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GDR results of the juvenile herring surveys in ICNAF
Div. 4X, 5Y, 5Z and Statistical Area 6A in the
spring of 1975, 1976 and 1977
(herring and mackerel)

by

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Introduction

GDR took part in the Juvenile Herring Survey with R/V "Ernst Haeckel" in 1975 (Febr. 26-March 17) and 1976 (March 2-March 18) and with ROS 224 "Görlitz" in 1977 (March 3-April 7).

In the period from 26 February to 10 March 1975 the investigations were done according to an own programme.

ROS 224 "Görlitz" was chartered from the VEB Fischkombinat Rostock for the investigations in 1977.

Methods and mode of work

During survey 1975 66 fishing stations (Fig. 1) were worked. All stations were fished with the herring bottom trawl HG 692. T-S measurements at each fishing station and two additional hydrographic stations were done. In 1976 46 fishing stations (HG 692 and HG 490) and 25 planktonstations all, except of 4, with T-S measurements were worked (Fig. 2). Besides T-S measurements only were taken on three additional stations.

In 1977 110 fishing stations (HG 600) and 109 planktonstations were worked (107 stations with temperature measurements, Fig. 3). Golf of Maine stations were fished with rollers because of rough bottom.

All plankton samples (1976 and 1977) were given to the NEFC, Woods Hole.

For temperature and salinity measurements Nansen bottles were used. Surface and bottom water temperature and salinity isograms are plotted in Figures 10-19.

Normally 30-minute tows were made except for stations of own programme in 1975 (1-hour-tows).

The numbers caught per 1-hour-tow during own programme in 1975 were divided by 2 to convert them into 30-minutes tow numbers. Then they were used to calculate stratified mean numbers and weights per tow.

The stratified mean number or weight per tow was calculated in the following way (Grosslein 1971):

$$1. \quad \bar{Y}_j = \frac{\sum_{i=1}^n \log_e (C_{ij} + 1)}{n}$$

\bar{Y}_j ... Mean value per stratum
C Catch in number or weight per tow
n Number tows per stratum

$$2. \quad \bar{Y}_{st} = \frac{\sum_{j=a}^k A_j \cdot \bar{Y}_j}{\sum_{j=a}^k A_j}$$

A Area of a stratum
a-k Indexes of fished strata
 \bar{Y}_{st} ... Stratified mean number or weight per tow

Usually all fish and most invertebrate species were measured in length and weight.

Herring were measured to cm below total length in 1975 and to half cm below total length in 1976 and 1977 (then measurements were grouped to cm below) and mackerel to cm below fork length. For aging otoliths were taken.

Results

Herring

The numbers of herring caught and the mean lengths are shown in Table 1. The relative high total catch in 1977 originated only on one tow with a catch of 4960 specimens, in the remaining 109 tows the herring catch amounted only to 340 specimens.

A review over the catch distributions is given in Figures 4-6. The largest herring catches (> 1,000/tow) were done within a range of bottom water temperatures from 4,9 to 5,2 °C in 1975 and at 1,2 °C in 1977 (1976 - no catches over 1,000 specimens per tow). The total ranges in which herring was caught were 3,4-9,8 °C in 1975, 4,0-8,4 °C in 1976 and 1,2-7,2 °C in 1977.

In length distribution the subsequent length groups were predominant:

1975	10-12 cm (4X) and 28-30 cm
1976	22-25 cm and 30-31 cm
1977	26-28 cm

In 1975 the 70, in 1976 the 73 and 70 and in 1977 the 73 year classes were predominant in the catches.

A review over the ascertained mean weights per length group gives the Tables 12-14.

The values for the stratified mean weight (all AGs) per tow for strata 1-25 were only 40 % in 1976 resp. 14 % in 1977 of that of 1975 (Table 16). This continuous decrease was characteristic for the trend in the stock development.

The stratified mean number per tow for AG 3 compared with 1975 value were 113 % in 1976 (year class 1973) and 27 % in 1977. The catch of juvenile herring (AG 2) was very low in all three years (Table 2). An estimation of the stock size of AG 2 herring is not possible on the basis of the low catch data.

Mackerel

In the division 4X, 5Y and Stat. Area 6 A no mackerel were caught in all three years.

The caught numbers of mackerel in Division 5 Z and the mean lengths are shown in Table 1. The great number of mackerel caught in 1976 bases on one tow with 32.390 specimens at the south east slope of Georges Bank. The Figures 7-9 show the catch distributions of mackerel.

The largest mackerel catches (> 1,000/tow) were done within a range of bottom water temperature from 5,0-6,2 °C in 1975 and from 6,5-8,4 °C in 1976 (1977 - no catches over 1,000 specimens per tow). The total ranges in which mackerel was caught were 4,3-10,5 °C in 1975, 5,1-12,6 °C in 1976 and 5,4-11,2 °C in 1977.

Subsequent length groups were predominant:

1975	16-17 cm and 24-26 cm
1976	16-20 cm
1977	25-27 cm

In 1975 the year class 1973 and in both subsequent years the year class 1975 were predominant (Tables 9-11).

A review over the ascertained mean weights gives Table 15, The computed stratified mean number (AG 1+AG 2) and weight (all AGs) per tow for strata 1-25 declined from year to year (Table 17).

Summary

- In spring 1975, 1976 and 1977 GDR took part with R/V "Ernst Haeckel" and RCS 224 "Görlitz" in the Juvenile Herring Surveys and worked in the ICNAF-divisions 4X, 5Y, 5Z and Stat. Area 6 A.
- The catch of juvenile herring was very low. The stratified mean number (AG2 + AG 3) and weight (all AGs) per tow for herring declined since 1975. An exception represent the AG 2 and AG3 in 1976 where herring of AG 2 was not caught and the AG3 was

caught in relative abundance. The year classes 1970 and 1973 were predominant.

- The stratified mean number (AG 1 + AG 2) and weight(all AGs) per tow for mackerel declined from year to year. In 1977 juvenile mackerel was not caught. In age distribution the year-class 1973 in 1975 and the year class 1975 in both subsequent years were predominant.

Literature cited

- Grosslein, M.D. 1971 Some Observations on Accuracy of Abundance
Indices Derived from Research Vessel Surveys
Int. Comm. Northw. Atlant. Fish., Res. Doc.
71/59 27 pp.

Table 1 Number of stations, catches and mean lengths of herring and mackerel by GDR from the Juvenile Herring Surveys in 1975, 1976 and 1977

Year	Division	No. of stations	Catch (No.)	Herring		Mackerel	
				mean length (L _t , cm)	Catch (No.)	mean length (L _f , cm)	Catch (No.)
1975	4 X	1	1226	11,60	-	-	-
	5 Y	8	49	-	-	-	-
	5 Z	57	4763	29,48	23020	22,87	-
1976	4 X	3	77	24,21	-	-	-
	5 Y	7	700	28,40	-	-	-
	5 Z	36	517	25,77	37448	18,94	-
1977	4 X	1	-	-	-	-	-
	5 Y	13	3	-	-	-	-
	5 Z	93	5275	27,50	183	27,46	-
	6 A	3	22	-	-	-	-

Table 2: Catches of juvenile herring (AG 2, number) and mackerel (AG 1, number) by GDR from Juvenile Herring Surveys in 1975, 1976 and 1977

species	year	Division			
		4 X	5 Y	5 Z	6 A
herring	1975	1226	-	2	no fishery
	1976	1	2	-	no fishery
	1977	-	2	1	-
mackerel	1975	-	-	7795	no fishery
	1976	-	-	35575	no fishery
	1977	-	-	-	-

Table 3: The 1975 herring age-length key by GDR from the Juvenile Herring Survey in Division 4 X

L_t (cm)	<u>Year class</u>		length composition (%)
	1973	aged	
9	-	-	7
10	4	4	200
11	32	32	543
12	13	13	190
13	1	1	40
14	-	-	13
15	-	-	7
Totals	50	50	1000

Number of age samples : 1
Number of length samples : 1
Number of fish measured : 300

Table 4: The 1975 herring age-length key by GDR from the Juvenile Herring Survey in Division 5 Z

L _t (cm)	<u>Year class</u>						aged	length composition (%)
	1972	1971	1970	1969	1968	1967		
13	-	-	-	-	-	-	-	+
20	-	-	-	-	-	-	-	+
21	-	-	-	-	-	-	-	1
22	2	-	-	-	-	-	2	3
23	7	-	-	-	-	-	7	7
24	11	-	-	-	-	-	11	15
25	9	3	-	-	-	-	12	15
26	4	6	2	-	-	-	12	16
27	-	20	15	1	-	-	36	50
28	-	19	112	2	-	-	133	175
29	-	11	209	4	-	-	224	337
30	-	2	177	7	-	-	186	273
31	-	-	53	4	-	-	57	88
32	-	-	8	5	1	-	14	18
33	-	-	-	1	2	-	3	3
34	-	-	-	-	-	-	-	1
35	-	-	-	-	-	-	-	-
36	-	-	-	-	-	-	-	-
37	-	-	-	-	-	-	1	+
Totals	33	61	576	24	3	1	698	

Number of age samples : 7
 Number of length samples : 30
 Number of fish measured : 4734

age composition

age	2	3	4	5	6	7	8
%o	+	42	83	836	34	4	+

Table 5: The 1976 herring age-length key by GDR from the Juvenile Herring Survey in Division 4 X

L _t (cm)	Year class					aged	length composition (%)
	1974	1973	1972	1971	1970		
14	1	-	-	-	-	1	13
15	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-
17	-	-	-	-	-	-	-
18	-	1	-	-	-	1	13
19	-	-	-	-	-	-	-
20	-	2	-	-	-	2	52
21	-	5	-	-	-	5	65
22	-	9	-	-	-	9	247
23	-	6	1	-	-	7	117
24	-	7	-	-	-	7	156
25	-	2	-	-	-	2	39
26	-	1	1	-	-	2	26
27	-	-	1	-	-	1	13
28	-	-	-	-	-	-	13
29	-	-	3	-	-	3	78
30	-	-	-	-	2	2	52
31	-	-	-	-	4	4	65
32	-	-	-	-	4	4	52
Totals	1	33	6	-	10	50	1001

Number of age samples : 1
 Number of length samples: 1
 Number of fish measured : 77

age composition

age	2	3	4	5	6
%o	13	688	130	-	169

Table 6: The 1976 herring age-length key by GDR from the Juvenile Herring Survey in Division 5 Y

L _t (cm)	<u>Year class</u>							aged	length composi- tion (%)
	1973	1972	1971	1970	1969	1968	1966		
14	-	-	-	-	-	-	-	-	2
19	-	-	-	-	-	-	-	-	1
20	1	-	-	-	-	-	-	1	1
21	2	-	-	-	-	-	-	2	14
22	8	-	-	-	-	-	-	8	49
23	17	-	-	-	-	-	-	17	65
24	26	1	-	-	-	-	-	27	109
25	25	2	-	-	-	-	-	27	110
26	5	3	-	-	-	-	-	8	30
27	4	4	-	-	-	-	-	8	39
28	-	4	2	-	-	-	-	6	27
29	-	2	5	-	-	-	-	7	56
30	-	1	6	12	-	-	-	19	157
31	-	-	4	30	-	-	-	34	215
32	-	-	1	20	2	-	-	23	94
33	-	-	1	1	-	1	-	3	17
34	-	-	-	-	1	-	-	1	10
35	-	-	-	-	1	-	1	2	3
totals	88	17	19	63	4	1	1	193	999

Number of age samples : 4
 Number of length samples: 4
 Number of fish measured :700

age composition

age	2	3	4	5	6	7	8	9	10
%	3	376	84	131	389	13	3	-	1

Table 7: The 1976 age-length key by GDR from the Juvenile Herring Survey in Division 5 Z

L _t (cm)	<u>Year class</u>							aged length composition (%)
	1973,	1972,	1971,	1970,	1969,	1968		
19	1	-	-	-	-	-	1	4
20	1	-	-	-	-	-	1	4
21	21	-	-	-	-	-	21	72
22	63	-	-	-	-	-	63	203
23	77	-	-	-	-	-	77	227
24	42	1	-	-	-	-	43	120
25	18	1	-	-	-	-	19	44
26	7	2	-	-	-	-	9	22
27	-	5	-	-	-	-	5	14
28	-	5	2	-	-	-	7	18
29	-	1	4	2	-	-	7	14
30	-	-	12	10	-	-	22	64
31	-	-	10	25	-	-	35	98
32	-	-	2	22	1	-	25	72
33	-	-	-	6	-	1	7	21
34	-	-	-	1	1	-	2	6
totals	230	15	30	66	2	1	344	1003

