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Biomass and Length Distribution for Roughhead Grenadier, Thorny Skate and White Hake from the Surveys Conducted by Spain in NAFO Divisions 3NO

by

Diana González-Troncoso, Fernando González and Xabier Paz

Instituto Español de Oceanografía, P. O. Box 1552. Vigo, Spain
E-mail: diana.gonzalez@vi.ieo.es

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 2002-2005 data are original data from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels for these two species. This year the data were updated, so a new calibration was made. The changes affect the species length distribution. The abundance and biomass were estimated for the period 1997-2005 for roughhead grenadier and thorny skate, and 2001-2005 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 increasing in the last two years, mainly in 2004. Thorny skate indices decreased since 2001 until 2003 and increase in 2004, reaching the second highest value of the series. This year, a slight decreasing occurred, but remained in a high value. For white hake, there were great catches in 2001, and a sharp decreasing since then, broken this year with an increasing in the indices. 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 1997-2005. 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, Thorny skate and white hake, each individual of the sample was measured to the total length to the nearest lower cm. We present the indices for the period 1997-2005 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 2001-2005.

This year, errors in the length distribution data process tools were found. The changes affect both the numbers and the shape of the length distribution. A new calibration factors for the length distribution were calculated for each species following identical method employed in previous years, fitting the ratios of the number of the two vessels length by length. There is a length range in which the ratios of the data are scattered, so it seems to be better not to apply the fit to the entire length range but to cut in an appropriate point. A residual analysis was made in order to choose the best length to make the cut, or if it was better to cut or not. The new transformation factors and their graph are presented for Roughhead grenadier and Thorny skate. The changes do not affect the mean catches and the biomass, so these indices are the same than last years. For details about the transformation of these species, see González Troncoso *et al.*, 2005 and González Troncoso, 2004. For white hake, it was no necessary to perform the calibration (González Troncoso and Paz, 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 2002-2005. 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 length distribution in number per haul stratified mean catch. To more information about the calculation of these indices, see González Troncoso *et al.*, 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. Since 1997 the roughhead catches have been correctly reported, but the mis-reporting problem is not still solved in the statistics prior 1996. The level of catches remains uncertain in Subareas 2 and 3 before the start of the Greenland halibut fishery in the Regulatory Area (NAFO, 2005).

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 haul mean catches by stratum and year and their SD are presented in Table 3.

The entire time series (1997-2005) of biomass and their SD estimates for roughhead grenadier are presented in Table 4. Estimated parameters values of length-weight relationship *a* and *b* are presented in Table 5.

The indices of roughhead grenadier present no trend along the years until 2003, with an increasing in 2004 followed with a slight decreasing in 2005, but the indices remain over the 1997-2003 values (Fig. 1 and 2).

Length Distribution

The result of the model proposed by Warren for roughhead grenadier was the following:

$$\ln(\text{ratio}) = \exp(0.9757 - 0.0115l - 0.9002\ln(l))$$

Figure 3 shows the ratios and their fit. In this figure, we observed that, although the data is a bit dispersed, in general the adjust is very good. So, for this species, this adjust was taken for all the length range.

Table 6 and Fig. 4 and 5 show the length distribution per haul stratified mean catches and year, besides the sampled size and its catch, for the period 1997-2005. 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 skate 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. There are substantial uncertainties in the catch levels prior to 1996 (NAFO, 2005).

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 haul mean catches by stratum and year, next to their SD, are presented in Table 8.

The entire time series (1997-2005) of biomass and their SD estimates of thorny skate are presented in Table 9. The estimated parameters values of length-weight relationship *a* and *b* are presented in Table 10.

The indices of the Thorny skate present a decreasing since the year 2001, but in 2004 an increasing in the biomass occurs, reaching the second highest value of the series. In 2005, it was a slight decreasing, but the value of that year is the third highest of the series (Fig. 6 and 7).

Length Distribution

The result of the model proposed by Warren for thorny skate was the following:

$$\ln(\text{ratio}) = \exp(-19.5997 - 0.0663l + 5.3608\ln(l))$$

Figure 8 shows the ratios and their fit. In this figure, we observed that, above the length 29, the data are very scattered, so, for these values, the mean of the ratios factor is applied, and two length classes are formed as follow:

$$\text{For } l \leq 28 \quad : \text{cf} = 0.6359$$
$$\text{For } l \geq 29 \quad : \text{cf} = \exp(-19.5997 - 0.0663l + 5.3608\ln(l))$$

The length distribution per haul stratified mean catches by sex and year are presented in Table 11 and Fig. 9 and 10, besides the sampled size and its catch, for the period 1997-2005, in two-cm groups. In 1997, we have a modal value that can be followed until 2005. 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 (NAFO, 2005)

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 Fig. 11, the stratified mean catches per stratum and year, as well as the annual variance, are presented. And in table 14 and Figure 12 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 2002-2005. 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.

Length Distribution

Table 16 presents the length distribution per haul stratified mean catches, 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 Fig. 13 and 14 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. In Fig. 12, we can follow a cohort since 2001 until 2004. Until 2004, no presence of new cohort was 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.

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TABLE 1. Spanish spring bottom trawl surveys on NAFO Div. 3NO: 1997-2005.

Year	Vessel	Valid tows	Depth strata covered (m)	Dates
1997	C/V *Playa de Menduíña*	128	56-1280	April 26-May 18
1998	C/V *Playa de Menduíña*	124	56-1464	May 06-May 26
1999	C/V *Playa de Menduíña*	114	56-1464	May 07-May 26
2000	C/V *Playa de Menduíña*	118	56-1464	May 07-May 28
2001 (*)	R/V *Vizconde de Eza*	83	56-1116	May 03-May 24
	C/V *Playa de Menduíña*	121	56-1464	May 05-May 23
2002	R/V *Vizconde de Eza*	125	56-1464	April 29-May 19
2003	R/V *Vizconde de Eza*	118	56-1464	May 11-Jun 02
2004	R/V *Vizconde de Eza*	120	56-1464	Jun 06 – Jun 24
2005	R/V *Vizconde de Eza*	119	56-1464	Jun 10 – Jun 29

(*) 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: 1997-2005. Swept area in square miles. n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data, and 2002-2005 data are original from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels.

