SPANISH BOTTOM TRAWL SURVEY *"FLETÁN ÁRTICO 2005"* IN THE SLOPE OF SVALBARD AREA, ICES DIVISION IIb.

Xabier Paz

Centro Oceanográfico de Vigo

The *"Fletán Ártico 2005"* survey was the ninth survey of the series of Spanish survey intended to obtain biomass and abundance indices and to determine the structure of the population's adult fraction of Greenland halibut *(Reinhardtius hippoglossoides*) and other species (redfish, cod,…) in the Svalbard Archipelago protection area, ICES Division IIb. The purposes and characteristic of the Survey they went identical to those of the last years.

The Survey was conduced by the same hired factory trawler between 536 to 1436 meters covering an area in the Protection Svalbard, between 73º 30 – 80º N (Table 1 , Figure 1).

The total catches were 144,5 Tm corresponding to the 144 valid hauls plus an amount non weighted and sampling to study the daily cycle of feeding of the halibut. This quantity could be approximately 15 Tm.

The objectives of the survey were:

1. To define the distribution and relative abundance of commercially important groundfish species, in particular of: Greenland halibut (*Reinhardtius hippoglossoides*), redfish (*Sebastes mentella*), cod (*Gadus morhua*), long rough dab (*Hippoglossoides platessoides*) and roughead grenadier (*Macrourus berglax*) inhabiting depths from 500 m to 1464 m.
2. To obtain biological data from groundfish species including length, weight and sex.
3. To collect age structures from Greenland halibut, cod and long rough dab.
4. To collect special project samples or information.

Charter Vessel and Gear Specifications

The characteristics of the vessel are described in the Table 1. An experienced captain, a crewmembers staffed and six scientist participated in the survey.

The vessel used a type of gear "Pedreira" (Table 2 an Figures 2, 3 and 4) with two panel bottom trawl with a small-mesh (40 mm stretched measure or less) liner in the codend in order to retain small organisms. The "*Pedreira*" trawls were fitted with 18" rubber discs footropes and spread with steel "TYBURON 125" doors (weight doors: 2000 Kg/u). A Furuno and Scanmar trawl instrumentation system was employed to monitor trawl performance and ensure that the gear's haul-to-haul catching performance (sampling efficiency) was kept as constant as possible.

Survey Design and Methods

As in previous years, the Survey was developed in a depth range of between 500 and 1464 meters on the west slope of the Svalbard archipelago, covering an area between 73º 30 – 80º N (Figure 1). The Survey took place from 4th to 28th October, with 22 effective fishing days using the same gear as the previous year to carry out 144 valid hauls. The position of the hauls can be seen in the Figure 5.

At the end of the survey It was carried out a continuous sampling for the study of the daily cycle of the feeding of the Greenland halibut.

The Table 3 shows the surface area for each stratum surveyed, the latitude and depth range limits, as well as the number of valid hauls made in each.

The West slope survey was designed primarily to assess the distribution and abundance of Greenland halibut. The duration of each haul was 30 minutes long from the time the net was properly configured on the bottom until haul back. Captain was instructed to attempt to maintain a constant speed. Mean speed value was 3.05 ± 0.14 knots. Bottom contact sensors, placed on the footrope of the net, verified that the trawl was on the bottom and monitored the duration of the tow. Acoustic instruments attached to the net recorded various aspects of their mechanical performance while other data on

operational conditions (e.g. depth, amount of towing cable deployed, towing speed, tow duration,) were recorded.

Catches were sorted to species or other appropriate taxon and weighed. In the Figures 6 and 7 can see the distribution of the catches of the Greenland halibut and cod in the Spanish bottom trawl survey. Samples were taken of the principal species for length-frequency determinations or acquisition of other biological data. Also, in this survey, ovarian samples and stomach content data were taken of the Greenland halibut for their study in the laboratory.

Results

The mean of hauls per day was 7,2 at mean speed values of 3.05 knots at mean depth of 758 m.. The catches of the main species are shows in the Table 4.

Biological information was gathered from 9 different fish species. In the Table 5 and 6 is shown a summary of biological data of the main species carried out during the survey, the length samples from 6 different fish species and age structures collected.

The length composition by sex of Greenland halibut is shown in the Table 7 and figure 8. As previous years the presence of males was higher than the females.

Total catch and the corresponding total yield for the 144 valid hauls of the principal species as well as their biomass and abundance estimate according to the method used in the area covered are shown in the Table 8. The presence of different species other than Greenland halibut in the catches was very limited, accounting for 3.6 % of the total. Only the Blue whiting catches attained 2100 kg, almost half of the catch of the previous year, followed by the redfish 713.8 kg and Arctic skate (*Raja hyperborea*) with 613.3 Kg (Table 8). The catches show a slow decreasing for Greenland halibut.

The presence of invertebrates in the catches was residual: 0,4 % of the total catches.

The abundance and biomass estimates by strata for Greenland halibut can see in the Table 9 and figure 10. The biomass value estimated for this specie was very high compared with the others species presents in the area.

The densest concentrations of Greenland halibut were detected between 600 and 875 meters and a relative decreasing in the stratum 2. Higher concentration was noted from 73º 30º N y 76º 30º N. In deeper strata (3 and 6 see figure 1) the catches were very scarce: 76,5 Kg by haul In the stratum 3 and 53,8 Kg by haul in the stratum 6 (figure 6).

Regarding the previous years the total yield diminished lightly: 66.5 Kg/h. The present year values was 2008 Kg/h.

In this period the sex ratio for Greenland halibut indicates a very high proportion of males throughout the zone, 2,5 times more abundant than the females, similar value than last year (2,7 times). Sampling length and weight data collected during this survey were used to produce relationship and length-weight plots for Greenland halibut (Figure 9). The parameter values were obtained by sex.

The population's structure was similar to that of previous years. The length range for both sexes was from 20 to 98 (Table 5), in the last year range values were: 25 to 90 cm even though the length of most of he individuals (62,7%) was between 40 and 52 cm. but with a relative decreasing. Ages by sex were similar to the previous year. The most abundant ages by sex were: 5, 6 and 7 years old for the males and 4, 5, 6 and 11 years old for the females[1]. The individuals below 35 cm were very scarce 4,3 % (3.7% last year), but the contribution of the individuals larger than 62 cm was bigger than previous year: 7.1%. This general pattern of the length distribution indicates a relative increasing of spawning biomass and the absence of recruits, this due probably to the great depth range surveyed.

