

# **Report of the *Fletán Ártico 2008* October bottom trawl survey in the Slope of Svalbard**

by

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# 1. Introduction

The "*Fletán Artico 2008*" survey is the continuation of the Spanish survey series that the Spanish Institute of Oceanography (IEO) has been carrying out since 1997, 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, 2007).

During the last years, the AFWG has advised a maximum catch of 13.000 T, exploitation level below which SSB has increased in the past.

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 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

*Eirado do Costal* was the selected vessel to conduct *Fletan Ártico 2008* survey in October, being its main characteristics:

Nationality: Spanish

Registered port & number: VI-4-4-01

Overall length: 56 m.

Maximum draught: 6,20 m

Net tonnage: 350 NT

Year: 2004

Fridge capacity: 9938 m<sup>3</sup>

Freezing capacity: 50 Tm / day

Engine: Mak6M25PX,1645,6C.V

Equipment:

Echo sounder: *Simrad ES60* y *Furuno FCU 1200L*

*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. Furthermore a 40 mm mesh size cover codend was added.

In figure 3, included in annex II, a trawl gear plane is shown. This gear is mounted with a 60.8 meters headline and a 78 meters long rockhooper, indicated for Greenland Halibut fishery.

Gear main characteristics:

- Ground gear

- Central section (8,5 m), with 18” rubber discs separated by a divider and four 14” sweepers.
  - Lateral section (9,5 m), with 18” rubber discs separated by two dividers and eight 14” sweepers..
  - Lateral extensions (7m), with half spheres of 16” separated by four dividers.
- Floats: 240mm and 300 mm diameter floats
  - Codend: (Polyethylene 6 mm), with 140mm mesh size. A 40 mm mesh size cover codend was added
  - Legs: 14 m.
  - Doors: Oval Floyd, 6,8 m<sup>2</sup> and 2200 kg.
  - Bridles: 300 m

## 2.3 Survey planning

The Survey took place from 3<sup>rd</sup> to 19<sup>th</sup> October. 74 hauls were carried out. Table 1, included in the annex I, shows specific data by haul.

As IEO used to do in 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. Next table shows latitude and depth range limits for each stratum, as well as the surface area and the number of valid hauls made.

Strata	Latitude	Depth (m)	Surface Square nautical miles	n° hauls
1	76° 00' - 81° 00' N	500- 699	702	20
2	76° 00' - 81° 00' N	700- 999	1263	11
3	76° 00' - 81° 00' N	1000-1500	2693	4
4	73° 30' - 76° 00' N	500- 699	488	17
5	73° 30' - 76° 00' N	700- 999	761	18
6	73° 30' - 76° 00' N	1000-1500	1672	4
	73° 30' - 81° 00' N	500-1500	7579	74

In order to study the feeding of the Greenland halibut, 4 extra hauls were made for intensive study of stomach contents.

The duration of each haul was 30 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. Gonad samples, otoliths and stomach contents were collected for the Greenland halibut.

Next table shows, the number of length samples by species and.

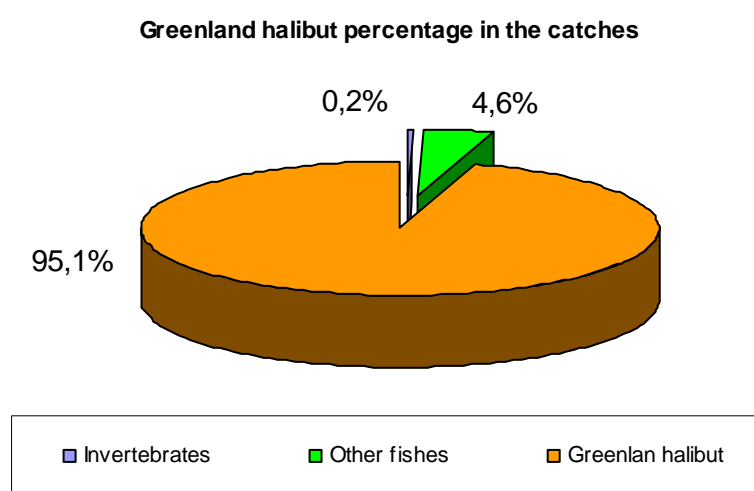
ESPECIE	N° Samples	Male	Female	Total	Range (cm)
Fletán negro ( <i>Reihardtius hippoglossoides</i> )	74	3079	1712	4791	26-98
Bacalao ( <i>Gadus morhua</i> )	20		203	203	29-110
Platija americana ( <i>Hippoglossoides platessoides</i> )	19		266	266	17-39
Gallineta Oceanica ( <i>Sebastes mentella</i> )	10		109	109	27-42

### 3. Results

#### 3.1 Catches

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

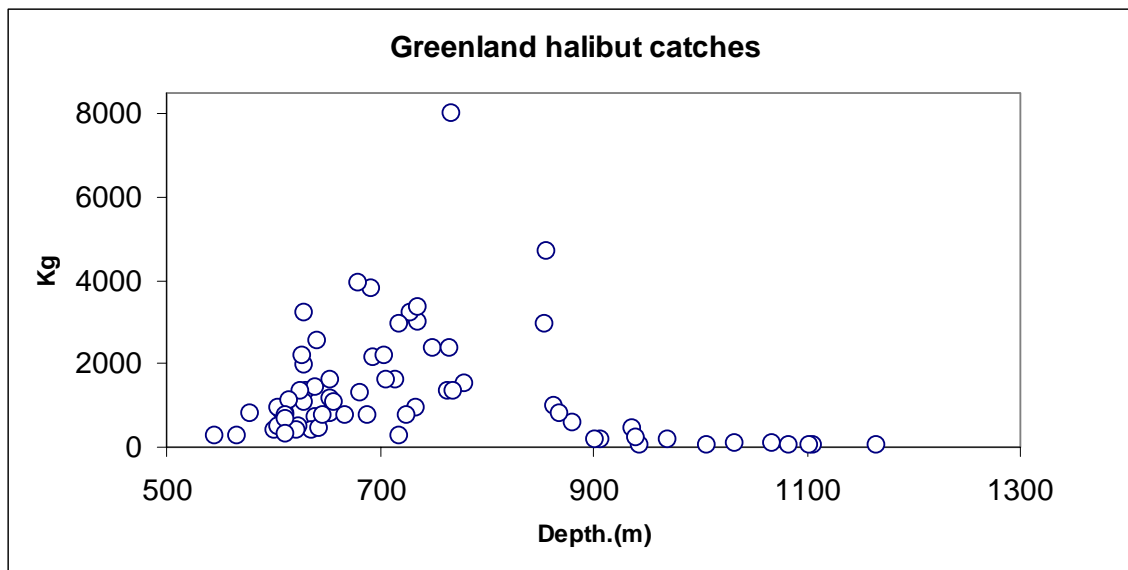
As the following figure shows, 95,1 % of the total catch correspond to Greenland halibut, while the rest of fishes and invertebrates suppose 4,6 % and 0,2 % respectively.



**Graph1.** Greenland halibut percentage in the catches during *Fletán Ártico 2008* Survey

Table 2, included in annex I, shows all species catches by haul. Greenland halibut was the principal species, with 91573 Kg captured. Cod (906.08 Kg), wolffish (704.31 Kg), thorny skate (775.15 Kg), redfish (495.96 Kg) and blue whiting (492.42 Kg) were the main species.

The main Greenland halibut catches were recorded in depths between 600 and 900 meters, reaching its maximum values between 600 and 850 meters depth (graph2). It should be noted that all hauls exceeding 1000 Kg of Greenland halibut, were made in this range of depth, reaching 8000 Kg of Greenland halibut in one case. Above the 1000 meters deep, catches of halibut were scarce, being under 100kg all of them.

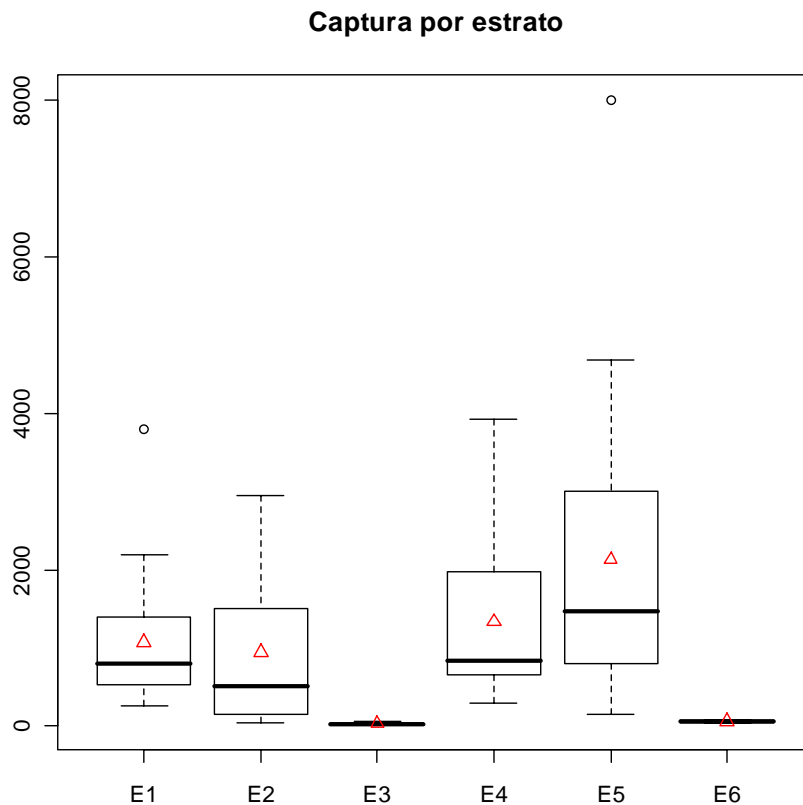


**Graph2.** Greenland halibut catches in relation to depth, during *Campaña Fletán Ártico 2008 Survey*.

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. Further north the catches decrease, and above 79° N catches are really scarce in all depths (figure 4, annex II).

