



SCIENTIFIC COUNCIL MEETING – JUNE 2007

Results from Bottom Trawl Survey on Flemish Cap of June-July 2006

by

José Miguel Casas¹ and Diana González Troncoso¹

¹Instituto Español de Oceanografía

Cabo Estay – Canido 36200 Vigo, Spain

mikel.casas@vi.ieo.es

Abstract

A stratified random bottom trawl survey on Flemish Cap was carried out from June 28th to July 27th 2006. The area surveyed was extended up to depths of 800 fathoms (1400 meters) following the same procedures as in previous years and increasing the number of hauls planned (195). The survey was carried out by the *R/V Vizconde de Eza* with the usual survey gear (Lofoten). A total of 179 valid hauls were made by the vessel *R/V Vizconde de Eza*, 115 up to 730 meters depth and 64 up to 1400 meters. Survey results including abundance indices of the main commercial species and age distributions for cod, redfish, American plaice, Greenland halibut and Shrimp are presented. The general indexes for this year are estimated taken into account the traditional swept area (strata 1-19, up to depths of 730 m.) and the total area surveyed (strata 1-34, up to depths of 1400 m.).

Introduction

The survey on Flemish Cap was carried out on board *R/V Vizconde de Eza* in 2006. A total of 179 valid bottom trawls were made up to a depth of 1400 m (800 fathoms) (Fig. 1). The survey covered all strata of the bank adequately with the exception of the strata corresponding with the Beothuk knoll (35-39 strata) in the southwest of the bank. A synoptic sheet of the survey with vessel and gear characteristics is shown in Table 1. This was the 19th survey of the series initiated by the EU in 1988. All surveys had a stratified random design following NAFO specifications (Doubleday, 1981). Dates of the previous surveys were:

Year	Vessel	Valid		111		Valid	
		tows	Dates	Year	Vessel	tows	Dates
1988	Cornide de Saavedra	115	8/7 – 22/7	1998	Cornide de Saavedra	119	17/7 – 2/8
1989	Cryos	116	12/7 – 1/8	1999	Cornide de Saavedra	117	2/7 – 20/7
1990	Ignat Pavlyuchenkov	113	18/7 – 6/8	2000	Cornide de Saavedra	120	10/7 – 28/7
1991	Cornide de Saavedra	117	24/6 – 11/7	2001	Cornide de Saavedra	120	3/7 – 20/7
1992	Cornide de Saavedra	117	29/6 – 18/7	2002	Cornide de Saavedra	120	30/6 – 17/7
1993	Cornide de Saavedra	101	23/6 – 8/7	2003	Vizconde de Eza	114	2/6 – 27/7
1994	Cornide de Saavedra	116	6/7 – 23/7	2004	Vizconde de Eza	177 ¹	25/6 – 2/8
1995	Cornide de Saavedra	121	2/7 – 19/7	2005	Vizconde de Eza	176 ²	1/7 – 21/8
1996	Cornide de Saavedra	117	28/6 – 14/7	2006	Vizconde de Eza	179 ³	28/6 – 27/7
1997	Cornide de Saavedra	117	16/7 – 1/8				

¹ 124 valid tows were carried out in depths lesser than 400 fathoms.

² 117 valid tows were carried out in depths lesser than 400 fathoms.

³ 115 valid tows were carried out in depths lesser than 400 fathoms.

Material and Methods

As the last year, the *R/V Vizconde de Eza* carried out the survey following the same procedures as in previous years, the same bottom trawl net Lofoten, with a cod-end mesh size of 35 mm, as well as all other details of its use (Saborido-Rey and Vazquez, 2003).

Results

Following the agreement of the NAFO Standing Committee on Fisheries Science (STACFIS), on preferring mean number or weight per tow over other survey indices, most tables in the report are presented in that way. Details on changes were presented in a previous report (Saborido-Rey and Vazquez, 2003).

Mean catch per tow (Kg) of main species in past surveys are:

Survey	Cod	American plaice	Redfish	Greenland halibut	Roughhead grenadier	Shrimp
1988	50.78	19.95	234.19	8.61	2.50	7.14
1989	141.82	17.47	202.11	5.56	1.08	2.86
1990	73.82	14.90	157.62	7.21	1.06	4.34
1991	50.05	12.54	95.69	10.16	1.66	14.50
1992	33.22	10.76	161.91	10.85	1.96	31.28
1993	75.81	9.78	90.29	8.12	3.76	15.03
1994	32.91	10.23	202.10	9.99	2.46	4.95
1995	12.06	8.44	108.98	13.52	1.94	9.33
1996	11.21	5.10	148.80	14.42	1.69	13.56
1997	12.39	3.76	206.19	20.02	1.49	9.58
1998	6.20	4.27	88.08	30.13	2.10	52.19
1999	3.55	3.21	122.67	26.37	1.55	32.00
2000	3.81	2.00	221.33	21.09	1.30	24.52
2001	3.35	2.99	96.18	17.25	2.59	35.21
2002	3.10	2.55	150.85	15.05	1.51	49.96
2003	1.98	2.84	116.66	7.73	2.92	26.75
2004* ₍₁₋₁₉₎	5.06	4.38	311.62	15.28	4.47	25.03
2005* ₍₁₋₁₉₎	6.52	3.43	563.35	14.55	2.97	38.14
2006* ₍₁₋₁₉₎	15.55	2.10	953.65	14.56	4.89	20.19
2004 ₍₁₋₃₄₎	3.32	2.88	204.71	23.15	14.03	16.49
2005 ₍₁₋₃₄₎	4.19	2.21	362.21	17.20	11.39	24.93
2006 ₍₁₋₃₄₎	10.00	1.35	613.12	19.47	9.68	13.14

*Mean catch per tow for the comparable area and depths in the total historical series.

These survey indices are also presented in Table 2, and even they belong to different species and pelagic vs. demersal character and the transformation to the new scale (since 2003 the *R/V Cornide de Saavedra* was substituted by the *R/V Vizconde de Eza*) only was carried out for the main species, a global index is presented for each year, which minimum occurred in 2001. Until 2003 redfish showed the highest annual variability probably due to its pelagic habitat, making accessibility to bottom gears more changeable than in the case of demersal or benthic species. However since 2004 the presence of some strong year classes mainly of *S. fasciatus* caused the increase of redfish and total biomass, reaching consecutive historic maximums in the last three years. The relative high values estimated in 2004 for American plaice did not keep in 2005 and 2006 and they were probably due to the occasional increases of catchability in 2004. Greenland halibut biomass maintained a continuous biomass increase to reach a maximum in 1998, since then the biomass decreased up to minimum historical value in 2003. The values in the last years around 15 kg./haul are in a poor level. Shrimp catches in 2005 were between the highest of the historical series but this high level is not continued in 2006 where the shrimp biomass decreased around 53%.

Excluding redfish, the whole period could be divided in two in regards to species composition: Cod, American plaice and skates dominating the first half, prior to 1995, Greenland halibut and shrimp the second half. For cod,

1995 was the spawning year for the first extremely weak recruitment; it had been 1991 for American plaice. The high cod indexes at age 1 in 2005 and 2006 could indicate the presence of two relative strong year classes in 2004 and 2005.

Cod

Mean catch per tow by strata and its standard error are presented in Table 3. These indices are compared with results of previous surveys in Table 5. Total biomass calculated by the swept area method and compared with Russian survey results are:

Year	EU (1)	Russia: (2)	(3)	Year	EU (1)	Russia: (2)	(3)
1983		23,070		1995	9,695	8,260	-
1984		31,210		1996	9,013	730	-
1985		28,070		1997	9,966	-	-
1986		26,060		1998	4,986	-	-
1987		10,150	21,600	1999	2,854	-	-
1988	40,839	7,720	34,200	2000	3,062		-
1989	114,050	36,520	78,300	2001	2,695	784	-
1990	59,362	3,920	15,200	2002	2,496	694	-
1991	40,248	6,740	8,200	2003	1,593		-
1992	26,719	2,490	2,400	2004	4,071		
1993	60,963	8,990	9,700	2005	5,242		
1994	26,463	-	-	2006	12,505		tons

1) Biomass estimated from bottom trawl survey. 2) Biomass estimated from bottom trawl survey (Kiseleva and Vaskov 1994; Kiseleva 1996, 1997; Vaskov and Igashov, 2003). 3) Biomass estimated of bottom trawlable plus pelagic biomass (Borovkov *et al.* 1993; Kiseleva and Vaskov 1994).

The mean frequency at age per tow is shown in the table below.

age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1	6.05	24.38	2.86	160.45	88.95	5.07	3.75	1.77	0.04	0.05	0.03	0.01	0.22	0.59		0.85		10.03	24.51
2	99.36	13.43	15.35	32.60	52.13	172.05	5.14	14.80	3.88	0.19	0.10	0.10	0.02	2.48	1.65	0.07	4.18	0.02	4.82
3	61.55	113.53	6.37	21.02	6.94	38.67	34.51	1.66	8.28	4.32	0.12	0.14	0.41	0.02	0.80	0.78	0.03	1.39	0.07
4	16.72	67.91	21.08	2.64	2.97	1.37	6.34	4.84	1.11	5.97	1.56	0.15	0.25	0.15	0.04	0.17	0.72	0.1	1.83
5	1.81	25.40	19.69	8.40	0.48	1.64	0.16	1.15	2.99	0.49	1.95	0.89	0.12	0.10	0.09	0.03	0.18	0.88	0.11
6	0.26	1.66	5.59	2.15	1.74	0.21	0.08	0.04	0.24	1.18	0.10	0.55	0.55	0.02	0.04	0.05	0.01	0.17	0.73
7	0.28	0.18	0.42	0.37	0.30	0.61	0.01	0.03	0.01	0.03	0.18	0.02	0.21	0.18	0.03	0.01	0.01		0.15
8	0.09	0.16	0.18	0.08	0.02	0.11	0.14		0.01			0.01	0.01	0.12	0.12	0.01	0.00	0.02	0.01
9		0.01	0.10	0.04				0.03			0.01		0.02	0.01	0.04	0.05	0.01	0.01	
10		0.01	0.03	0.00			0.01	0.01						0.01		0.03	0.02	0.01	0.01
11				0.01	0.01									0.01	0.01				0.01
12									0.01				0.01						
13																			0.01
14													0.01						
total	186.13	246.66	71.67	227.78	153.53	219.72	50.14	24.33	16.56	12.23	4.05	1.87	1.83	3.67	2.81	2.04	5.16	12.63	32.28

The 1990 year-class was the most abundant observed at age 1, but its level was not maintained in the following years, after recruitment. This may indicate that its abundance was overestimated in the 1991 survey. The abundance of the 1991 year-class, although recording a maximum at age 2, decreased quickly as a consequence of the intense fishery on ages 2 and 3 during 1993 and 1994. Later year-classes, from 1992 onwards (ages 13 or less in 2005), were weak, weaker than the ones observed in the previous period. The 1995 to 1999 year-classes (ages 11 to 7 in 2006) failed almost completely and, according to the results of the last surveys, the same failure appears to have occurred to the 2001 and 2003 year-classes (age 5 and 3 respectively in 2006). The abundance of 2000 and 2002 year classes, although low in the historical series, were estimated to above average in the last 10 years. The abundance of 2004 and 2005 year classes are the highest in the last 12 years.

Tables 6, 7 and 4 show mean length frequency per tow, the age-length key and mean frequency at age per tow and stratum respectively. Catch per haul distribution is presented in Figure 2.

