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THE RESULTS OF THE INTERNATIONAL O-GROUP GADOID SURVEY IN THE NORTH SEA, 1977

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INTRODUCTION

The 1977 survey was carried out in the period June to July by 4 vessels, CORILLA (England), EXPLORER (Scotland), JOHAN HJORT (Norway) and TRIDENS (Netherlands). The gears used, the design of the experiment and the method of fishing were all as described for the 1976 survey by Daan et al. (1976).

RESULTS

Area fished

The statistical squares fished by each vessel are shown in Figures 1 and 2. The withdrawal from service of the DANA (Denmark), shortly before the survey started, meant that one of the original design objectives of the survey - that each square should be sampled twice by a separate vessel at a time interval of more than 7 days to form two complete surveys - could not be achieved. In addition, the EXPLORER suffered mechanical breakdowns that prevented her fishing all the squares allotted to her. On the other hand, the JOHAN HJORT sampled some of the squares a third time (Figure 8).

That the survey did not proceed as planned meant that it was not possible to work up the data in the designed form as two separate surveys. However, calculation of the geometric means and their 95% confidence for all the statistical squares which had been fished twice showed that there was no statistically significant difference between the two surveys for cod, haddock and whiting. There was a difference for Norway pout but this could be attributed to patchiness, as found in the comparative fishing experiment made in 1975 (Daan et al., 1975). Therefore, the results were treated as forming one survey, referred to in this paper as the international survey. The results from the third survey by the JOHAN HJORT have been treated separately and are referred to as the Norwegian survey. For the international survey, mean numbers of O-group cod, haddock and whiting per 1 h haul for the three areas described by Daan et al. (1975) are shown in Table 1 and average numbers per haul, mean length, standard deviation and range for all species by groups of 4 statistical rectangles in Tables 2 and 3. Similar data for the Norwegian survey are given in Table 4.

Distribution

The numbers of 0-group gadoids caught in each statistical square during the international survey are shown in Figures 3-7 and those caught during the Norwegian survey in Figure 8.

Cod were widely distributed except around the north and east coasts of Scotland, where they were absent from the catches in the majority of statistical squares. For the second year running, the highest abundance was found off the Danish coast. By the time of the Norwegian survey, average numbers had fallen considerably from a geometric mean of 16.2 to 6.2 for the same squares and they were entirely absent from the E9 series of statistical squares.

The distribution of haddock was similar to that in previous years, the species being most abundant east of Shetland and least abundant off the Danish coast. As with cod, the abundance in the Norwegian survey was much less than in the international survey, 79.1 compared with 124.2, with the most marked decrease in abundance also being in the E9 series of statistical rectangles.

Whiting were generally scarce throughout the whole of the survey area, the area of highest abundance being the Danish coast. Small numbers were caught along the English north-east coast and also in a line running from the north coast of Scotland to Shetland. There was little difference between the international and the Norwegian surveys.

Saithe were very scarce, occurring in only 26 of 162 hauls made, the highest catch being 38. The mean was 0.50 compared with 4.1 in 1976.

The distribution of Norway pout was more westerly than in previous years, the largest catches being taken immediately to the east of Shetland instead of between 0° and 2°E as is the usual pattern. In the Norwegian survey, the abundance of Norway pout was very low, 104.2 compared with 2878.3 in the international survey.

Only 4 blue whiting were caught in the combined surveys, 3 in statistical square 50FO and 1 in 51FO.

Length distributions

The length data for all the surveys carried out between 1974 and 1977 are summarised in Table 5. Two main points are apparent:

- 1) differences in mean lengths within years are often greater than between years
- 2) the 0-group gadoids, and in particular cod, have not reached the size at which they descend to the bottom, by the time that the survey has normally finished.

Prediction of year-class size

The geometric means of the numbers of cod, haddock and whiting were calculated for the areas of highest average abundance shown in Figures 2, 3 and 4 in Daan et al. (1976). These are shown in Table 6, together with the geometric mean estimates of abundance as 1 year olds from both the International Young Herring Surveys (from Anon, 1977a) and the North Sea Roundfish Working Group Report (Anon, 1977b).

The data sets for both cod and whiting are very limited and the data for the 1972 and 1973 year-classes (shown in parentheses in Table 6) include catches made with a Boothbay net and capelin trawl, neither of which give results that are comparable with those taken by the IYGPT (Daan et al. 1975). Considering the results as they stand, there is a significantly positive correlation between the results from the 0-group surveys and those from the IYHS and VPA for cod, (although the 95% confidence limits of the slope are very wide) but not for whiting. As stated last year, it is unlikely that the 0-group survey will give a reliable index of year-class abundance for whiting because this species has an extended spawning period. Neither of the correlation coefficients for haddock was statistically significant (although both were higher than obtained from last year's data sets), despite the longer data series available. The poor correlation with the IYHS data results from the high values for the 1970 year-class given by the IYHS. As this does not correlate well with the VPA data, it suggests that the IYHS over-estimated this year-class. Although more data points are required before it can be stated whether the surveys can be used to predict year-class sizes of cod, haddock and whiting, the increase in the correlation coefficients for haddock and the statistically significant correlations for cod, indicate that the surveys will eventually meet this objective for these two species.

On the basis of this year's results, the year-class sizes of all these species are very small.

By-catches

By-catch data for herring, sandeel and sprat are given in Tables 7-9. By-catch data for other species are available on request from the co-ordinator (Holden); it is intended to publish these data for selected species in the Annales Biologiques.

Planning of the 1978 survey

The group discussed the planning of the 1978 survey. It was agreed that it should proceed as in 1977 but that the survey should be considered as an entity not as two separate surveys. It was agreed that if ships' time allowed, a partial third survey should be carried out. Additional participants would still be welcome and should contact the co-ordinator (Holden).

References

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|---|-------|---|
| Anon | 1977a | Report of the gadoid I group Working Group.
ICES C.M. 1977/F:19, pp 8 (mimeo). |
| Anon | 1977b | Report of the North Sea Roundfish Working
Group. ICES C.M. 1977/F:8, pp 61 (mimeo). |
| Daan, N., Hislop, J.R.G.,
Holden, M.J. and Lahn-
Johannessen, J. | 1975 | Report of the pelagic 0-group Survey of the
North Sea in 1975. ICES C.M. 1975/F:33,
7 pp (mimeo). |
| Daan, N., Hislop, J.R.G.,
Holden, M.J., Parnell, W.G.,
Knudsen, H. and Lahn-
Johannessen, J. | 1976 | The results of the international 0-group
gadoid survey in the North Sea, 1976.
ICES C.M. 1976/F:12, 4 pp (mimeo). |

TABLE 1

Geometric mean and upper and lower 95% confidence limits
based on standard survey, all data combined.

	Northern North Sea (79 obs)	British east coast (34 obs)	Danish coast (16 obs)	
	n	n	n	
	95%	95%	95%	
COD	10.10	14.08-7.25	71.95	197.77-26.17
HADDOCK	47.50	72.36-31.17	1.80	3.11-1.04
WHITING	2.34	3.03-1.81	51.02	152.87-17.03

TABLE 2. Catches, catch rates, mean length (cm), standard deviations and ranges of lengths by species and blocks of 4 statistical rectangles: 1st occasion of sampling.

Block	Date	Ships	Cod				Haddock				Whiting				Saithe				Norway Pout								
			N	N/hr	\bar{L}	Sd	Range	N	N/hr	\bar{L}	Sd	Range	N	N/hr	\bar{L}	Sd	N	N/hr	\bar{L}	Sd	Range						
52-51 F0-1	20/6	T	3	1	3.75	0.87	3.0-4.9	37	18	3.16	0.88	1.5-5.9	101	50	2.21	0.47	1.0-4.4	3	2	3.58	0.53	3.0-4.4	28	14	1.98	0.32	1.0-3.4
52-51 F2-3	20,22/6	T,JH	0					7	3	3.34	1.18	2.0-6.9	0				0				0						
50-49 F0-1	20,21/6	T,JH	103	26	3.70	0.66	2.0-6.4	941	235	3.88	1.14	2.0-8.9	142	36	2.63	0.65	1.5-4.9	12	4	3.54	0.63	3.0-4.9	6424	1606	3.72	0.43	1.5-5.9
50-49 F2-3	20,21, 22/6	T,JH	121	30	4.55	0.60	2.5-6.9	266	66	4.27	1.23	1.5-8.4	93	23	2.83	0.55	1.5-5.4	58	19	3.75	0.74	2.5-5.9	126	32	3.16	0.46	1.5-4.9
48-47 F0-1	17,20,24	T,JH	16	3	4.28	0.46	3.5-5.4	23	5	5.40	0.95	4.0-8.4	0				6	2	2.80	0.40	2.5-7.4	651	130	3.58	0.45	2.5-5.9	
48-47 F2-3	21,22, 23/6	T,JH	61	15	4.46	0.65	2.0-6.9	91	23	4.42	1.26	2.0-9.4	18	4	3.61	0.45	2.5-4.9	9	3	3.56	0.80	2.5-5.9	667	167	3.76	0.41	2.5-5.4
46-45 F0-1	16,17,21, 22,24/6	T,JH	12	2	2.67	0.56	2.0-4.9	85	14	2.71	1.06	1.5-5.9	0				2	1	2.50	0.59	2.0-3.4	95	16	3.84	0.75	1.5-5.9	
46-45 F2-3	22,23/6	T,JH	0					10	2	2.60	0.34	2.0-3.9	0				0				99	25	4.28	0.52	2.5-5.9		
44-43 F0-1	16,20,23, 24/6	T,C,JH	7	1	2.75	0.50	2.0-3.9	202	29	3.31	0.90	1.5-7.4	0				5	1	3.40	0.95	2.0-4.4	24	3	4.17	0.64	2.5-5.9	
44-43 F2-3	16,23/6	T,JH	243	40	2.57	0.54	1.5-6.4	24	4	3.35	1.00	1.5-7.4	0				4	1	3.75	0.64	3.0-4.9	5	1	3.45	0.57	2.5-4.9	
All area	-	-	566		3.46	1.05	1.5-6.9	1686		3.83	1.20	1.5-9.4	354		2.61	0.66	1.0-5.4	99		3.55	0.74	2.0-7.4	8119		3.71	0.46	1.0-5.9
50-49 E8-9	20/6	JH	30	30	4.35	0.40	3.5-5.4	48	48	5.92	0.94	4.0-8.4	0									800	800	3.58	0.46	2.5-4.9	
48-47 E6-7	24/6	E	0					2	2	4.25	2.12	2.5-5.9	2	2	2.50	0	2.0-2.9	0				1	1	2.75	0	2.5-3.4	
48-47 E8-9	19,24/6	JH,E	128	43	4.75	0.68	3.0-6.9	689	230	6.18	0.98	3.5-8.4	3	1	1.92	0	1.5-2.4	0				62330	20777	4.16	0.49	3.0-5.9	
46-45 E6-7	22,23, 24/6	E	10	3	3.65	0.32	3.0-4.4	3	1	4.42	1.15	3.5-6.4	4	1	2.12	0	1.5-2.4	0				1	<1	2.75	0	2.5-3.4	
46-45 E8-9	19,22,23, 24/6	E,T,JH	2	<1	4.25	0	4.0-4.9	3	1	3.58	0.29	3.0-4.4	1	<1	3.75	0	3.5-4.4	0				22	5	3.59	0.52	2.5-4.4	
44-43 E6-7	22/6	E	4	2	4.25	0.41	3.5-4.9	5	3	4.55	0.45	4.0-5.4	1	<1	3.75	0	3.5-4.4	0				0					
44-43 E8-9	20,21, 23/6	E,C	5	1	3.65	0.42	3.0-4.4	54	13	3.80	0.81	2.0-5.9	0				0				3	1	4.42	0.76	3.5-5.4		
All area	-	-	179		4.57	0.69	3.0-6.9	804		5.97	1.15	2.0-8.4	11		2.43	0.68	1.5-4.4	0				63157		4.15	0.49	2.5-5.9	
42-41 E6-7	19,21/6	C	149	74	3.27	0.49	2.0-4.9	18	9	4.08	0.70	2.5-4.9	17	9	3.04	0.36	2.5-3.9	0				0					
42-41 E8-9	19,21/6	C	7	2	3.18	0.34	2.5-3.9	18	4	4.50	0.83	2.5-6.4	2	<1	3.25	0	3.0-3.9	0				0					
42-41 F0-1	19/6	C	2	2	2.75	0	2.5-3.4	1	1	3.75	0	3.5-4.4	0				0				0						
40-39 E8-9	17,18,22, 24/6	C	87	12	3.08	0.84	1.5-5.4	12	2	3.79	0.89	2.5-5.4	17	2	2.93	0.71	1.5-4.4	0				0					
40-39 F0-1	18,20/6	C	0					0					0				0				0						
38-37 E8-9	16,17,22 23/6	C	132	22	3.30	0.49	2.0-4.9	28	5	3.48	1.07	1.5-5.9	48	8	3.00	0.49	1.5-4.4	0				0					
38-37 F0-1	16,23/6	C	2	<1	3.00	0	2.5-3.4	0				0				0				0							
All area	-	-	379		2.88	0.73	1.5-5.4	77		3.91	0.97	1.5-6.4	84		3.00	0.51	1.5-4.4	0				0					
42-41 F4-5	15,24/6	T	46	9	3.89	1.25	2.0-7.4	2	<1	3.75	1.41	2.5-4.9	0				0				0						
42-41 F6-7	14,24/6	T	518	86	3.72	0.44	2.5-5.9	3	<1	5.08	1.89	3.5-7.9	241	40	5.31	1.50	2.0-9.4	0				0					
All area	-	-	564		3.73	0.55	2.5-7.4	5		4.55	1.68	2.5-7.9	241		5.31	1.50	2.0-9.4	0				0					
All survey			1688		3.54	0.93	1.5-7.4	2572		4.50	1.54	1.5-9.4	690		3.60	1.62	1.0-9.4	99		3.55	0.74	2.0-7.4	71276		4.10	0.51	1.0-5.9

