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Results for the Greenland Halibut in the Spanish Spring Survey in the NAFO Regulatory Area
of Divisions 3NO, 1996-2001: Abundance, Biomass and Population Structure

by

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Abstract

Since 1995, a stratified random spring bottom trawl survey in the NAFO Regulatory Area of Div. 3NO was conducted by Spain. The depth strata surveyed was extended to 1464 m. The main propose of the surveys was obtain abundance and biomass indices for the commercial species in the area. The entire series of abundance and biomass for Greenland halibut are presented for the period 1996-2001. The indices calculated from the survey series shows an increasing in the Greenland halibut abundance and biomass until 1998, but in following years these values tend to decrease. However, recruitment is good in the last years, although the number of individuals of length over 70 cm. is very low.

Material and Methods

Survey design and gear used

Spanish spring survey on NAFO Regulatory Area (Div. 3NO) was started in 1995. The surveys were carried out in spring (May), on board the Spanish vessel *C/V Playa de Mendiña* (338 GT and 800 HP) using bottom trawl net type *Pedreira*. The main specifications and geometry of this gear, as the rigging profile and the net plan, and a sheet with the resume of the main technical data of the surveys are described in previous paper (Durán Muñoz *et al.*, 2001). The area and strata covered by the surveys were based on the stratification charts and tables in Bishop (1994). Sets were allocated to strata to their size; with the minimum of two planned hauls per stratum and the trawl positions were chosen at random (Doubleday, 1981). In the period 1998-2001, the surveyed depth strata were the same (extended to 1 464 m), deeper than in previous surveys. In the Table 1 are presented the number of valid tows, the depth strata covered and dates of the surveys series. Abundance and biomass for Greenland halibut was estimated by swept area method (Cochram, 1997), assuming catchability factor of 1. The catch from each haul was sorted by species and weighed. Samples of Greenland halibut were measured at random to the total length at cm below. Length distribution estimated from catches is presented for the period 1996-2001. The year 1995 is not representative for this specie, because in that year a few sets were made, so it is not included in the analysis.

Stratified mean catches of Greenland halibut

The mean catch is calculated by stratum by the following formula:

$$\bar{Y}_i = \sum_{j=1}^T \frac{y_j}{T}, i=1,\dots,h$$

where: y_j is the catch by haul in the stratum
 T is the number of hauls in the stratum
 h is the total number of strata

and the stratified mean catch by stratum is obtained as follow:

$$Y_i = \bar{Y}_i n_i, i=1,\dots,h$$

where: n_i is the area of the stratum $i, i=1,\dots,h$

Then the total stratified mean catch by year is calculated according to the formula:

$$\bar{Y} = \sum_{i=1}^h \frac{Y_i}{N}$$

where: $N = \sum_{i=1}^h n_i$ is the total area by year

Results

Catches of Greenland halibut

The Greenland halibut mean catches by stratum are presented in Table 2, included swept area, number of hauls and SD. The stratified mean catches of Greenland halibut are presented in Table 3. Until year 1999 we can see a gradual increasing of the mean, whereas in the two last years it is noted a decreasing in the catches (Fig. 1). This fact that agrees with the NAFO assessments, may be due to the low recruitment in previous years (see Fig. 4), so there were poor year classes.

The poor catches in years 1996 and 1997 are due to in that years less depth strata were covered, that are where the adult Greenland Halibut inhabits.

Abundance and Biomass of Greenland halibut

Following the recommendations of the 2000 Scientific Council Meeting, the entire time series (1996-2001) of abundance and biomass estimates of Greenland halibut are presented (updated) in Table 4 and Table 5, respectively. The abundance and biomass show similar patterns than the catches, except the high value in year 98 that is probably due to a distribution change (Fig. 2 and Fig. 3).

Length distribution of Greenland halibut

The length distribution of Greenland halibut is shown in Table 6, and in Fig. 4 we can see its evolution along the years. The evolution of a year-class is seen since 1996, although it breaks in 1997. There is a higher proportion of females than males. And in the year 2001, we can see an increasing of recruitment; perhaps this is the beginning of a great year-class.

We want to note that Spanish surveys only cover a small part of the area distribution of this stock (Div. 3NO), and the values of the index estimates can be affected by interannual changes in the pattern of the distribution.

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TABLE 1. Spanish spring bottom trawl surveys on NAFO Div. 3NO: 1996-2001.

Year	Vessel	Valid tows	Depth strata covered (m)	Dates
1996	C/V Playa de Mendiña	112	>56-1098	May 07-May 24
1997	C/V Playa de Mendiña	128	>56-1280	April 26-May 18
1998	C/V Playa de Mendiña	124	>56-1463	May 06-May 26
1999	C/V Playa de Mendiña	114	>56-1464	May 07-May 26
2000	C/V Playa de Mendiña	118	>56-1465	May 07-May 28
2001	C/V Playa de Mendiña	130	>56-1466	May 03-May 24

TABLE 2. Swept area, number of hauls and Greenland halibut mean catch (kg.) and SD (*) by stratum. Spanish Spring Surveys on NAFO Div. 3NO: 1996-2001. Swept area in square miles. n.s. means stratum not surveyed.

