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Quantitative distribution of herring larvae /Clupea harengus L./ in the North Sea in 1974

by

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Introduction

The investigations on quantitative distribution of herring larvae in the North Sea have been conducted since 1963. They have aimed at following changes which occur in crop of herring generations, the simultaneously investigations on fry and mature herring allow us to determine the dynamics of herring stock population of the North Sea.

Material and Method

The results of investigations were obtained on the base of biological materials /ichthyoplankton/ collected during a cruise of the RV "Birkut" in the period from 12th September to 29th October 1974.

Sampeles were taken at 65 stations dispersed in the routine research region that was limited by the parallels $53^{\circ}30'$ and $57^{\circ}20'N$ and the meridians $02^{\circ}00'E$ and $02^{\circ}00'W$. This spot contains such areas as Aberdeen Bank, Berwick Bank, Farne Deep, Whitby, Flambro Ground and Little Pitt. The investigated area and the route of the cruise together with the observation stations are presented in Fig.1.

Herring larvae were caught by means of a "Hal" sampler using standard method, viz., the speed of hauling device and that of the lift were 5 knots and 0.5 m/sek, respectively.

The collected material was preserved in 4%-formaline and segregated. The numbers of herring larvae were calculated for the water column under 1 m^2 of the sea surface.

The length of larvae was measured with an accuracy of 0.5 mm.

Results

It was found that under 1 m^2 of the sea surface as well the absolute numbers of herring larvae as their numbers in particular length classes /length 10 mm; 10-15 mm; 15mm/ differed considerably according to region; as it may be seen in fig.2. In the northern part of the area investigated, i.e., north of $55^{\circ}00'N$ individuals exclusively longer than 15 mm, were found except at one station /903/ where all the length classes of herring larvae were represented, those of 10-15 mm length being most numerous.

South from $55^{\circ}00'N$, viz, from the stations 918 to 923, the occurrence of 10-15 mm and of more than 15 mm long larvae was observed the class 10-15 mm being here richer than the other.

Stations 929 to 934 showed a marked increase in abundance of herring larvae in all length classes.

Covering the map of quantitative distribution of herring larvae with a map of temperature /Figs. 3 and 4/ one can see the herring larvae to occur most numerously where the surface temperature amounted to 11° , and the bottom temperature to $10-11^{\circ}C$, thus generally within the range from 10 to $11^{\circ}C$.

The above fact needs not only to be checked in the years to come, but also to be analysed backwards, i.e., to be compared with the hydrological and biological materials from the same area from the period of 1963-1973, as up to day there is lack of analyses of the type in question.

Assuming a conventional division of the area investigated into three regions:

- I. Aberdeen Bank - Berwick Bank,
- II. Farne Deep - Whitby, and
- III. Flamboro Ground - Little Pitt, it is apparent that this quantitative distribution of herring larvae gets still more differentiated and the hydrological background seems to support the pertinence of such a division.

Region of Aberdeen Bank and Berwick Bank

The region counted 18 observation stations. Herring larvae were found at 12 stations, largest amounts being found along $57^{\circ}00'N$ with a maximum of occurrence amounting to 13.07 individuals/ m^2 . Exclusively occurred here larvae longer than 15 mm /Table I/ at a surface temperature of 12° and bottom temperature of $10-12^{\circ}C$.

Region of Farne Deep - Whitby

In this region the material from as many as 23 stations was examined. At 8 stations larvae were present. It may be said that in this region relatively lowest bottom temperature /of $8-10^{\circ}$ / was noted. Herring larvae showed the maximum of their occurrence at station 914, viz., 14.00 individuals/ m^2 , then at 903, $13.12/m^2$. This latter station was the only one at which all the length classes were represented. At all other stations where larvae were present at all, their size exceeded 15 mm in length. Both of these stations were lying in the area where the surface temperature was 11° and the bottom temperature - $10^{\circ}C$.

