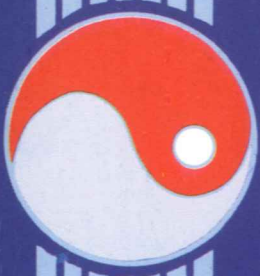


Jane Strømstad

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helv

havforskningsinstituttets
egg- og larveprogram

Kjell Nedreaas
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O-group saithe and herring
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1986 and 1987.

HAVFORSKNINGSINSTITUTTETS EGG- OG LARVEPROGRAM (HELP)

O-GROUP SAITHE AND HERRING OFF THE NORWEGIAN COAST
IN 1986 AND 1987.

by

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ABSTRACT

In 1985 investigations were started to try to measure the abundance of 0-group saithe before the main concentrations entered the inshore waters. In 1986 the investigation area were expanded to also cover the eastern part of the northern North Sea. This report gives some results from the cruises in April-May 1986 and April-May 1987. The results indicate that the end of April is too late to get a good measurement of the 0-group from the North Sea. For the northern stock the chosen time seem to be all right.

INTRODUCTION

One of the biggest problems in assessing the saithe stocks in the North Atlantic is the lack of good recruitment estimates. The 0- group saithe are very early distributed in the inshore waters and it is almost impossible to measure the abundance when the fish are so close to the shore. In 1985 a cruise were undertaken with the aim of measuring the abundance of postlarvae of the Northeast Arctic saithe before the main concentrations reached the shore (Nedreaas, 1986). In 1986 the investigation were expanded to also cover the North Sea. This report gives some results from the investigations in 1986 and 1987.

MATERIALS AND METHODS

In 1986 the investigation was carried out with R/V "Håkon Mosby" in the period 28. April - 28. May. In 1987 R/V "Håkon Mosby" covered the southern area in the period 22. April - 6. May, while R/V "Eldjarn" covered the northern area in the period 7. May - 30. May.

A mid-water capelin trawl with a 30 meter long codend with 8 mm stretched mesh was used. Height and depth sensors from SCANMAR A/S together with sensors measuring the distance between the wings of the trawl have given information about the trawl geometry on the different cruises.

Six extra 70' floats were tied to the headrope. The trawl was towed with 3 knots for 10 minutes with the headrope at the surface, then 10 minutes in 20 meter and 10 minutes in 40 meter depth. Total distance towed was 1.5 nautical mile.

The investigated area was covered by a rectangular survey grid. The distance between the tracks is 30 nautical miles, and the distance between two stations on the same track is 15 nautical miles (Figs. 1 - 3). Hydrographical stations were taken on each trawl station.

Measurements of the trawl geometry on R/V "Håkon Mosby" showed a variation around 20 x 20 meter in all depths. On R/V "Eldjarn", however, measurements showed that the geometry was different in the different depths. At the surface the height were measured to 20.0 m and the width to 10.7 m, at 20 m depth the trawl opening was 18.3 m x 14.2 m and at 40 m depth 15.0 m x 17.5 m. The volume of a trawl haul taken by R/V "Eldjarn" is calculated to be $V_1(E) = 1.075 \times 10^{-4} \text{ nm}^3$, while a haul taken by R/V "Håkon Mosby" is $V_1(H) = 1.75 \times 10^{-4} \text{ nm}^3$. Because of the different heights of the trawls the square around each trawl station of 15 x 30 nm will also have different volumes. The trawl on R/V "Eldjarn" has a height of about 15 m at 40 meter depth, which means that the trawl fishes down to 55 m. On R/V "Håkon Mosby" the trawl fishes down to about 58 m depth. The squares covered by R/V "Eldjarn" will have a volume of $V_2(E) = 13.36 \text{ nm}^3$, while the squares covered by R/V "Håkon Mosby" will be $V_2(H) = 14.09 \text{ nm}^3$.

The abundance indices (I) are then calculated by the formula:

$$I = \Sigma V_2/V_1 \times X_i = V_2/V_1 \Sigma X_i$$

where X_i is the number of 0-group on station i.

RESULTS

Hydrography

Horizontal distribution of temperature and salinity in 25 m depth are shown in Figs. 4 - 7. In the North Sea the hydrography seems to be very similar in 1986 and 1987. North of Stad the temperatures are a bit higher in 1986 than in 1987. The temperature distribution in 1987 is very similar to the distribution found in 1985.

Saithe. Pollachius virens.

The distributions of 0-group saithe are shown on Figs. 9 and 10. The distribution area seems to be well covered both years. However, south of Stad the highest catches are close to the coast especially in 1987. In addition no saithe were caught south of 60°N in offshore waters,

while 0-group saithe are observed south to about 59°N in inshore waters both years. This indicate that some of the 0-group already had come in to inshore waters in this area. North of Stad the investigation covers the main concentrations of 0-group saithe in both years.

Tables 1 and 2 shows length distributions from different survey tracks and areas. South of 62°N no increase or decrease in mean length are observed from north to south. The smallest specimens were found on the western stations (st. 53-55 and 75-77 in 1987). North of 63°N an increase in the mean lengths were observed northwards in both 1986 and 1987. This may indicate that most of the recorded 0- group originates from the spawning areas on Møre.

The abundance indices for the different areas in the different years are given in the text table below:

	North Sea	NE Arctic
1985	no data	828.2×10^6
1986	19.6×10^6	544.5×10^6
1987	60.9×10^6	284.5×10^6

The 1987 yearclass in the North Sea is measured to be about three times the 1986 yearclass. However, the uncertainties about how much of the yearclass which have reached inshore waters before the time of the investigation in these two years makes it very difficult to use the measured values for the North Sea.

North of Stad the measurements should cover most of the yearclass. As seen from the text table the 1985 yearclass is the best one while the 1987 yearclass is the poorest. At the moment it is not possible to evaluate the measured values as rich, average or poor, but in a few years when these yearclasses have recruited to the fishery it should be possible to evaluate the yearclasses.

Herring. Clupea harengus.

The distributions of herring larvae are shown in Figs. 11 and 12. There are two different distribution areas, one south of Stad and one north of Smøla. Table 3 and 4 show that the length distributions are different for those two areas.

We caught more herring larvae in 1987 than in 1986. For the North Sea component the total catch of herring larvae were 1261 specimens in 1987 against 215 in 1986. For the Atlanto-Skandian component the catches in 1985, 1986 and 1987 were 12 872, 447 and 1127 respectively.

Catfish. Anarhichas lupus.

Figs. 13 and 14 show the distribution of 0-group catfish. This species is found in small numbers scattered over the whole investigation area. North of 62°N the total catches in 1985, 1986 and 1987 were 256, 297 and 253, indicating a very stable situation. South of 62°N the catches in 1986 and 1987 were 44 and 106. The length distributions are given in Tables 5 and 6.

Squid. Gonatus fabricii.

Figs. 15 and 16 show the distribution of this small squid. The distribution area is very similar for the two years, but the abundance seems to be smaller in 1987 than in 1986. The squid was also smaller in 1987.

REFERENCES

- NEDREAAS, K. 1986. Abundance and distribution of postlarvae in the 0-group saithe survey in the north-east Arctic in 1985.
ICES Doc. C.M. 1986/G:87 32 pp.

Table 1. Length distributions (%) of saithe postlarvae in 1986.

Length- group	Track V st.no.	Track VI st.no.	Track VII st.no.	Track VIII st.no.	Track IX st.no.	Track X st.no.	Track XI st.no.	Track XII st.no.	Track XIII st.no.	Track XIV st.no.	Track XV st.no.	Track XVI st.no.	Track XVIII st.no.
mm	34-40	42-48	50-58	59-68	69-76	77-84	85-95	96-106	108-119	120-130	131-137	138-151	152-165
10-14		3.8	3.8	1.0	1.9	0.4	0.2						
15-19	28.6	29.6	53.0	21.9	35.5	0.0	21.7	19.1	16.4	31.9	15.7	10.9	
20-24	71.4	51.9	40.9	54.2	48.6	40.2	47.1	41.0	44.2	44.9	41.8	41.8	14.9
25-29		18.5	2.3	19.8	12.1	38.4	25.2	28.8	27.6	18.3	31.8	29.9	43.1
30-34				3.1	1.9	12.7	5.5	10.1	9.8	3.8	9.7	12.7	31.6
35-39						0.4	0.2	1.0	2.0	1.0	1.0	3.8	7.2
40-44							0.2		0.1	0.1		1.0	2.8
45-49													0.3
50-59													
Number	7	27	132	96	107	276	614	892	1309	922	708	505	967
Mean		21.67	18.83	21.97	20.85	24.85	22.95	23.73	23.97	21.95	24.07	25.14	24.17
length	3.02	2.73	2.93	3.69	3.65	3.84	3.92	4.45	4.43	4.22	4.01	4.82	4.18
St.dev.													

Table 1. continue

Length- group	Track XVIII st.no.	Track XIX st.no.	Track XX st.no.	Track XXI st.no.	Track XXII st.no.	Track XXIII st.no.	Track XXIV st.no.	Track XXV st.no.	Total S of 62 N st.no.	Total N of 62 N st.no.	TOTAL st.no.
mm	166-176	177-180	189-193	214,215	208-213	203-207	199-202	194-198	1-68	69-223	1-223
		216,217	218-223								
10-14									2.3	0.1	0.1
15-19	1.8			2.2					37.4	17.7	18.4
20-24	21.0	2.1	2.4	19.6			16.7		48.6	41.7	41.9
25-29	39.3	19.1	26.8	34.8			50.0	100.0	10.5	28.1	27.5
30-34	32.0	57.4	51.2	19.6	66.7	14.3	33.3		1.2	10.1	9.8
35-39	4.8	19.1	19.5	17.4	33.3	14.3				2.0	2.0
40-44	1.1	2.1		2.2						0.2	0.2
45-49				2.2						0.2	0.2
50-59				2.2						0.2	0.2
Number	272	47	41	46	3	7	6	1	265	6669	6934
Mean											
length	28.32	31.81	31.02	30.14	32.00	31.57	28.00	29.00	20.31	23.99	23.85
St.dev.	3.80	3.75	3.75	7.42	2.65	2.15	3.63	0.00	3.52	4.66	4.67

Table 2. Length distributions (%) of saithe postlarvae in 1987.

