

**REPORT OF THE
INTERNATIONAL BOTTOM TRAWL SURVEY IN THE
NORTH SEA, SKAGERRAK AND KATTEGAT
IN 1996: 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

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1 INTRODUCTION

This report presents the final results for the International Bottom Trawl Survey (IBTS) in 1996. 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 1996 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 with depth shallower than 10 m, or deeper than 200 m (250 m in Skagerrak), have been given less weight (ICES 1993).

It is implicitly assumed that all 1-ringer herring in the North Sea, Skagerrak, and Kattegat are autumn spawners. Unsampld 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 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 1996 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 1996

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.

Historical abundance indices for the period 1991-1991 were recalculated November 1998, due to resubmission of data.

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 1996 represent year class 1994.

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: 201 stations from 12 April to 15 May from two ships (Michael Sars, Scotia)

Quarter 3: 308 stations from 13 July to 18 September from five ships (Walther Herwig, Tideman, Cirolana, Scotia, Argos)

Quarter 4: 140 stations from 9 October to 20 November from two ships (Dana, 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 <http://www.ices.dk/ocean/project/datasets/iyfs.htm>. The web site 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 CM 1993/Assess:15.
- ICES 1996a. Report of the International Bottom Trawl Survey Working Group. ICES 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 1996.

Year 1996	Country	Vessel	Period	Number of Hauls	
				ABD	GOV
Quarter 1	Sweden	Argos	29/1–15/2		49
	Denmark	Dana	2/2–18/2		46
	Norway	Michael Sars	16/1–5/2		41
	UK Scotland	Scotia	8/2–25/2		45
	France	Thalassa	14/2–27/2		41
	Netherlands	Tridens	29/1–22/2		46
	Germany	Walter Herwig III	20/1–6/2		62
Quarter 2	Norway	Michael Sars	30/4–20/5		60
	UK Scotland	Scotia	12/4–15/5		72
Quarter 3	Sweden	Argos	2/9–18/9		50
	UK England	Cirolana	10/8–8/9		86
	UK Scotland	Scotia	7/8–26/8	86	
	France	Thalassa (new)	31/8–12/9		57
	Netherlands	Tridens	19/8–23/8		17
	Germany	Walter Herwig III	13/7–4/8		33
Quarter 4	UK England	Cirolana	23/10–20/11		76
	Denmark	Dana	9/10–28/10		66
	Norway	G.O. Sars	18/10–13/11		80

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 1996.

Species	Roundfish area									Total
	1	2	3	4	5	6	7	8	9	
Quarter 1										
Herring	836	809	785	328	142	826	567	578	915	5,786
Sprat	131	278	115	208	159	328	203	109	247	1,778
Mackerel	167	8	14	-	-	-	-	-	-	189
Cod	718	305	134	188	69	208	230	417	507	2,776
Haddock	693	818	940	399	-	15	239	219	144	3,467
Whiting	594	494	801	207	276	679	144	257	335	3,787
Saithe	155	4	5	-	-	-	43	-	-	207
Norway pout	240	270	279	124	-	-	59	87	52	1,111
Quarter 2										
Herring	238	439	346	328	336	215	63	-	-	1,965
Sprat	34	-	137	122	142	124	43	-	-	602
Mackerel	120	46	58	5	-	-	-	-	-	229
Cod	459	85	93	120	31	19	43	-	-	850
Haddock	700	416	377	151	1	3	48	-	-	1,696
Whiting	468	300	336	230	166	165	74	-	-	1,739
Saithe	181	-	7	-	-	-	38	-	-	226
Norway pout	156	58	93	44	-	1	27	-	-	379
Quarter 3										
Herring	672	625	560	538	54	419	166	544	586	4,164
Sprat	45	78	111	145	223	229	-	24	207	1,062
Mackerel	267	227	120	81	130	509	-	-	-	1,334
Cod	715	406	98	339	154	364	93	373	292	2,834
Haddock	1,727	885	750	564	-	24	76	276	99	4,401
Whiting	966	567	542	589	326	758	80	191	250	4,269
Saithe	726	9	4	1	-	-	11	-	-	751
Norway pout	543	163	141	37	-	-	19	113	73	1,089
Quarter 4										
Herring	818	461	232	306	47	368	134	170	169	2,705
Sprat	20	156	157	106	39	225	56	7	96	862
Mackerel	92	50	7	25	4	134	-	-	-	312
Cod	648	211	57	83	9	131	174	144	157	1,614
Haddock	1,110	513	527	274	-	10	189	145	-	2,768
Whiting	592	329	316	189	139	198	134	-	-	1,897
Saithe	439	9	7	-	-	-	10	146	-	611
Norway pout	301	107	72	47	-	-	22	-	-	549

Table 4.2 Age composition of standard species in 1996 for the relevant standard areas.

	Quarter	Age						6+
		0	1	2	3	4	5	
Herring	1	.0	1,734.8	194.3	43.3	12.6	8.5	-
	2	.0	1,313.5	900.7	220.6	25.8	16.4	-
	3	2,677.0	1,286.0	189.7	113.0	47.2	42.1	-
	4	2,826.5	507.8	3,36.8	162.1	42.1	51.3	-
Sprat	1	.0	232.6	557.5	176.9	22.4	1.1	-
	2	.0	93.3	536.0	728.5	129.9	.0	-
	3	3.3	507.6	1,312.2	584.5	79.2	4.5	-
	4	4.2	349.5	338.5	73.7	3.5	.0	-
Mackerel	1	.0	10.4	.7	1.2	.2	.2	.1
	2	.0	1.6	1.0	3.9	2.3	1.3	1.2
	3	.0	48.4	49.4	23.0	4.9	3.5	7.7
	4	19.9	5.7	2.3	3.1	1.4	.7	.5
Cod	1	.0	3.5	8.0	6.0	.7	.6	.4
	2	.0	1.2	5.7	3.1	.8	.3	.2
	3	68.9	10.3	5.3	1.8	.4	.2	.0
	4	23.3	20.4	3.4	1.2	.5	.2	.1
Haddock	1	.0	267.4	813.3	65.9	46.7	7.7	3.1
	2	.1	223.2	675.2	33.4	27.9	1.8	1.6
	3	622.8	249.2	447.3	30.8	21.5	2.7	.9
	4	879.4	218.6	518.2	32.9	28.7	3.5	1.7
Whiting	1	.0	502.4	486.0	244.7	69.7	23.1	9.8
	2	.0	378.3	381.8	165.0	50.7	9.1	4.2
	3	314.9	545.0	283.2	125.6	32.7	7.5	4.0
	4	270.4	365.8	334.7	88.5	37.0	11.3	6.9
Saithe	1	.0	.6	.6	1.8	17.9	1.5	.5
	2	.0	.0	.1	.4	6.3	1.4	1.4
	3	.0	.4	.8	4.6	7.1	1.1	1.2
	4	.2	.2	.6	6.0	18.8	.7	.5
Norway pout	1	.0	922.9	2,631.0	227.8	4.7	.1	.0
	2	.0	1,076.7	1,621.9	99.6	.0	.0	.1
	3	4,542.6	745.6	388.2	14.7	.8	.0	.0
	4	8,084.7	952.8	322.8	14.9	2.2	.1	.0

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	1,867	2,570	454	380	767	453	300
1990	640	1,078	1,205	3,162	1,074	775	779	618	325	63
1991	2,902	3,317	2,954	2,121	1,137	294	1,094	596	889	196
1992	3,799	3,489	1,644	2,890	1,653	826	1,174	1,834	353	573
1993	1,552	2,989	1,215	2,560	503	2,798	194	901	190	337
1994	714	4,733	1,735	1,314	1,286	508	-	-	-	-
1995	2,677	2,827	-	-	-	-	-	-	-	-

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	6,166
1993	6.8	2,528	4,003	2,403	4,298	7,959	2,696	5,582	3,867	5,286
1994	5.2	1,051	1,158	2,075	1,457	6,624	558	536	1,312	339
1995	0.3	526	233	93	508	350	-	-	-	-
1996	3.3	4	-	-	-	-	-	-	-	-

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	-	-	-	-	-	-	0.2	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	0.7	1.0	49.4	2.3
1995	0.0	3.1	10.4	1.6	48.4	5.7	-	-	-	-
1996	0.0	19.9	-	-	-	-	-	-	-	-

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	36.4	19.5	13.6	8.0	5.6
1992	19.7	55.4	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	8.0	5.7	5.3	3.4
1995	15.1	21.9	3.5	1.2	10.3	20.4	-	-	-	-
1996	68.9	23.3	-	-	-	-	-	-	-	-

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	1,356	1,450	1,027	2,108	813	675	447	518
1995	517	548	267	223	249	219	-	-	-	-
1996	623	879	-	-	-	-	-	-	-	-

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	564
1993	916	1,014	721	737	675	926	449	637	291	498
1994	610	926	679	1,277	620	990	486	382	283	335
1995	729	1,666	502	378	545	366	-	-	-	-
1996	315	270	-	-	-	-	-	-	-	-

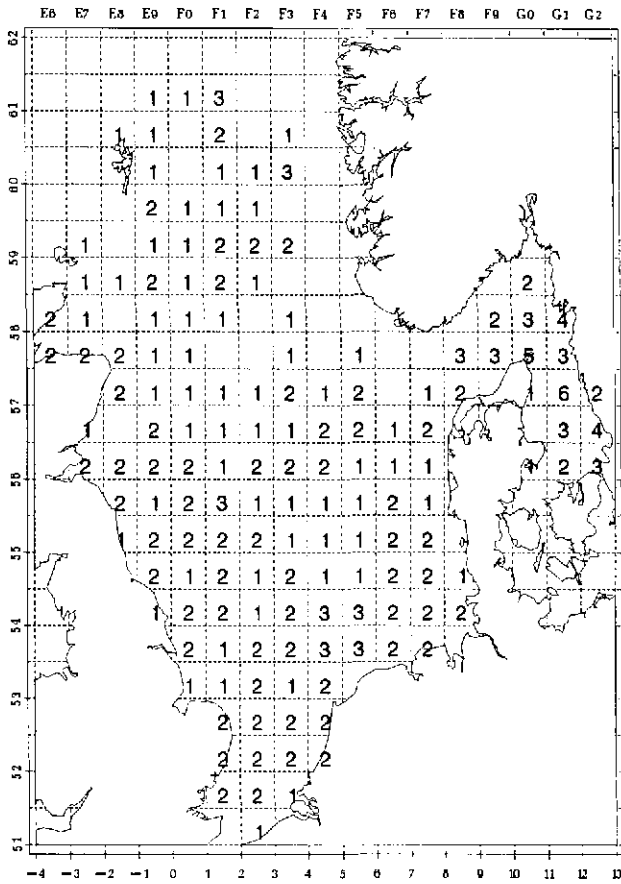
Table 4.9 Saithe IBTS indices as mean number per hour within the species standard area.

Year class	Age 2		Age 3				Age 4			
	Quarter		Quarter				Quarter			
	3	4	1	2	3	4	1	2	3	4
1987	-	-	-	-	-	-	3.0	3.1	0.5	1.5
1988	-	-	6.6	6.0	2.2	11.6	4.2	6.9	2.8	3.5
1989	0.7	0.6	0.8	0.8	1.4	1.5	1.5	1.6	2.8	1.9
1990	0.4	0.3	0.6	1.2	8.7	7.3	10.8	6.8	1.6	2.0
1991	1.9	1.6	4.0	1.4	1.3	2.3	1.1	1.2	2.7	1.2
1992	0.6	0.8	0.5	0.6	16.8	16.8	17.9	6.3	7.1	18.8
1993	0.7	0.6	1.8	0.4	4.6	6.0	-	-	-	-
1994	2.8	0.6	-	-	-	-	-	-	-	-

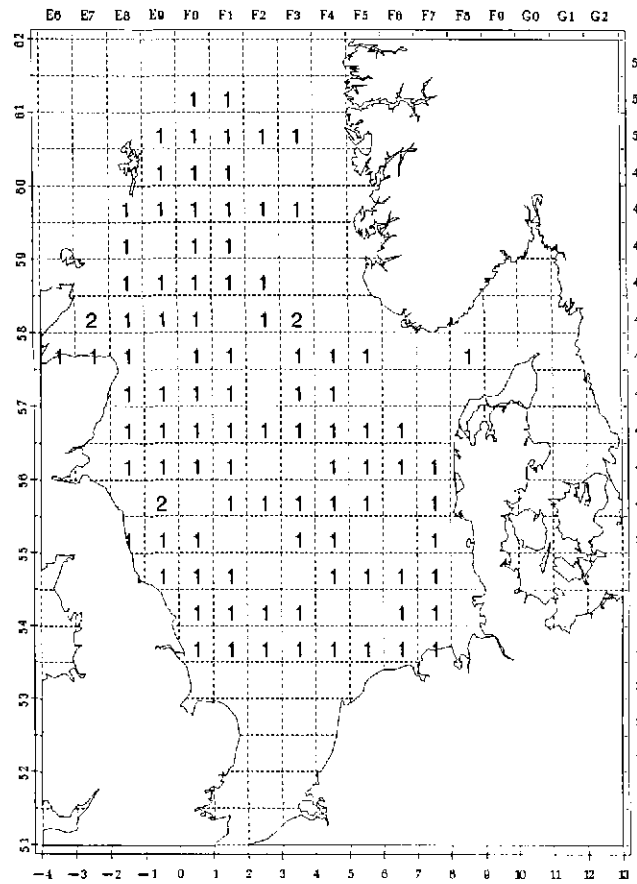
Table 4.10 Norway pout IBTS indices as mean number per hour within the species standard area.

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	374	437	102	216
1993	4,104	4,775	1,870	2,814	704	1,973	785	710	597	260
1994	3,196	18,083	5,940	10,387	4,440	5,610	2,631	1,622	388	323
1995	2,860	1,633	923	1,077	746	953	-	-	-	-
1996	4,543	8,085	-	-	-	-	-	-	-	-

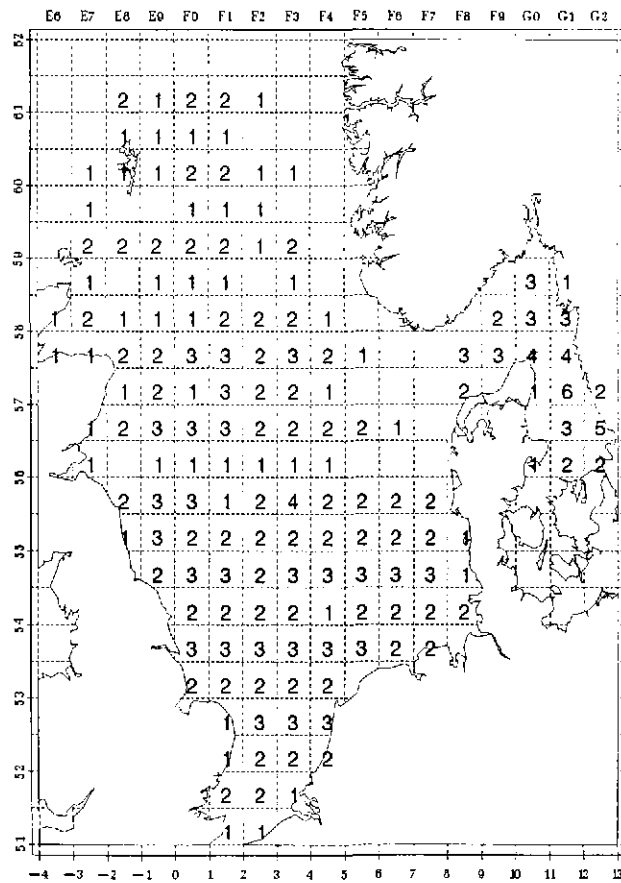
Number of daytime hauls. 1996 quarter 1



Number of daytime hauls. 1996 quarter 2



Number of daytime hauls. 1996 quarter 3



Number of daytime hauls. 1996 quarter 4

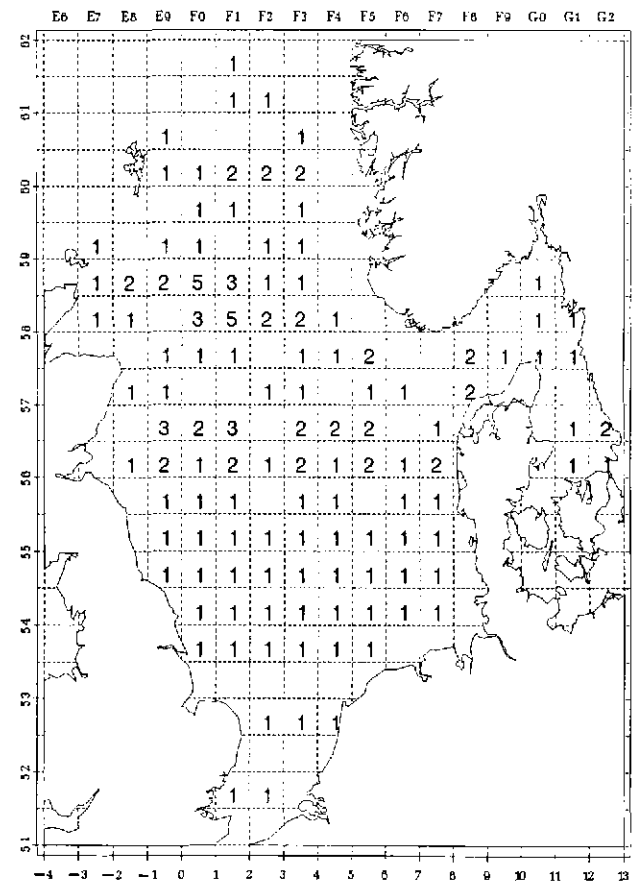


Figure 4.1 Number of valid daytime hauls.

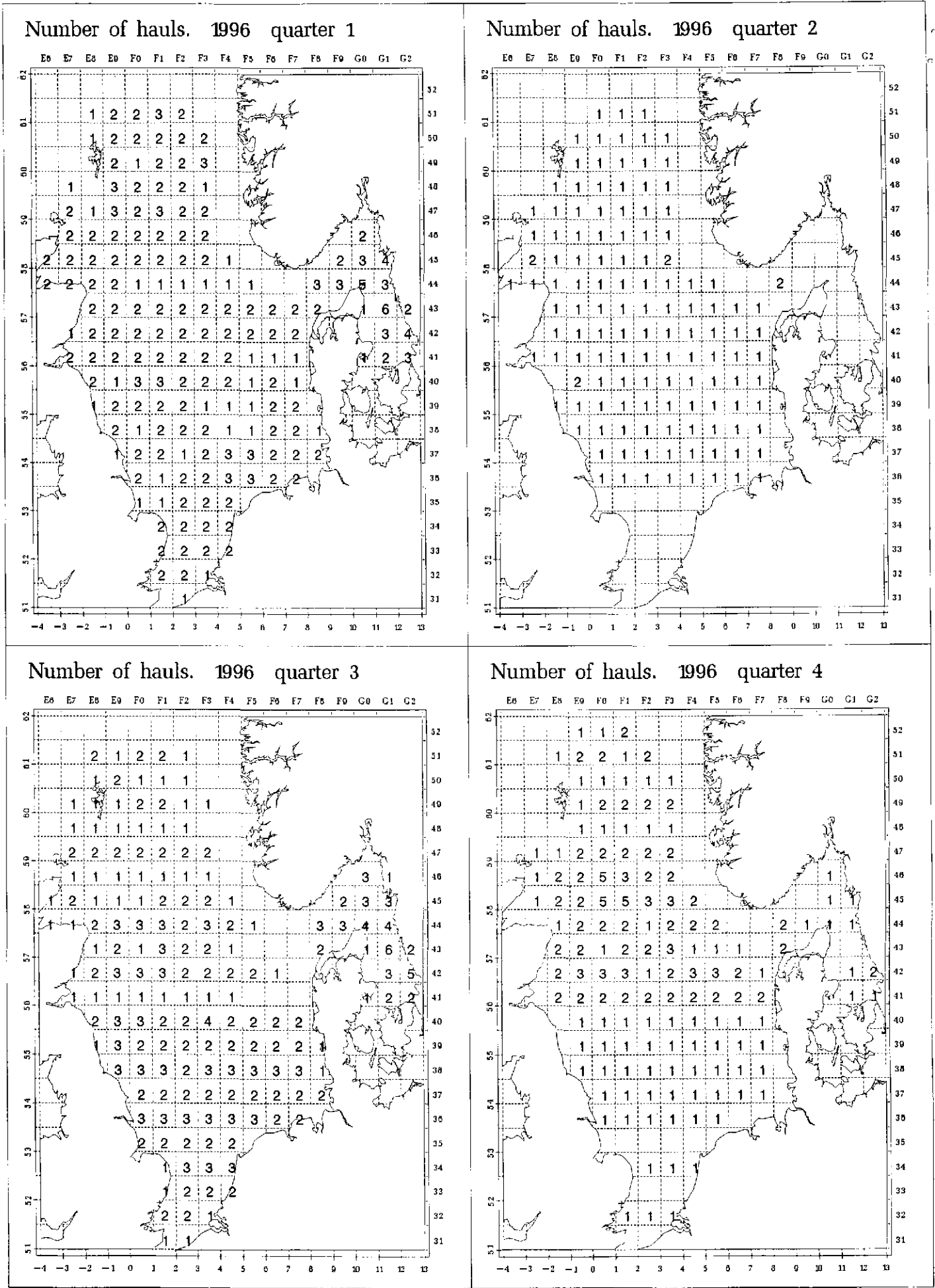
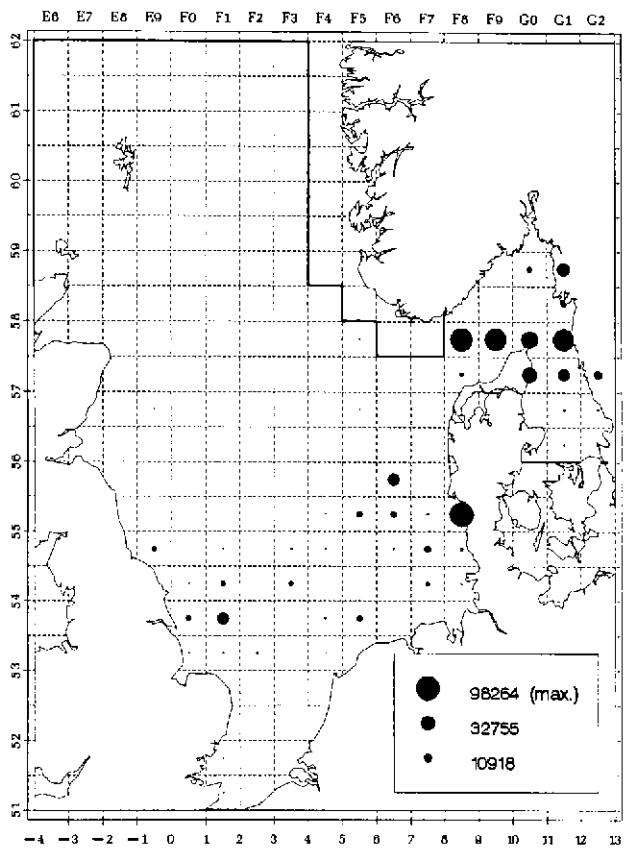


Figure 4.2 Number of valid day- and nighttime hauls.

Herring, Age group 0 1996 quarter 3
Abundance index: 2677



Herring, Age group 0 1996 quarter 4
Abundance index: 2827

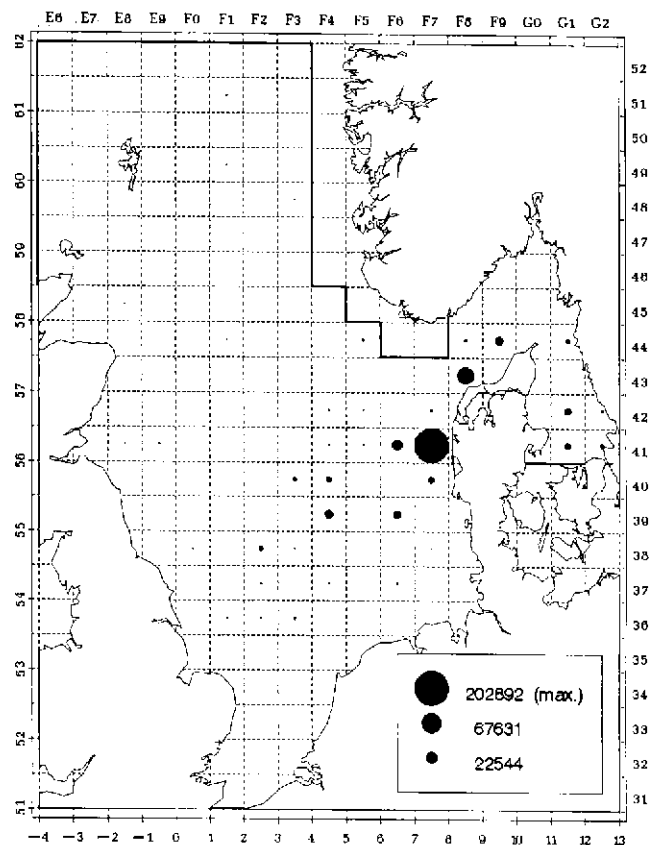
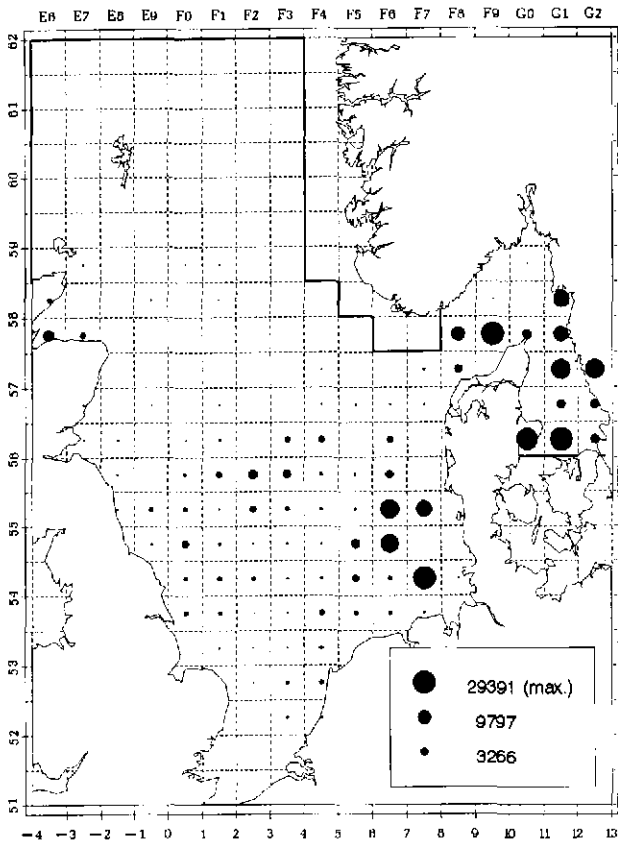
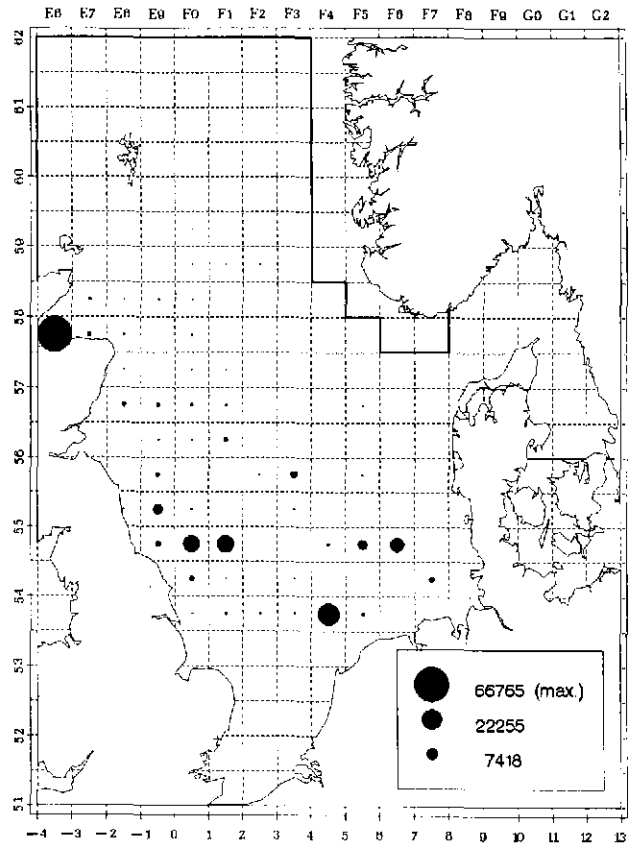


Figure 4.3 Herring: mean catch number per hour, 0-ringers.

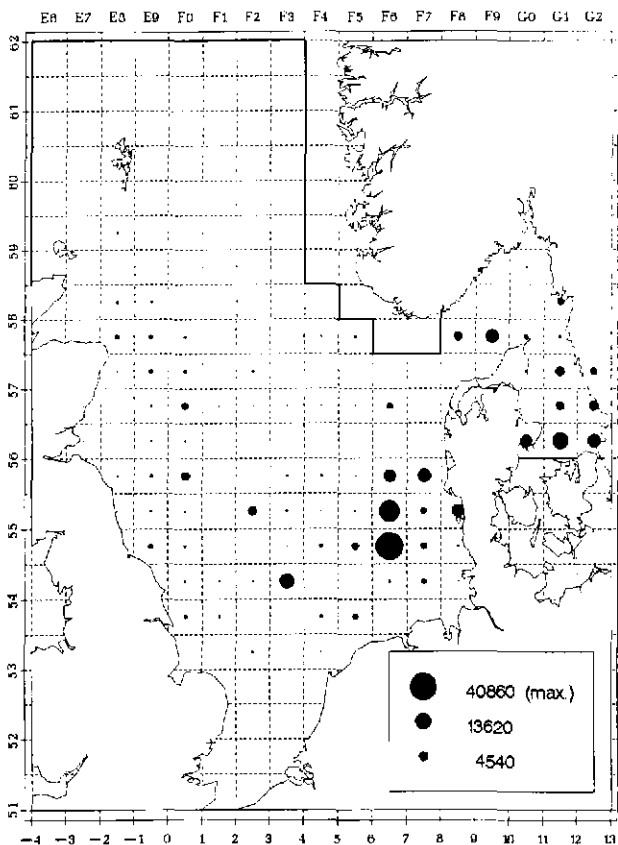
Herring, Age group 1 1996 quarter 1
Abundance index: 1735



Herring, Age group 1 1996 quarter 2
Abundance index: 1314



Herring, Age group 1 1996 quarter 3
Abundance index: 1286



Herring, Age group 1 1996 quarter 4
Abundance index: 508

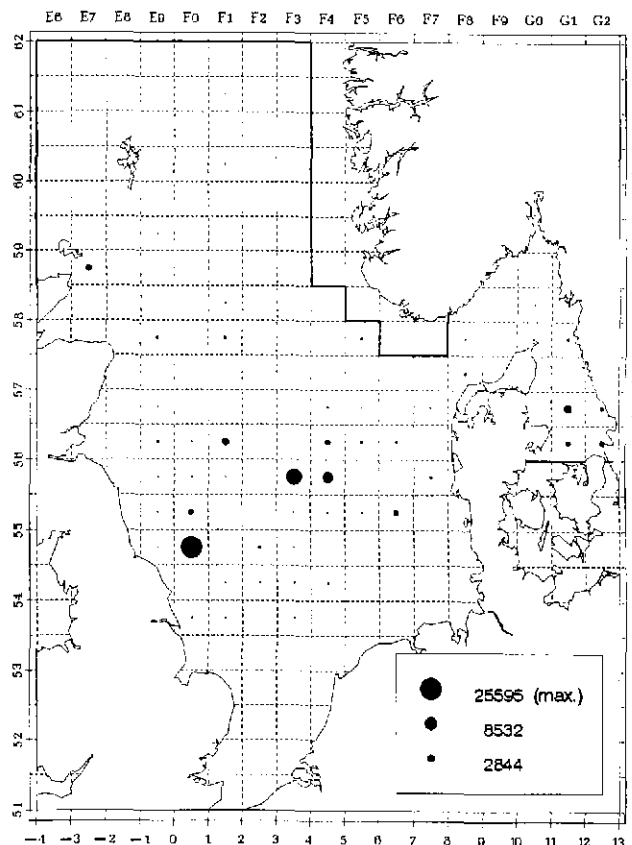


Figure 4.4 Herring: mean catch number per hour, 1-ringers.

