



**REPORT OF THE
INTERNATIONAL BOTTOM TRAWL SURVEY IN THE
NORTH SEA, SKAGERRAK AND KATTEGAT
IN 1993: QUARTER 2, 3 AND 4**

by

The International Bottom Trawl Survey Working Group

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1 INTRODUCTION

This report presents the final results for the International Bottom Trawl Survey (IBTS) in the second, third and fourth quarter of 1993. The survey was formerly called the International Young Fish Survey (IYFS). In 1990 it was decided to combine the effort of the International Young Fish Survey with a number of national surveys such as the English and Scottish Groundfish Surveys into a quarterly coordinated bottom trawl survey, to be held for a period of 5 years. These quarterly surveys started in 1991. This report presents the results of the quarterly surveys in 1993. The results for the first quarter IBTS are also given in separate reports, but first quarter indices are given in this report as well to give a better overview of the changes within a whole year.

The data in this report comprise the bottom trawl catches of the 8 standard species (herring *Clupea harengus*, sprat *Sprattus sprattus*, mackerel *Scomber scombrus*, cod *Gadus morhua*, haddock *Melanogrammus aeglefinus*, whiting *Merlangius merlangus*, saithe *Pollachius virens* and Norway pout *Trisopterus esmarkii*). Also summarised results of temperature and salinity sampling are presented.

2 SURVEY METHODS AND PARTICIPATION

For all matters on survey methodology, the reader is referred to the IBTS Manual (ICES, 1996b). Details on the participation in the 1993 surveys are given in Table 2.1

3 STANDARD OUTPUT FROM THE ICES IBTS 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.

In 1994 the Herring Assessment Working Group for the Area South of 62°N has adopted a new index for 1-ringer abundance of North Sea autumn spawners. The new index is based on daytime catches in all statistical rectangles sampled during the quarter 1 survey, both in the North Sea and in the Skagerrak/Kattegat. In the calculation of this index, catches made in rectangles shallower than 10 m, or deeper than 200 m (250 m in Skagerrak), have been given less weight. The weighting factors are given in Figure 3.1.

It is implicitly assumed that all 1-ringer herring in the North Sea, Skagerrak, and Kattegat are autumn spawners. Unsampled rectangles are allocated the mean catch rate estimated within "roundfish areas" and the index is expressed as the mean catch rate (number per hour) for the entire survey area. The indices for 2+-ringers have been revised in the same way, with the exception that the catches in Skagerrak and Kattegat are assumed to be 0. This implicitly assumed that all 2+-ringers in Skagerrak and Kattegat are local or Baltic spring spawners. The use of "zero" catches instead of "missing" catches of 2+-ringers in this area is convenient because it brings the indices of all age groups on a similar scale so that for instance mortalities can be calculated directly from the indices.

The above mentioned rules for separation of autumn and spring spawners were intended for the first quarter IBTS data. In this report similar rules have been adopted as well for the second, third and fourth quarter data. The indices for 0-ringlers in third and fourth quarter are calculated in a similar way as for the 1-ringlers.

The IBTS Working Group decided at the meeting in November 1995 (ICES 1996a) that saithe should be added to the list of standard species. The indices of saithe for each age group are calculated in a similar way as for 1-ringer herring (see above) with the exception that also night-time hauls are used for saithe.

The Herring Assessment Working Group has also for sprat adopted a new index series (ICES 1993) in which only hauls between 10 and 150 m depth are included. The standard area has remained the same: Division IVb only.

For the index of the remaining species (cod, haddock, whiting, Norway pout and mackerel), the catch at age per hour is averaged for all hauls within a rectangle, and the survey index is calculated by taking the average of all rectangles within a species-specific standard area. Rectangles where no haul was made, are excluded from the calculation.

The standard gear for IBTS is the GOV trawl, but in the third quarter of 1993 an Aberdeen 40 ft trawl has been used by "Scotia". See Knijn *et al.* (1993) for specifications of the Aberdeen 40 ft trawl. In the calculation of indices it is assumed that all trawl types have the same size and fishing power.

4 RESULTS FOR 1993

In the analysis only day-light hauls are used for herring, whereas for the other species all valid hauls are used. The number of hauls used for herring and for the other species is shown in Figures 4.1 and 4.2.

The number of otoliths sampled per target species, per roundfish area and quarter is given in Table 4.1.

Per species a set of figures gives the distributions of the 0-, 1-, 2-, and 3+ group and the mean length of 1-group fish per rectangle. In the analysis a specific standard area for each species is used to calculate the index of year class strength. This area is indicated in the figures. The distributions are given with dots of expanding size. Within one page, showing 2 or 4 quarterly distributions, the same scaling has been used. The catch in number per hour of the biggest dot is indicated. The surface area of each dot is relative to the average number per hour caught.

The mean age composition of the eight standard species within the relevant standard areas is given in Table 4.2.

Herring

Mean numbers of 0-, 1-, 2- and 3+ ringed herring are given per rectangle in Figures 4.3–4.6. Mean length per rectangle of 1-ringed herring are given in Figure 4.7. It should be noted that the term "age group" in herring refers to number of winter rings and not to years. All juvenile herring in the North Sea are assumed to be autumn spawners, and this means that for instance age group 1 herring in February 1993 represent year class 1991.

Sprat

The distributions of 0-, 1-, 2- and 3+ groups, and the mean length of 1-group fish are given in Figures 4.8–4.12.

Mackerel

The distributions of 0-, 1-, 2- and 3+ groups, and the mean length of 1-group fish are given in Figures 4.13–4.17.

Cod

The distributions of 0-, 1-, 2-, and 3+ group, and the mean length of 1-group fish are given in Figures 4.18–4.22.

Haddock

The distributions of 0-, 1-, 2-, and 3+ group, and the mean length of 1-group fish are given in Figures 4.23–4.27.

Whiting

The distributions of 0-, 1-, 2-, and 3+ group, and the mean length of 1-group fish are given in Figures 4.28–4.32.

Saithe

The distributions of 2-, and 3+ group, and the mean length of 2-group fish are given in Figures 4.33–4.35.

Norway pout

The distributions of 0-, 1-, 2-, and 3+ group, and the mean length of 1-group fish are given in Figures 4.36–4.40.

5 HYDROGRAPHIC DATA

5.1 Hydro-Chemistry Survey

Details concerning the data collected during the three surveys are as follows:

Quarter 2: 183 stations from 26 April to 19 June from four ships ("Walter Herwig", "Isis", "Tridens" and "Argos")
Quarter 3: 313 stations from 9 August to 23 September from five ships ("Thalassa", "Isis", "Tridens", "Cirolana", and "Argos")

Quarter 4: 349 stations from 16 October to 20 November from five ships ("Dana", "G.O. Sars", "Isis", "Tridens", and "Cirolana")

Charts showing the distribution of bottom (<20m of bottom) temperature and salinity for each of the surveys are shown in Figures 5.1 to 5.6.

Digital (gif) copies of these charts may be retrieved or viewed from <ftp://ftp.ices.dk/dist/ocean/iyfs/1993>. The ftp directory also includes charts showing the location of the stations.

6 REFERENCES

Knijn J.R, Boon, T.W, Heessen, H.J.L and Hislop, J.R.G. 1993. Atlas of North Sea Fishes. ICES Cooperative Research Report. No. 194, 268 pp.

ICES 1993. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES Doc. CM 1993/Assess:15.

ICES 1996a. Report of the International Bottom Trawl Survey Working Group. ICES Doc. CM 1996/H:1.

ICES 1996b. Manual for the International Bottom Trawl Surveys. Rev. V. Addendum to ICES CM 1996/H:1.

Pedersen, L. 1989. International Young Fish Survey, computation of aggregated standard tables and charts. ICES Secretariat, section computer management.

Table 2.1 Participation and number of hauls in the IBTS for 1993.

Year 1993	Country	Vessel	Period	Number of Hauls	
				ABD	GOV
Quarter 1	Sweden	Argos	8/2–25/2	46	
	Denmark	Dana	5/2–18/2	43	
	Netherlands	Isis	16/2–25/2	26	
	Norway	Michael Sars	5/2–1/3	49	
	UK Scotland	Scotia	4/2–24/2	52	
	France	Thalassa	17/1–3/2	51	
	Netherlands	Tridens	2/2–25/2	48	
	Germany	Walter Herwig	23/1–11/2	65	
Quarter 2	Sweden	Argos	26/4–12/5	48	
	Netherlands	Isis	10/5–18/5	24	
	Norway	Michael Sars	24/5–1/6	32	
	UK Scotland	Scotia	29/4–17/5	74	
	Netherlands	Tridens	3/5–18/5	44	
	Germany	Walter Herwig	19/5–19/6	12	
Quarter 3	Sweden	Argos	6/9–23/9	50	
	UK England	Cirolana	9/8–4/9	77	
	Netherlands	Isis	16/8–19/8	17	
	UK Scotland	Scotia	6/8–25/8	89	
	France	Thalassa	13/9–30/9	69	
	Netherlands	Tridens	16/8–3/9	48	
Quarter 4	UK England	Cirolana	19/10–13/11	73	
	Denmark	Dana	4/11–20/11	47	
	Norway	G.O. Sars	17/10–10/11	79	
	Netherlands	Isis	25/10–10/11	48	
	Netherlands	Tridens	18/10–28/10	32	

Gear used:

ABD Aberdeen 48 ft trawl

GOV Grand Overture Verticale trawl

Table 4.1 Number of otoliths sampled per species, roundfish area and quarter in 1993

Species	Roundfish area										Total
	1	2	3	4	5	6	7	8	9		
Quarter 1											
Herring	585	882	666	227	212	955	755	446	636	5,364	
Sprat	-	85	135	158	113	471	320	21	159	1,462	
Mackerel	113	-	-	-	-	-	-	-	-	113	
Cod	1,048	470	286	310	39	334	248	278	439	3,452	
Haddock	1,290	720	852	481	-	12	264	141	75	3,835	
Whiting	1,017	634	713	629	561	1,371	175	208	204	5,512	
Saithe	585	3	5	-	-	-	-	-	-	593	
Norway pout	282	181	155	193	-	-	-	-	-	811	
Quarter 2											
Herring	333	301	385	361	375	427	192	426	672	3,472	
Sprat	-	89	168	187	162	230	100	138	171	1,245	
Mackerel	27	17	49	82	119	218	-	-	-	512	
Cod	607	382	199	320	15	152	178	649	406	2,900	
Haddock	587	659	575	354	3	11	303	204	55	2,751	
Whiting	453	469	491	369	167	430	210	183	177	2,949	
Saithe	298	12	52	-	-	-	56	21	-	439	
Norway pout	185	140	100	142	5	1	11	77	40	701	
Quarter 3											
Herring	541	626	659	622	26	172	210	343	589	3,788	
Sprat	17	157	147	179	148	237	24	33	160	1,102	
Mackerel	221	300	163	88	96	233	97	-	-	1,198	
Cod	737	469	126	632	57	389	175	277	215	3,077	
Haddock	1,929	1,082	994	503	-	13	168	168	35	4,892	
Whiting	1,283	805	752	333	114	288	175	148	153	4,051	
Saithe	788	59	31	2	-	-	15	-	-	895	
Norway pout	420	137	141	94	-	-	22	110	73	997	
Quarter 4											
Herring	837	905	287	352	236	471	408	363	157	4,016	
Sprat	-	292	132	360	191	317	102	-	142	1,536	
Mackerel	214	122	128	27	13	304	22	-	-	83	
Cod	597	277	48	100	36	364	177	120	52	1,771	
Haddock	1,134	673	626	234	3	8	174	144	13	3,009	
Whiting	876	576	521	369	193	923	125	126	127	3,836	
Saithe	647	14	5	-	-	-	43	16	2	727	
Norway pout	430	190	82	88	-	-	30	49	-	869	

Table 4.2 Age composition of standard species in 1993 for the relevant standard areas.

	Quarter	Age						
		0	1	2	3	4	5	6+
Herring	1	.0	2,954.0	779.3	209.1	43.6	63.8	-
	2	.0	2,126.7	618.4	415.5	62.1	63.7	-
	3	3,799.2	1,136.9	324.8	175.2	92.0	195.8	-
	4	3,488.5	293.8	63.0	23.3	10.5	22.3	-
Sprat	1	.0	1,688.6	589.8	83.8	4.2	.1	-
	2	.0	7,815.4	5,196.1	504.6	19.5	.9	-
	3	6.8	2,575.1	2,728.4	559.3	23.5	.0	-
	4	2,528.0	9,476.2	2,918.0	81.3	.3	1.1	-
Mackerel	1	.0	1.0	.8	.9	.4	.2	.3
	2	.0	3.8	22.9	6.8	2.5	1.5	3.1
	3	5.3	91.3	67.6	25.7	18.9	10.1	18.1
	4	11.9	8.5	10.2	6.1	6.3	3.3	7.6
Cod	1	.0	13.1	19.5	2.0	.7	.6	.4
	2	2.1	8.4	13.6	1.9	.5	.3	.2
	3	17.0	10.0	8.0	.9	.2	.1	.1
	4	25.4	9.1	5.6	.8	.3	.1	.1
Haddock	1	.0	1,254.3	540.8	154.5	8.9	1.1	1.0
	2	.1	1,121.3	317.2	97.7	20.2	.9	.9
	3	571.9	604.3	141.5	37.7	2.4	.4	.3
	4	667.0	906.1	201.3	45.3	2.7	.5	.4
Whiting	1	.0	1,087.6	523.7	244.5	65.5	59.0	11.4
	2	7.2	742.5	244.2	147.0	35.1	21.4	6.7
	3	915.9	634.2	176.9	67.1	14.8	16.2	3.1
	4	1,014.1	755.5	324.1	110.3	42.0	14.2	7.6
Saithe	1	.0	.1	2.0	.5	1.3	2.5	1.8
	2	.0	.1	1.3	1.2	1.5	1.8	.8
	3	.0	.9	1.8	8.5	2.9	1.2	.4
	4	.0	.2	1.6	7.3	1.9	.6	.4
Norway pout	1	.0	2,681.4	2,644.1	258.5	6.0	7.0	.1
	2	.0	2,075.2	1,252.5	193.8	.2	.0	.0
	3	4,103.9	1,831.5	608.5	52.6	3.3	.0	.0
	4	4,775.1	1,767.0	579.9	47.5	2.7	.0	.0

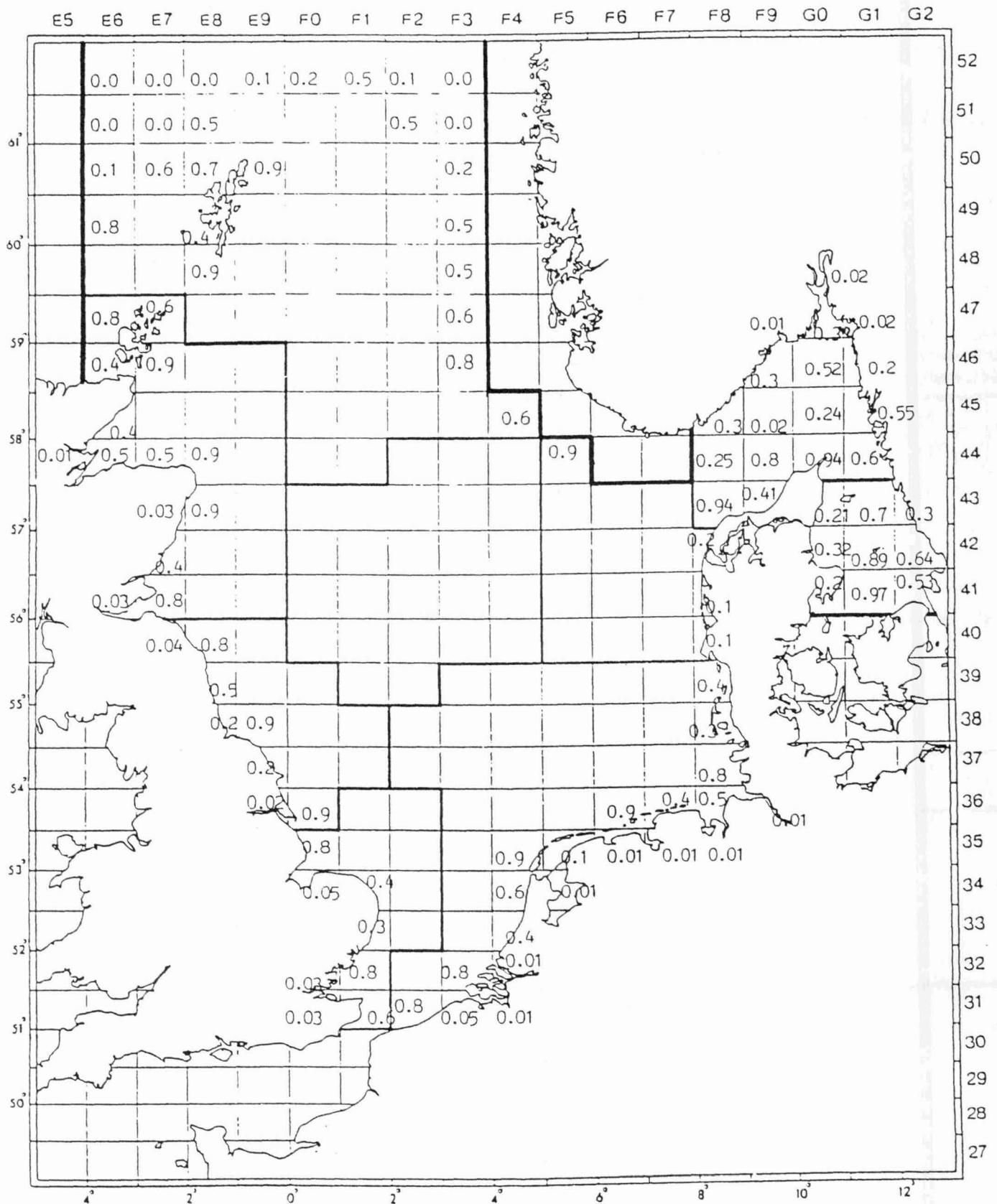
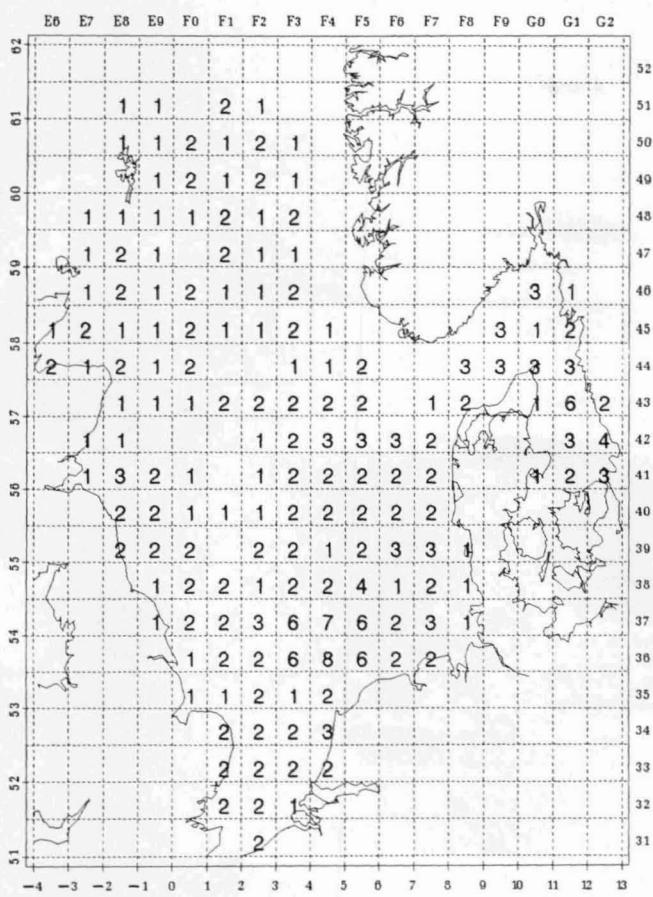
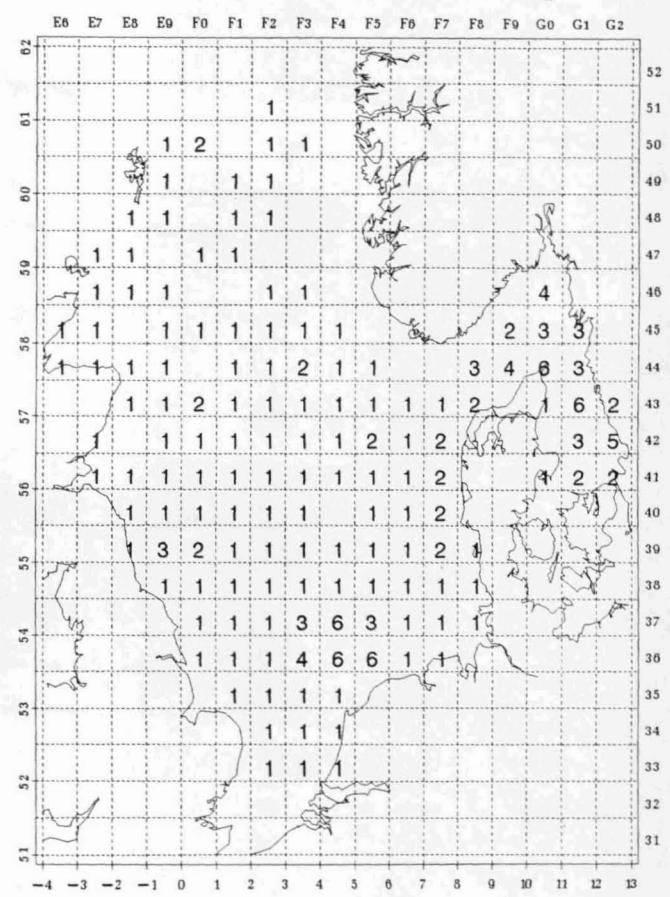


Figure 3.1 Weighting factors used in the calculation of the indices for herring and saithe. Numbers denote the relative weight of a given rectangle. Only weighting factors less than 1 are shown, other rectangles are given a weight of 1.

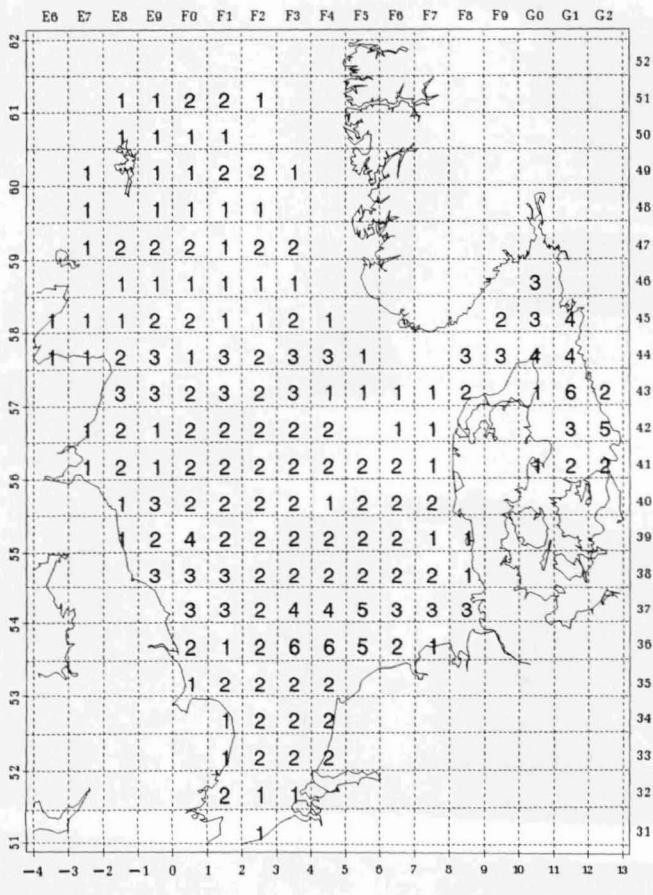
Number of daytime hauls. 1993 quarter 1



Number of daytime hauls. 1993 quarter 2



Number of daytime hauls. 1993 quarter 3



Number of daytime hauls. 1993 quarter 4

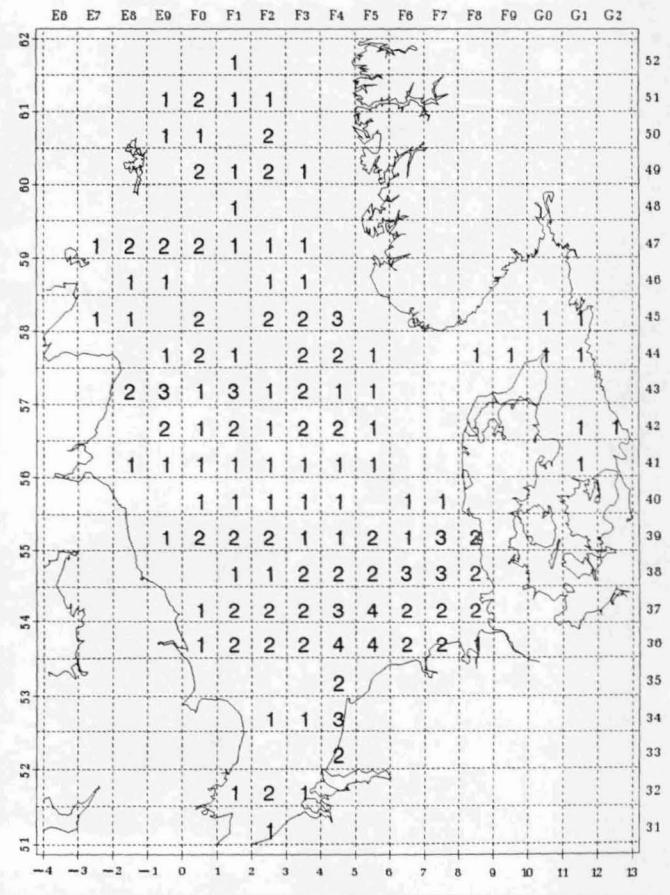
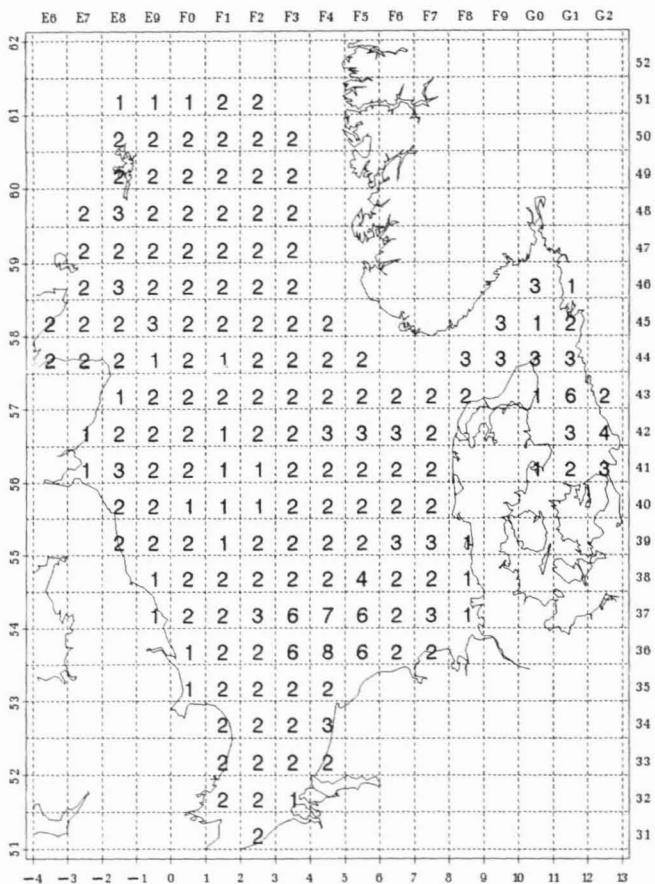
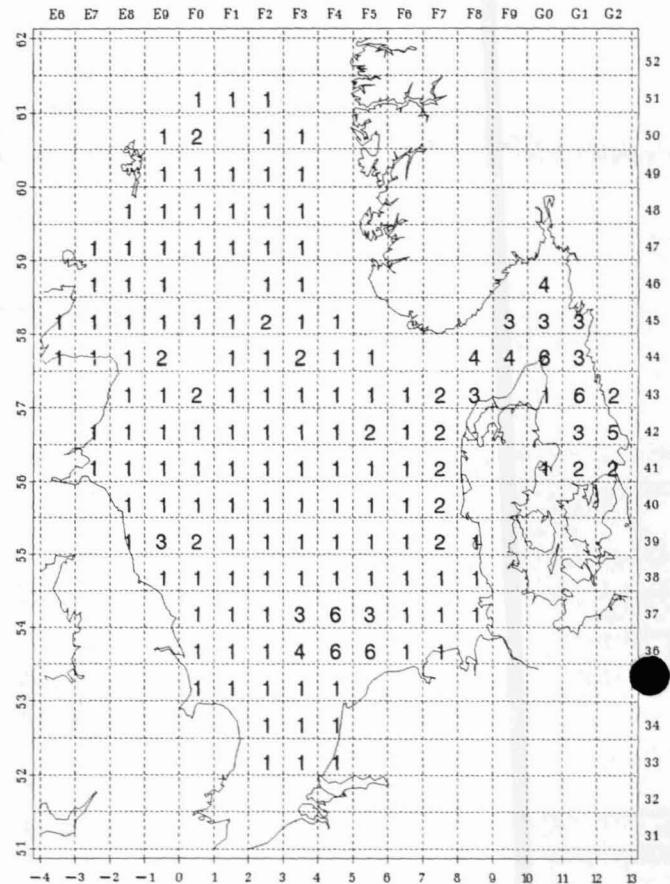


Figure 4.1 Number of valid daytime hauls.

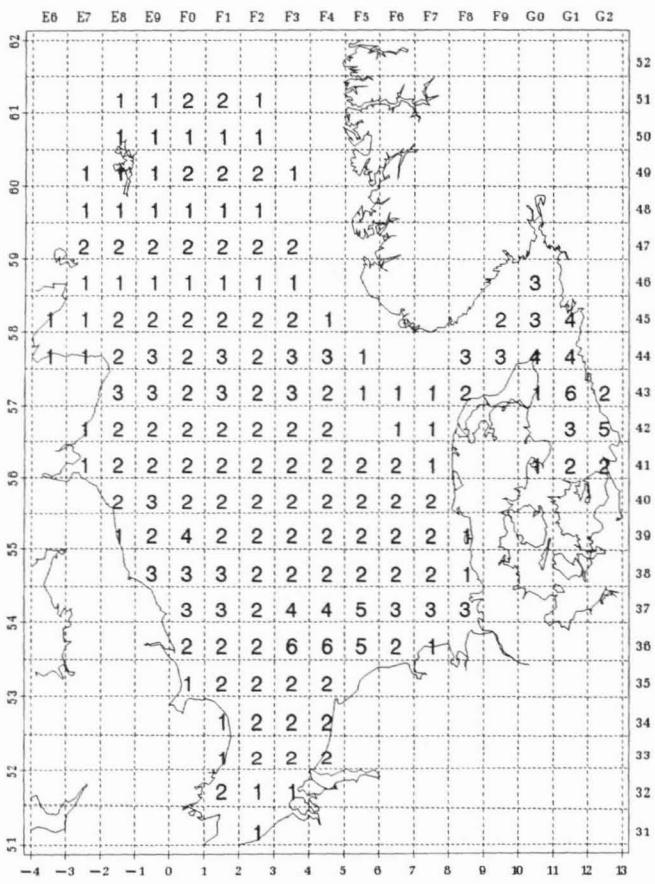
Number of hauls. 1993 quarter 1



Number of hauls. 1993 quarter 2



Number of hauls. 1993 quarter 3



Number of hauls. 1993 quarter 4

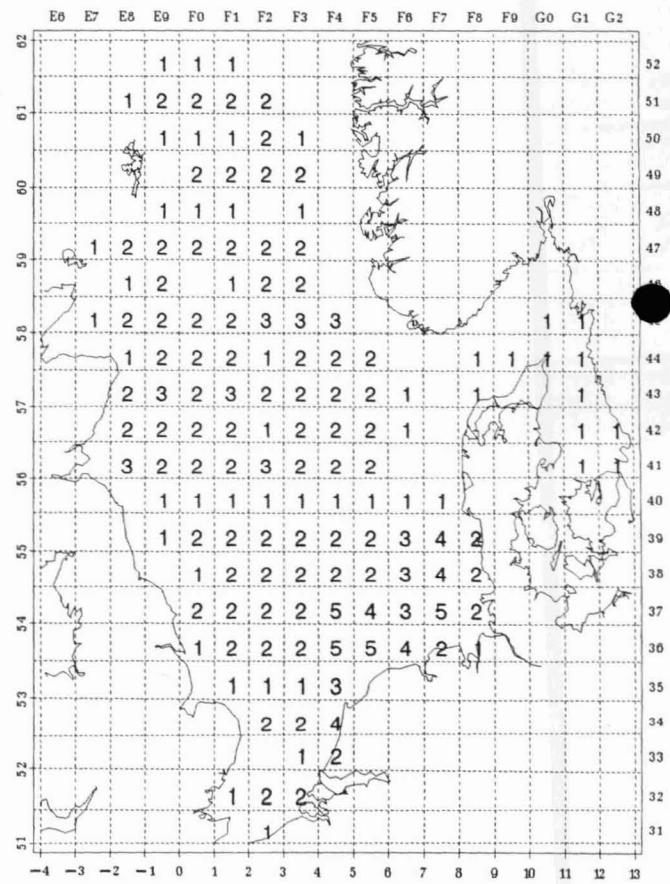
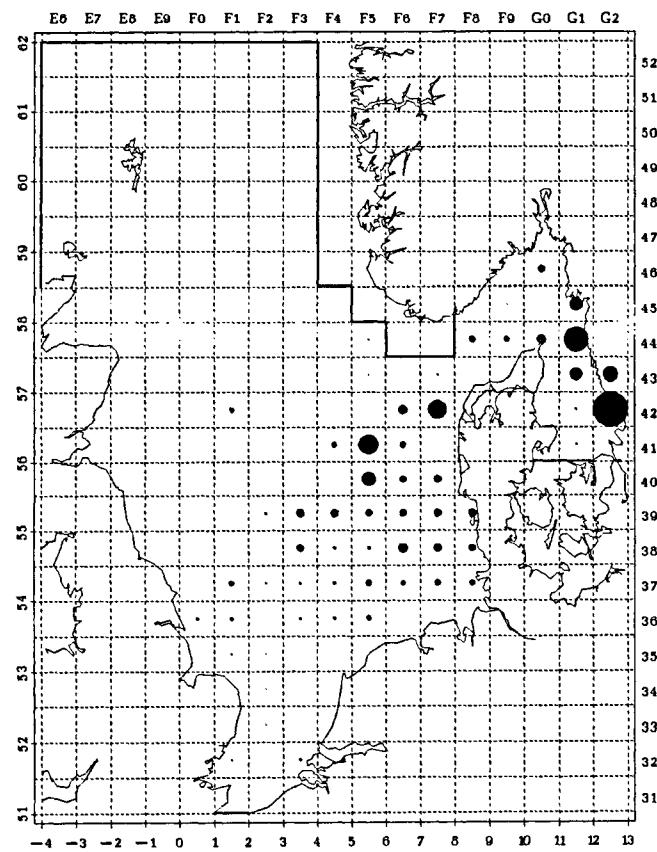


Figure 4.2 Number of valid day- and nighttime hauls.

Herring, Age group 0 1993 quarter 3
Max mean catch number per rectangle: 192831



Herring, Age group 0 1993 quarter 4
Max mean catch number per rectangle: 94561

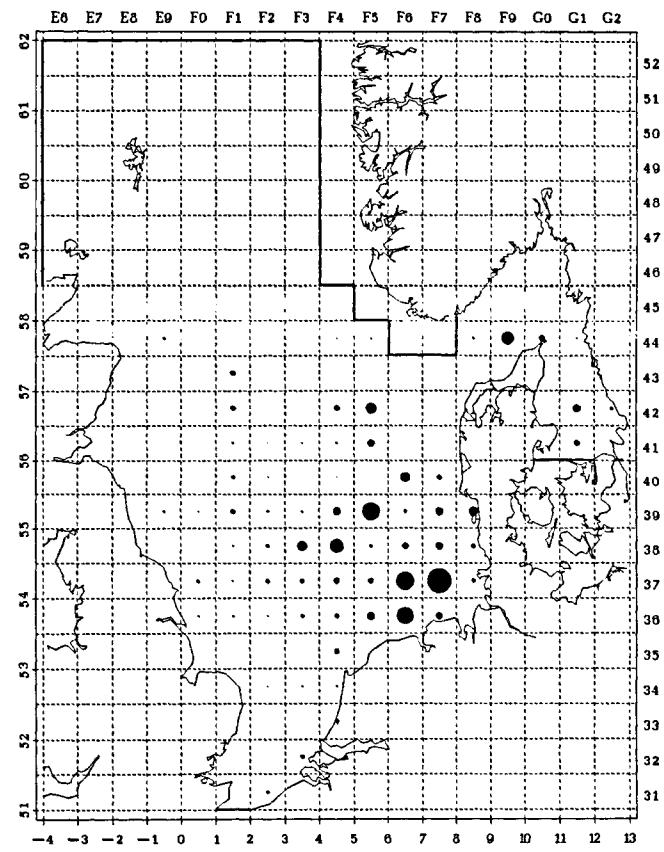
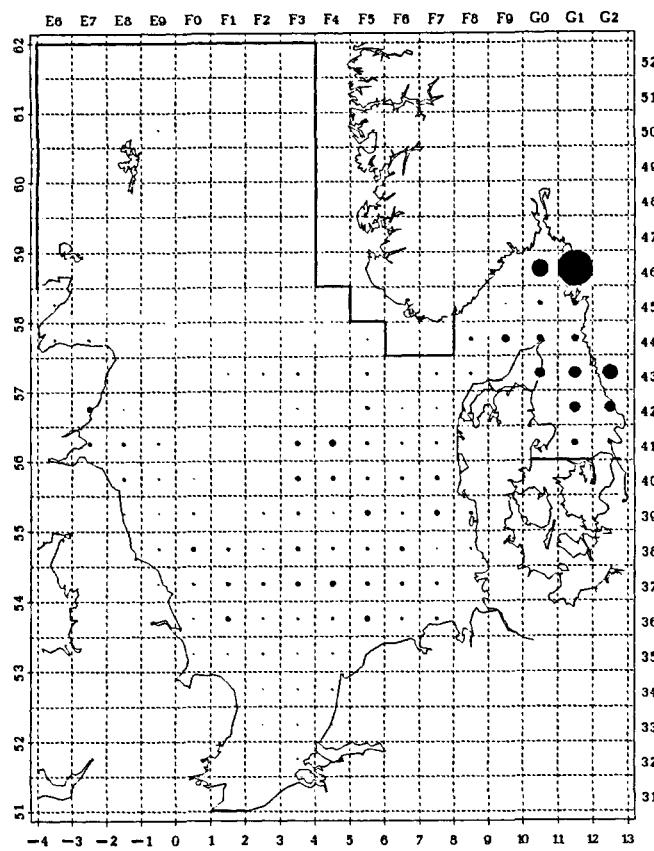
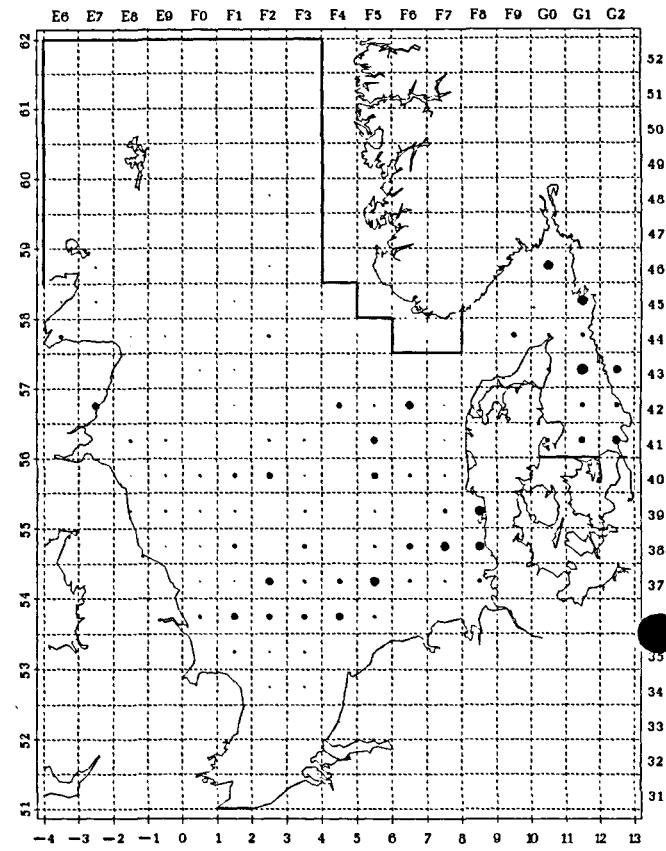


Figure 4.3 Herring: number per hour, 0-ringers.