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 Number of age samples: 11
 Number of length samples: 16
 Number of fish measured :517

age composition

age	3	4	5	6	7	8
%	685	39	77	188	8	4

Table 8: The 1977 herring age - length key by GDR
from the Juvenile Herring Survey in Division 5 Z

L _t (cm)	<u>Year class</u>					aged length composition (%)	
	1974	1973	1972	1971	1970		
13	-	-	-	-	-	-	+
14	-	-	-	-	-	-	-
15	-	-	-	-	-	-	-
16	-	-	-	-	-	-	-
17	1	-	-	-	-	1	+
18	2	-	-	-	-	2	1
19	-	-	-	-	-	-	-
20	1	-	-	-	-	1	+
21	2	-	-	-	-	2	5
22	1	-	-	-	-	1	6
23	-	-	-	-	-	-	16
24	2	-	-	-	-	2	24
25	2	6	-	-	-	8	46
26	1	10	-	-	-	11	148
27	-	31	-	-	-	31	252
28	-	24	2	-	-	26	220
29	-	7	4	-	-	11	85
30	-	1	11	5	-	17	43
31	-	-	5	26	15	46	59
32	-	-	-	12	23	35	65
33	-	-	-	-	10	10	29
34	-	-	-	-	1	1	2
35	-	-	-	-	-	-	+
Totals	12	79	22	43	49	205	1001

Number of age samples : 5
 Number of length samples : 10
 Number of fish measured : 650

age composition:

age	2	3	4	5	6	7
%	+	68	686	84	68	93

Table 9: The 1975 mackerel age - length key by GDR from the Juvenile Herring Surveys in Division 5 Z

L _f (cm)	<u>Year class</u>									aged length composition (%)
	1974	1973	1972	1971	1970	1969	1968	1967	aged	
14	-	-	-	-	-	-	-	-	-	+
15	-	-	-	-	-	-	-	-	-	37
16	-	-	-	-	-	-	-	-	-	114
17	1	-	-	-	-	-	-	-	4	106
18	1	-	-	-	-	-	-	-	1	48
19	-	-	-	-	-	-	-	-	-	19
20	-	-	-	-	-	-	-	-	-	5
21	1	1	-	-	-	-	-	-	2	5
22	2	-	-	-	-	-	-	-	2	7
23	-	4	-	-	-	-	-	-	4	29
24	-	27	-	-	-	-	-	-	27	155
25	-	52	-	-	-	-	-	-	52	269
26	-	31	1	-	-	-	-	-	32	127
27	-	9	-	-	-	-	-	-	9	42
28	-	1	-	-	-	-	-	-	1	24
29	-	2	-	-	-	-	-	-	2	6
30	-	-	2	-	-	-	-	-	2	4
31	-	-	-	4	-	-	-	-	4	2
32	-	-	-	-	-	-	-	-	-	+
33	-	-	-	-	2	1	-	-	3	1
34	-	-	-	-	-	-	-	-	-	+
35	-	-	-	-	-	1	1	1	3	1
36	-	-	-	-	-	1	2	-	3	+
37	-	-	-	-	-	-	-	-	-	+
38	-	-	-	-	-	-	-	-	-	+
39	-	-	-	-	-	-	-	-	-	+
40	-	-	-	-	-	-	-	-	-	+
totals	5	127	3	4	2	3	3	1	148	1001

Number of age samples : 3
 Number of length samples : 36
 Number of fish measured: 3218

age composition

age	1	2	3	4	5	6	7	8	9
%	338	650	8	2	+	1	1	+	+

Table 10: The 1976 mackerel age - length key by GDR from the Juvenile Herring Survey in Division 5 Z

L _F (cm)	<u>Year class</u>								aged length composition (%)	
	1975	1974	1973	1972	1971	1970	1969	1968		
14	1	-	-	-	-	-	-	-	1	2
15	-	-	-	-	-	-	-	-	-	84
16	1	-	-	-	-	-	-	-	1	133
17	1	-	-	-	-	-	-	-	1	155
18	6	-	-	-	-	-	-	-	6	143
19	16	-	-	-	-	-	-	-	16	186
20	22	1	-	-	-	-	-	-	23	166
21	9	-	-	-	-	-	-	-	9	73
22	5	1	-	-	-	-	-	-	6	14
23	2	4	-	-	-	-	-	-	6	8
24	1	25	-	-	-	-	-	-	26	12
25	-	31	-	-	-	-	-	-	31	9
26	-	10	-	-	-	-	-	-	10	10
27	-	6	-	-	-	-	-	-	6	2
28	-	2	-	-	-	-	-	-	2	+
29	-	3	2	-	-	-	-	-	5	+
30	-	3	5	-	-	-	-	-	8	+
31	-	-	11	-	-	-	-	-	11	+
32	-	-	8	2	-	-	-	-	10	+
33	-	-	1	4	-	-	-	-	5	+
34	-	-	1	4	-	-	1	-	6	+
35	-	-	-	1	2	3	-	-	6	+
36	-	-	-	-	1	-	1	1	3	+
37	-	-	-	-	2	-	2	-	4	+
38	-	-	-	-	-	-	2	-	2	+
39	-	-	-	-	-	-	1	-	1	+
totals	64	86	28	11	5	3	7	1	997	

Number of age samples: 5
 Number of length samples: 16
 Number of fish measured: 1127

age composition

age	1	2	3	4	5	6	7	8
%	9.50	4.8	1	1	+	+	+	+

Table 11: The 1977 mackerel age-length key by GDR from the Juvenile Herring Survey in Division 5 Z

L _f (cm)	<u>Year class</u>							aged	length composition (%)
	1975	1974	1973	1972	1971	1970	1969		
19	-	-	-	-	-	-	-	-	5
20	-	-	-	-	-	-	-	-	5
21	-	-	-	-	-	-	-	-	5
22	-	-	-	-	-	-	-	-	5
23	3	-	-	-	-	-	-	3	38
24	2	-	-	-	-	-	-	2	49
25	28	-	-	-	-	-	-	28	235
26	32	-	-	-	-	-	-	32	246
27	15	1	-	-	-	-	-	16	120
28	10	3	-	-	-	-	-	13	93
29	-	3	-	-	-	-	-	3	44
30	-	2	-	-	-	-	-	2	16
31	-	3	-	-	-	-	-	3	27
32	-	1	2	1	-	-	-	4	33
33	-	1	1	-	-	-	-	2	16
34	-	-	1	-	-	-	-	1	11
35	-	-	-	2	1	-	-	3	16
36	-	-	1	1	1	-	-	3	16
37	-	-	-	1	-	-	1	2	11
38	-	-	-	-	-	-	-	-	5
Totals	90	14	5	5	2	-	1	117	996

Number of age samples: 2
 Number of length samples: 14
 Number of fish measured: 183

<u>age composition</u>							
age	2	3	4	5	6	7	8
%	776	131	44	27	11	-	11

Table 12: The 1975 herring length-weight relation by GDR from the Juvenile Herring Survey in Division 4 X and 5 Z

Division	4 X		5 Z	
L_t (cm)	mean weight(g)	No. weighed	mean weight(g)	No. weighed
10	6,0	20	-	-
11	10,0	20	-	-
12	11,0	20	-	-
13	14,2	12	-	-
21	-	-	68,3	3
22	-	-	81,4	7
23	-	-	90,8	13
24	-	-	104,2	36
25	-	-	119,4	44
26	-	-	133,1	31
27	-	-	146,2	91
28	-	-	169,7	197
29	-	-	186,0	220
30	-	-	203,2	220
31	-	-	221,0	179
32	-	-	249,4	51
33	-	-	263,3	9
34	-	-	266,7	3
totals	9,9	72	183,8	1104
No. of weight samples		1		11

Table 13: The 1976 herring length-weight relation by GDR from the Juvenile Herring Survey in Division 4 X, 5 Y and 5 Z

Division L _t (cm)	4 X		5 Y		5 Z	
	mean weight(g)	No. weighed	mean weight(g)	No. weighed	mean weight(g)	No. weighed
14	20,0	1	-	-	-	-
18	45,0	1	-	-	-	-
19	-	-	65,0	1	-	-
20	57,5	2	50,0	1	65,0	1
21	74,0	5	72,5	8	72,5	2
22	81,7	9	77,4	21	82,7	15
23	99,0	7	87,3	26	94,8	22
24	102,8	7	96,7	47	107,5	16
25	102,5	2	111,3	49	119,5	11
26	135,0	2	117,6	17	142,0	5
27	155,0	1	127,2	16	153,8	4
28	-	-	163,3	15	185,0	2
29	203,3	3	175,3	33	193,3	3
30	212,5	2	193,7	103	210,0	2
31	237,5	4	206,1	136	220,0	4
32	245,0	4	218,6	59	240,0	2
33	-	-	231,2	12	-	-
34	-	-	263,6	7	280,0	1
35	-	-	260,0	2	-	-
totals	121,8	50	167,9	553	118,1	90
No. of weight samples		1		2		3

Table 14 : The 1977 herring length-weight relation by GDR from the Juvenile Herring Survey in Division 5 Z

<u>L_t (cm)</u>	<u>mean weight (g)</u>	<u>No. weighed</u>
17	30,0	1
18	32,5	2
19	-	-
20	70,0	1
21	50,0	2
22	75,0	1
23	-	-
24	86,7	3
25	102,8	9
26	114,4	9
27	136,3	27
28	148,7	23
29	155,6	9
30	193,0	15
31	209,7	30
32	227,0	23
33	232,9	7
<u>Totals</u>	<u>167,3</u>	<u>162</u>

No. of weight samples 4

Table 15: The 1975, 1976 and 1977 mackerel length-weight relation by GDR from the Juvenile Herring Survey in Division 5 Z