This means, that analyzing catches by stratum, as shown in graph 3, deeper strata, 3 and 6, would show lower concentration of Greenland halibut, while the two strata of the south, below 1000 meters, strata 4 and 5, show greatest concentrations. In these strata of greater concentration, the variability was also higher, particularly in the strata 5.





**Graph3.** Box Plot. Greenland halibut catches (Kg) by stratum. (Mean (▲), median (—) and percentiles 25 & 75).

Figures 5, 7, 9 and 11 of annex II, show the maps of the catches by haul of the main accompanying species, as well as their distribution in relation to the depth.

None of them presents a clear distribution pattern in relation to the latitude. With the exception of the starry ray, the rest are concentrated mostly in shallower depths, around 600-700 meters. In the case of the thorny skate, it seems that the depth it is no limiting factor in the distribution (Figures 6, 8, 10 and 12 of annex II).

### 3.2 Greenland halibut biomass and abundance

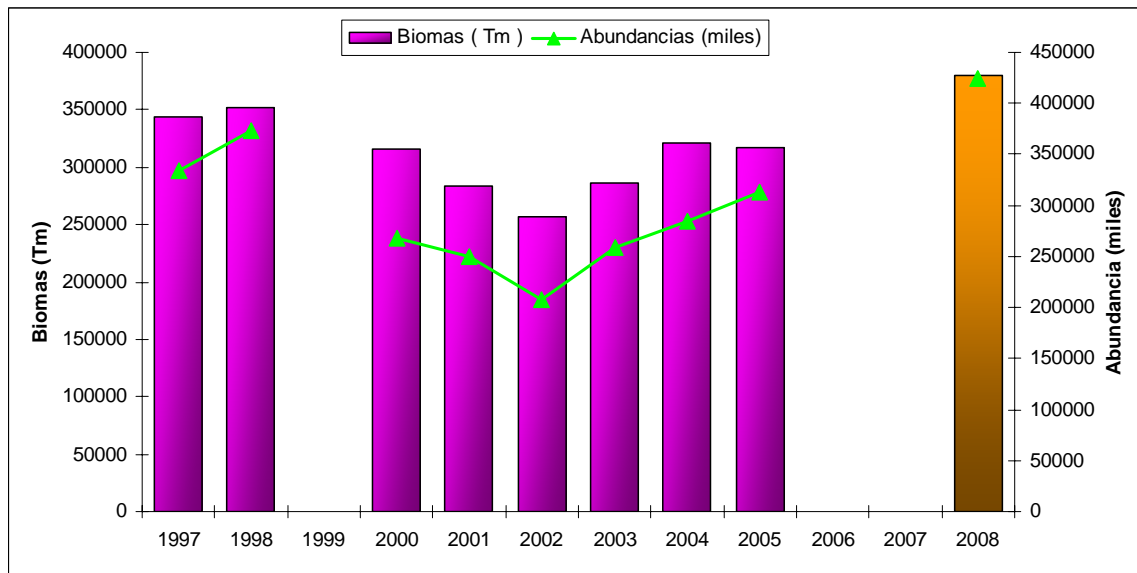
The abundance and biomass was estimated with the Swept Area method, as in previous years.

It should be noted however, that some of the parameters used in this survey for the calculation of the Swept Area, have been different to those used in previous years by the Spanish Institute of Oceanography (IEO).

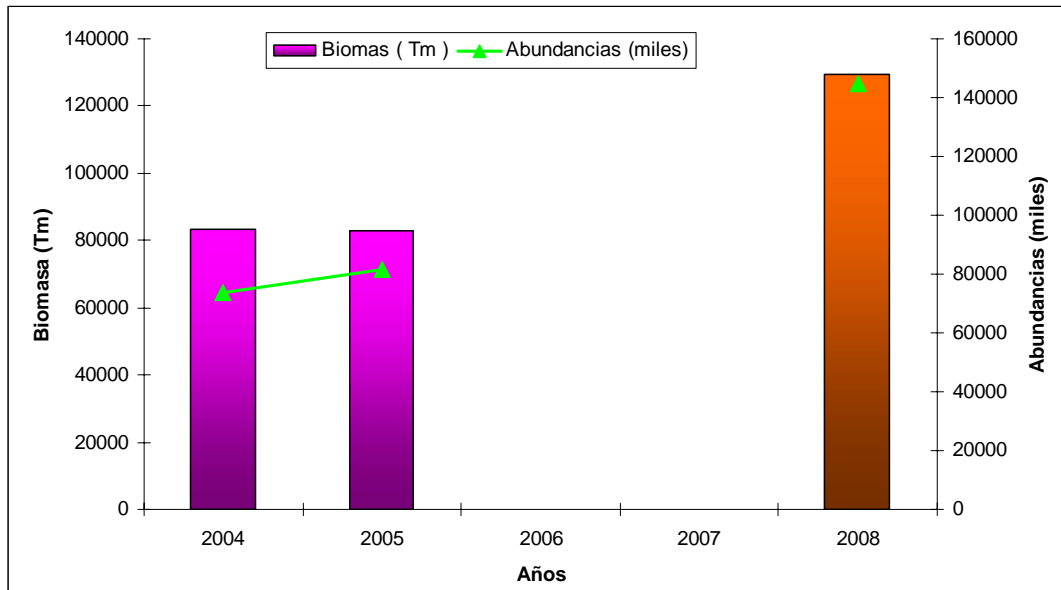
The methodology for calculating the horizontal opening of the net, has been different to that the IEO uses regularly. The data received from scanmar sensors, indicated a  $41 \pm 2$  meters long horizontal opening for the 2008 survey, while the IEO estimated minor values, for a net with similar characteristics. The difference in this parameter, supposes a big difference in the values scored for the Swept Area, with a clear effect on the biomass and abundance results.

Below, are shown, separately, the biomass and abundances of Greenland halibut, estimated by the two methodologies for calculating swept area.

Graphs 4 and 5 show the Greenland halibut biomass and abundance values during the “*Fletán Ártico*” survey series. On one hand, using the horizontal openings obtained in the 2008 survey (Graf. 5), and on the other hand, using horizontal openings obtained in previous surveys (Gráf.4).



**Graph4:** Greenland halibut biomass (t) and abundance (x1000) estimates during the period 1997-2008, calculated with the IEO Swept Area values. (2006-2007, the survey was not carried out).



**Graph5:** Greenland halibut biomass (t) and abundance (x1000) estimates during the last three surveys, calculated with Azti's Swept Area values.

Results vary significantly depending on the method used to estimate the swept area. Using parameter obtained during 2008 survey, the estimated Greenland halibut biomass is 129.220 t and the abundance, 144.651 (x1000) individuals. However, with the used in previous years, the value for biomass is 379456 t and 424.822 (x1000) individuals. This supposes a 65, 9% in function of the method used in the calculation of horizontal opening.

However, in both cases, a positive trend can be appreciated, reflecting a slight recovery of the population. Taking into account the parameters of this survey, the biomass has increased 36,02% comparing with 2005.

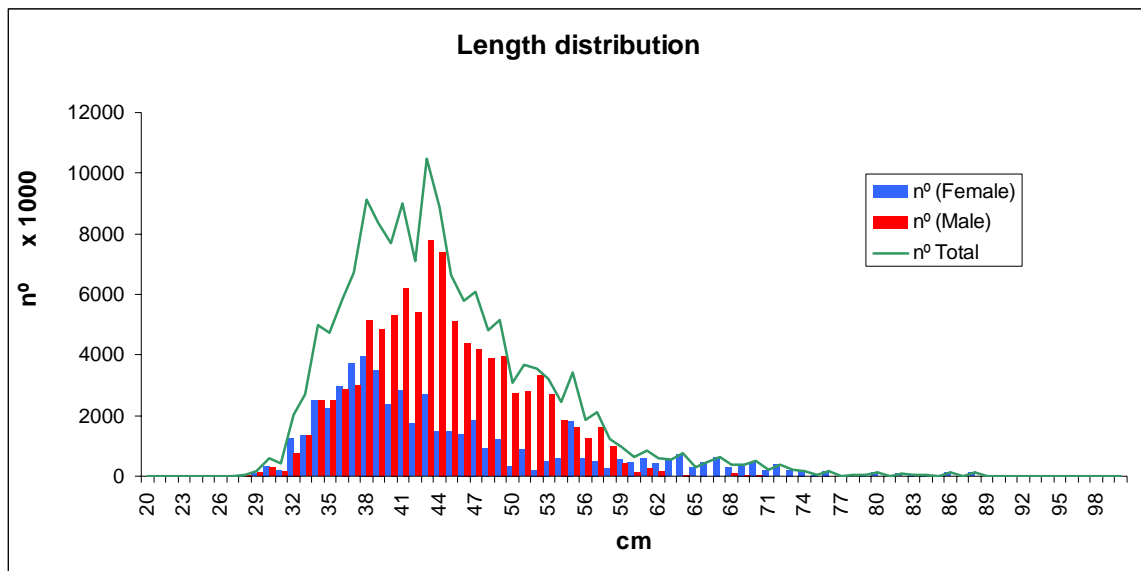
Table 3 included in the annex I, show the biomass and abundance values by stratum.

