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Biomass Estimate of the Northern Shrimp Stock on Flemish Cap
(Division 3M) for 1993 and 1994

by

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Introduction

Since May of 1993 a commercial fisheries for shrimp has been going on in the Flemish Cap (Div 3M) area. In the period May 1993 to August 1995 Faroese Vessels have caught about 19091 t in this area (Tab. 1). By and large, the weekly catches have fluctuated between 20 t and 60 t. Catches as reported each week to the Faroese Fishing Administration are presented in Tab. 2 and Fig. 1.

The following assessment is based on Faroese logbook data and is made in the same way as in two previous papers assessing this stock (Á. Nicolajsen, 1993 and 1994).

Material and method

This area swept assessment is based on 4754 recorded hauls by Faroese shrimp vessels in the period May 1993 - September 1994 which for each haul have information on date, time, position, towing time and shrimp catches. The hauls were grouped into squares of 10 degrees longitude and 7.5 degrees latitude. The material is divided into the years 1993 and 1994. Geographical distribution of number of hauls for each year is shown in Figs. 2 and 3.

Density is calculated by dividing catches by the area swept. The area swept is calculated as towing time times the average towing speed (2.75 nm/h) times the assumed effective width of the trawl (42 m). The biomass is calculated as area of square times density.

Results

Results of the calculations are shown in Table 3. Density in each square for 1993 and 1994 is presented in Figs. 4 and 5. In 1993 the average density was 2.03 g/m² and dropped to 1.24 g/m² in 1994. When squares with less than 5 hauls are left out, the biomass for 1993 was calculated as 23953 t compared with 14589 t for 1994. Biomass by squares for 1993 and 1994 is shown in Figs. 6 and 7.

References

- NAFO. Scientific Council Reports, 1993, 154 p.
- NAFO. Scientific Council Reports, 1994: 146-147 p.

Table 1 Shrimp catches caught by Faroese vessels in DIV 3M and 3L in the period May 1993 - August 1995.

Year	Catch t 3L	Catch t 3M
1993	0	8545
1994	355	6556
1995	0	3990
Sum	355	19091

Table 2 CPUE of shrimp caught by Faroese vessels in DIV 3M and 3L in the period May 1993 - August 1995.

Year	Week No	Catch/ vessel t 3L	No of vessels 3L	Catch/ vessel t 3M	No of vessels 3M
1993	21	0	0	92	3
1993	22	0	0	104	7
1993	23	0	0	75	7
1993	24	0	0	59	8
1993	25	0	0	46	9
1993	26	0	0	42	8
1993	27	0	0	52	7
1993	28	0	0	38	8
1993	29	0	0	39	7
1993	30	0	0	39	8
1993	31	0	0	46	8
1993	32	0	0	40	9
1993	33	0	0	41	8
1993	34	0	0	35	8
1993	35	0	0	29	8
1993	36	0	0	46	7
1993	37	0	0	30	7
1993	38	0	0	44	6
1993	39	0	0	34	6
1993	40	0	0	35	6
1993	41	0	0	35	5
1993	42	0	0	28	5
1993	43	0	0	32	4
1993	44	0	0	28	4
1993	45	0	0	30	4
1993	46	0	0	29	3
1993	47	0	0	21	4
1993	48	0	0	34	5
1993	49	0	0	32	5
1993	50	0	0	59	5
1993	51	0	0	46	5
1993	52	0	0	17	4
1994	1	0	0	20	2
1994	2	0	0	35	1
1994	3	0	0	55	1
1994	4	0	0	29	1
1994	5	0	0	29	1
1994	6	0	0	70	1
1994	7	0	0	32	3
1994	8	0	0	37	6

Table 2 CPUE of shrimp caught by Faroese vessels in DIV 3M and 3L in the period May 1993 - August 1995. (Continued).

Year	Week No	Catch/ vessel	No of vessels	Catch/ vessel	No of vessels
		t 3L	3L	t 3M	3M
1994	9	38	2	30	5
1994	10	35	2	22	5
1994	11	25	1	29	6
1994	12	44	2	18	5
1994	13	12	1	13	4
1994	14	16	1	5	2
1994	16	9	1	0	1
1994	17	0	0	24	1
1994	18	30	1	0	1
1994	19	29	1	0	1
1994	20	0	0	26	5
1994	21	0	0	38	7
1994	22	0	0	35	8
1994	23	0	0	45	8
1994	24	0	0	42	8
1994	25	0	0	43	8
1994	26	0	0	37	8
1994	27	0	0	25	8
1994	28	0	0	36	9
1994	29	0	0	24	9
1994	30	0	0	32	10
1994	31	0	0	24	8
1994	32	0	0	34	8
1994	33	0	0	24	8
1994	34	0	0	22	9
1994	35	0	0	22	9
1994	36	0	0	20	7
1994	37	0	0	23	6
1994	38	0	0	22	6
1994	39	0	0	19	6
1994	40	0	0	19	4
1994	41	0	0	22	4
1994	42	0	0	20	3
1994	43	0	0	22	3
1994	44	0	0	12	2
1994	45	0	0	18	3
1994	46	0	0	25	3
1994	47	0	0	27	3
1994	48	0	0	21	3
1994	49	0	0	19	3
1994	50	0	0	13	3
1994	51	0	0	21	1
1994	52	0	0	31	1
1995	10	0	0	6	1
1995	11	0	0	25	3
1995	12	0	0	25	3
1995	13	0	0	31	3
1995	14	0	0	30	3
1995	15	0	0	27	4
1995	16	0	0	42	4
1995	17	0	0	36	4
1995	18	0	0	39	4
1995	19	0	0	56	4
1995	20	0	0	54	4
1995	21	0	0	57	4

Table 2 CPUE of shrimp caught by Faroese vessels in DIV 3M and 3L in the period May 1993 - August 1995. (Continued).

Year	Week No	Catch/ vessel	No of vessels	Catch/ vessel	No of vessels
		t 3L	3L	t 3M	3M
1995	22	0	0	35	3
1995	23	0	0	33	3
1995	24	0	0	53	4
1995	25	0	0	40	5
1995	26	0	0	39	5
1995	27	0	0	51	4
1995	28	0	0	47	4
1995	29	0	0	27	4
1995	30	0	0	35	6
1995	31	0	0	46	6
1995	32	0	0	29	6
1995	33	0	0	40	6
1995	34	0	0	28	6
1995	35	0	0	20	1

Table 3. Calculated values for density, area, and biomass by squares in Div 3M for 1993 and 1994.

