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REPORT OF THE
INTERNATIONAL BOTTOM TRAWL SURVEY IN THE
NORTH SEA, SKAGERRAK AND KATTEGAT
IN 1995: QUARTER 2, 3 AND 4

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 1995. 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 1995. 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 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 1995 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 1995 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 1995

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

Indices for 0-, 1- and 2-ringed herring are presented in Table 4.3 and mean numbers per rectangle are given 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 1995 represent year class 1993.

Sprat

Sprat indices of 0-, 1- and 2-group are given in Table 4.4. The distribution of the same age groups and the 3+ group, as well as the mean length of 1-group per rectangle, are shown in Figures 4.8–4.12.

Mackerel

Indices for mackerel are given in Table 4.5. 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

Abundance indices are given in Table 4.6. 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

Abundance indices are given in Table 4.7. 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

Abundance indices are given in Table 4.8. 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

Abundance indices are given in Table 4.9. 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

Abundance indices are given in Table 4.10. 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: 181 stations from 18 April to 4 June from four ships (“Michael Sars”, “Tridens”, “Scotia” and “Argos”)

Quarter 3: 226 stations from 3 August to 20 September from four ships (“Tridens”, “Cirolana”, “Scotia”, and “Argos”)

Quarter 4: 435 stations from 17 October to 16 November from five ships (“Dana”, “Thalassa”, “G.O. Sars”, “Isis” 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/1995>. 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 1995.

Year 1995	Country	Vessel	Period	Number of Hauls	
				ABD	GOV
Quarter 1	Sweden	Argos	30/1–16/2		49
	Denmark	Dana	29/1–14/2		45
	Norway	Michael Sars	7/1–11/2		49
	UK Scotland	Scotia	7/2–28/2		46
	France	Thalassa	4/2–20/2		50
	Netherlands	Tridens	6/2–23/2		35
	Germany	Walter Herwig III	25/1–20/2		68
Quarter 2	Sweden	Argos	2/5–17/5		50
	Norway	Michael Sars	23/4–13/5		68
	UK Scotland	Scotia	20/5–4/6		66
	Netherlands	Tridens	18/4–26/4		28
	Germany	Walter Herwig III	13/5–11/6		71
Quarter 3	Sweden	Argos	28/8–20/9		52
	UK England	Cirolana	8/8–6/9		87
	UK Scotland	Scotia	3/8–22/8	87	
	Netherlands	Tridens	21/8–31/8		34
Quarter 4	UK England	Cirolana	14/10–12/11		81
	Denmark	Dana	1/11–25/11		73
	Norway	G.O. Sars	20/10–13/11		79
	Netherlands	Isis	30/10–15/11		39
	France	Thalassa	17/10–31/10		46

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 1995.

Species	Roundfish area									Total
	1	2	3	4	5	6	7	8	9	
Quarter 1										
Herring	459	509	413	111	173	638	501	791	579	4,174
Sprat	13	92	120	31	135	253	207	277	256	1,384
Mackerel	-	5	3	-	-	-	-	-	-	8
Cod	852	736	224	266	55	416	322	411	492	3,774
Haddock	815	910	848	287	-	-	247	237	80	3,424
Whiting	604	757	707	169	252	499	241	177	179	3,585
Saithe	408	5	-	-	-	-	64	-	-	477
Norway pout	285	287	233	115	-	-	45	104	60	1,129
Quarter 2										
Herring	521	621	581	428	155	468	94	544	775	4,187
Sprat	58	134	133	172	176	204	70	221	370	1,538
Mackerel	251	147	41	65	31	202	74	-	-	811
Cod	779	698	184	177	22	191	142	549	556	3,291
Haddock	881	525	538	319	43	60	177	-	-	2,543
Whiting	693	413	412	353	257	399	162	156	288	3,133
Saithe	299	4	3	-	-	-	3	22	-	331
Norway pout	246	141	148	136	6	5	40	-	-	722
Quarter 3										
Herring	626	621	852	491	16	171	76	475	836	4,164
Sprat	66	229	158	215	123	170	86	93	244	1,384
Mackerel	216	141	246	23	122	211	35	-	-	994
Cod	975	774	151	278	177	170	244	390	340	3,499
Haddock	1,728	1,115	899	399	36	41	158	257	81	4,714
Whiting	1,087	797	672	376	147	280	110	213	298	3,980
Saithe	843	12	29	11	-	-	15	-	-	910
Norway pout	442	197	156	117	-	-	13	118	48	1,091
Quarter 4										
Herring	902	608	504	472	79	421	427	231	276	3,920
Sprat	72	84	150	132	95	441	116	51	87	1,228
Mackerel	-	-	-	39	41	108	-	-	-	188
Cod	1,014	704	132	554	45	716	421	247	97	3,930
Haddock	1,108	672	516	455	1	76	248	138	26	3,240
Whiting	612	330	365	383	375	861	278	-	-	3,204
Saithe	413	28	-	-	-	-	21	12	-	474
Norway pout	276	121	108	86	-	-	13	-	-	604

Table 4.2 Age composition of standard species in 1995 for the relevant standard areas.

	Quarter	Age						6+
		0	1	2	3	4	5	
Herring	1	.0	1,186.2	1,284.9	152.4	46.2	9.3	-
	2	10.7	2,560.3	1,833.9	344.3	128.2	155.6	-
	3	652.4	564.6	353.1	160.0	56.3	60.3	-
	4	4,732.5	2,798.3	572.6	127.1	35.7	27.9	-
Sprat	1	.0	1,138.1	2,715.8	131.5	3.2	1.1	-
	2	.0	2,074.9	5,582.3	2,369.6	60.0	13.9	-
	3	.3	1,381.8	3,897.1	2,020.5	22.3	.9	-
	4	502.7	6,714.2	5,096.3	1,093.4	86.6	16.6	-
Mackerel	1	.0	.4	2.5	.9	.0	.0	.0
	2	.0	1.9	78.9	7.3	3.2	.9	.8
	3	.0	15.1	31.1	26.4	13.3	4.2	15.4
	4	3.1	9.7	48.7	26.7	12.6	2.7	6.3
Cod	1	.0	9.8	22.1	2.7	1.1	.3	.3
	2	.8	12.2	20.5	2.6	1.0	.2	.2
	3	15.1	18.1	17.4	1.5	.8	.1	.1
	4	21.9	23.6	13.6	1.7	.5	.1	.1
Haddock	1	.0	1,352.0	201.1	176.0	24.2	5.2	.8
	2	.2	1,450.2	159.2	167.1	18.2	8.8	1.6
	3	516.8	1,027.2	106.3	96.9	8.0	3.1	.3
	4	547.9	2,108.0	213.3	148.4	14.2	5.2	.5
Whiting	1	.0	676.0	448.4	239.4	58.0	11.8	5.6
	2	.1	1,276.8	636.8	215.1	46.2	14.9	7.1
	3	729.2	619.8	291.2	107.2	21.5	6.0	3.5
	4	1,666.3	989.7	498.3	118.5	21.4	5.2	2.0
Saithe	1	.0	.0	.0	.5	1.0	1.3	.8
	2	.0	.0	.0	.5	1.1	.7	.7
	3	.0	.0	.6	14.6	2.5	1.5	.8
	4	.2	.3	.7	17.4	1.2	.5	.4
Norway pout	1	.0	5,940.3	784.7	76.8	8.6	.0	.0
	2	.0	10,387.2	709.6	55.1	5.9	.2	.0
	3	2,859.6	4,440.2	597.4	68.6	1.7	.0	.0
	4	1,633.0	5,610.3	259.7	24.8	.0	.0	7.1

Table 4.3 Herring IBTS indices as mean number per hour within the species standard area.

Year class	0-ring		1-ring				2-ring			
	Quarter		Quarter				Quarter			
	3	4	1	2	3	4	1	2	3	4
1988	-	-	-	-	-	-	763	659	216	12
1989	-	-	1,180	1,869	2,575	454	380	767	453	302
1990	635	1,078	1,205	3,164	1,074	774	779	618	325	63
1991	2,902	3,318	2,954	2,127	1,137	294	1,094	596	889	196
1992	3,799	3,489	1,667	2,890	1,653	826	1,285	1,834	353	573
1993	1,552	2,989	1,186	2,560	565	2,798	-	-	-	-
1994	652	4,733	-	-	-	-	-	-	-	-

Table 4.4 Sprat IBTS indices as mean number per hour within the species standard area.

Year class	Age 0		Age 1				Age 2			
	Quarter		Quarter				Quarter			
	3	4	1	2	3	4	1	2	3	4
1989	-	-	-	-	-	-	114	644	151	444
1990	-	-	1,118	1,118	417	5,279	340	2,963	3,373	2,626
1991	16.8	1,518	1,561	2,389	3,992	8,340	590	5,196	2,728	2,918
1992	56.5	2,916	1,689	7,815	2,575	9,476	1,368	1,020	501	6,115
1993	6.8	2,528	4,003	2,403	4,298	7,959	2,716	5,582	3,897	5,096
1994	5.2	1,051	1,138	2,075	1,382	6,714	-	-	-	-
1995	0.3	503	-	-	-	-	-	-	-	-

Table 4.5 Mackerel IBTS indices as mean number per hour within the species standard area.

Year class	Age 0		Age 1				Age 2			
	Quarter		Quarter				Quarter			
	3	4	1	2	3	4	1	2	3	4
1989	-	-	-	-	-	-	0.1	52.3	15.8	59.2
1990	-	-	6.9	11.3	26.0	60.0	0.4	2.7	46.7	6.2
1991	0.0	0.2	16.0	0.8	40.1	5.8	0.8	22.9	67.6	10.2
1992	0.1	1.4	1.0	3.8	91.3	8.5	0.1	3.7	64.6	18.2
1993	5.3	11.9	2.2	2.5	82.6	88.4	2.5	78.9	31.1	48.7
1994	0.0	0.2	0.4	1.9	15.1	9.7	-	-	-	-
1995	0.0	3.1	-	-	-	-	-	-	-	-

Table 4.6 Cod IBTS indices as mean number per hour within the species standard area.

Year class	Age 0		Age 1				Age 2			
	Quarter		Quarter				Quarter			
	3	4	1	2	3	4	1	2	3	4
1989	-	-	-	-	-	-	4.7	5.4	2.5	1.9
1990	-	-	2.3	13.3	8.2	6.9	4.4	5.2	3.6	3.0
1991	29.4	28.4	13.0	51.2	43.8	40.4	19.5	13.6	8.0	5.6
1992	19.7	51.4	13.1	8.4	10.0	9.1	4.4	4.1	6.2	6.0
1993	17.0	25.4	14.8	30.8	43.2	52.9	22.1	20.5	17.4	13.6
1994	15.7	20.5	9.8	12.2	18.1	23.6	-	-	-	-
1995	15.1	21.9	-	-	-	-	-	-	-	-

Table 4.7 Haddock IBTS indices as mean number per hour within the species standard area.

Year class	Age 0		Age 1				Age 2			
	Quarter		Quarter				Quarter			
	3	4	1	2	3	4	1	2	3	4
1989	-	-	-	-	-	-	133	74	23	35
1990	-	-	678	794	233	497	344	257	187	214
1991	720	1,134	1,115	740	590	861	541	317	142	201
1992	2,717	2,474	1,254	1,121	604	906	504	339	265	355
1993	572	667	229	249	194	346	201	159	106	213
1994	1,772	3,405	1,352	1,450	1,027	2,108	-	-	-	-
1995	517	548	-	-	-	-	-	-	-	-

Table 4.8 Whiting IBTS indices as mean number per hour within the species standard area.

Year class	Age 0		Age 1				Age 2			
	Quarter		Quarter				Quarter			
	3	4	1	2	3	4	1	2	3	4
1989	-	-	-	-	-	-	686	335	159	251
1990	-	-	1,009	1,381	701	917	678	358	298	360
1991	529	759	904	881	595	682	524	244	177	324
1992	1,382	1,195	1,088	743	634	756	637	331	223	
1993	916	1,014	721	737	675	926	448	637	291	498
1994	610	926	676	1,277	620	990	-	-	-	-
1995	729	1,666	-	-	-	-	-	-	-	-

Table 4.9 Saithe IBTS indices as mean number per hour within the species standard area.

Year class	Age 2		Age 3				Age 4			
	Quarter		Quarter				Quarter			
	3	4	1	2	3	4	1	2	3	4
1987	-	-	-	-	-	-	2.2	3.0	0.4	1.2
1988	-	-	5.0	5.9	2.1	9.4	3.0	7.5	3.0	3.9
1989	0.7	0.5	0.6	0.9	1.4	1.6	1.3	1.5	2.9	1.9
1990	0.4	0.3	0.5	1.2	8.5	7.3	10.1	6.0	1.7	2.0
1991	1.8	1.6	3.7	1.3	1.3	2.4	1.0	1.1	2.5	1.2
1992	0.6	0.8	0.5	0.5	14.6	17.4	-	-	-	-
1993	0.6	0.7	-	-	-	-	-	-	-	-

Table 4.10 Norway pout IBTS indices as mean number per hour within the species standard area.

Year class	Age 0		Age 1				Age 2			
	Quarter		Quarter				Quarter			
	3	4	1	2	3	4	1	2	3	4
1989	-	-	-	-	-	-	713	586	222	43
1990	-	-	2,451	2,843	1,105	863	935	1,149	640	313
1991	7,383	7,451	8,095	7,134	4,366	4,658	2,644	1,253	609	580
1992	2,588	5,984	2,681	2,075	1,832	1,767	375	437	102	216
1993	4,104	4,775	1,868	2,814	704	1,973	785	710	597	260
1994	3,196	18,083	5,940	10,387	4,440	5,610	-	-	-	-
1995	2,860	1,633	-	-	-	-	-	-	-	-

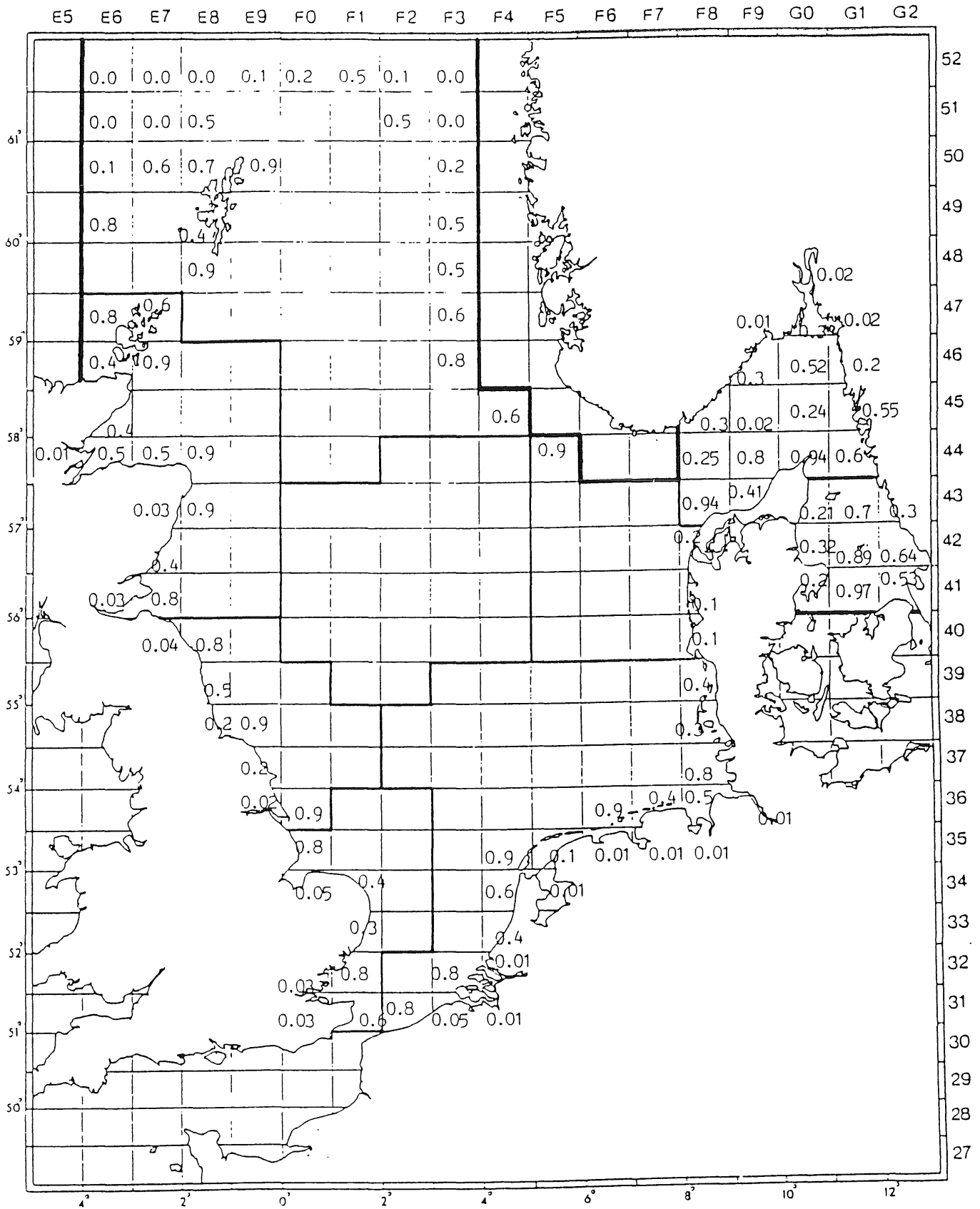
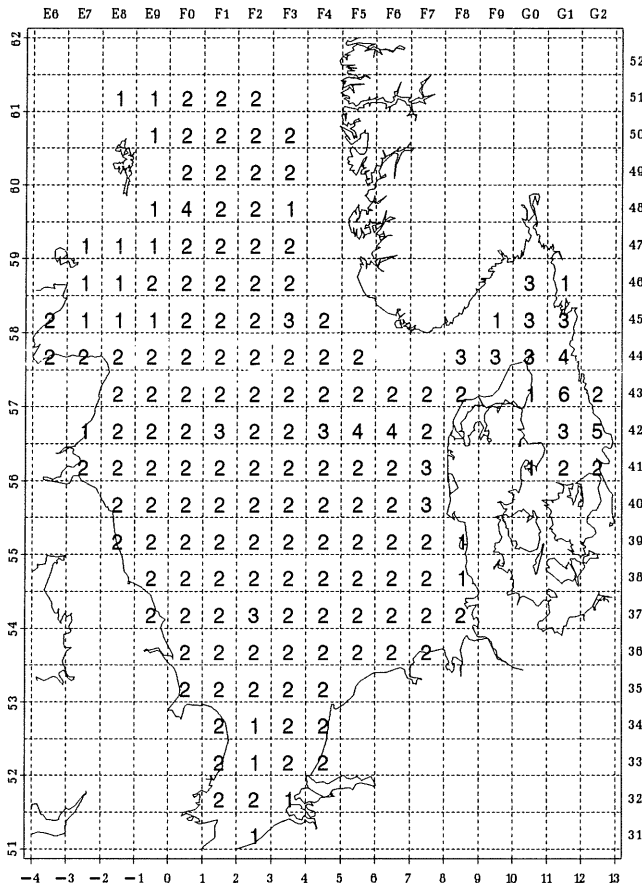
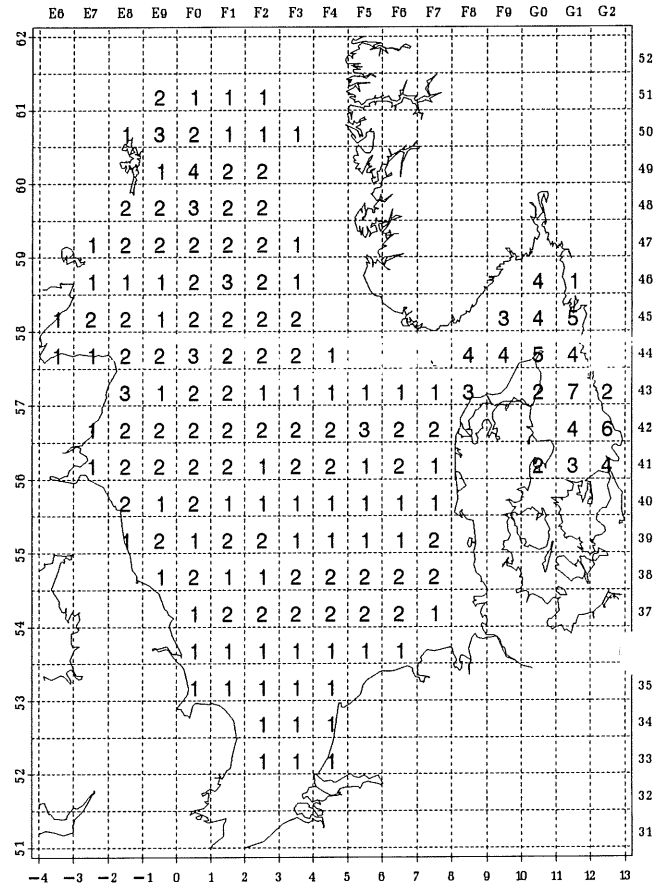


Figure 3.1 Weighting factors used in the calculation of the indices for herring and saithe. Numbers denote the relative weight of a given rectangle. Only weighting factors less than 1 are shown, other rectangles are given a weight of 1.

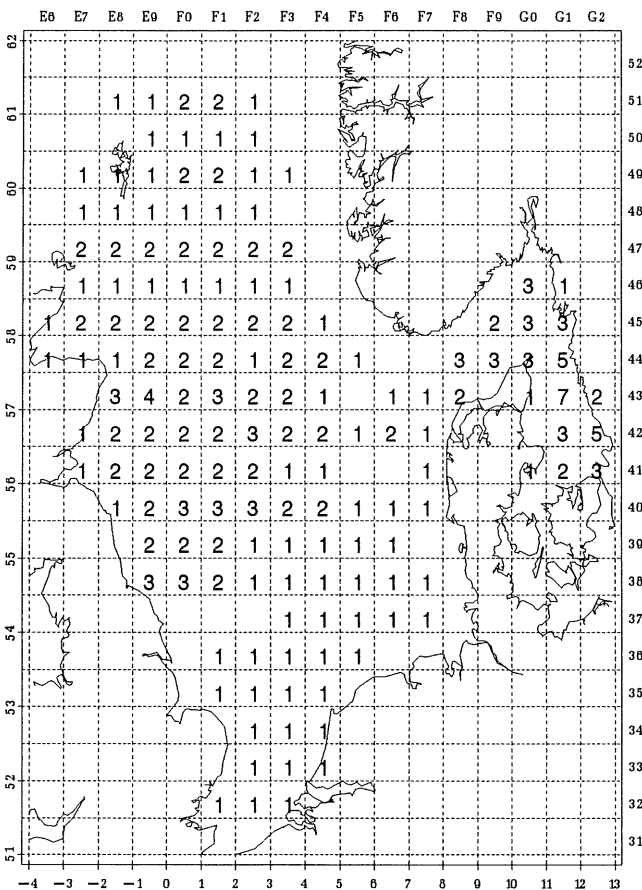
Number of hauls. 1995 quarter 1



Number of hauls. 1995 quarter 2



Number of hauls. 1995 quarter 3



Number of hauls. 1995 quarter 4

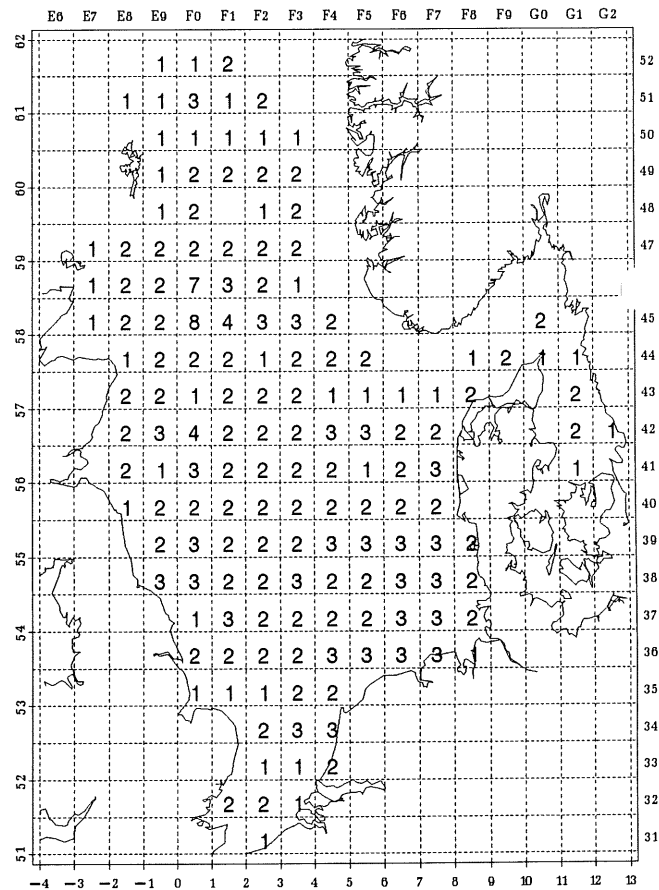
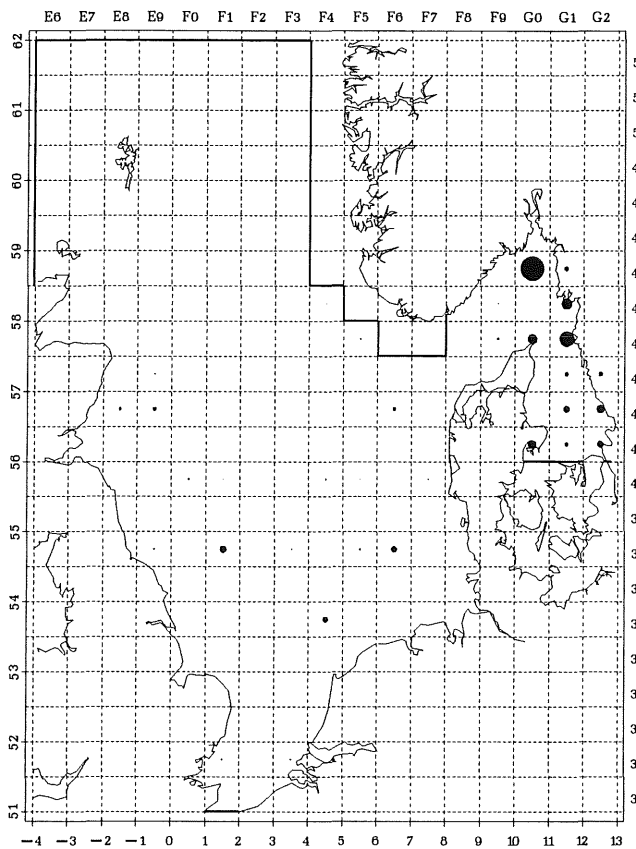


Figure 4.2 Number of valid day- and nighttime hauls.

Herring, Age group 0 1995 quarter 3
Max mean catch number per recangle: 62474



Herring, Age group 0 1995 quarter 4
Max mean catch number per recangle: 137366

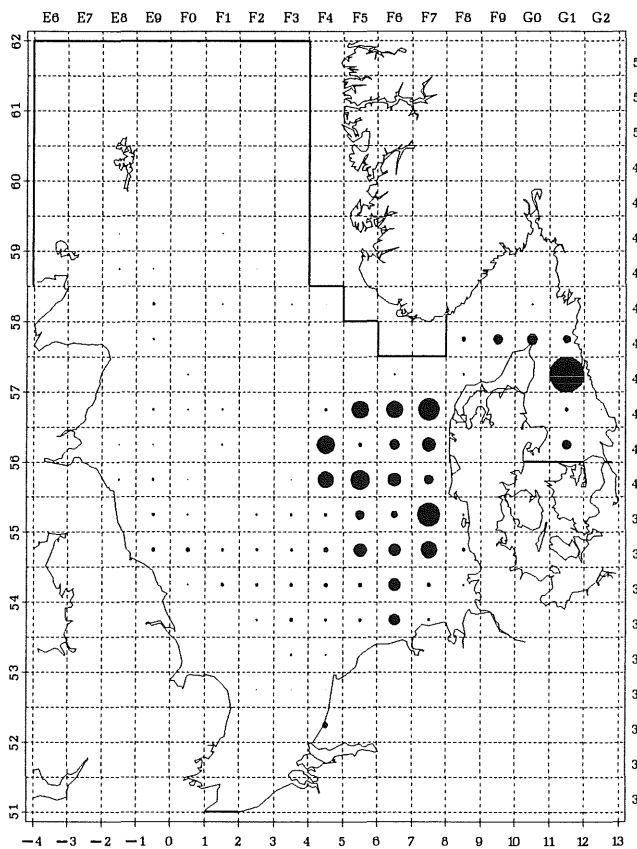
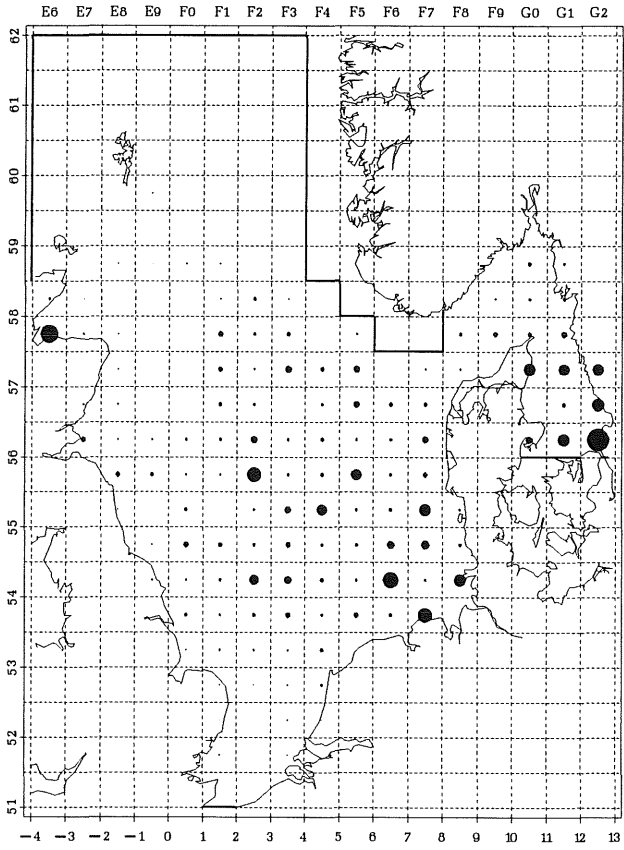
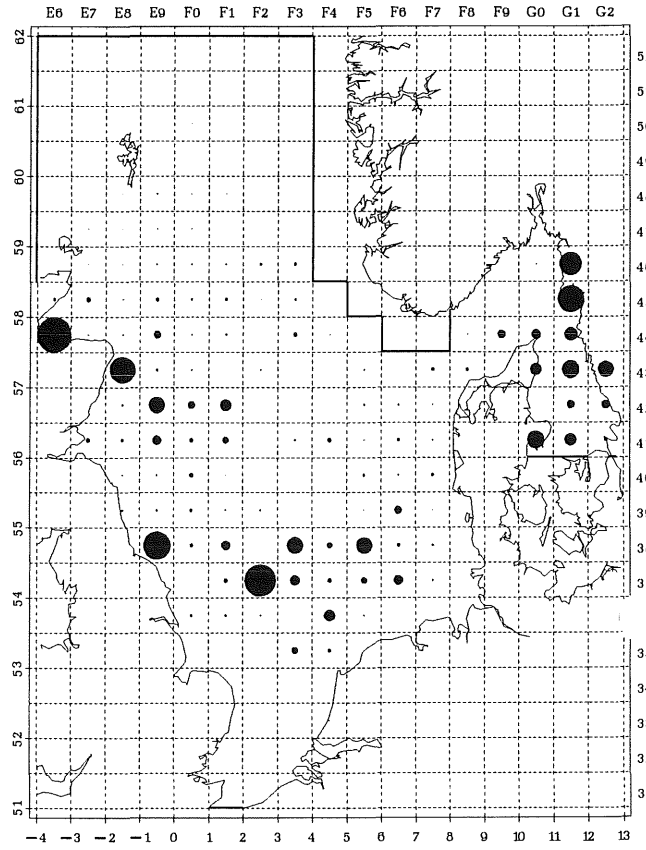


Figure 4.3 Herring: number per hour, 0-ringers.

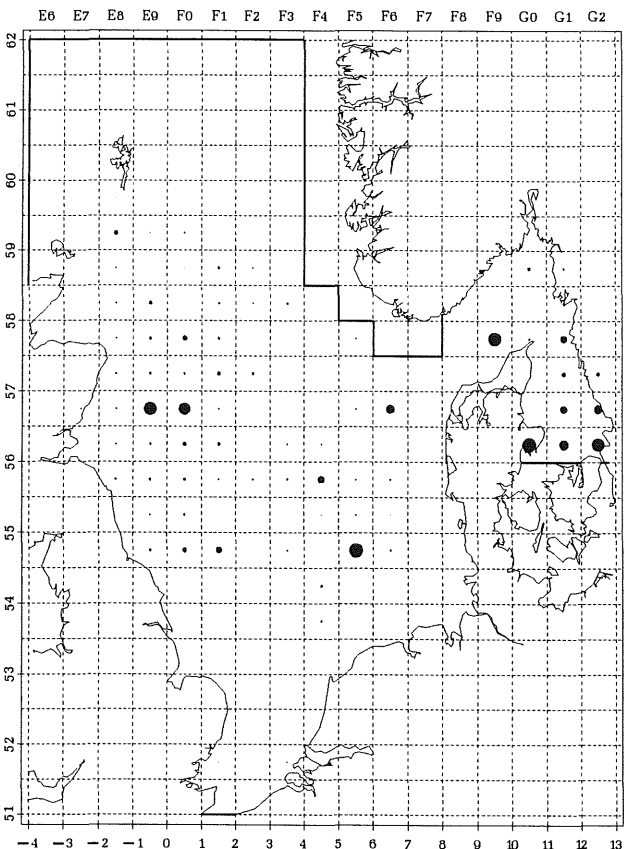
Herring, Age group 1 1995 quarter 1
 Max mean catch number per rectangle: 29317



Herring, Age group 1 1995 quarter 2
 Max mean catch number per rectangle: 70919



Herring, Age group 1 1995 quarter 3
 Max mean catch number per rectangle: 10832



Herring, Age group 1 1995 quarter 4
 Max mean catch number per rectangle: 59013

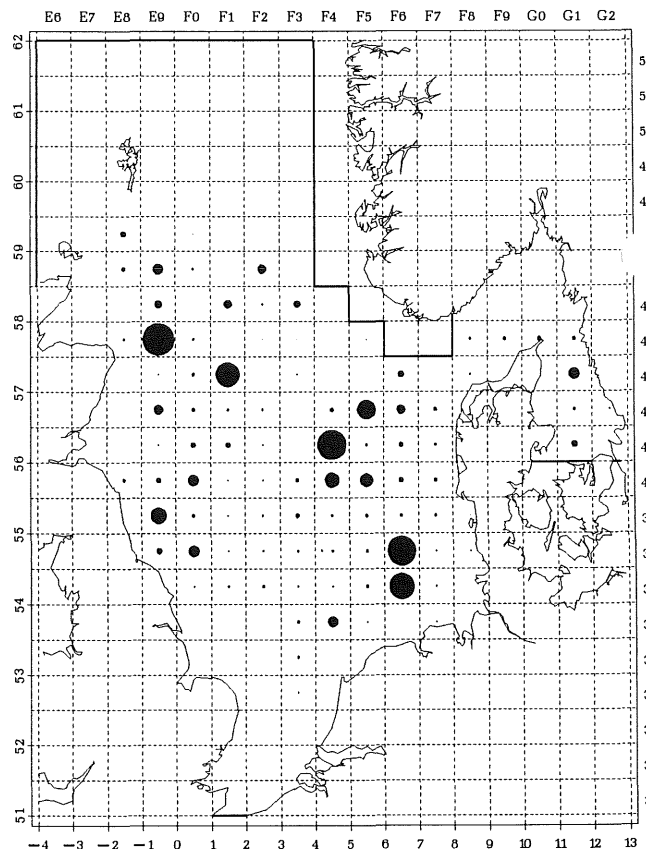
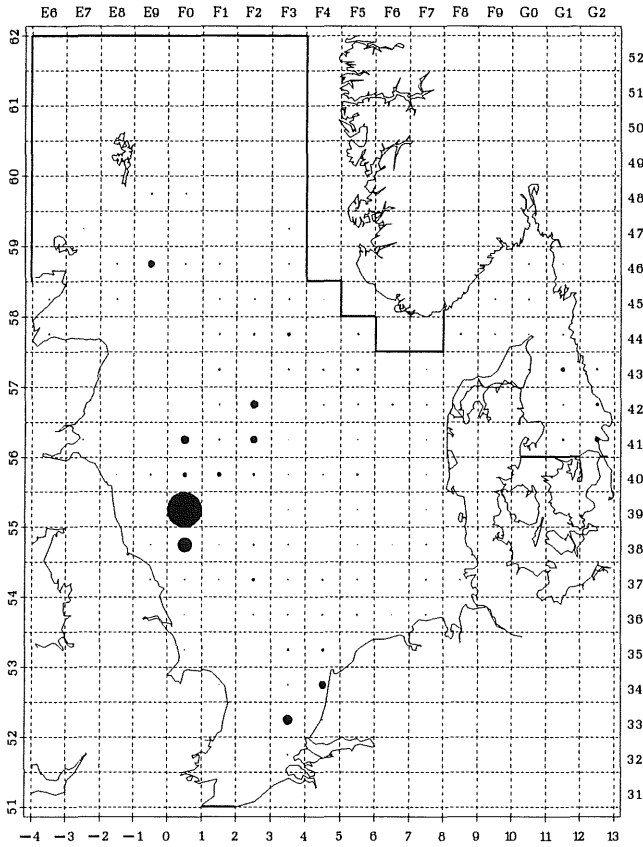
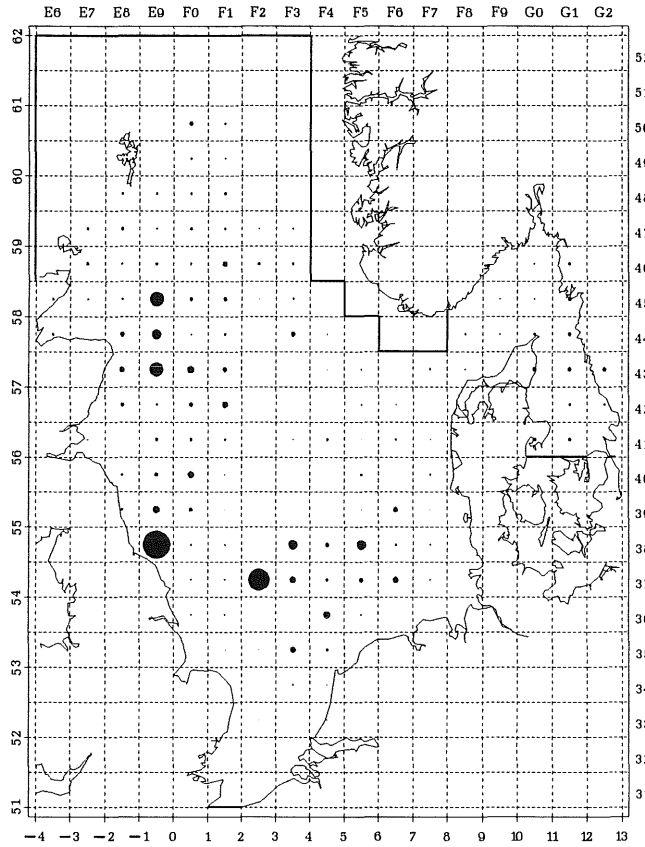


Figure 4.4 Herring: number per hour, 1-ringers.

