

## SPANISH BOTTOM TRAWL SURVEY “FLETÁN ÁRTICO 2002” IN THE SLOPE OF SVALBARD AREA, ICES DIVISION IIb.

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The “Fletán Ártico 2002” survey was the sixth 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 Survey was conducted by hired factory trawler at 500-1464 meters covering an area in the Protection Svalbard, between 73° 30 – 80° N (Table 1 , Figure 1).

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 and 3) with two panel bottom trawl with a small-mesh (36 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 "TIBURON 125" doors (weight doors: 2000 Kg/u). A 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 73° 30 – 80° N (Figure 1). The Survey took place from 4<sup>th</sup> to 30<sup>th</sup> October, with 23 effective fishing days using the same gear as the previous year to carry out 155 valid hauls. The position of the hauls can be seen in the Figure 4.

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 from 3.2 to 3.4 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 5 and 6 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, using an electronic measuring board to log data. Also, in this survey, ovarian samples and feeding data were taken of the Greenland halibut for their study in the laboratory.

## **Results**

The mean of hauls per day was 7 at mean speed values of 3.2 knots at mean depth of 753 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. As previous years the presence of males was higher than the females.

Total catch and the corresponding total yield for the 155 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% of the total. Only the Blue whiting catches attained 2306,5 kg, followed by the cod 456,5 kg and redfish with 420 kg (Table 8). The catches show a decreasing for Greenland halibut.

The abundance and biomass estimates by strata for Greenland halibut can see in the Table 9. The biomass value estimated for this specie was very high (83 times the catch of the second most abundant specie) compared with the others species presents in the area.

The densest concentrations of Greenland halibut were detected between 550 and 750 meters and a higher concentration was noted to the south, the yield in the strata 4, 5 and 6 far higher than the yield in the north (1, 2 and 3) (figure 5).

In this period the sex ratio for Greenland halibut indicates a very high proportion of males throughout the zone, 2,7 times more abundant than the females. The last year the proportion was 2,6 times and 3,2 times in 2000. Sampling length and weight data collected during this survey were used to produce relationship and length-weight plots for Greenland halibut (Figure 3). The parameter values were obtained by sex.

The length range for both sexes was from 24 to 98 cm (Table 5) even though the length of most of the individuals was between 43 and 53 cm. The most abundant ages by sex were: 6 and 7 years old for the males and 10 and 11 years old for the females<sup>1</sup>. The individuals below 34 cm were very scarce, also the presence of males larger than 60 cm and females larger than 75 cm was very low: 0,9 % and 0,7% respectively. This indicates a relatively low level of spawning biomass and the absence of recruits is probably due to the depth range surveyed.

The catches of Greenland halibut (as much in number as in weight) as well as the abundance and biomass estimated were lower to those of previous years (Table 10). The situation seems confirm the decreasing tendency begun in the year 2000. This fall could be due to the changes in the distribution of the species, however the increase of the effort directed to this species could be the reason of the decrease of biomass.

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<sup>1</sup> 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 (2002).

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<b>Vessel:</b>	Garoya Segundo (EHIM)
<b>Total length (m):</b>	68.2 m
<b>Breadth:</b>	13 m
<b>Building year:</b>	1989
<b>Principal engine:</b>	Echavarria WARTD 6R32E, 1950 CV
<b>Maximun speed:</b>	13 Knots
<b>Hold capacity:</b>	800 Tm
<b>Freezing capacity:</b>	25 Tm/day
<b>Gear:</b>	<i>Pedreira (Rock hopper)</i>
<b>Date:</b>	4 <sup>th</sup> to 30 <sup>th</sup> October
<b>Valid hauls:</b>	155
<b>Void hauls:</b>	0

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**Table 2.-** Description of the gear “*Pedreira*”, used in the Spanish bottom trawl survey in ICES IIb (2002).

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**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 36 mm mesh size

**GROUND GEAR:**

Type “Rock Hopper”  
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)

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**Table 3.-** Stratum characteristics and hauls performed. Spanish bottom trawl survey, *Fletán Ártico 2002*. Svalbard Area. ICES Division II b

<b>Strata</b>	<b>Latitude</b>	<b>Depth (m)</b>	<b>Surface</b> (Square nautical miles)	<b>Valid hauls</b>
1	76°00' - 81°00' N	500-699	702	37
2	76°00' - 81°00' N	700-999	1263	28
3	76°00' - 81°00' N	1000-1500	2693	10
4	73°30' - 76°00' N	500-699	488	37
5	73°30' - 76°00' N	700-999	761	33
6	73°30' - 76°00' N	1000-1500	1672	10
<b>Total</b>	<b>73°30'a 81°00' N</b>	<b>500-1500</b>	<b>7579</b>	<b>155</b>

**Table 4.-** Catches (kg) of the main species. Spanish Survey "*Fletán Ártico 2002*". Svalbard Area. ICES Division II b.

