

Report of the *Fletán Ártico 2009* bottom trawl survey in *May* in the Slope of Svalbard

by

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1. Introduction

The "*Fletán Artico 2009*" survey is the continuation of the Spanish survey series that Azti-Tecnalia has started in 2008. The objective is to obtain biomass and abundance indices to determine the population structure of Greenland halibut (*Reinhardtius hippoglossoides*) in the protection area of the Svalbard Archipelago, ICES Division IIb.

The Arctic Fisheries Working Group (AFWG), group within ICES in charge of the advice for this stock, states, that the stock has been at a low level for several years. But there are indications of an increase in recent years. During this period, mean catches have been around 13.000 tonnes. Given the state of the stock and the current paucity of information, primarily because of the difficulties in the interpretation of the age from the otoliths, the fishery should not be increased further until there is better information and firm evidence of a larger stock size (ICES, 2009).

From 1992, the Greenland halibut fishery has been restricted to vessels smaller than 28 m using long-line and gillnet. Trawl catches are limited to by-catch only.

The main aim of the survey is to obtain indices of abundance by age and data of the spatial and bathymetric distribution of the Arctic Greenland halibut (*Reinhardtius hippoglossoides*) population.

In addition to the main objective, complementary information was collected, both of Greenland halibut as of the main accompanying species. Thus, the following objectives were also covered within the survey:

- To obtain length/weight relationships parameters by sex.
- To obtain information about Greenland halibut feeding behaviour.
- Likewise, information will be obtained on accompanying fish fauna.

2. Survey design and methods

2.1 Vessel specifications

B/C Nuevo Virgen de la Lodairo was the selected vessel to conduct *Fletan Ártico 2009* survey in May, being its main characteristics:

Nationality: Spanish

Registered port & number: 3^a VI-59973

Overall length: 56m.

Tonnage: 971 GT

Year: 1988

Engine: 2555CV

Equipment:

Echo sounder: *Simrad ES60*

Scanmar net sensors.



2.2 Gear specifications

Pedreira type bottom trawl gear was used. This gear is often used in the commercial Greenland halibut fishery.

In figure 3, included in annex II, a trawl gear plane is shown. This gear is mounted with a 37,5 meters headline and a 52 meters long rockhooper.

Gear main characteristics:

- Ground gear
 - o Central section (8,2 m), with 21” rubber discs separated by dividers.
 - o Lateral section (6,4m), with 18” rubber discs separated by dividers.

- Floats: 250mm diameter floats.

- Codend: (Polyethylene 28 mm), with 140mm mesh size + 40mm cover codend.

- Legs: 17 m.

- Doors: “Inyector doors”, Shark model 2800 Kg.

2.3 Survey planning

The Survey took place from 21st April to 8th May. 91 hauls were carried out. Table 1, included in the annex I, shows specific data by haul.

As previous years, the survey was developed in a depth range between 500 and 1500 meters on the west slope of the Svalbard archipelago, covering an area between 73° 30' N and 80° 00' N (Figure 1, annex II). For the sampling scheme, the stratification designed in 1994 was used. In the table below latitude and depth range limits for each stratum, as well as the surface area and the number of valid hauls made is shown.

Strata	Latitud	Depth (m)	Area (squared nautical miles)	n° hauls
1	76° 00' - 81° 00' N	500- 699	702	28
2	76° 00' - 81° 00' N	700- 999	1263	15
3	76° 00' - 81° 00' N	1000-1500	2693	2
4	73° 30' - 76° 00' N	500- 699	488	19
5	73° 30' - 76° 00' N	700- 999	761	24
6	73° 30' - 76° 00' N	1000-1500	1672	3

In order to study the feeding of the Greenland halibut, some extra hauls were made for intensive study of stomach contents.

The duration of each haul was 30 to 60 minutes, since the moment when the net was on the bottom until the haul back. The moment in which the gear was properly configured in the bottom was controlled thanks to Scanmar sensors, in addition to know the geometry of the net and the distance between doors.

Catches were sorted and weighted by species. Greenland halibut and principal accompanying species were also measured. Otoliths and stomach contents were collected for the Greenland halibut.

3. Results

3.1 Catches

Detailed data of each haul are shown in table 1 included in Annex I. Figure 2, in Annex II shows the map with the prospected area and the position of each haul performed.

As it is shown in the following figure, 91 % of the total catches correspond to Greenland halibut, while the rest of fishes and invertebrates suppose 8 % and 1 % respectively.

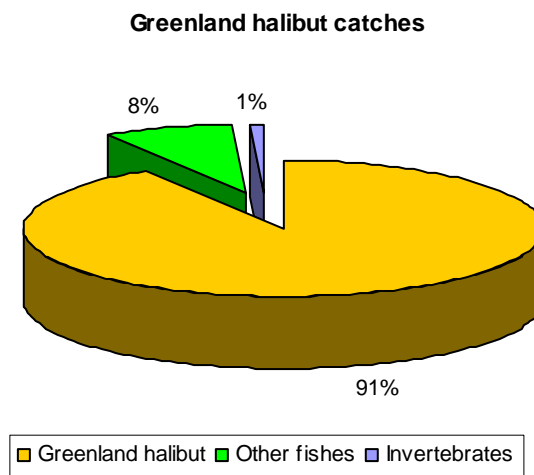


Figure 1. Greenland halibut percentage in the catches during *Fletán Ártico 2009* Survey

Table 2, included in Annex I, shows all species catches by haul. Greenland halibut was the principal species, with 200,299.17 kg captured. Cod (3,763. 94 kg), redfish (1,373. 23 kg), and wolffish (1,120. 62 kg) were the main accompanying species.

The main Greenland halibut catches were recorded in depths between 600 and 750 meters, reaching its maximum values between 600 and 700 meters depth (figure 2). Below the 1000 meters deep, catches of halibut were scarce, being under 200kg all of them.

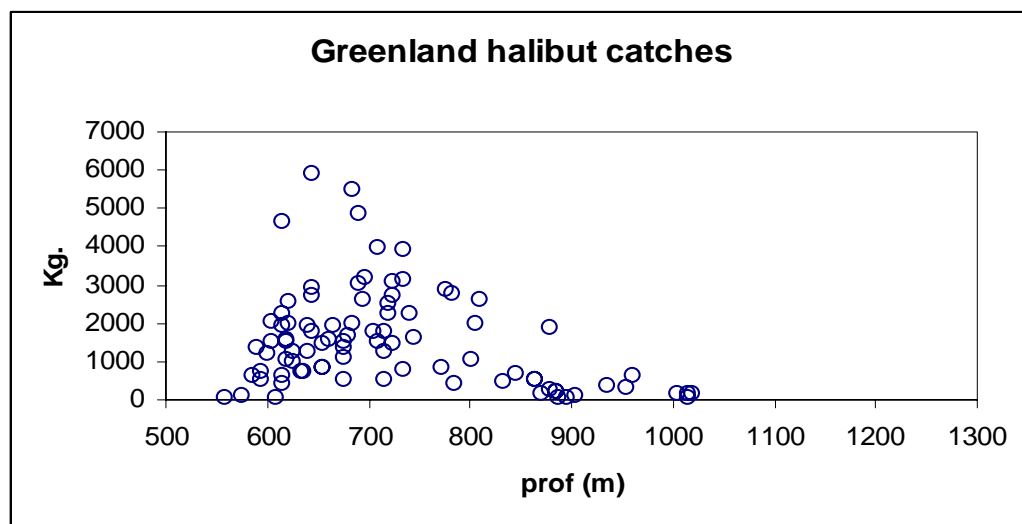


Figure 2. Greenland halibut catches in relation to depth, during *Campaña Fletán Ártico 2009 Survey*.

However, it seems that the depth is not the unique factor related with the abundance of Greenland halibut. Including the latitude in the analysis, we can see how hauls carried out further south, below the latitude 76°30'N, show greater abundance (figure 4, Annex II).

This means, that analyzing catches by stratum, as shown in figure 3, deeper strata, 3 and 6, would show lower concentration of Greenland halibut, while the shallower strata of the south, strata 4 and 5, show greatest concentrations. In these strata of greater concentration, the variability was also higher.