Region of Flamboro Ground - Little Pitt

From among 10 stations investigated in this region only at 2 stations negative results of catching larvae were obtained. The general maximum of the occurrence of herring larvae was noted in this region: 85.12 larvae /m² at station 819. In addition may be said that at 4 stations the numbers of larvae per 1 m² were as high as 43.25 to 52.75. At stations 918 - 923 two length classes: these of 10 - 15 mm, and of over 15 mm, were represented, whereas at stations 929-935 the representatives of all the three classes were caught. Generally, the highest numbers of herring larvae were found at stations lying nearer the sea shore, but if hydrological aspect is concerned - the stations with temperature of 11°C were the most abundant in larvae.

Discussion

The analysis of the results of Polish investigations concerning quantitative distribution of herring larvae in the area under consideration, i.e., investigations conducted since 1963 to 1973, allow us to state that after 1963 /the year of maximum abundance of herring, 261 individuals /m²/ a visible decrease in quantity of herring larvae took place /in 1964, the year's maximum amounted to 37 larvae /m² at other stations only 1 - 4 larvae /m² were noted/. In 1965 a further decrease was observed /the year's maximum - 16 larvae/m², W. Kijowski 1963 - 1965, 1966/. In 1968, in the area of question none larvae was caught at all, at least bei means of a "Hai" sampler, though with a Ring trawl a few specimens were sporadic taken at one of the stations yet lying outside the limits of Polish investigation area, viz., north of 58°50'N 2°00' / . The year 1968 could be called a sterile one as the herring larvae were concerned. In 1969 was evident that the number of larvae steadily though slowly increased, again but only in the region of Flambro Ground. The same process was observed in 1970 /14 larvae/m²/ /Ciszewski 1968, 1969, 1970/.

In 1971 a transgression of herring larvae in the North Sea took place. The number of larvae got higher and higher /in 1971 181 larvae, in 1972 242 larvae /m²/. In 1973, however, a slight drop in the abundance of herring larvae was noted /Szlachcikowska 1971, 1972, 1973/. The results from 1974 indicate that the number of larvae slowly increases all over the area in question.

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in the North Sea in 1974

Station number	Date	Depth of trawling	Wolumen of the water filtered in m ³	number of herring larvae in the sample	number of larvae per 1 m ²	Number of individuals under 1 m ² of the sea surface in particular length classes.		
						10-10mm	10-15mm	15-15 mm
875	18.09.74	70	115	3	1,87	-	-	1,87
876	18.09.	65	75	4	3,56	-	-	3,56
877	18.09.	62	70	3	2,68	-	-	2,68
878	18.09.	72	90	6	4,68	-	-	4,68
879	20.09.	50	50	2	2,02	-	-	2,02
880	20.09.	60	65	2	1,84	-	-	1,84
881	20.09.	65	75	6	5,32	-	-	5,32
882	20.09.	75	105	2	1,46	-	-	1,46
886	26.09.	65	65	14	13,97	-	-	13,97
888	26.09.	60	65	1	0,90	-	-	0,90
889	26.09.	43	40	1	1,08	-	-	1,08
892	27.09.	70	80	2	1,76	-	-	1,76
893	27.09.	80	100	1	0,69	-	-	0,69
894	29.09.	82	100	1	0,70	-	-	0,70
903	30.09.	90	165	24	13,12	3,28	8,19	1,64
904	30.09.	60	60	8	7,82	-	5,87	1,96
905	01.10	65	75	1	0,89	-	-	0,89
911	02.10	75	85	1	0,86	-	-	0,86
914	10.10	65	70	15	14,0	-	-	14,0
915	10.10	55	50	7	7,73	-	-	7,73
916	10.10	65	70	3	2,70	-	-	2,70
917	10.10	60	60	17	16,5	-	-	16,50
918	10.10	55	50	76	85,12	-	81,76	3,36
919	12.10	48	46	11	11,53	-	8,38	3,14
920	12.10	42	40	1	1,08	-	-	1,08
921	13.10	40	35	4	4,86	-	4,86	-
922	13.10	42	40	10	10,78	-	8,62	2,16
923	13.10	25	20	2	2,51	-	2,51	-
924	13.10	30	25	1	1,15	-	-	1,15
926	14.10	24	15	2	4,19	-	-	4,19
927	14.10	20	15	2	2,77	-	1,38	1,38
929	14.10	30	25	22	26,49	4,81	21,67	-
930	14.10	25	20	42	52,75	37,68	7,54	7,54
931	15.10	45	40	30	44,11	5,65	33,93	4,52
932	15.10	45	40	27	30,54	6,79	18,10	5,65
933	15.10	55	55	44	43,25	28,51	3,93	10,81
934	15.10	55	55	52	51,12	5,90	36,37	8,85
935	15.10	45	40	7	7,92	-	-	7,92

