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INVESTIGATIONS ON BLUE WHITING IN THE AREA WEST OF THE BRITISH
ISLES, SPRING 1995

by

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ABSTRACT

In March/April 1995 the fifth Norwegian-Russian joint acoustic survey on the blue whiting spawning stock was carried out. The shelf edge area to the west of The British Isles was covered by two vessels in a general south-north direction. A ship-to-ship calibration of the acoustic instruments justified a 1:1 relationship between the vessels when combining the acoustic data.

The biomass of the observed blue whiting stock within the area surveyed was estimated to 6.9 mill. tonnes. Of this, the spawning stock constituted 6.1 mill. tonnes. The 1994 year class was found to be the richest one contributing with 27% in numbers.

As the survey also was part of the SEFOS programme, plankton stations were carried out throughout the whole area for studies of blue whiting eggs and larvae.

The hydrographic situation in the surveyed area was similar to the one observed in 1993.

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INTRODUCTION

The fifth successive joint survey on the blue whiting spawning stock was carried out during the period 22 March-25 April 1995, by research vessels from IMR, Bergen and PINRO, Murmansk. The main objectives of these surveys are to obtain acoustic estimates of the blue whiting spawning stock size and to record the distribution and migration pattern in relation to the hydrological situation, as well as record the structure and composition of the stock.

For the years 1990-1993 except 1994, both countries carried out these investigations together (Monstad and Belikov, 1990, 1991, 1993; Monstad et al., 1992). In 1994 the survey was worked by Norway alone (Monstad et al., 1994).

The Norwegian survey in 1995 was also included in the EU-project SEFOS (Shelf Edge Fisheries and Oceanographic Studies) and personnel from Plymouth Marine Laboratory, England, participated onboard the R.V. "Johan Hjort" for studies of blue whiting eggs and larvae.

MATERIAL AND METHODS

One research vessel from each country participated within the following time period and geographical area (latitudes):

Russia: R.V. "Fridtjof Nansen", 22.03-24.04, 48°30'-62°00'N.
Norway: R.V. "Johan Hjort", 27.03-24.04, 50°30'-62°00'N.

Both vessels operated Simrad EK-500 echo sounders of 38 KHz frequency with settings as given in Appendix I. The instruments were precalibrated by use of a copper sphere (Foote, 1981) and a ship-to-ship calibration was also conducted. It took place along the shelf edge northeast of the Hebrides during daytime the 15 April, over a distance of 46 nautical miles. After comparison of the recordings from 100-300m and calculation of the values, it was concluded that the relationship between the two vessels' integrator values obtained during spring 1995 should be 1:1.

The shelf edge area west of the British Isles was surveyed from 48°30'N northwards to 62°00'N, including the Porcupine bank (Figs. 1 and 2a-b). In addition to daily radio communication with exchange of cruise informations, the two vessels also met twice for exchange of the data obtained and preliminary results ready prepared so far.

Pelagic as well as bottom trawls were used for identifying the echo traces and collecting biological samples. The Norwegian vessel used a Rock-hopper bottom trawl of 18 x 4 m opening and a pelagic trawl with 25 m vertical opening, both having inner-net in cod end of 11 mm mesh size. Russia used a pelagic trawl with 45 m vertical opening and inner-net of 16 mm mesh size.

For the assessment of abundance and biomass the area surveyed

was treated on maps as 5 separate subareas. These again were divided into rectangles of 0.5 deg. latitude x 1 deg. longitude size. The acoustic method used for the stock size calculation was the same as used for the previous blue whiting surveys, described in eg Monstad (1986) and Belikov et al. (1990).

The target strength value

$$TS = 21.8 \log L - 72.8 \text{ dB}$$

was used, where L is fish length. For a 30 cm fish (cod) this equals the length dependent density coefficient of

$$C_F = 1.488 \times 10^6 \times L^{-2.18} .$$

Separate estimates of blue whiting abundance and biomass were made by either country and combined on subarea basis.

For investigation of blue whiting eggs and larvae, R.V. "Johan Hjort" carried out plankton sampling at a number of 57 stations by means of double oblique tows with a 60 cm diameter bongo net (180 μ m mesh size) at 2.5 knots towing speed (Fig. 3). Maximum depth sampled was to 400 m but with most hauls sampling to lesser depths around 150-200m. Preservation was in 3.5% buffered formaldehyde solution with the sample from one cod-end being subsequently analysed for eggs and larvae.

The hydrological situation was observed by use of CTD-sonde at a net of stations, including 8 standard SEFOS-sections. Two of these were worked in Norwegian waters during the last period of the cruise, i.e. outside the blue whiting spawning area.

At the very end of the survey, the 24 April, the two vessels met for exchange of data and separate results.

RESULTS

Distribution

The distribution pattern of blue witing was found to be alike the ones obtained in earlier years during same periods. Concentrations were recorded along the continental slope from south of Ireland at latitude 48°30'N, to the Faroe-Shetland area at latitude 60°00'N. Fig. 4 shows both the Russian and the Norwegian observed distributions of the blue whiting stock. The Russian vessel operated in the southern Porcupine bank area 3-4 days before the Norwegian vessel, but in rest of the surveyed area the opposite situation was the case.

The densest concentrations were recorded the 5-6 April near the slope of the northern part of the Porcupine bank, between the latitudes 54°00'-54°30'N and the longitudes 12°00'-13°00'W. Approximately a week later these heavy recordings had moved northwards along the slope to between the latitudes 55°00' and 56°30'N.

To a great part the blue whiting appeared in a 25-50m thick

layer of varying density. Off the slope this layer was mainly recorded between 450-550m depth, but sometimes also as deep as 750m. Near the slope it follow the bottom up to 300-200m depth where the recordings ended.

Stock size

The countries separate estimates of the total biomass and abundance, as well as the mean length and weight at age, are given in Tables 1 and 2. The combined results of the acoustic assessment for each subarea and total, are given in Table 3. The total biomass estimated was 6.9 mill. tonnes with the abundance of 67.4×10^9 individuals. Of this 6.1 mill. tonnes representing 45.5×10^9 individuals belonged to the spawning stock. The biomass estimates on a rectangular basis are shown in Fig. 5 for Russia and in Fig. 6 for Norway.

Compared to the latest years, the weather conditions were very favorable, and a rather "good" coverage of the spawning stock was obtained. Due to the fact that the period of pre- and postspawning migration is longer than the survey period, acoustic measurements of the stock in the spawning area must be considered as underestimates. The 1995 result of 6.1 mill. tonnes, however, can be regarded as a lesser underestimate than obtained for many years.

In the text-table below the acoustic estimates of the spawning stock since 1991, are shown. Except for 1994, when Norway surveyed the stock alone, these are the combined Russian-Norwegian results.

	Abundance N x 10 ⁹	Biomass 1000 t
1991	35.2	4.4
1992	36.9	4.3
1993	39.3	4.9
1994	26.8	4.1
1995	45.5	6.1

The difference of 2 mill. tonnes from 1994, is partly due to the significant underestimate that year when the weather conditions were extremely bad (Monstad et al., 1994) and partly due to increased recruitment to the stock.

Stock composition

The total age and length composition of the blue whiting stock, as observed respectively by Norway and Russia and their combined result, are shown on Fig. 7. By numbers one year old blue whiting dominated, especially in the Faroe-Shetland area, but was absent off the Hebrides. Totally, the yearclass (1994) made up almost 30% of the stock, which is the highest contribution recorded for one year olds during similar surveys in the area. Among the adults, the 1992 yearclass was most

numerous, but the 1989 yearclass, which has predominated the spawning stock since 1991, still contributed significantly.

Hydrography

A meteorological situation in the studied period was caused by anticyclonic atmosphere processes and winds of SW- and W directions with predominating speeds of 6-8 m/s. Atmosphere pressure changed within 1014-1038 mb range. Synoptic situation during the survey was generally favorable for works.

Horizontal distributions of temperature at sea surface, 200, 400 and 600m depths are presented in Figs. 8-11. This year, maximum temperatures (11.1° C) were noted in the southern part of the surveyed area where they were higher in the 0-200m layer than in 1994. At horizons of 400 and 600m in the south-eastern part of the area, the temperature was higher than last year. Temperature distribution in the sea surface of the whole area was analogous to that of 1993.

On the section of 53°N in the 0-200m-layer (Fig. 12), the temperature was lower than mean temperature in March-April of 1983-1991. Characters of distribution and temperature values were analogous to that of 1993. Salinity values within the section ranged from 35.1-35.3 ‰ at 1000m depth to 35.3-35.4 ‰ at sea surface (Fig. 13).

The Faroe-Shetland section (Fig. 14) was made the same way and revealed a very expressed temperature stratification: temperature changed from 8° to 0° C from surface to 500m. Deeper, the temperature had negative values that are typical for deep waters of the Norwegian Sea. In the 0-200m layer of coastal part, where a channel line of the North-Atlantic Current is located, water temperature increased from 5-6° to 8° C. Water temperature in 0-500m and 200-500m layers turned out to be 1.4° and 1.8° C, correspondingly lower than for 1987-1993. The salinity in the section varied from 34.9 ‰ at bottom to 35.1-35.2 ‰ at sea surface (Fig. 15).

Eggs and larvae

Of the eggs, those of blue whiting comprised 40% of all eggs taken, with eggs of mackerel being present at similar levels overall (37%). However, the abundance of mackerel eggs was biased by being particularly numerous on a few stations over Porcupine Bank. Excluding these stations the percentages occurrence of eggs was 63% for blue whiting and 12% for mackerel. Of the larvae, those of blue whiting were overwhelmingly the most abundant (89% of all larvae taken) with larvae of other species being present at levels between 1% and 2%.

Blue whiting eggs were numerous throughout the sampled area except to the north of Scotland where spawning may not have commenced (Fig. 16). Since the sampled depth did not include the full depth range of eggs (Coombs et al., 1981) it is probable that the concentrations as plotted are under-estimates.

Larvae of blue whiting were taken mostly at the same stations as

the eggs, but with relative higher concentrations around Porcupine, indicating that spawning had taken place for a longer period of time in that area than to the west of Scotland (Fig. 17). Under-sampling of larvae was probably of less significance than for the eggs.

The blue whiting larvae ranged from 2.0-7.5mm in length (Fig.18) with a mean of 3.75mm. Larvae larger than 4.5mm predominated over and to the south of Porcupine Bank, indicating that spawning had been in progress for at least a few weeks in those areas. West of Scotland the blue whiting larvae were predominantly smaller than 4.0mm in length.