Stratum	1996					1997					1998				
	Swept area	Tow number	G. halibut Mean catch	G. halibut	SD	Swept area	Tow number	G. halibut Mean catch	G. halibut	SD	Swept area	Tow number	G. halibut Mean catch	G. halibut	SD
353	0.0371	3	2.17	2.542		0.0480	4	0.63	0.568		0.0465	4	14.75	13.728	
354	0.0319	3	13.32	7.854		0.0233	2	7.53	1.025		0.0356	3	25.47	13.419	
355	0.0221	2	60.35	5.020		0.0233	2	43.85	2.475		0.0221	2	3.10	0.707	
356	0.0203	2	15.70	11.597		0.0225	2	44.25	20.153		0.0221	2	45.95	51.265	
357	0.0218	2	48.48	55.968		0.0443	4	11.59	14.447		0.0240	2	90.50	69.296	
358	0.0319	3	36.17	37.304		0.0563	5	14.87	12.587		0.0236	3	25.33	19.856	
359	0.0548	5	4.32	3.810		0.0690	6	7.16	6.709		0.0698	6	2.42	1.995	
360	0.3761	31	0.14	0.470		0.3754	32	0.47	1.971		0.2561	25	0.39	1.702	
374	0.0233	2	0.00	0.000		0.0353	3	0.00	0.000		0.0353	3	0.50	0.866	
375	0.0229	2	0.00	0.000		0.0116	1	0.00	-		0.0345	3	0.00	0.000	
376	0.1650	14	0.00	0.000		0.1583	14	0.00	0.000		0.0930	10	0.00	0.000	
377	0.0229	2	14.38	13.258		0.0116	1	0.00	-		0.0229	2	0.30	0.424	
378	0.0330	3	17.28	12.716		0.0210	2	8.40	10.607		0.0120	2	7.15	9.405	
379	0.0113	1	56.25	-		0.0206	2	24.05	11.102		0.0356	3	20.27	8.895	
380	0.0221	2	37.15	10.819		0.0210	2	28.49	13.032		0.0113	2	26.70	21.779	
381	0.0229	2	52.25	36.133		0.0221	2	2.29	0.092		0.0229	2	7.50	1.556	
382	0.0338	3	8.33	12.659		0.0461	4	0.00	0.000		0.0229	3	0.40	0.693	
721	0.0214	2	17.40	0.424		0.0221	2	32.08	11.349		0.0203	2	127.30	105.925	
722	0.0206	2	33.28	35.956		0.0214	2	16.48	23.299		0.0101	2	267.60	17.536	
723	0.0109	1	38.80	-		0.0210	2	55.58	27.400		0.0233	2	57.30	21.072	
724	0.0203	2	26.25	11.667		0.0225	2	20.65	6.718		0.0206	2	90.45	11.243	
725	0.0225	2	14.50	2.546		0.0206	2	84.59	45.516		0.0086	1	22.30	-	
726	0.0218	2	16.43	3.147		n.s.	n.s.	n.s.	n.s.		0.0094	2	301.20	357.513	
727	0.0210	2	43.75	20.153		0.0094	1	55.60	-		0.0233	2	84.05	72.761	
728	0.0218	2	194.10	53.174		0.0214	2	390.43	248.371		0.0206	2	616.30	603.728	
752	0.0109	1	170.60	-		0.0218	2	397.50	107.339		0.0229	2	584.10	254.983	
753	0.0199	2	251.25	69.084		0.0214	2	349.40	89.095		0.0218	2	358.90	91.641	
754	n.s.	n.s.	n.s.	n.s.		0.0330	3	201.40	53.224		0.0210	2	186.55	50.700	
755	n.s.	n.s.	n.s.	n.s.		n.s.	n.s.	n.s.	n.s.		0.0206	2	205.45	1.909	
756	0.0210	2	317.00	190.919		0.0109	1	736.40	-		0.0225	2	2371.45	372.292	
757	0.0188	2	514.75	613.132		0.0304	3	373.81	116.597		0.0206	2	1026.15	232.992	
758	n.s.	n.s.	n.s.	n.s.		0.0214	2	423.97	253.187		0.0105	2	566.15	105.712	
759	n.s.	n.s.	n.s.	n.s.		n.s.	n.s.	n.s.	n.s.		0.0214	2	519.10	382.403	
760	0.0210	2	130.90	45.962		0.0105	1	112.50	-		0.0214	2	354.35	309.642	
761	0.0199	2	325.30	129.825		0.0315	3	666.79	398.434		0.0206	2	495.65	176.282	
762	n.s.	n.s.	n.s.	n.s.		0.0308	3	494.33	292.714		0.0094	2	411.75	161.998	
763	n.s.	n.s.	n.s.	n.s.		n.s.	n.s.	n.s.	n.s.		0.0218	2	377.25	294.227	
764	0.0210	2	238.05	40.376		0.0206	2	222.25	26.092		0.0218	2	229.60	115.117	
765	0.0199	2	187.85	54.377		0.0206	2	381.65	153.937		0.0098	2	245.85	33.729	
766	n.s.	n.s.	n.s.	n.s.		0.0308	3	677.28	105.399		0.0191	2	224.30	37.477	
767	n.s.	n.s.	n.s.	n.s.		n.s.	n.s.	n.s.	n.s.		0.0109	2	110.00	50.629	

TABLE 2 (cont.). Swept area, number of hauls and Greenland halibut mean catch (kg.) and SD (formula in previous sheet) by stratum. Spanish Spring Surveys on NAFO Div. 3NO: 1996-2001. Swept area in square miles. n.s. means stratum not surveyed.