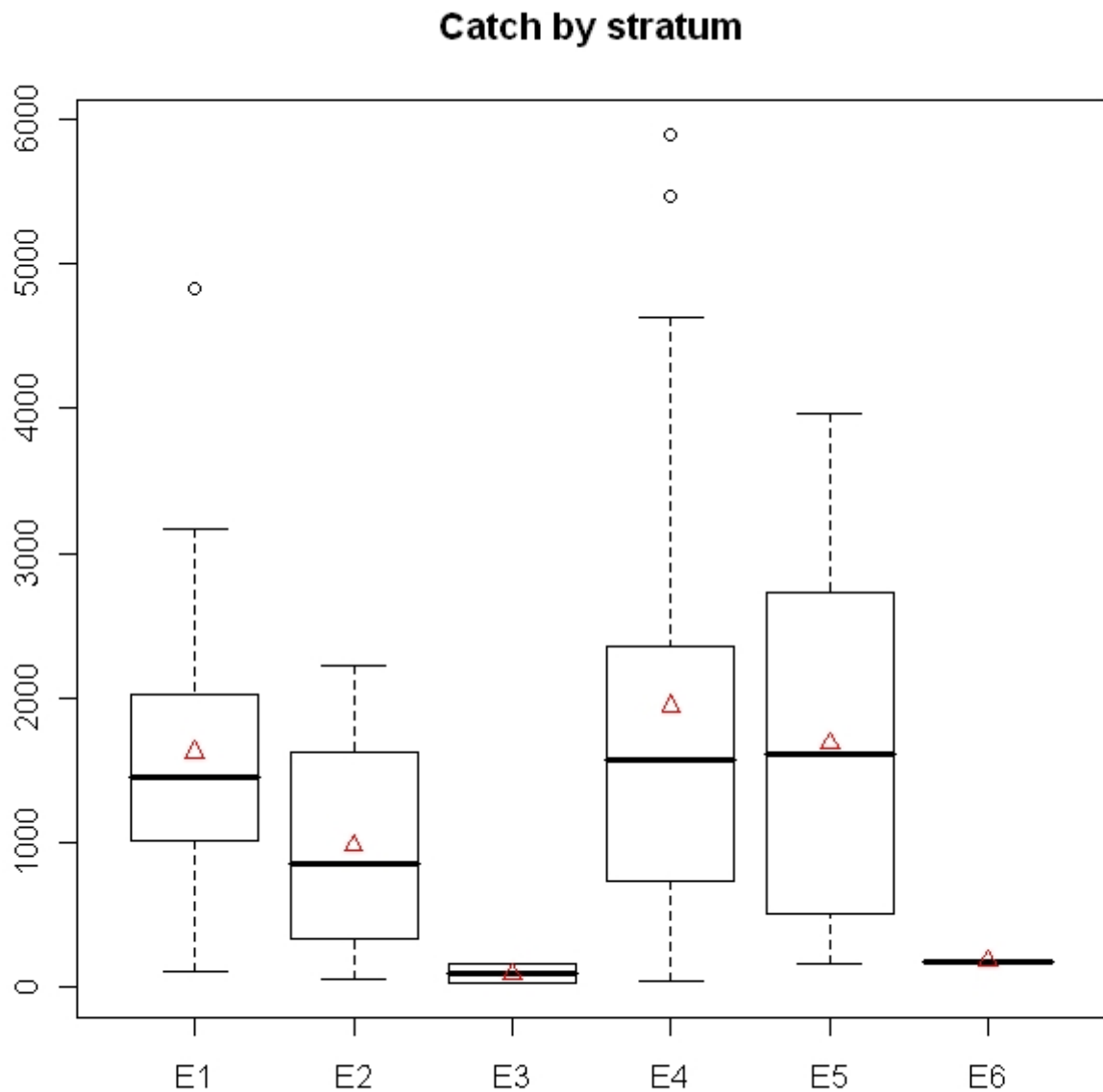


Figure 3.Greenland halibut catches (Kg) by stratum. (Mean (▲), median (—) and percentiles 25 & 75.

Figures 5, 6, 7, 8, 9, 10 and 11 of Annex II, show the maps of the catches by haul of the main accompanying species.

None of them presents a clear distribution pattern in relation to the latitude except from the haddock that appears mostly in the southern latitudes. Except from skates, other species are concentrated mostly in shallower depths, around 600-700 meters. In the case of the skates, it seems that the depth it is no so limiting factor in the distribution.

3.2 Greenland halibut biomass and abundance

The abundance and biomass was estimated with the Swept Area method, as in previous years.

The estimated Greenland halibut biomass in this survey was 58,273 tn and the abundance, 65,464 (x1000) individuals. This supposes an increase of 51% in biomass and 68 % in abundance, comparing with last years May survey.

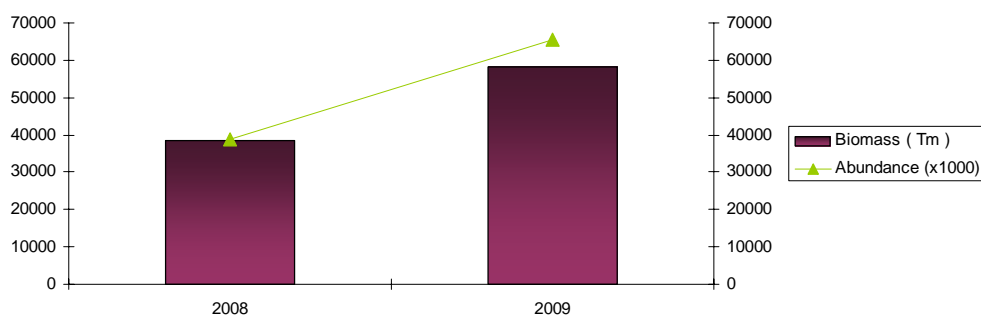


Figure4. Comparison between 2008 vs. 2009 May survey Greenland halibut biomass and abundance results.

Table 3 included in the Annex I, shows the biomass and abundance values by stratum.

3.3 Accompanying fauna biomass

Biomass valued estimated for the accompanying fauna were really low. These values indicate that, in the slope of Svalbard Archipelago, Greenland halibut constitutes the dominant species. Table 4 of Annex II, shows estimated biomass values for the main accompanying species.

3.4 Length distribution

The population's structure was similar to the described in previous surveys (Ruiz *et al.*, 2008). (Paz *et al.*, 2006). Length for both sexes ranged from 30 cm to 88 cm. As in previous cruises, the male proportion was higher, 62 % of males versus 38 % females.

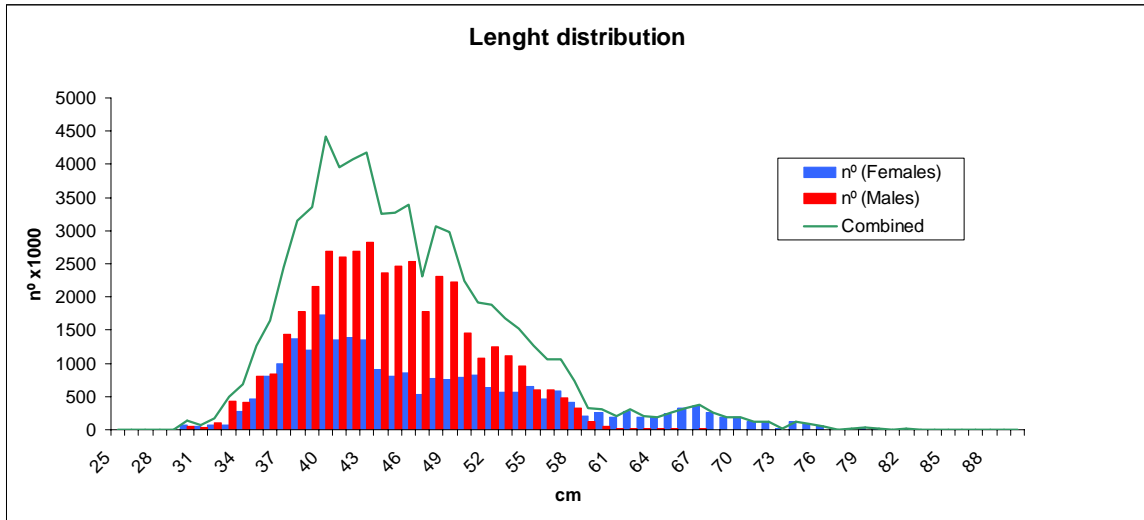


Figure 5. Greenland halibut length distribution in Svalbard.

3.5 Length – weight relationship

Figures 6, 7, and 8, show the Greenland halibut length – weight relationship, separated by sexes, and combined.

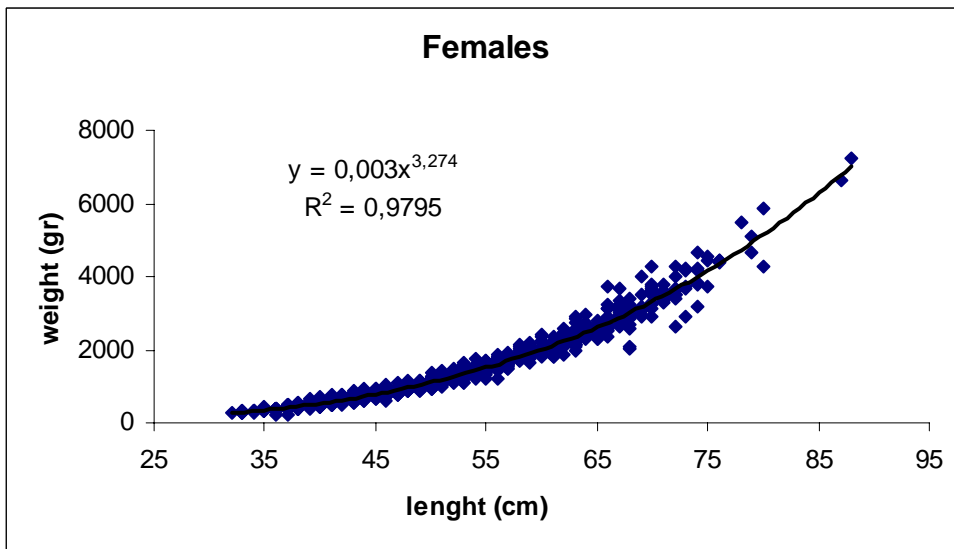


Figure 6. Length – weight relationship (females)