Length- group	Track V st.no.	Track VI st.no.	Track VII st.no.	Track VIII st.no.58, 75-77,94-96	Track IX st.no. 56-65	Track X st.no. 67-75	Track XI st.no. 77-85	Track XII st.no. 87-94
mm	33-39	41-46	48-56	75-77,94-96	56-65	67-75	77-85	87-94
10-14	6	2	3			2		2
15-19	17	48	32	34	19	22	8	31
20-24	75	41	53	42	69	56	37	50
25-29	8	4	11	20	13	17	44	15
30-34			3	1		2	10	2
35-39			1				1	
40-44								
45-49								
Mean								
length	22.08	19.86	21.64	21.64	22.19	22.27	25.42	21.20
St.dev.	2.48	3.71	3.82	4.13	2.79	3.82	4.12	3.32
Measured	12	250	133	479	16	86	84	397

Table 2. continue

Length- group	st.no.	st.no.	st.no.	st.no.	st.no.	S of 62 N	S of 63 N	N of 63 N
mm	33-36	53-55	66-69	61-62	70-72	S of 62 N	S of 63 N	N of 63 N
	43-51	75-77	81-86	81-86				
10-14	4	7	2	3	3	2	3	0.3
15-19	41	51	31	25	25	35	34	8
20-24	47	35	48	48	48	47	47	39
25-29	7	7	17	20	20	14	14	40
30-34	1		1	3	3	1	1	11
35-39	1			1				2
40-44								0.2
45-49								
Mean								
length	20.56	19.61	21.75	22.27	22.27	21.34	21.39	24.85
St.dev.	3.82	3.64	3.85	4.22	4.22	3.86	3.90	4.20
Measured	377	71	1026	64	64	889	1533	1754
(Catch)						(889)		

Table 2. continue

Length- group mm	Track XIII st.no. 109-119	Track XIV st.no. 120-129	Track XV st.no. 131-142	Track XVI st.no. 143-155	Track XVII st.no. 156-163	Track XVIII st.no. 164-177	Track XIX st.no. 178-189	Track XX st.no. 191-201
5-9								
10-14	0.4	0.5						
15-19	8.0	11.3	7.5	8.1		8.3		
20-24	35.6	44.9	46.5	21.6	10.4	25.0	25.0	10.0
25-29	38.0	37.1	37.8	32.4	62.0	8.3		10.0
30-34	15.2	5.9	7.5	24.4	50.0			
35-39	2.8	0.3	0.6	13.5	2.3	8.3	50.0	80.0
40-44				0.9			25.0	
Mean	25.23	23.76	24.20	27.51	27.82	28.25	35.00	34.30
St.dev.	4.41	3.99	3.28	5.41	4.21	6.25	7.44	4.88
Measured (Catch)	250 (251)	738 (742)	332 (333)	37 (37)	223 (221)	12 (12)	4 (5)	10 (10)

Table 2. continue

Length- group mm	st.no.84-86, 116-117, 121-122	st.no.113, 125-127, 136-137	st.no.105- 112,128, 131-132	st.no. 156, 158-159	st.no.172- 173,180, 199-200	TOTAL
5-9						
10-14	0.6	0.4	0.3	0.8		1.3
15-19	12.5	4.5	10.6	9.8		20.0
20-24	43.4	41.7	46.0	10.0	12.5	43.5
25-29	33.9	39.3	36.8	37.0	6.3	27.9
30-34	8.0	12.0	5.9	6.4	31.3	6.0
35-39	1.5	2.1	0.4	2.3	50.0	1.1
40-44	0.1			0.9		0.1
45-49						
Mean	23.98	24.98	23.84	23.80	32.62	22.99
St.dev.	4.23	3.91	3.70	3.74	5.56	4.33
Measured (Catch)	2430 (2569)	242	951	265	16 222	3453 (3458)

Table 3. Length distribution (%) of herring larvae in 1986.

Length- group mm	S of 62°N st.no. 1-68	N of 62°N st.no. 69-223	West of Lofoten st.no. 194-223	TOTAL st.no. 1-223
20-24		14.0	15.1	9.7
25-29	0.5	67.6	74.0	46.9
30-34	7.5	10.0	9.9	9.2
35-39	31.0	5.1	0.8	13.1
40-44	52.0	3.1	0.3	18.2
45-49	8.5	0.2		2.8
50-54	0.5			0.2
Number	204	447	390	651
Mean length	39.71	27.74	26.90	31.49
St.dev.	4.56	4.23	2.37	7.04

Table 4. Length distributions (%) of herring larvae in 1987.

Length- group mm	S of 59°30'	59°30' -60°30'	60°50' -61°30'	61°30' -62°20'	S of 62°20'	62°20' -66°00'	N of 66°00'	N of 62°20'
20-24	0.3		0.3		0.2	3.2	5.1	4.9
25-29	2.8	1.1	4.6		2.9	82.4	80.5	80.7
30-34	25.6	36.5	13.0	1.7	23.6	4.8	14.2	13.2
35-39	53.7	49.4	52.5	51.7	52.2	7.2	0.1	0.9
40-44	16.1	12.2	27.2	37.9	19.2	1.6	0.1	0.3
45-49	1.4	0.7	2.3	8.6	1.8			
Mean length	36.07	35.66	36.98	39.22	36.35	27.64	27.43	27.48
St.dev.	3.52	3.19	3.92	3.00	3.64	4.84	2.00	2.35
Measured (Catch)	577	271	345	58	1259 (1261)	125	962	1087 (1127)

Table 5. Length distribution (%) of other species/groups in 1986.

Length- group mm	<u>Irisopterus</u> <u>esmarkii</u>	<u>Gonatus</u> sp.	<u>Anarhichas</u> <u>lupus</u>	<u>Chirolophis</u> <u>ascanii</u>	<u>Lumpenus</u> sp.	<u>Ammodytidae</u>	Redfish	<u>Argentina</u> sp.
5-9							1.7	
10-14	7.1	8.4		0.4			67.0	
15-19	64.3	12.7	1.2	1.3			11.3	
20-24	28.6	13.4	11.4	6.2		6.9		
25-29		23.1	29.6	54.2		20.7		
30-34		20.5	17.1	35.2	4.6	48.3		
35-39		14.2	18.6	2.6	14.8	17.2		2.6
40-44		7.8	10.2		44.3	3.4		7.9
45-49			7.5		30.0	0.0		13.2
50-54			3.6		5.3	3.4		2.6
55-59			0.9		1.0			15.8
60-64								
65-69								34.2
70-74								15.8
75-79								2.6
80-84								2.6
85-89								2.6
Number	14	463	336	227	410	29	115	38
Mean length	17.93	25.52	32.97	28.41	43.27	31.86	12.64	63.55
St.dev.	3.45	8.45	8.48	3.81	3.52	5.57	1.72	9.96

† This is not the total number but the number measured.

Table 6. Length distributions (%) of other species/groups in 1987. N- North of 62°N, S- South of 62°N.

Length- group mm	<u>A. lupus</u>		<u>C. ascanii</u>	<u>Lumpenus</u> sp.	Ammodytidae		Cod	Redfish	<u>Argentina</u> sp.	
	S	N	N	N	S	N	S	N	S	N
5-9								21.0		
10-14								8.7		
15-19	1.9							26.3		
20-24	19.8	19.4			3.2			22.8		
25-29	34.9	36.9			12.9			21.1		
30-34	18.9	18.7			22.6					
35-39	12.3	10.3			41.9					
40-44	7.5	7.1			9.7					
45-49	2.8	3.2			9.7					
50-54	1.9	1.6								
55-59		1.6								
60-64		1.2								
Mean										
length	29.90	31.13	28.67	39.75	34.94	46.50	17.20	17.84	74.44	52.25
St.dev.	7.20	7.80	0.58	1.89	5.96	9.04	1.64	6.81	7.26	5.56
Measured	106	251	3	4	31	4	5	57	9	4
(Catch)	(106)	(253)	(3)	(5)	(34)	(8)	(5)	(60)	(9)	(4)

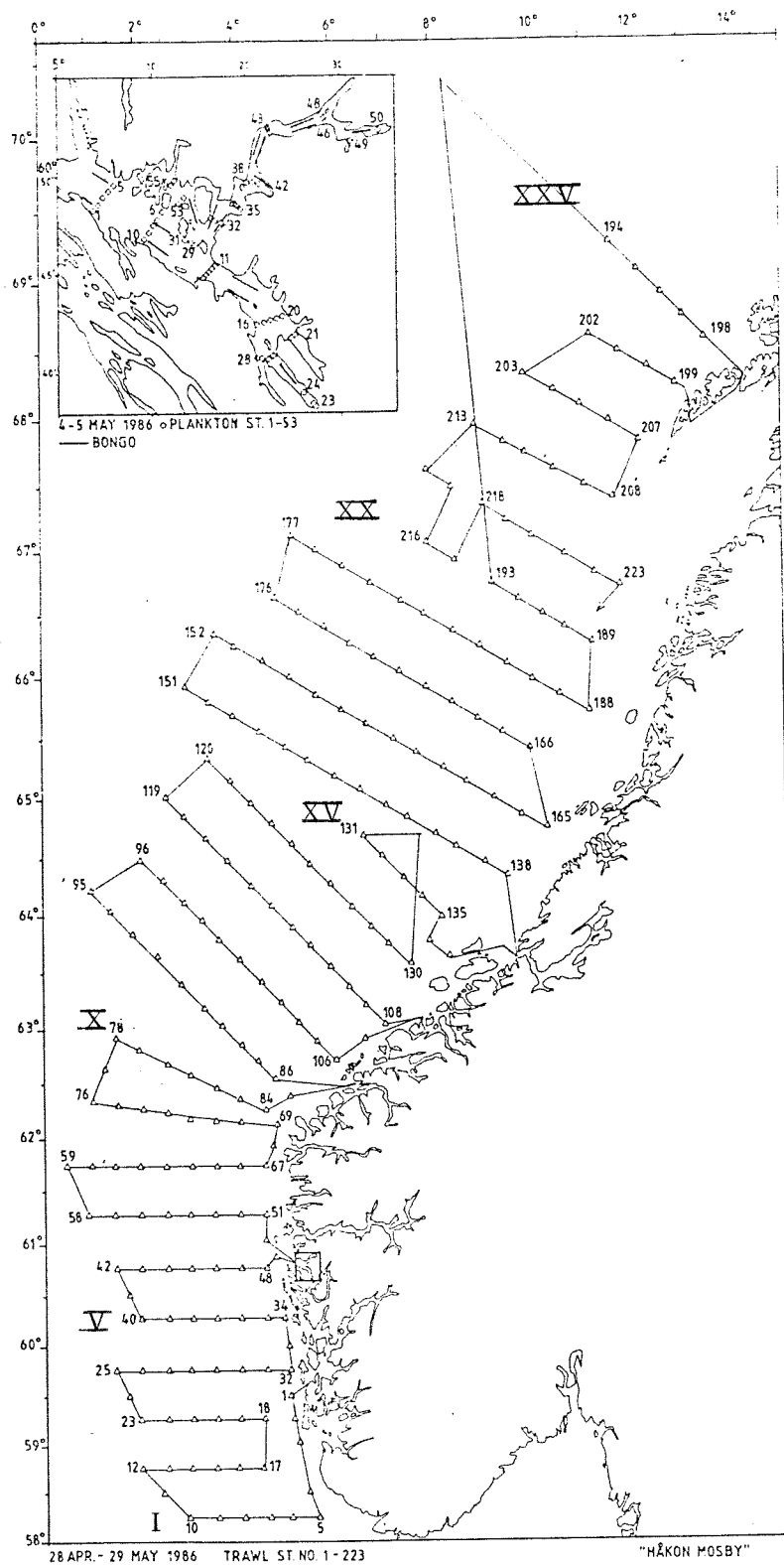


Fig.1. Survey tracks and trawl stations in 1986.