	1997				1998				1999			
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	0.0480	4	0.000	0.000	0.0465	4	0.000	0.000	0.0360	3	0.000	0.000
354	0.0233	2	0.000	0.000	0.0356	3	0.000	0.000	0.0218	2	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
356	0.0225	2	0.000	0.000	0.0221	2	0.426	0.602	0.0229	2	0.019	0.026
357	0.0443	4	0.101	0.202	0.0240	2	0.000	0.000	0.0236	2	0.216	0.152
358	0.0563	5	0.000	0.000	0.0236	3	0.000	0.000	0.0349	3	0.233	0.403
359	0.0690	6	0.000	0.000	0.0698	6	0.000	0.000	0.0364	3	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
374	0.0353	3	0.000	0.000	0.0353	3	0.000	0.000	0.0244	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
376	0.1583	14	0.000	0.000	0.0930	10	0.000	0.000	0.1219	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
378	0.0210	2	0.447	0.632	0.0120	2	0.000	0.000	0.0229	2	0.298	0.421
379	0.0206	2	0.000	0.000	0.0356	3	0.011	0.020	0.0236	2	0.024	0.034
380	0.0210	2	0.219	0.309	0.0113	2	0.000	0.000	0.0236	2	0.003	0.005
381	0.0221	2	0.000	0.000	0.0229	2	0.000	0.000	0.0229	2	0.000	0.000
382	0.0461	4	0.000	0.000	0.0229	3	0.000	0.000	0.0484	4	0.000	0.000
721	0.0221	2	0.000	0.000	0.0203	2	0.758	0.253	0.0244	2	2.443	0.132
722	0.0214	2	0.026	0.036	0.0101	2	3.950	0.385	0.0229	2	3.865	3.202
723	0.0210	2	0.000	0.000	0.0233	2	0.255	0.361	0.0229	2	2.367	2.528
724	0.0225	2	0.562	0.048	0.0206	2	1.064	0.349	0.0225	2	3.678	0.217
725	0.0206	2	0.000	0.000	0.0086	1	0.077	-	0.0229	2	3.718	3.790
726	n.s.	n.s.	n.s.	n.s.	0.0094	2	2.213	2.336	0.0225	2	7.296	0.205
727	0.0094	1	0.358	-	0.0233	2	0.196	0.181	0.0236	2	0.661	0.236
728	0.0214	2	0.835	0.167	0.0206	2	0.919	0.457	0.0233	2	17.996	15.217
752	0.0218	2	8.836	3.973	0.0229	2	8.172	6.983	0.0233	2	9.032	3.744
753	0.0214	2	15.528	7.705	0.0218	2	35.635	9.342	0.0229	2	28.442	30.760
754	0.0330	3	70.193	8.839	0.0210	2	60.723	3.985	0.0206	2	26.373	8.716
755	n.s.	n.s.	n.s.	n.s.	0.0206	2	42.088	3.130	0.0311	3	23.467	7.041
756	0.0109	1	3.252	-	0.0225	2	6.895	5.707	0.0225	2	29.642	5.995
757	0.0304	3	20.873	17.870	0.0206	2	39.313	39.079	0.0233	2	8.896	5.646
758	0.0214	2	46.823	8.232	0.0105	2	77.034	32.807	0.0214	2	46.200	23.151
759	n.s.	n.s.	n.s.	n.s.	0.0214	2	66.392	41.956	0.0218	2	22.491	13.002
760	0.0105	1	3.916	-	0.0214	2	8.862	1.890	0.0225	2	4.010	1.409
761	0.0315	3	19.198	3.744	0.0206	2	25.190	8.102	0.0210	2	16.592	10.125
762	0.0308	3	24.278	18.462	0.0094	2	30.068	18.564	0.0210	2	17.354	9.397
763	n.s.	n.s.	n.s.	n.s.	0.0218	2	10.820	5.285	0.0311	3	11.447	3.789
764	0.0206	2	6.393	4.081	0.0218	2	4.827	2.059	0.0225	2	4.044	1.240
765	0.0206	2	11.752	5.592	0.0098	2	6.734	3.431	0.0221	2	6.197	1.421
766	0.0308	3	7.741	2.498	0.0191	2	6.895	1.902	0.0218	2	5.516	3.371
767	n.s.	n.s.	n.s.	n.s.	0.0109	2	6.529	2.950	0.0214	2	4.844	0.277

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

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: 1997-2005. Swept area in square miles. n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data, and 2002-2005 data are original from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels.