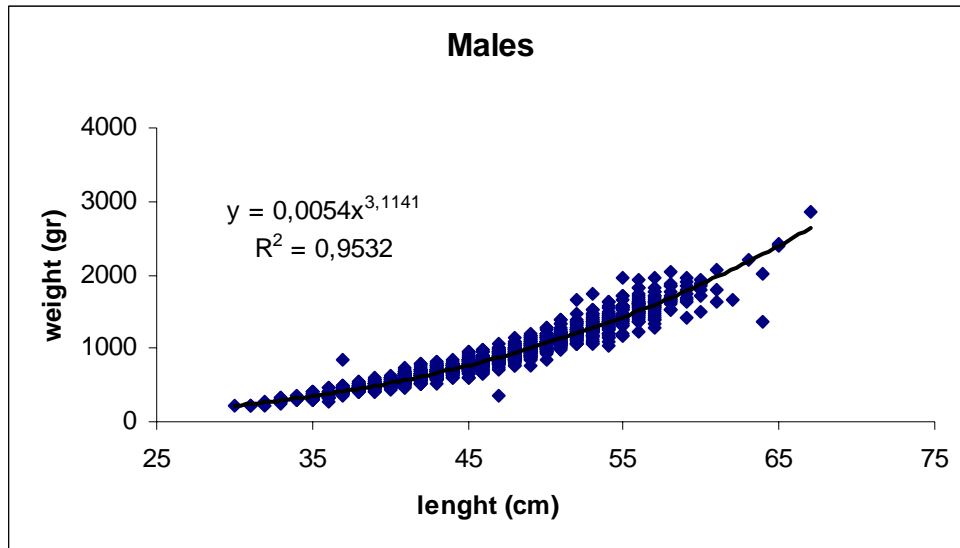


Figure 7. Length – weight relationship (Males)

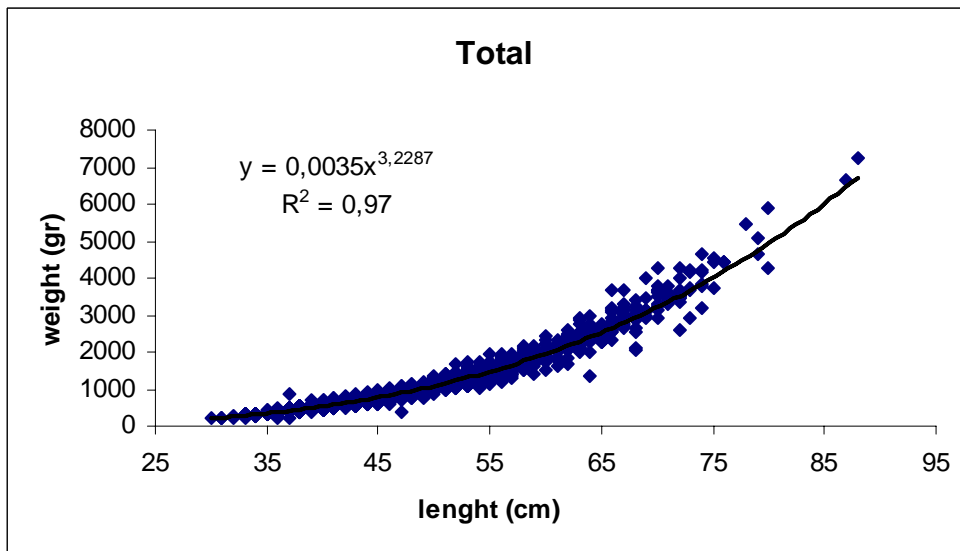


Figure 8. Length – weight relationship (total)

3.6. Feeding

The feeding intensity (FI), measured as the % of individuals with some contents in the stomach, of the Greenland halibut was low. Only 8, 75 % of the examined individuals had some stomach content. Analyzing the same parameter by size range, it appears that bigger individuals, above 70 cm, present higher feeding intensities (Figure 10).

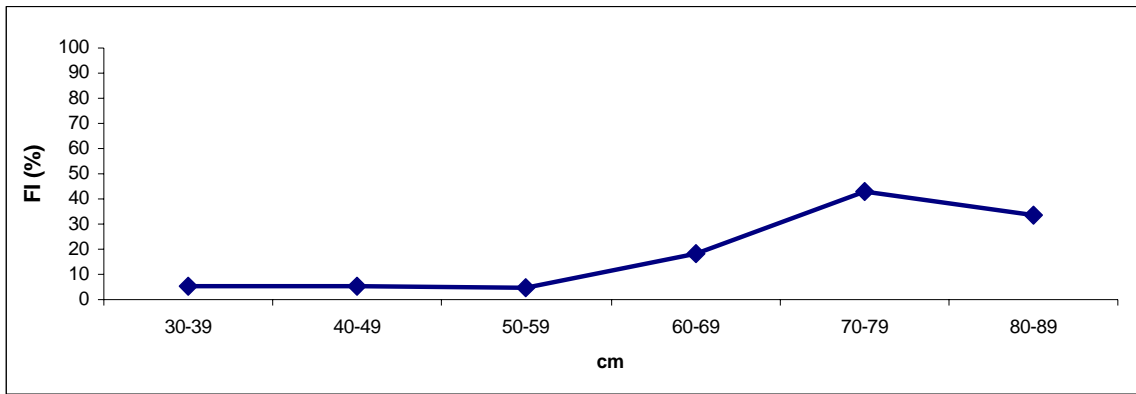


Figure 9. Feeding intensity by size range. Bigger individuals present higher FI values.

Different species compose Greenland halibut diet, been deep water prawn (*Pandalus borealis*) the most abundant species (32%), followed by Greenland halibut (29%) and cephalopods (18%) (Figure 10). It seems that the cannibalism plays an important role.

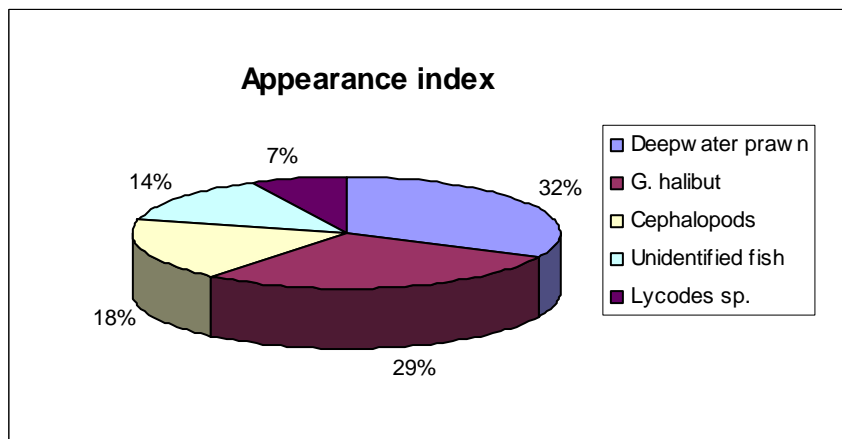


Figure10. Greenland halibut diet composition.

4 CONCLUSION

Main conclusions derived from the results obtained during the *Campaña Fletán Ártico 2009* Survey:

- Positive trend in the stock of Greenland halibut (*Reinhardtius hippoglossoides*) in the Archipelago of Svalbard continues, as the increase in the biomass and abundance shows. Nevertheless, absolute biomass and abundance values must be taken with care, principally due to the gear used in the survey, apparently less efficient catching benthonic species (Greenland halibut and skates) and more efficient catching species less associated to the sea bottom, as cod and redfish.
- Inter-annual stability situation continue. Both spatial and bathymetric distributions, as the structure of the population are similar to those describe in previous years and by other authors (Mugerza & Ruiz, 2008. Paz *et al*, 2006. Godo and Haug, 1989).
- The Greenland halibut is the dominant species on the slope of Svalbard Archipelago, and the only recourse open to commercial exploitation to depths greater than 500m. In that bathymetric range, the trawl fishery address, monospecifically, Greenland halibut.

5 BIBLIOGRAPHY

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Campaña Fletán Ártico 2009

ANNEX I: TABLES

Table1. Haul characteristics during *Campaña Fletán Ártico 2009 Survey*.