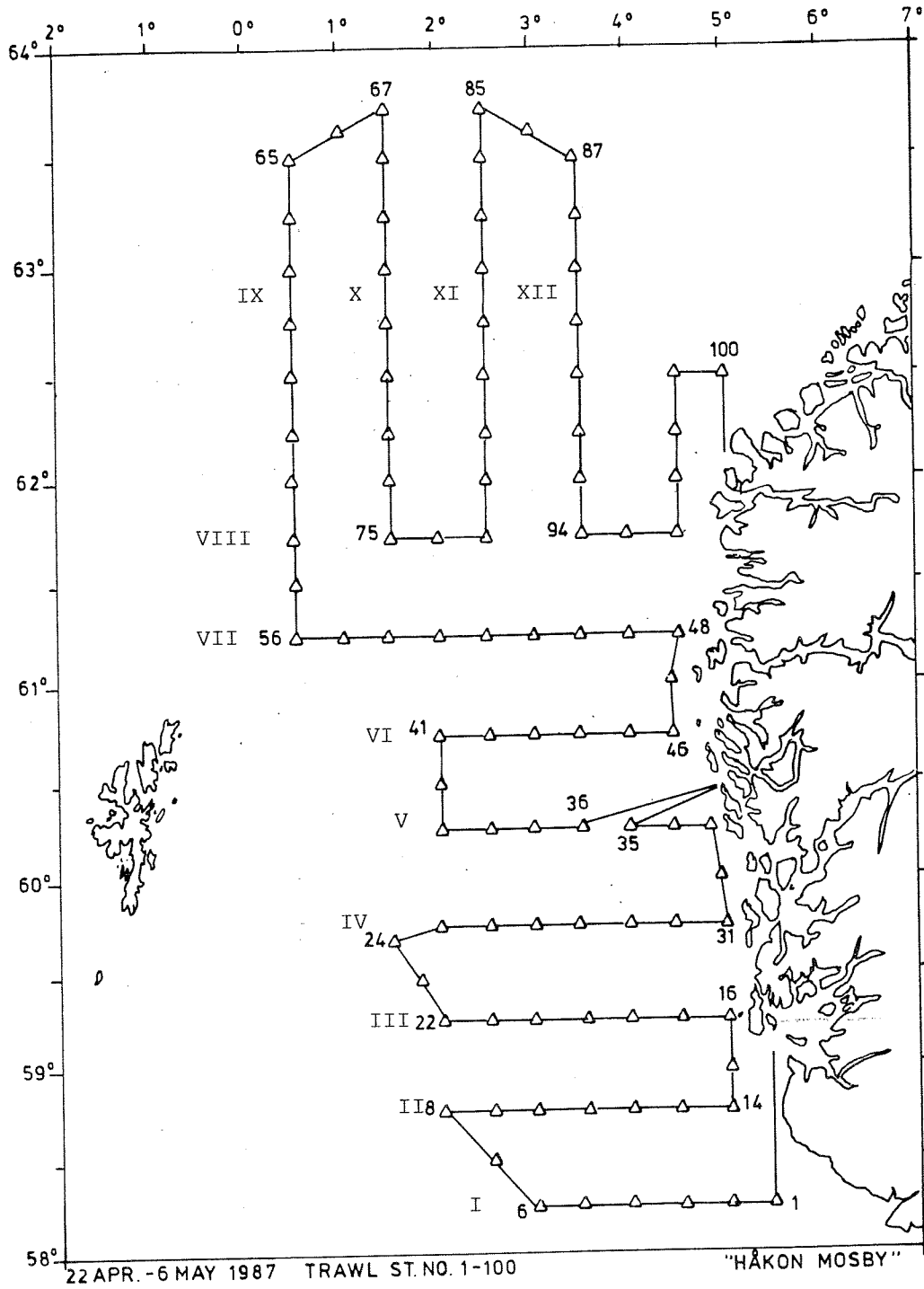


Fig.2. Survey tracks and trawl stations taken by R/V "Håkon Mosby" in 1987.

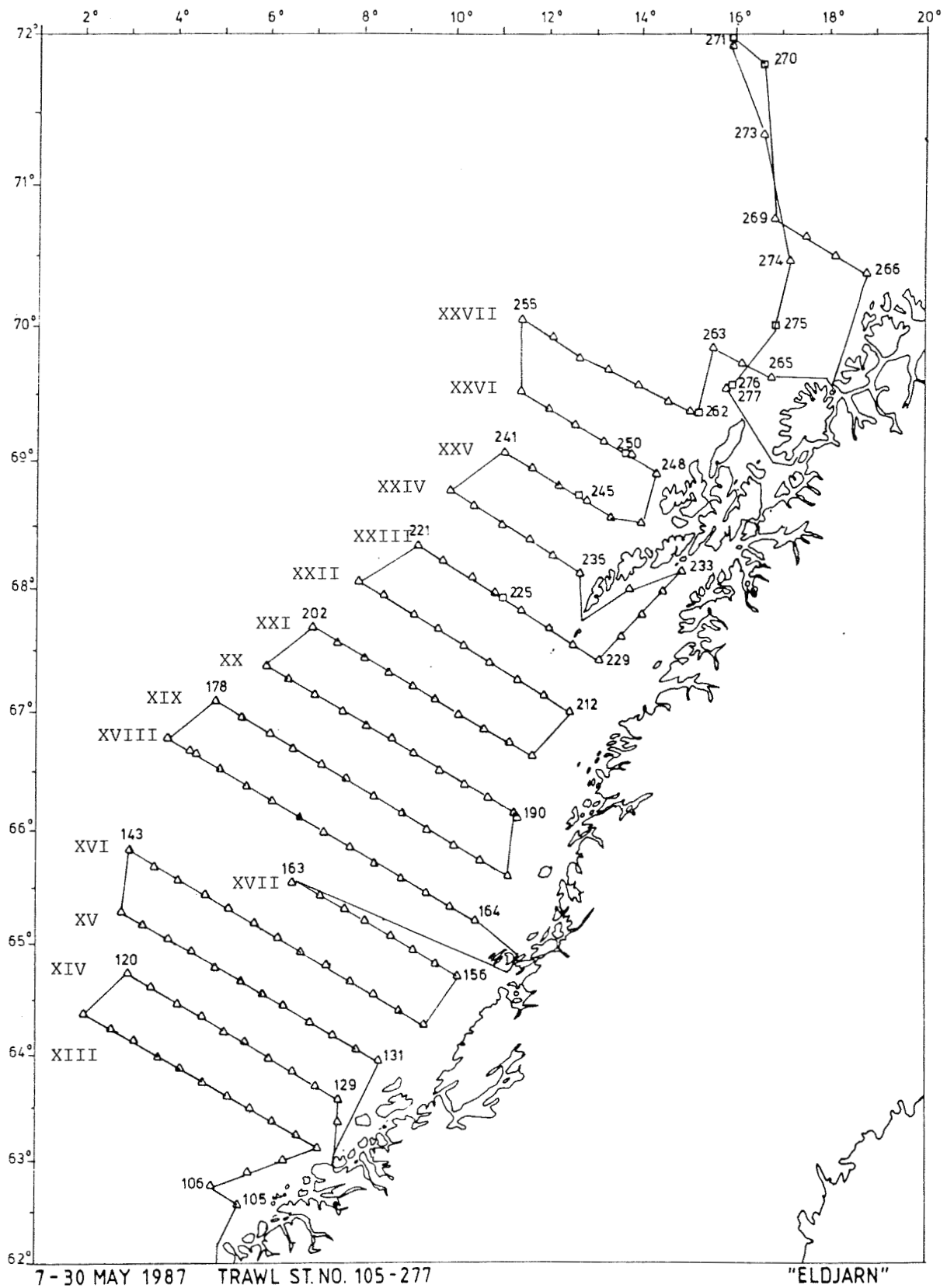


Fig.3. Survey tracks and trawl stations taken by R/V "Eldjarn" in 1987.