TABLE 3. Catches, catch rates, mean length (cm), standard deviations and ranges of lengths by species and blocks of 4 statistical rectangles: 2nd occasion of sampling

Block	Date	Ships	Cod	Haddock				Whiting				Saithe				Norway Pout												
				N	N/hr	L	Sd	Range	N	N/hr	L	Sd	Range	N	N/hr	L	Sd	Range	N	N/hr	L	Sd	Range					
52-51 F0-1	25,30/6	JH		1	<1	4.25	0	4.0-4.9	126	63	5.75	1.04	4.0-9.4	0		0			13	6	3.63	0.36	3.0-4.4					
52-51 F2-3	26/6	JH		0					1	1	3.75	0	3.5-4.4	0		0			0									
50-49 F0-1	25,29, 30/6	JH		35	9	4.85	0.66	3.0-6.4	803	201	6.02	1.21	3.5-9.4	0		0			270	68	3.86	0.60	2.0-5.4					
50-49 F2-3	26/6	JH		46	23	4.97	0.74	3.5-6.4	226	113	5.10	1.38	2.5-10.4	18	9	4.11	0.72	3.0-5.9	17	17	4.54	0.50	3.5-5.9					
48-47 F0-1	25,28, 29/6	JH		55	18	4.74	0.55	3.5-6.4	60	20	5.74	1.11	4.0-8.9	0		0			11766	3922	4.40	0.60	3.0-5.9					
48-47 F2-3	26,27/6	JH		7	3	4.46	0.49	3.5-5.4	18	9	5.64	1.83	3.0-9.4	18	9	4.08	0.64	3.0-5.4	1	<1	3.25	0	3.0-3.4					
46-45 F0-1	28/6	JH		1	<1	3.75	0	3.5-4.4	4	2	2.38	0.48	1.5-2.9	0		0			4	2	4.48	0.48	4.0-5.4					
46-45 F2-3	27/6	JH		55	28	3.49	0.80	2.5-5.9	15	8	4.38	1.19	2.5-6.9	0		0			889	444	4.95	0.44	3.5-5.9					
44-43 F0-1	28/6	JH		4	4	4.13	0.63	3.0-4.9	39	39	4.22	1.15	2.5-6.4	0		0			0									
44-43 F2-3	27/6	JH		13	13	3.67	0.57	3.0-4.9	1	1	5.75	0	5.5-6.4	0		0			0									
All area	-	-	217		4.40	0.91	2.5-6.4	1293		5.73	1.32	1.5-10.4	36		4.10	0.67	3.0-5.9	18		4.22	0.57	3.0-5.9	12944		4.42	0.61	2.0-5.9	
52-51 E8-9	28/6	E		0					0					0									0					
50-49 E8-9	28,29/6	E		76	19	4.74	0.78	2.0-6.4	372	93	5.11	1.22	2.0-9.9	46	12	2.23	0.84	1.0-5.4	0					28	7	3.50	1.08	2.0-5.9
48-47 E4-5	26,30/6	E		1	<1	3.25	0	3.0-3.9	6	3	3.33	1.43	1.5-5.9	60	30	2.08	0.57	1.0-3.9	0					45	23	1.88	0.25	1.0-2.4
48-47 E6-7	25,26, 29/6	E		0					44	9	4.20	1.29	2.0-7.9	81	16	2.52	0.67	1.0-4.9	0					2	<1	3.50	1.77	2.0-5.4
48-47 E8-9	27,29/6, 2/7	E,JH		11	2	4.57	0.60	3.5-5.9	62	12	5.03	1.62	2.0-9.4	26	5	3.23	0.73	1.5-4.9	0					2735	547	3.71	0.44	1.5-5.9
46-45 E4-5	25,30/6	E		46	23	4.02	0.58	2.5-5.4	18	9	5.44	0.99	3.0-7.4	103	54	3.93	1.05	1.5-6.4	0					11	5	2.43	0.34	1.5-2.9
46-45 E6-7	25,30/6, 3/7	E		2	<1	4.00	0	3.5-4.4	2	<1	5.00	1.06	4.0-5.9	12	3	3.58	0.98	1.5-4.9	1	<1	3.25	0	3.0-3.4	2	<1	3.00	0.35	2.5-3.4
46-45 E8-9	29/6	JH		1	1	5.75	0	5.5-6.4	0					0									13	13	4.79	0.56	3.5-5.9	
44-43 E6-7	3/7	E		0					2	2	6.00	0.35	5.5-6.4	5	5	3.55	0.76	2.5-4.9	0					1	1	3.25	0	3.0-3.9
44-43 E8-9	26/6,3/7	C,E		1	<1	2.75	0	2.5-3.4	43	14	4.89	1.05	2.5-6.4	7	2	3.96	0.57	3.0-4.9	0					0				
All area	-	-	138		4.46	0.79	2.0-6.4	549		5.00	1.29	1.5-9.9	345		3.00	1.14	1.0-6.4	1		3.25	0	3.0-3.4	2837		3.68	0.52	1.0-5.9	
42-41 E6-7	27/6	C		120	60	3.02	0.56	1.5-4.4	82	41	3.79	1.11	2.0-6.4	63	31	2.95	0.74	1.5-4.4	0					0				
42-41 E8-9	25,26/6	C		89	22	3.49	0.52	2.0-4.9	34	8	4.34	1.00	2.0-6.4	6	1	2.92	0.52	2.0-3.9	0					13	3	3.60	0.32	3.0-4.4
42-41 F0-1	25/6	C		4	4	3.00	0.50	2.5-3.9	1	1	4.25	0	4.0-4.9	0		0			0					0				
40-39 E8-9	25/6	C		13	13	3.98	0.44	3.0-4.9	2	2	4.75	0	4.5-5.4	1	1	3.75	0	3.5-4.4	0					0				
All area	-	-	226		3.26	0.61	1.5-4.9	119		3.96	1.09	2.0-6.4	70		2.96	0.72	1.5-4.4	0					13		3.60	0.32	3.0-4.4	
42-41 F4-5	27,28/6	T		509	170	4.95	1.02	2.5-8.4	67	22	4.98	1.05	2.5-8.4	478	159	4.61	0.95	1.5-8.4	1	<1	5.25	0	5.0-5.9	0				
42-41 F6-7	27/6	T		1	<1	4.25	0	4.0-5.4	0					79	40	5.14	1.96	2.5-10.9	0					1	<1	3.75	0	3.5-4.4
All area	-	-	510		4.95	1.02	2.5-8.4	67		4.98	1.05	2.5-8.4	557		4.69	1.16	1.5-10.9	1		5.25	0	5.0-5.9	1		3.75	0	3.5-4.4	
All survey	-	-	1091		4.43	1.10	1.5-8.4	2028		5.40	1.38	1.5-10.4	1008		3.97	1.39		20		4.20	0.63	3.0-5.9	15795		4.29	0.66	1.0-5.9	

TABLE 4. Catch rates, catches, mean length (cm), standard deviations and ranges of lengths by species and blocks of 4 statistical rectangles: Norwegian 3rd survey by Johan Hjort