### 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

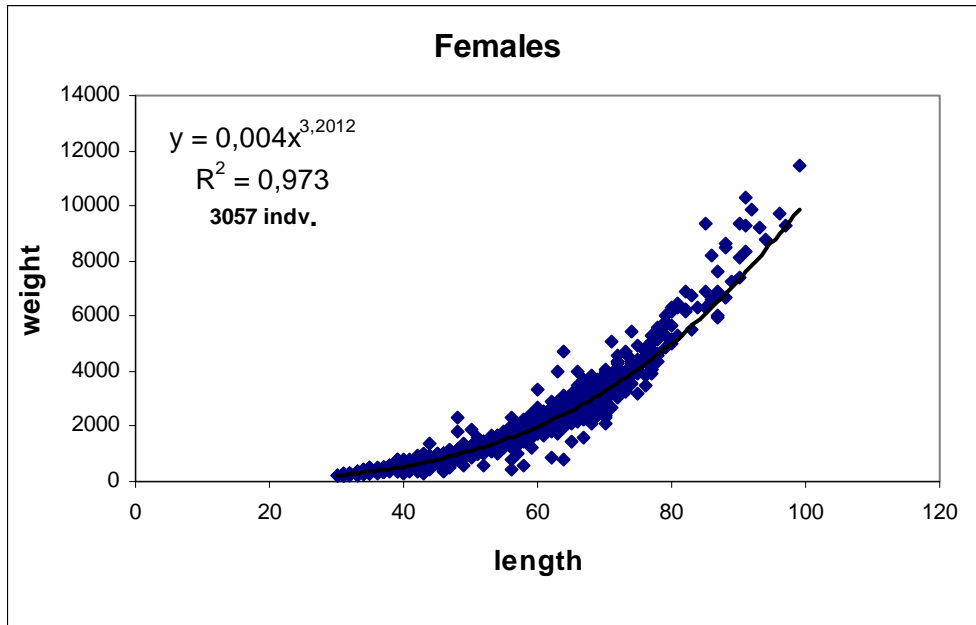
The population's structure was similar to the described in previous surveys (Paz X., *et al*, 2006). Length range for both sexes was from 26 cm to 98 cm. As in previous cruises, the male proportion was higher, 65 % of males versus 35 % females.



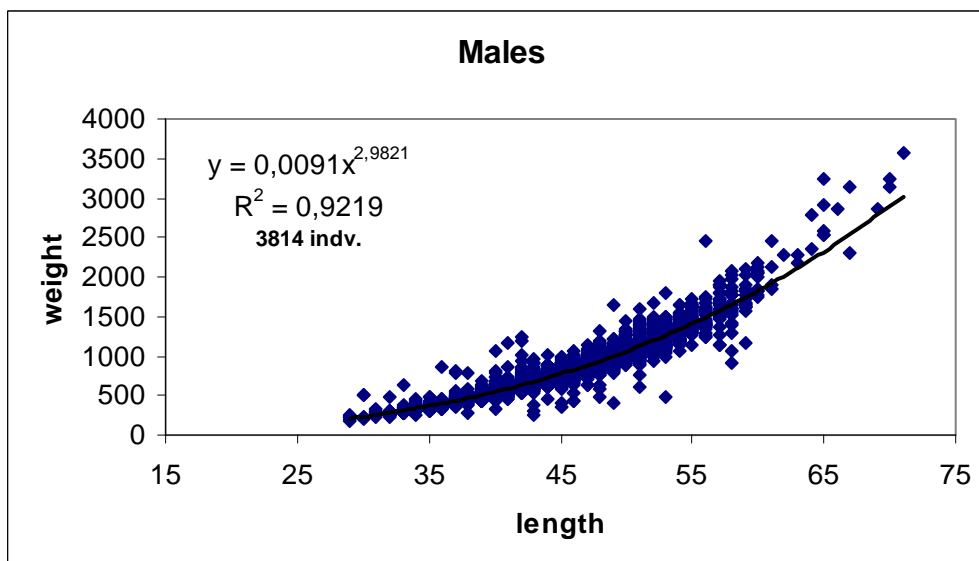
Graph6. Greenland halibut length distribution in Svalbard.

### 4.5 Length – weight relationship

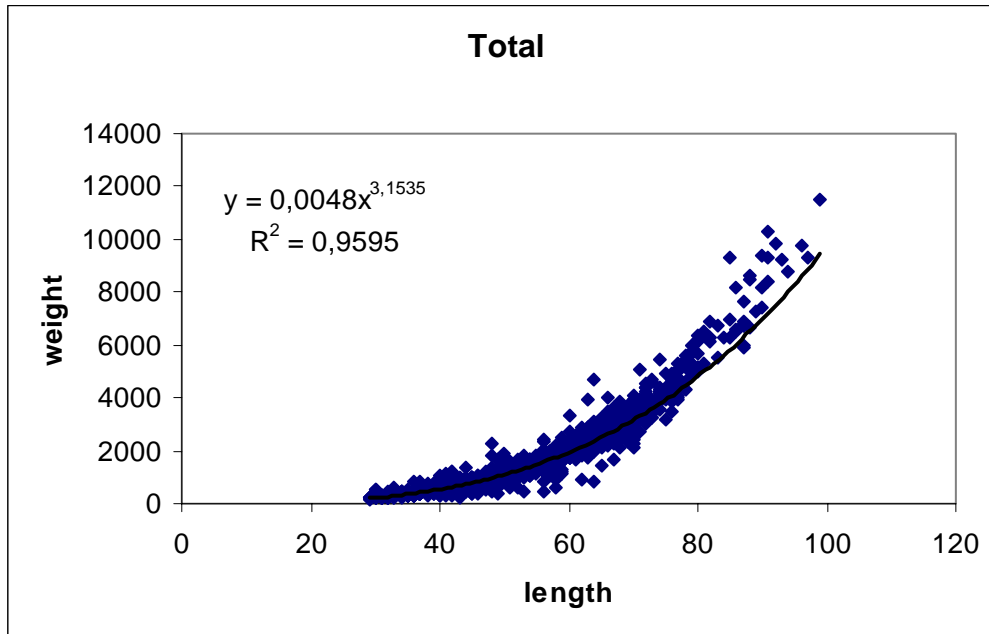
Graphs 7, 8, and 9, show the Greenland halibut length – weight relationship, separated by sexes, and combined.



**Graph7.** Length – weight relationship (females)



**Graph8.** Length – weight relationship (Males)



**Graph9.** Length – weight relationship (total)

## 5 CONCLUSION

Main conclusions derived from the results obtained during the *Campaña Fletán Ártico 2008* Survey:

- Comparison with the rest of the "*Fletán Ártico*" Survey series must be made with prudence, mainly due to the change of vessel.
- Positive trend in the stock of Greenland halibut (*Reinhardtius hippoglossoides*) in the Archipelago of Svalbard continue, as the increase in the abundances show.
- Inter-annual stability situation continue. Both spatial and bathymetric distributions, as the structure of the population are similar to those described by other authors ((Paz X., *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 500., been the trawl fishery in that bathymetric range monospecific, addressed to the Greenland halibut.

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Paz, X., C. Gonzalez y E. Roman. 2004 Informe de la *Campaña Fletán Ártico 2004*. Instituto Español de Oceanografía. Equipo de Pesquerías Lejanas , Centro Oceanográfico de Vigo.

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*Campaña Fletán Ártico 2008*