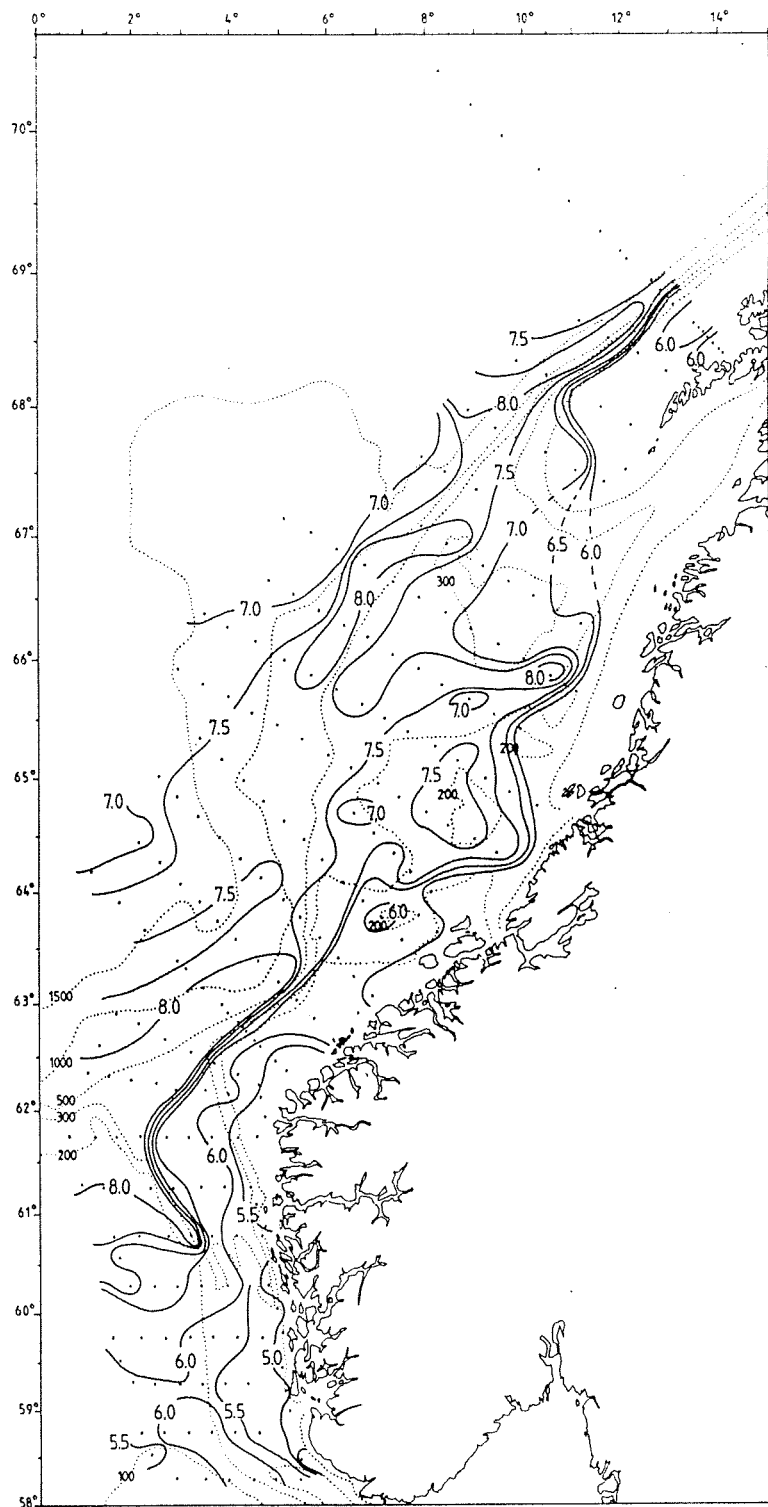


Fig.4. Temperature in 25 m in 1986.

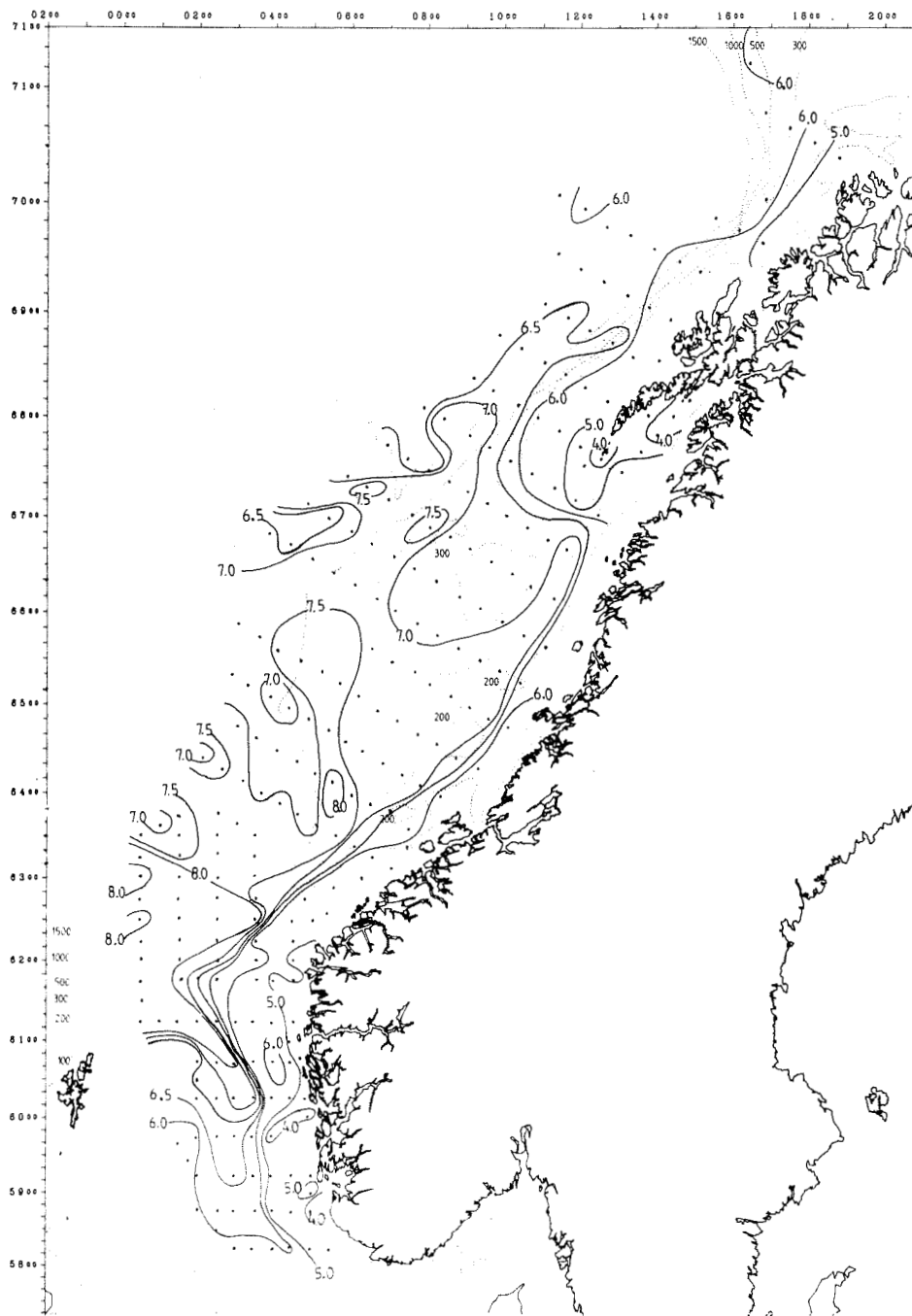


Fig.5. Temperature in 25 m in 1987.

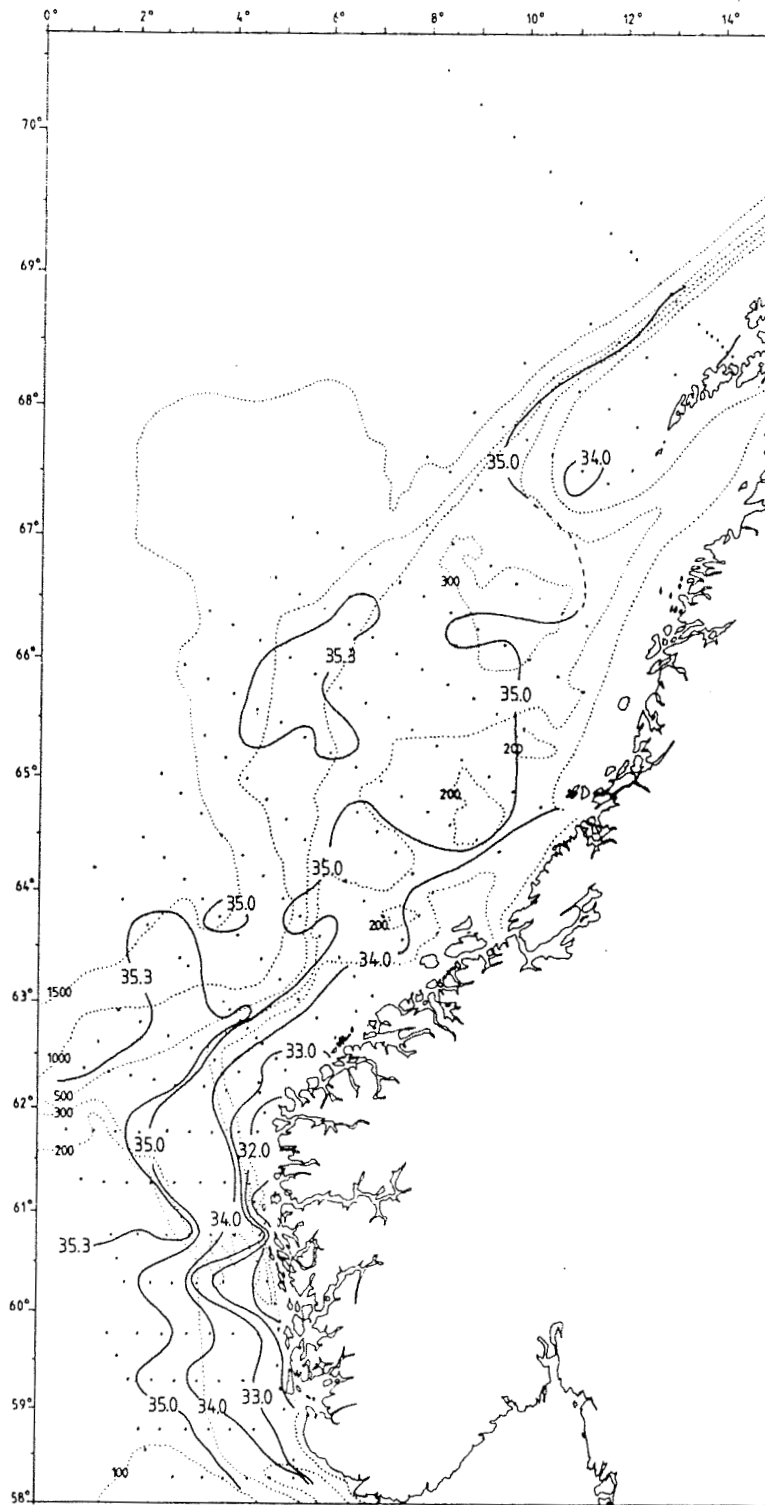


Fig.6. Salinity in 25 m in 1986.

