

## SPANISH BOTTOM TRAWL SURVEY “FLETÁN ÁRTICO 2003” IN THE SLOPE OF SVALBARD AREA, ICES DIVISION IIb.

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The “Fletán Ártico 2003” survey was the seventh 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 routhead 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 "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 5<sup>th</sup> to 29<sup>th</sup> October, with 22 effective fishing days using the same gear as the previous year to carry out 150 valid hauls. The position of the hauls can be seen in the Figure 5.

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  $3,2 \pm 0.12$  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, 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 6.8 at mean speed values of 3.2 knots at mean depth of 751 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 150 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 4.6% of the total. Only the Blue whiting catches attained 2029.9 kg, followed by the cod 1830.4 kg and redfish with 653.8 kg (Table 8). The catches show a increasing for Greenland halibut and other species.

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 (60.8 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 500 and 700 meters and a relative decreasing in the stratum 2 higher concentration was noted

from 75° 30'N to 76° 30'N. In deeper strata (3 and 6 see figure 1) the catches were very scarce (figure 6).

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, identical value than last year. 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 very similar to that of previous years. The length range for both sexes was from 25 to 95 (Table 5), in the last year range values were: 24 to 98 cm even though the length of most of the individuals was between 43 and 53 cm. But with a relative decreasing. 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 (2%), also the presence of males larger than 60 cm and females larger than 75 cm was very low. This indicates a relatively low level of spawning biomass and the absence of recruits is probably due to the depth range surveyed.

In the figure 11 are shown the stratified mean catch values by year: 1997-2003.

The catches of Greenland halibut (as much in number as in weight) as well as the abundance and biomass estimated were above to those last year (Table 10 and figure 10). The situation seems not to confirm the decreasing tendency of previous years. This increasing 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.

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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 (2003).

<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>Maximum 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>	150
<b>Void hauls:</b>	0

**Table 2.-** Description of the gear “*Pedreira*”, used in the Spanish bottom trawl survey in ICES IIb (2003).

Bottom trawl “ <i>Pedreira</i> ” type	
<u>Float rope:</u>	43.50 m
<u>Ground rope:</u>	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:	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)

**Table 3.-** Stratum characteristics and hauls performed. Spanish bottom trawl survey, *Fletán Ártico 2003*. 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	45
2	76°00' - 81°00' N	700-999	1263	19
3	76°00' - 81°00' N	1000-1500	2693	9
4	73°30' - 76°00' N	500-699	488	39
5	73°30' - 76°00' N	700-999	761	26
6	73°30' - 76°00' N	1000-1500	1672	12
<b>Total</b>	<b>73°30'a 81°00' N</b>	<b>500-1500</b>	<b>7579</b>	<b>150</b>

**Table 4.-** Catches (kg) of the main species. Spanish Survey "*Fletán Ártico 2003*". Svalbard Area. ICES Division II b.

<b>SPECIE</b> Common name	<b>Scientific name</b>	<b>Total Catch (kg)</b>
Greenland halibut	<i>Reinhardtius hippoglossoides</i>	151952.2
Blue Whiting	<i>Micromesistius poutasou</i>	2029.9
Cod	<i>Gadus morhua</i>	1830.4
Northern wolffish	<i>Anarhichas denticulatus</i>	649,0
Redfish	<i>Sebastes mentella</i>	653.8
Arctic Skate	<i>Amblyraja hyperborea</i>	184.6
Long rough dab	<i>Hippoglossoides platessoides</i>	628.6
Greater eelpout	<i>Lycodes esmarkii</i>	272.3
Routhead grenadier	<i>Macrourus berglax</i>	431,6
Thorny skate	<i>Amblyraja radiata</i>	114,9

**Table 5.-** Summary of length samples of the main species during Spanish Survey (2003).

Specie	Length Samples				
	N° samples	Males	Females	Total	Range (cm)
Greenland halibut ( <i>Reinhardtius hippoglossoides</i> )	150	19625	9043	28670	25-95
Cod ( <i>Gadus morhua</i> )	86	608		608	8-104
Redfish ( <i>Sebastes mentella</i> )	113	788	775	1563	13 - 43
Long rough dab ( <i>Hippoglossoides platessoides</i> )	88	525	306	832	8-47
Blue Whiting ( <i>Micromesistius poutassou</i> )	113	1357	4498	5857	16-40
Arctic hyperborea ( <i>Amblyraja hyperborea</i> )	83	224	116	340	6-91
Spinytail skate ( <i>Bathyraja spinicauda</i> )	16	10	16	26	22-71
	0	0	0	0	
<b>TOTAL:</b>	<b>649</b>	<b>22529</b>	<b>23797</b>	<b>37896</b>	<b>686</b>

**Table 6.-** Summary of biological samples and age structures of the main species during Spanish Survey (2003).

Specie	Biological Samples				
	N° samples	Males	Females	TOTAL	Range (cm)
Greenland halibut ( <i>Reinhardtius hippoglossoides</i> )	108	522	782	1304	25 - 106
Otoliths	139	283	422		
Gonads	239			239	
Stomachs	1304				
Cod ( <i>Gadus morhua</i> )	86	302	281	583	8 - 104
Otoliths:				223	
Stomachs	587			587	
Redfish ( <i>Sebastes mentella</i> )	5	4	1	5	34 - 43
Stomachs	309			309	
Long rough dab ( <i>Hippoglossoides platessoides</i> )	88	457	286	743	8 - 47
Otoliths	63	111	174		
Gonads	93			93	
Stomachs	744				
Roughead grenadier ( <i>Macrourus berglax</i> )	92	191	237	429	3.5 - 33
Stomachs	46			46	
Blue Whiting ( <i>Micromesistius poutassou</i> )	3	18	76	94	22 - 34
Arctic Skate ( <i>Amblyraja hyperborea</i> )	71	168	79	247	16 - 91
Thorny Skate ( <i>Amblyraja radiata</i> )	56	47	79	126	10 - 55
Spinytail Skate ( <i>Bathyraja spinicauda</i> )	14	8	13	21	22 - 71

**Table 7.-** Length composition by sex of Greenland halibut (*Reinhardtius hippoglossoides*) in the Spanish bottom trawl survey "Fletán Ártico 2003".