<b>SPECIE</b>		<b>TOTAL CATCH (kg)</b>
Common name	Scientific name	
Greenland halibut	<i>Reinhardtius hippoglossoides</i>	144335.04
Blue Whiting	<i>Micromesistius poutasou</i>	2306.5
Cod	<i>Gadus morhua</i>	456.5
Northern wolffish	<i>Anarhichas denticulatus</i>	422.1
Redfish	<i>Sebastes mentella</i>	420.0
Arctic Skate	<i>Amblyraja hyperborea</i>	265.8
Long rough dab	<i>Hippoglossoides platessoides</i>	127.0
Greater eelpout	<i>Lycodes esmarkii</i>	124.9
Routhead grenadier	<i>Macrourus berglax</i>	103.4
Thorny skate	<i>Amblyraja radiata</i>	100.7

**Table 5.-** Summary of length samples of the main species during Spanish Survey (2002).

Specie	Length Samples:			TOTAL	Range (cm)
	N° samples	Males	Females		
Greenland halibut ( <i>Reinhardtius hippoglossoides</i> )	155	18311	7766	26077	24 - 98
Cod ( <i>Gadus morhua</i> )	50		141	141	10 - 98
Redfish ( <i>Sebastes mentella</i> )	92	454	569	1023	20 - 42
Long rough dab ( <i>Hippoglossoides platessoides</i> )	83	311	191	502	9 - 58
Blue Whiting ( <i>Micromesistius poutassou</i> )	99	1103	3735	4838	19 - 38
Arctic hyperborea ( <i>Amblyraja hyperborea</i> )	50	95	54	149	11 - 85
<b>TOTAL:</b>	<b>529</b>	<b>20274</b>	<b>12315</b>	<b>32730</b>	

**Table 6.-** Summary of biological samples and age structures of the main species during Spanish Survey (2002).

Specie	Biological Samples:				Range (cm)
	N° samples	Males	Females	TOTAL	
Greenland halibut ( <i>Reinhardtius hippoglossoides</i> )	103	964	1046	2010	(22 – 103)
	Otoliths	208	321	529	
	Gonads		265	265	
	Stomachs			1798	
Cod ( <i>Gadus morhua</i> )	51	111	108	219	(10 – 110)
	Otoliths:	75	67	142	
Redfish ( <i>Sebastes mentella</i> )	51	83	90	173	(20 – 43)
Long rough dab ( <i>Hippoglossoides platessoides</i> )	84	364	239	603	(9 – 43)
	Otoliths	84	83	167	
	Gonads		109	109	
	Stomachs			478	
Routhead grenadier ( <i>Macrourus berglax</i> )	76	70	89	159	(4.5-33)
Blue Whiting ( <i>Micromesistius poutassou</i> )	8	28	123	151	(11 – 85)
Arctic Skate ( <i>Amblyraja hyperborea</i> )	51	92	57	149	(11 – 85)
Thorny Skate ( <i>Amblyraja radiata</i> )	59	50	106	156	(10 – 55)
Spinytail Skate ( <i>Bathyraja spinicauda</i> )	10	6	4	10	(27-142)
<b>TOTAL:</b>	<b>493</b>	<b>1768</b>	<b>1862</b>	<b>3630</b>	-



**Table 7.-** Length composition by sex of Greenland halibut (*Reinhardtius hippoglossoides*) in the Spanish bottom trawl survey "Fletán Ártico 2002".

<b>Length</b>	<b>Males</b>	<b>Females</b>	<b>Length</b>	<b>Males</b>	<b>Females</b>
21	1		66	9	1118
22			67	20	963
23	1		68	10	799
24	14	6	69	6	628
25	0	8	70	2	485
26	5	7	71		443
27	19	12	72	2	285
28	27	42	73		217
29	104	70	74		255
30	187	73	75		124
31	251	223	76		138
32	386	257	77		153
33	494	364	78		94
34	734	520	79		60
35	889	532	80		84
36	1233	561	81		63
37	1382	662	82		43
38	1783	720	83		57
39	2755	674	84		28
40	3479	721	85		44
41	4712	729	86		13
42	6009	632	87		13
43	6770	654	88		14
44	7452	753	89		21
45	7289	628	90		9
46	6417	575	91		5
47	5866	609	92		4
48	5018	717	93		
49	4305	700	94		
50	3841	757	95		4
51	3141	854	96		
52	2623	910	97		1
53	2354	910	98		4
54	1446	1003			
55	1135	1115			
56	720	1046			
57	518	1148			
58	240	1141			
59	199	1076			
60	89	1448			
61	53	1090			
62	19	1086			
63	1				
64					
65	1				
			<b>TOTAL</b>	84009	31202
			<b>N. Spec. Sampled</b>	18311	7766
			<b>N. Samplings.</b>	155	
			<b>Total Catches</b>	144335	

**Table 8.-** Total catch (kg), yield (kg/h), biomass and abundance for the main species. Spain bottom trawl survey "Fletán Ártico 2002".