Stratum	1999					2000					2001				
	Swept area	Tow number	G. halibut Mean catch	G. halibut	SD	Swept area	Tow number	G. halibut Mean catch	G. halibut	SD	Swept area	Tow number	G. halibut Mean catch	G. halibut	SD
353	0.0360	3	6.60	6.125		0.0356	3	2.01	1.918		0.0341	3	0.14	0.248	
354	0.0218	2	9.25	8.415		0.0356	3	1.21	0.616		0.0338	3	4.67	2.610	
355	0.0229	2	2.36	3.175		0.0233	2	2.35	2.956		0.0199	2	19.85	11.243	
356	0.0229	2	2.52	1.874		0.0225	2	5.33	0.467		0.0244	2	0.34	0.368	
357	0.0236	2	18.20	2.970		0.0124	1	1.17	-		0.0233	2	4.03	0.368	
358	0.0349	3	44.13	33.988		0.0341	3	5.20	5.696		0.0349	3	21.40	29.815	
359	0.0364	3	23.17	40.126		0.0469	4	14.56	21.698		0.0825	7	5.27	7.635	
360	0.2325	19	3.30	9.890		0.2396	20	1.39	3.790		0.2381	20	0.12	0.263	
374	0.0244	2	0.00	0.000		0.0240	2	0.00	0.000		0.0240	2	0.00	0.000	
375	0.0236	2	0.00	0.000		0.0244	2	0.00	0.000		0.0240	2	0.00	0.000	
376	0.1219	10	0.00	0.000		0.1200	10	0.00	0.000		0.1193	10	0.00	0.000	
377	0.0240	2	5.20	7.354		0.0229	2	1.68	2.376		0.0229	2	1.35	1.909	
378	0.0229	2	11.09	3.557		0.0233	2	11.75	13.081		0.0233	2	30.00	21.637	
379	0.0236	2	10.30	0.141		0.0225	2	13.30	9.475		0.0214	2	14.65	14.637	
380	0.0236	2	42.40	14.284		0.0236	2	26.07	15.585		0.0206	2	43.70	0.707	
381	0.0229	2	30.40	10.607		0.0236	2	14.69	3.797		0.0236	2	9.72	13.690	
382	0.0484	4	0.01	0.010		0.0499	4	1.34	1.579		0.0469	4	0.51	0.862	
721	0.0244	2	6.70	2.680		0.0236	2	5.19	7.340		0.0248	2	0.50	0.707	
722	0.0229	2	143.95	85.206		0.0218	2	210.00	107.480		0.0263	2	3.13	2.510	
723	0.0229	2	119.25	117.592		0.0248	2	30.67	11.787		0.0229	2	17.15	20.435	
724	0.0225	2	49.00	12.728		0.0233	2	62.80	23.476		0.0233	2	36.90	39.315	
725	0.0229	2	53.50	62.084		0.0210	2	108.00	94.752		0.0221	2	19.40	7.637	
726	0.0225	2	312.85	283.479		0.0221	2	139.50	36.062		0.0236	2	116.75	122.400	
727	0.0236	2	112.95	89.590		0.0210	2	28.50	12.728		0.0225	2	40.85	2.616	
728	0.0233	2	671.40	136.330		0.0210	2	322.25	1.061		0.0229	2	92.90	17.819	
752	0.0233	2	613.30	93.480		0.0206	2	251.35	21.425		0.0210	2	284.05	93.974	
753	0.0229	2	691.95	47.588		0.0218	2	536.20	233.770		0.0214	2	244.10	52.609	
754	0.0206	2	184.45	120.703		0.0195	2	502.95	154.927		0.0195	2	442.65	446.821	
755	0.0311	3	171.70	89.189		0.0431	4	384.95	216.272		0.0416	4	292.63	175.369	
756	0.0225	2	1349.60	503.319		0.0203	2	652.88	432.926		0.0233	2	323.75	174.443	
757	0.0233	2	1147.65	296.207		0.0214	2	403.00	108.894		0.0233	2	454.95	46.598	
758	0.0214	2	567.90	126.431		0.0210	2	610.50	123.744		0.0218	2	453.65	95.106	
759	0.0218	2	481.80	475.034		0.0210	2	317.05	92.419		0.0221	2	819.95	235.820	
760	0.0225	2	484.55	495.753		0.0210	2	329.20	30.830		0.0240	2	344.35	63.569	
761	0.0210	2	408.05	10.819		0.0221	2	388.75	288.853		0.0225	2	290.30	225.567	
762	0.0210	2	682.35	401.707		0.0203	2	391.85	18.597		0.0225	2	353.15	70.357	
763	0.0311	3	230.97	96.369		0.0416	4	276.18	234.836		0.0330	3	340.53	242.972	
764	0.0225	2	310.35	133.714		0.0218	2	182.70	70.004		0.0225	2	404.90	161.927	
765	0.0221	2	338.60	3.536		0.0203	2	400.00	329.512		0.0218	2	419.65	94.257	
766	0.0218	2	337.25	215.455		0.0214	2	180.55	26.658		0.0203	2	176.90	102.955	
767	0.0214	2	279.05	105.423		0.0210	2	228.50	68.872		0.0218	2	61.65	27.931	

TABLE 3. Greenland halibut stratified mean catches by stratum and year. n.s. means stratum not surveyed.