# ANNEX I: TABLES

Haul	Strata	Valid	DepthLarg (m)	Depth Vir (m)	Latitude largada		Longitude largada		Latitude virada		Longitude virada		Speed (knots)	vertical opening (m)	Doors opening (m)
					Gr	Min	Gr	Min	Gr	Min	Gr	Min			
1	6	Yes	1049	1086	73	45	14	59	73	46	15	1	3,3	2,8	250
2	5	Yes	734	737	73	48	15	24	73	50	15	27	3,3	2,7	245
3	5	Yes	940	933	73	50	15	20	73	52	15	24	3,2	2,7	275
4	4	Yes	694	695	73	54	15	41	73	52	15	36	3,2	2,7	240
5	4	Yes	606	651	73	57	15	51	73	58	15	52	3,1	2,8	240
6	6	Yes	1117	1094	74	14	15	52	74	15	15	55	3,2	2,8	260
7	5	Yes	743	724	75	6	15	11	75	7	15	5	3,1	2,8	240
8	4	Yes	606	654	75	8	15	19	75	5	15	24	3,2	2,8	240
9	4	Yes	646	637	75	2	15	32	75	4	15	28	3,1	2,8	242
10	5	Yes	877	885	75	10	14	42	75	11	14	37	3,3	2,7	260
11	4	Yes	597	619	75	21	14	28	75	23	14	21	3,3	2,8	253
12	5	Yes	747	753	75	24	14	11	75	22	14	21	3,1	2,8	268
13	6	Yes	1290	1316	75	25	14	27	75	26	14	23	3,1	2,8	240
14	2	Yes	701	707	77	0	12	6	77	1	11	59	3,2	2,8	260
15	1	Yes	639	641	77	3	11	52	77	4	11	47	3,4	2,8	245
16	1	Yes	629	634	77	21	11	15	77	23	11	14	3,1	2,8	265
17	1	Yes	643	638	77	7	11	37	77	9	11	32	3,0	2,8	240
18	2	Yes	773	786	77	23	11	9	77	24	11	7	2,7	2,8	263
19	2	Yes	935	954	77	30	10	49	77	31	10	45	3,1	2,8	252
20	1	Yes	569	587	77	39	10	36	77	40	10	32	3,3	2,8	252
21	2	No	735	740	78	44	8	29	78	45	8	24	3,0	2,9	245
22	1	Yes	517	574	78	55	8	28	78	57	8	27	3,3	2,7	243
23	2	Yes	732	719	78	51	8	22	78	59	8	22	3,1	2,8	243
24	1	Yes	666	640	79	9	8	15	79	11	8	12	3,1	2,9	239
25	1	Yes	542	592	79	17	8	2	79	19	7	58	3,1	2,8	250
26	3	Yes	1051	1013	79	19	7	26	79	21	8	26	3,1	2,8	270
27	2	Yes	901	913	79	27	7	29	79	28	7	26	3,1	2,8	250
28	2	Yes	720	718	79	53	7	24	79	55	7	20	3,0	2,8	237
29	1	Yes	659	650	78	32	9	5	78	31	9	10	3,0	2,8	237
30	3	Yes	1092	1075	78	23	9	7	78	21	9	7	3,0	2,6	270
31	1	Yes	689	696	78	13	9	14	78	11	9	14	3,0	2,7	230
32	1	Yes	635	619	78	6	9	18	78	4	9	20	3,0	2,6	220
33	1	Yes	626	599	77	57	9	28	77	56	9	32	3,1	2,8	227
34	3	Yes	1173	1159	77	51	9	20	77	49	9	23	3,1	2,5	254
35	1	Yes	631	640	77	48	9	58	77	47	10	2	3,0	2,6	240
36	1	Yes	595	624	77	47	10	1	77	46	10	6	3,0	2,7	230
37	1	Yes	597	606	77	46	10	5	77	45	10	10	3,0	2,8	236
38	2	Yes	897	907	77	43	10	6	77	42	10	11	3,0	2,6	232
39	2	Yes	1009	1005	76	56	12	0	76	55	12	5	3,0	2,5	251
40	2	Yes	842	867	76	53	12	33	76	51	12	37	3,0	2,6	227
41	3	Yes	1096	1110	76	41	12	59	76	40	12	52	3,0	2,4	252
42	1	Yes	721	708	76	20	14	24	76	19	14	22	3,0	2,6	236
43	2	Yes	754	774	76	15	14	12	76	14	14	9	3,0	2,6	229
44	1	Yes	649	686	76	12	14	14	76	10	14	13	3,0	2,6	229
45	1	Yes	656	651	76	11	14	16	76	9	14	14	3,0	2,6	242
46	1	Yes	632	626	76	7	14	13	76	55	14	51	3,0	2,7	248
47	1	Yes	625	622	76	5	14	11	76	3	14	11	3,0	2,7	256
48	1	Yes	609	602	76	2	14	10	76	0	14	8	3,0	2,5	246
49	4	Yes	640	648	76	1	14	7	75	59	14	5	3,0	2,8	230
50	4	Yes	649	645	75	58	14	4	75	56	14	3	3,0	2,4	264
51	5	Yes	983	956	75	57	13	42	75	55	13	43	3,0	2,6	261
52	5	Yes	749	782	75	54	13	55	75	52	13	53	3,0	2,8	247
53	4	Yes	630	621	75	49	14	0	75	47	14	0	3,0	2,7	249
54	4	Yes	628	604	75	44	14	1	75	43	14	1	3,0	2,7	249
55	4	Yes	645	668	75	40	14	0	75	39	14	0	3,0	2,8	240
56	5	Yes	760	777	75	37	13	57	75	35	13	55	3,0	2,8	232
57	4	Yes	624	622	75	33	14	7	75	31	14	8	3,0	2,8	252
58	5	Yes	840	885	75	32	13	54	75	30	13	52	3,0	2,6	247
59	5	Yes	700	711	74	56	15	31	75	54	15	30	3,0	2,8	233
60	5	Yes	781	676	74	55	15	32	75	53	15	32	3,0	2,8	240
61	5	Yes	949	933	74	52	15	20	74	51	15	20	3,0	2,8	270
62	4	Yes	683	676	74	47	15	36	74	45	15	38	3,0	2,8	249
63	5	Yes	875	863	74	36	15	48	74	35	15	52	2,8	2,8	268
64	4	Yes	610	612	74	36	16	4	74	34	16	4	3,0	2,8	229
65	5	Yes	714	724	74	34	16	4	74	35	16	0	3,2	2,7	236
66	6	No	1012	1034	74	34	15	45	74	33	15	46	3,0	2,7	248
67	4	Yes	620	588	74	31	16	10	74	28	16	11	3,0	3,2	227
68	5	Yes	688	675	74	15	16	12	74	15	16	11	2,9	2,8	260
69	5	Yes	818	894	74	14	16	5	74	12	16	1	2,9	3,1	215
70	4	Yes	709	670	74	11	16	10	74	10	16	9	3,0	2,9	239
71	5	Yes	790	745	74	8	16	3	74	8	16	5	3,0	2,9	228
72	4	Yes	622	603	74	7	16	8	74	6	16	6	3,0	3,1	246
73	5	Yes	706	766	74	4	15	58	74	3	15	55	3,0	3,1	226
74	4	Yes	592	632	74	2	16	3	74	1	15	59	2,9	3,1	229

Table1. Haul characteristics during *Campaña Fletán Ártico 2008 Survey*.

Lance	Fletan ( <i>Reinhardtius hippoglossoides</i> )	Lirio ( <i>Micromesistius poutassou</i> )	Bacalao ( <i>Gadus morhua</i> )	Gallineta ( <i>Sebastes mentella</i> )	Perro del norte ( <i>Anarhichas lupus</i> )	Raja ártica ( <i>Amblyraja hyperborea</i> )
1	85					
2	3006,74	23,5		7,87		1,13
3	426,09					
4	2137,33	22,38		5,66		1,82
5	3202,77	29,08	0,9	37,3	18	5,08
6	61,21	0,1				
7	957,64	0,92				
8	1965,11	7,6	2,18	3,75		
9	2541,09	7,75	2,84	5	34	
10	566,42					
11	835,19	6,85	4,35	3,86		5,02
12	2370,91	2,08				0,15
13	34,44					29,18
14	2208,31			0,75		0,7
15	705,02	1,61		1,88	30,8	4,2
16	1359,27	1,96	49,32	3,93	16	
17	1442,58	8,28	61,62	6,21	18,02	5,16
18	1509,38	0,53				1,32
19	38,15					
20	783,1	5,08	72,69	1,74	76,5	4,54
21						
22	259,17	36,32	124,01	93,91	12,3	1,07
23	777,1	0,88	5,06	10,3		1,2
24	8,02	1,45	10	7,62	43,61	
25	279,66	1,9	79,2	38,3	34,62	9,8
26	67,37	1,66		4,88		1,14
27	157,61					
28	257,35					
29	1623,75	0,4		4,35	23,77	1,04
30	33,12					
31	3788,79	1,1	12,14	1,45		4,8
32	2196,87	1,72	26,3	13,12		3,7
33	806,21	0,2	31,3	8,18	87,06	14,19
34	26,77			0,65		
35	417,39	1,27	10,02	0,9	42,21	2,3
36	585,15	0,44	17,5	0,9		3,36
37	409,51	2,75	14,22	1,34	85,35	1,44
38	194,93	0,2				
39	39,45					4,5
40	2938,48					1,45
41	28,67			0,55	0,2	
42	1627,24	0,29				2,61
43	1358,14	5,39		0,52		
44	747,24	1,2		3,19		0,72
45	1179,48	0,35		2,5		0,95
46	1065,58	2,48	8,66	6,31		5,66
47	474,96	7,36	33,88	7,92		3,93
48	937,3	6,77	72,34	4,94		3,72
49	439,57	6,4	13,12	2,73		4,95
50	782,34	1,52	10,9	4,97	21,3	2,26
51	160,24	0,3				0,3
52	2381,45	0,58				10,92
53	1349,22	10,95				0,49
54	1102,6	11,33	14,95	4,86	15,28	2,8
55	1053,72	2,04		0,66		
56	1344,86					
57	384,09	2,85		5,05		3,92
58	969,72	0,15				
59	1606,37	14,6		1		1,75
60	3243,36	50		3,6		2,84
61	241,38	0,3				
62	3927,91	0,77		2,37	12,46	4,34
63	794,71	1,7		0,6		
64	762,8	12,18	58,68	75		4,1
65	2952,29	4,55	8,63	2,78		5,5
66						
67	504,06	46,21	28,16	43,13	15,69	5,75
68	1319,65	10,08	76,96	5,98	60	0,36
69	4682,32	1,9		1,66		0,97
70	746,24		3,13	20,07		
71	8000					
72	655,21	60	28,68	14,15		2,21
73	3352,07		10,42	2,41		7,53
74	303,58	62,16	13,92	15,16	57,14	
<b>Total (kg)</b>	<b>91580,82</b>	<b>492,42</b>	<b>906,08</b>	<b>495,96</b>	<b>704,31</b>	<b>186,87</b>

Table2. Catch by haul during *Campaña Fletán Ártico 2008* Survey.