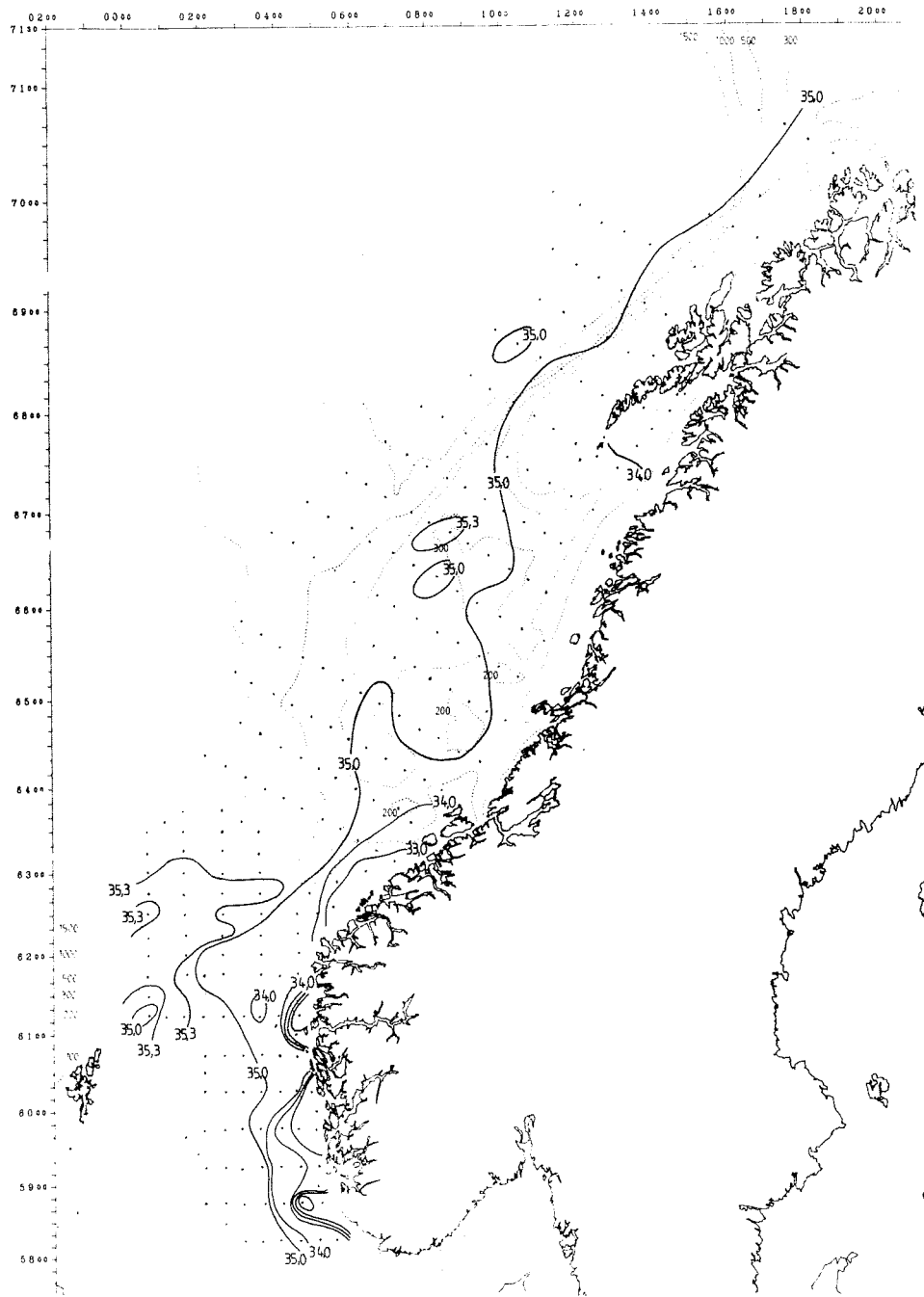
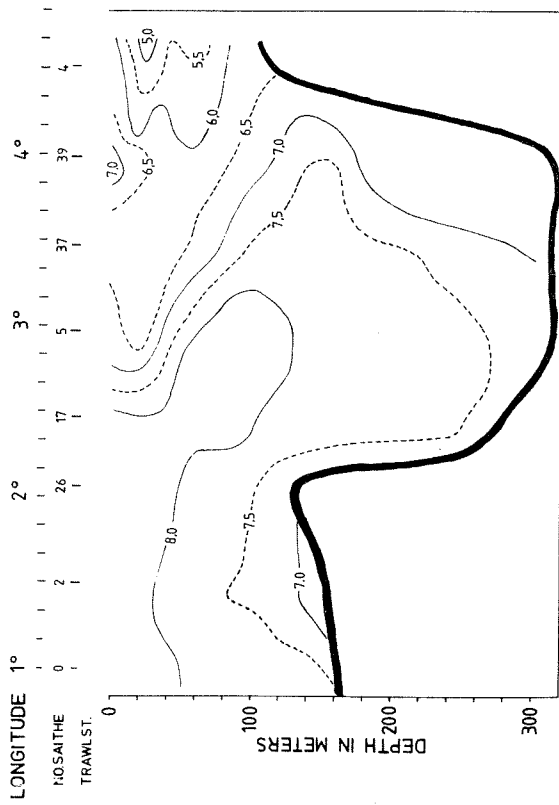
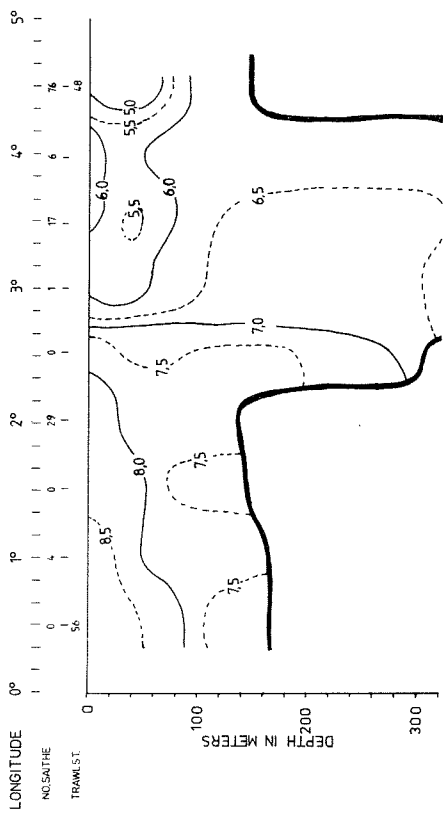


Fig.7. Salinity in 25 m in 1987.

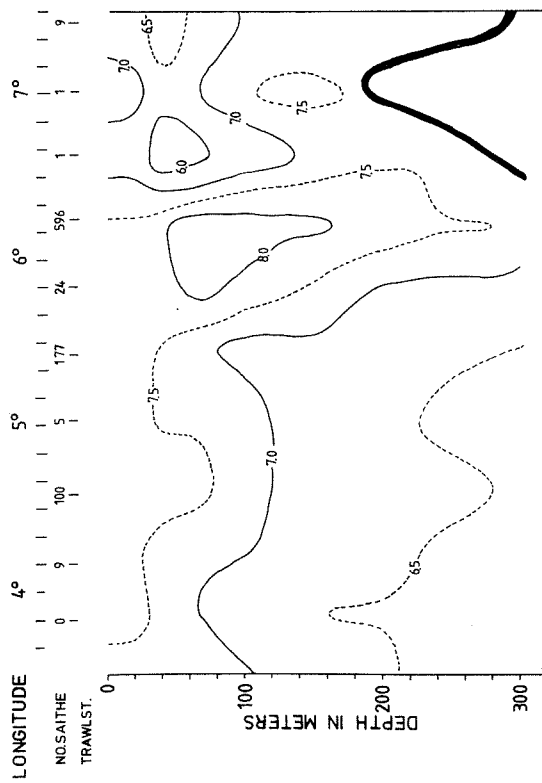
Survey Track VII 1986



Survey Track VII 1987



Survey Track XIV 1986



Survey Track XV 1987

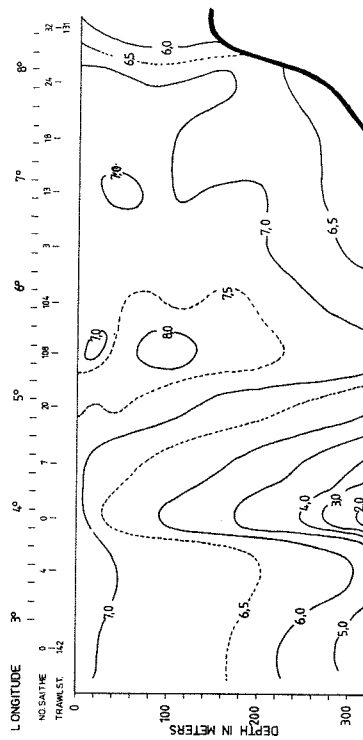


Fig. 8. Hydrographical sections from two different survey Tracks in 1986 and 1987. Station number and the corresponding catch of saithe are recorded at the top of the figures.