Length	Males	Females	TOTAL	Length	Males	Females	TOTAL
25	3	0	3	61	295	1178	1473
26	0	0	0	62	139	1360	1499
27	7	6	13	63	90	1385	1475
28	15	5	20	64	64	1292	1356
29	28	22	50	65	27	1196	1224
30	41	55	96	66	24	1001	1025
31	142	111	253	67	32	888	920
32	263	104	367	68	4	759	763
33	408	250	658	69	25	597	622
34	659	523	1191	70	0	484	484
35	876	598	1474	71	0	519	519
36	1366	1003	2369	72	0	350	350
37	1734	1100	2834	73	0	349	349
38	1762	1107	2869	74	0	288	288
39	2137	1013	3150	75	0	144	144
40	2482	1035	3517	76	0	116	116
41	2948	1018	3966	77	0	136	136
42	3641	901	4542	78	0	100	100
43	4462	933	5395	79	0	57	57
44	5226	779	6005	80	0	86	86
45	6568	766	7334	81	0	64	64
46	7069	668	7737	82	0	61	61
47	7460	681	8141	83	0	26	26
48	7366	655	8021	84	0	56	56
49	6964	590	7554	85	0	25	25
50	6414	608	7022	86	0	29	29
51	5270	651	5921	87	0	14	14
52	4800	612	5412	88	0	17	17
53	3891	726	4617	89	0	6	6
54	3037	728	3765	90	0	8	8
55	2592	819	3411	91	0	9	9
56	2354	858	3212	92	0	0	0
57	1485	942	2427	93	0	5	5
58	1304	848	2152	94	0	5	5
59	751	1024	1775	95	0	4	4
60	476	1063	1539				
				<b>TOTAL</b>	<b>96701</b>	<b>35416</b>	<b>132117</b>



**Table 8.-** Total catch (kg), yield (kg/h), biomass and abundance for the main species. Spain bottom trawl survey "Fletán Ártico 2003".

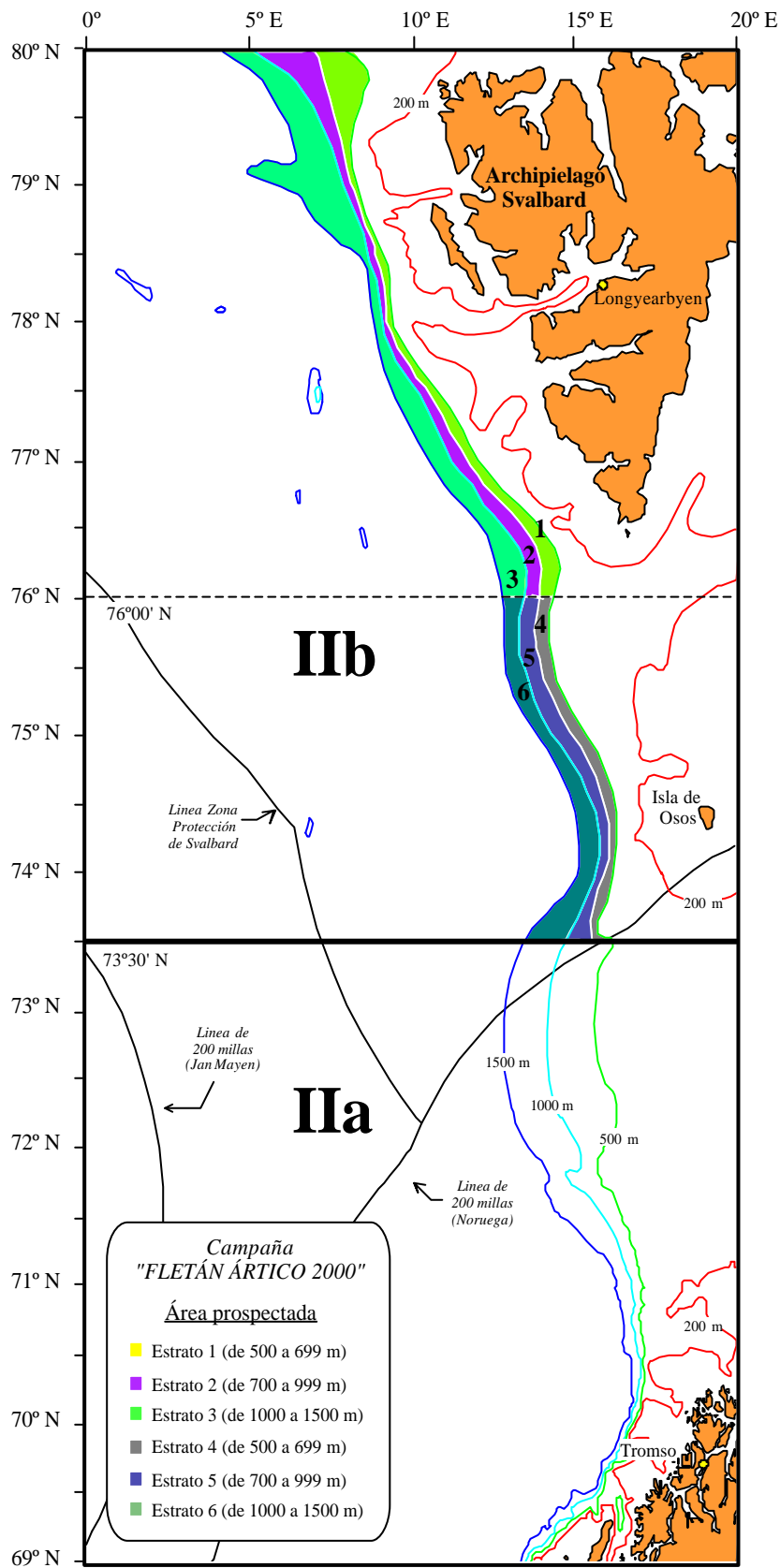
Common name	Scientific name	Catch (Kg)	Yield (kg/h)	Biomass (mt)	Abundance (000)
Greenland halibut	<i>Reinhardtius hippoglossoides</i>	151952.2	2032.3	256327	283644.1
Blue Whiting	<i>Micromesistius poutasou</i>	2029.9	24.5	21760	2747.0
Redfish	<i>Sebastes mentella</i>	653.8	8.7	2346	974.9
Arctic skate	<i>Amblyraja hyperborea</i>	628.6	8.4	3069	4661.5
Cod	<i>Gadus morhua</i>	1830.4	24.5	762	2363.2
Northern wolffish	<i>Anarhichas denticulatus</i>	649,0	8.6	80	1003.1
Long rough dab	<i>Hippoglossoides platessoides</i>	628.6	8.4	1417	290.4
Roughead grenadier	<i>Macrourus berglax</i>	431,6	5.7	1162	709.3

**Table 9.-** Greenland halibut (*Reinhardtius hippoglossoides*) abundance (number) and biomass (kg) estimates. Spain bottom trawl survey "Fletán Ártico 2003".