Lance	Granadero ( <i>Macrourus berglax</i> )	Platija americana ( <i>Hippoglossoides platessoides</i> )	Raja radiata ( <i>Amblyraja radiata</i> )	Raja ferreiro ( <i>Bathyrja spinicauda</i> )	<i>Lycodes esmarki</i>	<i>Cottunculus microps</i>	Invertebrados	Perro pintado ( <i>Anarhichas minor</i> )	<i>Lycodes spp</i>
1			6,2						
2	7,15			5,38	1,81	0,65			
3			0,39		0,26		1,21		0,46
4	7,07	0,37		0,1	7,15		2,5		
5	7,86			2,57			1,07		
6				0,01					
7	5,55			6,25	0,92		1,15		
8	4,43	0,74		8	4,72	0,1	1		
9	11,2	0,25			6,22		1,03		
10			8,12		0,81		1		
11	1,31	0,56	2,7		7,16		0,68		
12	4,77			7,23	4,41	1,03	0,2		
13			14,76	9,83	0,3		0,1		
14		4,1		14,32	4,59	6,55	0,5		
15	4,6	4,99	23,93	7,17	6,84		5,1		
16	2,46	5,88	11,09		8,2		4,85		
17	4,17	8,08	3,05		2,12		4,5		
18	2,6	1,04	6,74		3,47	0,5	2,11		
19			7,75		3,5		10,45		
20	0,58	8,4			2,2				
21									
22	0,35	7,16			0,67		3,32		
23	6,2	1,36		6,53	1,87	0,67	4,5		
24	2,53	3,18	46,63		1,97	1,06	3,14		
25	0,5	9			1,87	0,2	4,4		
26		1,02	18,6		0,6		0,2		
27			8,41		3,94	0,28	2,6		
28					7,2		12,06		
29	3,52	1,2	6,57		0,5	0,35	9,6		
30			14,15		2,01		0,5		
31	9,14	2,17	5		3,33	1,16	30,86		
32	7,75	11,84	41,85		3,1	0,32	0,32		
33	1,72	5,5	8,72		3,55				
34	0,2		18,93		0,08				
35	1,7	4,48	0,55		1,87	0,32	0,5		
36	0,7	3,87			5,38		1,16		
37		2,8			2,7		0,5		
38			12,6		3,52	0,77	40,97		
39			15,43		0,12		0,3		
40			13,31		5,9	0,9	49,4		
41			27,45		0,75		0,6		
42	1,01		11,71		3,52		2		
43	1,72		7,85		6,2	0,57	1,5		
44	2,2		3,44		4,85		0,3		
45	0,4	0,42	3,2	1,97	18,4	0,4	0,3		
46	1,47	0,33		4,33	14,61		1,35		
47	1,87	1,06			13,38	0,01	1,65		
48	0,18	1,47		1,66	8,07				
49	0,23	0,45			9		1,4		
50	2,83	0,74	0,43		9,35		0,5		
51			7,7		0,55	0,2	1,5		
52	5,57				4,05	0,5	1,5		
53	0,56	0,97	5,98		15,15		0,7		
54	0,5	0,2			9,4	0,12	0,5		
55	0,77	0,26	5,82		9,4	0,12	0,5		
56	4,53		21,78		4,35	0,13			
57		0,6			10,7	0,34			
58			3,2		2,88		2,5		
59		0,9			4,41				
60	7,2	5,45			10,5	0,15			
61		0,2	9,19		0,79		0,4		
62	16	0,4			18,32				
63	2,42		123,1		1,11	0,34			
64	2,89	5,18		2,5	9,48	0,57			
65	1,59	1,4	0,8		13,68	9,6			
66									
67	11,28	5,2		2,28	17		0,4	9,64	
68	8,25	1,72	48,3		7,1				
69	30		29,97		11,7				
70	7		135,08		4,32	0,5			
71									
72	5,32	1,87	25,94	0,48	6,06				
73	3,04	0,7	5,73		7,03				
74	4,49	1,17	3		6,1	2,29			
<b>Total (kg)</b>	<b>221,88</b>	<b>118,68</b>	<b>775,15</b>	<b>80,61</b>	<b>377,07</b>	<b>30,9</b>	<b>219,18</b>	<b>9,64</b>	<b>0,46</b>

Table2(cont). Catch by haul during *Campaña Fletán Ártico 2008* Survey.

Lance	Lumpo ( <i>Cyclopterus lumpus</i> )	Bertorella ( <i>Onogadus argentatus</i> )	<i>Careproctus reinhardti</i>	Capelin ( <i>Mallotus villosus</i> )	Brosmio ( <i>Brosme</i> )	Eglefino ( <i>Melanogrammus aeglefinus</i> )	Tomasa ( <i>Argentina silux</i> )	Arenque ( <i>Clupea harengus</i> )
1								
2								
3								
4								
5								
6								0,1
7								
8								3,2
9								
10								
11								
12								
13								
14	3,67							
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25				0,2				
26								
27		0,5	0,62					
28								
29								
30								
31								
32								
33								
34		0,6						
35		0,22		0,3				
36			0,1					
37				0,1				
38		1,6						
39								
40		0,66						
41		0,53						
42								
43				0,3				
44								
45								
46				0,33				
47								
48								
49								
50								
51		0,77						
52								
53								
54								
55								
56					1,11			
57								
58								
59								
60					0,89	0,6		
61								
62								
63								
64						13,96	4,15	
65						1,65		
66								
67					0,5		7,27	
68						2,58	0,5	
69								
70		0,6					1	
71								
72	2,27				2,05	0,3		0,3
73							1,15	
74							0,9	
<b>Total (kg)</b>	<b>5,94</b>	<b>5,48</b>	<b>0,72</b>	<b>1,23</b>	<b>4,55</b>	<b>19,09</b>	<b>14,97</b>	<b>3,6</b>

Table2(cont). Catch by haul during *Campaña Fletán Ártico 2008* Survey.

Strata	Tot. Area	N° hauls	Swept area	catch (kg)	Biomass (t)	Catch (n°)	Abundance (n° x1000)
1	702	20	0,67	20688,27	21576,27	23987	25016
2	1263	11	0,34	9478,9	34948,42	11309	41696
3	2693	4	0,14	155,93	2908,31	219	4091
4	488	17	0,57	22692,83	19459,90	25996	22292
5	761	18	0,61	38376,22	47521,01	39931	49447
6	1672	4	0,11	180,65	2806,69	136	2108
<b>Total</b>	<b>7579</b>	<b>74</b>	<b>2,45</b>	<b>91572,8</b>	<b>129220,60</b>	<b>101577,6833</b>	<b>144650,60</b>

Table3. Greenland biomass (t) and abundance (x1000) by stratum.

**Blue  
whiting**

Strata	Area Total	N° hauls	Area swept	Catch (Kg)	Biomass(T)
1	702	20	0,67	82,93	86,49
2	1263	11	0,34	7	25,81
3	2693	4	0,14	1,66	30,96
4	488	17	0,57	290,07	248,75
5	761	18	0,61	110,66	137,03
6	1672	4	0,11	0,1	1,55
<b>Total</b>	<b>7579</b>	<b>74</b>	<b>2,45</b>	<b>492,42</b>	<b>530,59</b>

**Cod**

<b>Strata</b>	<b>Area Total</b>	<b>N° hauls</b>	<b>Area swept</b>	<b>Catch (Kg)</b>	<b>Biomass(T)</b>
1	702	20	0,67	623,2	649,95
2	1263	11	0,34	5,06	18,66
3	2693	4	0,14	0	0,00
4	488	17	0,57	181,81	155,91
5	761	18	0,61	96,01	118,89
6	1672	4	0,11	0	0,00
<b>Total</b>	<b>7579</b>	<b>74</b>	<b>2,45</b>	<b>906,08</b>	<b>943,40</b>

**Redfish**

<b>Strata</b>	<b>Area Total</b>	<b>N° hauls</b>	<b>Area swept</b>	<b>Catch (Kg)</b>	<b>Biomass(T)</b>
1	702	20	0,67	208,69	217,65
2	1263	11	0,34	11,57	42,66
3	2693	4	0,14	6,08	113,40
4	488	17	0,57	243,72	209,00
5	761	18	0,61	25,9	32,07
6	1672	4	0,11	0	0,00
<b>Total</b>	<b>7579</b>	<b>74</b>	<b>2,45</b>	<b>495,96</b>	<b>614,78</b>

### Wolffish

Strata	Area Total	N° hauls	Area swept	Catch (Kg)	Biomass(T)
1	702	20	0,67	470,24	490,42
2	1263	11	0,34	0	0,00
3	2693	4	0,14	0,2	3,73
4	488	17	0,57	173,87	149,10
5	761	18	0,61	60	74,30
6	1672	4	0,11	0	0,00
<b>Total</b>	<b>7579</b>	<b>74</b>	<b>2,45</b>	<b>704,31</b>	<b>717,55</b>

### Arctic skate

Strata	Area Total	N° hauls	Area swept	Catch (Kg)	Biomass(T)
1	702	20	0,67	73,19	76,33
2	1263	11	0,34	9,17	33,81
3	2693	4	0,14	1,14	21,26
4	488	17	0,57	42,74	36,65
5	761	18	0,61	31,45	38,94
6	1672	4	0,11	29,18	453,36
<b>Total</b>	<b>7579</b>	<b>74</b>	<b>2,45</b>	<b>186,87</b>	<b>660,36</b>



**Roughhead  
grenadier**

<b>Strata</b>	<b>Area Total</b>	<b>N° hauls</b>	<b>Area swept</b>	<b>Catch (Kg)</b>	<b>Biomass(T)</b>
1	702	20	0,67	46,85	48,86
2	1263	11	0,34	10,52	38,79
3	2693	4	0,14	0,2	3,73
4	488	17	0,57	83,74	71,81
5	761	18	0,61	80,07	99,15
6	1672	4	0,11	0	0,00
<b>Total</b>	<b>7579</b>	<b>74</b>	<b>2,45</b>	<b>221,38</b>	<b>262,34</b>

**Long rough dab**

<b>Strata</b>	<b>Area Total</b>	<b>N° hauls</b>	<b>Area swept</b>	<b>Catch (Kg)</b>	<b>Biomass(T)</b>
1	702	20	0,67	81,83	85,34
2	1263	11	0,34	6,5	23,97
3	2693	4	0,14	1,02	19,02
4	488	17	0,57	18,96	16,26
5	761	18	0,61	10,37	12,84
6	1672	4	0,11	0	0,00
<b>Total</b>	<b>7579</b>	<b>74</b>	<b>2,45</b>	<b>118,68</b>	<b>157,43</b>

