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REPORT OF THE
INTERNATIONAL BOTTOM TRAWL SURVEY IN THE
NORTH SEA, SKAGERRAK AND KATTEGAT
IN 1991: QUARTER 2, 3 AND 4

The International Bottom Trawl Survey Working Group

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International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

Palægade 2-4 DK-1261 Copenhagen K Denmark

3109/6 5041

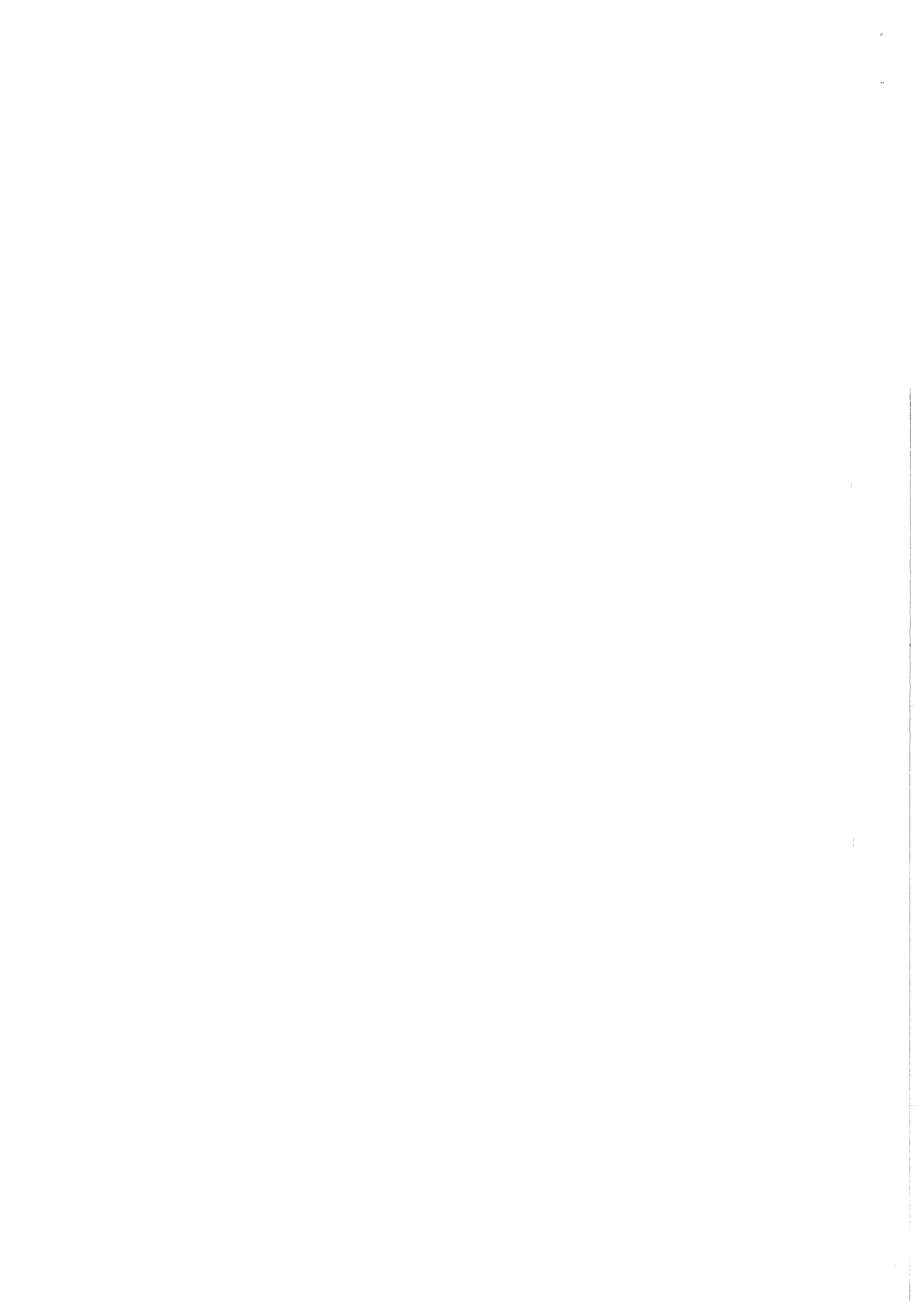


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1 INTRODUCTION

This report presents the final results for the International Bottom Trawl Survey (IBTS) in the second, third and fourth quarter of 1991. 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. The results for 1991, 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 esmarki*). 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 1991 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-ringings in third and fourth quarter are calculated in a similar way as for the 1-ringings.

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 1991, a Dutch Herring Trawl 48 ft trawl has been used by "Cirolana" and "Scotia" used a Granton Trawl. In the calculation of indices it is assumed that all trawl types have the same size and fishing power.

4 RESULTS FOR 1991

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 1991 represent year class 1989.

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: 363 stations from 15 April to 27 June from six ships (“Walter Herwig”, “Johan Hjort”, “Isis”, “Tridens”, “Cirolana”, and “Argos”)

Quarter 3: 127 stations from 13 August to 26 September from three ships (“Isis”, “Tridens”, and “Argos”)

Quarter 4: 231 stations from 20 October to 19 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/1991>. The ftp directory also includes charts showing the location of the stations.

6 REFERENCES

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 1991.

Year	Country	Vessel	Period	Number of Hauls		
				DHT48	GOV	GRT
1991 Quarter 1	Sweden	Argos	5/2–28/2		53	
	Denmark	Dana	7/2–21/2		40	
	Netherlands	Isis	4/2–14/2		23	
	Norway	Johan Hjort	20/1–6/2		54	
	UK Scotland	Scotia	29/1–17/2		66	
	France	Thalassa	7/1–21/2		77	
	Netherlands	Tridens	29/1–21/2		36	
	Germany	Walter Herwig	24/1–14/2		92	
Quarter 2	Sweden	Argos	15/4–25/4		40	
	UK England	Cirolana	11/5–5/6		77	
	Netherlands	Isis	30/5–30/5		29	
	Norway	Johan Hjort	7/6–19/6		27	
	UK Scotland	Scotia	11/5–19/6		57	
	Netherlands	Tridens	3/6–25/6		53	
	Germany	Walter Herwig	17/5–16/6		70	
Quarter 3	Sweden	Argos	10/9–26/9		49	
	UK England	Cirolana	9/8–4/9			89
	Netherlands	Isis	13/8–21/8		26	
	UK Scotland	Scotia	9/8–28/8	91		
	Netherlands	Tridens	19/8–5/9		47	
Quarter 4	UK England	Cirolana	24/10–19/11		67	
	Denmark	Dana	1/11–2/12		71	
	Norway	G.O. Sars	20/10–6/11		47	
	Netherlands	Isis	21/10–6/11		35	
	Netherlands	Tridens	21/10–7/11		37	

Gear used:

DHT48 Dutch Herring Trawl 48 ft

GOV Grand Overture Verticale trawl

GRT Granton Trawl

Table 4.1 Number of otoliths sampled per species, roundfish area and quarter in 1991

Species	Roundfish area									Total
	1	2	3	4	5	6	7	8	9	
Quarter 1										
Herring	2,257	610	476	1,149	364	2,929	2,117	412	641	10,955
Sprat	13	5	103	379	97	1,862	650	39	200	3,348
Mackerel	109	1	2	-	-	-	-	-	-	112
Cod	813	403	184	128	44	493	353	247	239	2,904
Haddock	1,222	1,203	711	386	-	-	403	151	35	4,111
Whiting	833	925	688	662	421	1,345	796	233	197	6,100
Saithe	49	6	-	-	-	-	-	-	-	55
Norway pout	307	167	133	62	-	-	110	102	41	922
Quarter 2										
Herring	699	505	494	536	263	356	147	240	330	3,570
Sprat	-	43	91	166	215	177	31	33	154	910
Mackerel	49	85	2	19	28	196	-	-	-	379
Cod	752	690	198	110	57	751	332	269	256	3,411
Haddock	1,340	1,040	548	387	3	15	412	102	23	3,870
Whiting	844	892	465	454	368	966	501	184	155	4,829
Saithe	248	9	12	-	-	2	5	-	-	276
Norway pout	437	196	117	128	-	13	95	-	-	986
Quarter 3										
Herring	254	426	564	508	41	109	40	246	521	2,709
Sprat	-	2	17	132	117	53	-	28	23	372
Mackerel	153	85	148	30	-	152	-	-	-	568
Cod	503	417	272	106	14	86	148	380	337	2,263
Haddock	1,492	777	892	175	-	2	211	-	-	3,549
Whiting	1,132	636	708	321	209	435	262	-	-	3,703
Saithe	389	33	21	1	-	-	-	-	-	444
Norway pout	229	96	96	39	-	-	25	-	-	485
Quarter 4										
Herring	320	648	-	129	27	766	72	-	984	2,946
Sprat	-	282	-	88	127	506	14	130	-	1,147
Mackerel	117	3	90	-	-	90	-	-	-	300
Cod	470	177	33	27	30	351	112	99	127	1,426
Haddock	669	570	392	49	-	23	168	162	-	2,033
Whiting	554	532	373	181	157	817	335	207	175	3,331
Saithe	286	6	-	-	-	-	25	-	-	317
Norway pout	218	202	146	50	-	16	3	105	-	740

Table 4.2 Age composition of standard species in 1991 for the relevant standard areas.

	Quarter	Age						6+
		0	1	2	3	4	5	
Herring	1	.0	1,180.3	763.2	268.3	240.4	162.0	-
	2	.0	1,869.2	658.8	314.6	72.7	181.7	-
	3	634.9	2,575.2	215.8	97.4	66.6	110.3	-
	4	1,077.6	454.0	12.3	5.0	6.5	15.9	-
Sprat	1	.0	1,117.8	113.6	25.7	3.2	.2	-
	2	.0	1,118.2	643.9	154.2	12.7	20.0	-
	3	16.8	416.6	150.7	57.0	1.1	.0	-
	4	1,517.9	5,278.8	443.7	457.3	13.3	.0	-
Mackerel	1	.0	6.9	.1	.0	.1	.0	.1
	2	.0	11.3	52.3	9.0	9.1	3.8	9.1
	3	.0	26.0	15.8	3.7	3.5	4.0	13.1
	4	.2	60.0	59.2	14.1	5.5	3.1	5.7
Cod	1	.0	2.3	4.7	4.4	.8	.4	.8
	2	3.5	13.3	5.4	3.9	.6	.3	.3
	3	29.4	8.2	2.5	1.2	.2	.1	.1
	4	28.4	6.9	1.9	1.3	.5	.1	.2
Haddock	1	.0	678.0	133.0	24.8	4.2	8.4	2.4
	2	.6	793.9	73.5	12.6	2.5	4.4	1.1
	3	720.4	232.8	22.9	2.8	.5	1.5	.3
	4	1,134.2	496.7	34.8	6.8	1.4	3.1	.8
Whiting	1	.0	1,009.2	686.2	479.2	70.9	37.6	7.6
	2	.0	1,380.5	335.4	182.0	59.4	24.4	10.0
	3	529.4	700.5	158.7	78.9	14.6	5.2	1.6
	4	759.1	917.2	251.4	117.3	24.2	12.3	4.9
Saithe	1	.0	.0	.1	5.0	2.2	1.0	.1
	2	.0	.5	.7	5.9	3.0	.3	.5
	3	.0	.7	.7	2.1	.4	.1	.2
	4	.2	.2	.5	9.4	1.2	.3	.3
Norway pout	1	.0	2,511.1	712.8	130.2	.2	.1	10.7
	2	2.7	2,843.4	586.4	51.4	6.1	.0	.1
	3	7,382.9	1,104.9	222.2	2.6	.0	.0	.0
	4	7,450.9	862.6	43.2	1.1	.0	.0	.0

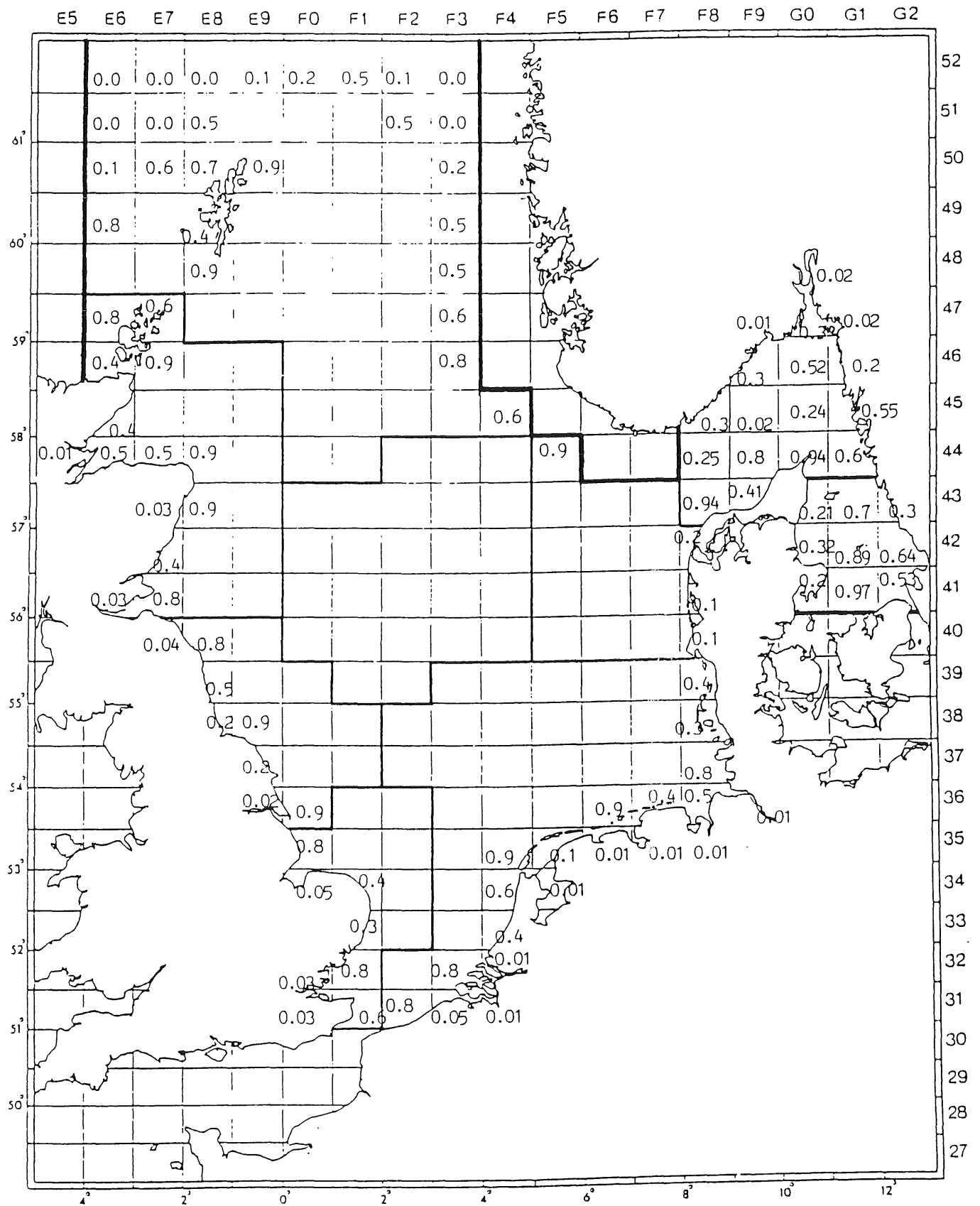
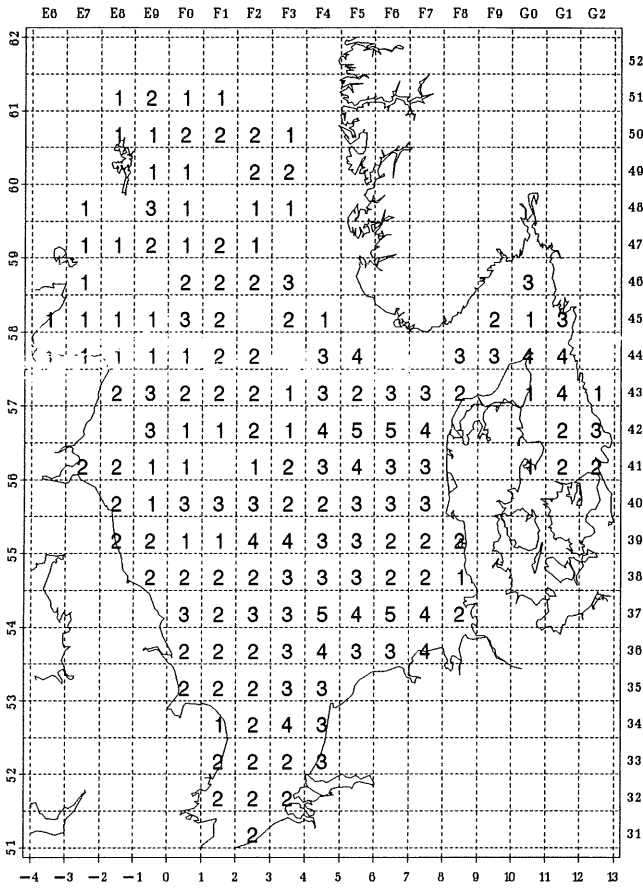
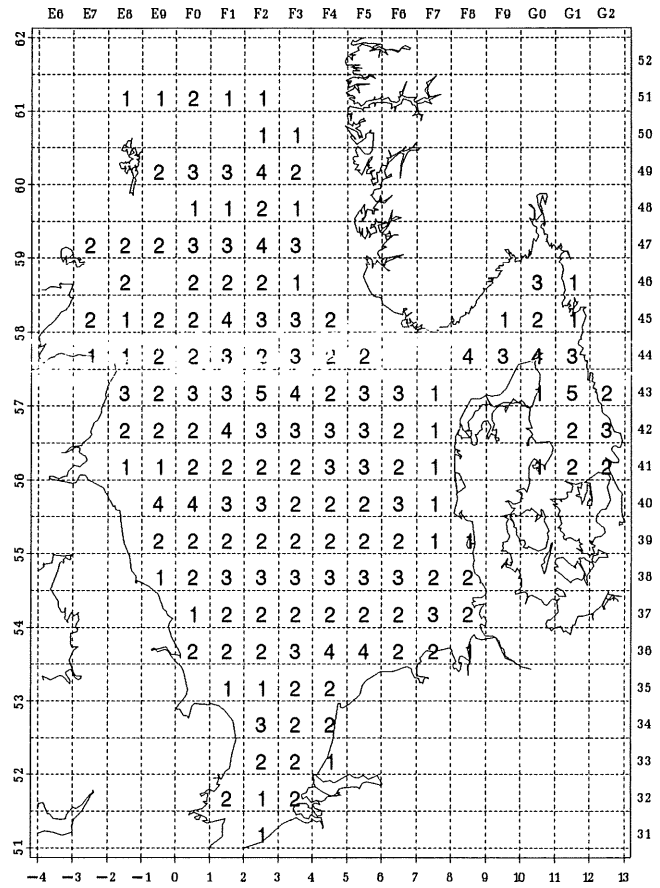


Figure 3.1 Weighting factors used in the calculation of the indices for herring and saithe. Numbers denote the relative weight of a given rectangle. Only weighting factors less than 1 are shown, other rectangles are given a weight of 1.

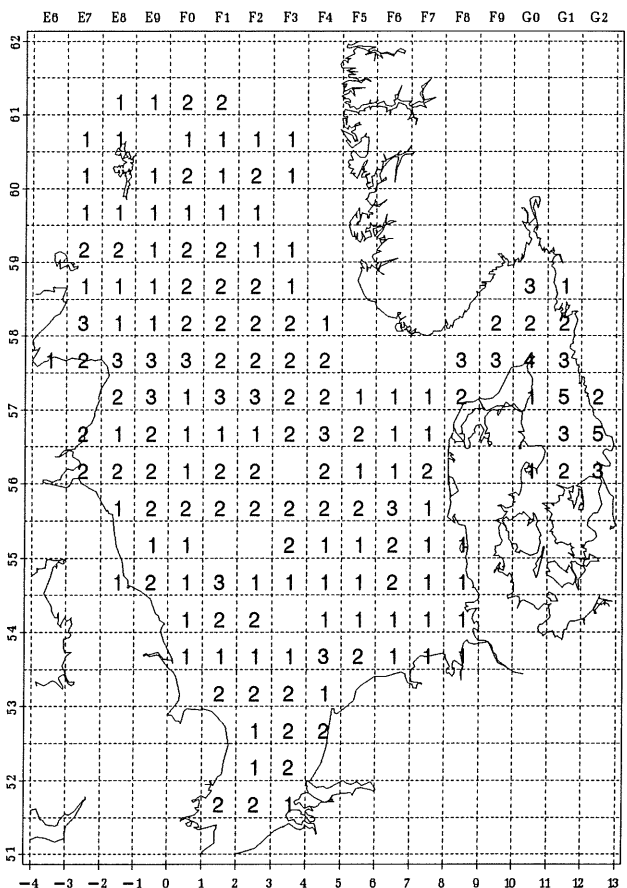
Number of daytime hauls. 1991 quarter 1



Number of daytime hauls. 1991 quarter 2



Number of daytime hauls. 1991 quarter 3



Number of daytime hauls. 1991 quarter 4

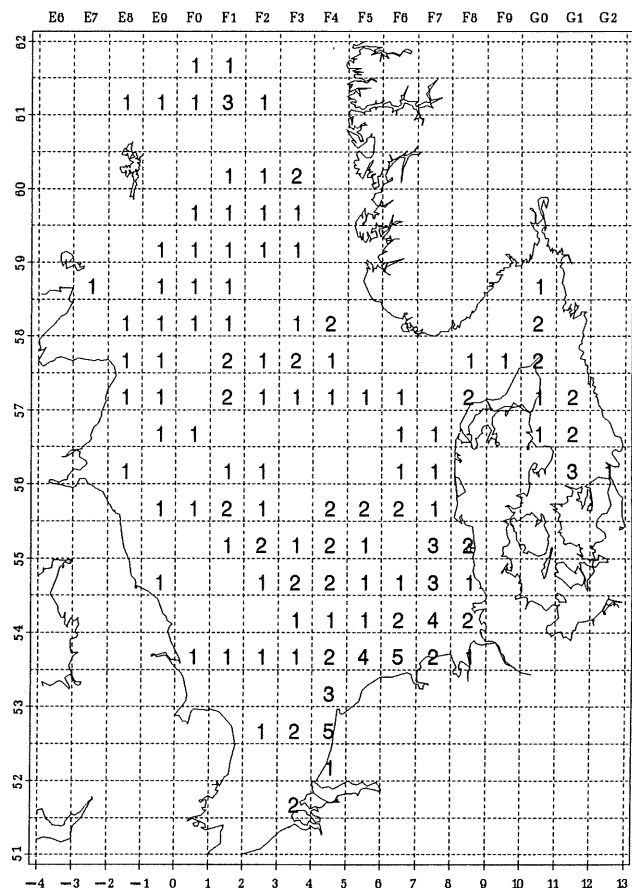
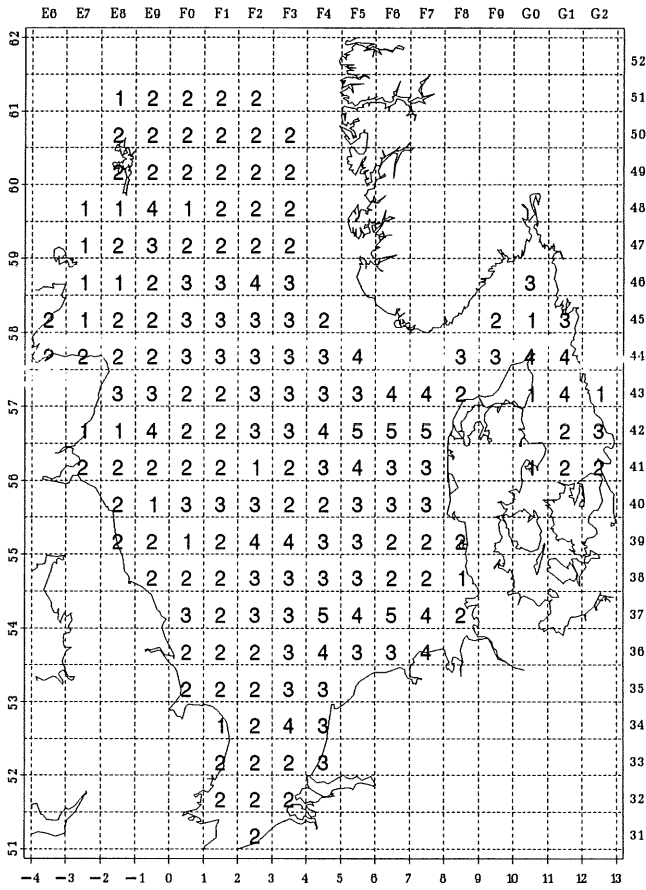
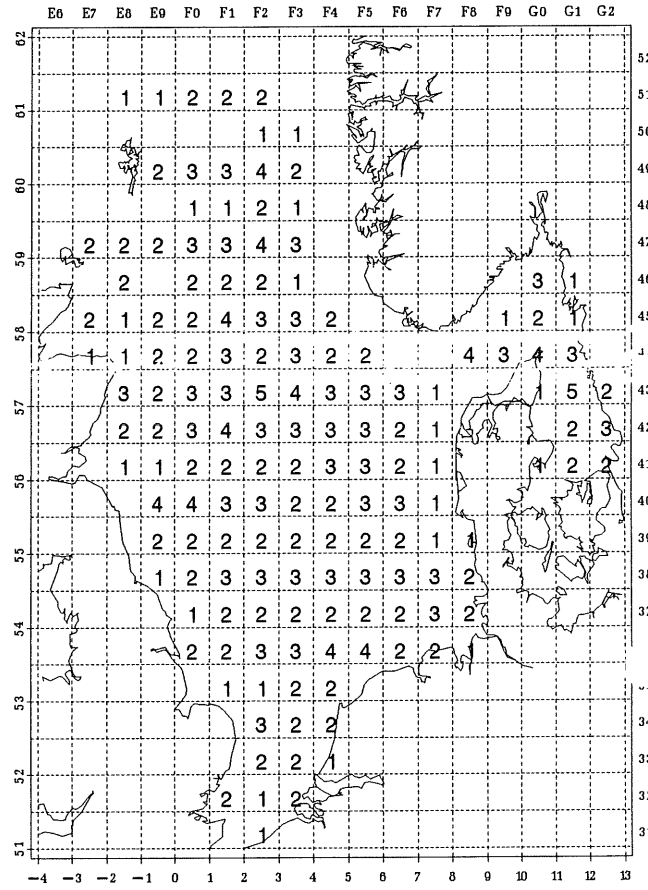


Figure 4.1 Number of valid daytime hauls.

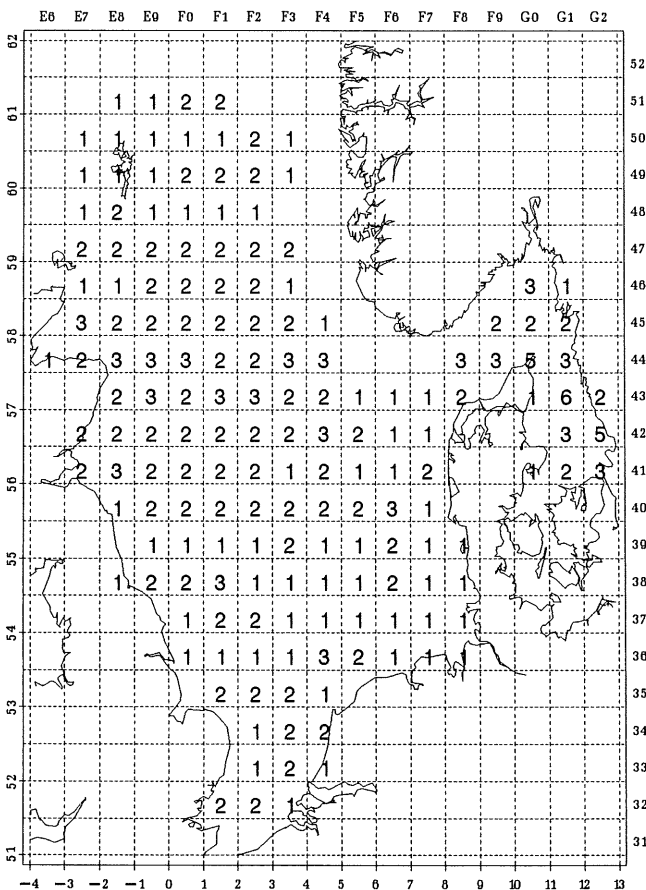
Number of hauls. 1991 quarter 1



Number of hauls. 1991 quarter 2



Number of hauls. 1991 quarter 3



Number of hauls. 1991 quarter 4

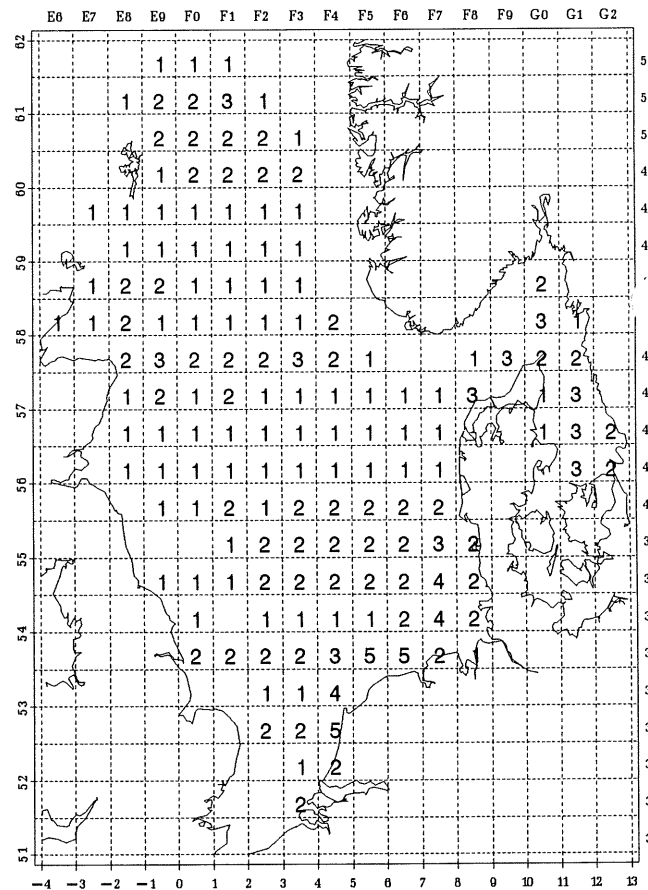
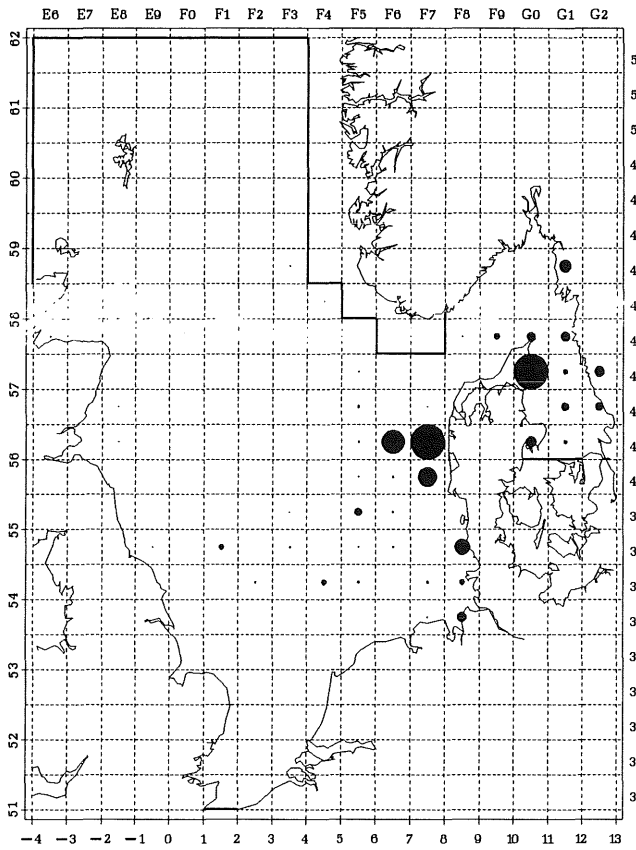


Figure 4.2 Number of valid day- and nighttime hauls.

Herring, Age group 0 1991 quarter 3
 Max mean catch number per recangle: 37283



Herring, Age group 0 1991 quarter 4
 Max mean catch number per recangle: 29986

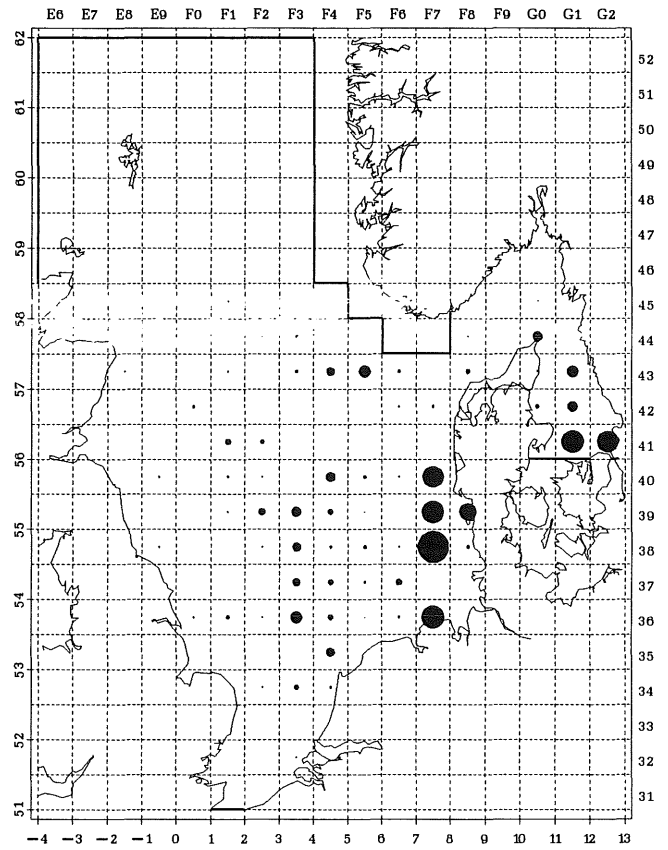
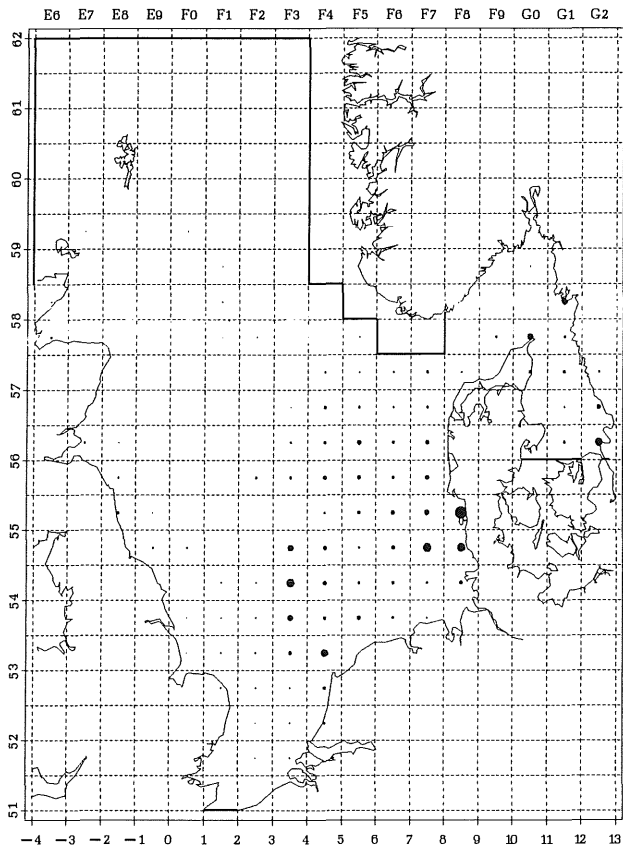
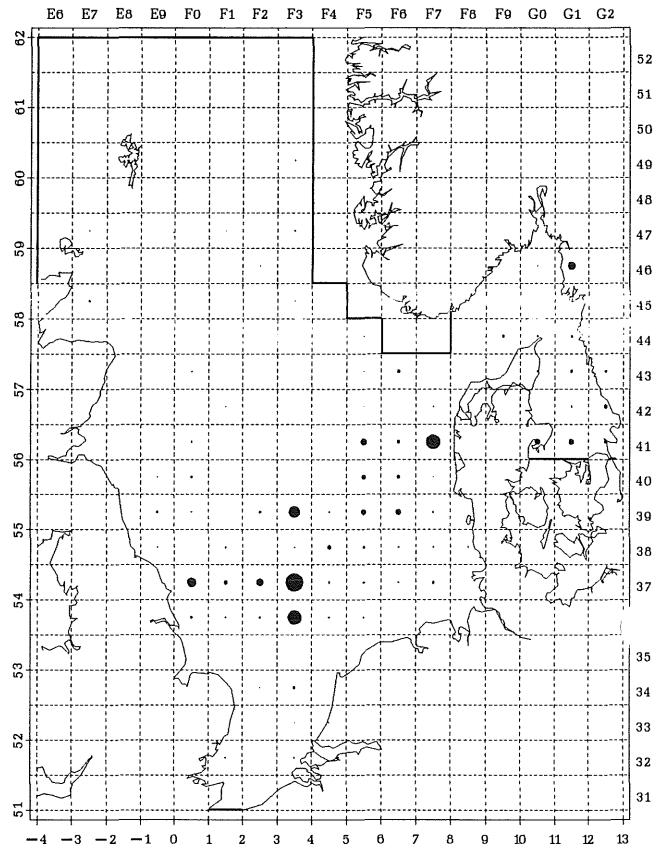


Figure 4.3 Herring: number per hour, 0-ringers.