Year	Midpoint of square Longitude	Latitude	No of hauls	Density g/m ²	Area Km ²	Biomass tonnes
1993	-46.35	46.34	4	1.35		
1993	-46.35	46.41	1	0.29		
1993	-46.35	46.49	2	1.53		
1993	-46.35	46.56	1	1.62		
1993	-46.25	46.34	1	2.05		
1993	-46.25	46.41	5	1.11	177	198
1993	-46.25	46.49	35	1.53	177	271
1993	-46.25	46.56	88	1.69	177	299
1993	-46.25	47.04	77	1.99	177	353
1993	-46.25	47.11	32	1.59	177	283
1993	-46.25	47.19	1	5.47		
1993	-46.25	47.34	1	0.72		
1993	-46.25	47.41	1	5.39		
1993	-46.25	47.56	1	2.74		
1993	-46.15	46.26	1	1.25		
1993	-46.15	46.34	2	1.57		
1993	-46.15	46.41	76	1.54	178	275
1993	-46.15	46.49	157	2.01	178	357
1993	-46.15	46.56	26	1.63	178	289
1993	-46.15	47.04	75	2.00	178	356
1993	-46.15	47.11	111	1.81	178	322
1993	-46.15	47.19	5	1.62	178	288
1993	-46.05	46.19	5	2.71	178	484
1993	-46.05	46.26	1	1.39		
1993	-46.05	46.34	47	1.88	178	335
1993	-46.05	46.41	127	2.08	178	371
1993	-46.05	46.49	24	1.34	178	240
1993	-46.05	47.04	30	1.51	178	269
1993	-46.05	47.11	69	1.78	178	317
1993	-46.05	47.19	82	1.80	178	322
1993	-46.05	47.26	23	2.02	178	361
1993	-46.05	47.34	1	0.53		
1993	-45.55	46.04	1	1.16		
1993	-45.55	46.19	1	1.79		
1993	-45.55	46.34	56	2.21	179	396
1993	-45.55	46.41	96	2.03	179	364
1993	-45.55	46.49	3	2.96		
1993	-45.55	47.04	1	2.09		
1993	-45.55	47.11	5	1.44	179	257
1993	-45.55	47.19	11	1.82	179	326
1993	-45.55	47.26	27	1.64	179	294
1993	-45.55	47.34	57	2.05	179	367
1993	-45.55	47.41	4	2.11		
1993	-45.55	47.49	3	1.39		
1993	-45.45	46.34	5	1.15	179	206
1993	-45.45	46.41	11	2.23	179	399
1993	-45.45	47.26	2	1.64		
1993	-45.45	47.34	17	2.22	179	399
1993	-45.45	47.41	39	2.75	179	493
1993	-45.45	47.49	20	2.72	179	488
1993	-45.45	47.56	1	0.74		
1993	-45.45	48.04	1	3.44		
1993	-45.35	46.26	2	1.00		
1993	-45.35	46.34	1	4.06		
1993	-45.35	46.41	2	1.87		

Table 3 Calculated values for density, area, and biomass by squares in Div 3M for 1993 and 1994 (continued).

Midpoint of square Year	Longitude	No of Latitude	Density hauls	Area g/m ²	Biomass Km ²	tonnes
1993	-45.35	47.19	2	3.84		
1993	-45.35	47.41	1	2.52		
1993	-45.35	47.49	40	1.94	180	349
1993	-45.35	47.56	26	2.46	180	442
1993	-45.35	48.04	17	1.56	180	281
1993	-45.25	46.34	5	2.28	181	411
1993	-45.25	46.56	1	0.59		
1993	-45.25	47.26	1	3.56		
1993	-45.25	47.34	1	5.15		
1993	-45.25	47.56	36	2.76	181	498
1993	-45.25	48.04	114	2.48	181	448
1993	-45.25	48.11	23	1.74	181	314
1993	-45.25	48.26	2	3.59		
1993	-45.25	48.34	1	2.56		
1993	-45.15	46.26	1	0.15		
1993	-45.15	47.04	1	1.69		
1993	-45.15	47.34	3	2.09		
1993	-45.15	47.41	1	0.00		
1993	-45.15	47.56	5	1.55	181	280
1993	-45.15	48.04	150	2.73	181	494
1993	-45.15	48.11	66	2.63	181	477
1993	-45.15	48.19	11	1.84	181	333
1993	-45.15	48.26	1	2.97		
1993	-45.05	46.41	2	1.65		
1993	-45.05	47.34	1	4.17		
1993	-45.05	47.56	1	2.11		
1993	-45.05	48.04	132	2.46	182	446
1993	-45.05	48.11	99	3.24	182	588
1993	-45.05	48.19	1	3.15		
1993	-45.05	48.26	1	5.37		
1993	-44.55	47.34	1	0.54		
1993	-44.55	47.56	3	1.12		
1993	-44.55	48.04	88	2.12	182	385
1993	-44.55	48.11	65	1.99	182	362
1993	-44.55	48.19	1	1.37		
1993	-44.45	47.49	1	0.75		
1993	-44.45	47.56	13	2.57	183	470
1993	-44.45	48.04	89	1.89	183	345
1993	-44.45	48.11	15	1.96	183	358
1993	-44.45	48.26	2	2.65		
1993	-44.35	47.26	1	1.69		
1993	-44.35	47.34	2	2.67		
1993	-44.35	47.41	1	0.38		
1993	-44.35	47.56	105	2.37	183	435
1993	-44.35	48.04	18	1.55	183	283
1993	-44.35	48.11	2	1.90		
1993	-44.35	48.26	3	2.76		
1993	-44.35	48.56	1	2.42		
1993	-44.25	47.04	1	1.27		
1993	-44.25	47.34	1	3.52		
1993	-44.25	47.41	7	1.92	184	352
1993	-44.25	47.49	42	1.66	184	305
1993	-44.25	47.56	36	1.64	184	302
1993	-44.25	48.04	1	2.37		
1993	-44.15	46.41	5	1.69	184	312

Table 3 Calculated values for density, area, and biomass by squares in Div 3M for 1993 and 1994 (continued).