American plaice

Mean catch per tow by strata is presented in Table 8. These indices are compared with results of previous surveys in Table 10. Total biomass calculated by the swept area method and compared with Russian survey results is shown in the following table:

Year	EU	Russia (1)	Year	EU	Russia (1)
1983		8,900	1995	6,785	
1984		7,500	1996	4,098	
1985		7,800	1997	3,026	
1986		20,200	1998	3,437	
1987		9,300	1999	2,585	
1988	16,046	6,500	2000	1,606	
1989	14,047	5,000	2001	2,404	
1990	11,983	1,200	2002	2,049	548
1991	10,087	14,400	2003	2,286	1,398
1992	8,656	1,200	2004	3,525	
1993	7,861	2,700	2005	2,760	
1994	8,227	tons	2006	1,691	tons

1) Rikhter *et al.* 1991; Borovkov *et al.* 1992, 1993, 1994; Vaskov and Igashov, 2003.

The mean frequency at age per tow is presented in the following table. The 1986 and 1990 year-classes, ages >14 in 2006, were between the most abundant cohorts in the period, but no good recruitment was observed since then. Fish aged 6 or more roughly correspond with fishable biomass. The abundance of this group (f 6+) decreased along the period except in 1992, when an increase was recorded as the consequence of the income of the abundant 1986 year-class. During the last years fluctuated in low levels without trends.

age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1		0.05	0.01	0.05					0.01	0.01		0.01	0.02			0.01			0.01
2	0.50	0.70	0.53	0.44	1.06	0.01	0.05	0.04	0.04	0.02	0.03		0.03	0.05		0.01	0.14	0.04	0.03
3	2.34	10.40	1.14	1.50	0.99	1.92	0.06	0.14	0.15	0.14	0.04	0.03	0.01	0.06	0.04	0.04	0.35	0.14	0.05
4	1.63	2.33	10.41	2.70	1.33	1.35	2.65	0.92	0.32	0.03	0.06	0.08	0.10	0.07	0.08	0.12	0.09	0.36	0.13
5	5.26	5.43	1.40	6.65	2.41	0.97	1.29	2.65	0.73	0.15	0.09	0.10	0.13	0.13	0.02	0.10	0.10	0.13	0.17
6	7.94	5.42	4.19	3.04	5.93	0.52	1.09	1.70	2.07	0.52	0.33	0.10	0.19	0.07	0.11	0.07	0.13	0.13	0.17
7	6.23	5.15	2.91	3.34	1.59	5.14	1.21	1.71	1.11	1.50	0.77	0.30	0.15	0.14	0.08	0.06	0.13	0.16	0.09
8	6.79	3.02	2.77	2.57	1.87	0.56	4.26	1.13	0.68	0.34	1.12	0.59	0.19	0.33	0.16	0.17	0.16	0.13	0.07
9	2.18	1.00	1.68	1.06	1.03	0.97	0.40	1.91	0.50	0.51	0.65	0.63	0.49	0.54	0.20	0.36	0.31	0.28	0.15
10	0.57	0.43	0.78	0.37	0.47	0.46	0.81	0.20	0.78	0.36	0.44	0.32	0.53	0.72	0.24	0.29	0.39	0.25	0.20
11	0.12	0.05	0.14	0.01	0.22	0.32	0.28	0.22	0.18	0.61	0.37	0.42	0.28	0.60	0.37	0.53	0.35	0.28	0.25
12	0.20	0.02	0.02	0.07	0.12	0.38	0.28	0.18	0.10	0.16	0.36	0.26	0.23	0.52	0.28	0.60	0.74	0.31	0.24
13	0.16		0.04		0.02	0.45	0.31	0.18	0.10	0.03	0.11	0.15	0.09	0.24	0.31	0.35	0.53	0.44	0.24
14	0.06		0.02			1.33	0.65	0.36	0.13	0.12	0.14	0.15	0.07	0.20	0.18	0.33	0.50	0.49	0.26
15	0.07					0.04	0.61	0.27	0.09	0.06	0.07	0.07	0.06	0.14	0.16	0.18	0.41	0.32	0.25
16+	0.05					0.05	0.01	0.04	0.03	0.14	0.13	0.12	0.07	0.12	0.23	0.20	0.65	0.68	0.40
Total	34.09	34.01	26.05	21.79	17.05	14.47	13.96	11.66	7.02	4.69	4.73	3.32	2.65	3.94	2.45	3.44	4.99	4.14	2.72
freq. 6+	24.37	15.09	12.55	10.46	11.25	10.22	9.91	7.90	5.77	4.35	4.49	3.11	2.35	3.62	2.32	3.14	4.30	3.47	2.09

Global indices of the table, such as total number by tow and frequency 6+, have declined over the whole period, reaching their lowest level in 2006: more than 10 times lower than in 1988-1990. Data in the table above indicates two periods for recruitment, and a change from an upper abundance level to a lower one. The 1991 year-class was the first weak cohort. The relative high values founded in 2004 and 2005 for American plaice, mainly in the ages older than 13 years old, are probably due to the relative strong year classes previous to 1991. The progressive disappearance of these year classes will provoke probably lower levels in the biomass indices in the next years.

Tables 11, 12 and 9 show mean length frequency per tow, the age-length key and mean frequency at age per tow and stratum respectively. Catch per haul distribution is presented in Figure 3.

Redfish

All redfish catches were classified by species. The group name *juvenile* contains those individuals of small size for which routine classification was not possible. The 15 cm maximum length is a good reference for this group, but it was never used as a criterion. The skill required to identify the species increased over time, so the group *juvenile* is not an uniform defined group, but it is maintained for practical reasons.

Mean catch per tow by strata are presented in Tables 13, 15, 19 and 21 for *Sebastes marinus*, *S. mentella*, *S. fasciatus* and the *juvenile* group respectively. The following table shows the total biomass (tons) by year.

Year	<i>Sebastes</i>	<i>Sebastes spp.</i>			total
	<i>marinus</i>	<i>mentella</i>	<i>fasciatus</i>	juvenile	
1988	18,229		170,102		188,331
1989	27,312		135,223		162,535
1990	16,751		86,695	23,311	126,757
1991	4,864	59,552	6,755	5,784	76,955
1992	4,909	85,408	6,314	33,578	130,209
1993	4,789	21,235	5,175	41,409	72,608
1994	39,516	42,495	9,303	71,211	162,525
1995	10,754	70,567	5,986	337	87,644
1996	13,431	92,647	13,112	472	119,662
1997	77,125	66,710	20,780	1,201	165,816
1998	7,640	53,946	7,656	1,590	70,832
1999	11,215	77,610	9,460	366	98,651
2000	53,388	106,283	15,364	2,955	177,990
2001	10,244	45,931	13,715	7,455	77,345
2002	11,651	48,760	27,556	33,345	121,312
2003	40,110	28,785	15,031	9,890	93,816
2004	85,383	45,999	76,164	43,059	250,605
2005	147,688	105,110	123,326	75,762	451,215
2006	298,290	105,849	319,387	43,396	766,922

Tables 14, 16, 20 and 22 show mean length frequency by tow for the four groups. Age-length keys and mean frequency at age by tow and stratum for *S. mentella* are presented in Tables 18 and 17 respectively. Catches per haul distributions of the three species are presented in Figures 4, 5 and 6.

Greenland halibut

Mean catch per tow by strata and its standard error are presented in Table 23. These indices are compared with results of previous surveys in Table 27. The following table summarises the total biomass in tons by year:

Year	EU	Year	EU
1988	6,926	1998	24,229
1989	4,472	1999	21,207
1990	5,799	2000	16,959
1991	8,169	2001	13,872
1992	8,728	2002	12,100
1993	6,529	2003	6,214
1994	8,037	2004	12,292
1995	10,875	2005	11,698
1996	11,594	2006	11,706
1997	16,098		

Mean length frequency by tow, age-length keys and mean frequency at age per tow are presented in Tables 24, 26 and 25, respectively. Catch per haul distribution is presented in Figure 7. Mean frequency at age per tow in the historical series was calculated as follows:

age	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1	1.62	2.09	1.77	1.78	12.41	5.84	3.33	2.74	1.06	3.75	8.03	4.08	2.20	2.19	0.54	0.68
2	0.26	1.57	1.55	1.24	2.54	7.97	3.78	2.13	0.70	0.29	1.43	2.94	1.00	3.29	0.81	0.40
3	0.43	0.56	0.97	1.70	2.23	2.41	6.00	7.68	3.01	0.60	1.81	2.79	0.61	4.37	3.18	0.65
4	1.31	1.27	0.86	1.78	1.91	3.04	6.50	11.00	10.47	2.16	0.99	1.67	1.51	1.97	2.50	1.17
5	2.87	2.30	1.27	1.92	2.66	4.20	7.11	12.33	13.41	7.09	2.79	3.79	2.48	6.96	6.89	5.98
6	1.60	2.80	1.92	2.97	5.10	5.82	8.46	11.30	12.58	14.10	7.79	5.59	2.94	7.80	7.59	7.46
7	2.75	2.42	2.02	2.66	3.77	2.49	4.99	7.84	5.55	5.40	6.63	5.73	1.93	2.54	2.92	3.31
8	0.66	1.31	1.57	1.47	2.12	1.62	2.15	2.62	1.82	2.32	3.21	1.28	0.47	0.64	0.61	0.77
9	0.57	0.58	0.96	0.78	1.31	0.42	0.66	0.75	0.35	0.45	0.18	0.13	0.13	0.29	0.11	0.22
10	0.44	0.34	0.26	0.27	0.26	0.09	0.22	0.20	0.10	0.11	0.04	0.06	0.10	0.13	0.12	0.18
11	0.18	0.17	0.13	0.11	0.07	0.03	0.03	0.03	0.01	0.05	0.01	0.02	0.02	0.08	0.06	0.13
12	0.01	0.08	0.05	0.06	0.02	0.04	0.02	0.01	0.00			0.01	0.00	0.05	0.02	0.06
13		0.03	0.03	0.02			0.02	0.02	0.00					0.01		0.01
14		0.01	0.01		0.01	0.00			0.01					0.00		
15	0.02					0.01	0.01							0.00		
16+	0.01						0.01									
total	12.74	15.53	13.38	16.76	34.39	33.98	43.26	58.64	49.08	36.33	32.92	28.09	13.38	30.33	25.33	21.04
freq. 10+	0.66	0.64	0.48	0.47	0.35	0.16	0.31	0.26	0.12	0.17	0.05	0.09	0.12	0.28	0.19	0.37

The tables 28 and 29 also show the abundance and biomass by age, corresponding at age greater or equal than five years in order to compare with XSA results.

Shrimp

Casas J.M. (2006) presented detailed results.

Roughhead grenadier (*Macrourus berglax*)

Biomass (tons) and mean catch per tow along this survey series were:

year	tons	kg./tow	year	tons	kg./tow
1988	2,009	2.50	1998	1,691	2.10
1989	871	1.08	1999	1,250	1.55
1990	852	1.06	2000	1,047	1.30
1991	1,335	1.66	2001	2,079	2.59
1992	1,577	1.96	2002	1,211	1.51
1993	3,021	3.76	2003	2,348	2.92
1994	1,975	2.46	2004	3,597	4.47
1995	1,558	1.94	2005	2,387	2.97
1996	1,362	1.69	2006	3,933	4.89
1997	1,197	1.49			

Detailed results are presented as SCR by Murua in this SC meeting. .