Strata	Area	Nº hauls	Catch (Nº)	Catch (Kg)	Steep Area	Abundance	Biomass
1	702	45	46725	48405.4	0.544125	60282	62449.9
2	1263	19	12958	13321.1	0.2265	72257	74280.5
3	2693	9	278	325.4	0.108375	6902	8086.6
4	488	39	46051	62029.5	0.46725	48096	64784.2
5	761	26	25621	27278.4	0.30975	62946	67018.1
6	1672	12	493	592.4	0.141	5845	7024.8
<b>TOTAL</b>	<b>7579</b>	<b>150</b>	<b>132125</b>	<b>151952.2</b>	<b>1.797</b>	<b>256327</b>	<b>283644.1</b>

**Table 10.-** Greenland halibut catch in weight and numbers and Biomass and abundance estimated from Spanish survey 1997-2003.

Year	Catch (Kg)	Catch (núm)	Biomass <sup>TM</sup>	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	144335.0	115213	256459.5	207466
2003	151952.2	132125	283644.1	256327



**Figure 1.-** Spanish bottom trawl *FLETAN ÁRTICO 2003*. Map of the area showing the six considered strata and its ranges of depth .

# Armado red

## Corcho 43,50 mts Burlon 58 mts

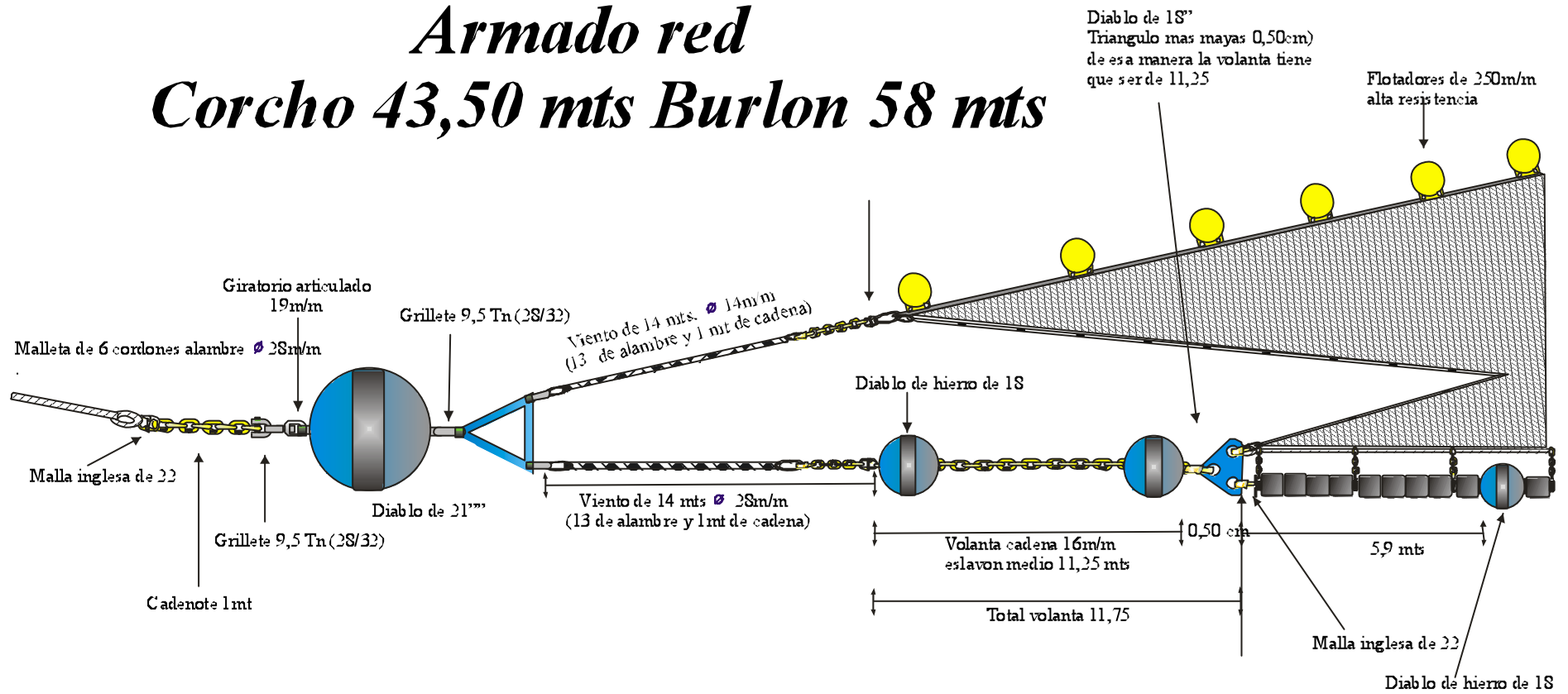
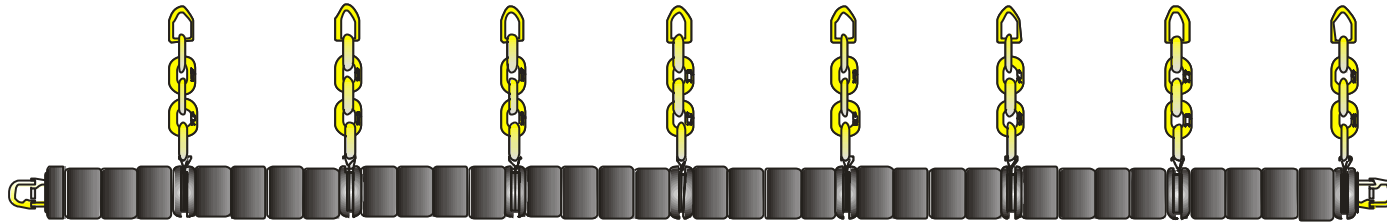
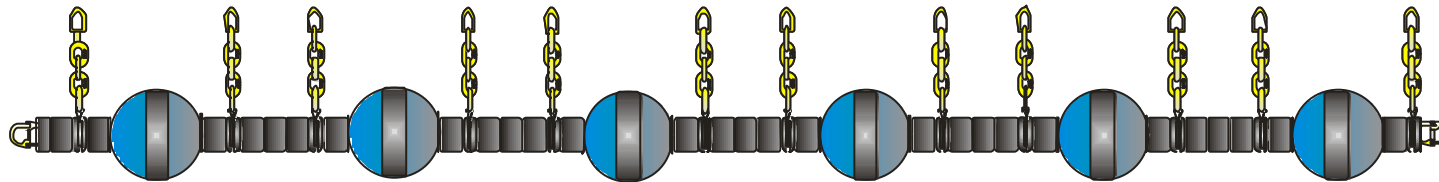