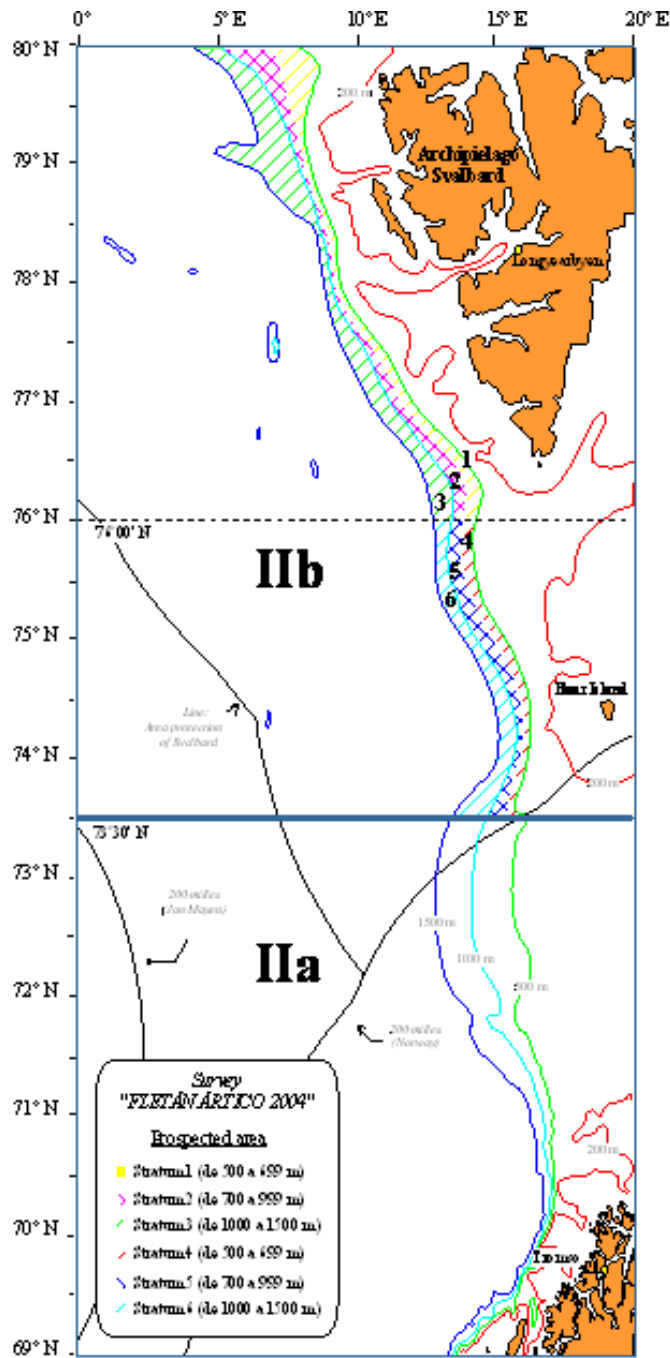
**Thorny skate**

<b>Strata</b>	<b>Area Total</b>	<b>N° hauls</b>	<b>Area swept</b>	<b>Catch (Kg)</b>	<b>Biomass(T)</b>
1	702	20	0,67	165,74	172,85
2	1263	11	0,34	72,09	265,79
3	2693	4	0,14	79,13	1475,88
4	488	17	0,57	178,95	153,46
5	761	18	0,61	258,28	319,83
6	1672	4	0,11	20,96	325,65
<b>Total</b>	<b>7579</b>	<b>74</b>	<b>2,45</b>	<b>775,15</b>	<b>2713,46</b>

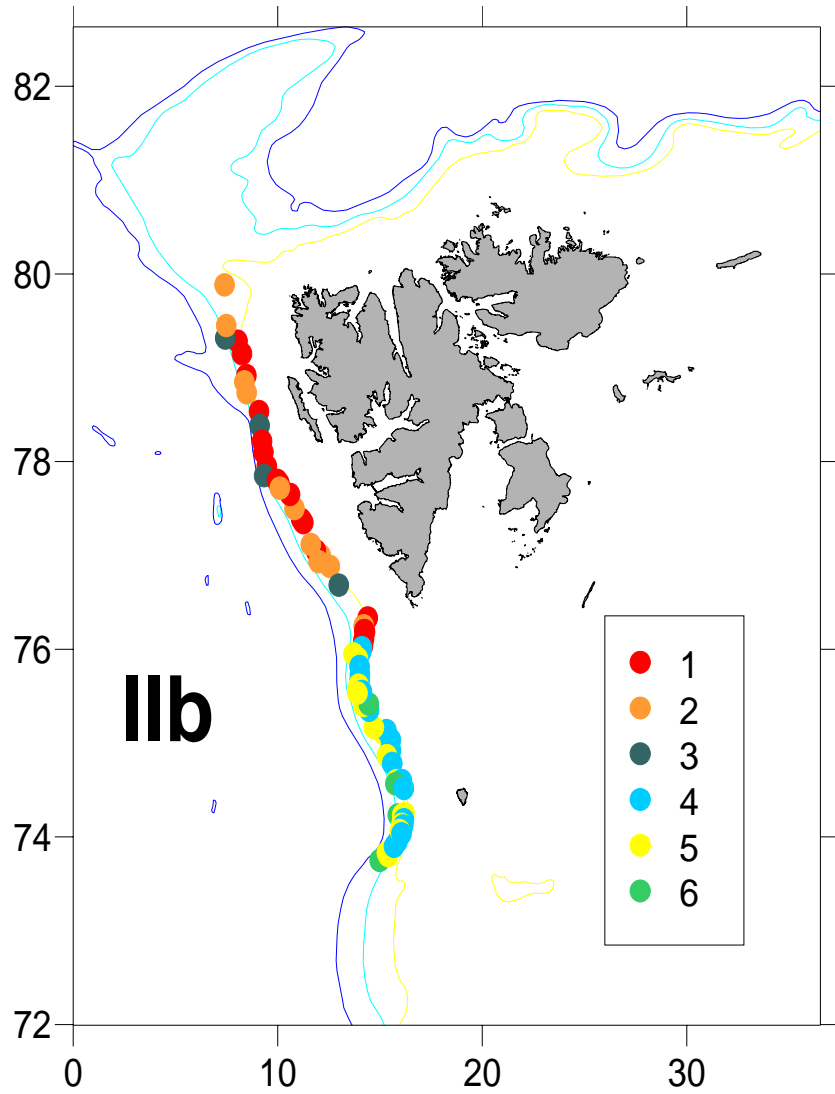
Table4. Accompanying fauna biomass (t) by strata in the Svalbard Archipelago.