Midpoint of square Year	Longitude	No of Latitude	Density hauls	Area g/m2	Biomass Km2	tonnes
1993	-44.15	47.34	19	1.49	184	275
1993	-44.15	47.41	80	1.85	184	342
1993	-44.15	47.49	17	2.10	184	388
1993	-44.15	47.56	1	2.17		
1993	-44.15	48.04	1	1.98		
1993	-44.05	46.34	1	1.87		
1993	-44.05	46.49	11	2.05	185	379
1993	-44.05	46.56	30	1.46	185	269
1993	-44.05	47.04	27	1.58	185	292
1993	-44.05	47.11	20	1.31	185	242
1993	-44.05	47.19	85	1.73	185	320
1993	-44.05	47.26	33	1.56	185	288
1993	-44.05	47.34	40	1.76	185	326
1993	-44.05	47.41	6	1.19	185	219
1993	-44.05	48.04	1	3.43		
1993	-43.55	46.56	12	2.35	185	436
1993	-43.55	47.04	27	1.68	185	311
1993	-43.55	47.11	33	1.68	185	311
1993	-43.55	47.19	27	1.67	185	309
1993	-43.55	47.26	3	0.75		
1993	-43.05	48.56	2	2.85		
				Average density g/m2	Total area km2	Total biomass tonnes
				2.03	12487	23953

Table 3 Calculated values for density, area, and biomass by squares in Div 3M for 1993 and 1994 (continued).

Year	Midpoint of square Longitude	Latitude	No of hauls	Density g/m ²	Area Km ²	Biomass tonnes
1994	-46.35	46.26	1	0.00		
1994	-46.35	47.04	3	1.37		
1994	-46.25	46.26	1	1.02		
1994	-46.25	46.34	1	0.97		
1994	-46.25	46.41	2	1.33		
1994	-46.25	46.49	16	0.98	177	175
1994	-46.25	46.56	63	1.68	177	298
1994	-46.25	47.04	102	1.52	177	270
1994	-46.25	47.11	88	1.54	177	273
1994	-46.25	47.19	14	1.27	177	226
1994	-46.15	46.26	1	0.76		
1994	-46.15	46.34	12	1.37	178	243
1994	-46.15	46.41	39	1.36	178	243
1994	-46.15	46.49	38	1.60	178	285
1994	-46.15	46.56	25	1.03	178	184
1994	-46.15	47.04	74	1.35	178	240
1994	-46.15	47.11	87	1.29	178	230
1994	-46.15	47.19	41	1.52	178	270
1994	-46.15	47.26	29	1.72	178	305
1994	-46.05	46.26	8	0.74	178	131
1994	-46.05	46.34	35	1.30	178	232
1994	-46.05	46.41	27	0.83	178	148
1994	-46.05	46.49	7	1.56	178	279
1994	-46.05	46.56	10	1.79	178	319
1994	-46.05	47.04	44	1.49	178	267
1994	-46.05	47.11	64	1.32	178	235
1994	-46.05	47.19	24	1.22	178	218
1994	-46.05	47.26	34	1.81	178	322
1994	-46.05	47.34	22	1.51	178	269
1994	-45.55	46.26	14	1.03	179	185
1994	-45.55	46.34	44	1.34	179	239
1994	-45.55	46.41	16	0.91	179	162
1994	-45.55	46.56	3	2.56		
1994	-45.55	47.04	12	1.93	179	345
1994	-45.55	47.11	23	1.62	179	291
1994	-45.55	47.19	25	1.51	179	271
1994	-45.55	47.26	37	1.27	179	228
1994	-45.55	47.34	26	1.34	179	241
1994	-45.55	47.41	14	1.58	179	283
1994	-45.55	47.49	18	1.60	179	287
1994	-45.55	47.56	1	1.87		
1994	-45.45	46.34	5	0.87	179	156
1994	-45.45	46.41	1	0.76		
1994	-45.45	47.11	1	1.59		
1994	-45.45	47.19	13	2.09	179	376
1994	-45.45	47.26	28	2.12	179	380
1994	-45.45	47.34	34	2.17	179	390
1994	-45.45	47.41	13	1.81	179	325
1994	-45.45	47.49	13	3.24	179	581
1994	-45.45	47.56	12	1.32	179	238
1994	-45.45	48.04	16	1.89	179	339
1994	-45.45	48.34	1	2.69		
1994	-45.35	46.34	1	1.32		
1994	-45.35	46.56	1	0.28		

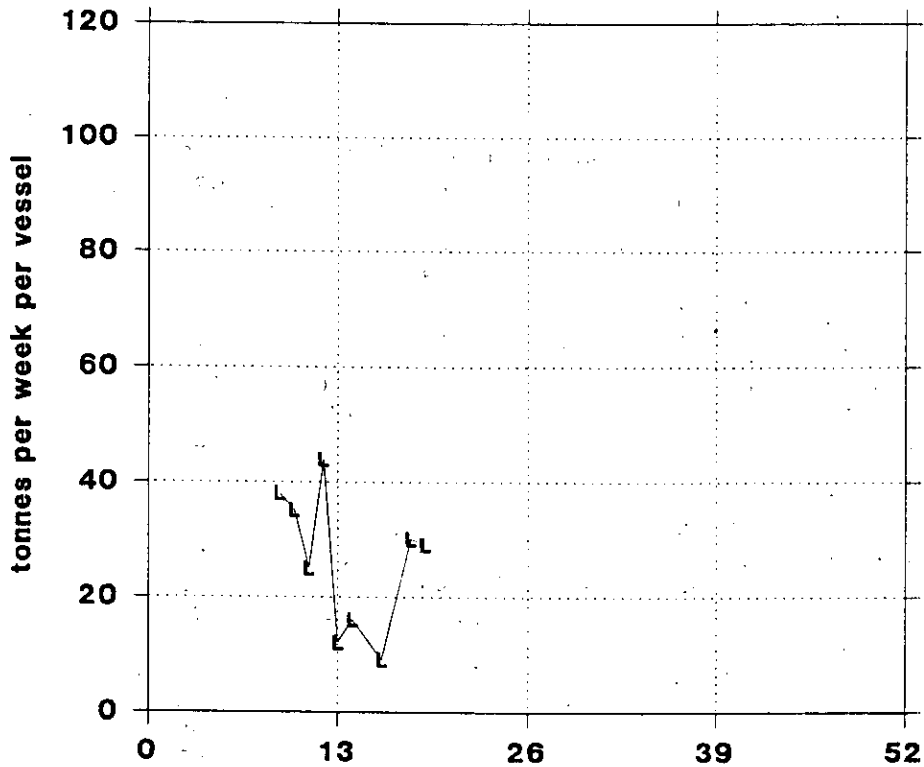
Table 3 Calculated values for density, area, and biomass by squares in Div 3M for 1993 and 1994 (continued).

