

REPORT OF THE
INTERNATIONAL BOTTOM TRAWL SURVEY IN THE NORTH
SEA, SKAGERRAK AND KATTEGAT IN 1998: QUARTER 3

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 third quarter of 1998. 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. During a meeting of this Working Group in November 1995 (ICES 1996/H:1a) early analyses of the data indicated the potential usefulness of quarterly surveys and it was decided to encourage their continuation. These quarterly surveys have been carried out in all four quarters in the period 1991-1997, but since 1998 only the 1st and the 3rd quarters have been covered.

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*), as well as the catches of herring and sprat larvae. 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 Manual (ICES 1999/D:2 Addendum). Details on the participation in the 1998 3q survey are given below as numbers of valid haul. The whole survey area has been covered as planned.

Country and Vessel		From	To	GOV	MIK
Denmark	Dana (new)	01/09	15/09	51	51
England	Cirolana	15/08	12/09	79	79
Germany	Walther Herwig (new)	19/07	03/08	28	28
Scotland	Scotia (new)	10/08	26/08	77	77
Sweden	Argos	31/08	16/09	46	46

3 DATA AVAILABLE

Table 3.1 shows number of valid hauls available in the ICES IBTS database.

At the time of the analysis of the 1998 data presented in this report all final data were available in the database.

4 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 (ICES 1993/Assess:15).

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 IBTS Working Group decided at the meeting in November 1995 (ICES 1996/H:1a) 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/Assess:15) 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 for which no hauls were taken are excluded from the calculation.

5 RESULTS OF GOV-TRAWL FOR 1998

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 Figure 5.1.

The number of otoliths sampled per target species and roundfish area is given in Table 5.1.

Per species a set of figures gives the distributions of the 1-, 2-, and 3 group and the mean length of 1-group fish per rectangle. The specific standard area used to calculate the index of year class strength is indicated in the figures.

The results are shown in Table 5.2 and in Figures 5.2-5.33.

6 RESULTS OF MIK TRAWL FOR 3RD QUARTER 1998 FOR HERRING AND SPRAT LARVAE

No fishing with MIK was conducted.

7 HYDROGRAPHIC DATA

7.1 Hydrographic Data

Three research vessels contributed to the 168 hydrographic stations worked during the IBTS-3 survey for 1998. The ships were Cirolana (76 stations – salinity only), Scotia (45) and Argos (47). The distribution of bottom temperature and salinity produced from these data is shown below in Figure 7.1

More information, including station locations, is available from [the IBTS hydrographic web page](#)

8 REFERENCES

- ICES 1993/Assess:15. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES Doc. CM 1993/Assess:15.
- ICES 1995/Assess:13. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES Doc. CM 1995/Assess:13.
- ICES 1996/H:1a. Report of the International Bottom Trawl Survey Working Group. ICES Doc. CM 1996/H:1.
- ICES 1999/D:2 Addendum. 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.

Table 3.1

Number of valid hauls in the IBTS database. 3rd quarter 1998.

Year	Total	Country						
		Denmark	England	France	Germany	Netherlands	Scotland	Sweden
1991	295	-	87	-	-	69	90	49
1992	363	-	74	61	62	31	87	48
1993	342	-	71	69	-	65	87	50
1994	307	-	73	55	-	42	87	50
1995	250	-	78	-	-	33	87	52
1996	320	-	78	57	33	17	85	50
1997	253	-	74	-	31	18	87	43
1998	274	51	74	-	28	-	77	44
Total	2404	51	609	242	154	275	687	386

Table 5.1

Number of otoliths sampled per species and roundfish area, 1998 quarter 3.

Species	Roundfish area									Total
	1	2	3	4	5	6	7	8	9	
Herring	581	654	390	777	162	391	409	419	428	4211
Cod	502	529	75	366	83	185	313	394	370	2817
Haddock	1543	882	929	585	1	6	260	179	87	4472
Whiting	909	598	621	431	134	261	129	207	224	3514
Saithe	599	12	-	-	-	-	22	-	-	633
Mackerel	268	182	129	43	19	290	35	-	-	966
Sprat	-	-	172	377	178	340	116	36	123	1342
Norway pout	479	97	129	15	-	-	26	125	54	925

Table 5.2.

Herring indices. Mean number per hour per haul. 3rd quarter 1998.

Year	Mean per statistical rectangle					
	Age group					
	0	1	2	3	4	5+
1991	640.18	2572.50	215.80	97.38	66.56	110.29
1992	2901.63	1082.06	452.86	166.20	80.58	159.87
1993	3799.23	1177.22	324.81	175.23	92.03	195.76
1994	1552.28	1679.17	889.04	196.98	181.76	131.72
1995	714.11	522.38	353.06	159.97	56.30	60.35
1996	2704.54	1314.76	190.14	111.73	48.09	42.04
1997	1149.63	1331.95	77.72	23.08	17.31	13.40
1998	1004.34	879.62	467.29	85.85	25.19	21.42

Table 5.2 cont. Sprat indices. Mean number per hour per haul. 3rd quarter 1998.

Year	Mean per statistical rectangle					
	Age group					
	0	1	2	3	4	5+
1991	16.78	435.87	133.90	54.93	0.77	0.00
1992	56.49	3975.23	3389.45	205.33	33.55	2.53
1993	6.85	2575.10	2728.38	559.33	23.52	0.00
1994	5.19	4298.10	500.79	131.14	12.27	0.00
1995	0.32	1381.76	3897.07	2020.47	22.29	0.92
1996	3.28	537.33	1321.67	586.21	79.27	4.49
1997	29.03	8331.55	2356.96	437.56	52.00	0.00
1998	343.84	3676.27	2038.12	260.45	8.37	0.41

Table 5.2 cont. Cod indices. Mean number per hour per haul. 3rd quarter 1998.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	29.43	8.20	2.47	1.16	0.18	0.06	0.08
1992	19.72	43.78	3.63	0.73	0.46	0.16	0.14
1993	16.96	10.00	8.00	0.86	0.19	0.15	0.05
1994	15.72	43.15	6.23	2.38	0.25	0.08	0.07
1995	15.08	18.06	17.37	1.50	0.77	0.07	0.07
1996	68.92	10.28	5.32	1.82	0.40	0.20	0.03
1997	0.13	60.52	5.47	1.67	0.63	0.13	0.12
1998	91.71	2.40	20.05	1.29	0.37	0.25	0.12

Table 5.2 cont. Haddock indices. Mean number per hour per haul. 3rd quarter 1998.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	720.38	232.79	22.94	2.82	0.50	1.54	0.29
1992	2716.86	589.67	187.14	10.36	1.57	0.39	1.45
1993	571.90	604.33	141.55	37.72	2.38	0.38	0.28
1994	1771.95	194.62	264.50	32.43	8.42	0.39	0.07
1995	516.84	1027.23	106.30	96.88	7.99	3.10	0.26
1996	622.78	254.87	443.65	30.33	20.11	2.63	0.68
1997	194.69	353.75	125.82	151.00	6.65	5.26	0.85
1998	272.92	262.16	168.13	53.30	42.26	3.06	1.66

Table 5.2 cont. Whiting indices. Mean number per hour per haul. 3rd quarter 1998.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	529.39	700.83	158.87	78.92	14.62	5.20	1.02
1992	1381.49	595.01	297.85	72.91	57.90	10.35	6.26
1993	915.86	634.16	176.88	67.13	14.82	16.19	3.15
1994	609.87	674.52	222.52	76.32	19.83	4.82	3.19
1995	729.25	619.79	291.18	107.20	21.51	6.01	3.46
1996	316.50	545.71	278.22	129.36	34.00	6.89	4.10
1997	2062.67	332.97	180.68	108.99	28.01	10.71	4.25
1998	2609.97	328.92	150.00	52.69	30.97	11.16	4.69

Table 5.2 cont. Saithe indices. Mean number per hour per haul. 3rd quarter 1998.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	0.01	0.16	1.00	3.25	0.70	0.13	0.27
1992	0.01	0.10	0.32	1.33	3.41	0.64	0.34
1993	0.00	0.14	2.59	11.78	4.10	1.68	0.56
1994	0.01	0.00	0.69	1.12	1.62	0.88	0.83
1995	0.00	0.01	0.83	20.04	3.60	2.23	1.17
1996	0.00	0.29	2.15	3.82	6.53	1.12	1.33
1997	0.01	0.14	0.51	3.76	3.35	7.45	1.54
1998	0.00	0.03	0.29	2.03	7.74	2.61	3.78

Table 5.2 cont. Norway pout indices. Mean number per hour per haul. 3rd quarter 1998.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	7382.90	1104.86	222.23	2.61	0.00	0.00	0.00
1992	2587.77	4365.81	640.21	48.21	2.77	0.00	0.06
1993	3952.70	1860.90	596.47	53.37	3.30	0.00	0.00
1994	3195.82	704.41	101.59	13.51	0.34	0.00	0.00
1995	1762.43	4526.74	316.98	42.24	1.72	0.00	0.00
1996	4553.64	763.03	362.42	12.01	0.78	0.00	0.00
1997	489.95	3520.53	169.10	40.33	1.36	0.01	0.00
1998	2931.40	805.69	743.45	11.40	3.01	0.00	0.00

Table 5.2 cont. Mackerel indices. Mean number per hour per haul. 3rd quarter 1998.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	0.00	25.99	15.85	3.61	3.48	4.01	13.06
1992	0.07	40.15	46.67	30.15	10.48	10.37	14.96
1993	5.34	91.28	67.55	25.70	18.94	10.09	18.12
1994	0.00	82.62	64.56	14.77	4.98	4.31	7.25
1995	0.03	15.12	31.12	26.42	13.28	4.24	15.39
1996	0.00	49.21	50.95	23.65	4.92	3.56	7.77
1997	0.11	63.12	39.13	12.26	6.23	3.45	4.72
1998	3.58	187.43	58.26	16.10	7.75	3.54	3.37

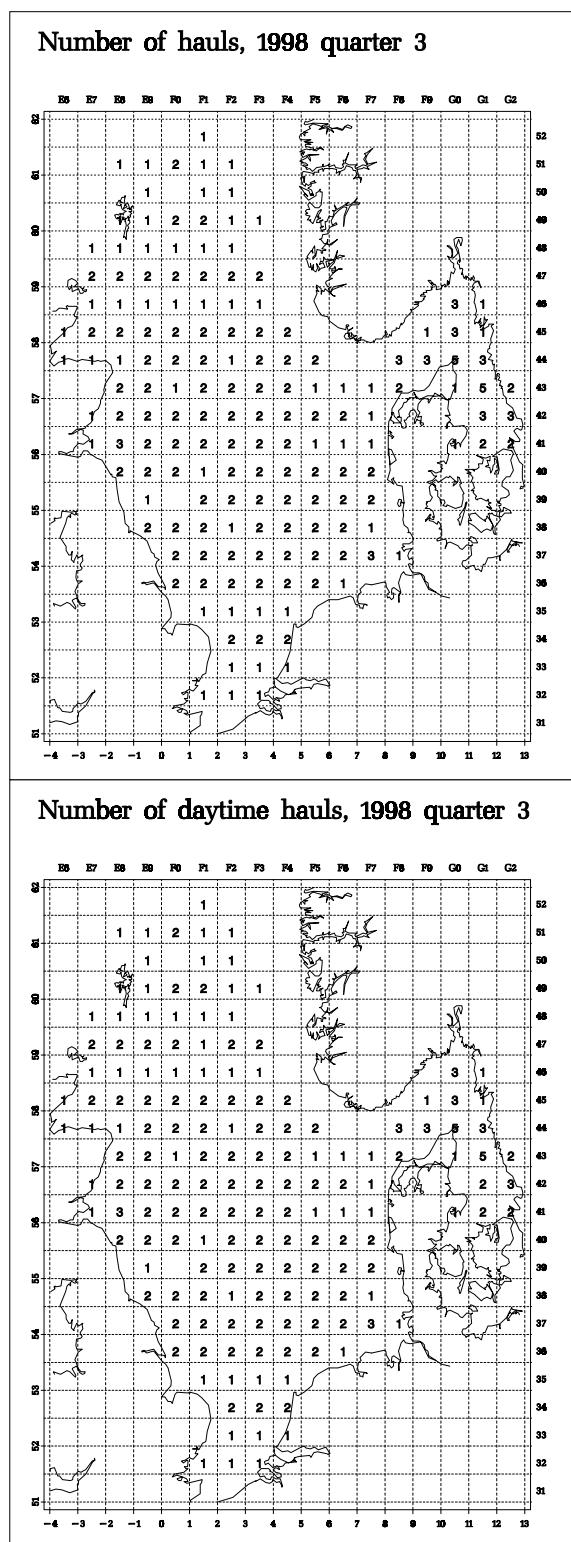


Figure 5.1. Number of valid day- and nighttime hauls.

Herring, number per hour Age group 1, 1998 quarter 3

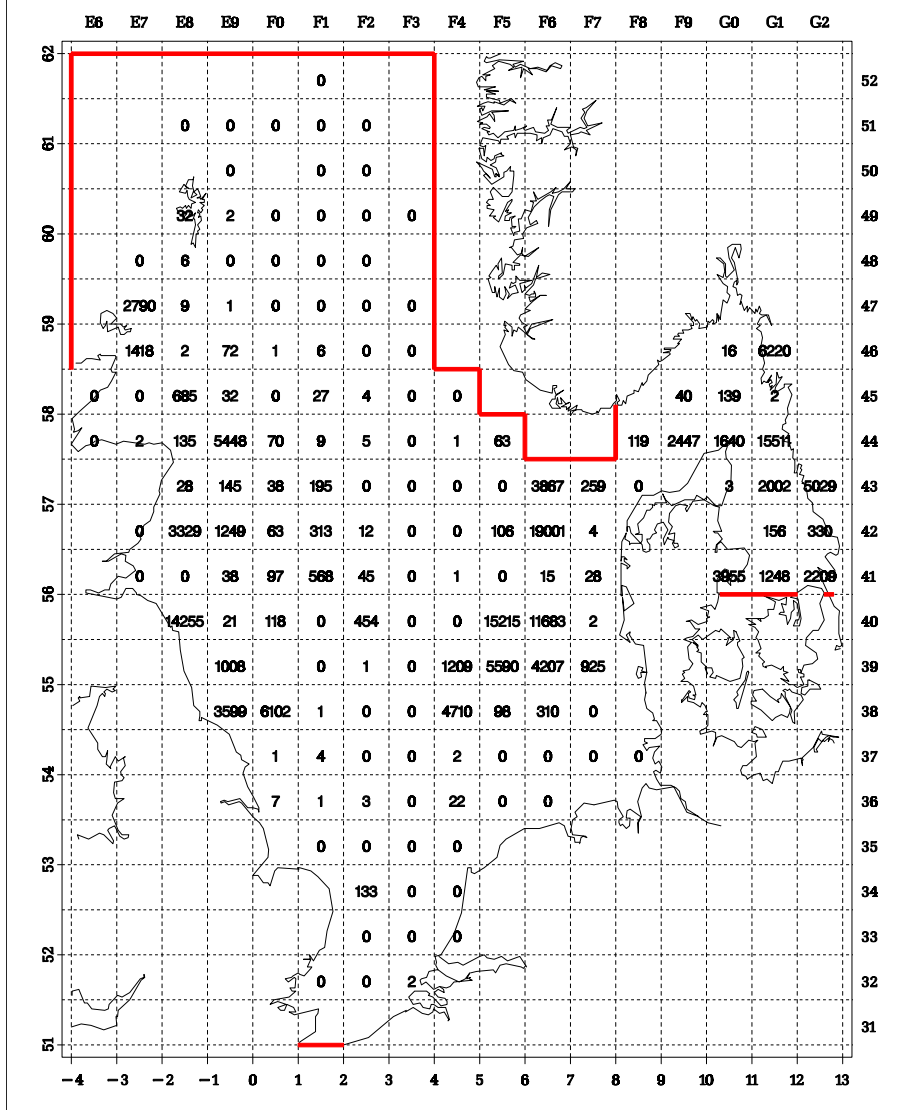


Figure 5.2 Herring: number per hour, 1-ringers

Herring, number per hour Age group 2, 1998 quarter 3

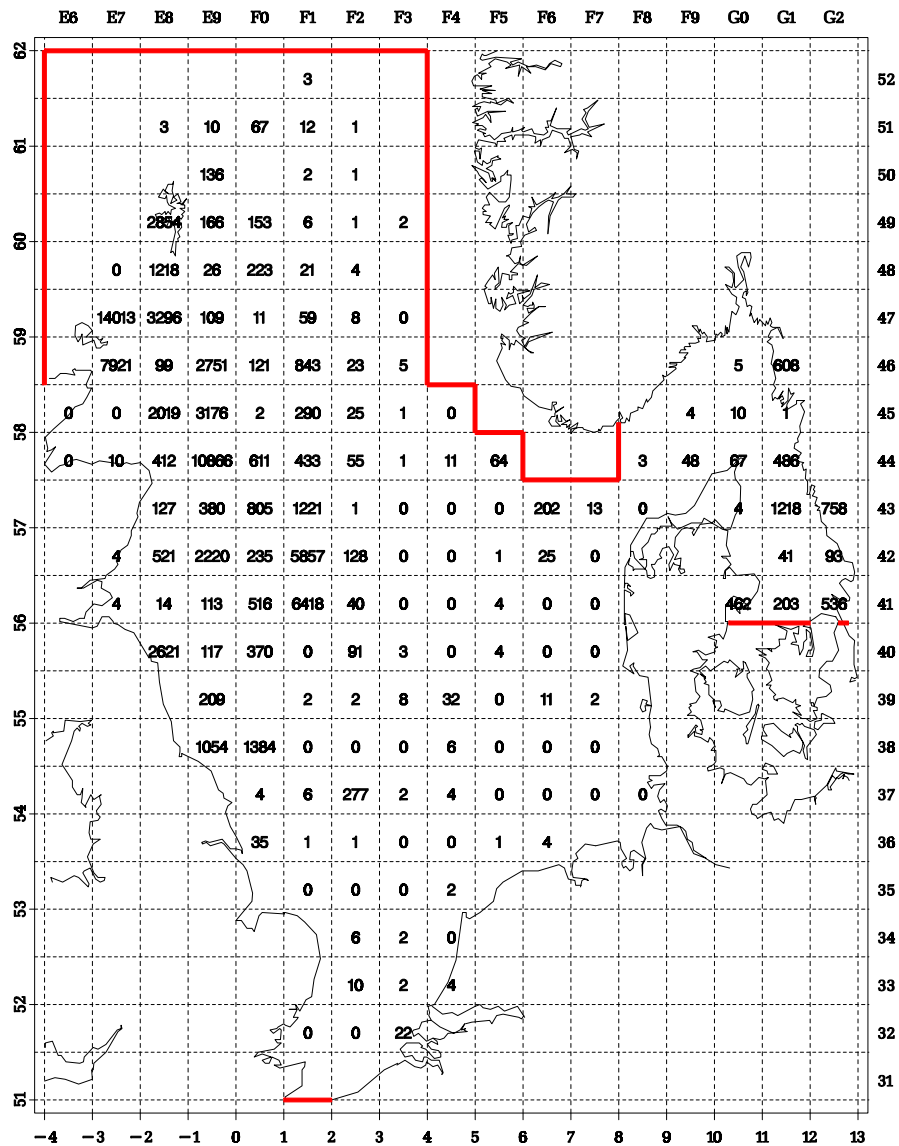


Figure 5.3 Herring: number per hour, 2-ringers

Herring, number per hour Age group 3, 1998 quarter 3

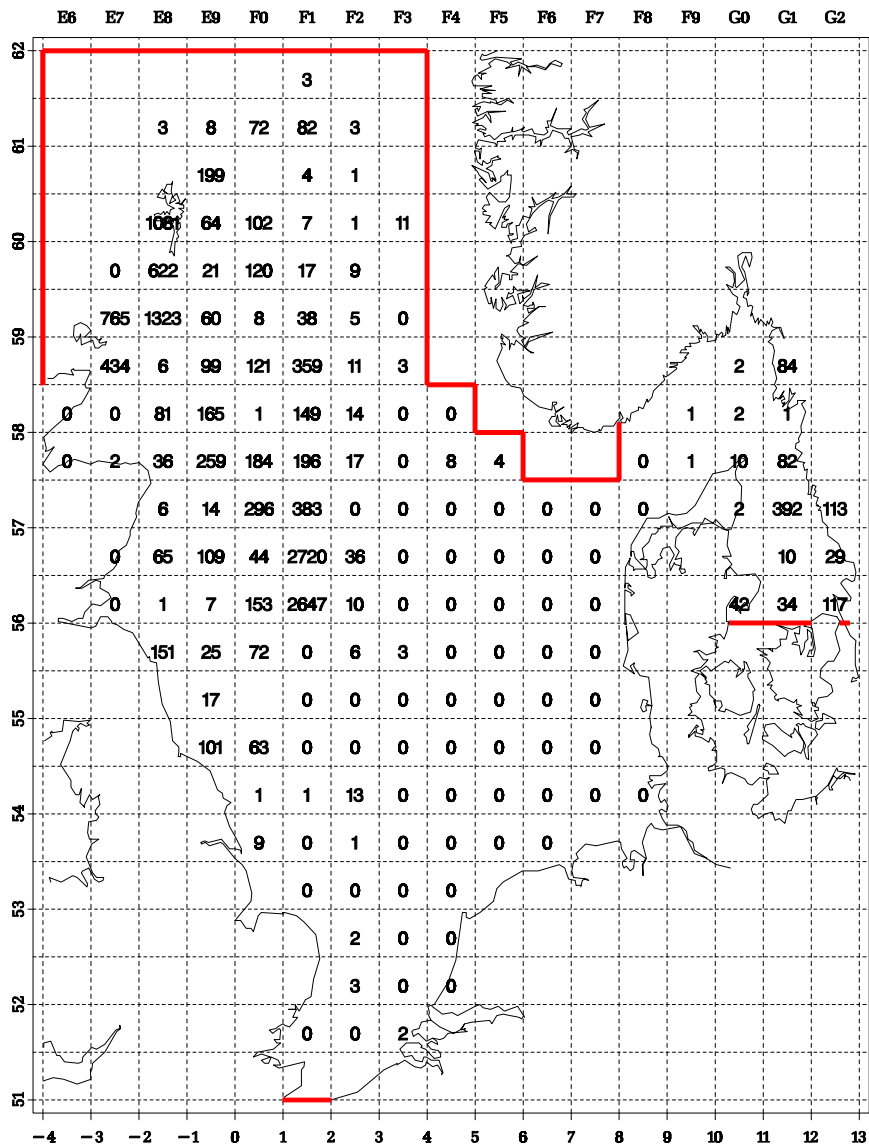


Figure 5.4 Herring: number per hour, 3 ringers

Herring, mean length Age group 1, 1998 quarter 3

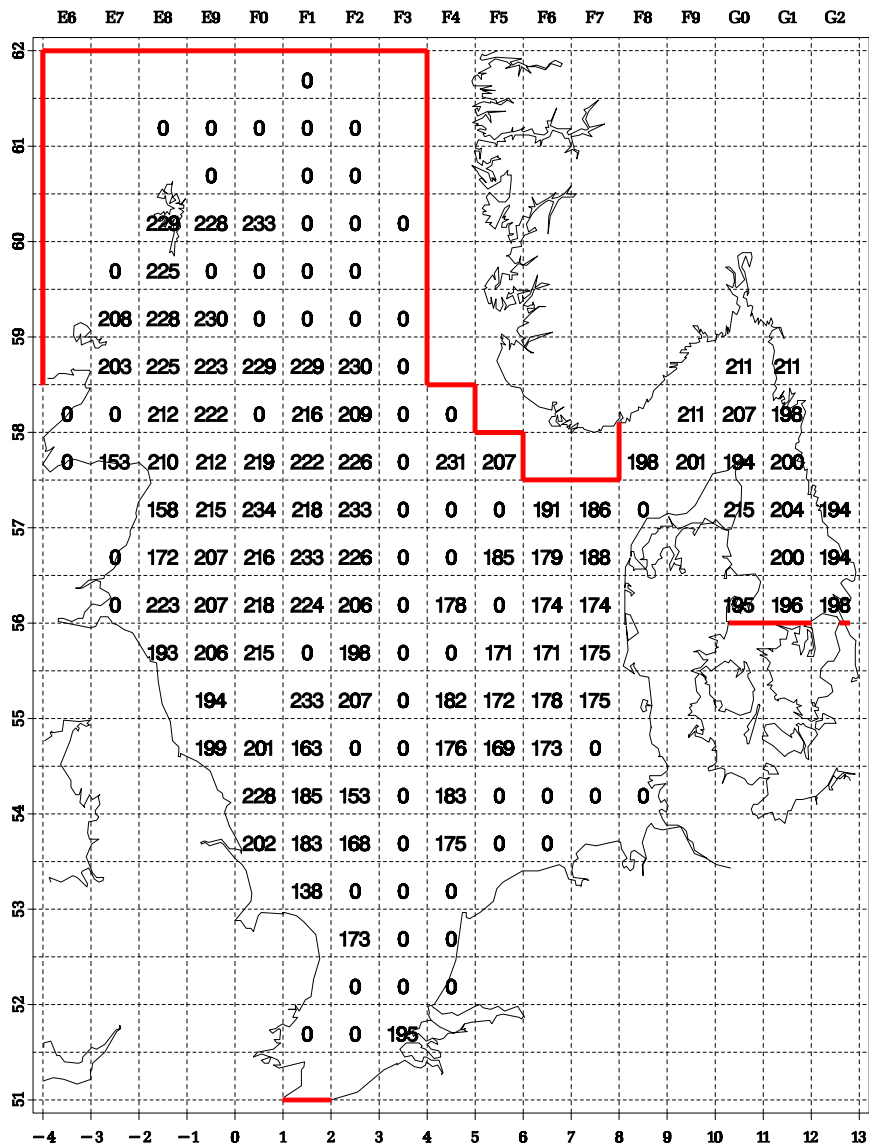


Figure 5.5 Herring: mean length (mm) 1- ringers

Sprat, number per hour Age group 1, 1998 quarter 3

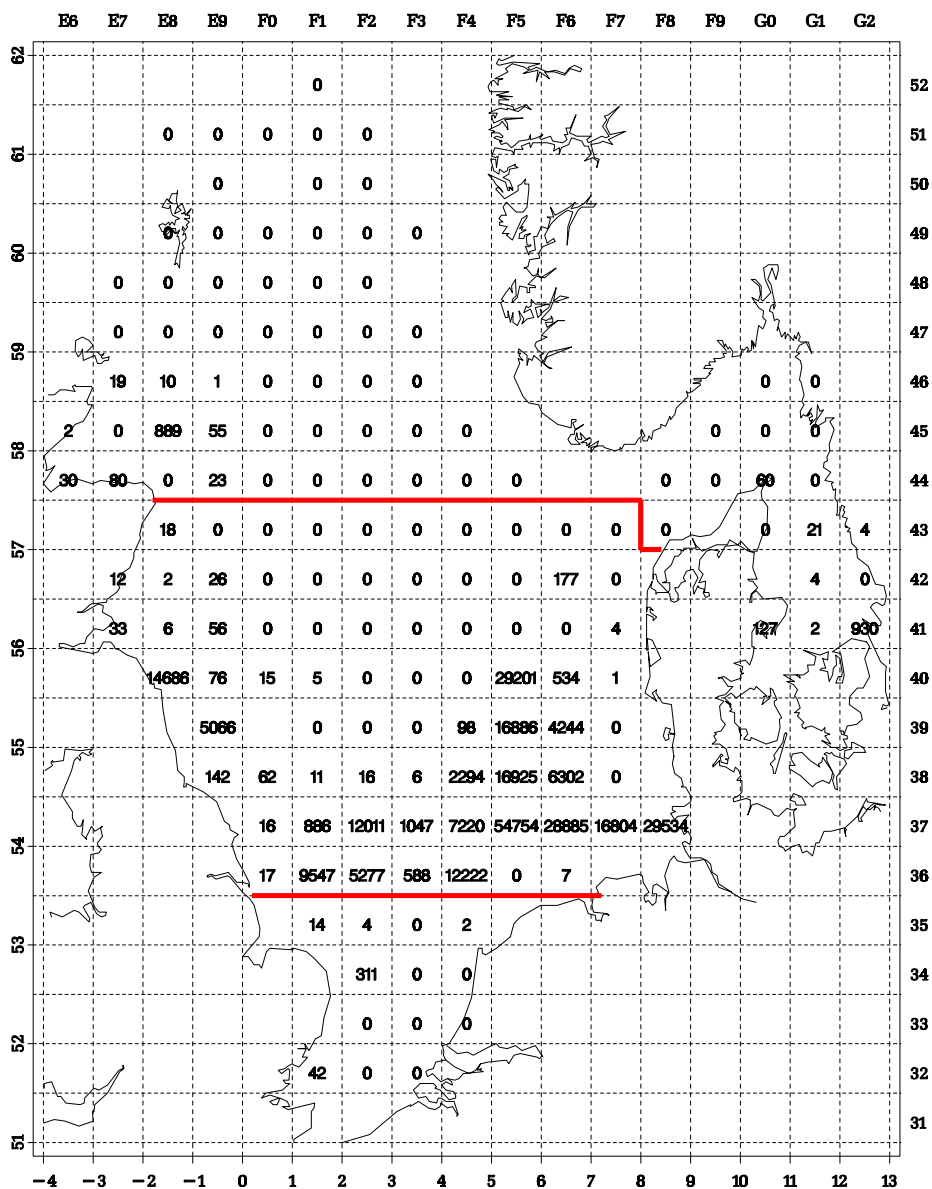


Figure 5.6 Sprat: number per hour, age 1

Sprat, number per hour Age group 2, 1998 quarter 3

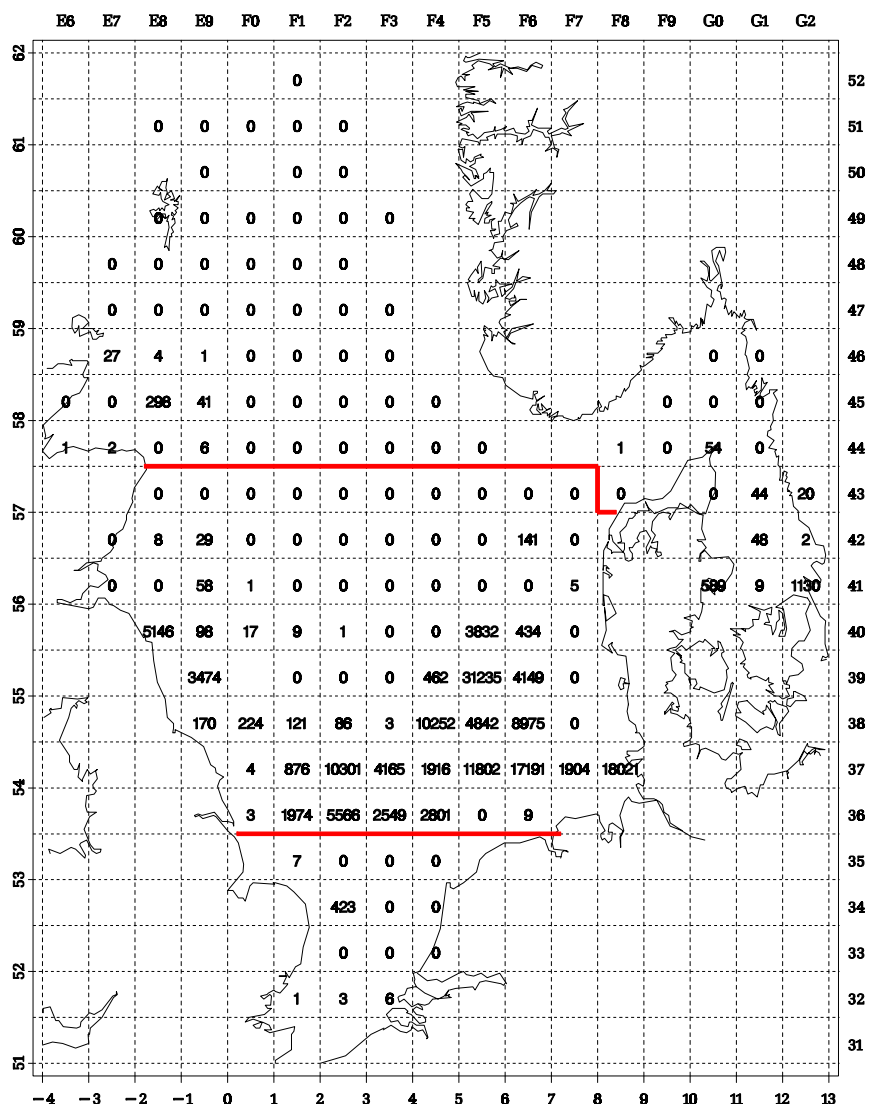


Figure 5.7 Sprat: number per hour, age 2

Sprat, number per hour Age group 3, 1998 quarter 3

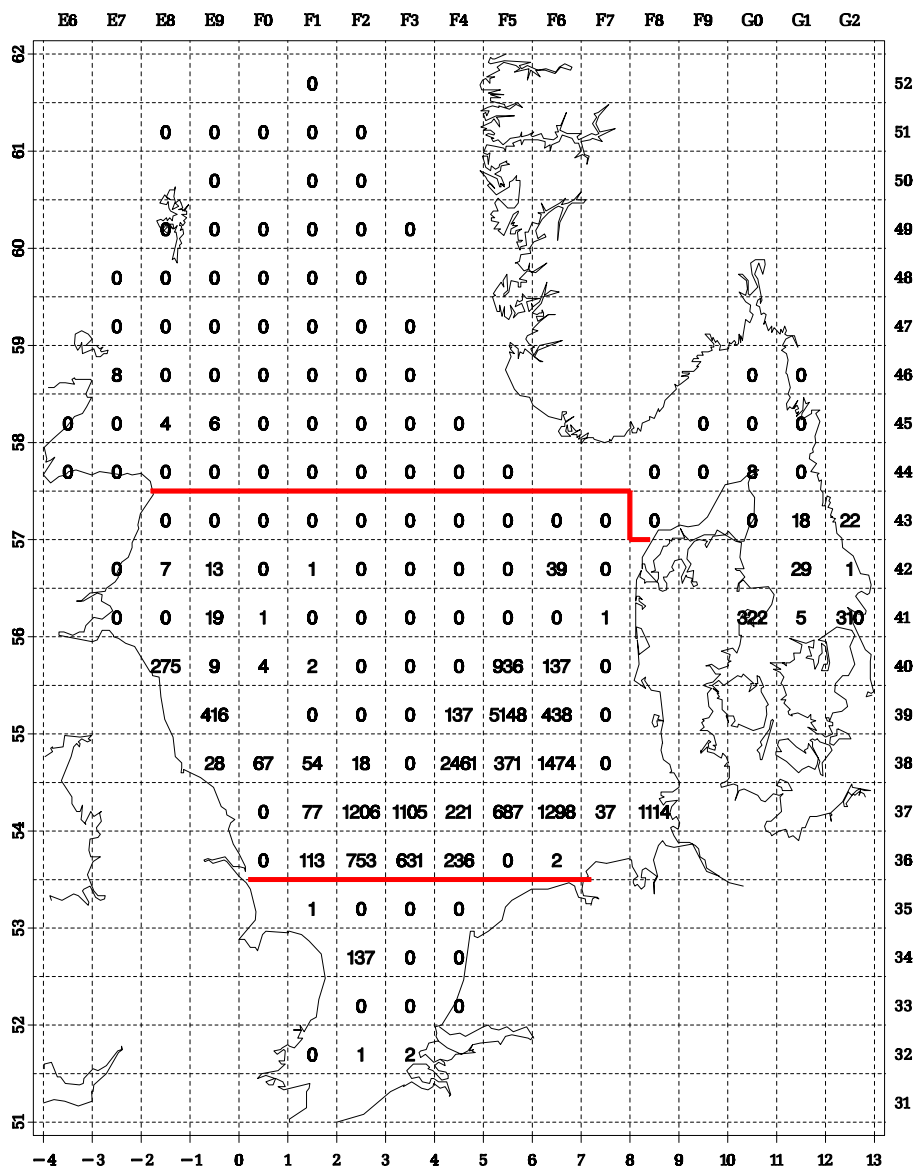


Figure 5.8 Sprat: number per hour, age 3

Sprat, mean length Age group 1, 1998 quarter 3

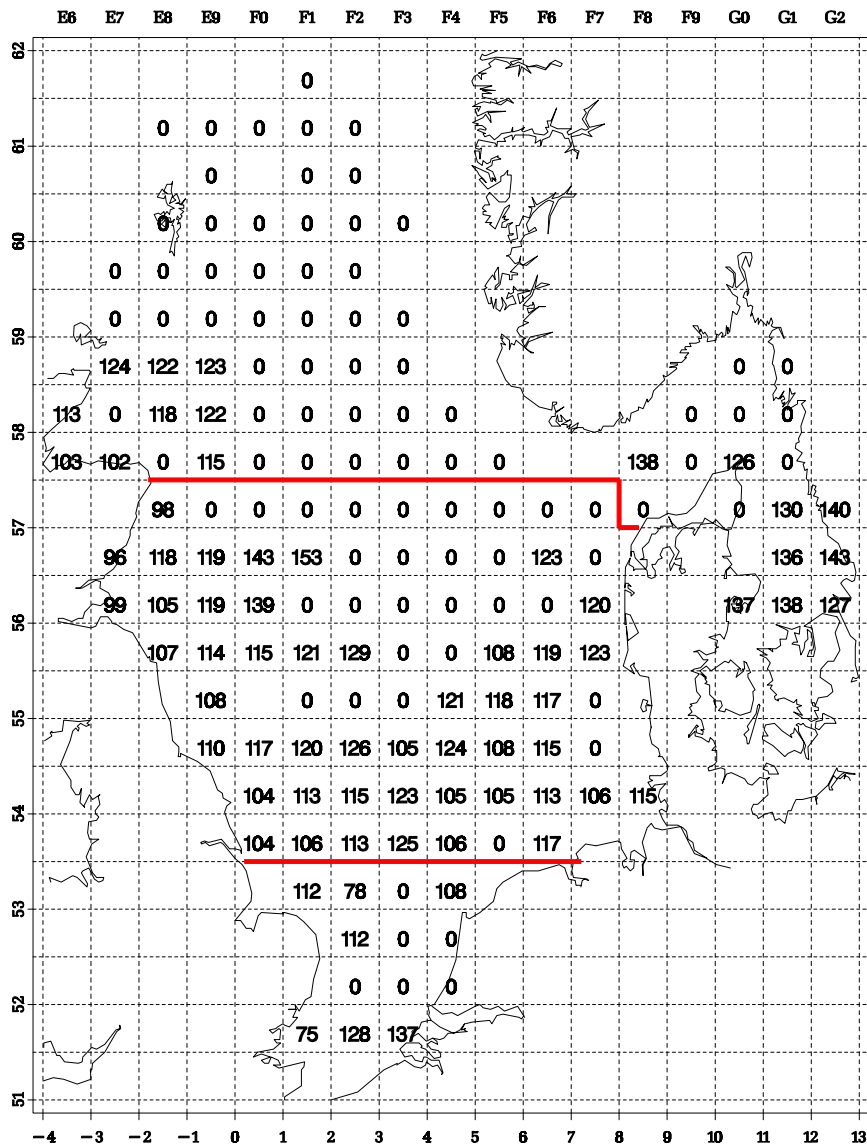


Figure 5.9. Sprat: mean length (mm), age 1.

Mackerel, number per hour Age group 1, 1998 quarter 3

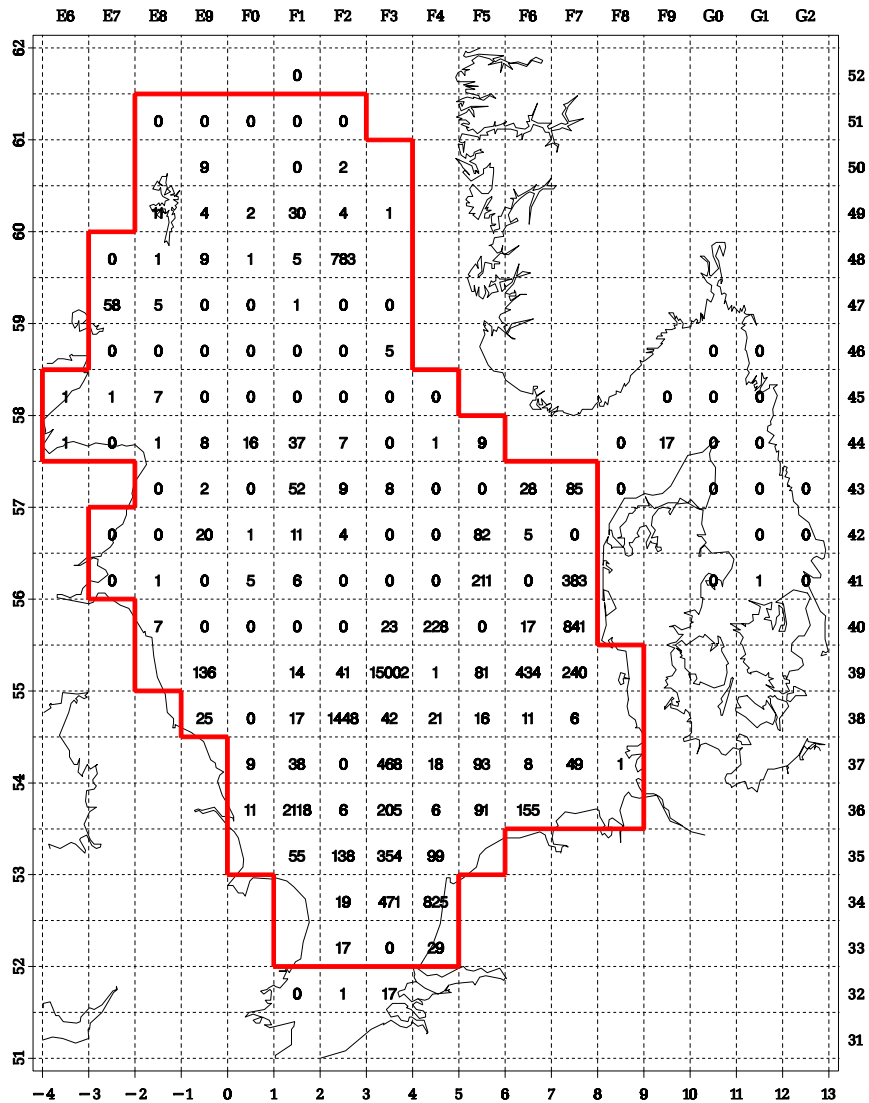


Figure 5.10 Mackerel: number per hour, age 1.

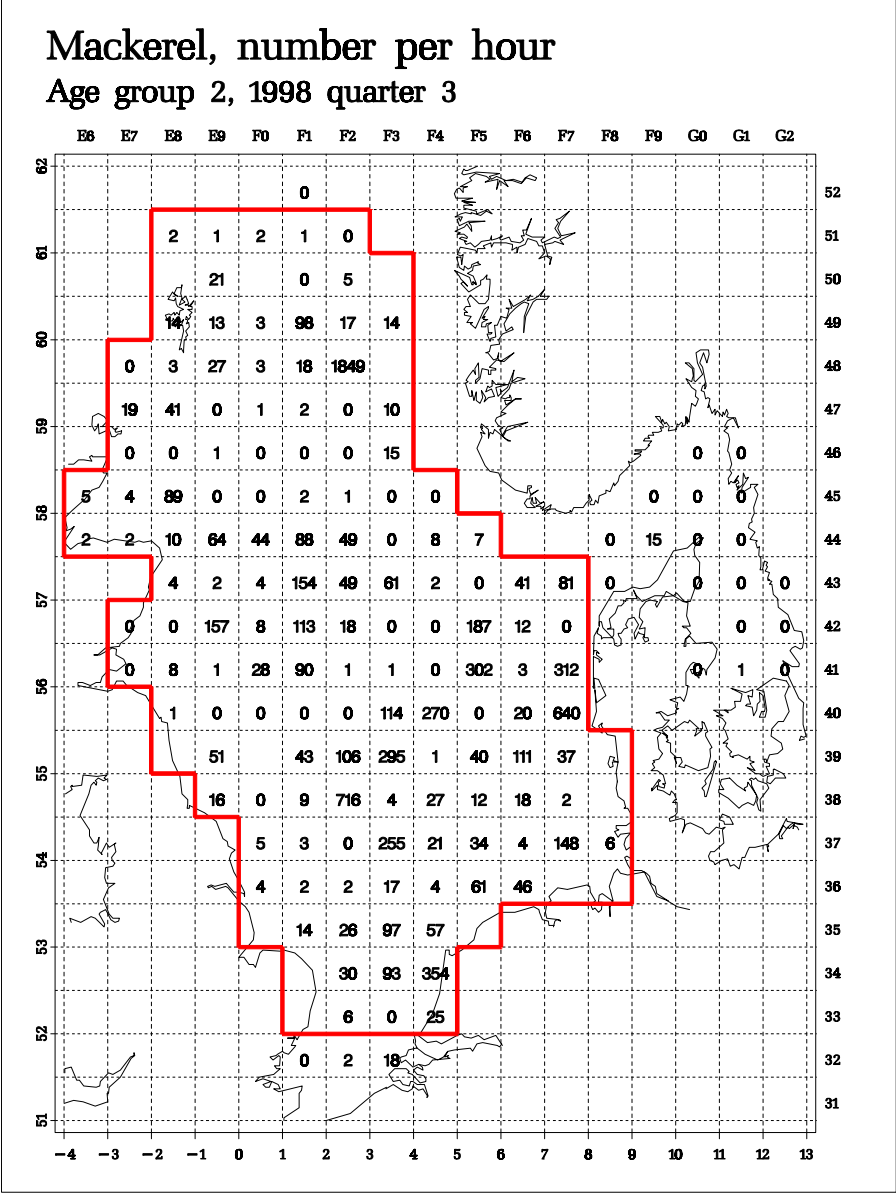


Figure 5.11 Mackerel: number per hour, age 2.

Mackerel, number per hour Age group 3, 1998 quarter 3

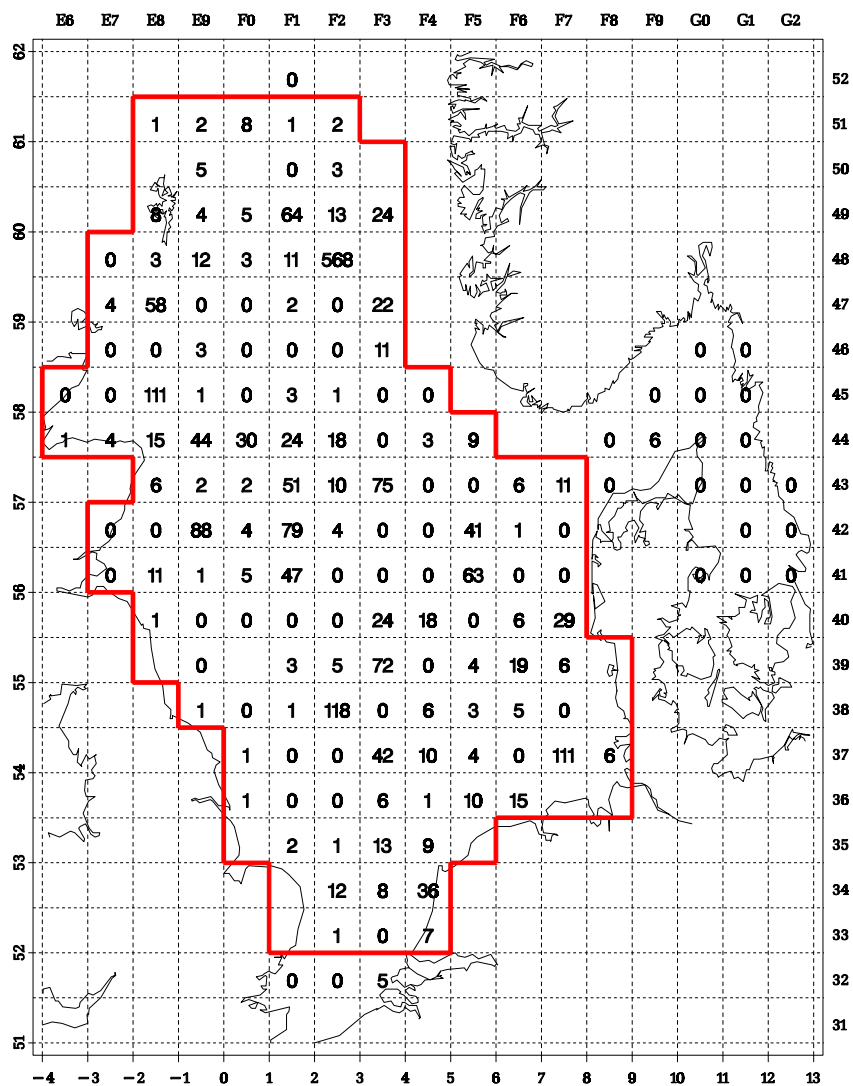


Figure 5.12 Mackerel: number per hour, age 3.

Mackerel, mean length Age group 1, 1998 quarter 3

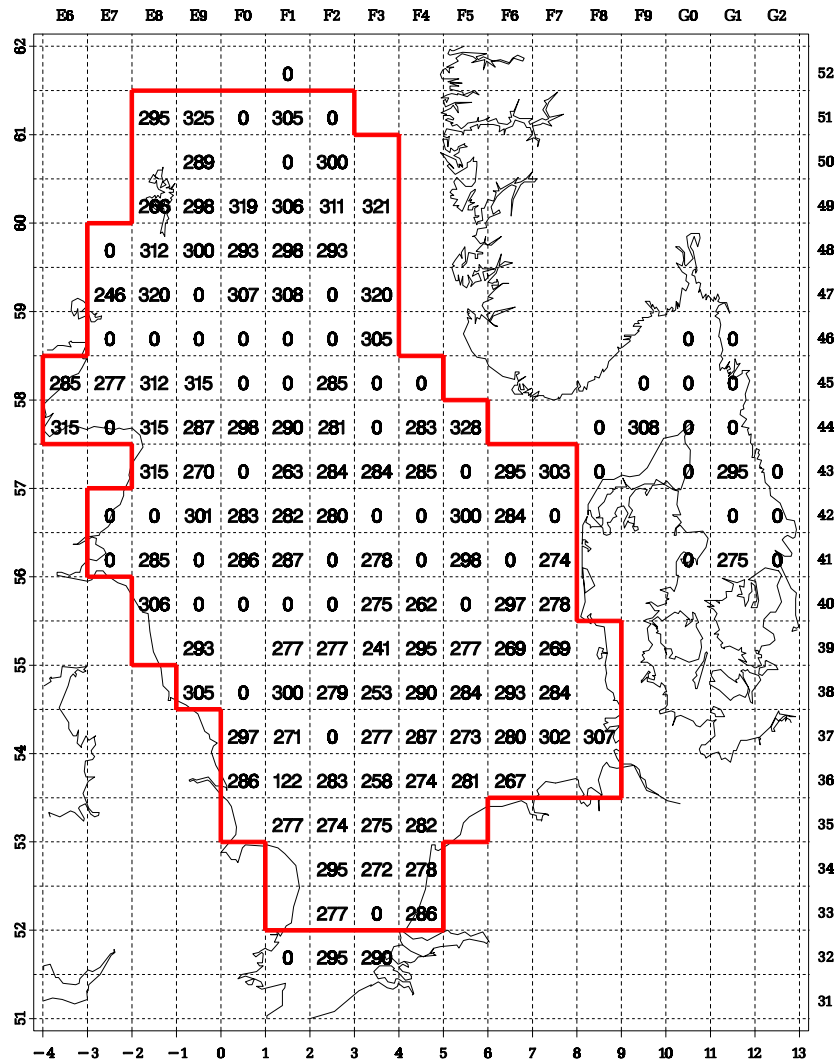


Figure 5.13 Mackerel: mean length (mm), age 1.

Cod, number per hour Age group 1, 1998 quarter 3

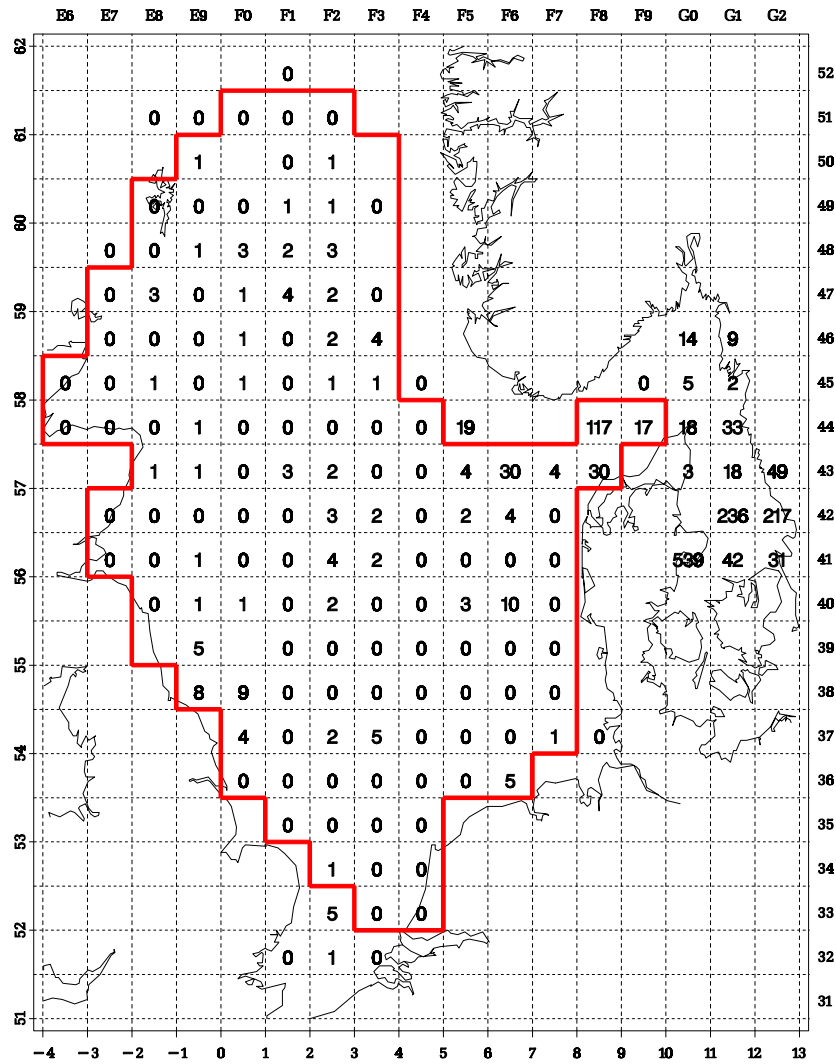


Figure 5.14 Cod: number per hour, age 1.

Cod, number per hour Age group 2, 1998 quarter 3

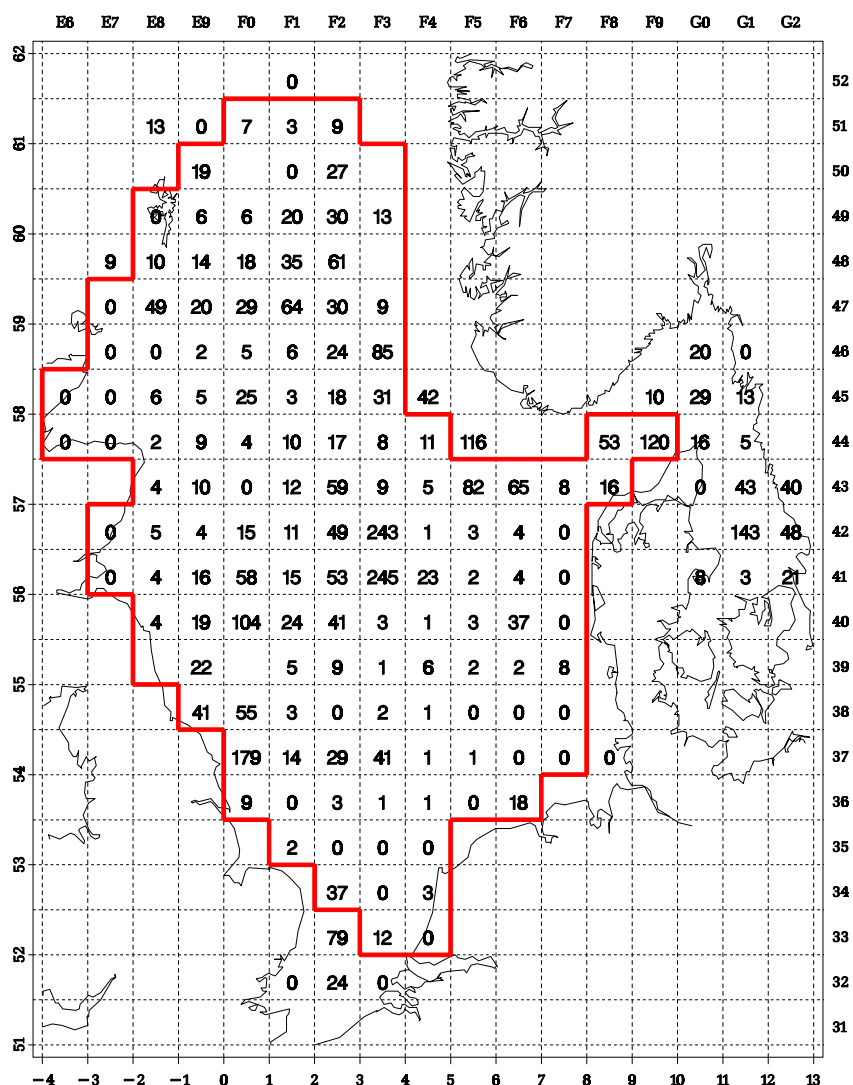


Figure 5.15 Cod: number per hour, age 2.

Cod, number per hour Age group 3, 1998 quarter 3

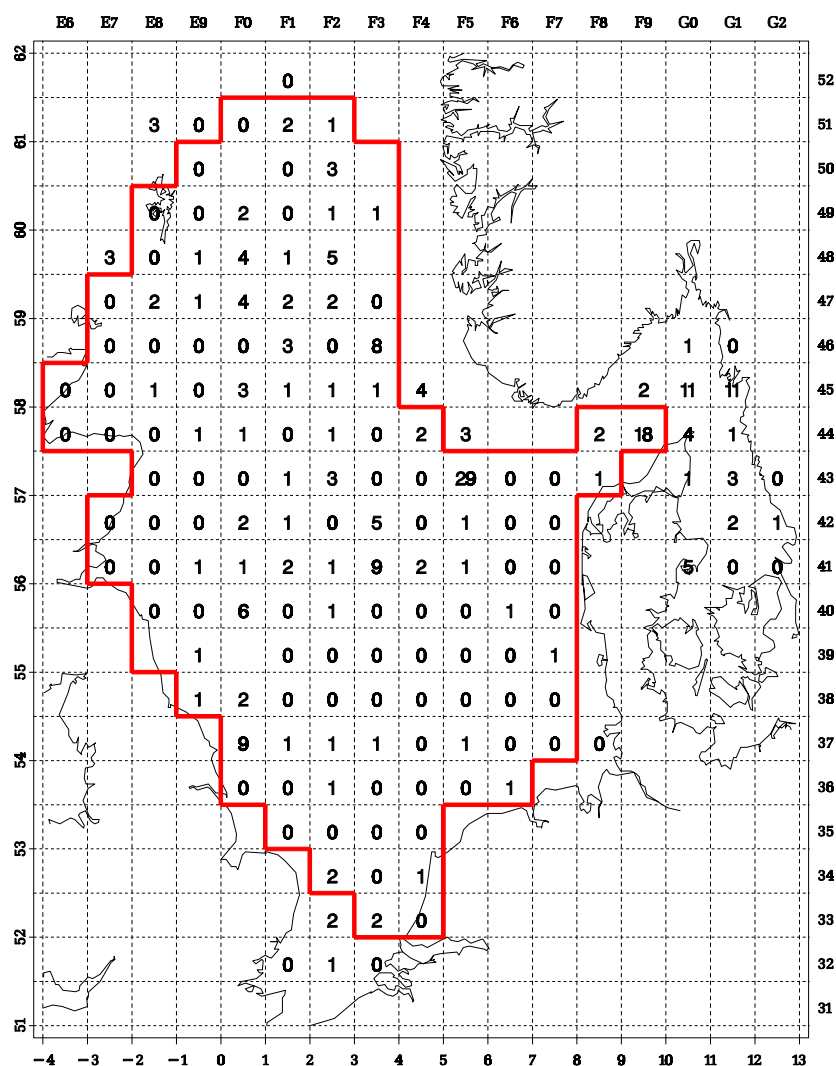


Figure 5.16 Cod: number per hour, age 3.

Cod, mean length Age group 1, 1998 quarter 3

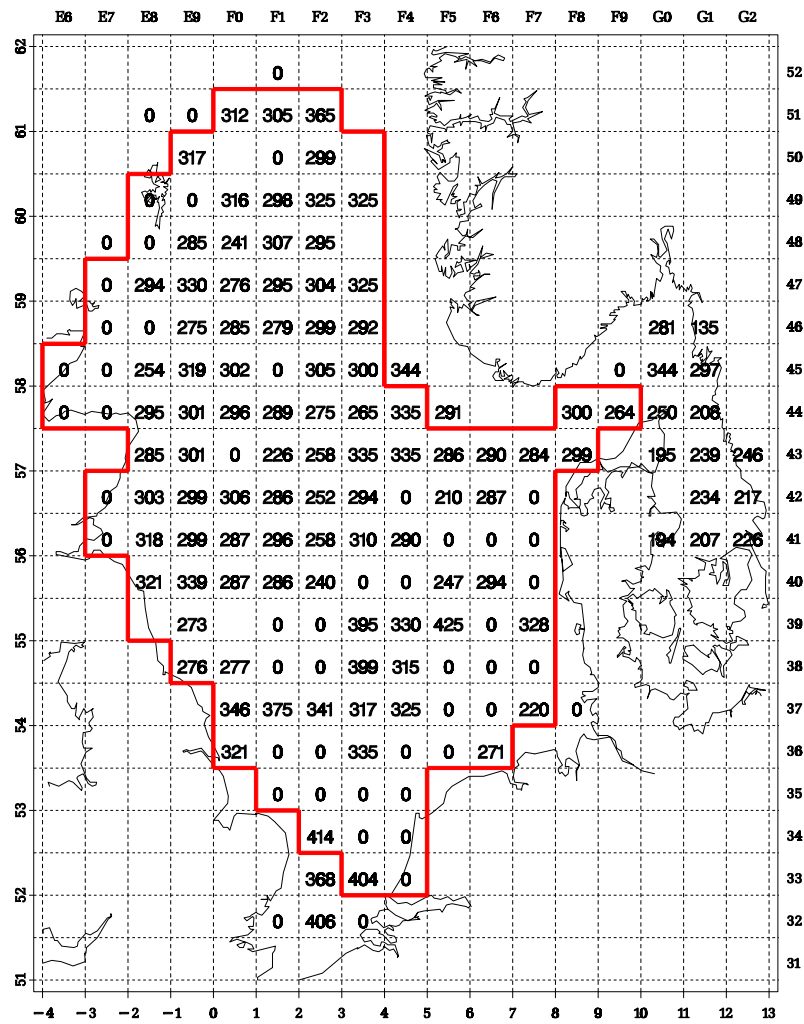


Figure 5.17 Cod, mean length (mm) age 1.

Haddock, number per hour Age group 1, 1998 quarter 3

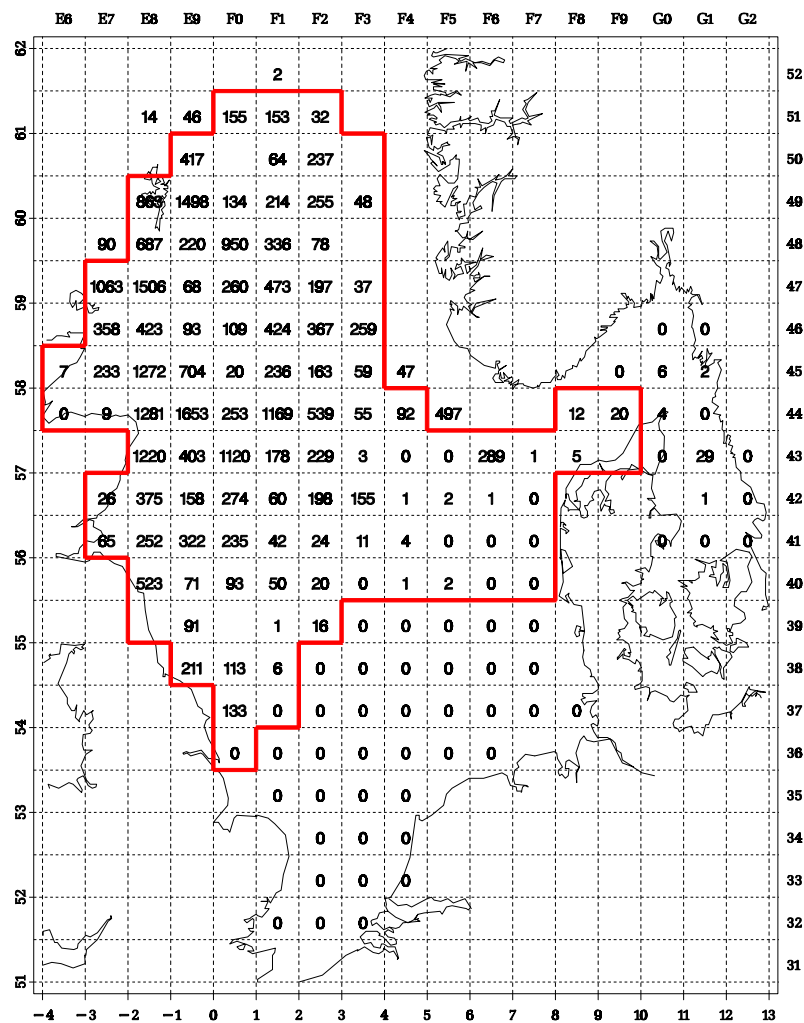


Figure 5.18 Haddock: number per hour, age 1.

Age group 2, 1998 quarter 3

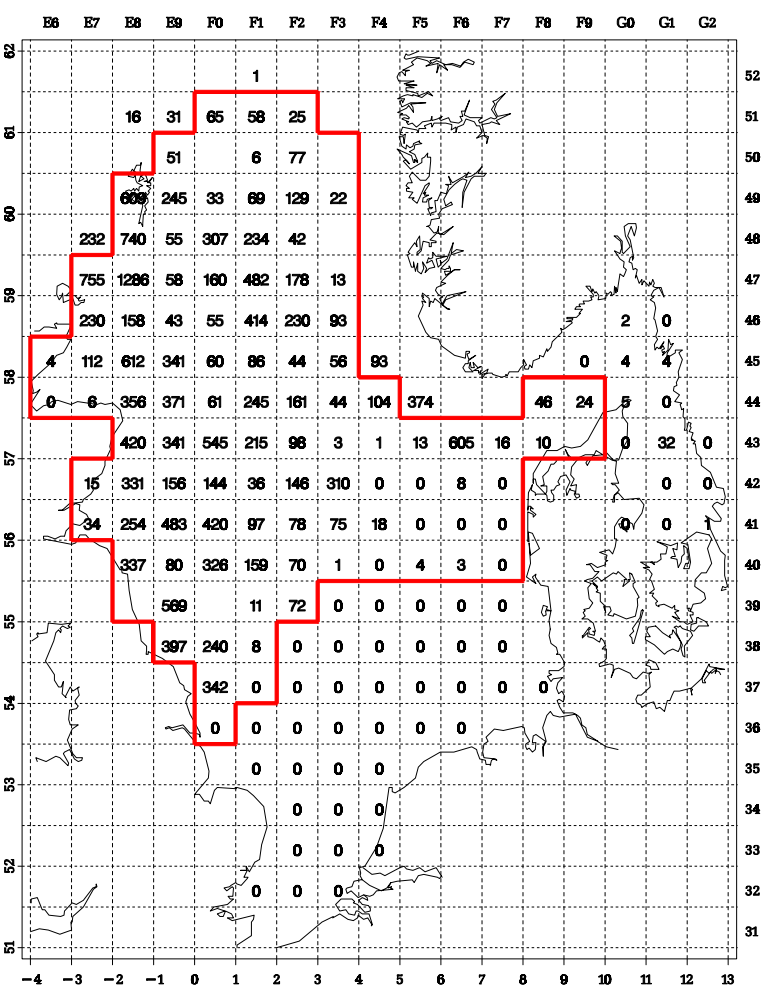


Figure 5.19 Haddock: number per hour, age 2.

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Haddock, mean length Age group 1, 1998 quarter 3

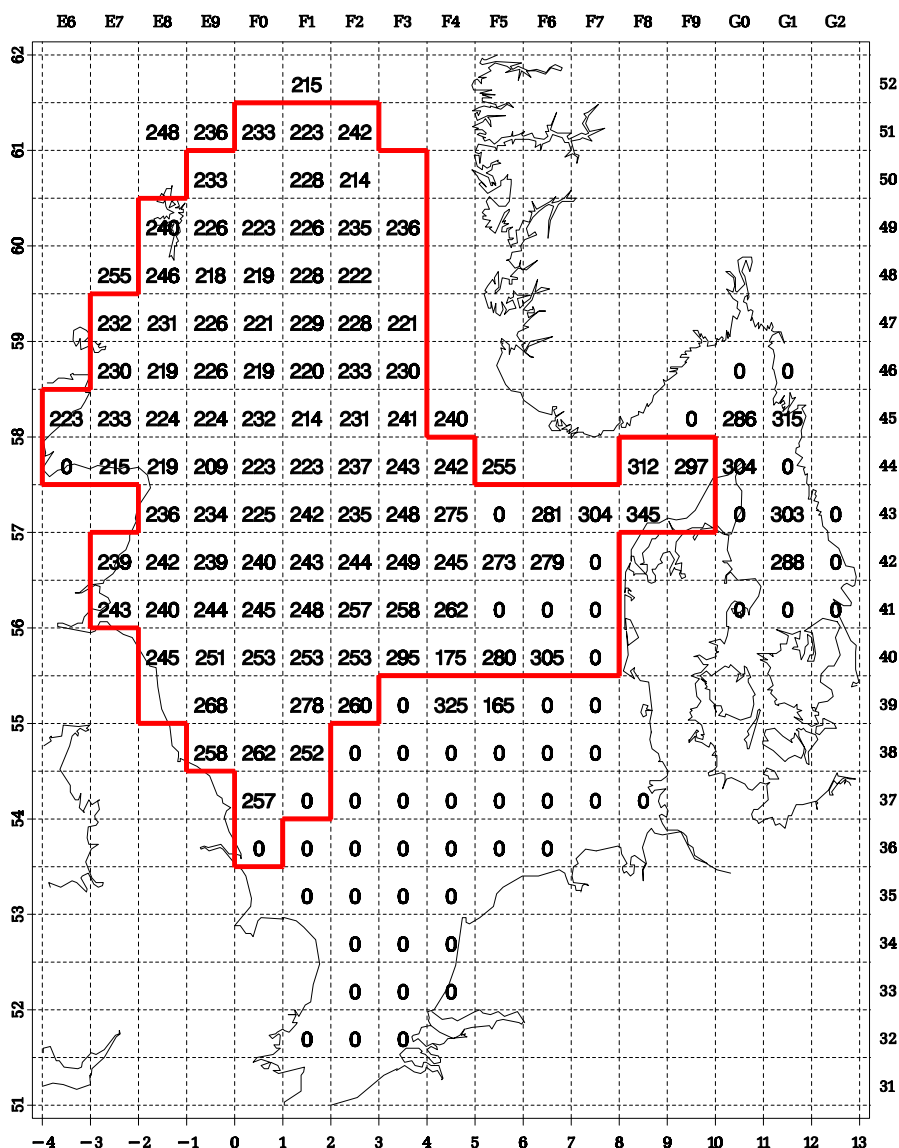


Figure 5.21 Haddock: mean length (mm), age 1.

Whiting, number per hour Age group 1, 1998 quarter 3

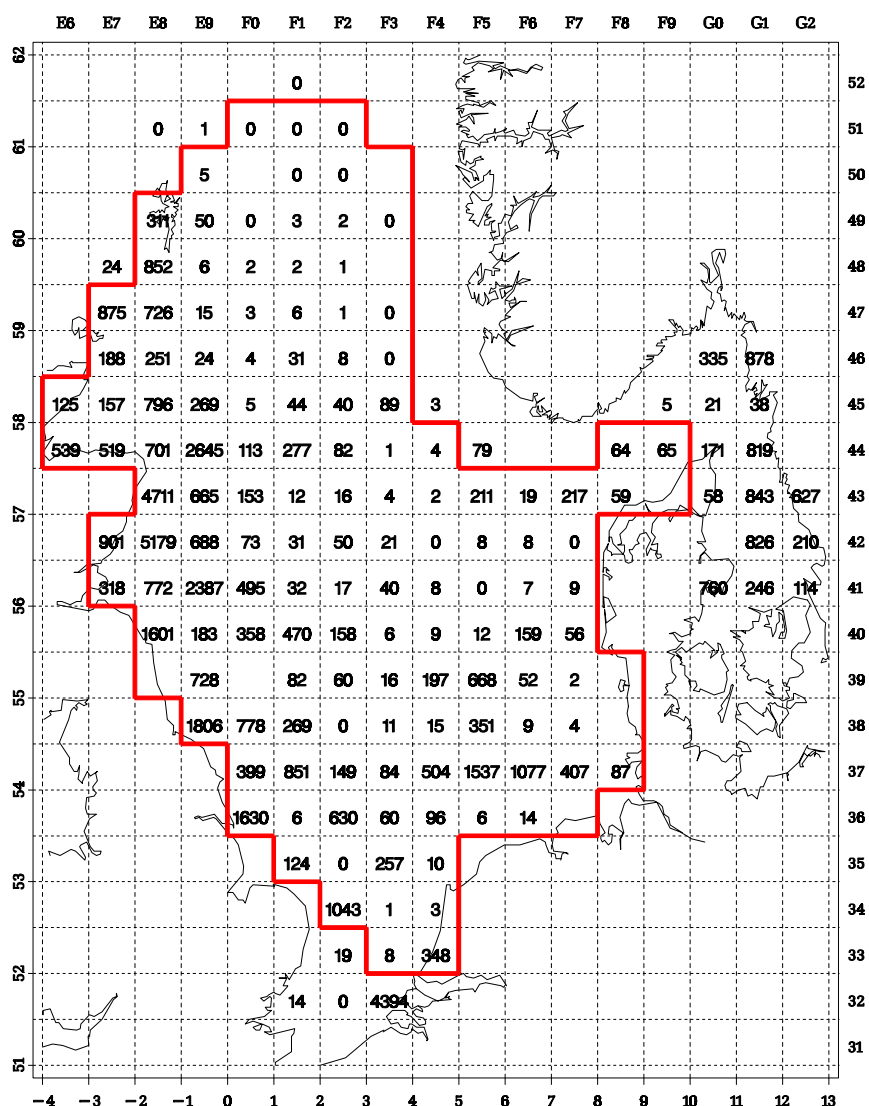


Figure 5.22 Whiting: number per hour, age 1.

Whiting, number per hour Age group 2, 1998 quarter 3

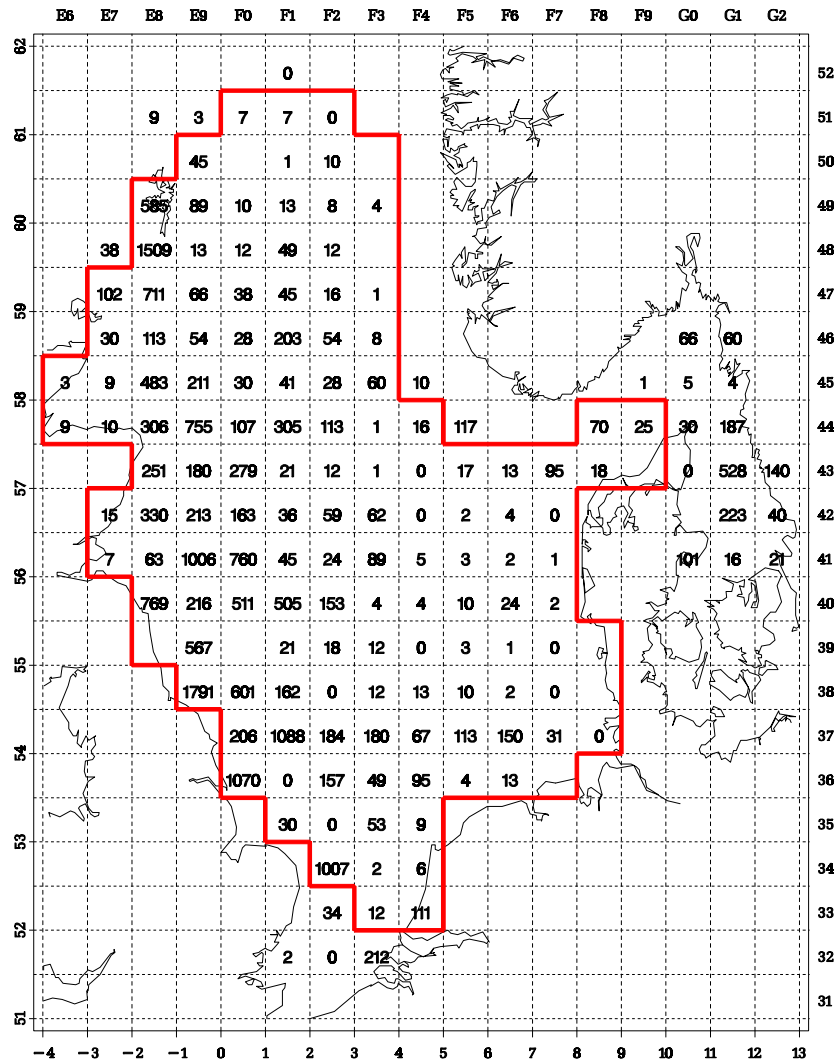


Figure 5.23 Whiting: number per hour, age 2.

Whiting, number per hour

Age group 3, 1998 quarter 3

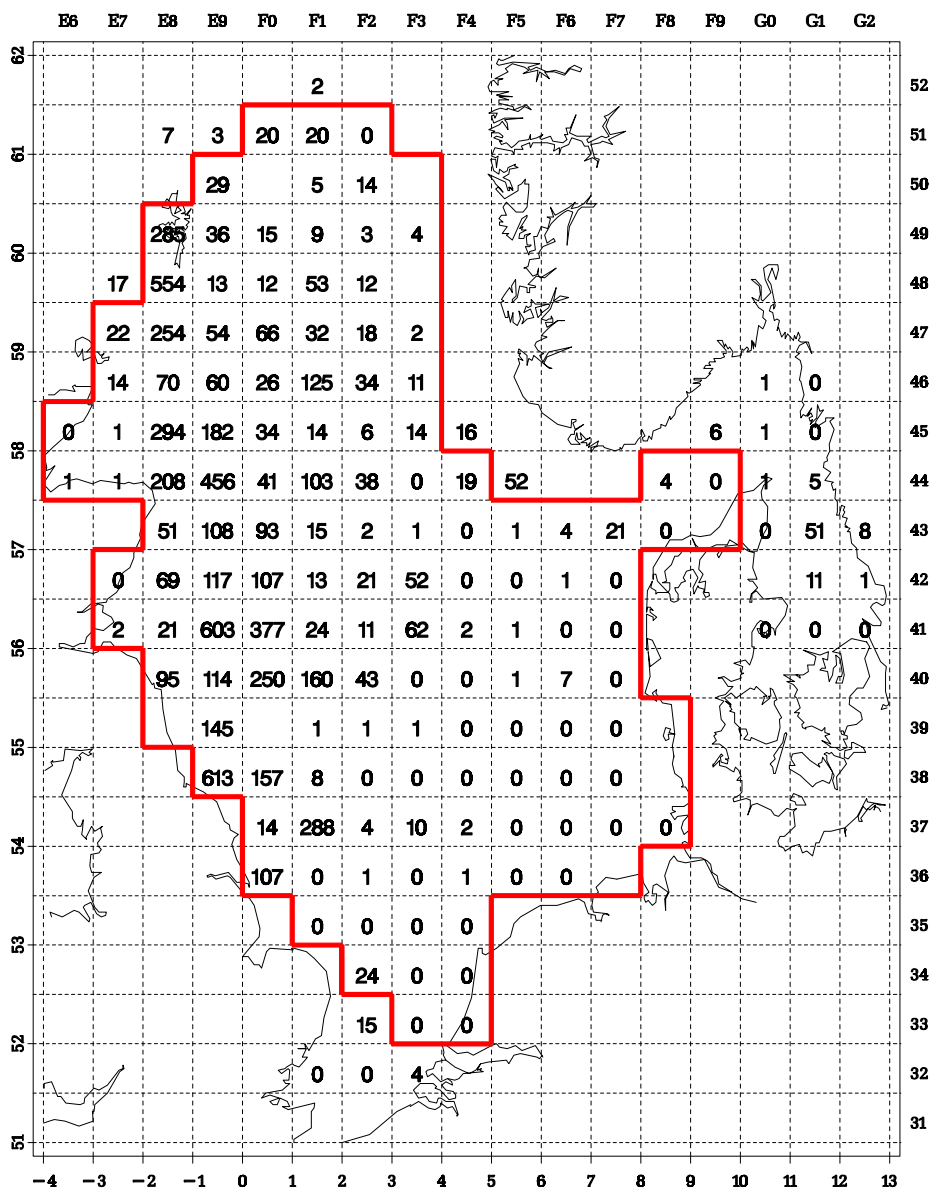


Figure 5.24 Whiting: number per hour, age 3.

Whiting, mean length Age group 1, 1998 quarter 3

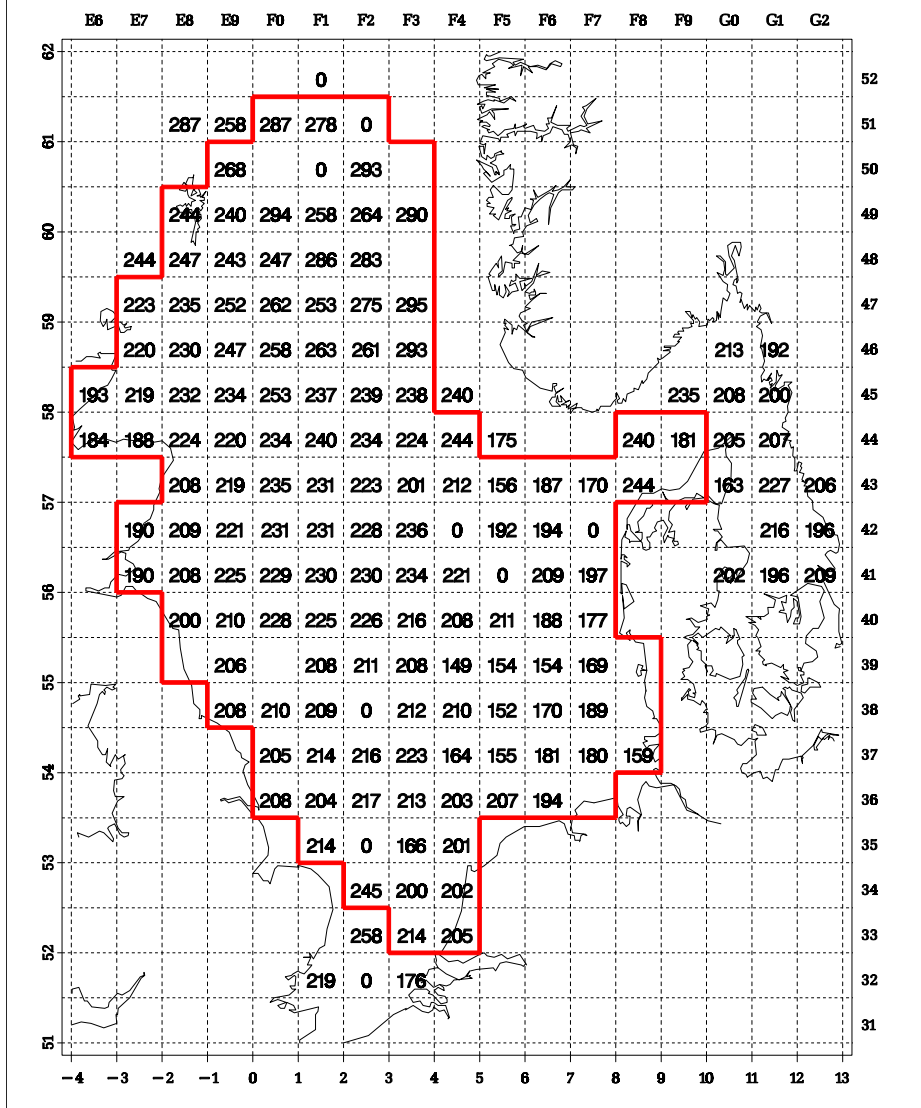


Figure 5.25 Whiting: mean length (mm), age 1.

Saithe, number per hour Age group 1, 1998 quarter 3

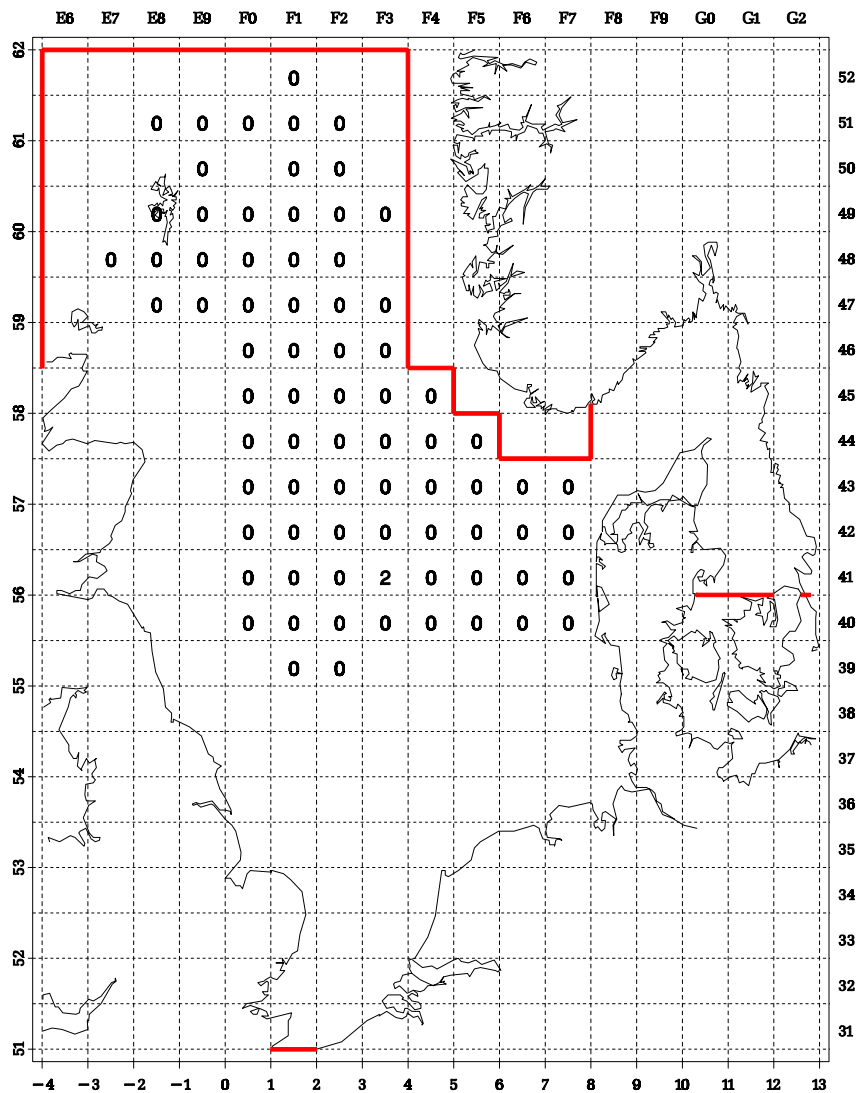


Figure 5.26 Saithe: number per hour, age 1.

Saithe, number per hour

Age group 2, 1998 quarter 3

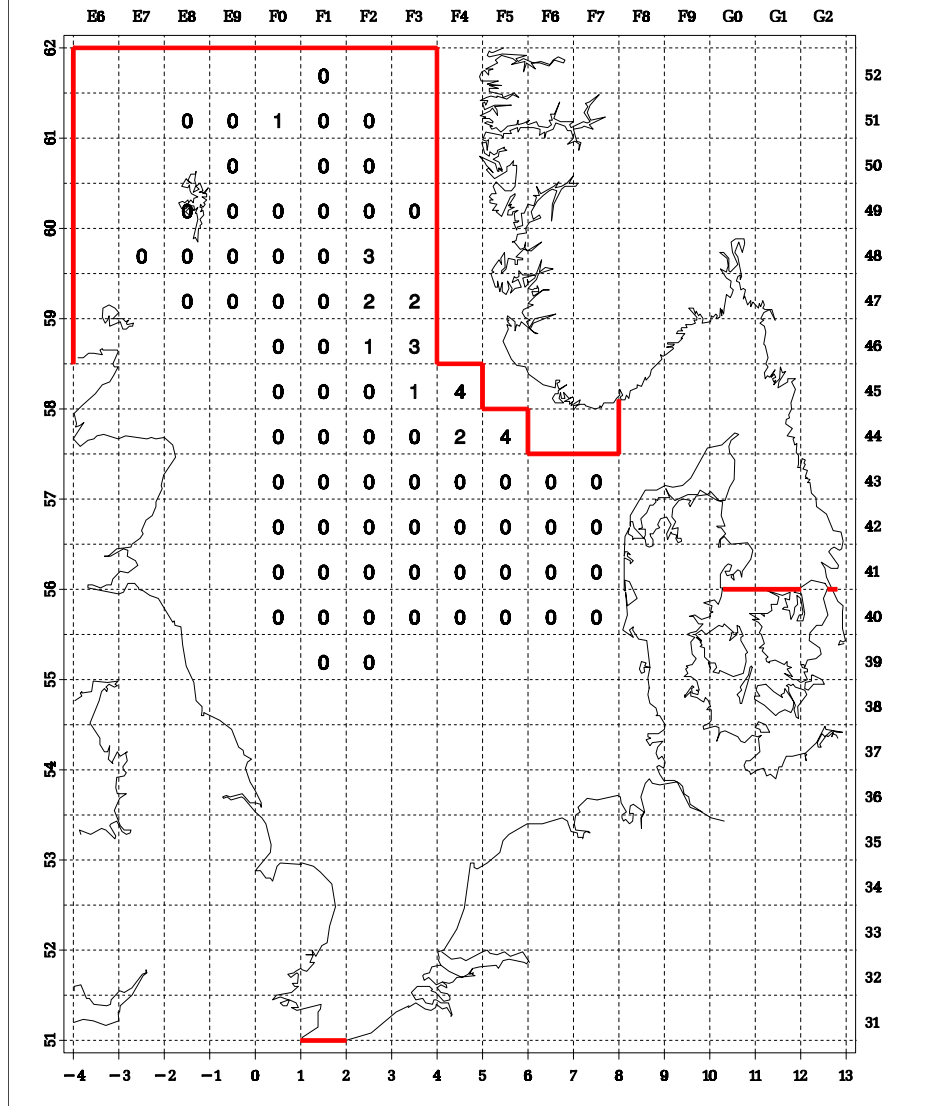


Figure 5.27 Saithe: number per hour, age 2.

Saithe, number per hour Age group 3, 1998 quarter 3

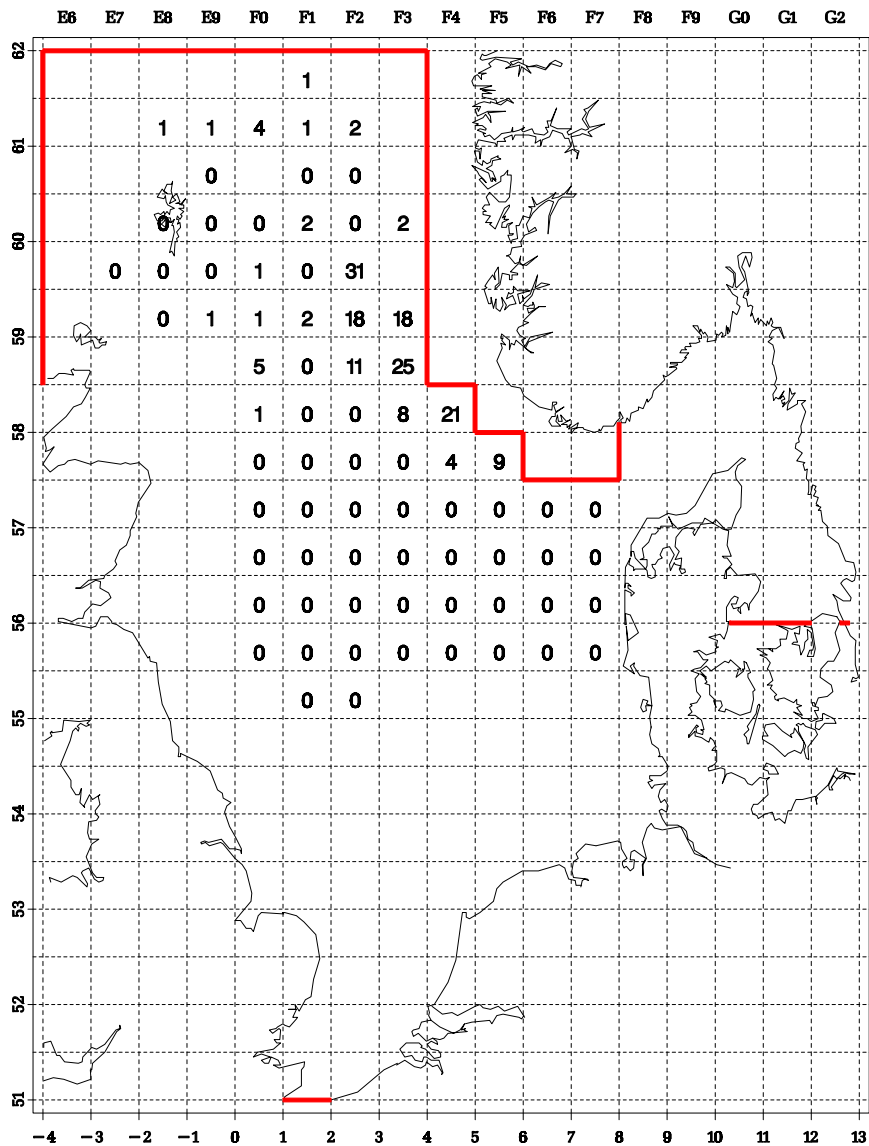


Figure 5.28 Saithe: number per hour, age 3.

Saithe, mean length Age group 1, 1998 quarter 3

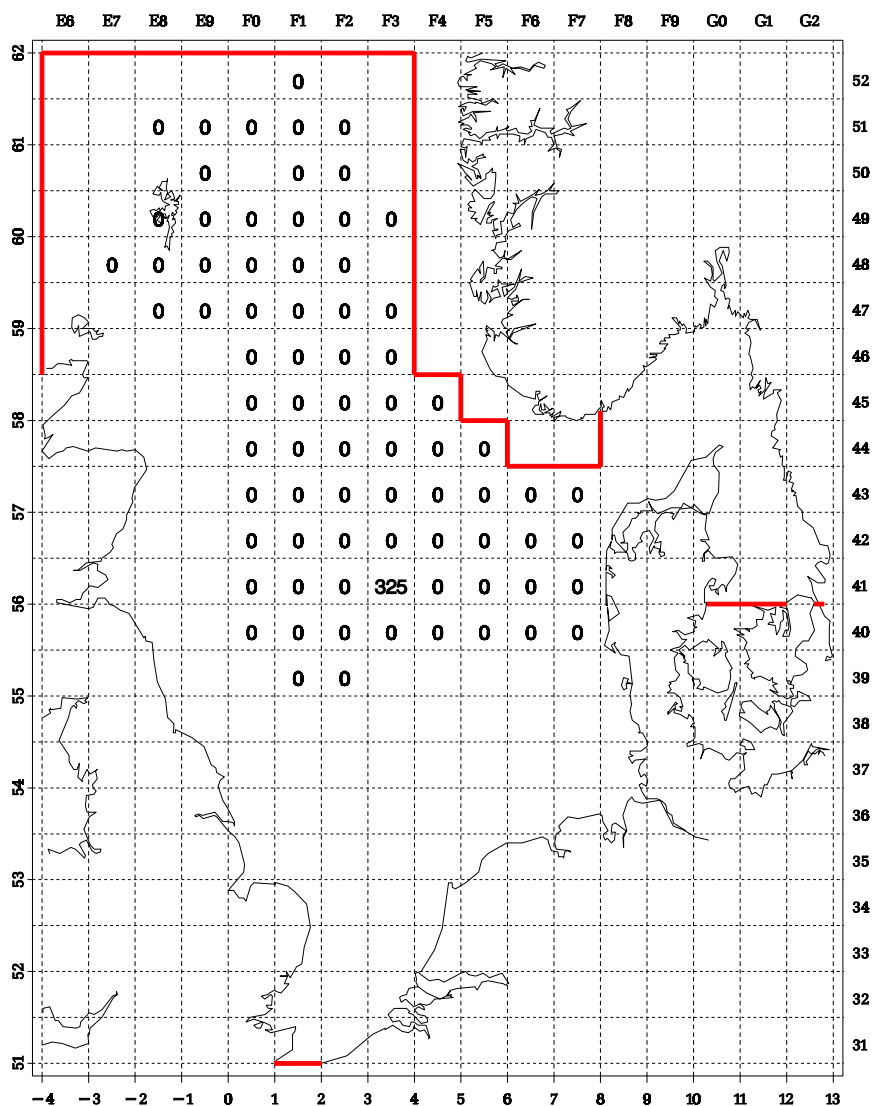


Figure 5.29 Saithe: mean length (mm), age 1.

E6	E7	E8	E9	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	G0	G1	G2
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

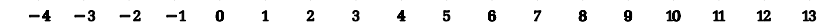


Figure 5.30 Norway pout: number per hour, age 1.

Norway pout, number per hour Age group 2, 1998 quarter 3

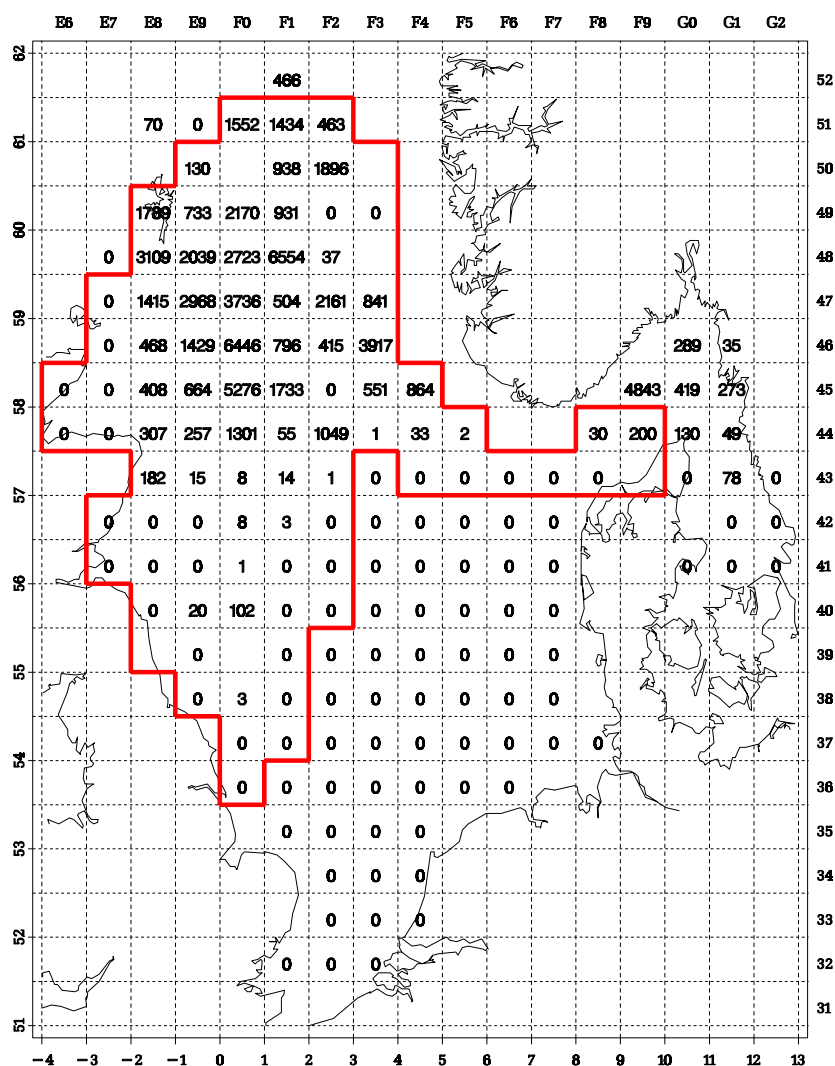


Figure 5.31 Norway pout: number per hour, age 2.

Norway pout, number per hour Age group 3, 1998 quarter 3

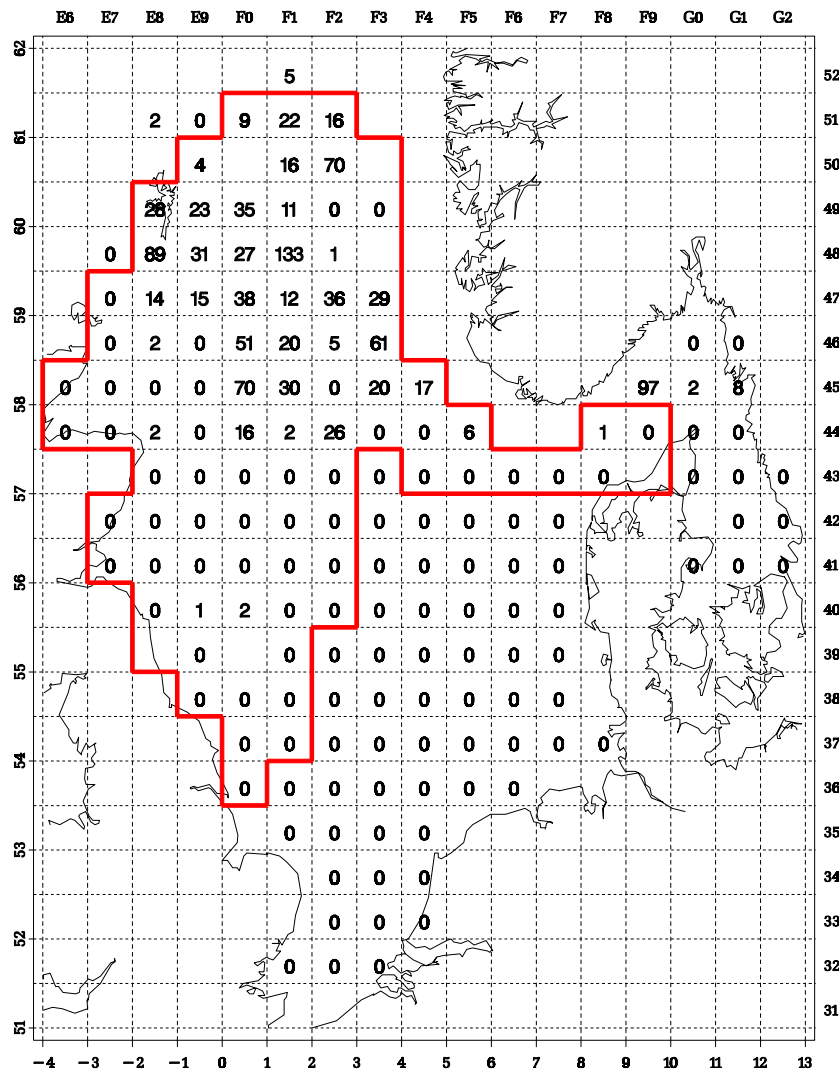


Figure 5.32 Norway pout: number per hour, age 3.

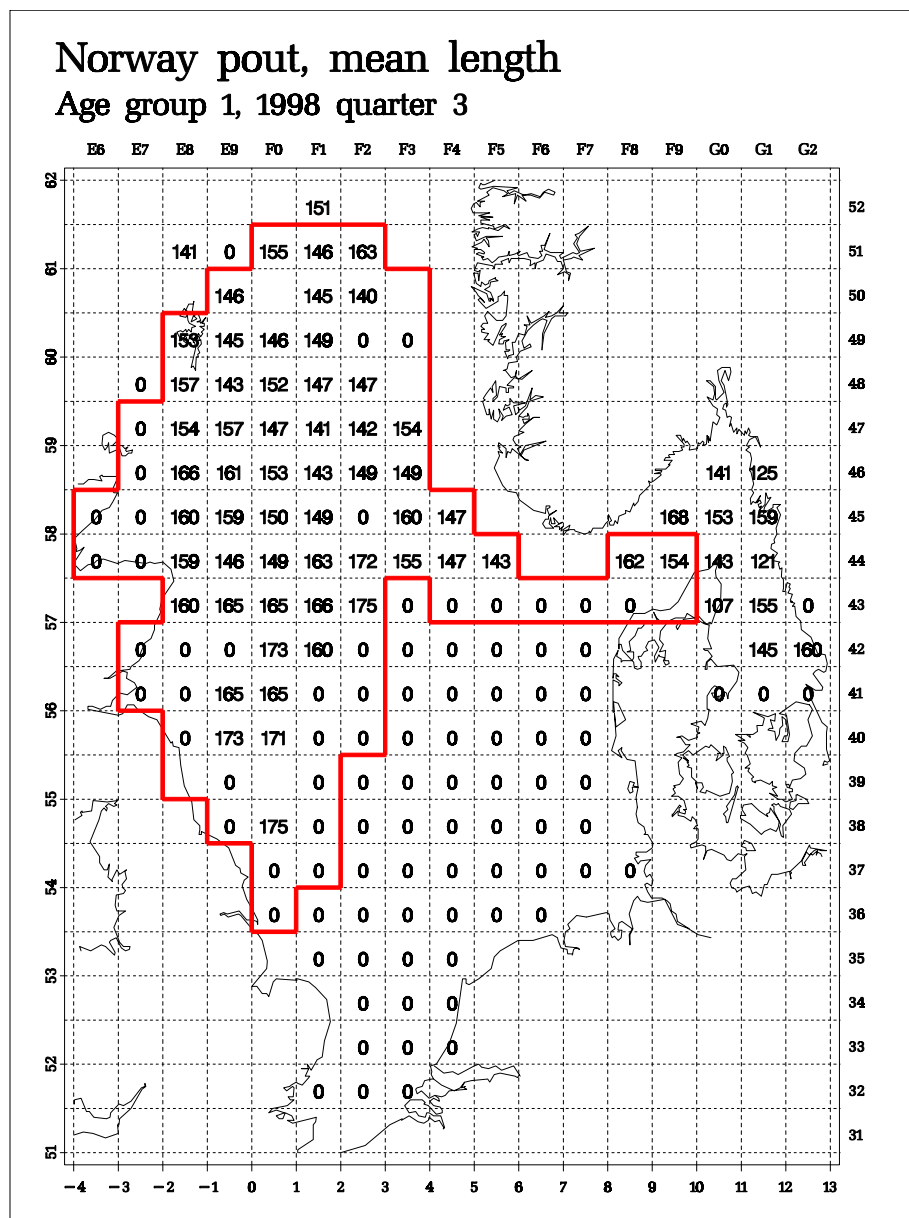


Figure 5.33 Norway pout: mean length (mm), age 1.

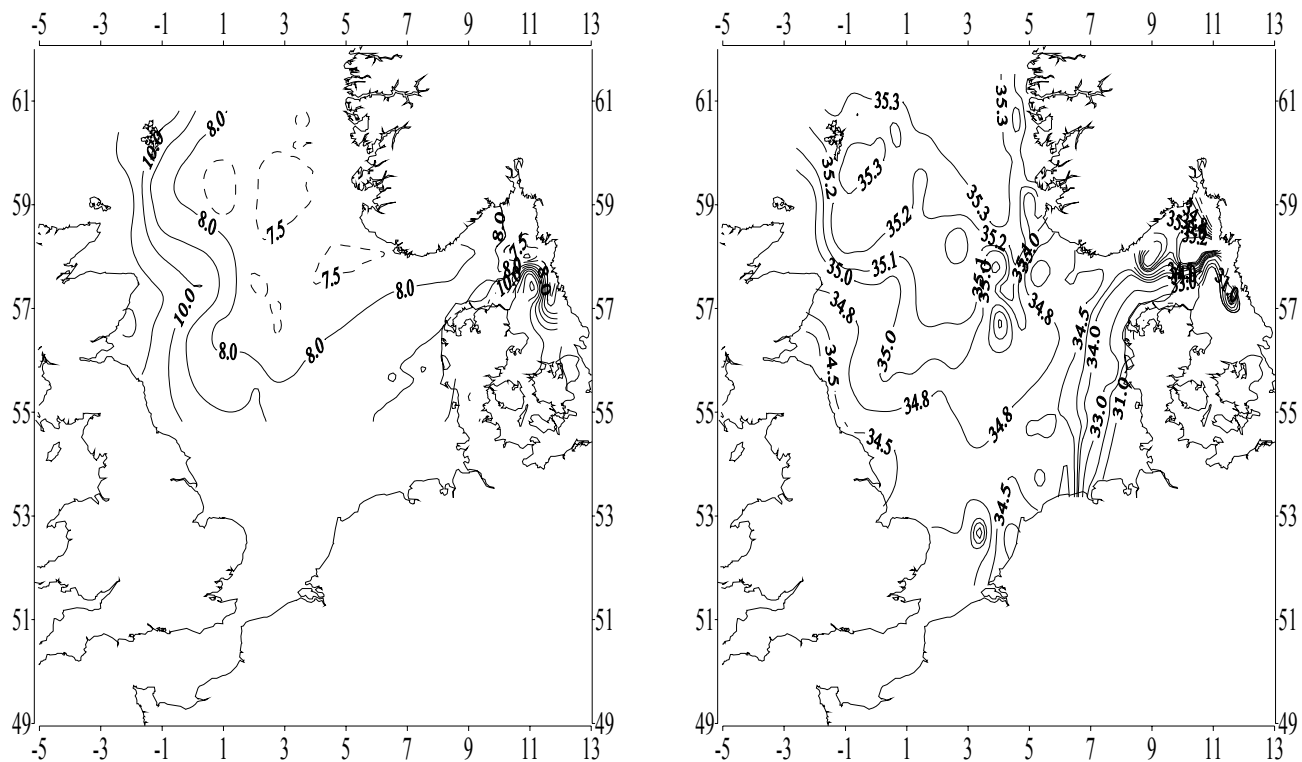


Figure 7.1 Distribution of bottom temperature and salinity during the IBTS quarter-3 1998 survey

REPORT OF THE
**INTERNATIONAL BOTTOM TRAWL SURVEY IN THE NORTH
SEA, SKAGERRAK AND KATTEGAT IN 1999: QUARTER 3**

The International Bottom Trawl Survey Working Group

This report is not to be quoted without prior consultation with the General Secretary. The document is a report of an expert group under the auspices of the International Council for the Exploration of the Sea and does not necessarily represent the views of the Council.

International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

Palægade 2–4 DK–1261 Copenhagen K Denmark

REPORT OF THE
INTERNATIONAL BOTTOM TRAWL SURVEY IN THE NORTH
SEA, SKAGERRAK AND KATTEGAT IN 1999: QUARTER 1

The International Bottom Trawl Survey Working Group

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International Council for the Exploration of the Sea

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1 INTRODUCTION

This report presents the final results for the International Bottom Trawl Survey (IBTS) in the first quarter of 1999. 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. During a meeting of this Working Group in November 1995 (ICES 1996/H:1a) early analyses of the data indicated the potential usefulness of quarterly surveys and it was decided to encourage their continuation. These quarterly surveys have been carried out in all four quarters in the period 1991-1997, but since 1998 only the 1st and the 3rd quarters have been covered.

The results for the 3rd quarter of 1999 will be published in separate ICES Reports.

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*), as well as the catches of herring larvae. 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 Manual (ICES 1996/H:1b). Details on the participation in the 1999 survey are given below. The whole survey area has been covered as planned.

Country	Vessel	Period	Number of Hauls	
			GOV	MIK
Denmark	Dana	30/1–09/2	33	68
France	Thalassa	03/2–23/2	63	45
Germany, F.R.	W. Herwig III	30/1–25/2	70	102
Netherlands	Tridens	26/1–24/2	53	67
Norway	Michael Sars	10/1–08/2	40	56
Sweden	Argos	25/1–11/2	46	61
UK Scotland	Scotia	25/1–13/2	53	100
Total			358	499

3 DATA AVAILABLE

In Table 3.1 it is shown for which years data are presently available in the ICES IBTS data base for the quarter 1 surveys.

At the time of the analysis of the 1999 data presented in this report all final data were available in the database.

4 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 (ICES 1993/Assess:15).

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 IBTS Working Group decided at the meeting in November 1995 (ICES 1996/H:1a) 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/Assess:15) 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.

5 RESULTS GOV-TRAWL FOR 1999

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 Figure 5.1.

The number of otoliths sampled per target species and roundfish area is given in Table 5.1.

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. The specific standard area used to calculate the index of year class strength is indicated in the figures.

5.1 North Sea

Preliminary indices based on certain size classes are compared with the final indices in Table 5.2. The preliminary indices are very close to the final ones. Final indices of 1- and 2-group fish of the eighth standard species are given in Table 5.3. Table 5.4 gives the mean age composition of the standard species within the relevant standard areas.

Herring

Indices for 1- and 2-ringed herring are presented in Table 5.3 and mean numbers per rectangle are given in Figures 5.2-5.5. 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 1998 represent year class 1996.

The index for the 1997 year class is the smallest since the recovery of the stock in the beginning of the 1980s.

Sprat

Sprat indices of 1- and 2-group are given in Table 5.3. The distribution of the same age groups and the 3+ group, as well as the mean length of 1-group per rectangle, are shown in Figures 5.6-5.9.

The index value for the 1998 year class is the 3rd largest observed.

Mackerel

Indices for mackerel are given in Table 5.3, the distributions of 1-, 2- and 3+ groups, and the mean length of 1-group fish are given in Figures 5.10-5.13.

The index value of 1-group is like last year back again at a normal level compared to the very high 1996 year class. This year, the 1-group was as usually in the northern and north-western part of the survey area.

Cod

Abundance indices are given in Table 5.3, the distributions of 1-, 2-, and 3+ group, and the mean length of 1-group fish are given in Figures 5.14-5.17.

The index value for one-year-old cod is again very low. The Kattegat area, which is not included in the cod standard area, has a relative high abundance of the 1998 year class.

Haddock

Abundance indices are given in Table 5.3, the distributions of 1-, 2-, and 3+ group, and the mean length of 1-group fish are given in Figures 5.18-5.21.

The index value at 212 is only about one third of the long-term average.

Whiting

Abundance indices are given in Table 5.3, the distributions of 1-, 2-, and 3+ group, and the mean length of 1-group fish are given in Figures 5.22-5.25.

The 1998 year class is of long-term average size.

Saithe

Abundance indices are given in Table 5.3, the distributions of 1-, 2-, and 3+ group, and the mean length of 1-group fish are given in Figures 5.26-5.29.

As usual only very few 1- and 2-group saithe were found in the North Sea in 1999.

Norway Pout

Abundance indices are given in Table 5.3, the distributions of 1-, 2-, and 3+ group, and the mean length of 1-group fish are given in Figures 5.30-5.33.

After a quite small 1997 year class index the 1998 year class index is back at normal size.

5.2 Skagerrak-Kattegat (Division IIIa)

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

The herring indices are calculated as the mean catches in four depth strata, covering the depth range of 10-150 m, and weighted by the surface area of each stratum.

The stocks of cod in Skagerrak and Kattegat are assessed separately and indices are given for each area.

Updates of the indices for the 1996-1999 surveys are not available. Previous years final and preliminary indices for herring and gadoids are given in Table 5.5-5.6.

6 RESULTS OF THE SAMPLING FOR HERRING AND SPRAT LARVAE IN 1999

Results of the sampling for herring and sprat larvae in 1999.

During the IBTS fish larvae are sampled by towing a small meshed ring net (MIK) in oblique hauls. The catches are used in an estimation of fish larval density and abundance, assuming a 100% efficiency of the gear in catching the larvae at night.

Larval density is estimated from:

Density (no. m⁻²) = (no. Caught / [distance towed (m) * net-opening (m²)] * water depth (m))

The number of larvae within a given statistical rectangle is estimated by multiplying the density found by the surface area of a rectangle (approx. 309 * 10⁷ m²). The total number of larvae in the sampled area (the MIK index) is the sum of estimates for all statistical rectangles.

Based on a series of comparative hauls a conversion factor between the IKMT, used in the first period of the series, and the MIK is estimated. This is used to convert earlier catches to total numbers (MIK indices).

Herring larvae

In total 499 hauls were made during the 1999 sampling. This is the highest number of hauls ever made during the programme, and the 1999 coverage of the sampling area was very good.

The herring larvae were distributed in central/eastern areas of the North Sea. This distribution pattern resemble the patterns observed during the preceding years (Figure 6.1), however, the overall abundance of larvae in 1999 is much higher and larval concentrations are found over a larger area. Consequently we estimate a large increase in the overall recruitment index. The 1999 index of the 1998 year class is estimated to 244.0, the second largest MIK-index on record (Table 6.1).

This year's index of 1-ringer herring recruitment, from the IBTS 1-ringer sampling, is compared to last years index from the MIK 0-ringer sampling. Both indices estimated the 1997 year class to be very low (Figure 7.2).

Sprat larvae

Sprat larvae were sampled in small quantities in the central/southern sections of the sampling area. Because of the limited numbers, no calculation of indices will be carried out.

7 HYDROGRAPHIC DATA

7.1 Hydro-chemistry Survey

Seven ships contributed hydrographic data to the 1999 dataset. These consist of 435 stations worked between 9 January and 26 February. Nutrient data were supplied from 66 stations, contributions being received from two ships (Argos and Scotia). Data quality was good. The supplied Michael Sars dataset, includes data in addition to those at which IBTS trawls were undertaken.

Charts of the distribution of bottom temperature and salinity are given in Figures 7.1 and 7.2. An updated table, giving the time series of temperature and salinity at 10 locations in the North Sea during IYFS/IBTS (1) surveys from 1970 to 1999 is provided as Table 7.1. The Figures and Table show that North Sea conditions were very similar to recent years, with sustained levels of relatively high temperature and salinity, especially in the northern North Sea. In Figure 7.3 5-year running mean temperature reveal the high spatial coherence in the temperature time series, based on the ten locations given in Table 7.1. In particular the sustained cooling around 1980 and the warming around 1990 are clearly demonstrated.

Charts from the 1999 IBTS-1 survey are also published on the ICES website on www.ices.dk/ocean/project/datasets/iyfs.htm, along with corresponding charts since 1970. The website also includes charts showing station locations. Charts of phosphate, silicate, nitrate and nitrite will follow later, after more data have been received.

8 REFERENCES

- ICES 1993/Assess:15. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES Doc. CM 1993/Assess:15.
- ICES 1995/Assess:13. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES Doc. CM 1995/Assess:13.
- ICES 1996/H:1a. Report of the International Bottom Trawl Survey Working Group. ICES Doc. CM 1996/H:1.
- ICES 1996/H:1b. 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.

Table 3.1 Data available in the ICES International Bottom Trawl Survey database as at October 1999.

First Quarter

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

Country	1973	1974	1975	1976	1977	1978	1979	1980	1981
Denmark	✓	✓	✓	✓	✓	✓	✓	x	x
France	x	x	x	x	x	✓	✓	✓	x
Germany	-	-	-	-	-	-	-	-	-
Netherlands	✓	✓	✓	✓	✓	✓	✓	✓	✓
Norway	-	-	-	-	-	-	-	-	-
Sweden	-	-	-	-	-	-	-	-	-
UK England	-	-	-	-	-	-	-	-	✓
UK Scotland	x	✓	✓	✓	✓	✓	✓	✓	✓
USSR	x	✓	✓	✓	✓	x	✓	x	✓

Country	1982	1983	1984	1985	1986	1987	1988	1989	1990
Denmark	✓	✓	✓	✓	✓	✓	✓	✓	✓
France	✓	✓	✓	✓	✓	✓	✓	✓	✓
Germany	-	✓	✓	✓	✓	✓	✓	✓	✓
Netherlands	✓	✓	✓	✓	✓	✓	✓	✓	✓
Norway	-	✓	✓	✓	✓	✓	✓	✓	✓
Sweden	-	✓	✓	✓	✓	✓	✓	✓	✓
UK England	✓	✓	✓	✓	✓	✓	✓	✓	✓
UK Scotland	✓	✓	✓	✓	✓	✓	✓	✓	✓
USSR	✓	x	x	x	x	x	x	x	x

Country	1991	1992	1993	1994	1995	1996	1997	1998	1999
Denmark	✓	✓	✓	✓	✓	✓	✓	✓	✓
France	✓	✓	✓	✓	✓	✓	✓	✓	✓
Germany	✓	✓	✓	✓	✓	✓	✓	✓	✓
Netherlands	✓	✓	✓	✓	✓	✓	✓	✓	✓
Norway	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sweden	✓	✓	✓	✓	✓	✓	✓	✓	✓
UK England	x	x	x	x	x	x	x	x	x
UK Scotland	✓	✓	✓	✓	✓	✓	✓	✓	✓
USSR	x	x	x	x	x	x	x	x	x

Table 5.1 Number of otoliths sampled per species and roundfish area, 1999, quarter 1.

Species	ICES Round fish area									ALL
	1	2	3	4	5	6	7	8	9	
Herring	624	444	794	365	212	855	550	559	509	4,912
Sprat	4	145	321	141	209	415	80	199	344	1,858
Mackerel	386	27	24	-	-	-	-	-	-	437
Cod	603	402	94	150	126	272	63	305	476	2,491
Haddock	864	723	1,007	404	1	10	219	-	-	3,228
Whiting	672	445	811	474	353	469	51	-	-	3,275
Saithe	414	1	-	-	-	-	96	-	-	511
Norway pout	321	136	264	114	-	1	55	-	-	891

Table 5.2 Preliminary indices for 1-group fish based on a split of the length distribution, and final indices for the North Sea from the first quarter IBTS in 1999.

	Preliminary	Final
Herring	707	714.8
Sprat	3825	3963.7
Mackerel	43	43.7
Cod	2.2	2.1
Haddock	195	211.8
Whiting	704	676.3
Saithe	-	0.2
Norway pout	3244	3526.7

Table 5.3 IBTS indices for 1- and 2-year-old fish of various species. Indices in mean number per hour within the relevant standard area in the North Sea.

Year class	HERRING		SPRAT		MACKEREL		COD		HADDOCK		WHITING		SAITHE		NORWAY POUT	
	1-ring	2-ring	age 1	age 2	age 1	age 2	age 1	age 2	age 1	age 2	age 1	age 2	age 1	age 2	age 1	age 2
1967	-	96	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1968	645	587	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1969	1,403	416	-	-	-	-	-	25.9	-	32	-	31	-	-	-	-
1970	1,496	82	-	-	-	-	98.3	34.5	855	299	274	190	-	-	-	-
1971	311	180	90	-	-	-	4.1	10.6	740	971	332	763	-	-	-	-
1972	558	70	123	-	-	-	38.0	9.5	187	110	1,156	496	-	-	-	-
1973	884	49	481	-	-	0.1	14.7	6.2	1,092	385	322	153	-	-	-	2,412
1974	693	22	-	-	16.5	0.2	40.3	19.9	1,168	670	893	535	-	-	4,242	385
1975	245	19	1,186	-	0.4	+	7.9	3.2	177	84	679	219	-	-	4,599	334
1976	623	27	136	-	1.4	+	36.7	29.3	162	108	418	293	-	-	4,813	1,215
1977	156	15	1,474	-	2.3	+	12.9	9.3	385	240	513	183	-	-	1,913	240
1978	342	270	248	-	0.2	+	9.9	14.8	480	402	457	391	-	-	2,690	611
1979	518	94	1,402	1,380	+	+	16.9	25.5	896	675	692	485	-	-	4,081	557
1980	799	128	941	502	0.1	0.1	2.9	6.7	268	252	227	232	-	-	1,375	403
1981	1,231	161	296	754	0.1	5.2	9.2	16.6	526	400	161	126	-	-	4,315	663
1982	1,443	716	210	387	1.9	0.4	3.9	8.0	307	219	128	179	-	-	2,331	802
1983	2,083	661	382	298	0.1	0.0	15.2	17.6	1,057	828	436	359	-	-	3,925	1,423
1984	2,542	838	660	103	0.7	2.1	0.9	3.6	229	244	341	261	-	-	2,109	384
1985	3,684	4,103	71	74	0.5	+	17.0	28.8	579	326	456	544	-	-	2,043	469
1986	4,530	775	803	1,437	8.9	0.1	8.8	6.1	885	688	669	862	-	-	3,023	760
1987	2,313	580	148	442	1.2	1.8	3.6	6.3	92	97	394	542	-	-	127	260
1988	1,016	794	4,246	557	1.1	1.2	13.1	15.2	210	114	1,465	887	-	-	2,079	773
1989	1,159	377	177	116	35.0	0.2	3.4	4.1	219	131	509	675	-	-	1,320	677
1990	1,162	762	1,121	340	6.9	0.4	2.4	4.5	679	371	1,014	748	-	-	2,497	902
1991	2,943	1,094	1,561	422	16.0	0.8	13.0	19.9	1,115	543	916	524	-	-	5,121	2,644
1992	1,667	1,285	1,755	1,368	1.0	0.1	12.7	4.4	1,242	504	1,087	637	-	-	2,681	375
1993	1,186	194	4,003	2,716	2.2	+	14.8	22.1	229	205	721	457	-	-	1,868	785
1994	1,735	437	1,138	558	+	0.7	9.7	8.0	1,375	813	679	486	-	1.1	5,941	2,631
1995	4,069	743	233	409	10.4	3.6	3.5	6.9	267	366	502	342	-	0	923	1,474
1996	2,067	425	854	1,711	718.8	7.8	40.0	26.4	860	423	288	162	0	0	9,752	5,343
1997	715		1,695	509	27.7	57.2	2.7	1.6	374	233	556	305	0.1	0	1,006	597
1998			3,964		43.7		2.1		212		676		0.2		3,527	

Table 5.4 Age composition of the standard species in 1999 for the relevant standard areas in the North Sea.

Age group	1	2	3	4	5	6+
Herring	714.8	424.6	509.2	101.4	37.5 ¹	-
Sprat	3,963.7	508.7	64.9	3.7	43.6 ¹	-
Mackerel	43.7	57.2	20.1	1.9	0.9	1.2
Cod	2.1	1.6	8.1	0.8	0.5	0.5
Haddock	211.8	232.9	129.7	48.1	36.6	4.3
Whiting	676.3	305.4	94.7	57.5	25.8	11.1
Saithe	0.2	0.0	0.3	1.1	3.3	1.4
Norway pout	3526.7	597.1	667.2	4.0	0.3	0.0

¹Plus-group.

Table 5.5 IBTS indices for herring and sprat in Skagerrak-Kattegat. The herring indices are weighted by the area of four depth strata and the sprat indices are the mean by hour within the total area (n.a. = not available).

Year	Herring						Sprat		
	Total 1-ring	2-ring	Spring-spawners 1-ring	2-ring	Autumn-spawners 1-ring	2-ring	1-group	2+group	Total
1974							1,325		
1975							5,339		
1976							2,069		
1977							5,713	984	6,697
1978							5,119	2,117	7,236
1979							3,338	1,482	4,820
1980	2,311	387	1,607	307	704	80	4,960	3,592	8,558
1981	3,246	1,393	966	1,318	2,250	75	2,809	3,068	5,877
1982	2,560	549	1,408	445	1,152	104	1,577	4,695	6,272
1983	5,419	1,063	1,522	946	3,897	117	1,173	1,685	2,858
1984	6,035	1,947	2,793	1,419	3,242	528	5,818**	861	7,034
1985	7,994	2,473	-*	1,867	-*	606	2,404	2,426	5,388
1986	21,489	2,738	-*	1,562	-*	1,176	670	1,934	4,545
1987	11,733	3,671	-*	2,921	-*	949	2,234	2,219	8,048
1988	67,753	10,095	-*	7,834	-*	2,161	950	5,527	10,634
1989	17,451	4,976	-*	0	-*	4,976	435	1,012	3,310
1990	3,544	3,876	0	3,192	3,544	684	510	243	944
1991	3,588	3,749	-*	480	-*	3,269	659	468	1,945
1992	5,057	1,934	0	771	5,057	1,163	5,897	634	7,122
1993	26,738	3,165	0	203	26,738	2,962	1,593	4,237	7,186
1994	8,777	2,333	0	0	8,777	2,333	1,494	586	3,361
1995	7,114	535	0	0	7,114	535	2,006	1,726	3,802
1996	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	255	5,099	5,312
1997	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1998	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1999	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

* Separation not valid.

** From 1984 onwards only hauls taken in depths between 10 and 150 m are included in the estimates

Table 5.6 Indices of 1- and 2-group cod and 1-group whiting and haddock in Skagerrak-Kattegat.
The preliminary indices are the mean number per hour for cod < 25 cm,
whiting and haddock < 20cm.

Year Class	Cod 1-group Skagerrak		Cod 1-group Kattegat		Cod 2-group Skagerrak Kattegat		Whiting 1-group Prel.	Haddock 1-group Prel.
	Prel.	Final	Prel.	Final				
1974							499	
1975							236	
1976							99	
1977							392	
1978							561	
1979	79		386		93	171	722	40
1980	18	15	42	26	31	63	968	4
1981	36	36	126	104	30	258	690	48
1982	32	28	113	96	19	143	262	34
1983	24	23	49	39	52	106	500	72
1984	18	14	18	9	10	72	940	161
1985	82	78	229	213	113	372	1379	57
1986	15	5	48	11	18	28	2178	251
1987	81	77	76	68	24	48	2978	125
1988	62	56	6	3	8	16	478	20
1989	25	31	131	153	25	112	2255	8
1990	42	9	39	19	5	20	1636	74
1991	119	96	64	64	16	38	1796	288
1992	171	110	40	31	7	13	1359	405
1993	77	82	22	19	47	114	525	180
1994	111	97	390	300	35	272	1105	233
1995	37	36	172	52	n.a.	n.a.	883	490
1996	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1997	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1998	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1999	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

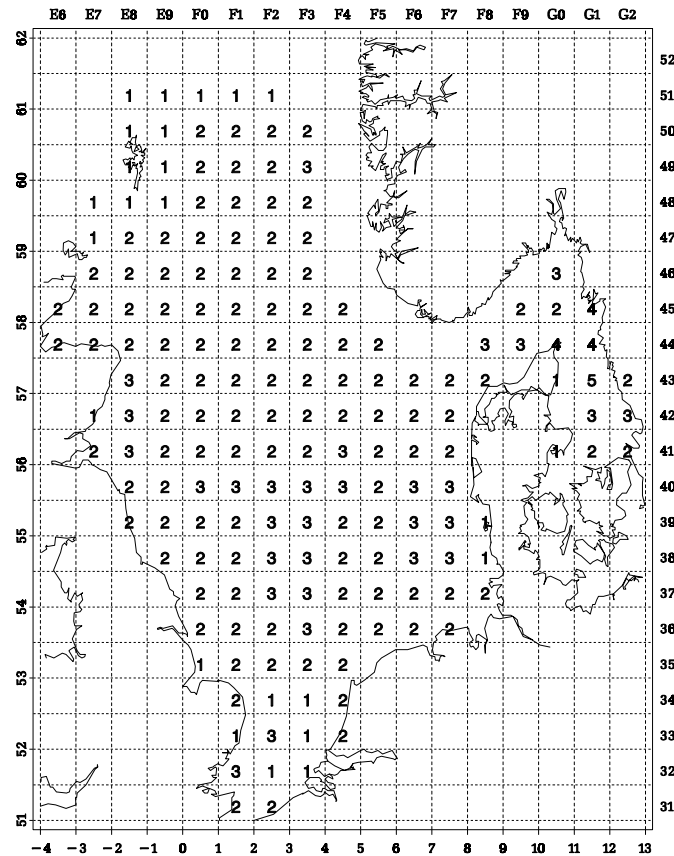
Table 6.1. Density and abundance estimates of 0-ringers caught in February during the IBTS. Values given for year classes by areas are density estimates in numbers per square metre. Total abundance is found by multiplying density by area and summing up.

Area	North west	North east	Central west	Central east	South west	South east	Division IIIa	South Bight	0-ringers abundance no. in 10^9
Area $m^2 \times 10^9$	83	34	86	102	37	93	31	31	
Year class									
1976	0.054	0.014	0.122	0.005	0.008	0.002	0.002	0.016	17.1
1977	0.024	0.024	0.050	0.015	0.056	0.013	0.006	0.034	13.1
1978	0.176	0.031	0.061	0.020	0.010	0.005	0.074	0.000	52.1
1979	0.061	0.195	0.262	0.408	0.226	0.143	0.099	0.053	101.1
1980	0.052	0.001	0.145	0.115	0.089	0.339	0.248	0.187	76.7
1981	0.197	0.000	0.289	0.199	0.215	0.645	0.109	0.036	133.9
1982	0.025	0.011	0.068	0.248	0.290	0.309	0.470	0.140	91.8
1983	0.019	0.007	0.114	0.268	0.271	0.473	0.339	0.377	115.0
1984	0.083	0.019	0.303	0.259	0.996	0.718	0.277	0.298	181.3
1985	0.116	0.057	0.421	0.344	0.464	0.777	0.085	0.084	177.4
1986	0.317	0.029	0.730	0.557	0.830	0.933	0.048	0.244	270.9
1987	0.078	0.031	0.417	0.314	0.159	0.618	0.483	0.495	168.9
1988	0.036	0.020	0.095	0.096	0.151	0.411	0.181	0.016	71.4
1989	0.083	0.030	0.040	0.094	0.013	0.035	0.041	0.000	25.9
1990	0.075	0.053	0.202	0.158	0.121	0.198	0.086	0.196	69.9
1991	0.255	0.390	0.431	0.539	0.500	0.369	0.298	0.395	200.7
1992	0.168	0.039	0.672	0.444	0.734	0.268	0.345	0.285	190.1
1993	0.358	0.212	0.260	0.187	0.120	0.119	0.223	0.028	101.7
1994	0.148	0.024	0.417	0.381	0.332	0.148	0.252	0.169	126.9
1995	0.260	0.086	0.699	0.092	0.266	0.018	0.001	0.020	106.2
1996	0.003	0.004	0.935	0.135	0.436	0.379	0.039	0.032	148.1
1997	0.042	0.021	0.338	0.064	0.178	0.035	0.023	0.083	53.1
1998	0.100	0.056	1.150	0.592	0.998	0.265	0.280	0.127	244.0

Table 7.1 Time series data of bottom temperature and salinity during IYFS/IBTS(1) 1970-1999

Location	1		2		3		4		5		6		7		8		9		10	
Position	60° 0'N 2°E		57° 30'N 0°E		57° 30'N 2°E		57° 30'N 4°E		55° 0'N 0°E		55° 0'N 2°E		55° 0'N 4°E		55° 0'N 8°E		54° 0'N 3°E		52° 30'N 3°E	
Year	°C	Sal	°C	Sal	°C	Sal	°C	Sal	°C	Sal	°C	Sal	°C	Sal	°C	Sal	°C	Sal	°C	Sal
1970	5.5	35.08	5.8	34.95	5.3	35.00	4.7	34.92	5.9	34.75	4.5	34.82	4.0	34.72	0.5	33.00	4.0	34.72	4.0	34.62
1971	7.1	35.15	7.0	35.05	6.9	35.15	6.0	35.10	7.0	34.82	6.2	34.88	5.5	34.80	3.5	33.00	5.9	34.55	7.0	34.95
1972	5.8	35.22	6.9	35.08	5.9	35.20	4.5	34.78	6.5	34.91	4.8	34.86	5.2	34.80	2.5	33.80	5.2	34.70	6.9	35.10
1973			7.4	35.02	7.2	35.20	6.7	35.10	7.0	35.05	6.1	35.00	6.0	34.86	5.0	33.00	6.4	34.80	6.5	35.05
1974	6.9	35.28	6.5	35.11	6.5	35.08	6.3	35.04	6.5	34.90	6.0	34.90	5.6	34.90	4.7	33.00	6.1	34.78	8.0	35.20
1975	7.3	35.20	6.6	35.05	6.6	35.15	6.4	35.13	6.6	34.95	6.4	34.90	6.1	34.85	5.2	33.50	5.9	34.62	6.9	34.62
1976	6.7	35.20	6.5	35.00	6.5	35.15	5.6	35.12	6.1	34.81	4.9	34.95	4.9	34.85	2.2	31.00	5.1	34.78	5.1	34.80
1977	6.0	35.18	6.2	35.02	5.1	35.00	4.8	34.92	6.0	34.98	4.9	34.85	5.0	34.80	3.1	33.60	5.6	34.78	7.1	35.22
1978	6.4	34.88	6.6	35.00	6.0	34.90	4.7	34.88	5.6	34.78	4.9	34.88	4.2	34.80	2.2	32.50	4.6	34.68	5.5	34.90
1979	6.4	35.15	6.0	34.80	4.1	34.88	4.0	34.98	4.5	34.64	2.8	34.62	2.8	34.62	-1.5	32.00	3.0	34.62	4.2	34.95
1980	5.9	35.12	6.6	35.00	5.5	35.00	4.5	34.70	6.1	34.60	3.8	34.65	4.5	34.50	3.1	33.50	5.1	34.70	6.1	35.11
1981	6.9	35.22	6.6	34.90	6.2	35.05	5.8	35.15	6.5	34.80	5.8	34.82	5.1	34.82	3.4	32.50				
1982	6.6	35.28	6.1	35.02	5.9	35.05	5.5	35.10	5.5	34.72	4.8	34.82	4.5	34.62	2.8	32.50	4.7	34.30	6.0	34.65
1983	6.9	35.22	6.5	35.00	6.4	35.10	6.2	35.15	5.6	34.62	6.1	34.95	5.2	34.90	3.0	33.00	5.2	34.80	6.4	34.70
1984	6.3	35.18	6.4	35.10	6.4	35.10	5.2	35.12	5.9	34.80	5.0	34.84	4.9	34.90	3.5	33.00	4.9	34.65	7.4	34.95
1985	6.9	35.17	6.8	35.10	6.5	35.18	5.9	35.05	6.5	34.70	4.7	34.91	5.0	34.90	1.0	32.50	4.0	34.70	6.0	34.80
1986	6.6	35.25	5.8	35.05	5.4	35.08	5.2	35.05	5.2	34.65	3.9	34.72	3.6	34.60	0.0	32.50	4.0	34.60	4.0	34.65
1987	6.5	35.28	6.1	34.90	5.9	35.08	4.9	35.00	5.0	34.75	4.2	34.80	4.3	34.60	0.8	30.00	4.9	34.60	4.8	34.90
1988	7.6	35.18	7.6	34.95	7.4	35.03	7.0	34.96	7.1	34.70	6.6	34.80	6.5	34.50	5.9	33.50	6.9	34.60	7.7	34.90
1989	8.5	35.29	8.0	34.85	7.8	34.89	7.6	35.05	7.5	34.76	7.1	34.81	6.8	34.80	6.0	34.10	6.5	34.68	7.5	34.62
1990	8.5	35.29	7.6	35.00	7.6	35.12	7.6	35.15	7.5	34.70	7.5	34.85	7.5	34.80	6.5	34.10	7.4	34.70	7.4	34.60
1991	7.9	35.30	6.7	35.10	7.1	35.22	6.1	34.97	6.6	34.65	5.8	34.85	5.5	34.80	3.0	34.00	5.8	34.60	6.1	35.30
1992	8.1	35.29	7.6	35.10	7.1	35.16	7.1	35.19	7.4	34.80	6.6	34.80	6.5	34.80	6.6	32.00	4.5	34.80	6.0	35.20
1993	7.4	35.31	6.5	34.92	6.4	35.18	6.5	35.30	6.5	35.05	6.2	35.00	5.4	34.95	4.3	33.50	5.6	34.80	6.0	35.00
1994	6.2	35.20	6.5	35.05	5.5	34.93	4.3	34.80	6.3	34.90	5.4	34.90	5.2	34.80	4.0	32.00	5.5	34.70	7.0	35.00
1995	7.5	35.23	7.0	34.92	7.1	35.00	6.7	35.09	6.7	34.71	6.0	34.87	5.6	34.81	4.0	30.03	6.0	34.65	7.9	34.51
1996	7.1	35.24	6.5	34.91	5.0	34.94	4.7	34.87	6.0	34.59	4.6	34.71	3.0	34.44	-0.2	32.12	3.4	34.71	3.8	34.83
1997	7.6	35.21	7.3	34.92	6.2	34.92	6.4	35.09	6.5	34.72	5.8	34.80	4.9	34.72	2.9	32.93	5.2	34.67	5.2	34.96
1998	8.2	35.29	8.5	35.14	7.8	35.16	7.0	35.00	7.5	34.79	6.3	34.84	6.1	34.62	3.5	31.78	6.3	34.56	7.2	35.25
1999	7.6	35.30	7.1	35.00	7.4	35.16	6.7	35.10	7.2	34.79	6.4	34.94	5.5	34.80	4.1	31.02	5.8	34.73	8.3	35.14

Number of hauls. 1999 quarter 1



Number of daytime hauls. 1999 quarter 1

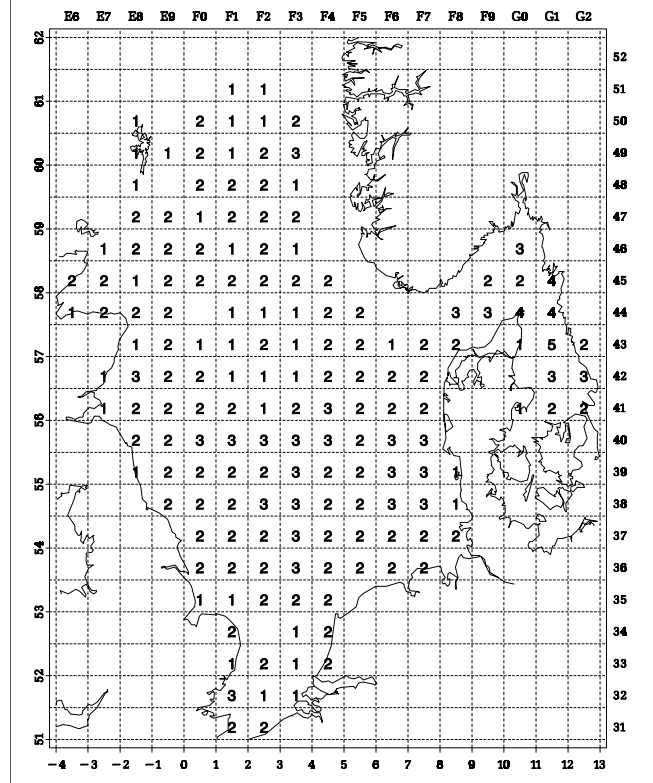


Figure 5.1. Number of valid day- and nighttime hauls.

