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Results from Bottom Trawl Survey on Flemish Cap of June-July 2009

by

Antonio Vázquez[1]
[1]Instituto de Investigaciones Marinas (CSIC)

Abstract

A stratified random bottom trawl survey on Flemish Cap was carried out on June - July 2009, covering the bank up to 1460 m depth (800 fathoms). The survey was carried out on board *R/V Vizconde de Eza*, using a Lofoten bottom trawl gear, and 178 haul were done, 119 of them in the region with less than 730 m depth. Survey results are presented and compared with results of previous surveys in the series since 1988. Biomass and abundance indices are provided for main commercial species, as well as age composition for cod, American plaice, Greenland halibut, and roughhead grenadier.

KEYWORDS: Survey, Flemish Cap, Cod, American plaice, Redfish, Greenland halibut, roughhead grenadier.

Introduction

The survey on Flemish Cap was carried out on board *R/V Vizconde de Eza* in 2009. A total of 178 valid bottom trawls were made up to a depth of 1460 m (800 fathoms) (Figure 1). The survey covered adequately 32 strata of the bank. Strata 26, 27 and those in the Beothuk knoll (strata 35-39) were excluded due to previous records that indicate they were unsuitable for trawling. A synoptic sheet of the survey with vessel and gear characteristics is shown in Table 1. This was the 22nd 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	1999	Cornide de Saavedra	117	2/7 – 20/7
1989	Cryos	116	12/7 – 1/8	2000	Cornide de Saavedra	120	10/7 – 28/7
1990	Ignat Pavlyuchenkov	113	18/7 – 6/8	2001	Cornide de Saavedra	120	3/7 – 20/7
1991	Cornide de Saavedra	117	24/6 – 11/7	2002	Cornide de Saavedra	120	30/6 –17/7
1992	Cornide de Saavedra	117	29/6 – 18/7	2003	Vizconde de Eza	114	2/6 – 27/7
1993	Cornide de Saavedra	101	23/6 – 8/7	2004	Vizconde de Eza	124-177[1]	25/6 – 2/8
1994	Cornide de Saavedra	116	6/7 – 23/7	2005	Vizconde de Eza	117-176	2/7 – 21/8
1995	Cornide de Saavedra	121	2/7 – 19/7	2006	Vizconde de Eza	115-179	1/7 – 26/7
1996	Cornide de Saavedra	117	28/6 – 14/7	2007	Vizconde de Eza	117-174	23/6 – 19/7
1997	Cornide de Saavedra	117	16/7 – 1/8	2008	Vizconde de Eza	110-167	21/6 – 19/7
1998	Cornide de Saavedra	119	17/7 – 2/8	2009	Vizconde de Eza	119-178	23/6 – 20/7

[1] Up to 730 m deep (400 f) – up to 1460 m deep (800 f)

Previous survey report was presented by Casas and González Troncoso (2009).

RESULTS

Biomass estimated by swept area method (tons) of main species in past surveys are:

	year	cod	American plaice	redfish	Greenland halibut	roughhead grenadier	shrimp
Strata 1-19 120-730 m	1988	40 839	16 046	188 331	6 926	2 009	5 745
	1989	114 050	14 047	162 535	4 472	871	2 298
	1990	59 362	11 983	126 757	5 799	852	3 489
	1991	40 248	10 087	76 955	8 169	1 335	11 657
	1992	26 719	8 656	130 209	8 728	1 577	25 155
	1993	60 963	7 861	72 608	6 529	3 021	12 090
	1994	26 463	8 227	162 525	8 037	1 975	3 980
	1995	9 695	6 785	87 644	10 875	1 558	7 504
	1996	9 013	4 098	119 662	11 594	1 362	10 902
	1997	9 966	3 026	165 816	16 098	1 197	7 701
	1998	4 986	3 437	70 832	24 229	1 691	41 970
	1999	2 854	2 585	98 651	21 207	1 250	25 737
	2000	3 062	1 606	177 990	16 959	1 047	19 719
	2001	2 695	2 404	77 345	13 872	2 079	28 317
	2002	2 496	2 049	121 312	12 100	1 211	40 176
	2003	1 593	2 286	93 816	6 214	2 348	21 515
	2004	4 071	3 525	250 605	12 292	3 597	20 127
	2005	5 242	2 760	453 040	11 698	2 387	30 675
	2006	12 505	1 691	766 922	11 706	3 933	15 044
	2007	23 886	1 053	464 618	13 040	1 367	17 046
	2008	43 675	1 766	566 647	11 995	2 961	11 064
	2009	75 228	1 442	358 479	7 777	782	2 758
32 strata 120-1460 m	2004	4 071	3 525	250 638	28 343	17 184	20 195
	2005	5 242	2 760	453 086	21 515	14 253	31 186
	2006	12 505	1 691	766 952	24 358	12 109	15 250
	2007	23 886	1 053	464 660	31 723	7 807	17 120
	2008	43 675	1 766	566 647	39 614	12 139	11 141
	2009	75 228	1 442	358 521	36 047	7 304	2 792

Values for surveys before 2003, when RV Cornide de Saavedra was used, are transformed to their equivalences for RV Vizconde de Eza following the accepted calibration among the two vessels (González Troncoso and Casas 2005). From 2004 onwards, abundances are calculated for 19 shallowest strata covering the bank up to 730 m deep, as it was done in previous years, and for 32 strata up to 1460 m deep. Table 2 presents similar data in more detail.

Cod

Mean catch per towed mile by strata and its standard error are presented in Table 3. Survey biomass, as calculated by the swept area method, is compared with results of previous years by stratum in Table 5. Survey biomass is compared with Russian survey results in the following table:

Year	EU (1)	Russia: (2)	(3)	Year	EU (1)	Russia: (2)	(3)
1983		23 070		1997	9 966	-	-
1984		31 210		1998	4 986	-	-
1985		28 070		1999	2 854	-	-
1986		26 060		2000	3 062		-
1987		10 150	21 600	2001	2 695	784	-
1988	40 839	7 720	34 200	2002	2 496	694	-
1989	114 050	36 520	78 300	2003	1 593		-
1990	59 362	3 920	15 200	2004	4 071		
1991	40 248	6 740	8 200	2005	5 242		
1992	26 719	2 490	2 400	2006	12 505		
1993	60 963	8 990	9 700	2007	23 886		
1994	26 463	-	-	2008	43 675		
1995	9 695	8 260	-	2009	75 228		
1996	9 013	730	-				

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).

Tables 4, 6, and 7 show length distribution, the age-length key and abundance at age by stratum respectively. Distribution of survey catches is presented in Figure 2. Evolution of biomass is illustrated in Figure 3.

The abundance at age along the series is shown in Table 8. 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. The 1992 to 1994 year-classes were weak, and those from 1992 to 2003 failed almost completely. The abundances of 2004-2007 year classes are higher than in previous 12 years. The abundance of the 2008 year-class seems to be also intermediate based on results at age 1 in 2009.

Figure 4 is a graph of the length distribution over the years. It shows that most recent year-classes are weaker than those in the 90's. It also shows that most recent year-classes reduced their growth in comparison with years of lower abundance, which is particularly well observed for age 2 and 3 in 2008 and 2009 compared with the same ages in 2006 and 2007.

Growth of cod has been higher in years of low abundance than in the beginning of the series or even before (Vázquez and Cerviño 2005). Figure 5 illustrates the evolution of the mean length at age, and it shows that the 2005 cohort reached the highest growth, but later cohorts are probably reducing it as a consequence of their greater abundance.

American plaice

Mean catch per towed mile by strata is presented in Table 9. Survey biomass, as calculated by the swept area method, is compared with results of previous surveys in Table 11. This biomass is compared with Russian survey results in the following table:

Year	EU	Russia	Year	EU	Russia	
1983		8 900	1997	3 026		
1984		7 500	1998	3 437		
1985		7 800	1999	2 585		
1986		20 200	2000	1 606		
1987		9 300	2001	2 404		
1988	16 046	6 500	2002	2 049	548	
1989	14 047	5 000	2003	2 286	1,398	
1990	11 983	1 200	2004	3 525		
1991	10 087	14 400	2005	2 760		
1992	8 656	1 200	2006	1 691		
1993	7 861	2 700	2007	1 053		
1994	8 227		2008	1 766		
1995	6 785		2009	1 442		tons
1996	4 098					

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

Tables 12, 14, and 10 show length distribution, the age-length key and abundances at age by stratum respectively. Distribution of survey catches along the series is presented in Figure 6. Evolution of biomass is illustrated in Figure 7.

Table 13 shows the abundance at age. Fish aged 6 or more roughly correspond with fishable biomass. The abundance of this group (a 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, and in the 2001-2004 period, even it cannot be attributed to any abundant year-class. Results indicate 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 2006 year-class is the more abundant since 1991, and its abundance is only intermediate, but later recruitment seems even weaker.

Figure 8 is a graph of the length distribution over the years. It shows the lack of recruitment that occurred for many years, and how most recent year-classes are weaker than those at the beginning of the series.

Redfish

All redfish catches were classified by species. The group named *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 towed mile by strata for *Sebastes marinus, S. mentella, S. fasciatus* and the *juvenile* group are presented in Table 15. The following table shows the total survey biomass (tons) by year in the strata up to 730 m deep (400 fathoms) and up to 1460 m, even differences are at a minimum.

	Year	*Sebastes marinus*	*Sebastes spp,*			total
			mentella	*fasciatus*	juvenile	
150-730 m	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
	2007	88 071	51 183	261 788	63 576	464 618
	2008	240 777	42 570	202 287	80 491	566 647
	2009	72 211	111 787	171 676	2 804	358 479
150-1460 m	2004	85 383	46 030	76 166	43 059	250 638
	2005	147 688	105 153	123 336	75 762	451 268
	2006	298 290	105 877	319 389	43 396	766 952
	2007	88 071	51 207	261 806	63 576	464 660
	2008	240 777	42 621	202 307	80 492	566 718
	2009	72 211	111 801	171 705	2 804	358 521

For the whole bank, tables 16, 17, 18 and 19 show length distribution for the four groups. Catches per haul distribution for the three species and juveniles are presented in Figure 9. Evolution of biomass is illustrated in Figure 10, which shows the highest level since 2004.

Figure 11 is a graph of the length distribution of all species combined over the years. It shows the occurrence of strong recruitments in most recent years.

Greenland halibut

Mean catch per towed mile by strata and its standard error are presented in Table 20. Survey biomass is compared with results of previous surveys in Table 21. Catch per haul distribution is presented in Figure 12. Evolution of biomass is illustrated in Figure 13.

For the whole bank, length distribution, age-length keys and abundance at age are presented in Tables 22, 23 and 24, respectively. Abundance at age along the series is presented in Table 25.

Most recent decrease of biomass in the shallowest strata, those at less than 730 m deep, seems to be partially due to competition with cod, which has increased its biomass to a noticeable level. Figure 14 illustrate this situation: the upper graph shows how Greenland halibut increased its biomass in the shallowest strata (less than 730 m deep) after cod collapse in 1995, and how it decreased abundance in 2009 after cod stock recovery. The lowest two graphs analyze the same behaviour by depth range: the maximum competition seems to occur at the 141-200 m deep stratum, and a less extent, at the 101-140 and 201-300 m deep strata.

Figure 15 shows survey mean length with depth in each year: smallest mean length are observed in shallowest strata. Figure 16 shows the length distribution in 2009: both males and female prefer deeper water at largest size.

Roughhead grenadier (*Macrourus berglax*)

Mean catch per towed mile by strata and its standard error are presented in Table 26. Survey biomass, as calculated by the swept area method, is compared with results of previous years by stratum in Table 27.

Tables 28, 29, and 30 show length distribution, the age-length key and abundance at age by stratum respectively. Distribution of survey catches is presented in Figure 17. Evolution of biomass is illustrated in Figure 18.

Survey biomass along this series for the 19 sallowest strata and the whole 32 strata were:

year	1-19	**year**	1-19	1-32
1988	2,009	**1999**	1,250	
1989	871	**2000**	1,047	
1990	852	**2001**	2,079	
1991	1,335	**2002**	1,211	
1992	1,577	**2003**	2,348	
1993	3,021	**2004**	3,597	17,783
1994	1,975	**2005**	2,387	15,246
1995	1,558	**2006**	3,933	12,537
1996	1,362	**2007**	1,367	6,749
1997	1,197	**2008**	2,961	14,999
1998	1,691	**2009**	782	7,306
				tons

Shrimp

Casas (2009) presented detailed results. Evolution of biomass is illustrated in Figure 19, where relationship with the cod is also shown.