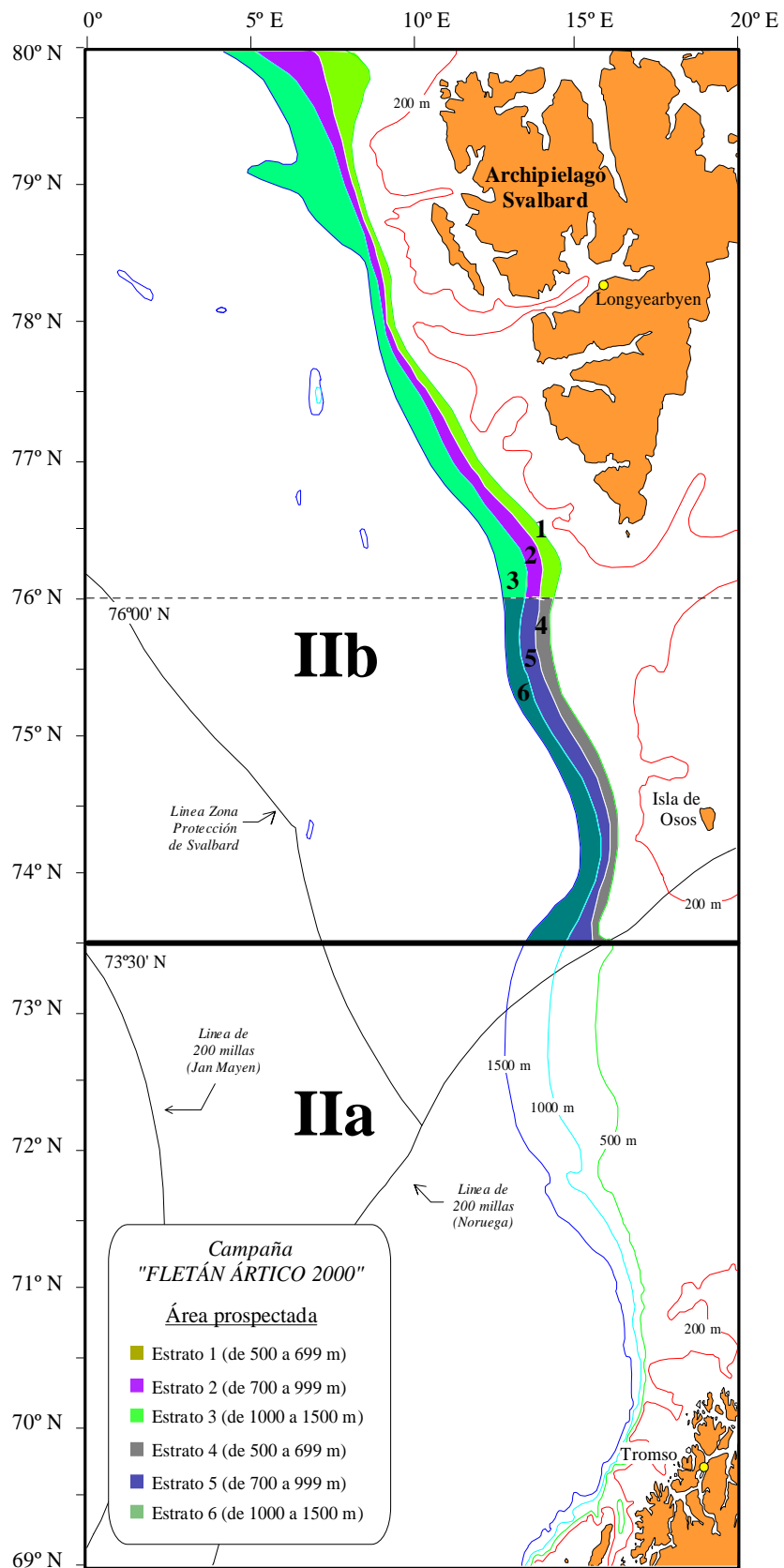
Common name	Scientific name	Catch (Kg)	Yield (kg/h)	Biomass (mt)	Abundance (000)
Greenland halibut	<i>Reinhardtius hippoglossoides</i>	144335.0	1862.4	256459.5	207466
Blue Whiting	<i>Micromesistius poutasou</i>	2306.5	29.8	3315.1	25749
Redfish	<i>Sebastes mentella</i>	420.0	5.4	650.6	1633
Arctic skate	<i>Amblyraja hyperborea</i>	265.8	3.4	1006.7	677
Cod	<i>Gadus morhua</i>	456.5	5.9	573.6	181
Long rough dab	<i>Hippoglossoides platessoides</i>	127.0	1.6	197.5	812

**Table 9.-** Greenland halibut (*Reinhardtius hippoglossoides*) abundance (number) and biomass (kg) estimates. Spain bottom trawl survey "Fletán Ártico 2002".

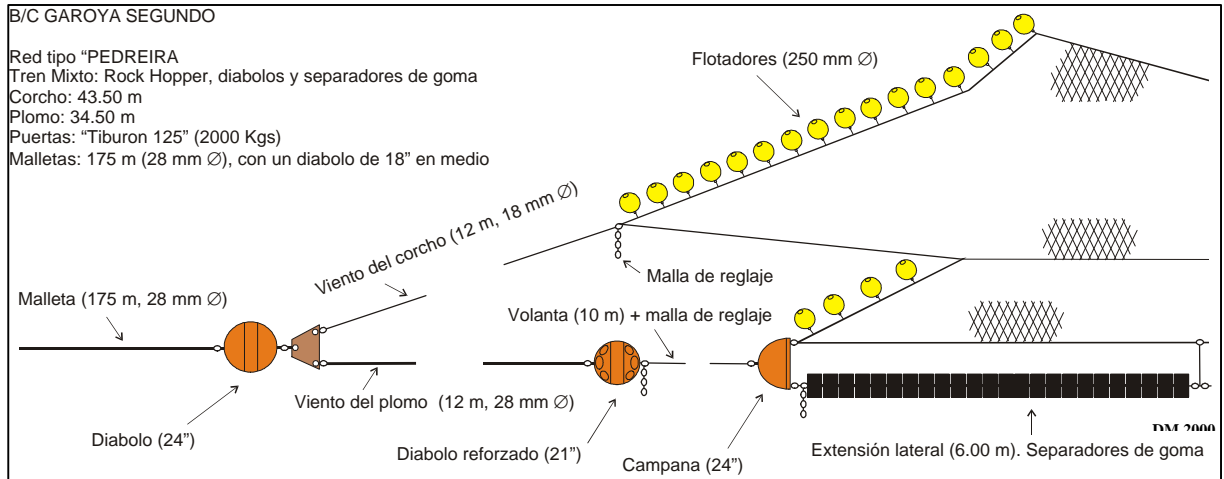
Strata	Area	N° hauls	Catch (N°)	Catch (Kg)	Steep Area	Abundance	Biomass
1	702	37	23903	28113.3	0.454875	36888891	43386730
2	1263	28	14688	17726.8	0.3375	54967121	66337646
3	2693	10	141	217.6	0.121125	3134886	4837951
4	488	37	44872	58196.5	0.451875	48458745	62849008
5	761	33	31226	39764.3	0.406125	58510834	74510640
6	1672	10	384	316.5	0.116625	5505234	4537517
TOTAL	7579	155	115213	144335.0	1.888125	207465711	256459492

**Table 10.-** Greenland halibut catch in weight and numbers and Biomass and abundance estimated from Spanish survey 1997-2002.