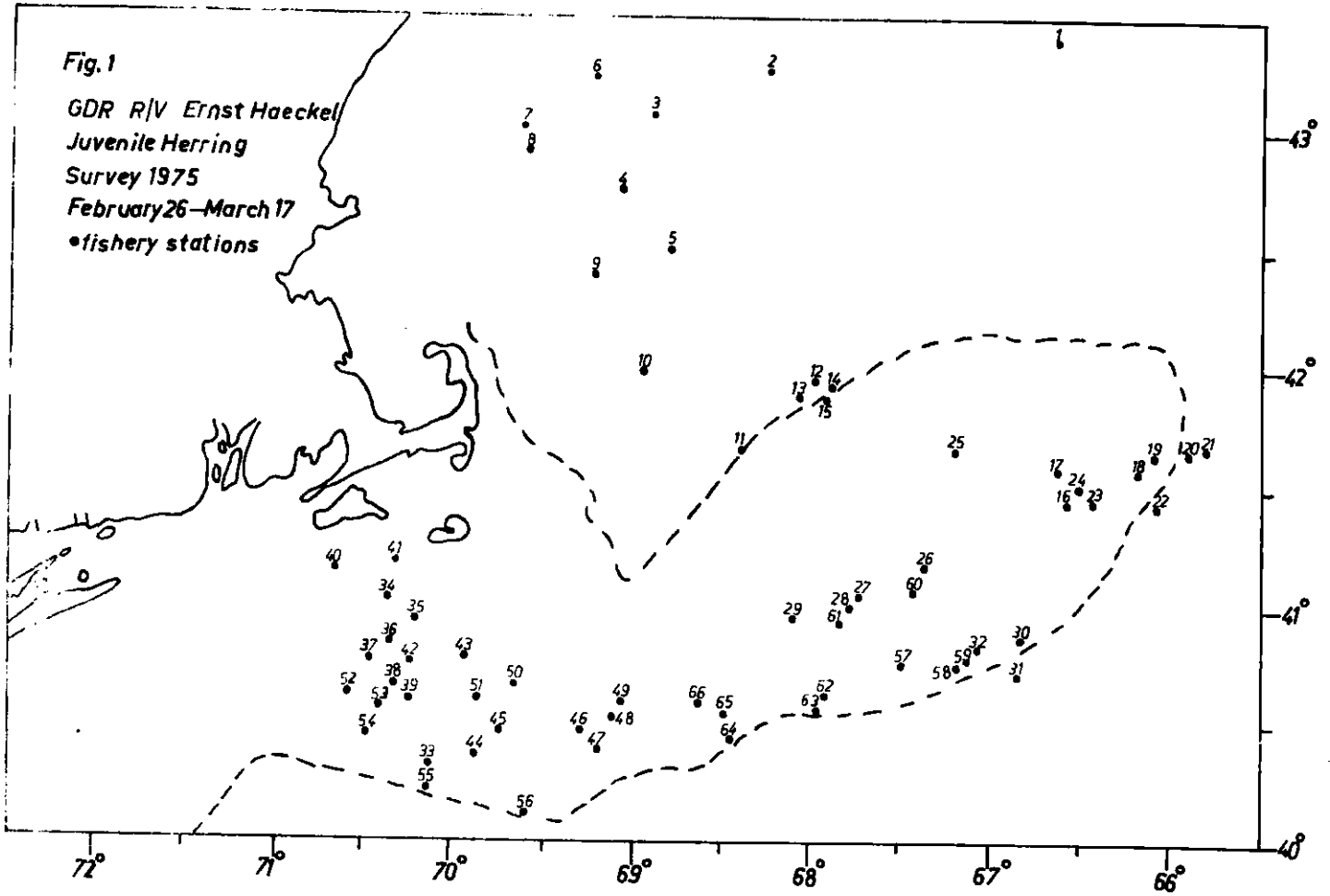
Year Division L _F (cm)	1975 5 Z		1976 5 Z		1977 5 Z	
	mean weight(g)	No. weighed	mean weight(g)	No. weighed	mean weight(g)	No. weighed
14	31,3	4	13,0	1	-	-
15	25,5	108	25,6	44	-	-
16	36,2	204	30,9	67	-	-
17	42,1	174	38,8	85	-	-
18	51,1	114	47,4	90	-	-
19	57,9	72	56,5	166	-	-
20	72,5	40	67,3	171	-	-
21	80,0	20	72,6	87	-	-
22	102,2	36	92,6	23	-	-
23	120,5	62	103,1	21	116,7	3
24	134,1	81	120,5	33	136,7	3
25	147,9	82	129,5	33	135,6	27
26	166,8	76	149,7	19	160,0	31
27	189,1	63	161,0	10	180,0	16
28	219,1	22	191,7	3	204,3	14
29	231,1	9	220,0	5	236,7	3
30	250,0	10	236,2	8	305,0	2
31	290,0	1	275,0	10	283,3	3
32	-	-	304,0	10	320,0	4
33	362,5	4	342,0	5	365,0	2
34	-	-	360,0	6	480,0	1
35	-	-	430,0	6	466,7	3
36	-	-	460,0	3	463,3	3
37	-	-	468,0	5	545,0	2
38	-	-	605,0	2	-	-
39	-	-	620,0	1	-	-
40	560,0	1	-	-	-	-
totals	86,7	1183	83,5	914	202,2	117
No. of weight samples		8		6		2

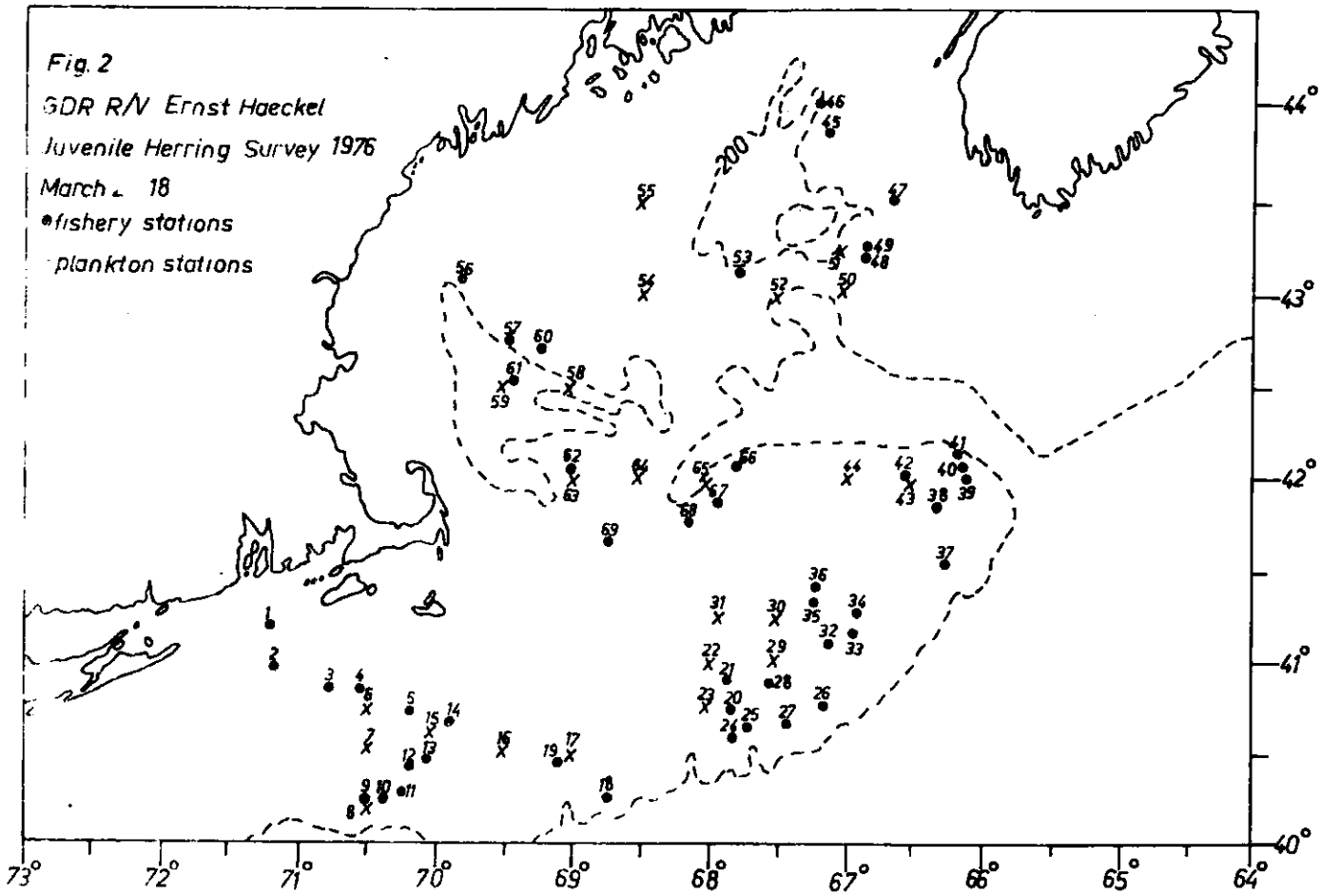
Table 16: The stratified mean number and weight per tow (Strata 1-25) for herring by GDR from the Juvenile Herring Surveys in 1975, 1976 and 1977

<u>Year</u>	<u>weight</u>	<u>age 2 (No.)</u>	<u>age 3 (No.)</u>
1975	1,382	0,014	0,789
1976	0,549	0,000	0,894
1977	0,194	0,008	0,210

Table 17: The stratified mean number and weight per tow (Strata 1-25) for mackerel by GDR from the Juvenile Herring Surveys in 1975, 1976 and 1977

<u>Year</u>	<u>weight</u>	<u>age 1(No.)</u>	<u>age 2(No.)</u>
1975	1,086	1,158	1,439
1976	0,569	0,594	0,823
1977	0,161	0,000	0,187