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Table 1 – Technical data of the 2009 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 30 cm
vertical opening	3.0 m (SCANMAR)
warps	100 meters, 45 mm, 200 Kg/100m
trawl doors	polyvalent, 850 Kg
wire length	26.712 × 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	- Unsuitable bottom for trawling according to ecosonder 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, shrimp, and other invertebrates
Species for age determination	Cod, American plaice, redfish (*Sebastes mentella*), Greenland halibut and Roughhead grenadier (*Macrourus berglax*).

Table 2 – Survey biomass (t) for several species or groups of species in 1988-2009 surveys in less than 400 fathoms deep.

year	Rajidae	*Synaphobranchus sp.*	*Urophycis sp.*	*Antimora sp.*	Macrouridae	*Notacanthus sp.*	*Illex sp.*	Anarhichadidae	Witch flounder	Greenland halibut	Zoarcidae	Cod	American plaice	Redfish	Shrimp*	Others	Total
1988	4495	217	643	394	3088	499	8	7994	909	6924	563	40837	16044	188333	5742	635	276698
1989	1938	88	169	306	1456	410	8	7487	338	4471	1142	114050	14049	162535	2300	209	310747
1990	2823	40	169	281	1222	64	1649	8122	418	5798	1206	59365	11982	126757	3490	1142	223388
1991	4061	80	257	563	2252	474	1158	10101	772	8171	1978	40250	10085	76953	11661	667	168816
1992	3780	72	72	724	2589	450	64	9095	820	8725	1359	26715	8653	130206	25155	426	218491
1993	6241	105	169	820	6498	740	0	14355	1045	6530	3474	60966	7865	72610	12087	0	193496
1994	3506	8	217	796	3233	458	209	15642	788	8034	1874	26466	8227	162527	3981	474	235966
1995	2268	16	80	193	2606	346	0	19220	708	10873	2179	9699	6787	87641	7503	394	150118
1996	2051	0	80	185	2340	177	88	20563	507	11596	1705	9015	4101	119664	10905	692	182969
1997	1842	8	32	233	2292	290	64	14033	322	16100	1729	9964	3024	165816	7704	587	223452
1998	1978	40	225	491	2831	169	72	10985	241	24230	2059	4986	3434	70833	41971	1110	164545
1999	1608	0	249	290	2332	64	16	5581	378	21207	893	2855	2581	98650	25734	619	162446
2000	1150	0	169	265	1809	97	0	4471	410	16960	780	3064	1608	177991	19719	1592	228487
2001	2236	24	394	667	3080	105	8	5863	458	13872	1246	2694	2405	77347	28316	1448	138715
2002	1544	8	129	346	2043	64	8	5227	209	12103	812	2493	2051	121312	40177	933	188526
2003	4608	24	547	306	3691	24	225	5983	844	6216	2067	1592	2284	93817	21512	5653	143741
2004	6241	88	667	1158	4914	145	474	10591	1568	12288	3683	4069	3522	250602	20129	2726	320148
2005	4238	72	740	1110	3353	64	80	9570	1777	11701	3080	5243	2758	453041	30672	1681	529190
2006	3506	32	611	474	5026	145	3546	9272	893	11709	1801	12505	1689	766924	16237	10881	845244
2007	2181	66	251	585	2362	64	411	8195	596	13040	353	23886	1053	464618	17046	0	540020
2008	6291	41	550	890	3953	88	5137	9863	2215	11997	457	43675	1766	566646	11064	0	672547
2009	2241	20	215	497	1162	35	1735	4600	762	7777	59	75228	1443	358478	2799	0	467602

*) 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 towed mile by stratum and its standard error in the 2009 survey.

stratum	square miles	hauls	mean catch Kg)	s.e.
1	342	4	49.41	81.30
2	838	10	59.31	112.16
3	628	7	91.12	80.76
4	348	4	111.85	210.19
5	703	8	74.11	117.68
6	496	6	162.31	190.65
7	822	9	115.50	278.14
8	646	7	32.68	16.24
9	314	3	12.01	11.41
10	951	11	39.99	30.12
11	806	9	40.35	25.85
12	670	8	3.79	6.42
13	249	3	4.06	3.57
14	602	6	122.03	247.91
15	666	8	2.20	2.36
16	634	7		
17	216	2		
18	210	2		
19	414	5		
total	10,555	119	53.45	11.52

Table 4 – Cod (*Gadus morhua*) length distribution (‘000) in the 2009 survey.

length		length		length		length	
12-14	6	42-44	3082	72-74	922	102- 4	58
15-17	526	45-47	6131	75-77	813	105- 7	34
18-20	2920	48-50	5027	78-80	748	108-10	21
21-23	1494	51-53	2565	81-83	526	111-13	
24-26	60	54-56	1945	84-86	367	114-16	7
27-29	230	57-59	3422	87-89	259	117-19	
30-32	1405	60-62	3626	90-92	234	120-22	7
33-35	3150	63-65	2988	93-95	256		
36-38	1774	66-68	1500	96-98	129		
39-41	1219	69-71	1125	99-100	121	total	48697

Table 5 – Cod (*Gadus morhua*) survey biomass (t) by strata in 1988-2009 surveys.

	depth in	year																					
stratum	fathoms	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
1	70- 80	1345	649	767	5585	76	516	2165	1563	1006	243	125	99	250	86	477	173	1996	1091	2433	4420	4224	2253
2	81-100	10150	10323	2065	5486	5150	9044	8186	3040	3991	2049	1899	1502	740	491	736	102	1668	1888	4145	1775	5346	6627
3	101-140	4471	10276	2391	2459	8473	8435	6092	1146	1054	1132	703	145	360	230	451	90	9	1791	1948	11466	4129	7630
4	"	3130	4843	2446	2900	3443	14171	1885	746	1068	857	140	25	443	488	66	136	168	152	466	1132	771	5190
5	"	2130	10702	8447	10651	4570	6824	924	1274	936	1149	976	256	425	260	146	303	19	30	644	548	1129	6947
6	"	3230	6789	3286	1531	952	4220	1412	1310	620	1074	613	375	511	749	525	24	155	206	1224	3214	12487	10734
7	141-200	2224	16025	4385	2538	945	6153	857	122	55	1067	78	52	5	12	24	107	18		473	140	4692	12659
8	"	8931	16434	15973	5107	2349	7964	3615	349	93	1610	77	23	74	123	37	111	5		347	475	3471	2814
9	"	184	5261	6340	188	143	998	239	9	103	174		20	41		14	376			64	151	81	503
10	"	1338	4898	4193	1558	327	936	506	58	46	301	199	102	107	81	2	24		28	304	246	2625	5071
11	"	2505	13219	3859	1787	224	1678	582	78	41	310	176	255	106	175	18	58	33	56	381	272	3699	4336
12	201-300	335	2469	1587	126		24										71					42	339
13	"	9	2534	734	93																	15	135
14	"	107	1121	545	131	67														76		160	9795
15		748	8436	2344	108												18				47	805	195
16	301-400		66																				
17			5																				
18		2																					
19																							
Total		40839	114050	59362	40248	26719	60963	26463	9695	9013	9966	4986	2854	3062	2695	2496	1593	4071	5242	12505	23886	43675	75228
s.e.		5784	12205	8225	6704	5837	17397	7367	2070	1459	1725	646	451	593	380	398	273	780	813	980	4526	5507	8109

s.e.: standard error

Table 6 – Cod (*Gadus morhua*) age-length key in 2009.

length	age														
cm	1	2	3	4	5	6	7	8	9	10	11	12	13	14	total
12-14															
15-17	25														25
18-20	86														86
21-23	65														65
24-26	4	1													5
27-29	17	10													27
30-32		77													77
33-35		98													98
36-38		76													76
39-41		38	6												44
42-44			81												81
45-47			77												77
48-50			77												77
51-53			20	15											35
54-56			6	36											42
57-59				83											83
60-62				86											86
63-65				87											87
66-68				16	12										28
69-71				14	20										34
72-74				1	17										18
75-77				3	15										18
78-80					18		1								19
81-83					7		2								9
84-86					3		3								6
87-89							7								7
90-92						1	8								9
93-95							11		5						16
96-98							4		3						7
99-101							2		5						7
102-104									4						4
105-107									2						2
108-110									3						3
111-113															0
114-116												1			1
117-119															0
120-122												1			1
total	197	300	267	341	92	1	38		22			2			1260

Table 7 – Cod (*Gadus morhua*) abundance at age (‘0000) by stratum in the 2009 survey.

	stratum																mean weight	mean length
age	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**total**	**g**	**cm**
1	6	351	123	18	3	11					1					513	73	20
2	5	310	262	51	31	43	9	22		8	6					748	390	35
3	61	324	285	215	202	252	145	84		25	24					1617	947	47
4	16	47	150	114	111	321	414	58	6	108	62	3		19	3	1430	2024	60
5	6	16	15	10	13	47	68	10	7	64	22	3	2	128	4	415	3809	75
6														1		2	6846	91
7	5	5	3	2	6	4	5	2	1	13	17	1	1	44		109	6481	89
8																		
9	2	2	3	1	2	2	2	1		4	8	1		6		34	9070	100
10																		
11																		
12					1			1								1	14984	118
13																		
14+																		
hauls	4	9	7	4	8	6	8	7	3	11	9	4	2	6	6	94	1516	
total	100	1056	840	411	369	680	643	180	14	223	139	8	3	198	6	4869	7381	49.9

Table 8 – Cod (*Gadus morhua*) abundance at age (thousands) in 1988-2009 surveys.

age	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1	4868	19604	2303	129032	71533	4075	3017	1425	36	37	23	5	178	473	0	684	13	8066	19711	3912	6090	5133
2	79905	10800	12348	26220	41923	138357	4130	11901	3121	150	83	84	16	1990	1330	54	3380	16	3876	11625	16670	7479
3	49496	91303	5121	16903	5578	31096	27756	1338	6659	3478	95	116	327	13	641	628	25	1118	56	5021	12440	16167
4	13448	54613	16952	2125	2385	1099	5097	3892	892	4803	1256	117	198	122	29	134	602	80	1472	21	4530	14299
5	1457	20424	15834	6757	385	1317	130	928	2407	391	1572	717	96	79	70	22	168	708	88	1138	70	4151
6	211	1336	4492	1731	1398	173	67	33	192	952	78	444	446	15	33	42	19	137	587	58	940	23
7	225	143	340	299	244	489	7	23	8	21	146	19	172	142	26	7	5	0	121	425	60	1088
8	72	126	146	68	14	87	111	0	5	0	0	5	11	99	96	8	10	16	8	74	230	
9		6	77	32	0		0	21		0	6		17	6	30	39	3	8	0	13	80	335
10		7	25	4	0		5	5		0			0	6	0	24	5	8	8	20		
11				10	8					0			0	6	5		16		8		10	
12										4			5						0			14
13													0						8			
14													5									
total	149683	198363	57637	183181	123468	176693	40319	19567	13320	9837	3259	1507	1470	2951	2261	1642	4229	10157	25959	22307	41120	48696

Table 9 – American plaice (*Hippoglossoides platessoides*) mean catch per towed mile by strata and its standard error in the 2009 survey.

stratum	square miles	hauls	mean catch (Kg)	s.e.
1	342	4	12.02	12.71
2	838	10	3.31	3.36
3	628	7	0.89	0.92
4	348	4	0.78	0.63
5	703	8	0.76	0.51
6	496	6	0.86	0.58
7	822	9	0.29	0.23
8	646	7	0.54	0.48
9	314	3	1.84	3.19
10	951	11	0.42	0.47
11	806	9	0.59	0.64
12	670	8	0.12	0.34
13	249	3		
14	602	6		
15	666	8	0.01	0.03
16	634	7		
17	216	2		
18	210	2		
19	414	5		
total	10555	119	1.02	1.02