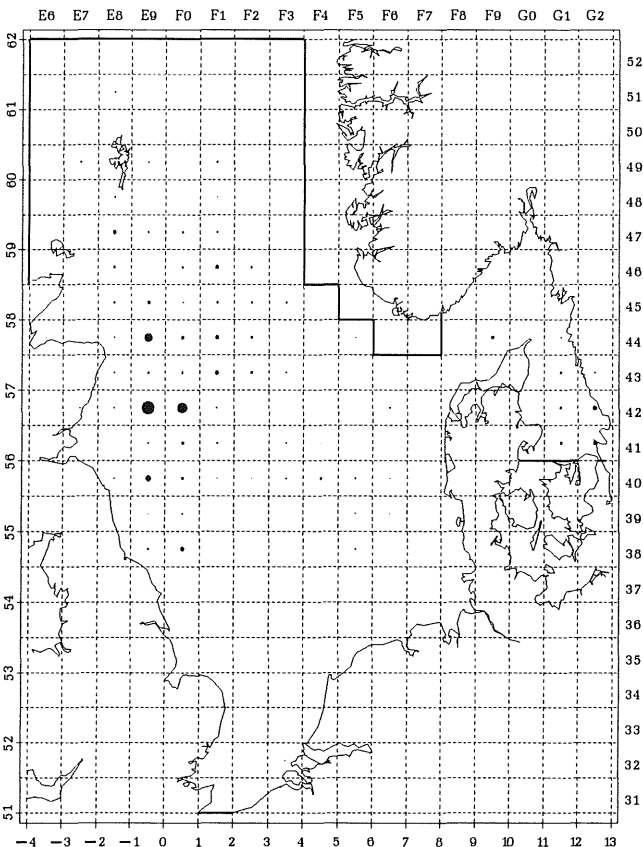
Herring, Age group 2 1995 quarter 1
 Max mean catch number per recangle: 126572



Herring, Age group 2 1995 quarter 2
 Max mean catch number per recangle: 77520



Herring, Age group 2 1995 quarter 3
 Max mean catch number per recangle: 15996



Herring, Age group 2 1995 quarter 4
 Max mean catch number per recangle: 17903

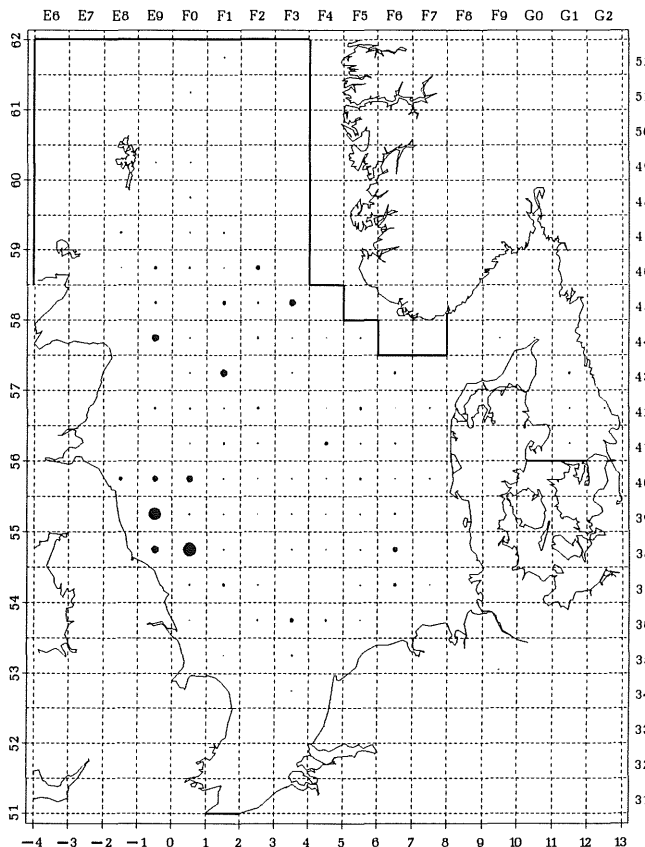
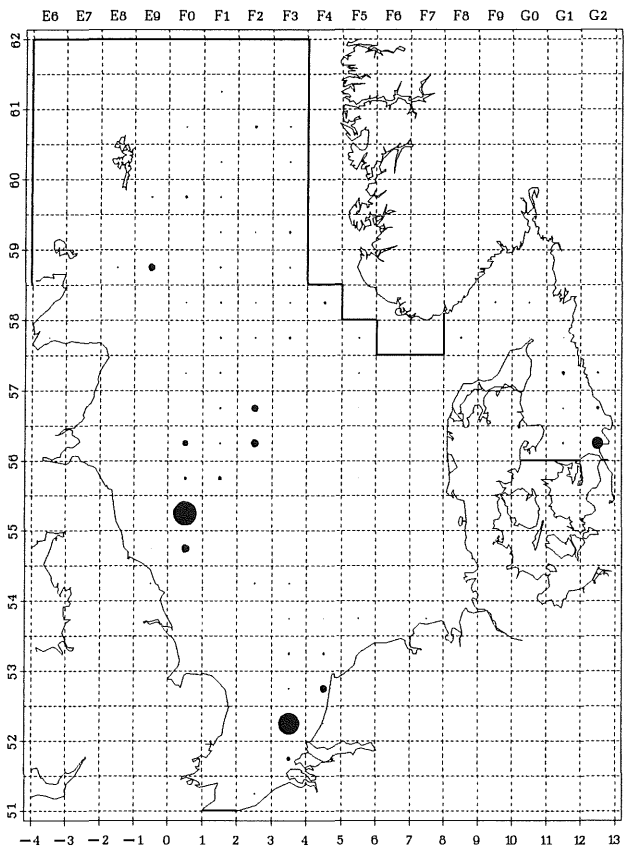
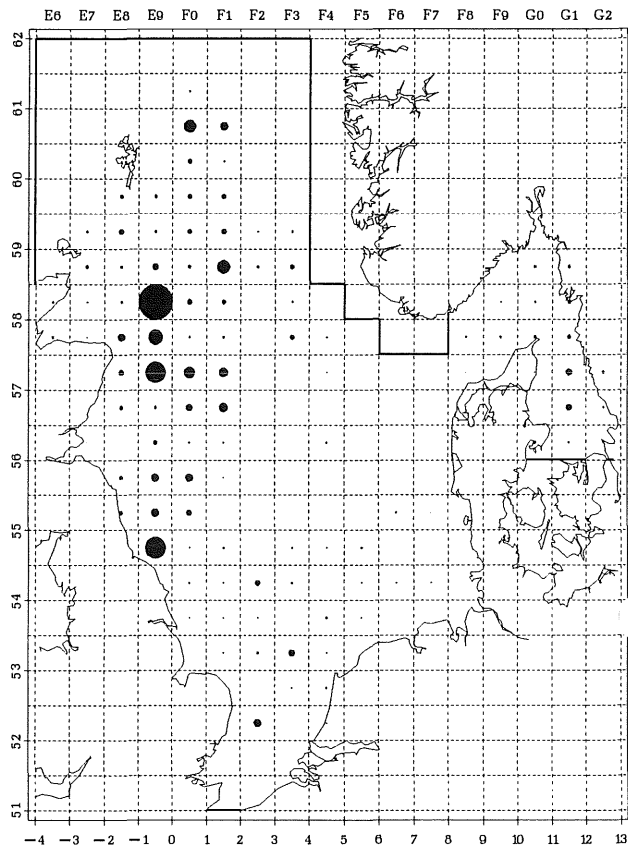


Figure 4.5 Herring: number per hour, 2-ringers.

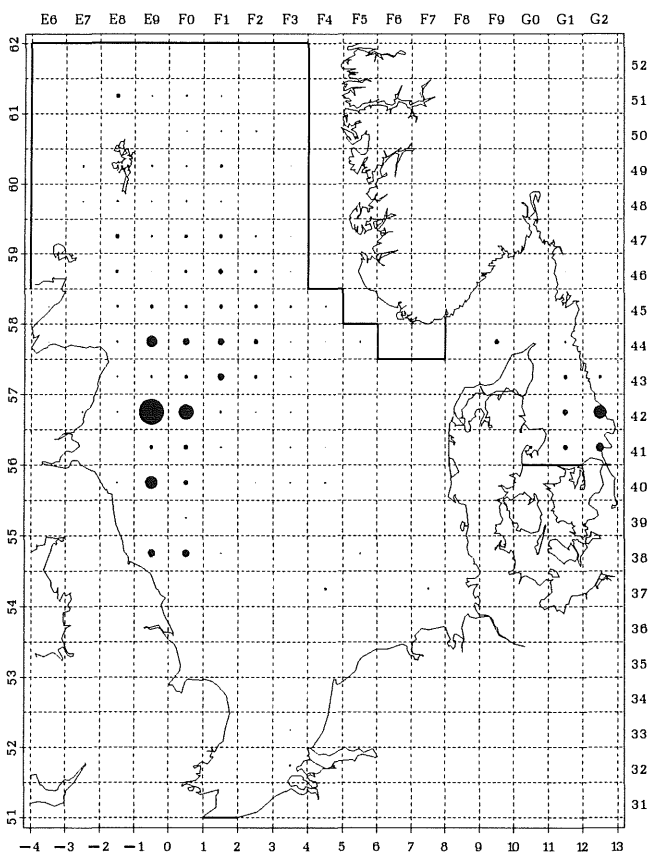
Herring, Age group 3+ 1995 quarter 1
 Max mean catch number per recangle: 13307



Herring, Age group 3+ 1995 quarter 2
 Max mean catch number per recangle: 28777



Herring, Age group 3+ 1995 quarter 3
 Max mean catch number per recangle: 15070



Herring, Age group 3+ 1995 quarter 4
 Max mean catch number per recangle: 7695

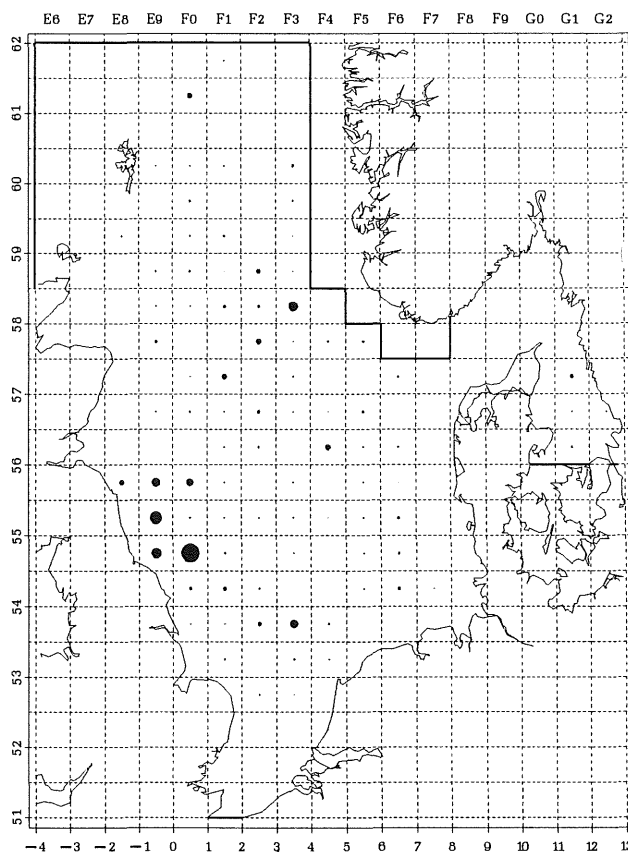
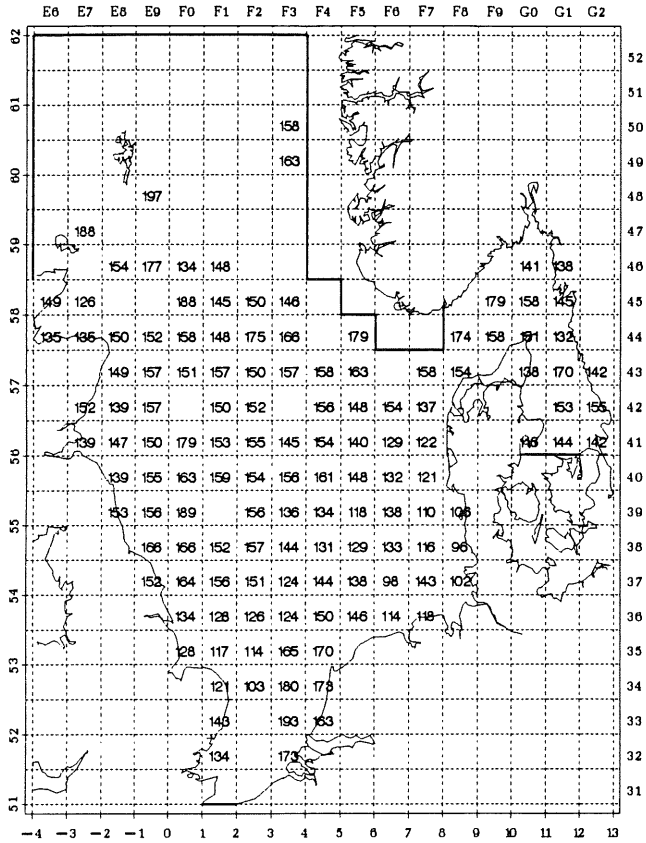
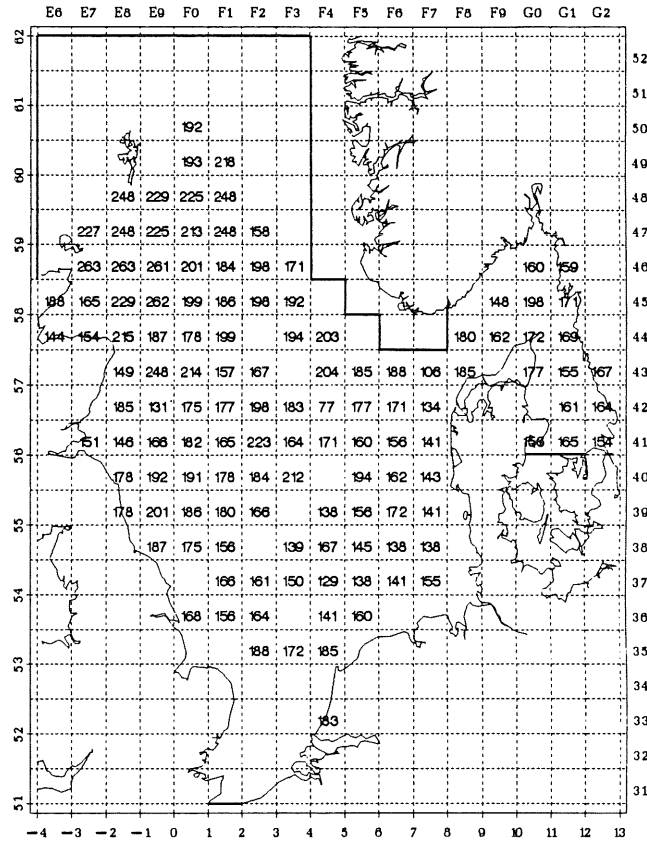


Figure 4.6 Herring: number per hour, 3+ringers.

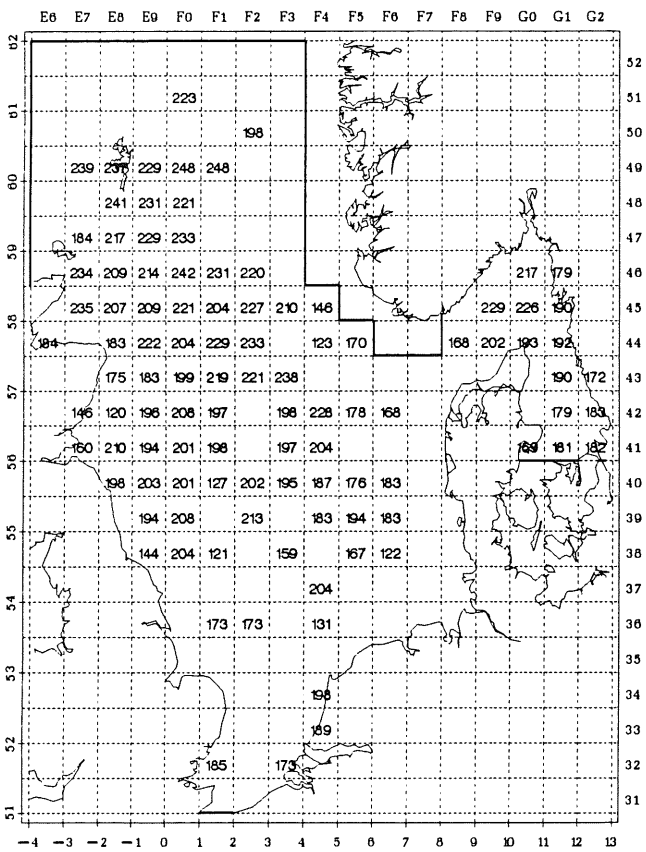
Herring, Age group 1 1995 quarter 1



Herring, Age group 1 1995 quarter 2



Herring, Age group 1 1995 quarter 3



Herring, Age group 1 1995 quarter 4

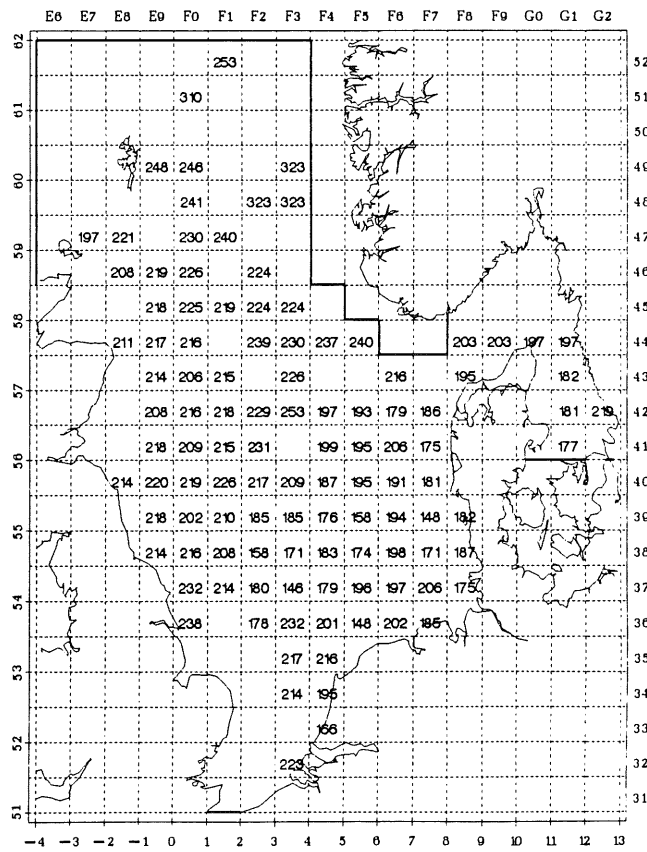
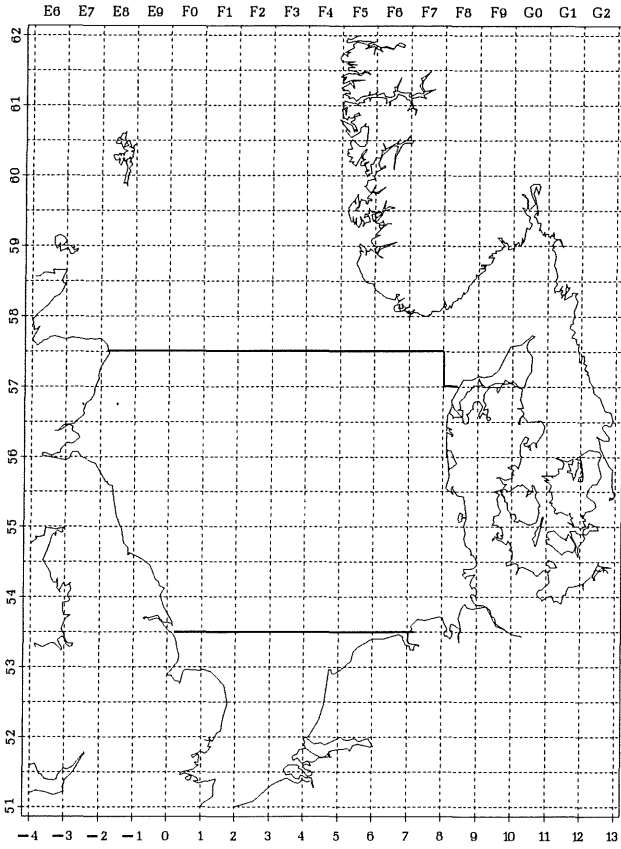


Figure 4.7 Herring: mean length (mm), 1-ringers.

Sprat, Age group 0 1995 quarter 3
Max mean catch number per recangle: 12



Sprat, Age group 0 1995 quarter 4
Max mean catch number per recangle: 6983

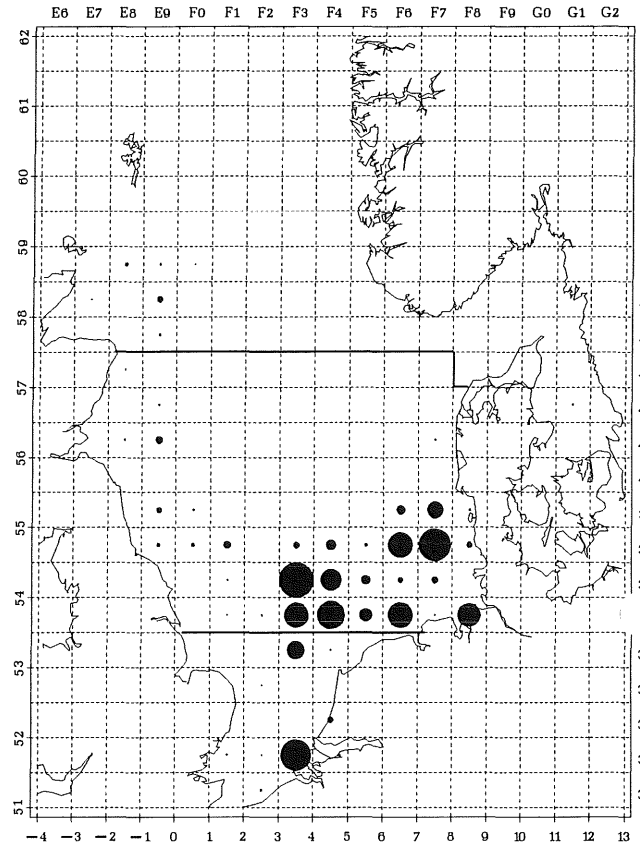
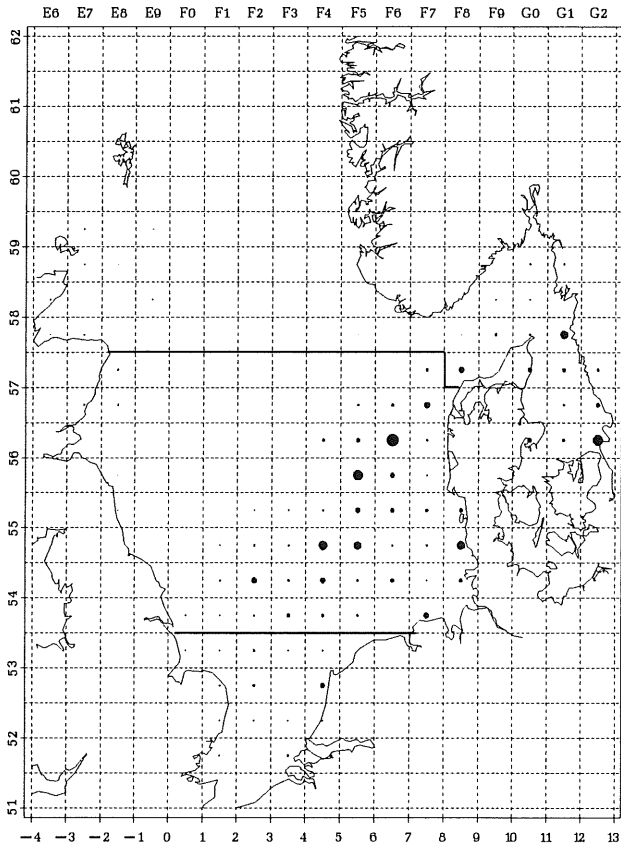
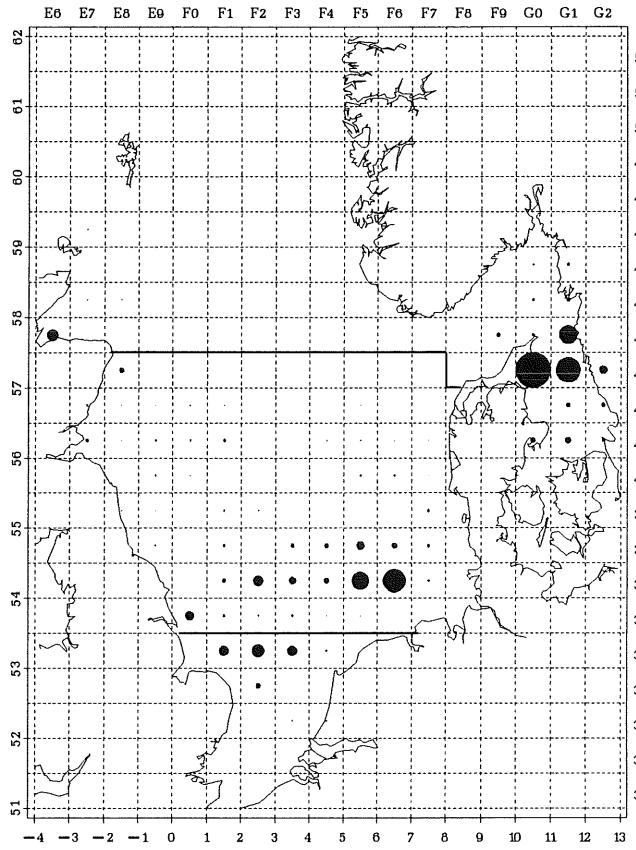


Figure 4.8 Sprat: number per hour, age-group 0.

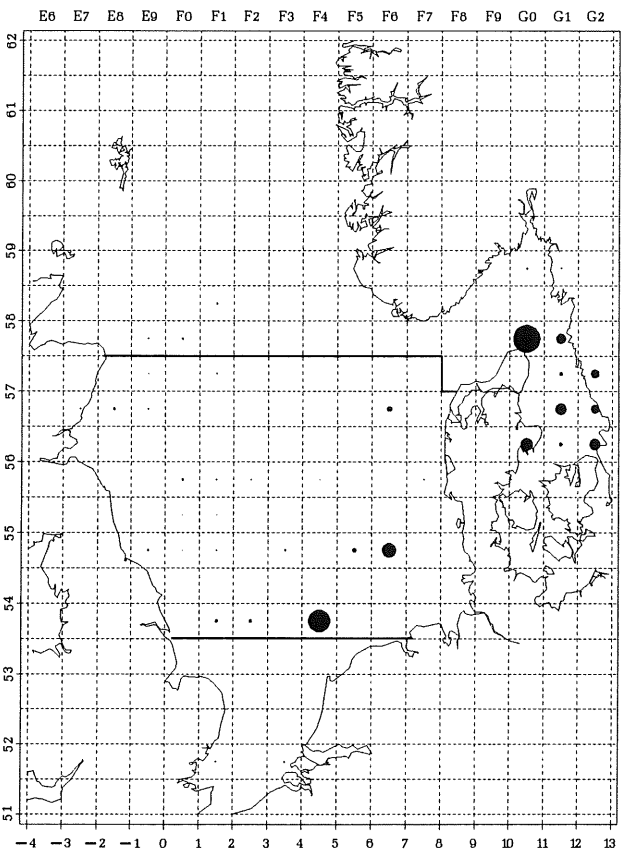
Sprat, Age group 1 1995 quarter 1
 Max mean catch number per rectangle: 16873



Sprat, Age group 1 1995 quarter 2
 Max mean catch number per rectangle: 147010



Sprat, Age group 1 1995 quarter 3
 Max mean catch number per rectangle: 89561



Sprat, Age group 1 1995 quarter 4
 Max mean catch number per rectangle: 79234

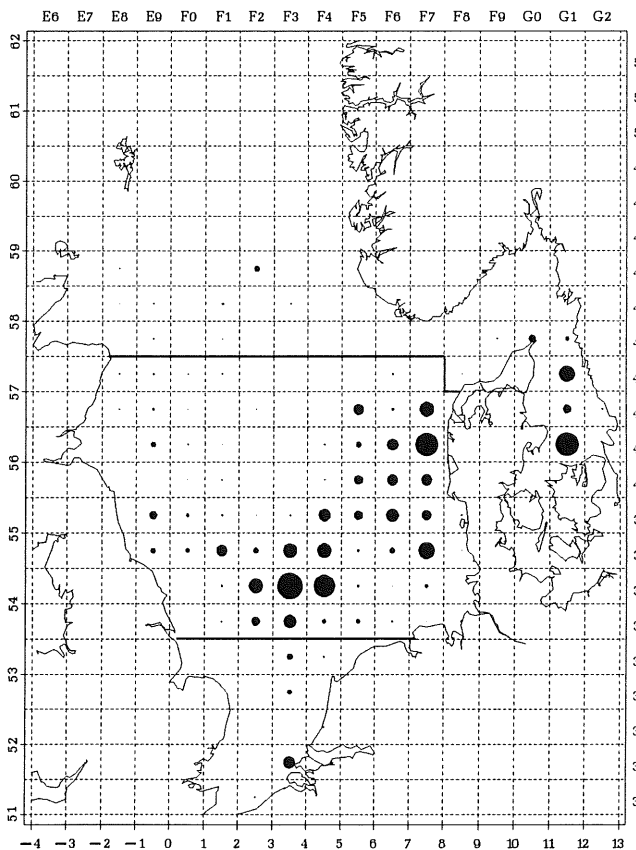
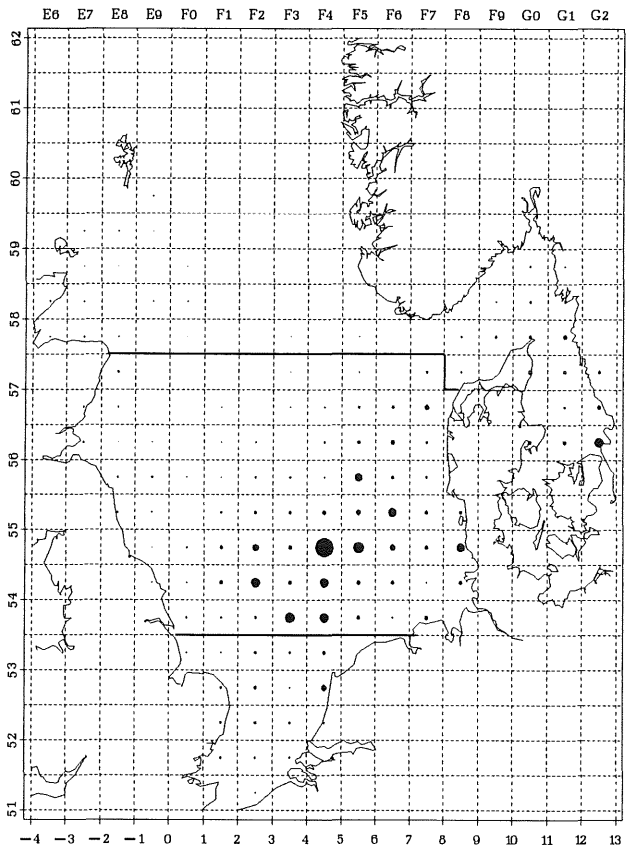
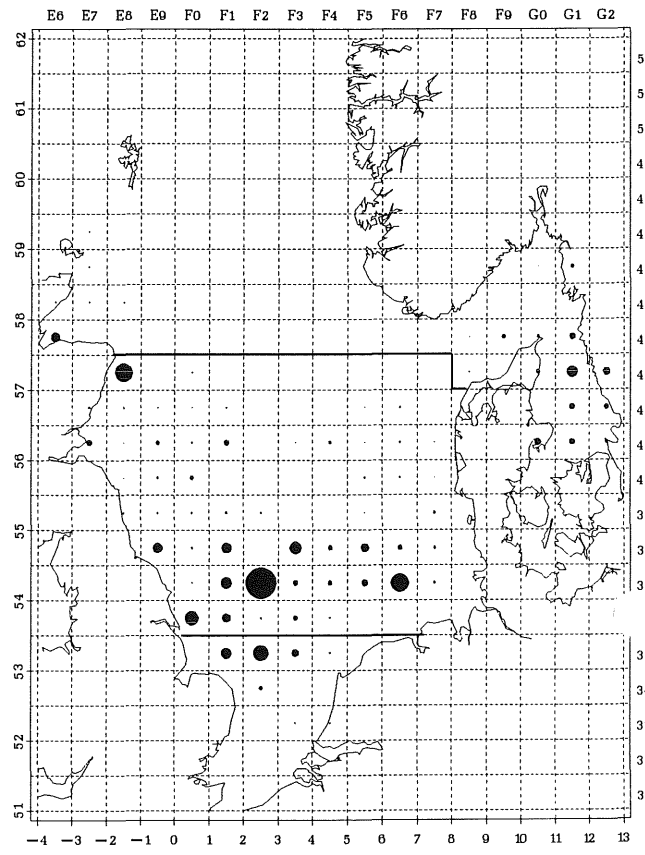


Figure 4.9 Sprat: number per hour, age-group 1.

