

SPANISH BOTTOM TRAWL SURVEY “FLETÁN ÁRTICO 2001” IN THE SLOPE OF SVALBARD AREA, ICES DIVISION IIb.

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The “*Fletán Ártico 2001*” survey was the fifth 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 500-1400 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 1400 m.
2. To obtain biological data from groundfish species including length, weight and sex.
3. To collect age structures from Greenland halibut and cod.
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) 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 1400 meters on the west slope of the Svalbard archipelago, covering an area between 73° 30 – 80° N (Figure 1). The Survey took place from 3rd to 26th October, with 24 effective fishing days using the same gear as the previous year to carry out 148 hauls, 146 being valid. The position of the hauls can be seen in the Figure 1.

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. A sensor Minilog was used in order to measure the depth and the temperature of the water of the bottom.

Catches were sorted to species or other appropriate taxon and weighed. In the Figures 2 can see the distribution of the catches of the Greenland halibut in the Spanish bottom trawl survey. Samples of the principal species were taken 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 $3 \pm 0,17$ 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.

Total catch and the corresponding total yield for the 146 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 2% of the total. Only the Blue whiting catches attained 1019.7 kg, followed by the cod with 438,7 kg (Table 8). The catches show a decreasing for almost all species in 2001.

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 (more than a hundred times the capture of the second species in importance) compared with the others species presents in the area.

The highest yields of Greenland halibut were detected in the southern strata (4 and 5). Also the densest concentrations were detected between 550 and 750 meters.

In this period the sex ratio for Greenland halibut indicates a very high proportion of males throughout the zone, 2.6 times more abundant than that for females. The last year the proportion was 3,2 times and 4 times in 1999. Sampling length and weight data collected during this survey were used to produce relationship and length-weight plots by sex for Greenland halibut (Figure 3).

The length range was from 21 to 96 cm (Table 5 and figure 4) even though the length of most of the individuals was between 43 and 54 cm. The most abundant ages by sex were: 6, 7 and 8 years old for both males and females. 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. The absence of recruits is probably due to the depth range surveyed. In the Table 10 is shown the age distribution catches and mean weight and mean length at age of Greenland halibut (*Reinhardtius hippoglossoides*) by sex for this period.

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. This situation seems to confirm the descending tendency begun in the year 2000 (Table 11 and Figure 5). This fall could be due to 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.

TABLE 1.- Characteristics of the vessel, date and hauls performed in the Spanish bottom trawl survey in ICES IIb (2001).

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:	<i>Pedreira (Rock hopper)</i>
Date:	3 th to 24 th October
Valid hauls:	146
Void hauls:	2

TABLE 2.- Description of the gear “*Pedreira*”, used in the Spanish bottom trawl survey in ICES IIb (2001).

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)

TABLE 3.- Stratum characteristics and hauls performed. Spanish bottom trawl survey, *Fletán Ártico – 2001*.

Strata	Latitude	Depth (m)	Surface (Square nautical miles)	Valid hauls
1	76°00' - 81°00' N	500-699	702	36
2	76°00' - 81°00' N	700-999	1263	37
3	76°00' - 81°00' N	1000-1500	2693	11
4	73°30' - 76°00' N	500-699	488	33
5	73°30' - 76°00' N	700-999	761	29
6	73°30' - 76°00' N	1000-1500	1672	10
Total	73°30'a 81°00' N	500-1500	7579	146

TABLE 4.- Catches (kg) of the main species. Spanish Survey "*Fletán Ártico 2001*". Svalbard Area. ICES Division II b.

SPECIE		TOTAL CATCH (kg)
Common name	Scientific name	
Greenland halibut	<i>Reinhardtius hippoglossoides</i>	152681.36
Blue Whiting	<i>Micromesistius poutasou</i>	1019.75
Redfish	<i>Sebastes mentella</i>	162.29
Skate (hyperborea)	<i>Raja hyperborea</i>	321.61
Spotted sea cat	<i>Anarhichas minor</i>	13.53
Cod	<i>Gadus morhua</i>	438.7
Eelpout	<i>Lycodes smarkii</i>	98.25
Roughead grenadier	<i>Macrourus berglax</i>	123.7
Eelpout sp	<i>Lycodes sp</i>	98.3
Thorny skate	<i>Raja radiata</i>	77.4
Long rough dab	<i>Hippoglossoides platessoides</i>	164.55

TABLE 5.- Summary of length samples of the main species during Spanish Survey (2001).