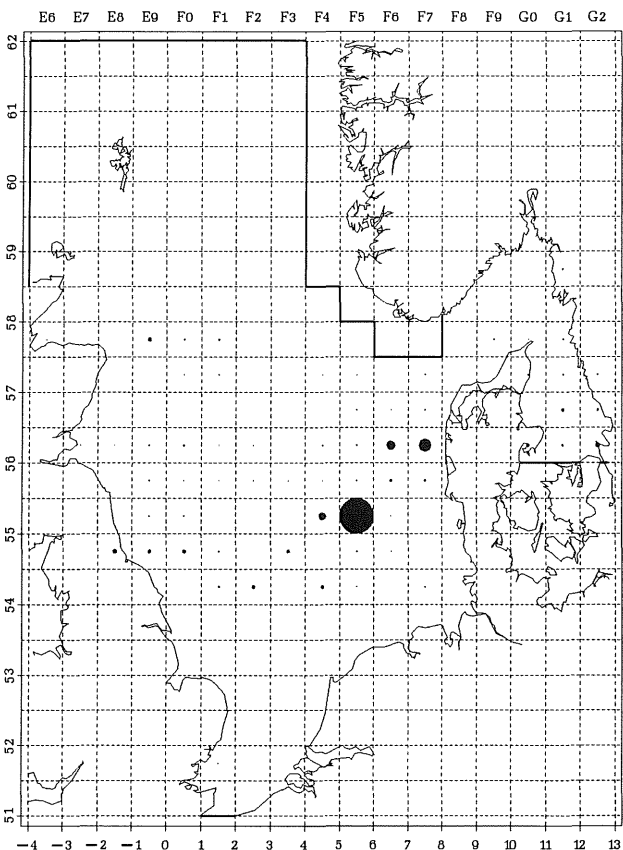
Herring, Age group 1 1991 quarter 1
 Max mean catch number per recangle: 33517



Herring, Age group 1 1991 quarter 2
 Max mean catch number per recangle: 71461



Herring, Age group 1 1991 quarter 3
 Max mean catch number per recangle: 287368



Herring, Age group 1 1991 quarter 4
 Max mean catch number per recangle: 19025

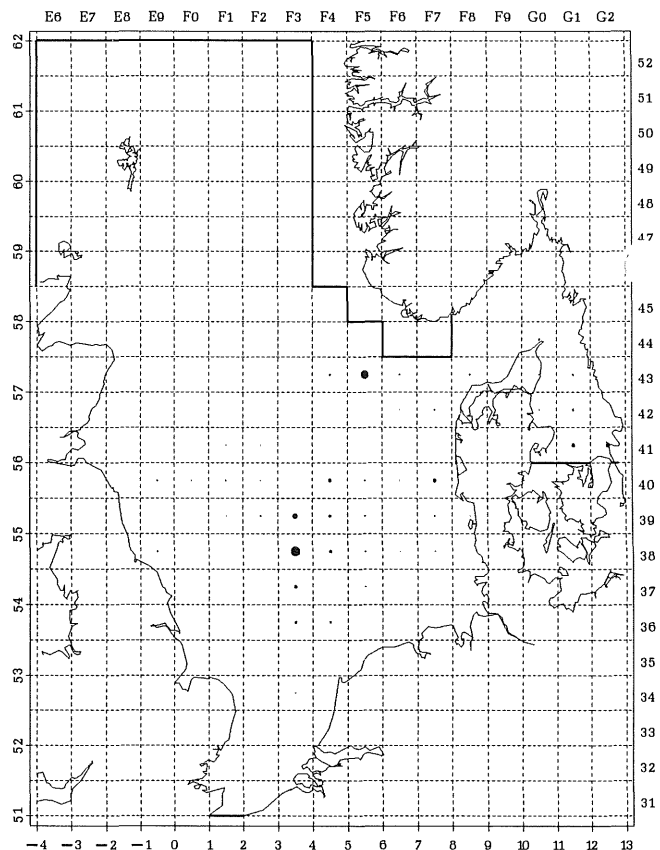
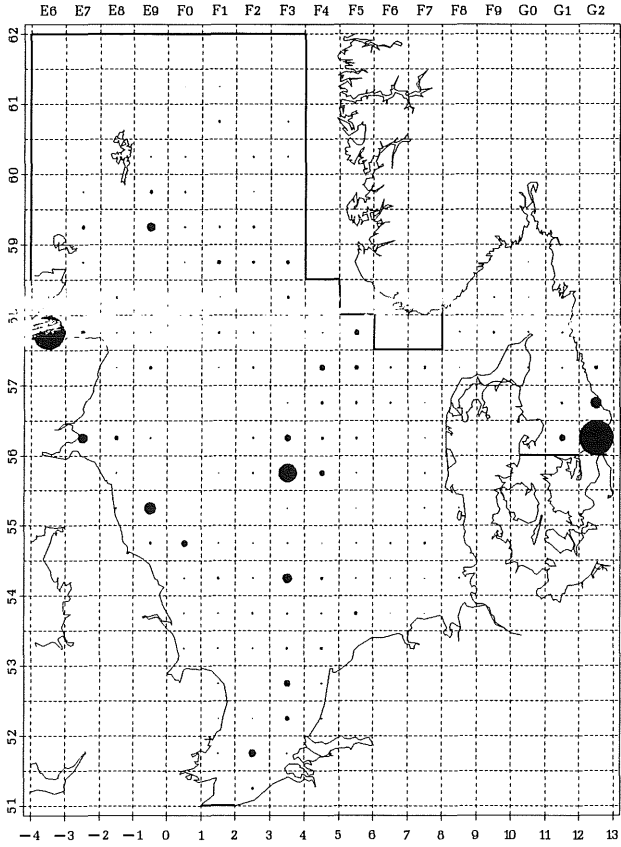
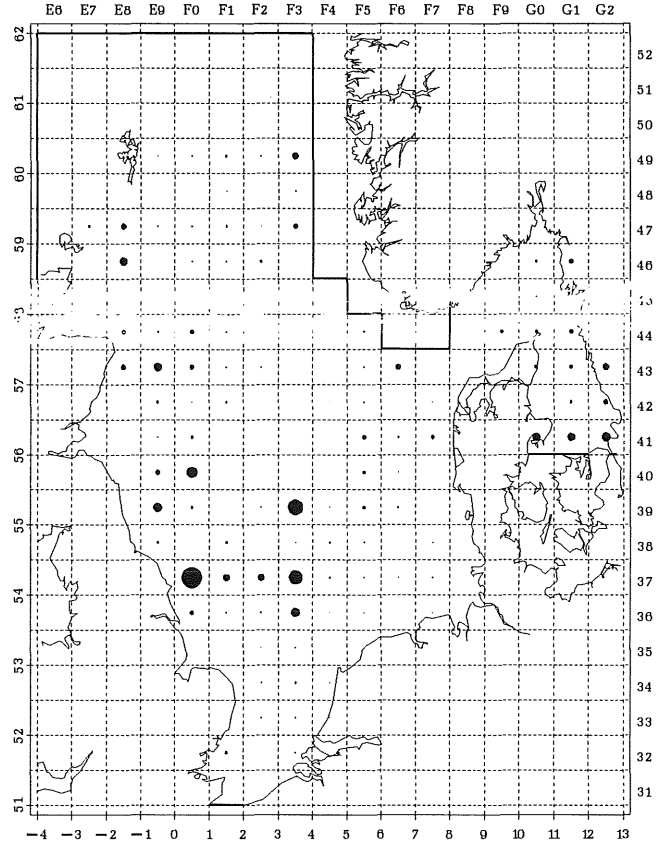


Figure 4.4 Herring: number per hour, 1-ringers.

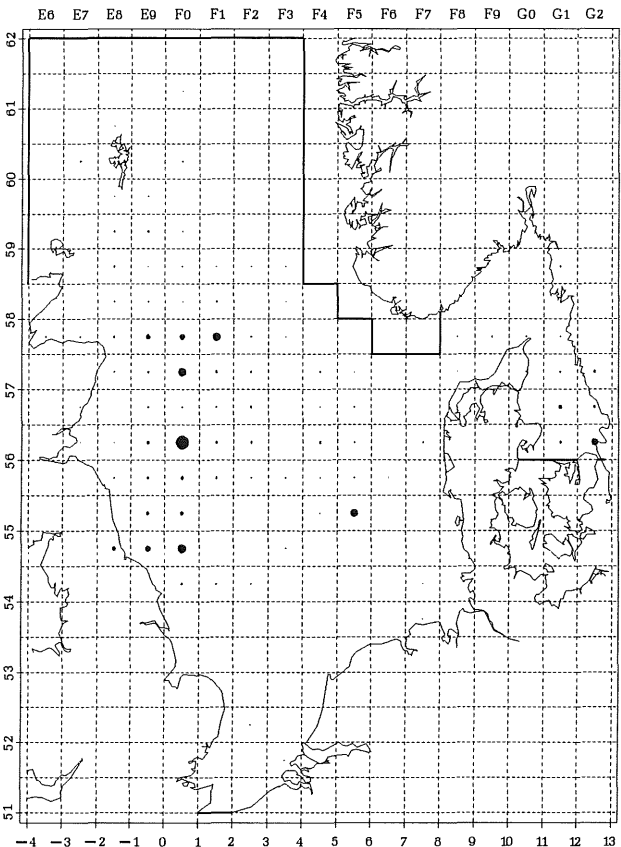
Herring, Age group 2 1991 quarter 1
 Max mean catch number per rectangle: 66881



Herring, Age group 2 1991 quarter 2
 Max mean catch number per rectangle: 23686



Herring, Age group 2 1991 quarter 3
 Max mean catch number per rectangle: 9274



Herring, Age group 2 1991 quarter 4
 Max mean catch number per rectangle: 647

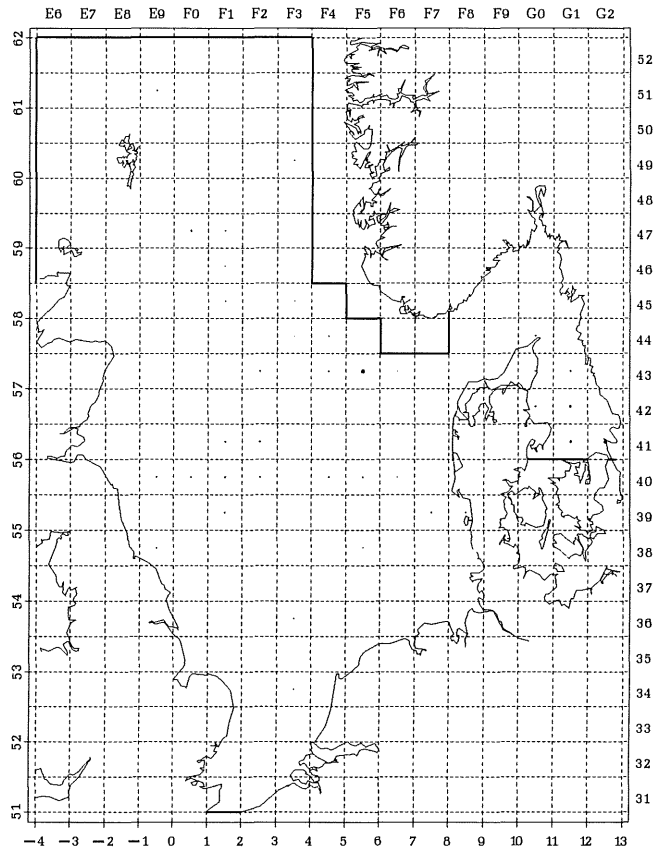
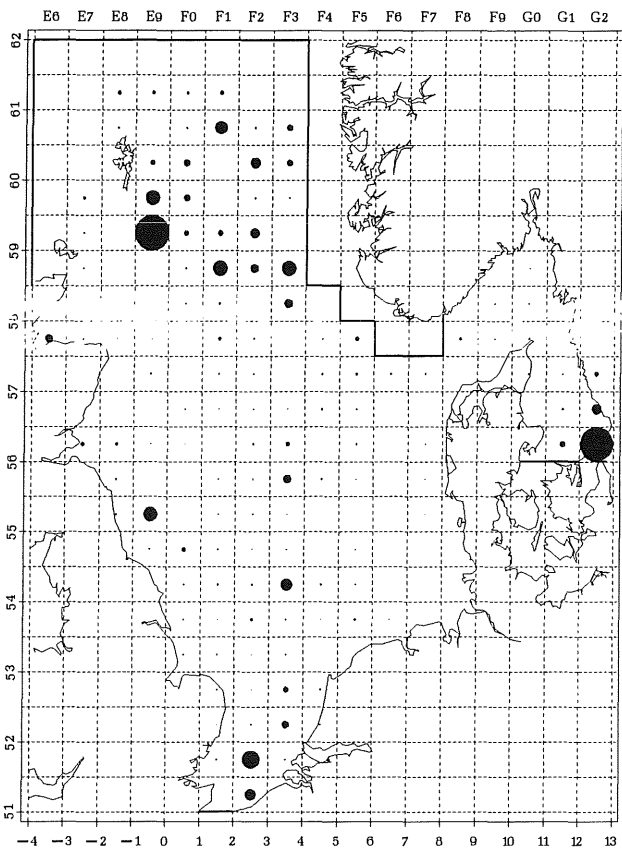
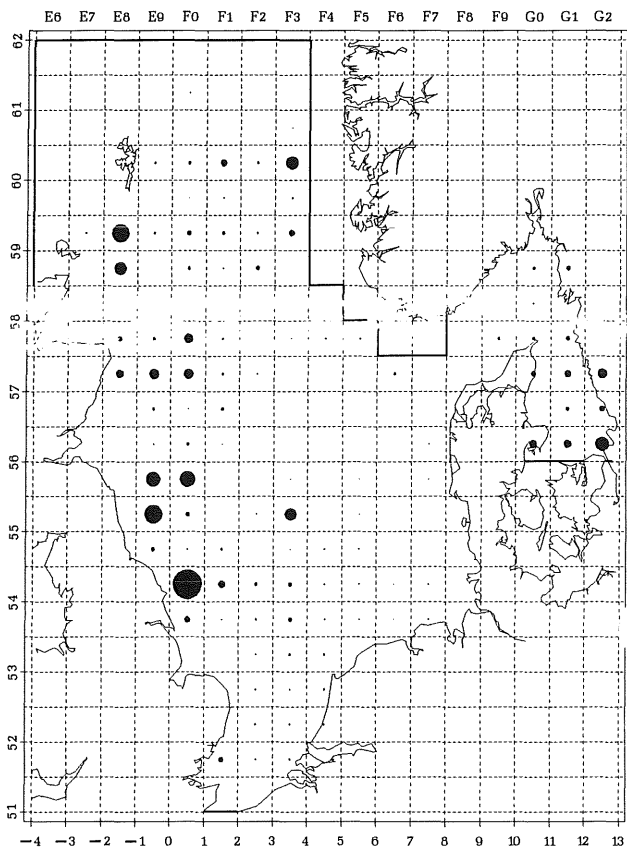


Figure 4.5 Herring: number per hour, 2-ringers.

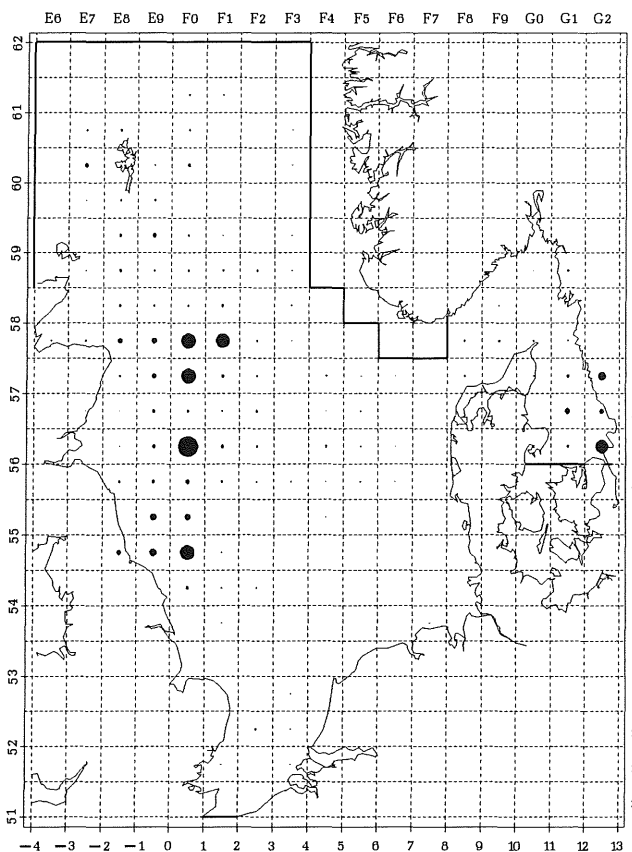
Herring, Age group 3+ 1991 quarter 1
 Max mean catch number per rectangle: 29517



Herring, Age group 3+ 1991 quarter 2
 Max mean catch number per rectangle: 20508



Herring, Age group 3+ 1991 quarter 3
 Max mean catch number per rectangle: 10114



Herring, Age group 3+ 1991 quarter 4
 Max mean catch number per rectangle: 1523

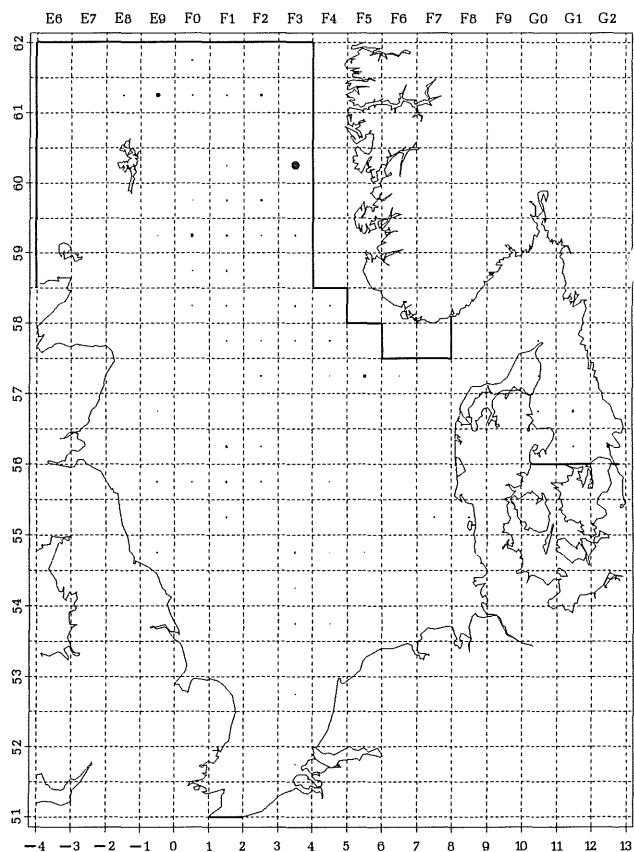
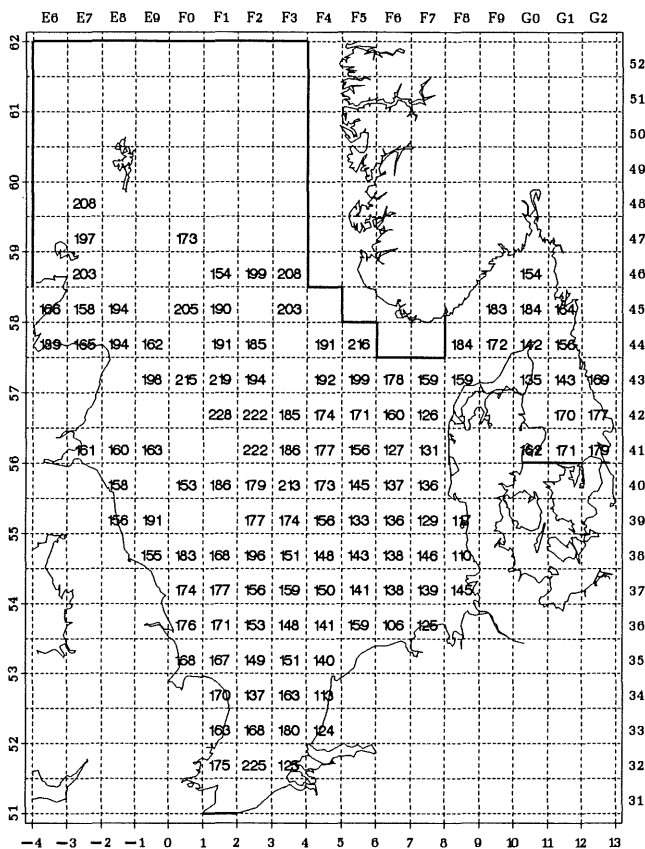
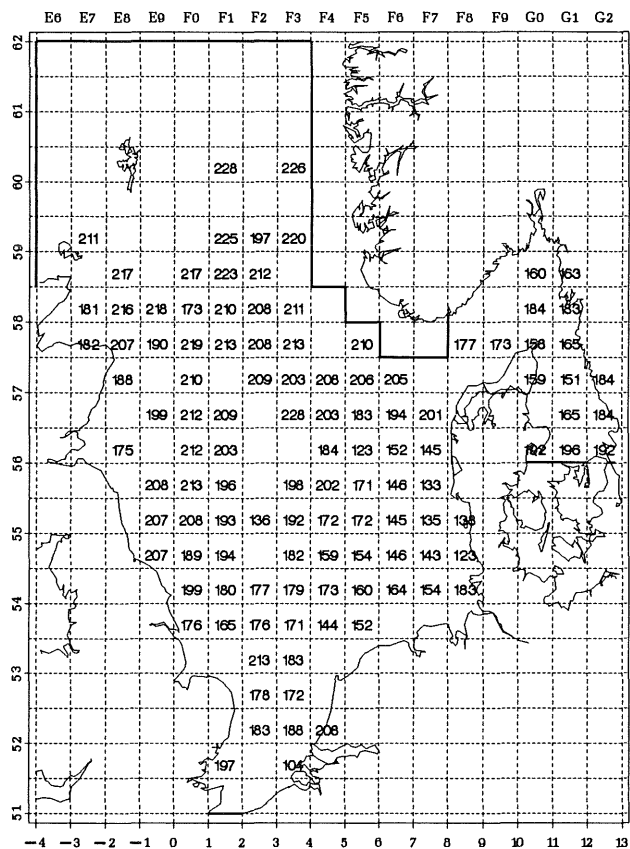


Figure 4.6 Herring: number per hour, 3+ringers.

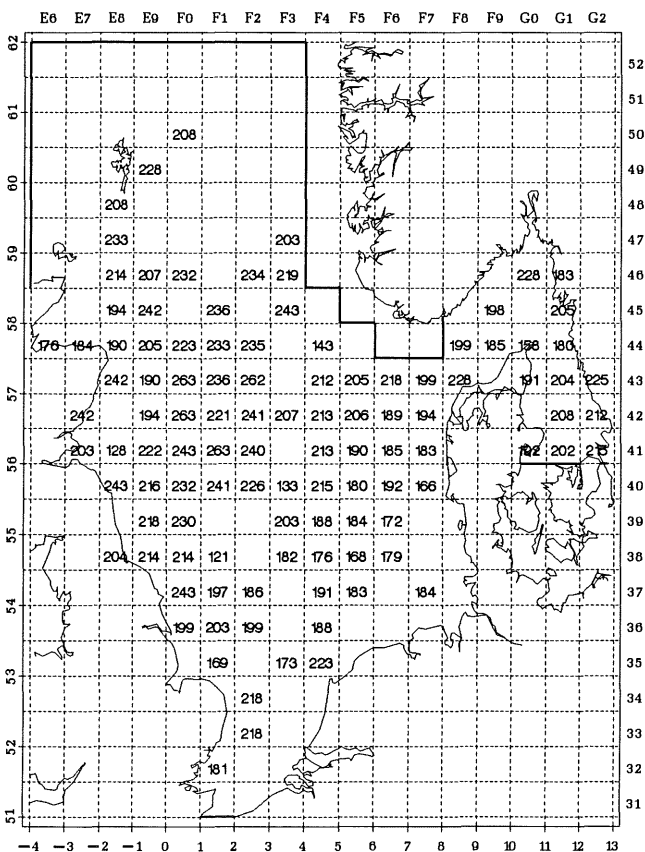
Herring, Age group 1 1991 quarter 1



Herring, Age group 1 1991 quarter 2



Herring, Age group 1 1991 quarter 3



Herring, Age group 1 1991 quarter 4

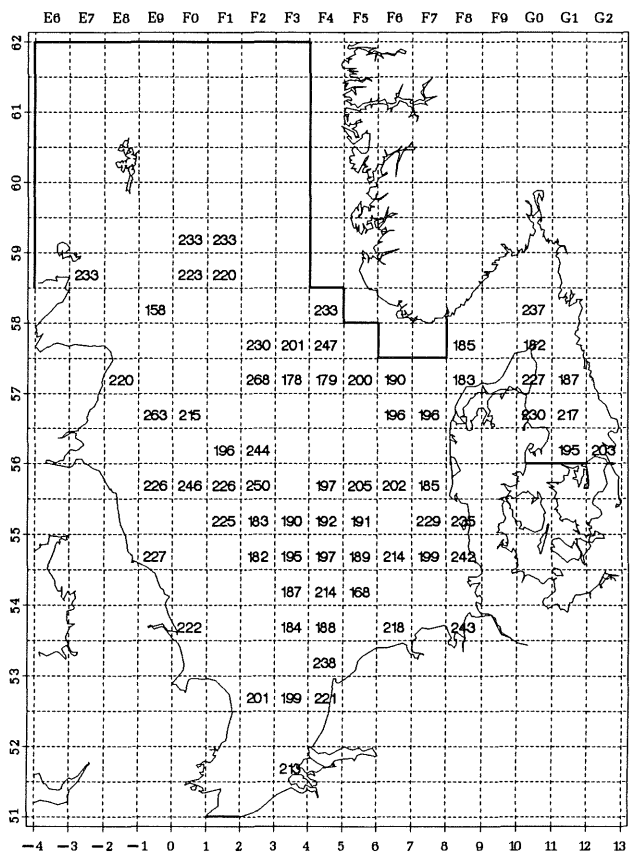
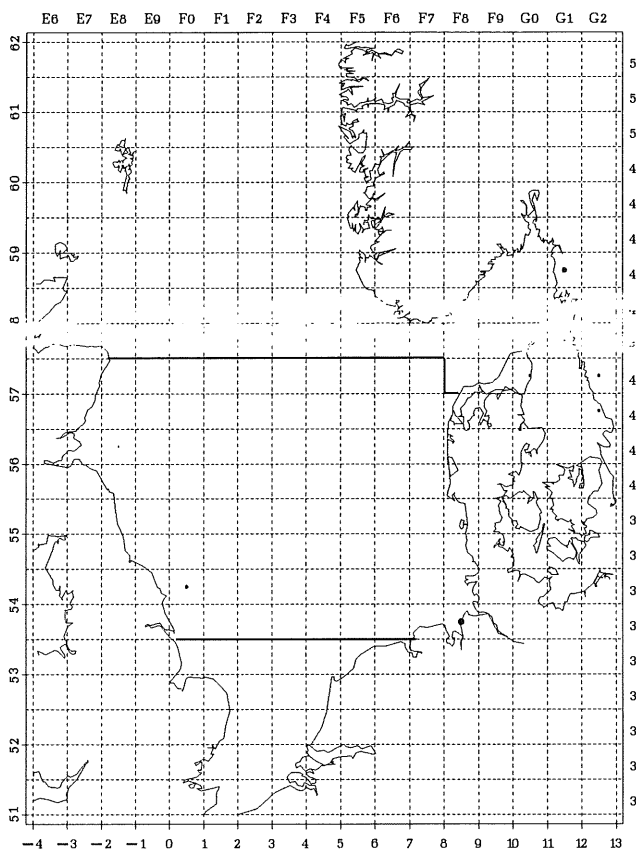


Figure 4.7 Herring: mean length (mm), 1-ringers.

Sprat, Age group 0 1991 quarter 3
 Max mean catch number per recangle: 1040



Sprat, Age group 0 1991 quarter 4
 Max mean catch number per recangle: 33023

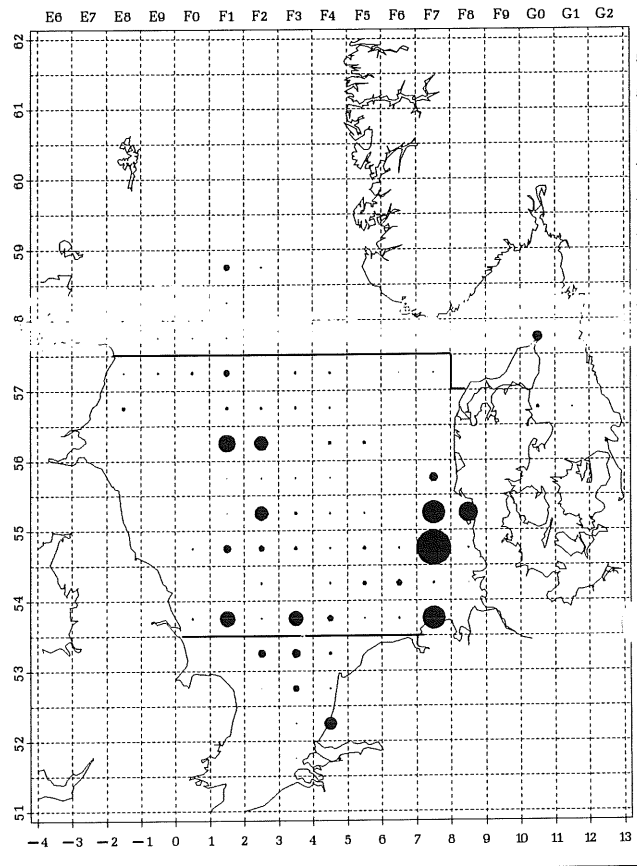
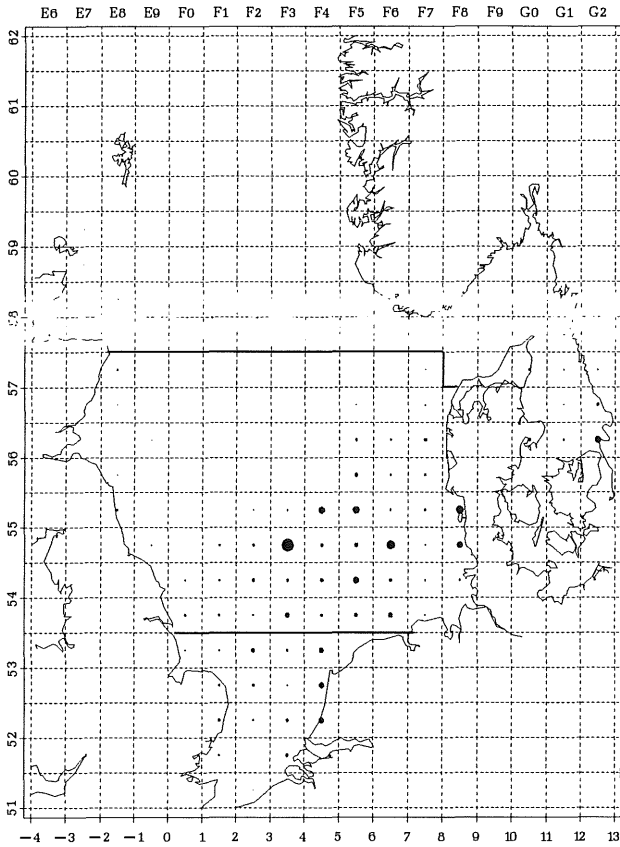
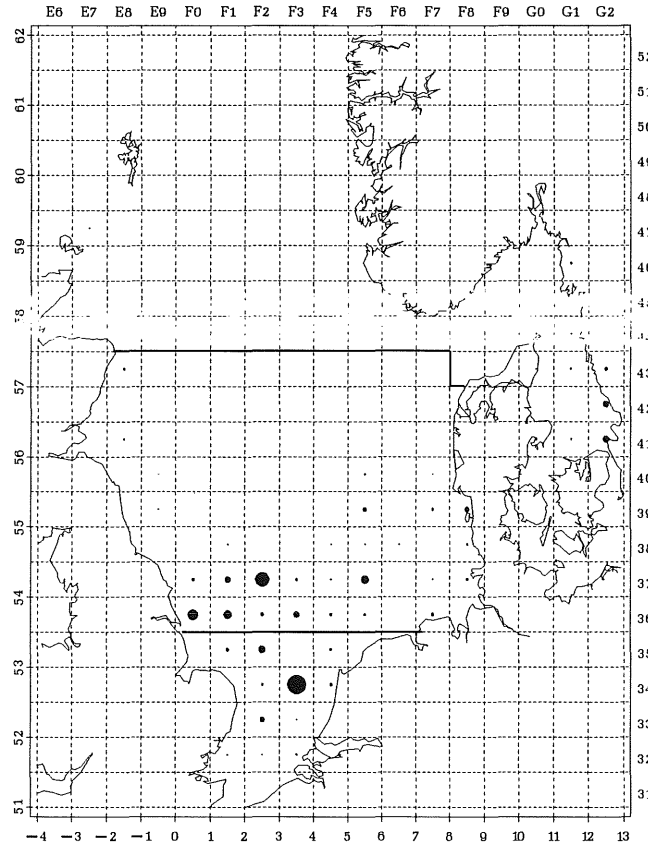


Figure 4.8 Sprat: number per hour, age-group 0.

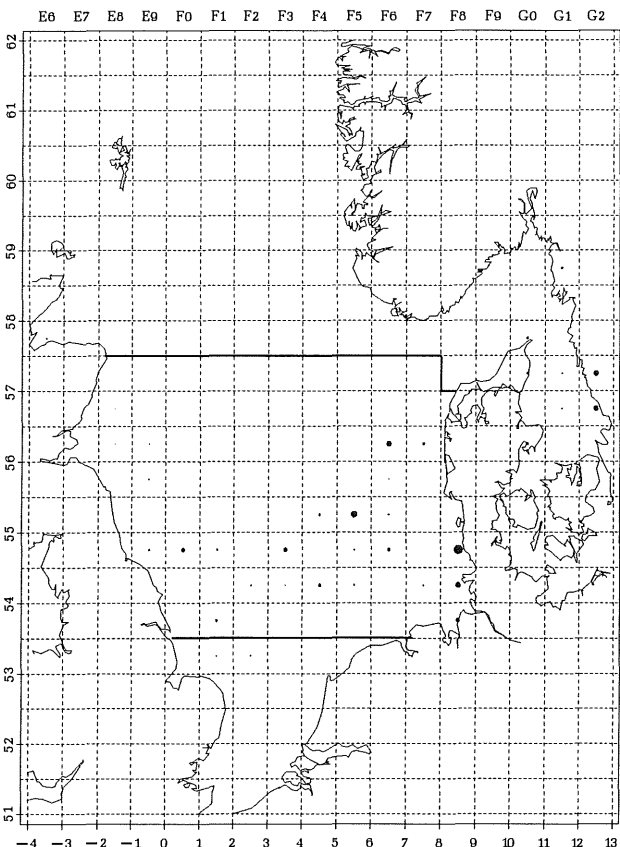
Sprat, Age group 1 1991 quarter 1
 Max mean catch number per rectangle: 21515



Sprat, Age group 1 1991 quarter 2
 Max mean catch number per rectangle: 50183



Sprat, Age group 1 1991 quarter 3
 Max mean catch number per rectangle: 11059



Sprat, Age group 1 1991 quarter 4
 Max mean catch number per rectangle: 174911

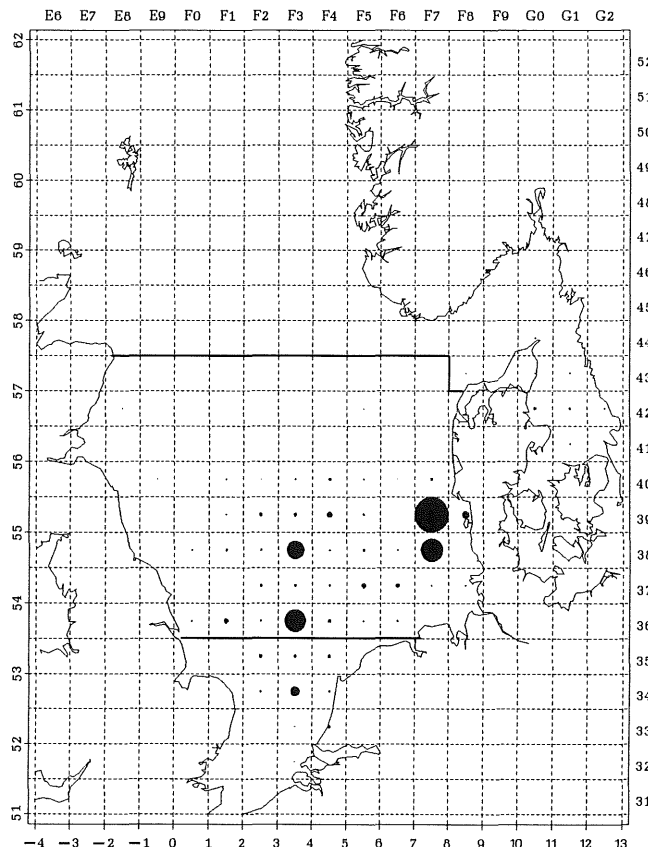
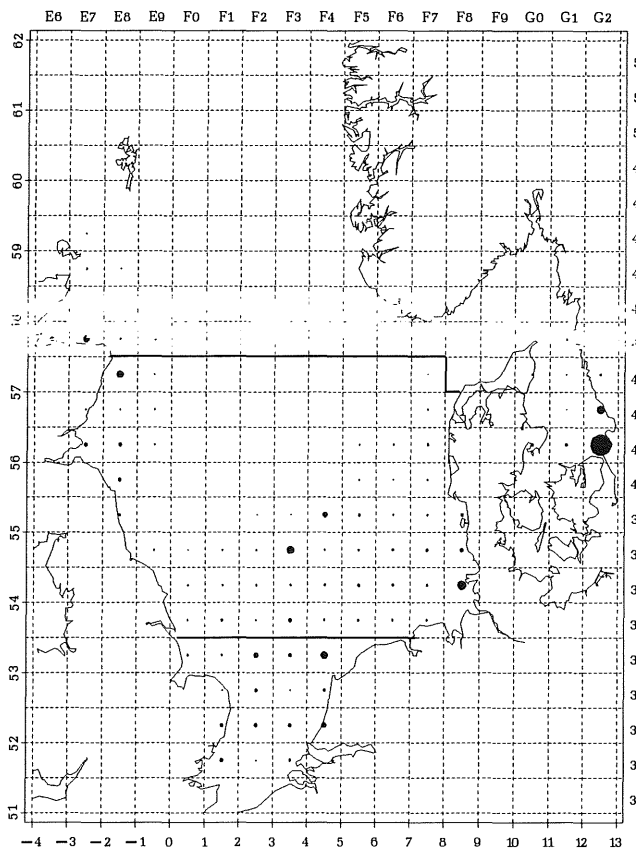
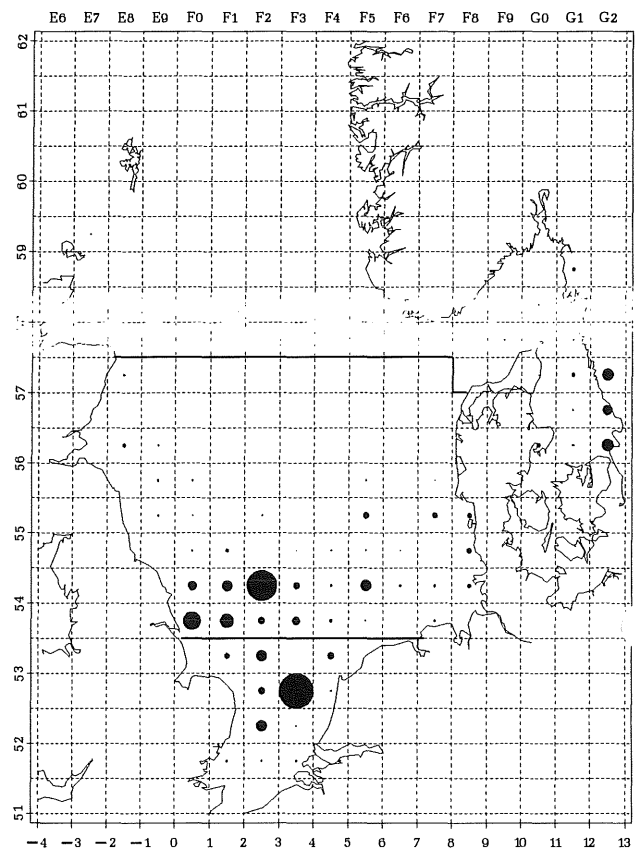


Figure 4.9 Sprat: number per hour, age-group 1.