Herring, number per hour

Age group 1, 1999 quarter 1

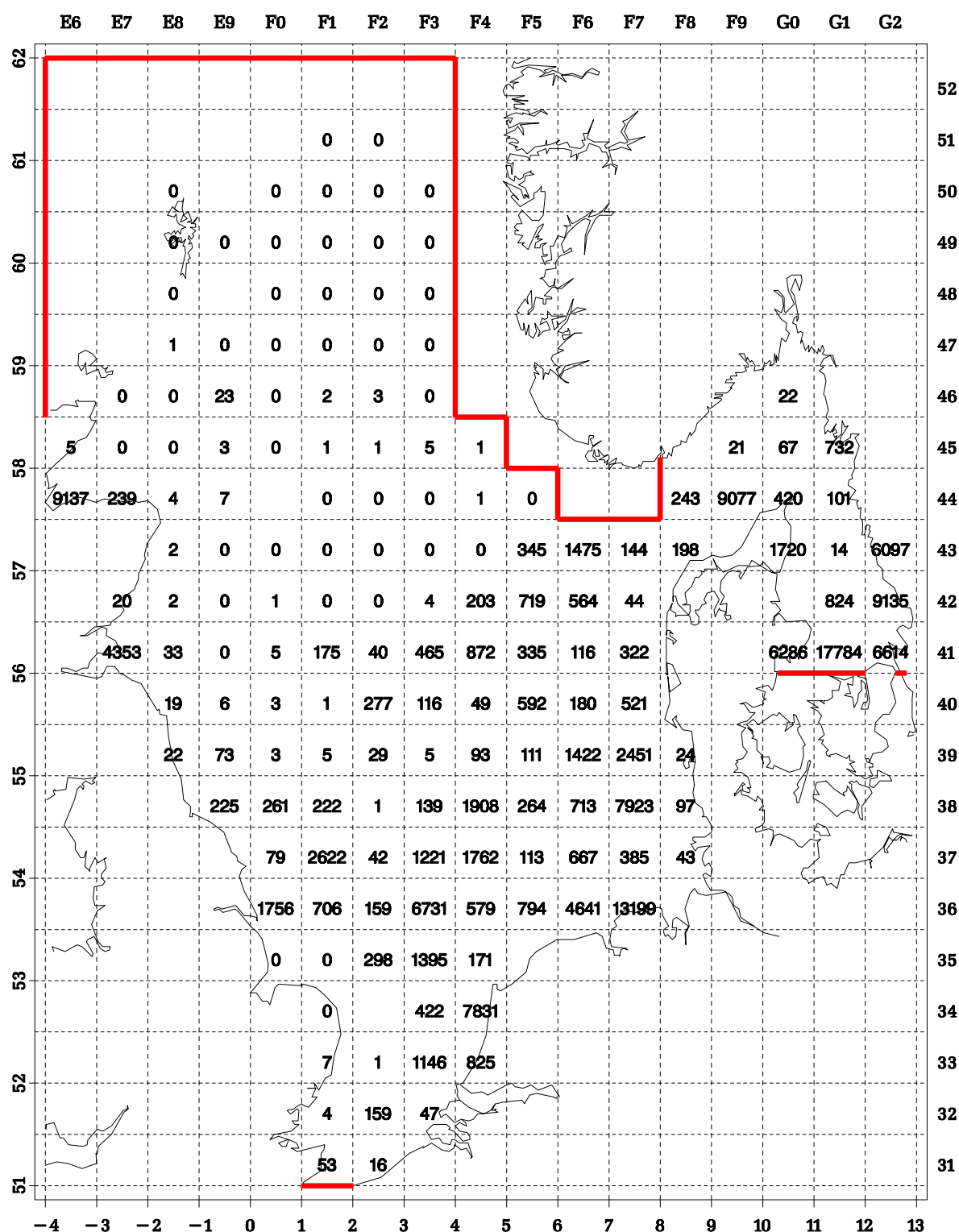


Figure 5.2 Herring: number per hour, 1-ringers

Herring, number per hour

Age group 2, 1999 quarter 1

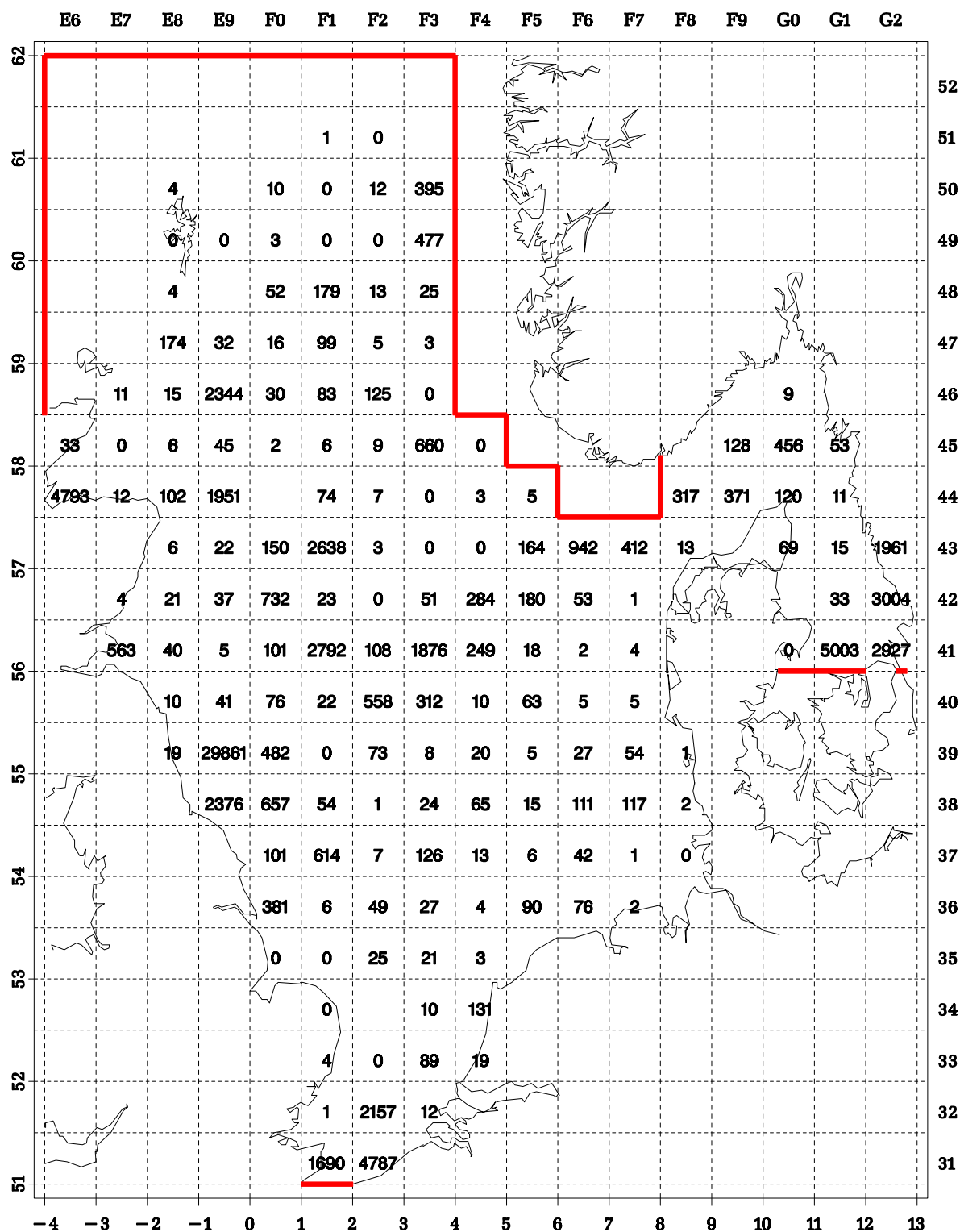


Figure 5.3 Herring: number per hour, 2-ringers

Herring, number per hour

Age group 3+, 1999 quarter 1

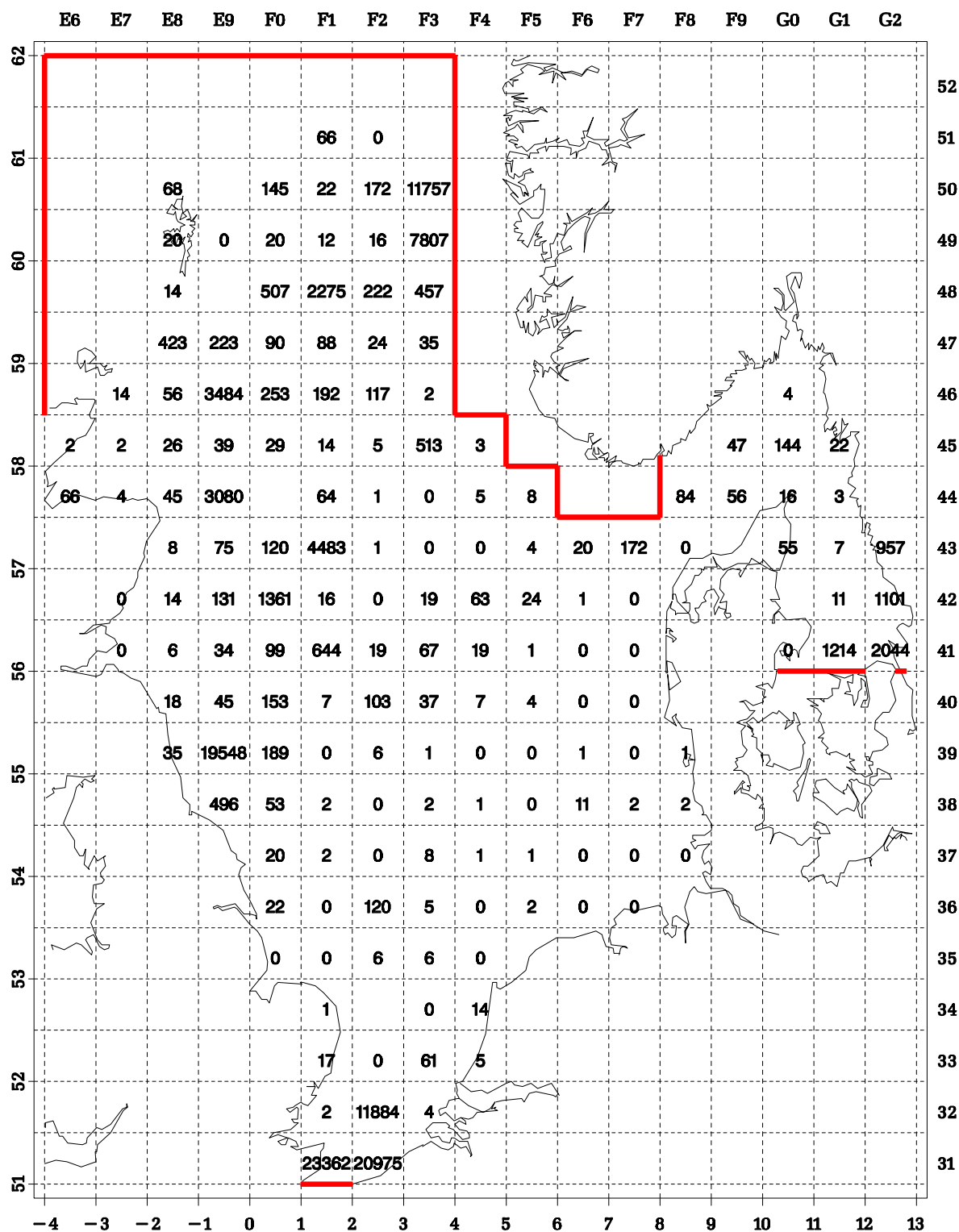


Figure 5.4 Herring: number per hour, 3+ ringers

Herring, mean length Age group 1, 1999 quarter 1

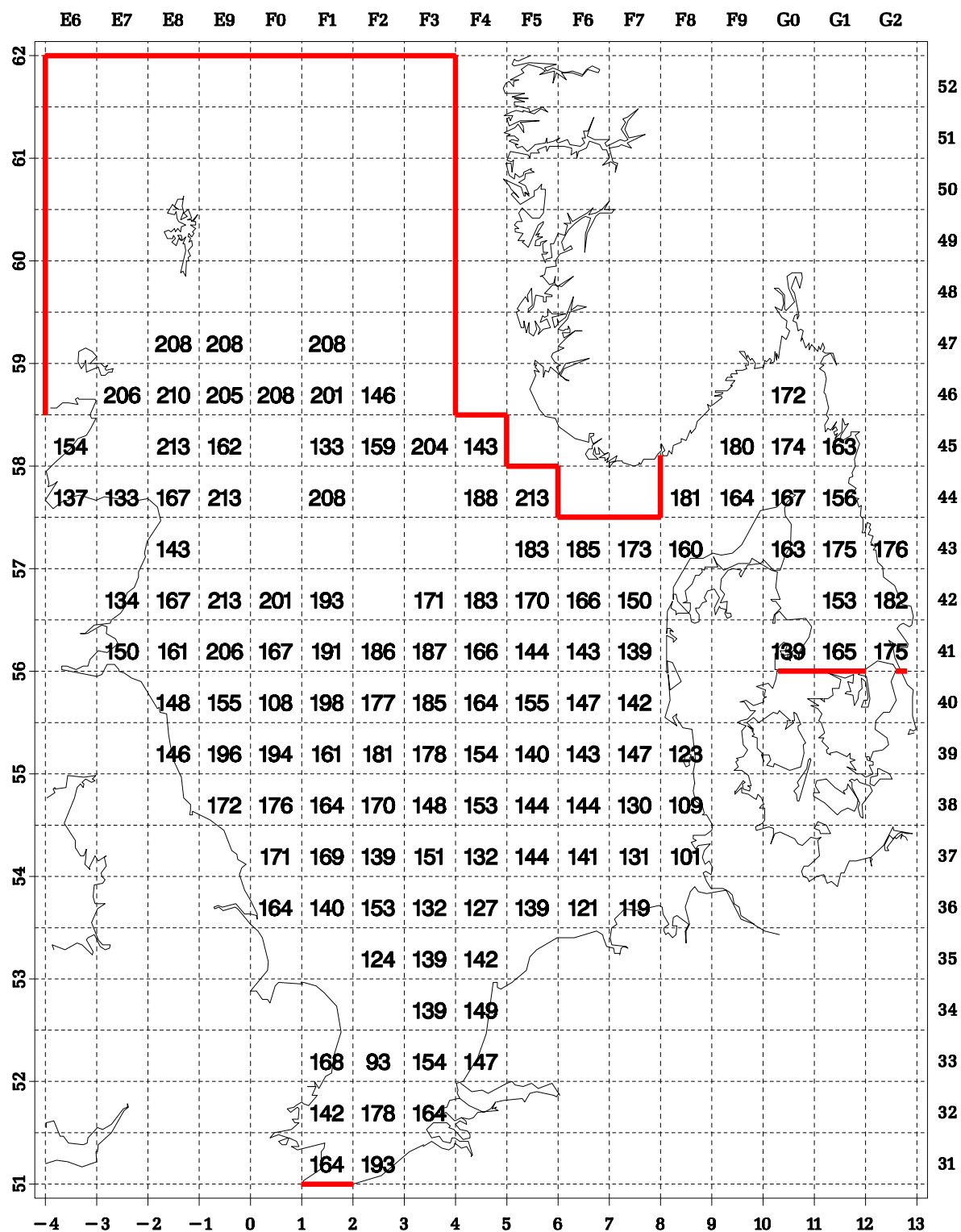


Figure 5.5 Herring: mean length (mm) 1- ringers

Sprat, number per hour

Age group 1, 1999 quarter 1

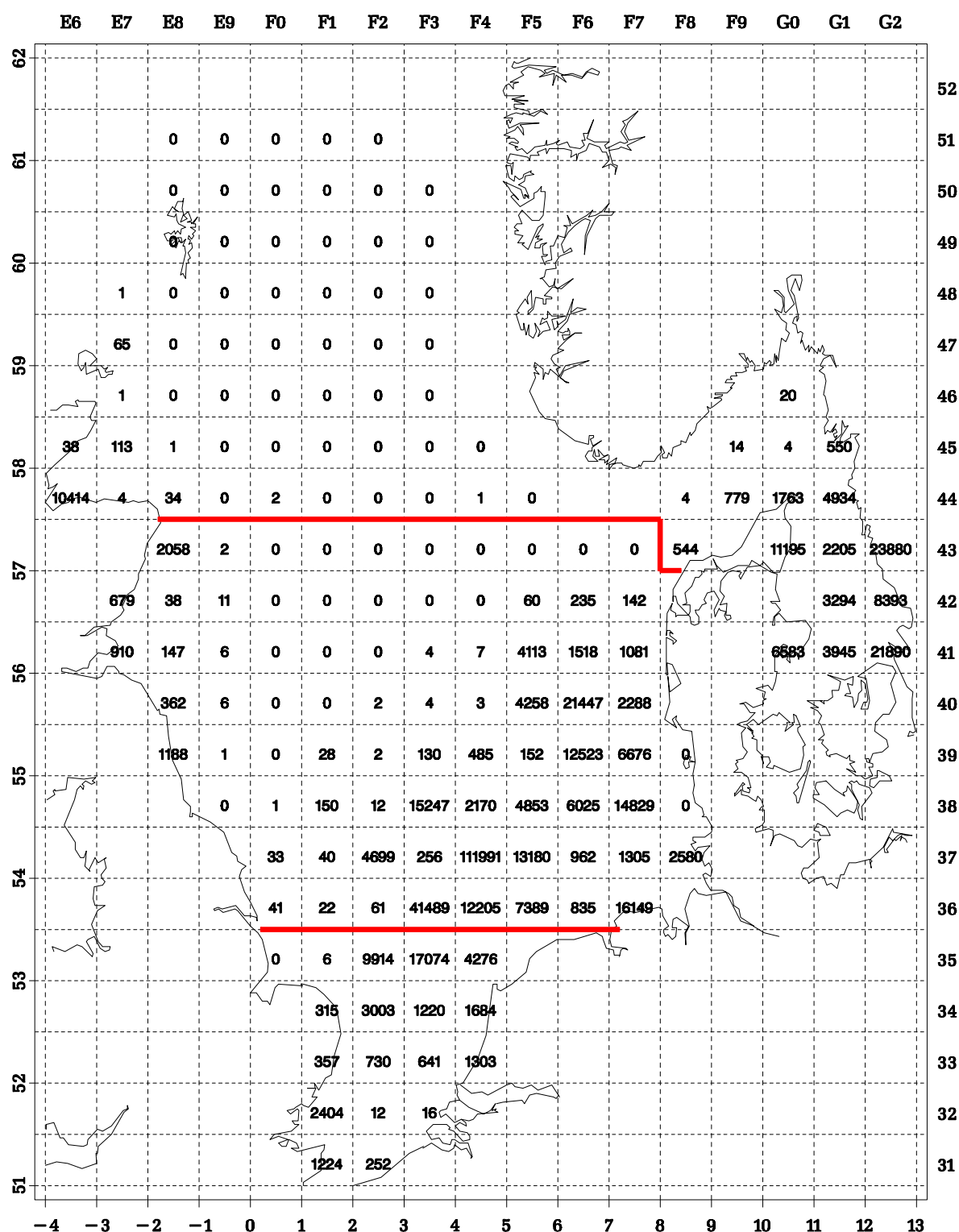


Figure 5.6 Sprat: number per hour, age 1

Sprat, number per hour

Age group 2, 1999 quarter 1

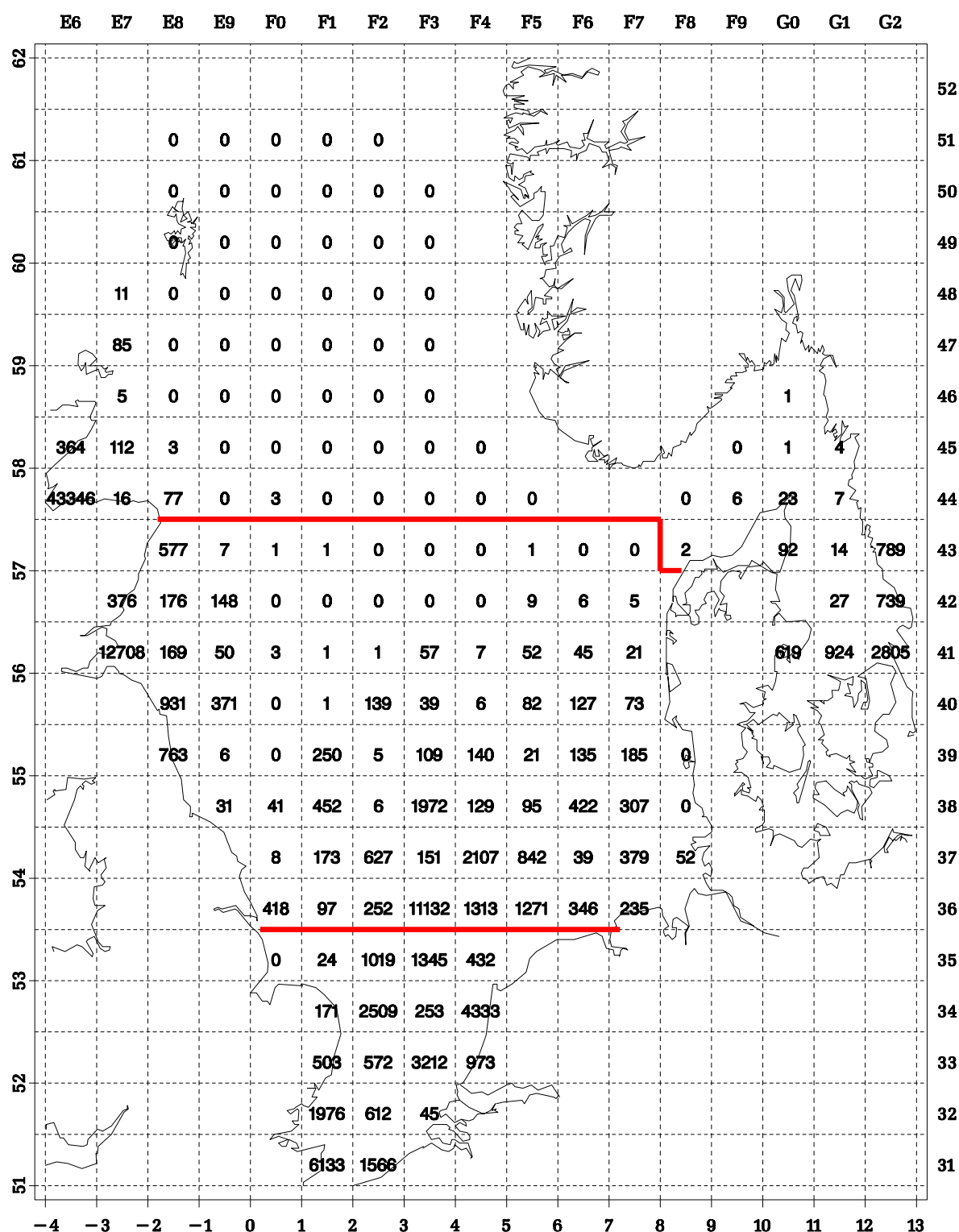


Figure 5.7 Sprat: number per hour, age 2

Sprat, number per hour Age group 3+, 1999 quarter 1

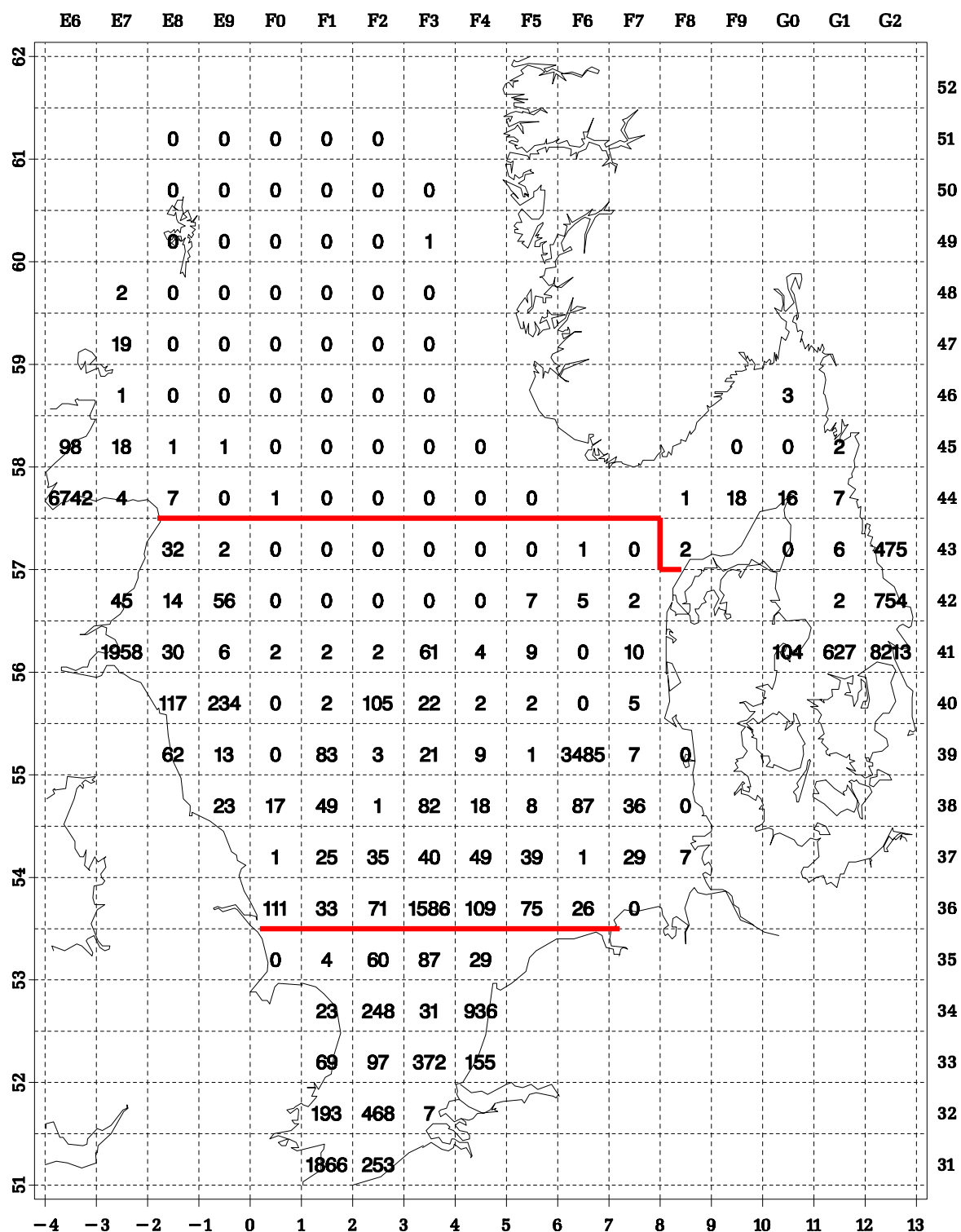


Figure 5.8 Sprat: number per hour, age 3+

Sprat, mean length

Age group 1, 1999 quarter 1

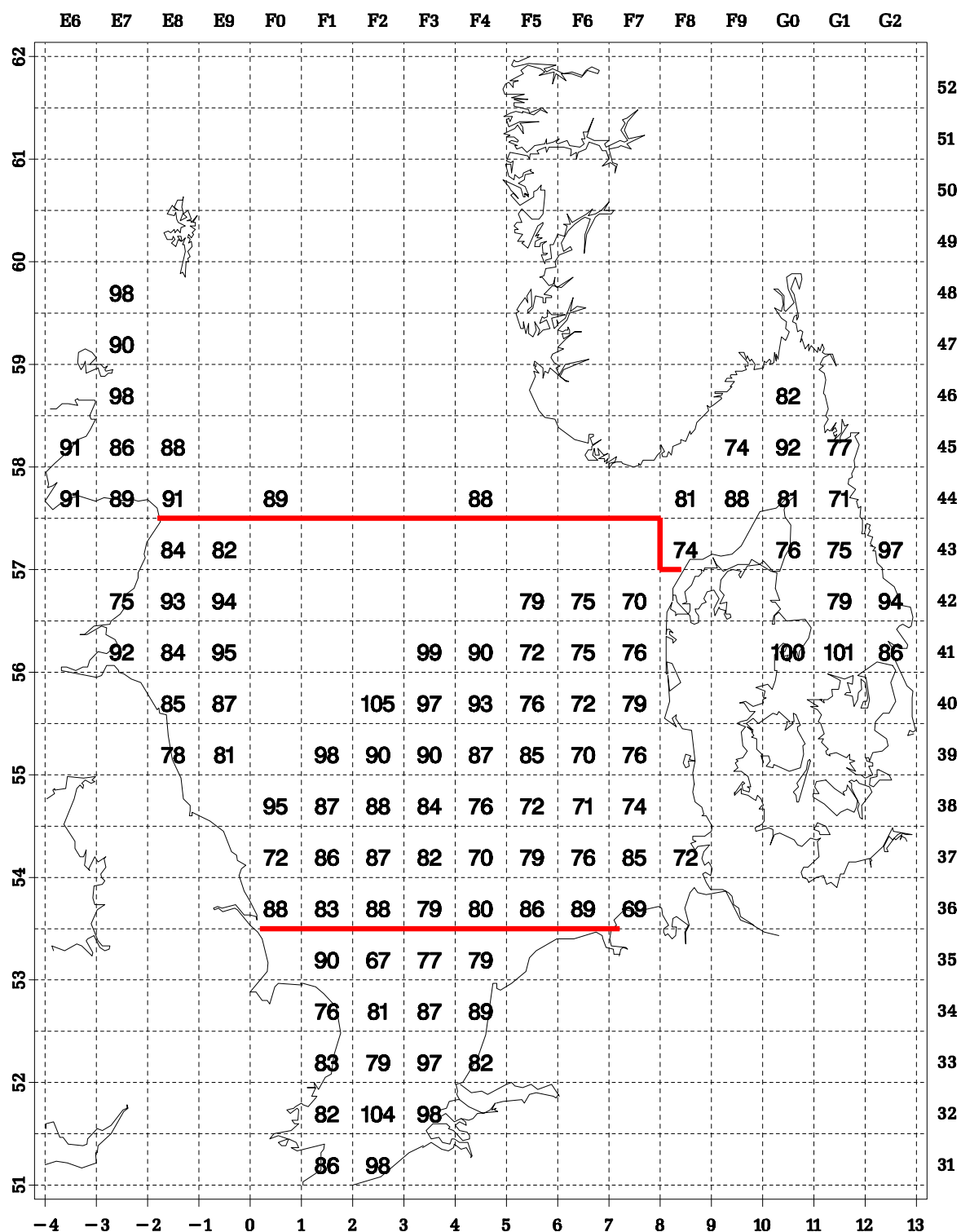


Figure 5.9. Sprat: mean length (MM), age 1

Mackerel, number per hour

Age group 1, 1999 quarter 1

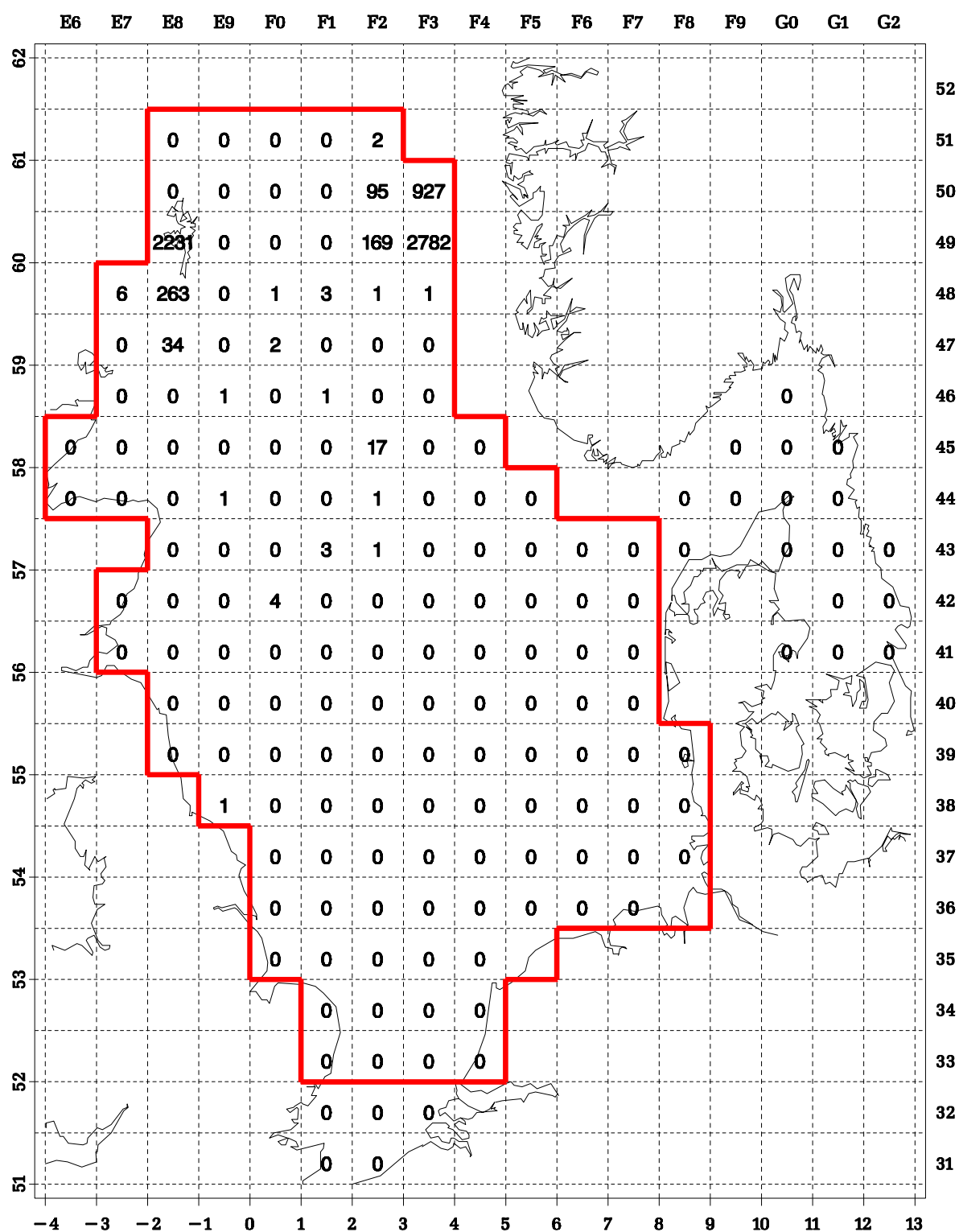


Figure 5.10 Mackerel: number per hour, age 1

Mackerel, number per hour

Age group 2, 1999 quarter 1

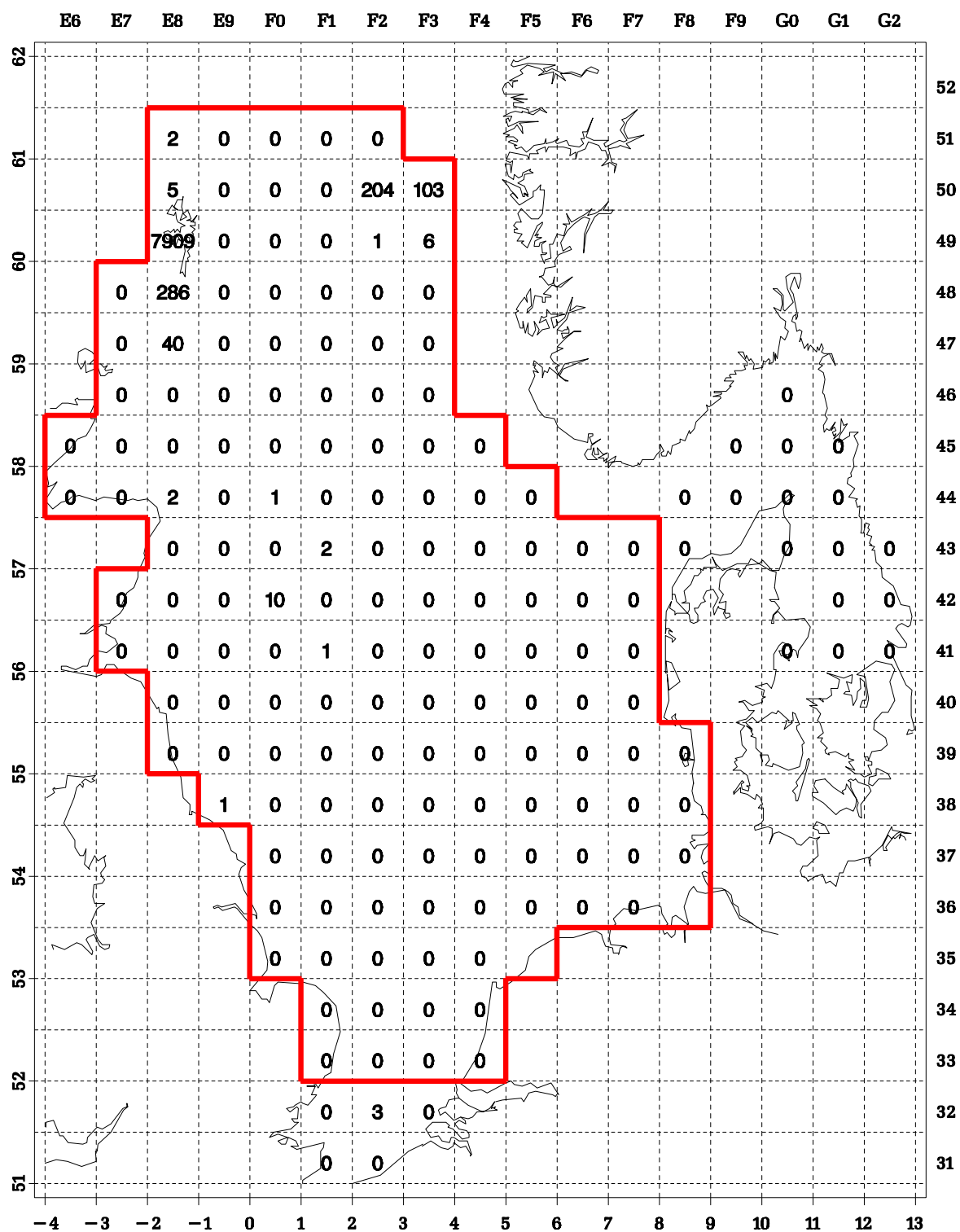


Figure 5.11 Mackerel: number per hour, age 2

Mackerel, number per hour
Age group 3+, 1999 quarter 1

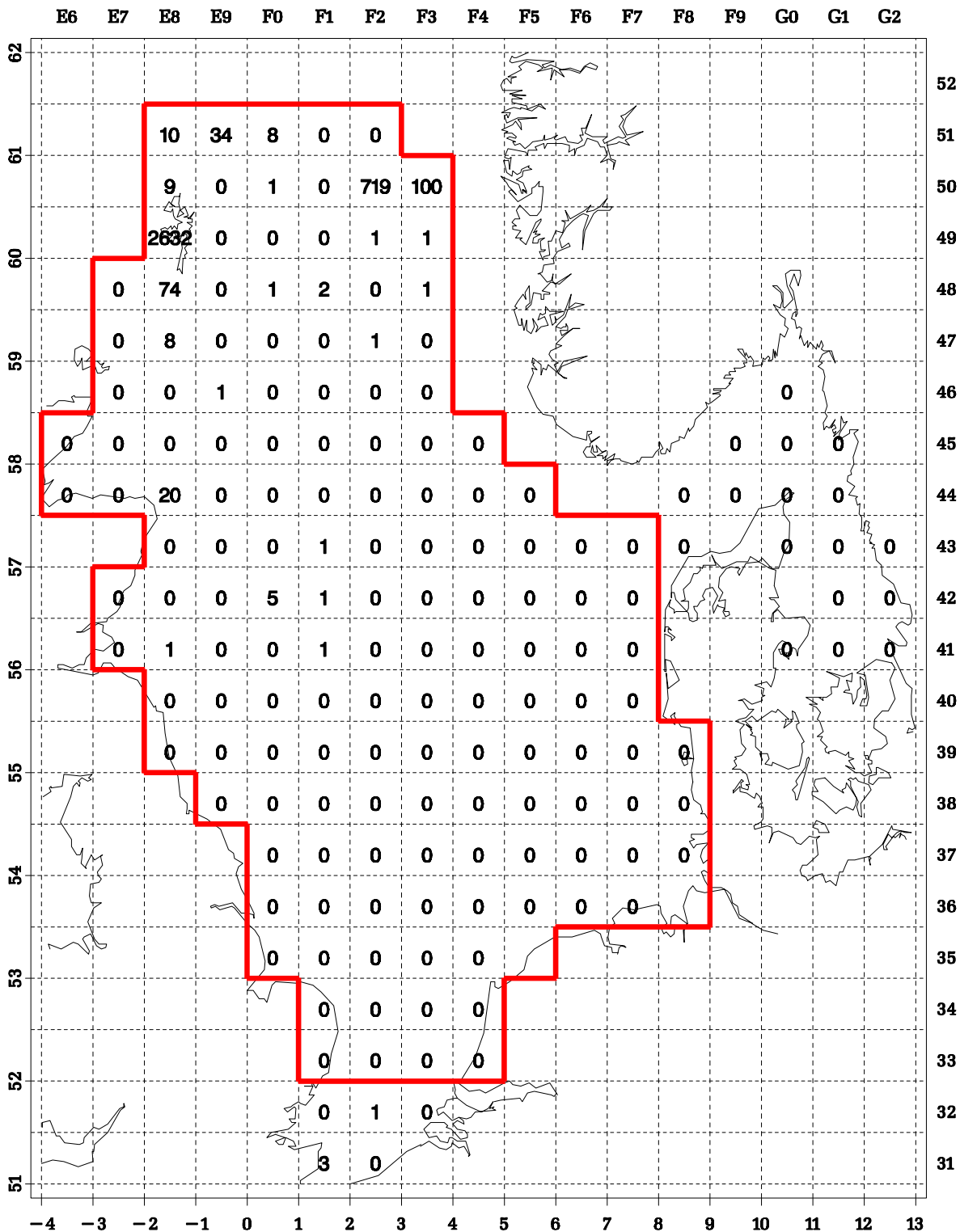


Figure 5.12 Mackerel: number per hour, age 3+

Mackerel, mean length

Age group 1, 1999 quarter 1

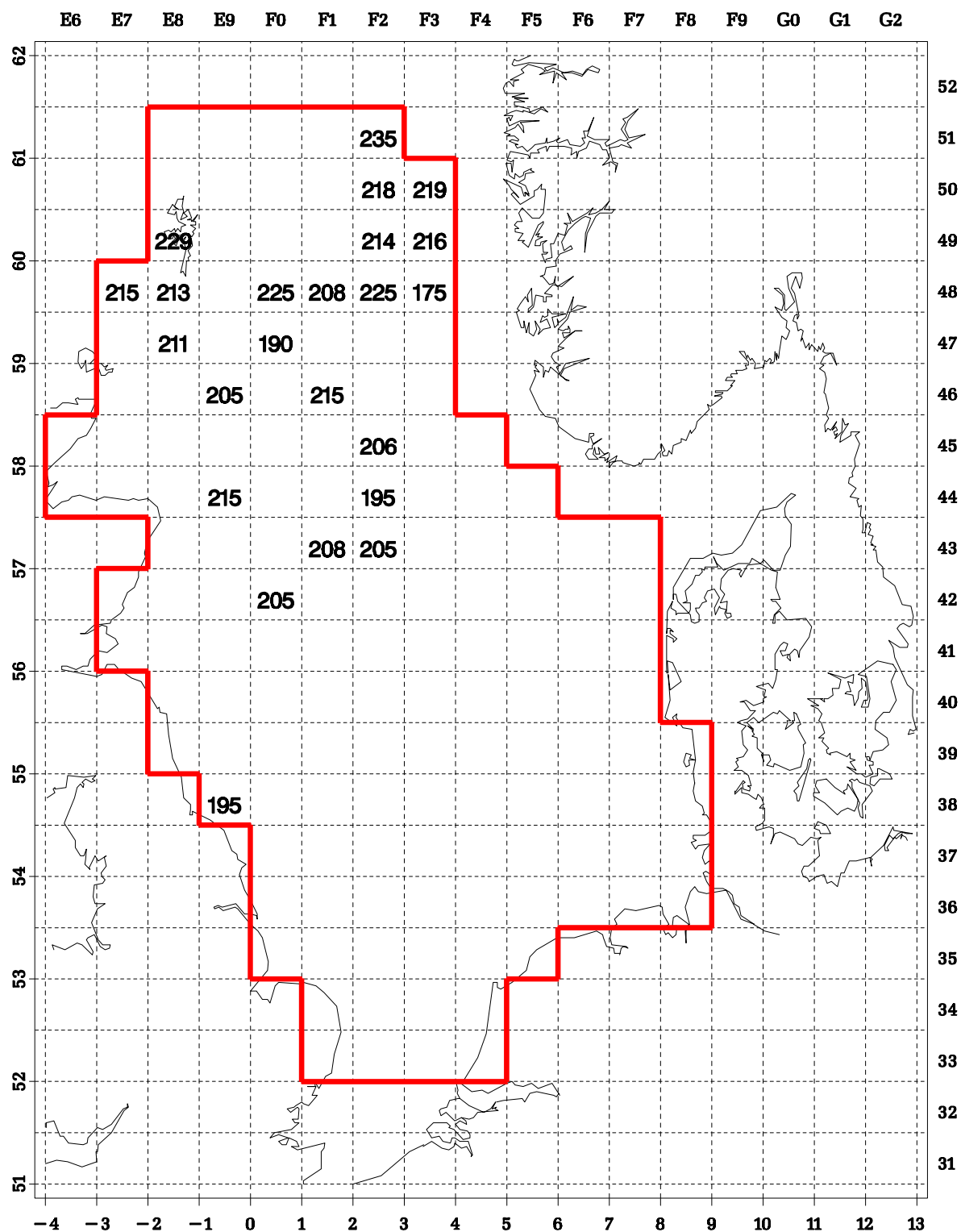


Figure 5.13 Mackerel: mean length (mm), age 1

Cod, number per hour

Age group 1, 1999 quarter 1

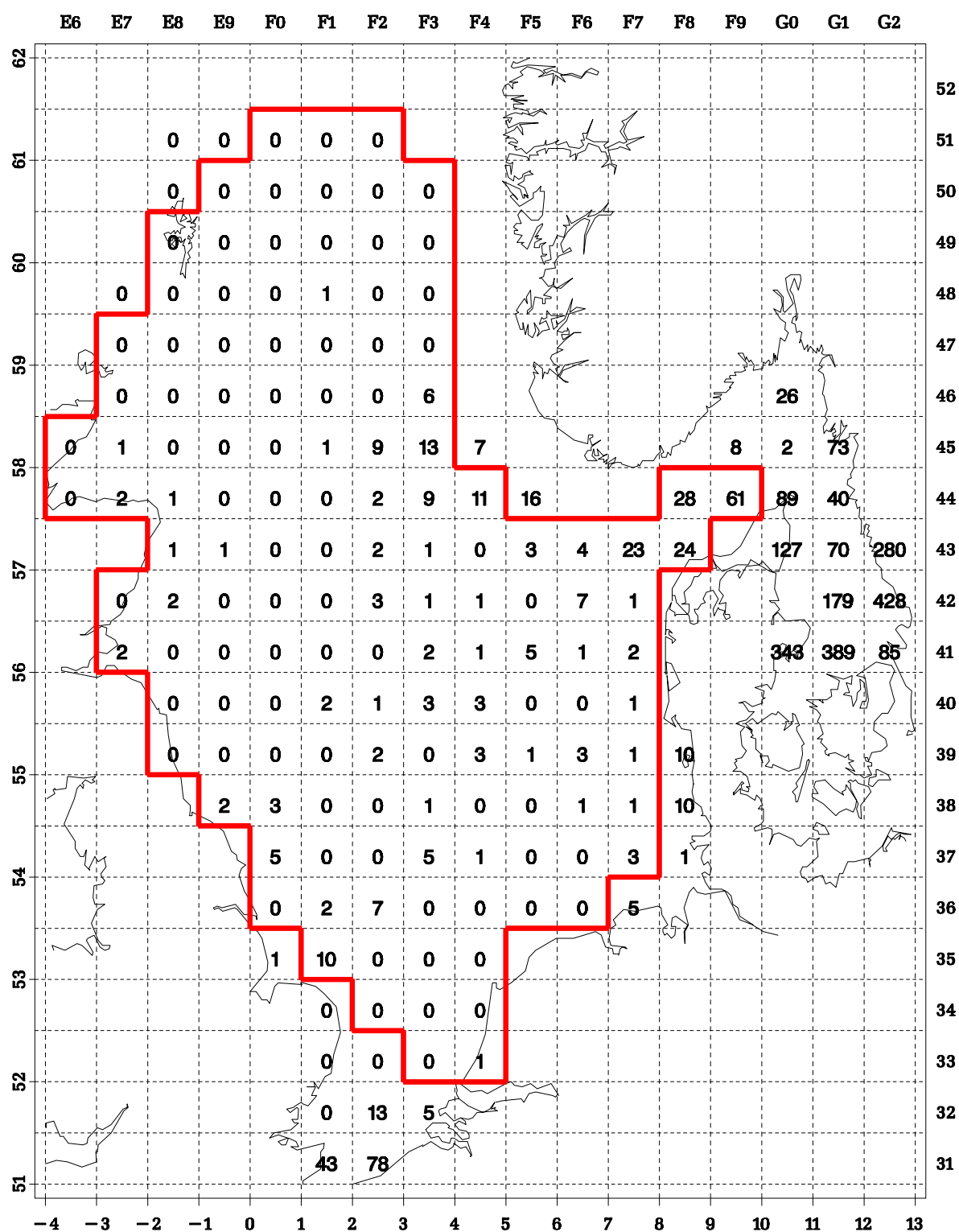


Figure 5.14 Cod: number per hour, age 1

Cod, number per hour

Age group 2, 1999 quarter 1

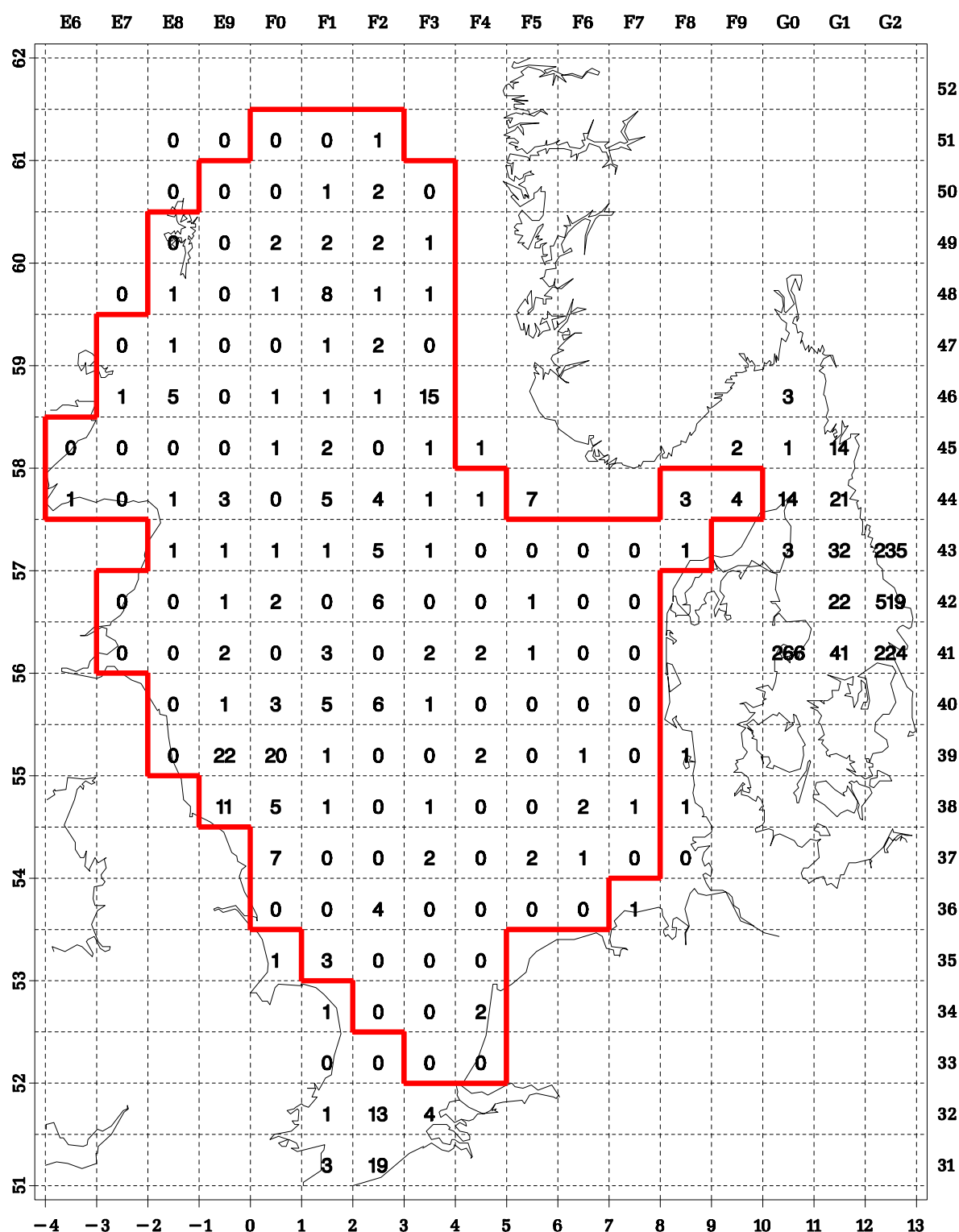


Figure 5.15 Cod: number per hour, age 2

Cod, number per hour Age group 3+, 1999 quarter 1

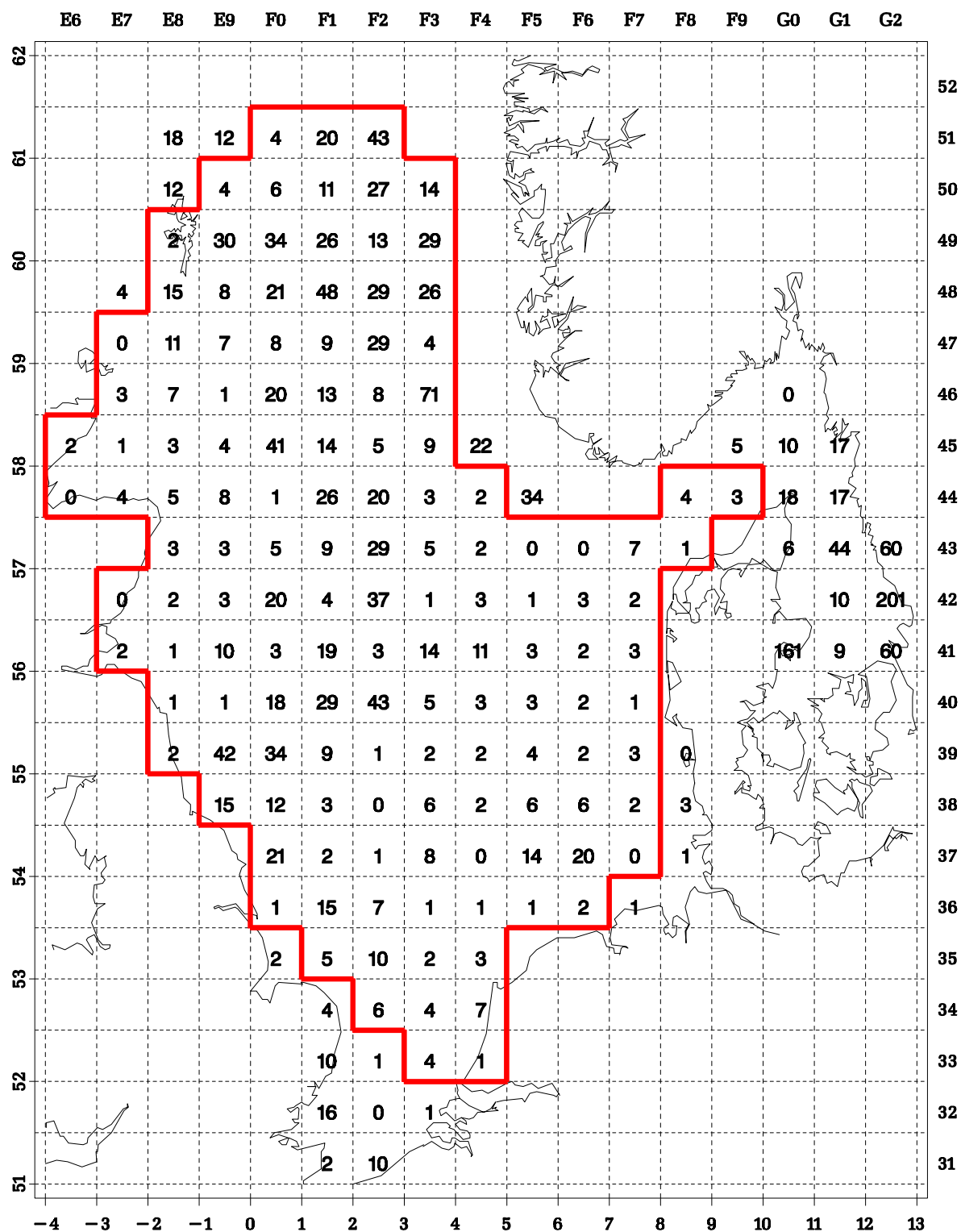


Figure 5.16 Cod: number per hour, age 3+

Cod, mean length Age group 1, 1999 quarter 1

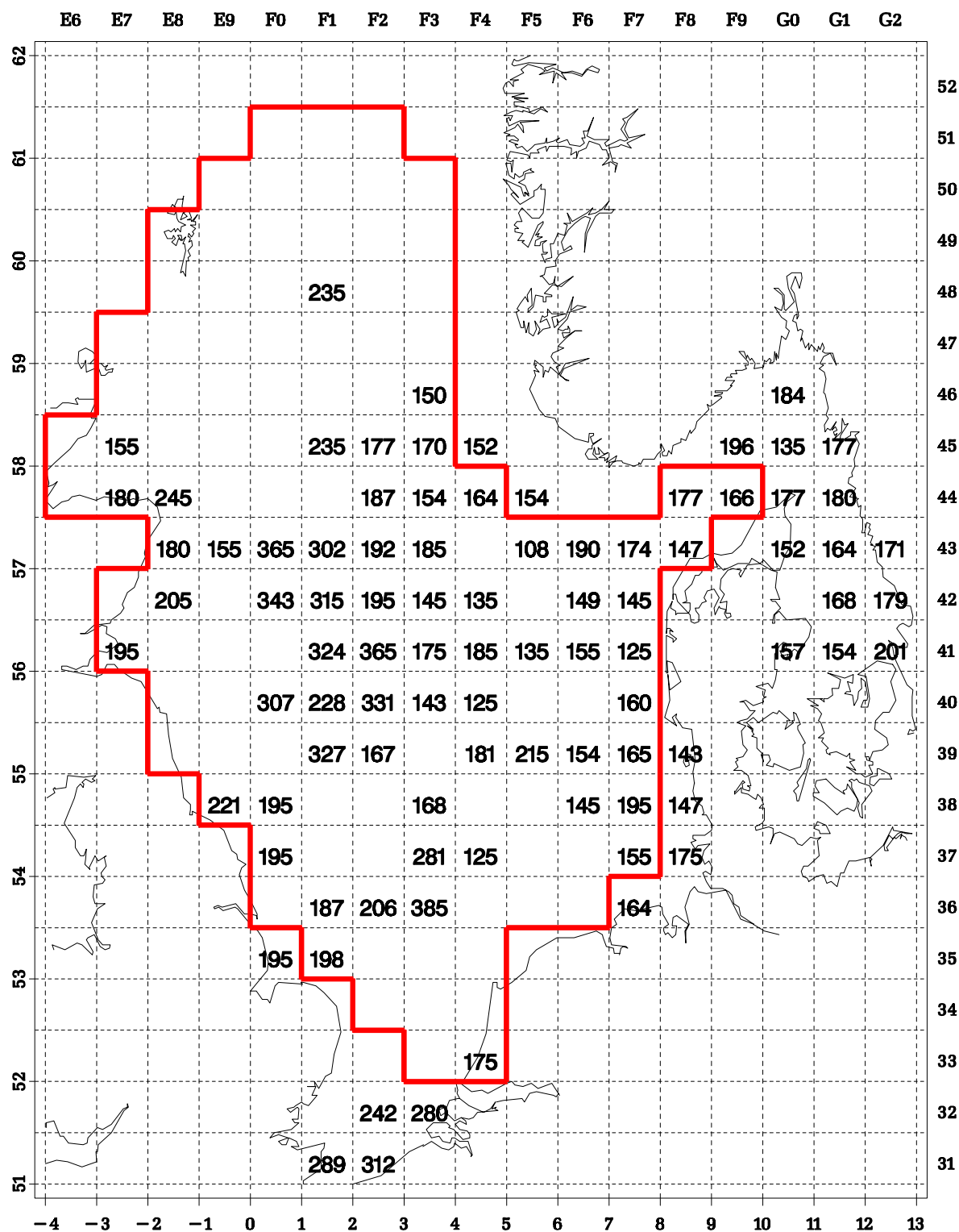


Figure 5.17 Cod, mean length (mm) age 1

Haddock, number per hour

Age group 1, 1999 quarter 1

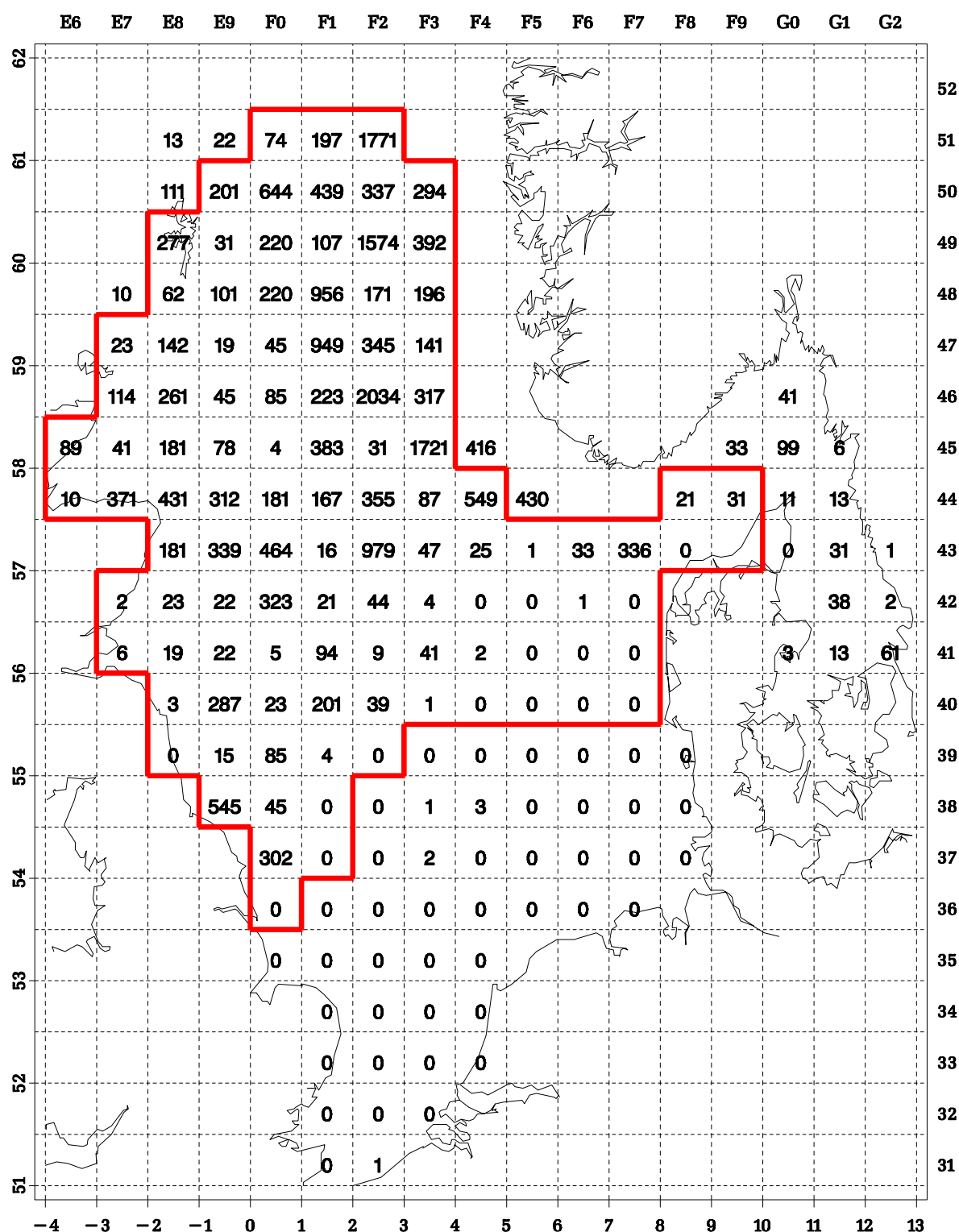


Figure 5.18 Haddock: number per hour, age 1

Haddock, number per hour

Age group 2, 1999 quarter 1

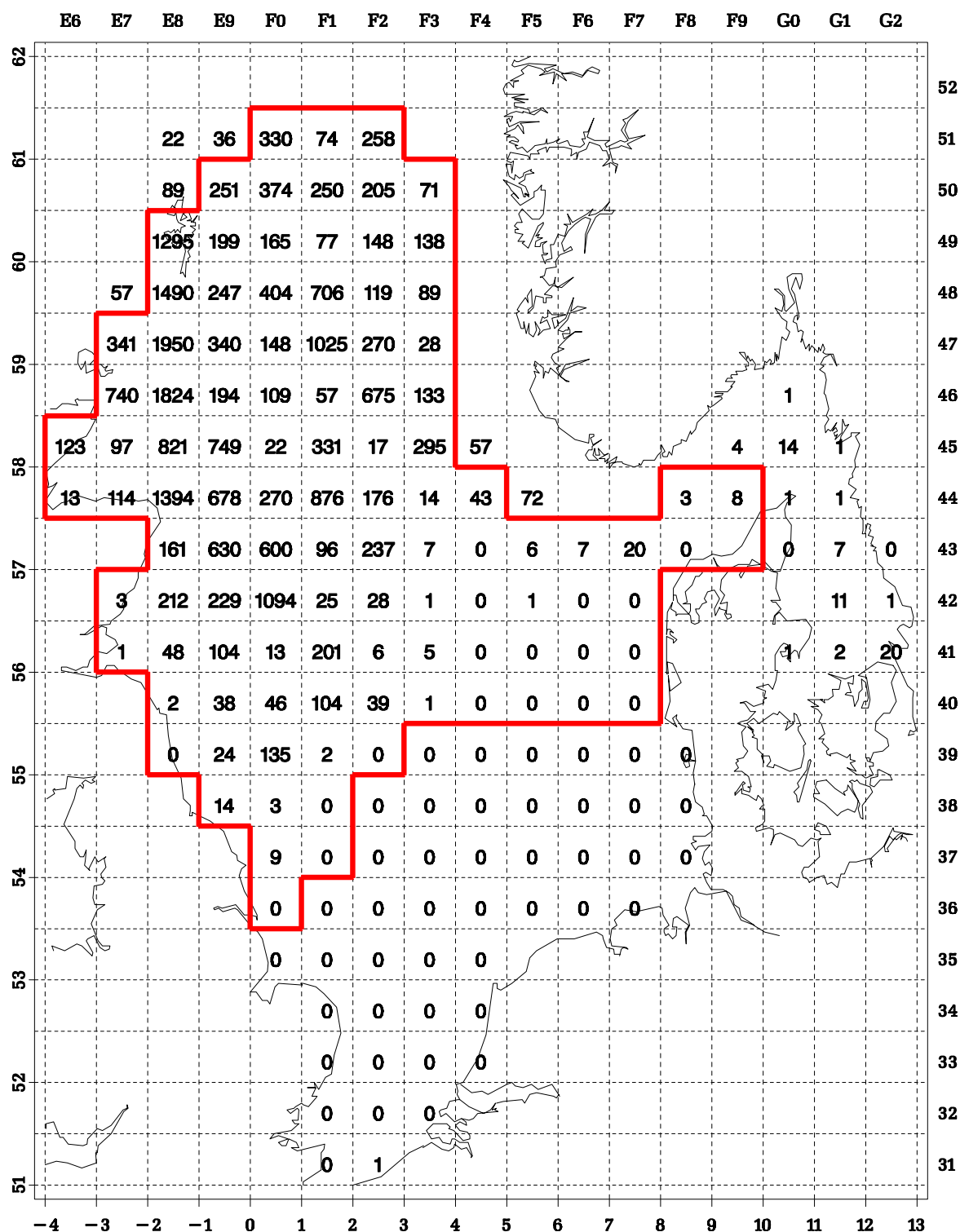


Figure 5.19 Haddock: number per hour, age 2

Haddock, number per hour

Age group 3+, 1999 quarter 1

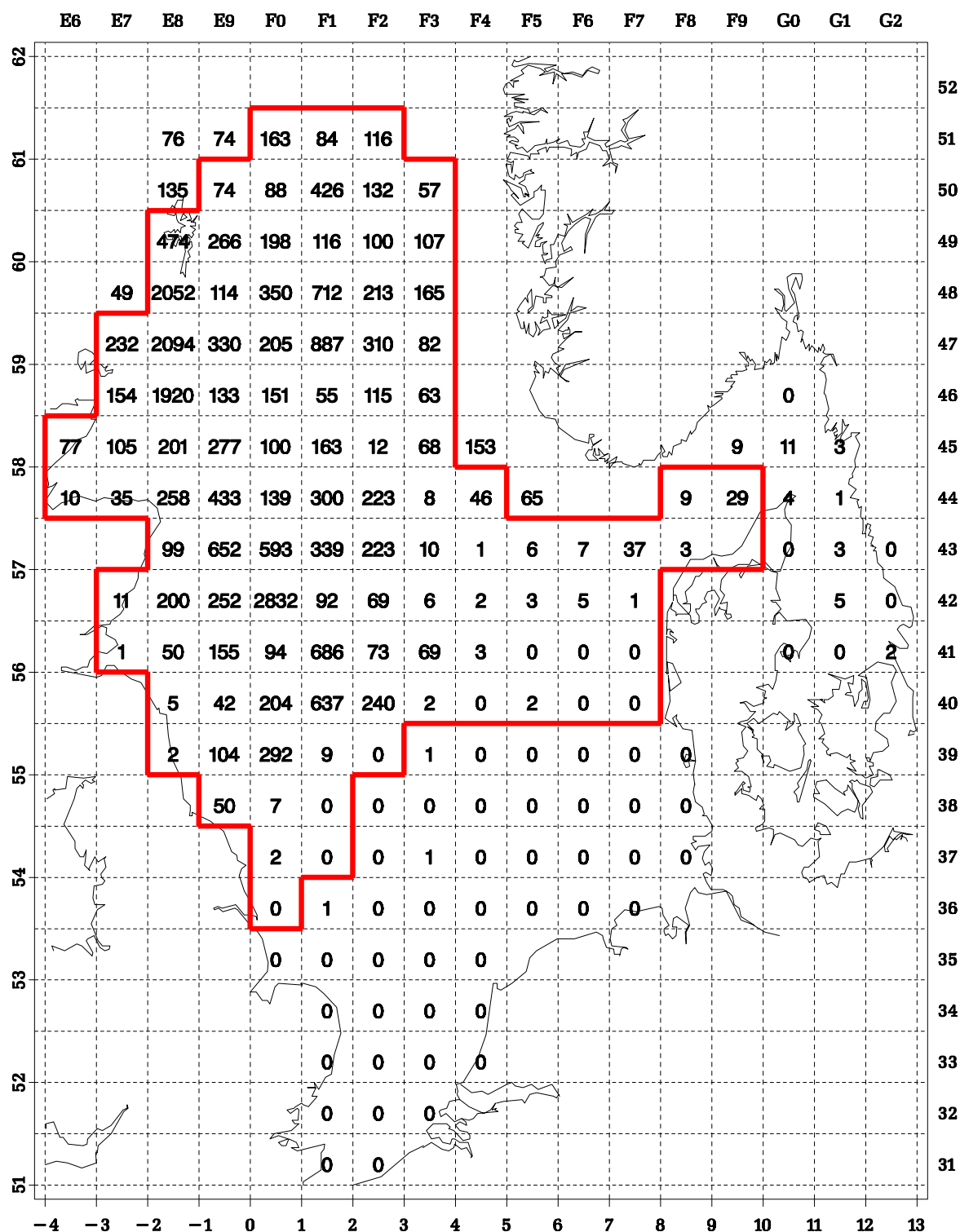


Figure 5.20 Haddock: number per hour, age 3+

Haddock, mean length

Age group 1, 1999 quarter 1

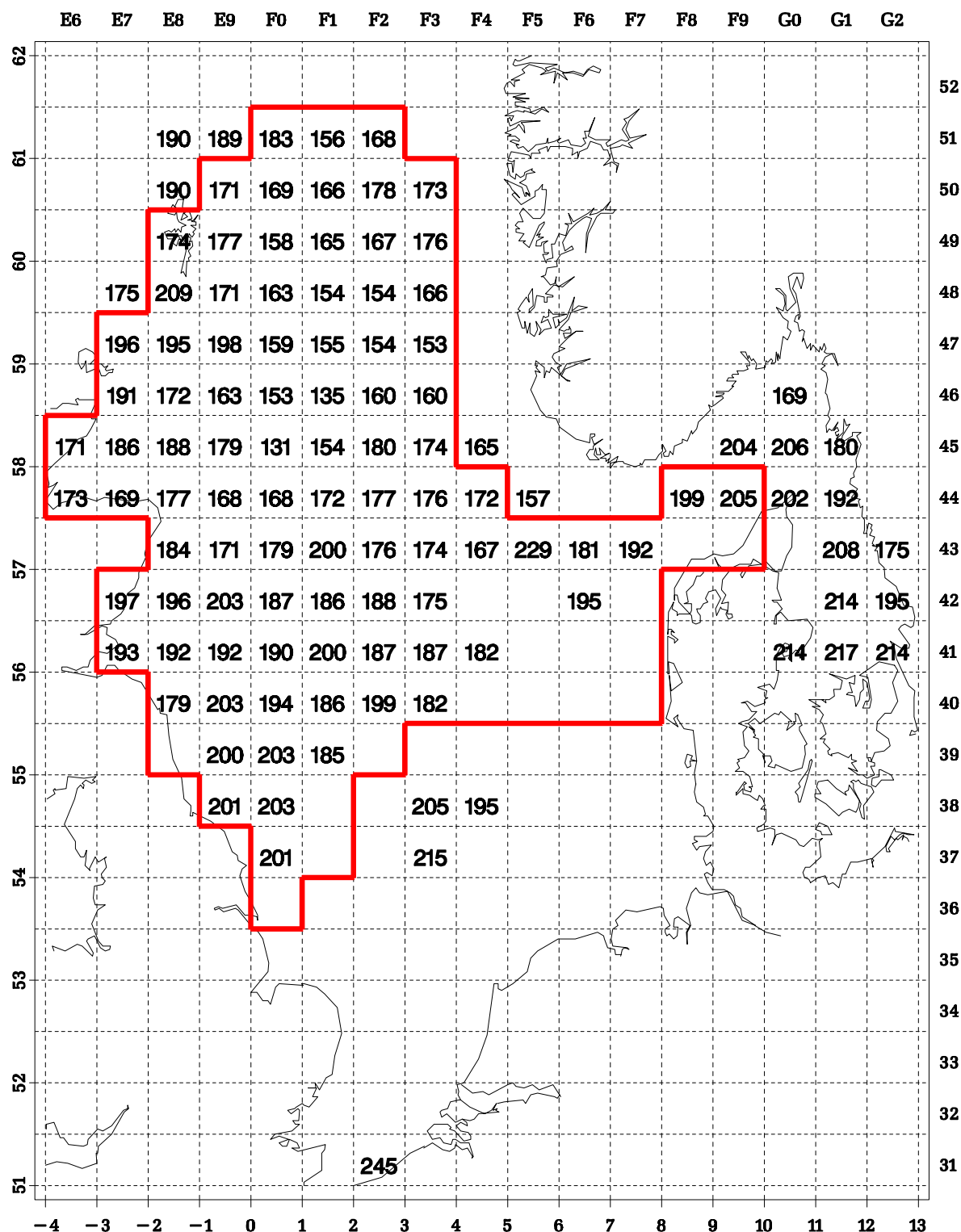


Figure 5.21 Haddock: mean length (mm), age 1

Whiting, number per hour

Age group 1, 1999 quarter 1

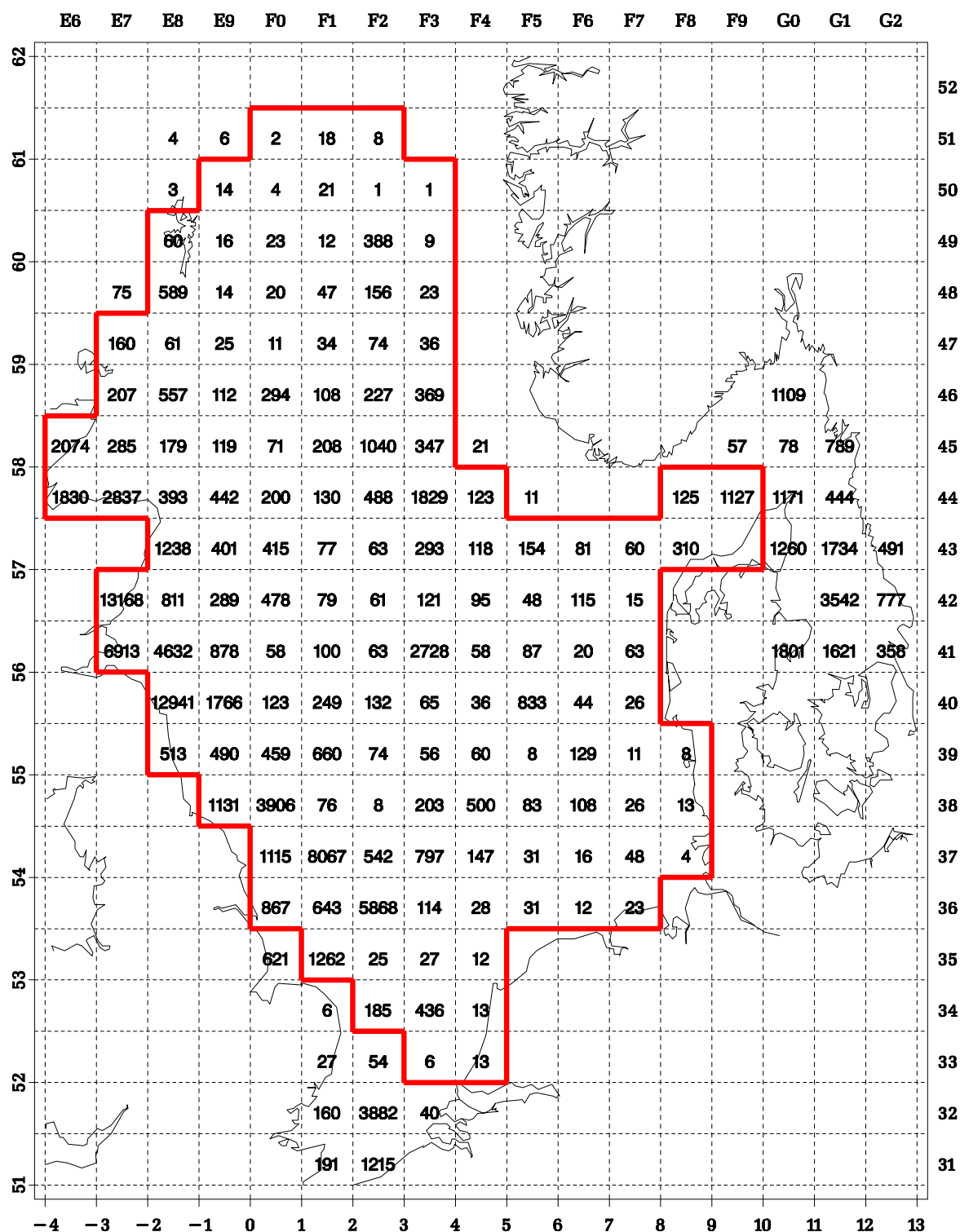


Figure 5.22 Whiting: number per hour, age 1

Whiting, number per hour

Age group 2, 1999 quarter 1

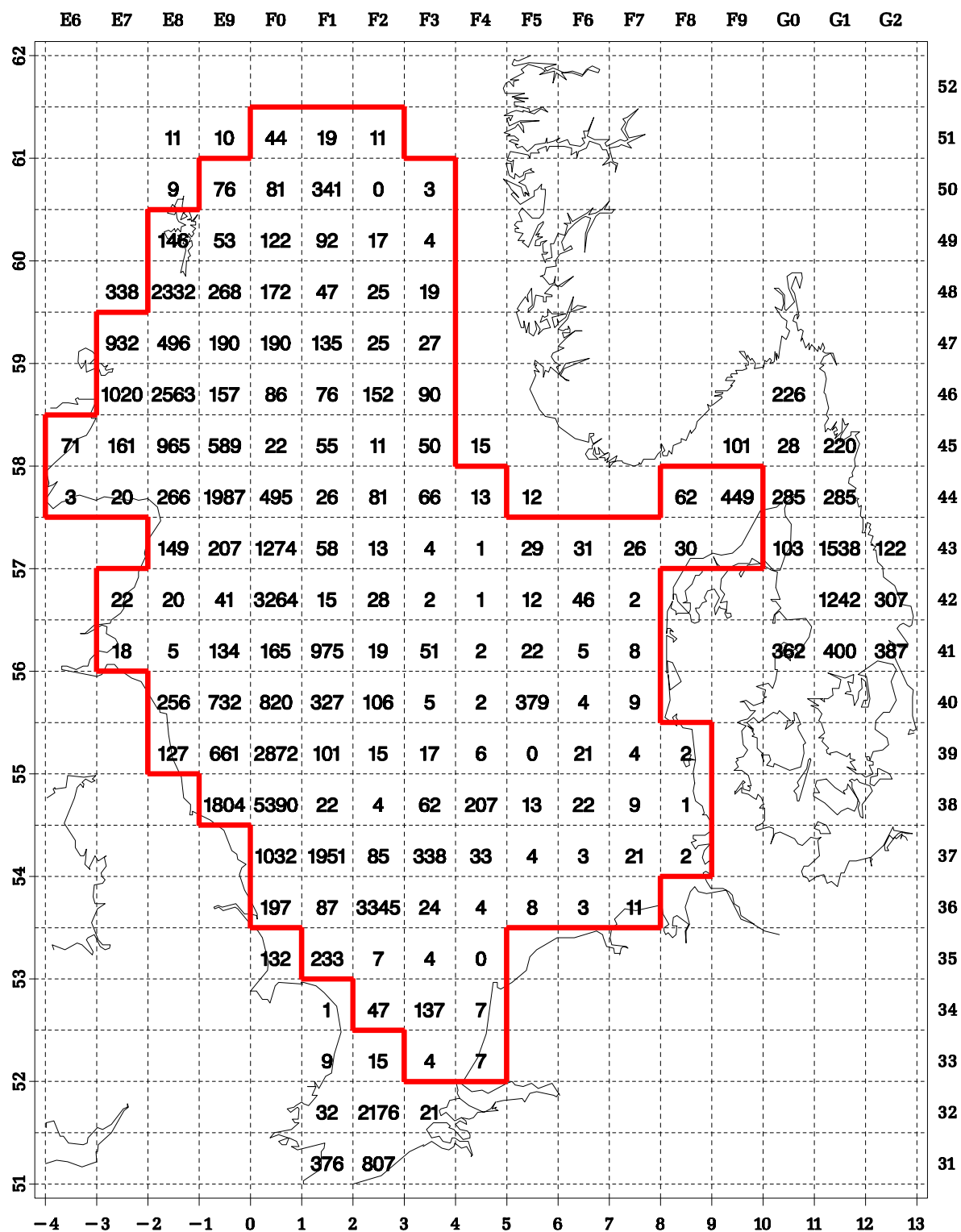


Figure 5.23 Whiting: number per hour, age 2

Whiting, number per hour

Age group 3+, 1999 quarter 1

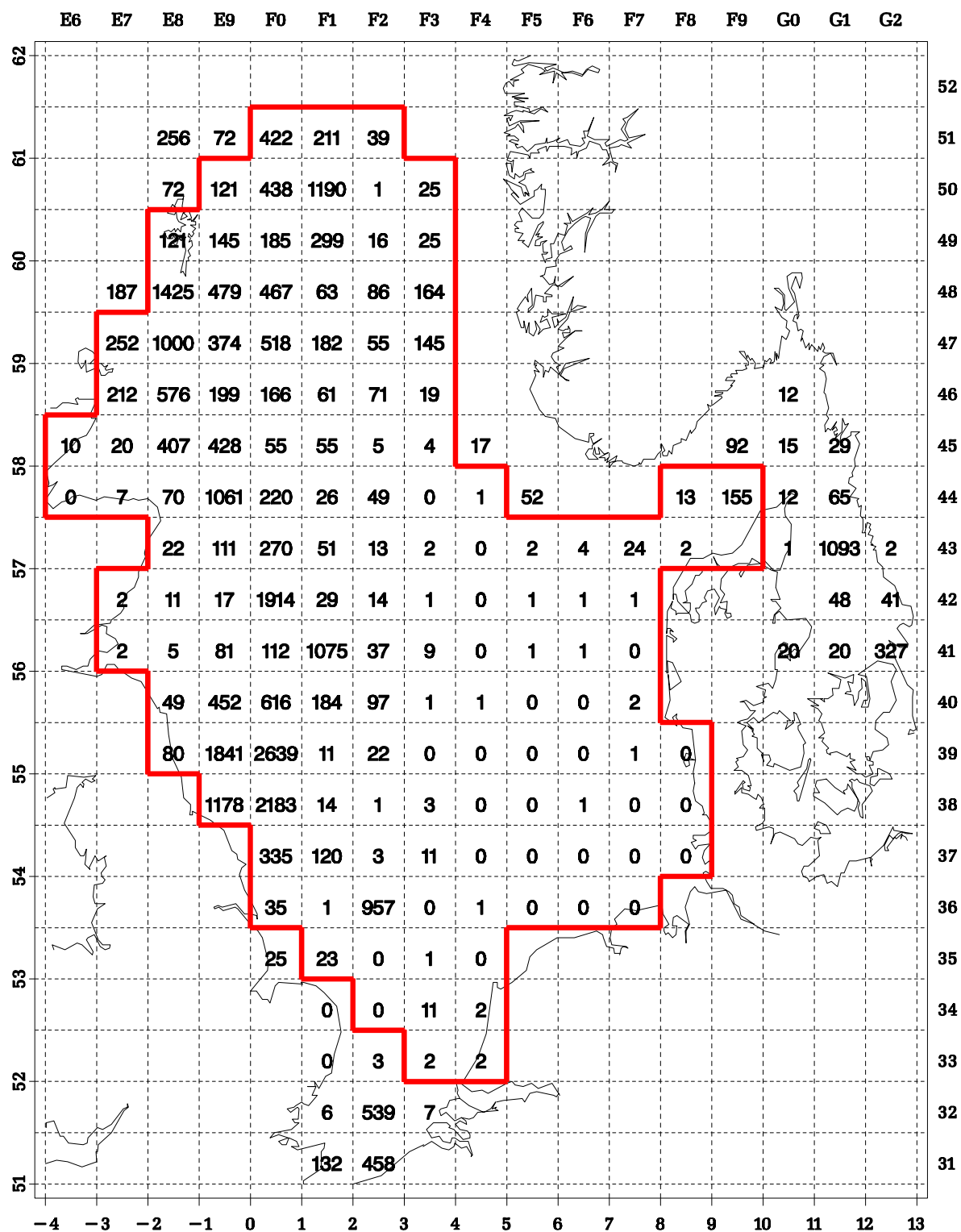


Figure 5.24 Whiting: number per hour, age 3+

Whiting, mean length

Age group 1, 1999 quarter 1

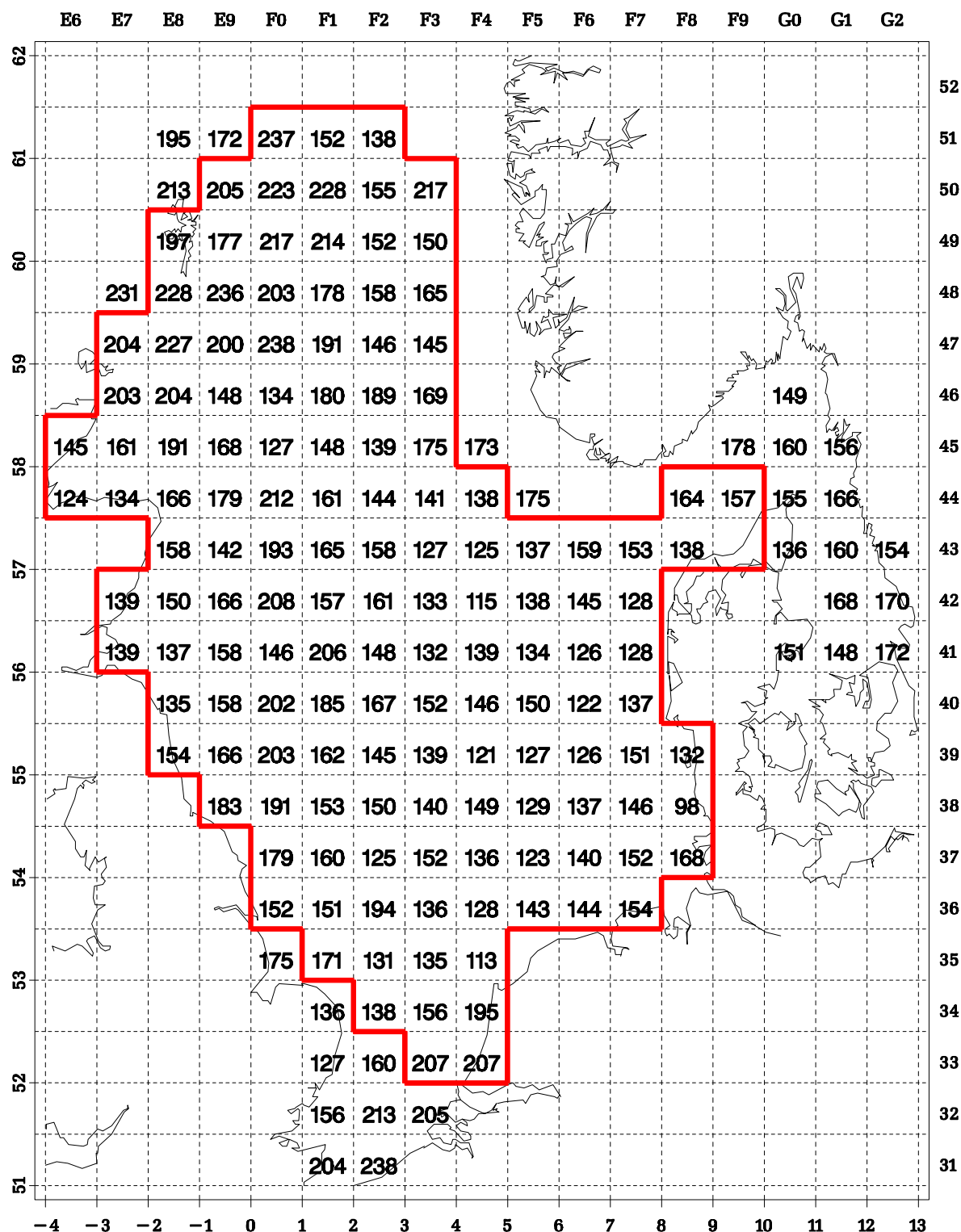


Figure 5.25 Whiting: mean length (mm), age 1

Saithe, number per hour

Age group 1, 1999 quarter 1

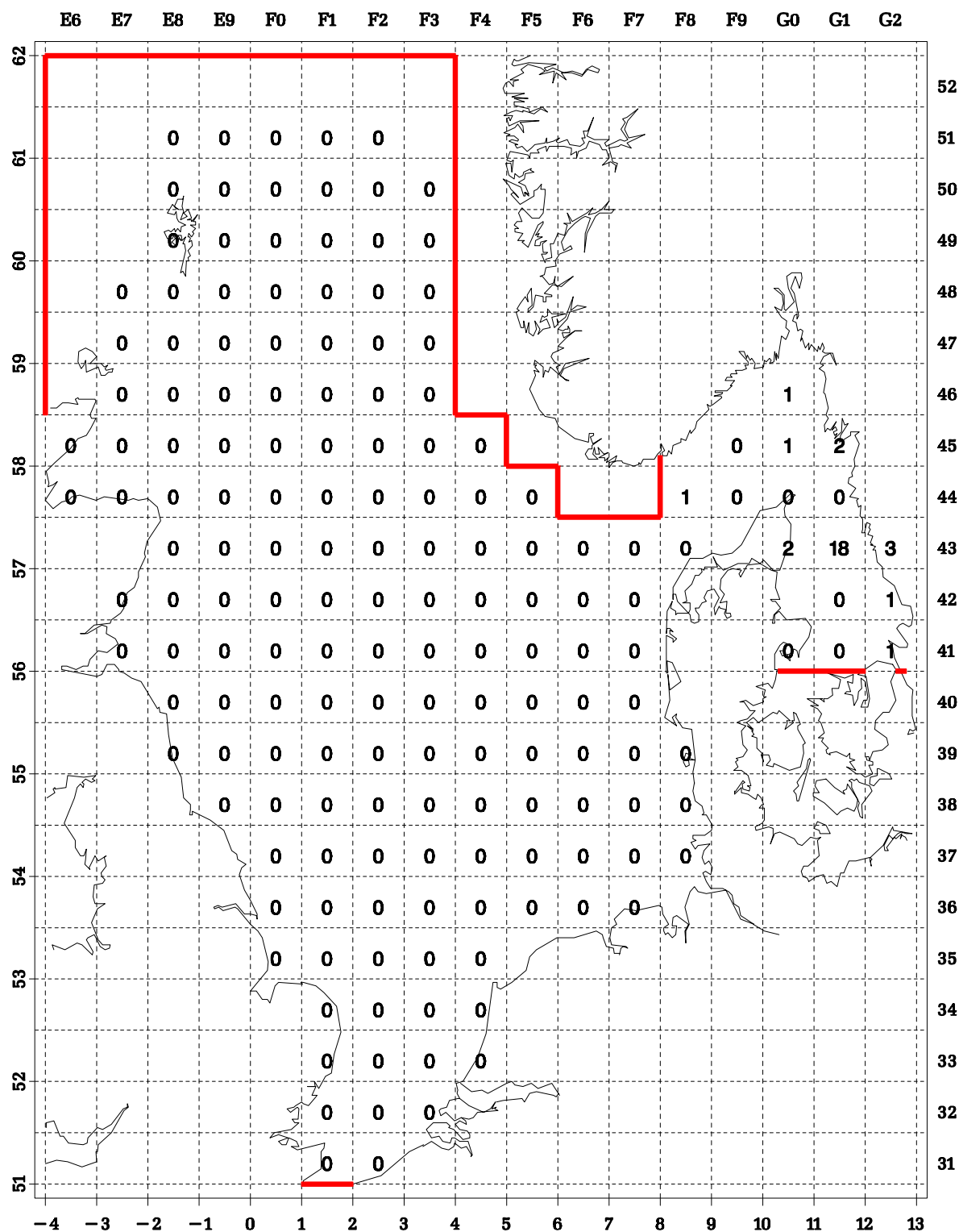


Figure 5.26 Saithe: number per hour, age 1

Saithe, number per hour

Age group 2, 1999 quarter 1

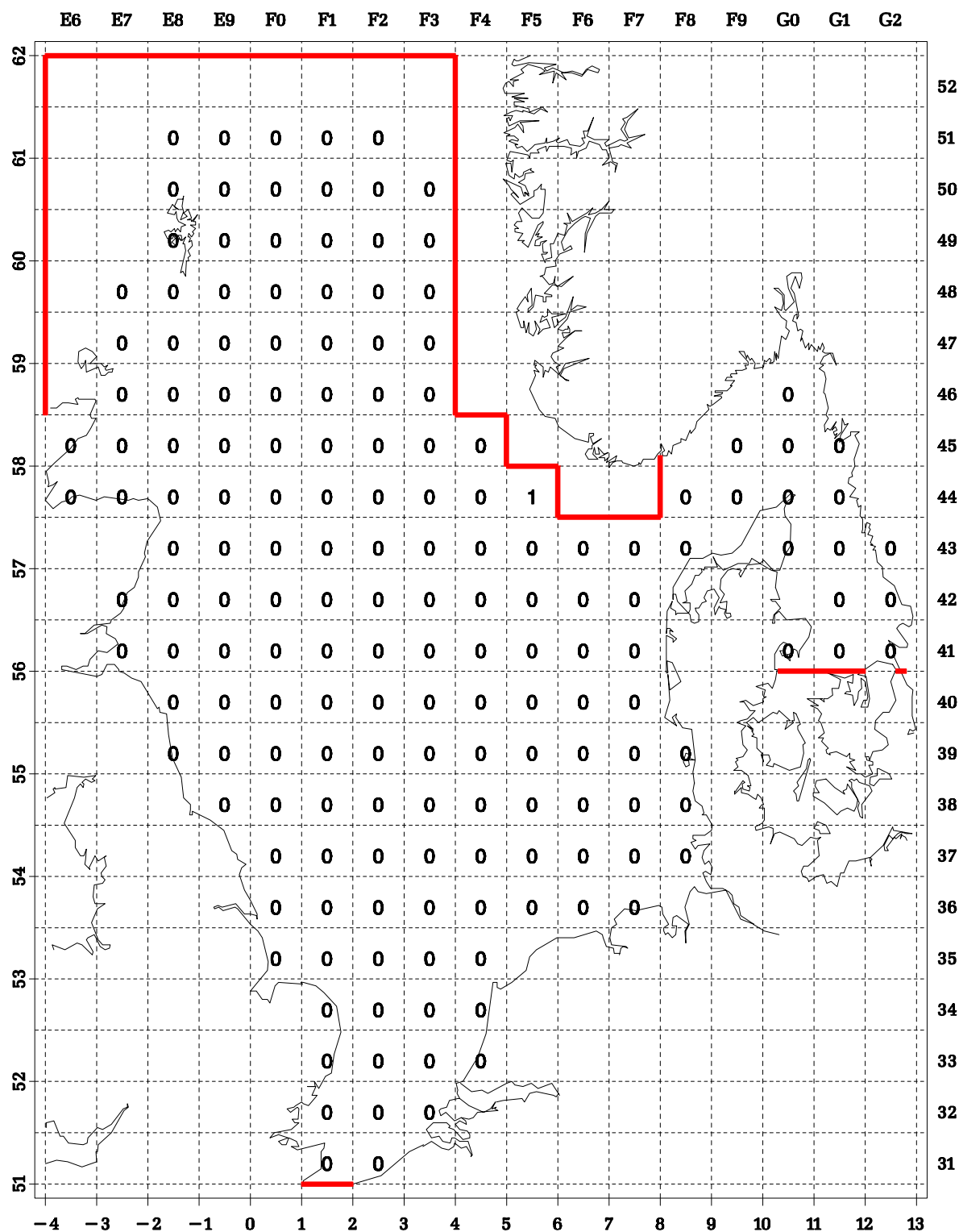


Figure 5.27 Saithe: number per hour, age 2

Saithe, number per hour

Age group 3+, 1999 quarter 1

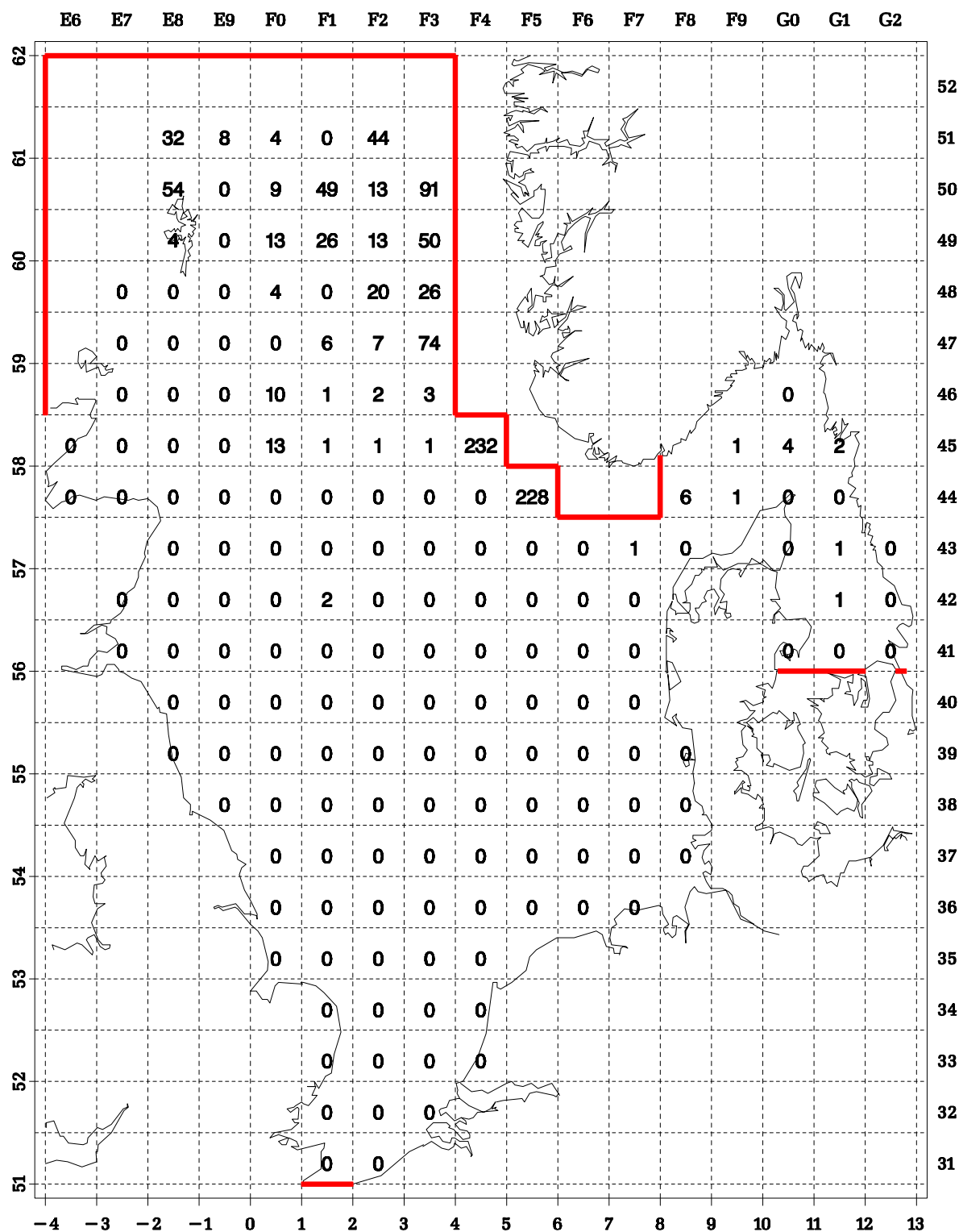


Figure 5.28 Saithe: number per hour, age 3+

Age group 1, 1999 quarter 1

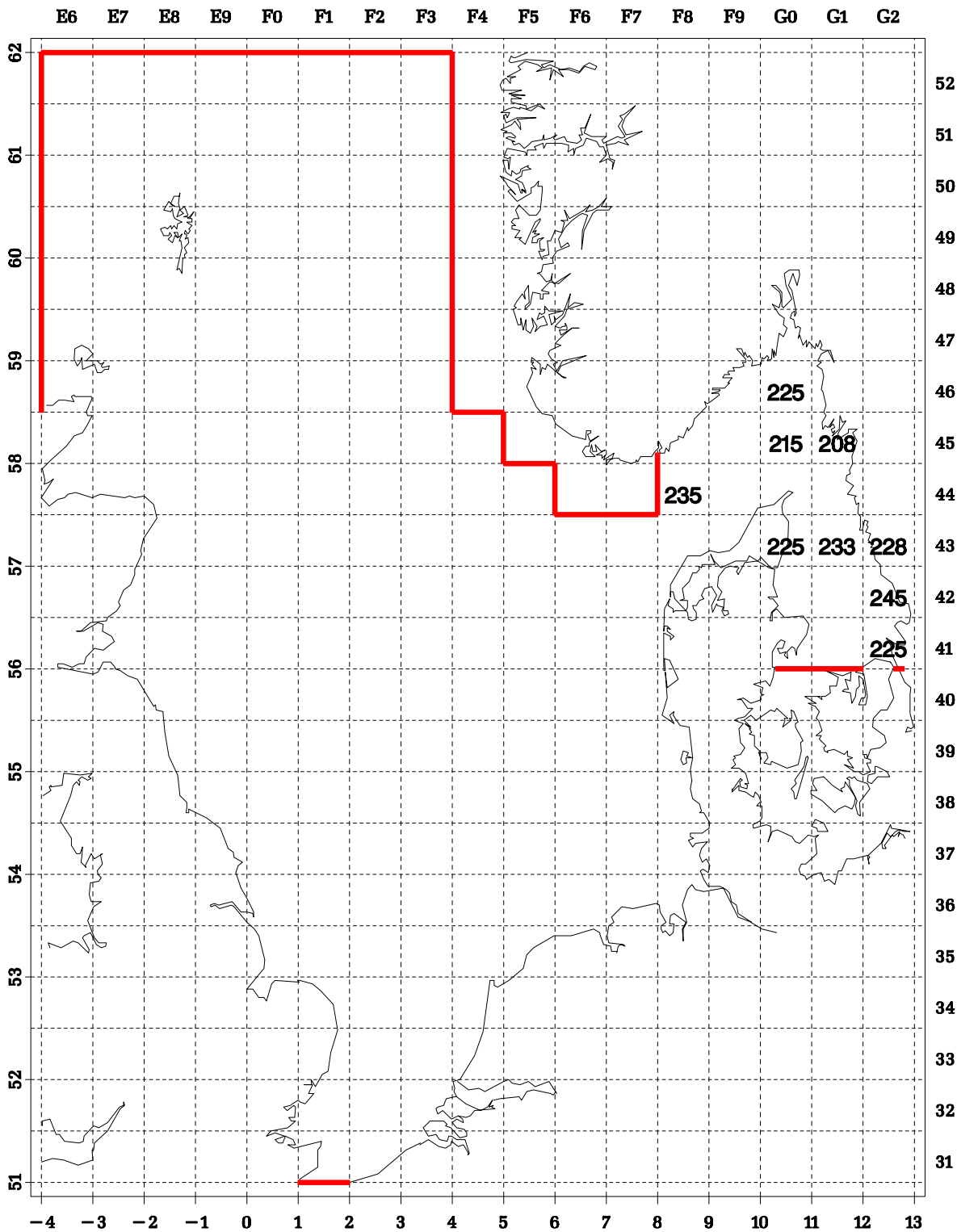


Figure 5.29 Saithe: mean length (mm), age 1

Norway pout, number per hour

Age group 1, 1999 quarter 1

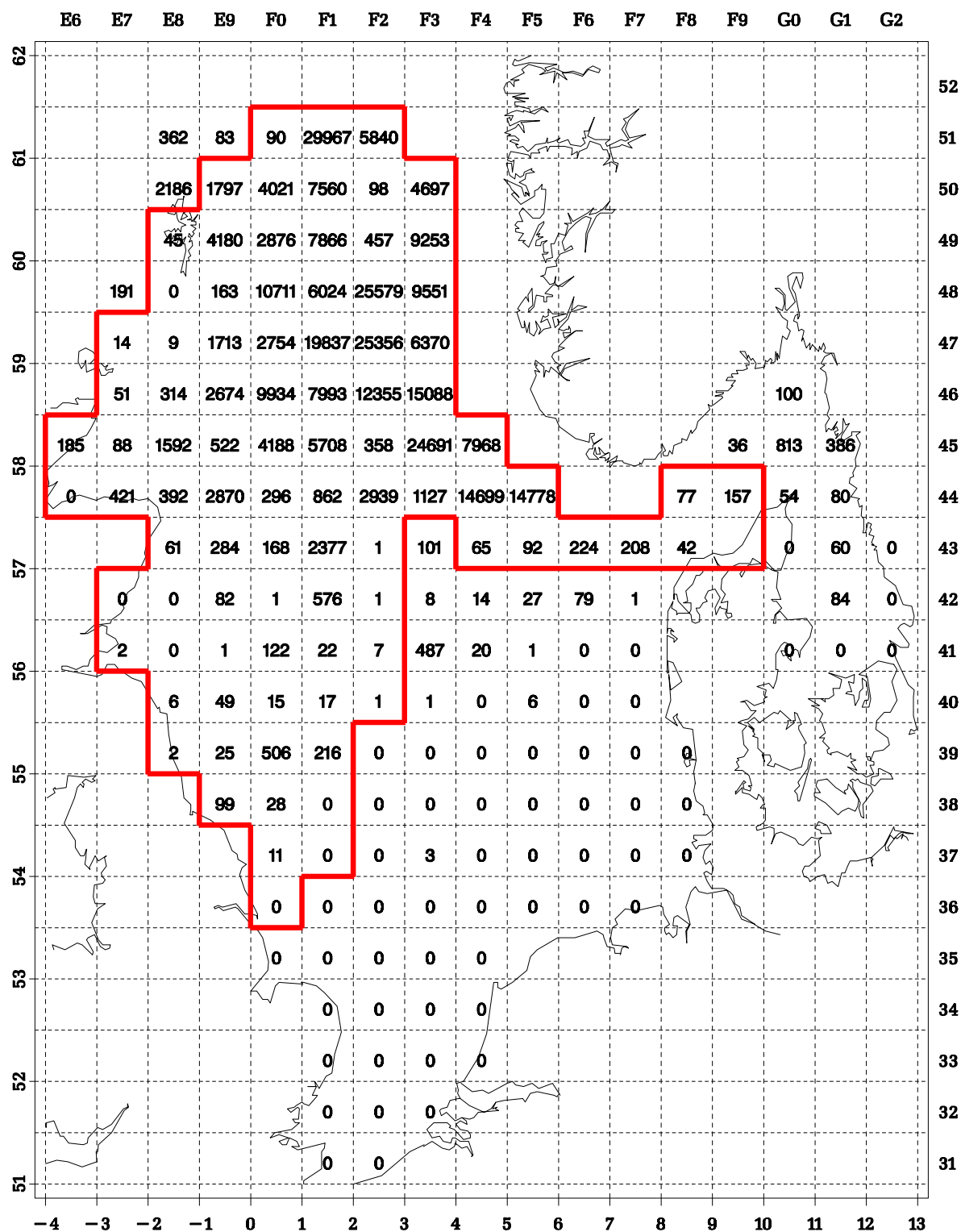


Figure 5.30 Norway pour: number per hour, age 1

Norway pout, number per hour

Age group 2, 1999 quarter 1

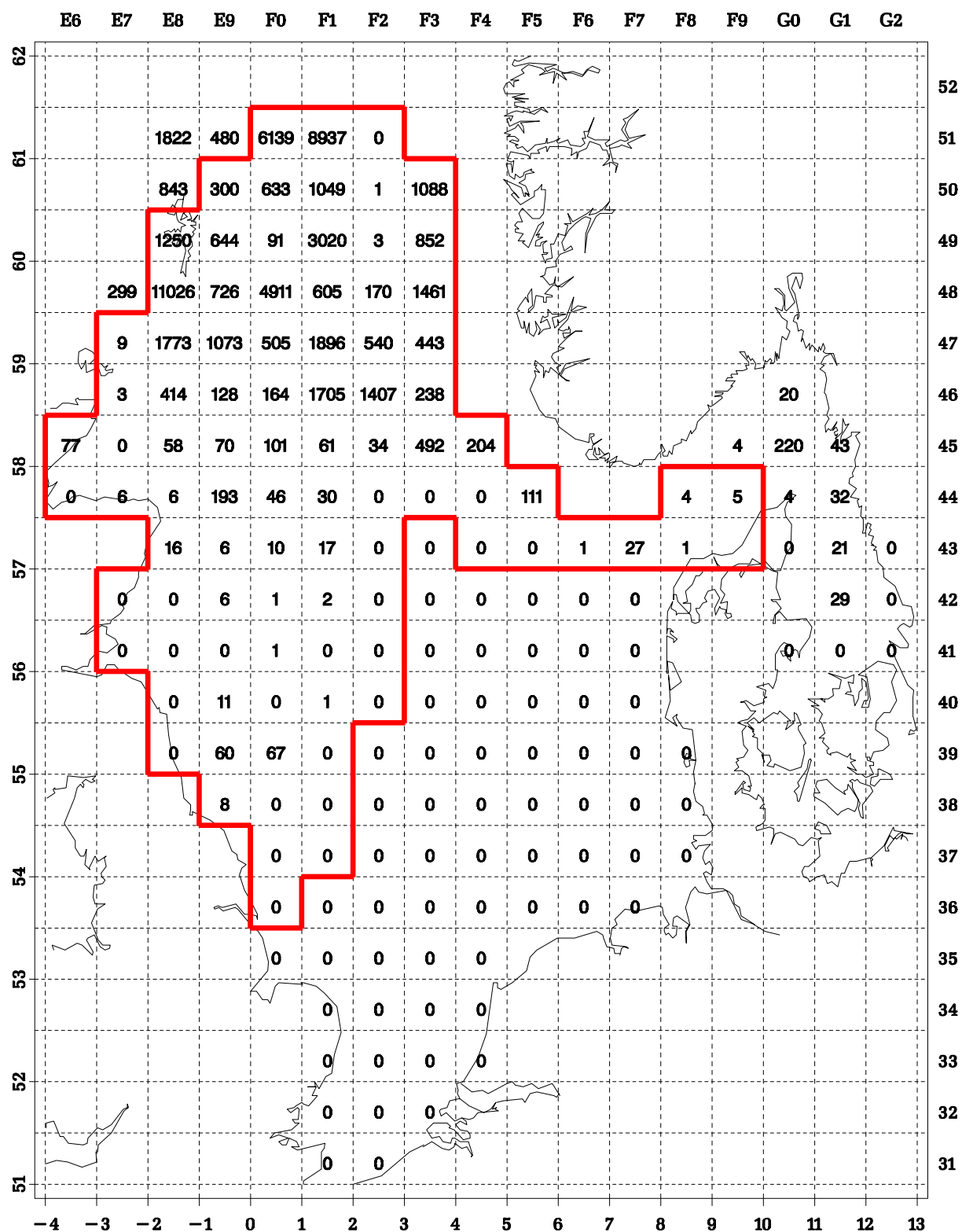


Figure 5.31 Norway pour: number per hour, age 2

Norway pout, number per hour

Age group 3+, 1999 quarter 1

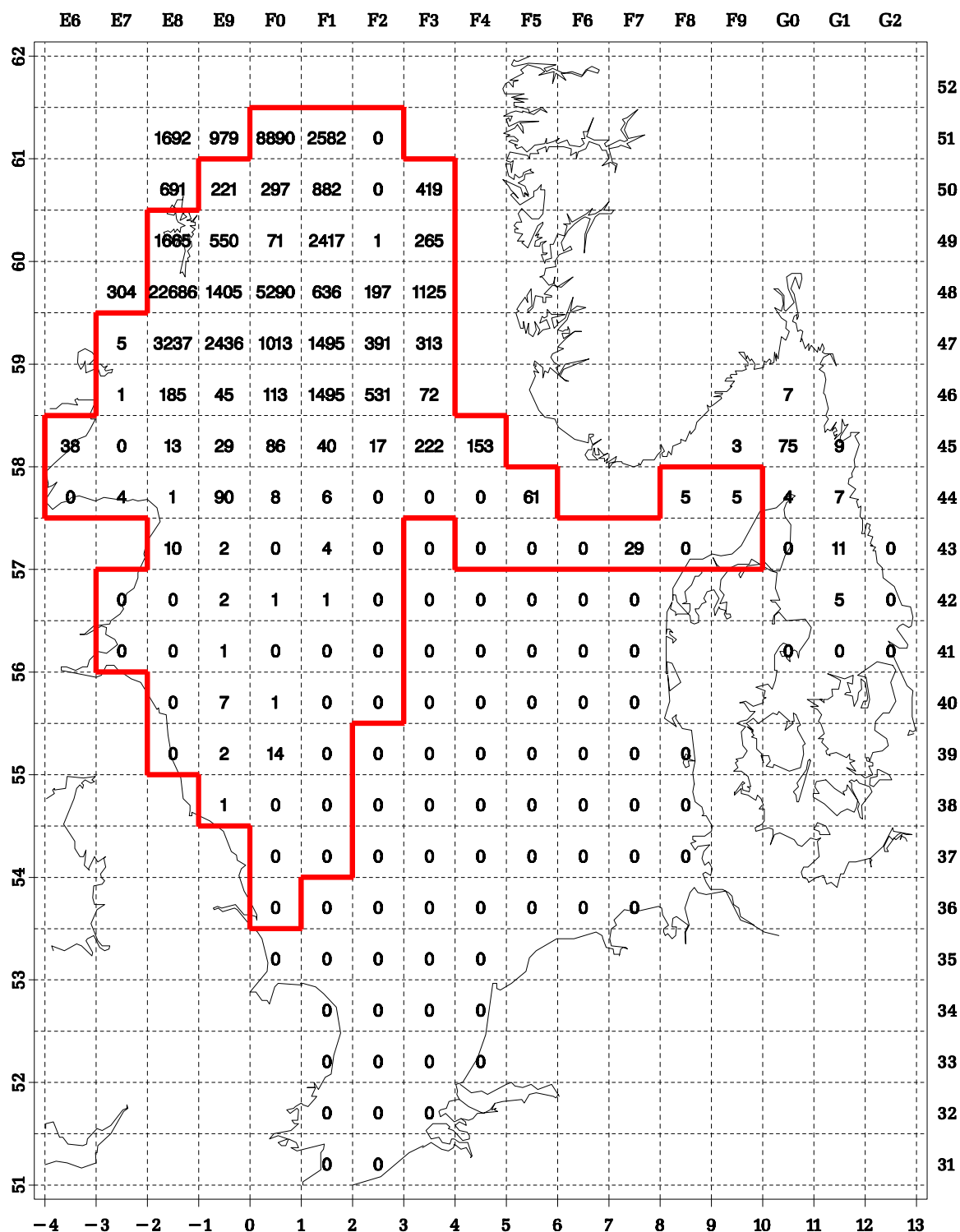


Figure 5.32 Norway pout: number per hour, age 3+

Norway pout, mean length

Age group 1, 1999 quarter 1

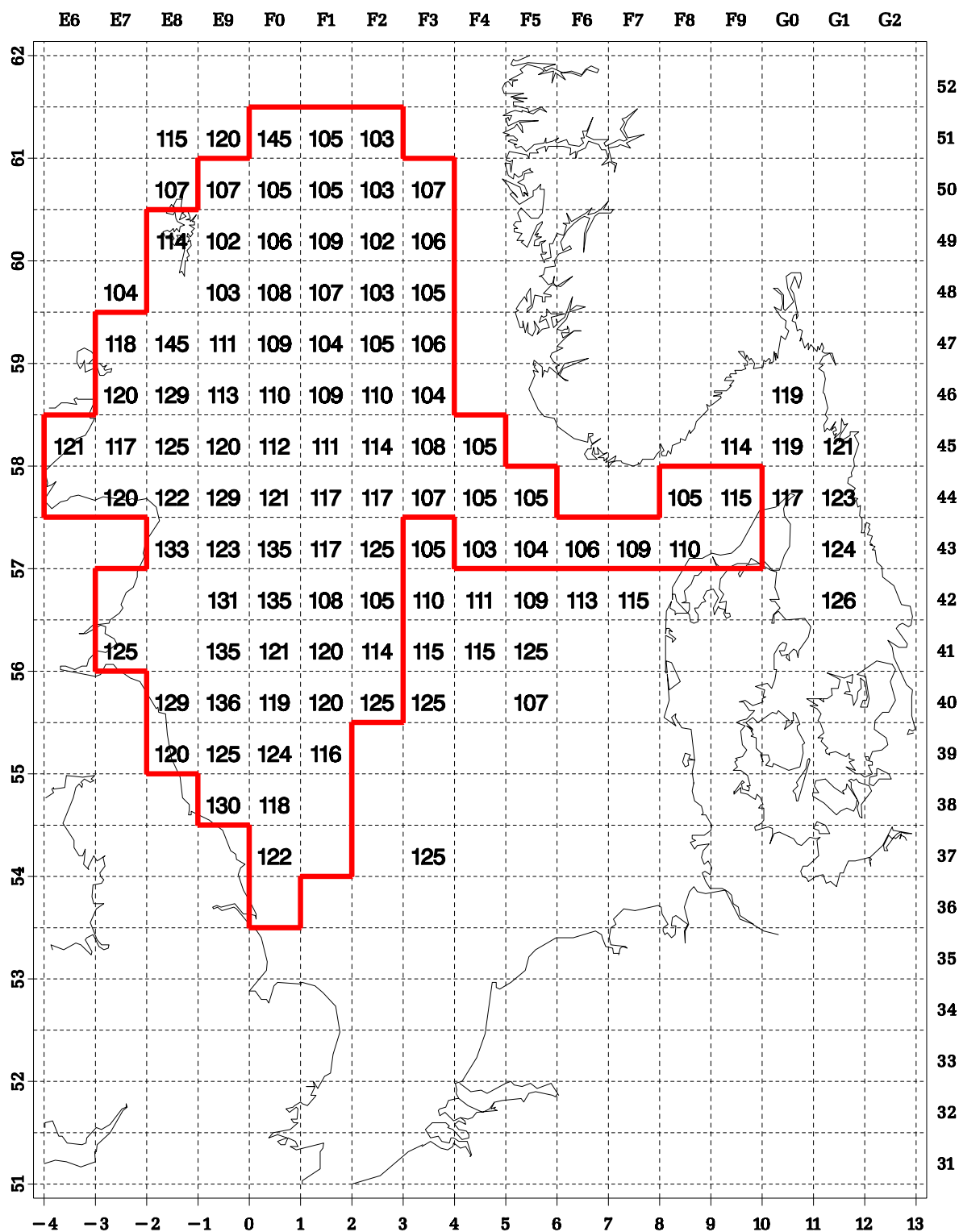


Figure 5.33 Norway pout: mean length (mm), age 1

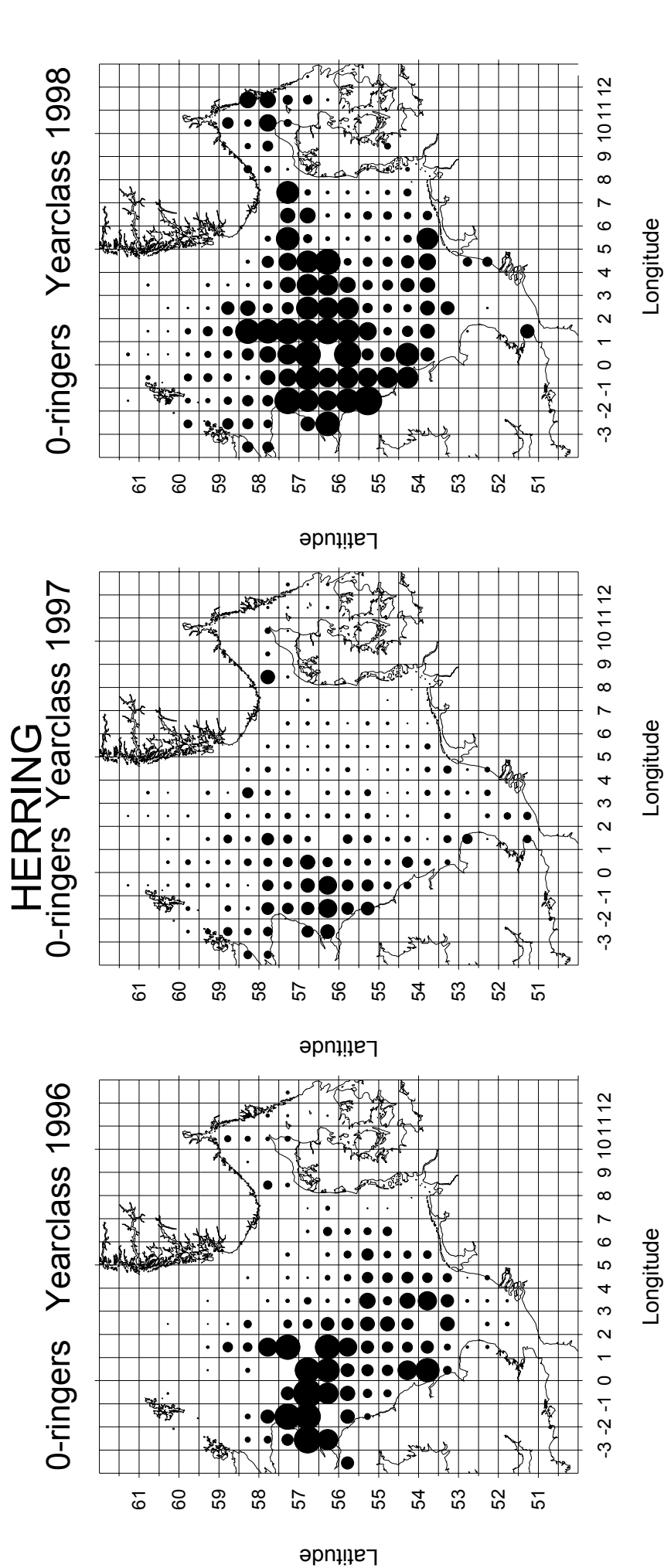


Figure 6.1. Distribution of 0-ringer herring, year classes 1996-1998. Abundance estimates of 0-ringers within each statistical rectangle are based on MIK catches during IBTS in February. Areas of filled circles illustrate densities in no m⁻², the area of a circle extending to the border of a rectangle represents 1 m⁻².

Relationship between herring recruitment indices

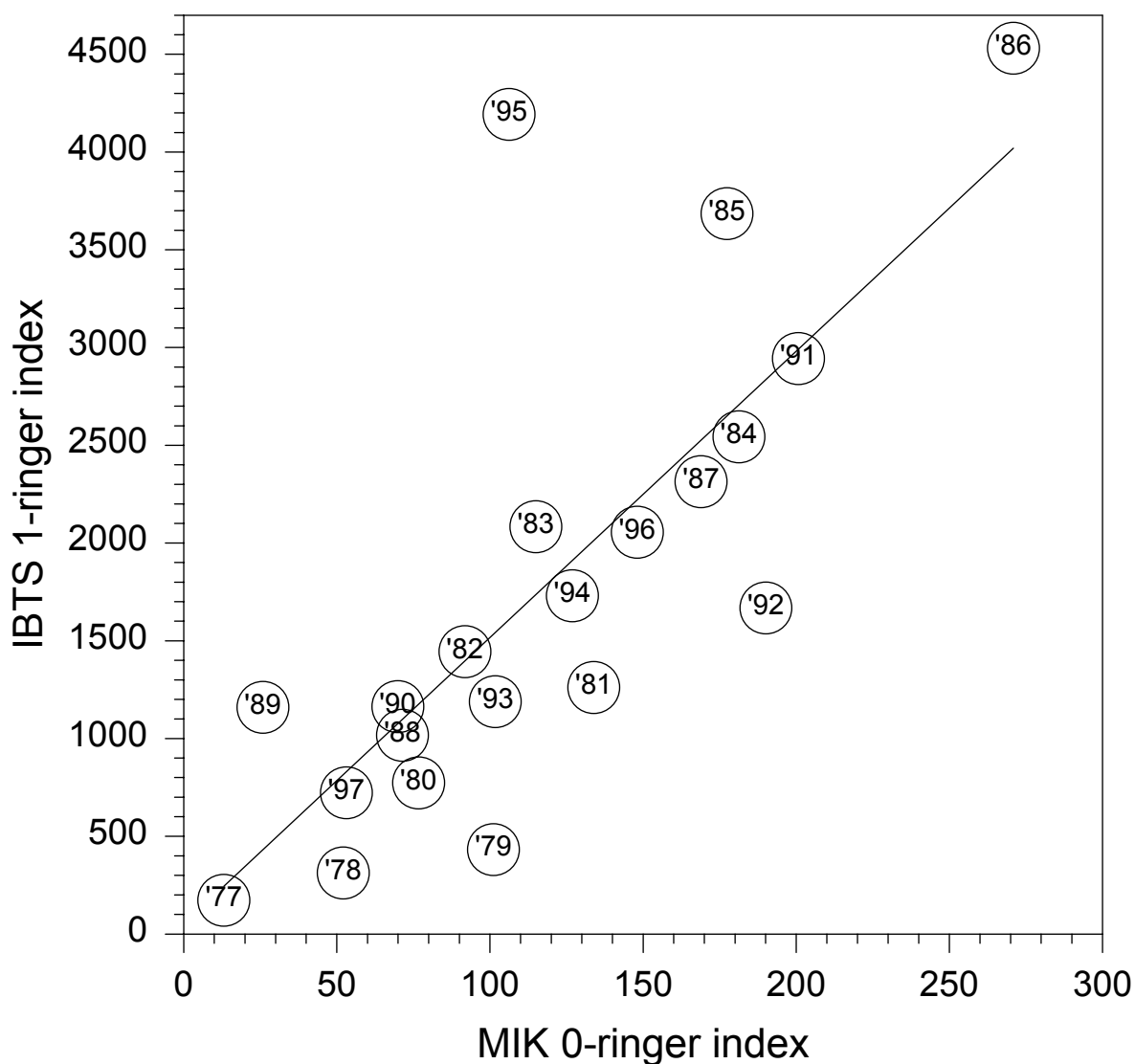


Figure 6.2. Herring recruitment indices. Relationship between the 0-ringer index and the 1-ringer index for year classes 1977 to 1997. Numbers in symbols indicate year class.

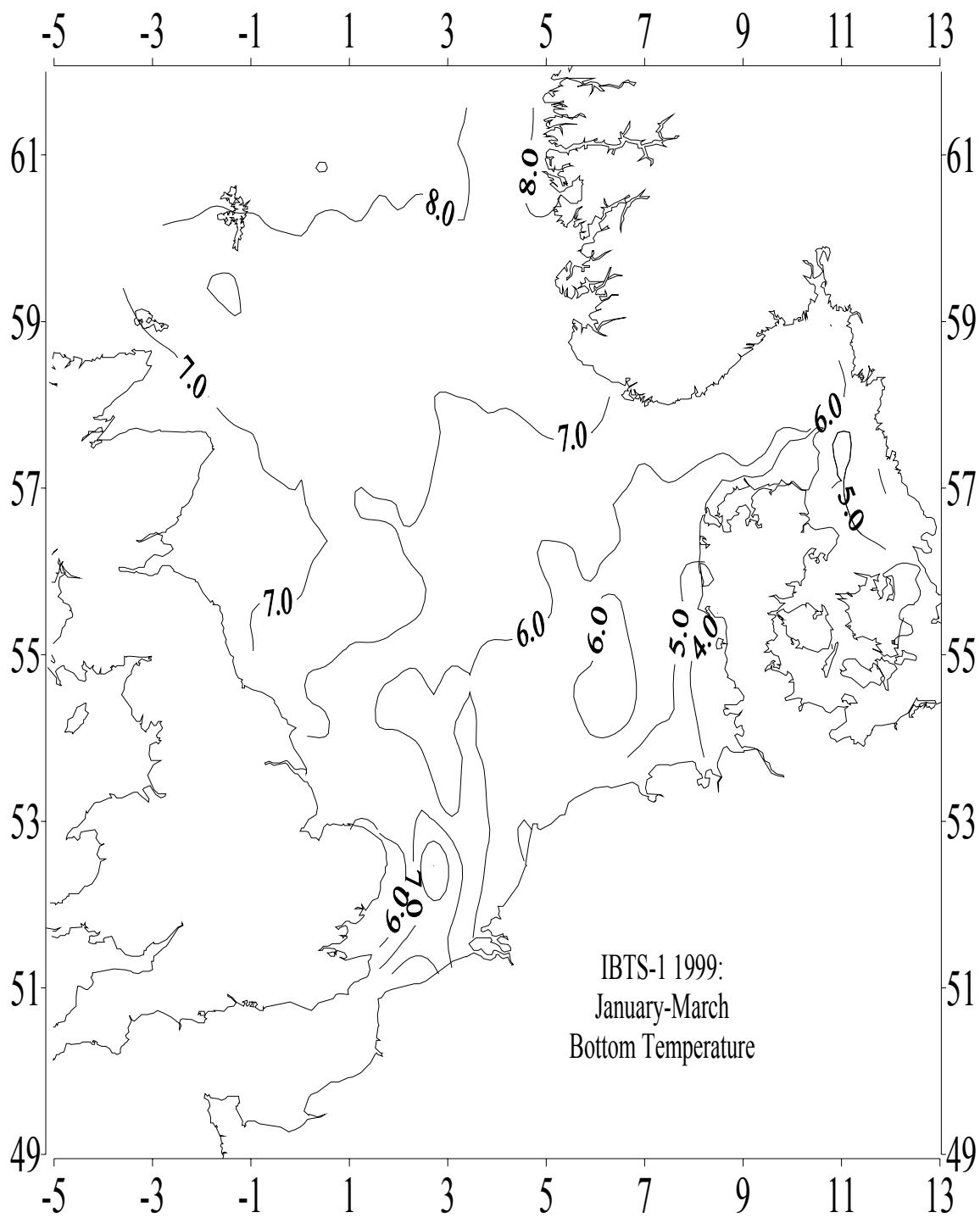


Figure 7.1

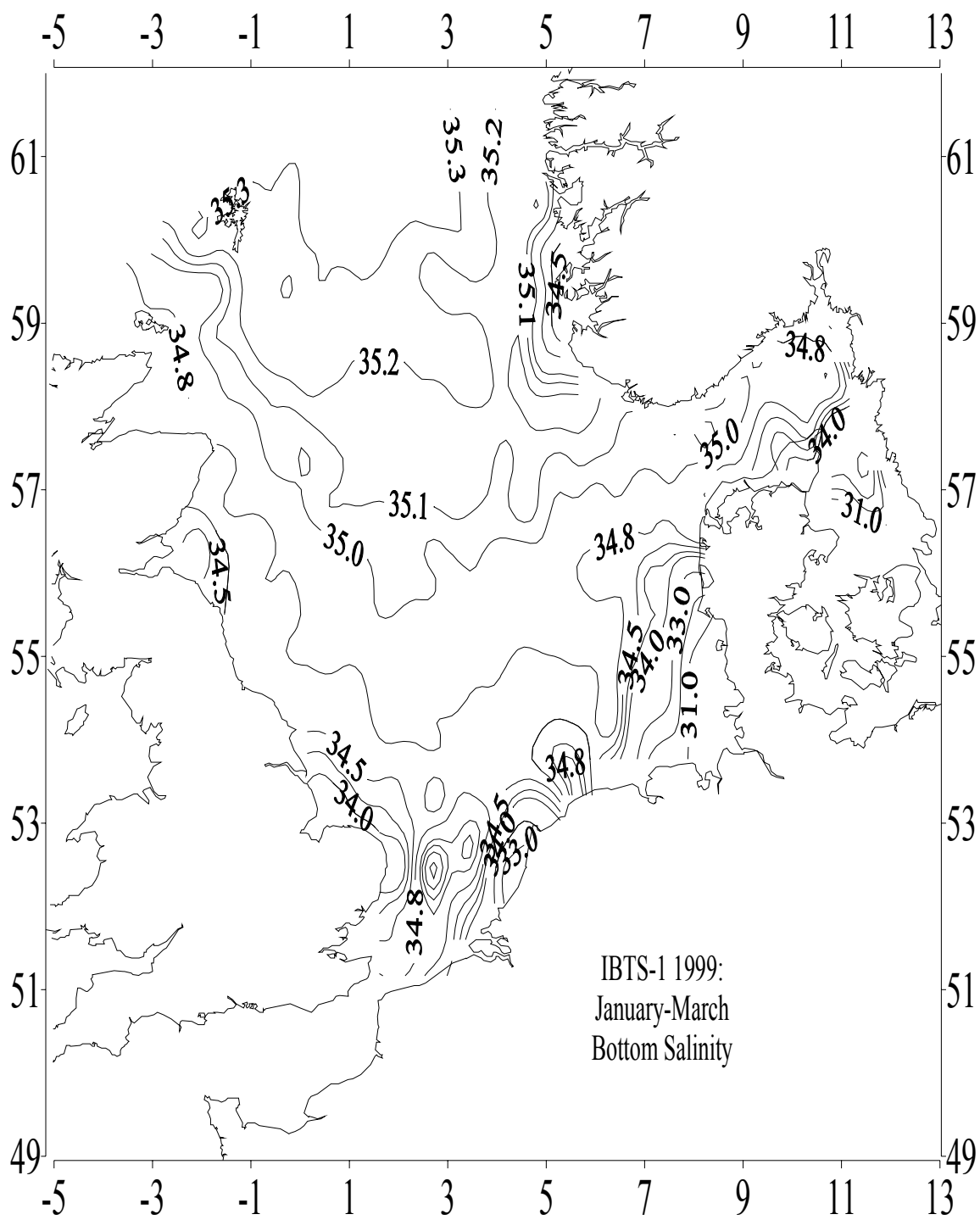


Figure 7.2



Figure 7.3 Five-Year averages of temperature at each of the ten locations in Table 7.1

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1 INTRODUCTION

This report presents the final results for the International Bottom Trawl Survey (IBTS) in the third quarter of 1999. 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. During a meeting of this Working Group in November 1995 (ICES 1996/H:1a) early analyses of the data indicated the potential usefulness of quarterly surveys and it was decided to encourage their continuation. These quarterly surveys have been carried out in all four quarters in the period 1991-1997, but since 1998 only the 1st and the 3rd quarters have been covered.

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*), as well as the catches of herring larvae. 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 Manual (ICES 1999/D:2 Addendum). Details on the participation in the 1999 3q survey are given below as numbers of valid haul. The whole survey area has been covered as planned.

Country and Vessel		From	To	GOV	MIK
Denmark	Dana (new)	07/09	22/09	53	53
England	Cirolana	19/08	17/09	75	75
Germany	Walther Herwig (new)	17/07	11/08	32	32
Norway	Michael Sars	29/08	22/09	76	76
Scotland	Scotia (new)	04/08	23/08	87	87
Sweden	Argos	30/08	15/09	47	47

3 DATA AVAILABLE

Table 3.1 shows number of valid hauls available in the ICES IBTS database.

At the time of the analysis of the 1999 data presented in this report all final data were available in the database.

4 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 (ICES 1993/Assess:15).

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 IBTS Working Group decided at the meeting in November 1995 (ICES 1996/H:1a) 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/Assess:15) 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.

5 RESULTS OF GOV-TRAWL FOR 1999

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 Figure 5.1.

The number of otoliths sampled per target species and roundfish area is given in Table 5.1.

Per species a set of figures gives the distributions of the 1-, 2-, and 3 group and the mean length of 1-group fish per rectangle. The specific standard area used to calculate the index of year class strength is indicated in the figures.

The results are shown in Table 5.2 and in Figures 5.2-5.33.

6 RESULTS OF MIK TRAWL FOR 3RD QUARTER 1999 FOR HERRING AND SPRAT LARVAE

No fishing with MIK was conducted.

7 HYDROGRAPHIC DATA

7.1 Hydrographic Data

Six research vessels contributed to the 442 hydrographic stations worked during the IBTS-3 survey for 1999. The ships were Walther Herwig (121 stations), Dana (53), Michael Sars (76), Cirolana (71 stations – surface salinity only), Scotia (74) and Argos (47). The distribution of bottom temperature and salinity produced from these data is shown below in Figure 7.1

More information, including station locations, is available from [the IBTS hydrographic web page](#).

8 REFERENCES

- ICES 1993/Assess:15. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES Doc. CM 1993/Assess:15.
- ICES 1995/Assess:13. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES Doc. CM 1995/Assess:13.
- ICES 1996/H:1a. Report of the International Bottom Trawl Survey Working Group. ICES Doc. CM 1996/H:1.
- ICES 1999/D:2 Addendum. 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.

Table 3.1

Number of valid hauls in the IBTS database. 3rd quarter 1999.

Year	Total	Country							
		Denmark	England	France	Germany	Netherlands	Norway	Scotland	Sweden
1991	295	-	87	-	-	69	-	90	49
1992	363	-	74	61	62	31	-	87	48
1993	342	-	71	69	-	65	-	87	50
1994	307	-	73	55	-	42	-	87	50
1995	250	-	78	-	-	33	-	87	52
1996	320	-	78	57	33	17	-	85	50
1997	253	-	74	-	31	18	-	87	43
1998	274	51	74	-	28	-	-	77	44
1999	367	53	74	-	32	-	74	87	47
Total	2771	104	683	242	186	275	74	774	433

Table 5.1Number of otoliths sampled per species and roundfish area, 3rd quarter 1999.

Species	Roundfish area									Total
	1	2	3	4	5	6	7	8	9	
Herring	1018	848	574	671	113	621	610	403	568	5426
Cod	381	356	26	194	10	134	243	320	285	1949
Haddock	1619	949	927	438	3	25	115	219	83	4378
Whiting	1026	673	775	471	225	684	358	26	-	4238
Saithe	528	1	-	-	-	-	57	-	-	586
Mackerel	307	112	158	121	83	526	120	8	-	1435
Sprat	-	10	211	193	177	583	150	50	214	1588
Norway pout	552	96	165	17	-	-	16	-	-	846

Table 5.2Herring indices. Mean number per hour per haul, 3rd quarter 1999.

Year	Mean per statistical rectangle					
	Age group					
	0	1	2	3	4	5+
1991	640.18	2572.50	215.80	97.38	66.56	110.29
1992	2901.63	1082.06	452.86	166.20	80.58	159.87
1993	3799.23	1177.22	324.81	175.23	92.03	195.76
1994	1552.28	1679.17	889.04	196.98	181.76	131.72
1995	714.11	522.38	353.06	159.97	56.30	60.35
1996	2704.54	1314.76	190.14	111.73	48.09	42.04
1997	1149.63	1331.95	77.72	23.08	17.31	13.40
1998	1004.34	879.62	467.29	85.85	25.19	21.42
1999	5373.56	595.10	216.29	135.11	68.71	34.66

Table 5.2 cont. Sprat indices. Mean number per hour per haul, 3rd quarter 1999.

Year	Mean per statistical rectangle					
	Age group					
	0	1	2	3	4	5+
1991	16.78	435.87	133.90	54.93	0.77	0.00
1992	56.49	3975.23	3389.45	205.33	33.55	2.53
1993	6.85	2575.10	2728.38	559.33	23.52	0.00
1994	5.19	4298.10	500.79	131.14	12.27	0.00
1995	0.32	1381.76	3897.07	2020.47	22.29	0.92
1996	3.28	537.33	1321.67	586.21	79.27	4.49
1997	29.03	8331.55	2356.96	437.56	52.00	0.00
1998	343.84	3676.27	2038.12	260.45	8.37	0.41
1999	3924.51	18229.36	1843.40	108.65	0.05	0.00

Table 5.2 cont. Cod indices. Mean number per hour per haul, 3rd quarter 1999.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	29.43	8.20	2.47	1.16	0.18	0.06	0.08
1992	19.72	43.78	3.63	0.73	0.46	0.16	0.14
1993	16.96	10.00	8.00	0.86	0.19	0.15	0.05
1994	15.72	43.15	6.23	2.38	0.25	0.08	0.07
1995	15.08	18.06	17.37	1.50	0.77	0.07	0.07
1996	68.92	10.28	5.32	1.82	0.40	0.20	0.03
1997	0.13	60.52	5.47	1.67	0.63	0.13	0.12
1998	91.71	2.40	20.05	1.29	0.37	0.25	0.12
1999	9.54	11.95	0.96	3.89	0.25	0.09	0.05

Table 5.2 cont. Haddock indices. Mean number per hour per haul, 3rd quarter 1999.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	720.38	232.79	22.94	2.82	0.50	1.54	0.29
1992	2716.86	589.67	187.14	10.36	1.57	0.39	1.45
1993	571.90	604.33	141.55	37.72	2.38	0.38	0.28
1994	1771.95	194.62	264.50	32.43	8.42	0.39	0.07
1995	516.84	1027.23	106.30	96.88	7.99	3.10	0.26
1996	622.78	254.87	443.65	30.33	20.11	2.63	0.68
1997	194.69	353.75	125.82	151.00	6.65	5.26	0.85
1998	272.92	262.16	168.13	53.30	42.26	3.06	1.66
1999	6907.32	175.58	94.51	48.13	13.18	9.85	1.36

Table 5.2 cont. Whiting indices. Mean number per hour per haul, 3rd quarter 1999.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	529.39	700.83	158.87	78.92	14.62	5.20	1.02
1992	1381.49	595.01	297.85	72.91	57.90	10.35	6.26
1993	915.86	634.16	176.88	67.13	14.82	16.19	3.15
1994	609.87	674.52	222.52	76.32	19.83	4.82	3.19
1995	729.25	619.79	291.18	107.20	21.51	6.01	3.46
1996	316.50	545.71	278.22	129.36	34.00	6.89	4.10
1997	2062.67	332.97	180.68	108.99	28.01	10.71	4.25
1998	2609.97	328.92	150.00	52.69	30.97	11.16	4.69
1999	2498.55	1203.50	190.65	53.93	24.45	9.53	4.18

Table 5.2 cont. Saithe indices. Mean number per hour per haul, 3rd quarter 1999.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	0.01	0.16	1.00	3.25	0.70	0.13	0.27
1992	0.01	0.10	0.32	1.33	3.41	0.64	0.34
1993	0.00	0.14	2.59	11.78	4.10	1.68	0.56
1994	0.01	0.00	0.69	1.12	1.62	0.88	0.83
1995	0.00	0.01	0.83	20.04	3.60	2.23	1.17
1996	0.00	0.29	2.15	3.82	6.53	1.12	1.33
1997	0.01	0.14	0.51	3.76	3.35	7.45	1.54
1998	0.00	0.03	0.29	2.03	7.74	2.61	3.78
1999	0.00	0.01	0.65	4.12	3.94	5.77	2.73

Table 5.2 cont. Norway pout indices. Mean number per hour per haul, 3rd quarter 1999.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	7382.90	1104.86	222.23	2.61	0.00	0.00	0.00
1992	2587.77	4365.81	640.21	48.21	2.77	0.00	0.06
1993	3952.70	1860.90	596.47	53.37	3.30	0.00	0.00
1994	3195.82	704.41	101.59	13.51	0.34	0.00	0.00
1995	1762.43	4526.74	316.98	42.24	1.72	0.00	0.00
1996	4553.64	763.03	362.42	12.01	0.78	0.00	0.00
1997	489.95	3520.53	169.10	40.33	1.36	0.01	0.00
1998	2931.40	805.69	743.45	11.40	3.01	0.00	0.00
1999	7844.32	2366.57	200.82	94.39	1.46	0.03	0.27

Table 5.2 cont. Mackerel indices. Mean number per hour per haul, 3rd quarter 1999.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	0.00	25.99	15.85	3.61	3.48	4.01	13.06
1992	0.07	40.15	46.67	30.15	10.48	10.37	14.96
1993	5.34	91.28	67.55	25.70	18.94	10.09	18.12
1994	0.00	82.62	64.56	14.77	4.98	4.31	7.25
1995	0.03	15.12	31.12	26.42	13.28	4.24	15.39
1996	0.00	49.21	50.95	23.65	4.92	3.56	7.77
1997	0.11	63.12	39.13	12.26	6.23	3.45	4.72
1998	3.58	187.43	58.26	16.10	7.75	3.54	3.37
1999	10.56	25.75	23.86	10.96	4.01	2.07	2.78

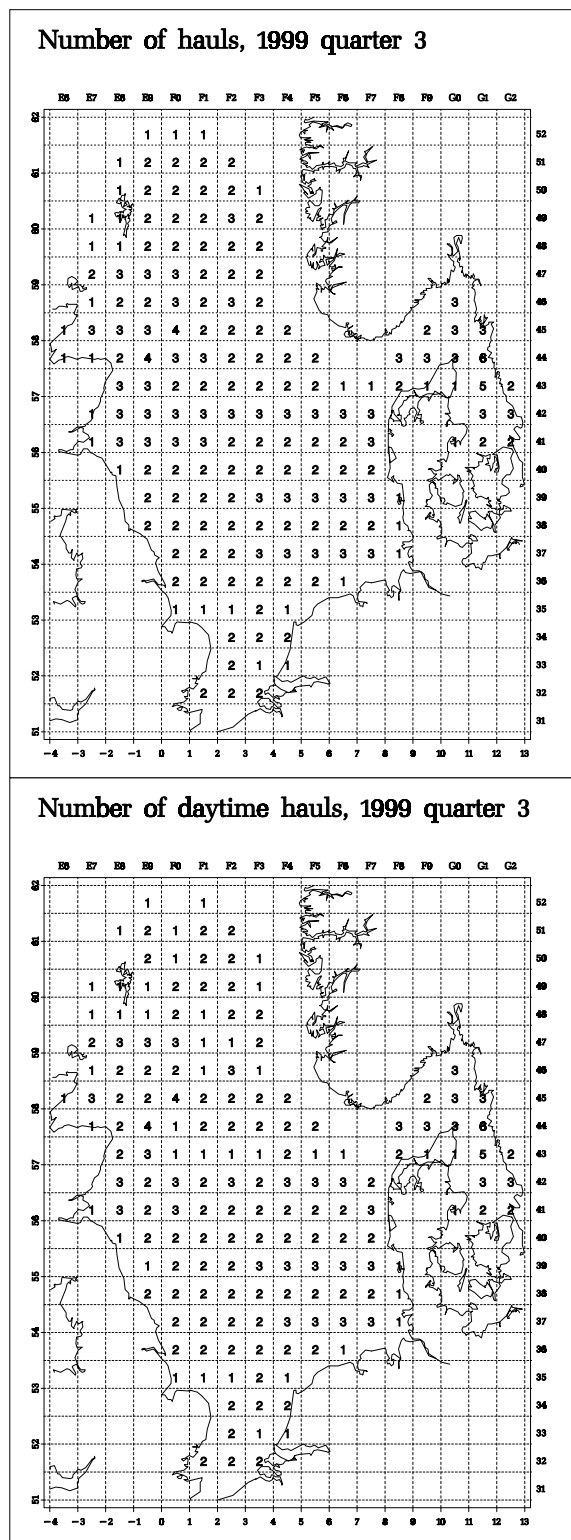


Figure 5.1. Number of valid day- and nighttime hauls.

Herring, number per hour

Age group 1, 1999 quarter 3

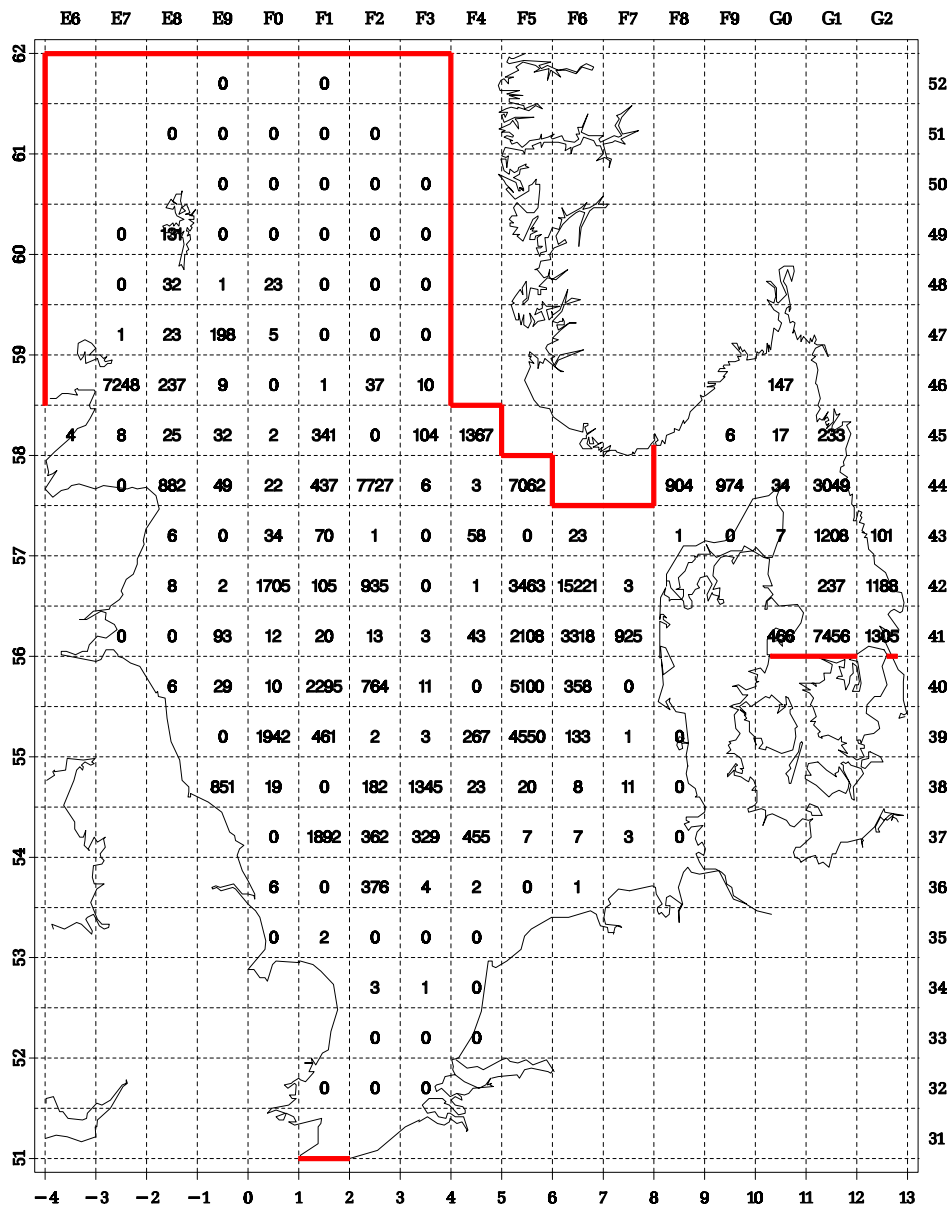


Figure 5.2 Herring: number per hour, 1-ringers.

