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Biomass and length distribution for Roughhead grenadier, Thorny skate and White hake from the surveys conducted by Spain in NAFO 3NO

by

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Abstract

Data for Roughhead grenadier (*Macrourus berglax*), Thorny skate (*Amblyraja radiata*) and White hake (*Urophycis tenuis*) from Spanish Spring survey are presented. The survey vessel changed in 2001, from the C/V *Playa de Menduíña* to the R/V *Vizconde de Eza*, so, in order to maintain the historical series, we transformed the data for Roughhead grenadier and Thorny skate until that year. 1997-2000 data are transformed data from the C/V *Playa de Menduíña* and 2002-2006 data are original data from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels for these two species. The abundance and biomass were estimated for the period 1997-2006 for Roughhead grenadier and Thorny skate, and 2001-2006 for White hake. The length distribution was obtained and presented in numbers per haul stratified mean catches. The indices of Roughhead grenadier present no trend along the years until 2003, with an increase in the last years, mainly in 2004. Thorny skate indices decreased since 2001 until 2003 and increase since then. The 2006 value is the second highest value of the series. For White hake, there were great catches in 2001, and a sharp decrease since then, broken in 2005 for an increase in the indices, but a new decrease in 2006. In 2004 we can see a presence of individuals between 16 and 26 cm.

Material and Methods

Spain carries out a spring survey since 1995 on board the vessel C/V *Playa de Menduíña* in Div. 3NO of the NAFO Regulatory Area, using a bottom trawl net type *Pedreira*. In 2001, this vessel was replaced by the R/V *Vizconde de Eza*, with a bottom trawl net type *Campelen*, in the carrying out of the survey. The main specifications and geometry of these gears, as the rigging profile and the net plan, and a sheet with the resume of the main technical data of the survey, are described in a previous paper (Walsh *et al.*, 2001). The number of valid tows, the depth strata covered and the dates of the surveys are presented in Table 1 for the period 1997-2006. The survey area was stratified following the standard stratification schemes (Bishop, 1994). The number of hauls was assigned to each strata proportionally to their size on a random way, with a minimum of two planned hauls per stratum (Doubleday, 1981). Biomass and abundance indices were calculated by swept area method (Cochran, 1997) assuming catchability factor of 1.

The catch of each haul was sorted and weighted into species and a sample of each species was taken in order to measure the length distribution. For Roughhead grenadier each individual of the sample was measured to from tip of snout to base of first anal-fin ray, in 0.5 cm intervals to the nearest lower half cm., and for Thorny skate and White

hake each individual was measured to the total length to the nearest lower cm. We present the indices for the period 1997-2006 for Roughhead grenadier and Thorny skate. Years 1995 and 1996 are not representative, because these years the deeper strata were not surveyed, so they are not included in the analysis. Before 2001, we have no data for White hake in this survey. For this species, we present the data for the period 2001-2006.

Random samples of Roughhead grenadier were measured Length distribution estimated from catches is presented for the period 1997-2004.

For each species, the haul mean catch, with its variance, and the stratified mean catches by stratum and year, with the annual variance, are presented, transformed until 2000 and no-transformed in the period 2002-2006. In the year 2001, there are data transformed from the former vessel with original data from the new vessel. Besides this, the biomass per stratum and year, with the annual variance, are presented, as the stratified mean catches per haul length distribution. To more information about the calculation of these indices, see González Troncoso *et al.*, 2005. For White hake, it was no necessary to perform the calibration (González Troncoso and Paz, 2005)

Results

Roughhead grenadier

Introduction

There is no directed fishery for Roughhead grenadier and most of the catches are taken as by-catches in the Greenland halibut fishery in Subareas 2 and 3. At the beginning of the Greenland halibut fishery in Subarea 3 of the Regulatory Area in 1988, the grenadier catches were systematically misreported as Roundnose grenadier. In last years the biomass of this species presents a decreasing trend (NAFO, 2006).

Mean Catches and Biomass

The Roughhead grenadier haul mean catches by stratum are presented in Table 2, included swept area, number of hauls and SD. Roughhead grenadier stratified mean catches per tow by stratum and year and their SD are presented in Table 3.

The entire time series (1997-2006) of biomass and their SD estimates for Roughhead grenadier are presented in Table 4. Estimated parameters *a* and *b* values of length-weight relationship are presented in Table 5.

The indices of Roughhead grenadier present no trend along the years until 2003, with a marked increasing in 2004 and then remains stable with a slight decrease. The indices are over the 1997-2003 values. (Fig. 1 and 2).

Length Distribution

Table 6 and Figures 3 and 4 show the stratified mean catches per haul length distribution by year, besides the sampled size and its catch, for the period 1997-2006. The data have been grouped two by two**,** so we present the data every two cm. We can follow easily a cohort since 1999. This last years it can be seen a quite good recruitment.

Thorny skate

Introduction

Thorny skate catches comprises the most of the skates catches during the Spanish spring survey and the Canadian surveys. This species is under TAC since 2004. Nominal catches increased in the mid-1980s with the commencement of a directed fishery for thorny skate The catches reached their lowest value in the period 1993-1995. The biomass has been relatively stable form 1996 to 2005 but at lower level than in the mid-1980s (NAFO, 2006).

Mean Catches and Biomass

In Table 7 we present the Thorny skate haul mean catches by stratum, included swept area, number of hauls and SD. Their stratified mean catches per tow by stratum and year, next to their SD, are presented in Table 8.

The entire time series (1997-2006) of biomass and their SD estimates of Thorny skate are presented in Table 9. The estimated parameters *a* and *b* values of length-weight relationship are presented in Table 10.

The indices of the Thorny skate present a decreasing since the year 2001, but since 2004 an increasing in the biomass occurs. Values of the last three years (2004-2006) are in the level of the 2000 value, the highest of the time series (Fig. 5 and 6).

Length Distribution

The stratified mean catches per haul length distribution by sex and year are presented in Table 11 and Figures 7 and 8, besides the sampled size and its catch, for the period 1997-2006, in two-cm groups. In 1997, we have a recruitment modal value that can be followed more or less until 2006. In 1998 there is another modal value at small lengths that can be more or less followed along the years, reaching a maximum in 2002. In 2002, too, there was a quite good recruitment, but we can no follow this peak in the following years. This year the trend is the same as last years.

White hake

Introduction

Catches of white hake in Div. 3NO peaked in 1987, then declined from 1988 to 1994. With the restriction of fishing by other countries to areas outside Canada's 200-mile limit in 1992, non-Canadian landings fell to zero. Average catch was at its lowest in 1995-2001; then increased in 2002 to decrease slightly in 2003. Total catch decreased a lot in 2004 and 2005. (NAFO, 2006)

Mean catches and biomass

Table 12 presents the mean catches per stratum, besides the standard deviation, the surveyed area and the number of hauls. In table 13 and in Figure 9, the stratified mean catches per tow by stratum and year, as well as the annual variance, are presented. And in table 14 and Figure 10 we present the biomass per stratum and year, and the correspondent annual variance.

Table 15 presents the length weight relationship parameters for White hake for the period 2002-2006. In 2001, we have no sufficient data to calculate the parameters, so we used the parameters of the year 2002.

The indices of the White hake show a great presence in 2001, with a peak in the biomass that is more than the double of the 2002 biomass. In 2003 and 2004 the biomass decreased respect to the two previous years, and in 2005 an increasing occurs, reaching the second highest value in the series, but I 2006 the biomass decreased again up to 2004 value.

Length distribution

Table 16 presents the stratified mean catches per tow length distribution, by sex and year, as the number of samples, the number of sampled individuals, the sampled catch, the sampled range, the total catch and the total numbers of hauls, and in Figures 11 and 12 it we can be seeing the distribution along the years.

In 2001, we can see a great presence of individuals, that decreasing in the later years. In 2002 and 2003, it is no presence of juveniles, although in 2004 there is a quite good presence of individuals between 16 and 26 cm. Except in 2004, no presence of new cohort is seen. In 2005, the length distribution decreased although the biomass increased. We can see the presence of individuals between 52 cm and 70 cm and a quite good presence of

individuals between 14 and 38 cm, but at low level compared with years 2001 and 2002. In 2006 there is no length class with a good presence.

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TABLE 1.- Spanish spring bottom trawl surveys on NAFO Div. 3NO: 1997-2006

Year	Vessel	Valid tows	Depth strata covered (m)	Dates
1997	C/V *Playa de Menduíña*	128	42-1263	April 26-May 18
1998	C/V *Playa de Menduíña*	124	42-1390	May 06-May 26
1999	C/V *Playa de Menduíña*	114	41-1381	May 07-May 26
2000	C/V *Playa de Menduíña*	118	42-1401	May 07-May 28
2001(*)	R/V *Vizconde de Eza*	83	36-1156	May 03-May 24
	C/V *Playa de Menduíña*	121	40-1500	May 05-May 23
2002	R/V *Vizconde de Eza*	125	38-1540	April 29-May 19
2003	R/V *Vizconde de Eza*	118	38-1666	May 11-June 02
2004	R/V *Vizconde de Eza*	120	43-1539	June 06–June 24
2005	R/V *Vizconde de Eza*	119	47-1485	June 10–June 29
2006	R/V *Vizconde de Eza*	120	45-1480	June 7–June 27

(*) We took, for the calculation of the series, 83 hauls from the R/V *Vizconde de Eza* and 40 hauls from the C/V *Playa de Menduíña* (123 hauls in total)

TABLE 2.- Swept area, number of hauls and Roughhead grenadier mean catch (kg) and SD by stratum. Spanish Spring Surveys on NAFO Div. 3NO: 1997-2006. Swept area in square miles. n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data, and 2002-2006 data are original from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels.

	1997				1998				1999				2000			
Stratum	Swept area	Tow number	R. grenadier Mean catch	R. grenadier SD	Swept area	Tow number	R. grenadier Mean catch	R. grenadier SD	Swept area	Tow number	R. grenadier Mean catch	R. grenadier SD	Swept area	Tow number	R. grenadier Mean catch	R. grenadier SD
353	0.0480	4	0.000	0.000	0.0465	4	0.000	0.000	0.0360	3	0.000	0.000	0.0356	3	0.002	0.004
354	0.0233	2	0.000	0.000	0.0356	3	0.000	0.000	0.0218	2	0.000	0.000	0.0356	3	0.000	0.000
355	0.0233	2	0.000	0.000	0.0221	2	0.000	0.000	0.0229	2	0.000	0.000	0.0233	2	0.083	0.117
356	0.0225	2	0.000	0.000	0.0221	2	0.426	0.602	0.0229	2	0.019	0.026	0.0225	2	0.084	0.016
357	0.0443	4	0.101	0.202	0.0240	2	0.000	0.000	0.0236	2	0.216	0.152	0.0124	1	0.473	-
358	0.0563	5	0.000	0.000	0.0236	3	0.000	0.000	0.0349	3	0.233	0.403	0.0341	3	0.000	0.000
359	0.0690	6	0.000	0.000	0.0698	6	0.000	0.000	0.0364	3	0.000	0.000	0.0469	4	0.000	0.000
360	0.3754	32	0.000	0.000	0.2561	25	0.000	0.000	0.2325	19	0.000	0.000	0.2396	20	0.000	0.000
374	0.0353	3	0.000	0.000	0.0353	3	0.000	0.000	0.0244	2	0.000	0.000	0.0240	2	0.000	0.000
375	0.0116	1	0.000	-	0.0345	3	0.000	0.000	0.0236	2	0.000	0.000	0.0244	2	0.000	0.000
376	0.1583	14	0.000	0.000	0.0930	10	0.000	0.000	0.1219	10	0.000	0.000	0.1200	10	0.000	0.000
377	0.0116	1	0.000	-	0.0229	2	0.000	0.000	0.0240	2	0.000	0.000	0.0229	2	0.000	0.000
378	0.0210	2	0.447	0.632	0.0120	2	0.000	0.000	0.0229	2	0.298	0.421	0.0233	2	0.149	0.211
379	0.0206	2	0.000	0.000	0.0356	3	0.011	0.020	0.0236	2	0.024	0.034	0.0225	2	0.511	0.722
380	0.0210	2	0.219	0.309	0.0113	2	0.000	0.000	0.0236	2	0.003	0.005	0.0236	2	0.157	0.220
381	0.0221	2	0.000	0.000	0.0229	2	0.000	0.000	0.0229	2	0.000	0.000	0.0236	2	0.074	0.100
382	0.0461	4	0.000	0.000	0.0229	3	0.000	0.000	0.0484	4	0.000	0.000	0.0499	4	0.004	0.009
721	0.0221	2	0.000	0.000	0.0203	2	0.758	0.253	0.0244	2	2.443	0.132	0.0236	2	0.812	0.778
722	0.0214	2	0.026	0.036	0.0101	2	3.950	0.385	0.0229	2	3.865	3.202	0.0218	2	4.767	1.204
723	0.0210	2	0.000	0.000	0.0233	2	0.255	0.361	0.0229	2	2.367	2.528	0.0248	2	2.859	1.554
724	0.0225	2	0.562	0.048	0.0206	2	1.064	0.349	0.0225	2	3.678	0.217	0.0233	2	4.130	1.074
725	0.0206	2	0.000	0.000	0.0086	1	0.077	-	0.0229	2	3.718	3.790	0.0210	2	12.646	17.511
726	n.s.	n.s.	n.s.	n.s.	0.0094	2	2.213	2.336	0.0225	2	7.296	0.205	0.0221	2	14.727	0.120
727	0.0094	1	0.358	-	0.0233	2	0.196	0.181	0.0236	2	0.661	0.236	0.0210	2	2.499	2.726
728	0.0214	2	0.835	0.167	0.0206	2	0.919	0.457	0.0233	2	17.996	15.217	0.0210	2	7.249	6.640
752	0.0218	2	8.836	3.973	0.0229	2	8.172	6.983	0.0233	2	9.032	3.744	0.0206	2	26.663	9.968
753	0.0214	2	15.528	7.705	0.0218	2	35.635	9.342	0.0229	2	28.442	30.760	0.0218	2	49.154	1.830
754	0.0330	3	70.193	8.839	0.0210	2	60.723	3.985	0.0206	2	26.373	8.716	0.0195	2	66.801	41.403
755	n.s.	n.s.	n.s.	n.s.	0.0206	2	42.088	3.130	0.0311	3	23.467	7.041	0.0431	4	28.192	7.595
756	0.0109	1	3.252	-	0.0225	2	6.895	5.707	0.0225	2	29.642	5.995	0.0203	2	17.852	0.205
757	0.0304	3	20.873	17.870	0.0206	2	39.313	39.079	0.0233	2	8.896	5.646	0.0214	2	88.705	79.940
758	0.0214	2	46.823	8.232	0.0105	2	77.034	32.807	0.0214	2	46.200	23.151	0.0210	2	55.334	32.746
759	n.s.	n.s.	n.s.	n.s.	0.0214	2	66.392	41.956	0.0218	2	22.491	13.002	0.0210	2	32.826	6.694
760	0.0105	1	3.916	-	0.0214	2	8.862	1.890	0.0225	2	4.010	1.409	0.0210	2	17.758	2.817
761	0.0315	3	19.198	3.744	0.0206	2	25.190	8.102	0.0210	2	16.592	10.125	0.0221	2	11.535	5.093
762	0.0308	3	24.278	18.462	0.0094	2	30.068	18.564	0.0210	2	17.354	9.397	0.0203	2	18.990	4.928
763	n.s.	n.s.	n.s.	n.s.	0.0218	2	10.820	5.285	0.0311	3	11.447	3.789	0.0416	4	14.523	15.110
764	0.0206	2	6.393	4.081	0.0218	2	4.827	2.059	0.0225	2	4.044	1.240	0.0218	2	4.427	2.047
765	0.0206	2	11.752	5.592	0.0098	2	6.734	3.431	0.0221	2	6.197	1.421	0.0203	2	7.755	4.467
766	0.0308	3	7.741	2.498	0.0191	2	6.895	1.902	0.0218	2	5.516	3.371	0.0214	2	3.184	1.156
767	n.s.	n.s.	n.s.	n.s.	0.0109	2	6.529	2.950	0.0214	2	4.844	0.277	0.0210	2	2.537	0.506

$$SD = \frac{\sum \left(x_i - \bar{x} \right)^2}{n-1}$$

TABLE 2 (cont.).- Swept area, number of hauls and Roughhead grenadier mean catch (kg) and SD by stratum. Spanish Spring Surveys on NAFO Div. 3NO: 1997-2006. Swept area in square miles. n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data, and 2002-2006 data are original from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels.

	2001				2002				2003			
Stratum	Swept area	Tow number	R. grenadier Mean catch	R. grenadier SD	Swept area	Tow number	R. grenadier Mean catch	R. grenadier SD	Swept area	Tow number	R. grenadier Mean catch	R. grenadier SD
353	0.0341	3	0.000	0.000	0.0476	4	0.000	0.000	0.0334	3	0.000	0.000
354	0.0338	3	0.000	0.000	0.0356	3	0.000	0.000	0.0338	3	0.000	0.000
355	0.0240	2	0.000	0.000	0.0236	2	0.000	0.000	0.0229	2	0.000	0.000
356	0.0240	2	0.000	0.000	0.0233	2	0.000	0.000	0.0225	2	0.115	0.163
357	0.0244	2	0.170	0.240	0.0240	2	1.050	1.061	0.0229	2	1.385	1.959
358	0.0345	3	0.000	0.000	0.0345	3	0.500	0.700	0.0338	3	0.000	0.000
359	0.0803	7	0.000	0.000	0.0686	6	0.041	0.100	0.0791	7	0.000	0.000
360	0.2423	20	0.390	1.744	0.2865	25	0.000	0.000	0.2254	20	0.000	0.000
374	0.0240	2	0.000	0.000	0.0345	3	0.000	0.000	0.0225	2	0.000	0.000
375	0.0338	3	0.000	0.000	0.0353	3	0.000	0.000	0.0330	3	0.000	0.000
376	0.1155	10	0.000	0.000	0.1140	10	0.000	0.000	0.1125	10	0.000	0.000
377	0.0229	2	0.000	0.000	0.0229	2	0.273	0.386	0.0225	2	0.000	0.000
378	0.0236	2	0.000	0.000	0.0233	2	0.008	0.011	0.0225	2	0.000	0.000
379	0.0229	2	0.430	0.580	0.0229	2	0.265	0.375	0.0229	2	0.124	0.175
380	0.0206	2	0.03	0.048	0.0225	2	0.008	0.011	0.0229	2	0.085	0.120
381	0.0236	2	0.00	0.00	0.0229	2	0.000	0.000	0.0229	2	0.000	0.000
382	0.0469	4	0.00	0.00	0.0341	3	0.002	0.004	0.0454	4	0.000	0.000
721	0.0248	2	0.220	0.085	0.0233	2	1.250	1.768	0.0225	2	0.000	0.000
722	0.0233	2	2.465	2.878	0.0236	2	10.930	14.213	0.0221	2	4.315	4.547
723	0.0240	2	1.705	0.304	0.0233	2	0.700	0.283	0.0229	2	8.370	3.253
724	0.0353	3	7.507	3.835	0.0225	2	10.000	4.384	0.0225	2	4.980	1.669
725	0.0116	2	1.415	1.832	0.0225	2	2.650	1.344	0.0229	2	0.377	0.532
726	0.0116	2	4.304	5.509	0.0214	2	2.650	1.909	0.0225	2	0.000	0.000
727	0.0225	2	0.21	0.132	0.0233	2	0.570	0.806	0.0218	2	21.900	24.607
728	0.0229	2	1.00	0.241	0.0229	2	0.620	0.876	0.0225	2	32.650	3.748
752	0.0210	2	6.04	3.455	0.0116	1	1.950	2.758	0.0229	2	77.900	100.268
753	0.0214	2	31.57	21.165	0.0229	2	5.400	7.637	0.0229	2	57.050	55.791
754	0.0195	2	75.61	17.890	0.0341	3	98.450	82.237	0.0218	2	65.600	40.729
755	0.0416	4	24.29	19.579	0.0338	3	1.460	1.307	0.0221	2	18.200	25.597
756	0.0113	2	12.796	11.520	0.0229	2	11.750	10.819	0.0221	2	7.160	9.051
757	0.0233	2	20.43	16.686	0.0225	2	16.250	16.193	0.0221	2	8.575	2.765
758	0.0218	2	69.10	46.916	0.0225	2	141.550	101.470	0.0221	2	41.050	58.053
759	0.0221	2	59.11	50.035	0.0225	2	69.250	97.934	0.0113	1	78.080	-
760	0.0229	2	7.195	9.468	0.0229	2	11.950	4.172	0.0218	2	40.650	3.465
761	0.0225	2	15.515	2.524	0.0225	2	5.350	5.445	0.0225	2	12.750	9.263
762	0.0116	2	2.839	3.040	0.0225	2	0.325	0.460	0.0225	2	14.650	3.861
763	0.0330	3	15.35	12.271	0.0225	2	1.225	1.732	0.0311	3	2.717	4.705
764	0.0240	2	5.550	3.323	0.0236	2	20.050	11.526	0.0221	2	19.420	19.771
765	0.0113	2	4.385	0.685	0.0236	2	2.700	2.404	0.0113	1	10.400	-
766	0.0203	2	2.65	1.233	0.0233	2	9.125	9.016	0.0225	2	5.690	6.548
767	0.0218	2	3.09	1.673	0.0225	2	9.150	12.940	0.0229	2	3.130	2.461

$$(**)\, SD = \frac{\sum \left(x_i - \bar{x}\right)^2}{n-1}$$

TABLE 2 (cont.).- Swept area, number of hauls and Roughhead grenadier mean catch (kg) and SD by stratum. Spanish Spring Surveys on NAFO Div. 3NO: 1997-2006. Swept area in square miles. n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data, and 2002-2006 data are original from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels.