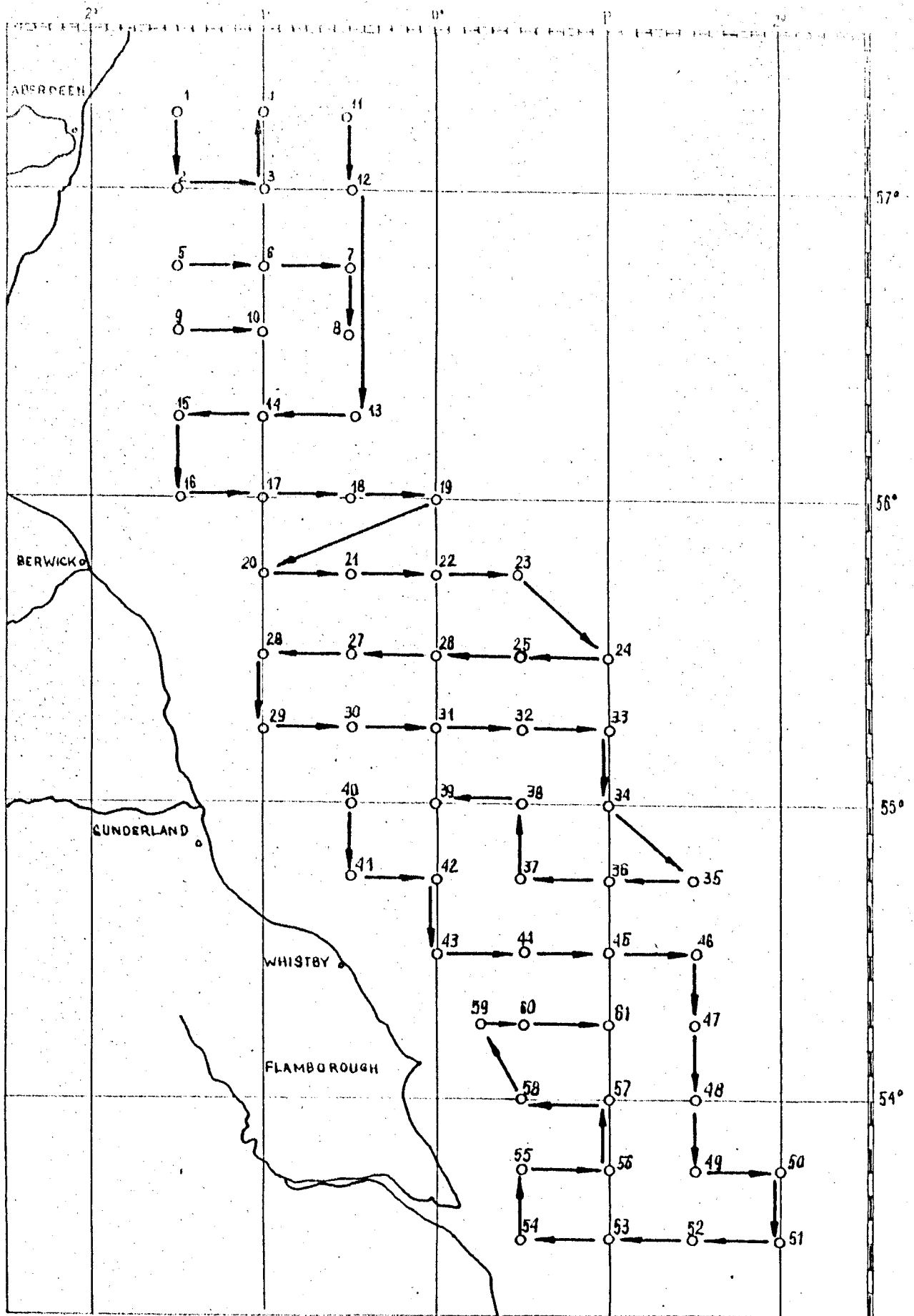


Fig. 1. Route of the research cruise in the North Sea in September-October 1974