Herring, number per hour Age group 2, 1999 quarter 3

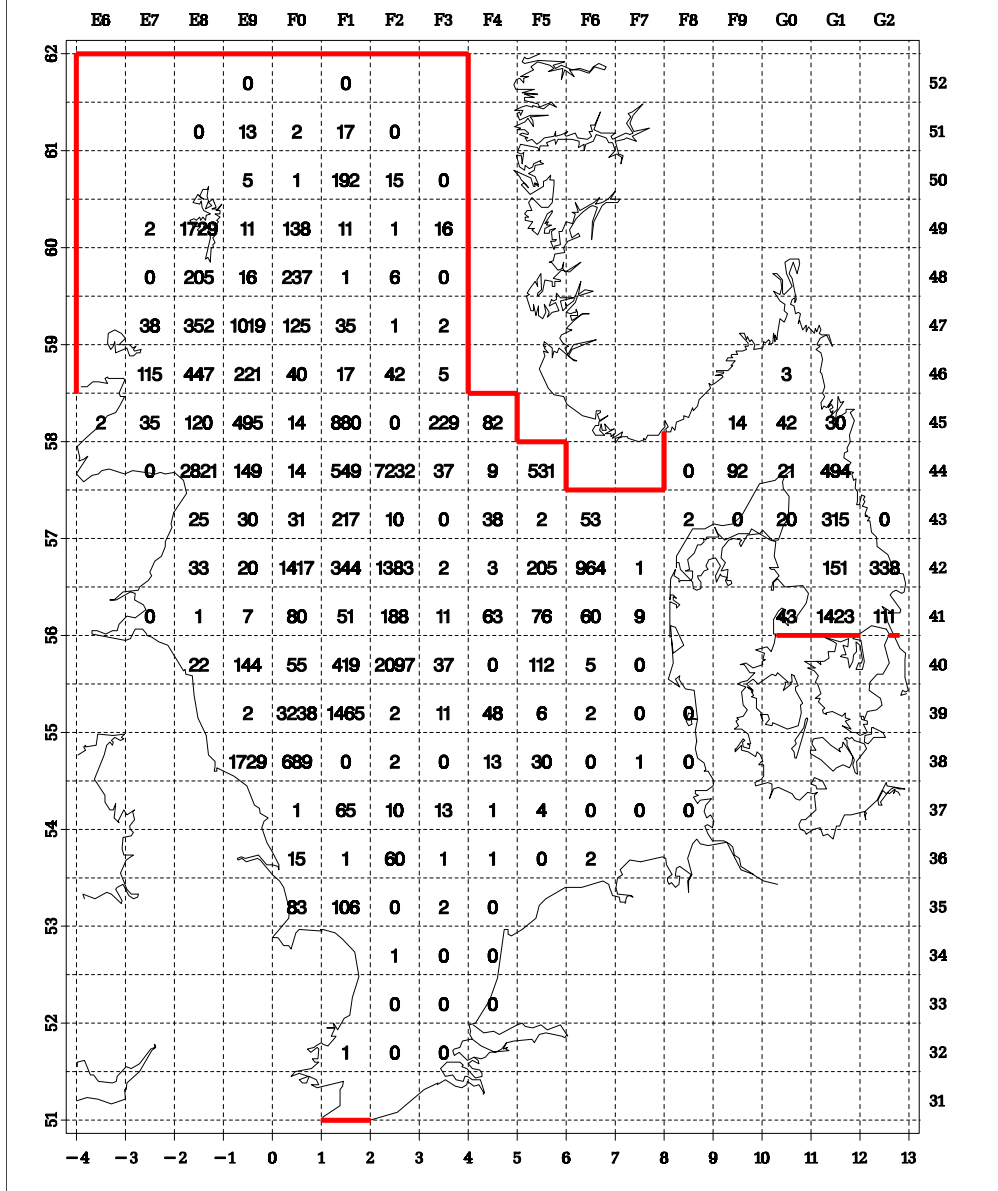


Figure 5.3 Herring: number per hour, 2-ringers.

Herring, number per hour Age group 3, 1999 quarter 3

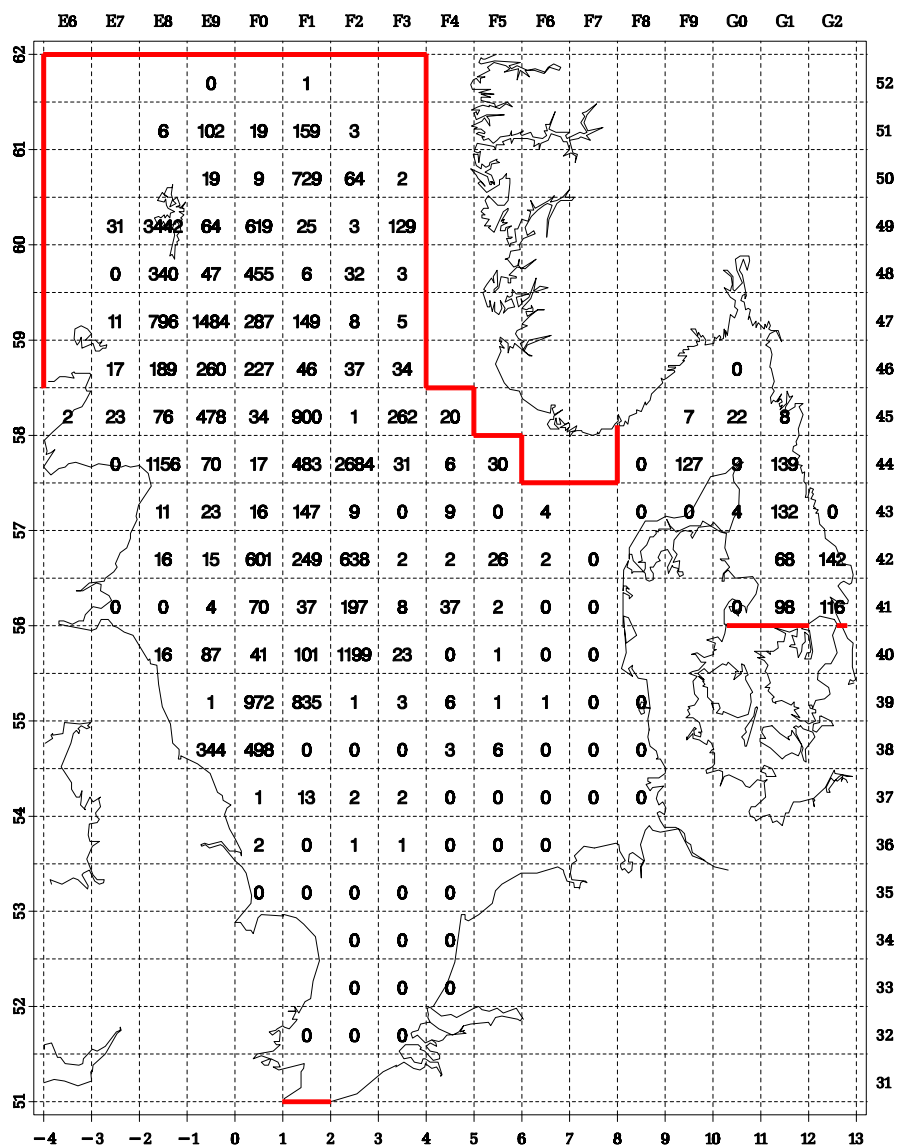


Figure 5.4 Herring: number per hour, 3 ringers.

Herring, mean length Age group 1, 1999 quarter 3

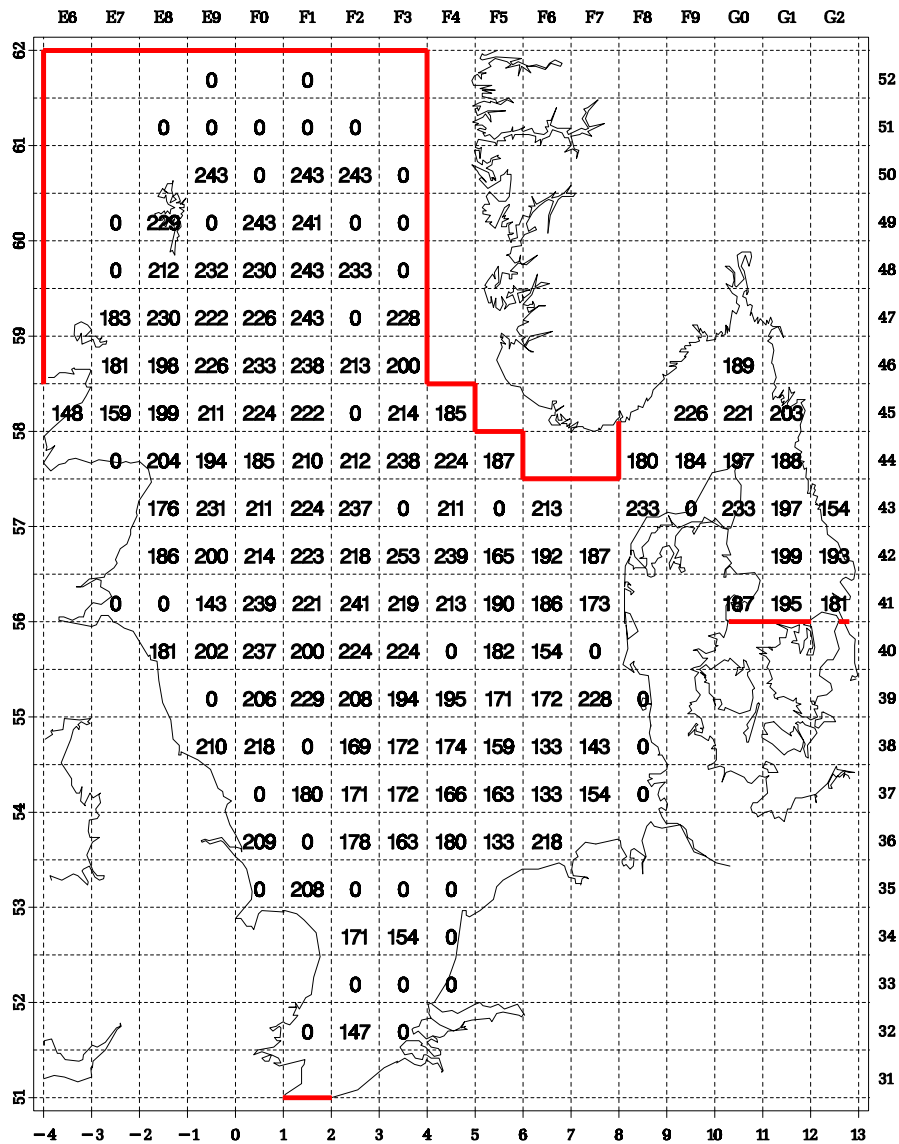


Figure 5.5 Herring: mean length (mm) 1- ringers.

Sprat, number per hour Age group 1, 1999 quarter 3

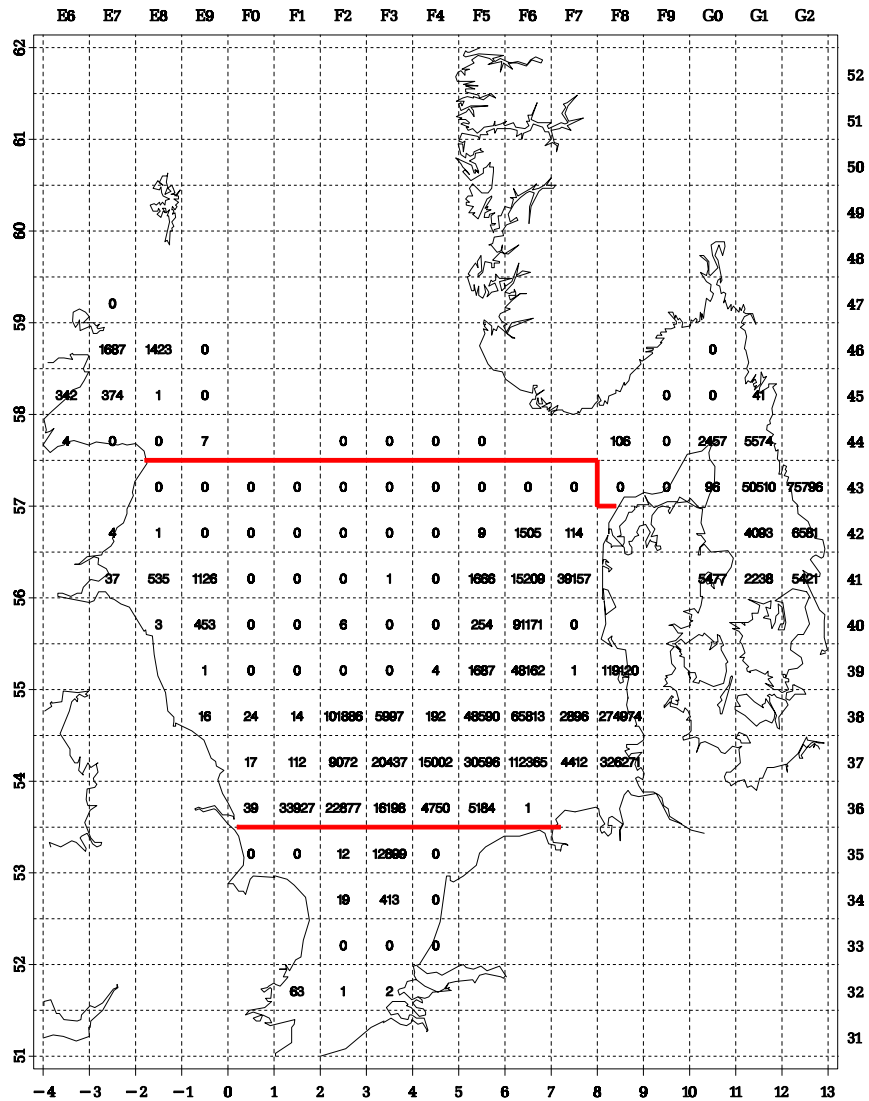


Figure 5.6 Sprat: number per hour, age 1.

Sprat, number per hour Age group 2, 1999 quarter 3

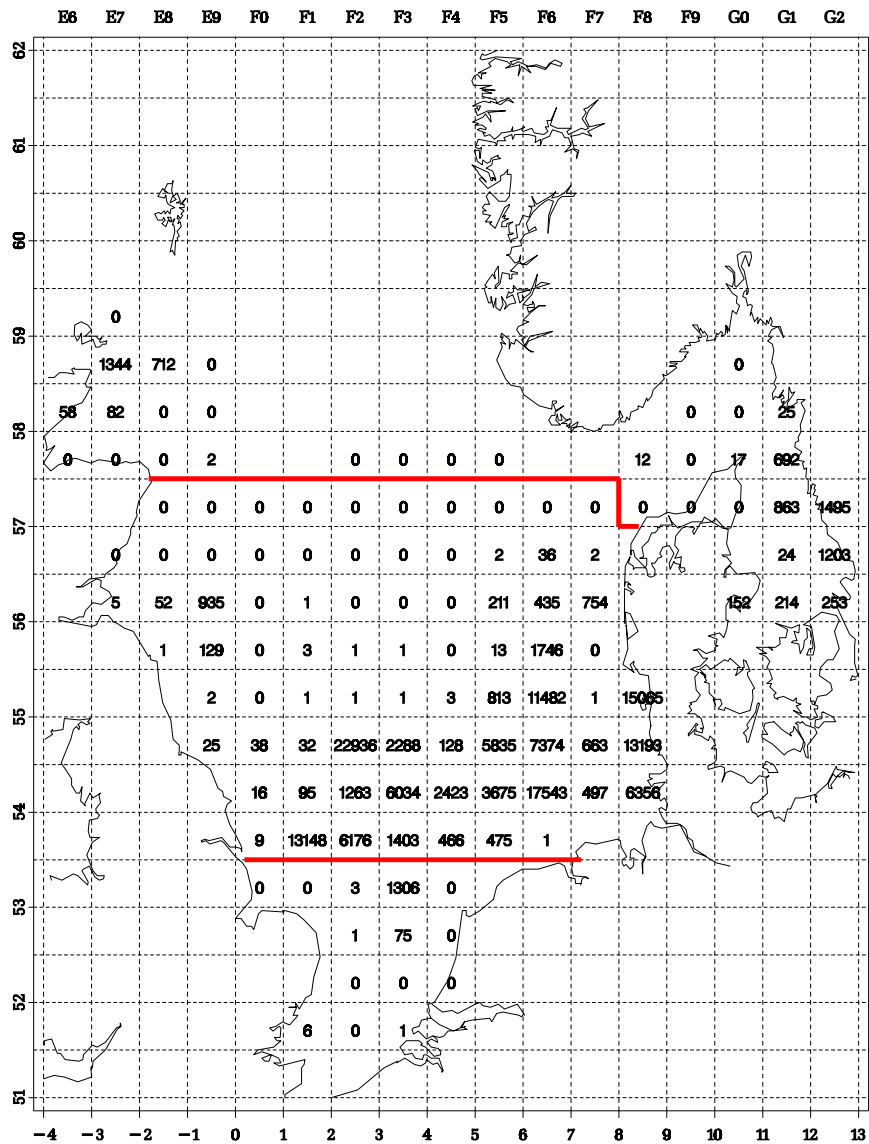


Figure 5.7 Sprat: number per hour, age 2.

Sprat, number per hour Age group 3, 1999 quarter 3

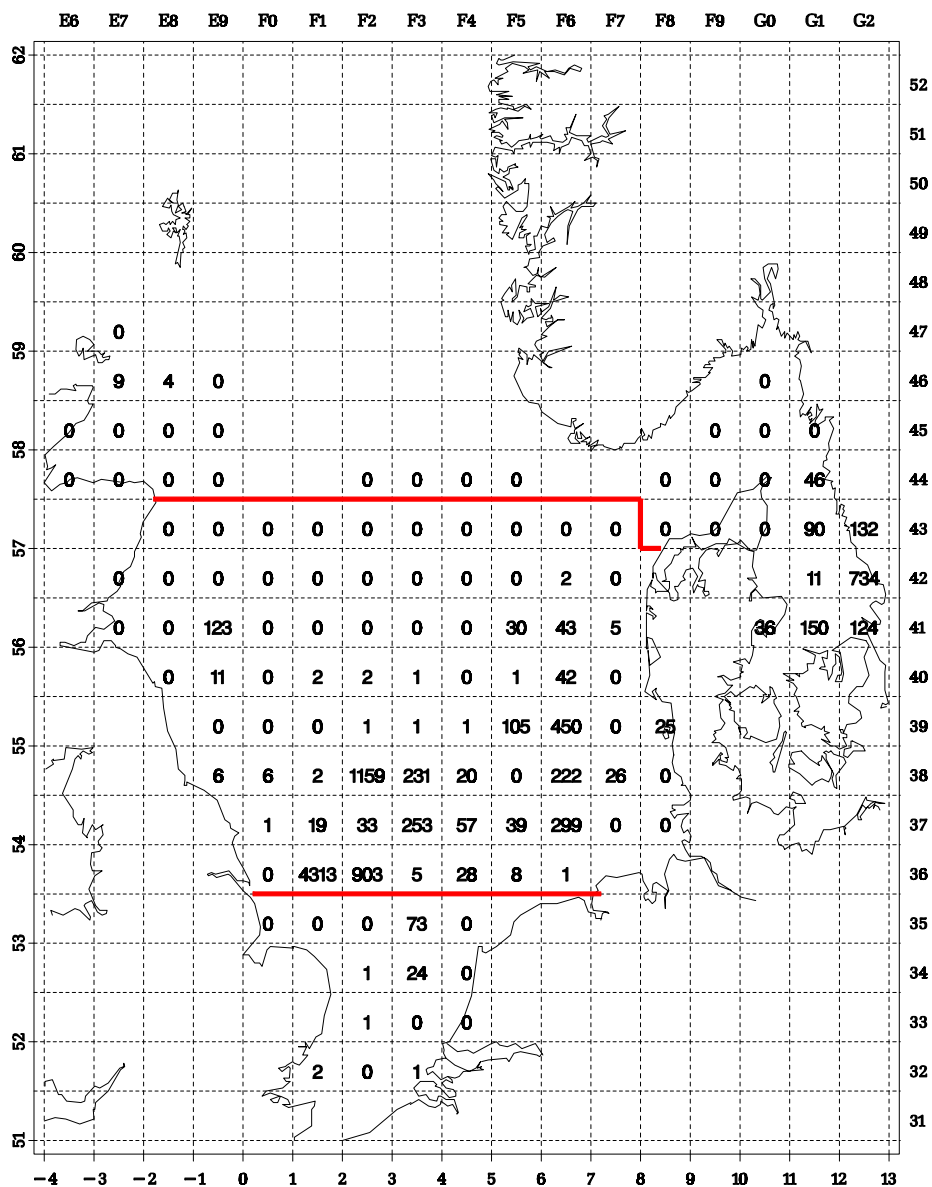


Figure 5.8 Sprat: number per hour, age 3.

Sprat, mean length Age group 1, 1999 quarter 3

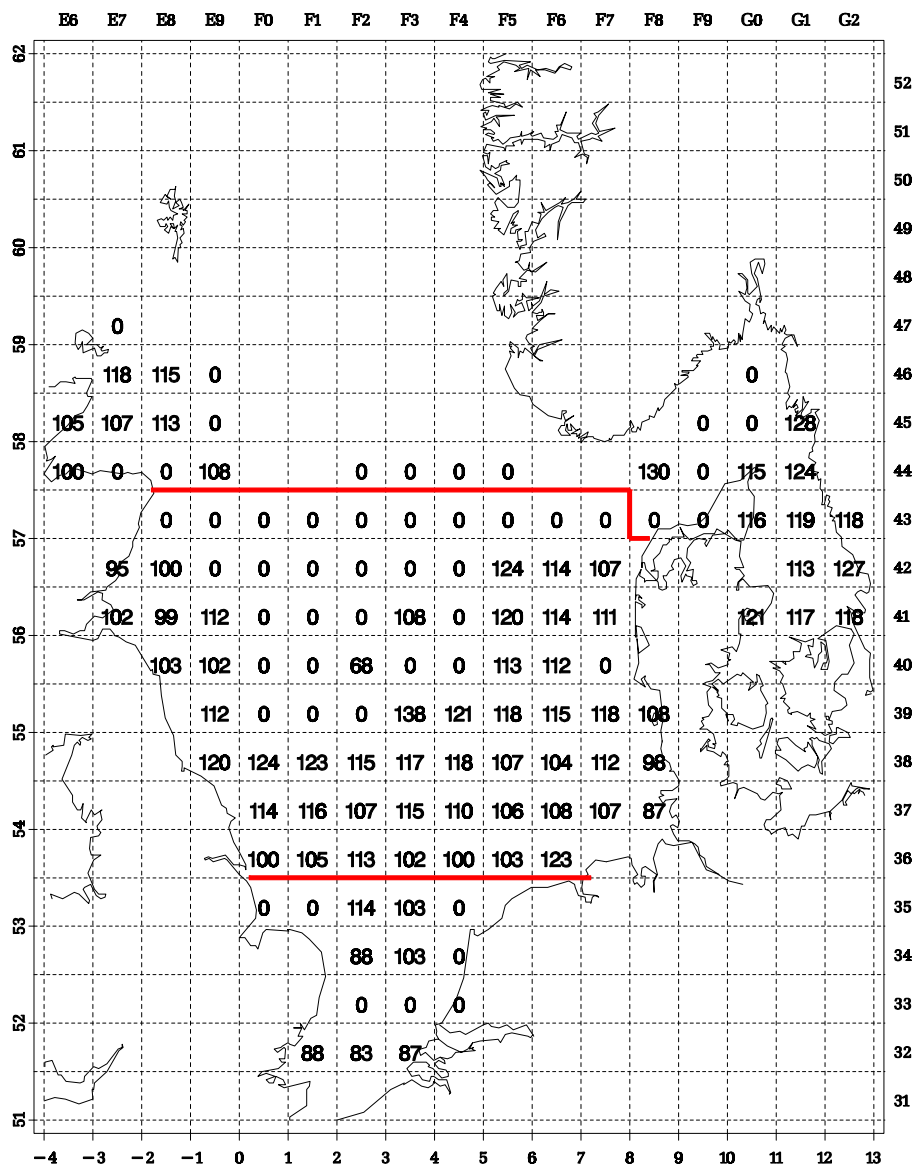


Figure 5.9. Sprat: mean length (mm), age 1.

Mackerel, number per hour Age group 1, 1999 quarter 3

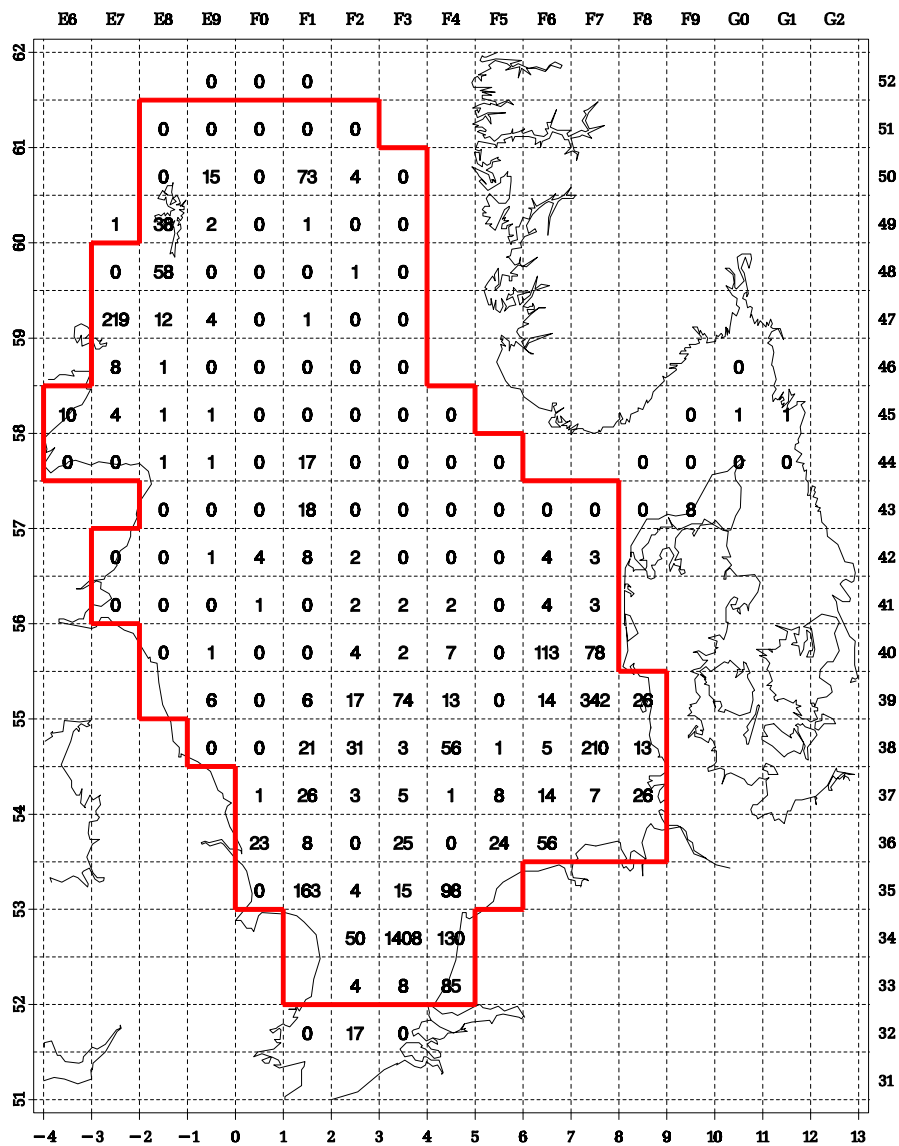


Figure 5.10 Mackerel: number per hour, age 1.

Mackerel, number per hour

Age group 2, 1999 quarter 3

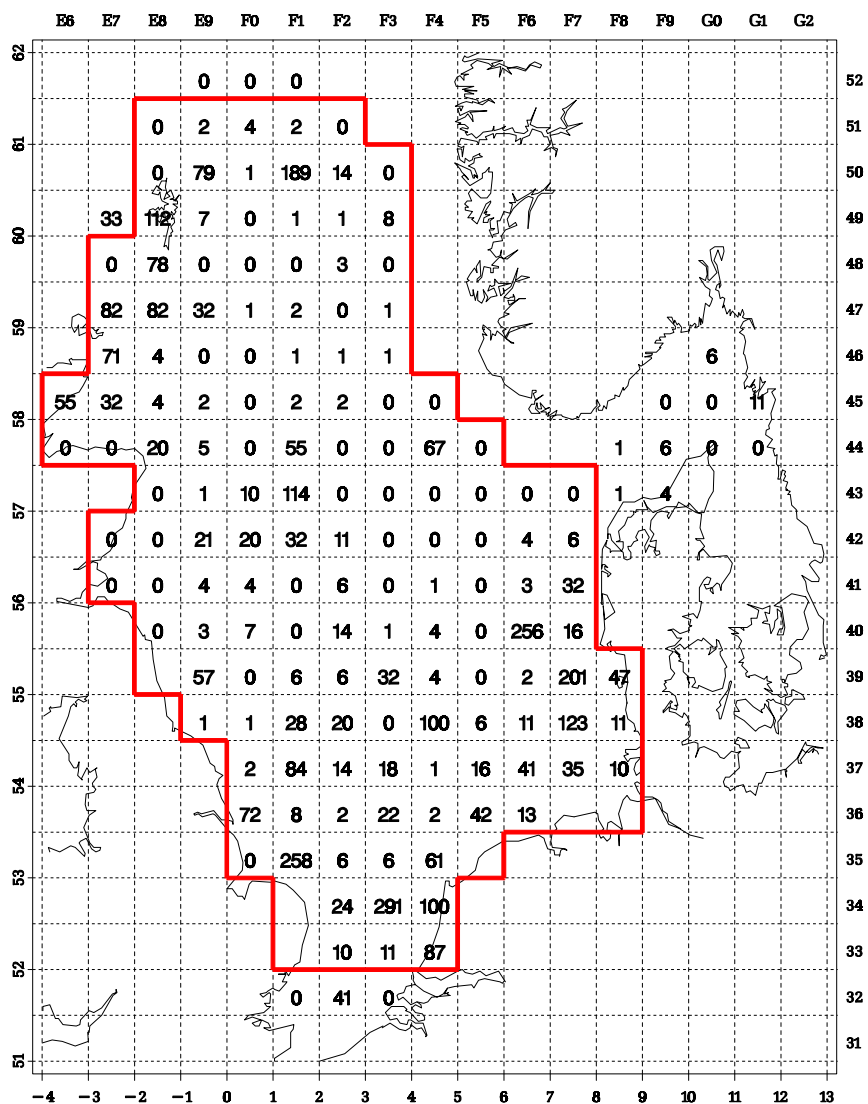


Figure 5.11 Mackerel: number per hour, age 2.

Mackerel, number per hour Age group 3, 1999 quarter 3

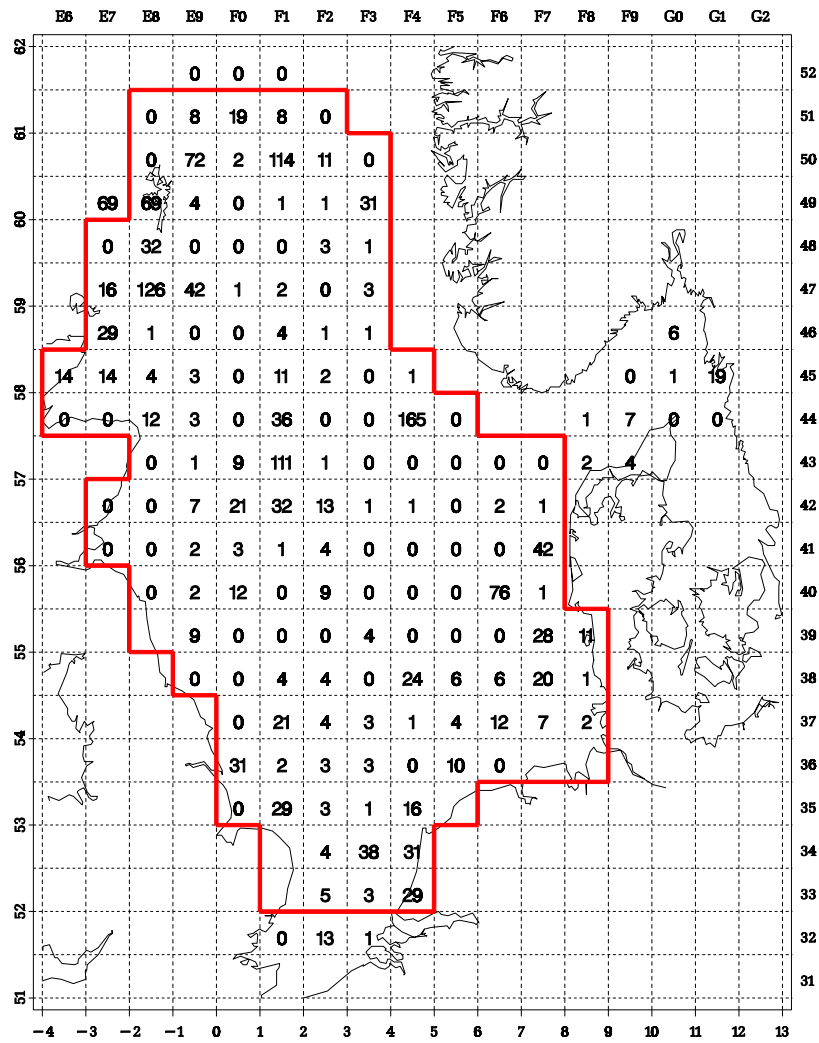


Figure 5.12 Mackerel: number per hour, age 3.

Mackerel, mean length Age group 1, 1999 quarter 3

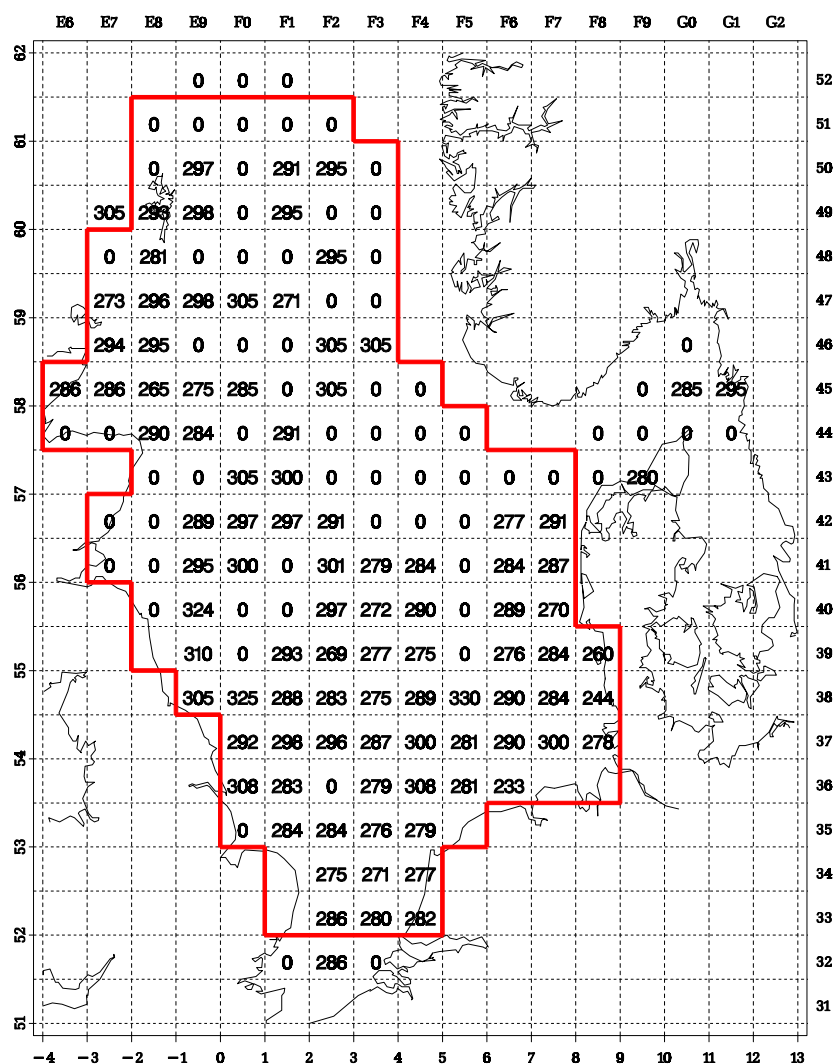


Figure 5.13 Mackerel: mean length (mm), age 1.

Cod, number per hour Age group 1, 1999 quarter 3

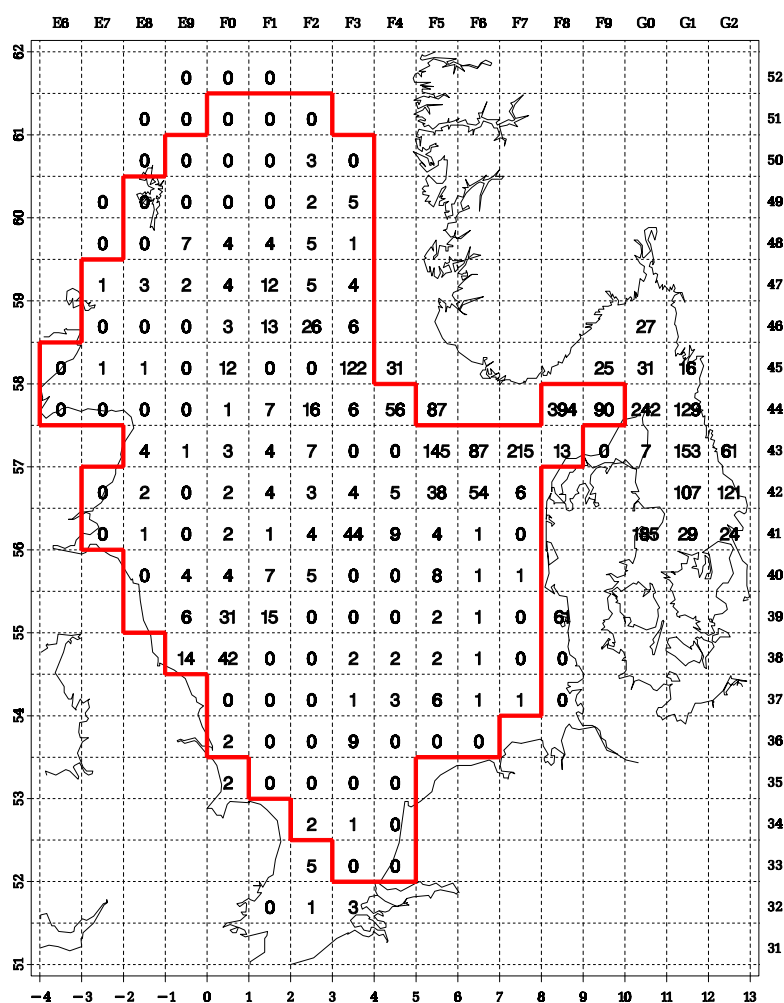


Figure 5.14 Cod: number per hour, age 1.

Figure 1 shows a map of the North Sea region with a grid of cells. The grid is defined by latitude (51 to 62) and longitude (E6 to G2). A red line outlines a specific area of interest, likely the study area for the model. The map includes coastlines and a grid of cells with numerical values. The values are mostly 0, with some non-zero values (e.g., 1, 2, 3, 4, 5, 7, 10, 13, 16, 21) scattered across the grid, particularly in the central and eastern parts. The red line starts at approximately (E6, 58) and follows a path that encloses a large area of the North Sea, ending near (G2, 52).

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Cod, number per hour Age group 3, 1999 quarter 3

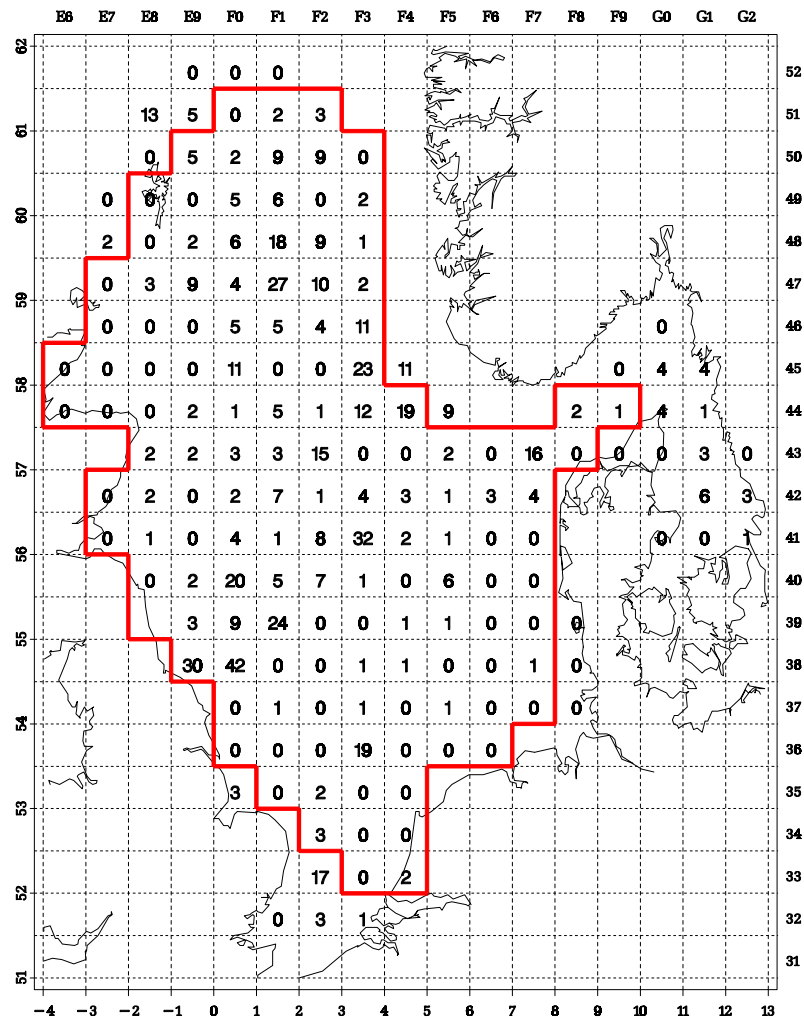


Figure 5.16 Cod: number per hour, age 3.

Cod, mean length Age group 1, 1999 quarter 3

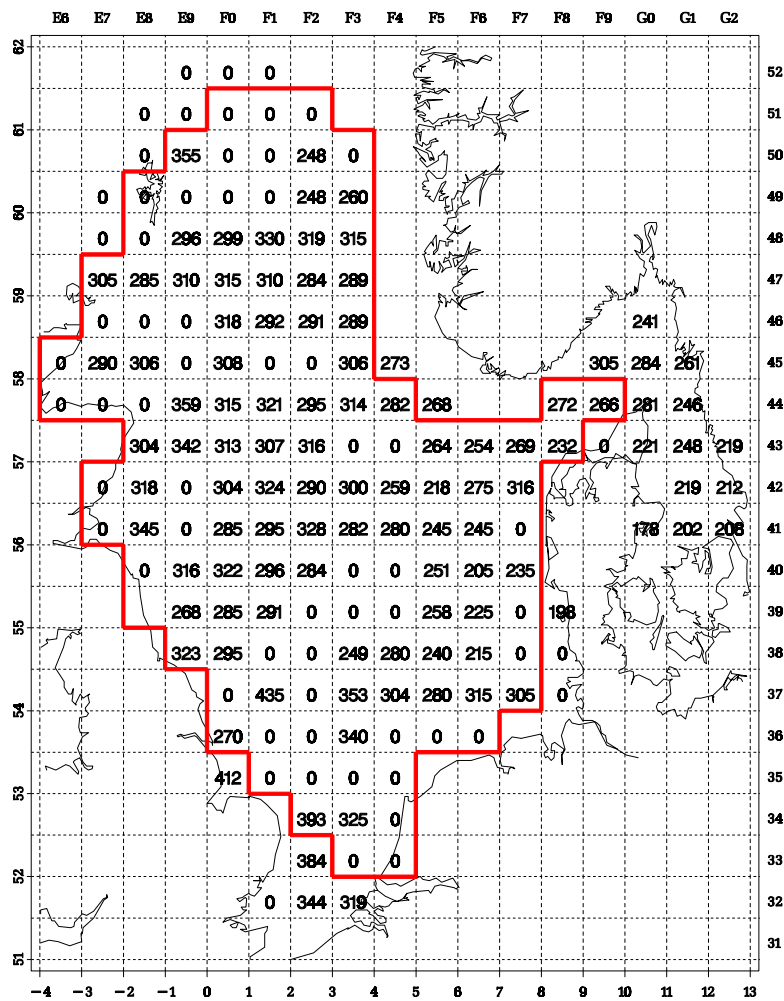


Figure 5.17 Cod, mean length (mm) age 1.

Haddock, number per hour Age group 2, 1999 quarter 3

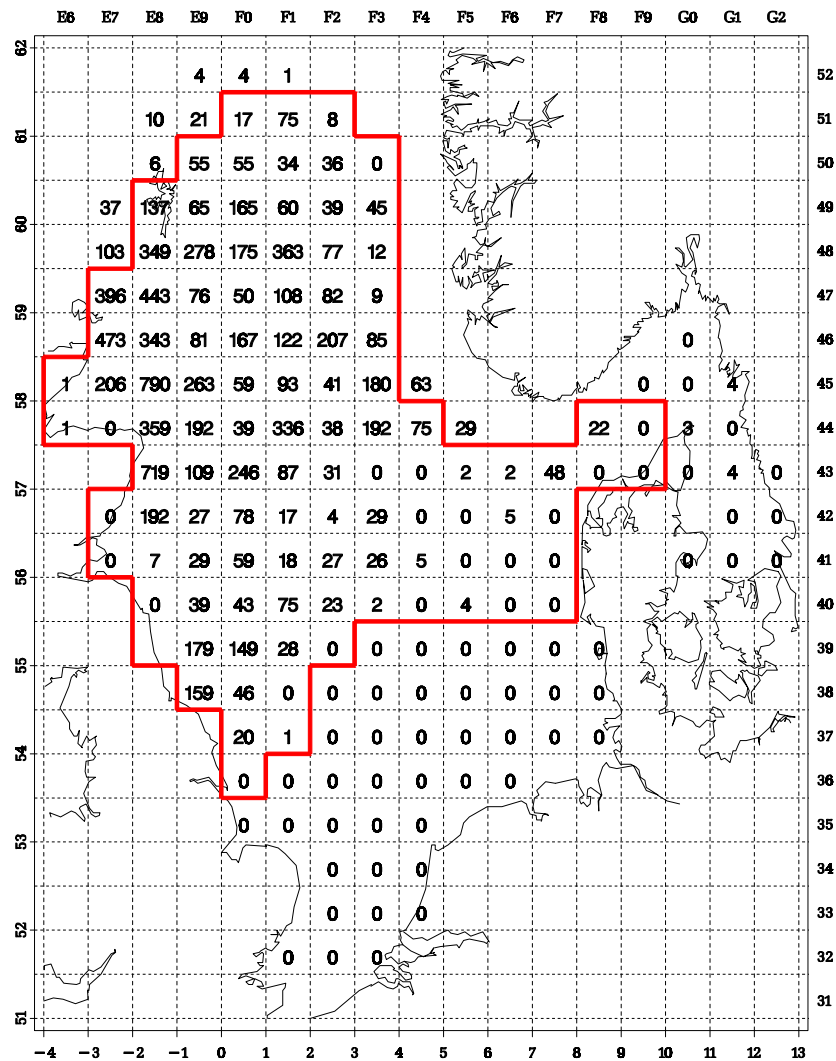


Figure 5.18 Haddock: number per hour, age 1.
WRONG MAP – SHOULD BE HADDOCK AGE GROUP 1

E6	E7	E8	E9	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	G0	G1	G2
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

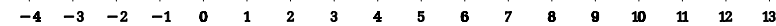


Figure 5.19 Haddock: number per hour, age 2.

Haddock, number per hour

Age group 3, 1999 quarter 3

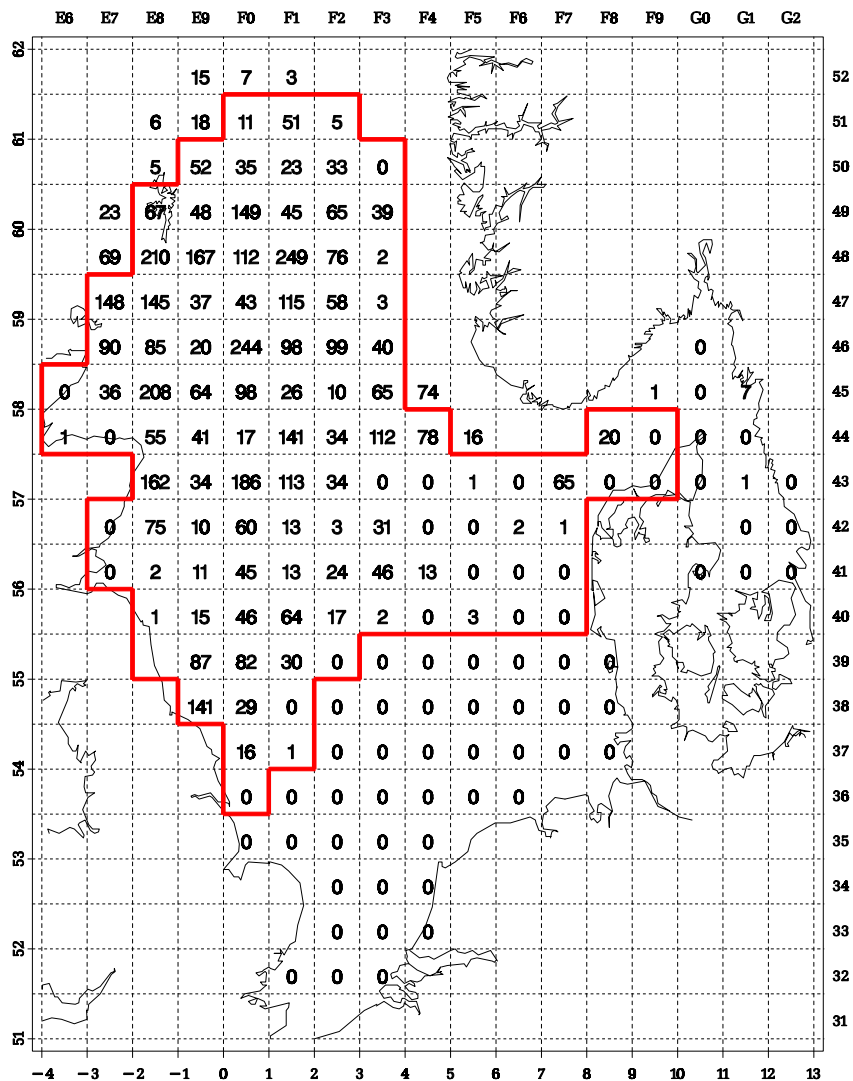


Figure 5.20 Haddock: number per hour, age 3.

The figure is a map of the North Sea region, showing a grid of stations. The grid is labeled with letters E6 to G2 along the top and numbers 51 to 62 along the right. A red line outlines a specific area of interest, likely the study area for the model. The map includes coastlines and a dashed grid.

O:\IBTS\Reports\Final-Report\19993kvt.Doc 27/08/03 13:42

Whiting, number per hour Age group 1, 1999 quarter 3

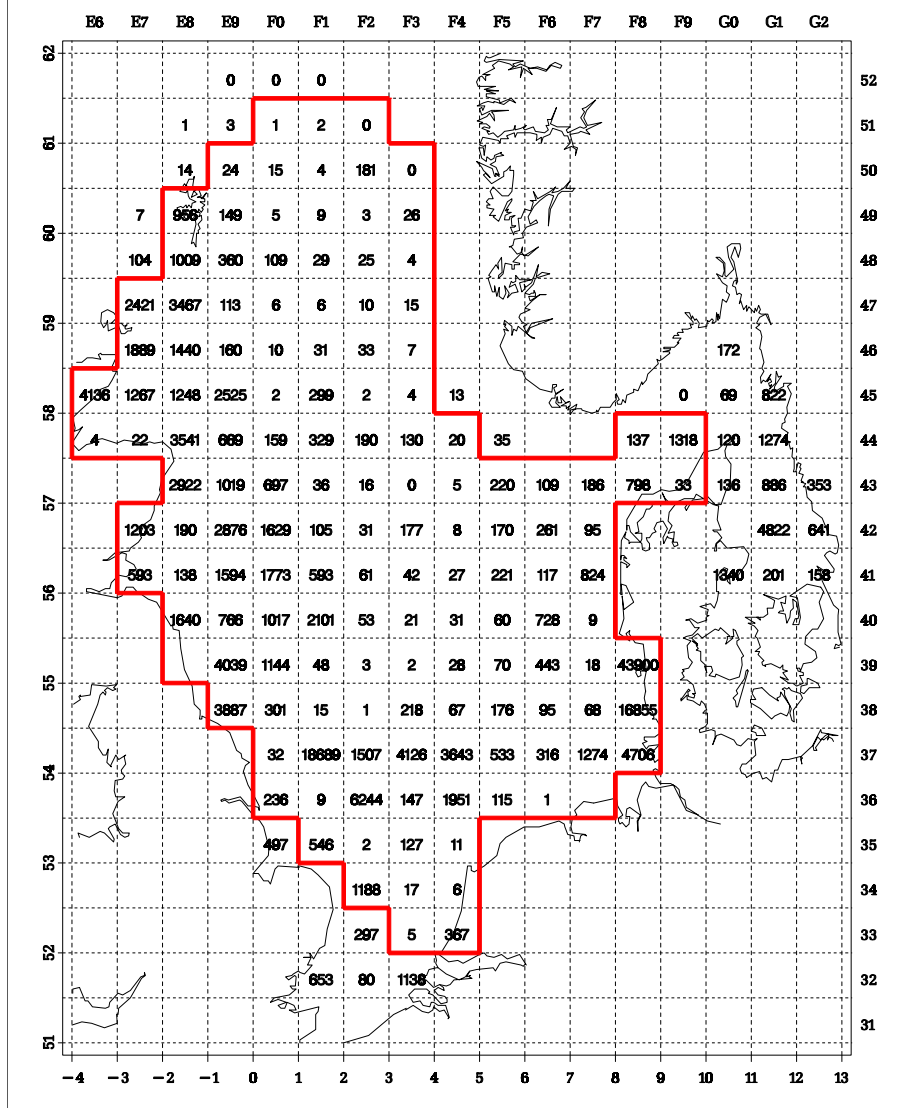


Figure 5.22 Whiting: number per hour, age 1.

Whiting, number per hour

Age group 2, 1999 quarter 3

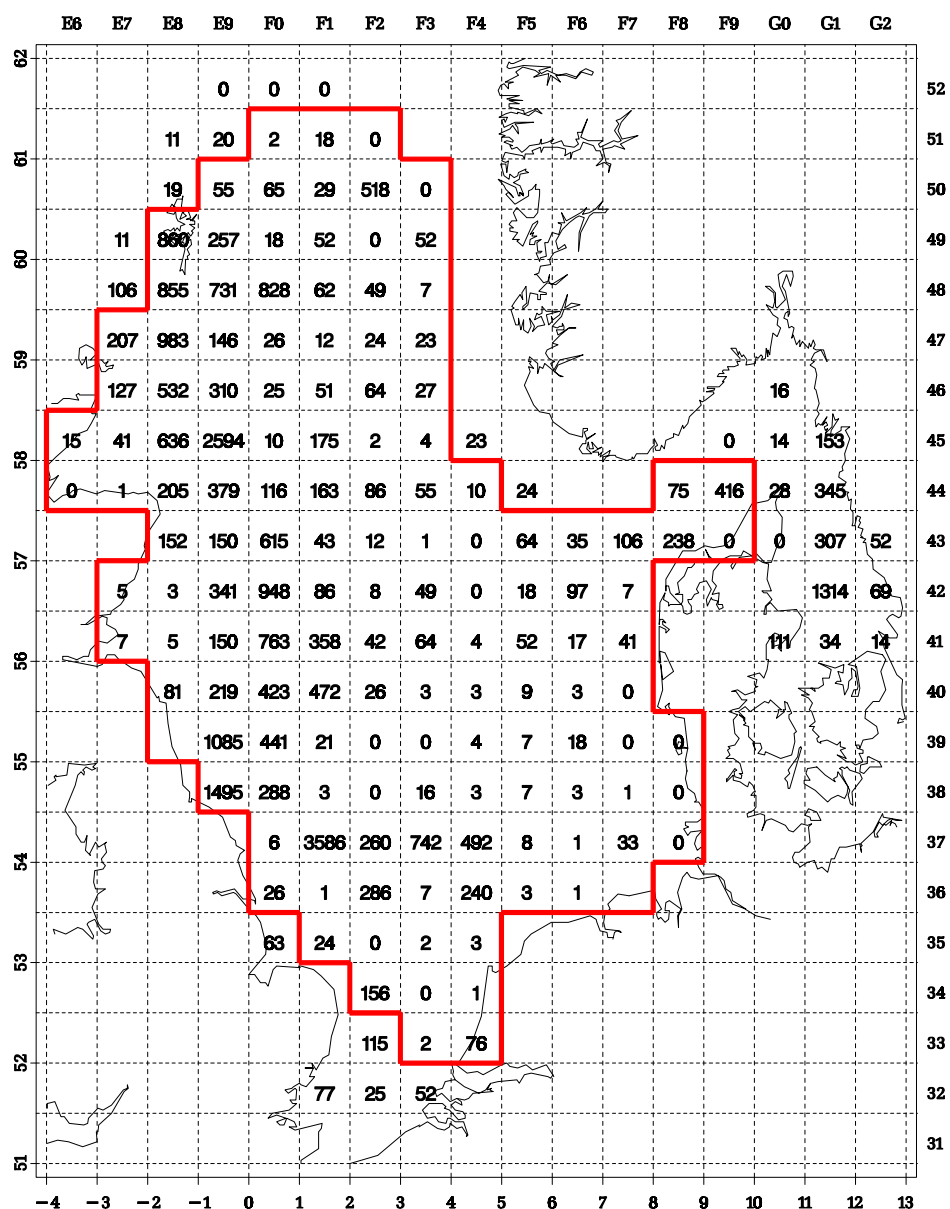


Figure 5.23 Whiting: number per hour, age 2.

Whiting, number per hour Age group 3, 1999 quarter 3

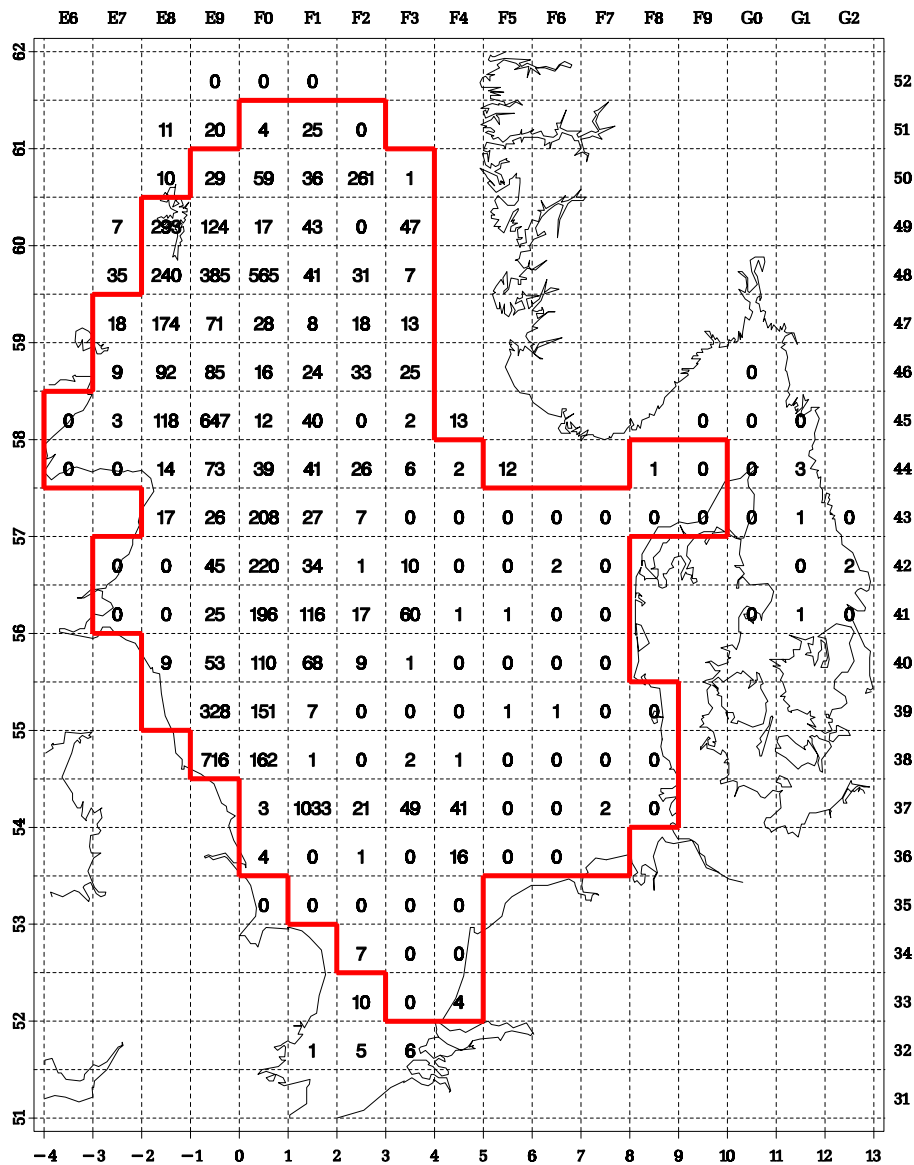


Figure 5.24 Whiting: number per hour, age 3.

Whiting, mean length Age group 1, 1999 quarter 3

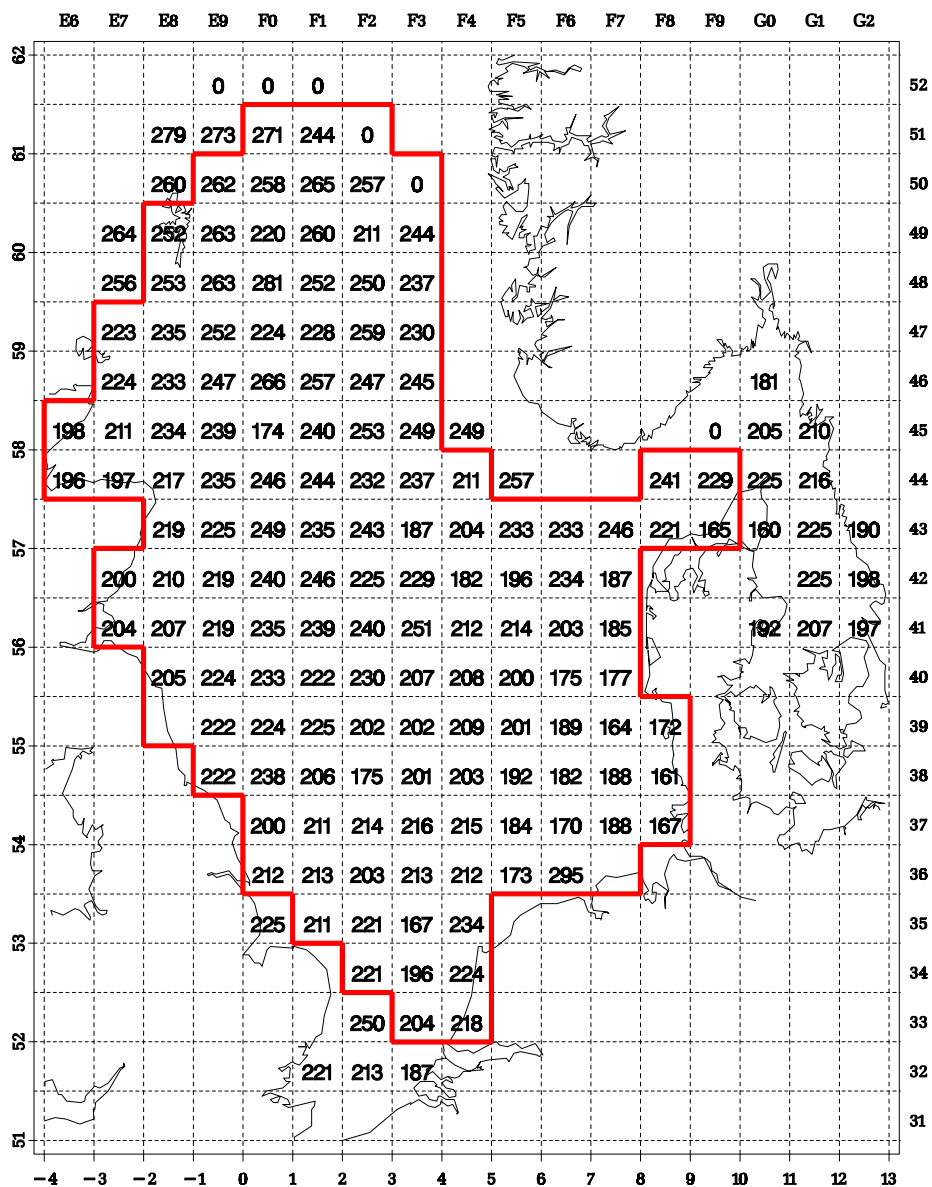


Figure 5.25 Whiting: mean length (mm), age 1.

Saithe, number per hour Age group 1, 1999 quarter 3

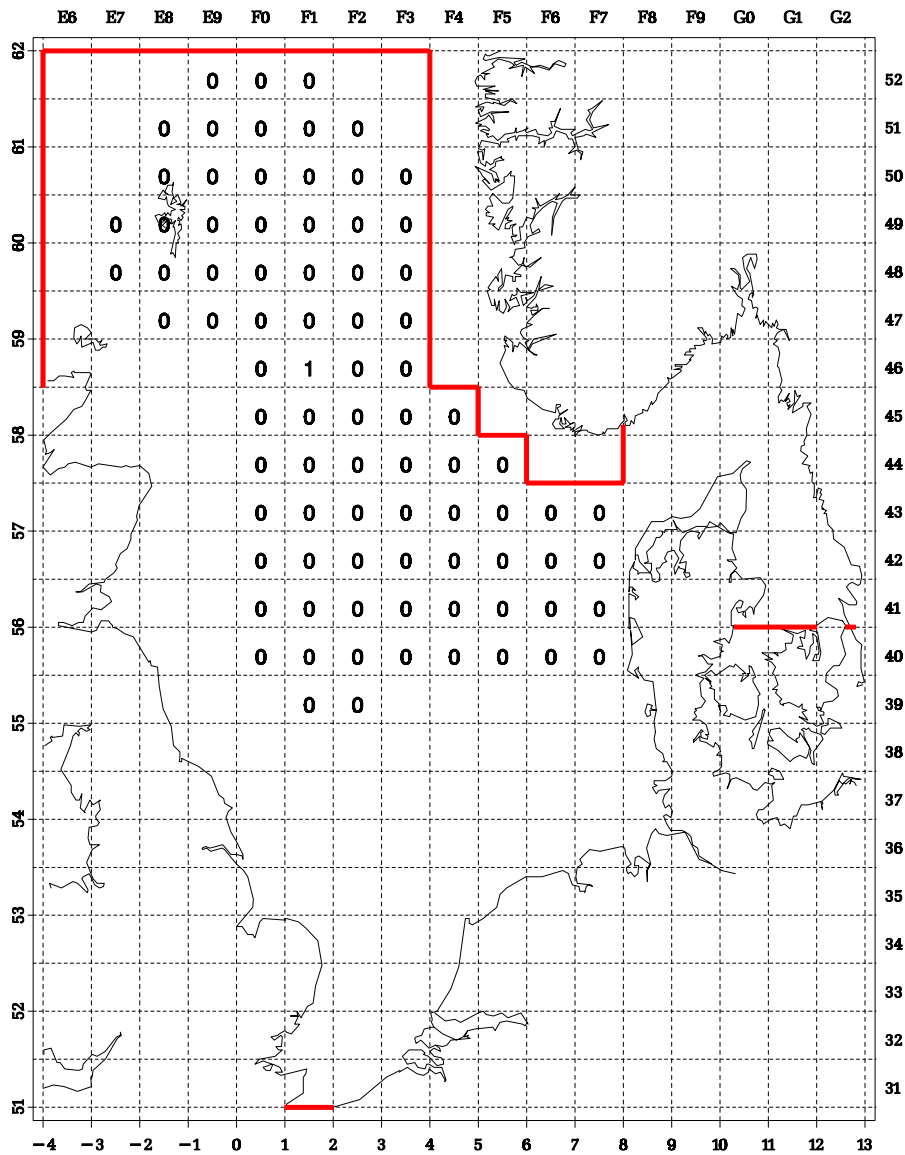


Figure 5.26 Saithe: number per hour, age 1.

Saithe, number per hour

Age group 2, 1999 quarter 3

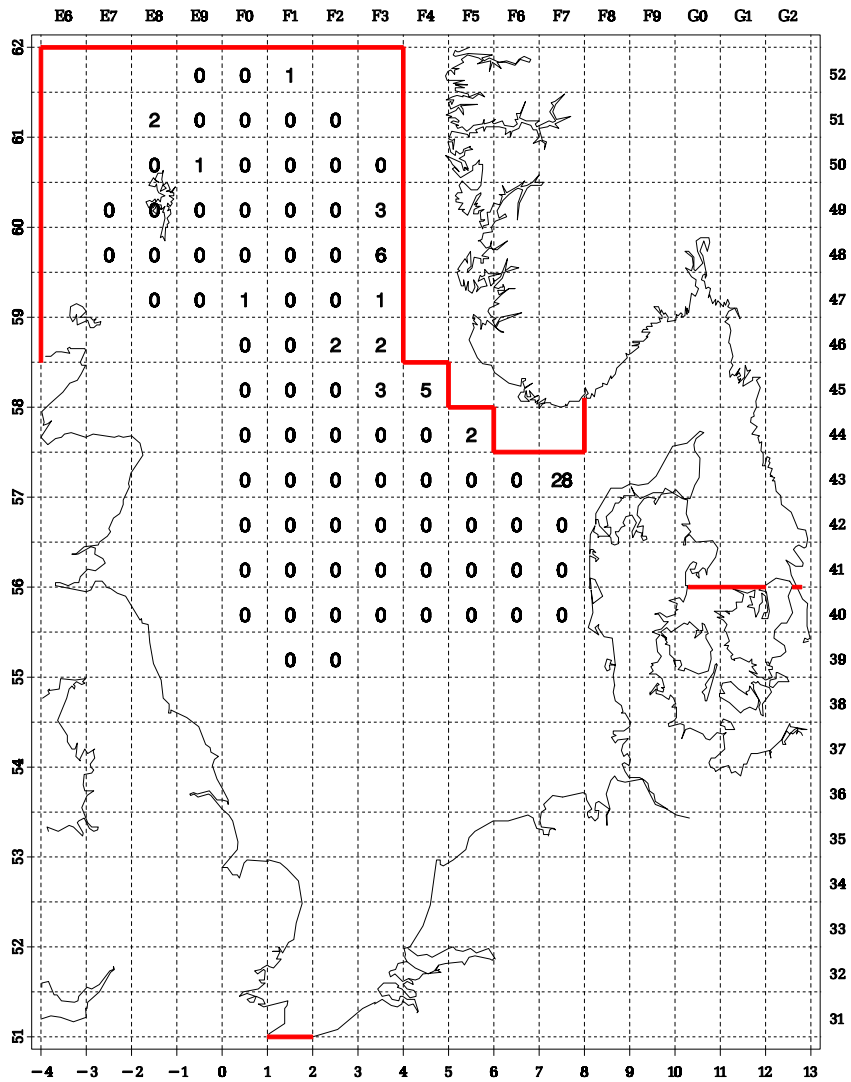


Figure 5.27 Saithe: number per hour, age 2.

Saithe, number per hour

Age group 3, 1999 quarter 3

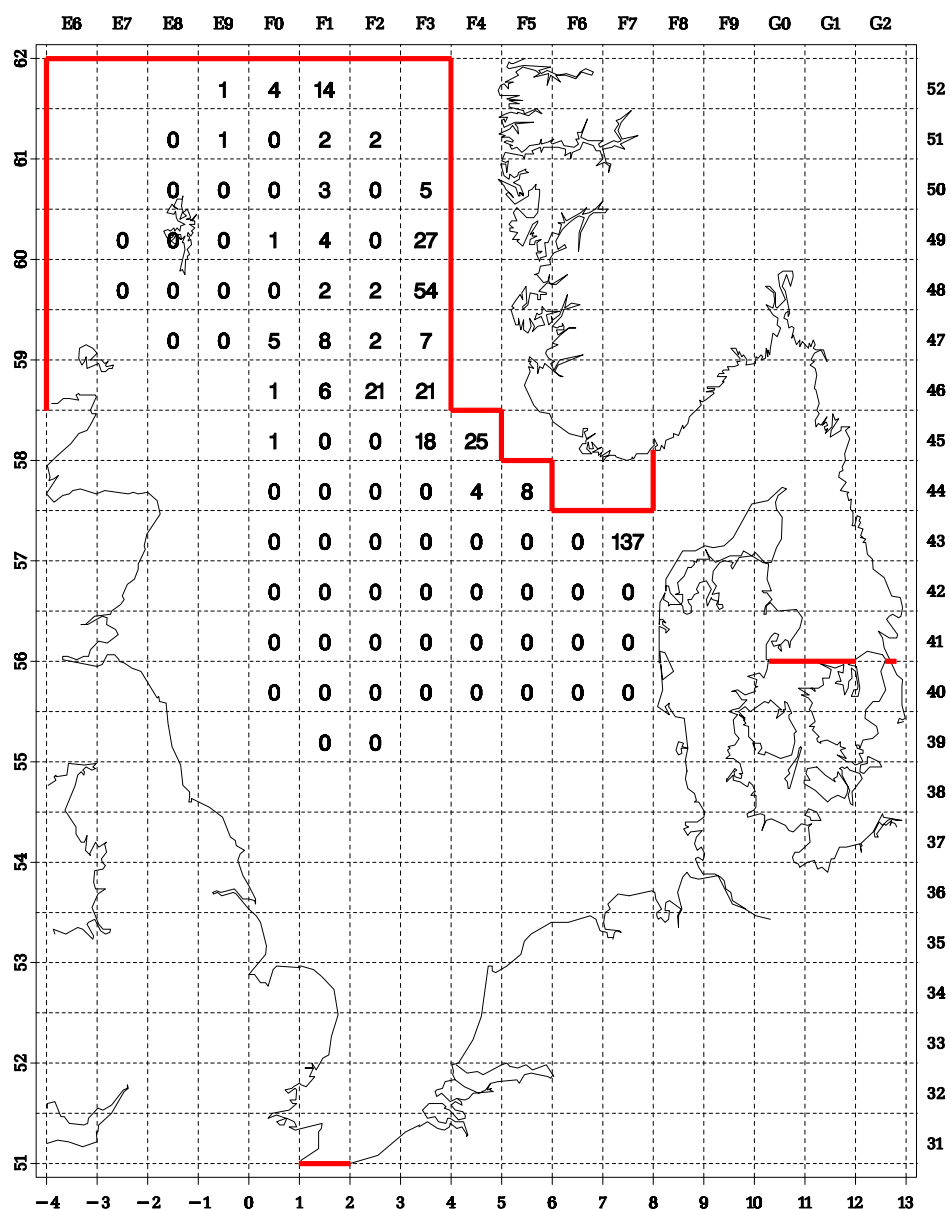


Figure 5.28 Saithe: number per hour, age 3.

Saithe, mean length

Age group 1, 1999 quarter 3

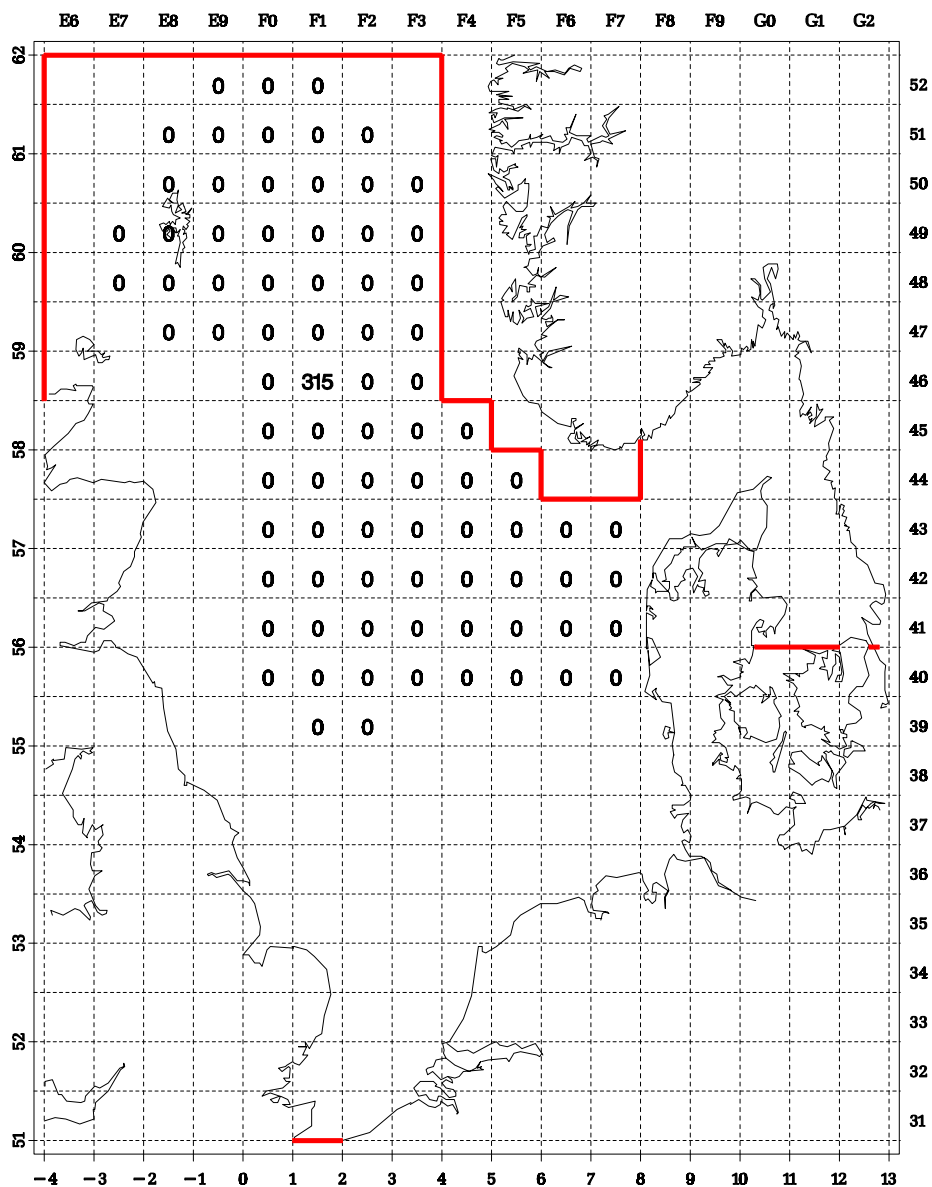


Figure 5.29 Saithe: mean length (mm), age 1.

Norway pout, number per hour Age group 1, 1999 quarter 3

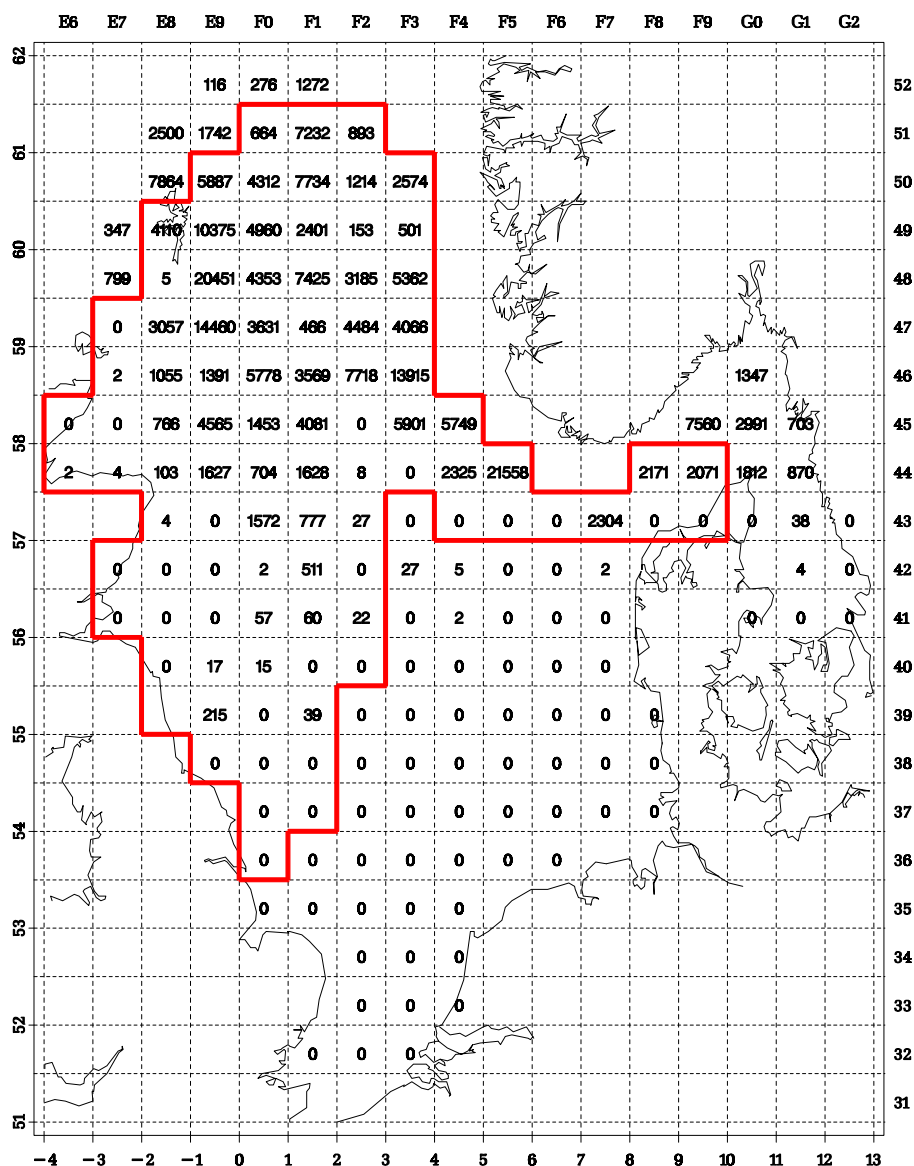


Figure 5.30 Norway pout: number per hour, age 1.

Cod, number per hour

Age group 1, 1999 quarter 3

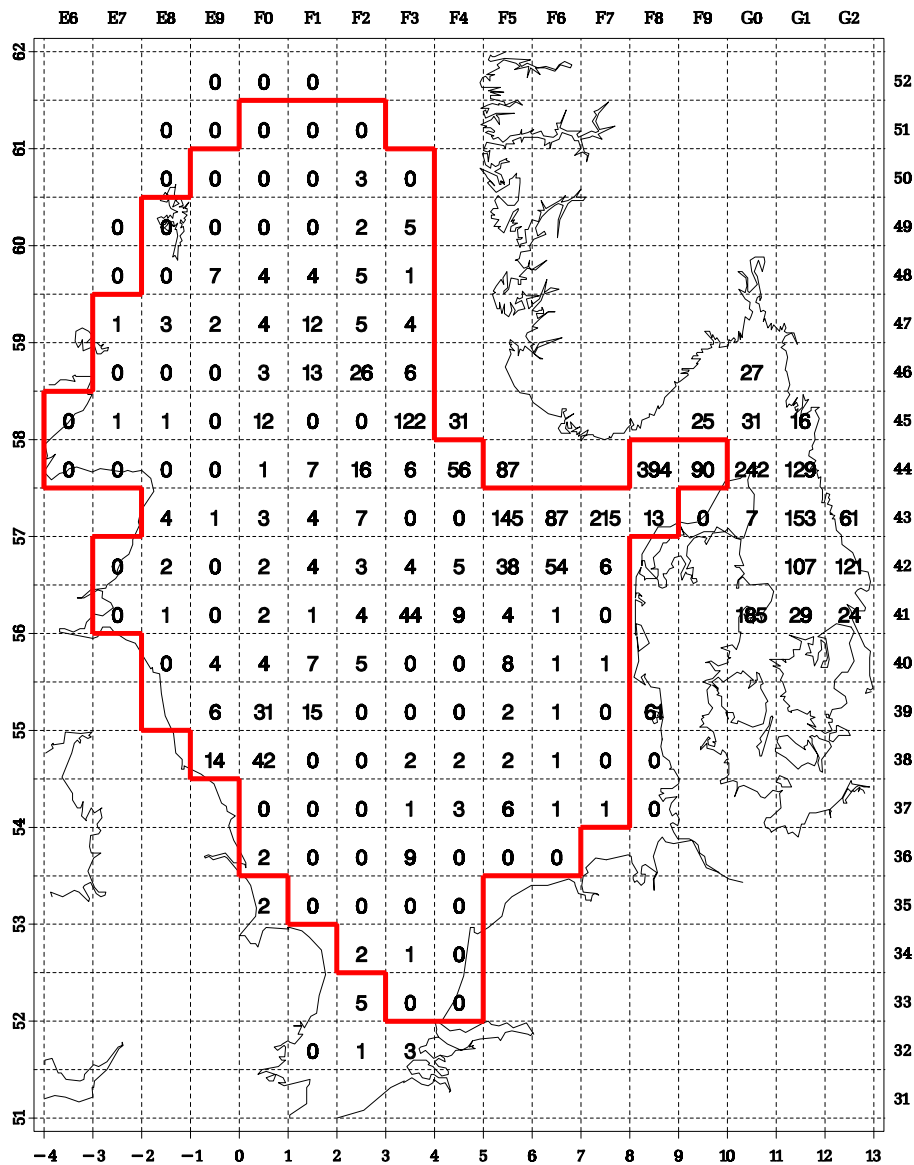


Figure 5.31 Norway pout: number per hour, age 2.
 WRONG MAP – should be Norway Pout age 2

E6	E7	E8	E9	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	G0	G1	G2
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

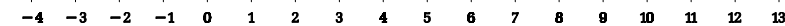


Figure 5.32 Norway pout: number per hour, age 3.

Norway pout, mean length Age group 1, 1999 quarter 3

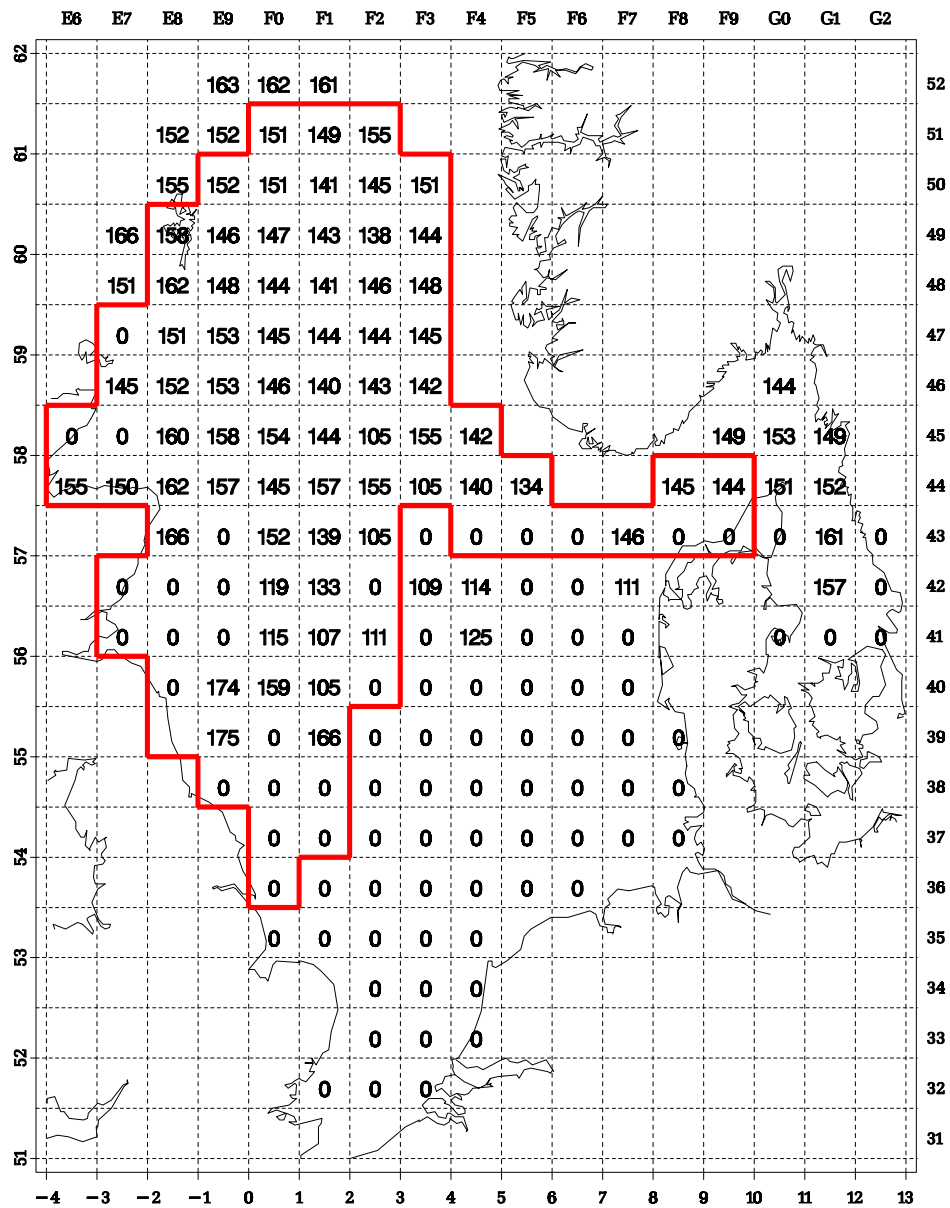


Figure 5.33 Norway pout: mean length (mm), age 1.

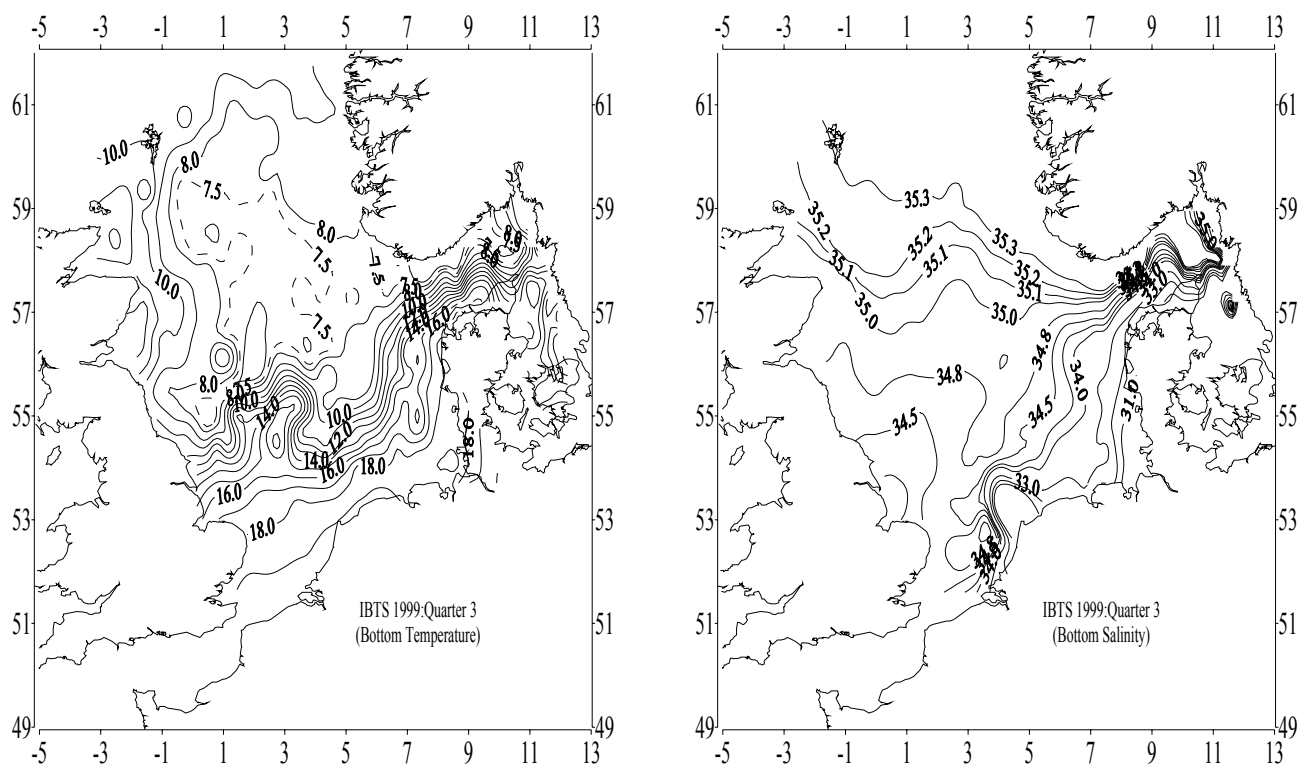


Figure 7.1 Distribution of bottom temperature and salinity during the IBTS quarter-3 1999 survey

REPORT OF THE
INTERNATIONAL BOTTOM TRAWL SURVEY IN THE NORTH
SEA, SKAGERRAK AND KATTEGAT IN 2000: QUARTER 1

The International Bottom Trawl Survey Working Group

This report is not to be quoted without prior consultation with the General Secretary. The document is a report of an expert group under the auspices of the International Council for the Exploration of the Sea and does not necessarily represent the views of the Council.

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1 INTRODUCTION

This report presents the final results for the International Bottom Trawl Survey (IBTS) in the first quarter of 2000. 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. During a meeting of this Working Group in November 1995 (ICES 1996/H:1a) early analyses of the data indicated the potential usefulness of quarterly surveys and it was decided to encourage their continuation. These quarterly surveys have been carried out in all four quarters in the period 1991-1997, but since 1998 only the 1st and the 3rd quarters have been covered.

The results for the 3rd quarter of 2000 will be published in a separate ICES Report.

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*), as well as the catches of herring larvae. 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 Manual (ICES 1999/D:2 Addendum). Details on the participation in the 2000 1q survey are given below as numbers of valid haul. The whole survey area has been covered as planned.

Country and Vessel		From	To	GOV	MIK
Denmark	Dana (new)	30/01	13/02	39	0
England	Cirolana	02/02	20/02	41	0
France	Thalassa (new)	03/02	28/02	78	0
Germany	Walther Herwig (new)	19/01	13/02	78	0
Netherlands	Tridens (new)	29/01	25/02	62	0
Norway	Michael Sars	21/01	17/02	39	0
Scotland	Scotia (new)	18/01	05/02	53	0
Sweden	Argos	21/01	07/02	45	0

3 DATA AVAILABLE

Table 3.1 shows number of valid hauls available in the ICES IBTS database.

At the time of the analysis of the 2000 data presented in this report all final data were available in the database.

4 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 (ICES 1993/Assess:15).

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 IBTS Working Group decided at the meeting in November 1995 (ICES 1996/H:1a) 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/Assess:15) 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.

5 RESULTS OF GOV-TRAWL FOR 1ST QUARTER 2000

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 Figure 5.1.

The number of otoliths sampled per target species and roundfish area is given in Table 5.1.

Per species a set of figures gives the distributions of the 1-, 2-, and 3 group and the mean length of 1-group fish per rectangle. The specific standard area used to calculate the index of year class strength is indicated in the figures.

The results are shown in Table 5.2 and in Figures 5.2-5.33.

6 RESULTS OF MIK TRAWL FOR 1ST QUARTER 2000 FOR HERRING AND SPRAT LARVAE

During the IBTS fish larvae are sampled by towing a small meshed ring net (MIK) in oblique hauls. The catches are used in an estimation of fish larval density and abundance, assuming a 100% efficiency of the gear in catching the larvae at night.

Larval density is estimated from:

$$\text{Density (no. m}^{-2}\text{)} = (\text{no. Caught} / [\text{distance towed (m)} * \text{net-opening (m}^2\text{)}] * \text{water depth (m)})$$

The number of larvae within a given statistical rectangle is estimated by multiplying the density found by the surface area of a rectangle (approx. $309 * 10^7 \text{ m}^2$). The total number of larvae in the sampled area (the MIK index) is the sum of estimates for all statistical rectangles.

Based on a series of comparative hauls a conversion factor between the IKMT, used in the first period of the series, and the MIK is estimated. This is used to convert earlier catches to total numbers (MIK indices).

6.1 Herring larvae

In total 488 hauls were made during the 2000 sampling. The overall coverage of standard rectangles was good, and major distributional patterns were well described.

The recruitment indices are given in Table 6.1. The spatial distribution of the 0-ringgers follows the trend of a north-westerly displacement which has been observed during the last years (Figure 6.1). Compared to the observations of the 1998 year class, larvae of the 1999 year class are less abundant in the central North Sea and in the division IIIa.

This years estimate of 1-ringer herring recruitment, from the IBTS 1-ringer sampling, are compared to last years index from the MIK 0-ringer sampling in the regression shown in Figure 6.2. The relation between the indices for the 1998 year class is in accordance with the long-term trend. Both indices indicate a very strong 1998 year class.

6.2 Sprat larvae

Sprat larvae were sampled in small quantities in the central/southern sections of the sampling area. Because of the limited numbers, no calculation of index is carried out.

7 HYDROGRAPHIC DATA

7.1 Hydro-chemistry Survey

Seven ships involved in the 2000 IBTS quarter 1 survey contributed hydrographic data to the 2000 dataset. These consist of 383 stations worked between 13 January and 14 march. Nutrient data were supplied from 115 stations, contributions being received from two ships (Argos, Scotia and Tridens). Data quality was good. The supplied Michael Sars dataset, includes data in addition to those at which IBTS trawls were undertaken. Additional hydrographic and nutrient data were received from a Corystes (UK) cruise, and these were added to the analysis. As a result 649 stations including 335 nutrient stations were used in this report. Additional nutrient samples were collected by Michael Sars but these have not yet been submitted.

Charts of the distribution of bottom temperature and salinity are given in Figs 7.1 and 7.2. An updated table, giving the time series of temperature and salinity at 10 locations in the North Sea during IYFS/IBTS (1) surveys from 1970 to 2000 is provided as Table 7.1. The Figures and Table show that North Sea conditions were very similar to recent years, with sustained levels of relatively high temperature and salinity, especially in the northern North Sea. In Fig 7.3 5-year running mean temperature reveal the high spatial coherence in the temperature time series, based on the ten locations given in Table 7.1. In particular the sustained cooling around 1980 and the warming around 1990 is clearly demonstrated. The warming following cooling in the mid 1990s has continued.

Charts from the 2000 IBTS-1 survey are also published on the ICES website on www.ices.dk/ocean/project/datasets/iyfs.htm, along with corresponding charts since 1970. The website also includes charts showing station locations. Charts of phosphate, silicate, nitrate and nitrite will follow later, after more data (in particular from the Micahel Sars) have been received.

8 REFERENCES

- ICES 1993/Assess:15. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES Doc. CM 1993/Assess:15.
- ICES 1995/Assess:13. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES Doc. CM 1995/Assess:13.
- ICES 1996/H:1a. Report of the International Bottom Trawl Survey Working Group. ICES Doc. CM 1996/H:1.
- ICES 1999/D:2 Addendum. 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.

Table 3.1 Number of valid hauls in the IBTS database. 1st quarter 2000.

Year	Total	Country								
		Denmark	England	France	Germany	Netherlands	Norway	Scotland	Sweden	USSR
1965	8	-	-	-	-	8	-	-	-	-
1966	90	-	-	-	63	27	-	-	-	-
1967	123	-	26	-	55	26	-	16	-	-
1968	136	-	18	-	61	24	-	33	-	-
1969	122	-	22	-	45	43	-	12	-	-
1970	130	-	24	-	41	49	-	16	-	-
1971	169	20	11	-	43	34	21	40	-	-
1972	207	17	22	-	30	36	24	45	33	-
1973	192	20	22	-	43	39	-	51	17	-
1974	247	28	20	-	50	52	2	39	16	40
1975	341	41	35	-	79	61	40	12	26	47
1976	342	31	31	-	61	50	51	36	24	58
1977	414	38	59	-	83	65	47	45	22	55
1978	451	39	58	52	98	68	53	59	24	-
1979	503	33	45	34	135	58	49	52	28	69
1980	404	-	55	53	69	84	55	57	31	-
1981	341	-	51	-	69	83	46	31	32	29
1982	373	27	49	40	62	58	46	38	23	30
1983	439	51	49	41	101	70	38	56	33	-
1984	465	37	51	44	101	94	45	58	35	-
1985	527	39	56	78	117	103	46	58	30	-
1986	527	39	61	73	114	107	41	52	40	-
1987	541	40	64	85	99	106	41	58	48	-
1988	404	39	43	69	74	51	44	46	38	-
1989	425	41	57	54	64	71	44	51	43	-
1990	379	24	55	58	82	23	47	46	44	-
1991	424	40	-	77	91	54	50	59	53	-
1992	381	40	-	53	92	40	47	63	46	-
1993	374	43	-	51	65	71	48	50	46	-
1994	363	48	-	54	84	46	27	56	48	-
1995	340	45	-	50	68	34	49	46	48	-
1996	328	46	-	41	62	45	41	45	48	-
1997	363	47	-	65	70	50	40	45	46	-
1998	405	51	-	79	79	54	41	56	45	-
1999	358	33	-	63	70	53	40	53	46	-
2000	380	34	-	68	91	55	41	46	45	-
Total	12016	1031	984	1282	2611	1992	1204	1526	1058	328

Table 5.1 Number of otoliths sampled per species and roundfish area, 2000 quarter 1.

Species	Roundfish area									Total
	1	2	3	4	5	6	7	8	9	
Herring	498	698	572	397	146	667	359	675	475	4487
Cod	491	249	185	216	92	254	82	359	467	2395
Haddock	904	857	1005	504	-	4	117	172	93	3656
Whiting	672	672	827	660	377	634	143	-	-	3985
Saithe	257	-	5	-	-	-	15	-	-	277
Mackerel	256	3	1	-	-	-	-	-	-	260
Sprat	9	210	358	142	106	417	184	200	294	1920
Norway pout	305	199	270	150	-	-	27	115	49	1115

Table 5.2 Herring indices. Mean number per hour per haul. 1st quarter 2000.

Year	Mean per statistical rectangle				
	Age group				
	1	2	3	4	5+
1965	10641.28	84.39	0.58	0.00	0.00
1966	600.60	183.43	9.02	0.06	0.00
1967	237.33	38.45	9.15	0.92	0.02
1968	266.72	14.34	0.35	0.15	0.01
1969	349.72	30.00	1.05	0.31	0.61
1970	644.52	96.12	2.02	0.19	0.30
1971	1382.10	586.01	28.06	3.52	0.22
1972	1496.37	416.03	18.14	5.55	2.30
1973	310.62	81.93	12.51	1.52	0.39
1974	558.14	179.67	9.20	1.26	0.42
1975	884.35	70.21	13.25	2.78	1.02
1976	693.23	49.17	0.84	0.43	0.05
1977	245.11	22.34	2.52	0.10	0.21
1978	622.49	19.42	5.68	28.94	2.74
1979	156.26	26.48	7.77	0.44	1.30
1980	342.81	14.77	10.03	2.59	5.52
1981	517.70	269.58	28.47	19.19	32.33
1982	799.25	93.68	21.40	3.18	3.76
1983	1230.70	127.69	43.15	14.23	26.47
1984	1468.93	157.91	62.30	27.86	10.05
1985	2082.43	695.43	280.28	44.29	28.97
1986	2593.00	762.39	268.52	78.21	26.48
1987	3733.82	879.67	115.29	58.76	49.80
1988	4469.57	4392.97	850.54	60.76	26.04
1989	2186.99	868.13	372.94	103.97	9.77
1990	1024.62	448.17	290.87	272.10	71.64
1991	1180.26	763.19	268.05	240.44	162.00
1992	1204.04	381.22	181.34	63.64	101.66
1993	2988.47	781.61	209.21	43.60	63.76
1994	1644.26	1093.59	199.32	63.56	39.95
1995	1215.41	1174.16	233.33	30.85	5.73
1996	1728.33	194.27	43.33	12.56	8.49
1997	3992.71	489.50	189.72	39.79	22.63
1998	2067.10	743.36	89.64	20.43	19.28
1999	714.82	424.60	509.23	101.36	37.49
2000	3638.91	215.86	157.37	60.86	9.02

Table 5.2 cont. Sprat indices. Mean number per hour per haul. 1st quarter 2000.

Year	Mean per statistical rectangle				
	Age group				
	1	2	3	4	5+
1974	0.94	0.85	0.90	1.05	0.00
1975	81.44	448.60	283.25	19.89	4.81
1976	680.18	638.82	232.19	26.07	0.07
1977	177.81	4078.96	242.11	28.37	0.03
1978	1762.62	726.22	335.57	1.29	0.01
1979	717.51	327.30	233.41	8.41	0.10
1980	557.87	1347.70	113.56	1.38	0.01
1981	1018.29	1176.29	190.78	10.20	1.25
1982	249.54	478.64	114.31	5.11	0.26
1983	228.85	744.73	179.51	7.83	0.67
1984	381.31	386.55	47.38	7.15	0.37
1985	652.00	301.14	40.04	6.40	0.61
1986	70.29	105.02	27.50	1.56	0.33
1987	792.23	86.83	24.19	2.18	0.18
1988	162.98	1429.56	91.28	9.23	0.00
1989	3909.80	757.51	346.18	4.71	2.12
1990	185.33	571.20	122.97	31.28	0.54
1991	1117.83	113.62	25.75	3.22	0.21
1992	1560.54	340.17	37.83	5.46	0.44
1993	1688.63	589.81	83.77	4.17	0.06
1994	4002.86	1368.02	127.00	2.72	0.65
1995	1157.89	2695.85	131.70	3.15	1.04
1996	232.58	557.50	176.95	22.38	1.06
1997	853.73	409.11	50.71	4.56	0.04
1998	1694.61	1710.60	280.42	11.89	2.26
1999	3963.67	508.74	64.90	3.74	43.57
2000	1652.99	1056.64	329.12	60.32	0.72

Table 5.2 cont. Cod indices. Mean number per hour per haul. 1st quarter 2000.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1971	58.81	18.40	5.08	0.76	1.56	4.40
1972	10.02	23.06	4.02	0.48	0.32	1.39
1973	40.40	9.40	23.73	13.11	0.95	2.69
1974	15.25	9.64	3.67	3.03	0.98	0.54
1975	37.38	6.32	1.93	0.56	0.81	0.59
1976	8.78	20.40	3.08	1.65	0.39	0.85
1977	37.11	2.88	3.07	0.75	0.48	0.31
1978	13.03	29.80	1.62	1.64	0.57	0.54
1979	9.59	8.78	4.87	0.60	0.88	0.37
1980	18.22	16.84	6.28	2.70	0.58	0.81
1981	2.70	23.96	5.07	2.32	1.74	1.05
1982	9.67	6.54	6.86	1.49	0.83	1.05
1983	4.73	16.66	2.78	1.92	0.82	1.33
1984	16.23	8.64	4.00	0.89	0.99	0.86
1985	0.92	18.61	3.37	1.70	0.52	0.92
1986	16.68	3.52	7.03	2.33	1.23	1.01
1987	9.41	29.37	1.53	1.84	0.59	0.84
1988	5.60	6.38	6.18	0.65	0.98	1.03
1989	15.12	6.33	5.01	2.35	0.42	0.99
1990	3.95	15.67	1.90	1.02	0.97	0.61
1991	2.33	4.73	4.44	0.84	0.43	0.78
1992	13.02	4.42	1.13	1.01	0.27	0.48
1993	13.08	19.51	2.03	0.67	0.58	0.38
1994	14.81	4.40	2.95	0.79	0.50	0.53
1995	9.83	22.06	2.71	1.12	0.28	0.34
1996	3.46	8.04	5.97	0.71	0.60	0.41
1997	39.96	6.90	2.24	1.09	0.43	0.43
1998	2.67	26.37	2.00	0.86	0.52	0.40
1999	2.11	1.57	8.07	0.76	0.47	0.48
2000	6.56	3.77	0.73	2.03	0.41	0.50

Table 5.2 cont. Haddock indices. Mean number per hour per haul. 1st quarter 2000.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1967	42.00	3.94	2.85	6.01	0.21	0.26
1968	4877.59	29.18	13.11	4.97	1.76	7.41
1969	3555.63	1600.88	159.08	46.54	21.70	24.98
1970	52.58	148.78	145.93	60.28	7.23	1.24
1971	528.51	30.02	31.80	64.81	1.10	0.23
1972	395.09	258.09	32.94	4.74	9.70	0.82
1973	327.80	876.33	200.08	12.08	2.24	0.96
1974	1136.06	136.13	198.45	18.66	0.87	7.44
1975	1146.29	355.76	18.62	34.47	6.22	0.88
1976	105.00	556.39	182.89	16.47	13.72	3.23
1977	139.44	66.46	134.55	16.45	1.17	1.80
1978	352.82	105.85	27.92	66.53	10.43	2.92
1979	468.16	212.41	52.46	6.70	15.32	2.61
1980	863.66	388.56	86.65	10.66	2.37	5.76
1981	267.74	637.56	159.70	25.73	4.38	3.06
1982	537.59	253.00	421.86	60.26	8.05	2.16
1983	308.22	402.61	89.79	115.26	12.71	1.92
1984	1067.67	221.34	130.95	20.93	21.20	4.65
1985	228.46	828.35	105.12	33.77	4.29	7.16
1986	584.54	251.14	285.87	17.22	6.03	2.06
1987	917.32	328.81	47.18	61.09	4.73	2.58
1988	100.66	670.95	96.97	12.70	13.56	2.02
1989	217.62	97.39	273.66	16.79	2.14	4.70
1990	217.45	139.11	33.00	50.37	3.16	1.80
1991	677.98	132.96	24.83	4.24	8.43	2.41
1992	1162.98	344.58	18.08	3.00	0.61	2.04
1993	1254.31	540.80	154.47	8.87	1.08	0.95
1994	228.73	503.86	98.30	23.29	1.56	0.79
1995	1355.49	201.07	176.17	24.34	5.31	0.80
1996	267.41	813.27	65.87	46.69	7.73	3.07
1997	860.15	366.45	470.59	24.83	15.14	3.39
1998	373.58	432.33	105.51	113.69	8.65	5.36
1999	211.76	232.93	129.71	48.10	36.62	4.26
2000	3702.06	107.83	49.88	25.37	15.56	10.28

Table 5.2 cont. Whiting indices. Mean number per hour per haul. 1st quarter 2000.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1967	440.36	97.85	21.16	7.21	0.84	1.15
1968	1267.71	81.75	25.43	4.74	0.65	0.31
1969	504.74	382.30	19.75	7.98	1.09	0.09
1970	57.55	132.91	27.44	5.31	0.60	0.18
1971	219.74	19.69	10.02	10.17	0.55	0.25
1972	263.69	104.31	33.53	10.68	4.15	0.18
1973	1460.01	381.80	53.72	33.61	8.36	5.70
1974	312.49	485.97	105.66	7.10	0.58	1.30
1975	881.19	174.47	91.13	19.69	3.81	0.57
1976	676.19	349.44	130.00	31.29	5.03	0.53
1977	411.42	232.59	69.08	12.25	11.03	13.00
1978	542.89	256.84	88.72	21.12	4.97	7.50
1979	440.93	228.84	112.59	33.06	4.89	1.17
1980	674.04	403.34	125.75	25.62	9.15	1.96
1981	229.26	464.30	228.31	45.93	9.29	2.78
1982	151.38	216.14	257.36	68.51	10.14	4.57
1983	127.09	126.86	112.57	79.19	33.39	6.36
1984	439.01	178.88	89.20	30.25	25.38	10.49
1985	339.01	361.76	65.70	18.53	7.03	7.18
1986	469.37	268.42	194.60	32.42	6.60	3.85
1987	683.38	556.49	90.42	46.17	4.98	1.98
1988	450.74	863.72	312.75	34.17	12.28	1.31
1989	1446.08	538.56	414.76	109.90	12.05	5.09
1990	518.94	862.35	198.16	91.61	16.98	3.62
1991	1009.16	686.18	479.41	70.86	37.60	7.59
1992	904.61	677.69	250.36	162.89	14.96	14.26
1993	1088.20	523.70	244.52	65.48	59.00	11.44
1994	720.99	636.97	179.84	66.59	11.56	8.93
1995	678.59	448.48	239.45	58.07	11.87	5.58
1996	502.36	485.97	244.70	69.74	23.09	9.85
1997	287.87	342.07	162.52	60.43	18.01	9.18
1998	556.11	161.26	125.49	54.05	15.50	9.26
1999	676.27	305.45	94.67	57.45	25.82	11.08
2000	756.58	537.39	182.10	53.05	20.01	14.74

Table 5.2 cont. Saithe indices. Mean number per hour per haul. 1st quarter 2000.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1974	0.01	0.03	0.03	0.00	0.00	0.00
1975	0.00	1.10	0.00	0.00	0.00	0.00
1977	0.00	0.00	0.23	10.25	2.07	0.90
1979	0.00	0.00	0.14	0.17	0.18	0.40
1980	0.42	0.00	0.29	0.79	0.50	1.59
1981	0.00	0.02	0.00	0.29	1.14	2.18
1982	0.01	0.26	0.29	0.35	0.21	0.87
1984	0.02	0.16	0.13	0.71	2.00	2.51
1985	0.02	0.92	105.92	15.67	0.00	25.76
1986	0.03	2.48	89.60	4.31	0.31	0.67
1987	0.01	0.90	1.35	5.26	0.29	1.77
1988	0.00	0.02	1.46	1.33	1.71	1.17
1989	0.03	0.00	4.64	4.25	1.00	2.76
1990	0.00	0.15	1.30	1.54	0.68	3.30
1991	0.02	0.08	4.56	1.98	0.91	0.09
1992	0.03	0.12	0.48	2.56	0.34	0.57
1993	0.05	1.94	0.48	1.21	2.30	1.71
1994	0.09	0.38	2.81	7.50	1.09	0.45
1995	0.00	0.01	0.43	0.86	1.08	0.74
1996	0.38	0.57	1.68	16.56	1.11	0.42
1997	0.02	0.00	0.03	1.37	2.24	0.47
1998	0.05	0.03	0.22	2.17	1.34	1.82
1999	0.11	0.01	0.30	0.88	2.53	1.19
2000	0.07	0.05	0.82	0.23	0.40	3.03

Table 5.2 cont. Norway pout indices. Mean number per hour per haul. 1st quarter 2000.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1972	1722.30	618.60	4.08	0.00	0.00	0.00
1974	11927.18	8094.98	775.27	1.00	0.12	0.03
1975	4826.87	1807.63	20.69	10.99	0.48	0.00
1976	4066.35	302.68	13.83	0.00	0.00	0.00
1977	6094.88	256.27	53.10	0.02	0.00	0.69
1978	1480.02	551.22	46.90	0.26	0.00	0.00
1979	2557.68	306.59	73.38	0.00	0.01	0.09
1980	3274.68	552.05	29.05	4.07	0.04	0.00
1981	1091.91	377.27	14.94	0.18	0.04	0.05
1982	4436.61	256.02	57.86	1.28	0.00	0.06
1983	2326.16	628.04	8.01	3.40	0.06	0.00
1984	4060.94	866.46	58.14	1.02	0.26	0.33
1985	2117.07	1423.36	72.92	3.22	0.03	0.01
1986	2111.67	397.30	20.56	1.12	0.02	0.00
1987	3243.79	499.43	64.68	3.31	0.30	0.00
1988	123.49	724.11	12.88	2.07	0.55	0.00
1989	2078.65	260.12	177.48	2.74	0.24	0.06
1990	1295.33	747.93	38.61	2.57	0.00	0.00
1991	2511.73	656.98	125.70	0.00	0.00	10.68
1992	5090.89	901.52	32.25	4.21	0.00	0.22
1993	2681.40	2644.13	258.50	5.95	7.01	0.13
1994	1869.95	374.26	66.29	2.51	0.22	0.02
1995	5940.49	784.85	76.45	8.56	0.00	0.00
1996	926.03	2628.21	227.45	4.70	0.07	0.00
1997	9762.09	1467.46	666.19	2.65	0.00	0.00
1998	1020.66	5335.46	256.77	85.71	24.80	0.00
1999	3526.75	597.12	667.25	3.99	0.29	0.00
2000	8095.25	1535.16	65.01	47.58	0.00	0.00

Table 5.2 cont. Mackerel indices. Mean number per hour per haul. 1st quarter 2000.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1974	0.97	0.00	0.00	0.00	0.00	0.00
1976	0.49	0.29	0.04	0.00	0.28	0.00
1977	1.97	0.00	0.00	0.01	0.00	0.00
1978	1.18	0.00	0.71	0.00	0.00	0.32
1979	0.54	0.00	0.00	0.00	0.00	0.00
1980	0.01	0.00	0.01	0.00	0.00	0.00
1981	0.44	0.12	0.00	0.00	0.00	0.00
1982	0.64	0.52	0.00	0.00	0.00	0.04
1983	2.16	6.60	2.59	1.07	0.03	0.11
1984	0.06	0.35	0.56	0.32	0.04	0.59
1985	1.25	0.00	0.00	0.00	0.00	0.02
1986	0.61	2.50	0.00	0.10	0.00	0.00
1987	88.42	0.24	0.49	0.12	0.05	0.23
1988	1.33	0.06	0.19	0.37	0.02	0.09
1989	1.43	2.26	0.11	0.05	0.31	0.00
1990	35.13	1.16	0.23	0.05	0.10	0.00
1991	6.93	0.16	0.01	0.08	0.02	0.07
1992	15.99	0.37	2.23	1.11	0.00	0.01
1993	1.03	0.78	0.90	0.41	0.24	0.34
1994	2.25	0.10	0.05	0.00	0.00	0.00
1995	0.36	2.55	0.90	0.00	0.00	0.00
1996	10.36	0.66	1.22	0.18	0.21	0.10
1997	719.19	3.31	0.45	1.25	0.49	0.53
1998	27.74	7.83	0.44	0.23	0.22	0.15
1999	43.65	57.17	20.15	1.87	0.94	1.24
2000	333.28	2.73	0.32	0.13	0.00	0.00

Table 6.1 Density and abundance estimates of 0-ringers caught in February during the IBTS. Values given for year classes by areas are density estimates in numbers per square metre. Total abundance is found by multiplying density by area and summing up.

Area	North west	North east	Central west	Central east	South west	South east	Division IIIa	South Bight	0-ringers abundance no. in 10 ⁹
Area m ² x 10 ⁹	83	34	86	102	37	93	31	31	
Year class									
1976	0.054	0.014	0.122	0.005	0.008	0.002	0.002	0.016	17.1
1977	0.024	0.024	0.050	0.015	0.056	0.013	0.006	0.034	13.1
1978	0.176	0.031	0.061	0.020	0.010	0.005	0.074	0.000	52.1
1979	0.061	0.195	0.262	0.408	0.226	0.143	0.099	0.053	101.1
1980	0.052	0.001	0.145	0.115	0.089	0.339	0.248	0.187	76.7
1981	0.197	0.000	0.289	0.199	0.215	0.645	0.109	0.036	133.9
1982	0.025	0.011	0.068	0.248	0.290	0.309	0.470	0.140	91.8
1983	0.019	0.007	0.114	0.268	0.271	0.473	0.339	0.377	115.0
1984	0.083	0.019	0.303	0.259	0.996	0.718	0.277	0.298	181.3
1985	0.116	0.057	0.421	0.344	0.464	0.777	0.085	0.084	177.4
1986	0.317	0.029	0.730	0.557	0.830	0.933	0.048	0.244	270.9
1987	0.078	0.031	0.417	0.314	0.159	0.618	0.483	0.495	168.9
1988	0.036	0.020	0.095	0.096	0.151	0.411	0.181	0.016	71.4
1989	0.083	0.030	0.040	0.094	0.013	0.035	0.041	0.000	25.9
1990	0.075	0.053	0.202	0.158	0.121	0.198	0.086	0.196	69.9
1991	0.255	0.390	0.431	0.539	0.500	0.369	0.298	0.395	200.7
1992	0.168	0.039	0.672	0.444	0.734	0.268	0.345	0.285	190.1
1993	0.358	0.212	0.260	0.187	0.120	0.119	0.223	0.028	101.7
1994	0.148	0.024	0.417	0.381	0.332	0.148	0.252	0.169	126.9
1995	0.260	0.086	0.699	0.092	0.266	0.018	0.001	0.020	106.2
1996	0.003	0.004	0.935	0.135	0.436	0.379	0.039	0.032	148.1
1997	0.042	0.021	0.338	0.064	0.178	0.035	0.023	0.083	53.1
1998	0.100	0.056	1.150	0.592	0.998	0.265	0.280	0.127	244.0
1999	0.045	0.011	0.799	0.200	0.514	0.220	0.107	0.026	137.1

Table 7.1 Time series data of bottom temperature and salinity during IYFS/IBTS(1) 1970-1999

Location	1		2		3		4		5		6		7		8		9		10	
Position	60N2E		57.5N0E		57.5N2E		57.5N4E		55N0E		55N2E		55N4E		55N8E		54N3E		52.5N3°E	
Year	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal
1970	5.5	35.08	5.8	34.95	5.3	35.00	4.7	34.92	5.9	34.75	4.5	34.82	4.0	34.72	0.5	33.00	4.0	34.72	4.0	34.62
1971	7.1	35.15	7.0	35.05	6.9	35.15	6.0	35.10	7.0	34.82	6.2	34.88	5.5	34.80	3.5	33.00	5.9	34.55	7.0	34.95
1972	5.8	35.22	6.9	35.08	5.9	35.20	4.5	34.78	6.5	34.91	4.8	34.86	5.2	34.80	2.5	33.80	5.2	34.70	6.9	35.10
1973			7.4	35.02	7.2	35.20	6.7	35.10	7.0	35.05	6.1	35.00	6.0	34.86	5.0	33.00	6.4	34.80	6.5	35.05
1974	6.9	35.28	6.5	35.11	6.5	35.08	6.3	35.04	6.5	34.90	6.0	34.90	5.6	34.90	4.7	33.00	6.1	34.78	8.0	35.20
1975	7.3	35.20	6.6	35.05	6.6	35.15	6.4	35.13	6.6	34.95	6.4	34.90	6.1	34.85	5.2	33.50	5.9	34.62	6.9	34.62
1976	6.7	35.20	6.5	35.00	6.5	35.15	5.6	35.12	6.1	34.81	4.9	34.95	4.9	34.85	2.2	31.00	5.1	34.78	5.1	34.80
1977	6.0	35.18	6.2	35.02	5.1	35.00	4.8	34.92	6.0	34.98	4.9	34.85	5.0	34.80	3.1	33.60	5.6	34.78	7.1	35.22
1978	6.4	34.88	6.6	35.00	6.0	34.90	4.7	34.88	5.6	34.78	4.9	34.88	4.2	34.80	2.2	32.50	4.6	34.68	5.5	34.90
1979	6.4	35.15	6.0	34.80	4.1	34.88	4.0	34.98	4.5	34.64	2.8	34.62	2.8	34.62	-1.5	32.00	3.0	34.62	4.2	34.95
1980	5.9	35.12	6.6	35.00	5.5	35.00	4.5	34.70	6.1	34.60	3.8	34.65	4.5	34.50	3.1	33.50	5.1	34.70	6.1	35.11
1981	6.9	35.22	6.6	34.90	6.2	35.05	5.8	35.15	6.5	34.80	5.8	34.82	5.1	34.82	3.4	32.50				
1982	6.6	35.28	6.1	35.02	5.9	35.05	5.5	35.10	5.5	34.72	4.8	34.82	4.5	34.62	2.8	32.50	4.7	34.30	6.0	34.65
1983	6.9	35.22	6.5	35.00	6.4	35.10	6.2	35.15	5.6	34.62	6.1	34.95	5.2	34.90	3.0	33.00	5.2	34.80	6.4	34.70
1984	6.3	35.18	6.4	35.10	6.4	35.10	5.2	35.12	5.9	34.80	5.0	34.84	4.9	34.90	3.5	33.00	4.9	34.65	7.4	34.95
1985	6.9	35.17	6.8	35.10	6.5	35.18	5.9	35.05	6.5	34.70	4.7	34.91	5.0	34.90	1.0	32.50	4.0	34.70	6.0	34.80
1986	6.6	35.25	5.8	35.05	5.4	35.08	5.2	35.05	5.2	34.65	3.9	34.72	3.6	34.60	0.0	32.50	4.0	34.60	4.0	34.65
1987	6.5	35.28	6.1	34.90	5.9	35.08	4.9	35.00	5.0	34.75	4.2	34.80	4.3	34.60	0.8	30.00	4.9	34.60	4.8	34.90
1988	7.6	35.18	7.6	34.95	7.4	35.03	7.0	34.96	7.1	34.70	6.6	34.80	6.5	34.50	5.9	33.50	6.9	34.60	7.7	34.90
1989	8.5	35.29	8.0	34.85	7.8	34.89	7.6	35.05	7.5	34.76	7.1	34.81	6.8	34.80	6.0	34.10	6.5	34.68	7.5	34.62
1990	8.5	35.29	7.6	35.00	7.6	35.12	7.6	35.15	7.5	34.70	7.5	34.85	7.5	34.80	6.5	34.10	7.4	34.70	7.4	34.60
1991	7.9	35.30	6.7	35.10	7.1	35.22	6.1	34.97	6.6	34.65	5.8	34.85	5.5	34.80	3.0	34.00	5.8	34.60	6.1	35.30
1992	8.1	35.29	7.6	35.10	7.1	35.16	7.1	35.19	7.4	34.80	6.6	34.80	6.5	34.80	6.6	32.00	4.5	34.80	6.0	35.20
1993	7.4	35.31	6.5	34.92	6.4	35.18	6.5	35.30	6.5	35.05	6.2	35.00	5.4	34.95	4.3	33.50	5.6	34.80	6.0	35.00
1994	6.2	35.20	6.5	35.05	5.5	34.93	4.3	34.80	6.3	34.90	5.4	34.90	5.2	34.80	4.0	32.00	5.5	34.70	7.0	35.00
1995	7.5	35.23	7.0	34.92	7.1	35.00	6.7	35.09	6.7	34.71	6.0	34.87	5.6	34.81	4.0	30.03	6.0	34.65	7.9	34.51
1996	7.1	35.24	6.5	34.91	5.0	34.94	4.7	34.87	6.0	34.59	4.6	34.71	3.0	34.44	-0.2	32.12	3.4	34.71	3.8	34.83
1997	7.6	35.21	7.3	34.92	6.2	34.92	6.4	35.09	6.5	34.72	5.8	34.80	4.9	34.72	2.9	32.93	5.2	34.67	5.2	34.96
1998	8.2	35.29	8.5	35.14	7.8	35.16	7.0	35.00	7.5	34.79	6.3	34.84	6.1	34.62	3.5	31.78	6.3	34.56	7.2	35.25
1999	7.6	35.30	7.1	35.00	7.4	35.16	6.7	35.10	7.2	34.79	6.4	34.94	5.5	34.80	4.1	31.02	5.8	34.73	8.3	35.14
2000	8.0	35.30	7.4	34.98	7.4	35.14	7.1	35.21	6.7	34.83	6.8	35.01	6.1	34.92	5.1	31.88	6.1	34.72	7.2	35.18

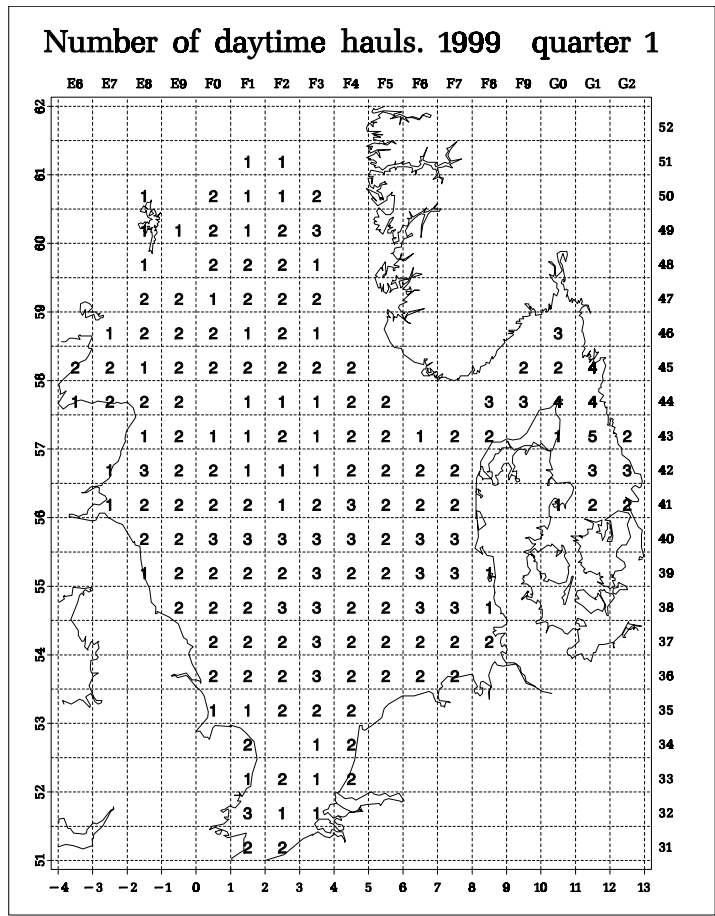
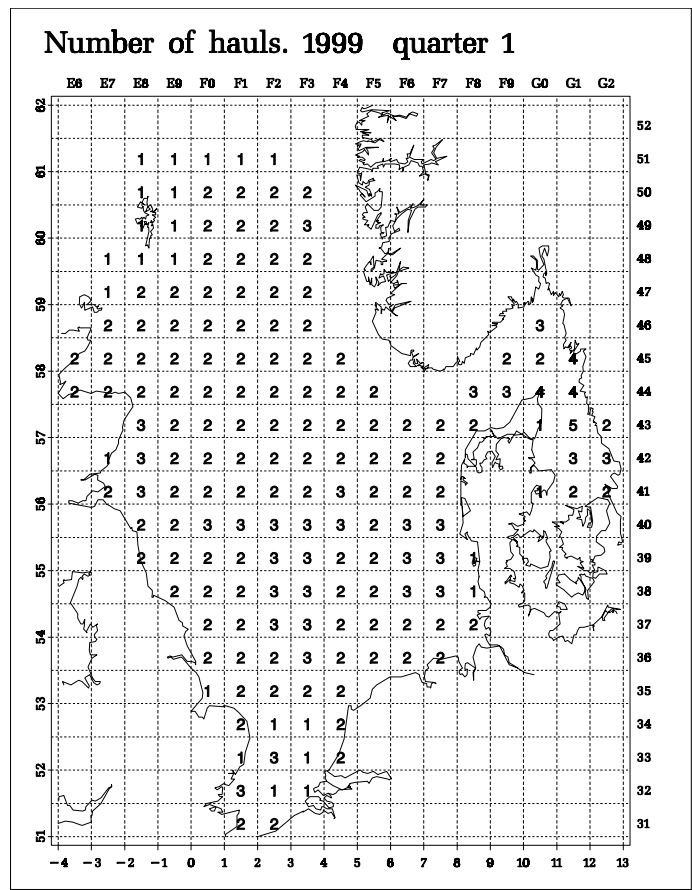


Figure 5.1. Number of valid day- and nighttime hauls.