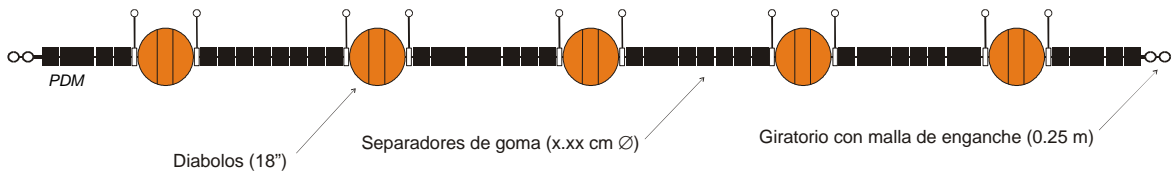
<b>Year</b>	<b>Catch (Kg)</b>	<b>Catch (número)</b>	<b>Biomass<sup>TM</sup></b>	<b>Abundance ('000)</b>
1997	195055.5	211533	344013.5	379444
1998	180973.9	187259	351466.3	373149
1999	198780.7	172687	436955.9	377792
2000	169389.3	140355	340618.5	291265
2001	152681.4	129289	283510.6	249219
2002	144335.0	115213	256459.5	207466



**Figure 1.-** Spanish bottom trawl *FLETAN ÁRTICO 2001*. Map of the area showing the six considered strata and its ranges of depth



SECCIONES LATERALES (7.00 m): Diabolos y separadores de goma



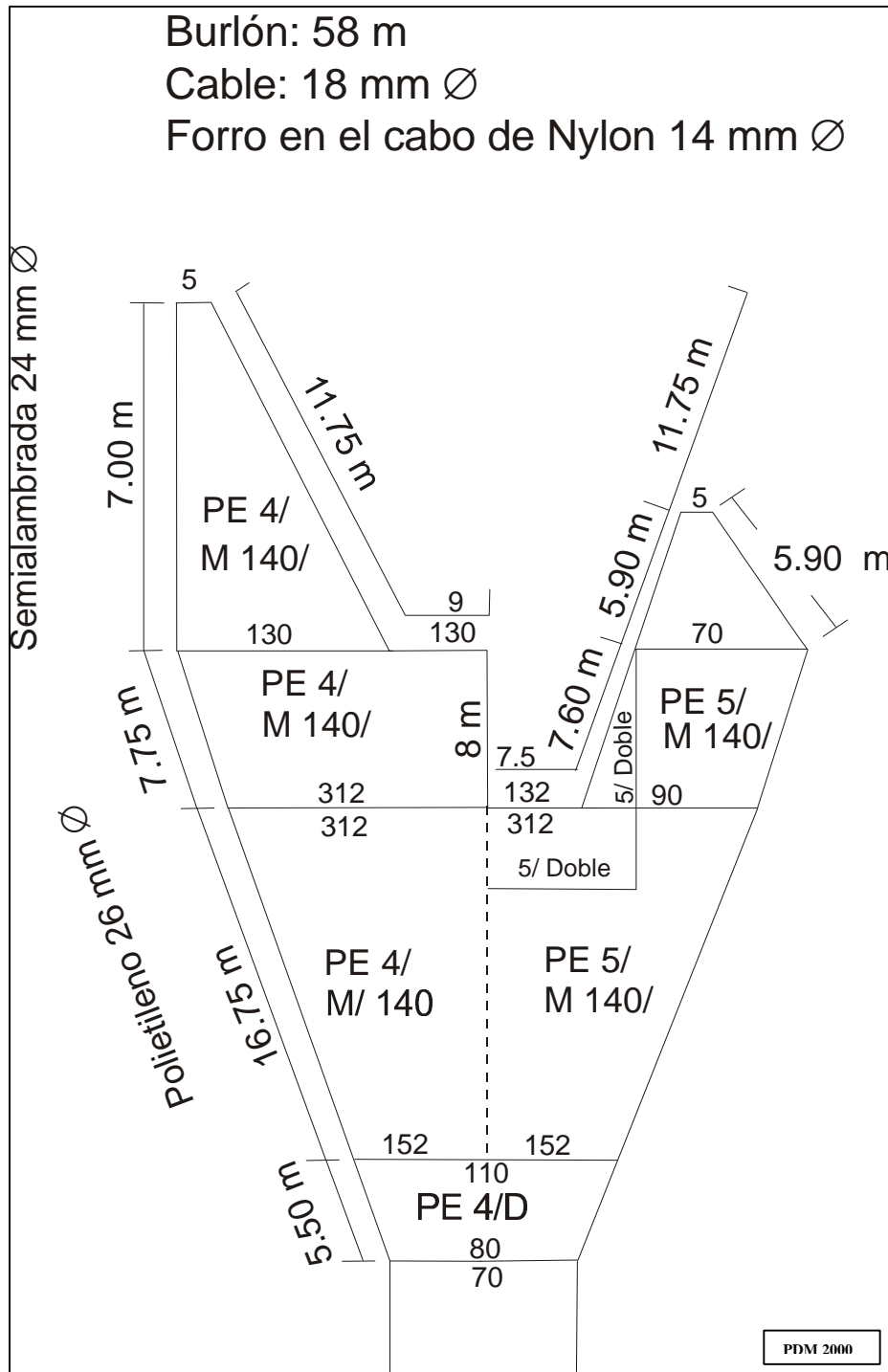
EXTENSIONES LATERALES (6.00 m): Separadores de goma