Specie	Length Samples:				
	N° samples	Males	Females	TOTAL	Range (cm)
Greenland halibut (<i>Reinhardtius hippoglossoides</i>)	145	16628	7925	24553	(21 – 96)
Cod (<i>Gadus morhua</i>)	32	-	-	133	(13 – 114)
Redfish (<i>Sebastes sp</i>)	71	295	263	558	(16 – 44)
Long rough dab (<i>Hippoglossoides platessoides</i>)	84	294	265	559	(16 – 35)
Blue Whiting (<i>Micromesistius poutassou</i>)	79	869	2827	3710	(18 – 40)
Skate hyperborea (<i>Raja hyperborea</i>)	37	92	32	124	(41 – 89)
TOTAL:	449	18105	11294	29546	

TABLE 6.- Summary of biological samples and age structures of the main species during Spanish Survey (2001).

Specie	Biological Samples:				
	N° samples	Males	Females	TOTAL	Range (cm)
Greenland halibut (<i>Reinhardtius hippoglossoides</i>)	117	7994	1003	17987	(21 – 102)
Otoliths		250	36	606	
Gonads			268	268	
Stomachs				1899	
Cod (<i>Gadus morhua</i>)	36	82	60	142	(35 – 91)
Otoliths:		84	61	145	
Redfish (<i>Sebastes sp</i>)	57	105	109	214	(16 – 44)
Long rough dab (<i>Hippoglossoides platessoides</i>)	86	319	268	587	(11 – 44)
Otoliths		124	118	242	
Gonads			112	112	
Stomachs				747	
Roughead grenadier (<i>Macrourus berglax</i>)	25	39	70	109	(5 – 40)
Blue Whiting (<i>Micromesistius poutassou</i>)	19	56	208	264	(17 – 40)
Hyperborea Skate (<i>Raja hyperborea</i>)	36	89	29	118	(11 – 84)
Thorny Skate (<i>Raja radiata</i>)	20	14	40	54	(18 – 61)
Spinytail Skate (<i>Raja spinicauda</i>)					
TOTAL:	396	91562	2382	23494	-

TABLE 7.- Length composition by sex of Greenland halibut (*Reinhardtius hippoglossoides*) in the Spanish bottom trawl survey "Fletán Ártico 2001".

Length	Males	Females	Length	Males	Females
21	1	1	62	112	1252
22		2	63	90	1222
23			64	65	1157
24		4	65	25	1308
25		1	66	23	972
26	5	4	67	26	855
27	9	6	68	12	807
28	4		69	7	772
29	12	3	70	8	477
30	57	8	71		493
31	49	39	72		398
32	109	68	73		252
33	159	143	74		268
34	321	184	75		201
35	517	342	76		160
36	563	542	77	19	114
37	879	614	78		115
38	884	668	79		91
39	1411	731	80		73
40	1717	851	81		42
41	2327	869	82		58
42	2846	819	83		45
43	4121	1067	84		30
44	5023	921	85		22
45	6364	827	86		15
46	6918	1114	87		17
47	7734	972	88		9
48	8138	856	89		11
49	7376	849	90		
50	6136	785	91		5
51	5553	818	92		11
52	4934	825	93		
53	4509	800	94		8
54	3536	933	95		
55	3067	976	96		8
56	2408	1192			
57	2042	1133	TOTAL	93263	35991
58	1456	1213	N. Spec. Sampled	16628	7925
59	876	1093			
60	522	1123	N. Samplings.	145	
61	293	1327	Total Catches	152681	

TABLE 8.- Total catch (kg), yield (kg/h), biomass and abundance for the main species. Spain bottom trawl survey "Fletán Ártico 2001".

