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Results from Bottom Trawl Survey on Flemish Cap of July 2003

by

José Miguel Casas

Instituto 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 2nd to July 27th 2003 following the same procedures as in previous years. However the survey was carried out by the R/V *Vizconde de Eza*, which will continue for this survey in the future. For this reason during the first ten days of the survey a comparative fishing trial for calibration was conducted between the former vessel *R/V Cornide de Saavedra* and the new one. Taking into account that the calibration will continue during the next year's survey, the indexes in the series from 1988 to 2002 were not changed to the new scale by now. Still, the 2003 current indices from the R/V *Vizconde de Eza* were transformed to the *R/V Cornide de Saavedra* scale, to make them comparable to the results obtained in previous years. Abundance at age indices was presented for cod, American plaice, redfish and Greenland halibut.

KEYWORDS: Survey, Flemish Cap, cod, American plaice, redfish, Greenland halibut.

Introduction

The survey on Flemish Cap was carried out on board R/V *Vizconde de Eza* in 2003. A total of 114 valid bottom trawls were made up to a depth of 730 m (400 fathoms) (Fig. 1). The survey covered all strata of the bank adequately. A synoptic sheet of the survey with vessel and gear characteristics is shown in Table 1. This was the 16th 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 tows	Dates	Year	Vessel	Valid tows	Dates
1988	Cornide de Saavedra	115	8/7 – 22/7	2000	Cornide de Saavedra	120	10/7 – 28/7
1989	Cryos	116	12/7 – 1/8	2001	Cornide de Saavedra	120	3/7 – 20/7
1990	Ignat Pavlyuchenkov	113	18/7 – 6/8	2002	Cornide de Saavedra	120	30/6 – 17/7
1991	Cornide de Saavedra	117	24/6 – 11/7	2003	Vizconde de Eza	114	2/6 – 27/7
1992	Cornide de Saavedra	117	29/6 – 18/7				
1993	Cornide de Saavedra	101	23/6 – 8/7				
1994	Cornide de Saavedra	116	6/7 – 23/7				
1995	Cornide de Saavedra	121	2/7 – 19/7				
1996	Cornide de Saavedra	117	28/6 – 14/7				
1997	Cornide de Saavedra	117	16/7 – 1/8				
1998	Cornide de Saavedra	119	17/7 – 2/8				
1999	Cornide de Saavedra	117	2/7 – 20/7				

Material and Methods

Change in vessel and calibration

Even the survey was carried out 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), the R/V *Vizconde de Eza* replaced the traditional research vessel used up to now. In order to establish a link between the two sets of survey data, comparative fishing trials were conducted during the present survey to develop conversion factors between the two vessels. A series of 59 valid paired hauls was carried out, where the two vessels were fishing at the same time, along parallel courses, at a speed of 3.0 knots, and for 30 minutes. The comparative trials were not concluded, and new paired hauls are planned for 2004, so no conversion of the whole series was attempted by now. However, the 2003 current indices from the R/V *Vizconde de Eza* were transformed to the R/V *Cornide de Saavedra* scale to make them comparable to previous results.

To convert data series it was necessary to convert the length distribution and abundance by means of multiplicative model, proposed by Warren (1997)

$$Ratio = \alpha l^{\beta} e^{\delta l}$$

where: $Ratio = \frac{R/V \text{ Cornide de Saavedra (catch number)}}{R/V \text{ Vizconde de Eza (catch number)}}$ by length

l is length

α , β and δ are the estimated parameters.

	α	β	δ	Hauls number
<i>Gadus morhua</i>	1.08E+01	-0.932	0.0209	21
<i>Hippoglossoides platessoides</i>	4.70E-06	4.9502	-0.1395	17
<i>Sebastes mentella</i>	2.28E-07	5.7995	-0.1328	21
<i>Sebastes marinus</i>	6.25E-05	3.5896	-0.0985	33
<i>Sebastes fasciatus</i>	3.23E-25	25.4499	-1.0073	38
<i>Sebastes juvenile</i>	9.32E+01	-5.268	0.7021	42
<i>Reinhardtius hippoglossoides</i>	1.35E-02	1.8242	-0.0476	32
<i>Macrourus berglax</i>	1.51E+00	-0.1508	0.0172	9
<i>Pandalus borealis</i>	1.41E+06	-7.8528	0.4348	36

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 last year 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	46.17	14.96	196.91	8.48	2.98	2.69
1989	129.07	13.10	170.27	5.47	1.29	2.45
1990	68.84	11.32	129.56	7.02	1.24	2.66
1991	45.51	9.41	79.39	10.00	1.97	10.21
1992	30.21	8.07	129.92	10.68	2.33	20.56
1993	69.18	7.34	70.12	8.79	7.88	10.83
1994	29.92	7.67	156.74	9.84	2.92	4.15
1995	10.96	6.33	91.57	13.31	2.31	6.73
1996	10.19	3.82	125.02	14.19	2.01	8.09
1997	11.27	2.82	173.14	19.70	1.77	6.34
1998	5.64	3.20	73.76	29.66	2.50	20.67
1999	3.23	2.41	103.08	25.96	1.85	15.46
2000	3.46	1.50	185.54	20.75	1.55	12.09
2001	3.05	2.24	79.48	16.98	3.08	17.54
2002	2.82	1.91	120.67	14.81	1.79	22.52
2003	1.79	4.22	97.81	12.43	3.98	17.22

These survey indices are also presented in Table 2, and even they belong to different species and pelagic vs. demersal character, a global index was calculated for each year, which minimum occurred in 2001. Redfish shows 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. Cod reached its biomass minimum in 2003. The relative high values founded for American plaice and grenadiers (mainly roughhead grenadier) are probably due to the occasional increasing of catchability. Greenland halibut maintained a continuous biomass increase to reach a maximum in 1998, but decreases since then. Shrimp catches in 2002 were the highest, but interpretation of survey results needs to take into account changes occurred in cod-end mesh size.

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, and Greenland halibut, the second half. For cod, 1995 was the spawning year for the first extremely weak recruitment; it had been 1991 for American plaice.

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	8,815	8,260	-
1984		31,210		1996	8,196	730	-
1985		28,070		1997	9,063	-	-
1986		26,060		1998	4,532	-	-
1987		10,150	21,600	1999	2,596	-	-
1988	37,133	7,720	34,200	2000	2,782		-
1989	103,644	36,520	78,300	2001	2,451	784	-
1990	55,360	3,920	15,200	2002	2,270	694	-
1991	36,597	6,740	8,200	2003	1,437		- tons
1992	24,295	2,490	2,400				
1993	55,642	8,990	9,700				
1994	24,062	-	-				

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 bellow.

age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	5.69	25.87	2.96	171.37	88.52	5.43	3.91	1.92	0.05	0.05	0.03	0.01	0.21	0.57	–	0.86
2	90.02	13.71	14.35	31.83	46.08	164.67	4.77	14.13	3.69	0.17	0.10	0.10	0.02	2.05	1.43	0.05
3	50.53	104.82	5.68	19.13	5.90	35.37	30.59	1.54	7.62	3.91	0.11	0.13	0.34	0.01	0.69	0.61
4	13.37	61.23	18.49	2.40	2.53	1.26	5.67	4.47	1.02	5.42	1.41	0.13	0.21	0.13	0.03	0.14
5	1.50	23.17	17.63	7.81	0.41	1.58	0.15	1.10	2.79	0.45	1.80	0.81	0.10	0.09	0.08	0.02
6	0.23	1.58	5.20	2.08	1.56	0.21	0.08	0.04	0.23	1.12	0.09	0.52	0.50	0.02	0.04	0.05
7	0.27	0.20	0.42	0.37	0.28	0.61	0.01	0.03	0.01	0.02	0.18	0.02	0.20	0.17	0.03	0.01
8	0.08	0.17	0.19	0.09	0.01	0.12	0.15	–	0.01	–	–	0.01	0.01	0.12	0.12	0.01
9	–	0.01	0.11	0.04	–	–	–	0.03	–	–	0.01	–	0.02	0.01	0.04	0.05
10	–	0.01	0.04	0.01	–	–	0.01	0.01	–	–	–	–	–	0.01	–	0.04
11	–	–	–	0.02	0.01	–	–	–	–	–	–	–	–	0.01	0.01	–
12	–	–	–	–	–	–	–	–	–	0.01	–	–	0.01	–	–	–
13	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
14	–	–	–	–	–	–	–	–	–	–	–	–	0.01	–	–	–
total	161.69	230.77	65.07	235.15	145.30	209.25	45.34	23.27	15.42	11.15	3.73	1.73	1.63	3.19	2.47	1.83

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 11 or less in 2003), were weak, weaker than the ones observed in the previous period. The 1995 to 1999 year-classes (ages 8 to 4 in 2003) failed almost completely and, according to the results of the last survey, the same failure appears to have occurred to the 2000 and 2001 year-class (age 3 and 2, respectively, in 2003).

Tables 6, 7 and 4 show mean length frequency per tow, the age-length key and mean frequency at age per tow respectively. Catch per tow distribution is presented in Fig. 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	1994	6,173	
1984		7,500	1995	5,087	
1985		7,800	1996	3,073	
1986		20,200	1997	2,268	
1987		9,300	1998	2,577	
1988	11,887	6,500	1999	1,940	
1989	10,533	5,000	2000	1,204	
1990	9,101	1,200	2001	1,803	548
1991	7,565	14,400	2002	1,536	1,398
1992	6,492	1,200	2003	3,397	
1993	5,949	2,700			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 the table. The 1984, 1986 and 1990 year-classes, ages 18, 16 and 12 in 2002, were 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.

There is no change in the perception on the condition of the stock relative to the last year views. The stock has recorded a steady decline since 1988. Global indices in the table of the following page, such as total number by tow and frequency 6+, have declined over the whole period, reaching their lowest level in 2002: 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, and all year-classes with less than 12 years old in 2002, were among the weakest ones observed in this survey. The high values founded in 2003 for American plaice, mainly in the ages older than 9 years old, are probably due to the occasional increasing of catchability in 2003 survey.