References

- Borovkov, V., S. Kovalev, P. Savvatimsky, V.A. Rikhter and I.K. Sigaev – 1992. Russian research report for 1991. *NAFO SCS Doc.* 92/12.
- Borovkov, V., K. Gorchinsky, S. Kovalev, P. Savvatimsky, V.A. Rikhter and I.K. Sigaev – 1993. Russian research report for 1992. *NAFO SCS Doc.* 93/10.
- Borovkov, V., K. Gorchinsky, S. Kovalev and P. Savvatimsky – 1994. Russian national research report for 1993. *NAFO SCS Doc.* 94/3.
- Casas, J.M – 2006. Northern shrimp (*Pandalus borealis*) on Flemish Cap Survey 2006. *NAFO SCR Doc.* 06/66.
- Doubleday, W.G.- 1981. Manual of Groundfish Surveys in the Northwest Atlantic. *NAFO Sci. Counc. Stud.* 2, 55pp.
- Kiseleva, V.M.– 1996. Estimation of cod stock in Div. 3M by data of 1995 trawl survey. *NAFO SCR Doc.* 96/7.
- Kiseleva, V.M.– 1997. Assessment of cod stock on the Flemish Cap from data of trawl survey in 1996. *NAFO SCR Doc.* 97/7.
- Kiseleva, V.M. and A.A. Vaskov – 1994. Assessment of cod stock in NAFO Subarea 3 from 1993 trawl-acoustic survey data. *NAFO SCR Doc.* 94/12.
- Rikhter, V.A., I.K. Sigaev, V. Borovkov, S. Kovalev and P. Savvatimsky – 1991. USSR research report for 1990. *NAFO SCS Doc.* 91/5.
- Saborido-Rey, F. And A. Vázquez. 2003. Results from Bottom Trawl Survey on Flemish Cap of July 2002. *NAFO SCR Doc.*, N° 42. Serial No. 4860, 40p.
- Vaskov, A.A. and T.M. Igashov – 2003. Results from the Russian trawl survey on the Flemish Cap Bank (Division 3M) in 2002. *NAFO SCS Doc.* 03/9.

Table 1 – Technical data of the 2006 survey.

Procedure	Specification
Vessel	R/V Vizconde de Eza
GT	1 400 t
Power	1 800 HP
Mean trawling speed	3.5 knots
Trawling time	30 minutes effective time
Fishing gear	type Lofoten
footrope / handrope	31.20 / 17.70 m
footgear	27 steel bobbins of 35 cm
vertical opening	3.0 m (SCANMAR)
warps	100 meters, 45 mm, 200 Kg/100m
trawl doors	polyvalent, 850 Kg
wire length	$26.712 \times \text{depth echo sounder (m.)}^{0.6268}$
mesh size in cod-end	35 mm
Type of survey	Stratified sampling
Station selection procedure	Random
Criterion to change position of a selected tow	<ul style="list-style-type: none"> - Unsuitable bottom for trawling according to ecosounder register. - Information on gear damage from previous surveys.
Criterion to reject data from tow	<ul style="list-style-type: none"> - tears in cod-end - severe tears in the gear - less than 20 minutes tow - bad behaviour of the gear
Daily period for fishing	6.00 to 22.00 hours
Species for sampling	All fish, squid and shrimp
Species for age determination	Cod, American plaice, redfish (<i>Sebastes mentella</i>), Greenland halibut and Roughhead grenadier (<i>Macrourus berglax</i>).

Table 2 – Mean catch per tow (Kg) for several species or groups of species in 1988-2006 surveys in depths lesser than 400 fathoms.

Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Rajidae	5.59	2.41	3.51	5.05	4.7	7.76	4.36	2.82	2.55	2.29	2.46	2	1.43	2.78	1.92	5.73	7.76	5.27	4.36
<i>Synaphobranchus sp.</i>	0.27	0.11	0.05	0.1	0.09	0.13	0.01	0.02	0	0.01	0.05	0	0	0.03	0.01	0.03	0.11	0.09	0.04
<i>Urophycis sp.</i>	0.8	0.21	0.21	0.32	0.09	0.21	0.27	0.1	0.1	0.04	0.28	0.31	0.21	0.49	0.16	0.68	0.83	0.92	0.76
<i>Antimora sp.</i>	0.49	0.38	0.35	0.7	0.9	1.02	0.99	0.24	0.23	0.29	0.61	0.36	0.33	0.83	0.43	0.38	1.44	1.38	0.59
Macrouridae	3.84	1.81	1.52	2.8	3.22	8.08	4.02	3.24	2.91	2.85	3.52	2.9	2.25	3.83	2.54	4.59	6.11	4.17	6.25
<i>Notacanthus sp.</i>	0.62	0.51	0.08	0.59	0.56	0.92	0.57	0.43	0.22	0.36	0.21	0.08	0.12	0.13	0.08	0.03	0.18	0.08	0.18
<i>Illex sp.</i>	0.01	0.01	2.05	1.44	0.08	0	0.26	0	0.11	0.08	0.09	0.02	0	0.01	0.01	0.28	0.59	0.10	4.41
Anarhichadidae	9.94	9.31	10.1	12.56	11.31	17.85	19.45	23.9	25.57	17.45	13.66	6.94	5.56	7.29	6.5	7.44	13.17	11.90	11.53
Witch flounder	1.13	0.42	0.52	0.96	1.02	1.3	0.98	0.88	0.63	0.4	0.3	0.47	0.51	0.57	0.26	1.05	1.95	2.21	1.11
Greenland halibut	8.61	5.56	7.21	10.16	10.85	8.12	9.99	13.52	14.42	20.02	30.13	26.37	21.09	17.25	15.05	7.73	15.28	14.55	14.56
Zoarcidae	0.7	1.42	1.5	2.46	1.69	4.32	2.33	2.71	2.12	2.15	2.56	1.11	0.97	1.55	1.01	2.57	4.58	3.83	2.24
Cod	50.78	141.82	73.82	50.05	33.22	75.81	32.91	12.06	11.21	12.39	6.20	3.55	3.81	3.35	3.10	1.98	5.06	6.52	15.55
American plaice	19.95	17.47	14.90	12.54	10.76	9.78	10.23	8.44	5.10	3.76	4.27	3.21	2.00	2.99	2.55	2.84	4.38	3.43	2.10
Redfish	234.19	202.11	157.62	95.69	161.91	90.29	202.10	108.98	148.80	206.19	88.08	122.67	221.33	96.18	150.85	116.66	311.62	563.35	953.66
Shrimp*	7.14	2.86	4.34	14.50	31.28	15.03	4.95	9.33	13.56	4.58	52.19	32.00	24.52	35.21	49.96	26.75	25.03	38.14	20.19
Others	0.79	0.26	1.42	0.83	0.53	0	0.59	0.49	0.86	0.73	1.38	0.77	1.98	1.8	1.16	7.03	3.39	2.09	13.53
Total	344.07	386.41	277.78	209.92	271.69	240.61	293.42	186.67	227.52	277.86	204.61	202.00	284.12	172.49	234.43	178.74	398.10	658.04	1051.05

*) Values affected by mesh size cod-end: 40 mm in 1994, 25 mm in 1998 and 30 mm in 1999.

Table 3 – Cod (*Gadus morhua*) mean catch per tow by strata and its standard error in the 2006 survey.

stratum	area sq. miles	tow number	catch per tow (Kg)	
			mean	s. error
1	342	4	93.36	57.37
2	838	10	64.92	71.37
3	628	7	40.71	47.90
4	348	4	17.57	17.03
5	703	8	12.03	17.38
6	496	6	32.40	31.08
7	822	9	7.55	4.77
8	646	7	7.04	8.81
9	314	3	2.68	2.43
10	951	11	4.19	5.16
11	806	7	6.20	3.98
12	670	8		
13	249	2		
14	602	7	1.66	3.36
15	666	7		
16	634	6		
17	216	2		
18	210	2		
19	414	5		
total	10555	115	15.55	
s.error			2.44	

Table 4 – Cod (*Gadus morhua*) mean frequency at age per tow and stratum in the 2006 survey.

age	strata												total	mean weight g	mean length cm	
	1	2	3	4	5	6	7	8	9	10	11	14				
1	17.65	6.22	0.09	0.56										24.51	90	21
2	0.71	1.75	1.19	0.50	0.01	0.24	0.06	0.30	0.01		0.05			4.82	695	42
3	0.01	0.04	0.01											0.07	1073	49
4	0.20	0.76	0.26	0.04	0.09	0.10	0.17	0.04	0.01	0.07	0.09	0.01		1.83	2496	65
5	0.01	0.02	0.01			0.01					0.01			0.11	3574	73
6	0.05	0.25	0.11	0.01	0.05	0.16	0.01	0.01		0.02	0.04			0.73	4688	80
7	0.01	0.04	0.02		0.02	0.01				0.01		0.01		0.15	5753	86
8														0.01	6789	91
9																
10														0.01	8227	97
11						0.01								0.01	11002	106
12																
13			0.01											0.01	10745	106

Table 5 – Cod (*Gadus morhua*) mean catch per tow (Kg) by strata in 1988-2006 surveys.

stratum	depth in		year																		
	fathoms		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1	70- 80		51.62	24.91	31.67	214.33	2.9	19.79	83.11	59.97	38.62	9.32	4.81	3.81	9.57	3.31	18.31	6.64	72.16	41.87	93.36
2	81-100		158.97	161.67	32.32	85.91	80.67	141.64	128.21	47.61	62.5	32.08	29.75	23.52	11.6	7.68	11.53	1.6	24.89	29.57	64.92
3	101-140		93.43	214.78	45.84	51.39	177.06	176.28	127.32	23.96	22.01	23.66	14.67	3.05	7.51	4.82	9.41	1.88	0.19	37.43	40.71
4	"		118.03	182.67	97.7	109.36	129.88	534.46	71.11	28.12	40.26	32.32	5.26	0.97	16.72	18.43	2.5	5.13	5.51	5.72	17.57
5	"		39.78	199.81	158.89	198.86	85.31	127.41	17.26	23.78	17.49	21.47	18.2	4.77	7.92	4.85	2.74	5.66	0.28	0.56	12.03
6	"		85.49	179.66	87.5	40.5	25.21	111.67	37.36	34.64	16.42	28.44	16.22	9.93	13.53	19.83	13.88	0.64	3.86	5.44	32.40
7	141-200		35.5	255.88	62.9	40.53	15.09	98.24	13.67	1.95	0.87	17.05	1.24	0.82	0.09	0.2	0.38	1.71	0.29		7.55
8	"		181.45	333.89	342.16	103.75	47.72	161.79	73.45	7.08	1.9	32.71	1.56	0.47	1.48	2.5	0.76	2.26	0.09		7.04
9	"		7.68	219.91	270.98	7.87	5.98	41.69	10	0.37	4.3	7.28		0.8	1.72		0.58	15.72			2.68
10	"		18.47	67.6	64.58	21.51	4.51	12.92	6.98	0.8	0.64	4.16	2.74	1.41	1.47	1.11	0.03	0.33		0.38	4.19
11	"		40.8	215.27	66.37	29.1	3.66	27.33	9.47	1.28	0.67	5.06	2.86	4.16	1.72	2.84	0.3	0.93	0.46	0.92	6.20
12	201-300		6.57	48.37	31.84	2.47			0.47												1.39
13	"		0.44	133.59	39.93	4.94															
14	"		2.33	24.43	14	2.85	1.46	4.81												0	1.66
15			14.74	166.25	46.32	2.13															0.35
16	301-400			1.35																	
17				0.31				0.14													
18			0.13					0.18													
19				3.19																	
total			50.78	141.95	75.71	50.05	33.22	76.08	32.91	12.05	11.21	12.39	6.2	3.55	3.81	3.35	3.1	1.98	5.06	6.52	15.55
s.e.			7.19	15.18	10.23	8.34	7.26	21.63	9.16	2.57	1.81	2.14	0.8	0.56	0.74	0.47	0.49	0.34	0.97	2.02	2.44

s.e.: standard error

Table 6 – Cod (*Gadus morhua*) mean length frequency per tow in the 2006 survey.

length		length		length		length	
6-8		36-38	0.43	63-65	0.62	90-92	0.07
12-14	0.04	39-41	1.11	66-68	0.55	93-95	0.01
15-17	1.31	42-44	2.02	69-71	0.29	96-98	0.02
18-20	7.72	45-47	1.06	72-74	0.15	99-101	
21-23	10.81	48-50	0.18	75-77	0.13	102-104	
24-26	4.23	51-53	0.01	78-80	0.17	105-107	0.01
27-29	0.36	54-56	0.03	81-83	0.19	108-110	
30-32	0.03	57-59	0.11	84-86	0.17	111-113	
33-35	0.09	60-62	0.27	87-89	0.07	114-116	0.01

Table 7 – Cod (*Gadus morhua*) age-length key in 2006.