Figure 2.- Rigging profile of the Spanish "Pedreira" survey trawl.

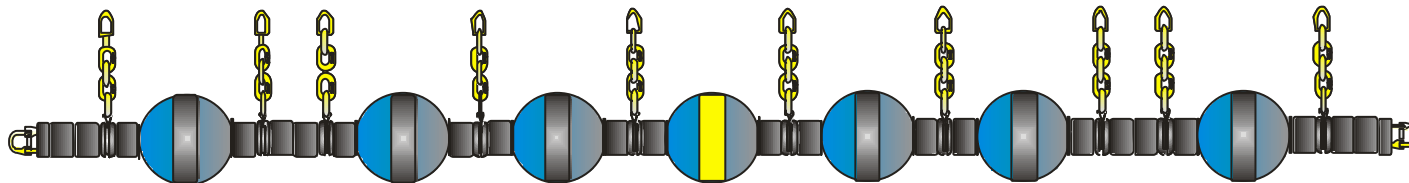
SECCIONES LATERALES GOMA DE 5,90 mts.



SECCIONES LATERALES 7,70 mts.

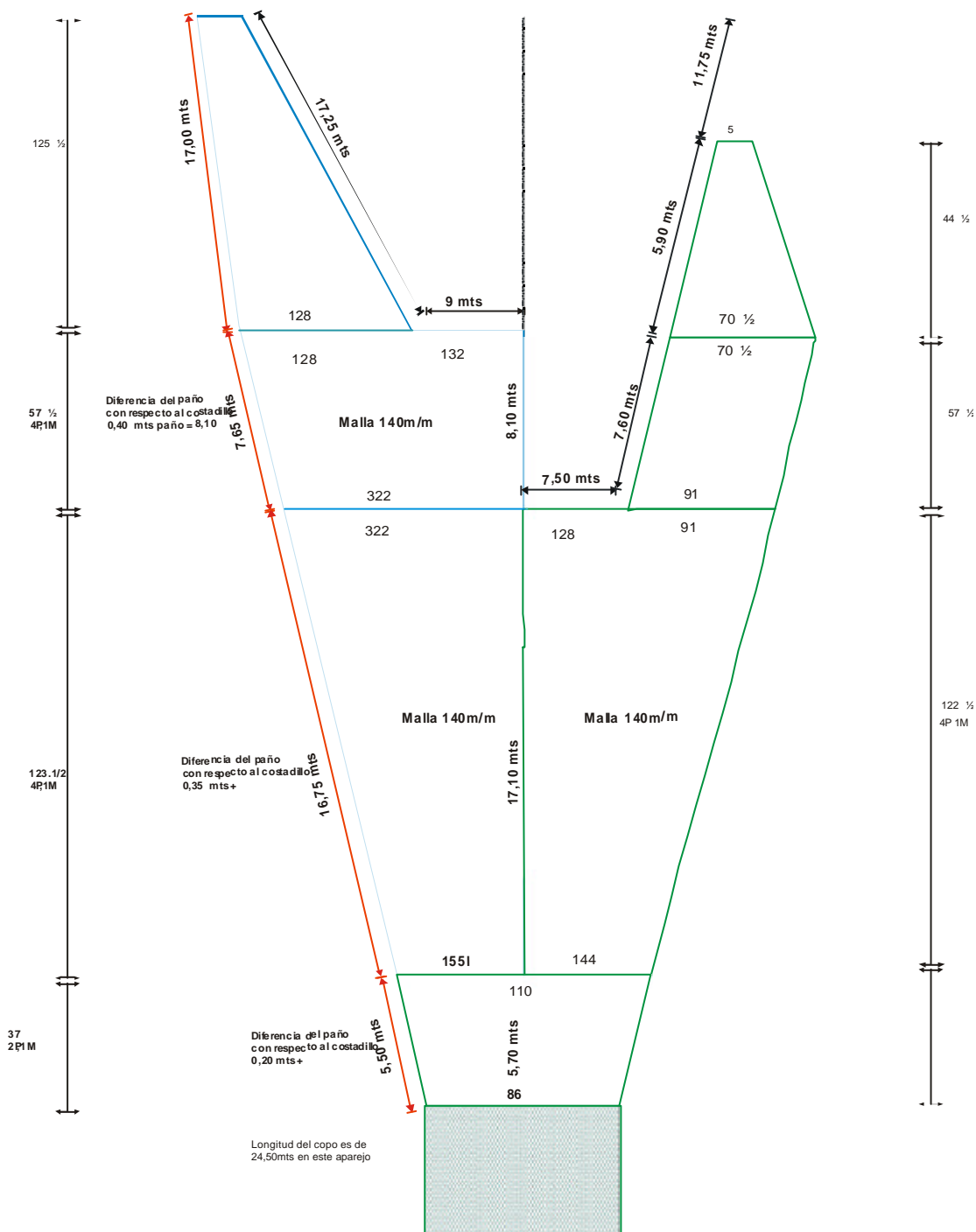


SECCION CENTRAL 7,50 mts.