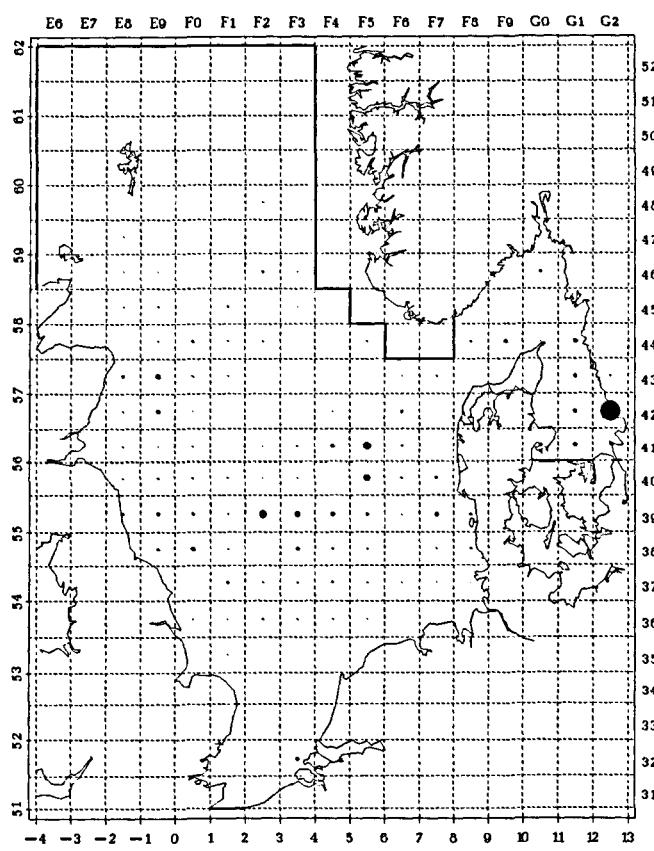
Herring, Age group 1 1993 quarter 1
Max mean catch number per rectangle: 347099



Herring, Age group 1 1993 quarter 2
Max mean catch number per rectangle: 31052



Herring, Age group 1 1993 quarter 3
Max mean catch number per rectangle: 110522



Herring, Age group 1 1993 quarter 4
Max mean catch number per rectangle: 11234

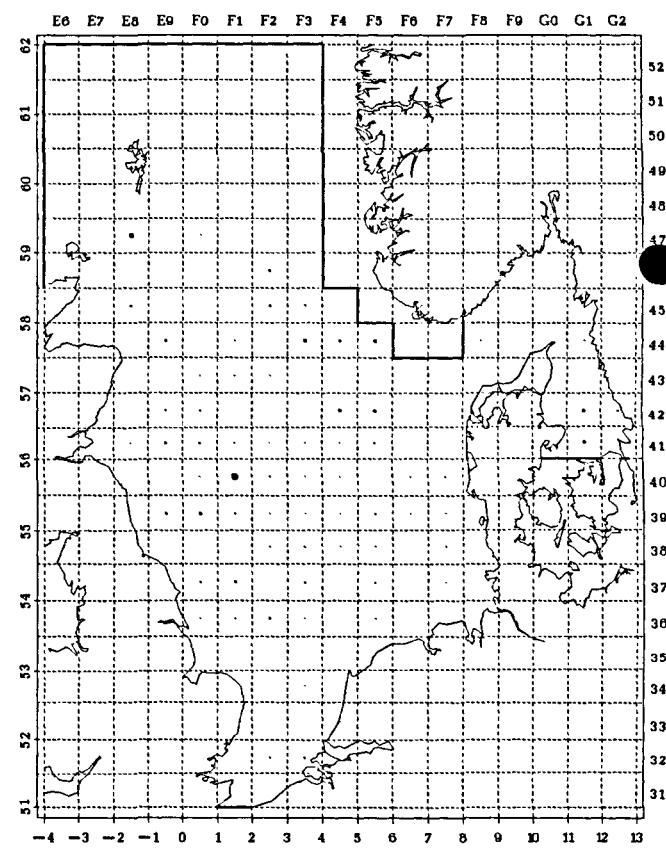
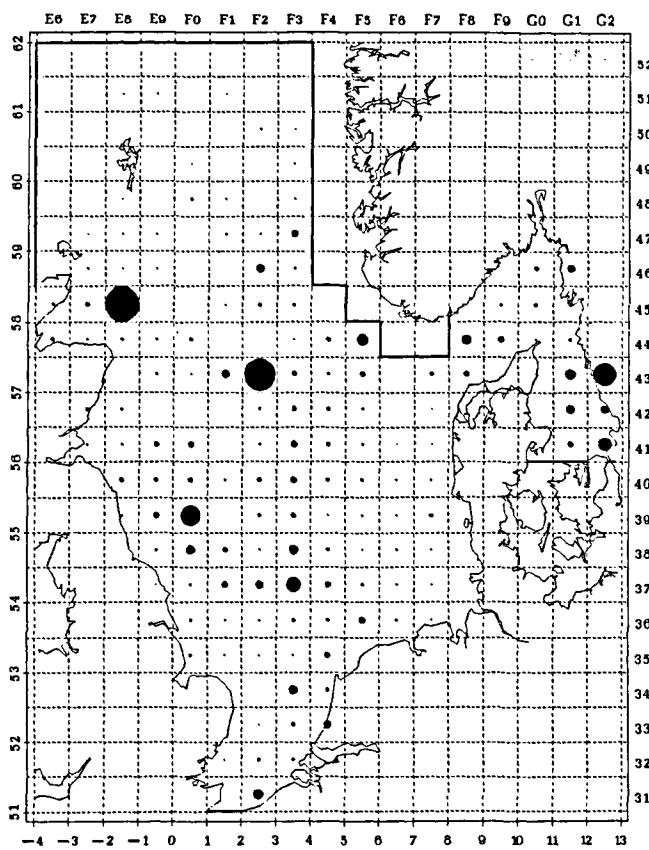
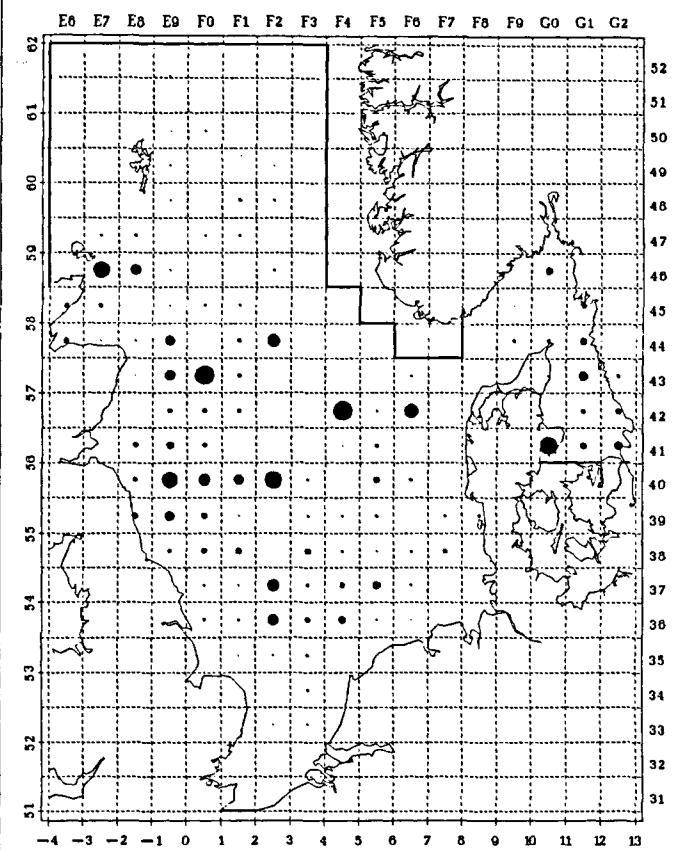


Figure 4.4 Herring: number per hour, 1-ringers.

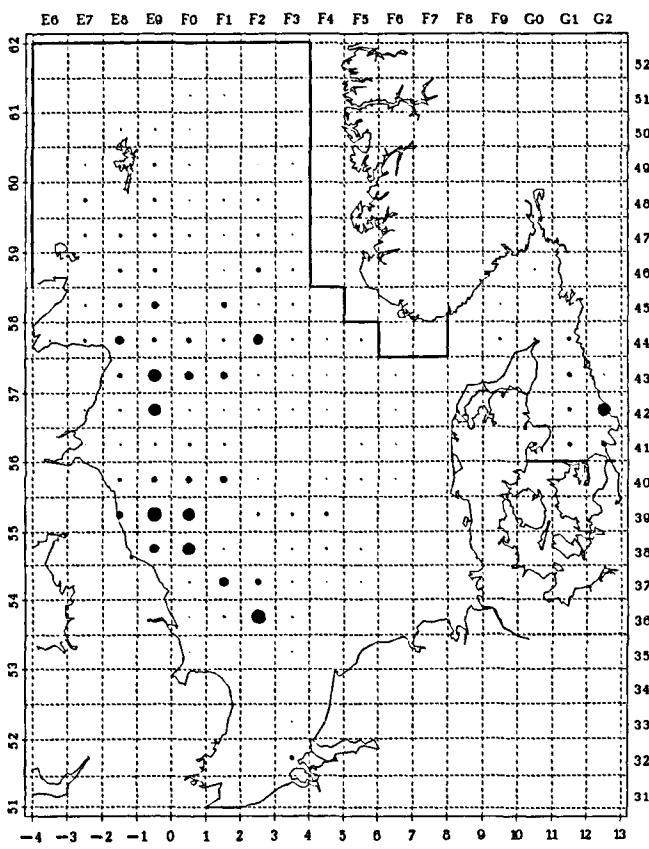
Herring, Age group 2 1993 quarter 1
Max mean catch number per rectangle: 32459



Herring, Age group 2 1993 quarter 2
Max mean catch number per rectangle: 10270



Herring, Age group 2 1993 quarter 3
Max mean catch number per rectangle: 5659



Herring, Age group 2 1993 quarter 4
Max mean catch number per rectangle: 938

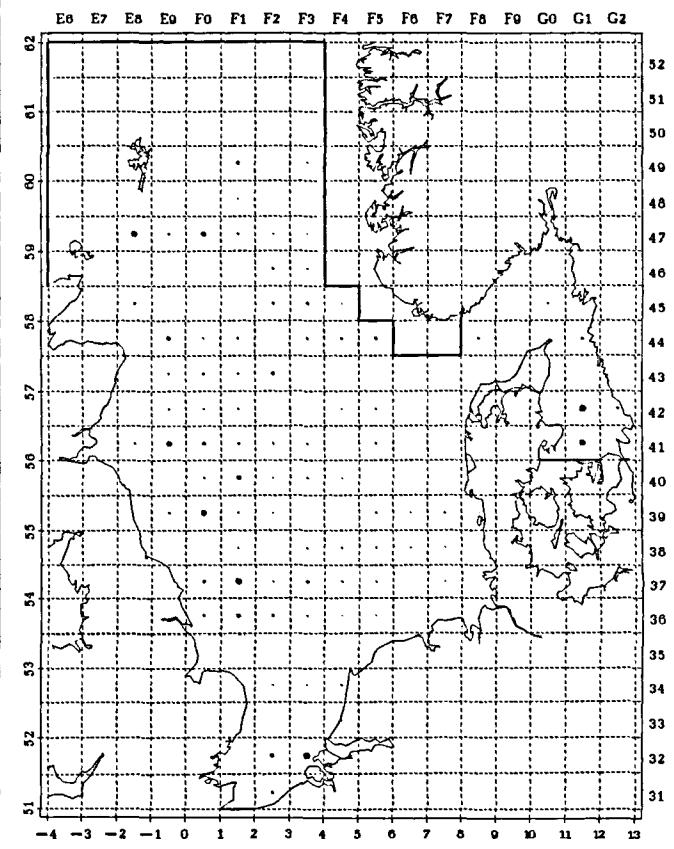
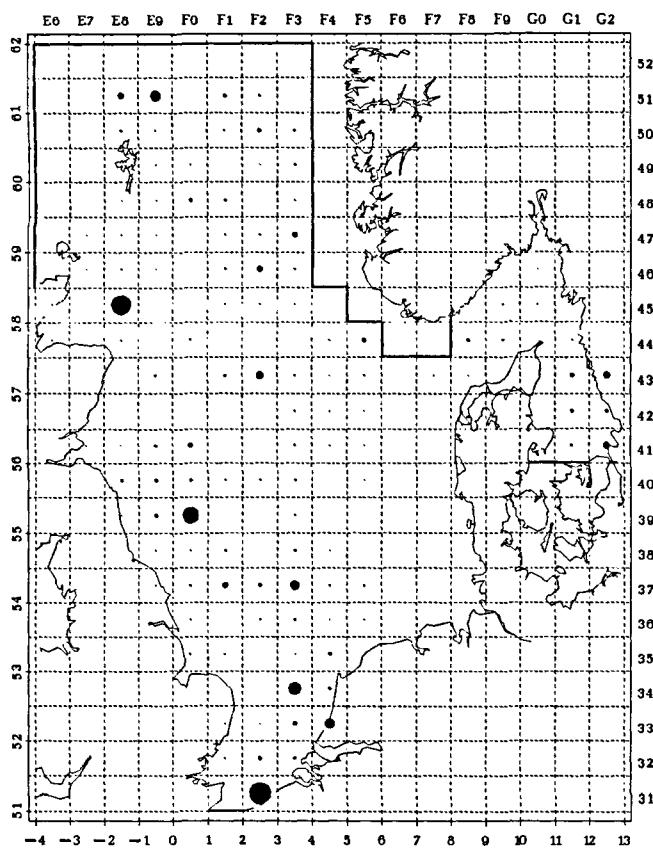
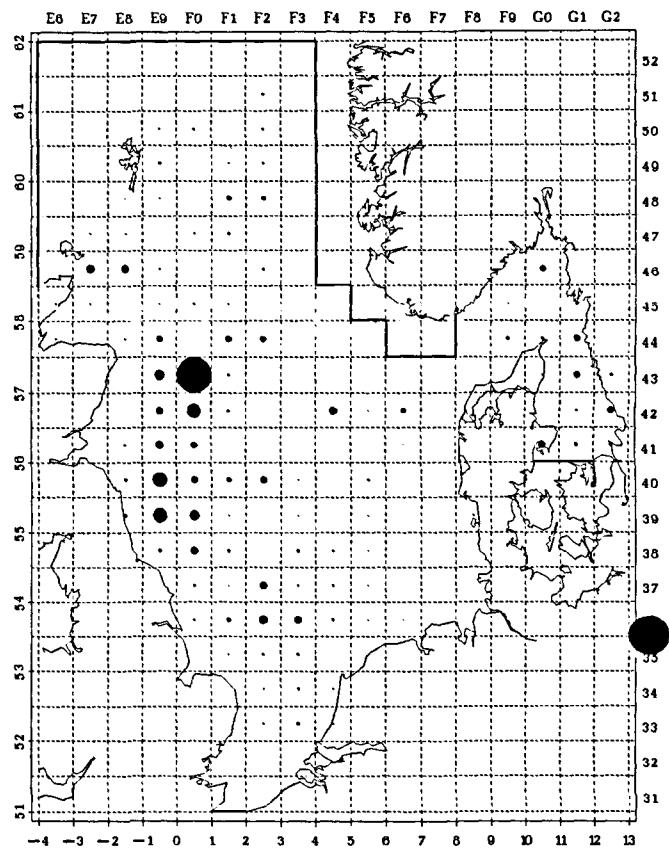


Figure 4.5 Herring: number per hour, 2-ringers.

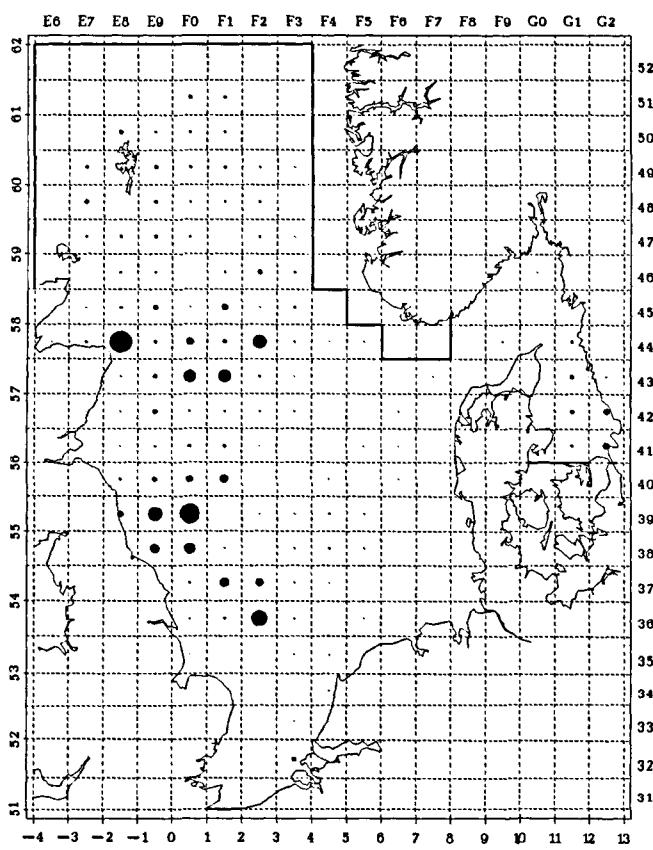
Herring, Age group 3+ 1993 quarter 1
Max mean catch number per rectangle: 12484



Herring, Age group 3+ 1993 quarter 2
Max mean catch number per rectangle: 33088



Herring, Age group 3+ 1993 quarter 3
Max mean catch number per rectangle: 14129



Herring, Age group 3+ 1993 quarter 4
Max mean catch number per rectangle: 1681

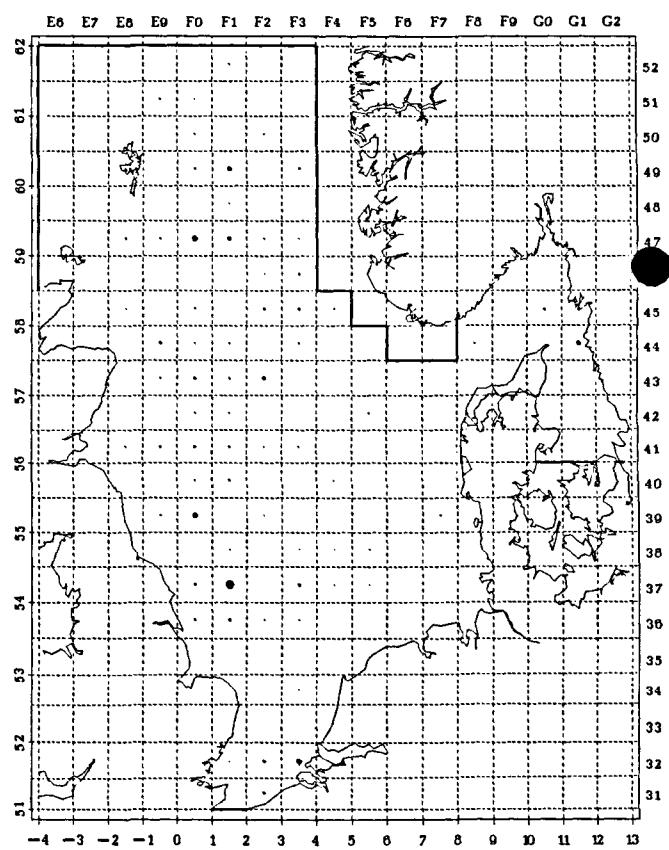
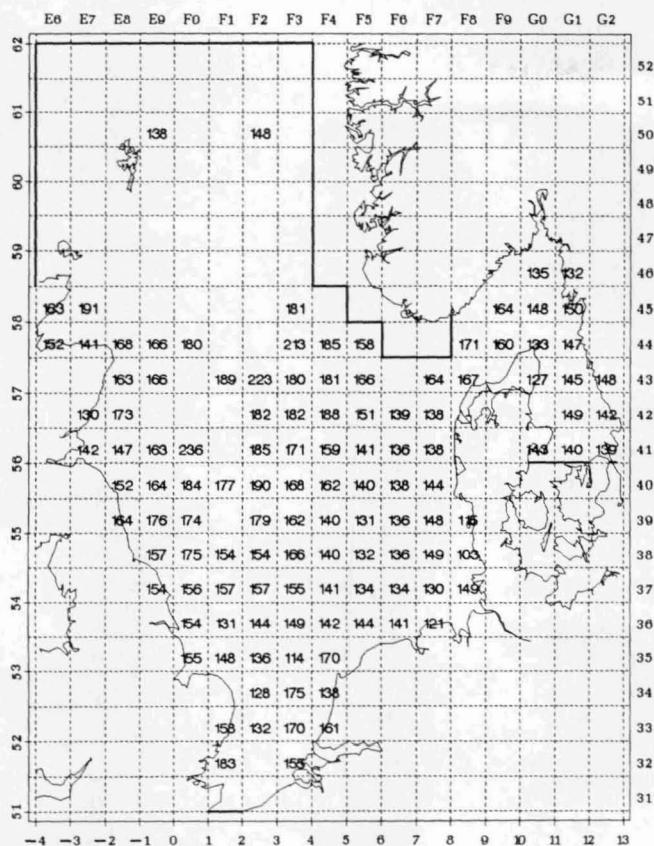
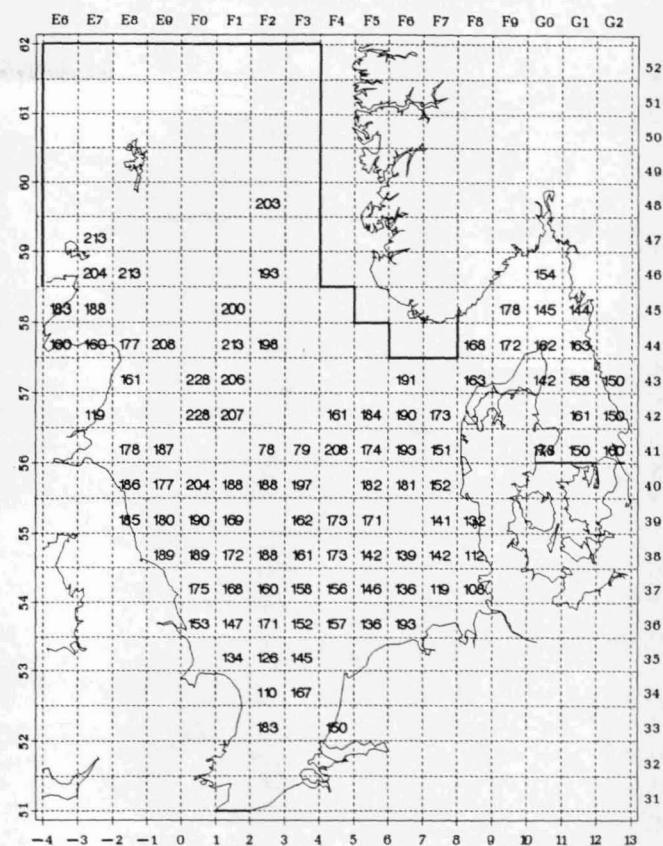


Figure 4.6 Herring: number per hour, 3+ringers.

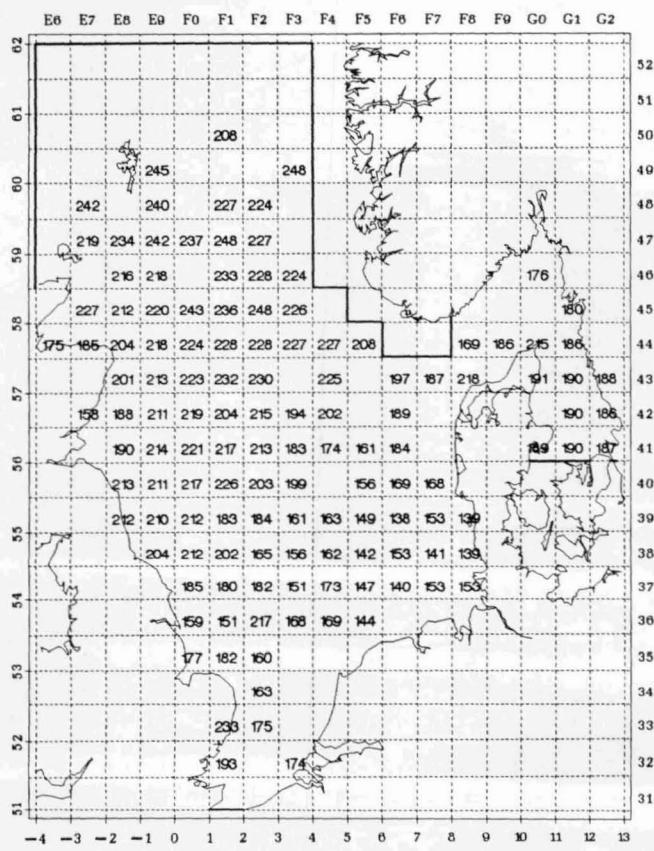
Herring, Age group 1 1993 quarter 1



Herring, Age group 1 1993 quarter 2



Herring, Age group 1 1993 quarter 3



Herring, Age group 1 1993 quarter 4

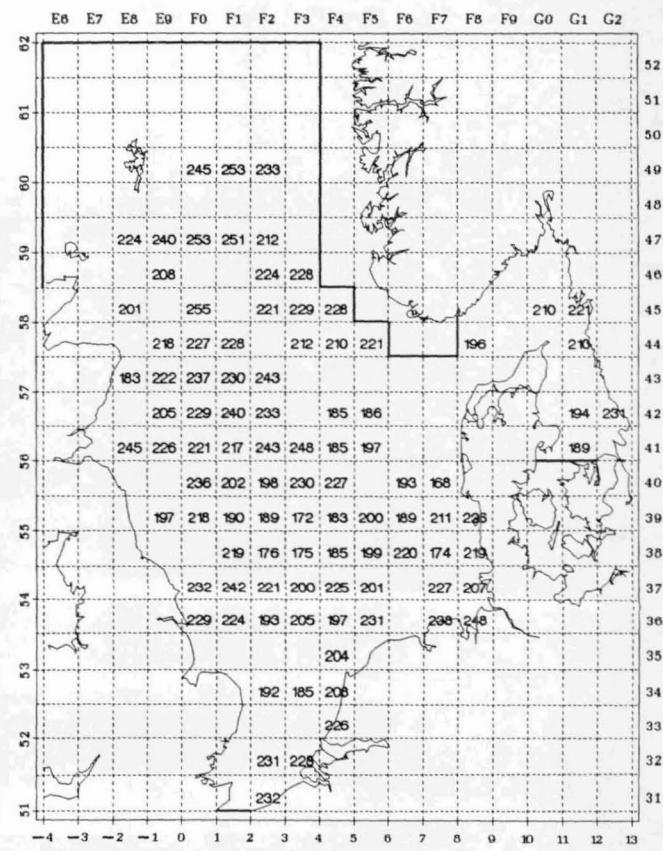
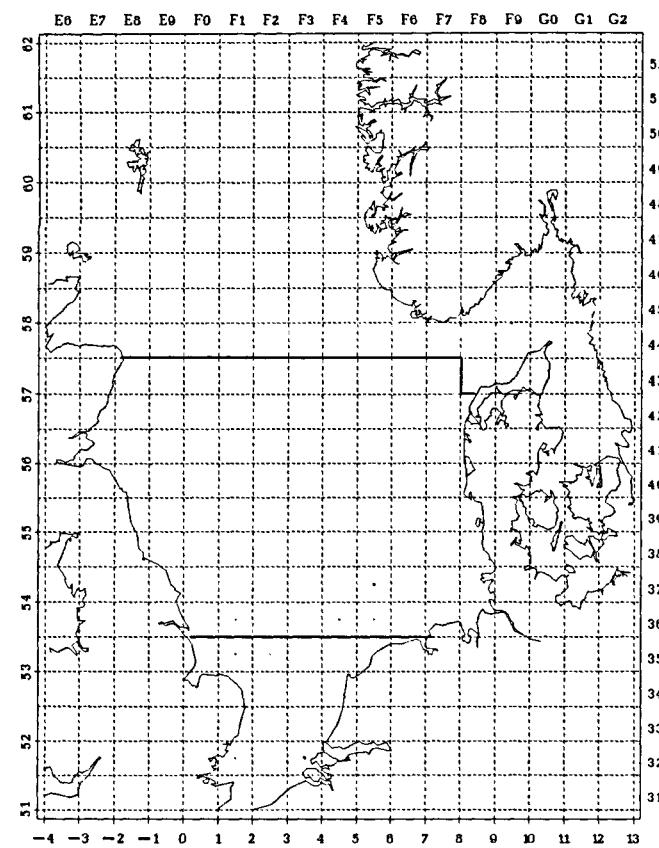


Figure 4.7 Herring: mean length (mm), 1-ringers.

Sprat, Age group 0 1993 quarter 3

Max mean catch number per rectangle: 567



Sprat, Age group 0 1993 quarter 4

Max mean catch number per rectangle: 152294

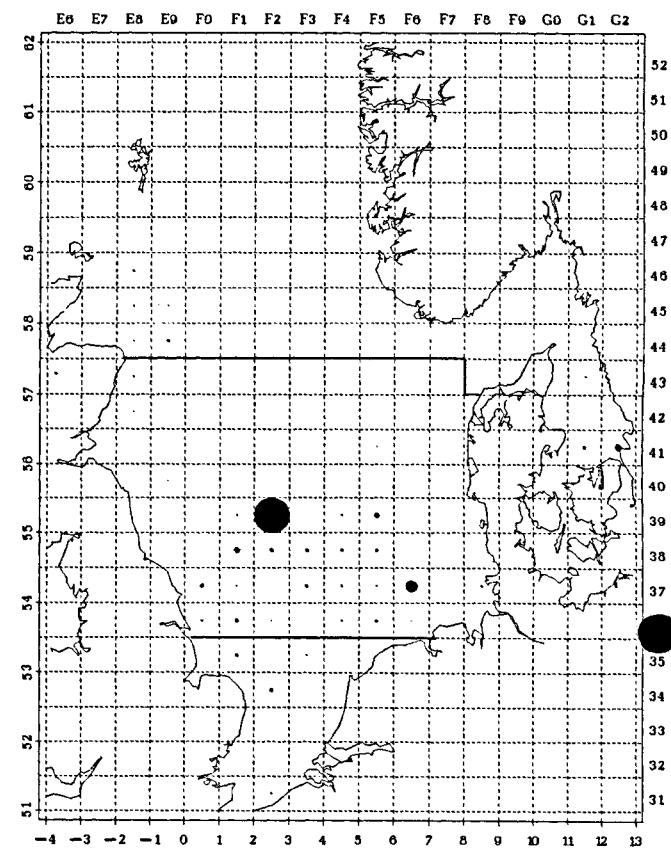
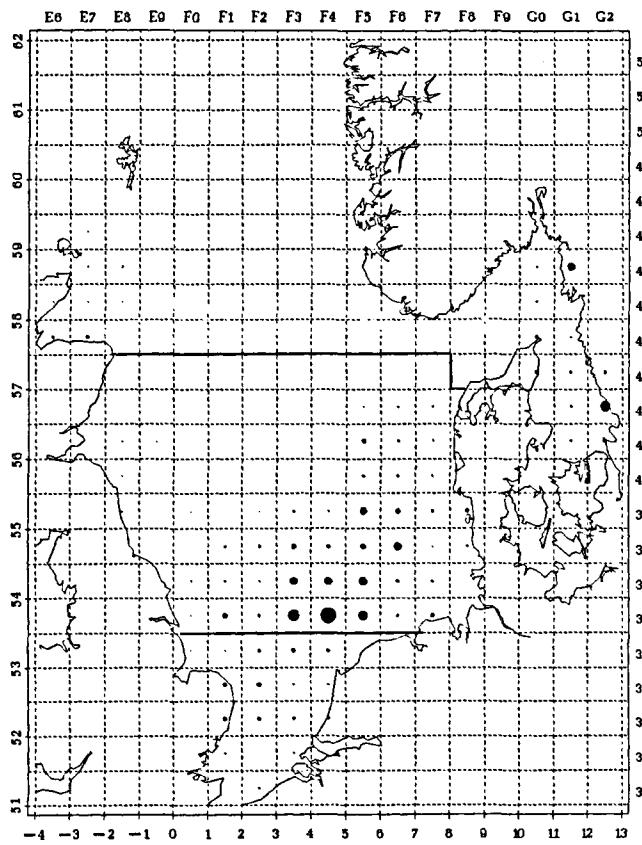
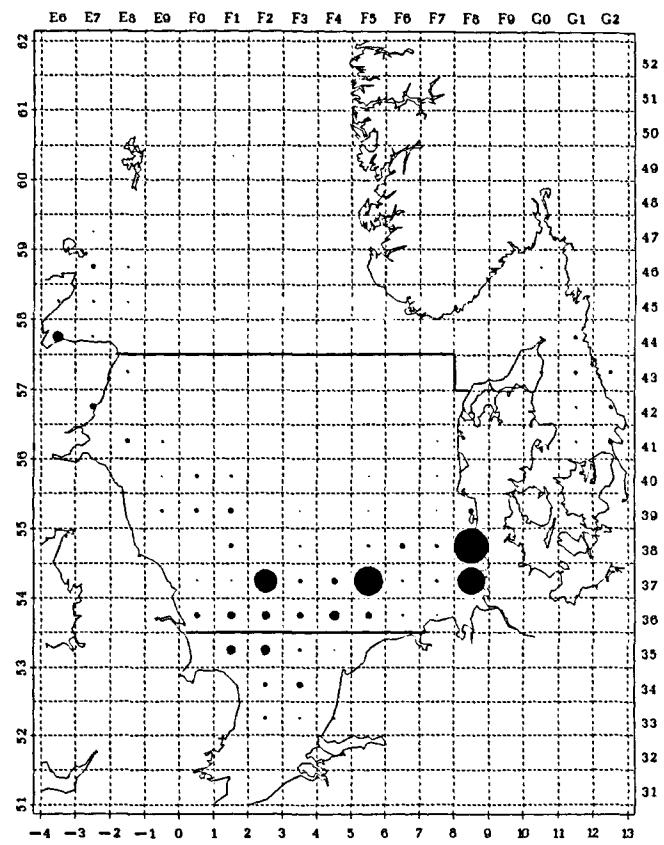


Figure 4.8 Sprat: number per hour, age-group 0.

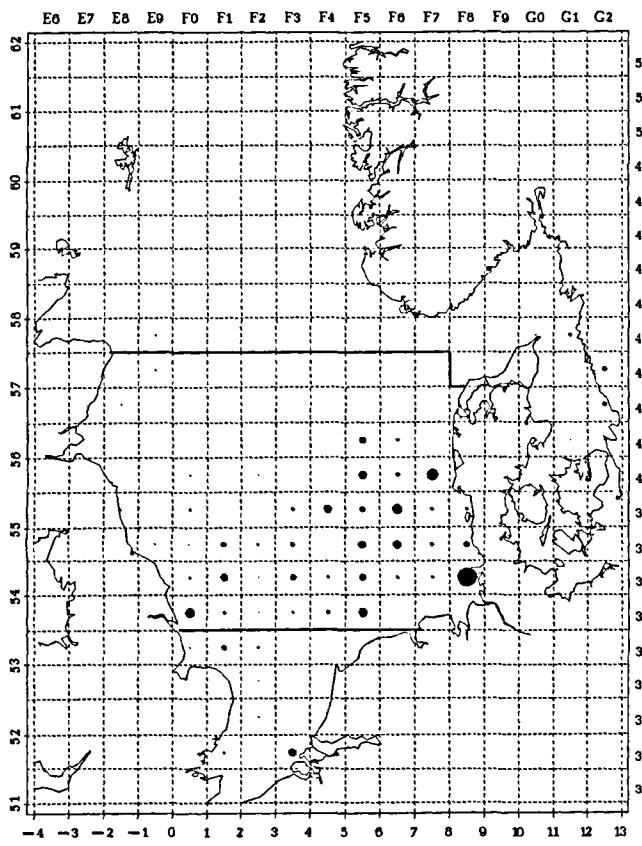
Sprat, Age group 1 1993 quarter 1
Max mean catch number per rectangle: 38100



Sprat, Age group 1 1993 quarter 2
Max mean catch number per rectangle: 195360



Sprat, Age group 1 1993 quarter 3
Max mean catch number per rectangle: 60161



Sprat, Age group 1 1993 quarter 4
Max mean catch number per rectangle: 113551

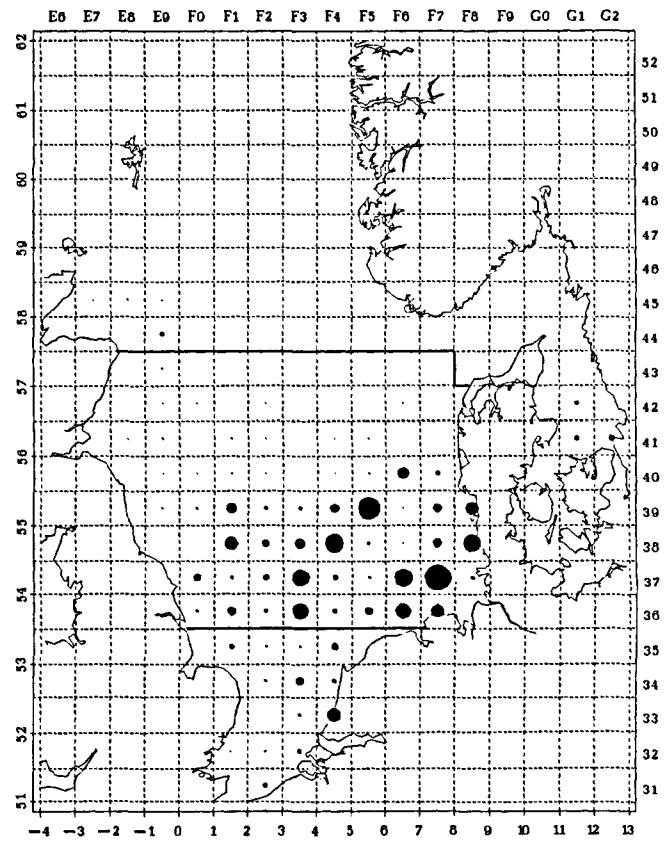
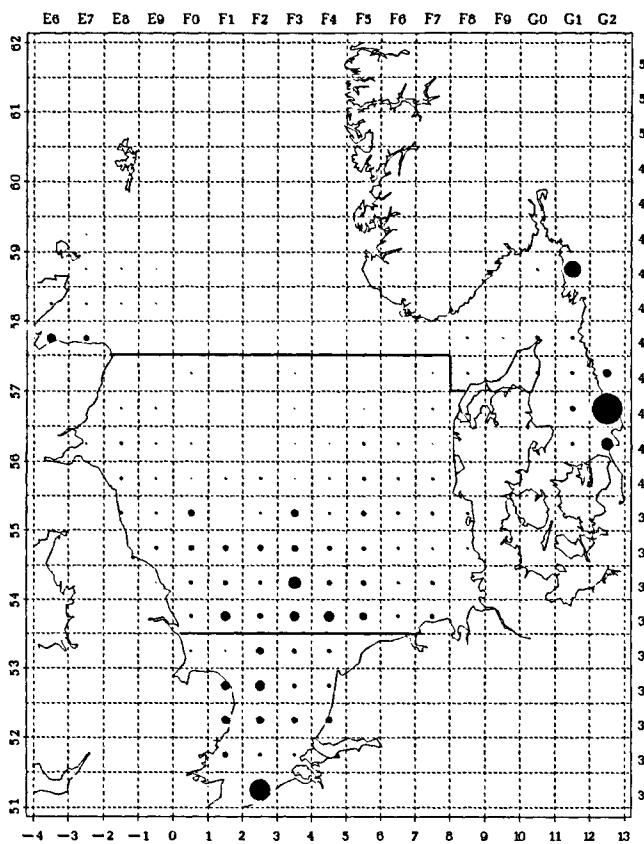


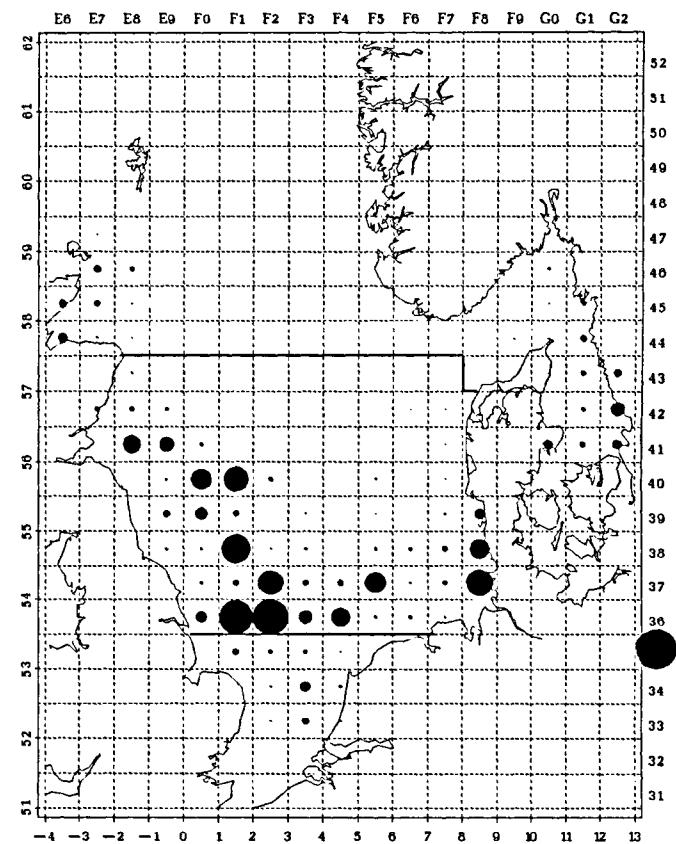
Figure 4.9 Sprat: number per hour, age-group 1.