Year	Midpoint of square Longitude	Latitude	No of hauls	Density g/m ²	Area Km ²	Biomass tonnes
1994	-45.35	47.11	1	0.05		
1994	-45.35	47.26	1	2.65		
1994	-45.35	47.34	1	1.14		
1994	-45.35	47.41	3	0.44		
1994	-45.35	47.49	17	1.55	180	280
1994	-45.35	47.56	9	1.00	180	180
1994	-45.35	48.04	11	1.26	180	227
1994	-45.35	48.11	12	1.57	180	283
1994	-45.35	48.19	3	0.84		
1994	-45.25	47.19	3	1.32		
1994	-45.25	47.49	1	0.31		
1994	-45.25	47.56	6	1.14	181	206
1994	-45.25	48.04	10	1.45	181	262
1994	-45.25	48.11	23	1.10	181	198
1994	-45.25	48.19	3	1.16		
1994	-45.15	47.56	1	0.21		
1994	-45.15	48.04	13	1.45	181	263
1994	-45.15	48.11	30	1.08	181	195
1994	-45.15	48.19	22	1.13	181	205
1994	-45.15	48.26	5	1.66	181	301
1994	-45.05	47.34	2	2.16		
1994	-45.05	48.04	14	2.01	182	365
1994	-45.05	48.11	25	1.17	182	212
1994	-45.05	48.19	19	1.21	182	219
1994	-45.05	48.26	2	0.40		
1994	-44.55	46.26	1	0.27		
1994	-44.55	48.04	2	1.22		
1994	-44.55	48.11	7	1.19	182	217
1994	-44.55	48.19	3	1.58		
1994	-44.45	46.26	1	0.02		
1994	-44.45	48.11	3	0.54		
1994	-44.35	46.34	1	0.00		
1994	-44.35	48.04	3	0.78		
1994	-44.05	46.49	1	0.00		
1994	-44.05	46.56	1	0.00		
1994	-43.55	47.04	5	0.00	185	0
1994	-43.45	47.04	1	0.00		

Average	Total	Total
density	area	biomass
g/m ²	km ²	tonnes
1.24	10217	14589

Northern shrimp, NAFO Div 3L, 1994

Weekly catches by Faroese vessels



Northern shrimp, NAFO Div 3M, 1993

Weekly catches by Faroese vessels

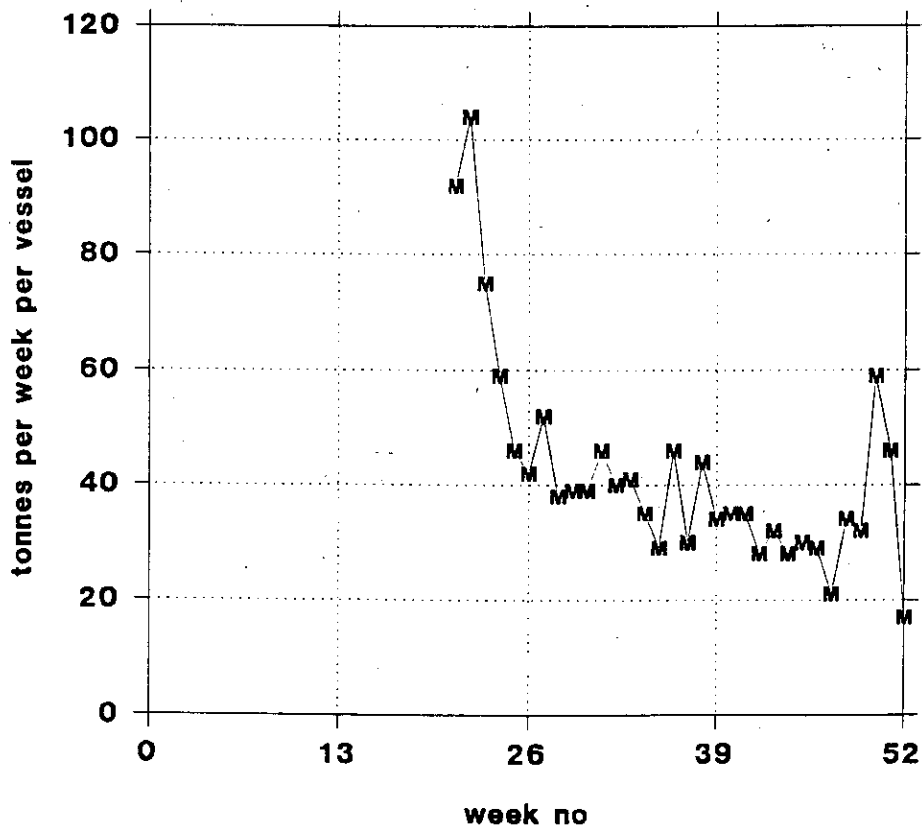
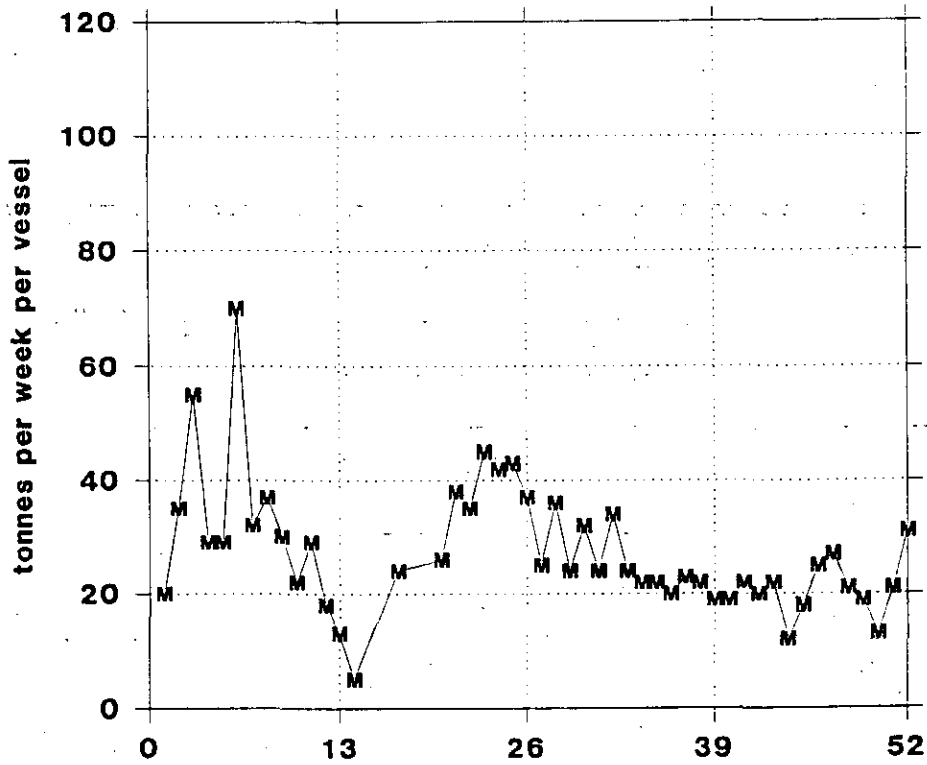


