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Report on the International Young Fish Survey in the North Sea, Skagerrak and Kattegat in 1990

by

The International North Sea, Skagerrak, and
Kattegat Bottom Trawl Survey Working Group

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TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1 INTRODUCTION	1
2 SURVEY METHODS AND PARTICIPATION	1
3 DATA AVAILABLE	1
4 STANDARD OUTPUT FROM THE ICES IYFS DATA BASE	2
5 RESULTS GOV-TRAWL FOR 1990	2
5.1 North Sea	2
5.2 Skagerrak-Kattegat (Division IIIa)	4
6 RESULTS OF IKMT SAMPLING IN 1990	5
7 HYDROGRAPHIC DATA	7
8 REFERENCES	7
Tables 3.1, 5.1 - 5.5, and 6.1	8
Figures 5.1 - 5.30, 6.1 - 6.3, and 7.1 and 7.2	15

1 INTRODUCTION

This report presents the final results for the International Young Fish Survey in February/March 1990. These data comprise as well the GOV catches of the seven standard species (herring, sprat, mackerel, cod, haddock, whiting and Norway pout), as the IKMT catches of late herring and sprat larvae. This report also gives summarized results of temperature and salinity sampling, which were, until the 1988 IYFS, presented as a separate report to the ICES Statutory Meeting.

The results from the International Young Fish Survey become available in successive steps. During the survey the numbers of 1-group fish, based on fish below a certain length, are exchanged between the participating research vessels. Immediately after the survey the length compositions of the seven standard species are sent to ICES (in IYFS exchange format), to be used by the different assessment working groups, together with all age-length keys which are available by then. Final data, including length compositions for all species and age-length data, should be submitted to ICES before 15 April. These data are then checked and stored in the ICES IYFS data base, in order to be able to run the final analysis in time for the May meeting of ACFM. This report is based on the analysis done in May 1990.

2 SURVEY METHODS AND PARTICIPATION

For all matters on survey methodology, the reader is referred to the IYFS Manual (ICES, Doc. C.M. 1986/H:2). Details on the participation in the 1990 survey are given below. As in 1988 and 1989 the weather during the 1990 survey was rather bad, which restricted the total number of stations which could be fished. Especially the coverage of the IKMT stations was rather poor.

The contribution to the 1990 IYFS by the Netherlands was limited due to the replacement of "Tridens" in the course of February. The 'old' "Tridens" took part in the International Young Fish Surveys since 1969.

Country	Vessel	Period	Number of hauls	
			GOV	IKMT
Denmark	"Dana"	30-1/15-2	24	35
France	"Thalassa"	02-2/23-2	58	-
Germany, F.R.	"W. Herwig"	01-2/24-2	86	-
Netherlands	"Tridens"	19-2/23-2	14	8
	"Isis"	01-2/09-2	9	-
Norway	"Eldjarn"	21-1/10-2	50	31
Sweden	"Argos"	05-2/21-2	45	49
UK England	"Cirolana"	27-1/18-2	57	60
UK Scotland	"Scotia"	01-2/20-2	52	30

3 DATA AVAILABLE

In Table 3.1 is shown which data were available in the ICES IYFS data base at 1 August 1990.

At the time of the final analysis of the 1990 survey, all final data were available in the data base except for Swedish age/length keys for cod in Skagerrak/Kattegat. The numbers at age for cod in that area were added to the figures later.

4 STANDARD OUTPUT FROM THE ICES IVFS DATA BASE

For details on the standard analysis of the data the reader is referred to a description by Pedersen (1989). At request, copies of this paper are available at the ICES Secretariat.

5 RESULTS GOV-TRAWL FOR 1990

5.1 North Sea

Preliminary indices based on certain size classes and indices used by the Assessment Working Groups are compared with the final indices and shown in Table 5.1. In the case of the pelagic species herring and sprat the indices are very close. Indices of 1- and 2- group fish of the six standard species from year class 1969 and onwards are given in Table 5.2 The mean age composition of the standard species in the catches within the relevant standard area are shown in Table 5.3.

Figure 5.1 shows the number of hauls used for the analysis of the herring data and the number of hauls used for the other standard species is shown in Figure 5.2. Per species there is a set of figures which gives the distribution of the 1-, 2-, and 3+ group and the mean length of 1-group fish per rectangle. The standard area used to calculate the index of year class strength is indicated in the figures.

HERRING

The indices for age groups 1 and 2 are given in Table 5.2 and the mean number per one hour trawling of 1-, 2- and 3+ group is shown in Figures 5.3 to 5.5. The mean length of the 1-group per rectangle is presented in Figure 5.6.

The 1987 year class was estimated in 1989 to be comparable to the 1983 and 1984 year classes as 1-ringer. The present estimate of the 1987 year class as 2-ringer is 443 which is the lowest estimate since the 1981 year class and about half of the 1983-1984 year classes as 2-ringer. A reduced abundance of North Sea herring is also indicated in Skagerrak-Kattegat (Table 5.4). The distribution of the 2-ringed herring was similar to the distribution in previous years with highest abundance in the northern and western parts of the North Sea (Figure 5.4).

The preliminary index of the 1988 year class is 2224 and the final index 2146. The index is about 60% of the 1987 year class and reflects a trend of reduced recruitment to the North Sea stock. The 1988 year class was distributed in the traditional nursery areas in the southeastern part of the North Sea (Figure 5.3). A reduced abundance of 1-ringed herring is also corroborated by a lower number of North Sea autumn spawners in Division IIIa (Table 5.4). Age group 3+ was found in the northern and northwestern parts of the North Sea (Figure 5.5).

SPRAT

Sprat indices of 1- and 2-group are given in Table 5.2. The distribution of the same age groups and the 3+ group as well as the mean length of 1-group per rectangle are shown in Figures 5.7-5.10.

The 1988 year class was estimated in the 1989 IYFS as being the highest on record since 1972. It was noted that the high index was totally dominated by an extremely large mean catch in only one rectangle, although this value was based on 5 hauls. There was no obvious reason to reject the high catches but the index was assumed to overestimate the strength of the 1988 year class. The same year class is now estimated as 2-group in 1989 to be close to the average of the preceding seven year classes and the 2-group index does not support the previous estimate of a very strong 1988 year class.

The index of the 1989 year class is 177 which is far below the historical average and indicates a very poor recruitment to the stock.

MACKEREL

Indices for mackerel are given in Table 5.2 and the distribution of 1-, 2- and 3+ group is shown in Figures 5.11-5.13. The mean length of the 1-group per rectangle is presented in Figure 5.14.

Un unusual high concentration of both juvenile and adult mackerel was found in the western North Sea off the English east coast (Figures 5.11-5.13). The index for 1-group mackerel, 35, is the highest on record since 1975.

COD

Indices are given in Table 5.2, the distribution of 1-, 2- and 3+ group and the mean length of 1-group fish is given in Figures 5.15-5.18.

The abundance of the 1989 year class at 1-year-old is far below both the abundance of the 1988 year class and the historical average and at approximately the same level as the 1987 year class which was the second poorest year class in the historical series.

The 2-group index is at the level of the historical average.

The highest catches of 1-group fish were made in the central North Sea and in one rectangle (39E8) off the coast of northern England. In the German Bight almost no 1-group cod was caught. Two-year-old cod was mainly concentrated in the northwestern North Sea.

HADDOCK

Indices are given in Table 5.2, the distribution of 1-, 2- and 3+ group and the mean length of 1-group fish is given in Figures 5.19-5.22.

The index of 1-group haddock is at the same level as the index of the 1988 year class and far below the historical average, indicating that the 1989 year class is the third consecutive very poor year class.

The index of 2-year-old fish confirms the low abundance of the 1988 year class at 1-year-old.

WHITING

Indices are given in Table 5.2, the distribution of 1-, 2- and 3+ group and the mean length of 1-group fish is given in Figures 5.23-5.26.

Although the index of abundance of the 1989 year class at 1-year old is far below the index of the 1988 year class (the highest one in the series), it remains at the historical average level and at a higher level than the 1987 year class. The number of 2-group fish is the higher of the series (2.5 times the average), confirming that the 1988 year class is the strongest one since 1970.

The largest catches of 1-year-old fish were widely distributed over the North Sea. The 2-year-old fish were concentrated in the western half of the North Sea.

NORWAY POUT

Indices are given in Table 5.2, the distribution of 1-, 2- and 3+ group and the mean length of 1-group fish is given in Figures 5.27-5.30.

Catches of 1-group Norway pout were below the historical average and about two third of those of 1989. The 2-group index confirms that the 1988 year class is approximately at the average level.

Concentrations of 1-group Norway pout were found more northerly than last year.

5.2 Skagerrak-Kattegat (Division IIIa)

The number of hauls per rectangle for herring and gadoids is shown in Figure 5.1 and 5.2.

The final indices for 1- and 2-group herring and 1- and 2+ group of sprat are given in Table 5.4. The herring indices are calculated as the mean catches in four depth strata, covering the depth range of 10 - 150 m, and weighted by the surface area of each stratum. Details of the analysis and separation of spring- and autumn spawners are given in the 1989 report (Anon., 1989).

Age/length keys for cod are now available from the 1981 IYFS and onwards. The stocks of cod in Skagerrak and Kattegat are assessed separately and indices are given for each area. Final and preliminary indices for whiting and haddock are given in Table 5.5.

The distribution of herring, sprat, and cod is included in the figures in Section 5.1.

HERRING

The indices are given in Table 5.4 and the distribution is shown in Figures 5.3-5.5. The mean length of 1-group is shown in Figure 5.6.

The final index for 1-group herring was 3544 which is the lowest value since 1983. Meristic characters show that the 1-group is dominated by North Sea autumn spawners. The 1-group herring was mainly distributed in shallow waters in the southern part of Kattegat and around the Skaw.

The total index of 2-group herring, 3876, is above the historical average. Most of the 2-group herring could be assigned to spring spawners with an index of 3192 compared to the index for autumn spawners of 684.

SPRAT

The index of 1- and 2+ group sprat is given in Table 5.4 and the distribution of 1-, 2- and 3+ group is shown in Figures 5.7-5.9. The mean length of 1-group sprat per rectangle is presented in Figure 5.10.

The index of the 1989 year class is 503 which is the second lowest since 1974 and about the same level as the very poor 1988 year class. The index of the 2+ group, 471, is the lowest on record.

COD

Indices are given in Table 5.5, the distribution of 1-, 2- and 3+ group is shown in Figures 5.15-5.17.

The 1988 year class is estimated as 2-group in 1990 to be the weakest since year class 1979 in both Skagerrak and Kattegat. This year class was estimated as 1-group in the 1989 IYFS to be above average in Skagerrak and very weak in Kattegat.

The 1989 year class is estimated to be close to the average in Skagerrak and strong in Kattegat.

HADDOCK

The index of haddock <20 cm is the second lowest on record and indicates a very weak year class.

WHITING

The preliminary index of 2255 is the second highest since year class 1974 and indicates a strong 1989 year class.

6 RESULTS OF IKMT SAMPLING IN 1990

During the IYFS herring and sprat larvae are sampled using an Isaacs-Kidd Midwater Trawl (IKMT). For details of methodology see the IYFS Manual (ICES, Doc. C.M.1986/H:2).

Series of oblique hauls are made at night and the abundance of larvae in each haul is expressed by an index value that, to some extent, corrects for differences in haul profiles:

$$\frac{\text{number caught} \times \text{water depth (m)}}{\text{haul duration (min)}}$$

A mean of index values and of larval mean lengths is calculated for each standard rectangle. The values for the 1990 sampling are shown in Figure 6.1. Finally mean abundance is calculated for larger areas (these areas are given in ICES C.M. 1988/ Assess:17, Figure 2.3.2) and raised by an area factor. An overall index of larval abundance is calculated by adding abundances in the individual areas (Table 6.1).

HERRING

In February 1990 the unfavourable weather conditions limited the IKMT sampling, and part of the standard rectangles were not sampled. A total of 213 hauls was made. Most catches contained only a few herring larvae. Significant densities were only observed in a restricted area in the central/northern part of the North Sea and in the Skagerrak (Figure 6.1). The 'Northwest' and 'Northeast' regions were not sampled during the IYFS, and sampling performed during a cruise in late January by DAFS Aberdeen, is used in estimating indices for these two regions.

The indices and the overall index are given in Table 6.1. The overall IKMT index is very low, and a dramatic reduction since the 1986 year class is observed. This year's index is as low as the lowest figures recorded (the 1976 and 1977 year classes).

The preliminary IYFS recruitment index for 1-ringed herring, year class 1988, was compared with last year's prediction based on the IKMT index (Figure 6.3).

The IKMT index predicted the year class to relatively smaller than the IYFS index, however, they both foresee the strength to be lower than has been attained since year class 1982. The comparison between IKMT index and IYFS index might be somewhat biased. The IYFS index (as well as the North Sea VPA estimate) do not include juvenile herring in the Skagerrak (IIIa), while the IKMT index includes catches of larvae made here, and also the larvae found off the Danish coast which probably will drift into these areas. These problems are discussed in ICES C.M.1990/ Assess:14, pp. 10-11.

The mean length of herring is shown in Figure 6.2. This year the herring larvae were relatively small compared to previous years. Samples with larvae of a mean size above 35 mm were seldom whereas normally significant numbers are seen in the southern part of the North Sea.

SPRAT

The number of sprat larvae caught was very low, and does not allow an interpretation of their distribution.

7 HYDROGRAPHIC DATA

Hydrographic stations were submitted by all participating countries but France. A total of 332 stations were worked, and at 108 of these, nutrients were also collected (by England, Scotland, and Denmark).

The temperature distribution (Figure 7.1), once again reflected the very mild winter, the third in a row. Positive temperature anomalies ranged from 1°C in the northwest to 3.5°C off the German/Danish coast. The salinity distribution (Figure 7.2) showed no marked anomalies except off the German/Dutch coasts where excesses greater than 0.3 occurred. In spite of these higher than usual salinity values, nutrient levels, especially silicate, were exceptionally high across the North Sea between 54° and 55°N . In this area values have normally been in the range of $3\text{--}5\mu\text{M}$, but this year's data showed values in excess of 8 over a wide area, with no clear association with the salinity distribution. This points to the possibility of analytical errors but the vigorous resuspension processes that must have occurred at this time, because of extremely severe weather, may have contributed to these anomalous nutrient levels, especially silicate. Figures of nutrient distributions are not included here, but these as well as temperature and salinity anomaly charts are available from the Secretariat.

8 REFERENCES

- Anon., 1989. Report of the Working Group on International Young Fish Surveys. ICES Doc. C.M. 1989/H:2.
- Pedersen, L., 1989. International Young Fish Survey, computation of aggregated standard tables and charts. ICES Secretariat, section computer management.

Table 3.1 Data available in the ICES IYFS database at 1 August 1990.