Sprat, Age group 2 1993 quarter 1
Max mean catch number per rectangle: 46124

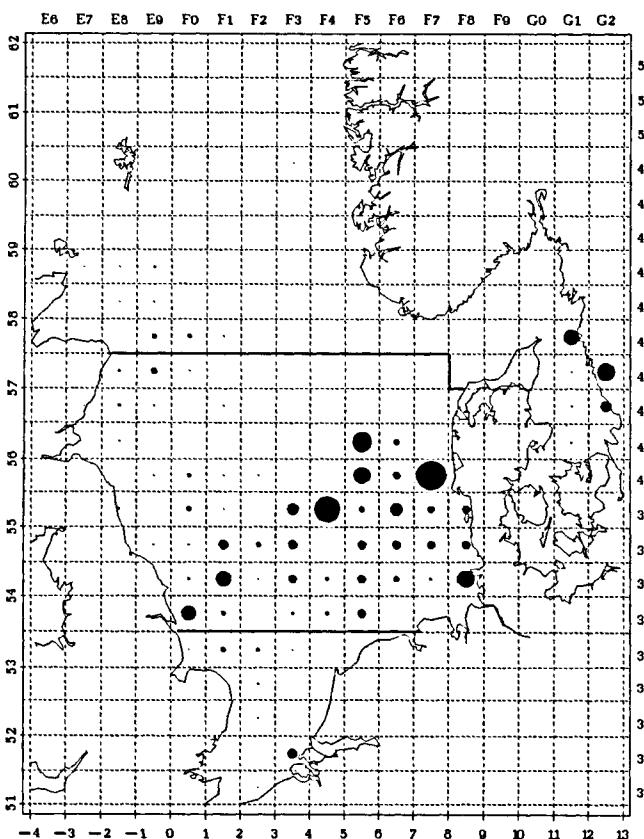


Sprat, Age group 2 1993 quarter 2
Max mean catch number per rectangle: 61859

Sprat, Age group 2 1993 quarter 2
Max mean catch number per rectangle: 61859



Sprat, Age group 2 1993 quarter 3
Max mean catch number per rectangle: 47191



Sprat, Age group 2 1993 quarter 4
Max mean catch number per rectangle: 32368

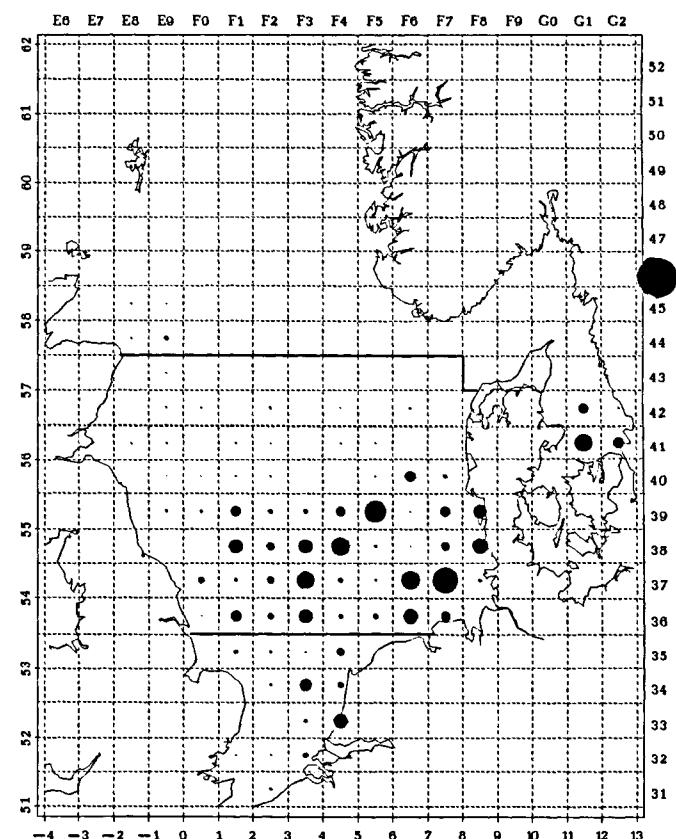
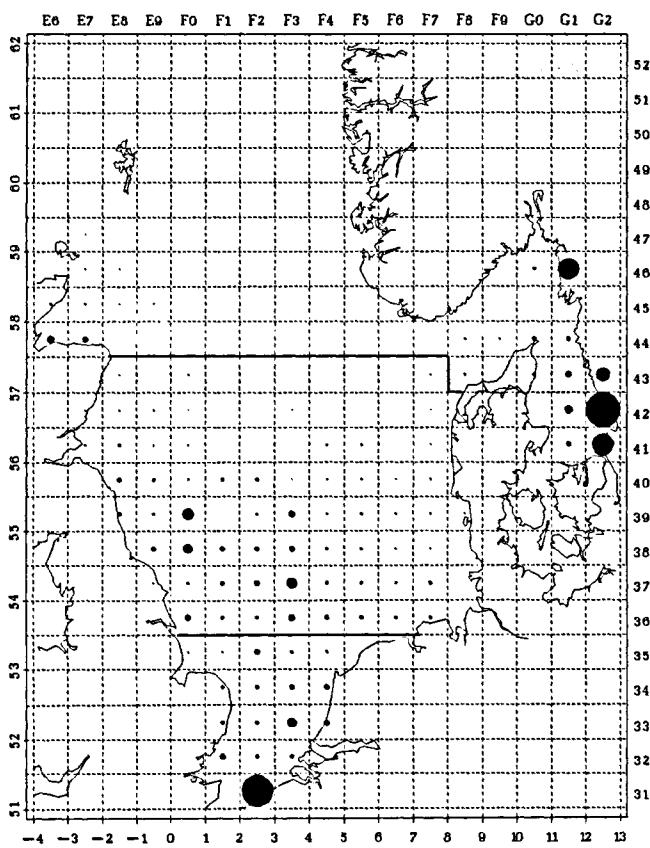
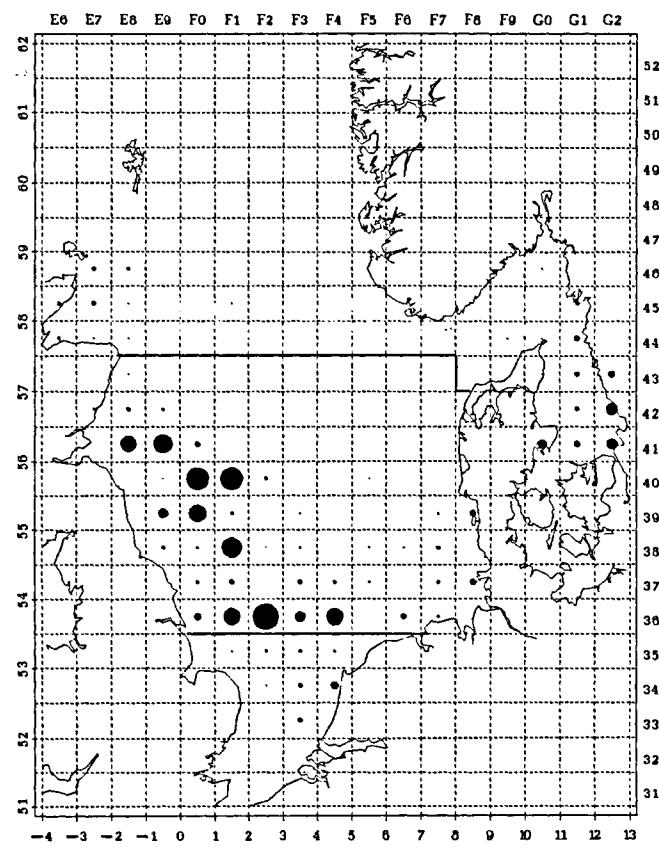


Figure 4.10 Sprat: number per hour, age-group 2.

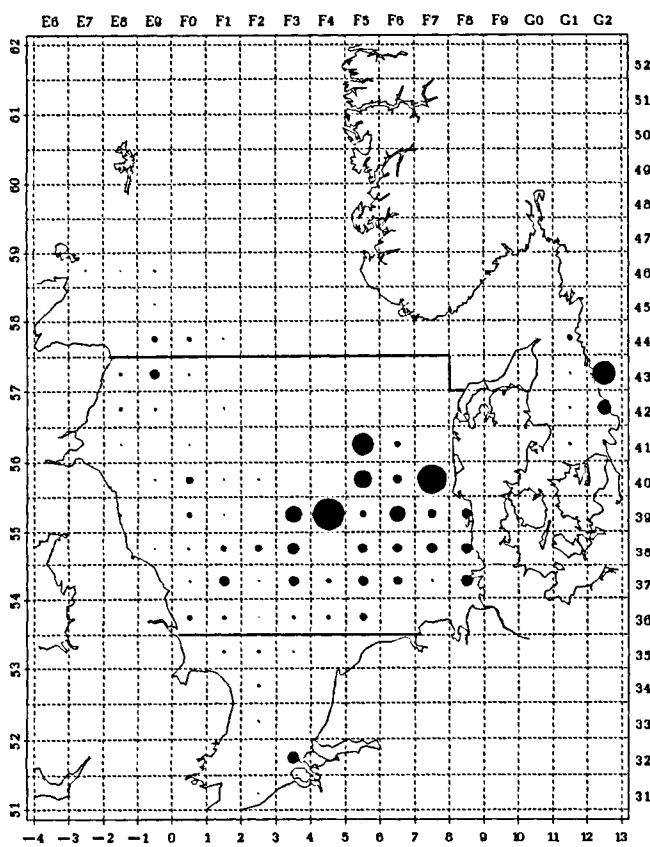
Sprat, Age group 3+ 1993 quarter 1
Max mean catch number per rectangle: 12020



Sprat, Age group 3+ 1993 quarter 2
Max mean catch number per rectangle: 6937



Sprat, Age group 3+ 1993 quarter 3
Max mean catch number per rectangle: 9524



Sprat, Age group 3+ 1993 quarter 4
Max mean catch number per rectangle: 1444

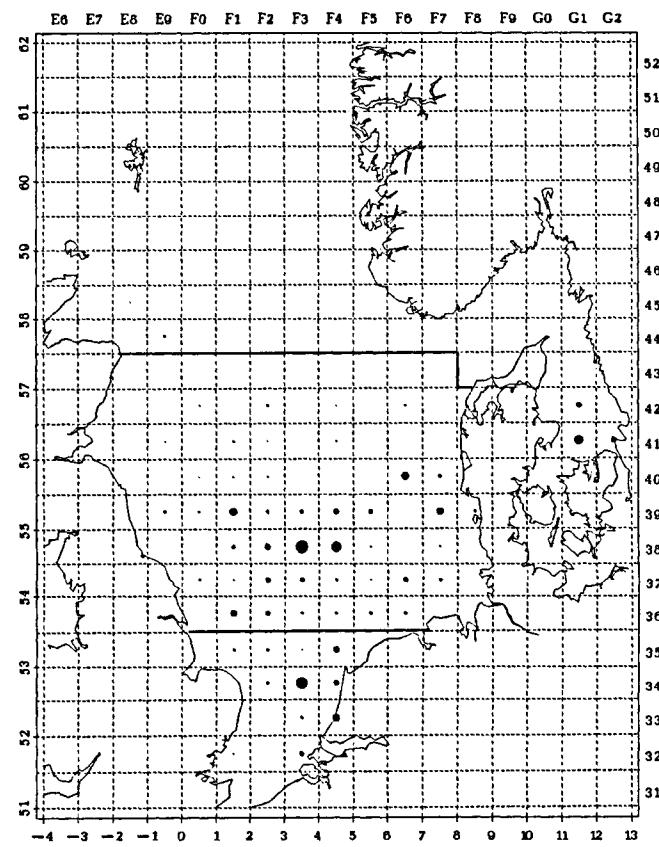
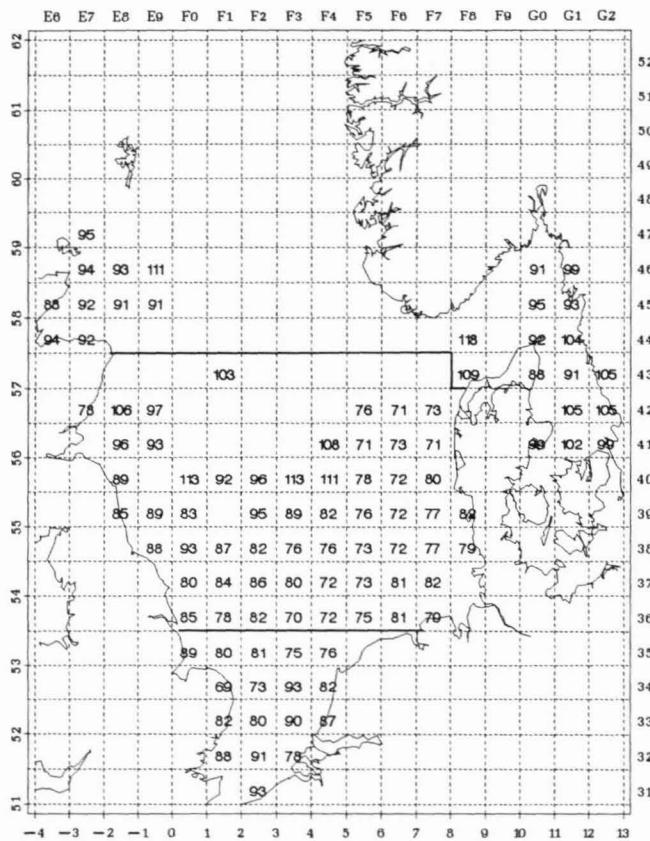
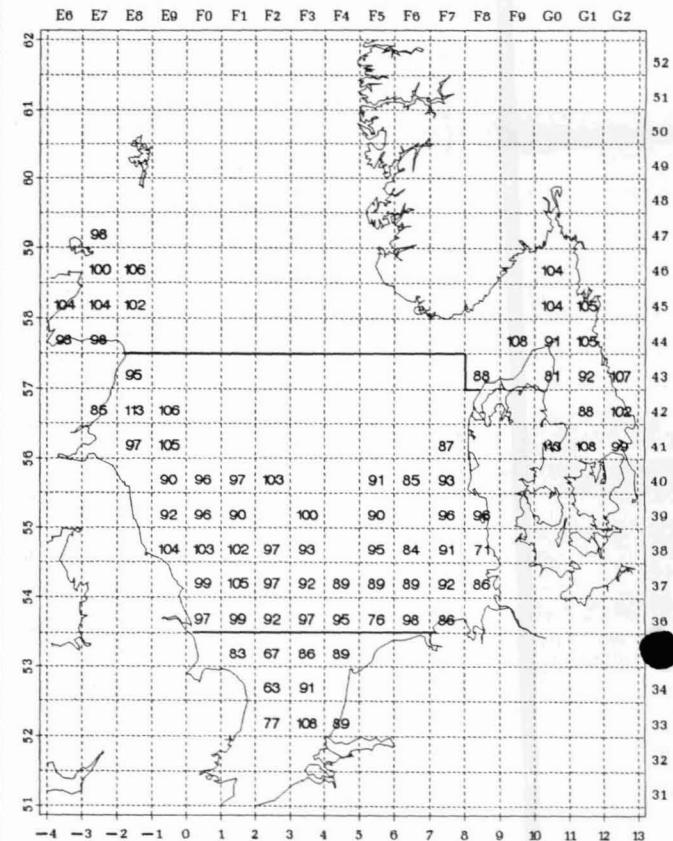


Figure 4.11 Sprat: number per hour, age-group 3+.

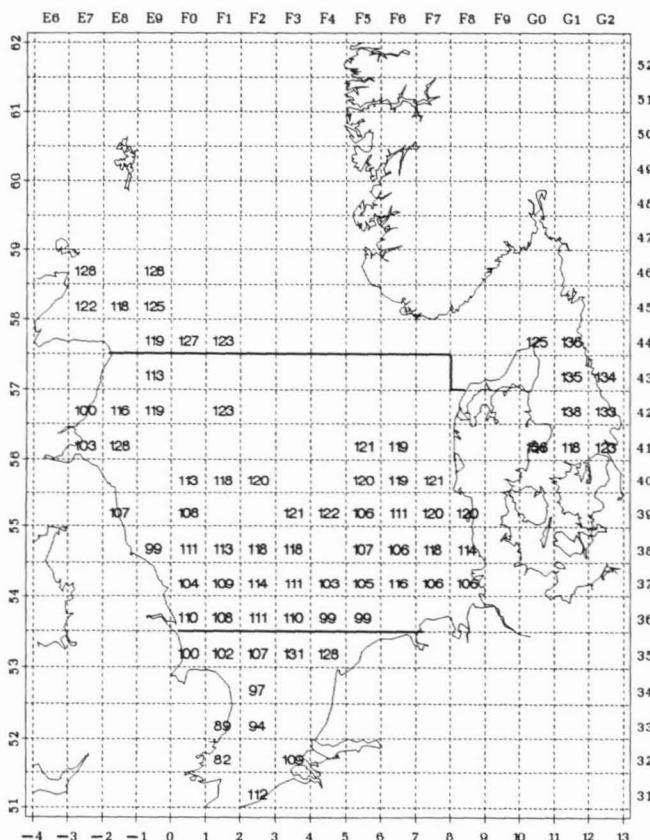
Sprat, Age group 1 1993 quarter 1



Sprat, Age group 1 1993 quarter 2



Sprat, Age group 1 1993 quarter 3



Sprat, Age group 1 1993 quarter 4

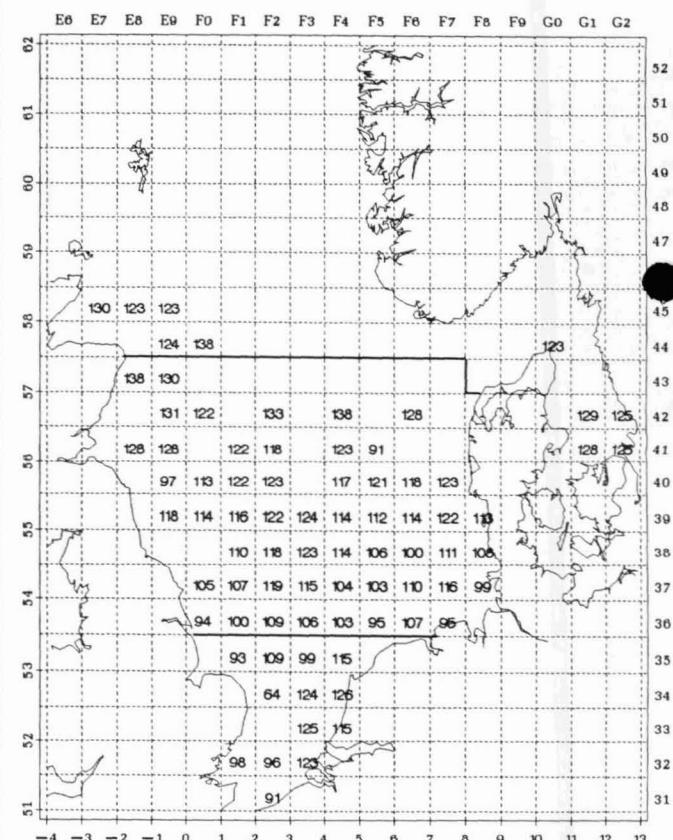
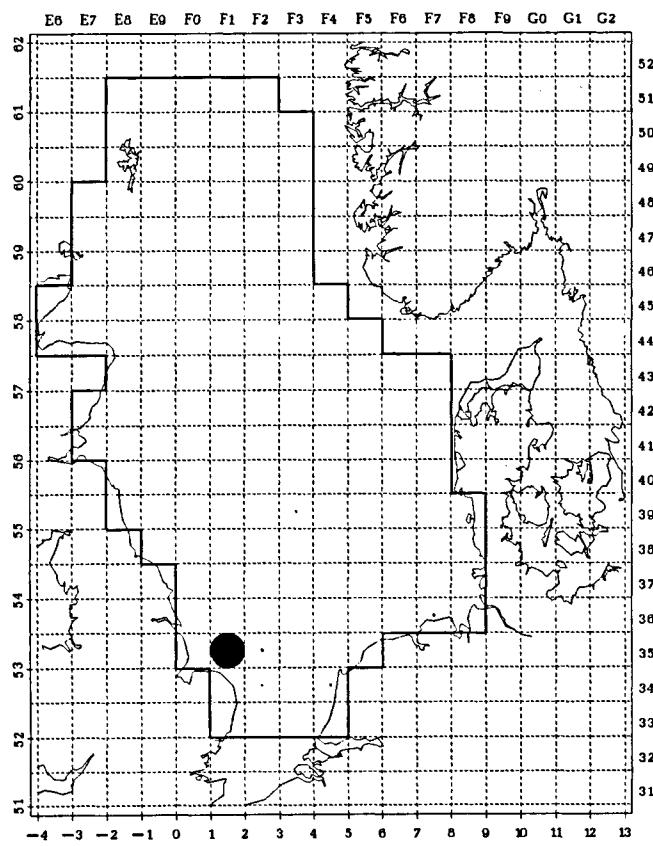


Figure 4.12 Sprat: mean length (mm), age-group 1.

Mackerel, Age group 0 1993 quarter 3

Max mean catch number per rectangle: 776



Mackerel, Age group 0 1993 quarter 4

Max mean catch number per rectangle: 422

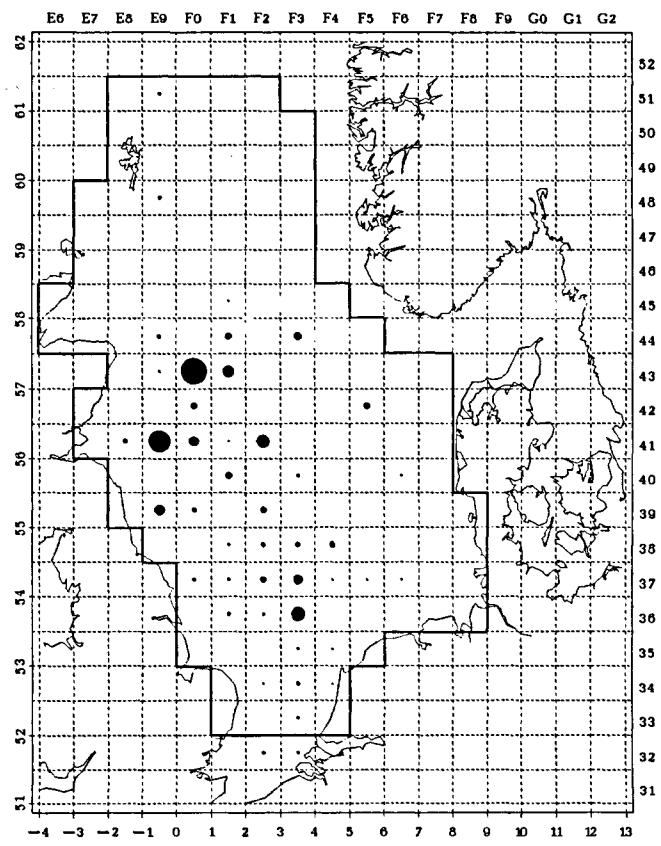
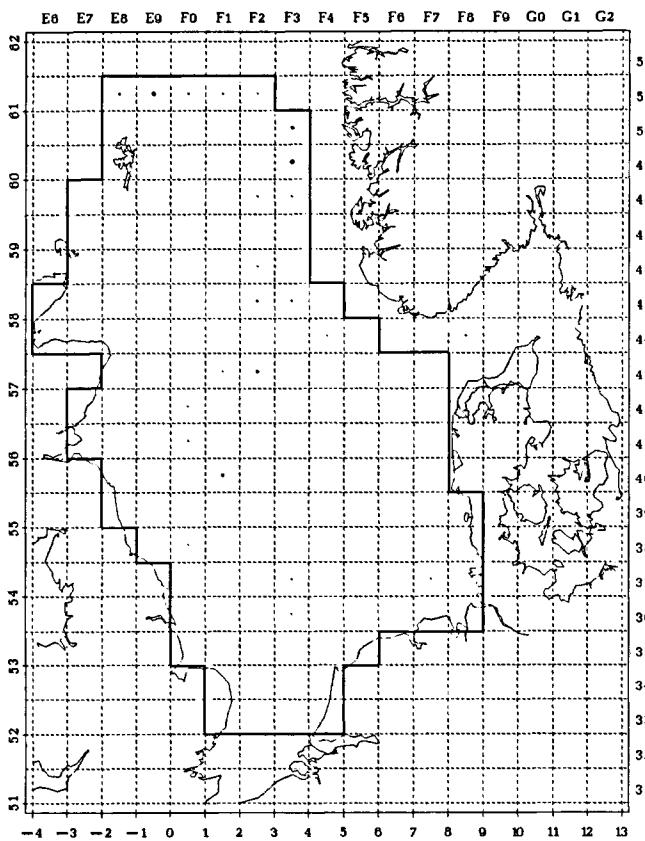
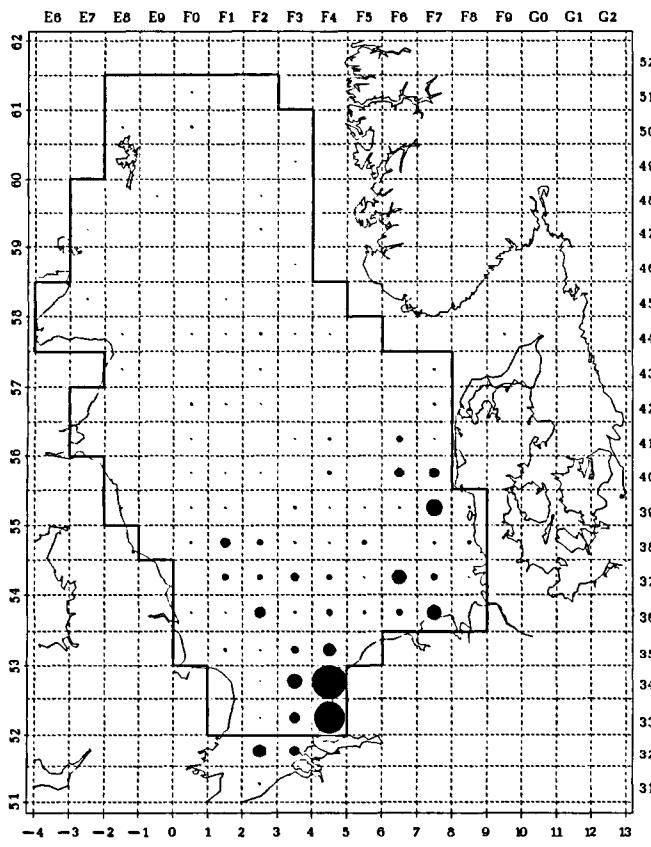


Figure 4.13 Mackerel: number per hour, age-group 0.

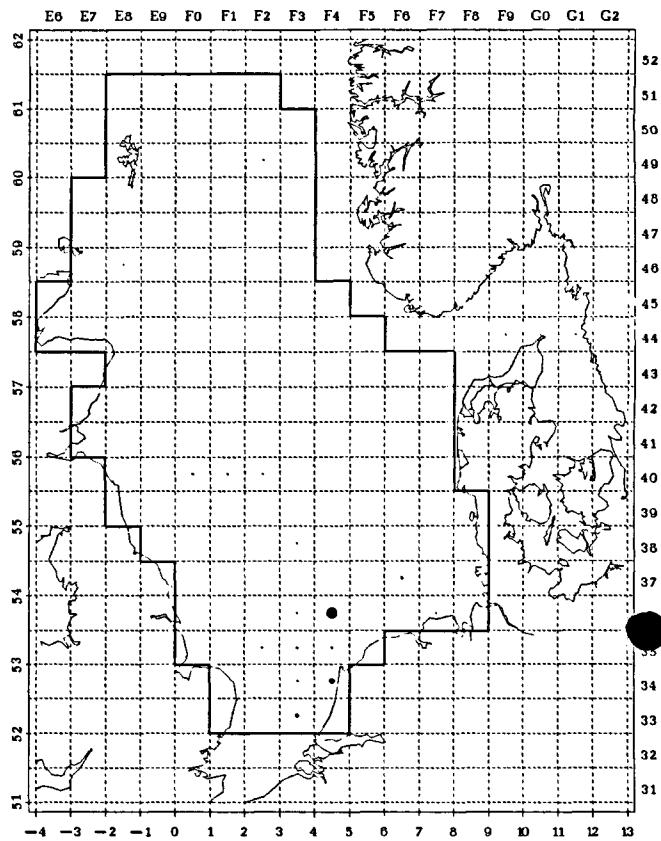
Mackerel, Age group 1 1993 quarter 1
Max mean catch number per rectangle: 38



Mackerel, Age group 1 1993 quarter 3
Max mean catch number per rectangle: 3939



Mackerel, Age group 1 1993 quarter 2
Max mean catch number per rectangle: 365



Mackerel, Age group 1 1993 quarter 4
Max mean catch number per rectangle: 440

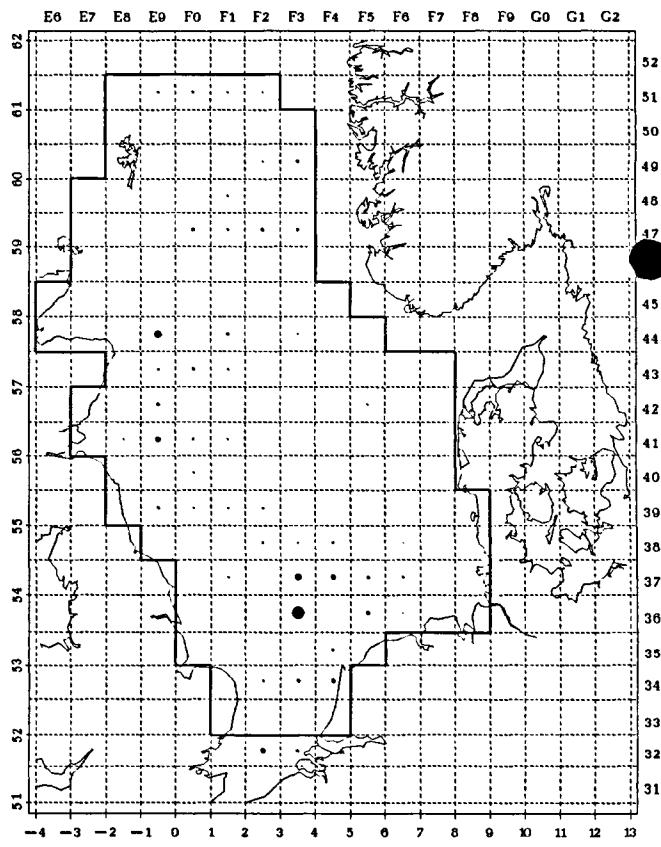
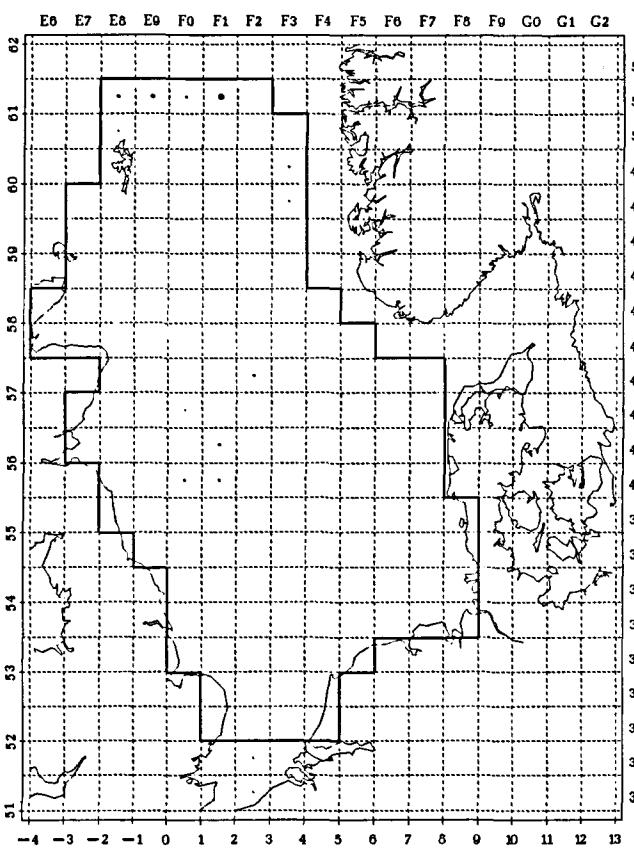
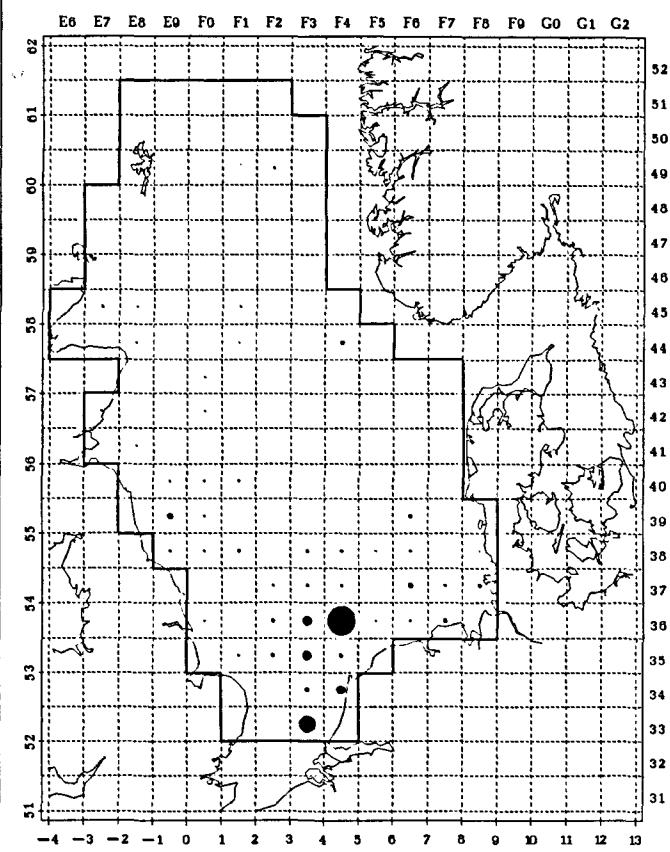


Figure 4.14 Mackerel: number per hour, age-group 1.