Figure 1 Variation in CPUE (t/week/vessel) in Div 3M and 3L in the period May 1993 - August 1995.

Northern shrimp, NAFO Div 3M, 1994 Weekly catches by Faroese vessels



Northern shrimp, NAFO Div 3M, 1995 Weekly catches by Faroese vessels

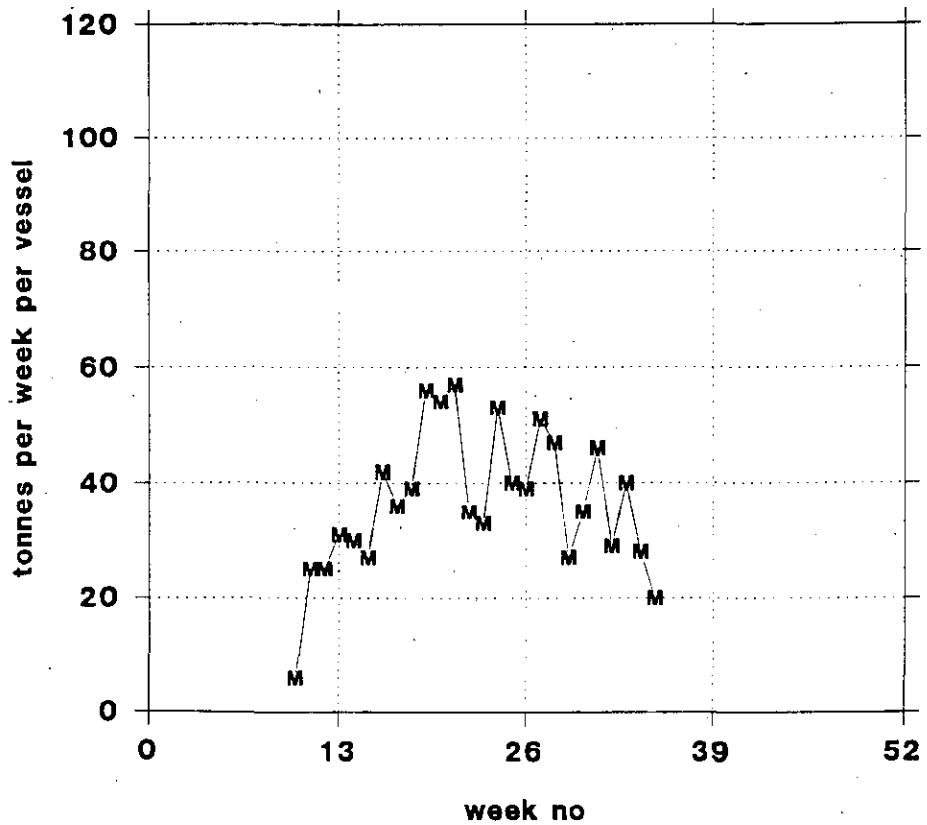


Figure 1 Variation in CPUE (t/week/vessel) in Div 3M and 3L in the period May 1993 - August 1995.