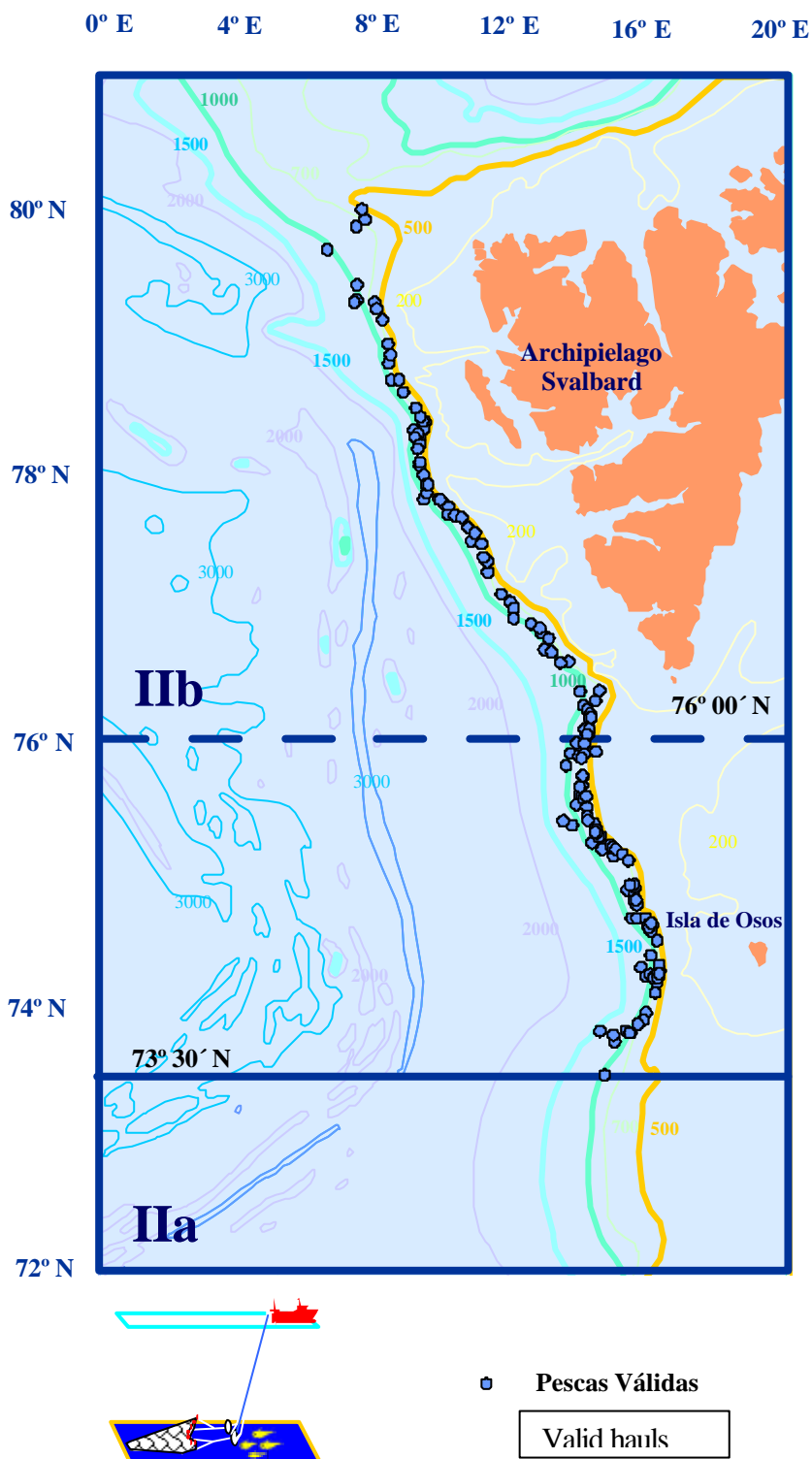


**Figure 3.-** Spanish “Pedreira” survey trawl. Detail of the groundrope.

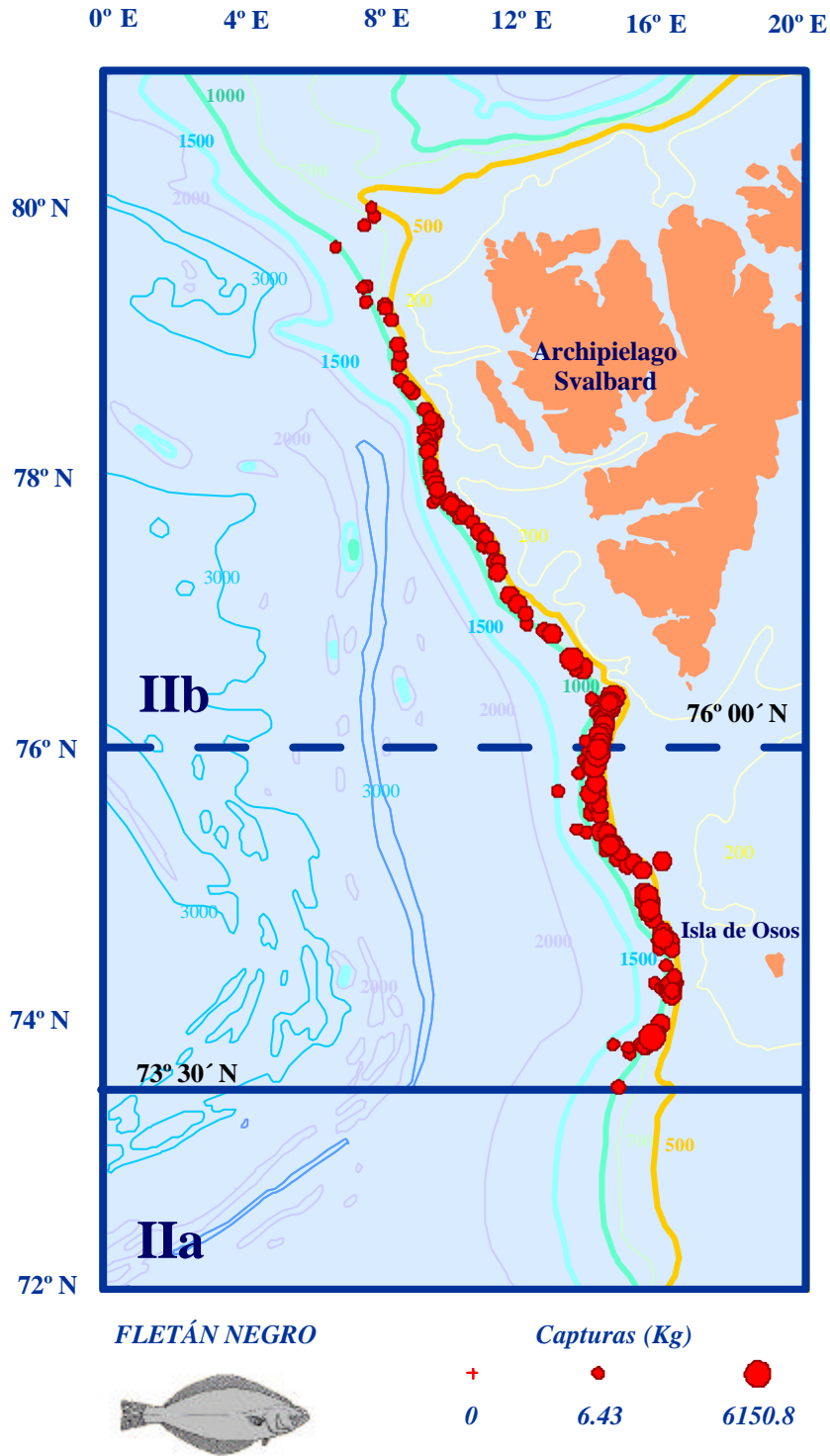
**Red Pedreira 58 mts Burlon, 43,50 mts Corcho  
Montada sobre burloncillo de 34,5 mts**