Herring, number per hour Age group 1, 2000 quarter 1

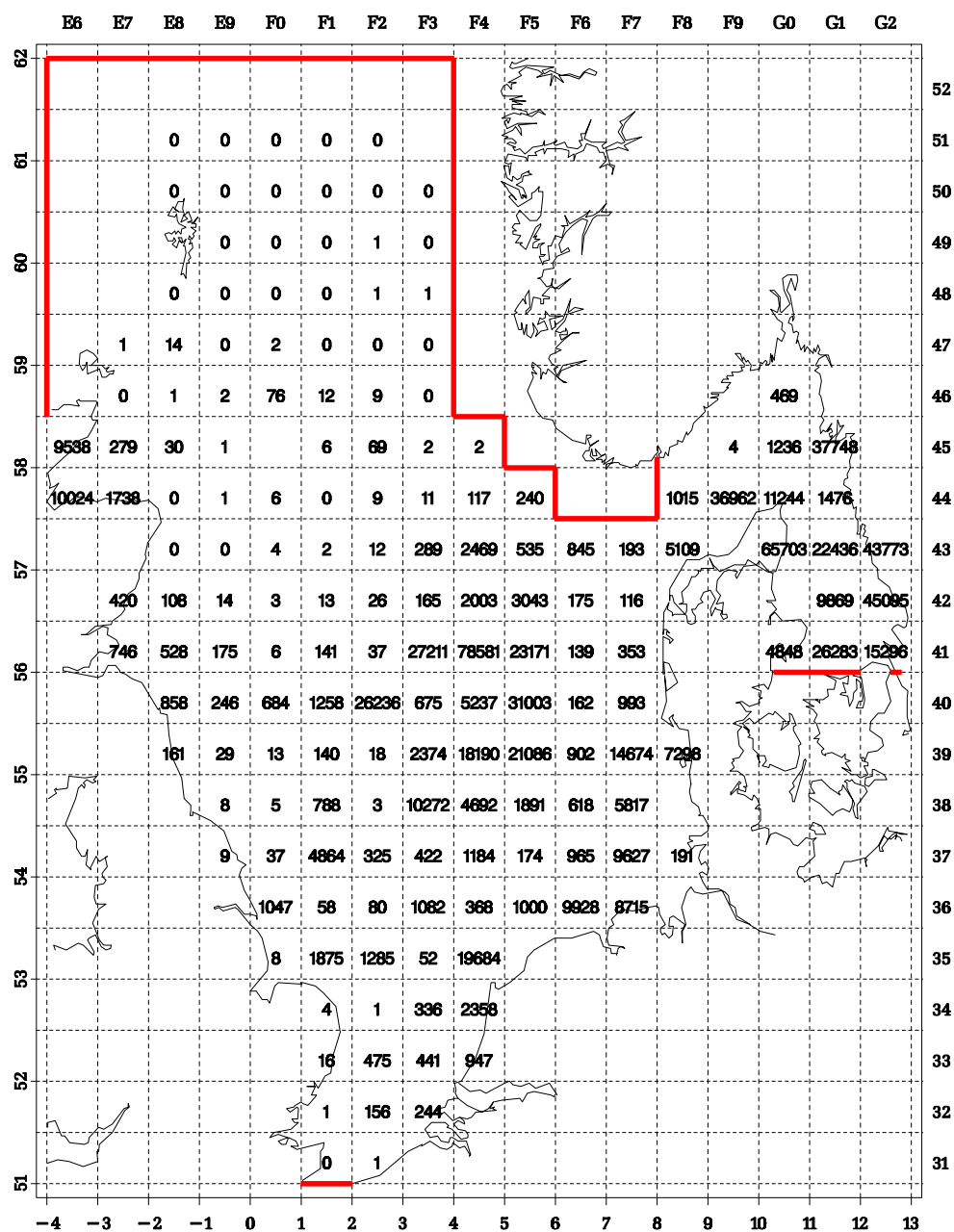


Figure 5.2 Herring: number per hour, 1-ringers

Herring, number per hour

Age group 2, 2000 quarter 1

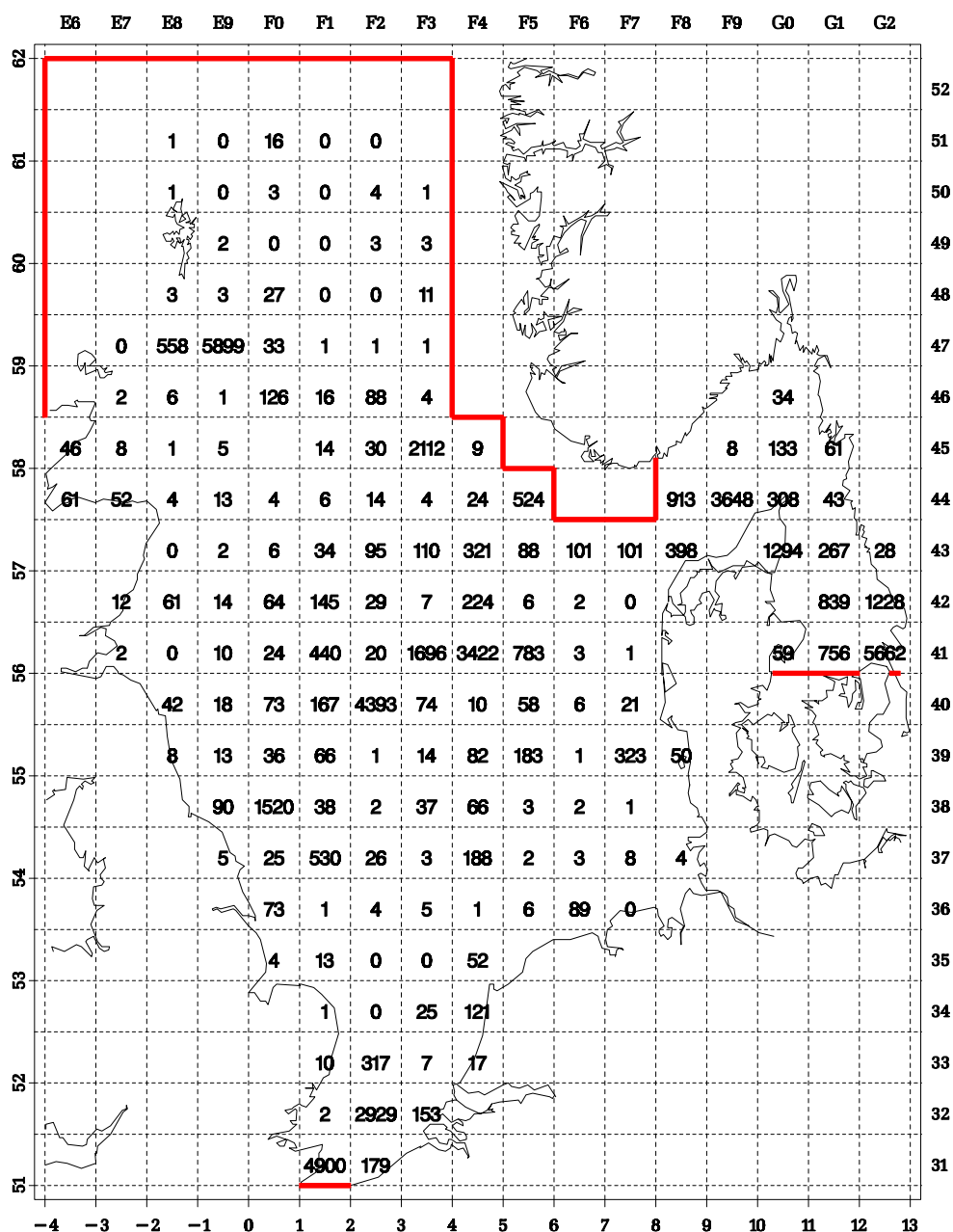


Figure 5.3 Herring: number per hour, 2-ringers

Herring, number per hour

Age group 3, 2000 quarter 1

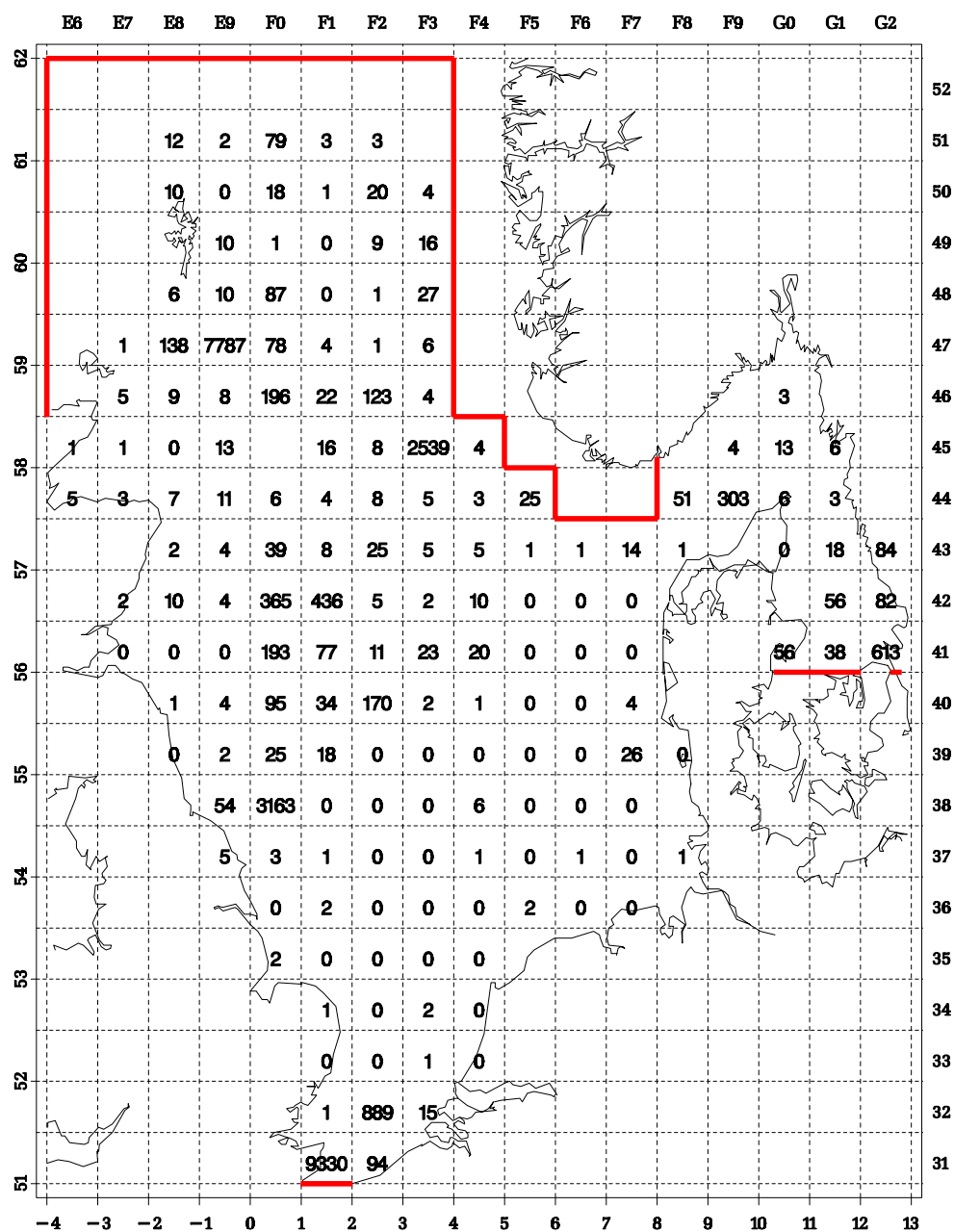


Figure 5.4 Herring: number per hour, 3 ringers

Herring, mean length Age group 1, 2000 quarter 1

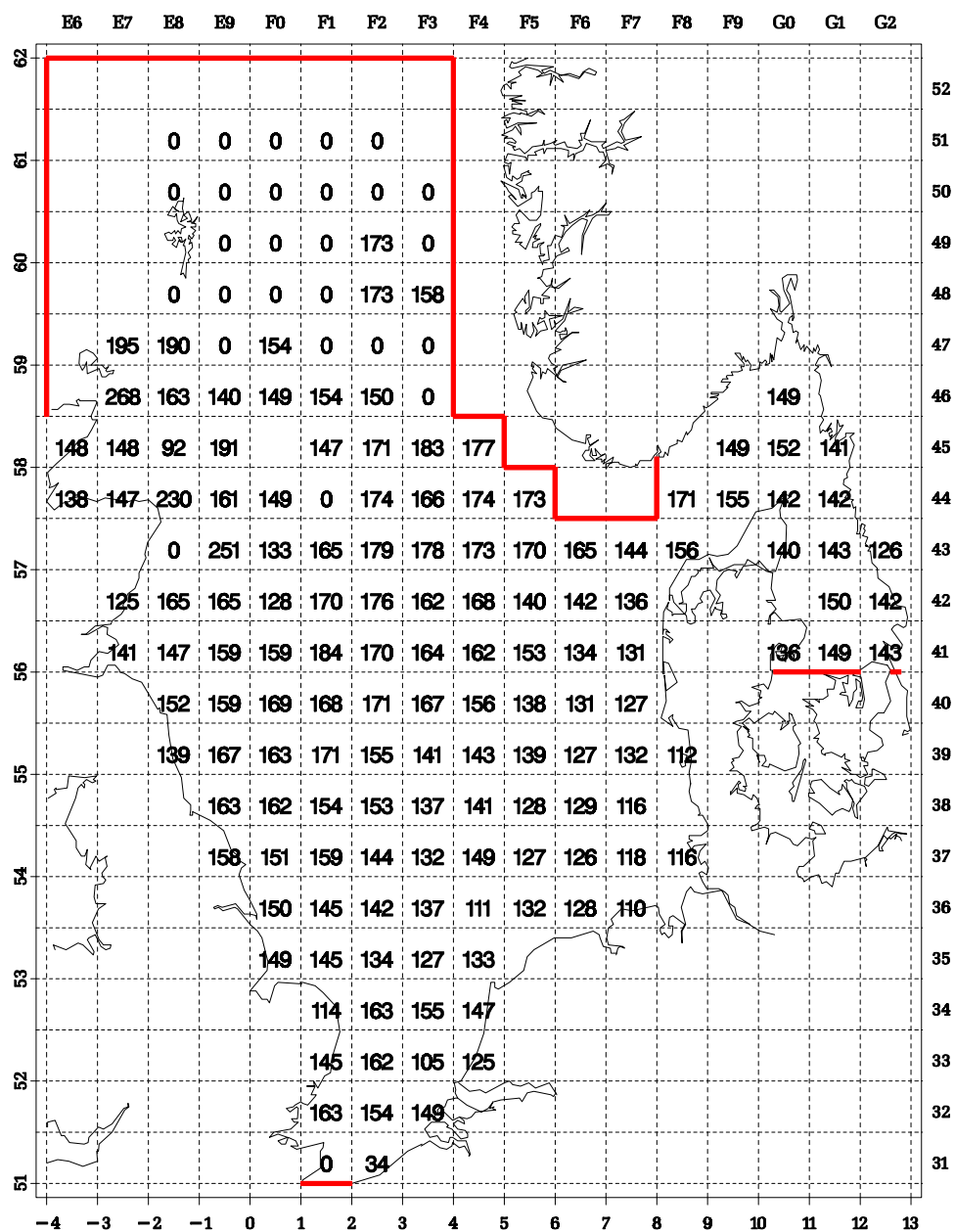


Figure 5.5 Herring: mean length (mm) 1- ringers

Sprat, number per hour

Age group 1, 2000 quarter 1

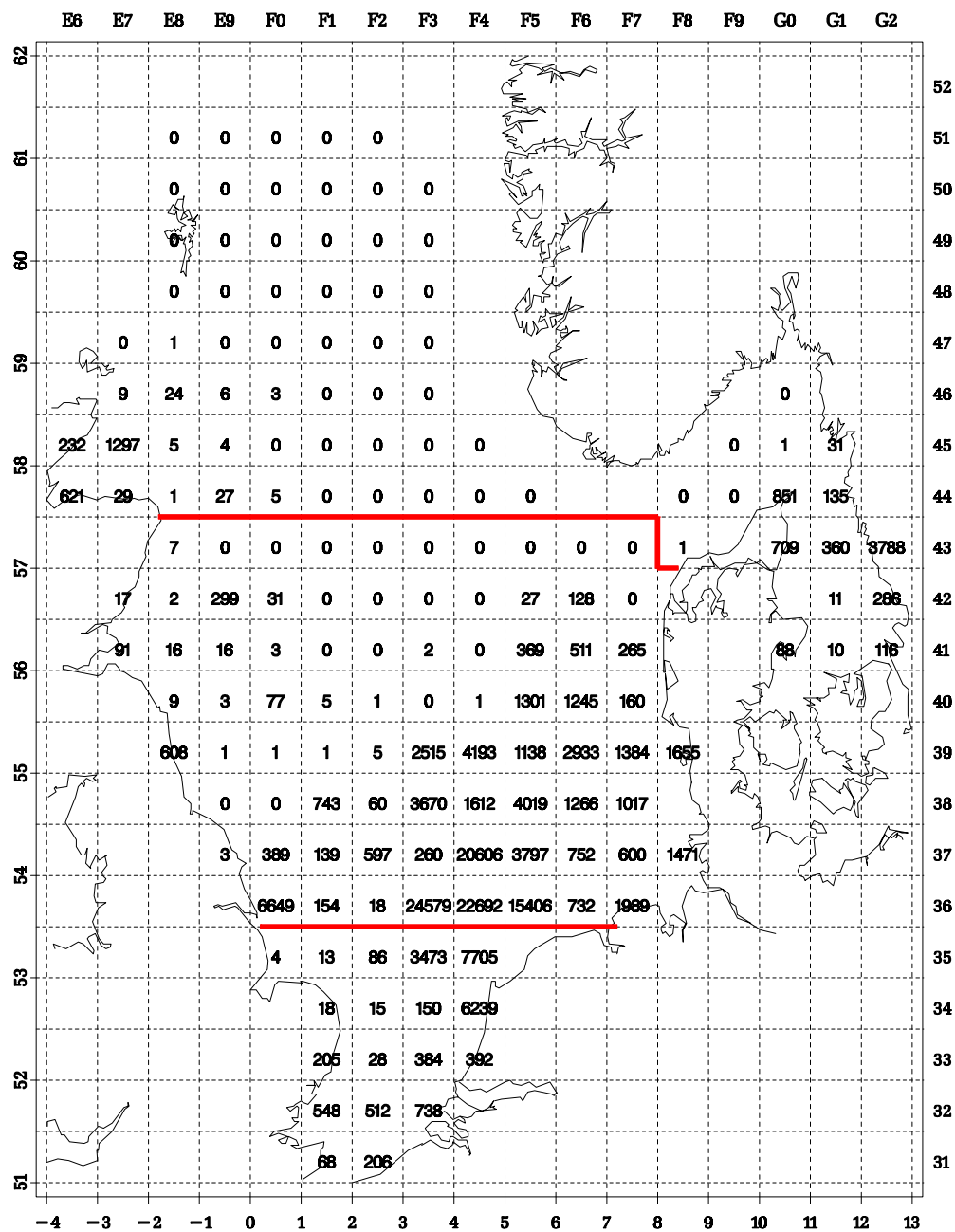


Figure 5.6 Sprat: number per hour, age 1

Sprat, number per hour Age group 2, 2000 quarter 1

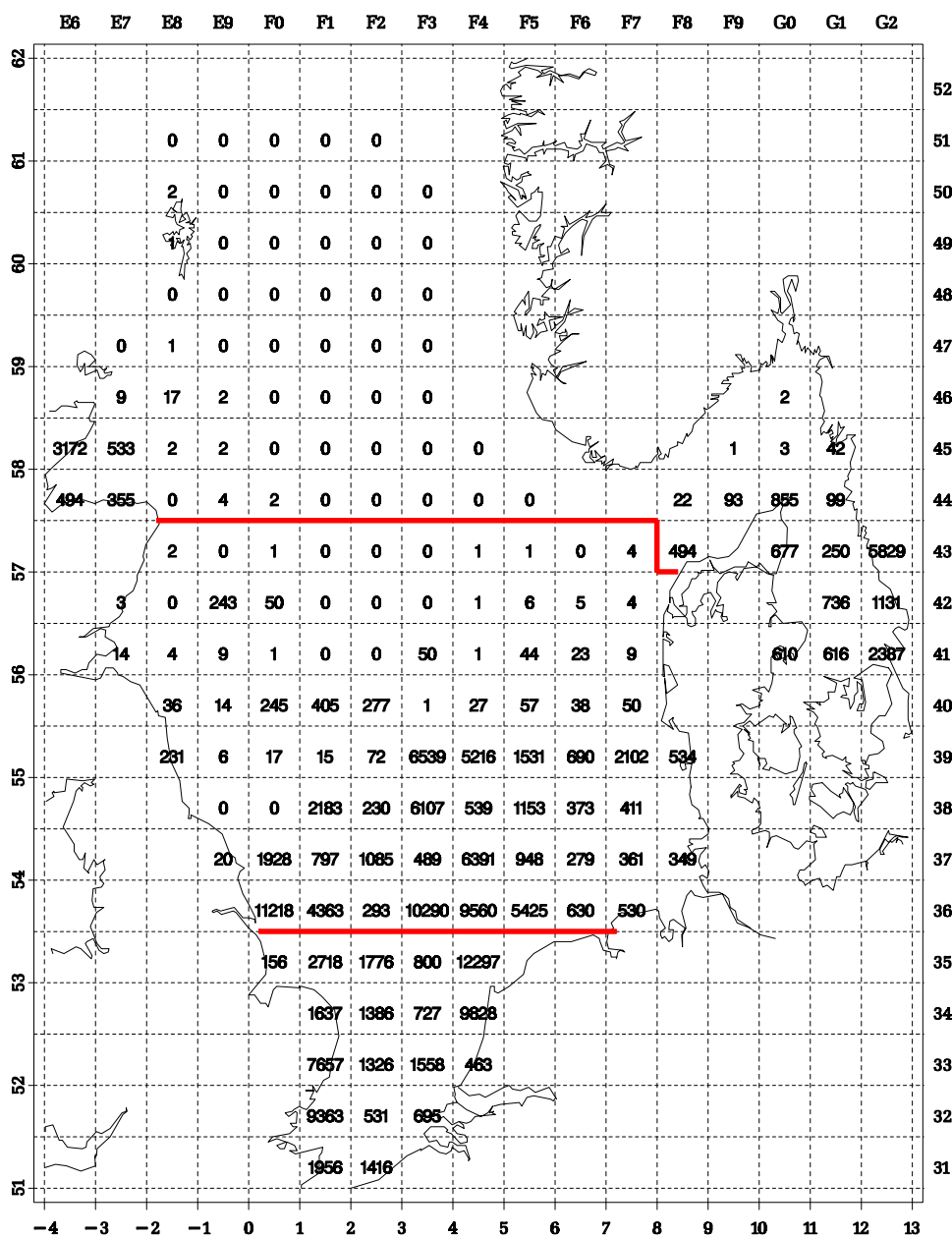


Figure 5.7 Sprat: number per hour, age 2

Sprat, number per hour Age group 3, 2000 quarter 1

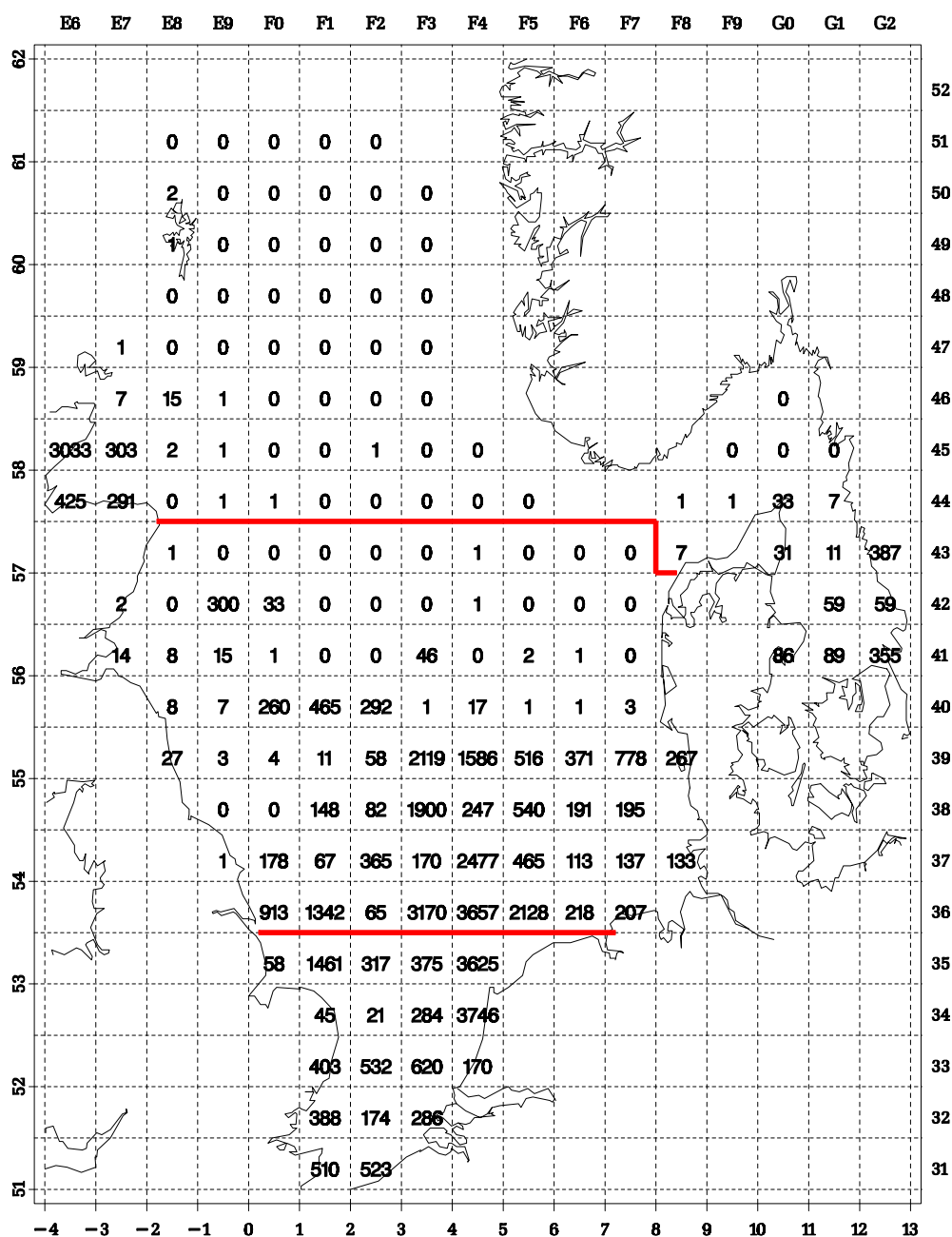


Figure 5.8 Sprat: number per hour, age 3

Sprat, mean length Age group 1, 2000 quarter 1

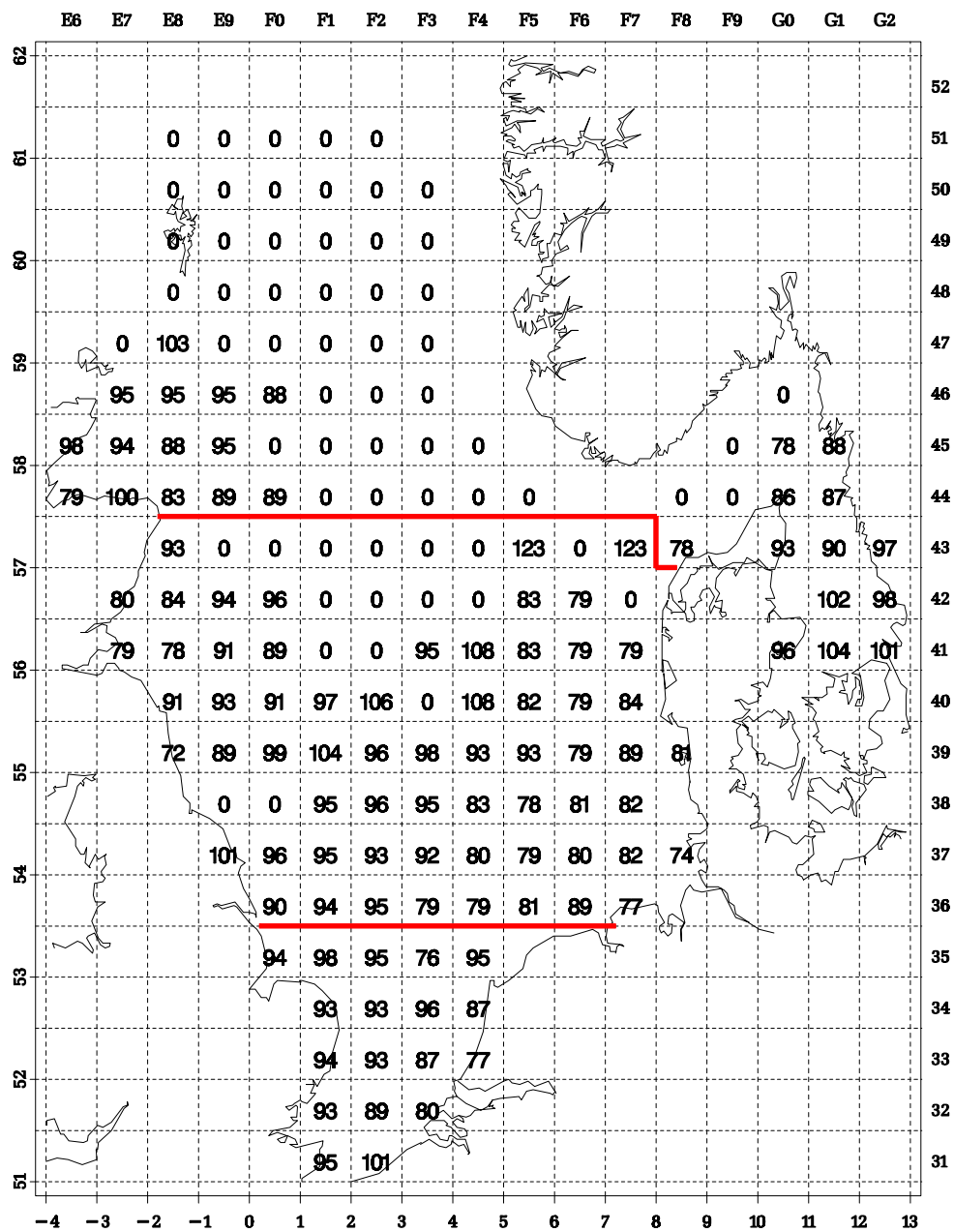


Figure 5.9. Sprat: mean length (mm), age 1

Mackerel, number per hour

Age group 1, 2000 quarter 1

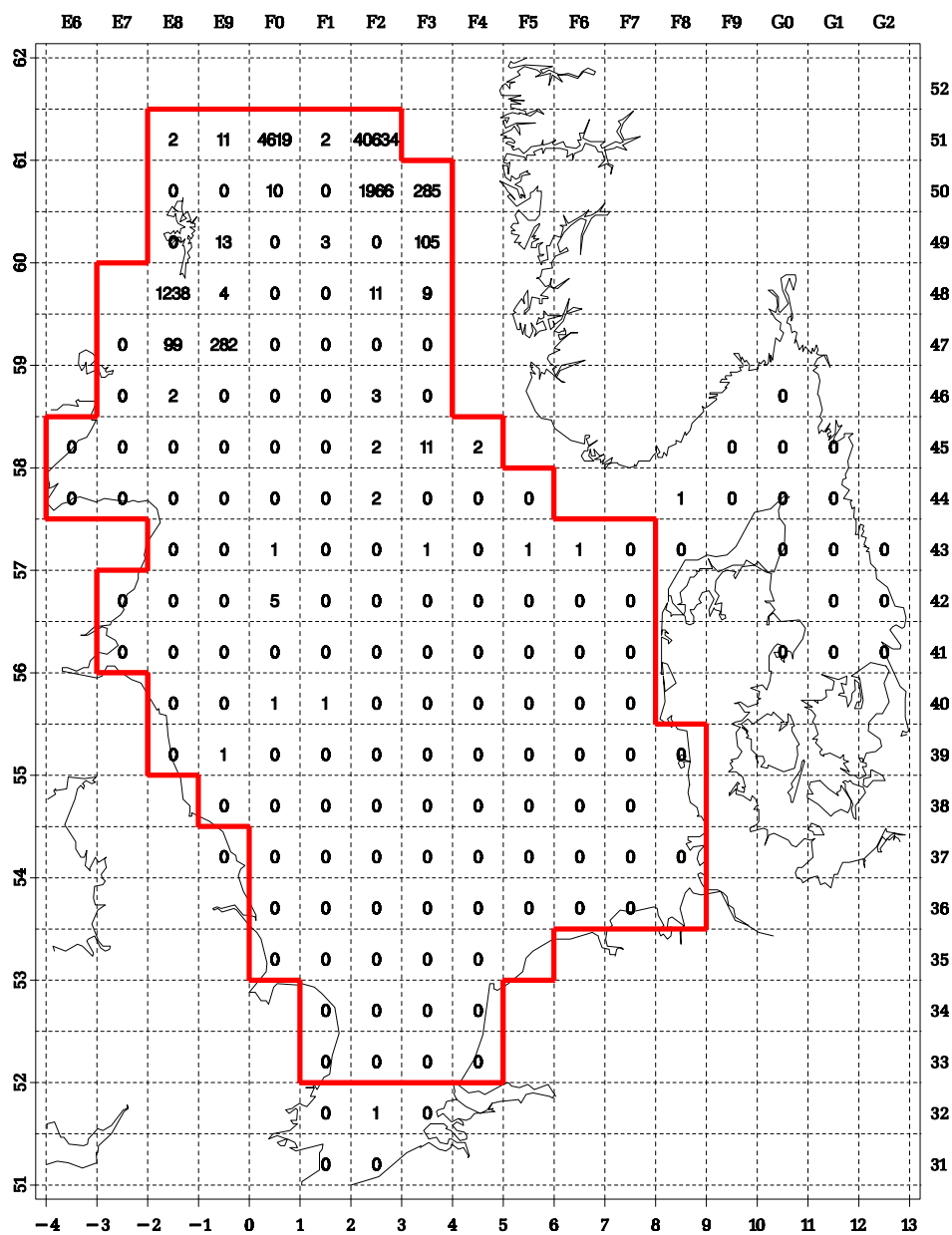


Figure 5.10 Mackerel: number per hour, age 1

Mackerel, number per hour

Age group 2, 2000 quarter 1

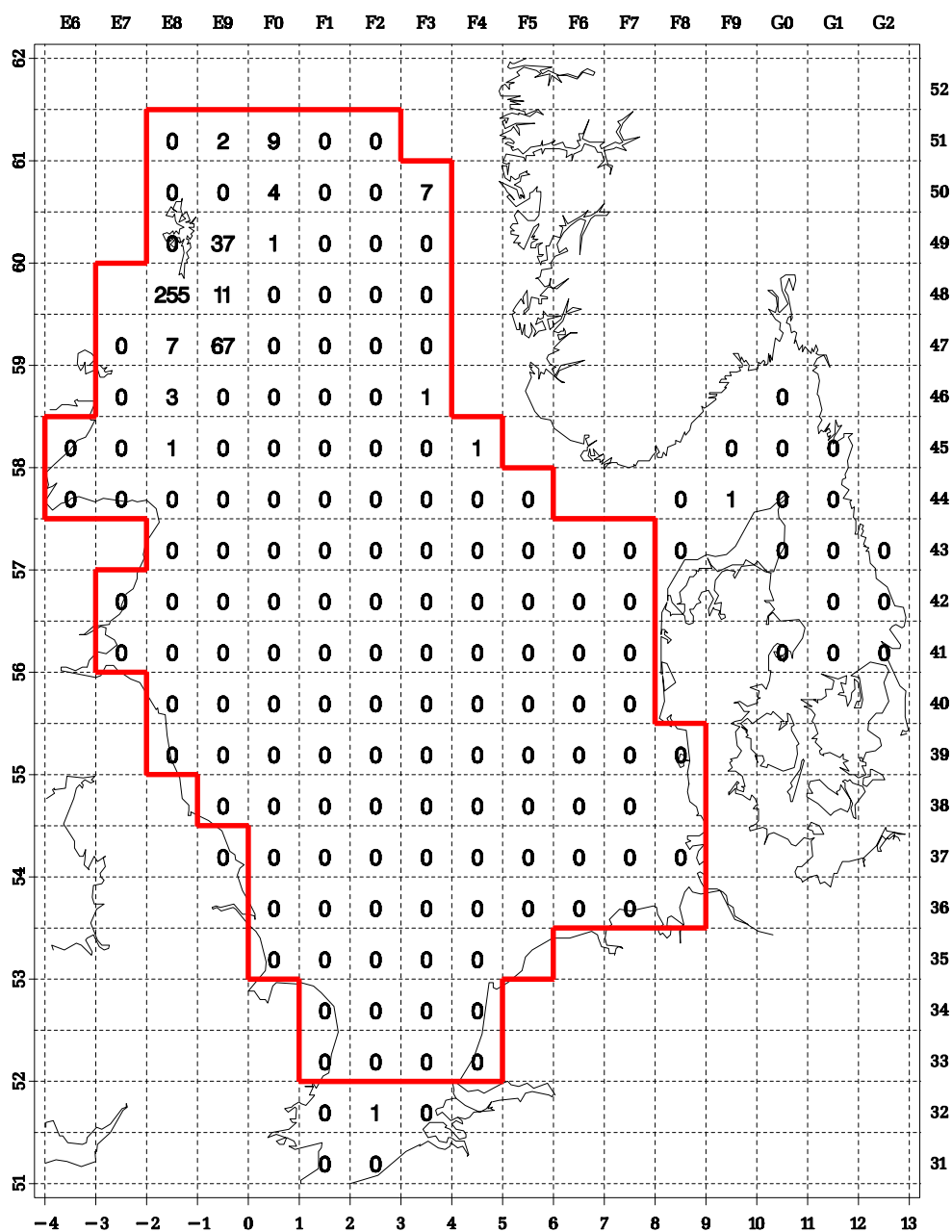


Figure 5.11 Mackerel: number per hour, age 2

Mackerel, number per hour

Age group 3, 2000 quarter 1

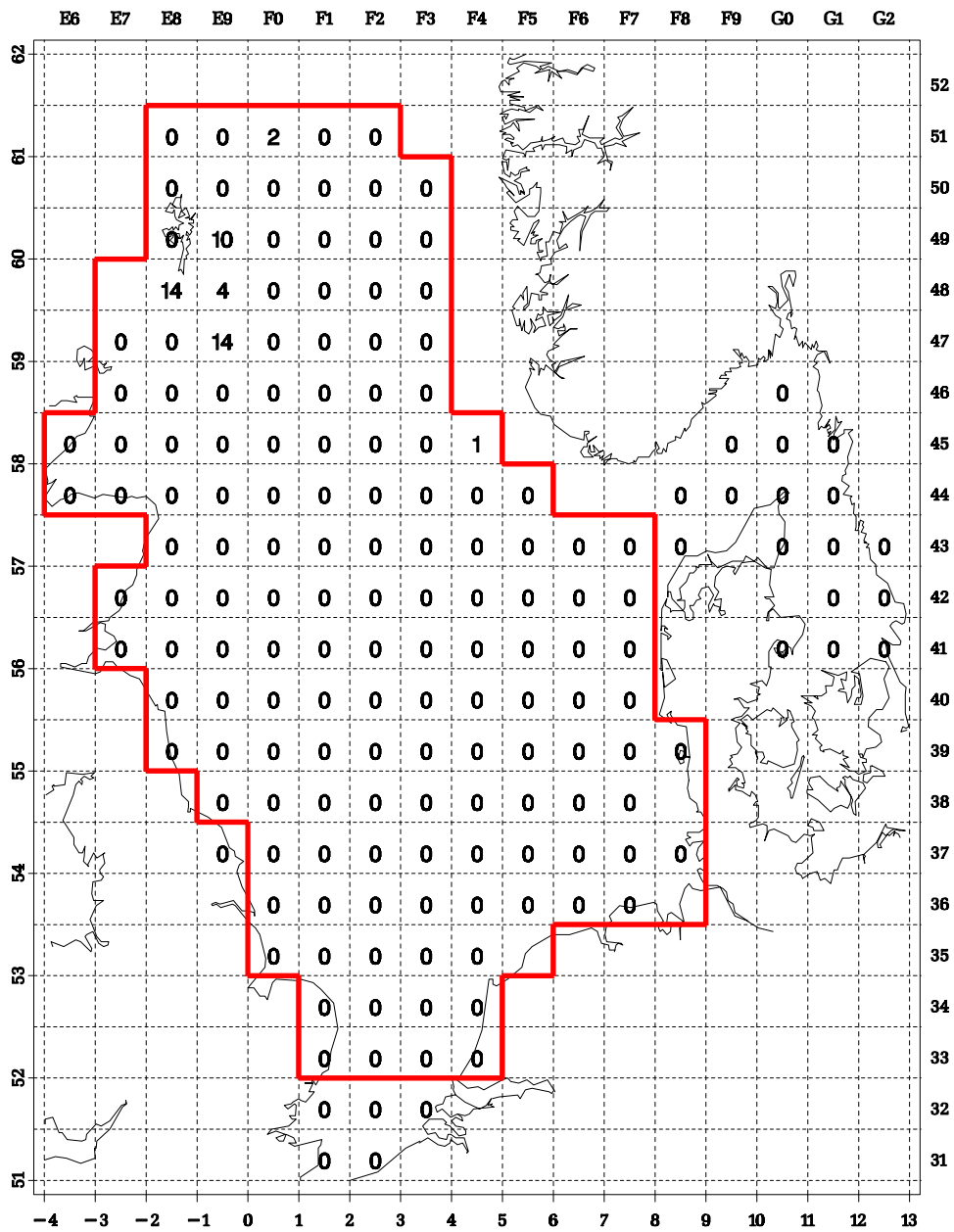


Figure 5.12 Mackerel: number per hour, age 3

Mackerel, mean length

Age group 1, 2000 quarter 1

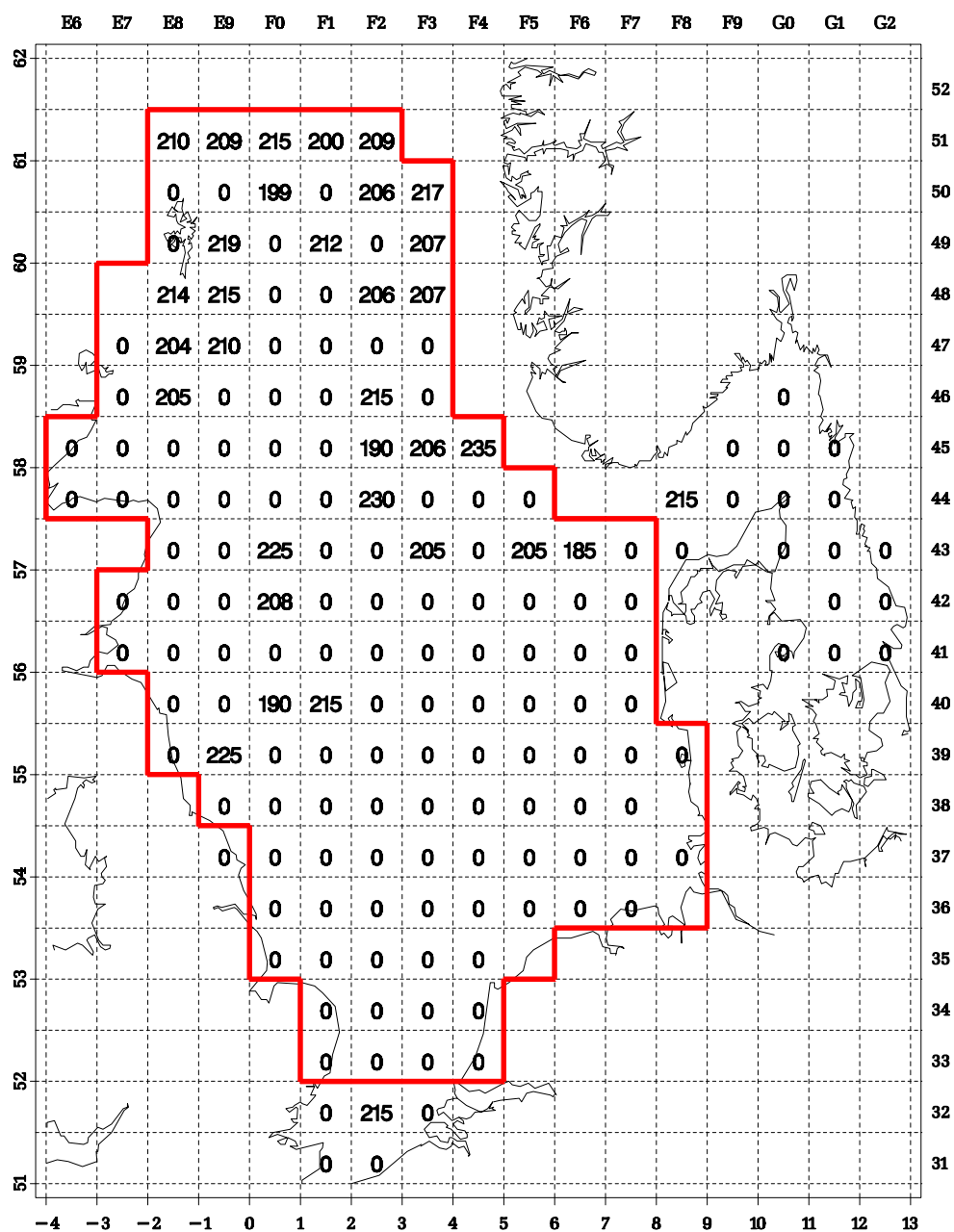


Figure 5.13 Mackerel: mean length (mm), age 1

Cod, number per hour

Age group 1, 2000 quarter 1

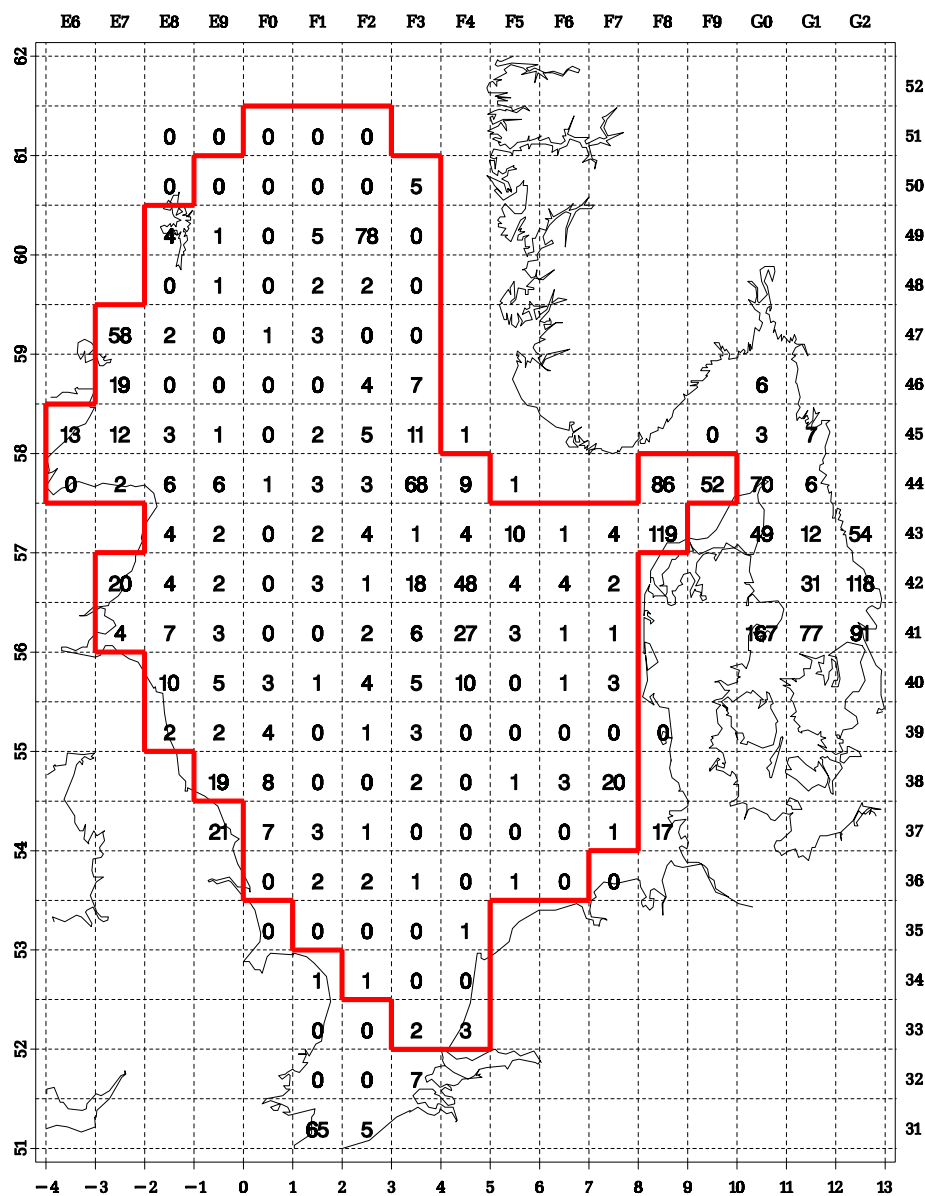


Figure 5.14 Cod: number per hour, age 1

Cod, number per hour Age group 2, 2000 quarter 1

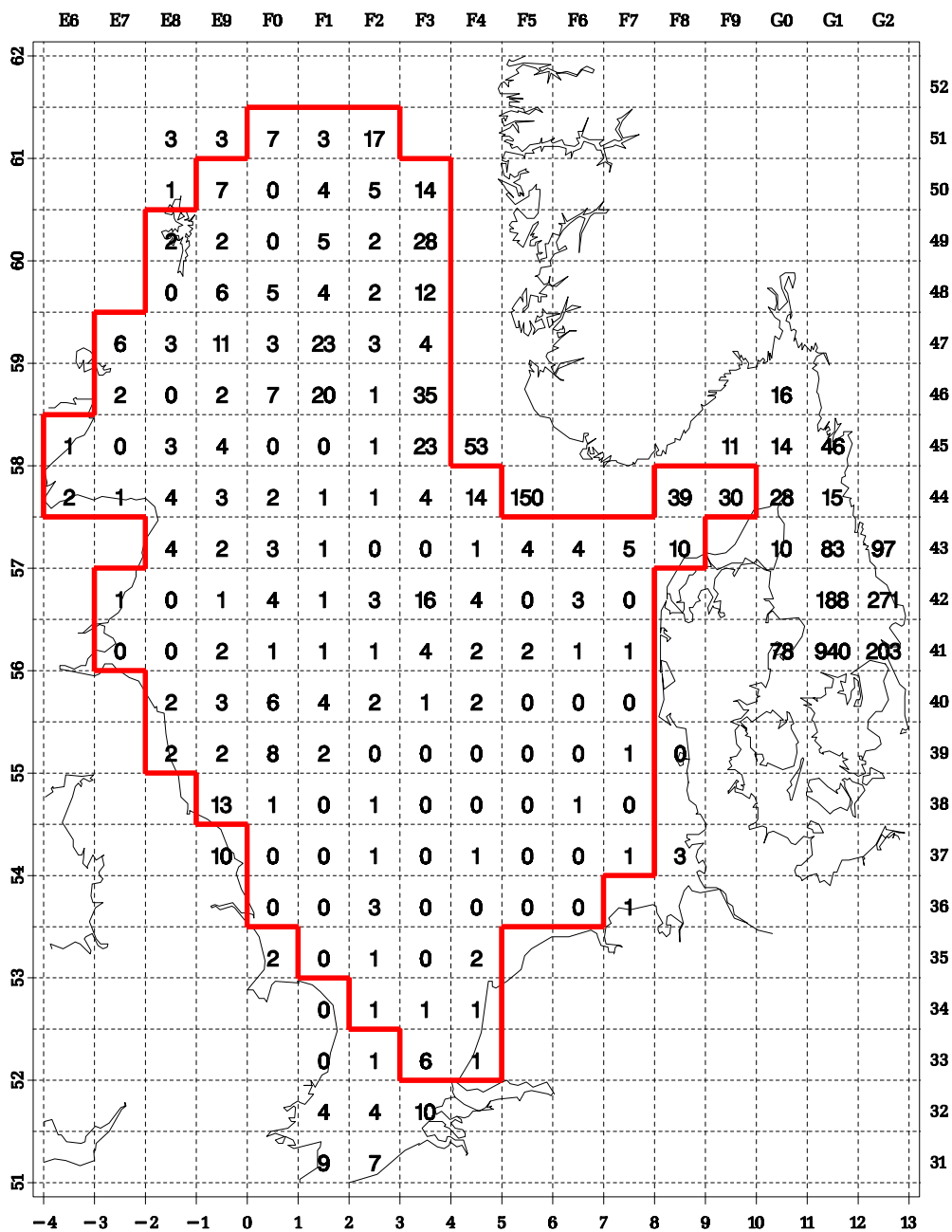


Figure 5.15 Cod: number per hour, age 2

Cod, number per hour Age group 3, 2000 quarter 1

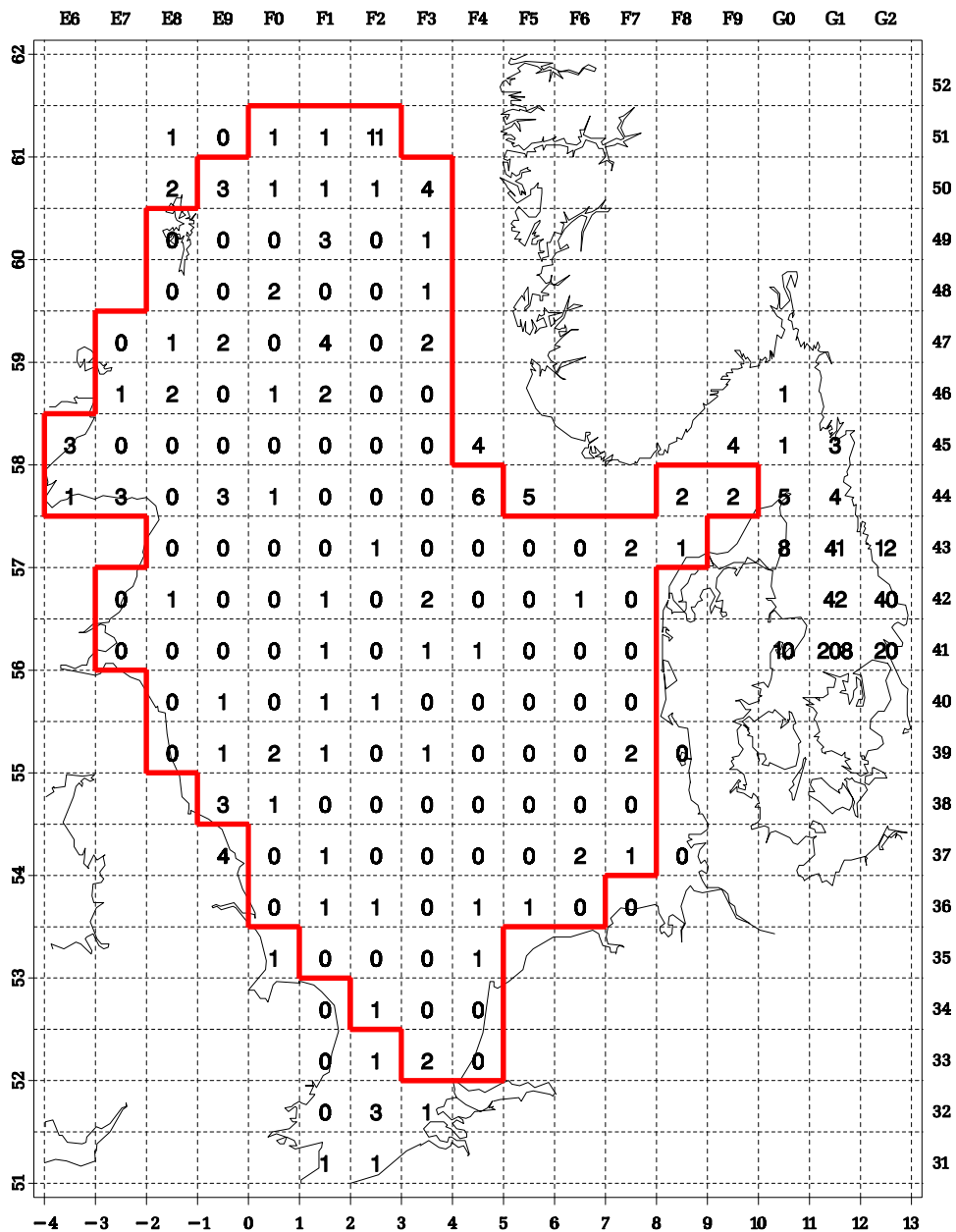


Figure 5.16 Cod: number per hour, age 3

Cod, mean length Age group 1, 2000 quarter 1

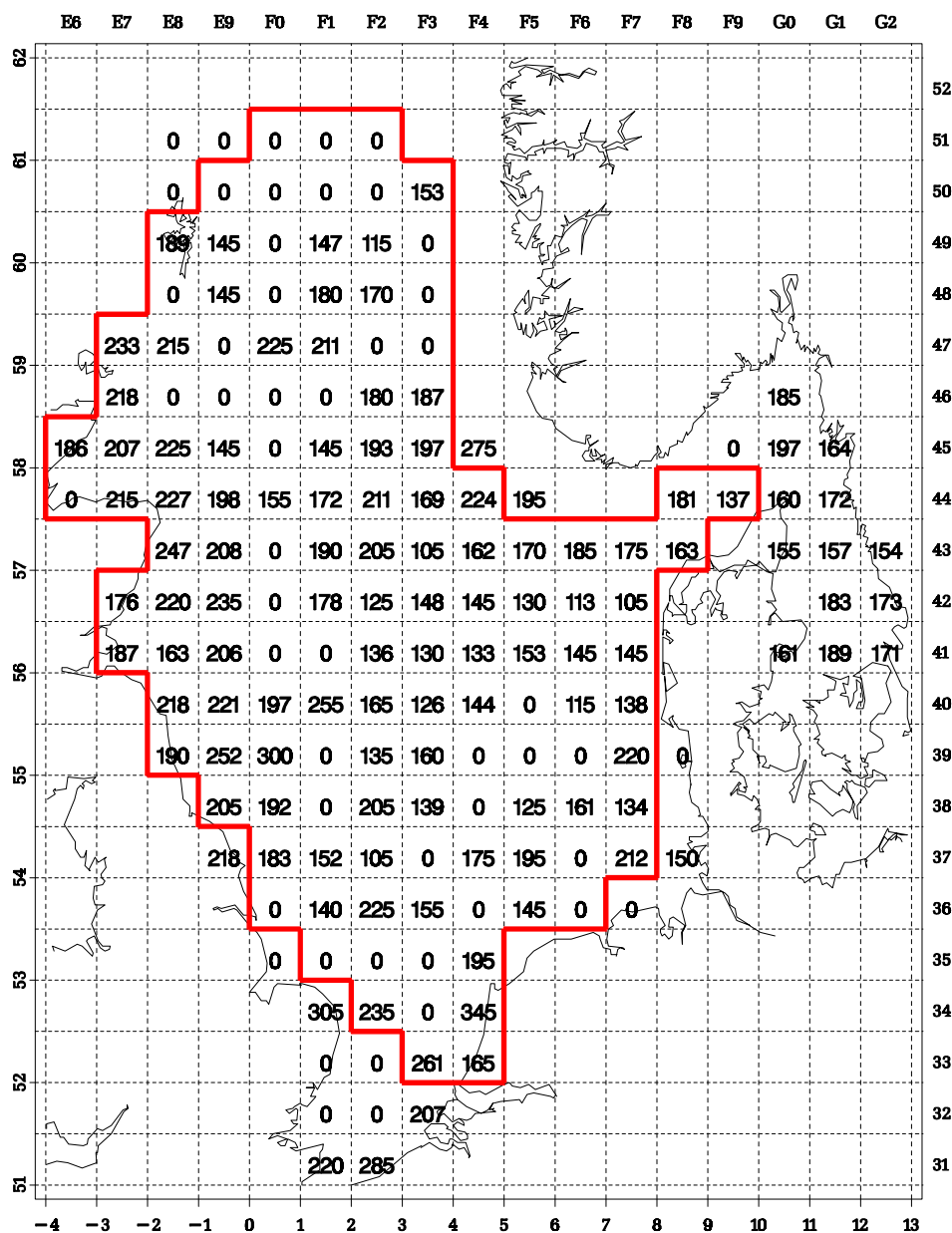


Figure 5.17 Cod, mean length (mm) age 1

Haddock, number per hour

Age group 1, 2000 quarter 1

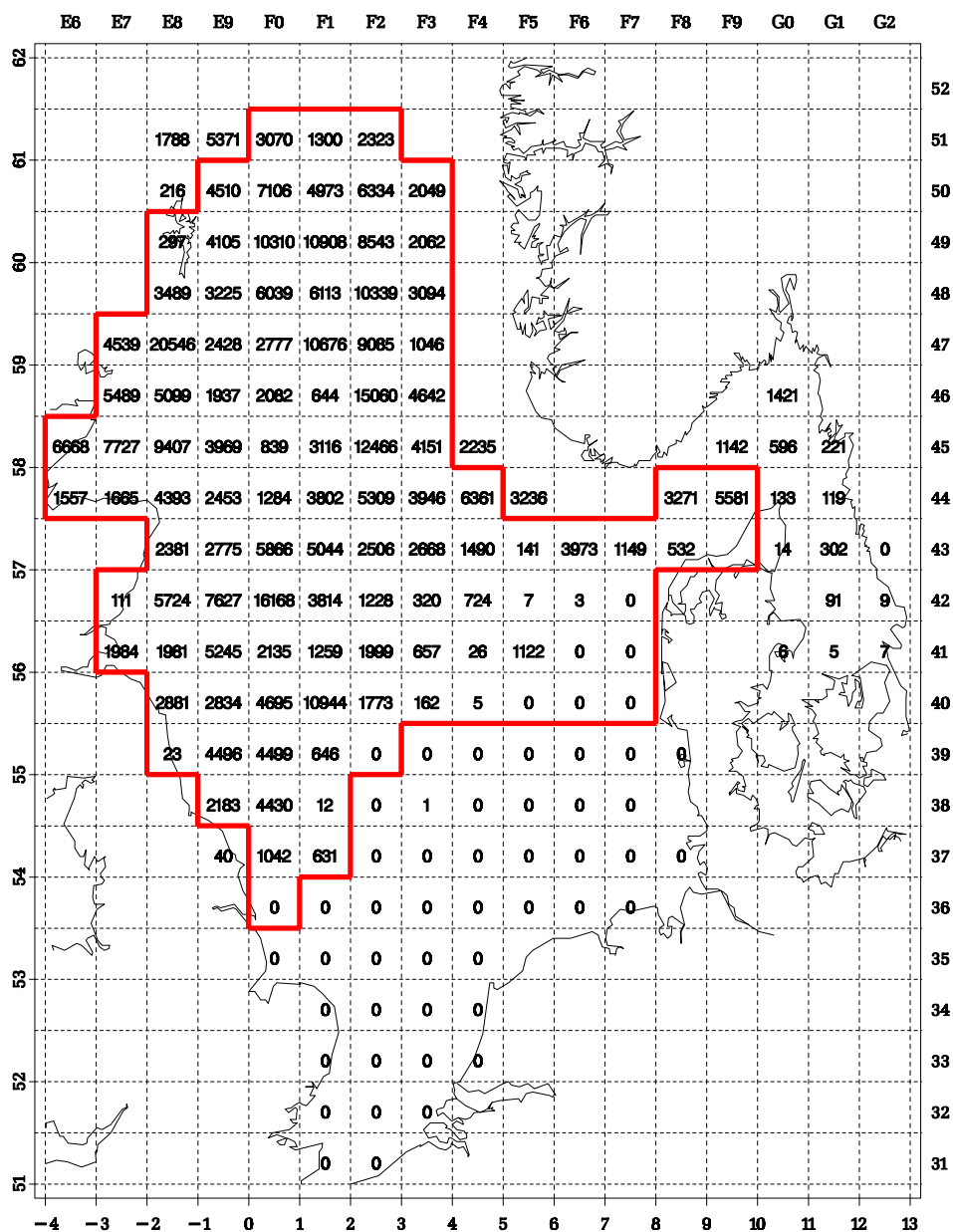


Figure 5.18 Haddock: number per hour, age 1

Haddock, number per hour Age group 2, 2000 quarter 1

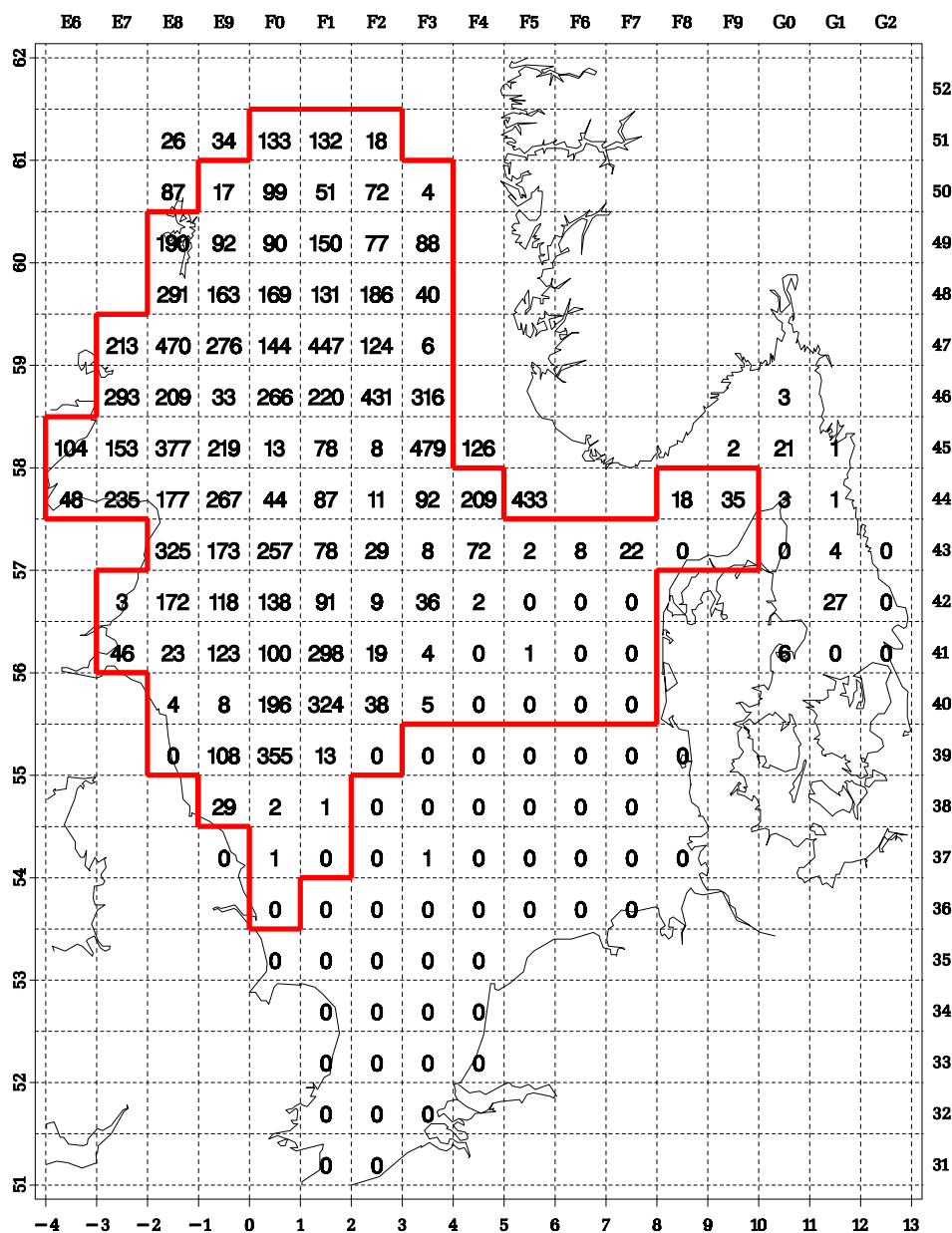


Figure 5.19 Haddock: number per hour, age 2

Haddock, number per hour

Age group 3, 2000 quarter 1

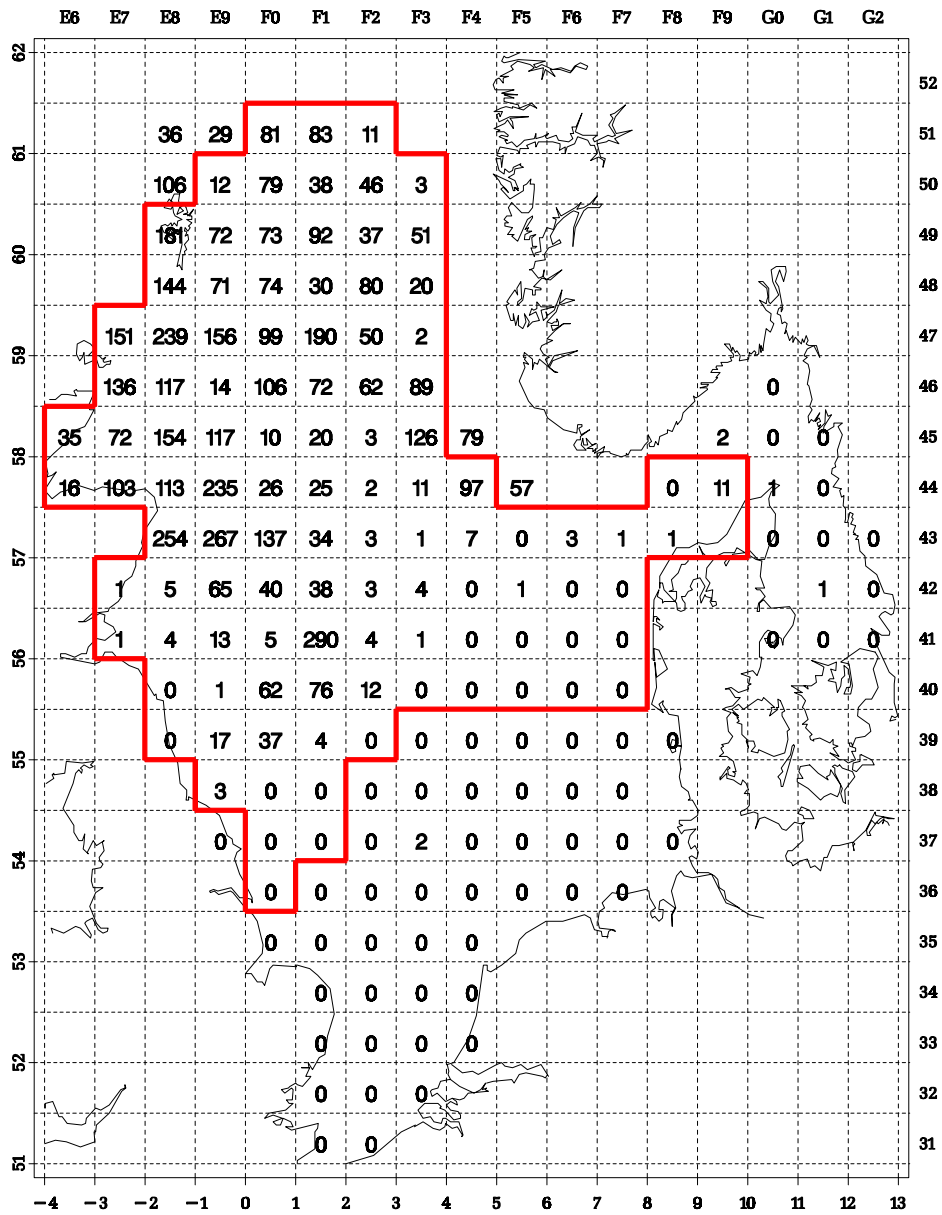


Figure 5.20 Haddock: number per hour, age 3

Haddock, mean length

Age group 1, 2000 quarter 1

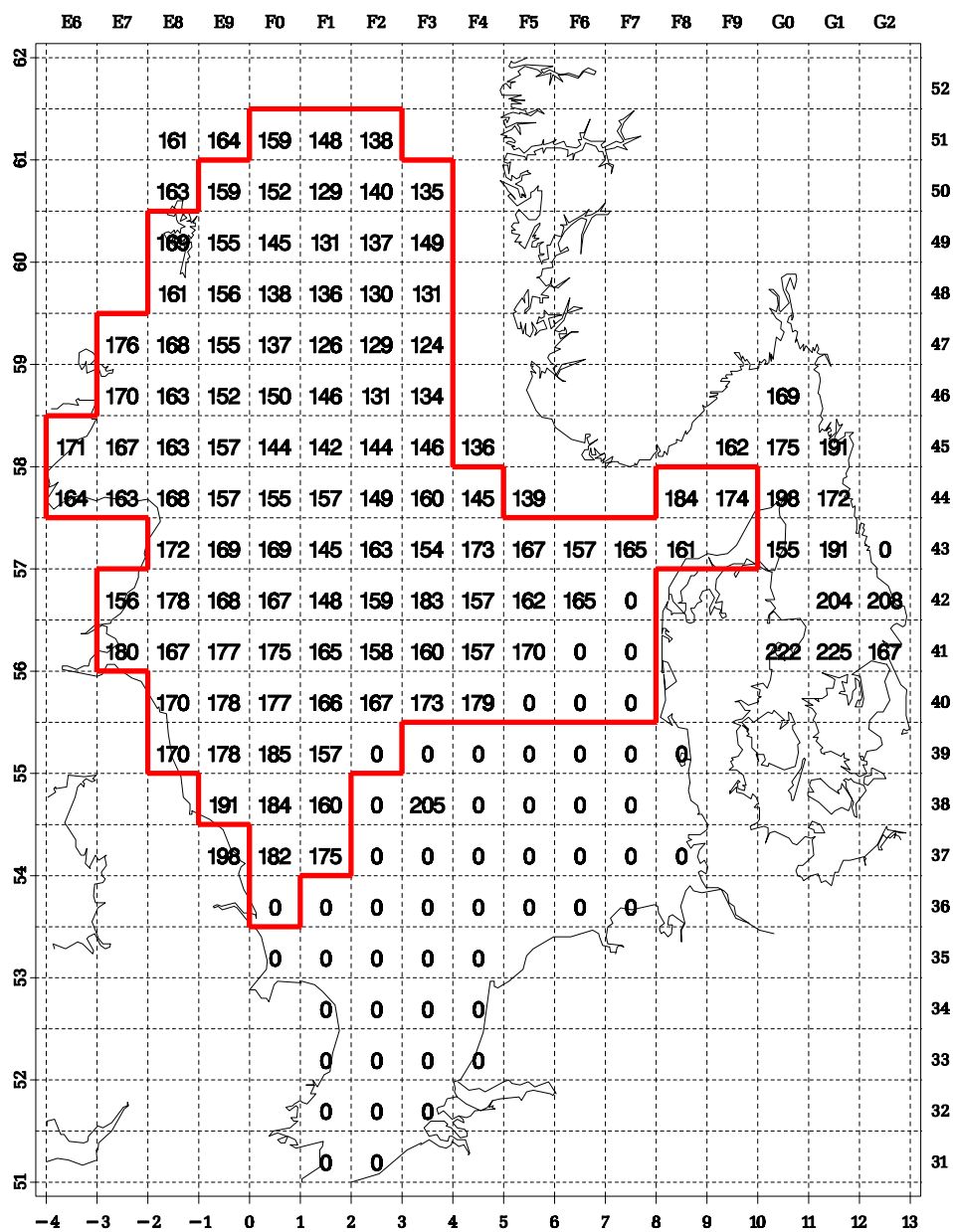


Figure 5.21 Haddock: mean length (mm), age 1

Whiting, number per hour

Age group 1, 2000 quarter 1

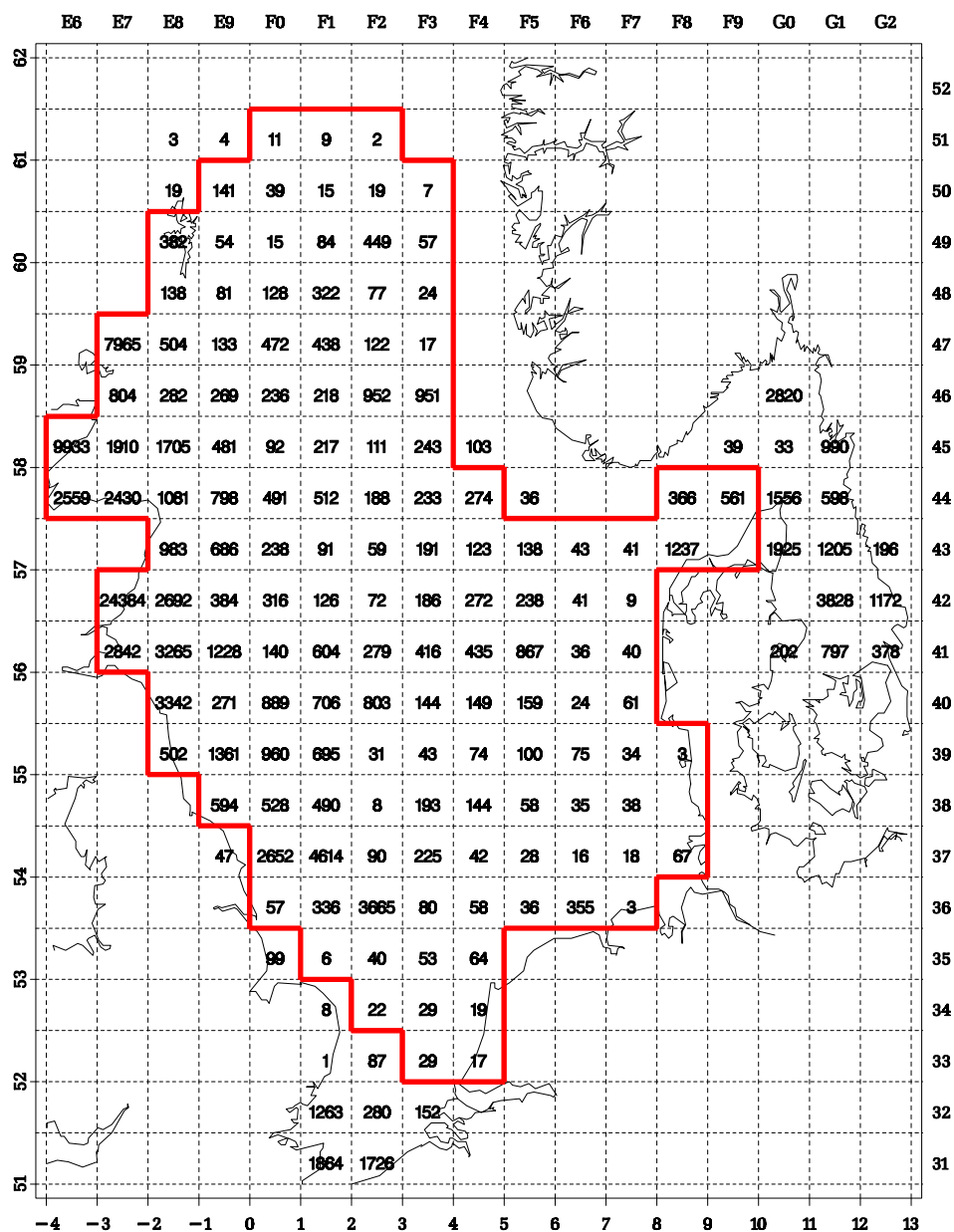


Figure 5.22 Whiting: number per hour, age 1

Whiting, number per hour

Age group 2, 2000 quarter 1

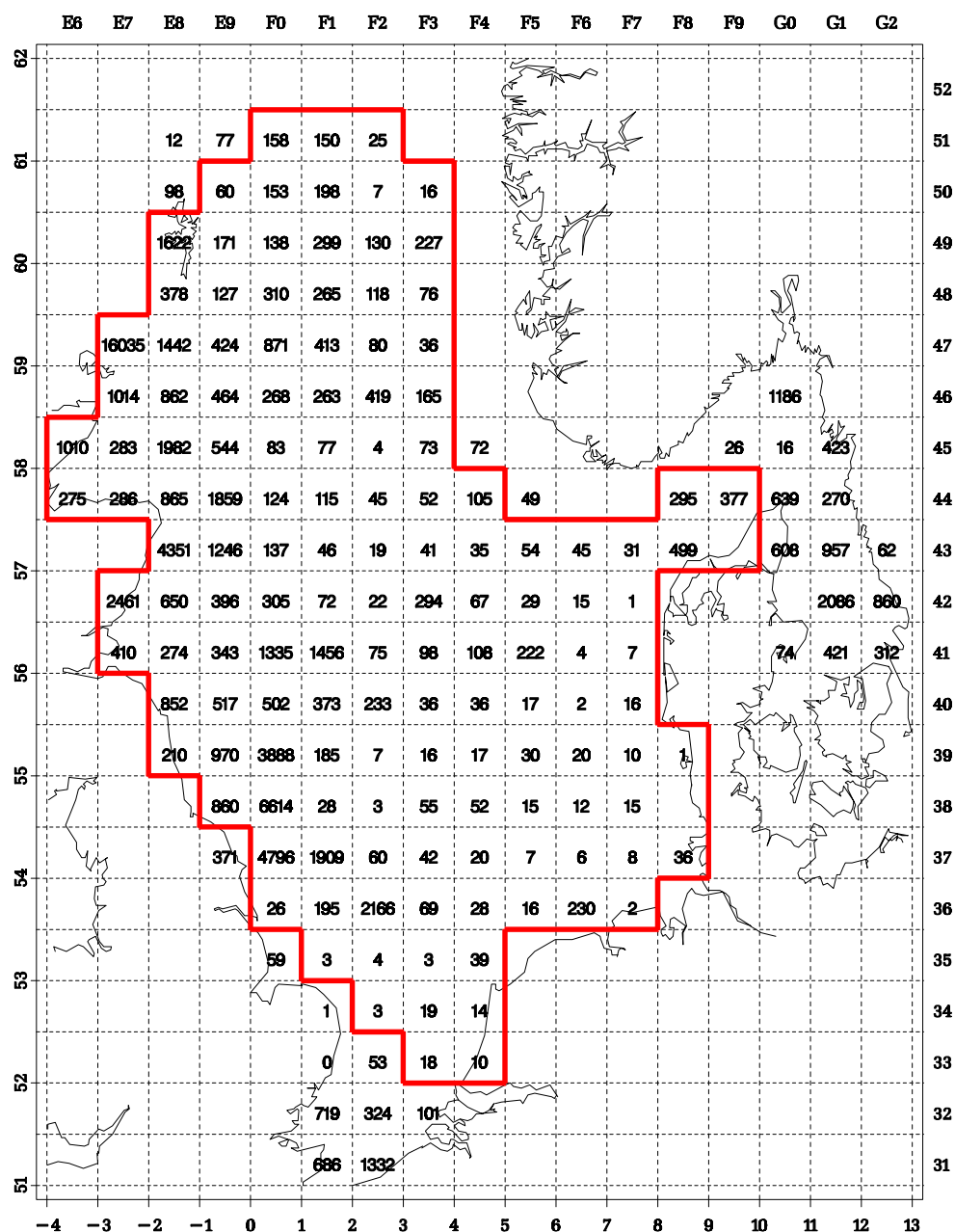


Figure 5.23 Whiting: number per hour, age 2

Whiting, number per hour

Age group 3, 2000 quarter 1

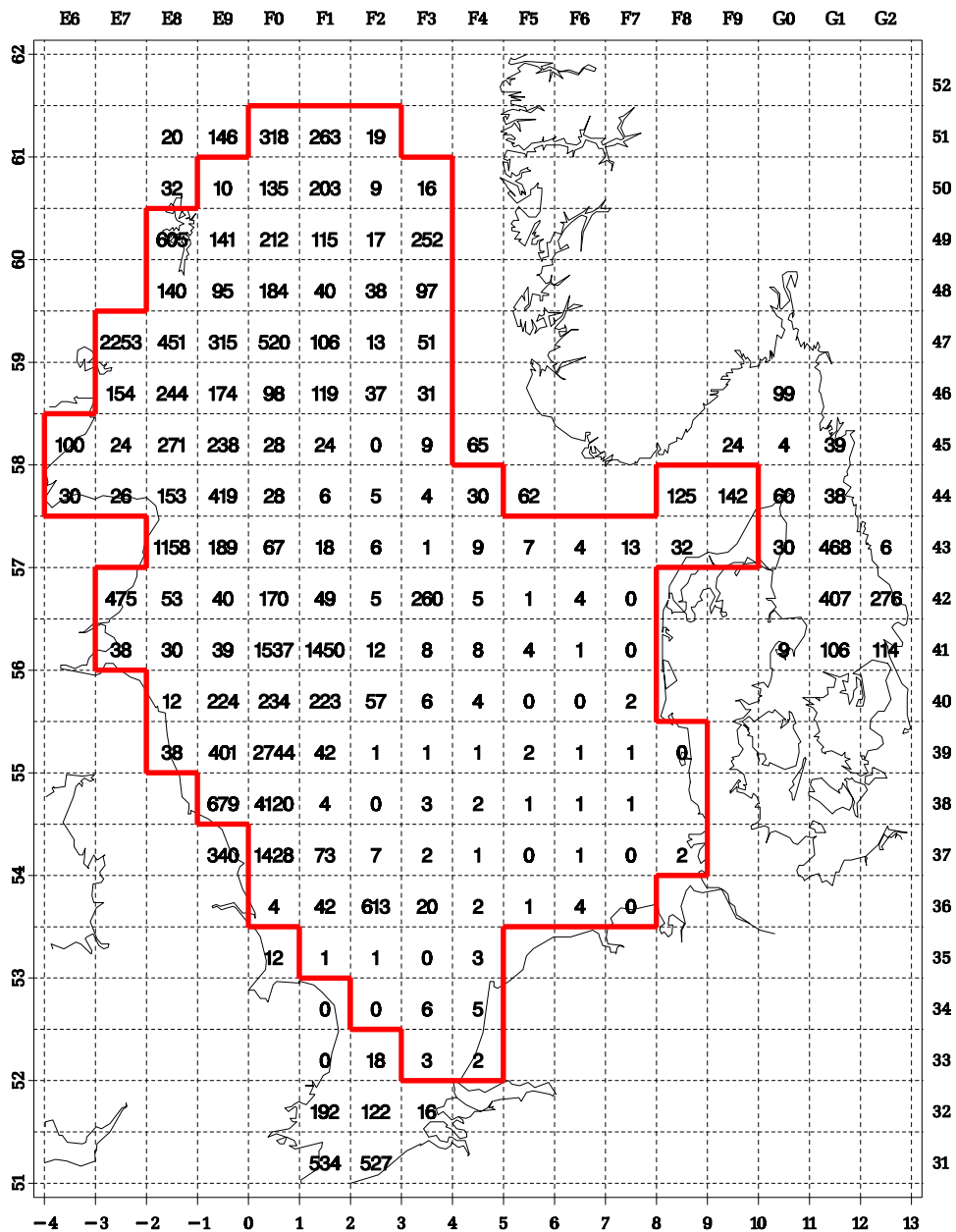


Figure 5.24 Whiting: number per hour, age 3

Whiting, mean length Age group 1, 2000 quarter 1

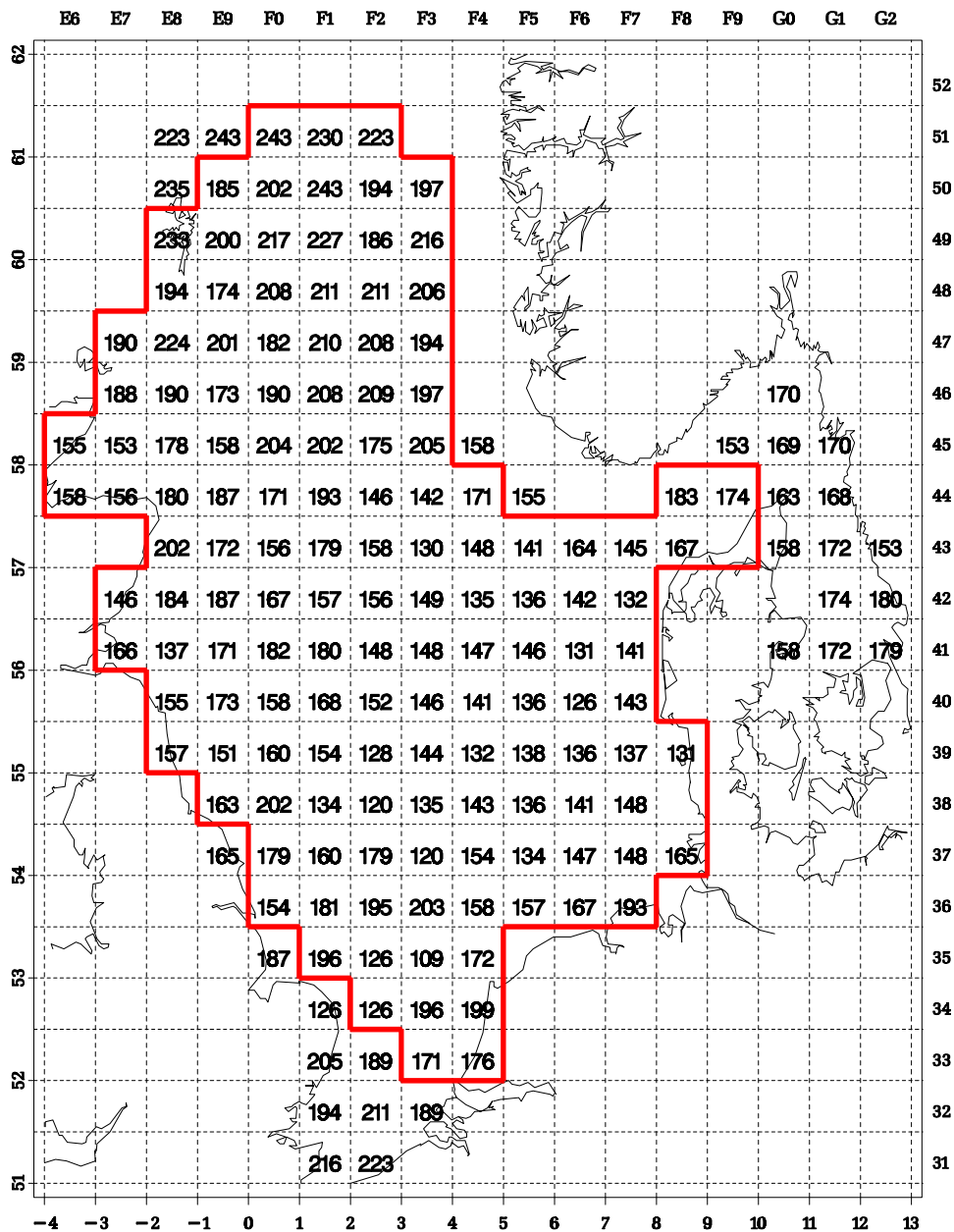


Figure 5.25 Whiting: mean length (mm), age 1

Saithe, number per hour

Age group 1, 2000 quarter 1

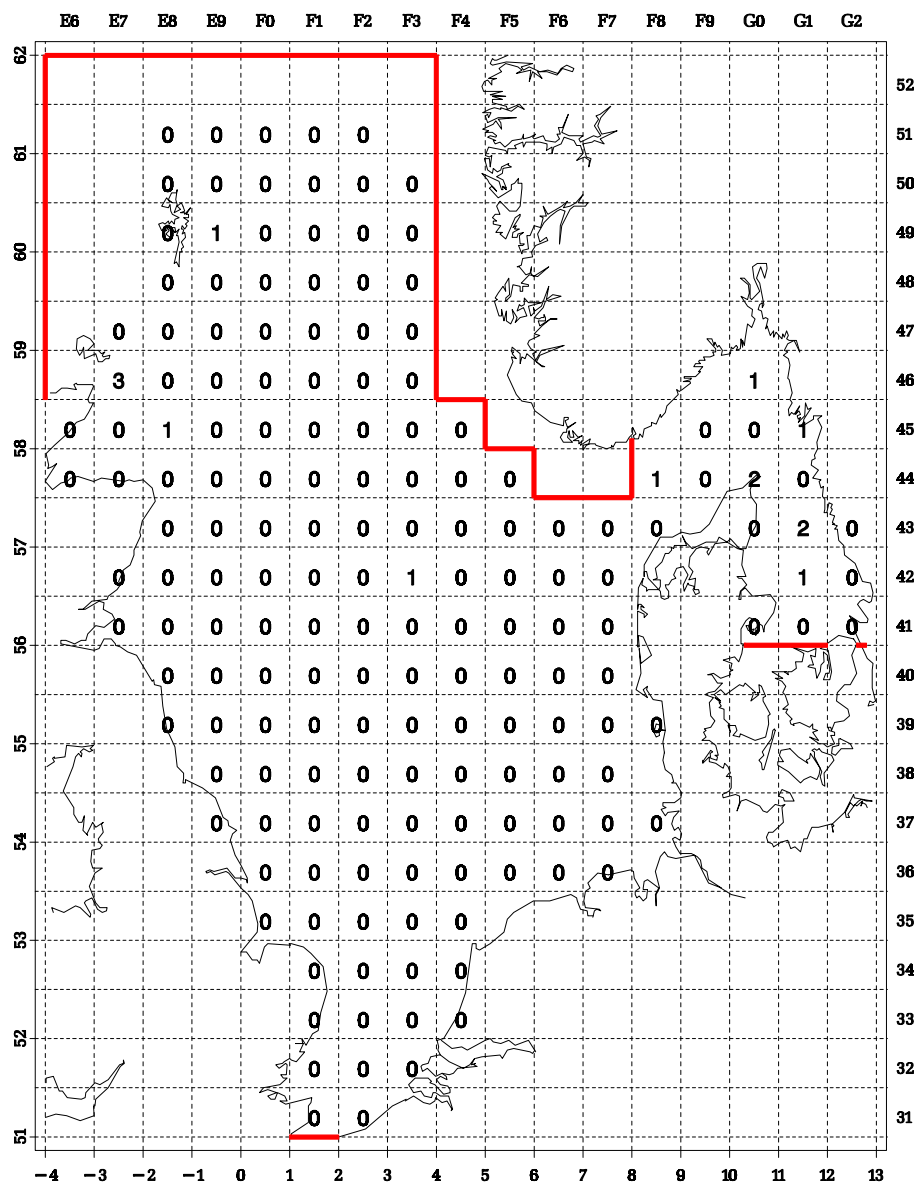


Figure 5.26 Saithe: number per hour, age 1

Saithe, number per hour Age group 2, 2000 quarter 1

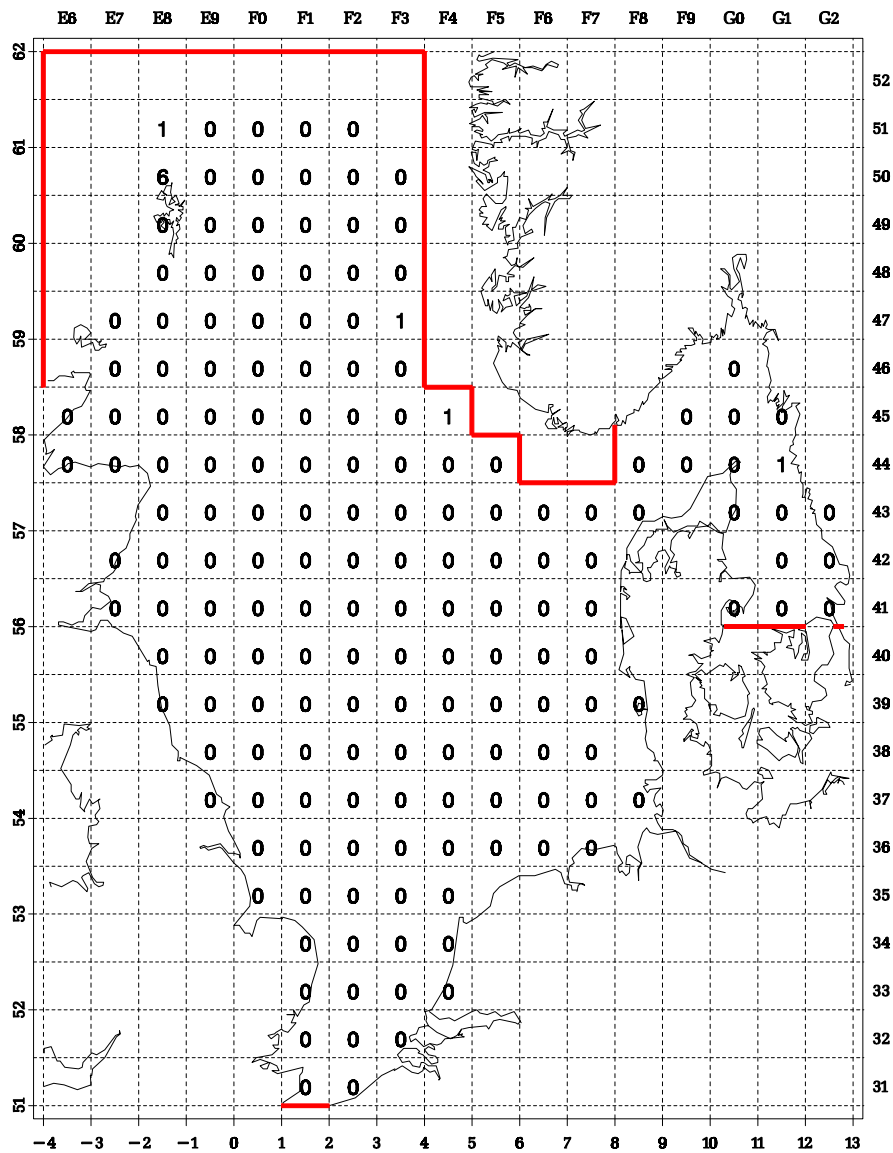


Figure 5.27 Saithe: number per hour, age 2

Saithe, number per hour

Age group 3, 2000 quarter 1

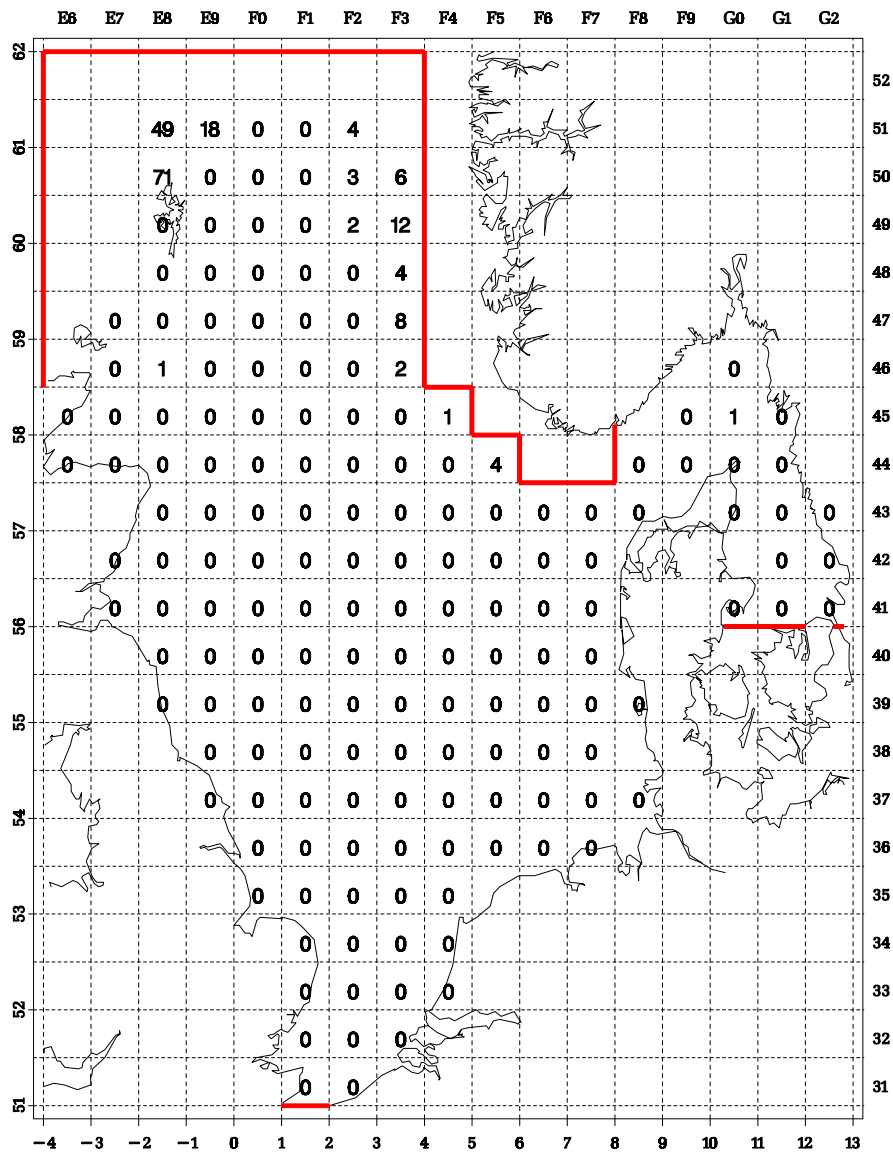


Figure 5.28 Saithe: number per hour, age 3

Saithe, mean length

Age group 1, 2000 quarter 1

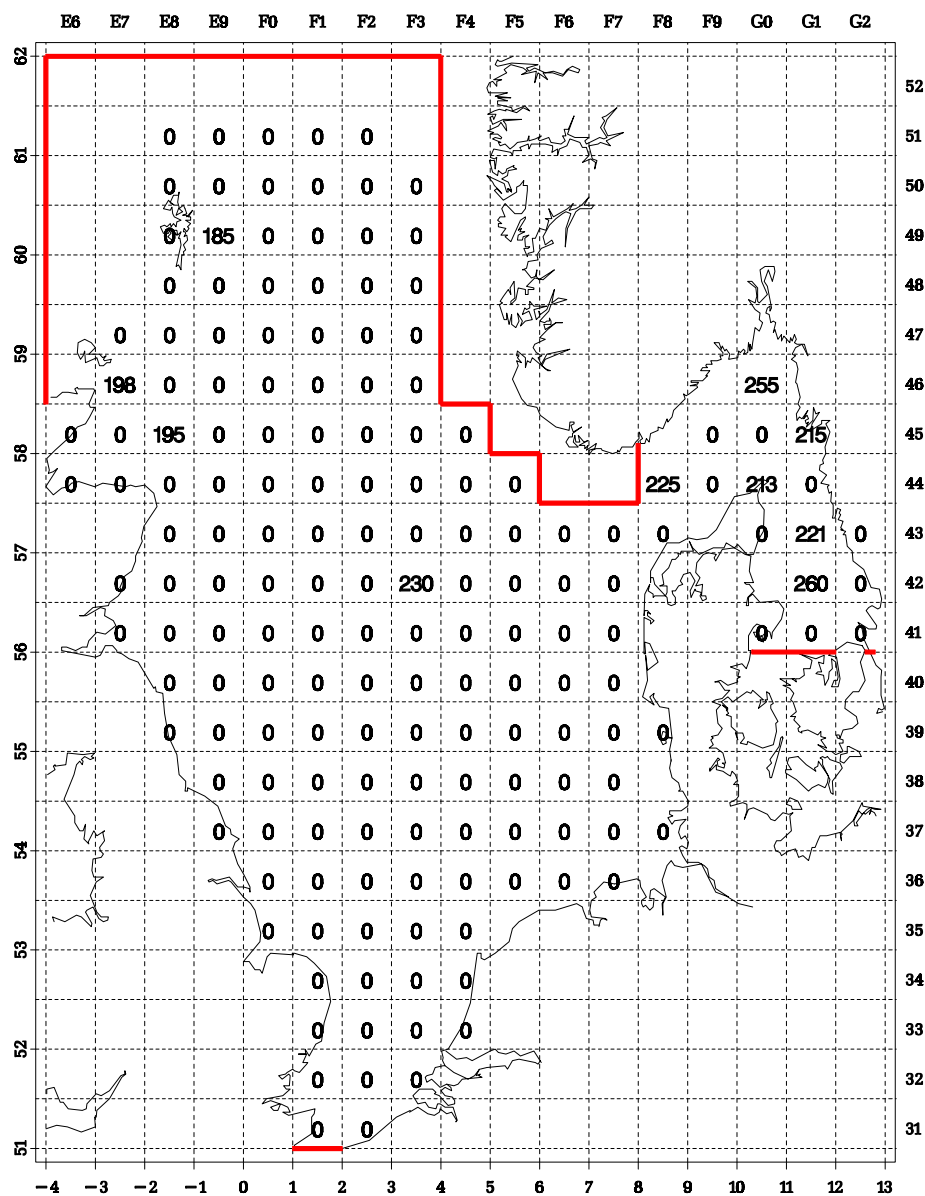


Figure 5.29 Saithe: mean length (mm), age 1

Norway pout, number per hour

Age group 1, 2000 quarter 1

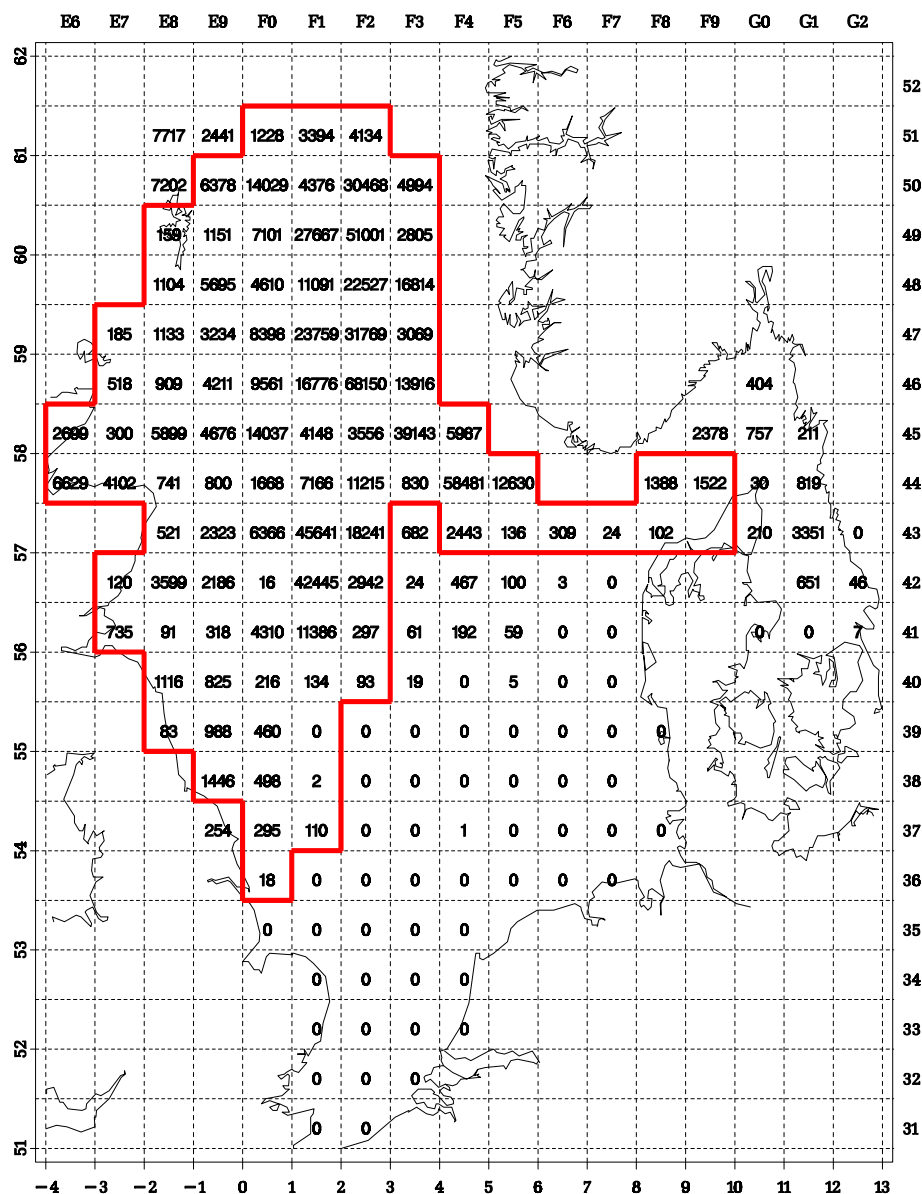


Figure 5.30 Norway pout: number per hour, age 1

Norway pout, number per hour

Age group 2, 2000 quarter 1

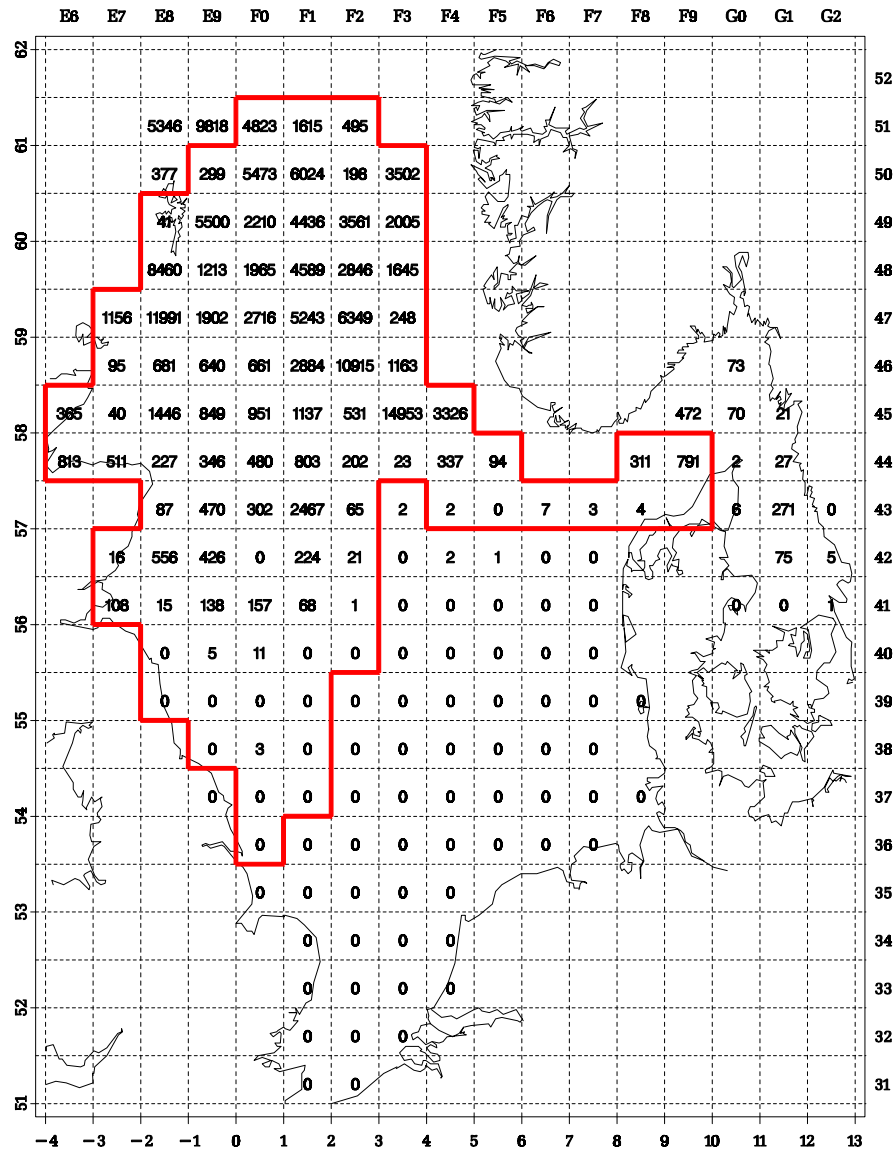


Figure 5.31 Norway pout: number per hour, age 2

Norway pout, number per hour Age group 3, 2000 quarter 1

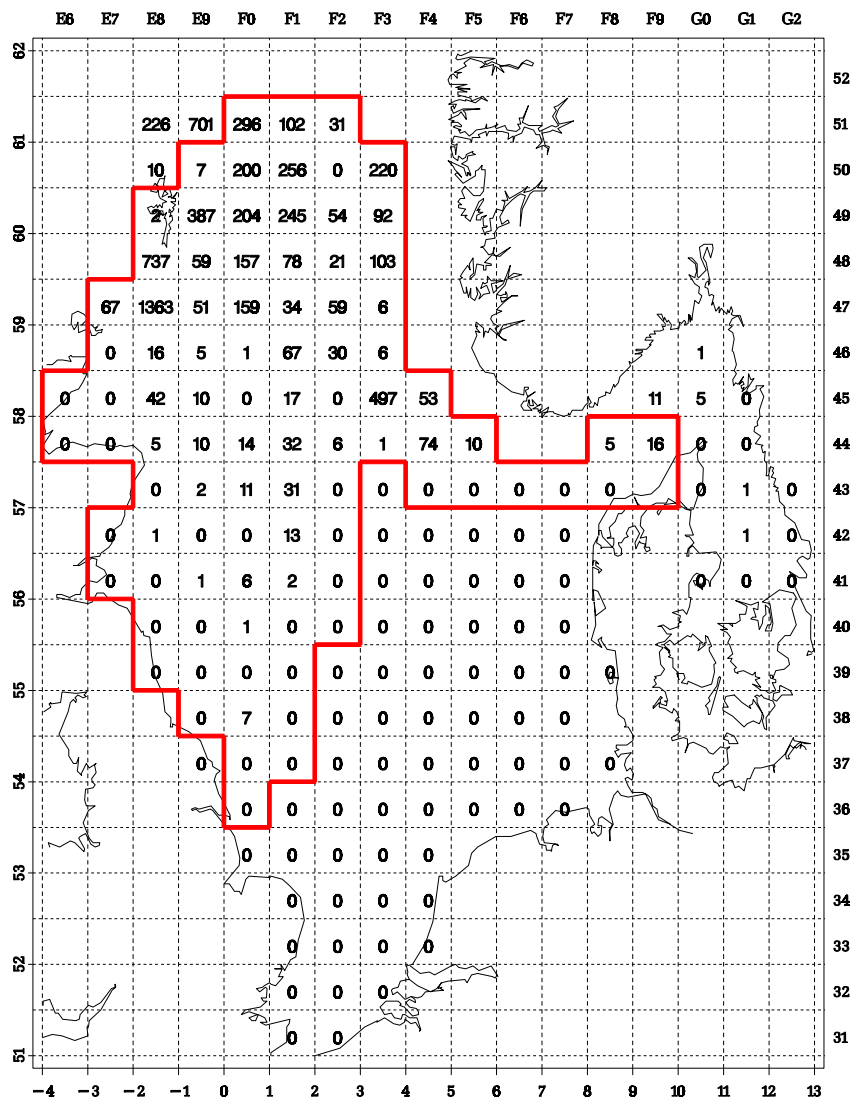


Figure 5.32 Norway pout: number per hour, age 3

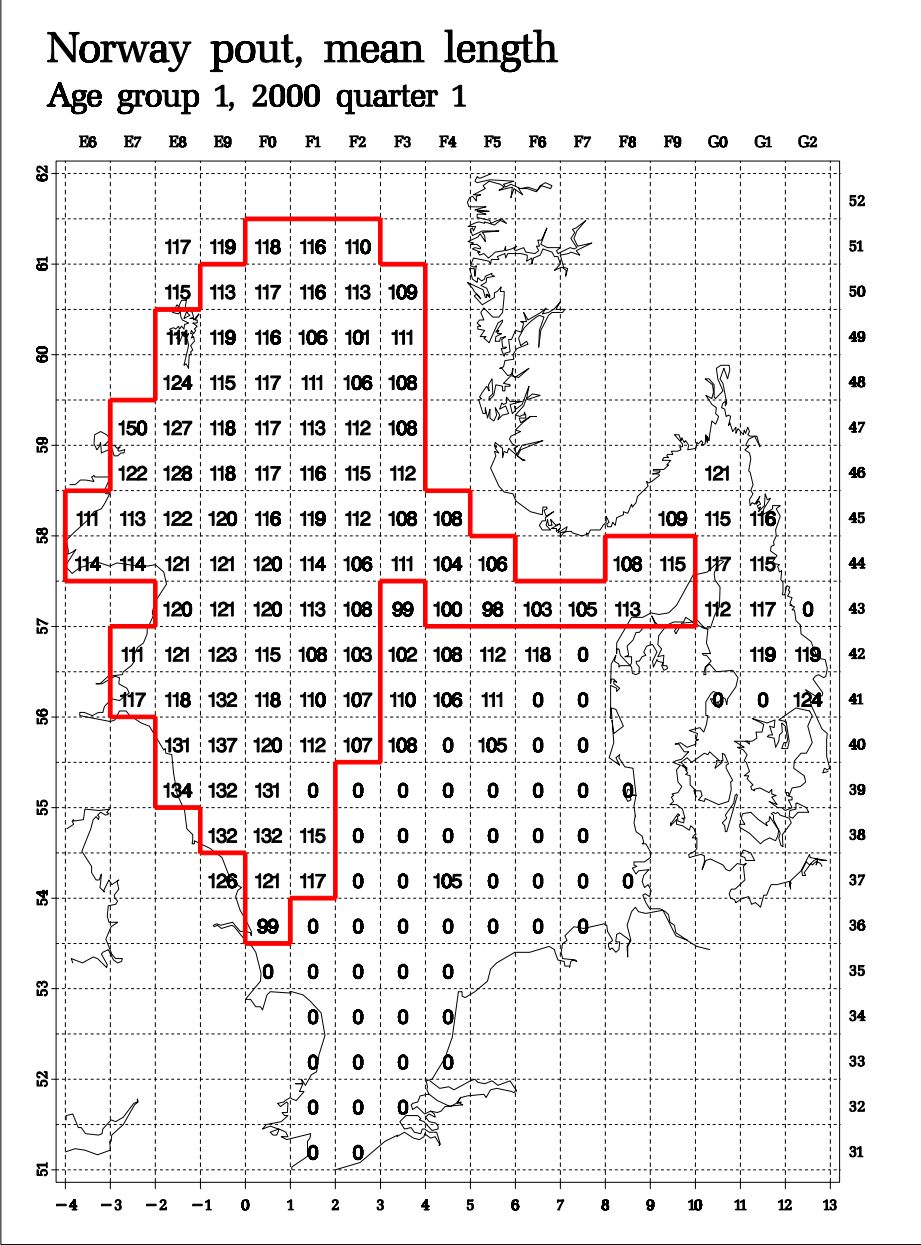


Figure 5.33 Norway pout: mean length (mm), age 1

Herring

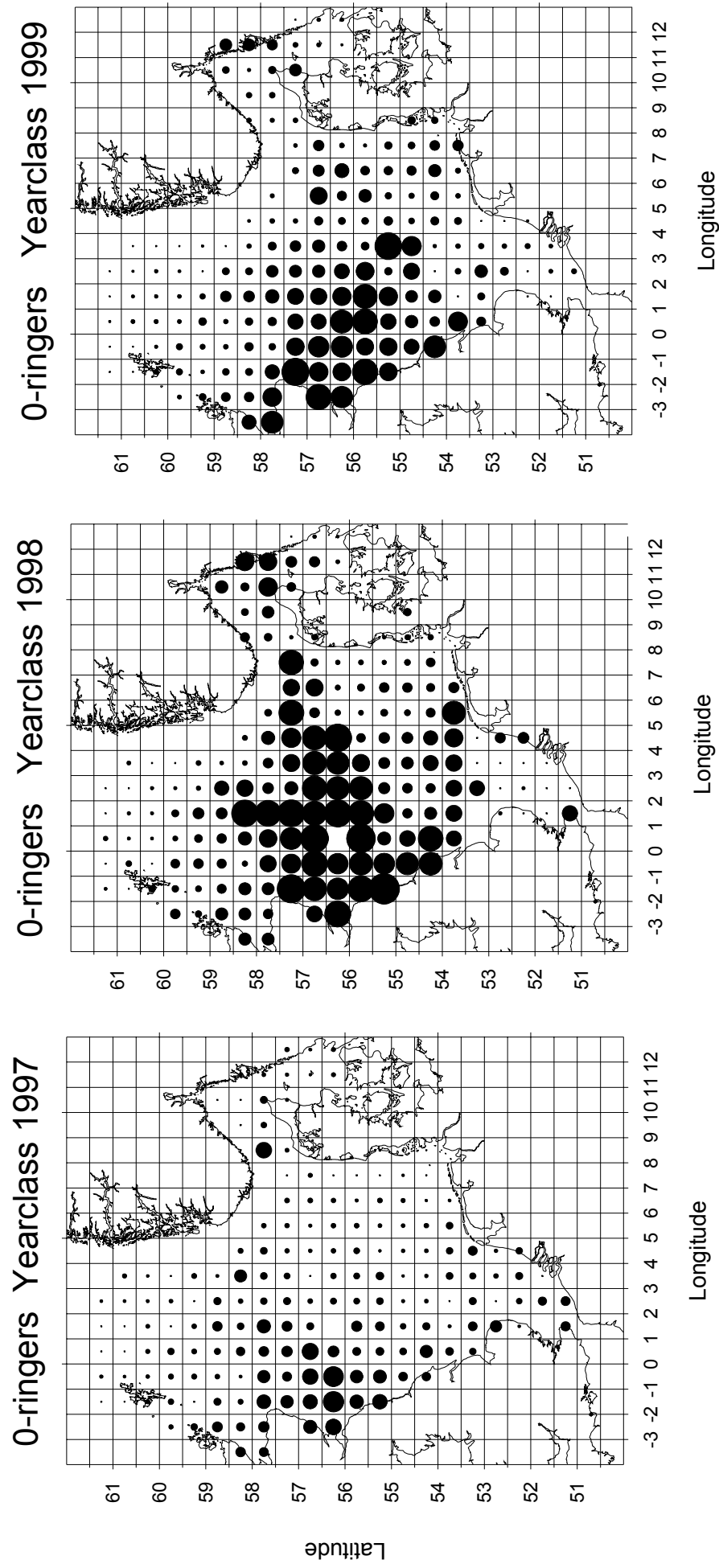


Figure 6.1 Distribution of 0-ringer herring, year classes 1997-1999. Abundance estimates of 0-ringers within each statistical rectangle are based on MIK catches during IBTS in February. Areas of filled circles illustrate density in no m⁻², the area of a circle extending to the border of a rectangle represents 1 m²

Figure 6.2. North Sea herring. Regression between the MIK 0-ringer index and the IBTS 1-ringer indices for year classes 1977 to 1998. Numbers in symbols indicate year class

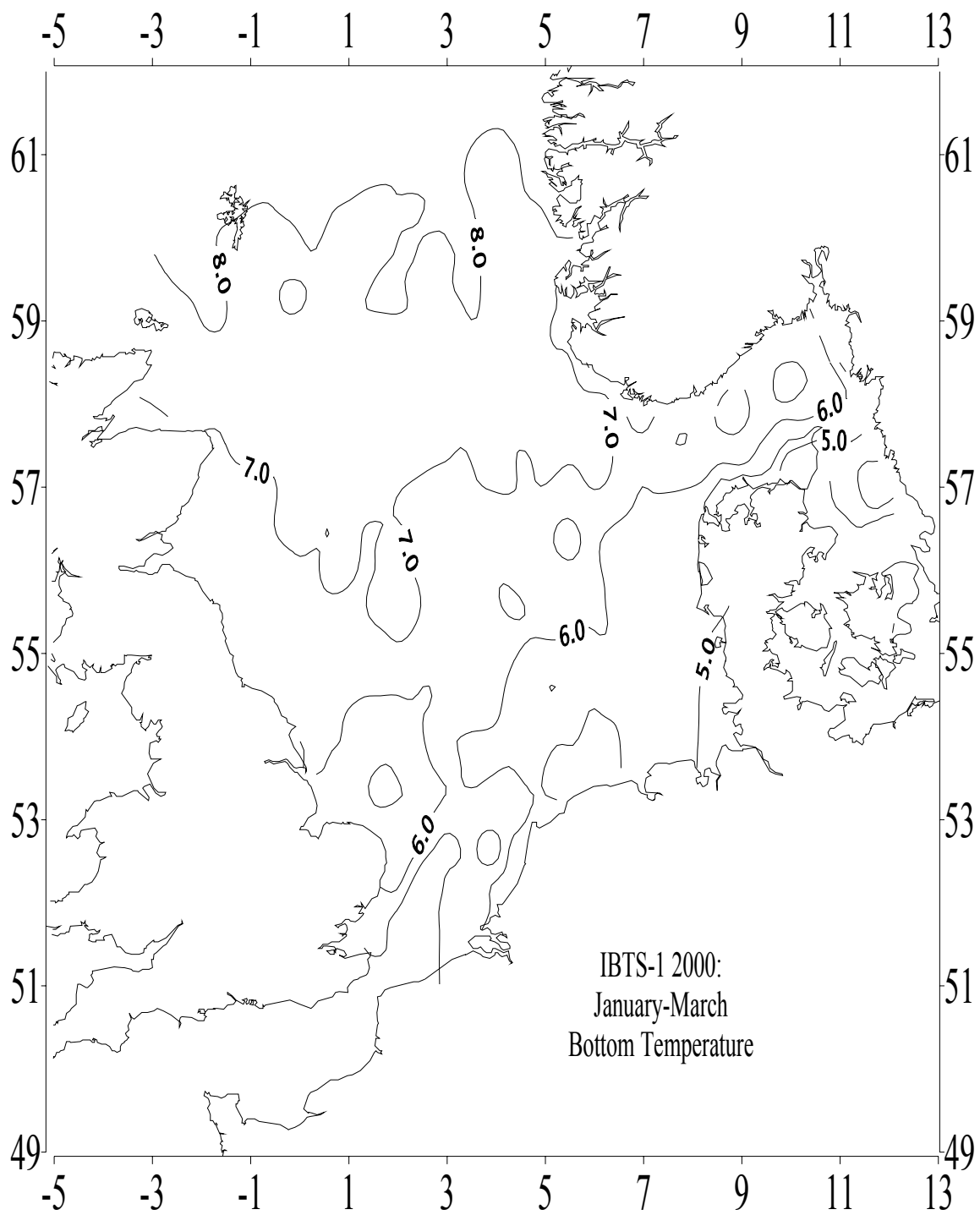


Figure 7.1

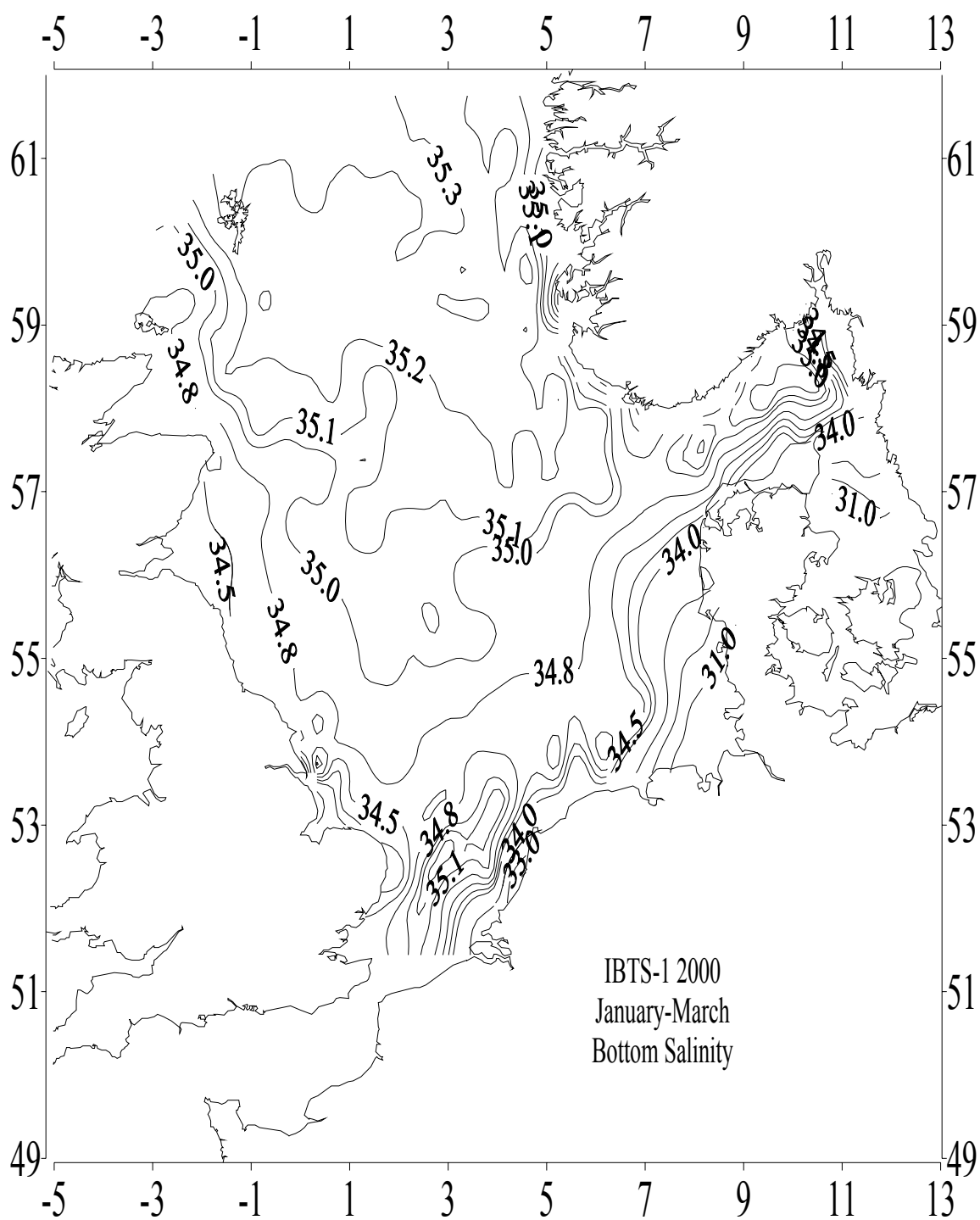


Figure 7.2

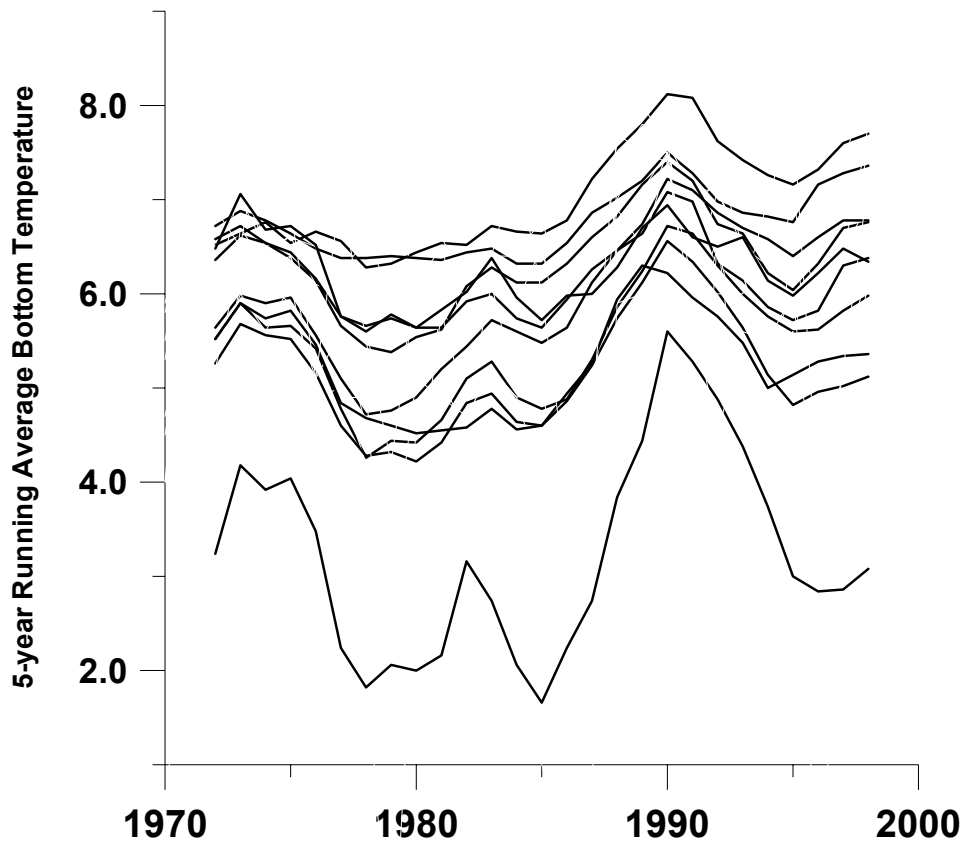


Figure 7.3 Five-Year averages of temperature at each of the ten locations in Table 7.1

REPORT OF THE
**INTERNATIONAL BOTTOM TRAWL SURVEY IN THE NORTH
SEA, SKAGERRAK AND KATTEGAT IN 2000: QUARTER 3**

The International Bottom Trawl Survey Working Group

This report is not to be quoted without prior consultation with the General Secretary. The document is a report of an expert group under the auspices of the International Council for the Exploration of the Sea and does not necessarily represent the views of the Council.

International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

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1 INTRODUCTION

This report presents the final results for the International Bottom Trawl Survey (IBTS) in the third quarter of 2000. 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. During a meeting of this Working Group in November 1995 (ICES 1996/H:1a) early analyses of the data indicated the potential usefulness of quarterly surveys and it was decided to encourage their continuation. These quarterly surveys have been carried out in all four quarters in the period 1991-1997, but since 1998 only the 1st and the 3rd quarters have been covered.

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*), as well as the catches of herring larvae. 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 Manual (ICES 1999/D:2 Addendum). Details on the participation in the 2000 3q survey are given below as numbers of valid haul. The whole survey area has been covered as planned.

Country and Vessel		From	To	GOV	MIK
Denmark	Dana (new)	04/09	19/09	60	0
England	Cirolana	11/08	06/09	76	0
Germany	Walther Herwig (new)	07/08	16/08	26	0
Norway	Michael Sars	24/08	12/09	71	0
Scotland	Scotia (new)	10/08	29/08	90	0

3 DATA AVAILABLE

Table 3.1 shows number of valid hauls available in the ICES IBTS database.

At the time of the analysis of the 2000 data presented in this report all final data were available in the database.

4 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 (ICES 1993/Assess:15).

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 IBTS Working Group decided at the meeting in November 1995 (ICES 1996/H:1a) 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/Assess:15) 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.

5 RESULTS OF GOV-TRAWL FOR 3RD QUARTER 2000

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 Figure 5.1.

The number of otoliths sampled per target species and roundfish area is given in Table 5.1.

Per species a set of figures gives the distributions of the 1-, 2-, and 3 group and the mean length of 1-group fish per rectangle. The specific standard area used to calculate the index of year class strength is indicated in the figures.

The results are shown in Table 5.2 and in Figures 5.2-5.33.

6 RESULTS OF MIK TRAWL FOR 3RD QUARTER 2000 FOR HERRING AND SPRAT LARVAE

No fishing with MIK was conducted.

7 HYDROGRAPHIC DATA

7.1 Hydrographic Data

Four research vessels contributed to the 285 hydrographic stations worked during the IBTS-3 survey for 2000. The ships were Walther Herwig (56 stations), Michael Sars (71), Cirolana (75 stations – salinity only), and Scotia (83). The distribution of bottom temperature and salinity produced from these data is shown below in Figure 7.1

More information, including station locations, is available from [the IBTS hydrographic web page](#).

8 REFERENCES

- ICES 1993/Assess:15. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES Doc. CM 1993/Assess:15.
- ICES 1995/Assess:13. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES Doc. CM 1995/Assess:13.
- ICES 1996/H:1a. Report of the International Bottom Trawl Survey Working Group. ICES Doc. CM 1996/H:1.
- ICES 1999/D:2 Addendum. 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.

Table 3.1

Number of valid hauls in the IBTS database. 3rd quarter 2000.

Year	Total	Country							
		Denmark	England	France	Germany	Netherlands	Norway	Scotland	Sweden
1991	295	-	87	-	-	69	-	90	49
1992	363	-	74	61	62	31	-	87	48
1993	342	-	71	69	-	65	-	87	50
1994	307	-	73	55	-	42	-	87	50
1995	250	-	78	-	-	33	-	87	52
1996	320	-	78	57	33	17	-	85	50
1997	253	-	74	-	31	18	-	87	43
1998	274	51	74	-	28	-	-	77	44
1999	367	53	74	-	32	-	74	87	47
2000	316	60	75	-	26	-	68	87	-
Total	3087	164	758	242	212	275	142	861	433

Table 5.1

Number of otoliths sampled per species and roundfish area, 2002 quarter 3.

Species	Roundfish area								Total
	1	2	3	4	5	6	7	8	
Herring	795	756	447	511	15	466	429	18	3437
Cod	471	335	60	203	62	132	254	-	1517
Haddock	1588	932	900	651	48	128	284	-	4531
Whiting	1066	814	710	578	306	853	411	-	4738
Saithe	637	2	1	-	-	-	76	-	716
Mackerel	145	190	63	28	72	341	170	20	1029
Sprat	34	124	164	184	-	243	10	-	759
Norway pout	446	101	168	77	5	-	26	-	823

Table 5.2. Herring indices. Mean number per hour per haul. 3rd quarter 2000.

Year	Mean per statistical rectangle					
	Age group					
	0	1	2	3	4	5+
1991	640.18	2572.50	215.80	97.38	66.56	110.29
1992	2901.63	1082.06	452.86	166.20	80.58	159.87
1993	3799.23	1177.22	324.81	175.23	92.03	195.76
1994	1552.28	1679.17	889.04	196.98	181.76	131.72
1995	714.11	522.38	353.06	159.97	56.30	60.35
1996	2704.54	1314.76	190.14	111.73	48.09	42.04
1997	1149.63	1331.95	77.72	23.08	17.31	13.40
1998	1004.34	879.62	467.29	85.85	25.19	21.42
1999	5373.56	595.10	216.29	135.11	68.71	34.66
2000	963.07	1212.38	353.99	164.55	103.87	68.83

Table 5.2 cont. Sprat indices. Mean number per hour per haul. 3rd quarter 2000.

Year	Mean per statistical rectangle					
	Age group					
	0	1	2	3	4	5+
1991	16.78	435.87	133.90	54.93	0.77	0.00
1992	56.49	3975.23	3389.45	205.33	33.55	2.53
1993	6.85	2575.10	2728.38	559.33	23.52	0.00
1994	5.19	4298.10	500.79	131.14	12.27	0.00
1995	0.32	1381.76	3897.07	2020.47	22.29	0.92
1996	3.28	537.33	1321.67	586.21	79.27	4.49
1997	29.03	8331.55	2356.96	437.56	52.00	0.00
1998	343.84	3676.27	2038.12	260.45	8.37	0.41
1999	3924.51	18229.36	1843.40	108.65	0.05	0.00
2000	49.68	5014.41	2802.90	70.77	5.86	0.00

Table 5.2 cont. Cod indices. Mean number per hour per haul. 3rd quarter 2000.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	29.43	8.20	2.47	1.16	0.18	0.06	0.08
1992	19.72	43.78	3.63	0.73	0.46	0.16	0.14
1993	16.96	10.00	8.00	0.86	0.19	0.15	0.05
1994	15.72	43.15	6.23	2.38	0.25	0.08	0.07
1995	15.08	18.06	17.37	1.50	0.77	0.07	0.07
1996	68.92	10.28	5.32	1.82	0.40	0.20	0.03
1997	0.13	60.52	5.47	1.67	0.63	0.13	0.12
1998	91.71	2.40	20.05	1.29	0.37	0.25	0.12
1999	9.54	11.95	0.96	3.89	0.25	0.09	0.05
2000	1.84	10.70	2.29	0.19	0.53	0.08	0.09

Table 5.2 cont. Haddock indices. Mean number per hour per haul. 3rd quarter 2000.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	720.38	232.79	22.94	2.82	0.50	1.54	0.29
1992	2716.86	589.67	187.14	10.36	1.57	0.39	1.45
1993	571.90	604.33	141.55	37.72	2.38	0.38	0.28
1994	1771.95	194.62	264.50	32.43	8.42	0.39	0.07
1995	516.84	1027.23	106.30	96.88	7.99	3.10	0.26
1996	622.78	254.87	443.65	30.33	20.11	2.63	0.68
1997	194.69	353.75	125.82	151.00	6.65	5.26	0.85
1998	272.92	262.16	168.13	53.30	42.26	3.06	1.66
1999	6907.32	175.58	94.51	48.13	13.18	9.85	1.36
2000	1087.26	2549.76	44.53	19.47	10.31	4.24	3.05

Table 5.2 cont.

Whiting indices. Mean number per hour per haul. 3rd quarter 2000.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	529.39	700.83	158.87	78.92	14.62	5.20	1.02
1992	1381.49	595.01	297.85	72.91	57.90	10.35	6.26
1993	915.86	634.16	176.88	67.13	14.82	16.19	3.15
1994	609.87	674.52	222.52	76.32	19.83	4.82	3.19
1995	729.25	619.79	291.18	107.20	21.51	6.01	3.46
1996	316.50	545.71	278.22	129.36	34.00	6.89	4.10
1997	2062.67	332.97	180.68	108.99	28.01	10.71	4.25
1998	2609.97	328.92	150.00	52.69	30.97	11.16	4.69
1999	2498.55	1203.50	190.65	53.93	24.45	9.53	4.18
2000	1968.07	941.66	326.94	64.11	13.63	6.53	4.87

Table 5.2 cont.

Saithe indices. Mean number per hour per haul. 3rd quarter 2000.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	0.01	0.16	1.00	3.25	0.70	0.13	0.27
1992	0.01	0.10	0.32	1.33	3.41	0.64	0.34
1993	0.00	0.14	2.59	11.78	4.10	1.68	0.56
1994	0.01	0.00	0.69	1.12	1.62	0.88	0.83
1995	0.00	0.01	0.83	20.04	3.60	2.23	1.17
1996	0.00	0.29	2.15	3.82	6.53	1.12	1.33
1997	0.01	0.14	0.51	3.76	3.35	7.45	1.54
1998	0.00	0.03	0.29	2.03	7.74	2.61	3.78
1999	0.00	0.01	0.65	4.12	3.94	5.77	2.73
2000	0.00	0.01	0.53	3.39	8.96	1.07	1.19

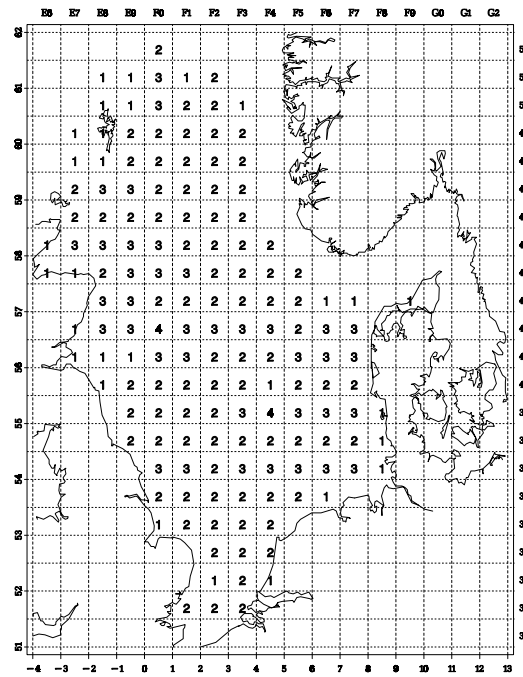
Table 5.2 cont. Norway pout indices. Mean number per hour per haul. 3rd quarter 2000.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	7382.90	1104.86	222.23	2.61	0.00	0.00	0.00
1992	2587.77	4365.81	640.21	48.21	2.77	0.00	0.06
1993	3952.70	1860.90	596.47	53.37	3.30	0.00	0.00
1994	3195.82	704.41	101.59	13.51	0.34	0.00	0.00
1995	1762.43	4526.74	316.98	42.24	1.72	0.00	0.00
1996	4553.64	763.03	362.42	12.01	0.78	0.00	0.00
1997	489.95	3520.53	169.10	40.33	1.36	0.01	0.00
1998	2931.40	805.69	743.45	11.40	3.01	0.00	0.00
1999	7844.32	2366.57	200.82	94.39	1.46	0.03	0.27
2000	1643.50	7868.34	281.68	11.26	5.34	0.00	0.00

Table 5.2 cont. Mackerel indices. Mean number per hour per haul. 3rd quarter 2000.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	0.00	25.99	15.85	3.61	3.48	4.01	13.06
1992	0.07	40.15	46.67	30.15	10.48	10.37	14.96
1993	5.34	91.28	67.55	25.70	18.94	10.09	18.12
1994	0.00	82.62	64.56	14.77	4.98	4.31	7.25
1995	0.03	15.12	31.12	26.42	13.28	4.24	15.39
1996	0.00	49.21	50.95	23.65	4.92	3.56	7.77
1997	0.11	63.12	39.13	12.26	6.23	3.45	4.72
1998	3.58	187.43	58.26	16.10	7.75	3.54	3.37
1999	10.56	25.75	23.86	10.96	4.01	2.07	2.78
2000	0.00	94.25	40.85	7.67	4.10	1.08	2.33

Number of hauls, 2000 quarter 3



Number of daytime hauls, 2000 quarter 3

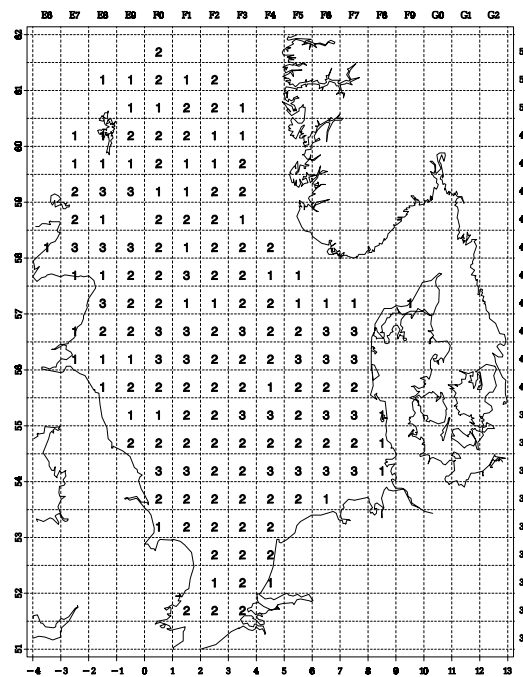


Figure 5.1. Number of valid day- and nighttime hauls.

Herring, number per hour

Age group 1, 2000 quarter 3

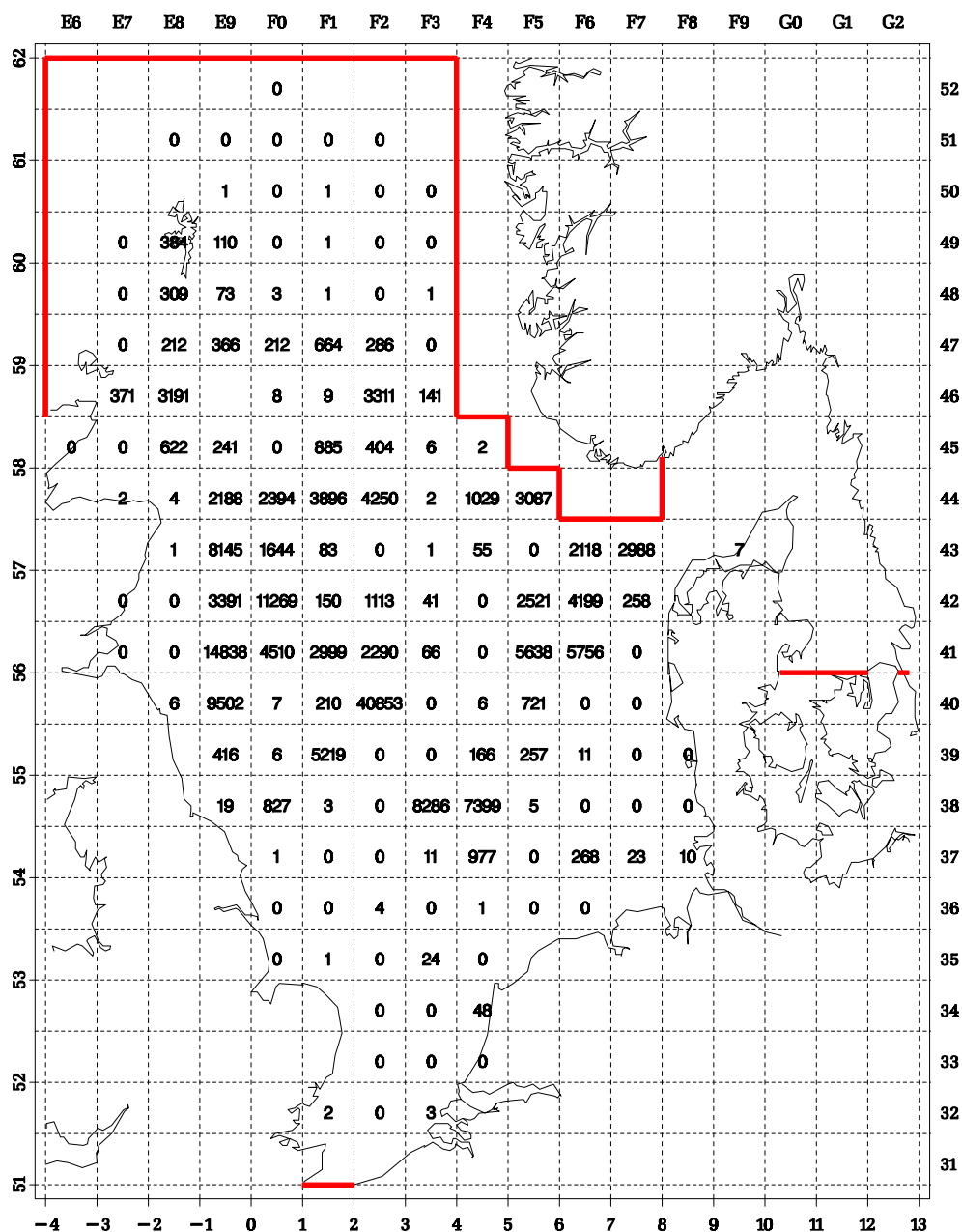


Figure 5.2 Herring: number per hour, 1-ringers.

Herring, number per hour

Age group 2, 2000 quarter 3

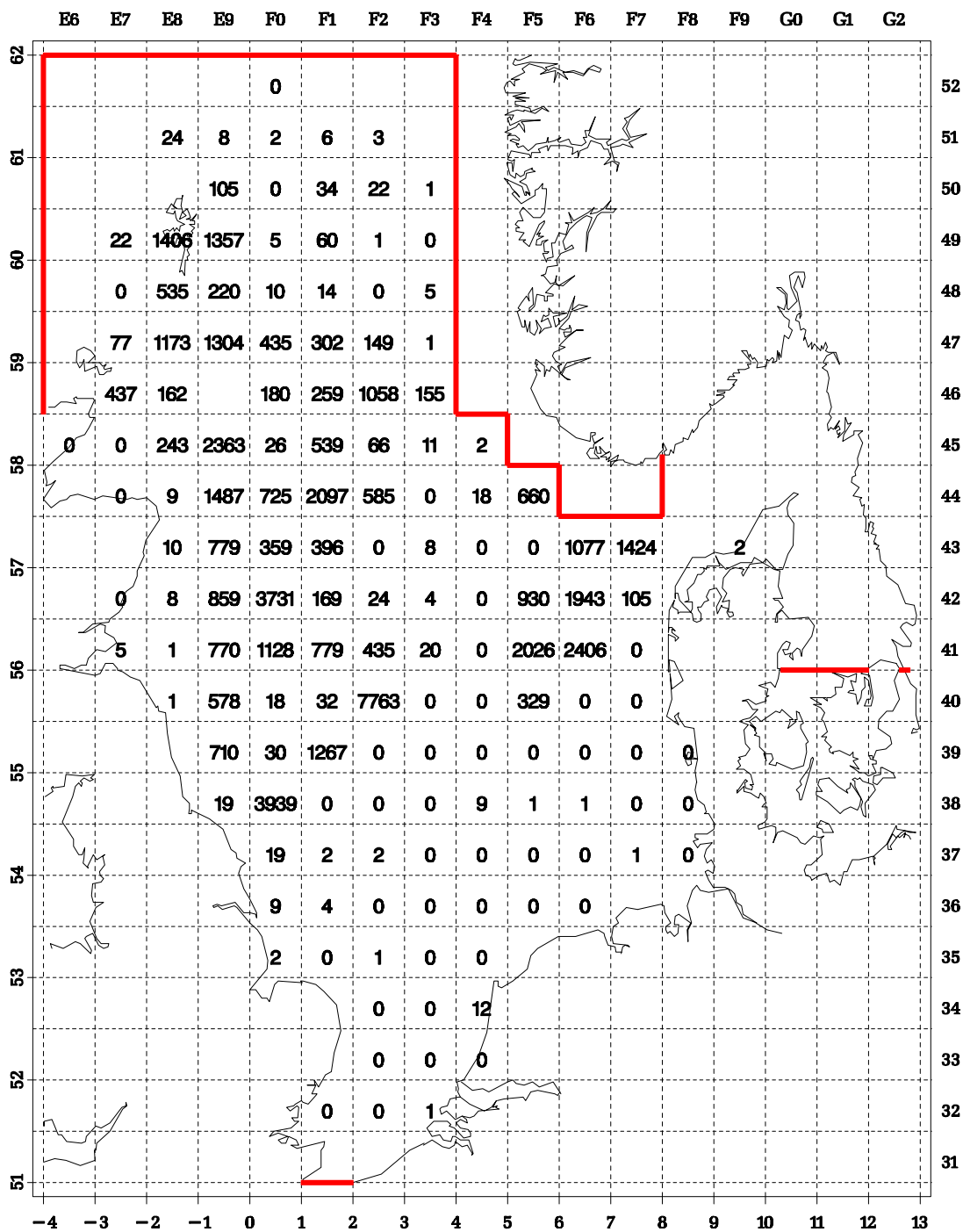


Figure 5.3 Herring: number per hour, 2-ringers.

Herring, number per hour

Age group 3, 2000 quarter 3

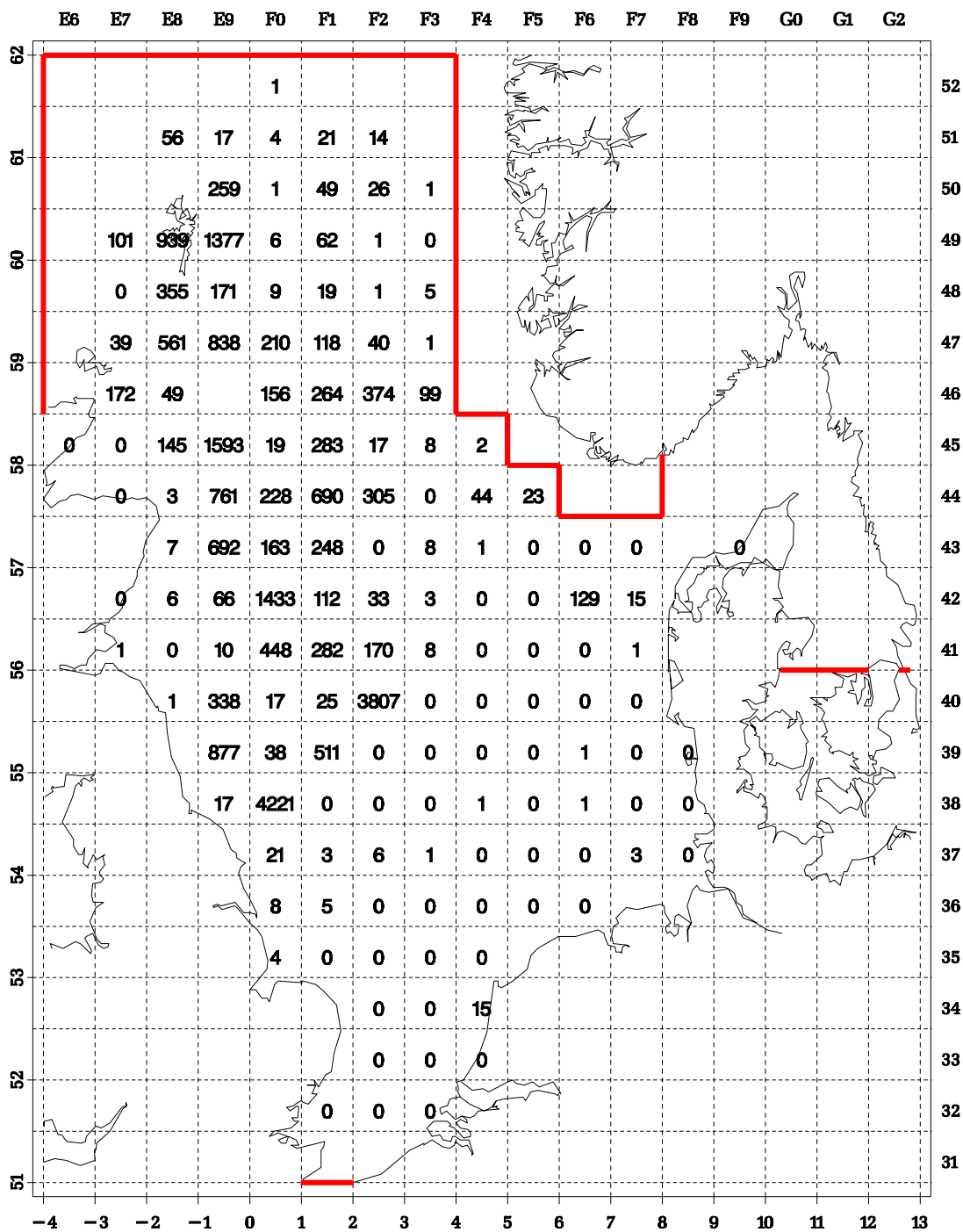


Figure 5.4 Herring: number per hour, 3 ringers.

Herring, mean length

Age group 1, 2000 quarter 3

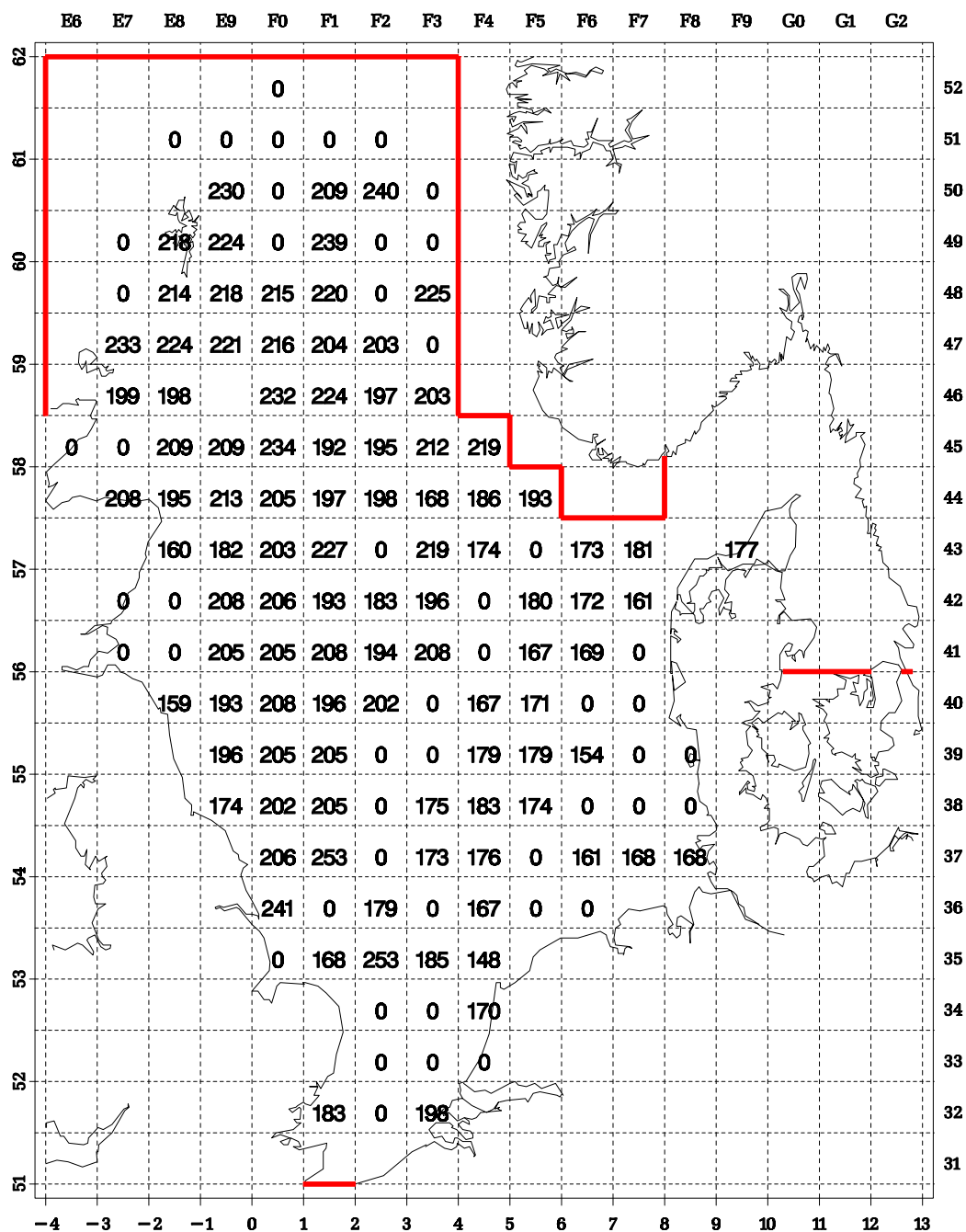


Figure 5.5 Herring: mean length (mm) 1- ringers.

Sprat, number per hour Age group 1, 2000 quarter 3

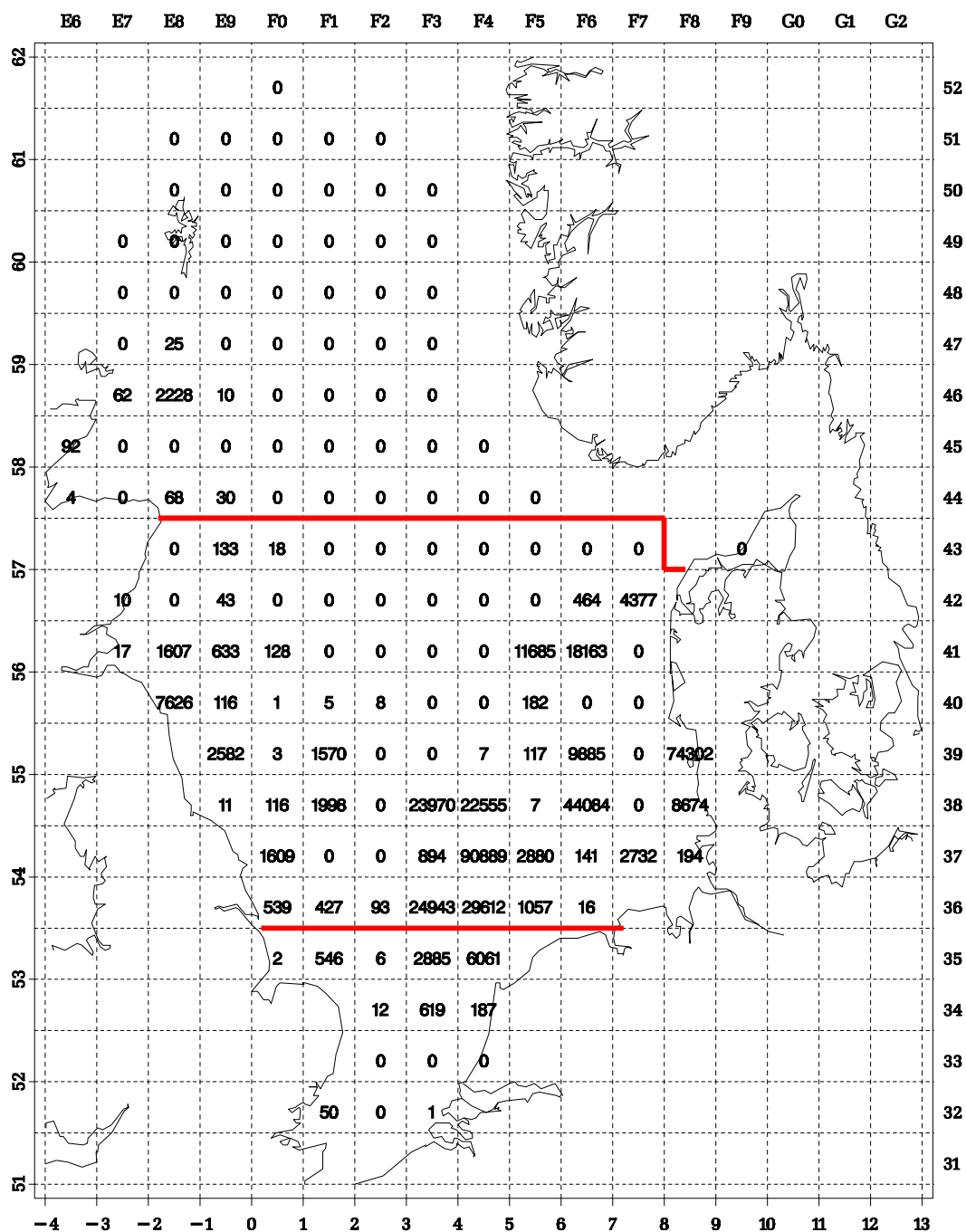


Figure 5.6 Sprat: number per hour, age 1.

Sprat, number per hour

Age group 2, 2000 quarter 3

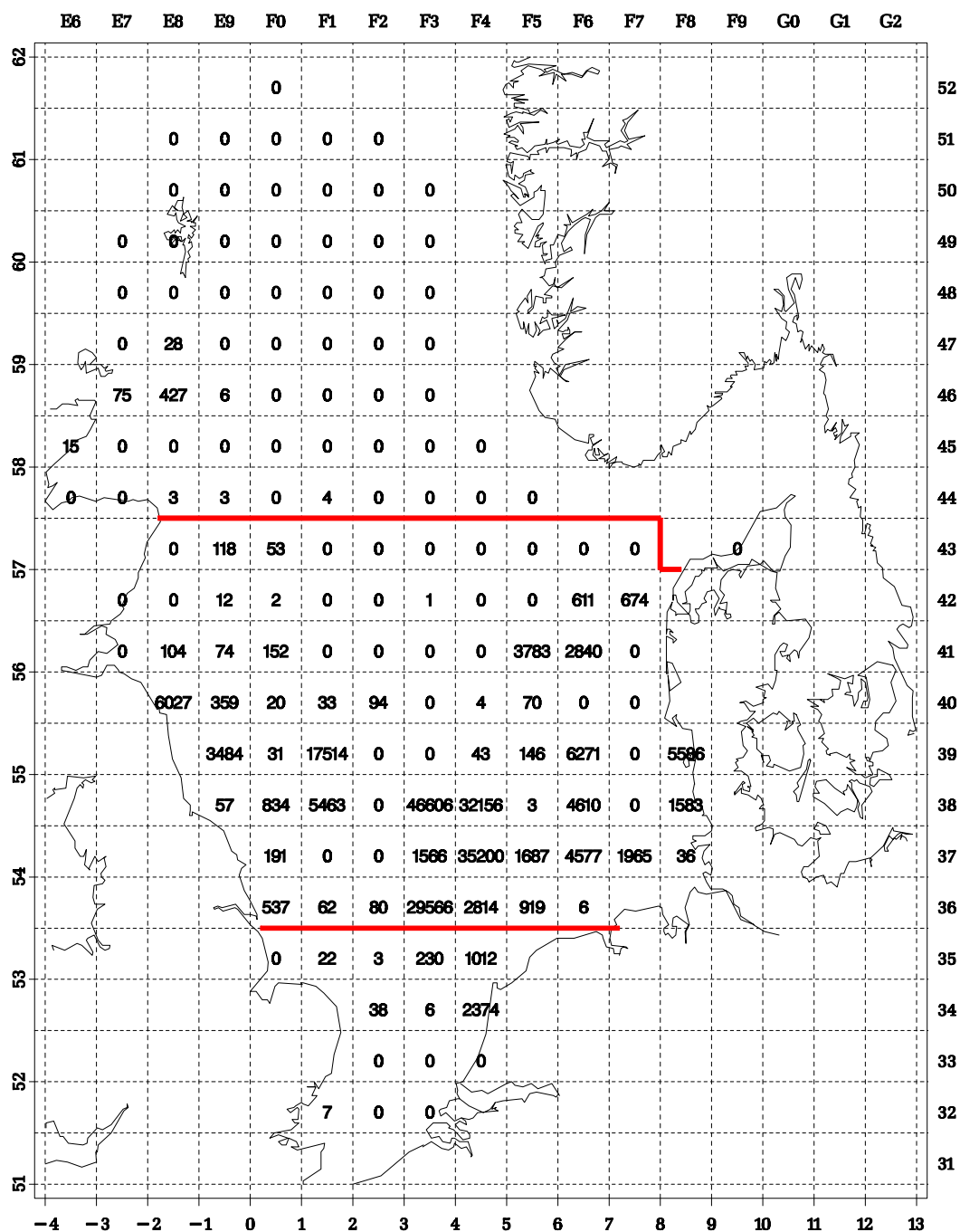


Figure 5.7 Sprat: number per hour, age 2.