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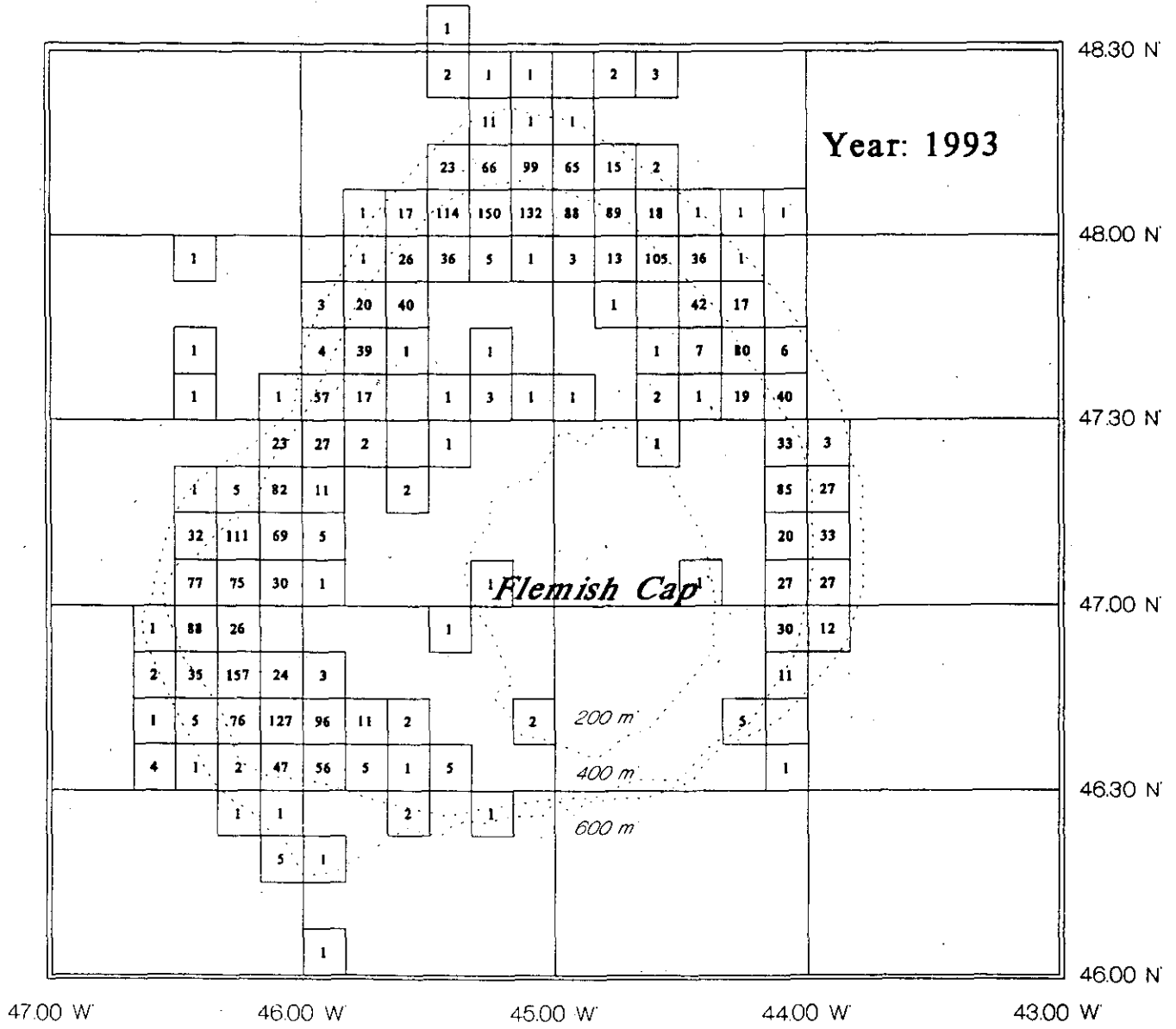


Figure 2 Geographical distribution of number of hauls in the period May 1993 - December 1993.

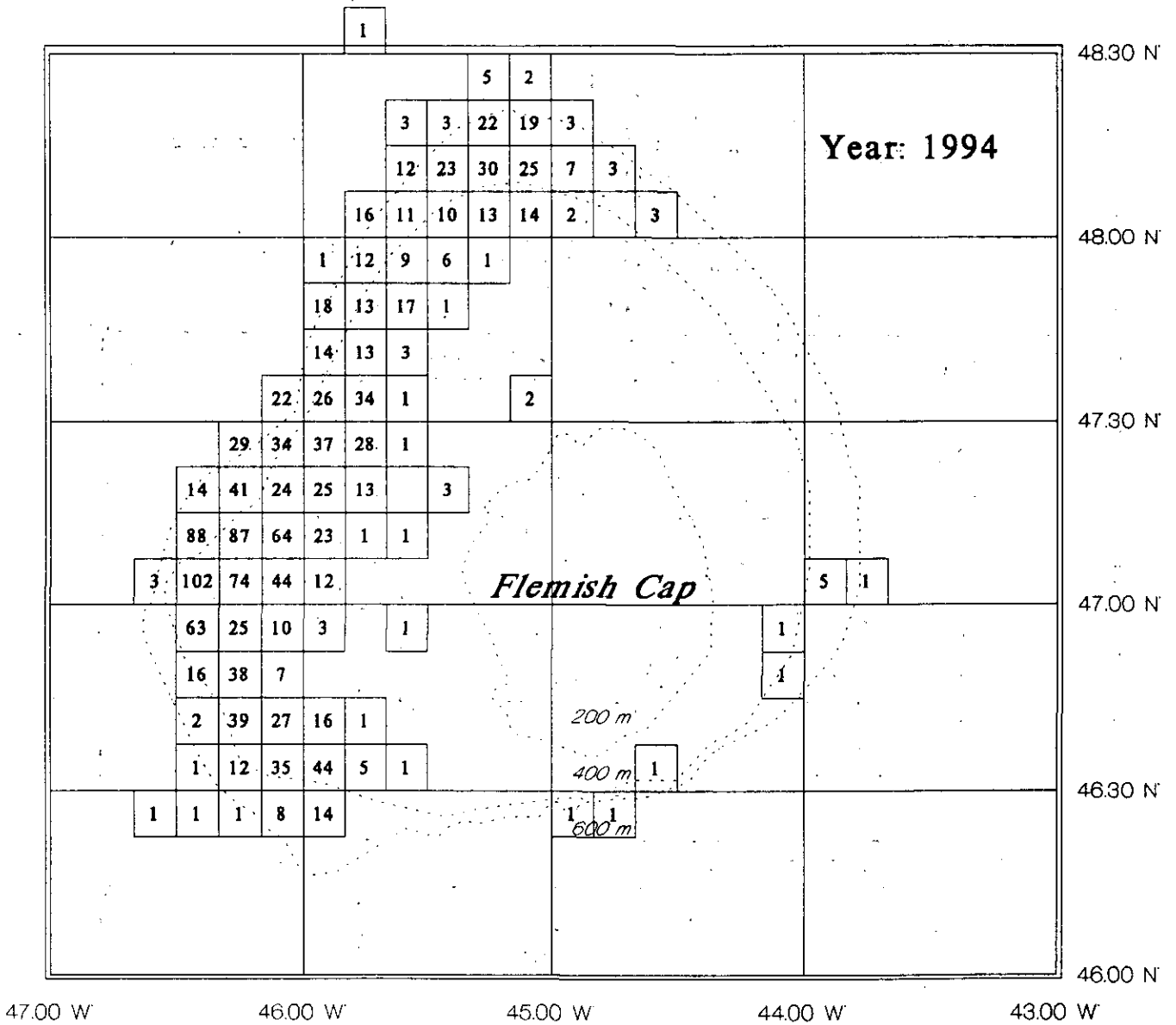


Figure 3 Geographical distribution of number of hauls in the period January 1994 - September 1994.