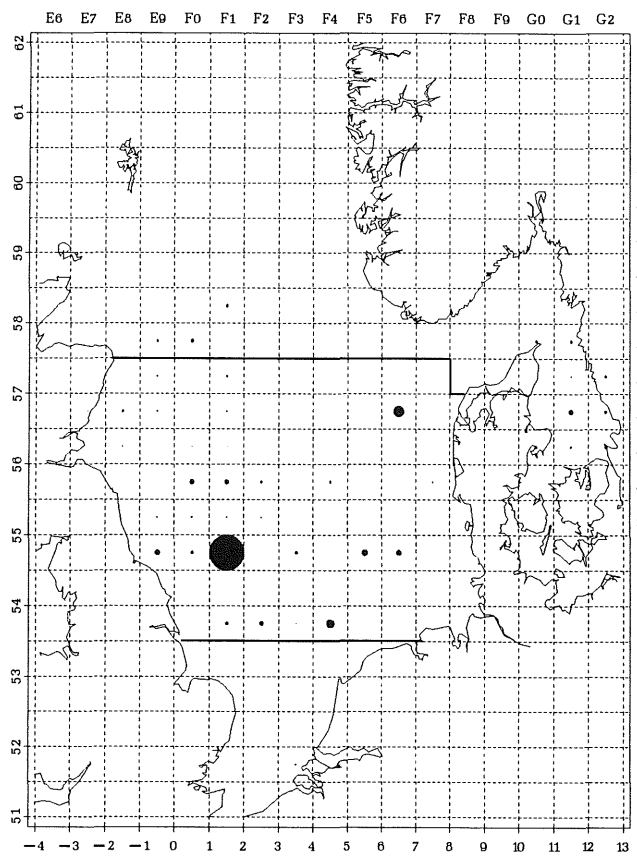
Sprat, Age group 2 1995 quarter 1
 Max mean catch number per recangle: 56289



Sprat, Age group 2 1995 quarter 2
 Max mean catch number per recangle: 151709



Sprat, Age group 2 1995 quarter 3
 Max mean catch number per recangle: 197649



Sprat, Age group 2 1995 quarter 4
 Max mean catch number per recangle: 83897

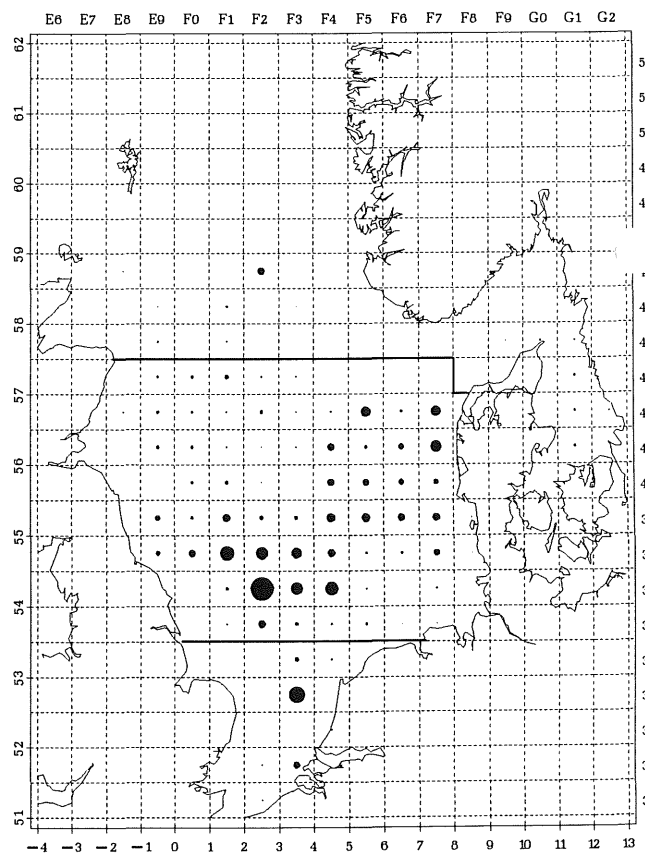
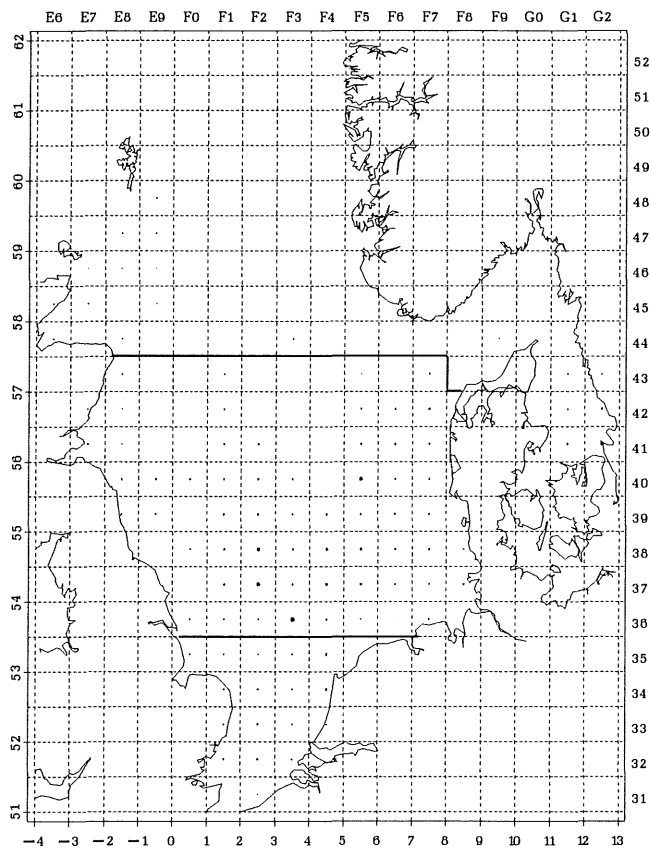
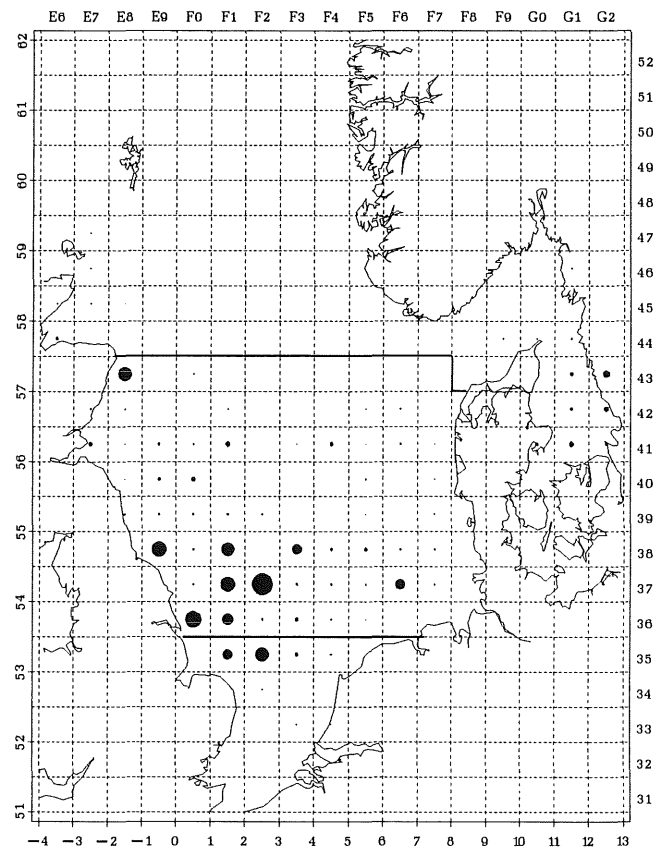


Figure 4.10 Sprat: number per hour, age-group 2.

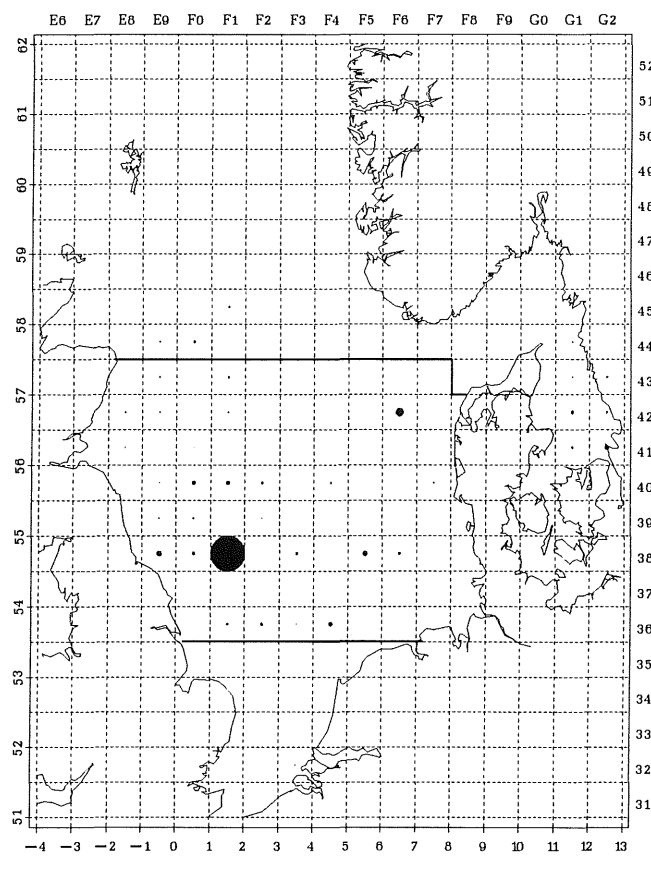
Sprat, Age group 3+ 1995 quarter 1
 Max mean catch number per recangle: 1555



Sprat, Age group 3+ 1995 quarter 2
 Max mean catch number per recangle: 42934



Sprat, Age group 3+ 1995 quarter 3
 Max mean catch number per recangle: 117493



Sprat, Age group 3+ 1995 quarter 4
 Max mean catch number per recangle: 23437

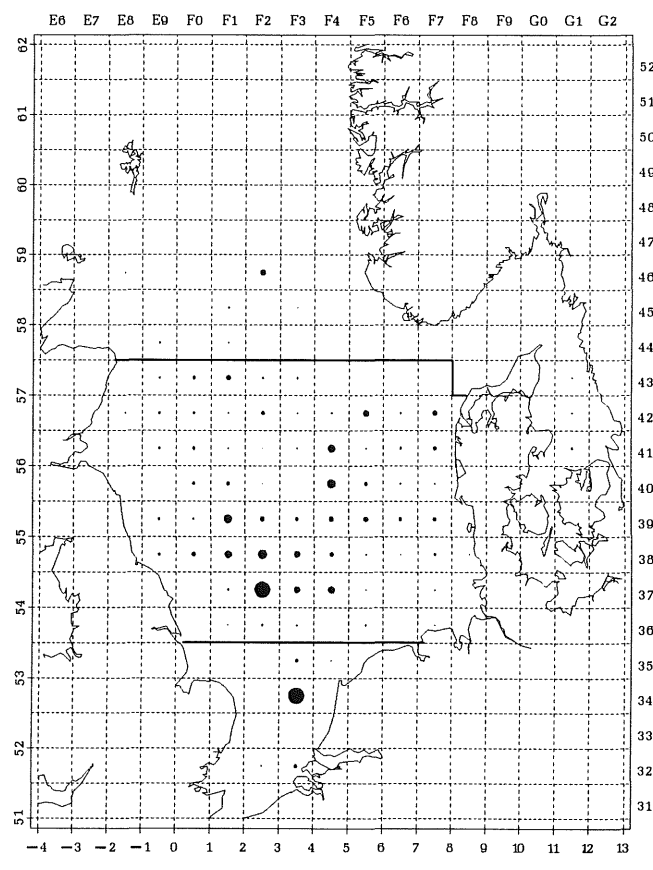
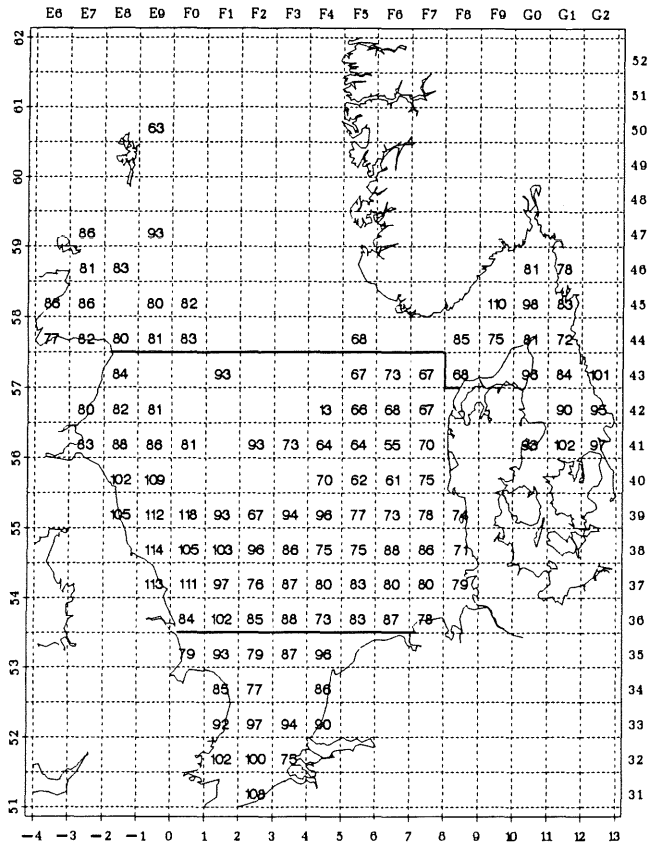
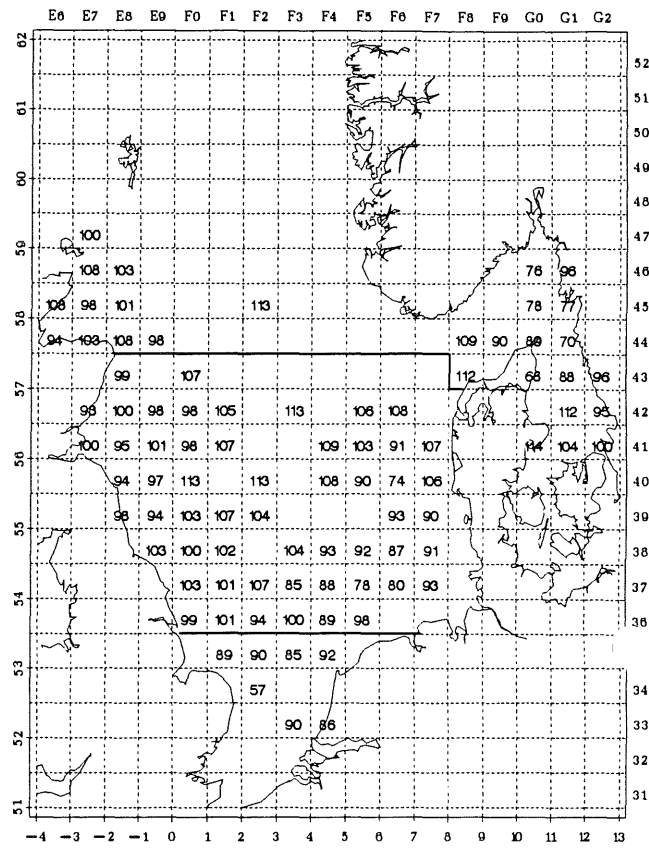


Figure 4.11 Sprat: number per hour, age-group 3+.

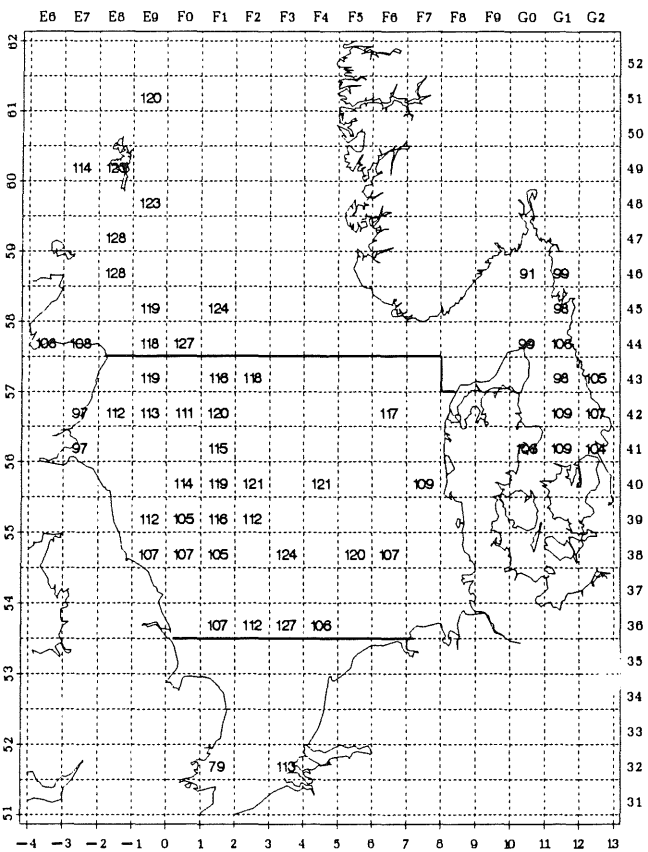
Sprat, Age group 1 1995 quarter 1



Sprat, Age group 1 1995 quarter 2



Sprat, Age group 1 1995 quarter 3



Sprat, Age group 1 1995 quarter 4

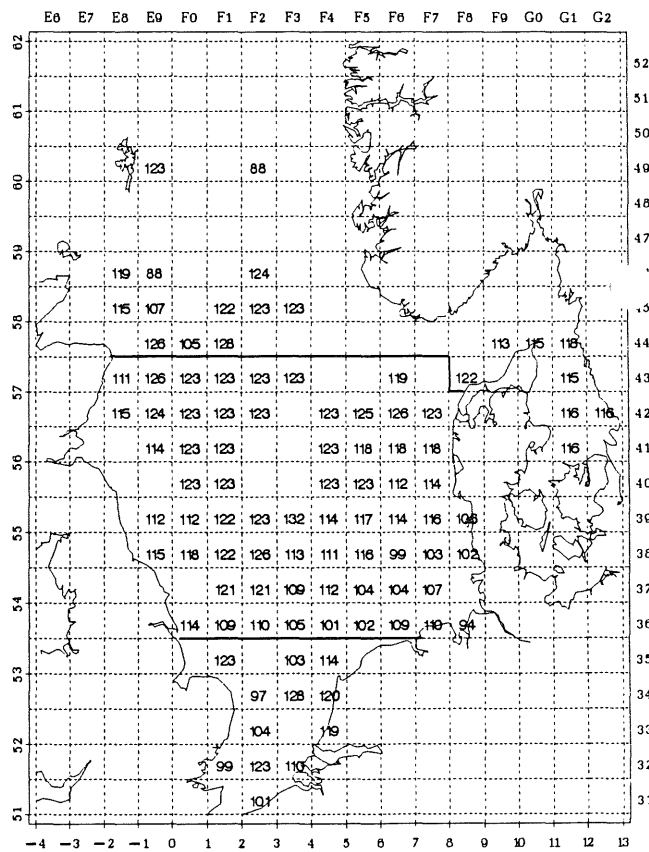
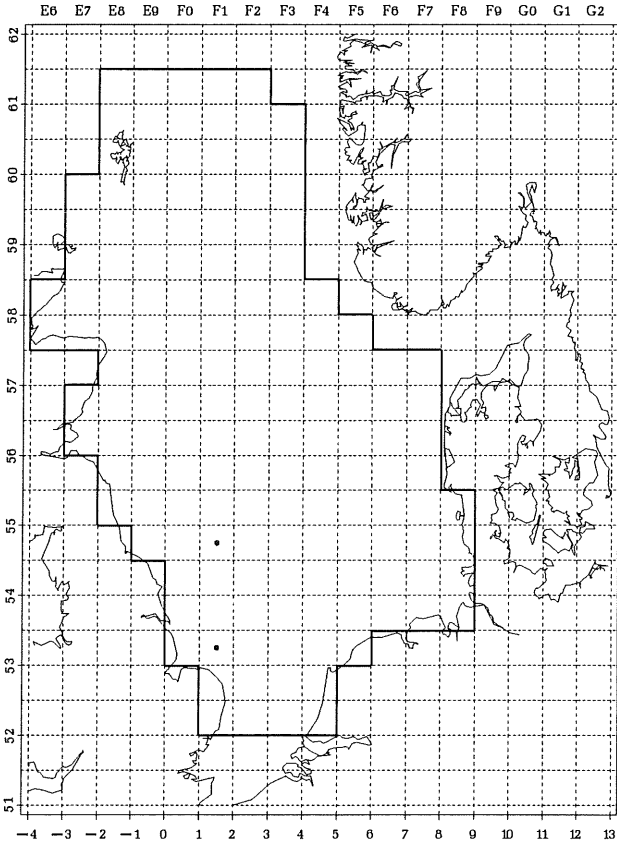


Figure 4.12 Sprat: mean length (mm), age-group 1.

Mackerel, Age group 0 1995 quarter 3
 Max mean catch number per recangle: 2



Mackerel, Age group 0 1995 quarter 4
 Max mean catch number per recangle: 105

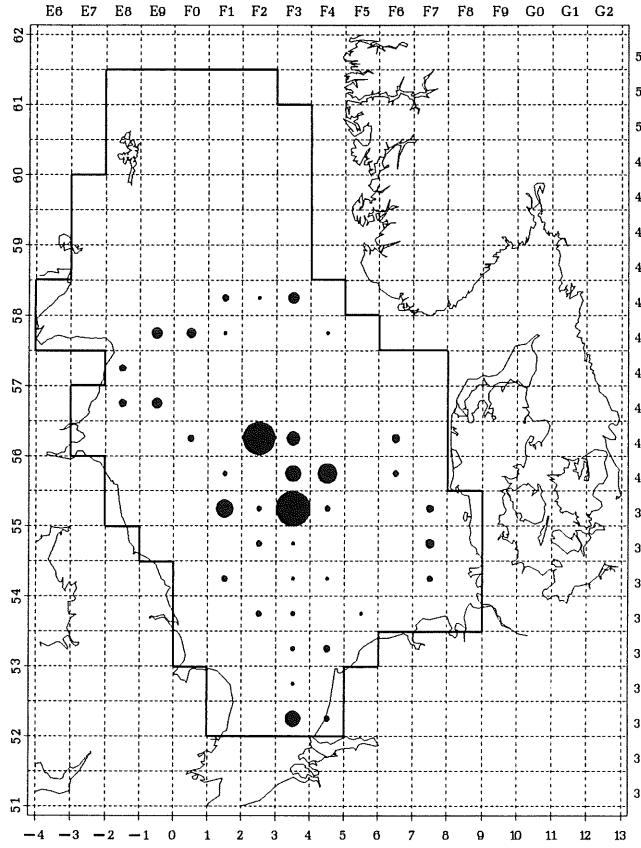
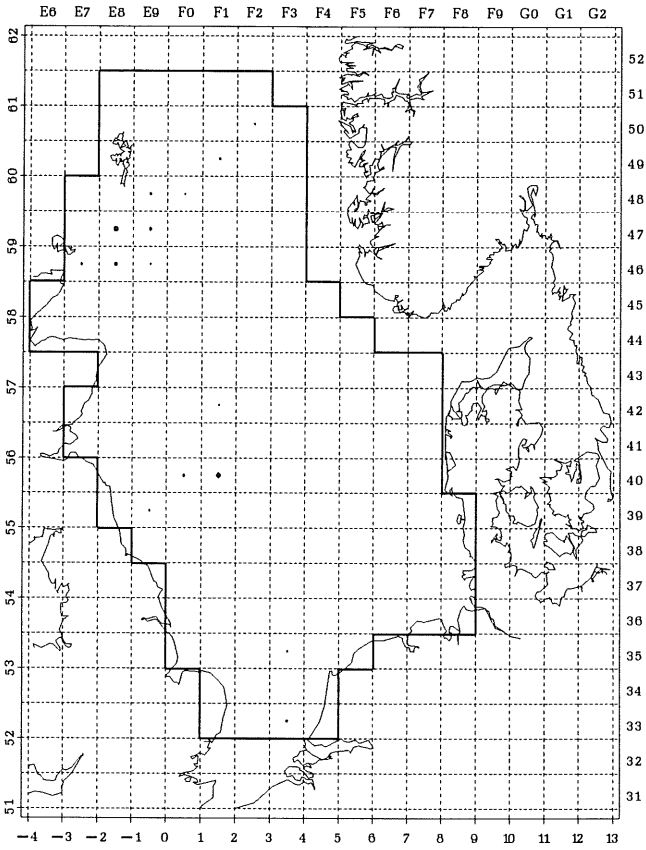
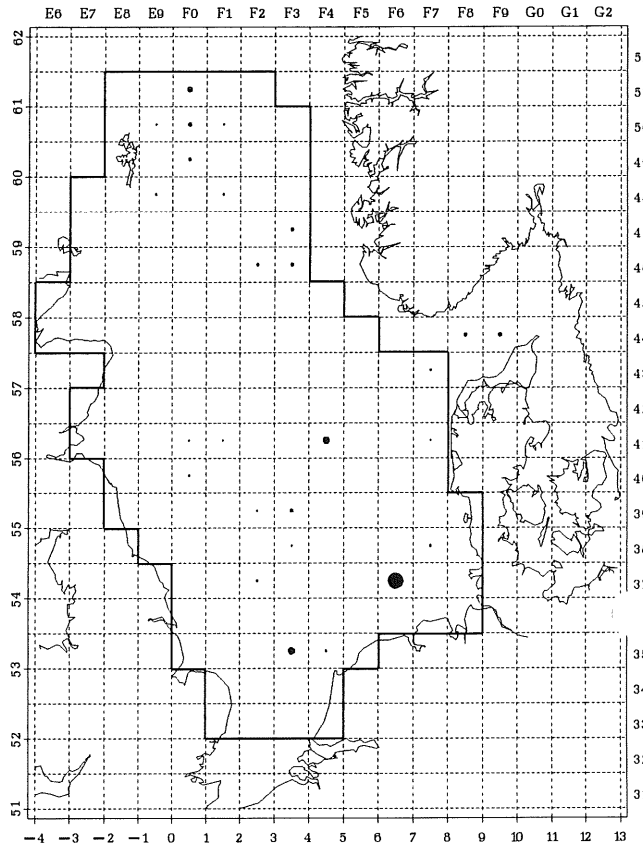


Figure 4.13 Mackerel: number per hour, age-group 0.

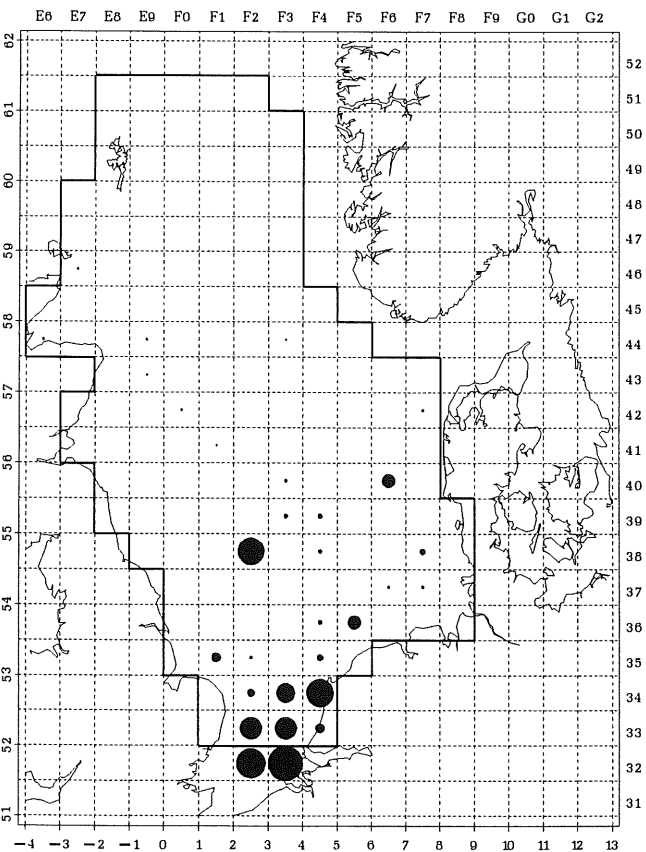
Mackerel, Age group 1 1995 quarter 1
 Max mean catch number per recangle: 13



Mackerel, Age group 1 1995 quarter 2
 Max mean catch number per recangle: 134



Mackerel, Age group 1 1995 quarter 3
 Max mean catch number per recangle: 669



Mackerel, Age group 1 1995 quarter 4
 Max mean catch number per recangle: 146

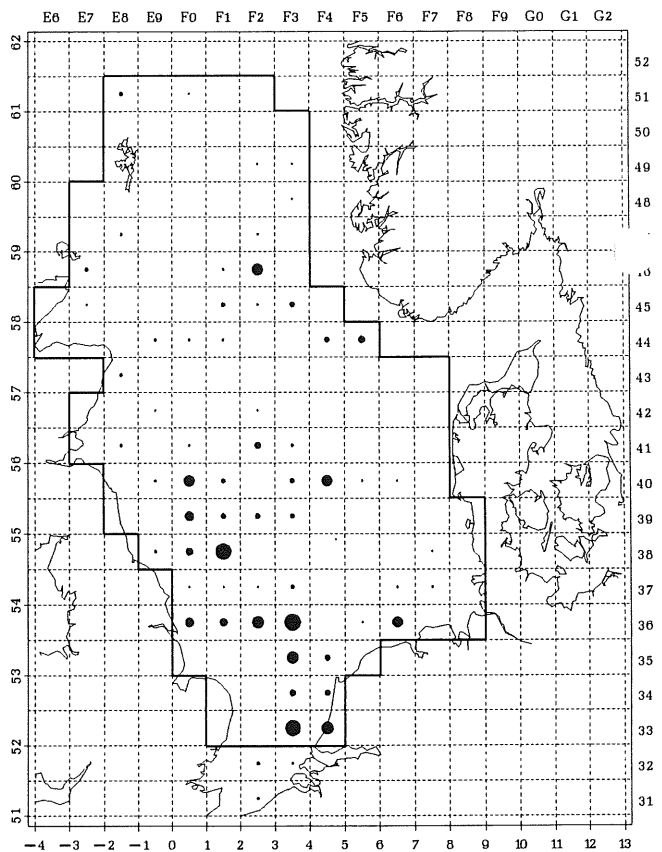
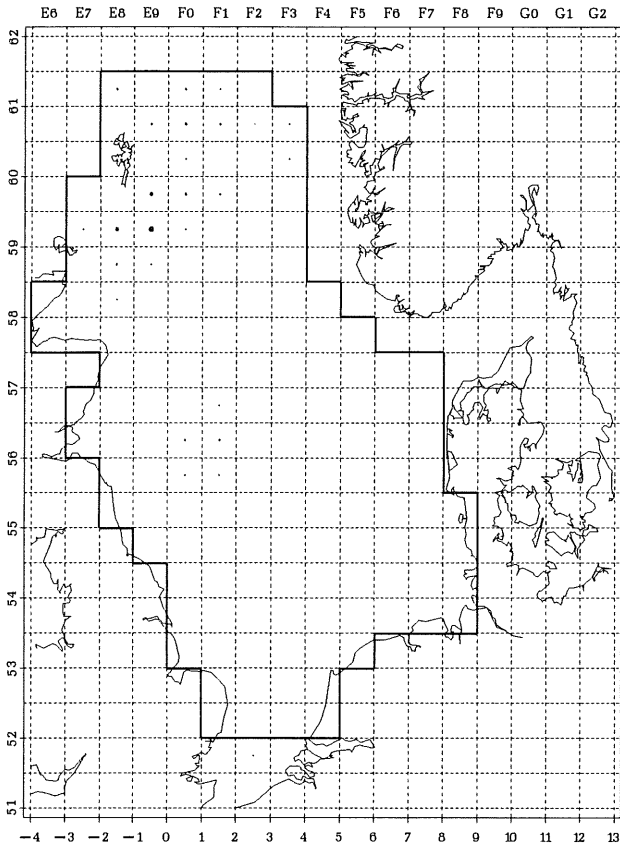
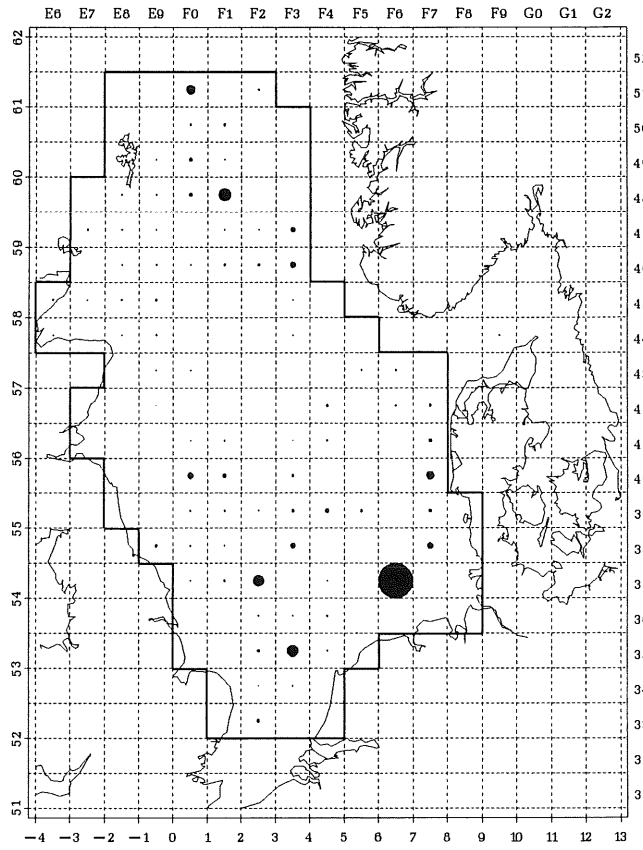


Figure 4.14 Mackerel: number per hour, age-group 1.

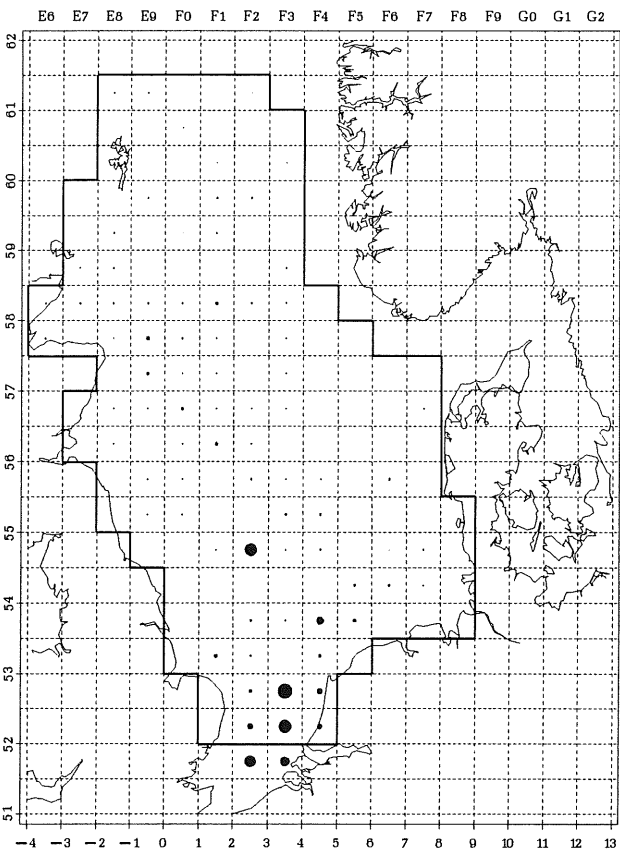
Mackerel, Age group 2 1995 quarter 1
 Max mean catch number per recangle: 115



Mackerel, Age group 2 1995 quarter 2
 Max mean catch number per recangle: 6239



Mackerel, Age group 2 1995 quarter 3
 Max mean catch number per recangle: 1019



Mackerel, Age group 2 1995 quarter 4
 Max mean catch number per recangle: 1742

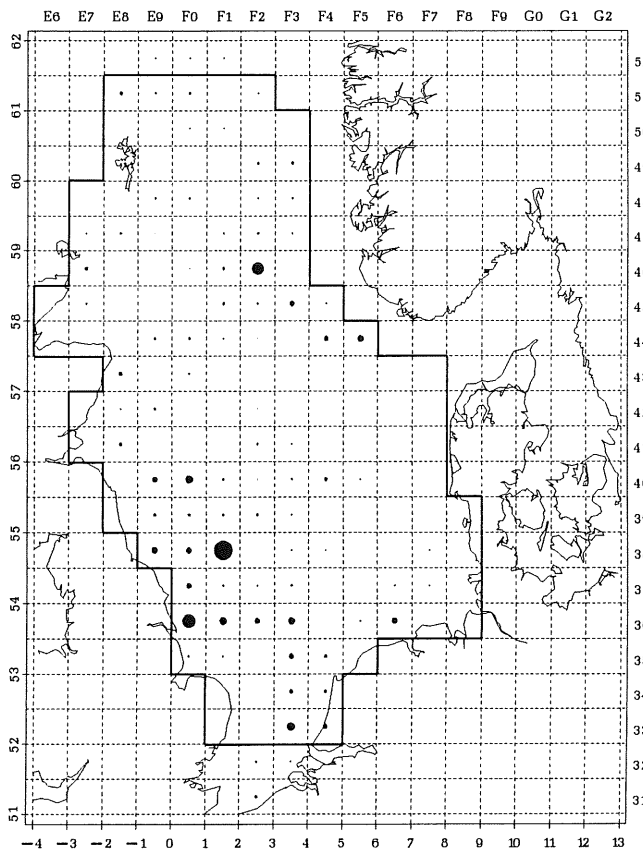
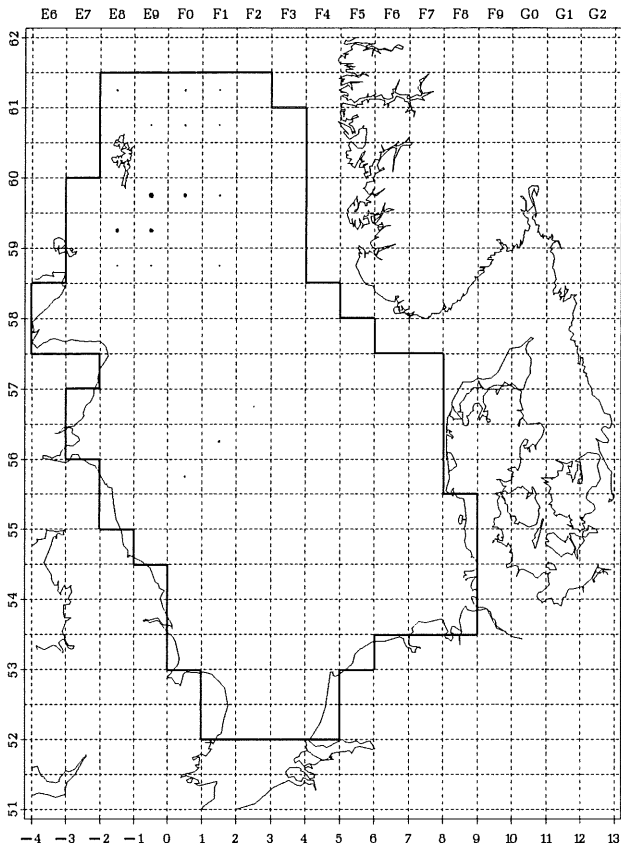
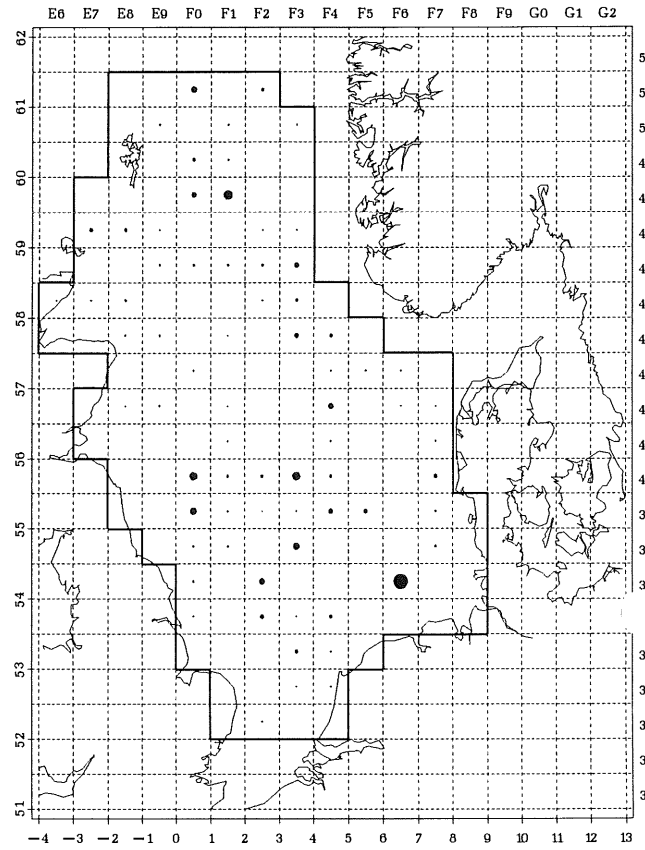


Figure 4.15 Mackerel: number per hour, age-group 2.