Sprat, number per hour Age group 3, 2000 quarter 3

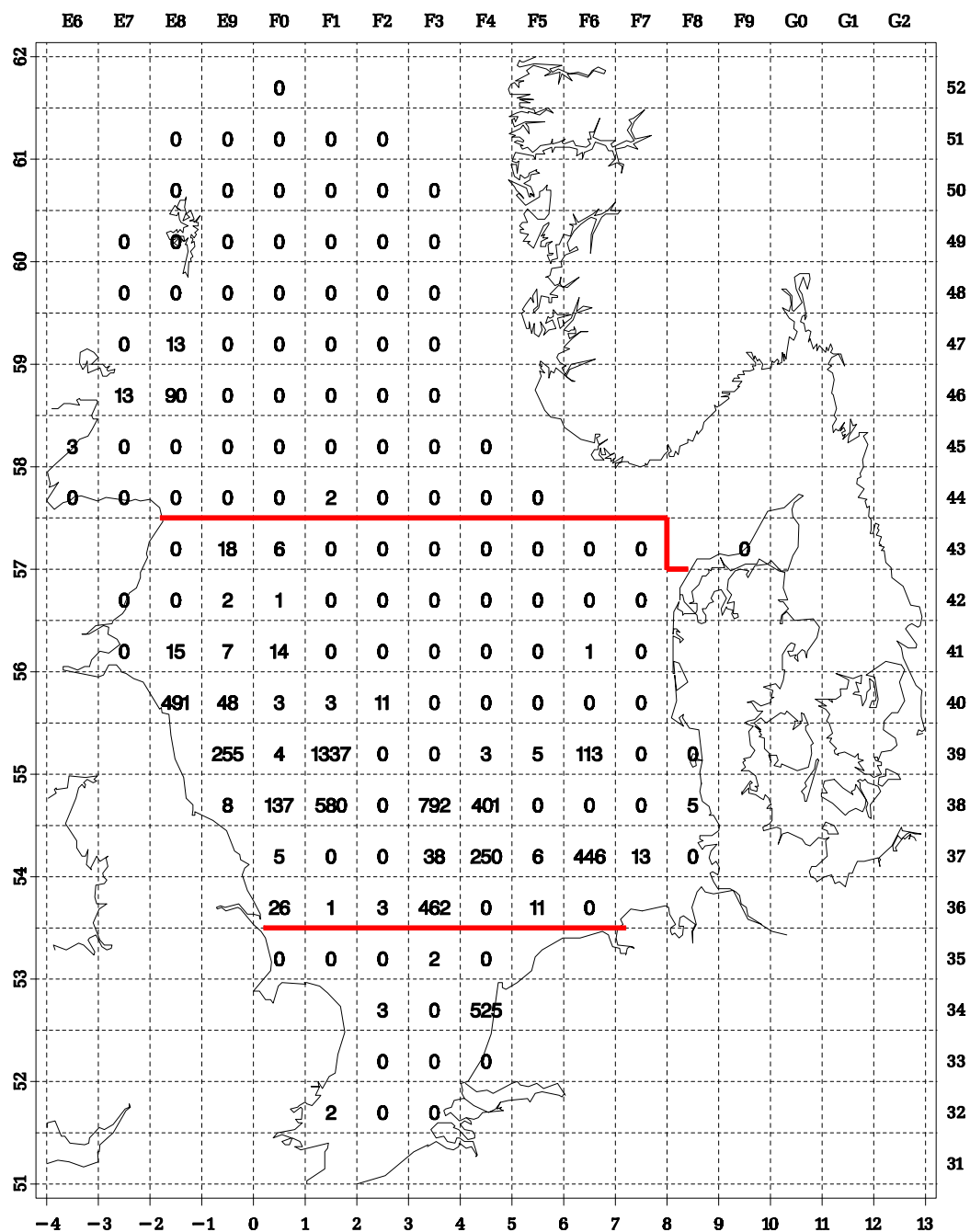


Figure 5.8 Sprat: number per hour, age 3.

Sprat, mean length Age group 1, 2000 quarter 3

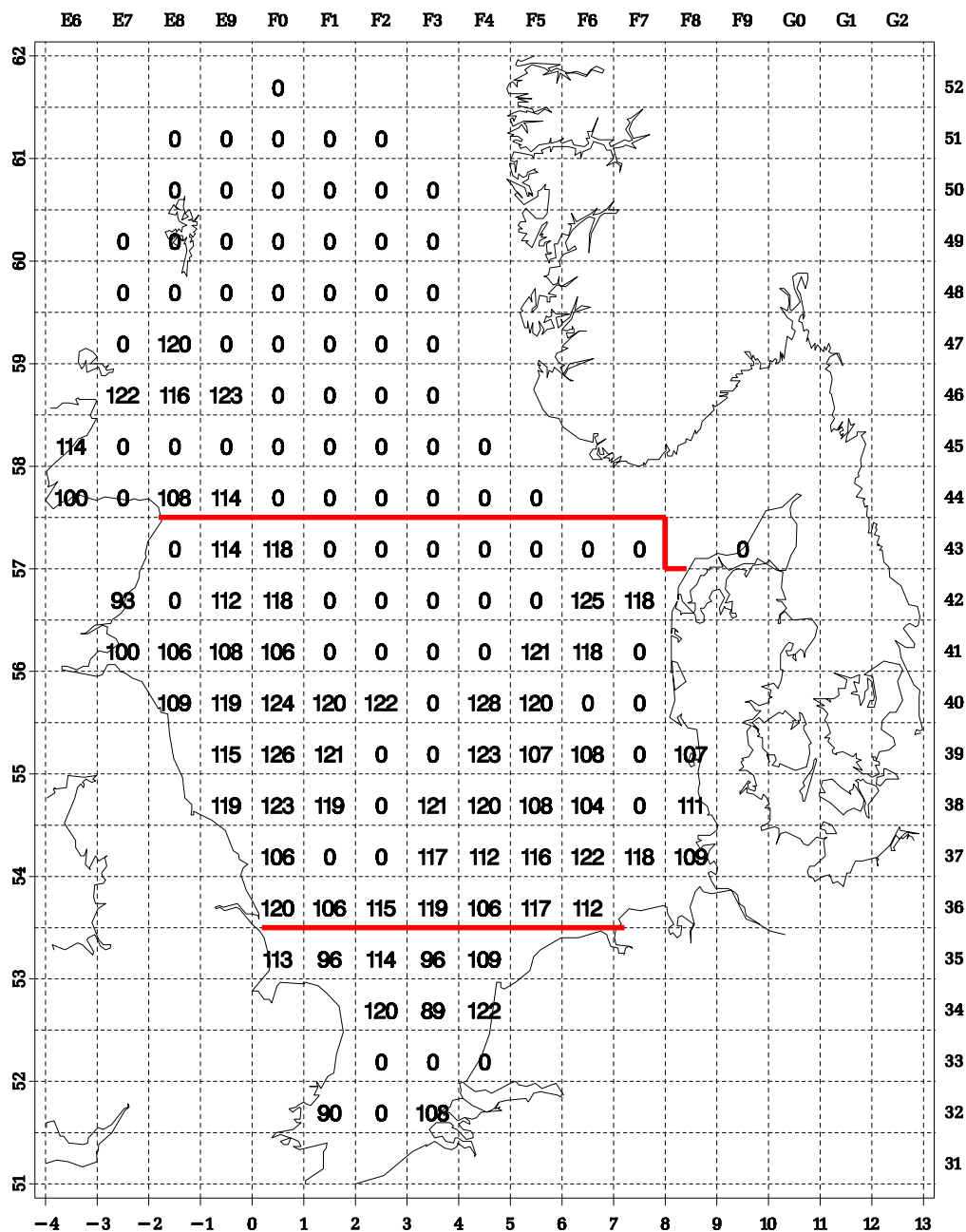


Figure 5.9. Sprat: mean length (mm), age 1.

Mackerel, number per hour

Age group 1, 2000 quarter 3

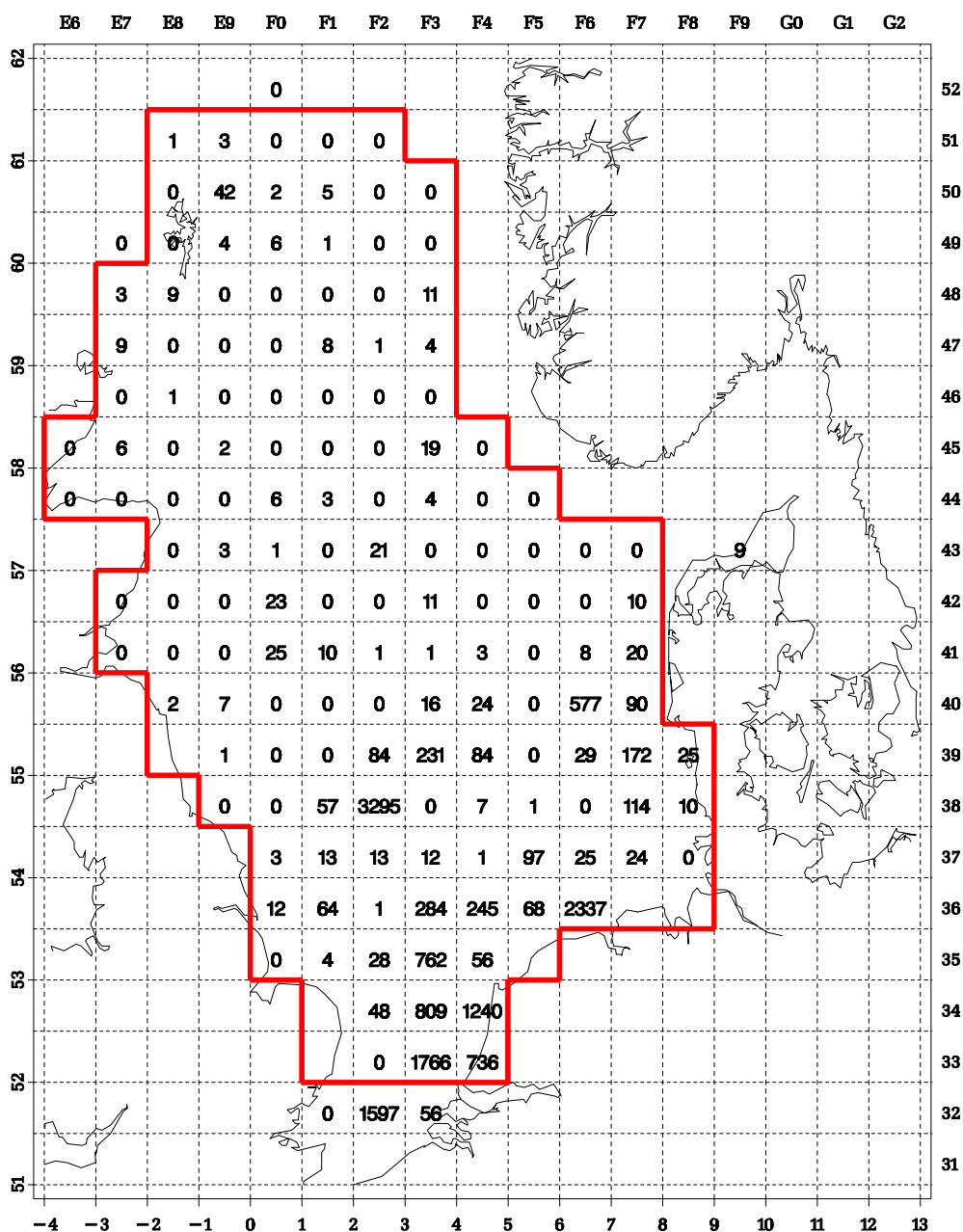


Figure 5.10 Mackerel: number per hour, age 1.

Mackerel, number per hour

Age group 2, 2000 quarter 3

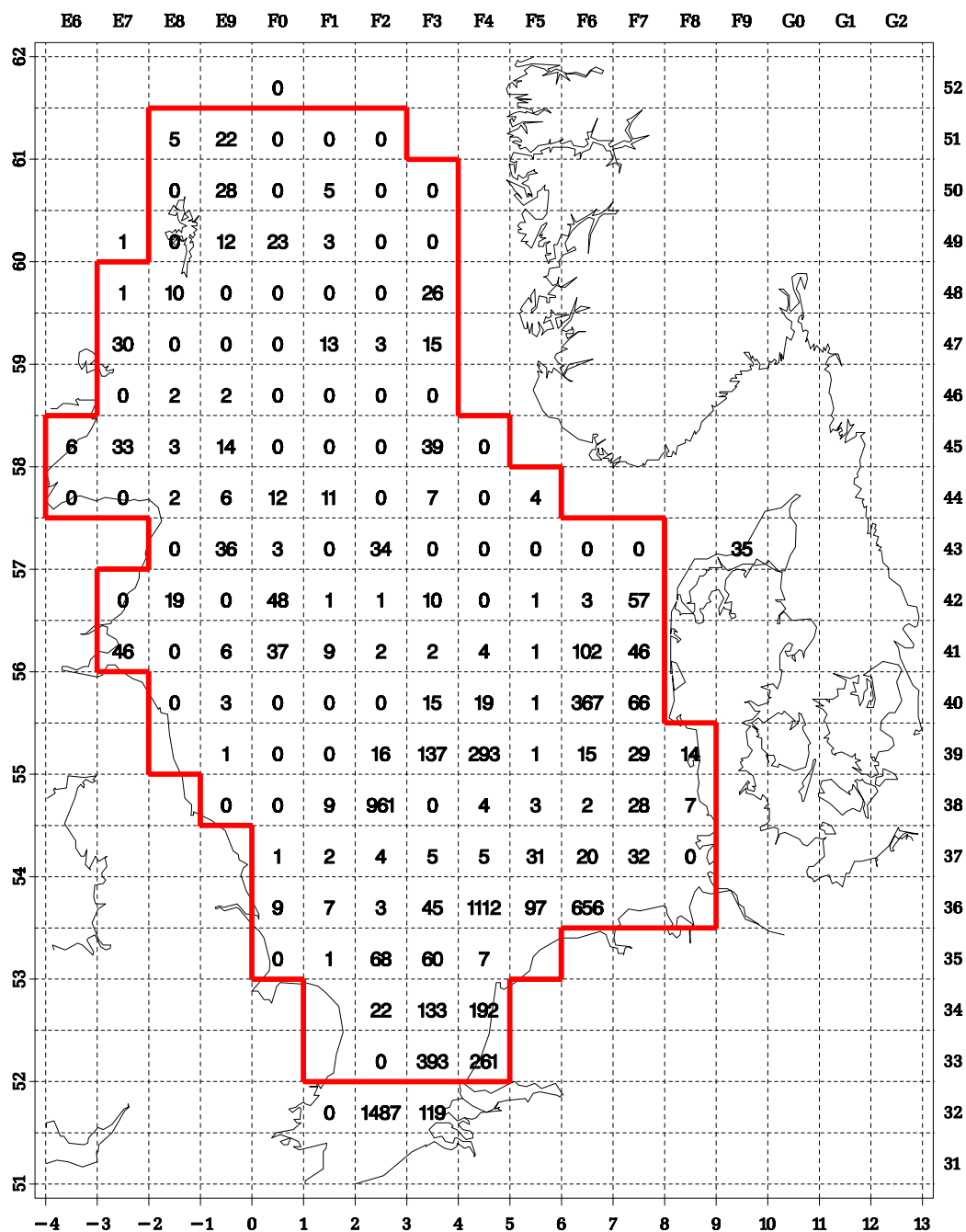


Figure 5.11 Mackerel: number per hour, age 2.

Mackerel, number per hour

Age group 3, 2000 quarter 3

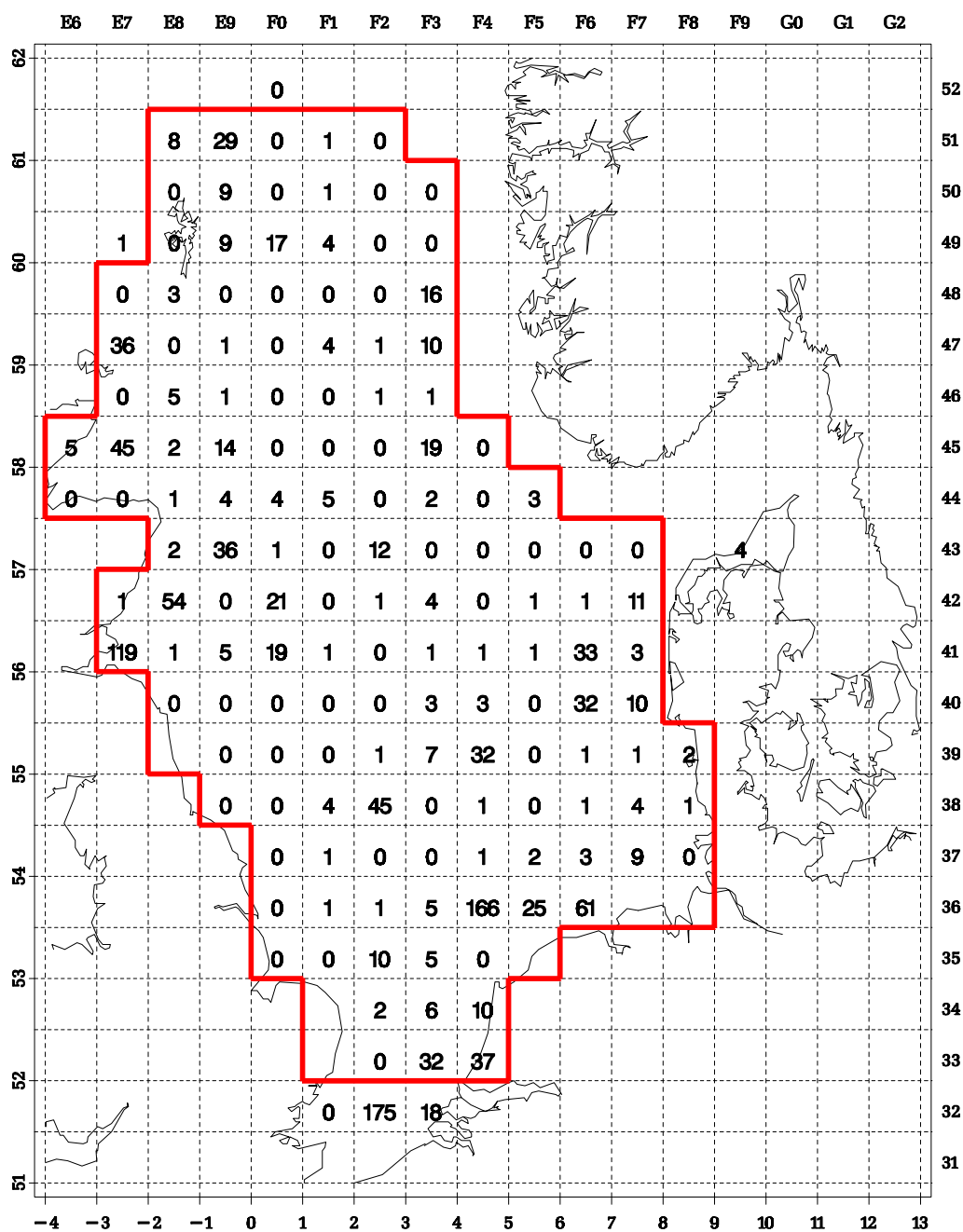


Figure 5.12 Mackerel: number per hour, age 3.

Mackerel, mean length

Age group 1, 2000 quarter 3

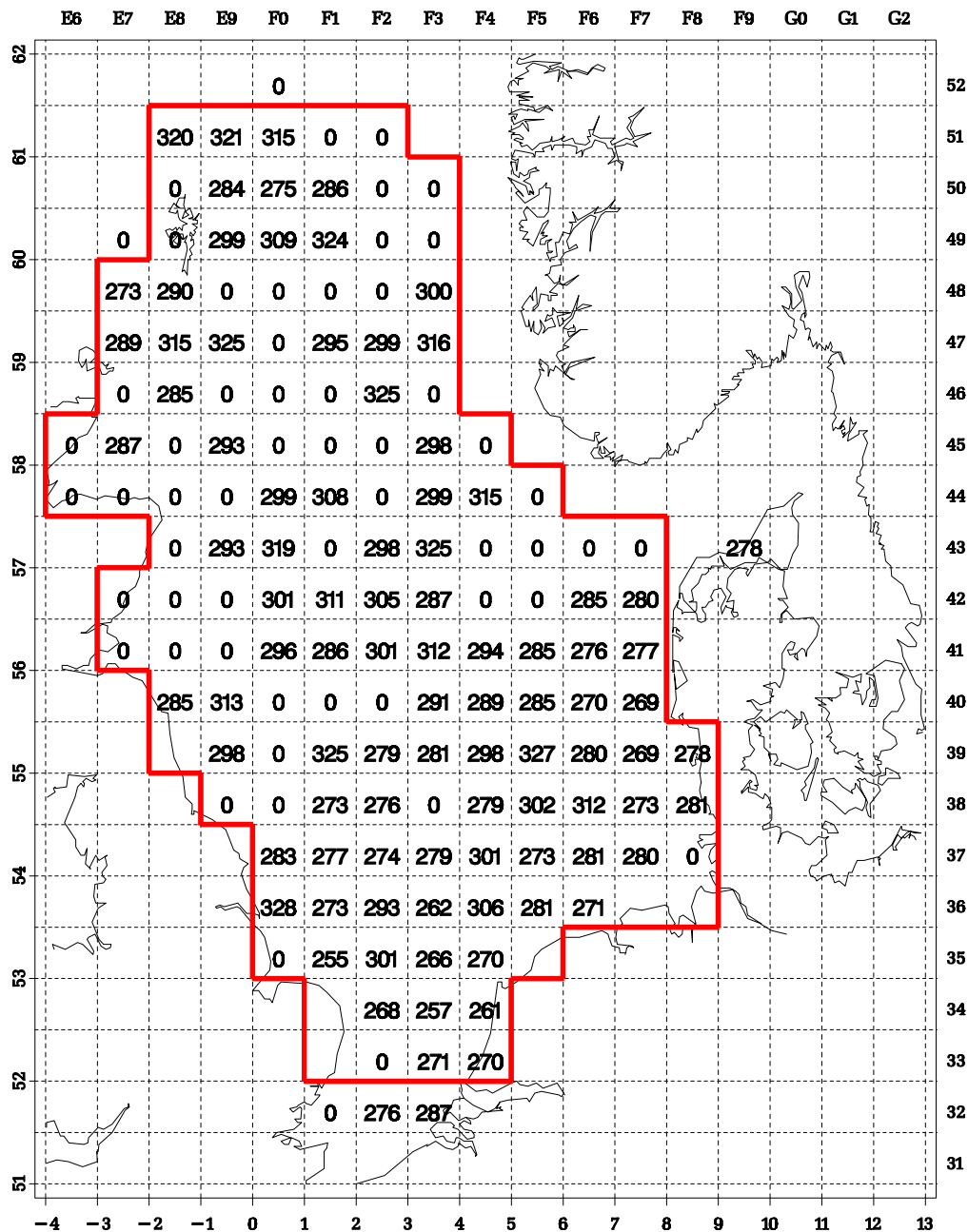


Figure 5.13 Mackerel: mean length (mm), age 1.

Cod, number per hour Age group 1, 2000 quarter 3

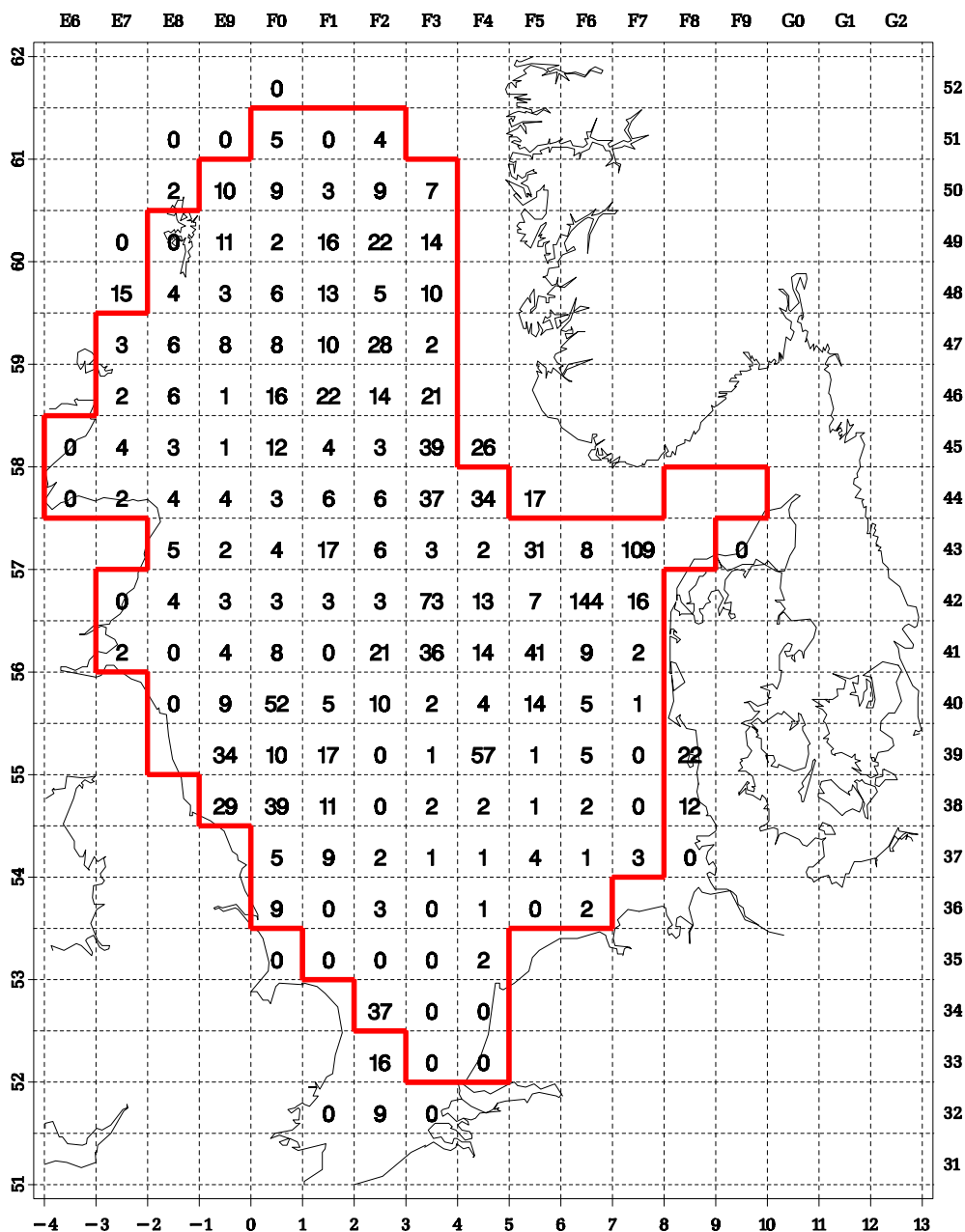


Figure 5.14 Cod: number per hour, age 1.

Cod, number per hour Age group 2, 2000 quarter 3

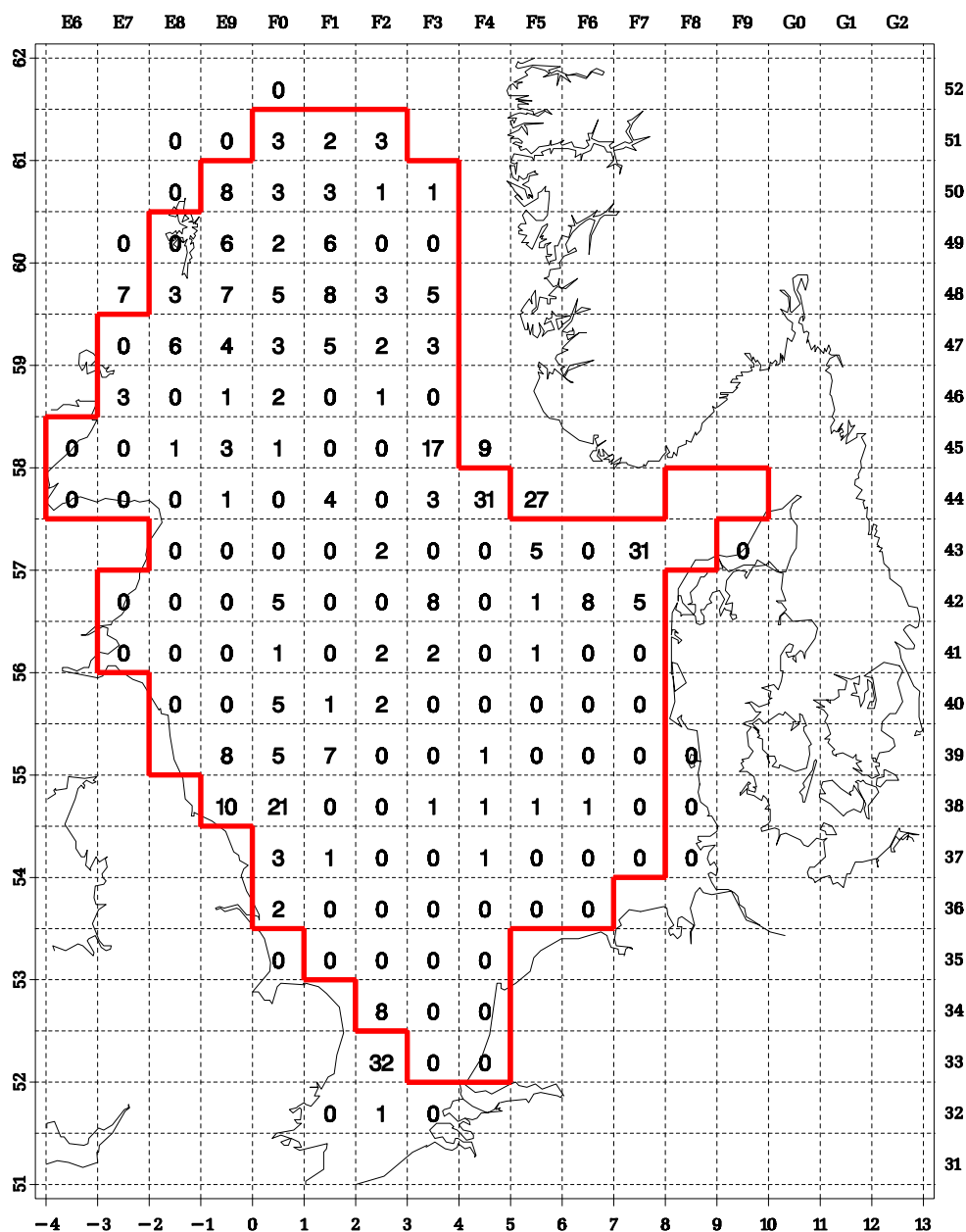


Figure 5.15 Cod: number per hour, age 2.

Cod, number per hour Age group 3, 2000 quarter 3

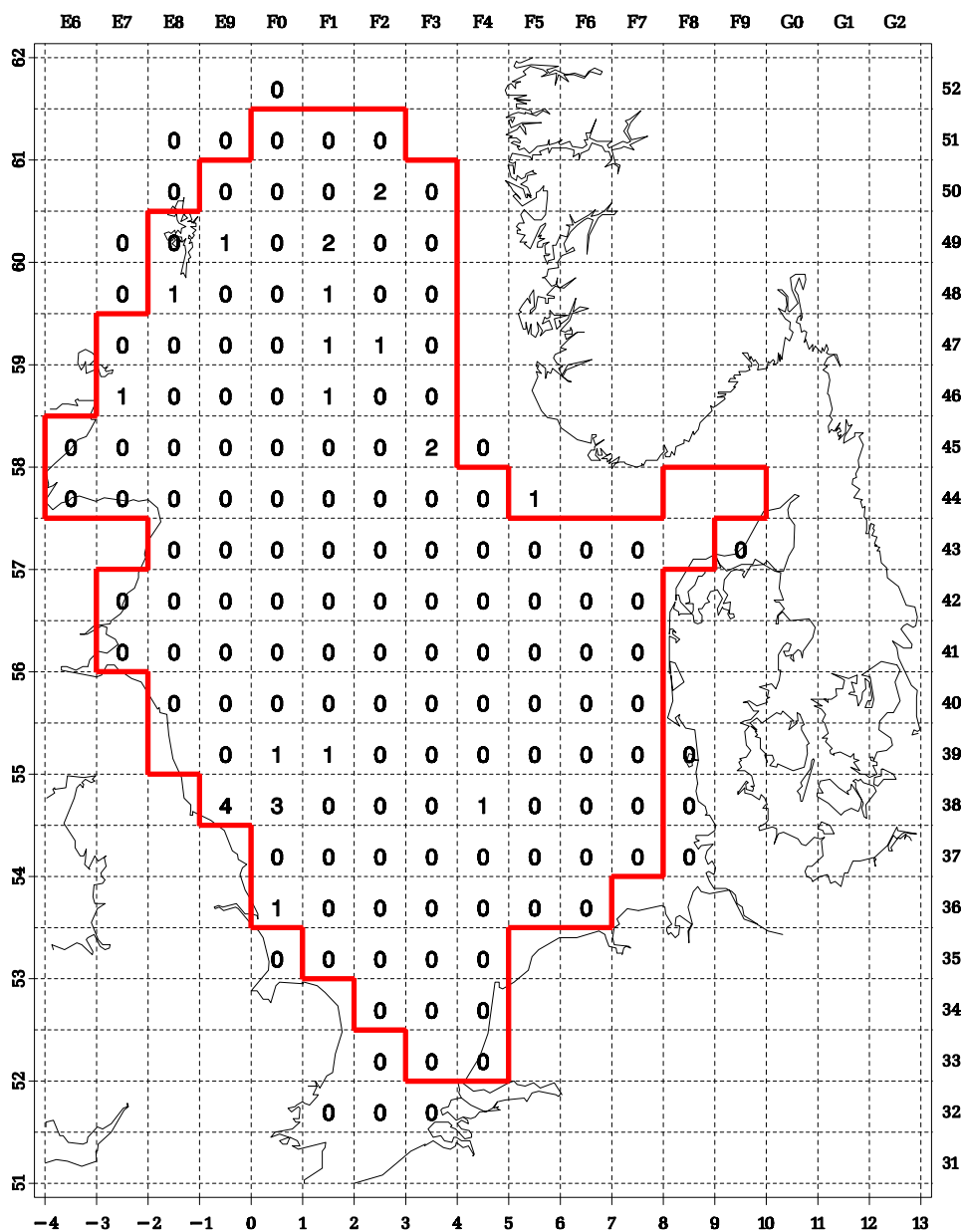


Figure 5.16 Cod: number per hour, age 3.

Cod, mean length

Age group 1, 2000 quarter 3

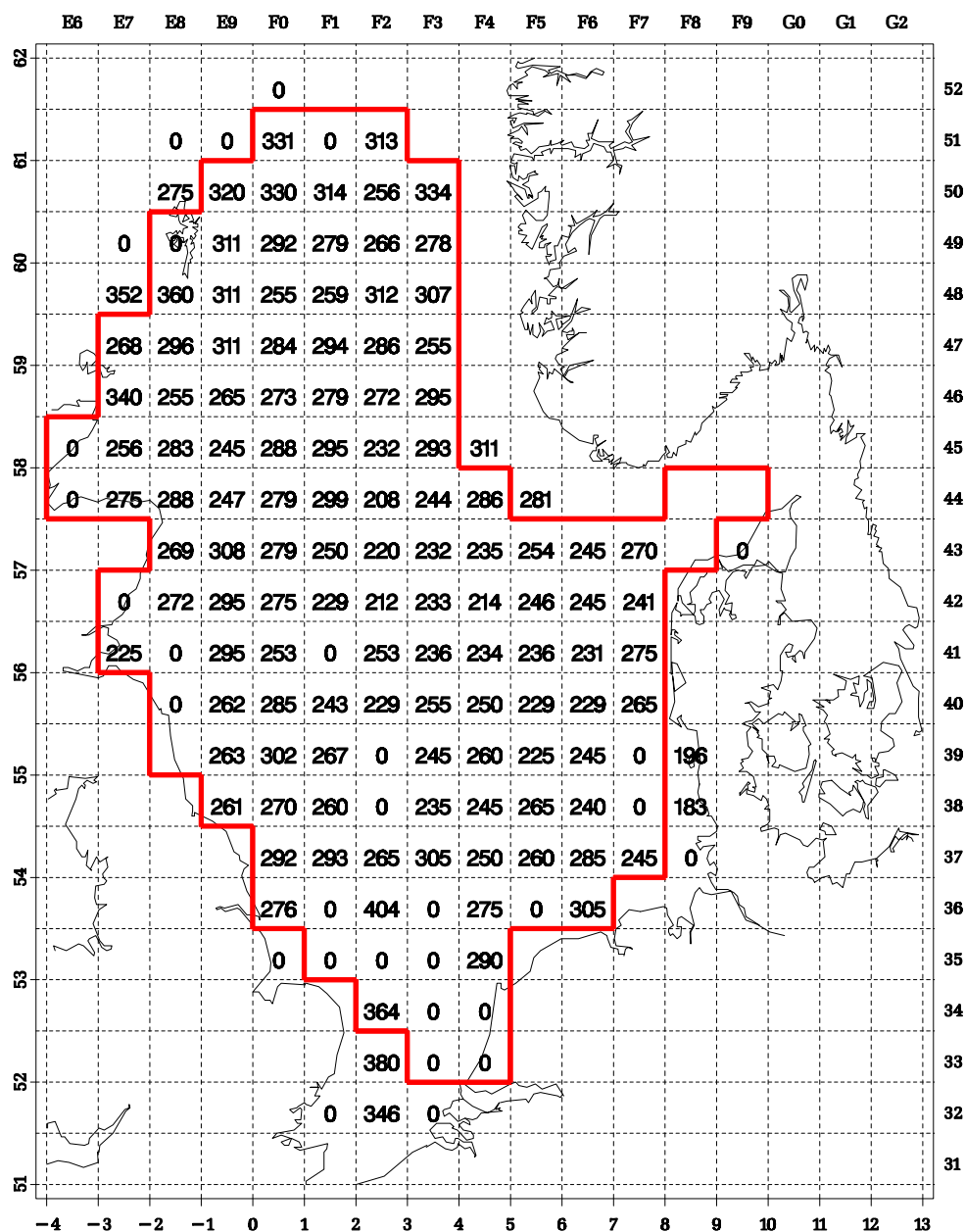


Figure 5.17 Cod, mean length (mm) age 1.

Haddock, number per hour

Age group 1, 2000 quarter 3

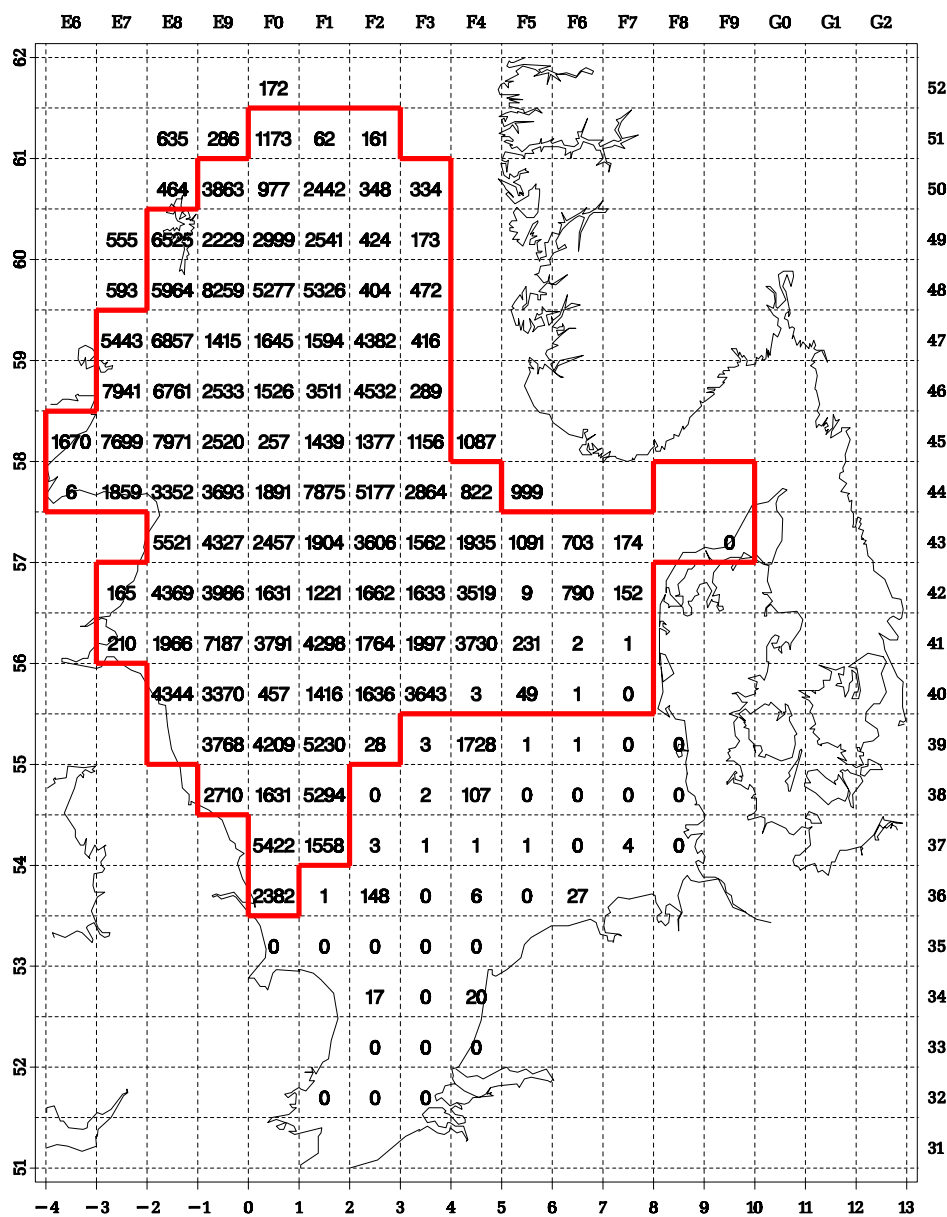


Figure 5.18 Haddock: number per hour, age 1.

Haddock, number per hour Age group 2, 2000 quarter 3

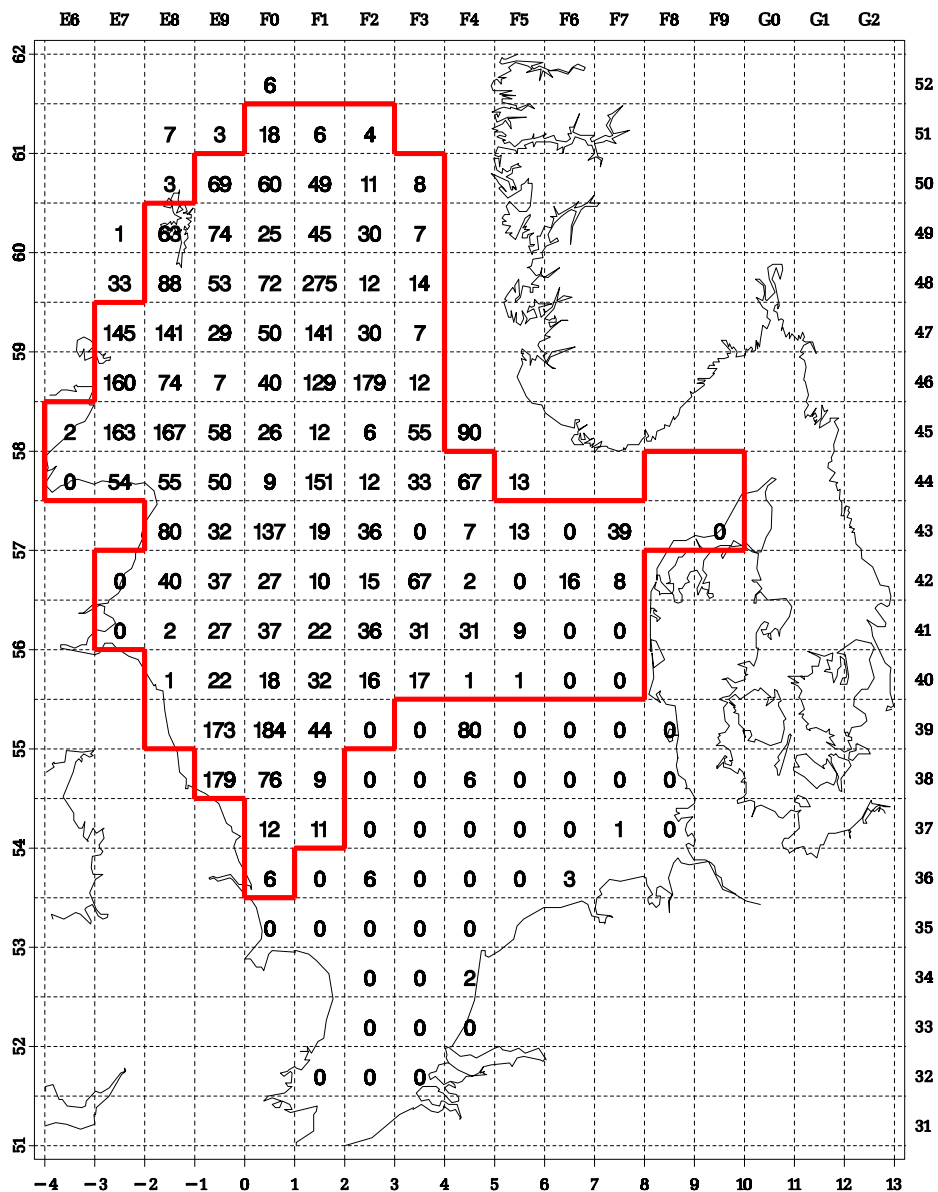


Figure 5.19 Haddock: number per hour, age 2.

Haddock, number per hour Age group 3, 2000 quarter 3

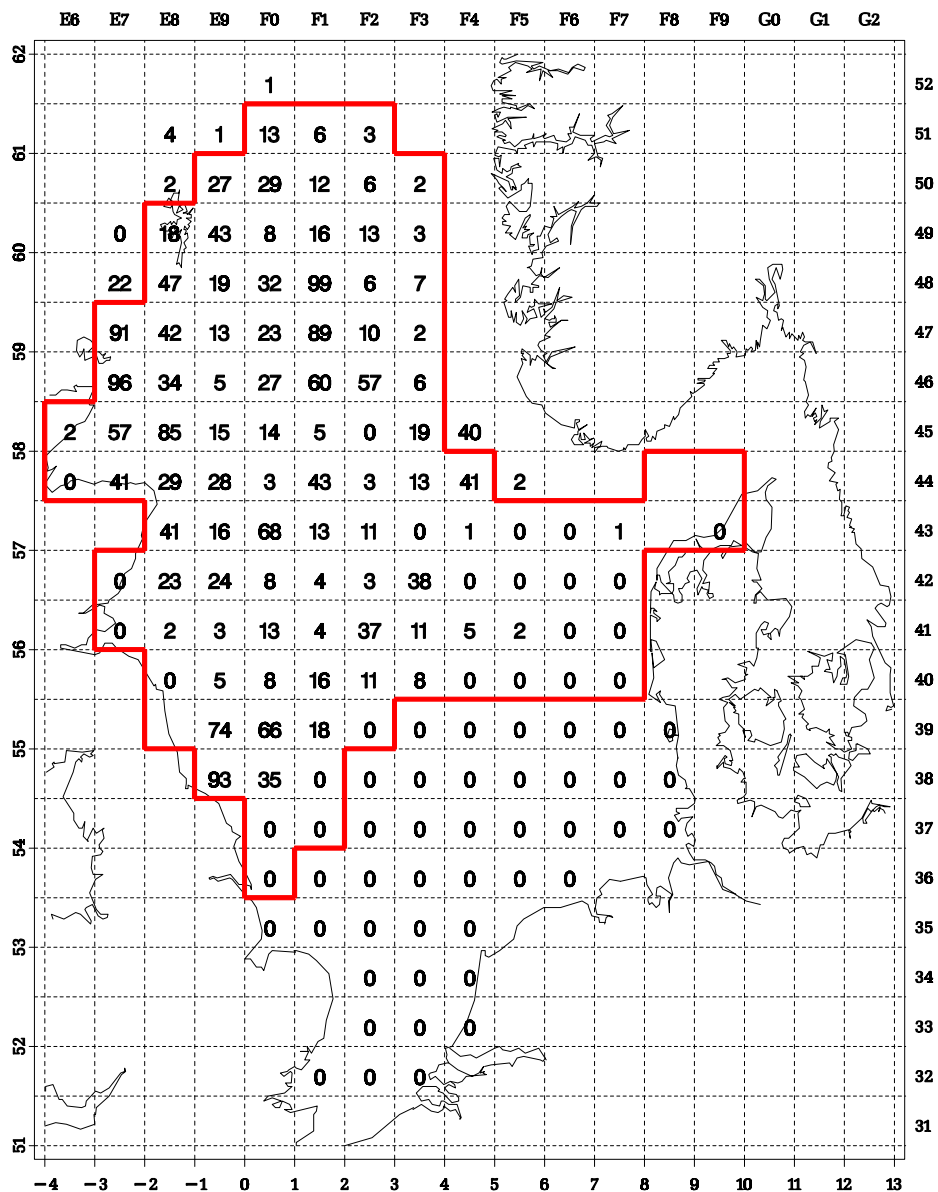


Figure 5.20 Haddock: number per hour, age 3.

Haddock, mean length

Age group 1, 2000 quarter 3

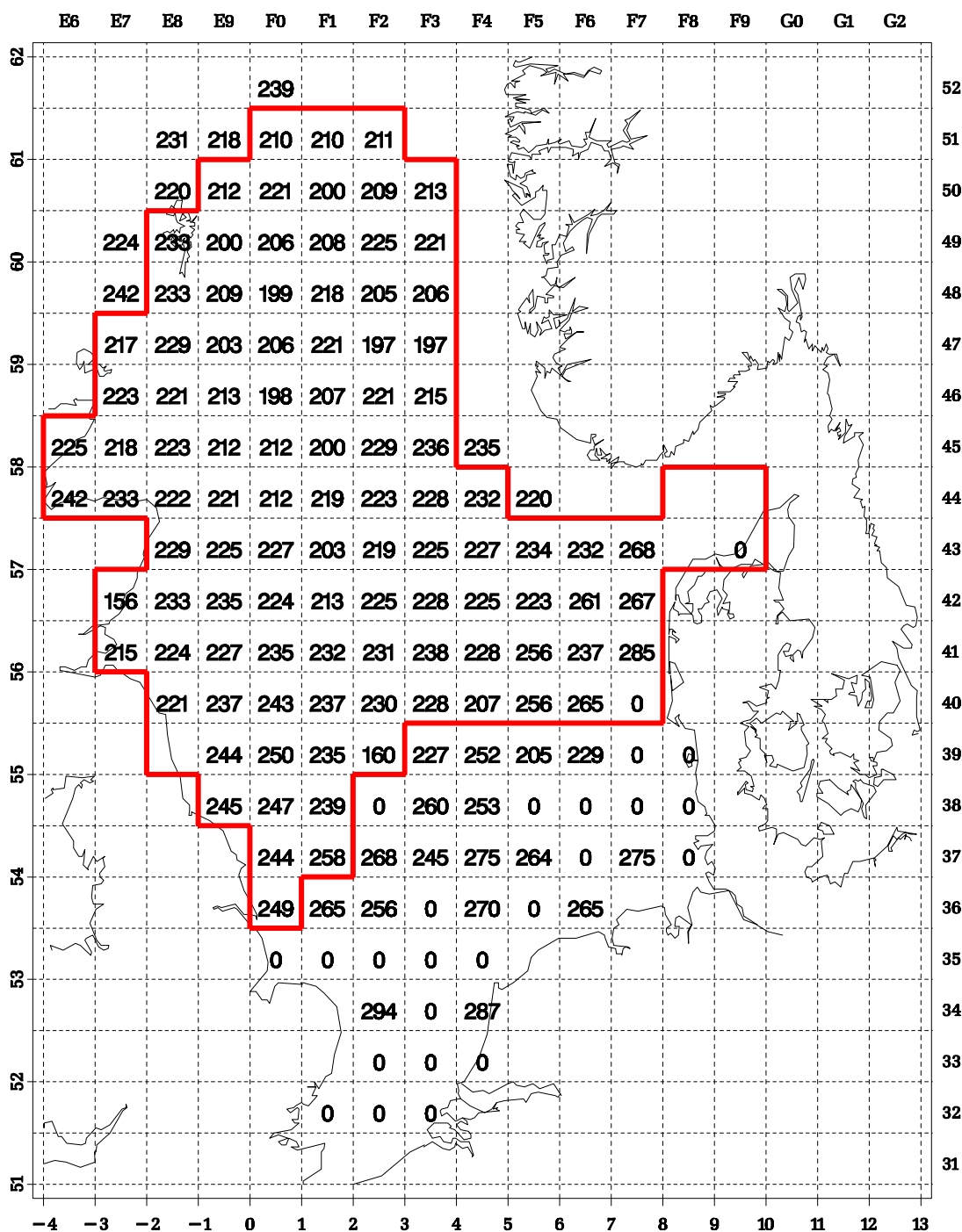


Figure 5.21 Haddock: mean length (mm), age 1.

Whiting, number per hour

Age group 1, 2000 quarter 3

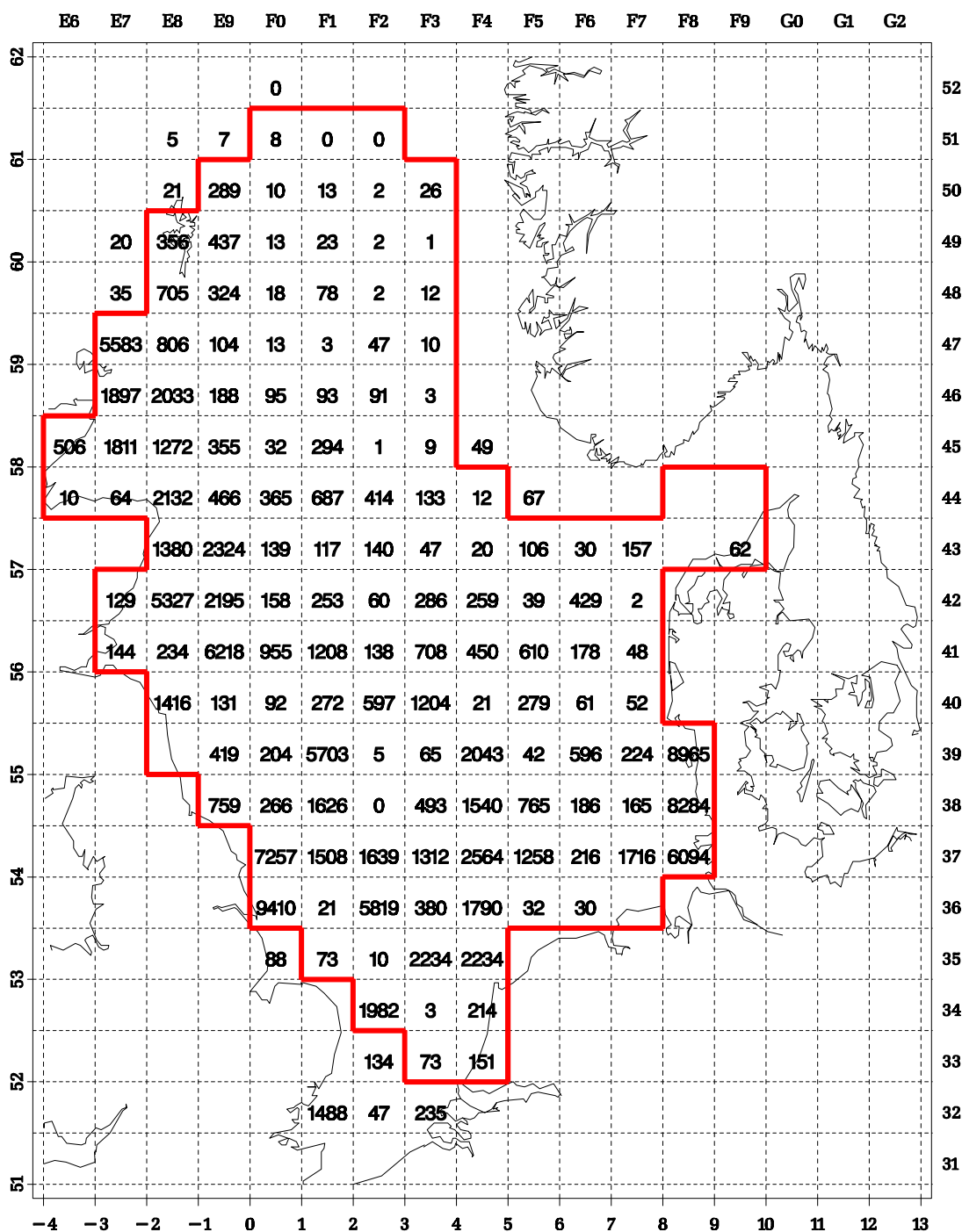


Figure 5.22 Whiting: number per hour, age 1.

Whiting, number per hour

Age group 2, 2000 quarter 3

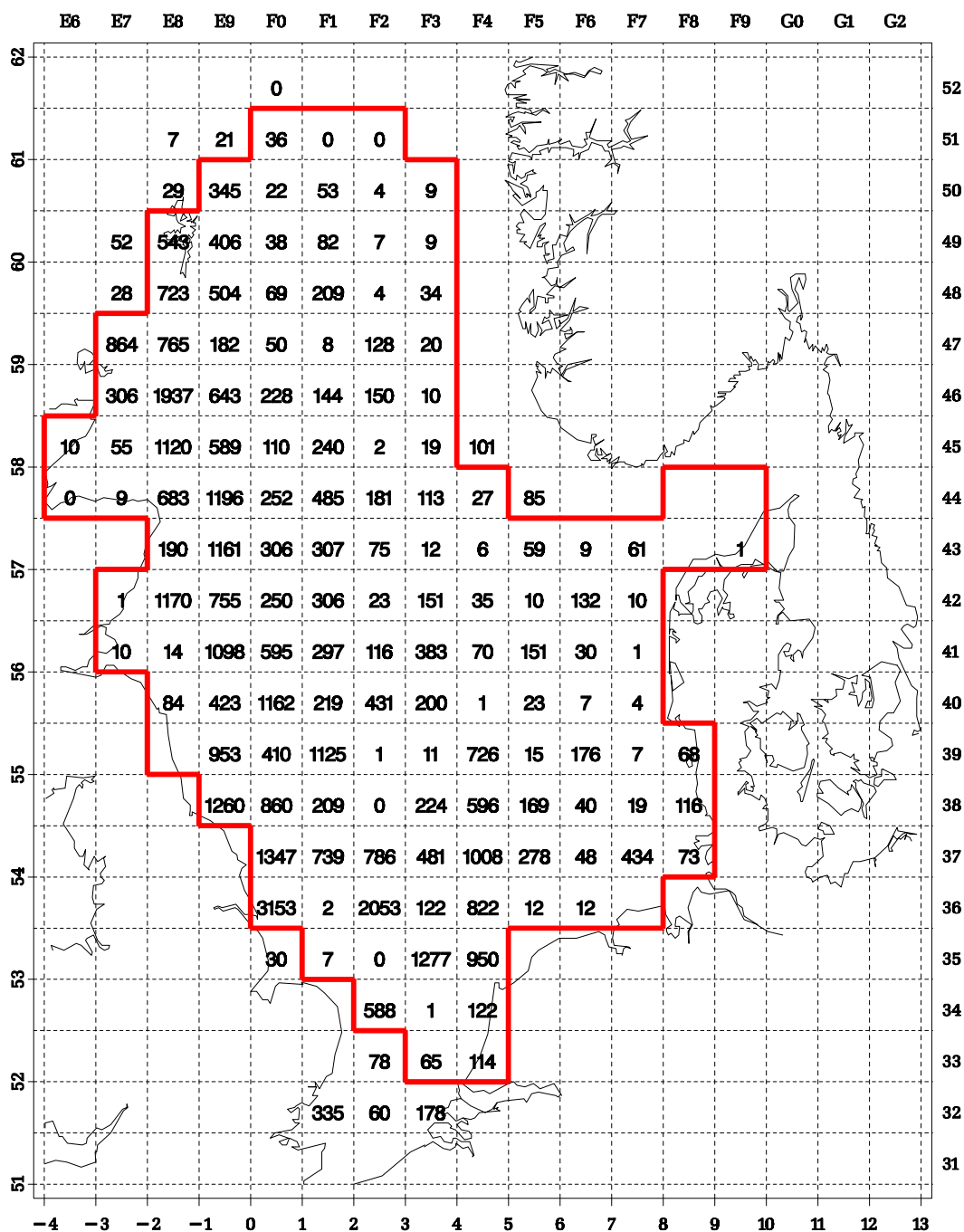


Figure 5.23 Whiting: number per hour, age 2.

Whiting, number per hour

Age group 3, 2000 quarter 3

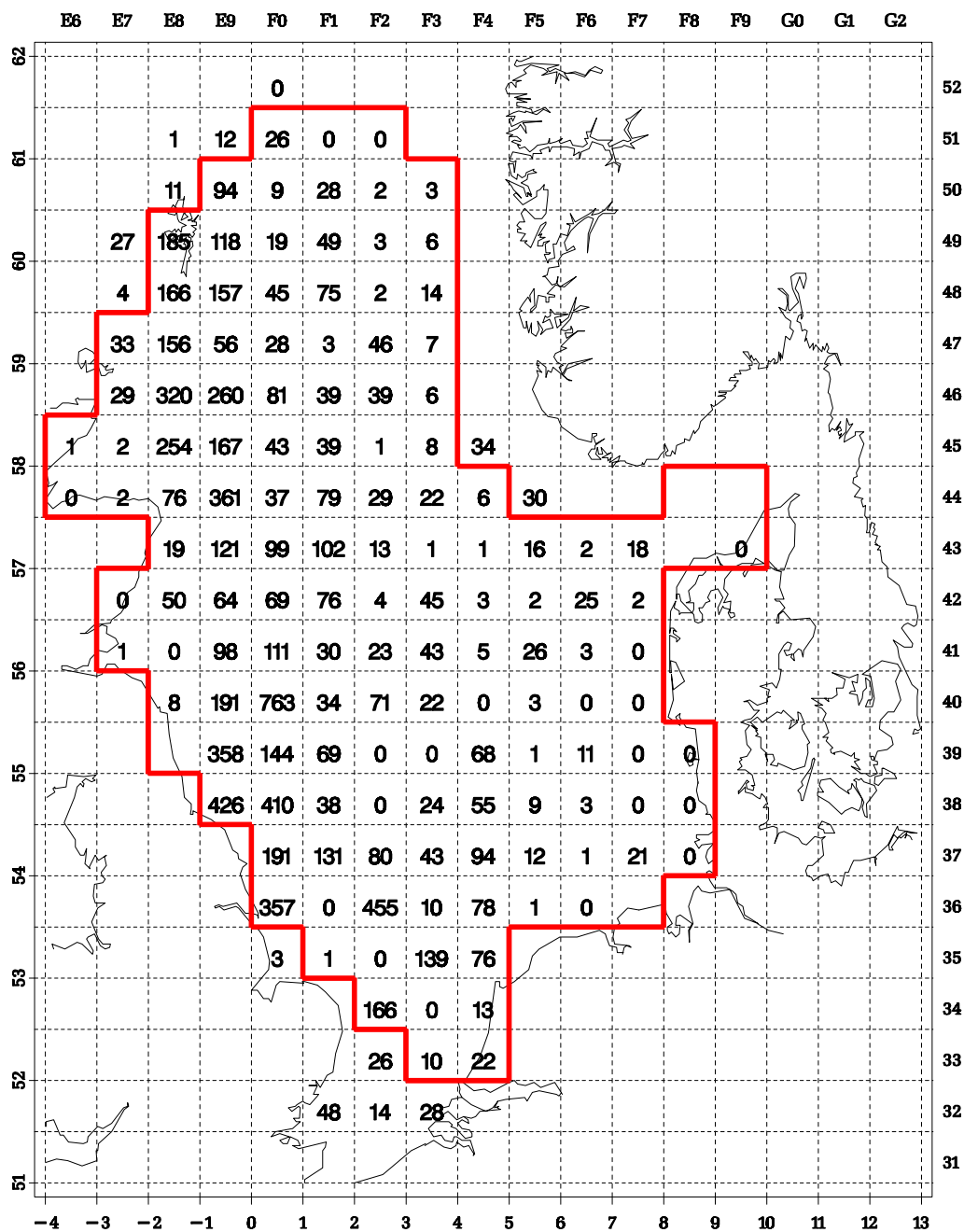


Figure 5.24 Whiting: number per hour, age 3.

Whiting, mean length

Age group 1, 2000 quarter 3

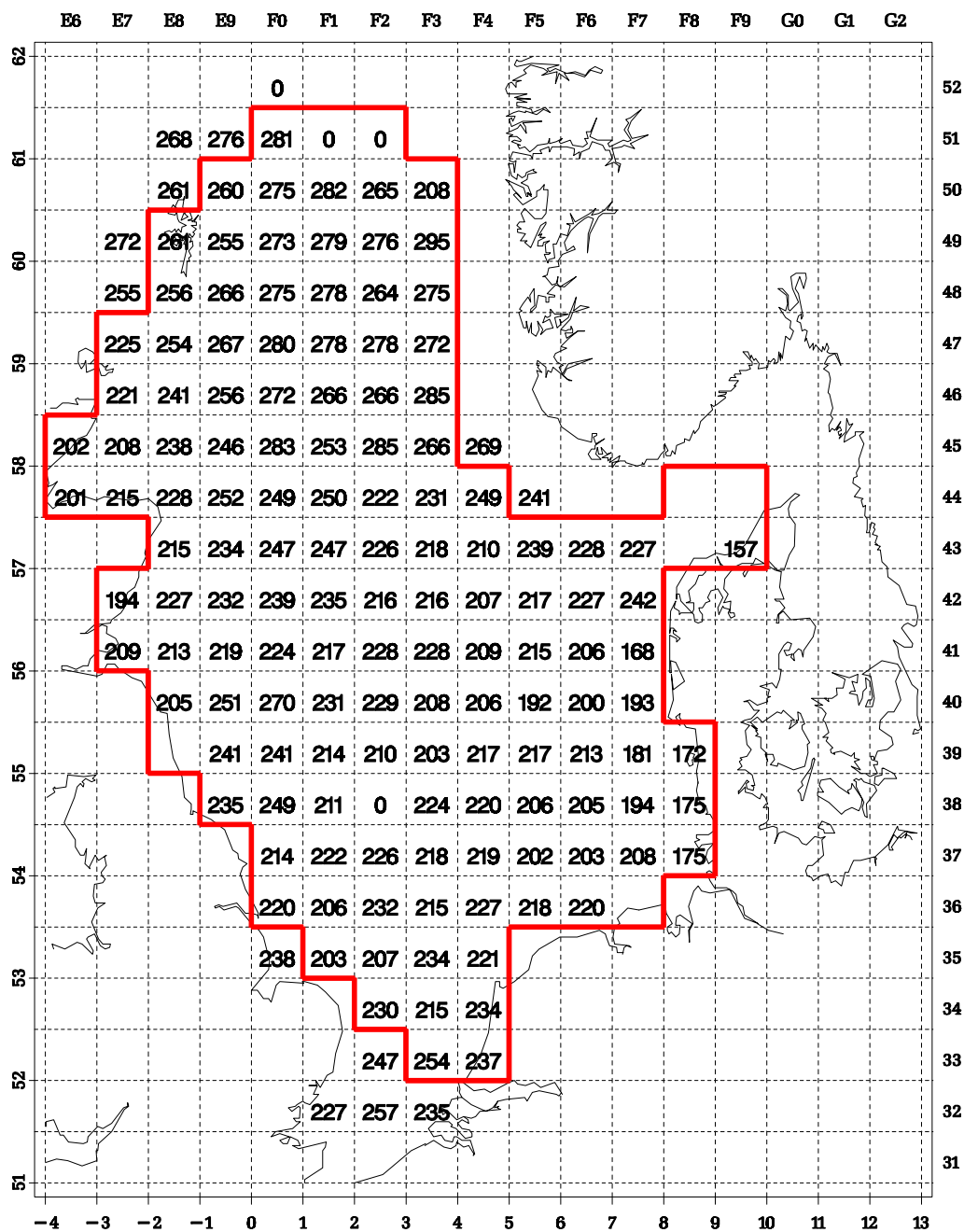


Figure 5.25 Whiting: mean length (mm), age 1.

Saithe, number per hour

Age group 1, 2000 quarter 3

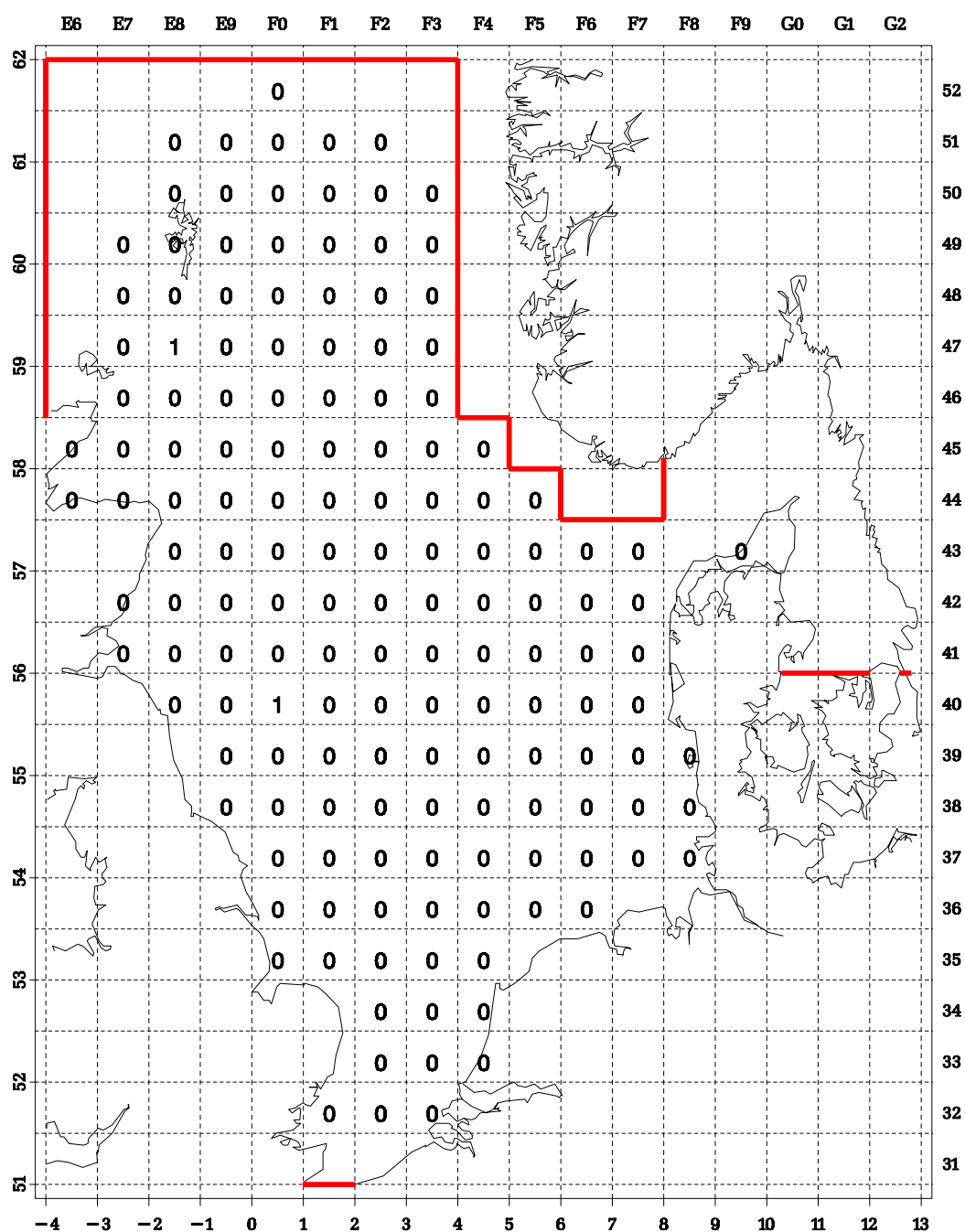


Figure 5.26 Saithe: number per hour, age 1.

Saithe, number per hour

Age group 2, 2000 quarter 3

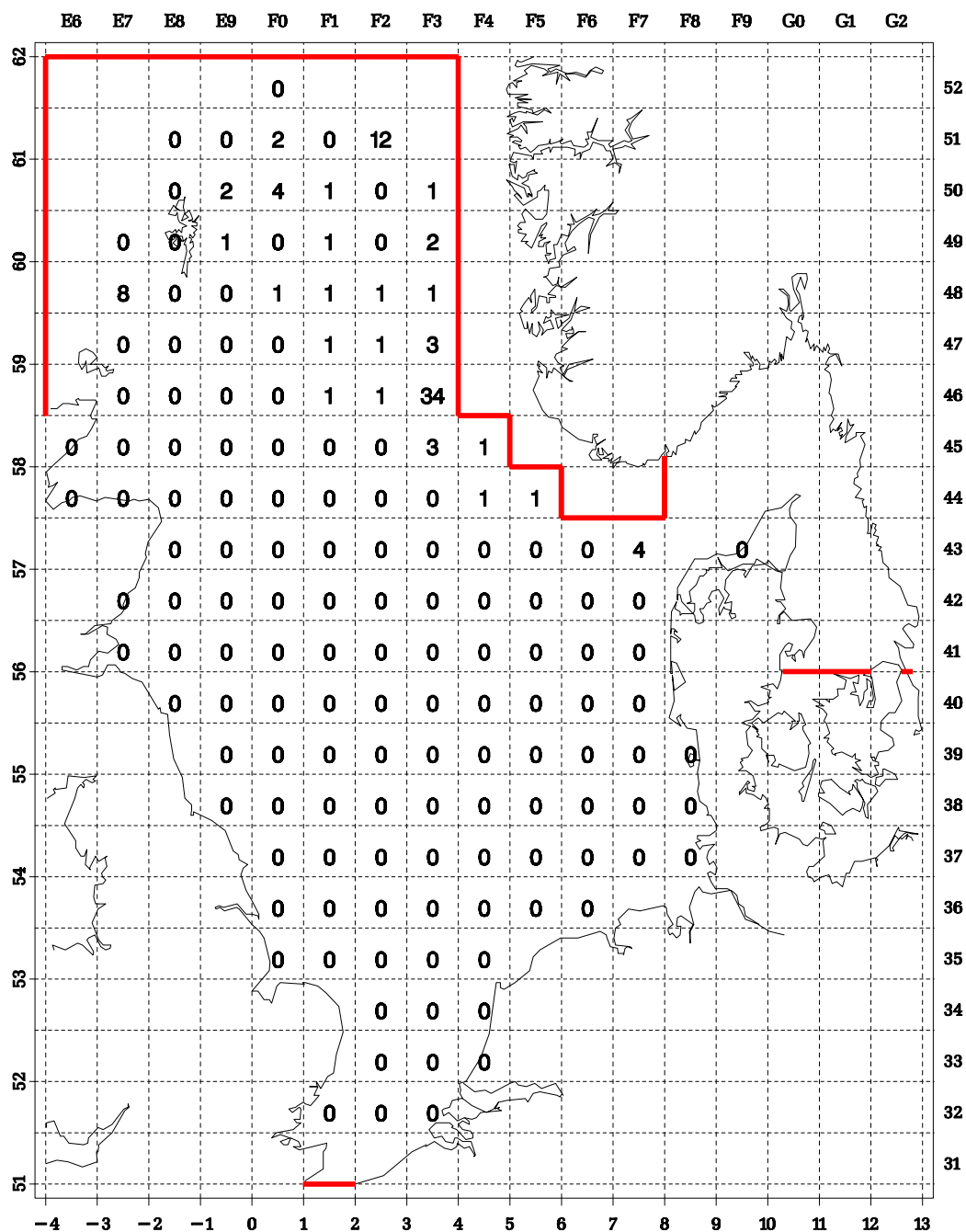


Figure 5.27 Saithe: number per hour, age 2.

Saithe, number per hour

Age group 3, 2000 quarter 3

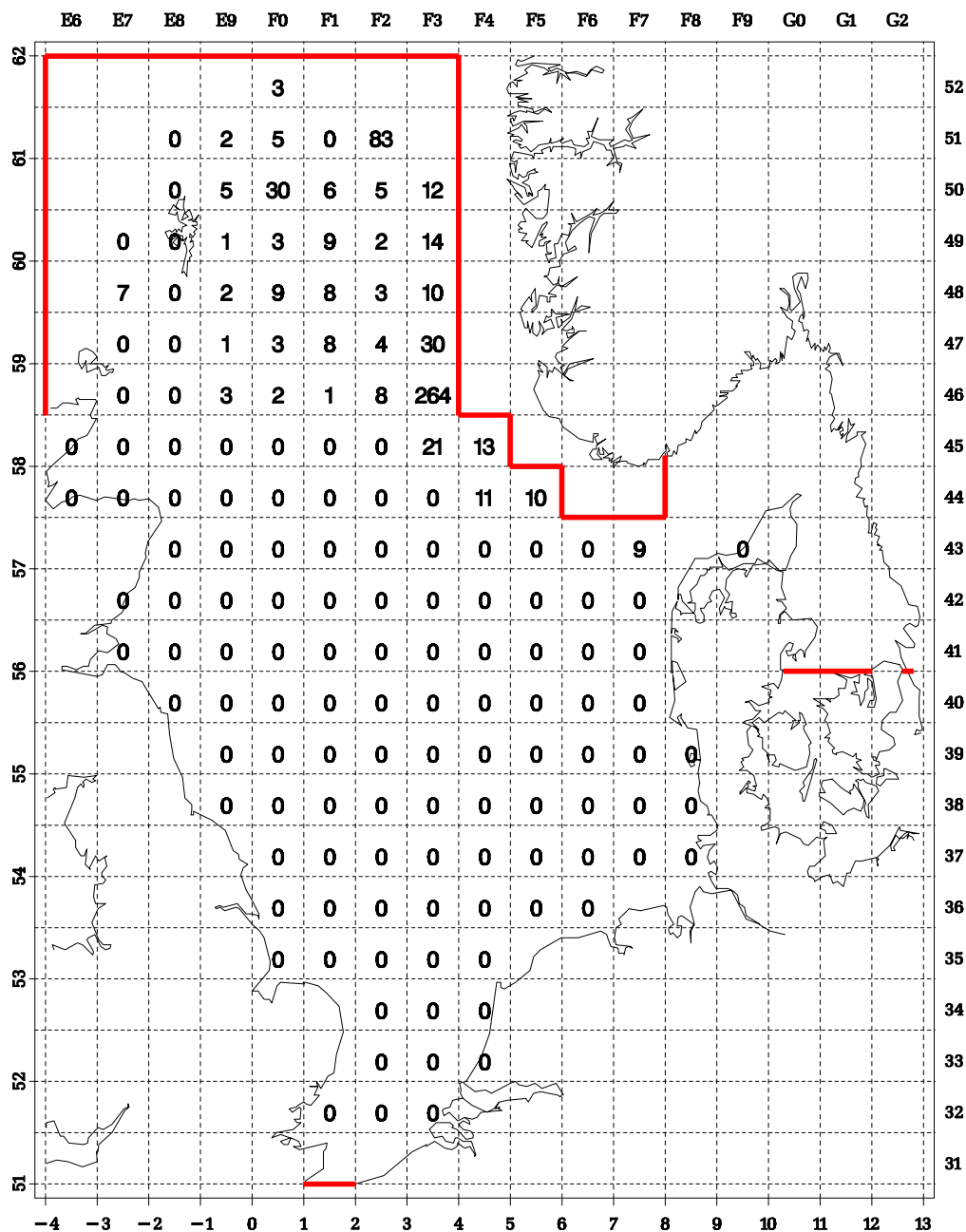


Figure 5.28 Saithe: number per hour, age 3.

Saithe, mean length Age group 1, 2000 quarter 3

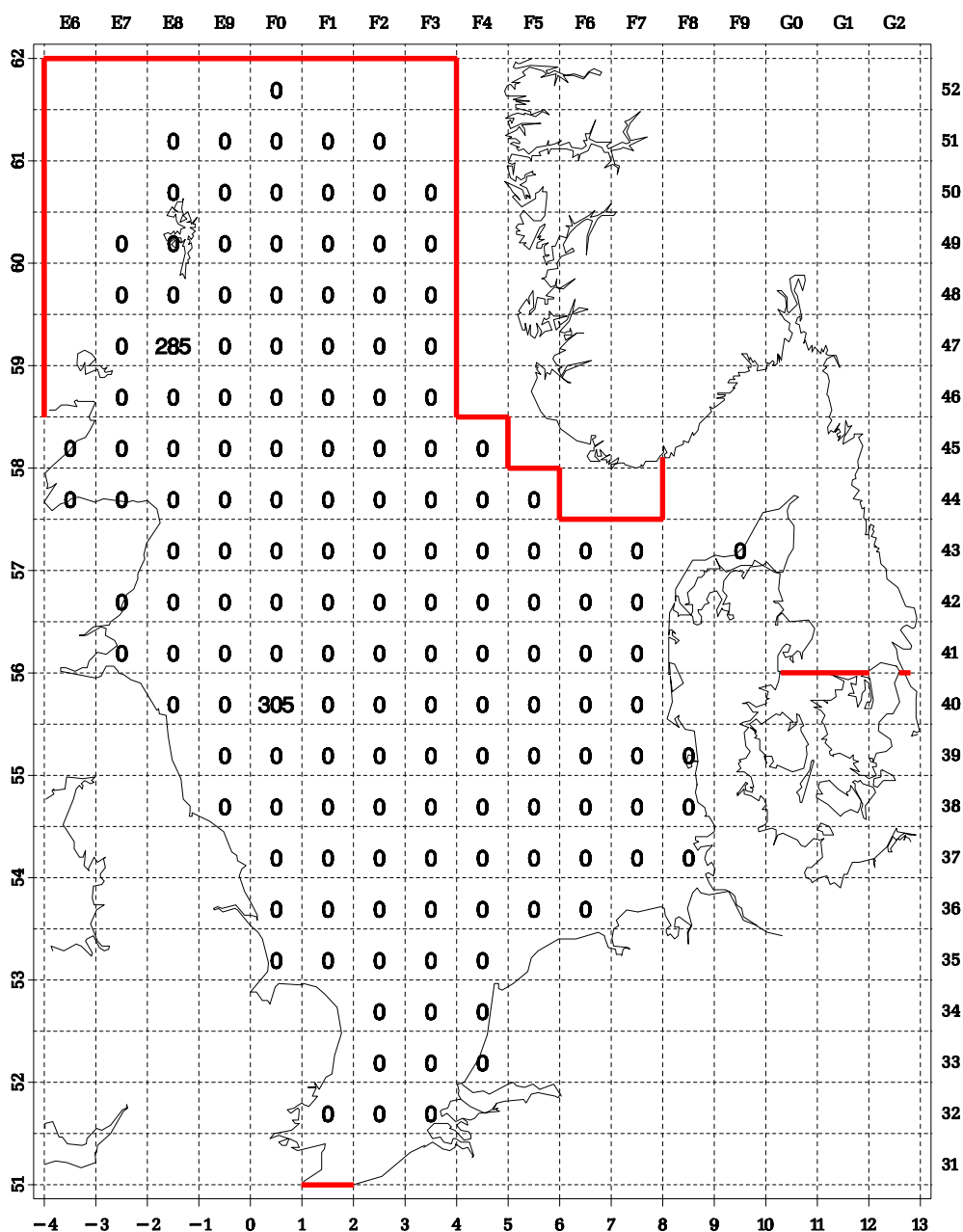


Figure 5.29 Saithe: mean length (mm), age 1.

Norway pout, number per hour Age group 1, 2000 quarter 3

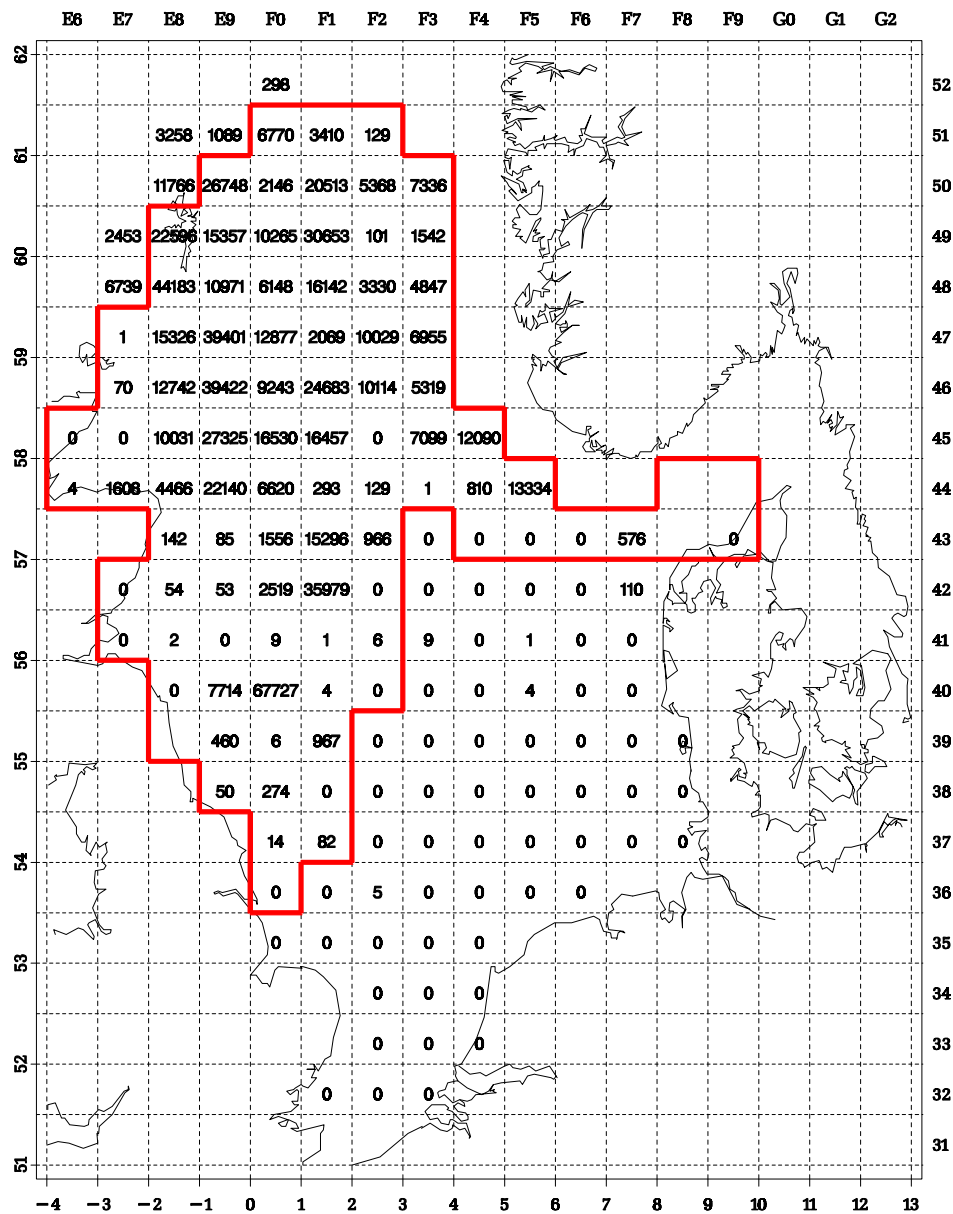


Figure 5.30 Norway pout: number per hour, age 1.

Norway pout, number per hour

Age group 2, 2000 quarter 3

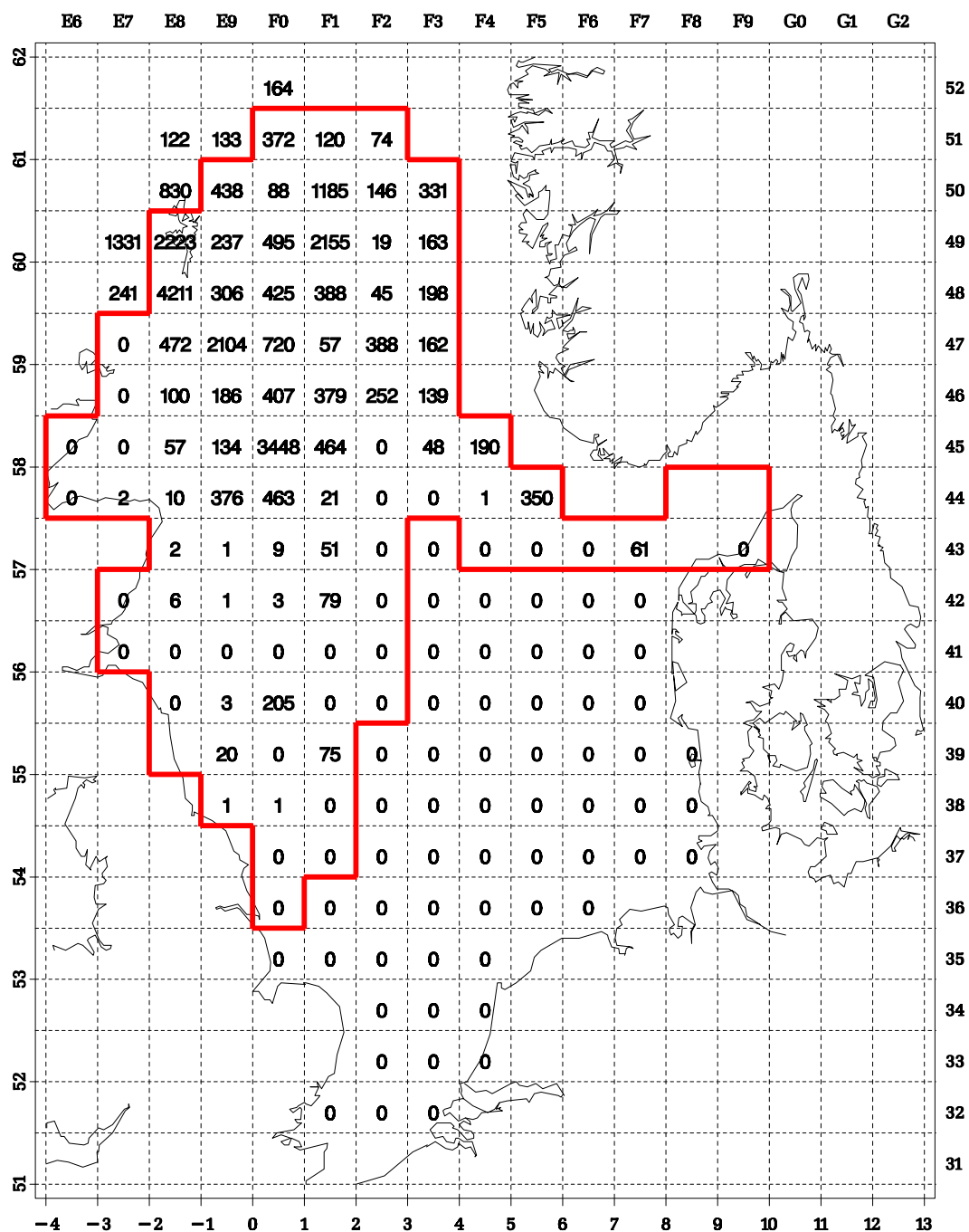


Figure 5.31 Norway pout: number per hour, age 2.

Age group 3, 2000 quarter 3

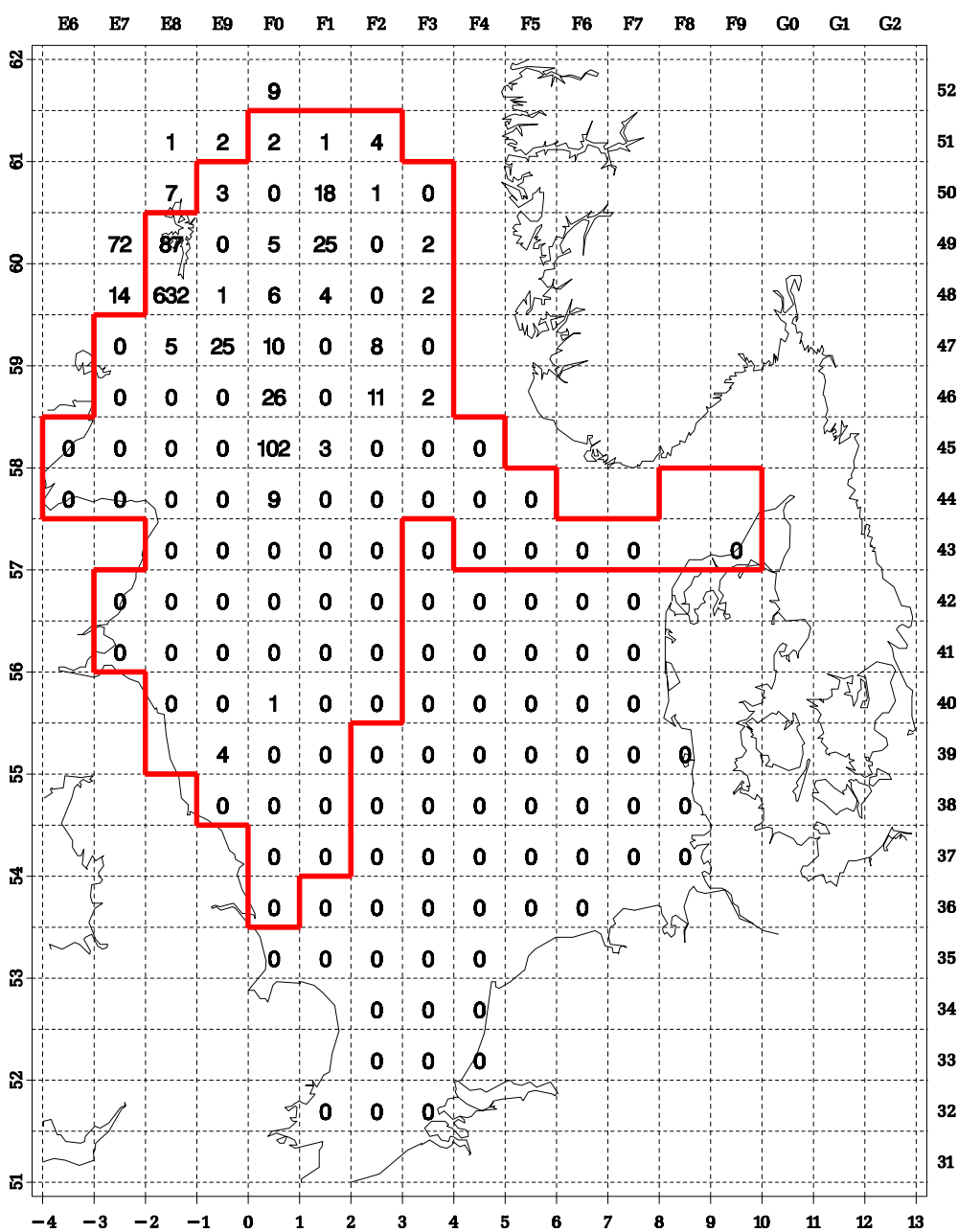


Figure 5.32 Norway pout: number per hour, age 3.

Norway pout, mean length

Age group 1, 2000 quarter 3

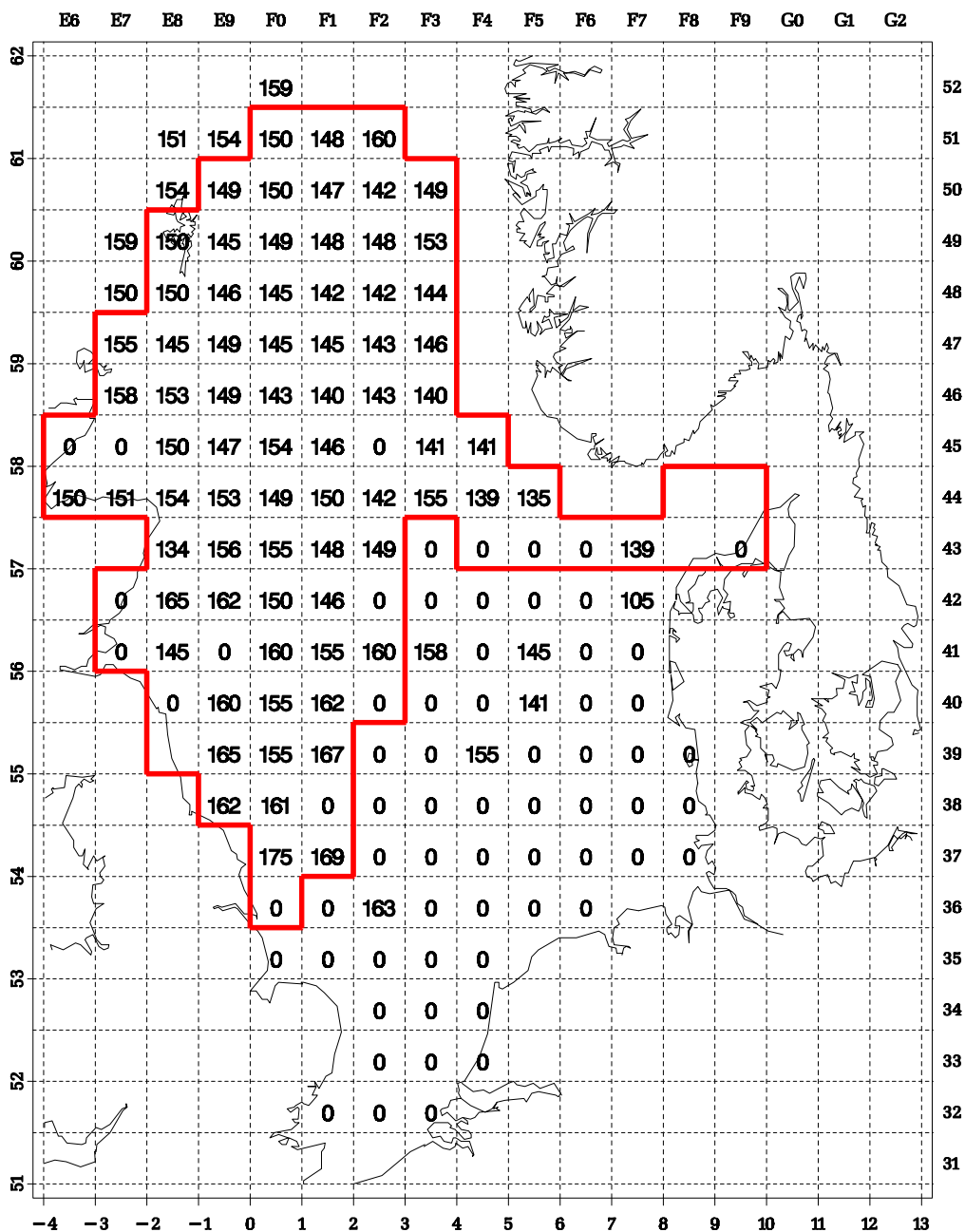


Figure 5.33

Norway pout: mean length (mm), age 1.

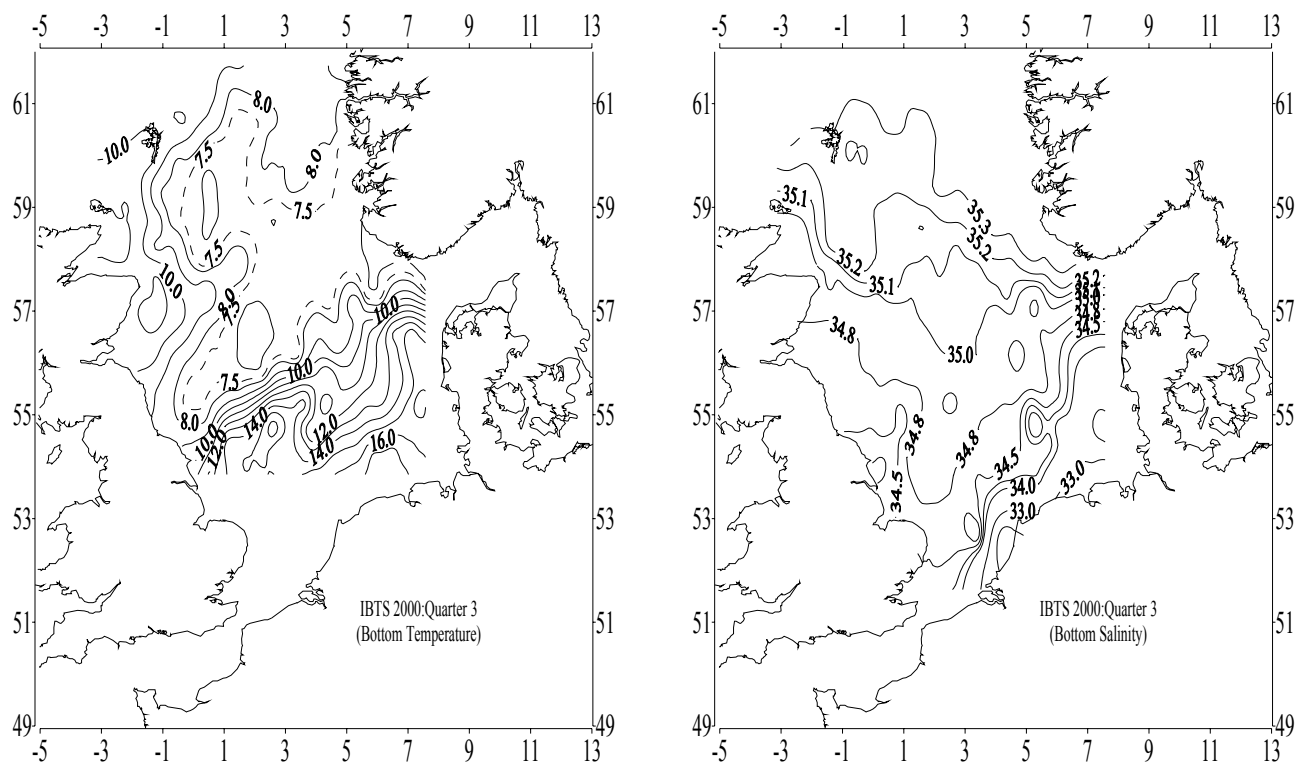


Figure 7.1 Distribution of bottom temperature and salinity during the IBTS quarter-3 2000 survey

REPORT OF THE
**International Bottom Trawl Survey in the North Sea,
Skagerrak and Kattegat in 2001: Quarter 1**

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 first quarter of 2002. 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. During a meeting of this Working Group in November 1995 (ICES 1996/H:1a) early analyses of the data indicated the potential usefulness of quarterly surveys and it was decided to encourage their continuation. These quarterly surveys have been carried out in all four quarters in the period 1991-1997, but since 1998 only the 1st and the 3rd quarters have been covered.

The results for the 3rd quarter of 2002 will be published in a separate ICES Report.

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*), as well as the catches of herring and sprat larvae. 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 Manual (ICES 1999/D:2 Addendum). Details on the participation in the 2002 1q survey are given below as numbers of valid hauls. The whole survey area has been covered as planned.

Country and Vessel		From	To	GOV Hauls	MIK
Denmark	Dana (new)	02/02	16/02	41	
England	Cirolana	31/01	18/02	53	
France	Thalassa (new)	09/03	22/03	62	
Germany	Walther Herwig (new)	20/01	14/02	70	
Netherlands	Tridens (new)	29/01	01/03	72	
Norway	Michael Sars	14/01	10/02	40	
Scotland	Scotia (new)	18/01	04/02	53	
Sweden	Argos	22/01	08/02	45	

3 DATA AVAILABLE

Table 3.1 shows number of valid hauls available in the ICES IBTS data base.

At the time of the analysis of the 2001 data presented in this report all final data were available in the database.

4 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 (ICES 1993/Assess:15).

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 IBTS Working Group decided at the meeting in November 1995 (ICES 1996/H:1a) 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/Assess:15) 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.

5 RESULTS OF GOV-TRAWL FOR 1st QUARTER 2001

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 Figure 5.1.

The number of otoliths sampled per target species and roundfish area is given in Table 5.1.

Per species a set of figures gives the distributions of the 1-, 2-, and 3 group and the mean length of 1-group fish per rectangle. The specific standard area used to calculate the index of year class strength is indicated in the figures.

The results are shown in Table 5.2 and in Figures 5.2-5.33.

6 RESULTS OF THE SAMPLING FOR HERRING AND SPRAT LARVAE IN 2001

During the IBTS fish larvae are sampled by towing a small meshed ring net (MIK) in oblique hauls. The catches are used in an estimation of fish larval density and abundance, assuming a 100% efficiency of the gear in catching the larvae at night.

Larval density is estimated from:

$$\text{Density (no. m}^{-2}\text{)} = (\text{no. Caught} / [\text{distance towed (m)} * \text{net-opening (m}^2\text{)}] * \text{water depth (m)})$$

The number of larvae within a given statistical rectangle is estimated by multiplying the density found by the surface area of a rectangle (approx. $309 * 10^7 \text{ m}^2$). The total number of larvae in the sampled area (the MIK index) is the sum of estimates for all statistical rectangles.

Based on a series of comparative hauls a conversion factor between the IKMT, used in the first period of the series, and the MIK is estimated. This is used to convert earlier catches to total numbers (MIK indices).

Herring larvae

In total 477 hauls were made during the 2001 sampling. The overall coverage of standard rectangles was good, and major distributional patterns were well described.

The estimation of recruitment indices is shown in Table 6.1. The spatial distribution of the 0-ringgers follows the trend of a north-westerly displacement which has been observed during the last years (Figure 6.1), this trend is especially marked for the present year. Unusual high catches were made in the north-west, for example off Moray Firth and off Buchan.

This years estimate of 1-ringer herring recruitment, from the IBTS 1-ringer sampling, are compared to last years index from the MIK 0-ringer sampling in the regression shown in Figure 6.2. The relation between the indices for the 1999 year class is in accordance with the long-term trend. Both indices indicate an intermediate 1999 year class.

Sprat larvae

Sprat larvae were sampled in small quantities in the central/southern sections of the sampling area. Because of the limited numbers, no calculation of index is carried out.

7 HYDROGRAPHIC DATA

7.1 Hydro-chemistry Survey

Eight ships involved in the 2001 IBTS quarter 1 survey contributed hydrographic data to the 2001 dataset. The contributions consisted of 490 stations worked between 12 January and 22 March. Nutrient data were supplied from 135 stations, contributions being received from three ships (Argos, Scotia and Tridens). Data quality was in general adequate, and had to be subject to special scrutiny because of exceptional hydrographic conditions in parts of the North Sea. The available IBTS data represented only about 50% of what had been collected in the North Sea in the period of the IBTS. Additional data provided to ICES were collected mainly by the same ships. Additional hydrographic and nutrient data were received from a *Corystes* (UK) and *Clupea* (UK) cruises, and these were included in the analysis presented here. As a result 929 stations including 365 nutrient stations were used in this report. Additional nutrient samples were collected by Michael Sars but these have not yet been submitted.

Charts of the distribution of bottom temperature and salinity are given in Figs 7.1 and 7.2. An updated table, giving the time series of temperature and salinity at 10 locations in the North Sea during IYFS/IBTS (1) surveys from 1970 to 2001 is provided in Table 7.1. The Figures and Table show a very low influence of Atlantic water between Shetland and Norway. This is illustrated by the salinity levels at time series location 1 (60N 4E) where values of 35.03 were much lower than in any year except 1978 (see Fig 7.3). According to the ICES Ocean Climate Status Report (www.ices.dk) such conditions were also apparent in the summer of 2001. Elsewhere conditions were similar to what they have been in recent years in response to a succession of positive NAO indexes. In particular the relative warmth following cooling in the mid-1990s has continued as well as the marked presence of the Channel water inflow.

8 REFERENCES

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- ICES 1996/H:1a. Report of the International Bottom Trawl Survey Working Group. ICES Doc. CM 1996/H:1.
- ICES 1999/D:2 Addendum. 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.

Table 3.1

Number of valid hauls. 1st quarter 2001.

Year	Total	Country								
		Denmark	England	France	Germany	Netherlands	Norway	Scotland	Sweden	USSR
1965	8	-	-	-	-	8	-	-	-	-
1966	90	-	-	-	63	27	-	-	-	-
1967	123	-	26	-	55	26	-	16	-	-
1968	136	-	18	-	61	24	-	33	-	-
1969	122	-	22	-	45	43	-	12	-	-
1970	130	-	24	-	41	49	-	16	-	-
1971	169	20	11	-	43	34	21	40	-	-
1972	207	17	22	-	30	36	24	45	33	-
1973	192	20	22	-	43	39	-	51	17	-
1974	247	28	20	-	50	52	2	39	16	40
1975	341	41	35	-	79	61	40	12	26	47
1976	342	31	31	-	61	50	51	36	24	58
1977	414	38	59	-	83	65	47	45	22	55
1978	451	39	58	52	98	68	53	59	24	-
1979	503	33	45	34	135	58	49	52	28	69
1980	404	-	55	53	69	84	55	57	31	-
1981	341	-	51	-	69	83	46	31	32	29
1982	373	27	49	40	62	58	46	38	23	30
1983	439	51	49	41	101	70	38	56	33	-
1984	465	37	51	44	101	94	45	58	35	-
1985	527	39	56	78	117	103	46	58	30	-
1986	527	39	61	73	114	107	41	52	40	-
1987	541	40	64	85	99	106	41	58	48	-
1988	404	39	43	69	74	51	44	46	38	-
1989	425	41	57	54	64	71	44	51	43	-
1990	379	24	55	58	82	23	47	46	44	-
1991	424	40	-	77	91	54	50	59	53	-
1992	381	40	-	53	92	40	47	63	46	-
1993	374	43	-	51	65	71	48	50	46	-
1994	363	48	-	54	84	46	27	56	48	-
1995	340	45	-	50	68	34	49	46	48	-
1996	328	46	-	41	62	45	41	45	48	-
1997	363	47	-	65	70	50	40	45	46	-
1998	405	51	-	79	79	54	41	56	45	-
1999	358	33	-	63	70	53	40	53	46	-
2000	380	34	-	68	91	55	41	46	45	-
2001	429	41	53	61	70	71	39	49	45	-
Total	12445	1072	1037	1343	2681	2063	1243	1575	1103	328

Table 5.1Number of otoliths sampled per species and roundfish area, 1st quarter 2001.

Species	Roundfish area									Total
	1	2	3	4	5	6	7	8	9	
Herring	846	736	879	381	292	822	497	797	561	5811
Cod	352	85	38	162	225	258	298	323	378	2119
Haddock	862	850	728	906	-	130	478	172	79	4205
Whiting	738	818	879	924	692	1068	293	-	-	5412
Saithe	359	-	-	-	-	1	14	-	-	374
Mackerel	120	30	111	-	-	-	-	-	-	261
Sprat	34	118	307	14	365	266	-	512	698	2314
Norway pout	188	172	176	213	-	-	122	-	-	871

Table 5.2Cod indices. Mean number per hour per haul. 1st quarter 2001.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1971	58.81	18.40	5.08	0.76	1.56	4.40
1972	10.02	23.06	4.02	0.48	0.32	1.39
1973	40.40	9.40	23.73	13.11	0.95	2.69
1974	15.25	9.64	3.67	3.03	0.98	0.54
1975	37.38	6.32	1.93	0.56	0.81	0.59
1976	8.78	20.40	3.08	1.65	0.39	0.85
1977	37.11	2.88	3.07	0.75	0.48	0.31
1978	13.03	29.80	1.62	1.64	0.57	0.54
1979	9.59	8.78	4.87	0.60	0.88	0.37
1980	18.22	16.84	6.28	2.70	0.58	0.81
1981	2.70	23.96	5.07	2.32	1.74	1.05
1982	9.67	6.54	6.86	1.49	0.83	1.05
1983	4.73	16.66	2.78	1.92	0.82	1.33
1984	16.23	8.64	4.00	0.89	0.99	0.86
1985	0.92	18.61	3.37	1.70	0.52	0.92
1986	16.68	3.52	7.03	2.33	1.23	1.01
1987	9.41	29.37	1.53	1.84	0.59	0.84
1988	5.60	6.38	6.18	0.65	0.98	1.03
1989	15.12	6.33	5.01	2.35	0.42	0.99
1990	3.95	15.67	1.90	1.02	0.97	0.61
1991	2.33	4.73	4.44	0.84	0.43	0.78
1992	13.02	4.42	1.13	1.01	0.27	0.48
1993	13.08	19.51	2.03	0.67	0.58	0.38
1994	14.81	4.40	2.95	0.79	0.50	0.53
1995	9.83	22.06	2.71	1.12	0.28	0.34
1996	3.46	8.04	5.97	0.71	0.60	0.41
1997	39.96	6.90	2.24	1.09	0.43	0.43
1998	2.67	26.37	2.00	0.86	0.52	0.40
1999	2.11	1.57	8.07	0.76	0.47	0.48
2000	6.56	3.77	0.73	2.03	0.41	0.50
2001	2.76	8.68	1.67	0.25	0.37	0.28

Table 5.2 cont'd Haddock indices. Mean number per hour per haul. 1st quarter 2001.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1967	42.00	3.94	2.85	6.01	0.21	0.26
1968	4877.59	29.18	13.11	4.97	1.76	7.41
1969	3555.63	1600.88	159.08	46.54	21.70	24.98
1970	52.58	148.78	145.93	60.28	7.23	1.24
1971	528.51	30.02	31.80	64.81	1.10	0.23
1972	395.09	258.09	32.94	4.74	9.70	0.82
1973	327.80	876.33	200.08	12.08	2.24	0.96
1974	1136.06	136.13	198.45	18.66	0.87	7.44
1975	1146.29	355.76	18.62	34.47	6.22	0.88
1976	105.00	556.39	182.89	16.47	13.72	3.23
1977	139.44	66.46	134.55	16.45	1.17	1.80
1978	352.82	105.85	27.92	66.53	10.43	2.92
1979	468.16	212.41	52.46	6.70	15.32	2.61
1980	863.66	388.56	86.65	10.66	2.37	5.76
1981	267.74	637.56	159.70	25.73	4.38	3.06
1982	537.59	253.00	421.86	60.26	8.05	2.16
1983	308.22	402.61	89.79	115.26	12.71	1.92
1984	1067.67	221.34	130.95	20.93	21.20	4.65
1985	228.46	828.35	105.12	33.77	4.29	7.16
1986	584.54	251.14	285.87	17.22	6.03	2.06
1987	917.32	328.81	47.18	61.09	4.73	2.58
1988	100.66	670.95	96.97	12.70	13.56	2.02
1989	217.62	97.39	273.66	16.79	2.14	4.70
1990	217.45	139.11	33.00	50.37	3.16	1.80
1991	677.98	132.96	24.83	4.24	8.43	2.41
1992	1162.98	344.58	18.08	3.00	0.61	2.04
1993	1254.31	540.80	154.47	8.87	1.08	0.95
1994	228.73	503.86	98.30	23.29	1.56	0.79
1995	1355.49	201.07	176.17	24.34	5.31	0.80
1996	267.41	813.27	65.87	46.69	7.73	3.07
1997	860.15	366.45	470.59	24.83	15.14	3.39
1998	373.58	432.33	105.51	113.69	8.65	5.36
1999	211.76	232.93	129.71	48.10	36.62	4.26
2000	3702.06	107.83	49.88	25.37	15.56	10.28
2001	887.61	2279.02	47.76	10.93	7.18	5.71

Table 5.2 cont'd Herring indices. Mean number per hour per haul. 1st quarter 2001.

Year	Mean per statistical rectangle				
	Age group				
	1	2	3	4	5+
1965	10641.28	84.39	0.58	0.00	0.00
1966	600.60	183.43	9.02	0.06	0.00
1967	237.33	38.45	9.15	0.92	0.02
1968	266.72	14.34	0.35	0.15	0.01
1969	349.72	30.00	1.05	0.31	0.61
1970	644.52	96.12	2.02	0.19	0.30
1971	1382.10	586.01	28.06	3.52	0.22
1972	1496.37	416.03	18.14	5.55	2.30
1973	310.62	81.93	12.51	1.52	0.39
1974	558.14	179.67	9.20	1.26	0.42
1975	884.35	70.21	13.25	2.78	1.02
1976	693.23	49.17	0.84	0.43	0.05
1977	245.11	22.34	2.52	0.10	0.21
1978	622.49	19.42	5.68	28.94	2.74
1979	156.26	26.48	7.77	0.44	1.30
1980	342.81	14.77	10.03	2.59	5.52
1981	517.70	269.58	28.47	19.19	32.33
1982	799.25	93.68	21.40	3.18	3.76
1983	1230.70	127.69	43.15	14.23	26.47
1984	1468.93	157.91	62.30	27.86	10.05
1985	2082.43	695.43	280.28	44.29	28.97
1986	2593.00	762.39	268.52	78.21	26.48
1987	3733.82	879.67	115.29	58.76	49.80
1988	4469.57	4392.97	850.54	60.76	26.04
1989	2186.99	868.13	372.94	103.97	9.77
1990	1024.62	448.17	290.87	272.10	71.64
1991	1180.26	763.19	268.05	240.44	162.00
1992	1204.04	381.22	181.34	63.64	101.66
1993	2988.47	781.61	209.21	43.60	63.76
1994	1644.26	1093.59	199.32	63.56	39.95
1995	1215.41	1174.16	233.33	30.85	5.73
1996	1728.33	194.27	43.33	12.56	8.49
1997	3992.71	489.50	189.72	39.79	22.63
1998	2067.10	743.36	89.64	20.43	19.28
1999	714.82	424.60	509.23	101.36	37.49
2000	3638.91	215.86	157.37	60.86	9.02
2001	2496.37	1141.62	313.24	99.27	73.43

Table 5.2 cont'd Mackerel indices. Mean number per hour per haul. 1st quarter 2001.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1974	0.97	0.00	0.00	0.00	0.00	0.00
1976	0.49	0.29	0.04	0.00	0.28	0.00
1977	1.97	0.00	0.00	0.01	0.00	0.00
1978	1.18	0.00	0.71	0.00	0.00	0.32
1979	0.54	0.00	0.00	0.00	0.00	0.00
1980	0.01	0.00	0.01	0.00	0.00	0.00
1981	0.44	0.12	0.00	0.00	0.00	0.00
1982	0.64	0.52	0.00	0.00	0.00	0.04
1983	2.16	6.60	2.59	1.07	0.03	0.11
1984	0.06	0.35	0.56	0.32	0.04	0.59
1985	1.25	0.00	0.00	0.00	0.00	0.02
1986	0.61	2.50	0.00	0.10	0.00	0.00
1987	88.42	0.24	0.49	0.12	0.05	0.23
1988	1.33	0.06	0.19	0.37	0.02	0.09
1989	1.43	2.26	0.11	0.05	0.31	0.00
1990	35.13	1.16	0.23	0.05	0.10	0.00
1991	6.93	0.16	0.01	0.08	0.02	0.07
1992	15.99	0.37	2.23	1.11	0.00	0.01
1993	1.03	0.78	0.90	0.41	0.24	0.34
1994	2.25	0.10	0.05	0.00	0.00	0.00
1995	0.36	2.55	0.90	0.00	0.00	0.00
1996	10.36	0.66	1.22	0.18	0.21	0.10
1997	719.19	3.31	0.45	1.25	0.49	0.53
1998	27.74	7.83	0.44	0.23	0.22	0.15
1999	43.65	57.17	20.15	1.87	0.94	1.24
2000	333.28	2.73	0.32	0.13	0.00	0.00
2001	43.20	26.12	22.51	6.28	1.86	1.83

Table 5.2 cont'd Norway Pout indices. Mean number per hour per haul. 1st quarter 2001.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1972	1722.30	618.60	4.08	0.00	0.00	0.00
1974	11927.18	8094.98	775.27	1.00	0.12	0.03
1975	4826.87	1807.63	20.69	10.99	0.48	0.00
1976	4066.35	302.68	13.83	0.00	0.00	0.00
1977	6094.88	256.27	53.10	0.02	0.00	0.69
1978	1480.02	551.22	46.90	0.26	0.00	0.00
1979	2557.68	306.59	73.38	0.00	0.01	0.09
1980	3274.68	552.05	29.05	4.07	0.04	0.00
1981	1091.91	377.27	14.94	0.18	0.04	0.05
1982	4436.61	256.02	57.86	1.28	0.00	0.06
1983	2326.16	628.04	8.01	3.40	0.06	0.00
1984	4060.94	866.46	58.14	1.02	0.26	0.33
1985	2117.07	1423.36	72.92	3.22	0.03	0.01
1986	2111.67	397.30	20.56	1.12	0.02	0.00
1987	3243.79	499.43	64.68	3.31	0.30	0.00
1988	123.49	724.11	12.88	2.07	0.55	0.00
1989	2078.65	260.12	177.48	2.74	0.24	0.06
1990	1295.33	747.93	38.61	2.57	0.00	0.00
1991	2511.73	656.98	125.70	0.00	0.00	10.68
1992	5090.89	901.52	32.25	4.21	0.00	0.22
1993	2681.40	2644.13	258.50	5.95	7.01	0.13
1994	1869.95	374.26	66.29	2.51	0.22	0.02
1995	5940.49	784.85	76.45	8.56	0.00	0.00
1996	926.03	2628.21	227.45	4.70	0.07	0.00
1997	9762.09	1467.46	666.19	2.65	0.00	0.00
1998	1020.66	5335.46	256.77	85.71	24.80	0.00
1999	3526.75	597.12	667.25	3.99	0.29	0.00
2000	8095.25	1535.16	65.01	47.58	0.00	0.00
2001	1304.39	2860.54	234.72	3.98	0.00	0.00

Table 5.2 cont'd Saithe indices. Mean number per hour per haul. 1st quarter 2001.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1974	0.01	0.03	0.03	0.00	0.00	0.00
1975	0.00	1.10	0.00	0.00	0.00	0.00
1977	0.00	0.00	0.23	10.25	2.07	0.90
1979	0.00	0.00	0.14	0.17	0.18	0.40
1980	0.42	0.00	0.29	0.79	0.50	1.59
1981	0.00	0.02	0.00	0.29	1.14	2.18
1982	0.01	0.26	0.29	0.35	0.21	0.87
1984	0.02	0.16	0.13	0.71	2.00	2.51
1985	0.02	0.92	105.92	15.67	0.00	25.76
1986	0.03	2.48	89.60	4.31	0.31	0.67
1987	0.01	0.90	1.35	5.26	0.29	1.77
1988	0.00	0.02	1.46	1.33	1.71	1.17
1989	0.03	0.00	4.64	4.25	1.00	2.76
1990	0.00	0.15	1.30	1.54	0.68	3.30
1991	0.02	0.08	4.56	1.98	0.91	0.09
1992	0.03	0.12	0.48	2.56	0.34	0.57
1993	0.05	1.94	0.48	1.21	2.30	1.71
1994	0.09	0.38	2.81	7.50	1.09	0.45
1995	0.00	0.01	0.43	0.86	1.08	0.74
1996	0.38	0.57	1.68	16.56	1.11	0.42
1997	0.02	0.00	0.03	1.37	2.24	0.47
1998	0.05	0.03	0.22	2.17	1.34	1.82
1999	0.11	0.01	0.30	0.88	2.53	1.19
2000	0.07	0.05	0.82	0.23	0.40	3.03
2001	0.63	0.01	0.12	0.68	1.69	0.76

Table 5.2 cont'd Sprat indices. Mean number per hour per haul. 1st quarter 2001.

Year	Mean per statistical rectangle				
	Age group				
	1	2	3	4	5+
1974	0.94	0.85	0.90	1.05	0.00
1975	81.44	448.60	283.25	19.89	4.81
1976	680.18	638.82	232.19	26.07	0.07
1977	177.81	4078.96	242.11	28.37	0.03
1978	1762.62	726.22	335.57	1.29	0.01
1979	717.51	327.30	233.41	8.41	0.10
1980	557.87	1347.70	113.56	1.38	0.01
1981	1018.29	1176.29	190.78	10.20	1.25
1982	249.54	478.64	114.31	5.11	0.26
1983	228.85	744.73	179.51	7.83	0.67
1984	381.31	386.55	47.38	7.15	0.37
1985	652.00	301.14	40.04	6.40	0.61
1986	70.29	105.02	27.50	1.56	0.33
1987	792.23	86.83	24.19	2.18	0.18
1988	162.98	1429.56	91.28	9.23	0.00
1989	3909.80	757.51	346.18	4.71	2.12
1990	185.33	571.20	122.97	31.28	0.54
1991	1117.83	113.62	25.75	3.22	0.21
1992	1560.54	340.17	37.83	5.46	0.44
1993	1688.63	589.81	83.77	4.17	0.06
1994	4002.86	1368.02	127.00	2.72	0.65
1995	1157.89	2695.85	131.70	3.15	1.04
1996	232.58	557.50	176.95	22.38	1.06
1997	853.73	409.11	50.71	4.56	0.04
1998	1694.61	1710.60	280.42	11.89	2.26
1999	3963.67	508.74	64.90	3.74	43.57
2000	1652.99	1056.64	329.12	60.32	0.72
2001	1048.96	1145.33	190.47	19.56	0.07

Table 5.2 cont'd Whiting indices. Mean number per hour per haul. 1st quarter 2001.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1967		97.85	21.16	7.21	0.84	1.15
1968	1267.71	81.75	25.43	4.74	0.65	0.31
1969	504.74	382.30	19.75	7.98	1.09	0.09
1970	57.55	132.91	27.44	5.31	0.60	0.18
1971	219.74	19.69	10.02	10.17	0.55	0.25
1972	263.69	104.31	33.53	10.68	4.15	0.18
1973	1460.01	381.80	53.72	33.61	8.36	5.70
1974	312.49	485.97	105.66	7.10	0.58	1.30
1975	881.19	174.47	91.13	19.69	3.81	0.57
1976	676.19	349.44	130.00	31.29	5.03	0.53
1977	411.42	232.59	69.08	12.25	11.03	13.00
1978	542.89	256.84	88.72	21.12	4.97	7.50
1979	440.93	228.84	112.59	33.06	4.89	1.17
1980	674.04	403.34	125.75	25.62	9.15	1.96
1981	229.26	464.30	228.31	45.93	9.29	2.78
1982	151.38	216.14	257.36	68.51	10.14	4.57
1983	127.09	126.86	112.57	79.19	33.39	6.36
1984	439.01	178.88	89.20	30.25	25.38	10.49
1985	339.01	361.76	65.70	18.53	7.03	7.18
1986	469.37	268.42	194.60	32.42	6.60	3.85
1987	683.38	556.49	90.42	46.17	4.98	1.98
1988	450.74	863.72	312.75	34.17	12.28	1.31
1989	1446.08	538.56	414.76	109.90	12.05	5.09
1990	518.94	862.35	198.16	91.61	16.98	3.62
1991	1009.16	686.18	479.41	70.86	37.60	7.59
1992	904.61	677.69	250.36	162.89	14.96	14.26
1993	1088.20	523.70	244.52	65.48	59.00	11.44
1994	720.99	636.97	179.84	66.59	11.56	8.93
1995	678.59	448.48	239.45	58.07	11.87	5.58
1996	502.36	485.97	244.70	69.74	23.09	9.85
1997	287.87	342.07	162.52	60.43	18.01	9.18
1998	556.11	161.26	125.49	54.05	15.50	9.26
1999	676.27	305.45	94.67	57.45	25.82	11.08
2000	756.58	537.39	182.10	53.05	20.01	14.74
2001	647.14	594.85	296.08	97.73	25.68	26.05

Table 6.1 Density and abundance estimates of 0-ringers caught in February during the IBTS. Values given for year classes by areas are density estimates in numbers per square metre. Total abundance is found by multiplying density by area and summing up.

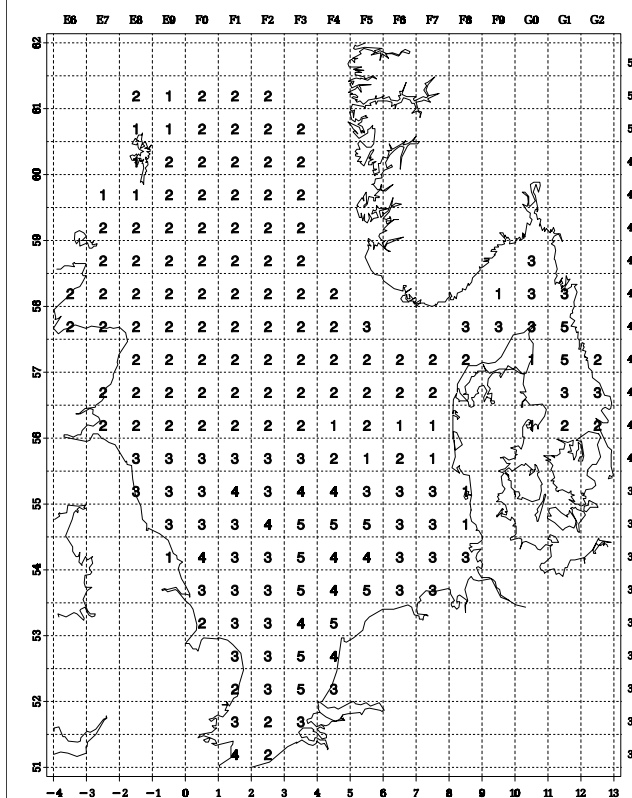
Area	North west	North east	Central west	Central east	South west	South east	Division IIIa	South Bight	0-ringers abundance no. in 10 ⁹
Area m ² x 10 ⁹	83	34	86	102	37	93	31	31	
Year class									
1976	0.054	0.014	0.122	0.005	0.008	0.002	0.002	0.016	17.1
1977	0.024	0.024	0.050	0.015	0.056	0.013	0.006	0.034	13.1
1978	0.176	0.031	0.061	0.020	0.010	0.005	0.074	0.000	52.1
1979	0.061	0.195	0.262	0.408	0.226	0.143	0.099	0.053	101.1
1980	0.052	0.001	0.145	0.115	0.089	0.339	0.248	0.187	76.7
1981	0.197	0.000	0.289	0.199	0.215	0.645	0.109	0.036	133.9
1982	0.025	0.011	0.068	0.248	0.290	0.309	0.470	0.140	91.8
1983	0.019	0.007	0.114	0.268	0.271	0.473	0.339	0.377	115.0
1984	0.083	0.019	0.303	0.259	0.996	0.718	0.277	0.298	181.3
1985	0.116	0.057	0.421	0.344	0.464	0.777	0.085	0.084	177.4
1986	0.317	0.029	0.730	0.557	0.830	0.933	0.048	0.244	270.9
1987	0.078	0.031	0.417	0.314	0.159	0.618	0.483	0.495	168.9
1988	0.036	0.020	0.095	0.096	0.151	0.411	0.181	0.016	71.4
1989	0.083	0.030	0.040	0.094	0.013	0.035	0.041	0.000	25.9
1990	0.075	0.053	0.202	0.158	0.121	0.198	0.086	0.196	69.9
1991	0.255	0.390	0.431	0.539	0.500	0.369	0.298	0.395	200.7
1992	0.168	0.039	0.672	0.444	0.734	0.268	0.345	0.285	190.1
1993	0.358	0.212	0.260	0.187	0.120	0.119	0.223	0.028	101.7
1994	0.148	0.024	0.417	0.381	0.332	0.148	0.252	0.169	126.9
1995	0.260	0.086	0.699	0.092	0.266	0.018	0.001	0.020	106.2
1996	0.003	0.004	0.935	0.135	0.436	0.379	0.039	0.032	148.1
1997	0.042	0.021	0.338	0.064	0.178	0.035	0.023	0.083	53.1
1998	0.100	0.056	1.150	0.592	0.998	0.265	0.280	0.127	244.0
1999	0.045	0.011	0.799	0.200	0.514	0.220	0.107	0.026	137.1
2000	0.284	0.011	1.052	0.197	1.156	0.376	0.063	0.006	214.8

Table 7.1

Time series data of bottom temperature and salinity during IYFS/IBTS(1) 1970-2001

Location Position	1		2		3		4		5		6		7		8		9		10	
	60N2E	Sal	57.5N0E	Sal	57.5N2E	Sal	57.5N4E	Sal	55N0E	Sal	55N2E	Sal	55N4E	Sal	55N8E	Sal	540N3E	Sal	52.5N3E	Sal
Year	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal
1970	5.5	35.08	5.8	34.95	5.3	35.00	4.7	34.92	5.9	34.75	4.5	34.82	4.0	34.72	0.5	33.00	4.0	34.72	4.0	34.62
1971	7.1	35.15	7.0	35.05	6.9	35.15	6.0	35.10	7.0	34.82	6.2	34.88	5.5	34.80	3.5	33.00	5.9	34.55	7.0	34.95
1972	5.8	35.22	6.9	35.08	5.9	35.20	4.5	34.78	6.5	34.91	4.8	34.86	5.2	34.80	2.5	33.80	5.2	34.70	6.9	35.10
1973			7.4	35.02	7.2	35.20	6.7	35.10	7.0	35.05	6.1	35.00	6.0	34.86	5.0	33.00	6.4	34.80	6.5	35.05
1974	6.9	35.28	6.5	35.11	6.5	35.08	6.3	35.04	6.5	34.90	6.0	34.90	5.6	34.90	4.7	33.00	6.1	34.78	8.0	35.20
1975	7.3	35.20	6.6	35.05	6.6	35.15	6.4	35.13	6.6	34.95	6.4	34.90	6.1	34.85	5.2	33.50	5.9	34.62	6.9	34.62
1976	6.7	35.20	6.5	35.00	6.5	35.15	5.6	35.12	6.1	34.81	4.9	34.95	4.9	34.85	2.2	31.00	5.1	34.78	5.1	34.80
1977	6.0	35.18	6.2	35.02	5.1	35.00	4.8	34.92	6.0	34.98	4.9	34.85	5.0	34.80	3.1	33.60	5.6	34.78	7.1	35.22
1978	6.4	34.88	6.6	35.00	6.0	34.90	4.7	34.88	5.6	34.78	4.9	34.88	4.2	34.80	2.2	32.50	4.6	34.68	5.5	34.90
1979	6.4	35.15	6.0	34.80	4.1	34.88	4.0	34.98	4.5	34.64	2.8	34.62	2.8	34.62	-1.5	32.00	3.0	34.62	4.2	34.95
1980	5.9	35.12	6.6	35.00	5.5	35.00	4.5	34.70	6.1	34.60	3.8	34.65	4.5	34.50	3.1	33.50	5.1	34.70	6.1	35.11
1981	6.9	35.22	6.6	34.90	6.2	35.05	5.8	35.15	6.5	34.80	5.8	34.82	5.1	34.82	3.4	32.50				
1982	6.6	35.28	6.1	35.02	5.9	35.05	5.5	35.10	5.5	34.72	4.8	34.82	4.5	34.62	2.8	32.50	4.7	34.30	6.0	34.65
1983	6.9	35.22	6.5	35.00	6.4	35.10	6.2	35.15	5.6	34.62	6.1	34.95	5.2	34.90	3.0	33.00	5.2	34.80	6.4	34.70
1984	6.3	35.18	6.4	35.10	6.4	35.10	5.2	35.12	5.9	34.80	5.0	34.84	4.9	34.90	3.5	33.00	4.9	34.65	7.4	34.95
1985	6.9	35.17	6.8	35.10	6.5	35.18	5.9	35.05	6.5	34.70	4.7	34.91	5.0	34.90	1.0	32.50	4.0	34.70	6.0	34.80
1986	6.6	35.25	5.8	35.05	5.4	35.08	5.2	35.05	5.2	34.65	3.9	34.72	3.6	34.60	0.0	32.50	4.0	34.60	4.0	34.65
1987	6.5	35.28	6.1	34.90	5.9	35.08	4.9	35.00	5.0	34.75	4.2	34.80	4.3	34.60	0.8	30.00	4.9	34.60	4.8	34.90
1988	7.6	35.18	7.6	34.95	7.4	35.03	7.0	34.96	7.1	34.70	6.6	34.80	6.5	34.50	5.9	33.50	6.9	34.60	7.7	34.90
1989	8.5	35.29	8.0	34.85	7.8	34.89	7.6	35.05	7.5	34.76	7.1	34.81	6.8	34.80	6.0	34.10	6.5	34.68	7.5	34.62
1990	8.5	35.29	7.6	35.00	7.6	35.12	7.6	35.15	7.5	34.70	7.5	34.85	7.5	34.80	6.5	34.10	7.4	34.70	7.4	34.60
1991	7.9	35.30	6.7	35.10	7.1	35.22	6.1	34.97	6.6	34.65	5.8	34.85	5.5	34.80	3.0	34.00	5.8	34.60	6.1	35.30
1992	8.1	35.29	7.6	35.10	7.1	35.16	7.1	35.19	7.4	34.80	6.6	34.80	6.5	34.80	6.6	32.00	4.5	34.80	6.0	35.20
1993	7.4	35.31	6.5	34.92	6.4	35.18	6.5	35.30	6.5	35.05	6.2	35.00	5.4	34.95	4.3	33.50	5.6	34.80	6.0	35.00
1994	6.2	35.20	6.5	35.05	5.5	34.93	4.3	34.80	6.3	34.90	5.4	34.90	5.2	34.80	4.0	32.00	5.5	34.70	7.0	35.00
1995	7.5	35.23	7.0	34.92	7.1	35.00	6.7	35.09	6.7	34.71	6.0	34.87	5.6	34.81	4.0	30.03	6.0	34.65	7.9	34.51
1996	7.1	35.24	6.5	34.91	5.0	34.94	4.7	34.87	6.0	34.59	4.6	34.71	3.0	34.44	-0.2	32.12	3.4	34.71	3.8	34.83
1997	7.6	35.21	7.3	34.92	6.2	34.92	6.4	35.09	6.5	34.72	5.8	34.80	4.9	34.72	2.9	32.93	5.2	34.67	5.2	34.96
1998	8.2	35.29	8.5	35.14	7.8	35.16	7.0	35.00	7.5	34.79	6.3	34.84	6.1	34.62	3.5	31.78	6.3	34.56	7.2	35.25
1999	7.6	35.30	7.1	35.00	7.4	35.16	6.7	35.10	7.2	34.79	6.4	34.94	5.5	34.80	4.1	31.02	5.8	34.73	8.3	35.14
2000	8.0	35.30	7.4	34.98	7.4	35.14	7.1	35.21	6.7	34.83	6.8	35.01	6.1	34.92	5.1	31.88	6.1	34.72	7.2	35.18
2001	7.7	35.03	7.7	34.97	7.7	35.12	6.6	34.98	6.7	34.81	6.4	34.86	5.3	34.66	2.1	31.41	5.7	34.46	7.9	34.78

Number of hauls, 2001 quarter 1



Number of daytime hauls, 2001 quarter 1

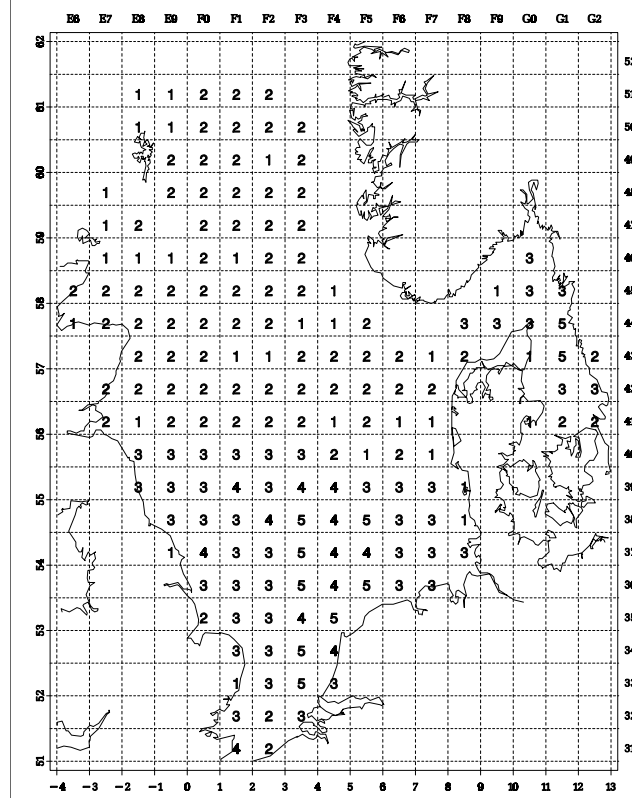


Figure 5.1 Number of valid day- and night-time hauls.