The catches of Greenland halibut (as much in number as in weight) as well as the abundance and biomass estimated were similar to those last year (Table 10 and figure 10). The situation seems confirms the light improvement of the resource observed in the last two years. This situation could be due to the changes in the distribution of the species. The relatively high value of the fishing mortality in the period could be the reason of the low level of biomass.

November, 2005

[1] Applying the age-length key of the previous year.

Table 1.- Characteristics of the vessel, date and hauls performed in the Spanish bottom trawl survey in ICES IIb (2005).

Vessel:	Garoya Segundo (EHIM)
Total length (m):	68.2 m
Breadth:	13 m
Building year:	1989
Principal engine:	Echavarria WARTD 6R32E, 1950 CV
Maximun speed:	13 Knots
Hold capacity:	800 Tm
Freezing capacity:	25 Tm/day
Gear:	*Pedreira*
Date:	4th to 28th October
Valid hauls:	144
Void hauls:	0

Table 2.- Description of the gear "*Pedreira*", used in the Spanish bottom trawl survey in ICES IIb (2005).

Bottom trawl "Pedreira" type

Float rope: 43.50 m

Ground rope: 34.50 m

Vertical opening of trawl: 3 m

NET:

- Bag of coral (23 m) with 140 mm mesh size
- Codend of nylon with 40 mm mesh size

GROUND GEAR:

- Central section (6.33 m): with rubber discs of 18"
- Lateral sections (7.0 m): with rubber half spheres of 18" and stried spacers
- Lateral extensions (6.0 m): with rubber spacers

DOORS:

- Type of doors: TIBURON 125
- Weight of doors: 2000 kg/u

FLOATS:

- Number of floats: 56
- Float diameter: 250 mm

LEGS: 12 m

BRIDLES:

- Length of bridles: 175 m (28 mm)

Table 3.- Stratum characteristics and hauls performed. Spanish bottom trawl survey, *Fletán Ártico 2005*. Svalbard Area. ICES Division II b

Strata	Latitude	Depth (m)	Surface (Square nautical miles)	Valid hauls
1	76º00'- 81º00' N	500-699	702	37
2	76º00'- 81º00' N	700-999	1263	201
3	76º00'- 81º00' N	1000-1500	2693	9
4	73º30'- 76º00' N	500-699	488	39
5	73º30'- 76º00' N	700-999	761	28
6	73º30'- 76º00' N	1000-1500	1672	11
Total	***73º30'a 81º00' N***	***500-1500***	***7579***	***144***

Table 4.- Catches (kg) of the main species. Spanish Survey "*Fletán Ártico 2005"*. Svalbard Area. ICES Division II b.

SPECIE Common name	**Scientific name**	**Total Catch (kg)**
Greenland halibut	*Reinhardtius hippoglossoides*	144573
Blue Whiting	*Micromesistius poutasou*	2100
Cod	*Gadus morhua*	476
Northern wolffish	*Anarhichas denticulatus*	631.6
Redfish	*Sebastes mentella*	713.8
Arctic Skate	*Amblyraja hyperborea*	613.3
Long rough dab	*Hippoglossoides platessoides*	88.9
Greater eelpout	*Lycodes esmarkii*	185.5
Roughead grenadier	*Macrourus berglax*	232.4
Thorny skate	*Amblyraja radiata*	112.3

Table 5.- Summary of length samples of the main species during Spanish Survey (2005).

Specie	Length Samples				
	Nº samples	Males	Females	Total	Range (cm)
Greenland halibut (*Reinhardtius hippoglossoides*)	139	17560	9004	26564	20-98
Cod (*Gadus morhua*)	50		147	147	11-104
Redfish (*Sebastes mentella*)	92	599	737	1336	24-44
Long rough dab (*Hippoglossoides platessoides*)	67	300	107	407	11-43
Blue Whiting (*Micromesistius poutassou*)	71	1006	4300	5306	19-39
Arctic hyperborea (*Amblyraja hyperborea*)	67	232	145	399	11-87
Spinytail skate (Bathyr*aja spinicauda*)	11	12	8	20	26-62
Roughead grenadier (*Macrourus berglax*)	92	109	176	285	4-33.5
Northern wolffish (*Anarhichas denticulatus*)	21	31	22	53	51-124
TOTAL:	**642**			**34517**	

Table 6.- Summary of biological samples and age structures of the main species during Spanish Survey (2005).

Specie	Biological Samples				
	Nº samples	Males	Females	TOTAL	Range (cm)
Greenland halibut (*Reinhardtius hippoglossoides*)	104	435	739	1174	27-104
Otoliths	424			424	
Gonads	332			332	
Stomachs		429	604	1033	
Cod (*Gadus morhua*)	53	81	63	144	11-104
Otoliths:	116			116	
Stomachs					
Redfish (*Sebastes mentella*)	78	194	178	372	24-44
Stomachs					
Long rough dab (*Hippoglossoides platessoides*)	64	237	88	325	11-43
Stomachs		106	57	163	
Roughead grenadier (*Macrourus berglax*)	68	97	164	261	4-33.5
Stomachs					
Blue Whiting (*Micromesistius poutassou*)	26	124	229	353	19-37
Arctic Skate (*Amblyraja hyperborea*)	42	197	105	302	15-87
Stomachs		128	82	210	
Thorny Skate (*Amblyraja radiata*)	51	113	102	215	10-54
Stomach		32	47	79	

Table 7.- Length composition by sex of Greenland halibut (*Reinhardtius hippoglossoides*) in the Spanish bottom trawl survey "*Fletán Ártico 2005*".