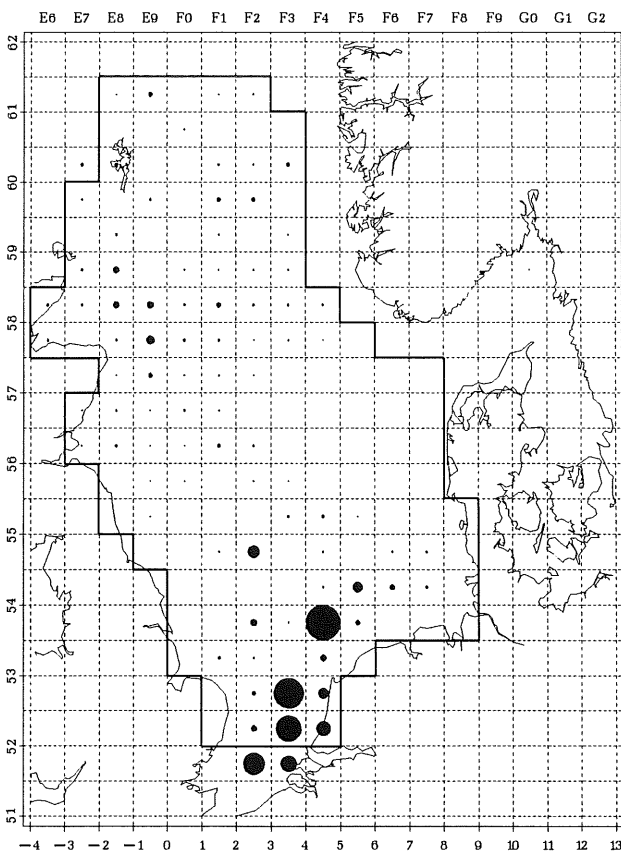
Mackerel, Age group 3+ 1995 quarter 1
 Max mean catch number per recangle: 40



Mackerel, Age group 3+ 1995 quarter 2
 Max mean catch number per recangle: 400



Mackerel, Age group 3+ 1995 quarter 3
 Max mean catch number per recangle: 2346



Mackerel, Age group 3+ 1995 quarter 4
 Max mean catch number per recangle: 977

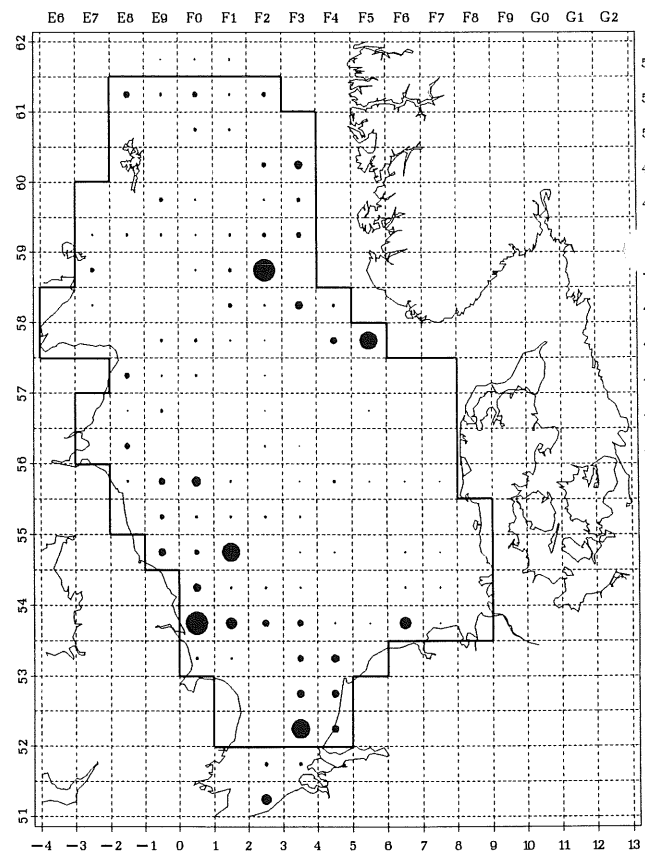
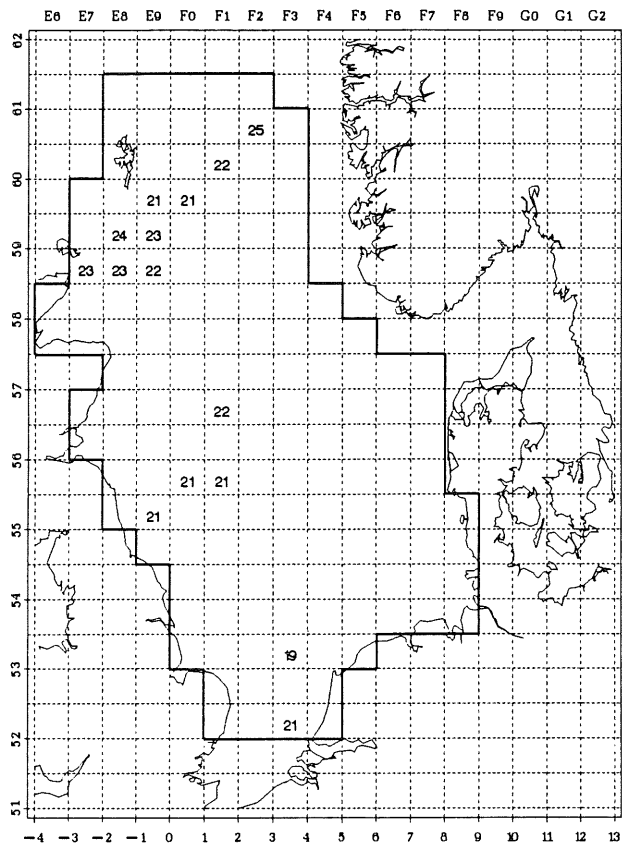
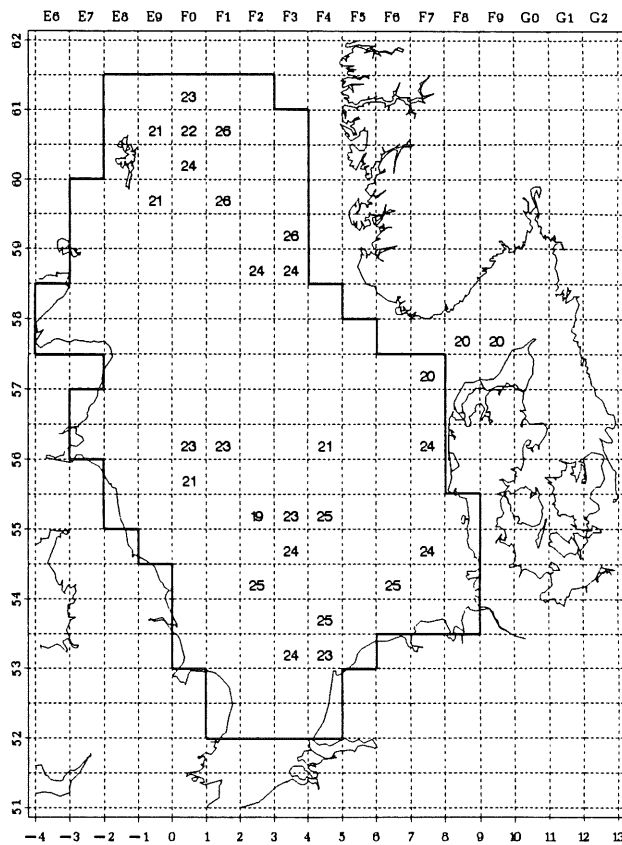


Figure 4.16 Mackerel: number per hour, age-group 3+.

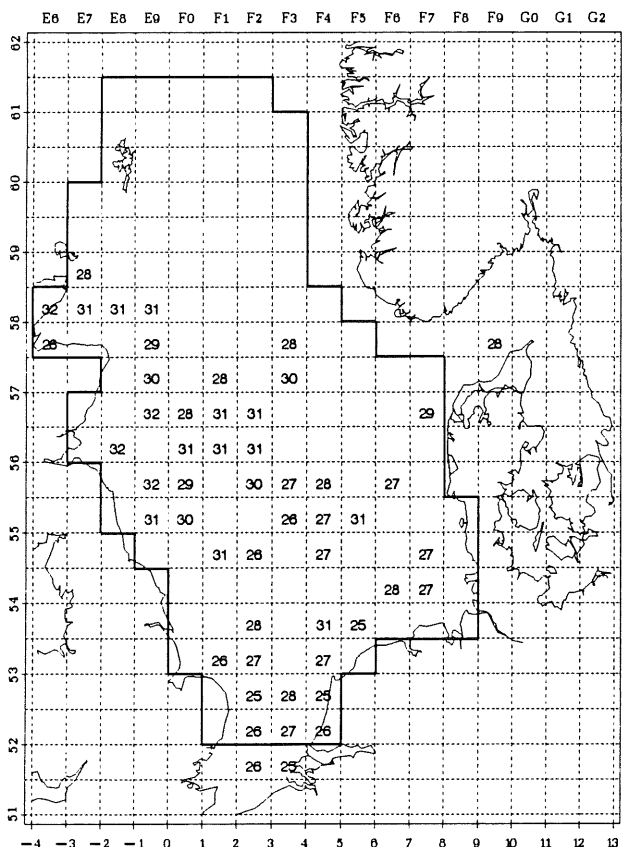
Mackerel, Age group 1 1995 quarter 1



Mackerel, Age group 1 1995 quarter 2



Mackerel, Age group 1 1995 quarter 3



Mackerel, Age group 1 1995 quarter 4

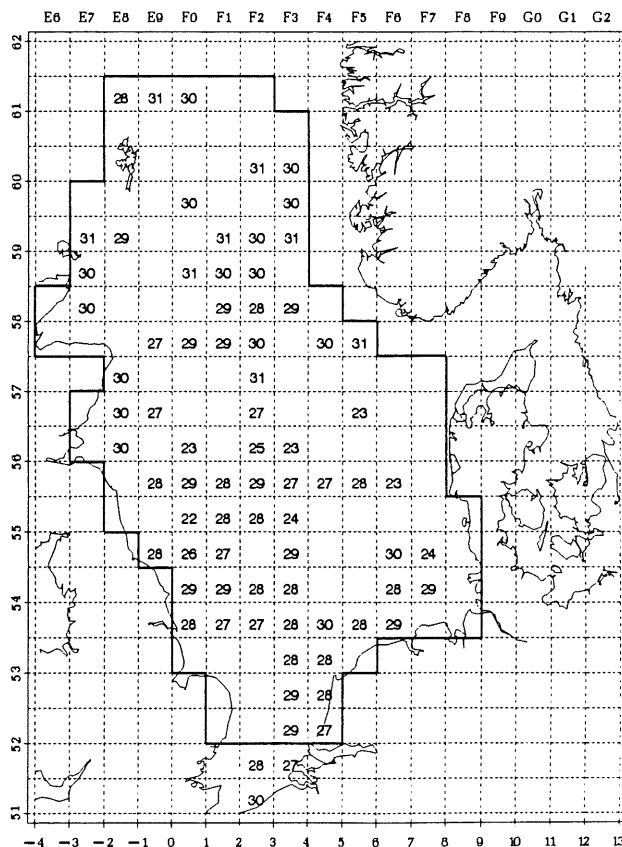
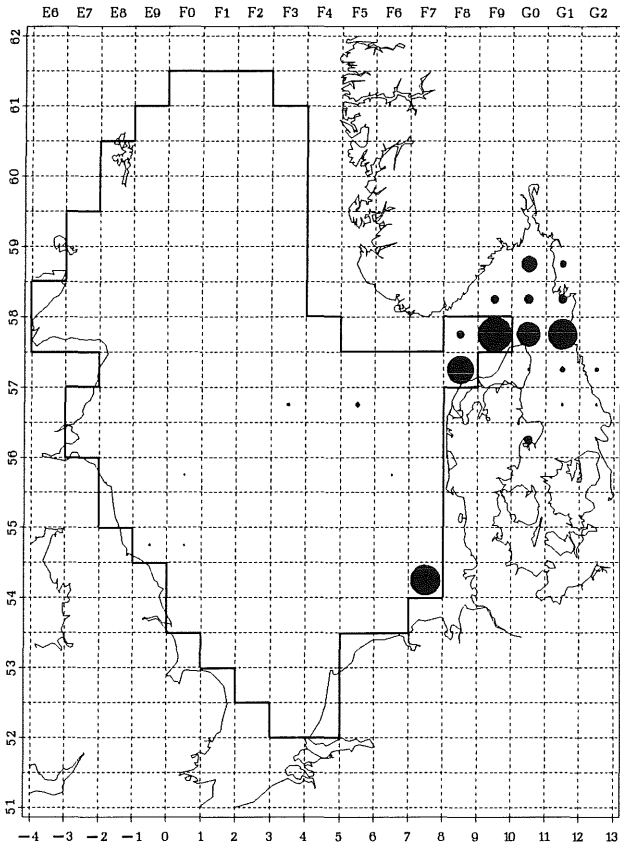


Figure 4.17 Mackerel: mean length (cm below), age-group 1.

Cod, Age group 0 1995 quarter 3
 Max mean catch number per recangle: 781



Cod, Age group 0 1995 quarter 4
 Max mean catch number per recangle: 640

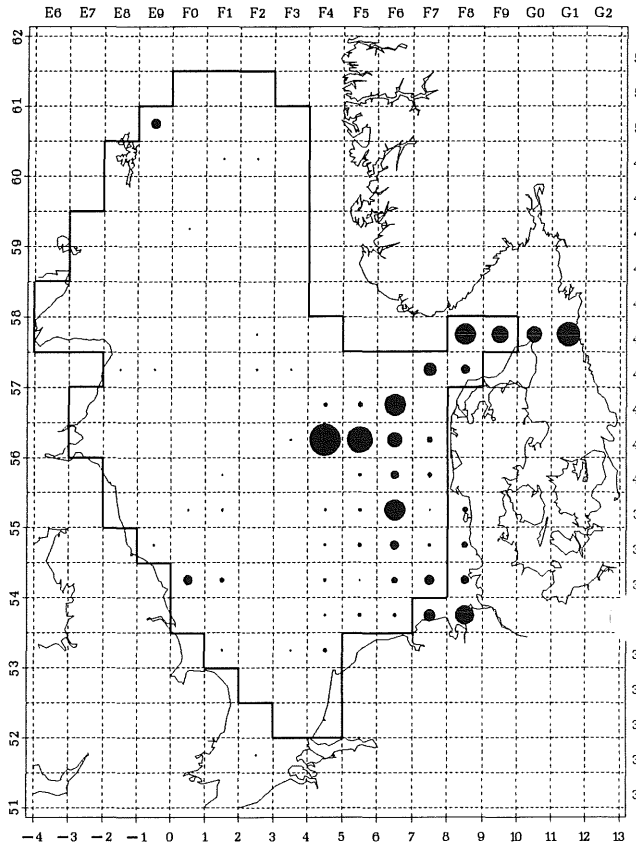
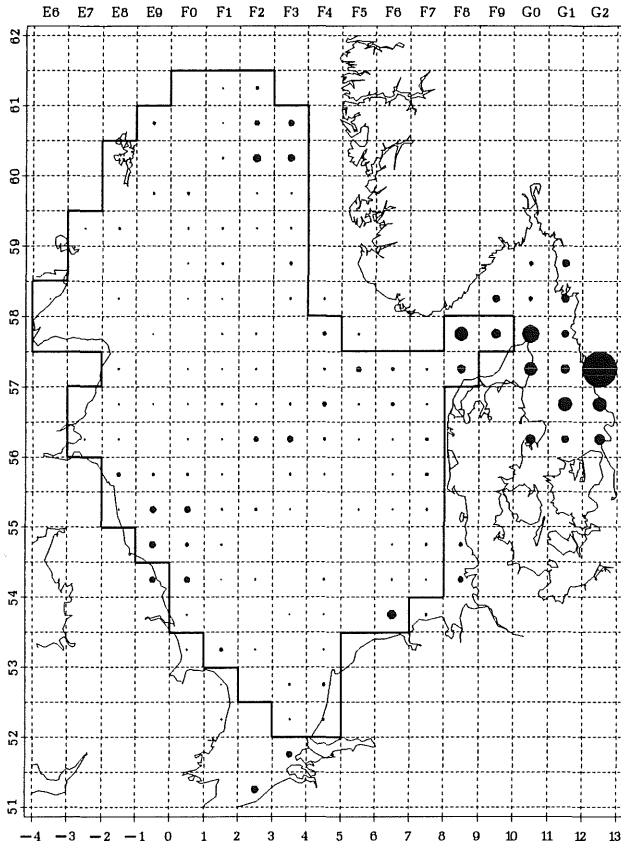
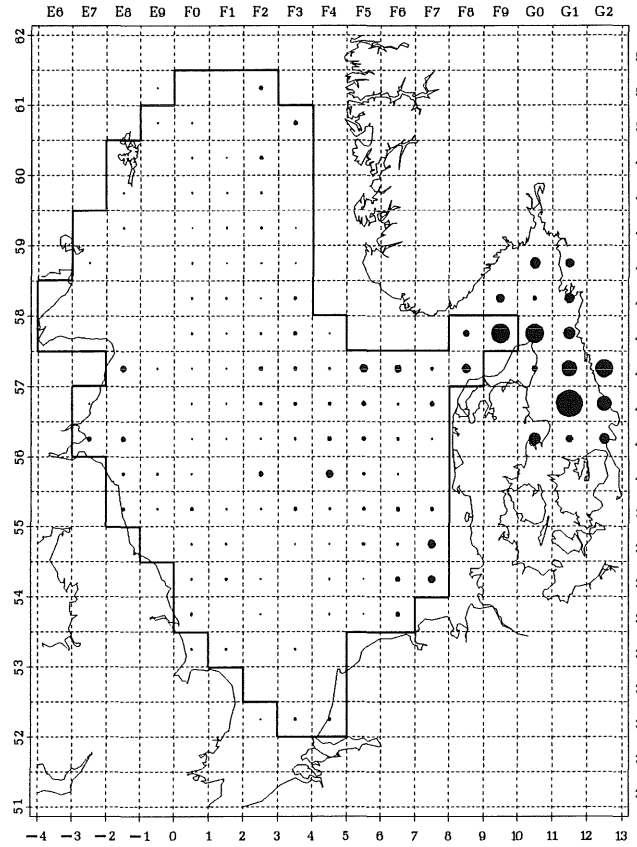


Figure 4.18 Cod: number per hour, age-group 0.

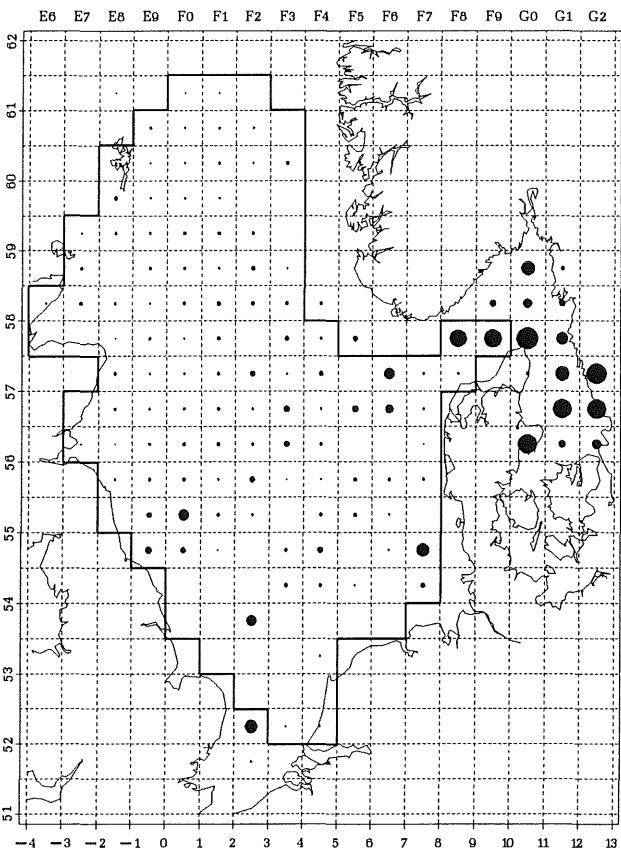
Cod, Age group 1 1995 quarter 1
 Max mean catch number per recangle: 1409



Cod, Age group 1 1995 quarter 2
 Max mean catch number per recangle: 814



Cod, Age group 1 1995 quarter 3
 Max mean catch number per recangle: 531



Cod, Age group 1 1995 quarter 4
 Max mean catch number per recangle: 591

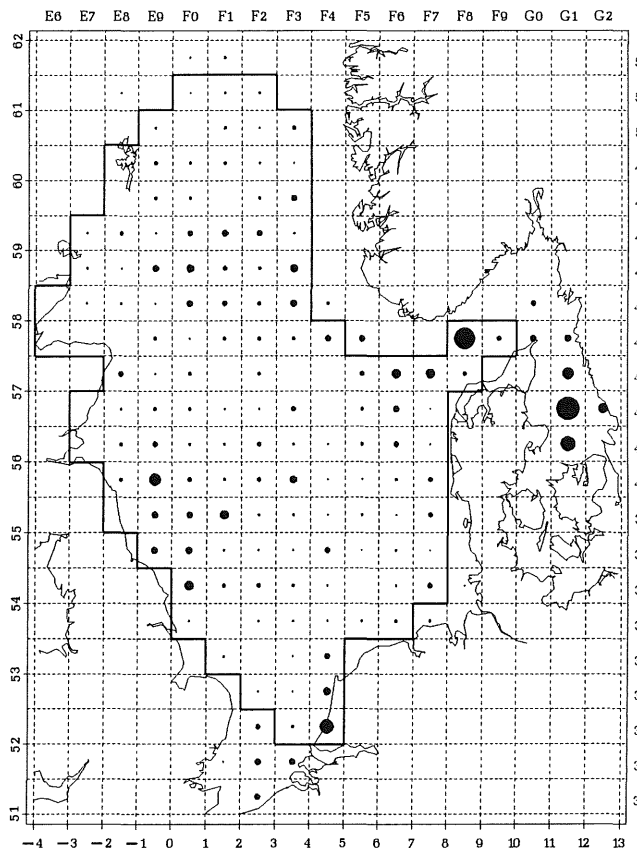
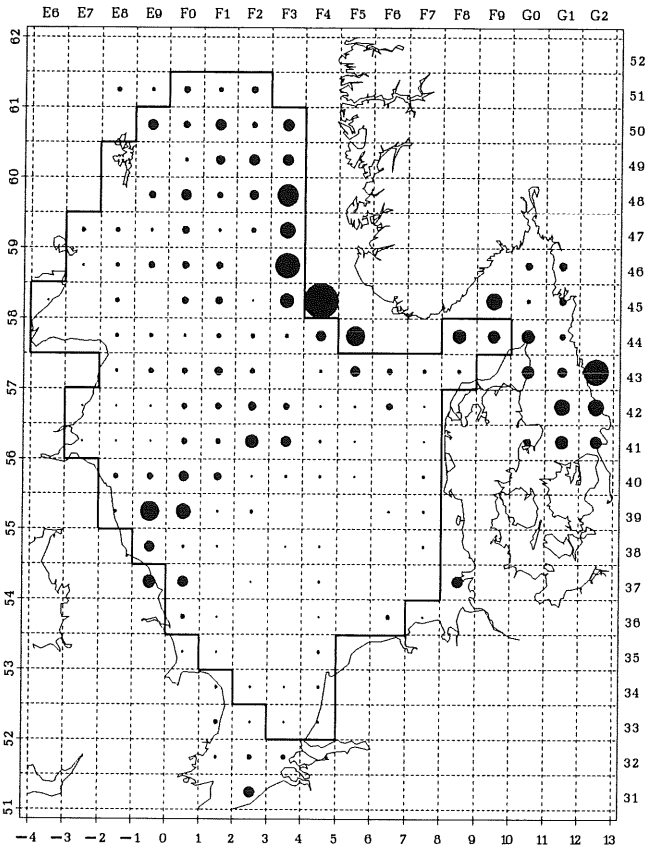
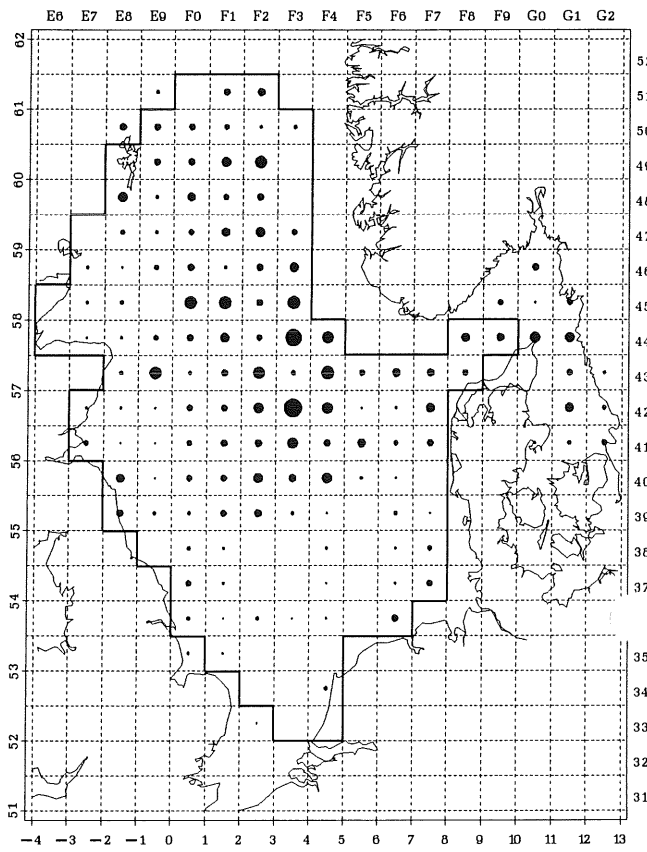


Figure 4.19 Cod: number per hour, age-group 1.

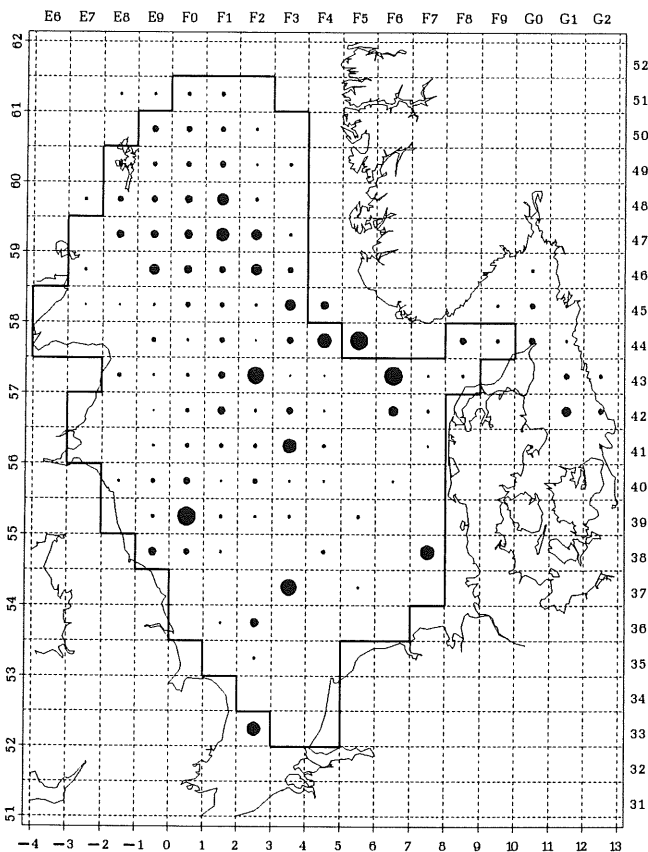
Cod, Age group 2 1995 quarter 1
 Max mean catch number per rectangle: 625



Cod, Age group 2 1995 quarter 2
 Max mean catch number per rectangle: 174



Cod, Age group 2 1995 quarter 3
 Max mean catch number per rectangle: 178



Cod, Age group 2 1995 quarter 4
 Max mean catch number per rectangle: 195

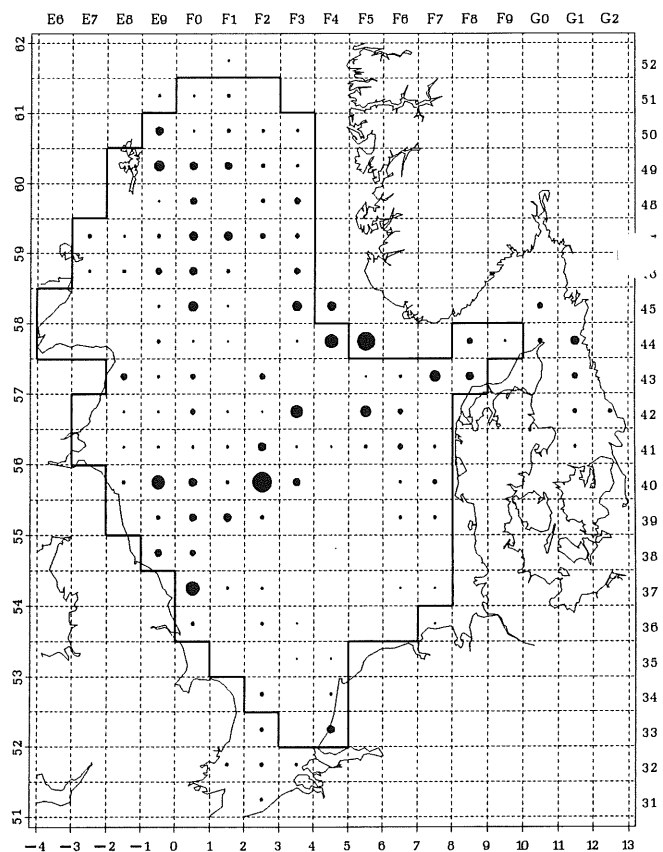
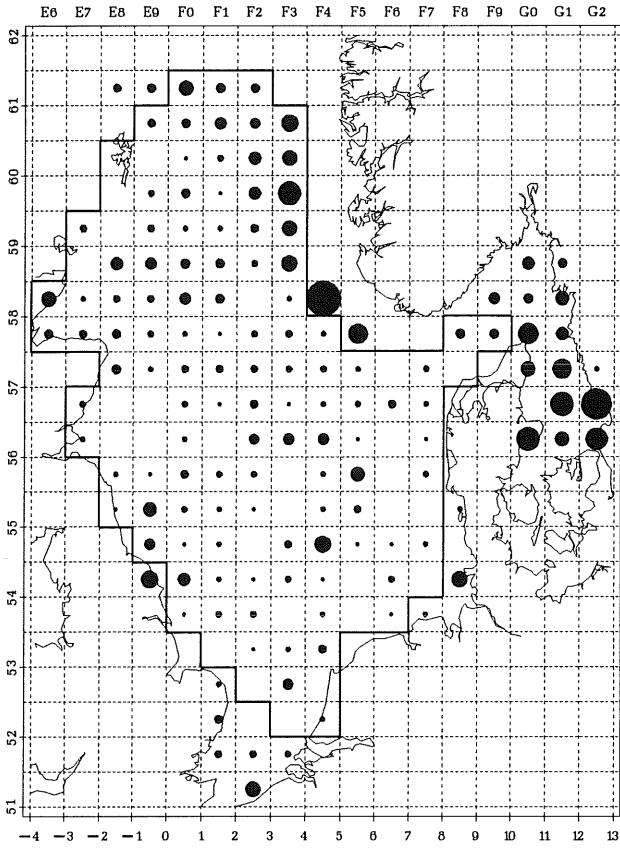
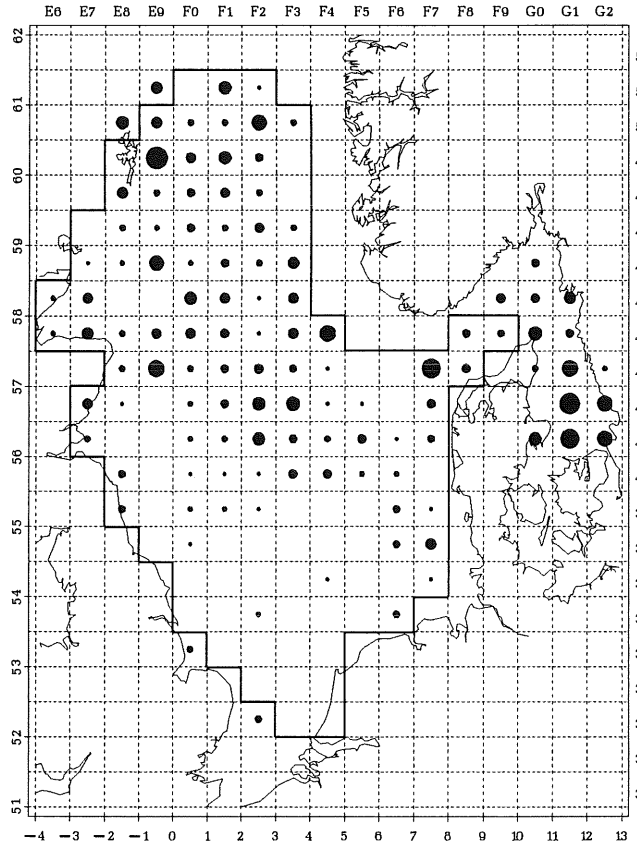


Figure 4.20 Cod: number per hour, age-group 2.