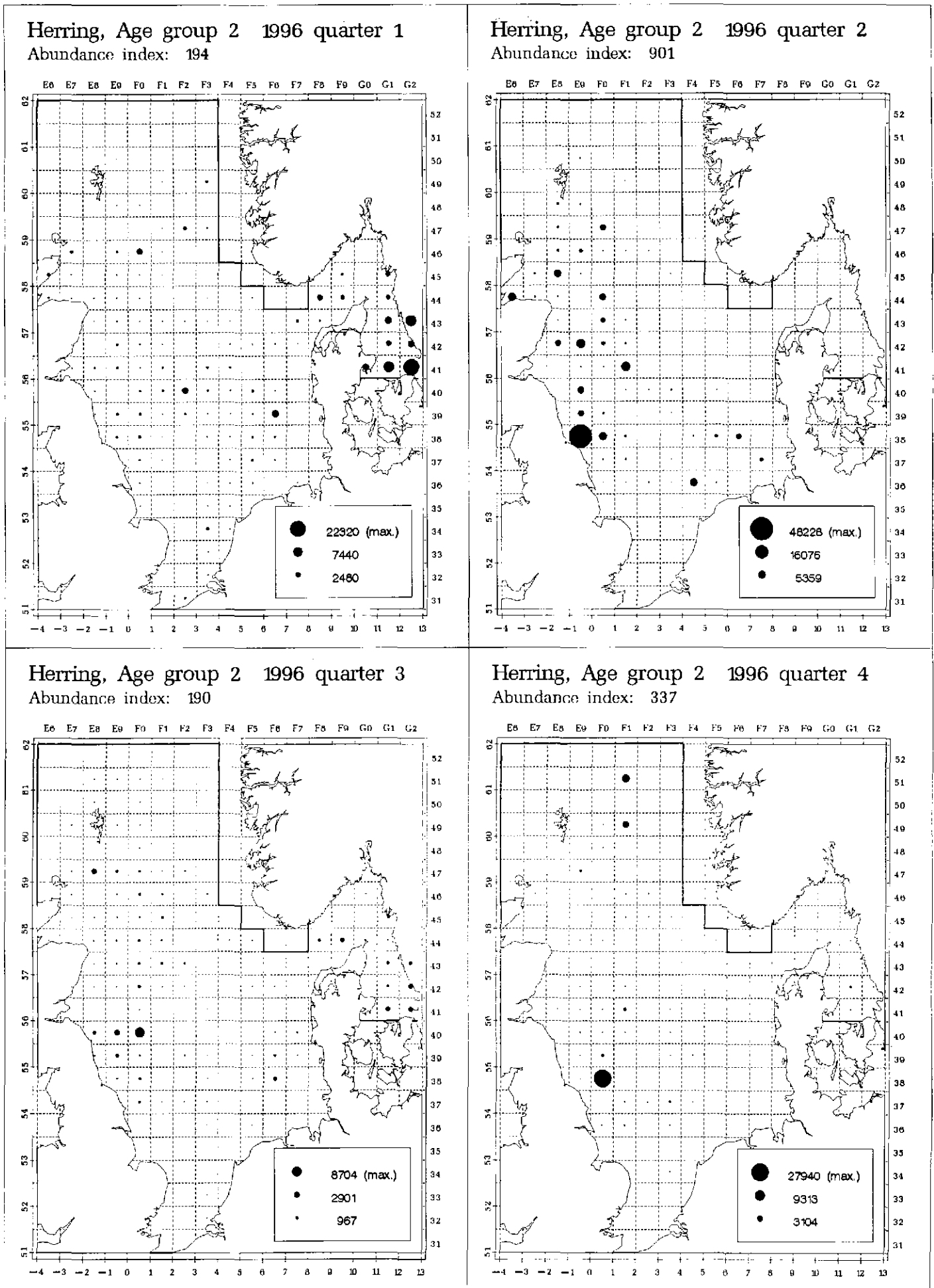
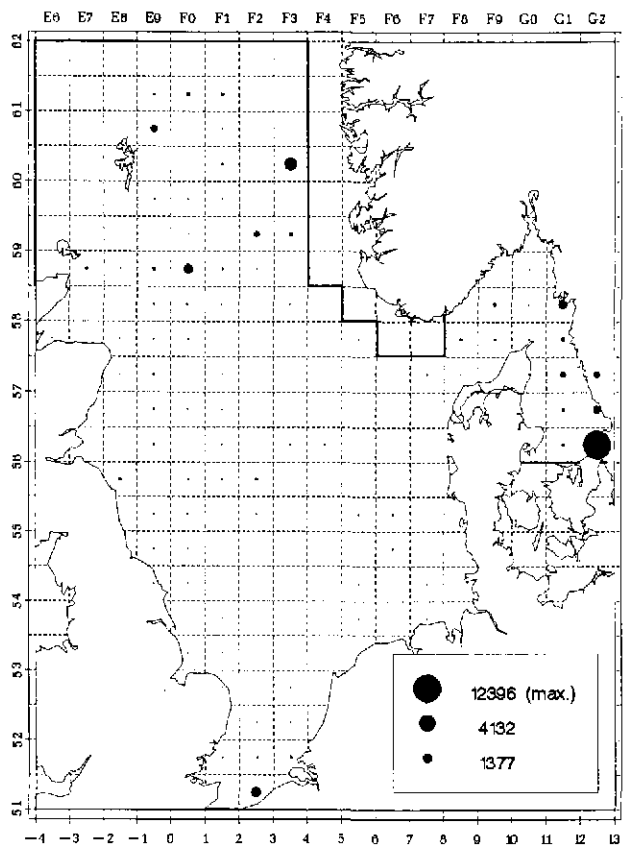
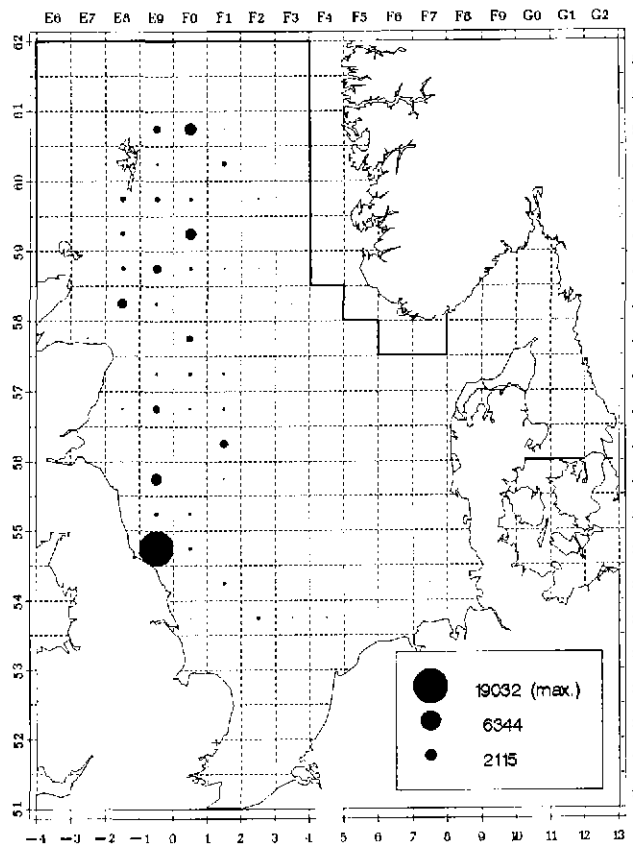


Figure 4.5 Herring: mean catch number per hour, 2-ringers.

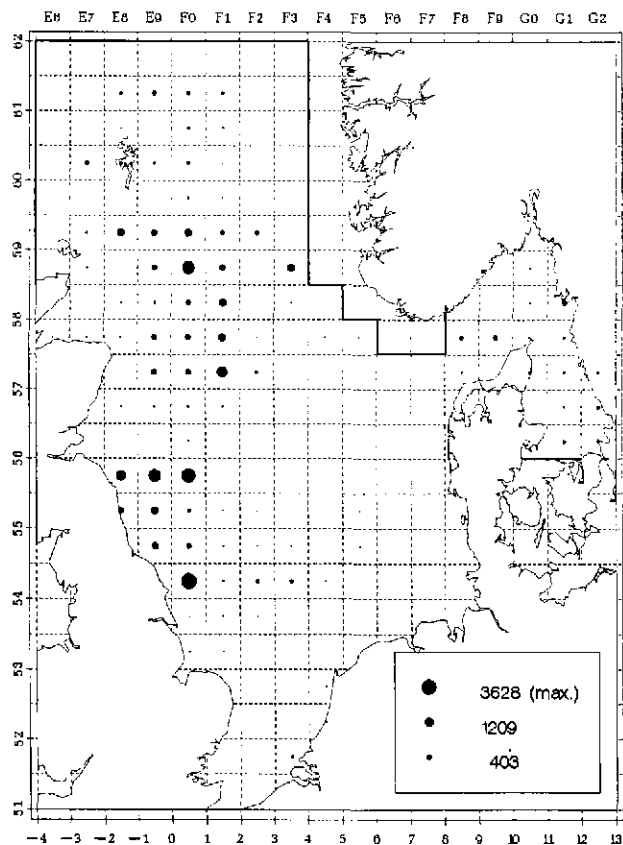
Herring, Age group 3+ 1996 quarter 1



Herring, Age group 3+ 1996 quarter 2



Herring, Age group 3+ 1996 quarter 3



Herring, Age group 3+ 1996 quarter 4

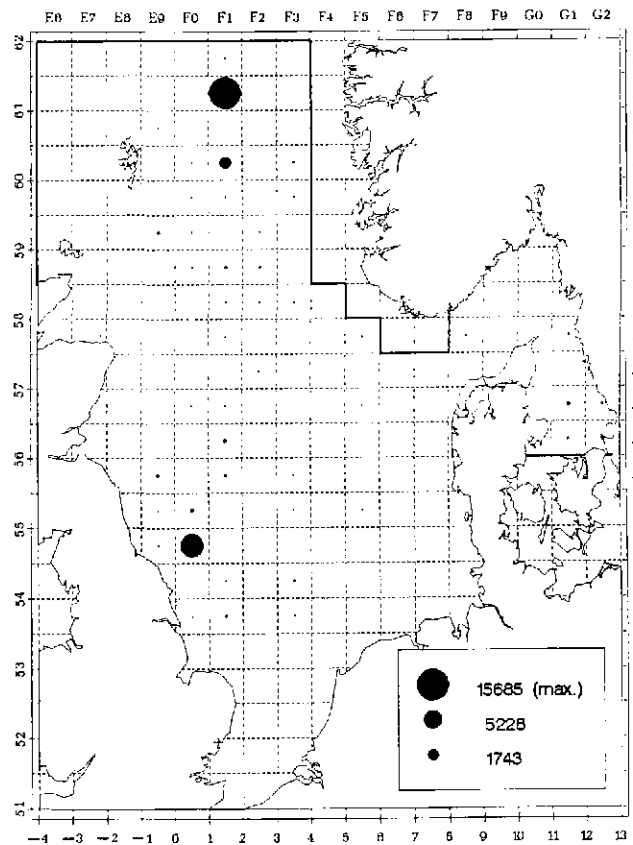
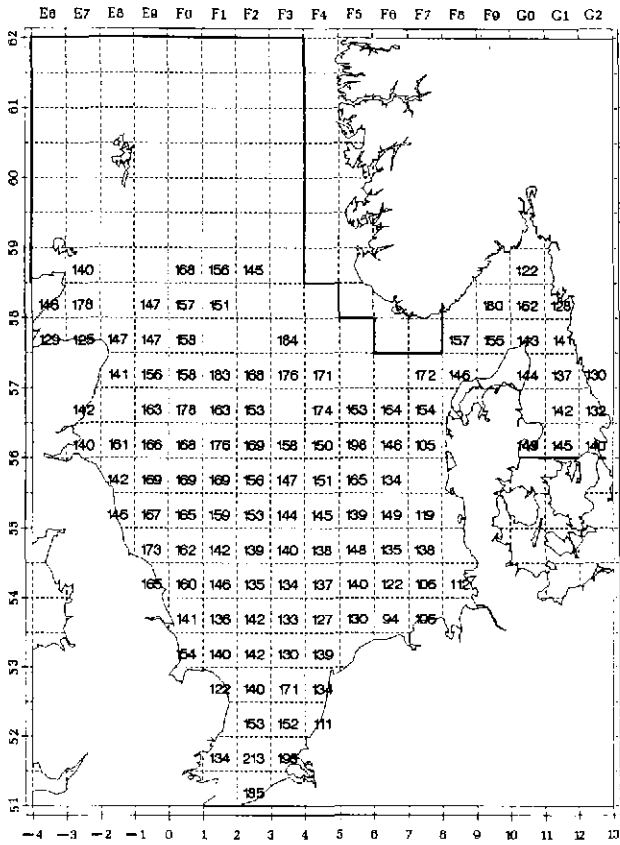
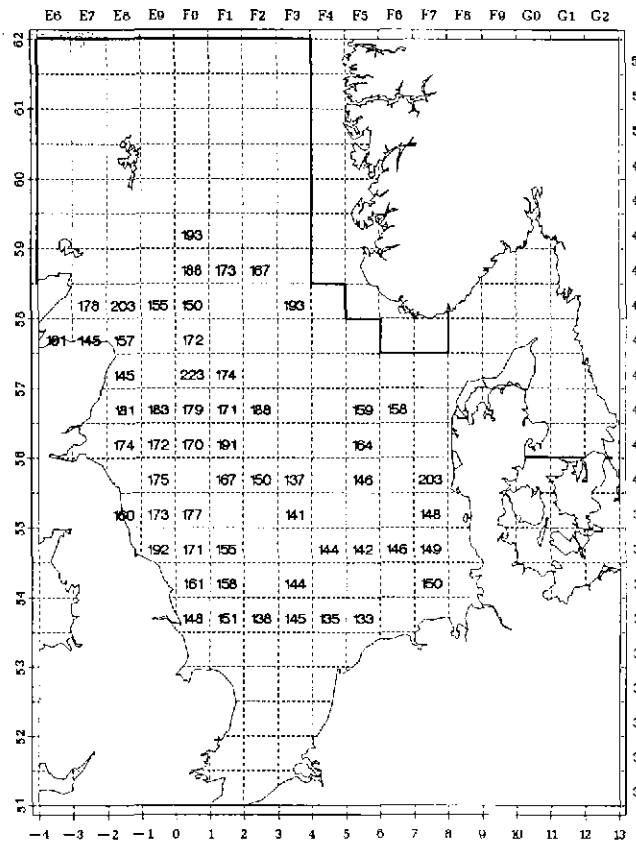


Figure 4.6 Herring: mean catch number per hour, 3+ringers.

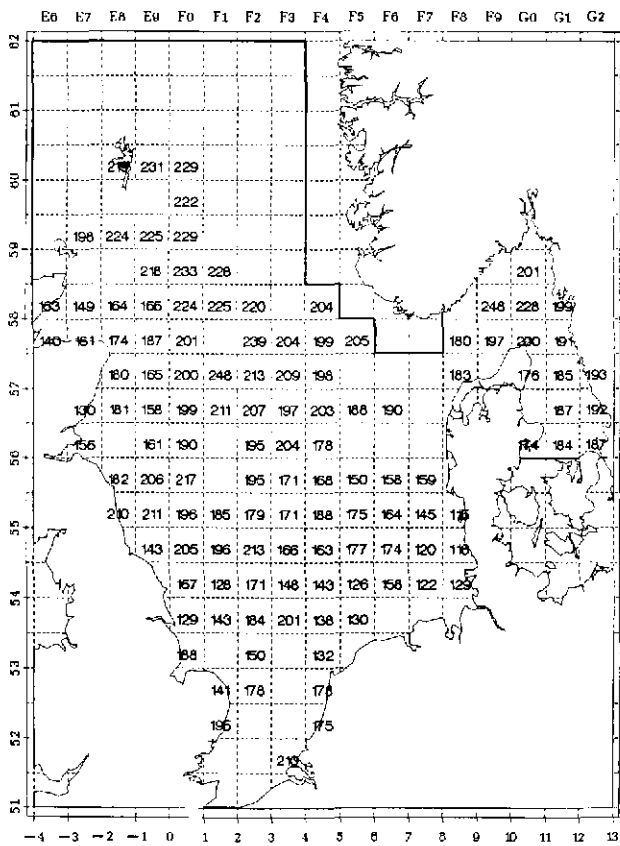
Herring, Age group 1 1996 quarter 1



Herring, Age group 1 1996 quarter 2



Herring, Age group 1 1996 quarter 3



Herring, Age group 1 1996 quarter 4

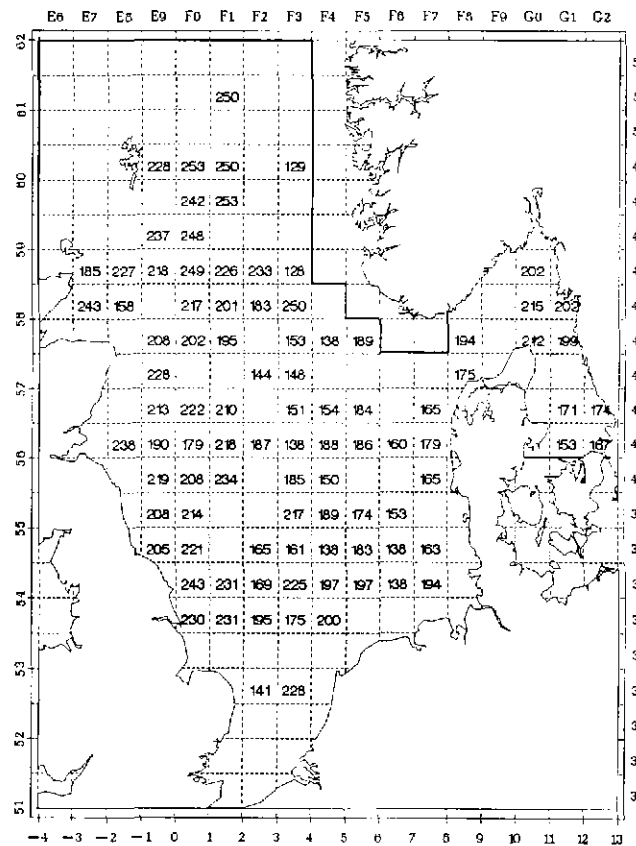
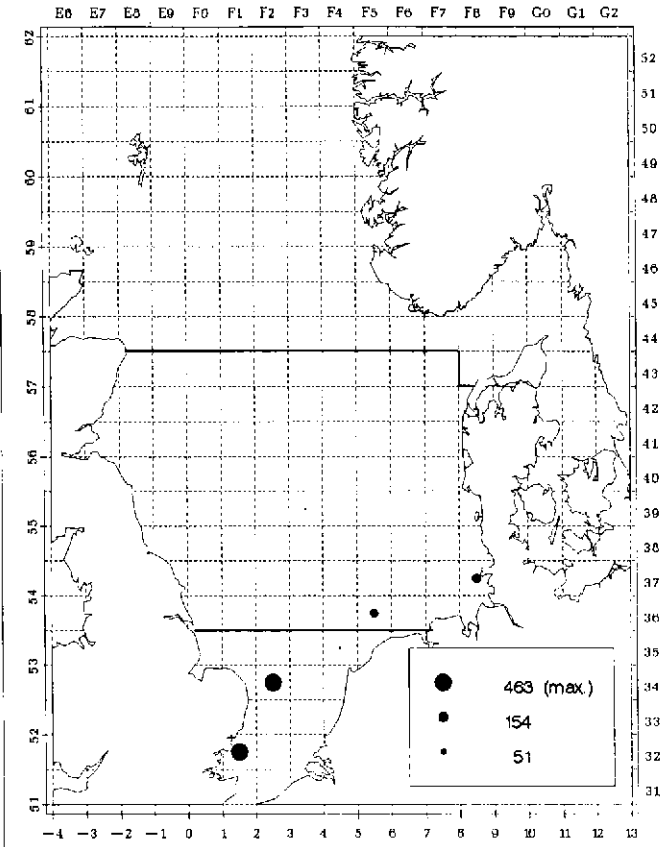


Figure 4.7 Herring: mean length (mm), 1-ringers.

Sprat, Age group 0 1996 quarter 3
Abundance index: 3.3



Sprat, Age group 0 1996 quarter 4
Abundance index: 4.2

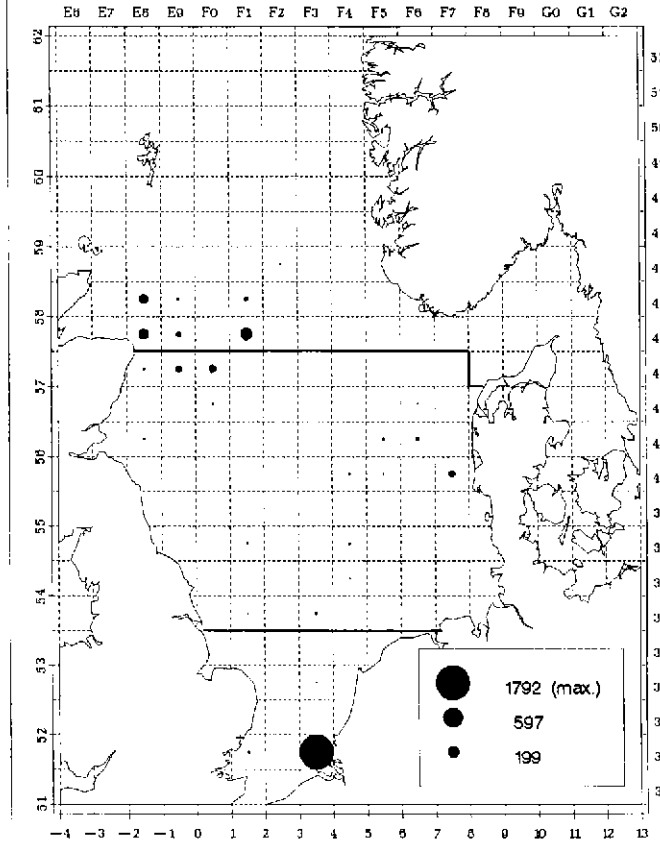


Figure 4.8 Sprat: mean catch number per hour, age-group 0.

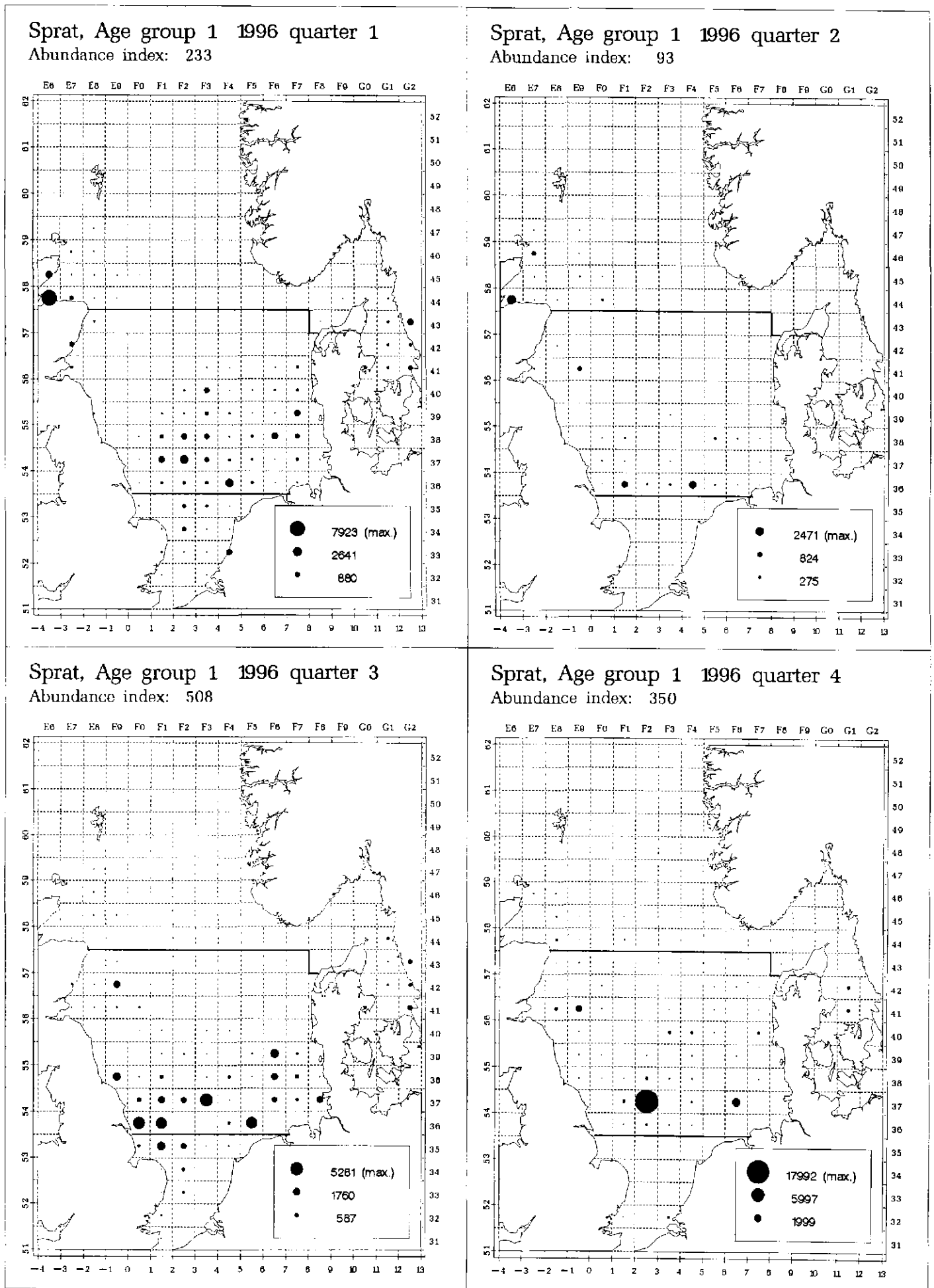
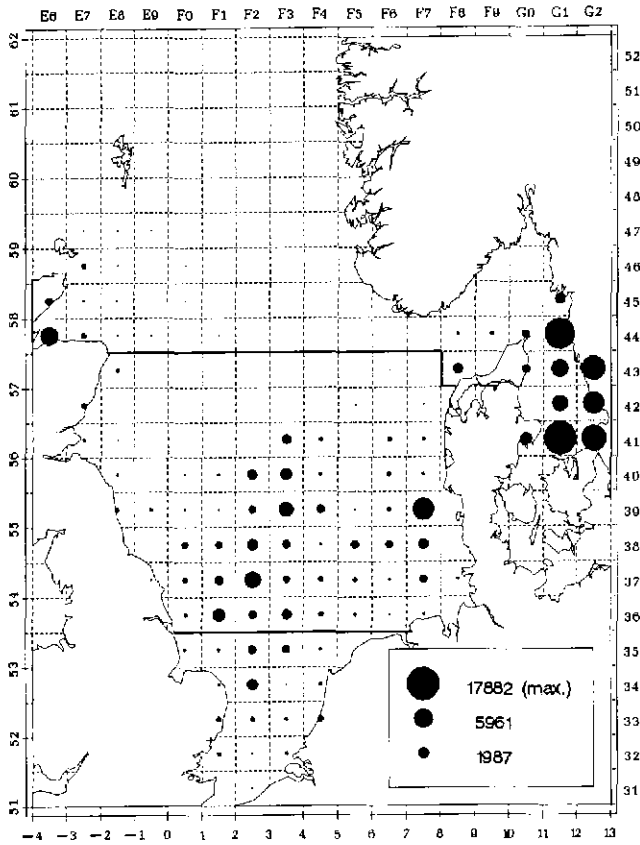
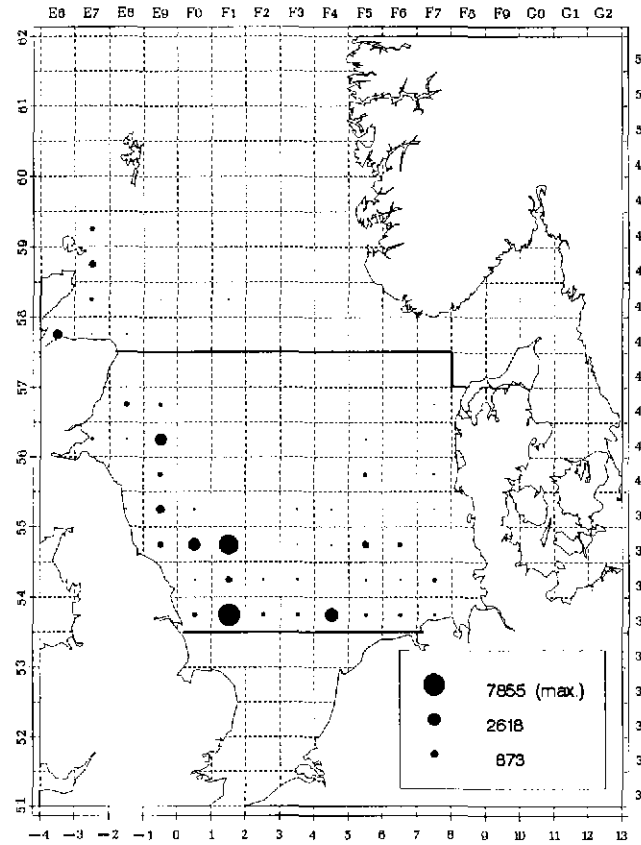


Figure 4.9 Sprat: mean catch number per hour, age-group 1.

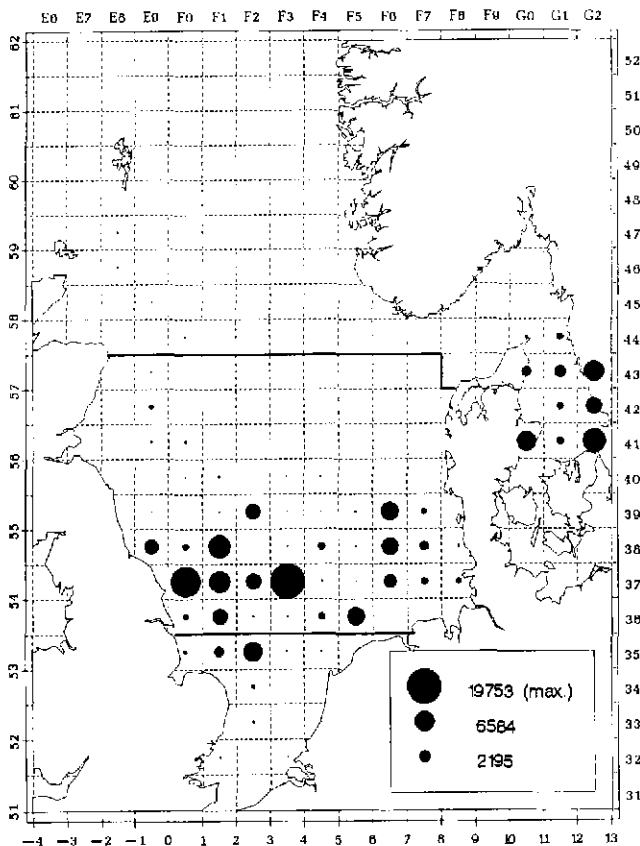
Sprat, Age group 2 1996 quarter 1
Abundance index: 558



Sprat, Age group 2 1996 quarter 2
Abundance index: 536



Sprat, Age group 2 1996 quarter 3
Abundance index: 1312



Sprat, Age group 2 1996 quarter 4
Abundance index: 339

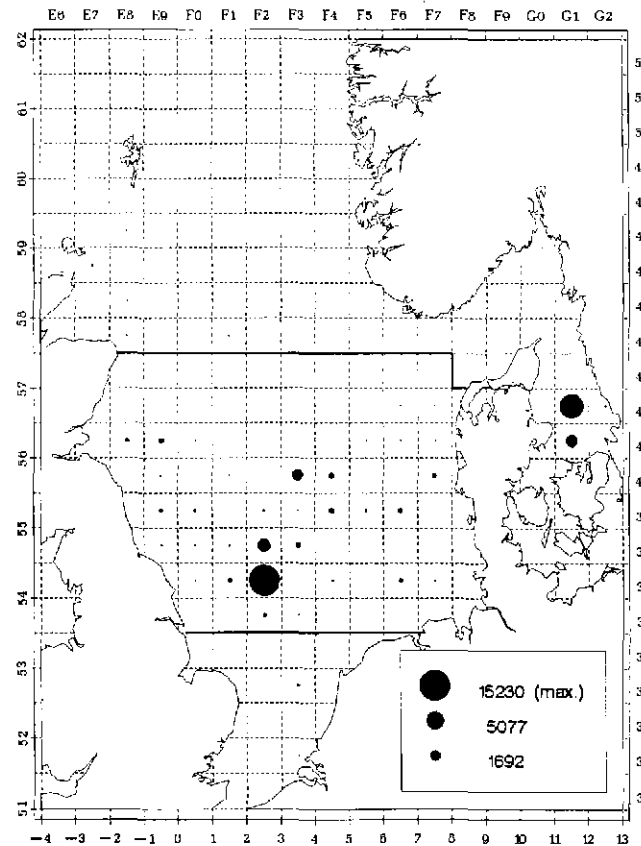
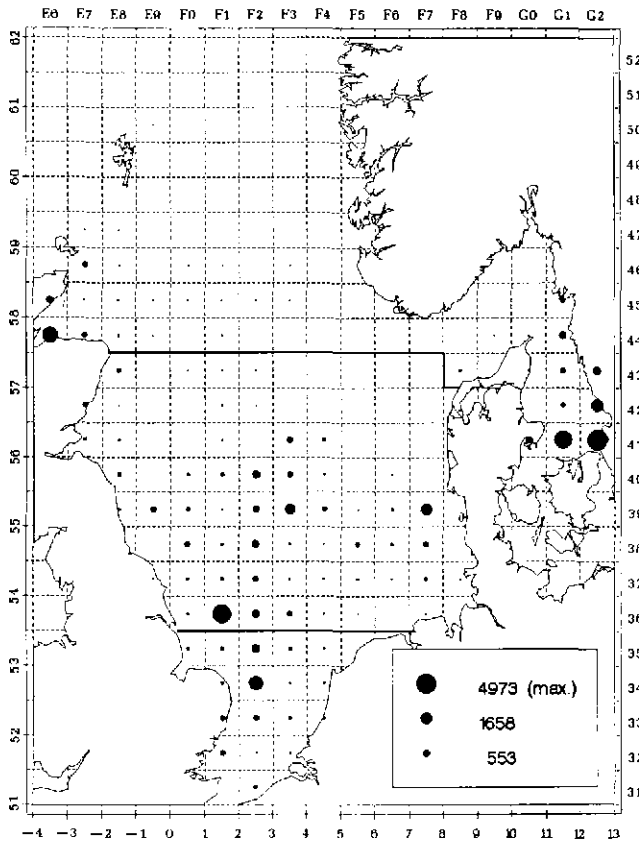
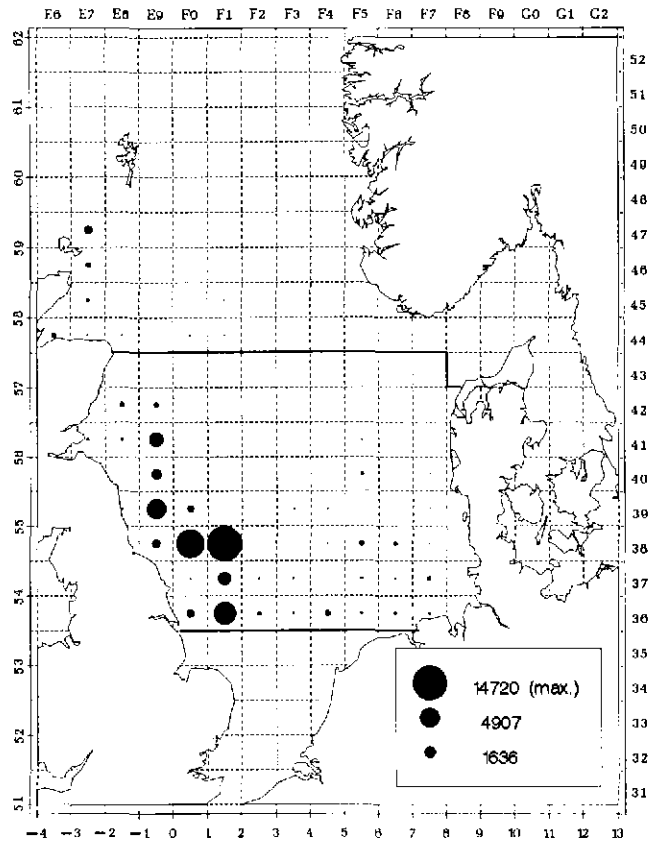


Figure 4.10 Sprat: mean catch number per hour, age-group 2.