+ = Data available
 - = No data available
 x = No survey made

<u>Country</u>	<u>1990</u>	<u>1989</u>	<u>1988</u>	<u>1987</u>	<u>1986</u>	<u>1985</u>	<u>1984</u>	<u>1983</u>	<u>1982</u>	<u>1981</u>
Denmark	+	+	+	+	+	+	+	+	+	x
France	+	+	+	+	+	+	+	+	+	x
Germany, Fed.Rep.	+	+	+	+	+	+	+	+	-	-
Netherlands	+	+*	+	+	+	+	+	+	+	+
Norway	+	+	+	+	+	+	+	+	-	-
Sweden	+	+	+	+	+	+	+	+	-	-
UK (Eng. & Wales)	+	+	+	+	+	+	+	+	+	+
UK (Scotland)	+	+	+	+	+	+	+	+	+	+
U.S.S.R	+	x	x	x	x	x	x	x	+	+

* No Smalk records for Herring

<u>Country</u>	<u>1980</u>	<u>1979</u>	<u>1978</u>	<u>1977</u>	<u>1976</u>	<u>1975</u>	<u>1974</u>	<u>1973</u>	<u>1972</u>	<u>1971</u>
Denmark	x	+	+	+	+	+	+	+	+	+
France	-	-	-	-	x	x	x	x	x	x
Germany, Fed.Rep.	-	-	-	-	-	-	-	-	-	-
Netherlands	+	+	+	+	+	+	+	+	+	+
Norway	-	-	-	-	-	-	-	-	-	-
Sweden	-	-	-	-	-	-	-	-	-	-
UK (Eng. & Wales)	-	-	-	-	-	-	-	-	-	-
UK (Scotland)	+	+	+	+	+	+	+	x	x	x
U.S.S.R	x	+	x	+	+	+	+	x	x	x

Table 5.1 Preliminary 1990 IYFS indices for 1-group fish based on a split of the length distribution, indices used by assessment working groups and final indices for the North Sea

	preliminary	working group	final
herring	2224	2111	2146
sprat	175	176	177
mackerel	33.6	40.9 *	35.0
cod	4.8		3.4
haddock	180		219
whiting	547		509
Norway pout	1527		1321

* South of 59° N

Table 5.2 IYFS indices for 1- and 2-year-old fish of various species. Indices in mean number per hour within the relevant standard area in the North Sea.

year class	HERRING		SPRAT		MACKEREL		COD		HADDOCK		WHITING		NORWAY POUT	
	age 1	age 2*	age 1	age 2	age 1	age 2	age 1	age 2	age1	age 2	age 1	age 2	age 1	age 2
1969	2647	-	-	-	-	-	-	25.9	-	32	-	31	-	-
1970	1629	-	-	-	-	-	98.3	34.5	855	299	274	190	-	-
1971	827	-	90	-	-	-	4.1	10.6	740	971	332	763	-	-
1972	1195	-	123	-	-	-	38.0	9.5	187	110	1156	496	-	-
1973	1592	-	481	-	-	0.1	14.7	6.2	1092	385	322	153	-	2412
1974	452	-	-	-	16.5	0.2	40.3	19.9	1168	670	893	535	4242	385
1975	342	-	1186	-	0.4	+	7.9	3.2	177	84	679	219	4599	334
1976	575	-	136	-	1.4	+	36.7	29.3	162	108	418	293	4813	1215
1977	139	-	1474	-	2.3	+	12.9	9.3	385	240	513	183	1913	240
1978	535	-	248	-	0.2	+	9.9	14.8	480	402	457	391	2690	611
1979	551	-	1402	-	+	+	16.9	25.5	896	675	692	485	4081	557
1980	1293	106	886	-	0.1	0.1	2.9	6.7	268	252	227	232	1375	403
1981	1797	149	183	461	0.1	5.2	9.2	16.6	526	400	161	126	4315	663
1982	2663	712	512	335	1.9	0.4	3.9	8.0	307	219	128	179	2331	802
1983	3416	648	347	295	0.1	0.0	15.2	17.6	1057	828	436	359	3925	1423
1984	3667	853	659	101	0.7	2.1	0.9	3.6	229	244	341	261	2109	384
1985	5717	3962	72	71	0.5	+	17.0	28.8	579	326	456	544	2043	469
1986	4192	816	807	1433	8.9	0.1	8.8	6.1	885	688	669	862	3023	760
1987	3468	443	145	442	1.2	1.8	3.6	6.3	92	97	394	542	127	260
1988	2146	-	4246	557	1.1	1.2	13.1	15.2	210	114	1465	887	2079	773
1989	-	-	177	-	35.0	-	3.4	-	219	-	509	-	1320	-

* Total North Sea

Table 5.3 Age composition of the standard species within the relevant standard area in the North Sea

age group	1	2	3	4	5	6+
herring	2146.3	442.8	93.2	27.6	8.9	-
sprat	176.8	557.4	146.4	30.0	0.6	-
mackerel	35.0	1.2	0.2	0.1	0.1	0.0
cod	3.4	15.2	2.0	1.0	1.0	0.8
haddock	219.1	114.1	33.5	52.9	3.4	2.0
whiting	509.1	887.4	202.2	92.4	16.5	3.5
Norway pout	1320.7	773.7	41.1	2.7	0.0	0.0

Table 5.4 IYFS indices for herring and sprat in Skagerrak-Kattegat. The herring indices are weighted by the area of four depth strata and the sprat indices are the mean by hour within the total area.

Year	Total		Herring		Autumn-spawners		Sprat		
	1-group	2-group	1-group	2-group	1-group	2-group	1-group	2+group	Total
1974							1325		
1975							5339		
1976							2069		
1977							5713	984	6697
1978							5119	2117	7236
1979							3338	1482	4820
1980	2311	387	1607	307	704	80	4960	3592	8558
1981	3246	1393	966	1318	2250	75	2809	3068	5877
1982	2560	549	1408	445	1152	104	1577	4695	6272
1983	5419	1063	1522	946	3897	117	1173	1685	2858
1984	6035	1947	2793	1419	3242	528	4141	2216	6357
1985	7994	2473	- *	1867	- *	606	2077	2067	4744
1986	21489	2738	- *	1562	- *	1176	684	4834	5518
1987	11733	3671	- *	2921	- *	949	1830	16543	18373
1988	67753	10095	- *	7834	- *	2161	945	8238	9183
1989	17451	4976	- *	0	- *	4976	442	2891	3333
1990	3544	3876	0	3192	3544	684	503	471	974

* Separation not valid

Table 5.5 Indices of 1- and 2-group cod and 1-group whiting and haddock in Skagerrak-Kattegat. The preliminary indices are the mean number per hour for cod <25 cm, whiting and haddock <20cm.

Year Class	Cod 1-group Skagerrak		Cod 1-group Kattegat		Cod 2-group Skagerrak Kattegat		Whiting 1-group Prel.	Haddock 1-group Prel.
	Prel.	Final	Prel.	Final				
1974							499	
1975							236	
1976							99	
1977							392	
1978							561	
1979	79		386		93	171	722	40
1980	18	15	42	26	31	63	968	4
1981	36	36	126	104	30	258	690	48
1982	32	28	113	96	19	143	262	34
1983	24	23	49	39	52	106	500	72
1984	18	14	18	9	10	72	940	161
1985	82	78	229	213	113	372	1379	57
1986	15	5	48	11	18	28	2178	251
1987	81	77	76	68	24	48	2978	125
1988	62	56	6	3	8	16	478	20
1989	25	31	131	153			2255	8

Table 6.1 Calculation of yearly IKMT-indices of abundance of herring larvae.

Area	North west	North east	Central west	Central east	South west	South east	Skagerrak/ Kattegat	Channel	IKMT INDEX
Areafactor	27	11	28	33	12	30	10	10	
Year Class									
1976	16.2	4.2	36.5	1.5	2.4	0.7	0.5	4.9	1658
1977	7.1	7.1	15.1	4.4	16.7	3.8	1.8	10.2	1273
1978	52.7	9.3	108.3	6.0	3.0	1.5	22.3	0.0	5061
1979	18.4	58.4	78.7	122.4	57.7	43.0	23.8	16.0	9821
1980	15.6	0.2	43.4	34.6	26.7	101.6	74.5	56.1	7455
1981	59.1	1.1	86.8	59.6	64.4	193.5	32.7	10.7	13016
1982	7.6	3.3	20.4	74.4	87.0	92.6	140.9	42.1	8918
1983	5.7	2.0	34.3	80.4	81.2	142.0	101.7	113.2	11173
1984	25.0	5.7	90.8	77.7	298.7	215.4	83.1	89.5	17617
1985	34.8	17.2	126.3	103.1	139.2	233.2	25.5	25.3	17242
1986	95.1	8.7	218.9	167.0	249.0	273.8	14.3	73.2	26381
1987	23.3	9.3	125.0*	94.3	47.8	185.5	144.9	148.4	16415
1988	10.7	6.1	28.5	28.8	45.2	123.2	54.4	4.8	6935
1989	24.9*	8.9*	11.9	28.1	4.0	10.6	12.3	0.0	2520

* estimated from sampling during other cruises

International Young Fish Survey 1990

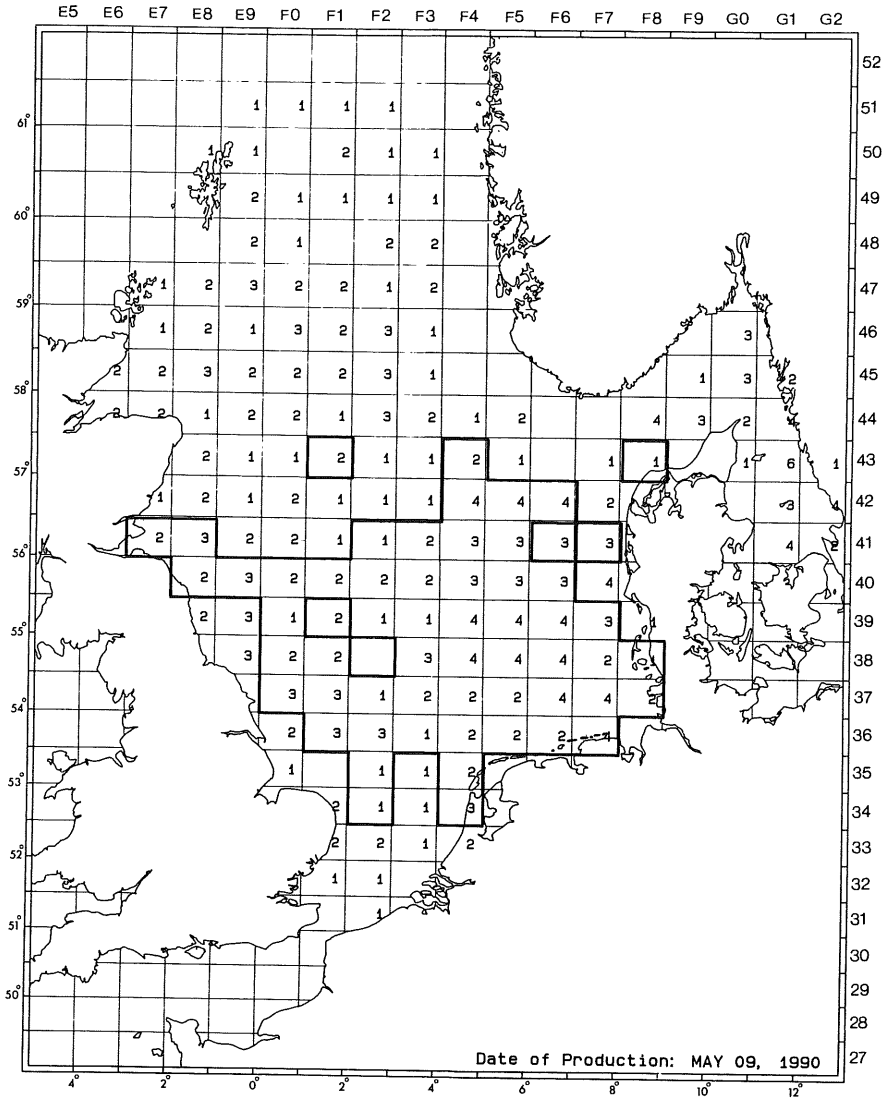


Figure 5.1 Herring, CLUP HAR
Number of Hauls.

International Young Fish Survey 1990

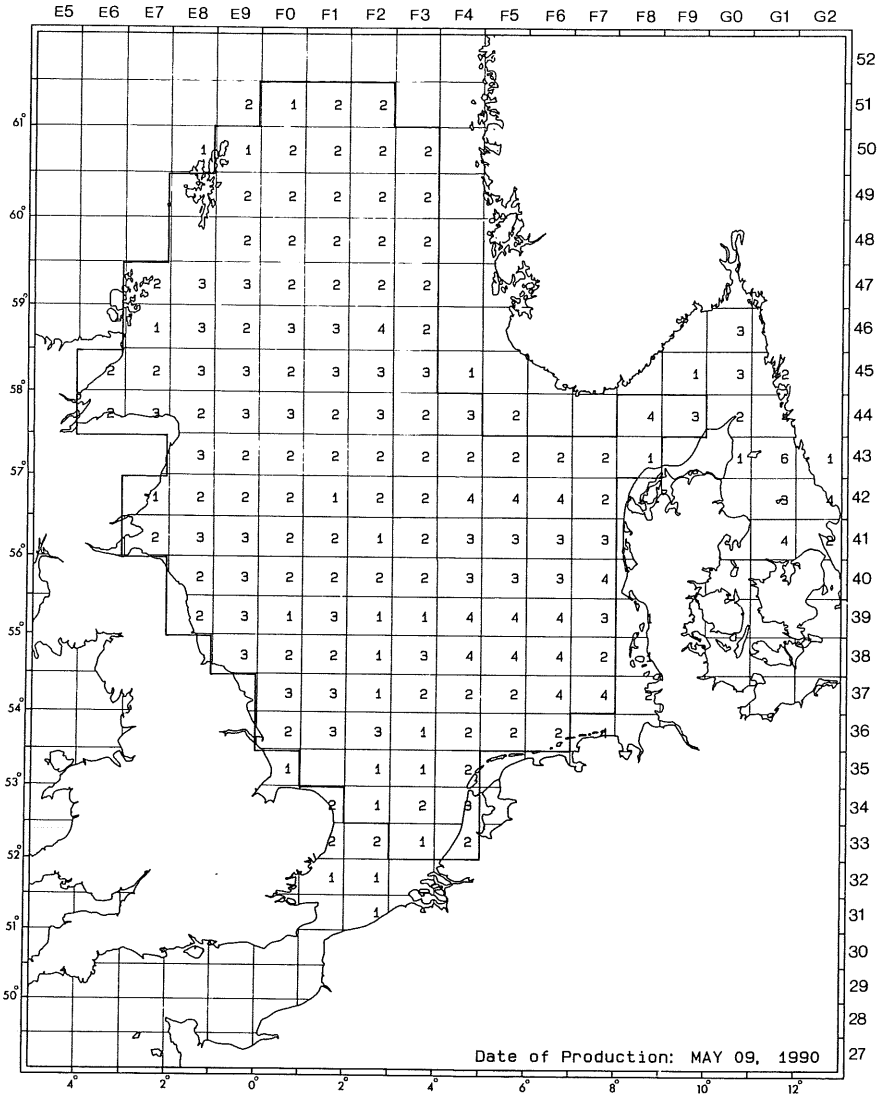


Figure 5.2 Number of Hauls.

International Young Fish Survey 1990

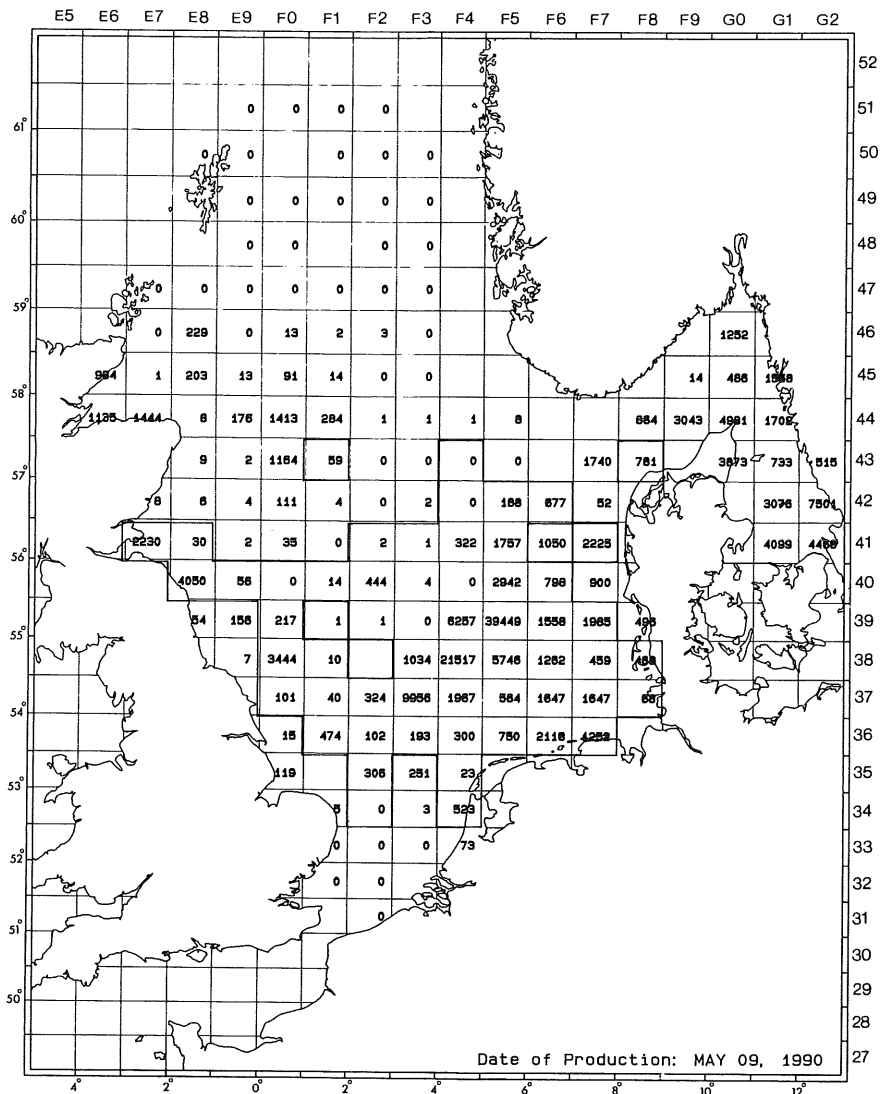


Figure 5.3 Herring, CLUP HAR
 Number per Hour per Haul, Age Group 1.