*Campaña Fletán Ártico 2008*

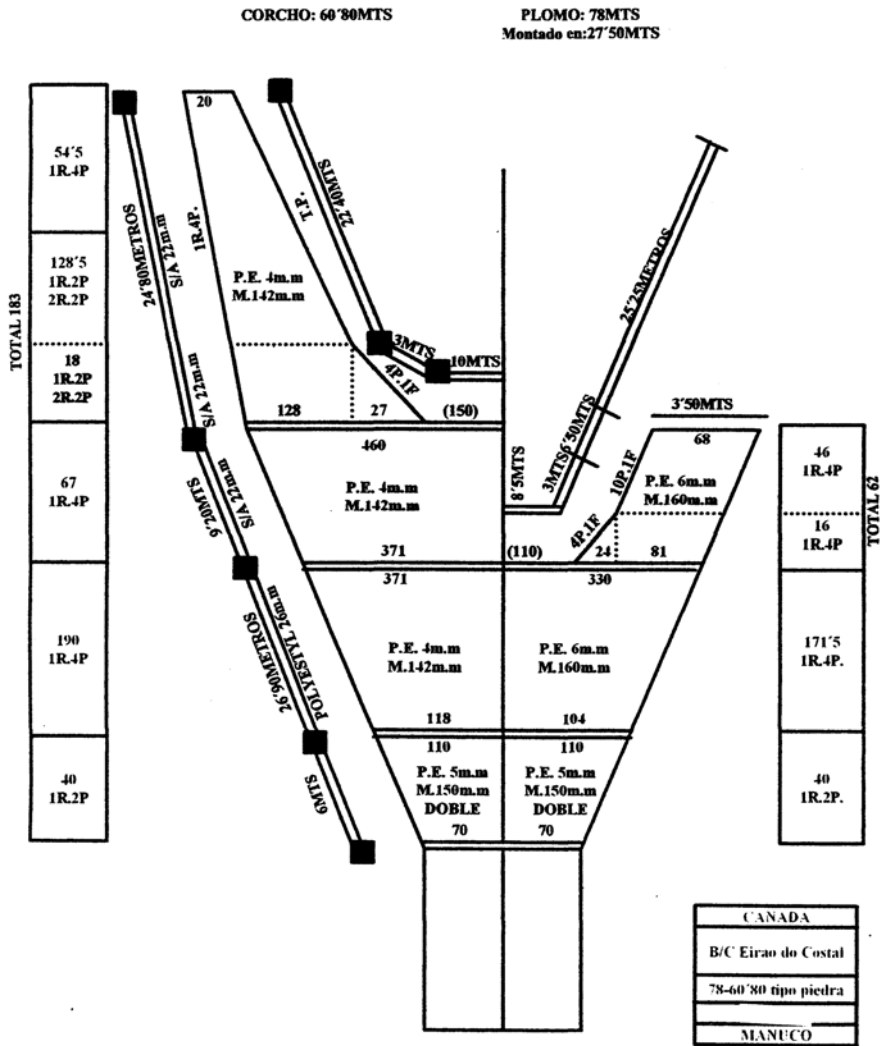
## ANNEX II: FIGURES



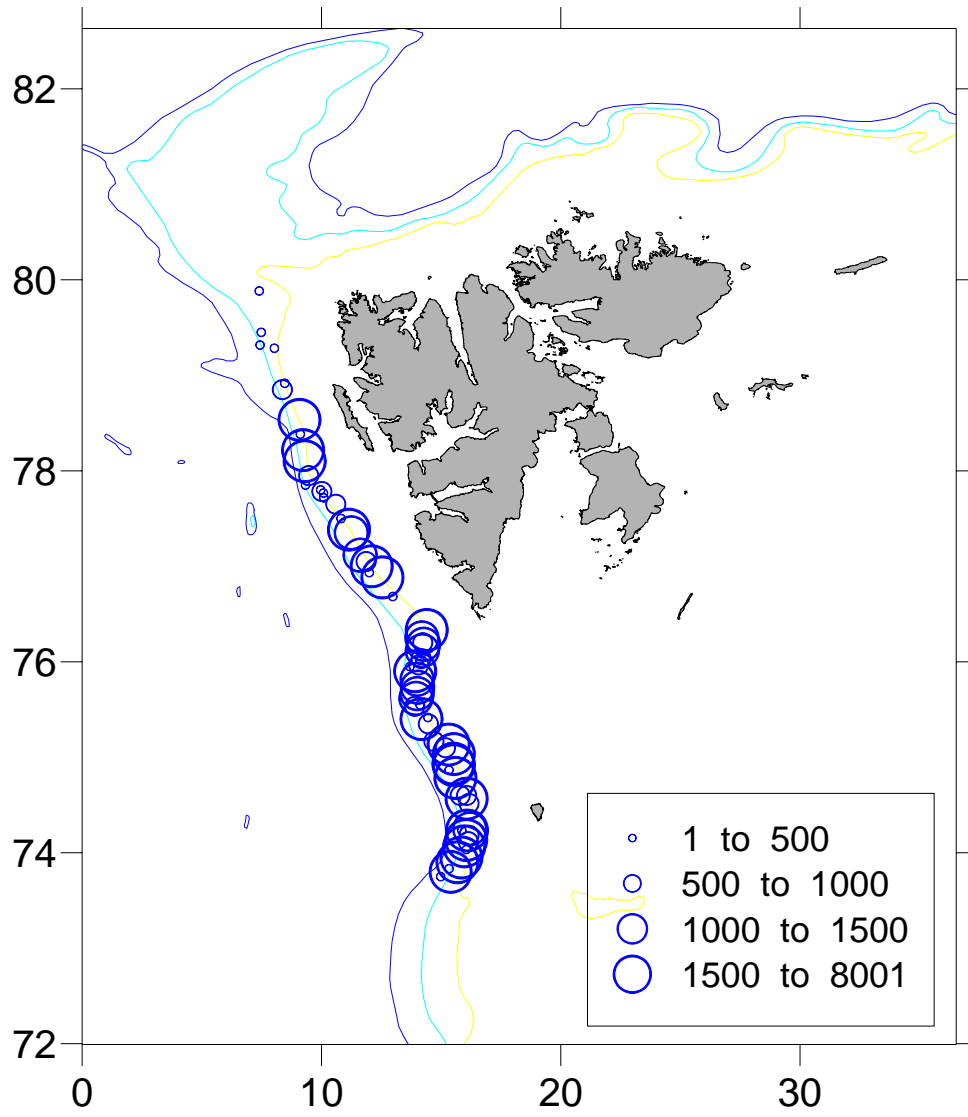
**Figure1.** Map of the area showing the six considered strata and its ranges of depth.



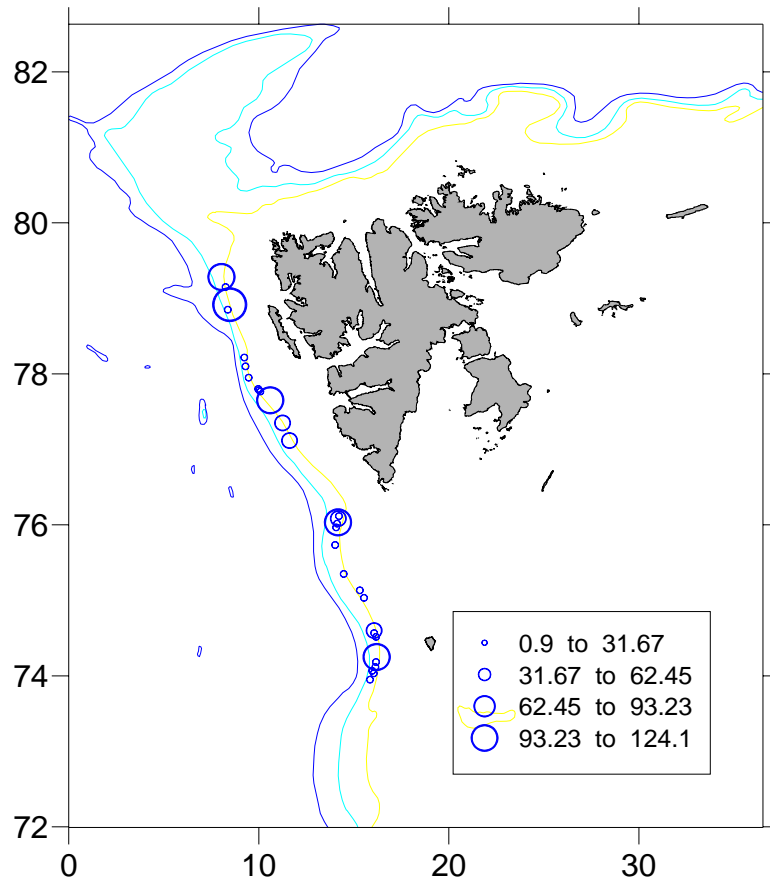
**Figure2.** Map showing the positions of the hauls made during the *Campaña Fletán Ártico 2008* Survey.



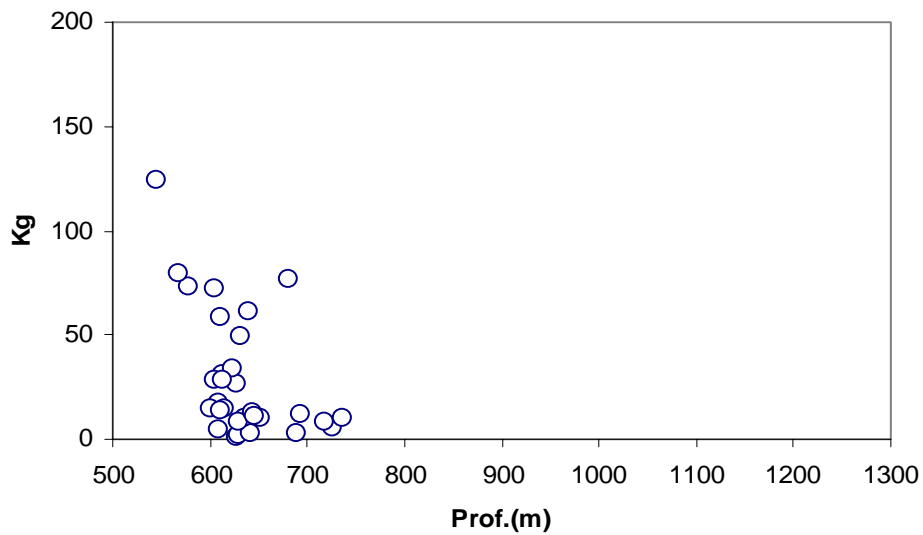
**Figure3.** Schematic of the net plan of the Spanish “Pedreira” survey trawl