	2000				2001				2002			
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	0.0356	3	0.002	0.004	0.0341	3	0.000	0.000	0.0476	4	0.000	0.000
354	0.0356	3	0.000	0.000	0.0338	3	0.000	0.000	0.0356	3	0.000	0.000
355	0.0233	2	0.083	0.117	0.0240	2	0.000	0.000	0.0236	2	0.000	0.000
356	0.0225	2	0.084	0.016	0.0240	2	0.000	0.000	0.0233	2	0.000	0.000
357	0.0124	1	0.473	-	0.0244	2	0.170	0.240	0.0240	2	1.050	1.061
358	0.0341	3	0.000	0.000	0.0345	3	0.000	0.000	0.0345	3	0.500	0.700
359	0.0469	4	0.000	0.000	0.0803	7	0.000	0.000	0.0686	6	0.041	0.100
360	0.2396	20	0.000	0.000	0.2423	20	0.390	1.744	0.2865	25	0.000	0.000
374	0.0240	2	0.000	0.000	0.0240	2	0.000	0.000	0.0345	3	0.000	0.000
375	0.0244	2	0.000	0.000	0.0338	3	0.000	0.000	0.0353	3	0.000	0.000
376	0.1200	10	0.000	0.000	0.1155	10	0.000	0.000	0.1140	10	0.000	0.000
377	0.0229	2	0.000	0.000	0.0229	2	0.000	0.000	0.0229	2	0.273	0.386
378	0.0233	2	0.149	0.211	0.0236	2	0.000	0.000	0.0233	2	0.008	0.011
379	0.0225	2	0.511	0.722	0.0229	2	0.430	0.580	0.0229	2	0.265	0.375
380	0.0236	2	0.157	0.220	0.0206	2	0.03	0.048	0.0225	2	0.008	0.011
381	0.0236	2	0.074	0.100	0.0236	2	0.00	0.00	0.0229	2	0.000	0.000
382	0.0499	4	0.004	0.009	0.0469	4	0.00	0.00	0.0341	3	0.002	0.004
721	0.0236	2	0.812	0.778	0.0248	2	0.220	0.085	0.0233	2	1.250	1.768
722	0.0218	2	4.767	1.204	0.0233	2	2.465	2.878	0.0236	2	10.930	14.213
723	0.0248	2	2.859	1.554	0.0240	2	1.705	0.304	0.0233	2	0.700	0.283
724	0.0233	2	4.130	1.074	0.0353	3	7.507	3.835	0.0225	2	10.000	4.384
725	0.0210	2	12.646	17.511	0.0116	2	1.415	1.832	0.0225	2	2.650	1.344
726	0.0221	2	14.727	0.120	0.0116	2	4.304	5.509	0.0214	2	2.650	1.909
727	0.0210	2	2.499	2.726	0.0225	2	0.21	0.132	0.0233	2	0.570	0.806
728	0.0210	2	7.249	6.640	0.0229	2	1.00	0.241	0.0229	2	0.620	0.876
752	0.0206	2	26.663	9.968	0.0210	2	6.04	3.455	0.0116	1	1.950	2.758
753	0.0218	2	49.154	1.830	0.0214	2	31.57	21.165	0.0229	2	5.400	7.637
754	0.0195	2	66.801	41.403	0.0195	2	75.61	17.890	0.0341	3	98.450	82.237
755	0.0431	4	28.192	7.595	0.0416	4	24.29	19.579	0.0338	3	1.460	1.307
756	0.0203	2	17.852	0.205	0.0113	2	12.796	11.520	0.0229	2	11.750	10.819
757	0.0214	2	88.705	79.940	0.0233	2	20.43	16.686	0.0225	2	16.250	16.193
758	0.0210	2	55.334	32.746	0.0218	2	69.10	46.916	0.0225	2	141.550	101.470
759	0.0210	2	32.826	6.694	0.0221	2	59.11	50.035	0.0225	2	69.250	97.934
760	0.0210	2	17.758	2.817	0.0229	2	7.195	9.468	0.0229	2	11.950	4.172
761	0.0221	2	11.535	5.093	0.0225	2	15.515	2.524	0.0225	2	5.350	5.445
762	0.0203	2	18.990	4.928	0.0116	2	2.839	3.040	0.0225	2	0.325	0.460
763	0.0416	4	14.523	15.110	0.0330	3	15.35	12.271	0.0225	2	1.225	1.732
764	0.0218	2	4.427	2.047	0.0240	2	5.550	3.323	0.0236	2	20.050	11.526
765	0.0203	2	7.755	4.467	0.0113	2	4.385	0.685	0.0236	2	2.700	2.404
766	0.0214	2	3.184	1.156	0.0203	2	2.65	1.233	0.0233	2	9.125	9.016
767	0.0210	2	2.537	0.506	0.0218	2	3.09	1.673	0.0225	2	9.150	12.940

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

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: 1997-2005. Swept area in square miles. n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data, and 2002-2005 data are original from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels.

	2003				2004				2005			
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	0.0334	3	0.000	0.000	0.033750	3	0.000	0.000	0.0353	3	0.000	0.000
354	0.0338	3	0.000	0.000	0.034500	3	0.000	0.000	0.0353	3	0.000	0.000
355	0.0229	2	0.000	0.000	0.022875	2	0.000	0.000	0.0225	2	0.000	0.000
356	0.0225	2	0.115	0.163	0.022125	2	1.225	1.732	0.0233	2	0.260	0.368
357	0.0229	2	1.385	1.959	0.022875	2	0.027	0.037	0.0233	2	15.785	3.090
358	0.0338	3	0.000	0.000	0.033000	3	0.007	0.012	0.0349	3	0.000	0.000
359	0.0791	7	0.000	0.000	0.079125	7	0.479	1.267	0.0814	7	0.103	0.217
360	0.2254	20	0.000	0.000	0.231000	20	0.000	0.000	0.2325	20	0.000	0.000
374	0.0225	2	0.000	0.000	0.023250	2	0.000	0.000	0.0229	2	0.000	0.000
375	0.0330	3	0.000	0.000	0.033750	3	0.000	0.000	0.0349	3	0.000	0.000
376	0.1125	10	0.000	0.000	0.116625	10	0.000	0.000	0.1174	10	0.000	0.000
377	0.0225	2	0.000	0.000	0.021750	2	0.000	0.000	0.0233	2	0.000	0.000
378	0.0225	2	0.000	0.000	0.022500	2	0.000	0.000	0.0225	2	0.620	0.877
379	0.0229	2	0.124	0.175	0.012375	1	3.960	-	0.0236	2	26.975	17.006
380	0.0229	2	0.085	0.120	0.022125	2	278.650	209.516	0.0229	2	194.750	113.491
381	0.0229	2	0.000	0.000	0.022500	2	4.145	5.169	0.0233	2	17.450	11.384
382	0.0454	4	0.000	0.000	0.046125	4	0.080	0.160	0.0458	4	0.235	0.286
721	0.0225	2	0.000	0.000	0.022125	2	3.473	0.449	0.0229	2	1.173	1.609
722	0.0221	2	4.315	4.547	0.021750	2	4.530	2.676	0.0233	2	5.415	4.985
723	0.0229	2	8.370	3.253	0.022875	2	10.053	4.938	0.0233	2	21.528	23.869
724	0.0225	2	4.980	1.669	0.021375	2	10.746	0.701	0.0225	2	9.500	8.514
725	0.0229	2	0.377	0.532	0.022500	2	92.415	82.046	0.0236	2	104.420	135.072
726	0.0225	2	0.000	0.000	0.022500	2	59.865	19.608	0.0113	1	34.900	-
727	0.0218	2	21.900	24.607	0.023250	2	16.700	1.697	0.0229	2	18.650	12.657
728	0.0225	2	32.650	3.748	0.018000	2	15.650	9.687	0.0109	1	35.400	-
752	0.0229	2	77.900	100.268	0.021375	2	94.610	95.162	0.0236	2	21.590	3.677
753	0.0229	2	57.050	55.791	0.021750	2	63.835	45.912	0.0225	2	63.320	12.629
754	0.0218	2	65.600	40.729	0.021375	2	33.355	11.377	0.0225	2	13.957	14.981
755	0.0221	2	18.200	25.597	0.031875	3	14.658	21.304	0.0450	4	34.228	9.637
756	0.0221	2	7.160	9.051	0.021750	2	9.772	3.778	0.0233	2	23.675	12.693
757	0.0221	2	8.575	2.765	0.021750	2	12.890	8.330	0.0225	2	17.758	8.403
758	0.0221	2	41.050	58.053	0.021375	2	32.955	10.260	0.0225	2	34.043	1.042
759	0.0113	1	78.080	-	0.021375	2	39.980	4.921	0.0229	2	46.825	37.512
760	0.0218	2	40.650	3.465	0.022125	2	76.475	94.293	0.0229	2	57.790	20.492
761	0.0225	2	12.750	9.263	0.022125	2	25.610	28.055	0.0221	2	37.553	18.438
762	0.0225	2	14.650	3.861	0.023250	2	15.729	4.594	0.0225	2	11.938	8.432
763	0.0311	3	2.717	4.705	0.032625	3	28.000	21.696	0.0334	3	13.424	3.205
764	0.0221	2	19.420	19.771	0.022875	2	40.790	41.988	0.0233	2	1.161	1.642
765	0.0113	1	10.400	-	0.022500	2	5.347	2.710	0.0229	2	7.252	2.647
766	0.0225	2	5.690	6.548	0.022500	2	7.214	1.582	0.0229	2	6.355	4.794
767	0.0229	2	3.130	2.461	0.021750	2	3.667	0.401	0.0113	1	4.646	-