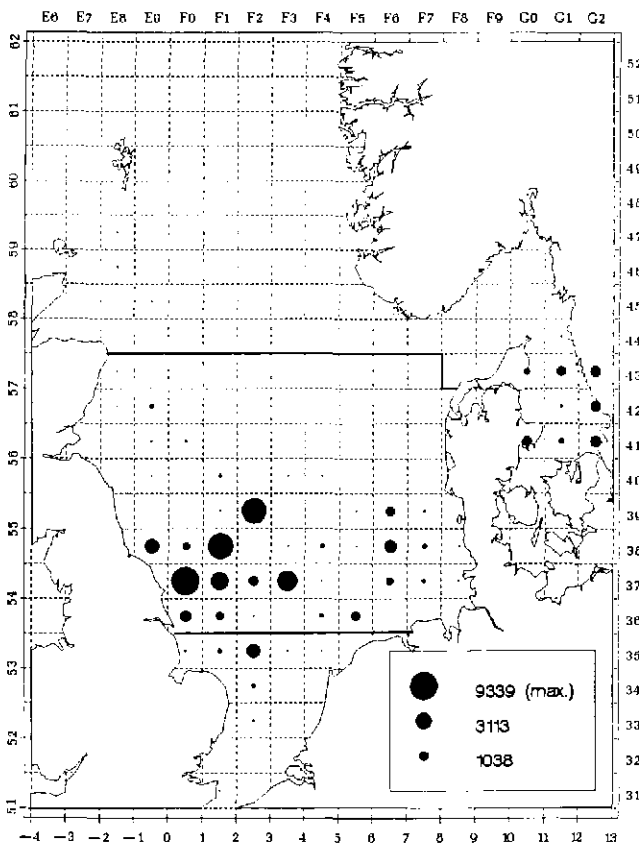
Sprat, Age group 3+ 1996 quarter 1



Sprat, Age group 3+ 1996 quarter 2



Sprat, Age group 3+ 1996 quarter 3



Sprat, Age group 3+ 1996 quarter 4

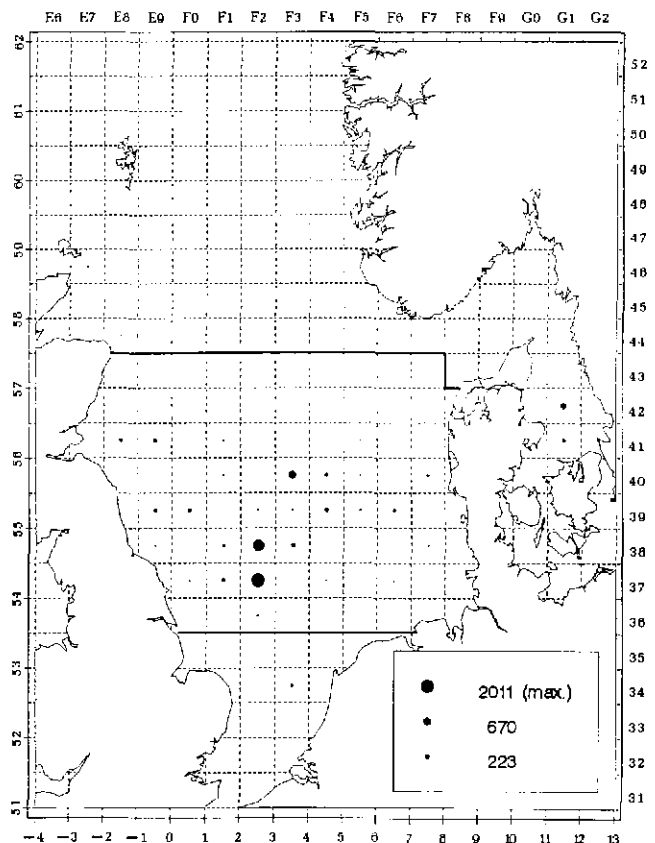
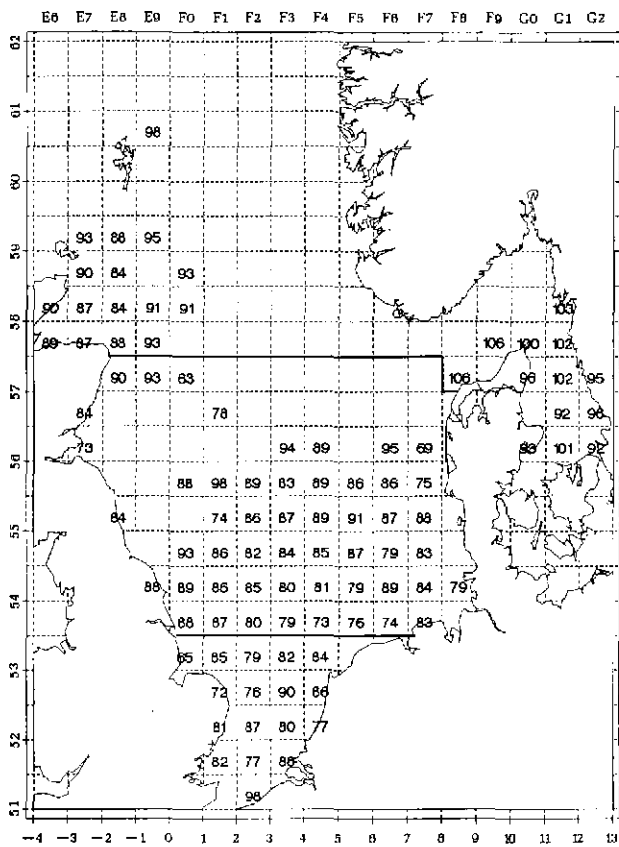
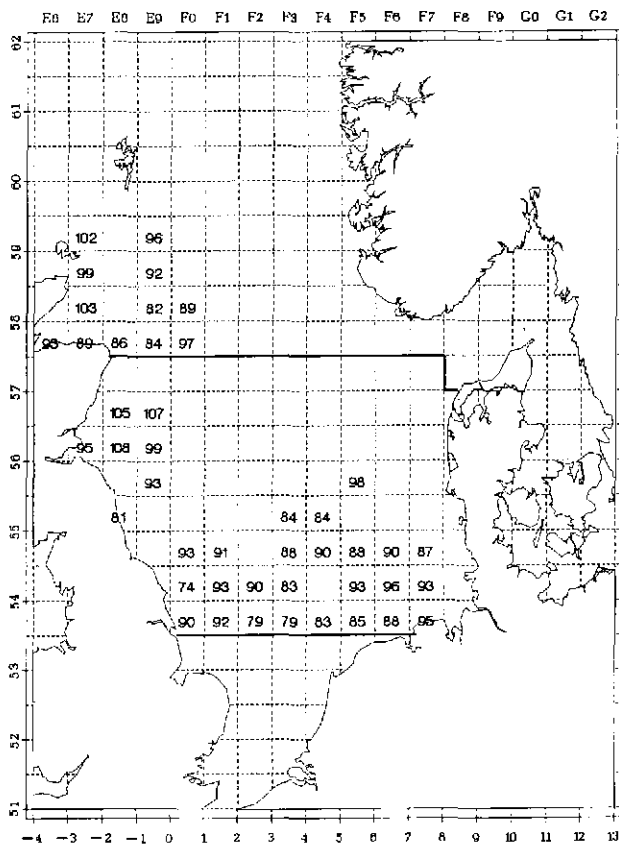


Figure 4.11 Sprat: mean catch number per hour, age-group 3+.

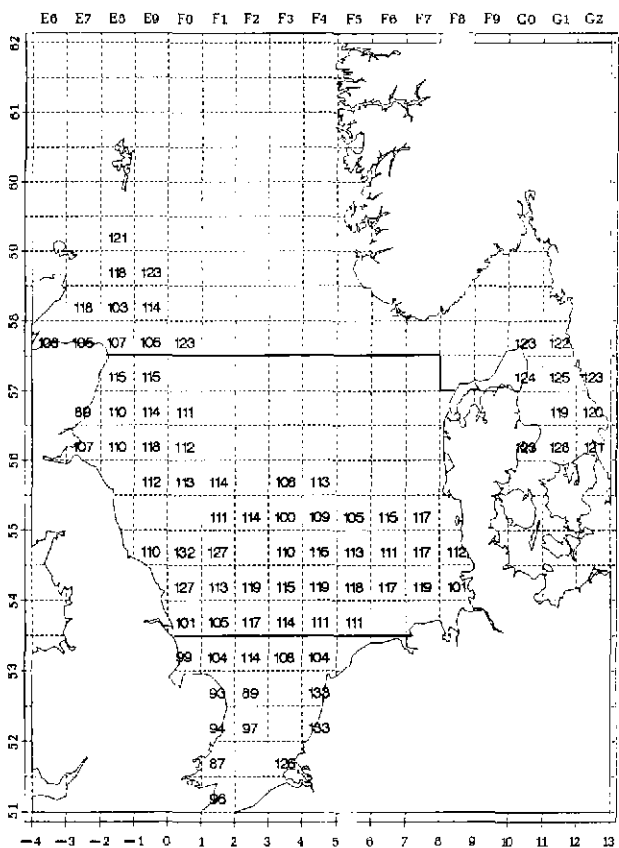
Sprat, Age group 1 1996 quarter 1



Sprat, Age group 1 1996 quarter 2



Sprat, Age group 1 1996 quarter 3



Sprat, Age group 1 1996 quarter 4

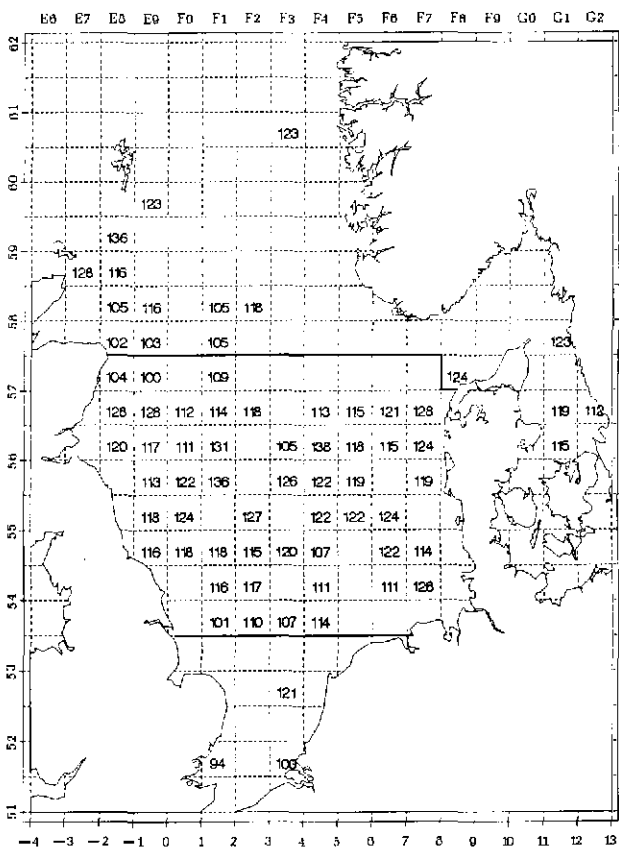


Figure 4.12 Sprat: mean length (mm), age-group 1.

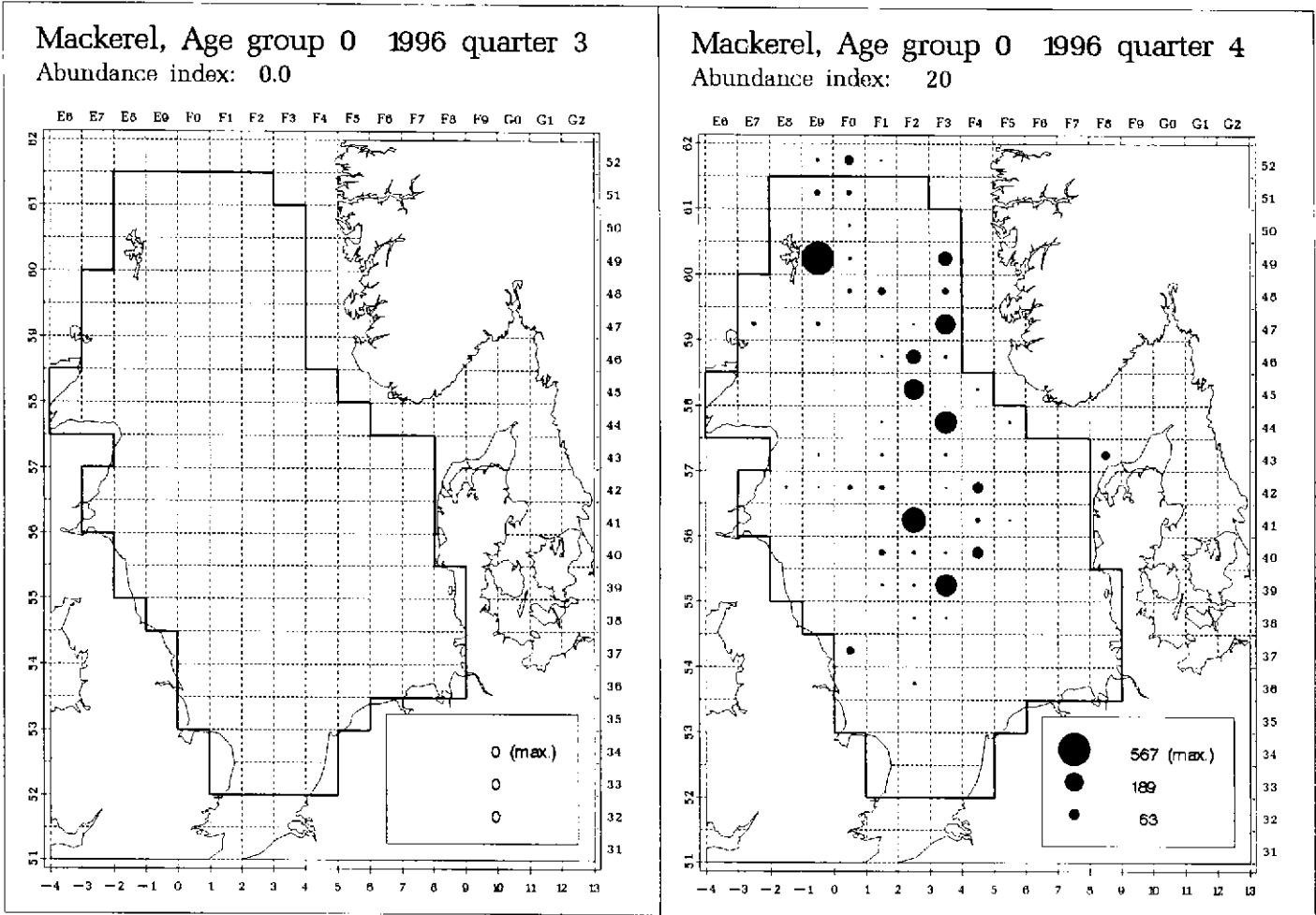


Figure 4.13 Mackerel: mean catch number per hour, age-group 0.

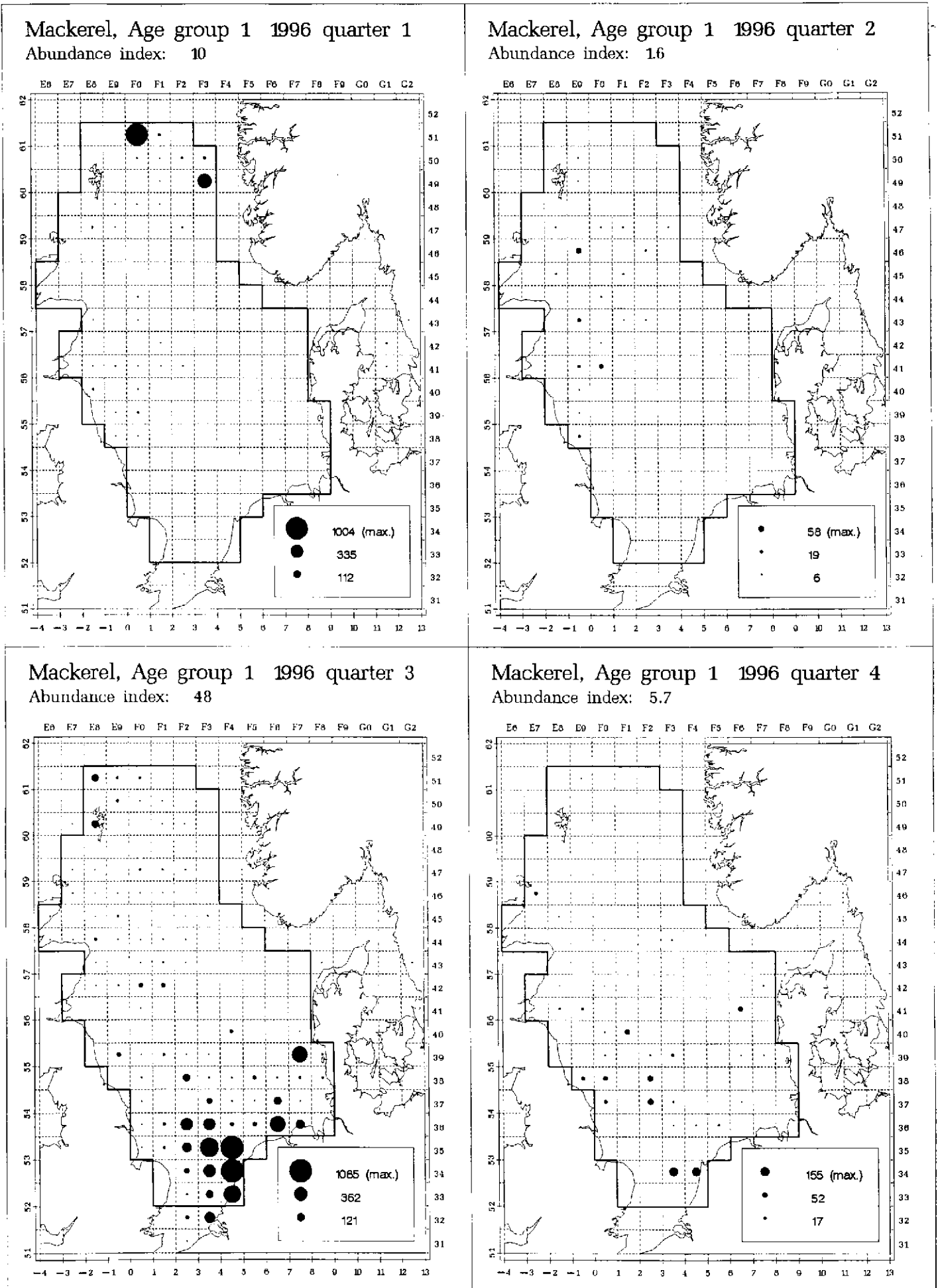
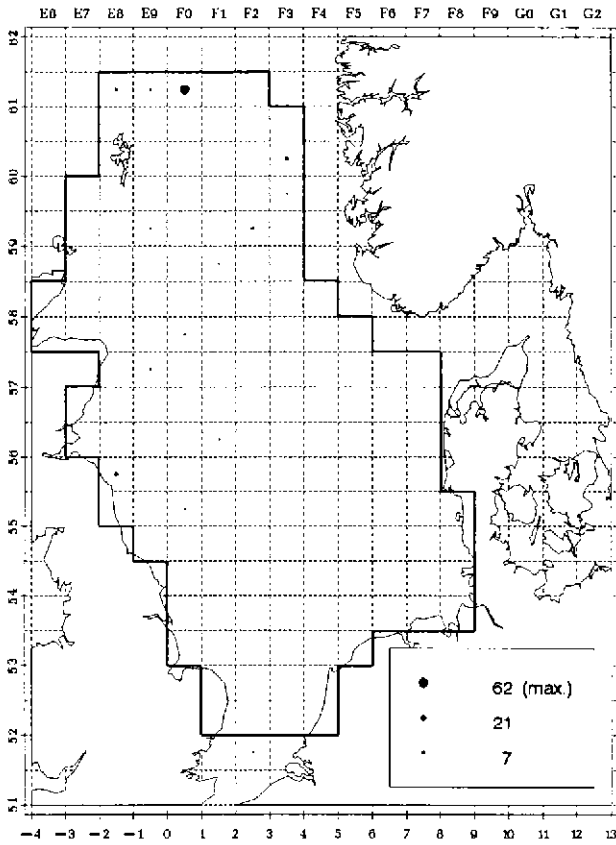
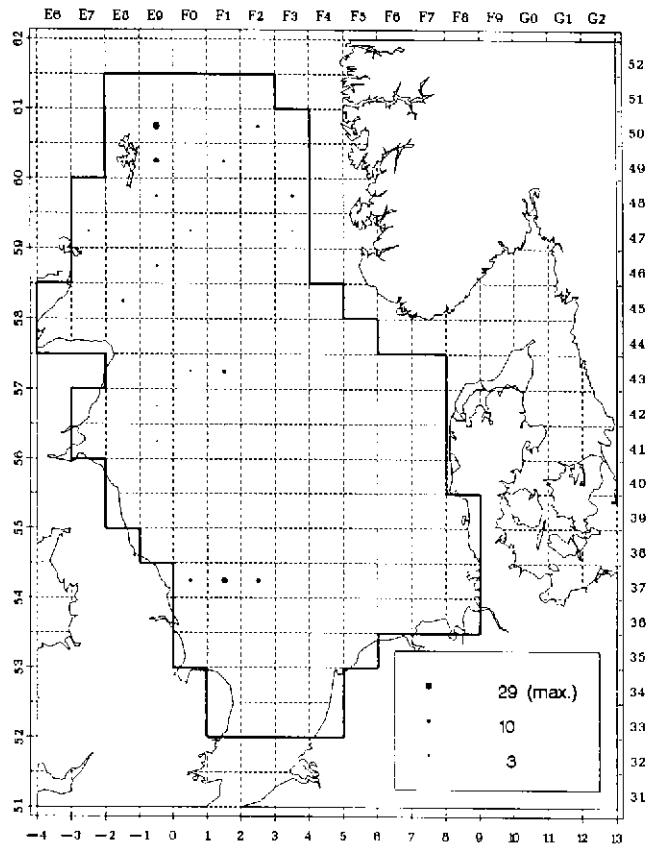


Figure 4.14 Mackerel: mean catch number per hour, age-group 1.

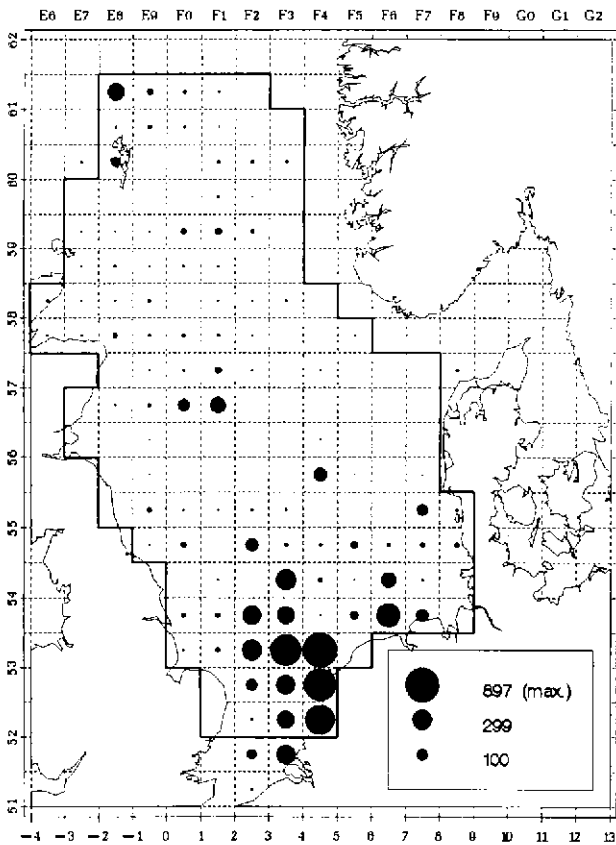
Mackerel, Age group 2 1996 quarter 1
Abundance index: 0.7



Mackerel, Age group 2 1996 quarter 2
Abundance index: 10



Mackerel, Age group 2 1996 quarter 3
Abundance index: 49



Mackerel, Age group 2 1996 quarter 4
Abundance index: 2.3

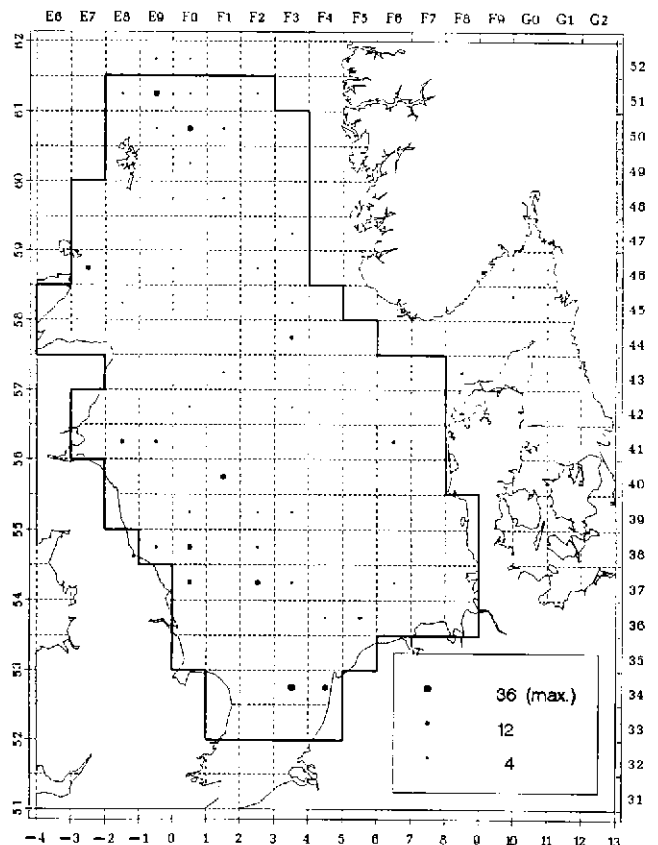
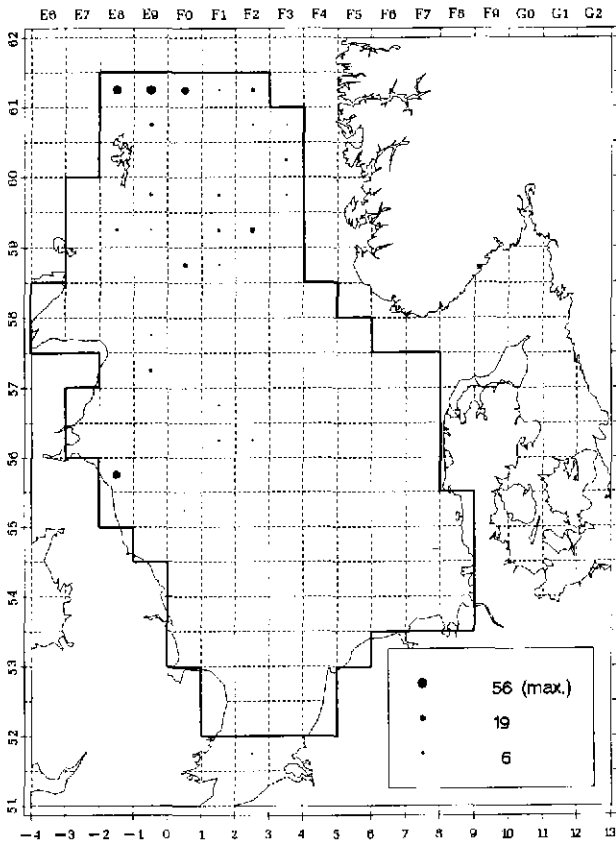
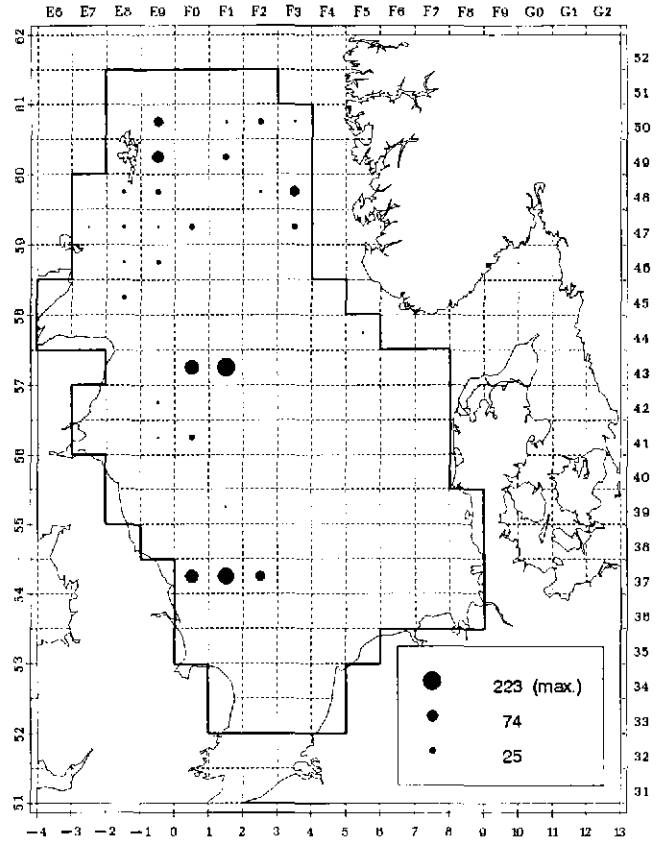


Figure 4.15 Mackerel: mean catch number per hour, age-group 2.

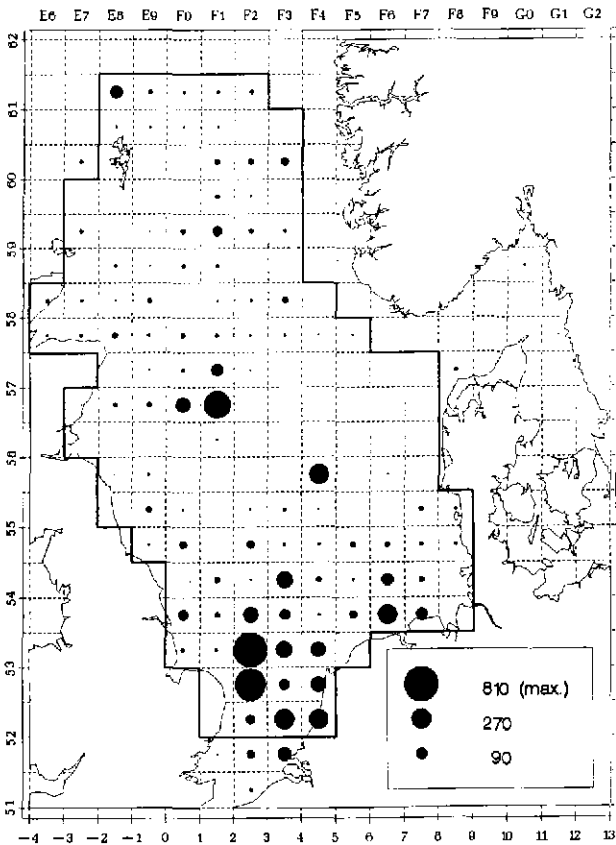
Mackerel, Age group 3+ 1996 quarter 1



Mackerel, Age group 3+ 1996 quarter 2



Mackerel, Age group 3+ 1996 quarter 3



Mackerel, Age group 3+ 1996 quarter 4

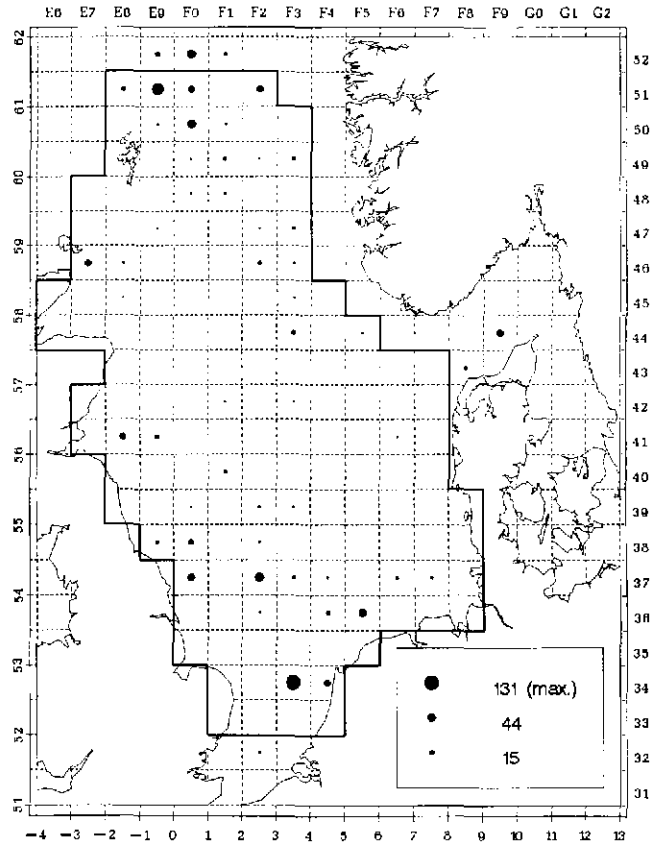
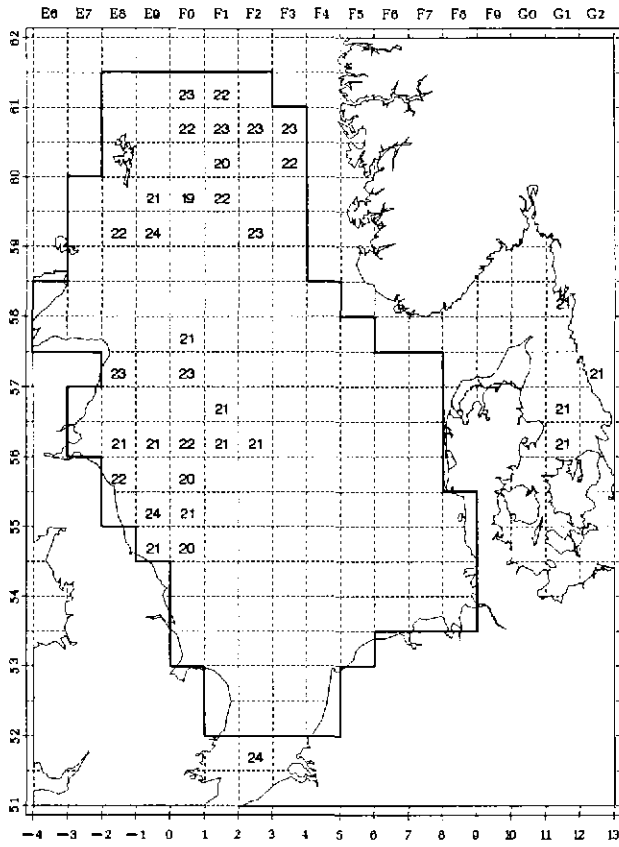
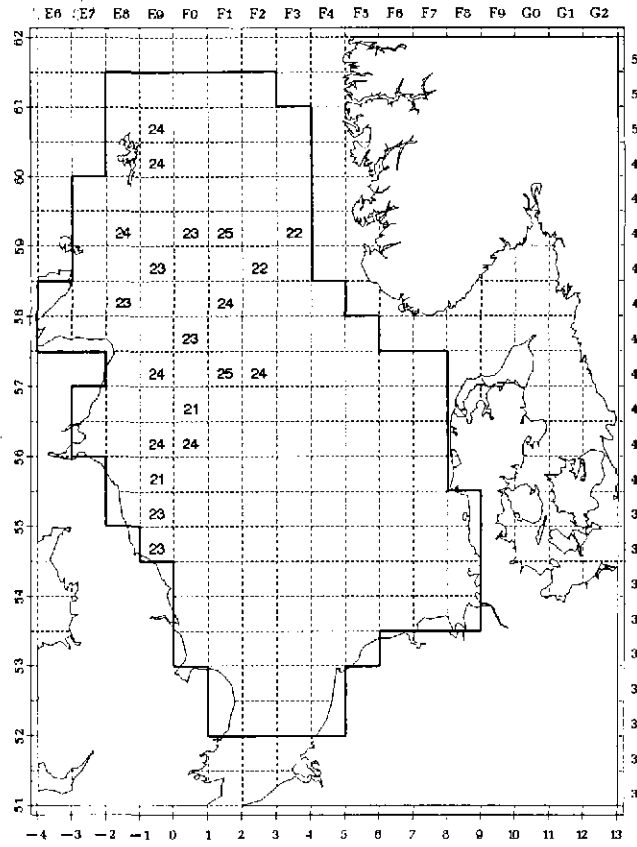


Figure 4.16 Mackerel: mean catch number per hour, age-group 3+.