	2004				2005				2006			
Stratum	Swept area	Tow number	R. grenadier Mean catch	R. grenadier SD	Swept area	Tow number	R. grenadier Mean catch	R. grenadier SD	Swept area	Tow number	R. grenadier Mean catch	R. grenadier SD
353	0.0338	3	0.000	0.000	0.0353	3	0.000	0.000	0.0371	3	0.000	0.000
354	0.0345	3	0.000	0.000	0.0353	3	0.000	0.000	0.0364	3	0.000	0.000
355	0.0229	2	0.000	0.000	0.0225	2	0.000	0.000	0.0248	2	0.000	0.000
356	0.0221	2	1.225	1.732	0.0233	2	0.260	0.368	0.0240	2	0.350	0.495
357	0.0229	2	0.027	0.037	0.0233	2	15.785	3.090	0.0244	2	42.575	1.407
358	0.0330	3	0.007	0.012	0.0349	3	0.000	0.000	0.0349	3	0.000	0.000
359	0.0791	7	0.479	1.267	0.0814	7	0.103	0.217	0.0975	8	0.000	0.000
360	0.2310	20	0.000	0.000	0.2325	20	0.000	0.000	0.2340	19	0.000	0.000
374	0.0233	2	0.000	0.000	0.0229	2	0.000	0.000	0.0236	2	0.000	0.000
375	0.0338	3	0.000	0.000	0.0349	3	0.000	0.000	0.0364	3	0.000	0.000
376	0.1166	10	0.000	0.000	0.1174	10	0.000	0.000	0.1219	10	0.000	0.000
377	0.0218	2	0.000	0.000	0.0233	2	0.000	0.000	0.0236	2	0.000	0.000
378	0.0225	2	0.000	0.000	0.0225	2	0.620	0.877	0.0240	2	0.260	0.367
379	0.0124	1	3.960	-	0.0236	2	26.975	17.006	0.0236	2	112.080	148.252
380	0.0221	2	278.650	209.516	0.0229	2	194.750	113.491	0.0229	2	130.294	89.342
381	0.0225	2	4.145	5.169	0.0233	2	17.450	11.384	0.0229	2	101.485	42.122
382	0.0461	4	0.080	0.160	0.0458	4	0.235	0.286	0.0469	4	0.200	0.400
721	0.0221	2	3.473	0.449	0.0229	2	1.173	1.609	0.0236	2	3.005	3.415
722	0.0218	2	4.530	2.676	0.0233	2	5.415	4.985	0.0240	2	0.901	1.005
723	0.0229	2	10.053	4.938	0.0233	2	21.528	23.869	0.0236	2	20.810	0.919
724	0.0214	2	10.746	0.701	0.0225	2	9.500	8.514	0.0233	2	4.712	4.322
725	0.0225	2	92.415	82.046	0.0236	2	104.420	135.072	0.0233	2	48.050	48.578
726	0.0225	2	59.865	19.608	0.0113	1	34.900	-	0.0225	2	21.017	5.822
727	0.0233	2	16.700	1.697	0.0229	2	18.650	12.657	0.0225	2	14.650	7.283
728	0.0180	2	15.650	9.687	0.0109	1	35.400	-	0.0225	2	25.250	1.626
752	0.0214	2	94.610	95.162	0.0236	2	21.590	3.677	0.0225	2	25.200	10.041
753	0.0218	2	63.835	45.912	0.0225	2	63.320	12.629	0.0225	2	14.863	7.973
754	0.0214	2	33.355	11.377	0.0225	2	13.957	14.981	0.0225	2	5.055	7.148
755	0.0319	3	14.658	21.304	0.0450	4	34.228	9.637	0.0338	3	22.257	27.055
756	0.0218	2	9.772	3.778	0.0233	2	23.675	12.693	0.0229	2	26.875	13.103
757	0.0218	2	12.890	8.330	0.0225	2	17.758	8.403	0.0225	2	7.399	6.079
758	0.0214	2	32.955	10.260	0.0225	2	34.043	1.042	0.0225	2	111.965	139.915
759	0.0214	2	39.980	4.921	0.0229	2	46.825	37.512	0.0225	2	2.410	3.242
760	0.0221	2	76.475	94.293	0.0229	2	57.790	20.492	0.0225	2	42.124	31.854
761	0.0221	2	25.610	28.055	0.0221	2	37.553	18.438	0.0233	2	18.333	4.104
762	0.0233	2	15.729	4.594	0.0225	2	11.938	8.432	0.0233	2	22.712	29.399
763	0.0326	3	28.000	21.696	0.0334	3	13.424	3.205	0.0225	2	29.163	24.236
764	0.0229	2	40.790	41.988	0.0233	2	1.161	1.642	0.0233	2	3.134	0.699
765	0.0225	2	5.347	2.710	0.0229	2	7.252	2.647	0.0236	2	15.093	19.846
766	0.0225	2	7.214	1.582	0.0229	2	6.355	4.794	0.0229	2	3.463	2.077
767	0.0218	2	3.667	0.401	0.0113	1	4.646	-	0.0233	2	2.495	3.528

$$SD = \frac{\sum \left(x_i - \bar{x} \right)^2}{n-1}$$

TABLE 3.- Stratified mean catches (Kg) by stratum and year and SD by year of Roughhead grenadier (1997-2006). n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2006 data are original from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels.

Strata	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
353	0.00	0.00	0.00	0.61	0.00	0.00	0.00	0.00	0.00	0.00
354	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
355	0.00	0.00	0.00	6.11	0.00	0.00	0.00	0.00	0.00	0.00
356	0.00	20.01	0.88	3.96	0.00	0.00	5.41	57.58	12.22	16.45
357	16.54	0.00	35.46	77.62	27.88	172.20	227.14	4.35	2588.74	6982.30
358	0.00	0.00	52.35	0.00	0.00	112.50	0.00	1.50	0.00	0.00
359	0.00	0.00	0.00	0.00	0.00	17.19	0.00	201.66	43.30	0.00
360	0.00	0.00	0.00	0.00	1085.37	0.00	0.00	0.00	0.00	0.00
374	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
375	0.00	0.00	0.00	0.00	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	0.00	0.00	0.00	0.00
377	0.00	0.00	0.00	0.00	0.00	27.30	0.00	0.00	0.00	0.00
378	62.12	0.00	41.42	20.71	0.00	1.04	0.00	0.00	86.18	36.07
379	0.00	1.20	2.53	54.14	45.58	28.09	13.14	419.76	2859.35	11880.48
380	21.00	0.00	0.33	15.12	3.27	0.72	8.16	26750.40	18696.00	12508.18
381	0.00	0.00	0.00	10.67	0.00	0.00	0.00	596.88	2512.80	14613.84
382	0.00	0.00	0.00	1.46	0.00	0.80	0.00	27.44	80.61	68.60
721	0.00	49.25	158.81	52.79	14.30	81.25	0.00	225.71	76.21	195.33
722	2.15	331.80	324.65	400.45	207.06	918.12	362.46	380.48	454.86	75.64
723	0.00	39.59	366.82	443.22	264.28	108.50	1297.35	1558.14	3336.84	3225.55
724	69.67	131.95	456.02	512.18	930.83	1240.00	617.52	1332.50	1178.00	584.29
725	0.00	8.04	390.44	1327.83	148.53	278.25	39.53	9703.58	10964.10	5045.25
726	n.s.	159.36	525.28	1060.37	309.91	190.80	0.00	4310.28	2512.80	1513.22
727	34.32	18.80	63.42	239.94	20.43	54.72	2102.40	1603.20	1790.40	1406.40
728	65.14	71.71	1403.72	565.40	78.35	48.32	2546.70	1220.70	2761.20	1969.50
752	1157.57	1070.59	1183.22	3492.80	790.67	255.45	10204.90	12393.91	2828.29	3301.20
753	2142.81	4917.66	3924.96	6783.22	4356.11	745.20	7872.90	8809.23	8738.16	2051.03
754	12634.78	10930.12	4747.16	12024.20	13610.16	17721.00	11808.00	6003.90	2512.26	909.81
755	n.s.	16203.89	9034.94	10853.88	9350.67	562.10	7007.00	5643.46	13177.59	8568.82
756	328.45	696.44	2993.85	1803.02	1292.39	1186.75	723.16	986.92	2391.18	2714.38
757	2129.06	4009.91	907.40	9047.90	2083.97	1657.50	874.65	1314.78	1811.32	754.65
758	4635.47	7626.33	4573.78	5478.08	6840.86	14013.45	4063.95	3262.55	3370.26	11084.54
759	n.s.	8431.85	2856.38	4168.89	7507.47	8794.75	9916.16	5077.46	5946.78	306.01
760	603.06	1364.74	617.48	2734.73	1108.03	1840.30	6260.10	11777.15	8899.66	6487.10
761	3282.93	4307.46	2837.19	1972.49	2653.07	914.85	2180.25	4379.31	6421.48	3134.94
762	5147.01	6374.36	3678.97	4025.85	601.93	68.90	3105.80	3334.44	2530.75	4814.94
763	n.s.	2824.01	2987.69	3790.53	4005.31	319.73	709.05	7307.91	3503.58	7611.41
764	639.32	482.68	404.37	442.67	555.00	2005.00	1942.00	4079.00	116.10	313.40
765	1457.26	834.98	768.48	961.66	543.70	334.80	1289.60	662.97	899.19	1871.53
766	1114.72	992.95	794.36	458.47	381.98	1314.00	819.36	1038.74	915.12	498.67
767	n.s.	1031.65	765.33	400.82	488.25	1445.70	494.54	579.31	734.07	394.21
TOTAL	35543.40	72931.33	46897.68	73231.81	59305.36	56459.28	76491.23	125045.18	114749.37	114937.72
$(\overline{Y})$	3.81	7.05	4.53	7.08	5.73	5.46	7.40	12.09	11.10	11.11
S.D.	0.31	0.61	0.45	0.85	0.77	1.51	1.42	2.17	1.38	1.89

TABLE 4.- Survey estimates (by the swept area method) of Roughhead grenadier biomass (t) and SD by stratum and year on NAFO Div. 3NO. n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2006 data are original from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels. The last row presents the biomass obtained from the length distribution.

Strata	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
353	0	0	0	0	0	0	0	0	0	0
354	0	0	0	0	0	0	0	0	0	0
355	0	0	0	1	0	0	0	0	0	0
356	0	2	0	0	0	0	0	5	1	1
357	1	0	3	6	2	14	20	0	223	573
358	0	0	5	0	0	10	0	0	0	0
359	0	0	0	0	0	2	0	18	4	0
360	0	0	0	0	90	0	0	0	0	0
374	0	0	0	0	0	0	0	0	0	0
375	0	0	0	0	0	0	0	0	0	0
376	0	0	0	0	0	0	0	0	0	0
377	0	0	0	0	0	2	0	0	0	0
378	6	0	4	2	0	0	0	0	8	3
379	0	0	0	5	4	2	1	34	242	1006
380	2	0	0	1	0	0	1	2418	1635	1094
381	0	0	0	1	0	0	0	53	216	1278
382	0	0	0	0	0	0	0	2	7	6
721	0	5	13	4	1	7	0	20	7	17
722	0	31	28	37	18	78	33	35	39	6
723	0	3	32	36	22	9	113	136	287	273
724	6	13	41	44	79	110	55	125	105	50
725	0	1	34	126	13	25	3	863	928	434
726	0	15	47	96	25	18	0	383	223	135
727	4	2	5	23	2	5	193	138	157	125
728	6	7	121	54	7	4	226	136	254	175
752	106	94	102	339	75	22	892	1160	239	293
753	200	452	343	624	407	65	688	810	777	182
754	1149	1041	460	1233	1395	1549	1086	562	223	81
755	n.s.	1571	871	1007	899	50	633	531	1171	762
756	30	62	266	178	113	104	65	91	206	237
757	210	389	78	847	179	147	79	121	161	67
758	434	701	428	522	629	1246	367	305	300	985
759	n.s.	789	263	397	679	782	881	475	520	27
760	57	128	55	260	97	161	576	1065	778	577
761	313	418	270	178	236	81	194	396	580	270
762	502	618	350	398	54	6	276	287	225	414
763	n.s.	260	288	364	364	28	68	672	315	677
764	62	44	36	41	46	170	176	357	10	27
765	141	80	69	95	49	28	115	59	79	158
766	109	104	73	43	38	113	73	92	80	44
767	n.s.	93	72	38	45	129	43	53	65	34
TOTAL	3340	6922	4357	7000	5568	4968	6860	11402	10064	10010
S.D.	290	644	431	807	700	1365	1316	2043	1236	1716

TABLE 5.- Length weight relationships in the calculation of Roughead grenadier biomass. The equation is $Weight = a(l + 0.25)^b$ Spanish Spring Surveys on NAFO Div. 3NO: 1997-2006. To calculate the parameters for the indeterminate individuals, we used the total data (males + females + indeterminate individuals)

		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Males	a	0.0686563	0.1094310	0.0649997	0.0554275	0.1095131	0.0881514	0.1141263	0.0903821	0.0599653	0.1058261
		Error = 0.3814	Error = 0.0983	Error = 0.1812	Error = 0.1403	Error = 0.0689	Error = 0.0485	Error = 0.0628	Error = 0.0792	Error = 0.1014	Error = 0.1087
	b	3.0452545	2.8929179	3.1084774	3.1410878	2.8905752	2.9672036	2.8805354	2.9517438	3.1089685	2.914968
		Error = 0.1340	Error = 0.09370	Error = 0.0728	Error = 0.0547	Error = 0.0279	Error = 0.0200	Error = 0.0262	Error = 0.0311	Error = 0.0389	Error = 0.0442
		R2 = 0.979	R2 = 0.995	R2 = 0.984	R2 = 0.989	R2 = 0.997	R2 = 0.998	R2 = 0.997	R2 = 0.995	R2 = 0.994	R2 = 0.995
		N = 26	N = 201	N = 102	N = 269	N = 116	N = 292	N = 496	N = 525	N = 411	N = 463
Females	a	0.0937428	0.0673134	0.1184983	0.0789802	0.2842789	0.0855960	0.1131568	0.0804420	0.0801587	0.3193442
		Error = 0.1618	Error = 0.0938	Error = 0.1245	Error = 0.0608	Error = 0.3519	Error = 0.0950	Error = 0.0441	Error = 0.0351	Error = 0.0499	Error = 0.3878
	b	2.9394836	3.0550714	2.8738821	3.0192313	2.5396540	2.9736202	2.8864205	2.9918664	2.995023	2.537343
		Error = 0.0531	Error = 0.0315	Error = 0.0422	Error = 0.0209	Error = 0.1311	Error = 0.0336	Error = 0.0156	Error = 0.0123	Error = 0.0175	Error = 0.1408
		R2 = 0.993	R2 = 0.993	R2 = 0.987	R2 = 0.997	R2 = 0.901	R2 = 0.992	R2 = 0.998	R2 = 0.999	R2 = 0.998	R2 = 0.918
		N = 41	N = 450	N = 233	N = 548	N = 168	N = 477	N = 788	N = 806	N = 626	N = 737
Indet.	a	0.0908568	0.0907145	0.1184514	0.0736017	0.1862139	0.1039522	0.1104181	0.0924286	0.0832725	0.2939031
		Error = 0.1433	Error = 0.0484	Error = 0.1043	Error = 0.0625	Error = 0.1546	Error = 0.0542	Error = 0.0425	Error = 0.0578	Error = 0.0451	Error = 0.3531
	b	2.9493921	2.9631140	2.8772707	3.0408785	2.6892207	2.9096048	2.8948522	2.9466412	2.9831567	2.5661442
		Error = 0.0475	Error = 0.0164	Error = 0.0357	Error = 0.0218	Error = 0.0603	Error = 0.0196	Error = 0.0151	Error = 0.0207	Error = 0.0161	Error = 0.1301
		R2 = 0.994	R2 = 0.998	R2 = 0.990	R2 = 0.997	R2 = 0.977	R2 = 0.997	R2 = 0.998	R2 = 0.997	R2 = 0.998	R2 = 0.928
		N = 67	N = 655	N = 338	N = 820	N = 292	N = 787	N = 1288	N = 1379	N = 1078	N = 1218

TABLE 6.- Roughhead grenadier length distribution. Estimated numbers per haul stratified mean catches. Spanish Spring Survey on NAFO 3NO: 1997-2006. Indet. means indeterminate. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2006 data are original R/V *Vizconde de Eza* data. In 2001, there are data from the two vessels. (*) indicates untransformed data.