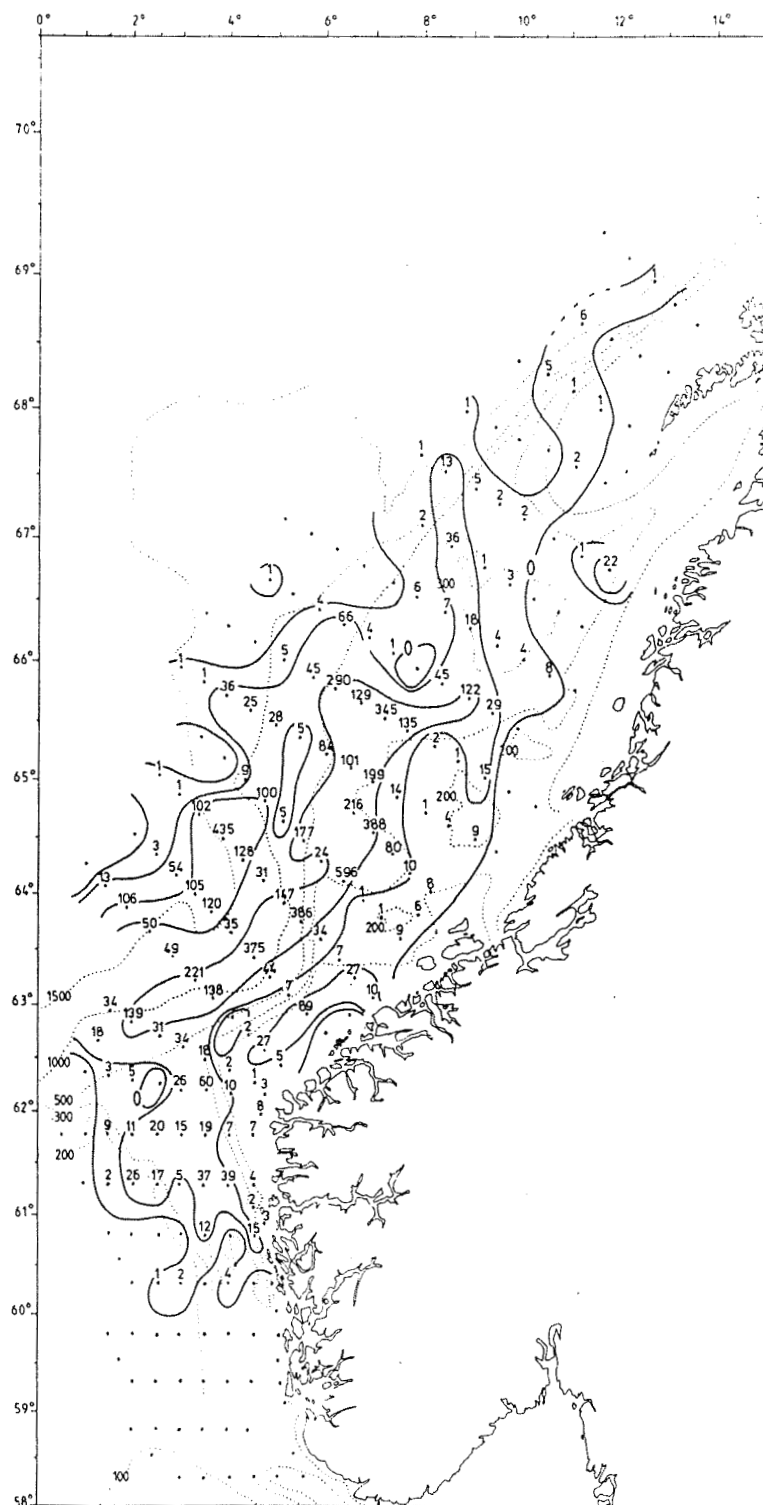


Fig.9. SAIITHE 1986. Distribution of postlarvae. Numbers per 1.5 nautical miles. Stations without catch are marked with dots.

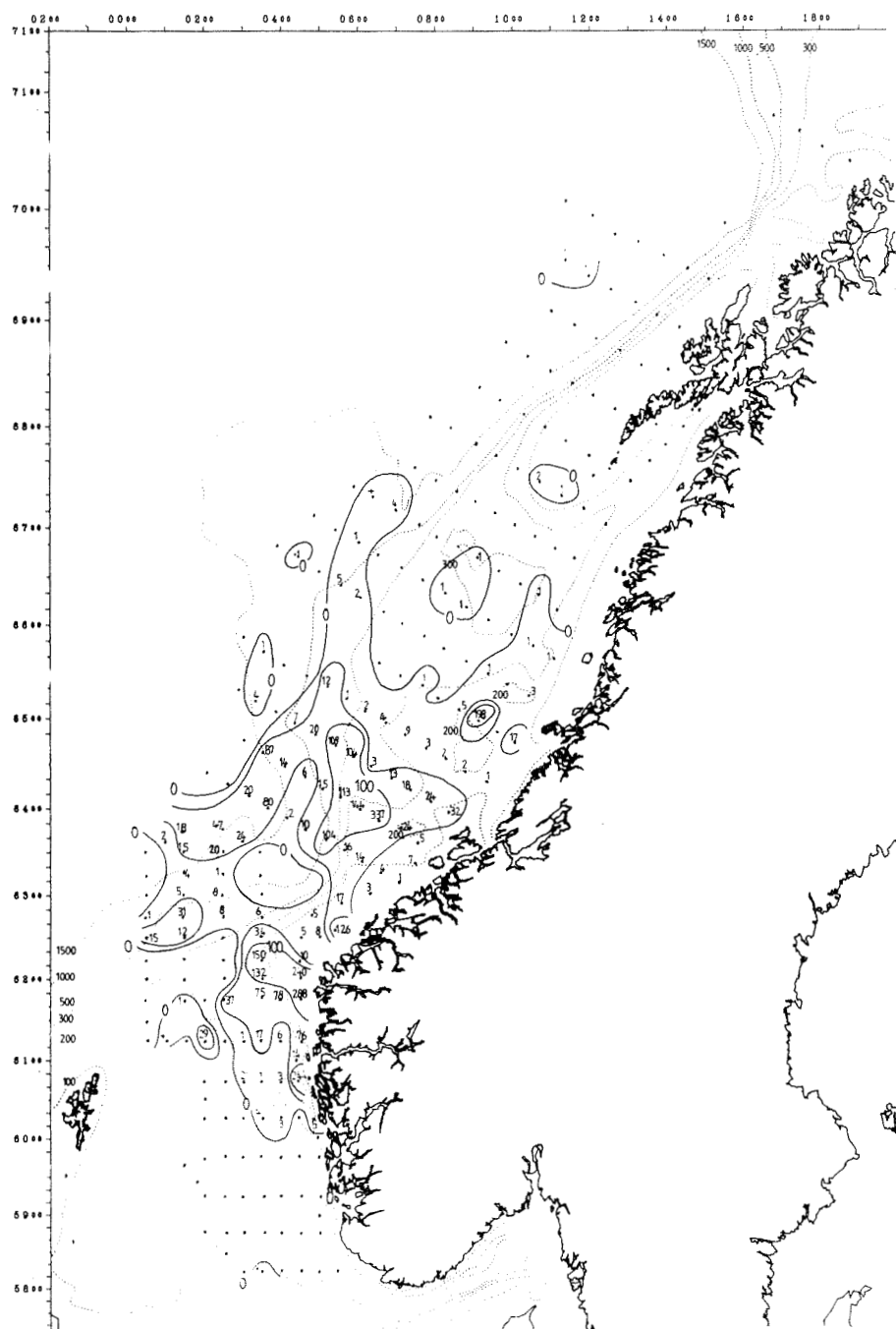


Fig.10. SAITHE 1987. Distribution of postlarvae. Numbers per 1.5 nautical miles.

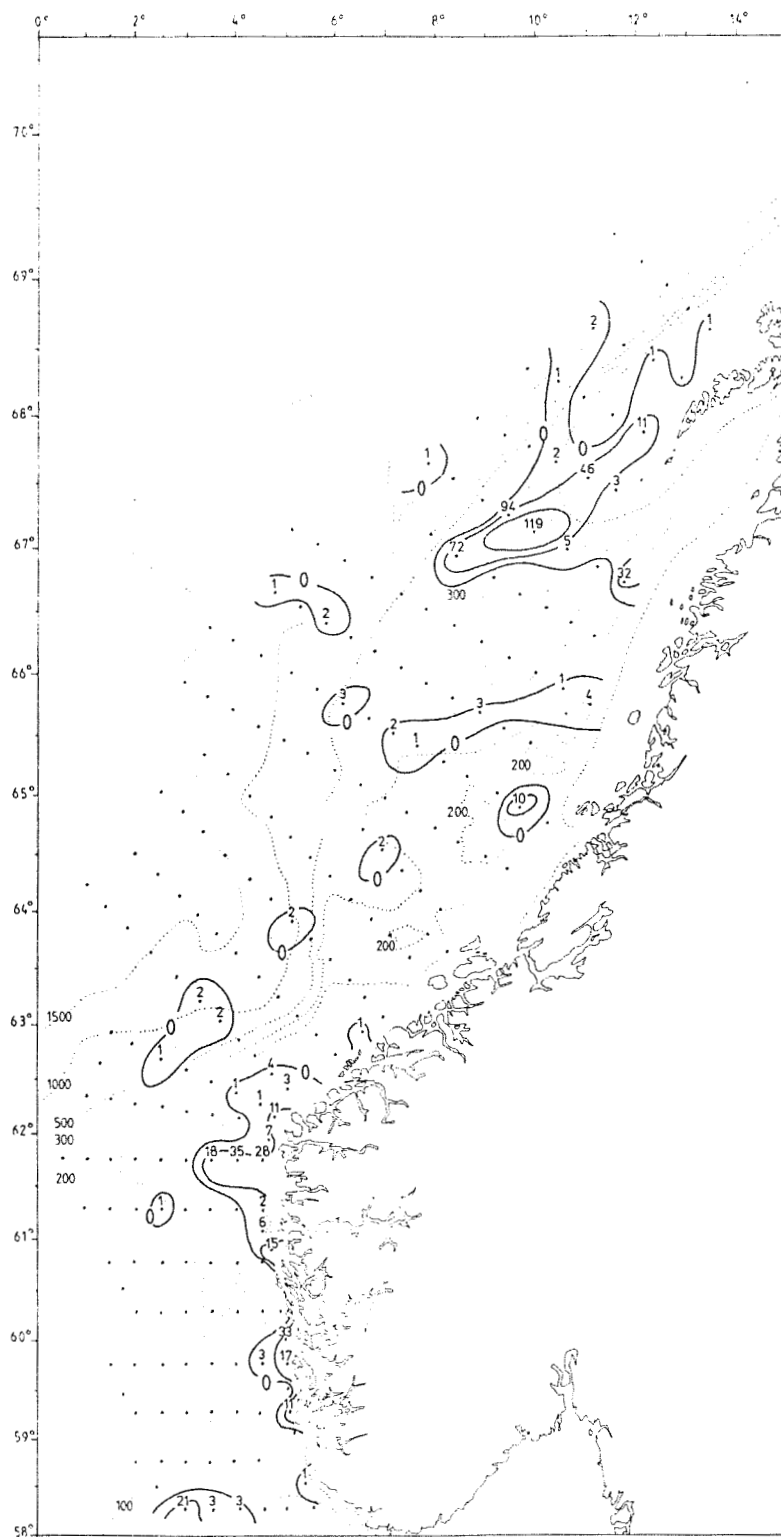


Fig.11. HERRING 1986. Distribution of larvae. Numbers per 1.5 nautical miles.