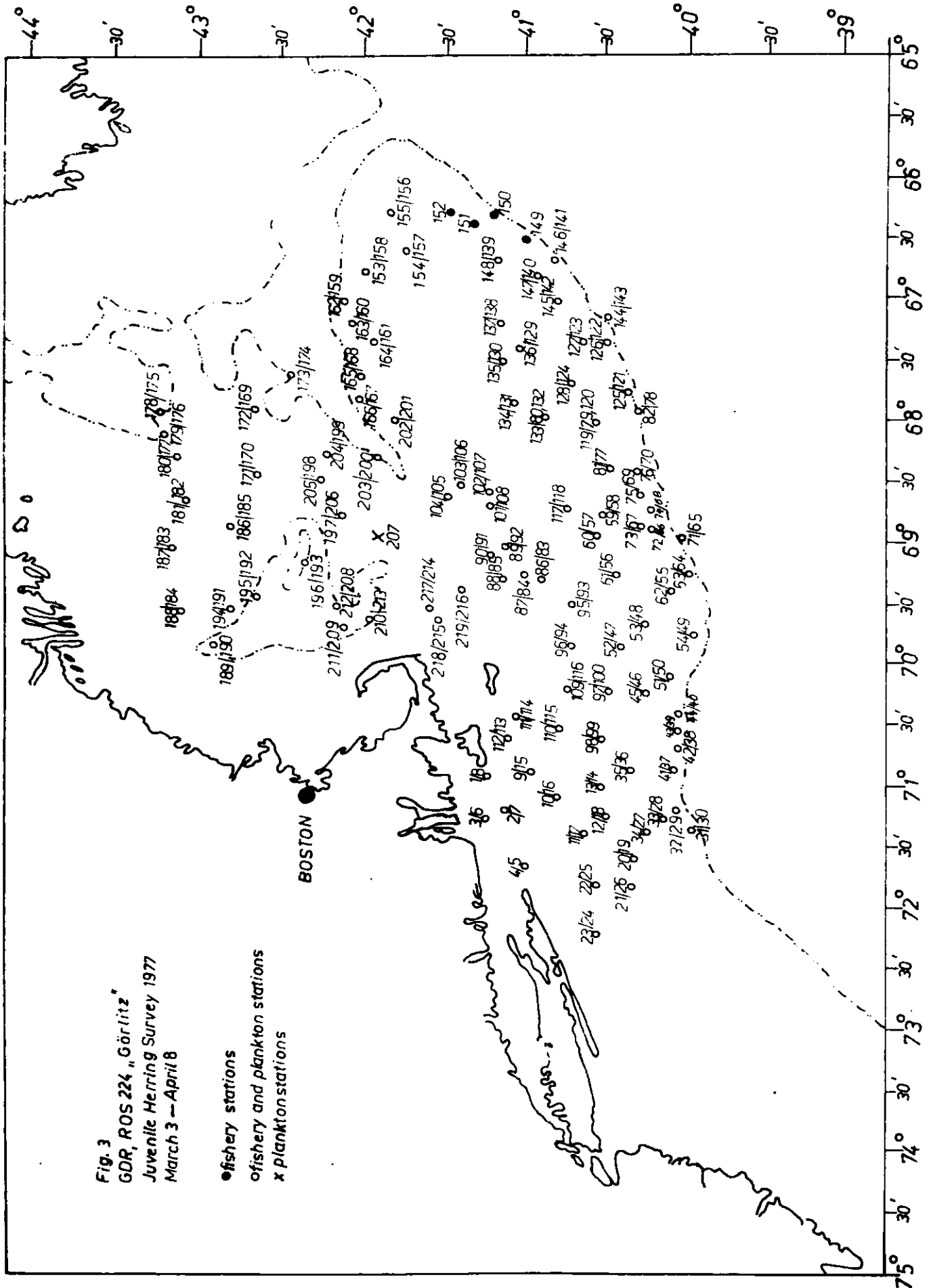
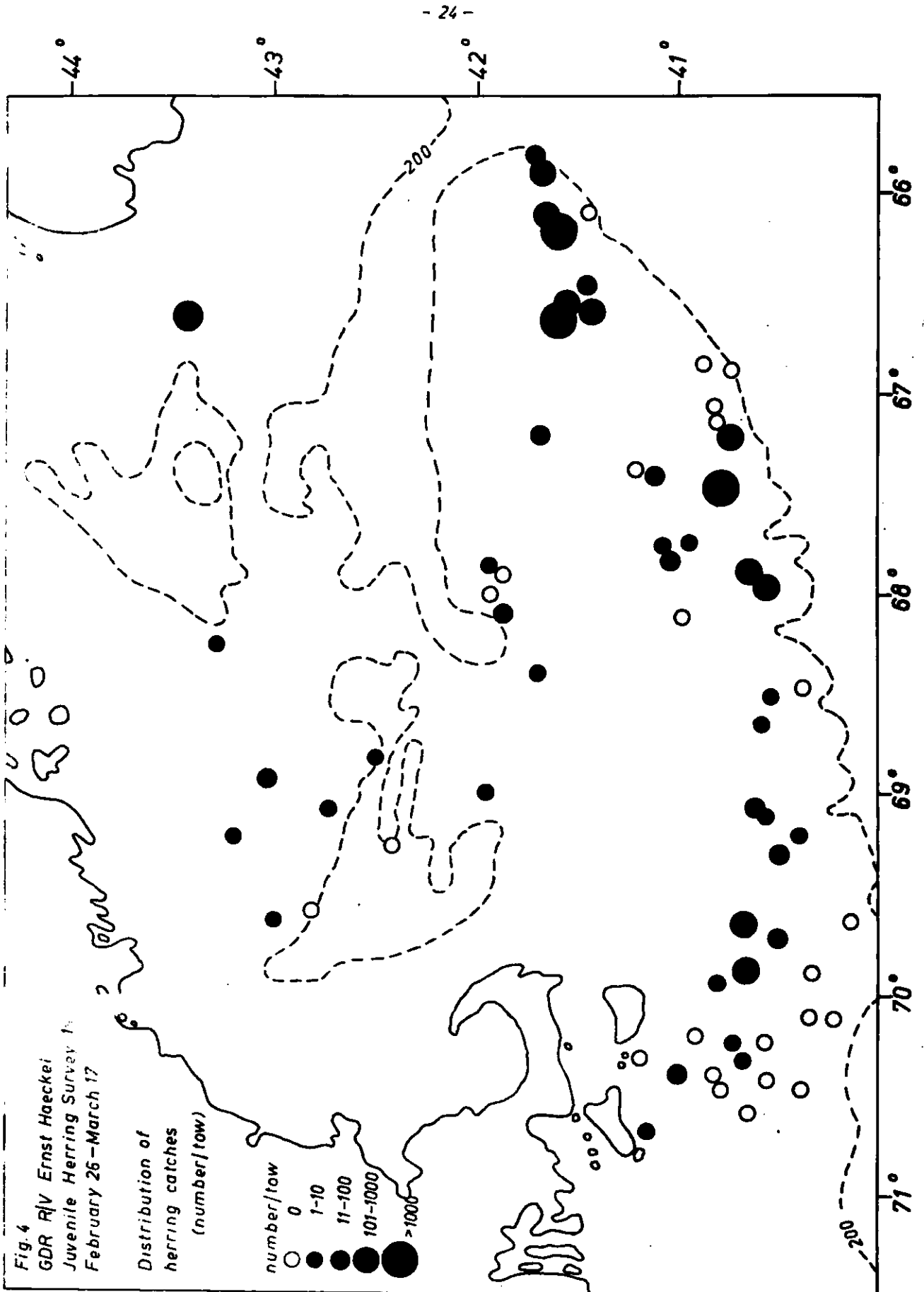
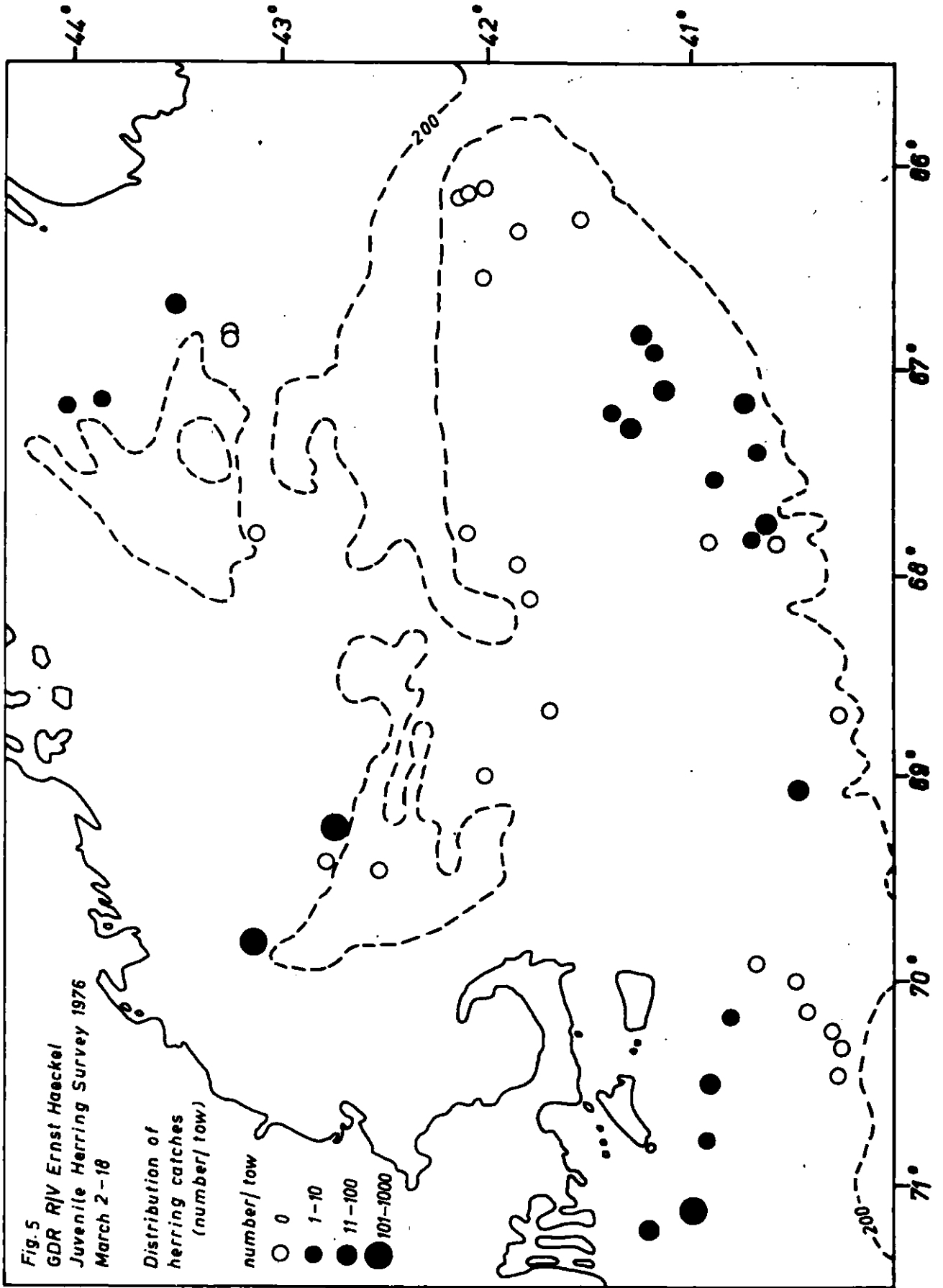