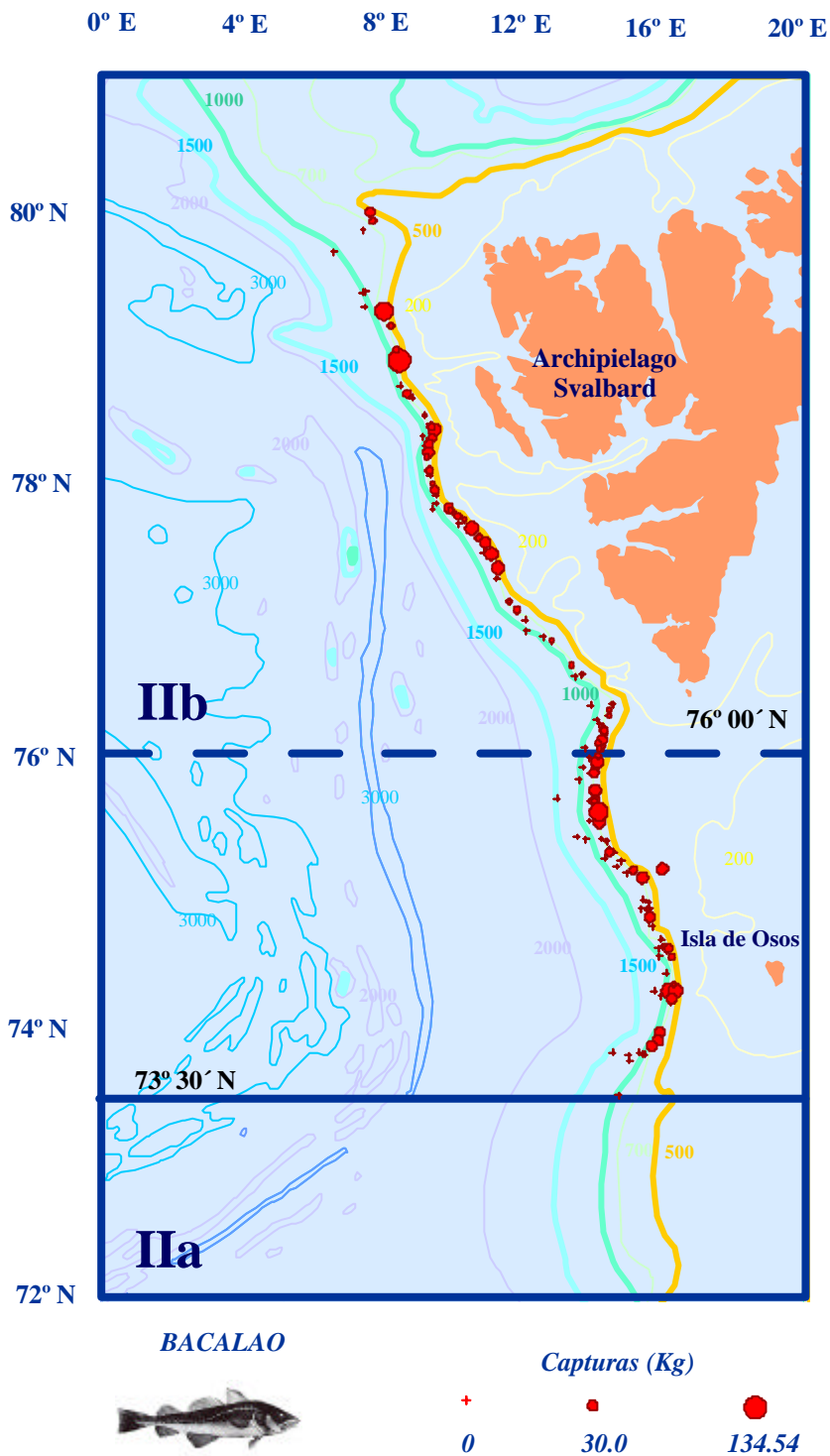
**Figure 4 .-** Schematic of net plan of the Spanish “Pedreira” survey trawl.