Length cm	age																total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	
12-14	5																5
15-17	61																61
18-20	104																104
21-23	98																98
24-26	95																95
27-29	25																25
30-32	2																2
33-35		9															9
36-38		43															43
39-41		83															83
42-44		117															117
45-47		80	3														83
48-50		15	2														17
51-53			1														1
54-56				3													3
57-59			1	12													13
60-62				32													32
63-65				64	1												65
66-68				53	2	2											57
69-71				27		3	1										31
72-74				6	4	5											15
75-77					2	12											14
78-80						17	1										18
81-83					2	18	2										22
84-86						14	4										18
87-89						5	3										8
90-92						3	4	1									8
93-95								1									1
96-98										1	1						2
99-101																	
102-104																	
105-107													1				1
108-110																	
111-113																	
114-116											1						1
total	390	347	7	197	11	79	16	1		1	2		1				1052

Table 8 – American plaice (*Hippoglossoides platessoides*) mean catch per tow by strata and its standard error in the 2006 survey.

stratum	area	tow	catch per tow (Kg)	
	sq. miles	number	mean	st. error
1	342	4	27.39	23.76
2	838	10	5.54	3.67
3	628	7	1.54	1.52
4	348	4	4.13	1.77
5	703	8	1.17	1.31
6	496	6	1.61	1.21
7	822	9	0.59	0.92
8	646	7	3.31	5.90
9	314	3		
10	951	11	1.33	1.55
11	806	7	0.32	0.54
12	670	8		
13	249	2		
14	602	7		
15	666	7		
16	634	6		
17	216	2		
18	210	2		
19	414	5		
total	10555	115	2.10	
s.error			0.43	

Table 9 – American plaice (*Hippoglossoides platessoides*) mean frequency at age per tow in the 2006 survey.

age	stratum													total	mean weight g	mean length cm
	1	2	3	4	5	6	7	8	9	10	11	15				
1							0.01							0.01	16	13
2		0.01	0.01	0.01	0.00		0.00							0.03	111	23
3	0.01	0.00		0.00	0.01		0.01			0.01				0.05	200	27
4	0.01	0.02	0.00	0.01	0.00	0.00	0.03			0.03	0.02			0.13	334	33
5	0.02	0.03	0.02	0.03	0.02	0.00	0.01			0.03				0.17	455	36
6	0.06	0.02	0.01	0.02	0.01	0.01	0.00	0.00		0.03	0.00			0.17	576	39
7	0.04	0.02	0.01	0.01	0.00	0.01		0.00		0.01	0.00			0.09	685	41
8	0.04	0.01	0.00	0.01	0.00	0.00		0.00		0.00	0.00			0.07	647	40
9	0.10	0.03	0.01	0.00	0.00	0.00	0.00	0.00		0.00				0.15	688	41
10	0.11	0.04	0.01	0.01	0.01	0.01	0.00	0.00		0.01				0.20	653	40
11	0.15	0.05	0.01	0.01	0.01	0.01	0.00	0.01		0.01	0.00			0.25	764	42
12	0.13	0.05	0.01	0.01	0.01	0.00	0.00	0.01		0.01	0.00			0.24	815	43
13	0.14	0.05	0.01	0.01	0.00	0.01	0.00	0.01		0.01	0.00			0.24	741	42
14	0.17	0.05	0.00	0.01	0.00	0.01		0.02		0.01	0.00			0.26	853	43
15	0.14	0.05	0.01	0.01	0.01	0.01	0.01	0.02		0.00	0.00			0.25	897	44
16+	0.14	0.10	0.01	0.03	0.01	0.02	0.01	0.06		0.02	0.00			0.40	1250	49

Table 10 – American plaice (*Hippoglossoides platessoides*) mean catch per tow (Kg) by strata in 1988-2006 surveys.

stratum	depth in	year																		
	fathoms	1988	1989	1990	1991	1992	1993	1984	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1	70- 80	50.09	38.38	19.4	41.37	27.24	41.42	25.4	85.58	56.1	14.64	5.99	14.3	13.24	40.02	5.41	49.58	52.62	39.83	27.39
2	81-100	44.54	56.42	21.52	41.71	26.84	19.84	18.76	20.91	14.78	11.6	24.86	28.34	15.3	13.07	19.76	11.36	11.52	12.47	5.54
3	101-140	28.57	23.35	34.86	26.06	13.18	9.27	6.8	5.27	3.52	10.34	5.95	2.04	0.44	1.93	1.55	0.36	8.9	2.11	1.54
4	"	82.92	17.43	30.81	12.07	21	21.56	32.19	18.46	10.12	7.65	12.92	2.03	3.77	3.24	4.85		13.21	13.55	4.13
5	"	48.53	57.74	34.15	26.26	15.64	24.1	22.95	10.26	9.32	11.55	13.88	1.37	1.05	2.08	3.55	1.53	1.27	0.85	1.17
6	"	12.68	29.9	25.22	13.28	15.91	8.07	21.39	3.24	0.84	0.36	0.93	1.05	0.65	0.97	1.65	0.77	0.61	1.88	1.61
7	141-200	18.74	8.47	13.38	6.21	10.2	5.09	5.04	3.97	1.15	1.32	0.75	0.29	0.23	0.45	0.84	0.48	1.24	0.49	0.59
8	"	8.49	3.33	5.35	5.08	14.78	9.9	3.47	2.67	1.15	2.49	3.35	0.04		0.93	0.87	0.28	1.08	3.56	3.31
9	"	4.29	6.83	14.34		15.59	8.57	0.81	20.91	2.31	1.48					0.05	0.38	2.99	0.74	
10	"	32.07	20.56	27.62	18.06	19.4	20.14	30.86	9.78	5.72	3.96	0.49	1	0.61	1.31	0.49	0.75	0.58	1.20	1.33
11	"	19.3	19.02	21.44	6.53	6.07	4.75	4.93	1.79	1.09	0.52	0.48	0.61	0.36	0.44	0.95	0.47	1.03	0.57	0.32
12	201-300	0.17	0.36	0.88	0.33	0.21	0.29	0.65	0.23	0.63	0.13				0.08		0.22			
13	"	0.11		1.08					0.13											
14	"	0.16	0.19	0.13	8.49	0.63	0.12	0.52	0.31	0.09		0.09	0.21							
15	"	0.44	1.95	0.05	1.91	0.75	2.16	0.79	1.35	0.44	0.13	0.13					0.12		0.09	
16	301-400	0.12			0.07	0.19	0.27	0.12												
17	"																			
18	"																			
19	"				0.47	0.11	0.17	0.08	0.32											
total		19.95	17.47	14.9	12.55	10.76	9.79	10.23	8.44	5.09	3.76	4.27	3.21	2	2.99	2.55	2.86	4.38	3.43	2.10
s.e.		2.29	2.55	1.59	1.47	1.19	1.29	1.71	1.35	1.13	0.88	0.93	1.08	0.41	0.53	0.91	0.93	0.92	0.85	0.43

Table 11 – American plaice mean length frequency per tow in the 2006 survey.

length	male	female	length	male	female	length	male	female	length	male	female
12-13		0.01	24-25		0.02	36-37	0.26	0.03	48-49		0.21
14-15			26-27	0.01		38-39	0.42	0.06	50-51		0.12
16-17			28-29	0.01	0.03	40-41	0.41	0.04	52-53		0.11
18-19			30-31	0.04	0.02	42-43	0.22	0.05	54-55		0.04
20-21		0.02	32-33	0.08		44-45	0.10	0.05	56-57		0.11
22-23	0.01		34-35	0.09	0.03	46-47	0.01	0.11	60-61		0.01

Table 12 – American plaice (*Hippoglossoides platessoides*) age-length key in 2006.**MALE**

Length cm	age																total	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+		
16-17																		
18-19																		
20-21																		
22-23		1																1
24-25																		0
26-27			1															1
28-29			1															1
30-31			1	2	1													4
32-33				2	5	1												8
34-35				1	3			2		2	1		1					10
36-37					1	4	3		4	5	2	4	3	2	1			29
38-39						4	1	2	2	4	7	4	6	6	9	3		48
40-41							2	1	6	5	4	4	6	6	4	7		45
42-43								2	2	2	4	5	3	4	1	2		25
44-45									1		2		1	5	1	1		11
46-47											1							1
total		1	3	5	10	9	6	7	15	18	21	17	20	23	16	13		184

FEMALE

Length cm	age																total	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+		
12-13	1																	1
14-15																		
16-17																		
18-19																		0
20-21		1	1															2
22-23																		
24-25		2																2
26-27																		
28-29				3														3
30-31			1	1														2
32-33																		
34-35				2	1													3
36-37				2		1												3
38-39				1	3	3												7
40-41					3	2												5
42-43					1	3	1											5
44-45						1	2			2	1							6
46-47									1	2	2	3	2		2	1		13
48-49							1	1			2	5	3	2	3	7		24
50-51										1	1		2		4	6		14
52-53									1		1	2		2	2	4		12
54-55																5		5
56-57														2	1	7		10
58-59																		
60-61																	1	1
Total	1	3	2	9	8	10	4	1	2	5	7	10	7	6	12	31		118

Table 13 – Redfish (*Sebastes marinus*) mean catch per tow by strata and its standard error in the 2006 survey.

stratum	area sq. miles	tow number	catch per tow (Kg)	
			mean	st. error
1	342	4	60.87	121.1
2	838	10	19.3	38.04
3	628	7	2387	4525
4	348	4	491.9	965.1
5	703	8	1351	2168
6	496	6	864.2	796.6
7	822	9	278.1	558.2
8	646	7	78.71	144.9
9	314	3	45.73	16.49
10	951	11	103.4	81.77
11	806	7	506.9	698.9
12	670	8	0.59	0.76
13	249	2	7.11	2.66
14	602	7	39.01	54.18
15	666	7	4.37	9.24
16	634	6		
17	216	2		
18	210	2		
19	414	5		
total	10555	115	370.9	
s.error			118.7	

Table 14 – Redfish (*Sebastes marinus*) mean length frequency per tow in the 2006 survey.

length	male	female	length	male	female
14	0.98	0.11	30	1.26	11.32
15	5.77	5.77	31	1.48	4.27
16	41.47	32.14	32	1.79	0.51
17	46.79	66.82	33	0.41	0.32
18	77.36	87.57	34	0.44	0.14
19	69.31	74.77	35	0.39	0.02
20	98.17	69.87	36	0.32	0.14
21	79.31	64.92	37	0.32	0.14
22	74.07	77.49	38	0.66	0.14
23	72.91	75.16	39	0.04	0.19
24	96.28	106.21	40	0.10	0.15
25	91.35	76.16	41		0.10
26	86.14	80.23	42		0.11
27	62.71	53.32	43		
28	31.77	40.67	44		0.09
29	6.69	15.75	45		0.10

Table 15 – Redfish (*Sebastes mentella*) mean catch per tow and its standard error by in the 2006 survey.

stratum	area sq. miles	tow number	catch per tow (Kg)	
			mean	st. error
1	342	4		
2	838	10	0.05	0.15
3	628	7	9.83	16.28
4	348	4	1.8	3.6
5	703	8	4.25	11.78
6	496	6	48.03	79.55
7	822	9	147.74	165.6
8	646	7	101.67	112.1
9	314	3	945.72	1290
10	951	11	301.39	269.9
11	806	7	283.84	343.2
12	670	8	51.3	33.85
13	249	2	62	7.08
14	602	7	413.15	319.3
15	666	7	73.61	37.2
16	634	6	1.78	2.14
17	216	2	4.33	4.64
18	210	2	22.03	9.08
19	414	5	4.62	4.9
total	10555	115	131.62	
s.error			26.82	

Table 16 – Redfish (*Sebastes mentella*) mean length frequency per tow in the 2006 survey.

length	male	female	length	male	female	length	male	female
13			24	34.44	29.10	35	0.12	0.50
14			25	16.04	18.28	36	0.12	0.12
15	7.83	7.83	26	8.83	7.96	37		
16	69.39	70.26	27	3.11	3.61	38		0.12
17	153.20	147.60	28	3.11	2.61	39		
18	112.78	101.47	29	2.49	1.49	40		
19	47.50	44.89	30	2.74	2.36	41		
20	59.56	50.11	31	0.99	1.24	42		
21	24.50	29.59	32	0.25	1.12	43		
22	24.12	23.87	33	0.12	1.12	44		
23	33.57	27.98	34	0.12	0.50	45		

Table 17 – Redfish (*Sebastes mentella*) mean frequency at age per tow in the 2006 survey.