International Young Fish Survey 1990

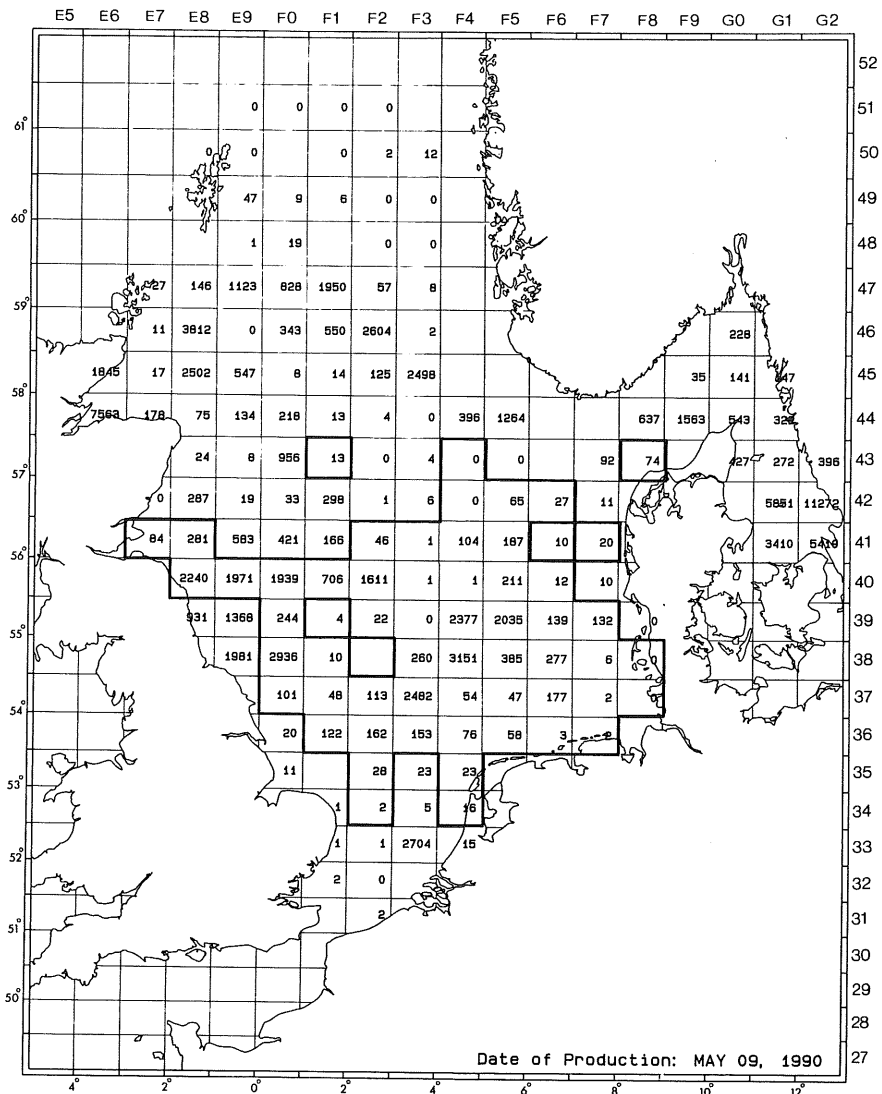


Figure 5.4 Herring, CLUP HAR
Number per Hour per Haul, Age Group 2.

International Young Fish Survey 1990

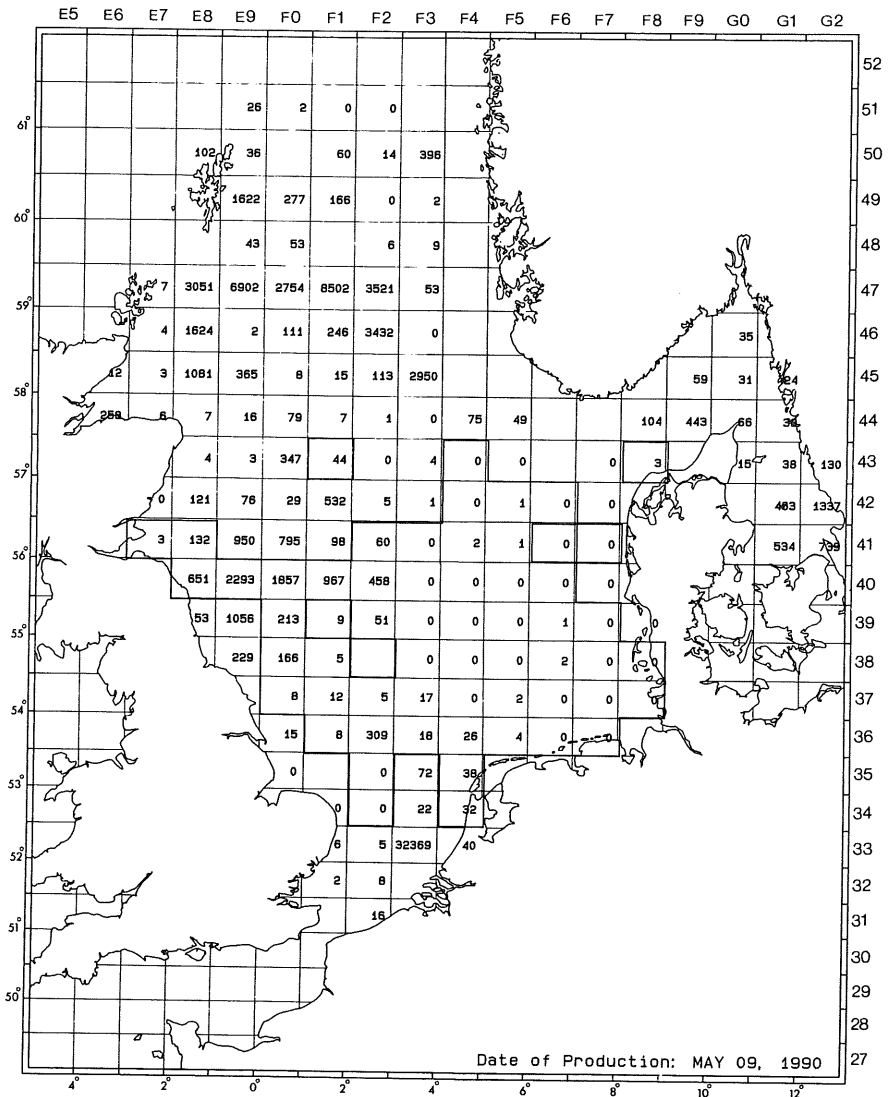


Figure 5.5 Herring, CLUP HAR
Number per Hour per Haul, Age Group 3+.

International Young Fish Survey 1990

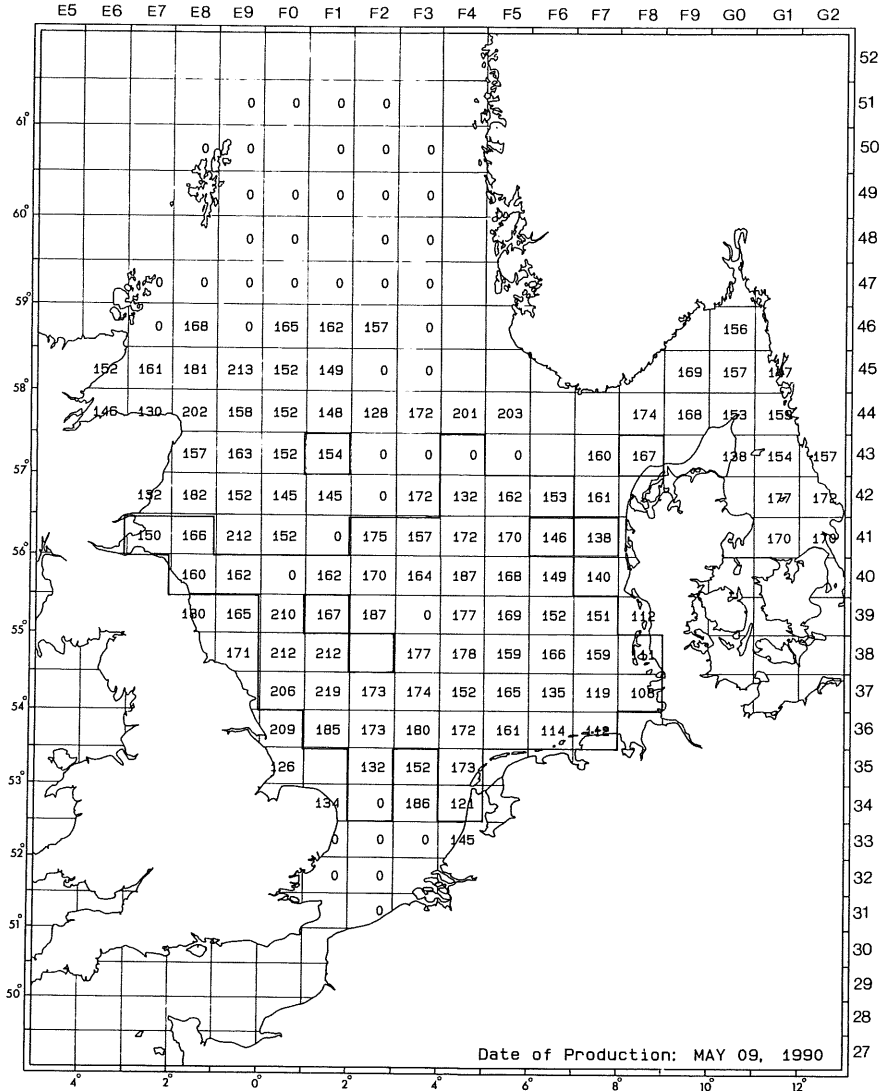


Figure 5.6 Herring, CLUP HAR
Mean Length, Age Group 1.

International Young Fish Survey 1990

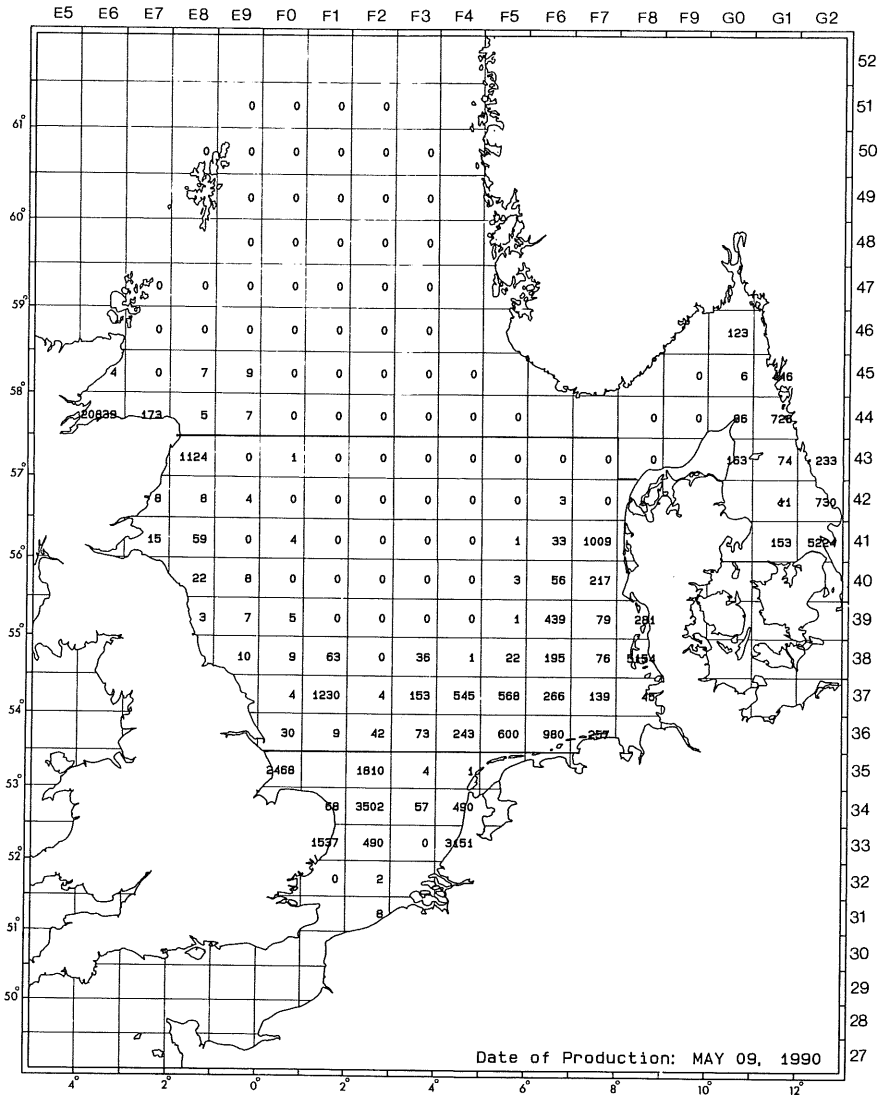


Figure 5.7 Sprat, SPRA SPR
 Number per Hour per Haul, Age Group 1.

International Young Fish Survey 1990

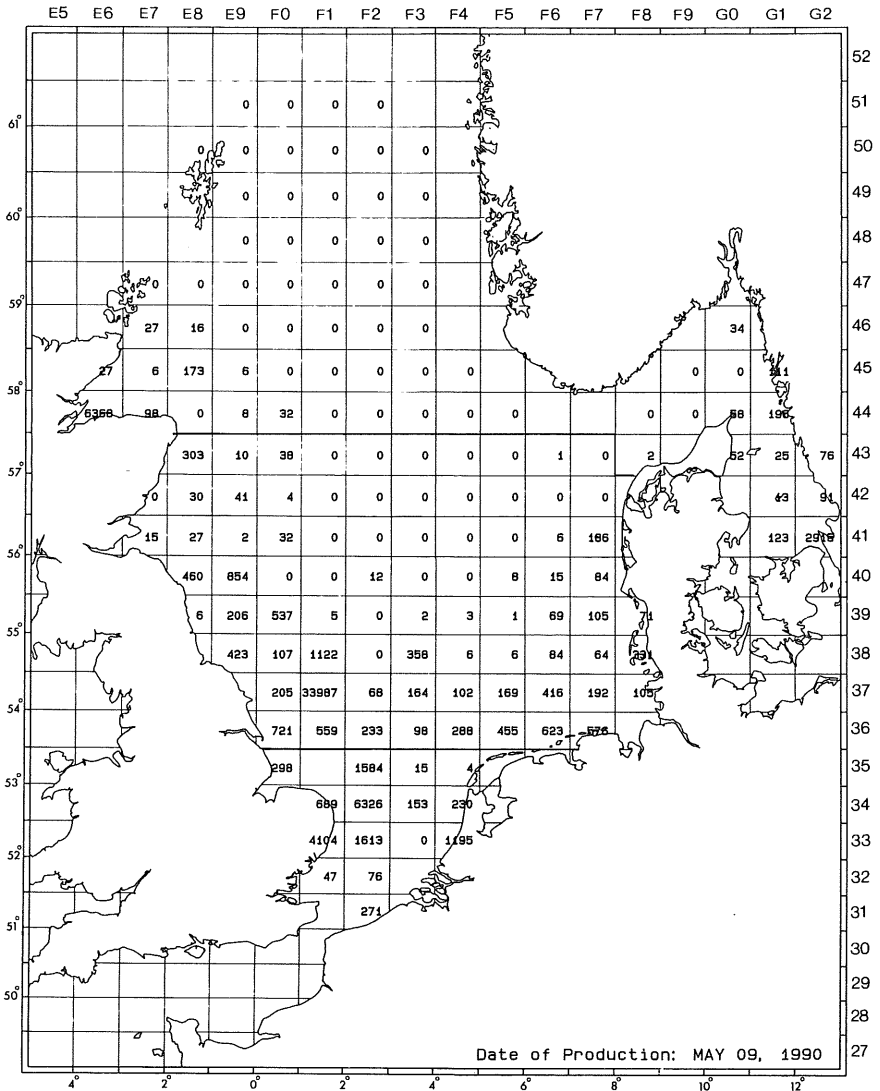


Figure 5.8 Sprat, SPRA SPR
 Number per Hour per Haul, Age Group 2.

International Young Fish Survey 1990

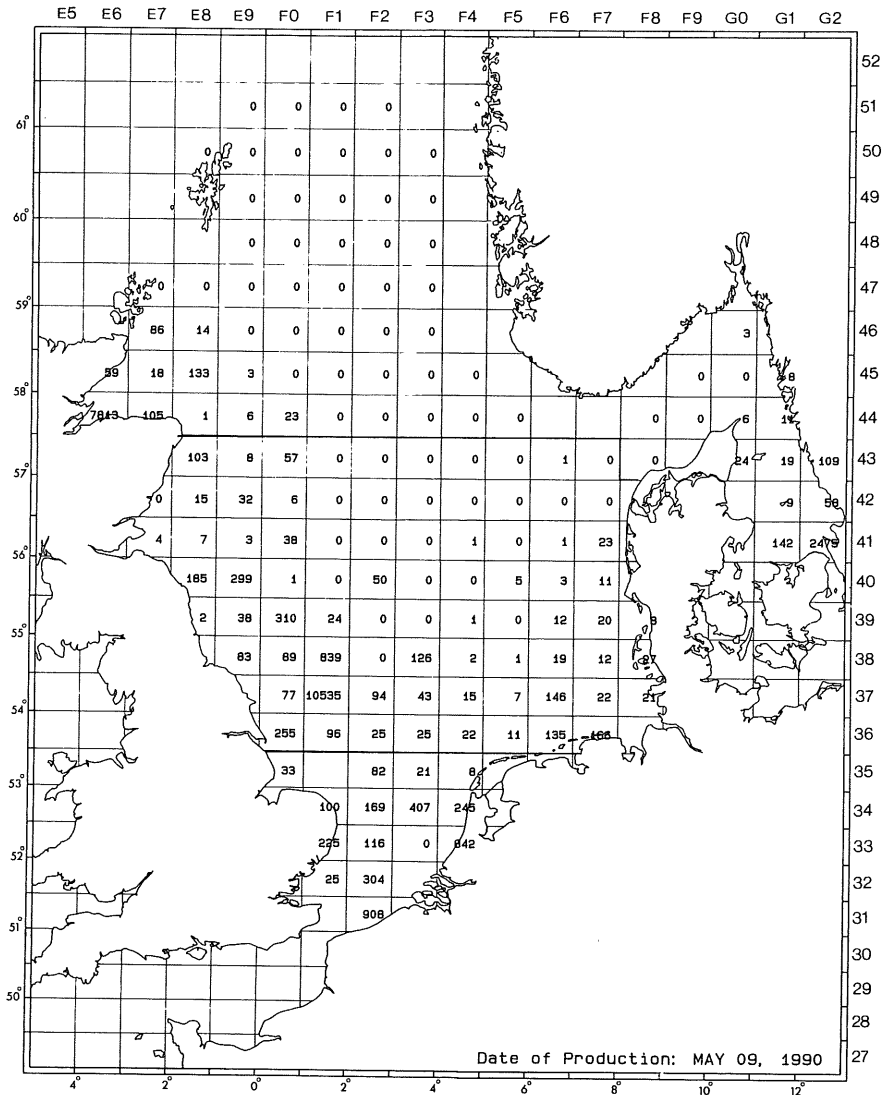


Figure 5.9 Sprat, SPRA SPR
 Number per Hour per Haul, Age Group 3+.