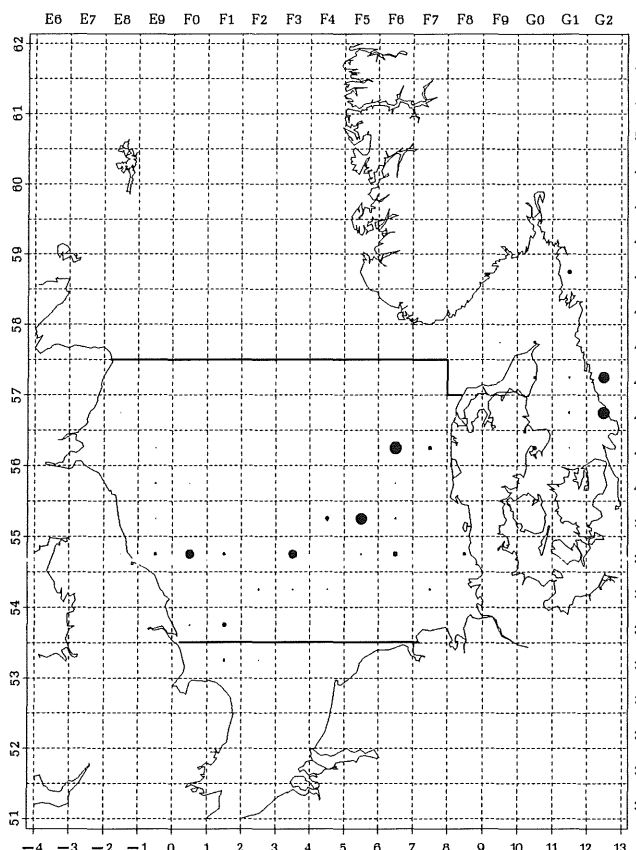
Sprat, Age group 2 1991 quarter 1
 Max mean catch number per rectangle: 10583



Sprat, Age group 2 1991 quarter 2
 Max mean catch number per rectangle: 28762



Sprat, Age group 2 1991 quarter 3
 Max mean catch number per rectangle: 3321



Sprat, Age group 2 1991 quarter 4
 Max mean catch number per rectangle: 17095

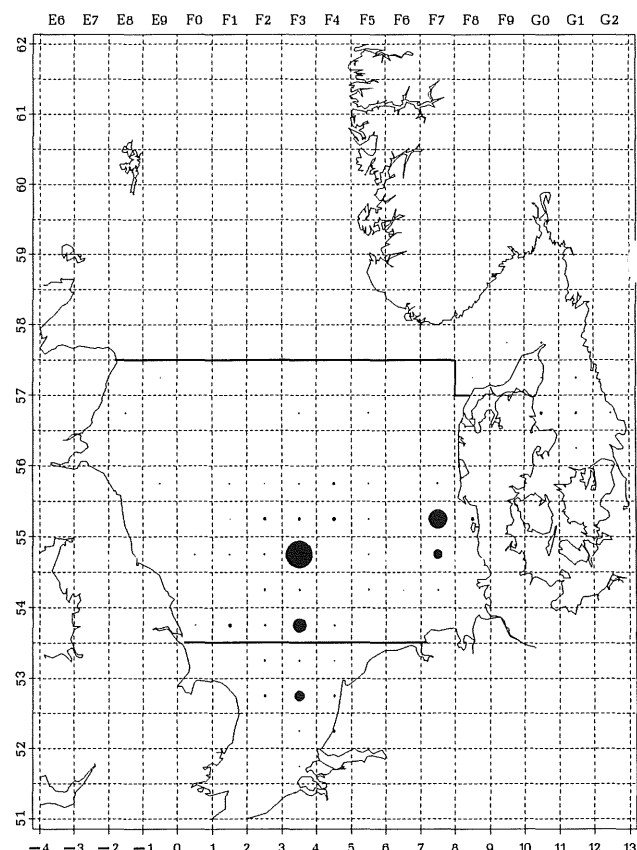
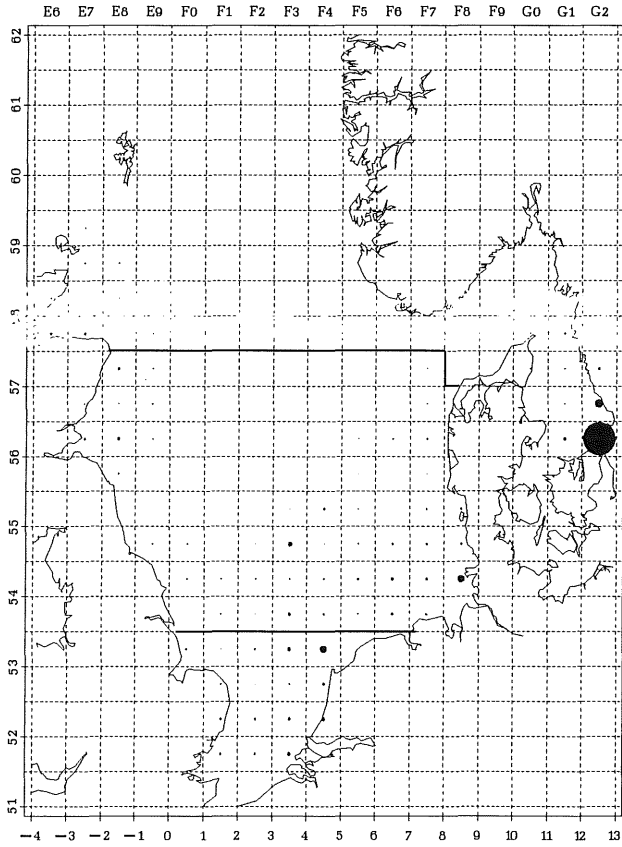
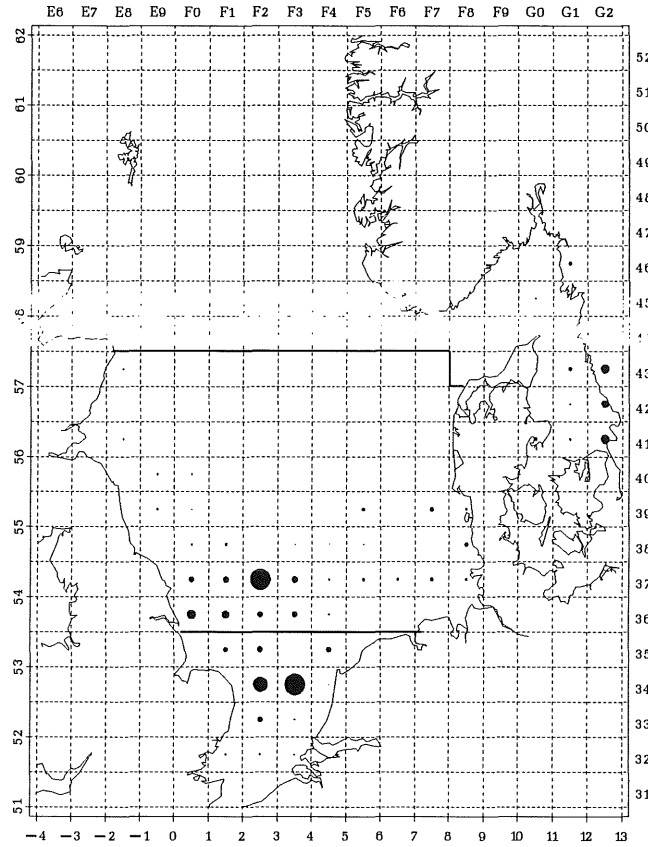


Figure 4.10 Sprat: number per hour, age-group 2.

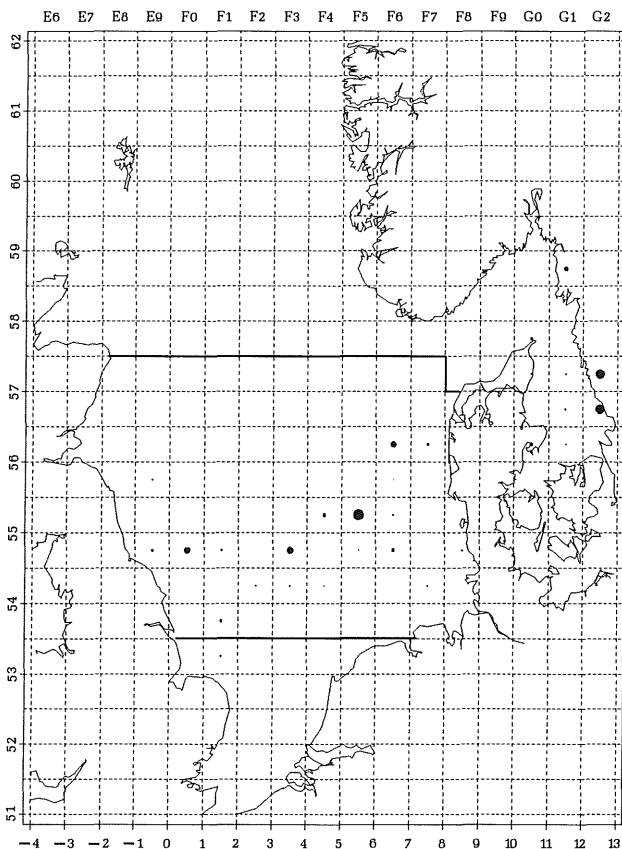
Sprat, Age group 3+ 1991 quarter 1
 Max mean catch number per rectangle: 19524



Sprat, Age group 3+ 1991 quarter 2
 Max mean catch number per rectangle: 8015



Sprat, Age group 3+ 1991 quarter 3
 Max mean catch number per rectangle: 1948



Sprat, Age group 3+ 1991 quarter 4
 Max mean catch number per rectangle: 22380

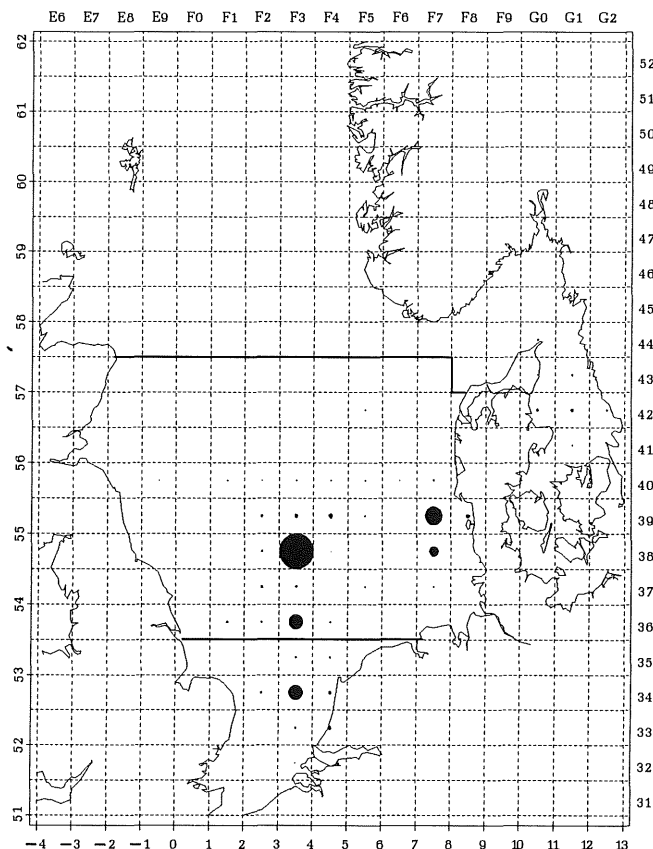
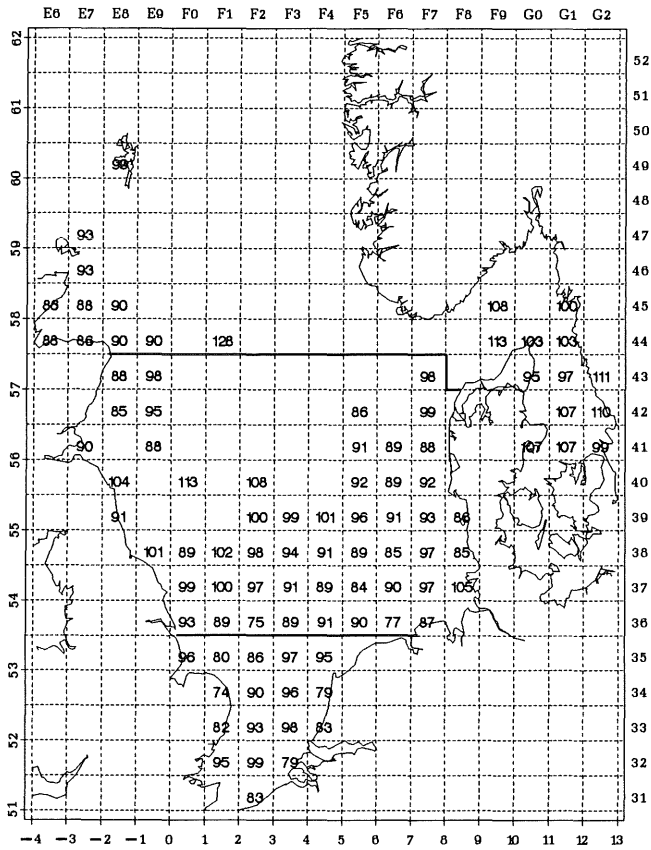
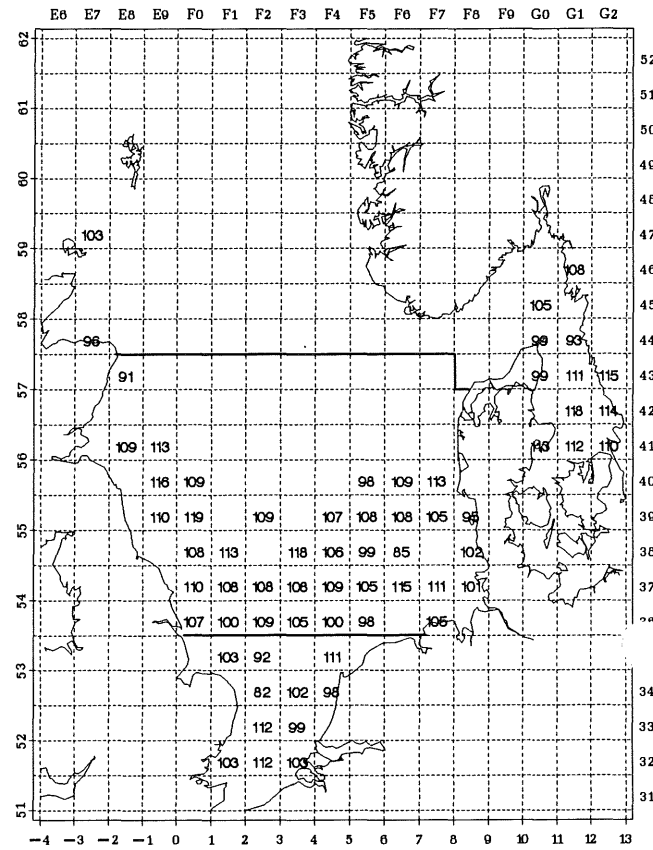


Figure 4.11 Sprat: number per hour, age-group 3+.

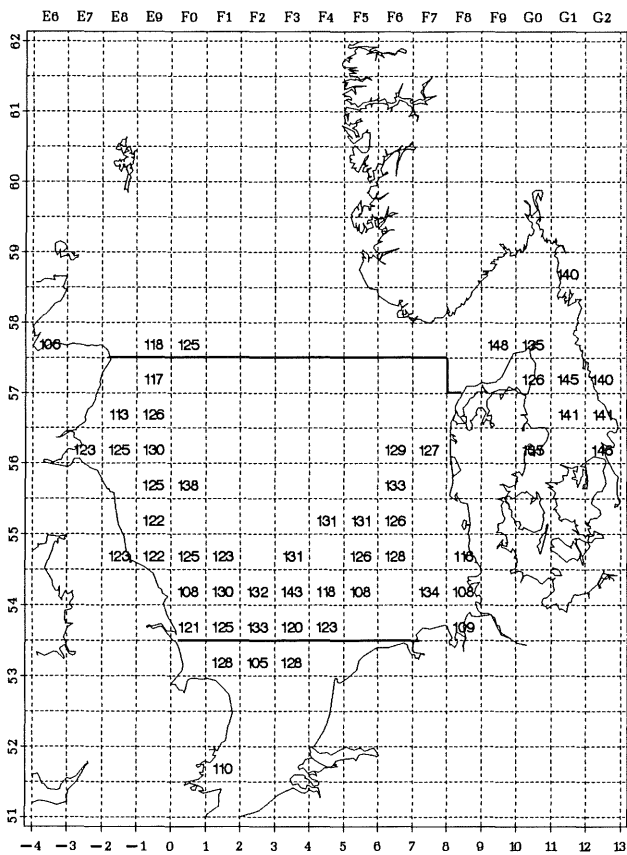
Sprat, Age group 1 1991 quarter 1



Sprat, Age group 1 1991 quarter 2



Sprat, Age group 1 1991 quarter 3



Sprat, Age group 1 1991 quarter 4

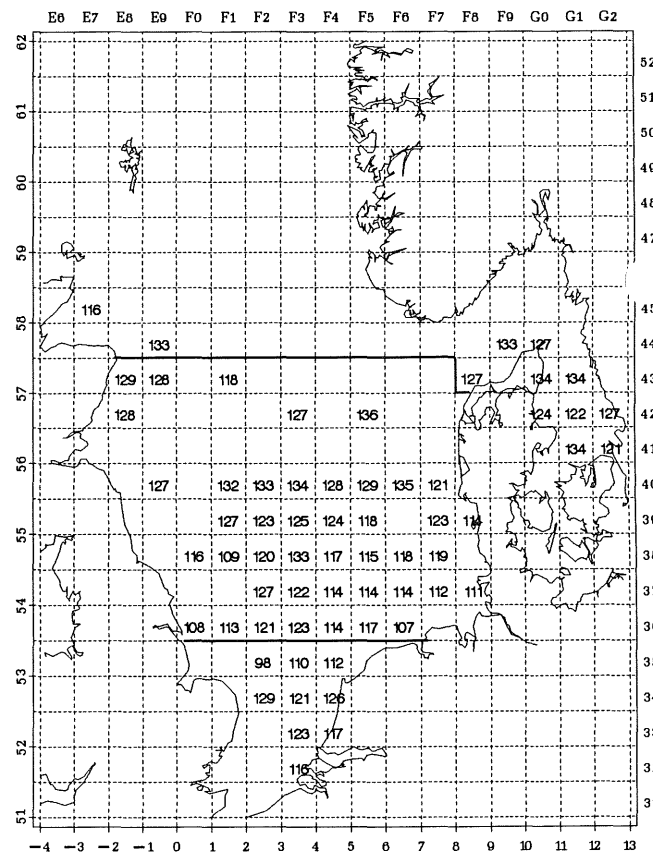
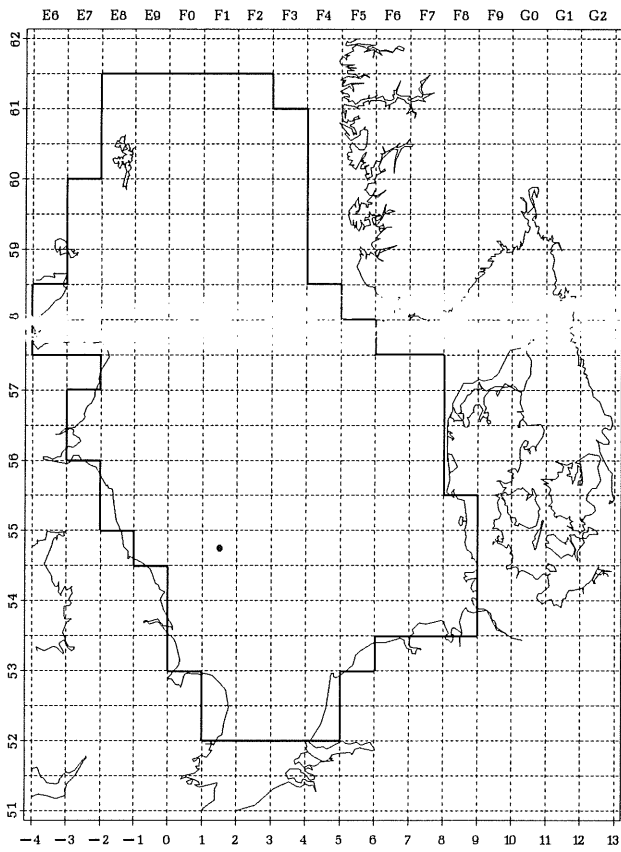


Figure 4.12 Sprat: mean length (mm), age-group 1.

Mackerel, Age group 0 1991 quarter 3
 Max mean catch number per recangle: 1



Mackerel, Age group 0 1991 quarter 4
 Max mean catch number per recangle: 31

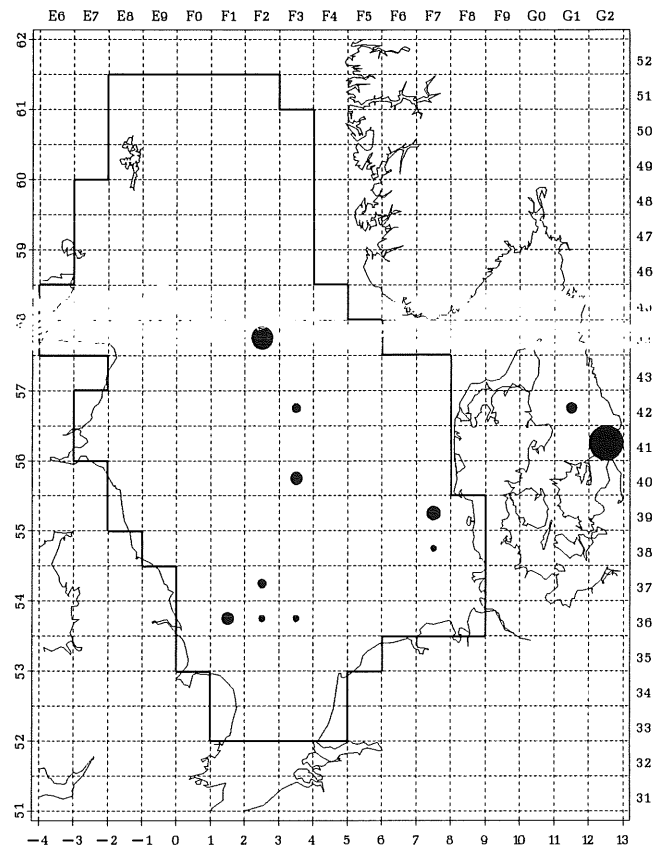
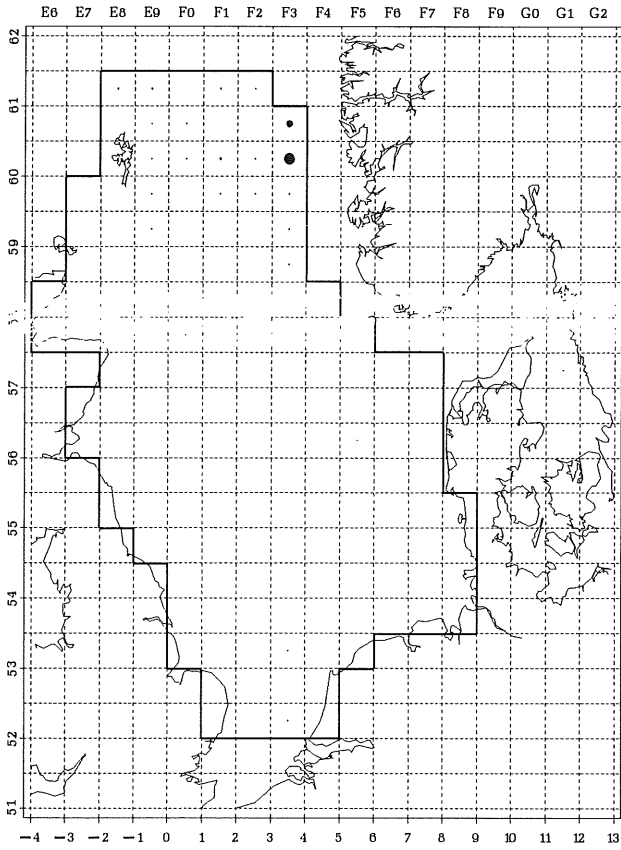
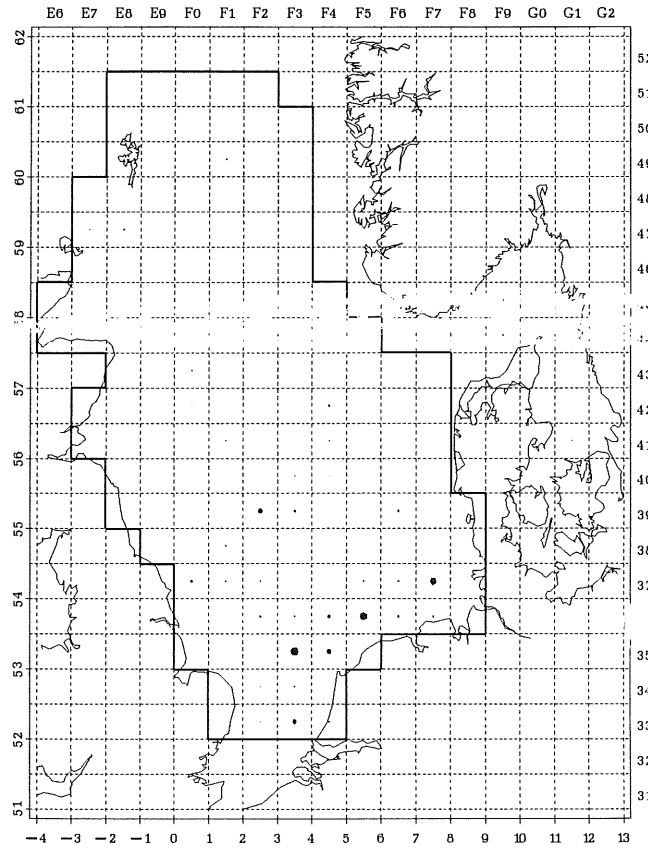


Figure 4.13 Mackerel: number per hour, age-group 0.

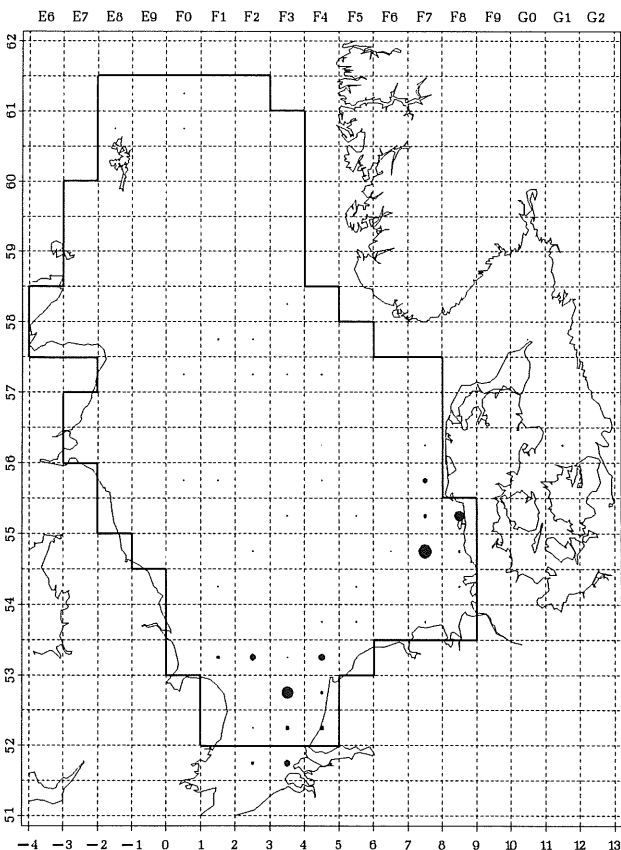
Mackerel, Age group 1 1991 quarter 1
 Max mean catch number per rectangle: 705



Mackerel, Age group 1 1991 quarter 2
 Max mean catch number per rectangle: 360



Mackerel, Age group 1 1991 quarter 3
 Max mean catch number per rectangle: 1094



Mackerel, Age group 1 1991 quarter 4
 Max mean catch number per rectangle: 7638

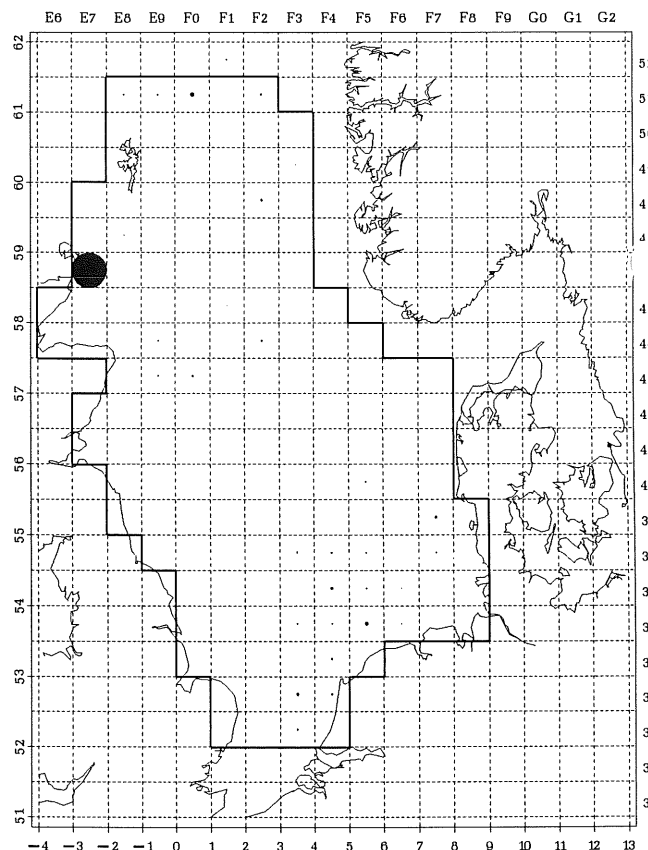
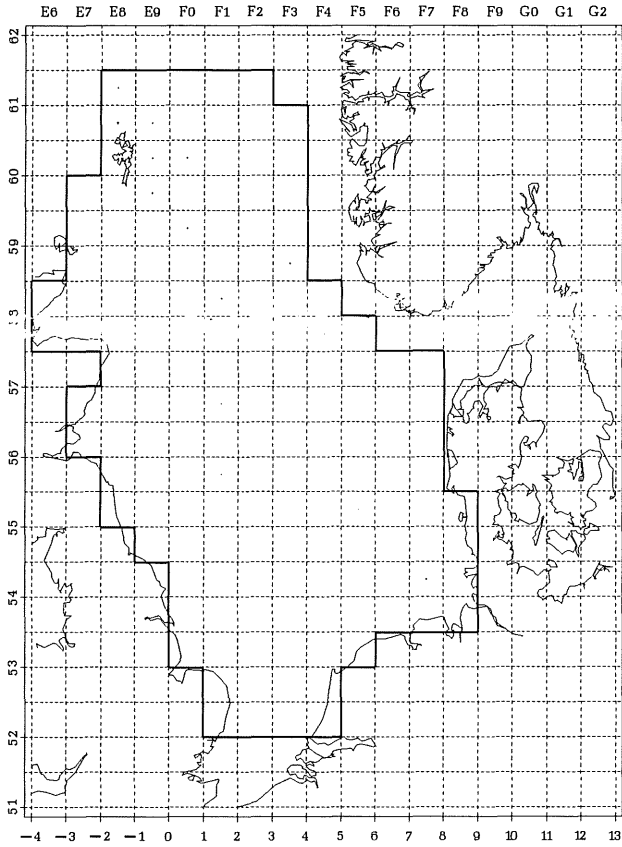
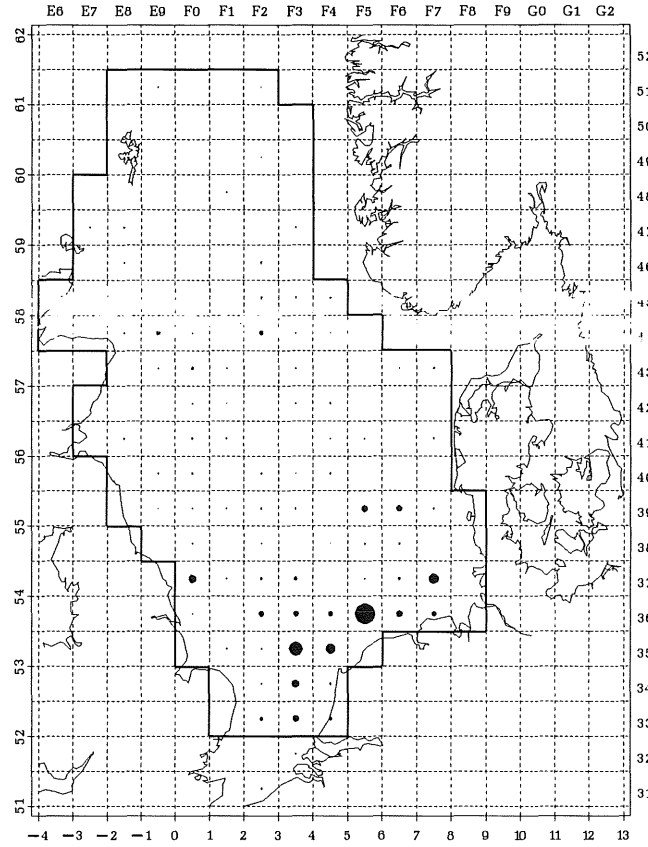


Figure 4.14 Mackerel: number per hour, age-group 1.