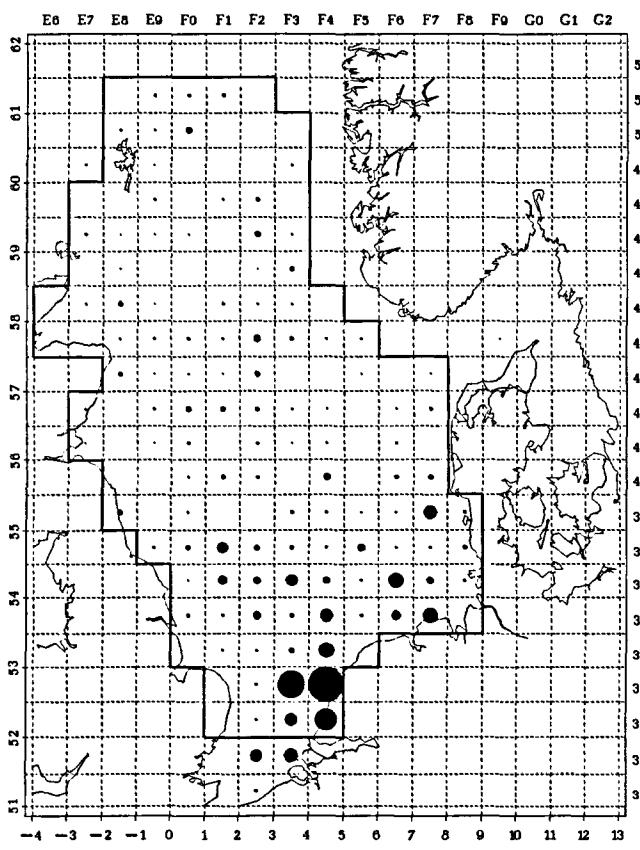
Mackerel, Age group 2 1993 quarter 1
Max mean catch number per rectangle: 59



Mackerel, Age group 2 1993 quarter 2
Max mean catch number per rectangle: 1714



Mackerel, Age group 2 1993 quarter 3
Max mean catch number per rectangle: 2469



Mackerel, Age group 2 1993 quarter 4
Max mean catch number per rectangle: 422

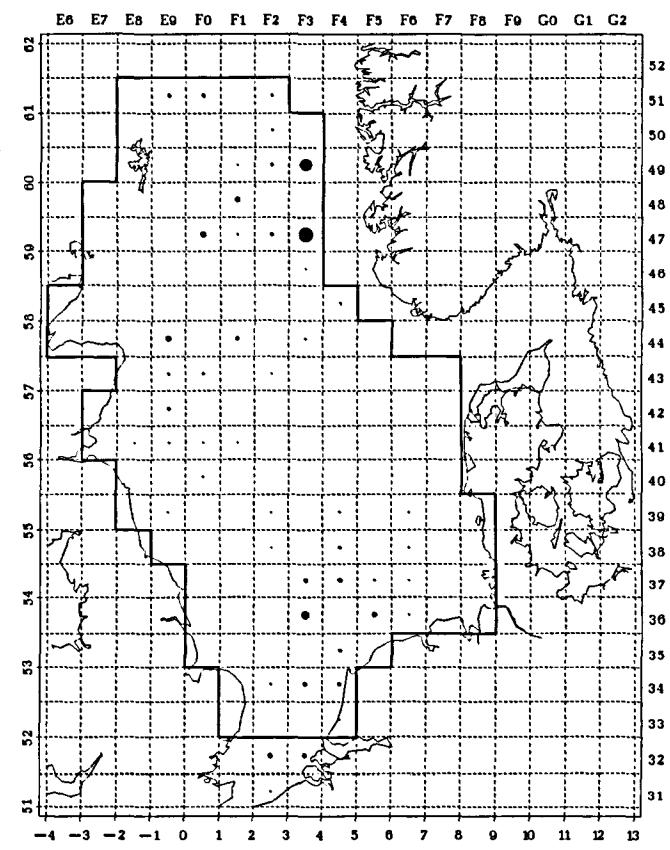
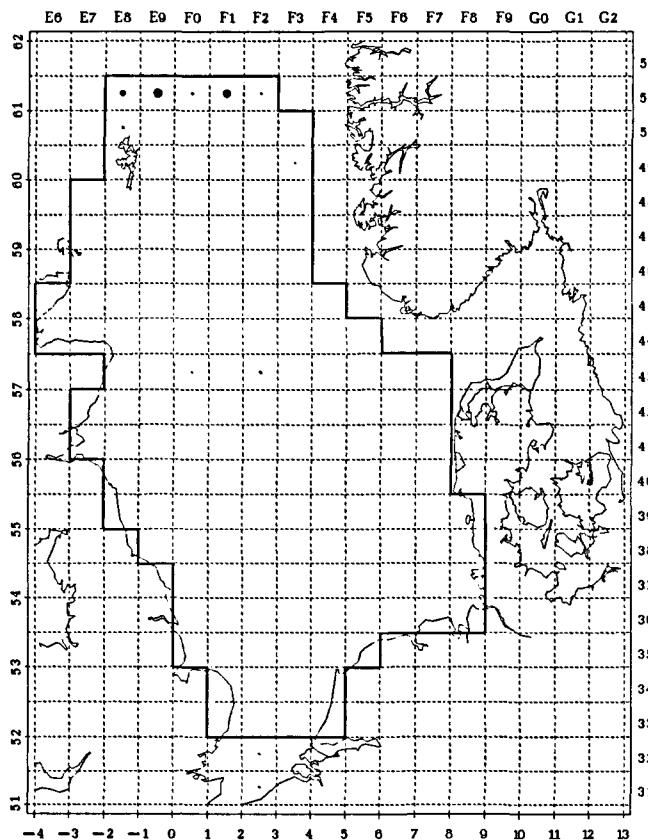
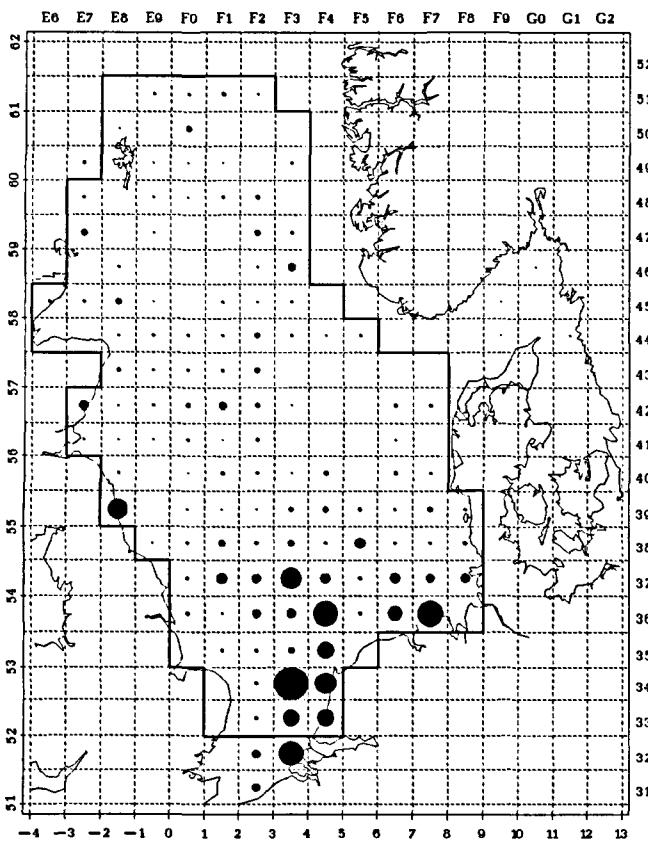


Figure 4.15 Mackerel: number per hour, age-group 2.

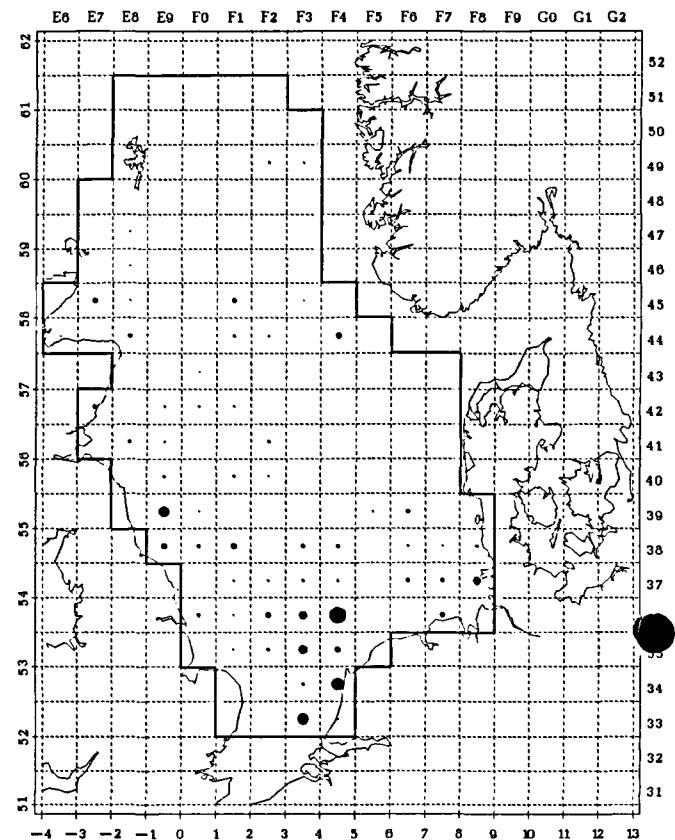
Mackerel, Age group 3+ 1993 quarter 1
Max mean catch number per rectangle: 122



Mackerel, Age group 3+ 1993 quarter 3
Max mean catch number per rectangle: 1997



Mackerel, Age group 3+ 1993 quarter 2
Max mean catch number per rectangle: 429



Mackerel, Age group 3+ 1993 quarter 4
Max mean catch number per rectangle: 1591

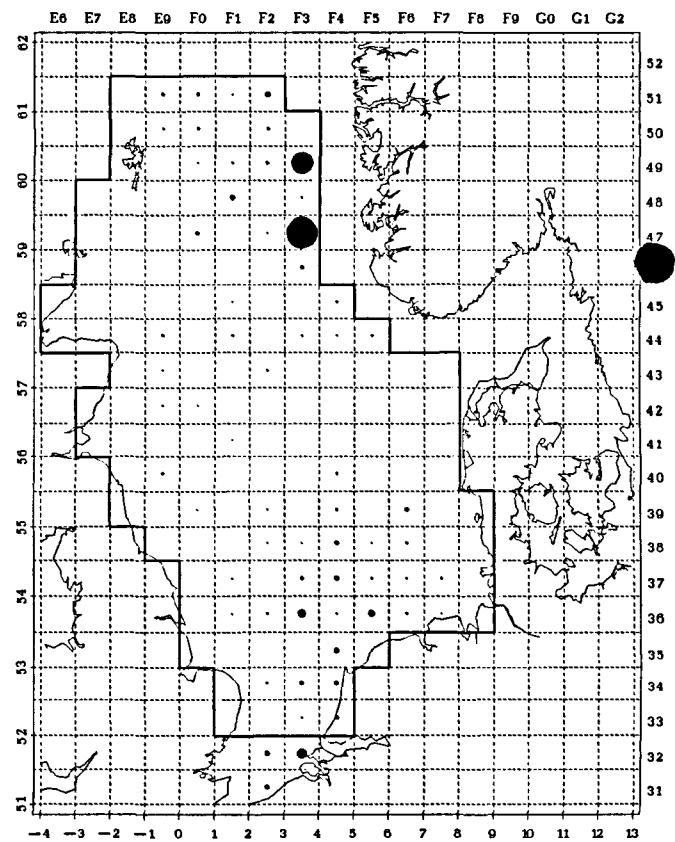
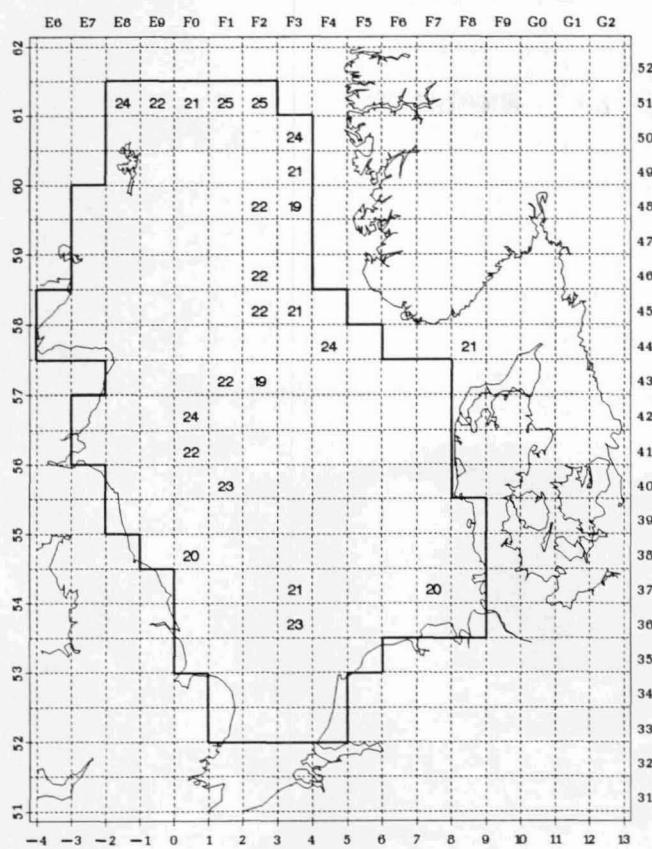
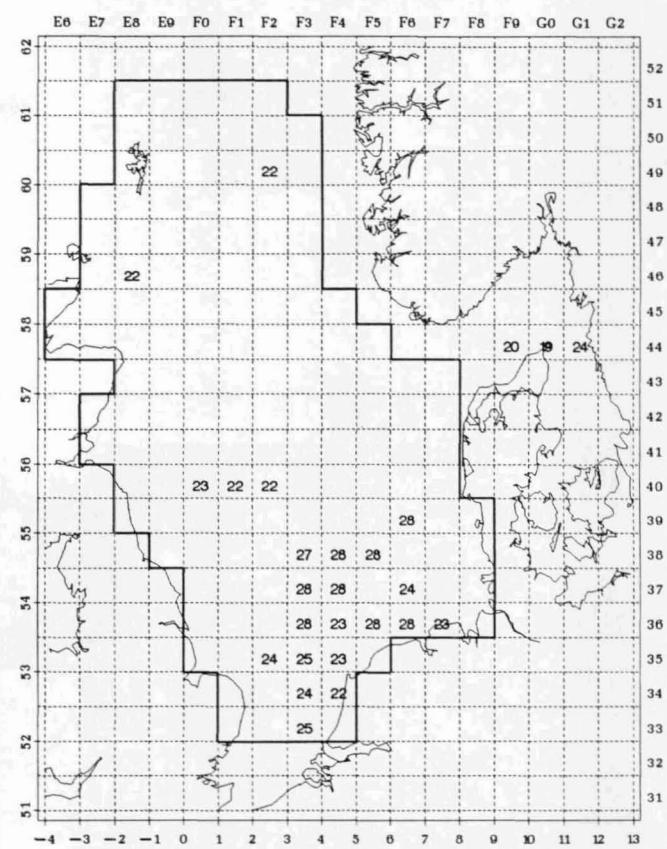


Figure 4.16 Mackerel: number per hour, age-group 3+.

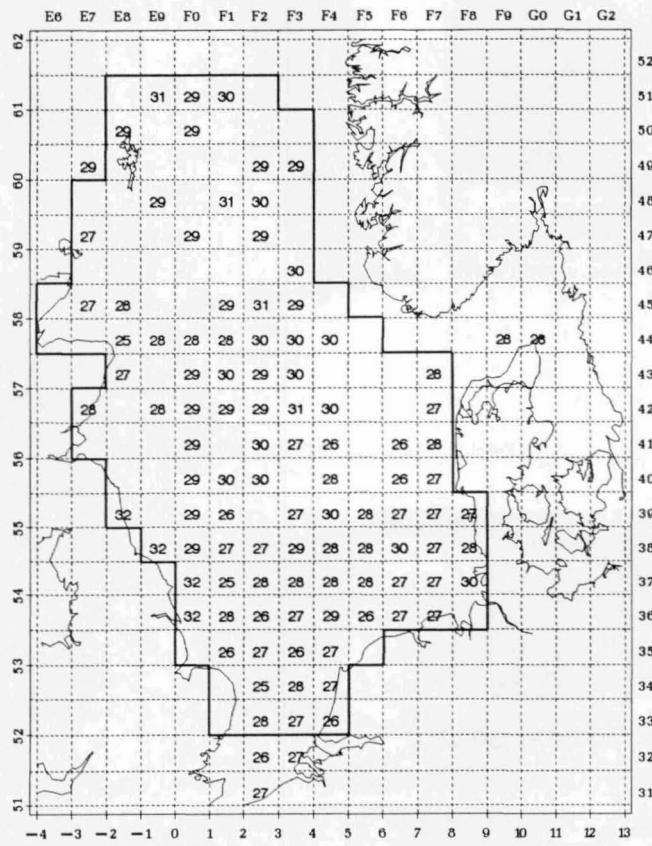
Mackerel, Age group 1 1993 quarter 1



Mackerel, Age group 1 1993 quarter 2



Mackerel, Age group 1 1993 quarter 3



Mackerel, Age group 1 1993 quarter 4

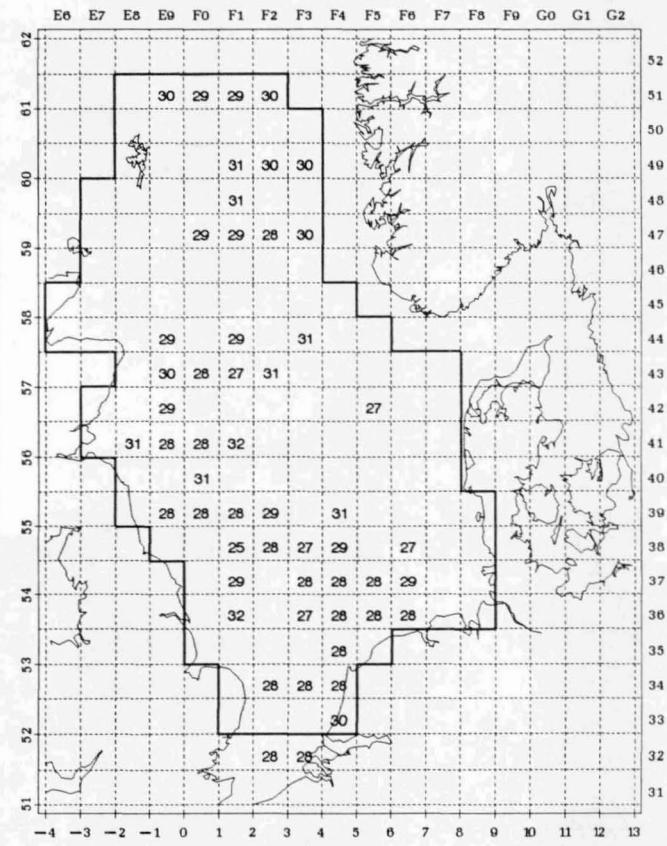
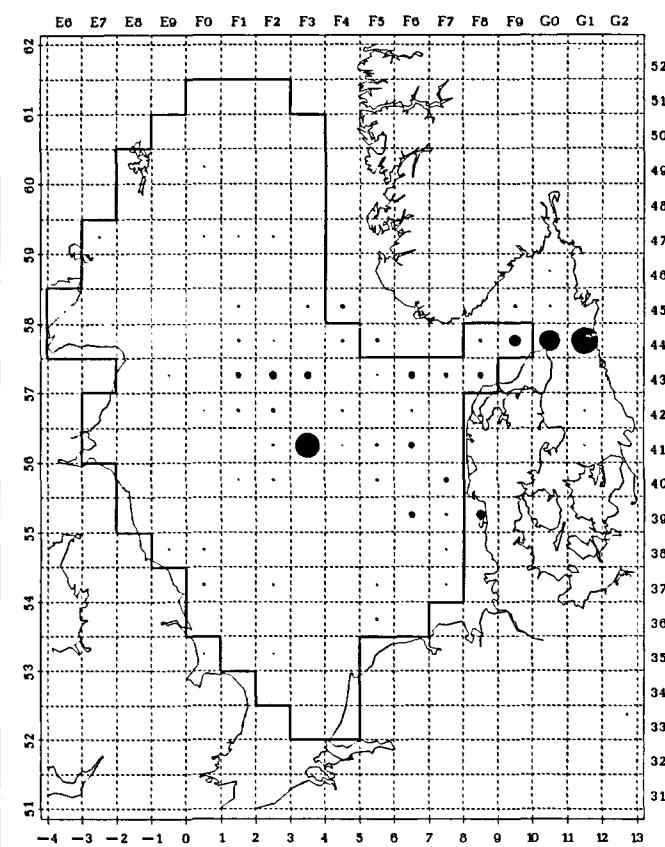


Figure 4.17 Mackerel: mean length (cm below), age-group 1.

Cod, Age group 0 1993 quarter 3
Max mean catch number per rectangle: 1484



Cod, Age group 0 1993 quarter 4
Max mean catch number per rectangle: 2640

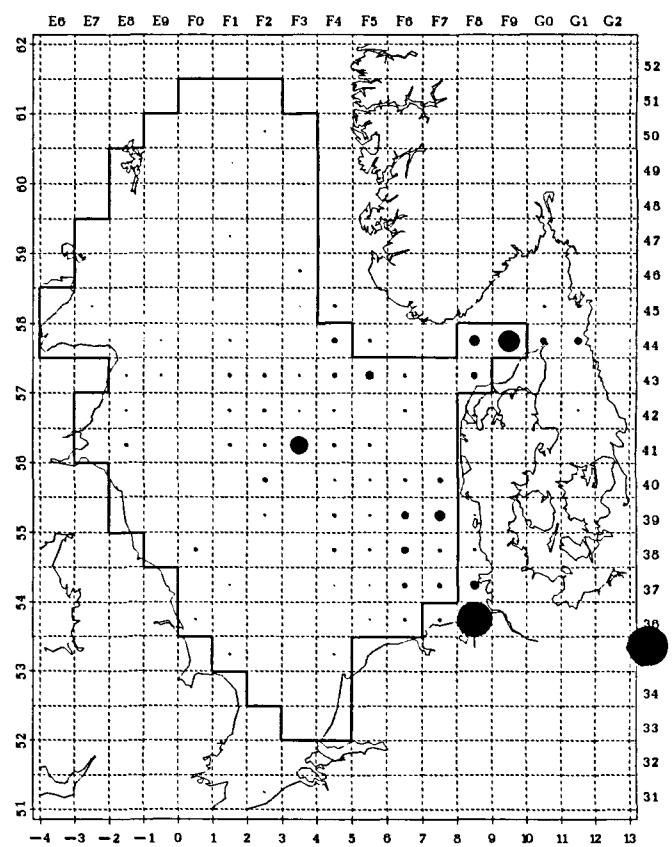
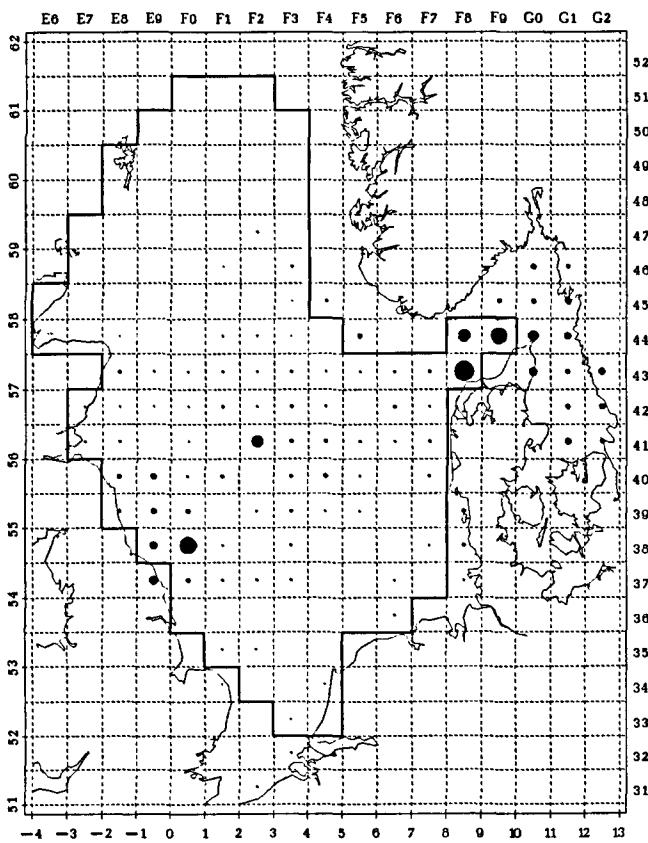
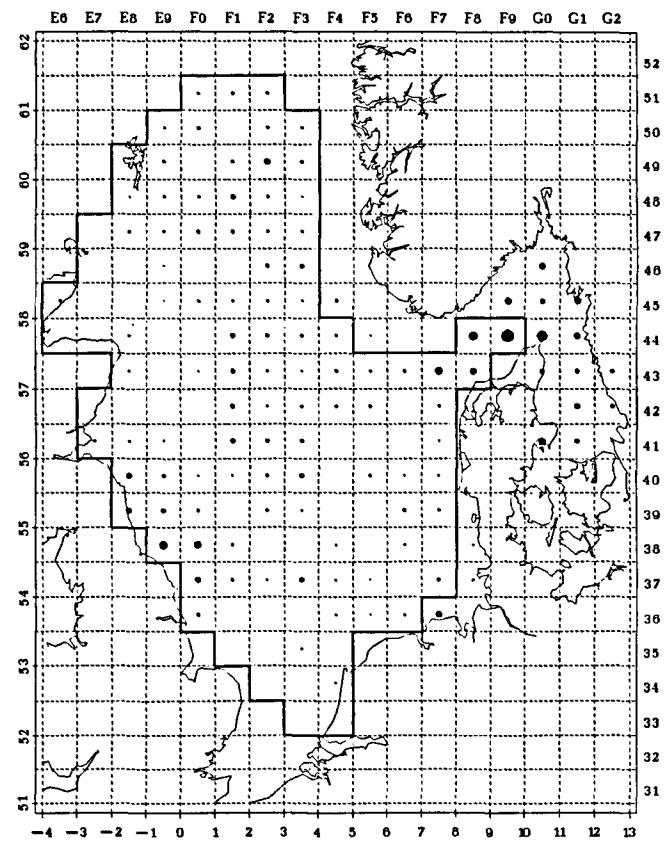


Figure 4.18 Cod: number per hour, age-group 0.

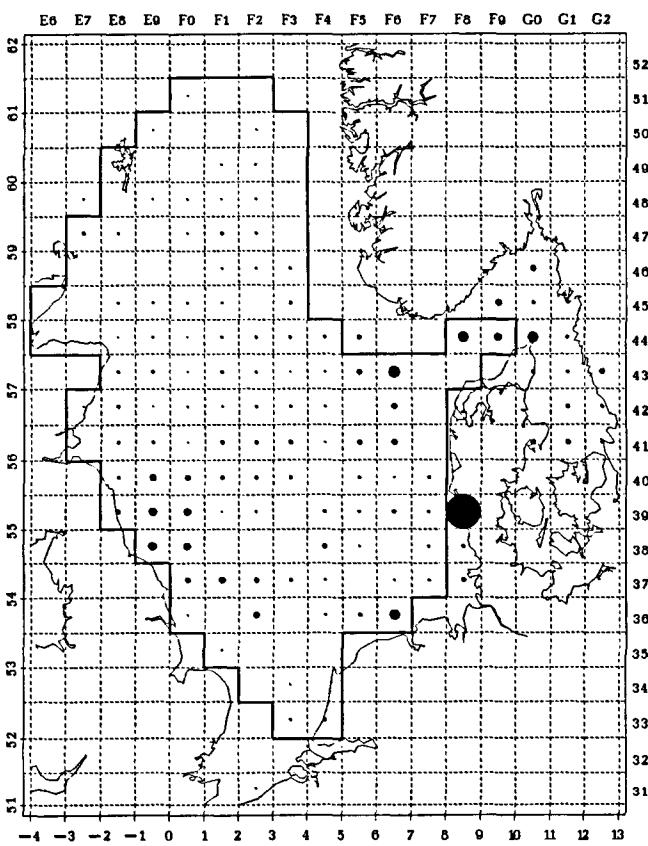
Cod, Age group 1 1993 quarter 1
Max mean catch number per rectangle: 435



Cod, Age group 1 1993 quarter 2
Max mean catch number per rectangle: 184



Cod, Age group 1 1993 quarter 3
Max mean catch number per rectangle: 1394



Cod, Age group 1 1993 quarter 4
Max mean catch number per rectangle: 172

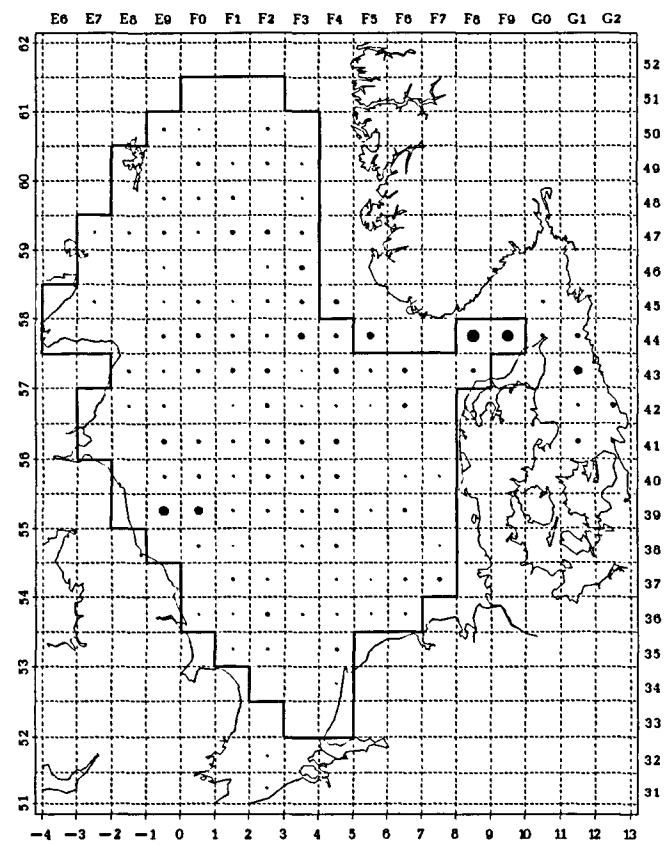
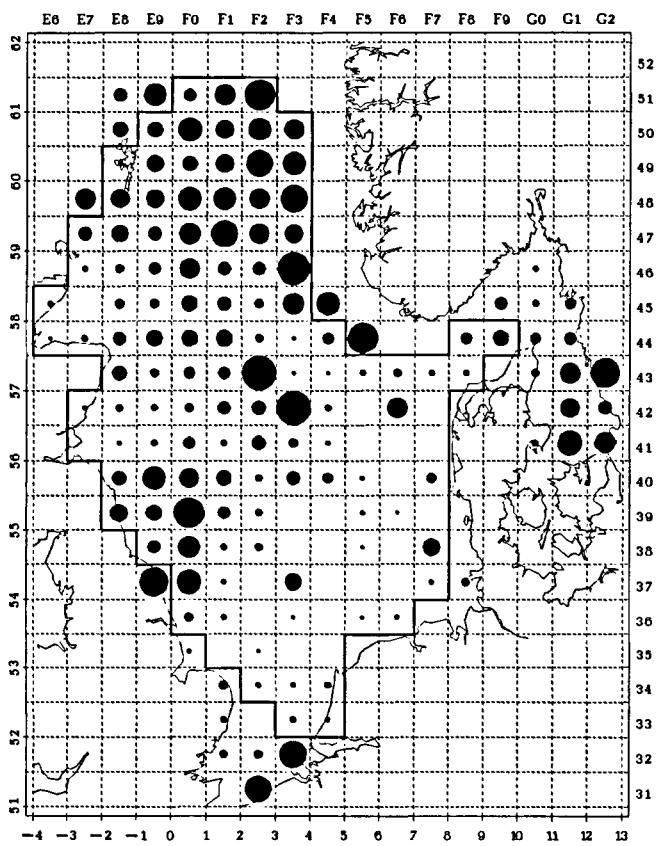
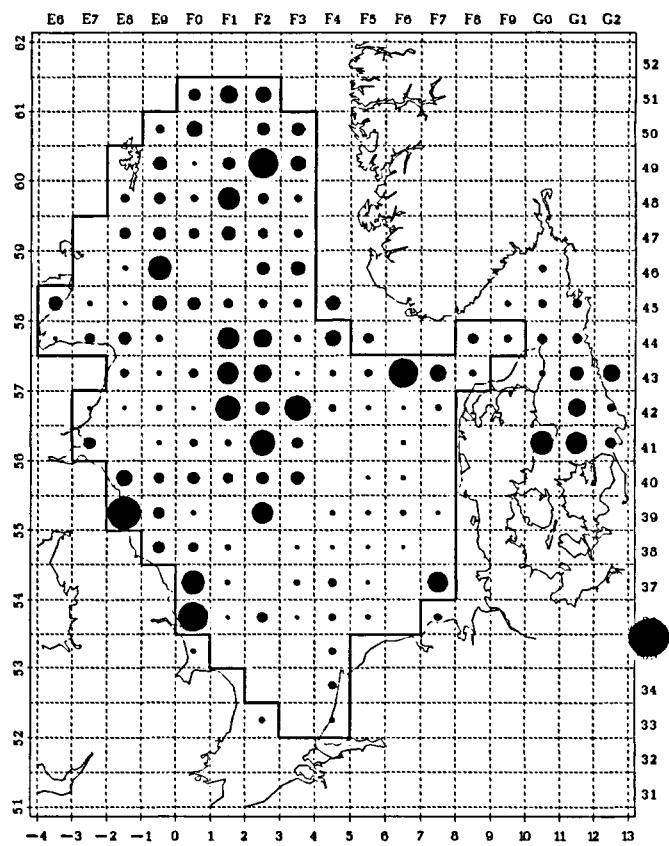


Figure 4.19 Cod: number per hour, age-group 1.

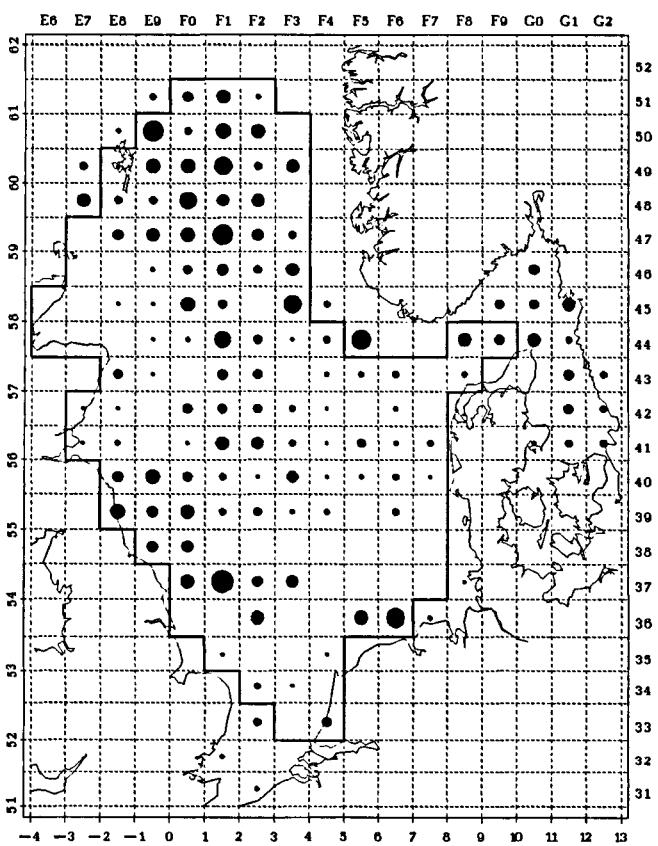
Cod, Age group 2 1993 quarter 1
Max mean catch number per rectangle: 124



Cod, Age group 2 1993 quarter 2
Max mean catch number per rectangle: 113



Cod, Age group 2 1993 quarter 3
Max mean catch number per rectangle: 51



Cod, Age group 2 1993 quarter 4
Max mean catch number per rectangle: 47

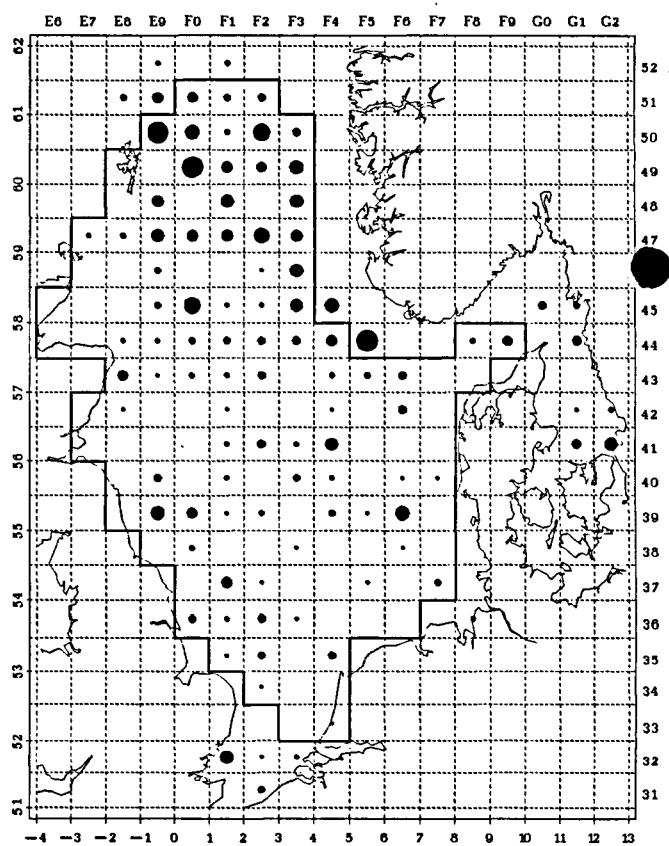
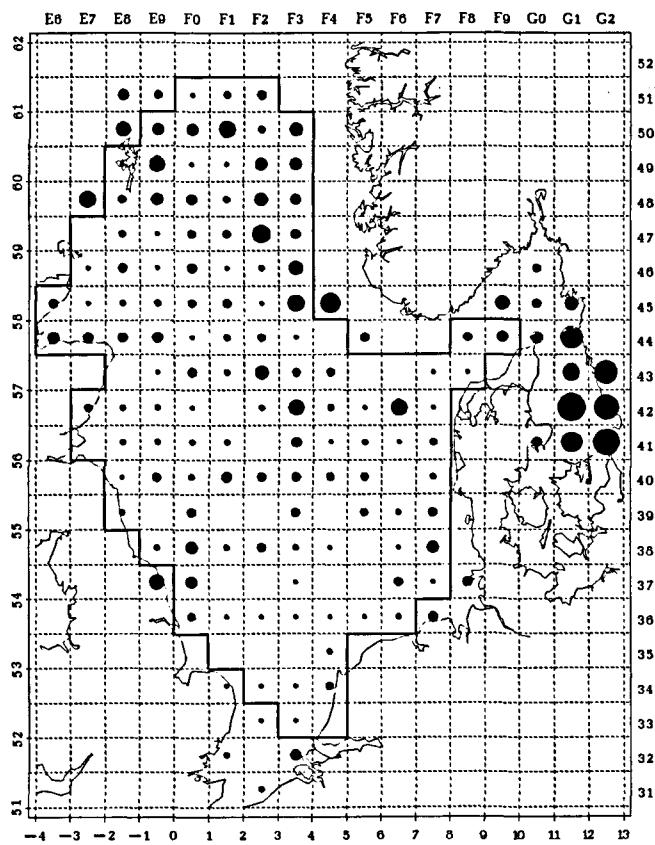
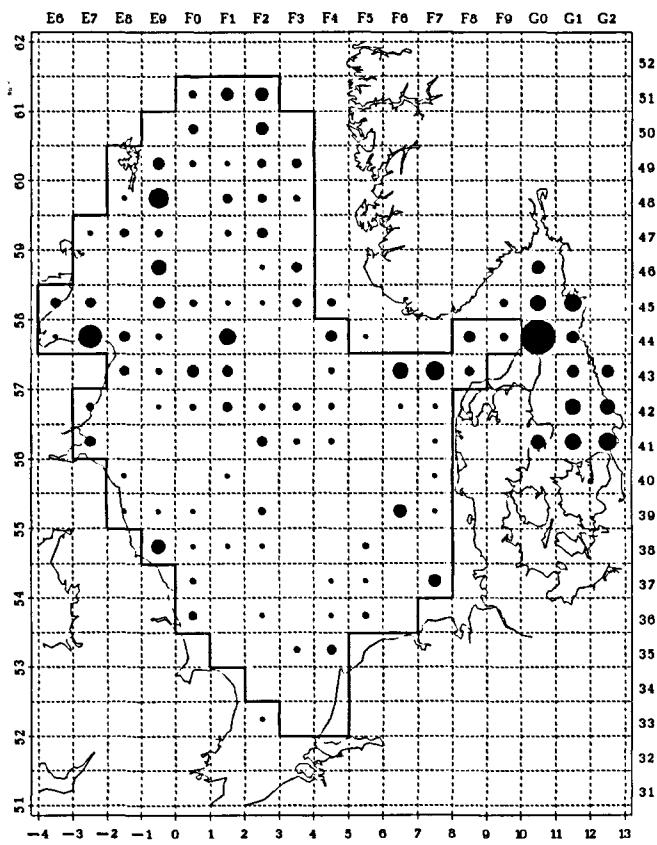


Figure 4.20 Cod: number per hour, age-group 2.