Age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	–	–	–	–	–	–	–	–	0.01	0.01	–	0.01	0.02	–	–	–
2	2.84	0.57	0.44	0.39	0.91	0.01	0.04	0.03	0.03	0.02	0.03	–	0.03	0.04	–	–
3	0.78	8.52	0.95	1.13	0.84	1.70	0.05	0.12	0.13	0.12	0.03	0.03	0.01	0.06	0.03	0.05
4	3.77	1.87	8.68	2.33	1.13	1.20	2.23	0.78	0.28	0.03	0.05	0.07	0.09	0.06	0.07	0.20
5	2.46	4.03	1.08	5.54	1.83	0.80	0.97	2.01	0.58	0.12	0.07	0.07	0.11	0.10	0.02	0.18
6	3.76	3.74	2.96	2.28	4.26	0.40	0.81	1.23	1.54	0.39	0.25	0.07	0.15	0.06	0.08	0.13
7	5.17	3.57	2.04	2.50	1.13	3.86	0.87	1.23	0.82	1.12	0.57	0.22	0.11	0.10	0.06	0.11
8	5.29	2.10	1.97	1.95	1.36	0.42	3.08	0.83	0.51	0.25	0.81	0.42	0.14	0.24	0.11	0.28
9	1.86	0.73	1.23	0.84	0.78	0.74	0.30	1.41	0.38	0.39	0.48	0.46	0.36	0.39	0.13	0.61
10	0.26	0.33	0.58	0.29	0.36	0.35	0.59	0.16	0.59	0.28	0.33	0.23	0.39	0.52	0.17	0.49
11	0.14	0.04	0.11	0.01	0.17	0.24	0.21	0.18	0.14	0.46	0.29	0.32	0.21	0.43	0.27	0.86
12	0.08	0.02	0.02	0.06	0.09	0.29	0.20	0.15	0.08	0.13	0.28	0.20	0.17	0.39	0.20	0.94
13	–	–	0.04	–	0.02	0.35	0.24	0.15	0.08	0.02	0.09	0.12	0.07	0.18	0.23	0.56
14	–	–	0.02	–	–	1.07	0.50	0.30	0.11	0.10	0.12	0.13	0.05	0.16	0.14	0.50
15	–	–	–	–	–	0.04	0.50	0.23	0.08	0.05	0.06	0.06	0.05	0.11	0.13	0.24
16+	–	–	–	–	–	0.04	0.01	0.03	0.02	0.12	0.11	0.10	0.06	0.10	0.18	0.25
Total	26.39	25.52	20.12	17.32	12.88	11.51	10.60	8.84	5.38	3.61	3.57	2.51	2.02	2.94	1.82	5.41
freq. 6+	16.54	10.53	8.97	7.93	8.17	7.80	7.31	5.90	4.35	3.31	3.39	2.33	1.76	2.68	1.70	4.97

Tables 11, 12 and 9 show mean length frequency per tow, the age-length key and mean frequency at age per tow respectively. Catch per tow distribution is presented in Fig. 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 a uniform defined group, but it is maintained for practical reasons.

Mean catch per tow by strata are presented in Tables 13, 15, 20 and 22 for *Sebastes marinus*, *S. mentella*, *S. fasciatus* and the *juvenile* group, respectively. The following table summarize past results.

Year	<i>Sebastes:</i>	spp.			total
	<i>marinus</i>	<i>mentella</i>	<i>fasciatus</i>	juvenile	
1988	19.06		177.85		196.91
1989	28.55		141.72		170.27
1990	17.52	90.36		20.05	127.93
1991	5.09	62.26	7.06	4.98	79.39
1992	5.14	89.29	6.60	28.89	129.92
1993	5.02	23.91	5.50	35.69	70.12
1994	41.32	44.43	9.73	61.26	156.74
1995	11.24	73.78	6.26	0.29	91.57
1996	14.04	96.86	13.71	0.41	125.02
1997	80.64	69.75	21.72	1.03	173.14
1998	7.99	56.40	8.00	1.37	73.76
1999	11.73	81.14	9.89	0.32	103.08
2000	55.82	111.12	16.06	2.54	185.54
2001	10.71	48.02	14.34	6.41	79.48
2002	12.18	50.98	28.82	28.69	120.67
2003	27.17	34.38	19.70	16.56	97.81

Tables 14, 16, 21 and 23 show mean length frequency by tow for the four groups. Age-length keys and mean frequency at age by tow as well the values in all previous surveys for *S. mentella* are presented in Tables 18, 17 and 19, respectively. Catches per tow distributions of the three species are presented in Fig. 4, 5 and 6.

Greenland halibut

Mean catch per tow by strata and its standard error are presented in Table 24. These indices are compared with results of previous surveys in Table 28 and summarised as follow:

Year	
1988	8.48
1989	5.47
1990	7.10
1991	10.00
1992	10.68
1993	8.79
1994	9.84
1995	13.31
1996	14.19
1997	19.70
1998	29.66
2000	20.75
2001	16.98
2002	14.81
2003	12.43

Kg/tow

Mean length frequency by tow, age-length keys and mean frequency at age per tow are presented in Tables 25, 27 and 26, respectively. Catch per tow distribution is presented in Fig. 7. Mean frequency at age per tow was calculated as follows:

age	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	0.43	1.15	1.17	1.03	7.66	3.57	1.98	1.79	0.65	1.99	5.17	2.44	2.10
2		0.99	1.16	0.88	1.74	5.74	2.63	1.58	0.53	0.18	1.04	2.04	1.38
3	0.29	0.36	0.75	1.34	1.70	1.90	5.46	6.40	2.37	0.39	1.43	2.01	0.98
4	1.23	1.07	0.71	1.52	1.55	2.57	6.41	9.75	8.93	1.75	0.85	1.37	2.54
5	2.43	1.99	1.20	1.70	2.13	3.82	6.49	11.40	12.21	6.91	2.54	3.40	4.12
6	1.56	2.48	1.96	2.78	4.72	5.46	7.51	10.97	11.94	14.41	7.37	5.18	4.81
7	2.84	2.23	2.16	2.61	3.76	2.51	4.83	7.88	5.45	5.09	6.93	5.85	2.96
8	0.68	1.23	1.73	1.51	2.15	1.71	2.12	2.91	1.92	2.11	3.70	1.24	0.71
9	0.58	0.59	1.13	0.86	1.41	0.49	0.74	0.87	0.40	0.44	0.21	0.16	0.18
10	0.49	0.33	0.32	0.33	0.32	0.10	0.25	0.25	0.12	0.12	0.06	0.07	0.13
11	0.15	0.17	0.18	0.12	0.08	0.04	0.04	0.04	0.01	0.06	0.01	0.02	0.02
12	–	0.08	0.06	0.07	0.03	0.04	0.03	0.01	–	–	–	0.01	0.01
13	–	0.02	0.02	0.02	–	–	0.03	0.03	–	–	–	–	–
14	–	0.02	0.01	–	0.01	0.01	–	–	0.01	–	–	–	–
15	–	–	–	–	–	0.01	0.01	–	–	–	–	–	–
16+	–	–	–	–	–	–	0.02	–	–	–	–	–	–
total	10.68	12.71	12.56	14.77	27.26	27.97	38.55	53.88	44.54	33.45	29.31	23.79	19.94
freq. 10+	0.64	0.62	0.59	0.54	0.44	0.20	0.38	0.33	0.14	0.18	0.07	0.10	0.16

Shrimp

Del Río *et al.* (2003) presented detailed results.

Roughhead grenadier (*Macrourus berglax*)

Mean catch per tow along this survey series was:

1989	1.29	
1990	1.26	
1991	1.97	
1992	2.33	
1993	7.88	
1994	2.92	
1995	2.31	
1996	2.01	
1997	1.77	
1998	2.50	
1999	1.85	
2000	1.55	
2001	3.08	
2002	1.79	
2003	3.98	Kg/tow

Detailed results were presented by Murua (2004).

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.
- Del Río, J.L., J.M. Casas and T. Patrocinio – 2002. Northern shrimp (*Pandalus borealis*) on Flemish Cap in July 2002. *NAFO SCR Doc.* 02/150.
- Del Río, J.L., J.M. Casas and D. González Troncoso – 2003. Northern shrimp (*Pandalus borealis*) on Flemish Cap in June 2003. *NAFO SCR Doc.* 03/80.
- 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.
- Murua, H.– 2003. A review on Roughhead Grenadier (*Macrourus berglax*) biology and population structure on Flemish Cap (NAFO Division 3M), 1991-2002 based on EU Flemish Cap survey data. *NAFO SCR Doc.* 03/13.
- 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 2003 survey.

Procedure	Specification
Vessel	R/V Vizconde de Eza
GT	1 400 t
Power	1 800 HP
Mean trawling speed	3.52 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	1.6 × depth echo sounder + 430 m.
mesh size in cod-end	35 mm
Type of survey	Stratified sampling
Station selection procedure	Random
Criterion to change position of a selected tow	- unsuitable bottom for trawling according to ecosounder register. Information on gear damage from previous surveys.
Criterion to reject data from tow	- 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 for several species or groups of species in 1988-2003 surveys (kg).

Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Rajidae	5.59	2.41	3.51	5.05	4.70	7.76	4.36	2.82	2.55	2.29	2.46	2.00	1.43	2.78	1.92	5.73
<i>Synaphobranchus sp.</i>	0.27	0.11	0.05	0.10	0.09	0.13	0.01	0.02	0.00	0.01	0.05	0.00	0.00	0.03	0.01	0.03
<i>Urophycis sp.</i>	0.80	0.21	0.21	0.32	0.09	0.21	0.27	0.10	0.10	0.04	0.28	0.31	0.21	0.49	0.16	0.68
<i>Antimora sp.</i>	0.49	0.38	0.35	0.70	0.90	1.02	0.99	0.24	0.23	0.29	0.61	0.36	0.33	0.83	0.43	0.38
Macrouridae	3.84	1.81	1.52	2.80	3.22	8.08	4.02	3.24	2.91	2.85	3.52	2.90	2.25	3.83	2.54	4.59
<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
<i>Illex sp.</i>	0.01	0.01	2.05	1.44	0.08	0.00	0.26	0.00	0.11	0.08	0.09	0.02	0.00	0.01	0.01	0.28
Anarhichadidae	9.94	9.31	10.10	12.56	11.31	17.85	19.45	23.90	25.57	17.45	13.66	6.94	5.56	7.29	6.50	7.44
Witch flounder	1.13	0.42	0.52	0.96	1.02	1.30	0.98	0.88	0.63	0.40	0.30	0.47	0.51	0.57	0.26	1.05
Greenland halibut	8.48	5.47	7.02	10.00	10.68	9.11	9.84	13.31	14.19	19.71	29.66	25.96	20.75	16.98	14.81	12.43
Zoarcidae	0.70	1.42	1.50	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
Cod	46.18	129.07	68.84	45.51	30.21	69.12	29.92	10.96	10.19	11.27	5.64	3.23	3.46	3.05	2.82	1.79
American plaice	14.96	13.10	11.32	9.41	8.07	7.38	7.67	6.33	3.82	2.82	3.21	2.41	1.50	2.24	1.91	4.22
Redfish	196.90	170.28	127.93	79.39	129.92	71.53	156.73	91.57	125.02	173.14	73.76	103.08	185.55	79.48	120.67	97.81
Shrimp*	2.69	2.45	2.66	10.21	20.56	11.36	4.15	6.73	8.09	6.34	20.67	15.46	12.09	17.54	22.52	17.22
Others	0.79	0.26	1.42	0.83	0.53	0.00	0.59	0.49	0.86	0.73	1.38	0.77	1.98	1.80	1.16	
Total	293.38	337.20	238.71	182.31	223.61	211.51	242.12	163.73	196.61	239.92	158.04	165.10	236.69	138.60	176.80	154.74

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

Table 5 – Cod mean catch per tow (kg) by strata in 1988-2003 surveys.

stratum	depth in	year															
	fathoms	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	70- 80	46.94	22.65	28.80	194.88	2.64	17.99	75.57	54.53	35.12	8.47	4.37	3.46	8.70	3.01	16.65	6.21
2	81-100	144.55	147.00	29.39	78.12	73.35	128.79	116.58	43.29	56.83	29.17	27.05	21.39	10.55	6.98	10.48	1.42
3	101-140	84.95	195.29	41.68	46.73	161.00	160.29	115.77	21.79	20.01	21.51	13.34	2.77	6.83	4.38	8.56	1.56
4	"	107.32	166.10	88.84	99.44	118.10	485.97	64.66	25.57	36.61	29.39	4.78	0.88	15.20	16.76	2.27	5.08
5	"	36.17	181.68	144.47	180.82	77.57	115.85	15.69	21.62	15.90	19.52	16.55	4.34	7.20	4.41	2.49	4.92
6	"	77.73	163.36	79.56	36.83	22.92	101.54	33.97	31.50	14.93	25.86	14.75	9.03	12.30	18.03	12.62	0.55
7	141-200	32.28	232.66	57.19	36.85	13.72	89.33	12.43	1.77	0.79	15.50	1.13	0.75	0.08	0.18	0.35	1.59
8	"	164.99	303.60	311.12	94.34	43.39	147.11	66.79	6.44	1.73	29.74	1.42	0.43	1.35	2.27	0.69	2.17
9	"	6.98	199.96	246.39	7.16	5.44	37.91	9.09	0.34	3.91	6.62	–	0.73	1.56	–	0.53	14.09
10	"	16.79	61.47	58.72	19.56	4.10	11.75	6.35	0.73	0.58	3.78	2.49	1.28	1.34	1.01	0.03	0.27
11	"	37.10	195.74	60.35	26.46	3.33	24.85	8.61	1.16	0.61	4.60	2.60	3.78	1.56	2.58	0.27	0.83
12	201-300	5.97	43.98	28.95	2.25	–	0.43	–	–	–	–	–	–	–	–	–	1.21
13	"	0.40	121.47	36.31	4.49	–	–	–	–	–	–	–	–	–	–	–	–
14	"	2.12	22.21	12.73	2.59	1.33	4.37	–	–	–	–	–	–	–	–	–	–
15		13.40	151.17	42.12	1.94	–	–	–	–	–	–	–	–	–	–	–	0.30
16	301-400	–	1.23	–	–	–	–	–	–	–	–	–	–	–	–	–	–
17		–	0.28	–	–	–	0.13	–	–	–	–	–	–	–	–	–	–
18		0.12	–	–	–	–	0.16	–	–	–	–	–	–	–	–	–	–
19		–	2.90	–	–	–	–	–	–	–	–	–	–	–	–	–	–
total		46.17	129.07	68.84	45.51	30.21	69.18	29.92	10.96	10.19	11.27	5.64	3.23	3.46	3.05	2.82	1.79
s.e.		6.54	13.80	9.30	7.58	6.60	19.67	8.33	2.34	1.65	1.95	0.73	0.51	0.67	0.43	0.45	0.31

s.e.: standard error

Table 6 – Cod mean length frequency per tow in the 2003 survey.

length		length		length		length	
12-14	0.01	36-38	0.02	60-62	0.03	84-86	0.01
15-17	0.14	39-41	0.01	63-65	0.01	87-89	0.02
18-20	0.65	42-44	0.10	66-68	0.01	90-92	0.02
21-23	0.06	45-47	0.21	69-71		93-95	0.02
24-26		48-50	0.14	72-74	0.03	96-98	
27-29		51-53	0.14	75-77	0.01	99- 101	0.02
30-32	0.02	54-56	0.08	78-80	0.04		
33-35	0.02	57-59	0.02	81-83			

Table 7 – Cod age-length key in 2003.

Length cm	age																total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	
12-14	1																1
15-17	11																11
18-20	60																60
21-23	6																6
24-26																	
27-29																	
30-32		2															2
33-35		3															3
36-38		2															2
39-41			1														1
42-44			14														14
45-47			28														29
48-50			19	1													20
51-53			15	3													18
54-56			5	5													10
57-59				2													2
60-62				4													4
63-65				1	1												2
66-68				1													1
69-71																	
72-74					1	2											3
75-77					1												1
78-80						3		1									4
81-83																	
84-86										1							1
87-89								1	1								2
90-92									2								2
93-95									1	1							2
96-98																	
99-101									1	1							2
total	78	7	82	17	3	5	1	1	5	3							203

Table 8 – American plaice mean catch per tow by strata and its standard error in the 2003 survey.

stratum	area	tow	catch per tow (Kg)
	sq. miles	number	mean
1	342	3	77.24
2	838	9	15.79
3	628	7	0.46
4	348	4	
5	703	8	1.85
6	496	6	0.98
7	822	9	0.61
8	646	7	0.47
9	314	3	0.57
10	951	11	1.01
11	806	8	0.75
12	670	7	0.32
13	249	3	
14	602	4	
15	666	9	0.15
16	634	7	
17	216	2	
18	210	2	
19	414	5	
total	10555	114	4.22
s.error			1.37

Table 9 – American plaice mean frequency at age per tow in the 2003 survey.

age	stratum													total	mean	mean
	1	2	3	4	5	6	7	8	9	10	11	12	15		weight	length
1	–	0.03	–	–	–	–	–	–	–	–	–	–	0.00	–	17	13.0
2	–	–	–	–	–	0.06	–	–	–	–	–	–	0.00	–	41	17.0
3	–	0.16	–	0.06	0.21	–	0.18	0.17	0.08	0.05	–	–	0.05	–	143	25.0
4	1.88	0.66	0.02	0.17	0.03	0.06	–	0.29	0.44	0.26	–	–	0.20	1.88	313	31.8
5	2.07	0.64	0.06	0.11	0.05	0.06	–	0.08	0.19	0.29	0.02	–	0.18	2.07	376	33.7
6	1.61	0.44	0.02	0.13	0.03	0.05	–	0.08	0.12	0.11	0.02	–	0.13	1.61	433	35.2
7	1.54	0.36	0.04	0.11	0.05	0.06	–	0.08	0.06	0.03	0.00	–	0.11	1.54	489	36.5
8	5.30	0.94	0.06	0.15	0.08	0.06	0.02	0.08	0.08	0.05	0.04	0.02	0.28	5.30	613	39.2
9	11.90	2.00	0.08	0.21	0.11	0.10	0.06	0.08	0.12	0.13	0.08	0.02	0.61	11.90	649	39.9
10	10.52	1.44	0.02	0.13	0.00	0.06	0.04	0.08	0.08	0.05	0.04	0.04	0.49	10.52	699	40.8
11	17.35	2.88	0.06	0.19	0.05	0.08	0.06	0.13	0.14	0.18	0.10	0.04	0.86	17.35	734	41.4
12	17.96	3.27	0.08	0.32	0.26	0.08	0.12	0.08	0.19	0.15	0.08	0.04	0.94	17.96	825	42.9
13	11.24	1.86	0.04	0.19	0.13	0.02	0.06	0.08	0.12	0.07	0.06	–	0.56	11.24	797	42.5
14	9.13	1.96	0.08	0.19	0.08	0.06	0.04	0.04	0.08	0.08	0.06	0.02	0.50	9.13	854	43.4
15	4.34	1.00	0.02	0.09	0.03	0.03	0.02	0.00	0.04	0.02	0.02	0.00	0.24	4.34	1154	47.7
16+	4.11	1.13	0.04	0.19	0.08	0.05	0.02	0.00	0.04	0.02	0.00	0.00	0.25	4.11	1347	50.0

Table 10 – American plaice mean catch per tow (Kg) by strata in 1988-2003 surveys.