Haul	Strata	Valid	Depth Larg (m)	Depth Vir (m)	Latitud largada		Longitud largada		Latitud virada		Longitud virada		Speed (nudos)	Doors opening (m)
					Gr	Min	Gr	Min	Gr	Min	Gr	Min		
1	5	Yes	868	874	73	31	14	43	73	33	14	48	3,5	165
2	5	Yes	707	711	73	47	15	23	73	48	15	25	3,5	150
3	5	nulo	930	928	73	50	15	17	73	50	15	17	0	0
4	5	Yes	765	786	73	51	15	31	73	53	15	35	3,5	210
5	4	Yes	686	635	73	51	30	15	73	54	15	44	3,5	190
6	4	Yes	558	561	73	56	15	52	73	58	15	55	3,7	195
7	5	Yes	780	838	73	56	15	43	73	59	15	43	3,2	210
8	5	Yes	710	700	73	36	15	5	73	47	15	24	3,5	150
9	4	Yes	610	606	73	57	15	51	73	59	15	53	3,4	200
10	5	Yes	786	780	73	58	15	44	73	59	15	47	3,2	200
11	5	Yes	700	747	74	4	15	56	74	5	15	57	3,1	215
12	5	Yes	730	740	74	5	16	2	74	7	16	3	3,1	200
13	4	Yes	590	640	74	8	16	8	74	9	16	9	3,1	190
14	5	Yes	830	780	74	10	16	3	74	12	16	8	3,1	200
15	4	Yes	660	670	74	11	16	10	74	15	16	8	3,1	200
16	5	Yes	810	815	73	50	15	25	73	53	15	35	3,2	180
17	5	Yes	770	775	73	55	15	38	74	3	15	55	3,2	190
18	6	Yes	1005	1005	74	15	15	57	74	18	15	57	3,1	220
19	5	Yes	775	830	74	13	16	6	74	16	16	8	3,1	210
20	4	Yes	630	680	74	16	16	13	74	18	16	12	3,1	220
21	5	Yes	720	770	74	18	16	8	74	20	16	14	3,1	220
22	4	Yes	632	640	74	19	16	16	74	22	16	13	3,1	210
23	4	Yes	610	620	74	31	16	9	74	35	16	4	3,1	210
24	5	Yes	750	735	74	12	16	7	74	5	16	0	3,2	200
25	5	Yes	735	720	74	2	15	54	74	7	16	3	3,2	200
26	6	nulo	1010	1010	74	32	15	46	74	34	15	44	0	0
27	4	Yes	680	690	74	34	16	0	74	38	15	53	3,2	220
28	5	Yes	880	890	74	36	15	44	74	41	15	35	3,1	220
29	4	Yes	640	650	74	40	15	49	74	44	15	39	3,4	220
30	5	Yes	940	930	74	54	15	18	74	59	15	17	3,4	220
31	5	Yes	740	700	74	58	15	30	74	54	15	30	3,3	230
32	4	Yes	650	640	75	0	15	33	75	2	15	30	3,6	230
33	5	Yes	730	740	74	34	15	54	74	43	15	39	3,2	220
34	5	Yes	730	740	74	44	15	38	74	35	15	54	3,4	220
35	5	Yes	717	730	75	8	15	8	75	10	14	56	3,6	220
36	5	Yes	842	825	75	8	14	53	75	10	14	41	3,5	225
37	5	Yes	865	827	75	11	14	36	75	14	14	27	3,5	220
38	5	Yes	960	950	75	16	14	10	75	19	14	6	3,6	230
39	4	Yes	700	680	75	21	14	18	75	24	14	13	3,6	230
40	4	Yes	620	610	75	22	14	20	75	27	14	13	3,7	230
41	5	Yes	730	740	75	24	14	11	75	28	14	4	3,7	230
42	5	Yes	880	890	75	30	13	52	75	35	13	48	3,6	230
43	4	Yes	650	630	75	35	14	2	75	38	14	2	3,5	220
44	4	Yes	635	610	75	32	14	6	75	38	14	3	3,7	235
45	5	Yes	730	740	75	43	13	54	75	48	13	55	3,6	230
46	6	Yes	1020	1020	75	51	13	36	75	55	13	39	3,6	230
47	5	Yes	740	740	75	54	13	54	75	58	13	58	3,4	290
48	5	Yes	860	870	76	0	13	52	75	57	13	48	3,4	285
49	4	Yes	670	690	75	56	14	2	75	53	14	1	3,4	280
50	4	Yes	630	640	75	57	14	3	76	0	14	6	3,4	280
51	4	Yes	630	640	75	35	14	2	75	27	14	13	3,6	220
52	4	Yes	620	630	75	23	14	18	75	33	14	6	3,6	220
53	5	Yes	960	950	75	56	13	41	76	2	13	47	3,7	290
54	4	Yes	670	680	75	59	14	4	75	55	14	0	3,3	240
55	4	Yes	610	590	75	59	14	7	76	4	14	12	3,6	240
56	2	Yes	710	710	76	4	14	3	76	0	14	1	3,3	235
57	1	Yes	630	650	76	2	14	8	76	6	14	8	3,7	240
58	1	Yes	680	670	76	9	14	14	76	15	14	20	3,7	240
59	2	Yes	780	790	76	16	14	12	76	13	14	8	3,7	240
60	4	Yes	740	750	75	2	14	2	75	58	13	57	3,3	290
61	2	Yes	880	880	76	20	14	10	76	17	14	5	3	230
62	1	Yes	680	670	76	17	14	21	76	20	14	30	3,6	240
63	1	Yes	650	660	76	22	14	31	76	26	14	34	3,3	240
64	3	Yes	1010	1020	76	36	13	21	76	38	13	11	3	225
65	1	Yes	690	700	76	36	13	34	76	40	13	17	4,3	240
66	1	Yes	680	690	76	40	13	18	76	44	13	8	4,1	245
67	1	Yes	690	700	76	12	14	13	76	30	14	2	3,5	235
68	2	Yes	870	860	76	55	12	21	76	52	12	32	3	225
69	2	Yes	710	700	76	59	12	7	77	2	11	54	4,1	240
70	1	Yes	620	625	77	4	11	47	77	7	11	38	3,6	240
71	1	Yes	620	630	77	6	11	37	77	12	11	24	3,6	240
72	2	Yes	710	720	77	16	11	15	77	19	11	13	3,3	240
73	2	Yes	720	730	77	21	11	11	77	25	11	10	3,2	240
74	1	Yes	650	660	76	43	12	11	76	51	12	45	4,1	240
75	1	Yes	660	650	76	51	12	46	76	59	12	12	4	225
76	1	Yes	620	620	77	22	11	14	77	26	11	9	3,2	235
77	1	Yes	610	620	77	27	11	8	77	31	11	2	3,5	240
78	2	Yes	900	910	77	29	10	41	77	34	10	41	3,4	245

Table1(cont). Haul characteristics during *Campaña Fletán Ártico 2009 Survey*

Haul	Strata	Valid	Depth Larg (m)	Depth Vir (m)	Latitud largada		Longitud largada		Latitud virada		Longitud virada		Speed (nudea)	Doors opening
					Gr	Min	Gr	Min	Gr	Min	Gr	Min		
79	1	Yes	590	600	77	33	10	55	77	37	10	44	3,6	240
80	1	Yes	670	680	77	36	10	45	77	39	10	31	3,6	240
81	1	Yes	580	590	77	39	10	34	77	42	10	23	3,6	240
82	2	Yes	720	720	77	43	10	17	77	46	10	0	3,6	240
83	1	Yes	630	630	77	26	11	10	76	10	11	30	3,3	245
84	1	Yes	630	610	77	44	10	11	77	48	10	10	3,5	235
85	1	Yes	600	580	77	45	10	6	77	50	9	52	3,6	240
86	1	Yes	600	610	77	47	9	59	77	52	9	42	3,6	240
87	1	Yes	595	645	77	48	9	57	77	53	9	37	3,6	235
88	2	Yes	910	880	77	51	9	31	77	55	9	22	3,1	250
89	1	Yes	600	610	77	56	9	30	78	0	9	24	3,5	240
90	1	Yes	690	705	77	56	9	27	78	0	9	20	3,6	240
91	2	Yes	720	715	77	44	10	3	77	51	11	42	3,5	235
92	2	Yes	720	715	77	50	9	44	77	44	10	9	3,3	245
93	1	Yes	625	625	77	59	9	25	78	3	9	21	3,5	235
94	1	Yes	650	660	78	4	9	19	78	8	9	16	3,6	240
95	1	Yes	680	700	78	11	9	15	78	16	9	19	3,5	240
96	2	Yes	910	850	78	16	9	9	78	21	9	16	3,3	245
97	1	Yes	600	630	78	22	9	28	78	27	9	18	3,4	220
98	1	Yes	640	650	78	31	9	9	78	34	8	59	3,4	240
99	1	Yes	715	720	77	57	9	26	78	9	9	14	3,5	235
100	2	Yes	770	775	78	43	8	27	78	47	8	20	3,2	230
101	1	nulo	0	0	78	44	8	41	78	45	8	36	0	0
102	1	Yes	600	550	78	55	8	27	78	58	8	27	3,6	230
103	2	Yes	710	720	78	59	8	22	79	2	8	22	3,6	240
104	1	Yes	640	650	79	9	8	15	79	12	8	8	3,3	240
105	1	Yes	608	580	79	17	8	1	79	20	7	56	3,4	240
106	3	Yes	1015	1015	79	19	7	30	79	23	7	25	3,6	235
107	1	Yes	690	700	78	33	8	59	78	49	8	25	3,2	225
108	2	Yes	888	885	79	26	7	30	79	28	7	29	3,2	240
109	2	Yes	713	717	79	42	7	53	79	45	7	49	3,5	240
110	1	Yes	660	670	79	9	8	14	79	5	8	27	3,3	240
111	1	Yes	690	700	78	11	9	14	78	21	9	21	3,3	240

Table2. Catch by haul during *Campaña Fletán Ártico 2009 Survey*.