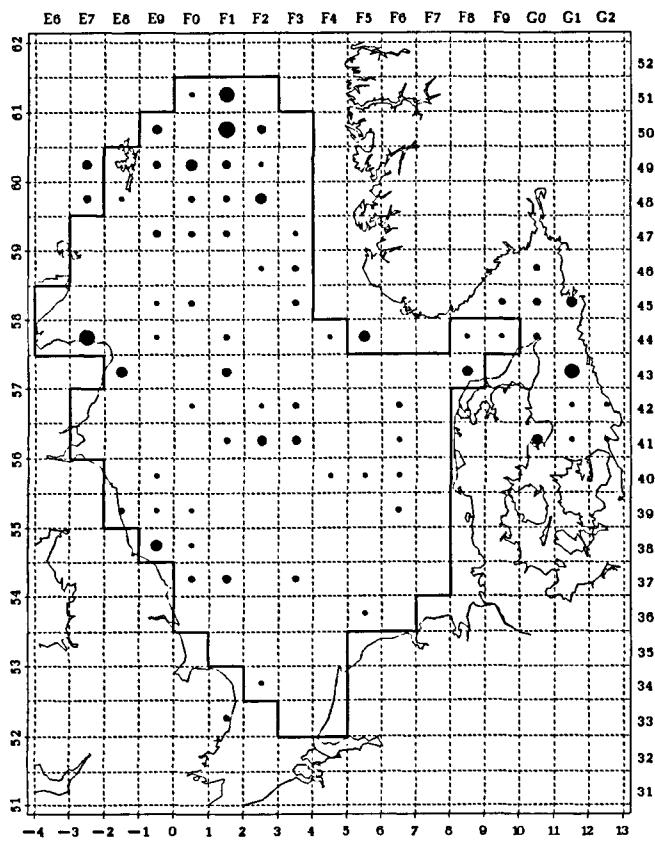
Cod, Age group 3+ 1993 quarter 1
Max mean catch number per rectangle: 47



Cod, Age group 3+ 1993 quarter 2
Max mean catch number per rectangle: 73



Cod, Age group 3+ 1993 quarter 3
Max mean catch number per rectangle: 16



Cod, Age group 3+ 1993 quarter 4
Max mean catch number per rectangle: 22

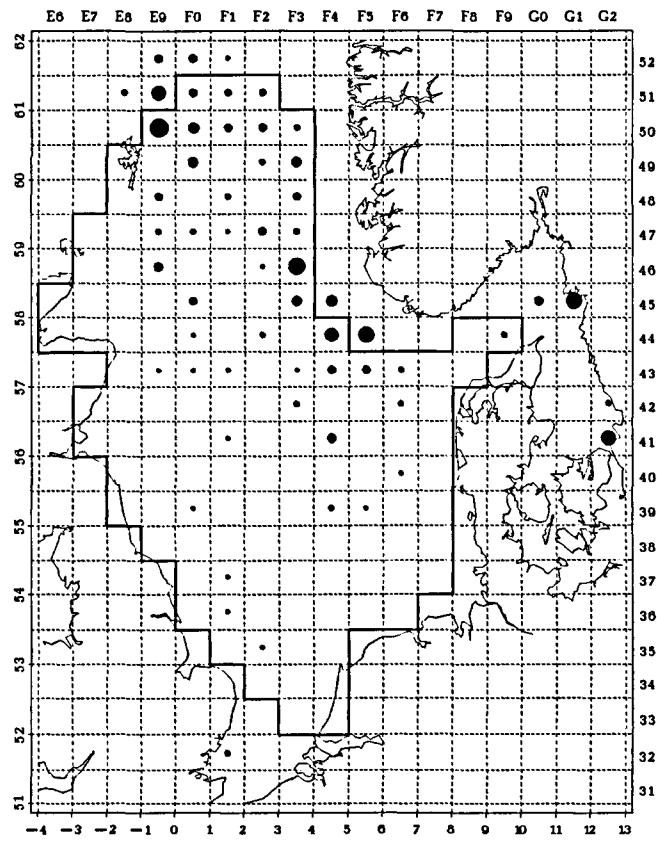
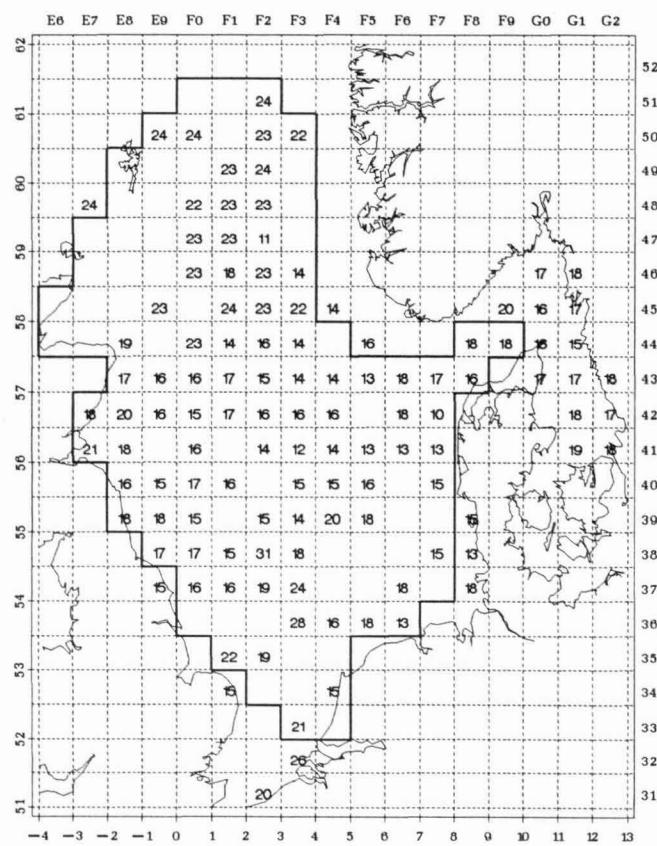
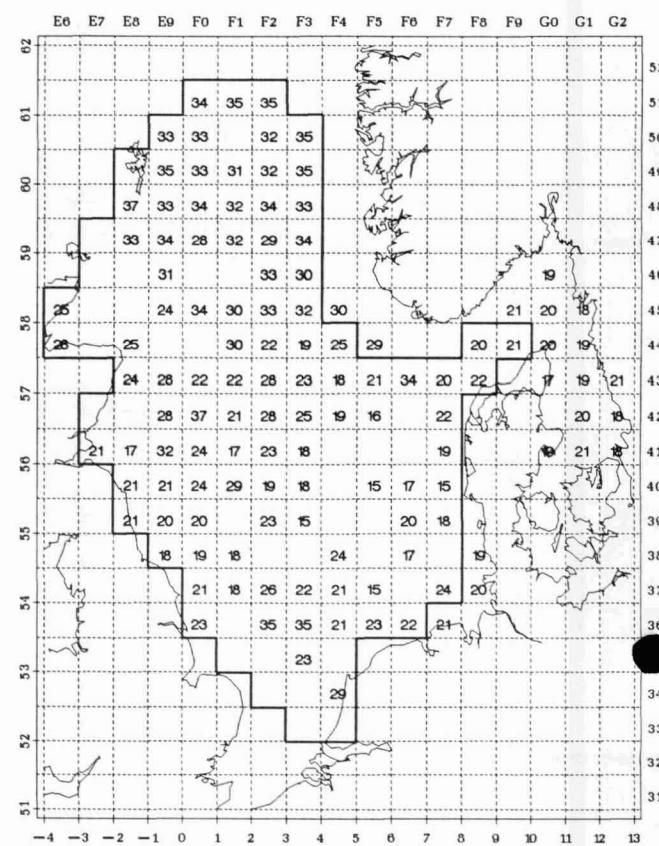


Figure 4.21 Cod: number per hour, age-group 3+.

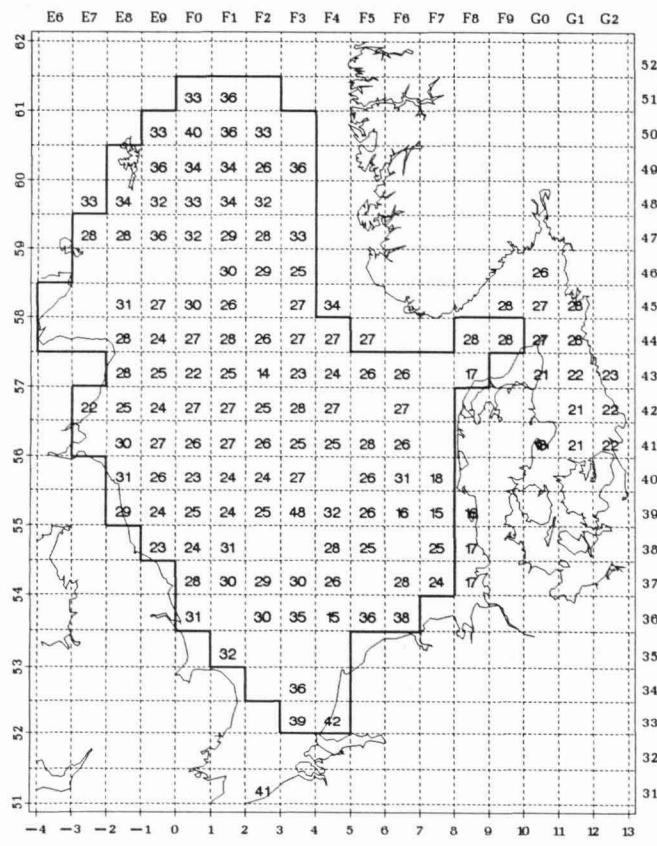
Cod, Age group 1 1993 quarter 1



Cod, Age group 1 1993 quarter 2



Cod, Age group 1 1993 quarter 3



Cod, Age group 1 1993 quarter 4

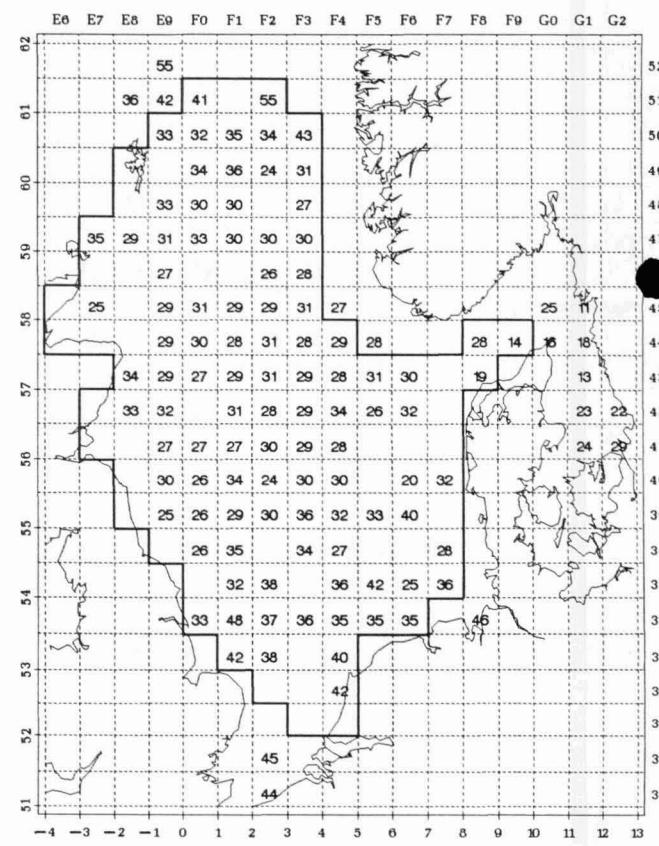
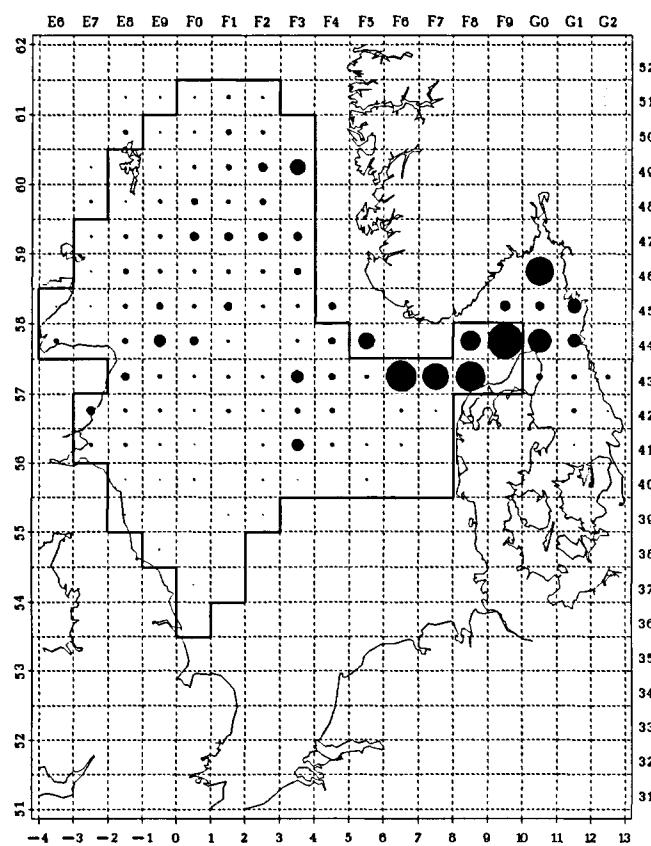


Figure 4.22 Cod: mean length (cm below), age-group 1.

Haddock, Age group 0 1993 quarter 3
Max mean catch number per rectangle: 11982



Haddock, Age group 0 1993 quarter 4
Max mean catch number per rectangle: 6451

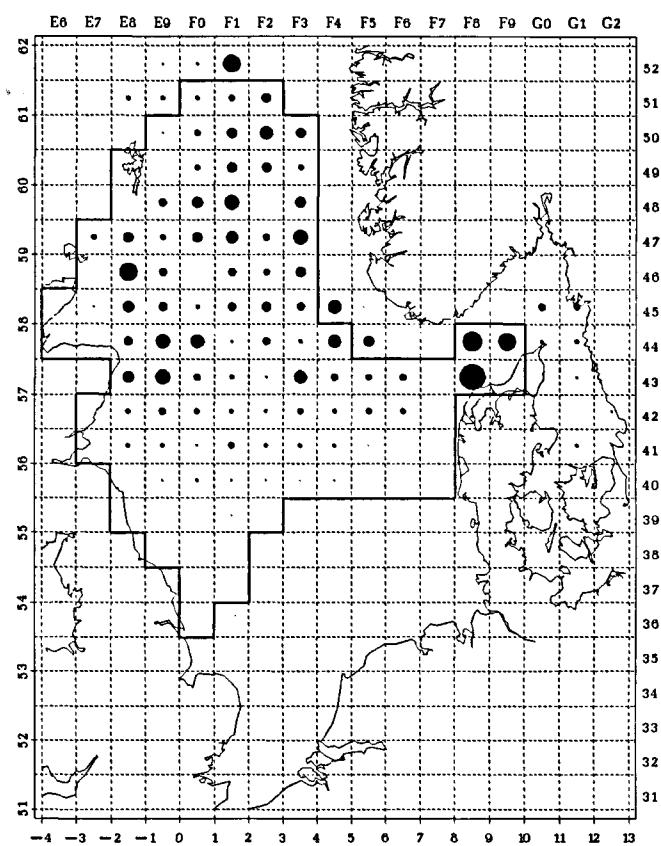
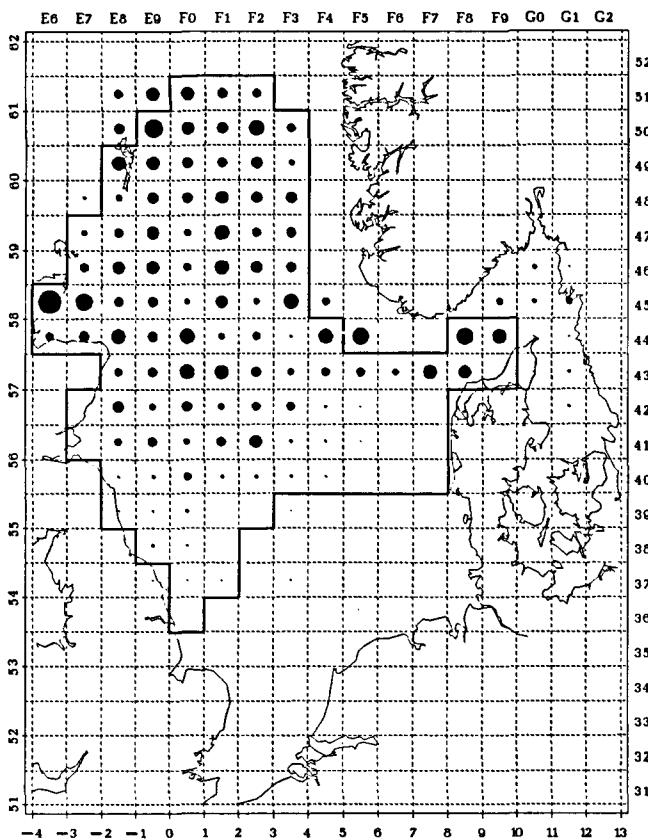
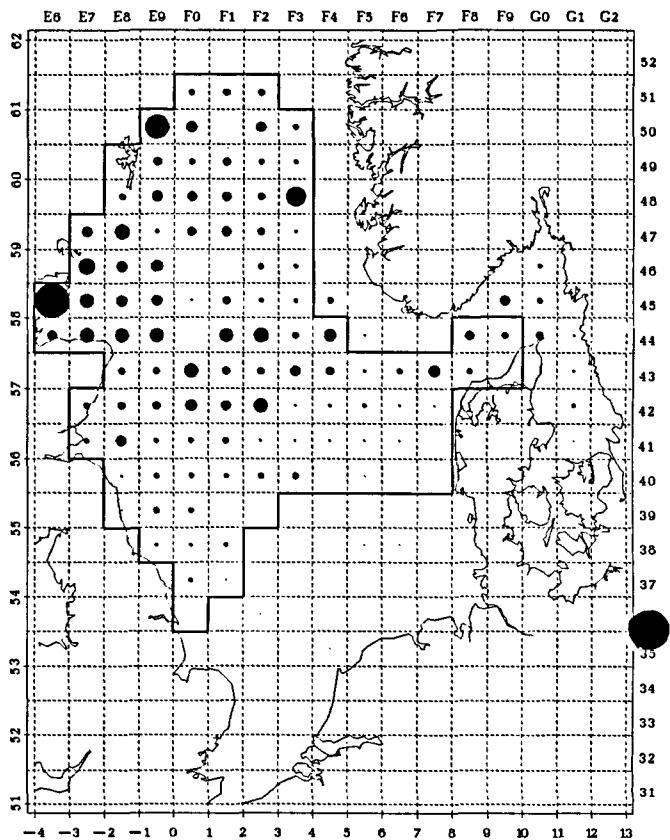


Figure 4.23 Haddock: number per hour, age-group 0.

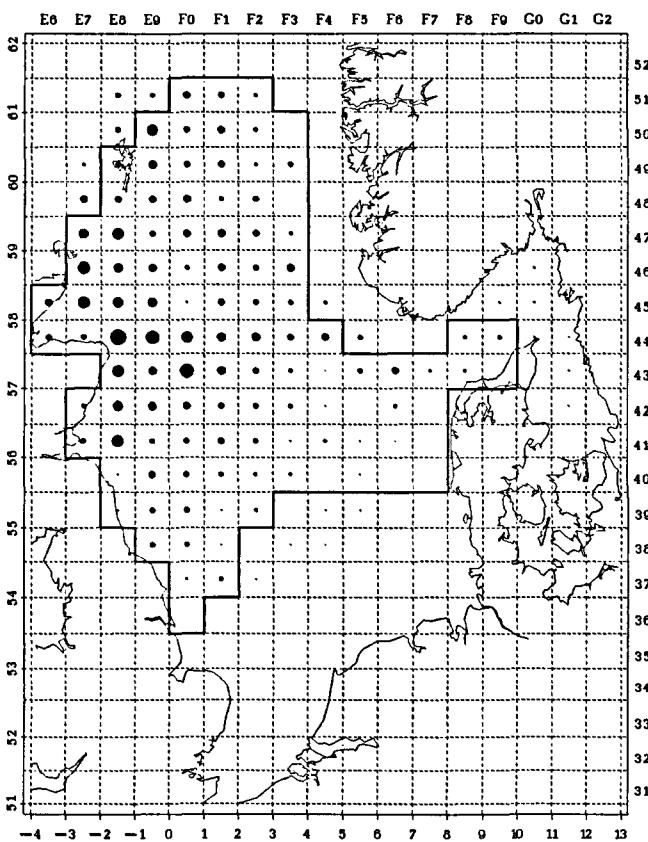
Haddock, Age group 1 1993 quarter 1
Max mean catch number per rectangle: 7944



Haddock, Age group 1 1993 quarter 2
Max mean catch number per rectangle: 17741



Haddock, Age group 1 1993 quarter 3
Max mean catch number per rectangle: 3794



Haddock, Age group 1 1993 quarter 4
Max mean catch number per rectangle: 5834

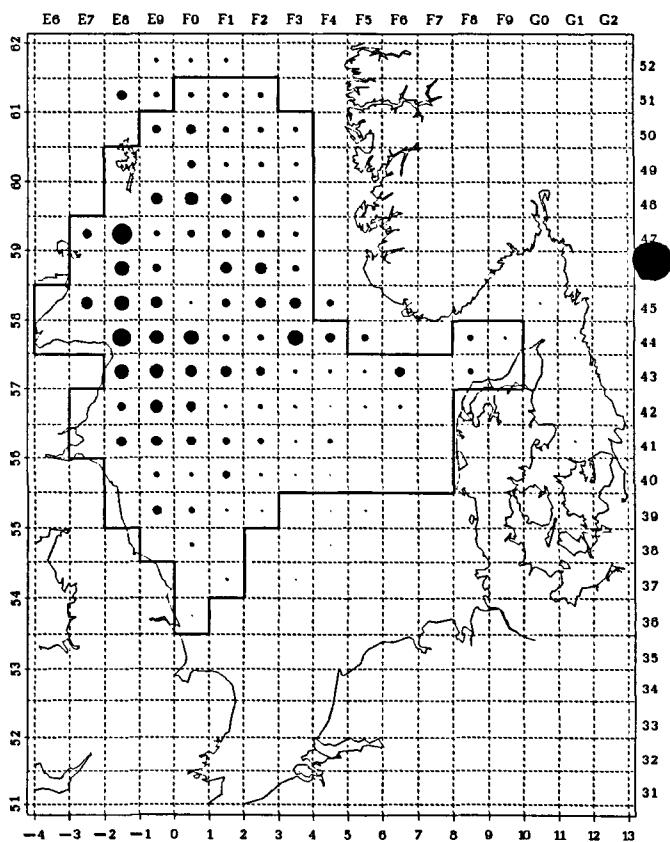
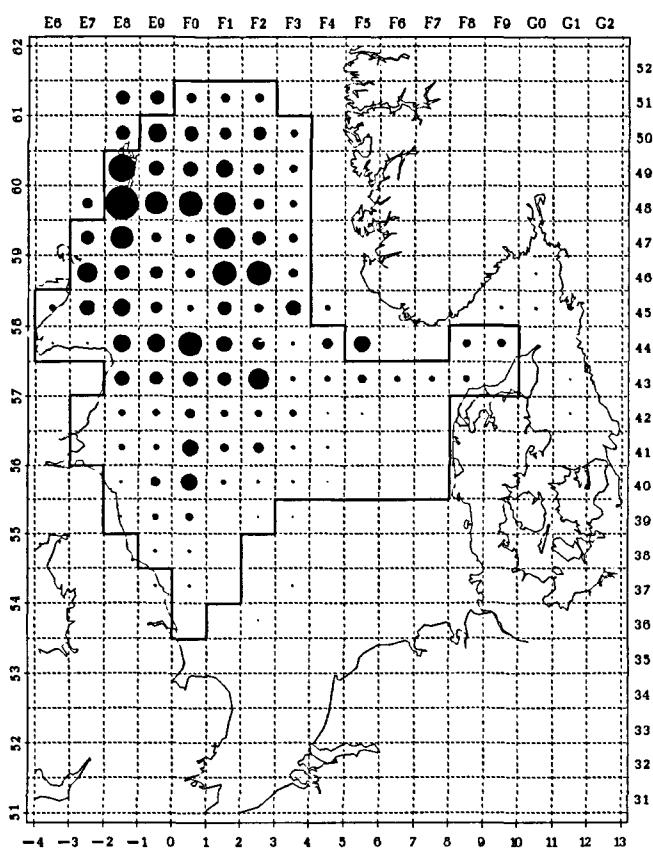


Figure 4.24 Haddock: number per hour, age-group 1.

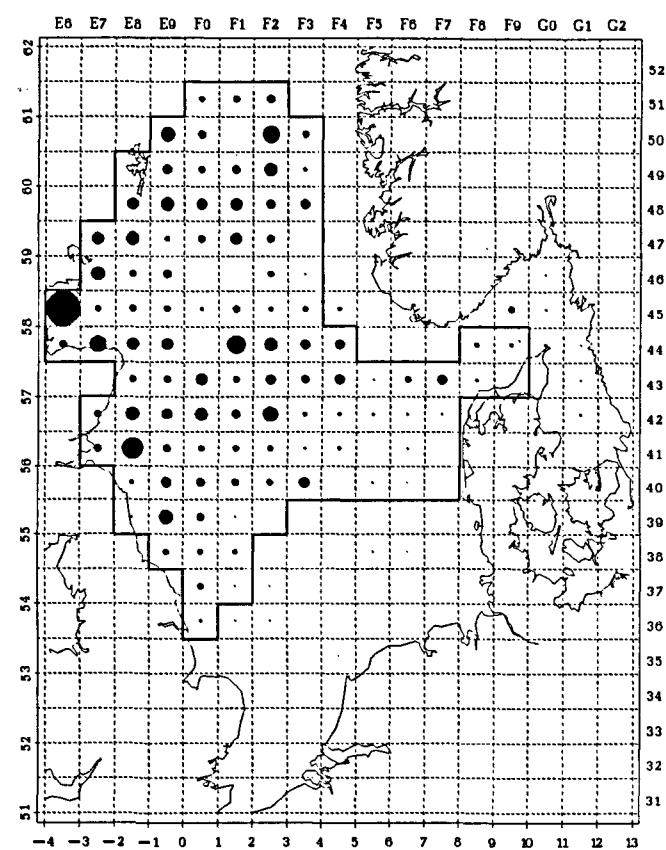
Haddock, Age group 2 1993 quarter 1

Max mean catch number per rectangle: 4365



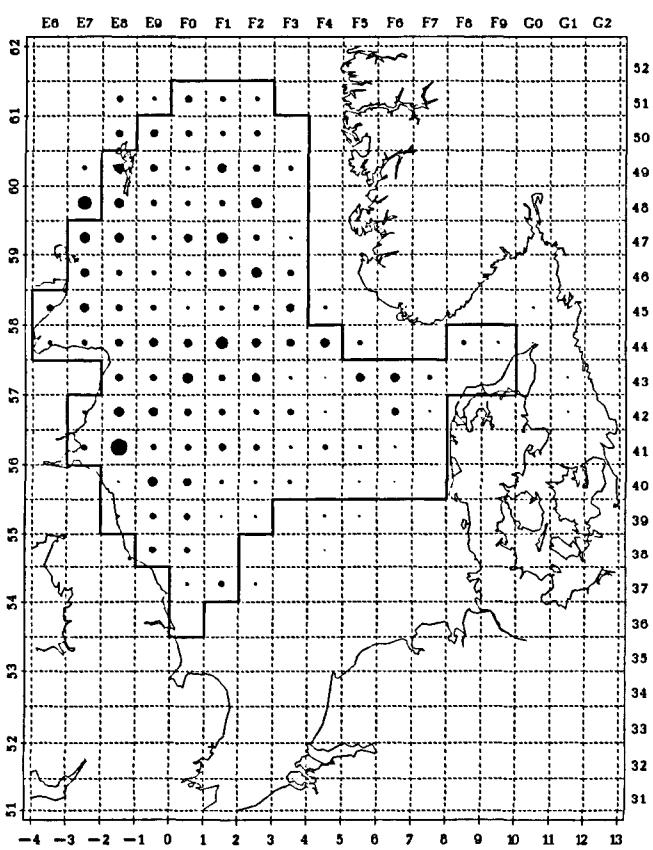
Haddock, Age group 2 1993 quarter 2

Max mean catch number per rectangle: 4698



Haddock, Age group 2 1993 quarter 3

Max mean catch number per rectangle: 1010



Haddock, Age group 2 1993 quarter 4

Max mean catch number per rectangle: 1193

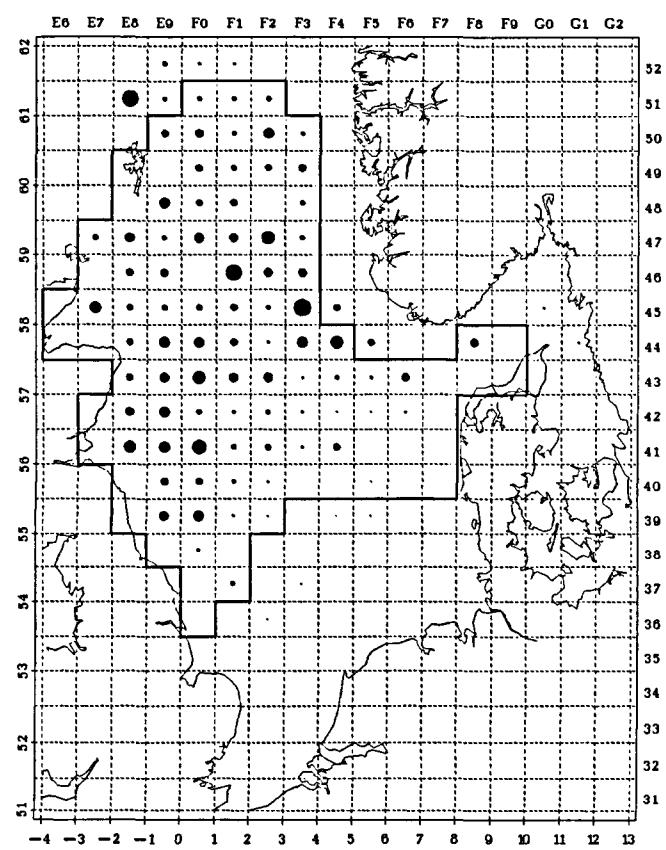
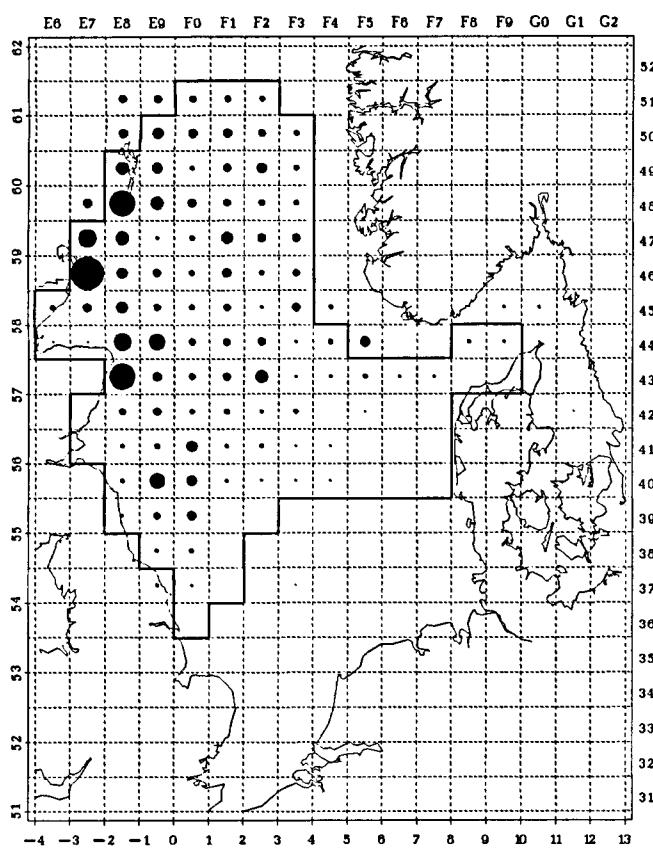


Figure 4.25 Haddock: number per hour, age-group 2.

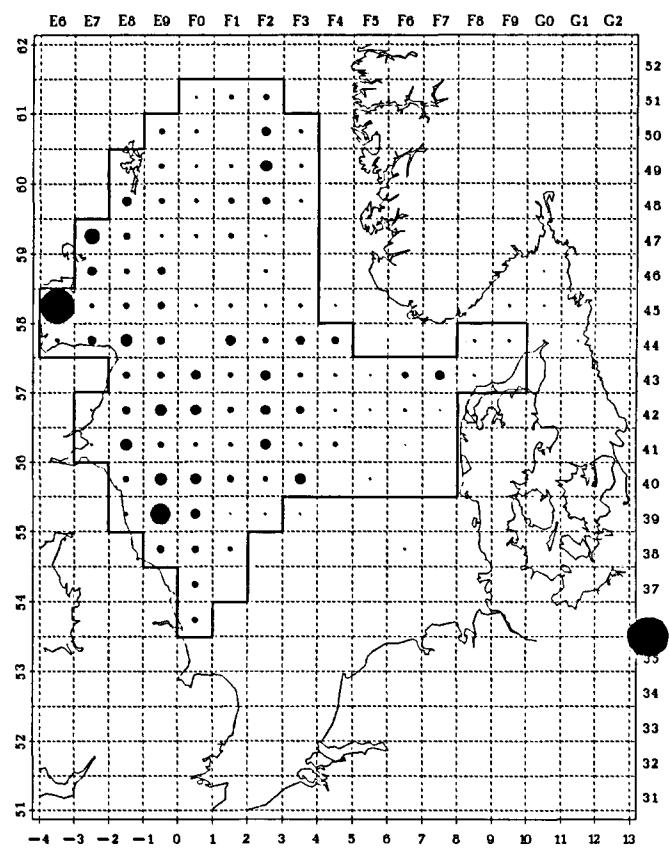
Haddock, Age group 3+ 1993 quarter 1

Max mean catch number per rectangle: 2650



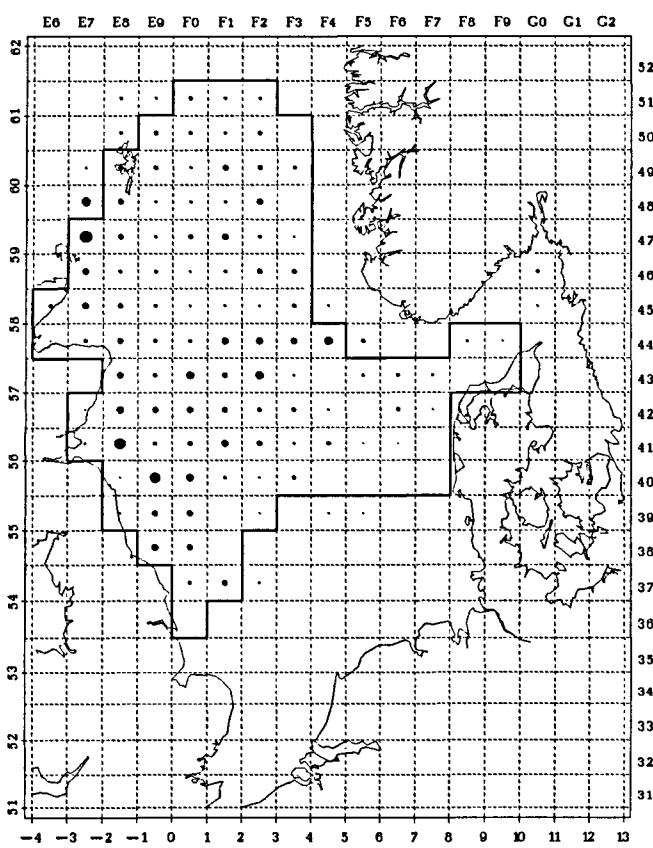
Haddock, Age group 3+ 1993 quarter 2

Max mean catch number per rectangle: 2924



Haddock, Age group 3+ 1993 quarter 3

Max mean catch number per rectangle: 356



Haddock, Age group 3+ 1993 quarter 4

Max mean catch number per rectangle: 447

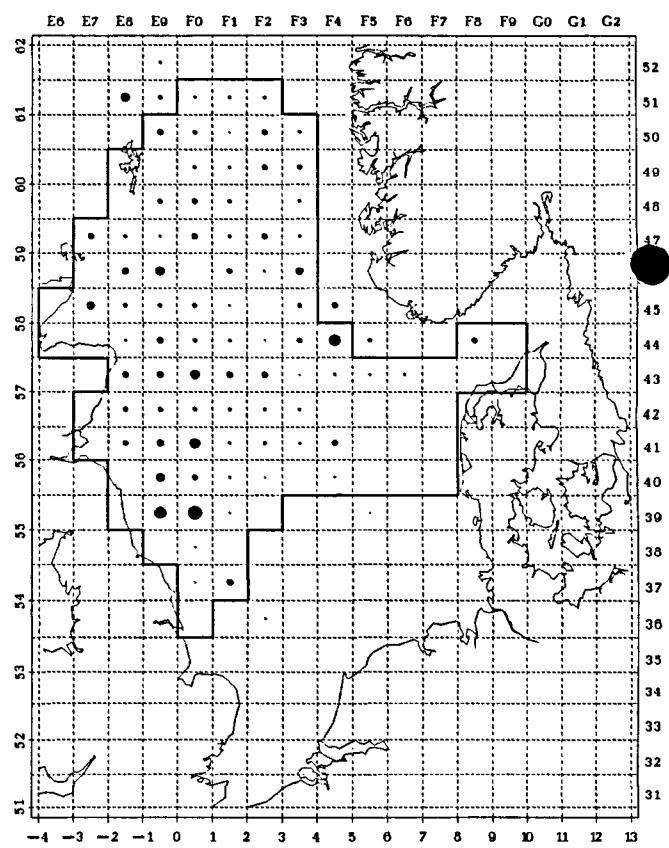
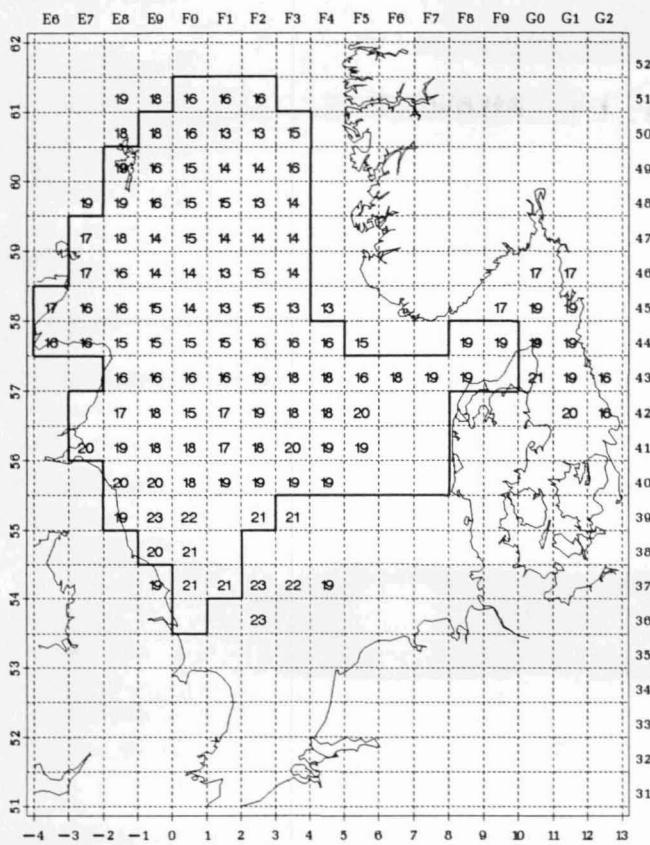
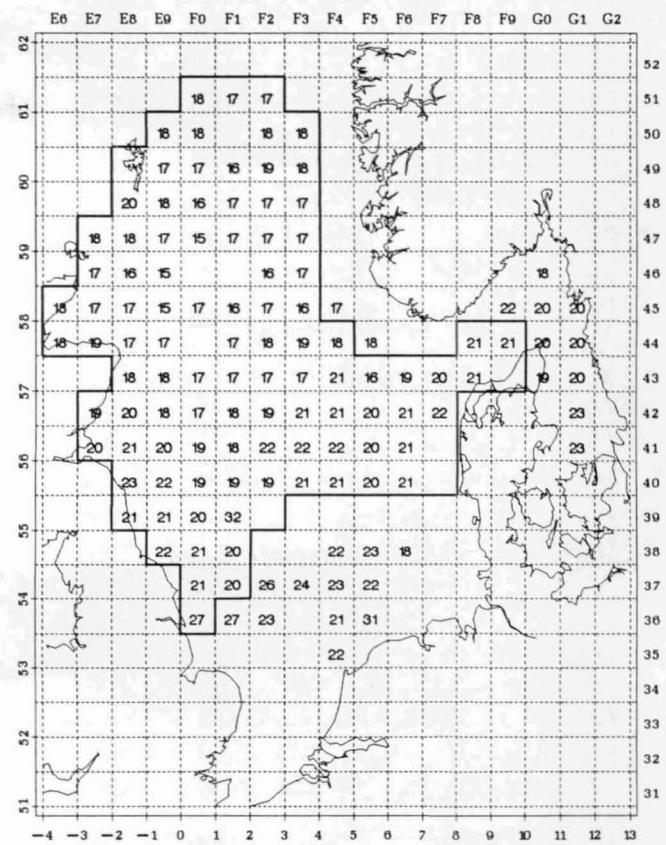


Figure 4.26 Haddock: number per hour, age-group 3+.