stratum	depth in fathoms	year															
		1988	1989	1990	1991	1992	1993	1984	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	70- 80	37.56	28.78	14.55	31.02	20.43	31.06	19.05	64.17	42.07	10.98	4.49	10.72	9.93	30.01	4.06	77.24
2	81-100	33.40	42.31	16.14	31.28	20.13	14.88	14.07	15.68	11.08	8.70	18.64	21.25	11.47	9.80	14.82	15.79
3	101-140	21.42	17.51	26.14	19.54	9.88	6.95	5.10	3.95	2.64	7.75	4.46	1.53	0.33	1.45	1.16	0.46
4	"	62.18	13.07	23.10	9.05	15.75	16.17	24.14	13.84	7.59	5.74	9.69	1.52	2.83	2.43	3.64	
5	"	36.39	43.30	25.61	19.69	11.73	18.07	17.21	7.69	6.99	8.66	10.41	1.03	0.79	1.56	2.66	1.85
6	"	9.51	22.42	18.91	9.96	11.93	6.05	16.04	2.43	0.63	0.27	0.70	0.79	0.49	0.73	1.24	0.98
7	141-200	14.05	6.35	10.03	4.66	7.65	3.82	3.78	2.98	0.86	0.99	0.56	0.22	0.17	0.34	0.63	0.61
8	"	6.37	2.50	4.01	3.81	11.08	7.42	2.60	2.00	0.86	1.87	2.51	0.03	–	0.70	0.65	0.47
9	"	3.22	5.12	10.75	–	11.69	6.43	0.61	15.68	1.73	1.11	–	–	–	–	0.04	0.57
10	"	24.05	15.42	20.71	13.54	14.55	15.10	23.14	7.33	4.29	2.97	0.37	0.75	0.46	0.98	0.37	1.01
11	"	14.47	14.26	16.08	4.90	4.55	3.56	3.70	1.34	0.82	0.39	0.36	0.46	0.27	0.33	0.71	0.75
12	201-300	0.13	0.27	0.66	0.25	0.16	0.22	0.49	0.17	0.47	0.10	–	–	–	0.06	–	0.32
13	"	0.08	–	0.81	–	–	–	–	0.10	–	–	–	–	–	–	–	–
14	"	0.12	0.14	0.10	6.37	0.47	0.09	0.39	0.23	0.07	–	0.07	0.16	–	–	–	–
15	"	0.33	1.46	0.04	1.43	0.56	1.62	0.59	1.01	0.33	0.10	0.10	–	–	–	–	0.15
16	301-400	0.09	–	–	0.05	0.14	0.20	0.09	–	–	–	–	–	–	–	–	–
17	"	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
18	"	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
19	"	–	–	–	0.35	0.08	0.13	0.06	0.24	–	–	–	–	–	–	–	–
total		14.96	13.10	11.17	9.41	8.07	7.34	7.67	6.33	3.82	2.82	3.20	2.41	1.50	2.24	1.91	4.22
s.e.		1.72	1.91	1.19	1.10	0.89	0.97	1.28	1.01	0.85	0.66	0.70	0.81	0.31	0.40	0.68	1.37

Table 11 – American plaice mean length frequency per tow in the 2003 survey.

length	male	female	length	male	female	length	male	female	length	male	female
12-13	0.00		24-25	0.01	0.01	36-37	0.69	0.05	48-49	0.01	0.21
14-15			26-27	0.01		38-39	1.01	0.03	50-51		0.32
16-17		0.00	28-29	0.04	0.01	40-41	0.84	0.03	52-53		0.20
18-19			30-31	0.12	0.03	42-43	0.72	0.04	54-55		0.06
20-21	0.01		32-33	0.12	0.02	44-45	0.21	0.05	56-57		0.02
22-23	0.02		34-35	0.25	0.03	46-47	0.11	0.11	58-59		0.01

Table 12 – American plaice age-length key in 2003.**MALE**

Length cm	age																total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	
12-13	1																1
20-21			1														1
22-23			1	1													2
24-25			1														1
26-27					1												1
28-29			1	1		1											3
30-31				4	3	1											8
32-33				2	2	2	2	1	1								10
34-35					3	1	3	3	3		1	1		1			16
36-37						1		3	8	3	9	6	3	7			40
38-39								5	11	12	12	12	10	4	1	1	68
40-41								2	6	8	14	11	8	4	1	1	55
42-43								2	5	5	8	10	7	4	4	1	46
44-45									2	3	3	5		2	1	1	17
46-47								1	1			1	4			1	8
total	1	0	4	8	9	6	5	17	37	31	47	46	32	22	7	5	277

FEMALE

Length cm	age																total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	
16-17	1																1
24-25		1															1
26-27																	
28-29			1														1
30-31			2														2
32-33			1														1
34-35			1		1												2
36-37				2													2
38-39			2			1											3
40-41					1	1											2
42-43					1	1	1			1							4
44-45							1	1	1	1							4
46-47								1		1	5		1				8
48-49								1		5	5	1	1	2	1		16
50-51									1	1	8	3	6	5	6		30
52-53										2	1	2	5	4	6		20
54-55											1	1	1	2	2		7
56-57													1		2		3
58-59															1		1
total	0	1	1	7	2	3	3	2	3	2	11	20	7	15	13	18	108

Table 13 – Redfish (*Sebastes marinus*) mean catch per tow by strata and its standard error in the 2003 survey.

stratum	Area sq. miles	tow number	catch per tow (Kg)
			mean
1	342	3	114.56
2	838	9	1.79
3	628	7	2.76
4	348	4	3.58
5	703	8	7.00
6	496	6	205.87
7	822	9	2.00
8	646	7	3.45
9	314	3	19.19
10	951	11	122.44
11	806	8	5.59
12	670	7	2.14
13	249	3	0.95
14	602	4	2.55
15	666	9	2.60
16	634	7	0.00
17	216	2	0.12
18	210	2	1.06
19	414	5	0.00
total	10555	114	27.17
s.error			12.73

Table 14 – Redfish (*Sebastes marinus*) mean length frequency per tow in the 2003 survey.

length	male	female	length	male	female	length	male	female
13		0.02	27	0.57	0.74	41	0.02	1.23
14	0.03	1.71	28	0.71	0.42	42		0.78
15	4.73	11.25	29	0.26	0.29	43		0.52
16	15.65	14.42	30	0.45	0.54	44		0.27
17	10.56	11.22	31	1.49	0.46	45		0.37
18	7.27	4.99	32	0.91	0.33	46		
19	2.04	3.25	33	3.24	0.79	47		
20	4.71	1.39	34	1.05	3.37	48		0.24
21	0.30	0.44	35	0.60	0.60	49		
22	0.63	0.19	36	0.55	3.03	50		
23	0.26	0.34	37	0.22	0.48	51		
24	0.69	0.43	38	0.13	0.57	52		
25	0.84	0.18	39	0.22	0.58	53		
26	0.65	0.02	40	0.03	1.43	54		0.01

Table 15 – Redfish (*Sebastes mentella*) mean catch per tow and its standard error by in the 2003 survey.

stratum	Area sq. miles	tow number	catch per tow (Kg)
			mean
1	342	3	
2	838	9	0.05
3	628	7	0.00
4	348	4	30.55
5	703	8	8.42
6	496	6	23.97
7	822	9	9.72
8	646	7	17.25
9	314	3	130.96
10	951	11	23.16
11	806	8	9.28
12	670	7	69.93
13	249	3	148.59
14	602	4	158.44
15	666	9	15.31
16	634	7	15.92
17	216	2	19.51
18	210	2	10.69
19	414	5	93.37
total	10555	114	34.38
s.error			5.36

Table 16 – Redfish (*Sebastes mentella*) mean length frequency per tow in the 2003 survey.

length	male	female	length	male	female	length	male	female
13		0.00	24	3.33	2.50	35	0.20	0.27
14	0.11	0.09	25	4.14	3.25	36	0.10	0.48
15	2.34	2.12	26	6.13	3.34	37	0.05	0.34
16	12.95	9.61	27	8.82	3.18	38	0.05	0.29
17	17.16	11.98	28	7.73	3.24	39		0.35
18	7.81	5.22	29	4.99	4.09	40		0.14
19	3.32	3.64	30	2.12	5.84	41		0.03
20	3.69	2.98	31	1.13	3.78	42	0.03	
21	3.84	3.50	32	1.00	2.61	43		
22	3.33	2.90	33	0.61	1.09	44		0.03
23	2.42	2.11	34	0.40	0.80	45		

Table 17 – Redfish (*Sebastes mentella*) mean frequency at age per tow in the 2003 survey.

age	stratum																			mean	mean	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	total	weight	length
																					g	cm
1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	-	0.02	-	3.37	3.25	0.25	3.68	1.57	5.25	13.23	3.25	1.21	0.48	0.11	1.31	0.01	0.01	0.00	0.05	37.05	63	16.8
4	-	0.02	-	2.37	2.21	0.20	1.84	1.32	4.70	7.90	1.48	0.85	0.44	0.08	0.86	0.01	0.01	0.00	0.07	24.33	73	17.7
5	-	0.01	-	3.26	1.04	1.24	1.35	3.00	7.29	4.91	0.86	2.39	1.48	0.97	1.47	0.17	0.12	0.03	0.45	30.06	110	20.1
6	-	-	-	0.65	0.03	0.26	0.18	1.07	2.72	0.62	0.15	1.27	1.47	1.60	0.57	0.25	0.14	0.05	0.71	11.73	172	23.3
7	-	-	-	0.34	0.09	0.04	0.12	0.53	2.03	0.26	0.08	1.66	2.13	3.56	0.41	0.42	0.24	0.07	1.40	13.36	229	25.6
8	-	-	-	0.15	0.06	0.01	0.07	0.22	1.12	0.09	0.03	1.46	1.62	3.83	0.28	0.34	0.20	0.06	1.29	10.83	262	26.8
9	-	-	-	0.05	0.01	0.01	0.06	0.09	0.61	0.02	0.01	1.30	1.07	4.16	0.23	0.23	0.14	0.06	1.45	9.49	322	28.7
10	-	-	-	0.05	0.01	0.01	0.05	0.06	0.53	0.04	0.01	1.22	0.88	3.24	0.18	0.26	0.13	0.07	1.50	8.23	352	29.5
11	-	-	-	0.01	-	0.05	0.03	0.04	0.34	0.01	0.06	0.76	0.52	1.75	0.11	0.17	0.05	0.05	0.77	4.72	402	30.8
12	-	-	-	0.01	-	0.07	0.02	0.03	0.25	0.01	0.06	0.61	0.41	1.08	0.07	0.16	0.04	0.04	0.52	3.35	445	31.8
13	-	-	-	0.16	0.02	0.11	0.12	0.25	1.61	0.12	0.08	3.09	2.36	7.92	0.48	0.65	0.30	0.16	3.09	20.55	344	29.1
14	-	-	-	-	-	0.03	0.00	0.01	0.04	-	0.03	0.12	0.10	0.11	0.02	0.04	0.00	0.01	0.03	0.55	517	33.5
15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16	-	-	-	-	-	0.01	-	0.01	0.02	-	0.02	0.04	0.05	0.03	0.01	0.02	-	0.00	0.01	0.20	516	33.5
17	-	-	-	-	-	0.04	-	0.01	0.05	-	0.03	0.12	0.08	0.22	0.02	0.03	0.01	0.01	0.09	0.69	523	33.5
18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	-	-	-	-	-	-	0.03	-	-	-	-	-	0.03	-	-	-	-	-	-	0.02	994	41.5
20	-	-	-	-	-	0.04	-	0.01	-	-	0.03	0.03	0.04	0.06	0.01	0.01	-	-	0.02	0.24	671	36.5
21	-	-	-	-	-	0.02	-	-	-	-	0.01	0.05	0.02	0.03	0.01	0.02	0.00	0.01	0.01	0.16	565	34.5
22	-	-	-	-	-	0.01	-	0.01	0.02	-	0.02	0.04	0.05	0.03	0.01	0.02	-	0.00	0.01	0.20	516	33.5
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
25+	-	-	-	-	-	0.10	0.03	-	-	-	0.08	0.10	-	0.05	-	0.08	0.02	0.02	0.05	0.44	794	38.3