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

TABLE 3. Stratified mean catches (Kg) by stratum and year and SD by year of Roughhead grenadier (1997-2005). n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2005 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
353	0.00	0.00	0.00	0.61	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
355	0.00	0.00	0.00	6.11	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
357	16.54	0.00	35.46	77.62	27.88	172.20	227.14	4.35	2588.74
358	0.00	0.00	52.35	0.00	0.00	112.50	0.00	1.50	0.00
359	0.00	0.00	0.00	0.00	0.00	17.19	0.00	201.66	43.30
360	0.00	0.00	0.00	0.00	1085.37	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
375	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
377	0.00	0.00	0.00	0.00	0.00	27.30	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
379	0.00	1.20	2.53	54.14	45.58	28.09	13.14	419.76	2859.35
380	21.00	0.00	0.33	15.12	3.27	0.72	8.16	26750.40	18696.00
381	0.00	0.00	0.00	10.67	0.00	0.00	0.00	596.88	2512.80
382	0.00	0.00	0.00	1.46	0.00	0.80	0.00	27.44	80.61
721	0.00	49.25	158.81	52.79	14.30	81.25	0.00	225.71	76.21
722	2.15	331.80	324.65	400.45	207.06	918.12	362.46	380.48	454.86
723	0.00	39.59	366.82	443.22	264.28	108.50	1297.35	1558.14	3336.84
724	69.67	131.95	456.02	512.18	930.83	1240.00	617.52	1332.50	1178.00
725	0.00	8.04	390.44	1327.83	148.53	278.25	39.53	9703.58	10964.10
726	n.s.	159.36	525.28	1060.37	309.91	190.80	0.00	4310.28	2512.80
727	34.32	18.80	63.42	239.94	20.43	54.72	2102.40	1603.20	1790.40
728	65.14	71.71	1403.72	565.40	78.35	48.32	2546.70	1220.70	2761.20
752	1157.57	1070.59	1183.22	3492.80	790.67	255.45	10204.90	12393.91	2828.29
753	2142.81	4917.66	3924.96	6783.22	4356.11	745.20	7872.90	8809.23	8738.16
754	12634.78	10930.12	4747.16	12024.20	13610.16	17721.00	11808.00	6003.90	2512.26
755	n.s.	16203.89	9034.94	10853.88	9350.67	562.10	7007.00	5643.46	13177.59
756	328.45	696.44	2993.85	1803.02	1292.39	1186.75	723.16	986.92	2391.18
757	2129.06	4009.91	907.40	9047.90	2083.97	1657.50	874.65	1314.78	1811.32
758	4635.47	7626.33	4573.78	5478.08	6840.86	14013.45	4063.95	3262.55	3370.26
759	n.s.	8431.85	2856.38	4168.89	7507.47	8794.75	9916.16	5077.46	5946.78
760	603.06	1364.74	617.48	2734.73	1108.03	1840.30	6260.10	11777.15	8899.66
761	3282.93	4307.46	2837.19	1972.49	2653.07	914.85	2180.25	4379.31	6421.48
762	5147.01	6374.36	3678.97	4025.85	601.93	68.90	3105.80	3334.44	2530.75
763	n.s.	2824.01	2987.69	3790.53	4005.31	319.73	709.05	7307.91	3503.58
764	639.32	482.68	404.37	442.67	555.00	2005.00	1942.00	4079.00	116.10
765	1457.26	834.98	768.48	961.66	543.70	334.80	1289.60	662.97	899.19
766	1114.72	992.95	794.36	458.47	381.98	1314.00	819.36	1038.74	915.12
767	n.s.	1031.65	765.33	400.82	488.25	1445.70	494.54	579.31	734.07
TOTAL	35543.40	72931.33	46897.68	73231.81	59305.36	56459.28	76491.23	125045.18	114749.37
$\left(\overline{Y}\right)$	3.81	7.05	4.53	7.08	5.73	5.46	7.40	12.09	11.10
S.D.	0.31	0.61	0.45	0.85	0.77	1.51	1.42	2.17	1.38

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

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

TABLE 6. Roughhead grenadier length distribution. Estimated numbers per haul stratified mean catches. Spanish Spring Survey on NAFO 3NO: 1997-2005. Indet. means indeterminate. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2005 data are original R/V *Vizconde de Eza* data. In 2001, there are data from the two vessels. (*) indicates untransformed data.