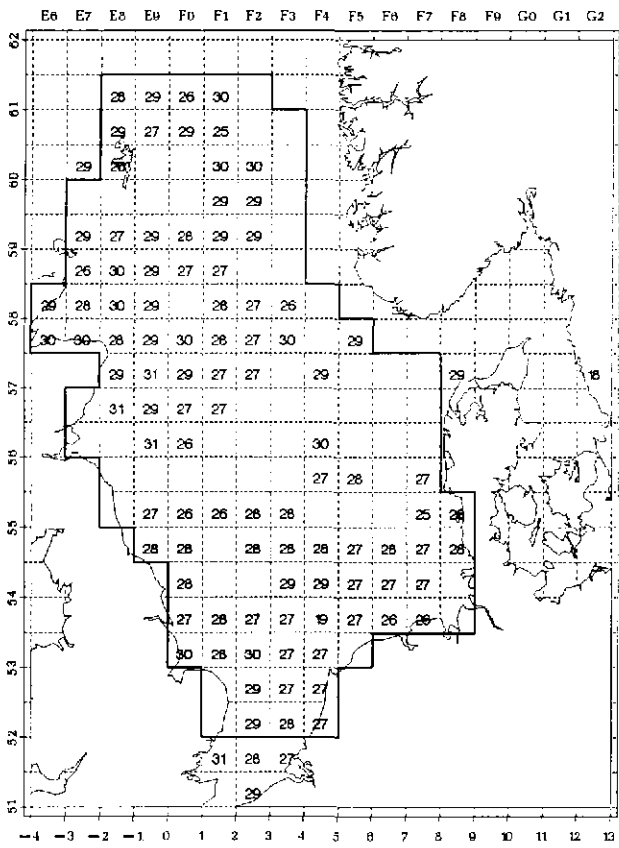
Mackerel, Age group 1 1996 quarter 1



Mackerel, Age group 1 1996 quarter 2



Mackerel, Age group 1 1996 quarter 3



Mackerel, Age group 1 1996 quarter 4

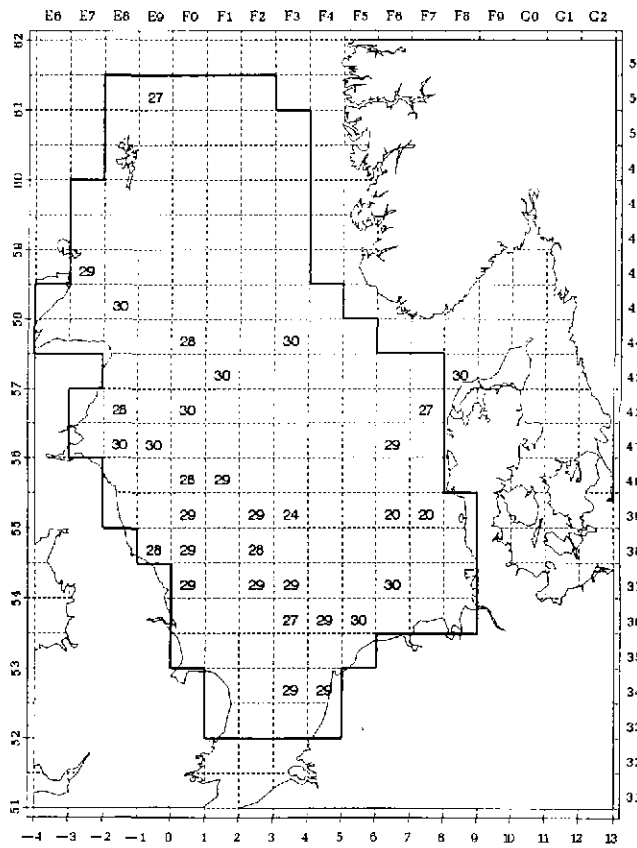
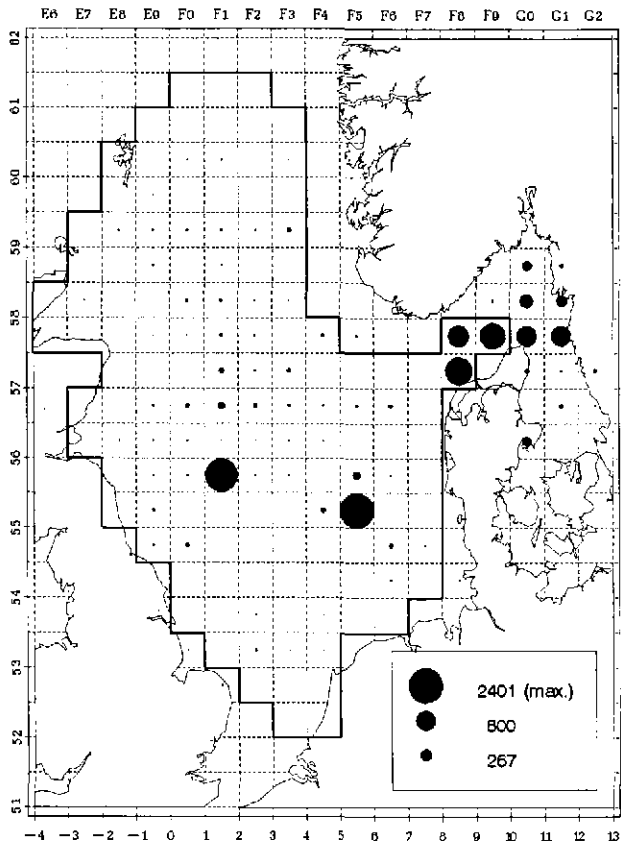


Figure 4.17 Mackerel: mean length (cm below), age-group 1.

Cod, Age group 0 1996 quarter 3
Abundance index: 69



Cod, Age group 0 1996 quarter 4
Abundance index: 23

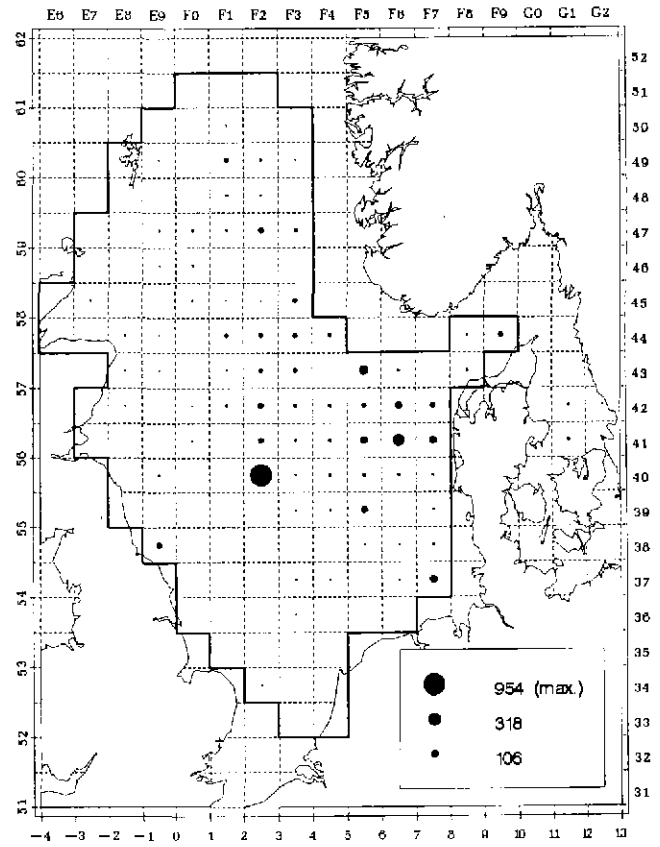
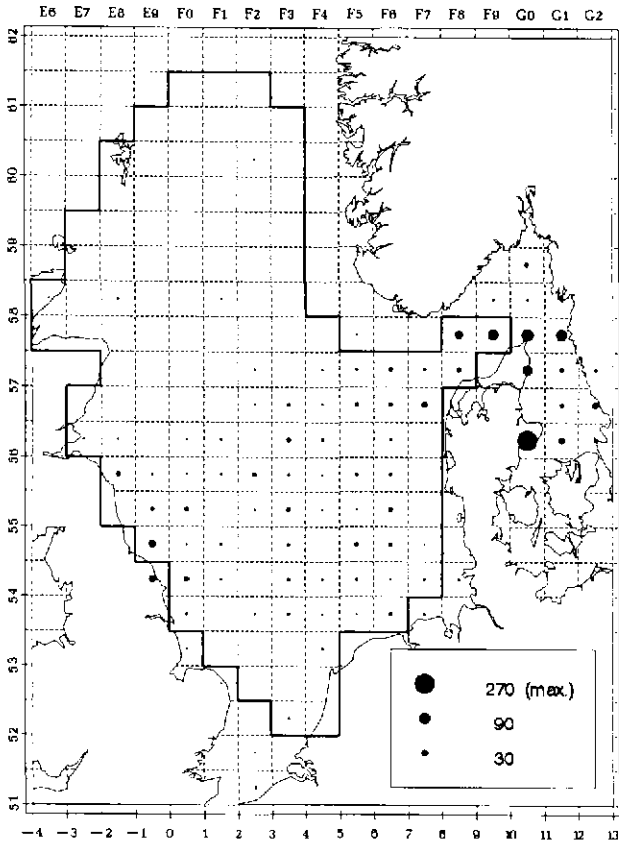
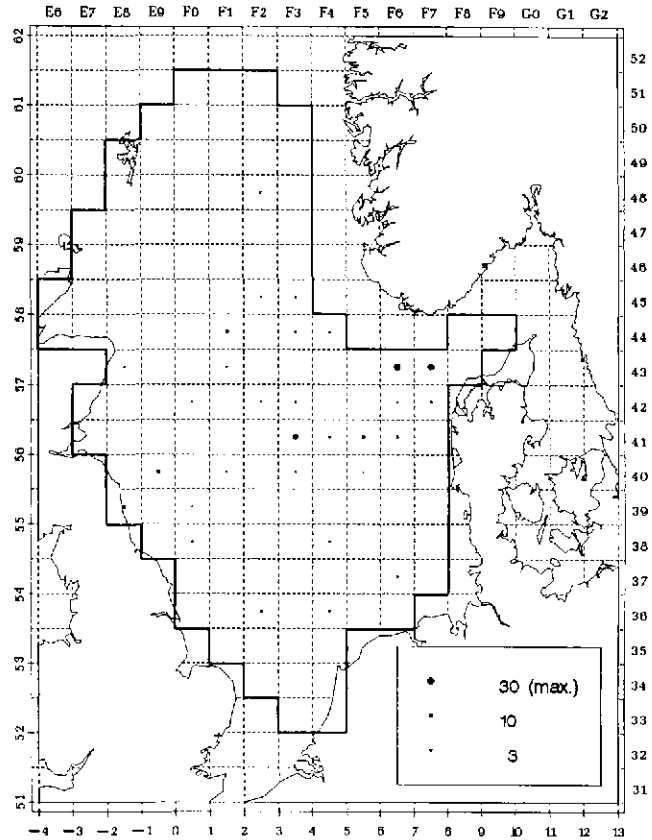


Figure 4.18 Cod: mean catch number per hour, age-group 0.

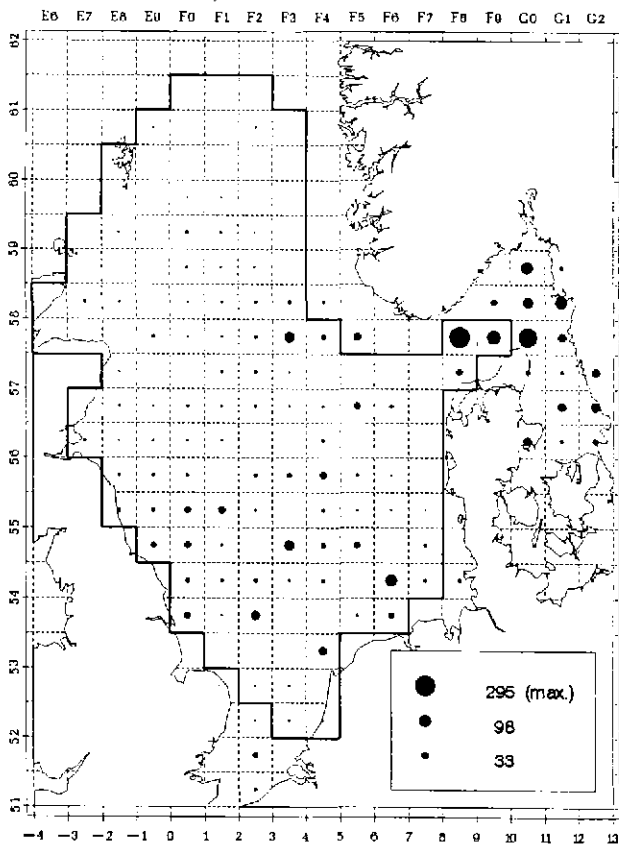
Cod, Age group 1 1996 quarter 1
Abundance index: 3.5



Cod, Age group 1 1996 quarter 2
Abundance index: 1.2



Cod, Age group 1 1996 quarter 3
Abundance index: 10



Cod, Age group 1 1996 quarter 4
Abundance index: 20

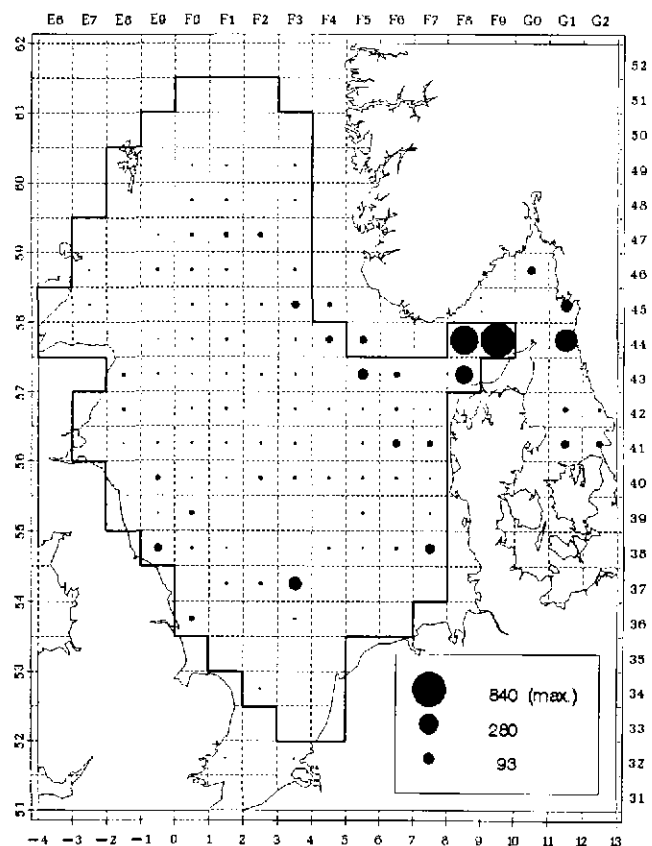


Figure 4.19 Cod: mean catch number per hour, age-group 1.

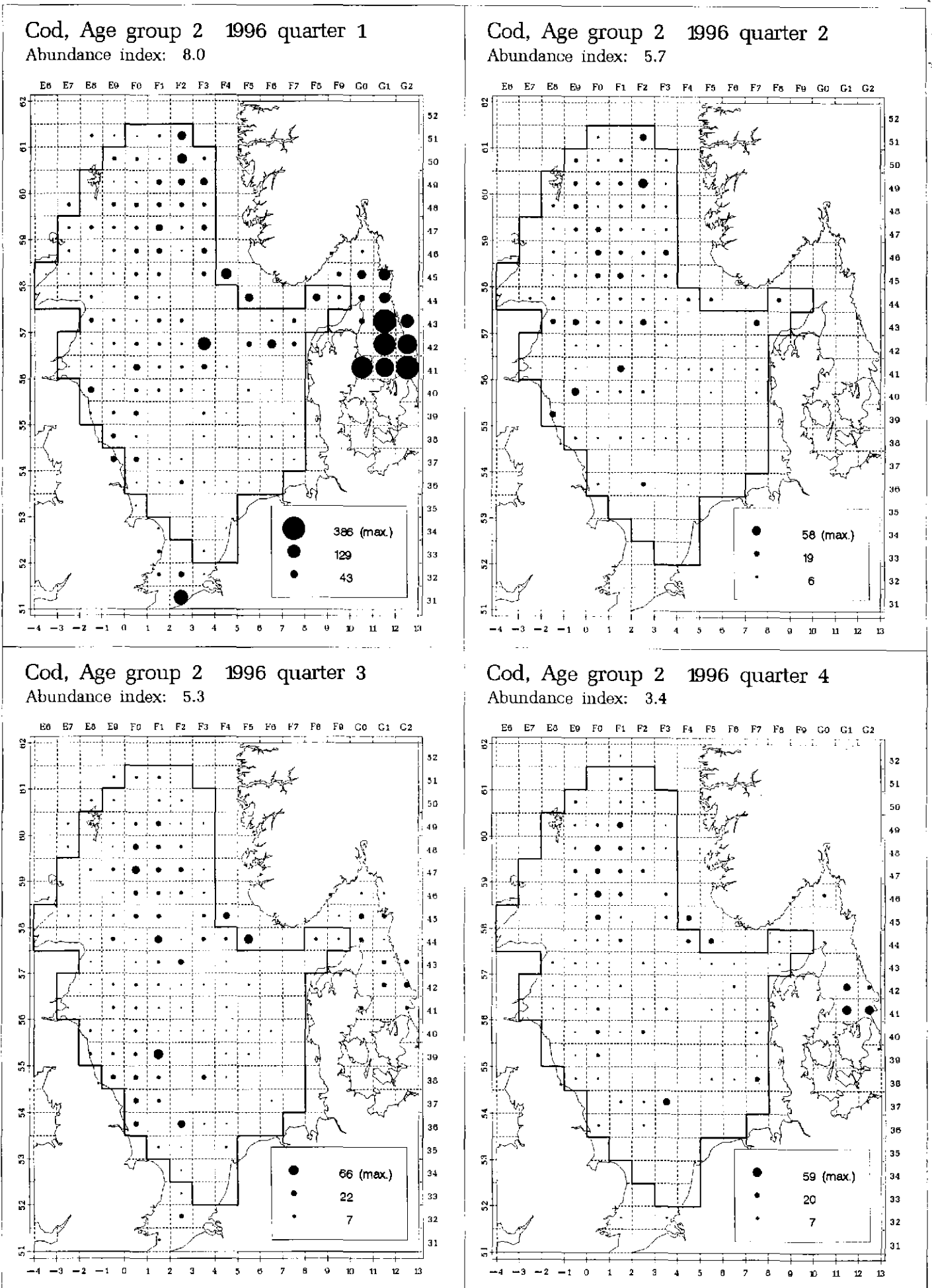
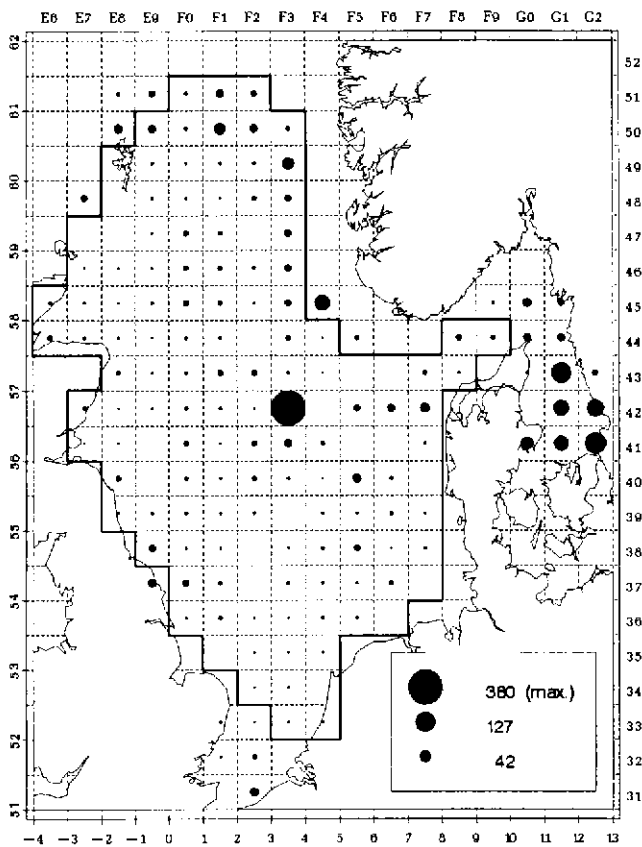
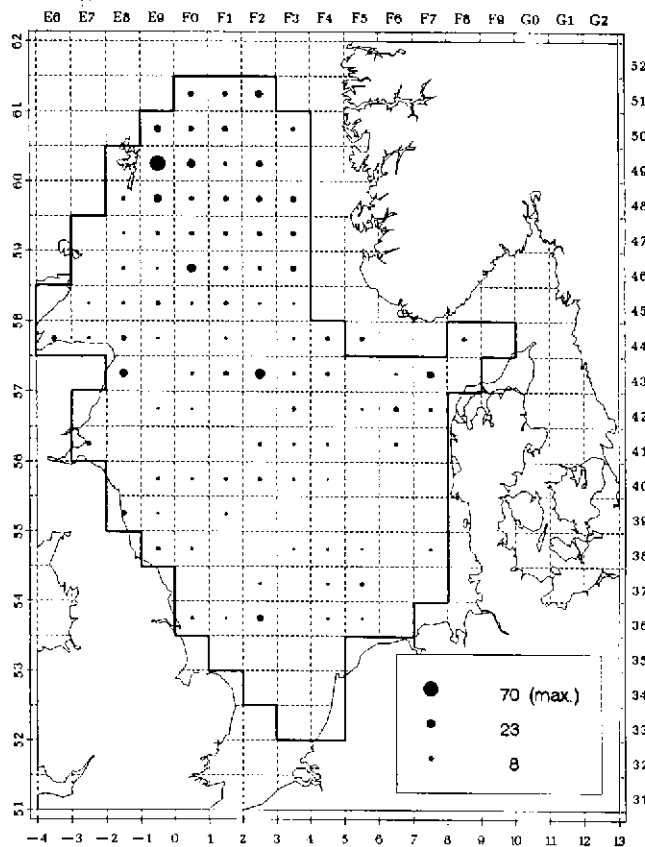


Figure 4.20 Cod: mean catch number per hour, age-group 2.

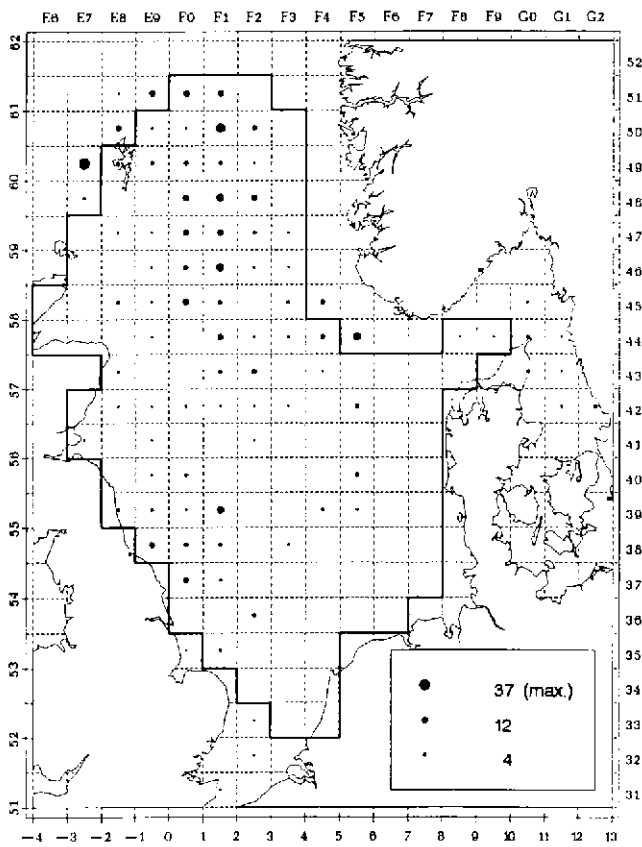
Cod, Age group 3+ 1996 quarter 1



Cod, Age group 3+ 1996 quarter 2



Cod, Age group 3+ 1996 quarter 3



Cod, Age group 3+ 1996 quarter 4

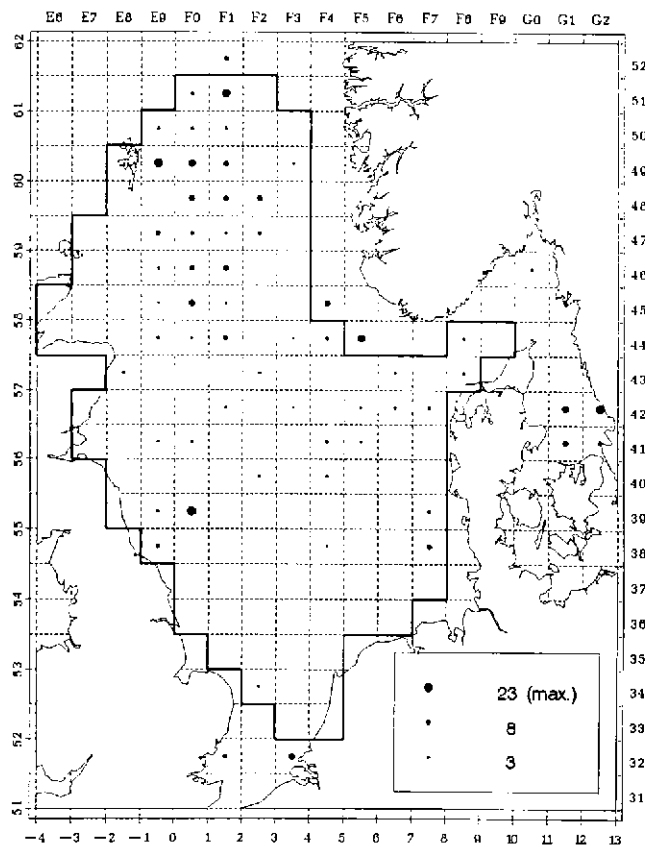
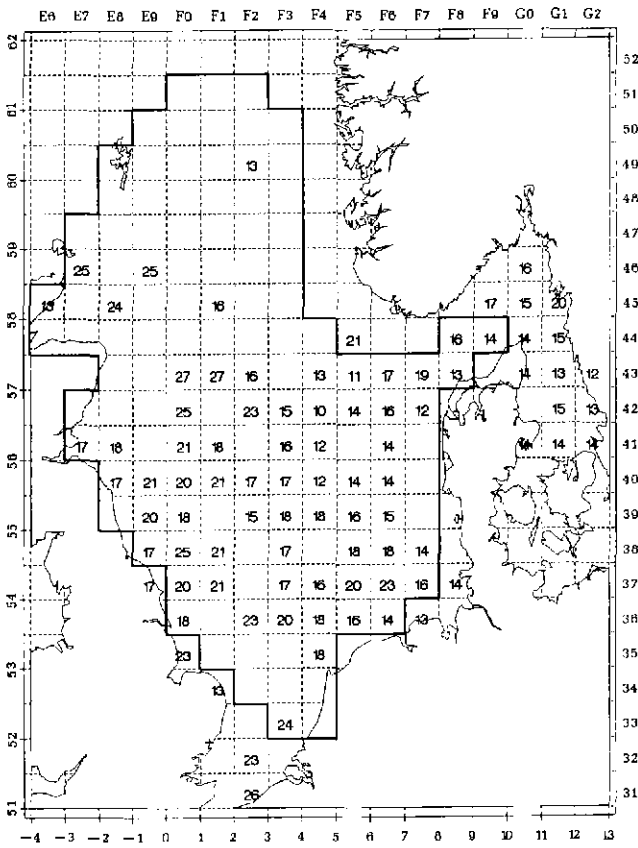
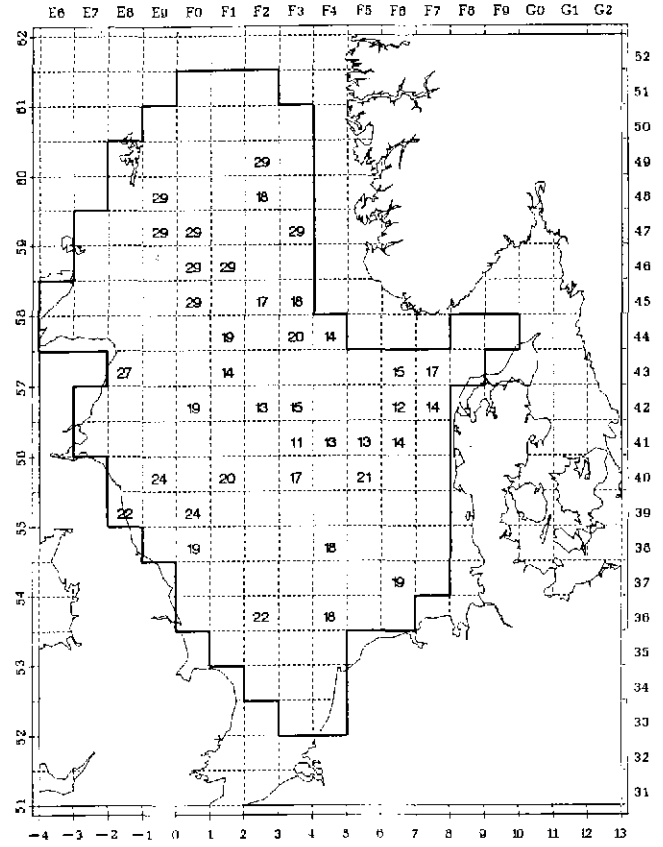


Figure 4.21 Cod: mean catch number per hour, age-group 3+.

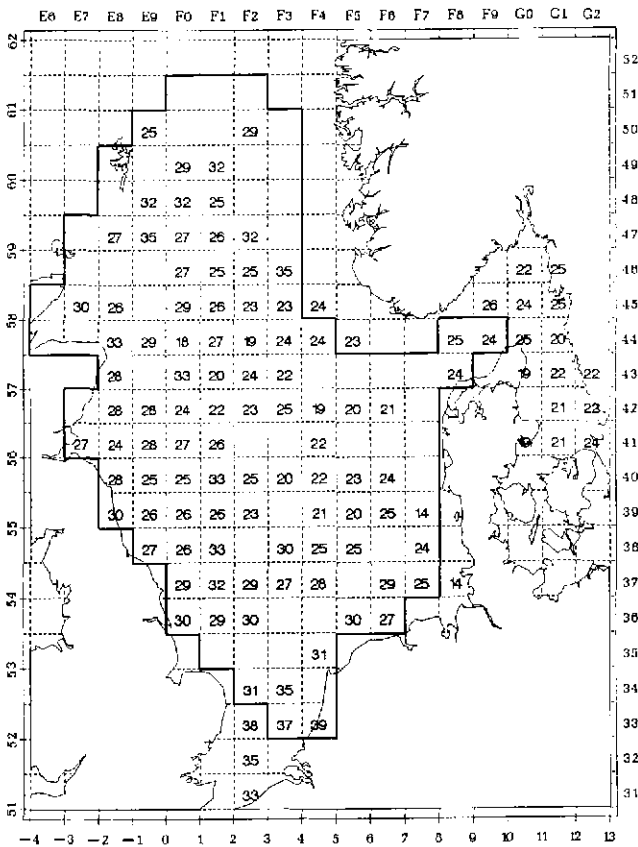
Cod, Age group 1 1996 quarter 1



Cod, Age group 1 1996 quarter 2



Cod, Age group 1 1996 quarter 3



Cod, Age group 1 1996 quarter 4

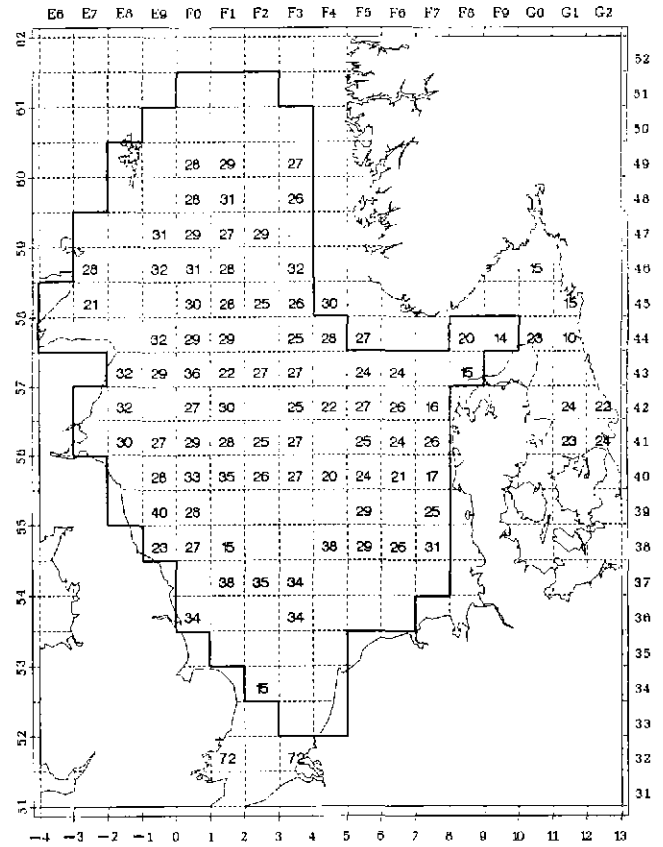


Figure 4.22 Cod; mean length (cm below), age-group 1.