International Young Fish Survey 1990

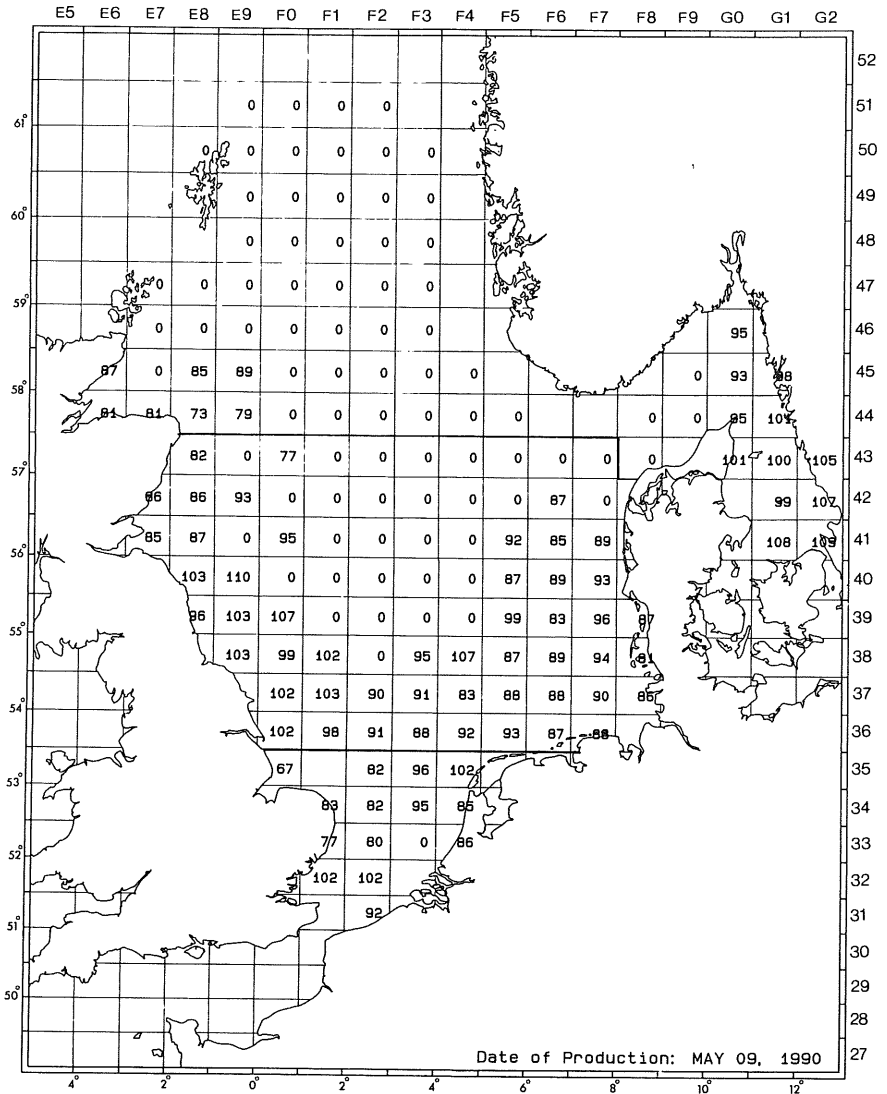


Figure 5.10 Sprat, SPRA SPR
Mean Length, Age Group 1.

International Young Fish Survey 1990

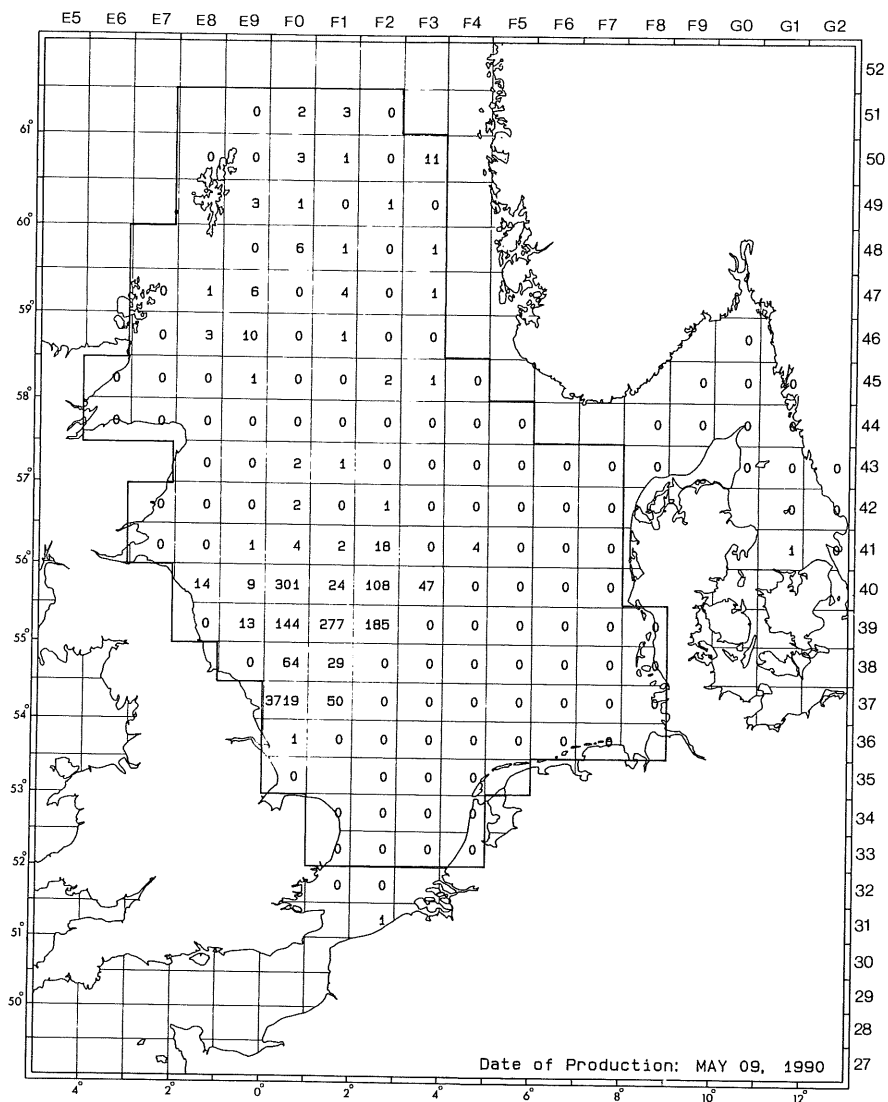


Figure 5.11 Mackerel, SCOM SCO
Number per Hour per Haul, Age Group 1.

International Young Fish Survey 1990

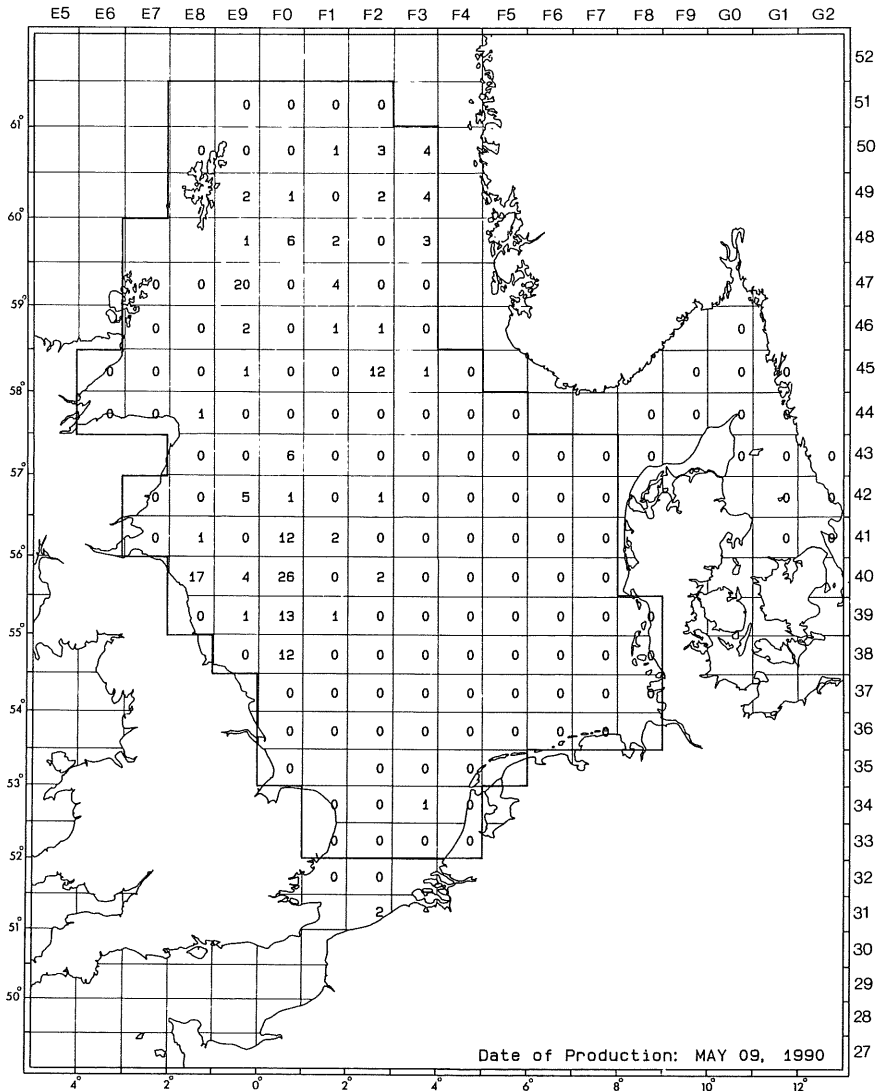


Figure 5.12 Mackerel, SCOM SCO
 Number per Hour per Haul, Age Group 2.

International Young Fish Survey 1990

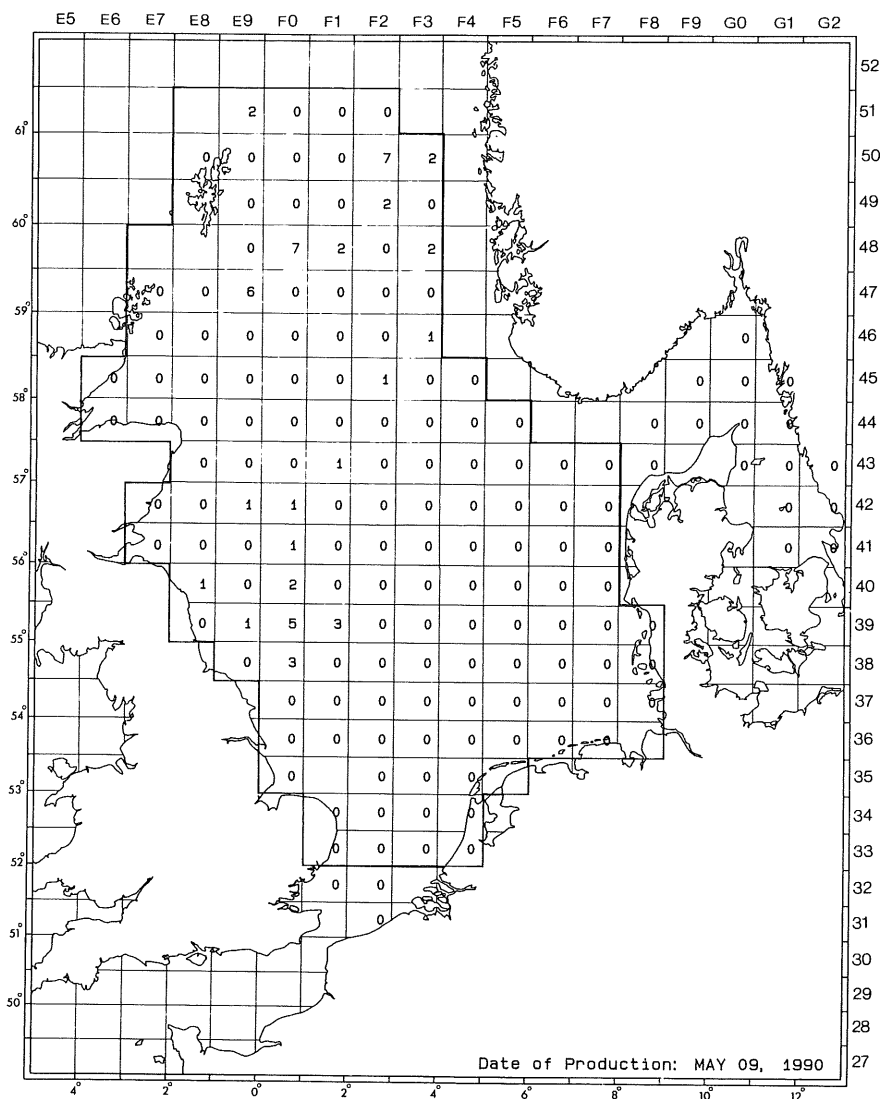


Figure 5.13 Mackerel, SCOM SCO
Number per Hour per Haul, Age Group 3+.

International Young Fish Survey 1990

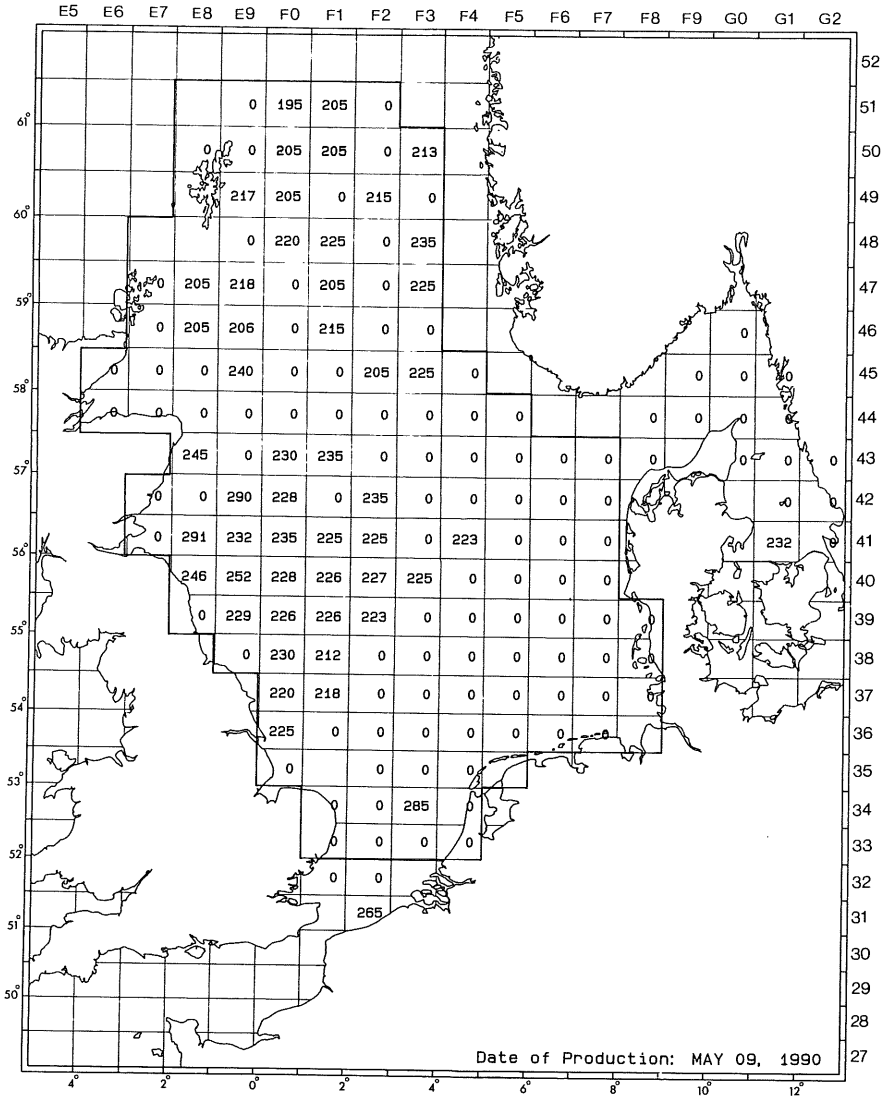


Figure 5.14 Mackerel, SCOM SCO
Mean Length, Age Group 1.