Lance	Greenland halibut (<i>Reinhardtius hippoglossoides</i>)	Blue whiting (<i>Micromesistius poutassou</i>)	Cod (<i>Gadus morhua</i>)	Redfish (<i>Sebastes mentella</i>)	Wolf-fish (<i>Anarhichas lupus</i>)	Artic skate (<i>Amblyraja hyperborea</i>)	Rough head grenadier (<i>Macrourus berglax</i>)	Long rough dab (<i>Hippoglossoides platessoides</i>)	Thorny skate (<i>Amblyraja radiata</i>)	Spine tail ray (<i>Bathyraja spinicauda</i>)	Feipour (<i>Lycodes esmarkii</i>)	Polar sculpin (<i>Cottunculus microps</i>)	Invertebrates	Spotted wolffish (<i>Anarhichas minor</i>)	Blue sea cat (<i>Anarhichas denticulatus</i>)	Lumpfish (<i>Cyclopterus lumpus</i>)	Silver rockling (<i>Orogadus argenteus</i>)	Careproctus reinhardtii	Torsk (<i>Brosme brosme</i>)	Haddock (<i>Melanogrammus aeglefinus</i>)	Atlantic argentine (<i>Argentina silus</i>)	Blue ling (<i>Molva dypterygia</i>)	Saithe (<i>Pollachius virens</i>)
1	81	0,28		0,65		1,15			10,11		0,90		0,93				0,16			0,20			
2	1980	0,25	178,94	115,81			35,33			6,66	10,27	0,34								57,83			
3	0																						
4	1440		44,57	15,83		0,98	16,95		23,79		1,86		0,25							13,83			
5	783		176,47	22,31	21,55	24,00	9,49		42,04											87,43			2,19
6	20		429,84	36,61	68,38	11,53	1,39		9,50											198,08			
7	1296		2,06	9,38		0,98	5,87	0,72	11,85		0,22	0,34	0,23							14,02			
8	4428																						
9	27		482,79		35,38	5,80			5,57	8,51													
10	1377			2,67	24,12	2,02	6,84	0,27	7,23	2,98	2,20	0,18								2,76			
11	1350			2,95		3,35	9,38		10,27		0,36				3,10								
12	1971	30,32	4,83	53,09		10,21	81,79		55,78	0,58	8,02									5,86			
13	216	0,40	88,65	91,80	53,34	9,05	14,45	0,60	19,95	8,15	2,81									57,23	0,49	2,85	
14	990	0,32		7,42		0,40	9,90	0,17	13,06		9,75		0,07										
15	1908	1,17	69,32	86,23	21,80	3,23	33,21	0,22	54,51		8,78			41,13	7,87				0,93	7,40			
16	1161																						
17	9603																						
18	180			2,67			3,94		54,53		0,08		0,62										
19	945			2,32		2,68	71,76		55,06	1,52	11,28	0,14	0,26							1,75	6,60		
20	819	2,37	29,66	20,40	42,29	4,31	49,10		13,15		4,96												
21	1449	0,37		4,05			85,11		63,12		7,22												
22	756	1,08	68,89	10,86	47,52	4,67	44,32		3,00		6,82								1,86	32,46			
23	648	37,63	72,88	179,46		2,10	18,89	2,75		3,43	7,30									122,20	2,30		3,24
24	3870																						
25	1215																						
26	0																						
27	4923	16,26		78,06		4,94	9,32		17,08		19,04	66,00	8,50				0,26			5,70			
28	224			1,11					21,70		2,67		0,75										
29	5896	3,50		10,35		1,10			3,75		19,15												
30	351			3,19			1,64		22,50		5,78		1,13							0,72			
31	2520		95,20	3,50		0,50	0,80		0,50		0,50		0,25							1,20			
32	1350		56,77	2,75	25,00		10,65				4,32				9,10					1,75			
33	3735																						
34	6066																						
35	1539	2,84	12,31	4,74	7,77	1,49	7,26	0,32	3,00		1,33	0,47	0,66										
36	234		3,50			0,50					1,10		2,50										
37	342										2,20		3,13							0,58			
38	648								6,65		2,00	0,25	3,00				0,45						
39	3015	1,20	11,10	10,18		2,76			6,72		6,66		1,60										
40	4626	13,08	75,64	35,04		1,12	10,52				5,80	0,88											
41	3124	1,60		8,55			9,50		0,25		4,20	0,40	4,00										
42	215								6,87		3,93		0,50										
43	1917		34,53	17,70		1,02	1,35		4,50		14,82	0,90	1,77			4,53							
44	2007	35,82	44,26	24,49		1,66	5,70	0,65			20,06	0,47	3,00							6,27	0,39		
45	768	0,79				1,03	0,36		4,97		10,53	0,67	3,81							0,76			
46	177								9,63		2,14		0,50										
47	2227			1,30					0,04		1,60		5,00										
48	545	0,14							14,10		3,04		2,03				1,80						
49	1656		8,30	3,12		0,30			4,83		6,18	0,20	3,20							1,11			
50	720																			1,34			
51	6093																						
52	3123																						
53	324		0,90						5,96		3,15		2,50										
54	1530	0,20	4,73			1,61					8,26	0,25	2,46										
55	1188	2,90		38,51	7,57	3,37	1,58		6,55		6,55		0,84		14,75								
56	1503	0,17		172,00		5,29	0,21		9,11		4,85	0,39	2,47							0,32			
57	1278	19,28	18,20	20,60		1,02	0,15		14,03		15,50		1,37										
58	1071	11,87	18,71	15,49		4,30	0,41	1,30			1,40												
59	432	0,28		4,49			0,30		16,89		6,75	0,99	1,30										
60	947																						
61	243			1,22	0,10		2,59	0,20	7,50		9,85		12,00										
62	522	0,70	16,30	1,67		0,32	1,64	0,65			13,36	0,30	3,67										
63	828	1,15	11,82	4,00	18,50	7,68	15,50	0,27	2,28		11,93		1,60		9,07		0,30						
64	153						2,21		5,64		2,60		4,50				0,57						
65	2619	3,36	106,11	0,91		23,34	10,15	0,40	8,02				3,07										
66	1998	0,88	55,60			28,20	9,14	0,58	14,56	1,30	12,14		2,40		5,08								
67	3969																						
68	531																						
69	1755																						
70	2583	2,10	234,51	4,84		10,69	5,83		24,54	10,62	1,95			7,38	25,75						0,30		

Table2 (cont). Catch by haul during *Campaña Fletán Ártico 2009 Survey*

Lance	Greenland halibut (<i>Reinhardtius hippoglossoides</i>)	Blue whiting (<i>Micromesistius poutassou</i>)	Cod (<i>Gadus morhua</i>)	Redfish (<i>Sebastes mentella</i>)	Wolf-fish (<i>Anarhichas lupus</i>)	Artic skate (<i>Amblyraja hyperborea</i>)	Rough head grenadier (<i>Macrourus berglax</i>)	Long rough dab (<i>Hippoglossoides pleurostotes</i>)	Thorny skate (<i>Amblyraja radiata</i>)	Spine tail ray (<i>Bathyraja spinicauda</i>)	Eslopout (<i>Lycodes esmarkii</i>)	Polar sculpin (<i>Cottunculus microps</i>)	Invertebrates	Spotted wolffish (<i>Anarhichas minor</i>)	Blue sea cat (<i>Anarhichas denticulatus</i>)	Lumpfish (<i>Cyclopterus lumpus</i>)	Silver rockling (<i>Ongodius argenteus</i>)	Careproctus reinhardtii	Torsk (<i>Brosme brosme</i>)	Haddock (<i>Melanogrammus aeglefinus</i>)	Atlantic argentine (<i>Argentina silus</i>)	Blue ling (<i>Melva dyprengii</i>)	Saithe (<i>Pollachius virens</i>)	
71	1467	10,14	100,74	8,74	19,20	5,08	7,24	1,77	25,65		5,10				8,96									
72	1800	0,42	7,18	1,48		1,78	0,54	0,20	7,26		2,72	1,74	3,66											
73	1350																							
74	3339																							
75	6300																							
76	1053	5,00	71,75	8,16	17,03		1,06	8,44			5,75													
77	1917	18,02	50,96		42,64		0,76	1,46	14,92		2,84		4,02		4,34									
78	81	0,42					0,14		0,04		0,01	0,07	5,25											
79	729	28,37	110,12	16,26	45,88	5,20		1,00	9,00		5,00	0,70	68,00		22,56							0,93		
80	1341	4,88	5,64	5,27	5,77	1,22	8,77	1,06	4,00		2,58	0,41	8,24	8,16								0,30		
81	612	9,89	82,89	13,53	93,36	1,43	1,93	3,44		1,41	4,02	0,04	6,50	4,65	7,35							0,16		
82	2223	4,62	19,66	5,00			19,10	1,36			5,16	0,64	100,00											
83	3789																							
84	1512	0,66	5,04			16,24	2,41	0,10	4,05		5,37	0,52	102,28											
85	1341	48,46	133,50	12,00	79,15	7,17	12,92	2,3		3,07	12,30	0,08	10,00		8,38							0,27		
86	2052	17,93	55,82	14,10	47,22	6,71	25,20	3,71	3,03		10,46		3,50	4,55										
87	1575	32,19	61,93	14,10	100,28	14,68	28,61	2,75	2,71		12,94	0,04	3,29	5,27										
88	72					0,23	0,18		2,50		0,70	0,24												
89	1530	1,96	38,00	2,96	185,30	0,54	12,96				2,30		8,00	22,76										
90	2907					0,84	4,47	0,18			0,72		35,34											
91	3195																							
92	2484																							
93	1251	2,91	117,85	27,75	59,00	12,31	7,37	2,98			6,30		5,00	8,47										
94	1449	5,60	103,76	10,47	15,00	4,50	7,73	0,80			4,07	0,88	3,10											
95	4833	2,16		3,96		9,72	10,72				5,24	2,40	168,20											
96	1899					1,41			16,26		1,41		500,00									0,66		
97	2241	1,26		2,90			23,58		10,64		2,58	0,06	8,65									0,44		
98	1773	0,92		3,18			35,28				0,26	0,32	43,12											
99	5229																							
100	846	0,23	1,38	0,58			6,00		11,45		1,88	0,40	30,00								1,29			
101	0																					0,72		0,32
102	108	87,05	156,26	49,99	20,17	1,07	1,15	0,40	1,50		3,15	0,01	0,05	2,77	6,92									
103	1269	7,08	30,11	17,22			16,38		4,50		2,08	0,25	1,30											
104	2673	0,66	25,17	3,21	10,80		3,60				2,67	1,35	1,05	9,33										
105	531	3,77	127,51	20,05	6,50	1,40	8,90	0,36			4,15	1,20	13,00	1,30										
106	27										0,16													
107	5823																							
108	27		0,26				0,08		15,77		0,35	0,09	1,00									0,22	0,14	
109	270		1,02			1,08					5,30	0,23	39,89											0,04
110	1458																							
111	5895																							
Total	200299,17	486,91	3763,94	1373,23	1120,62	281,31	851,61	39,11	827,47	48,23	435,74	84,84	1245,31	127,47	134,53	4,53	11,36	0,18	4,54	612,35	3,75	3,17	5,43	