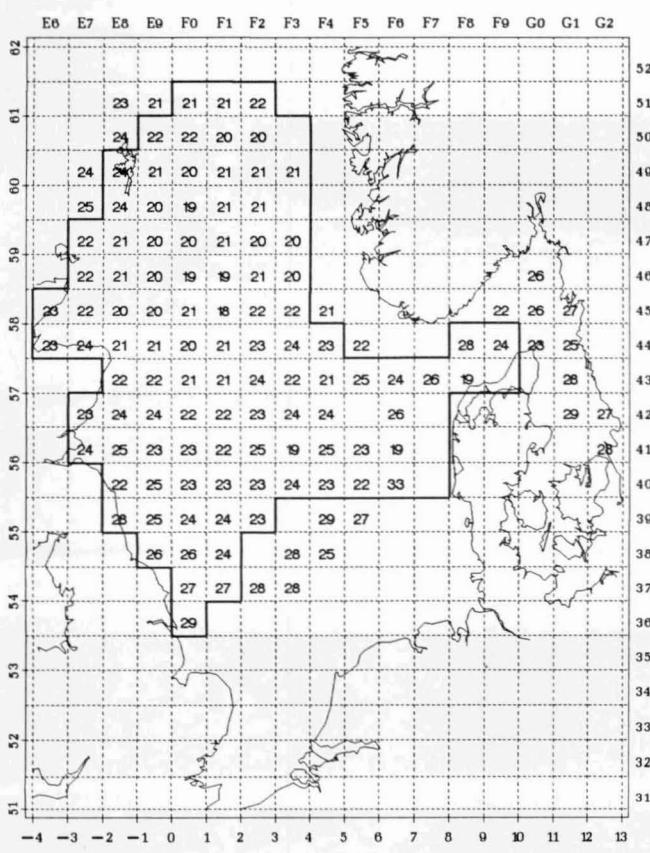
Haddock, Age group 1 1993 quarter 1



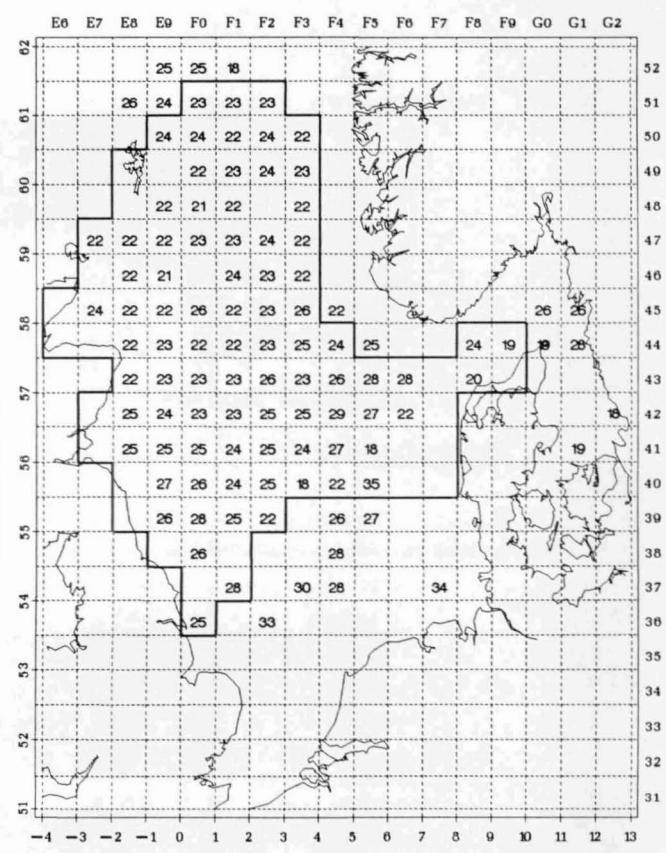
Haddock, Age group 1 1993 quarter 2



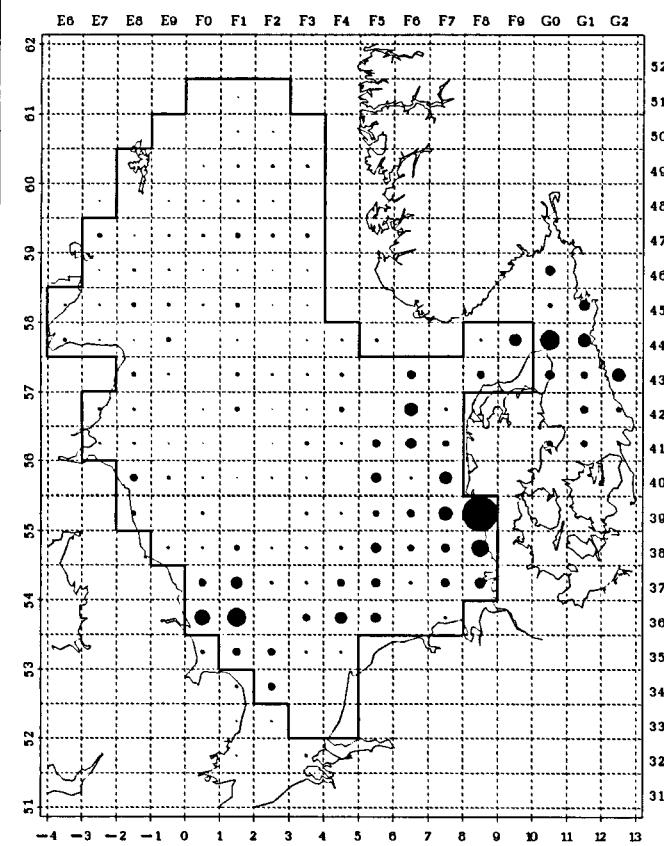
Haddock, Age group 1 1993 quarter 3



Haddock, Age group 1 1993 quarter 4



Whiting, Age group 0 1993 quarter 3
Max mean catch number per rectangle: 32869



Whiting, Age group 0 1993 quarter 4
Max mean catch number per rectangle: 22511

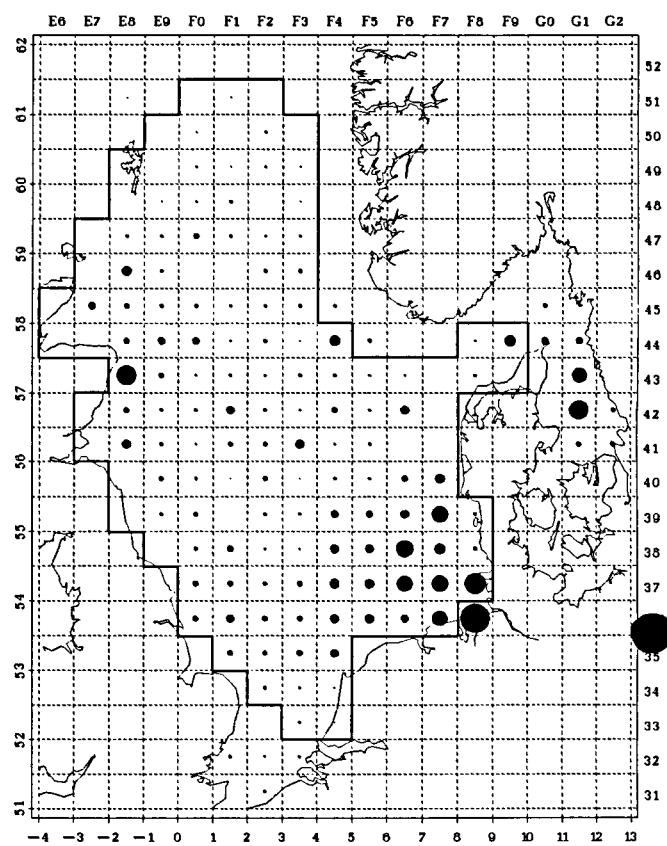
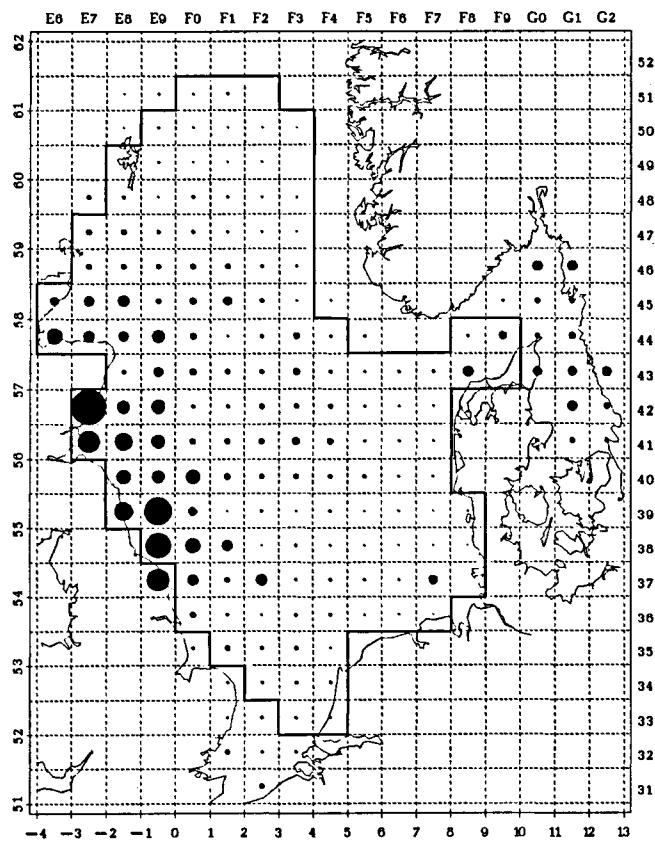
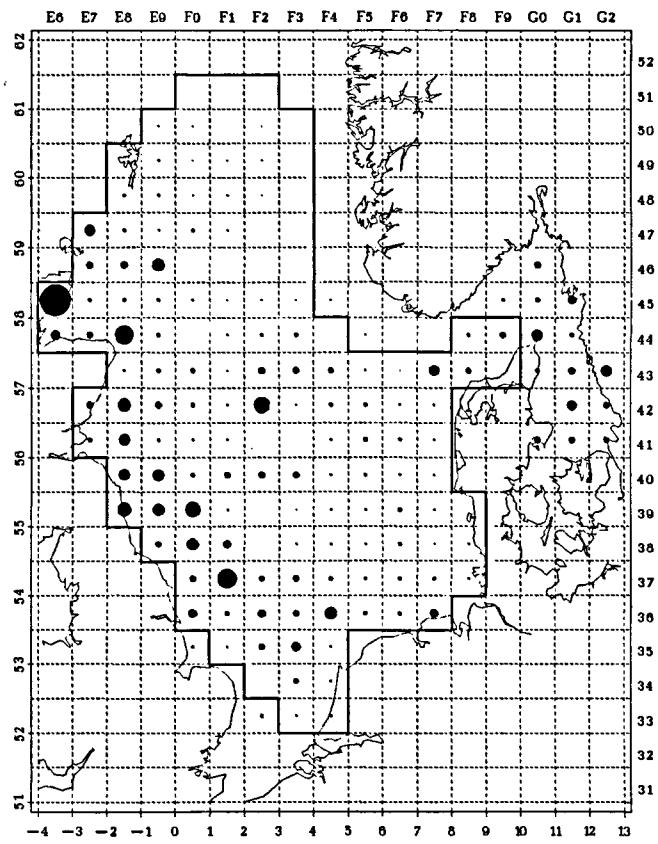


Figure 4.28 Whiting: number per hour, age-group 0.

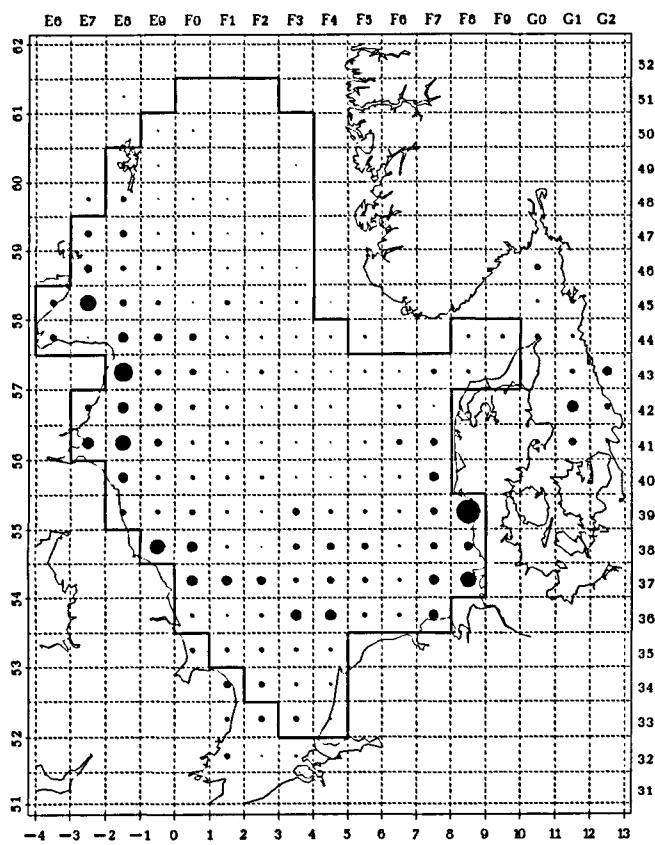
Whiting, Age group 1 1993 quarter 1
Max mean catch number per rectangle: 23456



Whiting, Age group 1 1993 quarter 2
Max mean catch number per rectangle: 19102



Whiting, Age group 1 1993 quarter 3
Max mean catch number per rectangle: 10610



Whiting, Age group 1 1993 quarter 4
Max mean catch number per rectangle: 13499

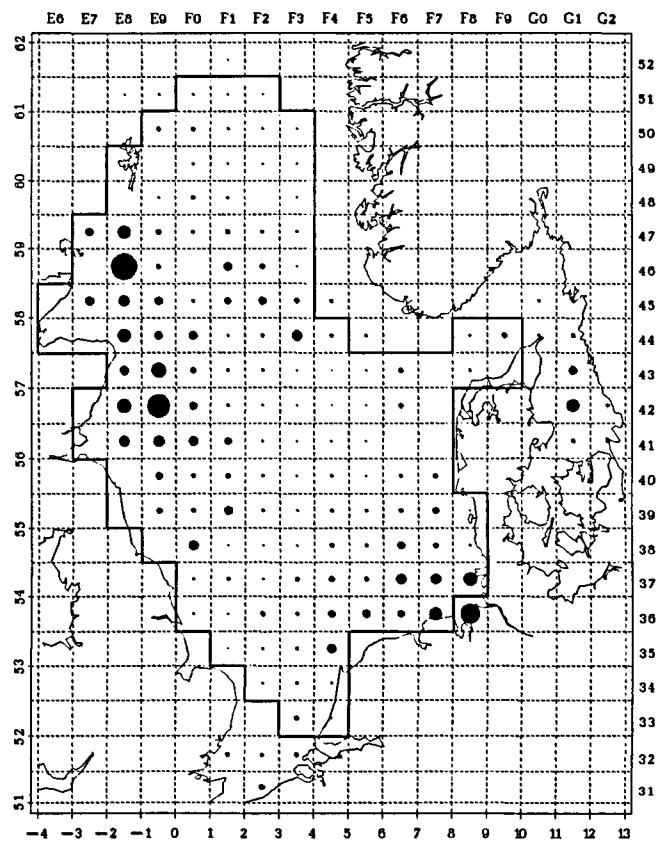
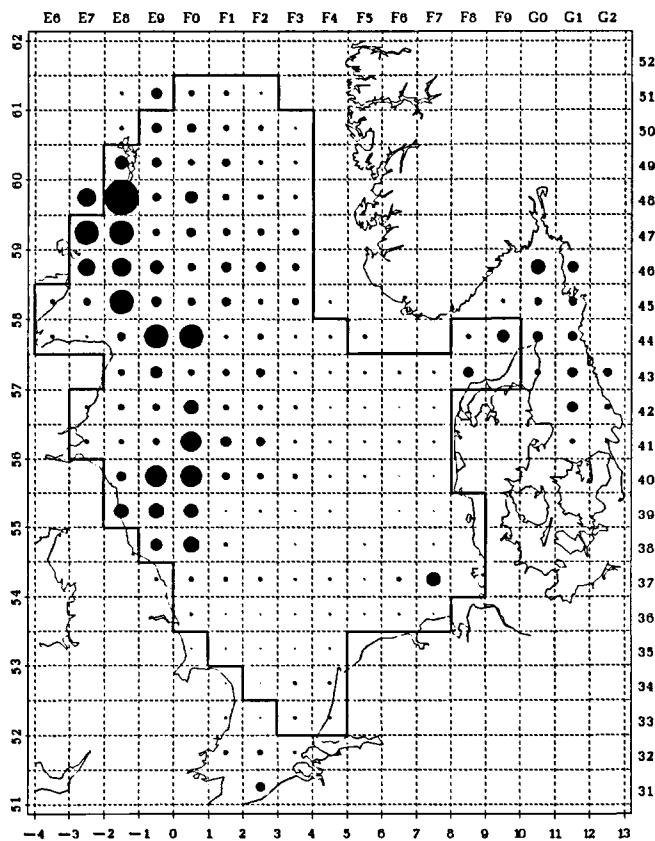
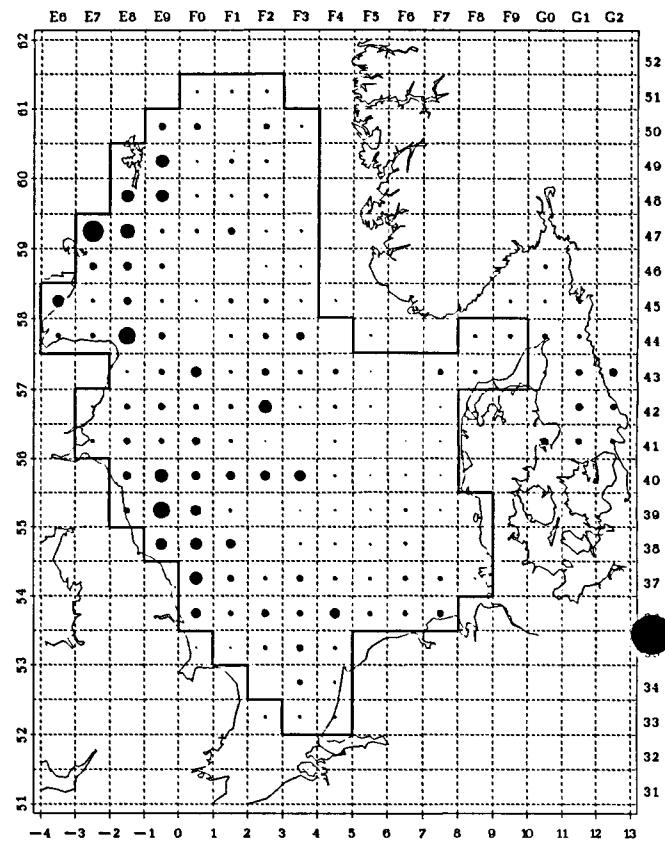


Figure 4.29 Whiting: number per hour, age-group 1.

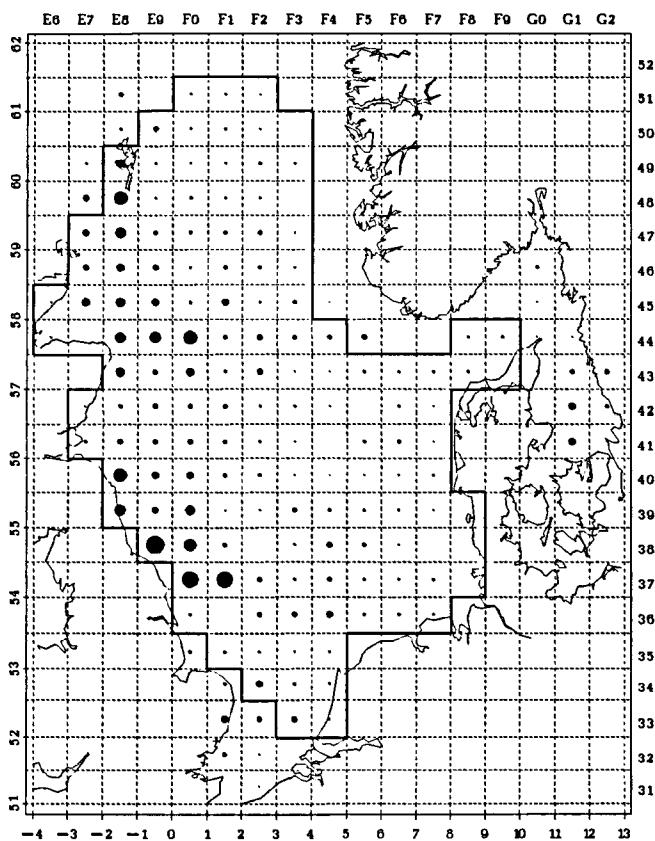
Whiting, Age group 2 1993 quarter 1
Max mean catch number per rectangle: 8381



Whiting, Age group 2 1993 quarter 2
Max mean catch number per rectangle: 2975



Whiting, Age group 2 1993 quarter 3
Max mean catch number per rectangle: 2230



Whiting, Age group 2 1993 quarter 4
Max mean catch number per rectangle: 6653

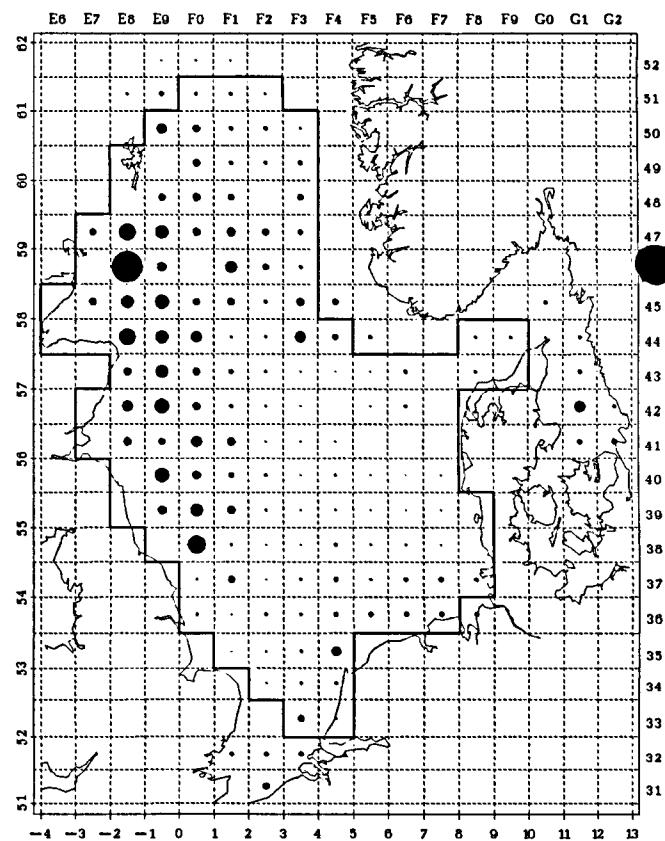
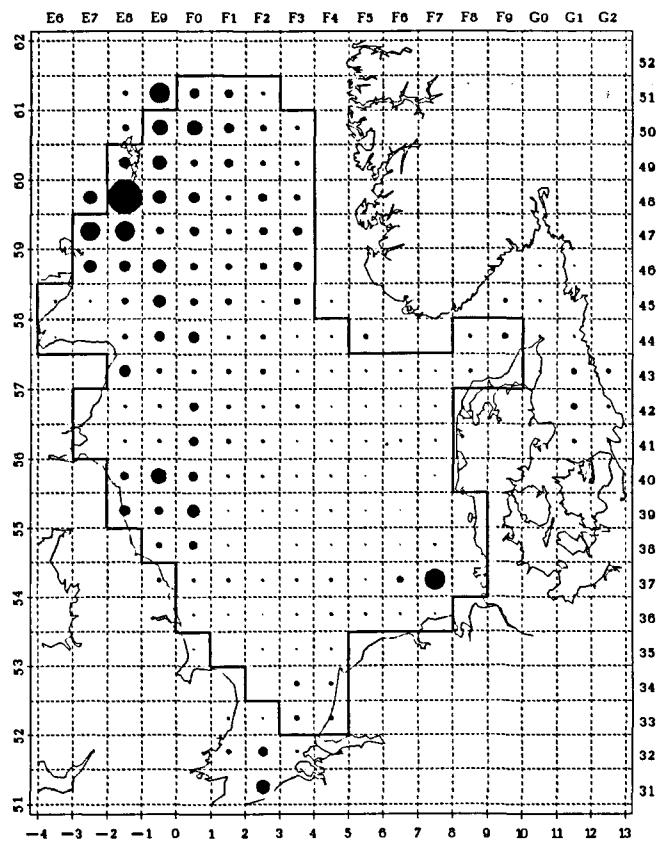
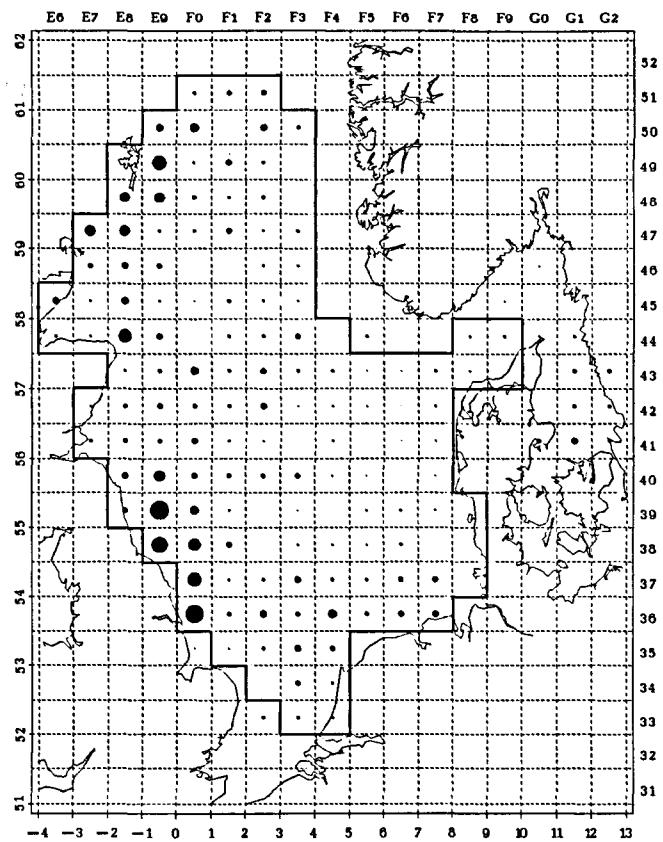


Figure 4.30 Whiting: number per hour, age-group 2.

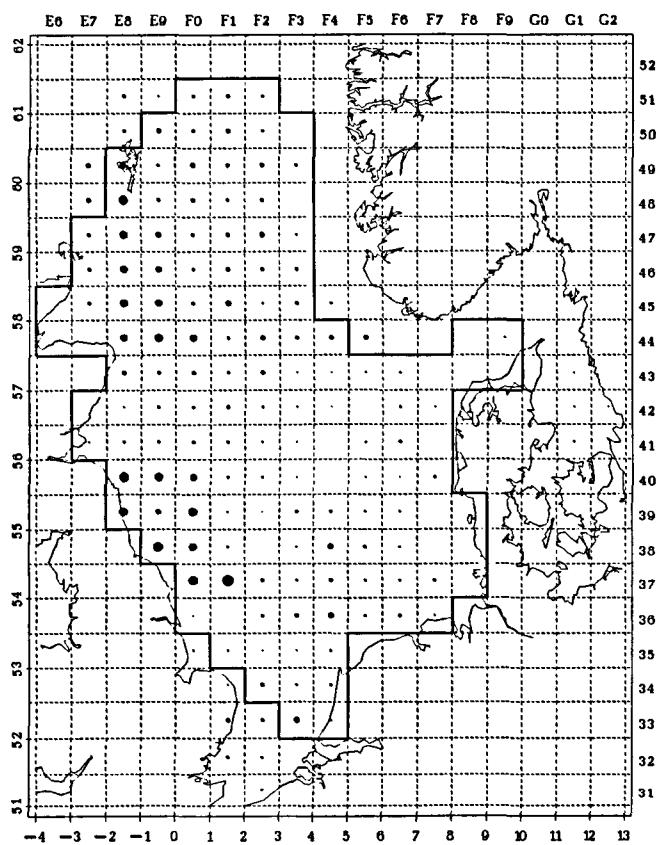
Whiting, Age group 3+ 1993 quarter 1
Max mean catch number per rectangle: 9536



Whiting, Age group 3+ 1993 quarter 2
Max mean catch number per rectangle: 2744



Whiting, Age group 3+ 1993 quarter 3
Max mean catch number per rectangle: 952



Whiting, Age group 3+ 1993 quarter 4
Max mean catch number per rectangle: 2190

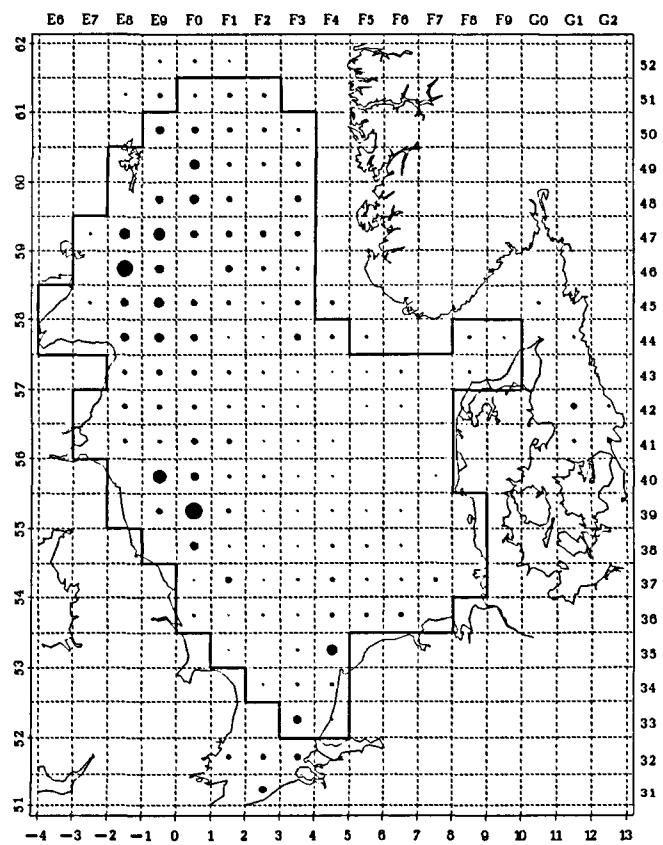
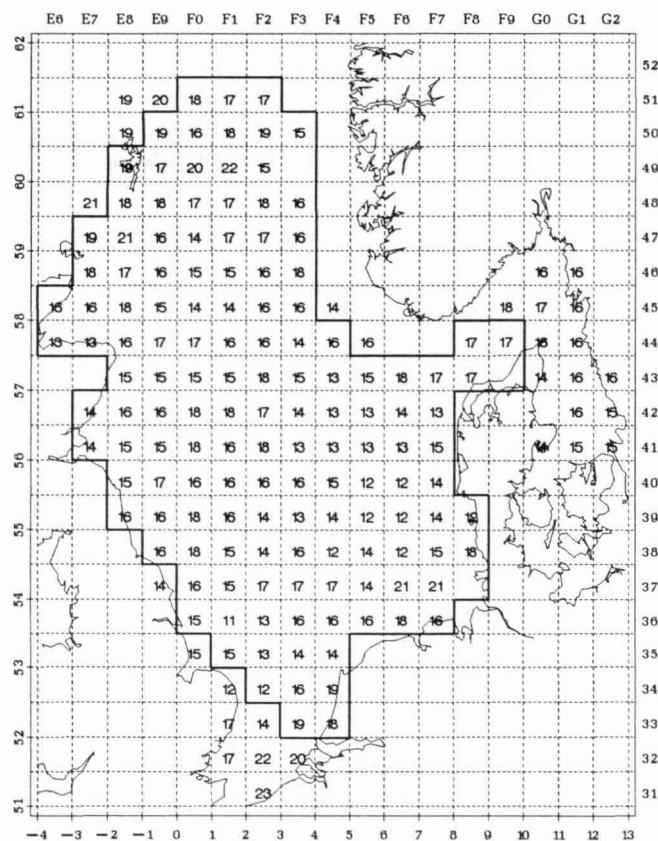
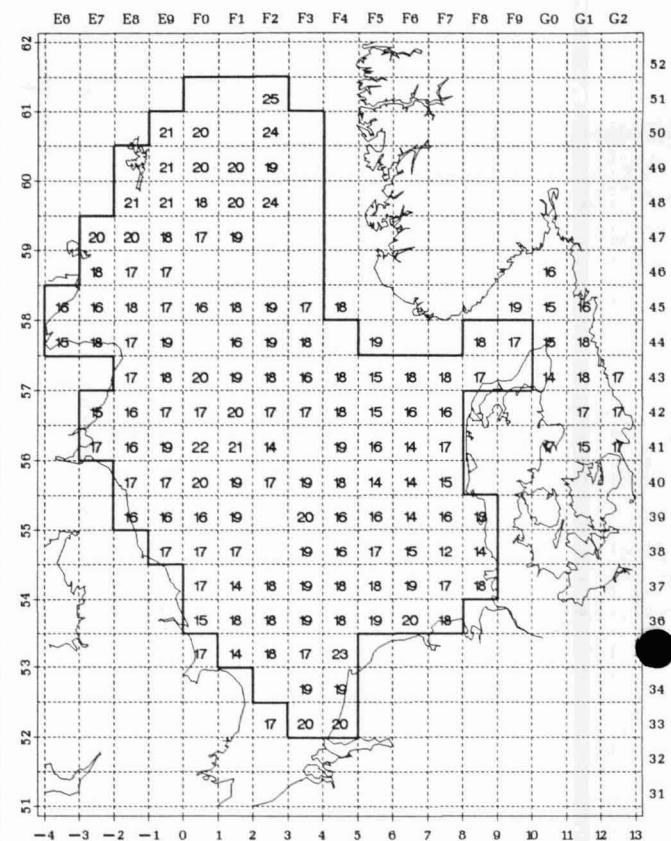


Figure 4.31 Whiting: number per hour, age-group 3+.

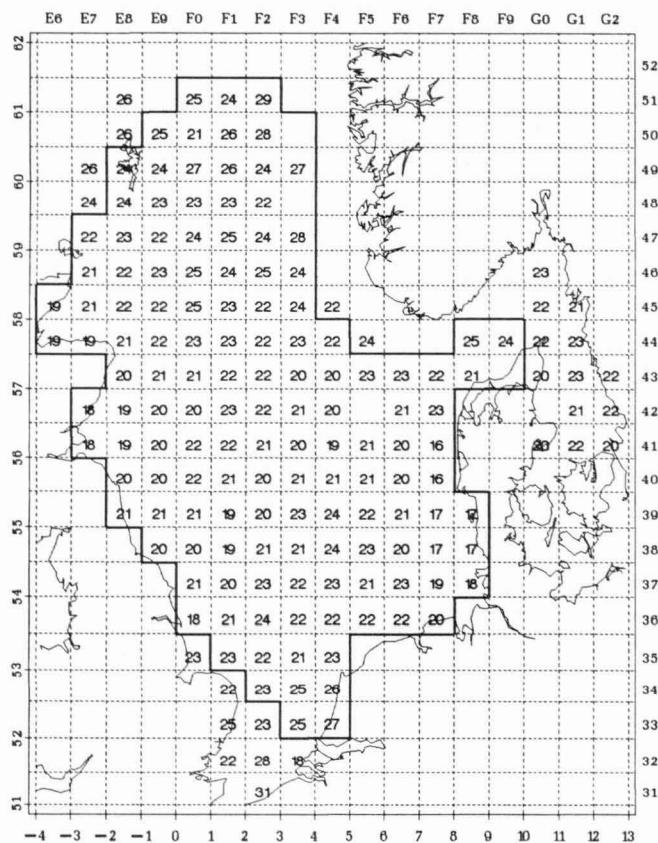
Whiting, Age group 1 1993 quarter 1



Whiting, Age group 1 1993 quarter 2



Whiting, Age group 1 1993 quarter 3



Whiting, Age group 1 1993 quarter 4

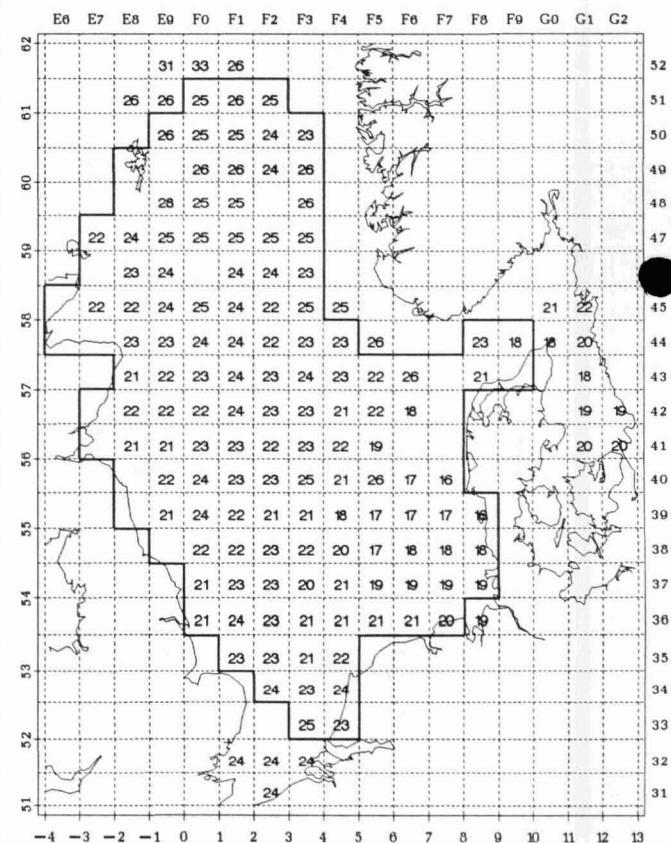
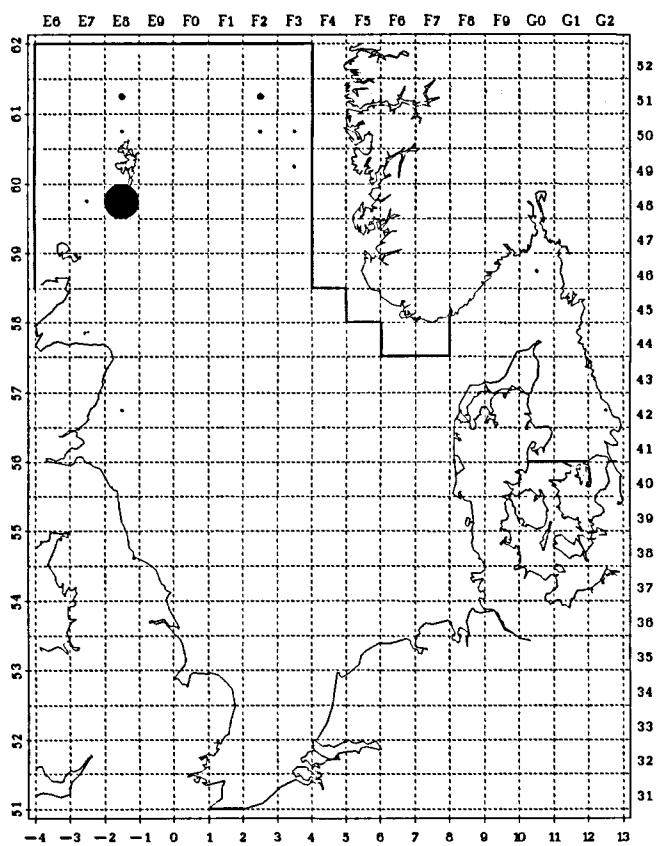


Figure 4.32 Whiting: mean length (cm below), age-group 1.