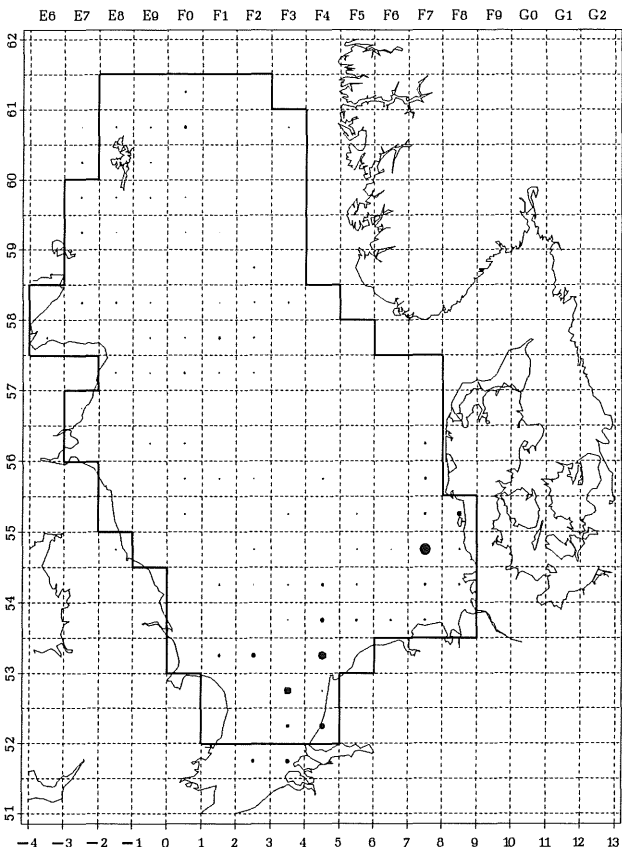
Mackerel, Age group 2 1991 quarter 1
 Max mean catch number per recangle: 7



Mackerel, Age group 2 1991 quarter 2
 Max mean catch number per recangle: 2284



Mackerel, Age group 2 1991 quarter 3
 Max mean catch number per recangle: 648



Mackerel, Age group 2 1991 quarter 4
 Max mean catch number per recangle: 6776

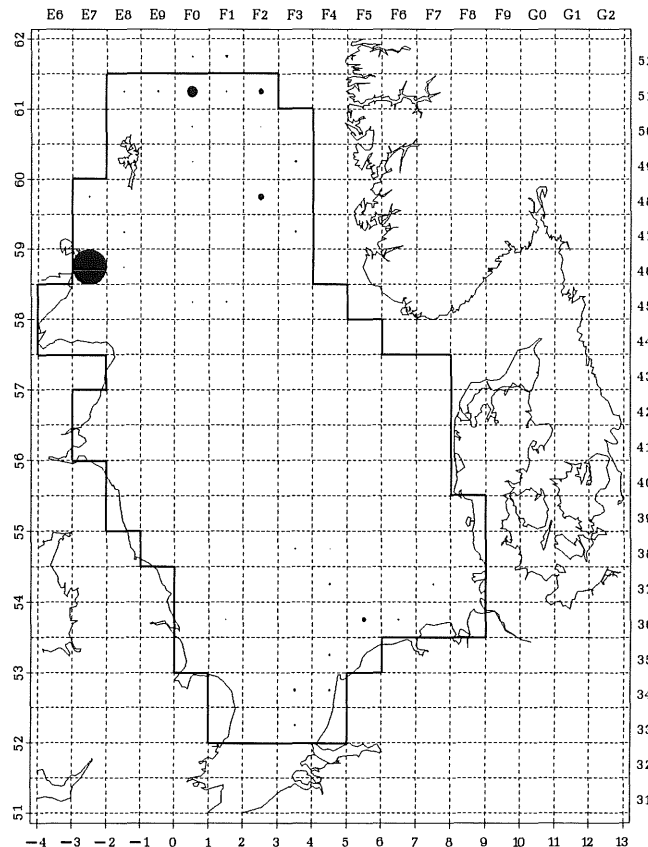
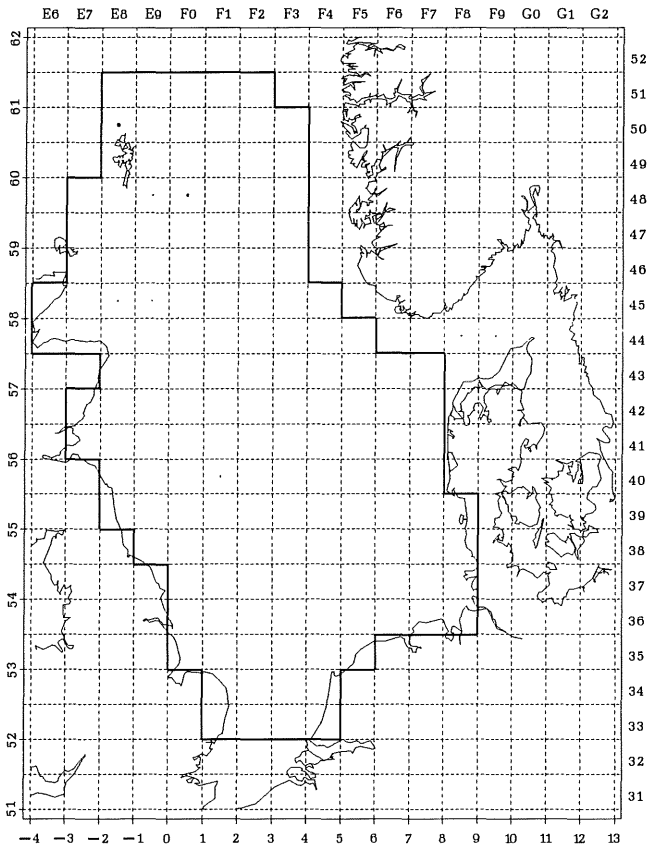
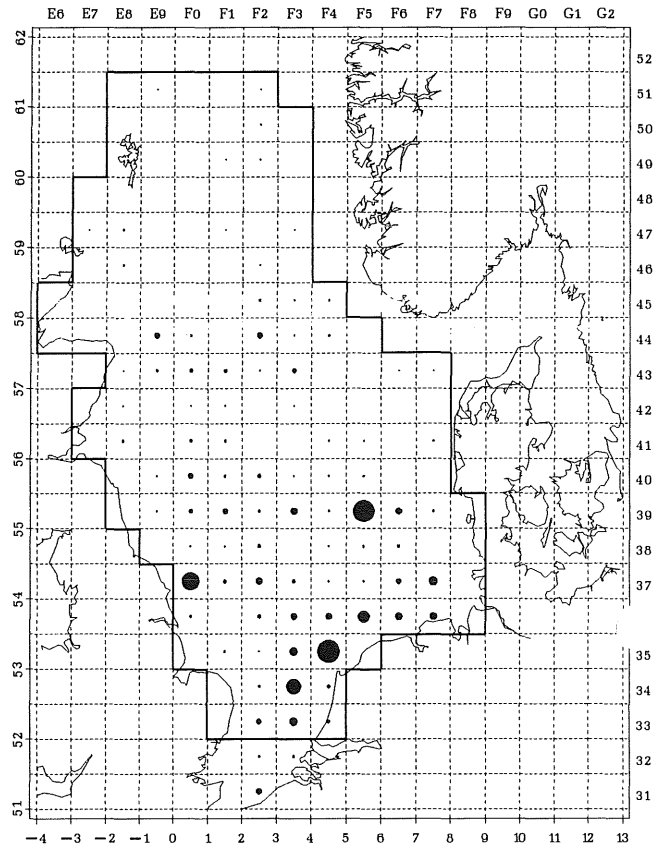


Figure 4.15 Mackerel: number per hour, age-group 2.

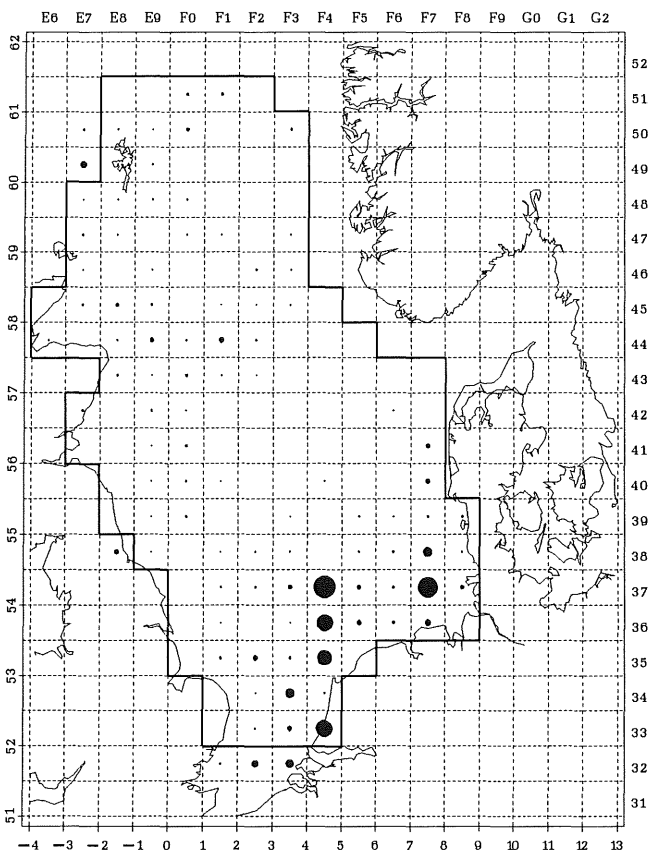
Mackerel, Age group 3+ 1991 quarter 1
 Max mean catch number per rectangle: 17



Mackerel, Age group 3+ 1991 quarter 2
 Max mean catch number per rectangle: 770



Mackerel, Age group 3+ 1991 quarter 3
 Max mean catch number per rectangle: 736



Mackerel, Age group 3+ 1991 quarter 4
 Max mean catch number per rectangle: 1898

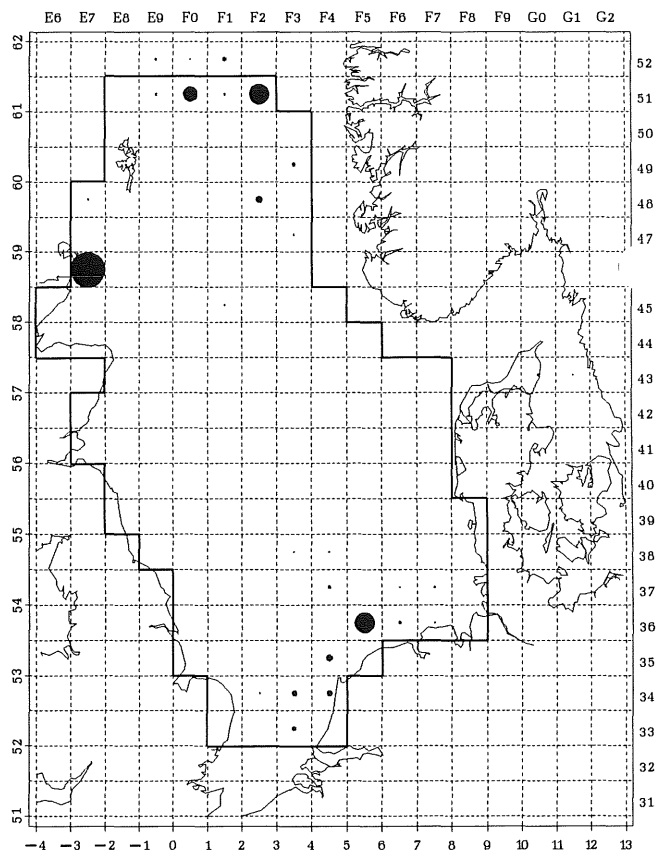
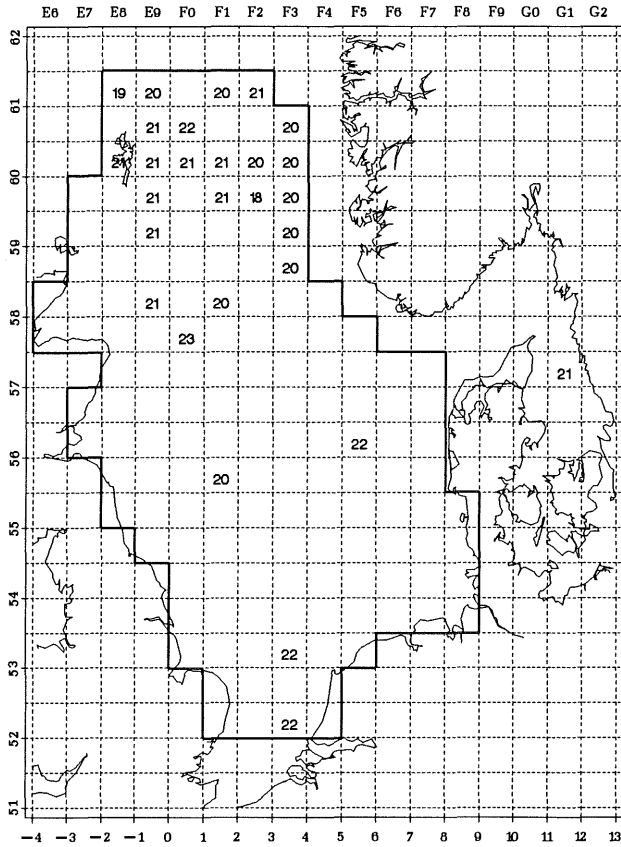
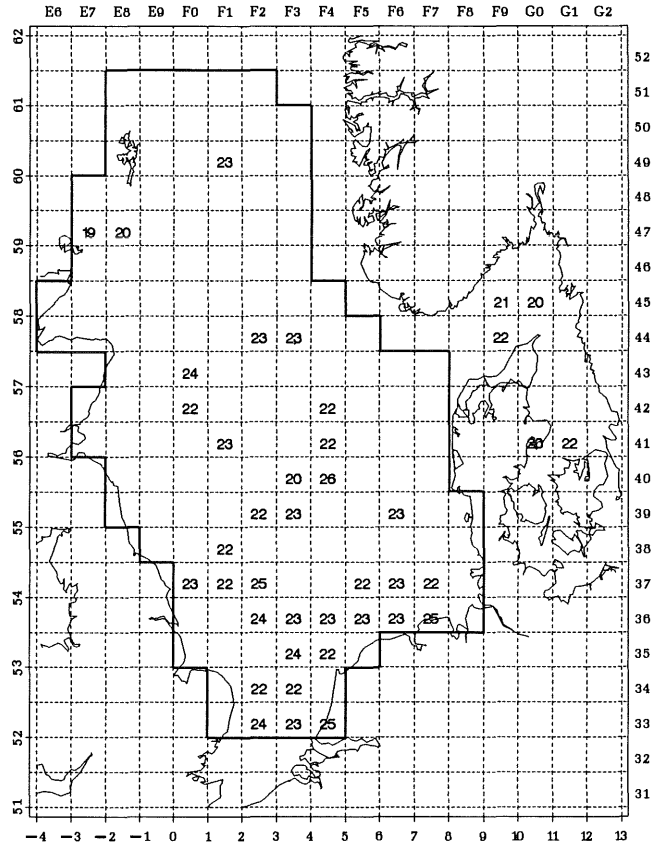


Figure 4.16 Mackerel: number per hour, age-group 3+.

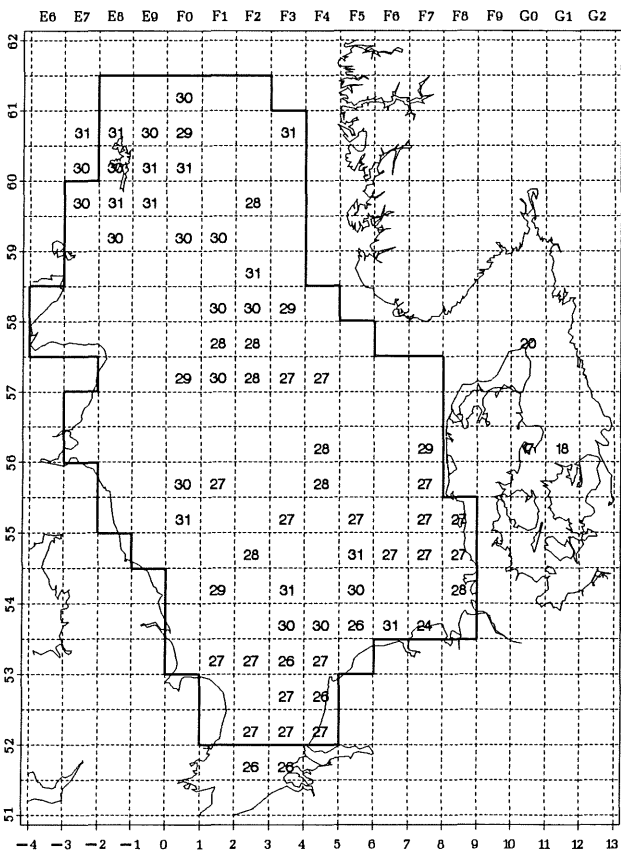
Mackerel, Age group 1 1991 quarter 1



Mackerel, Age group 1 1991 quarter 2



Mackerel, Age group 1 1991 quarter 3



Mackerel, Age group 1 1991 quarter 4

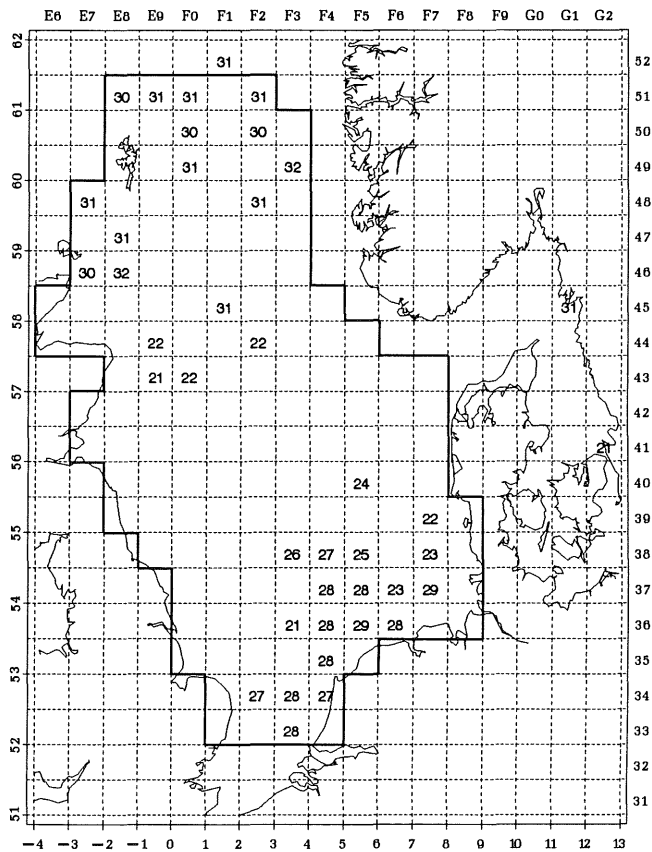
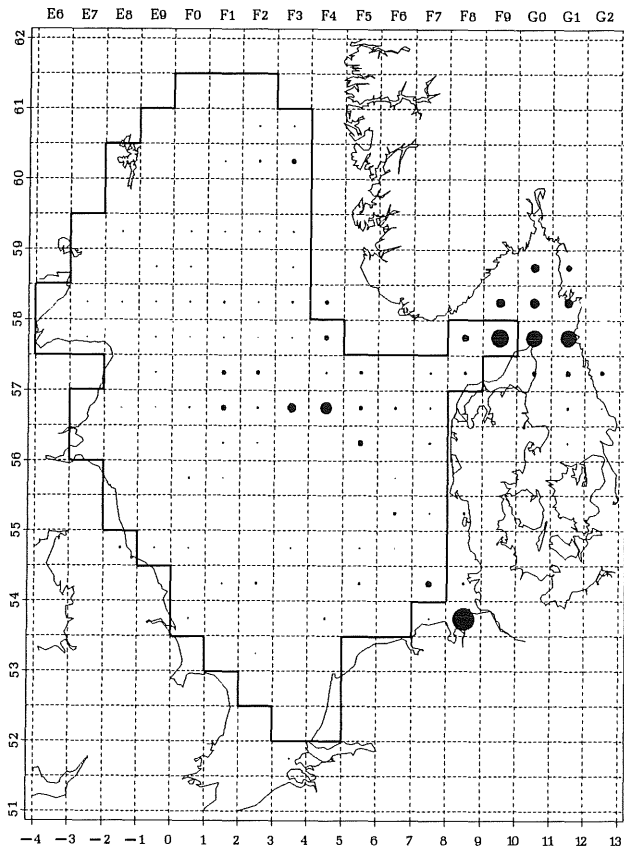


Figure 4.17 Mackerel: mean length (cm below), age-group 1.

Cod, Age group 0 1991 quarter 3
 Max mean catch number per recangle: 2320



Cod, Age group 0 1991 quarter 4
 Max mean catch number per recangle: 5888

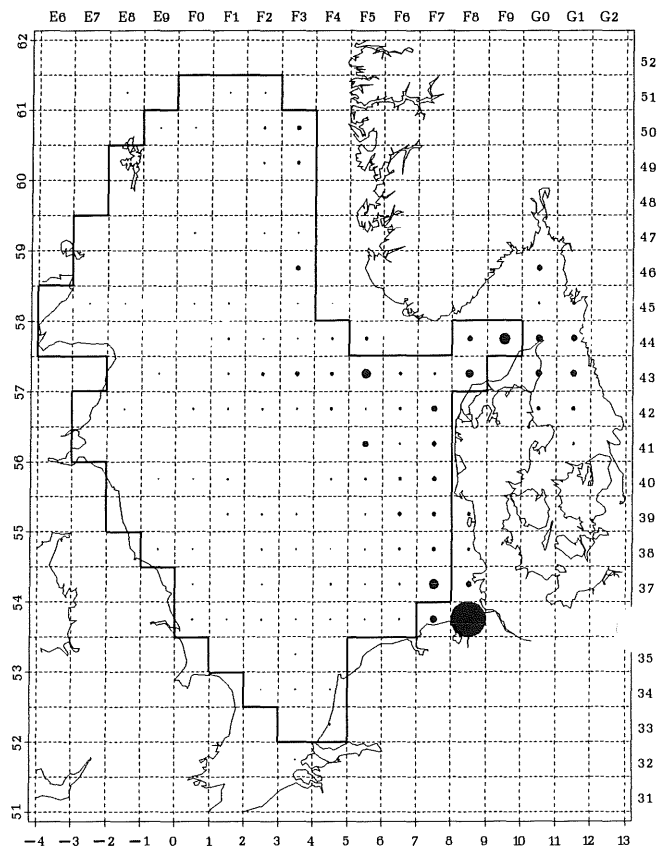
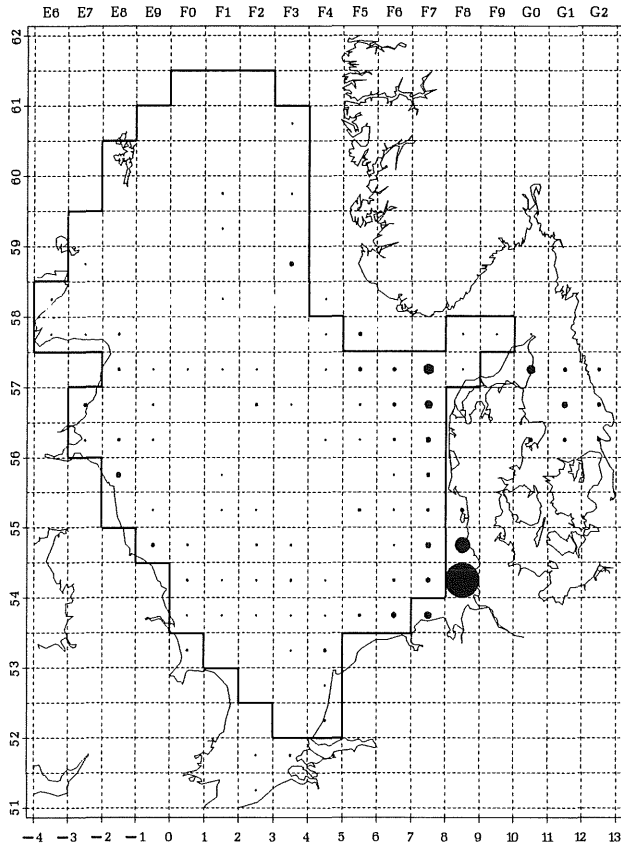
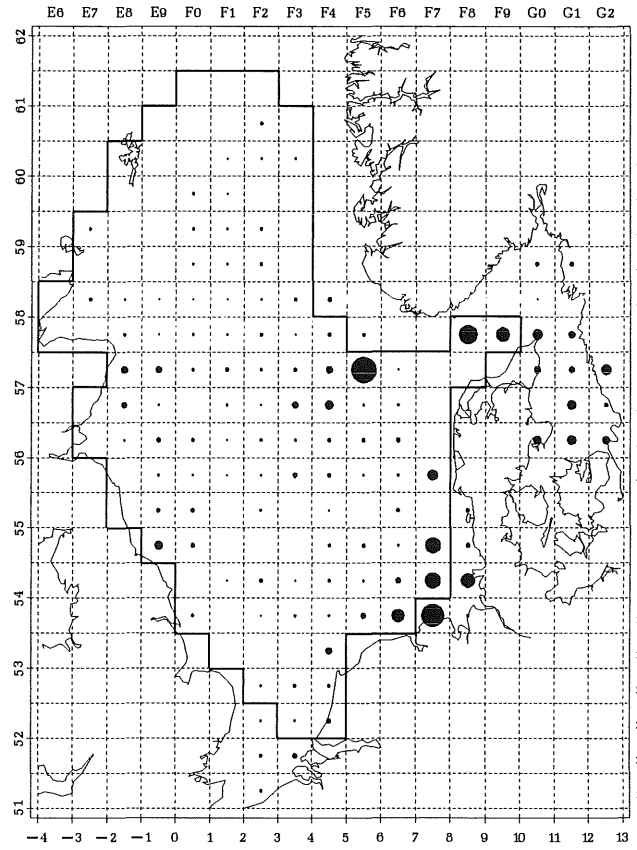


Figure 4.18 Cod: number per hour, age-group 0.

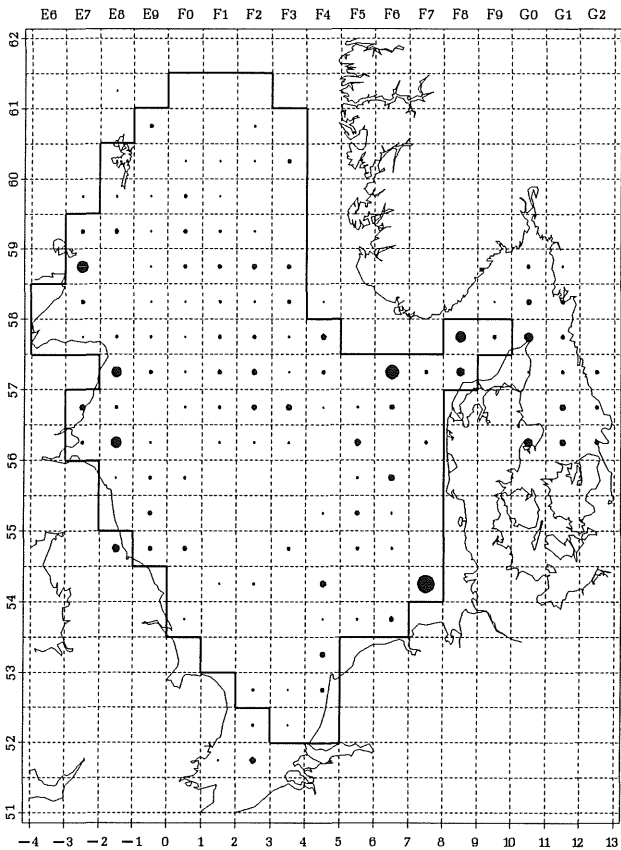
Cod, Age group 1 1991 quarter 1
 Max mean catch number per rectangle: 654



Cod, Age group 1 1991 quarter 2
 Max mean catch number per rectangle: 359



Cod, Age group 1 1991 quarter 3
 Max mean catch number per rectangle: 162



Cod, Age group 1 1991 quarter 4
 Max mean catch number per rectangle: 78

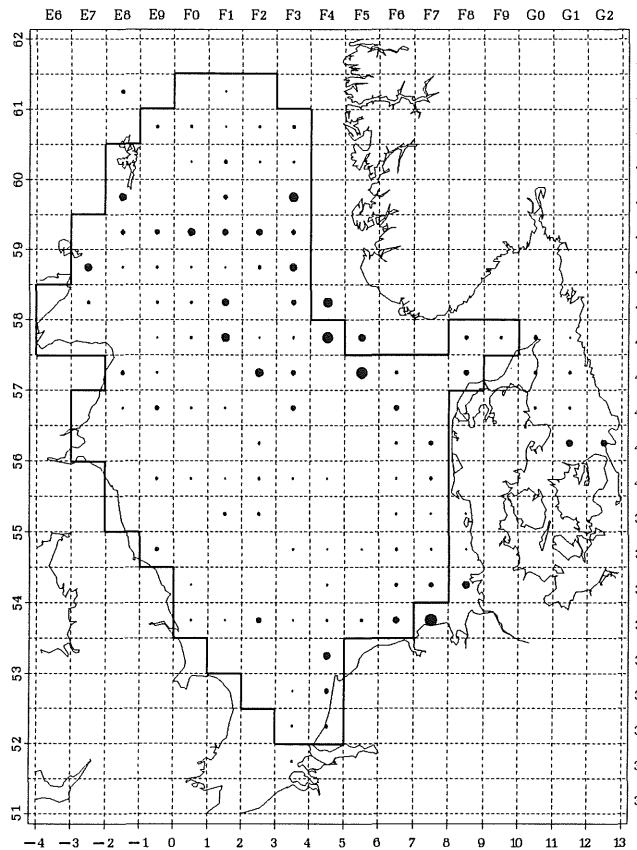
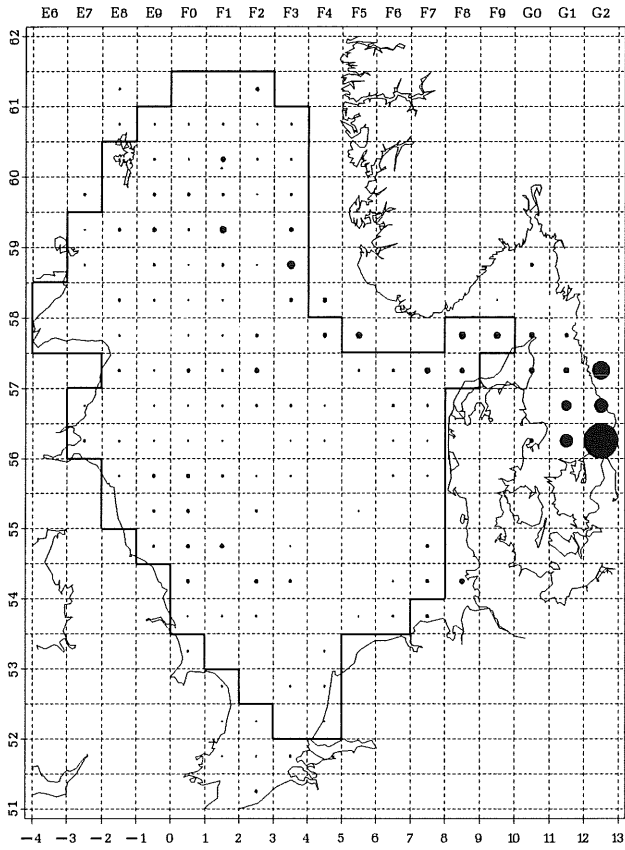
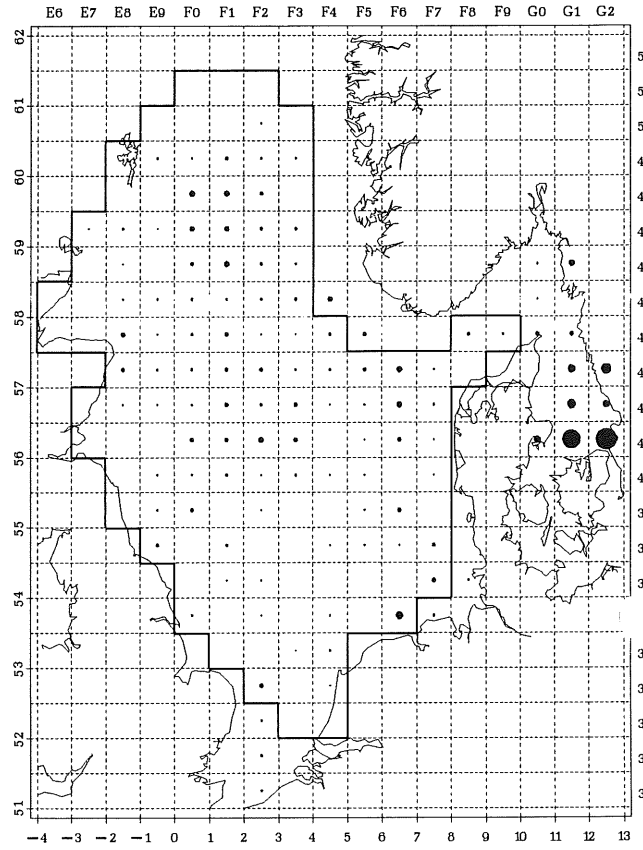


Figure 4.19 Cod: number per hour, age-group 1.

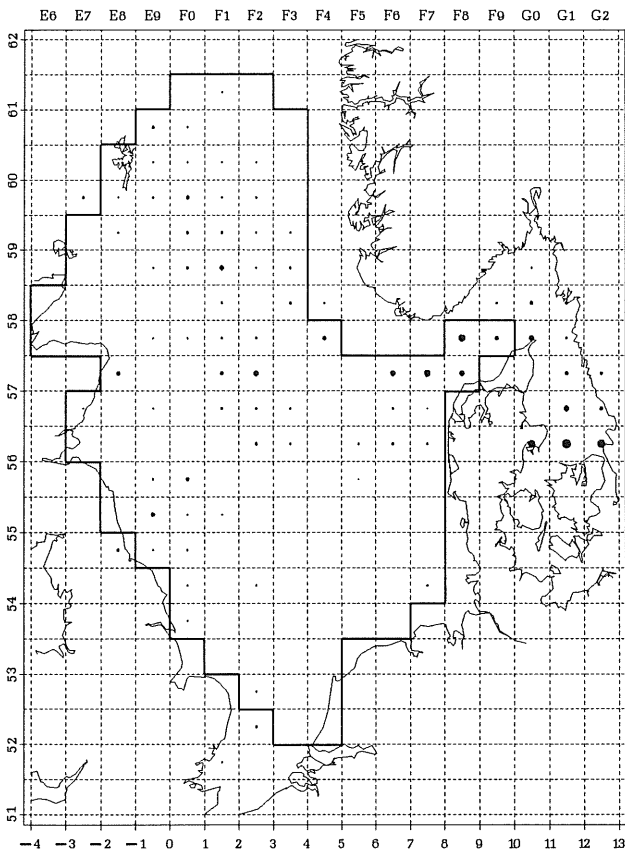
Cod, Age group 2 1991 quarter 1
 Max mean catch number per rectangle: 941



Cod, Age group 2 1991 quarter 2
 Max mean catch number per rectangle: 336



Cod, Age group 2 1991 quarter 3
 Max mean catch number per rectangle: 56



Cod, Age group 2 1991 quarter 4
 Max mean catch number per rectangle: 31

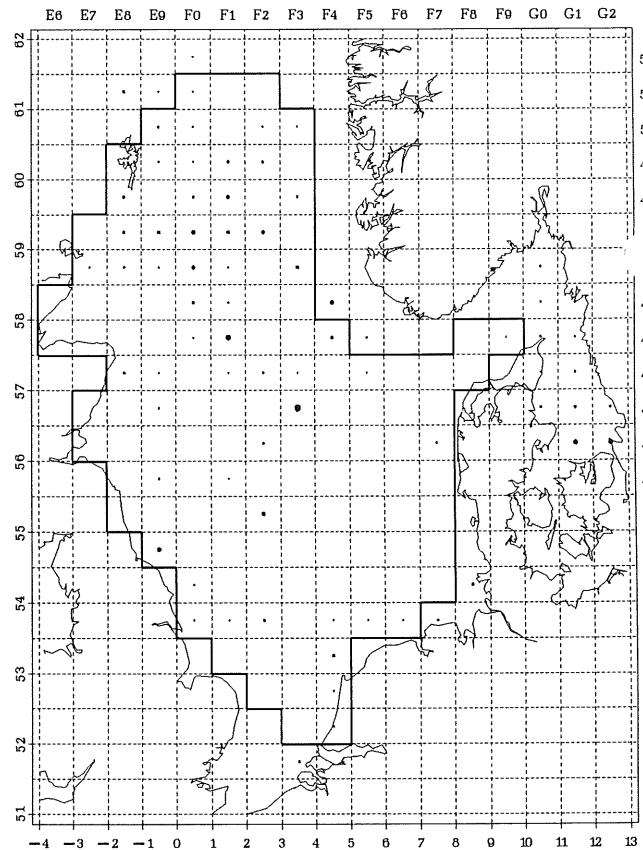
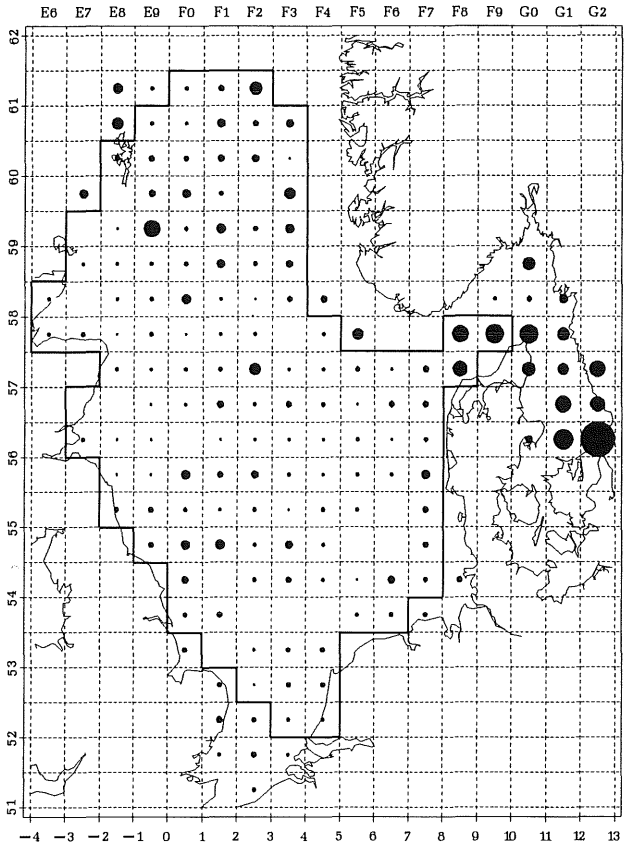
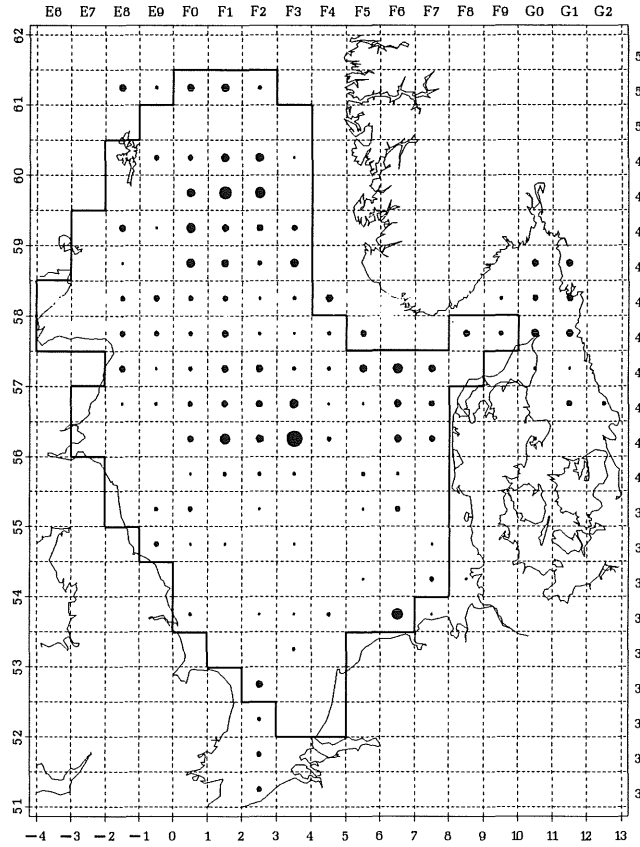


Figure 4.20 Cod: number per hour, age-group 2.