.	1997				1998				1999				2000			
Length (cm.)	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
2.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.5	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.023	0.023
4.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.061	0.009	0.070	0.016	0.063	0.000	0.079
5.5	0.000	0.042	0.000	0.042	0.000	0.000	0.030	0.030	0.265	0.186	0.021	0.472	0.191	0.393	0.000	0.584
6.5	0.000	0.000	0.000	0.000	0.005	0.013	0.007	0.024	0.105	0.171	0.003	0.280	0.153	0.169	0.027	0.349
7.5	0.000	0.055	0.000	0.055	0.061	0.025	0.002	0.087	0.213	0.296	0.000	0.509	0.253	0.159	0.000	0.412
8.5	0.087	0.070	0.000	0.156	0.201	0.152	0.000	0.353	0.191	0.253	0.000	0.444	0.172	0.174	0.000	0.346
9.5	0.006	0.054	0.000	0.060	0.238	0.208	0.000	0.446	0.301	0.331	0.000	0.631	0.379	0.358	0.000	0.737
10.5	0.055	0.097	0.000	0.152	0.725	0.612	0.000	1.337	0.702	0.754	0.000	1.456	0.420	0.461	0.000	0.881
11.5	0.095	0.211	0.000	0.305	0.537	0.691	0.000	1.227	1.232	1.447	0.000	2.679	0.955	1.019	0.000	1.974
12.5	0.141	0.208	0.000	0.349	0.399	0.471	0.000	0.870	1.156	1.582	0.000	2.738	1.506	1.653	0.000	3.159
13.5	0.236	0.332	0.000	0.568	0.522	0.484	0.000	1.006	0.643	0.889	0.000	1.532	1.993	2.471	0.000	4.464
14.5	0.639	0.529	0.000	1.168	0.899	0.678	0.000	1.576	0.498	0.569	0.000	1.067	1.107	1.762	0.000	2.869
15.5	0.699	0.836	0.000	1.536	1.242	1.013	0.000	2.255	0.728	0.565	0.000	1.293	0.879	0.972	0.000	1.851
16.5	0.471	0.554	0.000	1.025	1.159	1.006	0.000	2.165	0.698	0.663	0.000	1.361	0.709	0.771	0.000	1.480
17.5	0.251	0.374	0.000	0.625	0.920	0.943	0.000	1.862	0.480	0.561	0.000	1.041	0.626	0.789	0.000	1.415
18.5	0.244	0.319	0.000	0.563	0.455	0.707	0.000	1.162	0.245	0.318	0.000	0.563	0.427	0.589	0.000	1.016
19.5	0.263	0.288	0.000	0.551	0.380	0.429	0.000	0.808	0.151	0.181	0.000	0.332	0.191	0.412	0.000	0.603
20.5	0.235	0.280	0.000	0.514	0.235	0.303	0.000	0.538	0.067	0.131	0.000	0.198	0.057	0.250	0.000	0.308
21.5	0.159	0.198	0.000	0.358	0.118	0.359	0.000	0.476	0.022	0.116	0.000	0.138	0.028	0.274	0.000	0.302
22.5	0.042	0.212	0.000	0.254	0.035	0.237	0.000	0.272	0.008	0.079	0.000	0.087	0.007	0.167	0.000	0.174
23.5	0.022	0.165	0.000	0.187	0.025	0.223	0.000	0.248	0.002	0.071	0.000	0.074	0.006	0.118	0.000	0.124
24.5	0.000	0.116	0.000	0.116	0.002	0.203	0.000	0.204	0.001	0.074	0.000	0.075	0.000	0.143	0.000	0.143
25.5	0.002	0.082	0.000	0.084	0.001	0.187	0.000	0.188	0.001	0.058	0.000	0.059	0.005	0.092	0.000	0.097
26.5	0.000	0.046	0.000	0.046	0.003	0.076	0.000	0.079	0.002	0.045	0.000	0.047	0.002	0.091	0.000	0.094
27.5	0.000	0.014	0.000	0.014	0.009	0.071	0.000	0.080	0.000	0.038	0.000	0.038	0.004	0.070	0.000	0.074
28.5	0.000	0.033	0.000	0.033	0.000	0.066	0.000	0.066	0.000	0.033	0.000	0.033	0.000	0.057	0.000	0.057
29.5	0.008	0.022	0.000	0.030	0.007	0.051	0.000	0.057	0.002	0.033	0.000	0.035	0.000	0.034	0.000	0.034
30.5	0.000	0.014	0.000	0.014	0.001	0.054	0.000	0.054	0.000	0.013	0.000	0.013	0.000	0.037	0.000	0.037
31.5	0.000	0.012	0.000	0.012	0.000	0.044	0.000	0.044	0.000	0.014	0.000	0.014	0.000	0.025	0.000	0.025
32.5	0.000	0.011	0.000	0.011	0.000	0.023	0.000	0.023	0.000	0.010	0.000	0.010	0.000	0.018	0.000	0.018
33.5	0.000	0.008	0.000	0.008	0.000	0.016	0.000	0.016	0.000	0.013	0.000	0.013	0.000	0.004	0.000	0.004
34.5	0.000	0.000	0.000	0.000	0.000	0.015	0.000	0.015	0.000	0.004	0.000	0.004	0.000	0.011	0.000	0.011
35.5	0.000	0.001	0.000	0.001	0.000	0.010	0.000	0.010	0.000	0.003	0.000	0.003	0.000	0.002	0.000	0.002
36.5	0.000	0.005	0.000	0.005	0.000	0.007	0.000	0.007	0.000	0.001	0.000	0.001	0.000	0.019	0.000	0.019
37.5	0.000	0.003	0.000	0.003	0.000	0.003	0.000	0.003	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000
38.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.002	0.000	0.002
39.5	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.002
Total	3.654	5.191	0.000	8.845	8.176	9.385	0.039	17.600	7.712	9.565	0.033	17.309	10.087	13.633	0.050	23.770
Nº samples(*):				14				47				53				57
Nº Ind. (*):	416	609	2	1027	1647	2421	8	4076	2501	3512	7	6020	1957	2967	4	4928
Sampled catch:				89				338				379				318
Range(*):				5.5-37				3.5-39.5				4-38				3-40.5
Total catch:				626				892				650				1080
Total hauls(*):				128				124				114				118

TABLE 6 (cont.).- Roughhead grenadier length distribution. Estimated numbers per haul stratified mean catches. Spanish Spring Survey on NAFO 3NO: 1997-2006. Indet. means indeterminate. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2006 data are original R/V *Vizconde de Eza* data. In 2001, there are data from the two vessels. (*) indicates untransformed data.

.	2001				2002				2003			
Length (cm.)	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
2.5	0.000	0.000	0.036	0.036	0.031	0.009	0.012	0.052	0.016	0.000	0.019	0.035
3.5	0.007	0.021	0.050	0.079	0.112	0.036	0.047	0.195	0.219	0.069	0.074	0.362
4.5	0.059	0.013	0.029	0.102	0.088	0.039	0.017	0.144	0.045	0.052	0.015	0.113
5.5	0.110	0.143	0.010	0.263	0.198	0.208	0.009	0.414	0.353	0.390	0.000	0.743
6.5	0.074	0.087	0.000	0.161	0.058	0.102	0.005	0.165	0.653	0.652	0.000	1.305
7.5	0.051	0.060	0.000	0.111	0.095	0.080	0.000	0.175	0.215	0.256	0.000	0.470
8.5	0.121	0.134	0.000	0.254	0.087	0.149	0.000	0.235	0.401	0.491	0.000	0.892
9.5	0.158	0.090	0.000	0.248	0.084	0.063	0.000	0.147	0.254	0.233	0.000	0.487
10.5	0.189	0.215	0.000	0.404	0.110	0.098	0.000	0.208	0.351	0.320	0.000	0.671
11.5	0.319	0.371	0.000	0.690	0.109	0.185	0.000	0.294	0.220	0.407	0.000	0.627
12.5	0.476	0.550	0.000	1.026	0.201	0.243	0.000	0.444	0.312	0.354	0.000	0.665
13.5	0.959	1.182	0.000	2.141	0.378	0.284	0.000	0.662	0.482	0.542	0.000	1.024
14.5	1.521	1.543	0.000	3.063	0.603	0.552	0.000	1.155	0.751	0.859	0.000	1.610
15.5	1.453	1.650	0.000	3.104	0.627	0.904	0.000	1.531	1.246	1.169	0.000	2.414
16.5	0.844	1.158	0.000	2.003	0.612	0.928	0.000	1.540	1.525	1.389	0.000	2.914
17.5	0.773	0.628	0.000	1.401	0.343	0.729	0.000	1.072	0.793	1.335	0.000	2.128
18.5	0.646	0.464	0.000	1.111	0.244	0.502	0.000	0.746	0.384	0.806	0.000	1.190
19.5	0.283	0.317	0.000	0.600	0.202	0.505	0.000	0.707	0.234	0.656	0.000	0.890
20.5	0.071	0.361	0.000	0.432	0.115	0.387	0.000	0.502	0.171	0.356	0.000	0.527
21.5	0.025	0.148	0.000	0.173	0.028	0.349	0.000	0.377	0.005	0.257	0.000	0.262
22.5	0.001	0.095	0.000	0.095	0.017	0.299	0.000	0.316	0.019	0.289	0.000	0.308
23.5	0.000	0.082	0.000	0.082	0.008	0.152	0.000	0.160	0.008	0.187	0.000	0.195
24.5	0.000	0.061	0.000	0.061	0.004	0.102	0.000	0.106	0.000	0.108	0.000	0.108
25.5	0.002	0.058	0.000	0.060	0.000	0.070	0.000	0.070	0.000	0.111	0.000	0.111
26.5	0.004	0.040	0.000	0.044	0.000	0.114	0.000	0.114	0.000	0.109	0.000	0.109
27.5	0.000	0.026	0.000	0.026	0.000	0.149	0.000	0.149	0.000	0.100	0.000	0.100
28.5	0.002	0.040	0.000	0.041	0.000	0.086	0.000	0.086	0.000	0.104	0.000	0.104
29.5	0.000	0.027	0.000	0.027	0.000	0.063	0.000	0.063	0.000	0.083	0.000	0.083
30.5	0.000	0.032	0.000	0.032	0.000	0.059	0.000	0.059	0.000	0.073	0.000	0.073
31.5	0.000	0.029	0.000	0.029	0.000	0.062	0.000	0.062	0.000	0.018	0.000	0.018
32.5	0.000	0.021	0.000	0.021	0.000	0.023	0.000	0.023	0.000	0.040	0.000	0.040
33.5	0.000	0.008	0.000	0.008	0.000	0.034	0.000	0.034	0.000	0.016	0.000	0.016
34.5	0.000	0.008	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.005
35.5	0.000	0.008	0.000	0.008	0.000	0.041	0.000	0.041	0.000	0.030	0.000	0.030
36.5	0.000	0.004	0.000	0.004	0.000	0.018	0.000	0.018	0.000	0.010	0.000	0.010
37.5	0.000	0.003	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
38.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
39.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40.5	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	8.149	9.677	0.125	17.952	4.352	7.622	0.090	12.063	8.655	11.875	0.108	20.638
Nº samples(*):				22				48				43
Nº Ind. (*):	149	208	10	367	604	1018	18	1640	1089	1500	21	2610
Sampled catch:				107				754				931
Range(*):				2.5-29				2-36.5				2.5-36
Total catch:				453				877				990
Total hauls(*):				123				125				118

TABLE 6 (cont.).- Roughhead grenadier length distribution. Estimated numbers per haul stratified mean catches. Spanish Spring Survey on NAFO 3NO: 1997-2006. Indet. means indeterminate. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2006 data are original R/V *Vizconde de Eza* data. In 2001, there are data from the two vessels. (*) indicates untransformed data.

.	2004				2005				2006			
Length (cm.)	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
2.5	0.000	0.000	0.026	0.026	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.5	0.070	0.024	0.651	0.746	0.030	0.026	0.289	0.344	0.120	0.012	0.141	0.273
4.5	0.089	0.006	0.080	0.176	0.046	0.030	0.106	0.182	0.155	0.063	0.007	0.225
5.5	0.161	0.124	0.005	0.290	0.015	0.038	0.000	0.053	0.069	0.063	0.000	0.132
6.5	0.649	0.567	0.000	1.216	0.499	0.510	0.000	1.009	0.374	0.448	0.004	0.826
7.5	0.223	0.196	0.000	0.419	0.324	0.308	0.000	0.633	0.386	0.312	0.000	0.698
8.5	0.617	0.550	0.000	1.167	0.339	0.383	0.009	0.732	0.216	0.140	0.000	0.356
9.5	0.592	0.860	0.000	1.452	0.393	0.671	0.000	1.064	0.378	0.317	0.000	0.695
10.5	0.442	0.694	0.000	1.136	0.452	0.603	0.000	1.055	0.194	0.331	0.000	0.524
11.5	0.715	0.673	0.000	1.387	0.939	1.113	0.000	2.052	0.381	0.428	0.000	0.810
12.5	0.684	0.650	0.000	1.335	0.740	0.907	0.000	1.647	0.493	0.653	0.000	1.146
13.5	0.678	0.716	0.000	1.393	0.631	0.792	0.000	1.423	0.846	0.672	0.000	1.519
14.5	0.932	0.683	0.000	1.615	0.560	0.795	0.000	1.355	0.637	0.790	0.000	1.427
15.5	1.046	0.901	0.000	1.947	0.621	0.821	0.000	1.442	0.748	0.912	0.000	1.660
16.5	1.197	1.295	0.000	2.492	0.781	0.646	0.000	1.427	0.704	0.522	0.000	1.225
17.5	1.429	1.270	0.000	2.699	1.170	1.050	0.000	2.220	0.876	0.619	0.000	1.495
18.5	1.051	1.573	0.000	2.623	1.129	0.991	0.000	2.120	0.884	0.834	0.000	1.718
19.5	0.476	1.333	0.000	1.808	0.668	1.323	0.000	1.991	0.695	1.050	0.000	1.745
20.5	0.334	0.875	0.000	1.209	0.258	1.113	0.000	1.371	0.387	1.165	0.000	1.552
21.5	0.157	0.681	0.000	0.839	0.066	0.708	0.000	0.774	0.154	1.101	0.000	1.255
22.5	0.027	0.597	0.000	0.624	0.061	0.546	0.000	0.607	0.038	0.923	0.000	0.961
23.5	0.028	0.437	0.000	0.466	0.009	0.551	0.000	0.559	0.013	0.748	0.000	0.761
24.5	0.018	0.391	0.000	0.409	0.016	0.481	0.000	0.497	0.008	0.483	0.000	0.491
25.5	0.000	0.266	0.000	0.266	0.009	0.259	0.000	0.268	0.000	0.387	0.000	0.387
26.5	0.005	0.265	0.000	0.270	0.006	0.173	0.000	0.179	0.000	0.266	0.000	0.266
27.5	0.000	0.178	0.000	0.178	0.000	0.235	0.000	0.235	0.013	0.091	0.000	0.105
28.5	0.000	0.154	0.000	0.154	0.000	0.106	0.000	0.106	0.005	0.120	0.000	0.125
29.5	0.005	0.185	0.000	0.190	0.000	0.119	0.000	0.119	0.000	0.112	0.000	0.112
30.5	0.000	0.146	0.000	0.146	0.000	0.120	0.000	0.120	0.000	0.105	0.000	0.105
31.5	0.000	0.086	0.000	0.086	0.000	0.083	0.000	0.083	0.000	0.107	0.000	0.107
32.5	0.000	0.059	0.000	0.059	0.000	0.029	0.000	0.029	0.000	0.080	0.000	0.080
33.5	0.000	0.062	0.000	0.062	0.000	0.025	0.000	0.025	0.000	0.060	0.000	0.060
34.5	0.000	0.040	0.000	0.040	0.000	0.046	0.000	0.046	0.000	0.000	0.000	0.000
35.5	0.000	0.018	0.000	0.018	0.000	0.016	0.000	0.016	0.000	0.015	0.000	0.015
36.5	0.000	0.013	0.000	0.013	0.000	0.016	0.000	0.016	0.000	0.004	0.000	0.004
37.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
38.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
39.5	0.000	0.009	0.000	0.009	0.000	0.009	0.000	0.009	0.000	0.000	0.000	0.000
40.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	11.623	16.579	0.763	28.964	9.762	15.641	0.403	25.807	8.775	13.935	0.152	22.862
Nº samples(*):				59				61				57
Nº Ind. (*):	1535	2270	157	3962	1250	2028	57	3335	1140	1930	20	3090
Sampled catch:				1742				1499				1629
Range(*):				2.5-39				3-39				3-36
Total catch:				2055				1781				1779
Total hauls(*):				120				119				120

TABLE 7.- Swept area, number of hauls and Thorny skate mean catch (kg) and SD by stratum. Spanish Spring Surveys on NAFO Div. 3NO: 1997-2006. Swept area in square miles. n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data, and 2002-2006 data are original from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels.

	1997				1998				1999				2000			
Stratum	Swept area	Tow number	T. skate Mean catch	T. skate SD	Swept area	Tow number	T. skate Mean catch	T. skate SD	Swept area	Tow number	T. skate Mean catch	T. skate SD	Swept area	Tow number	T. skate Mean catch	T. skate SD
353	0.0480	4	6.21	1.73	0.0465	4	26.06	11.09	0.0360	3	319.35	89.29	0.0356	3	149.95	44.45
354	0.0233	2	1.20	1.12	0.0356	3	68.23	87.97	0.0218	2	20.21	28.57	0.0356	3	82.44	34.12
355	0.0233	2	27.19	22.38	0.0221	2	3.43	0.23	0.0229	2	12.40	17.54	0.0233	2	33.14	41.19
356	0.0225	2	2.72	0.61	0.0221	2	0.69	0.42	0.0229	2	1.55	0.28	0.0225	2	2.21	0.51
357	0.0443	4	1.32	1.56	0.0240	2	1.69	1.37	0.0236	2	2.98	1.74	0.0124	1	0.00	-
358	0.0563	5	1.56	1.52	0.0236	3	0.99	1.17	0.0349	3	2.81	2.22	0.0341	3	15.49	17.71
359	0.0690	6	7.47	2.92	0.0698	6	7.93	5.95	0.0364	3	13.25	14.73	0.0469	4	71.73	91.22
360	0.3754	32	10.11	11.61	0.2561	25	17.95	23.86	0.2325	19	67.68	55.88	0.2396	20	132.15	142.67
374	0.0353	3	2.29	1.19	0.0353	3	0.41	0.61	0.0244	2	5.91	0.14	0.0240	2	0.71	1.00
375	0.0116	1	0.84	-	0.0345	3	1.97	1.81	0.0236	2	6.57	0.77	0.0244	2	3.48	0.40
376	0.1583	14	15.16	16.62	0.0930	10	24.06	35.48	0.1219	10	75.94	45.71	0.1200	10	68.84	52.60
377	0.0116	1	1.28	-	0.0229	2	0.32	0.31	0.0240	2	1.04	0.18	0.0229	2	0.57	0.81
378	0.0210	2	2.07	0.59	0.0120	2	2.07	2.40	0.0229	2	8.32	5.01	0.0233	2	5.54	3.31
379	0.0206	2	0.54	0.24	0.0356	3	1.69	1.09	0.0236	2	0.76	0.53	0.0225	2	1.10	0.51
380	0.0210	2	1.27	0.37	0.0113	2	4.50	2.78	0.0236	2	3.96	1.95	0.0236	2	1.26	1.17
381	0.0221	2	6.17	7.81	0.0229	2	7.65	0.24	0.0229	2	1.03	0.28	0.0236	2	3.94	0.36
382	0.0461	4	0.64	0.95	0.0229	3	1.02	0.85	0.0484	4	4.44	3.05	0.0499	4	5.36	0.80
721	0.0221	2	2.28	0.18	0.0203	2	8.17	9.33	0.0244	2	1.16	1.64	0.0236	2	6.54	6.27
722	0.0214	2	7.54	10.66	0.0101	2	38.34	45.25	0.0229	2	10.79	15.26	0.0218	2	13.79	6.07
723	0.0210	2	6.32	7.25	0.0233	2	2.62	0.40	0.0229	2	3.77	3.99	0.0248	2	4.05	4.37
724	0.0225	2	2.06	2.45	0.0206	2	12.29	3.71	0.0225	2	9.83	6.80	0.0233	2	2.33	3.29
725	0.0206	2	0.27	0.31	0.0086	1	3.89	-	0.0229	2	3.63	5.13	0.0210	2	4.11	5.03
726	n.s.	n.s.	n.s.	n.s.	0.0094	2	0.26	0.37	0.0225	2	0.89	1.25	0.0221	2	9.68	10.56
727	0.0094	1	3.37	-	0.0233	2	6.02	2.84	0.0236	2	2.83	0.63	0.0210	2	0.58	0.60
728	0.0214	2	1.45	1.11	0.0206	2	4.68	2.68	0.0233	2	4.91	3.22	0.0210	2	1.85	1.22
752	0.0218	2	4.25	2.51	0.0229	2	58.62	78.69	0.0233	2	2.24	1.11	0.0206	2	1.20	1.30
753	0.0214	2	13.56	17.61	0.0218	2	4.01	5.19	0.0229	2	17.13	19.39	0.0218	2	3.01	4.26
754	0.0330	3	45.32	25.00	0.0210	2	112.25	14.65	0.0206	2	16.66	23.56	0.0195	2	54.96	23.46
755	n.s.	n.s.	n.s.	n.s.	0.0206	2	7.84	5.34	0.0311	3	0.00	0.00	0.0431	4	2.74	5.48
756	0.0109	1	13.91	-	0.0225	2	63.66	36.74	0.0225	2	16.21	19.54	0.0203	2	3.69	3.64
757	0.0304	3	32.68	39.04	0.0206	2	67.38	86.94	0.0233	2	10.74	10.98	0.0214	2	55.50	20.36
758	0.0214	2	52.54	7.90	0.0105	2	235.97	239.70	0.0214	2	117.49	142.60	0.0210	2	55.87	79.01
759	n.s.	n.s.	n.s.	n.s.	0.0214	2	114.12	147.96	0.0218	2	0.43	0.26	0.0210	2	41.86	56.21
760	0.0105	1	0.00	-	0.0214	2	6.73	3.05	0.0225	2	9.20	11.14	0.0210	2	12.97	11.59
761	0.0315	3	59.26	86.28	0.0206	2	17.62	10.16	0.0210	2	0.71	0.32	0.0221	2	10.20	13.55
762	0.0308	3	50.77	82.75	0.0094	2	5.24	4.35	0.0210	2	8.28	10.49	0.0203	2	5.54	7.83
763	n.s.	n.s.	n.s.	n.s.	0.0218	2	0.00	0.00	0.0311	3	0.00	0.00	0.0416	4	0.00	0.00
764	0.0206	2	14.84	5.60	0.0218	2	12.47	10.81	0.0225	2	0.00	0.00	0.0218	2	0.00	0.00
765	0.0206	2	14.88	18.39	0.0098	2	12.08	15.52	0.0221	2	0.00	0.00	0.0203	2	1.35	1.91
766	0.0308	3	15.23	9.42	0.0191	2	0.51	0.20	0.0218	2	0.00	0.00	0.0214	2	0.00	0.00
767	n.s.	n.s.	n.s.	n.s.	0.0109	2	2.83	3.87	0.0214	2	0.00	0.00	0.0210	2	0.00	0.00

$$SD = \frac{\sum \left(x_i - \bar{x} \right)^2}{n-1}$$

TABLE 7 (cont.).- Swept area, number of hauls and Thorny skate mean catch (kg) and SD by stratum. Spanish Spring Surveys on NAFO Div. 3NO: 1997-2006. Swept area in square miles. n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data, and 2002-2006 data are original from R/V *Vizconde de Eza*. In 2001,there are data from the two vessels.