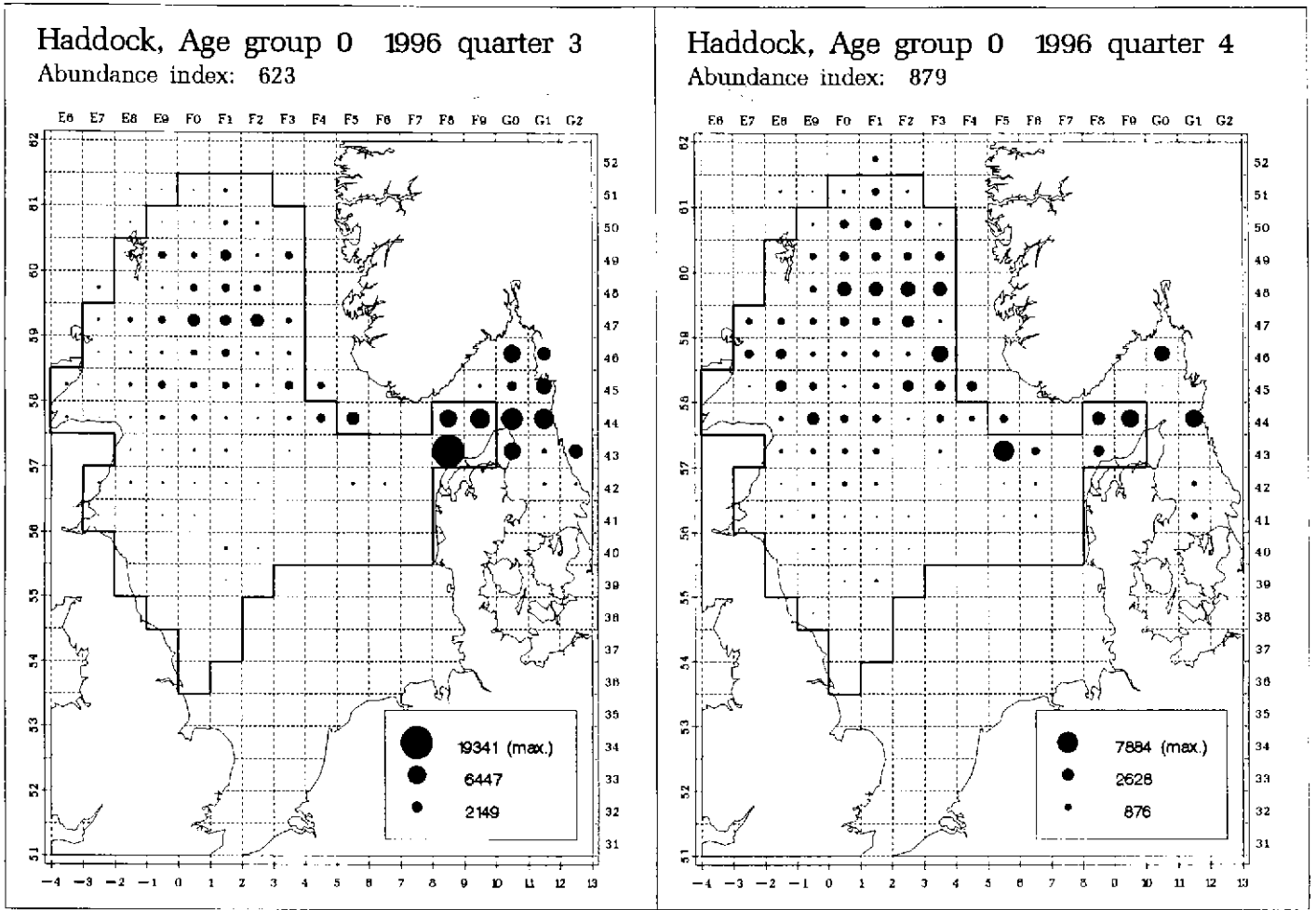
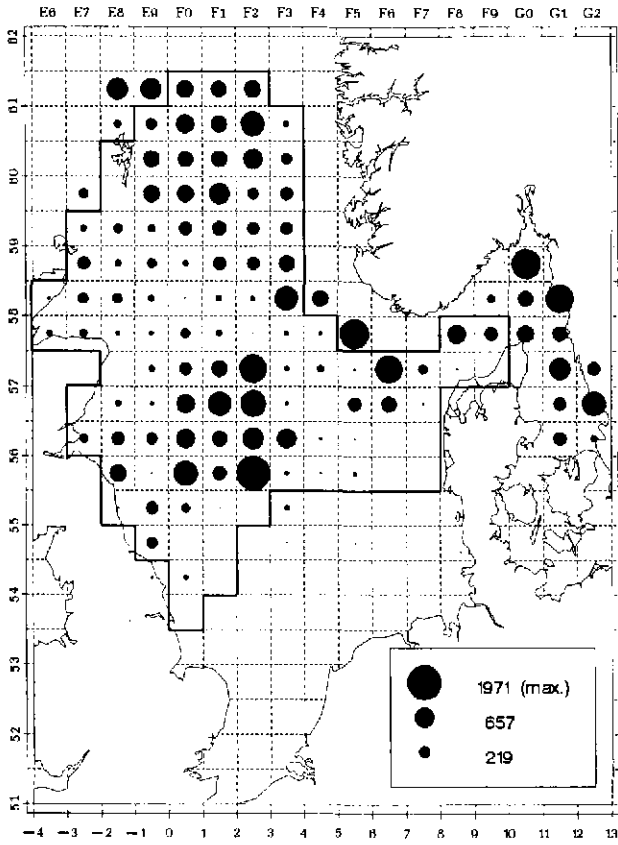
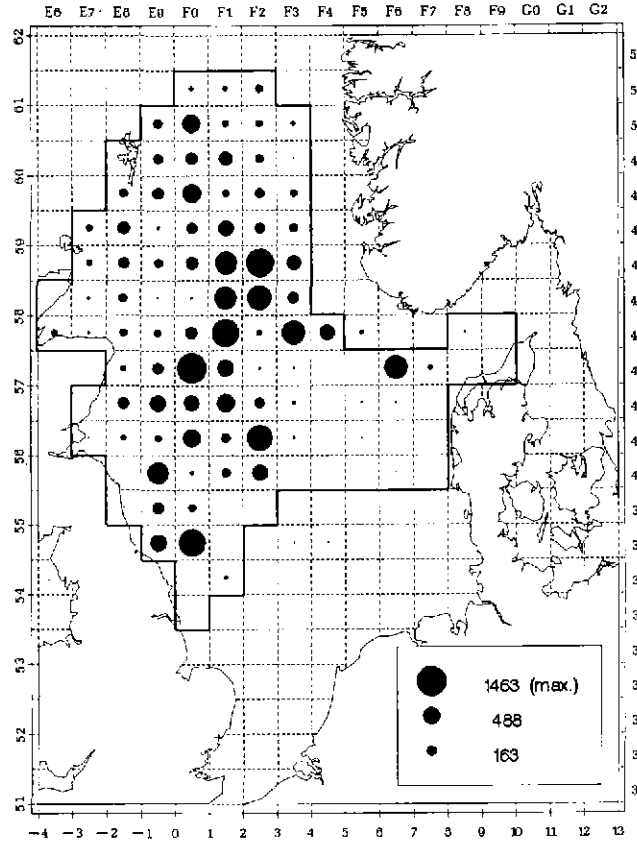


Figure 4.23 Haddock: mean catch number per hour, age-group 0.

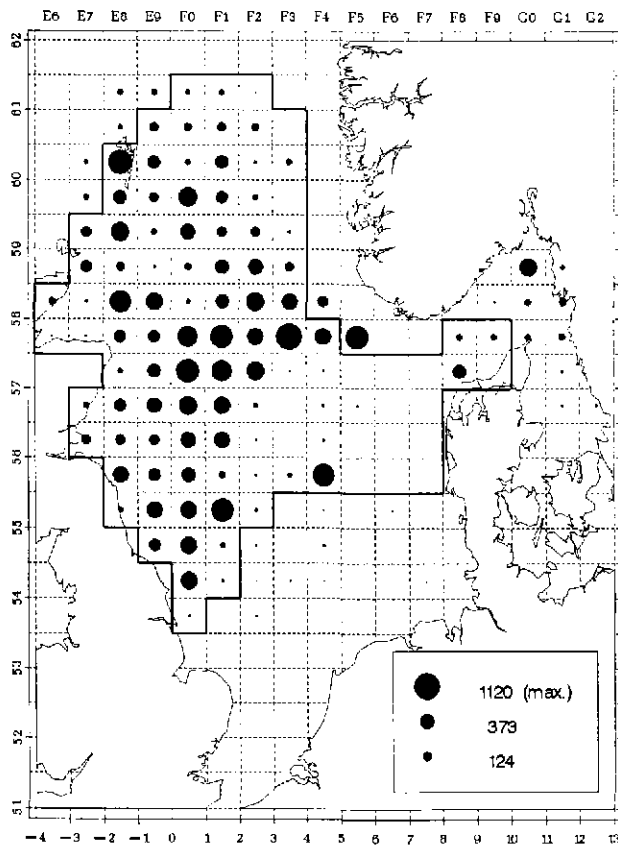
Haddock, Age group 1 1996 quarter 1
Abundance index: 267



Haddock, Age group 1 1996 quarter 2
Abundance index: 223



Haddock, Age group 1 1996 quarter 3
Abundance index: 249



Haddock, Age group 1 1996 quarter 4
Abundance index: 219

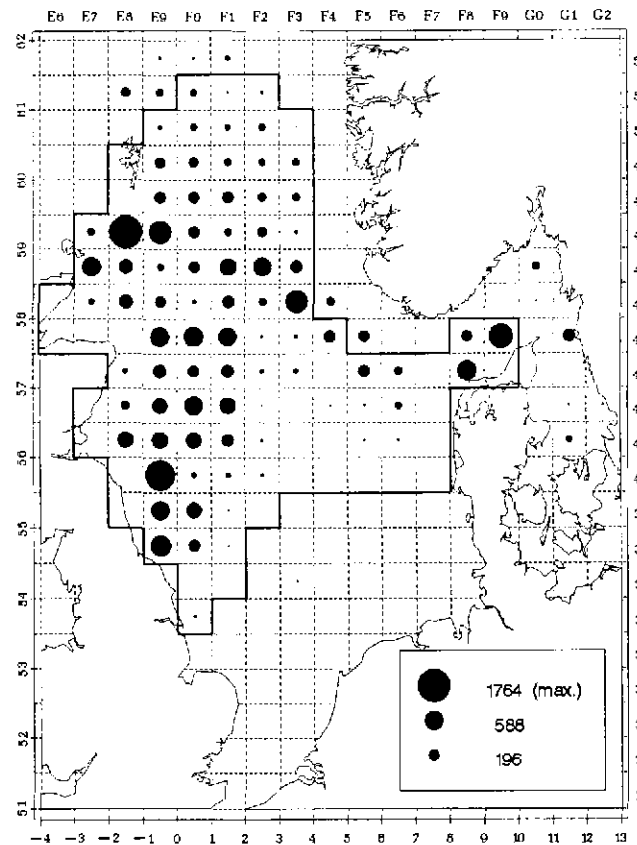
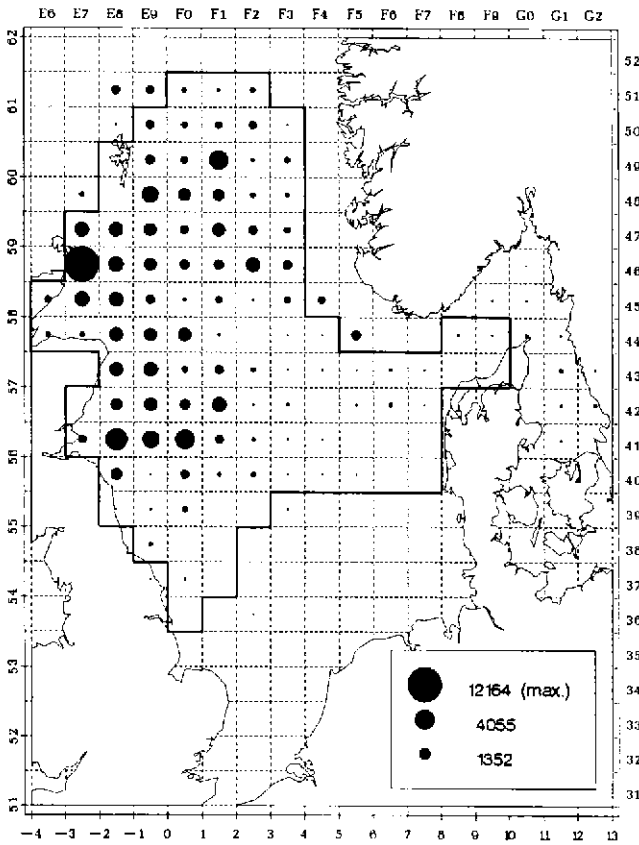
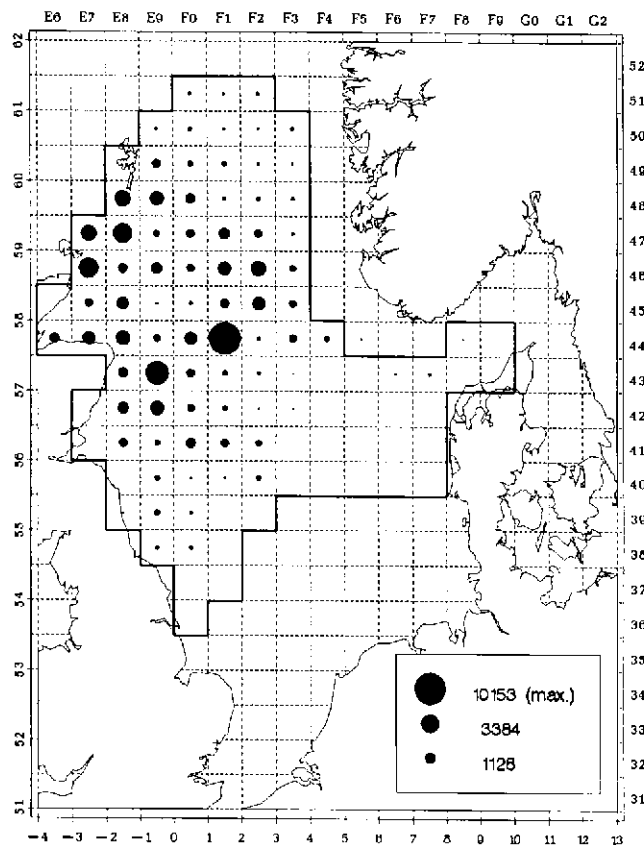


Figure 4.24 Haddock: mean catch number per hour, age-group 1.

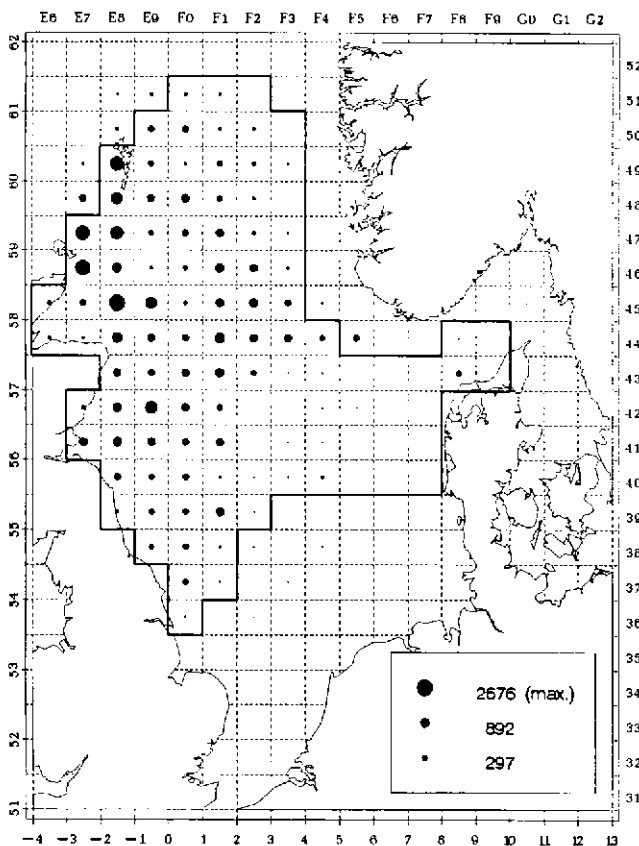
Haddock, Age group 2 1996 quarter 1
Abundance index: 813



Haddock, Age group 2 1996 quarter 2
Abundance index: 675



Haddock, Age group 2 1996 quarter 3
Abundance index: 447



Haddock, Age group 2 1996 quarter 4
Abundance index: 518

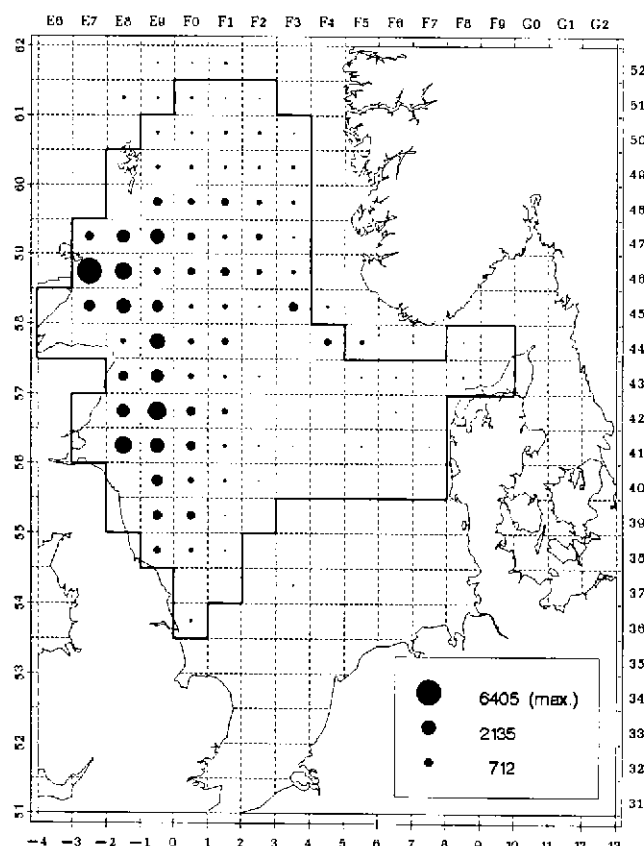
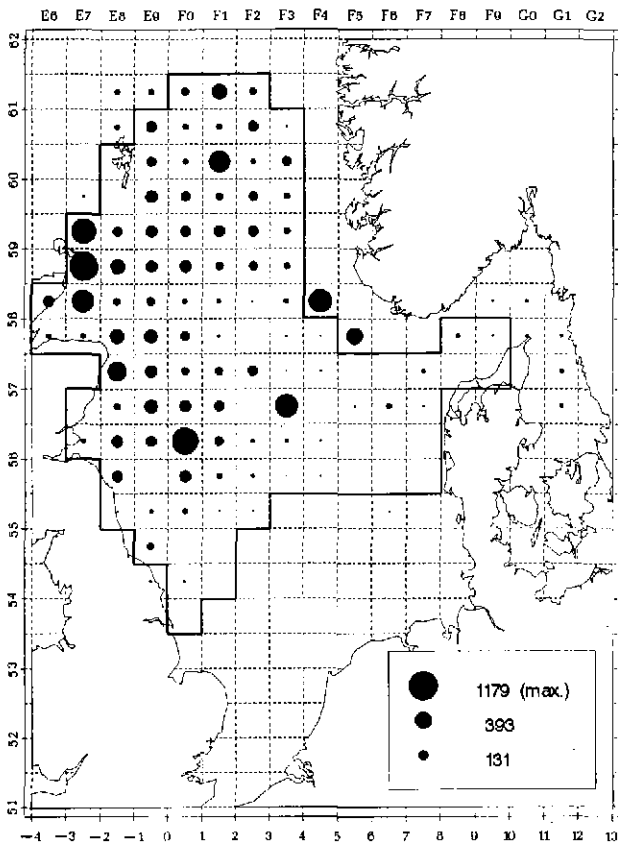
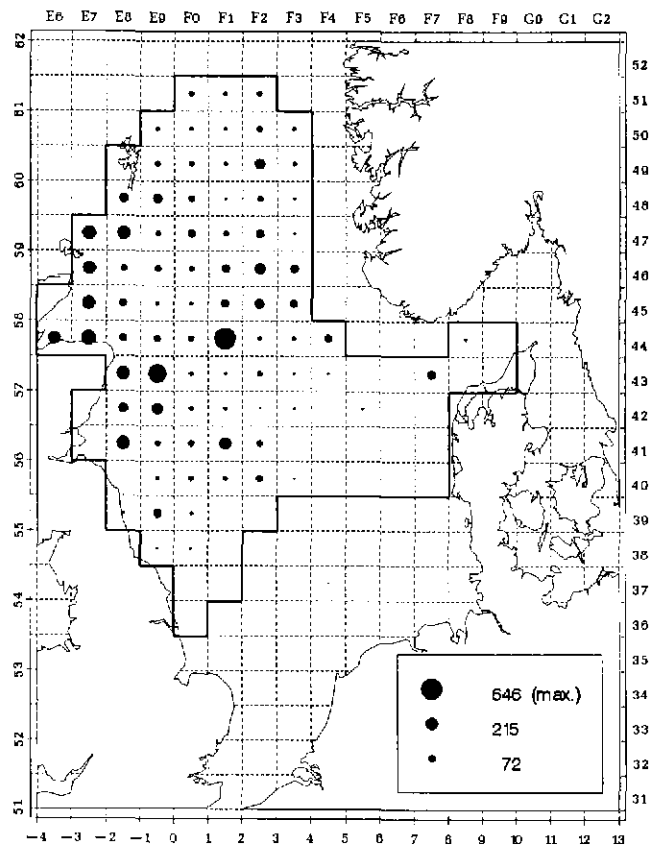


Figure 4.25 Haddock: mean catch number per hour, age-group 2.

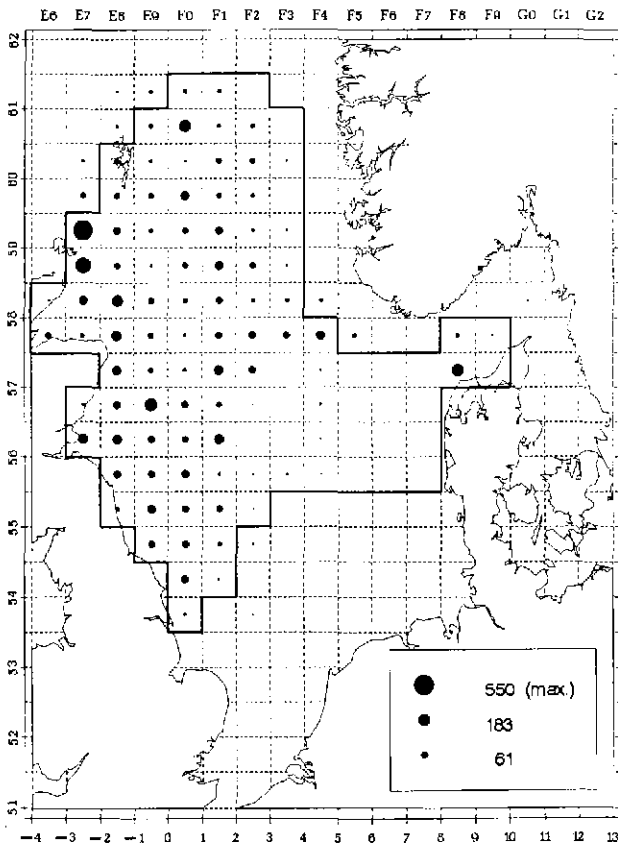
Haddock, Age group 3+ 1996 quarter 1



Haddock, Age group 3+ 1996 quarter 2



Haddock, Age group 3+ 1996 quarter 3



Haddock, Age group 3+ 1996 quarter 4

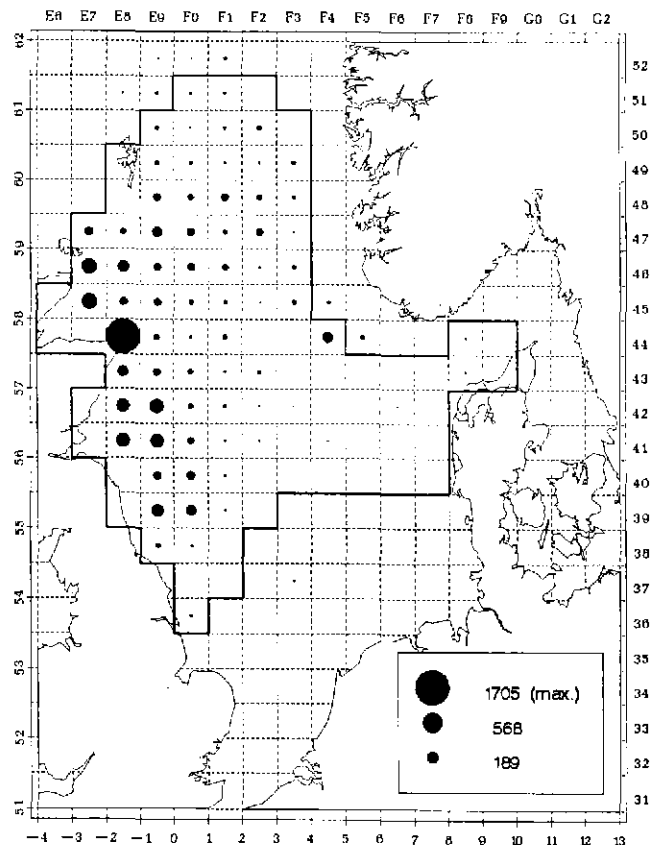


Figure 4.26 Haddock: mean catch number per hour, age-group 3+.

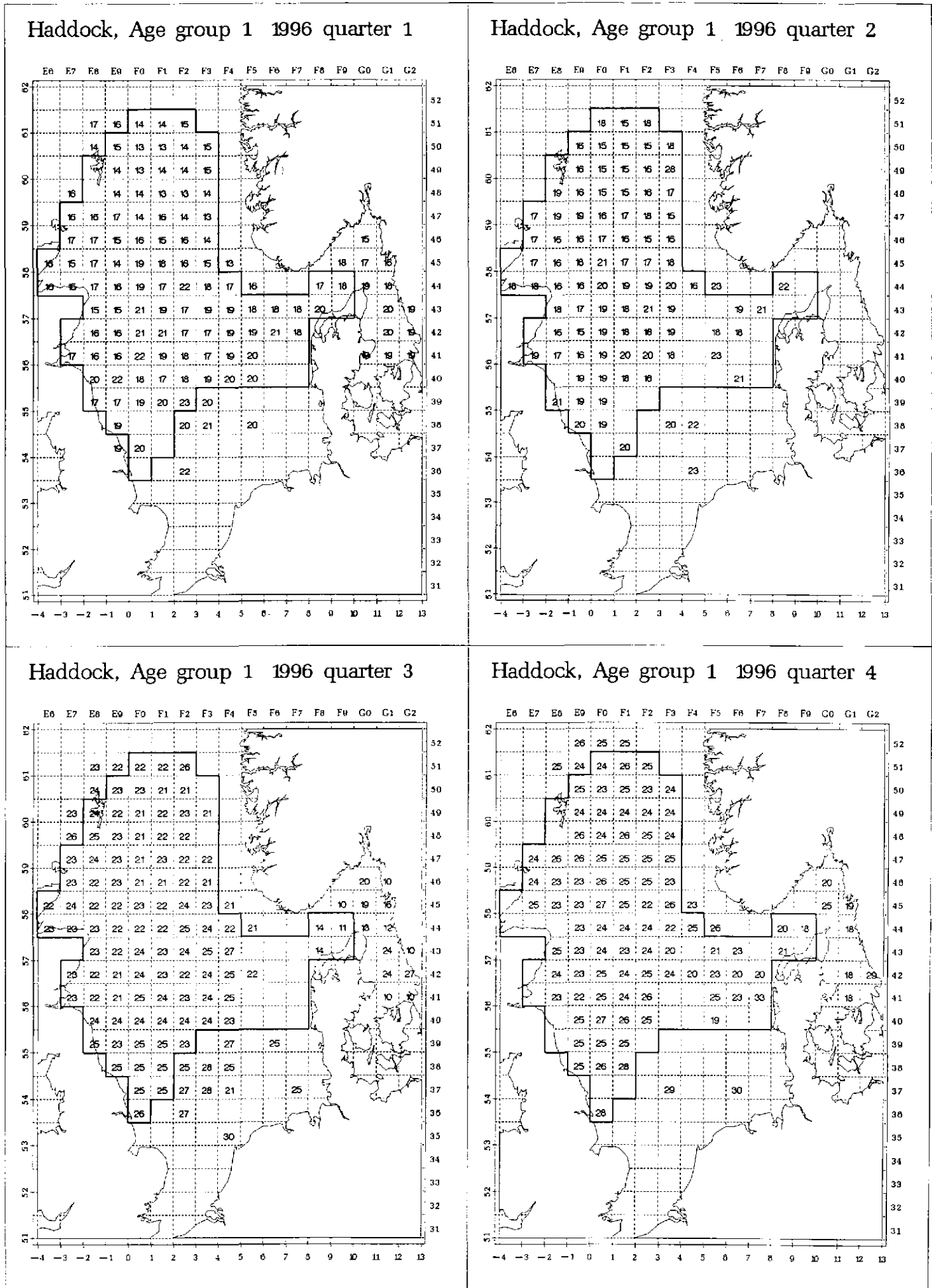
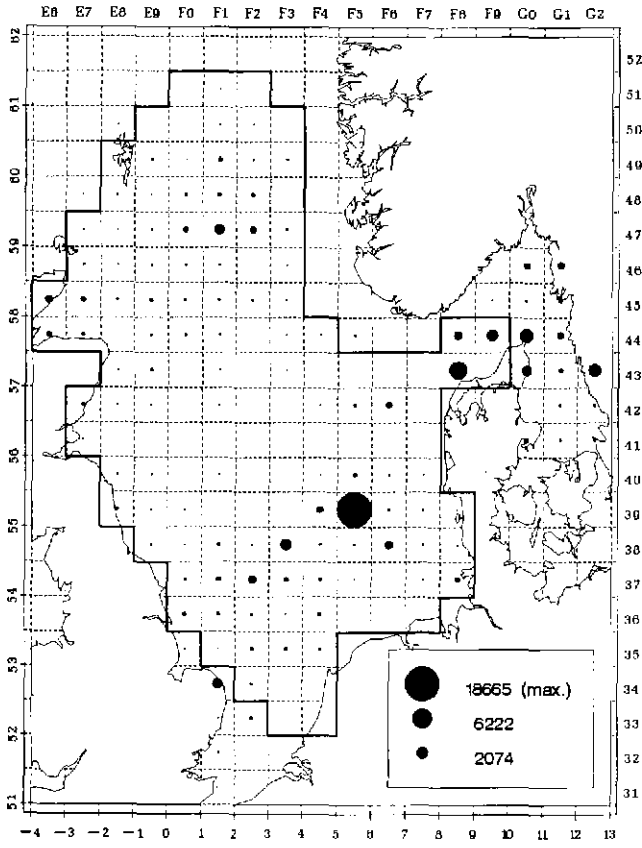


Figure 4.27 Haddock: mean length (cm below), age-group 1.