Age	Strata																	Total (1-19)	Mean length cm.	Mean weight g.	
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18				19
2		0.30			2.45	4.35	0.42	1.87	7.09	11.88			0.06	0.15					28.57	15.6	58
3		3.05	0.11	0.55	12.24	34.57	5.73	27.73	59.27	102.29	0.11		1.78	1.03					248.45	16.7	71
4		3.39	0.28	1.34	16.40	49.74	15.15	68.99	106.43	128.95	0.60	0.09	6.29	2.28					399.91	17.7	85
5		0.72	0.10	0.43	4.55	20.33	12.31	52.32	61.01	36.59	0.93	0.21	8.35	2.29					200.14	19.2	109
6		0.01	0.01	0.42	0.79	12.08	10.15	45.14	38.67	8.91	5.23	1.73	39.30	8.45					170.91	22.2	168
7				0.12	0.12	3.84	3.60	14.76	10.23	2.01	4.46	1.49	34.53	5.65					80.82	24.1	212
8						0.85	1.06	4.15	1.44	0.69	2.98	1.04	17.08	2.77					32.05	25.7	259
9						0.08	0.08	0.49				1.13	0.47	5.16	0.83		0.07		8.32	28.8	364
10								0.11		0.03	0.24	0.17	0.96	0.15					1.66	30.0	413
11								0.16				0.24	0.13	1.36	0.16				2.05	32.0	501
12													0.02	0.07	0.02				0.12	34.0	597
13								0.05					0.25	0.07	1.22	0.17		0.02	1.79	31.6	484
14												0.06		0.19					0.25	35.0	652
15																					
16								0.16				0.23	0.16	1.18	0.15		0.02		1.90	30.8	445
17												0.02		0.07	0.02				0.12	34.0	597
18																					
19																					
20+								0.12						0.12					0.25	32.0	497

Table 18 – Redfish (*Sebastes mentella*) age-length key applied to length data in 2006 survey.

length cm	ages																			Total		
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	19	20	26		27	28
12																						
13																						
14	1																					1
15	5	2																				7
16	1	6	1																			8
17		4	7	1																		12
18		2	7	2																		11
19			5	5	1																	11
20			2	6	2																	10
21			1	3	4																	8
22				1	4	1																6
23					6	2																8
24					2	4	1															7
25					2	1	1															4
26						4	2															6
27							2	5	1													8
28								1	2													3
29								3		1												4
30									3			1			1							5
31									1	1	2				1							5
32										1	1				1						1	4
33											2	1										3
34											1	1	1		1	1						5
35												1	1									2
36												1	2									3
37														1		1						2
38														1								1
39																			1			1
40																		1		1		2
43																					1	1
45																						
Total	7	14	23	18	21	14	13	7	3	6	1	5	3	2	4	2	1	1	1	1	1	148

Table 19 – Redfish (*Sebastes fasciatus*) mean catch per tow by strata in the 2006 survey.

stratum	area sq. miles	tow number	catch per tow (Kg)	
			mean	st. error
1	342	4		
2	838	10	40.73	84.57
3	628	7	650.03	653.65
4	348	4	466.87	916.26
5	703	8	708.06	716.7
6	496	6	1466.22	2529.46
7	822	9	699.93	1326.56
8	646	7	724.29	1380.8
9	314	3	581.1	488.19
10	951	11	467.06	293.59
11	806	7	657.02	632
12	670	8	26.66	26.8
13	249	2	98.59	112.88
14	602	7	138	102.1
15	666	7	52.21	73.34
16	634	6	0.32	0.39
17	216	2	0.79	0.5
18	210	2	9.13	5.2
19	414	5	0.33	0.6
total	10555	115	397.15	
s.error			75.98	

Table 20 – Redfish (*Sebastes fasciatus*) mean length frequency per tow in the 2006 survey.

length	male	female	length	male	female	length	male	female	length	male	female
13			20	173.84	185.16	27	3.11	7.96	34		
14	2.86	2.24	21	91.64	102.21	28	0.87	4.35	35		
15	98.98	63.67	22	47.25	62.67	29	0.25	2.36	36		
16	370.06	321.57	23	33.20	35.19	30	0.25	1.99	37		
17	582.32	496.40	24	17.41	18.40	31	0.12	0.75	38		
18	410.97	432.11	25	13.93	26.86	32	0.25	0.62	39		
19	297.82	283.76	26	6.09	9.70	33	0.12	0.37	40		0.12

Table 21 – Juvenile redbfish (*Sebastes sp.*) mean catch per tow by strata and its standard error in the 2006 survey.

stratum	area sq. miles	tow number	catch per tow (Kg)	
			mean	st. error
1	342	4	0.05	0.10
2	838	10	5.76	7.75
3	628	7	329.93	394.01
4	348	4	6.23	11.18
5	703	8	39.25	44.23
6	496	6	330.53	342.69
7	822	9	23.17	26.18
8	646	7	26.17	40.36
9	314	3	28.17	40.67
10	951	11	22.05	21.84
11	806	9	120.90	278.19
12	670	8	0.12	0.27
13	249	3		
14	602	7	0.88	1.80
15	666	5	0.01	0.04
16	634	7		
17	216	2		
18	210	2		
19	414	5		
total	10555	117	53.96	
s.error			13.77	

Table 22– Juvenile redbfish (*Sebastes sp.*) mean length frequency per tow in the 2006 survey.

length		length	
7	0.25	13	142.75
8	77.47	14	312.86
9	336.74	15	372.30
10	468.67	16	80.58
11	70.01	17	1.62
12	79.96	18	0.00

Table 23 – Greenland halibut (*Reinhardtius hippoglossoides*) mean catch per tow by strata and its standard error in the 2006 survey.

stratum	Area sq. miles	tow number	catch per tow (Kg)	
			mean	st. error
1	342	4		
2	838	10	0.14	0.44
3	628	7	6.78	6.93
4	348	4	6.88	7.57
5	703	8	4.32	3.68
6	496	6	1.62	2.49
7	822	9	12.43	9.74
8	646	7	18.49	8.41
9	314	3	23.01	4.26
10	951	11	11.74	7.37
11	806	7	4.72	3.51
12	670	8	19.15	7.8
13	249	2	11.54	2.01
14	602	7	12.49	4.19
15	666	7	35.13	17.13
16	634	6	36.28	13.14
17	216	2	38.82	10.81
18	210	2	37.85	8.46
19	414	5	30.79	7.34
total	10555	115	14.56	
s. error			0.76	

Table 24 – Greenland halibut (*Reinhardtius hippoglossoides*) mean length frequency per tow in the 2006 survey.

length	male	female	length	male	female	length	male	female	length	male	female
10-11			30-31	0.14	0.07	50-51	0.34	0.72	70-71		0.01
12-13		0.01	32-33	0.30	0.14	52-53	0.20	0.54	72-73		0.01
14-15	0.10	0.08	34-35	0.57	0.37	54-55	0.08	0.37	74-75		
16-17	0.24	0.34	36-37	0.92	0.74	56-57	0.01	0.23	76-77		
18-19	0.09	0.10	38-39	0.91	0.80	58-59	0.03	0.17	78-79		
20-21	0.00	0.01	40-41	0.94	1.09	60-61	0.01	0.13	80-81		
22-23	0.02	0.03	42-43	1.00	1.35	62-63		0.10	82-83		
24-25	0.06	0.07	44-45	0.97	1.68	64-65		0.07	84-85		
26-27	0.19	0.09	46-47	0.73	1.68	66-67		0.01			
28-29	0.12	0.16	48-49	0.61	1.24	68-69		0.01			

Table 26 - Greenland halibut (*Reinhardtius hippoglossoides*) age-length key in the 2006 survey.**MALE**

Length cm	age																total	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+		
12-13																		
14-15	9																	9
16-17	15	6																21
18-19	4	4																8
20-21																		0
22-23		2																2
24-25		3	3															6
26-27		4	17															21
28-29			10	2														12
30-31			2	12	1													15
32-33			1	15	8	1												25
34-35				11	15	3												29
36-37				4	21	5												30
38-39				1	22	6												29
40-41					12	17	1											30
42-43					13	18	1											32
44-45					7	20	5											32
46-47					4	20	7											31
48-49						14	15	1										30
50-51						2	25	5										32
52-53							19	8	1									28
54-55							8	19	2									29
56-57							3	6	1									10
58-59							1	3	4	1								9
60-61									3	2	1							6
62-63										1	1							2
64-65										1	1							2
66-67											1							1
total	28	19	33	45	103	106	85	42	11	5	4							481

Table 26 – (continued)

FEMALE

length cm	age																total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	
12-13	1																1
14-15	9																9
16-17	19	11															30
18-19	6	5															11
20-21																	
22-23			3														3
24-25		2	5														7
26-27			9														9
28-29			15	2													17
30-31			2	5													7
32-33			1	13	4												18
34-35				14	17												31
36-37				5	20	4											29
38-39				1	25	8											34
40-41					12	17	1										30
42-43					16	16											32
44-45					10	19	2										31
46-47					2	23	6										32
48-49					1	16	13										30
50-51						2	26	3									31
52-53							21	8	2								31
54-55							15	15	1								31
56-57							6	16	7	2							31
58-59								12	13	7							32
60-61								1	5	16	6	1					29
62-63										9	11	4					24
64-65										2	13	5	1				21
66-67											4	4					8
68-69											3	4					7
70-71												3	2				5
72-73												2	4				6
74-75													2				2
76-77													5				5
78-79															1		1
80-81															2		2
82-83																	
84-85																2	2
86-87															1		1
88-89															1	1	2
90-91																	1
total	35	18	35	40	107	105	90	55	28	36	37	23	14	5	3	1	633

Table 27 – Greenland halibut (*Reinhardtius hippoglossoides*) mean catch per tow (Kg) by strata in 1988-2006 surveys.