Table 10 – American plaice (*Hippoglossoides platessoides*) abundance at age (‘000) by stratum in the 2009 survey.

	stratum														**mean weight**	**mean length**
age	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**15**	**total**	**g**	**cm**
1		6			7	13								26	16	13
2	4	55	56	7	15	93	14		5		42			293	79	21
3	40	344	110	114	133	125	76	39	4	40	71	6	6	1107	180	27
4	3	39	19	30	16	11	9	11		5	5			147	227	29
5	4	2	4	4	7					5	3			29	366	34
6	4	1			1		8	1		2	4			22	720	41
7	22	8	9	2	4	1	5	7	2	8	12			80	717	41
8	26	5			1		5	7	2	4	5			57	751	42
9	39	19	2	2	3	2	2	5	3	9	9			94	859	44
10	54	17	1		2	2		1	2	5	6			90	824	43
11	91	26			7	2		1		1	5			132	788	42
12	74	23			3	1	1	4	3	6	5			121	909	45
13	44	14			2	1		1		1	1			63	775	42
14	61	23	2		1	2		2	4	3	4			104	839	43
15	83	19	1		2	1	1	2	3	4	5			121	890	44
16+	157	100	18		15	12		6	30	7	3	5		353	1350	50
hauls	4	10	7	4	7	6	7	5	1	8	6	1	1	67	519	
total	707	702	222	159	219	267	120	85	57	101	180	13	6	2838	1472	34.2

Table 11 – American plaice (*Hippoglossoides platessoides*) survey biomass (t) by strata in 1988-2009.

stratum	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1	1306	1000	505	1078	709	1079	661	2230	1462	381	156	372	345	1043	141	1292	1507	1038	714	284	144	548
2	2845	3602	1375	2663	1714	1267	1199	1335	943	740	1587	1810	976	835	1262	713	768	796	354	209	513	370
3	1367	1118	1668	1247	631	444	325	252	168	495	284	97	21	93	75	17	427	101	74	101	147	74
4	2199	461	817	320	557	572	853	489	268	203	343	53	100	85	128		395	359	109	153	440	36
5	2599	3093	1830	1407	837	1291	1230	549	500	619	744	73	56	112	189	82	72	45	63	81	88	72
6	479	1130	954	501	601	305	808	123	32	13	35	40	25	37	63	29	26	71	61	99	37	57
7	1174	531	837	389	639	319	316	249	72	83	47	19	15	28	52	30	84	31	37	20	47	32
8	417	164	263	251	727	487	171	132	56	123	165	3		45	43	14	55	175	163	58	128	47
9	103	163	343		373	205	20	500	55	36					1	9	77	18				77
10	2323	1491	2000	1308	1406	1459	2236	708	415	287	36	72	45	95	36	54	45	87	97	24	163	54
11	1186	1168	1316	401	372	292	303	109	68	32	29	37	23	27	59	29	69	35	19	22	50	64
12	9	19	45	17	11	15	33	12	32	7				4		11						11
13	3		20					3														
14	8	8	7	389	29		24	15	4		4	9										
15	23	99	3	97	37	109	40	68	23	7	7					6		4		3	7	1
16	5			4	9	12	5															
17																						
18																						
19				15	4	5	3	11														
Total	16046	14047	11983	10087	8656	7861	8227	6785	4098	3026	3437	2585	1606	2404	2049	2286	3525	2760	1691	1053	1766	1442
s.e.	1845	2048	1276	1180	954	1040	1373	1083	912	708	751	869	332	429	729	748	740	684	342	159	150	164

Table 12 – American plaice (*Hippoglossoides platessoides*) length distribution (‘00) in the 2009 survey.

length	ind	male	female	**length**	male	female	**length**	male	female	**length**	male	female
10-11	63			24-25	1303	402	38-39	1437	71	52-53		973
12-13		132		26-27	2830	3053	40-41	1780	69	54-55		815
14-15			64	28-29	1067	2545	42-43	1389	212	56-57		337
16-17		63	69	30-31	273	935	44-45	980	284	58-59		139
18-19		393	63	32-33	136	66	46-47	689	688	60-61		
20-21		993	470	34-35	270		48-49	210	724	62-63		64
22-23		473	536	36-37	484	68	50-51		832			

Table 13 – American plaice (*Hippoglossoides platessoides*) abundance at age in the 2009 survey, strata 1-19.

age	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**
1	0	40	8	40	0	0	0	0	8	8	0	8	16	0	0	8	0	0	8	207	51	26
2	402	563	426	354	852	8	40	32	32	16	24	0	24	40	0	8	113	32	24	7	1492	293
3	1882	8364	917	1206	796	1544	48	113	121	113	32	24	8	48	32	32	281	113	40	13	69	1107
4	1311	1874	8372	2171	1070	1086	2131	740	257	24	48	64	80	56	64	97	72	290	105	35		147
5	4230	4367	1126	5348	1938	780	1037	2131	587	121	72	80	105	105	16	80	80	105	137	106	32	29
6	6385	4359	3370	2445	4769	418	877	1367	1665	418	265	80	153	56	88	56	105	105	137	119	127	22
7	5010	4142	2340	2686	1279	4134	973	1375	893	1206	619	241	121	113	64	48	105	129	72	49	120	80
8	5460	2429	2228	2067	1504	450	3426	909	547	273	901	474	153	265	129	137	129	105	56	49	108	57
9	1753	804	1351	852	828	780	322	1536	402	410	523	507	394	434	161	290	249	225	121	35	104	94
10	458	346	627	298	378	370	651	161	627	290	354	257	426	579	193	233	314	201	161	47	111	90
11	97	40	113	8	177	257	225	177	145	491	298	338	225	483	298	426	281	225	201	76	63	132
12	161	16	16	56	97	306	225	145	80	129	290	209	185	418	225	483	595	249	193	122	47	121
13	129	0	32	0	16	362	249	145	80	24	88	121	72	193	249	281	426	354	193	143	118	63
14	48	0	16	0	0	1070	523	290	105	97	113	121	56	161	145	265	402	394	209	82	110	104
15	56	0	0	0	0	32	491	217	72	48	56	56	48	113	129	145	330	257	201	75	150	121
16+	40	0	0	0	0	40	8	32	24	113	105	97	56	97	185	161	523	547	322	236	561	353
Total	27415	27351	20949	17523	13711	11637	11226	9377	5645	3772	3804	2670	2131	3169	1970	2766	4013	3329	2187	1401	3263	2838
N 6+	19598	12135	10093	8412	9047	8219	7970	6353	4640	3498	3611	2501	1890	2911	1866	2525	3458	2791	1681	1033	1619	1237

Abundance in thousands

Table 14 – American plaice (*Hippoglossoides platessoides*) age-length key in 2009.

MALE

Length	age																	
cm	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	no id.	total
12-13	2																	2
14-15																		
16-17		1																1
18-19		6																6
20-21		15																15
22-23		4	3															7
24-25			20															20
26-27			40	2														42
28-29			13	3														16
30-31			2	1	1													4
32-33					1					1								2
34-35					1		1		1								1	4
36-37							1	1		1				3	1			7
38-39						1	3	1	2	2	6	1	1	1		3		21
40-41									1	2	5	4	4	3	3	3	1	26
42-43								2	2	3	3	1	1	2	4	2		20
44-45									1	1	1	3	1		3	3	1	14
46-47											1	2	1	2	2	2		10
48-49											1	1				1		3
total:	2	26	78	6	3	1	5	4	7	10	17	12	8	11	13	14	3	220

FEMALE

Length	age																	
cm	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	no id.	total
12-13																		
14-15	1																	1
16-17		1																1
18-19		1																1
20-21		7																7
22-23		8																8
24-25			6															6
26-27		1	44	1														46
28-29			29	9														38
30-31			9	5														14
32-33				1														1
34-35																		
36-37					1													1
38-39						1												1
40-41							1											1
42-43							1	2										3
44-45							1	1	1			1						4
46-47						1	3	1	2			1			1		1	10
48-49									2	1	1	2	1	1	1	2		11
50-51														3	1	8		12
52-53									1	1		1			1	10		14
54-55										1						11		12
56-57											1					4		5
58-59																2		2
total:	1	18	88	16	1	2	6	4	6	3	2	5	1	4	4	37	1	199

Table 15 – Redfish mean catch per towed mile by strata and their standard errors in the 2009 survey.

			Sebastes marinus		***Sebastes mentella***		***Sebastes fasciatus***		**Juvenile redfish**	
stratum	square miles	hauls	mean catch (Kg)	s.e.	mean catch (Kg)	s.e.	mean catch (Kg)	s.e.	mean catch (Kg)	s.e.
1	342	4	0.40	0.49					0.08	0.08
2	838	10	0.64	0.64					0.06	0.05
3	628	7	1.47	2.05			0.18	0.24	0.15	0.13
4	348	4	28.29	33.34	0.02	0.03	9.67	18.52	0.79	1.08
5	703	8	1.08	1.10			0.95	1.85	0.27	0.47
6	496	6	75.26	174.71	0.01	0.02	45.87	111.49	0.81	0.93
7	822	9	257.48	314.17	0.17	0.37	40.13	71.24	11.84	17.95
8	646	7	44.85	26.01	1.57	2.39	46.66	108.71	1.83	1.64
9	314	3	61.56	59.00	4.10	7.10	1727.21	2805.89	2.94	3.43
10	951	11	81.95	106.13	0.16	0.29	18.63	39.13	1.11	1.34
11	806	9	174.98	262.48	18.46	52.18	376.71	594.58	6.04	6.08
12	670	8	2.92	6.05	171.81	266.18	173.02	272.22	1.00	2.00
13	249	3	2.14	3.71	277.09	180.72	282.57	330.25		
14	602	6	13.61	13.45	783.09	740.52	138.98	110.99	0.39	0.61
15	666	8	3.67	5.41	244.18	237.87	93.40	81.93	1.98	3.44
16	634	7			0.74	1.03	1.00	0.81		
17	216	2			1.35	1.70	0.65	0.91		
18	210	2			6.44	9.11	0.88	0.89		
19	414	5			1.57	0.85	1.80	1.51	0.00	0.01
20	525	6					0.15	0.16		
21	517	6					0.08	0.15		
22	533	5								
23	284	2								
24	253	3					0.03	0.05		
25	226	3								
28	530	6			0.10	0.17	0.15	0.17		
29	488	6			0.10	0.26				
30	1134	11								
31	203	2								
32	238	2								
33	98	2								
34	486	5								
total	16070	178	33.70	7.56	52.18	12.62	80.14	33.71	1.31	0.33
strata 1-19	10555	119	51.31	11.51	79.43	19.21	121.99	51.33	1.99	0.51

Table 16 – Redfish (*Sebastes marinus*) length distribution (‘000) in the 2009 survey.

length	male	female	**length**	male	female	**length**	male	female
6	6		**21**	4477	3127	**36**	526	2013
7	6		**22**	4916	5075	**37**	468	1422
8			**23**	6424	6797	**38**	444	302
9			**24**	7779	6341	**39**	52	325
10			**25**	7235	7257	**40**	7	116
11			**26**	7197	6729	**41**	8	77
12	7		**27**	7556	6171	**42**		78
13	147	114	**28**	7642	5998	**43**		19
14	1036	563	**29**	8540	4442	**44**	7	30
15	2939	1898	**30**	8135	3852	**45**		7
16	6904	5691	**31**	7590	4108	**46**		
17	5838	6391	**32**	3930	3687	**47**		121
18	5932	5066	**33**	2212	5097	**48**		7
19	3497	3193	**34**	2116	3378	**49**		38
20	4596	2349	**35**	869	2201	**50**		36

Table 17 – Redfish (*Sebastes mentella*) length distribution (‘0000) in the 2009 survey.

length	male	female	**length**	male	female	**length**	male	female
13	99		**23**	1457	1415	**33**	15	25
14	94	187	**24**	2292	2195	**34**	1	18
15	1214	1383	**25**	1248	1250	**35**	9	11
16	3412	3237	**26**	1001	916	**36**	4	57
17	5426	4988	**27**	775	566	**37**	1	26
18	6979	6001	**28**	289	448	**38**	1	4
19	8310	6643	**29**	261	553	**39**	1	4
20	9045	8169	**30**	97	334	**40**	1	6
21	5395	4107	**31**	101	98	**41**		4
22	2222	1665	**32**	25	66	**42**		