Table3. Greenland halibut biomass (Tn) and abundance (x1000) by stratum.

Strata	Total Area	Nº Hauls	Swept area	Catch (Kg)	Biomass (t)	Catch (nº)	Abundance (nº x 1000)
1	702	28	2,60	43.794	11.841	53.398	14.438
2	1263	15	1,25	14.301	14.483	17.758	17.984
3	2693	2	0,17	180	2.860	259	4.111
4	488	19	1,36	34.005	12.168	33.571	12.013
5	761	24	1,48	25.940	13.376	26.017	13.415
6	1672	3	0,17	357	3.543	352	3.503
Total	7579	91	7,02	118.577	58.273	131.355	65.464

Table4 . Accompanying fauna biomass (Tn) by strata in the Svalbard Archipelago.

Cod

Strata	Totoal Area	Nº Hauls	Swept area	Catch (Kg)	Biomass (t)
1	702	28	2,60	1.708	462
2	1263	15	1,25	60	60
3	2693	2	0,17	0	0
4	488	19	1,36	1.654	592
5	761	24	1,48	342	177
6	1672	3	0,17	0	0
Total	7579	91	7,02	3.764	1.291

Redfish

Strata	Totoal Area	Nº Hauls	Swept area	Catch (Kg)	Biomass (t)
1	702	28	2,60	264	71
2	1263	15	1,25	202	205
3	2693	2	0,17	0	0
4	488	19	1,36	668	239
5	761	24	1,48	237	122
6	1672	3	0,17	3	27
Total	7579	91	7,02	1.373	663

Wolffish

Strata	Totoal Area	Nº Hauls	Swept area	Catch (Kg)	Biomass (t)
1	702	28	2,60	766	207
2	1263	15	1,25	0	0
3	2693	2	0,17	0	0
4	488	19	1,36	323	116
5	761	24	1,48	32	16
6	1672	3	0,17	0	0
Total	7579	91	7,02	1.121	339

Artic skate

Strata	Totoal Area	Nº Hauls	Swept area	Catch (Kg)	Biomass (t)
1	702	28	2,60	164	44
2	1263	15	1,25	10	10
3	2693	2	0,17	0	0
4	488	19	1,36	83	30
5	761	24	1,48	25	13
6	1672	3	0,17	0	0
Total	7579	91	7,02	281	97

Table4 (cont). Accompanying fauna biomass (Tn) by strata in the Svalbard Archipelago.

Rough head grenadier

Strata	Totoal Area	Nº Hauls	Swept area	Catch (Kg)	Biomass (t)
1	702	28	2,60	247	67
2	1263	15	1,25	46	46
3	2693	2	0,17	2	35
4	488	19	1,36	210	75
5	761	24	1,48	342	177
6	1672	3	0,17	4	39
Total	7579	91	7,02	852	919

Blue whiting

Strata	Totoal Area	Nº Hauls	Swept area	Catch (Kg)	Biomass (t)
1	702	28	2,60	321	87
2	1263	15	1,25	13	13
3	2693	2	0,17	0	0
4	488	19	1,36	116	41
5	761	24	1,48	37	19
6	1672	3	0,17	0	0
Total	7579	91	7,02	487	526

Thorny skate

Strata	Totoal Area	Nº Hauls	Swept area	Catch (Kg)	Biomass (t)
1	702	28	2,60	139	38
2	1263	15	1,25	91	92
3	2693	2	0,17	6	90
4	488	19	1,36	191	68
5	761	24	1,48	336	173
6	1672	3	0,17	64	638
Total	7579	91	7,02	827	893

Campaña Fletán Ártico 2009

ANNEX II: FIGURES

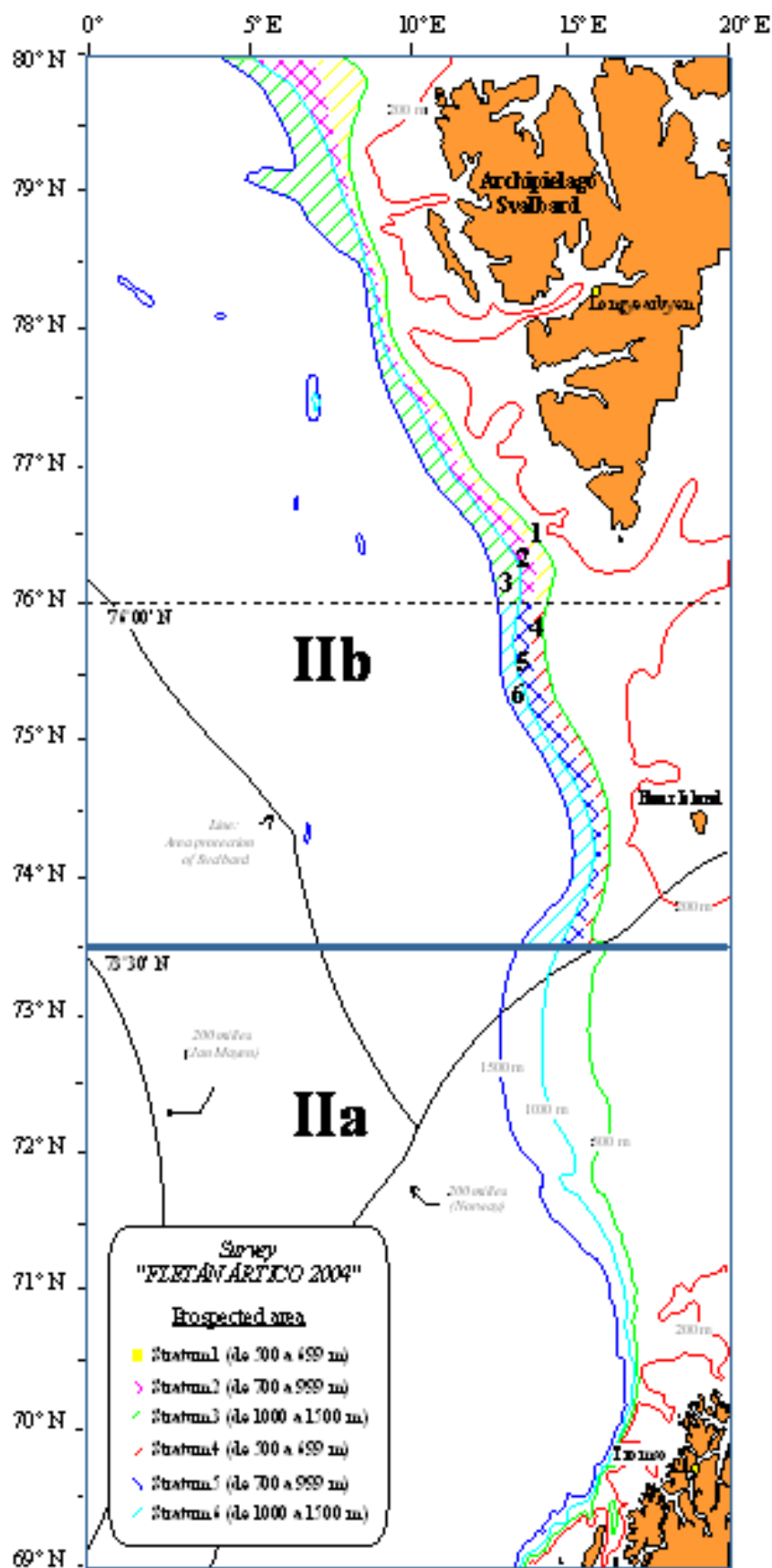


Figure 1. Map of the area showing the six considered strata and its ranges of depth.