Strata	Survey					
	1996	1997	1998	1999	2000	2001
353	582.83	168.13	3967.75	1775.40	541.59	38.56
354	0.05	1851.15	6264.80	2275.50	296.84	1148.00
355	0.82	3244.90	229.40	174.27	173.90	1468.90
356	0.33	2079.75	2159.65	118.21	250.51	15.98
357	7949.90	1899.94	14842.00	2984.80	191.88	660.92
358	8137.50	3345.30	5700.00	9930.00	1170.00	4815.00
359	1818.72	3012.26	1017.42	9753.17	6127.66	2219.27
360	386.03	1299.83	1079.80	9186.83	3862.80	320.05
374	0.00	0.00	107.00	0.00	0.00	0.00
375	0.00	0.00	0.00	0.00	0.00	0.00
376	0.00	0.00	0.00	0.00	0.00	0.00
377	1437.50	0.00	30.00	520.00	168.00	135.00
378	2402.38	1167.60	993.85	1540.82	1633.25	4170.00
379	5962.50	2549.30	2148.27	1091.80	1409.80	1552.90
380	3566.40	2734.56	2563.20	4070.40	2502.72	4195.20
381	7524.00	329.04	1080.00	4377.60	2114.64	1399.68
382	2858.33	0.00	137.20	1.72	457.91	174.07
721	1131.00	2084.88	8274.50	435.18	337.35	32.50
722	2795.10	1383.90	22478.40	12091.80	17640.00	262.50
723	6014.00	8614.13	8881.50	18483.75	4753.08	2658.25
724	3255.00	2560.60	11215.80	6076.00	7787.20	4575.60
725	1522.50	8881.43	2341.50	5617.50	11340.00	2037.00
726	1182.60	n.s.	21686.40	22525.20	10044.00	8406.00
727	4200.00	5337.60	8068.80	10843.20	2736.00	3921.60
728	388.20	30453.15	48071.40	52369.20	25135.50	7246.20
752	22348.60	52072.50	76517.10	80342.30	32926.85	37210.55
753	34672.50	48217.20	49528.20	95489.10	73995.60	33685.80
754	n.s.	36252.60	33579.00	33201.00	90531.00	79677.00
755	n.s.	n.s.	79098.25	66104.50	148205.75	112660.63
756	32017.00	74376.40	239516.45	136309.60	65940.38	32698.75
757	52504.50	38128.96	104667.30	117060.30	41106.00	46404.90
758	n.s.	41973.03	56048.85	56222.10	60439.50	44911.35
759	n.s.	n.s.	65925.70	61188.60	40265.35	104133.65
760	20158.60	17325.00	54569.90	74620.70	50696.80	53029.90
761	55626.30	114021.09	84756.15	69776.55	66476.25	49641.30
762	n.s.	104797.96	87291.00	144658.20	83072.20	74867.80
763	n.s.	n.s.	98462.25	60282.30	72081.68	88879.20
764	23805.00	22225.00	22960.00	31035.00	18270.00	40490.00
765	23293.40	47324.60	30485.40	41986.40	49600.00	52036.60
766	n.s.	97528.80	32299.20	48564.00	25999.20	25473.60
767	n.s.	n.s.	17380.00	44089.11	36103.00	9740.70
(\bar{Y})	37.32	83.23	126.32	129.30	102.15	90.60

TABLE 4. Survey estimates (by the swept area method) of Greenland halibut abundance ('000) by stratum on NAFO Div. 3NO. n.s. means stratum not surveyed.

Strata	Survey					
	1996	1997	1998	1999	2000	2001
353	0	88528	1770611	442039	151018	47297
354	1998871	899355	2535775	949833	213962	1494222
355	3538781	3284517	39882	52997	82753	2114817
356	433005	1410713	704292	34929	39689	19282
357	4434283	874667	6163393	791365	26460	169290
358	14118089	3995702	4197879	5986186	247124	5102812
359	891232	1732812	500599	3129770	1381509	1757290
360	0	719150	619021	2909314	801365	233743
374	0	0	42215	0	0	0
375	0	0	0	0	0	0
376	0	0	0	0	0	0
377	709433	0	13115	291667	48087	26230
378	1613621	682459	857883	1057311	538065	1188719
379	2694755	1661326	1169347	708910	334489	362012
380	2023614	1376000	3091456	9894603	1149968	2639127
381	3789639	130169	421770	2543213	621714	310857
382	922895	0	89967	7090	71828	51221
721	843009	1245624	3580403	66579	57800	10505
722	932240	633502	11419755	1955461	2009687	38400
723	2494253	3847060	3489674	4089980	770781	528525
724	1366633	887289	3406355	1179378	800000	880000
725	882000	4191442	1485217	1724484	2441223	526780
726	712426	n.s.	17927851	5785744	1650270	1161556
727	2469919	2787285	3609062	3057021	873143	1160533
728	4718801	12238407	20428314	13649672	5394216	1191206
752	4692877	9525365	20173437	18678325	5219798	5156561
753	8193326	6878012	6861504	16836008	10319226	3728915
754	n.s.	3281586	2919827	3958355	8314701	8900745
755	n.s.	n.s.	8319897	7442896	16171004	10630372
756	7365395	13757031	52498531	31927414	11863966	4131524
757	9356254	4864385	15298030	24923242	4889799	5376753
758	n.s.	6671839	12129262	5898865	5559978	3474937
759	n.s.	n.s.	7901901	9595344	4316218	8983355
760	4015094	3907895	10022408	14034732	7497104	6506117
761	5499792	10081123	17499985	9487818	7025397	5705344
762	n.s.	9785155	23424994	26621281	7739889	6722847
763	n.s.	n.s.	9131394	5787261	6840327	6871303
764	3879882	4041995	3340469	5641721	1922917	5106961
765	10654183	5176145	11789437	4332083	7263236	5343087
766	n.s.	9725729	2993613	1914145	1994725	2099329
767	n.s.	n.s.	2004966	3434397	2362134	602943
TOTAL	105.24	130.38	293.87	250.82	129.01	110.36