Herring, number per hour

Age group 1, 2001 quarter 1

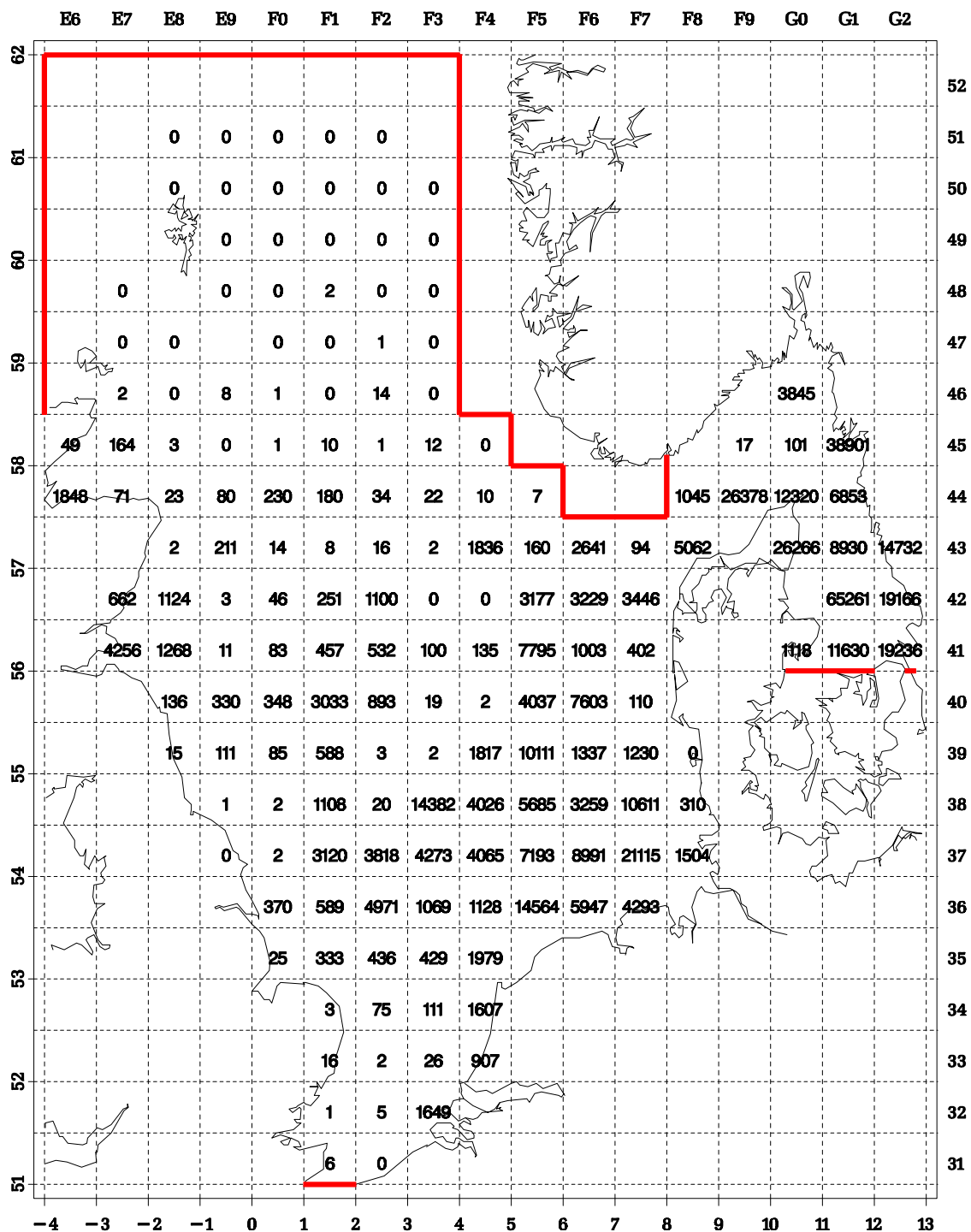


Figure 5.2 Herring: number per hour, 1-ringers

Herring, number per hour

Age group 2, 2001 quarter 1

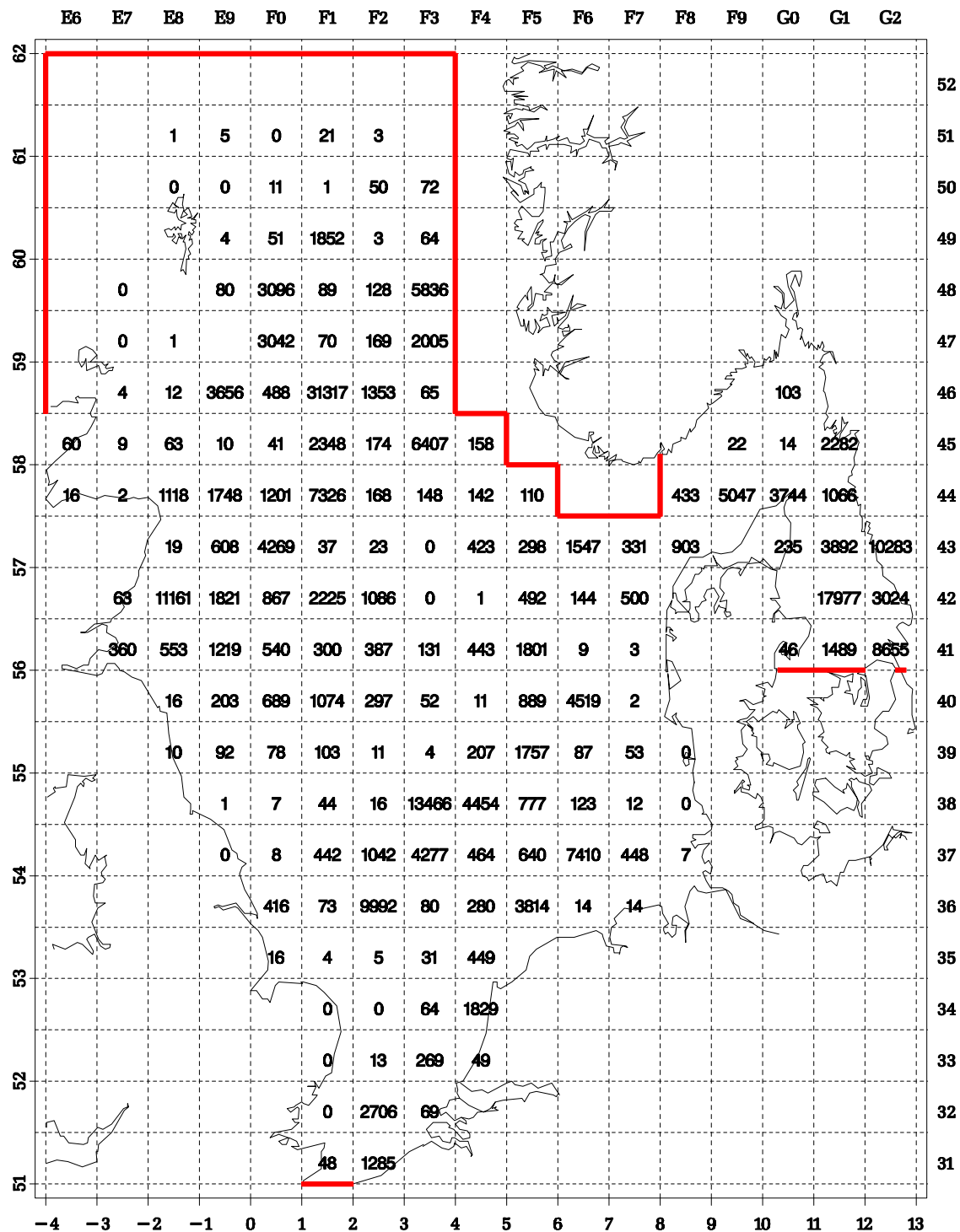


Figure 5.3 Herring: number per hour, 2-ringers

Herring, number per hour

Age group 3, 2001 quarter 1

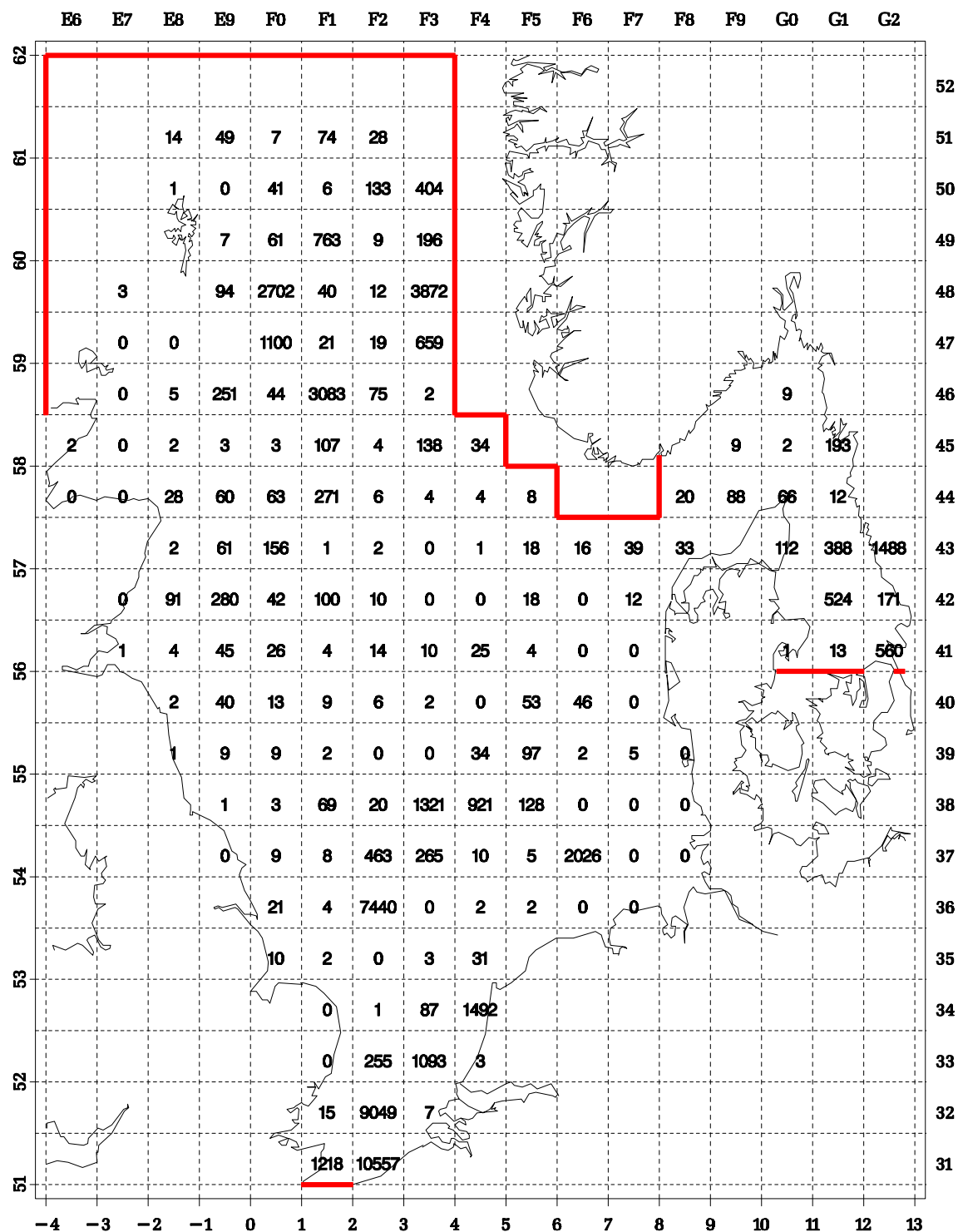


Figure 5.4 Herring: number per hour, 3-ringers

Herring, mean length

Age group 1, 2001 quarter 1

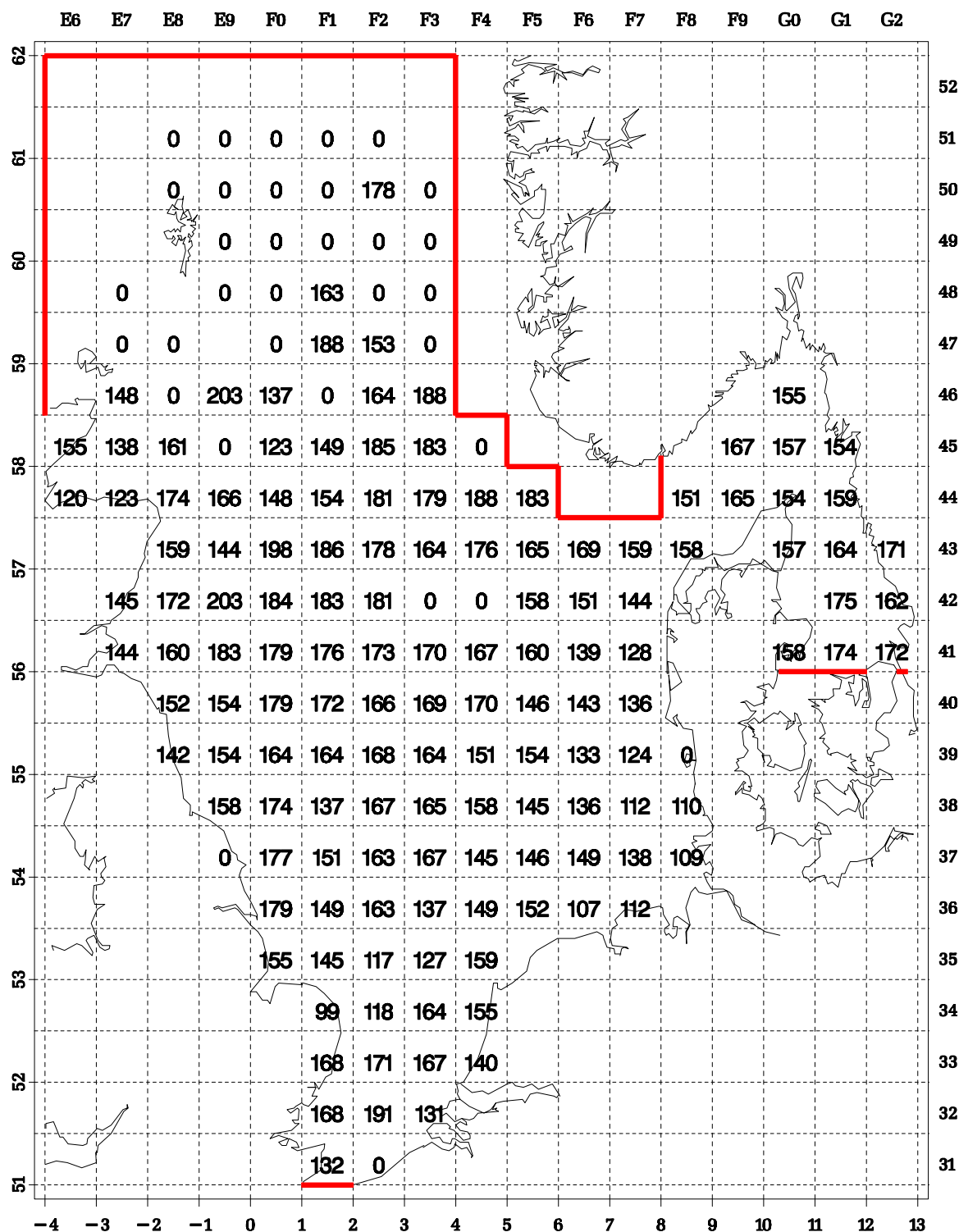


Figure 5.5 Herring mean length (mm) 1-ringers

Sprat, number per hour

Age group 1, 2001 quarter 1

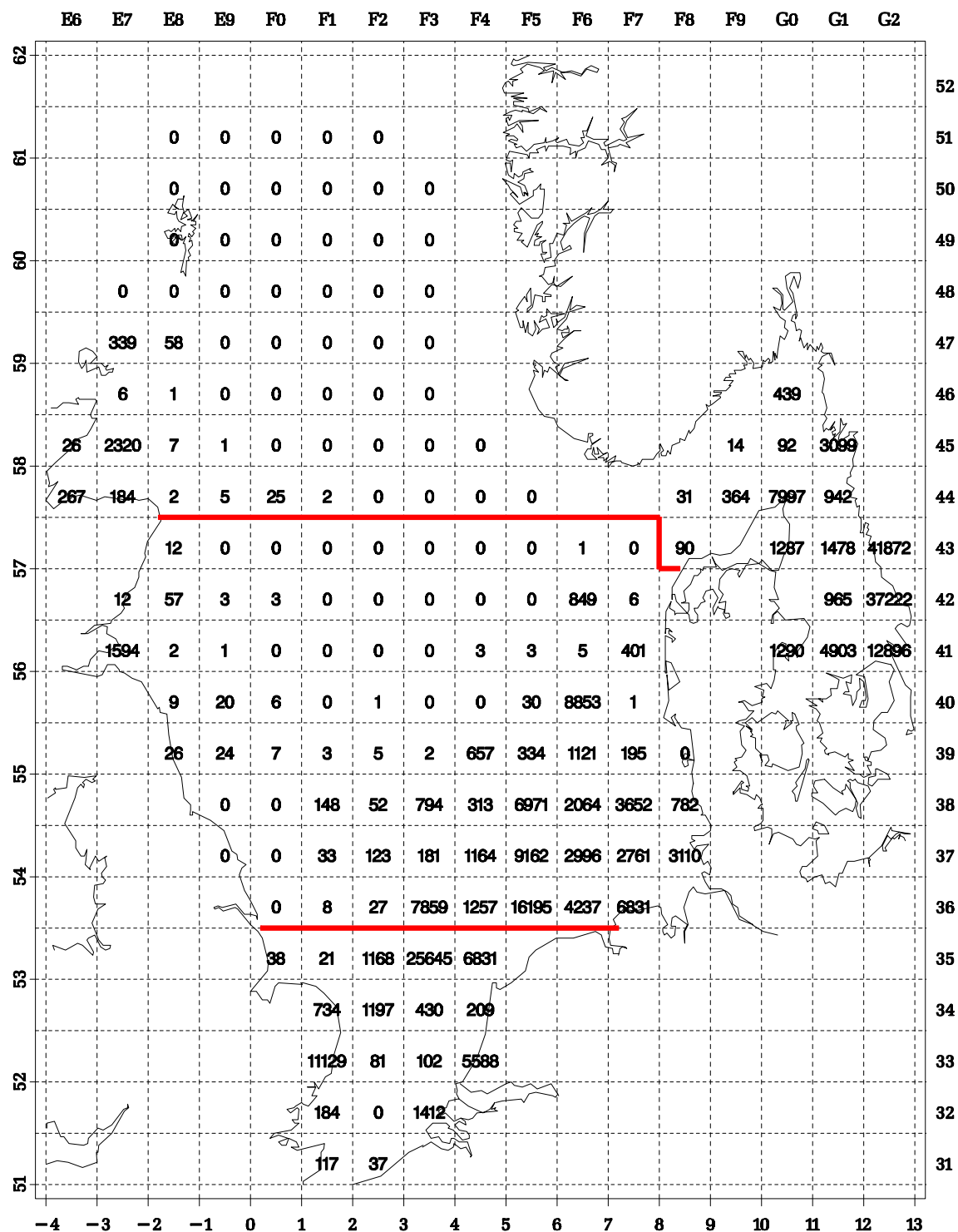


Figure 5.6 Sprat: number per hour, age 1

Sprat, number per hour

Age group 2, 2001 quarter 1

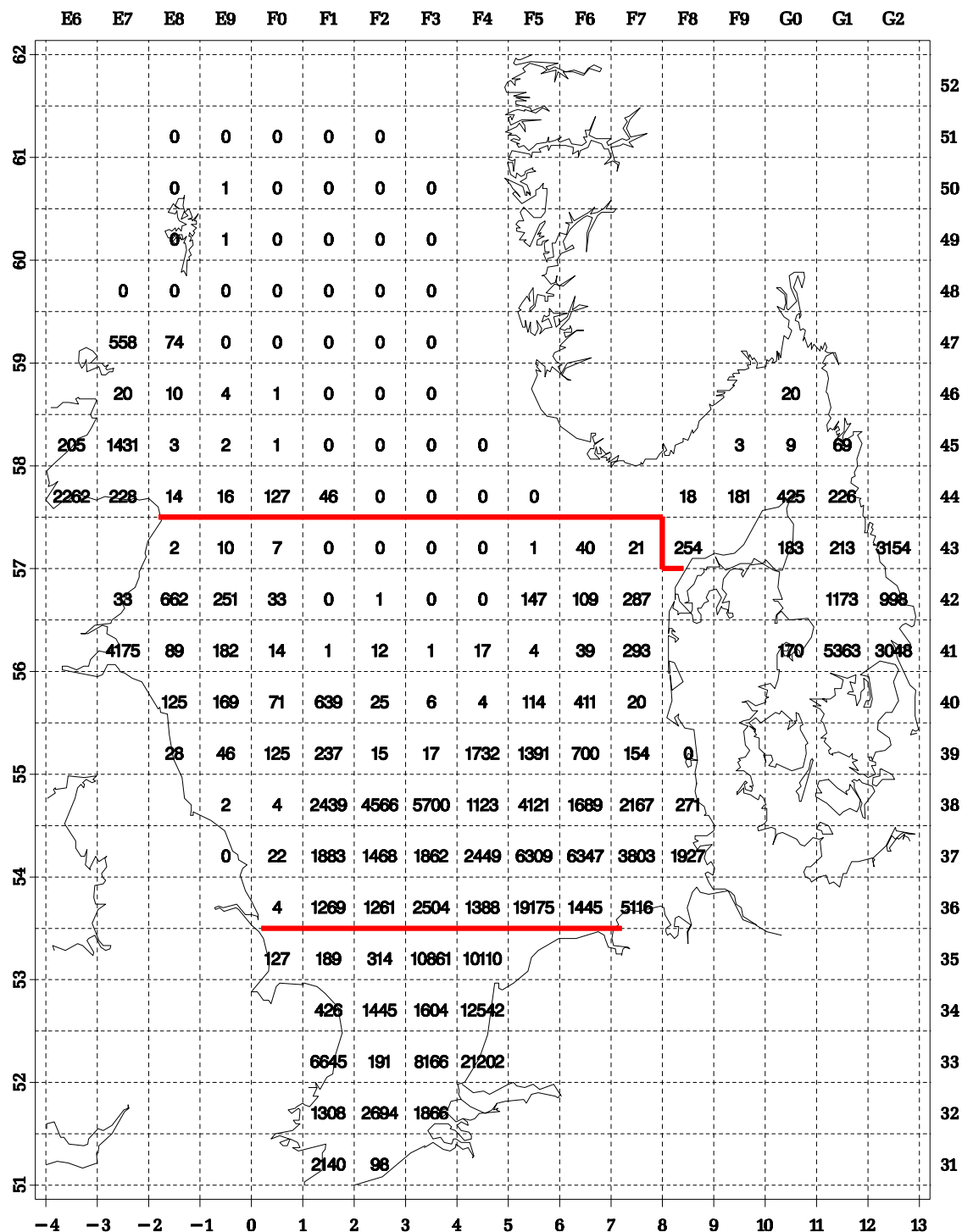


Figure 5.7 Sprat: number per hour, age 2

Sprat, number per hour

Age group 3, 2001 quarter 1

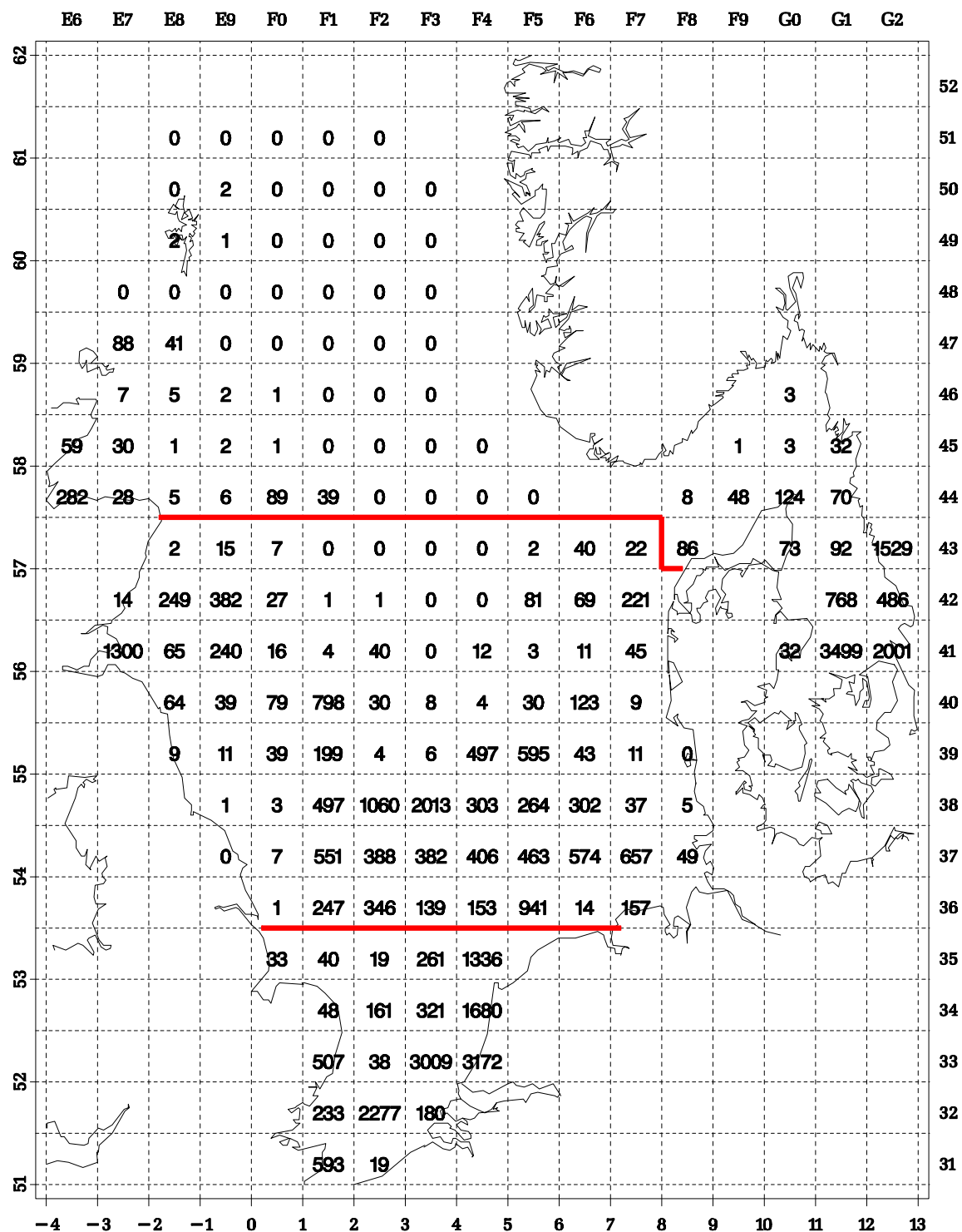


Figure 5.8 Sprat: number per hour, age 3

Sprat, mean length

Age group 1, 2001 quarter 1

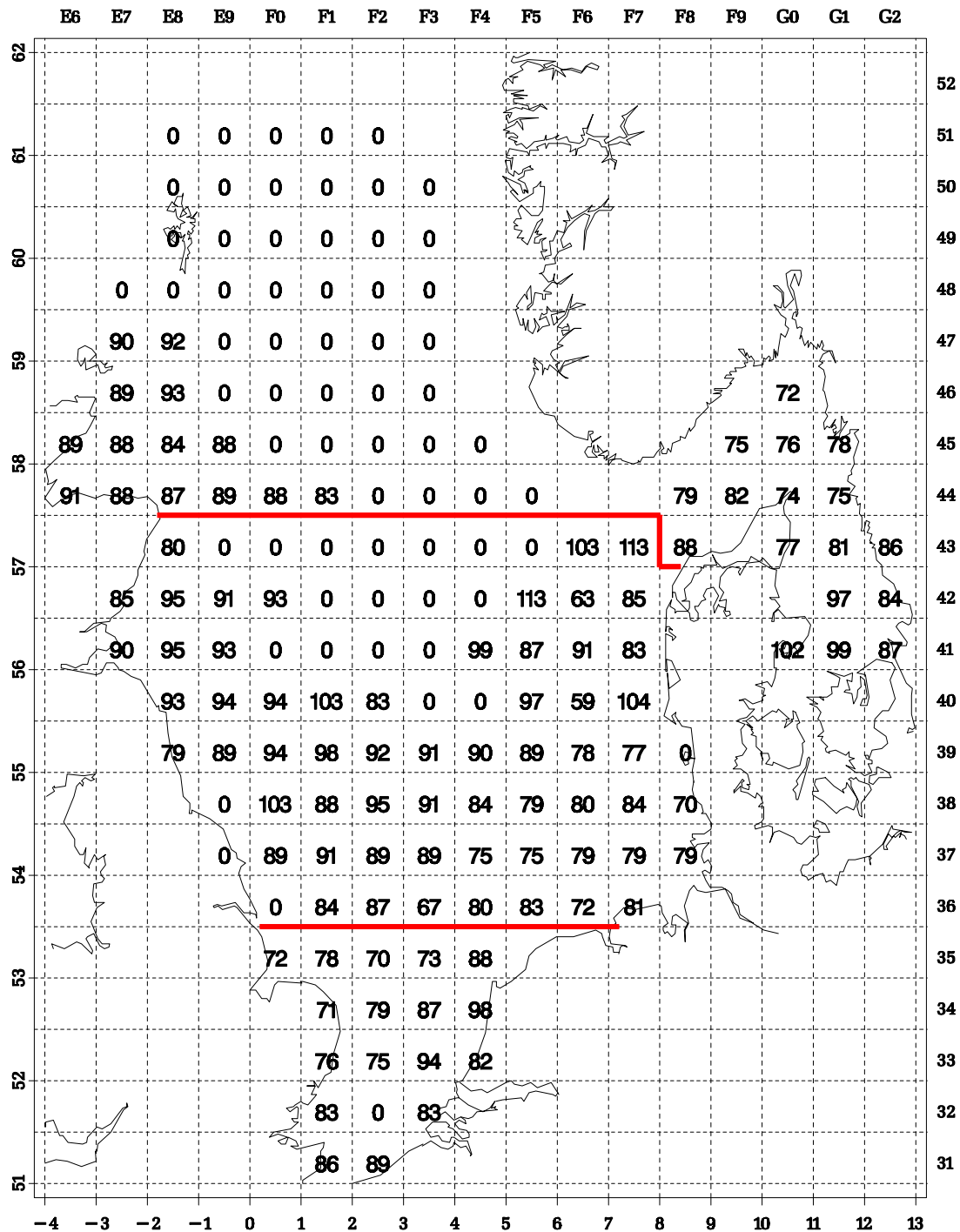


Figure 5.9 Sprat: mean length (mm), age 1

Mackerel, number per hour

Age group 1, 2001 quarter 1

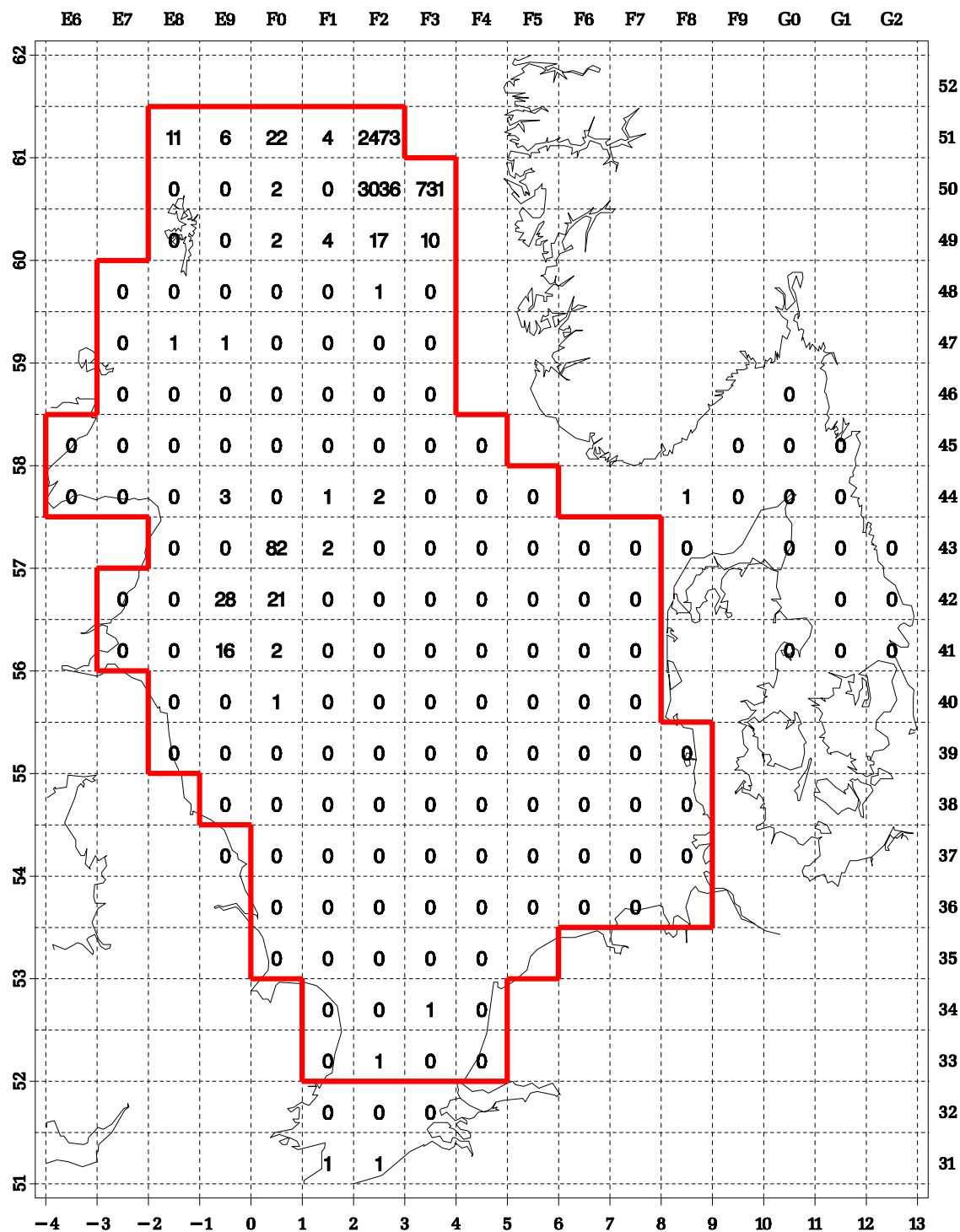


Figure 5.10 Mackerel: number per hour, age 1

Mackerel, number per hour

Age group 2, 2001 quarter 1

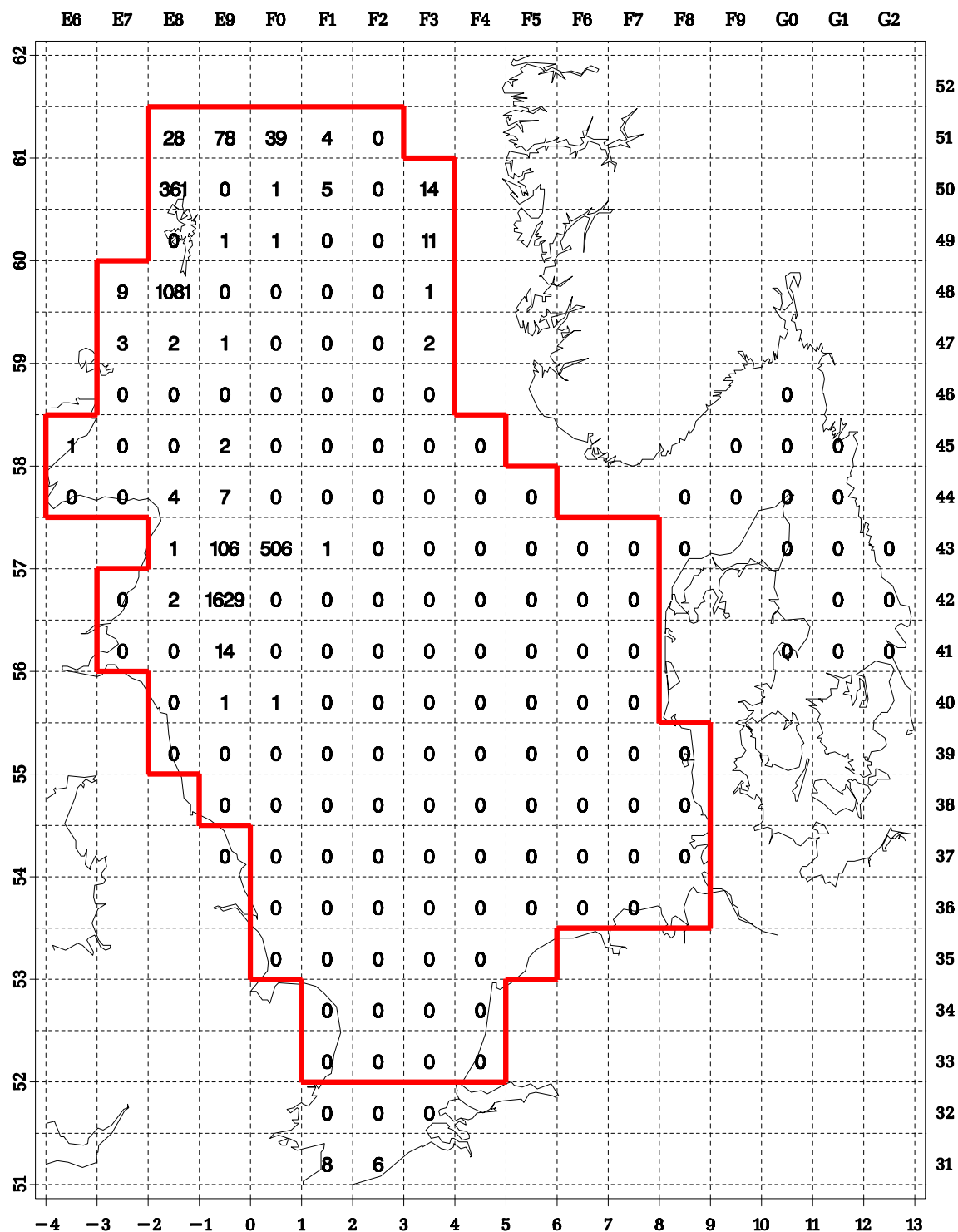


Figure 5.11 Mackerel: number per hour, age 2

Mackerel, number per hour

Age group 3, 2001 quarter 1

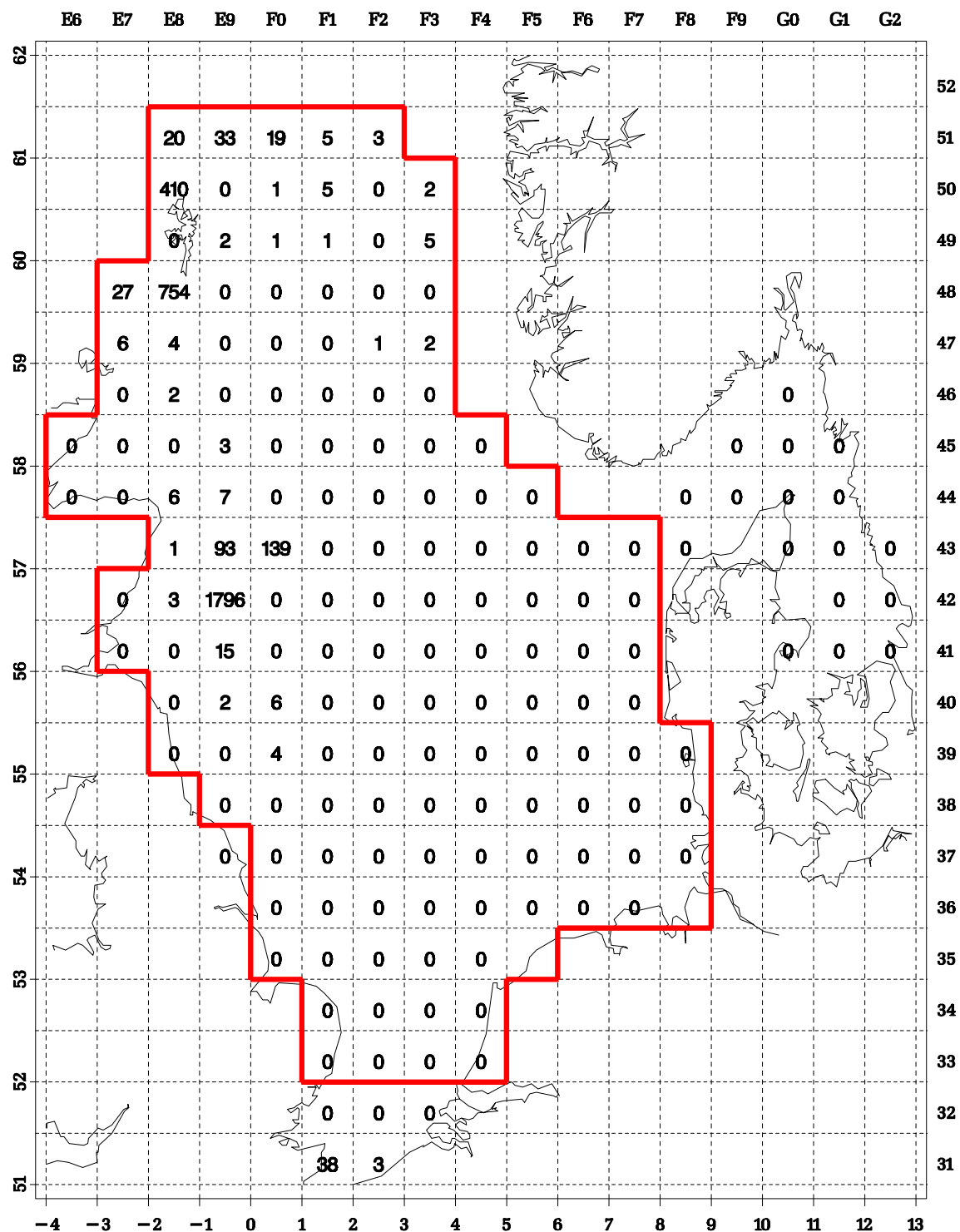


Figure 5.12 Mackerel: number per hour, age 3

Mackerel, mean length

Age group 1, 2001 quarter 1

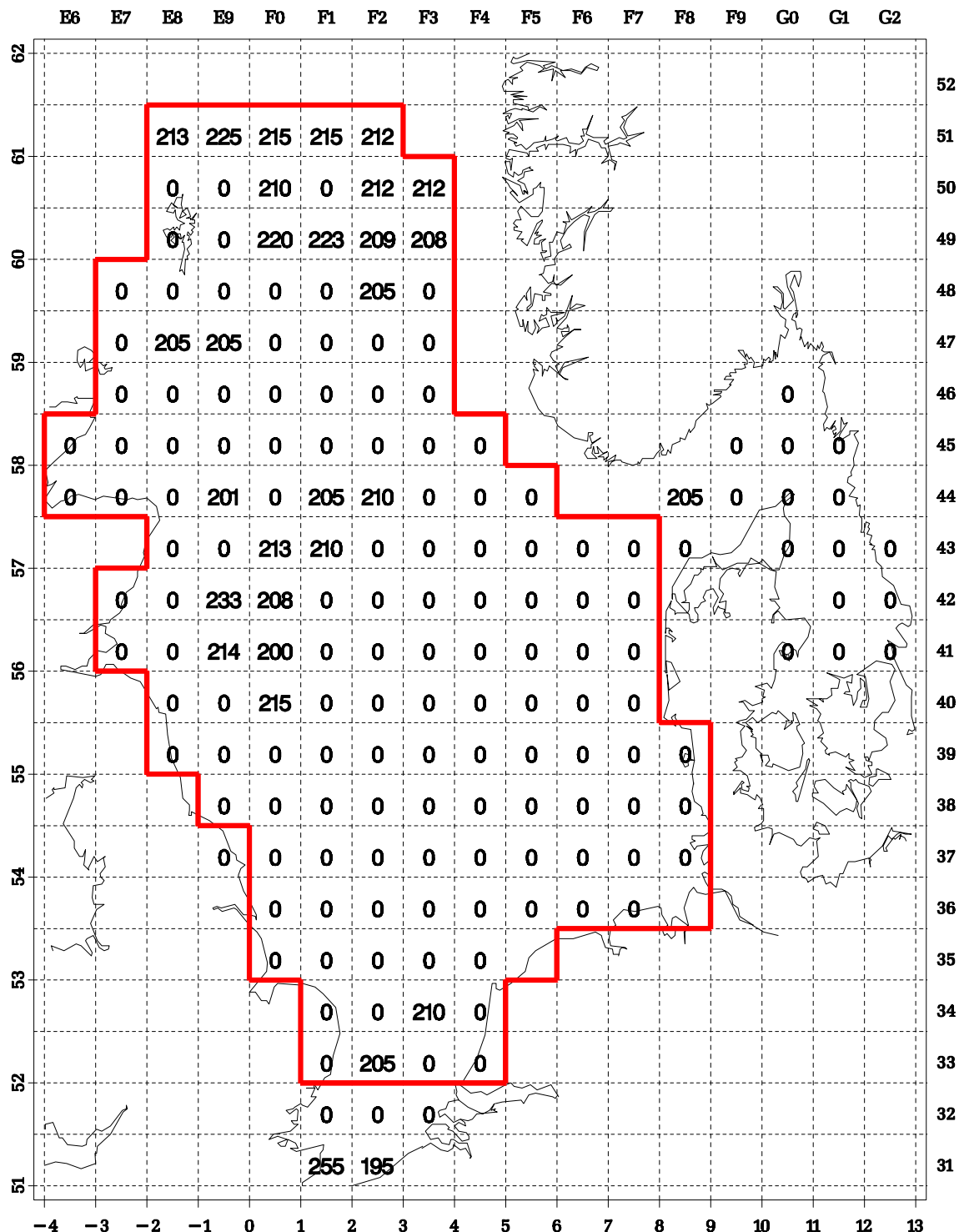


Figure 5.13 Mackerel: mean length (mm), age 1

Cod, number per hour Age group 1, 2001 quarter 1

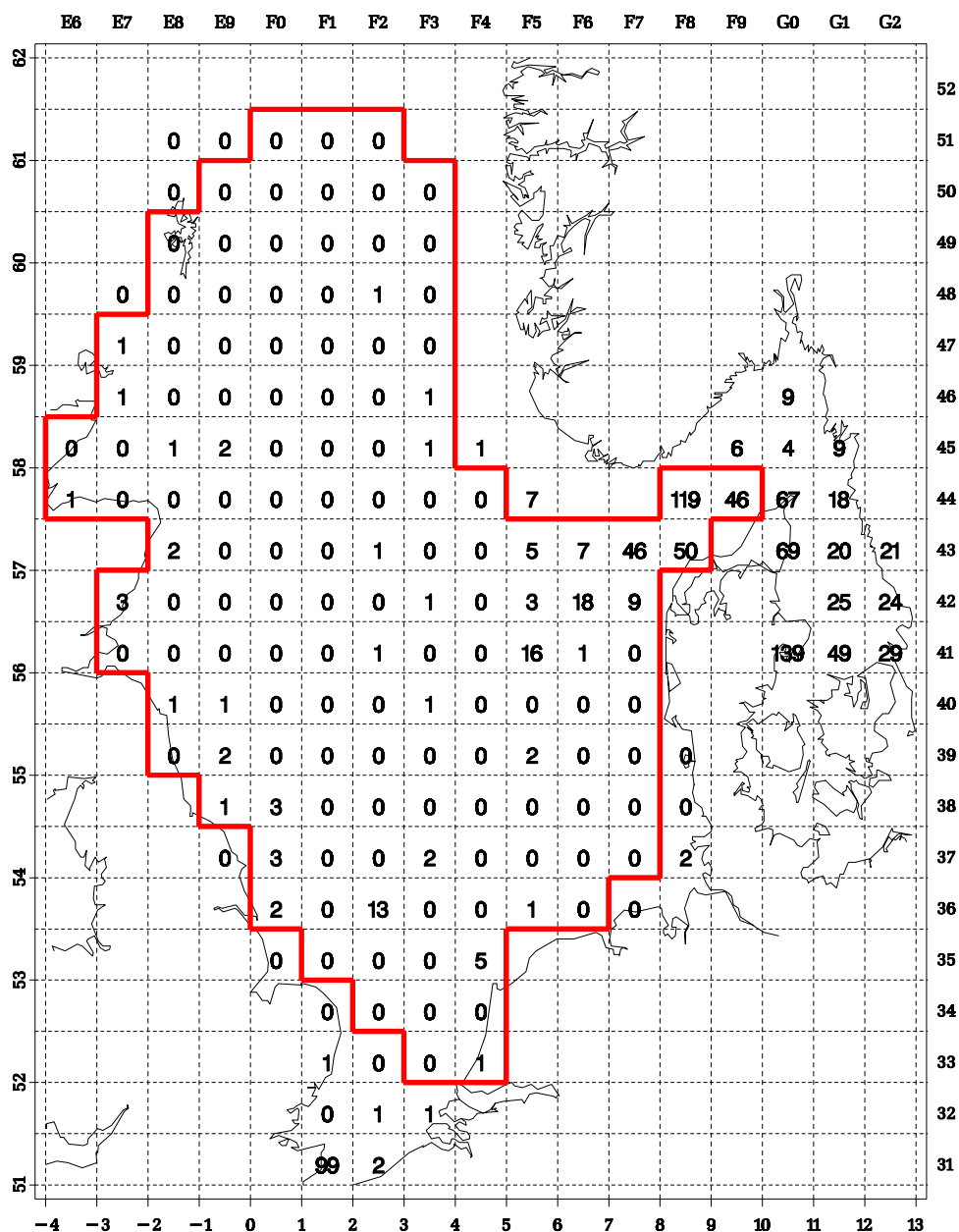


Figure 5.14 Cod: number per hour, age 1

Cod, number per hour

Age group 2, 2001 quarter 1

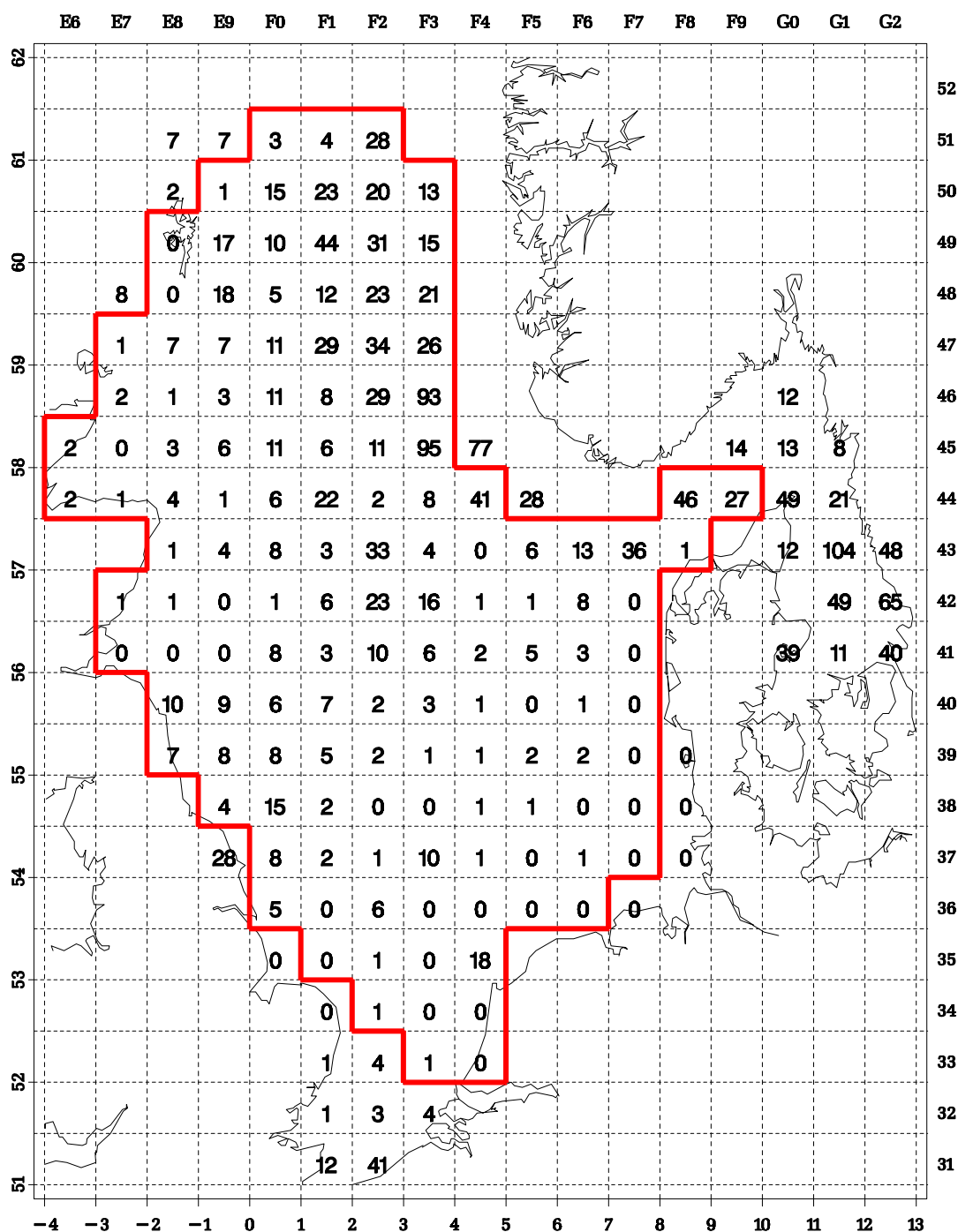


Figure 5.15 Cod: number per hour, age 2

Cod, number per hour

Age group 3, 2001 quarter 1

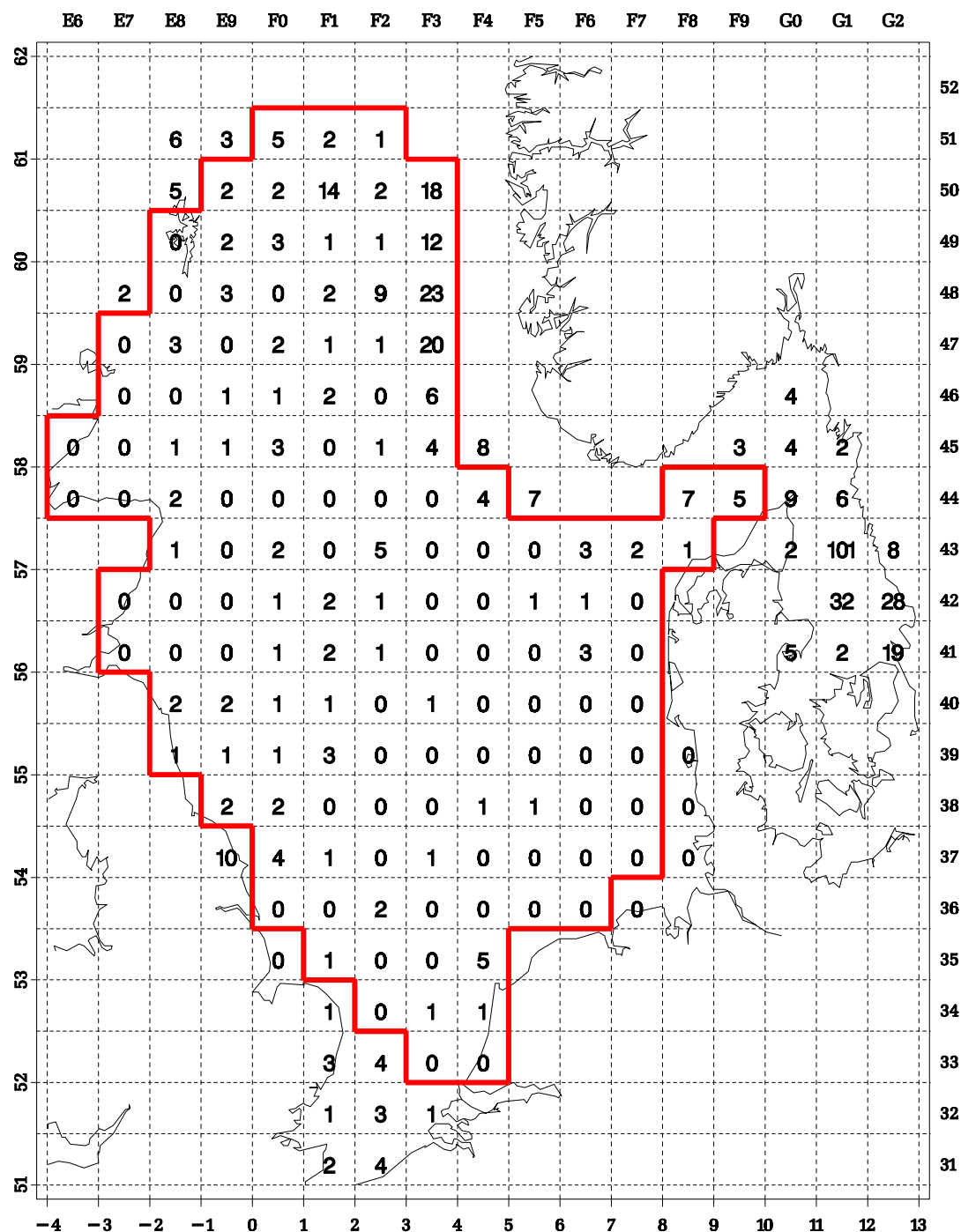


Figure 5.16 Cod: number per hour, age 3

Cod, mean length

Age group 1, 2001 quarter 1

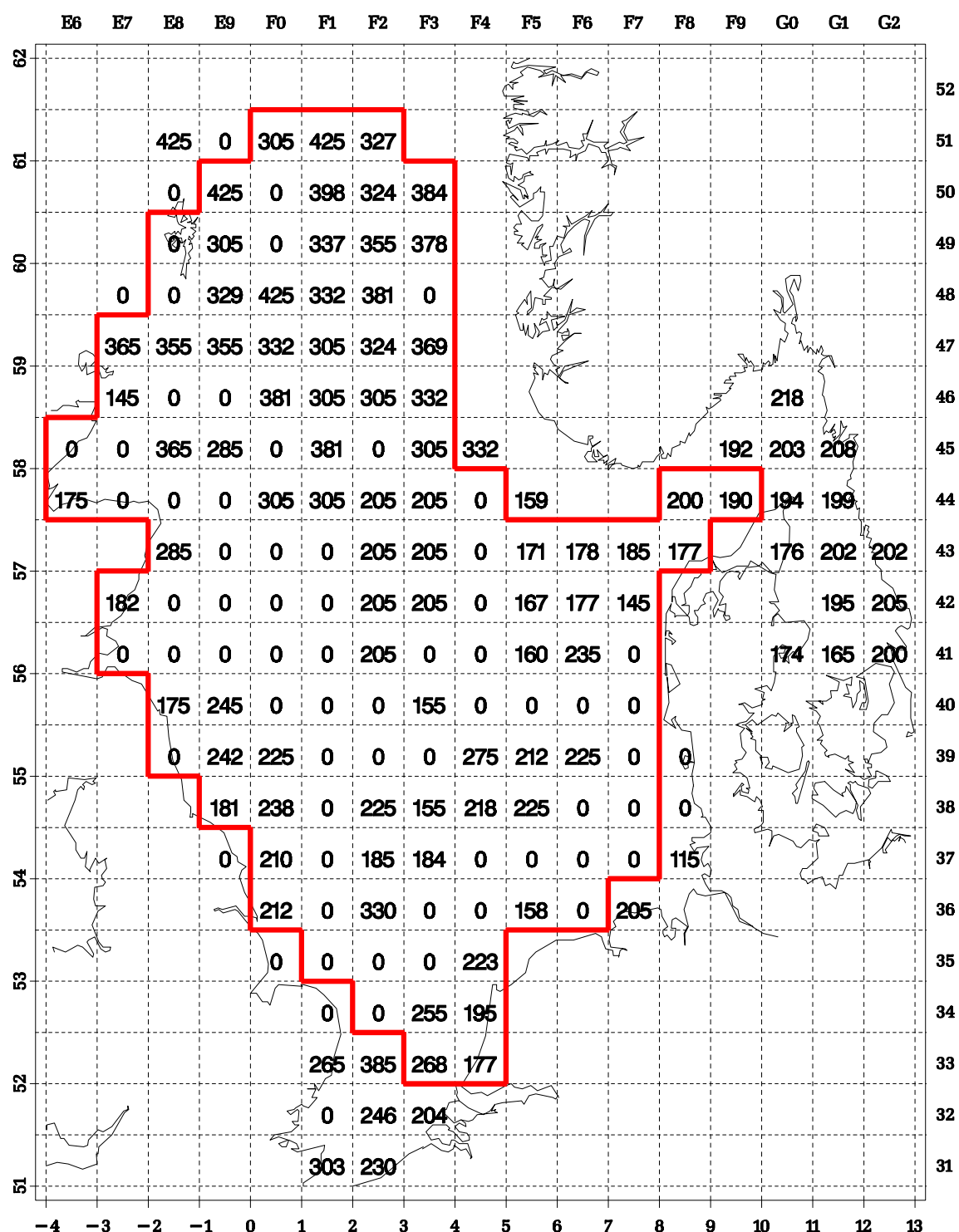


Figure 5.17 Cod, mean length (mm) age 1

Haddock, number per hour

Age group 1, 2001 quarter 1

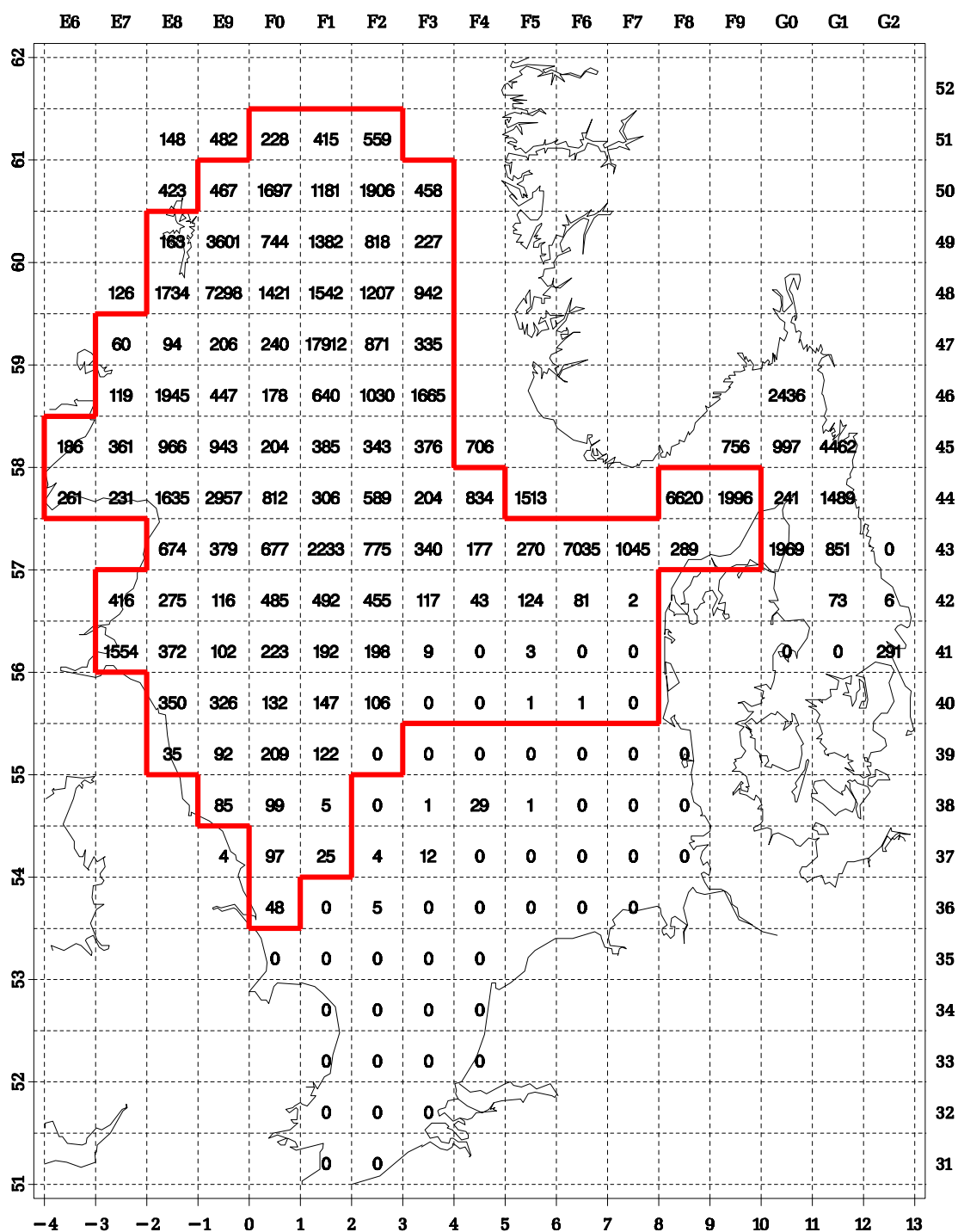


Figure 5.18 Haddock: number per hour, age

Haddock, number per hour

Age group 2, 2001 quarter 1

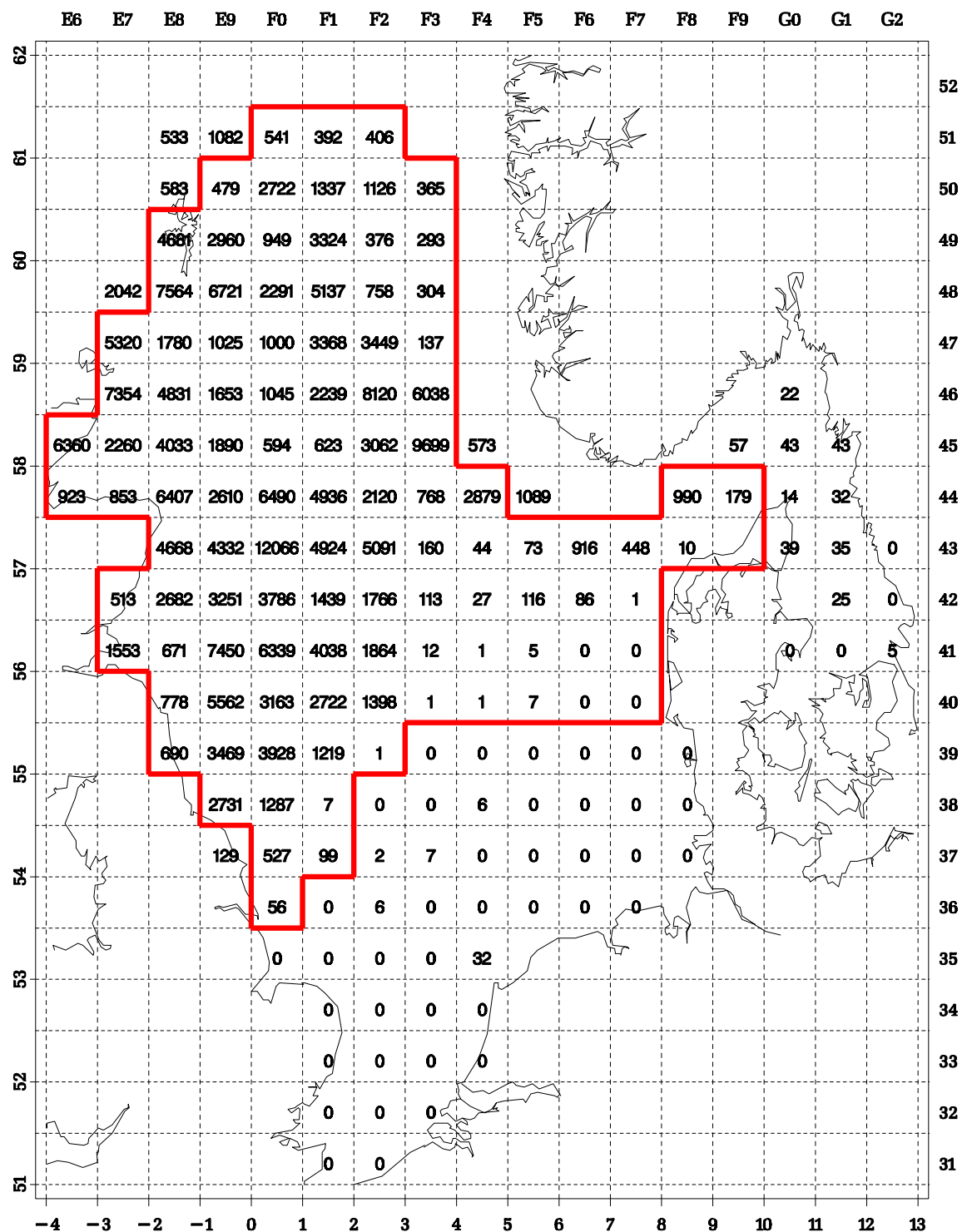


Figure 5.19 Haddock: number per hour, age 2

Map of the North Atlantic showing the distribution of Atlantic halibut (*H. hippoglossus*) in 1999. The map covers latitudes 31°N to 62°N and longitudes -4°W to 13°W. A red outline indicates the area covered by the 1999 survey. Data points are shown as numbers in a grid. The distribution is concentrated in the central and northern parts of the survey area, with higher densities (up to 226) in the central region. The density decreases towards the south and east.

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Haddock, mean length

Age group 1, 2001 quarter 1

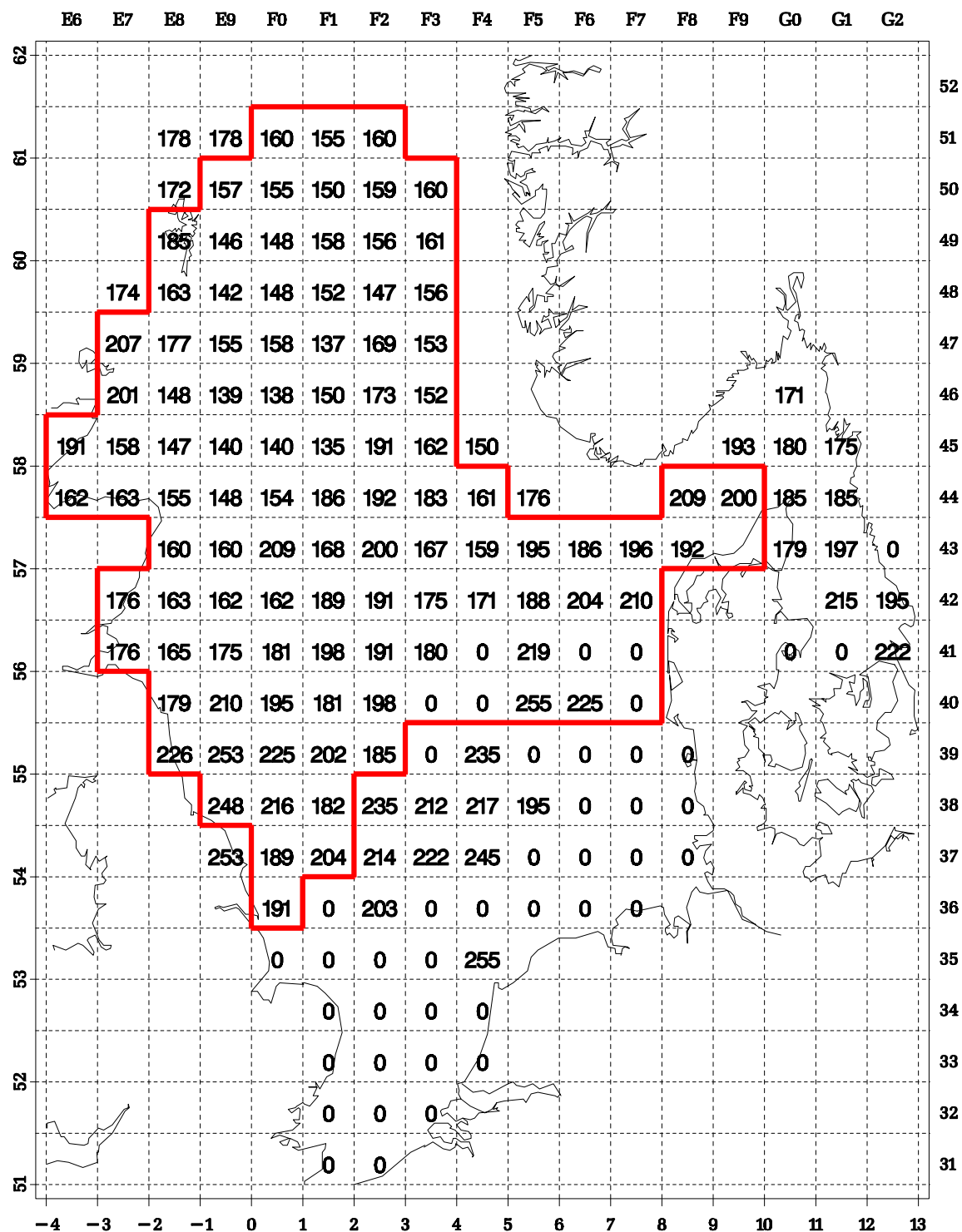


Figure 5.21 Haddock: mean length (mm), age 1

Whiting, number per hour

Age group 1, 2001 quarter 1

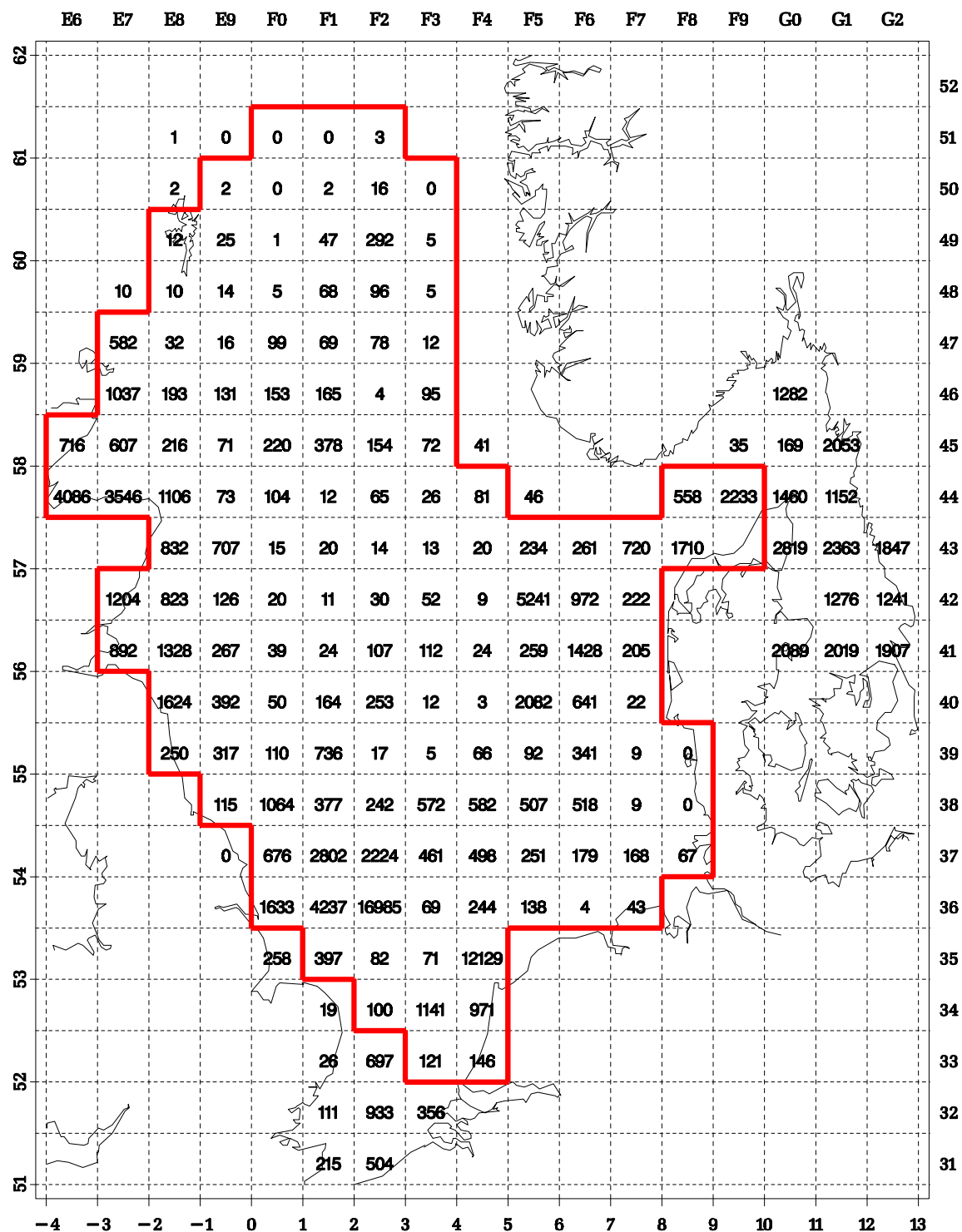


Figure 5.22 Whiting: number per hour, age 1

Whiting, number per hour

Age group 2, 2001 quarter 1

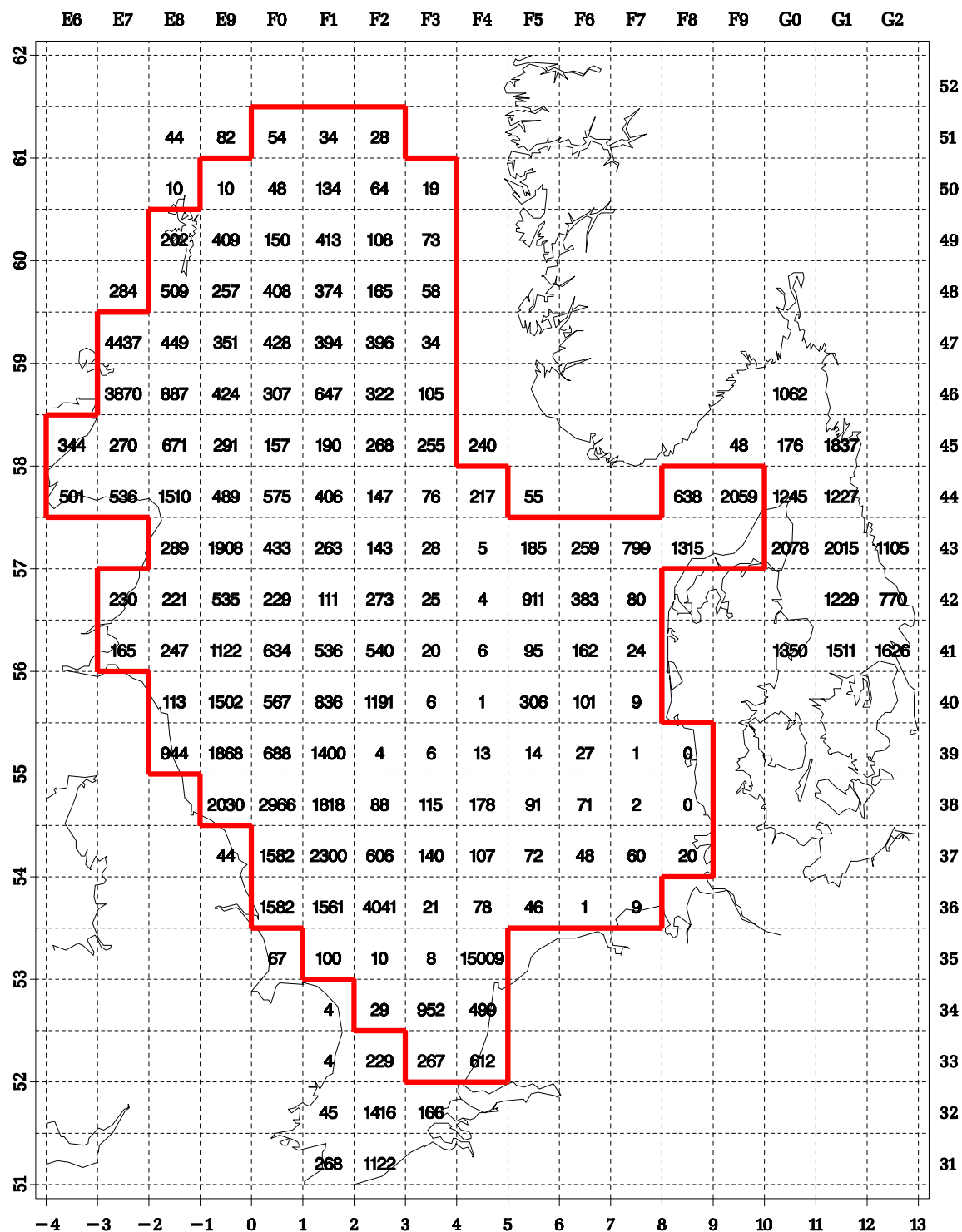


Figure 5.23 Whiting: number per hour, age 2

Whiting, number per hour

Age group 3, 2001 quarter 1

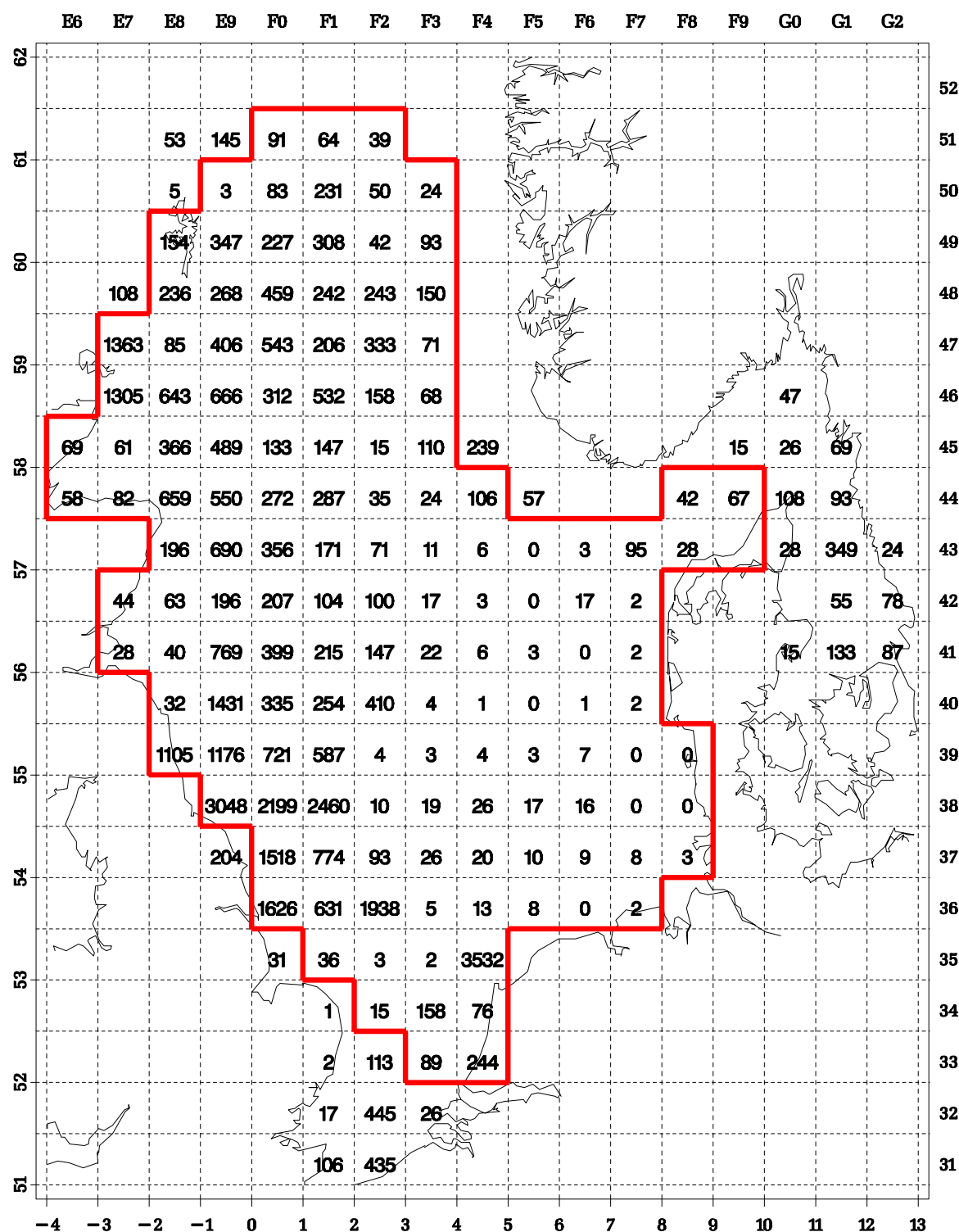


Figure 5.24 Whiting: number per hour, age 3

Whiting, mean length

Age group 1, 2001 quarter 1

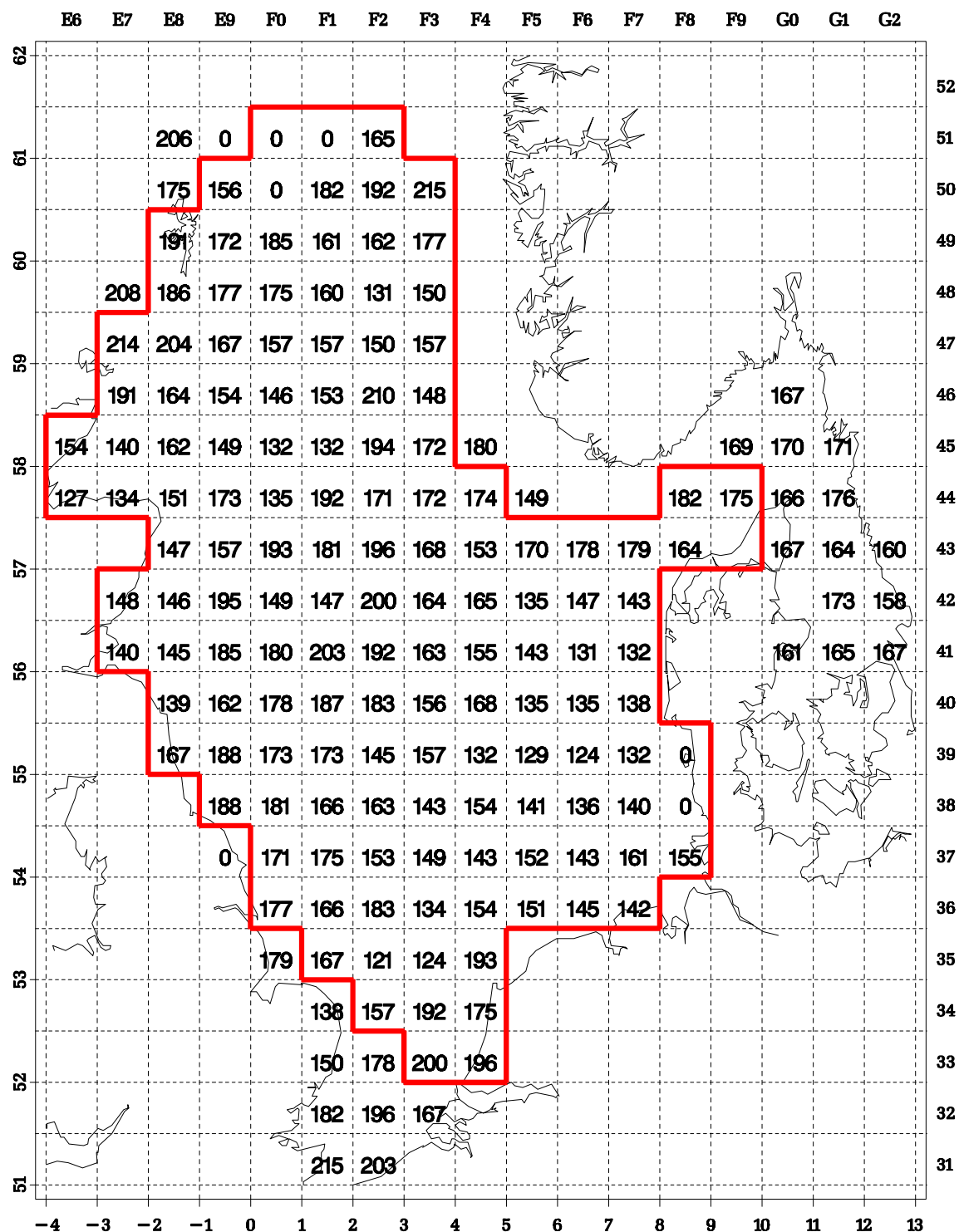


Figure 5.25 Whiting: mean length (mm), age 1

Saithe, number per hour

Age group 1, 2001 quarter 1

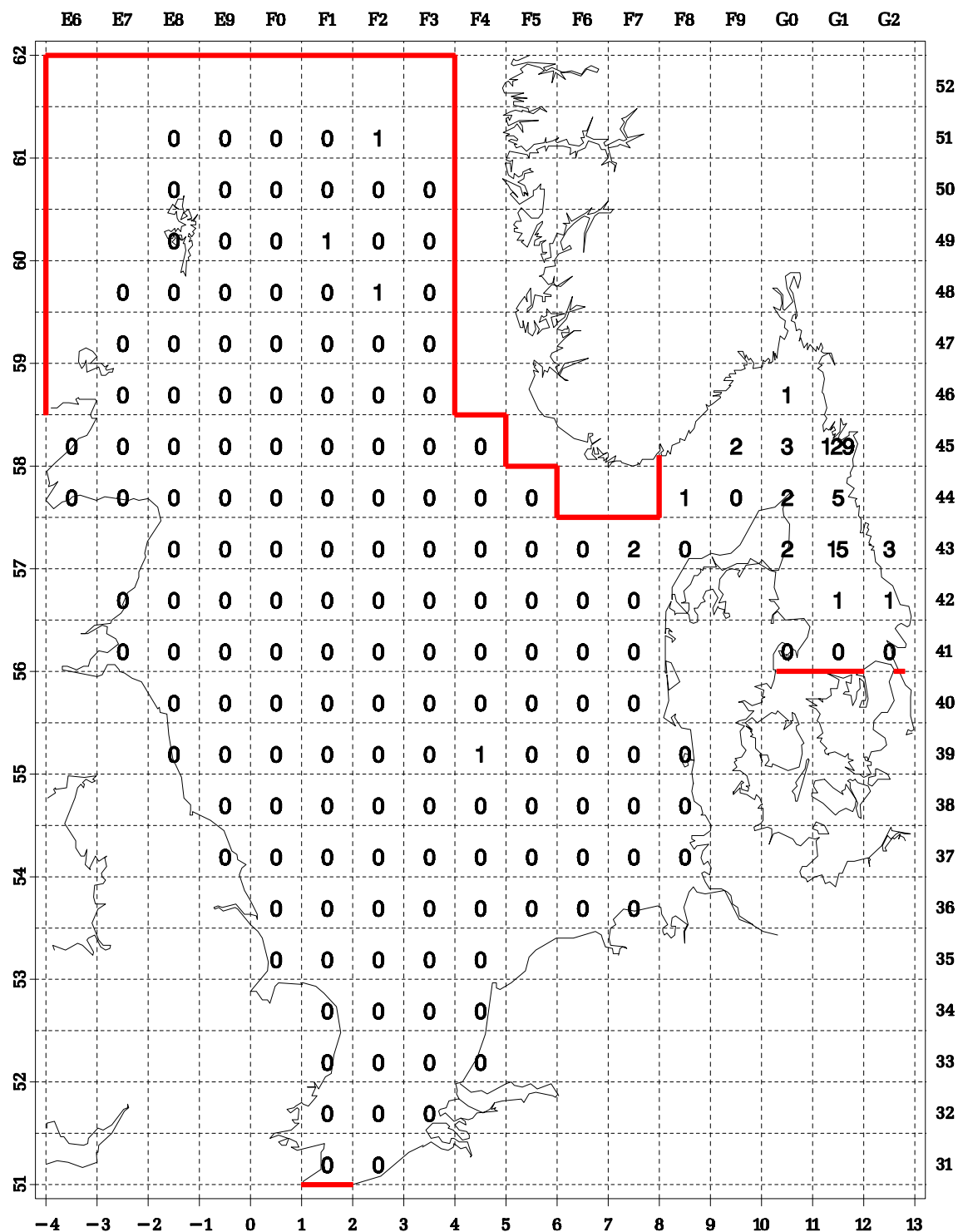


Figure 5.26 Saithe: number per hour, age 1

Saithe, number per hour

Age group 2, 2001 quarter 1

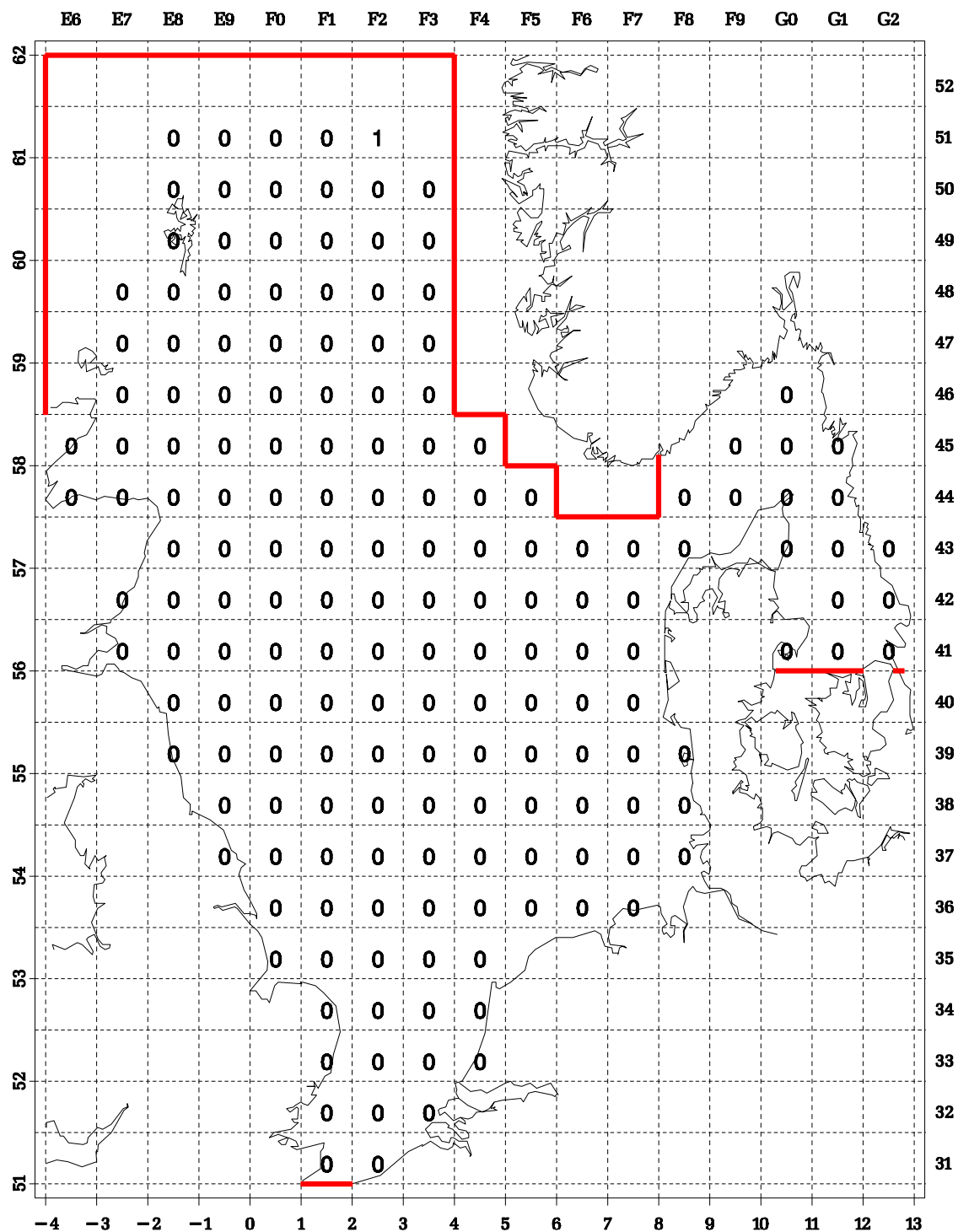


Figure 5.27 Saithe: number per hour, age 2

Saithe, number per hour

Age group 3, 2001 quarter 1

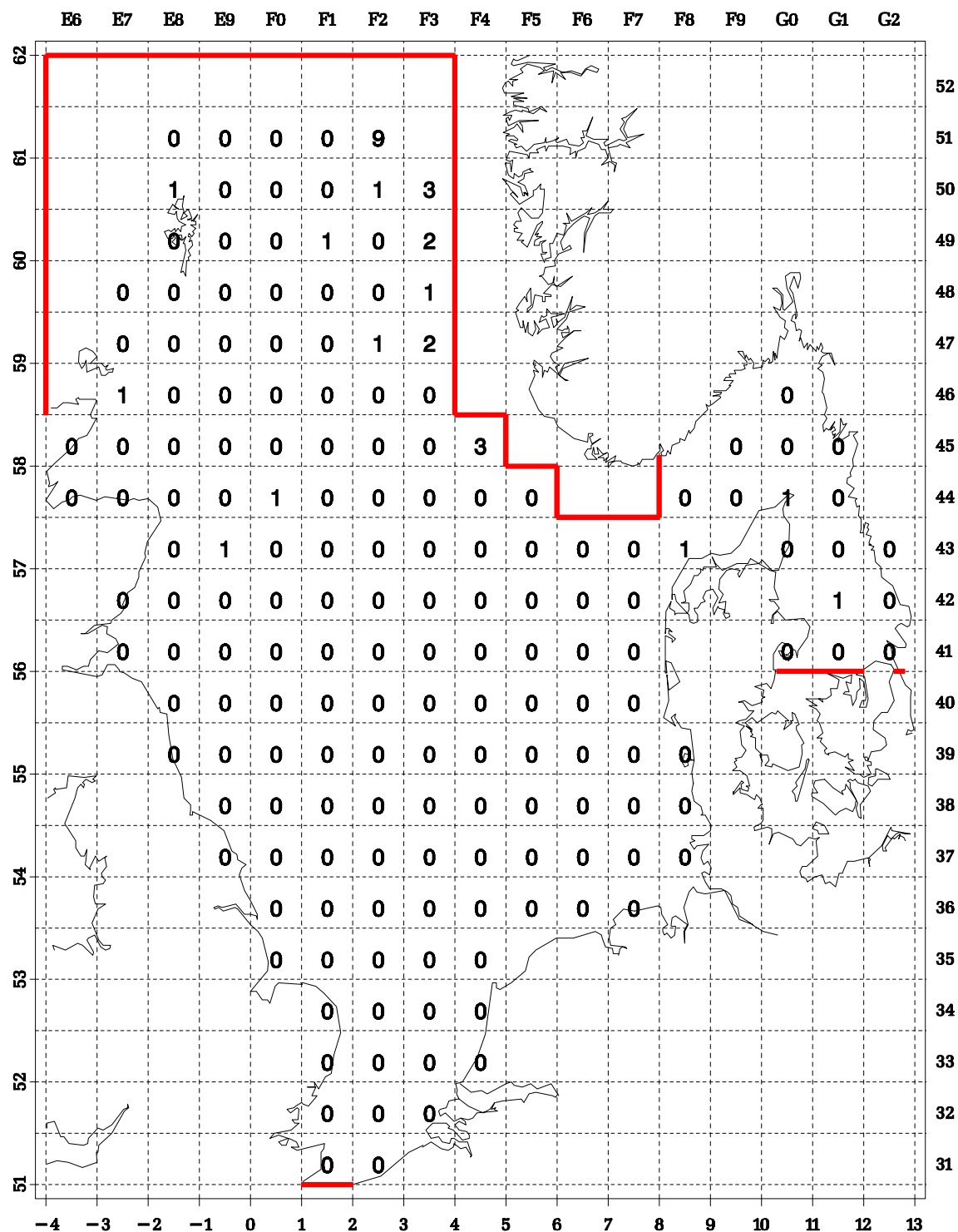


Figure 5.28 Saithe: number per hour, age 3

Saithe, mean length

Age group 1, 2001 quarter 1

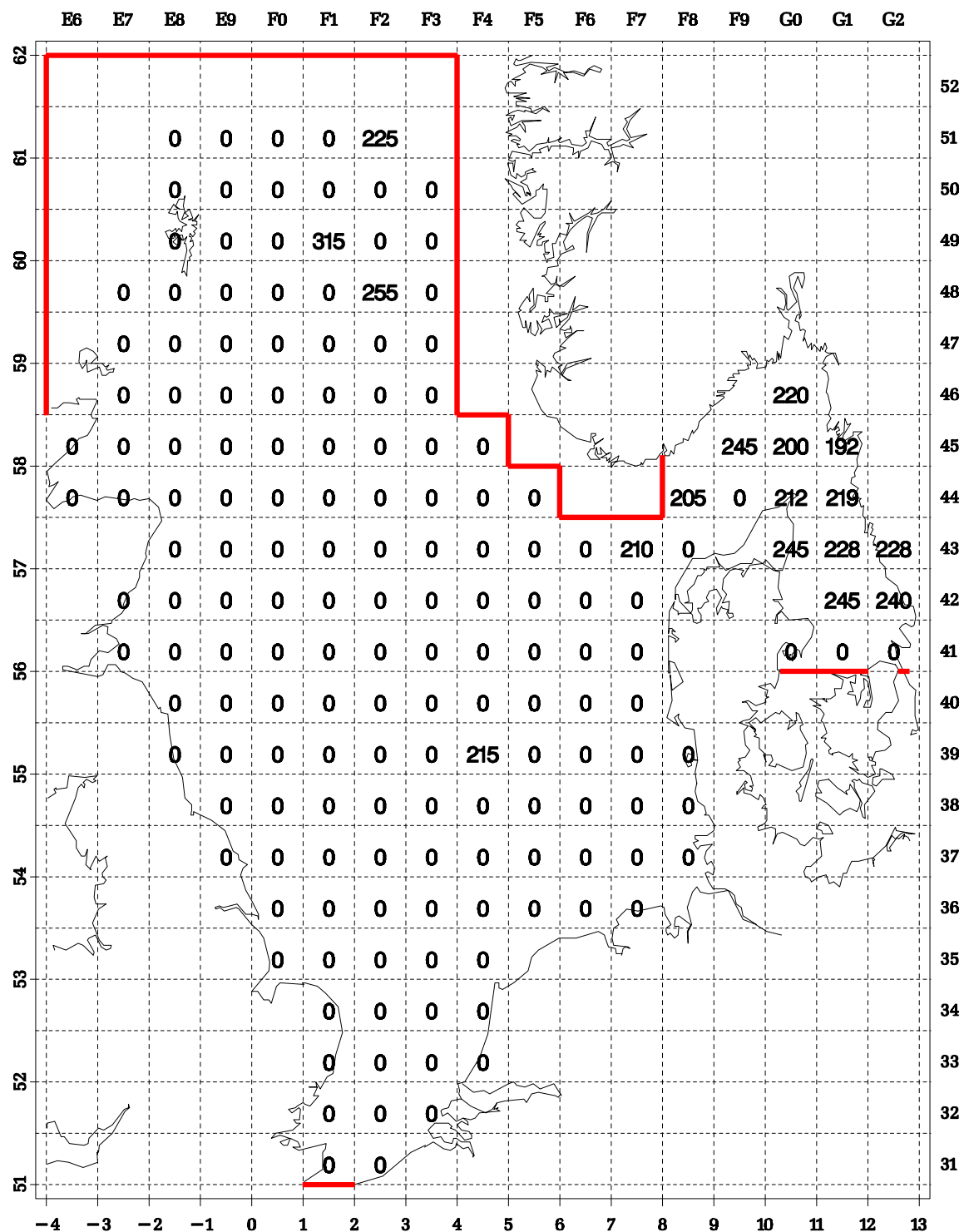


Figure 5.29 Saithe: mean length (mm), age 1

Norway pout, number per hour

Age group 1, 2001 quarter 1

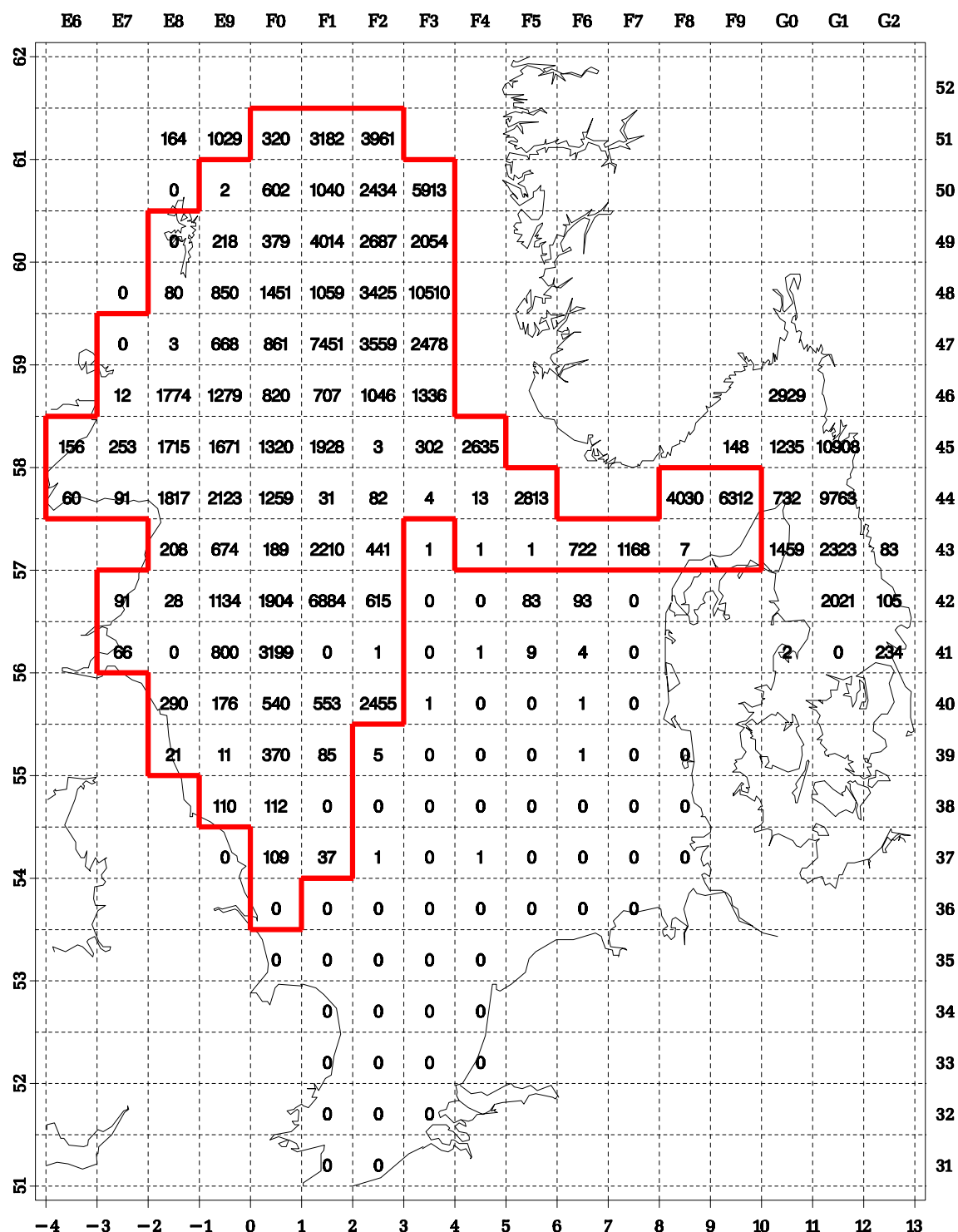


Figure 5.30 Norway pout: number per hour, age 1

Norway pout, number per hour

Age group 2, 2001 quarter 1

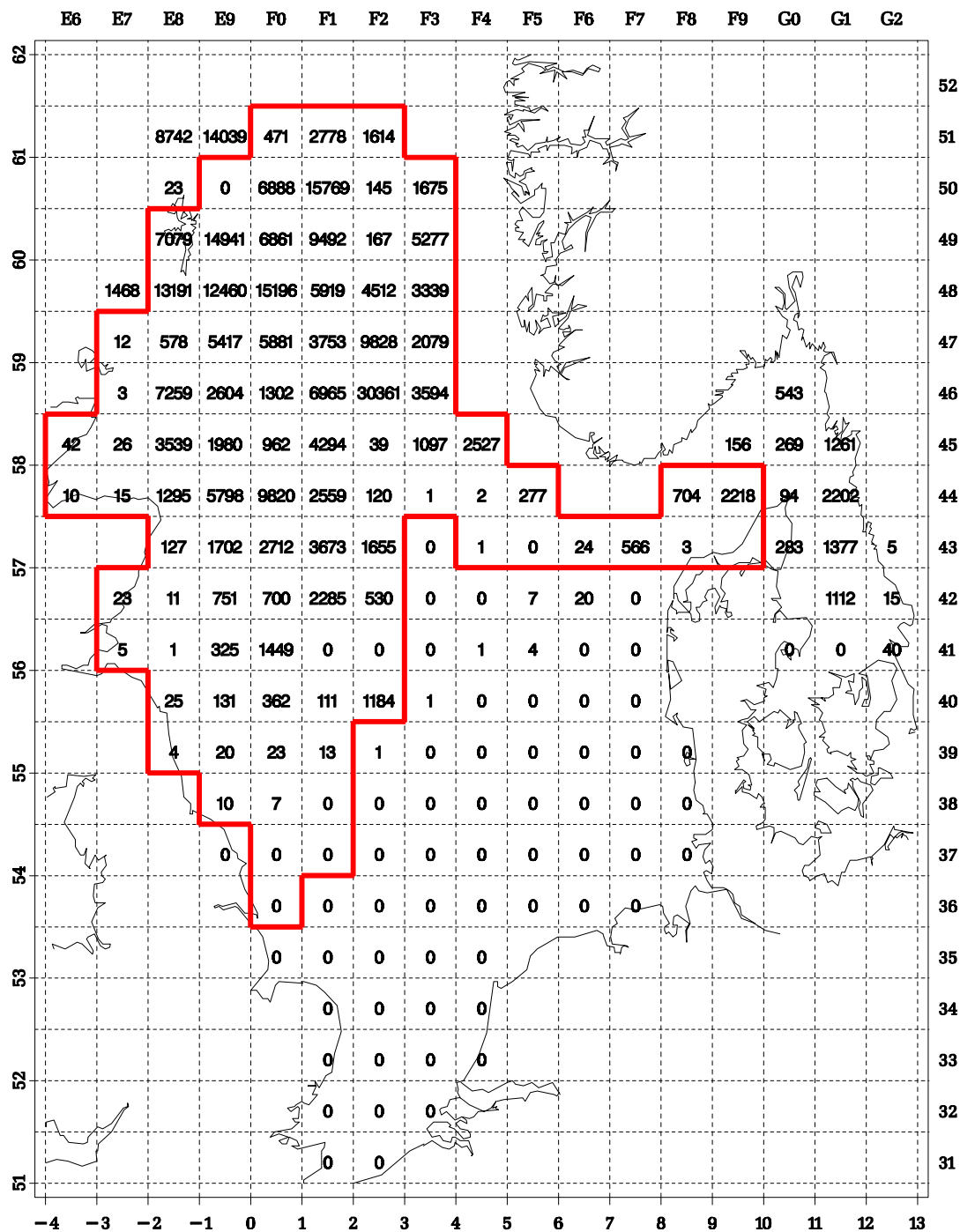


Figure 5.31 Norway pout: number per hour, age 2

Norway pout, number per hour

Age group 3, 2001 quarter 1

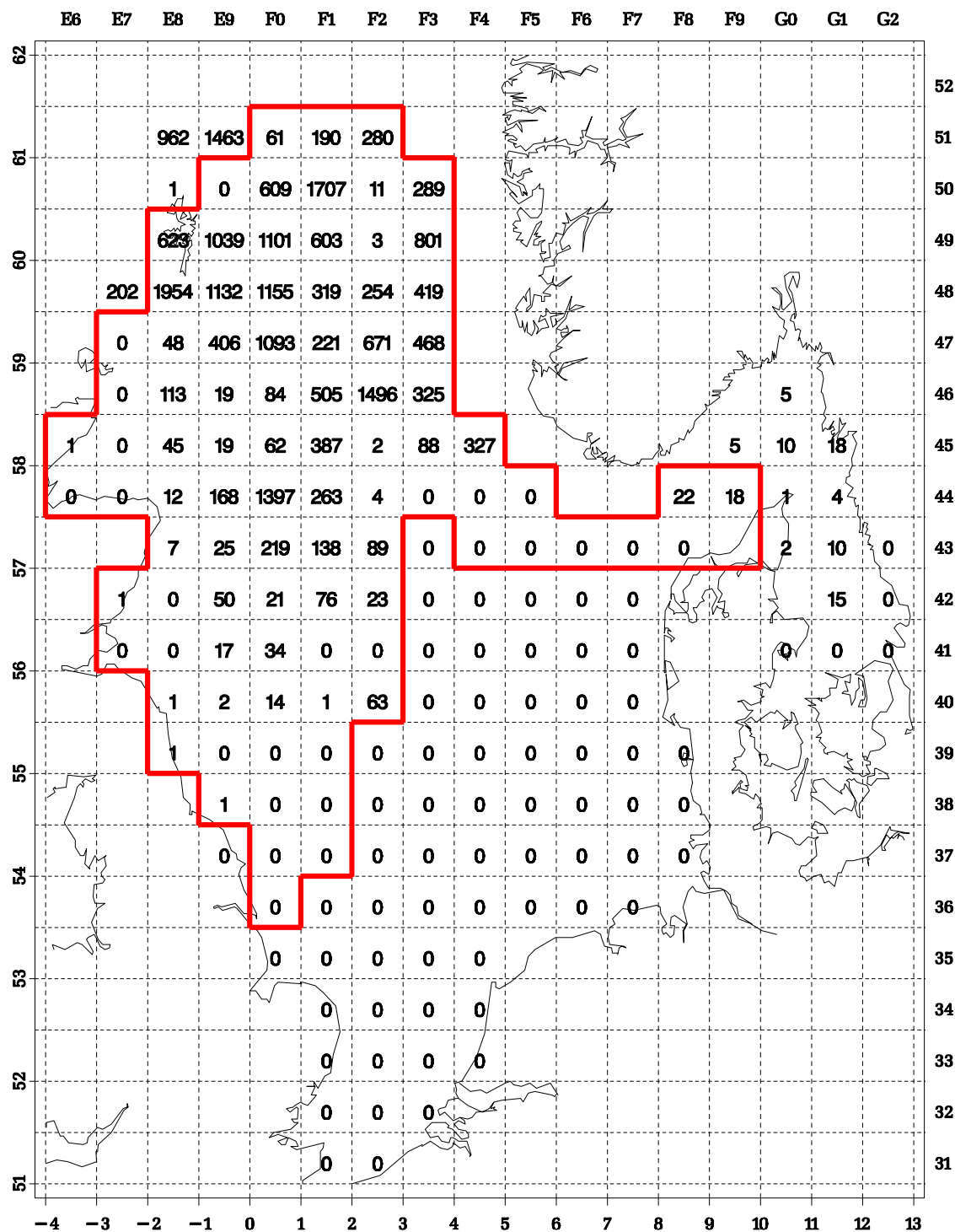


Figure 5.32 Norway pout: number per hour, age 3

Norway pout, mean length

Age group 1, 2001 quarter 1

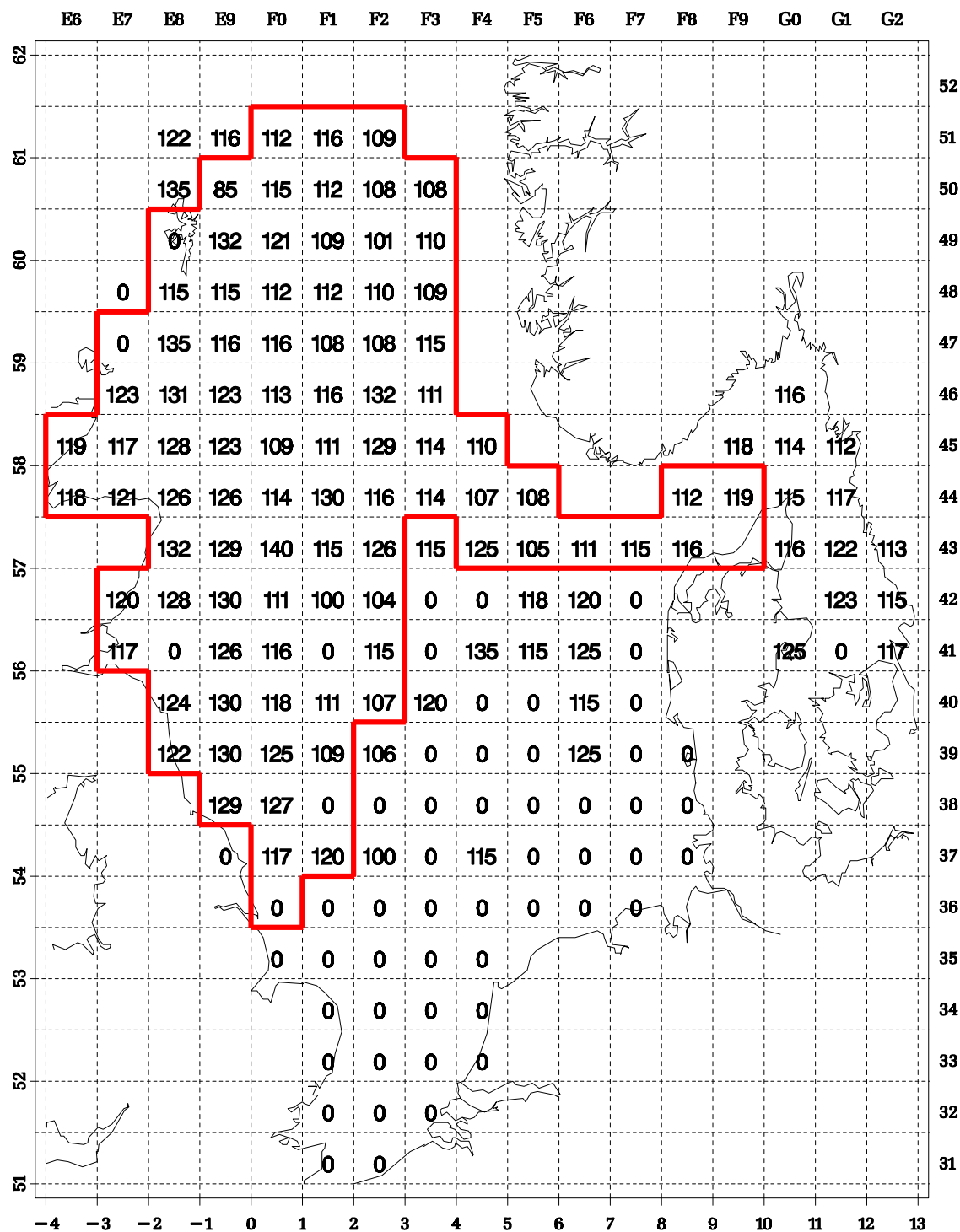


Figure 5.33 Norway pout: mean length (mm), age 1

Herring

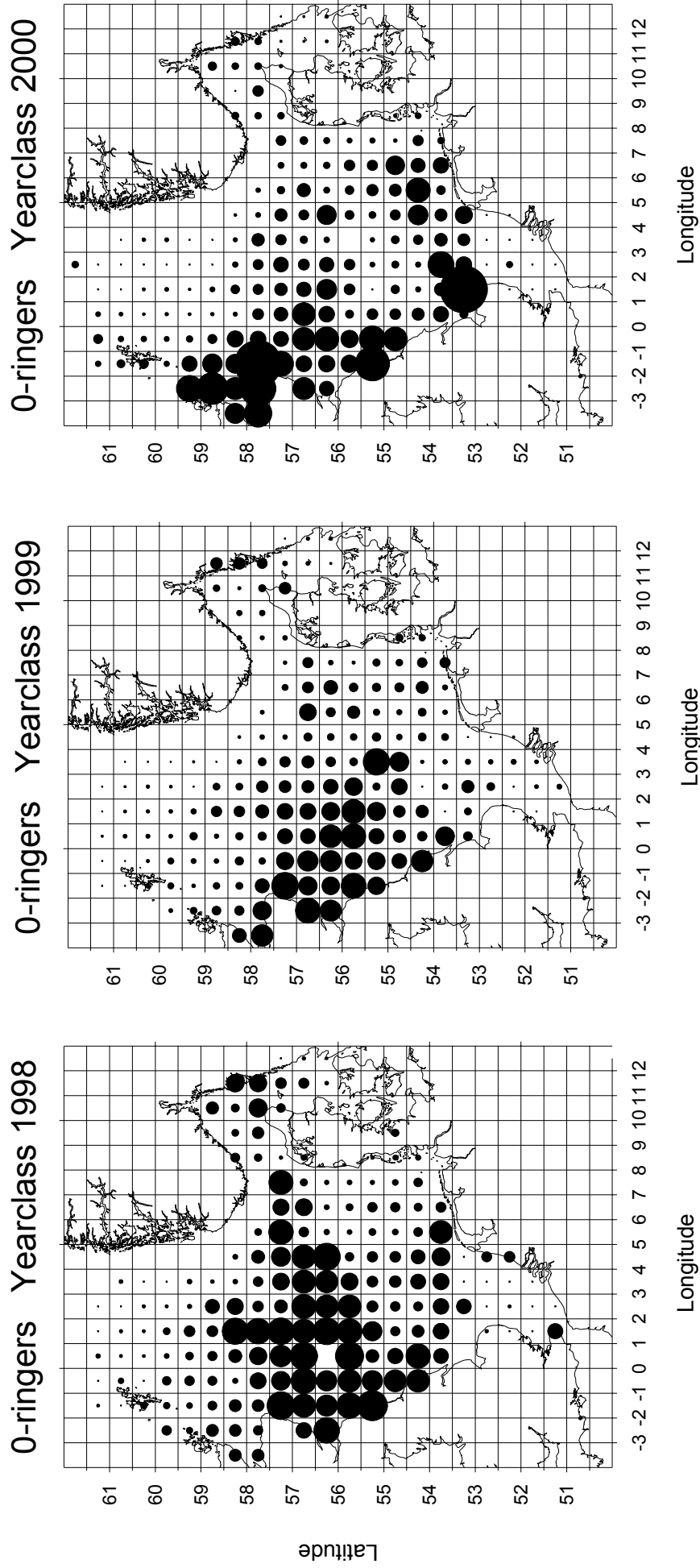


Figure 6.1 Distribution of 0-ringer herring, year classes 1998-2000. Abundance estimates of 0-ringers within each statistical rectangle are based on MIK catches during IBTS in February. Areas of filled circles illustrate densities in no m², the area of a circle extending to the border of a rectangle represents 1 m².

Relationship between herring recruitment indices

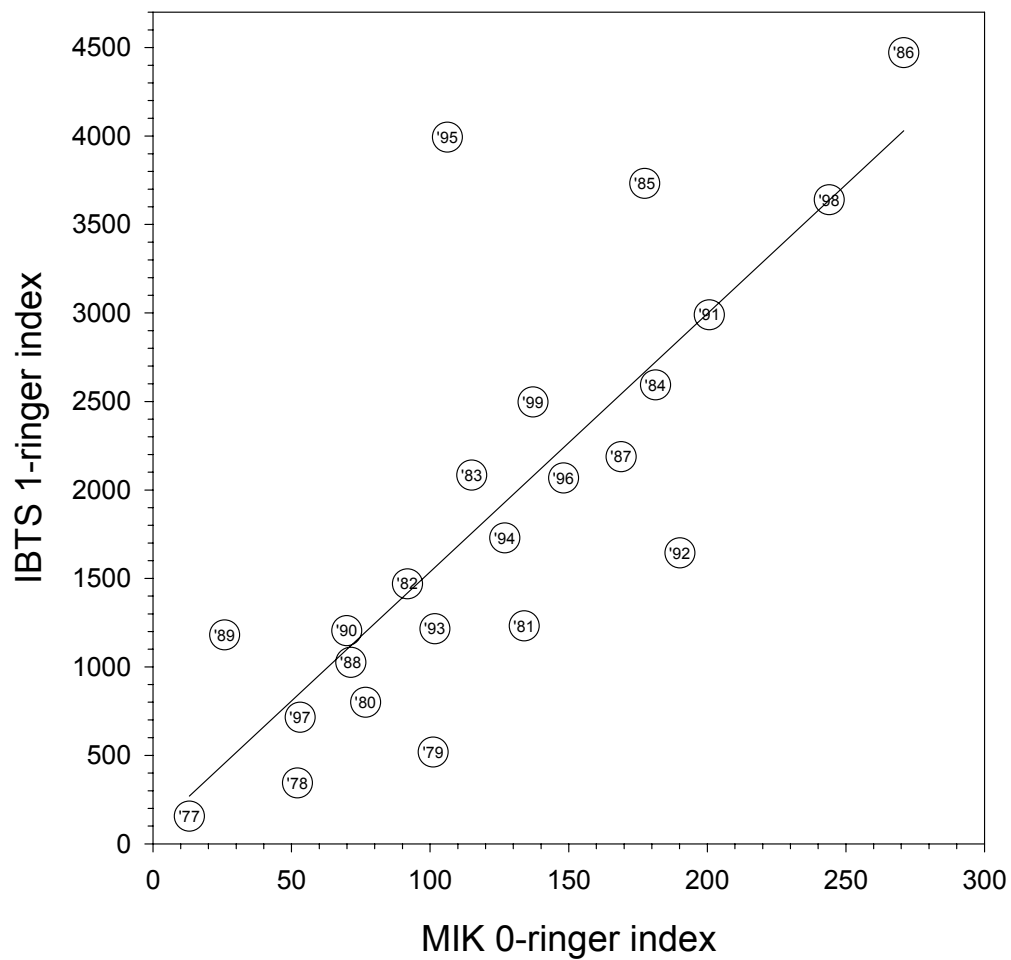


Figure 6.2. North Sea herring. Regression between the MIK 0-ringer index and the IBTS 1-ringer indices for year classes 1977 to 1999. Numbers in symbols indicate year class.

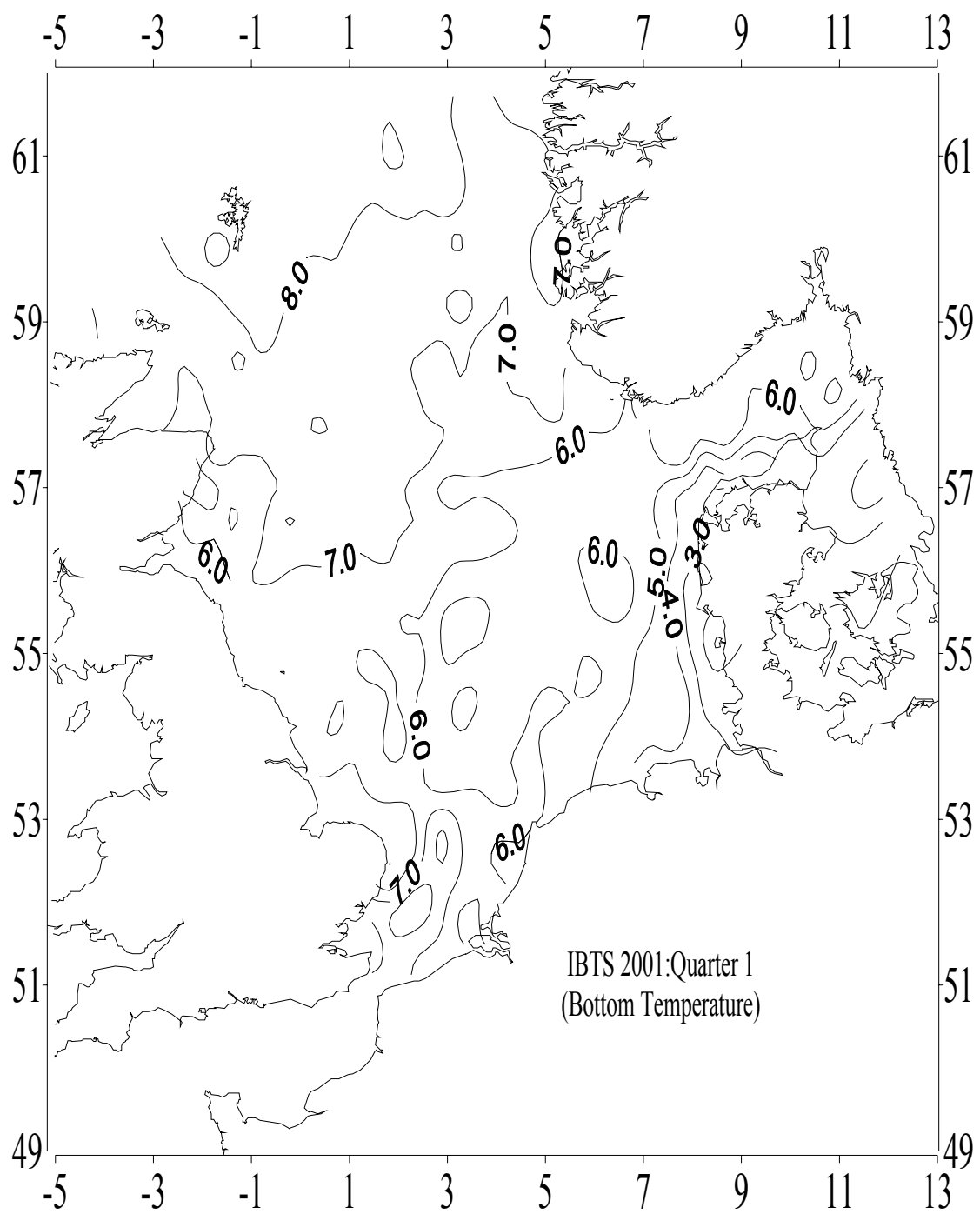


Figure 7.1

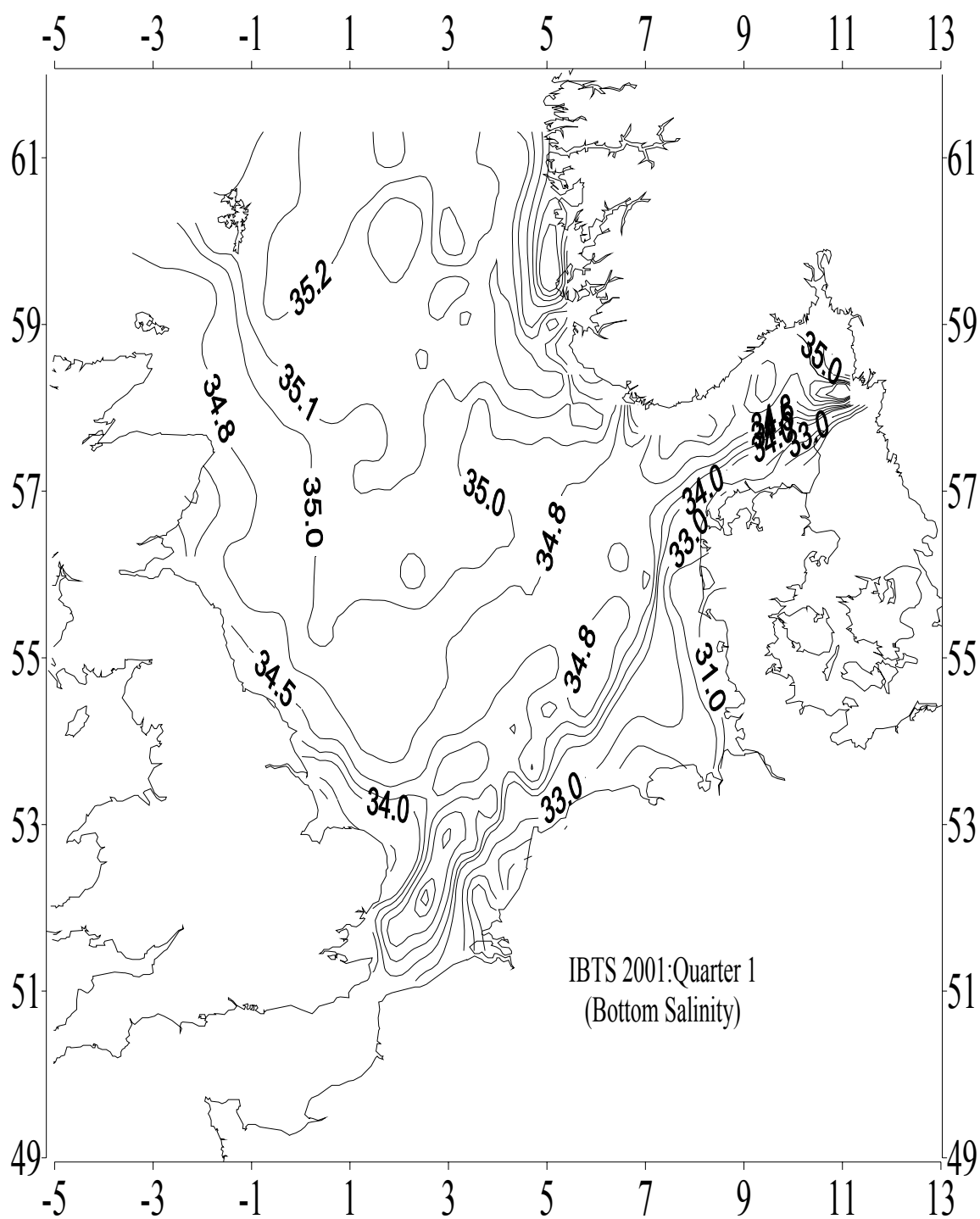


Figure 7.2

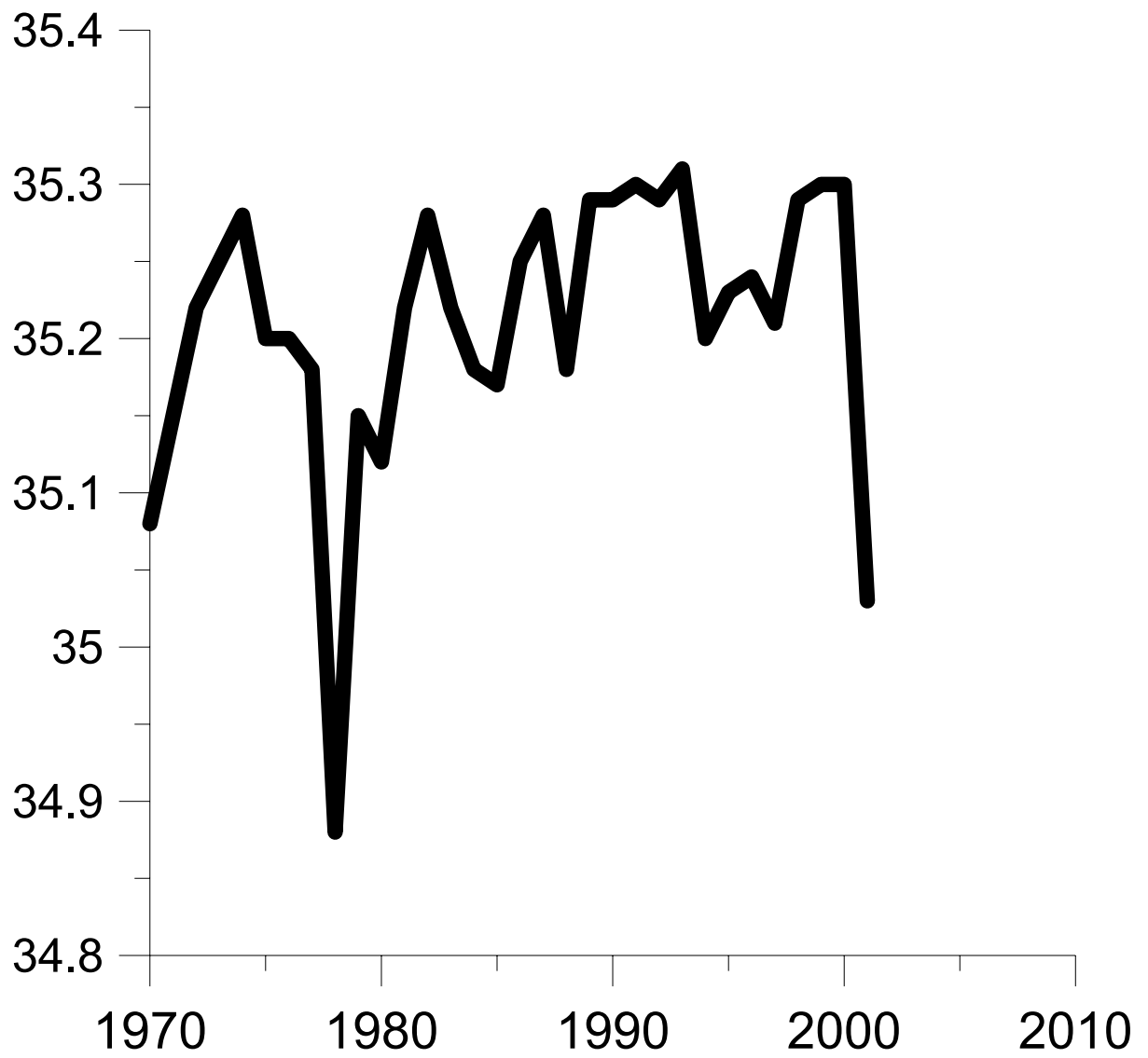


Figure 7.3 Time series plot of salinity values at time series station 1 in Northern North Sea (see table 7.1).

REPORT OF THE
**International Bottom Trawl Survey in the North Sea,
Skagerrak and Kattegat in 2001: Quarter 3**

The International Bottom Trawl Survey Working Group

This report is not to be quoted without prior consultation with the General Secretary. The document is a report of an expert group under the auspices of the International Council for the Exploration of the Sea and does not necessarily represent the views of the Council.

International Council for the Exploration of the Sea

Conseil International pour l'Exploration de la Mer

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1 INTRODUCTION

This report presents the final results for the International Bottom Trawl Survey (IBTS) in the third quarter of 2001. 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. During a meeting of this Working Group in November 1995 (ICES 1996/H:1a) early analyses of the data indicated the potential usefulness of quarterly surveys and it was decided to encourage their continuation. These quarterly surveys have been carried out in all four quarters in the period 1991-1997, but since 1998 only the 1st and the 3rd quarters have been covered.

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*), as well as the catches of herring and sprat larvae. 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 Manual (ICES 1999/D:2 Addendum). Details on the participation in the 2001 3q survey are given below as numbers of valid haul. The whole survey area has been covered as planned.

Country and Vessel		From	To	GOV	MIK
Denmark	Dana (new)	07/08	22/08	56	0
England	Cirolana	07/08	03/09	79	0
Germany	Walther Herwig (new)	20/07	16/08	29	0
Norway	Michael Sars	02/09	21/09	54	0
Scotland	Scotia (new)	27/07	17/08	87	0
Sweden	Argos	03/09	19/09	46	0

3 DATA AVAILABLE

Table 3.1 shows number of valid hauls available in the ICES IBTS data base.

At the time of the analysis of the 2001 data presented in this report all final data were available in the database.

4 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 (ICES 1993/Assess:15).

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 IBTS Working Group decided at the meeting in November 1995 (ICES 1996/H:1a) 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/Assess:15) 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.

5 RESULTS OF GOV-TRAWL FOR 2001

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 Figure 5.1.

The number of otoliths sampled per target species and roundfish area is given in Table 5.1.

Per species a set of figures gives the distributions of the 1-, 2-, and 3 group and the mean length of 1-group fish per rectangle. The specific standard area used to calculate the index of year class strength is indicated in the figures.

The results are shown in Table 5.2 and in Figures 5.2-5.33.

6 RESULTS OF MIK TRAWL FOR 3RD QUARTER 2001 FOR HERRING AND SPRAT LARVAE

No fishing with MIK was conducted.

7 HYDROGRAPHIC DATA

Four research vessels contributed to the 262 hydrographic stations worked during the IBTS-3 survey for 2001. The ships were Walther Herwig (104 stations), Michael Sars (54), Cirolana (61) and Argos (54). The distribution of bottom temperature and salinity produced from these data is shown below in Figure 7.1

More information, including station locations, is available from [the IBTS hydrographic web page](#).

8 REFERENCES

- ICES 1993/Assess:15. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES Doc. CM 1993/Assess:15.
- ICES 1995/Assess:13. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES Doc. CM 1995/Assess:13.
- ICES 1996/H:1a. Report of the International Bottom Trawl Survey Working Group. ICES Doc. CM 1996/H:1.
- ICES 1999/D:2 Addendum. 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.

Table 3.1 Number of valid hauls. 2001 3rd quarter.

Year	Total	Country							
		Denmark	England	France	Germany	Netherlands	Norway	Scotland	Sweden
1991	295	-	87	-	-	69	-	90	49
1992	363	-	74	61	62	31	-	87	48
1993	342	-	71	69	-	65	-	87	50
1994	307	-	73	55	-	42	-	87	50
1995	250	-	78	-	-	33	-	87	52
1996	320	-	78	57	33	17	-	85	50
1997	253	-	74	-	31	18	-	87	43
1998	274	51	74	-	28	-	-	77	44
1999	367	53	74	-	32	-	74	87	47
2000	316	60	75	-	26	-	68	87	-
2001	342	56	74	-	29	-	50	87	46
Total	3429	220	832	242	241	275	192	948	479

Table 5.1 Number of otoliths sampled per species and roundfish area, 2001 3rd quarter

Species	Roundfish area									Total
	1	2	3	4	5	6	7	8	9	
Herring	949	361	656	351	71	399	399	540	530	4256
Cod	661	200	31	107	61	62	205	307	148	1782
Haddock	1471	730	957	508	3	36	163	249	46	4163
Whiting	1023	569	677	534	313	828	408	-	-	4352
Saithe	1039	10	23	-	-	-	62	-	-	1134
Mackerel	343	63	71	17	25	424	42	-	-	985
Sprat	-	162	244	340	75	469	231	50	429	2000
Norway pout	578	89	158	34	-	1	16	107	60	1043

Table 5.2Cod indices. Mean number per hour per haul. 2001 3rd quarter.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	29.43	8.20	2.47	1.16	0.18	0.06	0.08
1992	19.72	43.78	3.63	0.73	0.46	0.16	0.14
1993	16.96	10.00	8.00	0.86	0.19	0.15	0.05
1994	15.72	43.15	6.23	2.38	0.25	0.08	0.07
1995	15.08	18.06	17.37	1.50	0.77	0.07	0.07
1996	68.92	10.28	5.32	1.82	0.40	0.20	0.03
1997	0.13	60.52	5.47	1.67	0.63	0.13	0.12
1998	91.71	2.40	20.05	1.29	0.37	0.25	0.12
1999	9.54	11.95	0.96	3.89	0.25	0.09	0.05
2000	1.84	10.70	2.29	0.19	0.53	0.08	0.09
2001	4.67	4.72	5.52	0.80	0.15	0.15	0.15

Table 5.2 cont'dHaddock indices. Mean number per hour per haul. 2001 3rd quarter.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	720.38	232.79	22.94	2.82	0.50	1.54	0.29
1992	2716.86	589.67	187.14	10.36	1.57	0.39	1.45
1993	571.90	604.33	141.55	37.72	2.38	0.38	0.28
1994	1771.95	194.62	264.50	32.43	8.42	0.39	0.07
1995	516.84	1027.23	106.30	96.88	7.99	3.10	0.26
1996	622.78	254.87	443.65	30.33	20.11	2.63	0.68
1997	194.69	353.75	125.82	151.00	6.65	5.26	0.85
1998	272.92	262.16	168.13	53.30	42.26	3.06	1.66
1999	6907.32	175.58	94.51	48.13	13.18	9.85	1.36
2000	1087.26	2549.76	44.53	19.47	10.31	4.24	3.05
2001	34.46	359.34	1101.48	30.06	6.32	3.62	2.97

Table 5.2 cont'd Herring indices. Mean number per hour per haul. 2001 3rd quarter.

Year	Mean per statistical rectangle					
	Age group					
	0	1	2	3	4	5+
1991	640.18	2572.50	215.80	97.38	66.56	110.29
1992	2901.63	1082.06	452.86	166.20	80.58	159.87
1993	3799.23	1177.22	324.81	175.23	92.03	195.76
1994	1552.28	1679.17	889.04	196.98	181.76	131.72
1995	714.11	522.38	353.06	159.97	56.30	60.35
1996	2704.54	1314.76	190.14	111.73	48.09	42.04
1997	1149.63	1331.95	77.72	23.08	17.31	13.40
1998	1004.34	879.62	467.29	85.85	25.19	21.42
1999	5373.56	595.10	216.29	135.11	68.71	34.66
2000	963.07	1212.38	353.99	164.55	103.87	68.83
2001	2770.16	814.41	443.54	136.07	50.61	49.10

Table 5.2 cont'd Mackerel indices. Mean number per hour per haul. 2001 3rd quarter.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	0.00	25.99	15.85	3.61	3.48	4.01	13.06
1992	0.07	40.15	46.67	30.15	10.48	10.37	14.96
1993	5.34	91.28	67.55	25.70	18.94	10.09	18.12
1994	0.00	82.62	64.56	14.77	4.98	4.31	7.25
1995	0.03	15.12	31.12	26.42	13.28	4.24	15.39
1996	0.00	49.21	50.95	23.65	4.92	3.56	7.77
1997	0.11	63.12	39.13	12.26	6.23	3.45	4.72
1998	3.58	187.43	58.26	16.10	7.75	3.54	3.37
1999	10.56	25.75	23.86	10.96	4.01	2.07	2.78
2000	0.00	94.25	40.85	7.67	4.10	1.08	2.33
2001	3.46	14.38	24.16	9.74	5.04	2.74	3.26

Table 5.2 cont'd Norway Pout indices. Mean number per hour per haul. 2001 3rd quarter.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	7382.90	1104.86	222.23	2.61	0.00	0.00	0.00
1992	2587.77	4365.81	640.21	48.21	2.77	0.00	0.06
1993	3952.70	1860.90	596.47	53.37	3.30	0.00	0.00
1994	3195.82	704.41	101.59	13.51	0.34	0.00	0.00
1995	1762.43	4526.74	316.98	42.24	1.72	0.00	0.00
1996	4553.64	763.03	362.42	12.01	0.78	0.00	0.00
1997	489.95	3520.53	169.10	40.33	1.36	0.01	0.00
1998	2931.40	805.69	743.45	11.40	3.01	0.00	0.00
1999	7844.32	2366.57	200.82	94.39	1.46	0.03	0.27
2000	1643.50	7868.34	281.68	11.26	5.34	0.00	0.00
2001	2084.09	1278.78	859.96	26.77	2.72	0.29	0.00

Table 5.2 cont'd Saithe indices. Mean number per hour per haul. 2001 3rd quarter.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	0.01	0.16	1.00	3.25	0.70	0.13	0.27
1992	0.01	0.10	0.32	1.33	3.41	0.64	0.34
1993	0.00	0.14	2.59	11.78	4.10	1.68	0.56
1994	0.01	0.00	0.69	1.12	1.62	0.88	0.83
1995	0.00	0.01	0.83	20.04	3.60	2.23	1.17
1996	0.00	0.29	2.15	3.82	6.53	1.12	1.33
1997	0.01	0.14	0.51	3.76	3.35	7.45	1.54
1998	0.00	0.03	0.29	2.03	7.74	2.61	3.78
1999	0.00	0.01	0.65	4.12	3.94	5.77	2.73
2000	0.00	0.01	0.53	3.39	8.96	1.07	1.19
2001	0.01	0.02	3.07	35.47	9.84	6.32	1.82

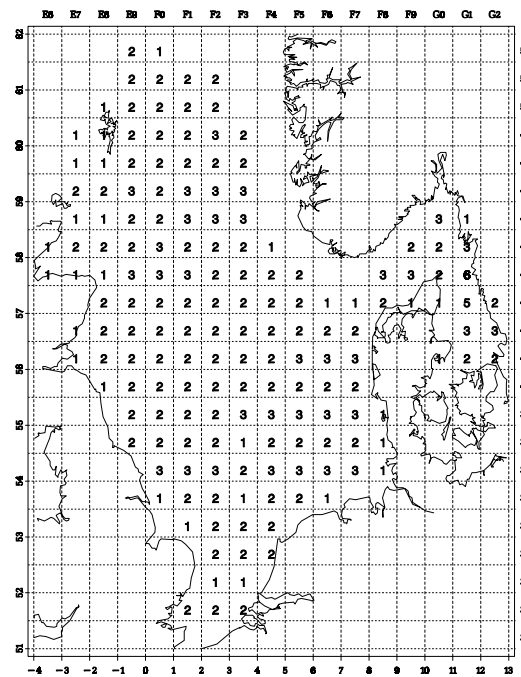
Table 5.2 cont'd Sprat indices. Mean number per hour per haul. 2001 3rd quarter.

Year	Mean per statistical rectangle					
	Age group					
	0	1	2	3	4	5+
1991	16.78	435.87	133.90	54.93	0.77	0.00
1992	56.49	3975.23	3389.45	205.33	33.55	2.53
1993	6.85	2575.10	2728.38	559.33	23.52	0.00
1994	5.19	4298.10	500.79	131.14	12.27	0.00
1995	0.32	1381.76	3897.07	2020.47	22.29	0.92
1996	3.28	537.33	1321.67	586.21	79.27	4.49
1997	29.03	8331.55	2356.96	437.56	52.00	0.00
1998	343.84	3676.27	2038.12	260.45	8.37	0.41
1999	3924.51	18229.36	1843.40	108.65	0.05	0.00
2000	49.68	5014.41	2802.90	70.77	5.86	0.00
2001	169.48	3098.85	2184.33	170.42	1.28	0.00

Table 5.2 cont'd Whiting indices. Mean number per hour per haul. 2001 3rd quarter.

Year	Mean per statistical rectangle						
	Age group						
	0	1	2	3	4	5	6+
1991	529.39	700.83	158.87	78.92	14.62	5.20	1.02
1992	1381.49	595.01	297.85	72.91	57.90	10.35	6.26
1993	915.86	634.16	176.88	67.13	14.82	16.19	3.15
1994	609.87	674.52	222.52	76.32	19.83	4.82	3.19
1995	729.25	619.79	291.18	107.20	21.51	6.01	3.46
1996	316.50	545.71	278.22	129.36	34.00	6.89	4.10
1997	2062.67	332.97	180.68	108.99	28.01	10.71	4.25
1998	2609.97	328.92	150.00	52.69	30.97	11.16	4.69
1999	2498.55	1203.50	190.65	53.93	24.45	9.53	4.18
2000	1968.07	941.66	326.94	64.11	13.63	6.53	4.87
2001	3625.85	681.41	288.06	96.90	19.56	4.41	7.67

Number of hauls, 2001 quarter 3



Number of daytime hauls, 2001 quarter 3

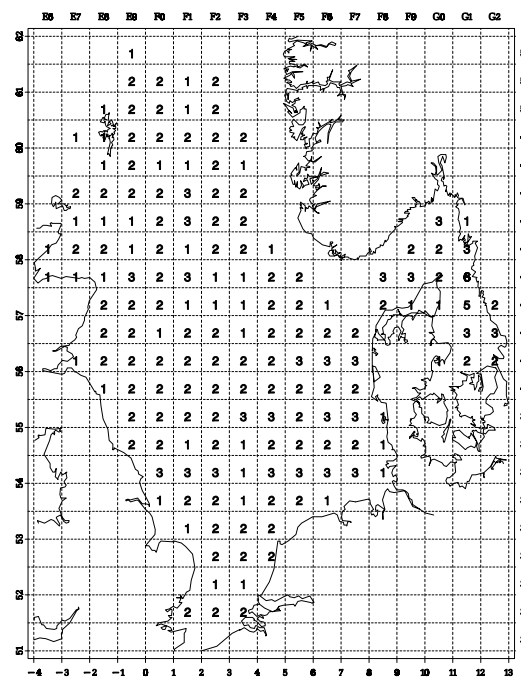


Figure 5.1 Number of valid day- and night-time hauls.