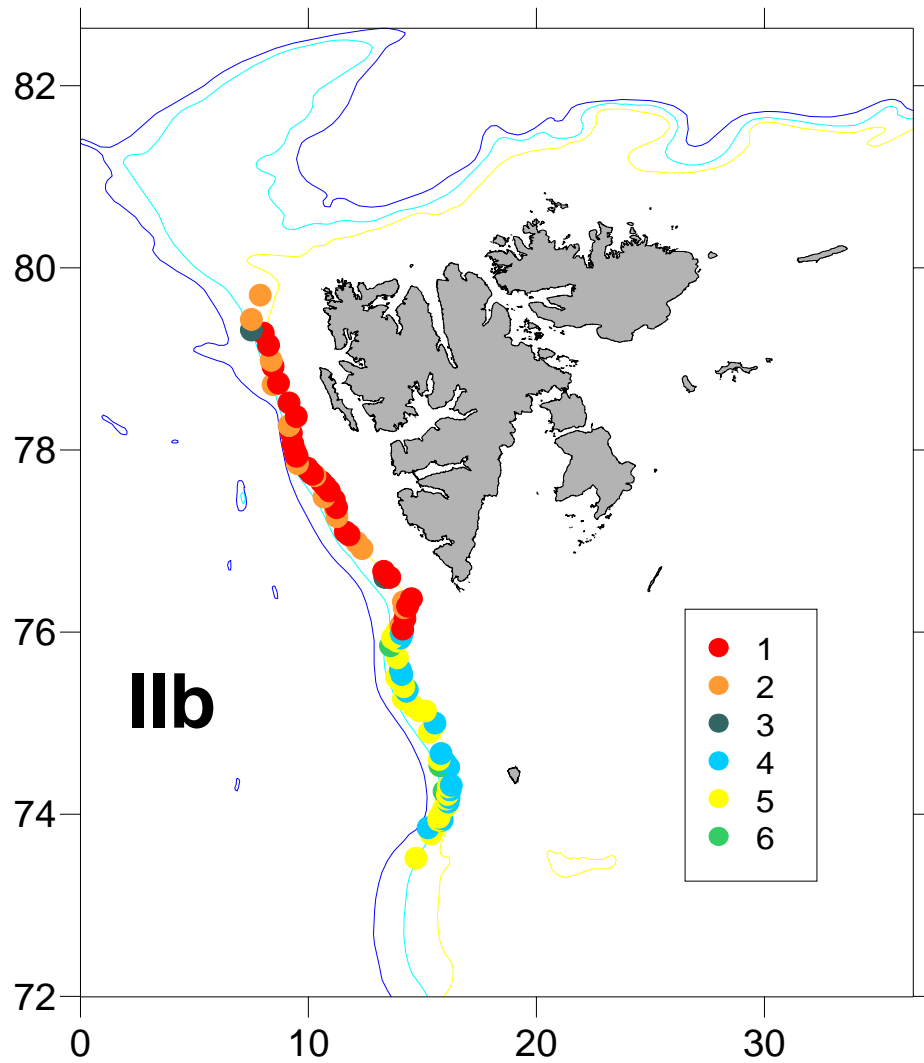


Figure2. Map showing the positions of the hauls made during the *Campaña Fletán* *Ártico 2009* Survey in May.