**Figure 5.-** Location of the valid hauls in the Spanish bottom trawl Survey in ICES División IIb (2003).

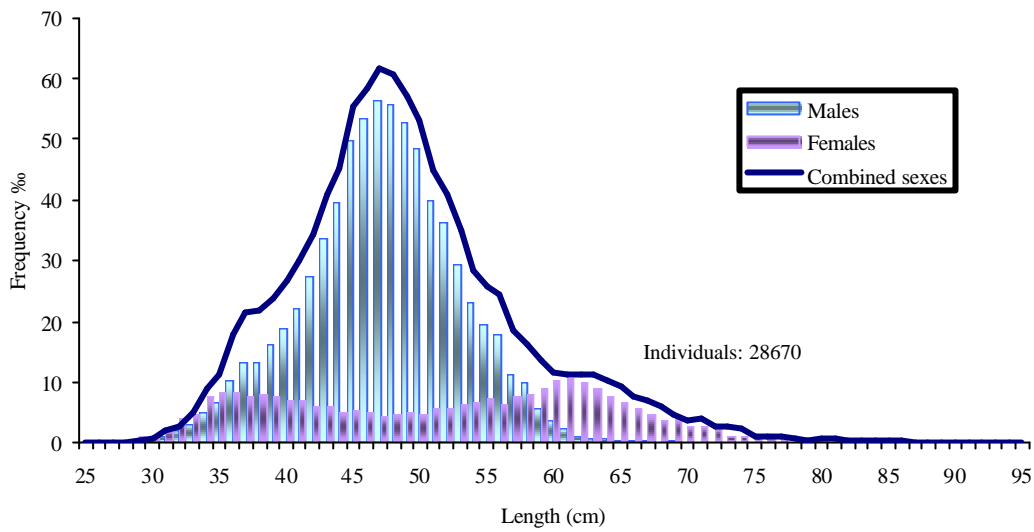


**Figure 6.-** Catches Distribution of Greenland halibut carried out Spanish annual research survey *Fletán Ártico 2003*. The symbols show the catches (kg) by haul (proportionally scale = square root).

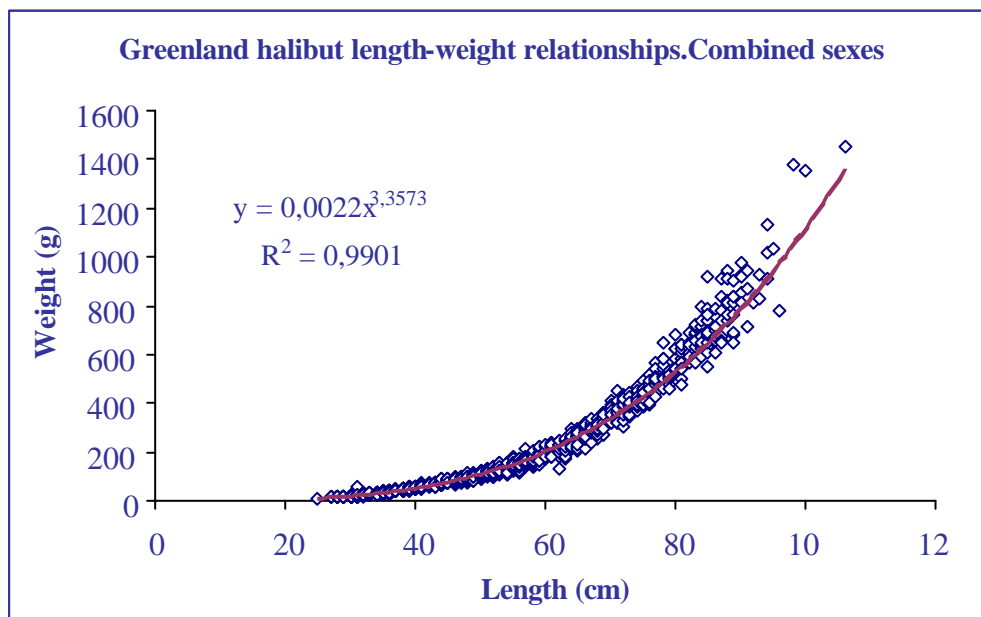


**Figure 7.-** Catches Distribution of Cod carried out Spanish annual research survey *Fletán Ártico 2003*. The symbols show the catches (kg) by haul (proportionally scale = square root).

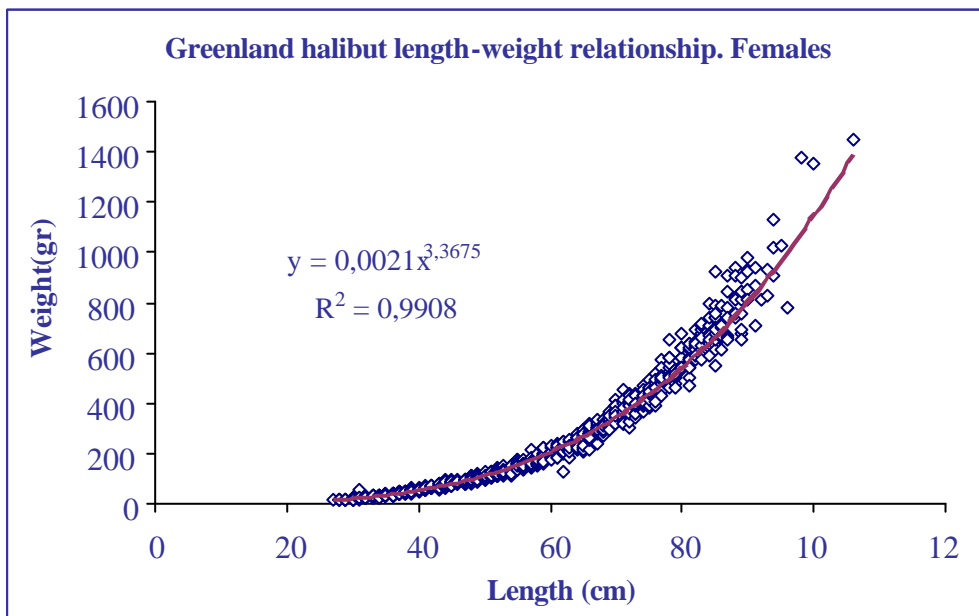
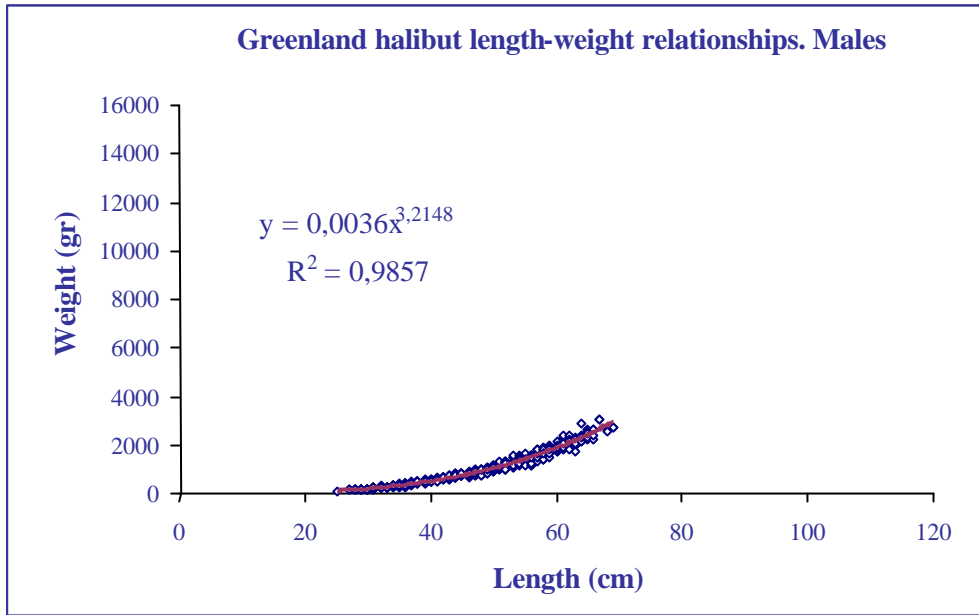