	2001				2002				2003			
Stratum	Swept area	Tow number	T. skate Mean catch	T. skate SD	Swept area	Tow number	T. skate Mean catch	T. skate SD	Swept area	Tow number	T. skate Mean catch	T. skate SD
353	0.0341	3	351.90	283.060	0.0476	4	356.30	215.772	0.0334	3	78.36	33.796
354	0.0338	3	67.63	19.515	0.0356	3	89.80	80.809	0.0338	3	40.33	40.683
355	0.0240	2	20.60	11.031	0.0236	2	2.67	3.723	0.0229	2	19.53	22.422
356	0.0240	2	0.29	0.410	0.0233	2	1.55	2.192	0.0225	2	5.19	7.333
357	0.0244	2	2.35	1.669	0.0240	2	2.00	2.828	0.0229	2	2.25	3.182
358	0.0345	3	4.05	6.974	0.0345	3	11.47	19.861	0.0338	3	21.14	25.809
359	0.0803	7	15.45	24.999	0.0686	6	72.34	148.583	0.0791	7	25.86	23.965
360	0.2423	20	67.67	79.827	0.2865	25	20.63	24.987	0.2254	20	35.53	29.397
374	0.0240	2	0.73	1.032	0.0345	3	0.30	0.520	0.0225	2	0.00	0.000
375	0.0338	3	0.51	0.878	0.0353	3	1.40	2.425	0.0330	3	2.29	2.414
376	0.1155	10	22.67	19.650	0.1140	10	12.59	12.093	0.1125	10	10.77	12.802
377	0.0229	2	5.70	2.270	0.0229	2	1.17	1.655	0.0225	2	0.46	0.438
378	0.0236	2	0.16	0.099	0.0233	2	0.02	0.021	0.0225	2	2.98	4.076
379	0.0229	2	0.00	0.000	0.0229	2	5.45	1.909	0.0229	2	0.01	0.014
380	0.0206	2	1.35	0.209	0.0225	2	4.42	4.476	0.0229	2	4.09	0.559
381	0.0236	2	0.74	0.419	0.0229	2	0.71	0.071	0.0229	2	3.40	3.394
382	0.0469	4	1.77	1.265	0.0341	3	0.65	0.257	0.0454	4	0.00	0.000
721	0.0248	2	0.00	0.000	0.0233	2	0.00	0.000	0.0225	2	10.63	7.481
722	0.0233	2	10.10	5.374	0.0236	2	0.00	0.000	0.0221	2	0.91	0.021
723	0.0240	2	2.40	2.121	0.0233	2	0.60	0.849	0.0229	2	5.19	4.865
724	0.0353	3	67.38	91.221	0.0225	2	25.85	14.354	0.0225	2	26.32	0.226
725	0.0116	2	1.91	1.235	0.0225	2	1.82	2.574	0.0229	2	1.31	0.506
726	0.0116	2	1.32	1.381	0.0214	2	3.30	1.980	0.0225	2	0.00	0.000
727	0.0225	2	0.64	0.905	0.0233	2	3.05	4.313	0.0218	2	96.69	91.097
728	0.0229	2	1.65	1.531	0.0229	2	6.69	9.454	0.0225	2	17.23	8.301
752	0.0210	2	8.93	5.430	0.0116	1	0.49	0.686	0.0229	2	183.35	38.537
753	0.0214	2	13.11	15.123	0.0229	2	12.90	18.243	0.0229	2	7.99	1.775
754	0.0195	2	98.76	126.307	0.0341	3	595.65	819.042	0.0218	2	3.35	4.731
755	0.0416	4	0.14	0.283	0.0338	3	0.00	0.000	0.0221	2	0.00	0.000
756	0.0113	2	7.04	3.761	0.0229	2	9.36	7.835	0.0221	2	133.16	187.864
757	0.0233	2	15.10	19.889	0.0225	2	1.55	2.192	0.0221	2	6.99	9.885
758	0.0218	2	184.47	248.733	0.0225	2	32.45	41.224	0.0221	2	4.29	6.060
759	0.0221	2	4.93	3.950	0.0225	2	3.70	5.233	0.0113	1	3.89	#¡DIV/0!
760	0.0229	2	6.47	5.282	0.0229	2	1.89	2.673	0.0218	2	30.68	30.717
761	0.0225	2	66.60	89.661	0.0225	2	11.90	4.667	0.0225	2	0.00	0.000
762	0.0116	2	0.00	0.000	0.0225	2	0.00	0.000	0.0225	2	2.99	1.570
763	0.0330	3	0.00	0.000	0.0225	2	0.00	0.000	0.0311	3	0.00	0.000
764	0.0240	2	2.45	3.465	0.0236	2	0.00	0.000	0.0221	2	42.05	45.064
765	0.0113	2	1.03	1.462	0.0236	2	0.71	1.004	0.0113	1	2.23	-
766	0.0203	2	0.00	0.000	0.0233	2	0.00	0.000	0.0225	2	0.00	0.000
767	0.0218	2	0.00	0.000	0.0225	2	0.00	0.000	0.0229	2	1.13	0.215

$$SD = \frac{\sum \left(x_i - \bar{x} \right)^2}{n-1}$$

TABLE 7 (cont.).- Swept area, number of hauls and Thorny skate mean catch (kg) and SD by stratum. Spanish Spring Surveys on NAFO Div. 3NO: 1997-2006. Swept area in square miles. n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data, and 2002-2006 data are original from R/V *Vizconde de Eza*. In 2001,there are data from the two vessels.

	2004				2005				2006			
Stratum	Swept area	Tow number	T. skate Mean catch	T. skate SD	Swept area	Tow number	T. skate Mean catch	T. skate SD	Swept area	Tow number	T. skate Mean catch	T. skate SD
353	0.0338	3	53.70	33.407	0.0353	3	40.97	40.382	0.0371	3	48.27	33.965
354	0.0345	3	147.46	134.348	0.0353	3	48.19	40.450	0.0364	3	62.30	19.336
355	0.0229	2	25.07	4.384	0.0225	2	17.80	2.628	0.0248	2	1.51	2.128
356	0.0221	2	16.31	7.732	0.0233	2	10.81	2.242	0.0240	2	19.15	18.314
357	0.0229	2	46.05	28.438	0.0233	2	51.88	55.763	0.0244	2	28.29	40.007
358	0.0330	3	42.24	13.838	0.0349	3	72.15	80.699	0.0349	3	5.75	6.983
359	0.0791	7	46.56	62.119	0.0814	7	45.11	63.415	0.0975	8	45.28	34.608
360	0.2310	20	93.53	78.305	0.2325	20	59.30	63.584	0.2340	19	74.59	59.722
374	0.0233	2	1.89	2.673	0.0229	2	2.70	1.082	0.0236	2	9.84	3.118
375	0.0338	3	10.32	5.359	0.0349	3	12.31	10.043	0.0364	3	34.35	17.964
376	0.1166	10	89.67	62.815	0.1174	10	154.50	136.423	0.1219	10	183.56	254.026
377	0.0218	2	7.23	9.648	0.0233	2	29.36	30.186	0.0236	2	61.48	33.411
378	0.0225	2	26.20	17.402	0.0225	2	6.10	7.264	0.0240	2	5.86	8.280
379	0.0124	1	13.61	-	0.0236	2	32.60	16.971	0.0236	2	181.31	256.409
380	0.0221	2	119.25	56.639	0.0229	2	66.74	45.199	0.0229	2	110.30	2.687
381	0.0225	2	70.60	17.536	0.0233	2	52.28	28.354	0.0229	2	72.41	8.775
382	0.0461	4	6.28	6.990	0.0458	4	5.06	4.563	0.0469	4	3.41	3.064
721	0.0221	2	2.70	3.818	0.0229	2	6.15	8.697	0.0236	2	0.00	0.000
722	0.0218	2	0.00	0.000	0.0233	2	6.90	9.758	0.0240	2	0.00	0.000
723	0.0229	2	4.85	1.913	0.0233	2	0.00	0.000	0.0236	2	5.41	4.226
724	0.0214	2	0.00	0.000	0.0225	2	4.20	5.940	0.0233	2	0.00	0.000
725	0.0225	2	44.22	57.679	0.0236	2	30.95	43.775	0.0233	2	73.01	100.261
726	0.0225	2	0.00	0.000	0.0113	1	0.00	-	0.0225	2	3.66	1.237
727	0.0233	2	10.16	10.380	0.0229	2	7.57	7.969	0.0225	2	0.00	0.000
728	0.0180	2	2.69	3.804	0.0109	1	0.00	-	0.0225	2	1.32	1.860
752	0.0214	2	0.00	0.000	0.0236	2	0.00	0.000	0.0225	2	0.73	1.025
753	0.0218	2	0.00	0.000	0.0225	2	0.00	0.000	0.0225	2	0.00	0.000
754	0.0214	2	0.00	0.000	0.0225	2	0.00	0.000	0.0225	2	0.00	0.000
755	0.0319	3	1.26	2.188	0.0450	4	0.00	0.000	0.0338	3	0.00	0.000
756	0.0218	2	0.00	0.000	0.0233	2	0.00	0.000	0.0229	2	0.01	0.008
757	0.0218	2	0.00	0.000	0.0225	2	0.00	0.000	0.0225	2	0.51	0.718
758	0.0214	2	0.00	0.000	0.0225	2	0.00	0.000	0.0225	2	0.00	0.000
759	0.0214	2	0.00	0.000	0.0229	2	0.00	0.000	0.0225	2	0.00	0.000
760	0.0221	2	0.00	0.000	0.0229	2	4.43	6.265	0.0225	2	0.00	0.000
761	0.0221	2	2.69	0.912	0.0221	2	0.00	0.000	0.0233	2	0.00	0.000
762	0.0233	2	1.15	1.619	0.0225	2	0.00	0.000	0.0233	2	1.45	2.044
763	0.0326	3	0.00	0.000	0.0334	3	0.00	0.000	0.0225	2	0.00	0.000
764	0.0229	2	4.35	6.152	0.0233	2	0.00	0.000	0.0233	2	7.90	11.172
765	0.0225	2	0.00	0.000	0.0229	2	0.00	0.000	0.0236	2	4.40	6.223
766	0.0225	2	0.67	0.940	0.0229	2	0.00	0.000	0.0229	2	0.00	0.000
767	0.0218	2	2.41	3.401	0.0113	1	0.00	-	0.0233	2	0.00	0.000

$$SD = \frac{\sum \left(x_i - \bar{x} \right)^2}{n-1}$$

TABLE 8.- Stratified mean catches (Kg) by stratum and year and SD by year of Thorny skate (1997-2006). n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2006 data are original from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels.

Stratum	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
353	1669.97	7010.90	85905.05	40337.51	94661.10	95844.70	21079.74	14444.04	11021.83	12983.73
354	295.14	16784.41	4970.54	20279.74	16637.80	22090.80	9922.00	36275.57	11854.08	15324.98
355	2012.42	254.06	917.88	2452.15	1524.40	197.40	1444.85	1855.18	1317.05	111.37
356	127.82	32.39	72.76	104.05	13.63	72.85	243.70	766.45	507.84	900.05
357	216.74	276.48	488.38	0.00	385.40	328.00	369.00	7551.46	8508.73	4639.40
358	351.96	223.34	632.19	3484.89	910.50	2580.00	4755.75	9504.23	16232.63	1293.75
359	3142.88	3339.74	5577.75	30200.14	6505.05	30455.91	10885.26	19600.14	18990.11	19063.93
360	28142.65	49941.51	188345.34	367770.68	188311.70	57415.52	98885.56	260307.63	165039.55	207581.48
374	490.16	87.78	1264.01	151.68	156.22	64.20	0.00	404.46	576.73	2104.69
375	226.76	533.56	1780.76	942.07	137.31	379.40	619.69	2796.27	3336.91	9307.95
376	20225.18	32095.39	101299.43	91833.65	30244.45	16788.39	14361.84	119622.45	206104.33	244867.71
377	127.98	31.99	103.98	56.97	569.50	117.05	46.00	723.25	2935.50	6147.50
378	287.36	287.36	1156.26	769.70	22.24	2.09	413.87	3641.11	847.41	813.85
379	57.26	179.13	80.48	116.74	0.00	577.70	1.06	1442.66	3455.60	19218.70
380	121.68	432.36	380.38	121.44	129.94	423.84	392.16	11448.00	6406.99	10588.80
381	887.94	1102.17	148.85	567.92	106.50	102.24	489.60	10166.40	7528.46	10426.32
382	220.75	350.60	1522.42	1838.77	607.79	224.32	0.00	2153.18	1734.72	1167.92
721	148.37	531.10	75.19	425.20	0.00	0.00	690.95	175.50	399.75	0.00
722	633.11	3220.86	906.51	1158.73	848.40	0.00	76.02	0.00	579.60	0.00
723	979.42	406.26	584.98	627.32	372.00	93.00	804.45	752.22	0.00	838.78
724	254.82	1524.34	1219.17	288.39	8355.12	3205.40	3263.68	0.00	520.80	0.00
725	28.43	408.29	381.16	431.94	200.22	191.10	137.81	4642.58	3250.12	7665.53
726	n.s.	18.61	63.79	697.27	95.29	237.60	0.00	0.00	0.00	263.16
727	323.68	577.66	271.70	56.11	61.43	292.80	9281.76	975.36	726.24	0.00
728	113.26	364.73	382.97	143.97	128.62	521.43	1343.94	209.82	0.00	102.57
752	556.95	7679.60	293.39	157.17	1170.32	63.54	24018.85	0.00	0.00	94.98
753	1871.36	553.60	2364.16	416.05	1808.52	1780.20	1101.93	0.00	0.00	0.00
754	8157.59	20204.97	2999.07	9892.06	17777.36	107217.00	602.10	0.00	0.00	0.00
755	n.s.	3017.84	0.00	1054.11	54.48	0.00	0.00	486.38	0.00	0.00
756	1404.41	6429.24	1636.83	372.60	711.08	945.36	13449.16	0.00	0.00	0.61
757	3333.76	6873.20	1095.75	5660.73	1540.20	158.10	712.98	0.00	0.00	51.77
758	5201.49	23360.86	11631.70	5530.78	18262.55	3212.55	424.22	0.00	0.00	0.00
759	n.s.	14493.27	54.38	5316.60	626.68	469.90	494.03	0.00	0.00	0.00
760	0.00	1036.58	1417.48	1997.36	995.61	291.06	4724.72	0.00	682.22	0.00
761	10133.38	3013.25	121.20	1744.82	11388.60	2034.90	0.00	459.14	0.00	0.00
762	10763.16	1111.32	1755.68	1173.93	0.00	0.00	633.88	242.74	0.00	306.34
763	n.s.	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
764	1484.03	1246.54	0.00	0.00	245.00	0.00	4204.50	435.00	0.00	790.00
765	1844.78	1498.40	0.00	167.85	128.17	88.04	276.52	0.00	0.00	545.60
766	2192.53	73.89	0.00	0.00	0.00	0.00	0.00	95.76	0.00	0.00
767	n.s.	446.89	0.00	0.00	0.00	0.00	178.22	379.99	0.00	0.00
TOTAL	108029.16	211054.49	421901.59	598341.10	405693.16	348466.38	230329.79	511556.95	472557.21	577201.44
$(\bar{Y})$	11.57	20.41	40.79	57.86	39.23	33.69	22.27	49.46	45.69	55.81
S.D.	1.74	3.26	4.32	9.12	6.99	10.91	2.57	5.82	7.00	11.22

TABLE 9.- Survey estimates (by the swept area method) of Thorny skate biomass (t) and SD by stratum and year on NAFO Div. 3NO. n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2006 data are original from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels.