REFERENCES

- Belikov, S.V., Mahon, D.M. and Molloy, J. 1990. Results of blue whiting investigations in the northeast Atlantic in spring 1990. ICES, Doc. C.M. 1990/H:38.
- Coombs, S.H., Pipe, R.K. and Mitchell C.E. 1981. The vertical distribution of eggs and larvae of blue whiting (*Micromesistius poutassou*) and mackerel (*Scomber scombrus*) in the eastern North Atlantic and North Sea. Rapp.P.-v.Reun. Cons. int. Explor. Mer., 178, 188-195.
- Foote, K.G., 1981. Echo sounder measurements of back-scattering cross sections of elastic spheres. Fisken og Havet, Ser. B, 1981 (6). Institute of Marine Research, Bergen.
- Monstad, T., 1986. Report of the Norwegian surveys on blue whiting during spring 1986. ICES, Doc. C.M. 1986/H:53.
- Monstad, T. and Belikov, S.V. 1990. Preliminary report of joint Norwegian/USSR acoustic survey of the blue whiting spawning stock west of the British Isles, spring 1990. Working paper for the Blue Whiting Assessment Working Group meeting, September 1990.
- Monstad, T. and Belikov, S.V. 1991. Report of the joint Norwegian-Soviet acoustic survey on blue whiting, spring 1991. ICES, Doc. C.M. 1991/H:4.
- Monstad, T., Borjkin, I. and Ermolchev, V., 1992. Report of the joint Norwegian-Russian acoustic survey on blue whiting, spring 1992. ICES, Doc. C.M. 1992/H:6.
- Monstad, T. and Belikov, S.V. 1993. Report of the joint Norwegian-Russian acoustic survey on blue whiting, spring 1993. ICES, Doc. C.M. 1993/H:10.
- Monstad, T., Belikov, S.V. and Coombs, S.H. 1994. Investigations on blue whiting in the area west of the British Isles, spring 1994. ICES, Doc. C.M. 1994/H:12.

APPENDIX I

Acoustic equipment and settings of the instruments:

	Johan Hjort	Fridtjof Nansen
Echo sounder:	Simrad EK-500	Simrad EK-500
Frequency:	38 kHz	38 kHz
Transducer:	ES-38B-SK	ES-38
Absorption:	10 dB/km	10 dB/km
Pulse length:	Medium (1 ms)	Medium (1 ms)
Band width:	Wide (3.8 kHz)	Wide (3.8 kHz)
Max power:	2000 W	2400 W
Angle sensitivity:	21.9 dB	21.9 dB
2-way beam angle:	-21.0 dB	-21.1 dB
Sv Transducer gain:	28.0 dB	23.4 dB
TS Transducer gain:	27.7 dB	23.4 dB
3 dB Beam width:	7.2 dg	7.3 dg
Range:	1000m	500m

Table 1. Abundance estimate of blue whiting in the northern stock, i.e. 48°30'-62°00'N, west of the British Isles, March/April 1995. R.V. "Fridtjof Nansen", Russia

Length cm	Age											number	biomass	weight	C.F.
	1	2	3	4	5	6	7	8	9	10	11+	10 ⁶	10 ³	g	
15	180.2											180.2	3.6	20.0	5.9
16	2189.5											2189.5	53.1	24.3	5.9
17	5363.7											5363.7	155.0	28.9	5.9
18	4684.5	344.5										5029.0	163.3	32.5	5.6
19	3720.3	117.5										3837.8	145.2	37.8	5.5
20	2853.9	229.0										3082.9	146.0	47.4	5.9
21	1010.1	332.6										1342.7	69.8	52.0	5.6
22	513.8	516.9										1030.7	56.9	55.2	5.2
23	244.0	476.4										720.4	48.2	67.0	5.5
24	69.8	831.4	220.6	103.5								1225.2	97.5	79.6	5.8
25		2117.1	540.2	107.2								2764.5	238.1	86.1	5.5
26		2234.1	1780.6	209.5								4224.2	405.2	95.9	5.5
27		1764.4	2440.4	978.8								5183.6	550.9	106.3	5.4
28		460.1	2975.9	1183.9	428.0							5047.9	574.9	113.9	5.2
29		47.7	2621.4	1332.4	859.5							4861.0	607.5	125.0	5.1
30		20.4	1191.2	2424.1	1067.7	52.0						4755.3	659.8	138.8	5.1
31			454.8	1390.0	1403.4	282.5	98.9	6.7				3636.3	545.0	149.9	5.0
32			346.9	1209.3	2338.9	572.7	41.1	8.3				4517.3	743.2	164.5	5.0
33			76.1	775.0	1189.5	649.9	149.3	35.9				2875.6	515.5	179.3	5.0
34			8.8	262.2	727.5	356.7	137.2	46.9				1539.2	301.5	195.9	5.0
35				52.2	643.7	247.3	193.0	75.3				1211.5	259.2	213.9	5.0
36					117.5	288.6	101.6	88.6				596.2	133.9	224.6	4.8
37					127.4	127.4	131.4	37.5	46.8	14.3		484.8	128.0	264.0	5.2
38					39.0	45.5	97.6	43.1	42.6			267.8	72.2	269.6	4.9
39						28.0	73.1	13.4	15.8			130.3	41.7	320.0	5.4
40							64.8	38.5	17.3			120.7	40.8	338.3	5.3
41							4.5				123.7	128.3	43.3	337.2	4.9
42															
43								8.6	8.6			17.3	6.9	398.0	5.0
44								5.4				5.4	3.4	620.1	7.3
45															
Total	20829.8	9492.0	12656.8	10028.0	8942.1	2650.6	1092.5	408.2	131.1	14.3	123.7	66368.9			
Length	18.3	24.8	28.0	29.9	31.8	33.5	35.3	36.2	38.4	37.0	41.0	25.7			
Biomass	742.5	815.7	1466.6	1388.0	1463.5	502.7	247.2	99.6	38.2	3.8	41.7		6809.6		
Weight	35.6	85.9	115.9	138.4	163.7	189.7	226.3	244.1	291.2	264.0	337.2			102.6	
C.F.	5.8	5.6	5.3	5.2	5.1	5.0	5.1	5.1	5.2	5.2	4.9				6.0

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Table 2. Abundance estimate of the blue whiting stock west of the the British Isles, March/April 1995. R.V."Johan Hjort", Norway.

Length cm	Age years															N	Biomass	Mean weight
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15+			
.0-13.9	3															3	.1	28.0
.0-14.9																0	.0	.0
.0-15.9	27															27	.5	18.7
.0-16.9	1156															1156	25.7	22.2
.0-17.9	4426															4426	115.0	26.0
.0-18.9	3324															3324	103.3	31.1
.0-19.9	2938															2938	108.8	37.0
.0-20.9	1716	54														1770	78.2	44.2
.0-21.9	1248	643														1891	96.6	51.1
.0-22.9	832	444														1276	74.5	58.4
.0-23.9	115	894														1009	69.3	68.7
.0-24.9		1752	184													1936	144.4	74.6
.0-25.9		2664	797	64												3525	298.4	84.6
.0-26.9		1423	1369	126	52	6										2976	282.5	94.9
.0-27.9		610	2322	444	235	81										3692	387.8	105.0
.0-28.9		20	2412	809	654	184										4079	470.7	115.4
.0-29.9		34	1641	1871	1016	987	186									5735	742.9	129.5
.0-30.9			747	2113	1418	1831	113									6222	869.8	139.8
.0-31.9			336	1462	1677	1247	286	16								5024	763.2	151.9
.0-32.9			66	683	1097	2620	386	295	25		2					5174	864.5	167.1
.0-33.9				249	279	1260	123	132	51			38				2132	385.1	180.6
.0-34.9				85	250	687	262	166	39		32					1521	298.8	196.5
.0-35.9					125	336	197	197	82	72	14					1023	233.9	228.6
.0-36.9					16	138	127	149	117	59						606	141.8	233.9
.0-37.9					42	83	67	87	18	18						315	80.1	254.3
.0-38.9						7	31	10	76							124	35.1	283.3
.0-39.9							17	31	17							65	20.4	313.3
.0-40.9																0	.0	.0
.0-41.9																0	.0	.0
.0-42.9									57							57	22.6	396.0
Number :	15785	8538	9874	7906	6861	9467	1795	1083	482	149	48	38	0	0	0	62026		
length:	18.96	24.93	28.12	30.28	31.01	32.04	33.23	34.67	36.81	36.14	34.71	33.50	.00	.00	.00	26.90		
omass :	551.5	677.5	1099.0	1081.1	1018.3	1553.1	327.3	230.4	125.0	33.5	9.7	7.8	.0	.0	.0	6714.0		
weight:	34.9	79.3	111.3	136.7	148.4	164.1	182.4	212.7	259.3	224.8	201.5	204.0	.0	.0	.0	108.2		
Cond.:	5.0	5.1	5.0	4.9	4.9	4.9	4.9	5.1	5.1	4.7	4.8	5.4	.0	.0	.0	5.0		

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Table 3. Assessment factors of blue whiting to the west of the British Isles. Combined results of R.V. "Johan Hjort" (Norway) and R.V. "Fridtjof Nansen" (Russia).

Sub area	Latitude north	Square nautic miles	Abundance N x 10 ⁻⁶			Biomass t x 10 ⁻³			Mean weight (g)	Mean length (cm)	Density tonnes/sq.n.mile
			Immature	Mature	Sum	Immature	Mature	Sum			
I	48°30' - 51°30'	5846	7344	2515	9859	229	314	543	56,8	20,7	93
II	51°30' - 53°30'	12862	4656	8674	13330	161	1273	1434	107,6	26,1	111
III	53°30' - 55°30'	5661	7480	18611	26091	270	2501	2771	106,1	26,7	489
IV	55°30' - 58°30'	4800	145	11037	11182	8	1531	1539	136,8	29,9	321
V	58°30' - 62°00'	7436	2259	4648	6907	110	530	640	92,5	24,9	86
All sub areas		36605	21884	45485	67369	778	6149	6927	102,9	26,0	189