Block	Date (July)	Cod					Haddock					Whiting					Saithe					Norway Pout				
		N	N/hr	\bar{L}	Sd	Range	N	N/hr	\bar{L}	Sd	Range	N	N/hr	\bar{L}	Sd	Range	N	N/hr	\bar{L}	Sd	Range	N	N/hr	\bar{L}	Sd	Range
50-49 F0-1	12,13,14	89	22	5.41	1.31	3.5-7.9	547	138	7.20	1.15	4.5-11.9	21	5	5.84	0.56	5.0-6.9	0					40632	10158	4.30	0.71	2.5-7.9
50-48 F2-3	12,14	7	4	5.82	0.85	4.0-6.9	269	134	6.89	1.13	4.5-10.4	40	20	5.11	1.05	3.5-8.4	1	<1	5.25	0	5.0-5.4	6	3	4.25	0.63	3.0-4.9
48-47 F0-1	14,15,17	34	7	5.22	0.63	4.0-6.4	80	16	6.22	2.44	2.5-10.4	0					0				49	10	5.07	0.98	3.5-7.4	
48-47 F2-3	14,17	10	5	5.25	0.82	4.0-6.9	136	68	7.04	1.43	4.0-10.9	106	53	5.56	1.07	3.0-8.9	0					0				
46-45 F0-1	16	5	1	5.45	1.09	3.5-6.9	30	8	4.42	0.79	3.0-6.9	0					0				43	11	5.61	0.95	3.0-7.4	
46-45 F2-3	17	14	14	4.79	0.76	3.5-6.4	11	11	6.34	1.71	4.0-8.9	256	256	5.44	0.89	3.0-7.4	0					0				
All area	-	159		5.33	1.00	3.5-7.9	1073		6.94	1.41	2.5-11.9	423		5.46	0.96	3.0-8.9	1		5.25	0	5.0-5.4	40730		4.29	0.71	2.5-7.9
50-49 E8-9	13	0					101	50	5.95	1.12	4.0-10.9	9	4	5.53	0.83	0	0					0				
48-47 E8-9	15	0					12	6	5.83	0.72	4.0-6.9	0					0				6	3	4.58	0.41	4.0-5.4	
All area	-	0					113		5.94	1.09	4.0-10.9	9		5.53	0.83	4.0-6.9	0					6		4.58	0.41	4.0-5.4
All survey		159		5.33	1.00	3.5-7.9	1186		6.85	1.42	2.5-11.9	432		5.46	0.95	3.0-8.9	1		5.25		5.0-5.4	40736		4.30	0.72	2.5-7.9

TABLE 5. Mean lengths (cm), standard deviations and ranges of lengths by species, area and time periods, 1974-1977

Year	Date	Cod			Haddock			Whiting			Saithe			Norway Pout			Blue Whiting		
		L	Sd	Range	L	Sd	Range	L	Sd	Range	L	Sd	Range	L	Sd	Range	L	Sd	Range
Danish Coast																			
1974	26/5-4/6	3.24	0.52	1.0-5.4	3.14	0.86	1.0-6.4	3.26	0.54	1.5-5.9	0	0	0	0	0	0	0	0	
1975	18-29/6	3.03	0.62	1.5-3.9	4.03	1.03	2.0-7.9	3.50	0.50	2.5-3.9	0	0	0	0	0	0	0	0	
1975	1-8/7	0	0	0	0	0.95	1.5-6.4	0	0	0	0	0	0	0	0	0	0	0	
1976	15-16/6	3.14	0.63	1.5-6.9	3.00	0.35	2.5-4.9	3.41	0.66	1.5-5.4	3.50	1.06	2.5-4.9	0	0	0	0	0	
1976	18-23/6	2.86	0.52	1.5-6.9	4.21	1.44	1.5-9.4	3.42	1.26	1.0-6.9	0	0	0	0	0	0	0	0	
1977	14-24/6	3.73	0.55	2.0-7.4	4.55	1.68	2.5-7.9	5.31	1.50	2.0-9.4	0	0	0	0	0	0	0	0	
1977	27-28/6	4.95	1.02	2.5-7.9	4.98	1.05	2.5-7.9	4.69	1.16	1.5-10.4	5.25	0	5.0-5.4	3.75	0	3.5-3.9	0	0	
English Coast																			
1974	20/6-14/6	2.85	0.50	1.0-4.4	5.79	2.38	1.5-7.4	2.19	0.20	1.5-2.9	0	0	0	0	0	0	0	0	
1975	8-30/6	6.25	0	6.0-5.4	4.75	2.12	3.0-6.4	3.26	1.01	1.5-6.4	0	0	0	0	0	0	0	0	
1975	1-8/7	3.15	0.50	2.0-4.4	4.75	1.41	3.0-6.4	2.63	0.42	2.0-3.4	0	0	0	2.45	0.27	2.0-2.9	0	0	
1976	15-19/6	2.49	0.54	1.0-3.9	2.61	0.49	1.5-4.9	5.56	0.54	4.5-7.4	5.03	0.71	3.5-8.4	0	0	0	0	0	
1976	23-29/6	3.28	1.12	1.5-6.9	3.24	0.85	1.0-5.9	2.34	0.51	1.0-4.4	5.63	0.48	5.0-6.4	2.25	0.47	1.0-3.4	0	0	
1977	16-24/6	2.88	0.73	1.5-4.9	3.91	0.97	1.5-6.4	3.00	0.51	1.5-4.4	0	0	0	0	0	0	0	0	
1977	25-27/6	3.26	0.61	1.5-4.4	3.96	1.09	2.0-8.9	2.96	0.72	1.5-3.9	0	0	0	3.60	0.32	3.0-3.9	0	0	
Scottish Coast																			
1974	6-15/6	3.25	0	3.0-3.4	2.58	0.31	2.0-3.9	0	0	3.0-3.4	3.25	0	3.0-3.4	2.26	0.58	1.0-3.9	0	0	
1974	15-25/6	4.74	0.64	3.0-7.9	5.36	1.45	1.5-11.9	4.37	0.86	1.0-7.9	4.93	0.40	3.0-7.4	4.20	0.37	1.5-6.4	3.83	3.54	1.5-6.9
1975	24-30/6	3.57	0.94	2.0-5.9	4.51	0.90	1.5-8.4	2.63	0.63	1.0-4.4	0	0	0	5.42	0.66	1.5-5.9	2.25	0.71	1.5-2.9
1975	2-8/7	3.03	0.44	2.0-3.4	5.82	2.29	1.5-10.4	2.53	0.81	1.0-5.9	2.58	0.66	1.5-3.9	5.85	0.77	2.0-7.9	0	0	
1976	16-21/6	3.61	0.84	2.0-6.9	3.56	0.93	1.5-8.4	2.56	0.56	1.0-5.4	5.18	1.33	2.5-7.9	2.22	0.35	1.0-5.9	3.50	0.53	2.5-4.9
1976	21-30/6	4.04	0.98	2.0-7.4	3.99	1.07	2.0-9.4	3.52	0.76	1.0-6.9	6.16	0.99	3.0-8.9	4.08	0.99	1.5-5.9	3.97	0.56	2.5-4.9
1977	19-24/6	4.57	0.69	3.0-4.9	5.97	1.15	2.0-8.4	2.43	0.68	1.5-4.4	0	0	0	4.15	0.49	2.5-5.9	0	0	
1977	25/6-3/7	4.46	0.79	2.0-5.9	5.00	1.29	1.5-9.4	3.00	1.14	1.0-5.9	4.22	0.57	3.0-5.9	3.68	0.52	1.0-5.4	0	0	
1977	13-15/7	0	0	0	5.94	1.09	4.0-10.9	5.53	0.83	4.0-6.9	0	0	0	4.58	0.41	4.0-5.4	0	0	
Northern																			
1974	7-13/6	3.59	0.78	1.5-6.9	4.22	1.38	1.0-9.9	3.53	0.80	1.5-6.9	4.43	0.45	2.5-6.4	3.78	0.69	2.0-5.9	5.59	2.48	3.0-7.4
1974	22-30/6	4.31	1.33	2.0-6.9	4.89	1.09	1.5-8.9	3.88	0.72	2.0-6.4	4.38	0.60	3.0-6.4	3.14	0.41	1.5-6.4	6.00	1.34	5.5-6.4
1974	2-8/7	5.54	1.51	3.0-8.4	7.72	2.28	3.0-13.4	6.82	1.54	2.5-11.4	6.93	1.03	5.5-7.4	6.18	0.53	2.0-8.4	9.57	1.22	7.0-11.9
1975	19-28/6	4.06	0.81	1.5-6.4	4.29	1.06	1.0-9.9	3.26	1.01	1.5-6.4	3.38	0.62	2.5-4.9	3.96	0.58	1.0-6.9	3.35	0.63	2.0-4.9
1975	3-5/7	6.46	1.04	4.5-7.4	4.10	1.57	3.0-10.9	2.63	0.42	2.0-3.4	0	0	0	5.35	0.84	3.0-6.9	0	0	
1976	13-21/6	4.52	0.93	2.0-7.9	4.22	1.25	1.0-10.9	2.30	0.82	1.0-6.0	4.40	1.30	1.5-9.4	4.06	0.63	1.5-6.9	8.75	0	8.5-3.9
1976	19-28/6	3.69	1.27	1.0-7.9	5.34	1.31	1.0-9.9	3.46	1.29	2.0-7.4	4.61	1.19	2.0-8.9	3.82	0.67	1.0-5.9	3.62	0.28	3.0-4.4
1977	16-24/6	3.46	1.05	1.5-6.9	3.83	1.20	1.5-9.4	2.61	0.66	1.0-5.4	0	0	0	3.71	0.46	1.0-5.9	3.63	0.63	2.5-4.4
1977	25-30/6	4.40	0.91	2.5-5.9	5.73	1.32	1.5-9.9	4.10	0.67	3.0-5.4	3.25	0	3.0-3.4	4.42	0.61	2.0-5.4	0	0	
1977	12-17/7	5.33	1.08	3.5-7.9	6.94	1.41	2.5-11.9	5.46	0.96	3.0-8.9	5.25	0	5.0-5.4	4.29	0.71	2.5-7.9	0	0	

Table 6 Estimates of year class size from G-group surveys, as 1 year olds from International Young Herring Survey (IYHS) (Anon, 1977a) and from VPA estimates in numbers $\times 10^{-3}$ (Anon, 1977b) : figures in parentheses include catches made with a Soothsay net and capelin trawl.