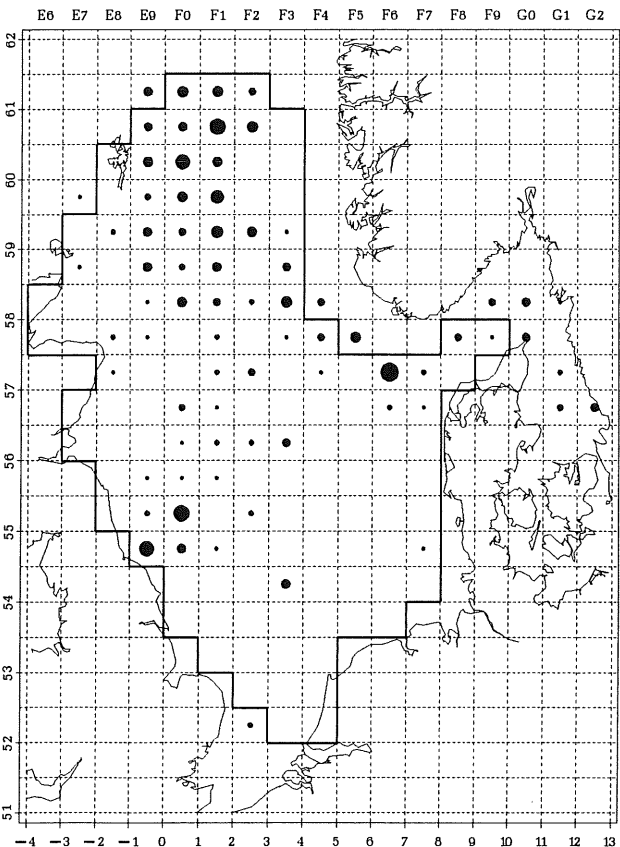
Cod, Age group 3+ 1995 quarter 1
 Max mean catch number per recangle: 89



Cod, Age group 3+ 1995 quarter 2
 Max mean catch number per recangle: 35



Cod, Age group 3+ 1995 quarter 3
 Max mean catch number per recangle: 25



Cod, Age group 3+ 1995 quarter 4
 Max mean catch number per recangle: 47

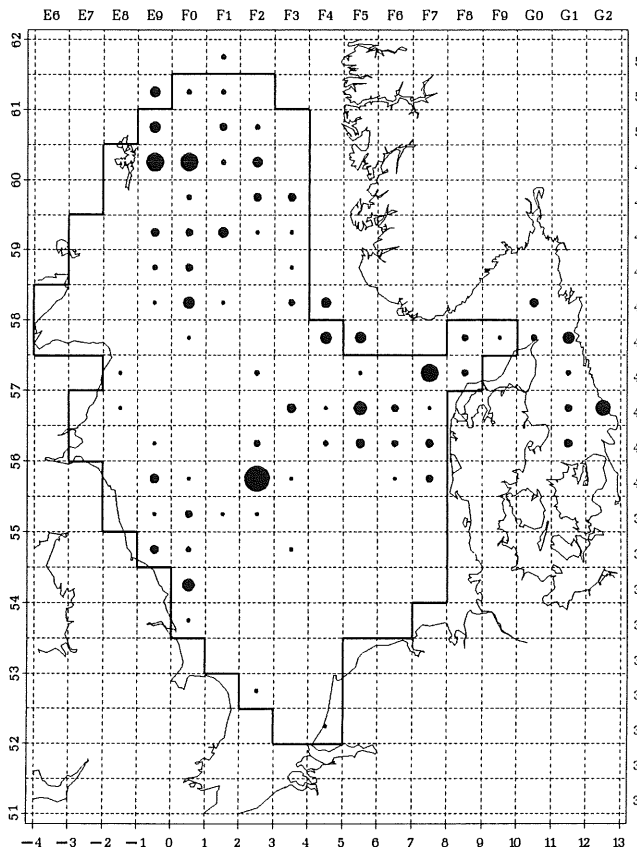
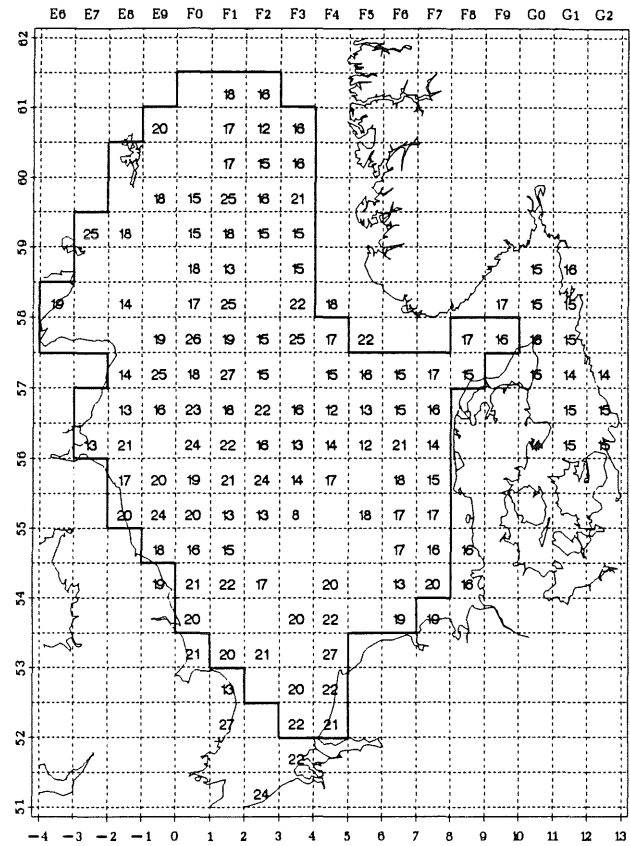
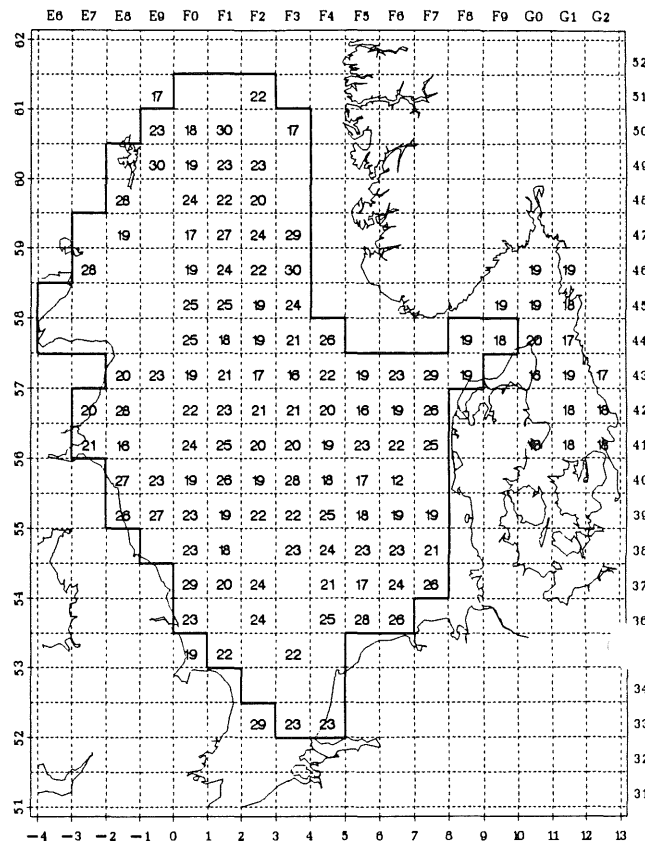


Figure 4.21 Cod: number per hour, age-group 3+.

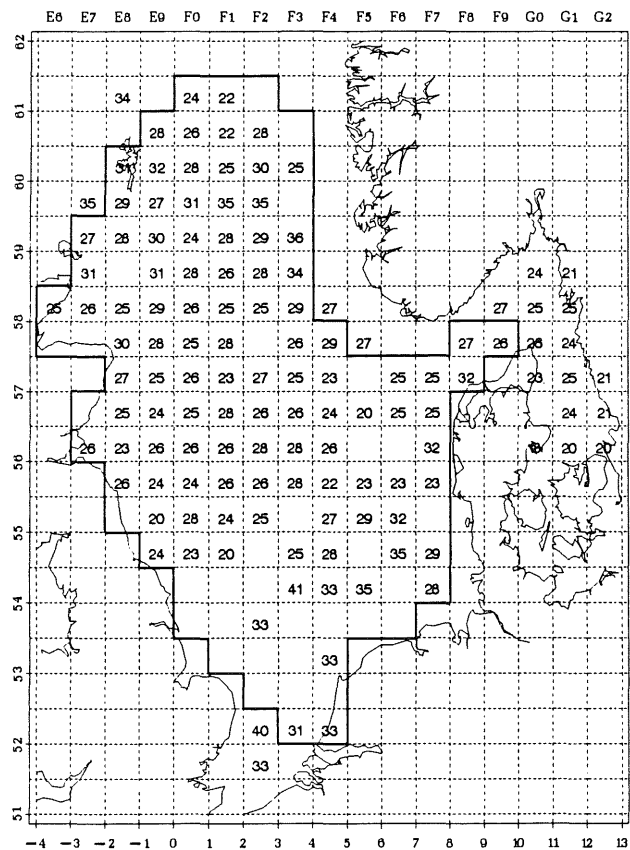
Cod, Age group 1 1995 quarter 1



Cod, Age group 1 1995 quarter 2



Cod, Age group 1 1995 quarter 3



Cod, Age group 1 1995 quarter 4

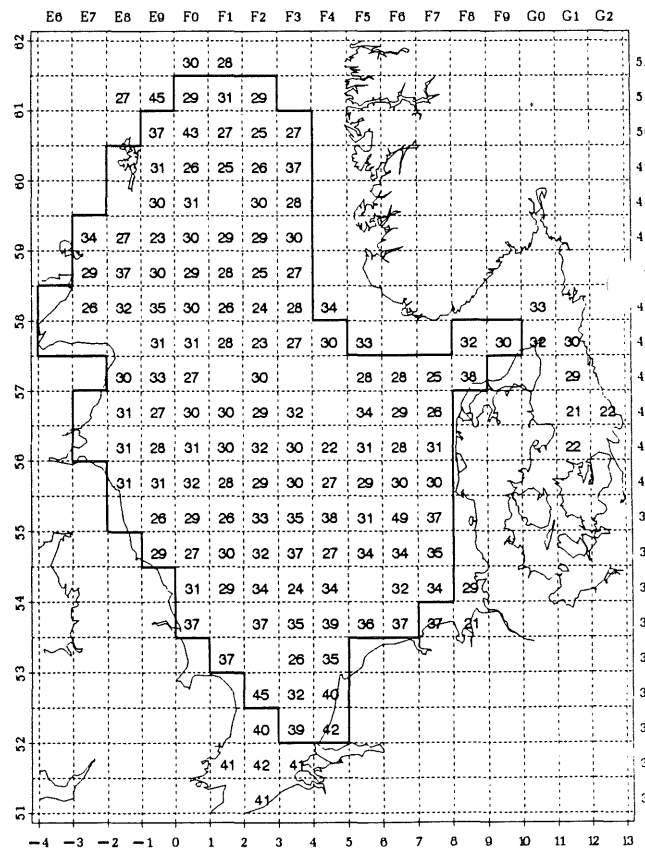
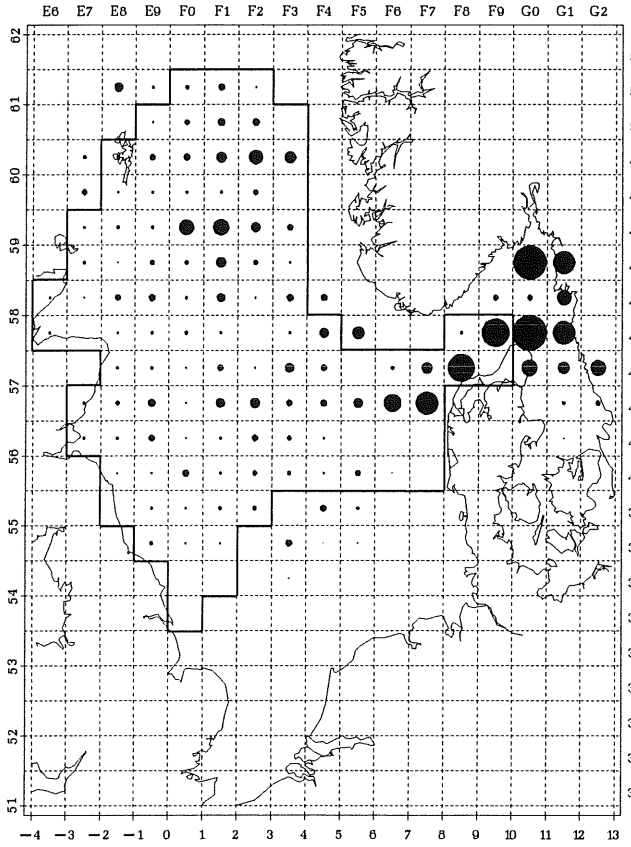


Figure 4.22 Cod: mean length (cm below), age-group 1.

Haddock, Age group 0 1995 quarter 3
 Max mean catch number per recangle: 11425



Haddock, Age group 0 1995 quarter 4
 Max mean catch number per recangle: 5174

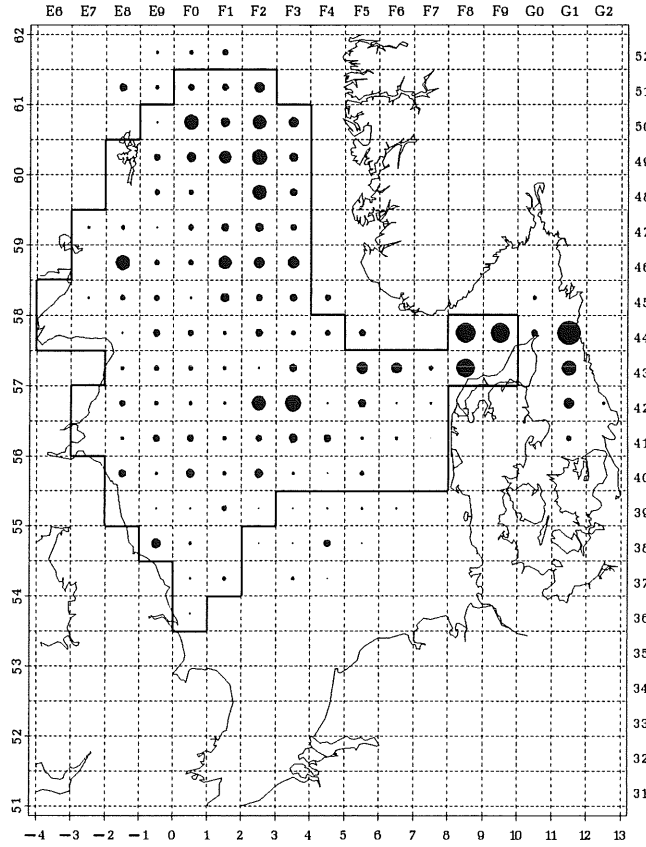
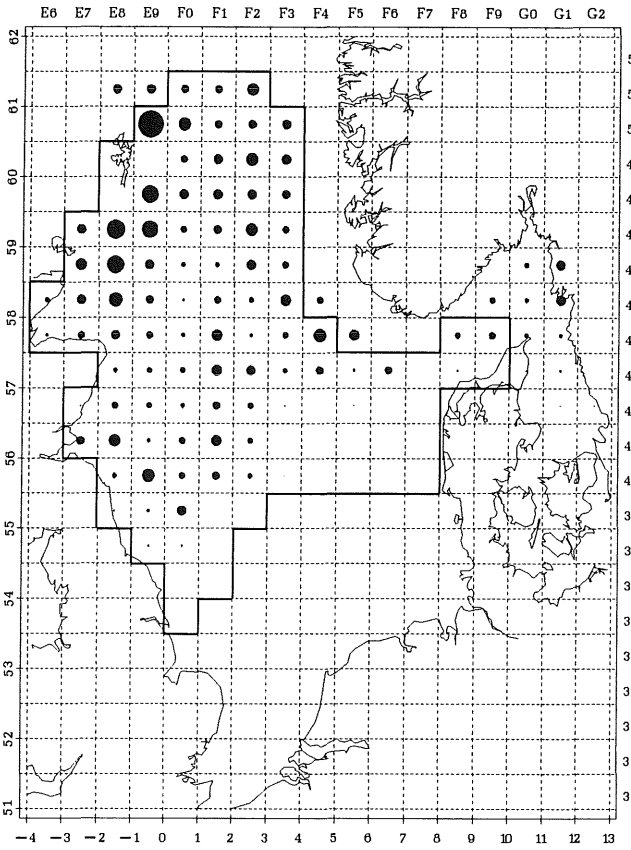
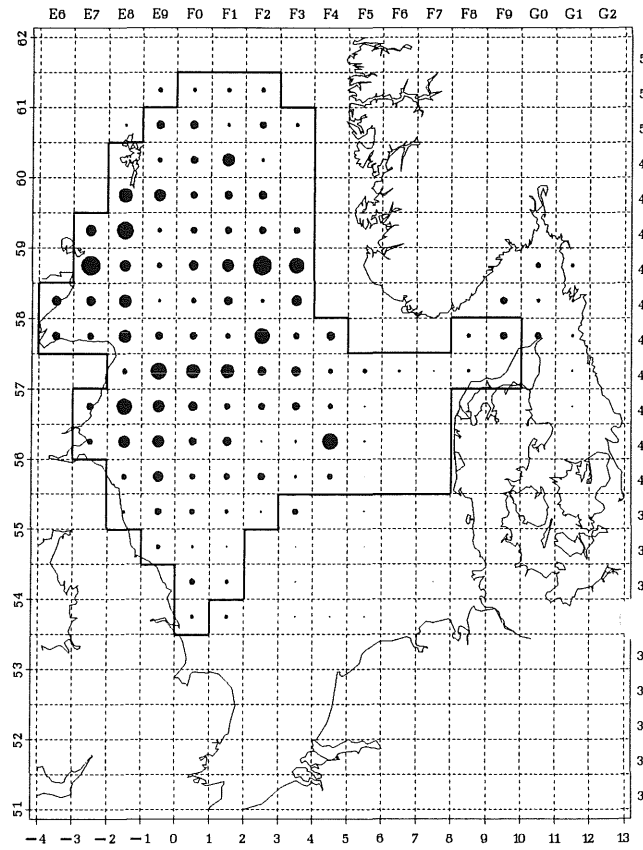


Figure 4.23 Haddock: number per hour, age-group 0.

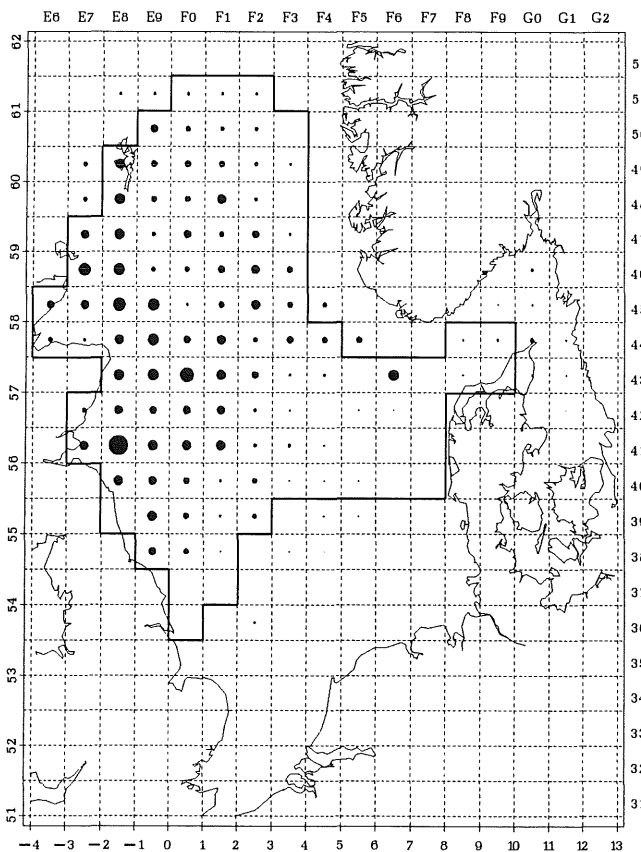
Haddock, Age group 1 1995 quarter 1
 Max mean catch number per recangle: 15119



Haddock, Age group 1 1995 quarter 2
 Max mean catch number per recangle: 7836



Haddock, Age group 1 1995 quarter 3
 Max mean catch number per recangle: 8032



Haddock, Age group 1 1995 quarter 4
 Max mean catch number per recangle: 26313

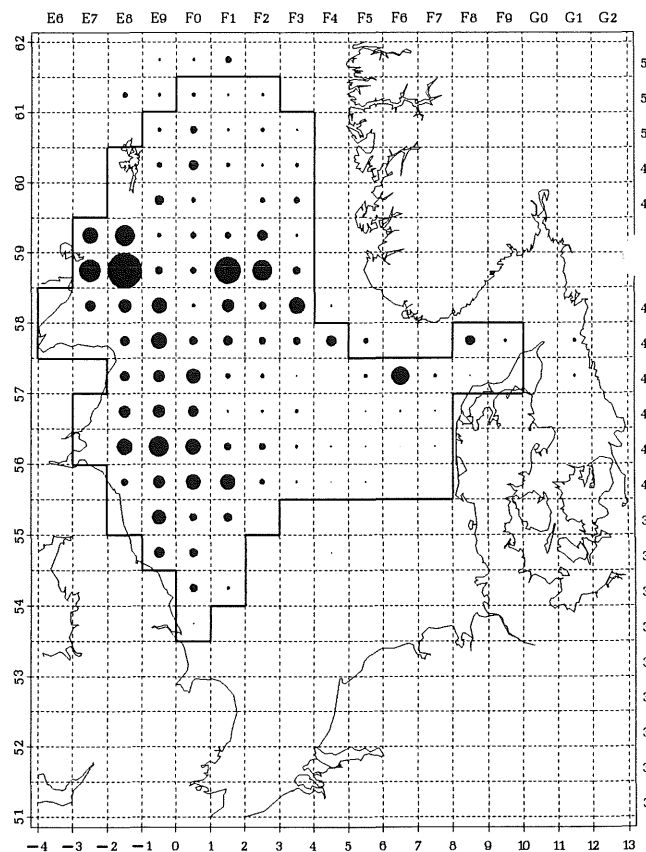
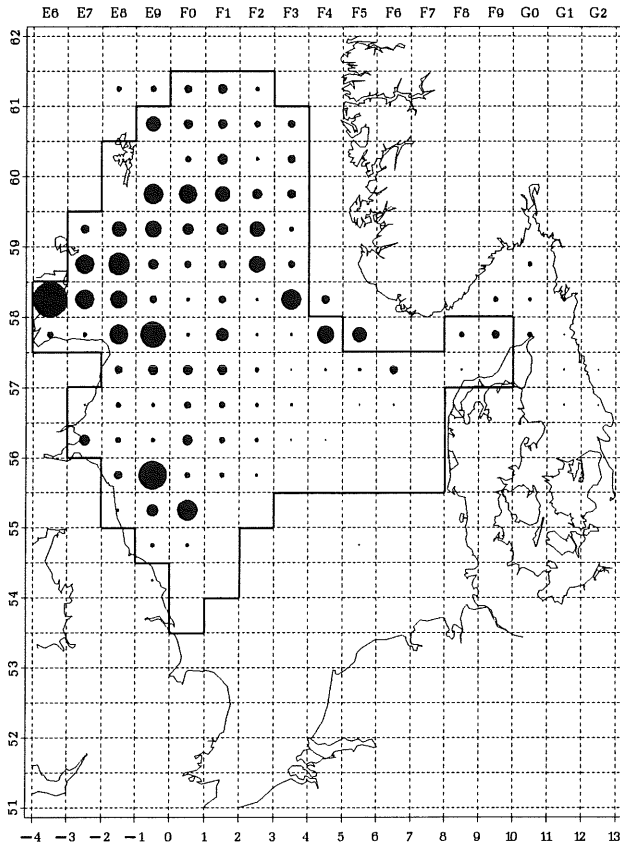
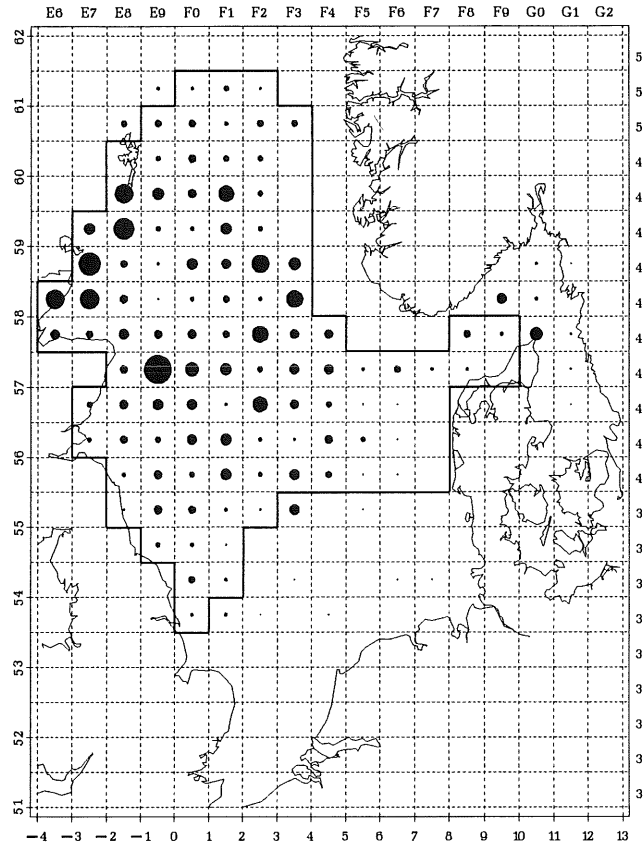


Figure 4.24 Haddock: number per hour, age-group 1.

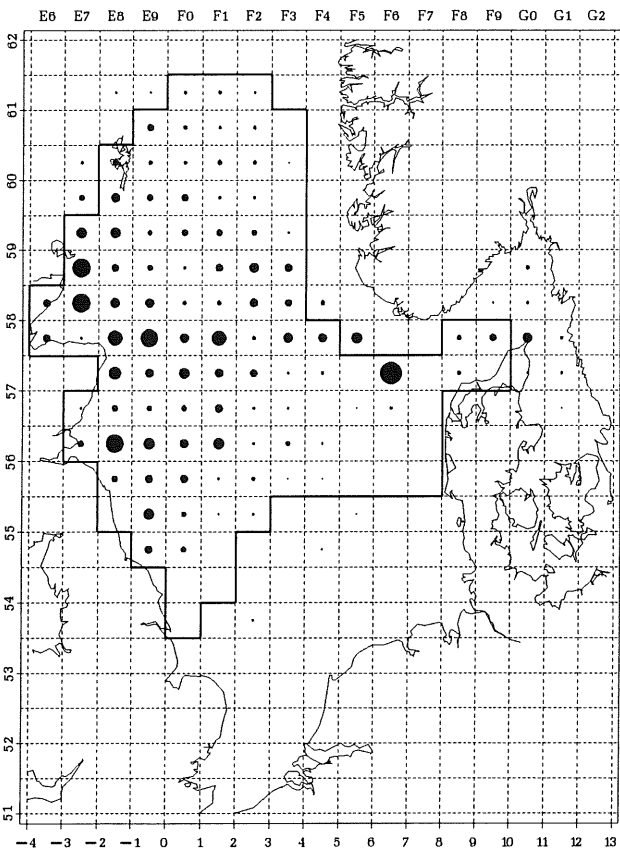
Haddock, Age group 2 1995 quarter 1
 Max mean catch number per recangle: 2348



Haddock, Age group 2 1995 quarter 2
 Max mean catch number per recangle: 1537



Haddock, Age group 2 1995 quarter 3
 Max mean catch number per recangle: 943



Haddock, Age group 2 1995 quarter 4
 Max mean catch number per recangle: 2287

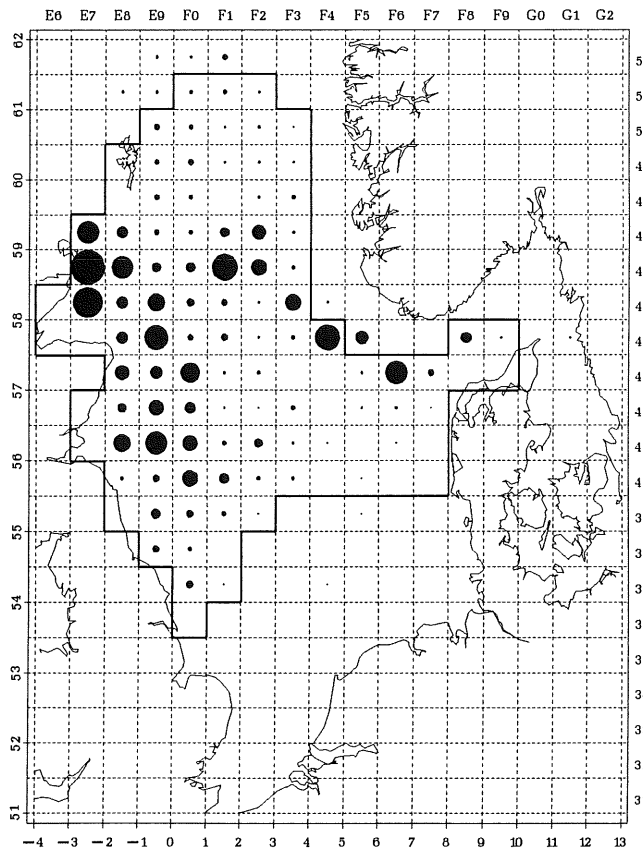
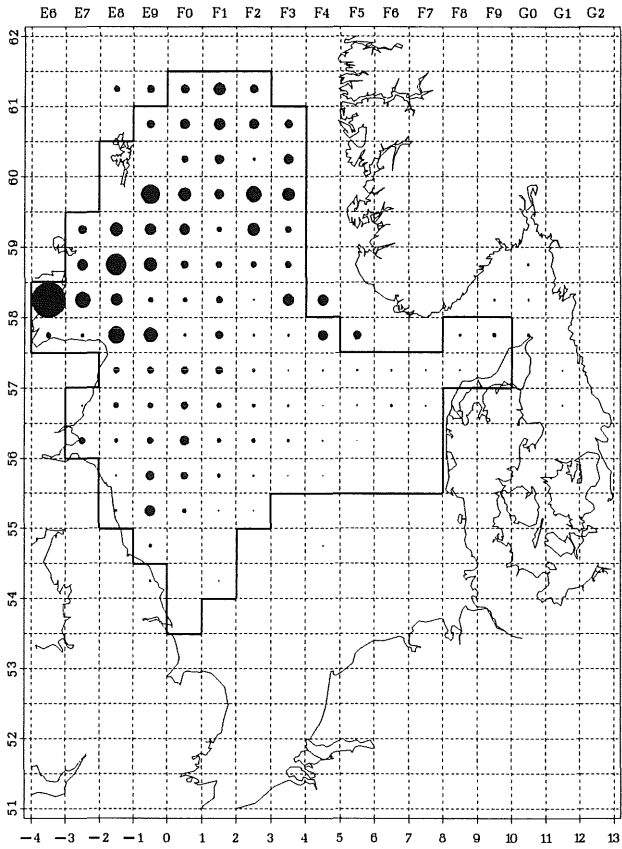
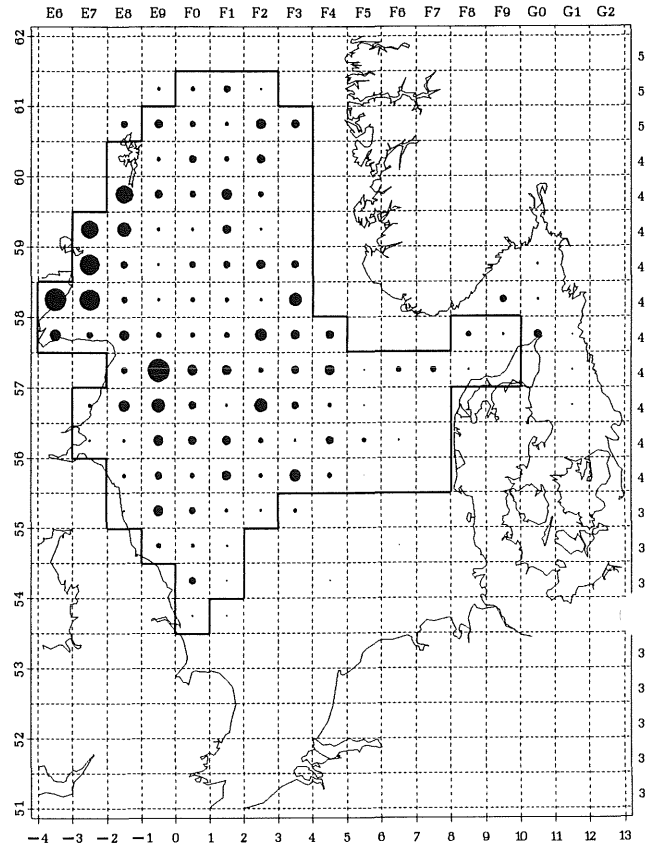


Figure 4.25 Haddock: number per hour, age-group 2.

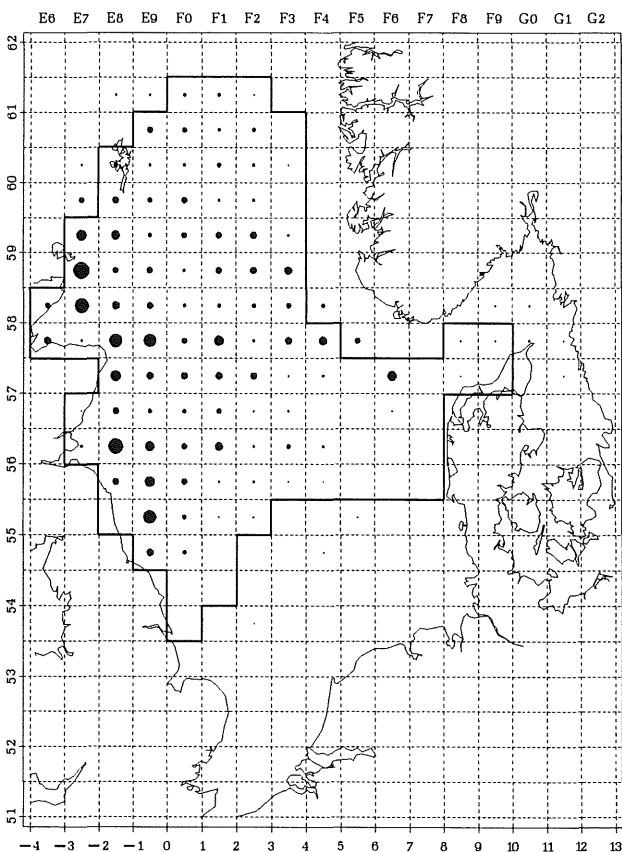
Haddock, Age group 3+ 1995 quarter 1
 Max mean catch number per recangle: 3782



Haddock, Age group 3+ 1995 quarter 2
 Max mean catch number per recangle: 1564



Haddock, Age group 3+ 1995 quarter 3
 Max mean catch number per recangle: 840



Haddock, Age group 3+ 1995 quarter 4
 Max mean catch number per recangle: 1829

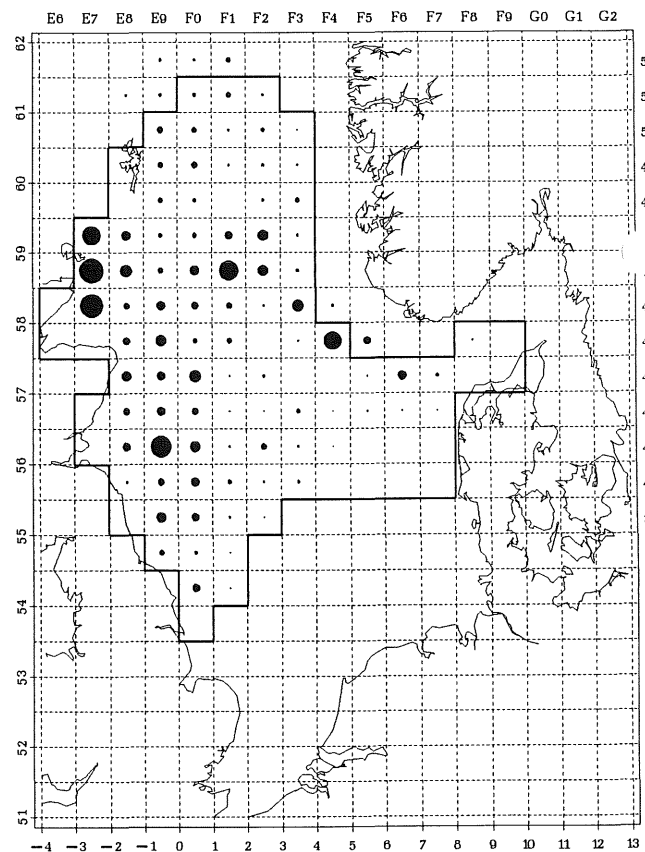
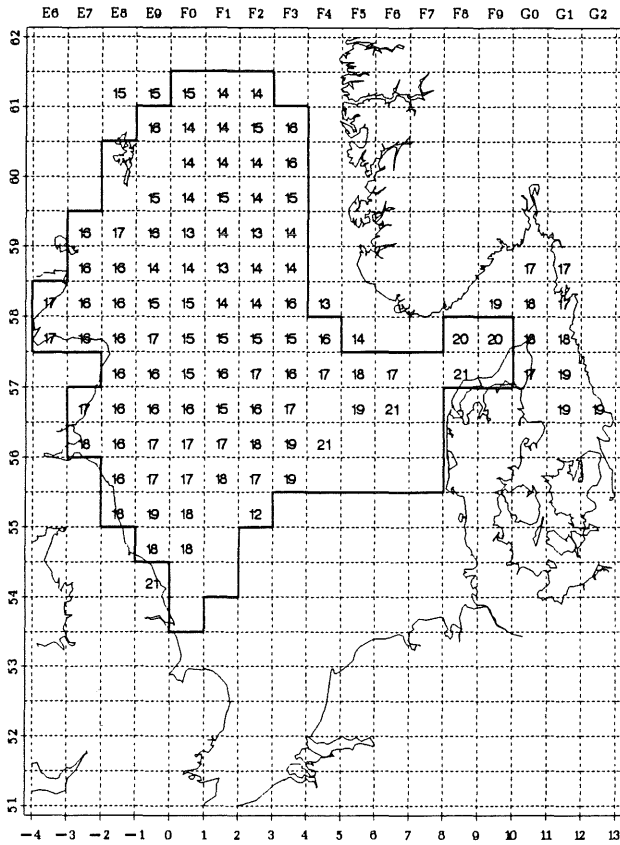
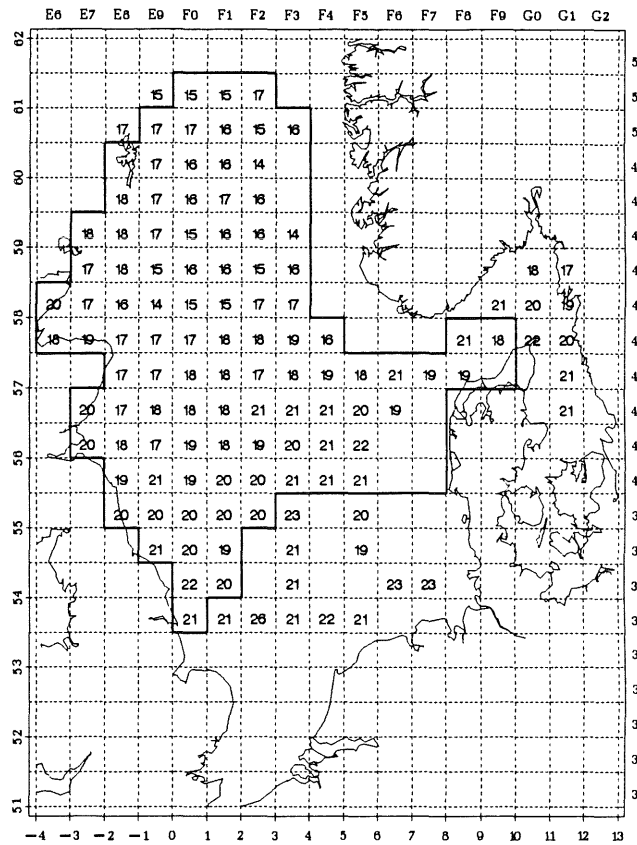


Figure 4.26 Haddock: number per hour, age-group 3+.