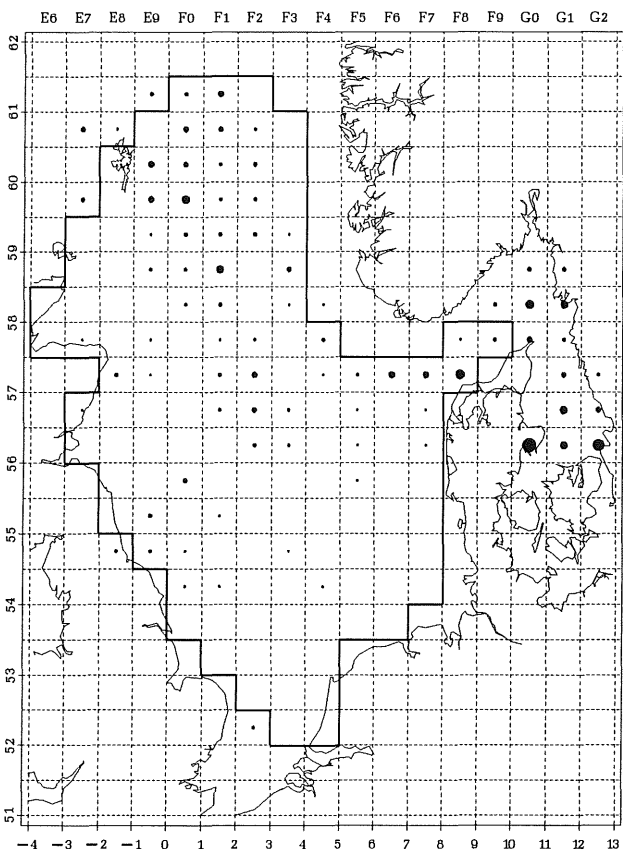
Cod, Age group 3+ 1991 quarter 1
 Max mean catch number per rectangle: 240



Cod, Age group 3+ 1991 quarter 2
 Max mean catch number per rectangle: 49



Cod, Age group 3+ 1991 quarter 3
 Max mean catch number per rectangle: 36



Cod, Age group 3+ 1991 quarter 4
 Max mean catch number per rectangle: 33

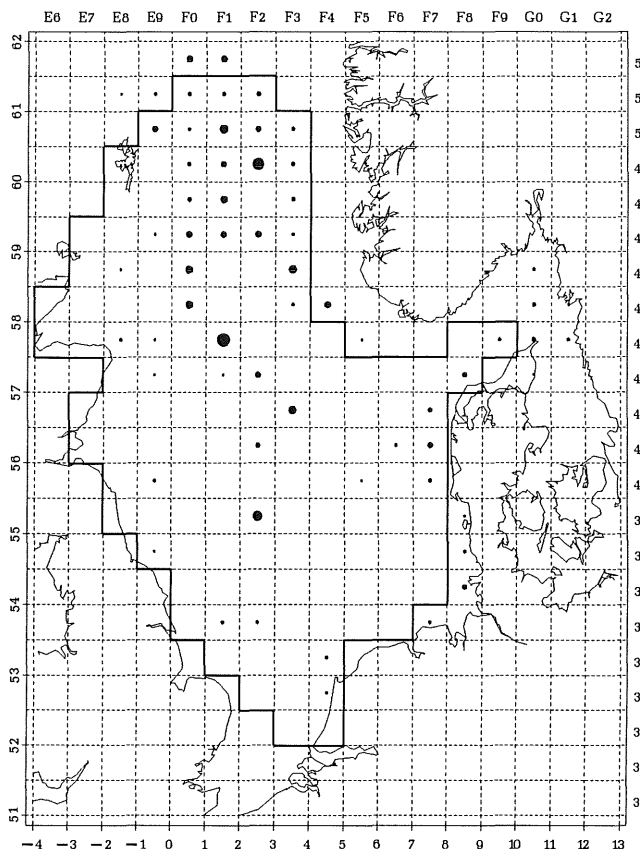
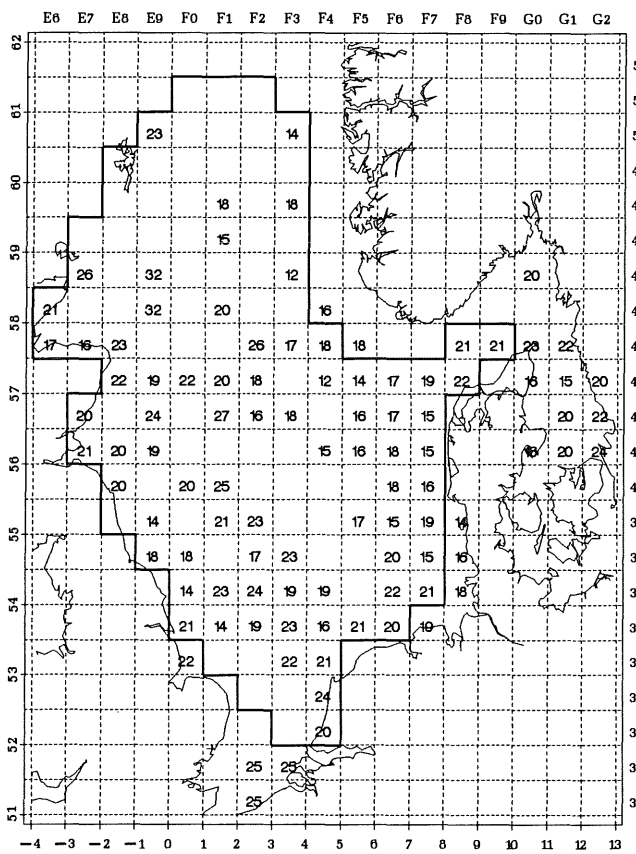
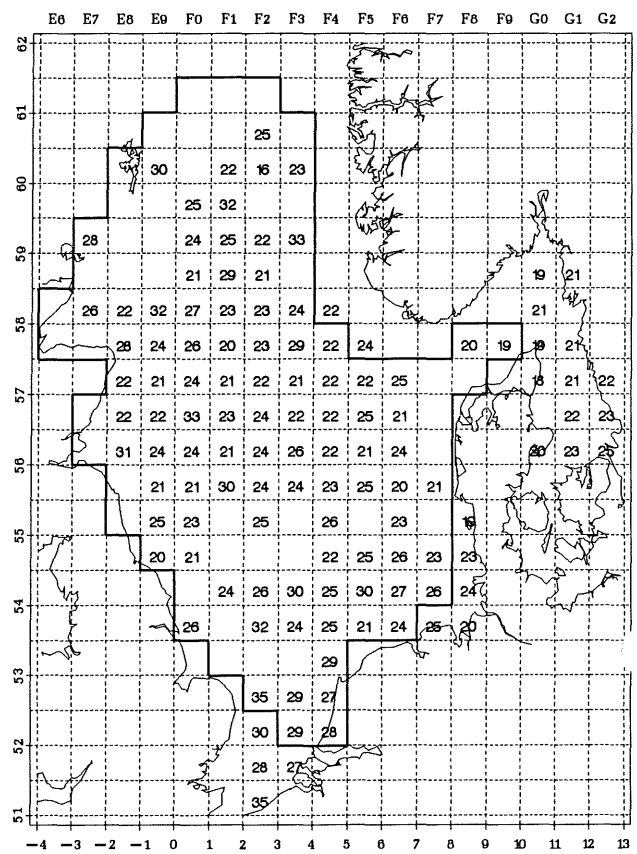


Figure 4.21 Cod: number per hour, age-group 3+.

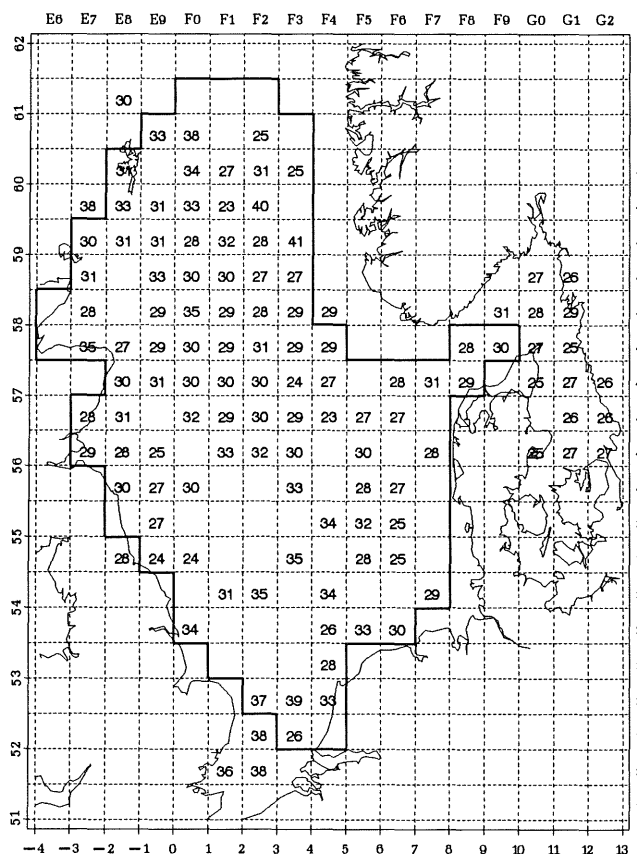
Cod, Age group 1 1991 quarter 1



Cod, Age group 1 1991 quarter 2



Cod, Age group 1 1991 quarter 3



Cod, Age group 1 1991 quarter 4

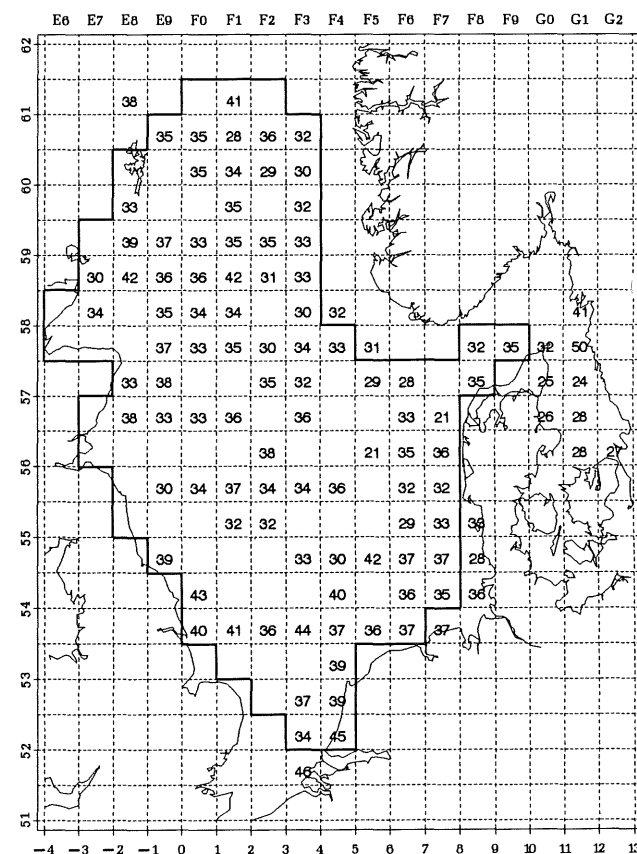
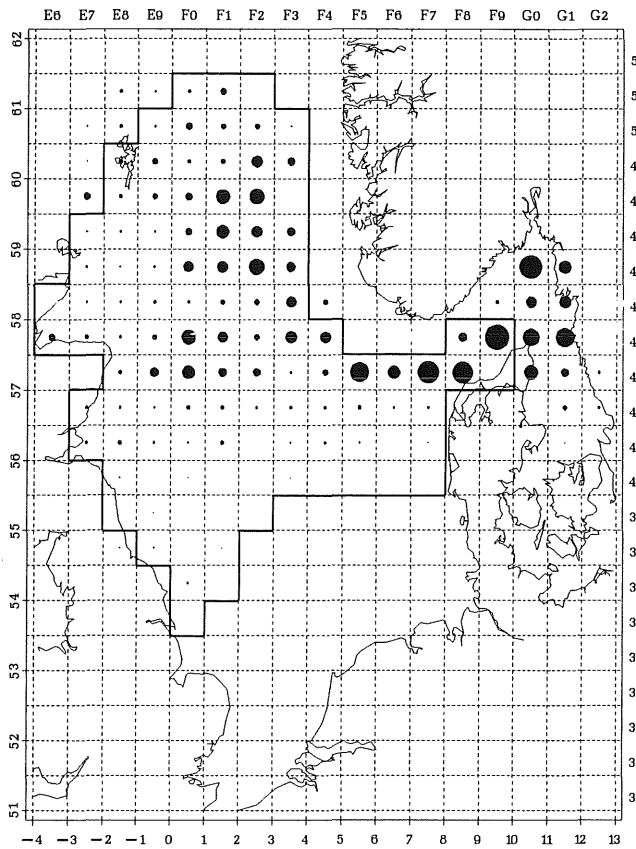


Figure 4.22 Cod: mean length (cm below), age-group 1.

Haddock, Age group 0 1991 quarter 3
 Max mean catch number per recangle: 8177



Haddock, Age group 0 1991 quarter 4
 Max mean catch number per recangle: 16385

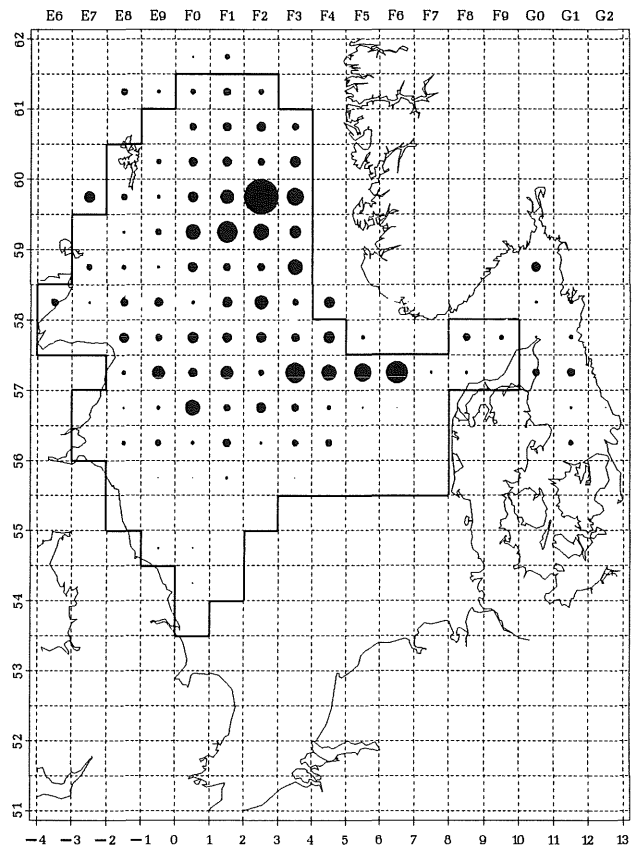
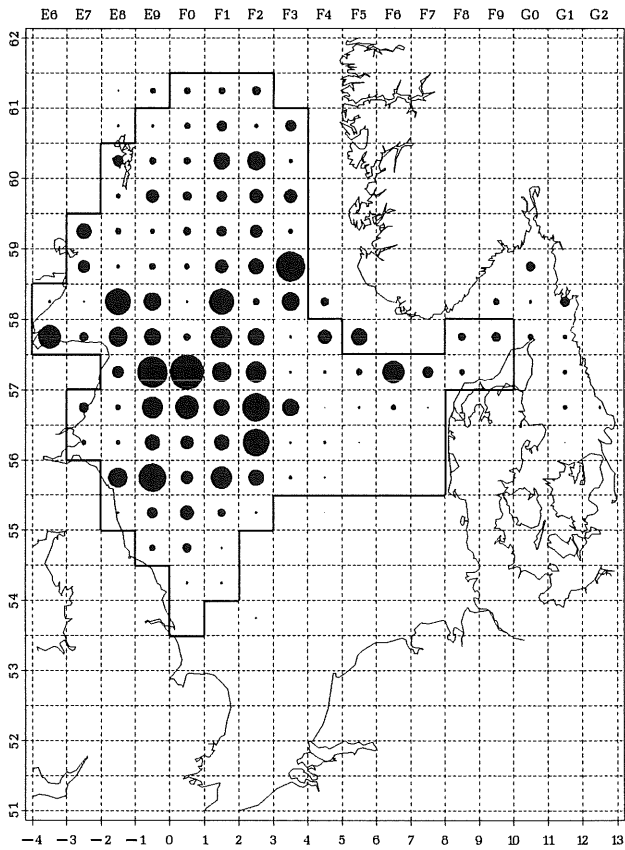
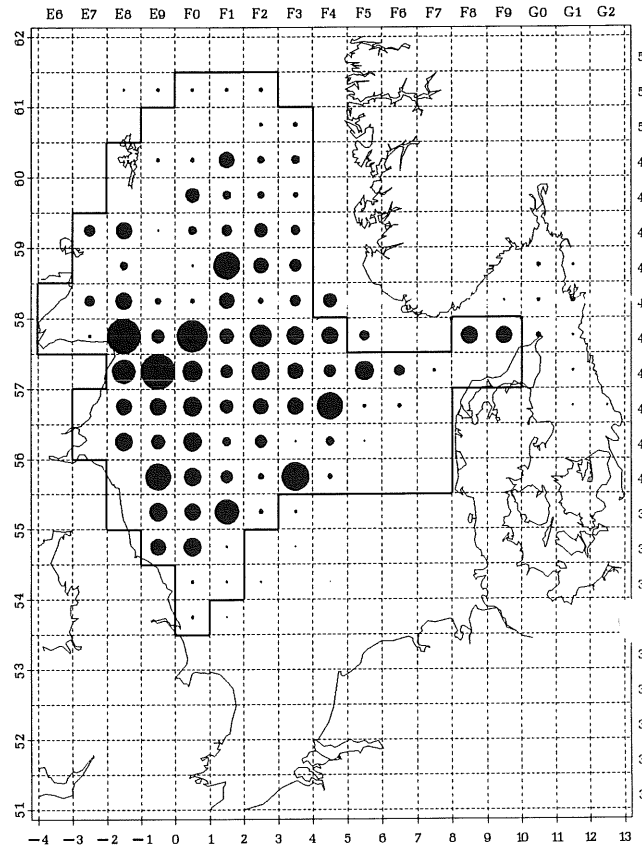


Figure 4.23 Haddock: number per hour, age-group 0.

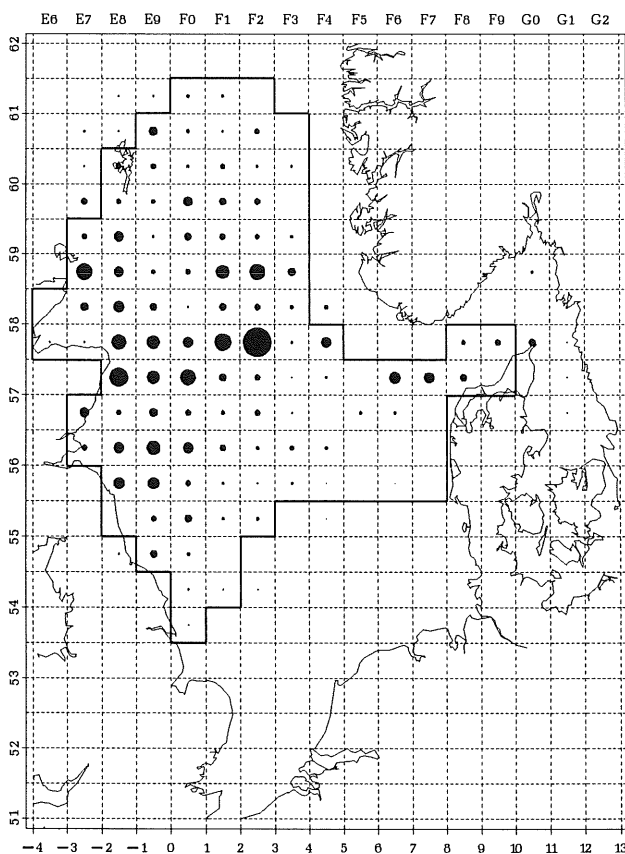
Haddock, Age group 1 1991 quarter 1
 Max mean catch number per recangle: 4510



Haddock, Age group 1 1991 quarter 2
 Max mean catch number per recangle: 4730



Haddock, Age group 1 1991 quarter 3
 Max mean catch number per recangle: 3240



Haddock, Age group 1 1991 quarter 4
 Max mean catch number per recangle: 2833

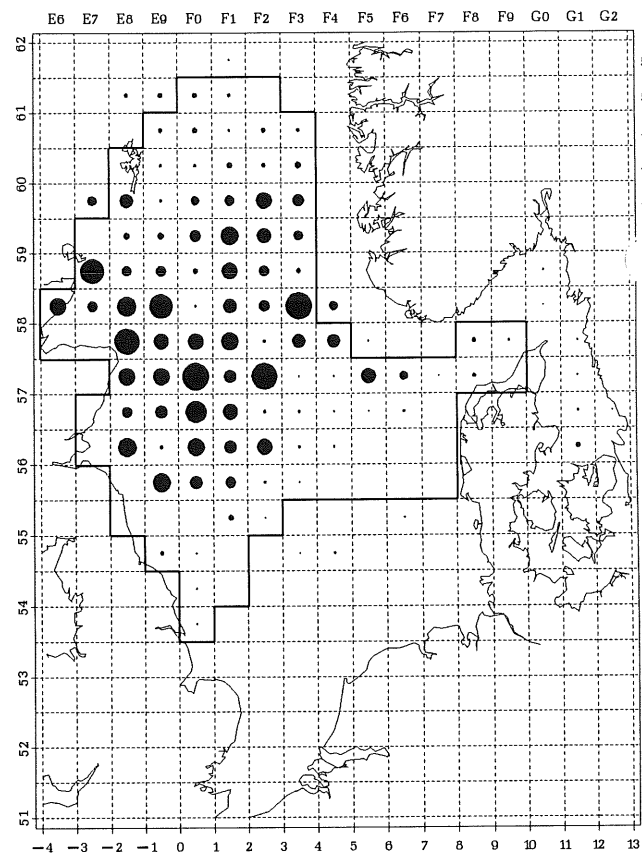
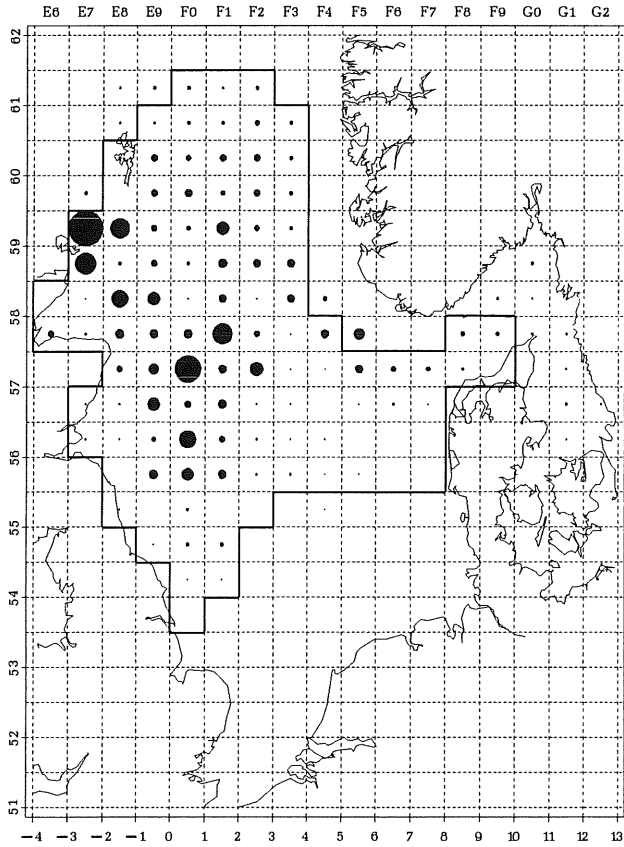
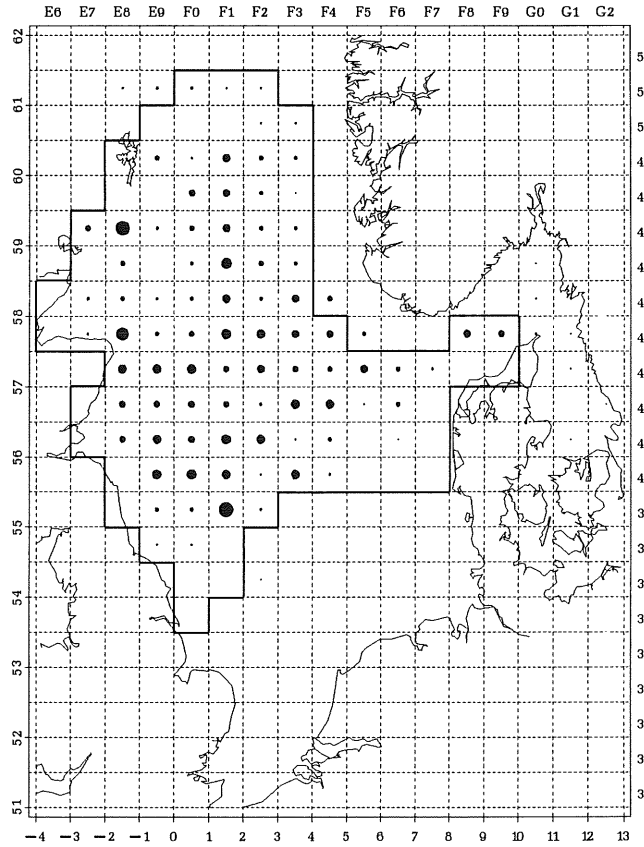


Figure 4.24 Haddock: number per hour, age-group 1.

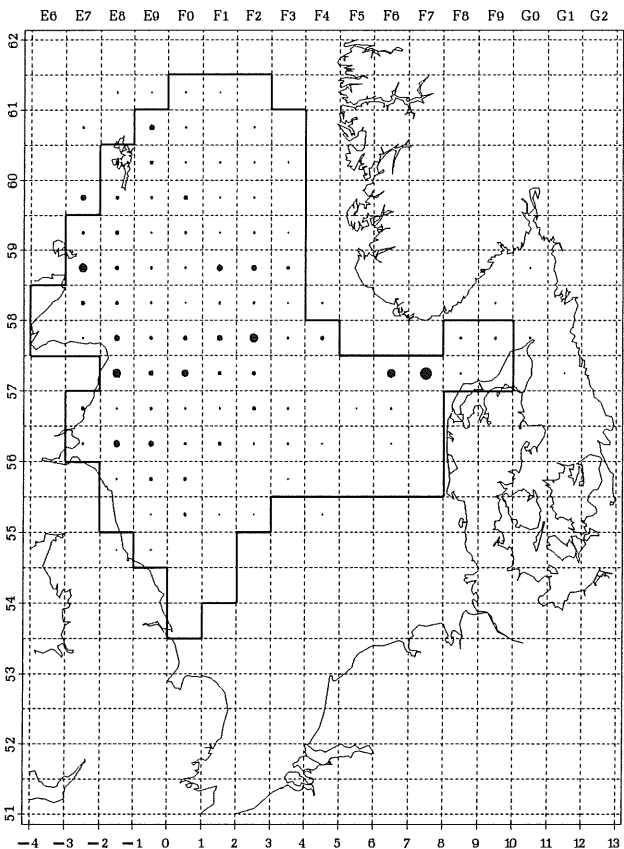
Haddock, Age group 2 1991 quarter 1
 Max mean catch number per rectangle: 2576



Haddock, Age group 2 1991 quarter 2
 Max mean catch number per rectangle: 432



Haddock, Age group 2 1991 quarter 3
 Max mean catch number per rectangle: 292



Haddock, Age group 2 1991 quarter 4
 Max mean catch number per rectangle: 270

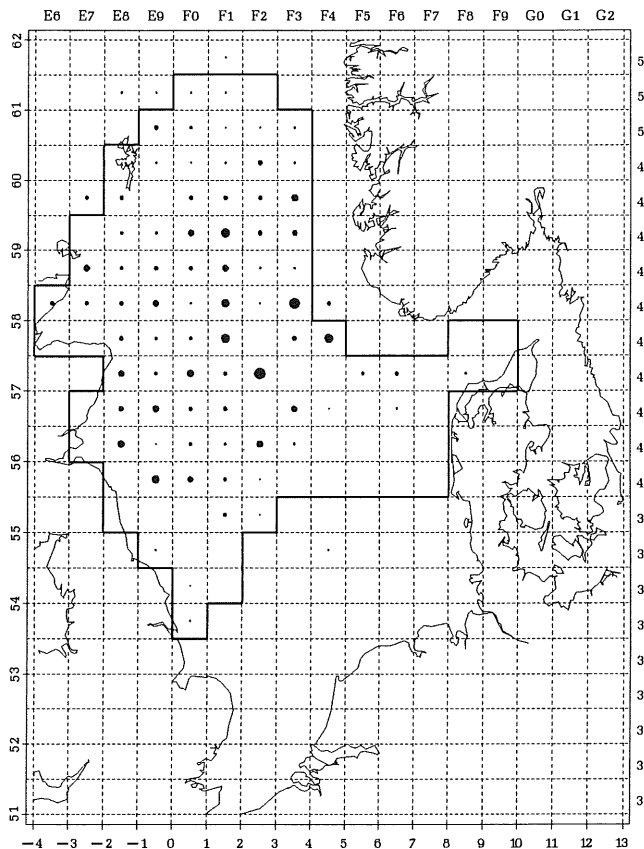
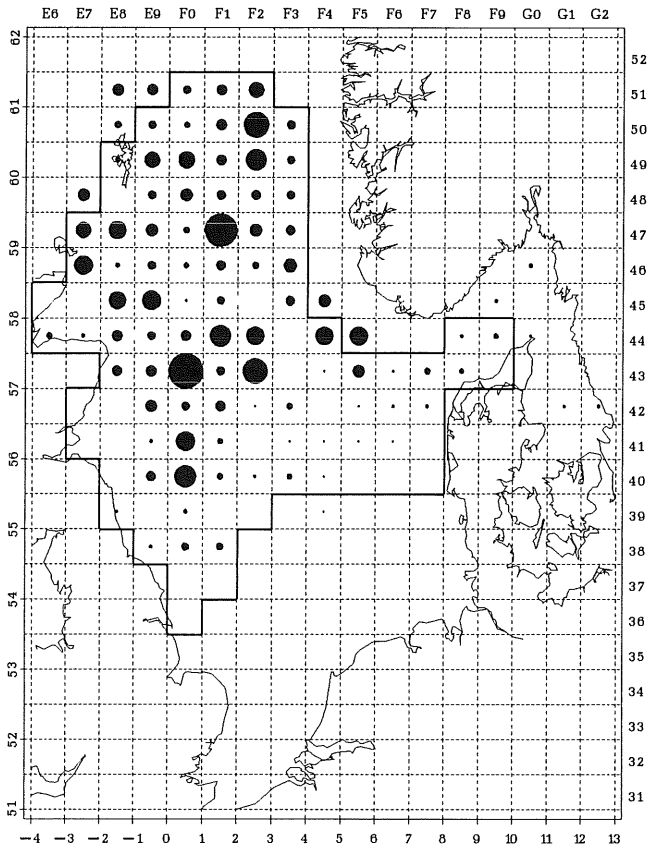
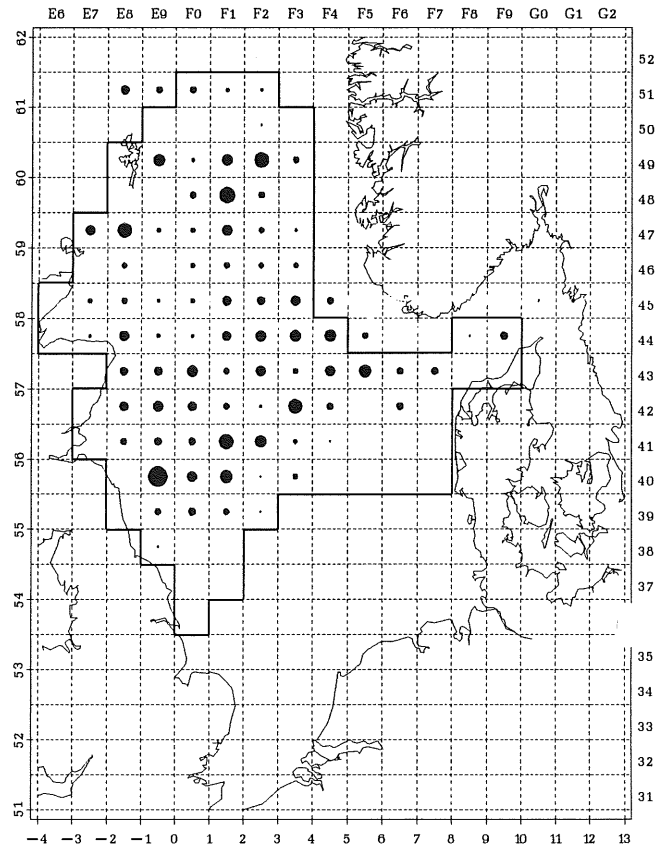


Figure 4.25 Haddock: number per hour, age-group 2.

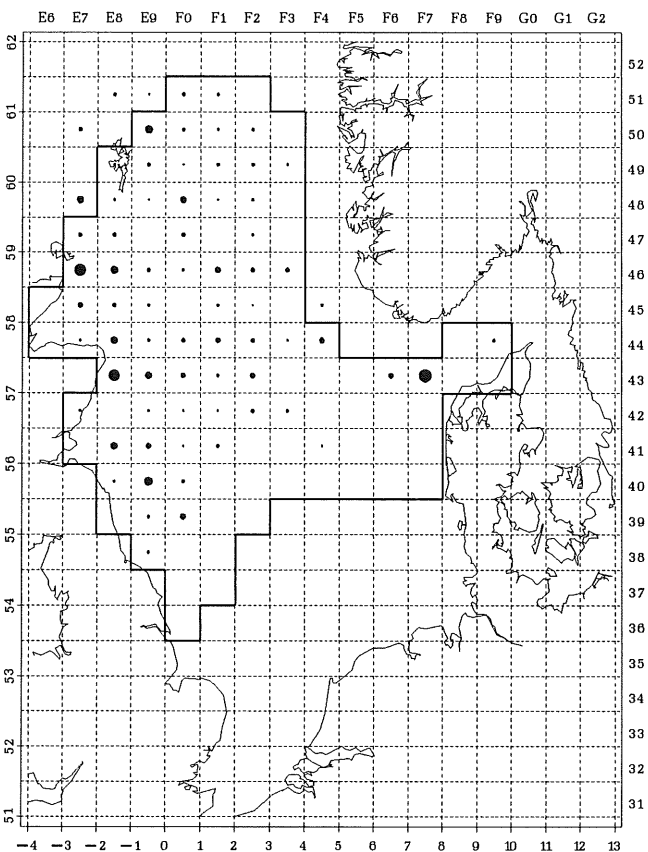
Haddock, Age group 3+ 1991 quarter 1
 Max mean catch number per recangle: 425



Haddock, Age group 3+ 1991 quarter 2
 Max mean catch number per recangle: 139



Haddock, Age group 3+ 1991 quarter 3
 Max mean catch number per recangle: 56



Haddock, Age group 3+ 1991 quarter 4
 Max mean catch number per recangle: 152

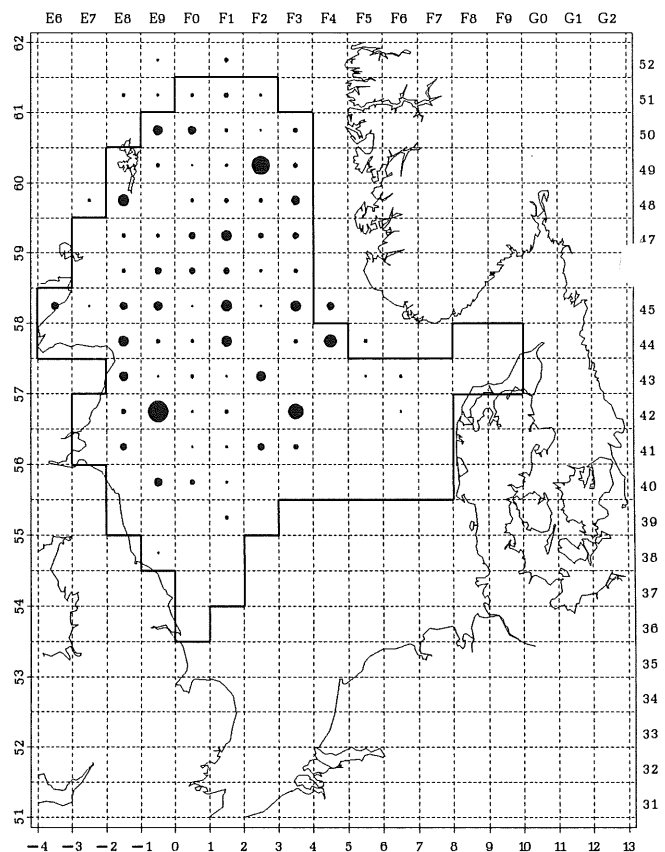
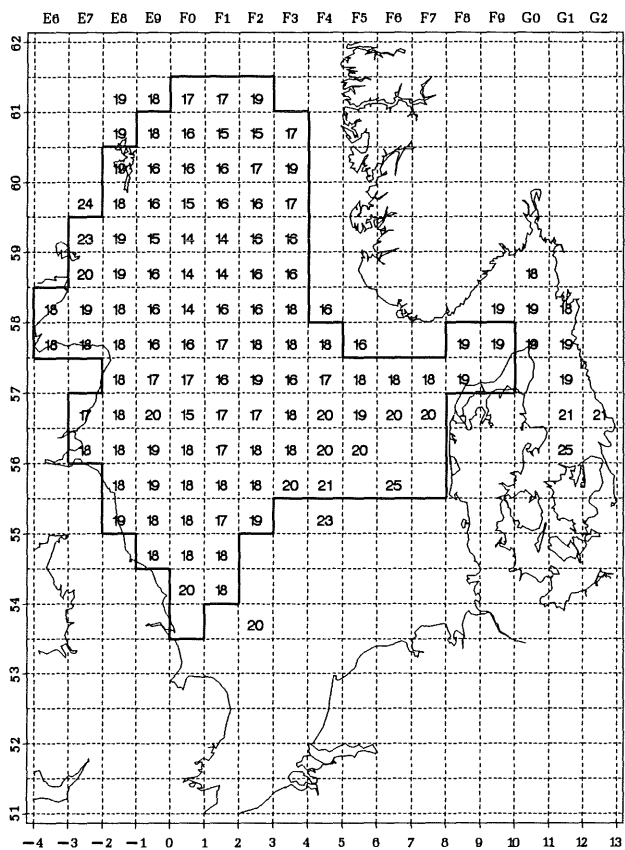
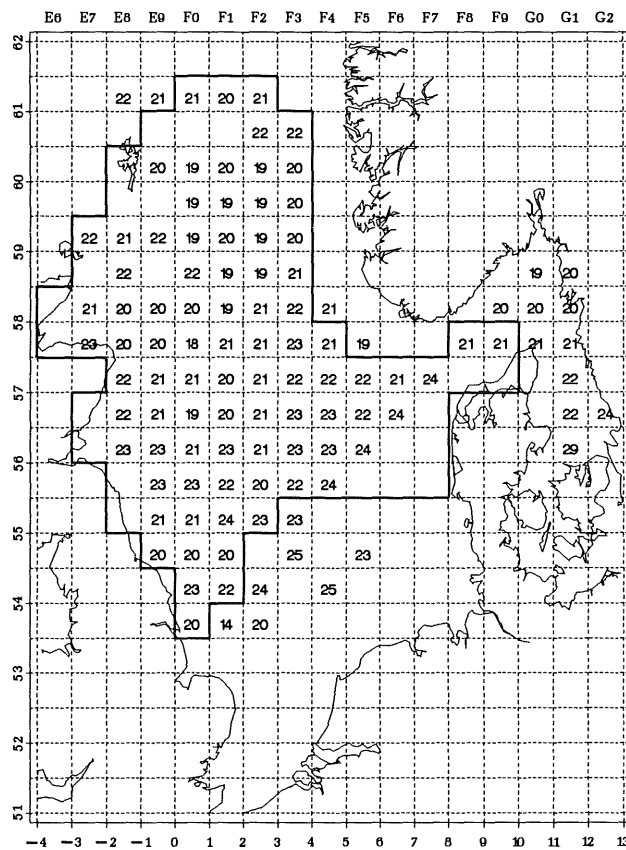


Figure 4.26 Haddock: number per hour, age-group 3+.