Fig. 3
GDR, ROS 224 „Görnitz“
Juvenile Herring Survey 1977
March 3 — April 8

- fishery stations
- fishery and plankton stations
- x plankton stations





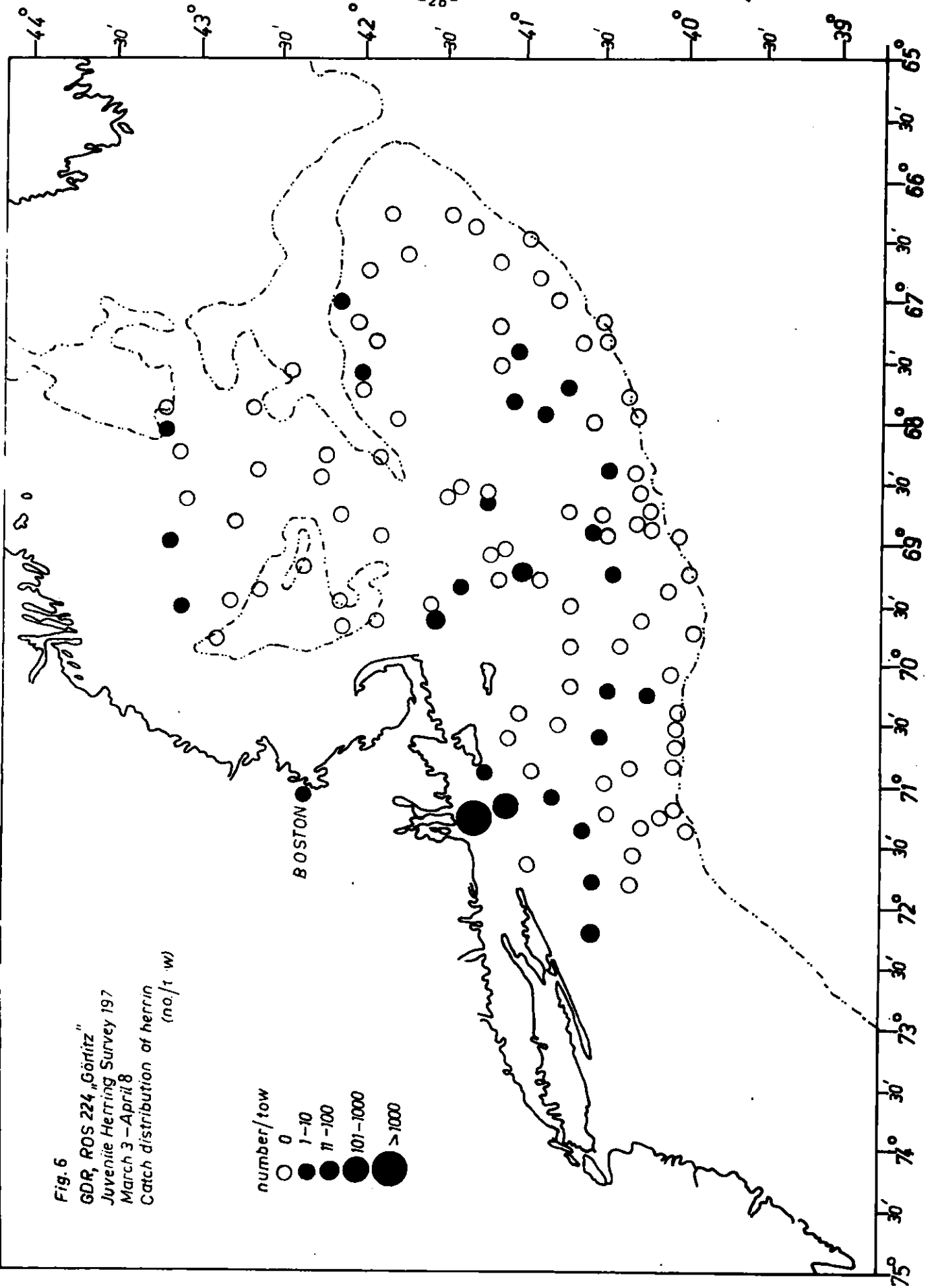
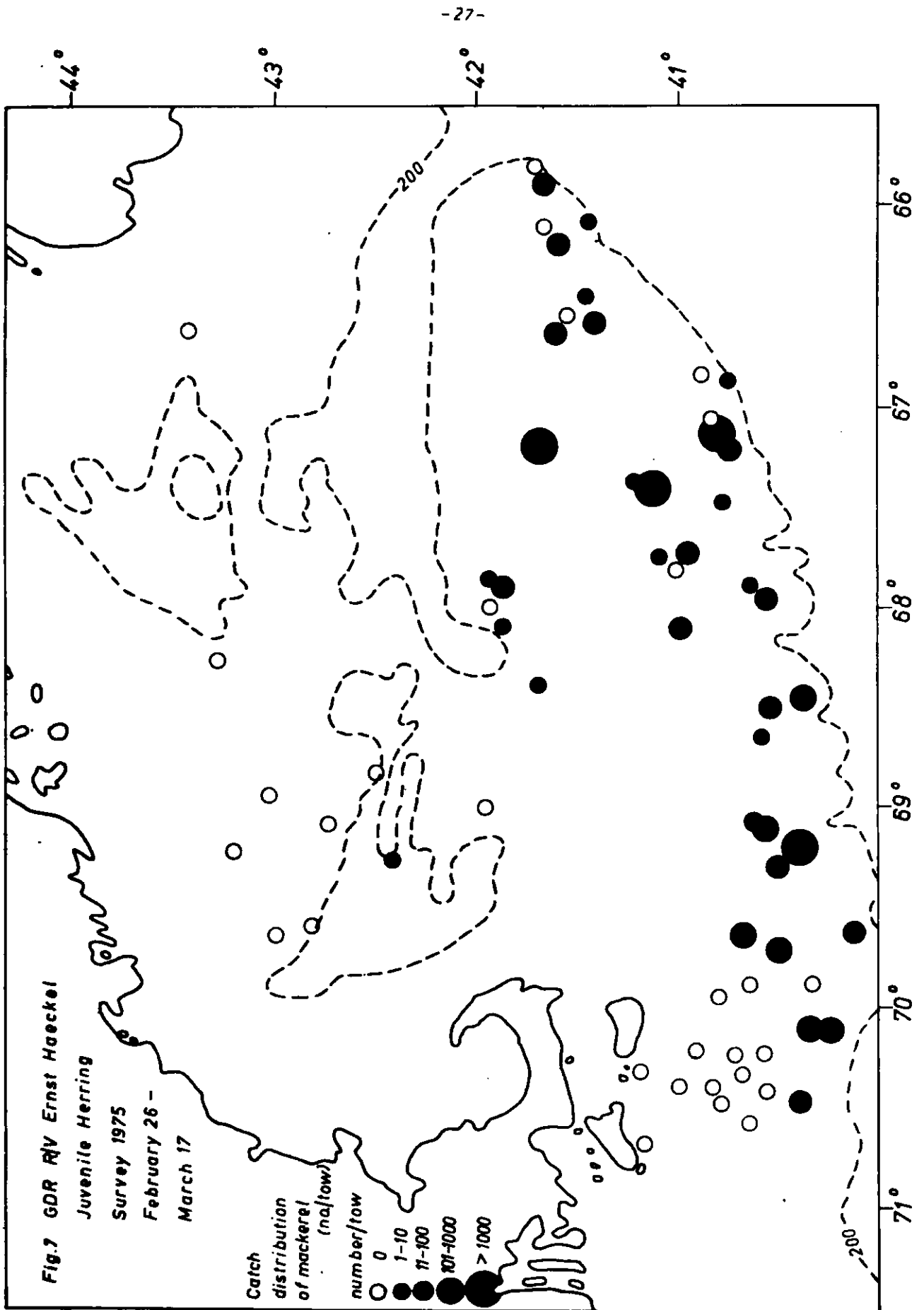
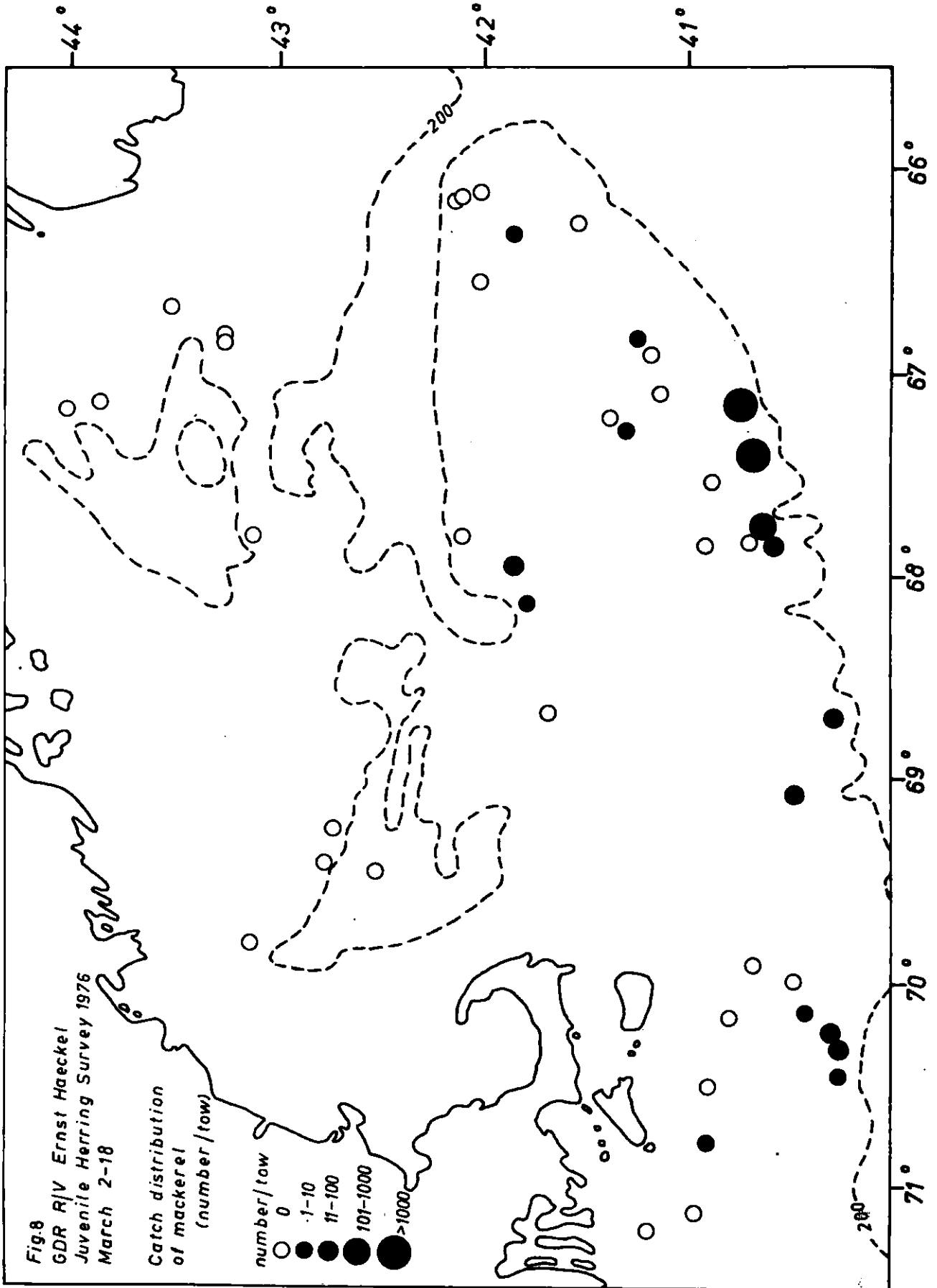


Fig. 6
 GDR, ROS 224, "Görnitz"
 Juvenile Herring Survey 197
 March 3 - April 8
 Catch distribution of herring
 (no./t.w)