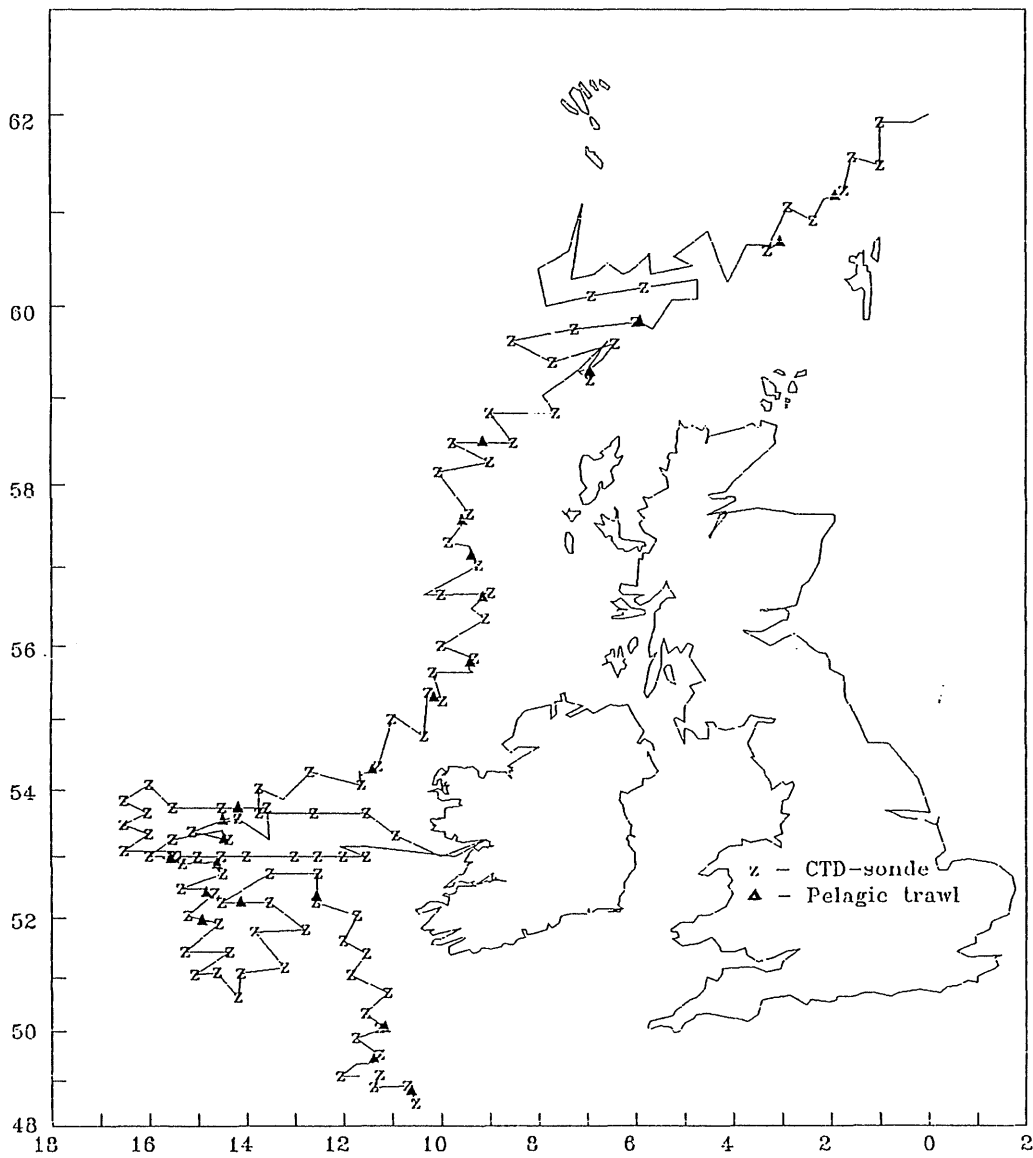


Fig. 1. Cruise track and stations of R.V. "Fridtjof Nansen", 22 March-23 April 1995.

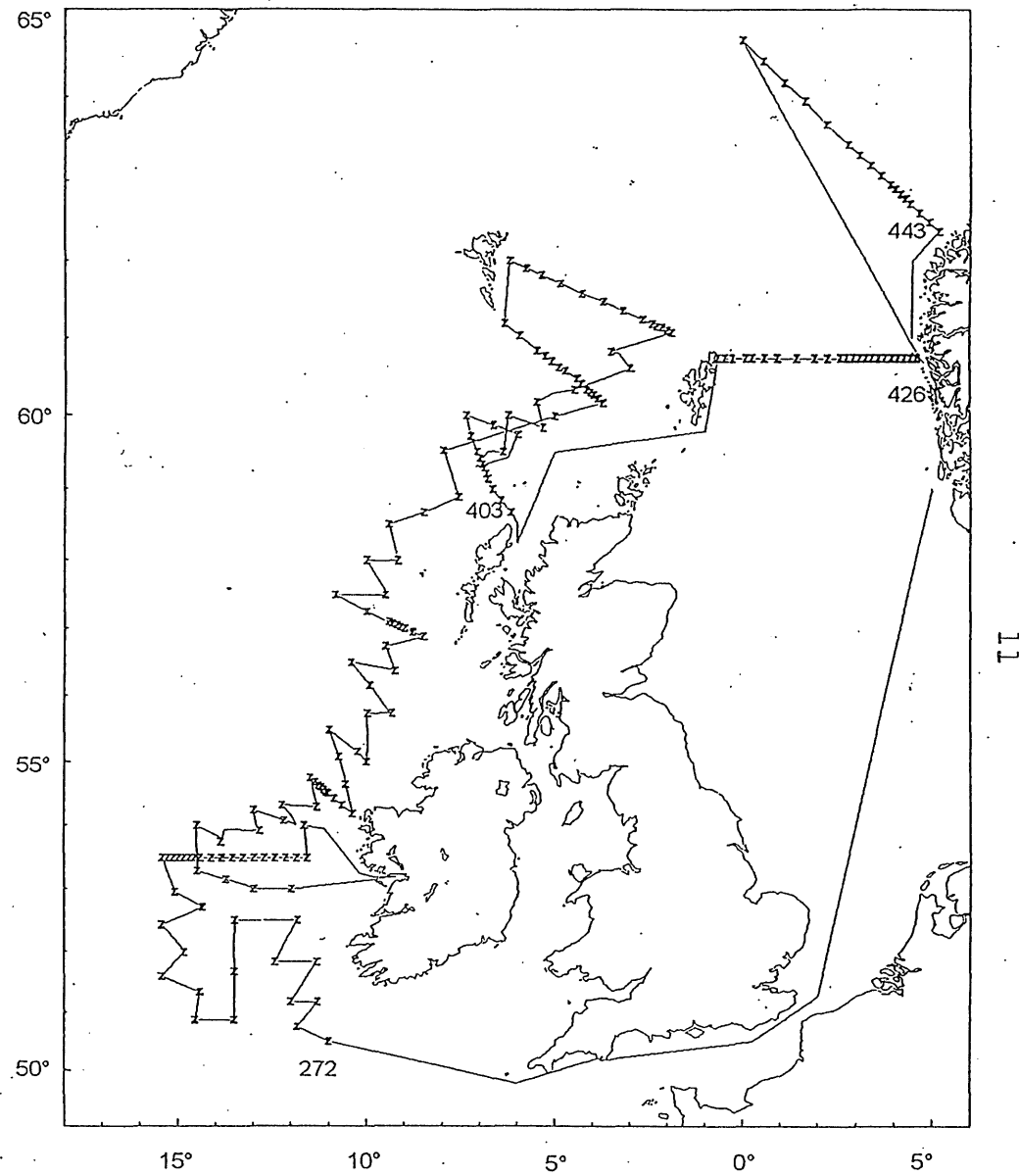


Fig. 2a. Cruise track and CTD-stations (z) of R.V. "Johan Hjort", 22 March-24 April 1995.

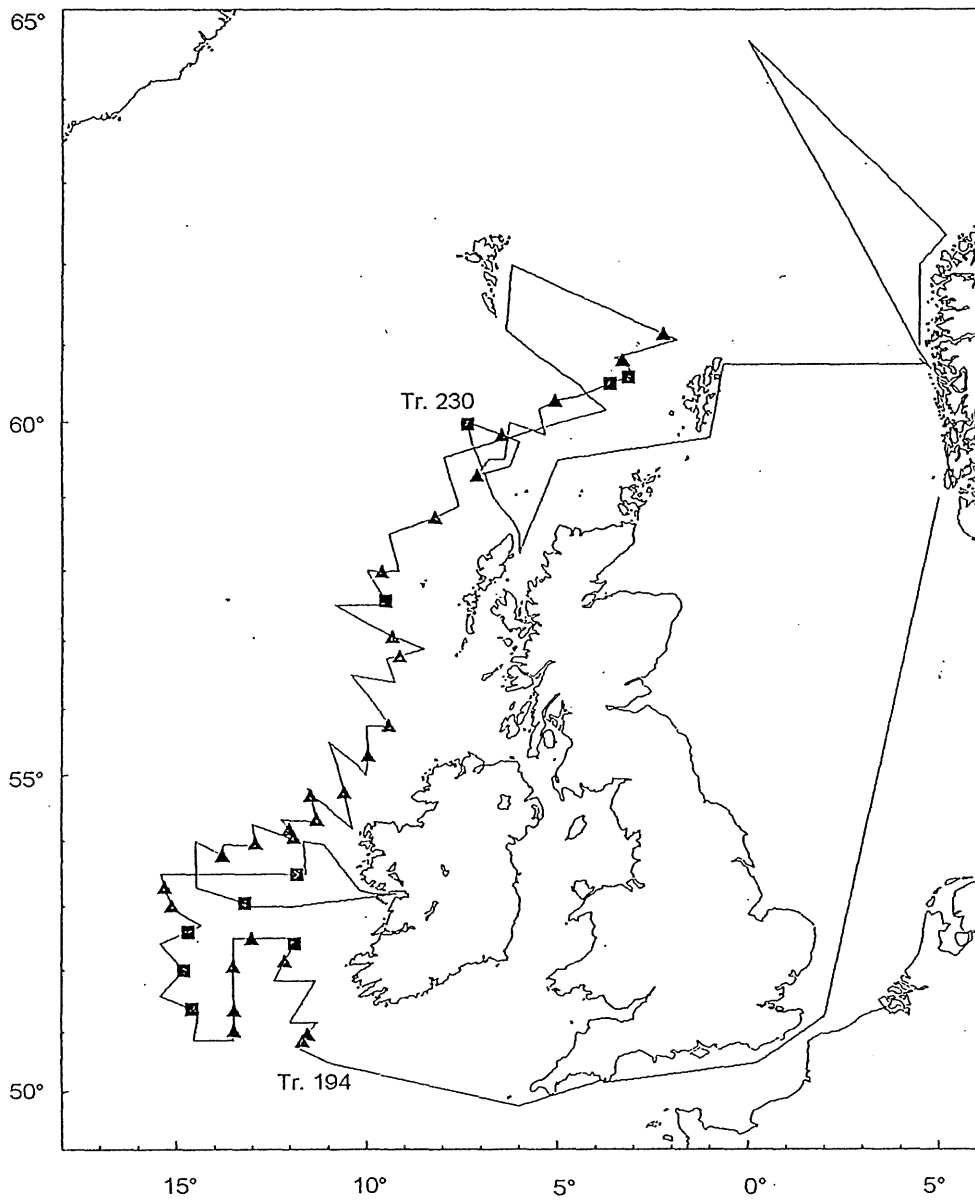


Fig. 2b. Cruise track and trawl stations of R.V. "Johan Hjort", 22 March-24 April 1995. Triangle: Pelagic trawl, square: Bottom trawl.