Whiting, Age group 0 1996 quarter 3
Abundance index: 315



Whiting, Age group 0 1996 quarter 4
Abundance index: 270

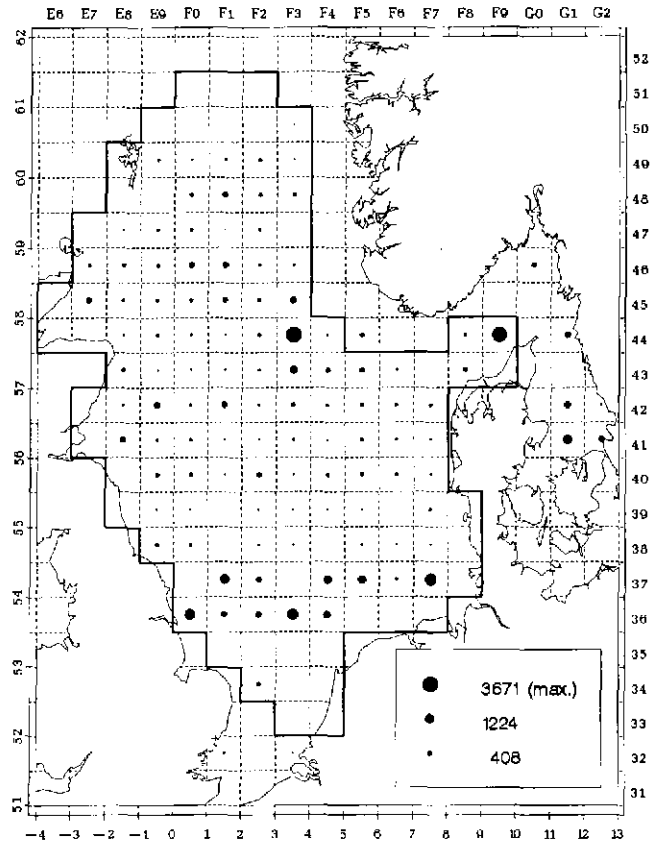
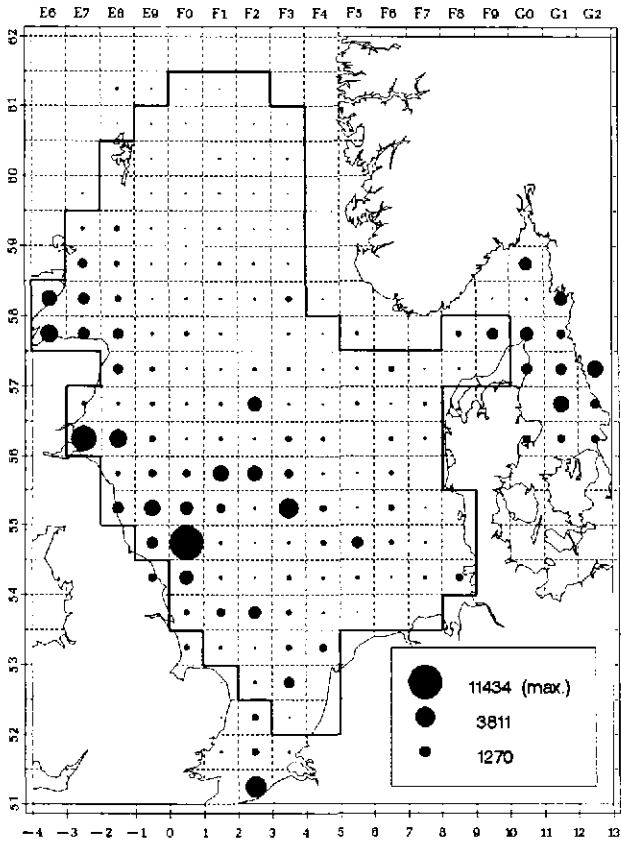
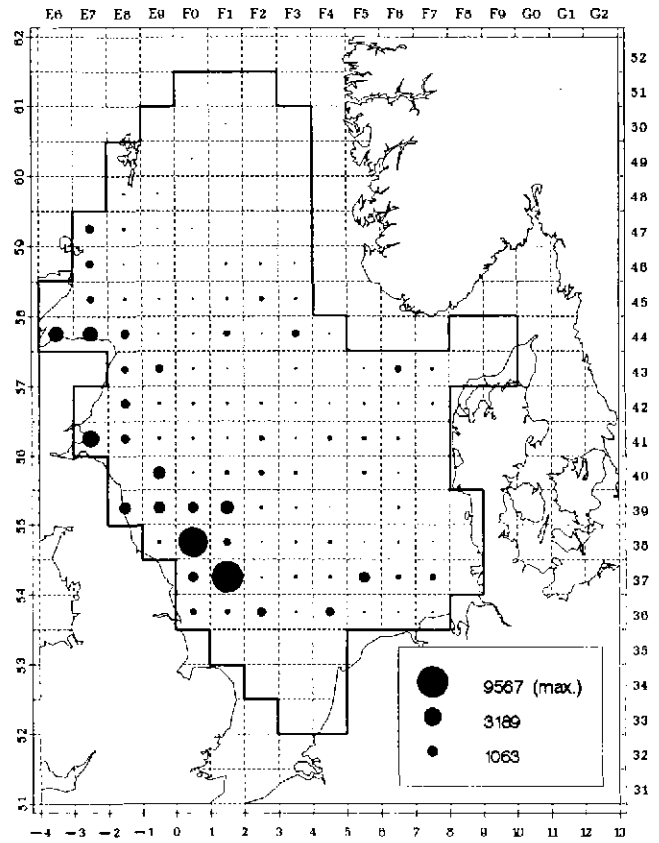


Figure 4.28 Whiting: mean catch number per hour, age-group 0.

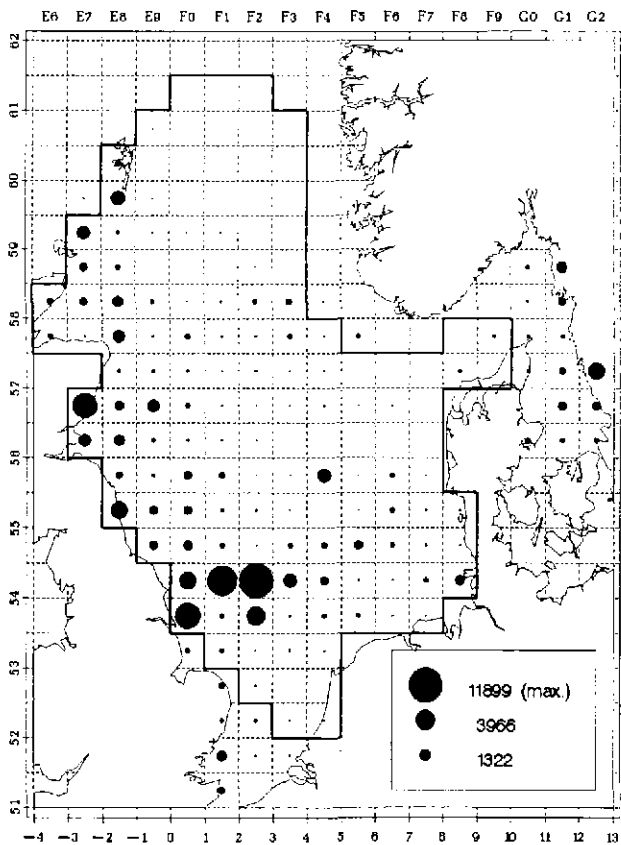
Whiting, Age group 1 1996 quarter 1
Abundance index: 502



Whiting, Age group 1 1996 quarter 2
Abundance index: 378



Whiting, Age group 1 1996 quarter 3
Abundance index: 545



Whiting, Age group 1 1996 quarter 4
Abundance index: 366

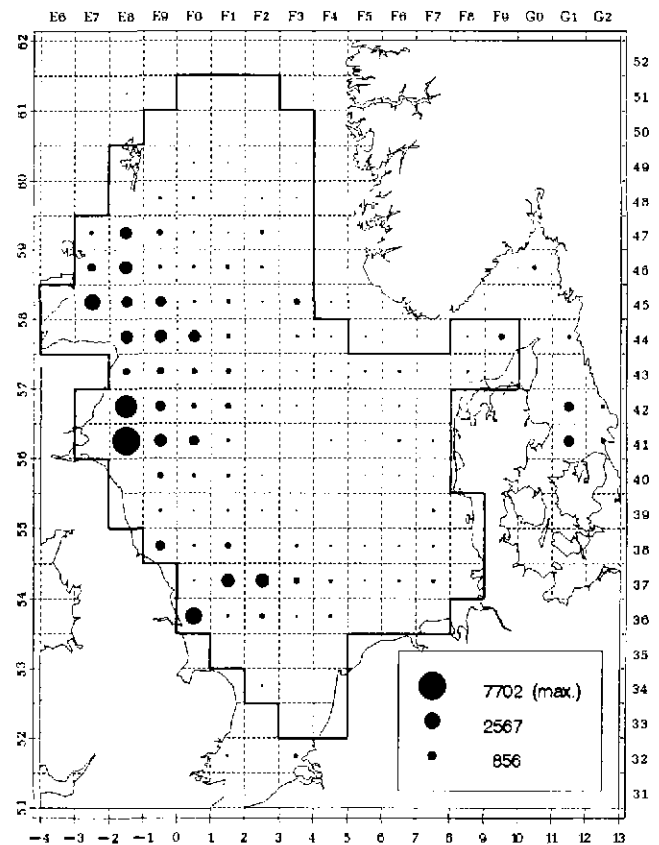
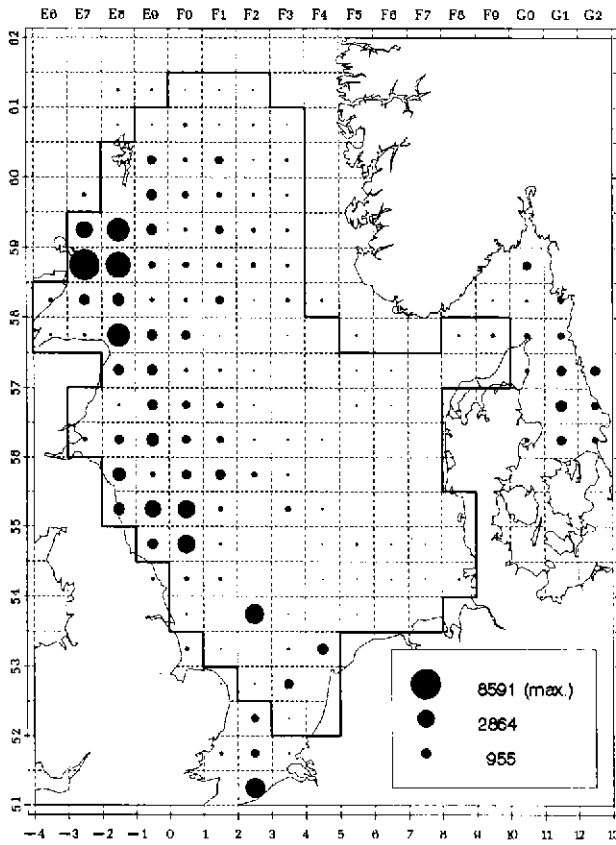
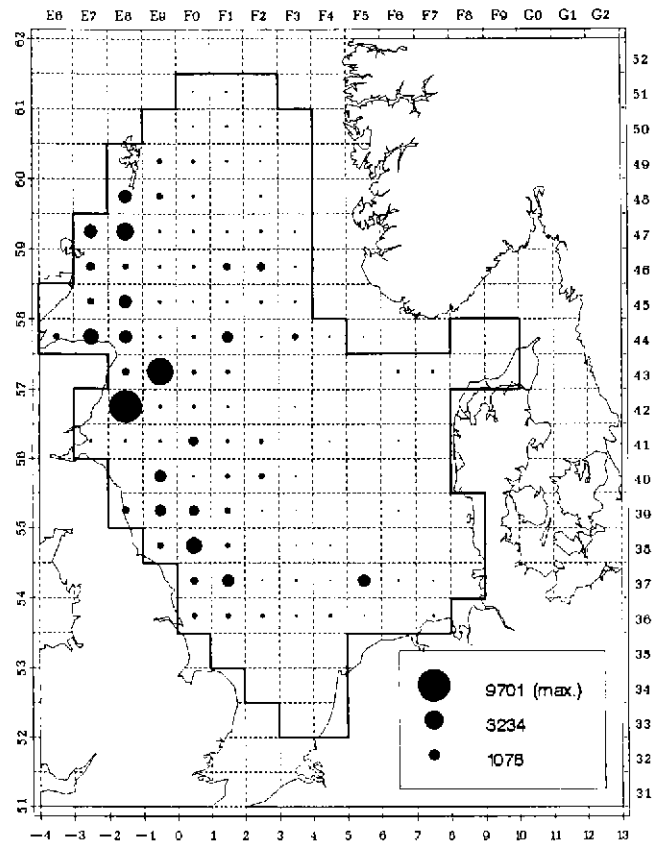


Figure 4.29 Whiting: mean catch number per hour, age-group 1.

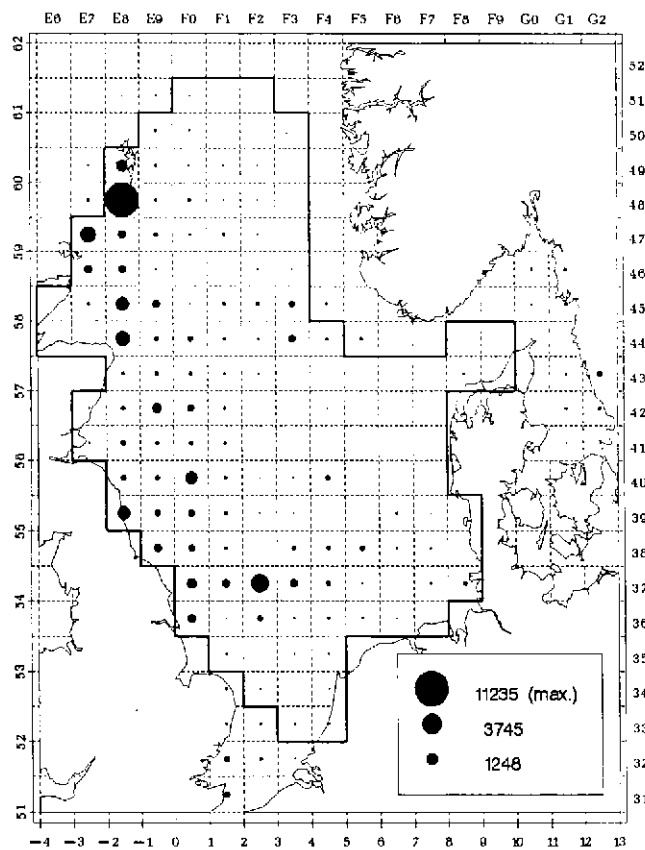
Whiting, Age group 2 1996 quarter 1
Abundance index: 486



Whiting, Age group 2 1996 quarter 2
Abundance index: 382



Whiting, Age group 2 1996 quarter 3
Abundance index: 283



Whiting, Age group 2 1996 quarter 4
Abundance index: 335

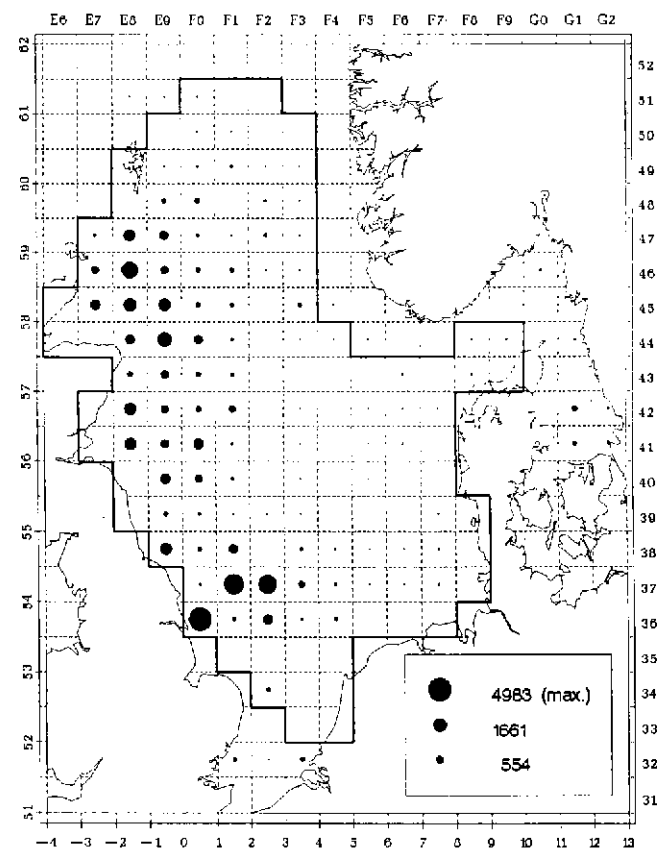
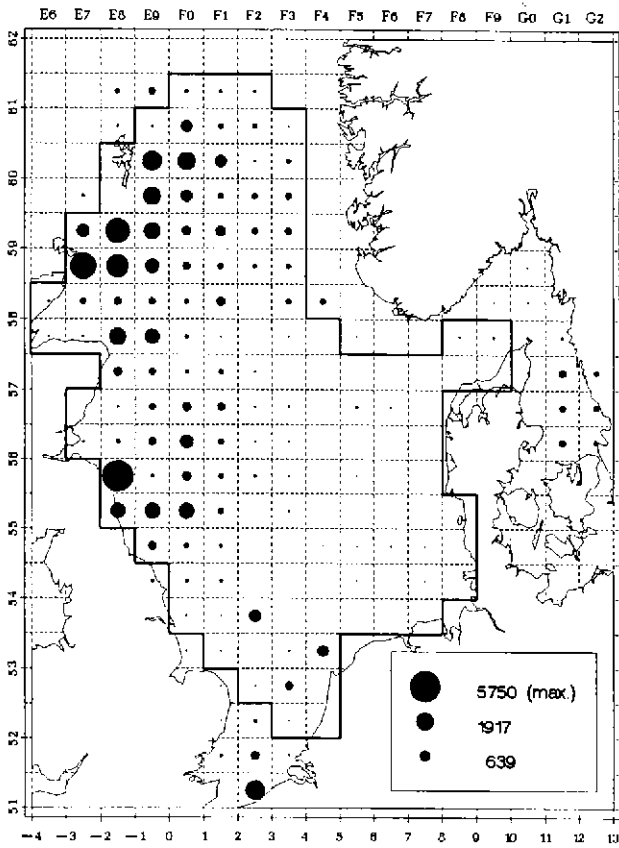
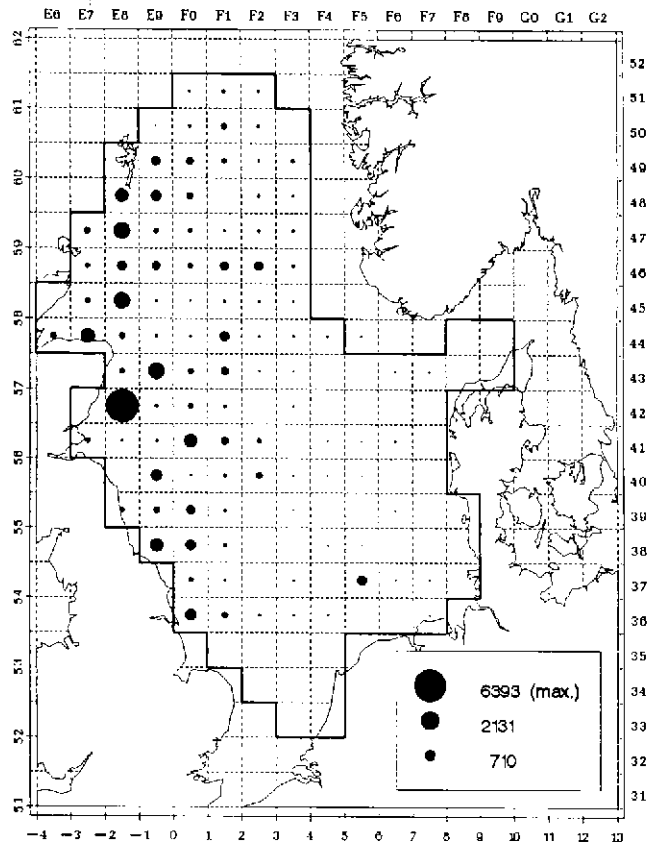


Figure 4.30 Whiting: mean catch number per hour, age-group 2.

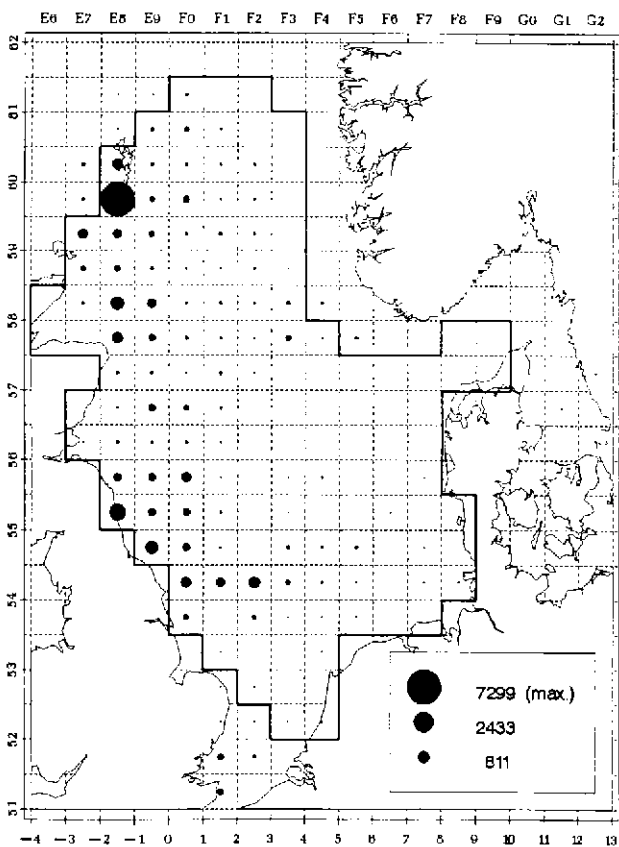
Whiting, Age group 3+ 1996 quarter 1



Whiting, Age group 3+ 1996 quarter 2



Whiting, Age group 3+ 1996 quarter 3



Whiting, Age group 3+ 1996 quarter 4

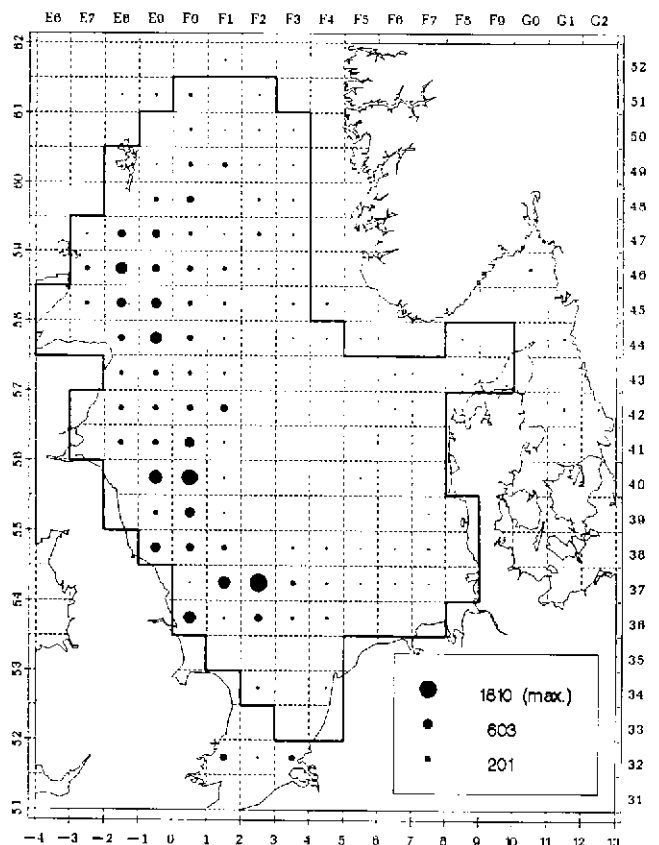
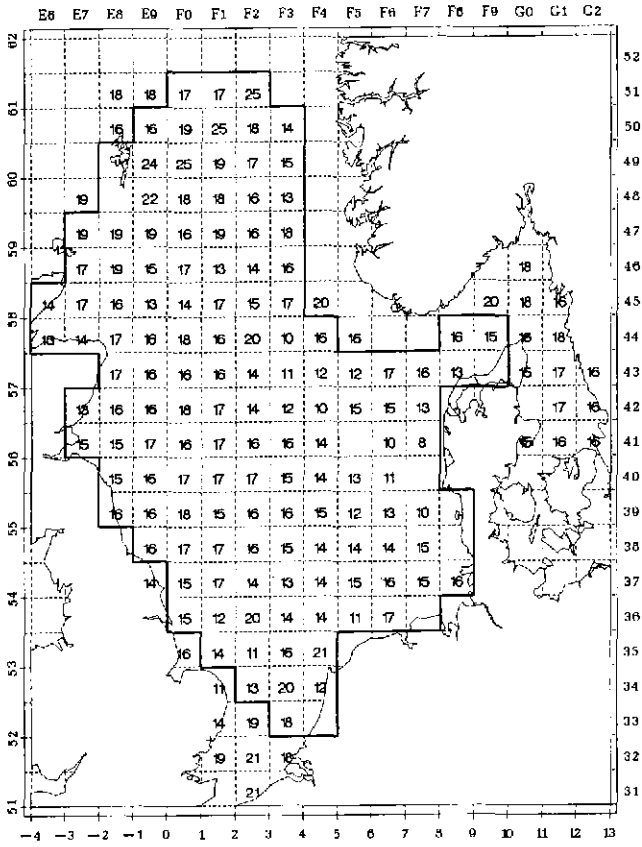
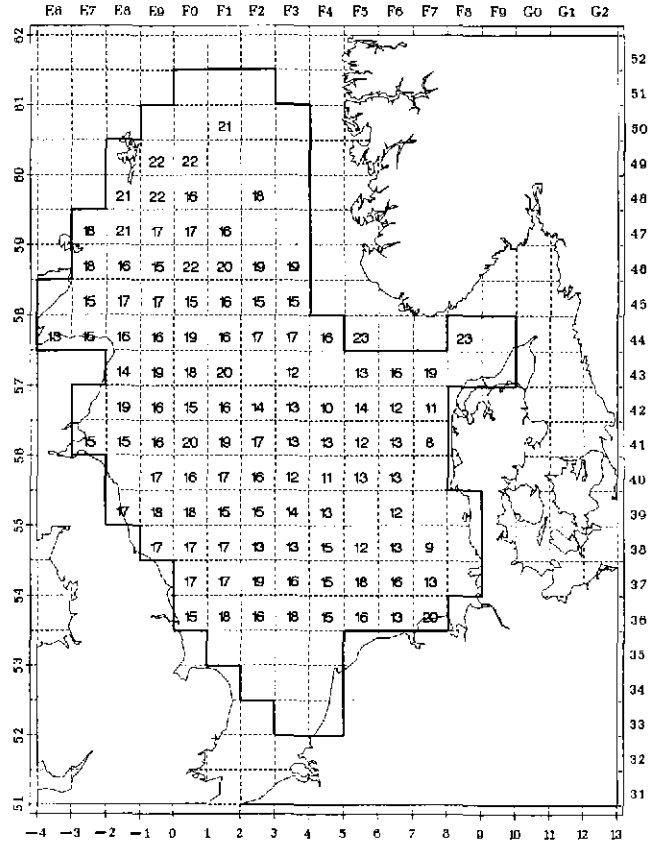


Figure 4.31 Whiting: mean catch number per hour, age-group 3+.

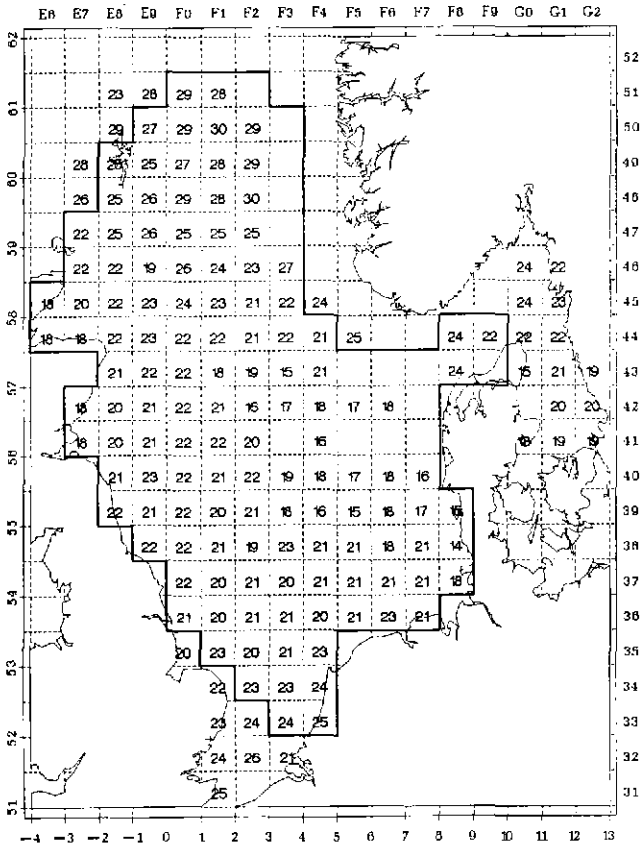
Whiting, Age group 1 1996 quarter 1



Whiting, Age group 1 1996 quarter 2



Whiting, Age group 1 1996 quarter 3



Whiting, Age group 1 1996 quarter 4

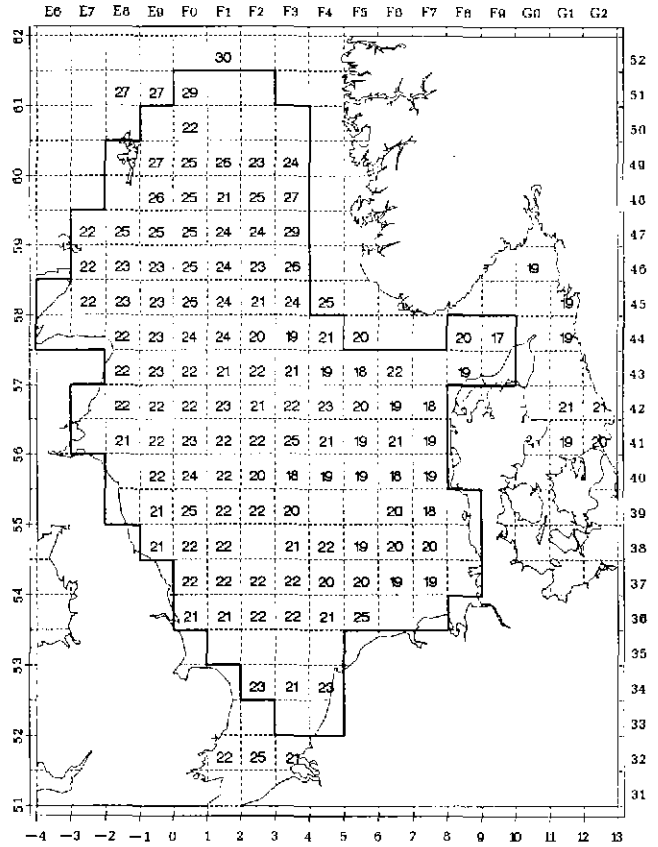


Figure 4.32 Whiting: mean length (cm below), age-group 1.

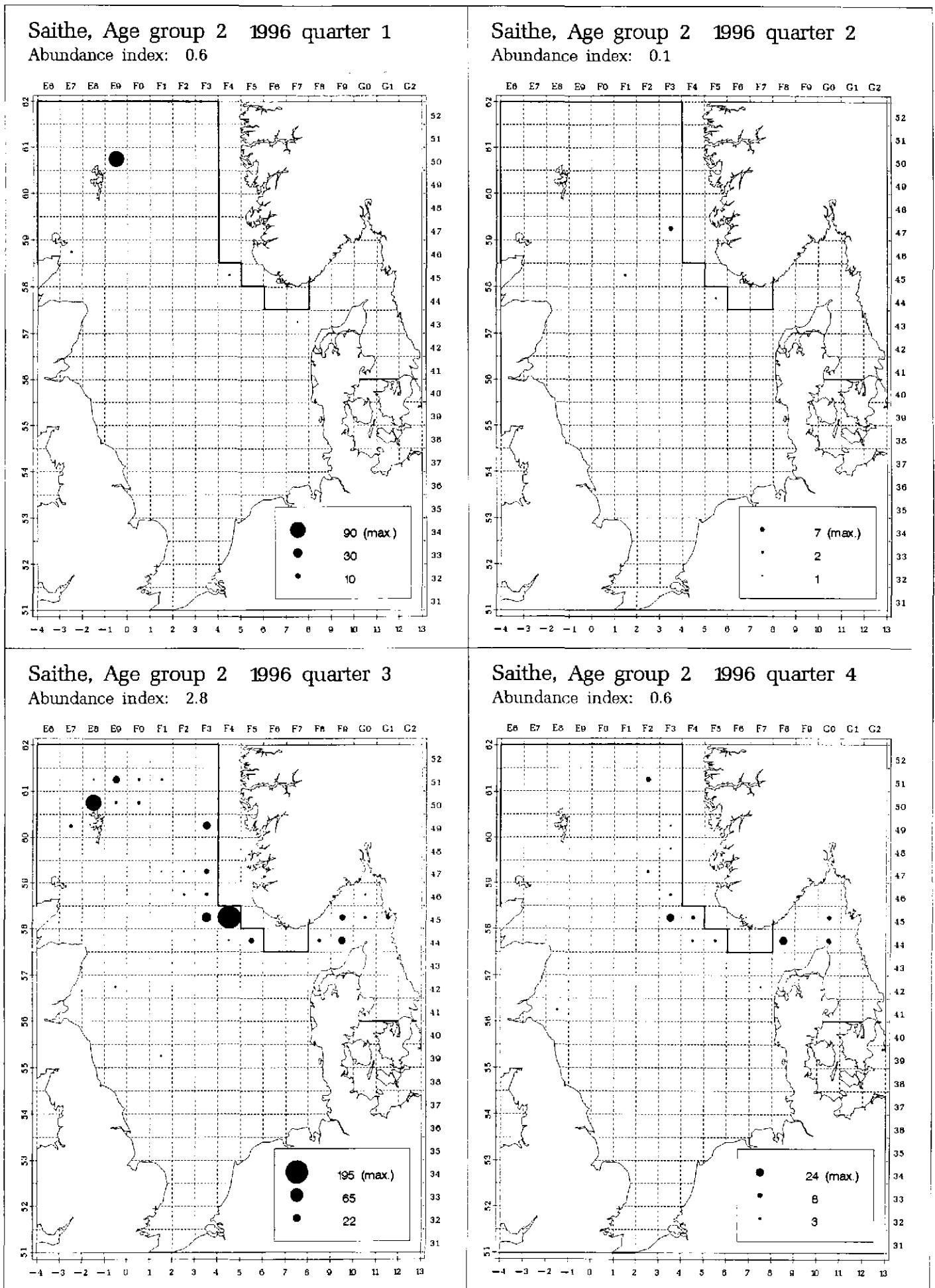
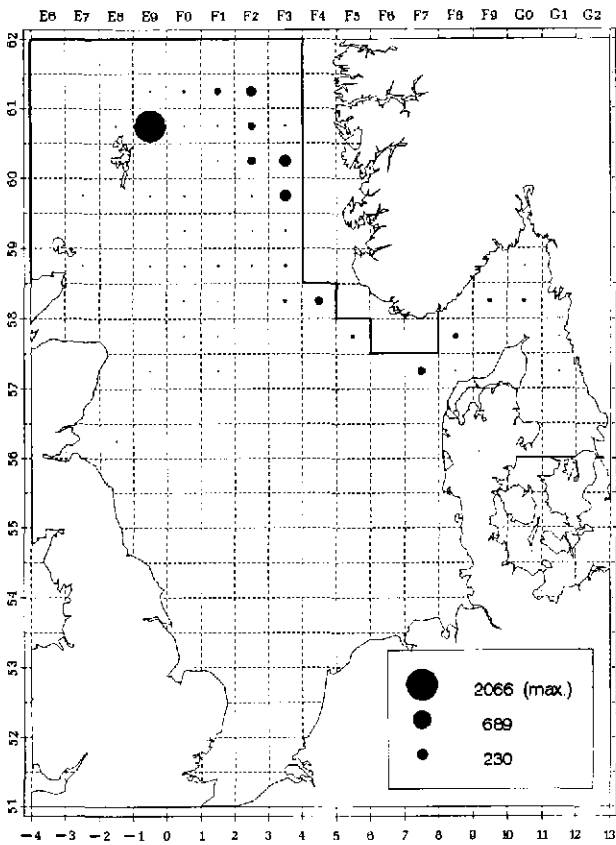
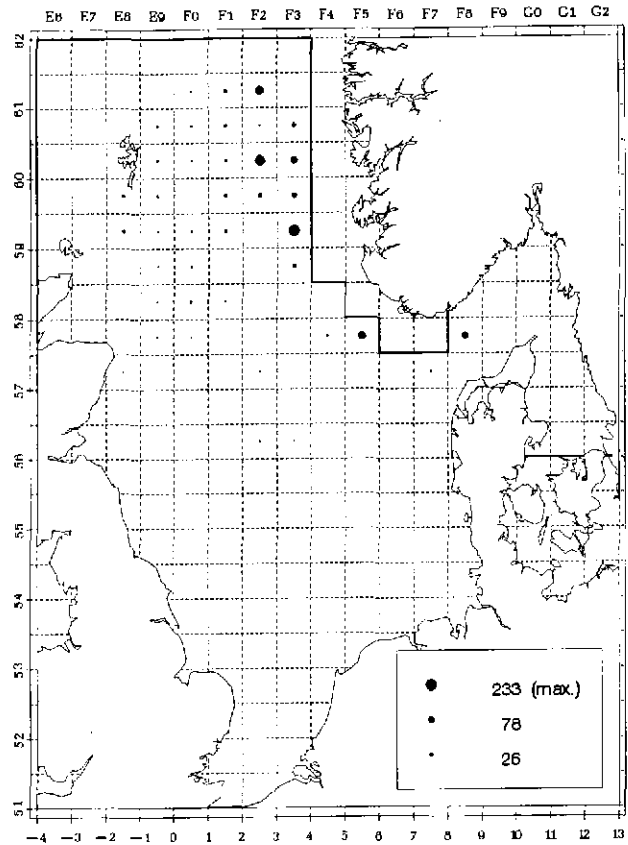


Figure 4.33 Saithe: mean catch number per hour, age-group 2.