Table 18– Redfish (*Sebastes fasciatus*) length distribution (‘00000) in the 2009 survey.

length	male	female	**length**	male	female	**length**	male	female
13	2	4	**23**	499	614	**33**		20
14	7	17	**24**	292	680	**34**		
15	17	18	**25**	199	506	**35**		14
16	25	38	**26**	78	238	**36**		
17	62	40	**27**	15	239	**37**		
18	188	92	**28**	6	126	**38**		
19	332	115	**29**	6	113	**39**		
20	912	250	**30**		24	**40**		16
21	1106	469	**31**		22	**41**		
22	1058	689	**32**		18	**42**		

Table 19 – Juvenile redfish (*Sebastes sp*.) length distribution (‘00000) in the 2009 survey.

length	Indet.	male	female
6	8		
7	71		
8	393		
9	853		
10	504		
11	796		
12	1069		7
13	812	28	28
14	1301	25	61
15	1331	39	59
16	960	53	23
17	95		1
18	39		
19	1		
20			
21		1	
22			
23			

Table 20 – Greenland halibut (*Reinhardtius hippoglossoides*) mean catch per towed mile by strata and its standard error in the 2009 survey.

stratum	sq. miles	hauls	mean catch (Kg)	s.e
1	342	4		
2	838	10		
3	628	7	0.05	0.13
4	348	4		
5	703	8	0.08	0.22
6	496	6		
7	822	9	0.1	0.22
8	646	7	0.36	0.36
9	314	3	0.74	0.67
10	951	10	0.2	0.32
11	806	9	0.2	0.3
12	670	8	13.62	12.31
13	249	3	6.54	0.86
14	602	5	9.24	12.6
15	666	8	8.68	3.99
16	634	7	25.86	5.99
17	216	2	19.39	0.45
18	210	2	19.27	17.11
19	414	5	25.62	7.64
20	525	4	26.51	15.7
21	517	4	22.76	19.8
22	533	4	27.73	17.23
23	284	3	12.53	2.43
24	253	2	35.12	30.77
25	226	2	24.28	14.04
28	530	6	44.62	31.35
29	488	6	40.24	21.08
30	1134	11	50.87	39.05
31	203	2	34.87	19.07
32	238	2	75.35	71.01
33	98	2	23.68	7.3
34	486	5	52.12	29.25
total	17051	174	29.44	2.51
strata 1-19	10555	119	9.67	0.90

Table 21 – Greenland halibut (*Reinhardtius hippoglossoides*) survey biomass (t) by strata in 1988-2009.

stratum	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		2					
2	0	3	6	0	0	0	0	121	0	2	6	3	0	15	10	0	12	7	9			
3	26	31	8	8	18	3	0	21	108	90	367	347	244	384	140	55	852	416	325	22		4
4	144	20	0	15	27	10	0	5	0	23	41	197	207	157	58	105	347	91	182	8		
5	74	98	0	28	42	1	2	21	36	98	173	409	307	268	66	92	254	280	231	92	15	7
6	31	18	15	12	8	15	0	31	106	228	361	301	178	265	104	21	466	332	61	75	8	
7	85	63	58	189	246	94	214	904	1148	1423	2607	2356	1570	982	429	414	1032	596	778	729	524	11
8	151	222	62	180	379	140	46	333	359	1065	989	1993	1317	1124	878	507	811	934	910	432	226	31
9	180	165	53	76	323	30	43	178	160	254	471	354	245	355	138	140	464	91	550	487	401	31
10	108	82	58	172	362	31	235	526	716	862	1369	1528	1602	1743	744	286	753	1058	850	560	777	25
11	45	61	22	106	229	234	236	492	671	627	1227	1320	1088	1021	338	277	631	1063	290	503	563	21
12	405	647	288	761	619	933	1219	1147	2124	2248	3077	3661	2174	1582	1086	673	902	1020	978	1246	1393	1217
13	64	124	218	44	24	143	152	127	298	484	554	978	382	291	521	61	447	310	219	392	431	217
14	368	302	284	787	847	0	620	410	902	1589	1461	1080	491	877	1081	885	1658	618	573	878	1023	742
15	435	169	525	973	643	1378	1492	1768	1448	2689	4055	2987	2687	1616	1233	607	1084	1747	1783	3041	1621	771
16	1374	1363	2543	2527	1827	2175	1524	1861	2098	1770	3356	1143	2016	1328	2182	633	1166	1357	1752	2263	1623	2186
17	266	120	127	415	40	0	742	742	258	525	737	603	498	170	204	148	223	429	639	407	411	558
18	106	50	506	354	58	0	386	958	191	557	775	932	179	574	694	1062	578	434	606	865	944	540
19	3064	934	1026	1522	3036	1342	1126	1230	971	1564	2603	1015	1774	1120	2194	248	608	915	971	1042	2035	1414
20																	1647	1061	666	2041	4119	1855
21																	729	345	359	742	2161	1569
22																	454	510	845	551	883	1970
23																	407	42	130	495	1144	475
24																	208	328	555	588	1082	1185
25																	2377	993	322	436	441	732
28																	1728	1162	1239	2857	3920	3153
29																	2300	1330	674	1488	3335	2618
30																	2024	602	2772	4719	5066	7692
31																	546	186	354	347	385	944
32																	599	596	1357	1040	1755	2391
33																	358	147	608	166	698	309
34																	2675	1460	1886	2222	2627	3377
total (1-19)	6926	4472	5799	8169	8728	6529	8037	1087	1159	1609	24229	21207	16959	13872	12100	6214	12292	11698	11708	13040	11997	7777
s.e. (1-19)	768	392	809	817	1389	956	678	1226	882	1136	1348	1520	923	776	662	611	400	630	609	786	583	363
total (1-32)																	28343	21515	24357	31723	39614	36047
s.e. (1-32)																	1335	933	1263	1270	1312	1538

Table 22 – Greenland halibut (*Reinhardtius hippoglossoides*) length distribution in the 2009 survey.

In the 19 shallowest strata (hundreds**):**

length	ind.	male	female	**length**	ind.	male	female	**length**	ind.	male	female
12-13	132	134	4	**34-35**		270	65	**56-57**		424	2615
14-15	203	65	71	**36-37**		999	392	**58-59**		156	1509
16-17				**38-39**	67	1648	1053	**60-61**		65	1889
18-19				**40-41**		2978	1637	**62-63**			400
20-21			71	**42-43**		2905	4206	**64-65**			622
22-23			65	**44-45**		5391	3995	**66-67**			363
24-25				**46-47**		5206	7285	**68-69**			145
26-27		68	134	**48-49**		4288	8029	**70-71**			80
28-29		71		**50-51**		2359	6705	**72-73**			80
30-31		356	198	**52-53**		1326	5624	**74-75**			
32-33		216	268	**54-55**		1003	3990	**76-77**			

In the whole bank (thousands**):**

length	ind.	male	female	**length**	ind.	male	female	**length**	ind.	male	female
12-13	13	13		**38-39**	7	274	224	**64-65**			391
14-15	20	6	7	**40-41**		738	552	**66-67**		7	213
16-17				**42-43**		762	1124	**68-69**			198
18-19				**44-45**		1256	1511	**70-71**			91
20-21			7	**46-47**		1577	2050	**72-73**			36
22-23			6	**48-49**		1749	2767	**74-75**			79
24-25				**50-51**		1365	2836	**76-77**			51
26-27		7	13	**52-53**		1123	2652	**78-79**			30
28-29		21		**54-55**		671	2131	**80-81**			33
30-31		44	20	**56-57**		305	1777	**82-83**			15
32-33		22	36	**58-59**		140	1270	**84-85**			15
34-35		60	16	**60-61**		22	978	**86-87**			
36-37		180	111	**62-63**		17	385	**88-89**			

Table 23 - Greenland halibut (*Reinhardtius hippoglossoides*) age-length key in the 2009 survey.

MALE

	age																
length	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16+**	**no id.**	**total**
12-13	2																	2
14-15	1																	1
16-17																		
18-19																		
20-21																		
22-23																		
24-25																		
26-27			1															1
28-29			1	1														2
30-31				6	1													7
32-33				1	2													3
34-35					8													8
36-37					17	3												20
38-39					19	10												29
40-41					6	27												33
42-43					7	22												29
44-45						28	3											31
46-47						23	10											33
48-49						4	27										1	32
50-51							32	1									1	34
52-53							27	5										32
54-55							17	16	1									34
56-57							5	15	7									27
58-59							1	8	6									15
60-61										2	1							3
62-63										1	1							2
64-65																		
66-67													1					1
total:	3		2	8	60	117	122	45	14	3	2		1				2	379

Table 23 – (continued)

FEMALE

	age																	
length	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16+**	**no id.**	**total**
12-13	1																	1
14-15	2																	2
16-17																		
18-19																		
20-21		1																1
22-23			1															1
24-25																		
26-27			2															2
28-29																		
30-31				2														2
32-33				2	1													3
34-35					2													2
36-37					14	1												15
38-39					20	9												29
40-41					10	20											1	31
42-43					5	29	1										1	36
44-45					1	28	2											31
46-47						21	15											36
48-49						8	35										1	44
50-51						1	37	2										40
52-53							36	12	1									49
54-55							21	22										43
56-57							6	21	6									33
58-59							1	14	14	3							1	33
60-61									1	28	2							31
62-63									1	15	10	2						28
64-65										2	9	13	5	1				30
66-67											11	9	8	2				30
68-69											3	7	13	1				24
70-71												3	4	5				12
72-73													2	2				4
74-75													1	6	3	1		11
76-77													2	3	1			6
78-79														1	3			4
80-81																4		4
82-83																2		2
84-85																3		3
total:	3	1	3	4	53	117	154	71	23	48	35	34	35	21	7	10	4	623

Table 24 – Greenland halibut (*Reinhardtius hippoglossoides*) abundance at age (‘0000) by strata in the 2009 survey.

	age																
stratum	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	n
3	1					1											1
5							1										1
7		1					1										2
8						2	2										4
9							1	1									2
10	2					2	1										5
11			1	1	1	1	1										4
12			1	3	15	58	50	8	2	3							141
13					2	6	8	2	1	1			1				20
14					1	7	17	5	2	8	3	2	2	1			48
15	3		1	1	13	37	30	7	1	2							94
16	1			1	11	70	108	24	5	4	1	1					227
17				1	4	31	23	6	1								65
18					3	11	18	7	2	2	1	1					45
19				1	12	63	65	12	2	1							158
20					5	44	89	23	6	4	2	2	2	1			178
21					5	18	47	21	6	8	2	2	2	1	1	2	115
22				1	3	30	69	22	7	5	3	3	2	2		2	149
23						7	14	6	2	3	1		1	1			36
24					4	37	56	11	3	1	1	1	1				116
25					1	8	34	11	3	2	1	1					61
28					9	63	133	49	13	7	3	2	2				282
29			1	1	7	43	96	37	10	9	4	2	2	1	1	1	214
30				1	19	123	253	104	29	39	15	12	9	4	2	1	611
31					1	17	27	10	2	4	2	2	2	1		2	69
32					11	44	98	31	8	11	2	1	2	1			209
33					1	8	13	3	1	1							27
34					12	97	147	36	9	10	2	2	1	1			318
total	6	1	4	10	141	829	1401	434	113	126	44	34	31	17	5	7	3202
mean weight (g)	16	60	136	223	488	714	1067	1408	1610	1910	2239	2471	2788	3331	3998	4833	3571
mean weight (cm)	14	21	26	31	39	44	50	55	58	61	64	66	68	72	77	81	50.3

Table 25 – Greenland halibut (*Reinhardtius hippoglossoides*) abundance at age (thousands) in the upper 19 strata (up) and in the whole 32 strata (down).