International Young Fish Survey 1990

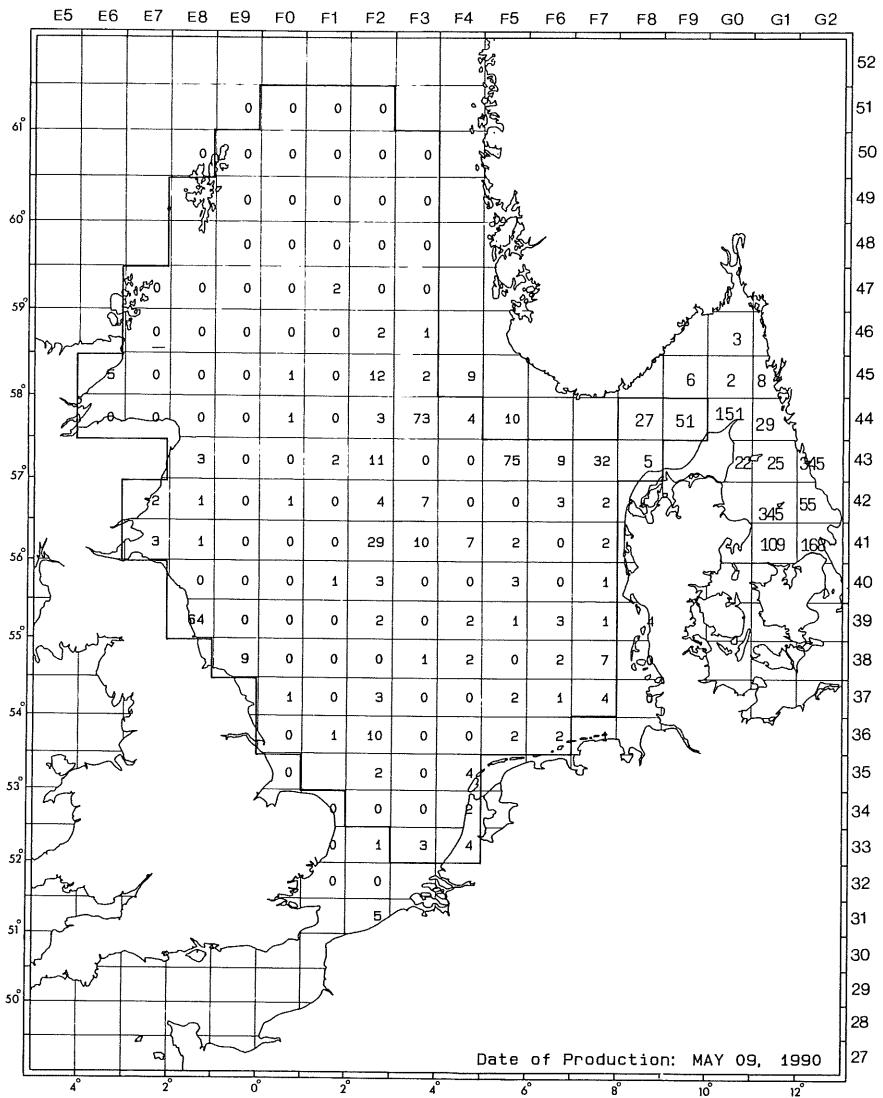


Figure 5.15

Cod, GADU MOR

Number per Hour per Haul, Age Group 1.

International Young Fish Survey 1990

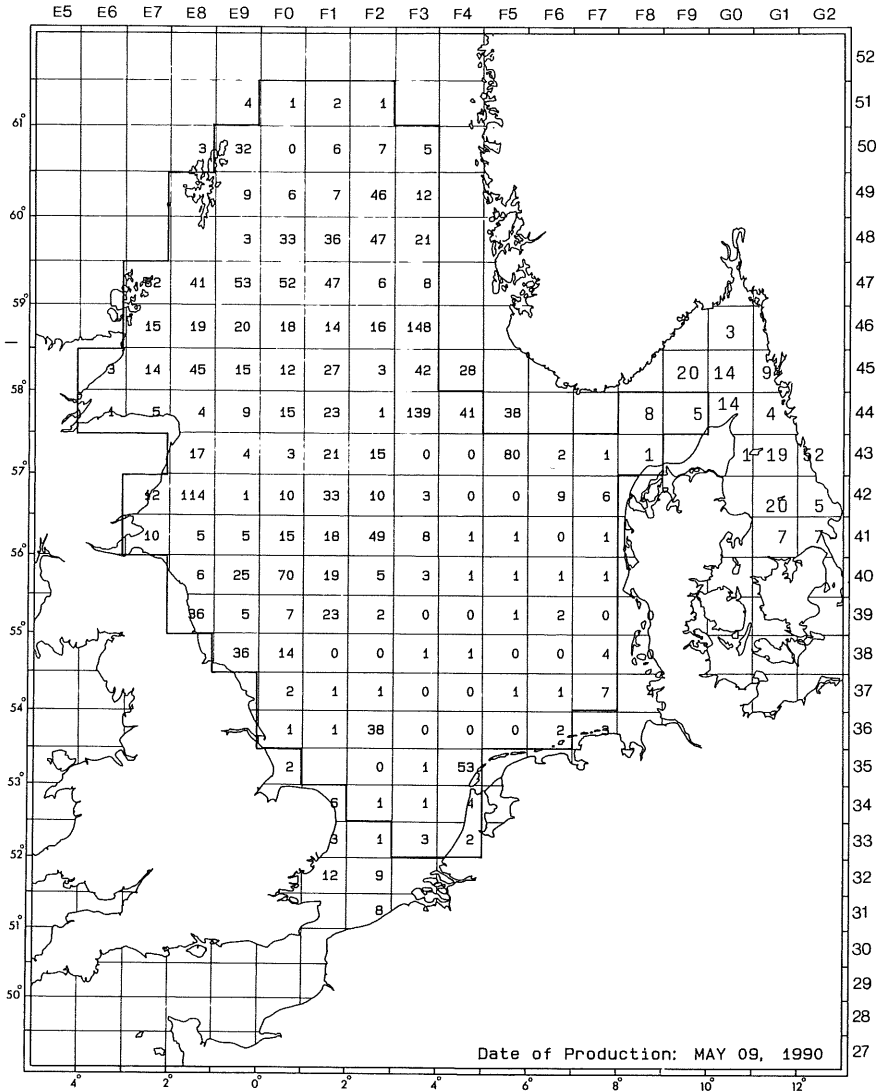


Figure 5.16 Cod, GADU MOR
 Number per Hour per Haul, Age Group 2.

International Young Fish Survey 1990

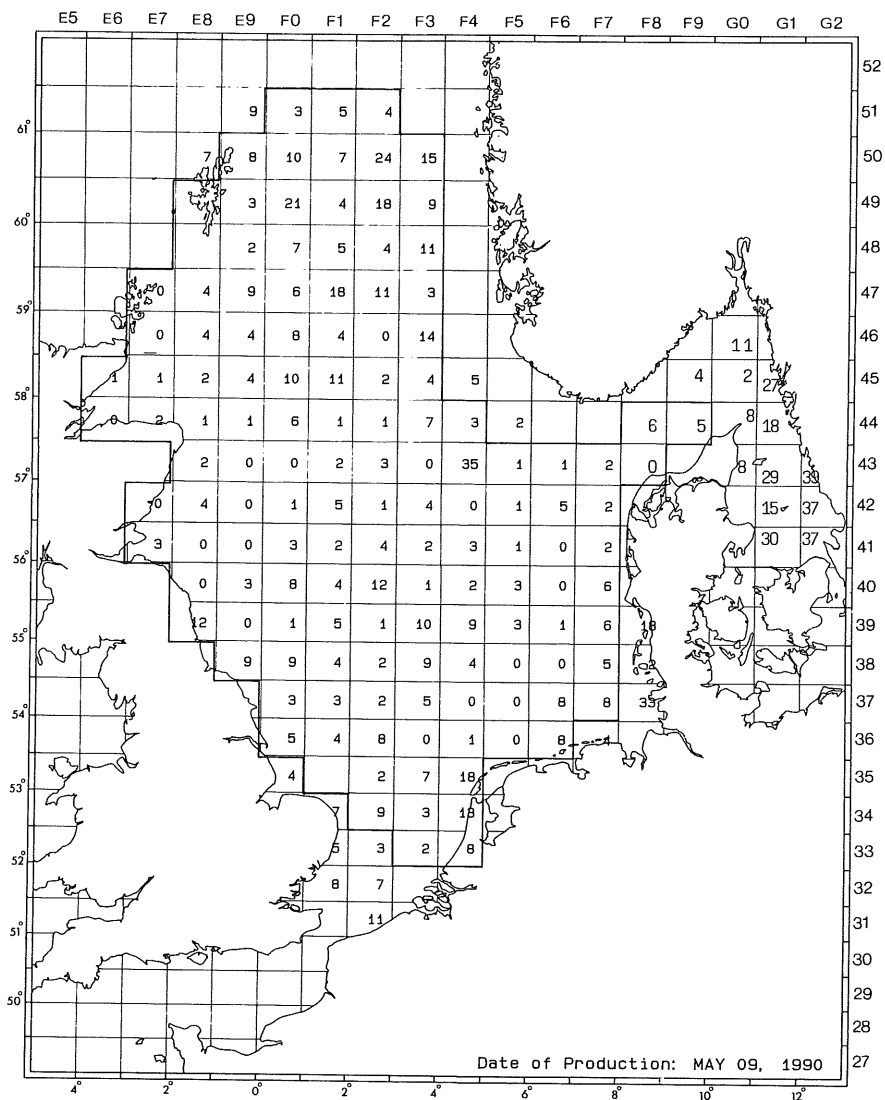


Figure 5.17 Cod, GADU MOR

Number per Hour per Haul, Age Group 3+.

International Young Fish Survey 1990

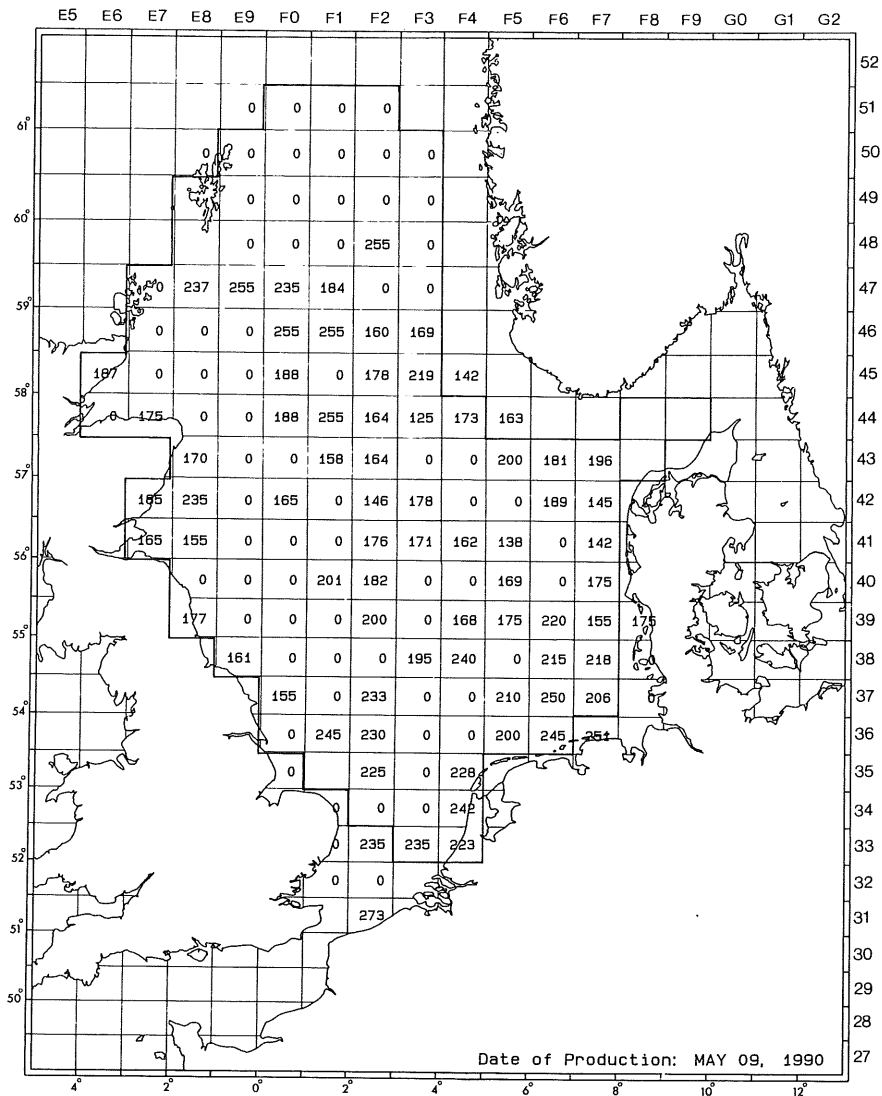


Figure 5.18 Cod, GADU MOR
Mean Length, Age Group 1.

International Young Fish Survey 1990

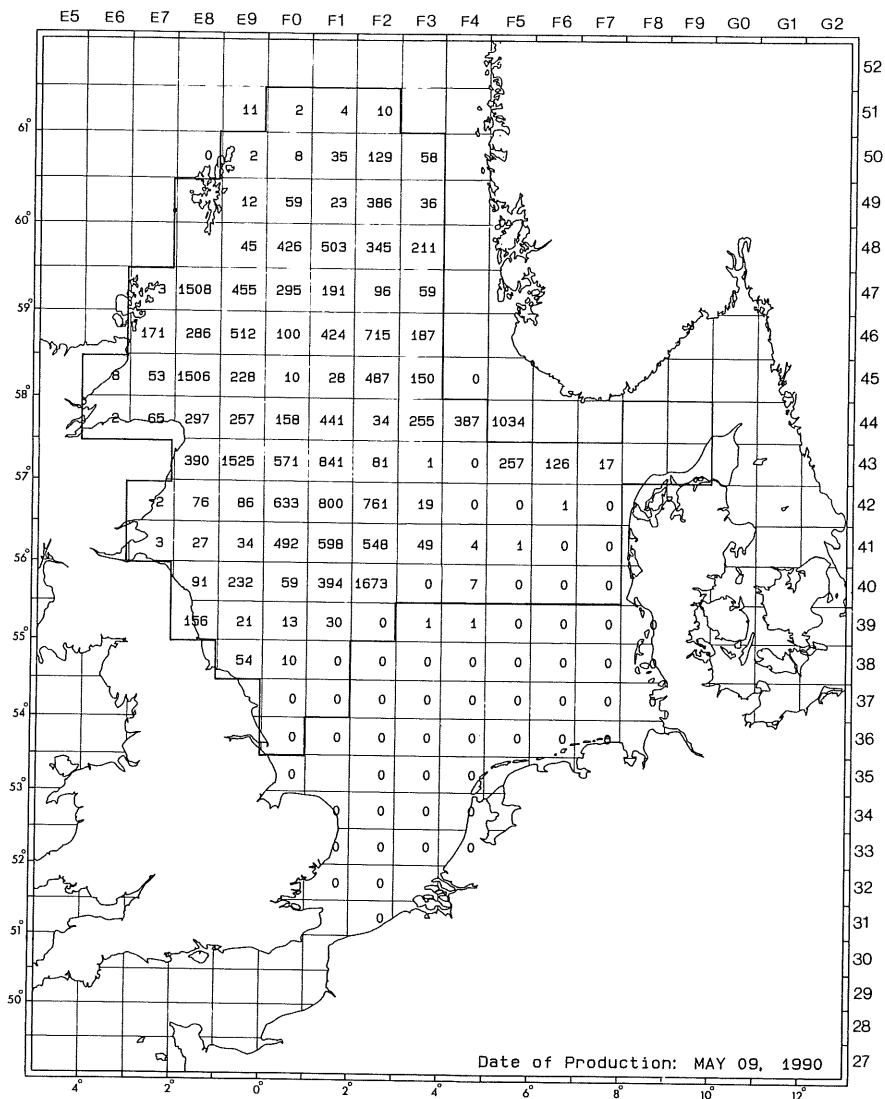


Figure 5.19

Haddock, MELA AEG

Number per Hour per Haul, Age Group 1.