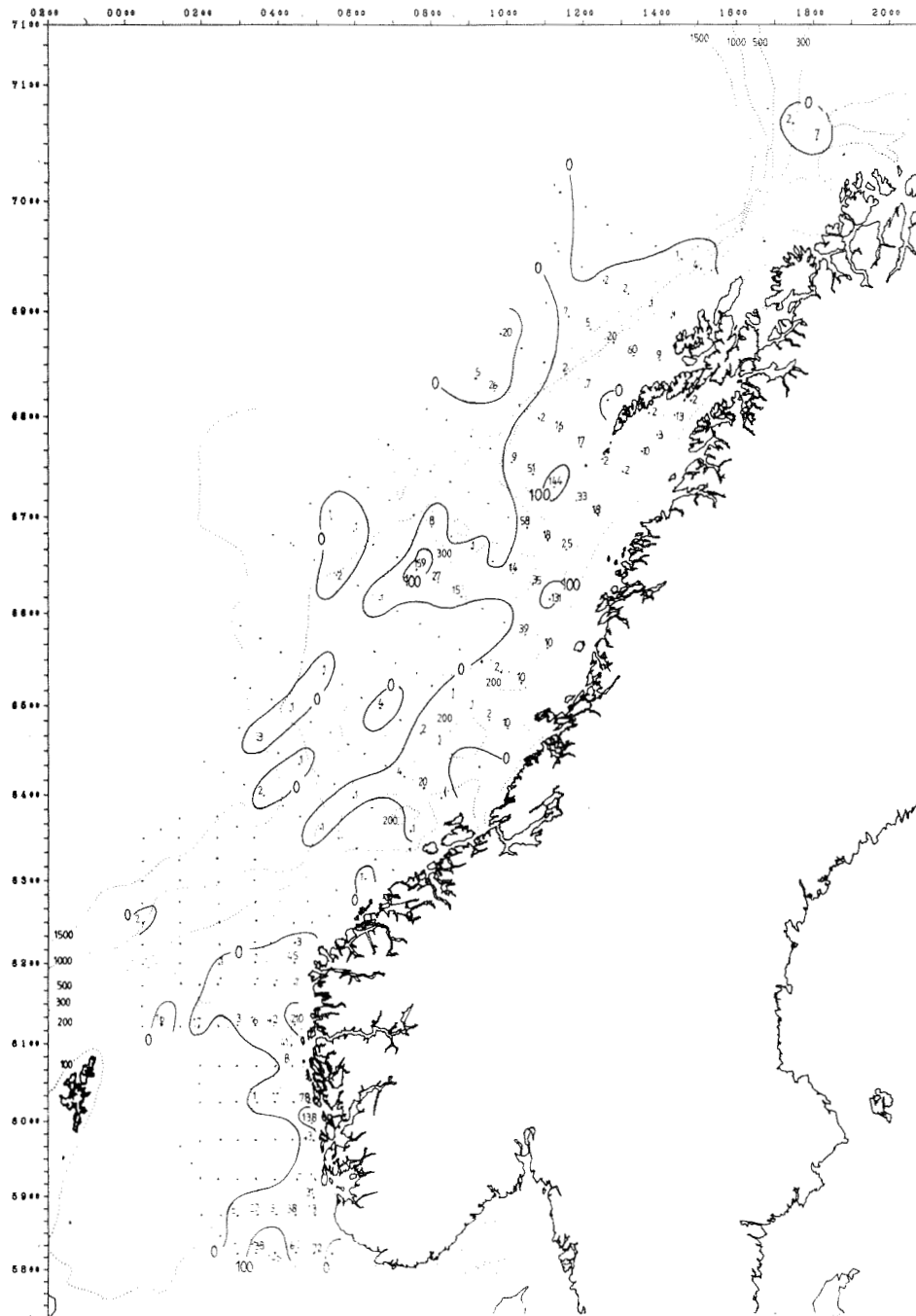


Fig.12. HERRING 1987. Distribution of larvae. Numbers per 1.5 nautical miles.

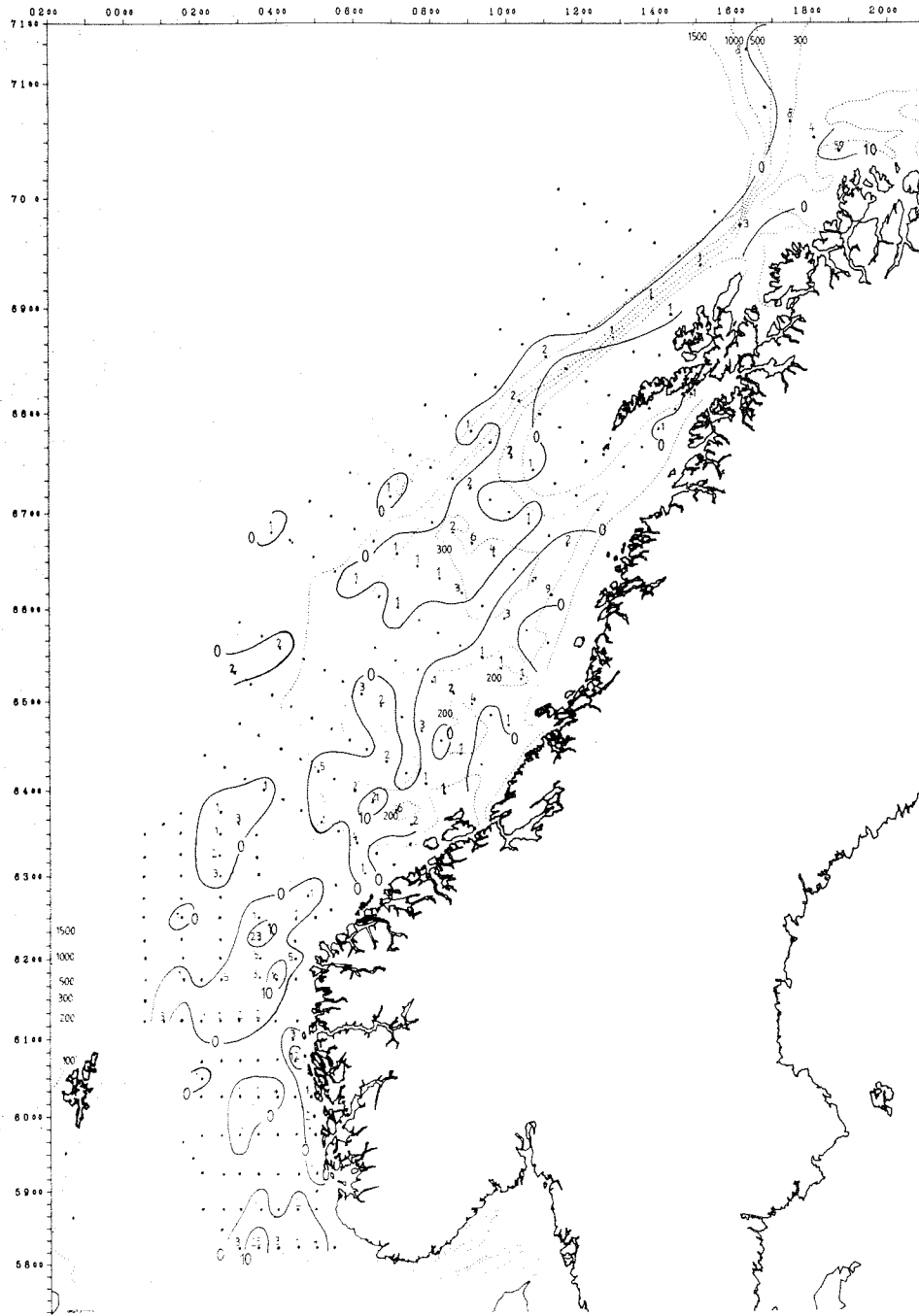


Fig.13. CATFISH 1986. Distribution of postlarvae. Numbers per 1.5 nautical miles.

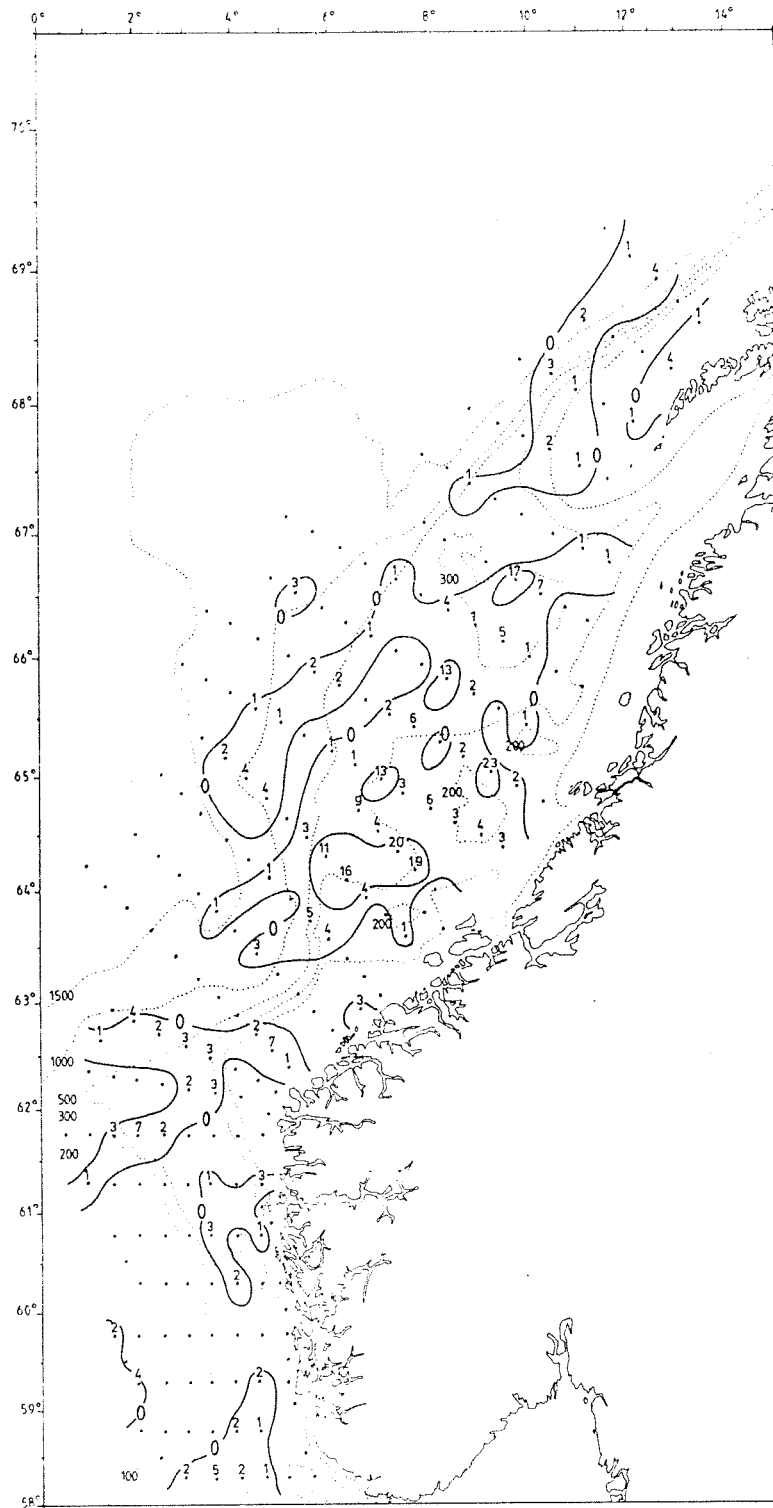


Fig.14. CATFISH 1987. Distribution of postlarvae. Numbers per 1.5 nautical miles.