age	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1	1302	1677	1423	1429	9978	4699	2674	2200	852	3014	6459	3282	1768	1762	437	548	336	157	61
2	207	1260	1245	996	2045	6408	3036	1716	563	235	1153	2364	804	2644	652	322	74	78	7
3	348	447	777	1365	1793	1942	4822	6180	2419	479	1456	2248	489	3517	2554	525	456	121	30
4	1054	1023	692	1435	1535	2442	5225	8843	8419	1741	799	1342	1217	1585	2007	943	275	155	79
5	2307	1852	1021	1545	2136	3380	5714	9919	10787	5703	2242	3045	1991	5601	5537	4807	2765	1205	620
6	1291	2249	1545	2385	4099	4680	6800	9085	10119	11336	6262	4498	2362	6271	6105	6002	5928	4584	2888
7	2212	1947	1627	2139	3029	2001	4014	6304	4467	4346	5328	4610	1552	2040	2345	2665	4632	4950	3258
8	534	1054	1266	1180	1706	1299	1731	2108	1466	1865	2584	1025	375	518	491	623	1217	909	715
9	462	468	776	631	1052	341	528	600	280	361	147	104	105	233	89	180	247	283	153
10	352	273	213	219	209	70	177	157	82	92	36	48	79	107	97	143	165	210	215
11	141	138	104	90	53	21	23	27	6	44	5	16	15	63	44	103	62	100	62
12	12	67	38	47	18	31	17	6	3	0	0	6	4	38	15	45	38	43	47
13	0	25	21	18	0	0	17	16	3	0	0	0	0	5	3	10	5	18	35
14	0	12	9	0	5	4	0	0	5	0	0	0	0	3	3	0	2	10	12
15	15	0	0	0	0	5	6	0	0	0	0	0	0	3	3	0		4	
16+	8	0	0	0	0	0	9	0	0	0	0	0	0	3	3	0		1	
total	10245	12490	10757	13479	27659	27323	34792	47160	39470	29216	26471	22587	10762	24390	20374	16918	16204	12825	8182

age	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1														1710	424	560	350	160	60
2														2680	621	320	70	80	10
3														3580	2374	540	480	120	40
4														1880	1810	1110	360	200	100
5														8330	5085	7160	4700	2480	1410
6														11210	6420	10480	11130	11020	8290
7														6060	3180	5730	10490	15340	14010
8														1790	874	1700	3530	3890	4340
9														890	171	510	880	1400	1130
10														450	293	440	720	1060	1260
11														320	152	370	370	540	440
12														200	91	180	210	300	340
13														180	50	60	80	160	310
14														70	23	30	60	120	170
15														80	9	10	20	80	50
16+														60		10	10	70	70
total														39470	21578	29210	33440	37030	32020

Table 26 – Roughhead grenadier (*Macrourus berglax*) mean catch per towed mile by strata and its standard error in the 2009 survey.

stratum	square miles	hauls	mean catch (Kg)	s.e.
1	342	4		
2	838	10		
3	628	7		
4	348	4		
5	703	8		
6	496	6		
7	822	9		
8	646	7		
9	314	3		
10	951	11		
11	806	9		
12	670	8	0.82	1.01
13	249	3	0.76	1.31
14	602	6	0.01	0.04
15	666	8		
16	634	7	2.52	2.52
17	216	2	1.39	0.48
18	210	2	6.93	8.37
19	414	5	4.26	3.23
20	525	6	1.85	0.93
21	517	6	7.66	4.25
22	533	5	17.11	11.89
23	284	2	8.07	0.09
24	253	3	4.32	2.96
25	226	3	12.02	8.34
28	530	6	3.86	2.12
29	488	6	6.51	4.36
30	1134	11	16.93	17.87
31	203	2	8.33	1.82
32	238	2	6.22	2.14
33	98	2	0.88	0.13
34	486	5	2.22	1.88
total	16070	178	3.41	0.45
strata 1-19	10555	119	0.56	0.15

Table 27 – Roughhead grenadier (*Macrourus berglax*) survey biomass (t) by strata in 1988-2009.

stratum	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
1																						
2								8														
3																	10					
4																9						
5																						
6									22													
7					0								3	0		0	10					
8		10		1					11	3		7		16	2	13	28	65	13			
9	47	4		5	28	21	3	21	153	18	40	45	29	29		30	282	82	181	17	39	
10	1								6	1		18	68	18		0	48	38	21			
11												3	8	6			3	2				
12	112	103	40	108	100	413	55	126	46	137	55	191	81	236	154	165	292	207	97	22	92	73
13	21	64	18	18	60	18	32	75	5	18	78	92	50	116	121	123	299	94	154	80	108	25
14	200	145	107	85	139		73	67	270	77	194	135	103	292	124	346	877	379	362	223	539	1
15	92	5	29	64	52	321	82	180	84	69	101	72	103	60	16	87	259	16	85	55	12	
16	349	140	212	229	432	1333	523	256	397	211	405	150	225	338	272	352	594	426	1391	242	493	213
17	134	45	31	180	123		98	129	27	116	204	96	67	370	380	101	244	124	603	70	385	40
18	311	128	143	356	215		756	414	154	224	189	313	219	383	27	877	423	588	435	491	610	194
19	743	227	273	289	429	915	352	282	187	322	424	129	92	216	116	245	228	366	592	167	683	235
20																	419	182	353	144	269	130
21																	1432	996	763	755	1114	528
22																	1095	1115	1545	608	1735	1216
23																	897	463	342	332	399	305
24																	137	1030	419	165	152	146
25																	344	870	817	197	391	362
28																	425	695	610	299	360	273
29																	3113	1012	445	527	555	424
30																	3553	2869	1108	2139	3356	2560
31																	650	327	235	242	176	225
32																	274	267	132	86	222	197
33																	118	17	122	105	38	12
34																	1131	330	511	305	410	144
total (1-19)	2009	871	852	1335	1577	3021	1975	1558	1362	1197	1691	1250	1047	2079	1211	2348	3597	2387	3933	1367	2961	782
s.e. (1-19)	264	142	149	250	270	487	169	223	277	169	243	338	196	284	176	611	362	282	697	310	305	103
total (1-32)																	1718	1425	1210	7807	1213	7304
s.e. (1-32)																	1616	1563	1225	836	659	478

Table 28 - Roughhead grenadier (*Macrourus berglax*) length distribution (hundreds) in the 2009 survey.

length		length		length		length	
2	83	13	4750	24	2698	35	557
3	368	14	7965	25	3279	36	414
4	171	15	6921	26	3053	37	69
5	644	16	6870	27	2959	38	88
6	1717	17	6209	28	1678	39	
7	1074	18	5582	29	2468	40	88
8	1986	19	5357	30	1869	41	
9	2167	20	4081	31	1209	42	84
10	2451	21	3160	32	1128		
11	3031	22	2566	33	646	total	98835
12	4989	23	3756	34	650	mean l.	18.3

Table 29 - Roughhead grenadier (*Macrourus berglax*) age-length key in the 2009 survey.

MALE

	age																	
length	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	no id.	total
1																		
2																		
3		1																1
4																		
5		1																1
6		1	4	2													1	8
7		1	1														1	3
8			4	2													2	8
9				5	2												6	13
10				2	3												5	10
11					1	5											19	25
12						4	2										21	27
13						6	2	1									17	26
14							4	2									28	34
15							2	7	1								23	33
16								2	3	1							27	33
17								4	2								25	31
18									3	2	1						18	24
19								1		1	3	1					25	31
20										2	1	2					20	25
21									1		1	2	1	1			17	23
22											2	2	2				3	9
23												2	1	1			2	6
24															1	1		2
25																		
total		4	9	11	6	15	10	17	10	6	8	9	4	2	1	1	260	373

Table 29 – (continued)

FEMALE

	age																	
length	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16+	no id.	total
1																		
2																		
3																		
4		1																1
5		1																1
6		2	3	1													4	10
7			5	1													1	7
8			2	4													7	13
9			2	4													5	11
10				3	4												9	16
11				1	1	3											6	11
12						5	2										23	30
13					1	5	2										17	25
14						3	6	3									19	31
15							3	8									16	27
16							1	5									23	29
17								3	2	1							19	25
18								2	3		1						21	27
19								1	2	1	1	1					8	14
20								1	1	3	1						10	16
21											4	1					11	16
22											5	1					15	21
23											2	1	2		1		25	31
24												1	3	1	1		23	29
25												1	3		1	1	26	32
26													2	1	2	1	23	29
27												1		3		1	29	34
28														4	1	1	15	21
29														1	2	4	18	25
30														1	2	3	16	22
31																6	9	15
32																6	9	15
33																4	4	8
34																4	4	8
35																5	2	7
36																5	1	6
37																2		2
38																1		1
39																		
40																1		1
41																		
42																1		1
total		4	12	14	6	16	14	23	8	5	14	7	10	11	10	46	418	618

Table 30 - Roughhead grenadier (*Macrourus berglax*) abundance at age (thousands) in the 2009 survey.

age	n	mean weight (g)	mean length (cm)
1	26	3	3
2	149	15	5
3	313	36	7
4	424	63	9
5	253	103	10
6	961	161	12
7	938	228	14
8	1680	348	16
9	866	439	17
10	476	538	19
11	824	726	21
12	563	911	22
13	561	1157	24
14	485	1564	27
15	430	1514	26
16+	935	2379	31
total	9884	7050	18.3

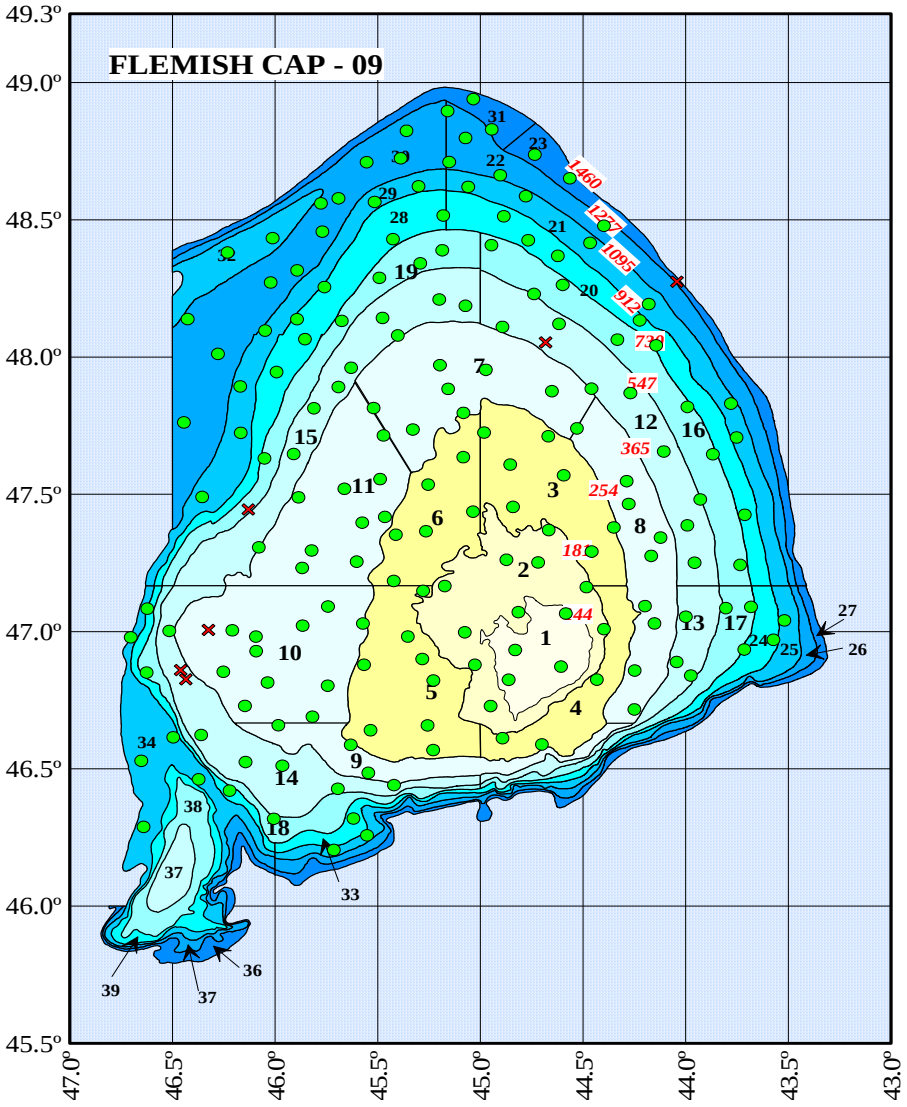

Figure 1 - Haul positions for the Flemish Cap survey 2009.