Survey Year-class	Cod			Haddock			Whiting		
				0-gp	IYHS	VPA	0-gp	IYHS	VPA
	0-gp	IYHS	VPA	0-gp	IYHS	VPA	0-gp	IYHS	VPA
1959	-	60	371	248	42	109	-	NO DATA AVAILABLE	778
1970	-	89	549	34	2364	974	-	NO DATA AVAILABLE	829
1971	-	3	86	4068	2767	1510	-	NO DATA AVAILABLE	1784
1972	(25)	32	193	93	470	273	(138)	NO DATA AVAILABLE	2343
1973	(8)	11	184	301	3621	1338	(40)	NO DATA AVAILABLE	1667
1974	157	55	385	2173	1616	2050	276	NO DATA AVAILABLE	2304
1975	17	6	119	622	326	423	70	NO DATA AVAILABLE	830
1976	183	44	-	579	316	-	16	-	-
1977	35	-	-	143	-	-	4	-	-
s		0.86	0.96		0.35	0.64	-	-	0.66
p		<0.05	<0.01	-	>0.1	>0.05	-	-	>0.1
Slope	-	0.21	1.56	-	0.34	0.30	-	-	4.48
Intercept	-	13.02	139.27	-	1098.6	622.0	-	-	1119.2
95% confidence limits of slope	-	23.8	107.2	-	2994.7	1361.1	-	-	530.1

Table 7 Herring by-catch R.V."Corella")

Square	38E9	41E7	37E9	43E8	42E7
Station No	28	16	30	43	45
Date	22.6	19.6	23.6	26.6	27.6
Length (cm)			Length (cm)		Length (cm)
5.0	2	2	14.0		4.5
.5	20	3	.5	2	1
6.0	33	5	15.0		
.5	23	13	.5	1	
7.0	4	2	16.0		
.5			.5	1	2
8.0			17.0	1	4
.5			.5	1	2
9.0			18.0		3
.5			.5		2
10.0			19.0		3
.5			.5		2
11.0			20.0		1
.5			.5		
12.0			21.0		
.5			.5		
13.0			22.0		
.5			.5		
14.0		1	23.0		
.5		3	.5	1	
15.0		1			
.5		2			
16.0		1			
.5		1			
17.0		1			
Total (Sample)	82	35	7	19	1
Est. Total Catch	4 920	35	7	19	1

Table 7 (contd) Herring by-catch (R.V."Tridens") Figures in brackets represent unsorted clupeid larvae																		
Square	41F6	41F7	42F7	42F6	42F5	41F5	43F2	50F6	51F1	50F2	50F1	45E9	44F0	43F0	42F7	41F7	41F5	41F4
Station	1	2	3	4	5	6	10	17	19	21	22	30	31	32	38	39	41	42
Date	14.6	14.6	14.6	14.6	15.6	15.6	16.6	20.6	20.6	20.6	21.6	22.6	23.6	23.6	24.6	27.6	27.6	27.6
Length (cm)																		
2																		
3		(3)	1	1	1	(3)										(1)	(2)	
4	1	(11)	2	1	2	(1)												
5	1	(22)		2	1											1		
6		(1)														6		
7																1		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
16																	8	
17		4															17	
18		12															18	
19		44															13	
20		24															1	1
21		24	1															
22		8																
23		8																
24																		
25																		
26																		
27																		
28																		
29																		
30																		
Total (Sample)	2	124 (37)	4	4	4	(5)	(2)		(38)	(3)	(10)	(1)	1	8	1 (6)	59 (2)		
Est. Total Catch	2	124 (37)	4	4	4	(5)	(2)	(69)*	(40)	(3)	(10)	(1)	1	8	1 (6)	236 (2)	(41)*	(?)*

* Not measured

Table 7 (contd)
Herring by-catch (R.V."Explorer")

Square	44E7	44E7
Station No	E77/111	141
Date	22.6	3.7
Length (cm)		
.5	1	
6.0	4	
.5	29	
7.0	54	
.5	25	
8.0	6	
.5		
9.0		1
.5		
10.0		
.5		
11.0		4
.5		
12.0		
.5		5
13.0		7
.5		
14.0		5
.5		
15.0		9
.5		
16.0		2
.5		
17.0		3
.5		
Total (Sample)	1	158
Est. Total Catch	1	264

Herring by-catch (R.V."Johan Hjort")

Table 8 Sprat by-catch (R.V. "Explorer")

Square	43E8	44E6	44E7	44E7	44E8	44E8	45E7	45E7	46E5	46E5	46E6	46E6	46E7
Station No	E77/107	110	111	141	108	142	114	140	121	136	120	137	139
Date	20.6	22.6	22.6	3.7	21.6	3.7	23.6	3.7	25.6	30.6	25.6	30.6	3.7
Length (cm)													
.5													
2.0													
.5													
3.0				1				1					
.5									2				
4.0								1	2				
.5								1					
5.0			2							1			
.5		4	1										
6.0		4	2										
.5	33		17	13									
7.0	119	1	8	28	5								
.5	52		2	40	40	1							1
8.0	8		3	58	71	30							
.5	7		12	31	63	46							
9.0	4	2	21	23	22	45							
.5	2		46	12	15	22							
10.0	1		41	5	3	12							
.5		27	2										
11.0		20											13
.5		24	2										12
12.0		9	1				1						7
.5		7	1										23
13.0		2											20
.5													8
14.0													7
.5													2
15.0													1
Total (Sample)	226	3	249	220	219	156	1	3	4	4	24	25	94
Est. Total Catch	4812	3	1087	1207	614	1248	1	3	4	4	24	25	94

Table 8 (contd.)
Sprat by-catch (R.V. "Explorer") Continued

Square	47E5	47E7	47E8	48E6	48E6	48E7	48E7	48E8	48E8	49E8	50E8	50E9
Station No.	135	118	117	123	134	124	133	125	132	131	130	128
Date	30.6	24.6	24.6	26.6	29.6	26.6	29.6	27.6	29.6	29.6	28.6	28.6
Length (cm.)												
.5												
1.0												
1.5												
2.0		31				2						
2.5						4						
3.0		24			5	1			2	22	3	1
3.5					1	1			6			2
4.0		1										
4.5												
5.0												
5.5												
6.0												
6.5												
7.0						1						
7.5												
8.0												
8.5												
9.0		3										
9.5		19										
10.0		105										
10.5		54	1				4					
11.0		16	3				33	1				
11.5		4	7				46					
12.0			11				71	1				
12.5		2	18				67	3				
13.0		2	24				22	1				
13.5			8				9					
14.0			1					1				
14.5			3									
15.0		1										
Total (Sample)	110	205	77	12	3	253	6	3	28	4	1	2
Act. Total Catch	110	1486	77	12	3	1659	6	3	28	4	1	2

Table 8 (contd)
Sprat by-catch (R.V. "Corella")

Square	37E9		37F0		38E8		38E9		38F0		39E8		39E9		40E8		40E9	
Station No.	2	30	3	31	7	6	28		32	36	9	27			14	35		
Date	16.6	23.6	16.6	23.6	17.6	17.6	22.6		23.6	24.6	17.6	22.6			18.6	24.6		
Length (cm)	.5		.5		.5		.5		.5		.5				.5		.5	
	5.0		5.5		6.0		6.5		7.0		7.5		8.0		8.5		9.0	
	6.5		7.0		7.5		8.0		8.5		9.0		9.5		10.0		10.5	
	7.0		7.5		8.0		8.5		9.0		9.5		10.0		10.5		11.0	
	6.0		6.5		7.0		7.5		8.0		8.5		9.0		9.5		10.0	
	5.5		6.0		6.5		7.0		7.5		8.0		8.5		9.0		9.5	
	5.0		5.5		6.0		6.5		7.0		7.5		8.0		8.5		9.0	
	4.5		5.0		5.5		6.0		6.5		7.0		7.5		8.0		8.5	
	4.0		4.5		5.0		5.5		6.0		6.5		7.0		7.5		8.0	
	3.5		4.0		4.5		5.0		5.5		6.0		6.5		7.0		7.5	
	3.0		3.5		4.0		4.5		5.0		5.5		6.0		6.5		7.0	
	2.5		3.0		3.5		4.0		4.5		5.0		5.5		6.0		6.5	
	2.0		2.5		3.0		3.5		4.0		4.5		5.0		5.5		6.0	
	1.5		2.0		2.5		3.0		3.5		4.0		4.5		5.0		5.5	
	1.0		1.5		2.0		2.5		3.0		3.5		4.0		4.5		5.0	
	0.5		1.0		1.5		2.0		2.5		3.0		3.5		4.0		4.5	
	0.0		0.5		1.0		1.5		2.0		2.5		3.0		3.5		4.0	
	Not measured	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Total (Sample)		69	59	65		64	30	84		113	20	4	1	1	1	1	1	1
Est. Total Catch	55	69	338	21500	1	64	1440	336		226	20	4	8	8	8	1		

Table 8 (contd)
Sprat by-catch (R.V. "Corella") Continued

Square	41E7	41E8	41E0	42E7	42E8	42E9	43E8	43E9	43E0					
Station No	16	46	46	17	40	23	45	45	24	44	41	43	42	21
Date	19.6	27.6	27.6	19.6	25.6	21.6	27.6	27.6	21.6	26.6	26.6	26.6	26.6	20.6
Length (cm)														
.5														
1.0														
1.5														
2.0														
2.5														
3.0														
3.5														
4.0														
4.5														
5.0														
5.5														
6.0														
6.5														
7.0														
7.5														
8.0														
8.5														
9.0														
9.5														
10.0														
10.5														
11.0														
11.5														
12.0														
12.5														
13.0														
13.5														
14.0														
14.5														
Total (Sample)	13	12	71	50	2	84	5	51	57	53	3	38	3	7
Est. Total Catch	13	12	284	1320	2	6888	5	101	1596	159	3	38	3	7

Table 8 (contd)

Sprat by-catch (R.V. "Tridens")*

Square	41F6	41F7	45B9	44F0	41F7
Station No	1	2	30	31	39
Date	14.6	14.6	22.6	23.6	27.6
Length (cm)					
2	1				.5
3					3.0
4					.5
5					4.0
6					.5
7		1	1		5.0
8			1		.5
9		2			6.0
10	11		1	13	.5
11	10	1	2	10	7.0
12	4		2		.5
13	7		1		8.0
14	1		2		
15	2				
16					
17					
18					
19					
20					
Total (Sample)	1	35	4	10	23
Est. Total Catch	1	560	4	10	92

Sprat by-catch (R.V. "Johan Hjort")

Square	50F1	44F0	47B9
Station No	23	33	38
Date	25.6	28.6	29.6
Length (cm)			
2	1		4
3			11
4			2
5			
6			
7			
8			
9			
10			1
11			
12			
13			
14			
15			
16			
17			
Total Catch	1	2	17