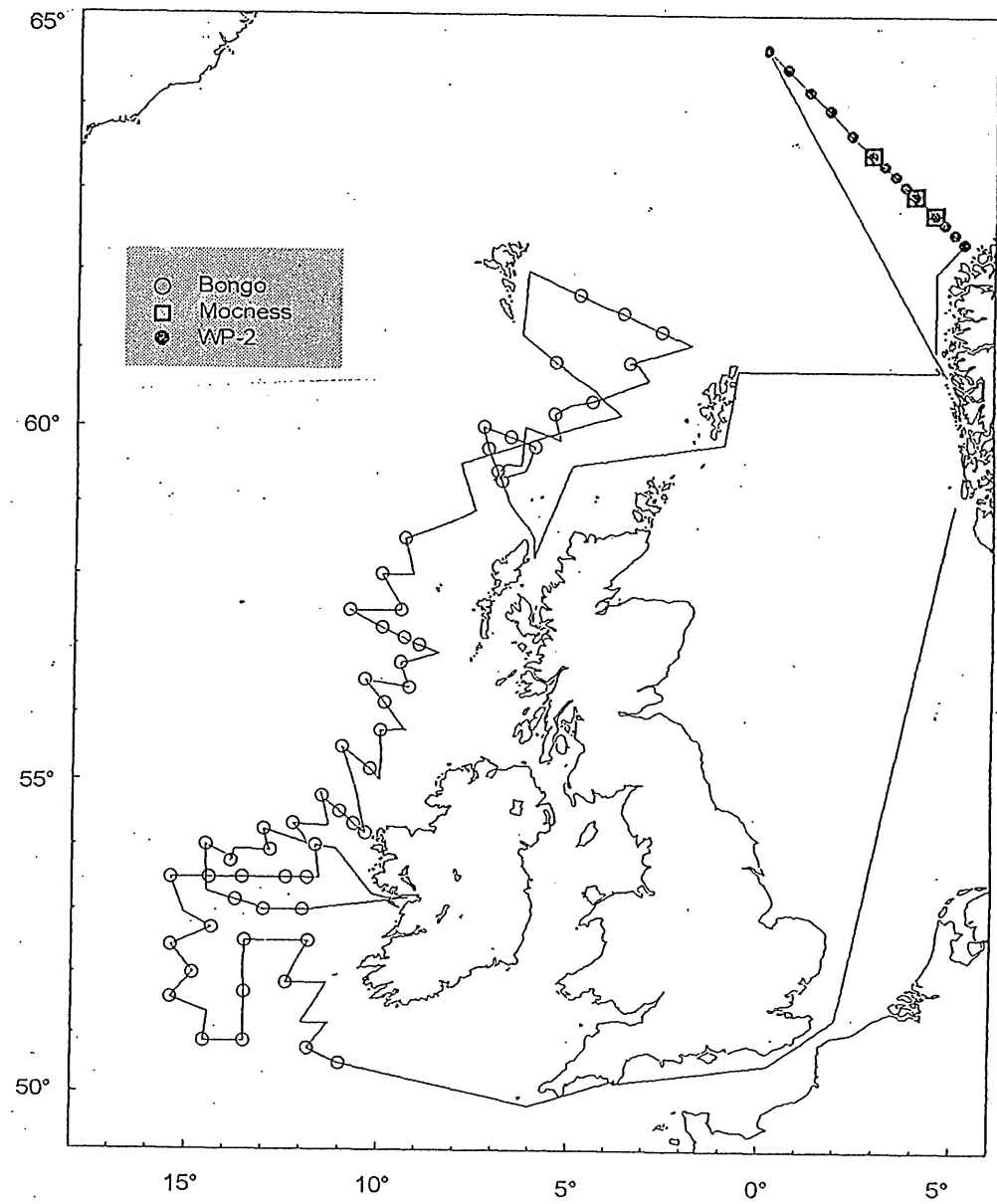


Fig. 3. Cruise track and plankton stations of R.V. "Johan Hjort", 22 March-24 April 1995.

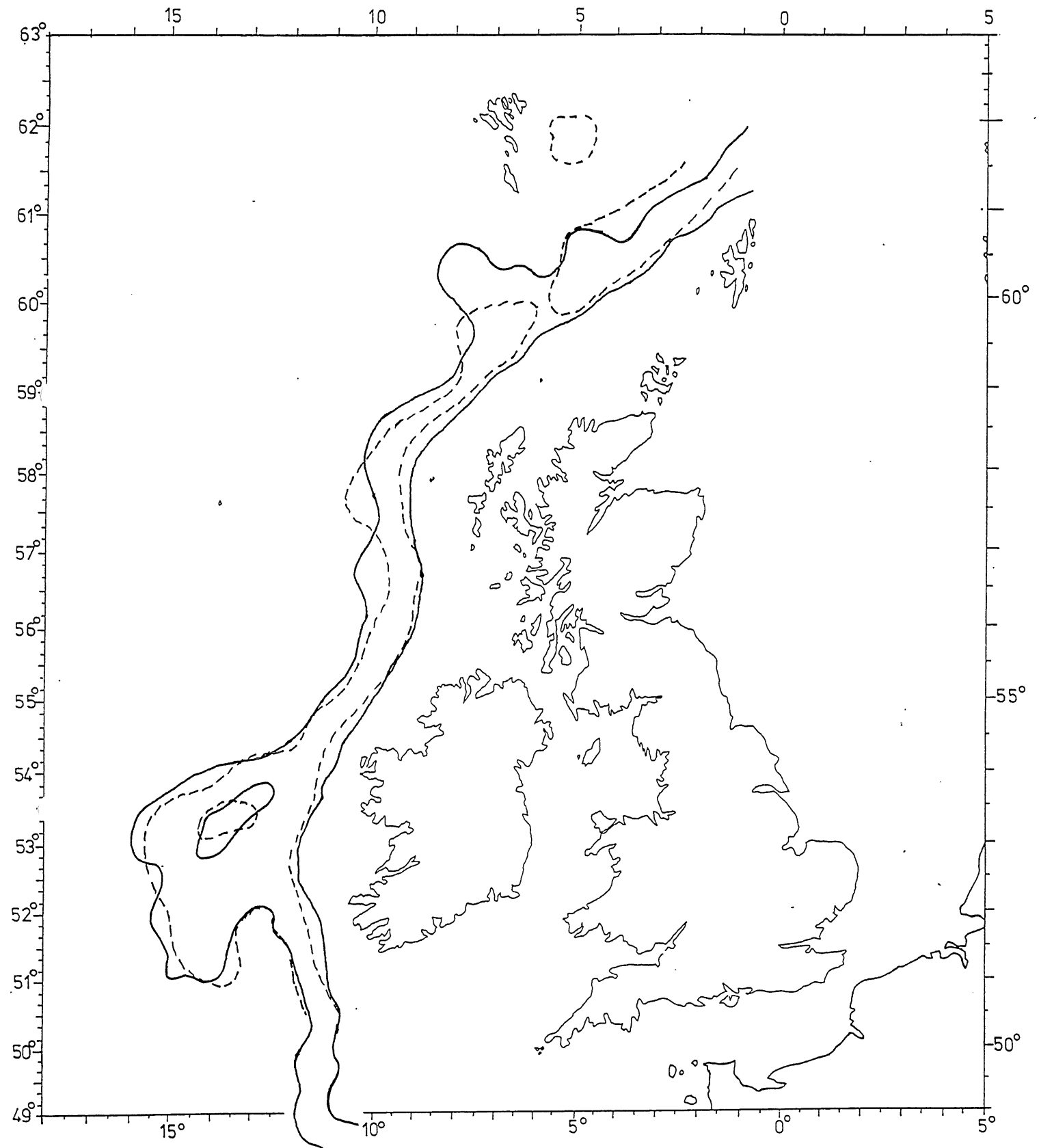


Fig. 4. Distributions of blue whiting in spring 1994. Full line: Russian result 22 March-23 April. Hatched line: Norwegian result 27 March-18 April.

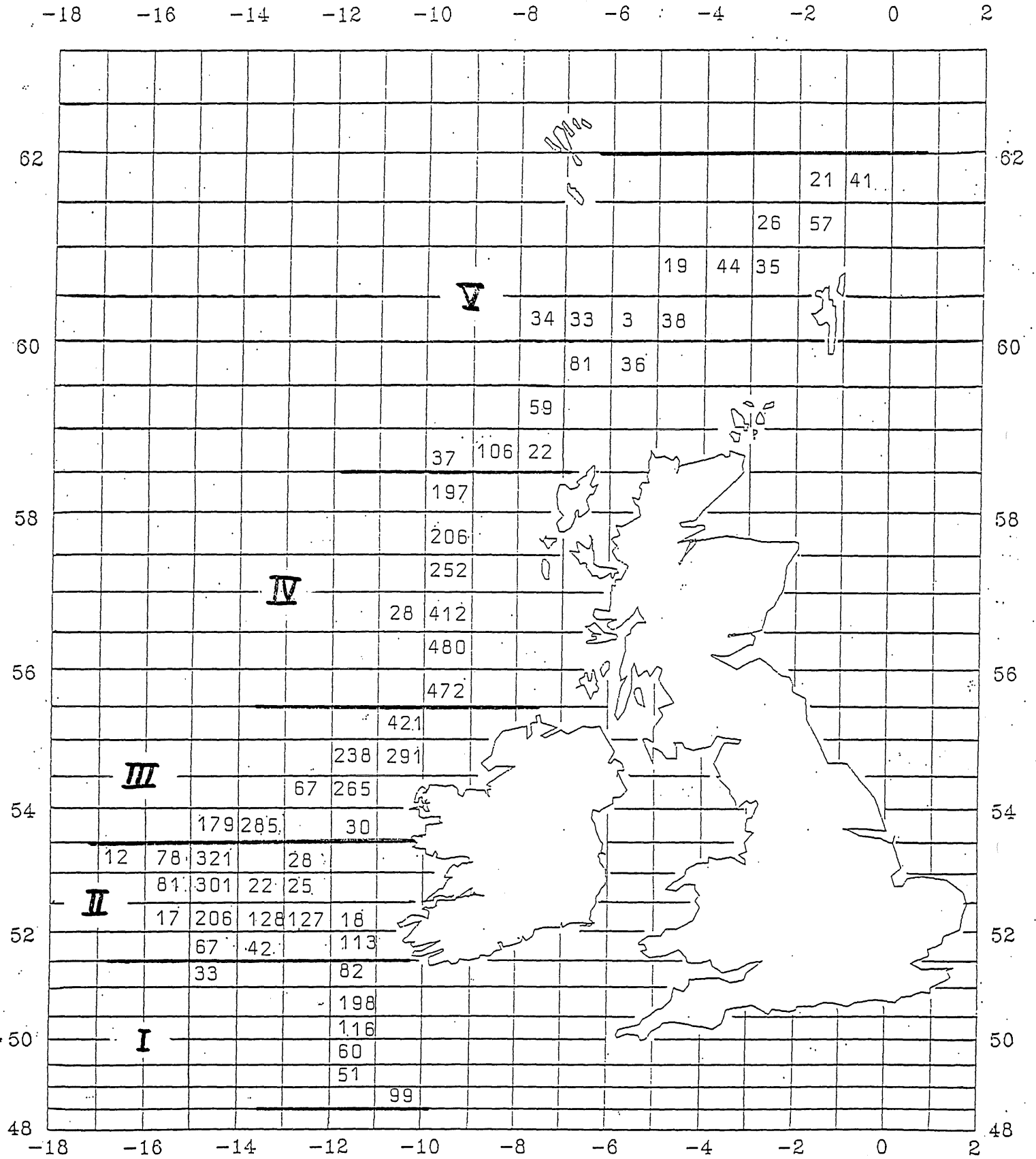


Fig. 5. Blue whiting biomass (in thousand tonnes) obtained by Russia, March/April 1995. Markings of subareas I-V used in the assessment.