.	1997				1998				1999			
Length (cm.)	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
2	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	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.006	0.000	0.000	0.000	0.000
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.061	0.009	0.070
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
6	0.000	0.000	0.000	0.000	0.005	0.013	0.007	0.024	0.105	0.171	0.003	0.280
7	0.000	0.055	0.000	0.055	0.061	0.025	0.002	0.087	0.213	0.296	0.000	0.509
8	0.087	0.070	0.000	0.156	0.201	0.152	0.000	0.353	0.191	0.253	0.000	0.444
9	0.006	0.054	0.000	0.060	0.238	0.208	0.000	0.446	0.301	0.331	0.000	0.631
10	0.055	0.097	0.000	0.152	0.725	0.612	0.000	1.337	0.702	0.754	0.000	1.456
11	0.095	0.211	0.000	0.305	0.537	0.691	0.000	1.227	1.232	1.447	0.000	2.679
12	0.141	0.208	0.000	0.349	0.399	0.471	0.000	0.870	1.156	1.582	0.000	2.738
13	0.236	0.332	0.000	0.568	0.522	0.484	0.000	1.006	0.643	0.889	0.000	1.532
14	0.639	0.529	0.000	1.168	0.899	0.678	0.000	1.576	0.498	0.569	0.000	1.067
15	0.699	0.836	0.000	1.536	1.242	1.013	0.000	2.255	0.728	0.565	0.000	1.293
16	0.471	0.554	0.000	1.025	1.159	1.006	0.000	2.165	0.698	0.663	0.000	1.361
17	0.251	0.374	0.000	0.625	0.920	0.943	0.000	1.862	0.480	0.561	0.000	1.041
18	0.244	0.319	0.000	0.563	0.455	0.707	0.000	1.162	0.245	0.318	0.000	0.563
19	0.263	0.288	0.000	0.551	0.380	0.429	0.000	0.808	0.151	0.181	0.000	0.332
20	0.235	0.280	0.000	0.514	0.235	0.303	0.000	0.538	0.067	0.131	0.000	0.198
21	0.159	0.198	0.000	0.358	0.118	0.359	0.000	0.476	0.022	0.116	0.000	0.138
22	0.042	0.212	0.000	0.254	0.035	0.237	0.000	0.272	0.008	0.079	0.000	0.087
23	0.022	0.165	0.000	0.187	0.025	0.223	0.000	0.248	0.002	0.071	0.000	0.074
24	0.000	0.116	0.000	0.116	0.002	0.203	0.000	0.204	0.001	0.074	0.000	0.075
25	0.002	0.082	0.000	0.084	0.001	0.187	0.000	0.188	0.001	0.058	0.000	0.059
26	0.000	0.046	0.000	0.046	0.003	0.076	0.000	0.079	0.002	0.045	0.000	0.047
27	0.000	0.014	0.000	0.014	0.009	0.071	0.000	0.080	0.000	0.038	0.000	0.038
28	0.000	0.033	0.000	0.033	0.000	0.066	0.000	0.066	0.000	0.033	0.000	0.033
29	0.008	0.022	0.000	0.030	0.007	0.051	0.000	0.057	0.002	0.033	0.000	0.035
30	0.000	0.014	0.000	0.014	0.001	0.054	0.000	0.054	0.000	0.013	0.000	0.013
31	0.000	0.012	0.000	0.012	0.000	0.044	0.000	0.044	0.000	0.014	0.000	0.014
32	0.000	0.011	0.000	0.011	0.000	0.023	0.000	0.023	0.000	0.010	0.000	0.010
33	0.000	0.008	0.000	0.008	0.000	0.016	0.000	0.016	0.000	0.013	0.000	0.013
34	0.000	0.000	0.000	0.000	0.000	0.015	0.000	0.015	0.000	0.004	0.000	0.004
35	0.000	0.001	0.000	0.001	0.000	0.010	0.000	0.010	0.000	0.003	0.000	0.003
36	0.000	0.005	0.000	0.005	0.000	0.007	0.000	0.007	0.000	0.001	0.000	0.001
37	0.000	0.003	0.000	0.003	0.000	0.003	0.000	0.003	0.000	0.001	0.000	0.001
38	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.001
39	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.002	0.000	0.000	0.000	0.000
40	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	3.654	5.191	0.000	8.845	8.176	9.385	0.039	17.600	7.712	9.565	0.033	17.309
Nº samples(*):				14				47				53
Nº Ind. (*):	416	609	2	1027	1647	2421	8	4076	2501	3512	7	6020
Sampled catch:				89				338				379
Range(*):				5.5-37				3.5-39.5				4-38
Total catch:				626				892				650
Total hauls(*):				128				124				114

TABLE 6 (cont.). Roughhead grenadier length distribution. Estimated numbers per haul stratified mean catches. Spanish Spring Survey on NAFO 3NO: 1997-2005. Indet. means indeterminate. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2005 data are original R/V *Vizconde de Eza* data. In 2001, there are data from the two vessels. (*) indicates untransformed data.