Herring, number per hour

Age group 1, 2001 quarter 3

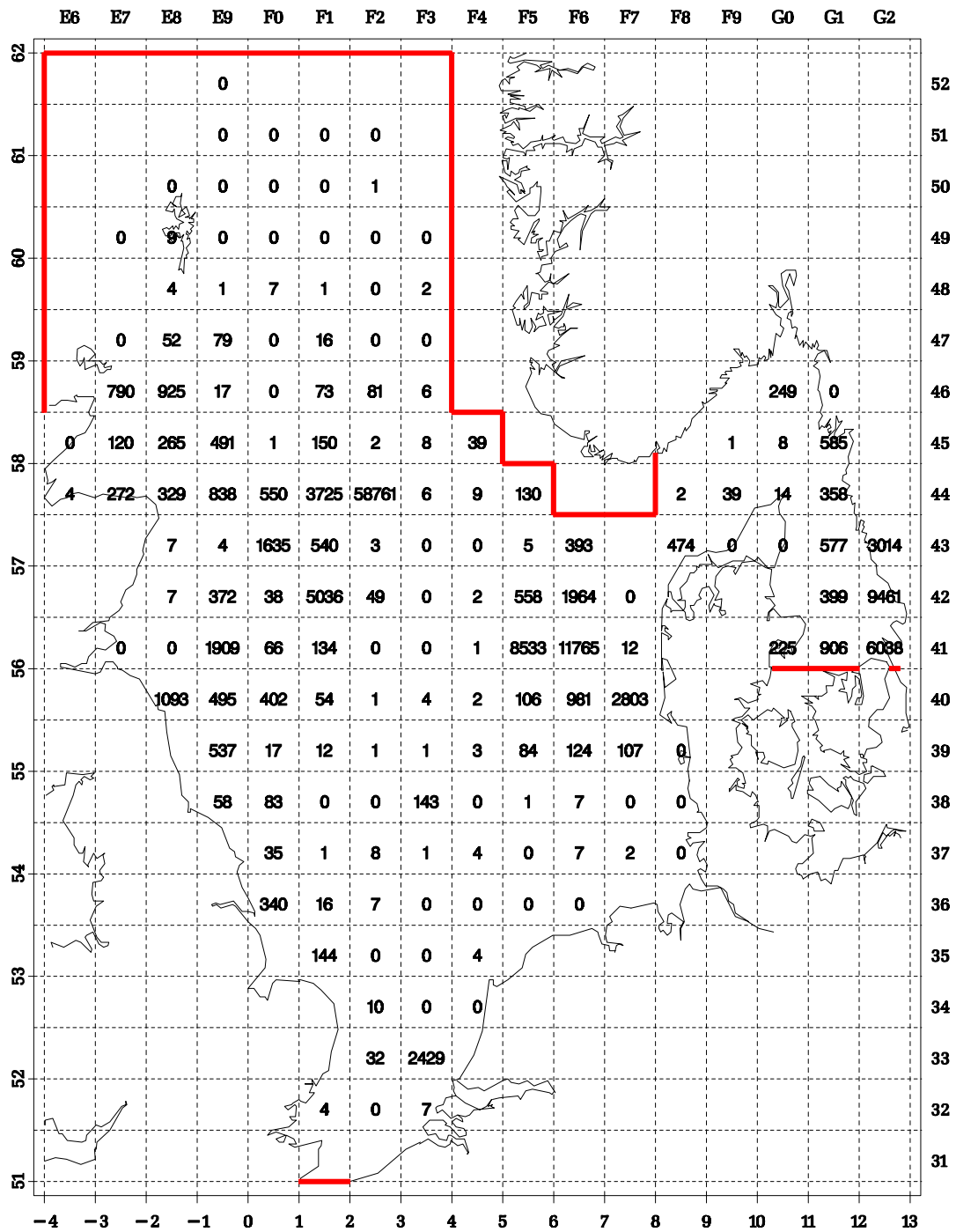


Figure 5.2 Herring: number per hour, 1-ringers

Herring, number per hour

Age group 2, 2001 quarter 3

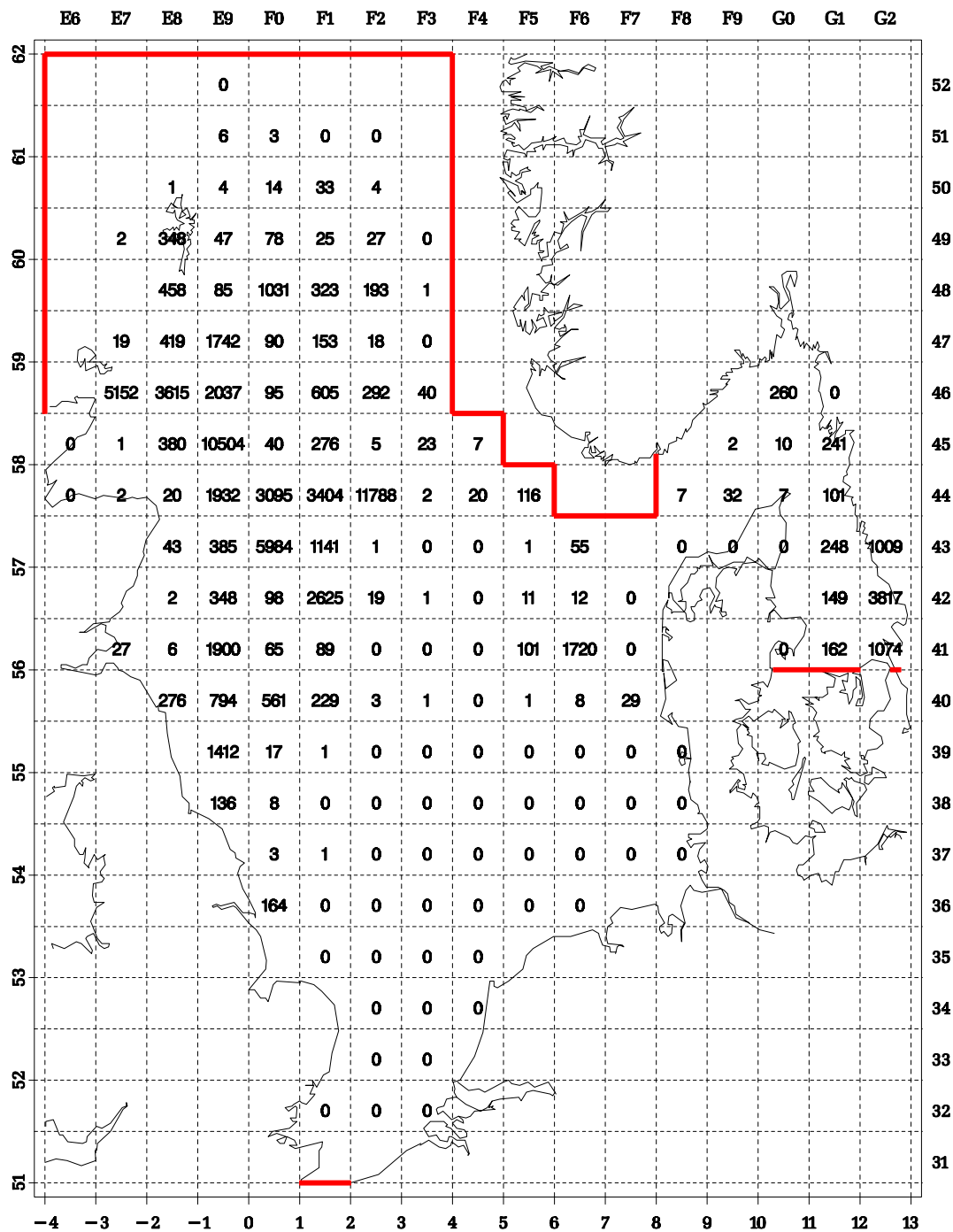


Figure 5.3 Herring: number per hour, 2-ringers

Herring, number per hour

Age group 3, 2001 quarter 3

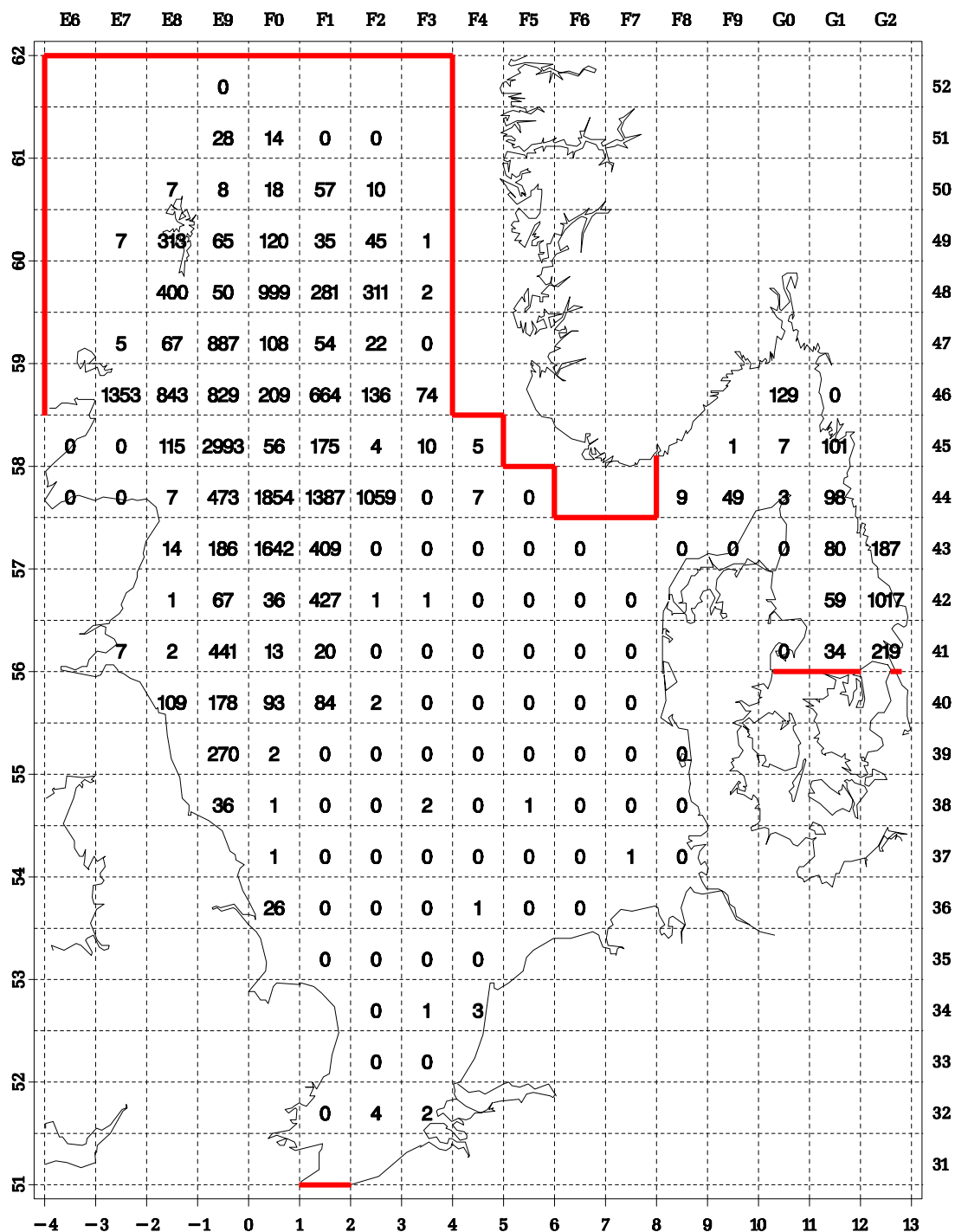


Figure 5.4 Herring: number per hour, 3-ringers

Herring, mean length Age group 1, 2001 quarter 3

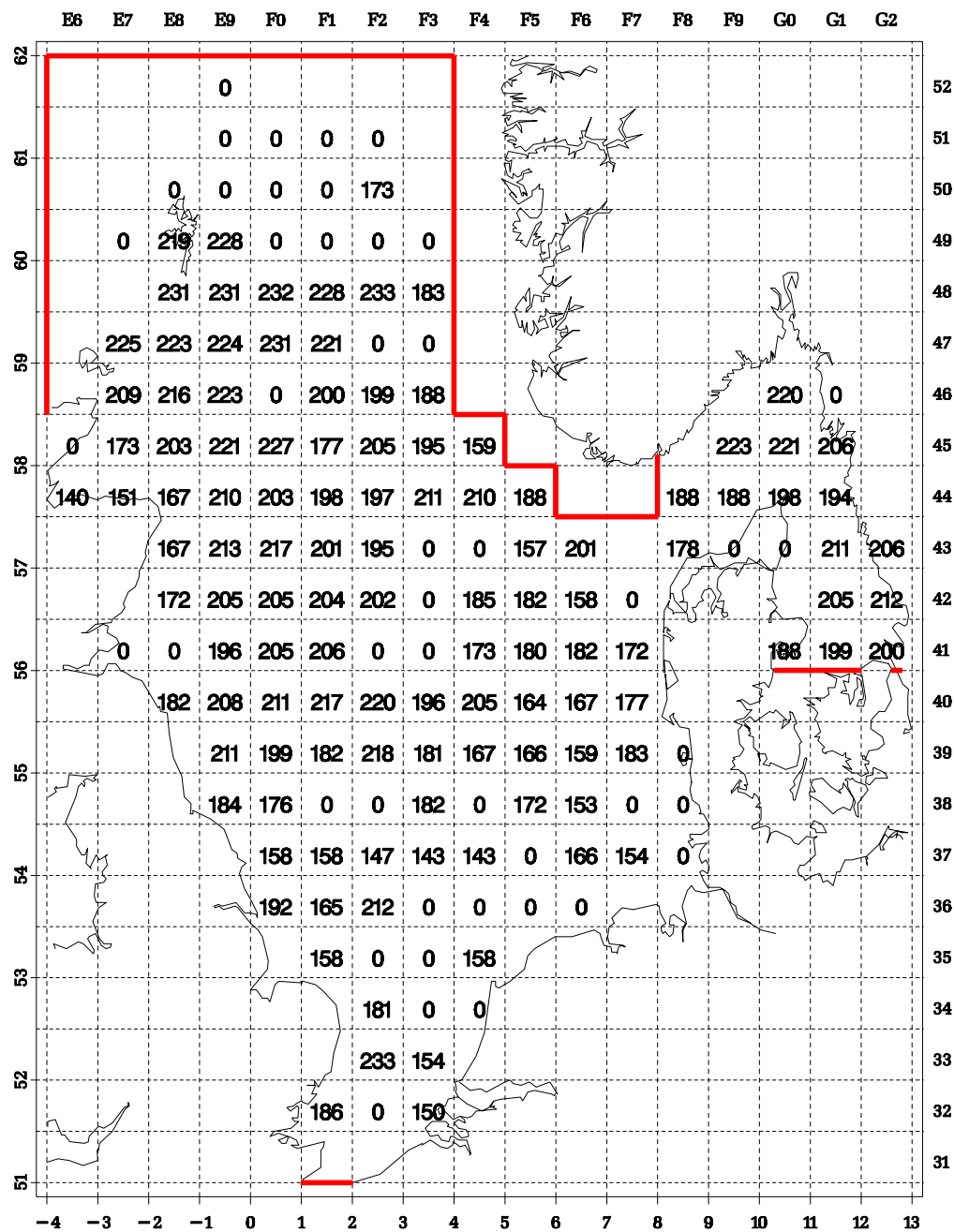


Figure 5.5 Herring mean length (mm) 1-ringers

Age group 1, 2001 quarter 3

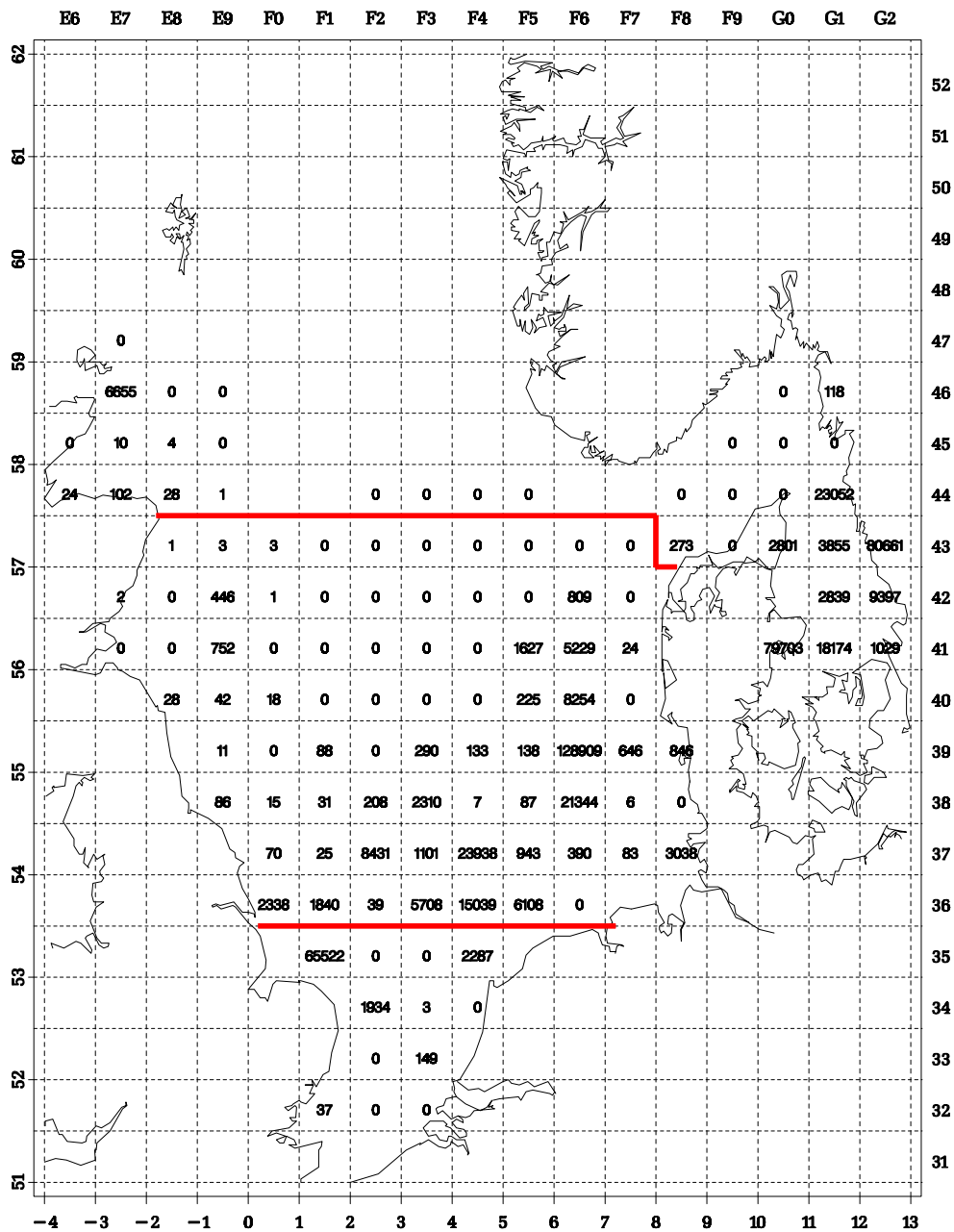


Figure 5.6 Sprat: number per hour, age 1

Sprat, number per hour Age group 2, 2001 quarter 3

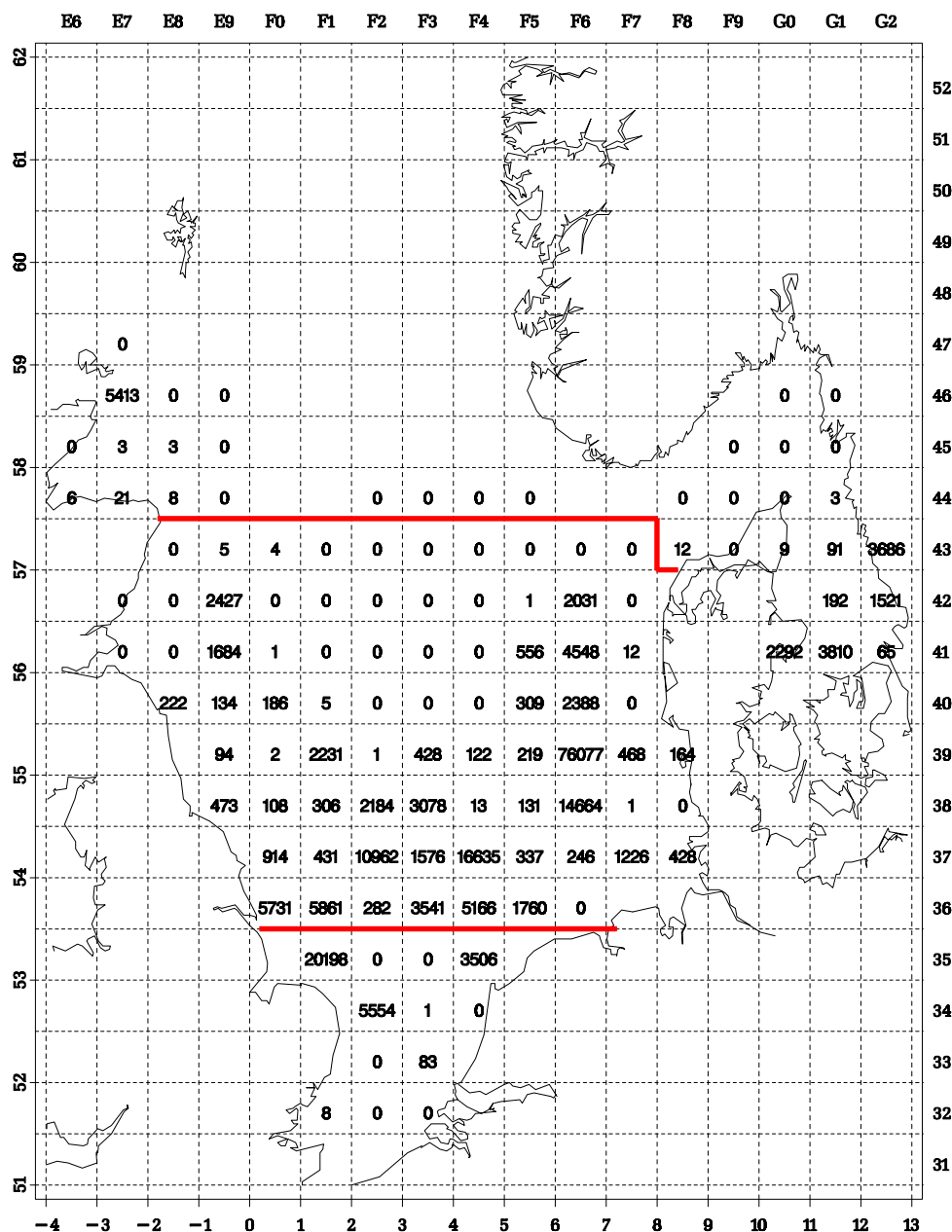


Figure 5.7 Sprat: number per hour, age 2

Sprat, number per hour
Age group 3, 2001 quarter 3

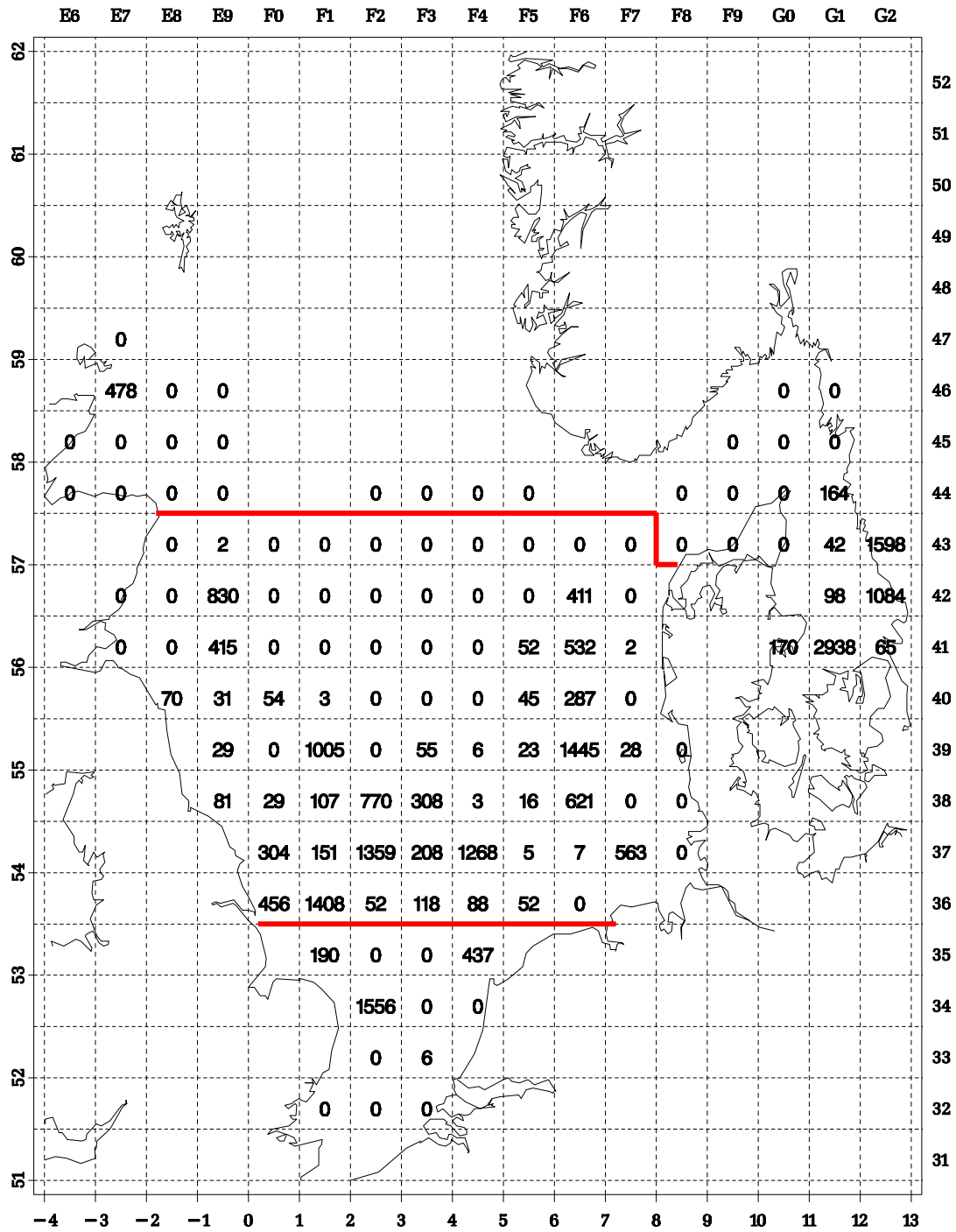


Figure 5.8 Sprat: number per hour, age 3

Sprat, mean length

Age group 1, 2001 quarter 3

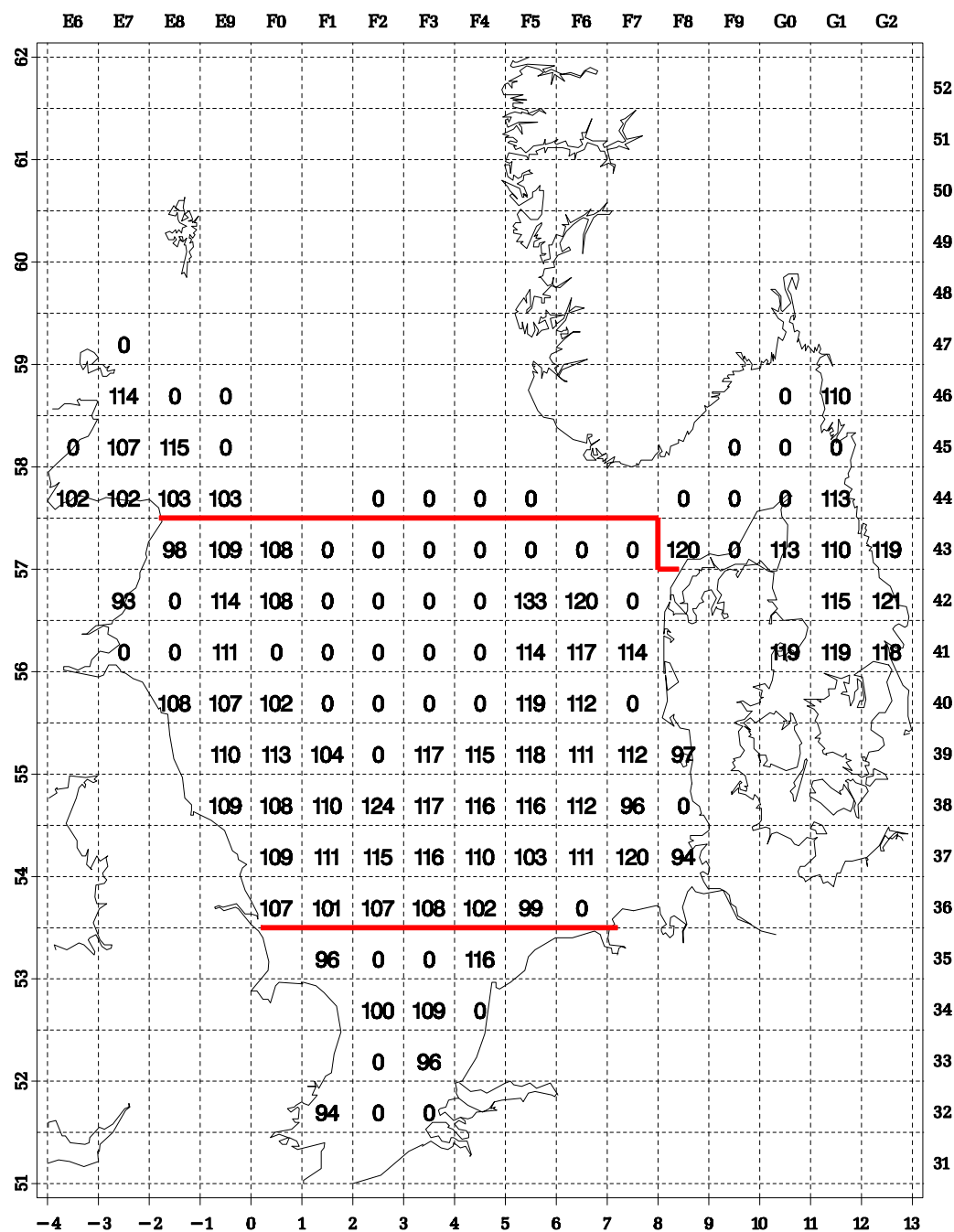


Figure 5.9 Sprat: mean length (mm), age 1

Mackerel, number per hour

Age group 1, 2001 quarter 3

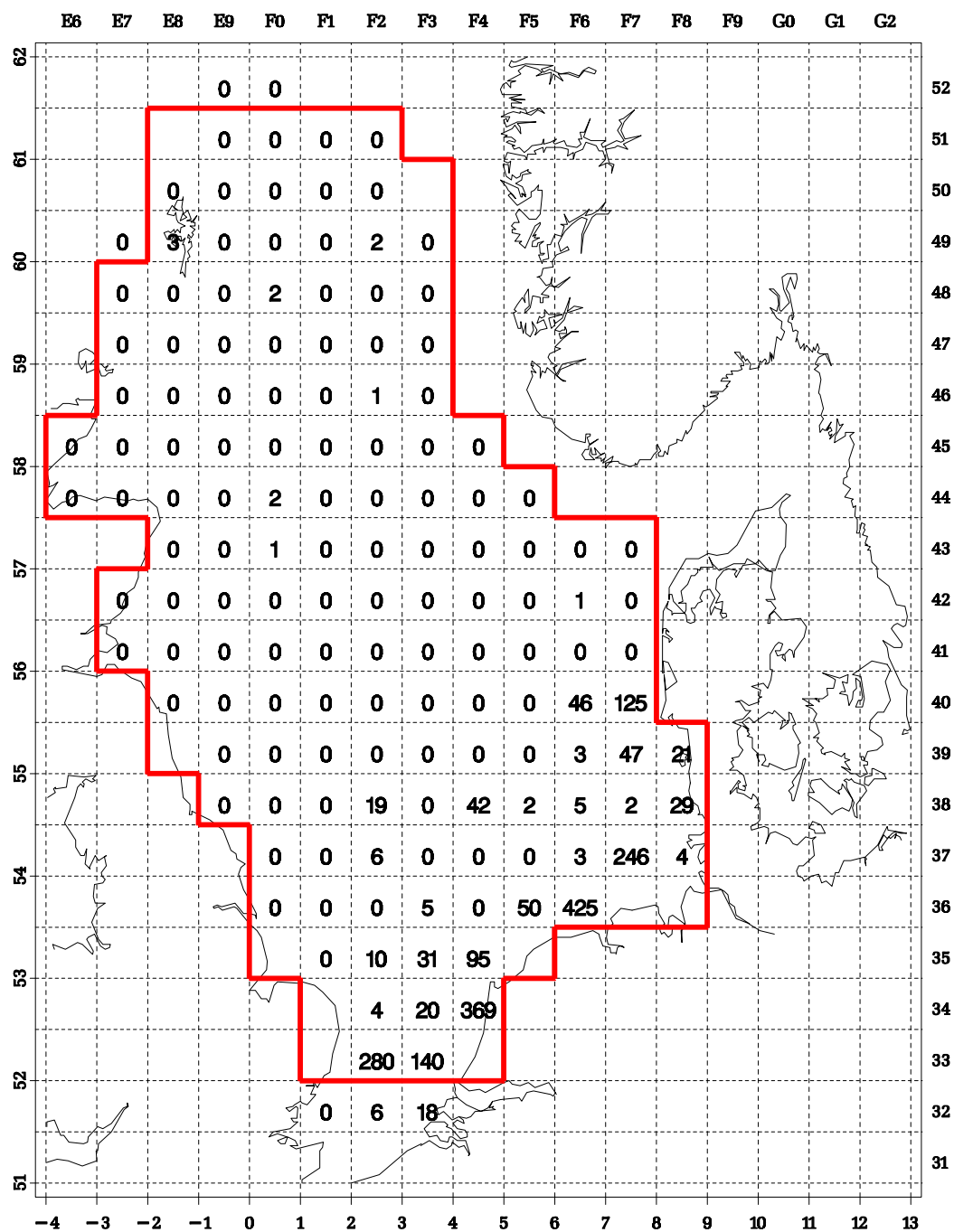


Figure 5.10 Mackerel: number per hour, age 1

Mackerel, number per hour

Age group 2, 2001 quarter 3

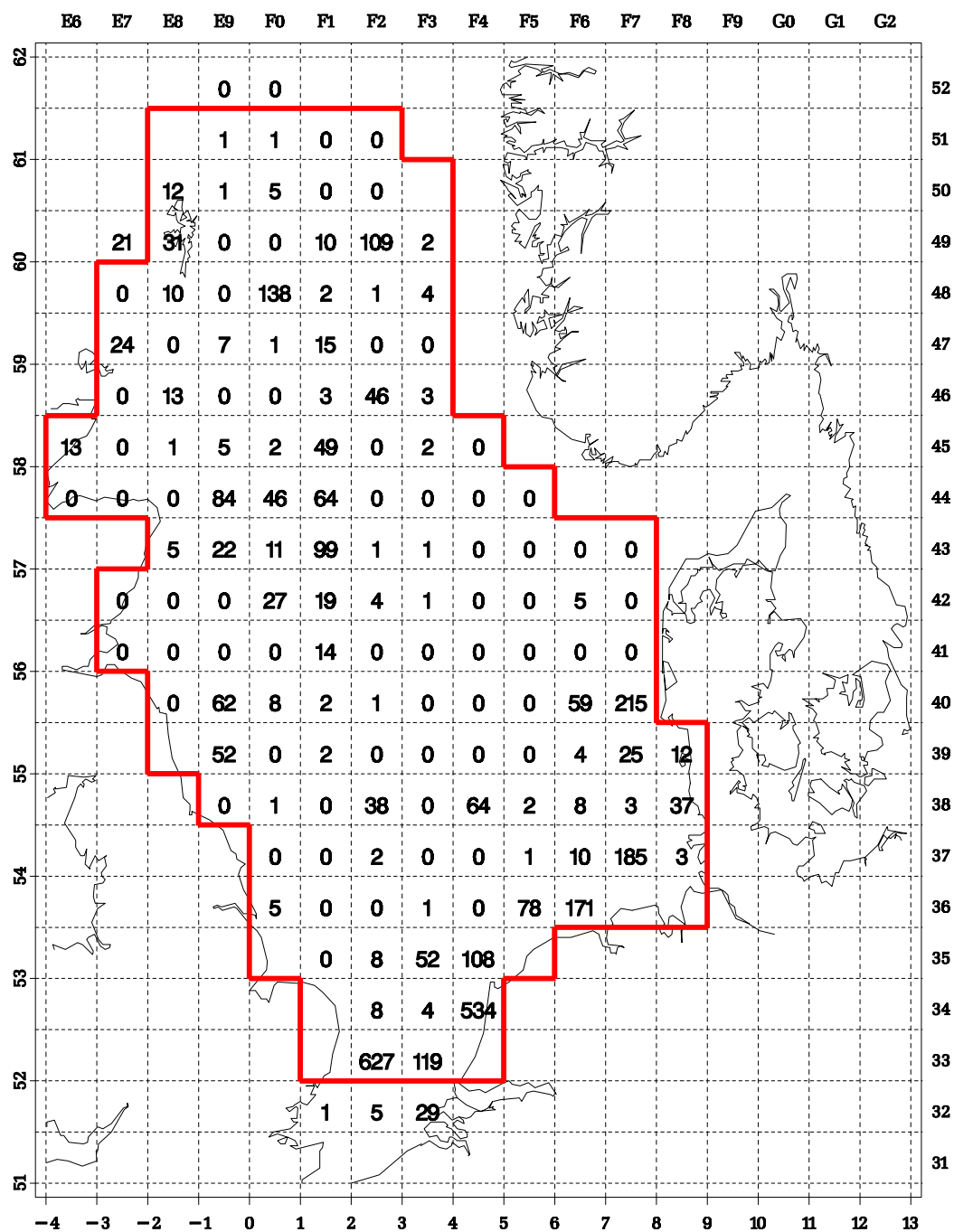


Figure 5.11 Mackerel: number per hour, age 2

Mackerel, number per hour

Age group 3, 2001 quarter 3

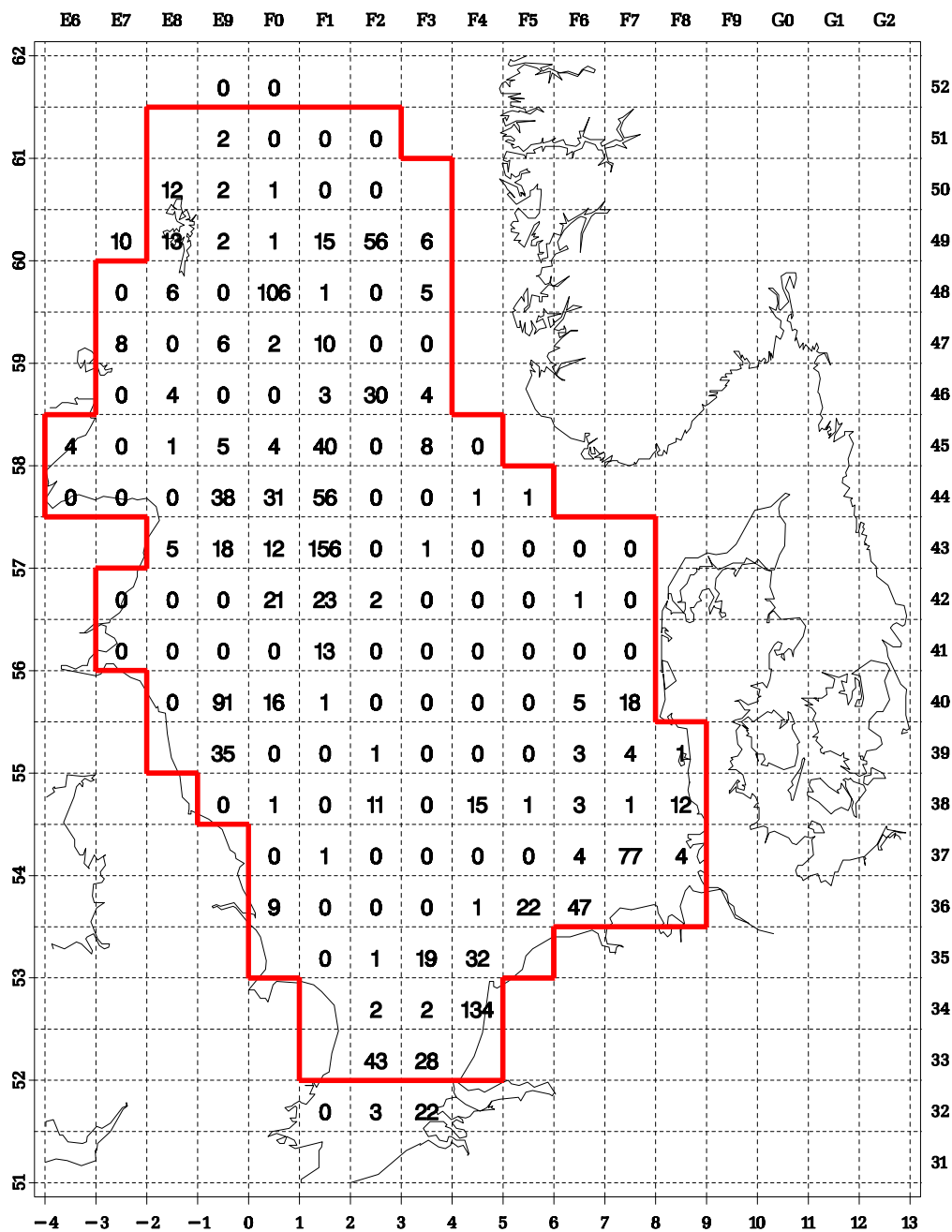


Figure 5.12 Mackerel: number per hour, age 3

Mackerel, mean length

Age group 1, 2001 quarter 3

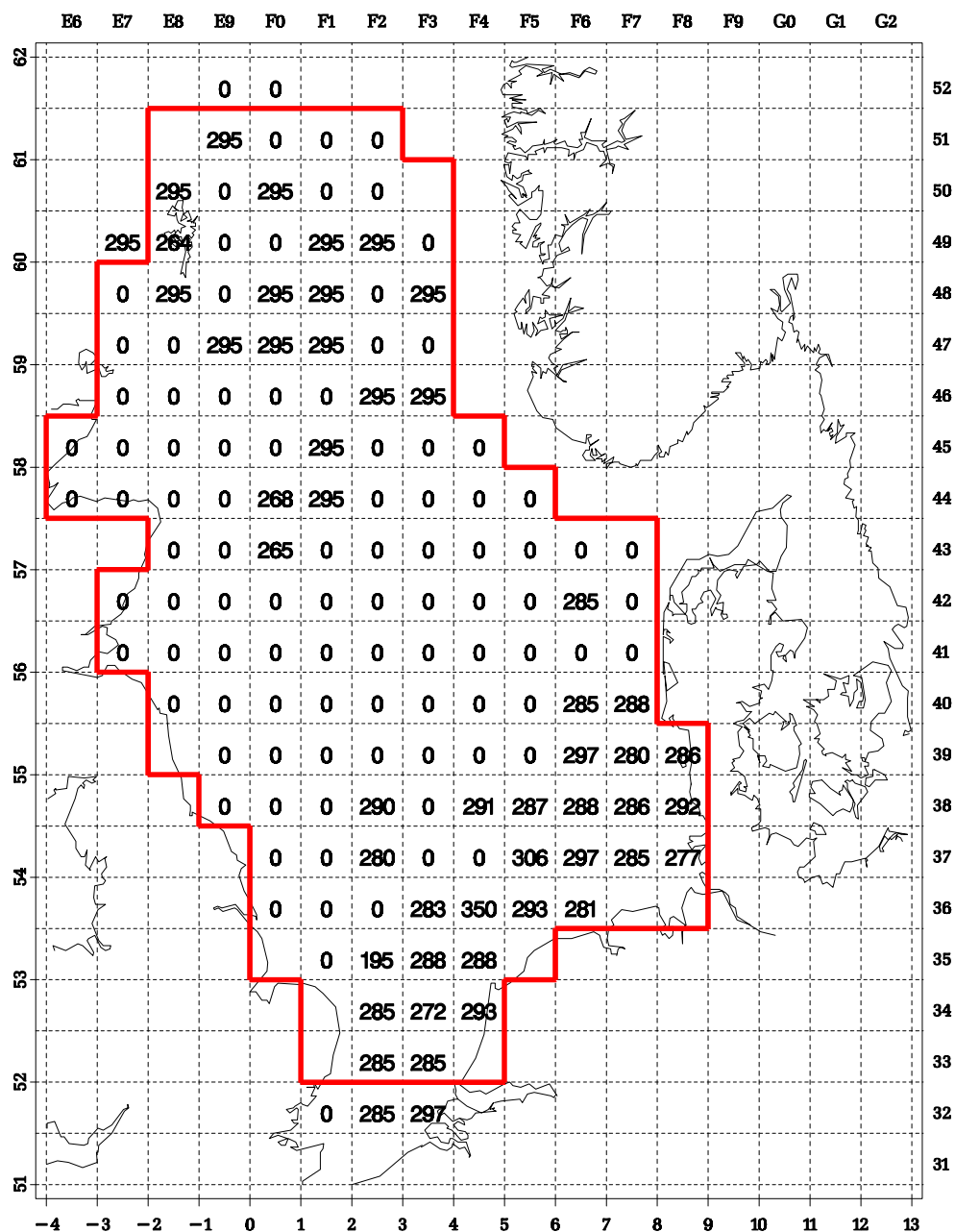


Figure 5.13 Mackerel: mean length (mm), age 1

Cod, number per hour Age group 1, 2001 quarter 3

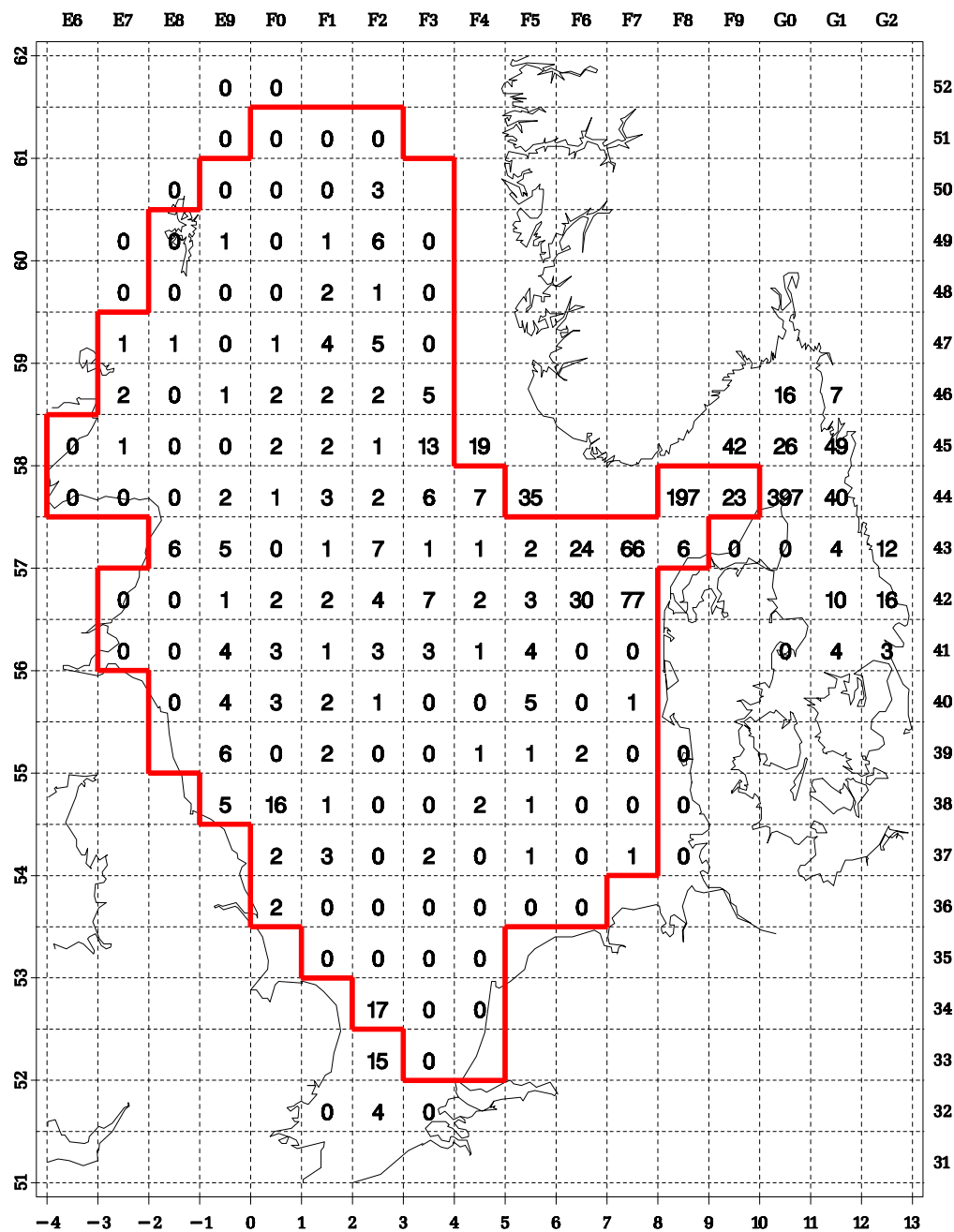


Figure 5.14 Cod: number per hour, age 1

Cod, number per hour Age group 2, 2001 quarter 3

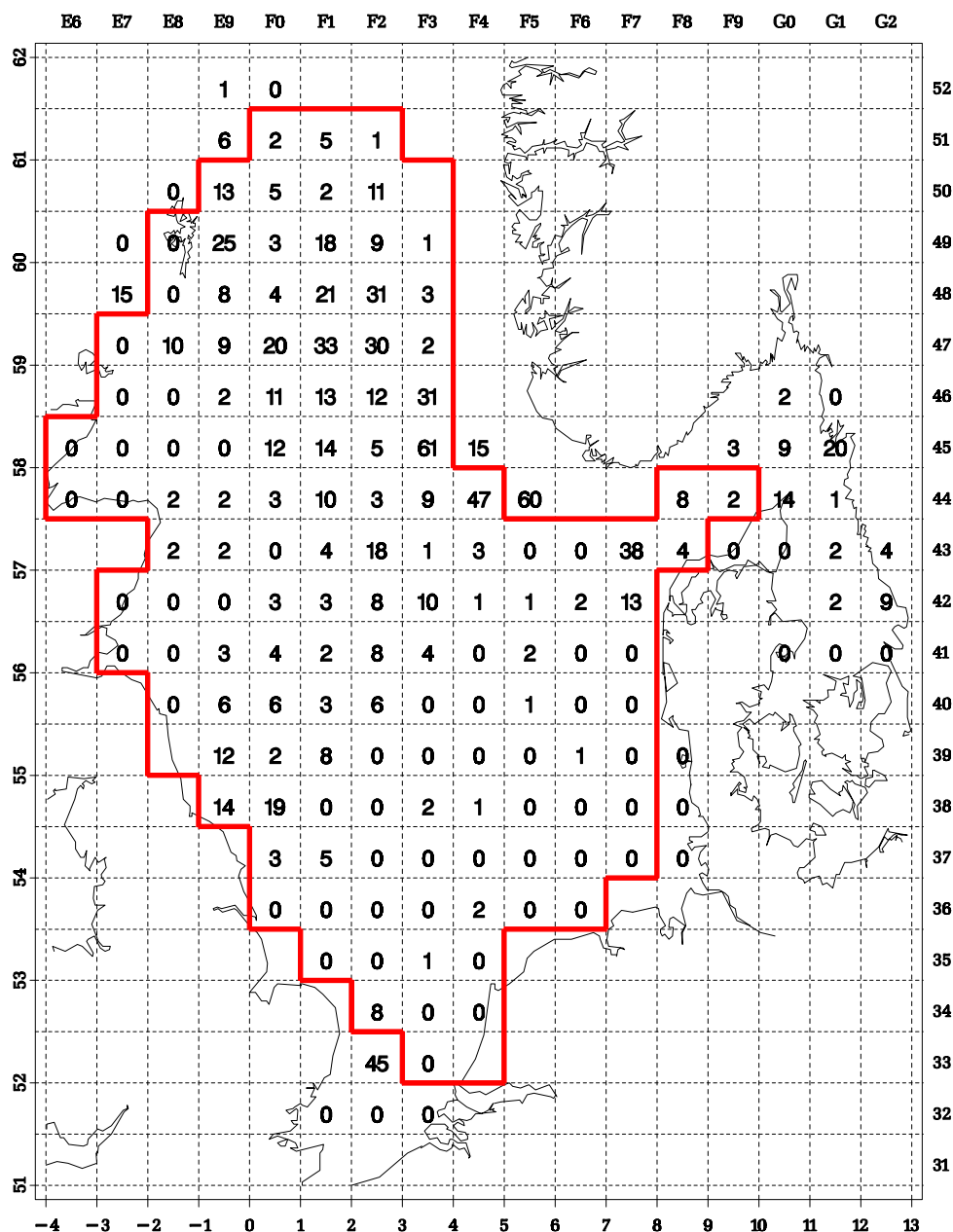


Figure 5.15 Cod: number per hour, age 2

Cod, number per hour Age group 3, 2001 quarter 3

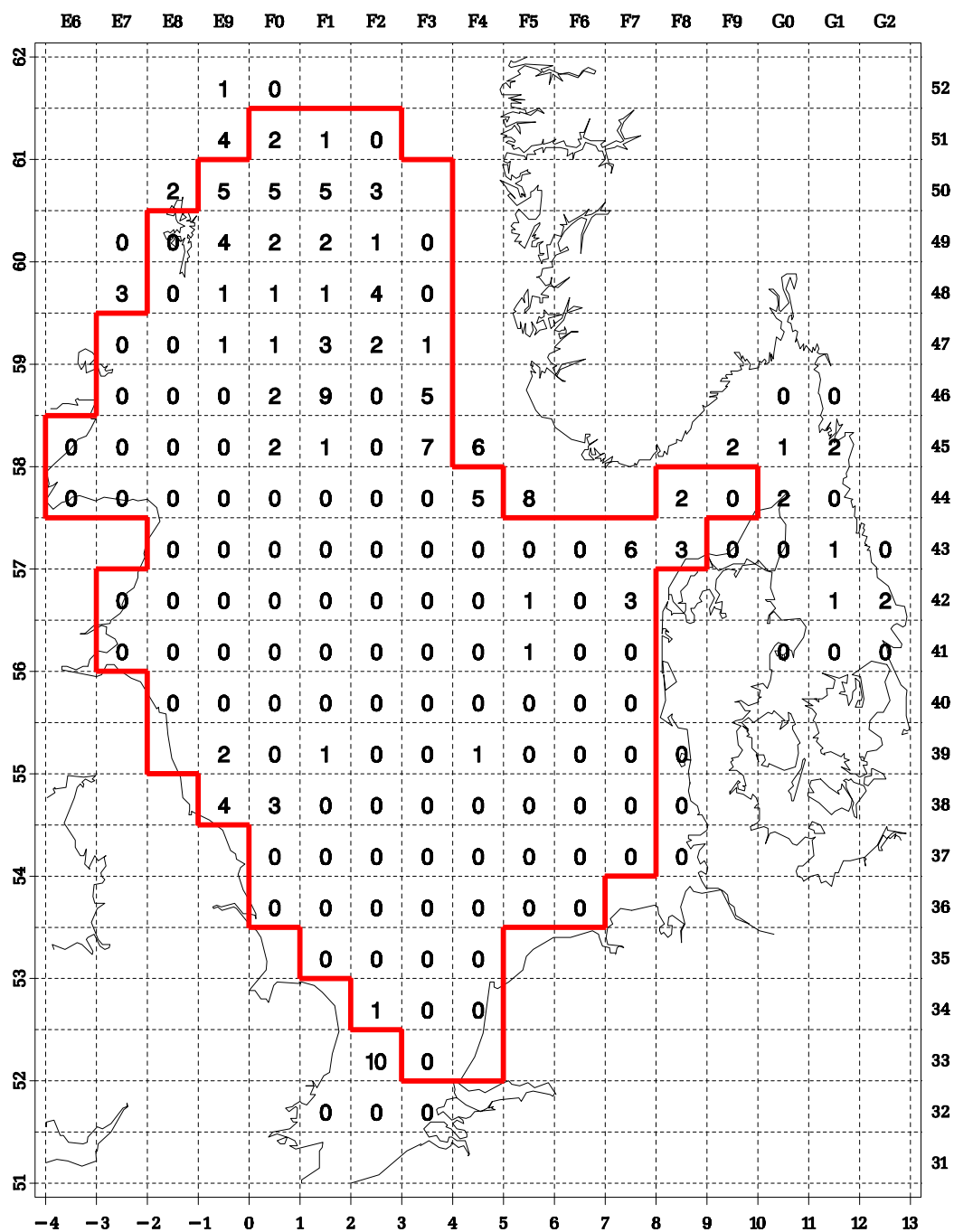


Figure 5.16 Cod: number per hour, age 3

Cod, mean length

Age group 1, 2001 quarter 3

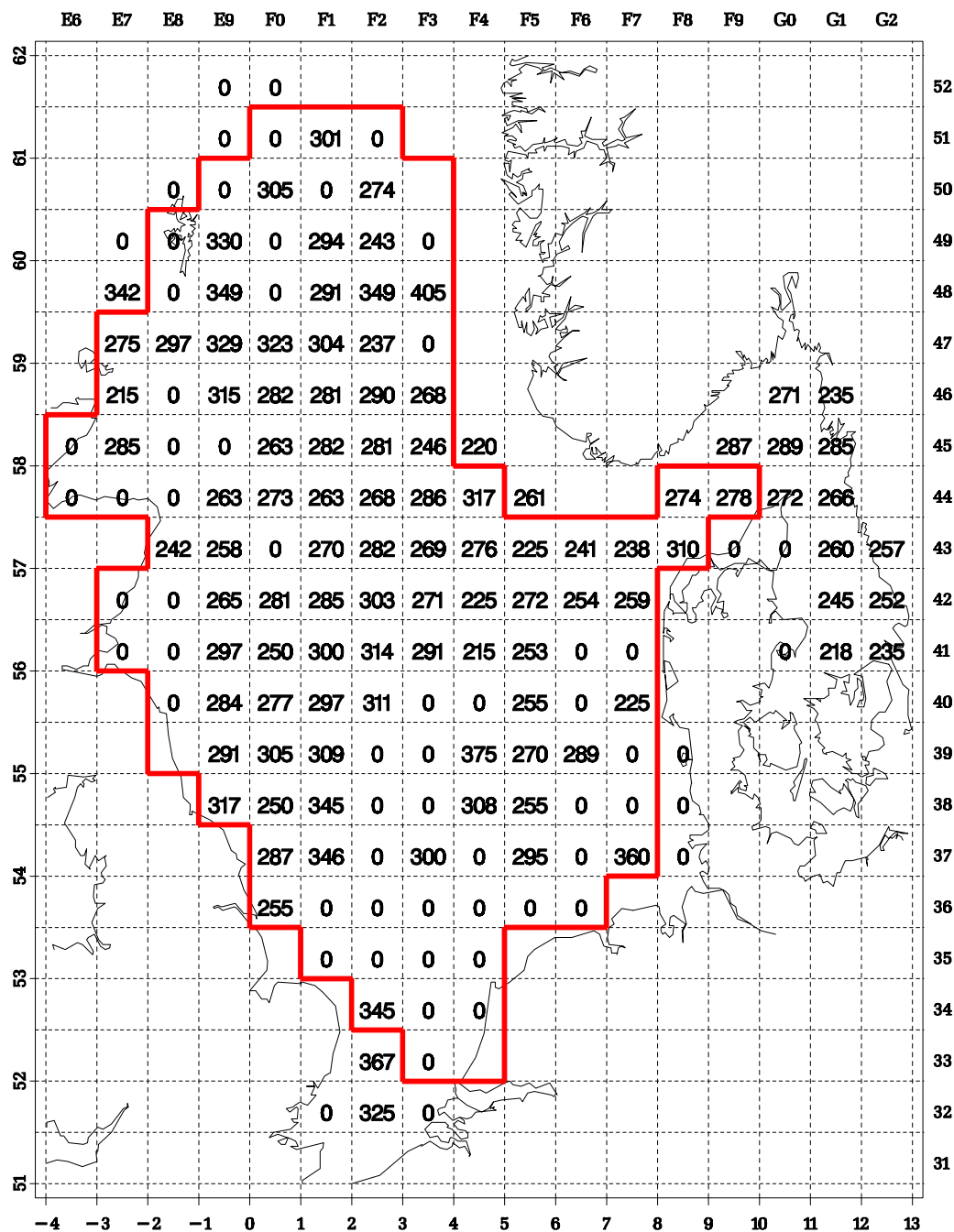


Figure 5.17 Cod, mean length (mm) age 1

Haddock, number per hour

Age group 1, 2001 quarter 3

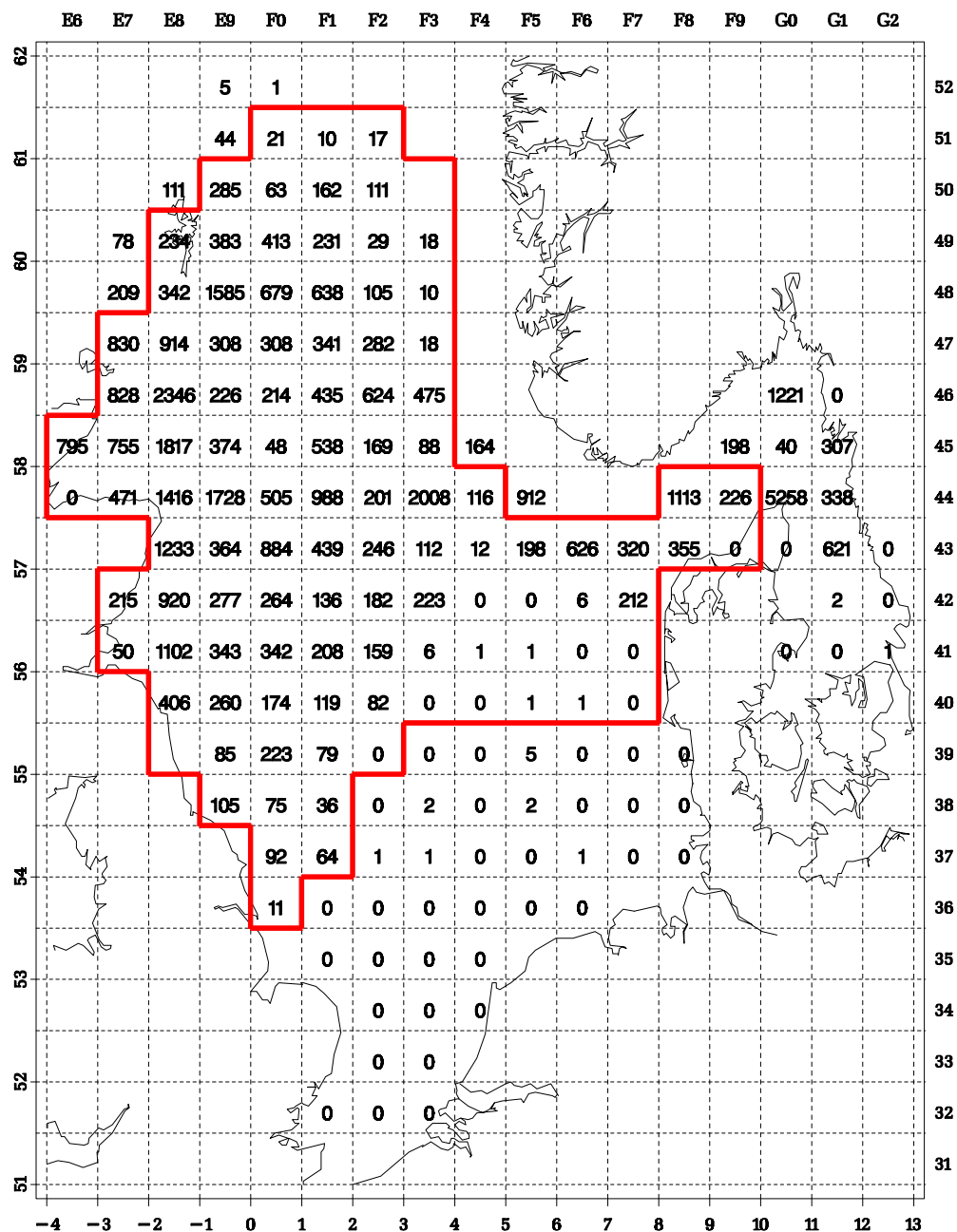


Figure 5.18 Haddock: number per hour, age 1

Haddock, number per hour

Age group 2, 2001 quarter 3

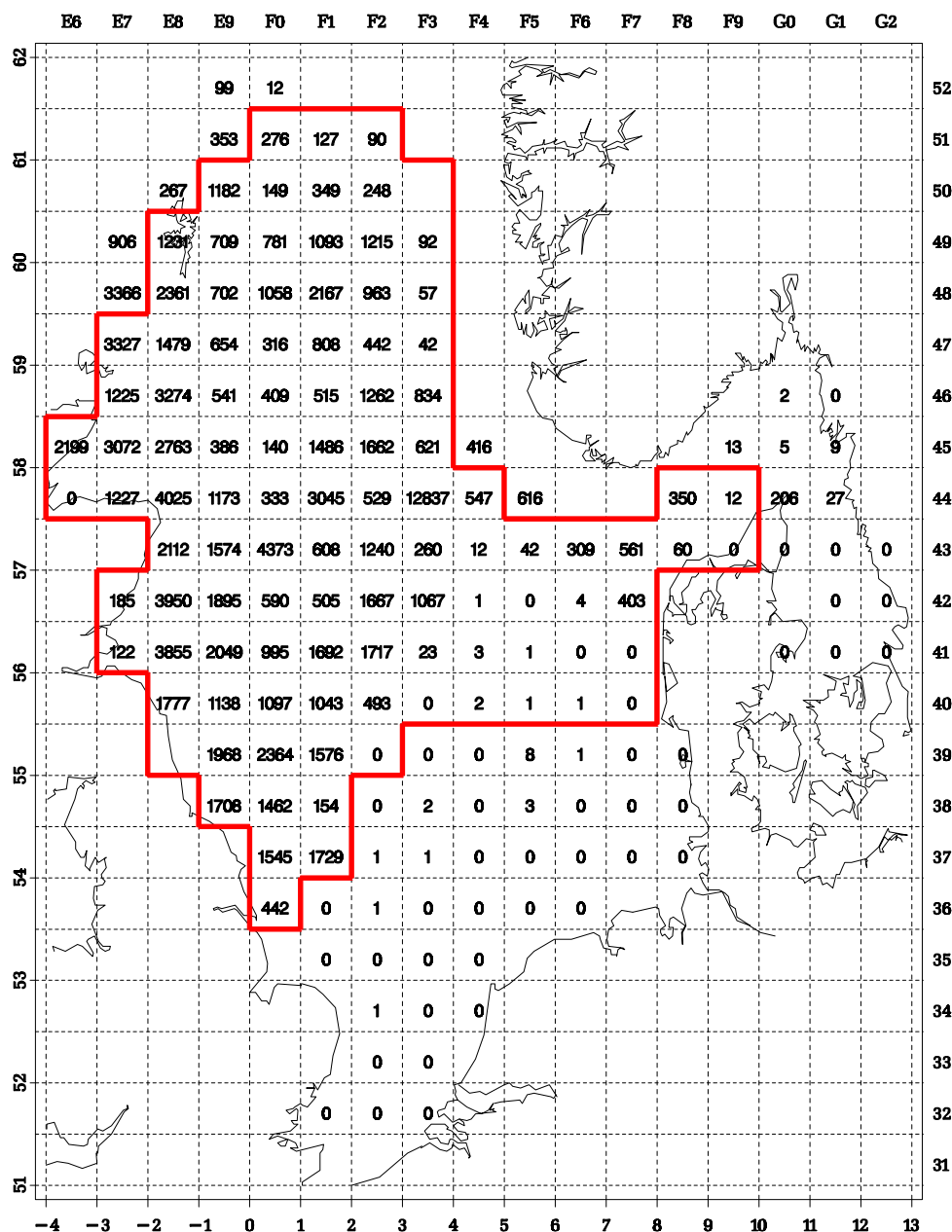


Figure 5.19 Haddock: number per hour, age 2

Haddock, number per hour

Age group 3, 2001 quarter 3

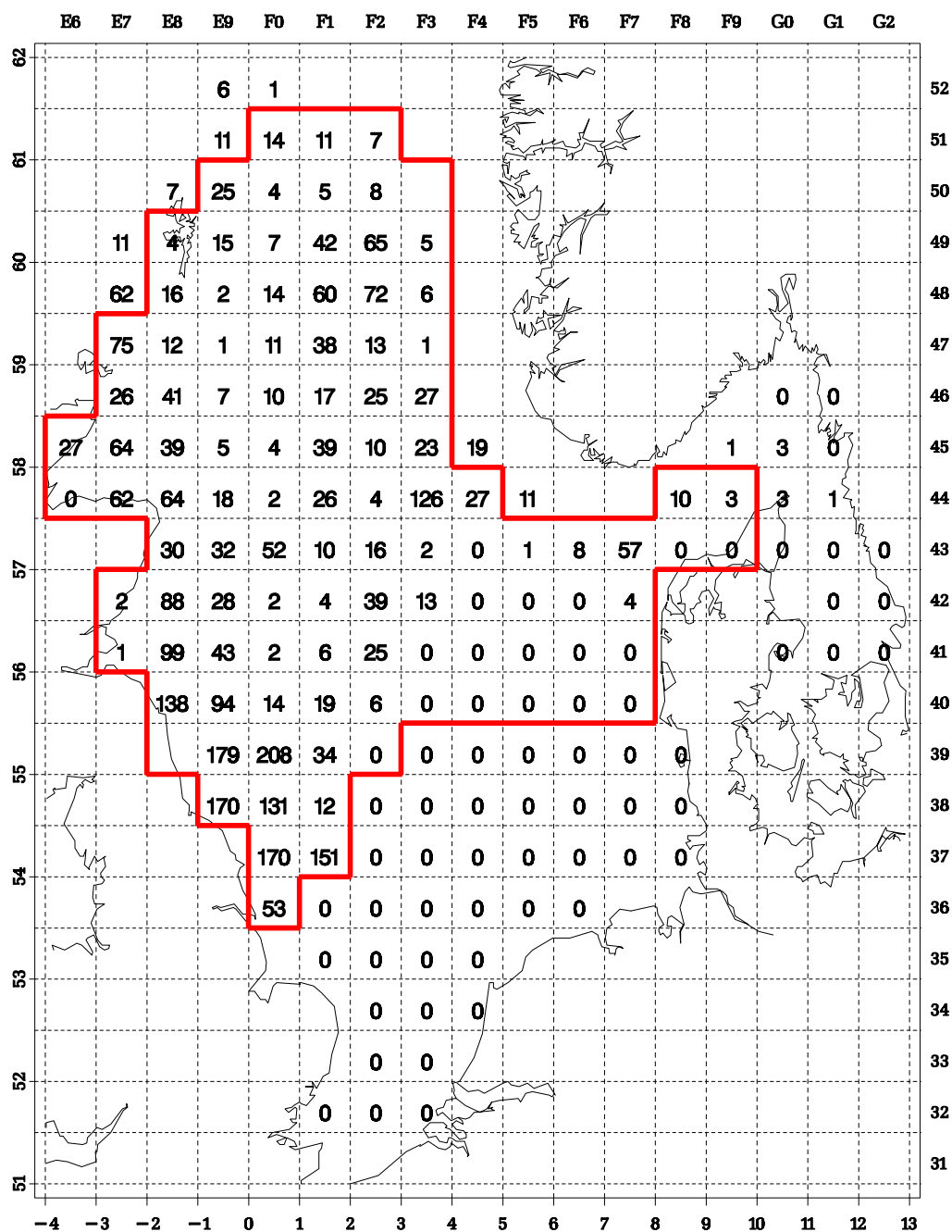


Figure 5.20 Haddock: number per hour, age 3

Haddock, mean length

Age group 1, 2001 quarter 3

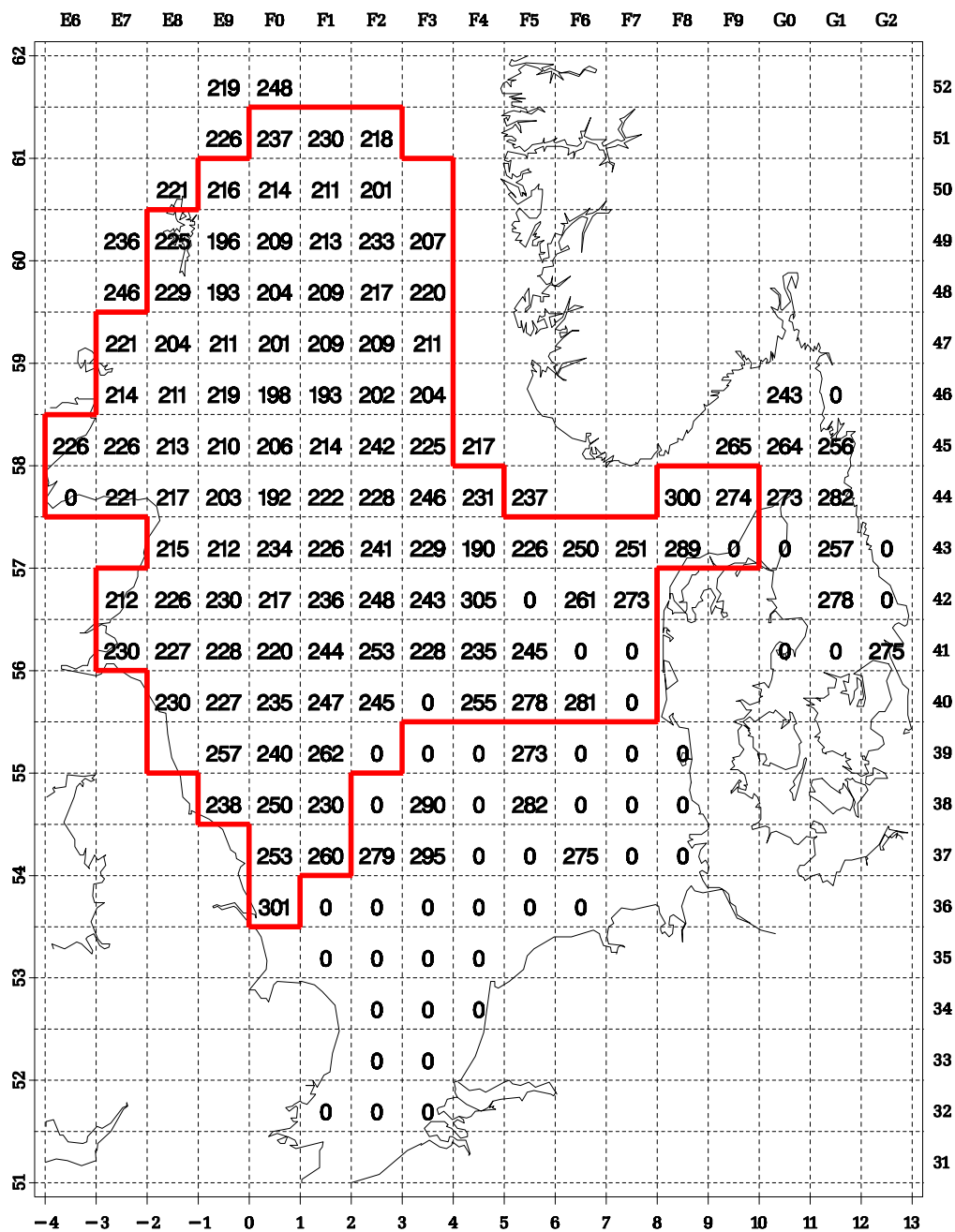


Figure 5.21 Haddock: mean length (mm), age 1

Whiting, number per hour

Age group 1, 2001 quarter 3

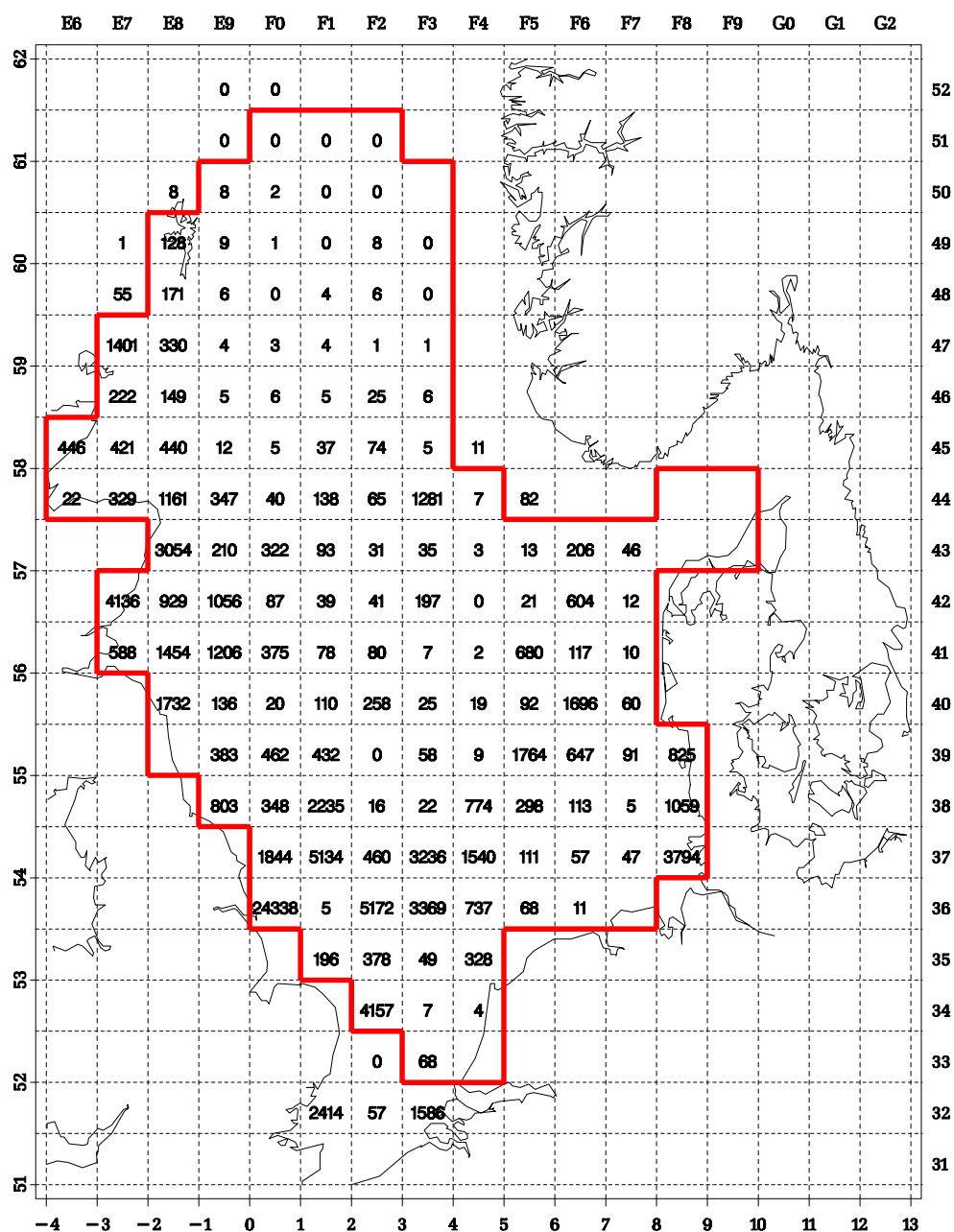


Figure 5.22 Whiting: number per hour, age 1

Whiting, number per hour

Age group 2, 2001 quarter 3

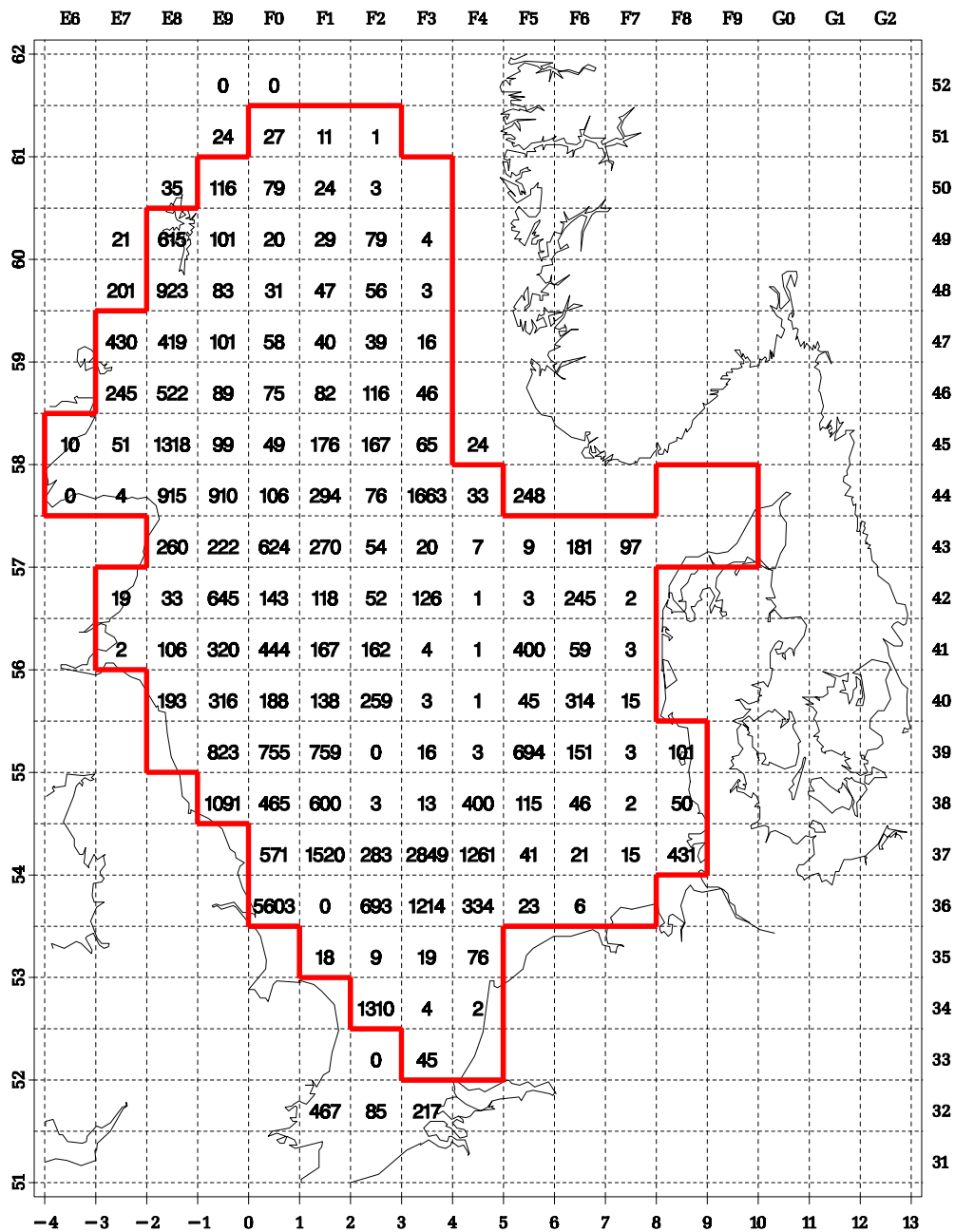


Figure 5.23 Whiting: number per hour, age 2

Whiting, number per hour

Age group 3, 2001 quarter 3

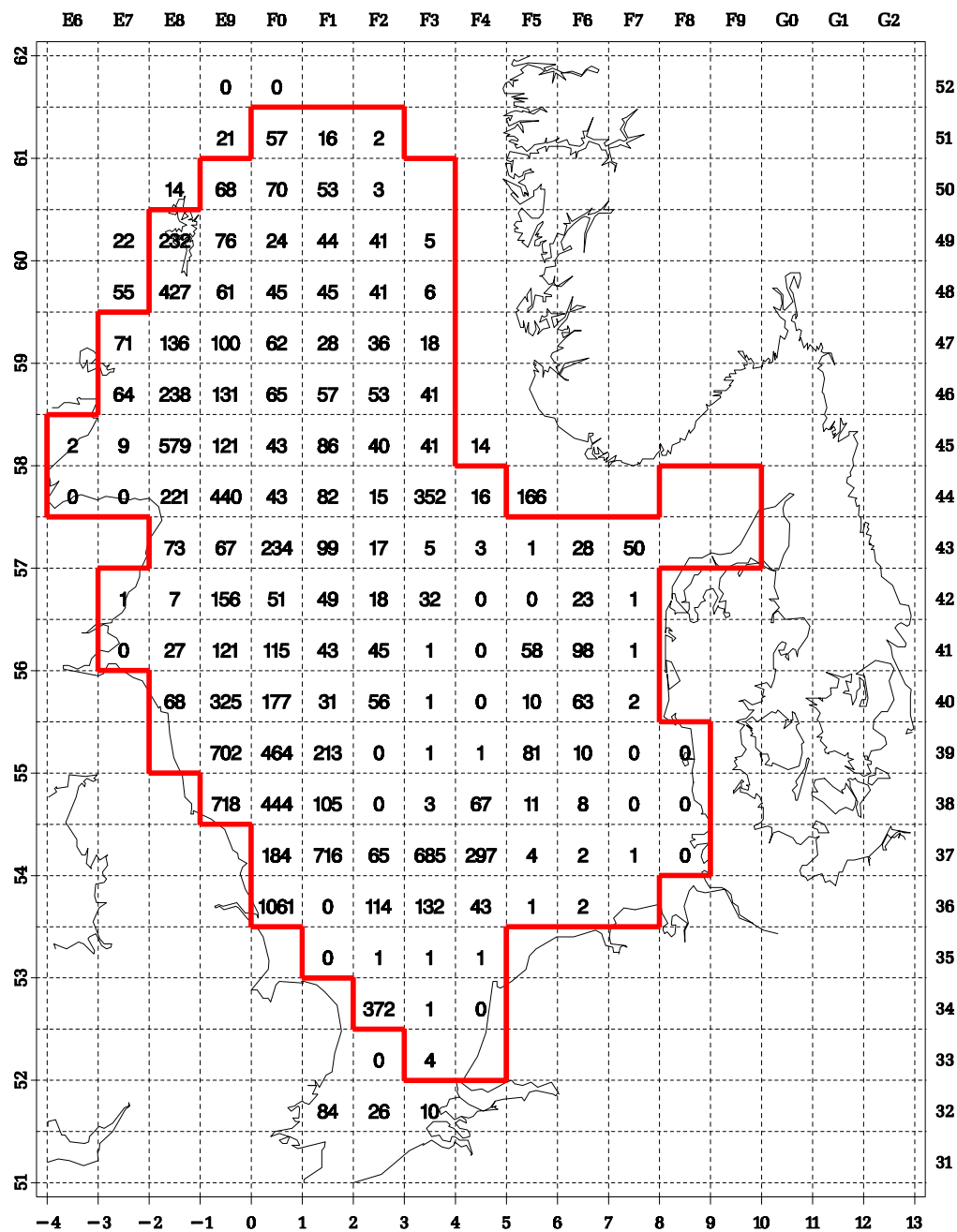


Figure 5.24 Whiting: number per hour, age 3

Whiting, mean length Age group 1, 2001 quarter 3

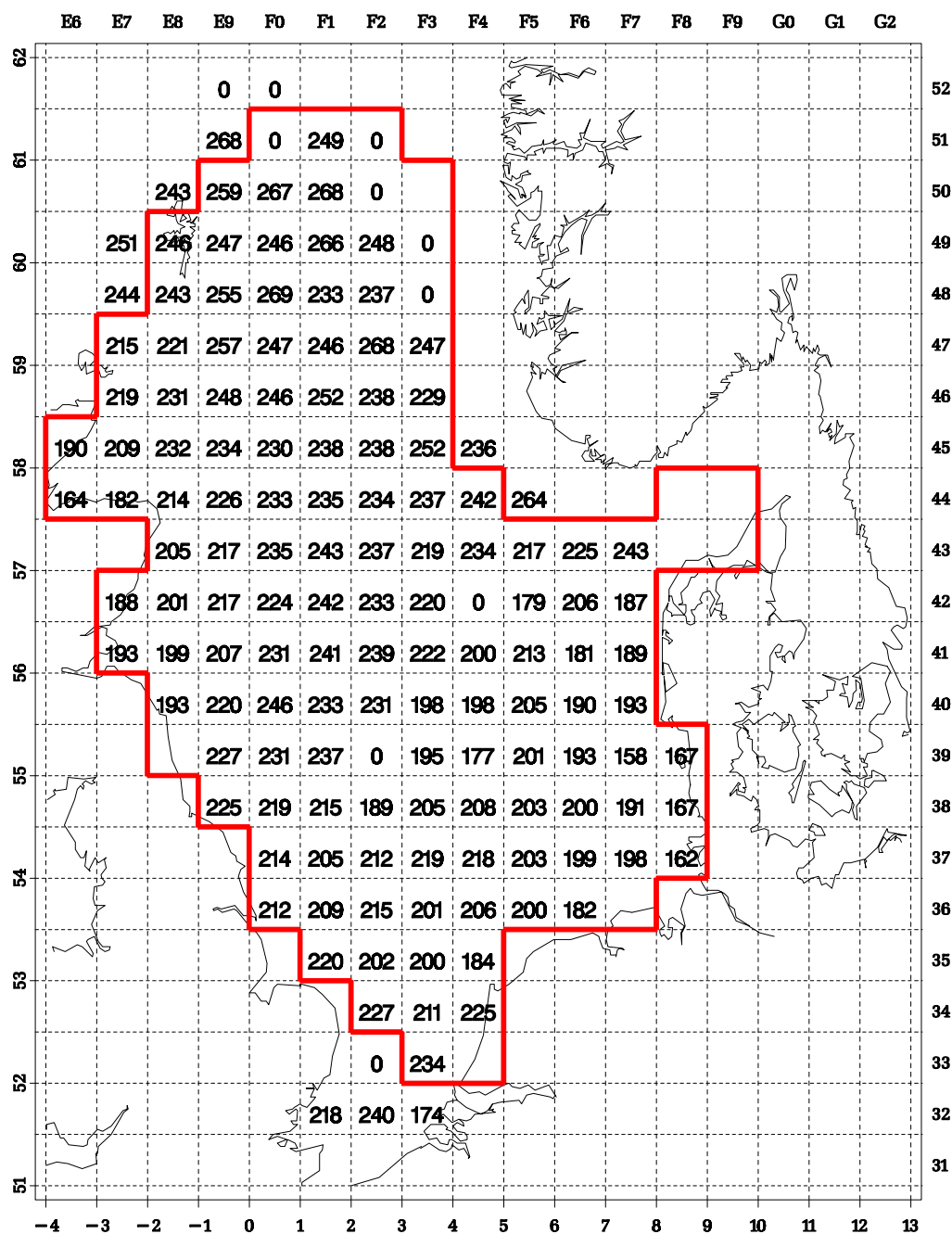


Figure 5.25 Whiting: mean length (mm), age 1

Saithe, number per hour

Age group 1, 2001 quarter 3

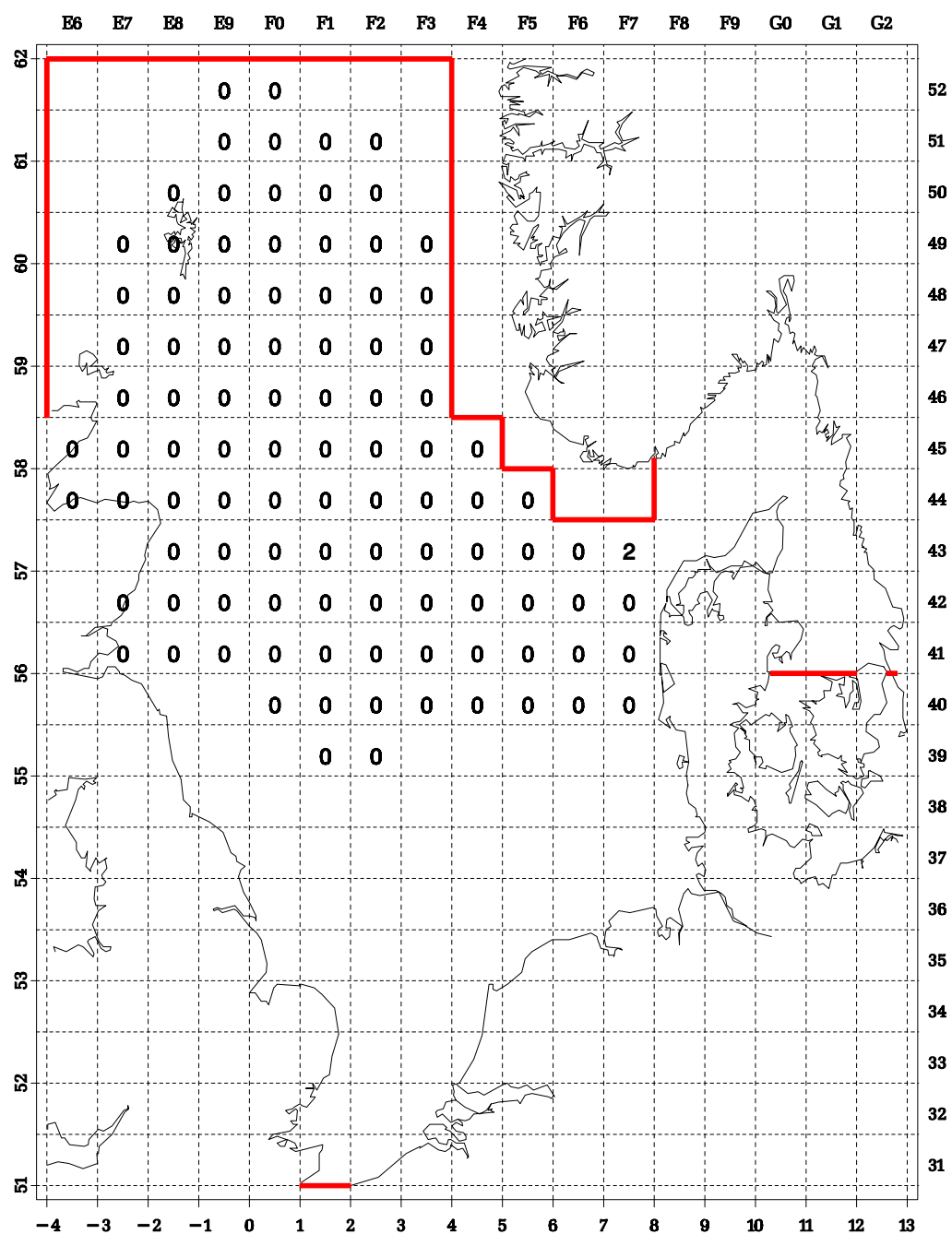


Figure 5.26 Saithe: number per hour, age 1

Saithe, number per hour

Age group 2, 2001 quarter 3

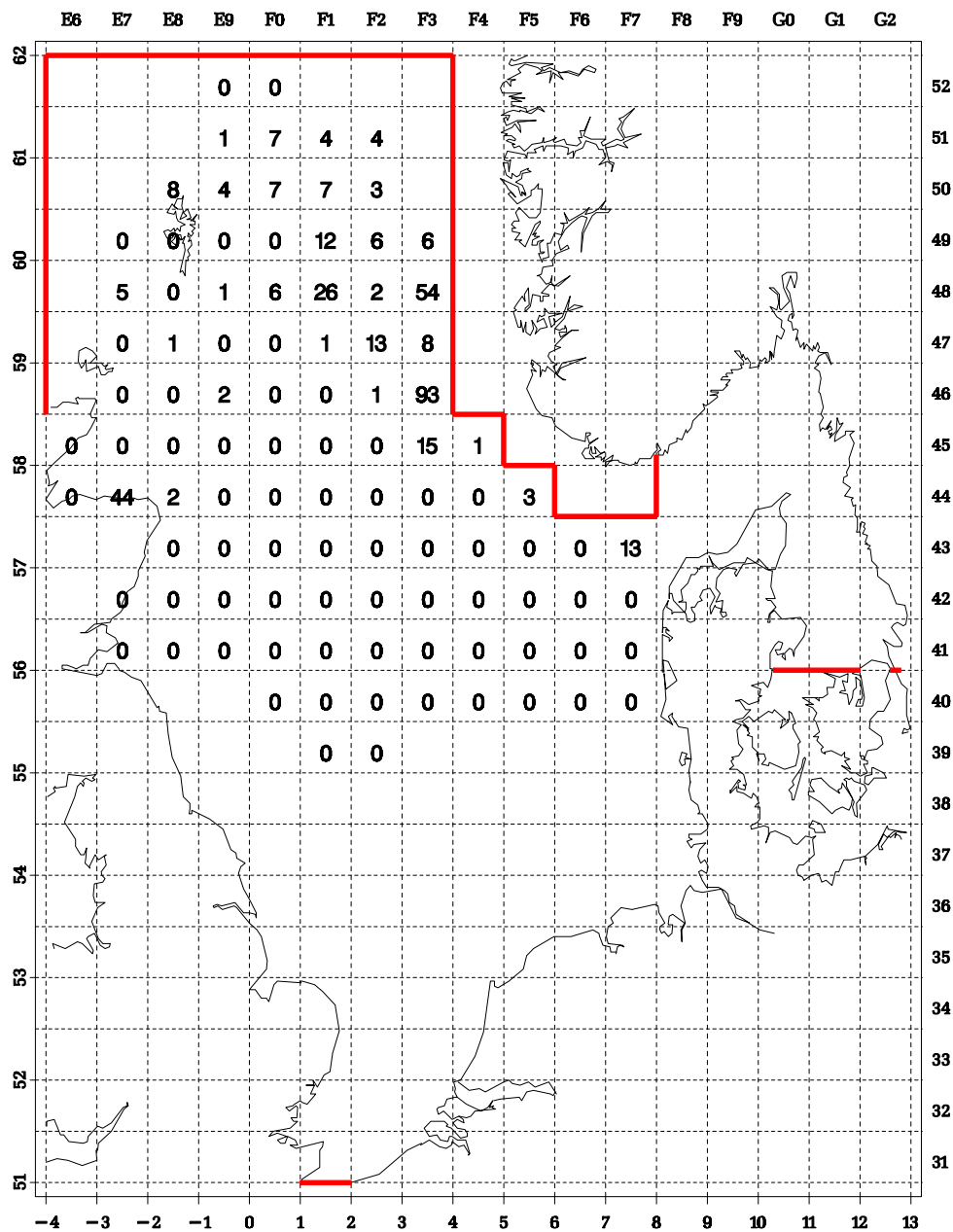


Figure 5.27 Saithe: number per hour, age 2

Saithe, number per hour

Age group 3, 2001 quarter 3

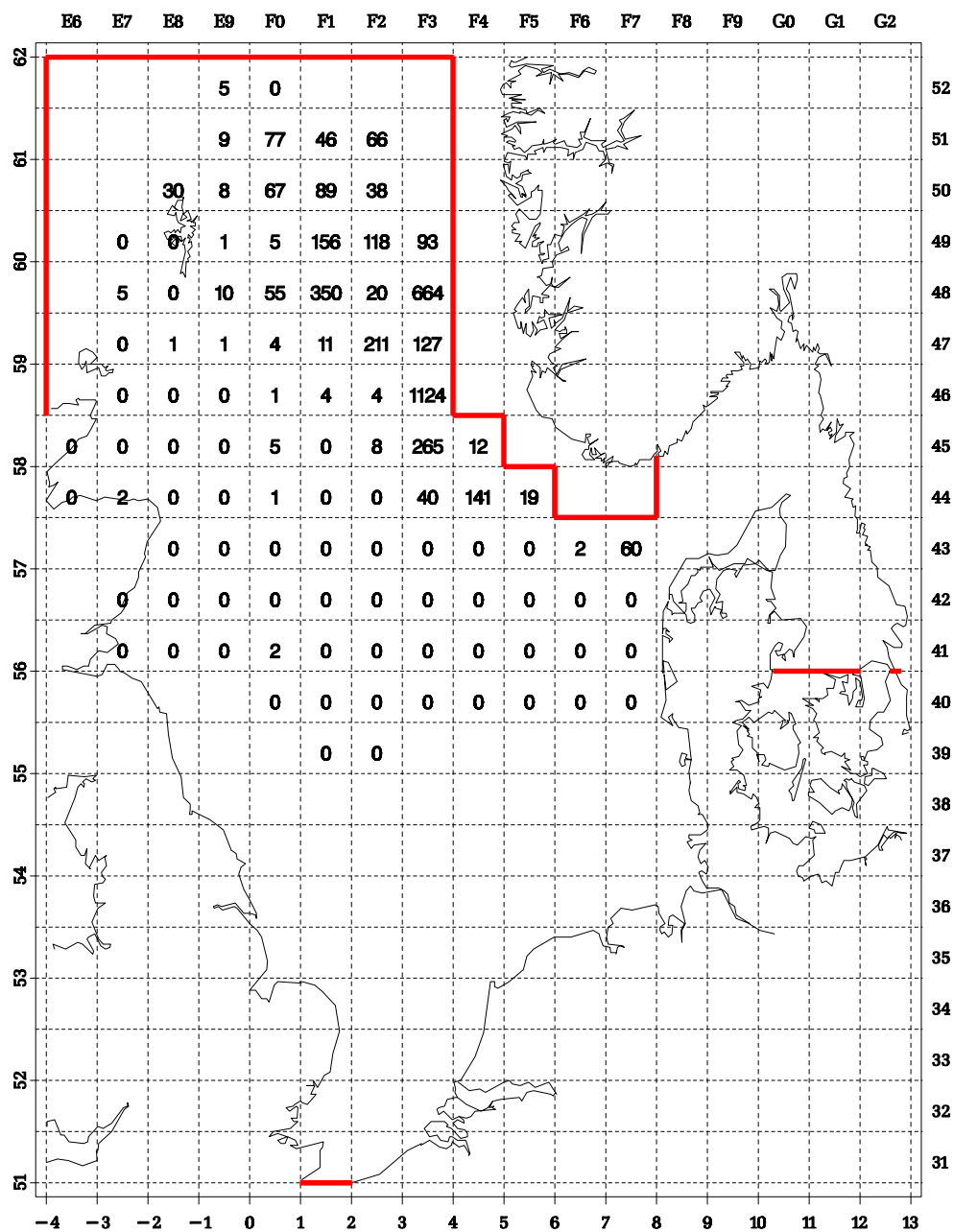


Figure 5.28 Saithe: number per hour, age 3

Saithe, mean length Age group 1, 2001 quarter 3

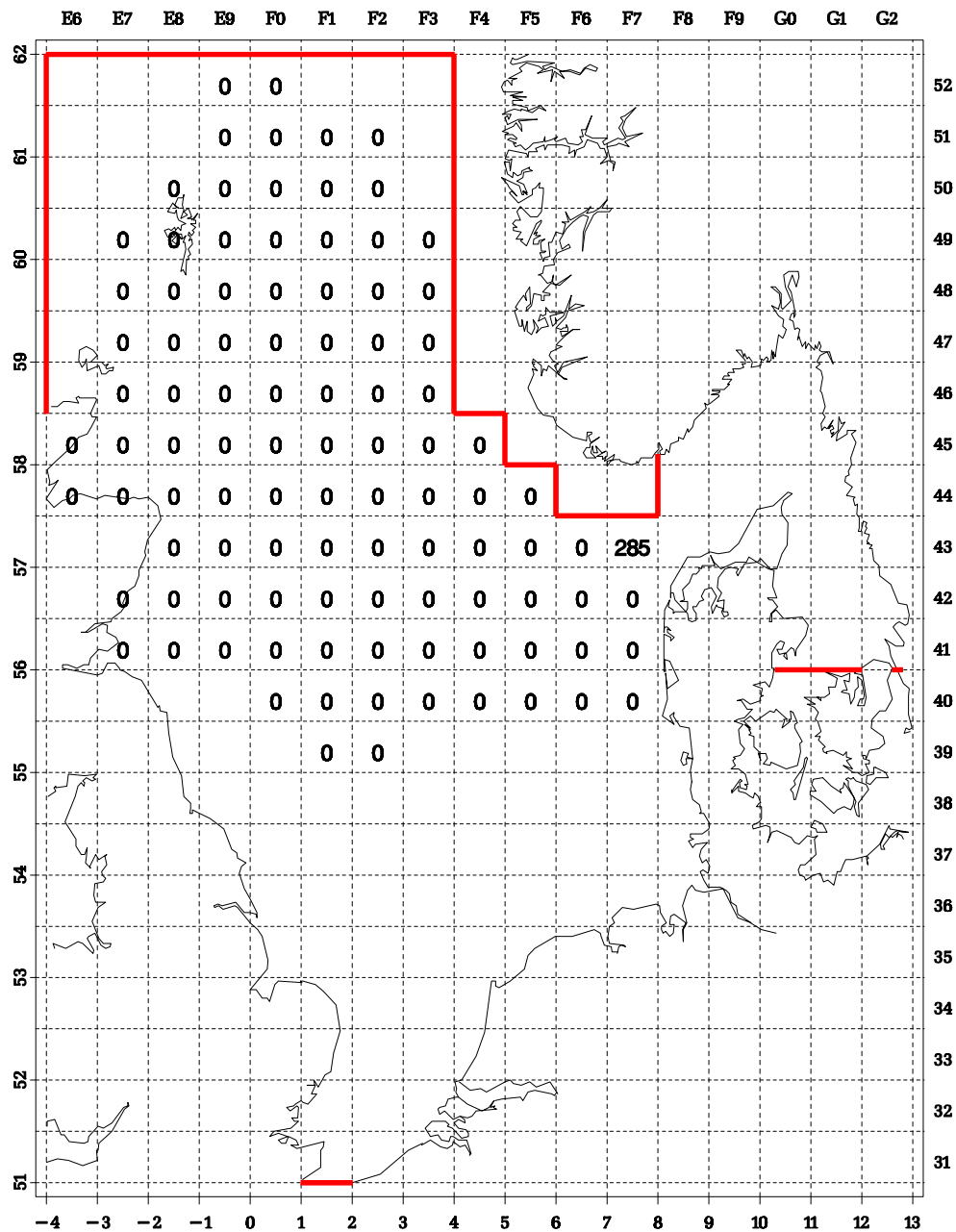


Figure 5.29 Saithe: mean length (mm), age 1

Norway pout, number per hour

Age group 1, 2001 quarter 3

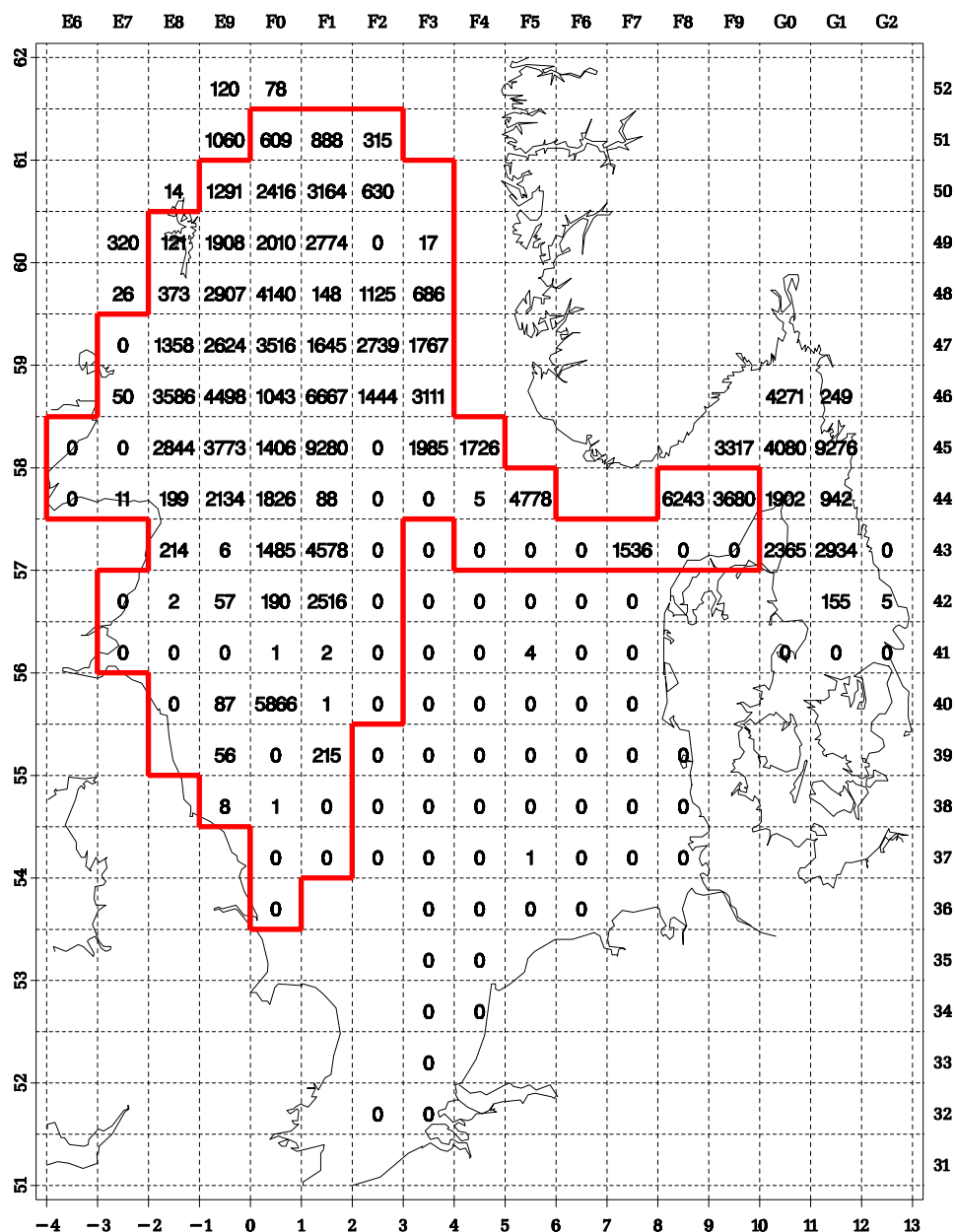


Figure 5.30 Norway pout: number per hour, age 1

Norway pout, number per hour

Age group 2, 2001 quarter 3

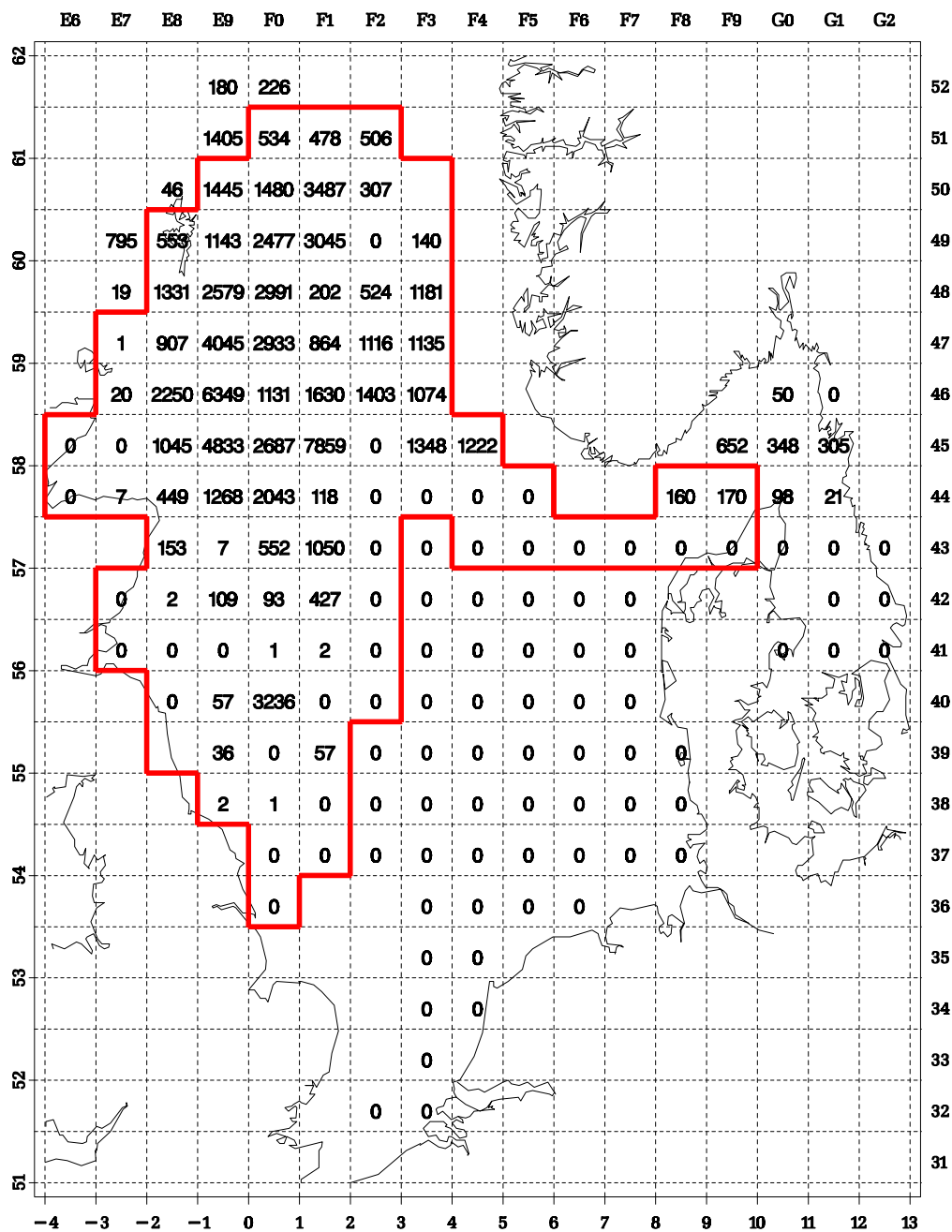


Figure 5.31 Norway pout: number per hour, age 2

Norway pout, number per hour

Age group 3, 2001 quarter 3

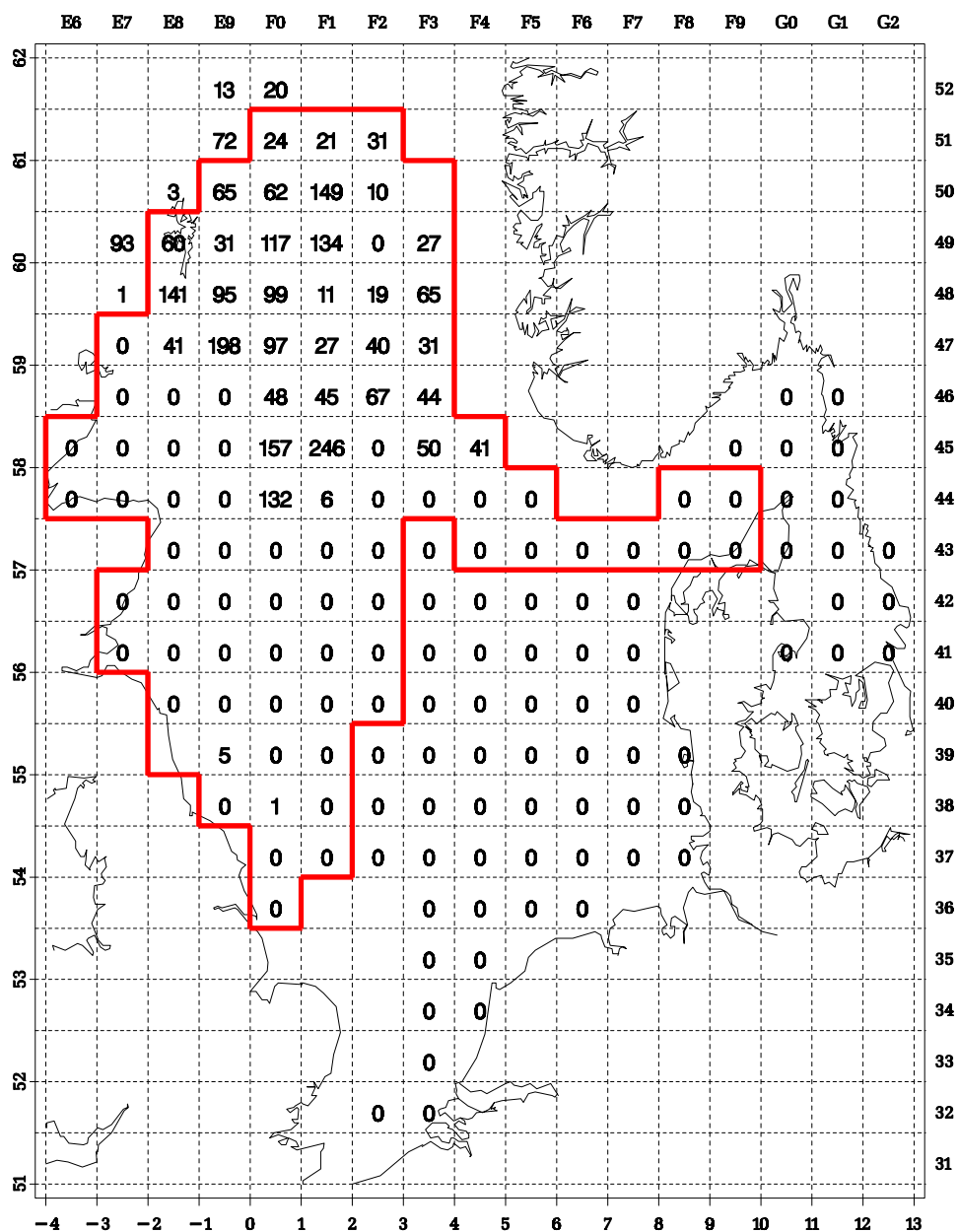


Figure 5.32 Norway pout: number per hour, age 3

Norway pout, mean length

Age group 1, 2001 quarter 3

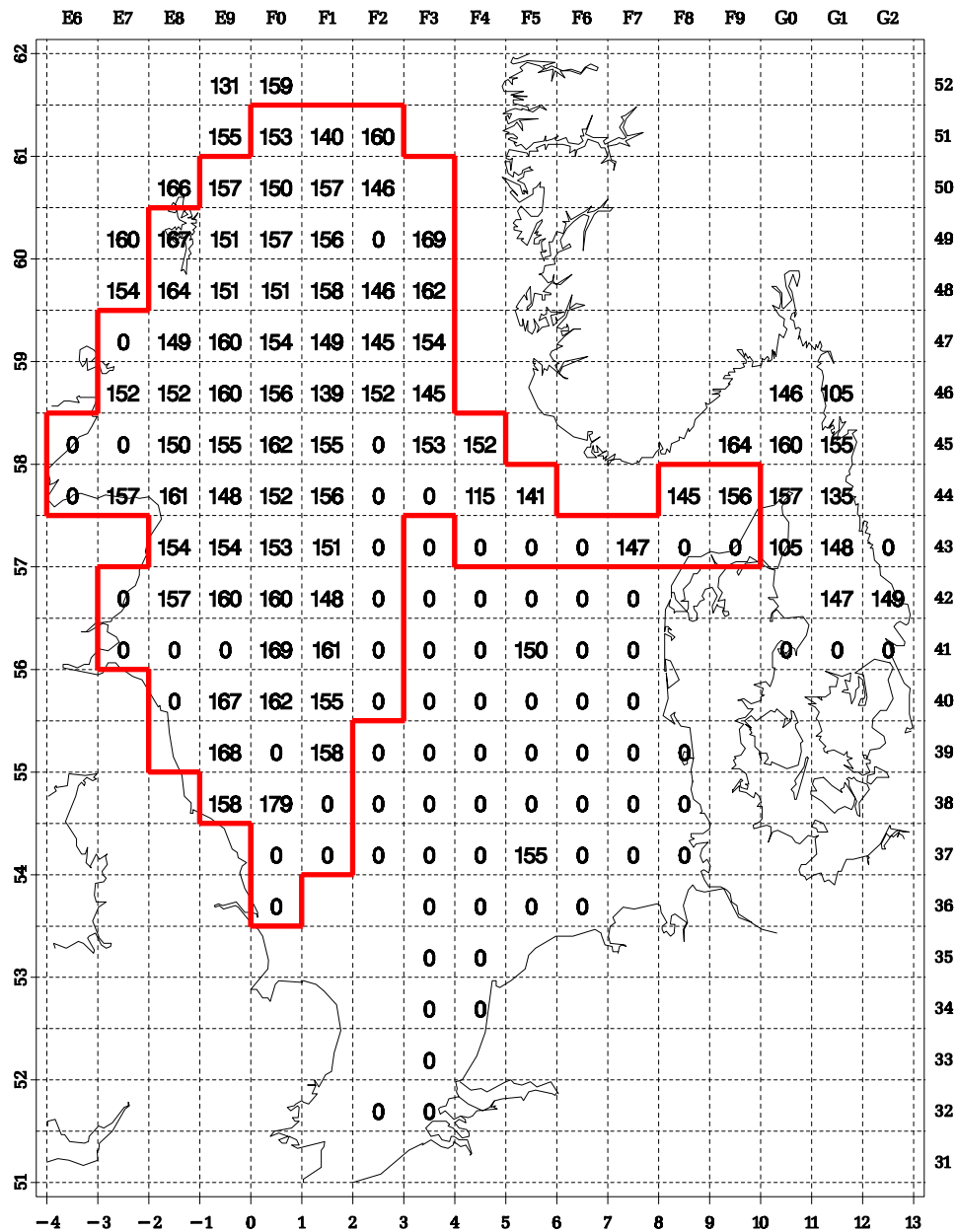


Figure 5.33

Norway pout: mean length (mm), age 1

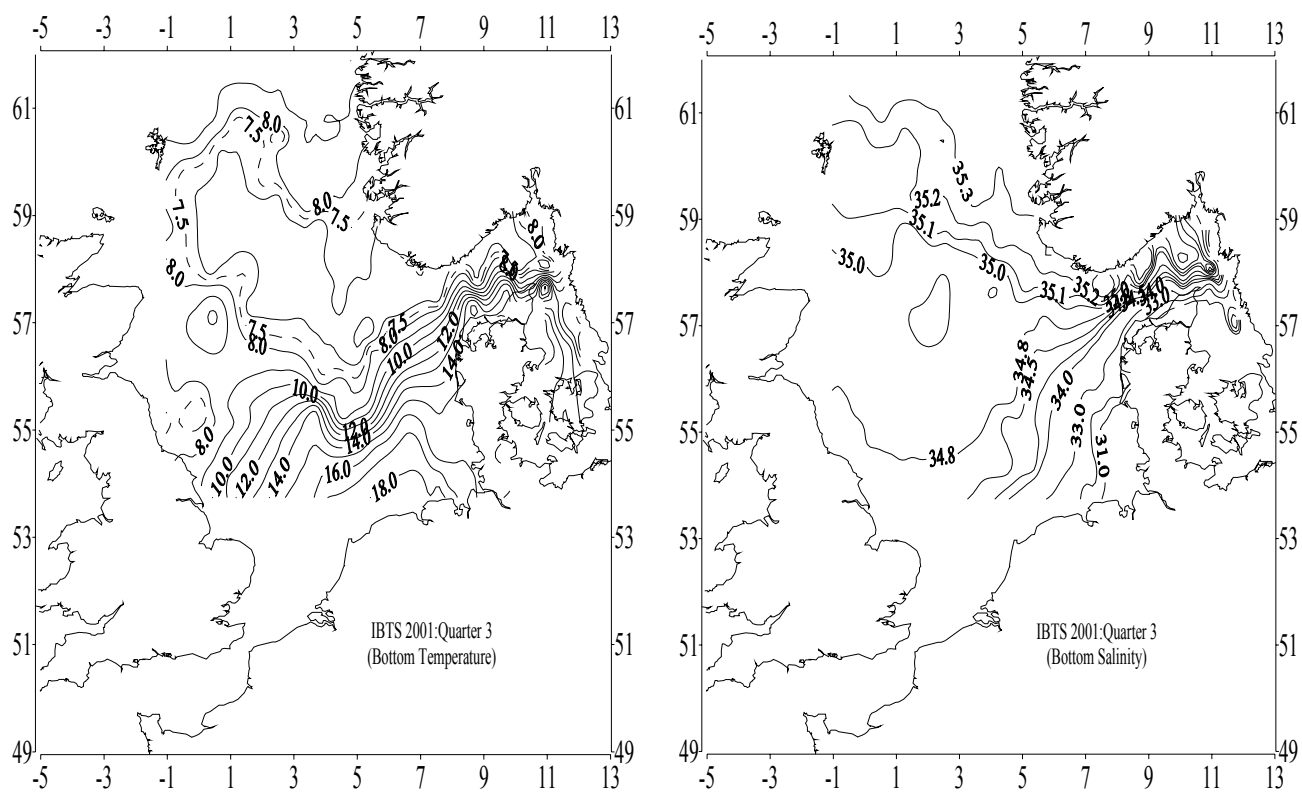


Figure 7.1 Distribution of bottom temperature and salinity during the IBTS quarter-3 2001 survey

REPORT OF THE
INTERNATIONAL BOTTOM TRAWL SURVEY IN THE NORTH
SEA, SKAGERRAK AND KATTEGAT IN 2002: QUARTER 1

The International Bottom Trawl Survey Working Group

This report is not to be quoted without prior consultation with the General Secretary. The document is a report of an expert group under the auspices of the International Council for the Exploration of the Sea and does not necessarily represent the views of the Council.

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1 INTRODUCTION

This report presents the final results for the International Bottom Trawl Survey (IBTS) in the first quarter of 2002. 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. During a meeting of this Working Group in November 1995 (ICES 1996/H:1a) early analyses of the data indicated the potential usefulness of quarterly surveys and it was decided to encourage their continuation. These quarterly surveys have been carried out in all four quarters in the period 1991-1997, but since 1998 only the 1st and the 3rd quarters have been covered.

The results for the 3rd quarter of 2002 will be published in a separate ICES Report.

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*), as well as the catches of herring and sprat larvae. 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 Manual (ICES 1999/D:2 Addendum). Details on the participation in the 2002 1q survey are given below as numbers of valid hauls. The whole survey area has been covered as planned.

Country and Vessel		From	To	GOV	MIK
Denmark	Dana (new)	30/01	13/02	39	39
England	Cirolana	02/02	20/02	41	41
France	Thalassa (new)	03/02	28/02	78	78
Germany	Walther Herwig (new)	19/01	13/02	78	78
Netherlands	Tridens (new)	29/01	25/02	62	62
Norway	Michael Sars	21/01	17/02	39	39
Scotland	Scotia (new)	18/01	05/02	53	53
Sweden	Argos	21/01	07/02	45	45

3 DATA AVAILABLE

Table 3.1 shows number of valid hauls available in the ICES IBTS database.

At the time of the analysis of the 2002 data presented in this report all final data were available in the database.

4 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 (ICES 1993/Assess:15).

It is implicitly assumed that all 1-ringer herring in the North Sea, Skagerrak, and Kattegat are autumn spawners. Unsampling 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 IBTS Working Group decided at the meeting in November 1995 (ICES 1996/H:1a) 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/Assess:15) 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.

5 RESULTS OF GOV-TRAWL FOR 2002

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 Figure 5.1.

The number of otoliths sampled per target species and roundfish area is given in Table 5.1.

Per species a set of figures gives the distributions of the 1-, 2-, and 3 group and the mean length of 1-group fish per rectangle. The specific standard area used to calculate the index of year class strength is indicated in the figures.

The results are shown in Table 5.2 and in Figures 5.2-5.33.

6 RESULTS OF THE SAMPLING FOR HERRING AND SPRAT LARVAE

During the IBTS fish larvae are sampled by towing a small meshed ring net (MIK) in oblique hauls. The catches are used in an estimation of fish larval density and abundance, assuming a 100% efficiency of the gear in catching the larvae at night.

Larval density is estimated from:

$$\text{Density (no. m}^{-2}\text{)} = (\text{no. Caught} / [\text{distance towed (m)} * \text{net-opening (m}^2\text{)}] * \text{water depth (m)})$$

The number of larvae within a given statistical rectangle is estimated by multiplying the density found by the surface area of a rectangle (approx. $309 * 10^7 \text{ m}^2$). The total number of larvae in the sampled area (the MIK index) is the sum of estimates for all statistical rectangles.

Based on a series of comparative hauls a conversion factor between the IKMT, used in the first period of the series, and the MIK is estimated. This is used to convert earlier catches to total numbers (MIK indices).

Herring larvae

In total 490 hauls were made during the 2002 sampling, however, the 75 hauls of one of the participants were biased due to gear problems, and these samples were not included in the description of distributional patterns and estimation of recruitment index. Consequently the coverage of the southern areas of the North Sea was restricted, with 13 unsampled standard rectangles. The calculation procedure of recruitment index assigns the mean abundance of the southwestern or Southern Bight areas to these unsampled areas.

The strength of this 2001 year class is not as high as predicted for the 2000 year class (Table 6.1), and in contrast to this, the 0-ringings in 2002 were widespread across the North Sea, with major concentrations in the central parts (Figure 6.1).

This easterly displacement of 0-ringer concentrations was also observed in 1999, while the general trend during the last decade has been 0-ringers concentrated in the northwesterly parts of the North Sea.

This years estimate of 1-ringer herring recruitment, from the IBTS 1-ringer sampling, are compared to last years index from the MIK 0-ringer sampling in the regression shown in Figure 6.2. The relation between the indices for the 2000 year class is in accordance with the long-term trend. Both indices indicate a large 2000 year class.

Sprat larvae

Sprat larvae were sampled in small quantities in the central/southern sections of the sampling area. Because of the limited numbers, no calculation of index is carried out.

7 HYDROGRAPHIC DATA

7.1 Hydro-chemistry Survey

Seven ships involved in the 2002 IBTS quarter 1 survey contributed hydrographic data to the 2002 dataset. The contributions consisted of 452 stations worked between 18 January and 28 February. Nutrient data were supplied from 93 stations, contributions being received from the same three ships as in 2001 (Argos, Scotia and Tridens). Data quality was in general adequate, but data collected by Cirolana could not be used as these were uncalibrated.

Charts of the distribution of bottom temperature and salinity are given in Figs 7.1 and 7.2. An updated table, giving the time series of temperature and salinity at 10 locations in the North Sea during IYFS/IBTS (1) surveys from 1970 to 2002 is provided in Table 7.1. The Figures and Table show the continuation of the warm conditions that have typified the winter-time North Sea since the late 1980s. This is illustrated by the temperature at time series location 1 (60N 4E) where the temperature has been more than 1 °C higher in all years since 1988 than it has been in any year prior to that (except 1994) (see Fig 7.3). The area of the Channel water inflow in the Southern North Sea has also demonstrated this persistent warmth, irrespective of whether there has been an inflow from the Channel. Indeed in 2002 no Channel inflow was apparent as demonstrated by the fact that salinity levels in the region were almost as low as they were in 1995 when they were the lowest of the time series. Almost all other areas of the North Sea were amongst the warmest experienced since the start of the time series.

More information is available by clicking on IBTS/IYFS in www.ices.dk/ocean

8 REFERENCES

- ICES 1993/Assess:15. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES Doc. CM 1993/Assess:15.
- ICES 1995/Assess:13. Report of the Herring Assessment Working Group for the Area South of 62°N. ICES Doc. CM 1995/Assess:13.
- ICES 1996/H:1a. Report of the International Bottom Trawl Survey Working Group. ICES Doc. CM 1996/H:1.
- ICES 1999/D:2 Addendum. 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.

Table 3.1

Number of valid hauls in the IBTS database. 1st quarter

Year	Total	Country								
		Denmark	England	France	Germany	Netherlands	Norway	Scotland	Sweden	USSR
1965	8	-	-	-	-	8	-	-	-	-
1966	90	-	-	-	63	27	-	-	-	-
1967	123	-	26	-	55	26	-	16	-	-
1968	136	-	18	-	61	24	-	33	-	-
1969	122	-	22	-	45	43	-	12	-	-
1970	130	-	24	-	41	49	-	16	-	-
1971	169	20	11	-	43	34	21	40	-	-
1972	207	17	22	-	30	36	24	45	33	-
1973	192	20	22	-	43	39	-	51	17	-
1974	247	28	20	-	50	52	2	39	16	40
1975	341	41	35	-	79	61	40	12	26	47
1976	342	31	31	-	61	50	51	36	24	58
1977	414	38	59	-	83	65	47	45	22	55
1978	451	39	58	52	98	68	53	59	24	-
1979	503	33	45	34	135	58	49	52	28	69
1980	404	-	55	53	69	84	55	57	31	-
1981	341	-	51	-	69	83	46	31	32	29
1982	373	27	49	40	62	58	46	38	23	30
1983	439	51	49	41	101	70	38	56	33	-
1984	465	37	51	44	101	94	45	58	35	-
1985	527	39	56	78	117	103	46	58	30	-
1986	527	39	61	73	114	107	41	52	40	-
1987	541	40	64	85	99	106	41	58	48	-
1988	404	39	43	69	74	51	44	46	38	-
1989	425	41	57	54	64	71	44	51	43	-
1990	379	24	55	58	82	23	47	46	44	-
1991	424	40	-	77	91	54	50	59	53	-
1992	381	40	-	53	92	40	47	63	46	-
1993	374	43	-	51	65	71	48	50	46	-
1994	363	48	-	54	84	46	27	56	48	-
1995	340	45	-	50	68	34	49	46	48	-
1996	328	46	-	41	62	45	41	45	48	-
1997	363	47	-	65	70	50	40	45	46	-
1998	405	51	-	79	79	54	41	56	45	-
1999	358	33	-	63	70	53	40	53	46	-
2000	380	34	-	68	91	55	41	46	45	-
2001	429	41	53	61	70	71	39	49	45	-
2002	423	39	36	78	78	61	39	47	45	-
Total	12868	1111	1073	1421	2759	2124	1282	1622	1148	328

Table 5.1

Number of otoliths sampled per species and roundfish area, 2002, quarter 1.

Species	Roundfish area									Total
	1	2	3	4	5	6	7	8	9	
Herring	639	1016	655	497	402	957	482	1192	733	6573
Cod	577	100	176	110	101	149	150	352	472	2187
Haddock	667	796	764	427	-	99	246	202	116	3317
Whiting	533	828	722	680	562	734	271	-	-	4330
Saithe	662	-	9	-	-	-	6	-	-	677
Mackerel	160	85	51	-	21	2	44	-	-	363
Sprat	16	205	341	155	158	458	255	498	458	2544
Norway pout	305	100	262	102	-	-	86	94	66	1015

Table 5.2

Herring indices. Mean number per hour per haul. 1st quarter.

Year	Mean per statistical rectangle				
	Age group				
	1	2	3	4	5+
1965	10641.28	84.39	0.58	0.00	0.00
1966	600.60	183.43	9.02	0.06	0.00
1967	237.33	38.45	9.15	0.92	0.02
1968	266.72	14.34	0.35	0.15	0.01
1969	349.72	30.00	1.05	0.31	0.61
1970	644.52	96.12	2.02	0.19	0.30
1971	1382.10	586.01	28.06	3.52	0.22
1972	1496.37	416.03	18.14	5.55	2.30
1973	310.62	81.93	12.51	1.52	0.39
1974	558.14	179.67	9.20	1.26	0.42
1975	884.35	70.21	13.25	2.78	1.02
1976	693.23	49.17	0.84	0.43	0.05
1977	245.11	22.34	2.52	0.10	0.21
1978	622.49	19.42	5.68	28.94	2.74
1979	156.26	26.48	7.77	0.44	1.30
1980	342.81	14.77	10.03	2.59	5.52
1981	517.70	269.58	28.47	19.19	32.33
1982	799.25	93.68	21.40	3.18	3.76
1983	1230.70	127.69	43.15	14.23	26.47
1984	1468.93	157.91	62.30	27.86	10.05
1985	2082.43	695.43	280.28	44.29	28.97
1986	2593.00	762.39	268.52	78.21	26.48
1987	3733.82	879.67	115.29	58.76	49.80
1988	4469.57	4392.97	850.54	60.76	26.04
1989	2186.99	868.13	372.94	103.97	9.77
1990	1024.62	448.17	290.87	272.10	71.64
1991	1180.26	763.19	268.05	240.44	162.00
1992	1204.04	381.22	181.34	63.64	101.66
1993	2988.47	781.61	209.21	43.60	63.76
1994	1644.26	1093.59	199.32	63.56	39.95
1995	1215.41	1174.16	233.33	30.85	5.73
1996	1728.33	194.27	43.33	12.56	8.49
1997	3992.71	489.50	189.72	39.79	22.63
1998	2067.10	743.36	89.64	20.43	19.28
1999	714.82	424.60	509.23	101.36	37.49
2000	3638.91	215.86	157.37	60.86	9.02
2001	2496.37	1141.62	313.24	99.27	73.43
2002	3949.05	612.05	303.54	23.64	19.35

Table 5.2 cont. Sprat indices. Mean number per hour per haul. 1st quarter.

Year	Mean per statistical rectangle				
	Age group				
	1	2	3	4	5+
1974	0.94	0.85	0.90	1.05	0.00
1975	81.44	448.60	283.25	19.89	4.81
1976	680.18	638.82	232.19	26.07	0.07
1977	177.81	4078.96	242.11	28.37	0.03
1978	1762.62	726.22	335.57	1.29	0.01
1979	717.51	327.30	233.41	8.41	0.10
1980	557.87	1347.70	113.56	1.38	0.01
1981	1018.29	1176.29	190.78	10.20	1.25
1982	249.54	478.64	114.31	5.11	0.26
1983	228.85	744.73	179.51	7.83	0.67
1984	381.31	386.55	47.38	7.15	0.37
1985	652.00	301.14	40.04	6.40	0.61
1986	70.29	105.02	27.50	1.56	0.33
1987	792.23	86.83	24.19	2.18	0.18
1988	162.98	1429.56	91.28	9.23	0.00
1989	3909.80	757.51	346.18	4.71	2.12
1990	185.33	571.20	122.97	31.28	0.54
1991	1117.83	113.62	25.75	3.22	0.21
1992	1560.54	340.17	37.83	5.46	0.44
1993	1688.63	589.81	83.77	4.17	0.06
1994	4002.86	1368.02	127.00	2.72	0.65
1995	1157.89	2695.85	131.70	3.15	1.04
1996	232.58	557.50	176.95	22.38	1.06
1997	853.73	409.11	50.71	4.56	0.04
1998	1694.61	1710.60	280.42	11.89	2.26
1999	3963.67	508.74	64.90	3.74	43.57
2000	1652.99	1056.64	329.12	60.32	0.72
2001	1048.96	1145.33	190.47	19.56	0.07
2002	1804.74	1173.56	116.46	14.83	0.54

Table 5.2 cont.

Cod indices. Mean number per hour per haul. 1st quarter.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1971	58.81	18.40	5.08	0.76	1.56	4.40
1972	10.02	23.06	4.02	0.48	0.32	1.39
1973	40.40	9.40	23.73	13.11	0.95	2.69
1974	15.25	9.64	3.67	3.03	0.98	0.54
1975	37.38	6.32	1.93	0.56	0.81	0.59
1976	8.78	20.40	3.08	1.65	0.39	0.85
1977	37.11	2.88	3.07	0.75	0.48	0.31
1978	13.03	29.80	1.62	1.64	0.57	0.54
1979	9.59	8.78	4.87	0.60	0.88	0.37
1980	18.22	16.84	6.28	2.70	0.58	0.81
1981	2.70	23.96	5.07	2.32	1.74	1.05
1982	9.67	6.54	6.86	1.49	0.83	1.05
1983	4.73	16.66	2.78	1.92	0.82	1.33
1984	16.23	8.64	4.00	0.89	0.99	0.86
1985	0.92	18.61	3.37	1.70	0.52	0.92
1986	16.68	3.52	7.03	2.33	1.23	1.01
1987	9.41	29.37	1.53	1.84	0.59	0.84
1988	5.60	6.38	6.18	0.65	0.98	1.03
1989	15.12	6.33	5.01	2.35	0.42	0.99
1990	3.95	15.67	1.90	1.02	0.97	0.61
1991	2.33	4.73	4.44	0.84	0.43	0.78
1992	13.02	4.42	1.13	1.01	0.27	0.48
1993	13.08	19.51	2.03	0.67	0.58	0.38
1994	14.81	4.40	2.95	0.79	0.50	0.53
1995	9.83	22.06	2.71	1.12	0.28	0.34
1996	3.46	8.04	5.97	0.71	0.60	0.41
1997	39.96	6.90	2.24	1.09	0.43	0.43
1998	2.67	26.37	2.00	0.86	0.52	0.40
1999	2.11	1.57	8.07	0.76	0.47	0.48
2000	6.56	3.77	0.73	2.03	0.41	0.50
2001	2.76	8.68	1.67	0.25	0.37	0.28
2002	7.75	3.39	4.27	0.51	0.13	0.20

Table 5.2 cont. Haddock indices. Mean number per hour per haul. 1st quarter.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1967	42.00	3.94	2.85	6.01	0.21	0.26
1968	4877.59	29.18	13.11	4.97	1.76	7.41
1969	3555.63	1600.88	159.08	46.54	21.70	24.98
1970	52.58	148.78	145.93	60.28	7.23	1.24
1971	528.51	30.02	31.80	64.81	1.10	0.23
1972	395.09	258.09	32.94	4.74	9.70	0.82
1973	327.80	876.33	200.08	12.08	2.24	0.96
1974	1136.06	136.13	198.45	18.66	0.87	7.44
1975	1146.29	355.76	18.62	34.47	6.22	0.88
1976	105.00	556.39	182.89	16.47	13.72	3.23
1977	139.44	66.46	134.55	16.45	1.17	1.80
1978	352.82	105.85	27.92	66.53	10.43	2.92
1979	468.16	212.41	52.46	6.70	15.32	2.61
1980	863.66	388.56	86.65	10.66	2.37	5.76
1981	267.74	637.56	159.70	25.73	4.38	3.06
1982	537.59	253.00	421.86	60.26	8.05	2.16
1983	308.22	402.61	89.79	115.26	12.71	1.92
1984	1067.67	221.34	130.95	20.93	21.20	4.65
1985	228.46	828.35	105.12	33.77	4.29	7.16
1986	584.54	251.14	285.87	17.22	6.03	2.06
1987	917.32	328.81	47.18	61.09	4.73	2.58
1988	100.66	670.95	96.97	12.70	13.56	2.02
1989	217.62	97.39	273.66	16.79	2.14	4.70
1990	217.45	139.11	33.00	50.37	3.16	1.80
1991	677.98	132.96	24.83	4.24	8.43	2.41
1992	1162.98	344.58	18.08	3.00	0.61	2.04
1993	1254.31	540.80	154.47	8.87	1.08	0.95
1994	228.73	503.86	98.30	23.29	1.56	0.79
1995	1355.49	201.07	176.17	24.34	5.31	0.80
1996	267.41	813.27	65.87	46.69	7.73	3.07
1997	860.15	366.45	470.59	24.83	15.14	3.39
1998	373.58	432.33	105.51	113.69	8.65	5.36
1999	211.76	232.93	129.71	48.10	36.62	4.26
2000	3702.06	107.83	49.88	25.37	15.56	10.28
2001	887.61	2279.02	47.76	10.93	7.18	5.71
2002	58.17	491.76	1392.57	9.97	7.45	4.34

Table 5.2 cont.

Whiting indices. Mean number per hour per haul. 1st quarter.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1967	440.36	97.85	21.16	7.21	0.84	1.15
1968	1267.71	81.75	25.43	4.74	0.65	0.31
1969	504.74	382.30	19.75	7.98	1.09	0.09
1970	57.55	132.91	27.44	5.31	0.60	0.18
1971	219.74	19.69	10.02	10.17	0.55	0.25
1972	263.69	104.31	33.53	10.68	4.15	0.18
1973	1460.01	381.80	53.72	33.61	8.36	5.70
1974	312.49	485.97	105.66	7.10	0.58	1.30
1975	881.19	174.47	91.13	19.69	3.81	0.57
1976	676.19	349.44	130.00	31.29	5.03	0.53
1977	411.42	232.59	69.08	12.25	11.03	13.00
1978	542.89	256.84	88.72	21.12	4.97	7.50
1979	440.93	228.84	112.59	33.06	4.89	1.17
1980	674.04	403.34	125.75	25.62	9.15	1.96
1981	229.26	464.30	228.31	45.93	9.29	2.78
1982	151.38	216.14	257.36	68.51	10.14	4.57
1983	127.09	126.86	112.57	79.19	33.39	6.36
1984	439.01	178.88	89.20	30.25	25.38	10.49
1985	339.01	361.76	65.70	18.53	7.03	7.18
1986	469.37	268.42	194.60	32.42	6.60	3.85
1987	683.38	556.49	90.42	46.17	4.98	1.98
1988	450.74	863.72	312.75	34.17	12.28	1.31
1989	1446.08	538.56	414.76	109.90	12.05	5.09
1990	518.94	862.35	198.16	91.61	16.98	3.62
1991	1009.16	686.18	479.41	70.86	37.60	7.59
1992	904.61	677.69	250.36	162.89	14.96	14.26
1993	1088.20	523.70	244.52	65.48	59.00	11.44
1994	720.99	636.97	179.84	66.59	11.56	8.93
1995	678.59	448.48	239.45	58.07	11.87	5.58
1996	502.36	485.97	244.70	69.74	23.09	9.85
1997	287.87	342.07	162.52	60.43	18.01	9.18
1998	556.11	161.26	125.49	54.05	15.50	9.26
1999	676.27	305.45	94.67	57.45	25.82	11.08
2000	756.58	537.39	182.10	53.05	20.01	14.74
2001	647.14	594.85	296.08	97.73	25.68	26.05
2002	671.11	416.88	275.27	66.64	22.11	10.41

Table 5.2 cont. Saithe indices. Mean number per hour per haul. 1st quarter.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1974	0.01	0.03	0.03	0.00	0.00	0.00
1975	0.00	1.10	0.00	0.00	0.00	0.00
1977	0.00	0.00	0.23	10.25	2.07	0.90
1979	0.00	0.00	0.14	0.17	0.18	0.40
1980	0.42	0.00	0.29	0.79	0.50	1.59
1981	0.00	0.02	0.00	0.29	1.14	2.18
1982	0.01	0.26	0.29	0.35	0.21	0.87
1984	0.02	0.16	0.13	0.71	2.00	2.51
1985	0.02	0.92	105.92	15.67	0.00	25.76
1986	0.03	2.48	89.60	4.31	0.31	0.67
1987	0.01	0.90	1.35	5.26	0.29	1.77
1988	0.00	0.02	1.46	1.33	1.71	1.17
1989	0.03	0.00	4.64	4.25	1.00	2.76
1990	0.00	0.15	1.30	1.54	0.68	3.30
1991	0.02	0.08	4.56	1.98	0.91	0.09
1992	0.03	0.12	0.48	2.56	0.34	0.57
1993	0.05	1.94	0.48	1.21	2.30	1.71
1994	0.09	0.38	2.81	7.50	1.09	0.45
1995	0.00	0.01	0.43	0.86	1.08	0.74
1996	0.38	0.57	1.68	16.56	1.11	0.42
1997	0.02	0.00	0.03	1.37	2.24	0.47
1998	0.05	0.03	0.22	2.17	1.34	1.82
1999	0.11	0.01	0.30	0.88	2.53	1.19
2000	0.07	0.05	0.82	0.23	0.40	3.03
2001	0.63	0.01	0.12	0.68	1.69	0.76
2002	0.07	0.08	2.59	6.73	2.83	5.26

Table 5.2 cont. Norway pout indices. Mean number per hour per haul. 1st quarter.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1972	1722.30	618.60	4.08	0.00	0.00	0.00
1974	11927.18	8094.98	775.27	1.00	0.12	0.03
1975	4826.87	1807.63	20.69	10.99	0.48	0.00
1976	4066.35	302.68	13.83	0.00	0.00	0.00
1977	6094.88	256.27	53.10	0.02	0.00	0.69
1978	1480.02	551.22	46.90	0.26	0.00	0.00
1979	2557.68	306.59	73.38	0.00	0.01	0.09
1980	3274.68	552.05	29.05	4.07	0.04	0.00
1981	1091.91	377.27	14.94	0.18	0.04	0.05
1982	4436.61	256.02	57.86	1.28	0.00	0.06
1983	2326.16	628.04	8.01	3.40	0.06	0.00
1984	4060.94	866.46	58.14	1.02	0.26	0.33
1985	2117.07	1423.36	72.92	3.22	0.03	0.01
1986	2111.67	397.30	20.56	1.12	0.02	0.00
1987	3243.79	499.43	64.68	3.31	0.30	0.00
1988	123.49	724.11	12.88	2.07	0.55	0.00
1989	2078.65	260.12	177.48	2.74	0.24	0.06
1990	1295.33	747.93	38.61	2.57	0.00	0.00
1991	2511.73	656.98	125.70	0.00	0.00	10.68
1992	5090.89	901.52	32.25	4.21	0.00	0.22
1993	2681.40	2644.13	258.50	5.95	7.01	0.13
1994	1869.95	374.26	66.29	2.51	0.22	0.02
1995	5940.49	784.85	76.45	8.56	0.00	0.00
1996	926.03	2628.21	227.45	4.70		0.00
1997	9762.09	1467.46	666.19		0.00	0.00
1998	1020.66	5335.46		85.71	24.80	0.00
1999	3526.75		667.25	3.99	0.29	0.00
2000		1535.16	65.01	47.58	0.00	0.00
2001	1304.39	2860.54	234.72	3.98	0.00	0.00
	1795.20	809.43	880.00	39.76	0.08	0.45

Table 5.2 cont. Mackerel indices. Mean number per hour per haul. 1st quarter.

Year	Mean per statistical rectangle					
	Age group					
	1	2	3	4	5	6+
1974	0.97	0.00	0.00	0.00	0.00	0.00
1976	0.49	0.29	0.04	0.00	0.28	0.00
1977	1.97	0.00	0.00	0.01	0.00	0.00
1978	1.18	0.00	0.71	0.00	0.00	0.32
1979	0.54	0.00	0.00	0.00	0.00	0.00
1980	0.01	0.00	0.01	0.00	0.00	0.00
1981	0.44	0.12	0.00	0.00	0.00	0.00
1982	0.64	0.52	0.00	0.00	0.00	0.04
1983	2.16	6.60	2.59	1.07	0.03	0.11
1984	0.06	0.35	0.56	0.32	0.04	0.59
1985	1.25	0.00	0.00	0.00	0.00	0.02
1986	0.61	2.50	0.00	0.10	0.00	0.00
1987	88.42	0.24	0.49	0.12	0.05	0.23
1988	1.33	0.06	0.19	0.37	0.02	0.09
1989	1.43	2.26	0.11	0.05	0.31	0.00
1990	35.13	1.16	0.23	0.05	0.10	0.00
1991	6.93	0.16	0.01	0.08	0.02	0.07
1992	15.99	0.37	2.23	1.11	0.00	0.01
1993	1.03	0.78	0.90	0.41	0.24	0.34
1994	2.25	0.10	0.05	0.00	0.00	0.00
1995	0.36	2.55	0.90	0.00	0.00	0.00
1996	10.36	0.66	1.22	0.18	0.21	0.10
1997	719.19	3.31	0.45	1.25	0.49	0.53
1998	27.74	7.83	0.44	0.23	0.22	0.15
1999	43.65	57.17	20.15	1.87	0.94	1.24
2000	333.28	2.73	0.32	0.13	0.00	0.00
2001	43.20	26.12	22.51	6.28	1.86	1.83
2002	47.89	0.95	2.48	2.07	0.44	1.31

Table 6.1 Density and abundance estimates of 0-ringers caught in February during the IBTS. Values given for year classes by areas are density estimates in numbers per square metre. Total abundance is found by multiplying density by area and summing up.