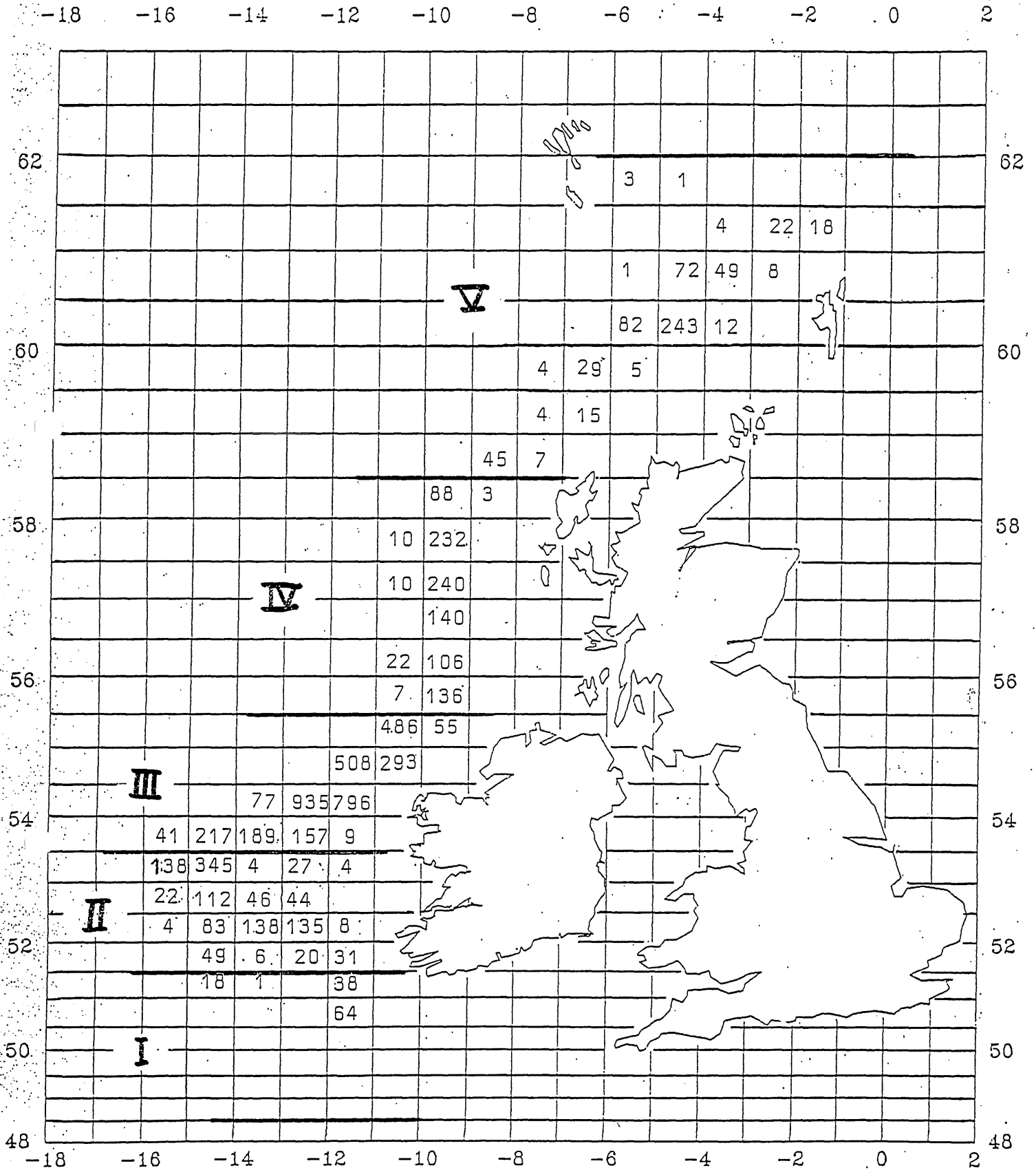


Fig. 6. Blue whiting biomass (in thousand tonnes) obtained by Norway, March/April 1995. Markings of subareas I-V used in the assessment.

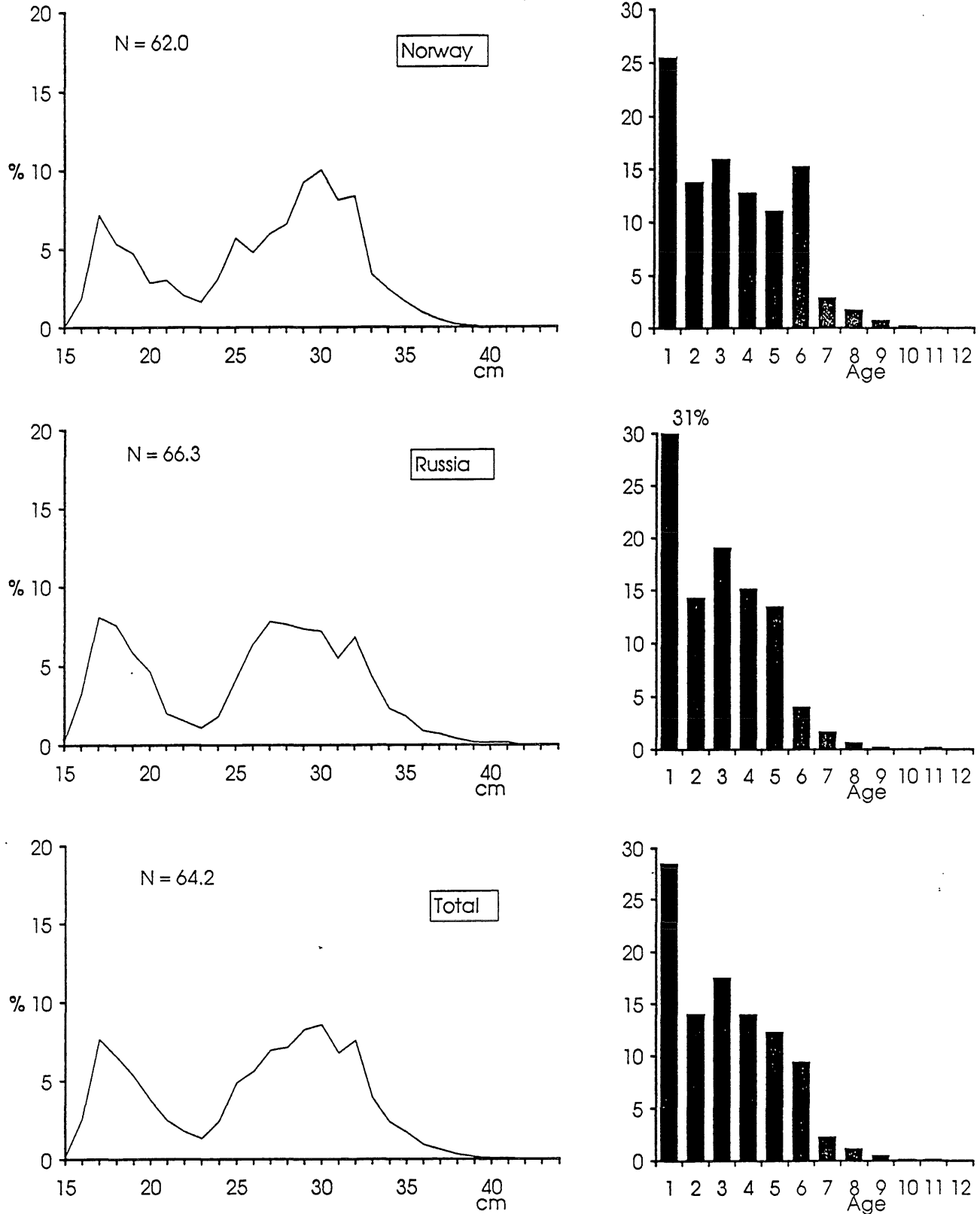


Fig. 7. Total length and age compositions (N%) of blue whiting to the west of the British Isles, spring 1995, obtained by Norway and Russia respectively and their combined results. $N \times 10^{-9}$, weighted by abundance.