strata	depth in fathoms	year																		
		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1	70- 80																0	0.08		
2	81-100		0.04	0.1					1.89		0.04	0.09	0.05		0.24	0.16	0	0.16	0.11	0.14
3	101-140	0.55	0.66	0.16	0.17	0.38	0.06		0.46	2.25	1.9	7.67	7.27	5.09	8.03	2.93	1.15	17.58	8.69	6.78
4	"	5.45	0.76		0.57	1.04	0.39		0.2	0.02	0.87	1.55	7.46	7.81	5.92	2.19	3.96	11.91	3.42	6.88
5	"	1.39	1.81		0.53	0.77	0.01	0.03	0.4	0.67	1.82	3.22	7.65	5.72	5.01	1.24	1.72	4.19	5.22	4.32
6	"	0.84	0.48	0.4	0.34	0.22	0.42		0.84	2.8	6.02	9.54	7.94	4.69	7.02	2.74	0.56	11.58	8.79	1.62
7	141-200	1.36	1.01	0.92	3.01	3.92	1.5	3.42	14.44	18.33	22.74	41.63	37.61	25.06	15.68	6.85	6.61	15.46	9.52	12.43
8	"	3.07	4.51	1.25	3.65	7.7	2.84	0.92	6.77	7.28	21.64	20.09	40.51	26.74	22.84	17.83	10.3	15.69	18.97	18.49
9	"	7.53	6.86	2.21	3.17	13.48	1.29	1.8	7.45	6.66	10.63	19.72	14.79	10.22	14.84	5.8	5.85	18.07	3.81	23.01
10	"	1.48	1.14	0.8	2.37	4.99	0.44	3.23	7.25	9.89	11.89	18.9	21.08	22.11	24.06	10.26	3.95	9.1	14.61	11.74
11	"	0.73	0.99	0.37	1.72	3.72	3.81	3.84	8.01	10.91	10.21	19.99	21.5	17.73	16.63	5.52	4.51	9.33	17.31	4.72
12	201-300	7.94	12.68	5.64	14.9	12.12	18.27	23.88	22.46	41.6	44.04	60.3	71.74	42.59	31	21.27	13.18	14.73	19.99	19.15
13	"	3.38	6.51	11.49	2.29	1.26	7.53	8.06	6.7	15.69	25.47	29.21	51.59	20.15	15.29	27.47	3.22	18.2	16.37	11.54
14	"	8.01	6.58	6.2	17.16	18.48	7.12	13.51	8.95	19.67	34.64	31.86	23.54	10.7	19.11	23.57	19.3	29.46	13.48	12.49
15	"	8.57	3.32	10.35	19.18	12.67	27.15	29.41	34.84	28.52	53	79.91	58.86	52.95	31.86	24.31	11.96	19.57	34.43	35.13
16	301-400	28.43	28.22	52.65	52.31	37.8	45.03	31.55	38.53	43.43	36.65	69.46	23.65	41.72	27.48	45.17	13.1	19.09	28.09	36.28
17	"	16.18	7.26	7.71	25.16	2.44	12.01	45.1	45.07	15.66	31.93	44.75	36.7	30.28	10.29	12.42	8.99	11.8	26.05	38.82
18	"	6.58	3.08	31.63	22.08	3.65	8.15	24.13	59.86	11.95	34.78	48.43	58.21	11.21	35.9	43.36	66.38	34.4	27.11	37.85
19	"	97.13	29.6	32.52	48.26	96.24	42.54	35.69	38.99	30.78	49.58	82.51	32.19	56.24	35.48	69.55	7.86	16.27	29.00	30.79
total		8.62	5.56	7.21	10.16	10.85	8.93	10	13.52	14.42	20.01	30.13	26.37	21.08	17.25	15.05	7.73	15.28	14.55	14.56
s.e.		0.95	0.49	1.01	1.02	1.73	1.19	0.84	1.52	1.1	1.41	1.68	1.89	1.15	0.97	0.82	0.76	0.99	0.78	0.76

Table 28 – Greenland halibut (*Reinhardtius hippoglossoides*) abundance ('000) by age in 1991-2006 surveys.

AGE	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1	1302	1677	1423	1429	9978	4699	2674	2200	852	3014	6459	3282	1768	1762	437	548
2	207	1260	1245	996	2045	6408	3036	1716	563	235	1153	2364	804	2644	652	322
3	348	447	777	1365	1793	1942	4822	6180	2419	479	1456	2248	489	3517	2554	525
4	1054	1023	692	1435	1535	2442	5225	8843	8419	1741	799	1342	1217	1585	2007	943
5	2307	1852	1021	1545	2136	3380	5714	9919	10787	5703	2242	3045	1991	5601	5537	4807
6	1291	2249	1545	2385	4099	4680	6800	9085	10119	11336	6262	4498	2362	6271	6105	6002
7	2212	1947	1627	2139	3029	2001	4014	6304	4467	4346	5328	4610	1552	2040	2345	2665
8	534	1054	1266	1180	1706	1299	1731	2108	1466	1865	2584	1025	375	518	491	623
9	462	468	776	631	1052	341	528	600	280	361	147	104	105	233	89	180
10	352	273	213	219	209	70	177	157	82	92	36	48	79	107	97	143
11	141	138	104	90	53	21	23	27	6	44	5	16	15	63	44	103
12	12	67	38	47	18	31	17	6	3	0	0	6	4	38	15	45
13	0	25	21	18	0	0	17	16	3	0	0	0	0	5	3	10
14	0	12	9	0	5	4	0	0	5	0	0	0	0	3	3	0
15	15	0	0	0	0	5	6	0	0	0	0	0	0	3	3	0
16+	8	0	0	0	0	0	9	0	0	0	0	0	0	3	3	0
TOTAL ('000)	10245	12490	10757	13479	27659	27323	34792	47160	39470	29216	26471	22587	10762	24390	20374	16918
N5+('000)	7334	8084	6620	8254	12307	11832	19035	28221	27217	23747	16605	13352	6483	14884	14734	14578

Table 29 – Greenland halibut (*Reinhardtius hippoglossoides*) biomass (ton.) by age in 1991-2006 surveys.

AGE	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1	37	65	43	50	376	161	87	91	29	107	270	105	49	71	16	31
2	20	170	136	114	249	961	386	246	76	26	176	315	85	138	72	30
3	256	134	160	374	386	466	1200	1802	596	93	337	404	116	560	455	109
4	609	640	204	602	530	1006	1821	3472	3302	633	326	506	456	487	676	340
5	1619	1403	510	845	984	1872	2653	4960	5338	2709	1149	1649	1116	2634	2818	2605
6	1231	1930	1085	1631	2490	3233	4057	5746	6274	7162	4200	3202	1877	4179	4390	4165
7	2502	1895	1418	1782	2299	1748	3101	4763	3576	3539	4470	4427	1745	2118	2408	2468
8	666	1169	1344	1231	1683	1415	1727	2109	1481	1977	2570	1222	511	725	657	722
9	471	590	979	811	1341	473	714	726	376	437	222	161	178	385	153	238
10	446	358	314	344	348	113	280	214	148	150	66	93	157	211	199	219
11	221	202	185	157	104	57	64	36	11	88	13	32	37	134	106	176
12	33	108	71	60	41	57	32	9	8	0	0	15	11	86	43	84
13	0	46	48	35	0	0	36	34	8	0	0	0	0	20	0	22
14	0	16	36	0	15	20	0	0	14	0	0	0	0	13	0	0
15	51	0	0	0	0	19	13	0	0	0	0	0	0	0	0	0
16+	34	0	0	0	0	0	30	0	0	0	0	0	0	13	0	0
TOTAL (ton.)	8157	8722	6520	8033	10857	11574	16088	24218	21200	16945	13855	12084	6338	11719	12021	11209
Biomass 5+	7274	7716	5990	6896	9307	9007	12708	18596	17233	16062	12691	10802	5632	10519	10774	10699

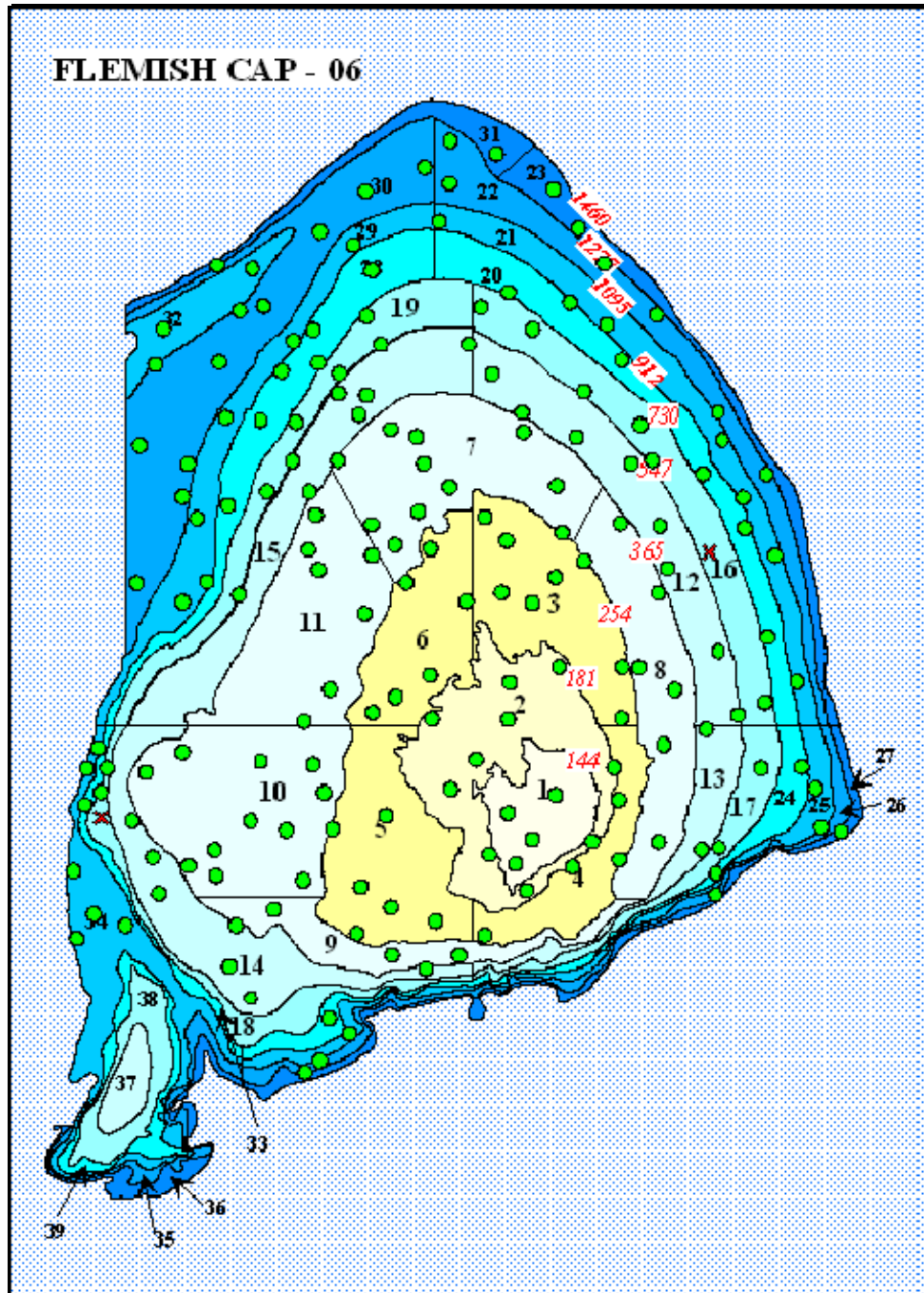


Figure 1 - Haul positions for the Flemish Cap survey 2006.