International Young Fish Survey 1990

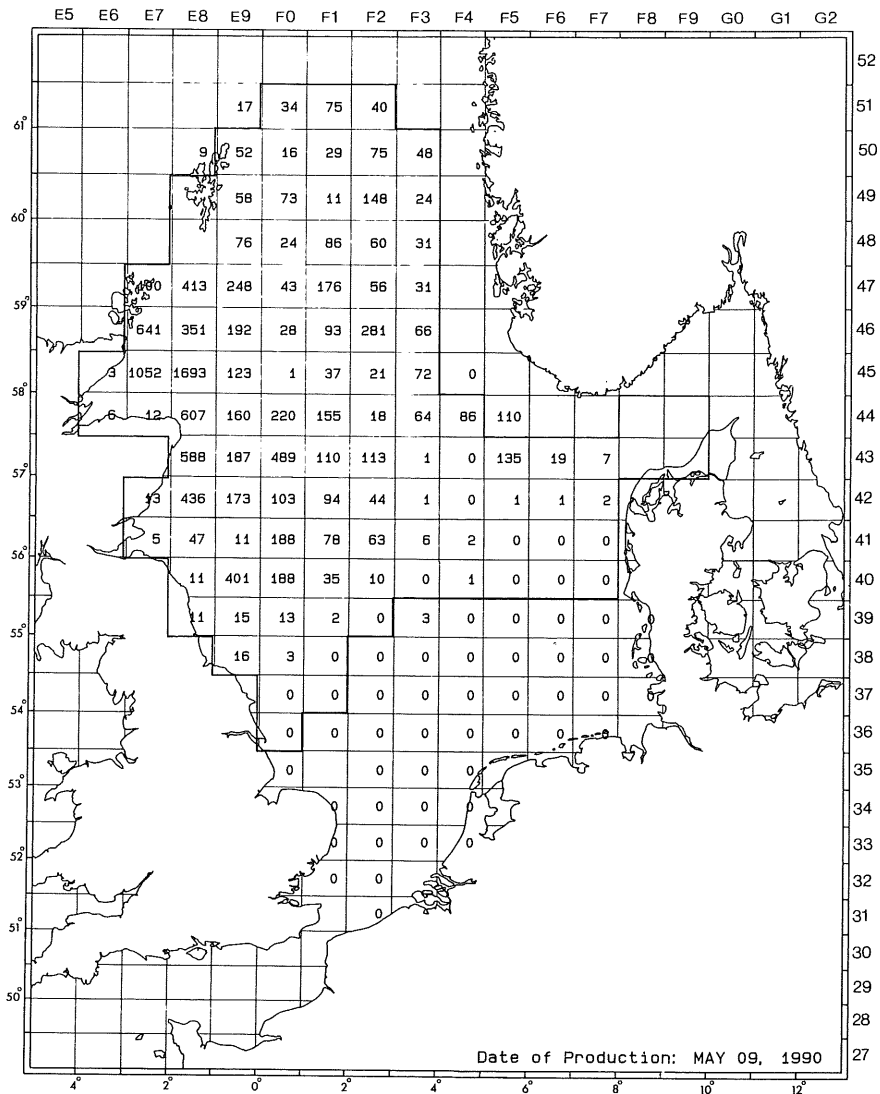


Figure 5.20 Haddock, MELA AEG
 Number per Hour per Haul, Age Group 2.

International Young Fish Survey 1990

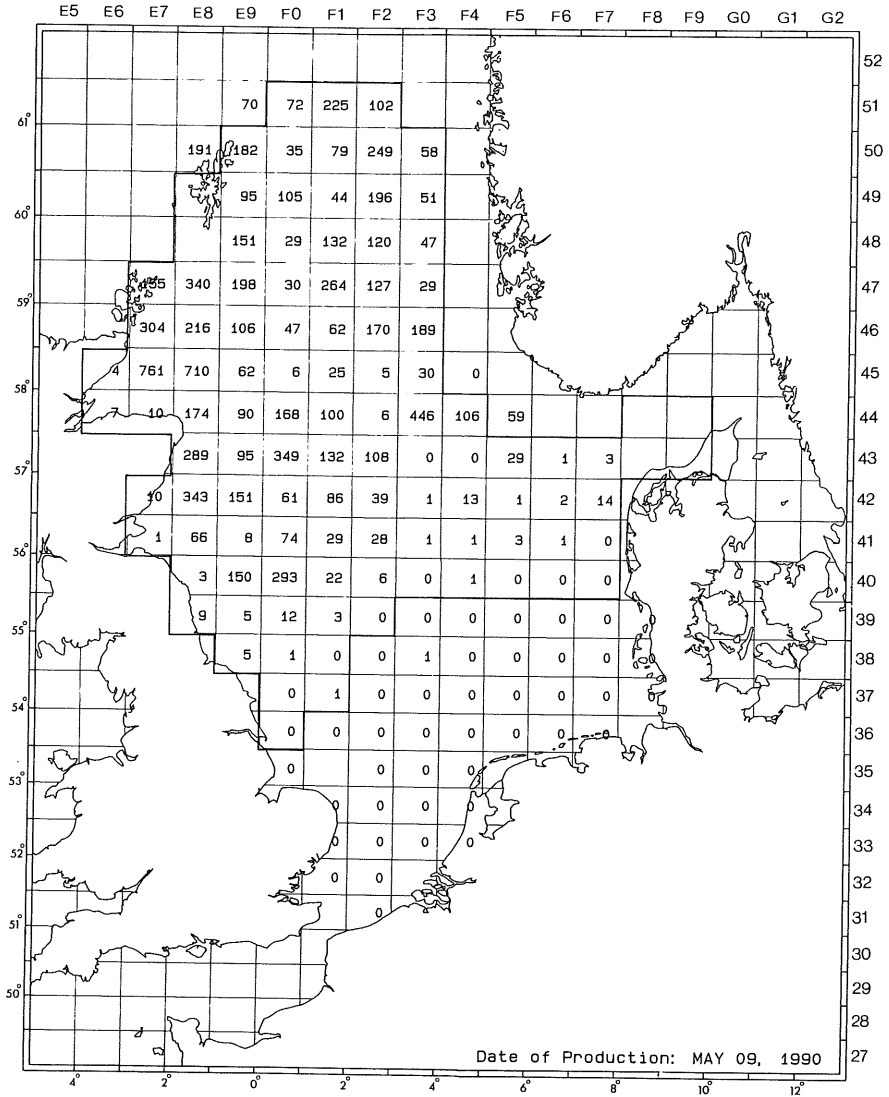


Figure 5.21 Haddock, MELA AEG
Number per Hour per Haul, Age Group 3+.

International Young Fish Survey 1990

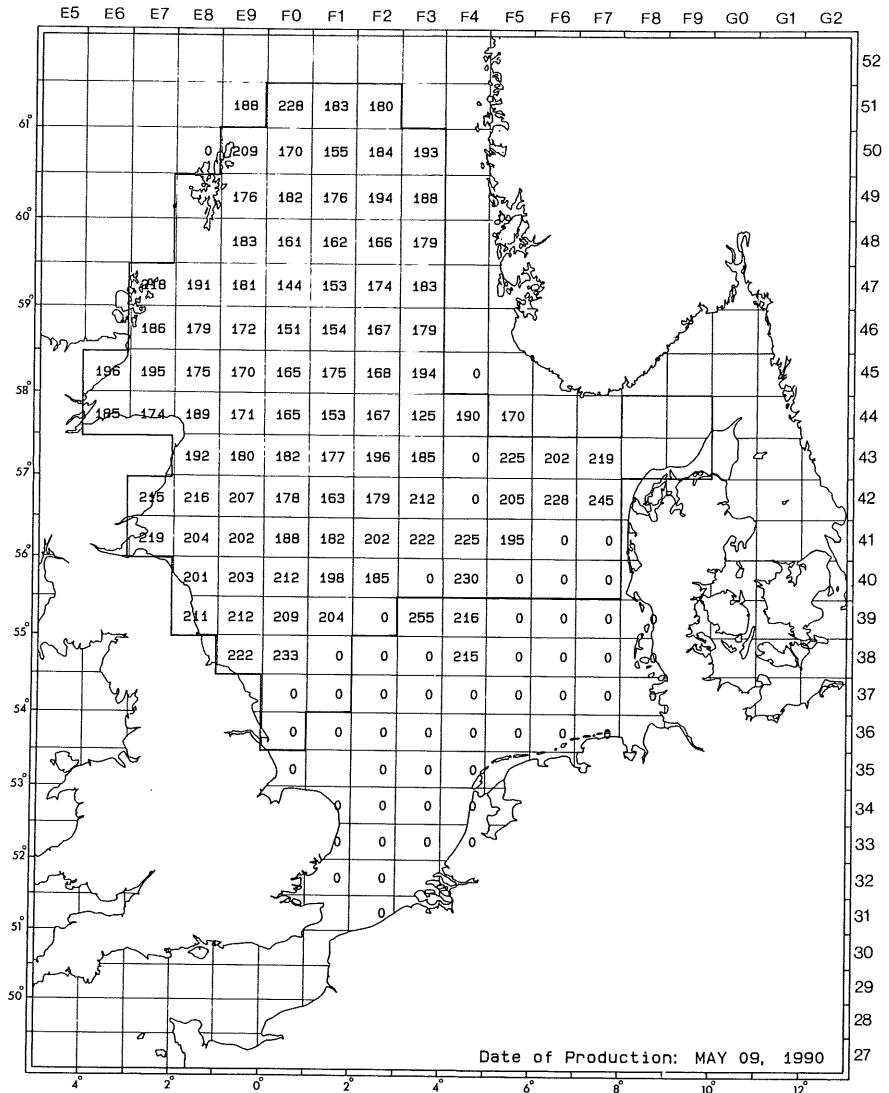


Figure 5.22 Haddock, MELA AEG
Mean Length, Age Group 1.

International Young Fish Survey 1990

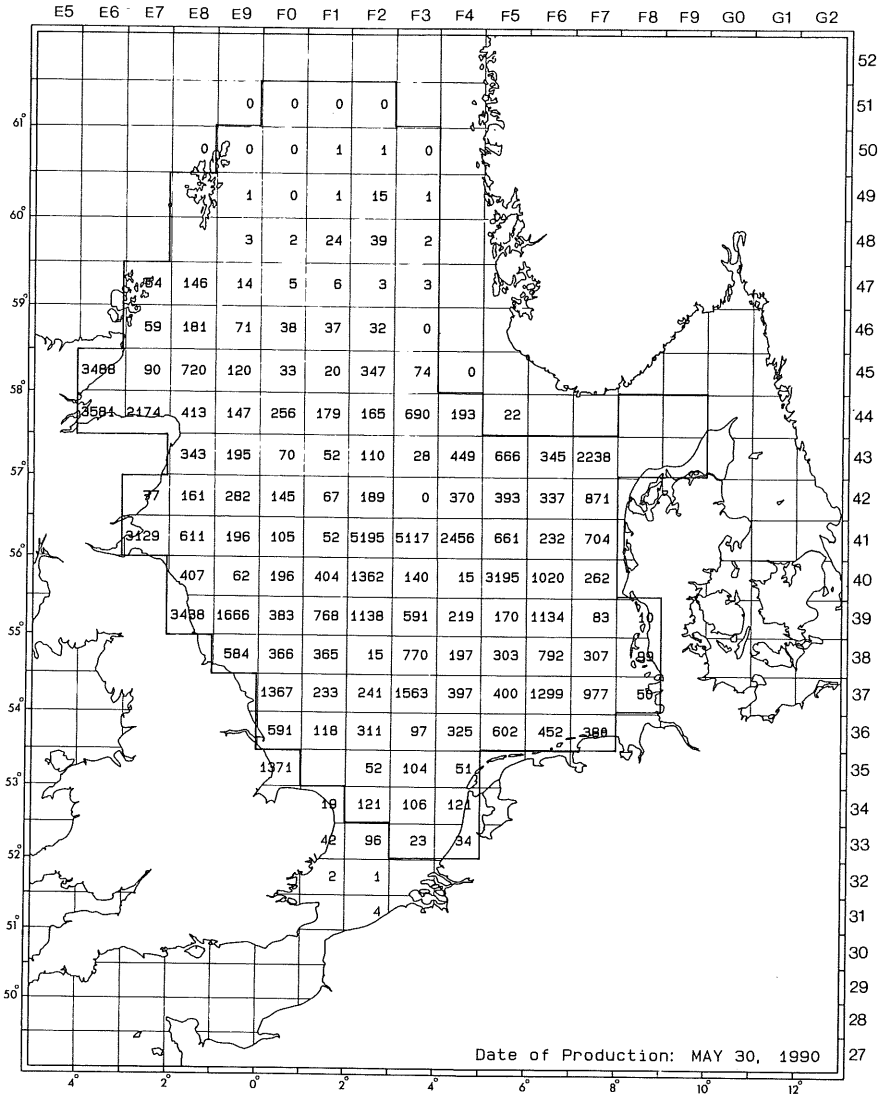


Figure 5.23 Whiting, MERL MNG
 Number per Hour per Haul, Age Group 1.

International Young Fish Survey 1990

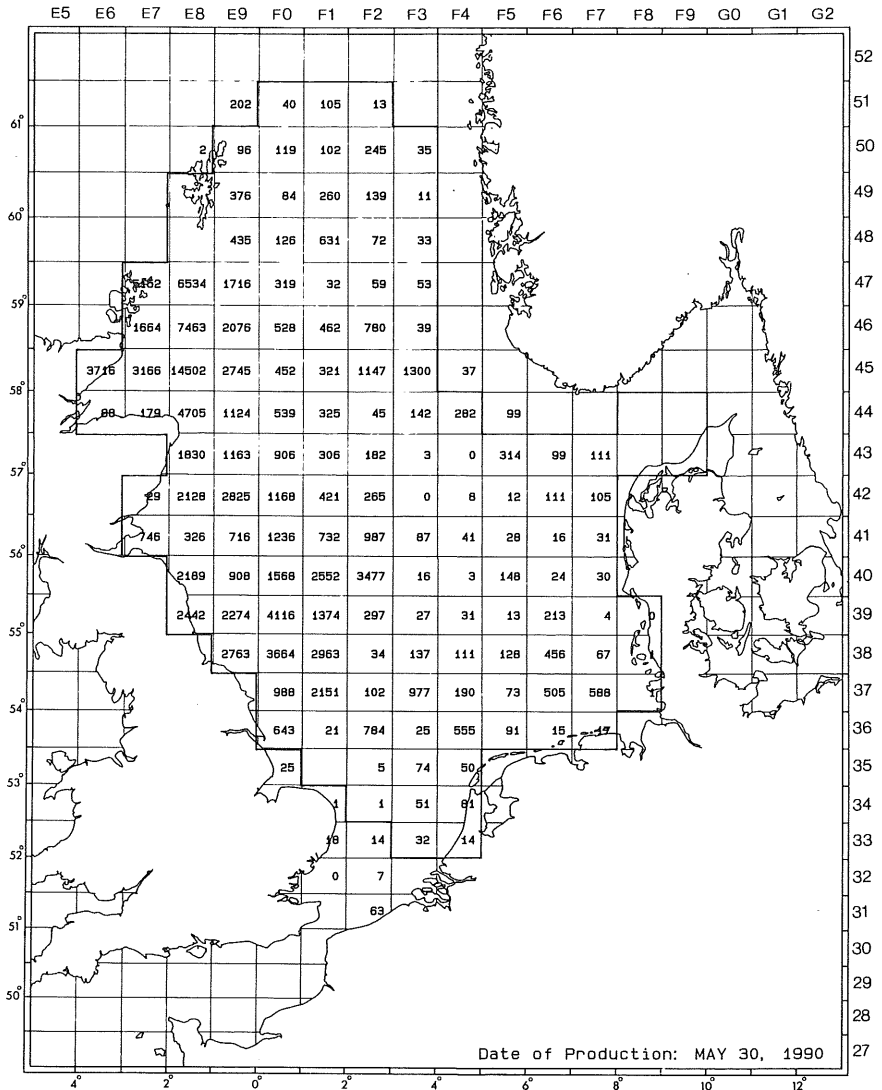


Figure 5.24 Whiting, MERL MNG
Number per Hour per Haul, Age Group 2.