Common name	Scientific name	Catch (Kg)	Yield (kg/h)	Biomass (mt)	Abundance (000)
Greenland halibut	<i>Reinhardtius hippoglossoides</i>	152681.36	2091.53	283510.555	249218.824
Blue Whiting	<i>Micromesistius poutasou</i>	1019.75	13.97	1599.144	12791.741
Redfish	<i>Sebastes mentella</i>	162.29	2.22	275.302	893.596
Skate (hyperborea)	<i>Raja hyperborea</i>	321.61	4.4	1205.120	662.409
Cod	<i>Gadus morhua</i>	438.7	6.0	601.225	195.605
Long rough dab	<i>Hippoglossoides platessoides</i>	164.55	2.25	266.967	7242.285

TABLE 9.- Greenland halibut (*Reinhardtius hippoglossoides*) abundance (number) and biomass (kg) estimates. Spain bottom trawl survey "Fletán Ártico 2001".

Strata	Area	N° hauls	Catch (N°)	Catch (Kg)	Steep Area	Abundance	Biomass
1	702	36	34605	34207.1	0.445875	54482910	53856771
2	1263	27	18929	20091.7	0.32475	73617686	78139555
3	2693	11	153	192.1	0.13125	3141654	3941526
4	488	33	47119	67961.2	0.408375	56305923	81212287
5	761	29	28359	30018.9	0.36	59947497	63456623
6	1672	10	125	210.36	0.121125	1723154	2903793
TOTAL	7579	146	129290	152681	1.791375	249218824	283510555

TABLE 10.- Age distribution of Greenland halibut (*Reinhardtius hippoglossoides*) catches. Spain bottom trawl survey "Fletán Ártico 2001"

DIVISION: II b
YEAR: 2001
SPECIE: Greenland halibut (*Reinhardtius hippoglossoides*)

Weight (kg) corresponding of this Age Distribution:

152681

<i>II b</i>	<i>4nd QUARTER</i>					
	<i>Males:</i>			<i>Females:</i>		
AGE	<i>Number</i> '000	<i>M. Length</i> cm	<i>M. Weight</i> g	<i>Number</i> '000	<i>M. Length</i> cm	<i>M. Weight</i> g
1						
2	0.005	25.7	135	0.011	24	94
3	0.102	32.1	270	0.040	31	220
4	1.081	34.9	347	0.955	35	341
5	12.030	41.5	602	2.087	38	457
6	23.855	45.3	786	7.112	43	667
7	28.495	49.7	1052	4.613	50	1104
8	20.971	51.3	1169	5.297	55	1469
9	5.478	55.4	1480	3.084	59	1848
10	0.869	59.5	1835	1.826	61	2098
11	0.282	62.5	2144	2.284	64	2450
12	0.066	65.4	2476	3.631	65	2685
13	0.009	64.0	2301	3.163	69	3146
14	0.019	77.0	4113	1.225	73	3883
15				0.505	77	4693
16				0.122	80	5412
17				0.022	90	8007
18				0.012	92	8491
19						
20						
Total Number:	93.263			35.991		

Sampled Catch (kg):	152681	
Samples (N°):	145	
Fish measured (N°):	16628	7925
Mean weight (g)	977	1710
Total Catch (kg):	152681	

Table 11.- Greenland halibut catch in weight and numbers and Biomass and abundance estimated from Spanish survey 1997-2001.