* Unsorted clupeid larvae are included in the herring table

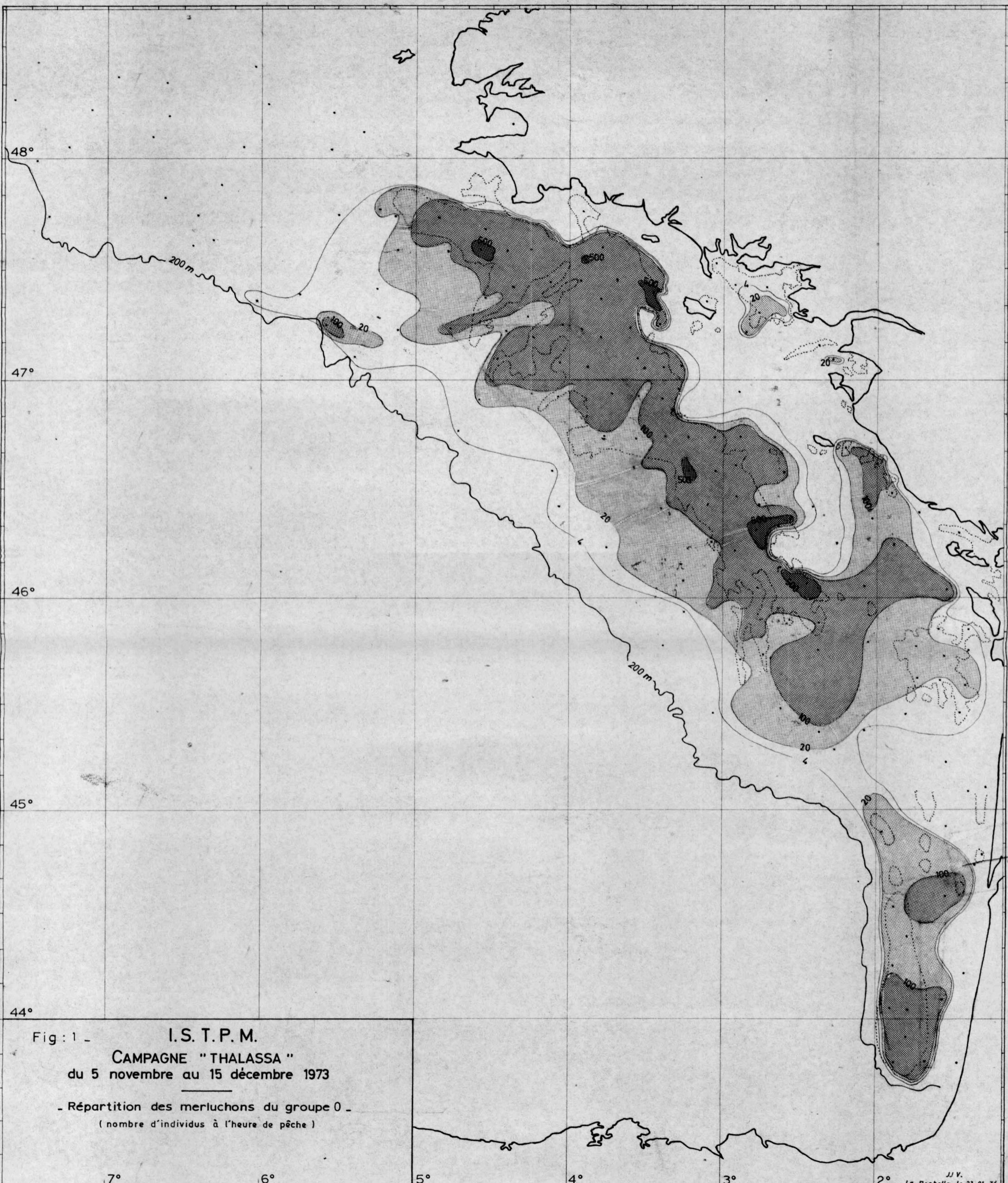


Table 9 Sandeel by-catch (R.V."Johan Hjort")

Square	46E9	47E9	48E9	49E9	49F0	48F0	47F0	46F0	50F3	49F3	44F1	45F1	46F1	48F1	49F1	50F1		
Station No.	1	2	3	4	5	6	7	8	10	11	17	18	19	21	22	23		
Date	19.6	19.6	19.6	20.6	20.6	20.6	20.6	21.6	22.6	22.6	24.6	24.6	24.6	25.6	25.6	25.6		
Length (cm)																		
.5																		
1.0																		
.5																		
2.0																		
.5																		
3.0		29																
.5	396	176																
4.0	634	498	23															
.5	264	381	61	23														
5.0	106	439	57	163	19	154	196	60										
.5	117	23	444	464	62	140	12	1	1	67	1	56	600					
6.0		397	406	31				2	1	800	8	556	400	1	100	79		
.5	163	174	15					1	1	533	8	833	2	800	2	000		
7.0			39							267	12	444	3	400	1	100		
.5			19							467	8	222	1	200	700	1		
8.0										332	4	333	1	400	100	628		
.5										400	1	56	400			314		
9.0											1	56				393		
.5																471		
10.0																		
.5																		
11.0																		
.5																		
12.0																		
.5																		
13.0																		
.5																		
14.0																		
.5																		
15.0																		
Total (Sample)																		
Est. Total Catch	1400	1640	164	1190	1121	785	1400	300	5	3	3	333	43	2890	10	200	5 000	4 400

Table 9 (contd)
Sandeel by-catch (R.V."Johan Hjort") Continued

Square	50F2	49F2	47F2	46F2	45F2	44F2	44X0	45F	46F0	47F0	46E9	47E9	48F0	49F0
Station No	26	27	29	30	31	32	33	34	35	36	37	38	39	40
Date	26.6	26.6	27.6	27.6	27.6	27.6	28.6	28.6	28.6	28.6	29.6	29.6	29.6	29.6
Length (cm)														
.5														
1.0														
.5														
2.0														
.5														
3.0								1				36		
.5								3	2					
4.0								4	3	6	187	67	264	12
.5								6	3	2	187	156	216	84
5.0								7	2	226	38	60	48	150
.5								12		93	45	24	120	300
6.0								14	1		22		216	900
.5								8	3	13	8		84	750
7.0	1029	1882						5	2	27	8		12	300
.5	1828	2259		1				8	1	27	8			100
8.0	2057	3953		1							8			12
.5	686	942									15			
9.0	343	188								1				12
.5	114													
10.0														
.5														
11.0		188						2	1					
.5								8	1					
12.0								8	3					
.5								1	9	3				
13.0								7	2	1				
.5								5	1					
14.0								2						
.5														
15.0														
Total (Sample)														
Est. Total Catch	6057	9412	3	44	11	1	69	14	12	760	375	600	600	2500

Table 9 (contd)
Sandeel by-catch (R.V. "Johan Hjort") Continued

Square	50F1	49F1	48FO	46FO	45FO	46F1	47F1	47FO
Station No	44	49	53	58	59	61	62	56
Date	12.7	14.7	15.7	16.7	16.7	16.7	17.7	15.7
Length (cm)								
.5								
1.0								
.5								
2.0								
.5								
3.0								
.5								
4.0								
.5								
5.0					1	1		
.5					2			
6.0			4		2			
.5			2		2			
7.0	125	22	22		1	1		1
.5	25	2	3					
8.0	50	3	3					
.5	25	3	1					
9.0	50	2	2					
.5		1						
10.0								
.5								
11.0			1					
.5								
12.0							1	
.5								
13.0								
.5								
14.0								
.5								
15.0								
Total (Sample)								
Est. Total Catch	275	13	14	7	2	1	1	1

Table 9 (contd)

Sandeel by-catch (R.V."Corella")

Table 9 (contd)

Sandeel by-catch (R.V. "Corella") Continued

Square	42E8	42E9	39E8	43E9	43E8	
Station No	24	26	41	36	42	
Date	21.6	21.6	26.6	24.6	26.6	
Length (cm)						
3.0			1			
.5			4			
4.0			6			
.5			12		1	
5.0			12			
.5			11			
6.0		3	17	3	1	
.5	2	2	10	14		
7.0	64	25	17	14	14	
.5	54	59	11	19	84	
8.0	17	53	15	19	52	
.5	4	9	1	4	12	
9.0	1	6	1	4		
.5		1				
10.0			1			
.5						
Total (Sample)	142	158	118	1	78	163
Est. Total Catch	16 104	6 952	1 888	1	27 300	6 564

Table 9 (contd)
Sandeel by-catch (R.V."Corella") Continued

Square	40E8	41E7	41E8	42E8
Station No	14	37	16	17
Date	18.6	25.6	19.6	19.6
Length (cm)				
7.0			1	10
.5		2	2	50
8.0		10	4	42
.5		8	1	32
9.0		4		8
.5				2
10.0		1	1	
.5				3
11.0	4	12	7	1
.5	12	14	9	
12.0	22	20	15	8
.5	13	9	13	8
13.0	9	7	10	11
.5	9	4	2	8
14.0	2		1	8
.5				1
15.0		3		2
.5		2		3
16.0		3	1	3
.5		1		2
17.0		3	1	4
.5		5		
18.0		5		1
.5		6		
19.0				
.5		3		
20.0		1		
.5				
21.0				
.5			1	
Total (Sample)	71	123	61	73
Est. Total Catch	2 130	6 765	281	1 590
				2 435

Table 9 (contd)

Sandeel by-catch (R.V. "Explorer")

Square	43E3	44E6	44E7	44E8	44E8	44E9	45E7	45E7	45E8	46E5	46E5	46E6	46E7	46E7	46E8	47E6
Station No	E77/107	110	141	108	142	112	114	140	113	121	136	137	115	139	116	119
Date	20.6	22.6	3.7	21.6	3.7	23.6	23.6	3.7	23.6	25.6	30.6	30.6	24.6	3.7	24.6	25.6
Length (cm)																
3.0							7									
.5							24									
4.0							32			1						
.5							33			1						
5.0							36			1						
.5							17			1						
6.0							9			1						
.5							12	1	5	18						
7.0							38			48						
.5							49			11	43					
8.0							32		2	7	17					
.5							7	1		5	15					
9.0										8	50					
.5										9	40					
10.0										2	12	14	20	21	1	
.5										1	1	56	37	17	2	
11.0							19	1	2	1	59	28	5	1	1	1
.5										15	2	49	20	3	3	
12.0							77		30	5	3	19	7	1	8	
.5							89		46	3	8	10	1		2	
13.0							28		51	10	10	5		1	1	
.5							5		21	13	11	8		7	6	
14.0									7	10	24	1		3	4	
.5										5	34	18	1		8	
15.0							1		1	33	26	1			6	
.5										24	17				5	
16.0								1		38	16				3	
.5										35	8				6	
17.0										24	5				2	
.5										31	4				3	
18.0										9	3				1	
.5										6	2				1	
19.0										6						
Total (Sample)	219	147	6	198	5	165	178	327	407	225	174	216	110	105	33	13
Est. Total Catch	2 628	239	6	594	5	437	178	327	407	2 232	449	672	110	105	33	13