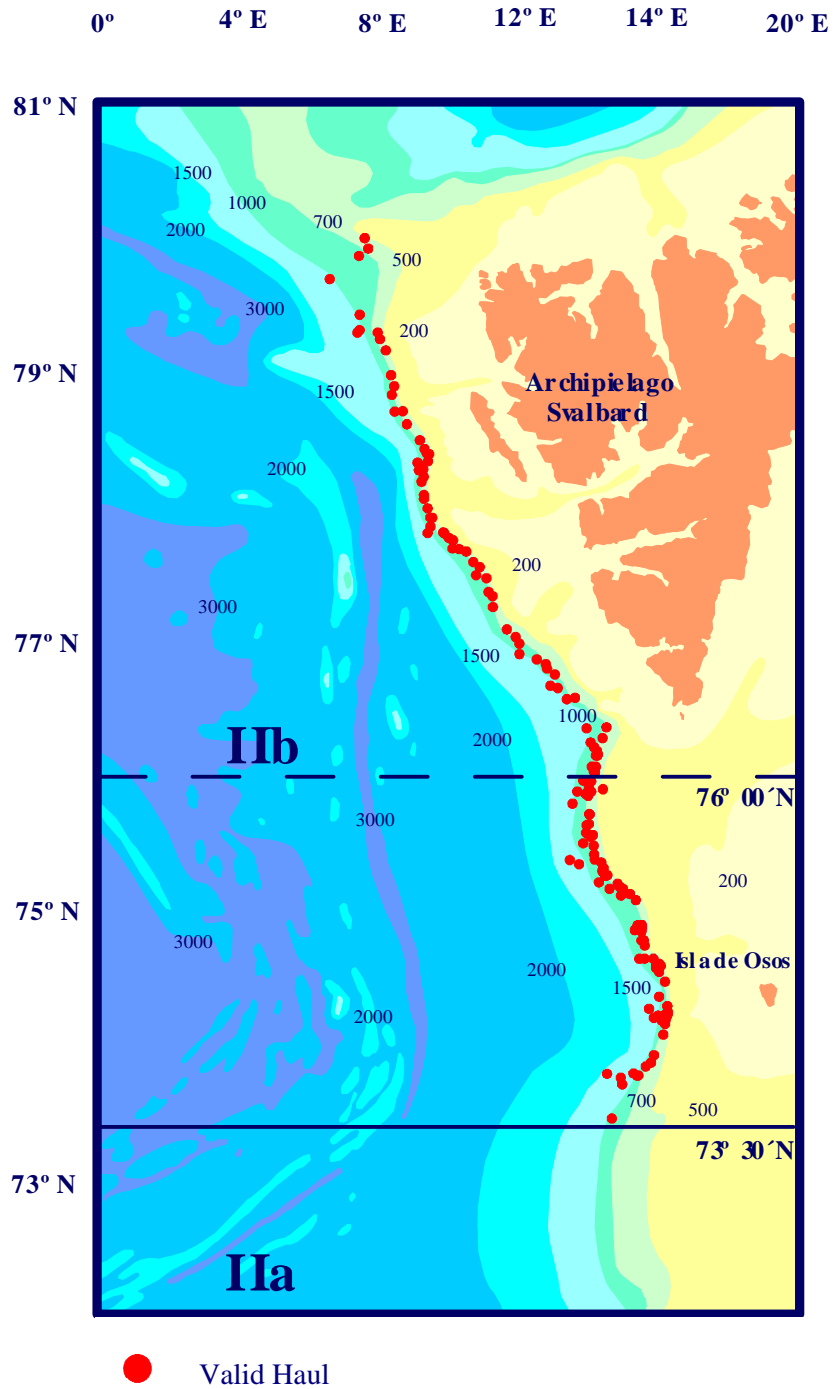
SECCION CENTRAL (6.34 m): Rock Hopper



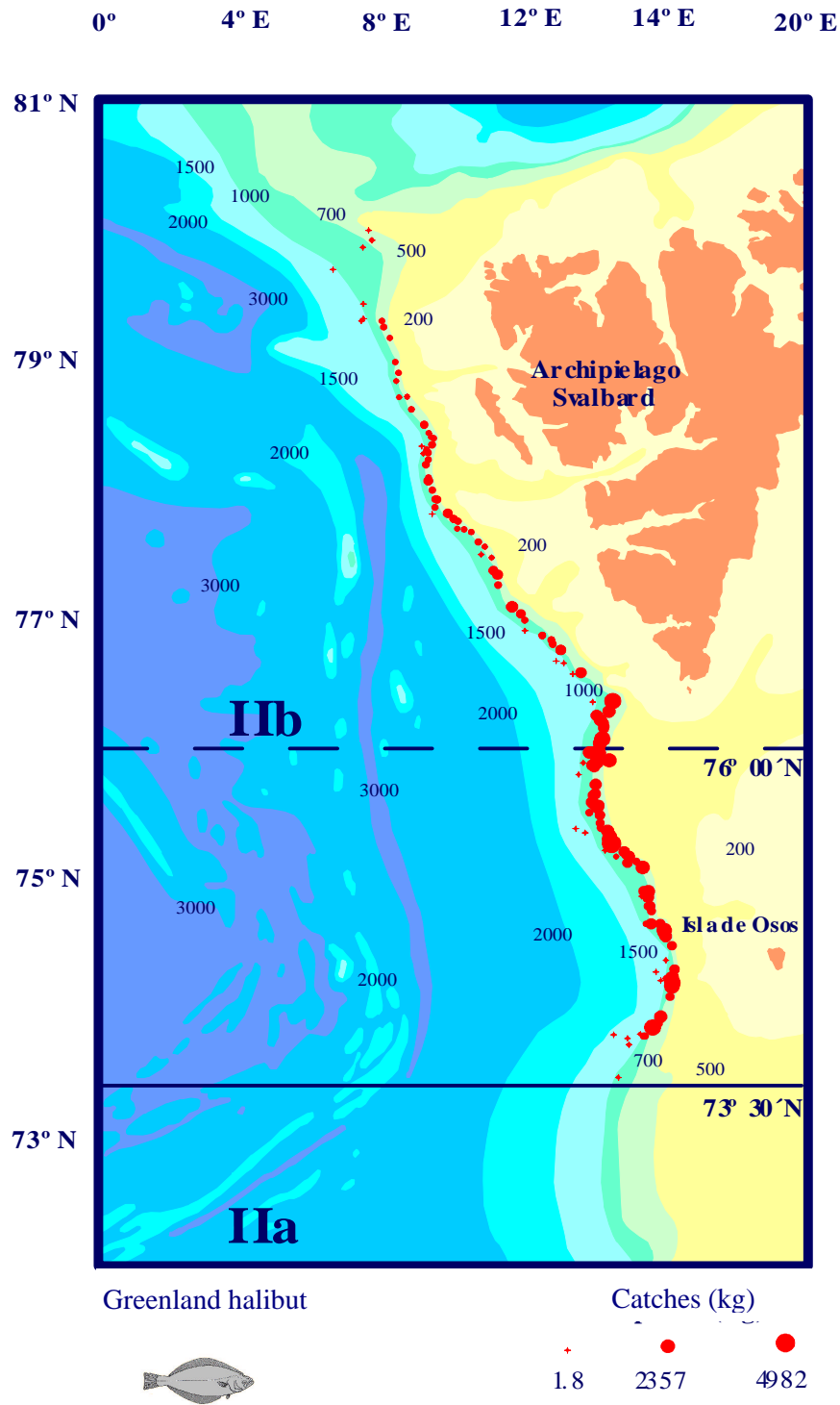
**Figure 2.-** Rigging profile of the Spanish "Pedreira" survey trawl, and detail of the groundrope.