TABLE 5. Survey estimates (by the swept area method) of Greenland halibut biomass (t) by stratum on NAFO Div. 3NO. n.s. means stratum not surveyed.

Strata	Survey					
	1996	1997	1998	1999	2000	2001
353	47098	14010	341312	147950	45607	3390
354	308320	159239	527562	209241	24997	102044
355	403697	279131	20737	15237	14959	147814
356	72879	184867	195223	10335	22268	1311
357	731025	171746	1236833	252681	15505	56853
358	765882	297360	723809	854193	102857	414194
359	166093	261935	87520	804385	522893	188302
360	31816	110808	105398	750752	322404	26880
374	0	0	9106	0	0	0
375	0	0	0	0	0	0
376	0	0	0	0	0	0
377	125683	0	2623	43333	14689	11803
378	218398	111200	165642	134716	140495	358710
379	530000	247205	180907	98260	125316	145301
380	322386	260434	455680	344584	211870	406807
381	657836	29744	94426	382741	179017	118491
382	254074	0	17993	142	36724	14854
721	105825	188463	817235	35707	28559	2626
722	271040	129488	4440178	1057207	1622069	20000
723	553011	820393	764000	1616066	384087	232415
724	321481	227609	1087593	540089	669867	393600
725	135333	861229	271478	497115	1080000	184136
726	108745	n.s.	4626432	2002240	907932	711619
727	400000	569344	694090	917943	260571	348587
728	1392166	2849417	4661469	4504877	2393857	633548
752	2055044	4788276	6690019	6911166	3192907	3543862
753	3489056	4511551	4554318	8348773	6804193	3151888
754	n.s.	3295691	3198000	3219491	9285232	8172000
755	n.s.	n.s.	7670134	6371518	13746622	10826246
756	3049238	6839210	21290350	12116408	6512630	2812796
757	5600480	3765823	10149557	10069703	3846175	3991819
758	n.s.	3927301	10675972	5260547	5756143	4129780
759	n.s.	n.s.	6168486	5626538	3834795	9413211
760	1919867	1650000	5105955	6632951	4828267	4419158
761	5597615	10859151	8218778	6645386	6009153	4412560
762	n.s.	10224191	18622079	13776971	8204662	6654915
763	n.s.	n.s.	9054000	5810342	6926767	8079927
764	2267143	2155152	2111264	2758667	1680000	3599111
765	2343990	4589052	6253415	3795381	4898765	4784975
766	n.s.	9515004	3377694	4465655	2432673	2515911
767	n.s.	n.s.	3196322	4125296	3438381	895697
TOTAL	34.25	73.89	147.86	121.15	100.52	85.93

TABLE 6. Greenland halibut length distribution in NAFO 3NO 1996-2001 in frequency in %. Indet. means indeterminates.