Length (cm)	Males	Females	TOTAL	Length (cm)	Males	Females	TOTAL
20	0	2329	0	60	537261	2276633	2659618
21	2329	0	2329	61	399523	2122357	3110694
22	0	0	0	62	364166	2711171	3172086
23	0	0	0	63	109503	2807920	2638162
24	0	0	0	64	67090	2528659	2494511
25	11669	0	11669	65	95184	2427421	2394324
26	0	0	17470	66	42921	2299140	2247305
27	28620	17470	102697	67	24328	2204384	1853896
28	61622	74077	148863	68	30035	1829568	1257122
29	124120	87241	378262	69	0	1227087	1059987
30	169735	254142	707302	70	38138	1059987	976059
31	640450	537567	1587569	71	2718	937921	775835
32	1070209	947119	2273738	72	0	773117	611828
33	1543453	1203529	3741502	73	8075	611828	539007
34	2134366	2198049	4497616	74	3272	530932	432900
35	2450048	2363250	4988674	75	0	429628	356137
36	3233399	2538626	5561651	76	0	356137	222043
37	4217492	2328252	7466246	77	0	222043	192016
38	5187497	3248754	8062201	78	0	192016	92918
39	6262438	2874704	9549199	79	0	92918	173637
40	9283847	3286761	12340991	80	0	173637	83023
41	10896078	3057144	14361670	81	0	83023	94824
42	12571441	3465592	15355090	82	0	94824	47204
43	13160137	2783649	16210058	83	0	47204	95183
44	15581714	3049921	17923068	84	0	95183	120617
45	15214411	2341354	17528833	85	0	120617	87084
46	16878808	2314422	19145483	86	0	87084	48539
47	16271439	2266675	17802462	87	0	48539	71795
48	15542395	1531023	17060380	88	0	71795	22085
49	12760483	1517985	14641805	89	0	22085	43576
50	11368764	1881322	12897798	90	0	43576	16070
51	9107248	1529034	10685609	91	0	16070	14501
52	9136407	1578361	10592492	92	0	14501	14737
53	7340596	1456085	8913982	93	0	14737	7829
54	5904308	1573386	7193737	94	0	7829	0
55	4850660	1289429	6535606	95	0	0	0
56	4155779	1684946	5833474	96	0	0	0
57	2335191	1677695	4042592	97	0	0	4071
58	2052893	1707401	3833118	98	0	4071	0
59	1151240	1780225	3427873				
				TOTAL	***224423456***	***89033160***	***313456661***

Table 8.- Total catch (kg), yield (kg/h), biomass and abundance for the main species. Spain bottom trawl survey "*Fletán Ártico 2005*".

Common name	Scientific name	Catch (Kg)	Yield (kg/h)	Biomass (mt)	Abundance (000)
Greenland halibut	*Reinhardtius hippoglossoides*	144573	2008	317319.9	313459
Blue Whiting	*Micromesistius poutasou*	2100	29,2	3343.3	34999
Redfish	*Sebastes mentella*	713.8	9,9	1332	2491
Arctic skate	*Amblyraja hyperborea*	613.3	8,5	4442.7	3435
Cod	*Gadus morhua*	476	6,6	769.3	223
Northern wolffish	*Anarhichas denticulatus*	631.6	8,8	893.7	82
Long rough dab	*Hippoglossoides platessoides*	88.9	1,2	707	149.1
Roughead grenadier	*Macrourus berglax*	232.4	3,2	509.2	659

Table 9.- Greenland halibut (*Reinhardtius hippoglossoides*) abundance (number) and biomass (kg) estimates. Spain bottom trawl survey "*Fletán Ártico 2005*".

Strata	Area	Nº hauls	Catch (Nº)	Catch (Kg)	Steep Area	Abundance	Biomass
1	702	37	38615	39044.9	0.4211	64369	65086.4
2	1263	20	14299	13412.9	0.2284	79079	74178.4
3	2693	9	736	688.55	0.0979	20260	18945.2
4	488	39	38535	49843.5	0.4485	41929	54233.3
5	761	28	41689	40991.2	0.3210	98832	97178.5
6	1672	11	692	592.2	0.1286	8989	7698.0
TOTAL	7579	144	134566	144573.3	1.6455	313459	317319.9

Table 10.- Greenland halibut catch in weight and numbers and Biomass and abundance estimated from Spanish survey 1997-2005.

Year	Catch (Kg)	Catch (núm)	Biomass™	Abundance ('000)
1997	195055.5	211533	344013.5	379444
1998	180973.9	187259	351466.3	373149
1999	198780.7	172687	436955.9	377792
2000	169389.3	140355	340618.5	291265
2001	152681.4	129289	283510.6	249219
2002	144335	115213	256459.5	207466
2003	151952.2	132125	283644.1	256327
2004	153859	135631	320485	283965
2005	144573	134566	317319.9	313459