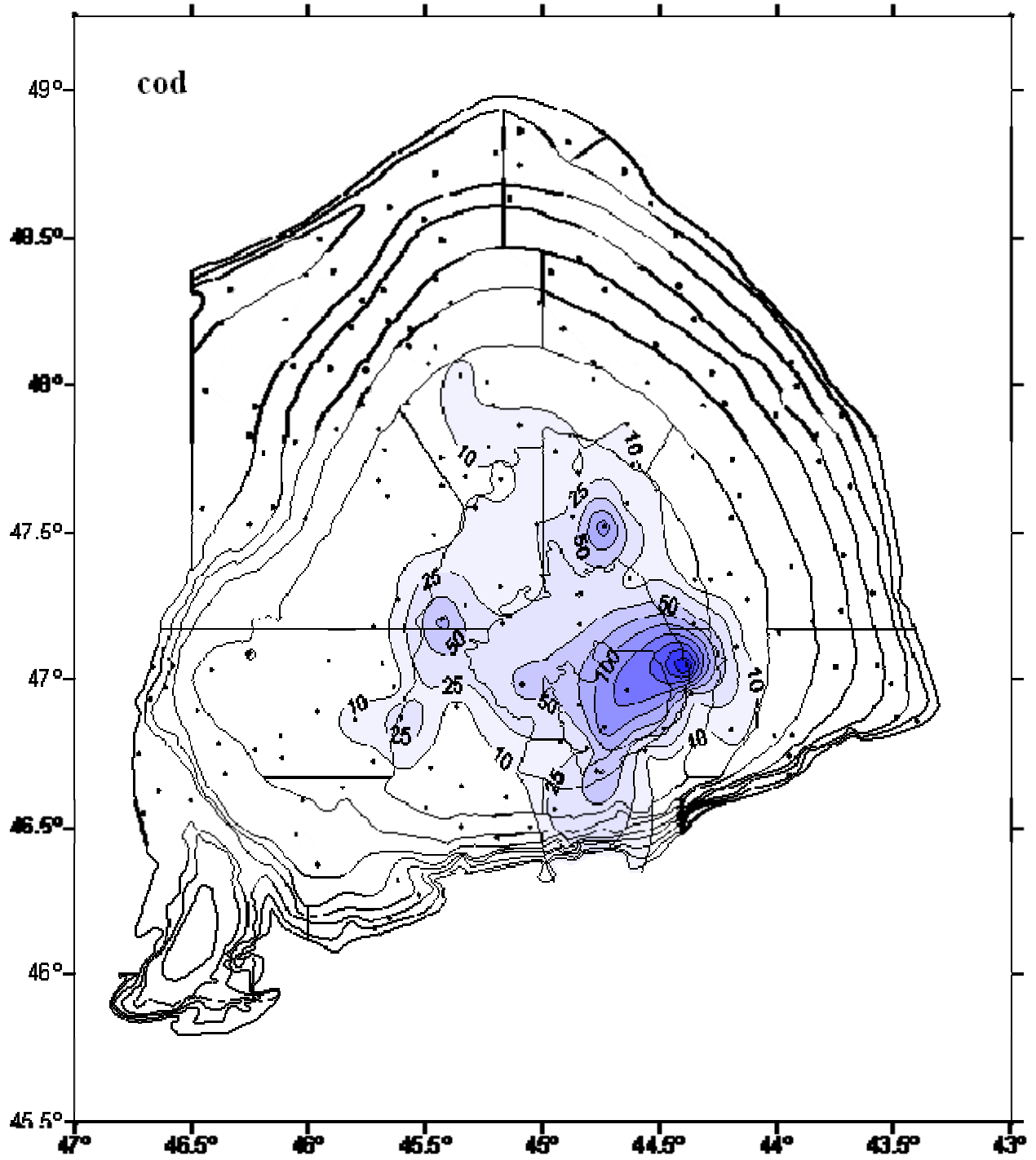


Figure 2 - Cod (*Gadus morhua*) catch distribution in the 2006 survey in Kg.

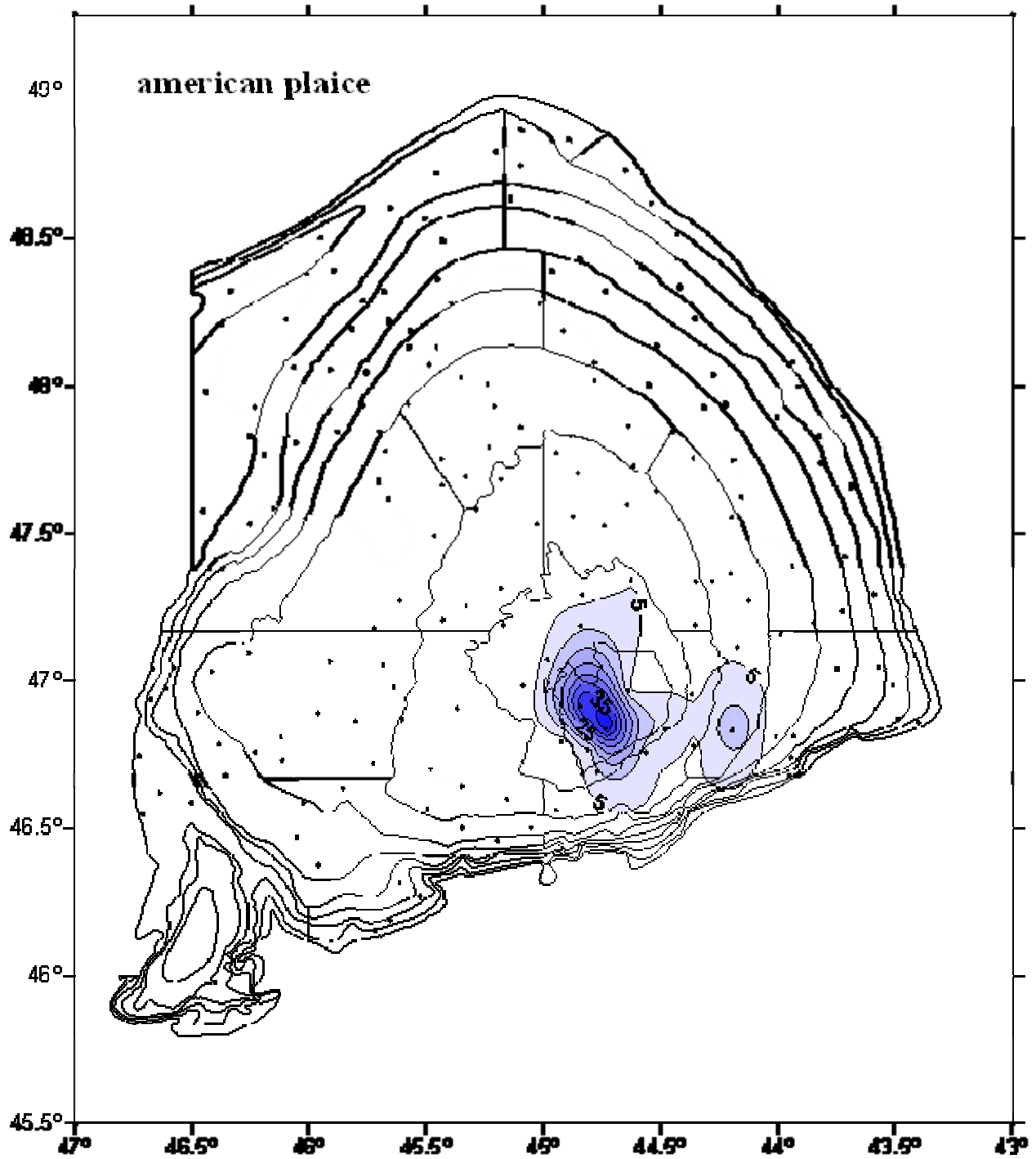


Figure 3 - American plaice (*Hippoglossoides platessoides*) catch distribution in the 2006 survey in Kg.

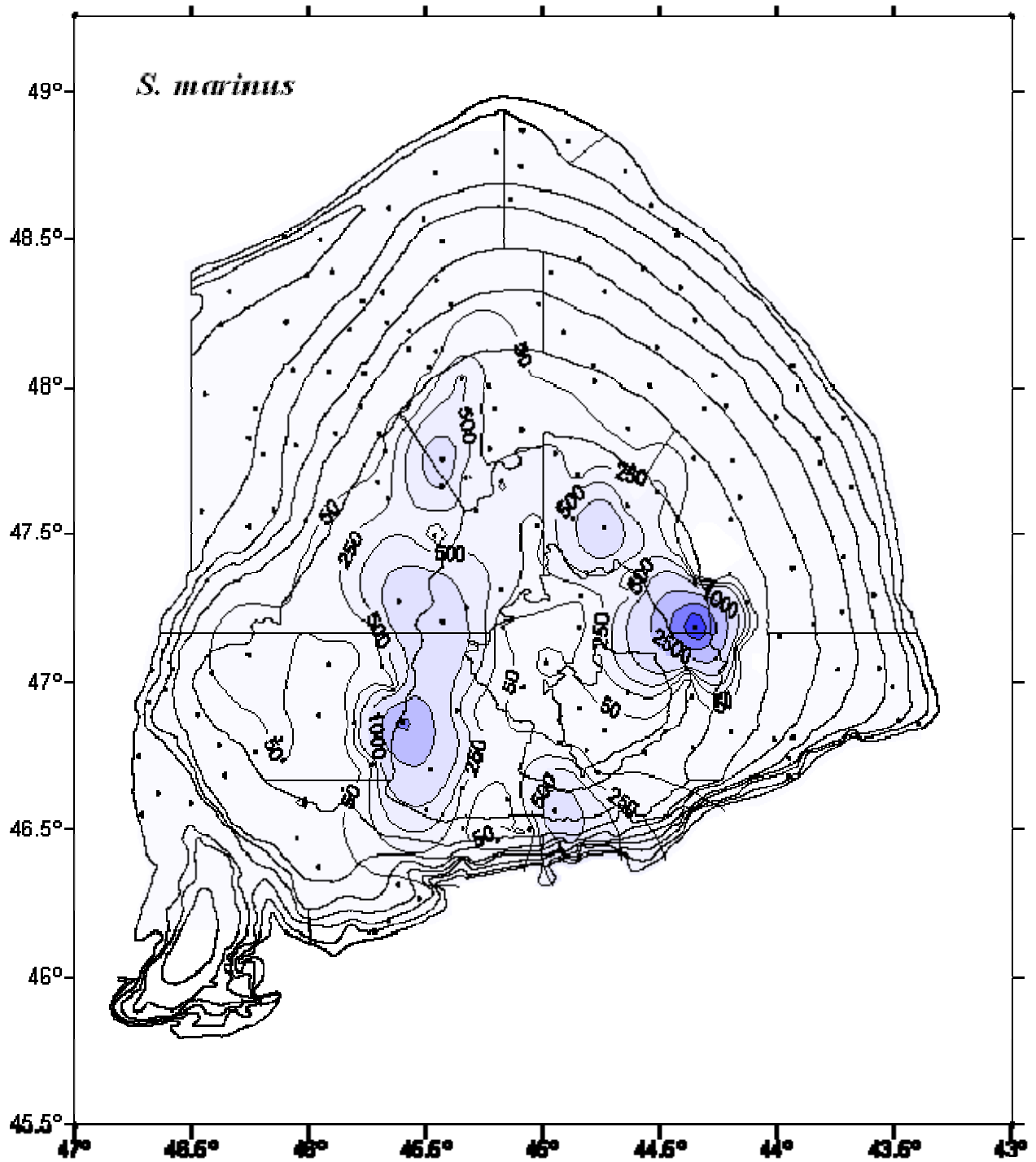


Figure 4 - Redfish (*Sebastes marinus*) catch distribution in the 2006 survey in Kg.