Lenght (cm.)	1996			1997			1998		
	Males	Females	Indet.	Males	Females	Indet.	Males	Females	Indet.
8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000	0.248	0.000	0.000	0.000
12	0.000	0.000	0.115	0.541	0.737	1.031	0.000	0.000	0.043
14	0.000	0.153	3.725	0.925	3.396	2.155	0.000	0.458	0.130
16	0.000	1.024	0.516	0.464	0.741	0.073	0.113	0.238	0.133
18	0.948	1.570	0.000	2.954	4.363	0.000	0.111	0.174	0.000
20	14.628	22.532	0.057	17.610	20.423	0.170	1.525	1.846	0.000
22	46.309	86.548	1.177	25.226	30.131	0.000	5.965	7.294	0.118
24	33.024	51.292	1.119	13.219	14.452	0.000	8.617	12.650	0.000
26	14.479	21.233	0.280	14.907	19.082	0.000	14.660	14.523	0.000
28	20.431	34.691	0.000	28.491	33.898	0.000	30.648	41.105	0.000
30	19.156	33.009	0.000	32.651	39.296	0.000	48.588	65.831	0.000
32	20.067	31.269	0.000	20.385	34.761	0.000	46.297	56.324	0.000
34	24.815	36.897	0.000	20.329	28.272	0.000	49.205	56.734	0.000
36	33.031	44.460	0.000	20.108	39.086	0.000	50.445	62.983	0.000
38	26.069	42.514	0.000	21.404	44.662	0.000	45.021	67.376	0.000
40	31.774	48.110	0.000	22.093	44.626	0.000	31.839	50.381	0.000
42	21.990	35.143	0.000	24.318	42.050	0.000	19.643	34.591	0.000
44	18.137	29.327	0.000	21.640	40.575	0.000	13.570	30.899	0.000
46	11.651	33.308	0.000	19.994	36.872	0.000	10.282	21.697	0.000
48	10.173	17.271	0.000	14.320	37.675	0.000	8.739	17.941	0.000
50	6.036	18.324	0.000	12.352	27.263	0.000	6.441	14.101	0.000
52	3.531	7.097	0.000	8.960	22.395	0.000	4.730	9.131	0.000
54	1.304	7.642	0.000	6.809	13.912	0.000	2.951	5.640	0.000
56	1.953	9.814	0.000	4.423	11.248	0.000	2.352	5.383	0.000
58	3.678	2.603	0.000	4.049	8.590	0.000	0.931	4.588	0.000
60	0.582	4.733	0.000	2.709	7.477	0.000	1.110	3.361	0.000
62	0.000	1.912	0.000	1.879	5.898	0.000	0.533	1.157	0.000
64	0.131	3.170	0.000	0.142	3.764	0.000	0.404	1.519	0.000
66	0.086	0.384	0.000	0.397	4.219	0.000	0.438	1.069	0.000
68	0.000	0.388	0.000	0.220	3.470	0.000	0.000	0.784	0.000
70	0.000	0.365	0.000	0.071	1.548	0.000	0.031	0.914	0.000
72	0.000	0.237	0.000	0.000	2.181	0.000	0.000	0.556	0.000
74	0.000	0.504	0.000	0.000	1.360	0.000	0.000	0.653	0.000
76	0.000	0.000	0.000	0.000	1.080	0.000	0.000	0.339	0.000
78	0.000	0.302	0.000	0.000	0.263	0.000	0.000	0.683	0.000
80	0.000	0.151	0.000	0.000	1.442	0.000	0.000	0.464	0.000
82	0.000	0.347	0.000	0.000	0.490	0.000	0.000	0.370	0.000
84	0.000	0.172	0.000	0.000	0.095	0.000	0.000	0.170	0.000
86	0.000	0.202	0.000	0.000	0.000	0.000	0.000	0.185	0.000
88	0.000	0.110	0.000	0.000	0.097	0.000	0.000	0.105	0.000
90	0.000	0.110	0.000	0.000	0.252	0.000	0.000	0.052	0.000
92	0.000	0.110	0.000	0.000	0.586	0.000	0.000	0.030	0.000
94	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.089	0.000
96	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
98	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
102	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
104	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	363.984	629.028	6.989	363.592	632.732	3.676	405.191	594.385	0.424
N° Ind.:	2867	4667	60	3444	5550	55	4470	7080	14
N° samples:		52			75			84	
Range:		12-91			10-92			11-94	
Total catch:		5602			13393			20305	
Sampled catch:		2380.090			4198.357			5803.875	
Total hauls:		120			139			136	

TABLE 6 (cont.). Greenland halibut length distribution in NAFO 3NO 1996-2001 in frequency in %. Indet. means indeterminates.