Year	Catch (Kg)	Catch (núm)	BiomTM	Abun ('000)
1997	195055.5	211533.1	344013.5	379443.9
1998	180973.9	187259.2	351466.3	373148.6
1999	198780.7	172686.7	436955.9	377791.5
2000	169389.3	140355.3	340618.5	291264.8
2001	152681.4	129289.3	283510.6	249218.8

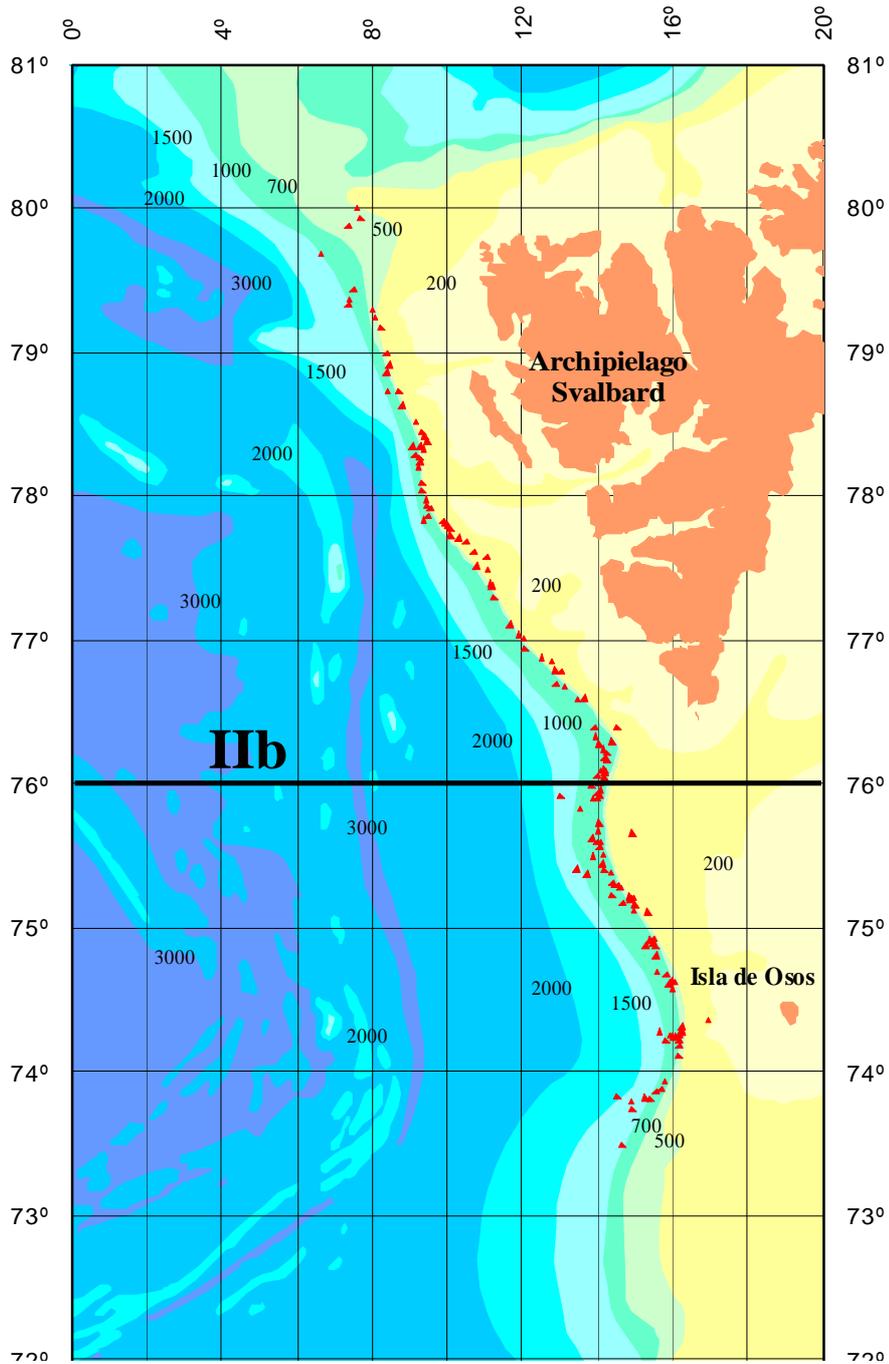


FIGURE 1.- Location of the valid hauls in the Spanish bottom trawl Survey in ICES Division IIb (2001).