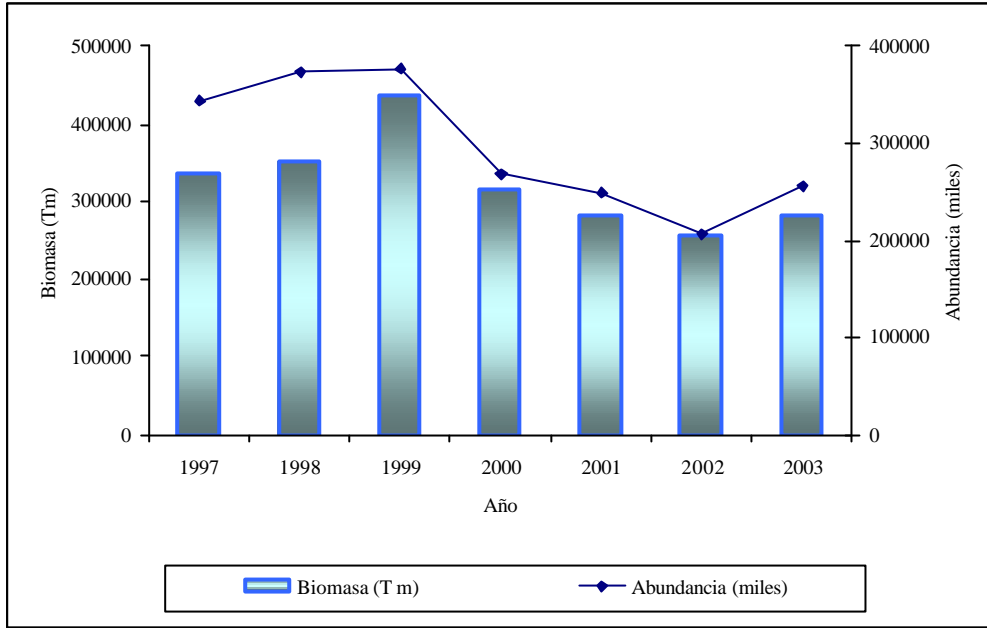
**Figure 8.-** Length Distribution of Greenland halibut (*Reinhardtius hippoglossoides*) as percentage from Spanish Bottom trawl survey, October 2003.



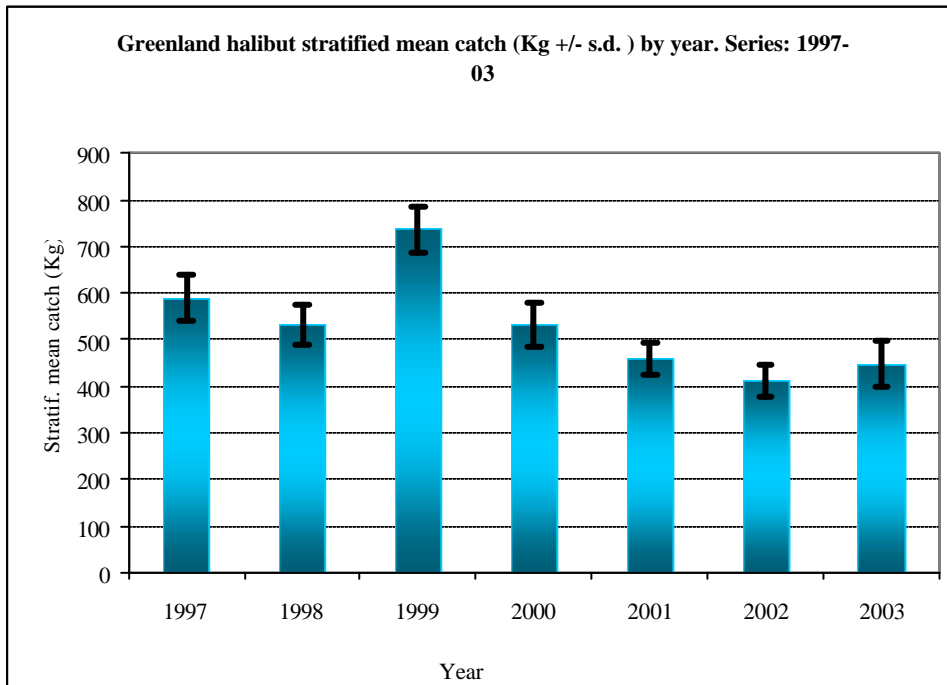
**Figure 9.-** Length/Weight for *Reinhardtius hippoglossoides* during October for slope Svalbard. Sexes combined and by sex. 2003



**Figure 9 (cont.).-** Length/Weight for *Reinhardtius hippoglossoides* during October for slope Svalbard. Sexes combined and by sex. 2003



**Figure 10.-** Greenland halibut (*Reinhardtius hippoglossoides*) abundance and biomass estimated from Spanish Bottom trawl survey: 1997 - 2003.



**Figure 11.-** Greenland halibut stratified mean catch (Kg +/- s.d.) by year along the Spanish bottom trawl series: 1997-2003.