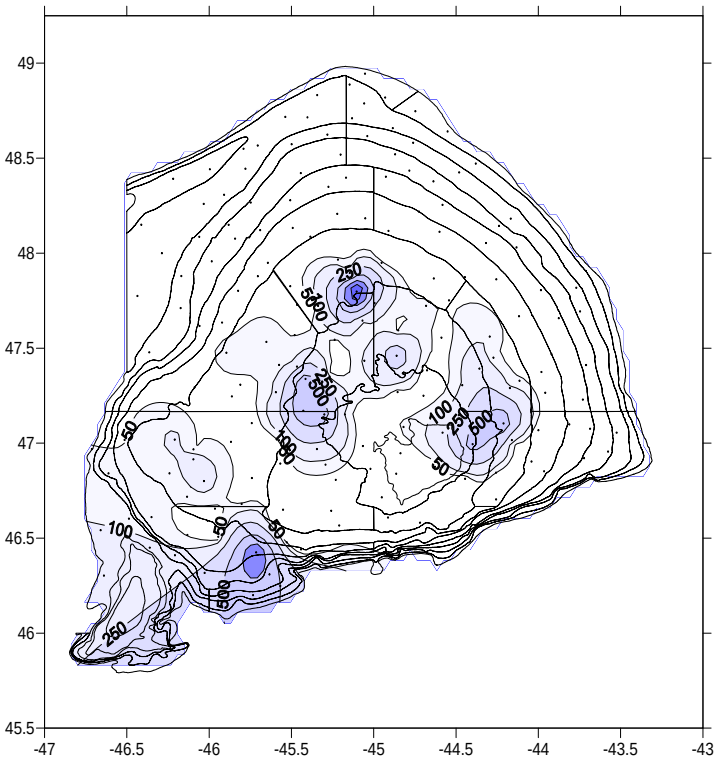

Figure 2 - Cod (*Gadus morhua*) catch distribution in the 2009 survey in Kg.

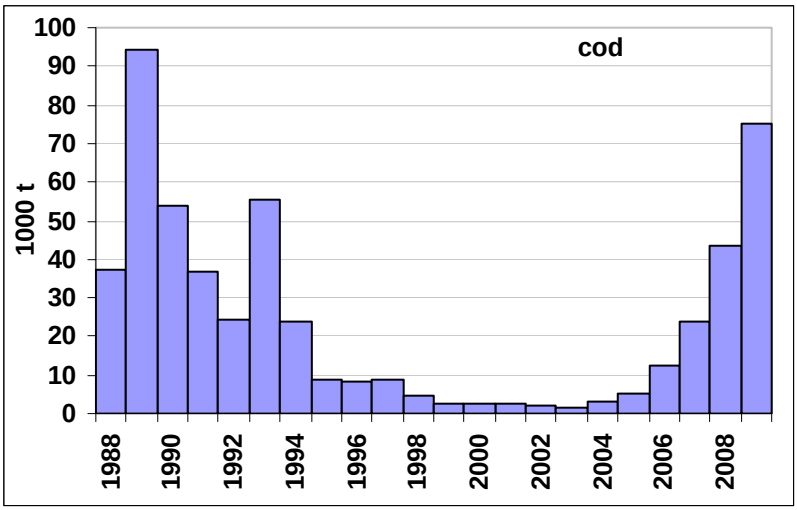

Figure 3 - Cod (*Gadus morhua*) survey biomass.

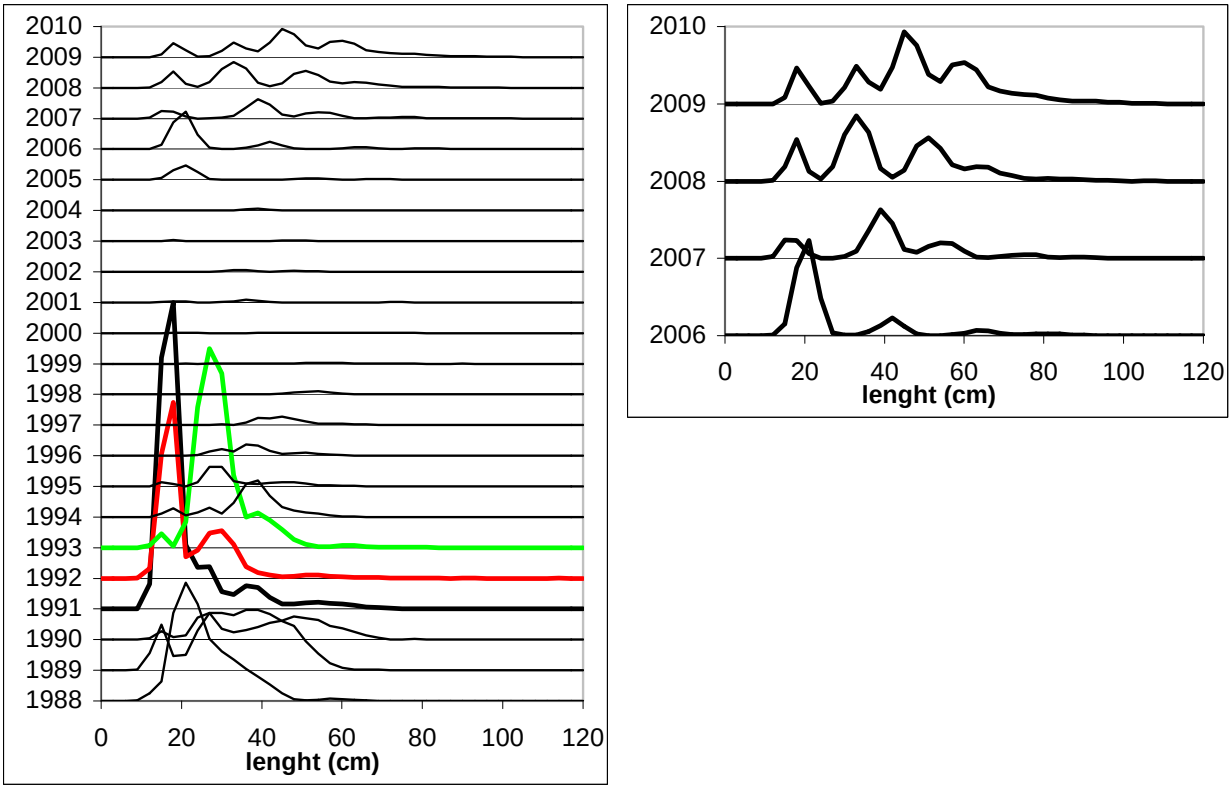

Figure 4 – Cod: length distribution along the survey series. Most recent years are repeated at the right side for better view. Stock in 2009 is clearly dominated by ages 1 to 5.

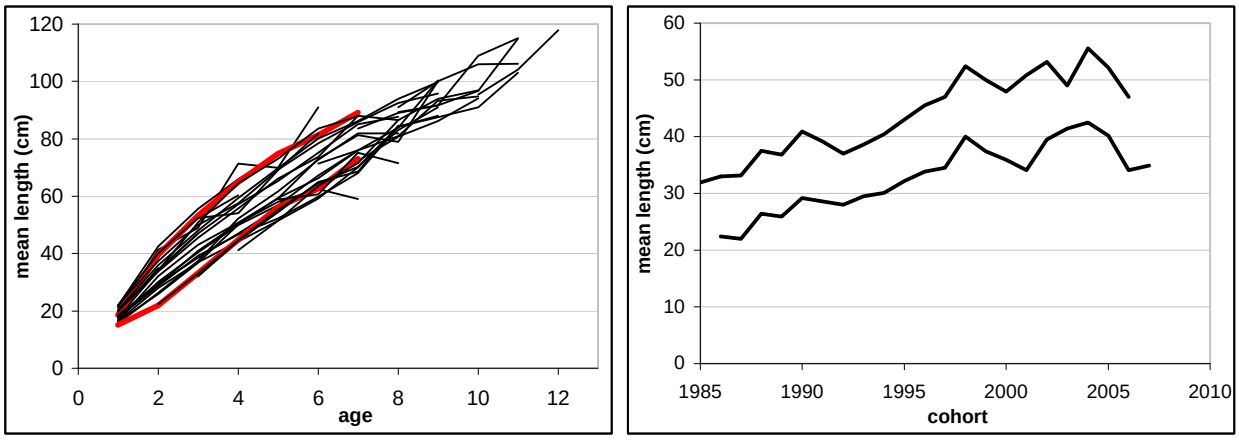

Figure 5 – Cod: mean length at age in July.

On left side, each line represent a cohort from 1980 (ages 8-11) to 2007 (ages 2-3). Red lines correspond to the 1987 (down) and 2002 (up) cohort; the 1987 was a very abundant cohort and the 2002 was a very poor one.

On the right side, both lines correspond to mean length at ages 2 (down) and 3 (up). Growth of each cohort is well established at these two youngest ages .

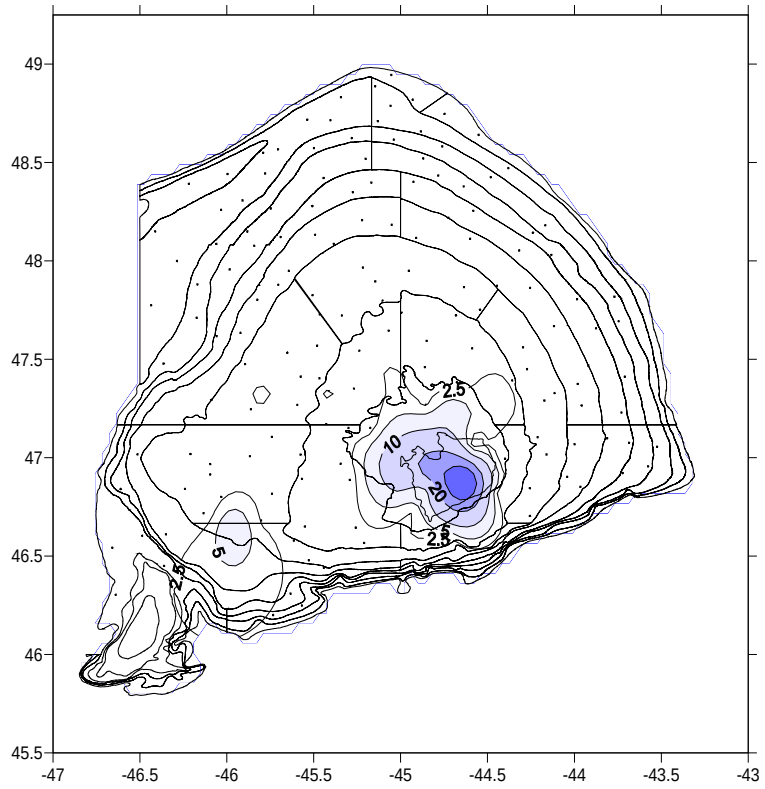

Figure 6 - American plaice (*Hippoglossoides platessoides*) catch distribution in the 2009 survey in Kg.

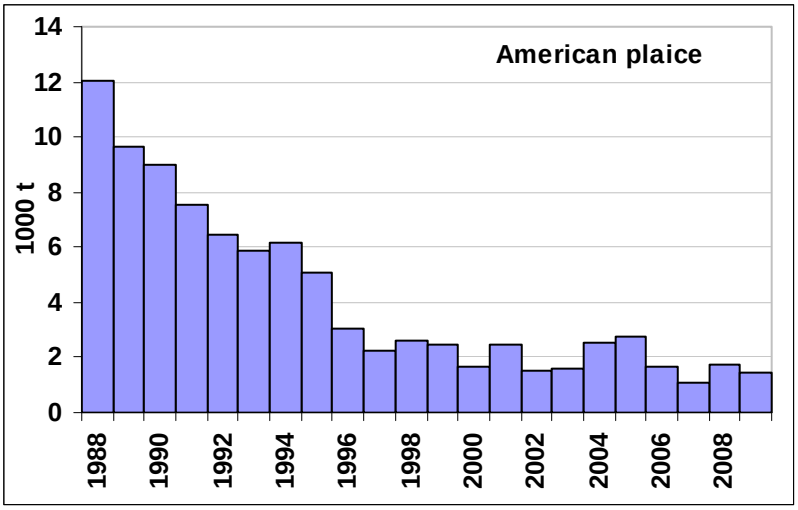

Figure 7 - American plaice (*Hippoglossoides platessoides*) survey biomass.