Stratum	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
353	139	603	7159	3397	8321	8050	1895	1284	938	1049
354	25	1413	457	1708	1479	1860	882	3154	1009	1264
355	173	23	80	211	127	17	126	162	117	9
356	11	3	6	9	1	6	22	69	44	75
357	20	23	41	0	32	27	32	660	732	381
358	31	19	54	306	79	224	423	864	1396	111
359	273	287	460	2577	567	2663	963	1734	1634	1564
360	2399	4307	15392	30696	15548	5010	8775	22537	14197	16855
374	42	7	104	13	13	6	0	35	50	178
375	20	46	151	77	12	32	56	249	287	768
376	1789	2779	8312	7653	2618	1473	1277	10257	17559	20092
377	11	3	9	5	50	10	4	67	253	520
378	27	25	101	66	2	0	37	324	75	68
379	6	15	7	10	0	51	0	117	293	1627
380	12	38	32	10	13	38	34	1035	560	926
381	80	96	13	48	9	9	43	904	648	912
382	19	31	126	147	52	20	0	187	152	100
721	13	52	6	36	0	0	61	16	35	0
722	59	301	79	107	73	0	7	0	50	0
723	93	35	51	51	31	8	70	66	0	71
724	23	148	108	25	711	285	290	0	46	0
725	3	47	33	41	17	17	12	413	275	659
726	n.s.	2	6	63	8	22	0	0	0	23
727	35	50	23	5	5	25	853	84	63	0
728	11	35	33	14	11	46	119	23	0	9
752	51	671	25	15	111	6	2100	0	0	8
753	175	51	207	38	169	156	96	0	0	0
754	742	1924	291	1015	1822	9374	55	0	0	0
755	n.s.	293	0	98	5	0	0	46	0	0
756	129	571	145	37	62	83	1216	0	0	0
757	329	666	94	530	132	14	64	0	0	5
758	487	2148	1088	527	1679	286	38	0	0	0
759	n.s.	1356	5	506	57	42	44	0	0	0
760	0	97	126	190	87	25	434	0	60	0
761	965	292	12	158	1012	181	0	42	0	0
762	1050	108	167	116	0	0	56	21	0	26
763	n.s.	0	0	0	0	0	0	0	0	0
764	144	115	0	0	20	0	380	38	0	68
765	179	143	0	17	12	7	25	0	0	46
766	214	8	0	0	0	0	0	9	0	0
767	n.s.	40	0	0	0	0	16	35	0	0
TOTAL	9779	18875	35004	50521	34948	30072	20508	44429	40473	47415
S.D.	1544	3114	3736	7991	10687	9699	2371	5281	6171	9207

TABLE 10.- Length weight relationships in the calculation of Thorny skate biomass. The equation is $Weight = a(l + 0.5)^b$ Spanish Spring Surveys on NAFO Div. 3NO: 1997-2006. To calculate the parameters for the indeterminate individuals, we used the total data (males + females + indeterminate individuals)

		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Males	a	0.0069	0.0064	0.025	0.0506	0.0085	0.0075	0.0079	0.0060	0.0066	0.0079
		Error = 0.202	Error = 0.259	Error = 0.456	Error = 0.192	Error = 0.091	Error = 0.086	Error = 0.101	Error = 0.0978	Error = 0.0954	Error = 0.1133
	b	3.0921	3.1161	2.769	2.5954	3.0171	3.0566	3.0414	3.1122	3.0882	3.0399
		Error = 0.052	Error = 0.075	Error = 0.124	Error = 0.049	Error = 0.022	Error = 0.022	Error =0.026	Error = 0.0251	Error = 0.0246	Error = 0.0292
		R2 = 0.987	R2 = 0.986	R2 = 0.967	R2 = 0.983	R2 = 0.998	R2 = 0.996	R2 = 0.995	R2 = 0.996	R2 = 0.996	R2 = 0.997
		N = 107	N = 67	N = 33	N = 199	N = 104	N = 374	N = 426	N = 368	N = 360	N = 7492
Females	a	0.0072	0.0098	0.0294	0.0313	0.0073	0.0061	0.0067	0.0071	0.0036	0.0104
		Error = 0.182	Error = 0.169	Error = 0.268	Error =0.223	Error = 0.119	Error =0.074	Error = 0.101	Error = 0.1072	Error = 0.2213	Error = 0.2042
	b	3.0927	2.9904	2.7383	2.7247	3.0509	3.1115	3.0887	3.0752	3.2435	2.9798
		Error = 0.046	Error = 0.046	Error = 0.072	Error = 0.058	Error = 0.031	Error = 0.019	Error = 0.026	Error = 0.0281	Error = 0.0575	Error = 0.0534
		R2 = 0.991	R2 = 0.992	R2 = 0.985	R2 = 0.977	R2 = 0.996	R2 = 0.997	R2 = 0.996	R2 = 0.994	R2 = 0.980	R2 = 0.990
		N = 113	N = 89	N = 53	N = 245	N = 77	N = 425	N = 477	N = 442	N = 396	N = 583
Indet.	a	0.0068	0.0072	0.0267	0.0423	0.0077	0.0066	0.0075	0.0071	0.0057	0.0091
		Error = 0.144	Error = 0.166	Error = 0.205	Error = 0.174	Error = 0.079	Error = 0.068	Error = 0.095	Error = 0.0091	Error = 0.1146	Error = 0.1258
	b	3.099	3.073	2.7618	2.6472	3.0411	3.0887	3.0552	3.0730	3.1287	3.0086
		Error = 0.037	Error = 0.046	Error = 0.055	Error = 0.045	Error = 0.020	Error = 0.018	Error = 0.025	Error = 0.0237	Error = 0.0298	Error = 0.0326
		R^2 = 0.993	R^2 = 0.991	R^2 = 0.990	R^2 = 0.984	R^2 = 0.998	R^2 = 0.998	R^2 = 0.995	R^2 = 0.996	R^2 = 0.993	R^2 = 0.995
		N = 220	N =156	N = 86	N = 444	N = 181	N = 800	N = 903	N = 810	N = 756	N = 1075

TABLE 11.- Thorny skate length distribution. Estimated numbers per haul stratified mean catches. Spanish Spring Survey on NAFO 3NO: 1997-2006. Indet. means indeterminate. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2006 data are original R/V *Vizconde de Eza* data. In 2001, there are data from the two vessels. (*) indicates untransformed data.

	1997				1998				1999				2000			
Length (cm.)	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
12	0.014	0.394	0.000	0.408	0.014	0.000	0.000	0.014	0.000	0.013	0.006	0.019	0.006	0.006	0.000	0.013
14	0.254	0.224	0.000	0.479	0.021	0.013	0.000	0.034	0.035	0.053	0.006	0.094	0.037	0.047	0.000	0.083
16	0.116	0.272	0.000	0.388	0.026	0.009	0.000	0.035	0.049	0.092	0.006	0.148	0.271	0.106	0.000	0.377
18	0.033	0.132	0.000	0.165	0.042	0.294	0.000	0.336	0.075	0.120	0.000	0.195	0.039	0.065	0.000	0.104
20	0.331	0.112	0.000	0.443	0.164	0.030	0.000	0.193	0.094	0.115	0.000	0.209	0.197	0.167	0.000	0.364
22	0.728	0.202	0.000	0.930	0.337	0.886	0.000	1.223	0.115	0.091	0.000	0.206	0.058	0.135	0.000	0.193
24	0.635	0.670	0.000	1.305	1.239	0.171	0.000	1.410	0.176	0.073	0.000	0.249	0.178	0.175	0.000	0.353
26	0.416	0.781	0.000	1.197	0.314	0.238	0.000	0.552	0.305	0.240	0.000	0.545	0.290	0.206	0.000	0.496
28	0.064	0.282	0.000	0.346	0.217	0.268	0.000	0.485	0.143	0.321	0.000	0.464	0.217	0.174	0.000	0.391
30	0.044	0.037	0.000	0.080	0.095	0.069	0.000	0.164	0.060	0.041	0.000	0.102	0.028	0.038	0.000	0.066
32	0.033	0.038	0.000	0.071	0.071	0.156	0.000	0.227	0.105	0.091	0.000	0.196	0.048	0.054	0.000	0.101
34	0.068	0.085	0.000	0.153	0.190	0.217	0.000	0.407	0.165	0.112	0.000	0.277	0.119	0.105	0.000	0.224
36	0.131	0.067	0.000	0.197	0.160	0.295	0.000	0.454	0.205	0.237	0.000	0.442	0.170	0.105	0.000	0.275
38	0.086	0.141	0.000	0.227	0.256	0.217	0.000	0.472	0.294	0.371	0.000	0.665	0.228	0.265	0.000	0.493
40	0.123	0.058	0.000	0.181	0.168	0.242	0.000	0.410	0.431	0.483	0.000	0.914	0.300	0.322	0.000	0.621
42	0.092	0.097	0.000	0.189	0.254	0.241	0.000	0.494	0.676	0.634	0.000	1.310	0.410	0.498	0.000	0.908
44	0.172	0.129	0.000	0.301	0.291	0.191	0.000	0.482	0.737	0.720	0.000	1.458	0.549	0.617	0.000	1.166
46	0.165	0.100	0.000	0.265	0.169	0.309	0.000	0.478	0.546	0.787	0.010	1.343	0.629	0.762	0.000	1.391
48	0.066	0.064	0.000	0.130	0.211	0.378	0.000	0.589	0.608	0.541	0.000	1.149	1.035	0.690	0.000	1.725
50	0.089	0.156	0.000	0.245	0.260	0.286	0.000	0.546	0.709	0.580	0.000	1.290	0.745	0.730	0.000	1.475
52	0.098	0.181	0.000	0.279	0.231	0.216	0.000	0.447	0.605	0.665	0.000	1.270	0.847	0.726	0.000	1.573
54	0.064	0.118	0.000	0.182	0.122	0.265	0.000	0.388	0.418	0.436	0.000	0.854	0.702	0.623	0.000	1.325
56	0.078	0.139	0.000	0.217	0.292	0.341	0.000	0.633	0.411	0.413	0.000	0.824	0.814	0.849	0.000	1.663
58	0.055	0.071	0.000	0.126	0.186	0.211	0.000	0.397	0.378	0.379	0.000	0.757	0.700	0.605	0.000	1.305
60	0.200	0.105	0.000	0.305	0.222	0.290	0.000	0.512	0.523	0.523	0.000	1.047	0.562	0.581	0.000	1.143
62	0.066	0.227	0.000	0.293	0.188	0.227	0.000	0.415	0.364	0.379	0.000	0.743	0.548	0.532	0.000	1.080
64	0.103	0.079	0.000	0.182	0.403	0.276	0.000	0.679	0.350	0.388	0.000	0.739	0.621	0.600	0.000	1.221
66	0.116	0.206	0.000	0.322	0.213	0.327	0.000	0.540	0.289	0.339	0.000	0.628	0.317	0.842	0.000	1.159
68	0.074	0.127	0.000	0.200	0.119	0.331	0.000	0.449	0.439	0.397	0.000	0.836	0.387	0.621	0.000	1.008
70	0.075	0.116	0.000	0.191	0.066	0.257	0.000	0.323	0.334	0.393	0.000	0.726	0.398	0.799	0.000	1.197
72	0.040	0.079	0.000	0.119	0.188	0.124	0.000	0.312	0.301	0.343	0.000	0.644	0.398	0.585	0.000	0.983
74	0.044	0.151	0.000	0.195	0.187	0.125	0.000	0.312	0.179	0.268	0.000	0.447	0.434	0.505	0.000	0.939
76	0.000	0.098	0.000	0.098	0.085	0.058	0.000	0.144	0.288	0.192	0.000	0.480	0.373	0.405	0.000	0.778
78	0.067	0.100	0.000	0.167	0.047	0.033	0.000	0.080	0.251	0.282	0.000	0.533	0.317	0.282	0.000	0.599
80	0.027	0.000	0.000	0.027	0.045	0.012	0.000	0.057	0.161	0.092	0.000	0.253	0.209	0.167	0.000	0.377
82	0.005	0.055	0.000	0.059	0.050	0.009	0.000	0.060	0.196	0.027	0.000	0.224	0.166	0.077	0.000	0.243
84	0.005	0.000	0.000	0.005	0.010	0.000	0.000	0.010	0.066	0.028	0.000	0.093	0.109	0.040	0.000	0.149
86	0.029	0.000	0.000	0.029	0.000	0.031	0.000	0.031	0.050	0.006	0.000	0.056	0.087	0.066	0.000	0.153
88	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.000	0.009	0.116	0.010	0.000	0.126
90	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.014	0.001	0.000	0.015	0.046	0.000	0.000	0.046
92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.017	0.003	0.000	0.020	0.023	0.000	0.000	0.023
94	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.000	0.011
96	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.022	0.000	0.000	0.022
98	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001
100	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.004	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	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000
106	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
108	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
110	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
112	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
114	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
116	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
118	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
120	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
122	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
124	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
126	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
128	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
130	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	4.803	5.892	0.000	10.695	7.158	7.649	0.000	14.808	11.173	11.271	0.029	22.472	13.760	14.185	0.000	27.945
Nº samples (*):				33				33				88				83
Nº Ind. (*):	404	425	0	829	723	812	0	1535	2082	2200	4	4286	2397	2429	0	4826
Sampled catch:				212				461				1526				2289
Range (*):				12-87				13-131				13-93				13-99
Total catch:				1580				2696				3672				5076
Total hauls (*):				128				124				114				118

TABLE 11 (cont.).- Thorny skate length distribution. Estimated numbers per haul stratified mean catches. Spanish Spring Survey on NAFO 3NO: 1997-2006. Indet. means indeterminate. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2006 data are original R/V *Vizconde de Eza* data. In 2001, there are data from the two vessels. (*) indicates untransformed data.

	2001				2002				2003			
Length (cm.)	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
12	0.000	0.011	0.000	0.011	0.035	0.021	0.000	0.056	0.007	0.000	0.000	0.007
14	0.063	0.089	0.000	0.153	0.089	0.192	0.005	0.285	0.026	0.043	0.000	0.069
16	0.026	0.088	0.000	0.114	0.125	0.181	0.000	0.305	0.016	0.011	0.000	0.027
18	0.018	0.020	0.000	0.038	0.094	0.320	0.000	0.415	0.040	0.035	0.000	0.075
20	0.033	0.010	0.000	0.043	0.049	0.096	0.000	0.146	0.059	0.008	0.000	0.067
22	0.008	0.042	0.000	0.050	0.034	0.074	0.000	0.109	0.050	0.056	0.000	0.106
24	0.000	0.037	0.000	0.037	0.014	0.027	0.000	0.041	0.007	0.020	0.000	0.027
26	0.045	0.019	0.000	0.064	0.023	0.047	0.000	0.070	0.027	0.000	0.000	0.027
28	0.000	0.070	0.000	0.070	0.021	0.044	0.000	0.065	0.040	0.019	0.000	0.059
30	0.023	0.040	0.000	0.063	0.060	0.056	0.000	0.115	0.038	0.023	0.000	0.061
32	0.029	0.077	0.000	0.106	0.059	0.105	0.000	0.164	0.145	0.095	0.000	0.239
34	0.075	0.140	0.000	0.215	0.082	0.336	0.000	0.419	0.096	0.078	0.000	0.174
36	0.124	0.255	0.000	0.379	0.180	0.151	0.000	0.331	0.175	0.137	0.000	0.312
38	0.184	0.249	0.000	0.434	0.344	0.333	0.000	0.677	0.209	0.172	0.000	0.382
40	0.400	0.497	0.000	0.897	0.733	0.617	0.000	1.350	0.295	0.399	0.000	0.694
42	0.343	0.372	0.000	0.715	0.811	0.913	0.000	1.724	0.358	0.323	0.000	0.681
44	0.396	0.575	0.000	0.971	0.763	0.887	0.000	1.650	0.382	0.400	0.000	0.782
46	0.474	0.576	0.000	1.049	0.849	0.920	0.000	1.769	0.309	0.374	0.000	0.683
48	0.452	0.623	0.000	1.075	0.651	1.024	0.000	1.675	0.320	0.456	0.000	0.776
50	0.548	0.473	0.000	1.021	0.773	0.698	0.000	1.471	0.283	0.377	0.000	0.660
52	0.618	0.582	0.000	1.199	0.551	0.711	0.000	1.261	0.257	0.372	0.000	0.630
54	0.452	0.580	0.000	1.032	0.482	0.452	0.000	0.934	0.324	0.394	0.000	0.718
56	0.672	0.381	0.000	1.053	0.244	0.389	0.000	0.633	0.256	0.285	0.000	0.541
58	0.377	0.448	0.000	0.825	0.487	0.325	0.000	0.812	0.284	0.342	0.000	0.626
60	0.342	0.434	0.000	0.776	0.179	0.196	0.000	0.375	0.247	0.330	0.000	0.578
62	0.197	0.349	0.000	0.547	0.279	0.187	0.000	0.466	0.186	0.257	0.000	0.443
64	0.392	0.389	0.000	0.781	0.221	0.212	0.000	0.433	0.083	0.259	0.000	0.342
66	0.233	0.561	0.000	0.794	0.171	0.334	0.000	0.505	0.187	0.203	0.000	0.390
68	0.228	0.580	0.000	0.808	0.155	0.254	0.000	0.409	0.152	0.332	0.000	0.484
70	0.274	0.401	0.000	0.675	0.240	0.292	0.000	0.532	0.144	0.221	0.000	0.365
72	0.218	0.438	0.000	0.656	0.142	0.437	0.000	0.580	0.136	0.159	0.000	0.295
74	0.327	0.342	0.000	0.668	0.195	0.305	0.000	0.501	0.134	0.274	0.000	0.408
76	0.481	0.335	0.000	0.816	0.210	0.086	0.000	0.296	0.091	0.150	0.000	0.240
78	0.334	0.189	0.000	0.523	0.152	0.092	0.000	0.245	0.096	0.111	0.000	0.207
80	0.171	0.196	0.000	0.367	0.164	0.035	0.000	0.199	0.073	0.040	0.000	0.113
82	0.131	0.067	0.000	0.198	0.135	0.157	0.000	0.292	0.074	0.014	0.000	0.088
84	0.109	0.011	0.000	0.120	0.048	0.013	0.000	0.062	0.020	0.033	0.000	0.053
86	0.142	0.014	0.000	0.157	0.015	0.008	0.000	0.023	0.023	0.000	0.000	0.023
88	0.031	0.010	0.000	0.041	0.041	0.013	0.000	0.054	0.000	0.000	0.000	0.000
90	0.009	0.000	0.000	0.009	0.000	0.000	0.000	0.000	0.009	0.000	0.000	0.009
92	0.011	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
94	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
96	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
98	0.004	0.003	0.000	0.008	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	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	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	0.000	0.000	0.000
106	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
108	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
110	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
112	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
114	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
116	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
118	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
120	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
122	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
124	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
126	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
128	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
130	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	8.996	10.572	0.000	19.568	9.903	11.540	0.005	21.448	5.660	6.802	0.000	12.461
Nº samples (*):				66				78				88
Nº Ind. (*):	629	632	0	1261	888	928	1	1817	743	811	0	1554
Sampled catch:				2777				2961				2627
Range (*):				13-99				12-89				13-90
Total catch:				3413				4271				2656
Total hauls (*):				123				125				118

TABLE 11 (cont.).- Thorny skate length distribution. Estimated numbers per haul stratified mean catches. Spanish Spring Survey on NAFO 3NO: 1997-2006. Indet. means indeterminate. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2006 data are original R/V *Vizconde de Eza* data. In 2001, there are data from the two vessels. (*) indicates untransformed data.

	2004				2005				2006			
Length (cm.)	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
12	0.038	0.019	0.000	0.057	0.030	0.015	0.000	0.045	0.009	0.005	0.000	0.014
14	0.090	0.076	0.000	0.166	0.030	0.039	0.000	0.070	0.036	0.022	0.000	0.059
16	0.036	0.058	0.000	0.094	0.034	0.013	0.000	0.047	0.014	0.013	0.000	0.027
18	0.061	0.059	0.000	0.120	0.085	0.070	0.000	0.155	0.025	0.010	0.000	0.036
20	0.076	0.062	0.000	0.138	0.053	0.045	0.000	0.098	0.041	0.085	0.000	0.126
22	0.078	0.057	0.000	0.135	0.066	0.064	0.000	0.130	0.090	0.078	0.000	0.168
24	0.095	0.048	0.000	0.143	0.116	0.117	0.000	0.233	0.039	0.113	0.000	0.153
26	0.085	0.042	0.000	0.127	0.128	0.089	0.000	0.217	0.054	0.049	0.000	0.103
28	0.064	0.047	0.000	0.111	0.123	0.120	0.000	0.243	0.066	0.154	0.000	0.220
30	0.129	0.133	0.000	0.263	0.149	0.115	0.000	0.264	0.059	0.173	0.000	0.232
32	0.217	0.133	0.000	0.349	0.158	0.247	0.000	0.405	0.086	0.260	0.000	0.346
34	0.200	0.244	0.000	0.444	0.180	0.136	0.000	0.316	0.142	0.211	0.000	0.353
36	0.295	0.284	0.000	0.579	0.241	0.338	0.000	0.579	0.194	0.219	0.000	0.413
38	0.332	0.422	0.000	0.755	0.266	0.255	0.000	0.521	0.226	0.164	0.000	0.390
40	0.373	0.402	0.000	0.776	0.286	0.306	0.000	0.592	0.296	0.351	0.000	0.647
42	0.709	0.681	0.000	1.390	0.455	0.554	0.000	1.009	0.328	0.401	0.000	0.729
44	0.760	0.744	0.000	1.504	0.454	0.534	0.000	0.987	0.239	0.635	0.000	0.874
46	0.575	0.672	0.000	1.247	0.541	0.592	0.000	1.134	0.484	0.494	0.000	0.977
48	0.653	0.759	0.000	1.413	0.693	0.575	0.000	1.268	0.456	0.608	0.000	1.064
50	0.469	0.627	0.000	1.096	0.711	0.680	0.000	1.390	0.638	0.680	0.000	1.318
52	0.824	0.621	0.000	1.444	0.686	0.615	0.000	1.302	0.872	1.205	0.000	2.077
54	0.419	0.576	0.000	0.995	0.531	0.581	0.000	1.112	0.932	0.929	0.000	1.861
56	0.498	0.899	0.000	1.398	0.741	0.696	0.000	1.436	0.700	0.939	0.000	1.640
58	0.511	0.781	0.000	1.293	0.576	0.525	0.000	1.100	0.644	0.724	0.000	1.367
60	0.424	0.680	0.000	1.104	0.527	0.586	0.000	1.114	0.707	0.692	0.000	1.398
62	0.449	0.735	0.000	1.184	0.375	0.640	0.000	1.016	0.549	0.776	0.000	1.325
64	0.383	0.655	0.000	1.038	0.469	0.394	0.000	0.863	0.472	0.780	0.000	1.252
66	0.349	0.562	0.000	0.911	0.398	0.586	0.000	0.984	0.448	0.669	0.000	1.117
68	0.343	0.418	0.000	0.761	0.252	0.664	0.000	0.916	0.344	0.766	0.000	1.111
70	0.503	0.492	0.000	0.994	0.324	0.433	0.000	0.757	0.429	0.858	0.000	1.287
72	0.245	0.461	0.000	0.705	0.248	0.523	0.000	0.771	0.230	0.829	0.000	1.059
74	0.360	0.392	0.000	0.752	0.254	0.377	0.000	0.631	0.270	0.519	0.000	0.789
76	0.392	0.299	0.000	0.692	0.242	0.186	0.000	0.428	0.377	0.300	0.000	0.677
78	0.259	0.164	0.000	0.423	0.263	0.168	0.000	0.431	0.282	0.196	0.000	0.478
80	0.226	0.117	0.000	0.342	0.193	0.178	0.000	0.371	0.312	0.077	0.000	0.389
82	0.121	0.073	0.000	0.194	0.190	0.004	0.000	0.194	0.234	0.000	0.000	0.234
84	0.180	0.003	0.000	0.183	0.062	0.034	0.000	0.096	0.187	0.000	0.000	0.187
86	0.076	0.018	0.000	0.094	0.074	0.020	0.000	0.094	0.075	0.017	0.000	0.092
88	0.055	0.014	0.000	0.069	0.026	0.000	0.000	0.026	0.058	0.000	0.000	0.058
90	0.028	0.000	0.000	0.028	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.005
92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
94	0.005	0.000	0.000	0.005	0.003	0.006	0.000	0.009	0.000	0.000	0.000	0.000
96	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.004	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	0.012	0.000	0.000	0.012
100	0.000	0.000	0.000	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	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	0.000	0.000	0.000
106	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
108	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
110	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
112	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
114	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
116	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
118	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
120	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
122	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
124	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
126	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
128	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
130	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	11.985	13.529	0.000	25.514	11.235	12.125	0.000	23.360	11.658	15.005	0.000	26.663
Nº samples (*):				83				78				45
Nº Ind. (*):	1150	1290	0	2440	1012	1102	0	2114	928	1198	0	2126
Sampled catch:				4666				4130				4595
Range (*):				12-95				12-96				13-99
Total catch:				4674				4249				5258
Total hauls (*):				120				119				120

TABLE 12.- Swept area, number of hauls and White hake mean catch (kg) and SD by stratum. Spanish Spring Surveys on NAFO Div. 3NO: 2001-2006. Swept area in square miles. n.s. means strata not surveyed.