Table 9 (contd)
Sandeel by-catch (R.V."Explorer") Continued

Square	47E7	47E8	47E9	48E6	48E6	48E7	48E7	48E8	48E8	48E9	49E8	49E9	50E8	50E9
Station No	E77/118	117	138	123	134	124	133	125	132	126	131	127	130	128
Date	24.6	24.6	2.7	26.6	29.6	26.6	29.6	27.6	29.6	27.6	29.6	28.6	28.6	28.6
Length (cm)														
3.0														
.5														2
4.0	1	1												
.5	15	15												
5.0	10	31												
.5		7												
6.0		1												
.5														
7.0														
.5														
8.0														
.5														
9.0	1	2												
.5	4													
10.0	5													
.5	25	1	1											
11.0	46	7	52	34	10	5	1	7						
.5	37	16	3	49	23	31	28							
12.0	26	29	3	30	20	55	48							
.5	15	27		19	12	36	32							
13.0	6	42	1	14	5	15	8							
.5	10	16		6	1	10	2							
14.0	3	21		2		1								
.5	3	10		1		2	1							
15.0	4	9												
.5	1	2												
16.0	1	1												
.5	2	2												
17.0	1	2												
.5														
18.0														
.5														
19.0														
Total (Sample)	217	240	46	324	163	222	293	128	301	193	234	14	46	25
Est. Total Catch	217	980	46	4049	8965	32423	1318	900	1634	193	668	14	46	25

Table 9 (contd)
Sandeel by-catch (R.V. "Tridens")

Square	41F6	41F7	42F7	42F6	42F5	41F5	42F4	43F3	44F2	44F1	45F1	46F1	47F1
Station No	1	2	3	4	5	6	8	9	11	12	13	14	15
Date	14.6	14.6	14.6	14.6	15.6	15.6	15.6	16.6	16.6	16.6	16.6	17.6	17.6

Length (cm)

1													
2													
3		1											
4				4	12	2		2		1	25	10	4
5				4	8		5	7		3	35	41	31
6				4	3		6	3		5	3	3	14
7				2				1					6
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21			1										
22			1										
23													
24				1									
25				3									
26				5									
27				2									
28				5									
29				2									
30				2									
31				1									
32													
33													
34													
35													

Total (Sample)	1	1	21	14	26	3	11	13	1	9	63	54	55
Est. Total Catch	1	1	21	14	26	3	11	13	1	9	504	108	440

Table 9 (contd.)
Sandeel by-catch (R.V."Tridens") continued

Square	48F1	50F0	50F1	49F1	45F0	45E9	44F0	43F0	42F5	42F6	41F7	41F6	41F5	41F4	42F4	
Station No	16	17	22	23	29	30	31	32	36	37	39	40	41	42	43	
Date	17.6	20.6	21.6	21.6	22.6	22.6	23.6	23.6	24.6	24.6	27.6	27.6	27.6	27.6	28.6	
Length (cm)																
1																
2														1	14	
3					6	18	3	3						4	28	
4	18	1	1		68	71	5	7						4	6	
5	17	14	18	13	7	15	23	12						3	5	
6	13	36	20	11	1		31	7					6	2	8	
7	1	11	3	2			7	6					2		2	
8			1				5	1				5	12		4	
9												6				
10												1				
11																
12																
13																
14																
15												1				
16												1	1			
17												1				
18												1				
19												4				
20												8				
21												4				
22												5				
23												1				
24													2			
25													1			
26												2				
27												2				
28												1				
29												2				
30												1				
31																
32																
33																
34																
35																
Total (Sample)	49	61	43	27		82	104	74	36	1	7	27	13	29	14	63
Est. Total Catch	3 136	3 904	688	54	1	312	3 328	9 620	4 608	1	7	27	13	29	14	65

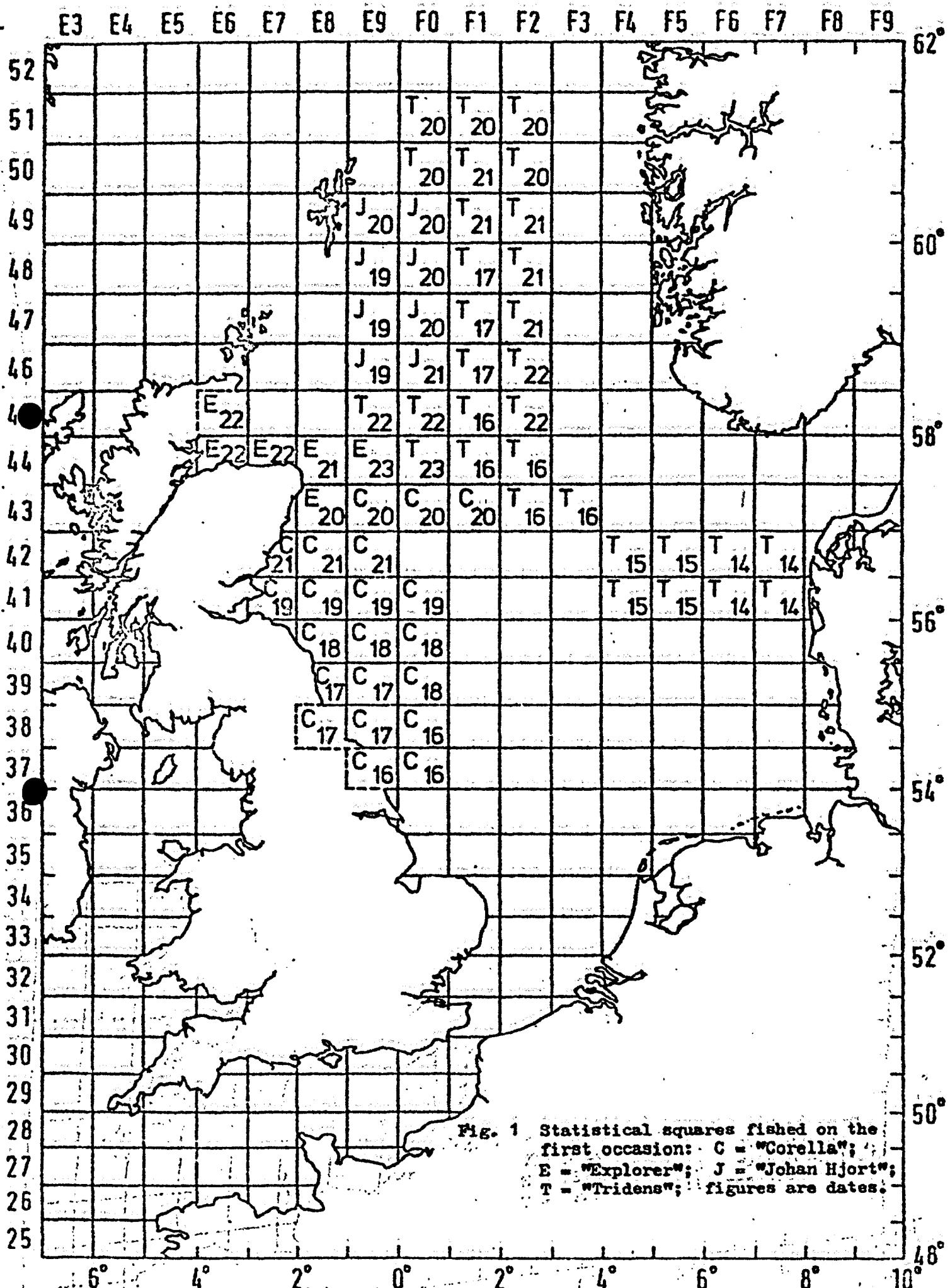
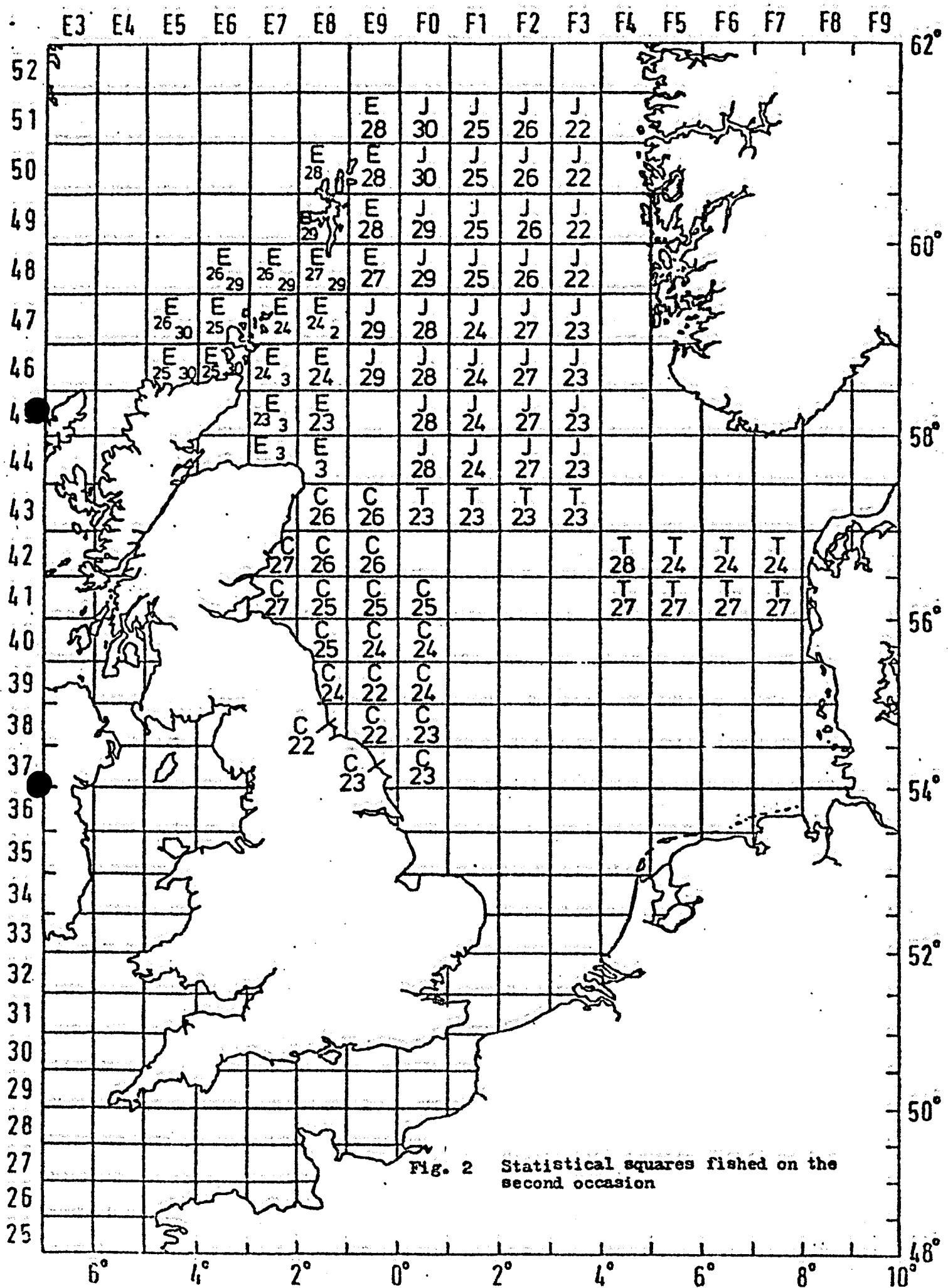


Fig. 1 Statistical squares fished on the first occasion: C = "Corella"; E = "Explorer"; J = "Johan Hjort"; T = "Tridens"; figures are dates.