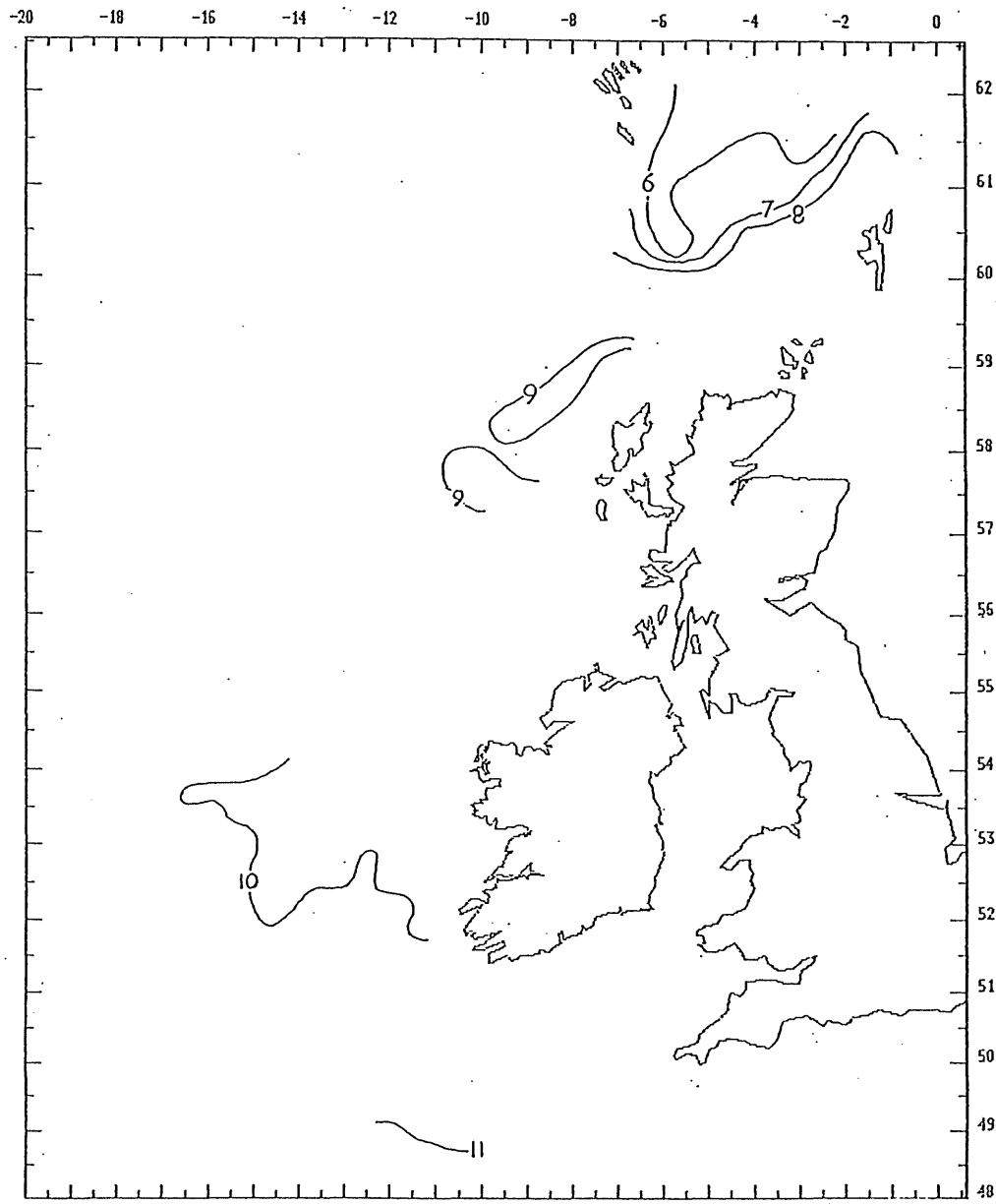
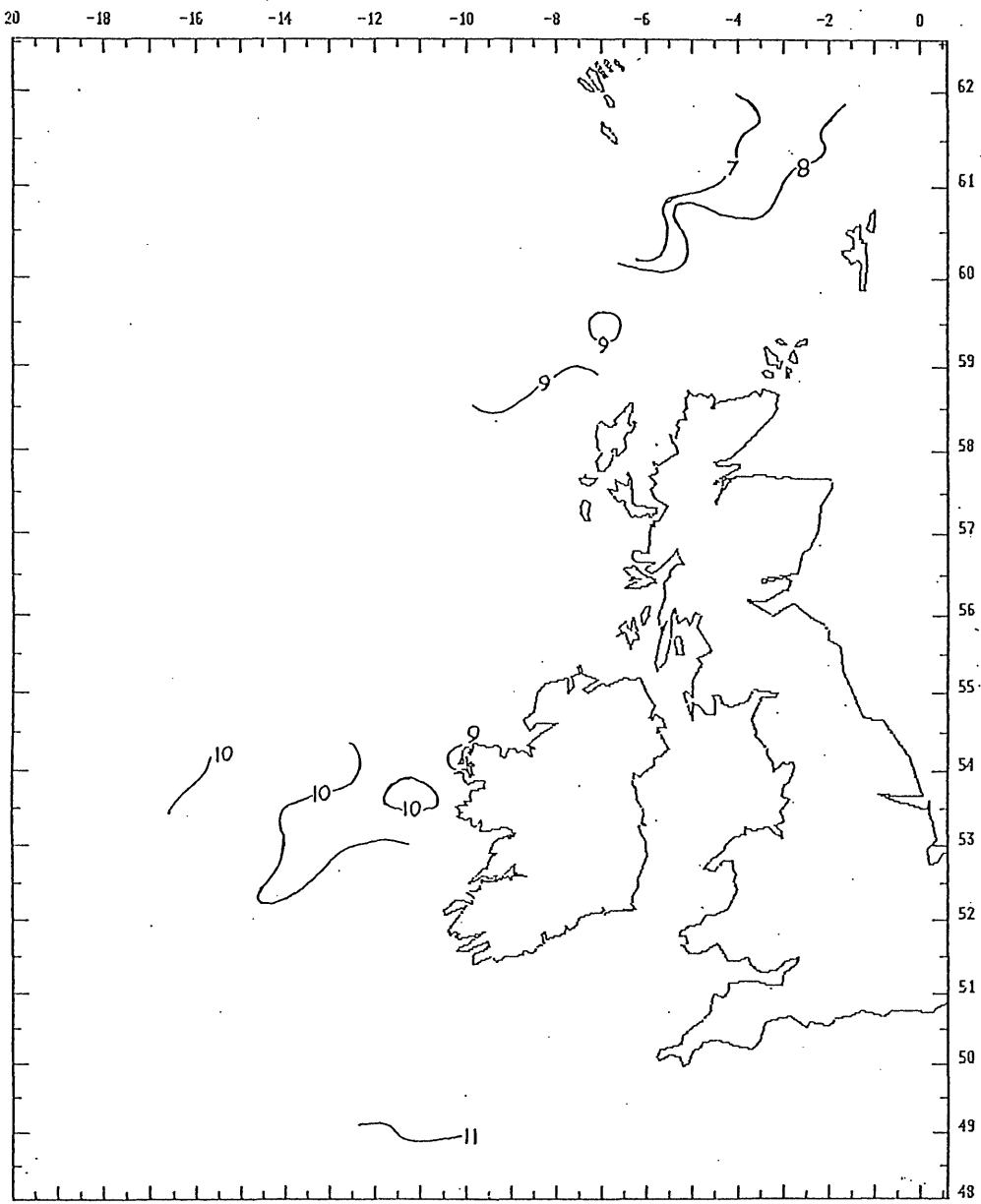


Fig. 8. Temperature, $t^{\circ}\text{C}$, at sea surface
22 March-23 April 1995.

Fig. 9. Temperature, $t^{\circ}\text{C}$, at 200m depth
22 March-23 April 1995.

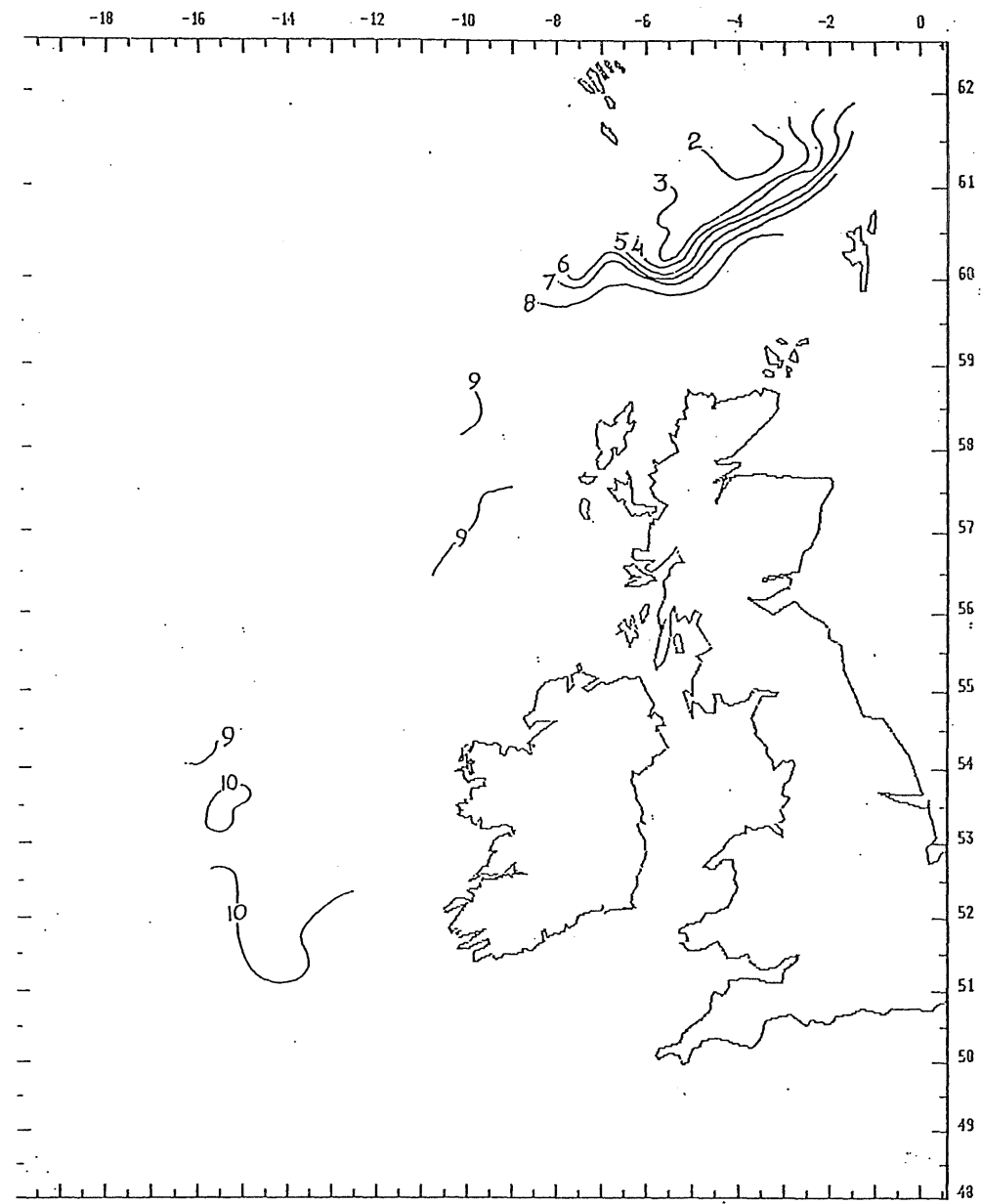


Fig. 10. Temperature, $t^{\circ}\text{C}$, at 400m depth
22 March-23 April 1995.

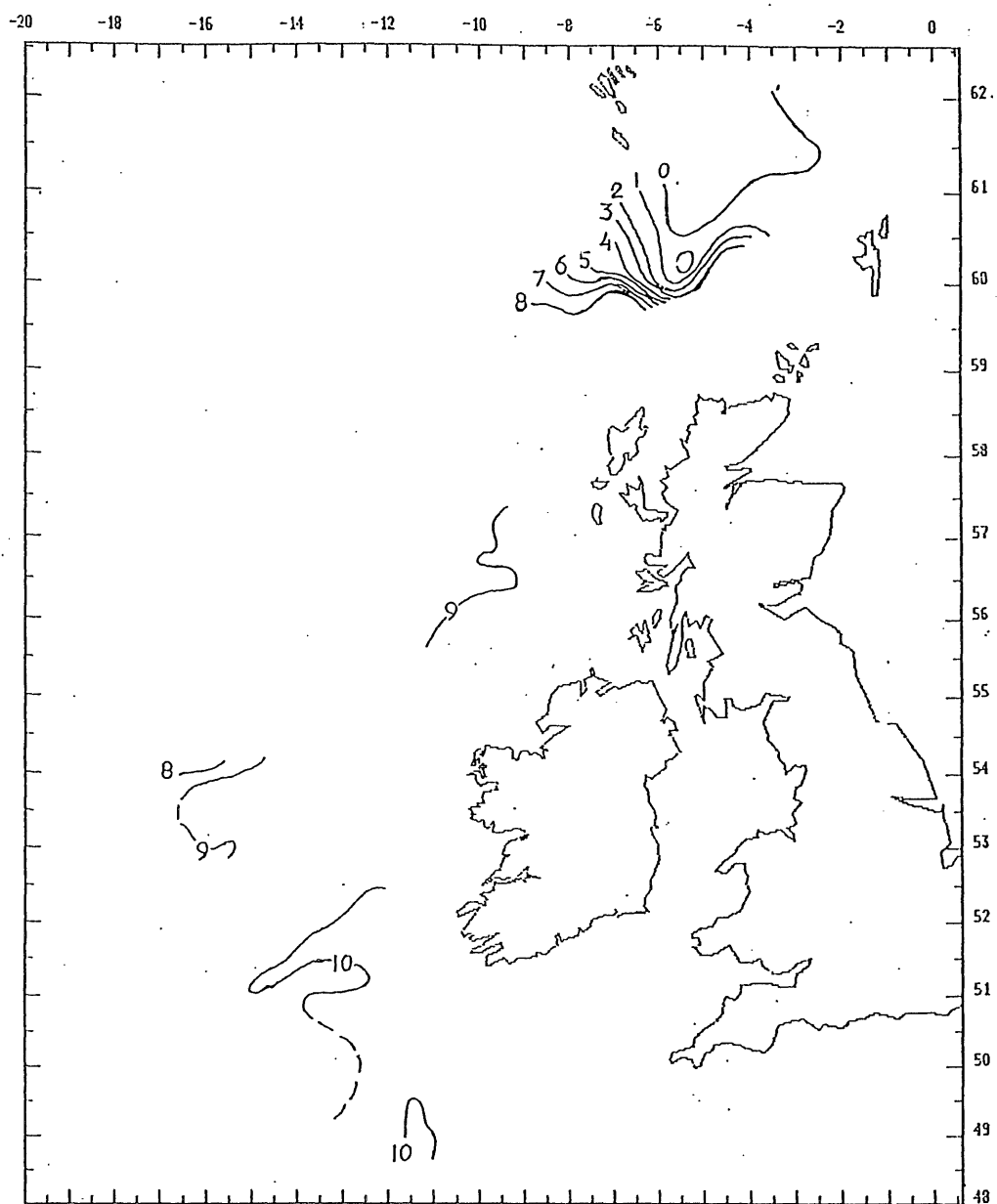


Fig. 11. Temperature, $t^{\circ}\text{C}$, at 600m depth
22 March-23 April 1995.