International Young Fish Survey 1990

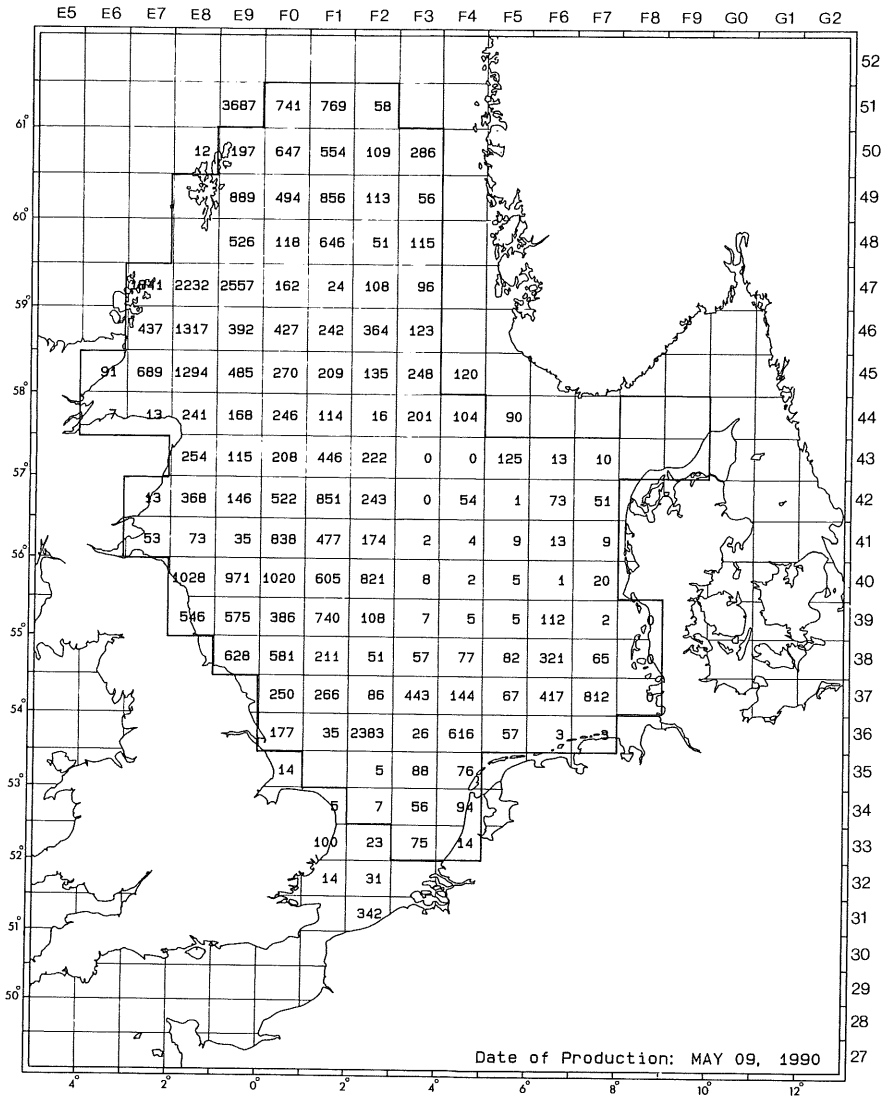


Figure 5.25 Whiting, MERL MNG
 Number per Hour per Haul, Age Group 3+.

International Young Fish Survey 1990

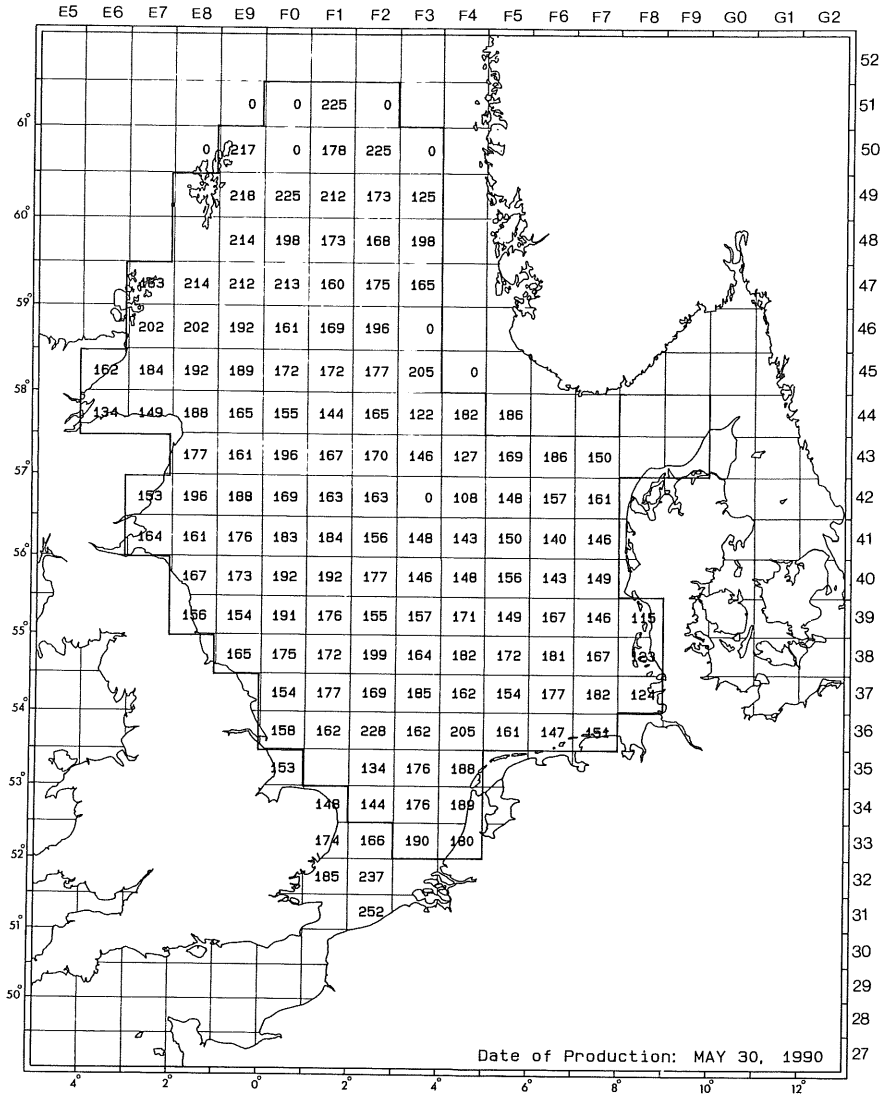


Figure 5.26 Whiting, MERL MNG
Mean Length, Age Group 1.

International Young Fish Survey 1990

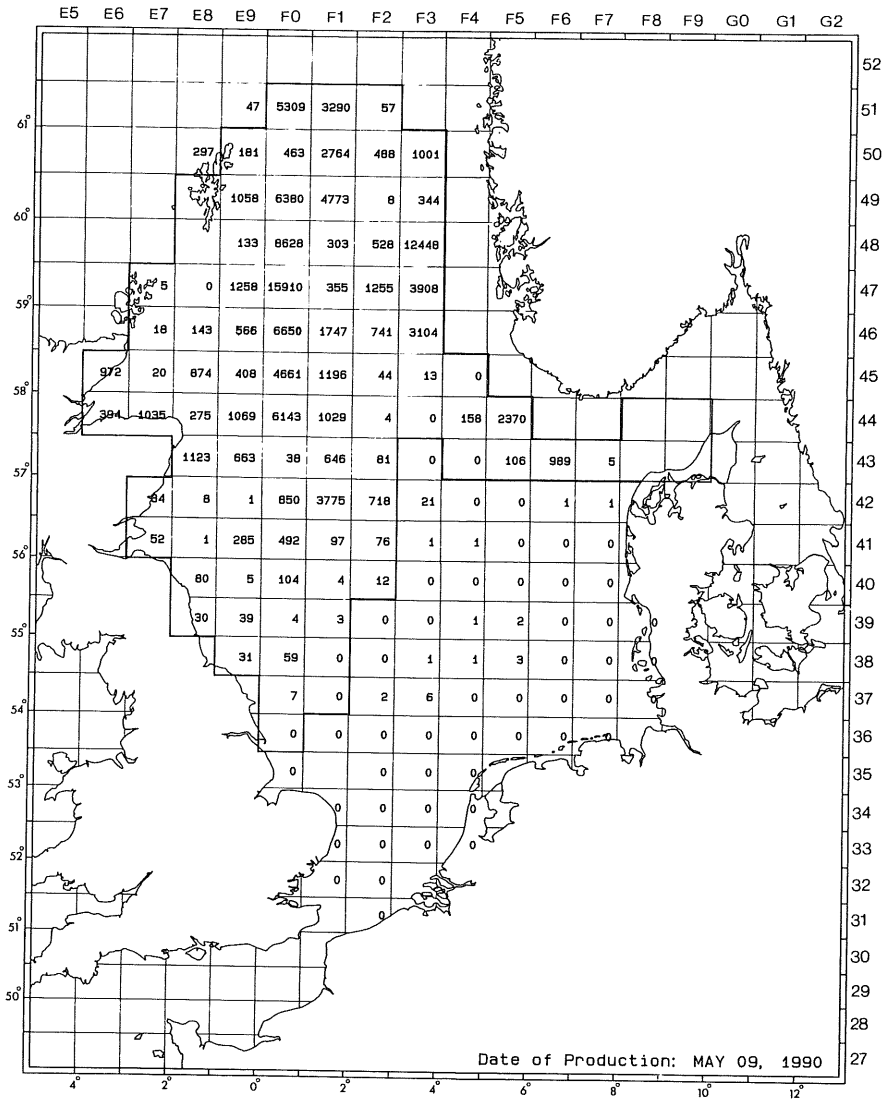


Figure 5.27 Nor. Pout, TRIS ESM
Number per Hour per Haul, Age Group 1.

International Young Fish Survey 1990

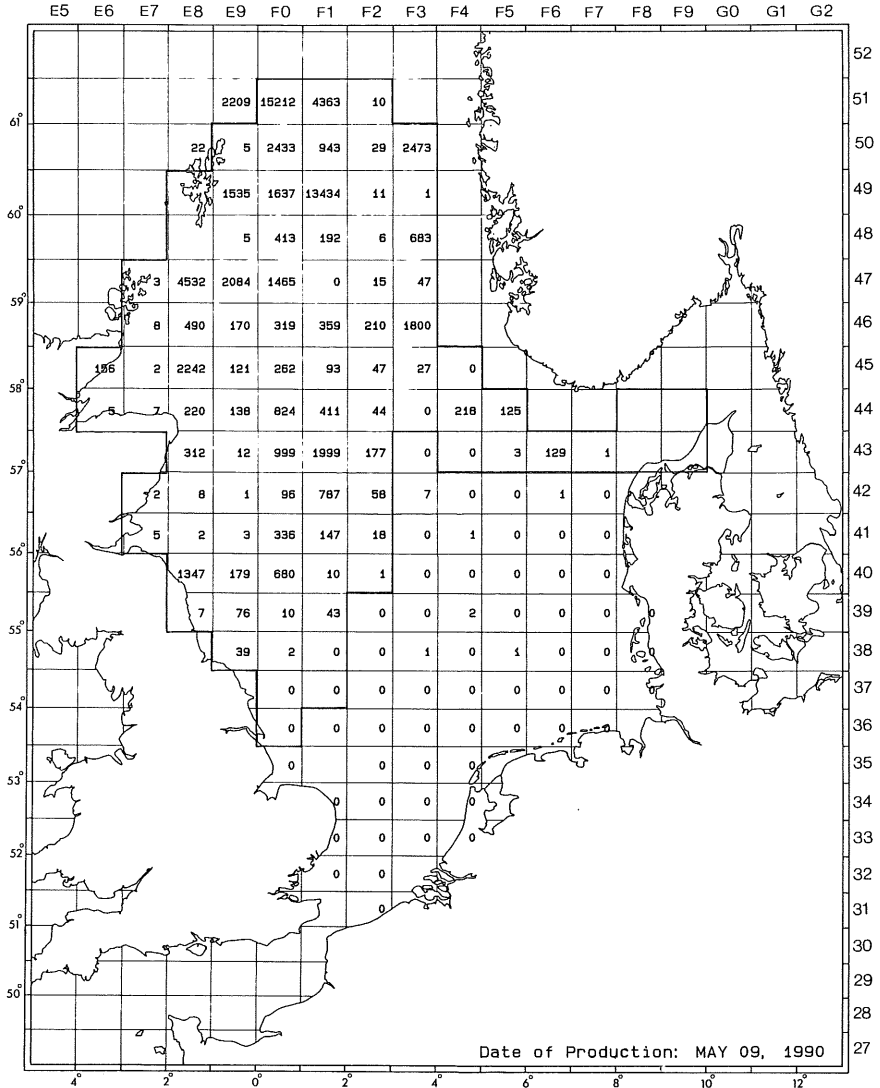


Figure 5.28 Nor. Pout, TRIS ESM
 Number per Hour per Haul, Age Group 2.

International Young Fish Survey 1990

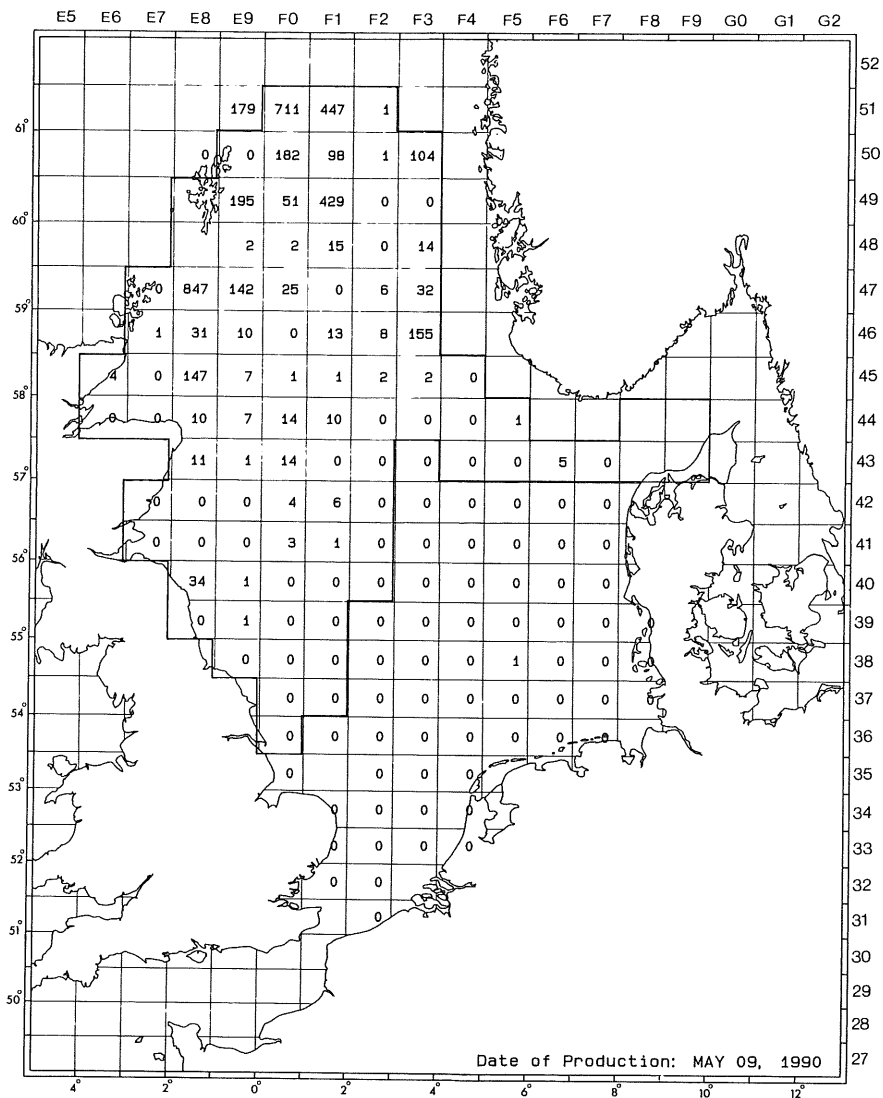


Figure 5.29 Nor. Pout, TRIS ESM

Number per Hour per Haul, Age Group 3+.

International Young Fish Survey 1990

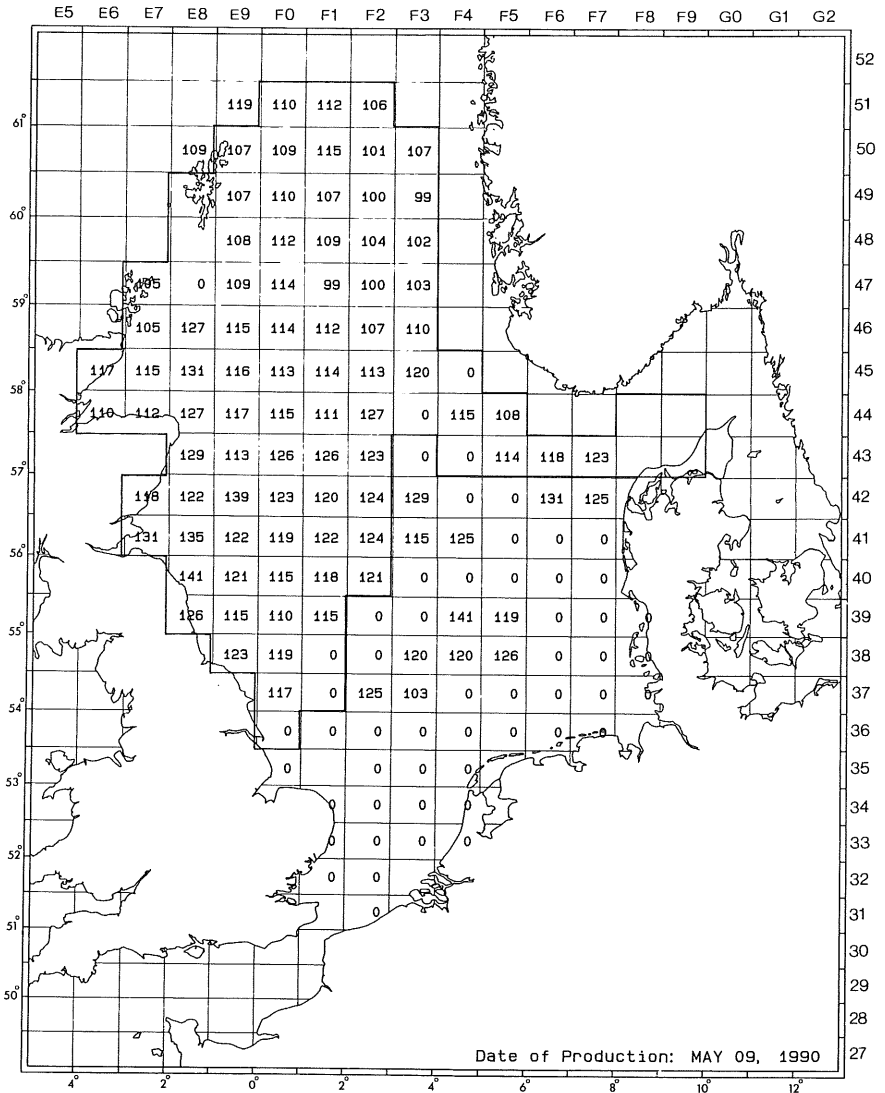


Figure 5.30 Nor. Pout, TRIS ESM
Mean Length, Age Group 1.