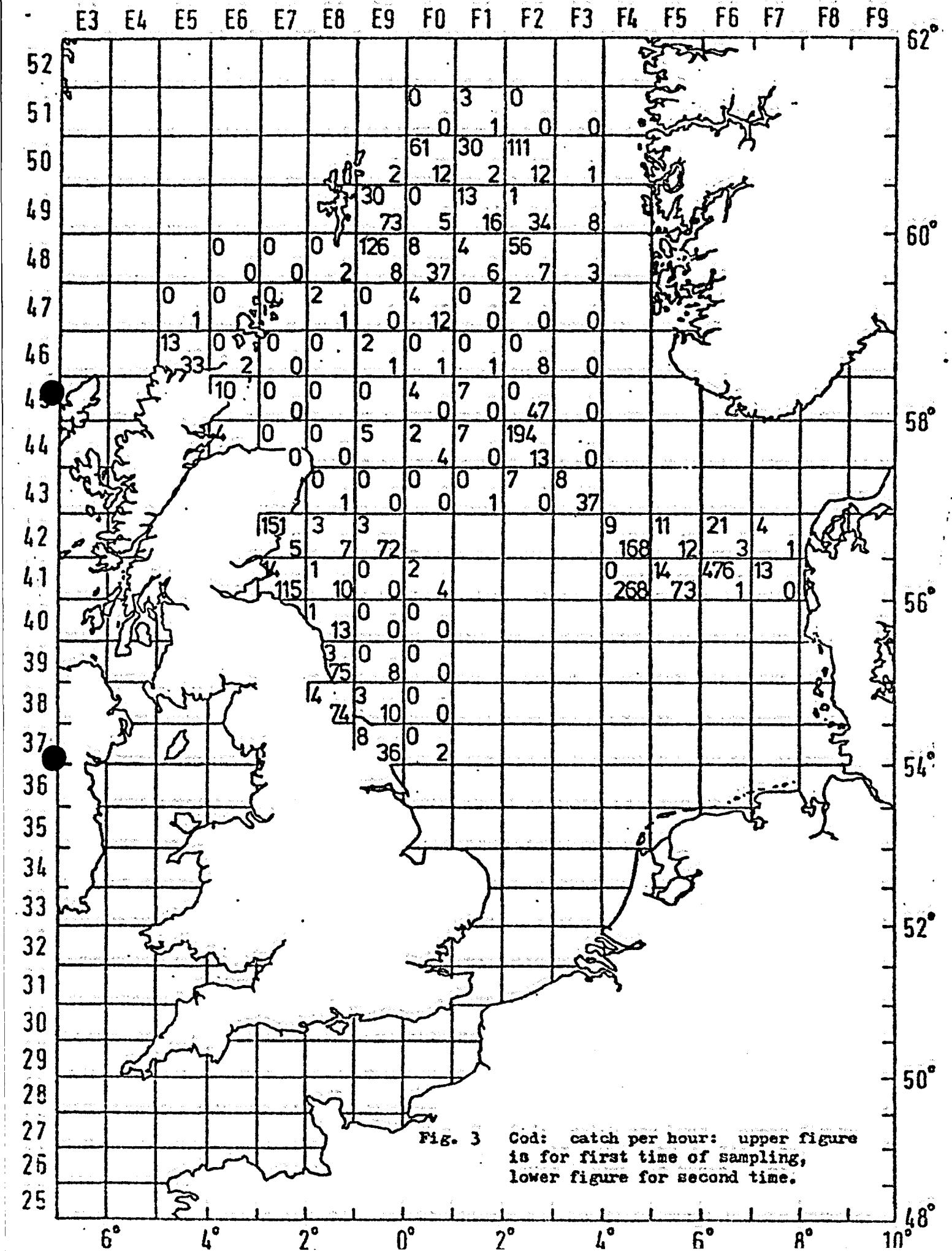


Fig. 3 Cod: catch per hour: upper figure
is for first time of sampling,
lower figure for second time.

62°

60°

58°

56°

54°

52°

50°

48°

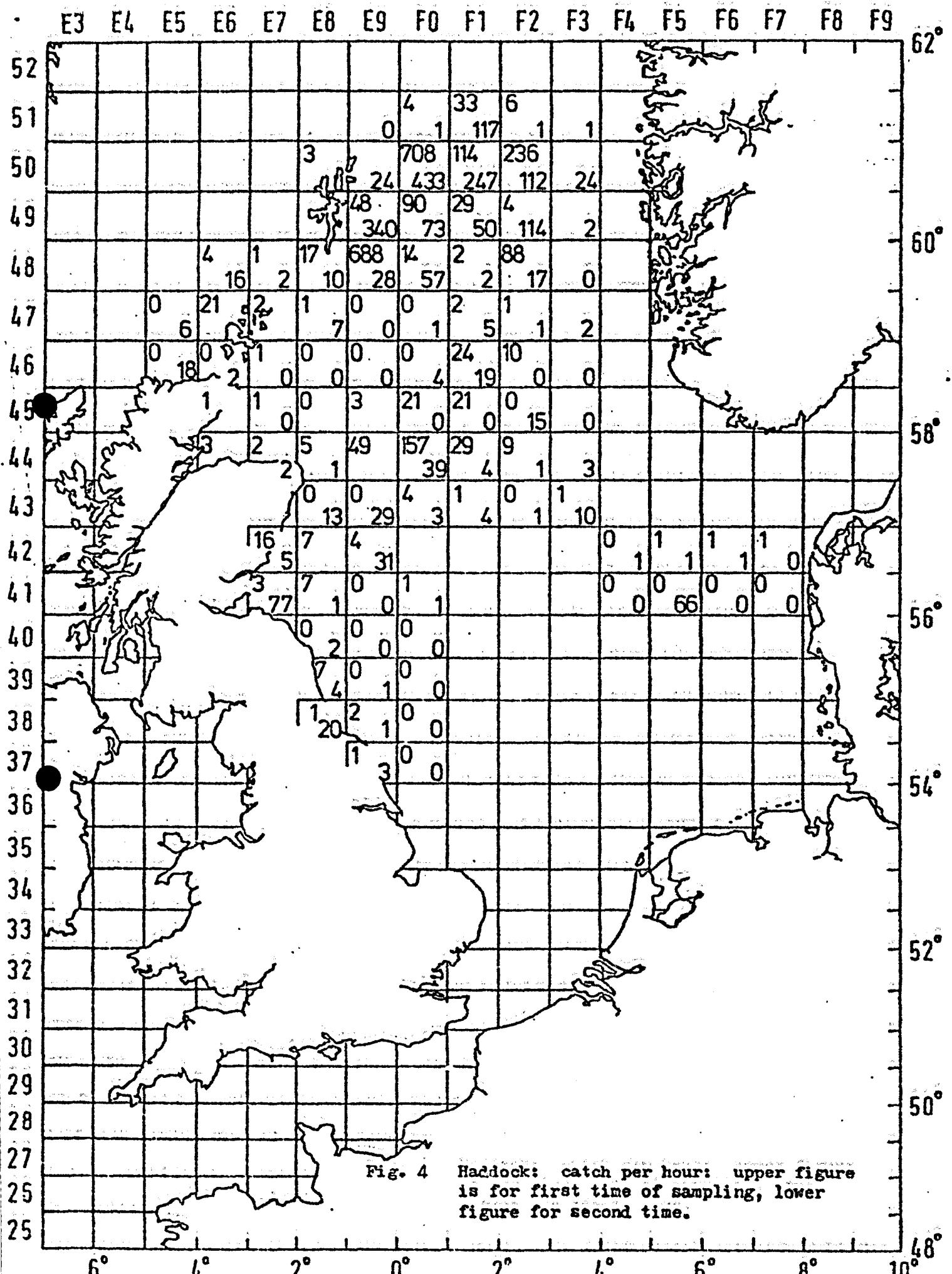


Fig. 4 Haddock: catch per hour: upper figure is for first time of sampling, lower figure for second time.

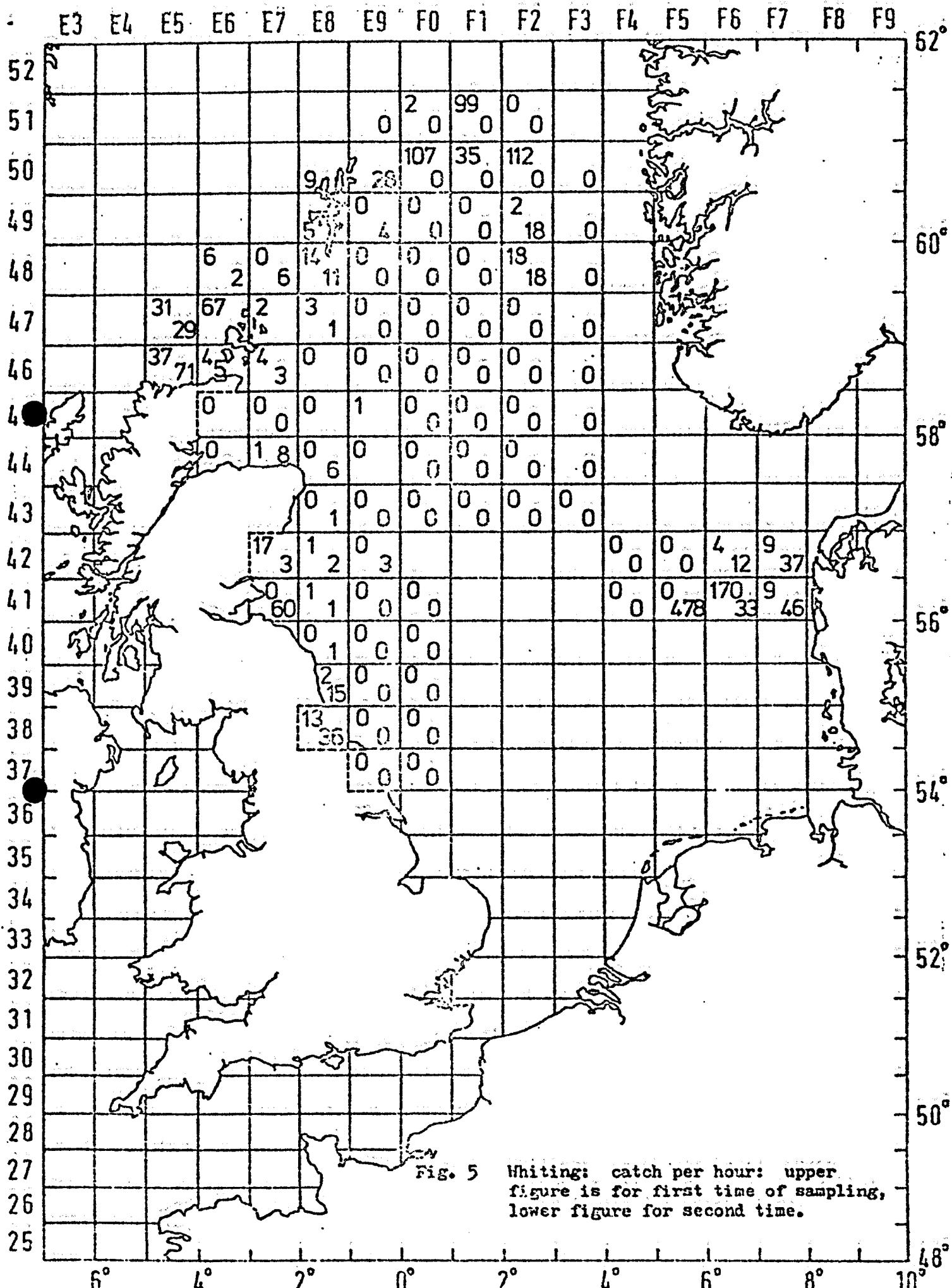


Fig. 5 Whiting: catch per hour: upper figure is for first time of sampling, lower figure for second time.