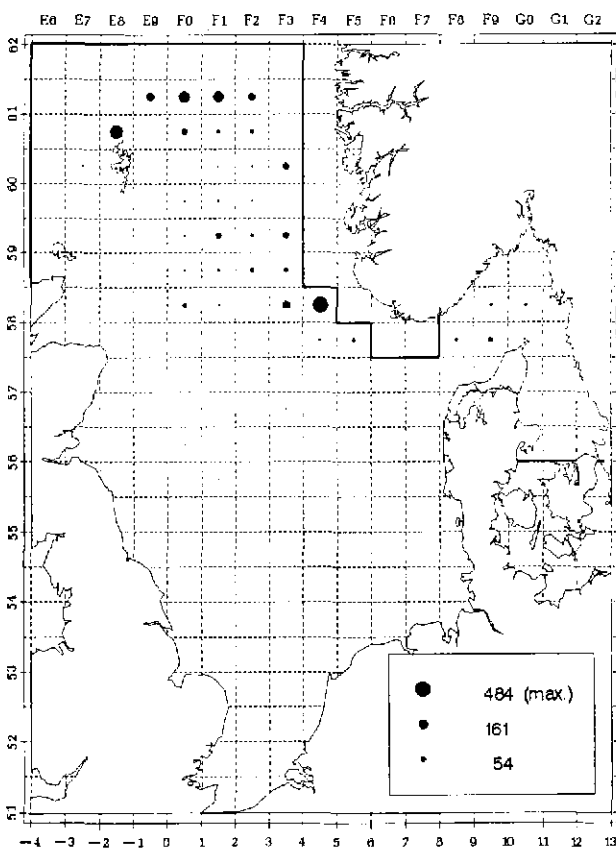
Saithe, Age group 3+ 1996 quarter 1



Saithe, Age group 3+ 1996 quarter 2



Saithe, Age group 3+ 1996 quarter 3



Saithe, Age group 3+ 1996 quarter 4

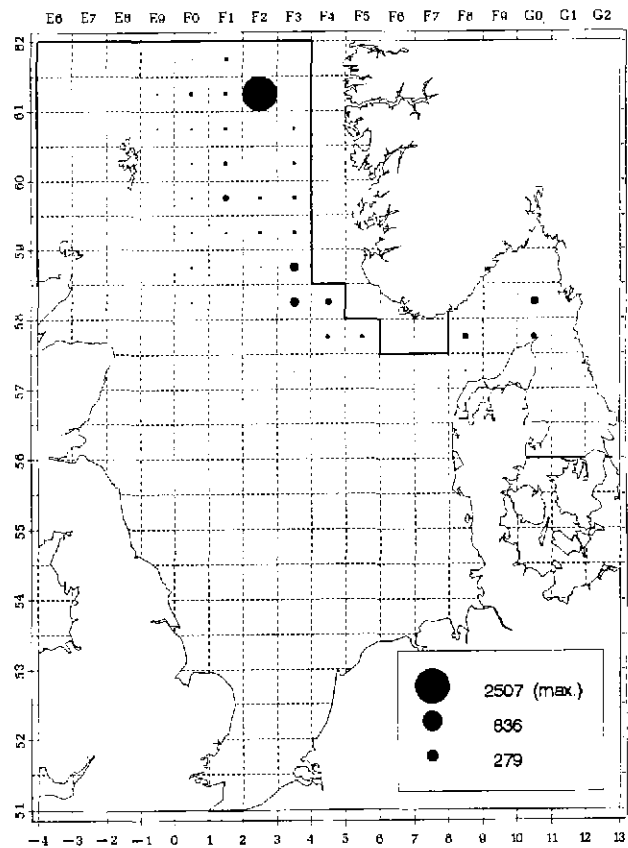
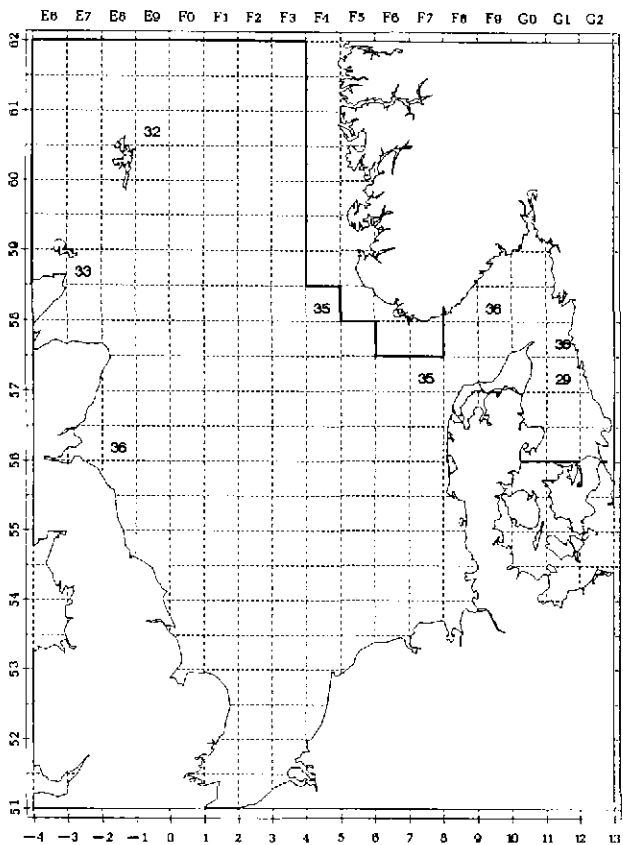
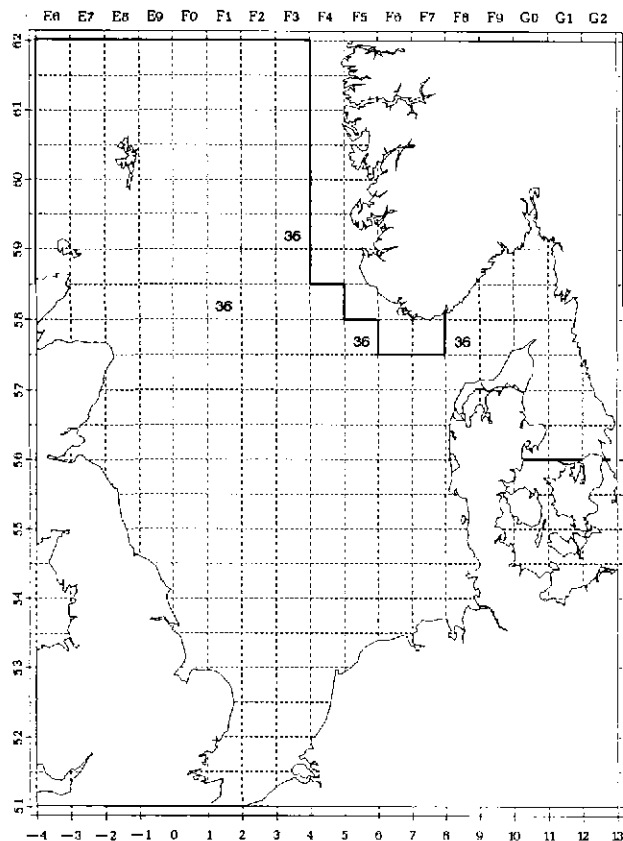


Figure 4.34 Saithe: mean catch number per hour, age-group 3+.

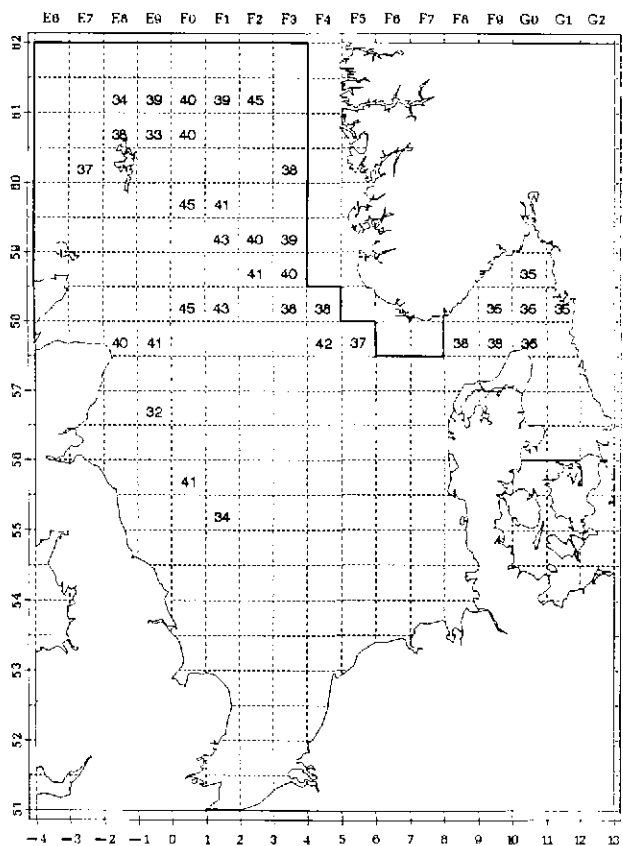
Saithe, Age group 2 1996 quarter 1



Saithe, Age group 2 1996 quarter 2



Saithe, Age group 2 1996 quarter 3



Saithe, Age group 2 1996 quarter 4

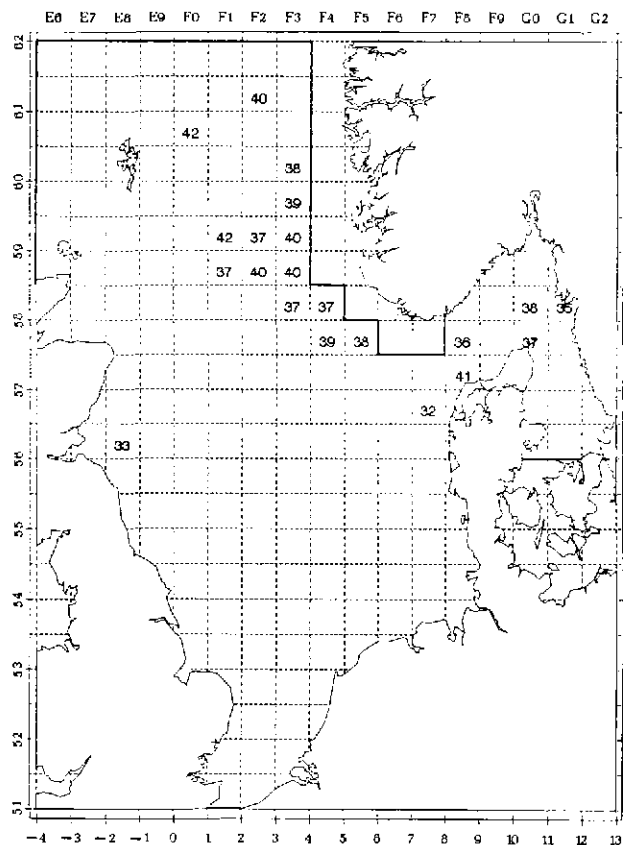
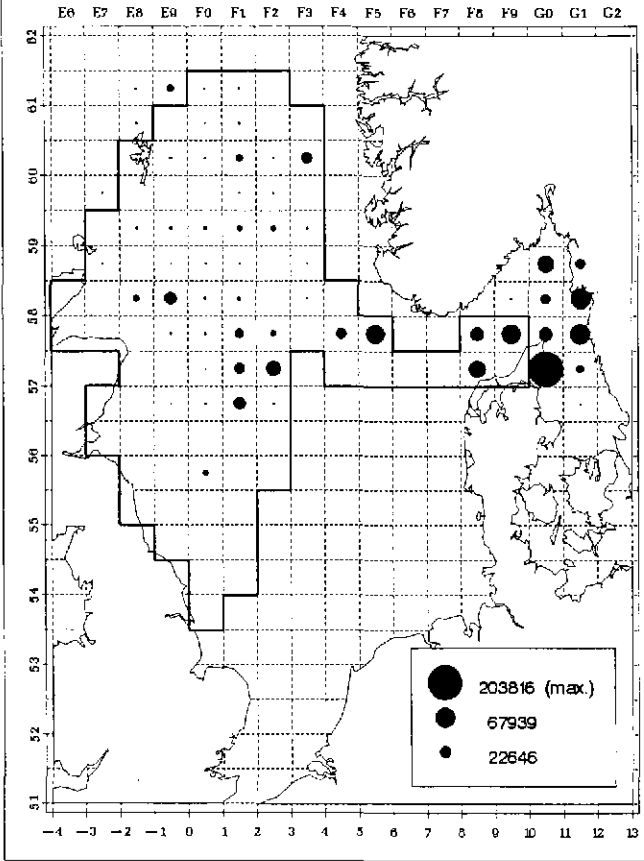


Figure 4.35 Saithe: mean length (cm below), age-group 2.

Norway pout, Age group 0 1996 quarter 3
Abundance index: 4543



Norway pout, Age group 0 1996 quarter 4
Abundance index: 8085

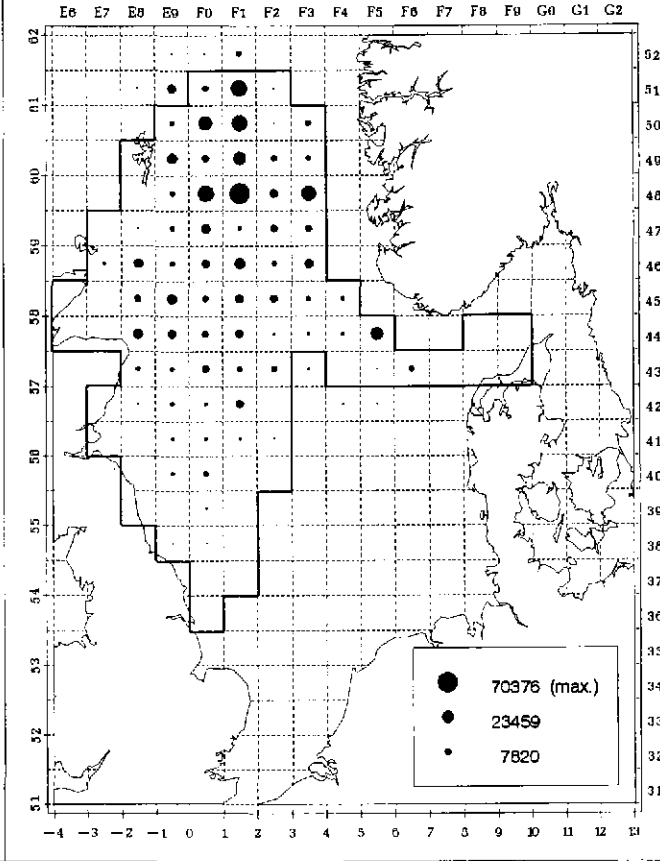
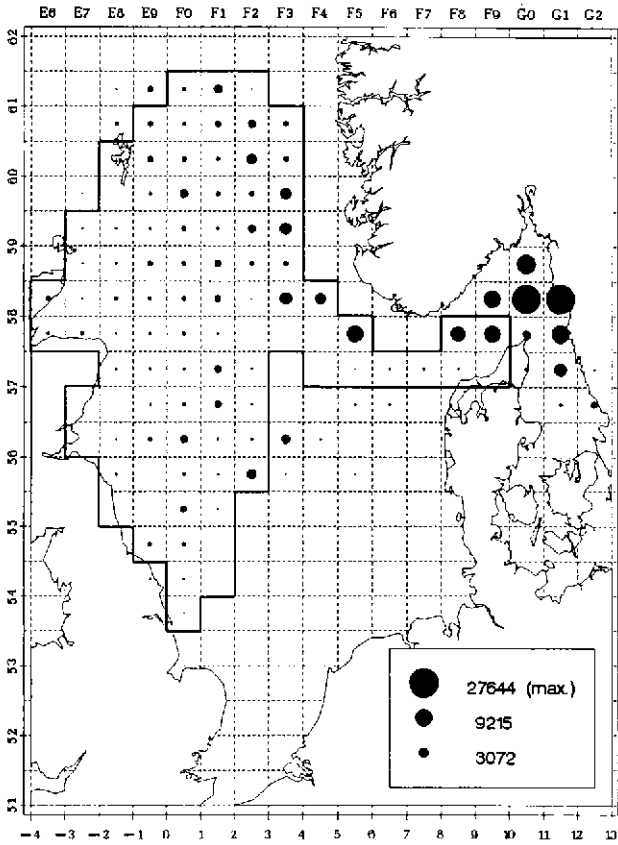
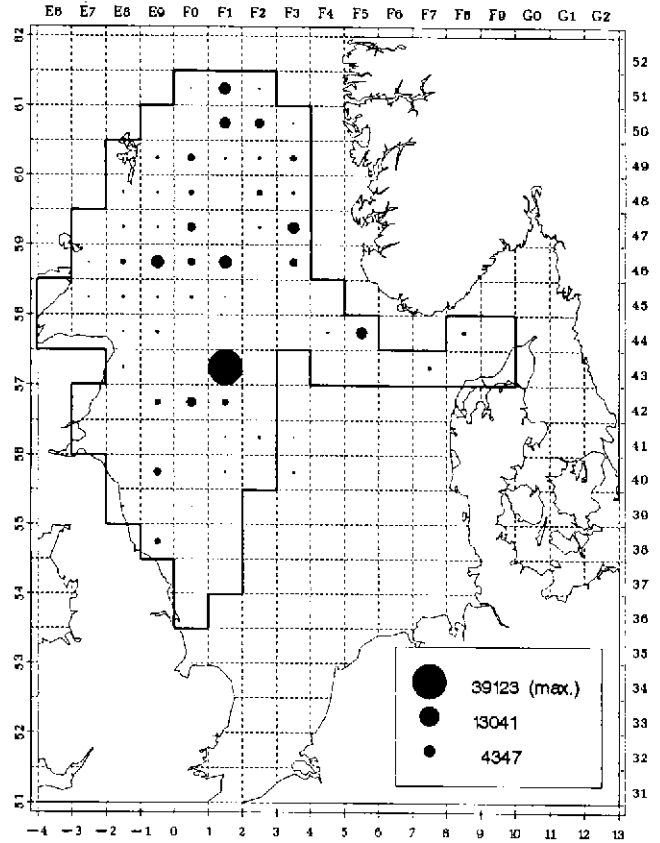


Figure 4.36 Norway pout: mean catch number per hour, age-group 0.

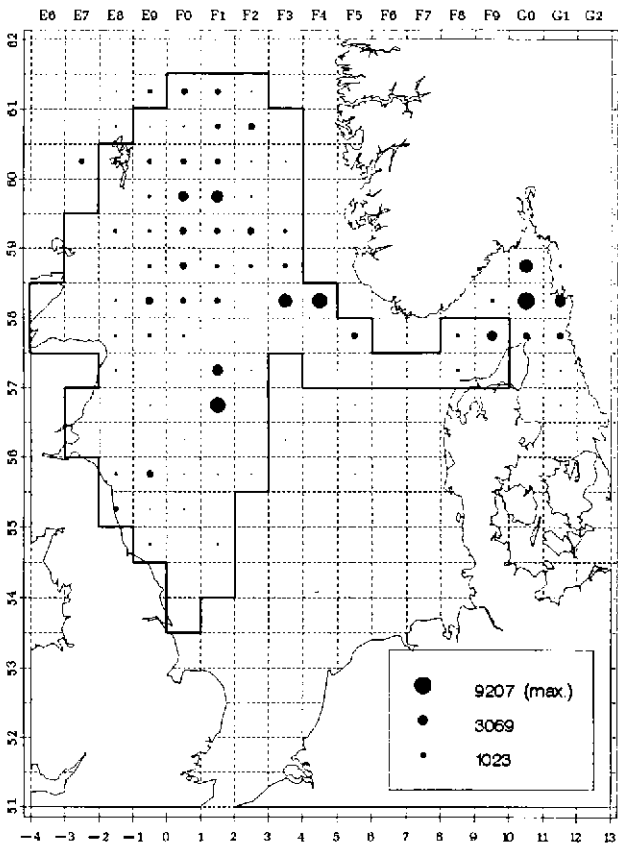
Norway pout, Age group 1 1996 quarter 1
Abundance index: 923



Norway pout, Age group 1 1996 quarter 2
Abundance index: 1077



Norway pout, Age group 1 1996 quarter 3
Abundance index: 746



Norway pout, Age group 1 1996 quarter 4
Abundance index: 953

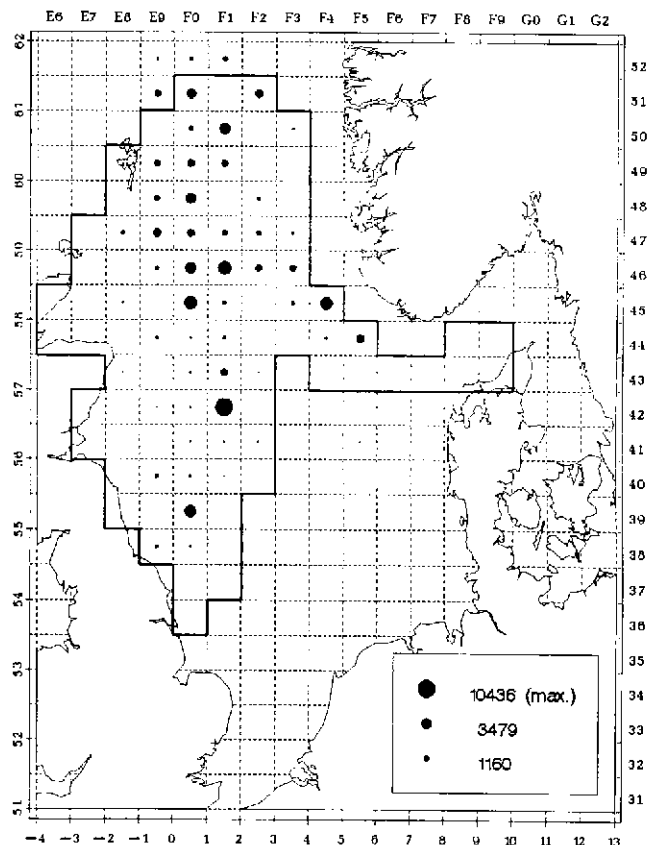
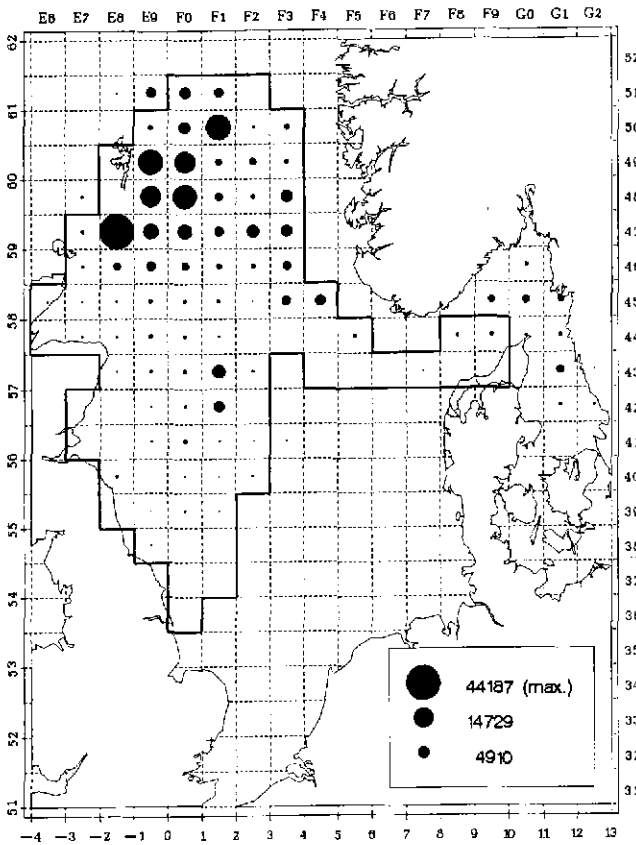
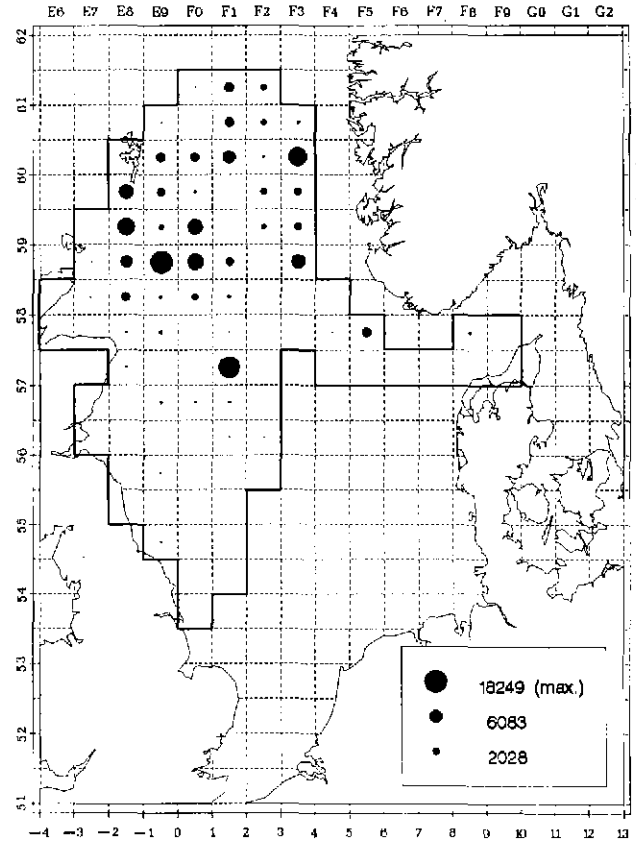


Figure 4.37 Norway pout: mean catch number per hour, age-group 1.

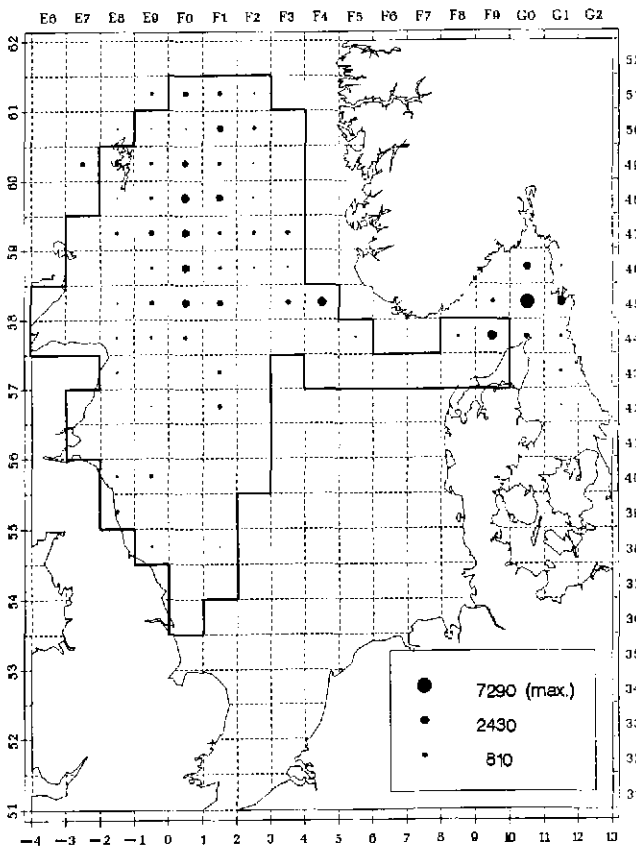
Norway pout, Age group 2 1996 quarter 1
Abundance index: 2631



Norway pout, Age group 2 1996 quarter 2
Abundance index: 1622



Norway pout, Age group 2 1996 quarter 3
Abundance index: 388



Norway pout, Age group 2 1996 quarter 4
Abundance index: 323

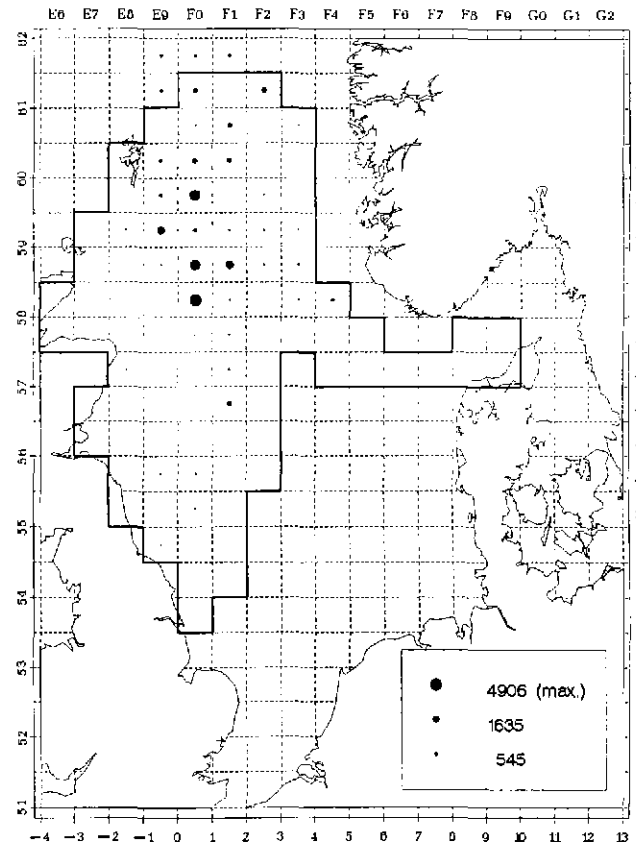
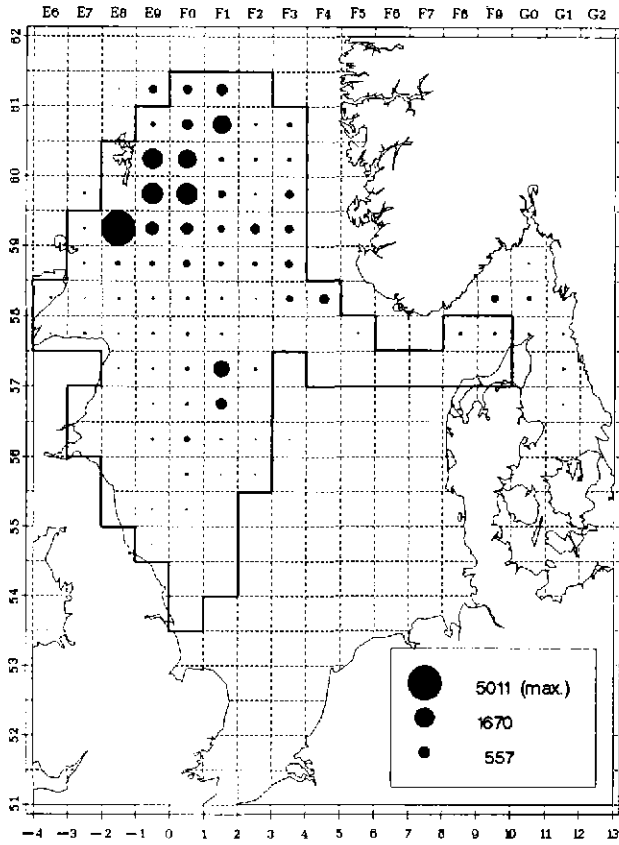
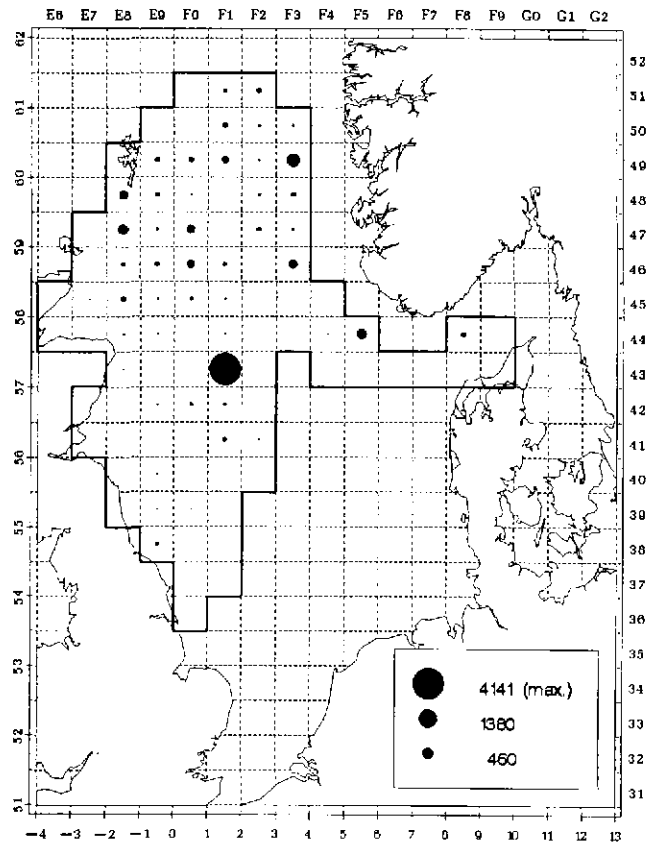


Figure 4.38 Norway pout: mean catch number per hour, age-group 2.