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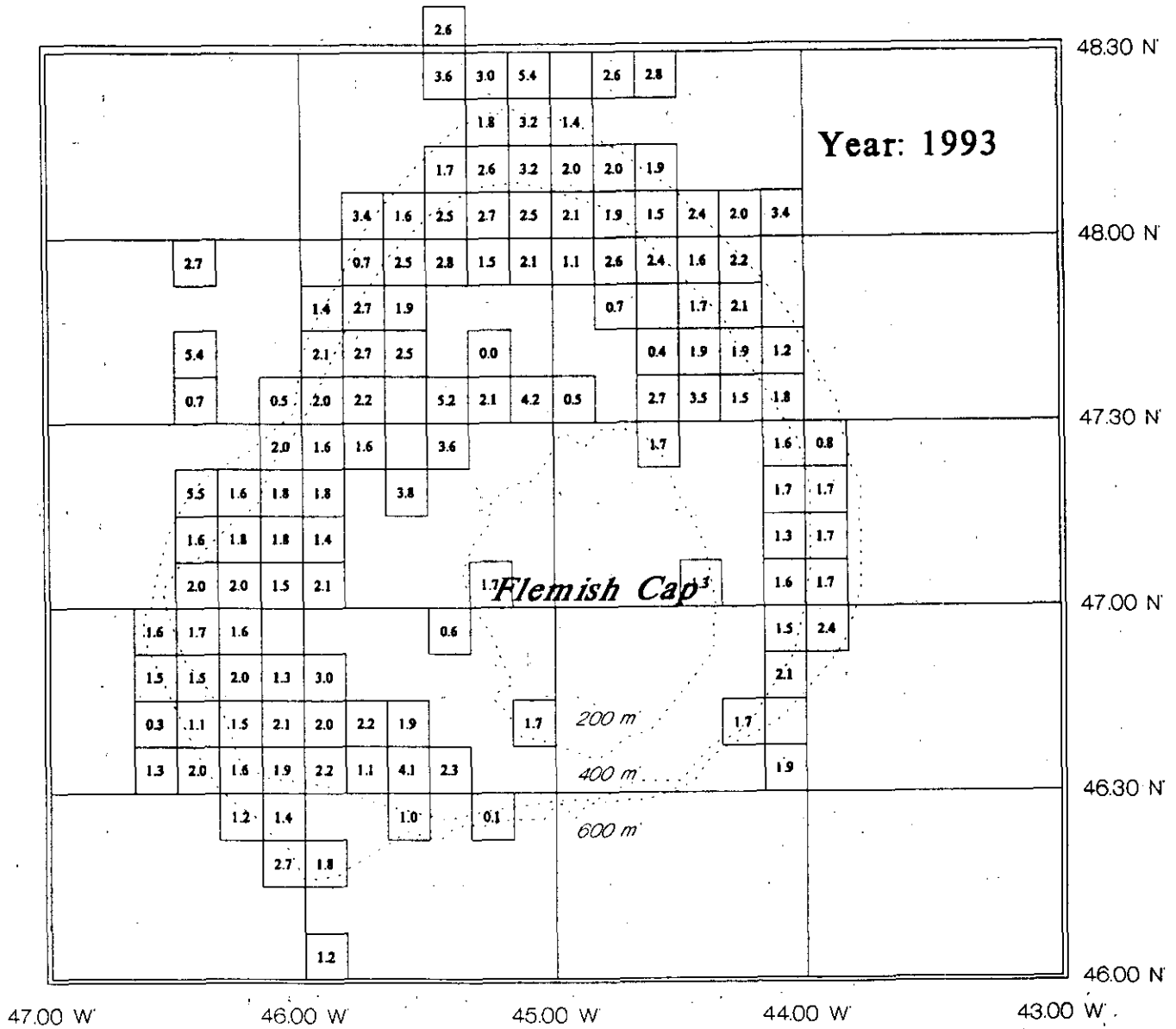


Figure 4 Geographical distribution of density (g/m^3) in the period May 1993 - December 1993.