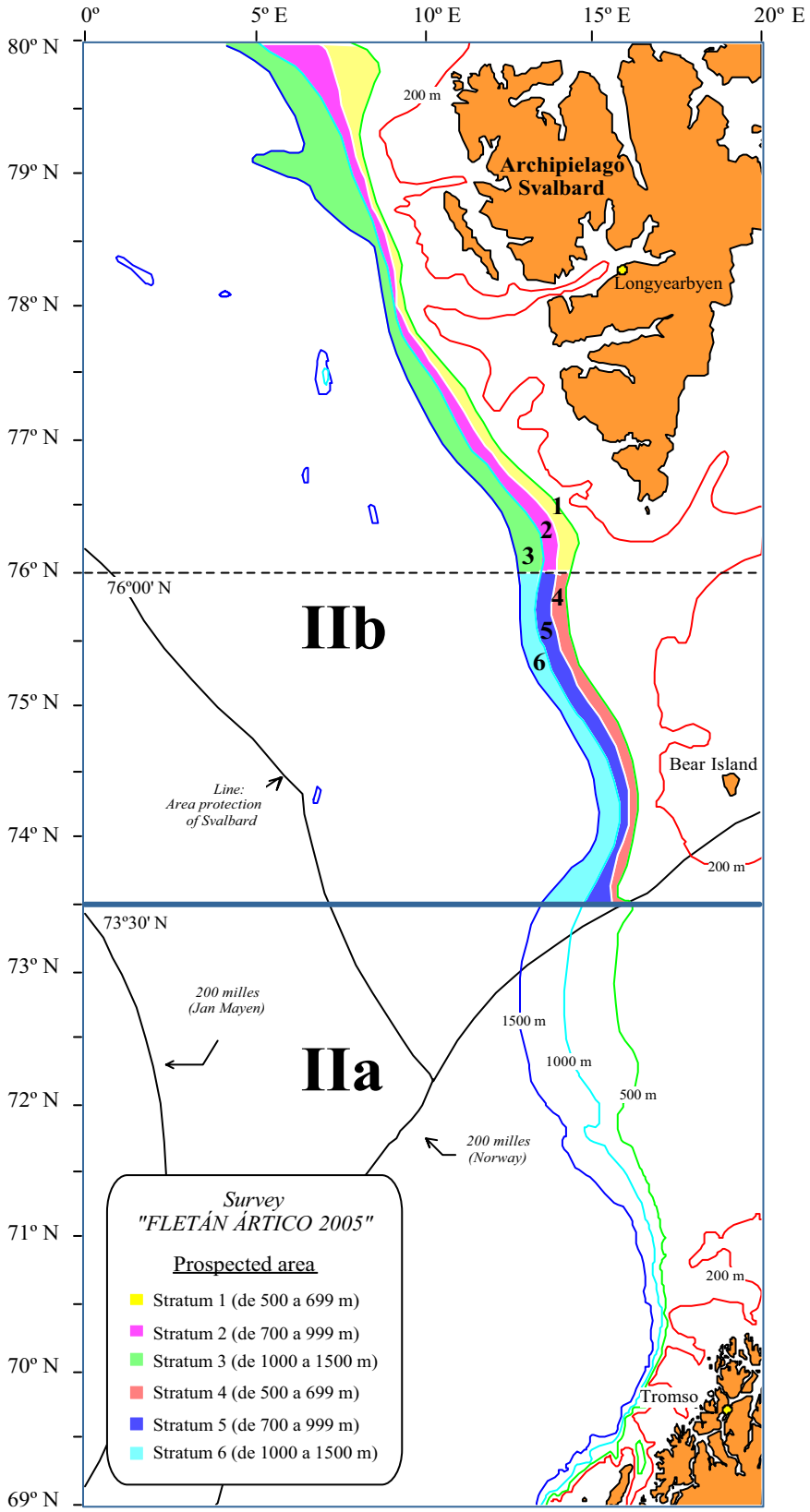

Figure 1.- Spanish bottom trawl *FLETAN ÁRTICO 2005*. Map of the area showing the six considered strata and its ranges of depth.

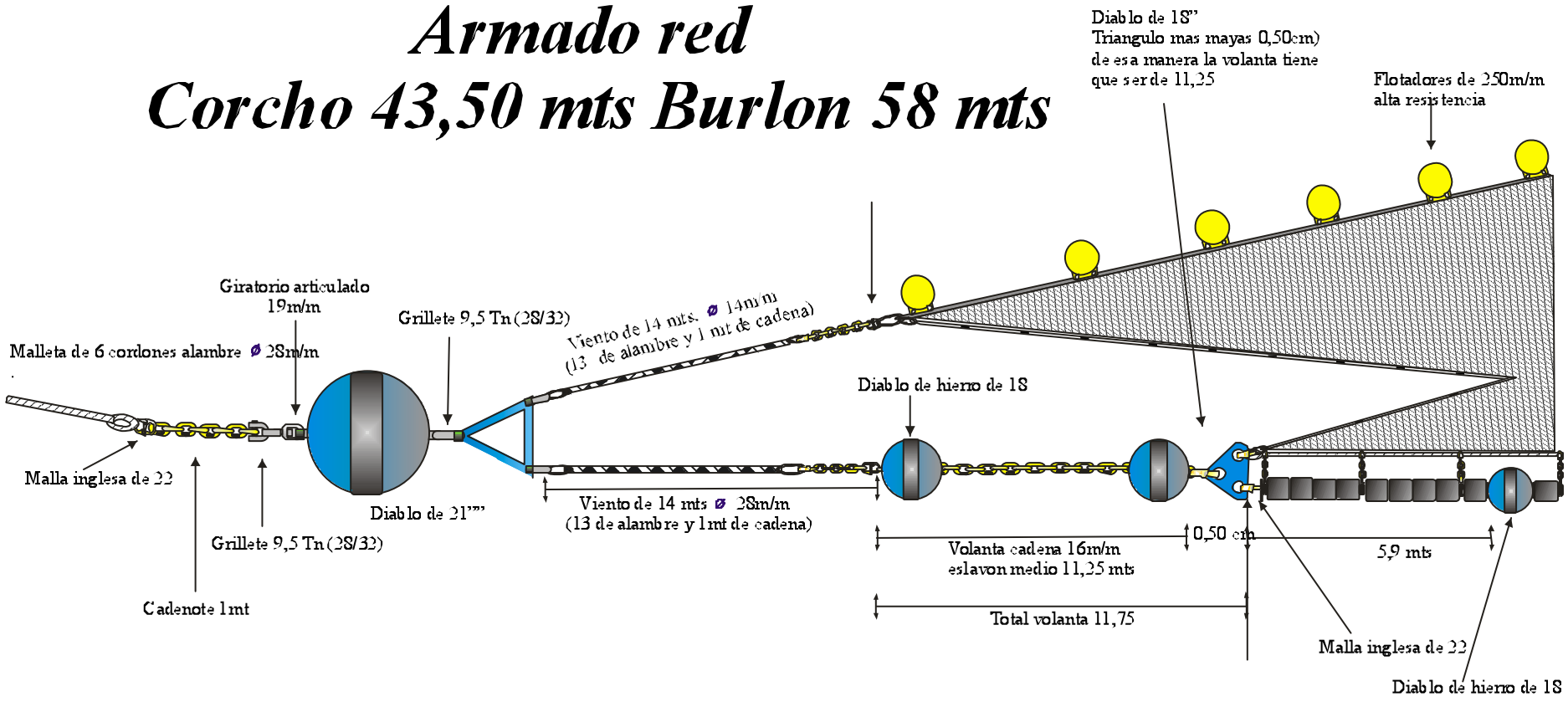

Figure 2.- Rigging profile of the Spanish "*Pedreira*" survey trawl.