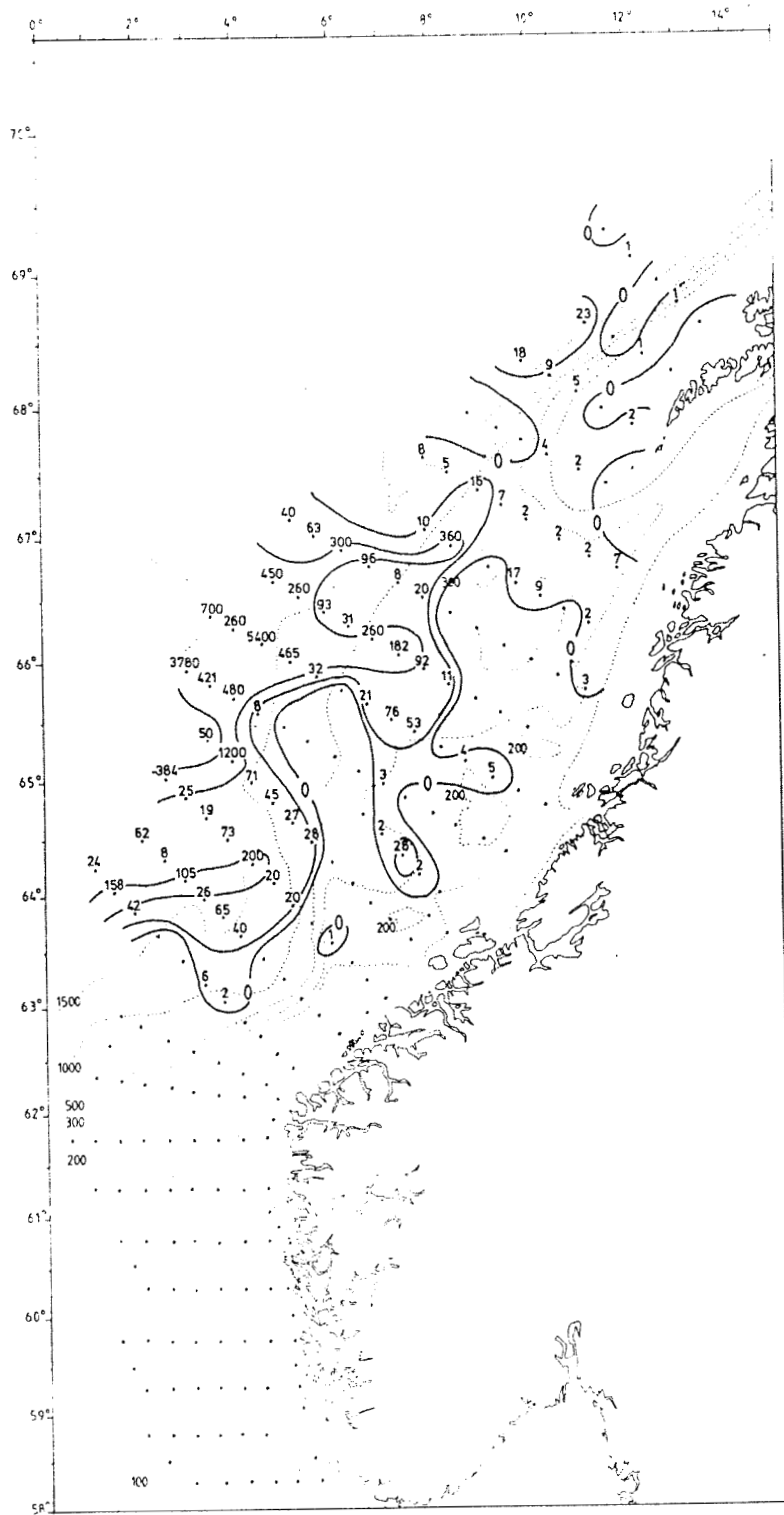


Fig.15. Distribution of the squid *Gonatus fabricii* in 1986. Numbers per 1.5. nautical miles.

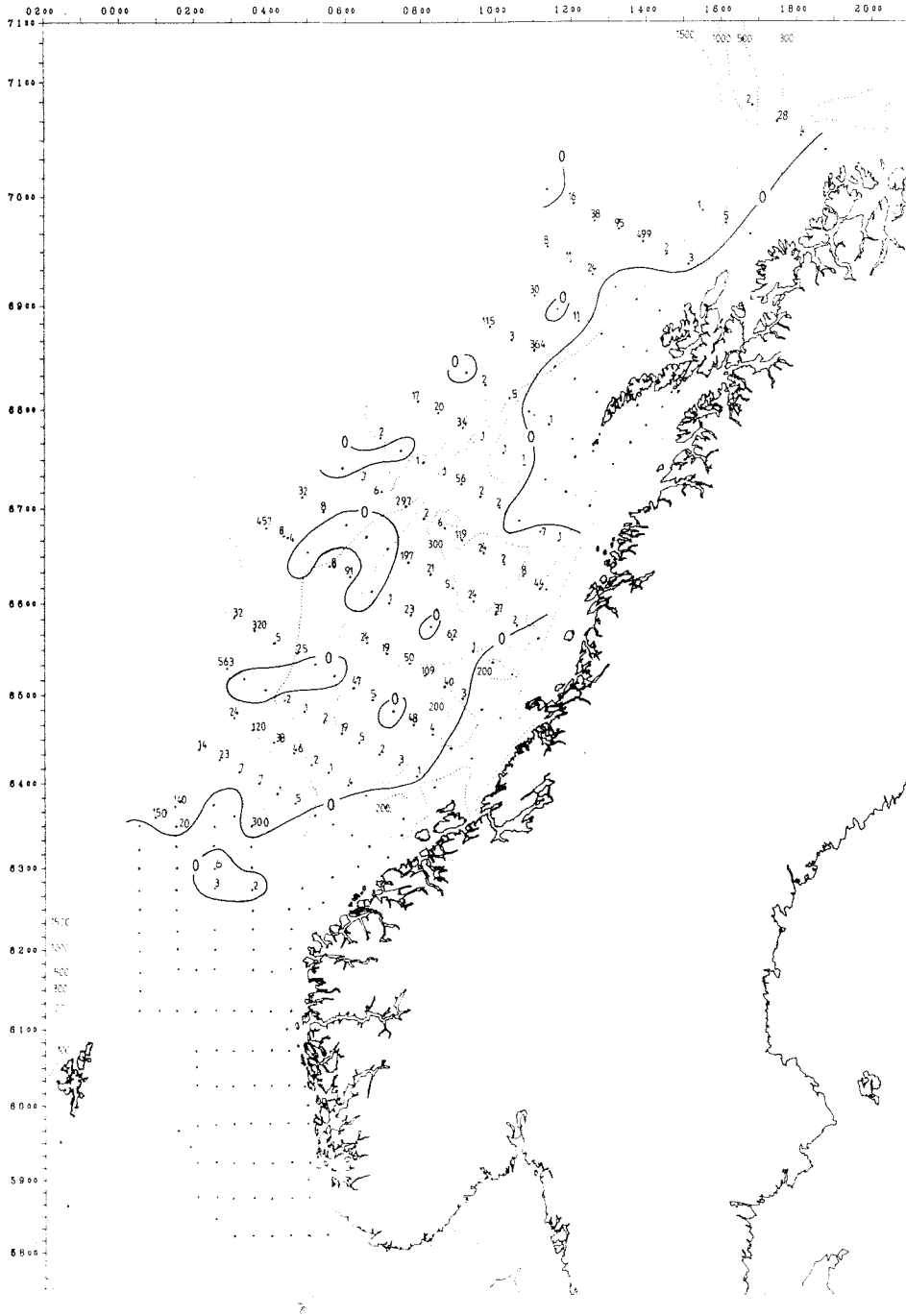


Fig.16. Distribution of the squid *Gonatus fabricii* in 1987. Numbers per 1.5 nautical miles.

Denne rapportserien har begrenset distribusjon. Opplysninger om programmet og rapportene kan rettes til

Programledelsen for HELP
Fiskeridirektoratets Havforskningsinstitutt
Postboks 1870
5024 Bergen

Oversikt over tidligere utkomne rapporter.

- 1987
- Nr. 1. P.Solemdal og P.Bratland: Klekkeforløp for lodde i Varangerfjorden 1986.
 - Nr. 2. T.Haug og S.Sundby: Kveitelarver og miljø. Undersøkelser på gytefeltene ved Sørøya.
 - Nr. 3. H.Bjørke, K.Hansen og S.Sundby: Postlarveundersøkelser i 1986.
 - Nr. 4. H.Bjørke, K.Hansen og W.Melle: Sildeklekking og seigyting på Møre 1986.
 - Nr. 5. H.Bjørke and S.Sundby: Abundance indices for the Arcto-Norwegian cod in 1979-1986 based on larvae investigations.
 - Nr. 6. P.Fossum: Sult under larvestadiet - en viktig rekrutteringsmekanisme ?
 - Nr. 7. P.Fossum og S.Tuene: Loddelarveundersøkelsene 1987.
 - Nr. 8. P.Fossum, H.Bjørke and R.Sætre: Studies on herring larvae off western Norway in 1986.