Table 19 – Mean frequency at age by tow of *Sebastes mentella*.

age	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	–	–	0.12	0.07	–	–	0.07	0.13	–	–	–	–
2	–	–	0.61	3.25	3.49	0.73	1.89	2.95	–	0.70	0.27	–
3	0.82		13.33	38.01	20.16	5.96	26.60	28.49	4.35	55.70	15.09	37.05
4	15.87	2.28	65.25	245.15	145.82	39.67	17.04	49.37	15.55	44.65	87.10	24.33
5	112.89	5.20	28.27	148.12	379.24	219.25	19.07	27.64	31.90	30.98	33.79	30.06
6	63.47	18.32	15.93	5.86	59.24	126.37	49.11	30.29	25.38	28.60	29.89	11.73
7	34.42	15.67	23.81	10.88	10.57	9.88	33.73	50.86	40.94	23.98	24.74	13.36
8	30.99	11.08	14.67	12.34	10.28	4.11	139.86	47.68	72.13	24.79	19.51	10.83
9	21.65	4.29	9.68	7.35	7.97	2.71	5.53	177.77	38.27	9.90	17.33	9.49
10	13.59	5.09	7.54	6.93	4.65	3.12	0.85	7.41	203.99	6.82	5.11	8.23
11	8.97	5.19	6.49	7.71	3.50	1.66	0.59	0.29	3.63	37.43	3.66	4.72
12	6.59	6.15	4.10	3.67	3.54	1.66	3.42	0.52	0.34	1.29	29.87	3.35
13	6.49	4.10	3.16	3.01	2.08	0.89	0.36	1.23	0.28	0.58	0.91	20.55
14	4.83	4.36	2.01	3.27	2.34	1.51	0.46	0.16	2.47	0.30	0.24	0.55
15	4.34	5.35	2.11	3.36	1.83	0.42	0.21	0.34	0.13	0.42	0.39	–
16	3.05	1.59	1.08	2.09	1.32	0.60	0.35	0.37	0.11	0.22	0.10	0.20
17	1.95	1.86	0.73	1.29	0.85	0.55	0.64	0.24	0.18	0.17	0.36	0.69
18	1.36	1.32	1.04	1.10	0.83	0.13	0.03	0.65	0.10		0.02	
19	1.25	0.95	0.45	0.58	0.40	0.17	0.09	0.09	0.63	0.03	0.10	0.02
20	0.44	0.79	0.28	0.48	0.50	0.19	–	0.13	–	–	0.15	0.24
21	0.33	0.38	0.17	0.32	0.21	0.07	–	0.14	0.05	–	–	0.16
22	0.01	–	0.16	0.16	0.07	0.03	0.03	0.02	0.09	–	0.02	0.20
23	0.07	0.13	0.09	0.06	0.16	–	–	0.08	0.12	0.05	0.05	–
24	0.11	0.13	0.04	0.06	0.06	–	0.02	0.05	0.13	–	0.01	–
25+	0.19	–	–	0.32	0.20	–	0.02	0.13	0.16	–	0.01	0.44

Table 20 – Redfish (*Sebastes fasciatus*) mean catch per tow by strata in the 2003 survey.

stratum	Area sq. miles	tow number	catch per tow (Kg)
			mean
1	342	3	40.60
2	838	9	1.10
3	628	7	1.25
4	348	4	40.85
5	703	8	11.11
6	496	6	61.07
7	822	9	7.47
8	646	7	20.60
9	314	3	92.54
10	951	11	42.25
11	806	8	7.56
12	670	7	26.13
13	249	3	18.34
14	602	4	18.77
15	666	9	11.23
16	634	7	2.05
17	216	2	3.16
18	210	2	1.44
19	414	5	5.10
total	10555	114	19.70
s. error			5.33

Table 21 – Redfish (*Sebastes fasciatus*) mean length frequency per tow in the 2003 survey.

length	male	female	length	male	female	length	male	female	length	male	female
13			20	10.19	9.86	27	0.58	1.87	34	0.43	0.19
14	0.00	0.01	21	7.35	8.20	28	0.32	1.25	35	0.08	0.07
15	1.26	0.85	22	6.50	5.37	29	0.08	0.70	36	0.12	0.05
16	3.57	3.00	23	6.30	2.85	30	0.05	0.41	37	0.03	0.07
17	5.36	4.56	24	4.72	2.18	31	0.19	0.27	38	0.01	0.06
18	7.15	6.45	25	3.12	1.60	32	0.36	0.21	39	0.03	0.04
19	9.21	9.07	26	1.32	1.77	33	0.14	0.13	40	0.43	0.19

Table 22 – Juvenile redbfish (*Sebastes sp.*) mean catch per tow by strata and its standard error in the 2003 survey.

stratum	Area sq. miles	tow number	catch per tow (Kg)
			mean
1	342	3	62.17
2	838	9	4.24
3	628	7	6.08
4	348	4	10.11
5	703	8	48.56
6	496	6	5.66
7	822	9	3.53
8	646	7	8.61
9	314	3	24.83
10	951	11	73.92
11	806	8	9.56
12	670	7	7.62
13	249	3	
14	602	4	1.09
15	666	9	7.02
16	634	7	
17	216	2	
18	210	2	
19	414	5	
total	10555	114	16.56
s. error			5.02

Table 23 – Juvenile redbfish (*Sebastes sp.*) mean length frequency per tow in the 2003 survey.

length		length		length		length	
3	0.03	8	16.76	13	72.23	18	0.59
4		9	10.53	14	104.11	19	0.14
5	0.10	10	6.40	15	121.51		
6	2.83	11	18.41	16	30.41		
7	9.91	12	66.02	17	4.56		

Table 24 – Greenland halibut (*Reinhardtius hippoglossoides*) mean catch per tow by strata and its standard error in the 2003 survey.

stratum	Area sq. miles	tow number	catch per tow (Kg)
			mean
1	342	3	
2	838	9	0.00
3	628	7	1.91
4	348	4	5.97
5	703	8	2.37
6	496	6	0.82
7	822	9	10.85
8	646	7	15.79
9	314	3	9.86
10	951	11	5.57
11	806	8	7.09
12	670	7	20.28
13	249	3	4.75
14	602	4	26.77
15	666	9	18.62
16	634	7	21.44
17	216	2	14.83
18	210	2	118.98
19	414	5	18.29
total	10555	114	12.43
s. error			1.22

Table 25 – Greenland halibut (*Reinhardtius hippoglossoides*) mean length frequency per tow in the 2003 survey.

length	male	female	length	male	female	length	male	female
10-11			30-31	0.12	0.05	50-51	0.50	0.67
12-13	0.07	0.06	32-33	0.23	0.20	52-53	0.48	0.52
14-15	0.43	0.35	34-35	0.67	0.56	54-55	0.17	0.41
16-17	0.63	0.53	36-37	0.55	0.79	56-57	0.07	0.18
18-19	0.16	0.17	38-39	0.52	0.62	58-59	0.02	0.18
20-21	0.00	0.02	40-41	0.53	0.92	60-61	0.01	0.08
22-23	0.04	0.03	42-43	0.89	1.10	62-63	0.00	0.02
24-25	0.25	0.20	44-45	0.69	1.32	64-65	0.00	0.03
26-27	0.34	0.32	46-47	0.57	0.74	66-67	0.00	0.00
28-29	0.09	0.16	48-49	0.81	0.83	68-69	0.00	0.01

Table 27 - Greenland halibut (*Reinhardtius hippoglossoides*) age-length key in the 2003 survey.**MALE**

Length cm	age																total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	
12-13	9																9
14-15	22																22
16-17	19	2															21
18-19	5	6															11
20-21																	
22-23			3	1													4
24-25			14	2													16
26-27			14	8													22
28-29			4	1													5
30-31				4	3												7
32-33				6	7												13
34-35				5	16	3											24
36-37					13	9											22
38-39					8	13											21
40-41					1	13	7										21
42-43						15	8										23
44-45						6	14	2									22
46-47						1	18	3									23
48-49							13	7									20
50-51							2	19									21
52-53								14	6								20
54-55								8	4								12
56-57								1	3								4
58-59								1		1							2
60-61											1						1
total	55	43	27	48	60	62	55	13	1	1							366

Table 27 – (continued)