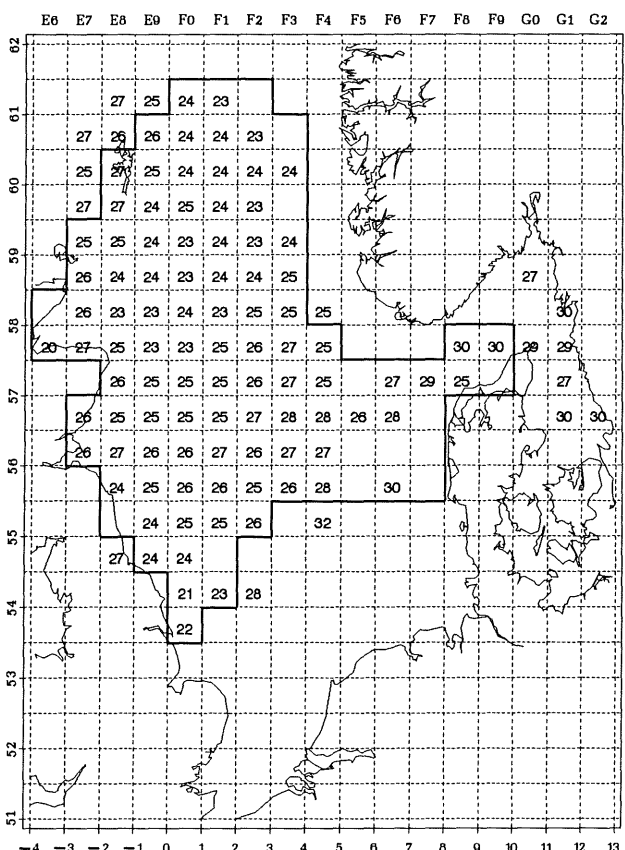
Haddock, Age group 1 1991 quarter 1



Haddock, Age group 1 1991 quarter 2



Haddock, Age group 1 1991 quarter 3



Haddock, Age group 1 1991 quarter 4

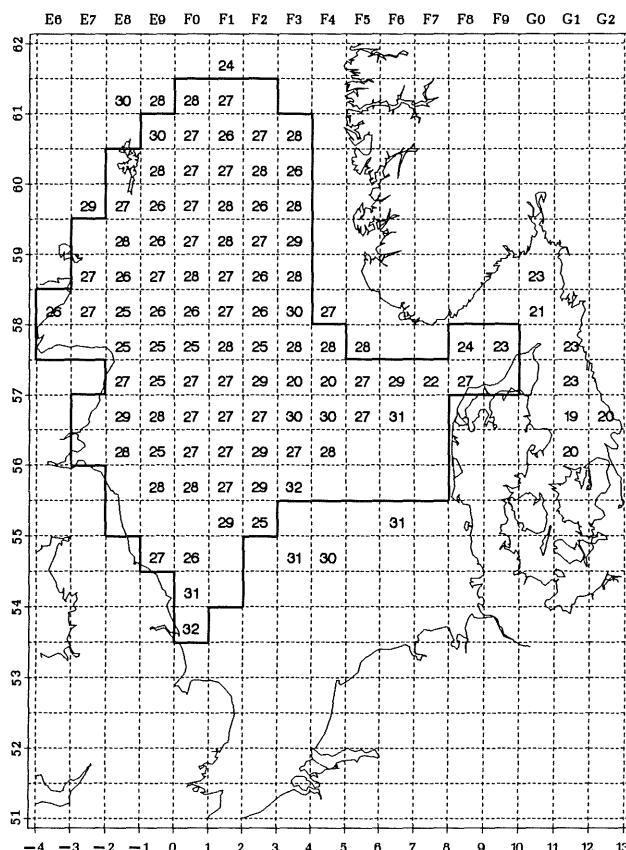
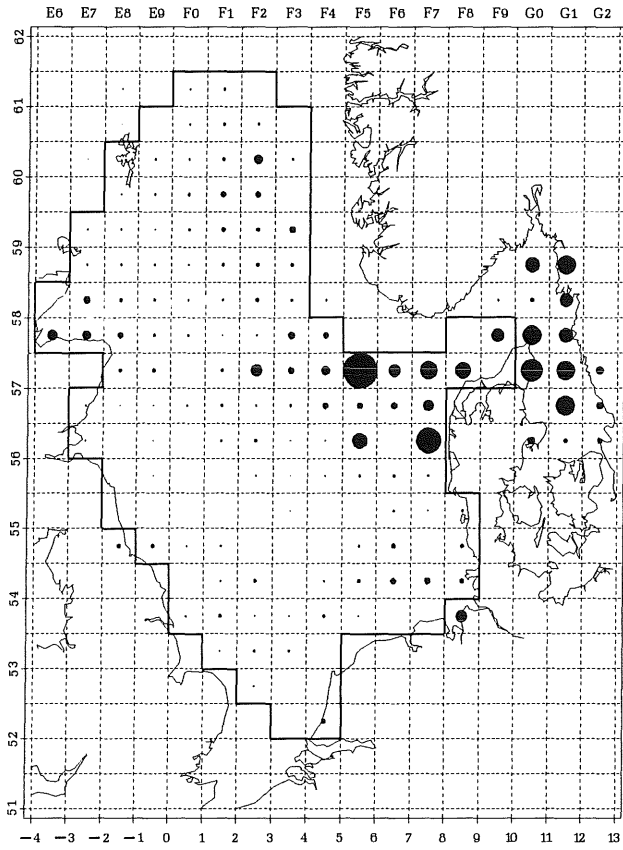


Figure 4.27 Haddock: mean length (cm below), age-group 1.

Whiting, Age group 0 1991 quarter 3
 Max mean catch number per recangle: 19968



Whiting, Age group 0 1991 quarter 4
 Max mean catch number per recangle: 17323

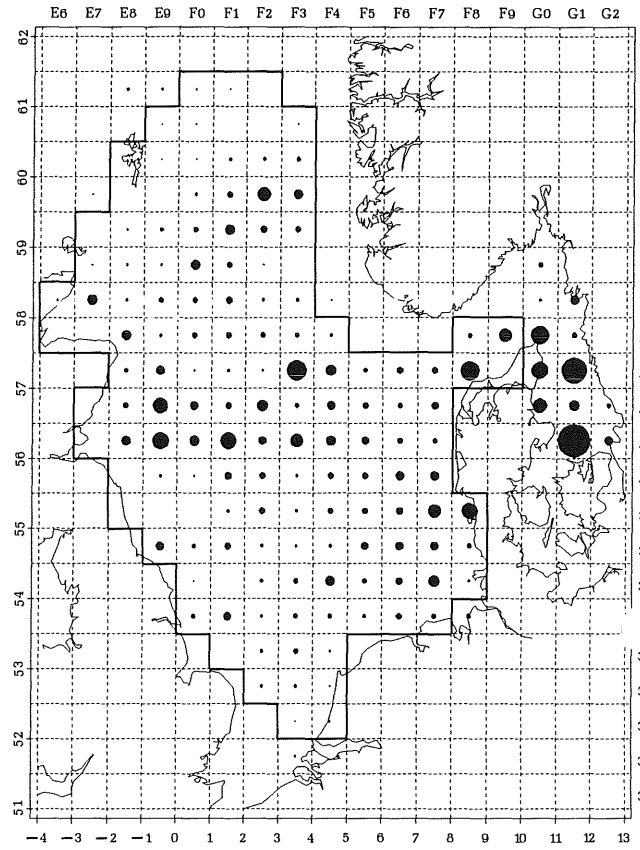
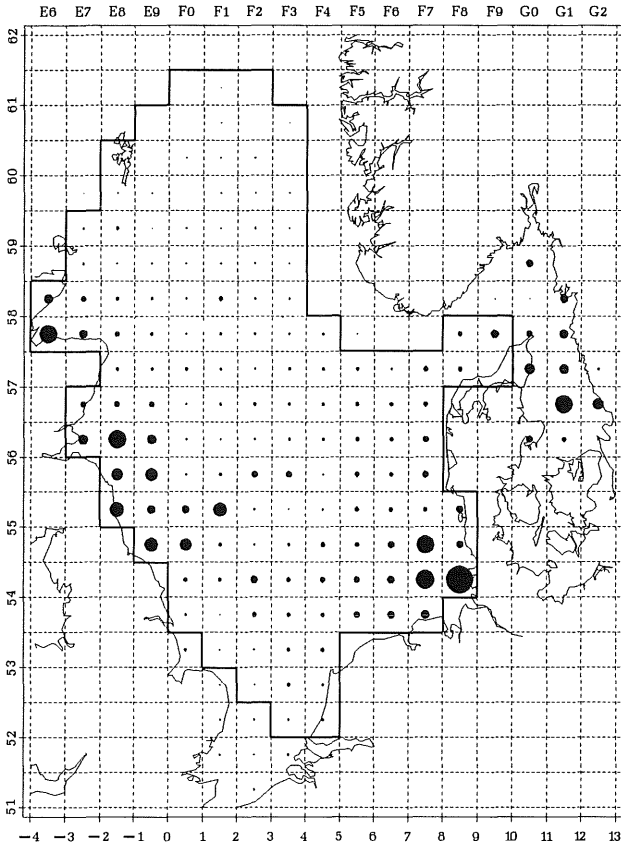
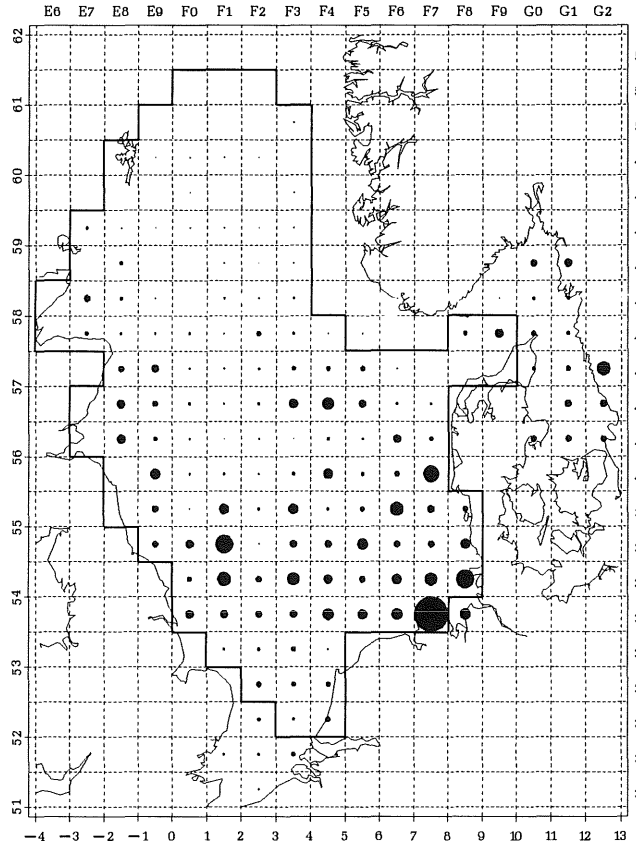


Figure 4.28 Whiting: number per hour, age-group 0.

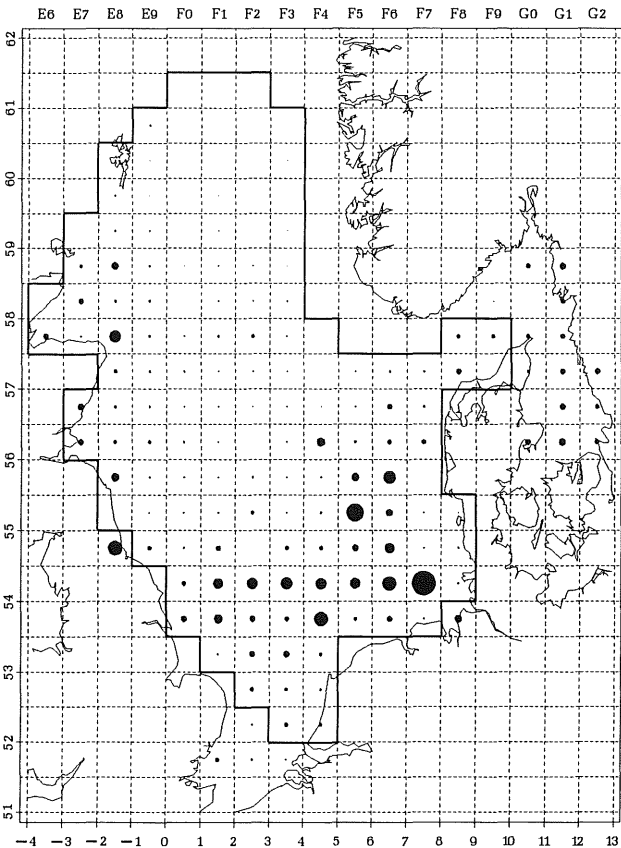
Whiting, Age group 1 1991 quarter 1
 Max mean catch number per recangle: 21408



Whiting, Age group 1 1991 quarter 2
 Max mean catch number per recangle: 35680



Whiting, Age group 1 1991 quarter 3
 Max mean catch number per recangle: 16859



Whiting, Age group 1 1991 quarter 4
 Max mean catch number per recangle: 23017

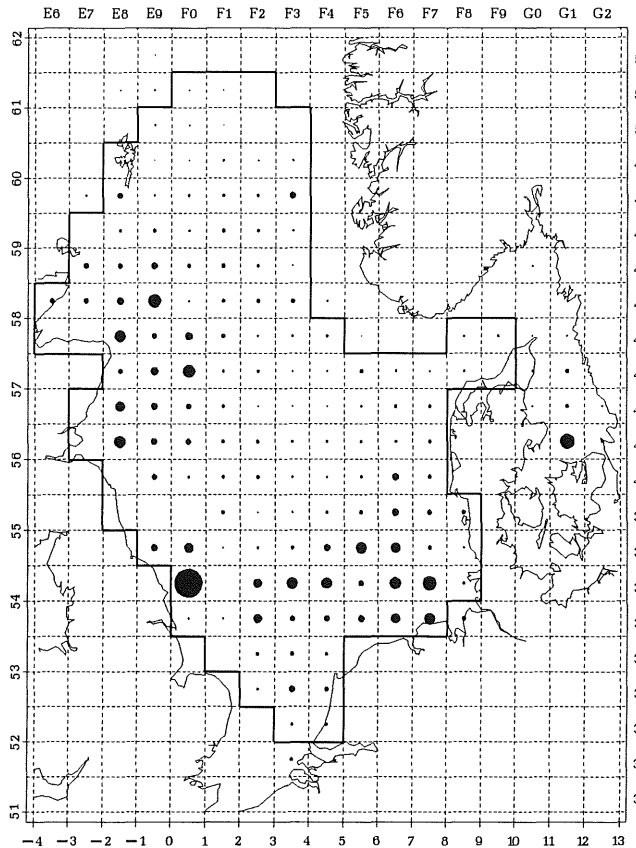
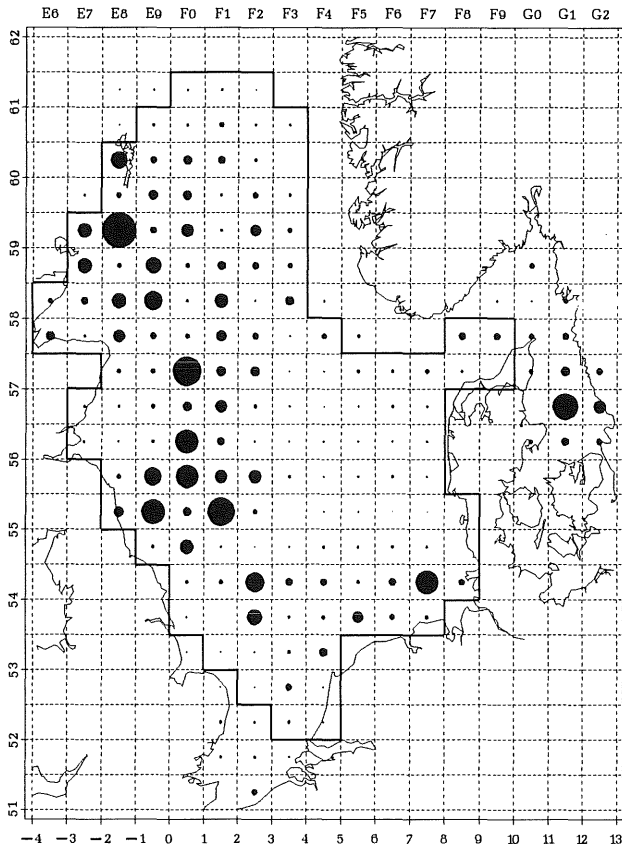
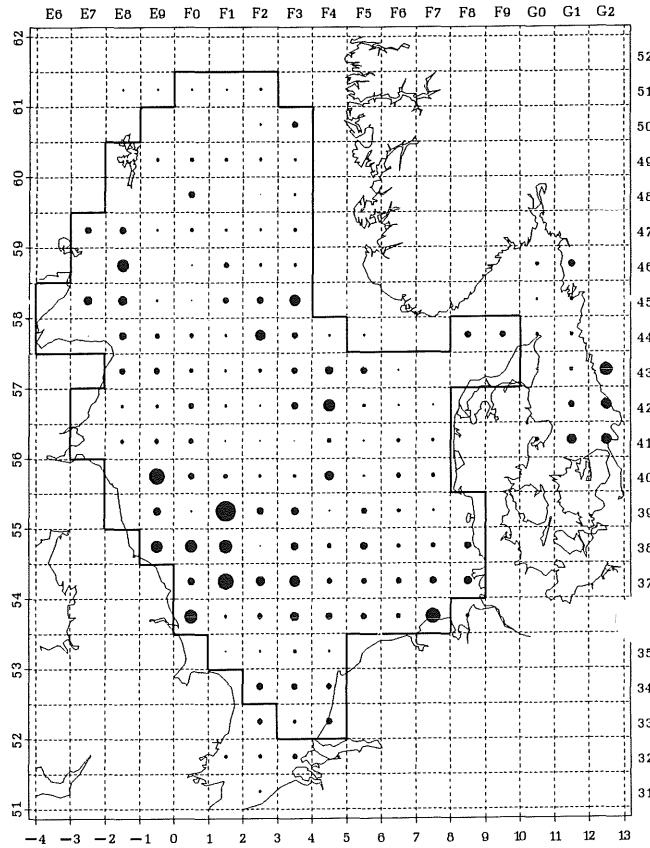


Figure 4.29 Whiting: number per hour, age-group 1.

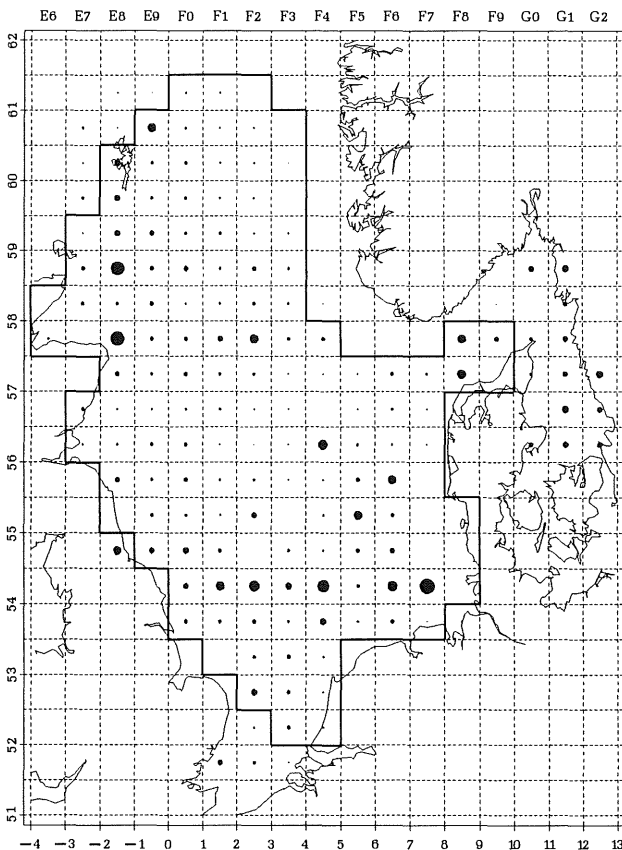
Whiting, Age group 2 1991 quarter 1
Max mean catch number per recangle: 10505



Whiting, Age group 2 1991 quarter 2
Max mean catch number per recangle: 3501



Whiting, Age group 2 1991 quarter 3
Max mean catch number per recangle: 1897



Whiting, Age group 2 1991 quarter 4
Max mean catch number per recangle: 5884

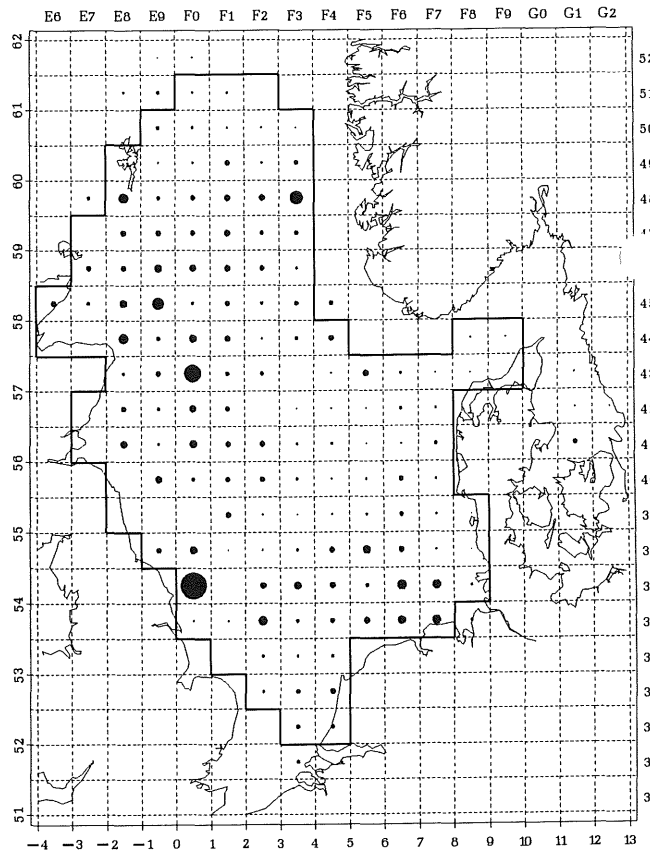
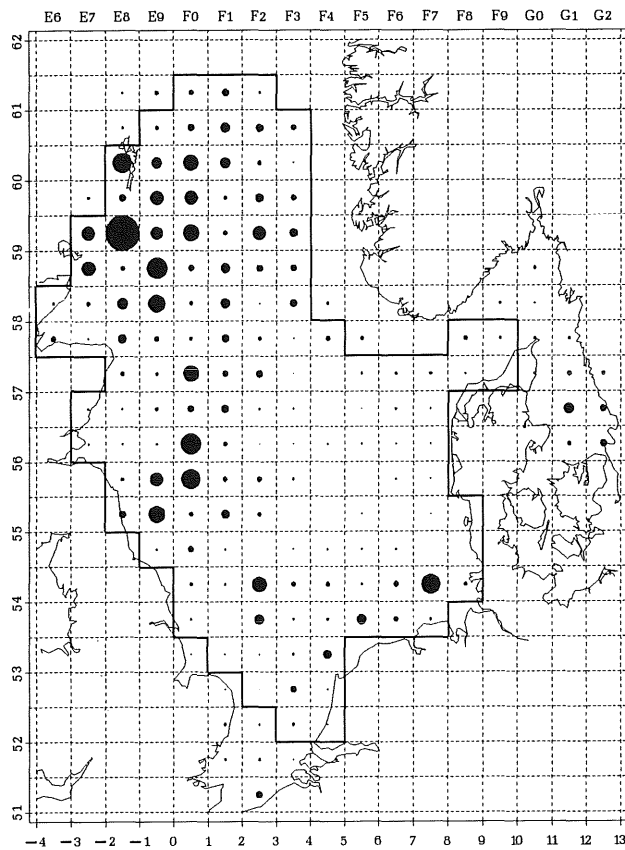
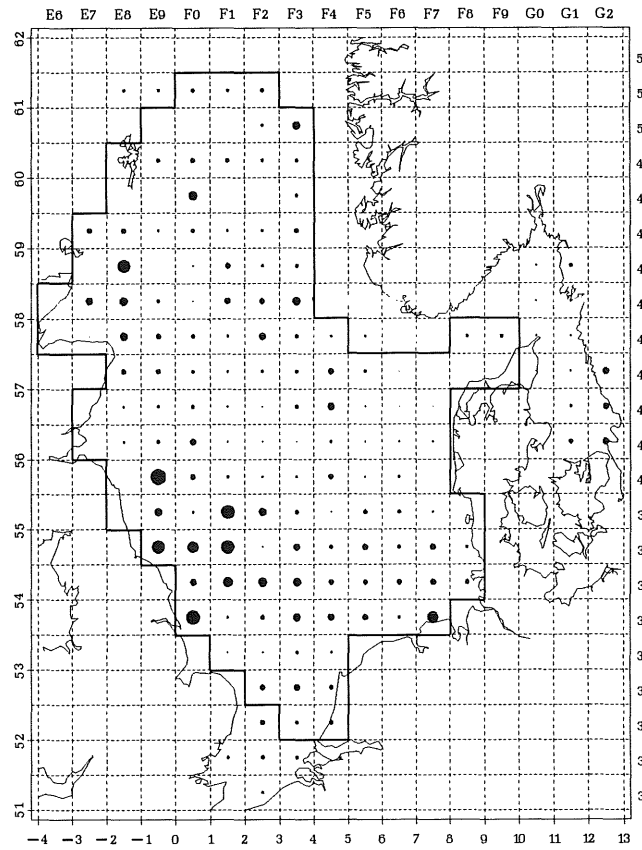


Figure 4.30 Whiting: number per hour, age-group 2.

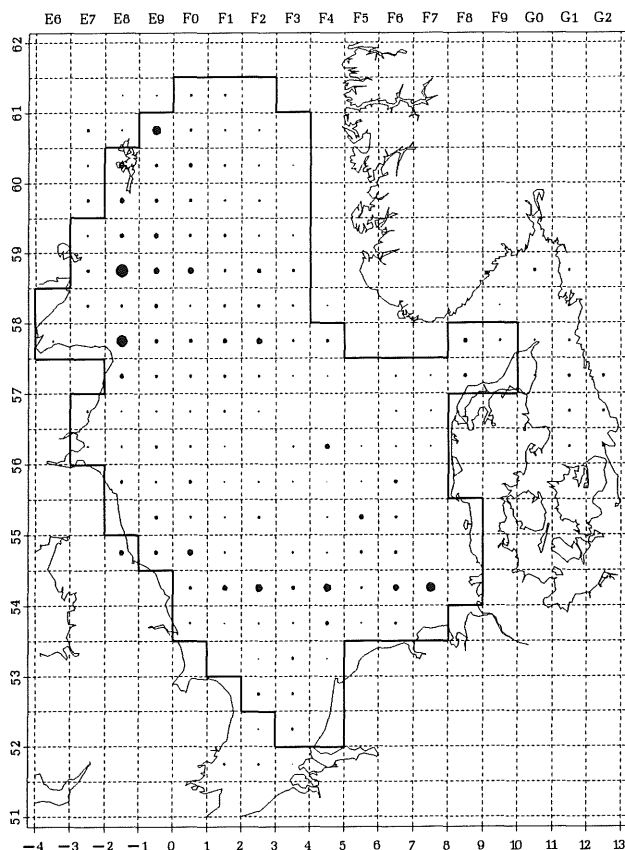
Whiting, Age group 3+ 1991 quarter 1
 Max mean catch number per recangle: 12073



Whiting, Age group 3+ 1991 quarter 2
 Max mean catch number per recangle: 2232



Whiting, Age group 3+ 1991 quarter 3
 Max mean catch number per recangle: 1554



Whiting, Age group 3+ 1991 quarter 4
 Max mean catch number per recangle: 1556

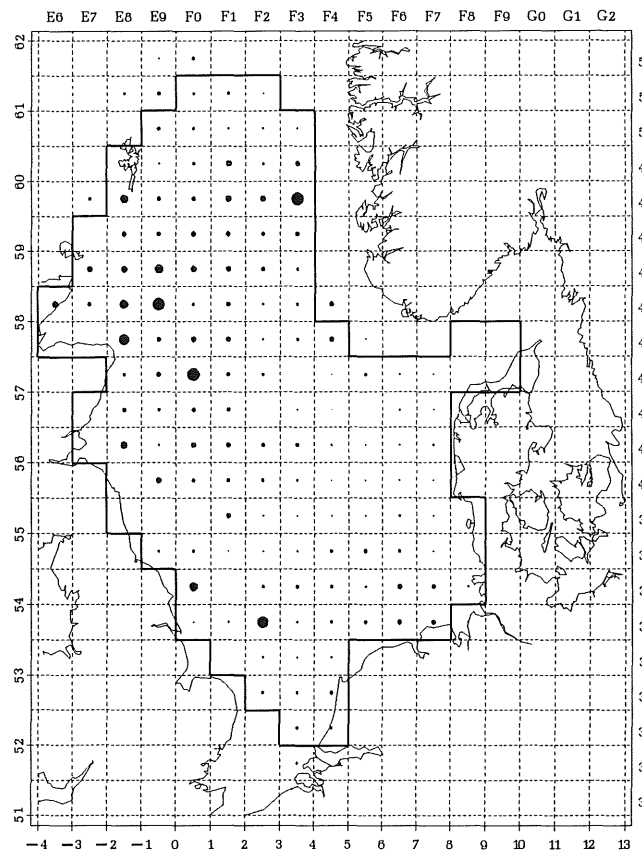
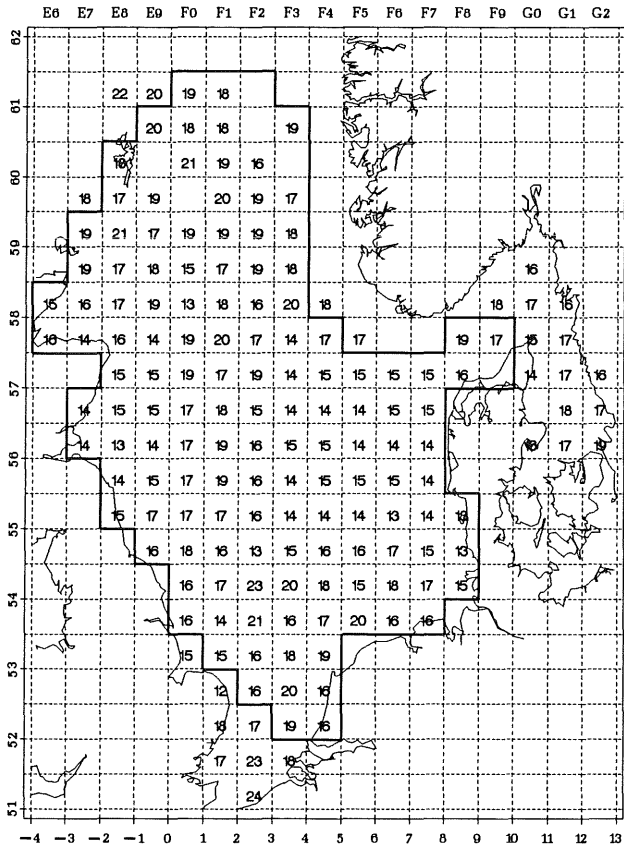
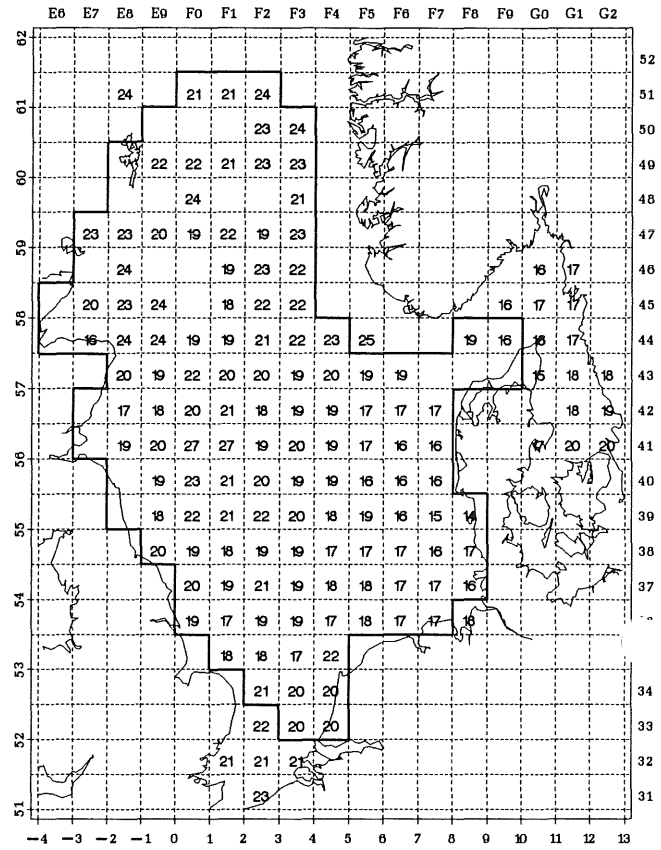


Figure 4.31 Whiting: number per hour, age-group 3+.

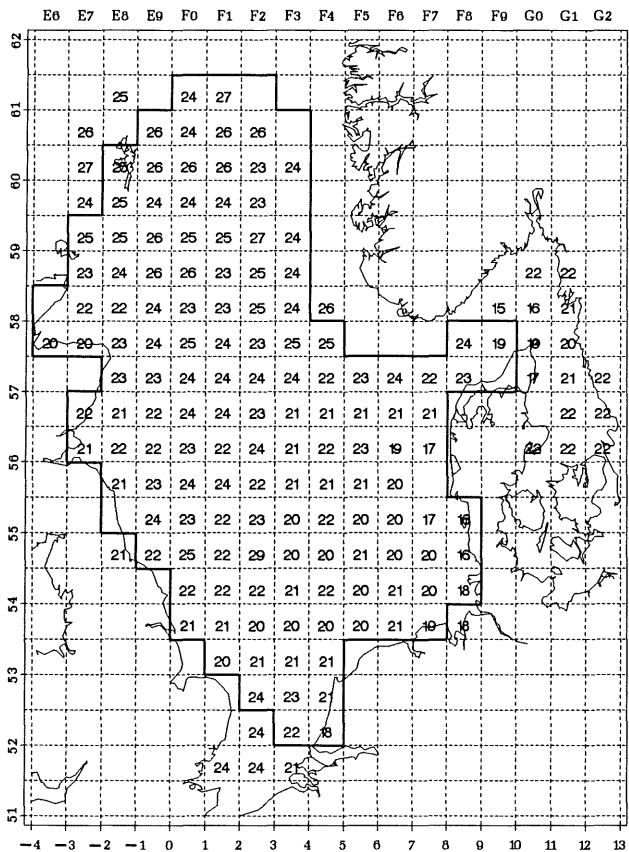
Whiting, Age group 1 1991 quarter 1



Whiting, Age group 1 1991 quarter 2



Whiting, Age group 1 1991 quarter 3



Whiting, Age group 1 1991 quarter 4

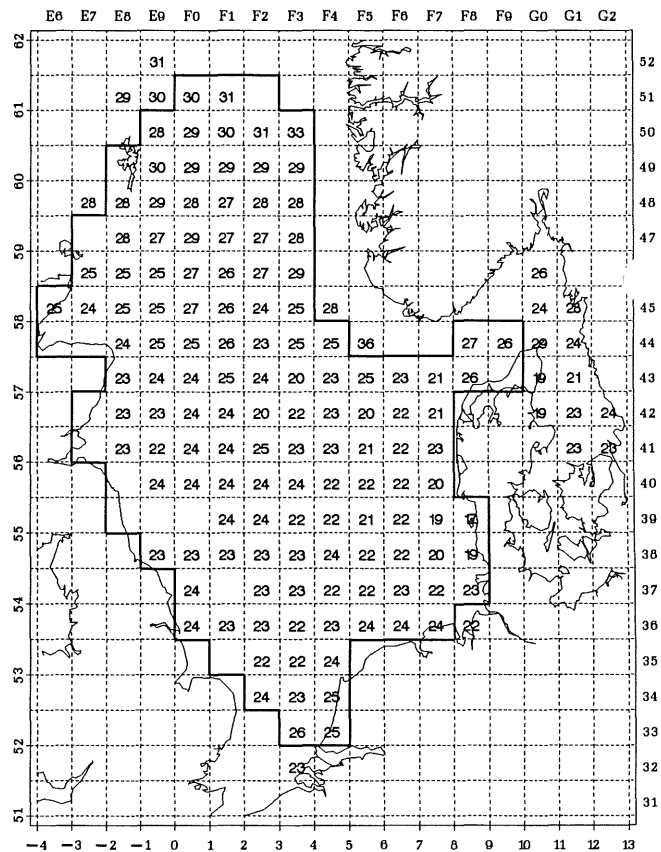
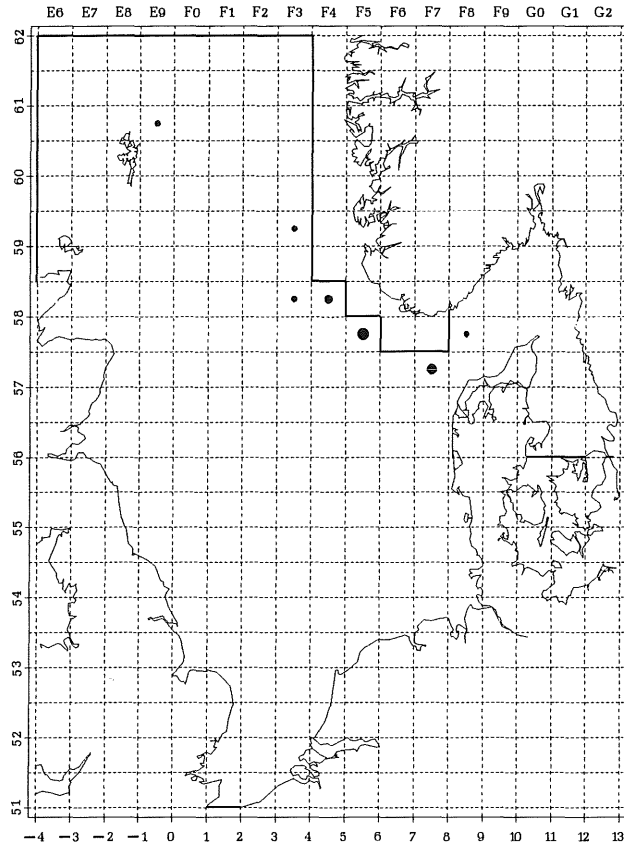
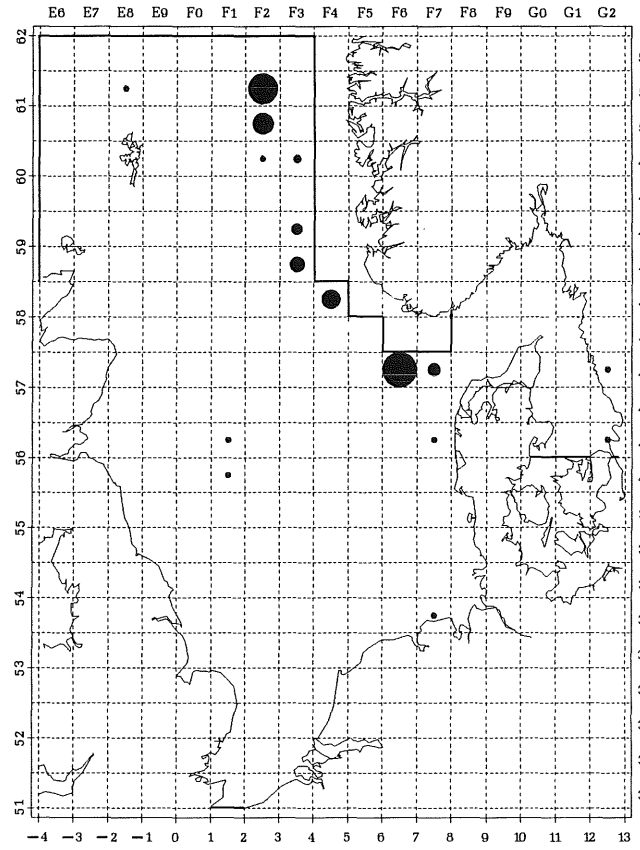


Figure 4.32 Whiting: mean length (cm below), age-group 1.