Figure 6.1 Herring larvae, 1989 year class, sampled in February 1990.

Herring yearclass 1989

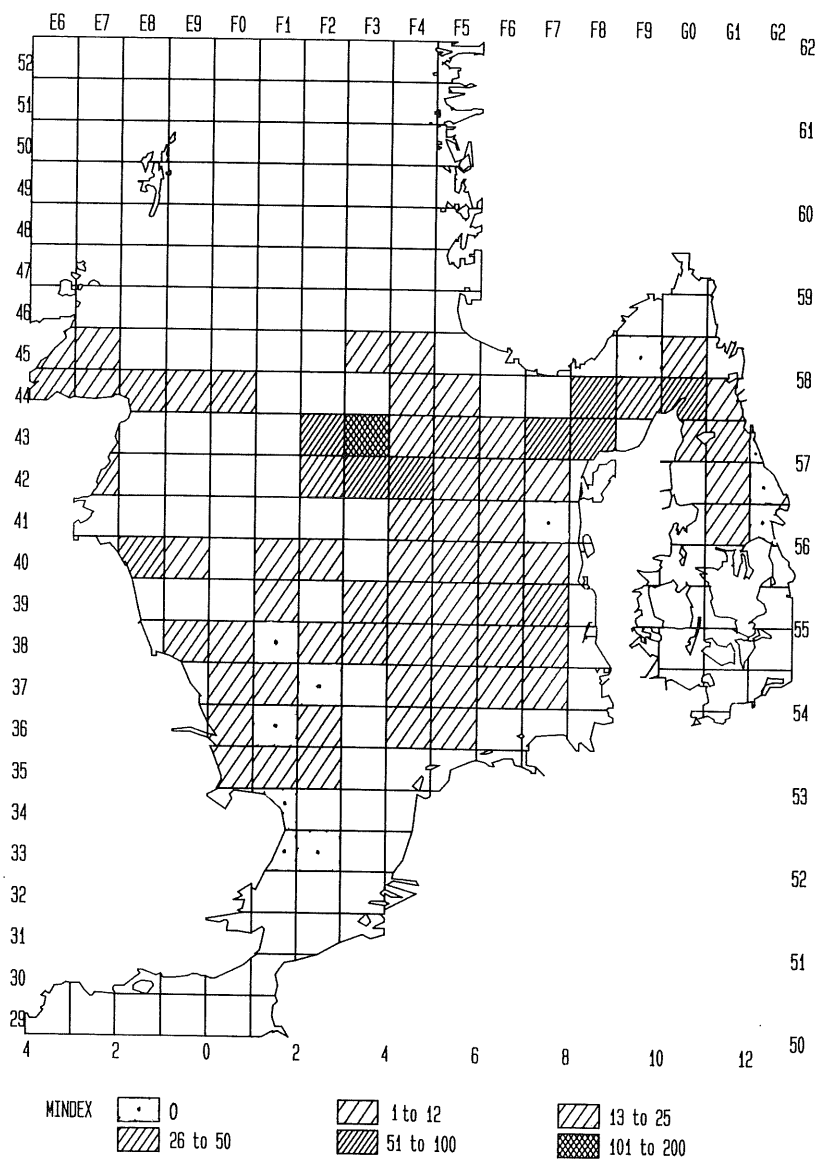


Figure 6.2 Herring larvae: mean abundance per statistical rectangle expressed in index values. 1989 year class sampled in February 1990.

Length of herring larvae, yearclass 1989

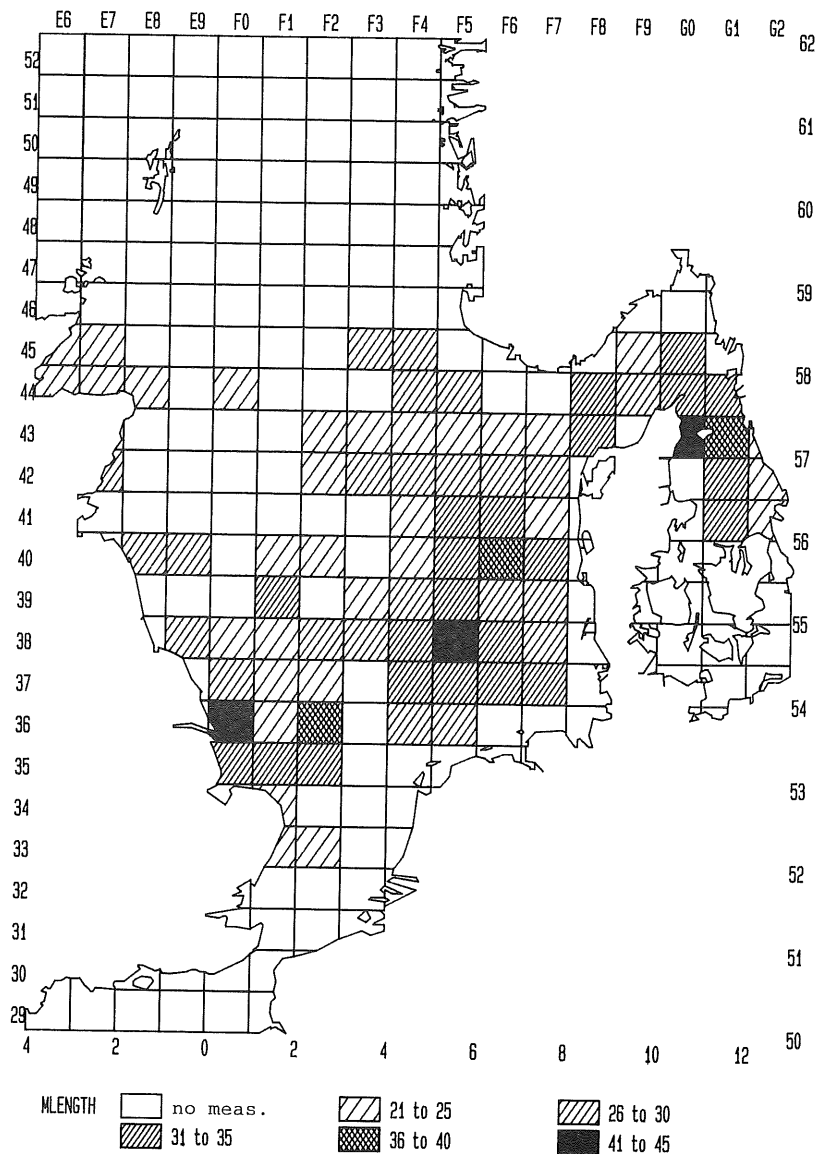
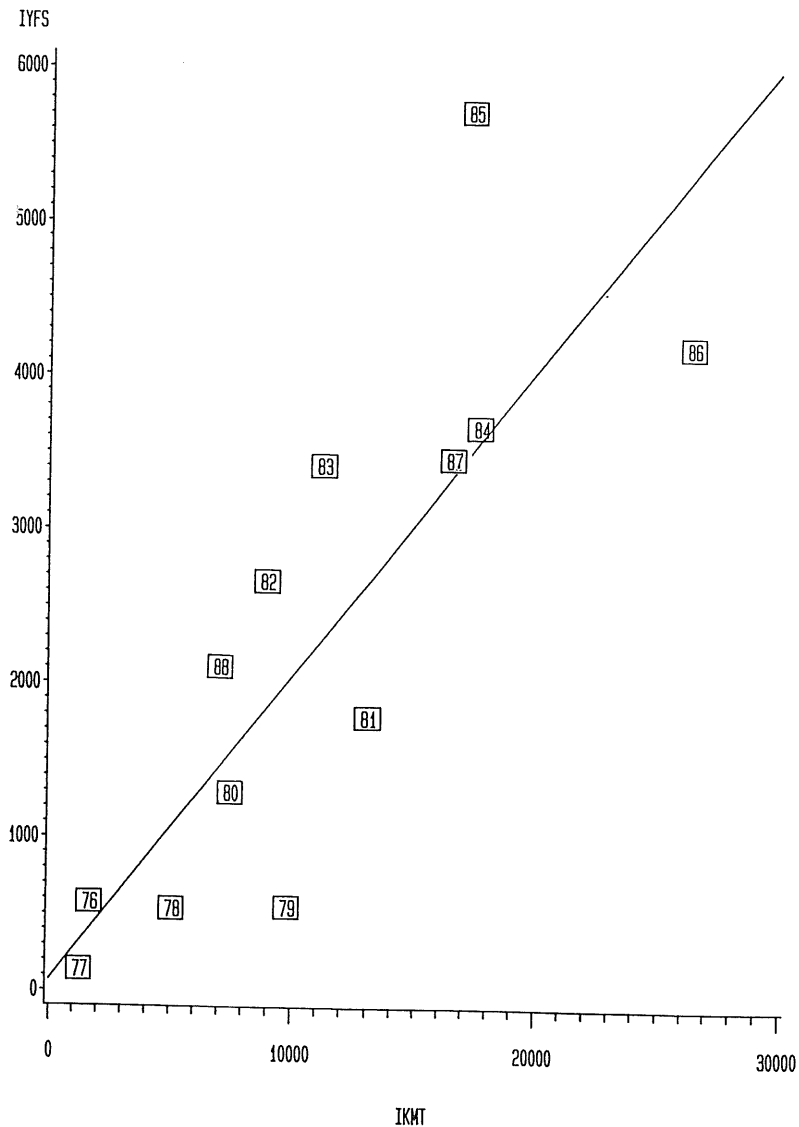


Figure 6.3 Herring: comparison between IYFS index of 1-year-old fish and IKMT index of larval abundance in the previous year. Year classes 1976-1988.

IYFS index versus IKMT index



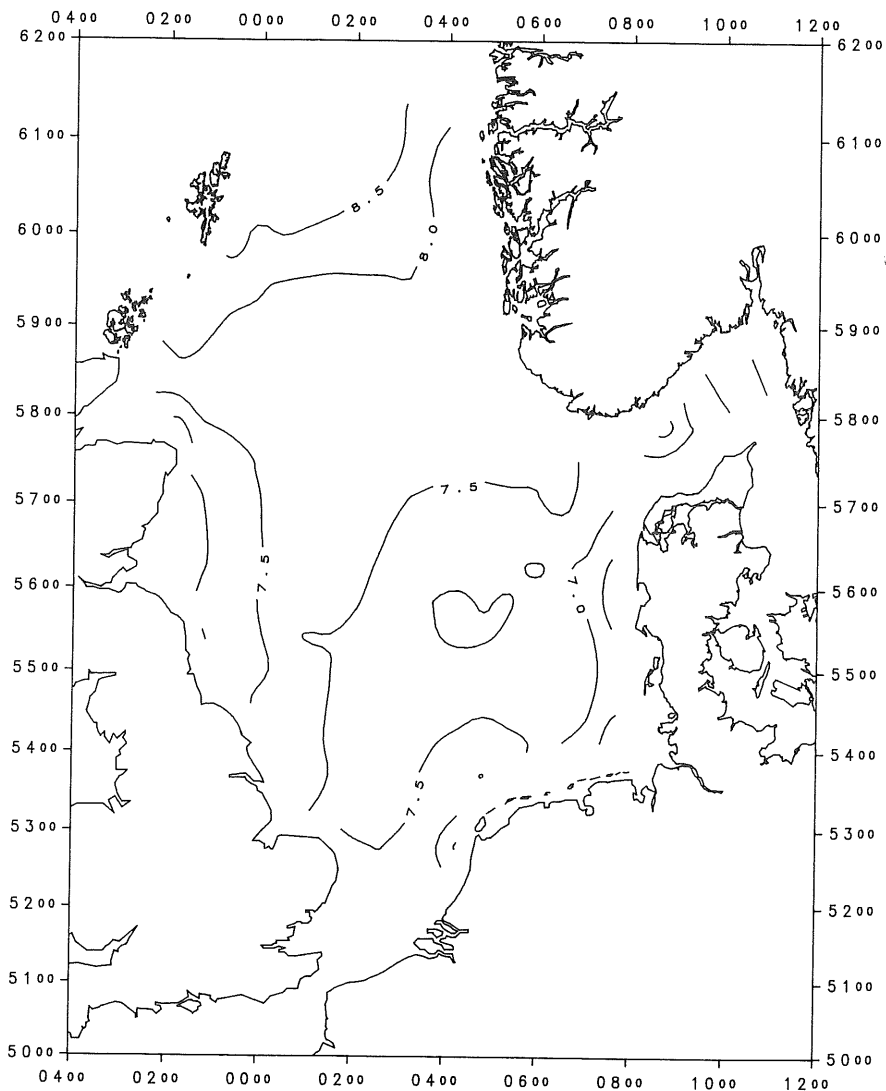


Figure 7.1 IYFS 1990
Bottom temperature (February)

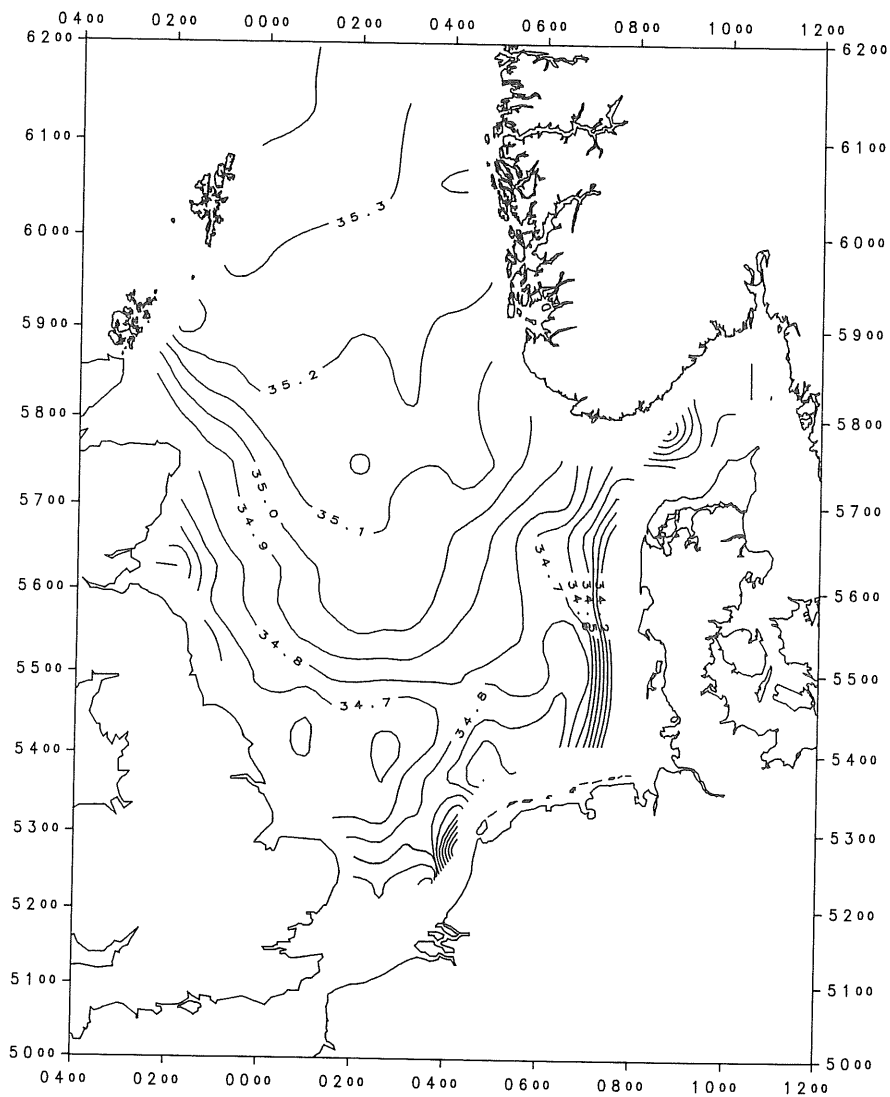


Figure 7.2

IYFS 1990

Bottom salinity (February)