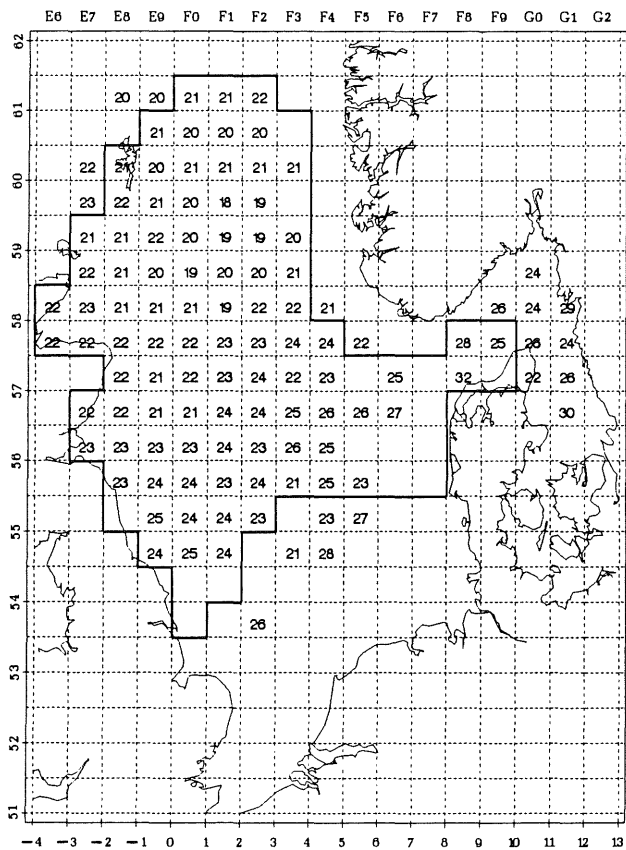
Haddock, Age group 1 1995 quarter 1



Haddock, Age group 1 1995 quarter 2



Haddock, Age group 1 1995 quarter 3



Haddock, Age group 1 1995 quarter 4

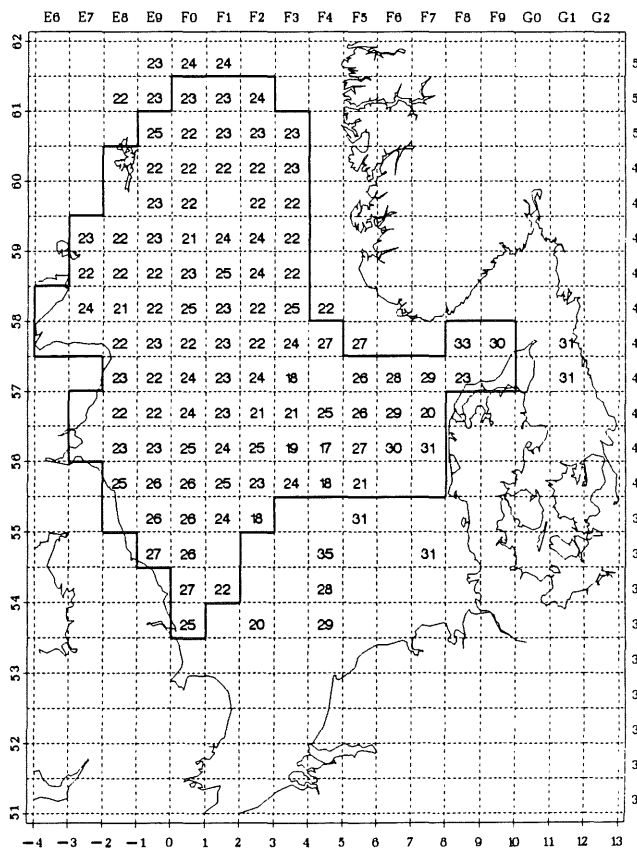
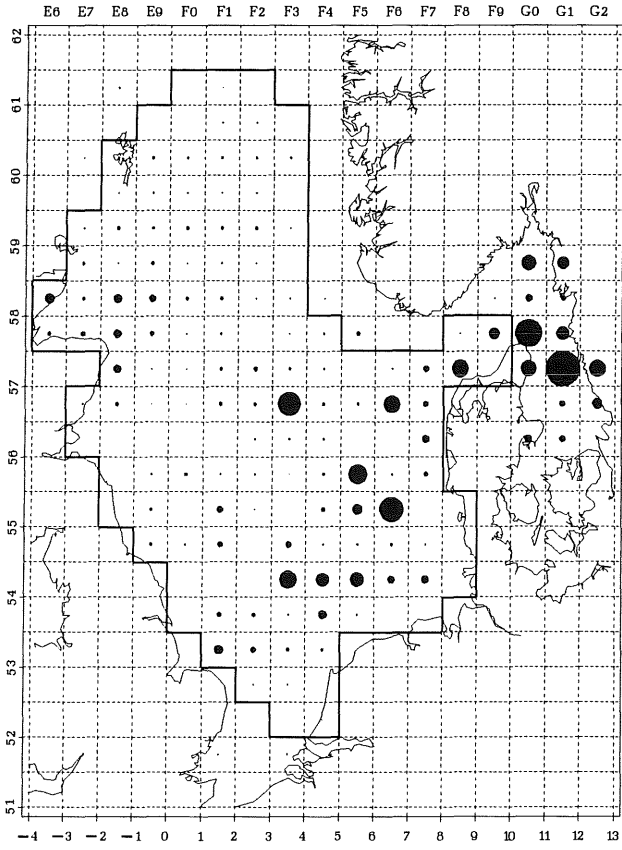


Figure 4.27 Haddock: mean length (cm below), age-group 1.

Whiting, Age group 0 1995 quarter 3
 Max mean catch number per recangle: 26099



Whiting, Age group 0 1995 quarter 4
 Max mean catch number per recangle: 22538

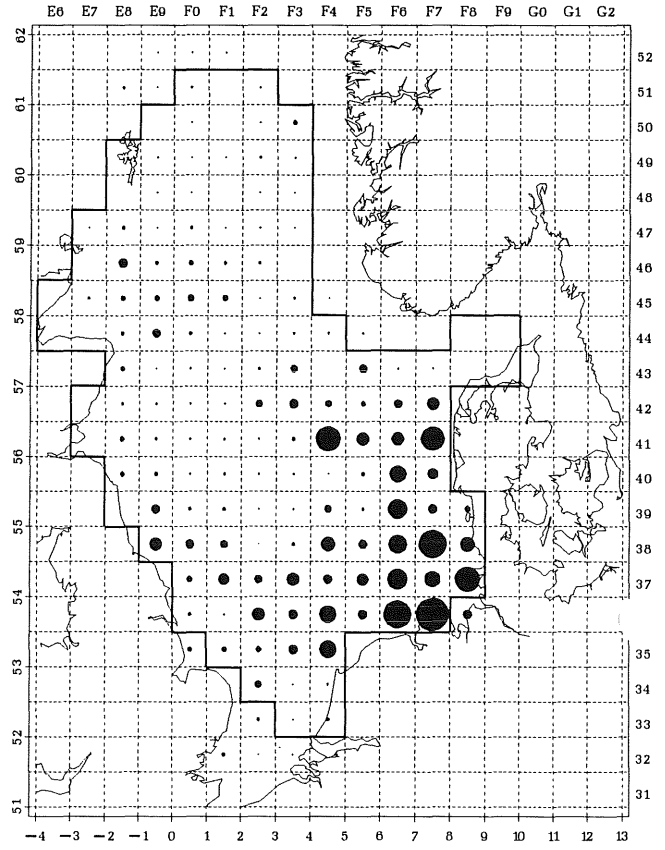
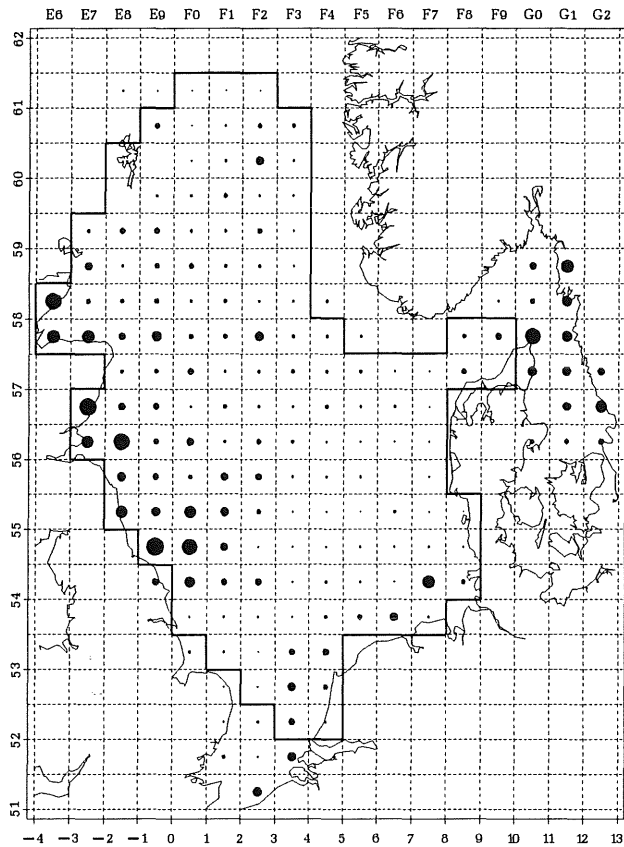


Figure 4.28 Whiting: number per hour, age-group 0.

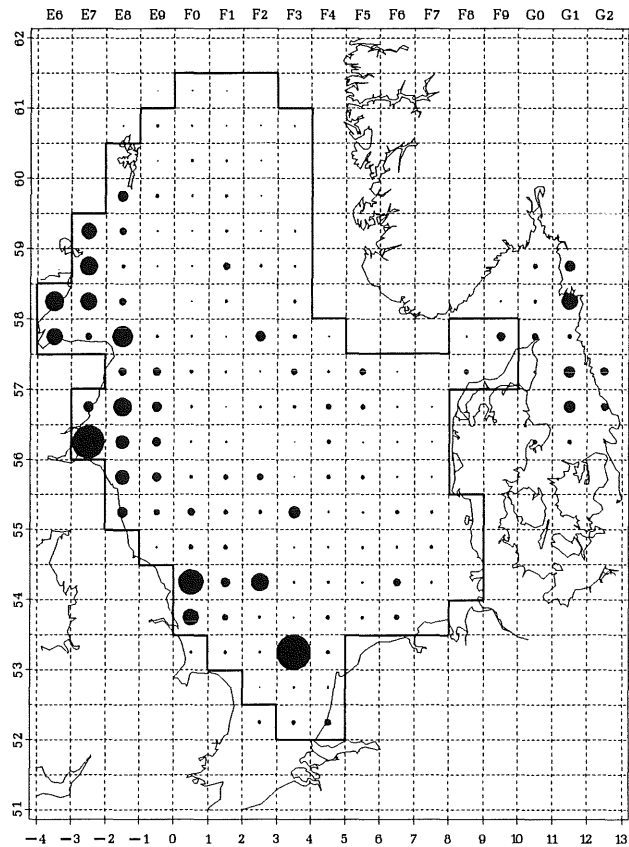
Whiting, Age group 1 1995 quarter 1

Max mean catch number per recangle: 6446



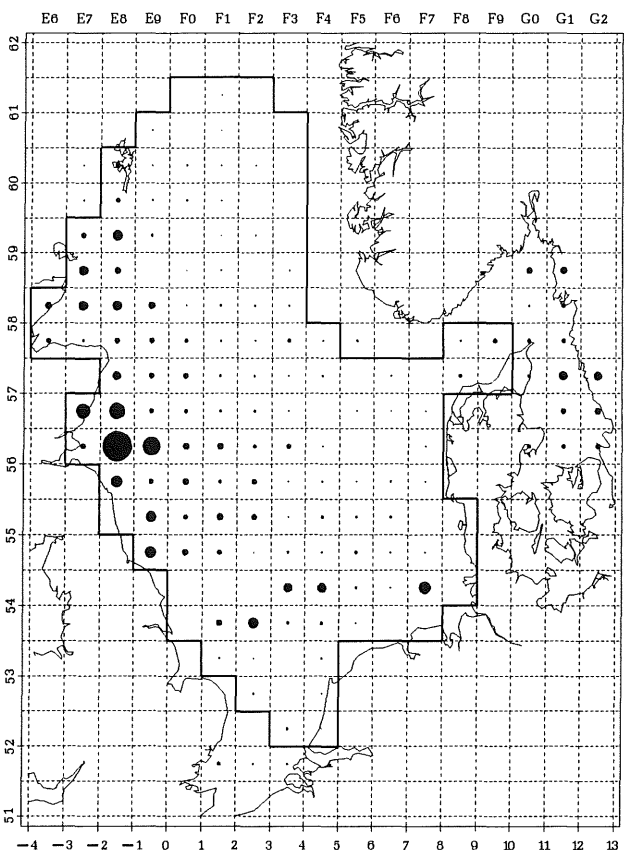
Whiting, Age group 1 1995 quarter 2

Max mean catch number per recangle: 25487



Whiting, Age group 1 1995 quarter 3

Max mean catch number per recangle: 18297



Whiting, Age group 1 1995 quarter 4

Max mean catch number per recangle: 10762

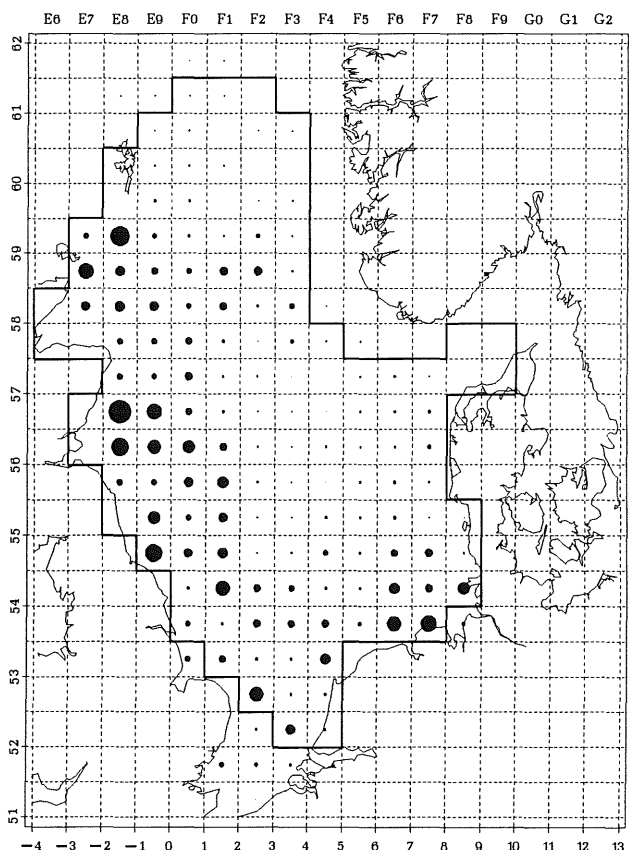
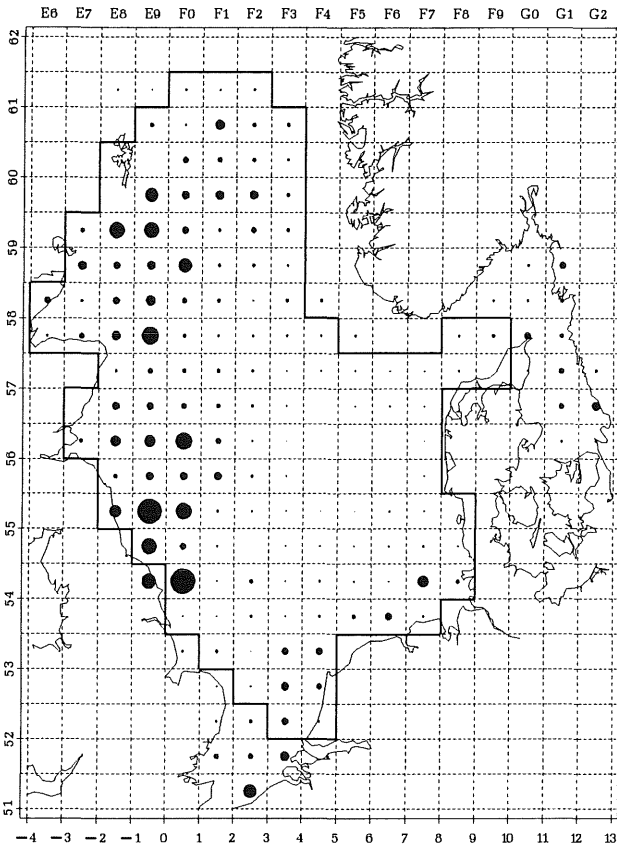
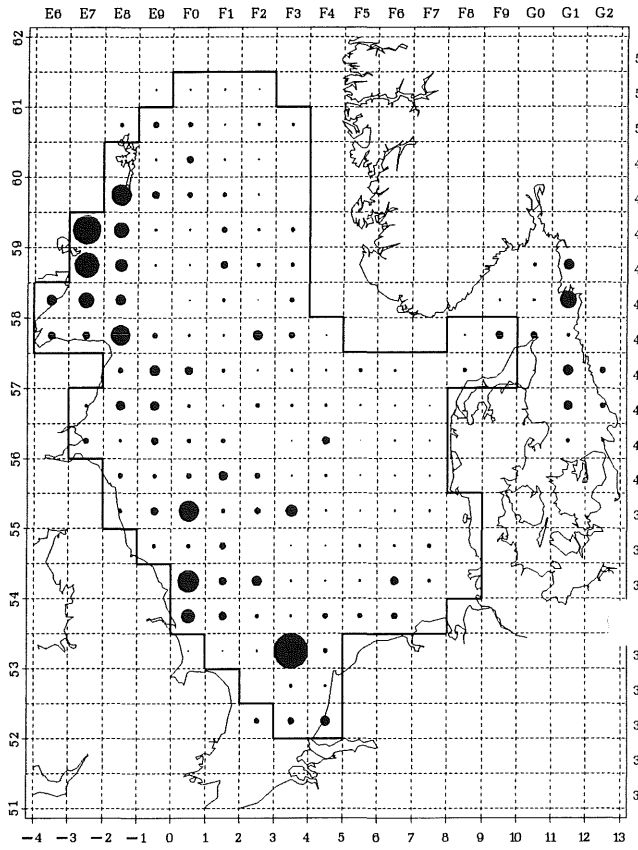


Figure 4.29 Whiting: number per hour, age-group 1.

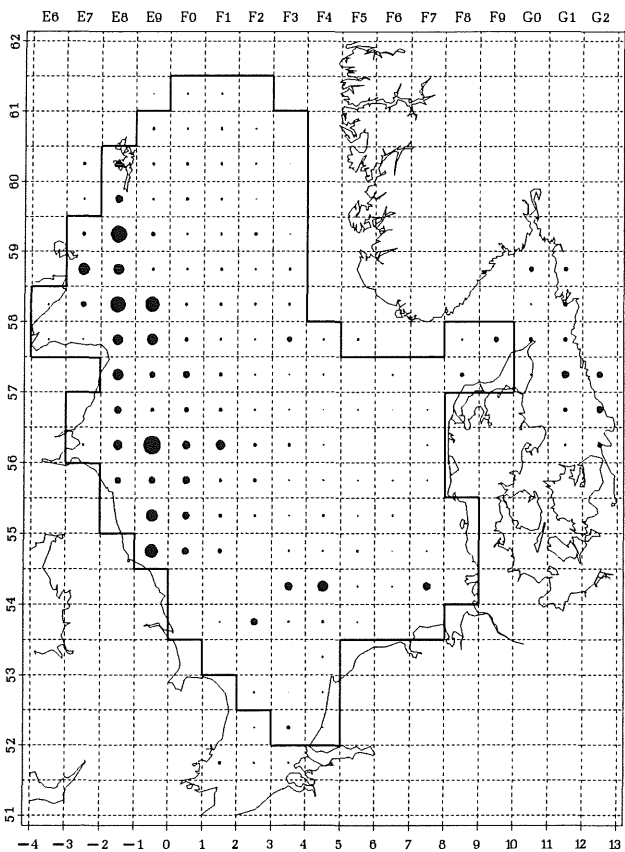
Whiting, Age group 2 1995 quarter 1
 Max mean catch number per recangle: 6976



Whiting, Age group 2 1995 quarter 2
 Max mean catch number per recangle: 13369



Whiting, Age group 2 1995 quarter 3
 Max mean catch number per recangle: 3509



Whiting, Age group 2 1995 quarter 4
 Max mean catch number per recangle: 5090

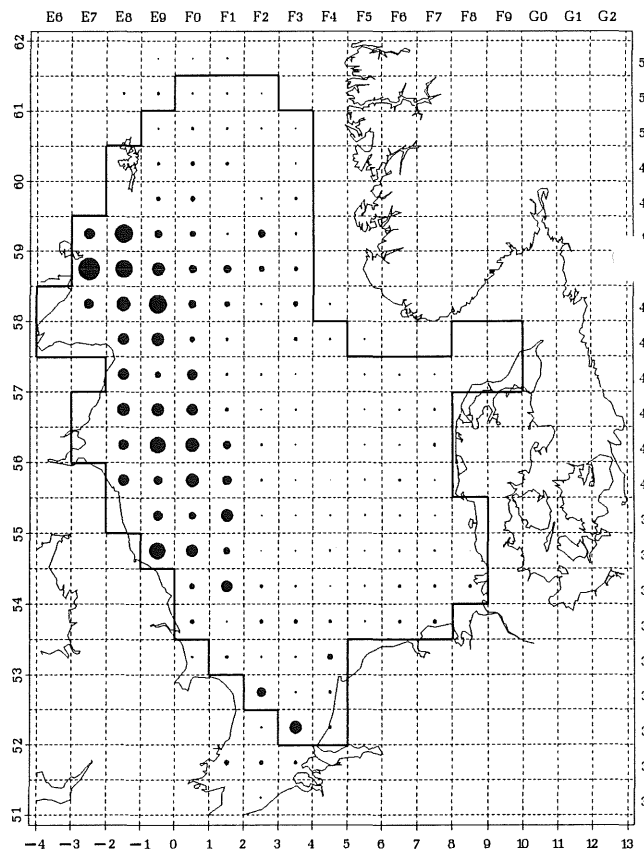
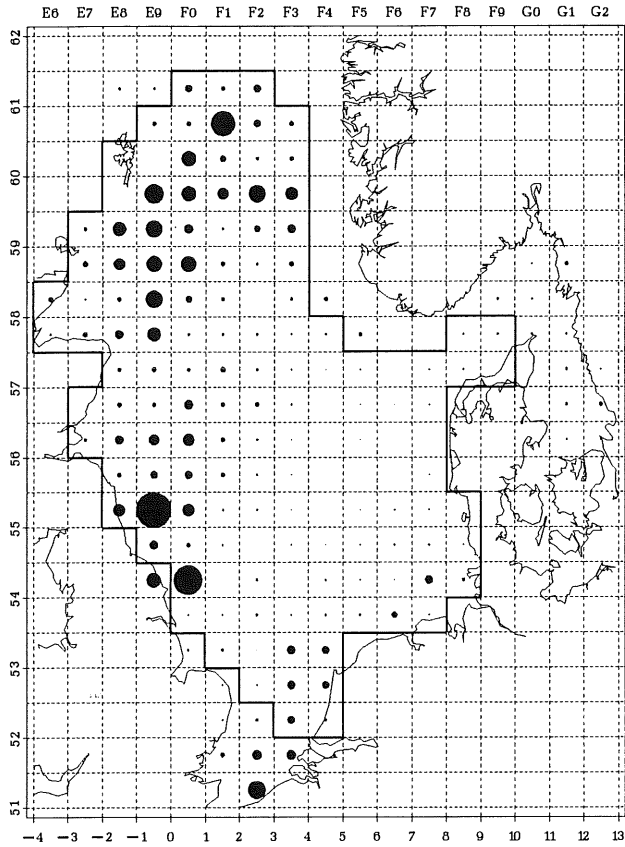
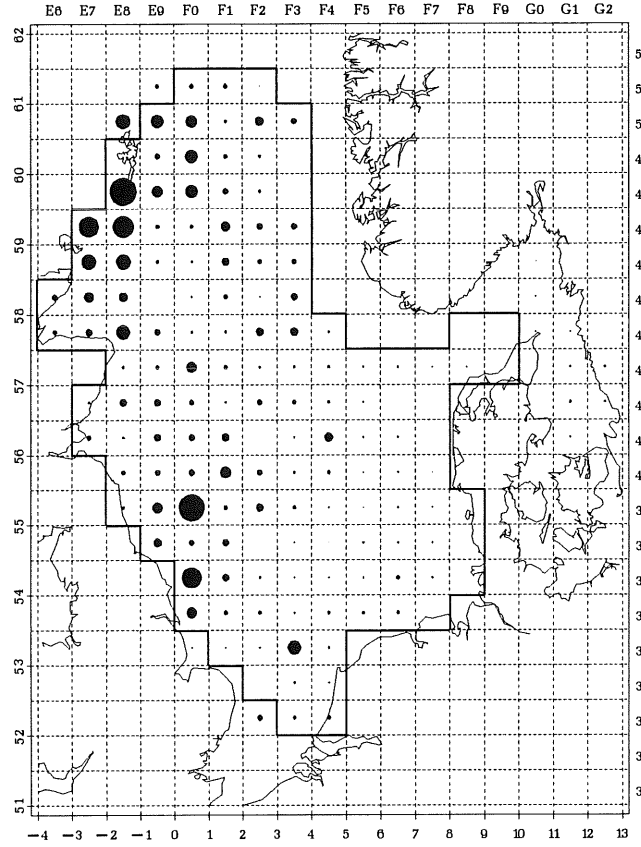


Figure 4.30 Whiting: number per hour, age-group 2.

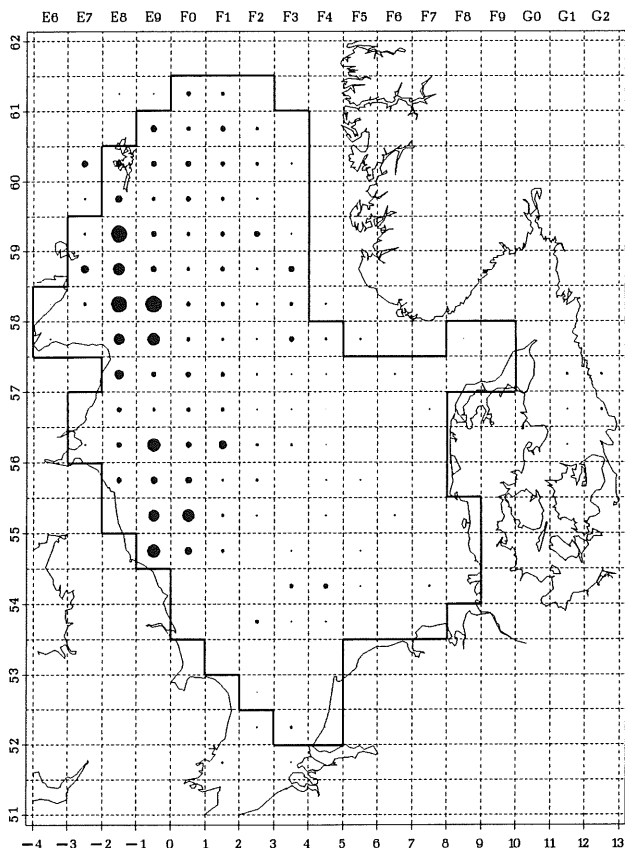
Whiting, Age group 3+ 1995 quarter 1
 Max mean catch number per recangle: 6966



Whiting, Age group 3+ 1995 quarter 2
 Max mean catch number per recangle: 4251



Whiting, Age group 3+ 1995 quarter 3
 Max mean catch number per recangle: 1522



Whiting, Age group 3+ 1995 quarter 4
 Max mean catch number per recangle: 1644

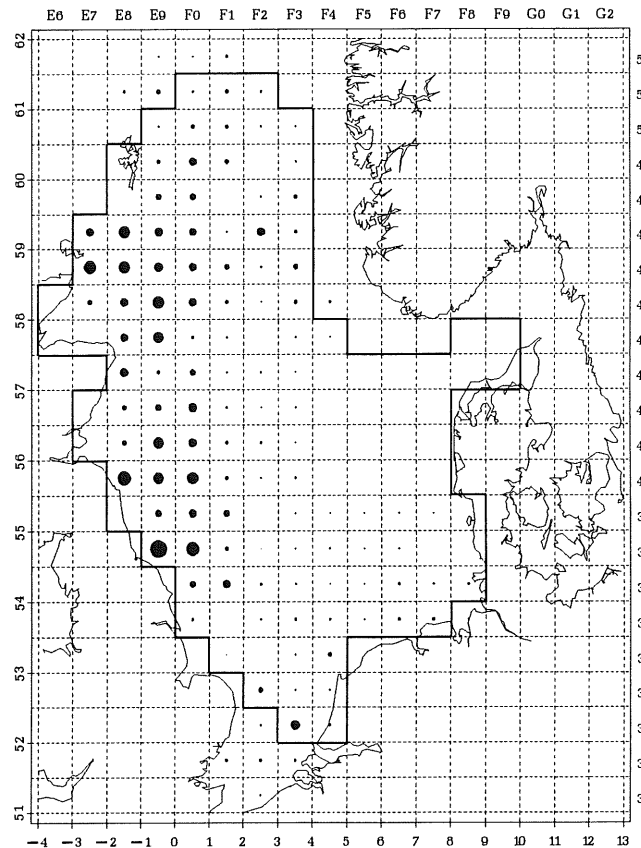
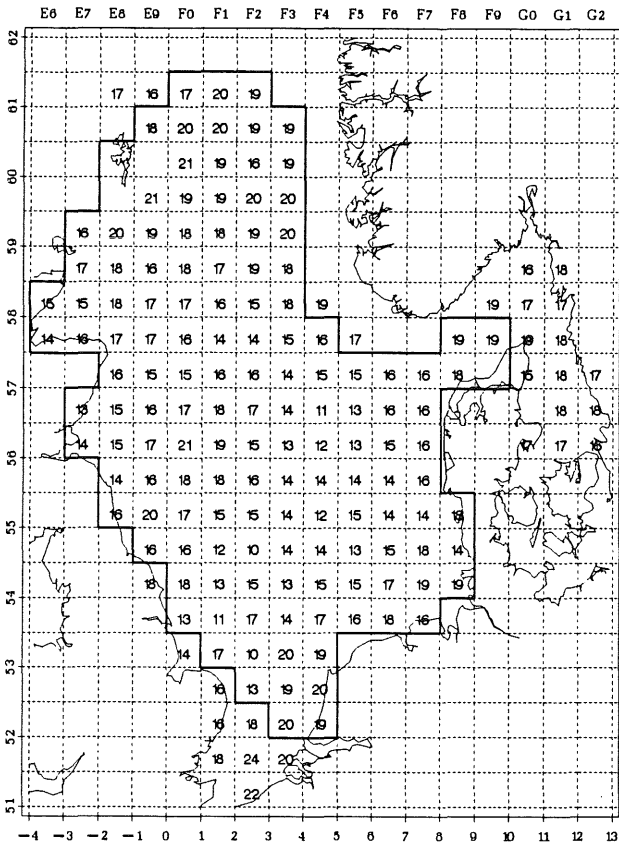
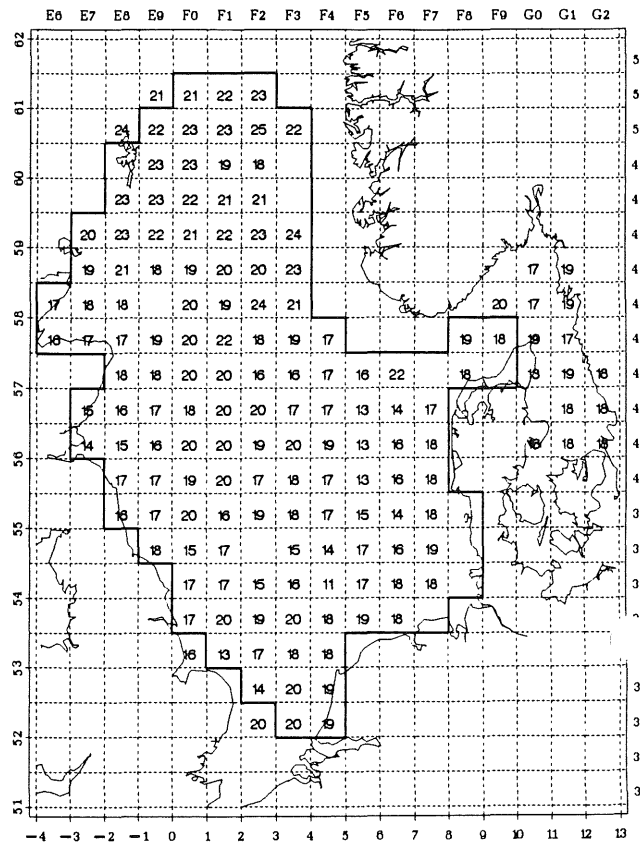


Figure 4.31 Whiting: number per hour, age-group 3+.

