/V "Anton Dohrn" Cruise No. 213, October 14-17, 1979.