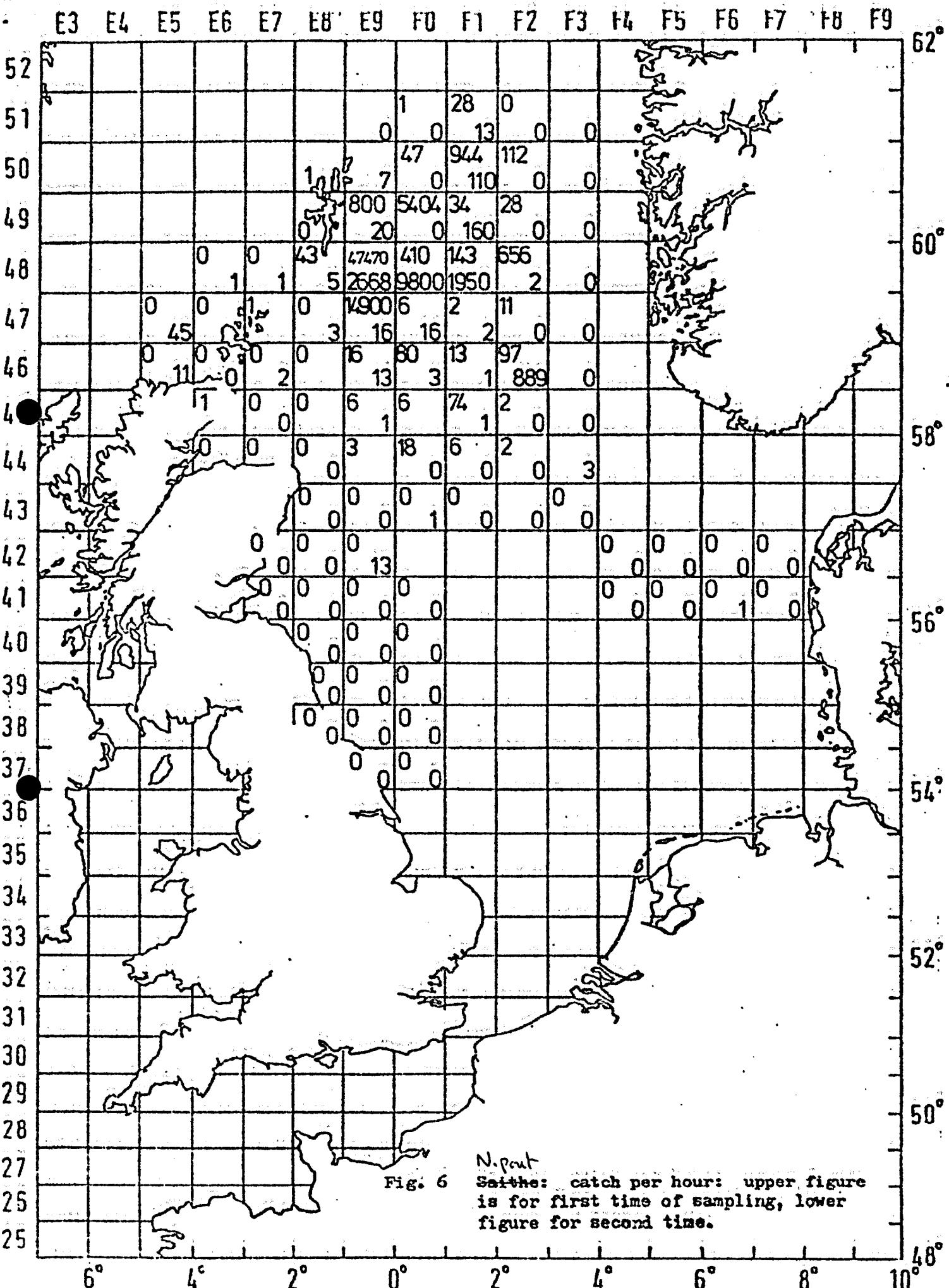
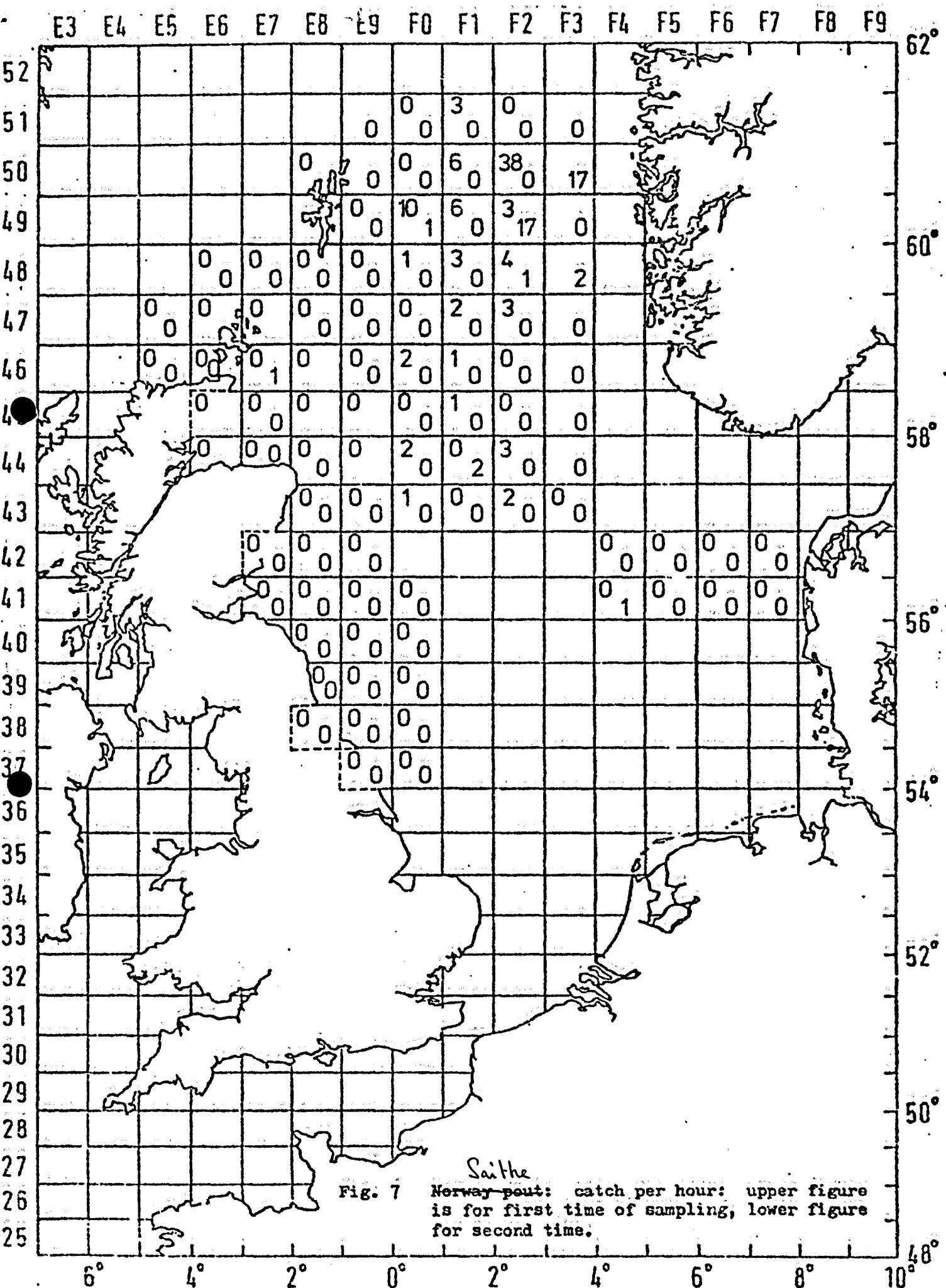


Fig. 6

N. prout
Saithe: catch per hour: upper figure
is for first time of sampling, lower
figure for second time.



Sampling date (July)

E8 E9 F0 F1 F2 F3

51					
50	13	13	12	12	
49	13	13	14	14	
48	15	15	14	14	
47	15	15	17	17	
46	16	16	16	17	
45		16	16		

Cod

E8 E9 F0 F1 F2 F3

51					
50	0	0	75	5	
49	0	5	9	2	
48	0	6	19	5	
47	0	6	3	5	
46	0	1	3	14	
45		1	0		

Haddock

E8 E9 F0 F1 F2 F3

51					
50	0	100	350	115	
49	101	86	11	154	
48	12	4	39	84	
47	0	33	4	52	
46	0	3	1	11	
45		23	3		

Whiting

E8 E9 F0 F1 F2 F3

51					
50	0	15	0	1	
49	9	6	0	39	
48	0	0	0	55	
47	0	0	0	51	
46	0	0	0	256	
45		0	0		

Saithe

E8 E9 F0 F1 F2 F3

51					
50	0	0	0	0	
49	0	0	0	1	
48	0	0	0	0	
47	0	0	0	0	
46	0	0	0	0	
45		0	0		

Norway Pout

E8 E9 F0 F1 F2 F3

51					
50	0	48	10500	5	
49	0	12	72	1	
48	6	46	0	0	
47	0	2	1	0	
46	0	0	39	0	
45		4	0		

Fig. 8

Statistical squares fished by "Johan Hjort" during Norwegian survey with dates of fishing and catches per hour of cod, haddock, whiting, saithe and Norway pout.