FEMALE

length cm	age																total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	
12-13	8																9
14-15	18																18
16-17	15	3															18
18-19	9	6															15
20-21		2															2
22-23		2															2
24-25		13	1														15
26-27		13	6														20
28-29		6	5														11
30-31			2	1													3
32-33			7	5													12
34-35			3	18	2												24
36-37			2	12	7												22
38-39				10	10												20
40-41				2	20	4											26
42-43					15	6											22
44-45					3	22	1										28
46-47					3	16	3										23
48-49						15	6										21
50-51						5	17	2									24
52-53							17	3									20
54-55								11	10								21
56-57								5	4	3							12
58-59									3	5	1						9
60-61										2	5						7
62-63											2						2
64-65											1	1					2
66-67																	
68-69												1	1				2
total	50	45	26	48	60	68	60	22	10	9	2	1					410

Table 28 – Greenland halibut (*Reinhardtius hippoglossoides*) mean catch per tow (kg) by strata in 1988-2003 surveys.

stratum	depth in fathoms	year															
		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
1	70- 80	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.00
2	81-100	–	0.04	0.10	–	–	–	–	1.86	–	0.04	0.09	0.05	–	0.24	0.16	0.00
3	101-140	0.54	0.65	0.16	0.17	0.37	0.06	–	0.45	2.21	1.87	7.55	7.16	5.01	7.90	2.88	1.91
4	"	5.36	0.75	–	0.56	1.02	0.38	–	0.20	0.02	0.86	1.53	7.34	7.69	5.83	2.16	5.97
5	"	1.37	1.78	–	0.52	0.76	0.01	0.03	0.39	0.66	1.79	3.17	7.53	5.63	4.93	1.22	2.37
6	"	0.83	0.47	0.39	0.33	0.22	0.41	–	0.83	2.76	5.93	9.39	7.82	4.62	6.91	2.70	0.82
7	141-200	1.34	0.99	0.91	2.96	3.86	1.48	3.37	14.21	18.04	22.38	40.98	37.02	24.67	15.43	6.74	10.85
8	"	3.02	4.44	1.23	3.59	7.58	2.80	0.91	6.66	7.17	21.30	19.77	39.87	26.32	22.48	17.55	15.79
9	"	7.41	6.75	2.18	3.12	13.27	1.27	1.77	7.33	6.56	10.46	19.41	14.56	10.06	14.61	5.71	9.86
10	"	1.46	1.12	0.79	2.33	4.91	0.43	3.18	7.14	9.73	11.70	18.60	20.75	21.76	23.68	10.10	5.57
11	"	0.72	0.97	0.36	1.69	3.66	3.75	3.78	7.88	10.74	10.05	19.68	21.16	17.45	16.37	5.43	7.09
12	201-300	7.82	12.48	5.55	14.67	11.93	17.98	23.51	22.11	40.95	43.35	59.35	70.61	41.92	30.51	20.94	20.28
13	"	3.33	6.41	11.31	2.25	1.24	7.41	7.93	6.59	15.44	25.07	28.75	50.78	19.83	15.05	27.04	4.75
14	"	7.88	6.48	6.10	16.89	18.19	7.01	13.30	8.81	19.36	34.10	31.36	23.17	10.53	18.81	23.20	26.77
15	"	8.44	3.27	10.19	18.88	12.47	26.72	28.95	34.29	28.07	52.17	78.66	57.94	52.12	31.36	23.93	18.62
16	301-400	27.98	27.78	51.82	51.49	37.21	44.32	31.05	37.93	42.75	36.07	68.37	23.28	41.07	27.05	44.46	21.44
17	"	15.93	7.15	7.59	24.77	2.40	11.82	44.39	44.36	15.41	31.43	44.05	36.12	29.80	10.13	12.23	14.83
18	"	6.48	3.03	31.13	21.73	3.59	8.02	23.75	58.92	11.76	34.23	47.67	57.30	11.03	35.34	42.68	118.98
19	"	95.61	29.14	32.01	47.50	94.73	41.87	35.13	38.38	30.30	48.80	81.22	31.68	55.36	34.92	68.46	18.29
total		8.48	5.47	7.10	10.00	10.68	8.79	9.84	13.31	14.19	19.70	29.66	25.96	20.75	16.98	14.81	12.43
s.e.		0.94	0.48	0.99	1.00	1.70	1.17	0.83	1.50	1.08	1.39	1.65	1.86	1.13	0.95	0.81	1.22

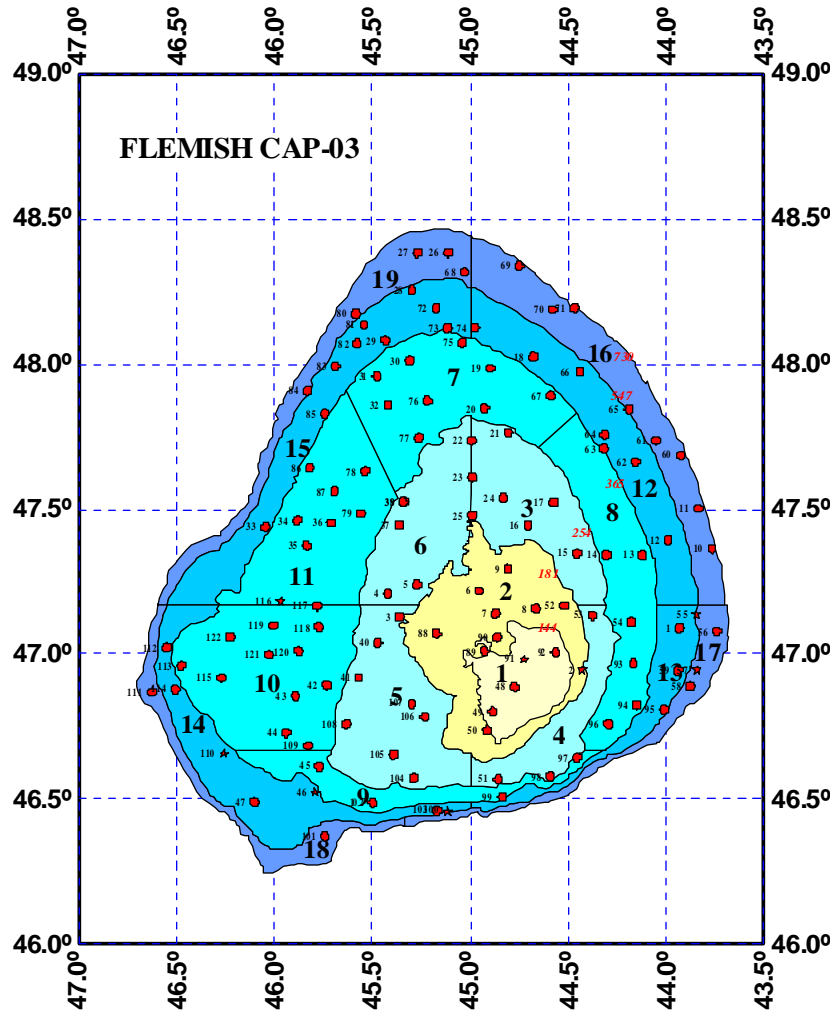


Fig. 1 - Haul positions for the Flemish Cap 2003 survey.

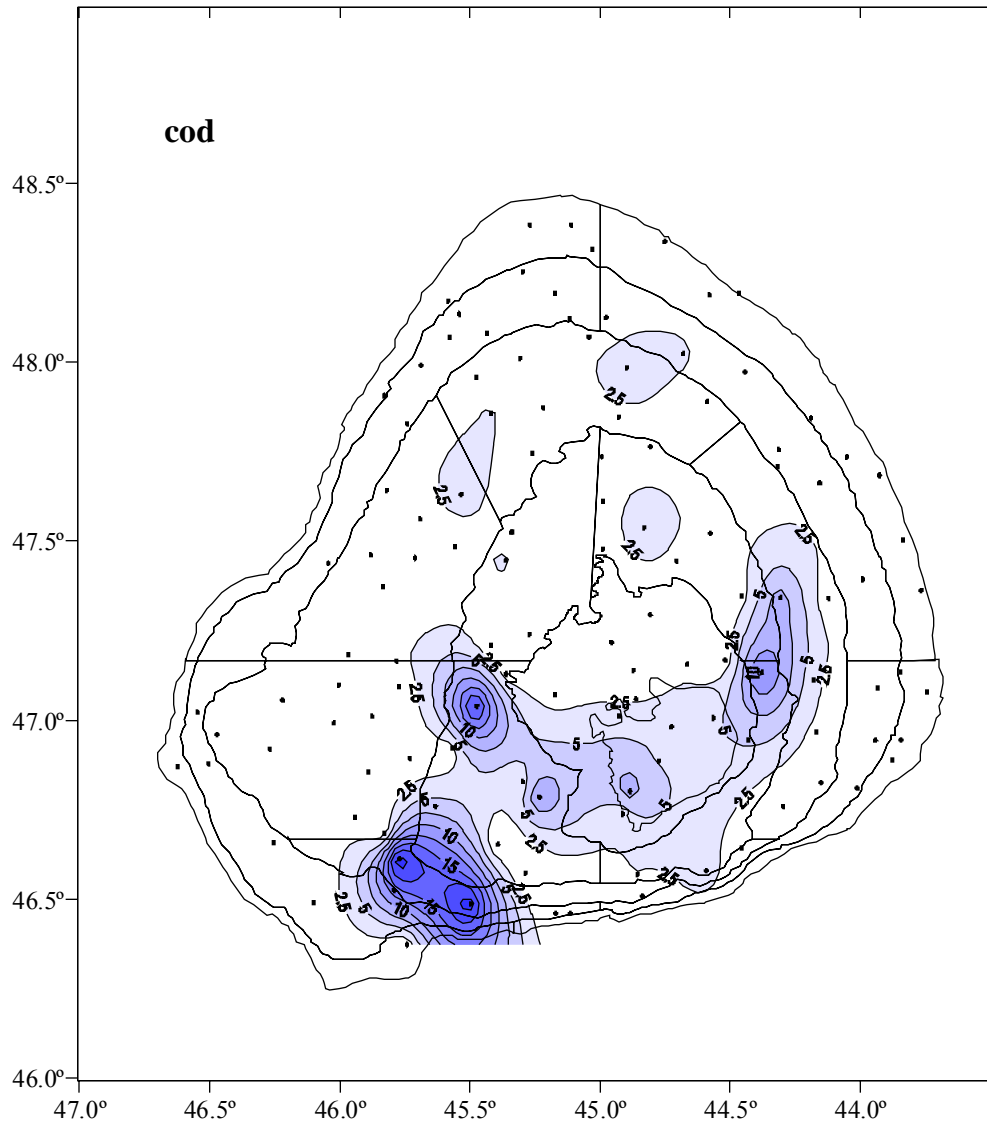


Fig. 2 - Cod (*Gadus morhua*) catch distribution in the 2033 survey in kg/tow.