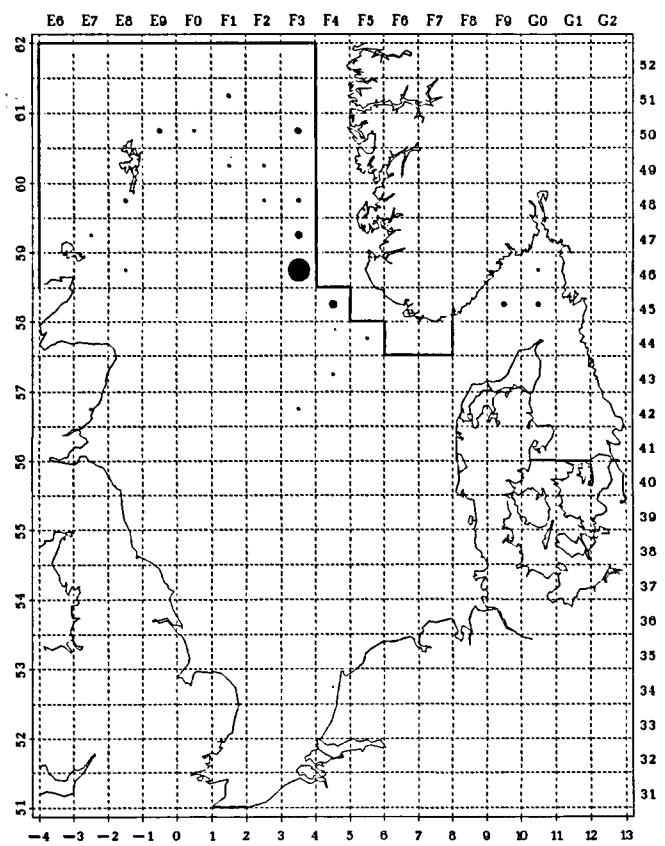
Saithe, Age group 2 1993 quarter 1

Max mean catch number per rectangle: 305



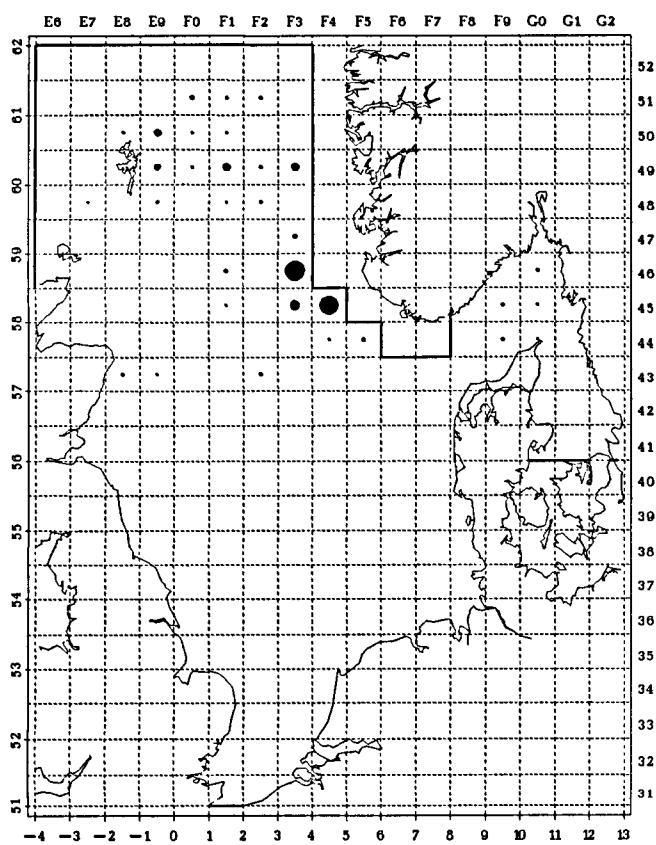
Saithe, Age group 2 1993 quarter 2

Max mean catch number per rectangle: 123



Saithe, Age group 2 1993 quarter 3

Max mean catch number per rectangle: 105



Saithe, Age group 2 1993 quarter 4

Max mean catch number per rectangle: 54

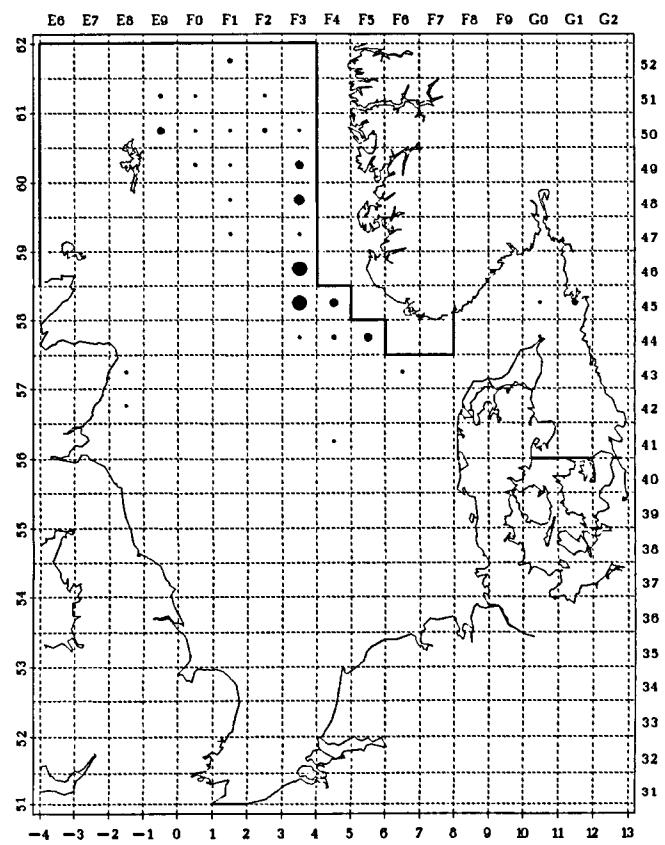
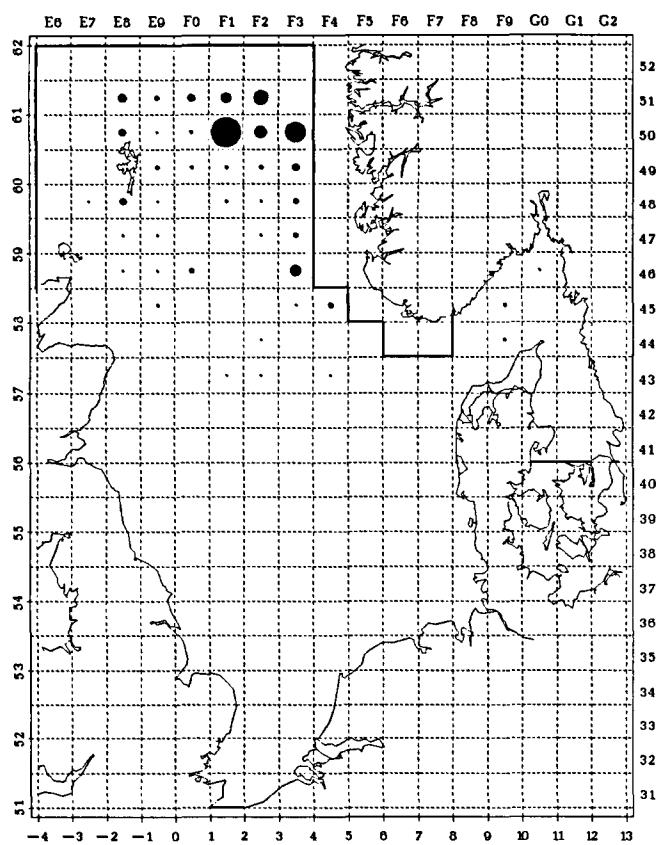


Figure 4.33 Saithe: number per hour, age-group 2.

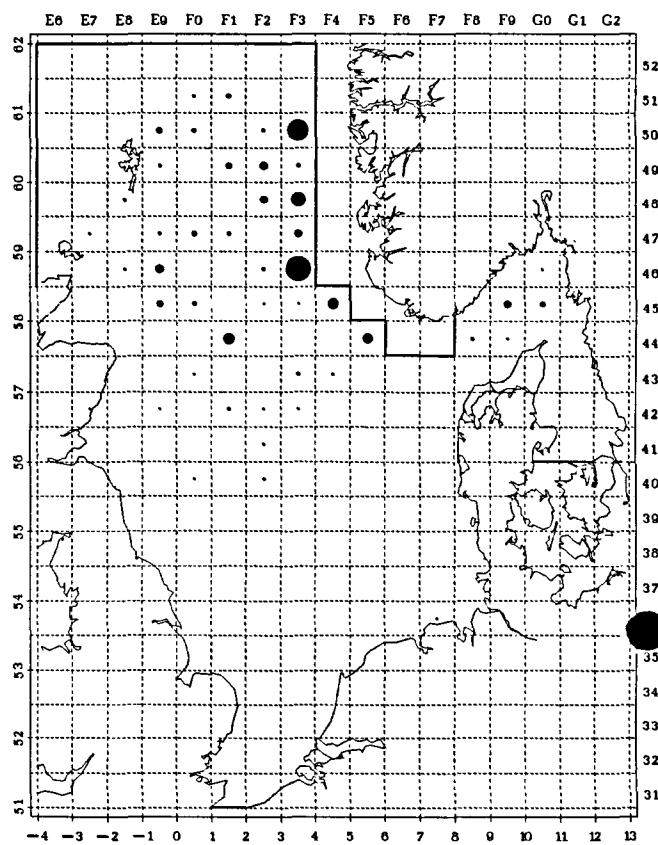
Saithe, Age group 3+ 1993 quarter 1

Max mean catch number per rectangle: 427



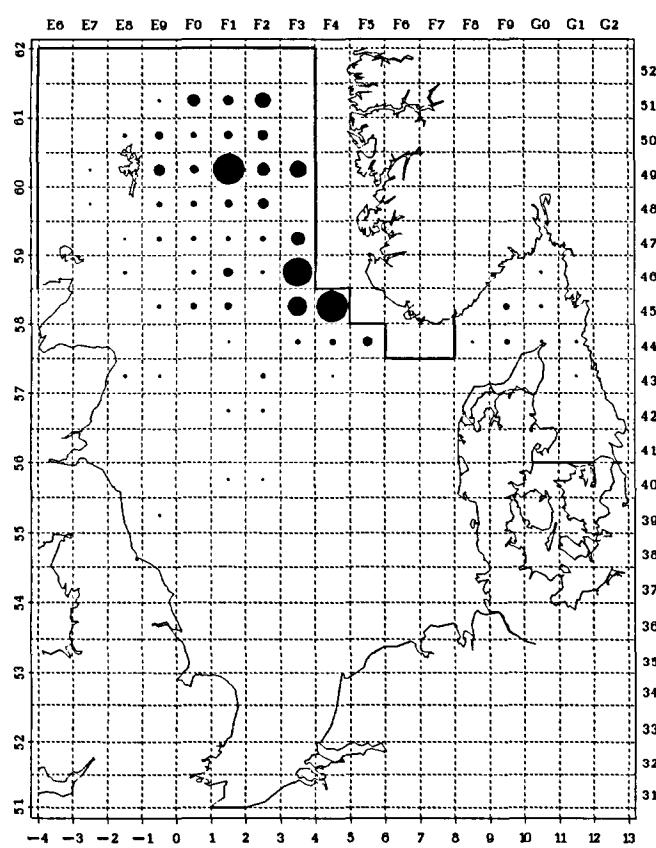
Saithe, Age group 3+ 1993 quarter 2

Max mean catch number per rectangle: 294



Saithe, Age group 3+ 1993 quarter 3

Max mean catch number per rectangle: 459



Saithe, Age group 3+ 1993 quarter 4

Max mean catch number per rectangle: 564

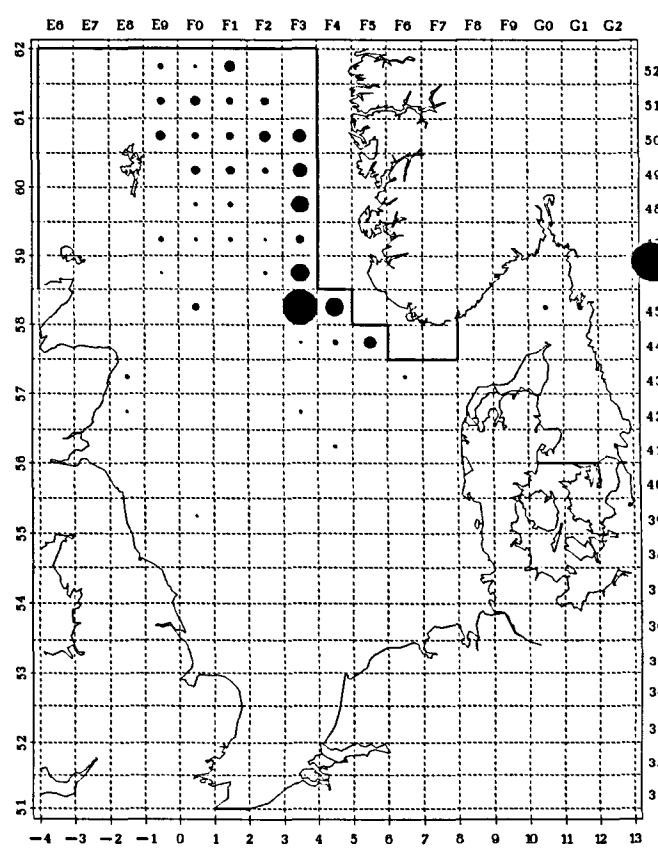
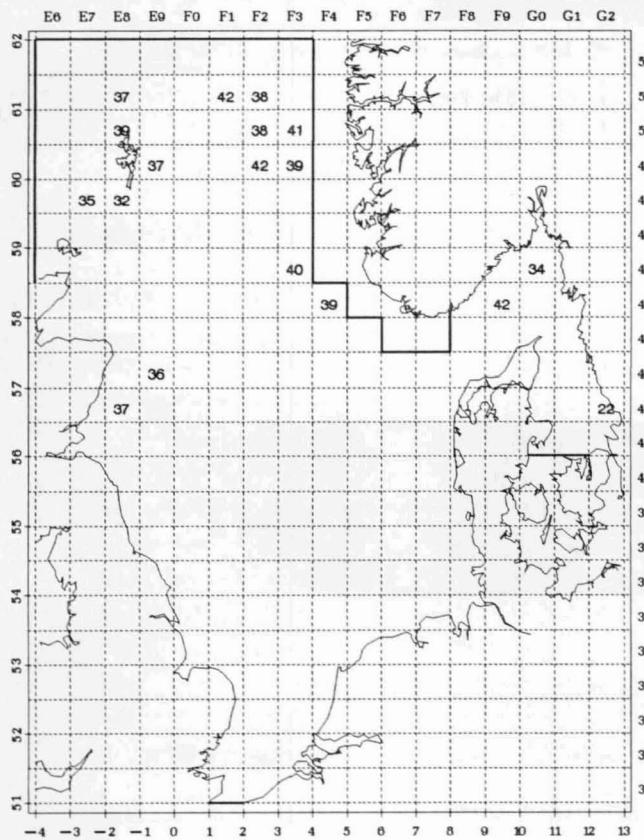
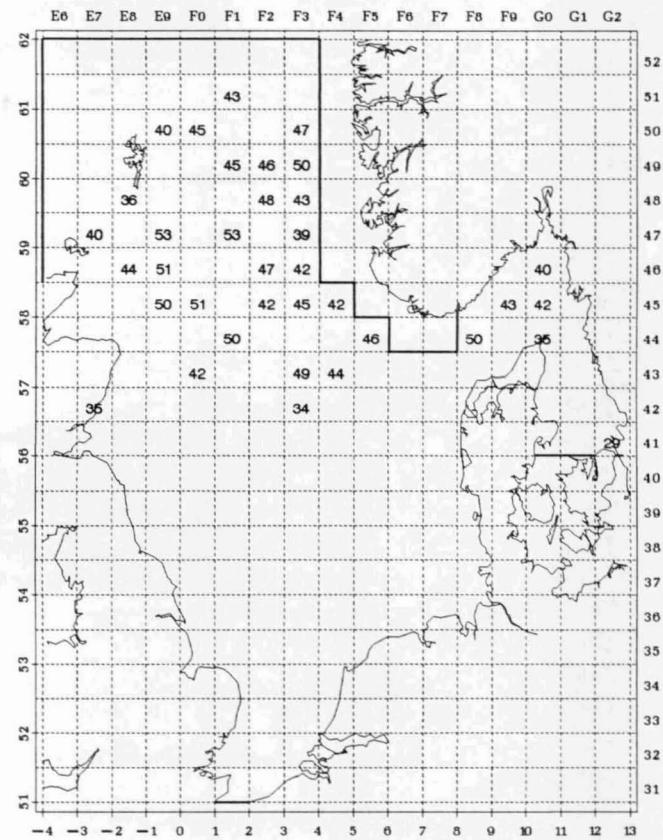


Figure 4.34 Saithe: number per hour, age-group 3+.

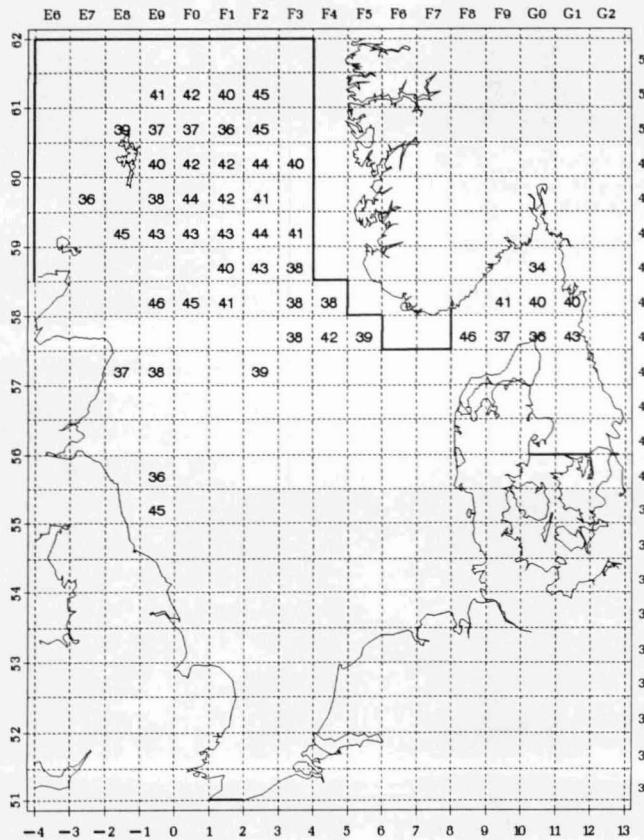
Saithe, Age group 2 1993 quarter 1



Saithe, Age group 2 1993 quarter 2



Saithe, Age group 2 1993 quarter 3



Saithe, Age group 2 1993 quarter 4

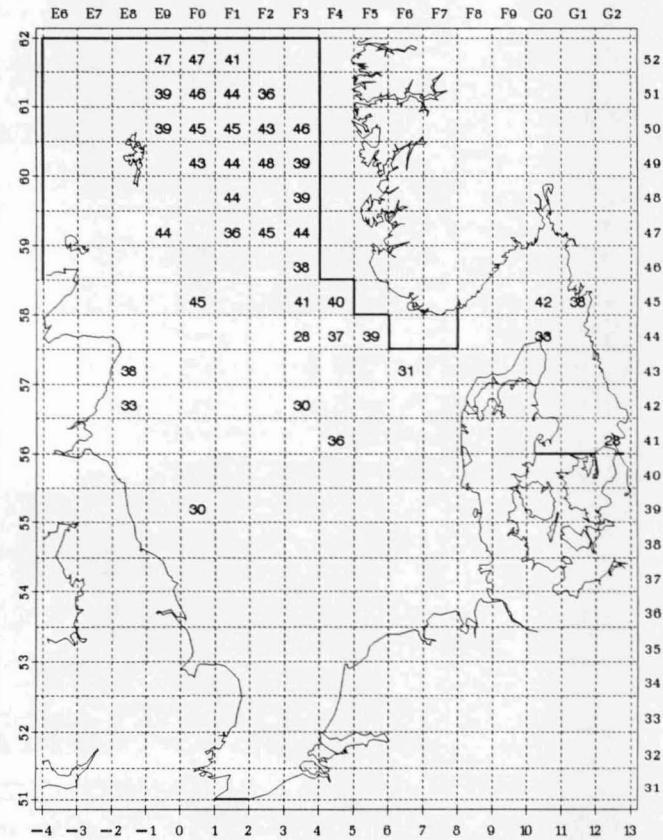
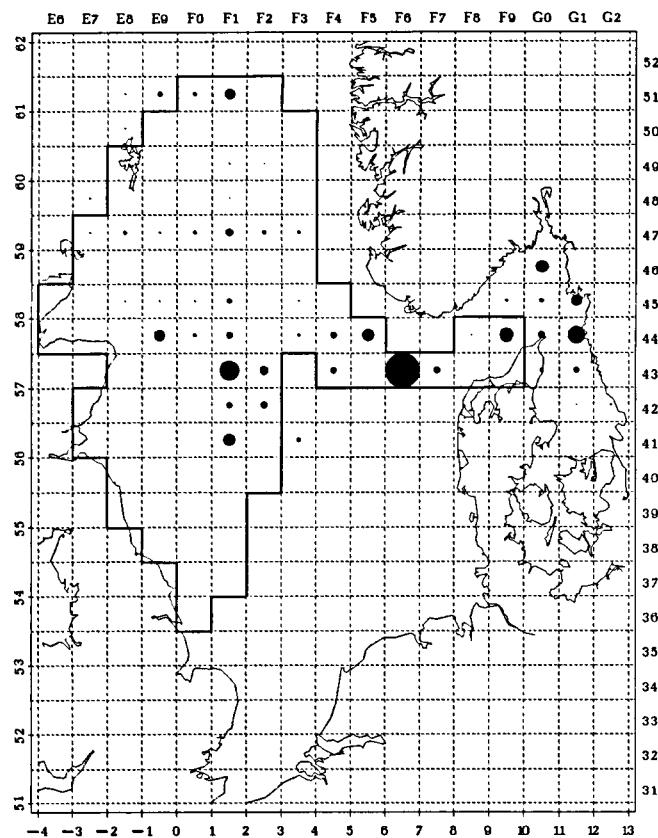


Figure 4.35 Saithe: mean length (cm below), age-group 2.

Norway pout, Age group 0 1993 quarter 3
Max mean catch number per rectangle: 167108



Norway pout, Age group 0 1993 quarter 4
Max mean catch number per rectangle: 58887

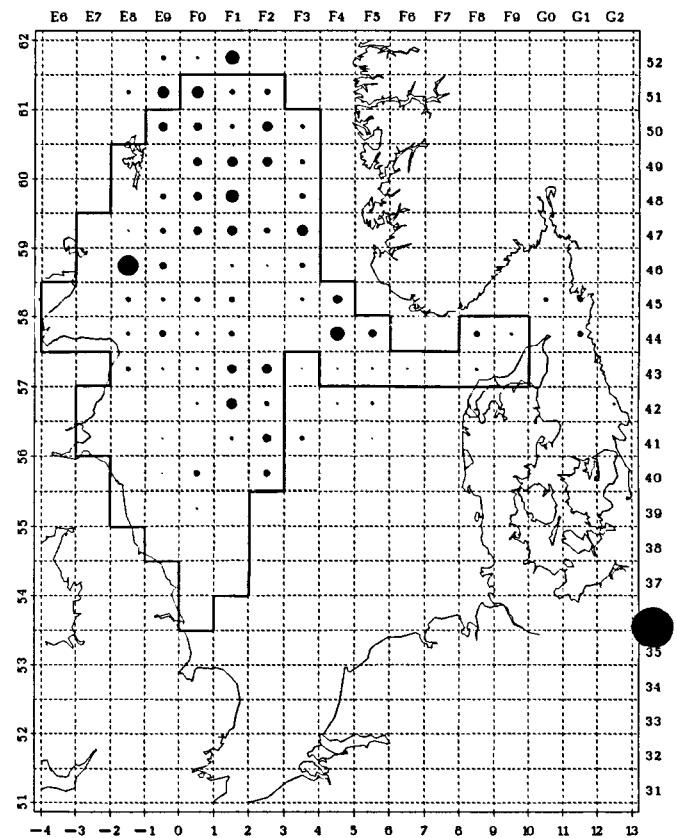
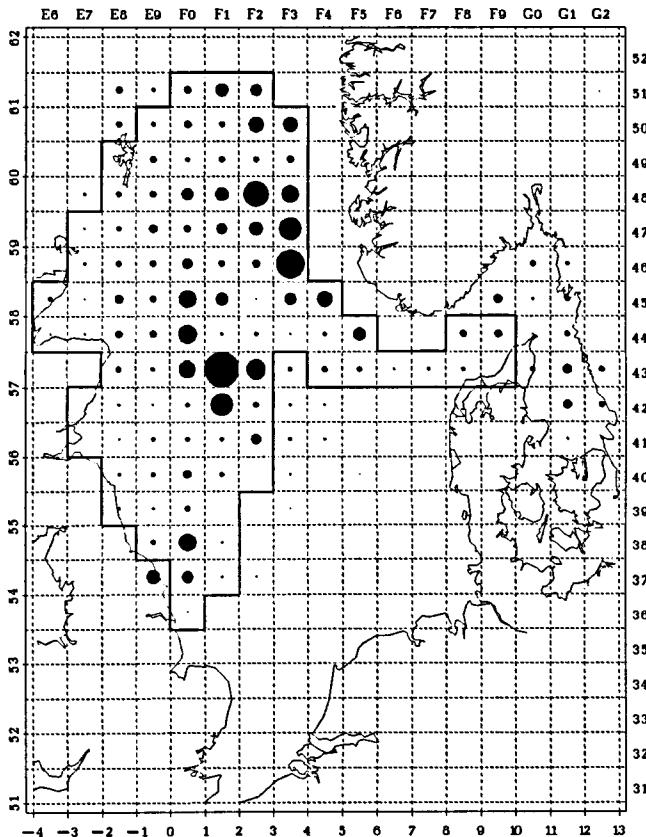
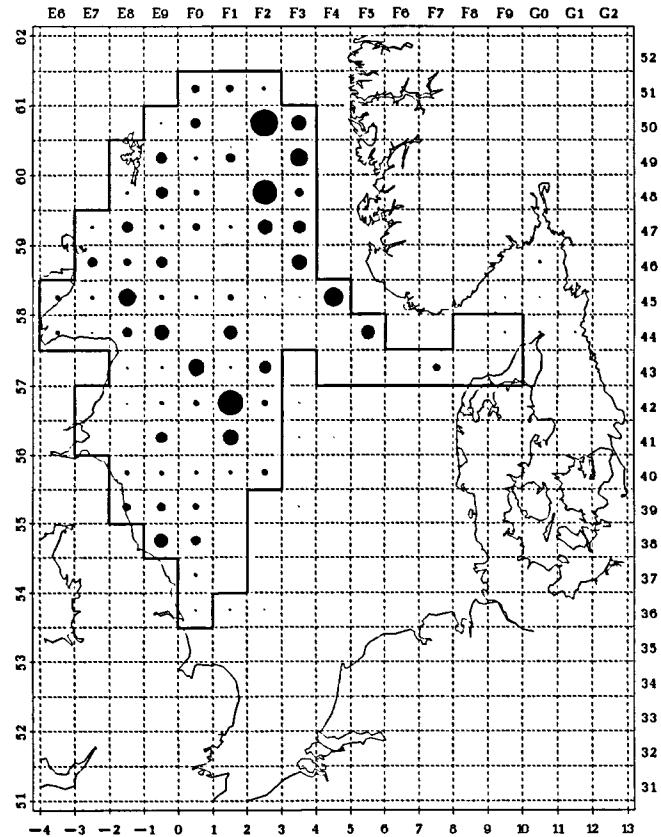


Figure 4.36 Norway pout: number per hour, age-group 0.

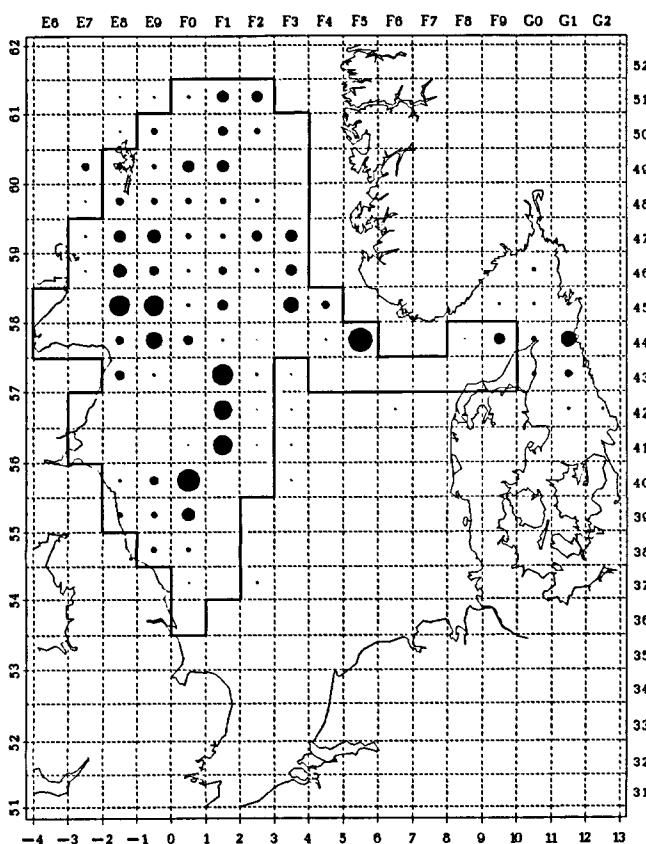
Norway pout, Age group 1 1993 quarter 1
Max mean catch number per rectangle: 31324



Norway pout, Age group 1 1993 quarter 2
Max mean catch number per rectangle: 19452



Norway pout, Age group 1 1993 quarter 3
Max mean catch number per rectangle: 15059



Norway pout, Age group 1 1993 quarter 4
Max mean catch number per rectangle: 29897

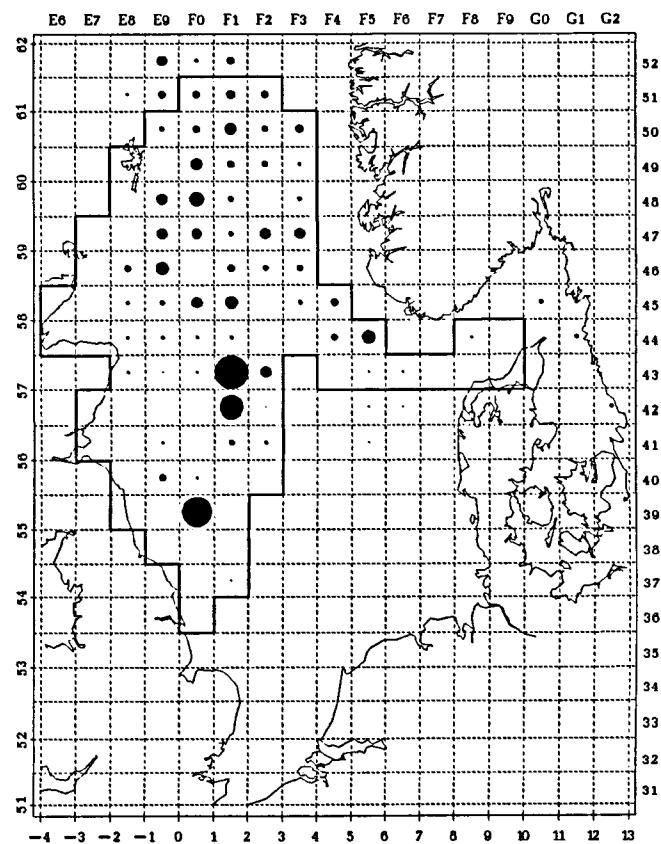
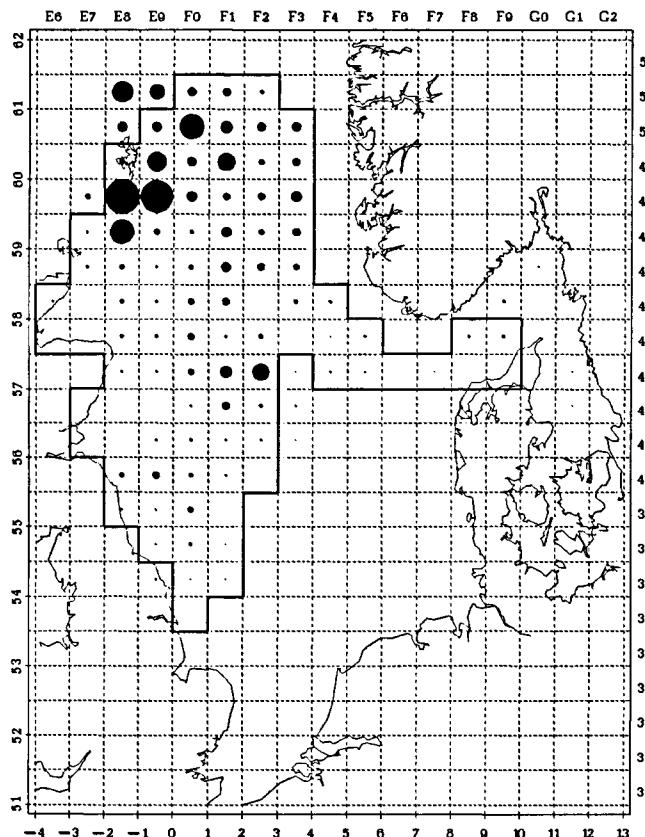
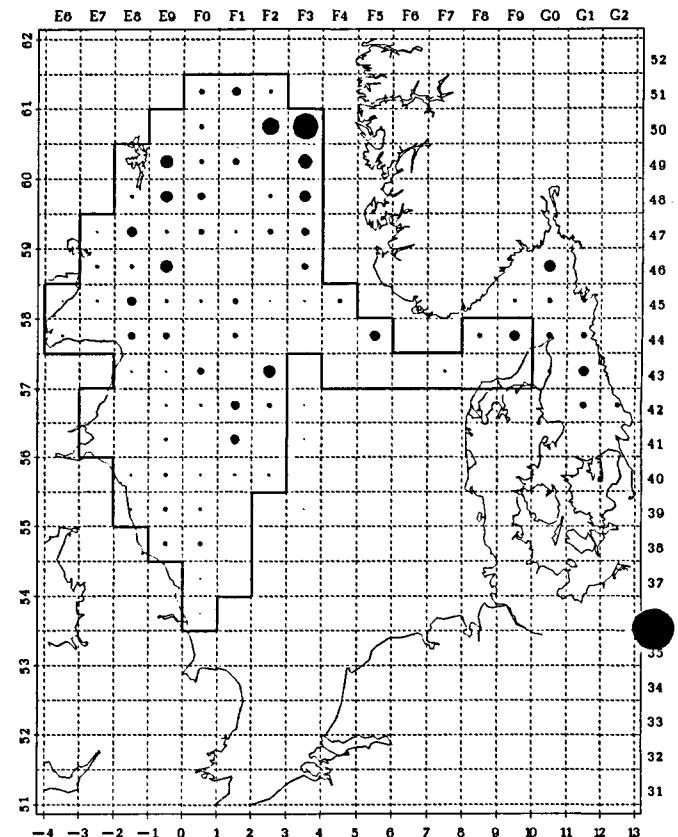


Figure 4.37 Norway pout: number per hour, age-group 1.