.	2000				2001				2002			
Length (cm.)	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
2	0.000	0.000	0.000	0.000	0.000	0.000	0.036	0.036	0.031	0.009	0.012	0.052
3	0.000	0.000	0.023	0.023	0.007	0.021	0.050	0.079	0.112	0.036	0.047	0.195
4	0.016	0.063	0.000	0.079	0.059	0.013	0.029	0.102	0.088	0.039	0.017	0.144
5	0.191	0.393	0.000	0.584	0.110	0.143	0.010	0.263	0.198	0.208	0.009	0.414
6	0.153	0.169	0.027	0.349	0.074	0.087	0.000	0.161	0.058	0.102	0.005	0.165
7	0.253	0.159	0.000	0.412	0.051	0.060	0.000	0.111	0.095	0.080	0.000	0.175
8	0.172	0.174	0.000	0.346	0.121	0.134	0.000	0.254	0.087	0.149	0.000	0.235
9	0.379	0.358	0.000	0.737	0.158	0.090	0.000	0.248	0.084	0.063	0.000	0.147
10	0.420	0.461	0.000	0.881	0.189	0.215	0.000	0.404	0.110	0.098	0.000	0.208
11	0.955	1.019	0.000	1.974	0.319	0.371	0.000	0.690	0.109	0.185	0.000	0.294
12	1.506	1.653	0.000	3.159	0.476	0.550	0.000	1.026	0.201	0.243	0.000	0.444
13	1.993	2.471	0.000	4.464	0.959	1.182	0.000	2.141	0.378	0.284	0.000	0.662
14	1.107	1.762	0.000	2.869	1.521	1.543	0.000	3.063	0.603	0.552	0.000	1.155
15	0.879	0.972	0.000	1.851	1.453	1.650	0.000	3.104	0.627	0.904	0.000	1.531
16	0.709	0.771	0.000	1.480	0.844	1.158	0.000	2.003	0.612	0.928	0.000	1.540
17	0.626	0.789	0.000	1.415	0.773	0.628	0.000	1.401	0.343	0.729	0.000	1.072
18	0.427	0.589	0.000	1.016	0.646	0.464	0.000	1.111	0.244	0.502	0.000	0.746
19	0.191	0.412	0.000	0.603	0.283	0.317	0.000	0.600	0.202	0.505	0.000	0.707
20	0.057	0.250	0.000	0.308	0.071	0.361	0.000	0.432	0.115	0.387	0.000	0.502
21	0.028	0.274	0.000	0.302	0.025	0.148	0.000	0.173	0.028	0.349	0.000	0.377
22	0.007	0.167	0.000	0.174	0.001	0.095	0.000	0.095	0.017	0.299	0.000	0.316
23	0.006	0.118	0.000	0.124	0.000	0.082	0.000	0.082	0.008	0.152	0.000	0.160
24	0.000	0.143	0.000	0.143	0.000	0.061	0.000	0.061	0.004	0.102	0.000	0.106
25	0.005	0.092	0.000	0.097	0.002	0.058	0.000	0.060	0.000	0.070	0.000	0.070
26	0.002	0.091	0.000	0.094	0.004	0.040	0.000	0.044	0.000	0.114	0.000	0.114
27	0.004	0.070	0.000	0.074	0.000	0.026	0.000	0.026	0.000	0.149	0.000	0.149
28	0.000	0.057	0.000	0.057	0.002	0.040	0.000	0.041	0.000	0.086	0.000	0.086
29	0.000	0.034	0.000	0.034	0.000	0.027	0.000	0.027	0.000	0.063	0.000	0.063
30	0.000	0.037	0.000	0.037	0.000	0.032	0.000	0.032	0.000	0.059	0.000	0.059
31	0.000	0.025	0.000	0.025	0.000	0.029	0.000	0.029	0.000	0.062	0.000	0.062
32	0.000	0.018	0.000	0.018	0.000	0.021	0.000	0.021	0.000	0.023	0.000	0.023
33	0.000	0.004	0.000	0.004	0.000	0.008	0.000	0.008	0.000	0.034	0.000	0.034
34	0.000	0.011	0.000	0.011	0.000	0.008	0.000	0.008	0.000	0.000	0.000	0.000
35	0.000	0.002	0.000	0.002	0.000	0.008	0.000	0.008	0.000	0.041	0.000	0.041
36	0.000	0.019	0.000	0.019	0.000	0.004	0.000	0.004	0.000	0.018	0.000	0.018
37	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.003	0.000	0.000	0.000	0.000
38	0.000	0.002	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
39	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	0.000	0.002	0.000	0.002	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000
Total	10.087	13.633	0.050	23.770	8.149	9.677	0.125	17.952	4.352	7.622	0.090	12.063
Nº samples(*):				57				22				48
Nº Ind. (*):	1957	2967	4	4928	149	208	10	367	604	1018	18	1640
Sampled catch:				318				107				754
Range(*):				3-40.5				2.5-29				2-36.5
Total catch:				1080				453				877
Total hauls(*):				118				123				125

TABLE 6 (cont.). Roughhead grenadier length distribution. Estimated numbers per haul stratified mean catches. Spanish Spring Survey on NAFO 3NO: 1997-2005. Indet. means indeterminate. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2005 data are original R/V *Vizconde de Eza* data. In 2001, there are data from the two vessels. (*) indicates untransformed data.