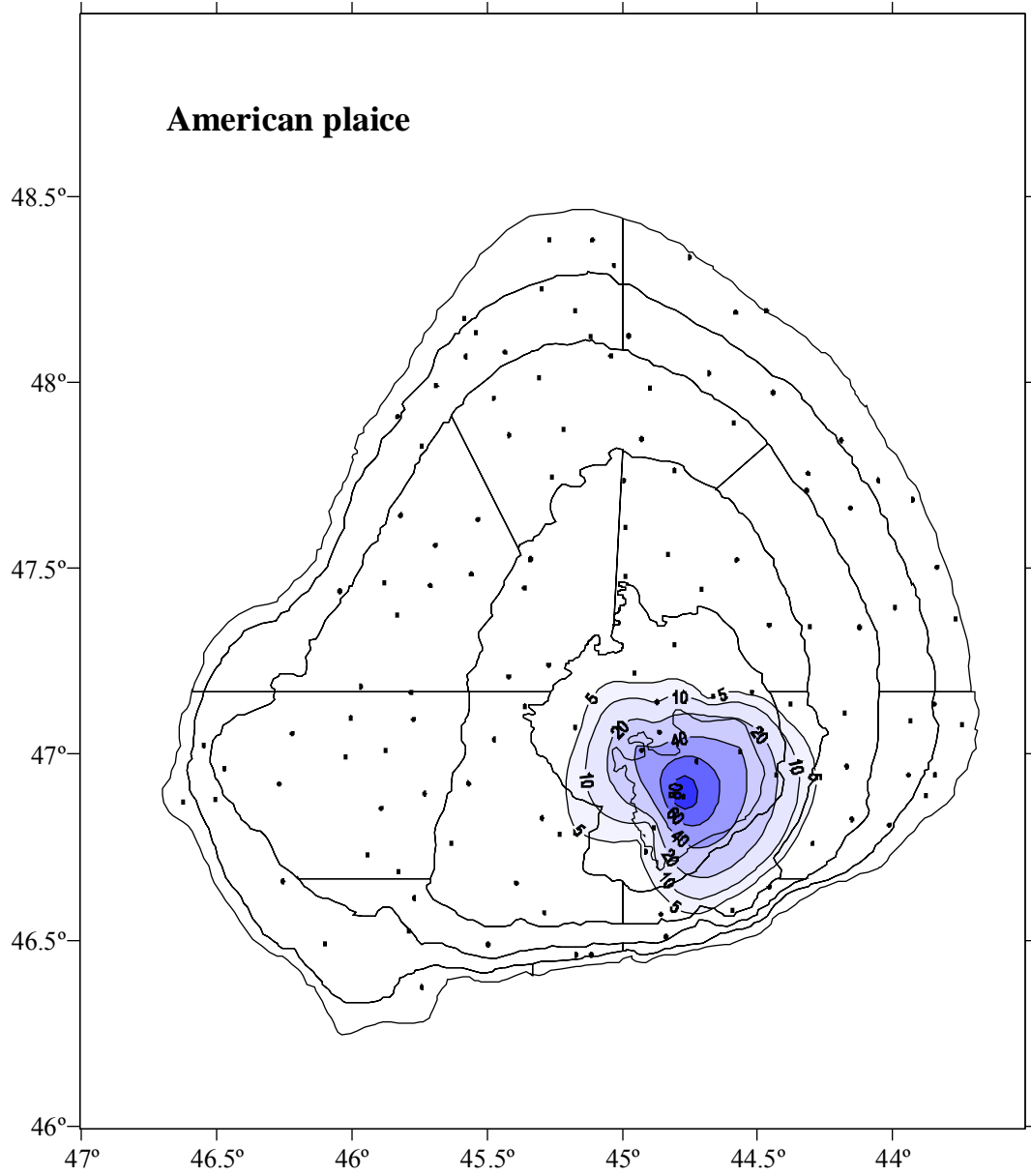


Fig. 3 - American plaice (*Hippoglossoides platessoides*) catch distribution in the 2003 survey in kg/tow

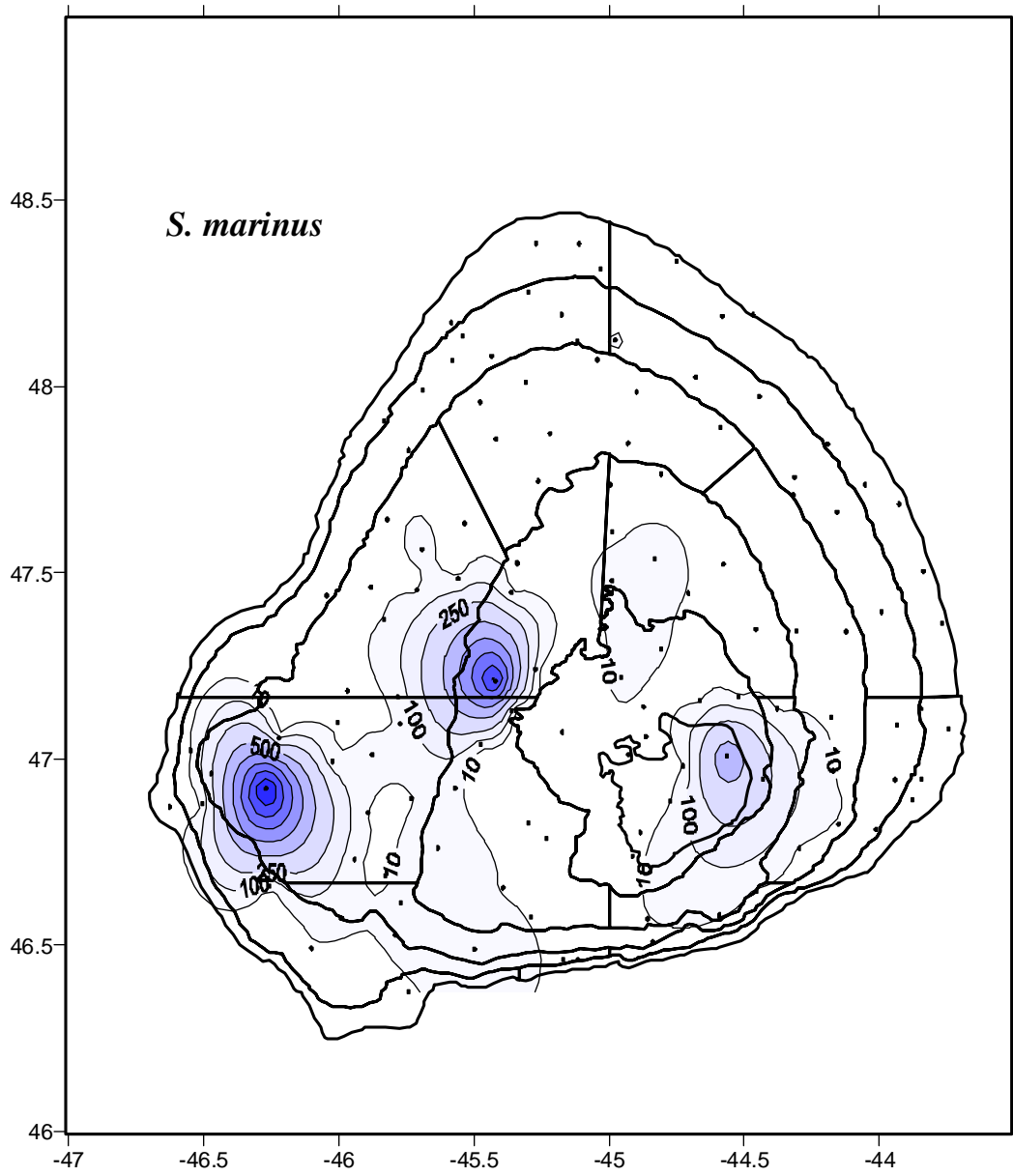


Fig. 4 - Redfish (*Sebastes marinus*) catch distribution in the 2003 survey in kg/tow