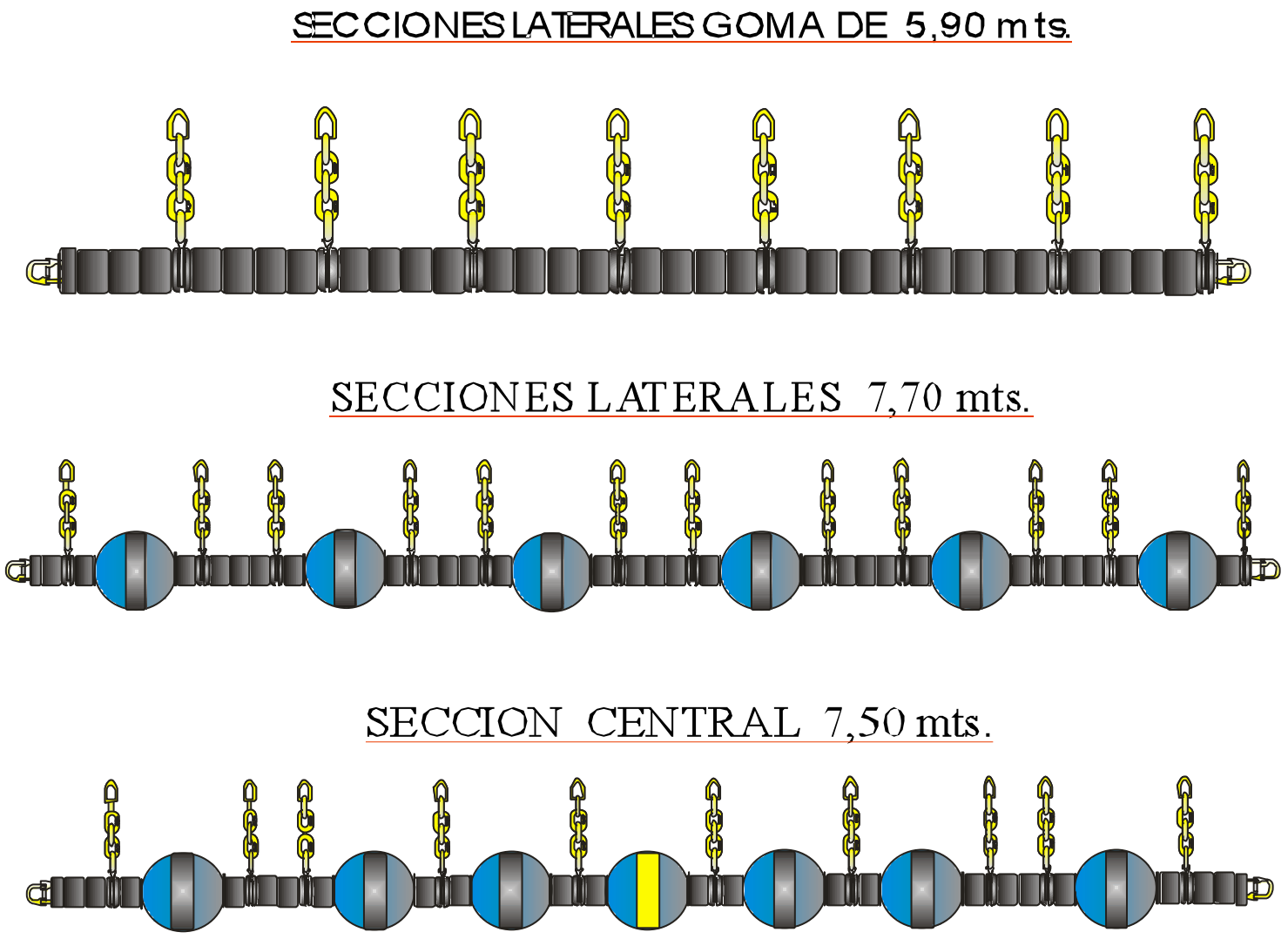

Figure 3.- Spanish "*Pedreira*" survey trawl. Detail of the groundrope.

Red Pedreira 58 mts Burlon, 43,50 mts Corcho
Montada sobre burloncillo de 34,5 mts

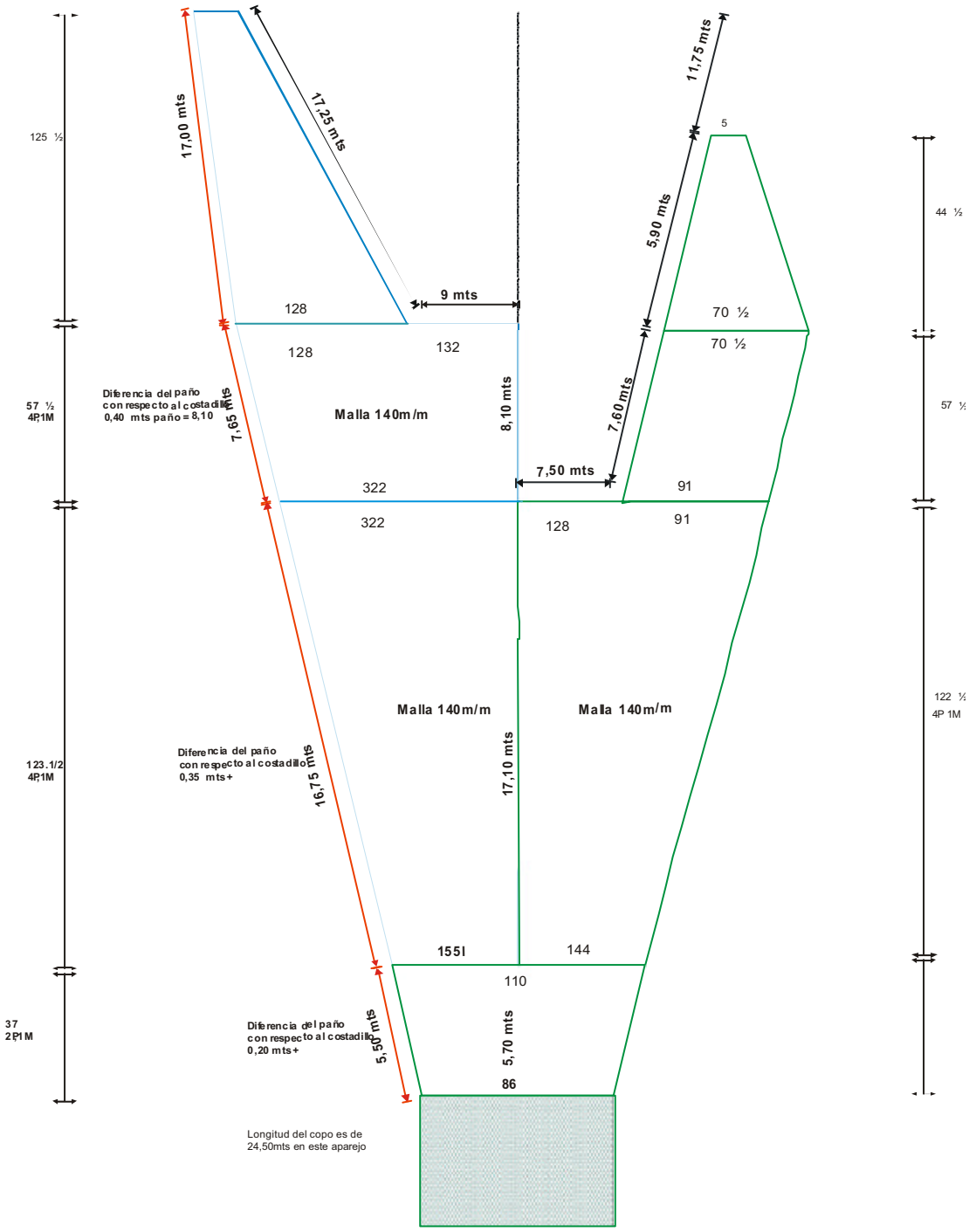

Figure 4 .- Schematic of net plan of the Spanish "Pedreira" survey trawl.