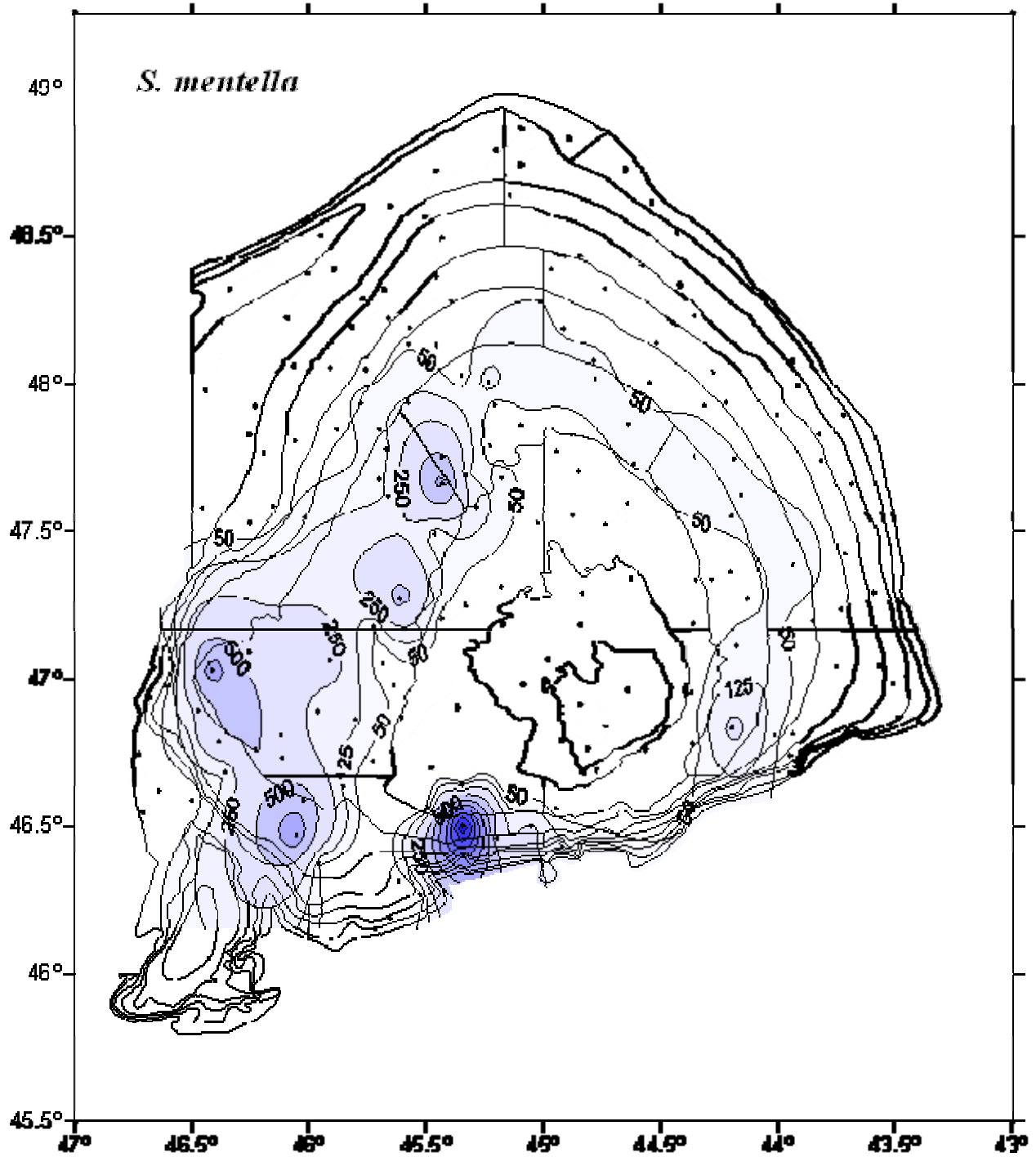


Figure 5 - Redfish (*Sebastes mentella*) catch distribution in the 2006 survey in Kg.

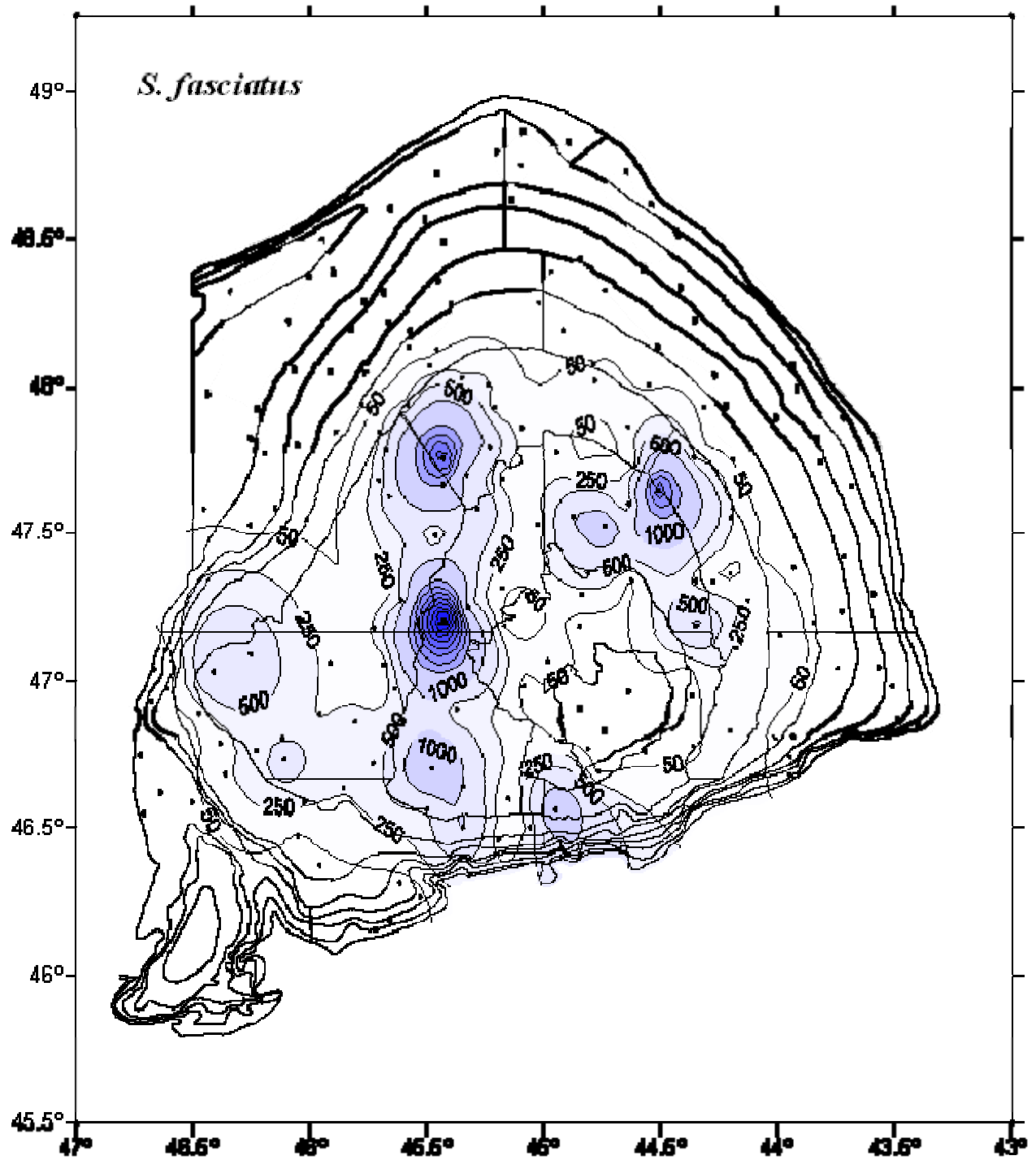


Figure 6 - Redfish (*Sebastes fasciatus*) catch distribution in the 2006 survey in Kg.

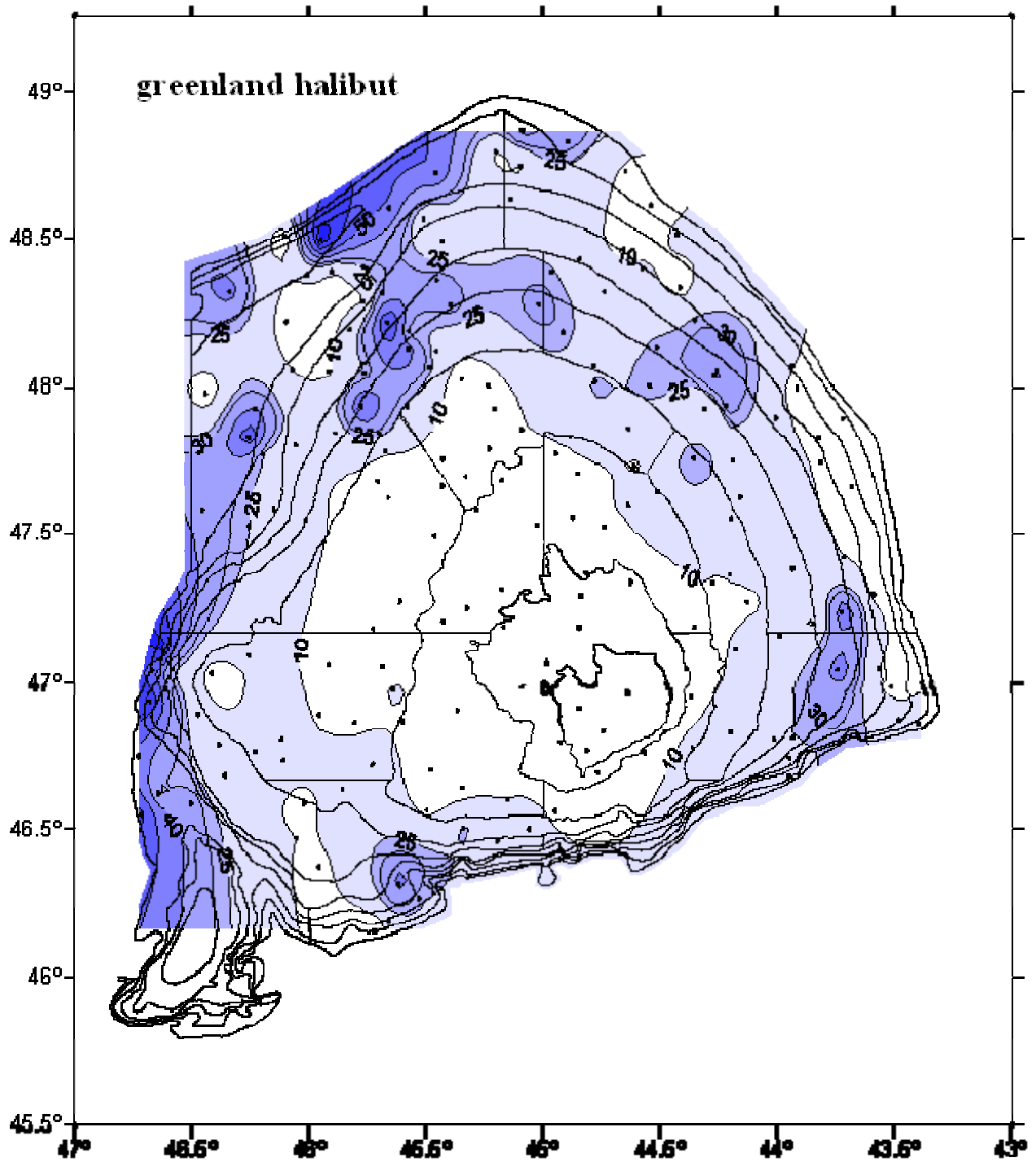


Figure 7 - Greenland halibut (*Reinhardtius hippoglossoides*) catch distribution in the 2006 survey in Kg.