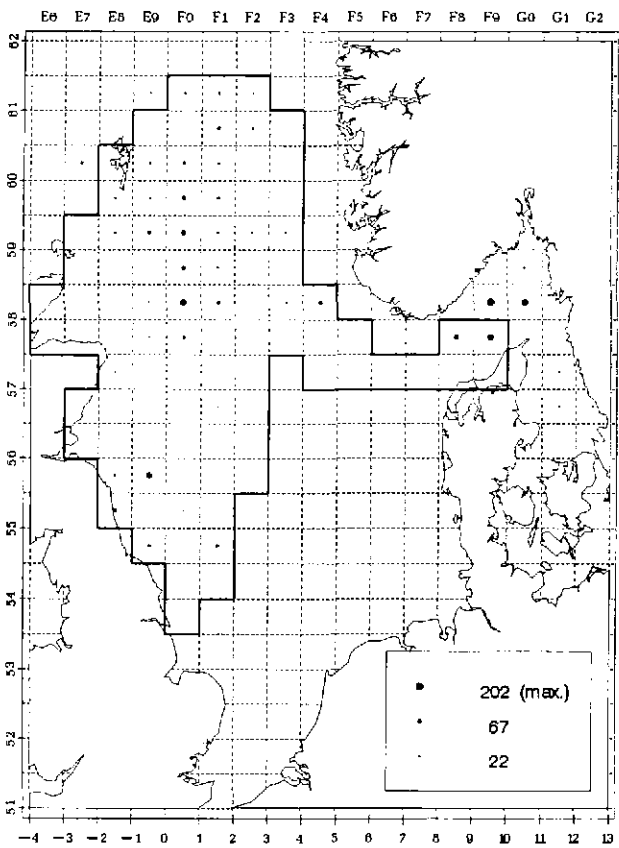
Norway pout, Age group 3+ 1996 quarter 1



Norway pout, Age group 3+ 1996 quarter 2



Norway pout, Age group 3+ 1996 quarter 3



Norway pout, Age group 3+ 1996 quarter 4

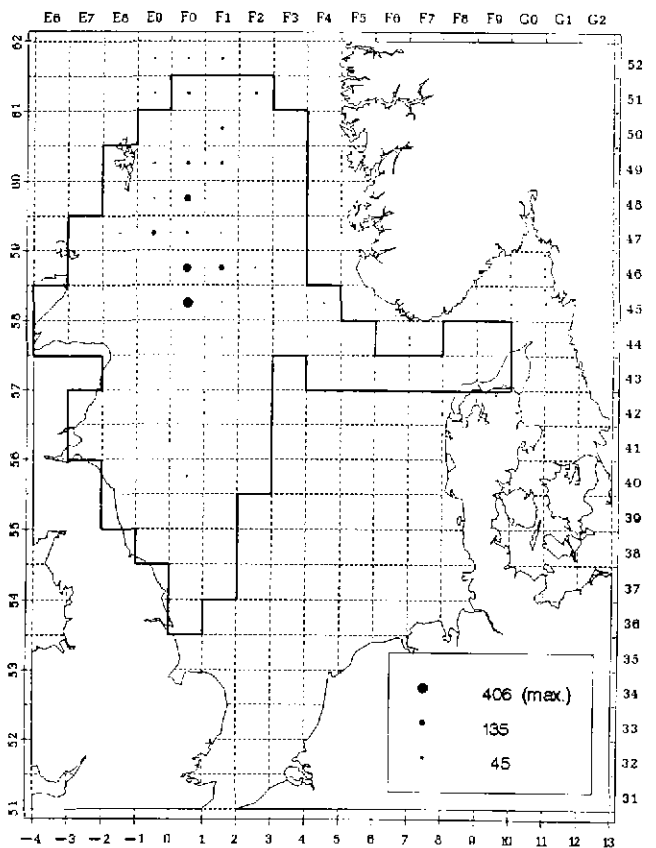
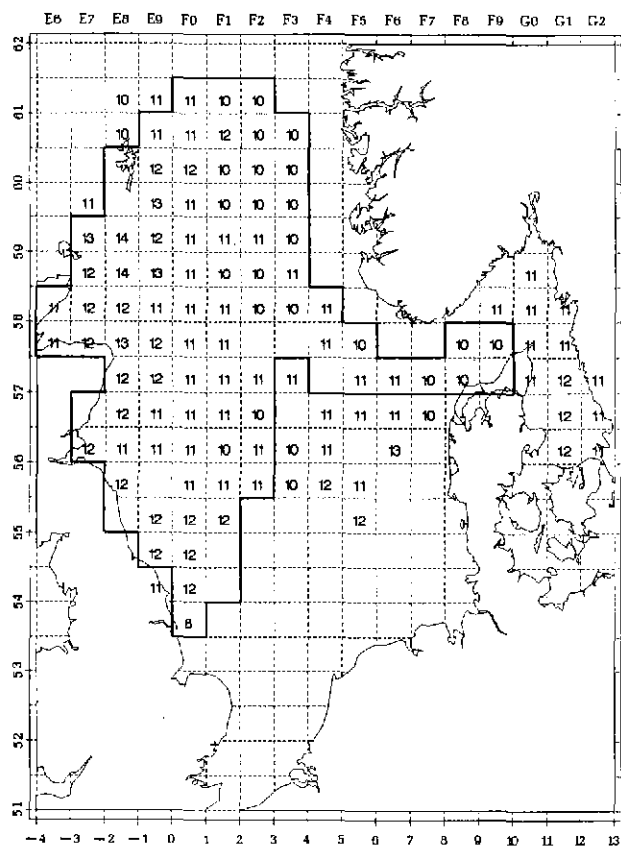
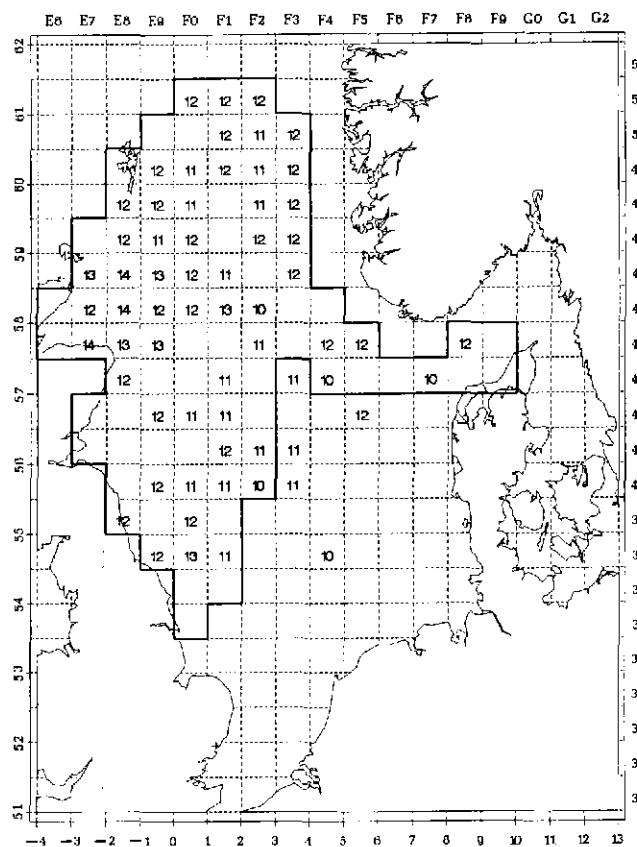


Figure 4.39 Norway pout: mean catch number per hour, age-group 3+.

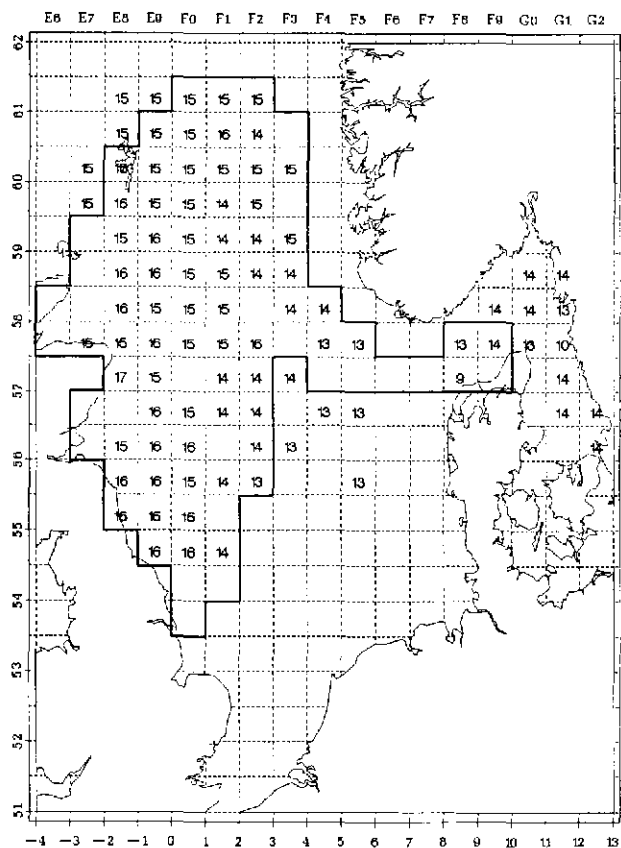
Norway pout, Age group 1 1996 quarter 1



Norway pout, Age group 1 1996 quarter 2



Norway pout, Age group 1 1996 quarter 3



Norway pout, Age group 1 1996 quarter 4

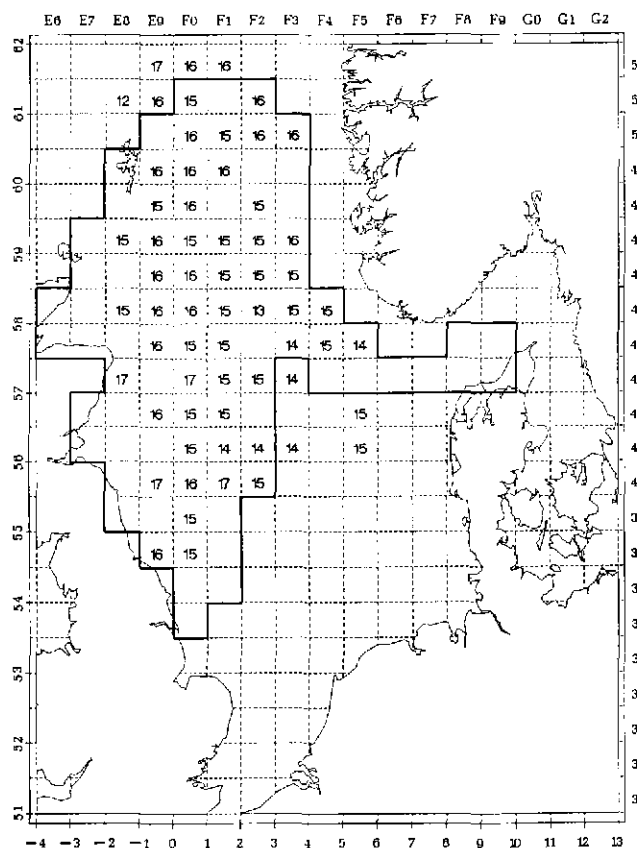


Figure 4.40 Norway pout: mean length (cm below), age-group 1.

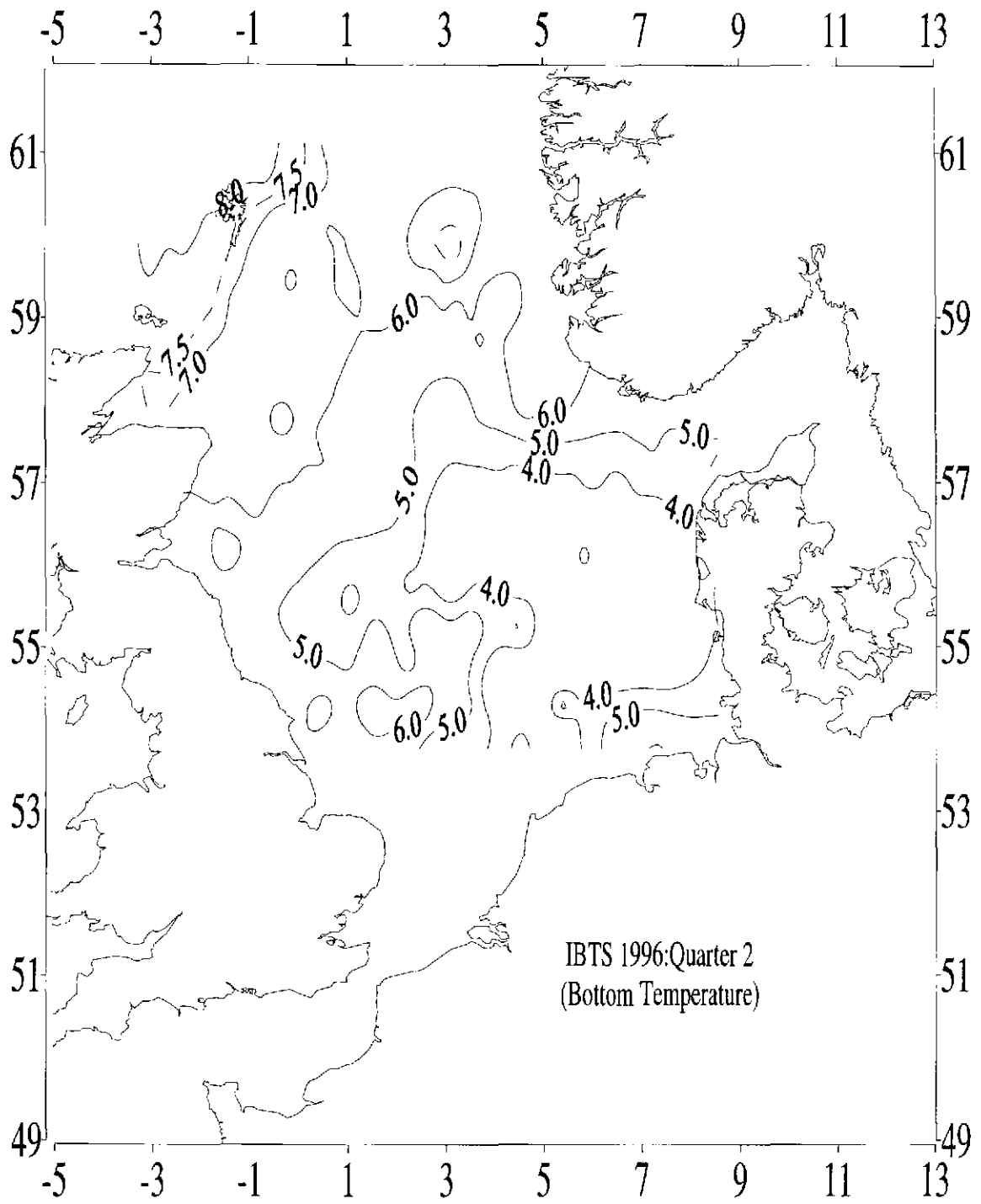


Figure 5.1

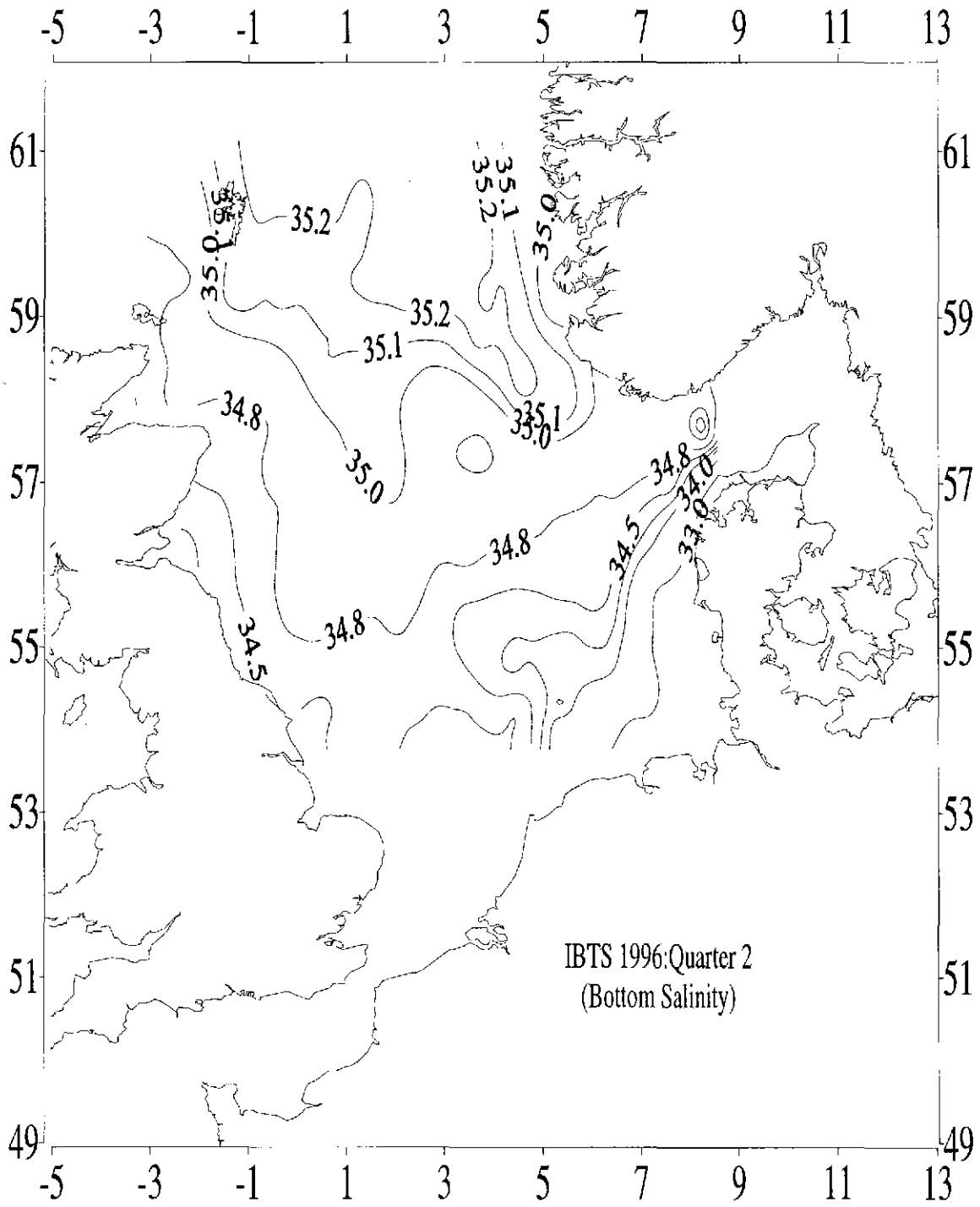


Figure 5.2

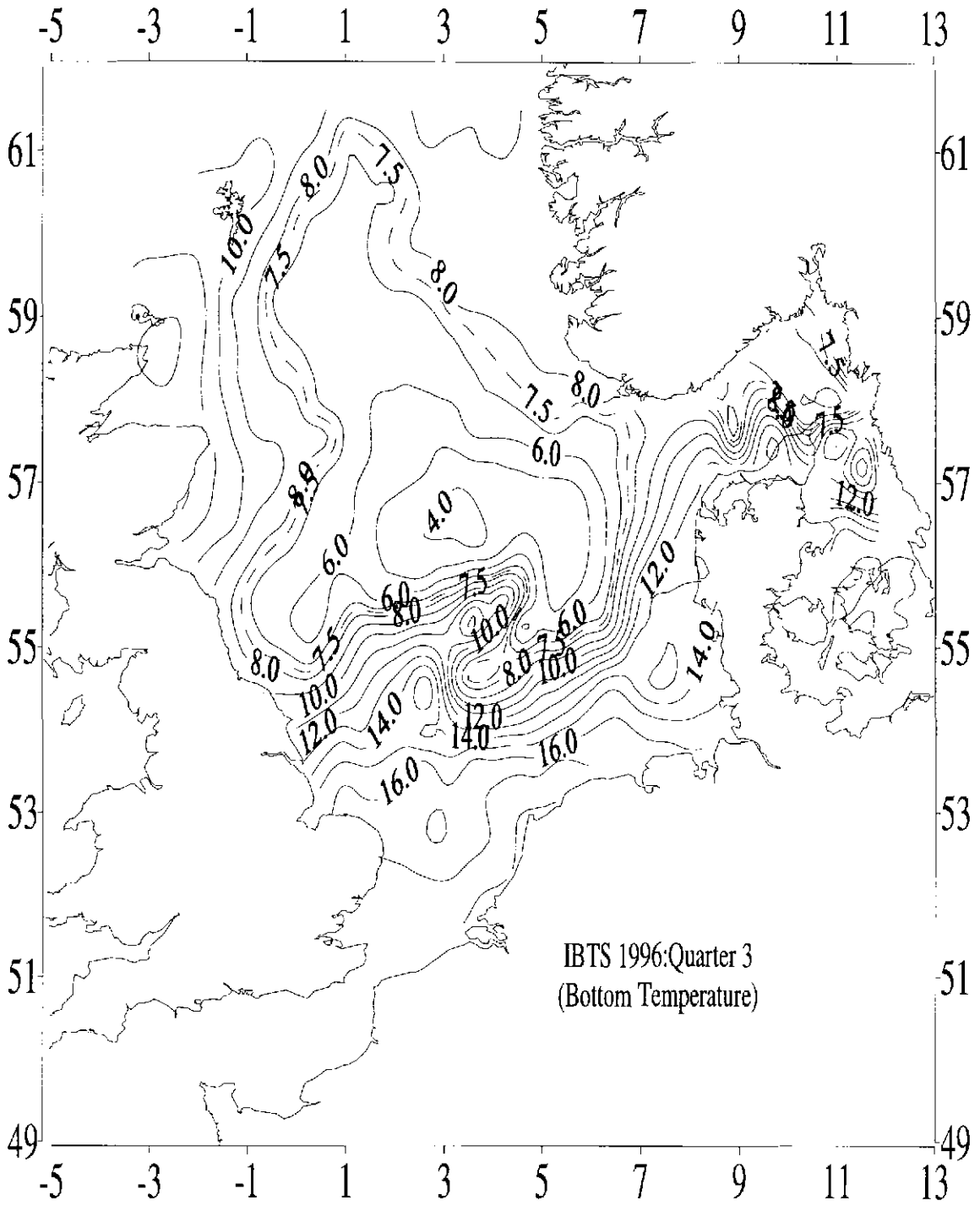


Figure 5.3

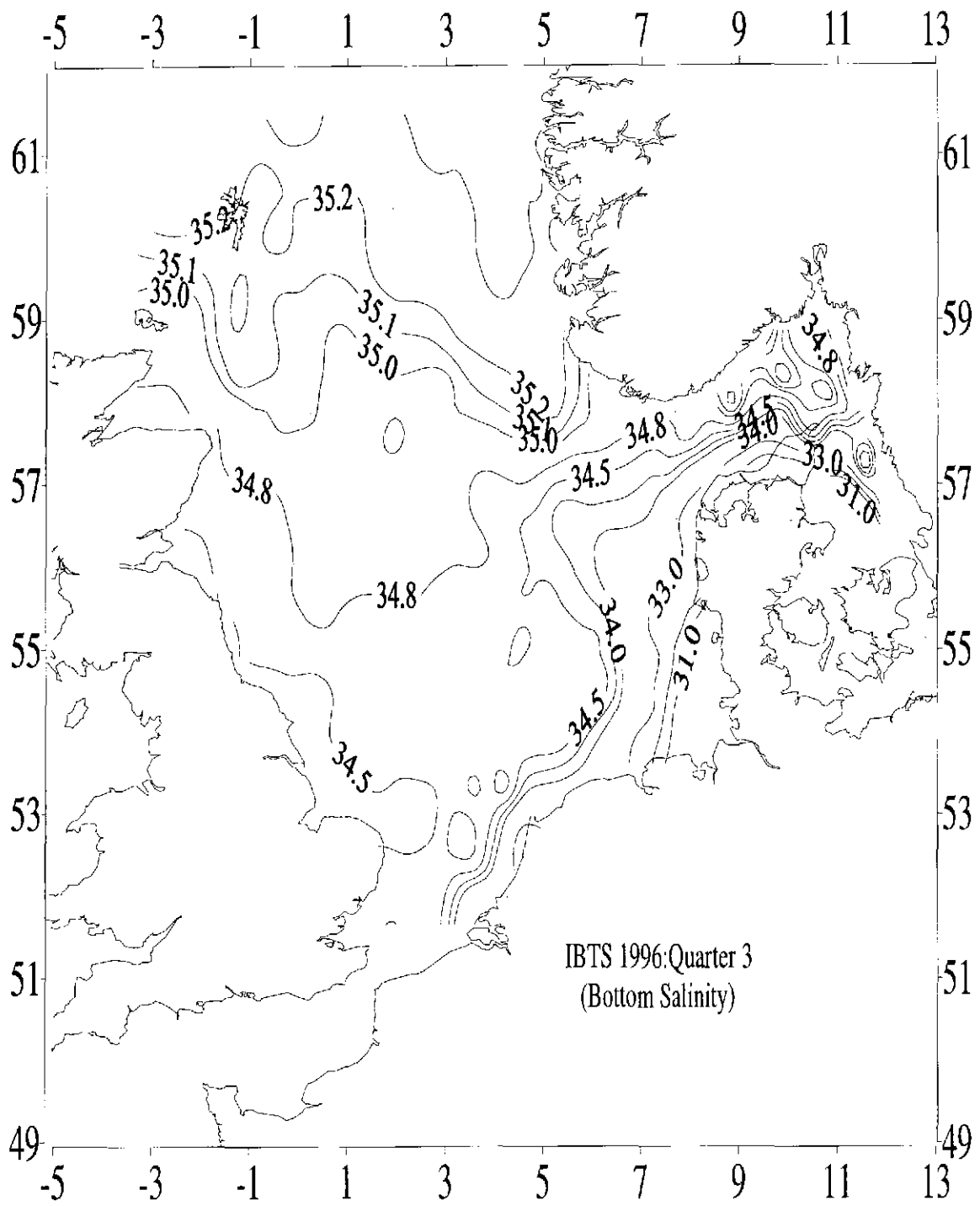


Figure 5.4

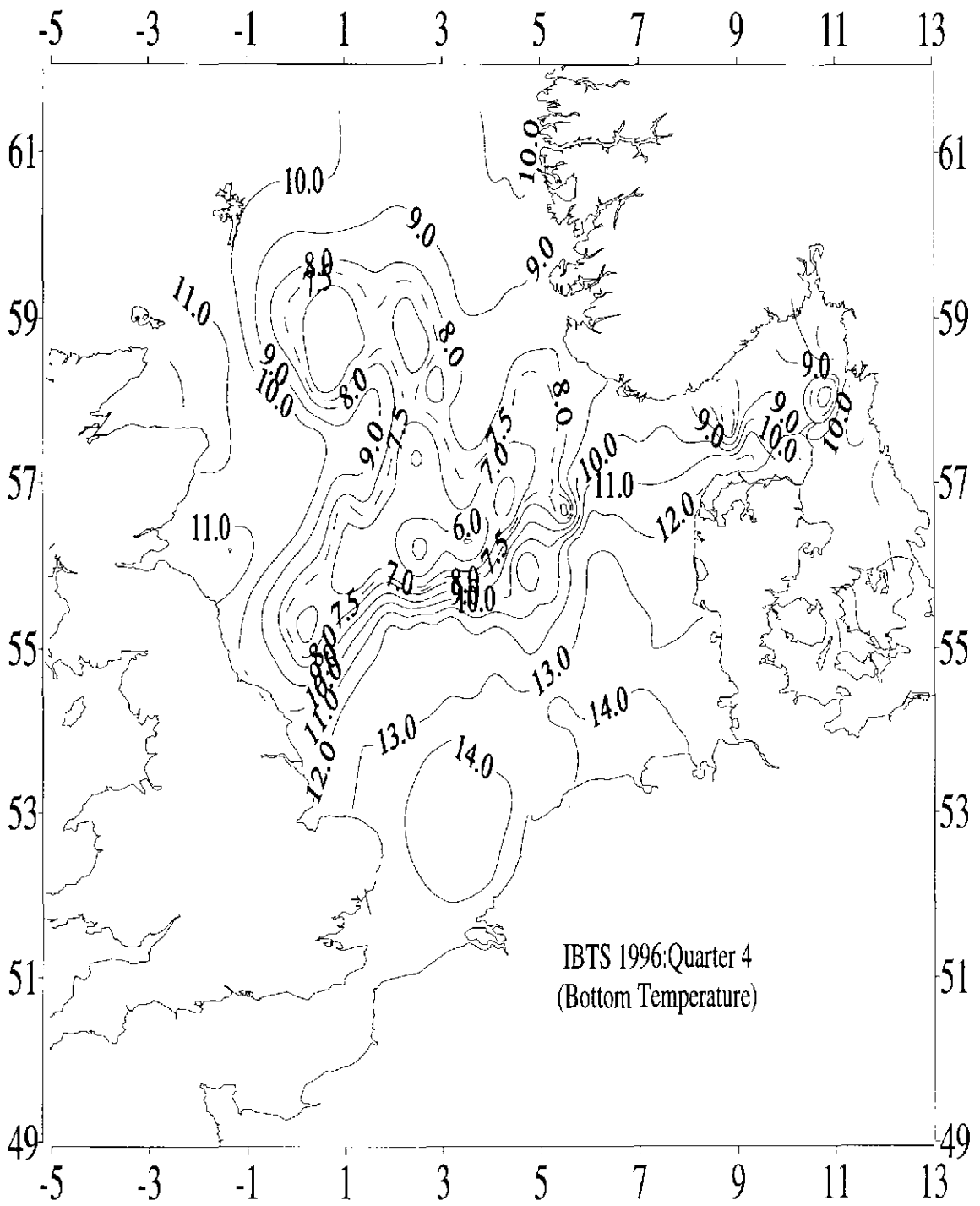


Figure 5.5

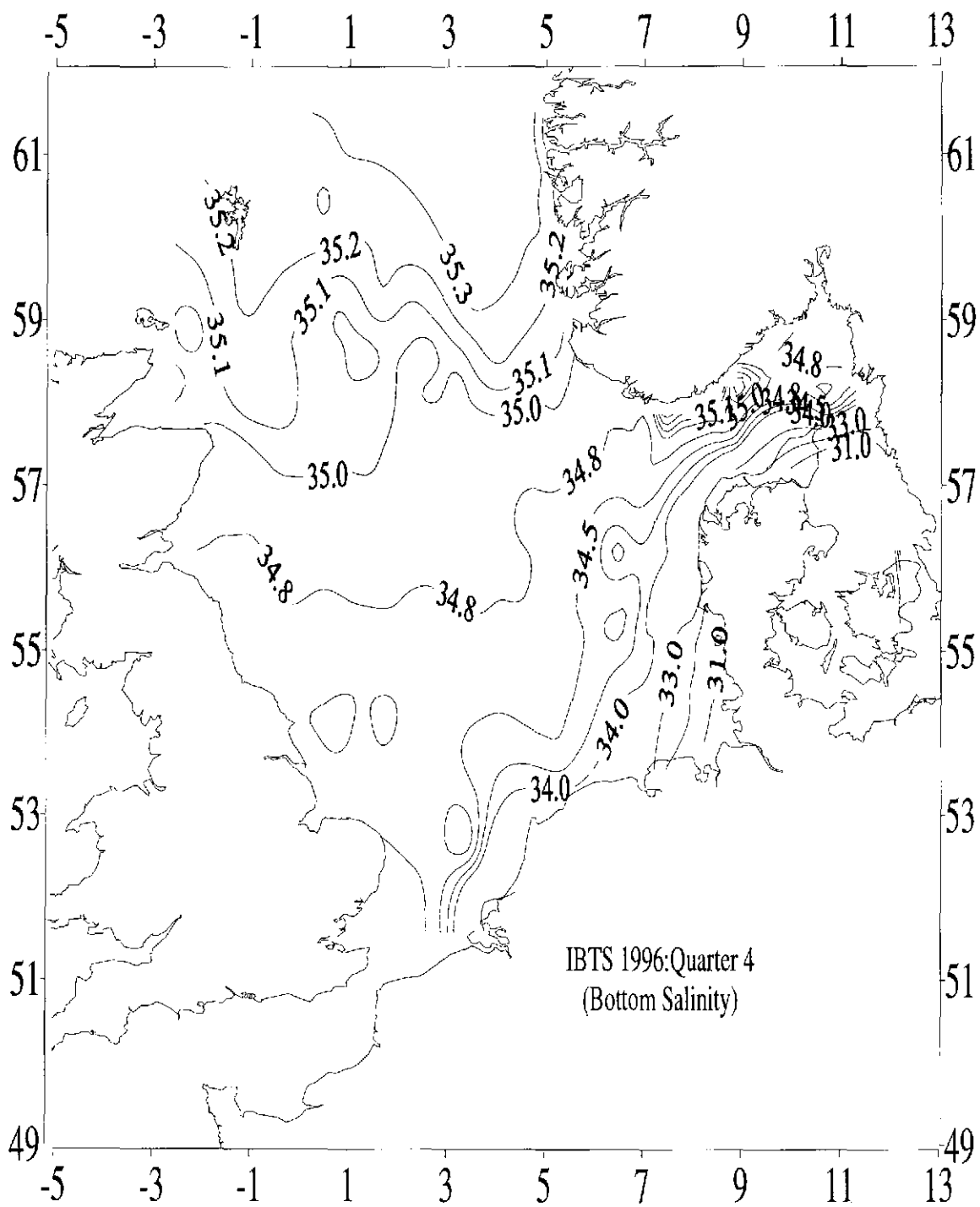


Figure 5.6