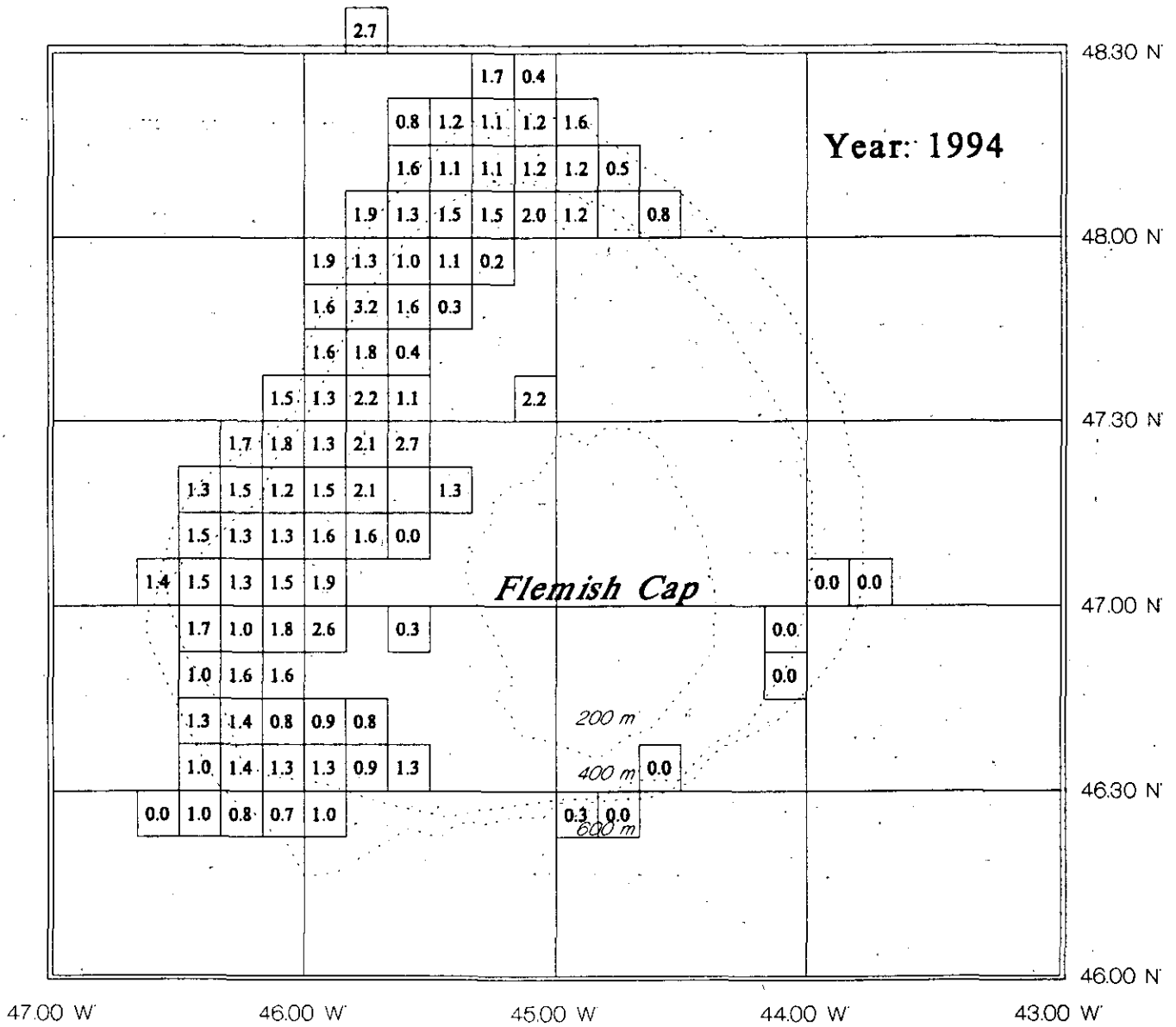


Figure 5 Geographical distribution of density (g/m³) in the period January 1994 - September 1994.

443

536

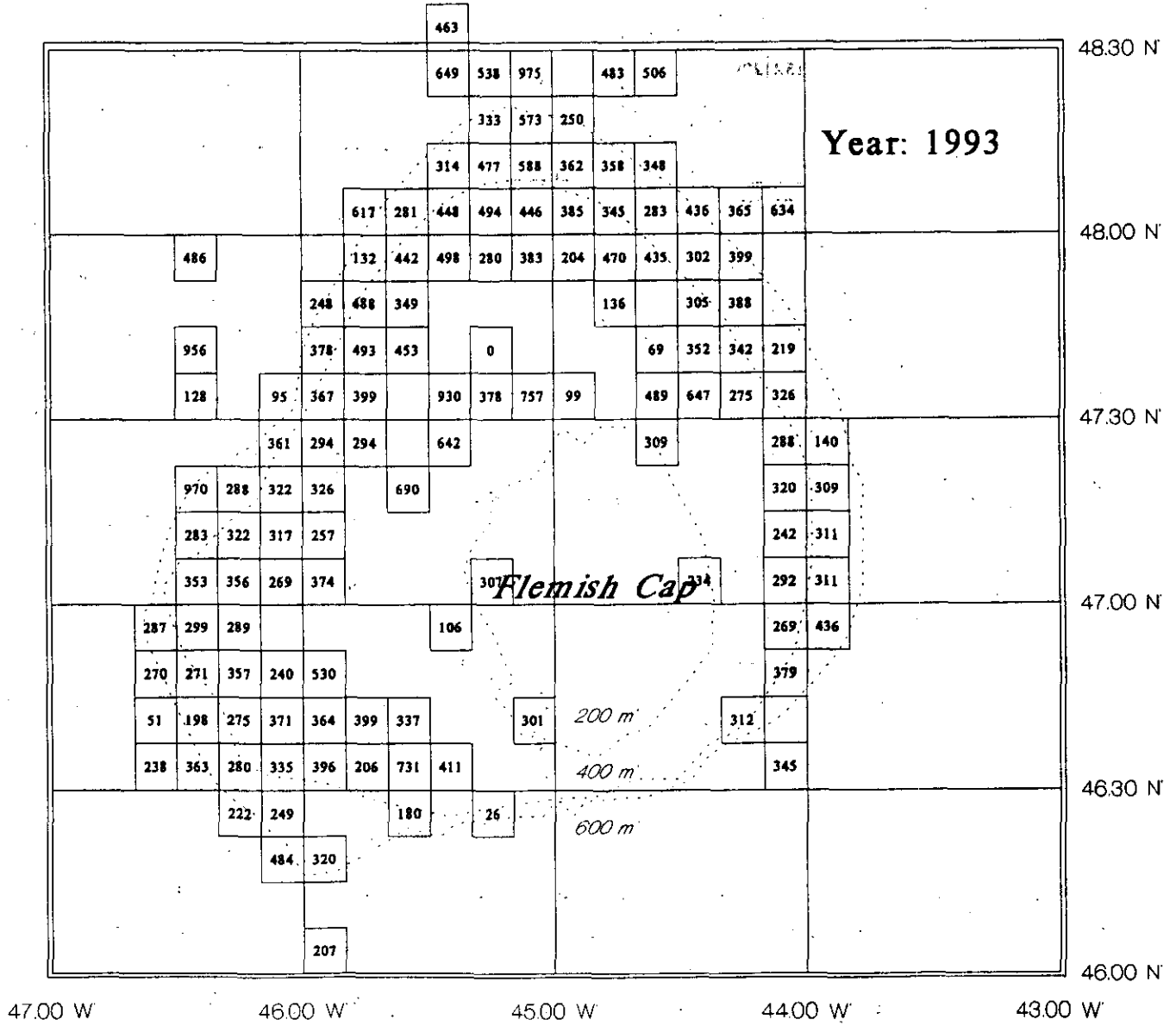


Figure 6 Geographical distribution of biomass (t) in the period May 1993 - December 1993.