number/tow
 ○ 0
 ● 1-10
 ● 11-100
 ● 101-1000
 ● >1000





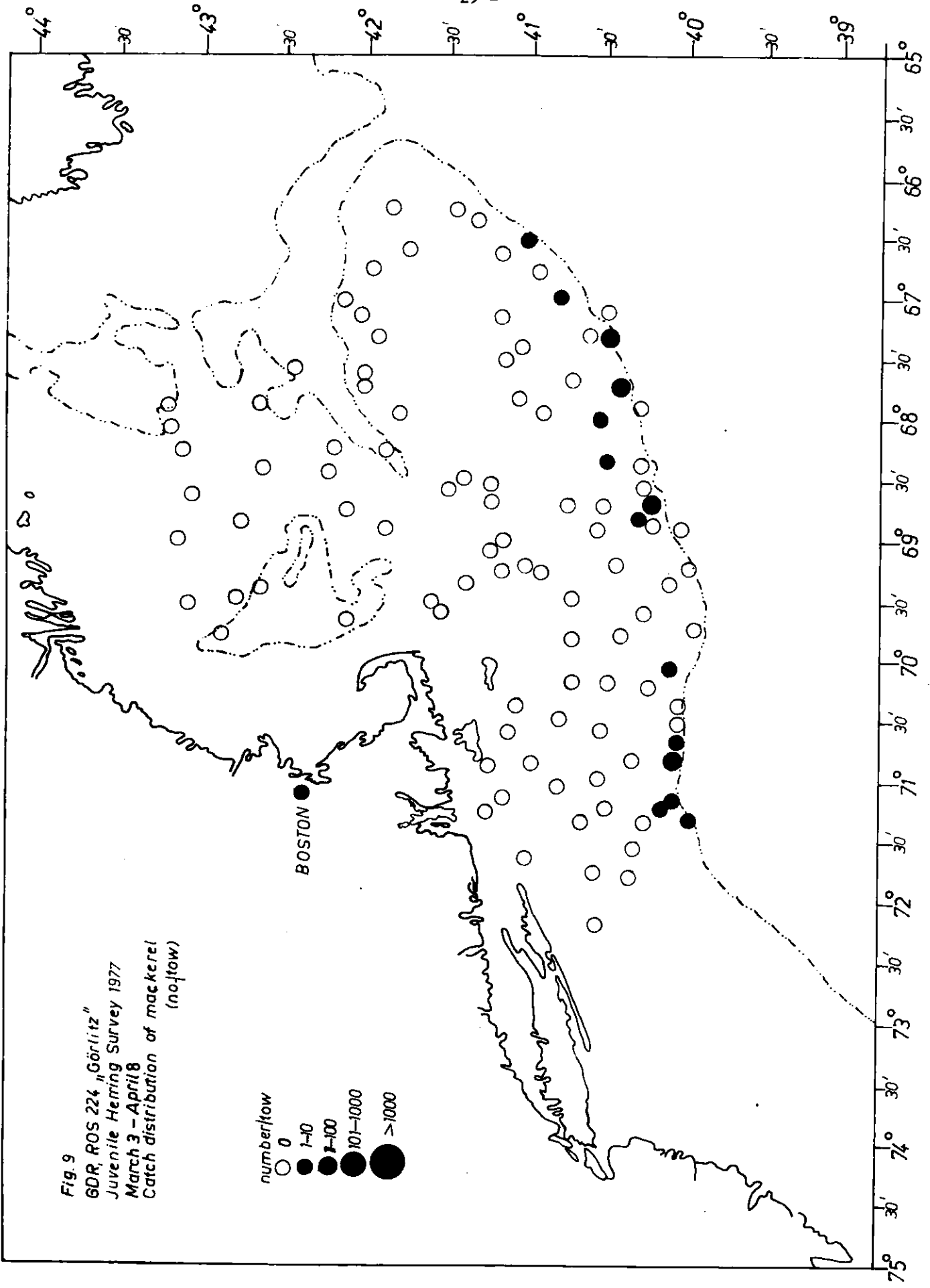
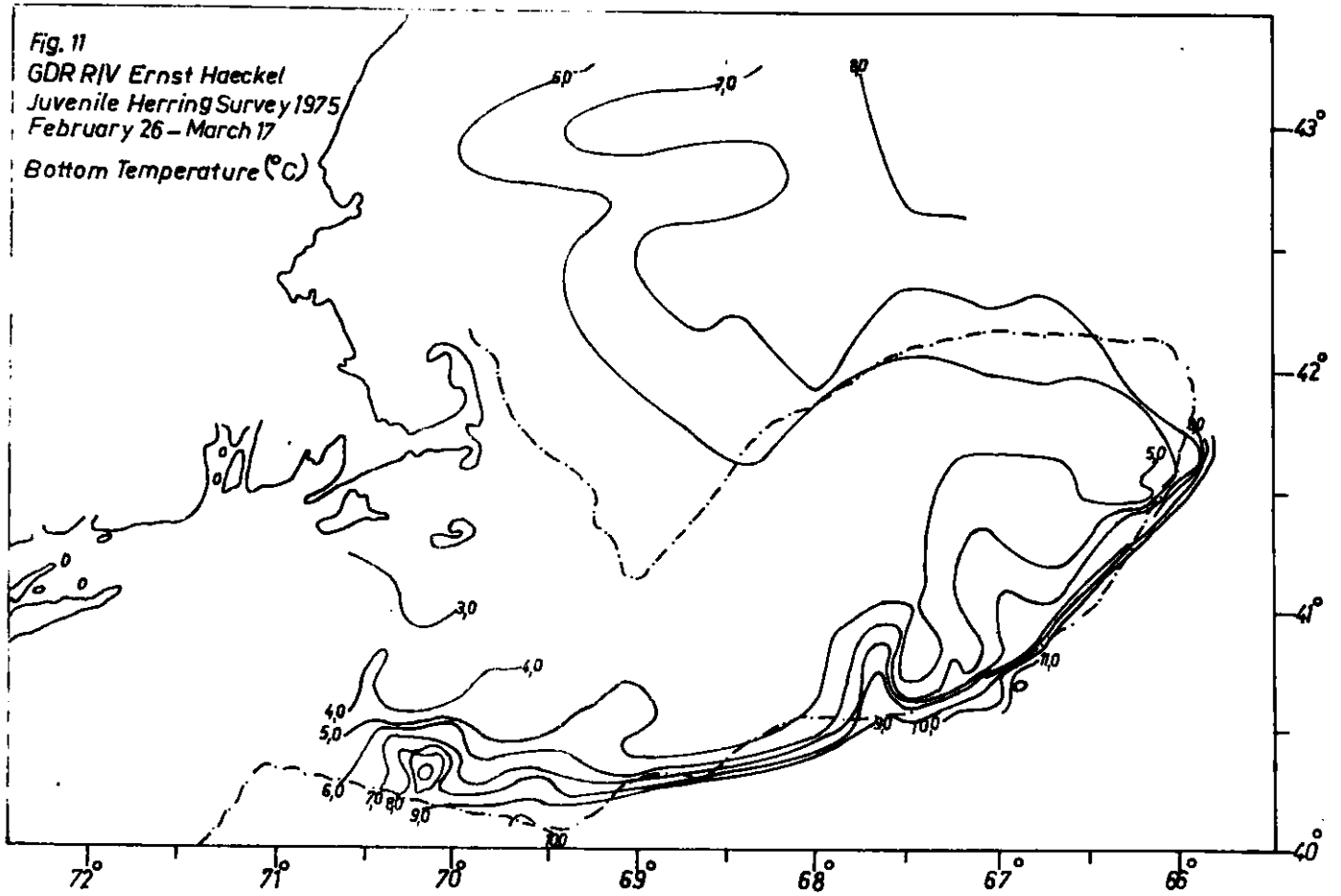
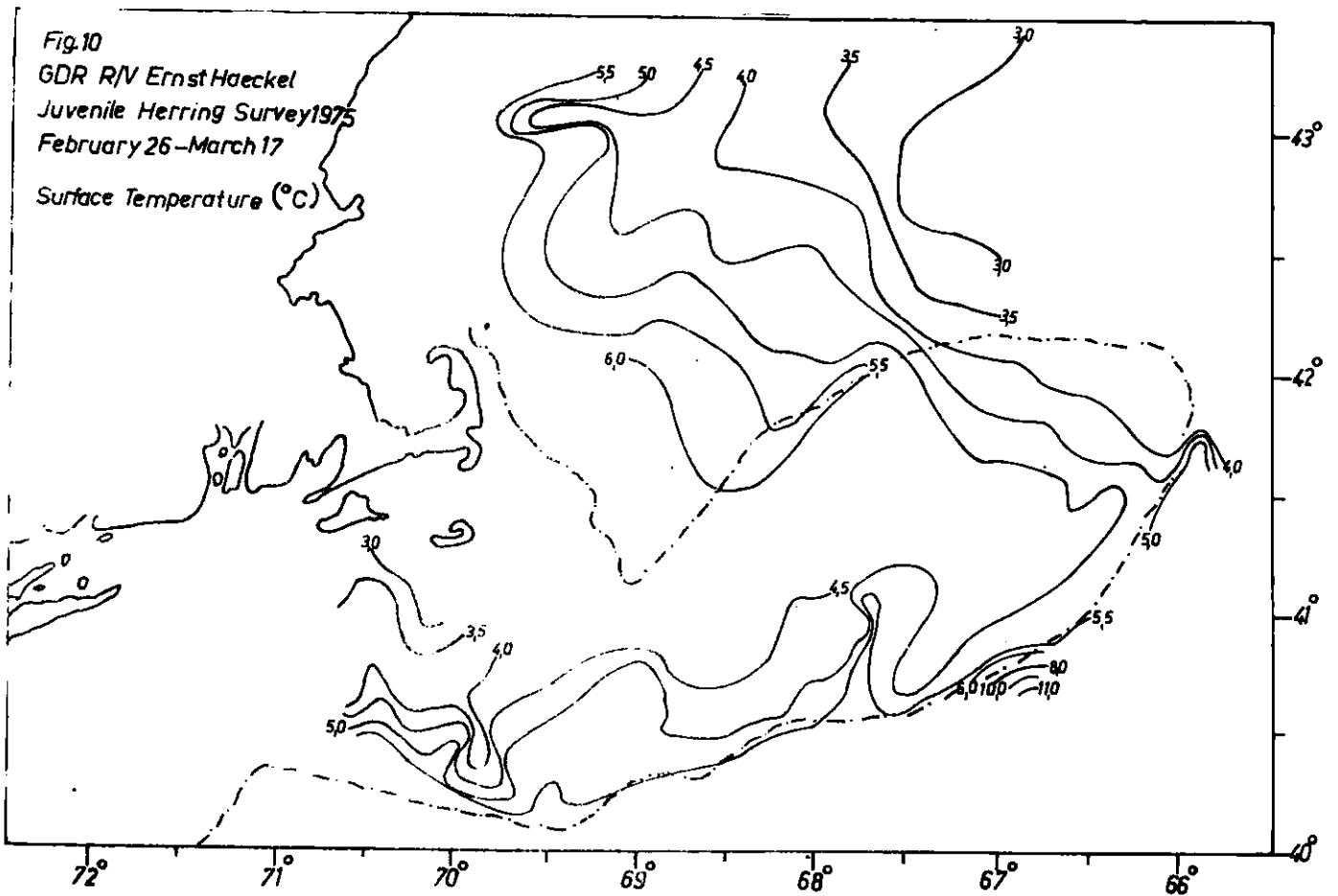
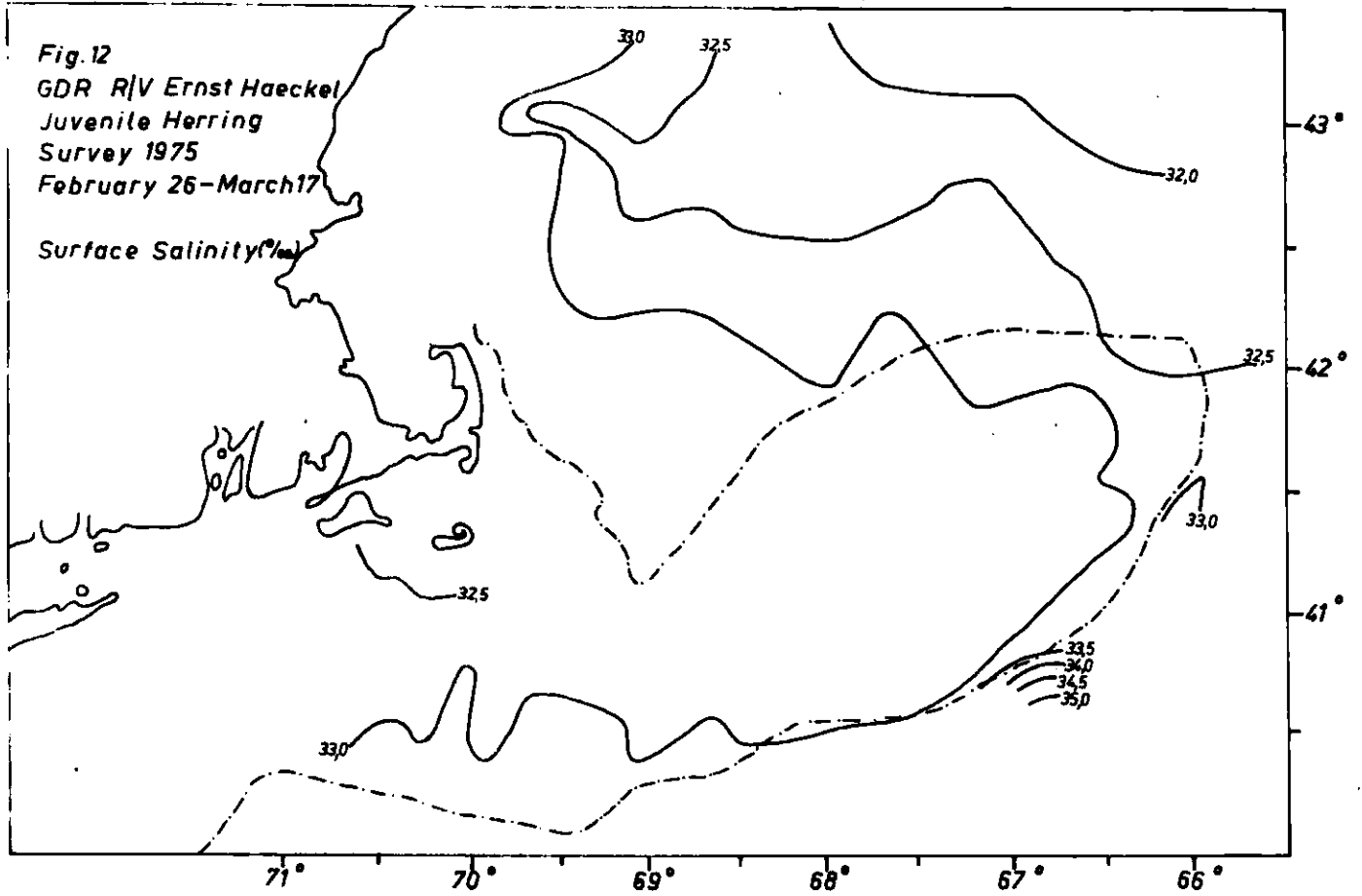
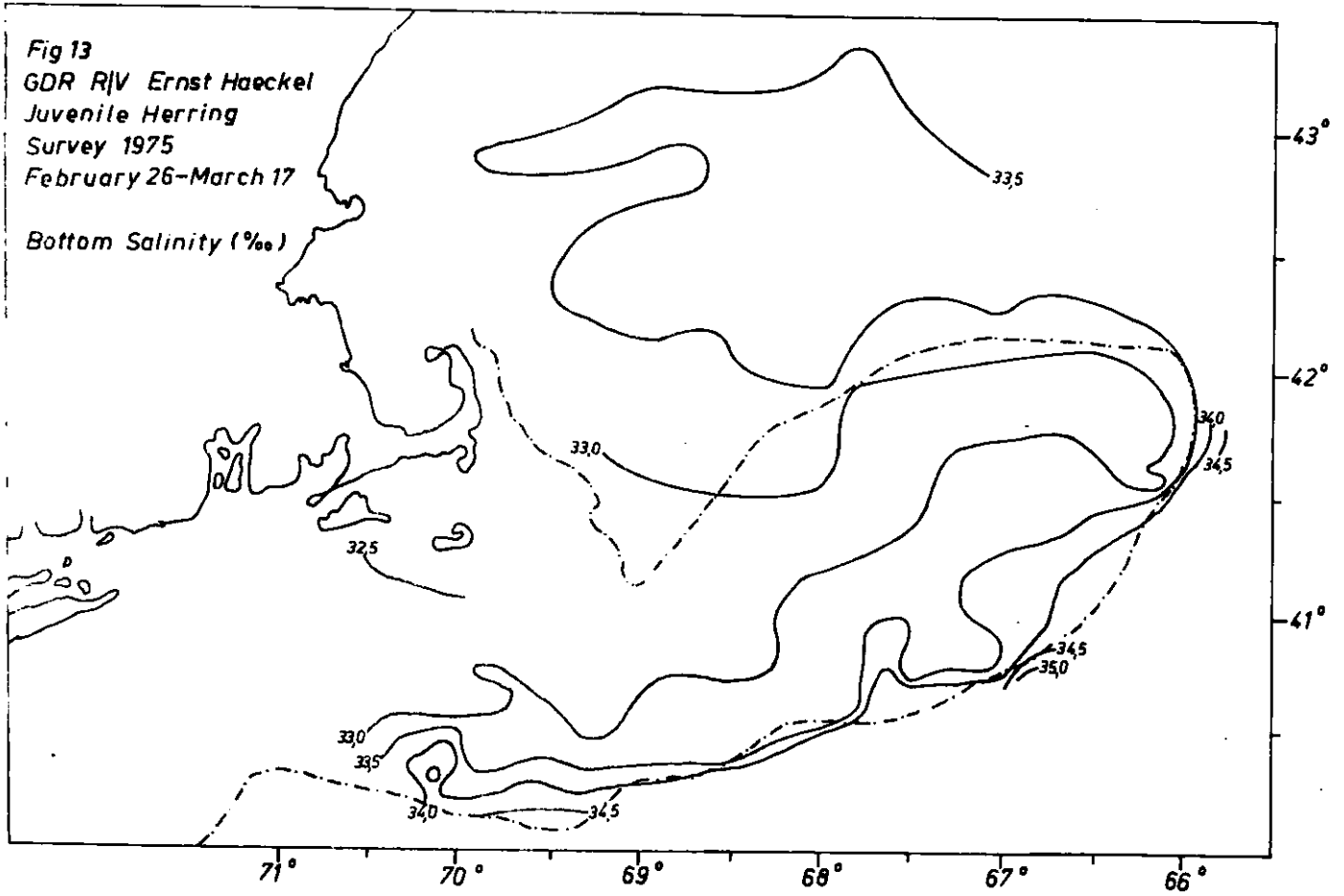