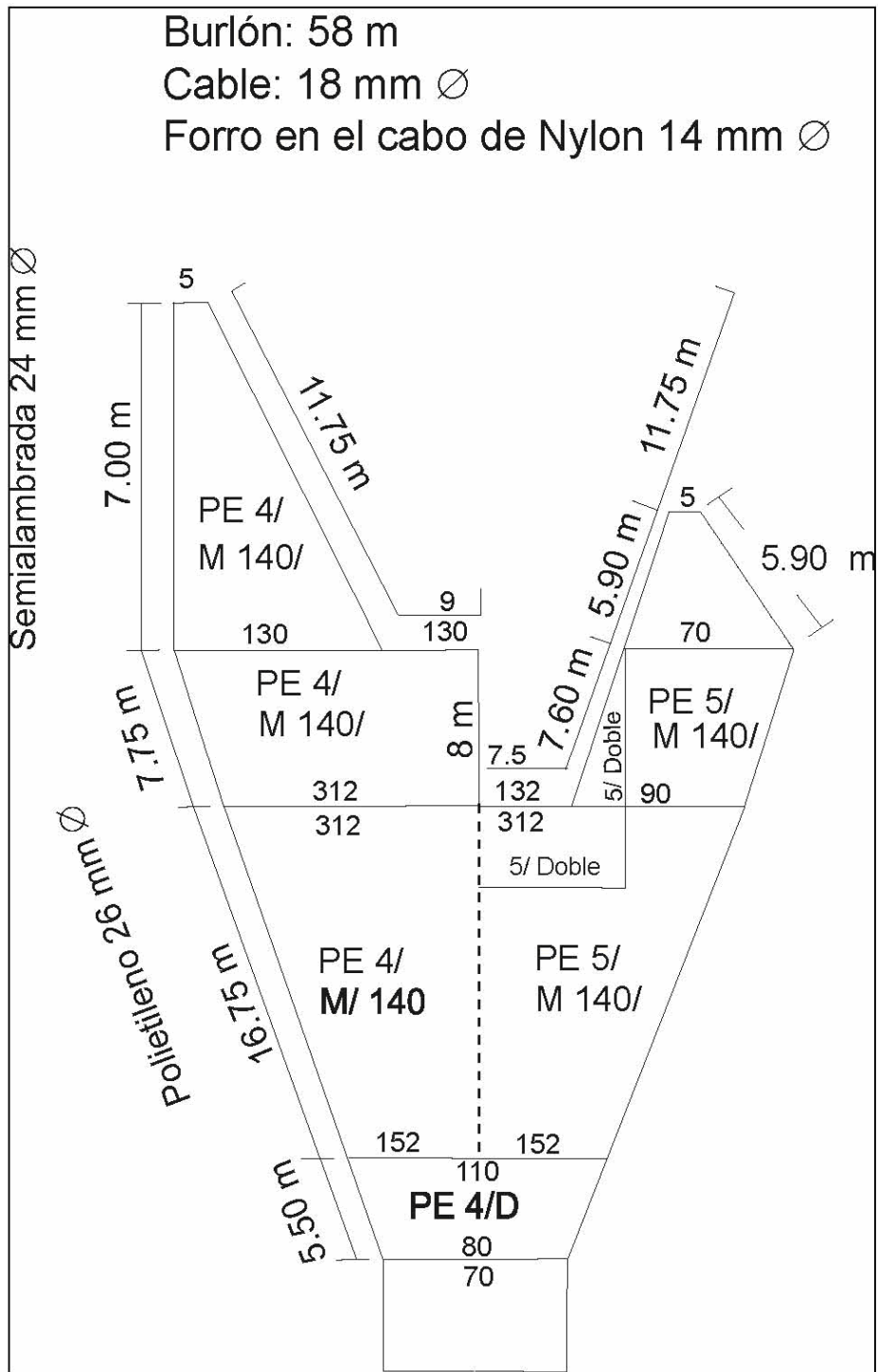


Figure 3. Schematic of the net plan of the Spanish “Pedreira” survey trawl

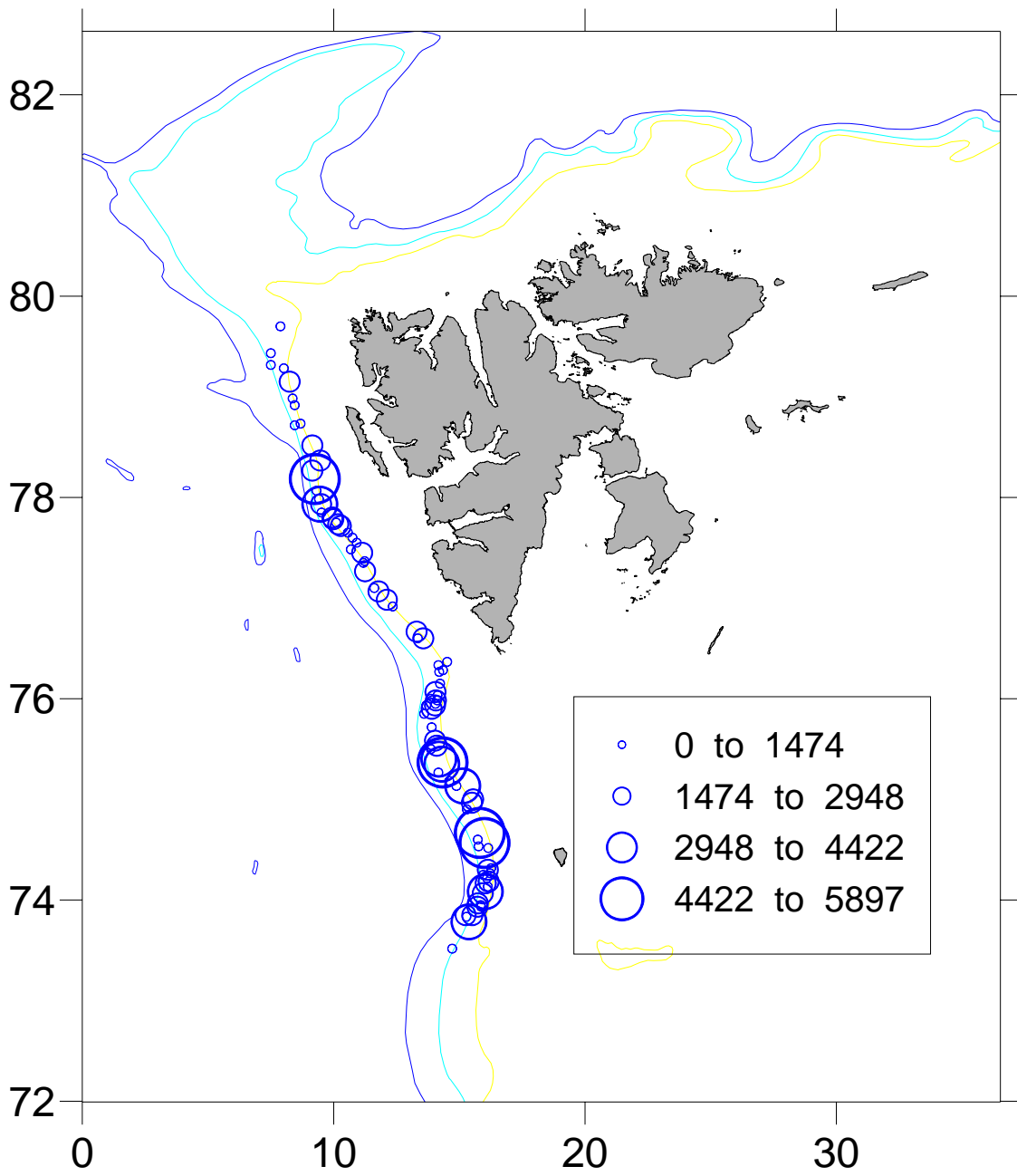


Figure 4. Distribution of the **Greenland halibut** catches (Kg/h).

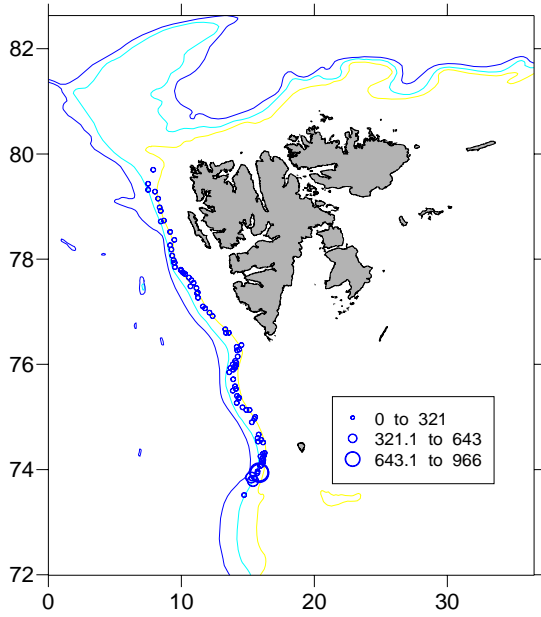


Figure 5. Distribution of the **Cod** catches (Kg/h).

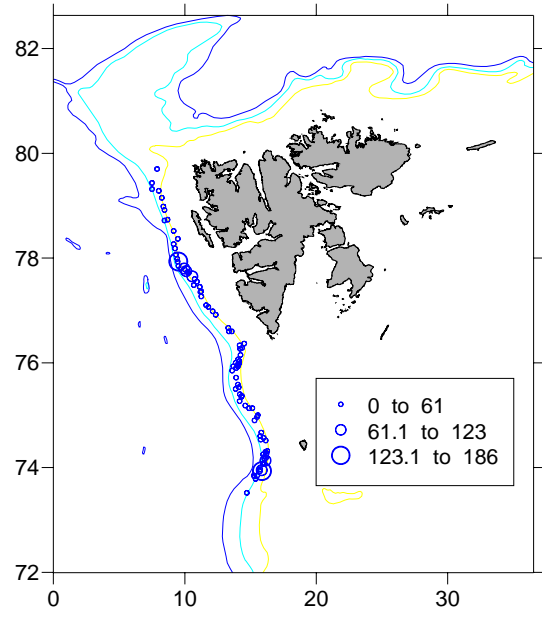


Figure 6. Distribution of the **wolffish** catches (Kg/h)

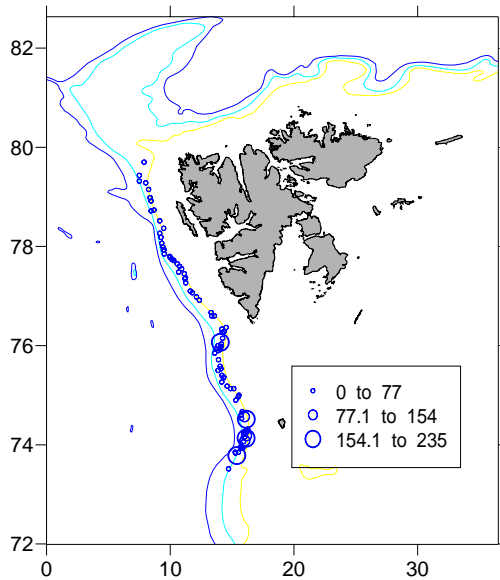


Figure 7. Distribution of the **redfish** catches (Kg/h).

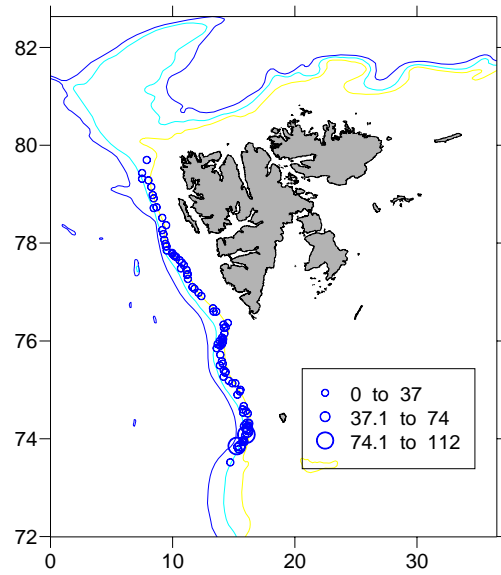


Figure 8. Distribution of the **thorny skate** catches (Kg/h)

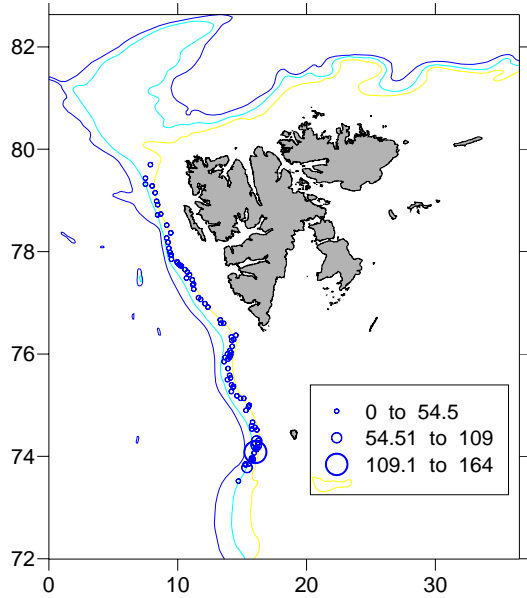


Figure 9. Distribution of the **grenadier** catches (Kg/h)

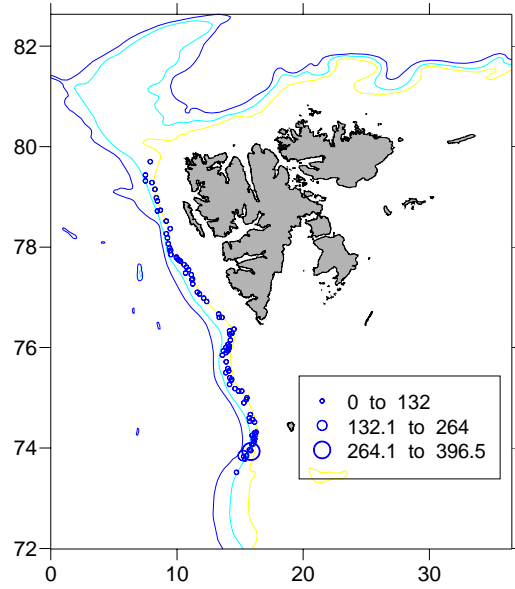


Figure 10. Distribution of the **haddock** catches (Kg/h)

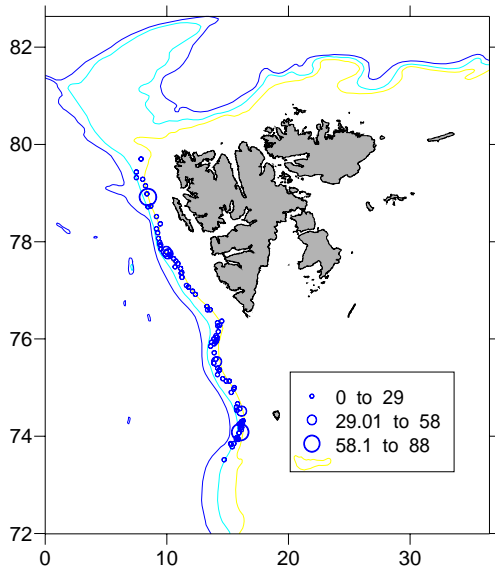


Figure 11. Distribution of the **blue whiting** catches (Kg/h)