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

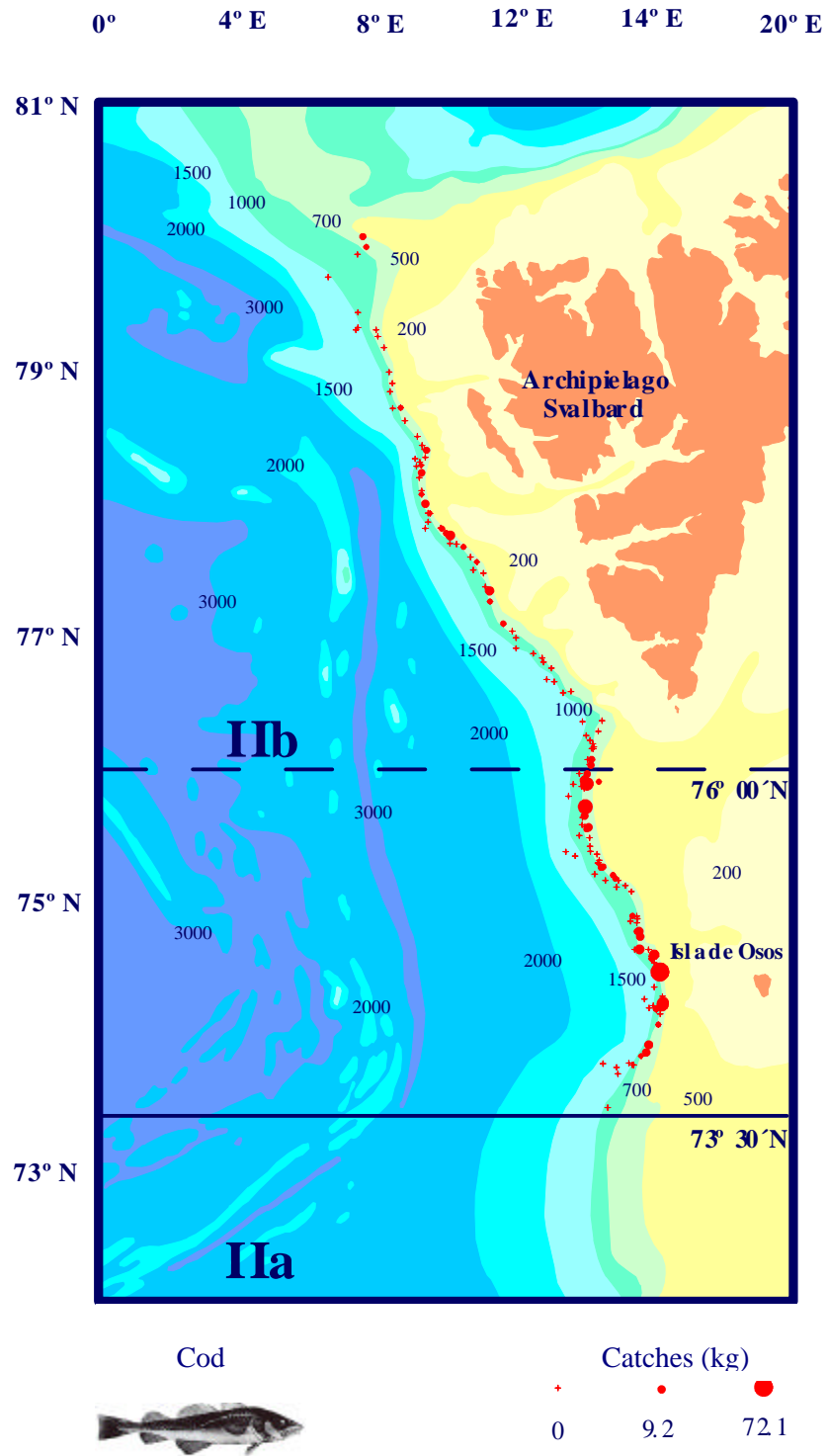


**Figure 4.-** Location of the valid hauls in the Spanish bottom trawl Survey in ICES División IIb (2002).

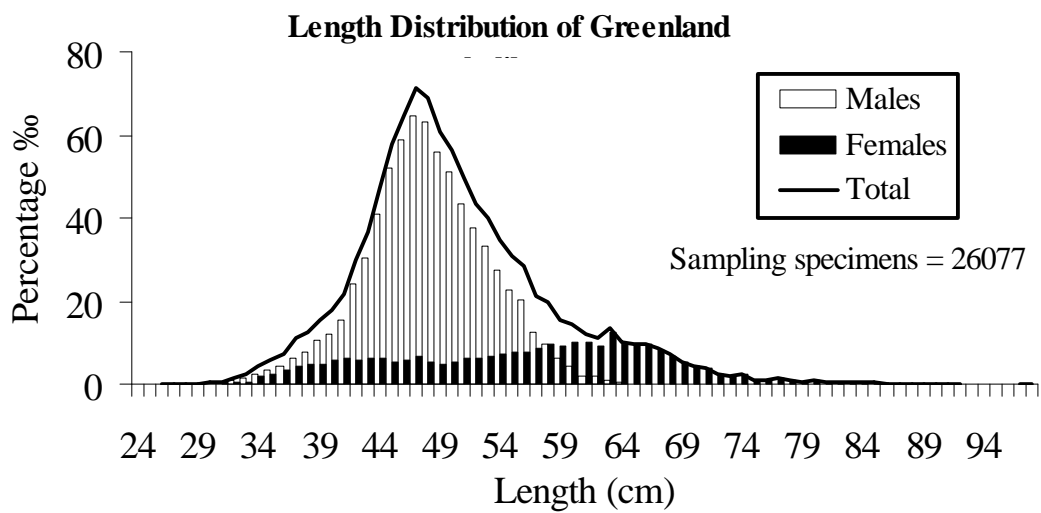