Lenght (cm.)	1999			2000			2001		
	Males	Females	Indet.	Males	Females	Indet.	Males	Females	Indet.
8	0.000	0.000	0.022	0.000	0.000	0.000	0.000	0.000	0.000
10	0.000	0.044	0.000	0.000	0.000	0.000	0.055	0.000	0.055
12	0.176	0.607	0.066	0.673	0.721	0.192	2.364	1.831	0.055
14	0.335	1.647	0.022	1.249	2.400	0.240	12.186	10.635	0.111
16	0.311	0.449	0.000	0.673	0.912	0.000	6.385	6.655	0.000
18	0.346	0.642	0.022	0.625	0.673	0.000	0.693	0.770	0.000
20	1.742	2.808	0.000	0.673	0.721	0.000	3.947	4.928	0.000
22	8.102	11.935	0.000	0.529	0.913	0.000	17.715	21.311	0.000
24	4.911	10.092	0.000	2.490	2.800	0.000	18.948	27.784	0.055
26	4.273	6.918	0.000	2.828	4.159	0.048	4.519	9.609	0.000
28	15.528	12.666	0.000	1.945	3.202	0.000	1.338	1.390	0.000
30	32.039	30.310	0.000	3.026	4.381	0.000	1.599	2.519	0.000
32	52.345	57.089	0.000	8.114	8.779	0.000	3.878	6.298	0.000
34	77.600	85.847	0.000	15.761	20.115	0.000	7.331	10.259	0.000
36	67.046	87.438	0.000	29.699	35.901	0.000	13.723	14.047	0.000
38	48.772	78.005	0.000	48.392	62.023	0.000	19.591	28.697	0.000
40	31.536	56.488	0.000	48.730	91.649	0.000	26.320	49.479	0.000
42	19.610	43.887	0.000	50.215	98.221	0.000	38.057	68.906	0.000
44	13.356	27.531	0.000	37.376	97.010	0.000	43.899	87.661	0.000
46	8.547	19.885	0.000	24.175	63.866	0.000	41.727	90.027	0.000
48	6.093	13.410	0.000	13.359	44.192	0.000	29.425	73.882	0.000
50	3.486	11.562	0.000	10.090	29.897	0.000	16.564	47.802	0.000
52	2.763	6.777	0.000	8.804	20.580	0.000	9.924	30.564	0.000
54	1.908	5.898	0.000	4.798	15.298	0.000	5.139	15.876	0.000
56	1.406	4.138	0.000	4.870	14.380	0.000	2.727	11.796	0.000
58	1.134	3.040	0.000	2.359	9.098	0.000	2.783	7.254	0.000
60	0.846	2.485	0.000	1.245	6.736	0.000	2.363	5.891	0.000
62	0.332	1.512	0.000	1.670	6.977	0.000	1.450	3.531	0.000
64	0.400	2.080	0.000	0.322	3.965	0.000	0.628	4.776	0.000
66	0.107	1.587	0.000	0.287	3.456	0.000	0.602	2.587	0.000
68	0.136	1.005	0.000	0.553	3.897	0.000	0.145	2.088	0.000
70	0.046	1.263	0.000	0.000	2.691	0.000	0.000	2.016	0.000
72	0.000	0.683	0.000	0.000	2.428	0.000	0.000	1.882	0.000
74	0.000	1.197	0.000	0.000	2.106	0.000	0.000	1.957	0.000
76	0.000	0.593	0.000	0.000	1.894	0.000	0.000	2.153	0.000
78	0.000	0.997	0.000	0.000	1.479	0.000	0.086	1.792	0.000
80	0.000	1.064	0.000	0.000	2.584	0.000	0.000	1.217	0.000
82	0.000	0.079	0.000	0.000	1.353	0.000	0.000	1.174	0.000
84	0.000	0.241	0.000	0.000	0.949	0.000	0.000	0.813	0.000
86	0.000	0.198	0.000	0.000	0.935	0.000	0.000	0.728	0.000
88	0.000	0.272	0.000	0.000	0.192	0.000	0.000	0.431	0.000
90	0.000	0.022	0.000	0.000	0.169	0.000	0.000	0.184	0.000
92	0.000	0.000	0.000	0.000	0.187	0.000	0.000	0.162	0.000
94	0.000	0.024	0.000	0.000	0.102	0.000	0.000	0.107	0.000
96	0.000	0.196	0.000	0.000	0.000	0.000	0.000	0.000	0.000
98	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.145	0.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
102	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
104	0.000	0.024	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	405.232	594.635	0.132	325.530	673.989	0.481	336.112	663.612	0.277
N° Ind.:	4012	6533	6	2991	6162	10	3418	6721	5
N° samples:		78			81			86	
Range:		7-104			11-94			10-97	
Total catch:		20451			15477			13362	
Sampled catch:		5642.920			6845.142			7080.660	
Total hauls:		117			123			124	

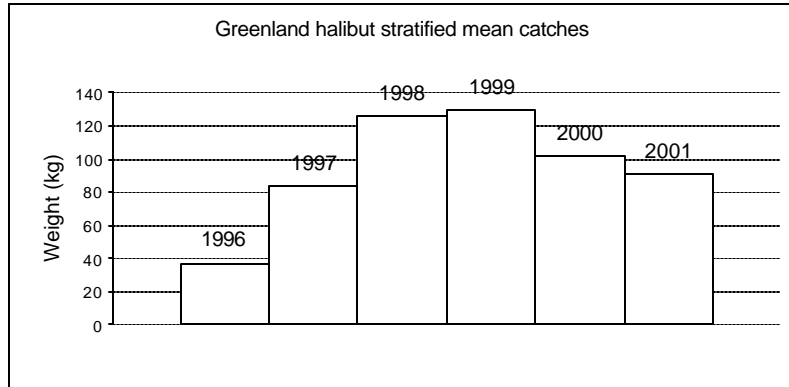


Fig. 1. Greenland halibut stratified mean catches by year. Spanish Spring Surveys on NAFO Div. 3NO: 1996-2001.

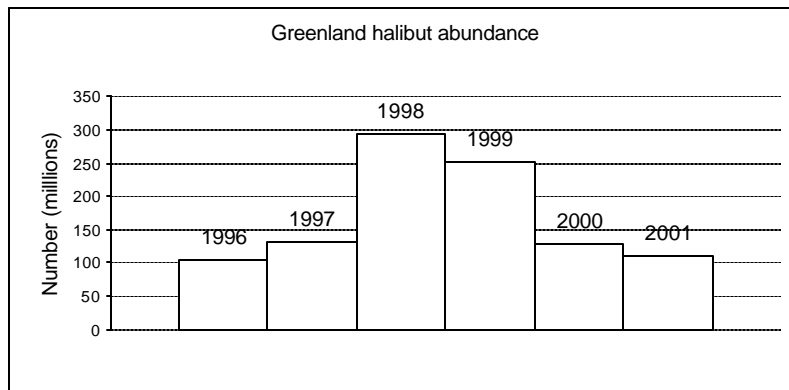


Fig. 2. Greenland halibut abundance by year. Spanish Spring Surveys on NAFO Div. 3NO: 1996-2001.