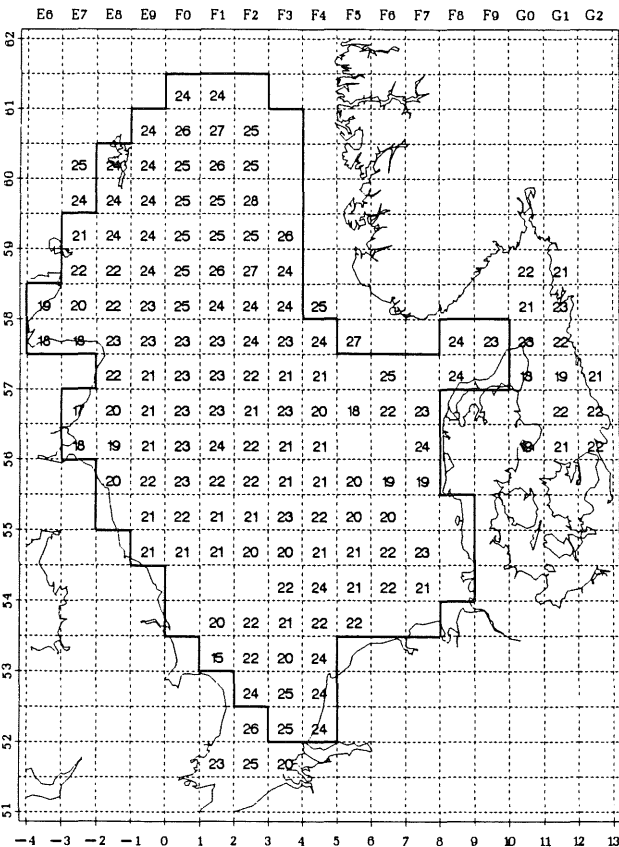
Whiting, Age group 1 1995 quarter 1



Whiting, Age group 1 1995 quarter 2



Whiting, Age group 1 1995 quarter 3



Whiting, Age group 1 1995 quarter 4

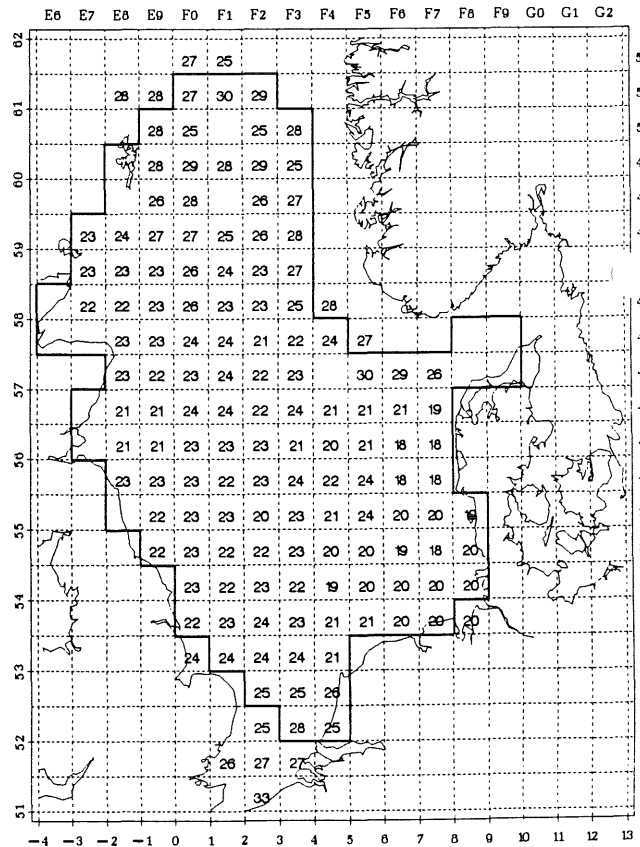
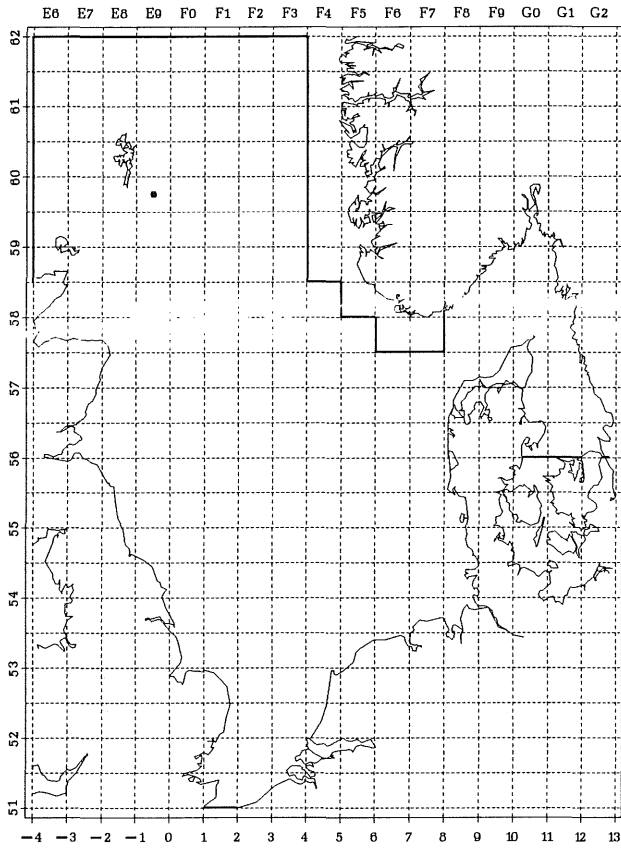
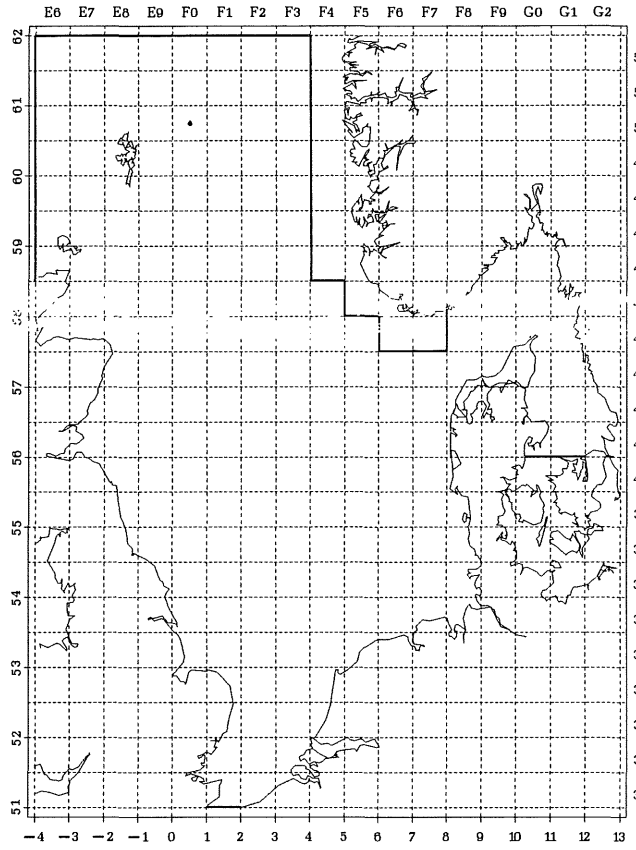


Figure 4.32 Whiting: mean length (cm below), age-group 1.

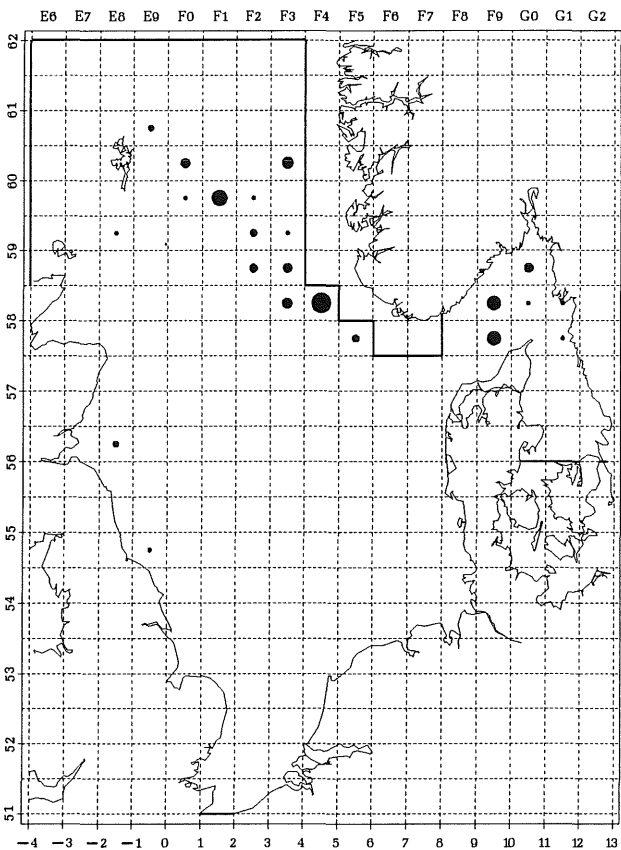
Saithe, Age group 2 1995 quarter 1
 Max mean catch number per recangle: 2



Saithe, Age group 2 1995 quarter 2
 Max mean catch number per recangle: 1



Saithe, Age group 2 1995 quarter 3
 Max mean catch number per recangle: 22



Saithe, Age group 2 1995 quarter 4
 Max mean catch number per recangle: 67

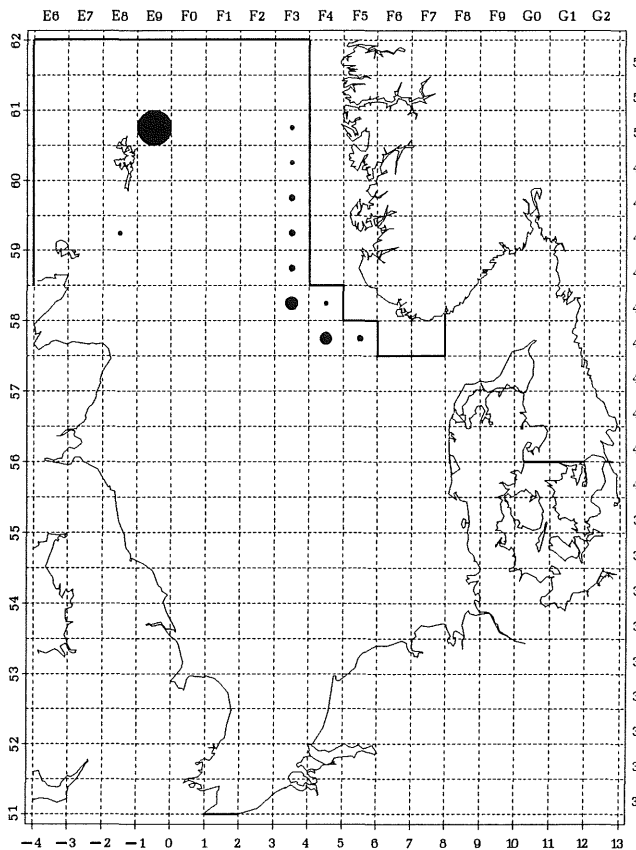
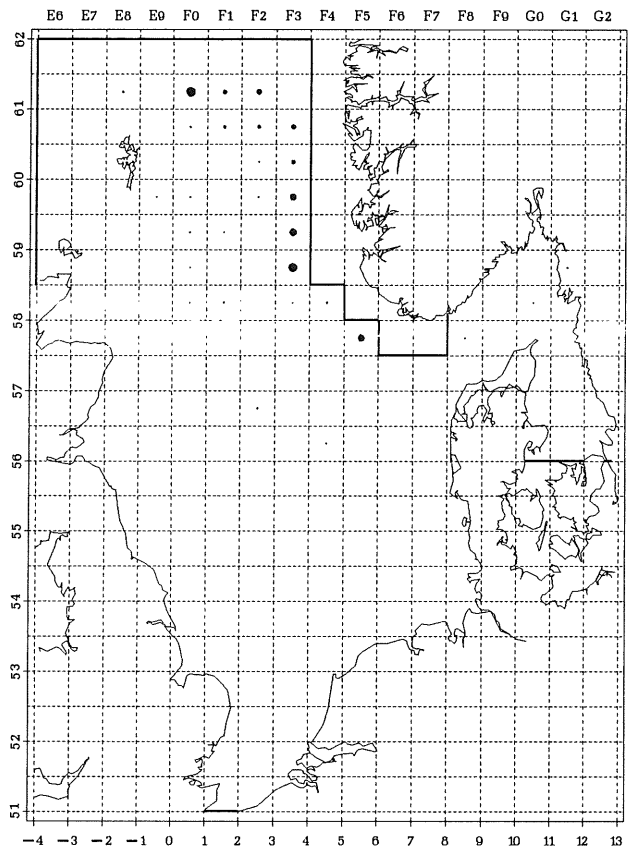
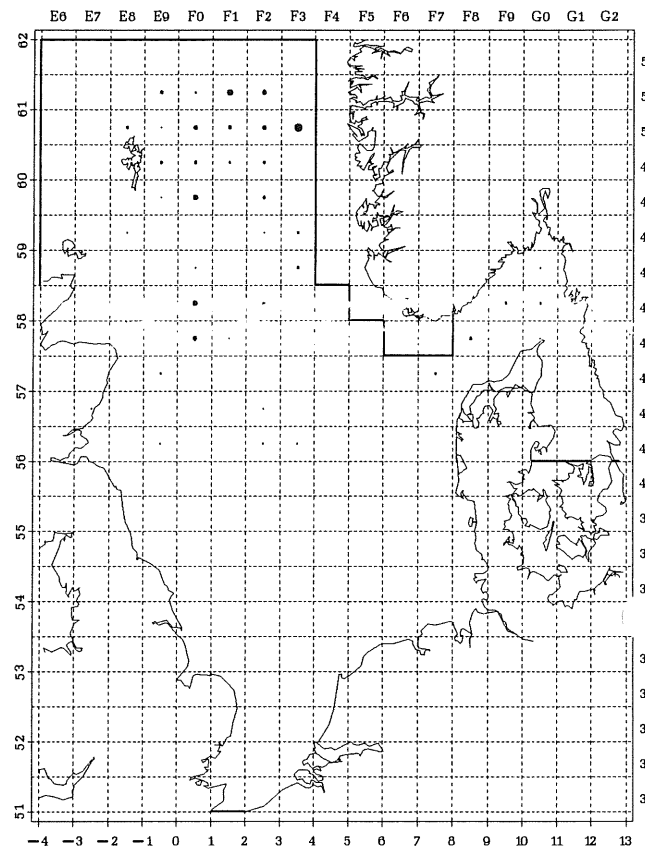


Figure 4.33 Saithe: number per hour, age-group 2.

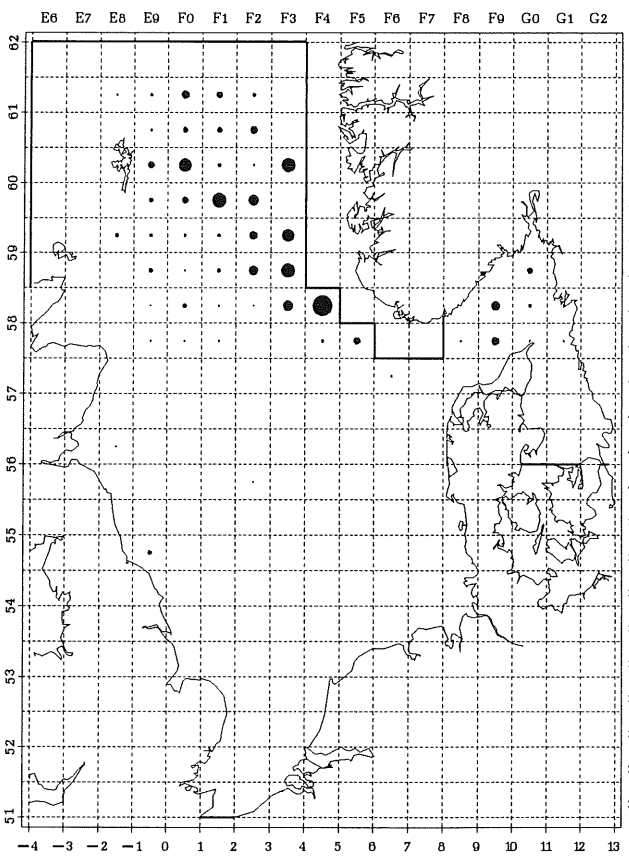
Saithe, Age group 3+ 1995 quarter 1
 Max mean catch number per recangle: 123



Saithe, Age group 3+ 1995 quarter 2
 Max mean catch number per recangle: 86



Saithe, Age group 3+ 1995 quarter 3
 Max mean catch number per recangle: 594



Saithe, Age group 3+ 1995 quarter 4
 Max mean catch number per recangle: 1837

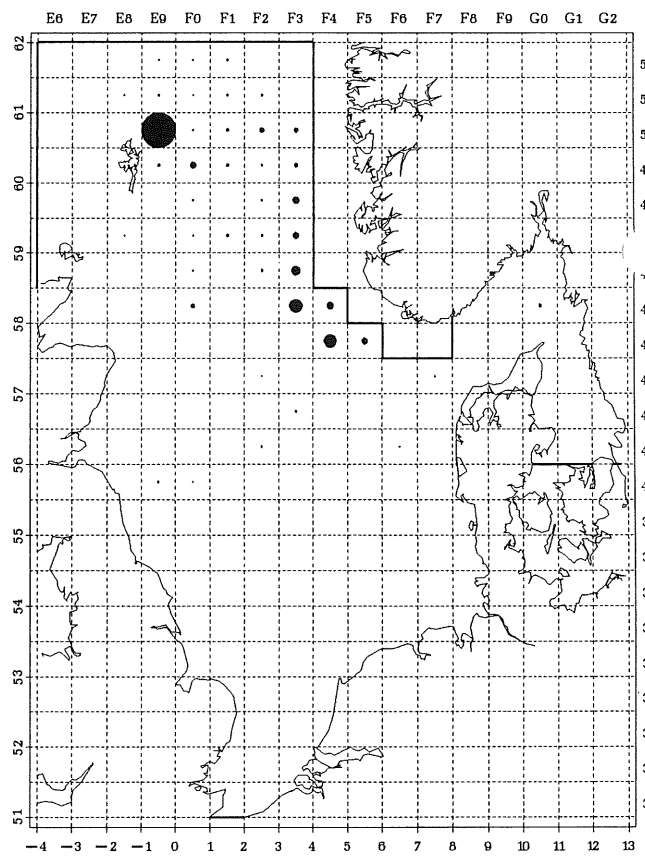
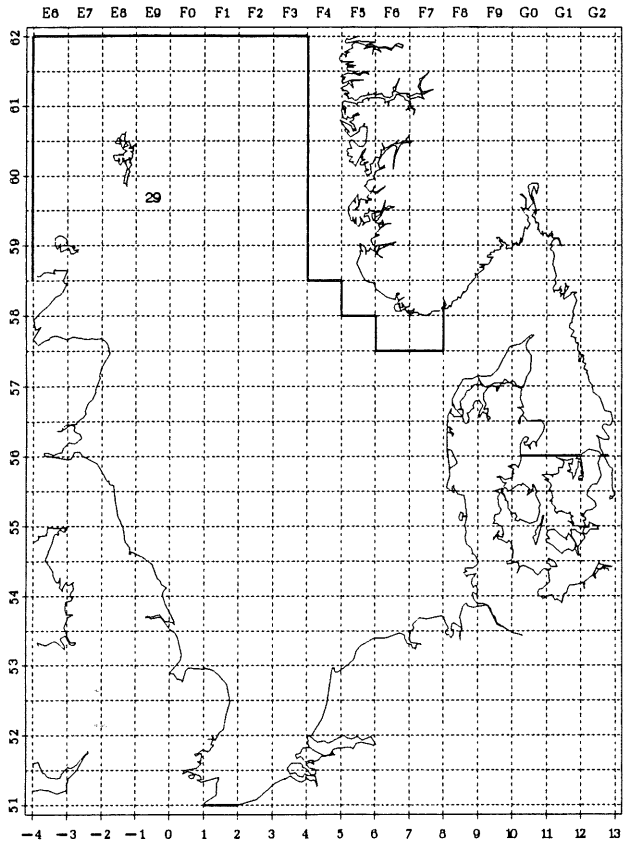
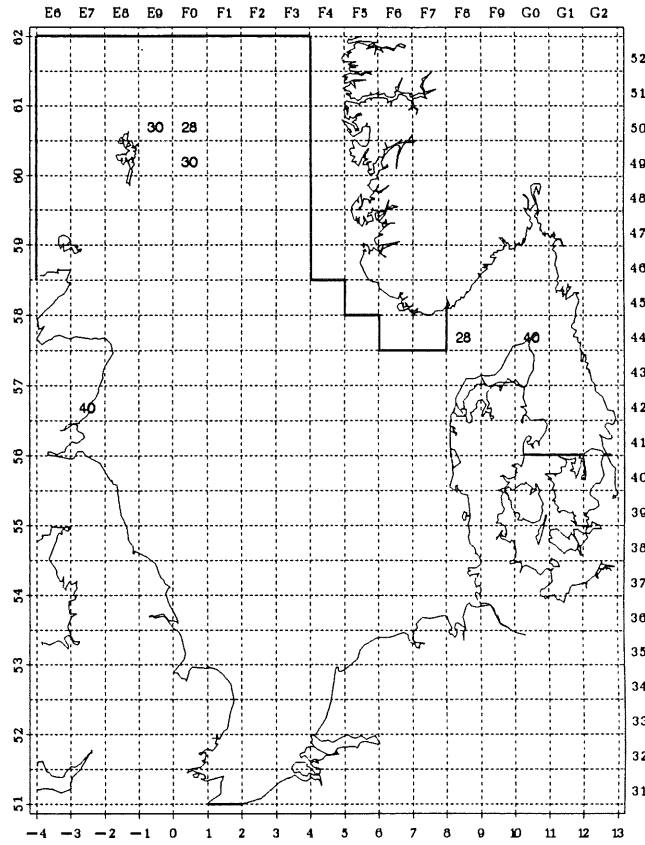


Figure 4.34 Saithe: number per hour, age-group 3+.

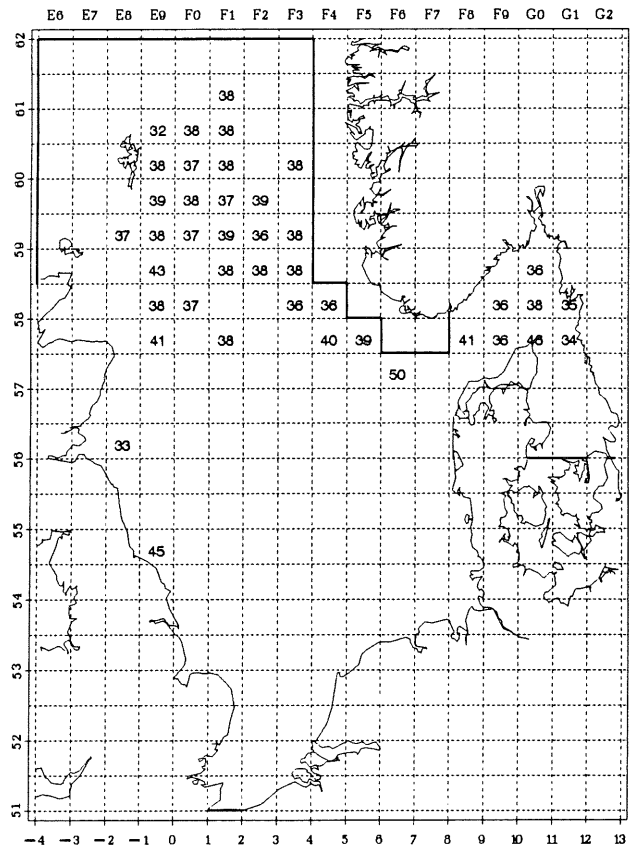
Saithe, Age group 2 1995 quarter 1



Saithe, Age group 2 1995 quarter 2



Saithe, Age group 2 1995 quarter 3



Saithe, Age group 2 1995 quarter 4

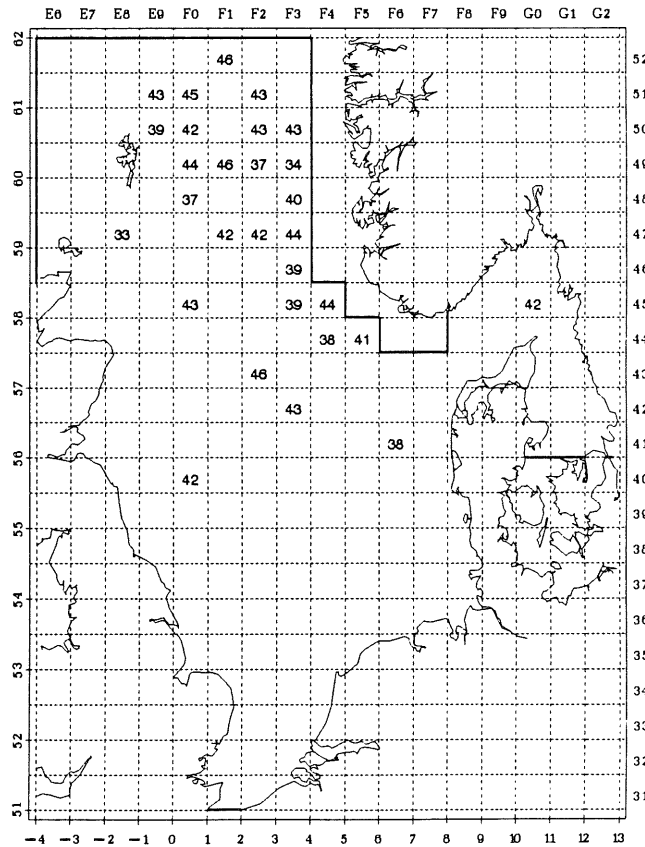
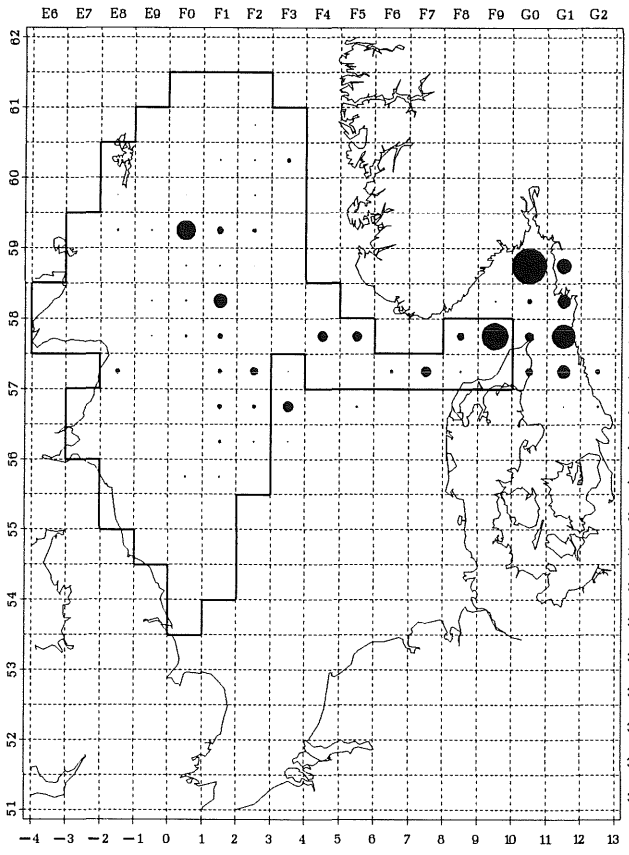


Figure 4.35 Saithe: mean length (cm below), age-group 2.

Norway pout, Age group 0 1995 quarter 3
 Max mean catch number per recangle: 159034



Norway pout, Age group 0 1995 quarter 4
 Max mean catch number per recangle: 29156

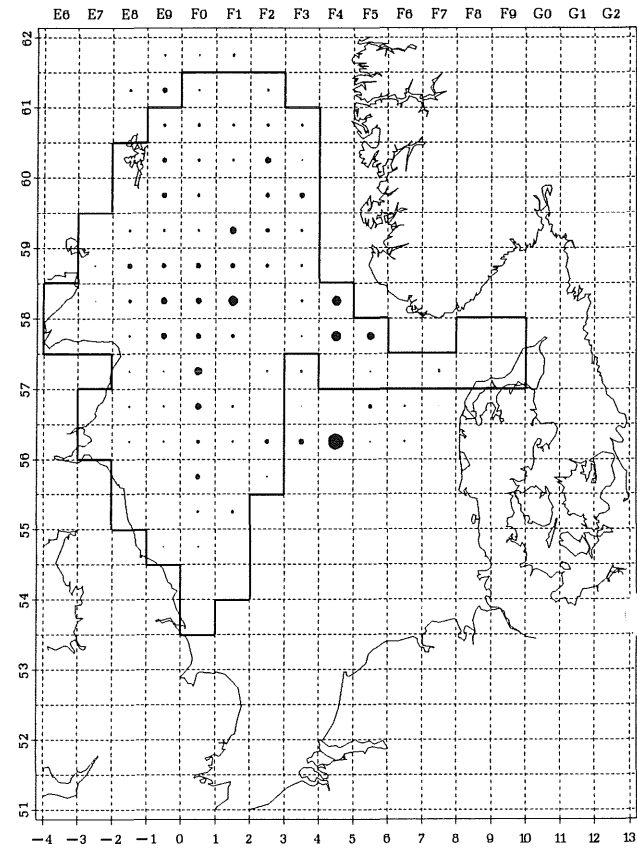
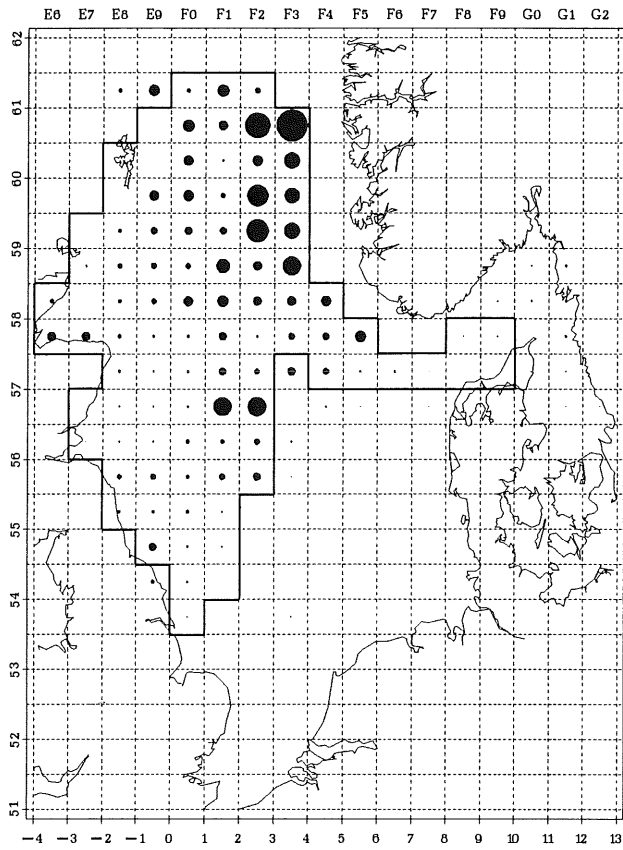
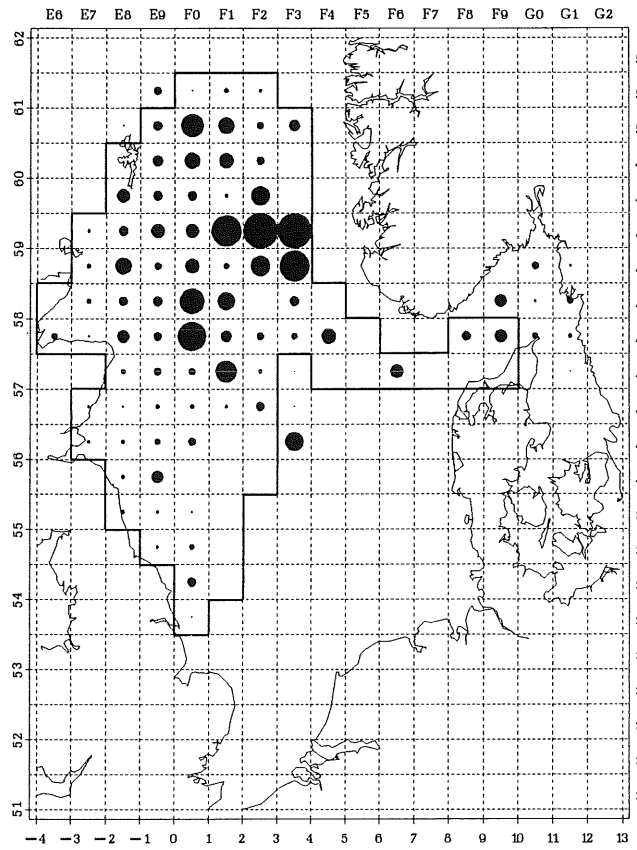


Figure 4.36 Norway pout: number per hour, age-group 0.

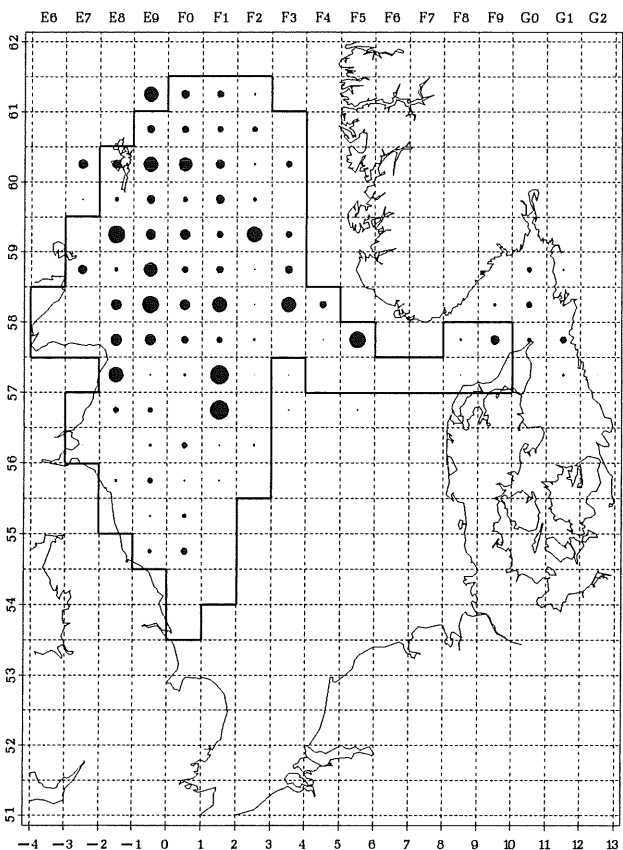
Norway pout, Age group 1 1995 quarter 1
 Max mean catch number per recangle: 72547



Norway pout, Age group 1 1995 quarter 2
 Max mean catch number per recangle: 90025



Norway pout, Age group 1 1995 quarter 3
 Max mean catch number per recangle: 25608



Norway pout, Age group 1 1995 quarter 4
 Max mean catch number per recangle: 89391

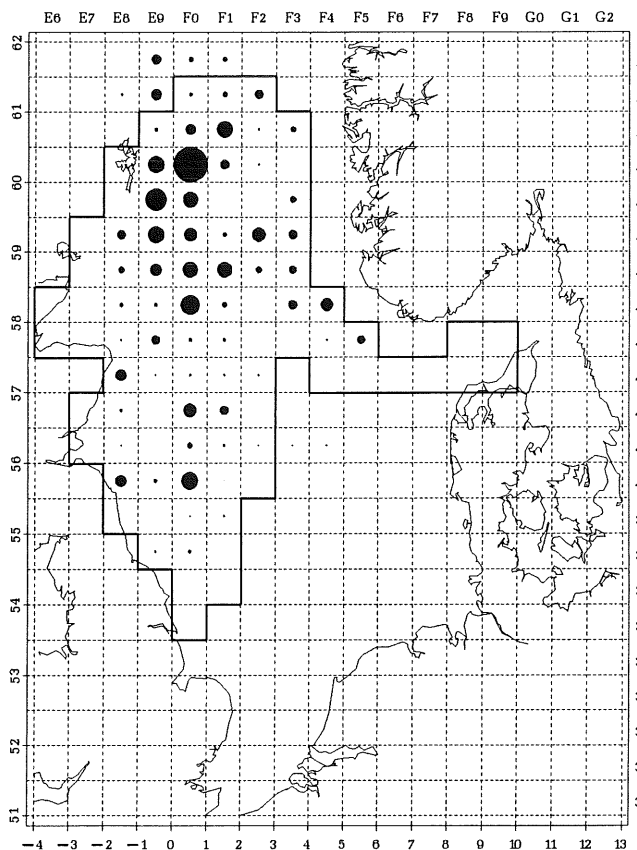
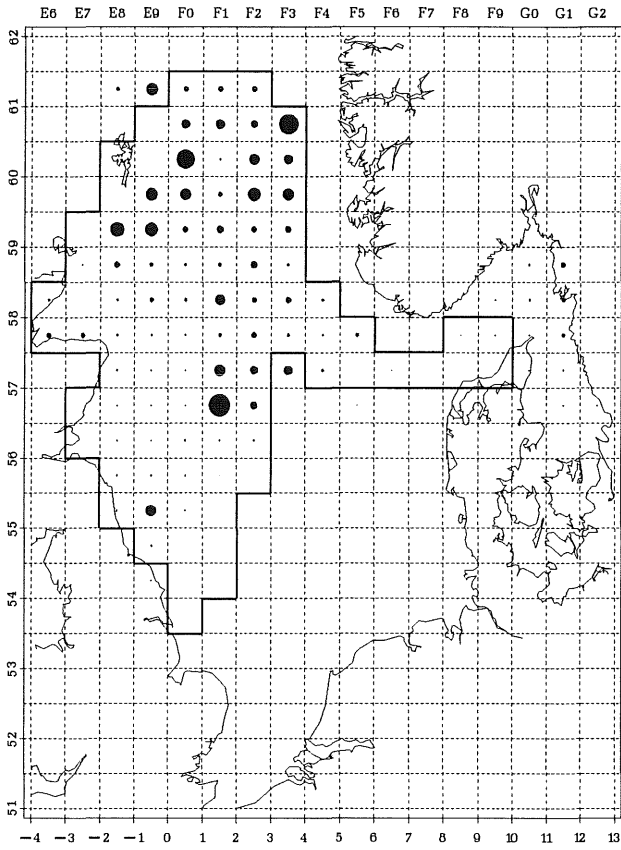
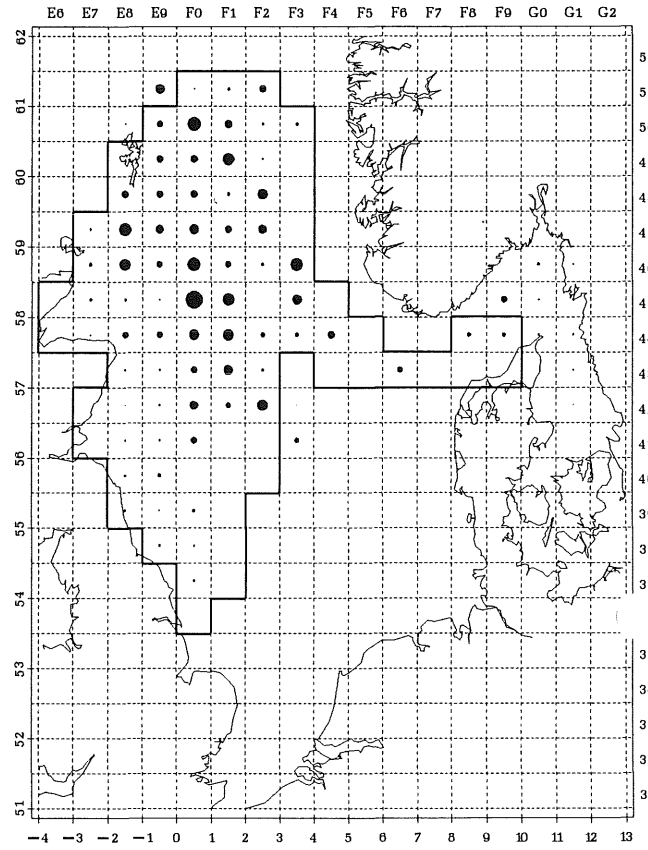


Figure 4.37 Norway pout: number per hour, age-group 1.