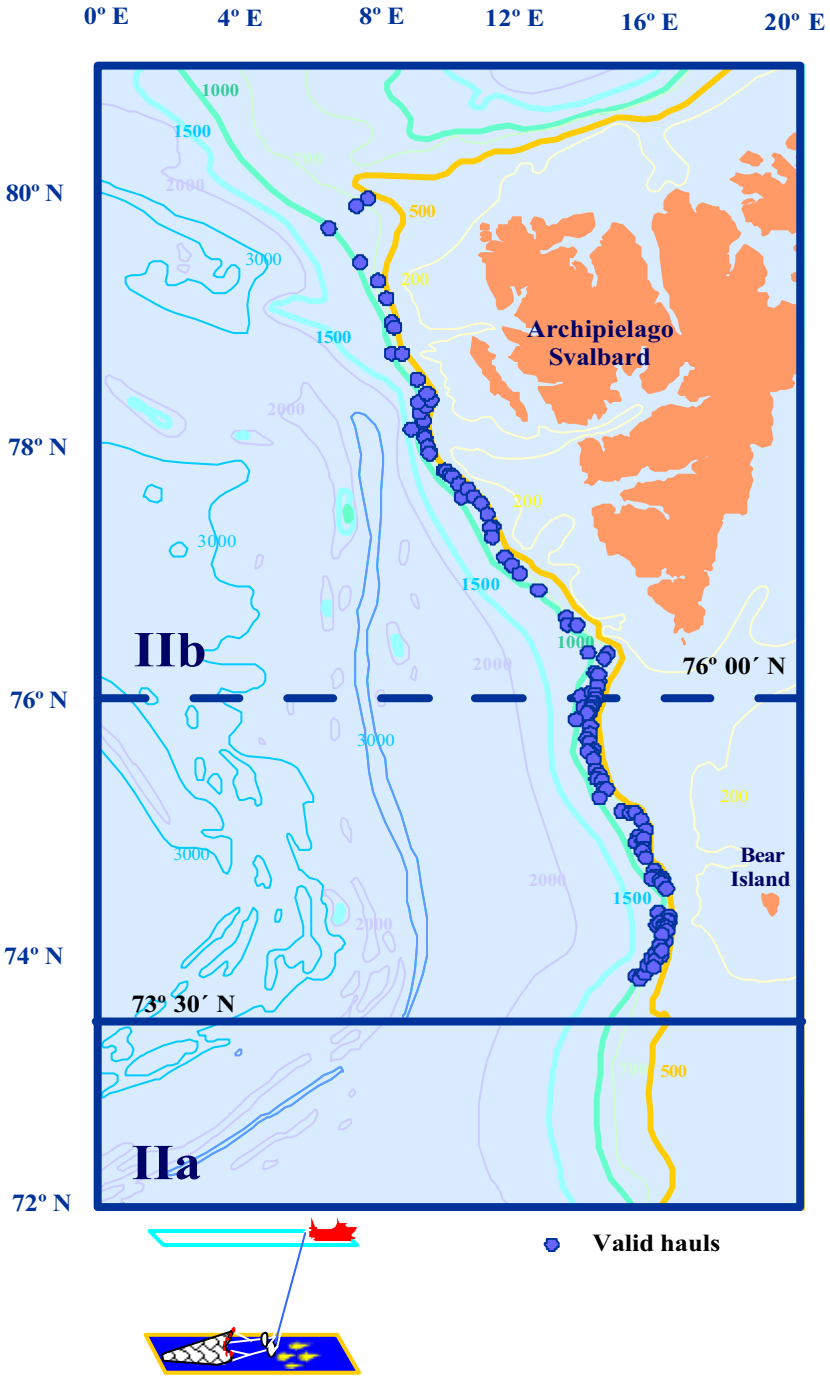

Figure 5.- Location of the valid hauls in the Spanish bottom trawl Survey in ICES División IIb (2005).