	2001				2002				2003			
Stratum	Swept area	Tow number	White hake Mean catch	White hake SD	Swept area	Tow number	White hake Mean catch	White hake SD	Swept area	Tow number	White hake Mean catch	White hake SD
353	0.0356	3	1.04	1.180	0.0476	4	0.05	0.100	0.0334	3	0.00	0.000
354	0.0356	3	76.70	117.298	0.0356	3	0.07	0.115	0.0338	3	0.00	0.000
355	0.0233	2	131.95	135.128	0.0236	2	156.75	55.649	0.0229	2	31.24	26.955
356	0.0225	2	23.95	12.092	0.0233	2	85.90	90.651	0.0225	2	14.83	9.935
357	0.0124	2	1.75	2.475	0.0240	2	0.00	0.000	0.0229	2	2.25	3.182
358	0.0341	3	0.43	0.751	0.0345	3	0.17	0.289	0.0338	3	0.40	0.693
359	0.0469	7	16.50	41.790	0.0686	6	0.00	0.000	0.0791	7	0.00	0.000
360	0.2396	20	0.01	0.022	0.2865	25	0.00	0.000	0.2254	20	0.00	0.000
374	0.0240	2	0.00	0.000	0.0345	3	0.00	0.000	0.0225	2	0.00	0.000
375	0.0244	3	0.00	0.000	0.0353	3	0.00	0.000	0.0330	3	0.00	0.000
376	0.1200	10	0.00	0.000	0.1140	10	0.00	0.000	0.1125	10	0.00	0.000
377	0.0229	2	0.00	0.000	0.0229	2	0.00	0.000	0.0225	2	0.00	0.000
378	0.0233	2	0.03	0.042	0.0233	2	0.00	0.000	0.0225	2	0.00	0.000
379	0.0225	2	0.00	0.000	0.0229	2	0.02	0.033	0.0229	2	0.00	0.000
380	0.0236	2	n.s.	n.s.	0.0225	2	0.00	0.000	0.0229	2	0.00	0.000
381	0.0236	2	n.s.	n.s.	0.0229	2	0.00	0.000	0.0229	2	0.00	0.000
382	0.0499	4	n.s.	n.s.	0.0341	3	0.00	0.000	0.0454	4	0.00	0.000
721	0.0236	2	10.90	2.828	0.0233	2	50.00	6.223	0.0225	2	23.69	27.280
722	0.0218	2	21.75	30.759	0.0236	2	18.20	23.624	0.0221	2	28.08	24.911
723	0.0248	2	1.60	2.263	0.0233	2	0.00	0.000	0.0229	2	0.00	0.000
724	0.0233	3	1.34	1.404	0.0225	2	2.05	0.071	0.0225	2	0.00	0.000
725	0.0210	1	0.00	-	0.0225	2	0.00	0.000	0.0229	2	0.00	0.000
726	0.0221	1	0.00	-	0.0214	2	0.00	0.000	0.0225	2	0.00	0.000
727	0.0210	2	n.s.	n.s.	0.0233	2	0.00	0.000	0.0218	2	0.00	0.000
728	0.0210	2	n.s.	n.s.	0.0229	2	0.00	0.000	0.0225	2	0.00	0.000
752	0.0206	2	n.s.	n.s.	0.0116	1	0.00	0.000	0.0229	2	0.00	0.000
753	0.0218	2	n.s.	n.s.	0.0229	2	0.00	0.000	0.0229	2	0.00	0.000
754	0.0195	2	n.s.	n.s.	0.0341	3	0.00	0.000	0.0218	2	0.00	0.000
755	0.0431	4	n.s.	n.s.	0.0338	3	0.00	0.000	0.0221	2	0.00	0.000
756	0.0203	1	0.000	-	0.0229	2	0.00	0.006	0.0221	2	0.00	0.000
757	0.0214	2	n.s.	n.s.	0.0225	2	0.00	0.000	0.0221	2	0.00	0.000
758	0.0210	2	n.s.	n.s.	0.0225	2	0.00	0.000	0.0221	2	0.00	0.000
759	0.0210	2	n.s.	n.s.	0.0225	2	0.00	0.000	0.0113	1	0.00	-
760	0.0210	2	0.000	0.000	0.0229	2	0.00	0.000	0.0218	2	0.00	0.000
761	0.0221	2	0.000	0.000	0.0225	2	0.00	0.000	0.0225	2	0.00	0.000
762	0.0203	1	0.000	-	0.0225	2	0.00	0.000	0.0225	2	0.00	0.000
763	0.0416	3	n.s.	n.s.	0.0225	2	0.00	0.000	0.0311	3	0.00	0.000
764	0.0218	2	0.000	0.000	0.0236	2	0.00	0.000	0.0221	2	3.78	4.236
765	0.0203	1	0.000	-	0.0236	2	1.65	2.333	0.0113	1	0.00	-
766	0.0214	2	n.s.	n.s.	0.0233	2	0.00	0.000	0.0225	2	0.00	0.000
767	0.0210	2	n.s.	n.s.	0.0225	2	0.00	0.000	0.0229	2	0.00	0.000

$$SD = \frac{\sum \left(x_i - \bar{x} \right)^2}{n-1}$$

TABLE 12 (cont.).- Swept area, number of hauls and White hake mean catch (kg) and SD by stratum. Spanish Spring Surveys on NAFO Div. 3NO: 2001-2006. Swept area in square miles. n.s. means strata not surveyed.

	2004				2005				2006			
Stratum	Swept area	Tow number	White hake Mean catch	White hake SD	Swept area	Tow number	White hake Mean catch	White hake SD	Swept area	Tow number	White hake Mean catch	White hake SD
353	0.0338	3	0.00	0.000	0.0353	3	0.01	0.023	0.0371	3	1.87	3.245
354	0.0345	3	23.15	32.074	0.0353	3	54.33	91.362	0.0364	3	34.59	33.056
355	0.0229	2	14.95	15.203	0.0225	2	41.75	40.489	0.0248	2	2.17	3.062
356	0.0221	2	4.15	5.869	0.0233	2	12.32	6.795	0.0240	2	0.80	1.131
357	0.0229	2	0.90	1.273	0.0233	2	0.00	0.000	0.0244	2	0.00	0.000
358	0.0330	3	12.02	20.597	0.0349	3	30.64	53.008	0.0349	3	1.69	2.923
359	0.0791	7	0.00	0.000	0.0814	7	0.00	0.000	0.0975	8	6.29	10.192
360	0.2310	20	0.07	0.172	0.2325	20	0.00	0.007	0.2340	19	0.00	0.000
374	0.0233	2	0.00	0.000	0.0229	2	0.00	0.000	0.0236	2	0.00	0.000
375	0.0338	3	0.00	0.000	0.0349	3	0.00	0.000	0.0364	3	0.00	0.000
376	0.1166	10	0.00	0.000	0.1174	10	0.01	0.019	0.1219	10	0.00	0.000
377	0.0218	2	0.00	0.000	0.0233	2	0.00	0.000	0.0236	2	0.00	0.000
378	0.0225	2	0.00	0.000	0.0225	2	0.00	0.000	0.0240	2	0.00	0.000
379	0.0124	1	0.00	-	0.0236	2	0.07	0.099	0.0236	2	0.10	0.141
380	0.0221	2	0.04	0.049	0.0229	2	0.53	0.049	0.0229	2	0.15	0.212
381	0.0225	2	0.00	0.000	0.0233	2	0.00	0.000	0.0229	2	0.00	0.000
382	0.0461	4	0.00	0.000	0.0458	4	0.00	0.000	0.0469	4	0.00	0.000
721	0.0221	2	3.50	0.544	0.0229	2	0.00	0.000	0.0236	2	6.18	6.901
722	0.0218	2	1.29	1.824	0.0233	2	0.00	0.000	0.0240	2	0.00	0.000
723	0.0229	2	1.05	1.485	0.0233	2	1.51	2.128	0.0236	2	1.84	2.496
724	0.0214	2	0.00	0.000	0.0225	2	0.00	0.000	0.0233	2	0.00	0.000
725	0.0225	2	0.00	0.000	0.0236	2	0.00	0.000	0.0233	2	0.51	0.714
726	0.0225	2	0.00	0.000	0.0113	1	0.00	-	0.0225	2	0.00	0.000
727	0.0233	2	0.00	0.000	0.0229	2	0.00	0.000	0.0225	2	0.00	0.000
728	0.0180	2	0.06	0.078	0.0109	1	0.00	-	0.0225	2	0.00	0.000
752	0.0214	2	0.00	0.000	0.0236	2	0.00	0.000	0.0225	2	0.00	0.000
753	0.0218	2	0.73	1.025	0.0225	2	0.00	0.000	0.0225	2	0.00	0.000
754	0.0214	2	0.00	0.000	0.0225	2	0.00	0.000	0.0225	2	0.00	0.000
755	0.0319	3	0.00	0.000	0.0450	4	0.00	0.000	0.0338	3	0.00	0.000
756	0.0218	2	0.00	0.000	0.0233	2	0.00	0.000	0.0229	2	0.00	0.000
757	0.0218	2	0.00	0.000	0.0225	2	0.00	0.000	0.0225	2	0.00	0.000
758	0.0214	2	0.00	0.000	0.0225	2	0.00	0.000	0.0225	2	0.00	0.000
759	0.0214	2	0.00	0.000	0.0229	2	0.00	0.000	0.0225	2	0.00	0.000
760	0.0221	2	0.00	0.000	0.0229	2	0.00	0.000	0.0225	2	0.00	0.000
761	0.0221	2	0.00	0.000	0.0221	2	0.00	0.000	0.0233	2	0.00	0.000
762	0.0233	2	0.00	0.000	0.0225	2	0.01	0.014	0.0233	2	0.00	0.000
763	0.0326	3	0.00	0.000	0.0334	3	0.00	0.000	0.0225	2	0.00	0.000
764	0.0229	2	0.00	0.000	0.0233	2	0.00	0.000	0.0233	2	0.00	0.000
765	0.0225	2	0.00	0.000	0.0229	2	0.00	0.000	0.0236	2	0.00	0.000
766	0.0225	2	0.00	0.000	0.0229	2	0.00	0.000	0.0229	2	0.00	0.000
767	0.0218	2	0.00	0.000	0.0113	1	0.00	-	0.0233	2	0.00	0.000

$$SD = \frac{\sum \left(x_i - \bar{x} \right)^2}{n-1}$$

TABLE 13.- Stratified mean catches (Kg) by stratum and year and SD by year of White hake (2001-2006). n.s. means strata not surveyed.

Stratum	2001	2002	2003	2004	2005	2006
353	279.76	13.45	0.00	0.00	3.59	503.93
354	18868.20	16.40	0.00	5694.08	13365.18	8509.96
355	9764.30	11599.50	2311.76	1106.30	3089.50	160.21
356	1125.65	4037.30	696.78	195.05	578.81	37.60
357	287.00	0.00	369.00	147.60	0.00	0.00
358	97.50	37.50	90.00	2703.75	6894.98	379.73
359	6946.50	0.00	0.00	0.00	0.00	2648.25
360	13.92	0.00	0.00	201.77	6.26	0.00
374	0.00	0.00	0.00	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	8.14	0.00
377	0.00	0.00	0.00	0.00	0.00	0.00
378	4.17	0.00	0.00	0.00	0.00	0.00
379	0.00	2.44	0.00	0.00	7.42	10.55
380	n.s.	0.00	0.00	3.36	50.40	14.40
381	n.s.	0.00	0.00	0.00	0.00	0.00
382	n.s.	0.00	0.00	0.00	0.00	0.00
721	708.50	3250.00	1539.85	227.18	0.00	401.70
722	1827.00	1528.38	2358.30	108.36	0.00	0.00
723	248.00	0.00	0.00	162.75	233.28	284.43
724	166.16	254.20	0.00	0.00	0.00	0.00
725	0.00	0.00	0.00	0.00	0.00	53.03
726	0.00	0.00	0.00	0.00	0.00	0.00
727	n.s.	0.00	0.00	0.00	0.00	0.00
728	n.s.	0.00	0.00	4.29	0.00	0.00
752	n.s.	0.00	0.00	0.00	0.00	0.00
753	n.s.	0.00	0.00	100.05	0.00	0.00
754	n.s.	0.00	0.00	0.00	0.00	0.00
755	n.s.	0.00	0.00	0.00	0.00	0.00
756	0.00	0.45	0.00	0.00	0.00	0.00
757	n.s.	0.00	0.00	0.00	0.00	0.00
758	n.s.	0.00	0.00	0.00	0.00	0.00
759	n.s.	0.00	0.00	0.00	0.00	0.00
760	0.00	0.00	0.00	0.00	0.00	0.00
761	0.00	0.00	0.00	0.00	0.00	0.00
762	0.00	0.00	0.00	0.00	2.12	0.00
763	n.s.	0.00	0.00	0.00	0.00	0.00
764	0.00	0.00	377.50	0.00	0.00	0.00
765	0.00	204.60	0.00	0.00	0.00	0.00
766	n.s.	0.00	0.00	0.00	0.00	0.00
767	n.s.	0.00	0.00	0.00	0.00	0.00
TOTAL	40336.66	20944.22	7743.19	10654.53	24239.66	13003.77
$(\bar{Y})$	5.13	2.03	0.75	1.03	2.34	1.26
S.D.	1.87	0.43	0.24	0.52	1.44	0.48

TABLE 14.- Survey estimates (by the swept area method) of White hake biomass (t) and SD by stratum and year on NAFO Div. 3NO. n.s. means stratum not surveyed.

Stratum	2001	2002	2003	2004	2005	2006
353	25	1	0	0	0	41
354	1677	1	0	495	1137	702
355	814	982	202	97	275	13
356	94	347	62	18	50	3
357	24	0	32	13	0	0
358	8	3	8	246	593	33
359	606	0	0	0	0	217
360	1	0	0	17	1	0
374	0	0	0	0	0	0
375	0	0	0	0	0	0
376	0	0	0	0	1	0
377	0	0	0	0	0	0
378	0	0	0	0	0	0
379	0	0	0	0	1	1
380	0	0	0	0	4	1
381	0	0	0	0	0	0
382	0	0	0	0	0	0
721	57	280	137	21	0	34
722	157	129	213	10	0	0
723	21	0	0	14	20	24
724	15	23	0	0	0	0
725	0	0	0	0	0	5
726	0	0	0	0	0	0
727	0	0	0	0	0	0
728	0	0	0	0	0	0
752	0	0	0	0	0	0
753	0	0	0	9	0	0
754	0	0	0	0	0	0
755	0	0	0	0	0	0
756	0	0	0	0	0	0
757	0	0	0	0	0	0
758	0	0	0	0	0	0
759	0	0	0	0	0	0
760	0	0	0	0	0	0
761	0	0	0	0	0	0
762	0	0	0	0	0	0
763	0	0	0	0	0	0
764	0	0	34	0	0	0
765	0	17	0	0	0	0
766	0	0	0	0	0	0
767	0	0	0	0	0	0
TOTAL	3498	1784	688	940	2082	1073
S.D.	1107	389	224	464	1270	407

TABLE 15.- Length weight relationships in the calculation of White hake biomass. The equation is $Weight = a(l + 0.5)^b$ Spanish Spring Surveys on NAFO Div. 3NO: 2002-2006. To calculate the parameters for the indeterminate individuals, we used the total data (males + females + indeterminate individuals).

		2002	2003	2004	2005	2006
Males	a	0.0018 Error = 0.234	0.0045 Error = 0.243	0.0043 Error = 0.237	0.0034 Error = 0.1497	0.0175 Error = 0.5190
	b	3.3586 Error = 0.060	3.1161 Error = 0.062	3.1313 Error = 0.063	3.2086 Error = 0.0395	2.7891 Error = 0.1320
		R2 = 0.991 N = 107	R2 = 0.992 N = 73	R2 = 0.992 N = 41	R2 = 0.995 N = 108	R2 = 0.965 N = 75
Females	a	0.0027 Error = 0.221	0.0013 Error = 0.465	0.0037 Error = 0.202	0.0043 Error = 0.0992	0.0019 Error = 0.2136
	b	3.2537 Error = 0.056	3.4264 Error = 0.115	3.1960 Error = 0.056	3.1602 Error = 0.0253	3.3563 Error = 0.0530
		R2 = 0.992 N = 61	R2 = 0.977 N = 51	R2 = 0.995 N = 32	R2 = 0.997 N = 80	R2 = 0.998 N = 28
Indet.	a	0.0025 Error = 0.152	0.0026 Error = 0.254	0.0048 Error = 0.127	0.0036 Error = 0.1026	0.0066 Error = 0.367
	b	3.2731 Error = 0.039	3.2565 Error = 0.064	3.1208 Error = 0.035	3.1961 Error = 0.0266	3.0472 Error = 0.0930
		R2 = 0.995 N = 168	R2 = 0.989 N = 125	R2 = 0.997 N = 91	R2 = 0.997 N = 188	R2 = 0.980 N = 103

TABLE 16.- White hake length distribution per haul mean catches by sex and year. Number per stratified mean catches. Spanish Spring Survey on NAFO 3NO: 2001-2006. Indet. means indeterminate.