No 88 89 90 91 92 93 94 95 96 97
 Lat 53.00 53.00 53.00 53.00 53.00 53.00 53.00 53.00 53.00 53.00
 Lng -16.00 -15.30 -15.00 -14.30 -14.00 -13.30 -13.00 -12.30 -12.00 -11.30

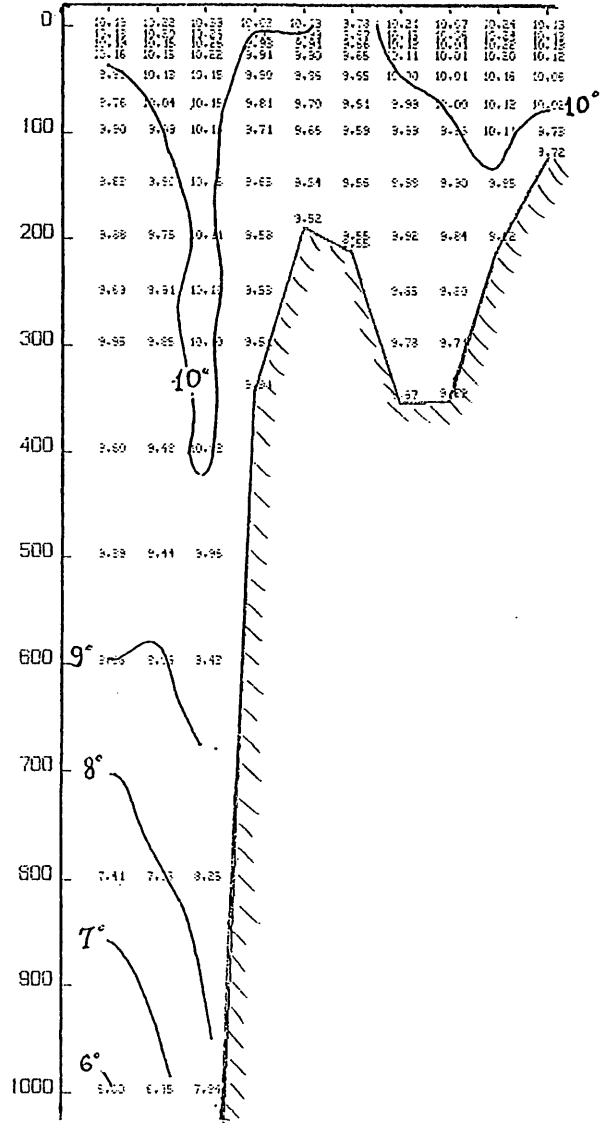


Fig. 12. Temperature, $t^{\circ}\text{C}$, in a section along $53^{\circ}00'\text{N}$ over the Porcupine Bank, "Fridtjof Nansen" 3-4 April 1995.

No 88 89 90 91 92 93 94 95 96 97
 Lat 53.00 53.00 53.00 53.00 53.00 53.00 53.00 53.00 53.00 53.00
 Lng -16.00 -15.30 -15.00 -14.30 -14.00 -13.30 -13.00 -12.30 -12.00 -11.30

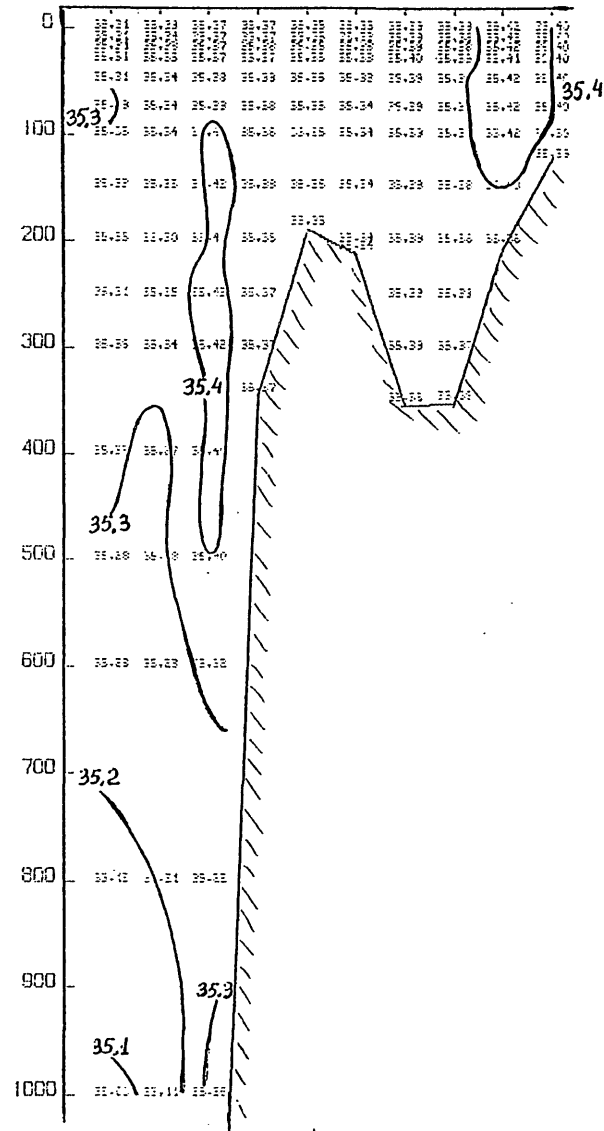


Fig. 13. Salinity, S°/oo , in a section along $53^{\circ}00'\text{N}$ over the Porcupine Bank, "Fridtjof Nansen" 3-4 April 1995.

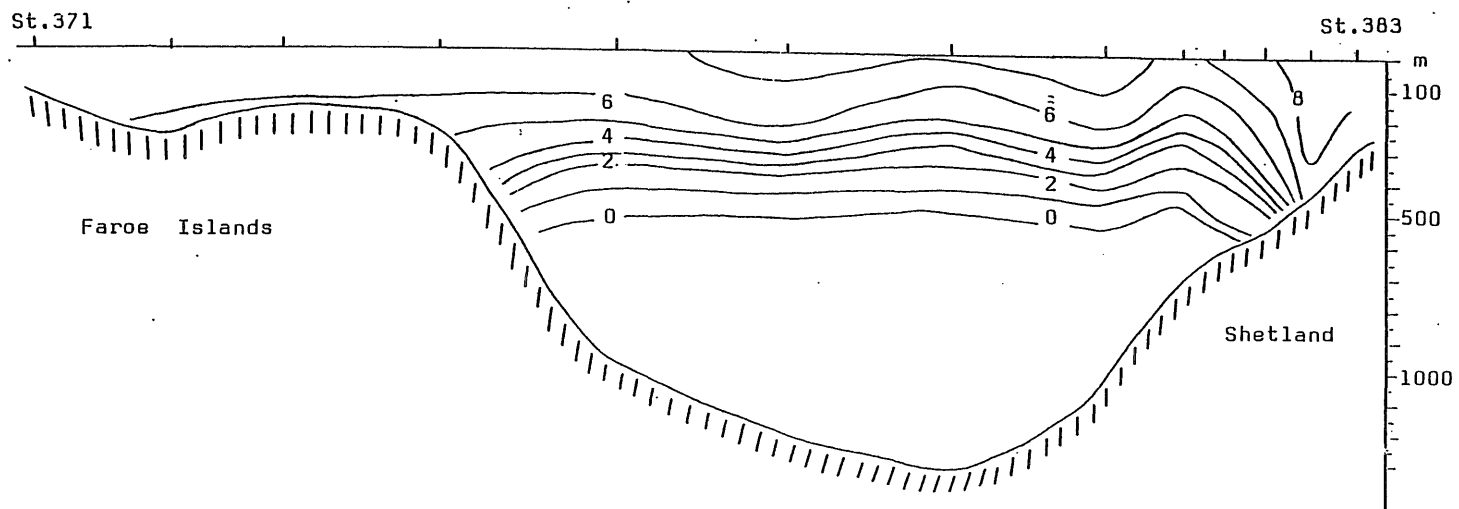


Fig. 14. Temperature, $t^{\circ}\text{C}$, in a section from Nolsø (Faroe Islands) to Fluga (Shetland), "Johan Hjort" 13-14 April 1995.

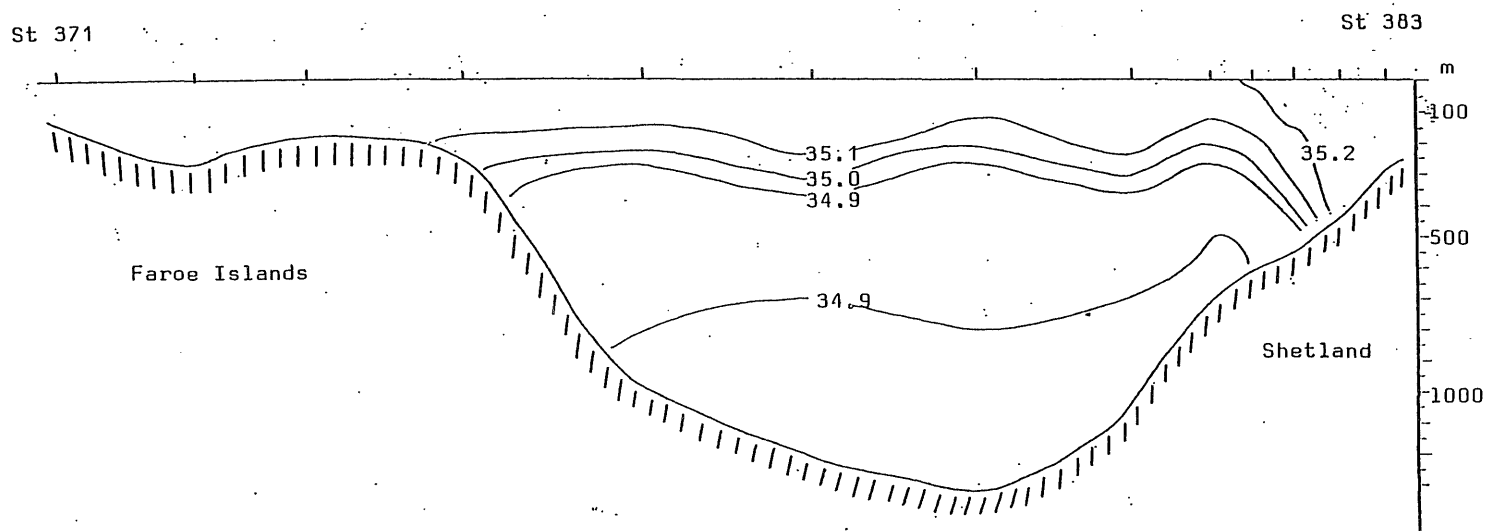


Fig. 15. Salinity, $S^{\circ}/\text{‰}$, in a section from Nolsø (Faroe Islands) to Fluga (Shetland), "Johan Hjort" 13-14 April 1995.