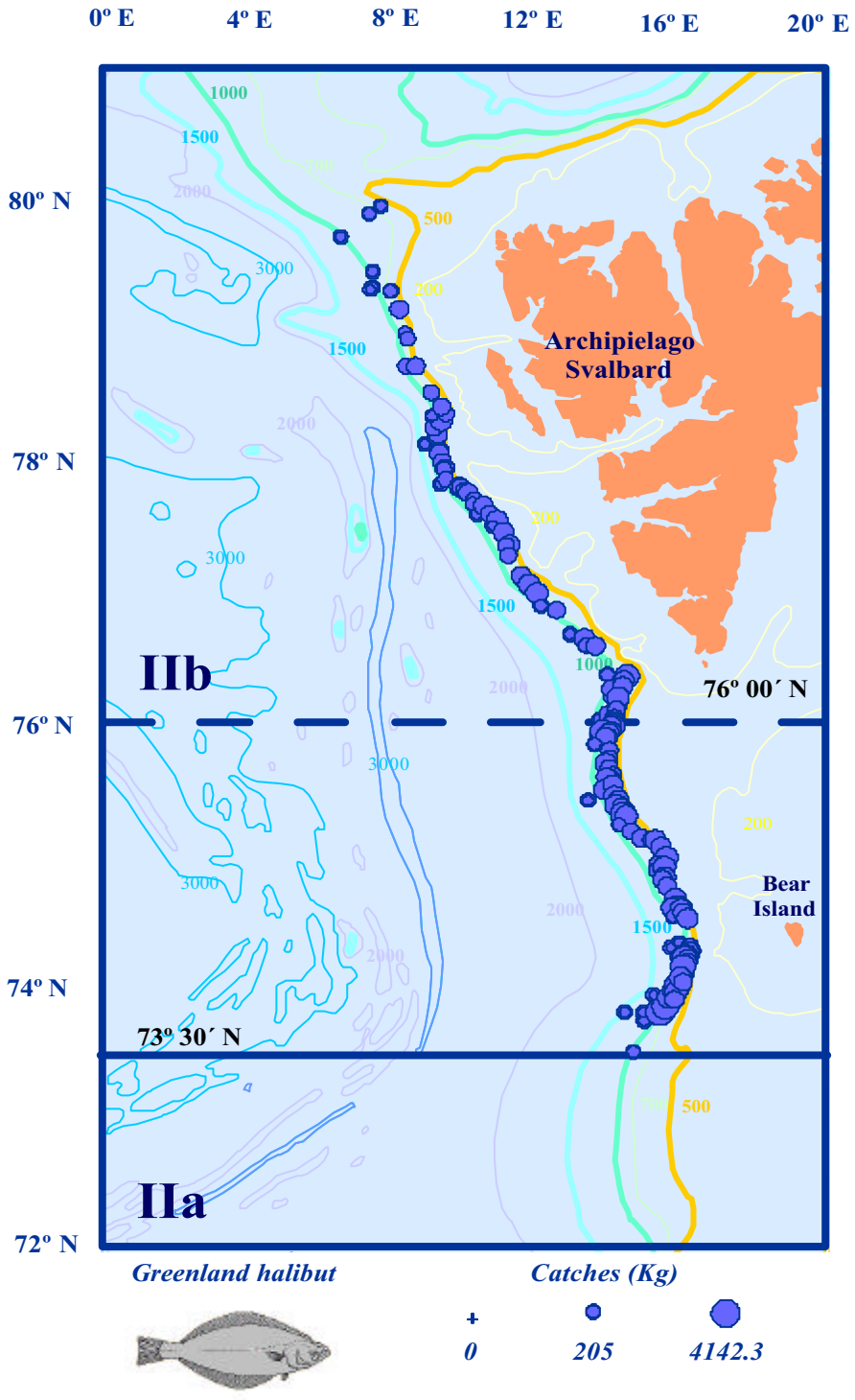

Figura 6.- Catches Distribution of Greenland halibut carried out Spanish annual research survey *Fletán Ártico 2005*. The symbols show the catches (kg) by haul (proportionally scale = square root).

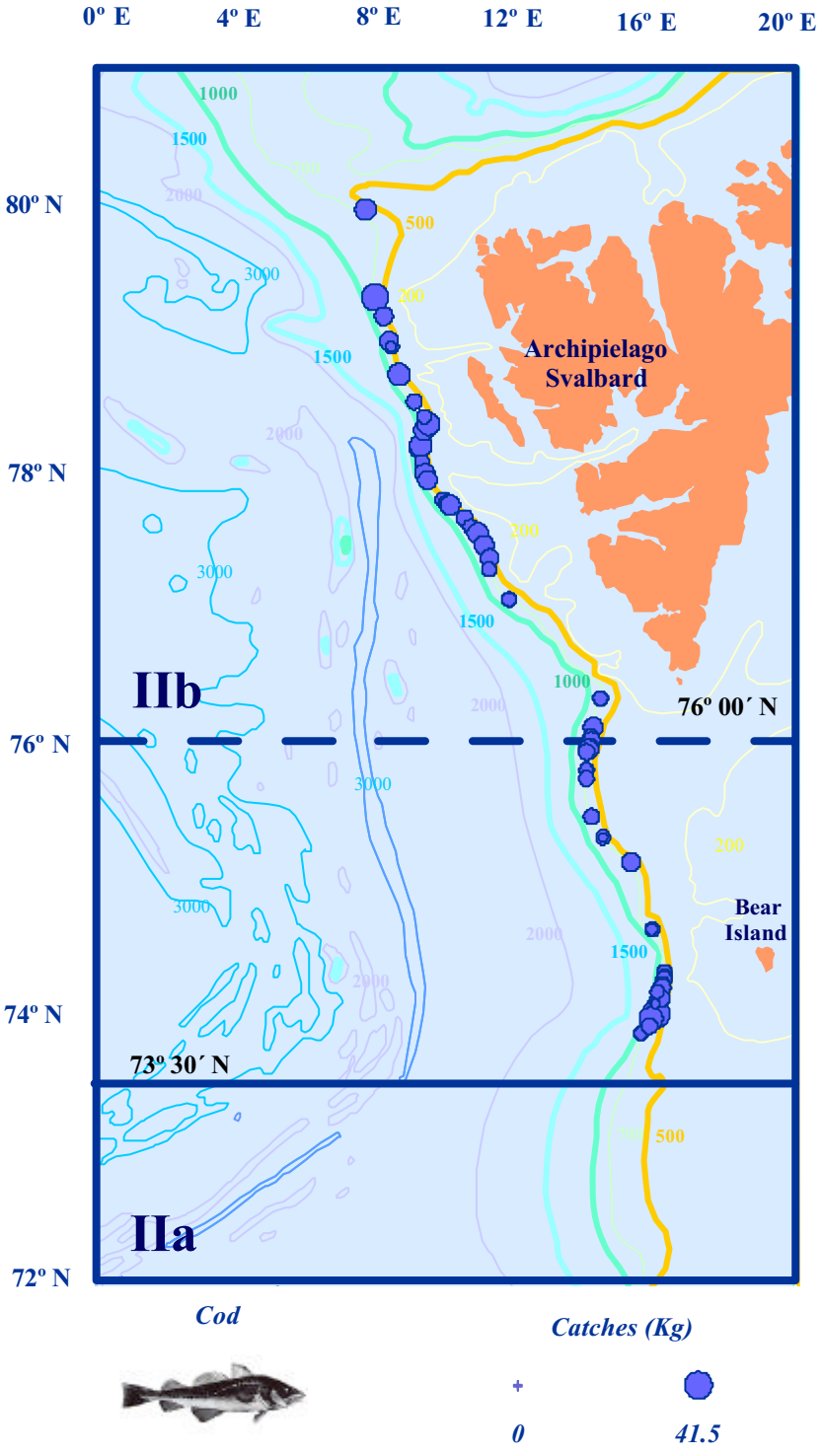

Figura 7.- Catches Distribution of Cod carried out Spanish annual research survey *Fletán Ártico 2005*. The symbols show the catches (kg) by haul (proportionally scale = square root).

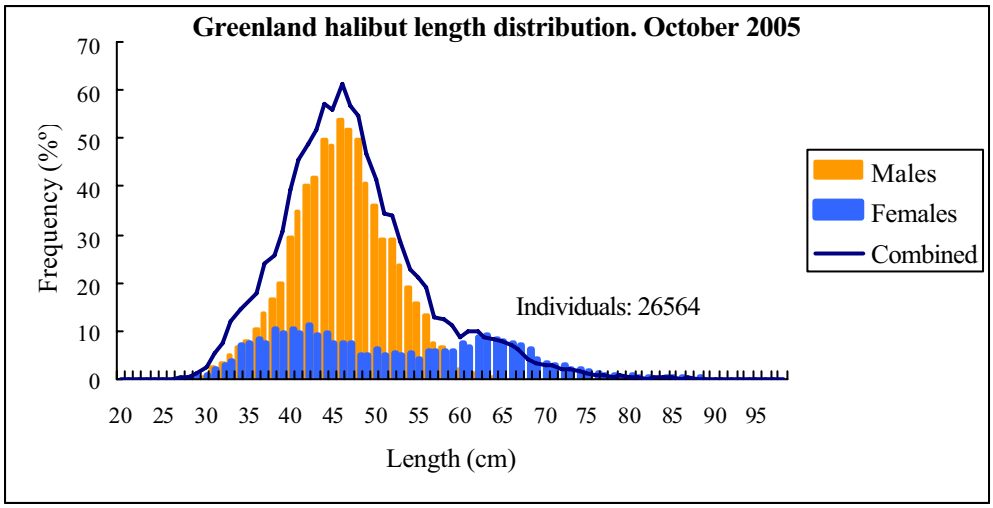

Figure 8.- Length Distribution of Greenland halibut (*Reinhardtius hippoglossoides*) as percentage from Spanish Bottom trawl survey, October 2005.