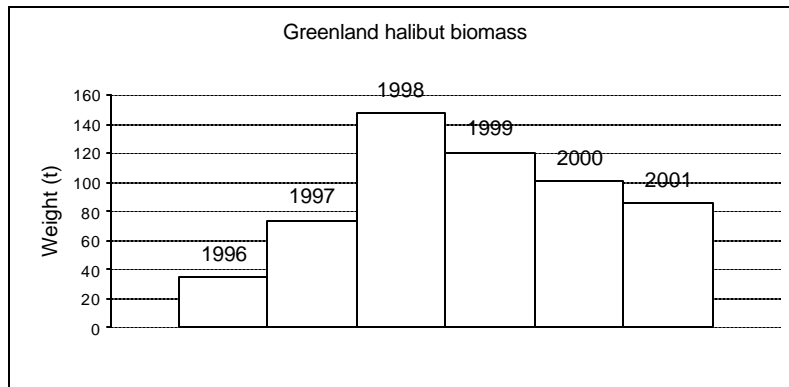


Fig. 3. Greenland halibut biomass by year. Spanish Spring Surveys on NAFO Div. 3NO: 1996-2001

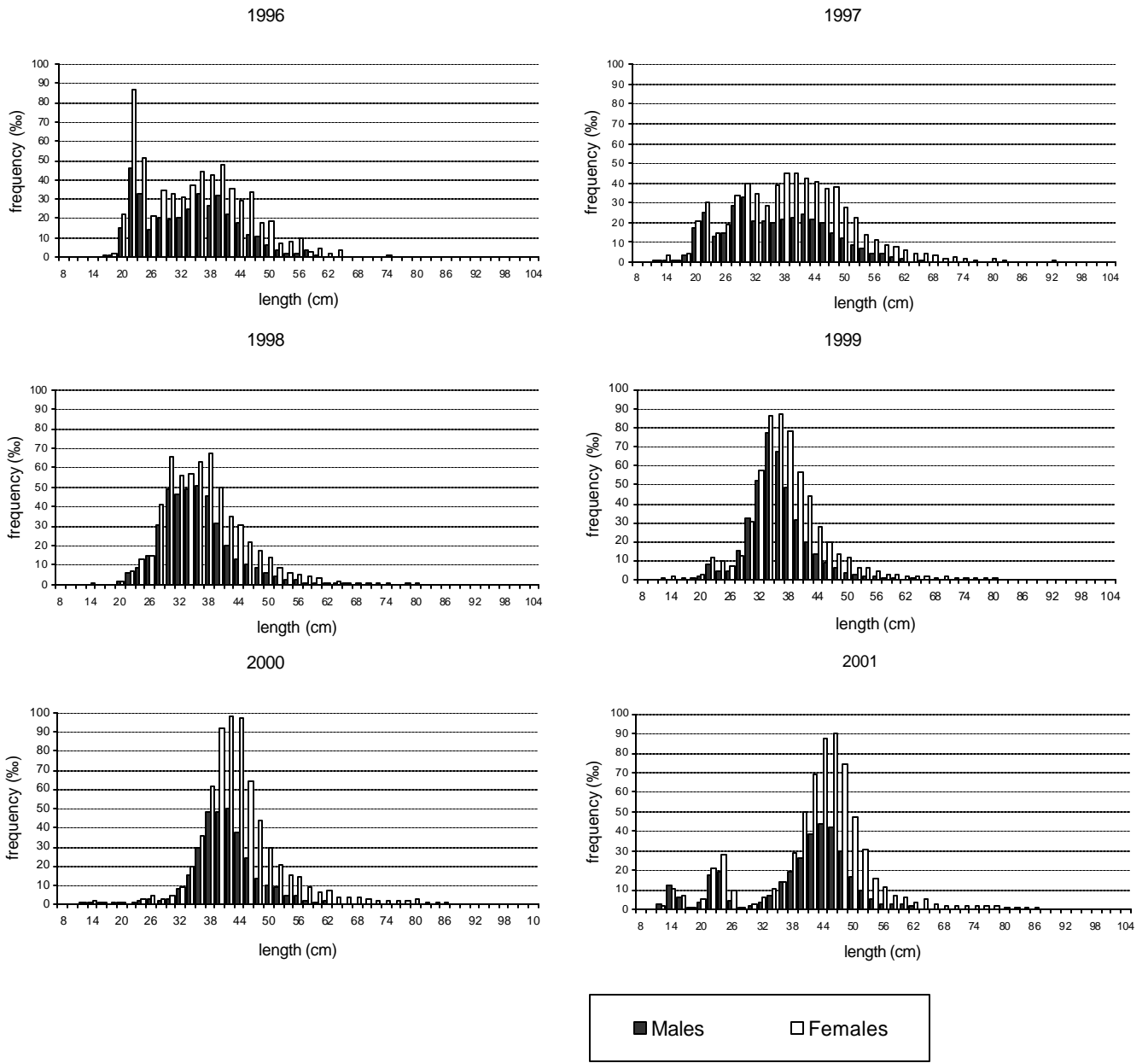


Fig. 4. Greenland halibut length distribution (cm) on NAFO 3NO: 1996-2001. Frequency in %.