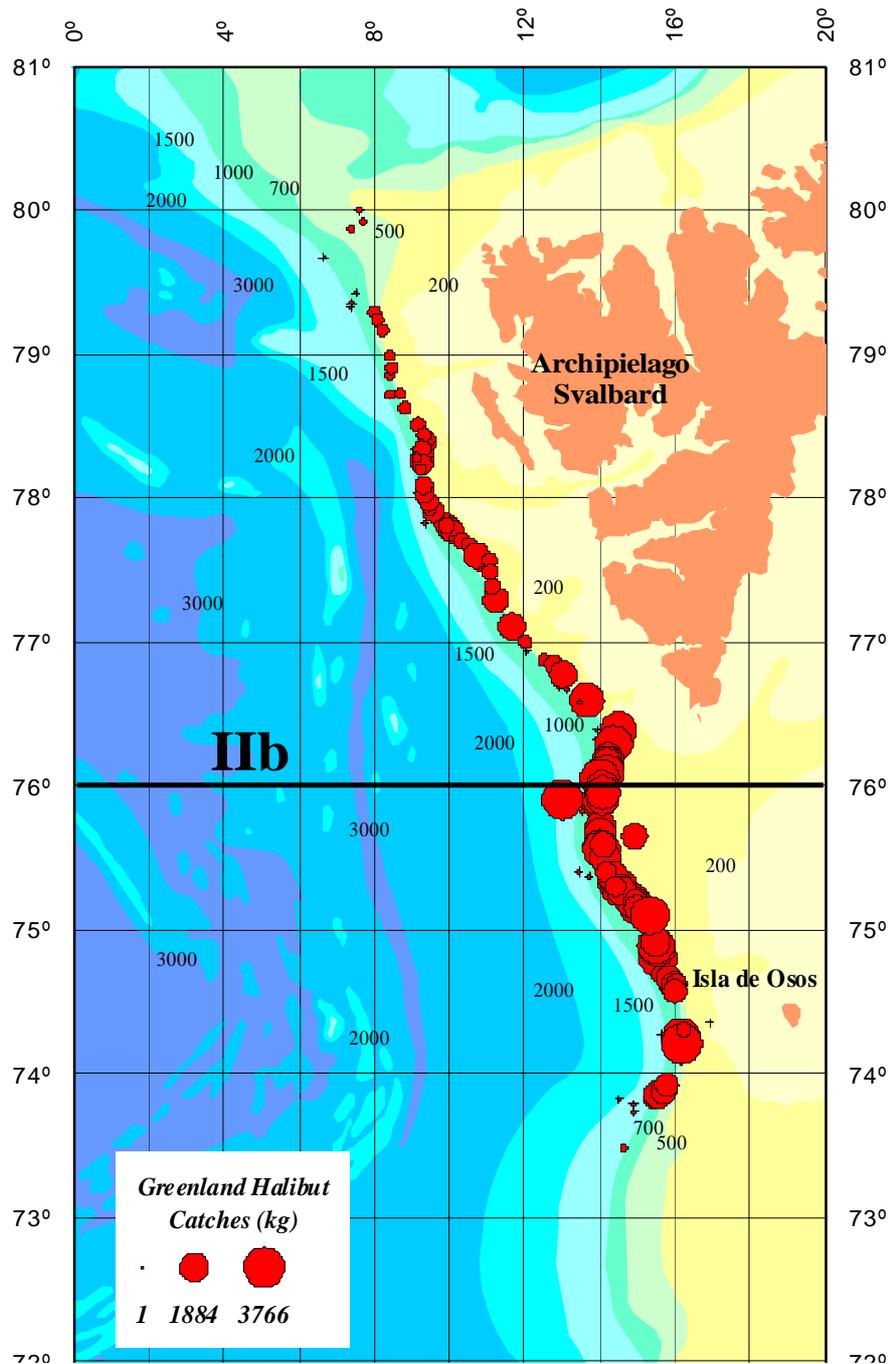


Figure 2.- Catches Distribution of Greenland Halibut carried out during Spanish annual research survey *FLETÁN ÁRTICO 2001*. The symbols show the catches (kg) by haul (proportionally scale = square root).