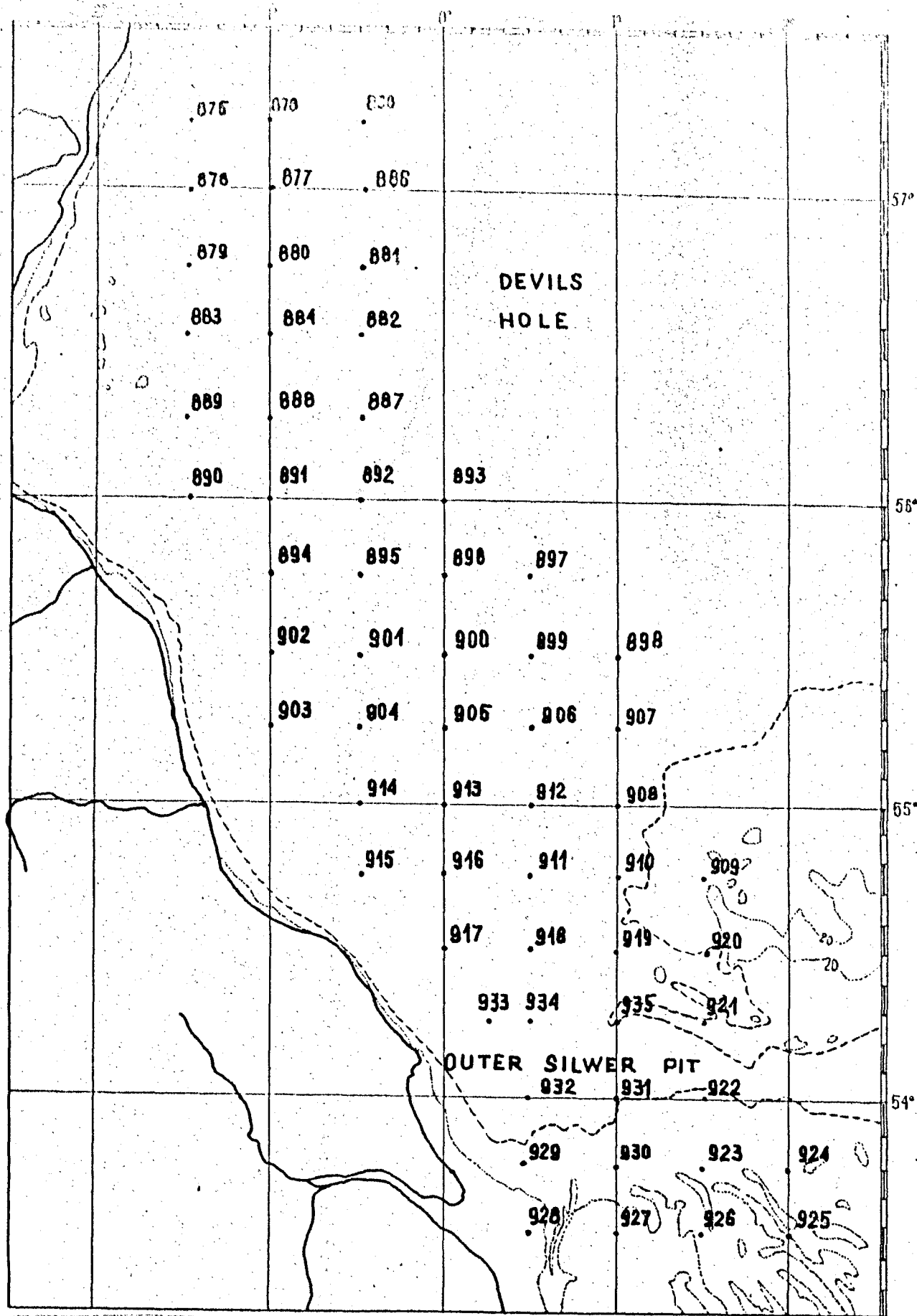


Fig. 2. Location of observation stations where biological and hydrological samples were taken during the cruise