**Figure 5.-** Catches Distribution of Greenland halibut carried out Spanish annual research survey *Fletán Ártico 2002*. The symbols show the catches (kg) by haul (proportionally scale = square root).

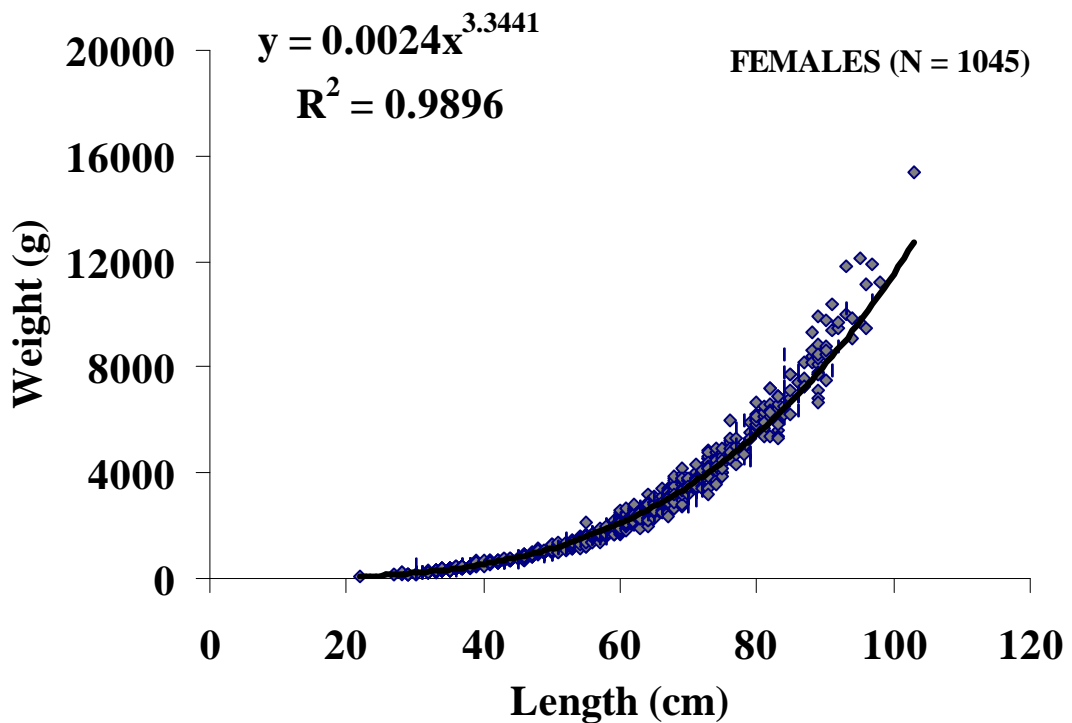
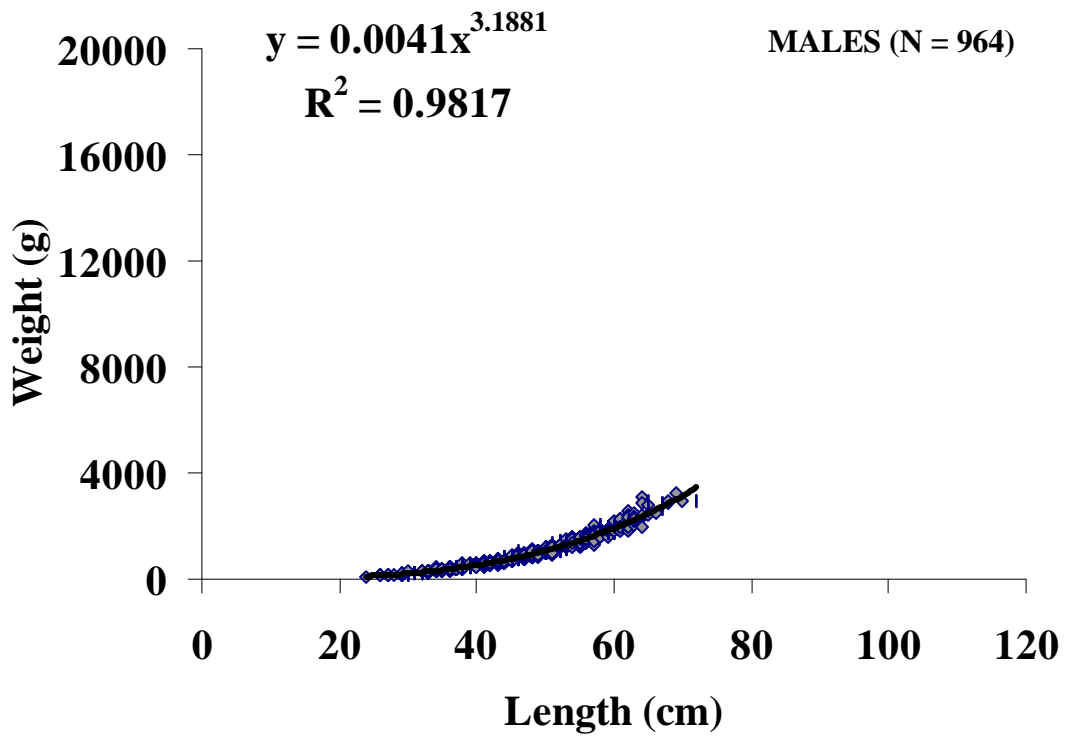