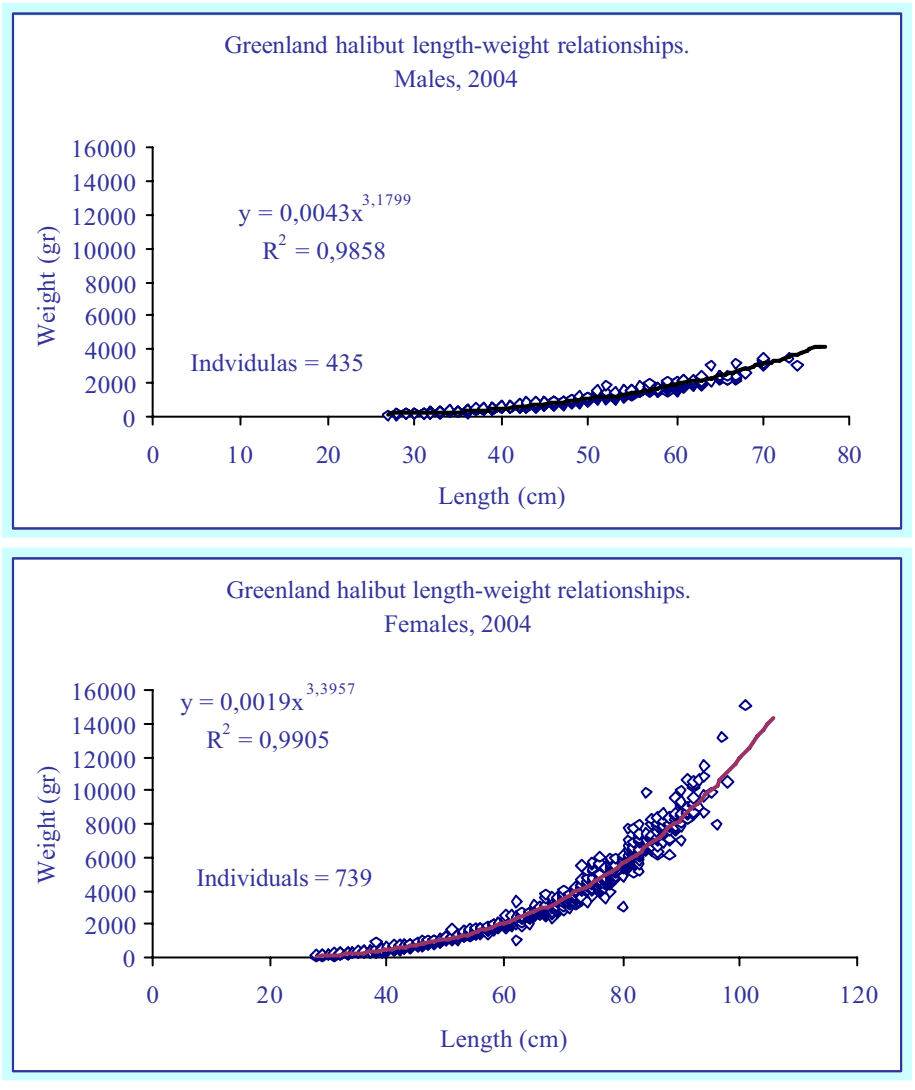

Figure 9.- Length/Weight by sex for *Reinhardtius hippoglossodies* during October for slope Svalbard. 2005

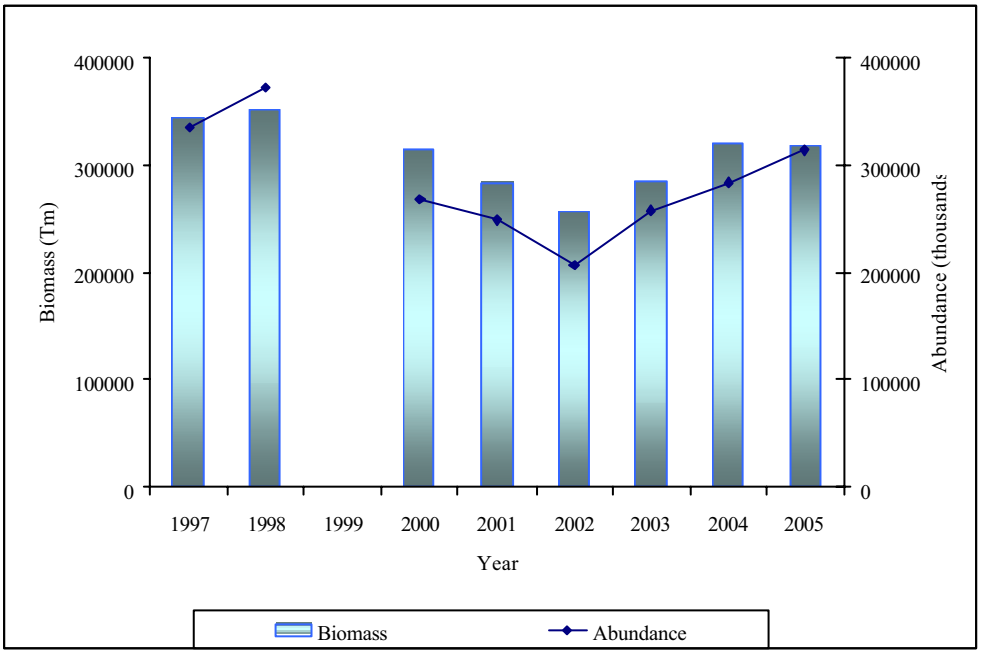

Figure 10.- Greenland halibut (*Reinhardtius hippoglossoides*) abundance and biomass estimated from Spanish Bottom trawl survey: 1997-2005.
(N) 1999 non comparable data.