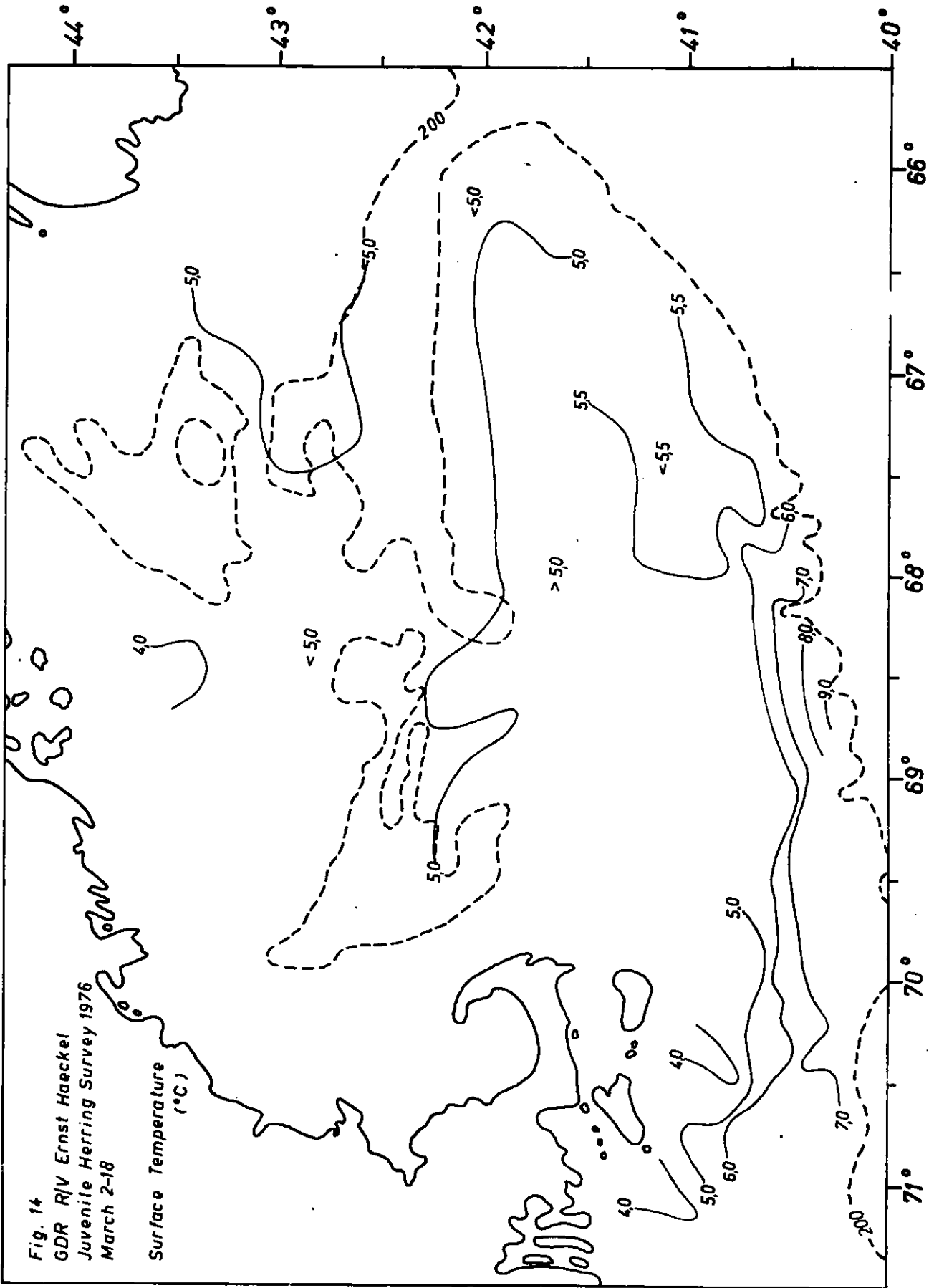
Fig. 9
GDR, ROS 224 "Görlitz"
Juvenile Herring Survey 1977
March 3 - April 8
Catch distribution of mackerel
(no./tow)

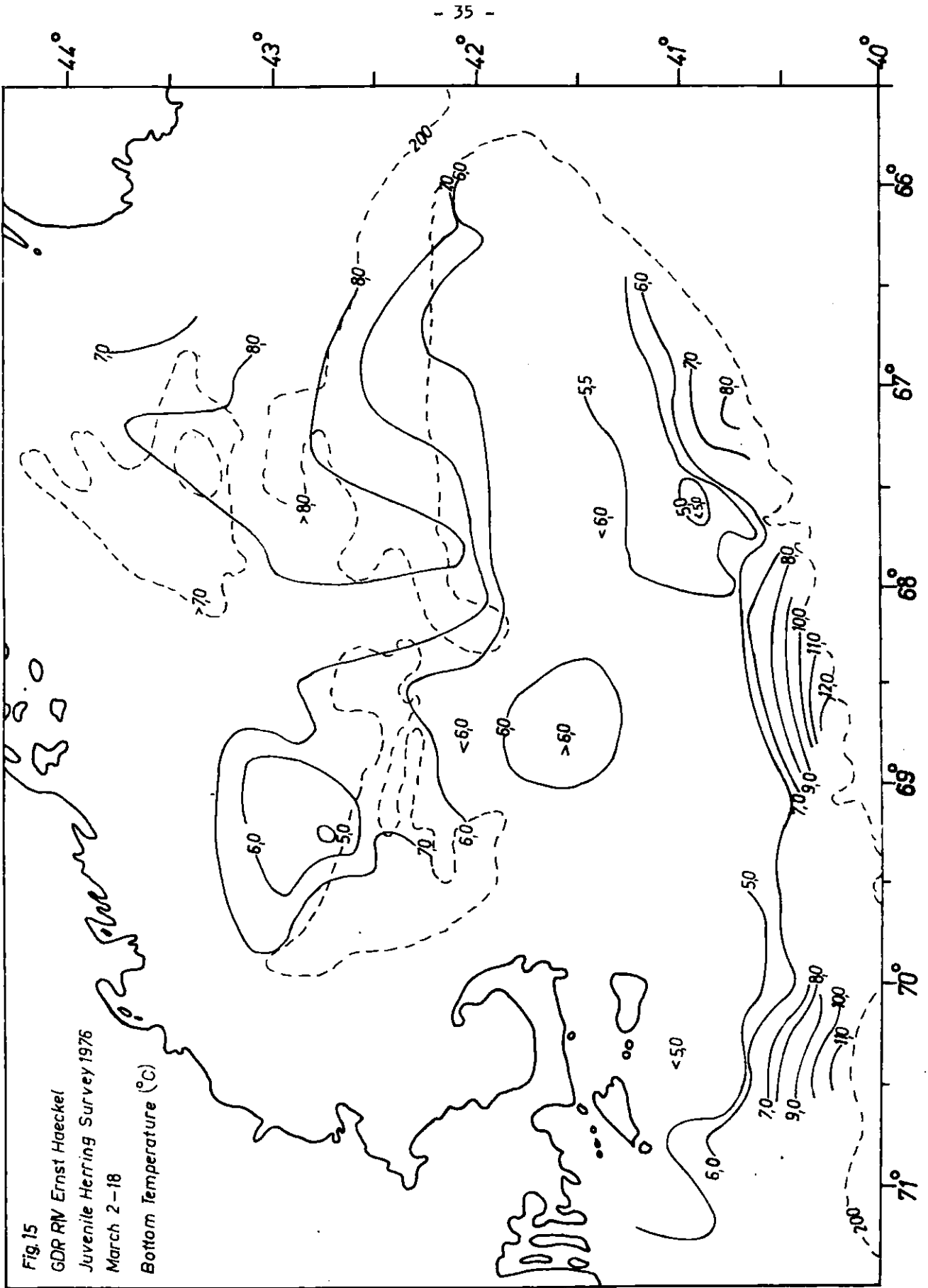












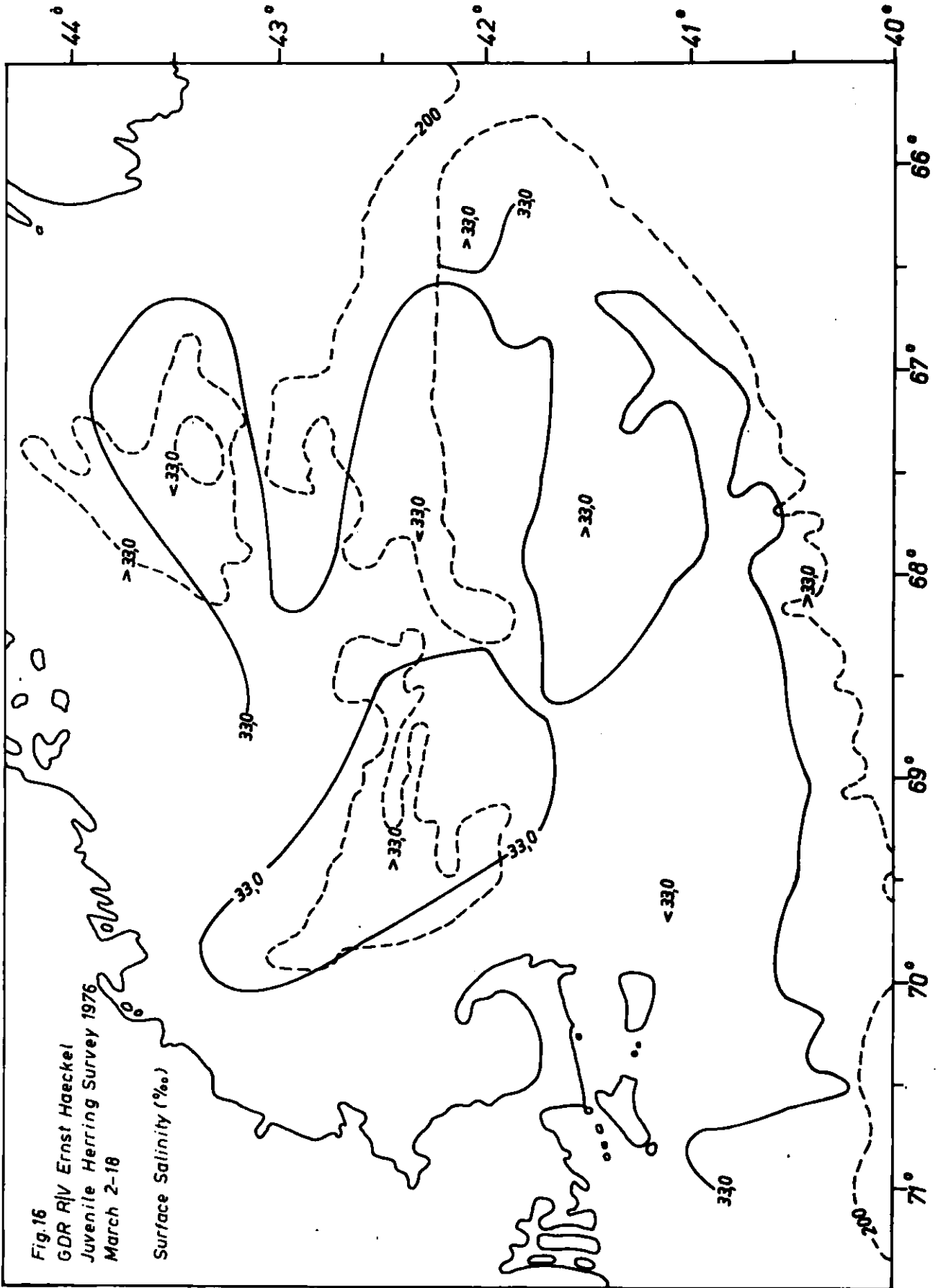


Fig. 16
GDR R/V Ernst Haeckel
Juvenile Herring Survey 1976
March 2-18

Surface Salinity (‰)