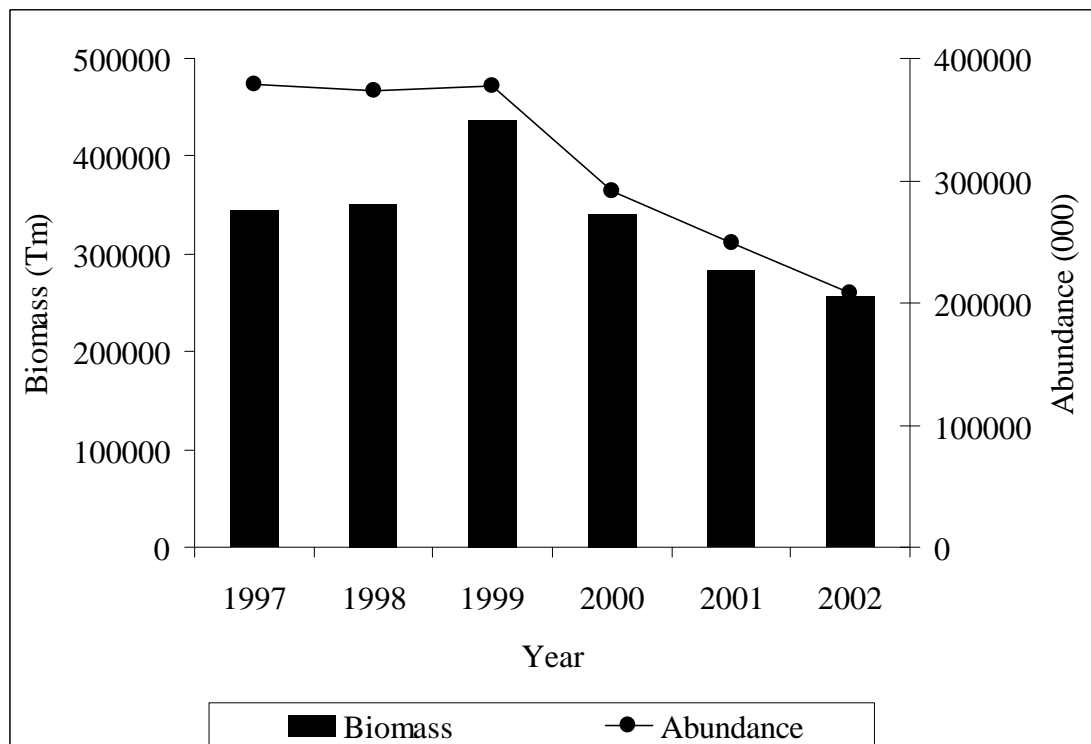
**Figure 6.-** Catches Distribution of Cod carried out Spanish annual research survey *Fletán Ártico 2002*. The symbols show the catches (kg) by haul (proportionally scale = square root).



**Figure 7.-** Length Distribution of Greenland halibut (*Reinhardtius hippoglossoides*) as percentage from Spanish Bottom trawl survey, October 2002.



**Figure 8.-** Length-Weight Relationships by sex for the Greenland halibut (*Reinhardtius hippoglossoides*). Spain bottom trawl survey “Fletán Ártico 2002”.



**Figure 9.-** Greenland halibut (*Reinhardtius hippoglossoides*) abundance and biomass estimated from Spanish Bottom trawl survey: 1997 - 2002.