0 - .0 1-9  10-49  50-249  pod m²

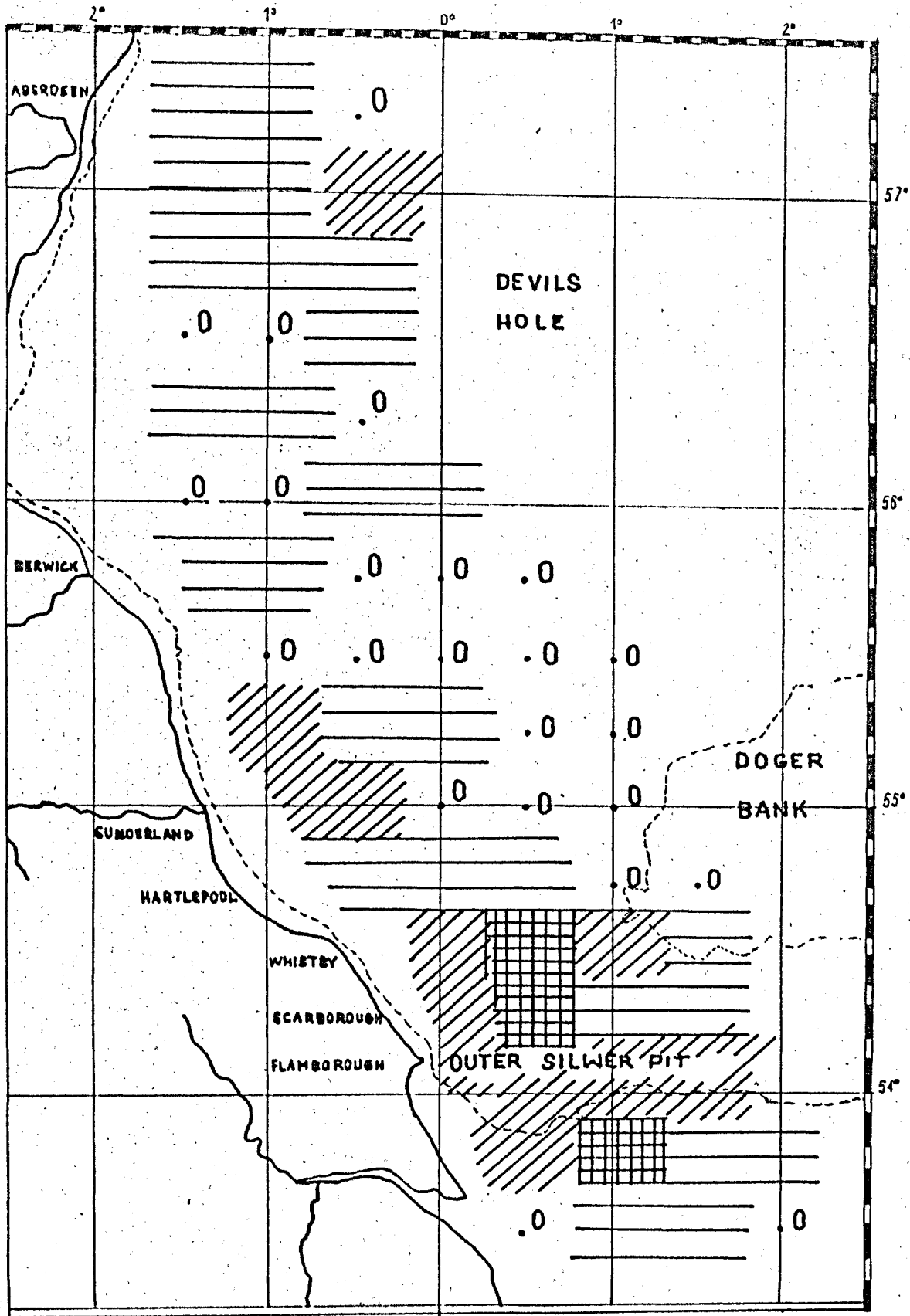


Fig. 3. Quantitative distribution of herring larvae under 1m² of the sea surface in the North Sea, ordered according to different length classes