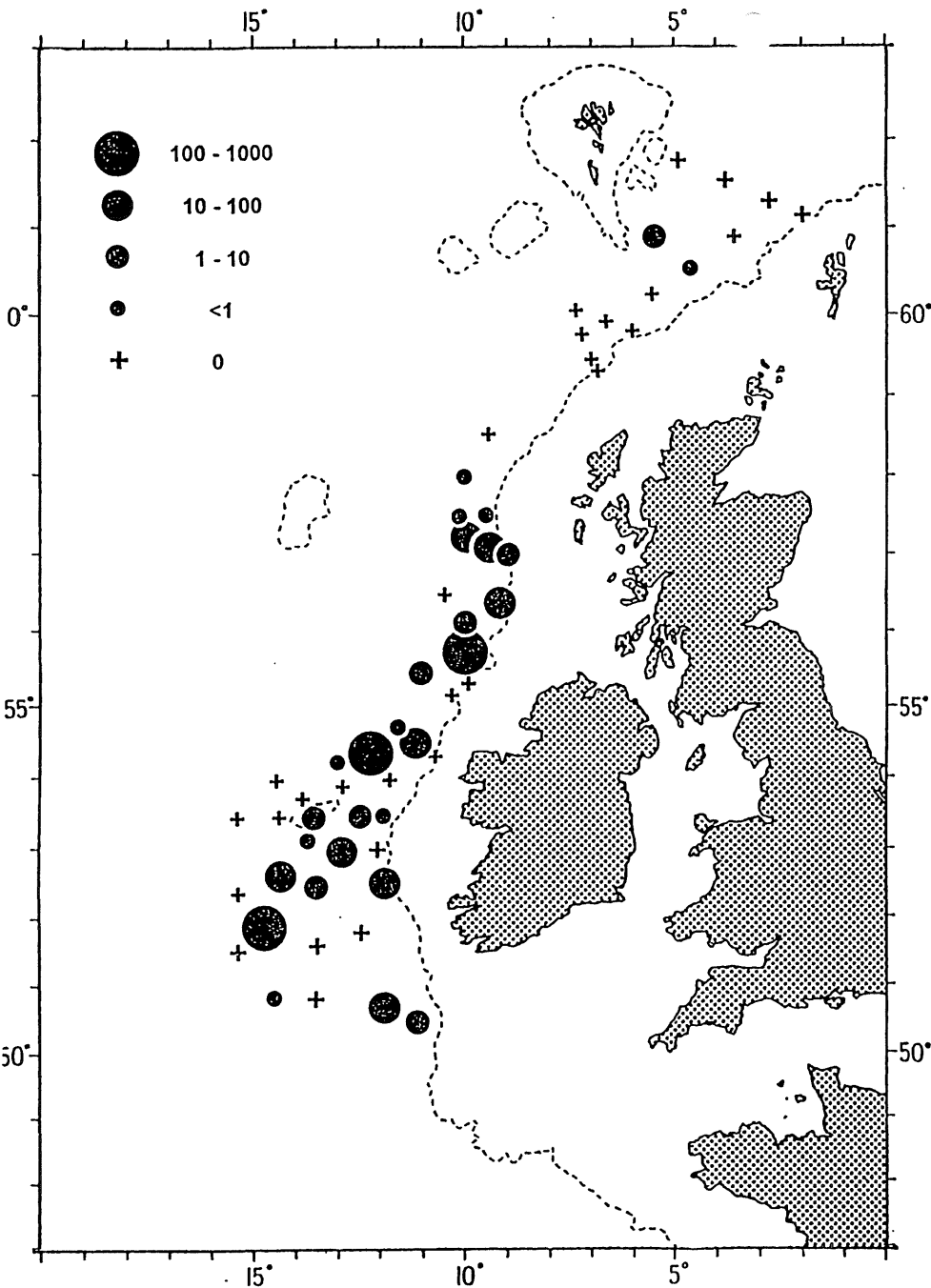


Fig. 16. Distribution of blue whiting eggs, nm^{-2} , R.V. "Johan Hjort" 27 March-17 April 1995.

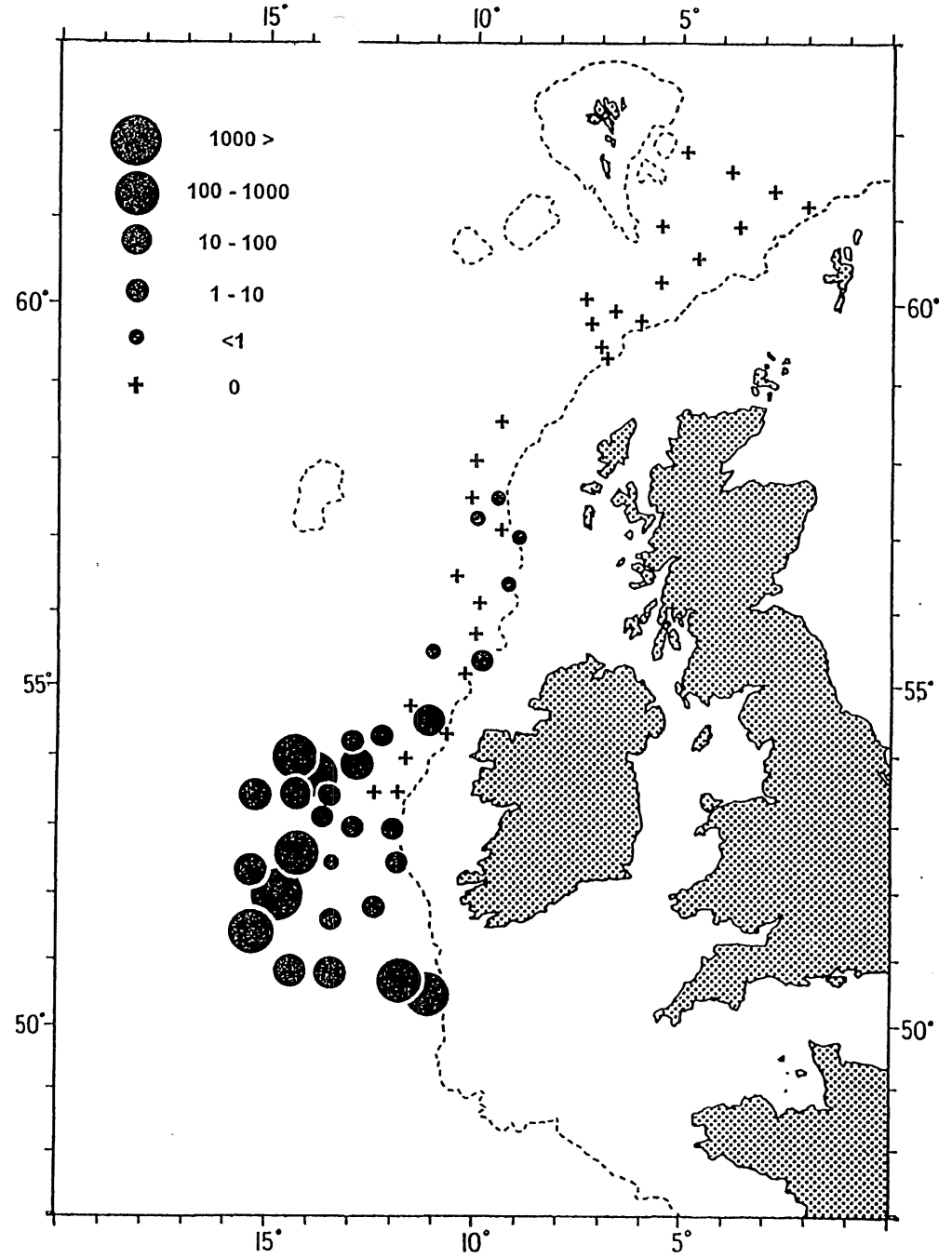


Fig. 17. Distribution of blue whiting larvae, nm^{-2} , R.V. "Johan Hjort" 27 March-17 April 1995.

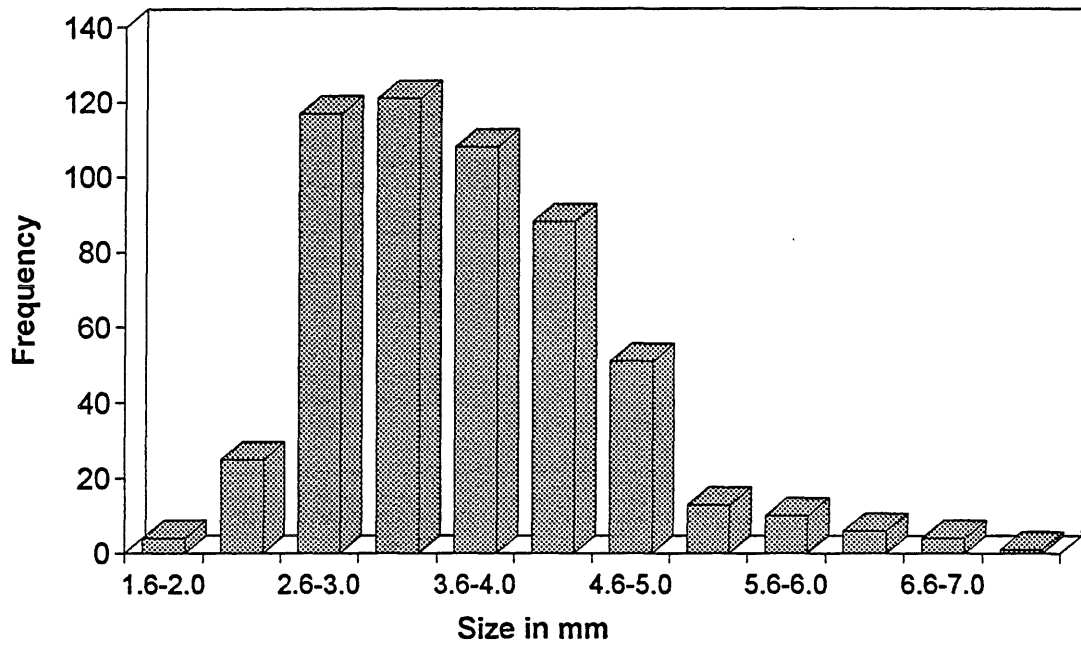


Fig. 18. Length distribution of blue whiting larvae, R.V. "Johan Hjort" 27 March-17 April 1995.