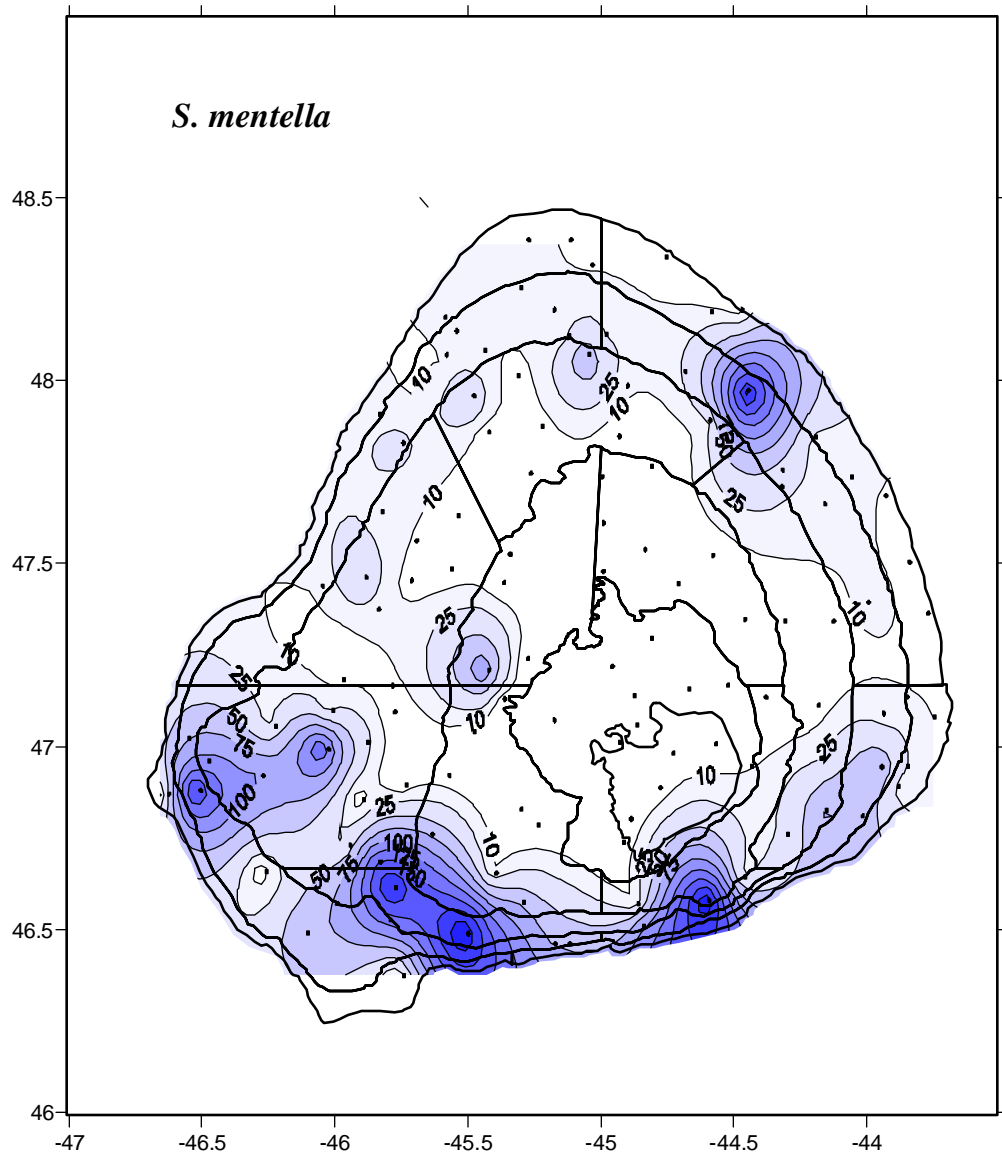


Fig. 5 - Redfish (*Sebastes mentella*) catch distribution in the 2003 survey in kg/tow

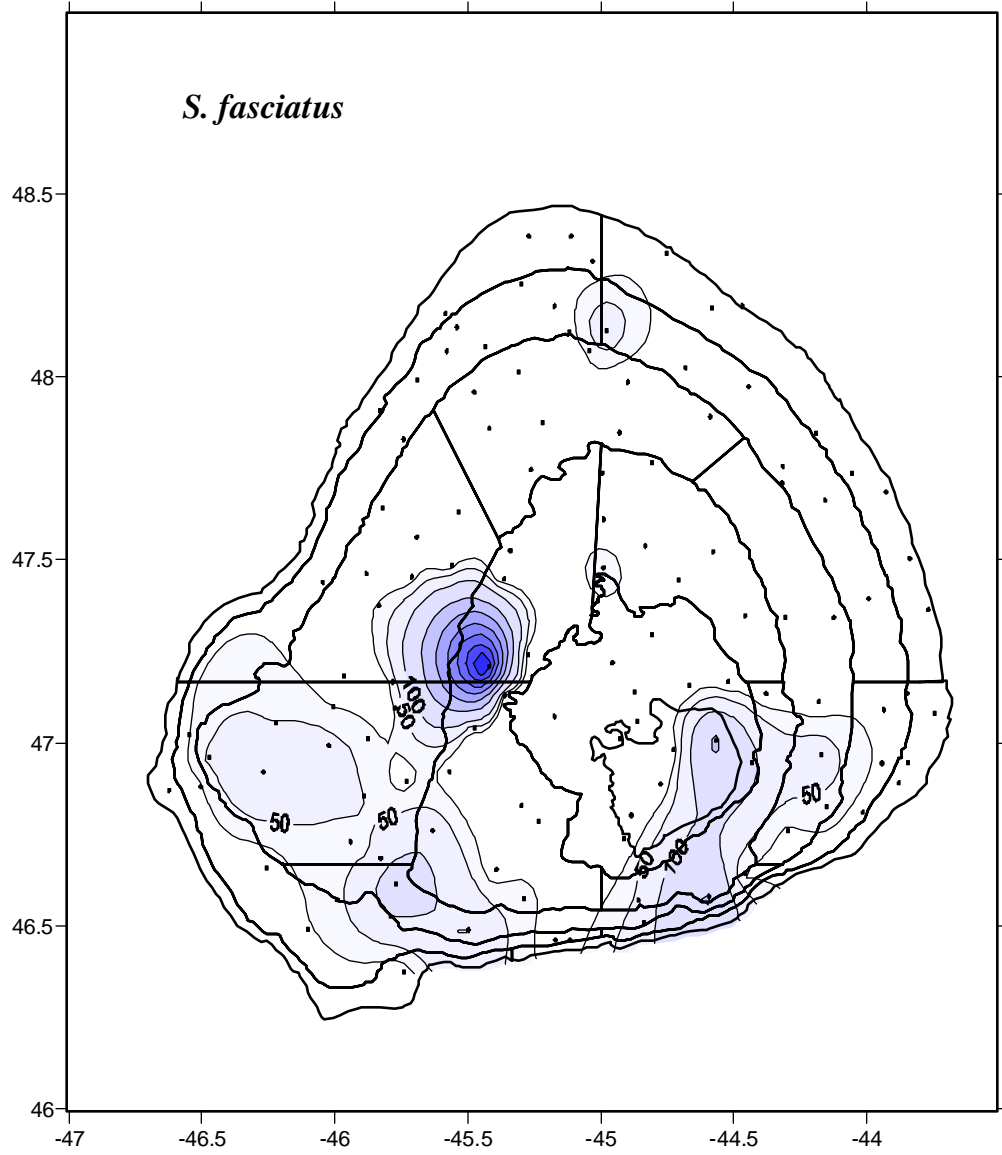


Fig. 6 - Redfish (*Sebastes fasciatus*) catch distribution in the 2003 survey in kg/tow

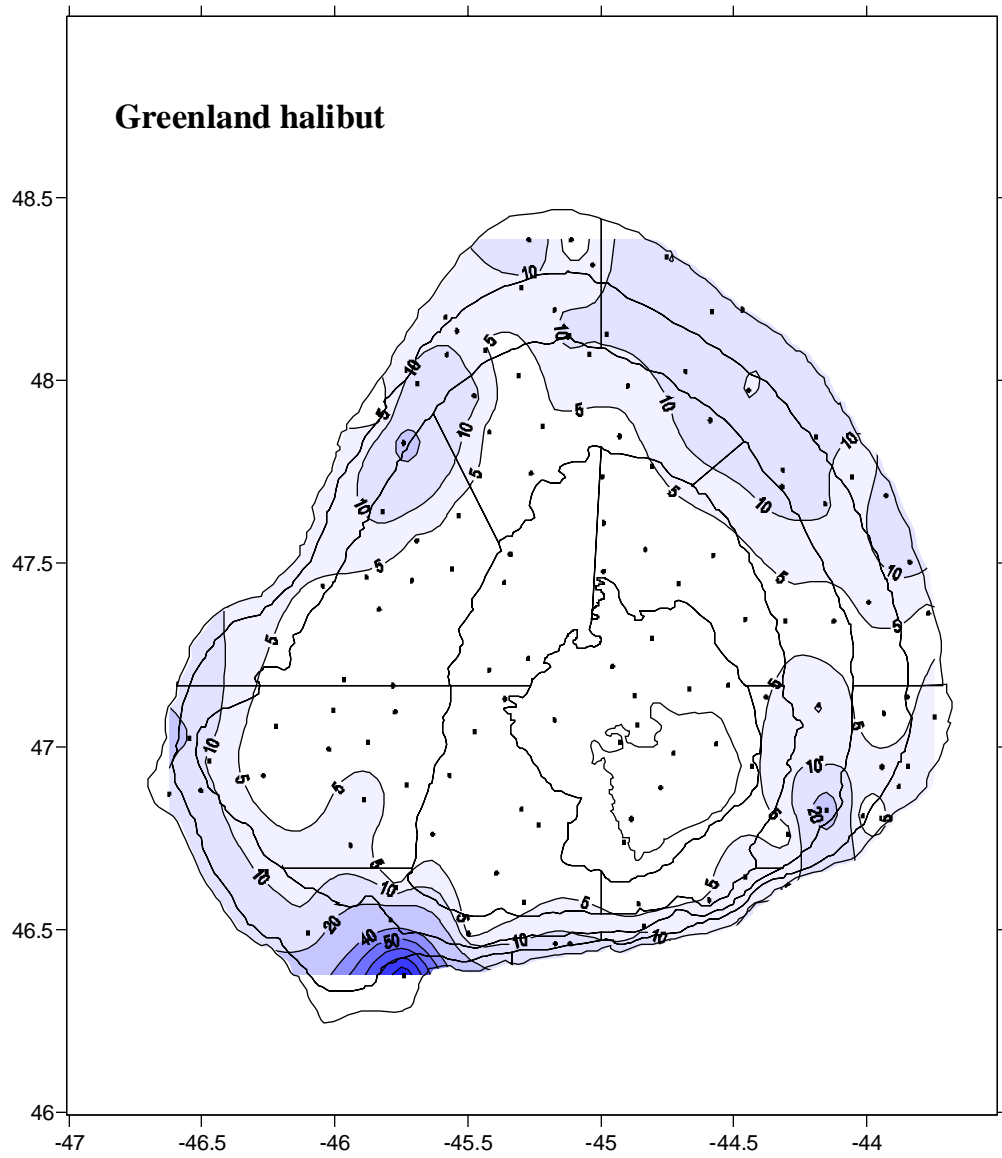


Fig. 7 - Greenland halibut (*Reinhardtius hippoglossoides*) catch distribution in the 2003 survey in kg/tow.