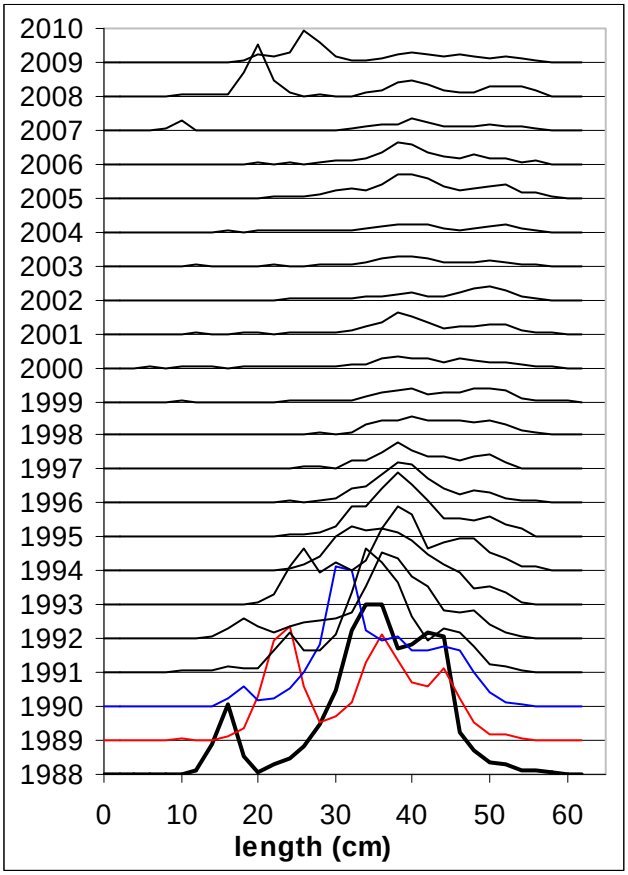

Figure 8 – American plaice: length distribution along the survey series.

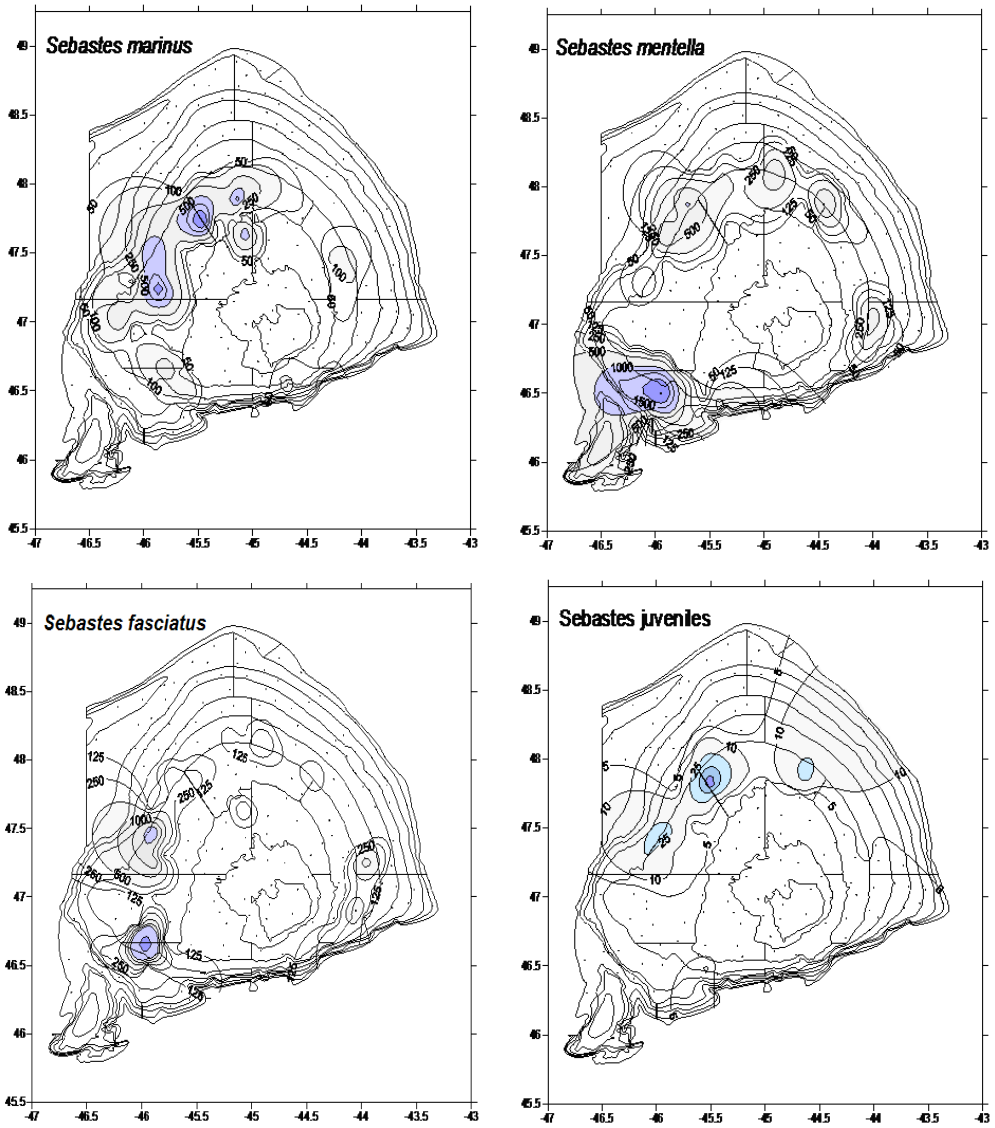

Figure 9 - Redfish catch distribution in the 2009 survey in Kg.

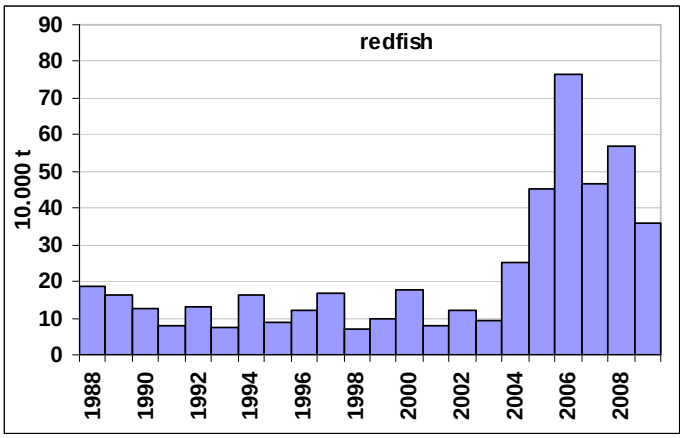

Figure 10 - Redfish survey biomass.

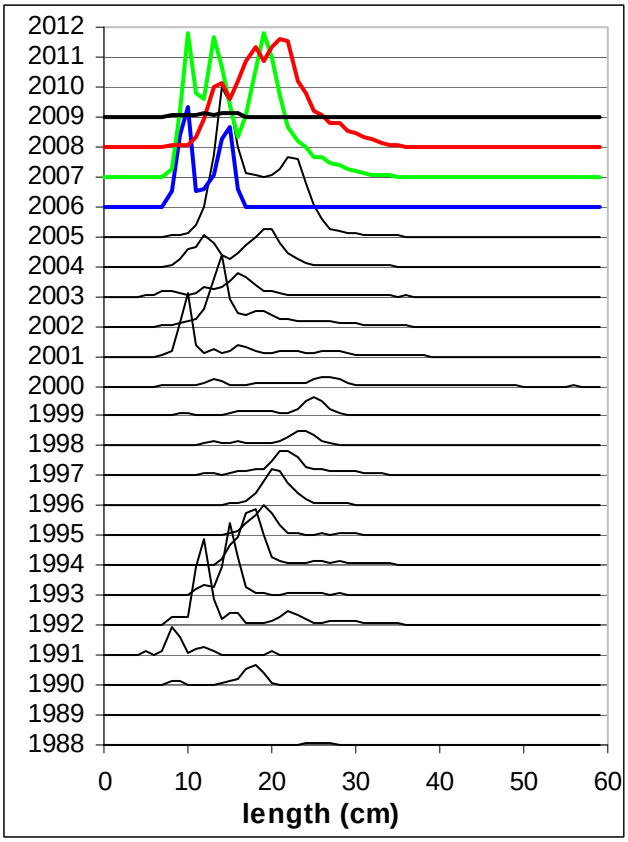

Figure 11 – Redfish: length distribution of all species combined along the survey series.

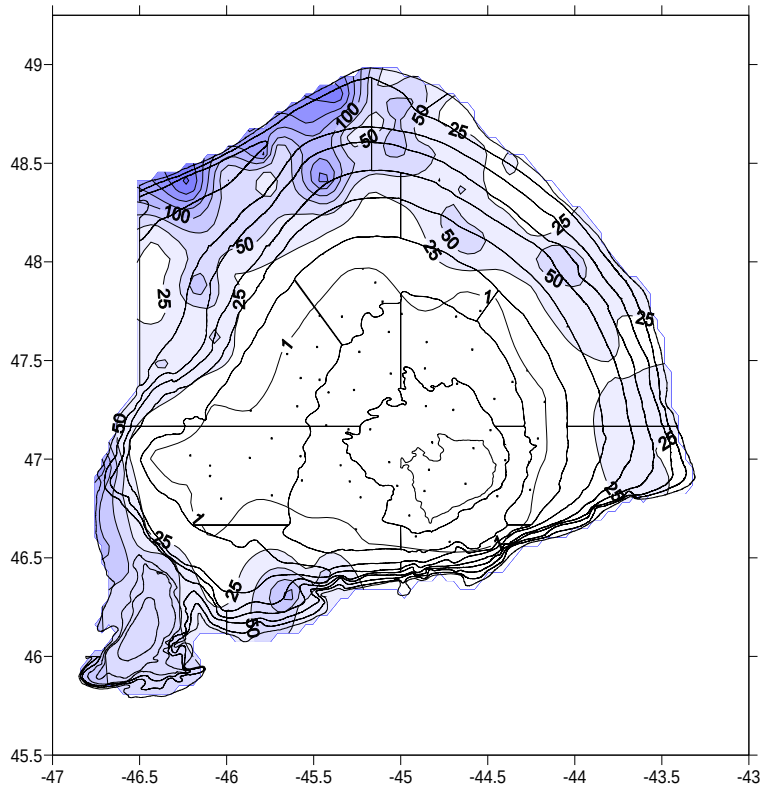

Figure 12 - Greenland halibut (*Reinhardtius hippoglossoides*) catch distribution in the 2009 survey in Kg.

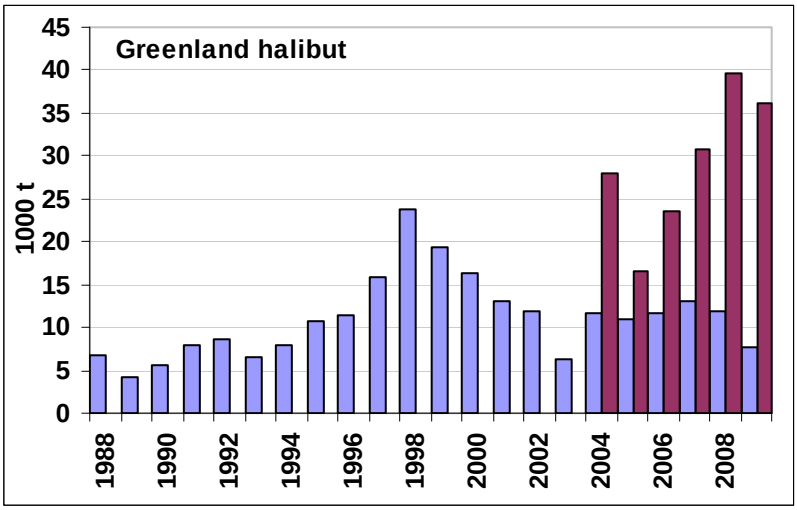

Figure 13 - Greenland halibut (*Reinhardtius hippoglossoides*) survey biomas up to 730 (blue) and 1460 m (red).