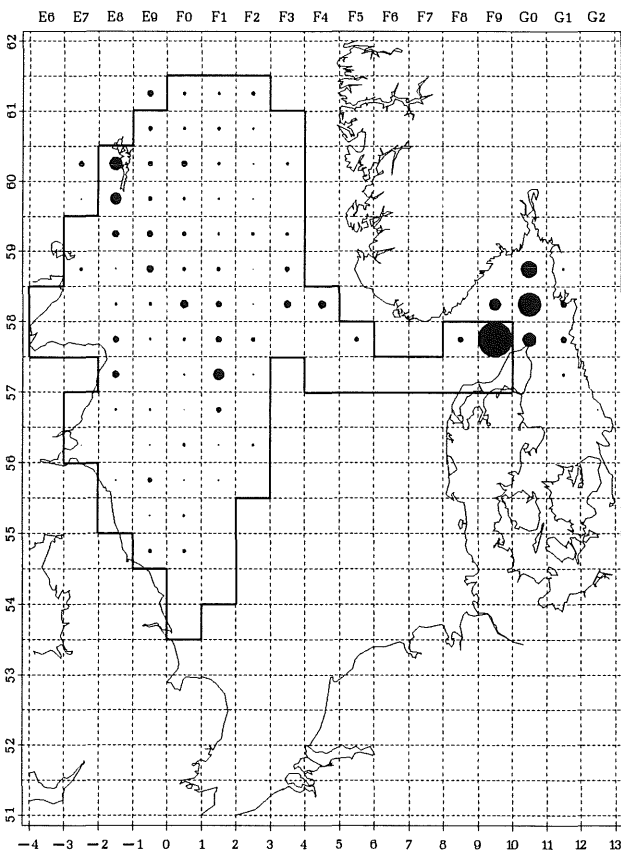
Norway pout, Age group 2 1995 quarter 1
 Max mean catch number per recangle: 9455



Norway pout, Age group 2 1995 quarter 2
 Max mean catch number per recangle: 5845



Norway pout, Age group 2 1995 quarter 3
 Max mean catch number per recangle: 24202



Norway pout, Age group 2 1995 quarter 4
 Max mean catch number per recangle: 4084

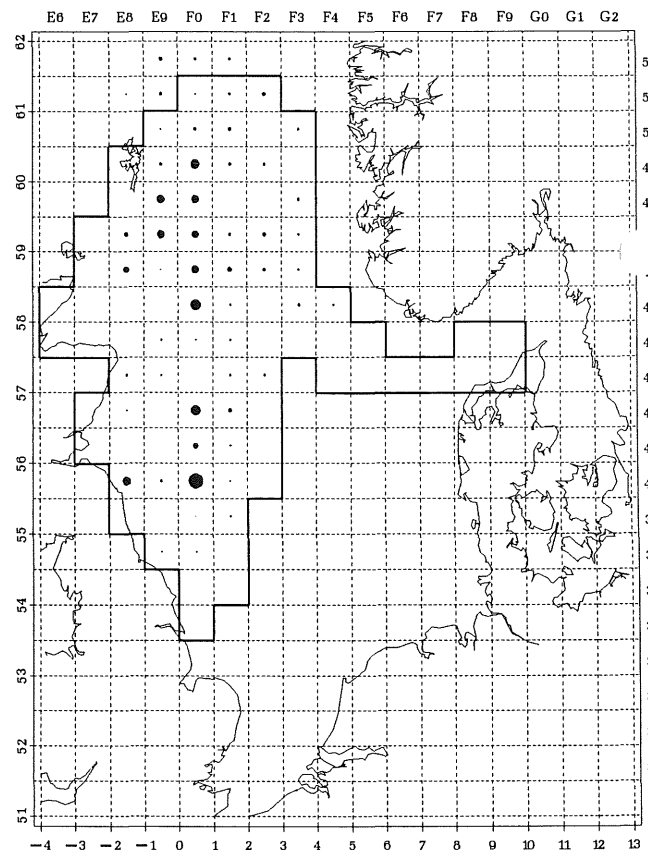
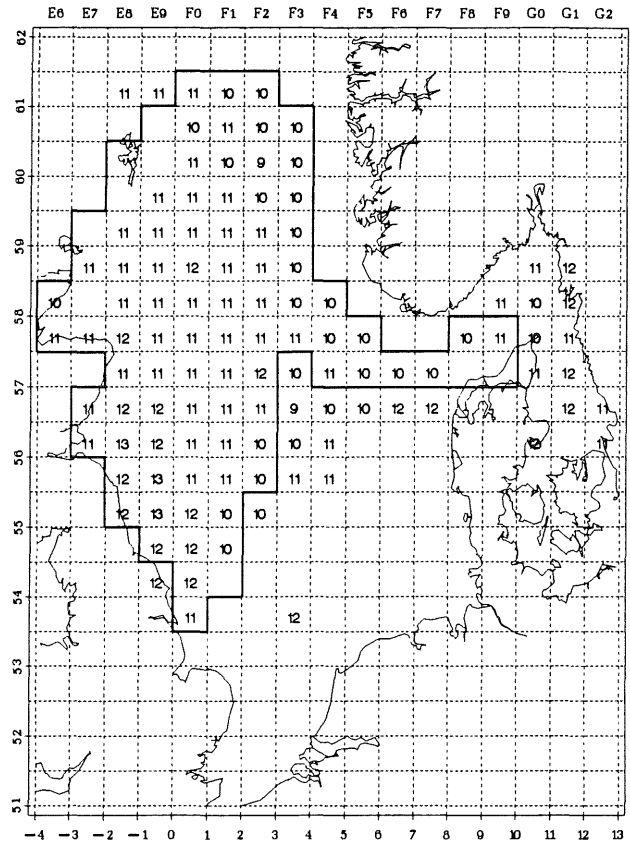
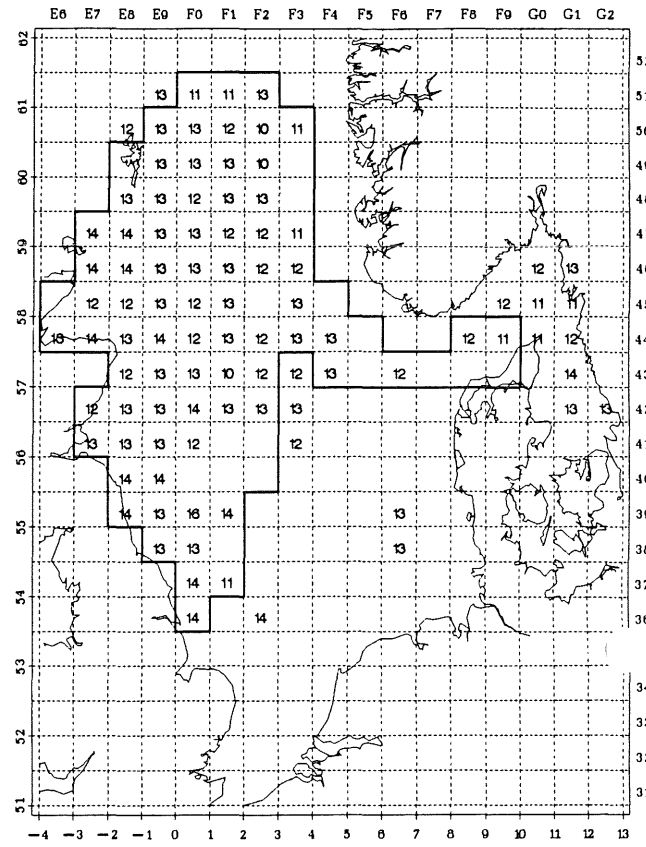


Figure 4.38 Norway pout: number per hour, age-group 2.

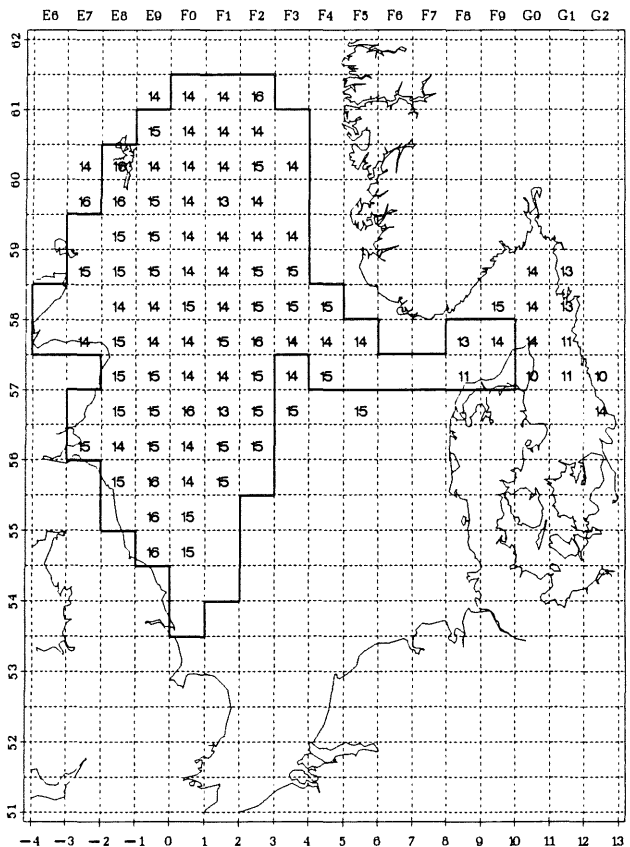
Norway pout, Age group 1 1995 quarter 1



Norway pout, Age group 1 1995 quarter 2



Norway pout, Age group 1 1995 quarter 3



Norway pout, Age group 1 1995 quarter 4

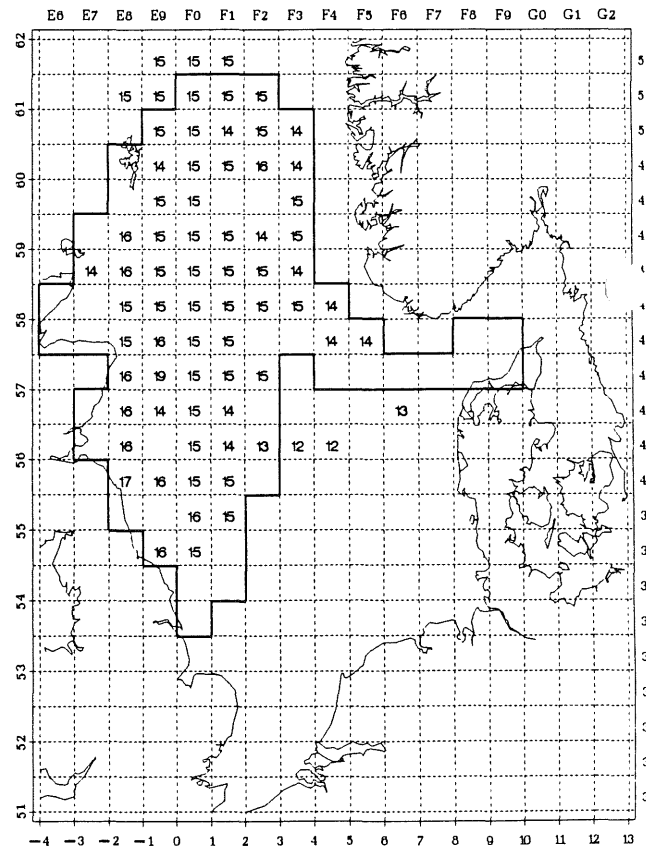


Figure 4.40 Norway pout: mean length (cm below), age-group 1.

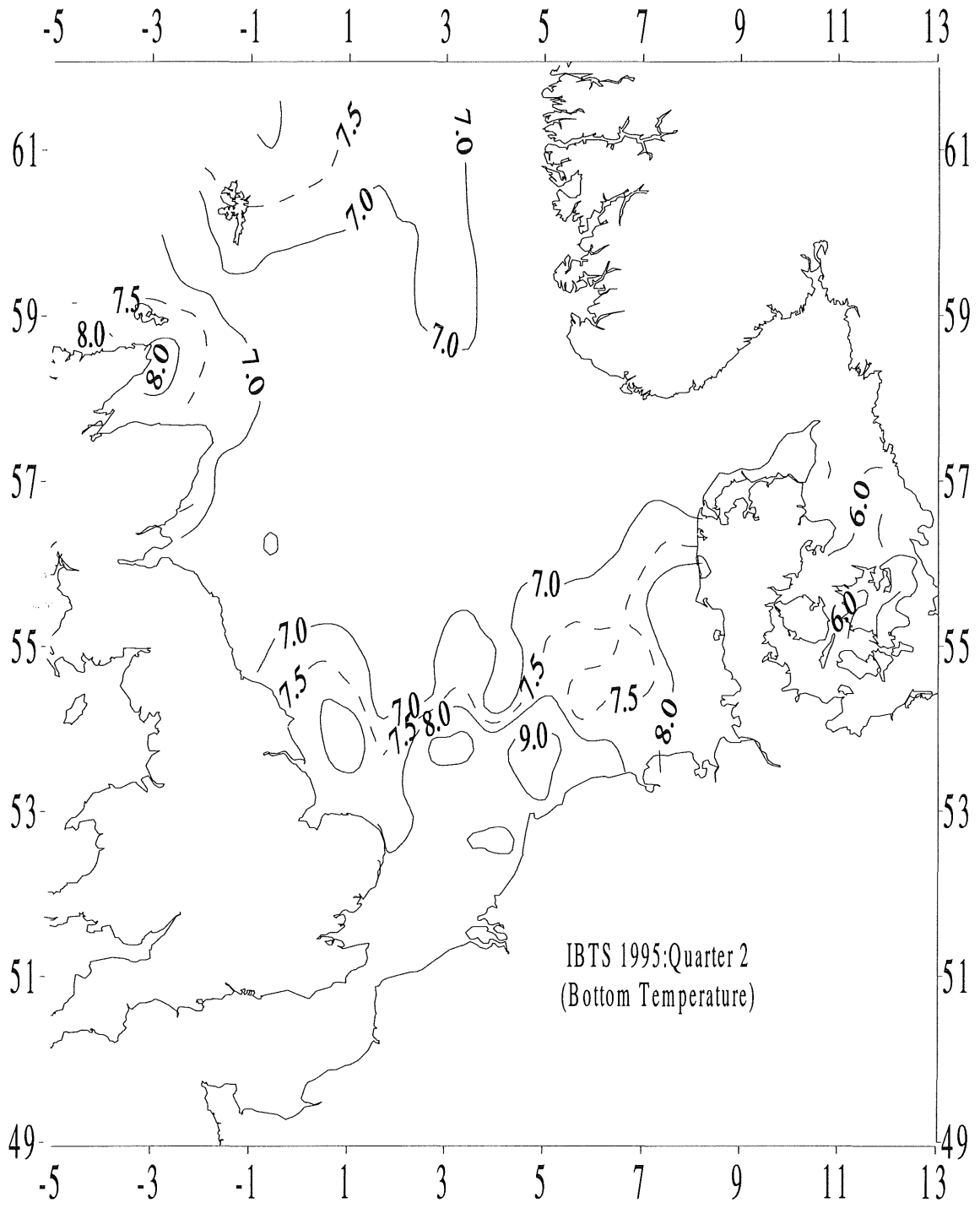


Figure 5.1

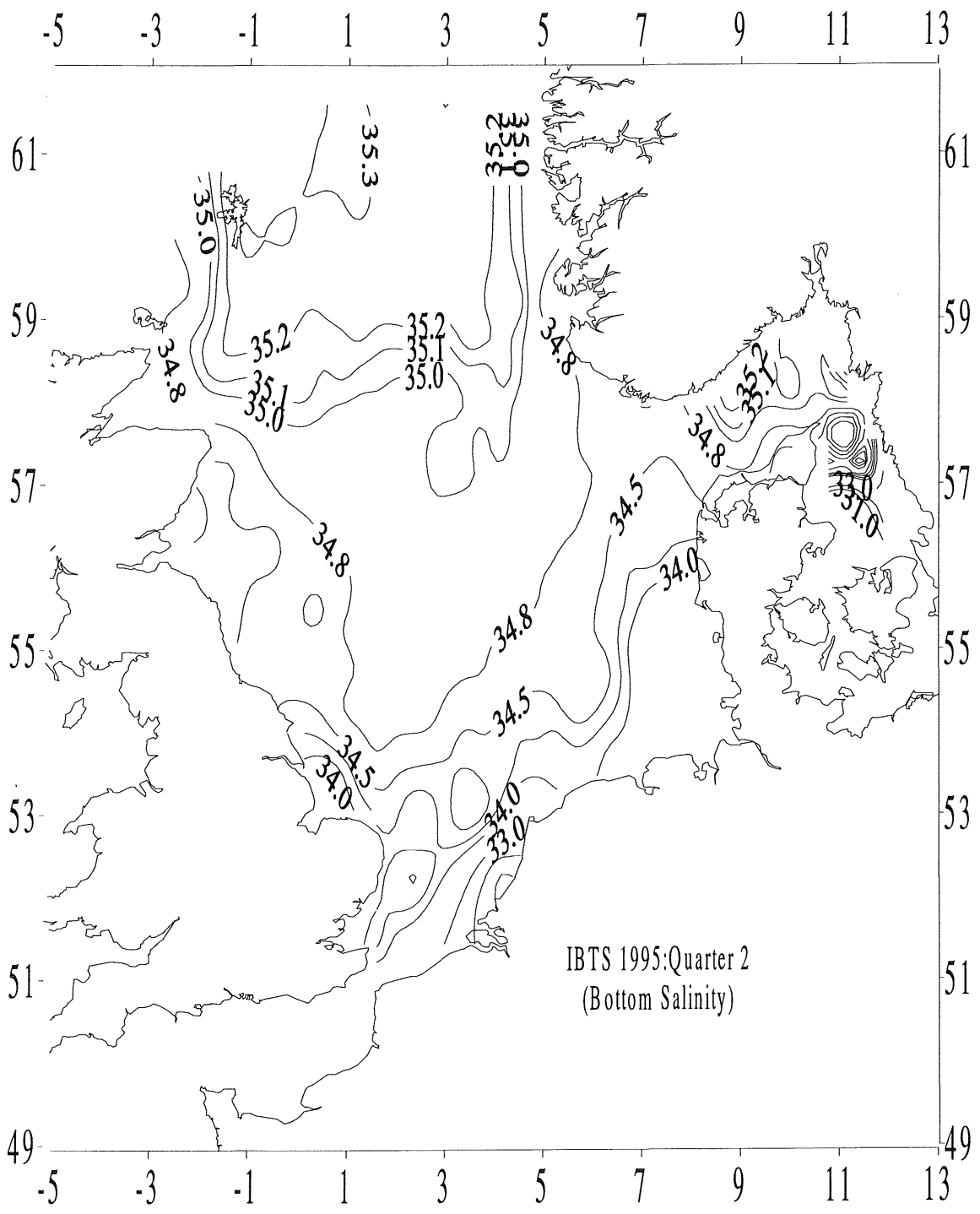


Figure 5.2

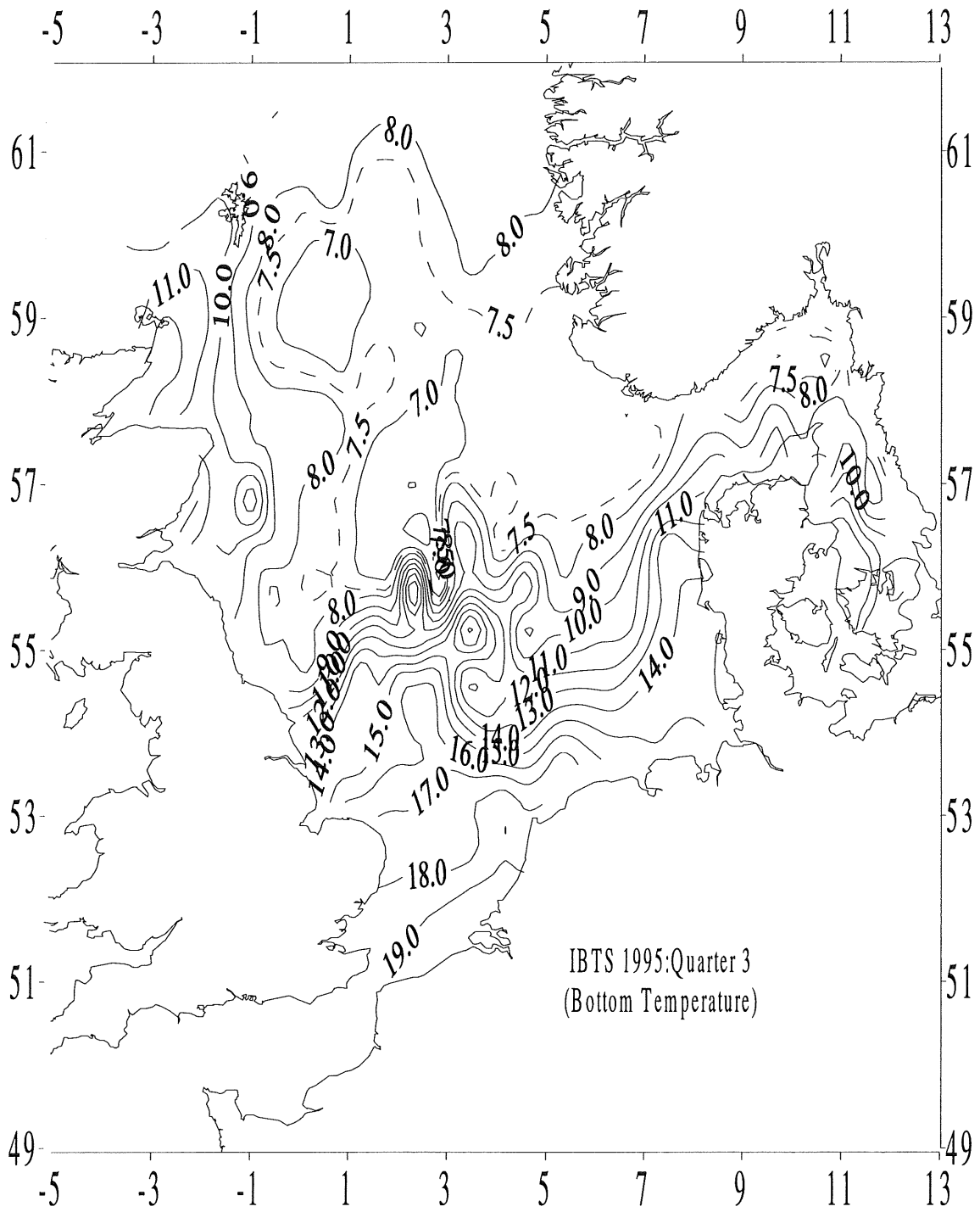


Figure 5.3

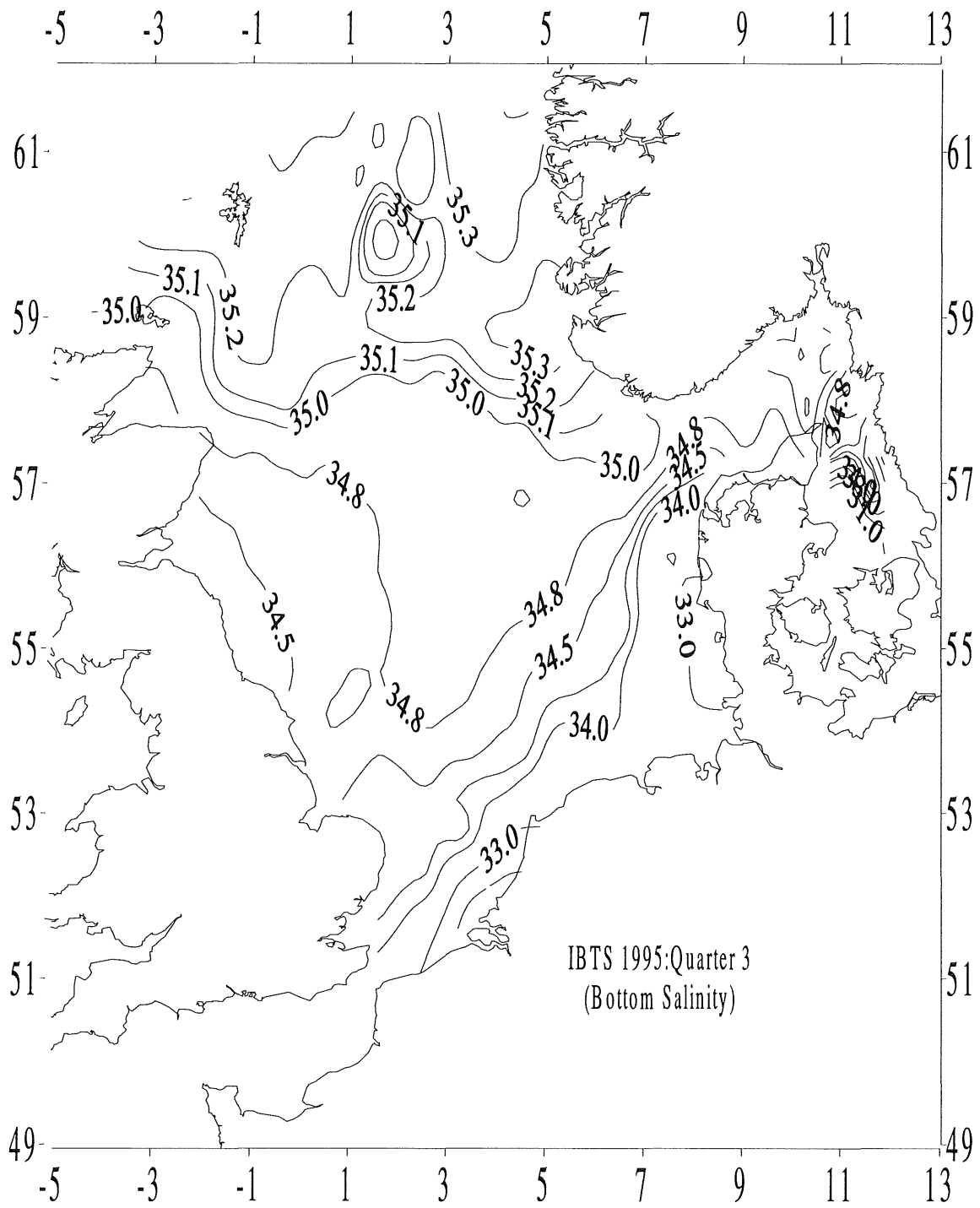


Figure 5.4

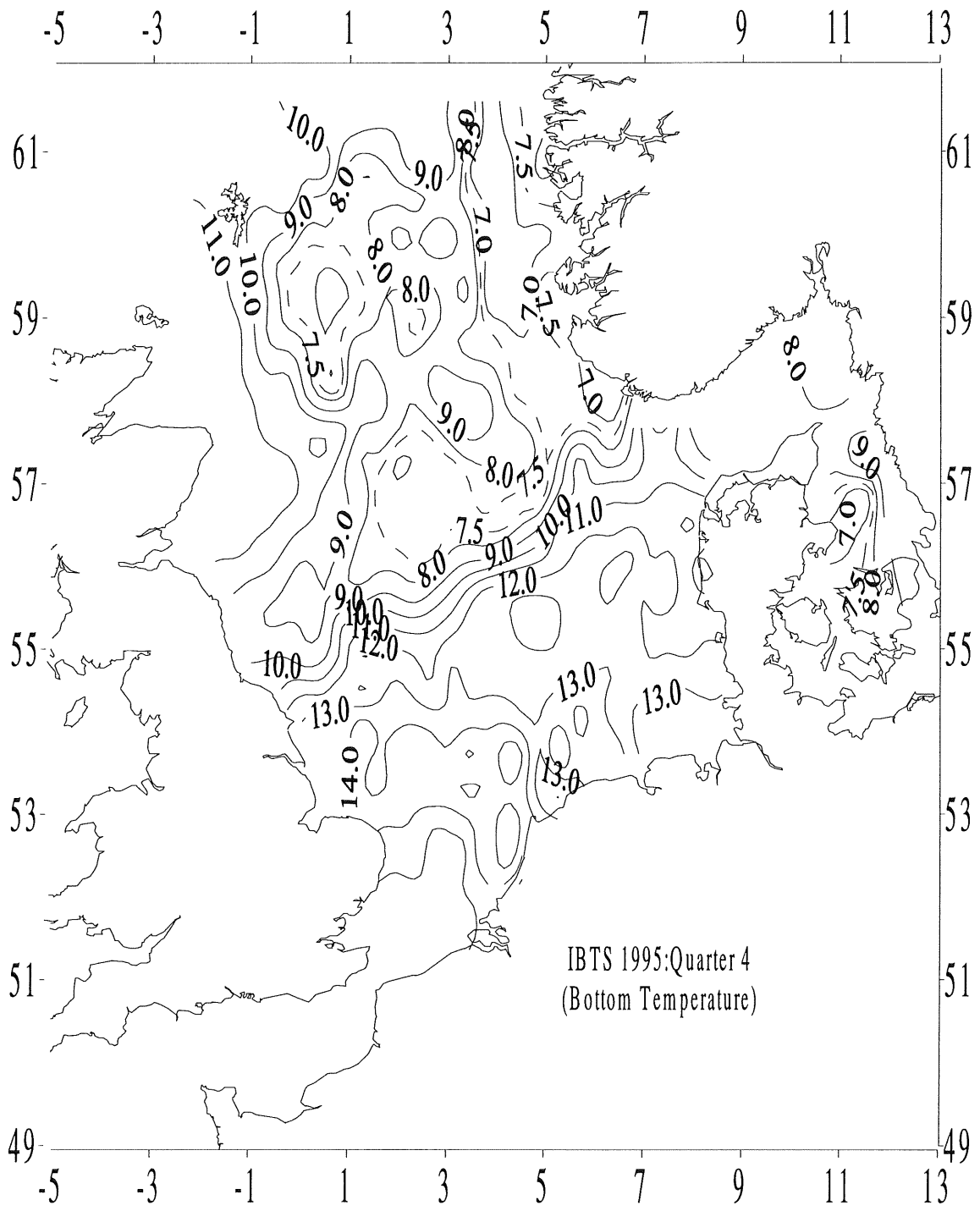


Figure 5.5

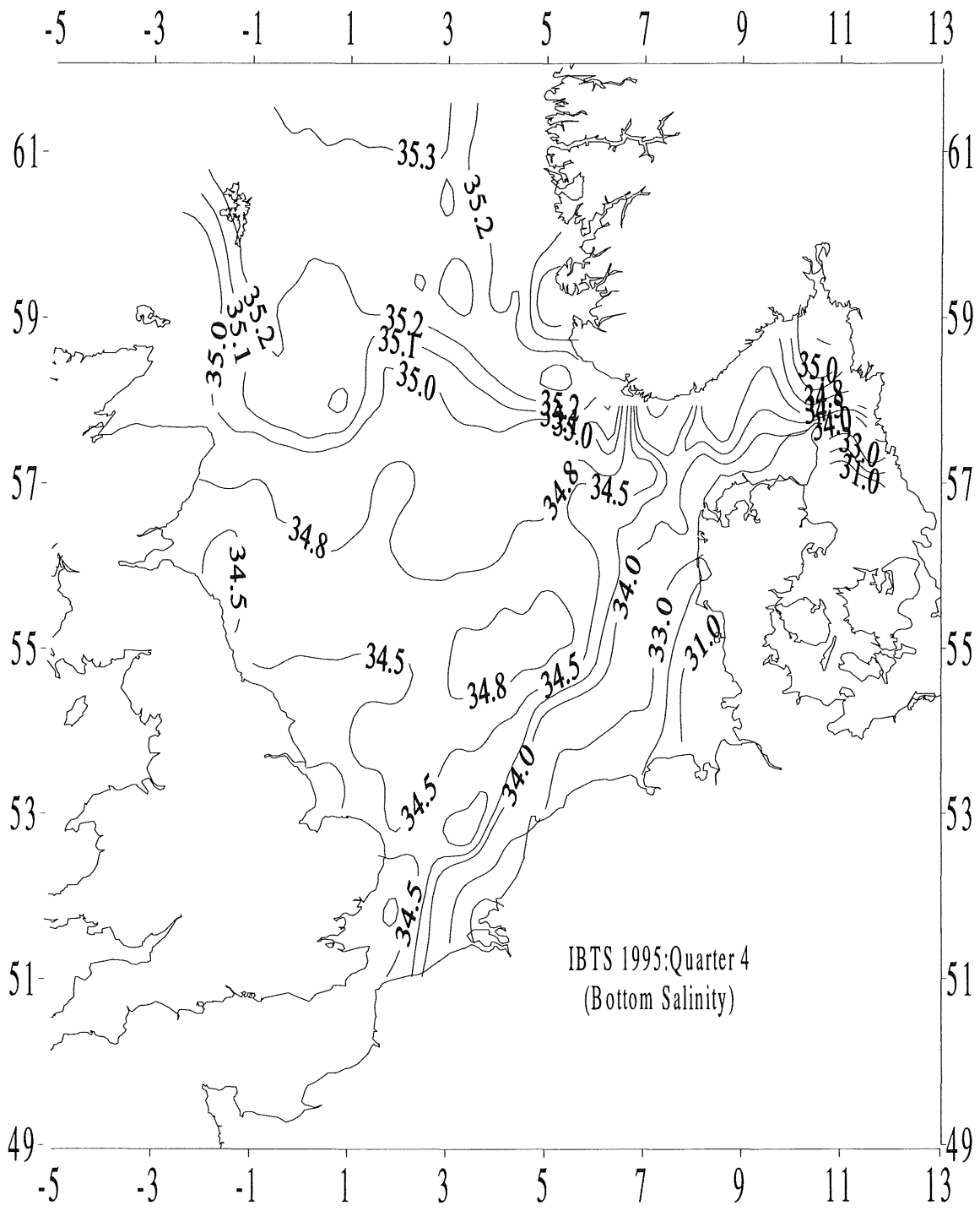


Figure 5.6