**Figure4.** Distribution of the **Greenland halibut** catches (Kg).

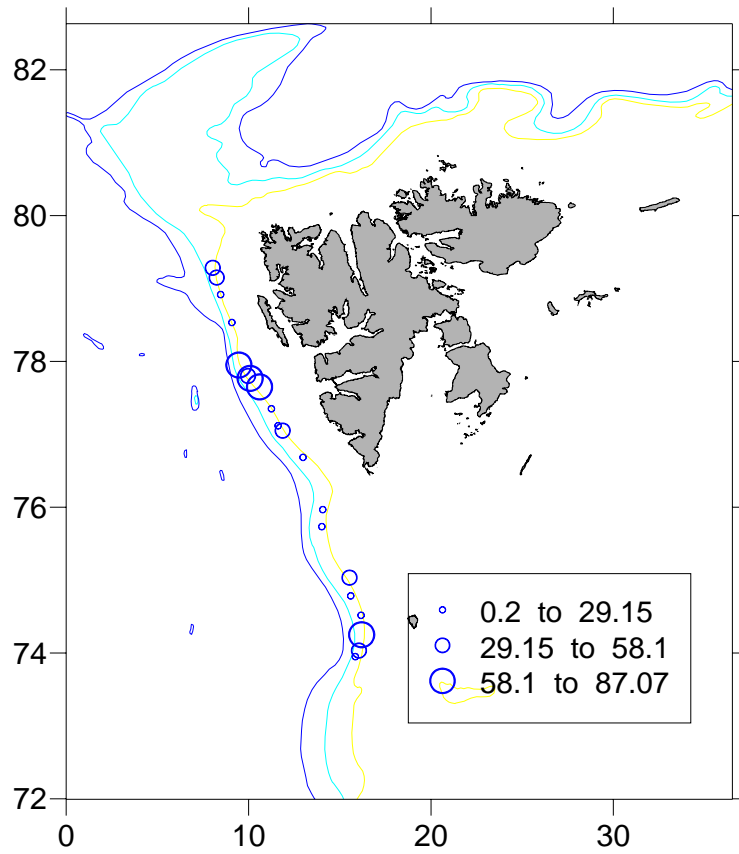


**Figure5.** Distribution of the **Cod** catches (Kg).

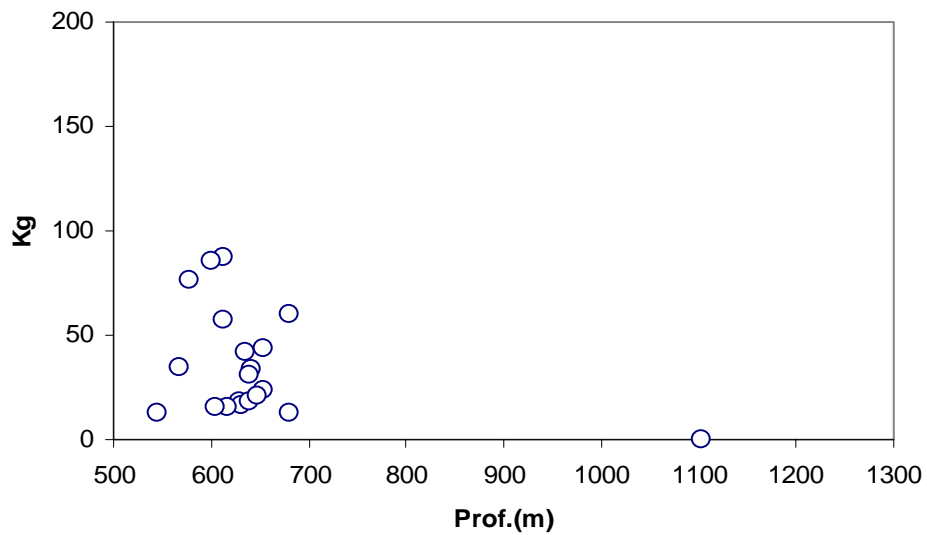


**Figure6.** Distribution of the **cod** catches in relation to depth

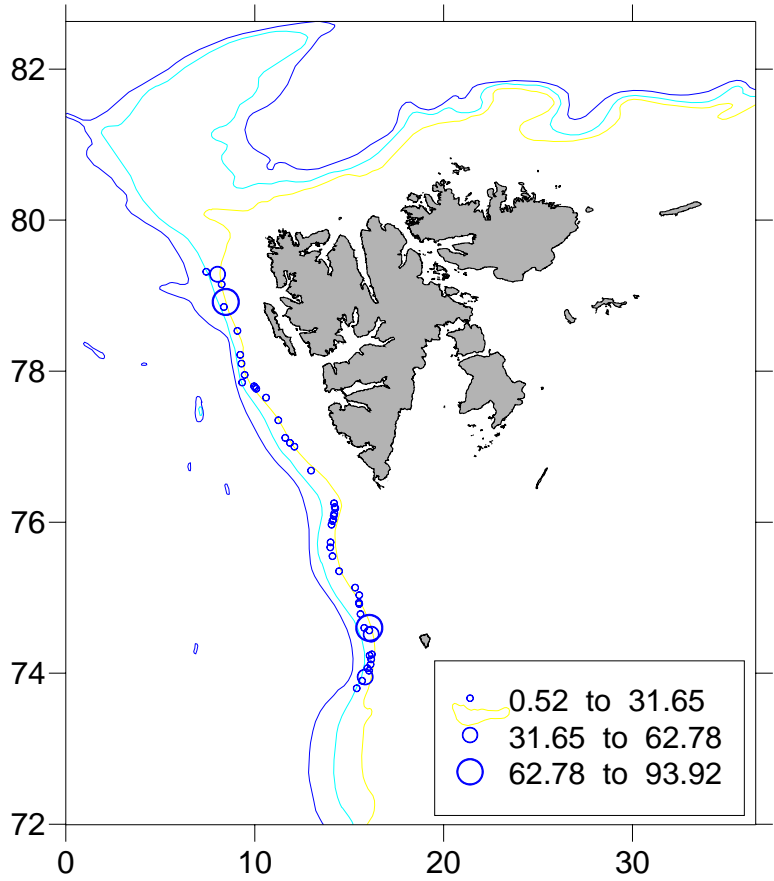




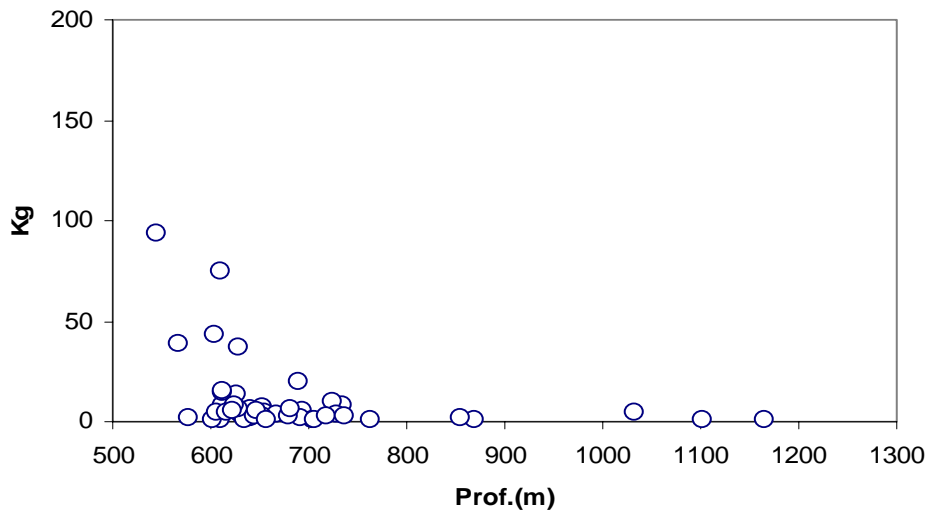
**Figure7.** Distribution of the **wolffish** catches (Kg).



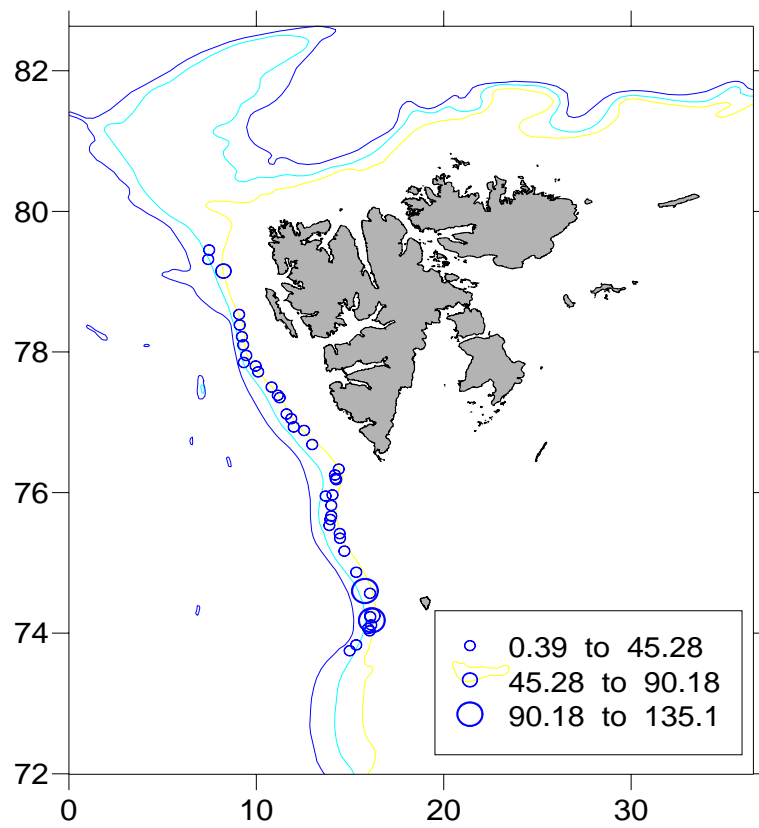
**Figure8.** Distribution of the **wolffish** catches in relation to depth



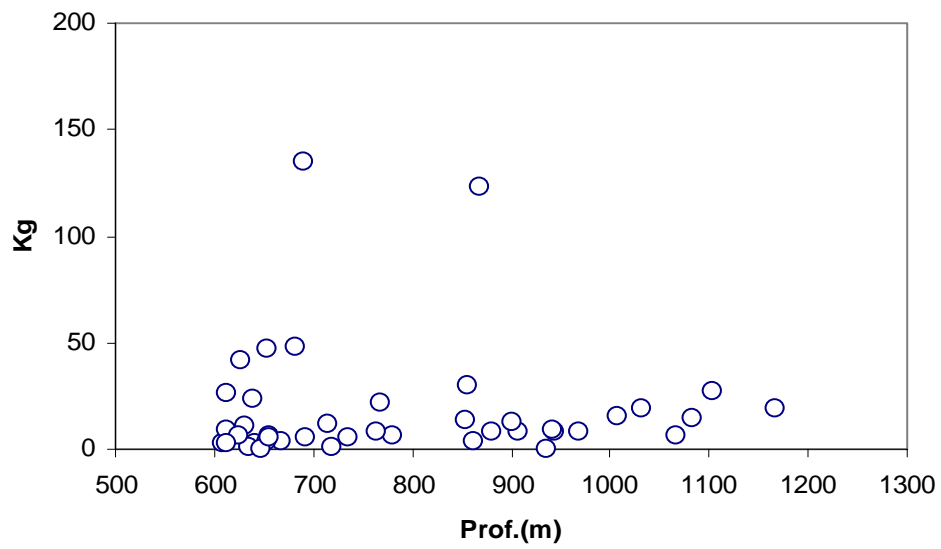
**Figure9.** Distribution of the **redfish** catches (Kg).



**Figure10.** Distribution of the **redfish** catches in relation to depth



**Figure11.** Distribution of the **thorny skate** catches (Kg)



**Figure12.** . Distribution of the **thorny skate** catches in relation to depth.