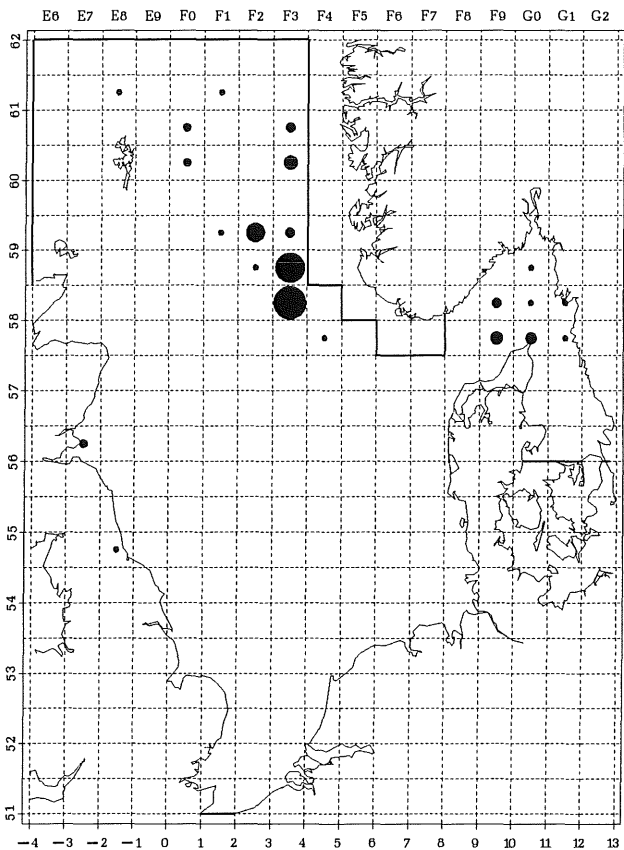
Saithe, Age group 2 1991 quarter 1
 Max mean catch number per recangle: 4



Saithe, Age group 2 1991 quarter 2
 Max mean catch number per recangle: 37



Saithe, Age group 2 1991 quarter 3
 Max mean catch number per recangle: 33



Saithe, Age group 2 1991 quarter 4
 Max mean catch number per recangle: 33

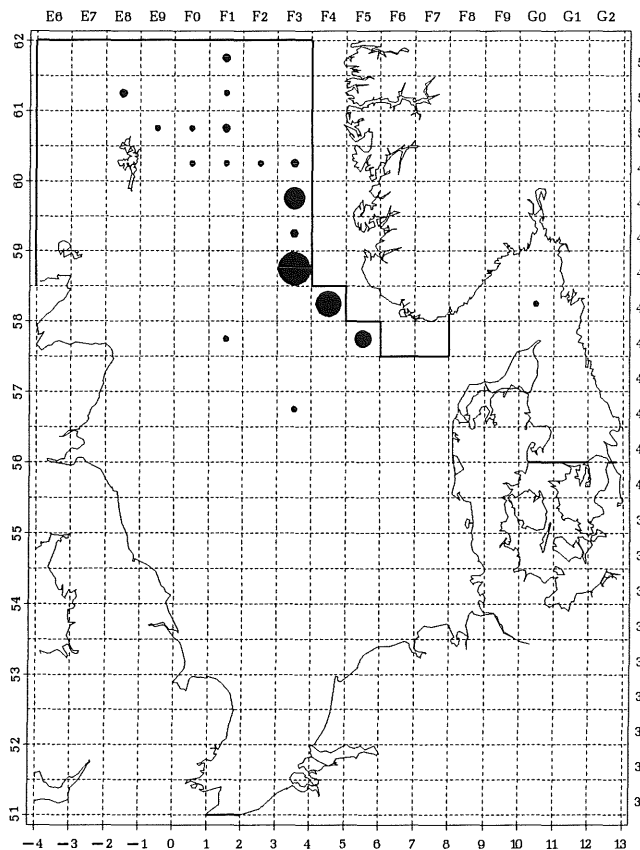
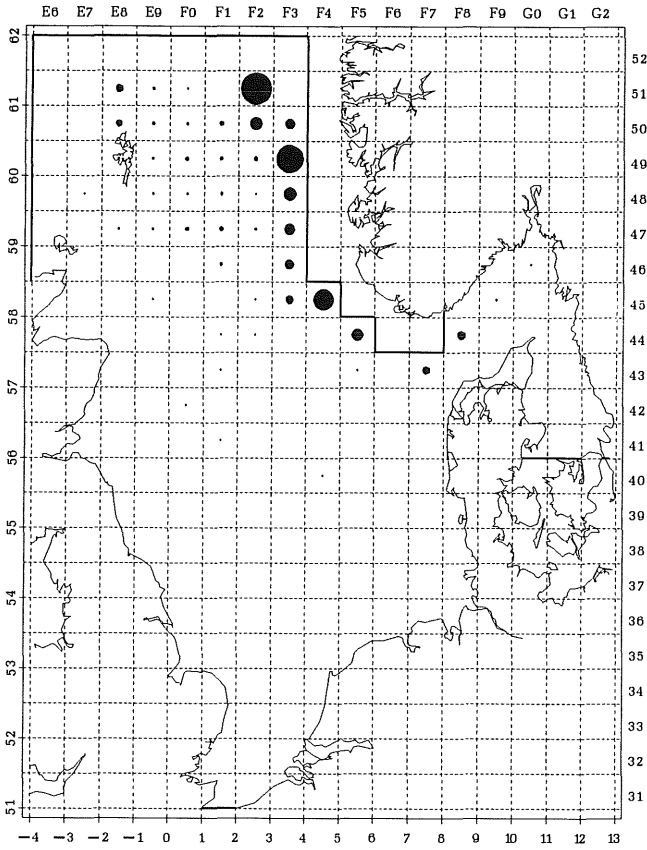
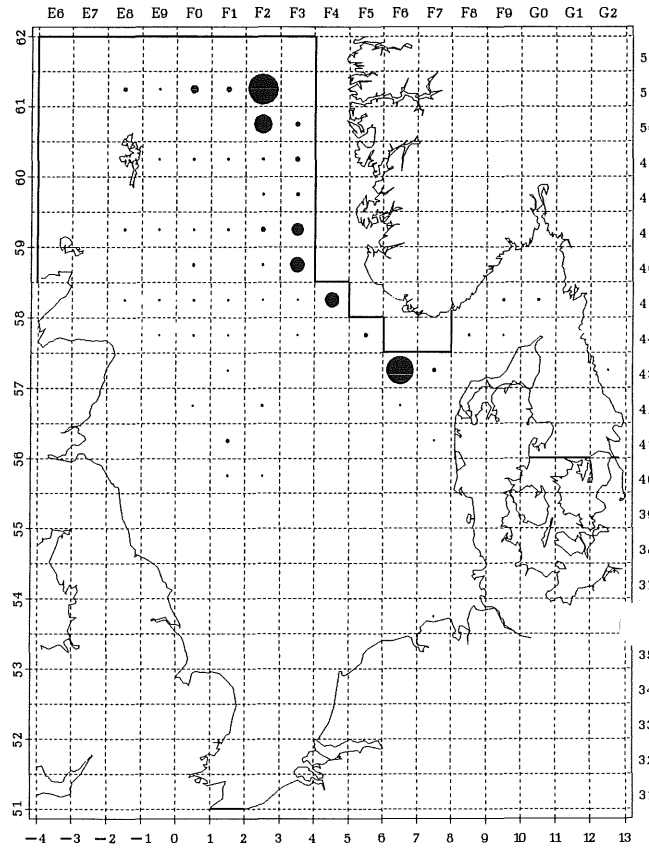


Figure 4.33 Saithe: number per hour, age-group 2.

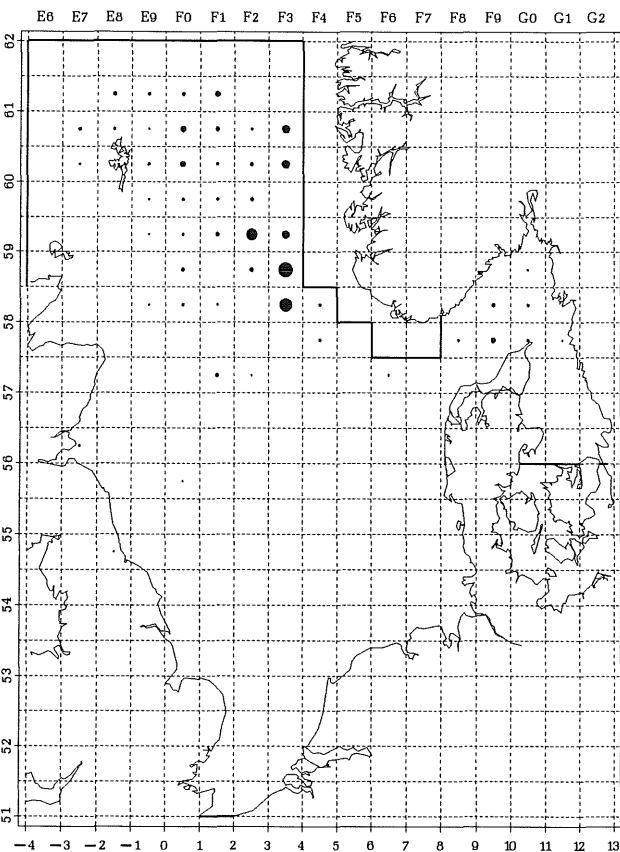
Saithe, Age group 3+ 1991 quarter 1
 Max mean catch number per rectangle: 549



Saithe, Age group 3+ 1991 quarter 2
 Max mean catch number per rectangle: 509



Saithe, Age group 3+ 1991 quarter 3
 Max mean catch number per rectangle: 116



Saithe, Age group 3+ 1991 quarter 4
 Max mean catch number per rectangle: 676

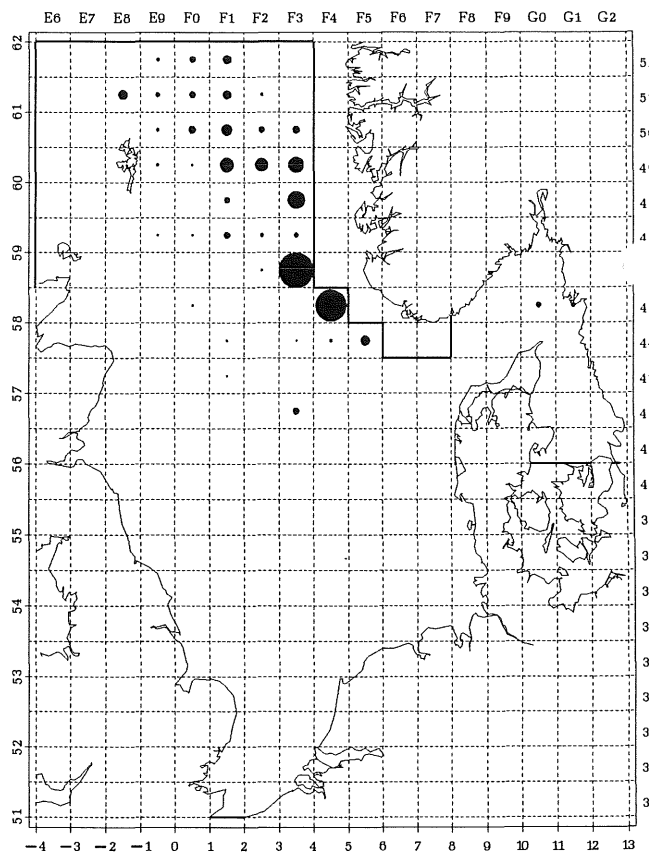
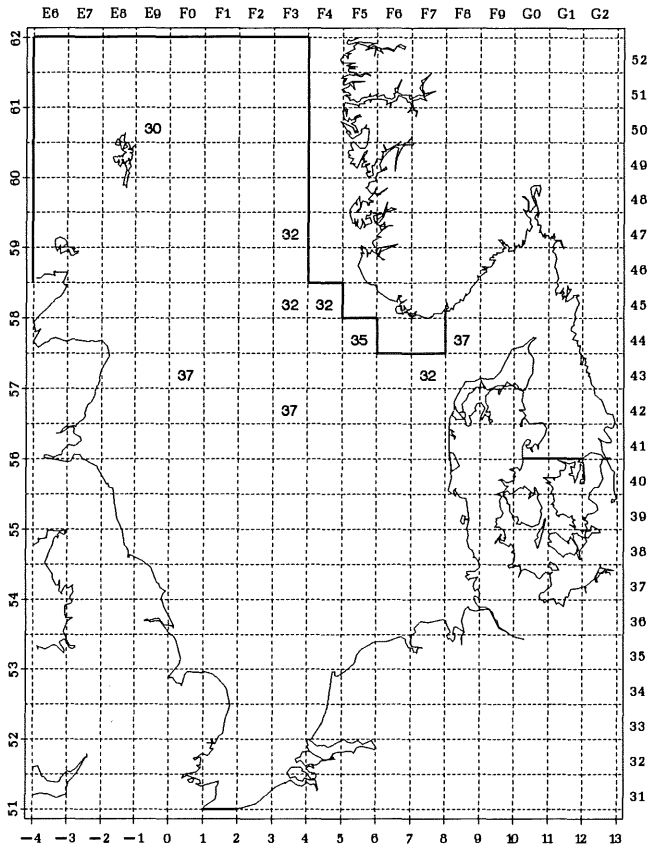
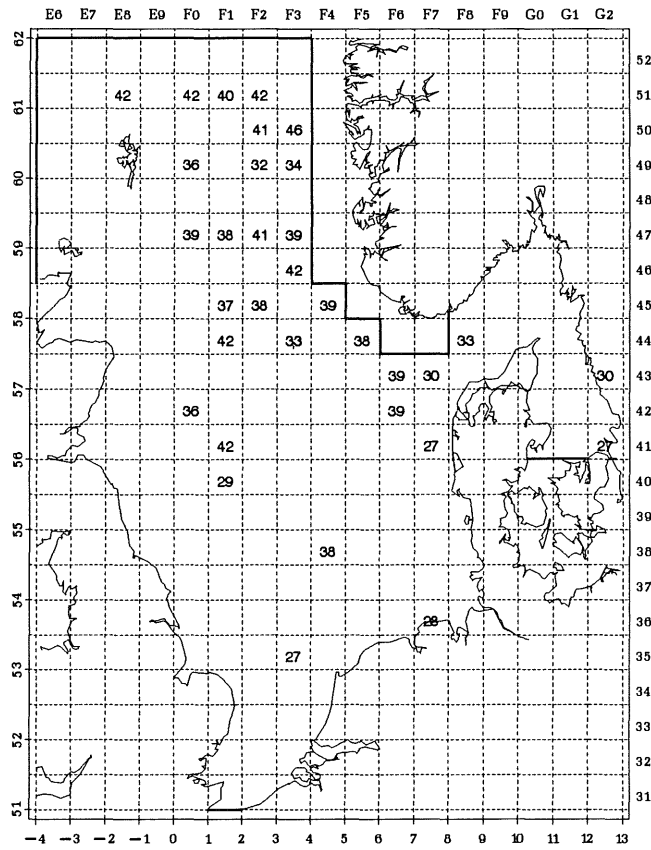


Figure 4.34 Saithe: number per hour, age-group 3+.

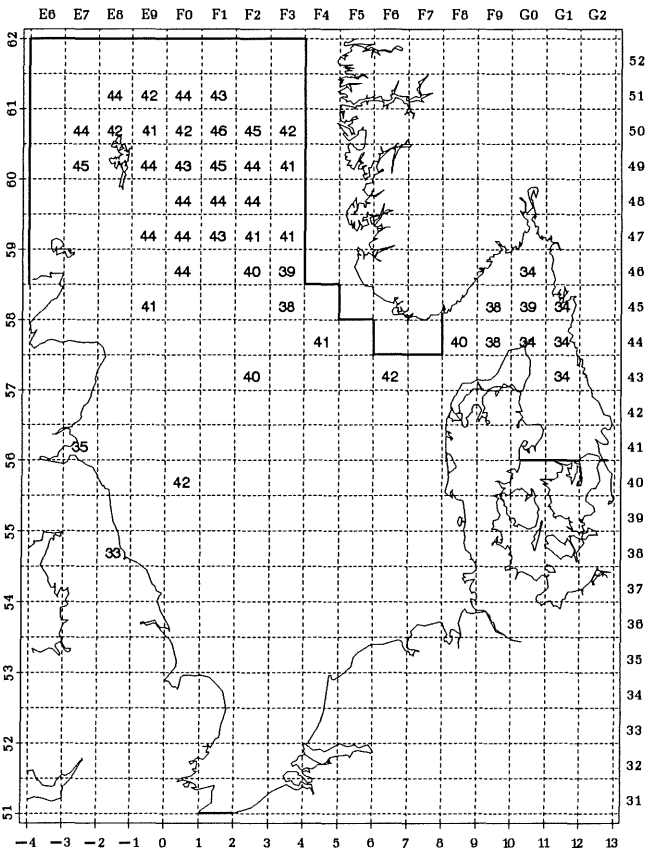
Saithe, Age group 2 1991 quarter 1



Saithe, Age group 2 1991 quarter 2



Saithe, Age group 2 1991 quarter 3



Saithe, Age group 2 1991 quarter 4

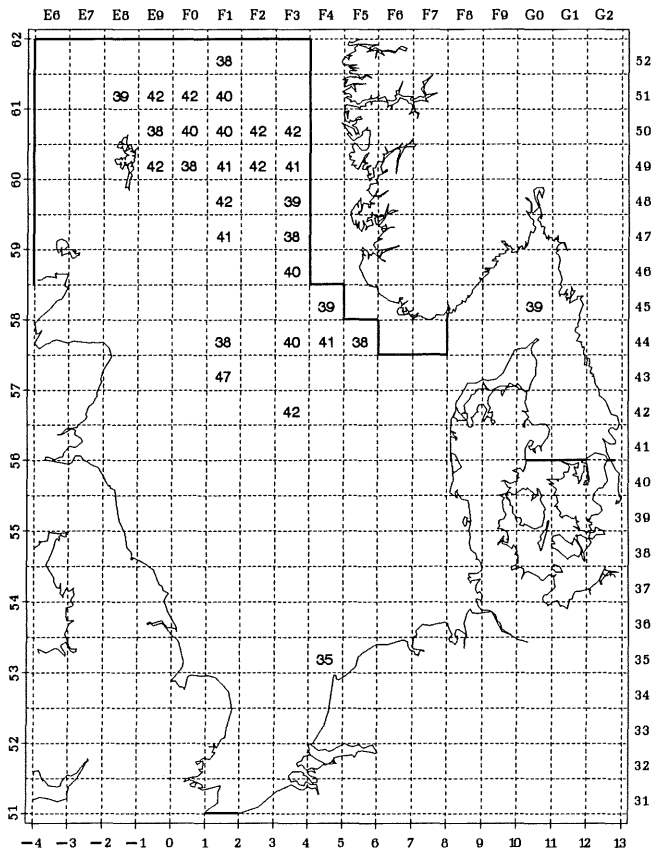
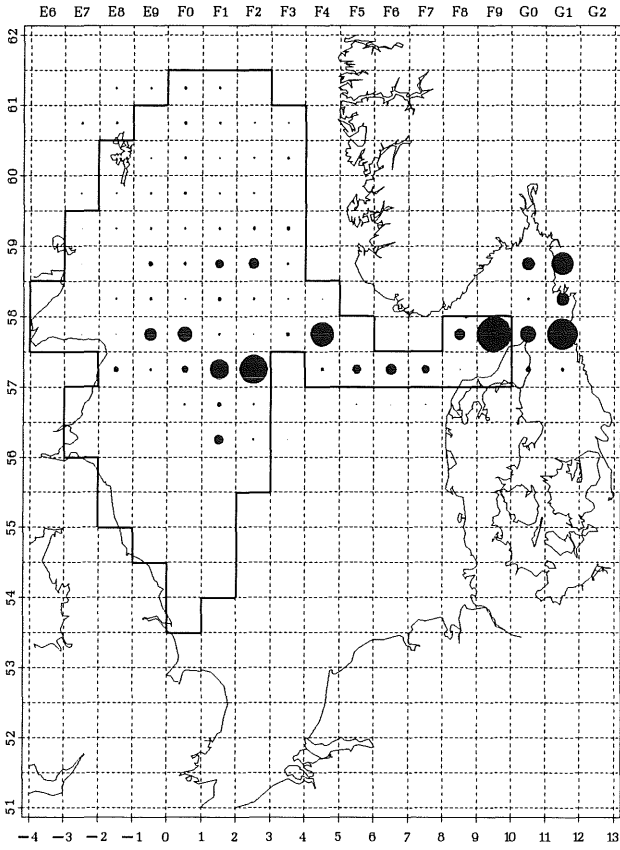


Figure 4.35 Saithe: mean length (cm below), age-group 2.

Norway pout, Age group 0 1991 quarter 3
 Max mean catch number per recangle: 186390



Norway pout, Age group 0 1991 quarter 4
 Max mean catch number per recangle: 70772

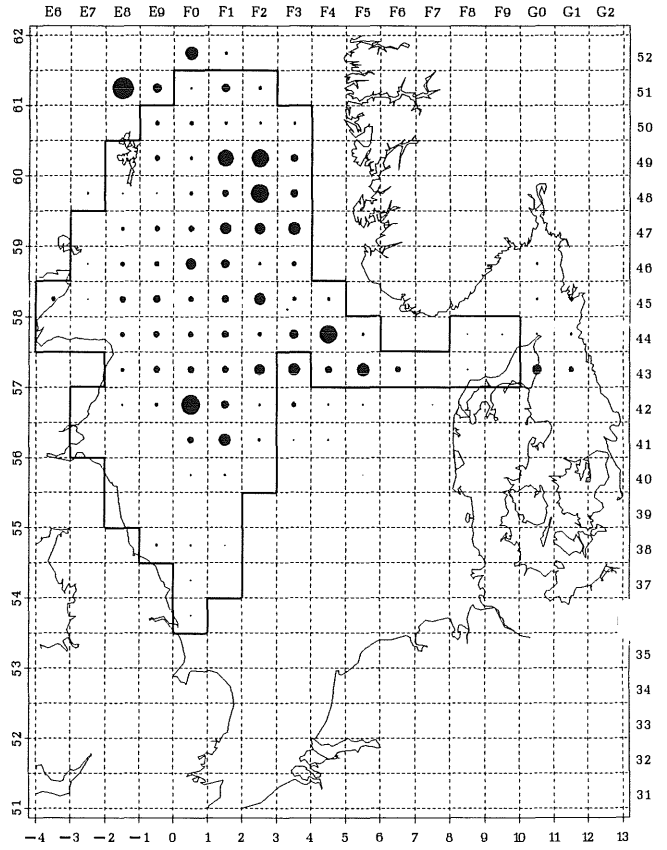
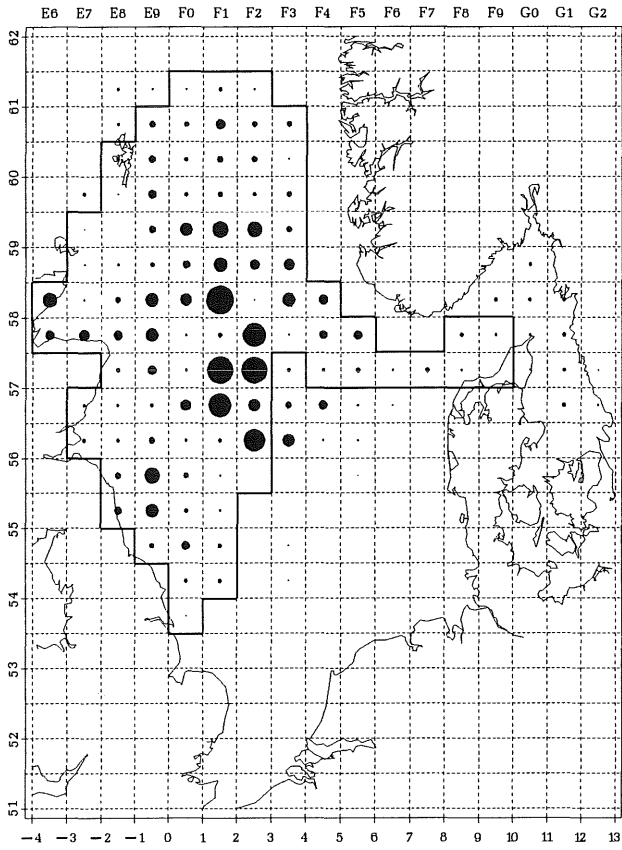
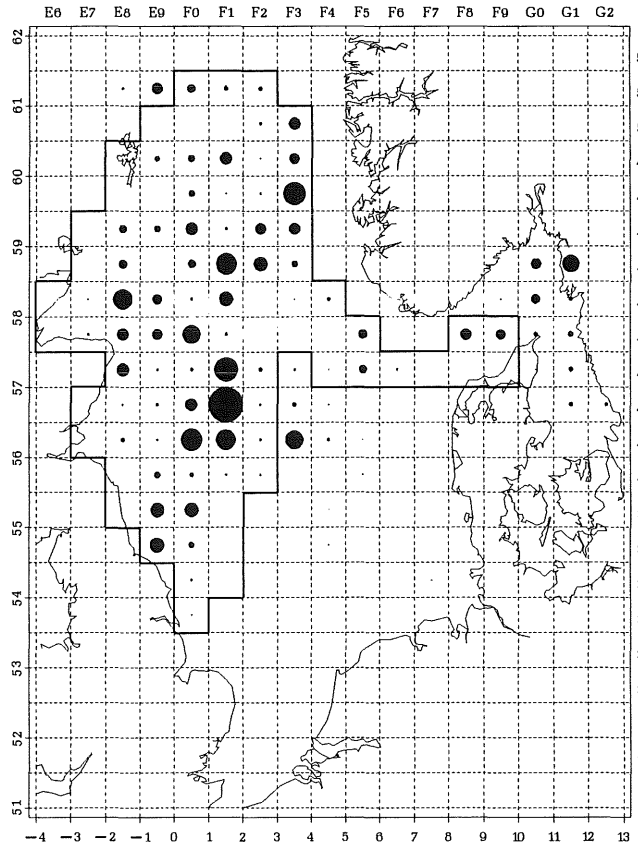


Figure 4.36 Norway pout: number per hour, age-group 0.

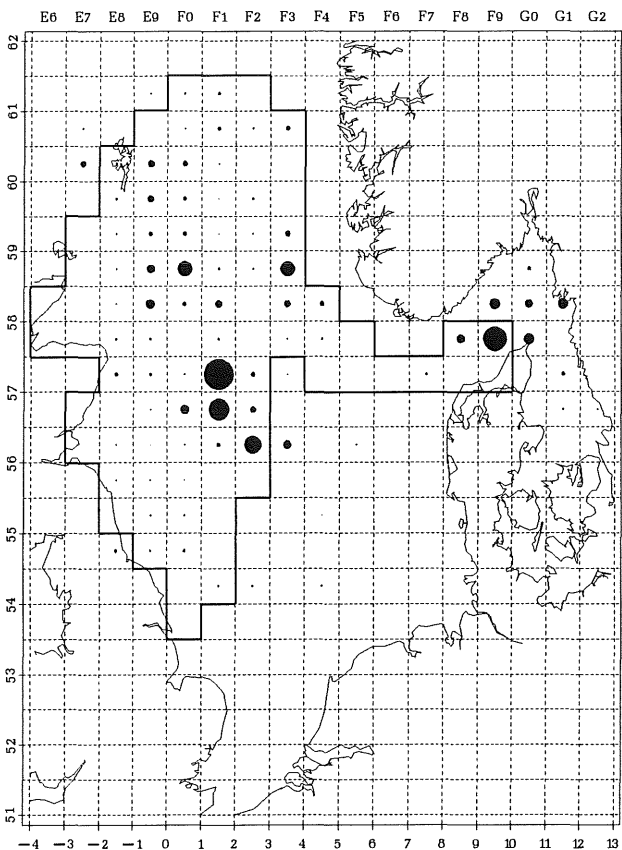
Norway pout, Age group 1 1991 quarter 1
 Max mean catch number per recangle: 22176



Norway pout, Age group 1 1991 quarter 2
 Max mean catch number per recangle: 34000



Norway pout, Age group 1 1991 quarter 3
 Max mean catch number per recangle: 25422



Norway pout, Age group 1 1991 quarter 4
 Max mean catch number per recangle: 16270

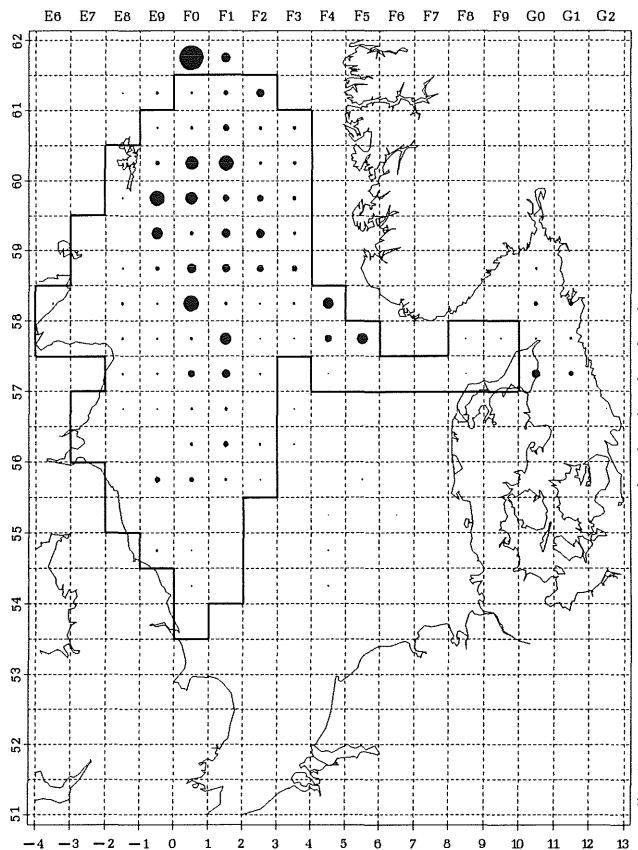
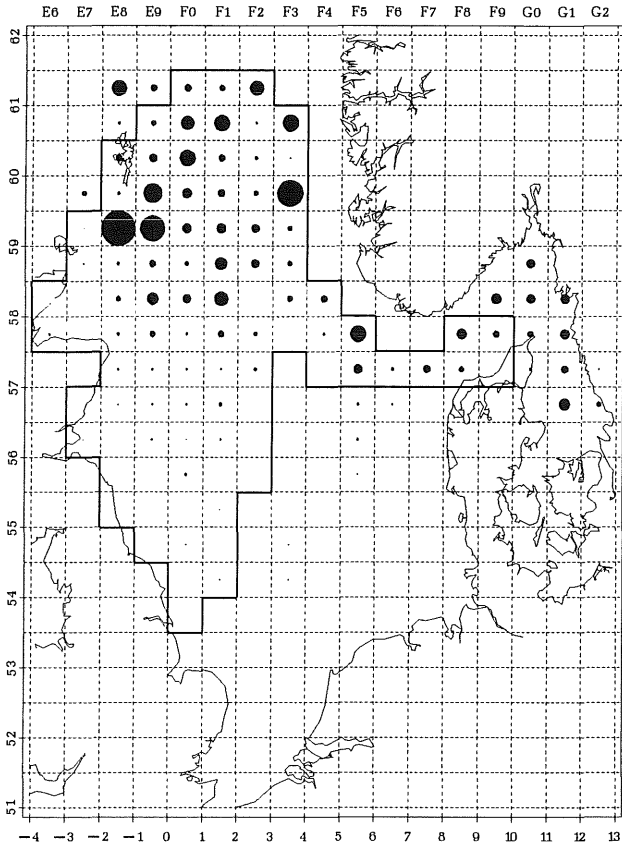
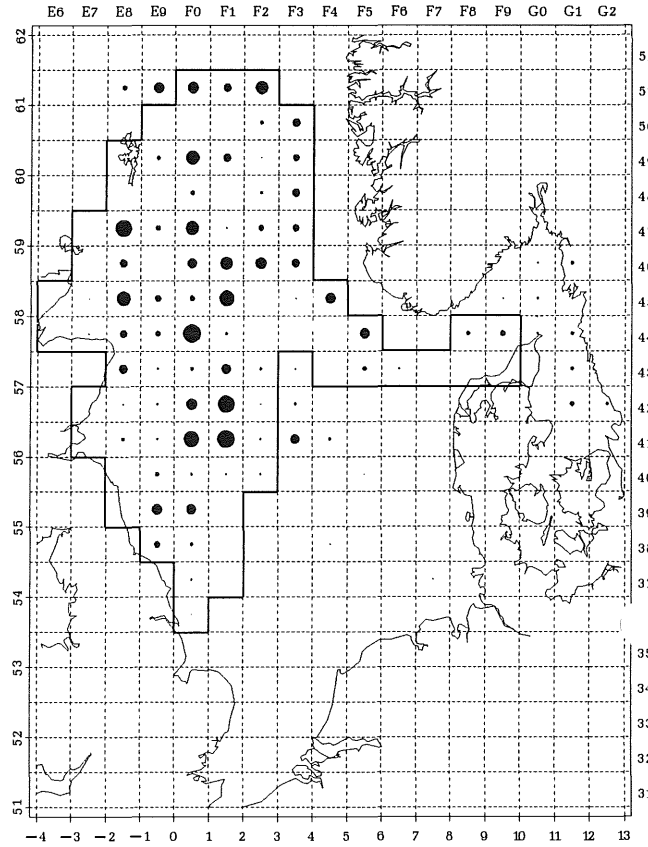


Figure 4.37 Norway pout: number per hour, age-group 1.