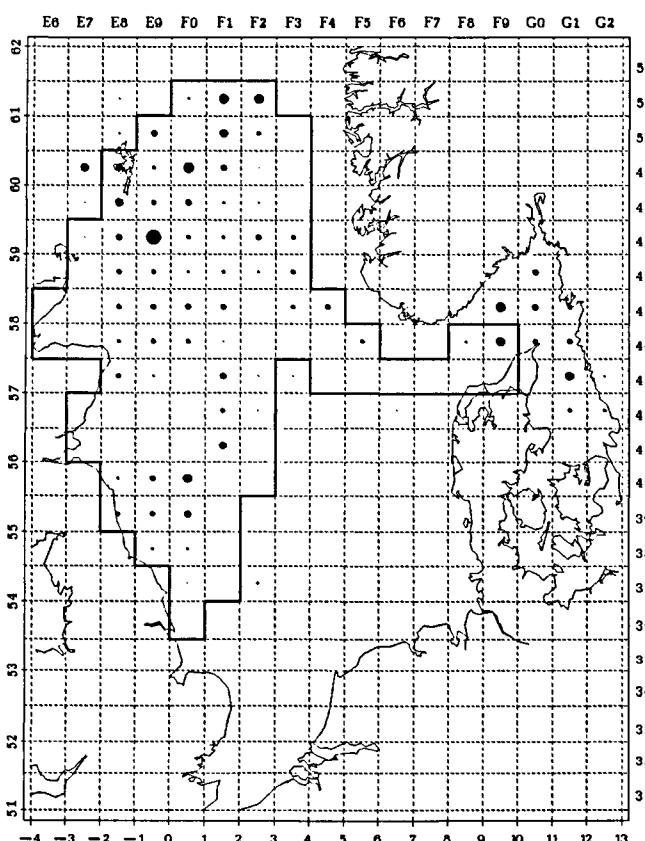
Norway pout, Age group 2 1993 quarter 1
Max mean catch number per rectangle: 45939



Norway pout, Age group 2 1993 quarter 2
Max mean catch number per rectangle: 23604



Norway pout, Age group 2 1993 quarter 3
Max mean catch number per rectangle: 8284



Norway pout, Age group 2 1993 quarter 4
Max mean catch number per rectangle: 8130

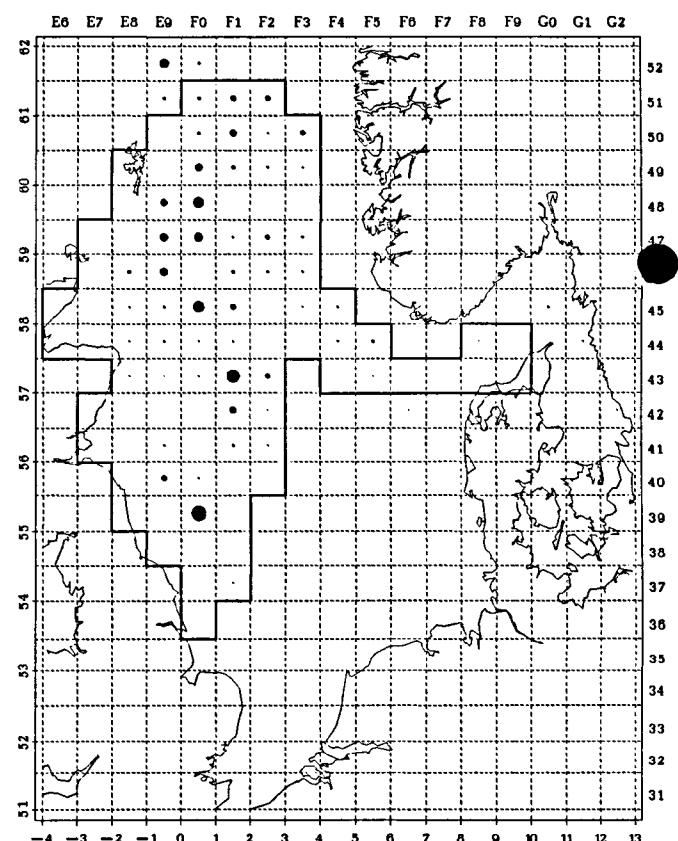
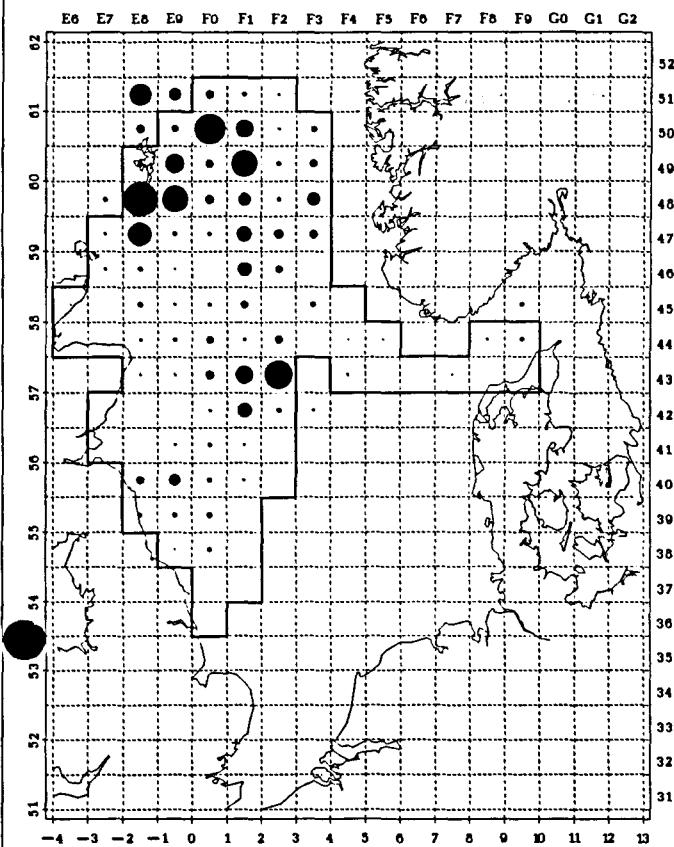
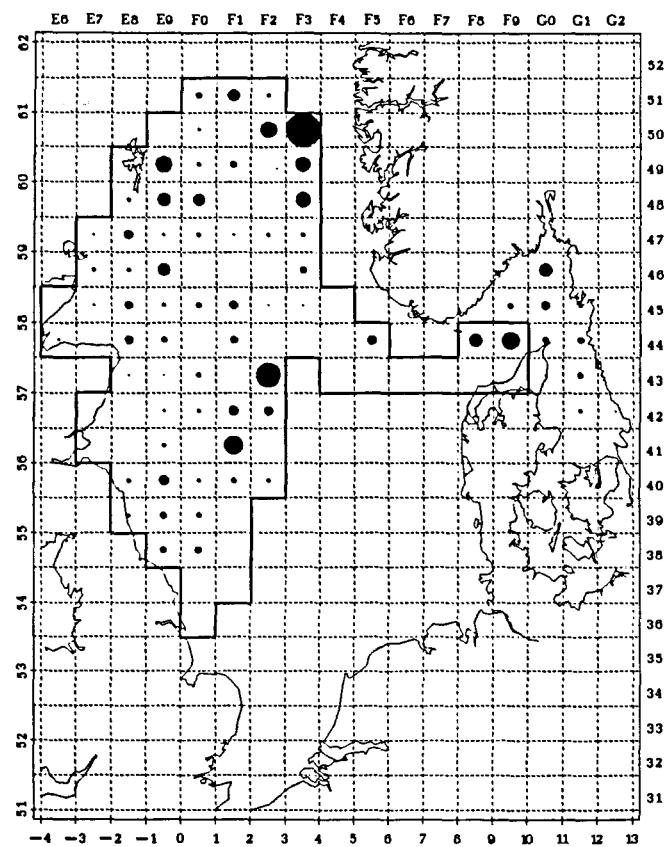


Figure 4.38 Norway pout: number per hour, age-group 2.

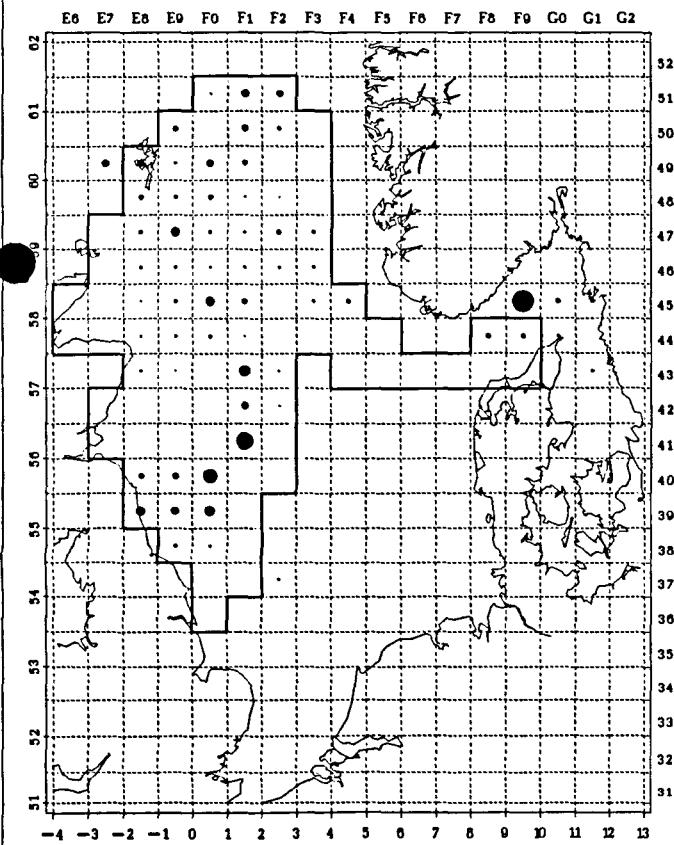
Norway pout, Age group 3+ 1993 quarter
Max mean catch number per rectangle: 3718



1 Norway pout, Age group 3+ 1993 quarter 2
Max mean catch number per rectangle: 3912



Norway pout, Age group 3+ 1993 quarter
Max mean catch number per rectangle: 1492



3 Norway pout, Age group 3+ 1993 quarter 4
Max mean catch number per rectangle: 575

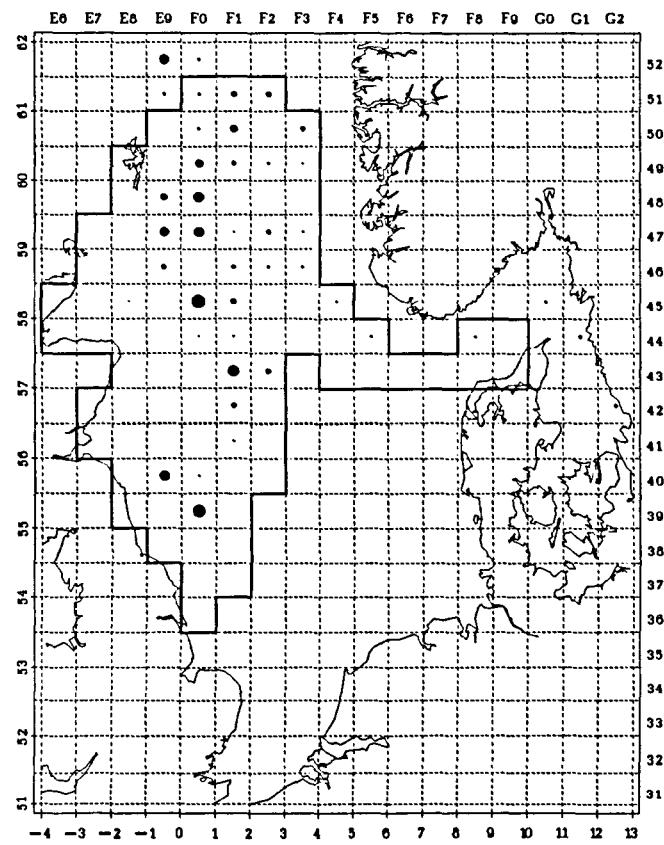
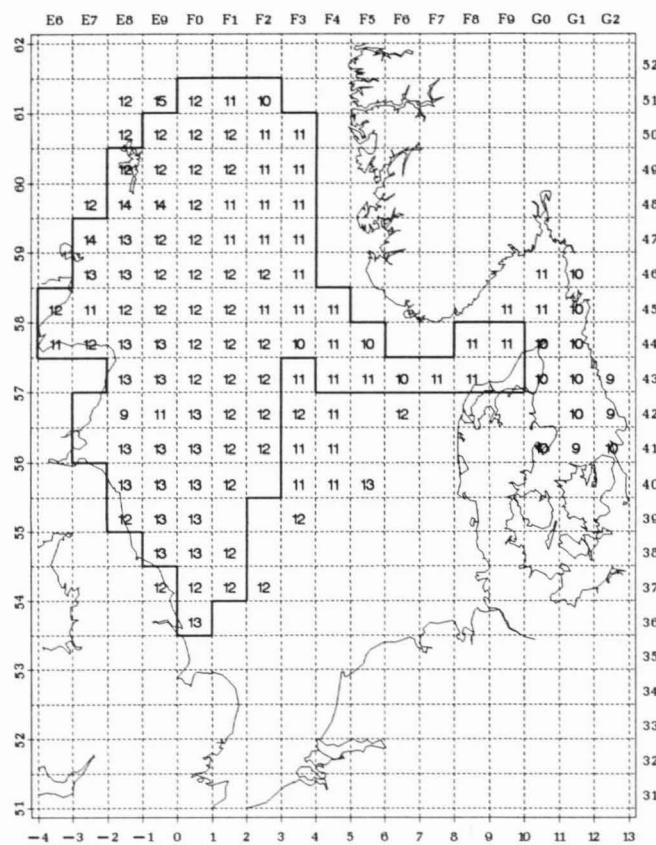
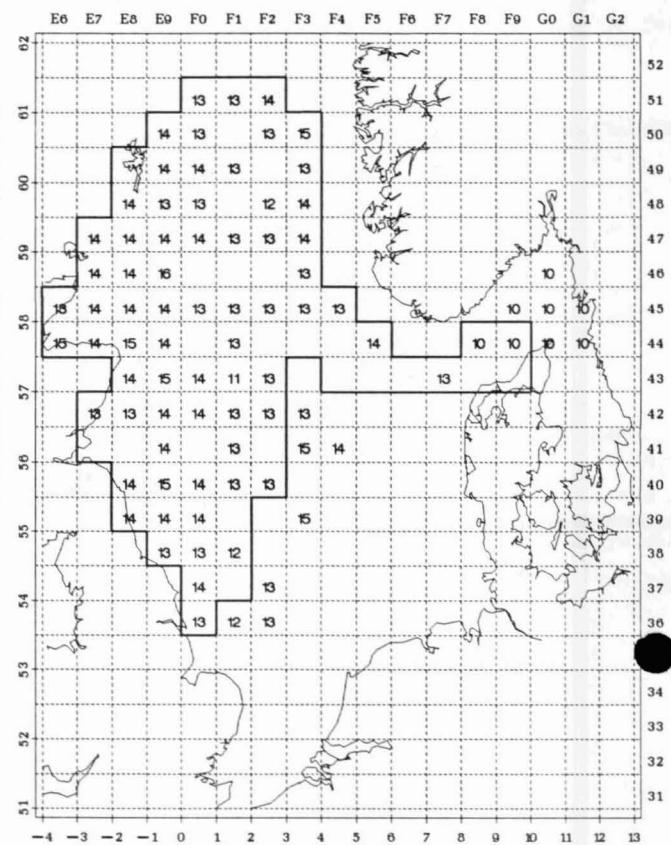


Figure 4.39 Norway pout: number per hour, age-group 3+.

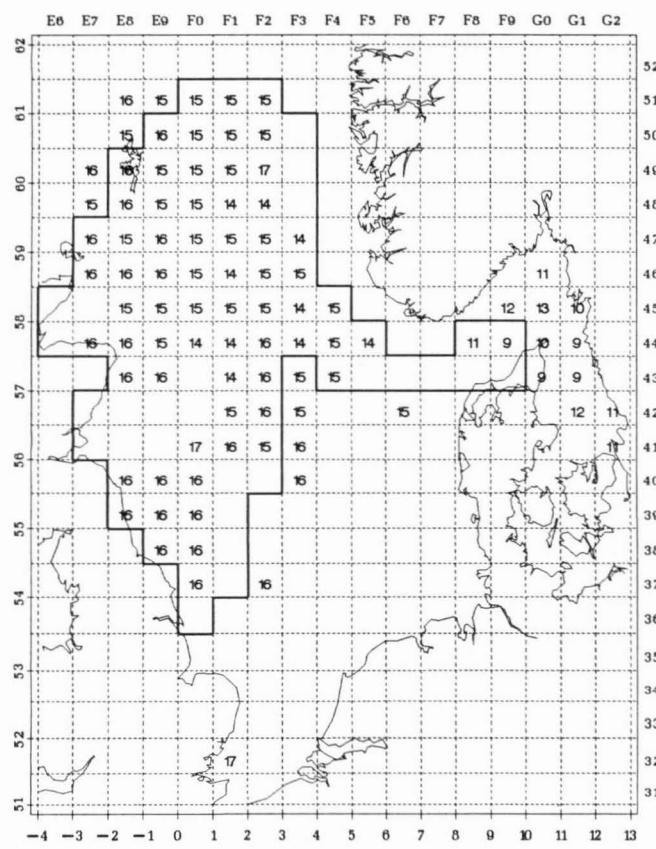
Norway pout, Age group 1 1993 quarter 1



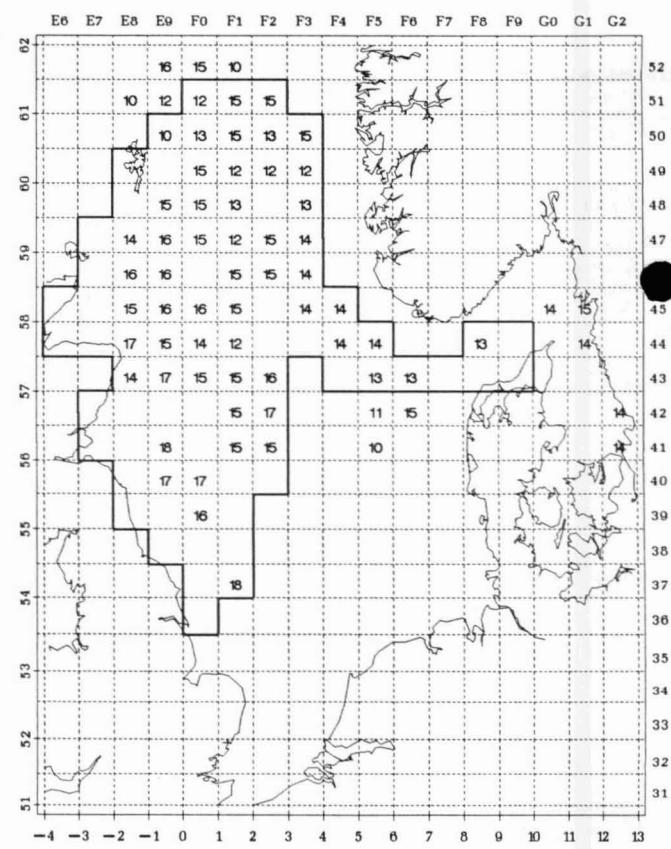
Norway pout, Age group 1 1993 quarter 2



Norway pout, Age group 1 1993 quarter 3



Norway pout, Age group 1 1993 quarter 4



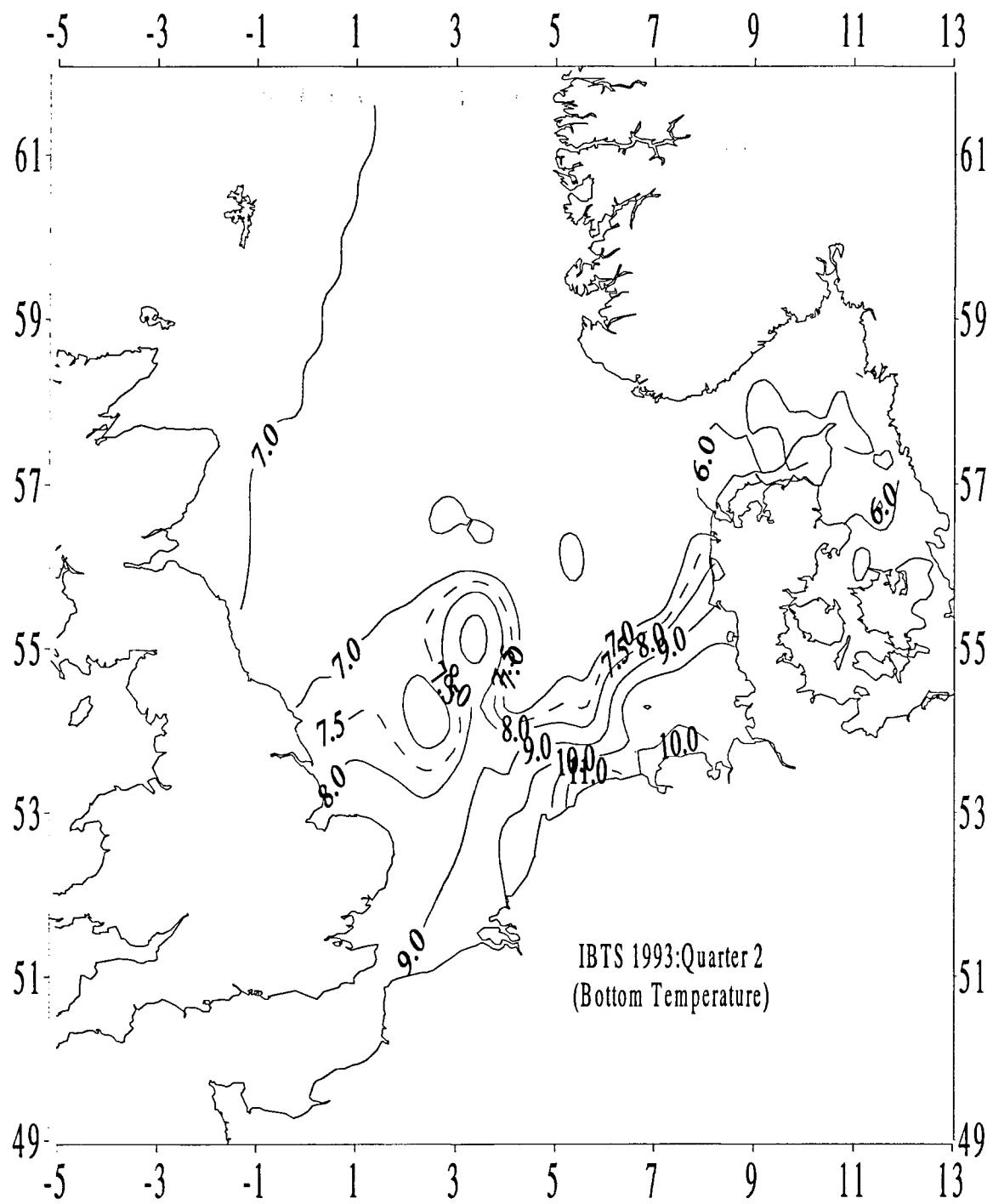


Figure 5.1

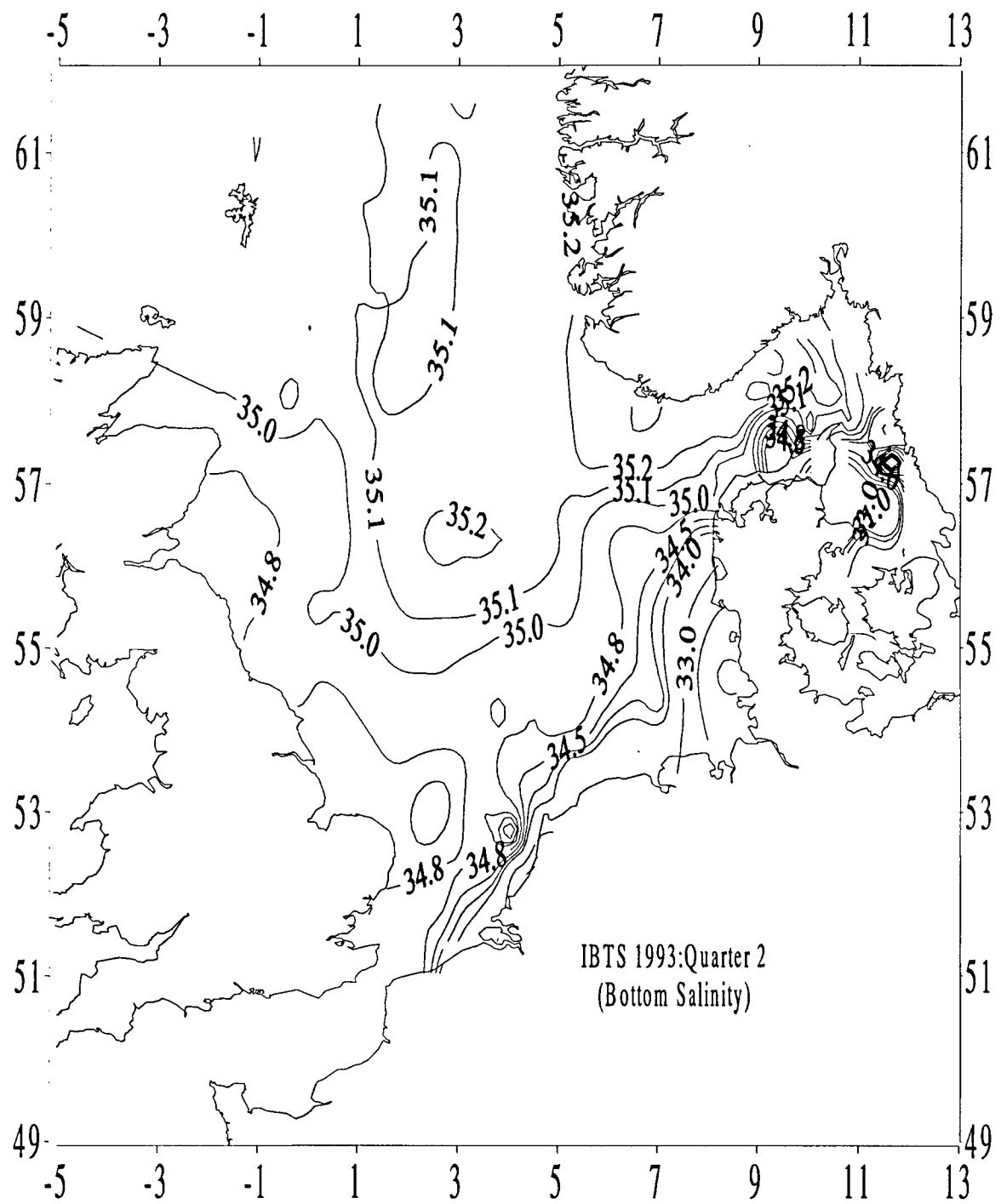


Figure 5.2

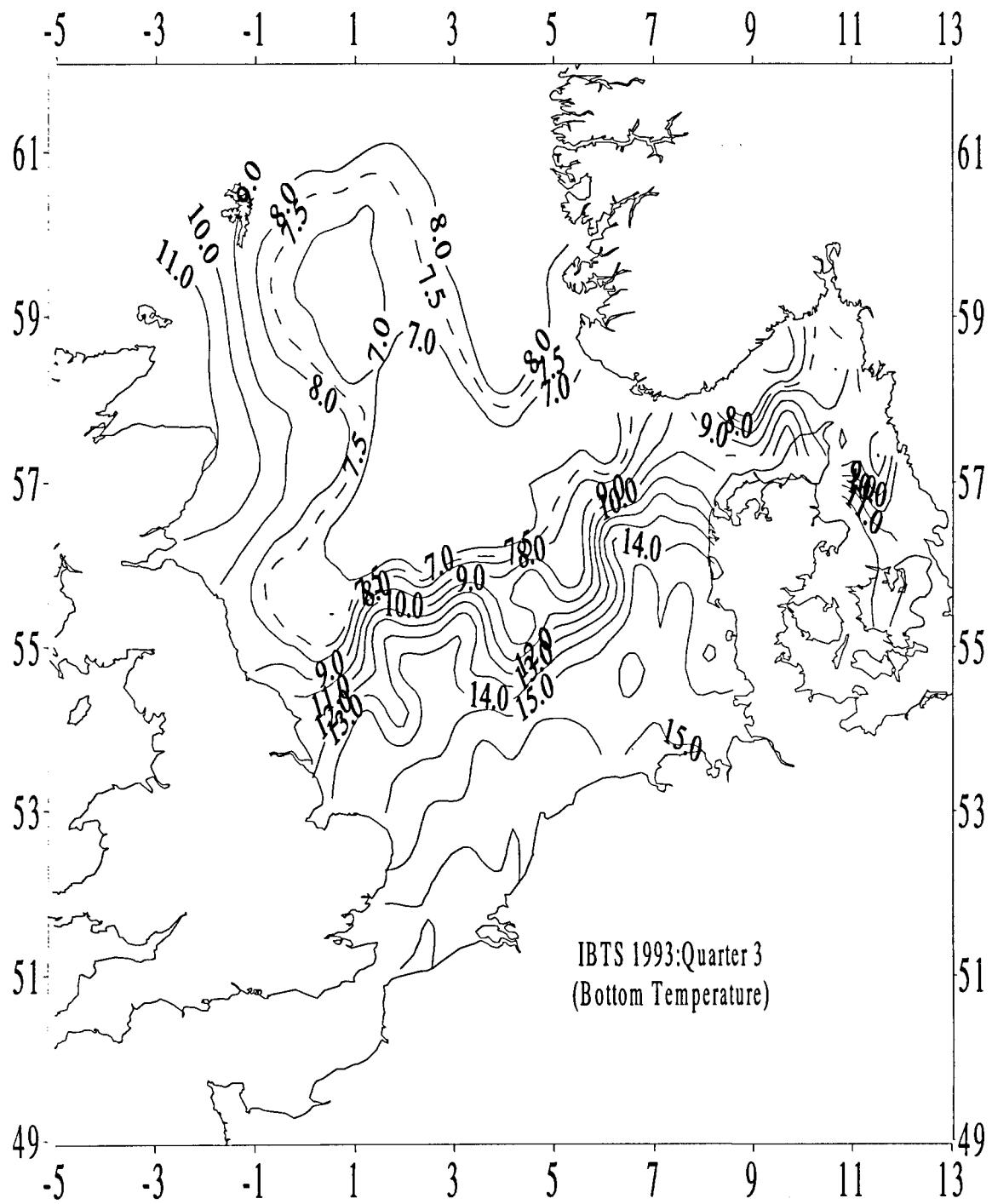


Figure 5.3

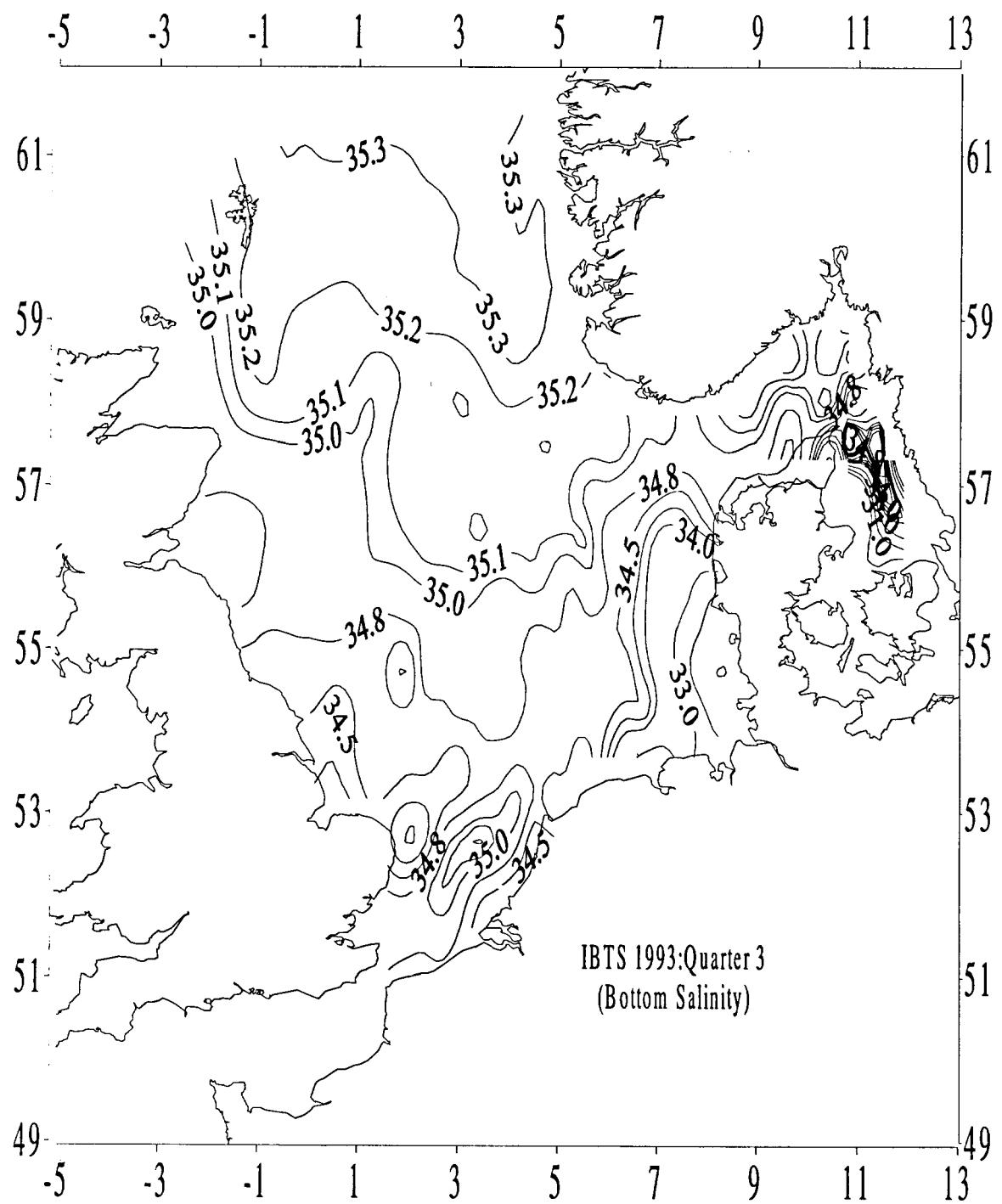


Figure 5.4

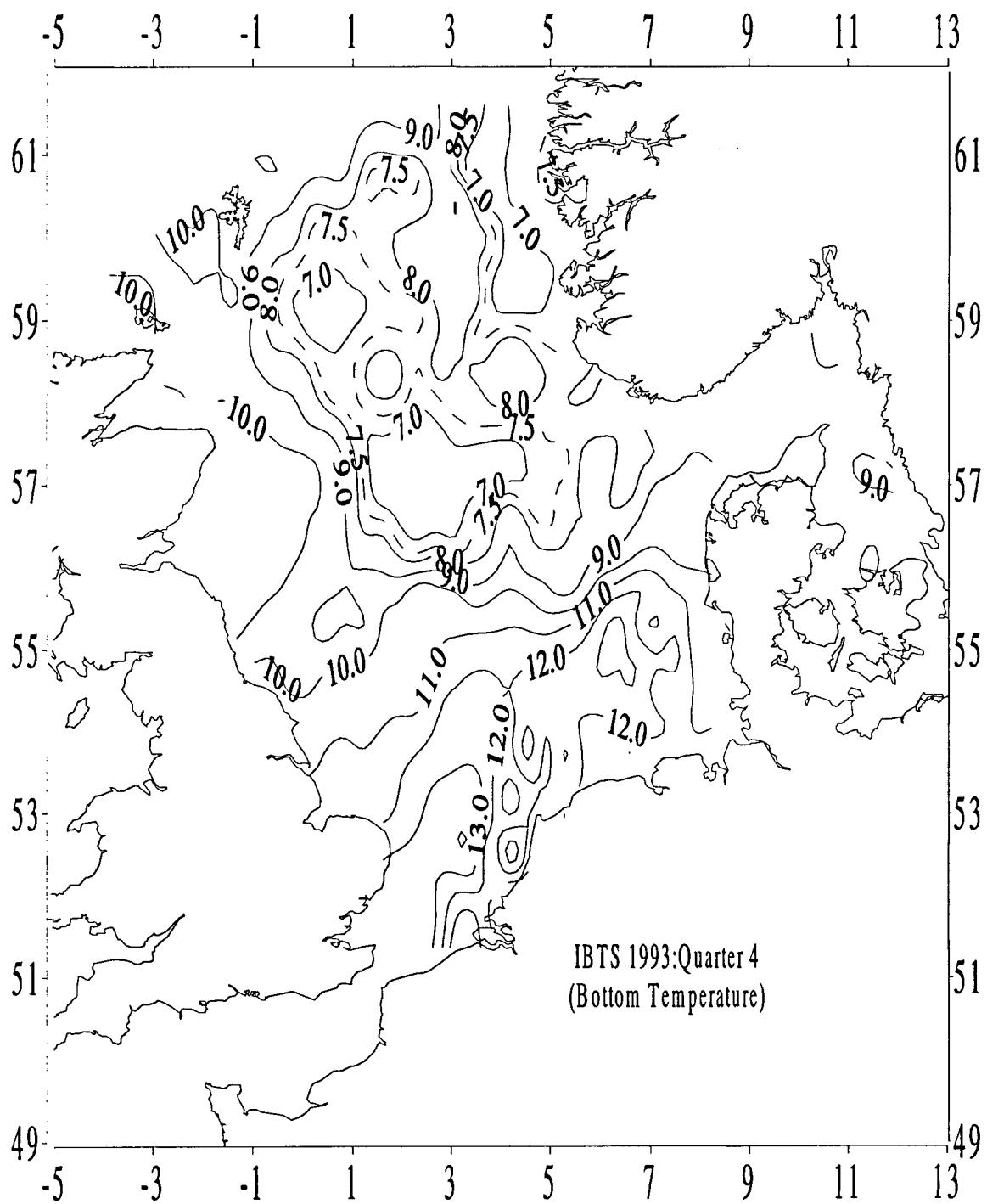


Figure 5.5

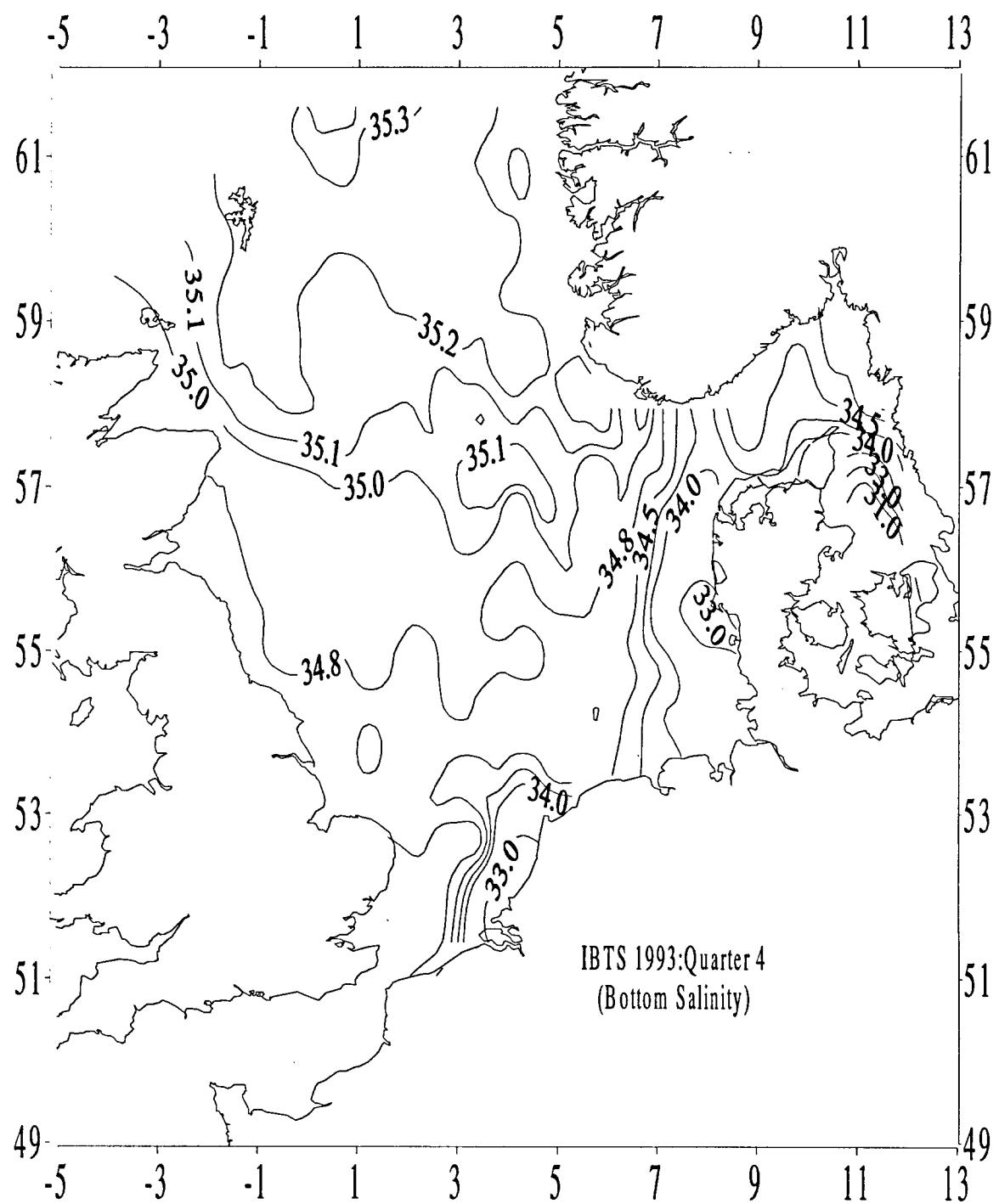


Figure 5.6