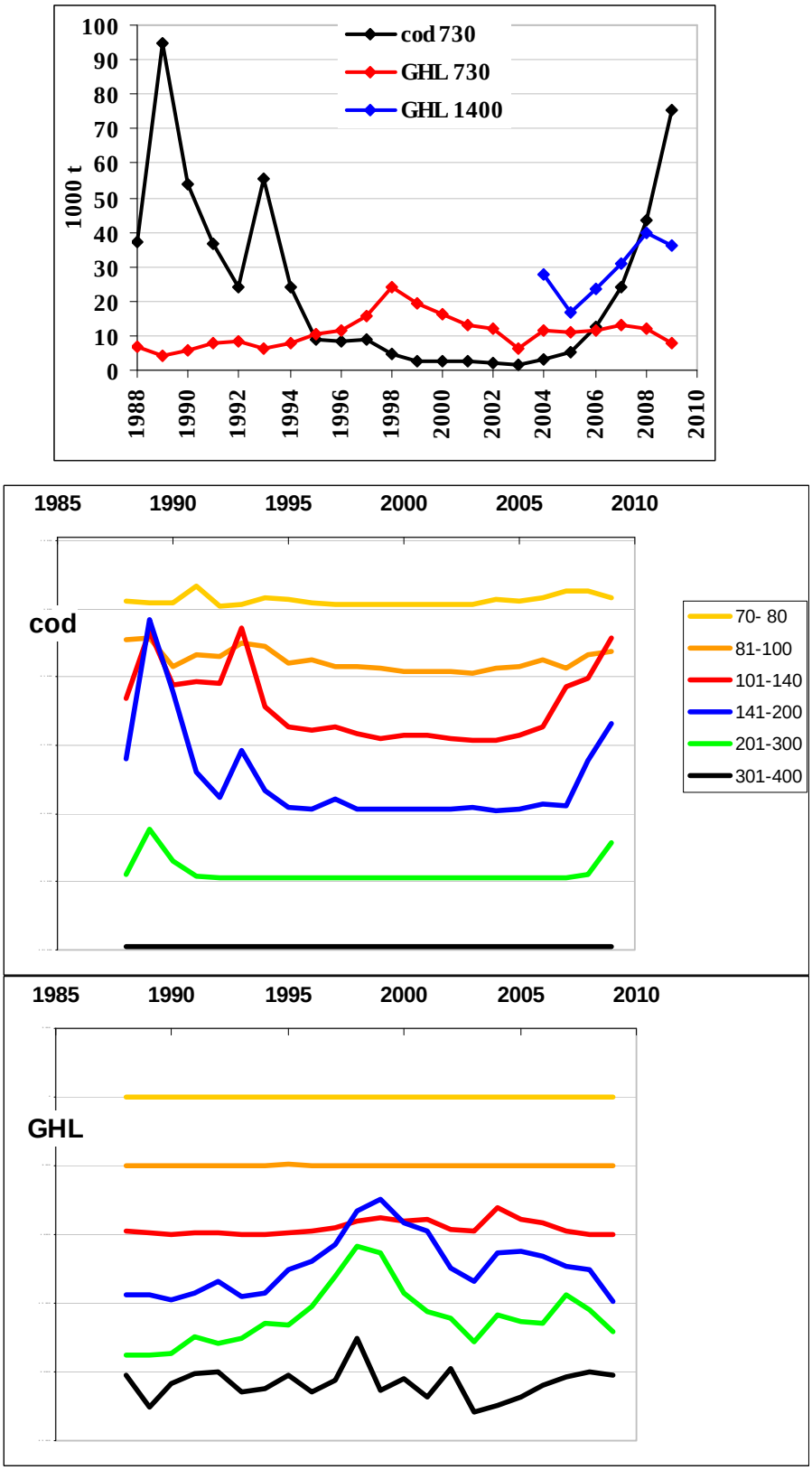

Figure 14 – Evolution of cod and Greenland halibut: jointly and by depth range.

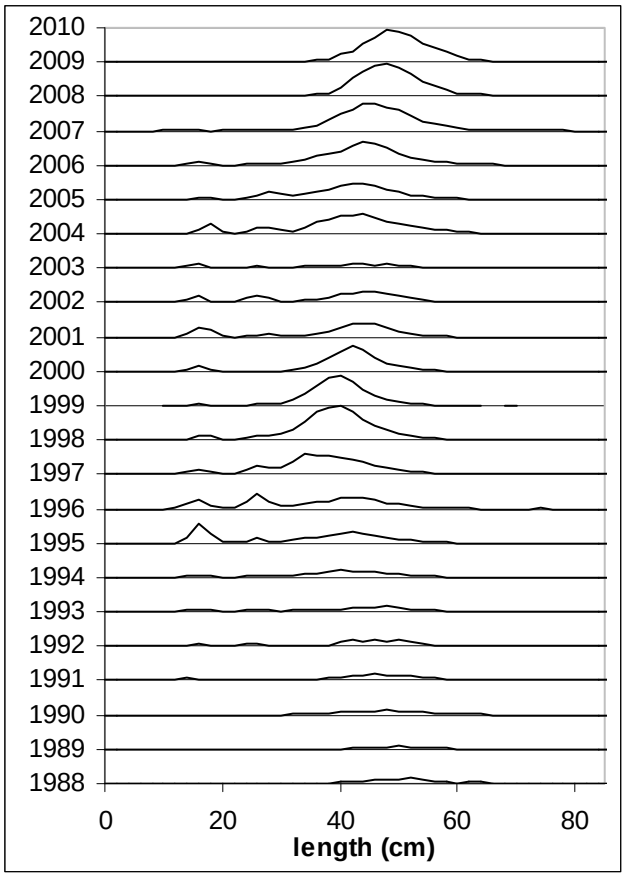

Figure 15 – Greenland halibut: length distribution along the survey series.

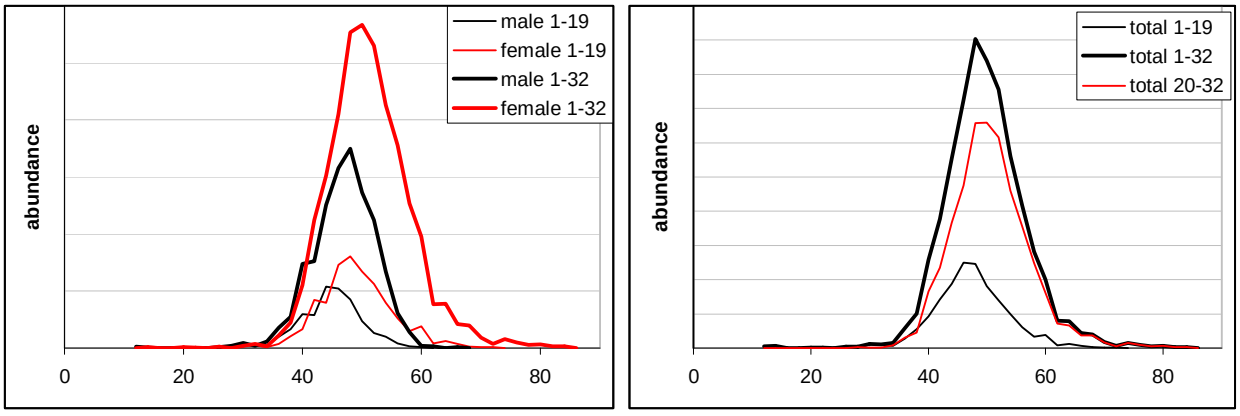

Figure 16 – Greenland halibut: length distribution of male and female (left) or both sexes combined (right) in the shallowest 19 strata or in the whole 32 strata.

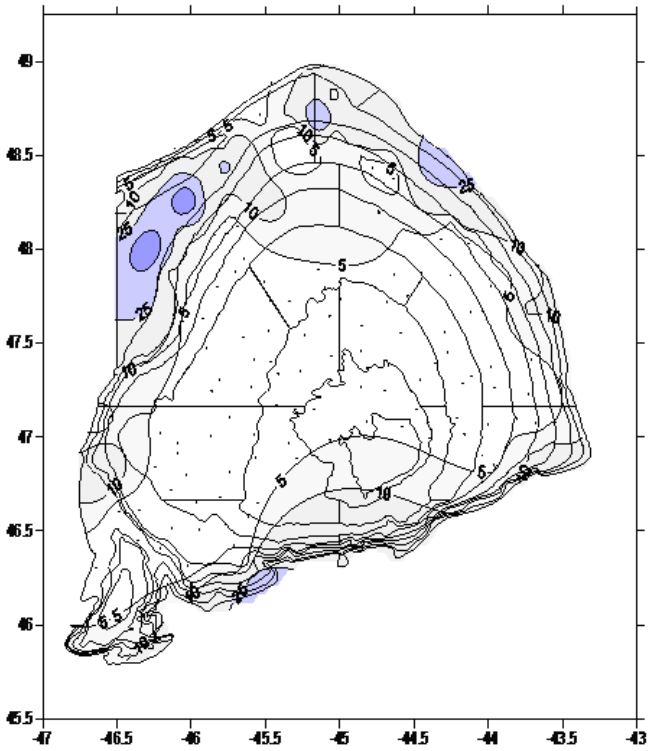

Figure 17 - Roughhead grenadier (*Macrourus berglax*) catch distribution in the 2009 survey in Kg.

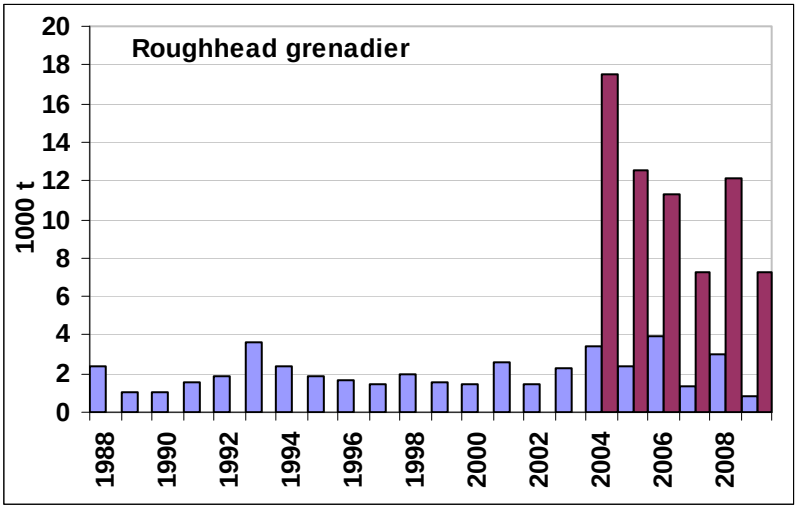

Figure 18 - Roughhead grenadier (*Macrourus berglax*) survey biomas up to 730 (blue) and 1460 m (red).

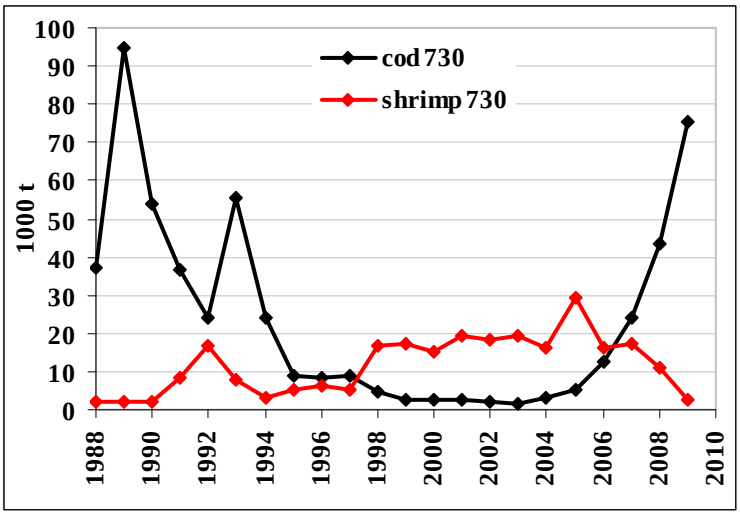

Figure 19 – Shrimp and cod joint evolution in depths less that 730 m