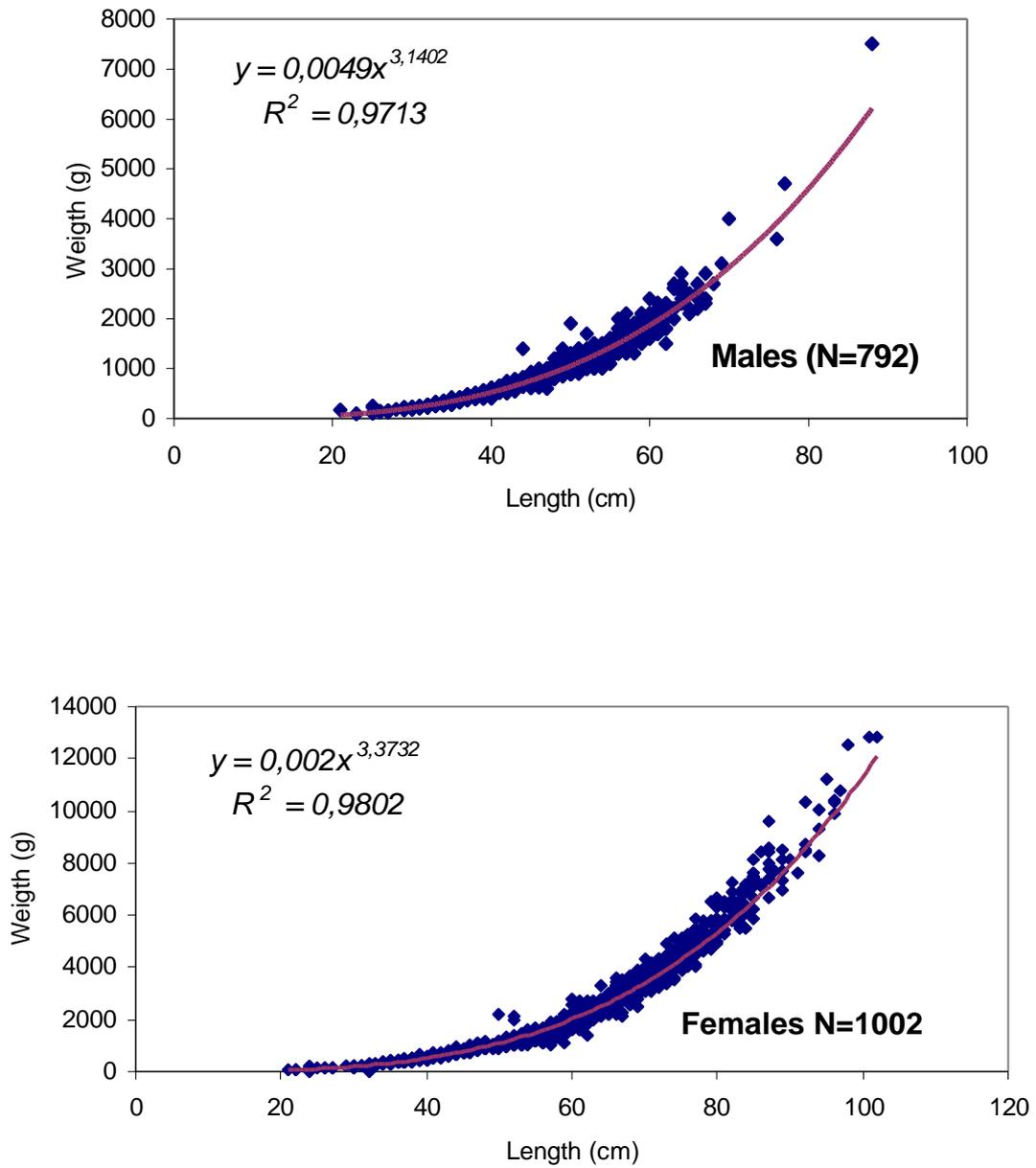


FIGURE 3.- Length-Weight Relationships by sex for the Greenland halibut (*Reinhardtius hippoglossoides*). Spain bottom trawl survey "Fletán Ártico 2001".