.	2003				2004				2005			
Length (cm.)	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
2	0.016	0.000	0.019	0.035	0.000	0.000	0.026	0.026	0.000	0.000	0.000	0.000
3	0.219	0.069	0.074	0.362	0.070	0.024	0.651	0.746	0.030	0.026	0.289	0.344
4	0.045	0.052	0.015	0.113	0.089	0.006	0.080	0.176	0.046	0.030	0.106	0.182
5	0.353	0.390	0.000	0.743	0.161	0.124	0.005	0.290	0.015	0.038	0.000	0.053
6	0.653	0.652	0.000	1.305	0.649	0.567	0.000	1.216	0.499	0.510	0.000	1.009
7	0.215	0.256	0.000	0.470	0.223	0.196	0.000	0.419	0.324	0.308	0.000	0.633
8	0.401	0.491	0.000	0.892	0.617	0.550	0.000	1.167	0.339	0.383	0.009	0.732
9	0.254	0.233	0.000	0.487	0.592	0.860	0.000	1.452	0.393	0.671	0.000	1.064
10	0.351	0.320	0.000	0.671	0.442	0.694	0.000	1.136	0.452	0.603	0.000	1.055
11	0.220	0.407	0.000	0.627	0.715	0.673	0.000	1.387	0.939	1.113	0.000	2.052
12	0.312	0.354	0.000	0.665	0.684	0.650	0.000	1.335	0.740	0.907	0.000	1.647
13	0.482	0.542	0.000	1.024	0.678	0.716	0.000	1.393	0.631	0.792	0.000	1.423
14	0.751	0.859	0.000	1.610	0.932	0.683	0.000	1.615	0.560	0.795	0.000	1.355
15	1.246	1.169	0.000	2.414	1.046	0.901	0.000	1.947	0.621	0.821	0.000	1.442
16	1.525	1.389	0.000	2.914	1.197	1.295	0.000	2.492	0.781	0.646	0.000	1.427
17	0.793	1.335	0.000	2.128	1.429	1.270	0.000	2.699	1.170	1.050	0.000	2.220
18	0.384	0.806	0.000	1.190	1.051	1.573	0.000	2.623	1.129	0.991	0.000	2.120
19	0.234	0.656	0.000	0.890	0.476	1.333	0.000	1.808	0.668	1.323	0.000	1.991
20	0.171	0.356	0.000	0.527	0.334	0.875	0.000	1.209	0.258	1.113	0.000	1.371
21	0.005	0.257	0.000	0.262	0.157	0.681	0.000	0.839	0.066	0.708	0.000	0.774
22	0.019	0.289	0.000	0.308	0.027	0.597	0.000	0.624	0.061	0.546	0.000	0.607
23	0.008	0.187	0.000	0.195	0.028	0.437	0.000	0.466	0.009	0.551	0.000	0.559
24	0.000	0.108	0.000	0.108	0.018	0.391	0.000	0.409	0.016	0.481	0.000	0.497
25	0.000	0.111	0.000	0.111	0.000	0.266	0.000	0.266	0.009	0.259	0.000	0.268
26	0.000	0.109	0.000	0.109	0.005	0.265	0.000	0.270	0.006	0.173	0.000	0.179
27	0.000	0.100	0.000	0.100	0.000	0.178	0.000	0.178	0.000	0.235	0.000	0.235
28	0.000	0.104	0.000	0.104	0.000	0.154	0.000	0.154	0.000	0.106	0.000	0.106
29	0.000	0.083	0.000	0.083	0.005	0.185	0.000	0.190	0.000	0.119	0.000	0.119
30	0.000	0.073	0.000	0.073	0.000	0.146	0.000	0.146	0.000	0.120	0.000	0.120
31	0.000	0.018	0.000	0.018	0.000	0.086	0.000	0.086	0.000	0.083	0.000	0.083
32	0.000	0.040	0.000	0.040	0.000	0.059	0.000	0.059	0.000	0.029	0.000	0.029
33	0.000	0.016	0.000	0.016	0.000	0.062	0.000	0.062	0.000	0.025	0.000	0.025
34	0.000	0.005	0.000	0.005	0.000	0.040	0.000	0.040	0.000	0.046	0.000	0.046
35	0.000	0.030	0.000	0.030	0.000	0.018	0.000	0.018	0.000	0.016	0.000	0.016
36	0.000	0.010	0.000	0.010	0.000	0.013	0.000	0.013	0.000	0.016	0.000	0.016
37	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	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	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.009	0.000	0.009	0.000	0.009
40	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	8.655	11.875	0.108	20.638	11.623	16.579	0.763	28.964	9.762	15.641	0.403	25.807
Nº samples(*):				43				59				61
Nº Ind. (*):	1089	1500	21	2610	1535	2270	157	3962	1250	2028	57	3335
Sampled catch:				931				1742				1499
Range(*):				2.5-36				2.5-39				3-39
Total catch:				990				2055				1781
Total hauls(*):				118				120				119

TABLE 7. Swept area, number of hauls and Thorny skate mean catch (kg) and SD (**) by stratum. Spanish Spring Surveys on NAFO Div. 3NO: 1997-2005. Swept area in square miles. n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data, and 2002-2005 data are original from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels.

	1997				1998				1999			
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	0.0480	4	6.21	1.73	0.0465	4	26.06	11.09	0.0360	3	319.35	89.29
354	0.0233	2	1.20	1.12	0.0356	3	68.23	87.97	0.0218	2	20.21	28.57
355	0.0233	2	27.19	22.38	0.0221	2	3.43	0.23	0.0229	2	12.40	17.54
356	0.0225	2	2.72	0.61	0.0221	2	0.69	0.42	0.0229	2	1.55	0.28
357	0.0443	4	1.32	1.56	0.0240	2	1.69	1.37	0.0236	2	2.98	1.74
358	0.0563	5	1.56	1.52	0.0236	3	0.99	1.17	0.0349	3	2.81	2.22
359	0.0690	6	7.47	2.92	0.0698	6	7.93	5.95	0.0364	3	13.25	14.73
360	0.3754	32	10.11	11.61	0.2561	25	17.95	23.86	0.2325	19	67.68	55.88
374	0.0353	3	2.29	1.19	0.0353	3	0.41	0.61	0.0244	2	5.91	0.14
375	0.0116	1	0.84	-	0.0345	3	1.97	1.81	0.0236	2	6.57	0.77
376	0.1583	14	15.16	16.62	0.0930	10	24.06	35.48	0.1219	10	75.94	45.71
377	0.0116	1	1.28	-	0.0229	2	0.32	0.31	0.0240	2	1.04	0.18
378	0.0210	2	2.07	0.59	0.0120	2	2.07	2.40	0.0229	2	8.32	5.01
379	0.0206	2	0.54	0.24	0.0356	3	1.69	1.09	0.0236	2	0.76	0.53
380	0.0210	2	1.27	0.37	0.0113	2	4.50	2.78	0.0236	2	3.96	1.95
381	0.0221	2	6.17	7.81	0.0229	2	7.65	0.24	0.0229	2	1.03	0.28
382	0.0461	4	0.64	0.95	0.0229	3	1.02	0.85	0.0484	4	4.44	3.05
721	0.0221	2	2.28	0.18	0.0203	2	8.17	9.33	0.0244	2	1.16	1.64
722	0.0214	2	7.54	10.66	0.0101	2	38.34	45.25	0.0229	2	10.79	15.26
723	0.0210	2	6.32	7.25	0.0233	2	2.62	0.40	0.0229	2	3.77	3.99
724	0.0225	2	2.06	2.45	0.0206	2	12.29	3.71	0.0225	2	9.83	6.80
725	0.0206	2	0.27	0.31	0.0086	1	3.89	-	0.0229	2	3.63	5.13
726	n.s.	n.s.	n.s.	n.s.	0.0094	2	0.26	0.37	0.0225	2	0.89	1.25
727	0.0094	1	3.37	-	0.0233	2	6.02	2.84	0.0236	2	2.83	0.63
728	0.0214	2	1.45	1.11	0.0206	2	4.68	2.68	0.0233	2	4.91	3.22
752	0.0218	2	4.25	2.51	0.0229	2	58.62	78.69	0.0233	2	2.24	1.11
753	0.0214	2	13.56	17.61	0.0218	2	4.01	5.19	0.0229	2	17.13	19.39
754	0.0330	3	45.32	25.00	0.0210	2	112.25	14.65	0.0206	2	16.66	23.56
755	n.s.	n.s.	n.s.	n.s.	0.0206	2	7.84	5.34	0.0311	3	0.00	0.00
756	0.0109	1	13.91	-	0.0225	2	63.66	36.74	0.0225	2	16.21	19.54
757	0.0304	3	32.68	39.04	0.0206	2	67.38	86.94	0.0233	2	10.74	10.98
758	0.0214	2	52.54	7.90	0.0105	2	235.97	239.70	0.0214	2	117.49	142.60
759	n.s.	n.s.	n.s.	n.s.	0.0214	2	114.12	147.96	0.0218	2	0.43	0.26
760	0.0105	1	0.00	-	0.0214	2	6.73	3.05	0.0225	2	9.20	11.14
761	0.0315	3	59.26	86.28	0.0206	2	17.62	10.16	0.0210	2	0.71	0.32
762	0.0308	3	50.77	82.75	0.0094	2	5.24	4.35	0.0210	2	8.28	10.49
763	n.s.	n.s.	n.s.	n.s.	0.0218	2	0.00	0.00	0.0311	3	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
765	0.0206	2	14.88	18.39	0.0098	2	12.08	15.52	0.0221	2	0.00	0.00
766	0.0308	3	15.23	9.42	0.0191	2	0.51	0.20	0.0218	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