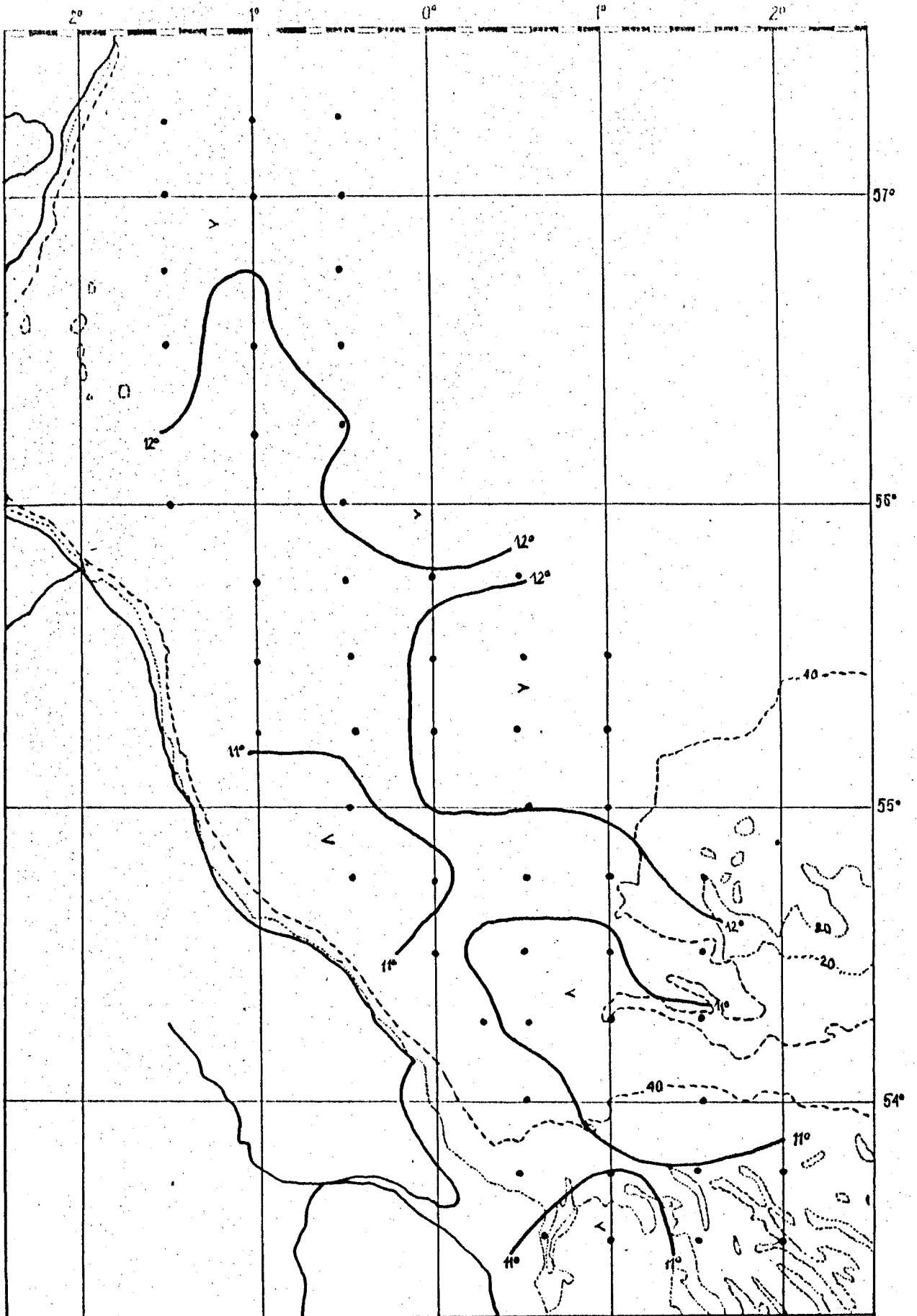


Fig. 4. Temperature of surface waters in September and October 1974

/after W. Kijowski/