Area	North west	North east	Central west	Central east	South west	South east	Division IIIa	South Bight	0-ringers abundance
Area m ² x 10 ⁹	83	34	86	102	37	93	31	31	no. in 10 ⁹
Year class									
1976	0.054	0.014	0.122	0.005	0.008	0.002	0.002	0.016	17.1
1977	0.024	0.024	0.050	0.015	0.056	0.013	0.006	0.034	13.1
1978	0.176	0.031	0.061	0.020	0.010	0.005	0.074	0.000	52.1
1979	0.061	0.195	0.262	0.408	0.226	0.143	0.099	0.053	101.1
1980	0.052	0.001	0.145	0.115	0.089	0.339	0.248	0.187	76.7
1981	0.197	0.000	0.289	0.199	0.215	0.645	0.109	0.036	133.9
1982	0.025	0.011	0.068	0.248	0.290	0.309	0.470	0.140	91.8
1983	0.019	0.007	0.114	0.268	0.271	0.473	0.339	0.377	115.0
1984	0.083	0.019	0.303	0.259	0.996	0.718	0.277	0.298	181.3
1985	0.116	0.057	0.421	0.344	0.464	0.777	0.085	0.084	177.4
1986	0.317	0.029	0.730	0.557	0.830	0.933	0.048	0.244	270.9
1987	0.078	0.031	0.417	0.314	0.159	0.618	0.483	0.495	168.9
1988	0.036	0.020	0.095	0.096	0.151	0.411	0.181	0.016	71.4
1989	0.083	0.030	0.040	0.094	0.013	0.035	0.041	0.000	25.9
1990	0.075	0.053	0.202	0.158	0.121	0.198	0.086	0.196	69.9
1991	0.255	0.390	0.431	0.539	0.500	0.369	0.298	0.395	200.7
1992	0.168	0.039	0.672	0.444	0.734	0.268	0.345	0.285	190.1
1993	0.358	0.212	0.260	0.187	0.120	0.119	0.223	0.028	101.7
1994	0.148	0.024	0.417	0.381	0.332	0.148	0.252	0.169	126.9
1995	0.260	0.086	0.699	0.092	0.266	0.018	0.001	0.020	106.2
1996	0.003	0.004	0.935	0.135	0.436	0.379	0.039	0.032	148.1
1997	0.042	0.021	0.338	0.064	0.178	0.035	0.023	0.083	53.1
1998	0.100	0.056	1.150	0.592	0.998	0.265	0.280	0.127	244.0
1999	0.045	0.011	0.799	0.200	0.514	0.220	0.107	0.026	137.1
2000	0.284	0.011	1.052	0.197	1.156	0.376	0.063	0.006	214.8
2001	0.080	0.019	0.566	0.473	0.567	0.247	0.209	0.226	161.8

Table 7.1 Time series data of bottom temperature and salinity during IYFS/IBTS(1) 1970-2002

Location	1		2		3		4		5		6		7		8		9		10	
Position	60N2E		57.5N0E		57.5N2E		57.5N4E		55N0E		55N2E		55N4E		55N8E		54N3E		52.5N3°E	
Year	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal	t°C	Sal
1970	5.5	35.08	5.8	34.95	5.3	35.00	4.7	34.92	5.9	34.75	4.5	34.82	4.0	34.72	0.5	33.00	4.0	34.72	4.0	34.62
1971	7.1	35.15	7.0	35.05	6.9	35.15	6.0	35.10	7.0	34.82	6.2	34.88	5.5	34.80	3.5	33.00	5.9	34.55	7.0	34.95
1972	5.8	35.22	6.9	35.08	5.9	35.20	4.5	34.78	6.5	34.91	4.8	34.86	5.2	34.80	2.5	33.80	5.2	34.70	6.9	35.10
1973			7.4	35.02	7.2	35.20	6.7	35.10	7.0	35.05	6.1	35.00	6.0	34.86	5.0	33.00	6.4	34.80	6.5	35.05
1974	6.9	35.28	6.5	35.11	6.5	35.08	6.3	35.04	6.5	34.90	6.0	34.90	5.6	34.90	4.7	33.00	6.1	34.78	8.0	35.20
1975	7.3	35.20	6.6	35.05	6.6	35.15	6.4	35.13	6.6	34.95	6.4	34.90	6.1	34.85	5.2	33.50	5.9	34.62	6.9	34.62
1976	6.7	35.20	6.5	35.00	6.5	35.15	5.6	35.12	6.1	34.81	4.9	34.95	4.9	34.85	2.2	31.00	5.1	34.78	5.1	34.80
1977	6.0	35.18	6.2	35.02	5.1	35.00	4.8	34.92	6.0	34.98	4.9	34.85	5.0	34.80	3.1	33.60	5.6	34.78	7.1	35.22
1978	6.4	34.88	6.6	35.00	6.0	34.90	4.7	34.88	5.6	34.78	4.9	34.88	4.2	34.80	2.2	32.50	4.6	34.68	5.5	34.90
1979	6.4	35.15	6.0	34.80	4.1	34.88	4.0	34.98	4.5	34.64	2.8	34.62	2.8	34.62	-1.5	32.00	3.0	34.62	4.2	34.95
1980	5.9	35.12	6.6	35.00	5.5	35.00	4.5	34.70	6.1	34.60	3.8	34.65	4.5	34.50	3.1	33.50	5.1	34.70	6.1	35.11
1981	6.9	35.22	6.6	34.90	6.2	35.05	5.8	35.15	6.5	34.80	5.8	34.82	5.1	34.82	3.4	32.50				
1982	6.6	35.28	6.1	35.02	5.9	35.05	5.5	35.10	5.5	34.72	4.8	34.82	4.5	34.62	2.8	32.50	4.7	34.30	6.0	34.65
1983	6.9	35.22	6.5	35.00	6.4	35.10	6.2	35.15	5.6	34.62	6.1	34.95	5.2	34.90	3.0	33.00	5.2	34.80	6.4	34.70
1984	6.3	35.18	6.4	35.10	6.4	35.10	5.2	35.12	5.9	34.80	5.0	34.84	4.9	34.90	3.5	33.00	4.9	34.65	7.4	34.95
1985	6.9	35.17	6.8	35.10	6.5	35.18	5.9	35.05	6.5	34.70	4.7	34.91	5.0	34.90	1.0	32.50	4.0	34.70	6.0	34.80
1986	6.6	35.25	5.8	35.05	5.4	35.08	5.2	35.05	5.2	34.65	3.9	34.72	3.6	34.60	0.0	32.50	4.0	34.60	4.0	34.65
1987	6.5	35.28	6.1	34.90	5.9	35.08	4.9	35.00	5.0	34.75	4.2	34.80	4.3	34.60	0.8	30.00	4.9	34.60	4.8	34.90
1988	7.6	35.18	7.6	34.95	7.4	35.03	7.0	34.96	7.1	34.70	6.6	34.80	6.5	34.50	5.9	33.50	6.9	34.60	7.7	34.90
1989	8.5	35.29	8.0	34.85	7.8	34.89	7.6	35.05	7.5	34.76	7.1	34.81	6.8	34.80	6.0	34.10	6.5	34.68	7.5	34.62
1990	8.5	35.29	7.6	35.00	7.6	35.12	7.6	35.15	7.5	34.70	7.5	34.85	7.5	34.80	6.5	34.10	7.4	34.70	7.4	34.60
1991	7.9	35.30	6.7	35.10	7.1	35.22	6.1	34.97	6.6	34.65	5.8	34.85	5.5	34.80	3.0	34.00	5.8	34.60	6.1	35.30
1992	8.1	35.29	7.6	35.10	7.1	35.16	7.1	35.19	7.4	34.80	6.6	34.80	6.5	34.80	6.6	32.00	4.5	34.80	6.0	35.20
1993	7.4	35.31	6.5	34.92	6.4	35.18	6.5	35.30	6.5	35.05	6.2	35.00	5.4	34.95	4.3	33.50	5.6	34.80	6.0	35.00
1994	6.2	35.20	6.5	35.05	5.5	34.93	4.3	34.80	6.3	34.90	5.4	34.90	5.2	34.80	4.0	32.00	5.5	34.70	7.0	35.00
1995	7.5	35.23	7.0	34.92	7.1	35.00	6.7	35.09	6.7	34.71	6.0	34.87	5.6	34.81	4.0	30.03	6.0	34.65	7.9	34.51
1996	7.1	35.24	6.5	34.91	5.0	34.94	4.7	34.87	6.0	34.59	4.6	34.71	3.0	34.44	-0.2	32.12	3.4	34.71	3.8	34.83
1997	7.6	35.21	7.3	34.92	6.2	34.92	6.4	35.09	6.5	34.72	5.8	34.80	4.9	34.72	2.9	32.93	5.2	34.67	5.2	34.96
1998	8.2	35.29	8.5	35.14	7.8	35.16	7.0	35.00	7.5	34.79	6.3	34.84	6.1	34.62	3.5	31.78	6.3	34.56	7.2	35.25
1999	7.6	35.30	7.1	35.00	7.4	35.16	6.7	35.10	7.2	34.79	6.4	34.94	5.5	34.80	4.1	31.02	5.8	34.73	8.3	35.14
2000	8.0	35.30	7.4	34.98	7.4	35.14	7.1	35.21	6.7	34.83	6.8	35.01	6.1	34.92	5.1	31.88	6.1	34.72	7.2	35.18
2001	7.7	35.03	7.7	34.97	7.7	35.12	6.6	34.98	6.7	34.81	6.4	34.86	5.3	34.66	2.1	31.41	5.7	34.46	7.9	34.78
2002	8.2	35.30	8.1	34.99	8.0	35.03	7.0	34.97	7.5	34.70	7.3	34.72	6.6	34.71	5.4	30.18	6.8	34.57	7.8	34.52

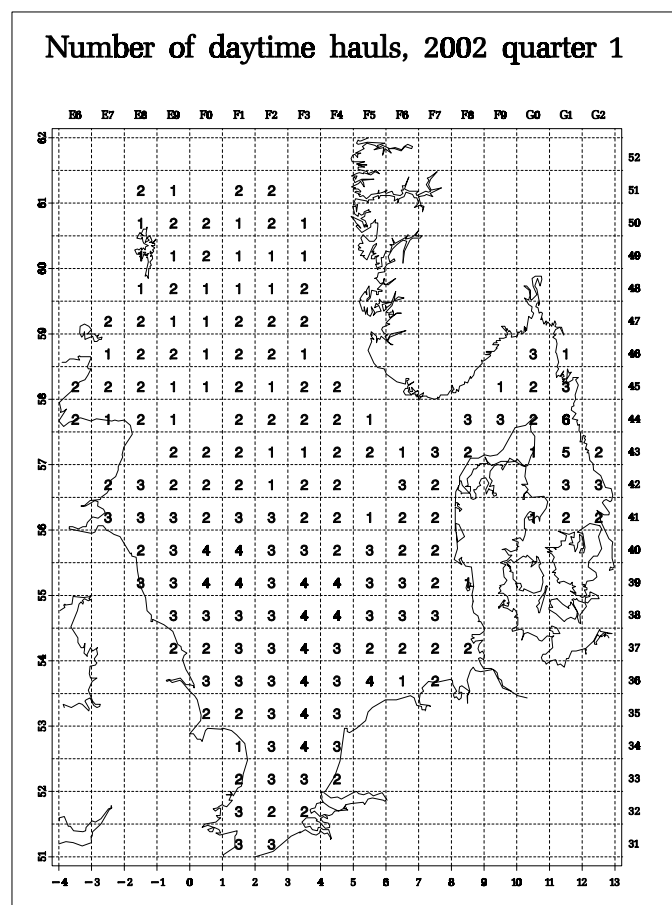
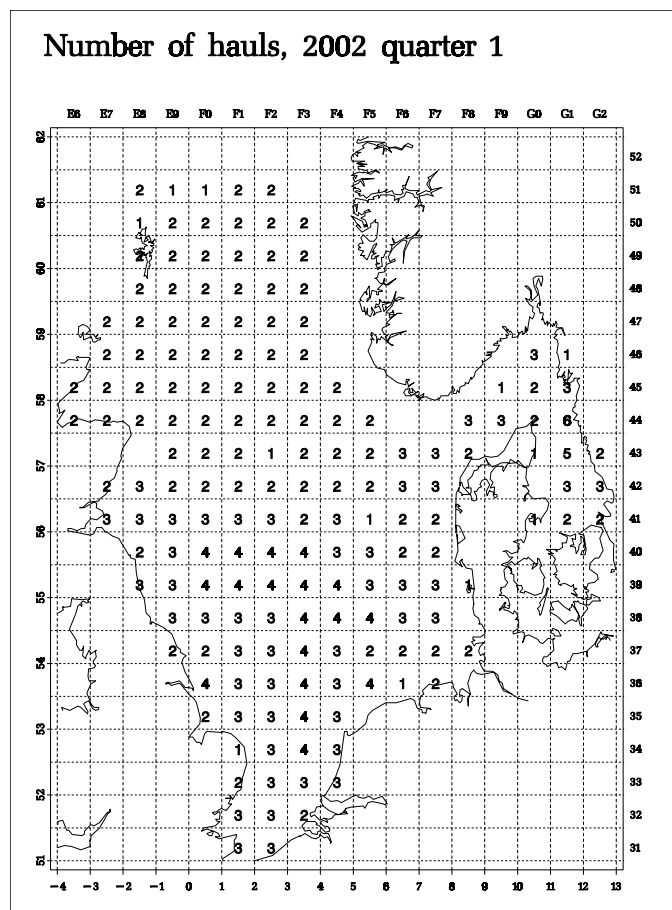


Figure 5.1 Number of valid day- and nighttime hauls.

Herring, number per hour

Age group 1, 2002 quarter 1

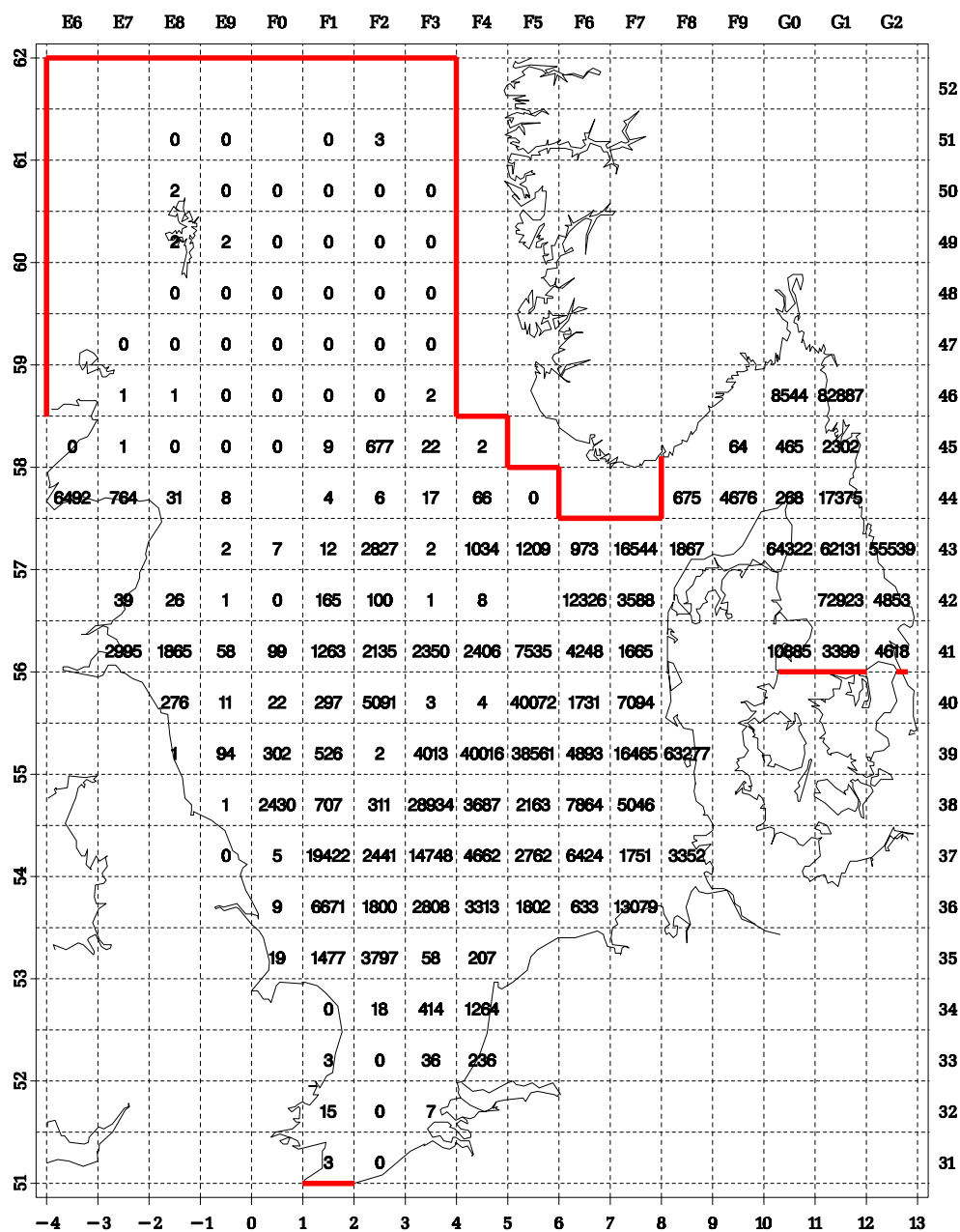


Figure 5.2 Herring: number per hour, 1-ringers

Herring, number per hour

Age group 2, 2002 quarter 1

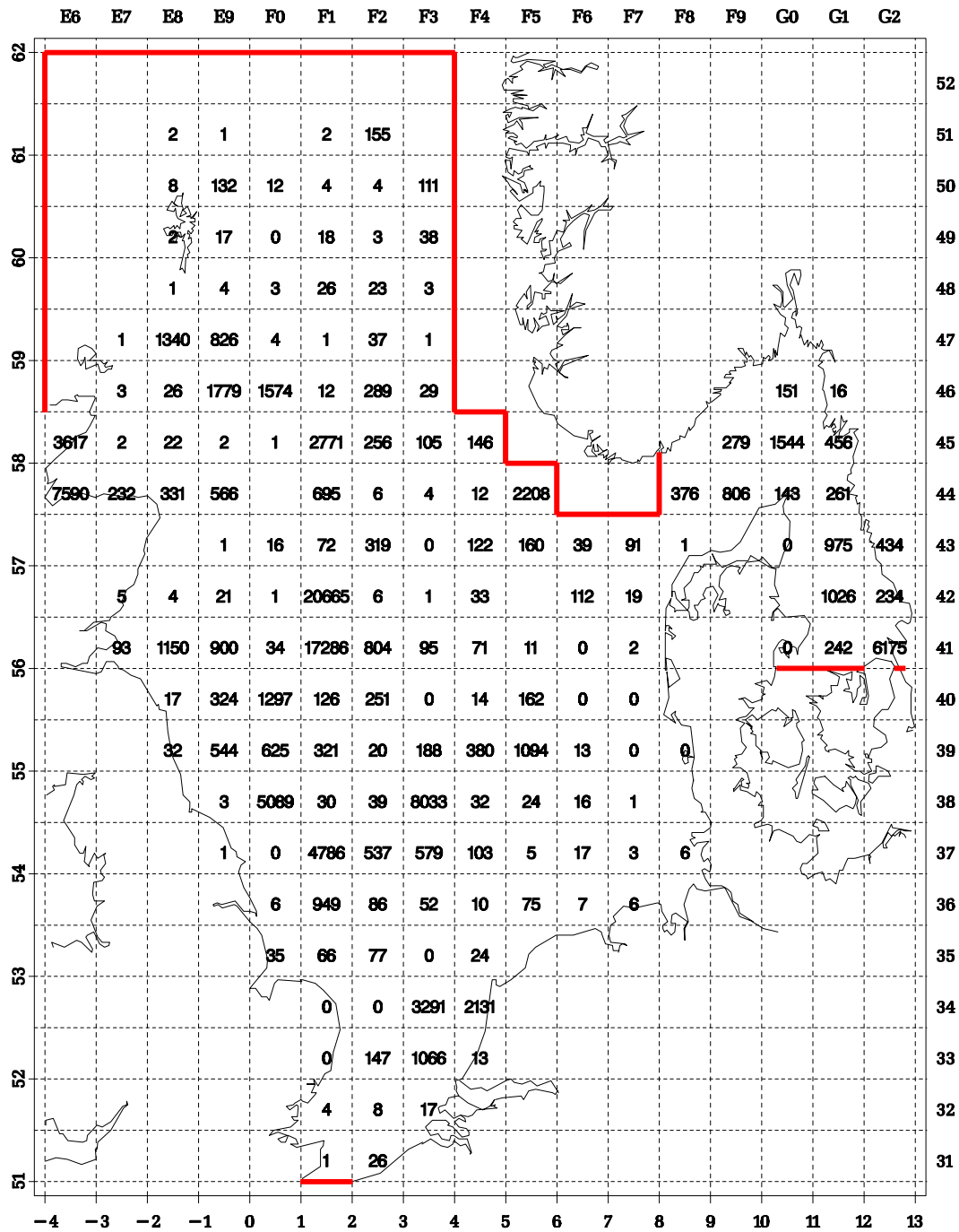


Figure 5.3 Herring: number per hour, 2-ringers

Herring, number per hour

Age group 3, 2002 quarter 1

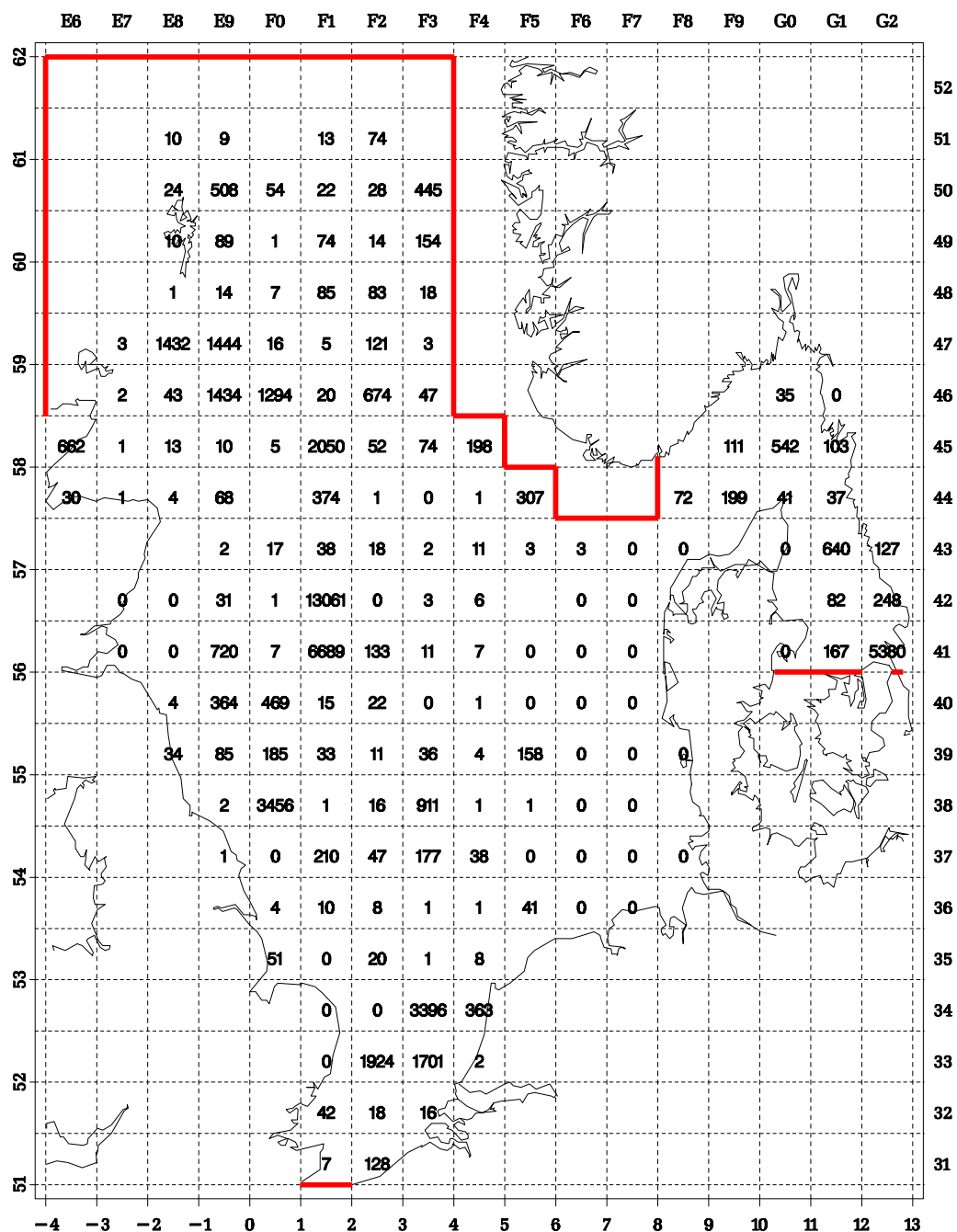


Figure 5.4 Herring: number per hour, 3 ringers

Herring, mean length

Age group 1, 2002 quarter 1

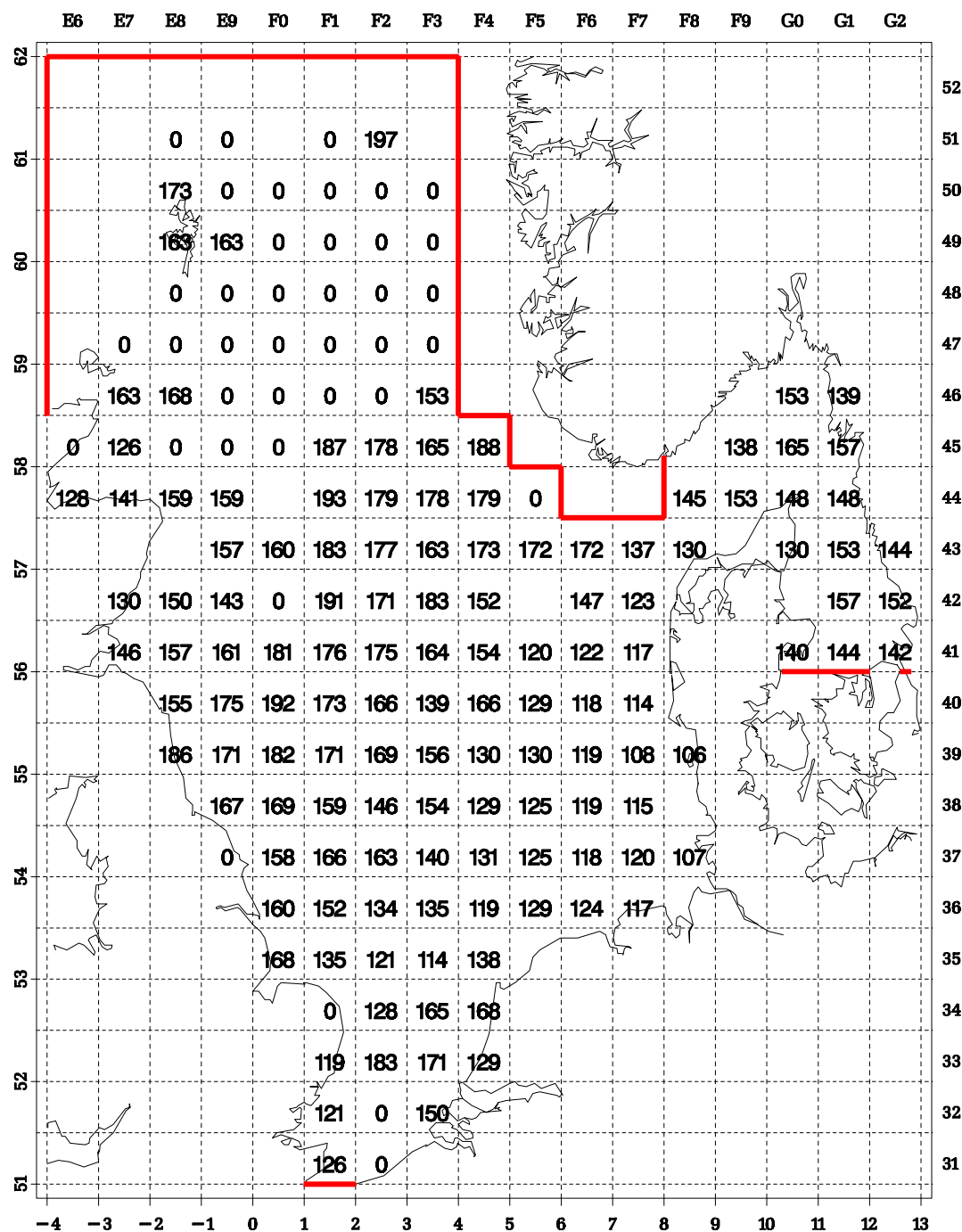


Figure 5.5 Herring: mean length (mm) 1- ringers

Sprat, number per hour

Age group 1, 2002 quarter 1

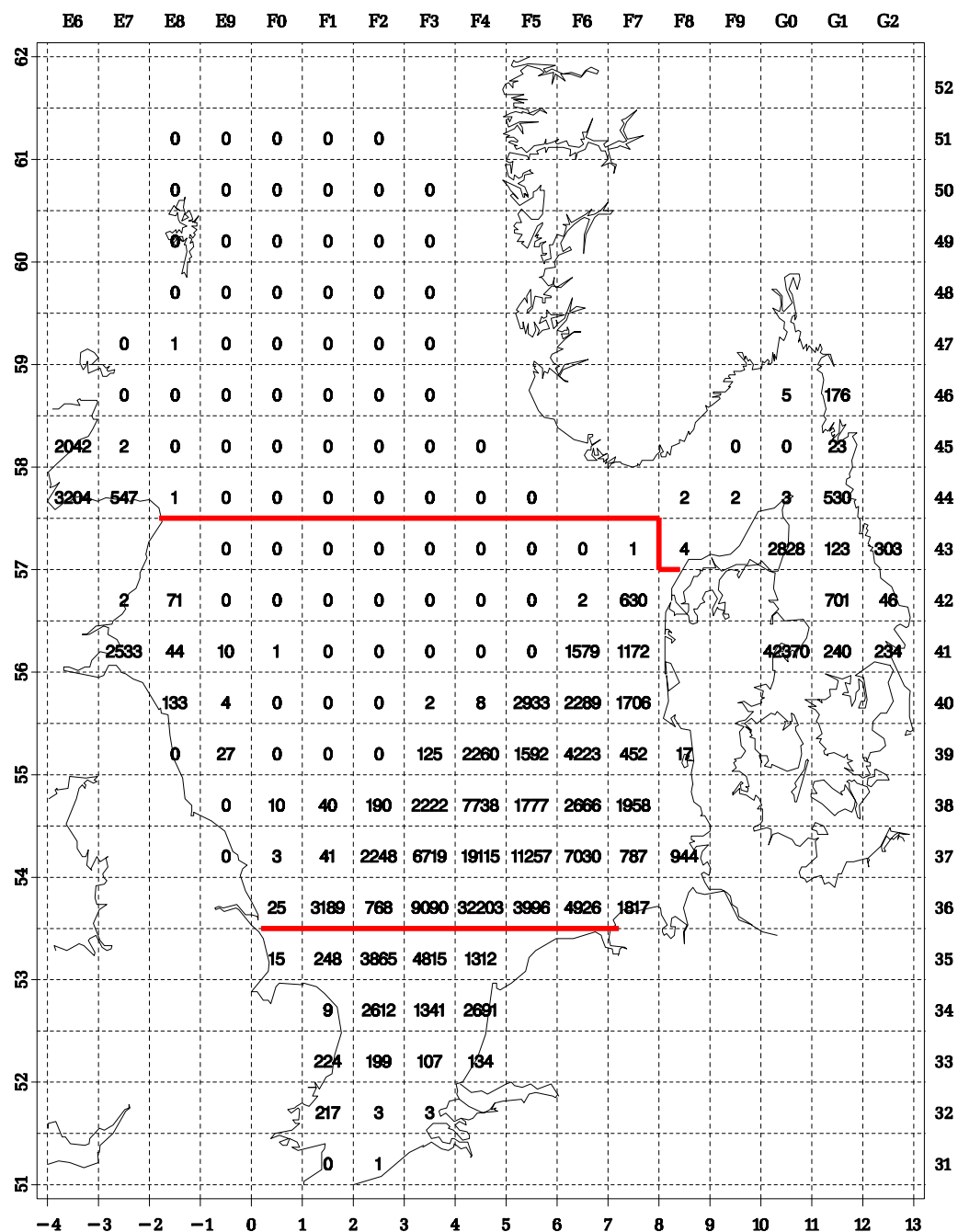


Figure 5.6 Sprat: number per hour, age 1

Sprat, number per hour

Age group 2, 2002 quarter 1

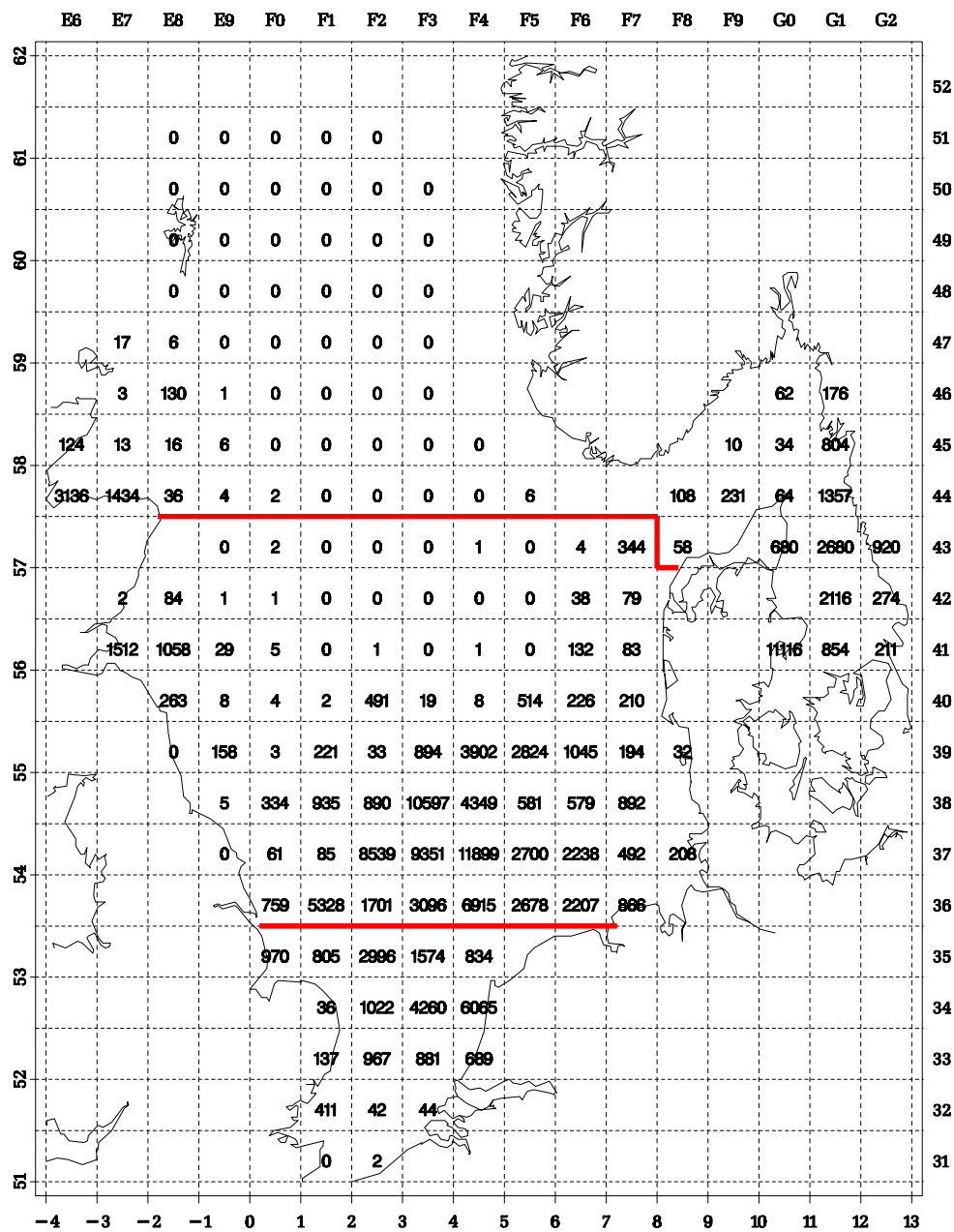


Figure 5.7 Sprat: number per hour, age 2

Sprat, number per hour

Age group 3, 2002 quarter 1

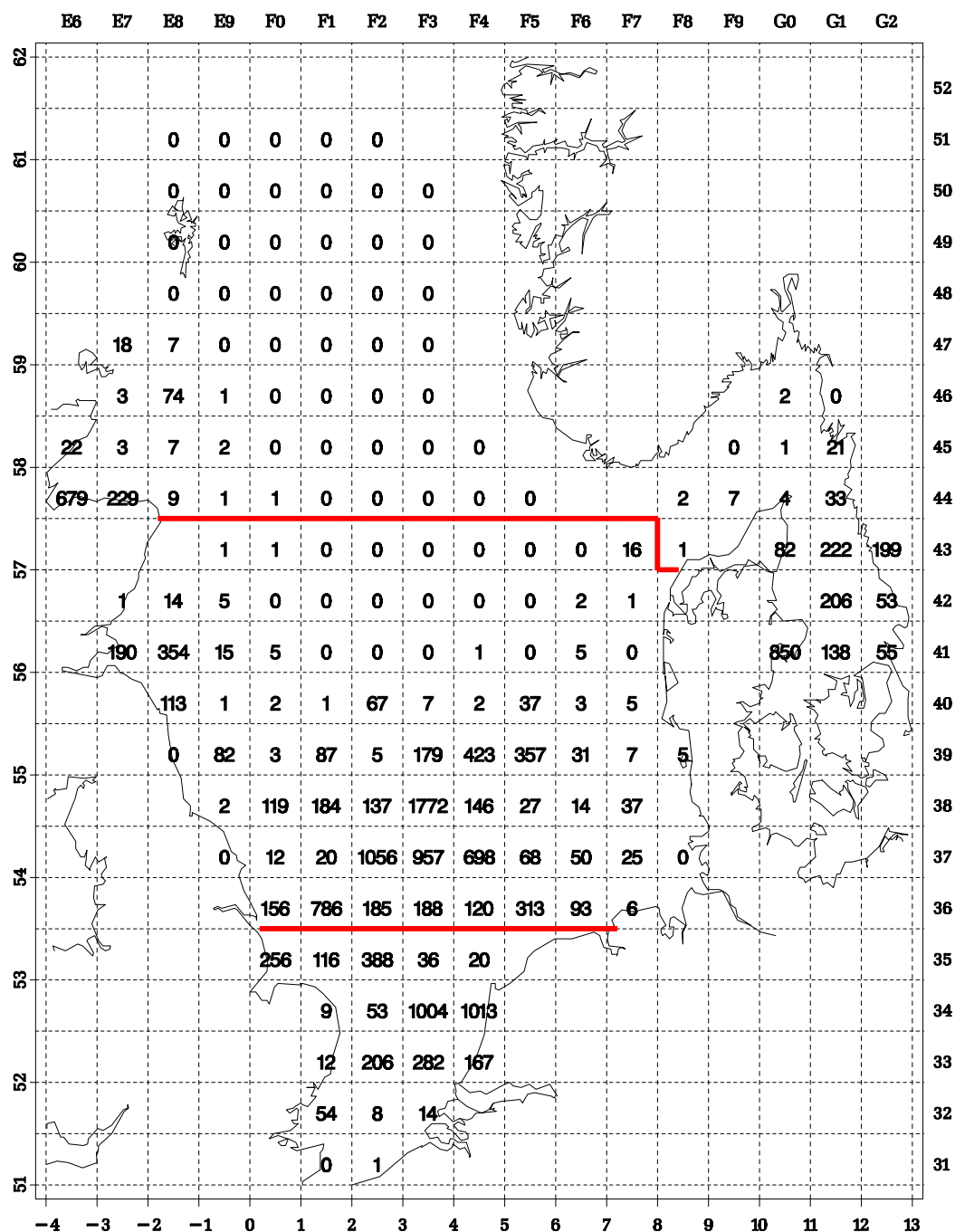


Figure 5.8 Sprat: number per hour, age 3

Sprat, mean length

Age group 1, 2002 quarter 1

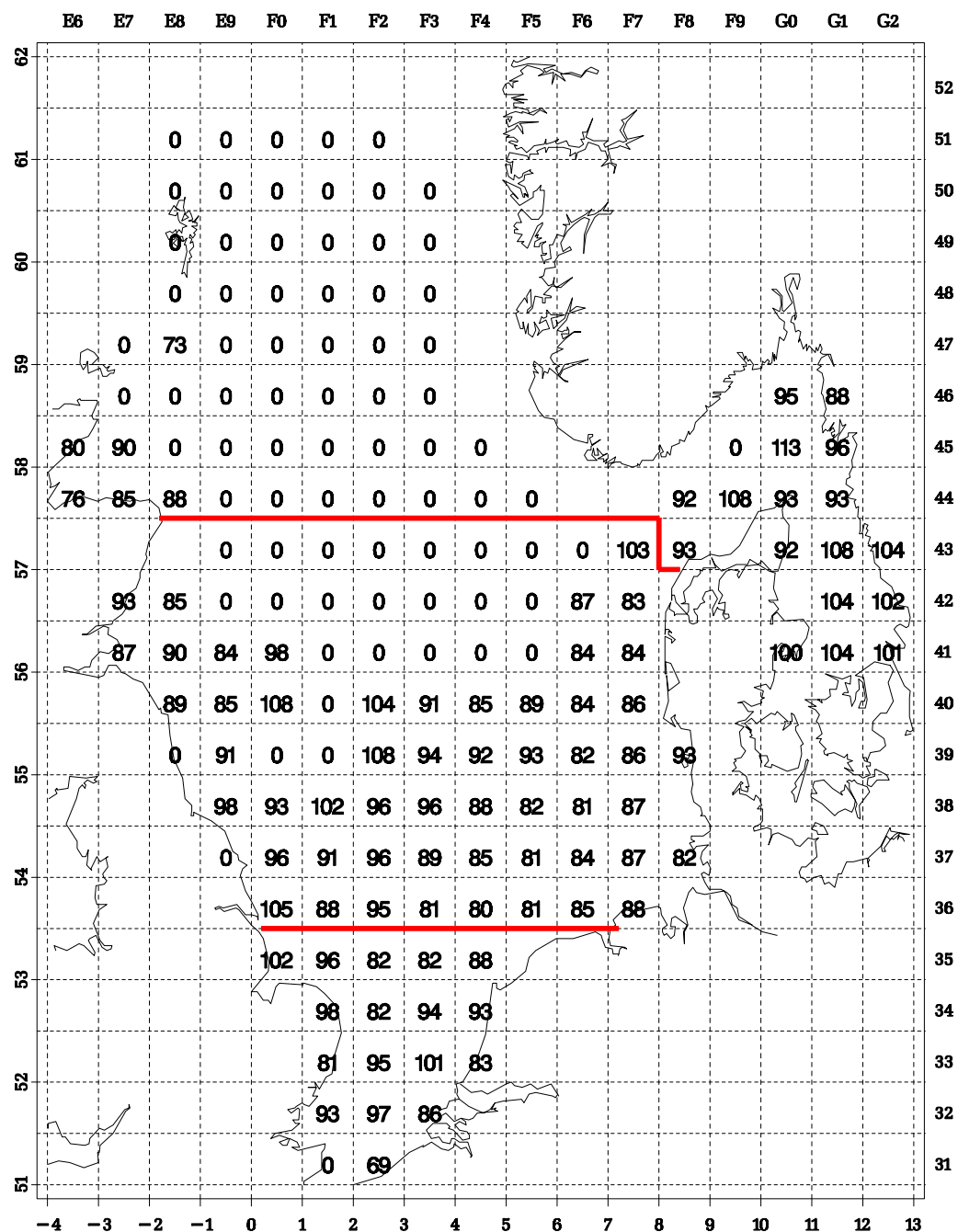


Figure 5.9. Sprat: mean length (mm), age 1

Mackerel, number per hour

Age group 1, 2002 quarter 1

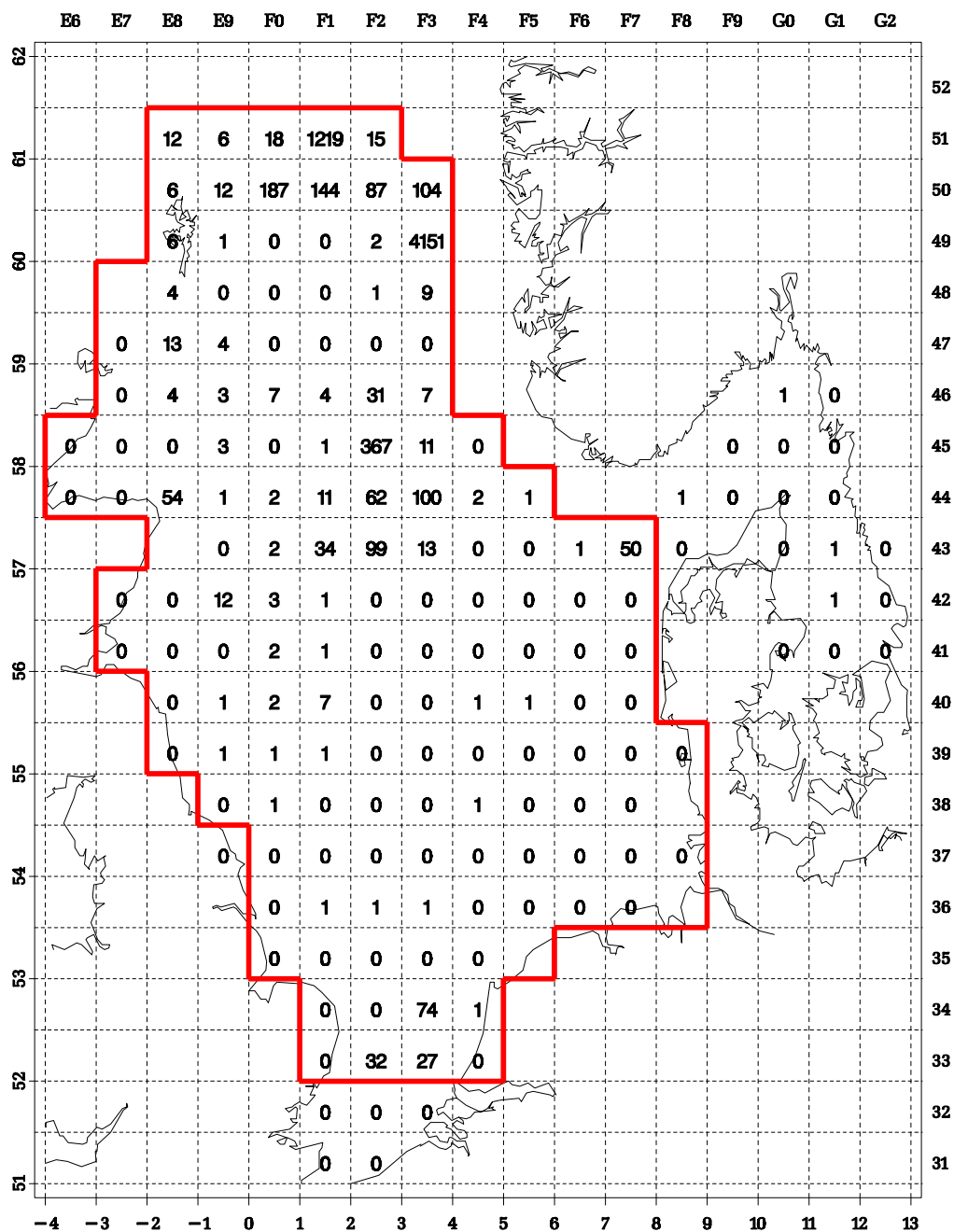


Figure 5.10 Mackerel: number per hour, age 1

Mackerel, number per hour

Age group 2, 2002 quarter 1

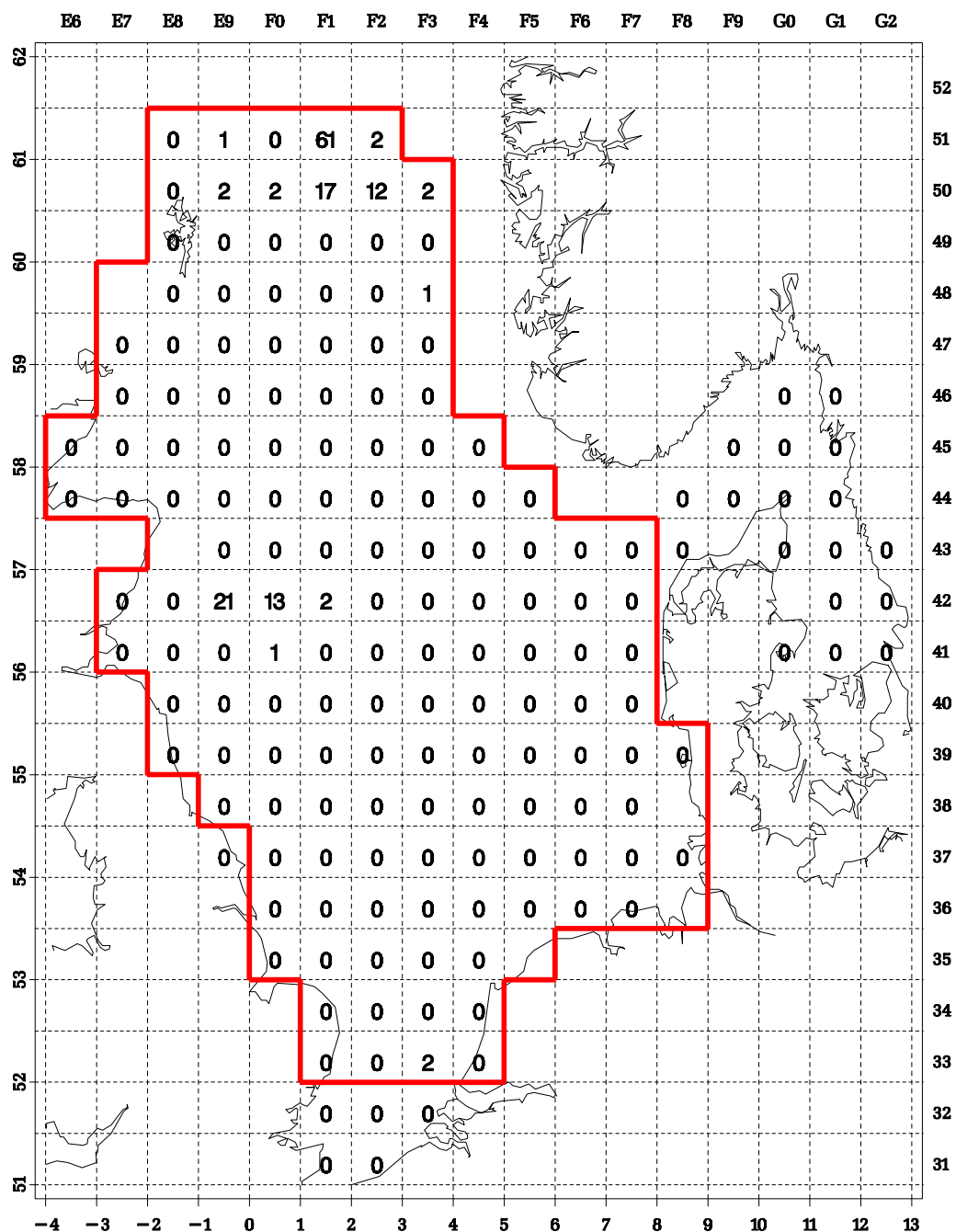


Figure 5.11 Mackerel: number per hour, age 2

E6	E7	E8	E9	F0	F1	F2	F3	F4	F5	F6	F7	F8	F9	G0	G1	G2
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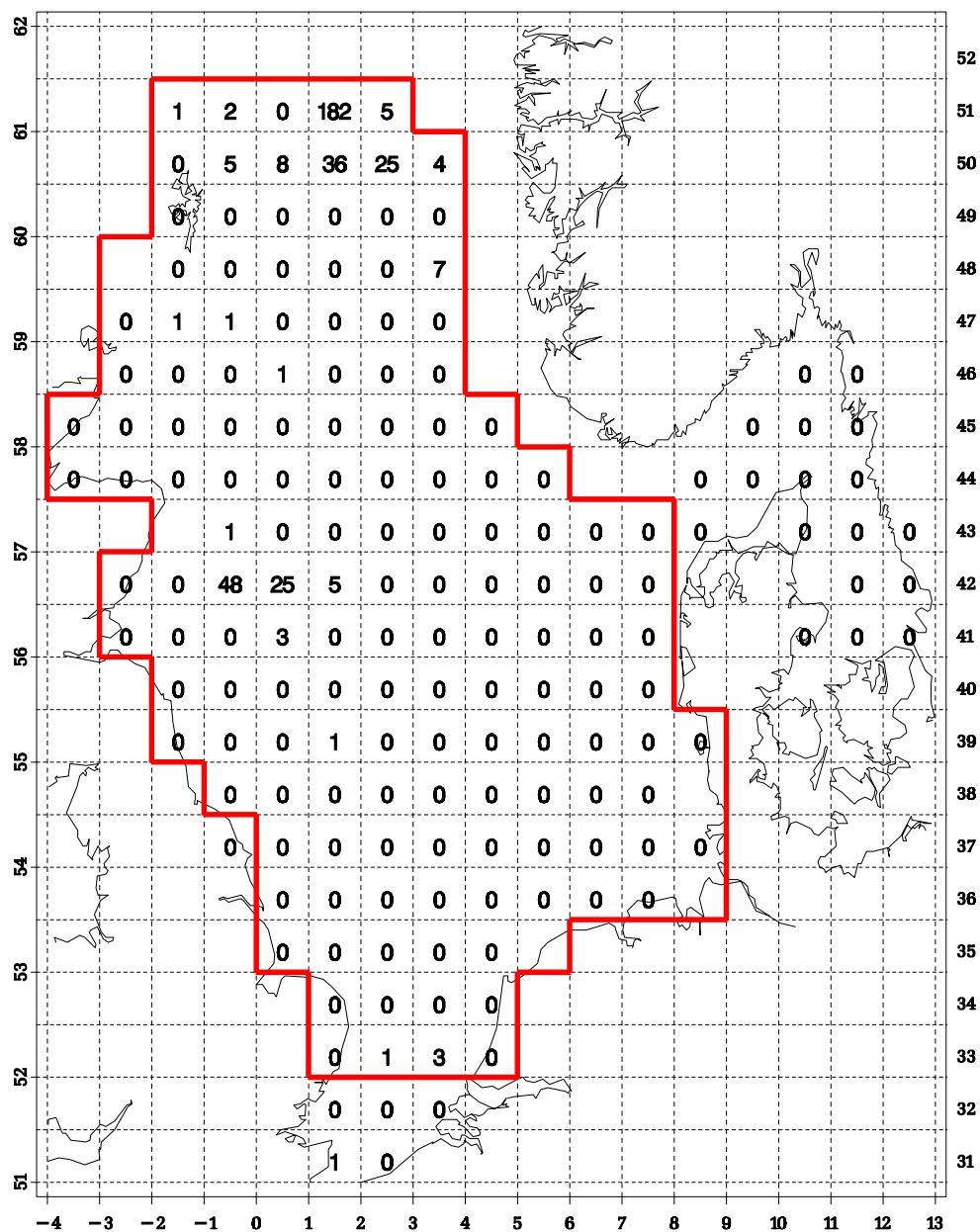


Figure 5.12 Mackerel: number per hour, age 3

Mackerel, mean length

Age group 1, 2002 quarter 1

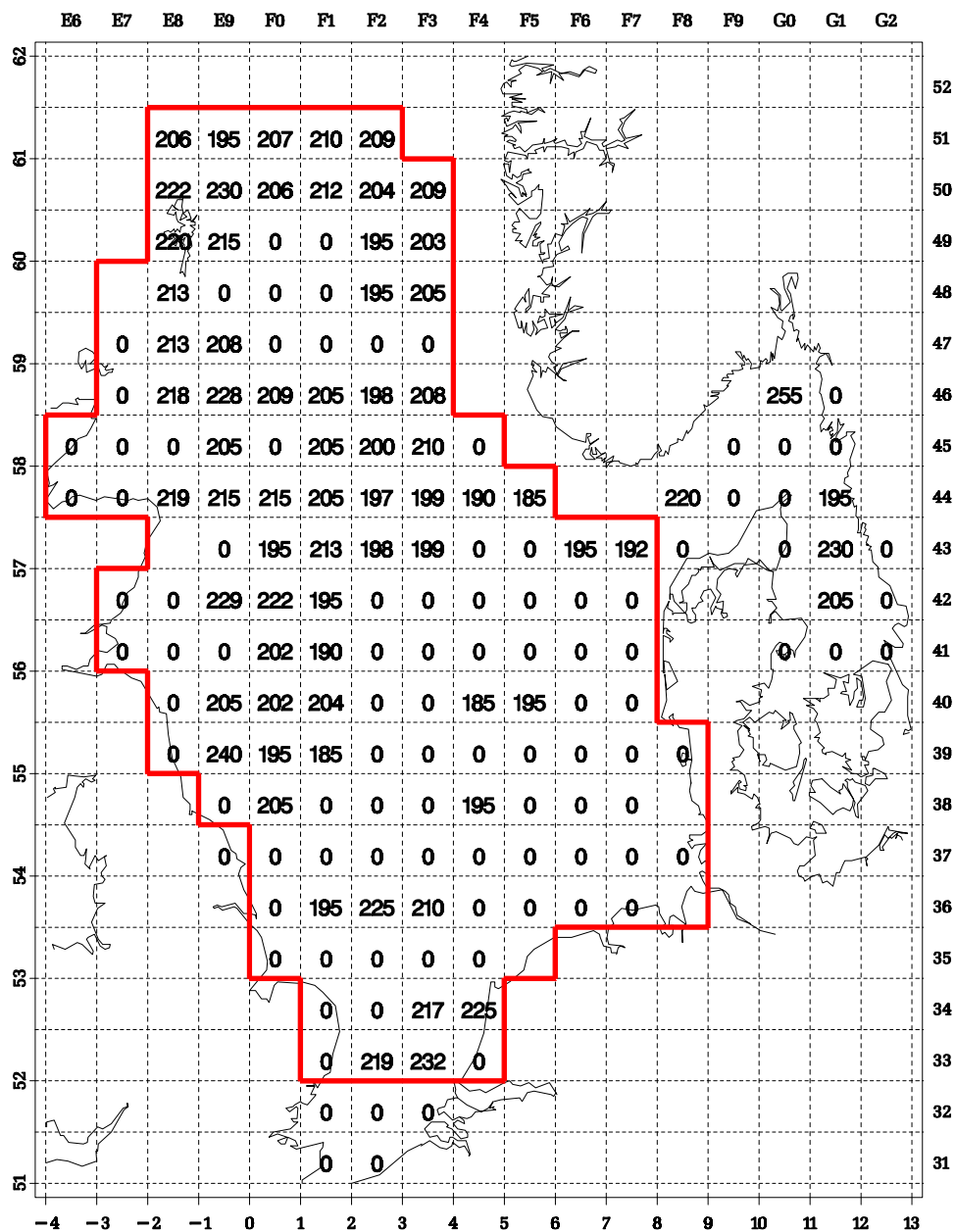


Figure 5.13 Mackerel: mean length (mm), age 1

Cod, number per hour Age group 1, 2002 quarter 1

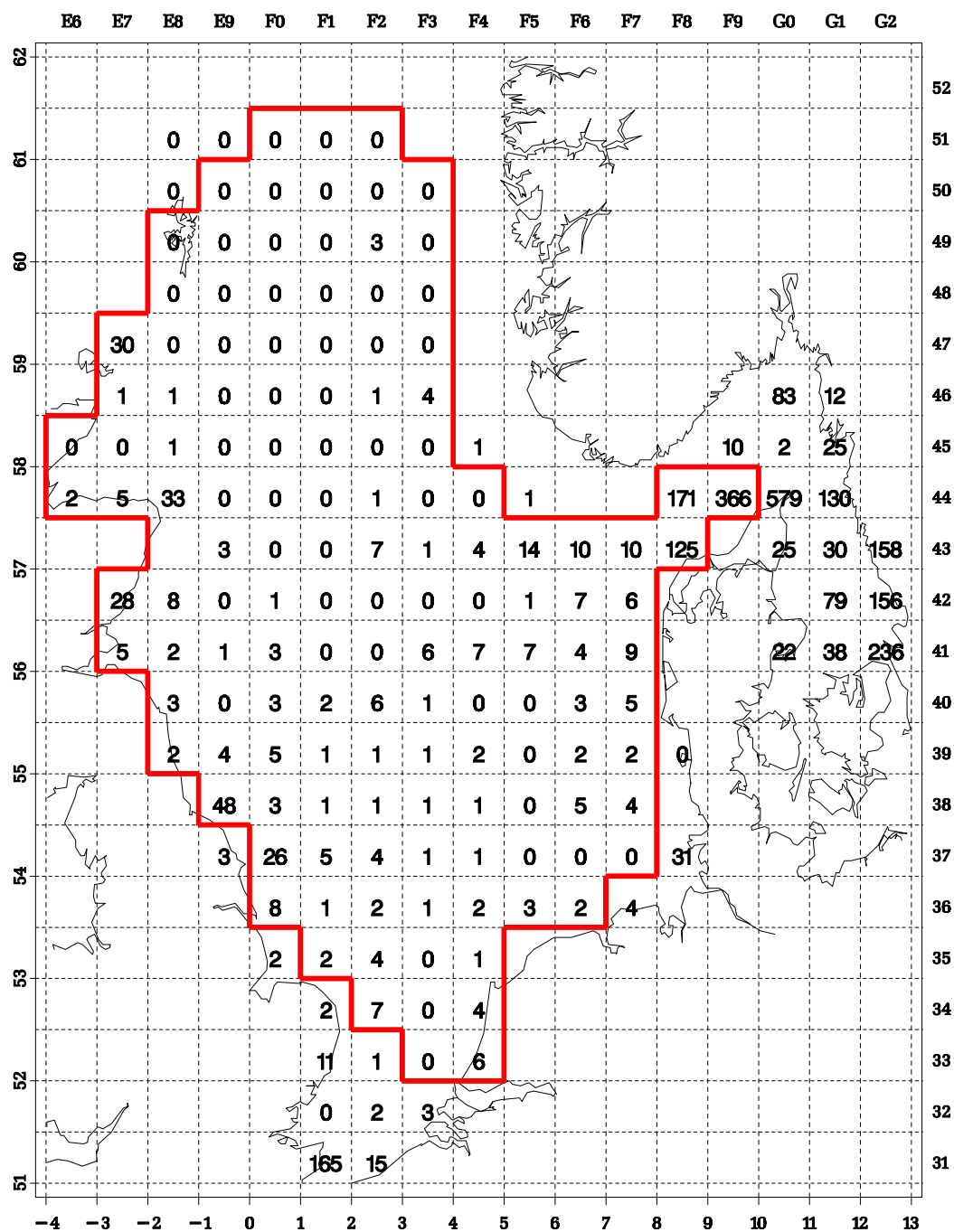


Figure 5.14 Cod: number per hour, age 1

Cod, number per hour Age group 2, 2002 quarter 1

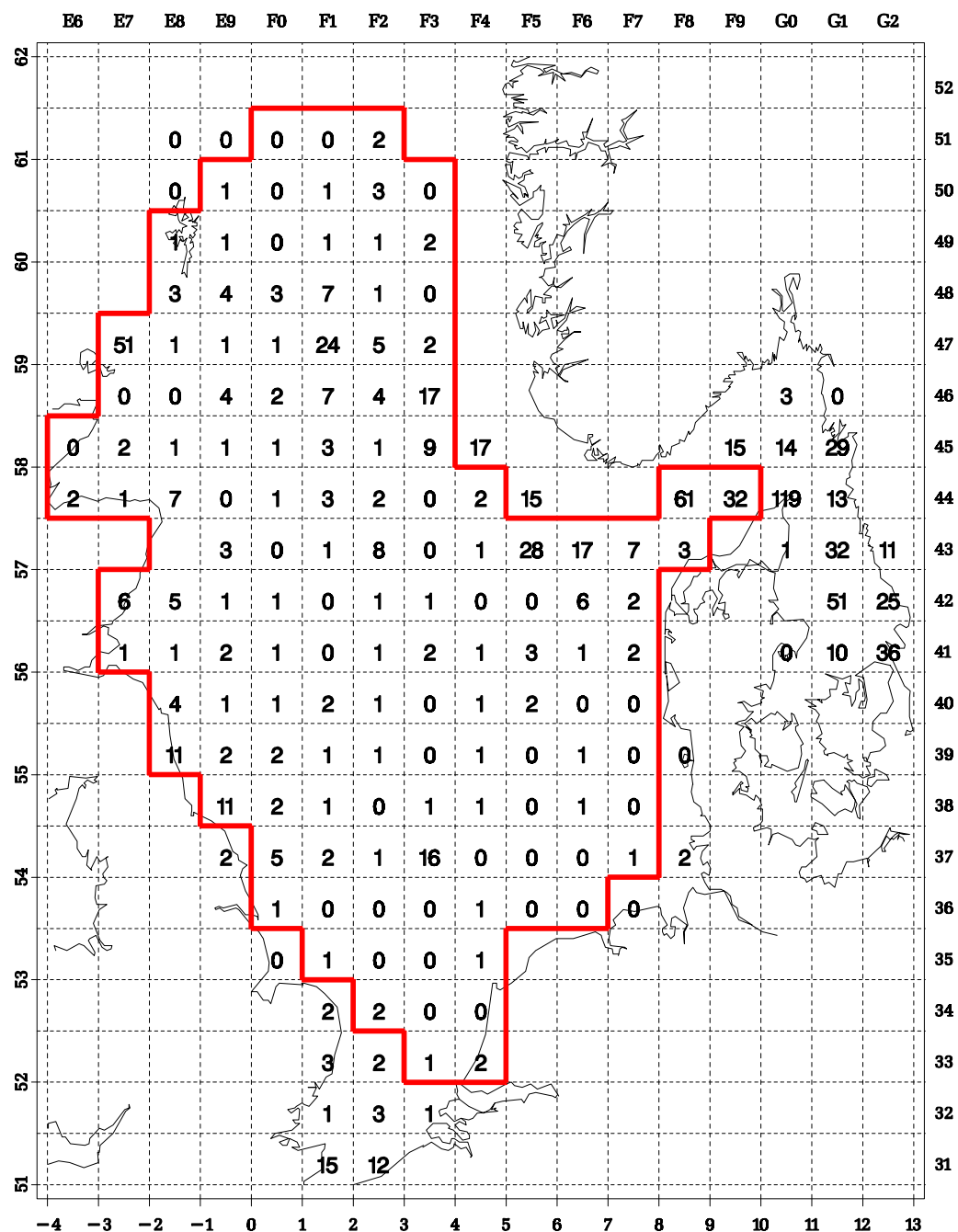


Figure 5.15 Cod: number per hour, age 2

Cod, number per hour Age group 3, 2002 quarter 1

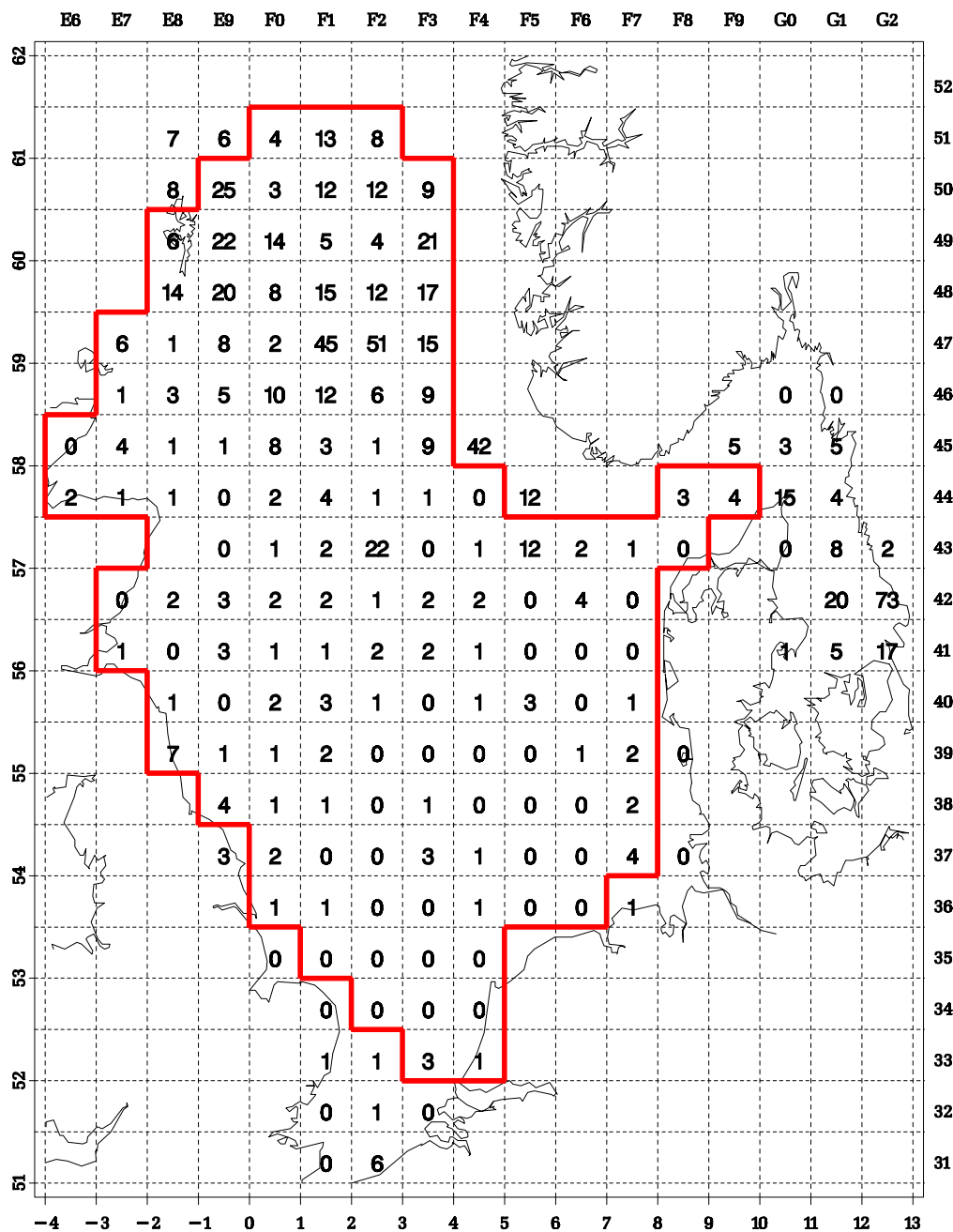


Figure 5.16 Cod: number per hour, age 3

Cod, mean length Age group 1, 2002 quarter 1

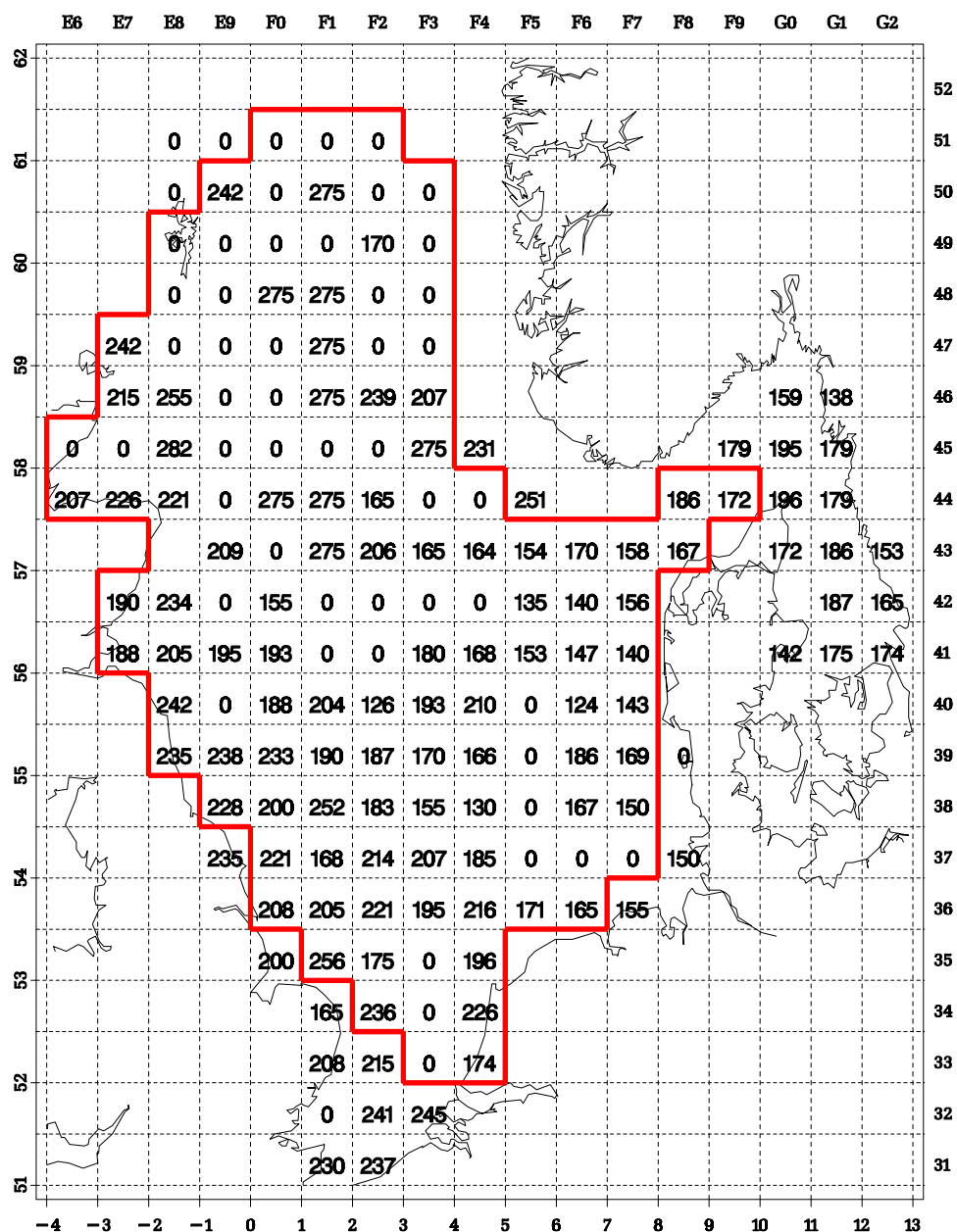


Figure 5.17 Cod, mean length (mm) age 1

Haddock, number per hour

Age group 1, 2002 quarter 1

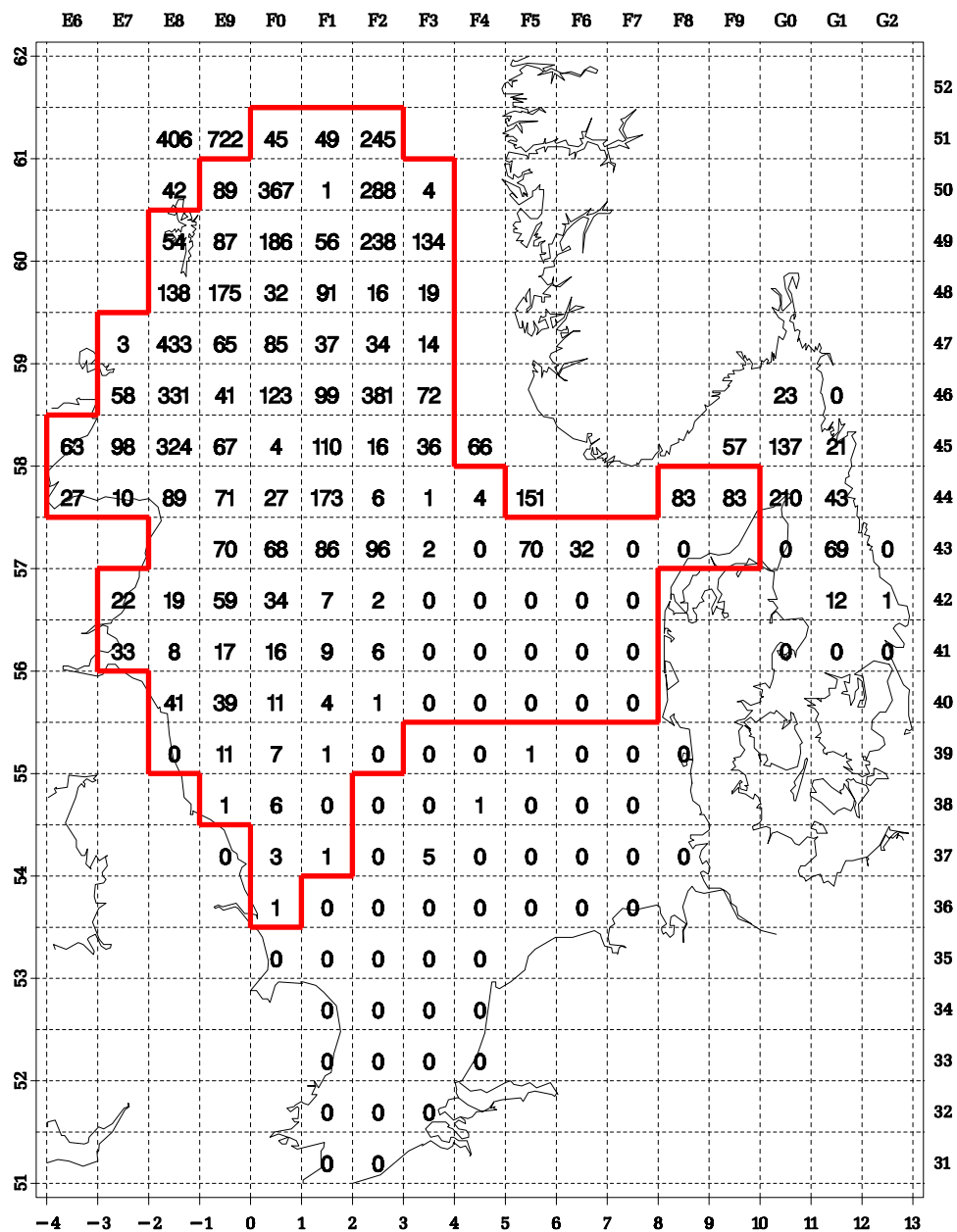


Figure 5.18 Haddock: number per hour, age 1

Haddock, number per hour

Age group 2, 2002 quarter 1

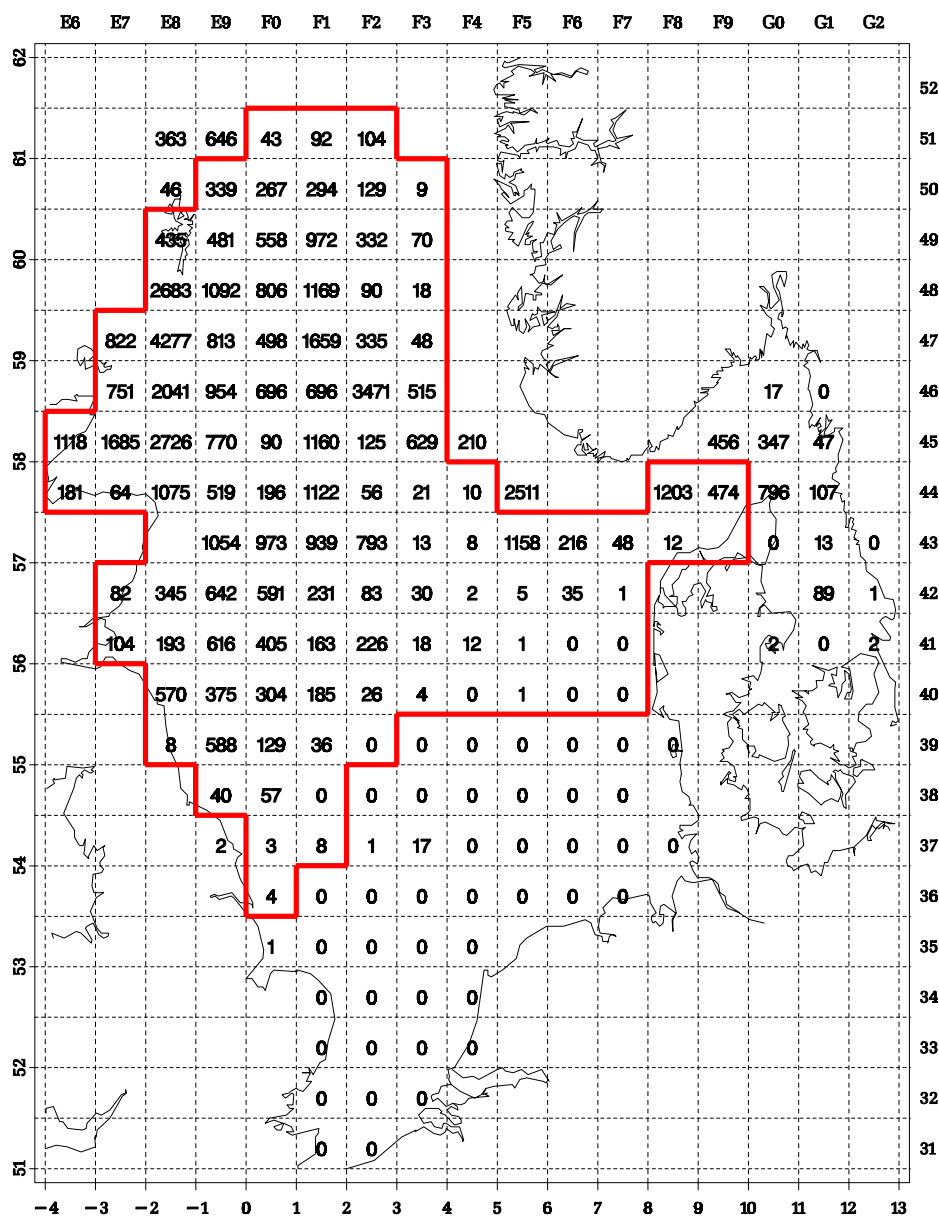


Figure 5.19 Haddock: number per hour, age 2

Haddock, number per hour

Age group 3, 2002 quarter 1

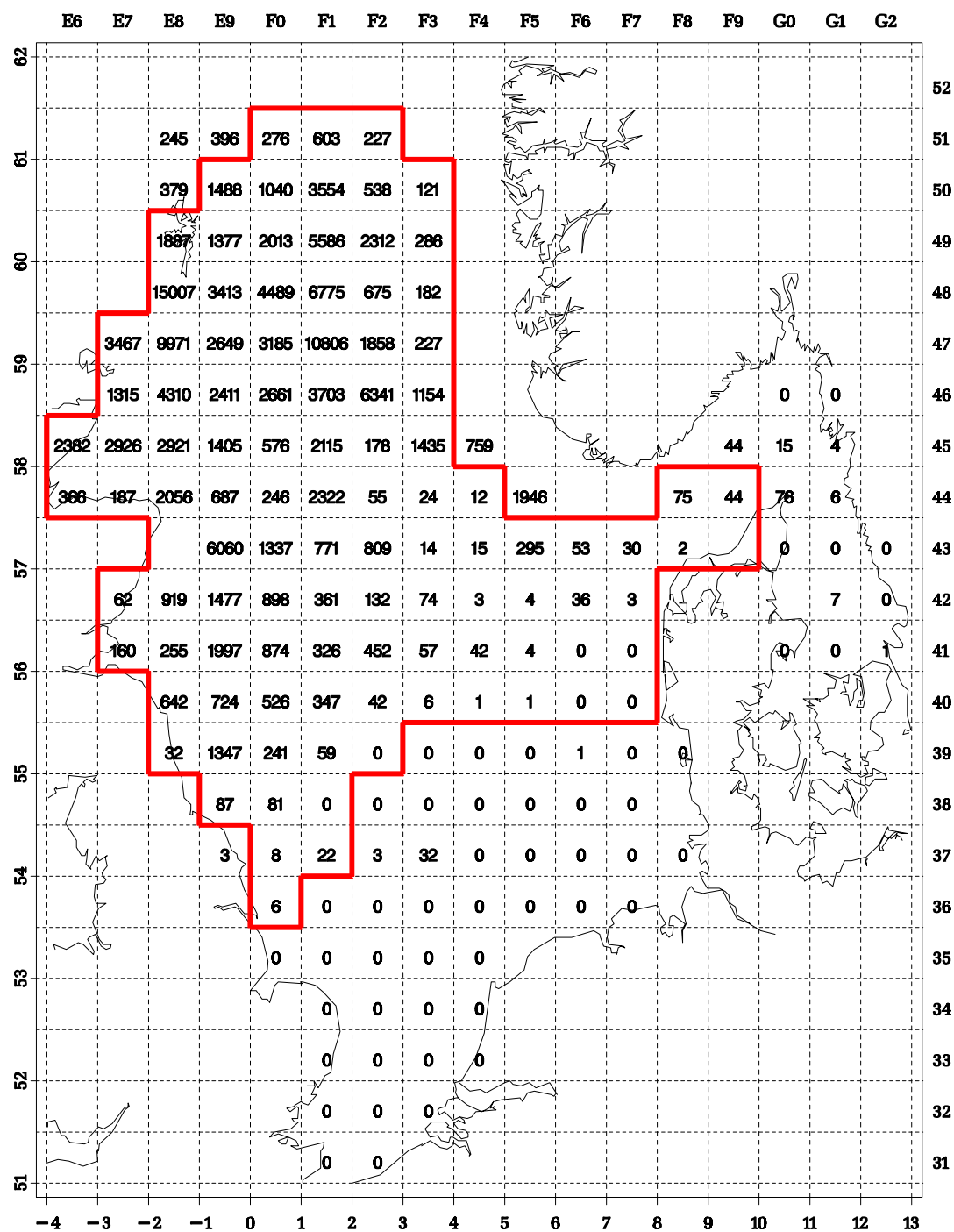


Figure 5.20 Haddock: number per hour, age 3

Haddock, mean length

Age group 1, 2002 quarter 1

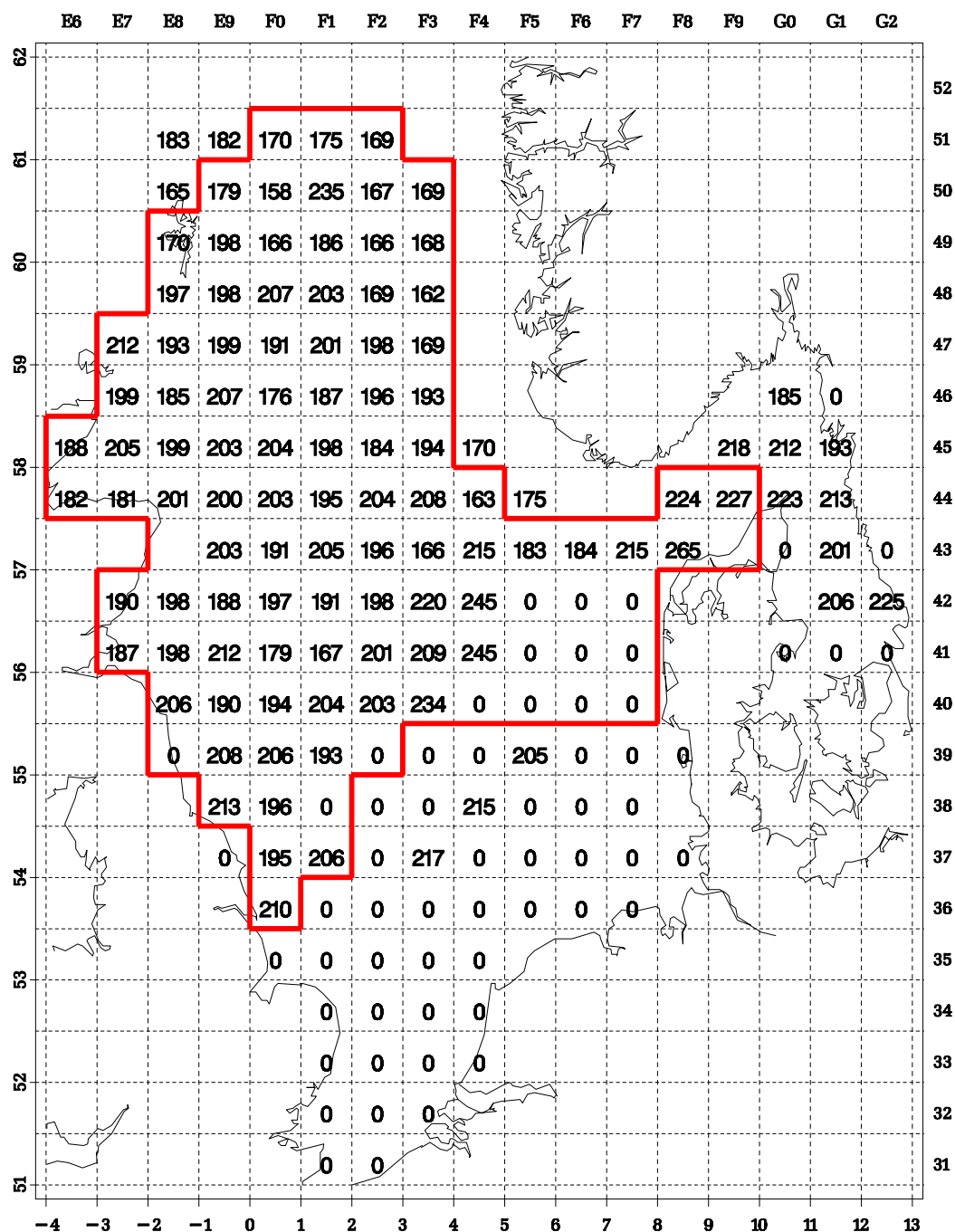


Figure 5.21 Haddock: mean length (mm), age 1

Whiting, number per hour

Age group 1, 2002 quarter 1

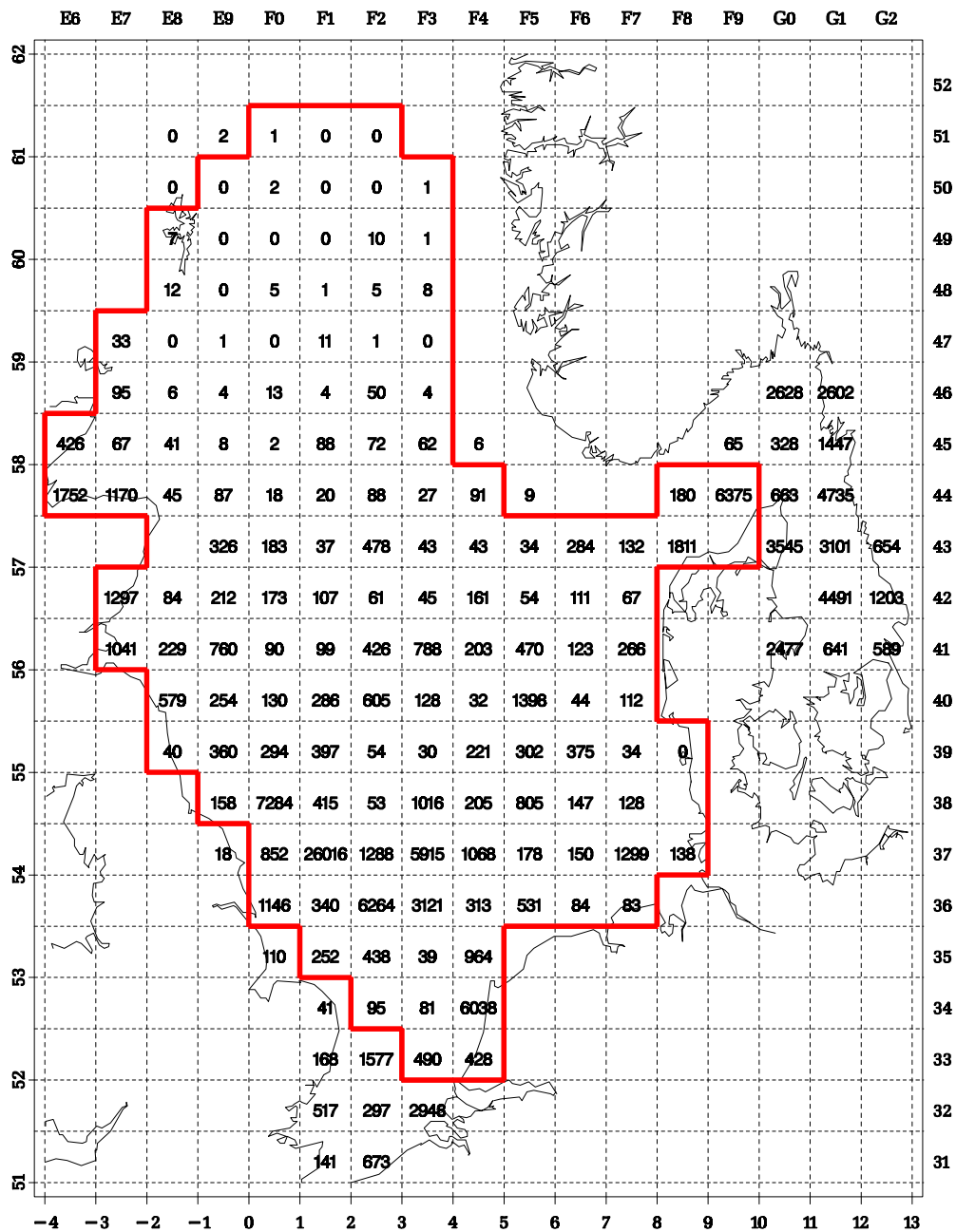


Figure 5.22 Whiting: number per hour, age 1

Whiting, number per hour

Age group 2, 2002 quarter 1

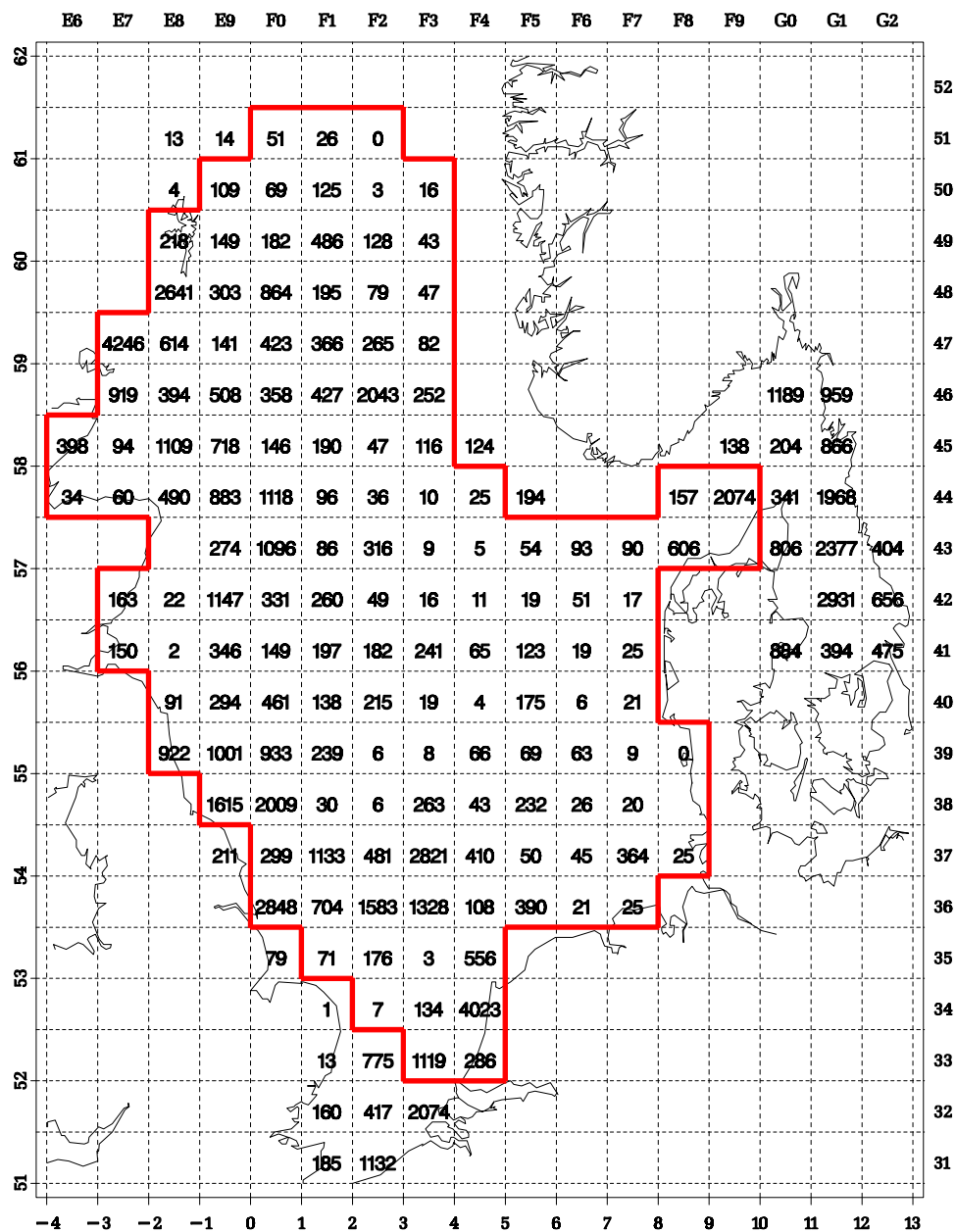


Figure 5.23 Whiting: number per hour, age 2

Whiting, number per hour

Age group 3, 2002 quarter 1

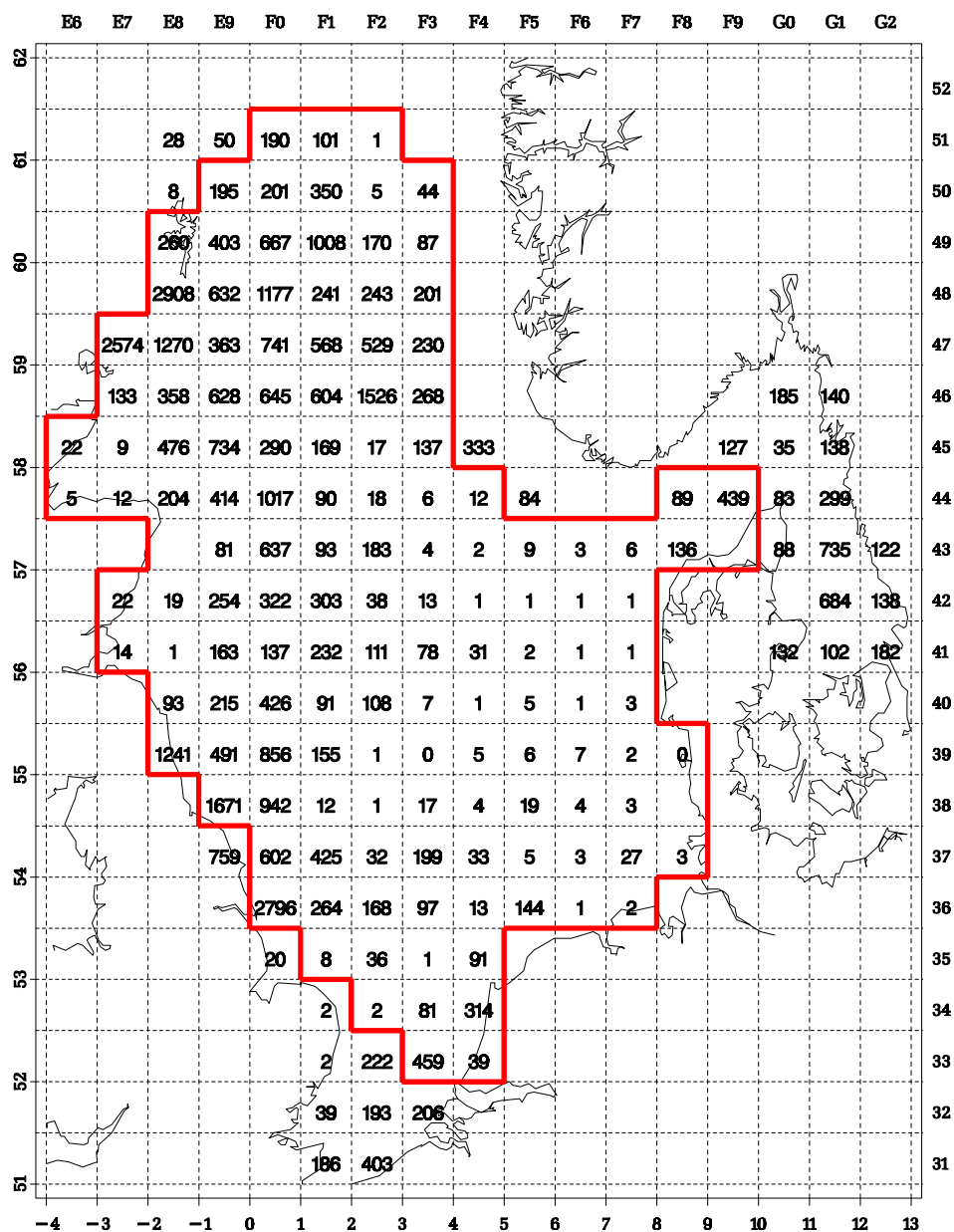


Figure 5.24 Whiting: number per hour, age 3

Whiting, mean length Age group 1, 2002 quarter 1

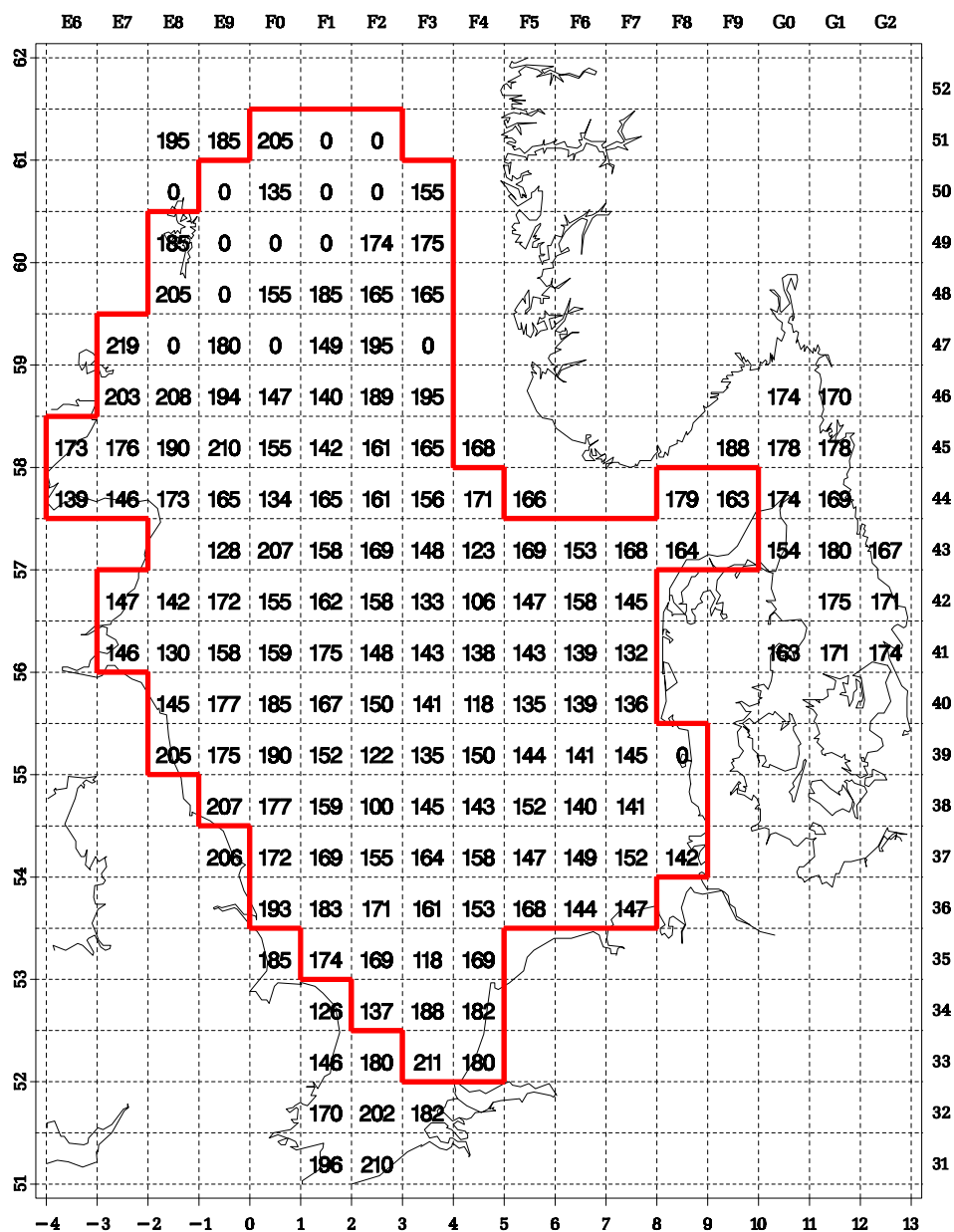


Figure 5.25 Whiting: mean length (mm), age 1

Saithe, number per hour

Age group 1, 2002 quarter 1

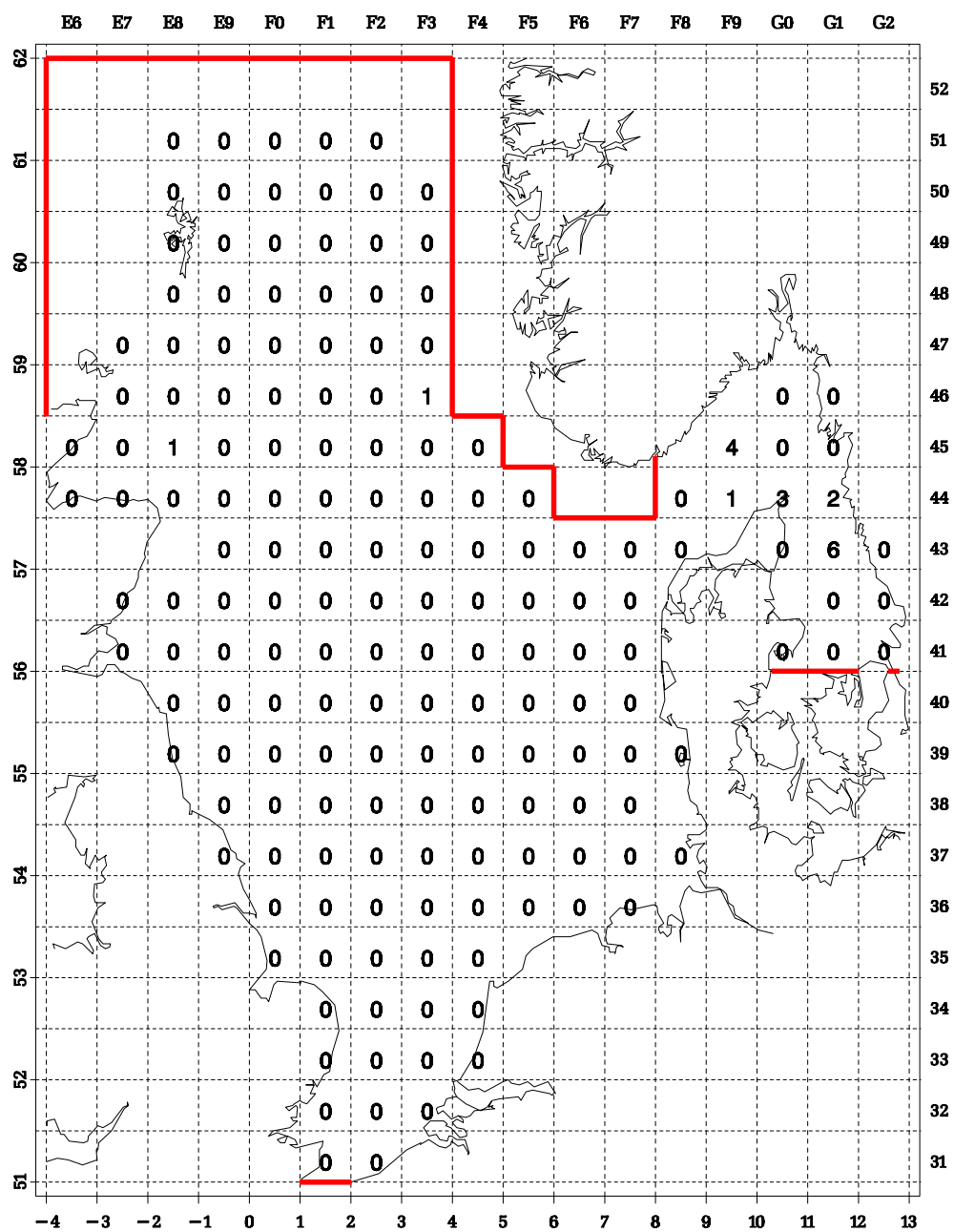


Figure 5.26 Saithe: number per hour, age 1

Saithe, number per hour

Age group 2, 2002 quarter 1

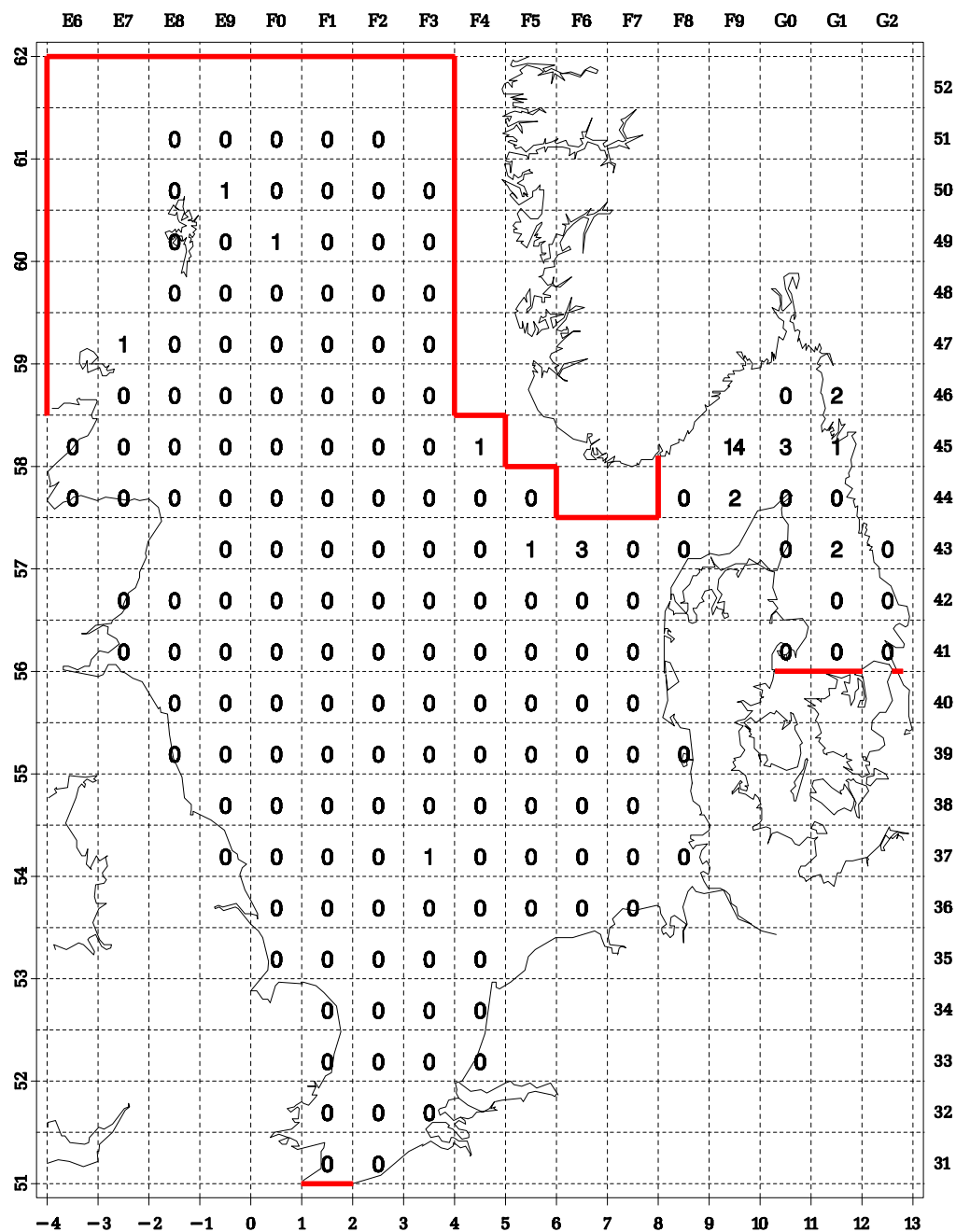


Figure 5.27 Saithe: number per hour, age 2

Saithe, number per hour

Age group 3, 2002 quarter 1

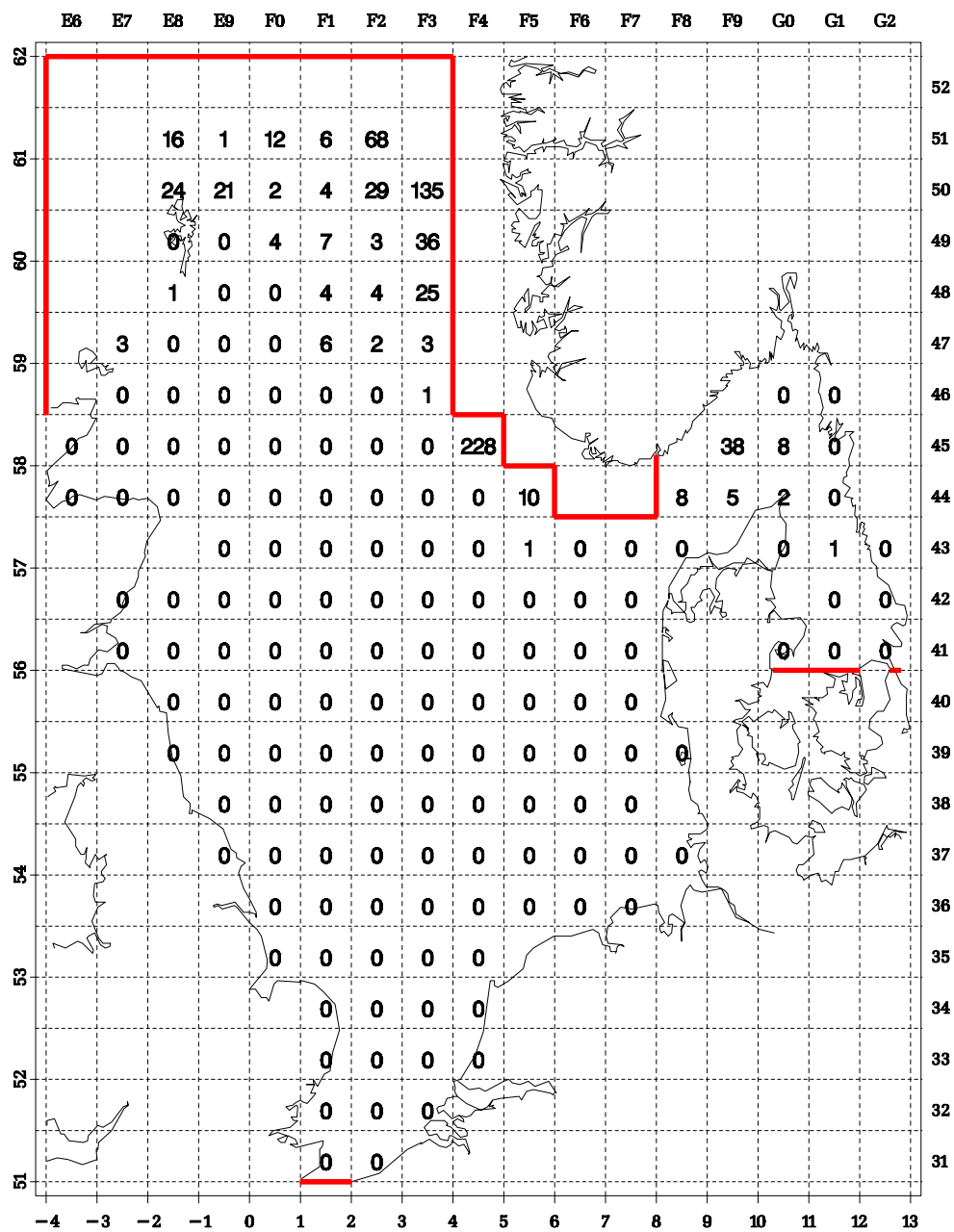


Figure 5.28 Saithe: number per hour, age 3

Saithe, mean length Age group 1, 2002 quarter 1

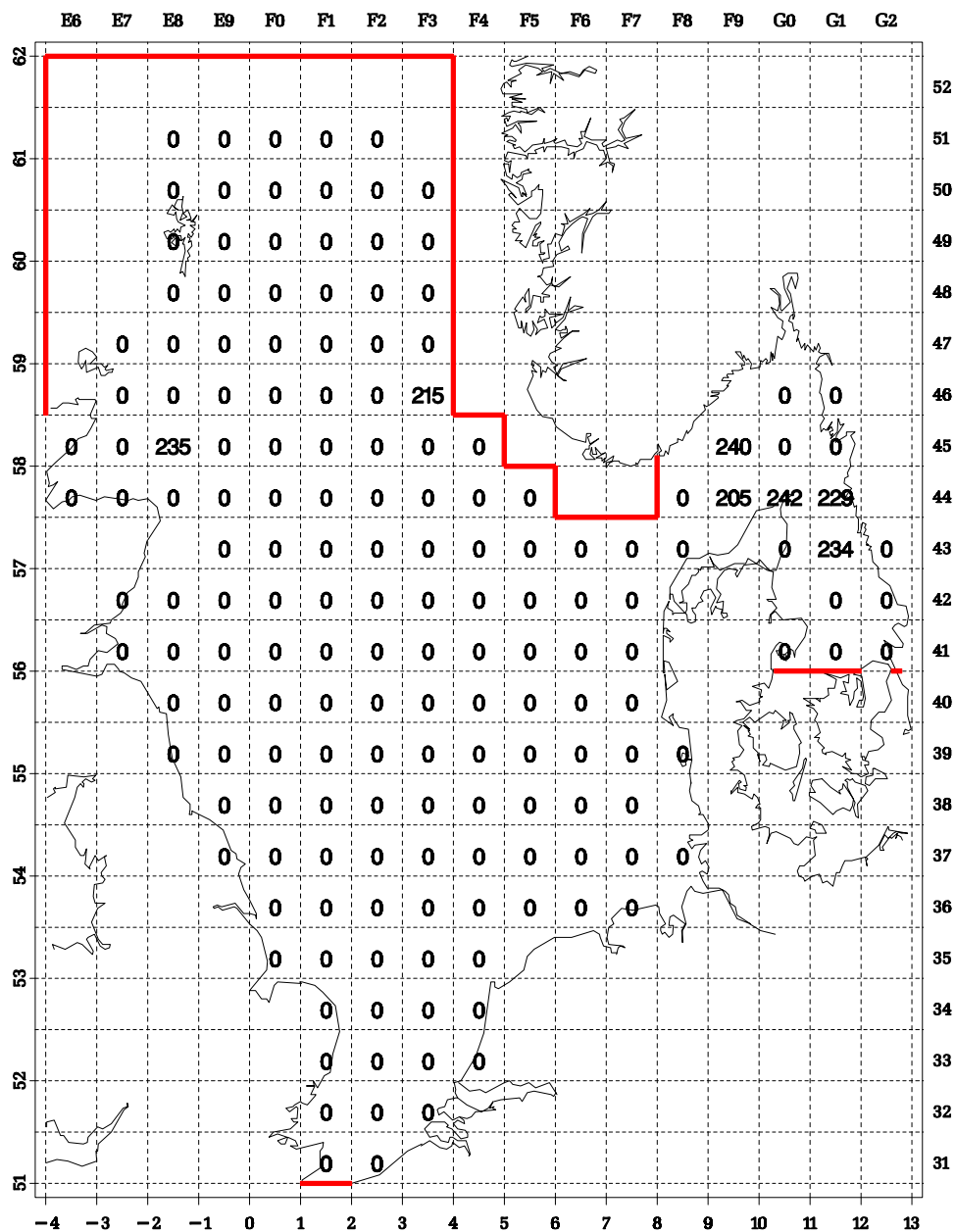


Figure 5.29 Saithe: mean length (mm), age 1

Norway pout, number per hour

Age group 1, 2002 quarter 1

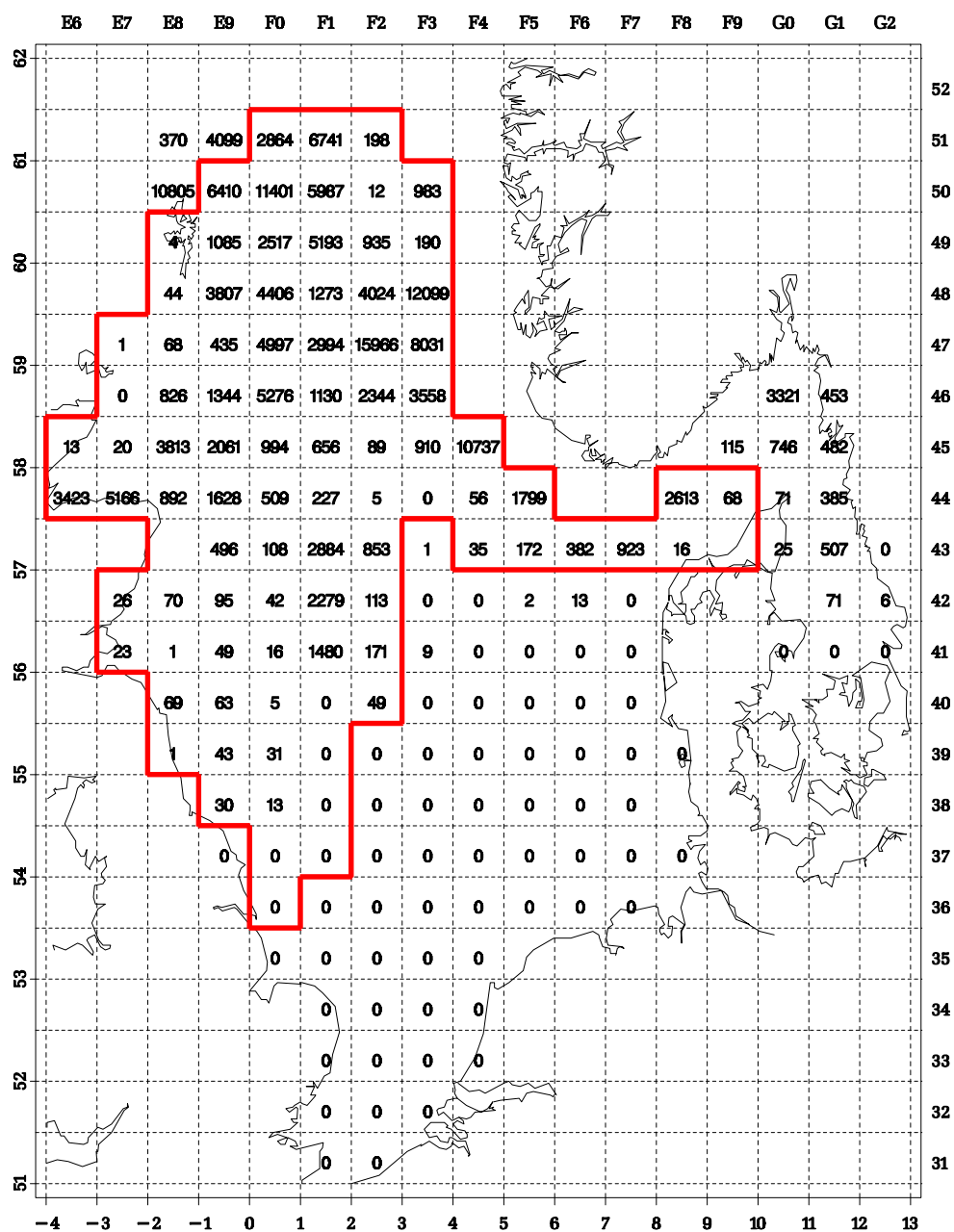


Figure 5.30 Norway pout: number per hour, age 1

Norway pout, number per hour

Age group 2, 2002 quarter 1

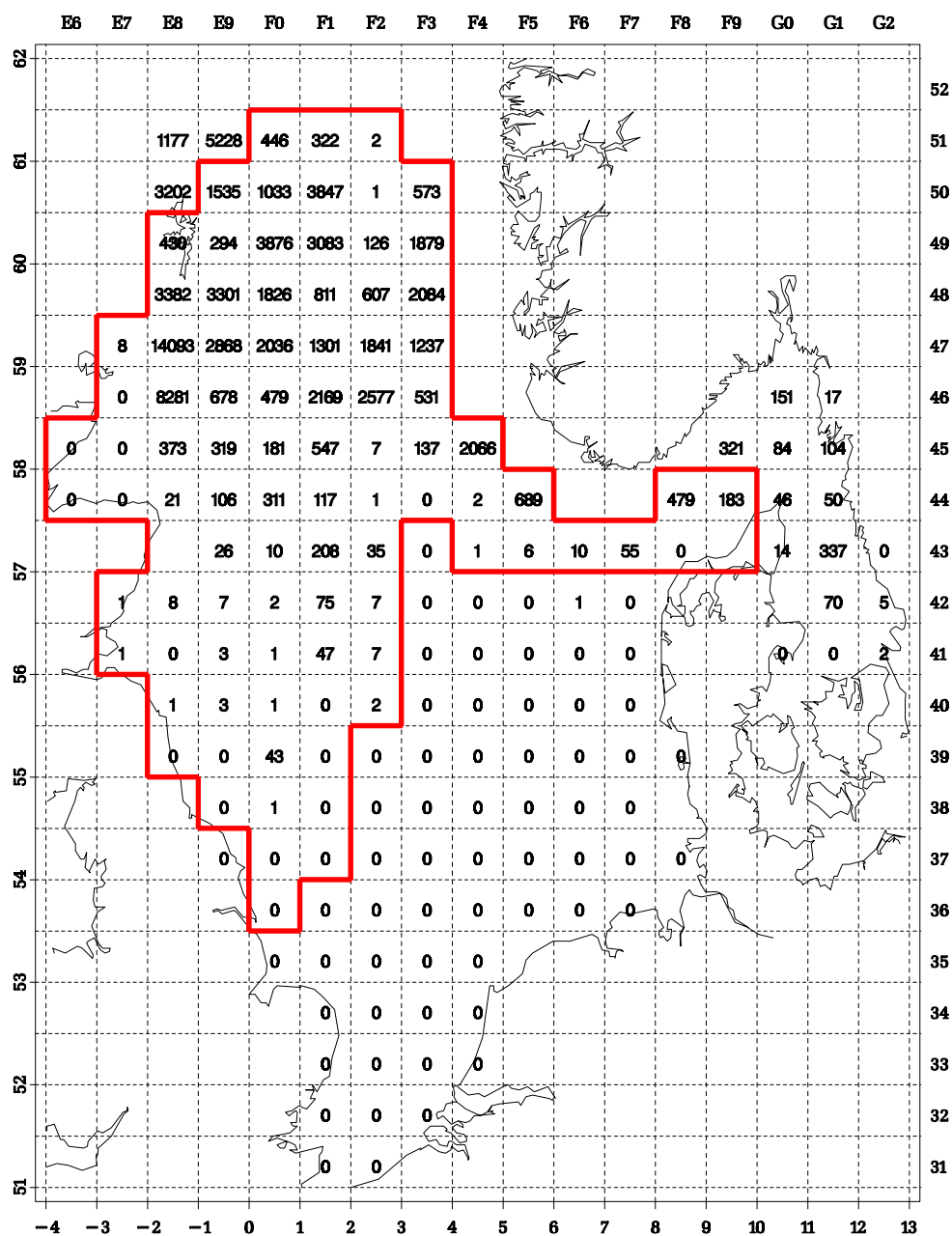


Figure 5.31 Norway pout: number per hour, age 2

Norway pout, number per hour

Age group 3, 2002 quarter 1

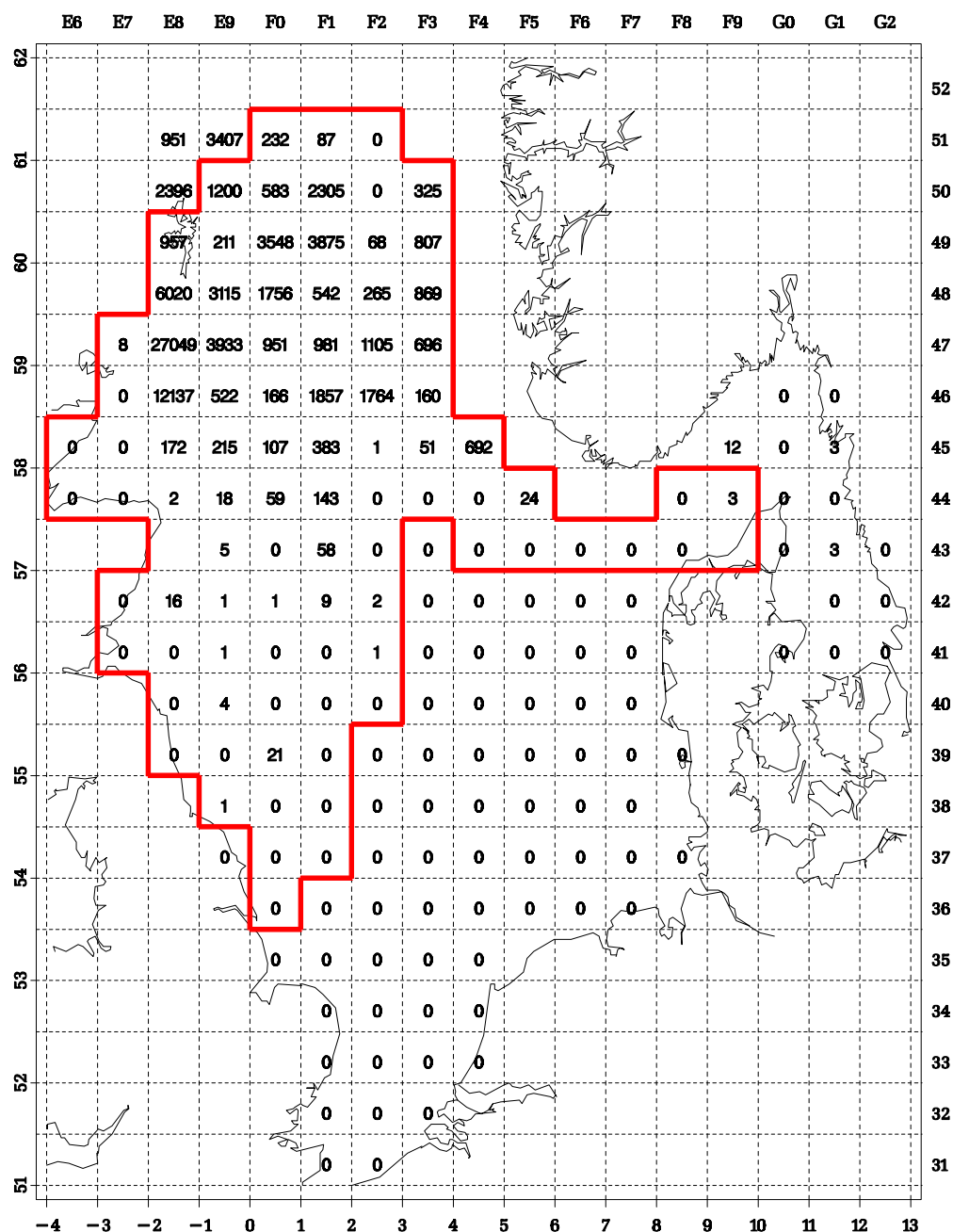


Figure 5.32 Norway pout: number per hour, age 3

Norway pout, mean length

Age group 1, 2002 quarter 1

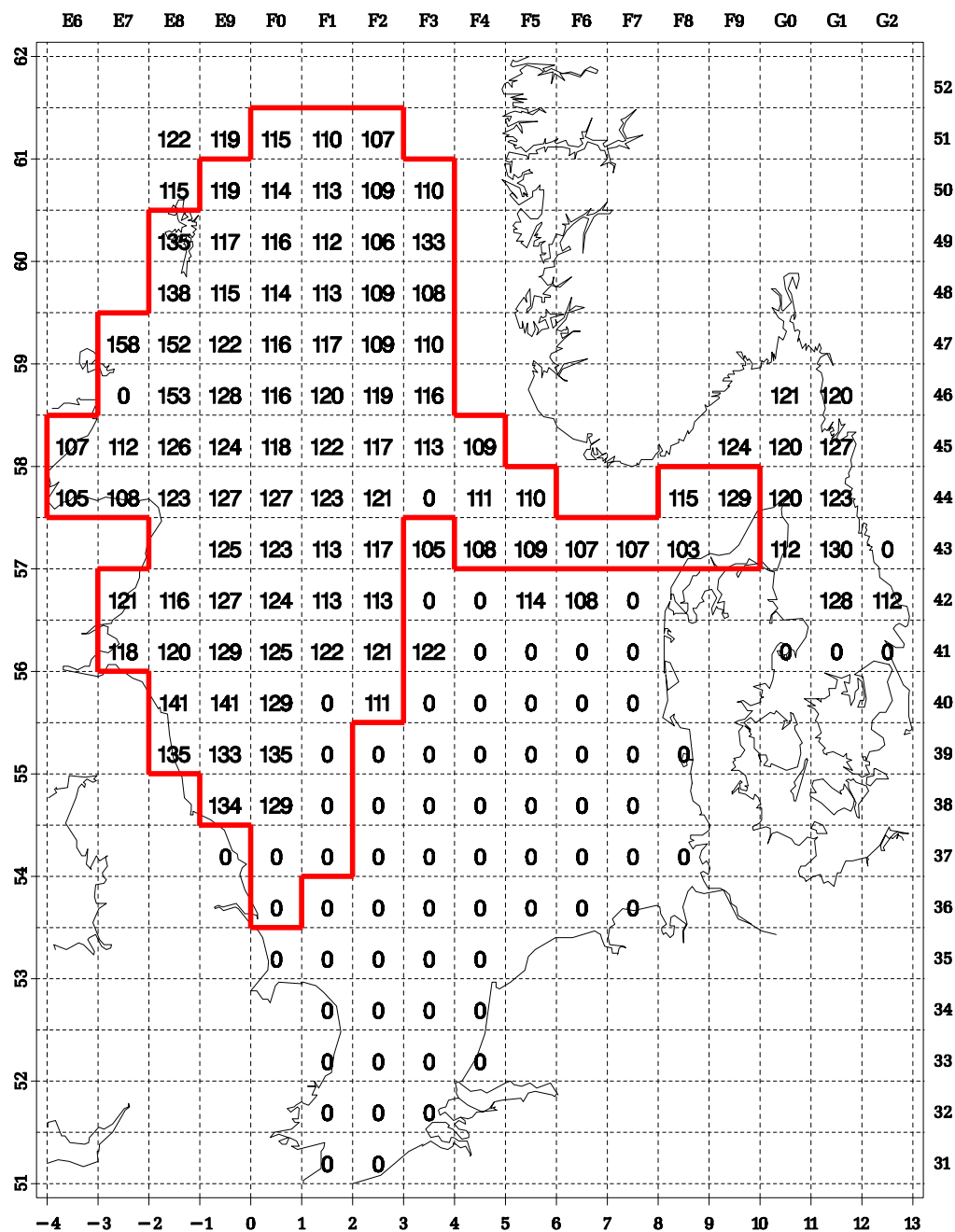


Figure 5.33 Norway pout: mean length (mm), age 1

Herring

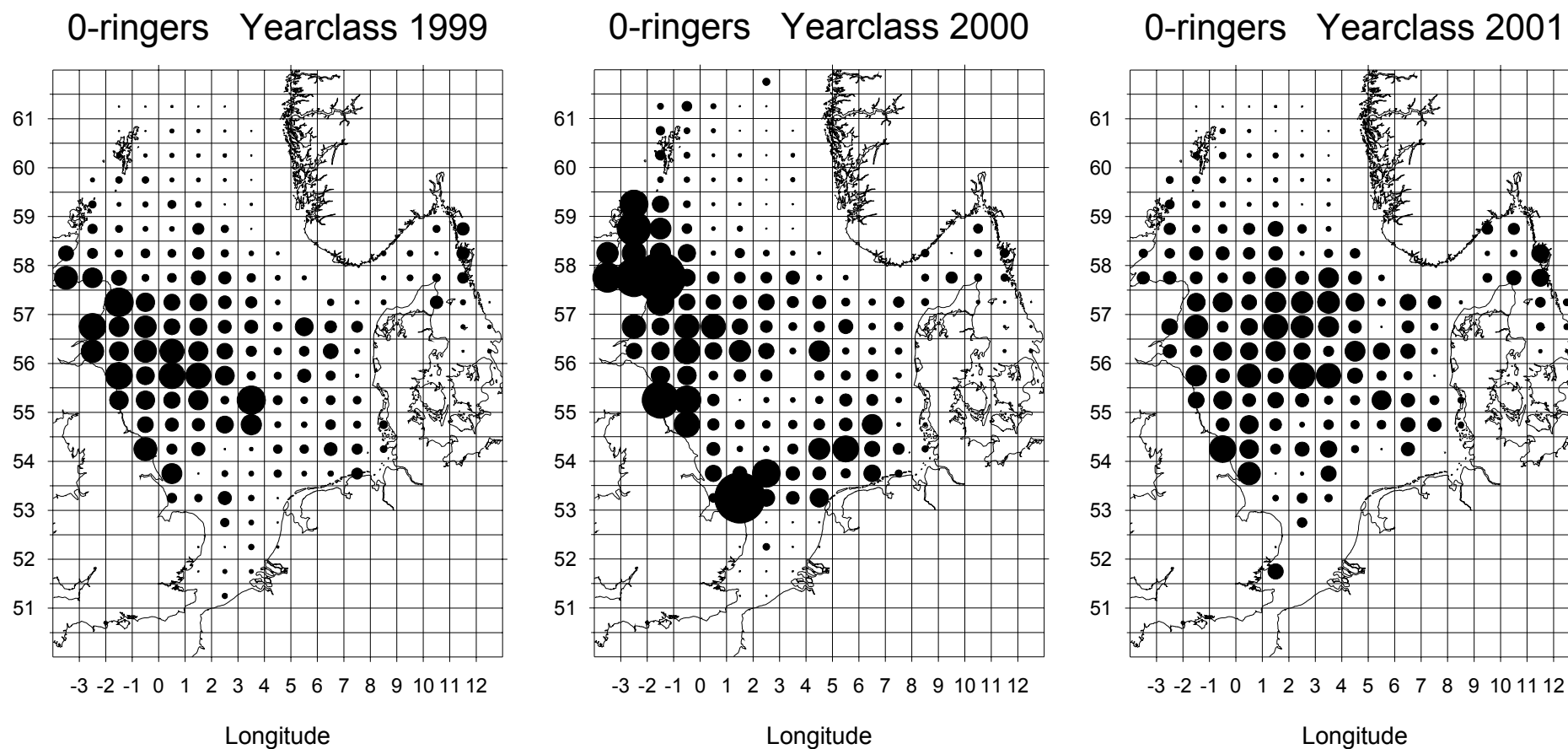


Figure 6.1 Distribution of 0-ringer herring, year classes 1999-2001. Abundance estimates of 0-ringers within each statistical rectangle are based on MIK catches during IBTS in February. Areas of filled circles illustrate densities in no m⁻², the area of a circle extending to the border of a rectangle represents 1 m⁻²

Relationship between herring recruitment indices

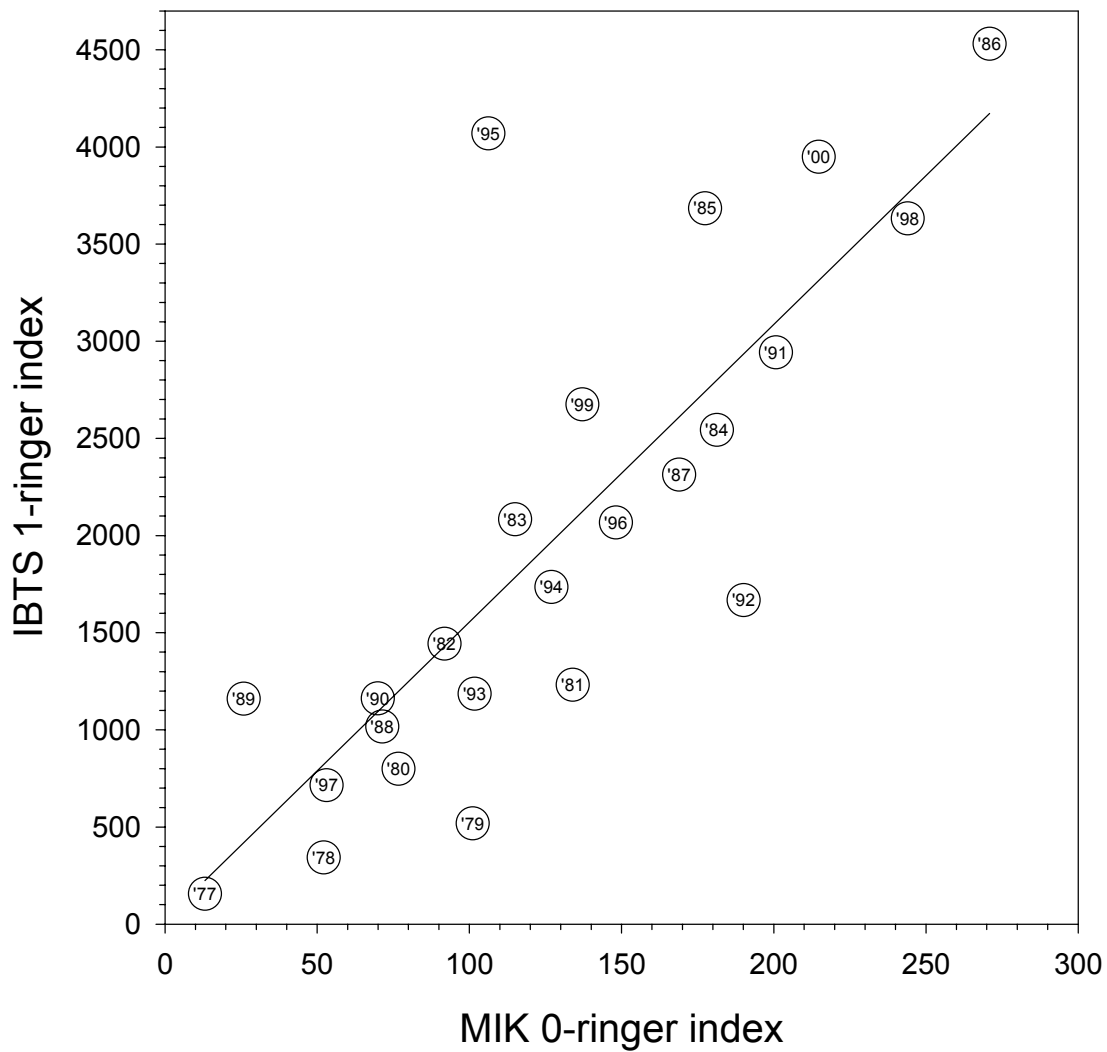


Figure 6.2. Herring recruitment indices. Relationship between the 0-ringer index and the 1-ringer index for year classes 1977 to 1997. Numbers in symbols indicate year class.

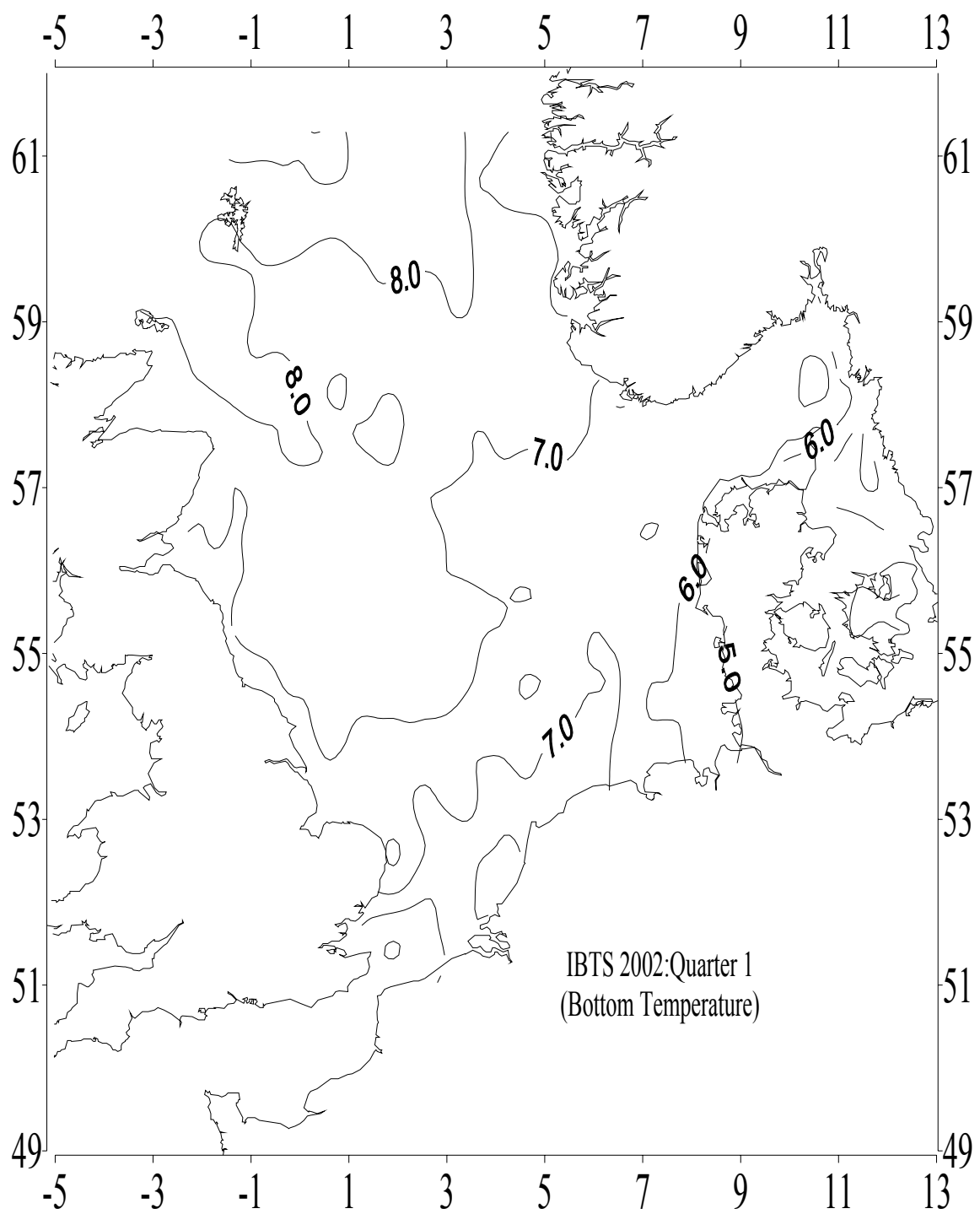


Figure 7.1

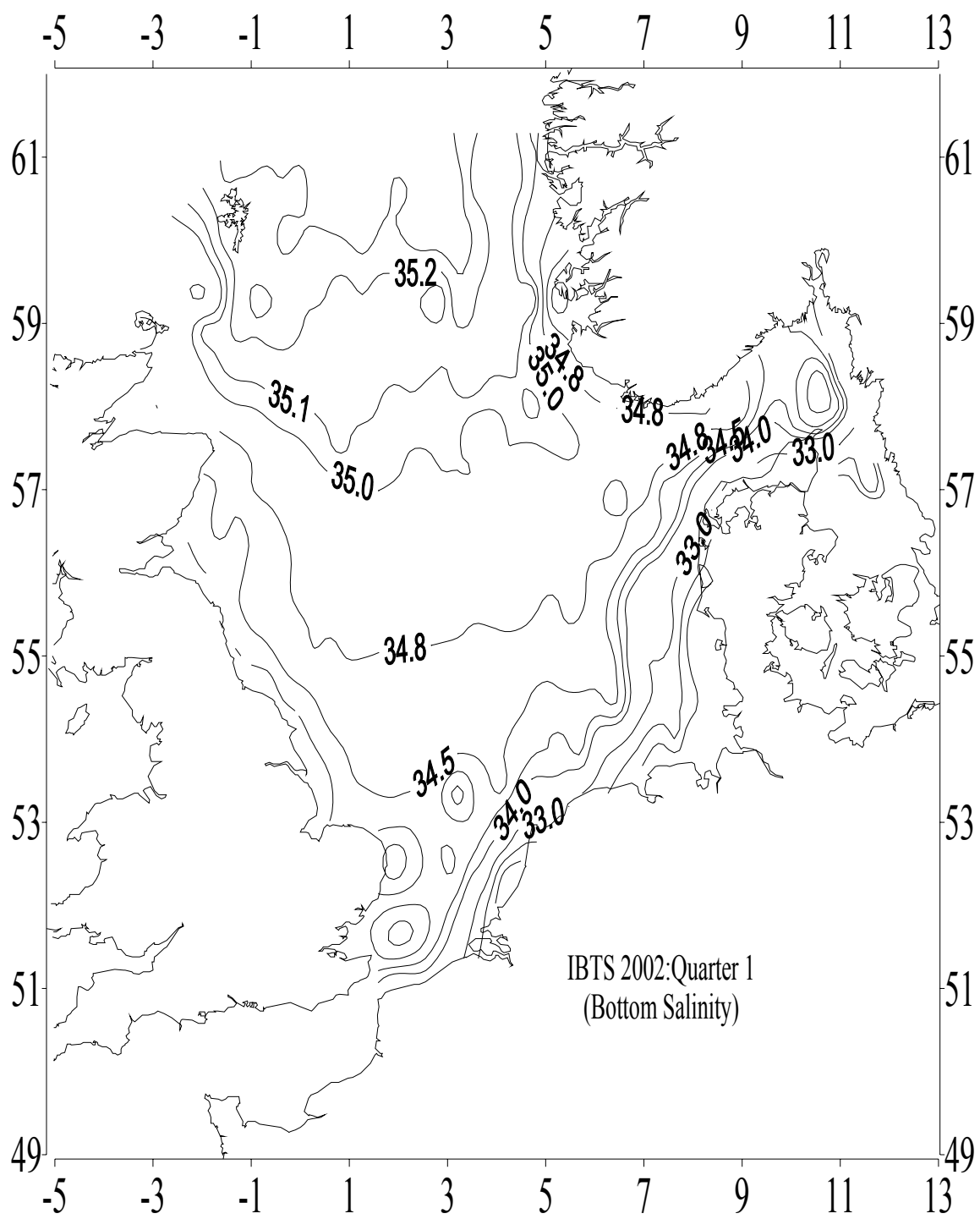


Figure 7.2

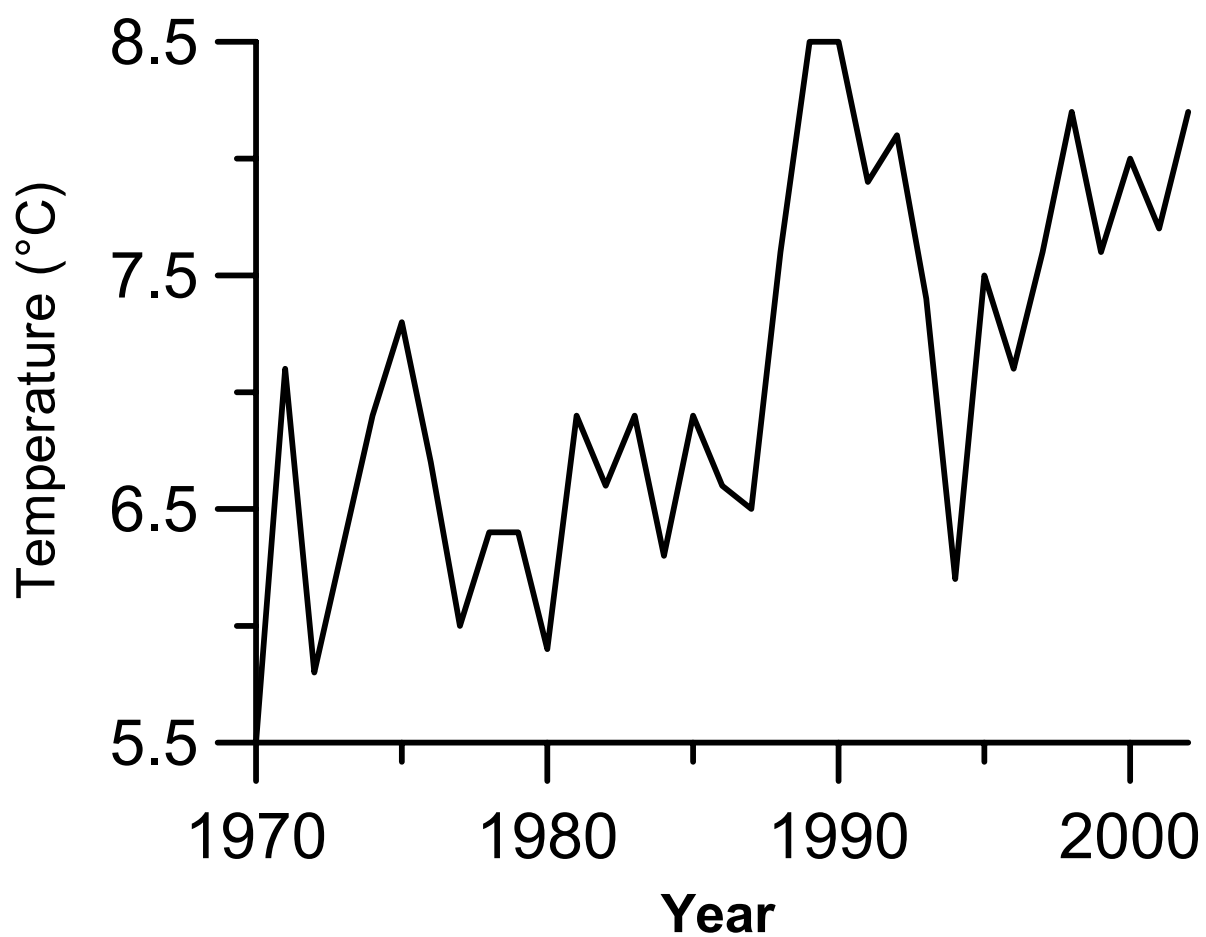


Figure 7.3 – Time series plot of temperature at Location “1” in Northern North Sea (see table 7.1)