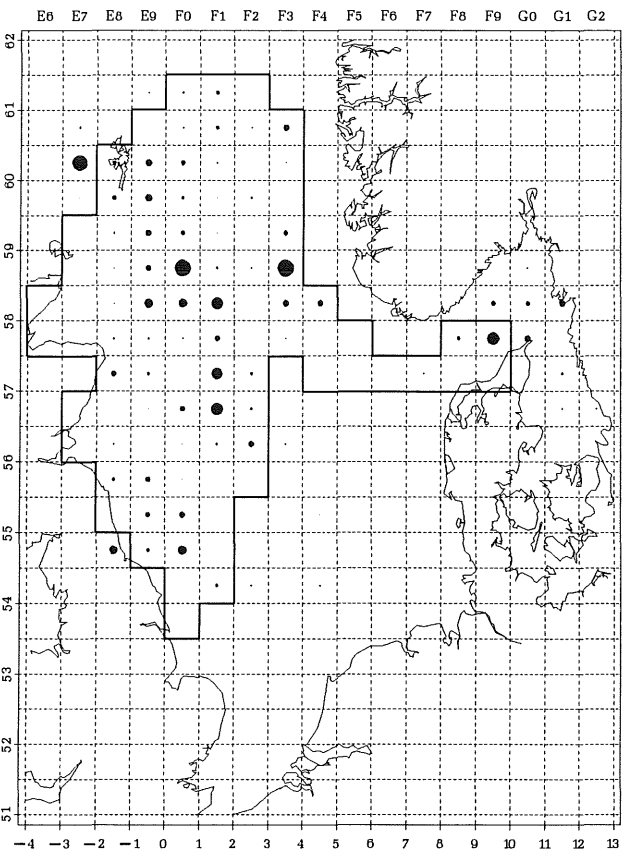
Norway pout, Age group 2 1991 quarter 1
 Max mean catch number per recangle: 12336



Norway pout, Age group 2 1991 quarter 2
 Max mean catch number per recangle: 3261



Norway pout, Age group 2 1991 quarter 3
 Max mean catch number per recangle: 2804



Norway pout, Age group 2 1991 quarter 4
 Max mean catch number per recangle: 941

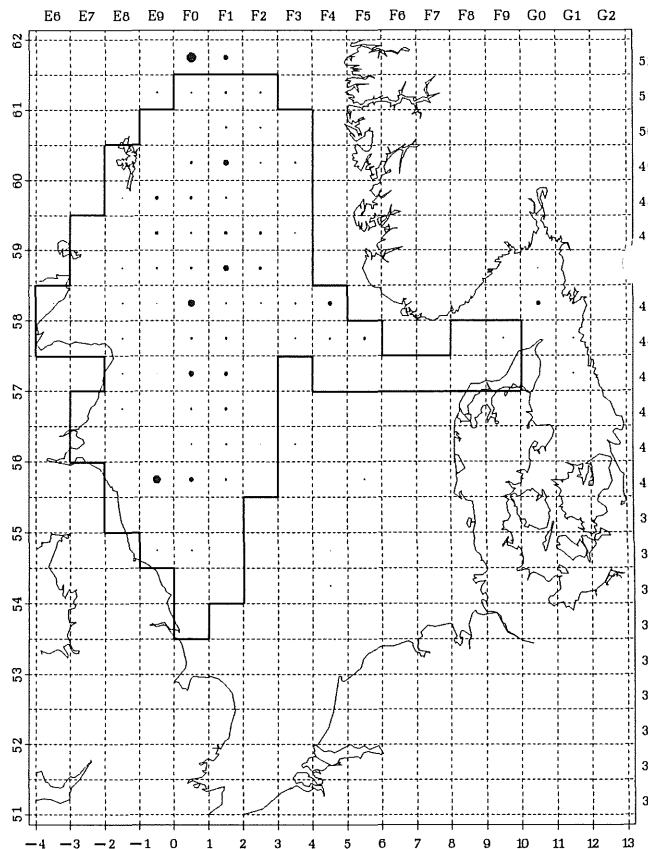
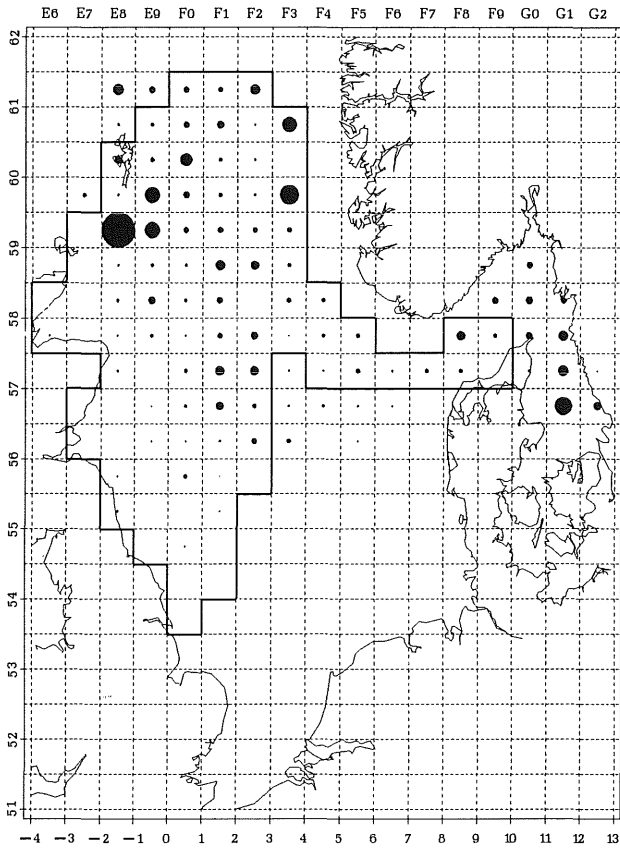
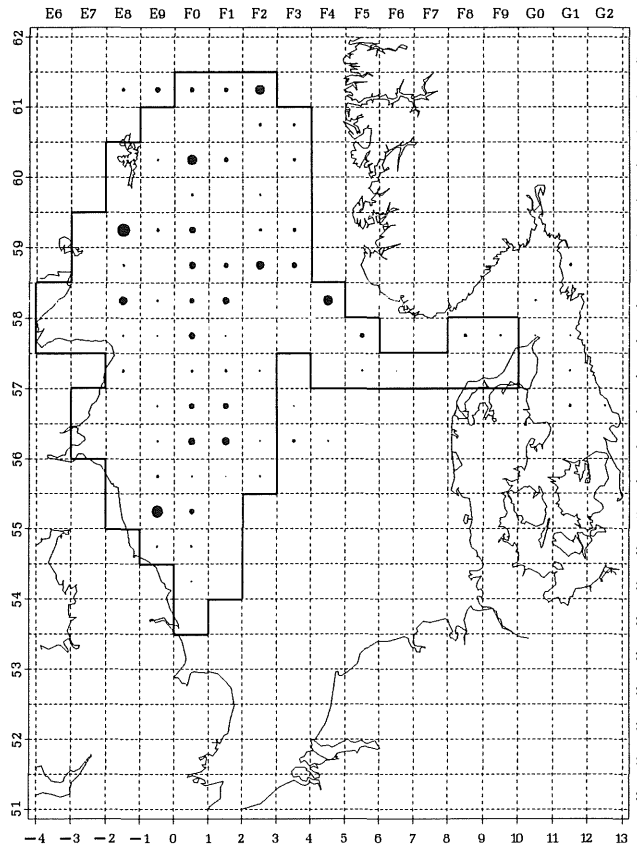


Figure 4.38 Norway pout: number per hour, age-group 2.

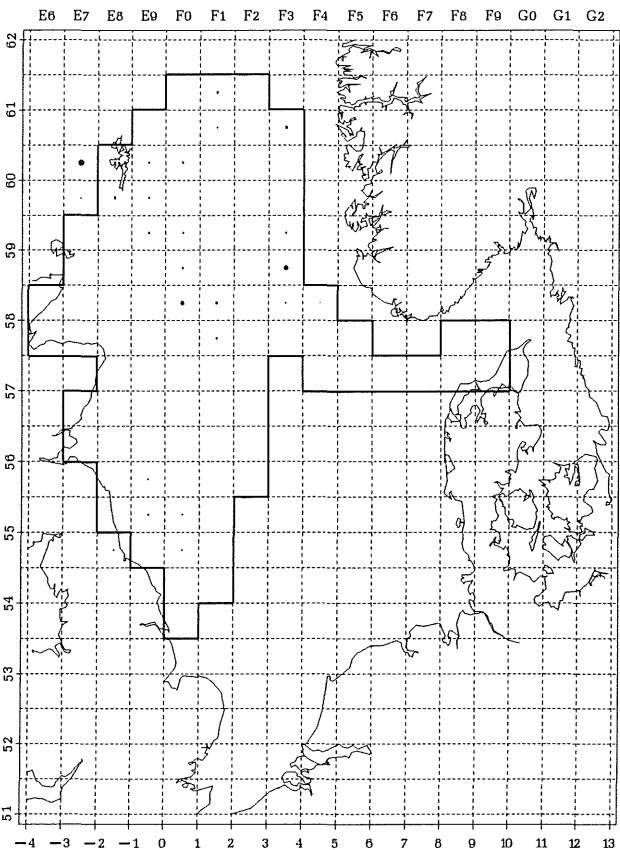
Norway pout, Age group 3+ 1991 quarter 1
 Max mean catch number per recangle: 4108



Norway pout, Age group 3+ 1991 quarter 2
 Max mean catch number per recangle: 547



Norway pout, Age group 3+ 1991 quarter 3
 Max mean catch number per recangle: 99



Norway pout, Age group 3+ 1991 quarter 4
 Max mean catch number per recangle: 61

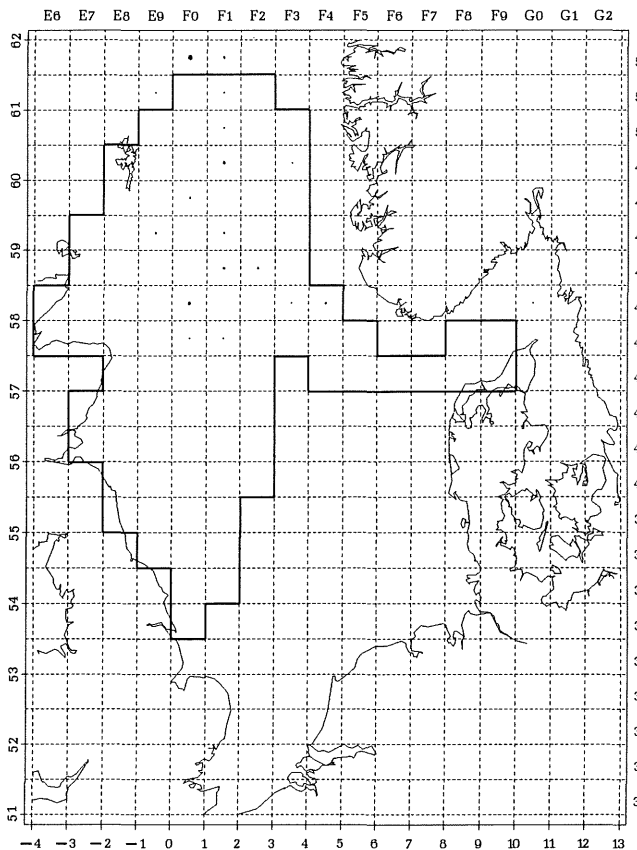
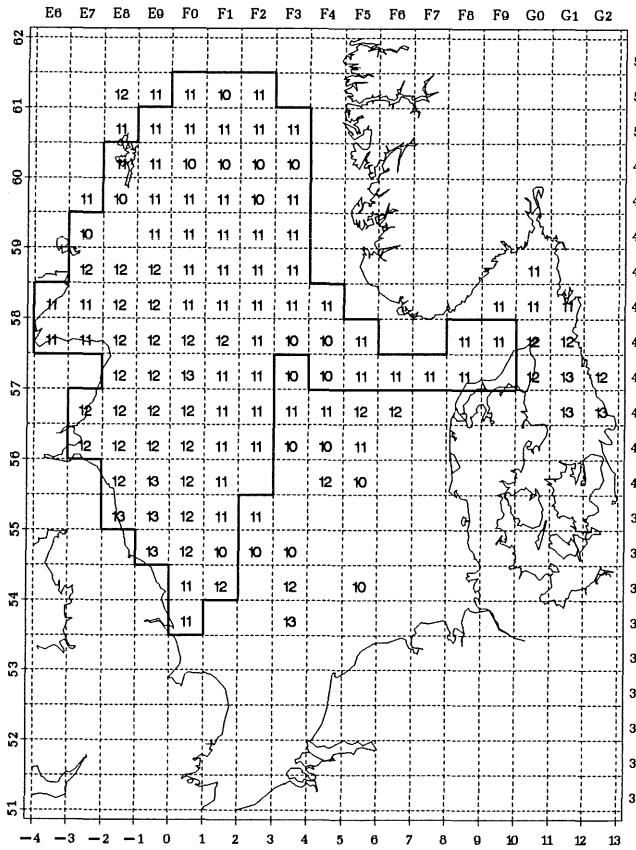
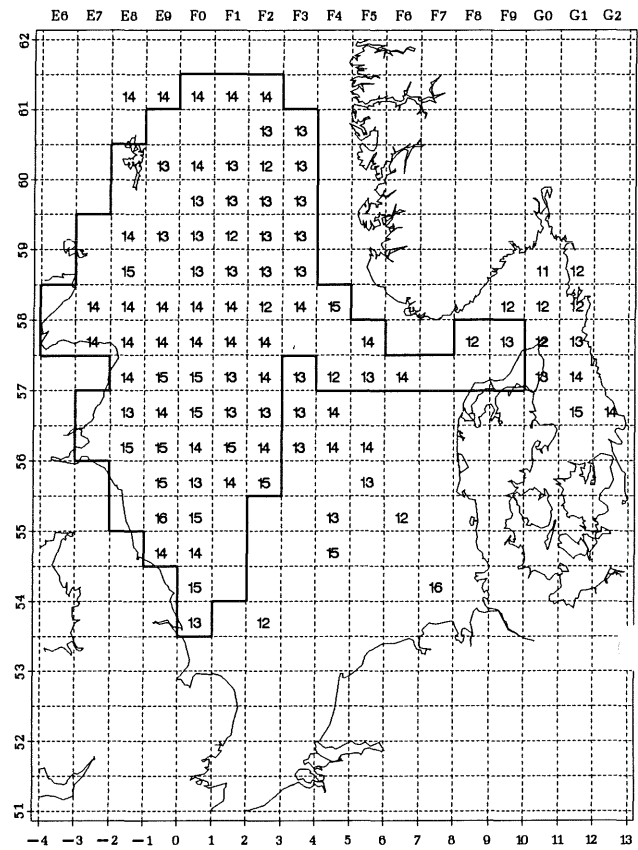


Figure 4.39 Norway pout: number per hour, age-group 3+.

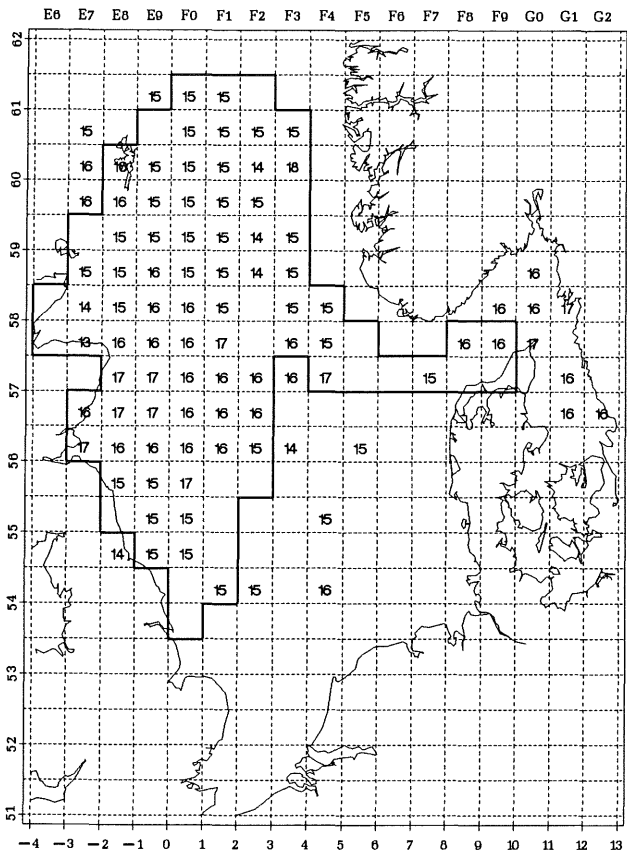
Norway pout, Age group 1 1991 quarter 1



Norway pout, Age group 1 1991 quarter 2



Norway pout, Age group 1 1991 quarter 3



Norway pout, Age group 1 1991 quarter 4

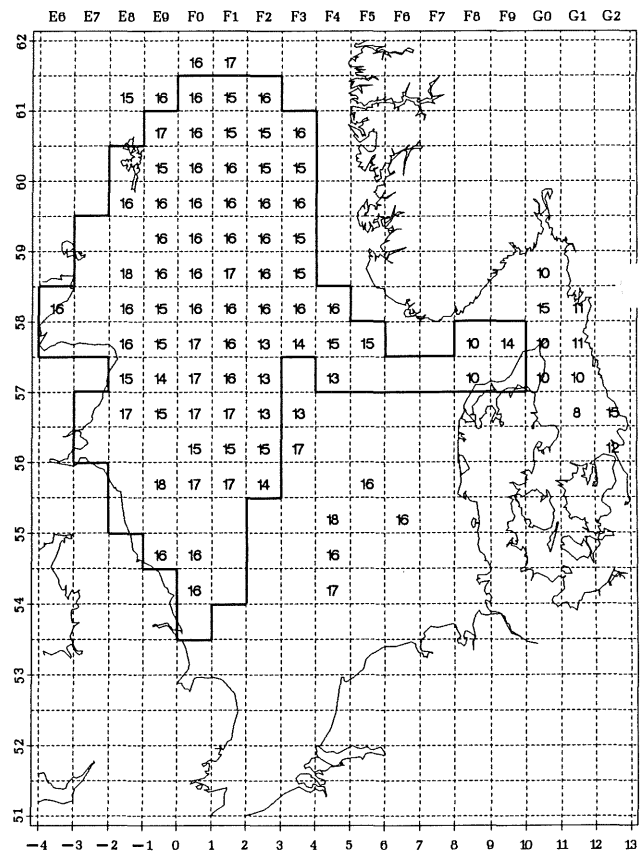


Figure 4.40 Norway pout: mean length (cm below), age-group 1.

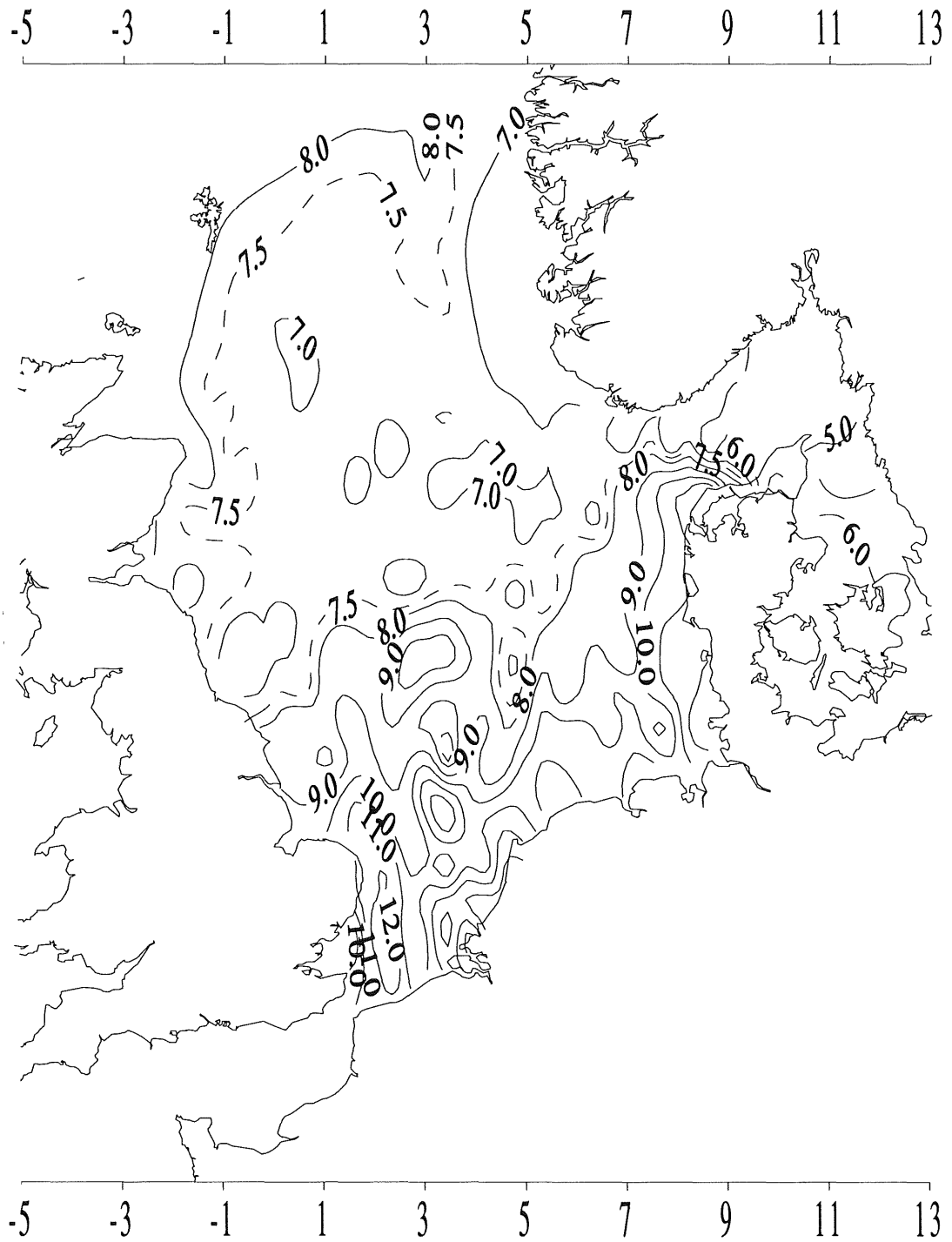


Figure 5.1 Bottom temperature, IBTS 1991, quarter 2

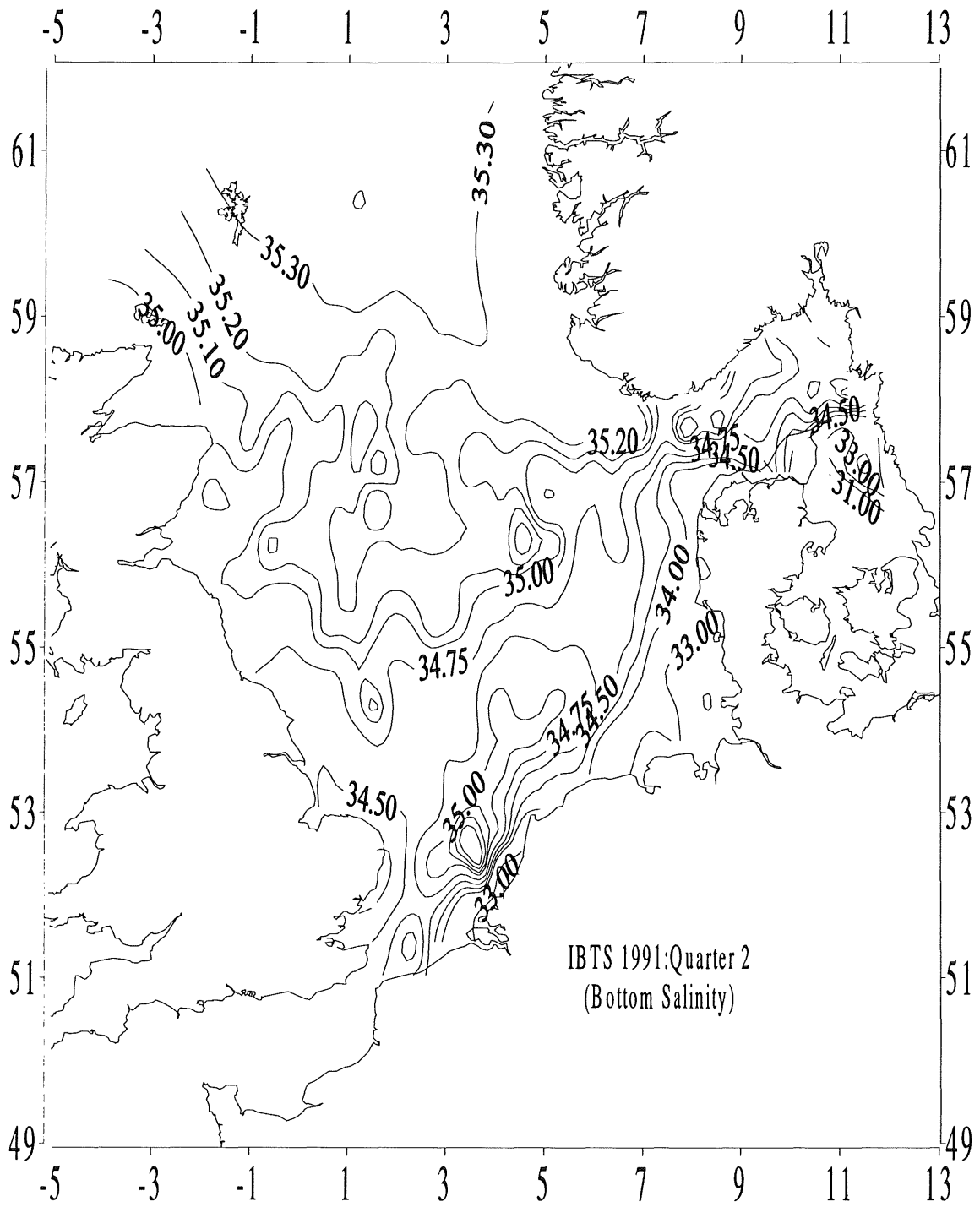


Figure 5.2

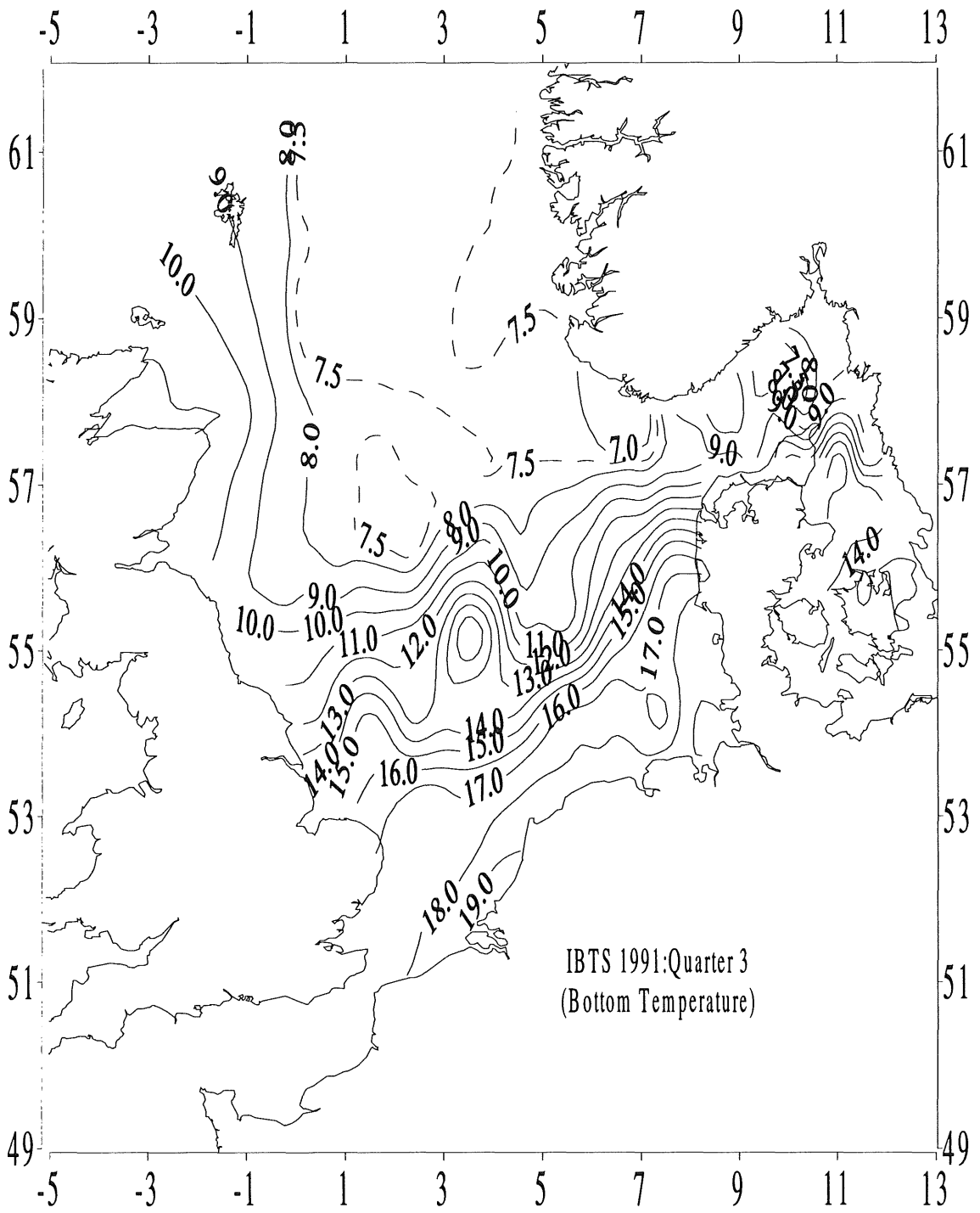


Figure 5.3

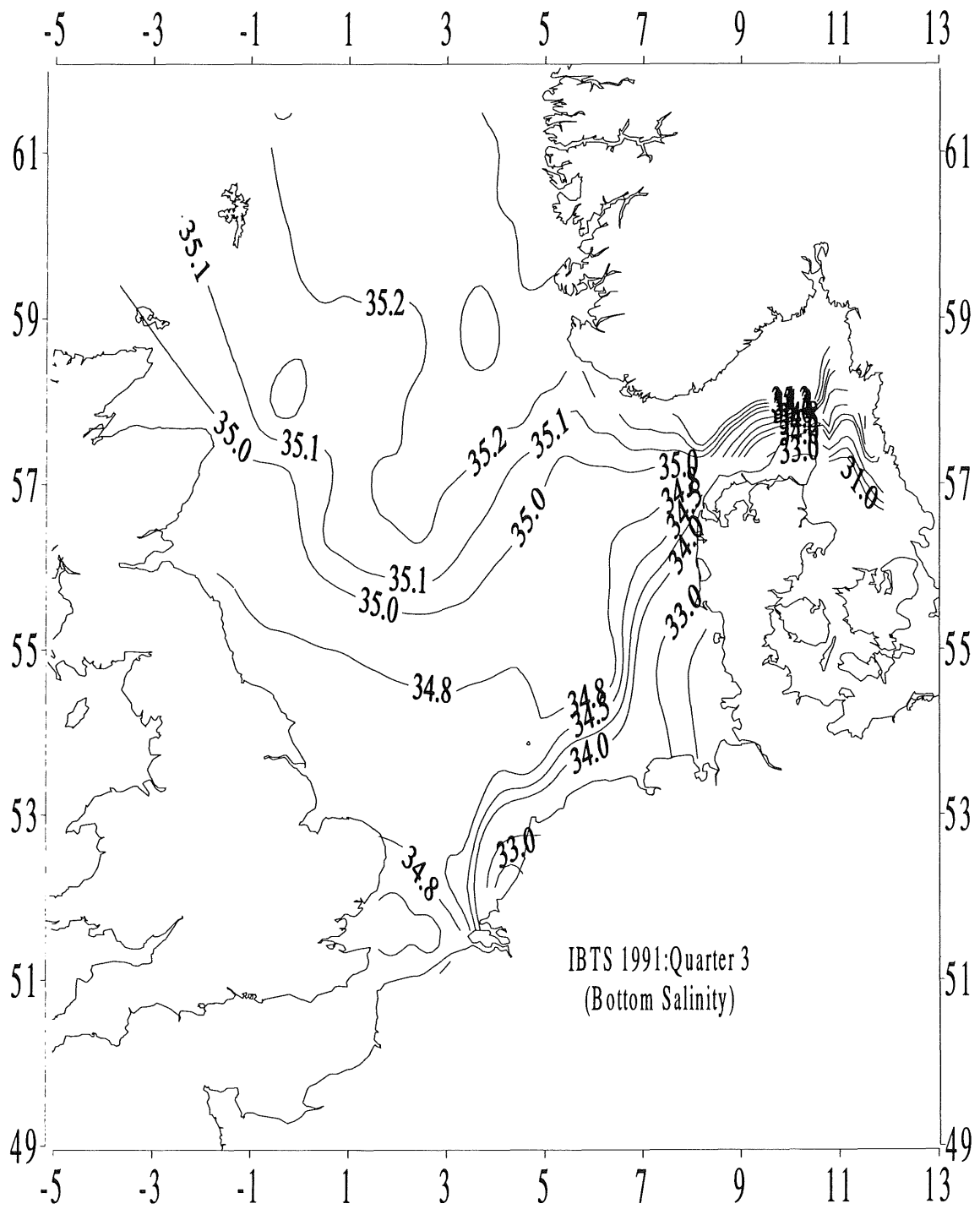


Figure 5.4

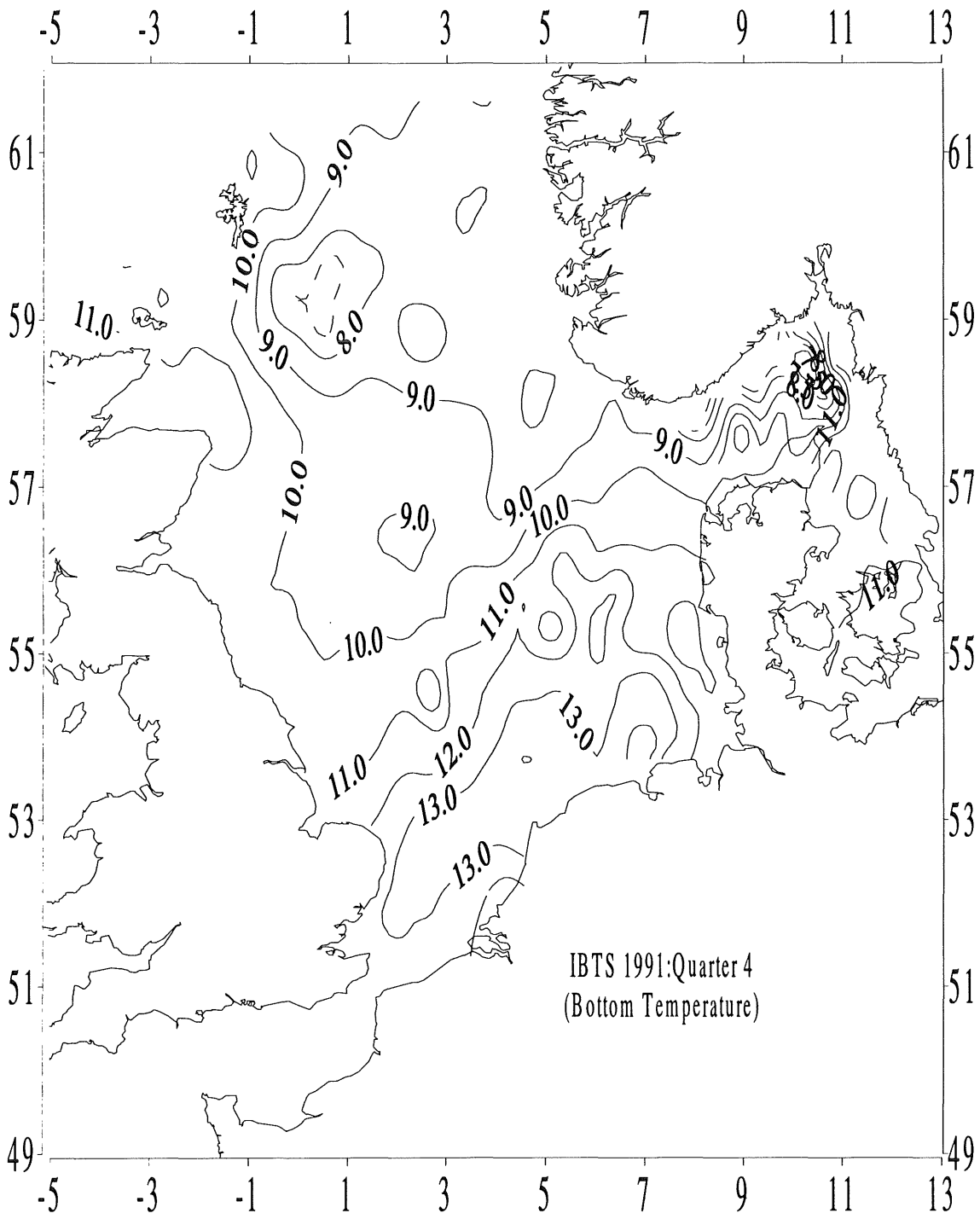


Figure 5.5

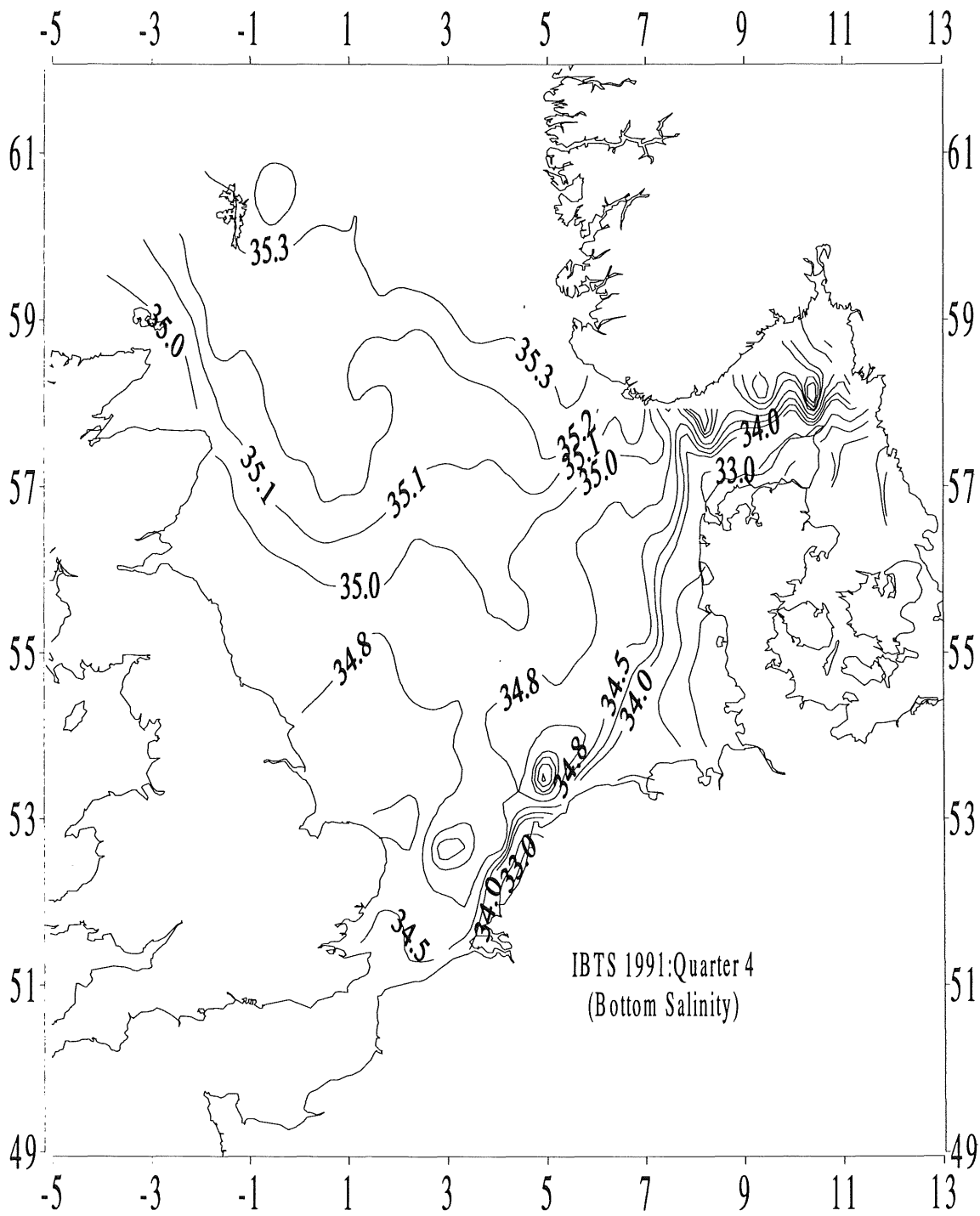


Figure 5.6