	2001				2002				2003			
Length (cm.)	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
10	0.000	0.000	0.015	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12	0.000	0.000	0.000	0.000	0.007	0.000	0.000	0.007	0.000	0.000	0.000	0.000
14	0.009	0.020	0.000	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
16	0.034	0.009	0.000	0.043	0.014	0.000	0.000	0.014	0.000	0.000	0.000	0.000
18	0.048	0.024	0.000	0.073	0.014	0.012	0.000	0.026	0.000	0.000	0.000	0.000
20	0.074	0.055	0.000	0.129	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
22	0.075	0.044	0.000	0.120	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.004
24	0.069	0.058	0.000	0.127	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
26	0.055	0.055	0.000	0.110	0.000	0.000	0.000	0.000	0.011	0.004	0.000	0.015
28	0.229	0.154	0.000	0.383	0.000	0.000	0.000	0.000	0.004	0.004	0.000	0.007
30	0.399	0.188	0.000	0.587	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
32	1.092	0.665	0.000	1.758	0.009	0.000	0.000	0.009	0.004	0.004	0.000	0.007
34	1.019	0.873	0.000	1.892	0.007	0.004	0.000	0.011	0.000	0.004	0.000	0.004
36	0.572	0.768	0.000	1.340	0.035	0.018	0.000	0.053	0.004	0.000	0.000	0.004
38	0.294	0.511	0.000	0.806	0.123	0.017	0.000	0.140	0.000	0.004	0.000	0.004
40	0.101	0.159	0.000	0.260	0.268	0.128	0.000	0.397	0.000	0.000	0.000	0.000
42	0.134	0.131	0.000	0.265	0.340	0.212	0.000	0.553	0.010	0.015	0.000	0.025
44	0.165	0.042	0.000	0.207	0.228	0.192	0.000	0.420	0.033	0.004	0.000	0.037
46	0.098	0.110	0.000	0.208	0.093	0.162	0.000	0.256	0.080	0.012	0.000	0.092
48	0.107	0.069	0.000	0.177	0.055	0.074	0.000	0.128	0.079	0.028	0.000	0.107
50	0.164	0.053	0.000	0.217	0.052	0.077	0.000	0.129	0.041	0.041	0.000	0.082
52	0.203	0.105	0.000	0.308	0.054	0.033	0.000	0.086	0.061	0.028	0.000	0.089
54	0.119	0.047	0.000	0.166	0.051	0.044	0.000	0.095	0.017	0.026	0.000	0.043
56	0.119	0.050	0.000	0.168	0.028	0.025	0.000	0.053	0.014	0.027	0.000	0.041
58	0.051	0.050	0.000	0.101	0.025	0.009	0.000	0.034	0.004	0.029	0.000	0.034
60	0.078	0.063	0.000	0.141	0.048	0.021	0.000	0.070	0.000	0.016	0.000	0.016
62	0.040	0.040	0.000	0.081	0.008	0.010	0.000	0.018	0.004	0.004	0.000	0.008
64	0.034	0.022	0.000	0.056	0.020	0.018	0.000	0.038	0.000	0.013	0.000	0.013
66	0.035	0.019	0.000	0.054	0.010	0.000	0.000	0.010	0.011	0.000	0.000	0.011
68	0.019	0.046	0.000	0.065	0.011	0.016	0.000	0.027	0.004	0.009	0.000	0.013
70	0.026	0.019	0.000	0.045	0.007	0.008	0.000	0.015	0.004	0.004	0.000	0.009
72	0.000	0.000	0.000	0.000	0.004	0.007	0.000	0.011	0.000	0.000	0.000	0.000
74	0.000	0.015	0.000	0.015	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.008
76	0.000	0.016	0.000	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
78	0.000	0.015	0.000	0.015	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.004
80	0.000	0.016	0.000	0.016	0.000	0.003	0.000	0.003	0.000	0.003	0.000	0.003
82	0.000	0.020	0.000	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
84	0.000	0.006	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
86	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
88	0.000	0.006	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	5.462	4.544	0.015	10.022	1.511	1.091	0.000	2.602	0.387	0.295	0.000	0.682
Nº samples:				12				11				9
Nº Ind.:	427	328	1	756	329	222	0	551	102	79	0	181
Sampled catch:				401				303				195
Range:				10-89				13-80				22-80
Total catch:				738				630				209
Total hauls:				123				125				118

TABLE 16 (cont.).- White hake length distribution per haul mean catches by sex and year. Number per stratified mean catches. Spanish Spring Survey on NAFO 3NO: 2001-2006. Indet. means indeterminate.

	2004				2005				2006			
Length (cm.)	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.040	0.000	0.000	0.000	0.000
16	0.000	0.025	0.000	0.025	0.009	0.000	0.000	0.009	0.000	0.000	0.000	0.000
18	0.058	0.034	0.000	0.092	0.005	0.004	0.000	0.009	0.000	0.000	0.000	0.000
20	0.025	0.050	0.000	0.075	0.028	0.015	0.000	0.043	0.000	0.000	0.000	0.000
22	0.050	0.042	0.000	0.091	0.008	0.000	0.000	0.008	0.005	0.000	0.000	0.005
24	0.008	0.025	0.000	0.033	0.013	0.014	0.000	0.027	0.000	0.000	0.000	0.000
26	0.000	0.005	0.000	0.005	0.043	0.007	0.000	0.051	0.005	0.000	0.000	0.005
28	0.000	0.000	0.000	0.000	0.000	0.013	0.000	0.013	0.013	0.000	0.000	0.013
30	0.000	0.000	0.000	0.000	0.013	0.005	0.000	0.017	0.000	0.011	0.000	0.011
32	0.000	0.000	0.000	0.000	0.016	0.000	0.000	0.016	0.000	0.000	0.000	0.000
34	0.000	0.000	0.000	0.000	0.007	0.038	0.000	0.045	0.000	0.011	0.000	0.011
36	0.000	0.008	0.000	0.008	0.015	0.023	0.000	0.038	0.008	0.005	0.000	0.013
38	0.000	0.000	0.000	0.000	0.023	0.023	0.000	0.046	0.012	0.000	0.000	0.012
40	0.000	0.000	0.000	0.000	0.000	0.016	0.000	0.016	0.012	0.004	0.000	0.015
42	0.000	0.000	0.000	0.000	0.008	0.019	0.000	0.027	0.015	0.008	0.000	0.023
44	0.000	0.000	0.000	0.000	0.008	0.007	0.000	0.015	0.000	0.000	0.000	0.000
46	0.000	0.000	0.000	0.000	0.007	0.000	0.000	0.007	0.016	0.000	0.000	0.016
48	0.046	0.000	0.000	0.046	0.008	0.000	0.000	0.008	0.009	0.008	0.000	0.017
50	0.049	0.000	0.000	0.049	0.016	0.000	0.000	0.016	0.020	0.000	0.000	0.020
52	0.057	0.024	0.000	0.082	0.068	0.004	0.000	0.072	0.028	0.000	0.000	0.028
54	0.030	0.016	0.000	0.047	0.122	0.018	0.000	0.140	0.005	0.010	0.000	0.016
56	0.058	0.016	0.000	0.075	0.085	0.019	0.000	0.104	0.028	0.008	0.000	0.036
58	0.021	0.029	0.000	0.050	0.151	0.028	0.000	0.179	0.031	0.000	0.000	0.031
60	0.017	0.028	0.000	0.045	0.098	0.010	0.000	0.108	0.075	0.013	0.000	0.089
62	0.021	0.021	0.000	0.042	0.092	0.030	0.000	0.122	0.066	0.000	0.000	0.066
64	0.008	0.032	0.000	0.041	0.027	0.026	0.000	0.052	0.076	0.000	0.000	0.076
66	0.008	0.062	0.000	0.070	0.027	0.052	0.000	0.079	0.024	0.000	0.000	0.024
68	0.004	0.013	0.000	0.017	0.019	0.038	0.000	0.057	0.021	0.000	0.000	0.021
70	0.017	0.008	0.000	0.025	0.000	0.081	0.000	0.081	0.016	0.008	0.000	0.024
72	0.000	0.000	0.000	0.000	0.000	0.032	0.000	0.032	0.016	0.021	0.000	0.037
74	0.000	0.008	0.000	0.008	0.000	0.011	0.000	0.011	0.000	0.005	0.000	0.005
76	0.000	0.000	0.000	0.000	0.000	0.015	0.000	0.015	0.008	0.026	0.000	0.034
78	0.000	0.000	0.000	0.000	0.000	0.022	0.000	0.022	0.000	0.020	0.000	0.020
80	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.000	0.013
82	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
84	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.008	0.000	0.000	0.000	0.000
86	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
88	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	0.480	0.447	0.000	0.927	0.953	0.579	0.000	1.532	0.512	0.172	0.000	0.684
Nº samples:				11				14				14
Nº Ind.:	59	59	0	118	137	91	0	228	73	28	0	101
Sampled catch:				144				367				187
Range:				16-75				15-85				23-80
Total catch:				160				367				187
Total hauls:				120				119				120

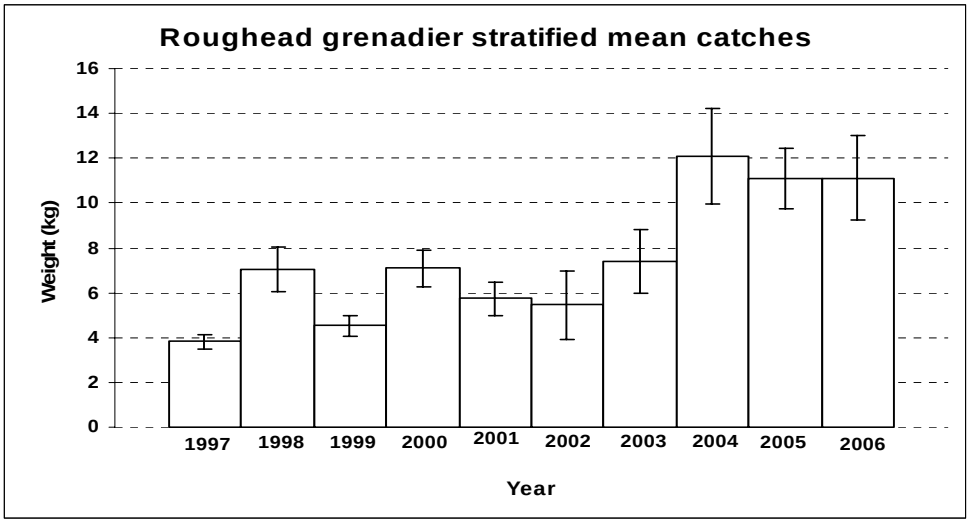

FIGURE 1.- Roughhead grenadier stratified mean catches in Kg and ±SD by year. Spanish Spring surveys on NAFO Div. 3NO: 1997-2006 (1997-2000 transformed data from C/V *Playa de Menduíña*; 2002-2006 original data from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels).

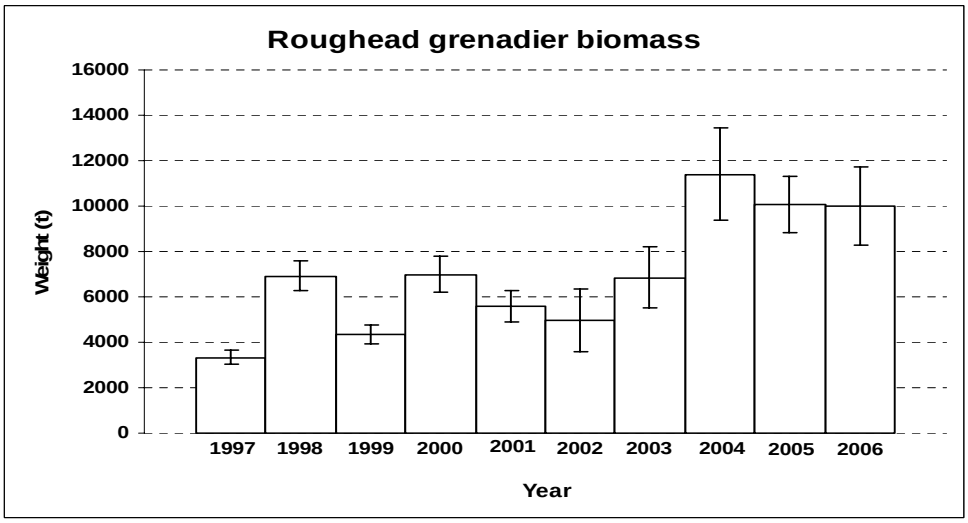

FIGURE 2.- Roughhead grenadier biomass calculated by the swept area method in tons and ±SD by year. Spanish Spring surveys on NAFO Div. 3NO: 1997-2006 (1997-2000 transformed data from C/V *Playa de Menduíña*; 2002-2006 original data from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels).

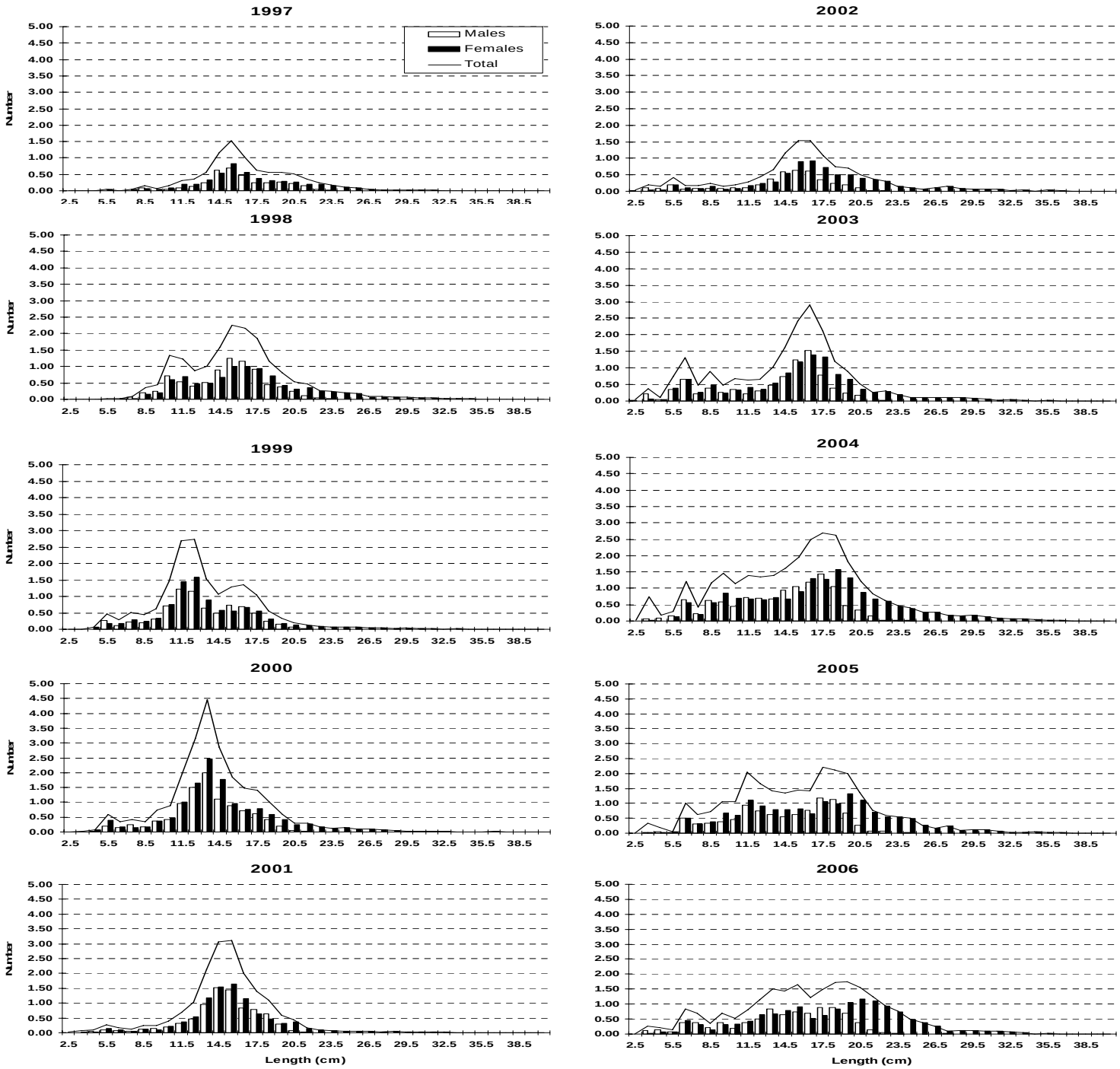

FIGURE 3.- Roughhead grenadier length distribution (cm) on NAFO 3NO: 1997-2006. Estimated numbers per haul stratified mean catches. 1997-2000 data are transformed data from C/V *Playa de Menduíña*, and 2002-2006 data are original from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels.

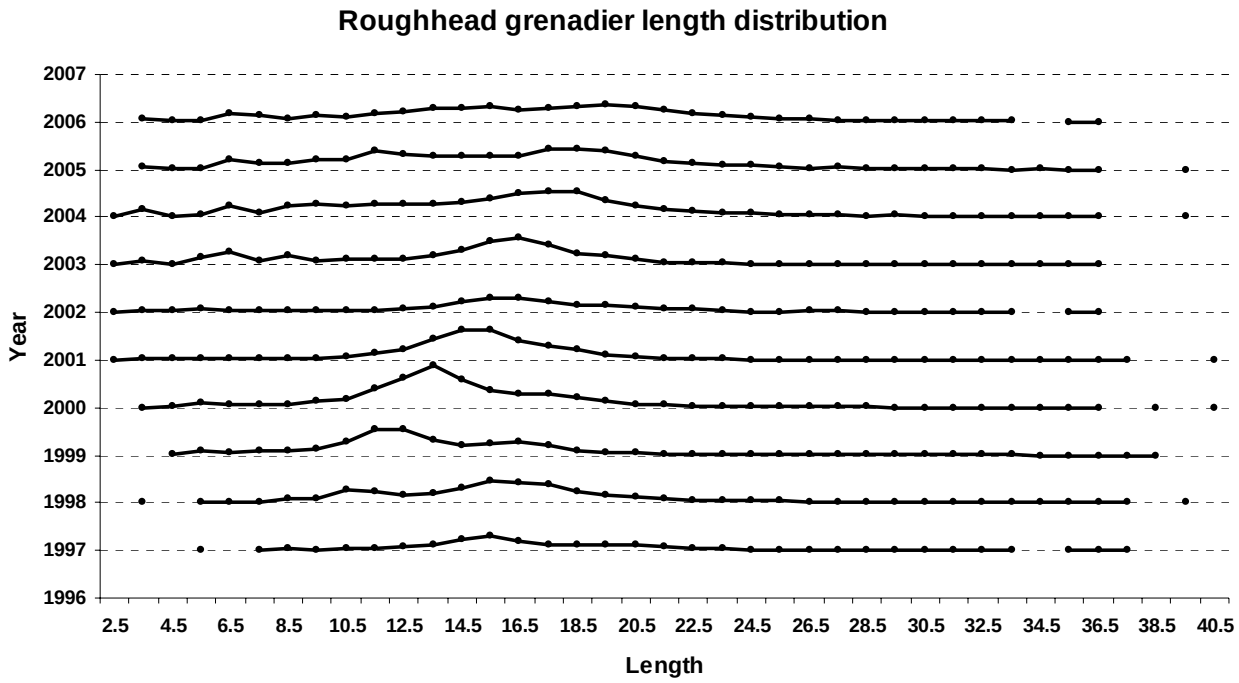

FIGURE 4.- Roughhead grenadier mean catches per tow length distribution (cm) on NAFO 3NO: 1997-2006.

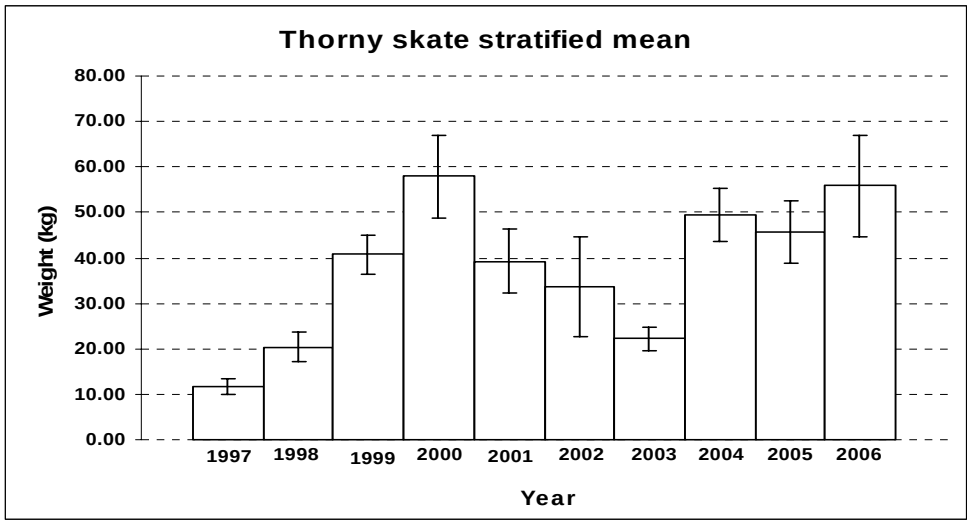

FIGURE 5.- Thorny skate stratified mean catches in Kg and ±SD by year. Spanish Spring surveys on NAFO Div. 3NO: 1997-2006 (1997-2000 transformed data from C/V *Playa de Menduíña*; 2002-2006 original data from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels).