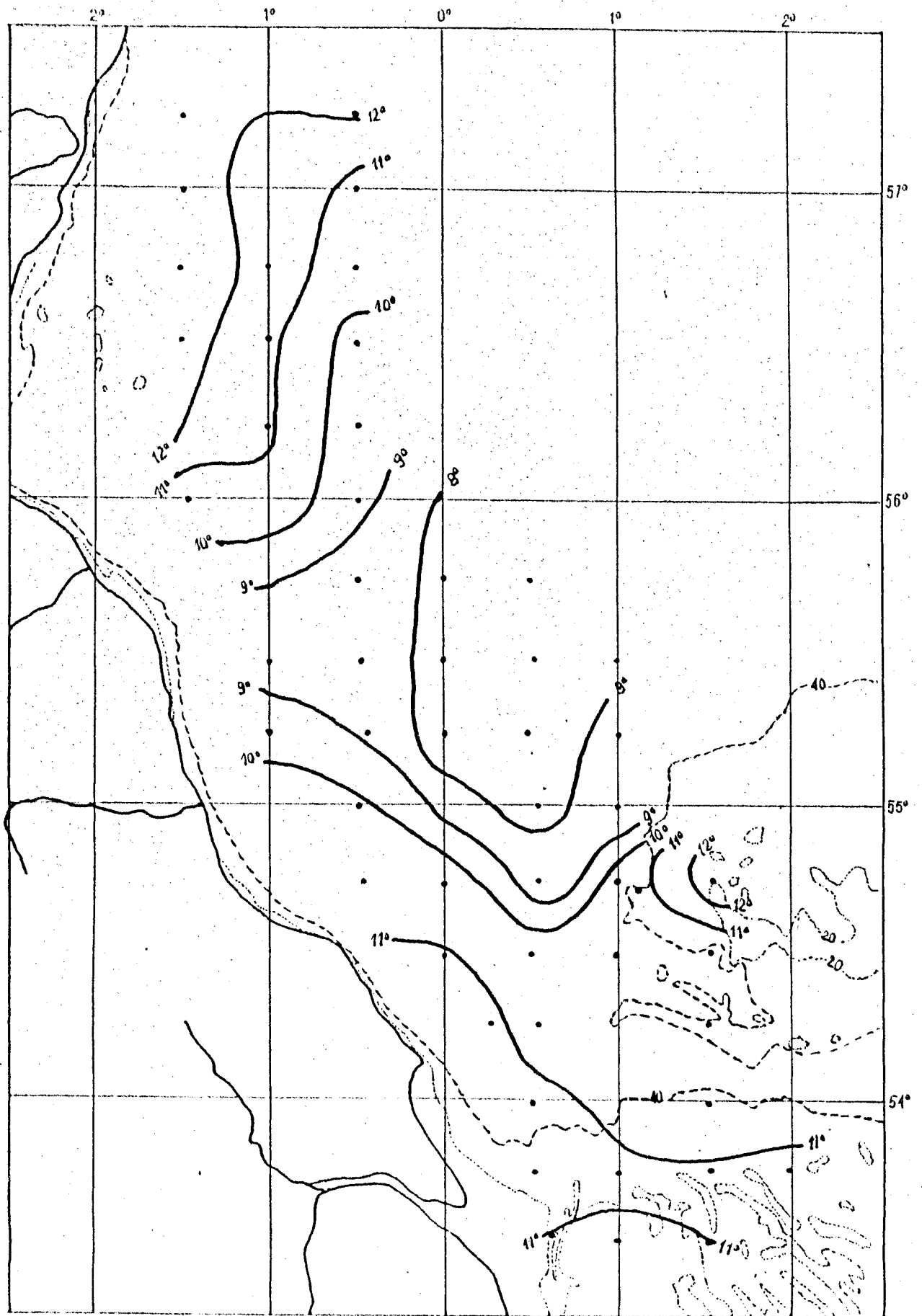


FIG. 5. Temperature of bottom waters in September and October 1974
/after W. RYJOWSKI/