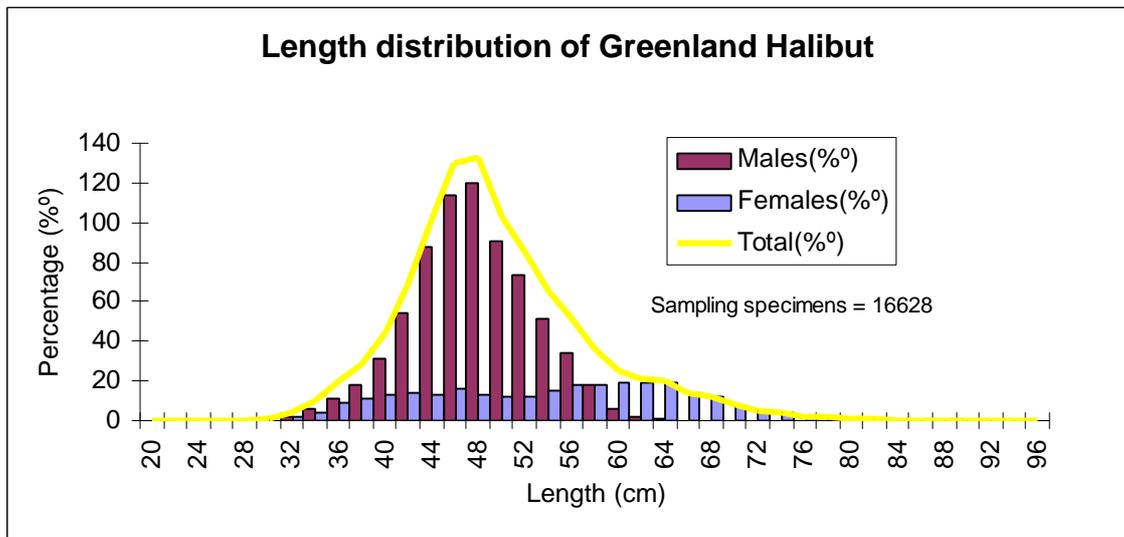


Figure 4.- Length distribution of Greenland halibut as percentage from Spanish Bottom trawl survey, October 2001.

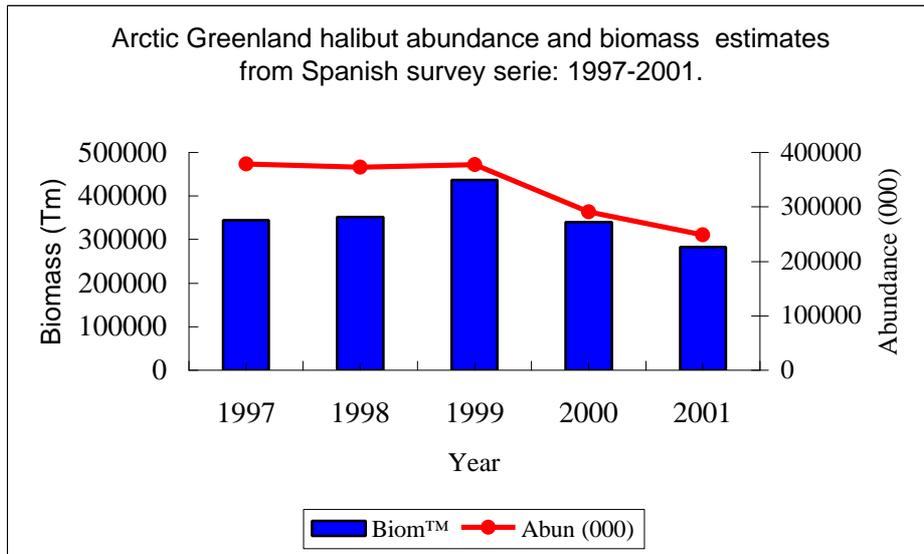


Figure 5.- Greenland halibut abundance and biomass estimated from Spanish Bottom trawl survey, October 2001.