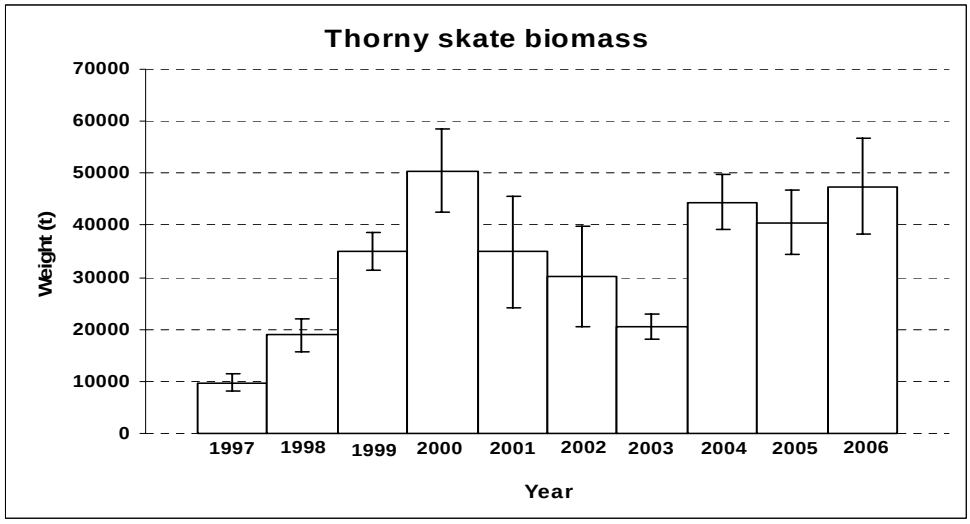

FIGURE 6.- Thorny skate biomass calculated by the swept area method in tons and ±SD by year. Spanish Spring surveys on NAFO Div. 3NO: 1997-2006 (1997-2000 transformed data from C/V *Playa de Menduíña*; 2002-2006 original data from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels).

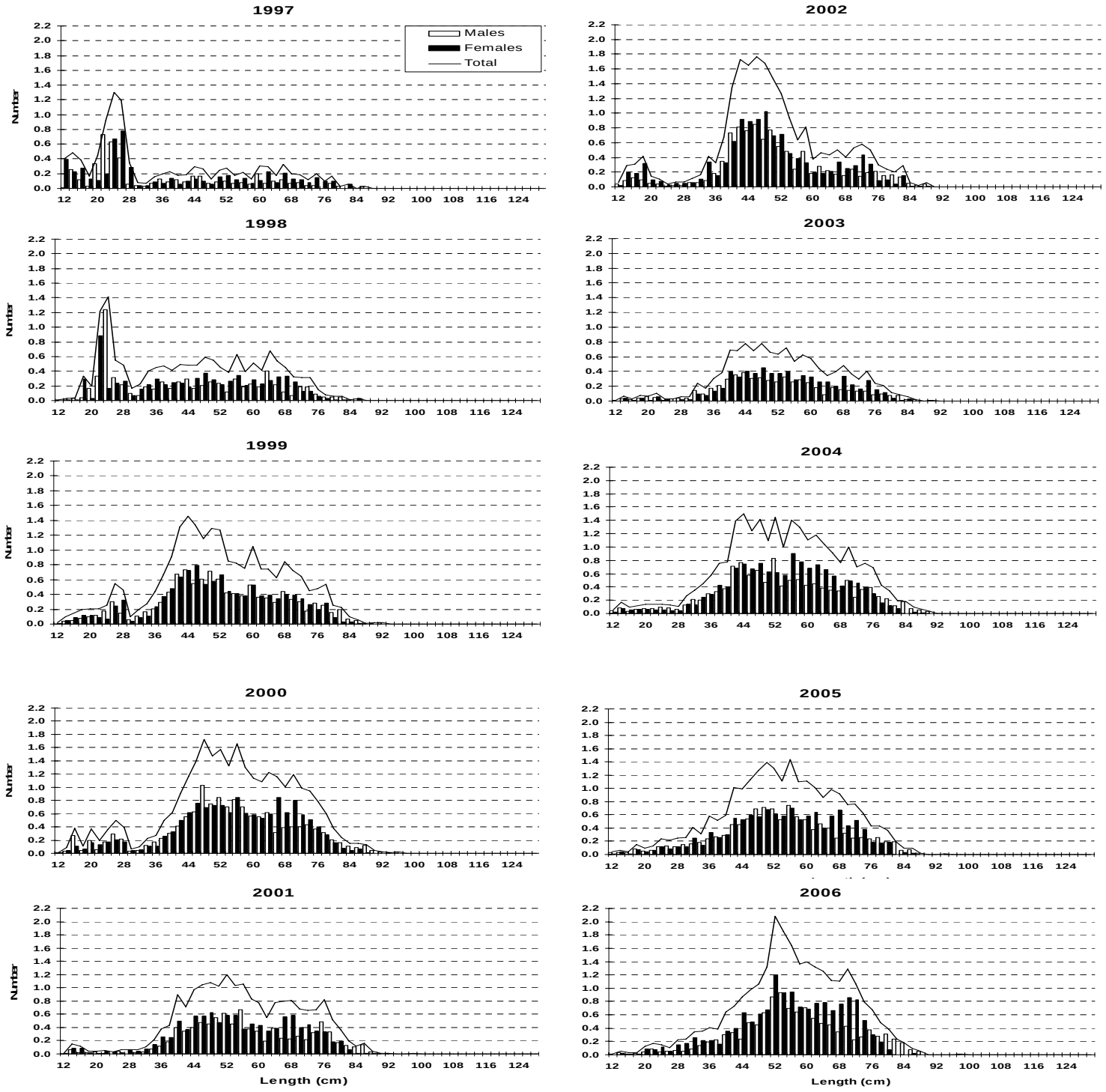

FIGURE 7.- Thorny skate length distribution (cm) on NAFO 3NO: 1997-2006. Estimated numbers per haul stratified mean catches. 1997-2000 data are transformed data from C/V *Playa de Menduíña*, and 2002-2006 data are original from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels

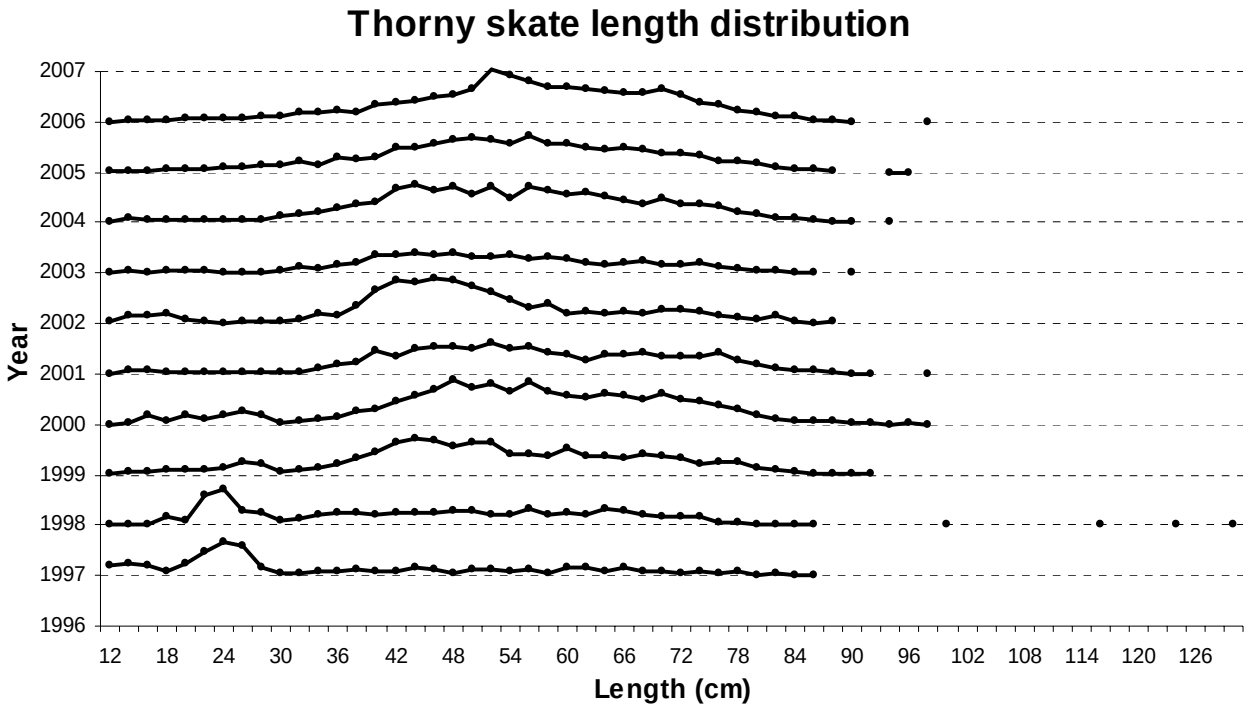

FIGURE 8.- Thorny skate mean catches per tow length distribution (cm) on NAFO 3NO: 1997-2006.

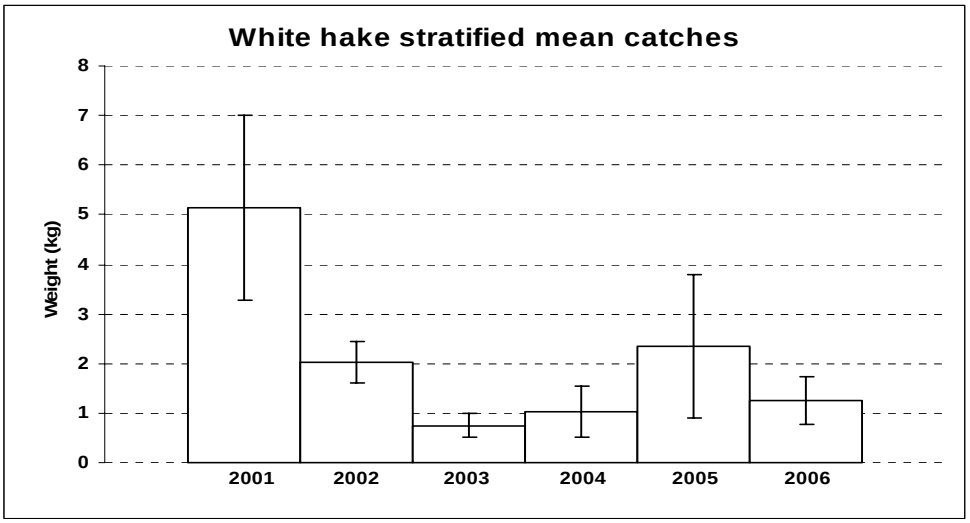

FIGURE 9.- White hake stratified mean catches in Kg and ±SD by year. Spanish Spring surveys on NAFO Div. 3NO: 2001-2006

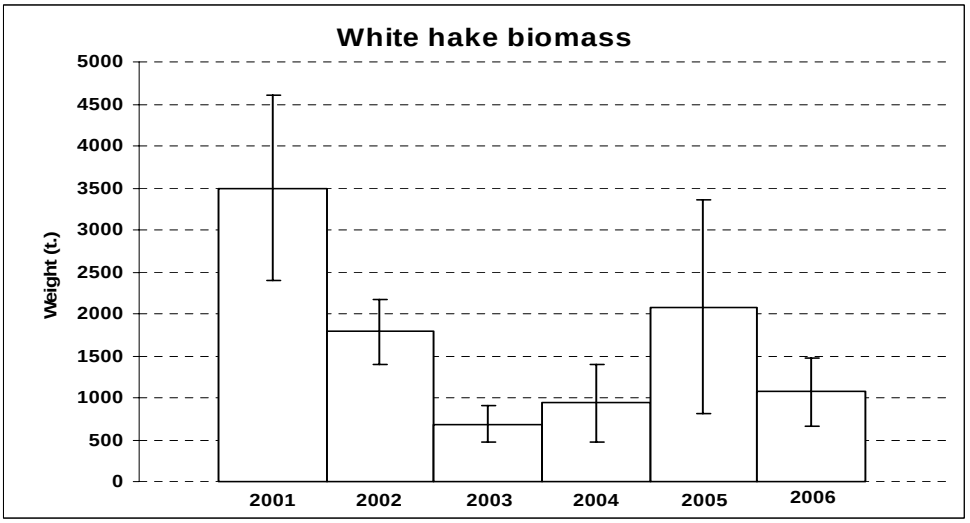

FIGURE 10.- White hake biomass calculated by the swept area method in tons and ±SD by year. Spanish Spring surveys on NAFO Div. 3NO: 2001-2006

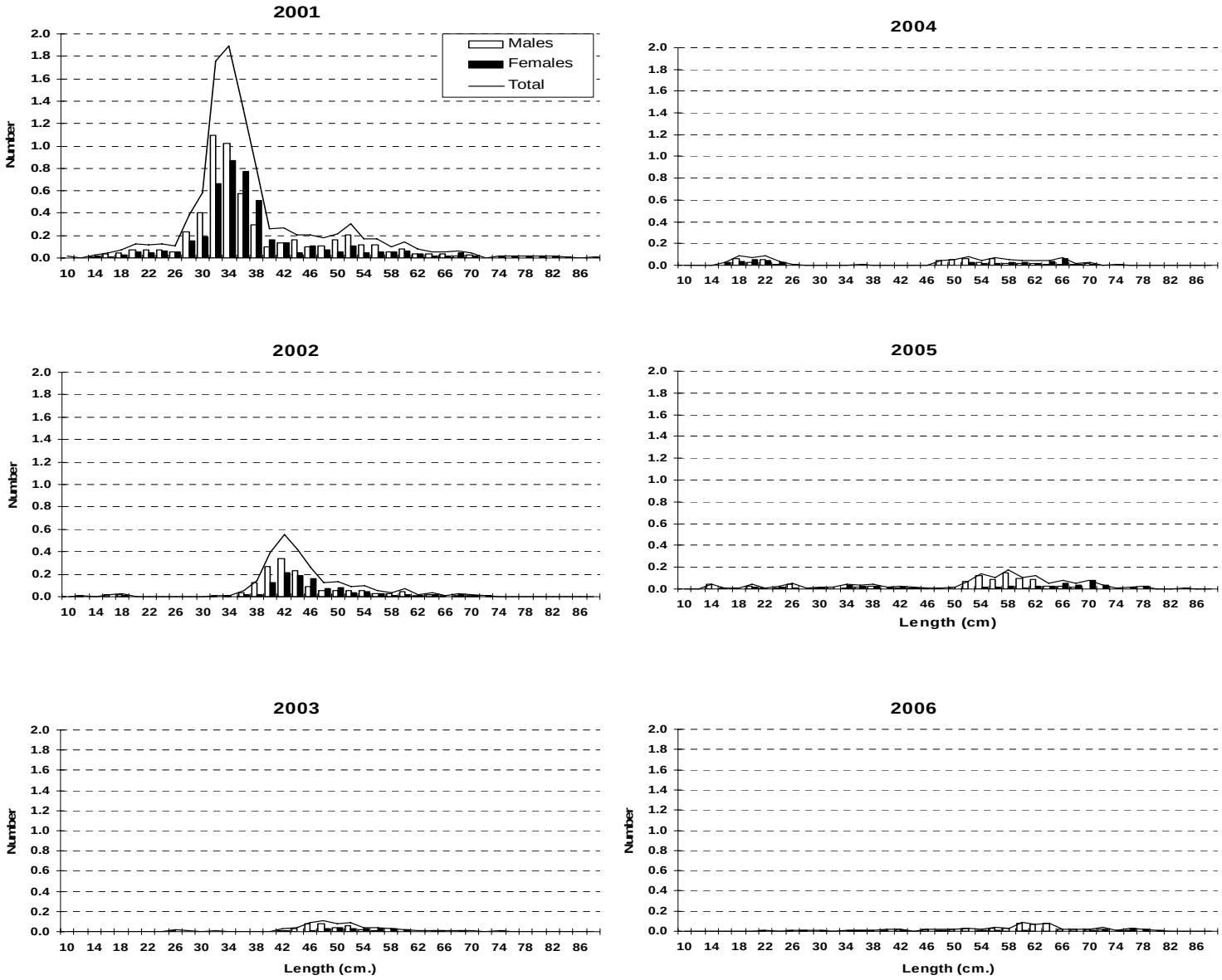

FIGURE 11.- White hake length distribution (cm) on NAFO 3NO: 2001-2006. Number per stratified mean catches.

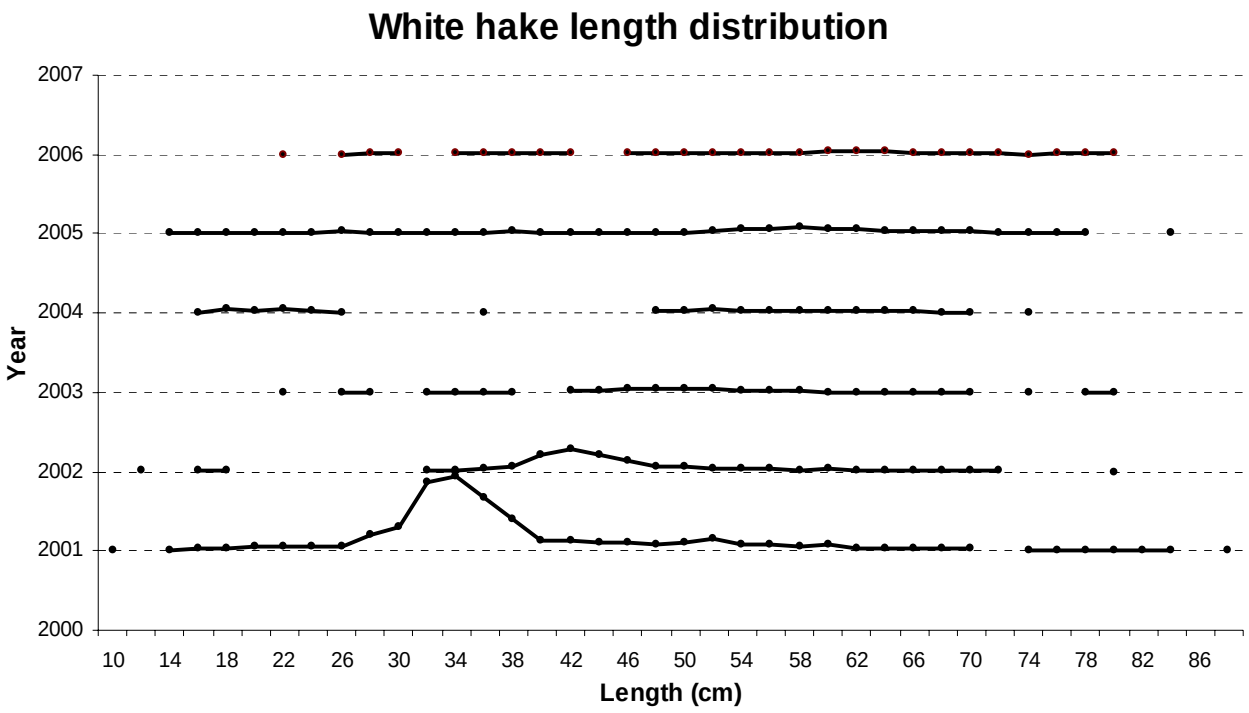

FIGURE 12.- White hake mean catches per tow length distribution (cm) on NAFO 3NO: 2001-2006.