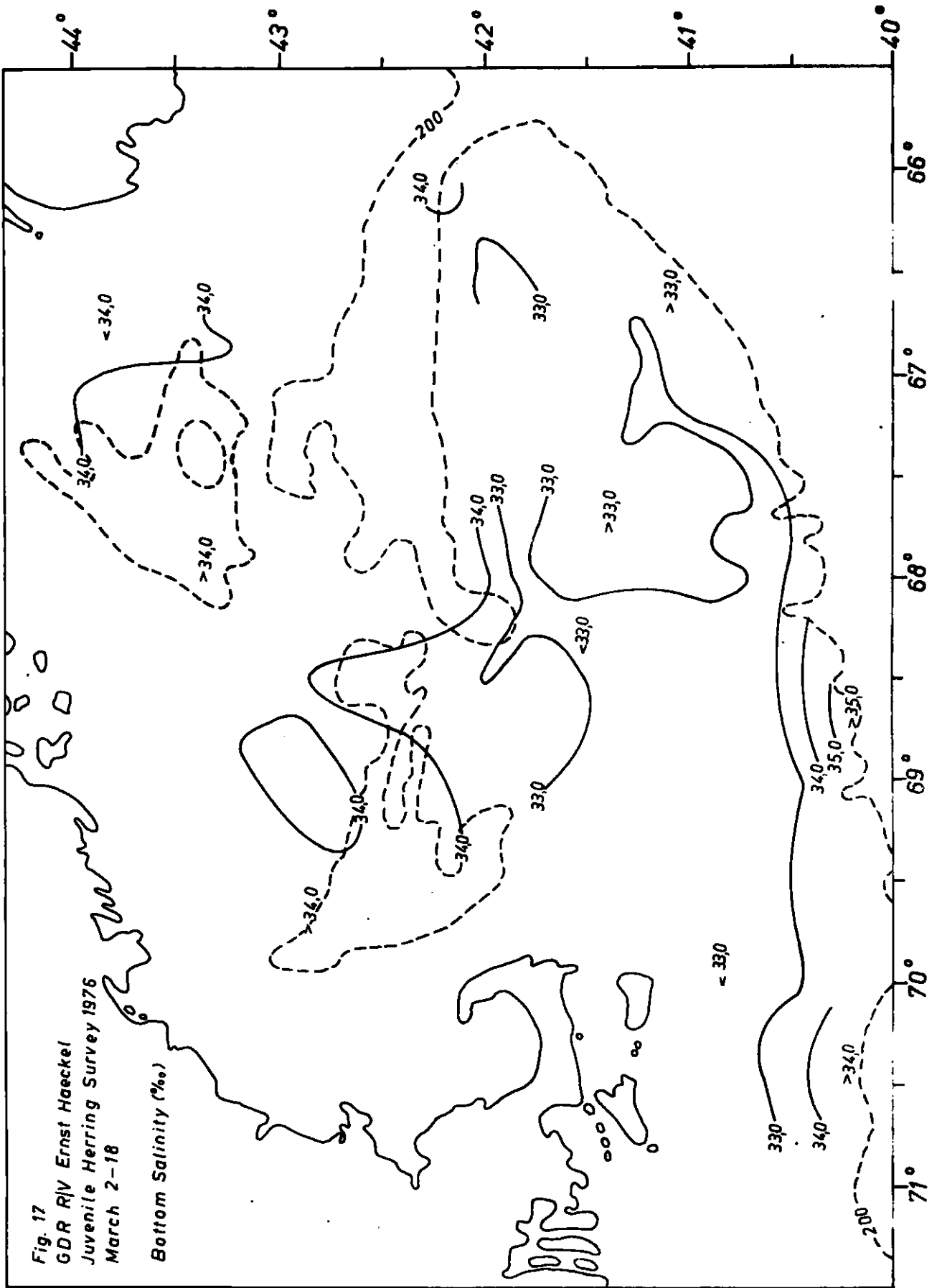


Fig. 17
GDR R/V Ernst Haeckel
Juvenile Herring Survey 1976
March 2-18

Bottom Salinity (‰)

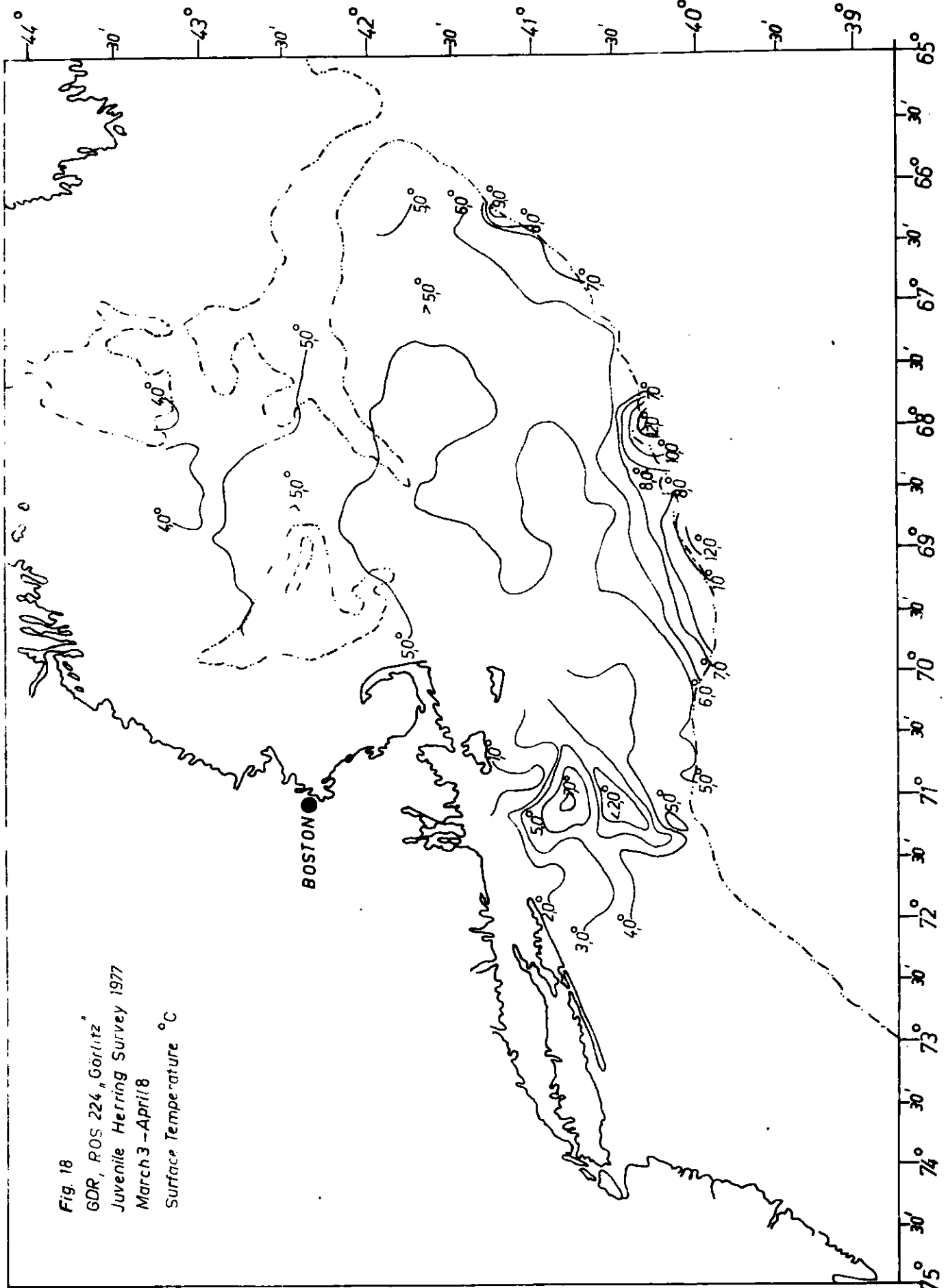


Fig. 18
GDR, ROS 224, "Görlitz"
Juvenile Herring Survey 1977
March 3 - April 8
Surface Temperature °C

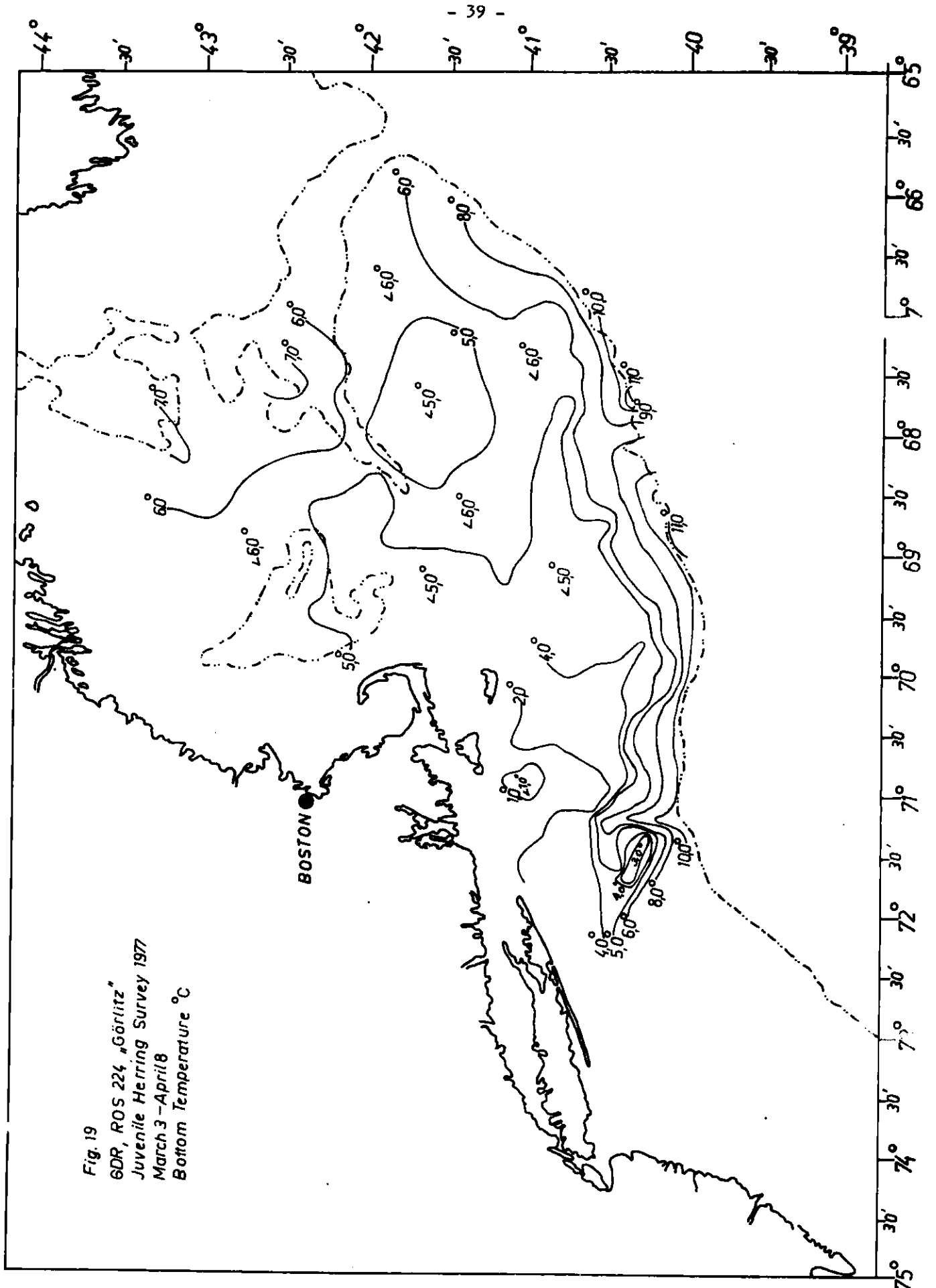


Fig. 19
 GDR, ROS 224 "Görnitz"
 Juvenile Herring Survey 1977
 March 3 - April 8
 Bottom Temperature °C