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

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: 1997-2005. Swept area in square miles. n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data, and 2002-2005 data are original from R/V *Vizconde de Eza*. In 2001,there are data from the two vessels.

	2000				2001				2002			
Stratum	Swept area	Tow number	T. skate Mean catch	T. skate SD	Swept area	Tow number	T. skate Mean	T. skate SD	Swept area	Tow number	T. skate Mean catch	T. skate SD
353	0.0356	3	149.95	44.45	0.0341	3	351.90	283.060	0.0476	4	356.30	215.772
354	0.0356	3	82.44	34.12	0.0338	3	67.63	19.515	0.0356	3	89.80	80.809
355	0.0233	2	33.14	41.19	0.0240	2	20.60	11.031	0.0236	2	2.67	3.723
356	0.0225	2	2.21	0.51	0.0240	2	0.29	0.410	0.0233	2	1.55	2.192
357	0.0124	1	0.00	.	0.0244	2	2.35	1.669	0.0240	2	2.00	2.828
358	0.0341	3	15.49	17.71	0.0345	3	4.05	6.974	0.0345	3	11.47	19.861
359	0.0469	4	71.73	91.22	0.0803	7	15.45	24.999	0.0686	6	72.34	148.583
360	0.2396	20	132.15	142.67	0.2423	20	67.67	79.827	0.2865	25	20.63	24.987
374	0.0240	2	0.71	1.00	0.0240	2	0.73	1.032	0.0345	3	0.30	0.520
375	0.0244	2	3.48	0.40	0.0338	3	0.51	0.878	0.0353	3	1.40	2.425
376	0.1200	10	68.84	52.60	0.1155	10	22.67	19.650	0.1140	10	12.59	12.093
377	0.0229	2	0.57	0.81	0.0229	2	5.70	2.270	0.0229	2	1.17	1.655
378	0.0233	2	5.54	3.31	0.0236	2	0.16	0.099	0.0233	2	0.02	0.021
379	0.0225	2	1.10	0.51	0.0229	2	0.00	0.000	0.0229	2	5.45	1.909
380	0.0236	2	1.26	1.17	0.0206	2	1.35	0.209	0.0225	2	4.42	4.476
381	0.0236	2	3.94	0.36	0.0236	2	0.74	0.419	0.0229	2	0.71	0.071
382	0.0499	4	5.36	0.80	0.0469	4	1.77	1.265	0.0341	3	0.65	0.257
721	0.0236	2	6.54	6.27	0.0248	2	0.00	0.000	0.0233	2	0.00	0.000
722	0.0218	2	13.79	6.07	0.0233	2	10.10	5.374	0.0236	2	0.00	0.000
723	0.0248	2	4.05	4.37	0.0240	2	2.40	2.121	0.0233	2	0.60	0.849
724	0.0233	2	2.33	3.29	0.0353	3	67.38	91.221	0.0225	2	25.85	14.354
725	0.0210	2	4.11	5.03	0.0116	2	1.91	1.235	0.0225	2	1.82	2.574
726	0.0221	2	9.68	10.56	0.0116	2	1.32	1.381	0.0214	2	3.30	1.980
727	0.0210	2	0.58	0.60	0.0225	2	0.64	0.905	0.0233	2	3.05	4.313
728	0.0210	2	1.85	1.22	0.0229	2	1.65	1.531	0.0229	2	6.69	9.454
752	0.0206	2	1.20	1.30	0.0210	2	8.93	5.430	0.0116	1	0.49	0.686
753	0.0218	2	3.01	4.26	0.0214	2	13.11	15.123	0.0229	2	12.90	18.243
754	0.0195	2	54.96	23.46	0.0195	2	98.76	126.307	0.0341	3	595.65	819.042
755	0.0431	4	2.74	5.48	0.0416	4	0.14	0.283	0.0338	3	0.00	0.000
756	0.0203	2	3.69	3.64	0.0113	2	7.04	3.761	0.0229	2	9.36	7.835
757	0.0214	2	55.50	20.36	0.0233	2	15.10	19.889	0.0225	2	1.55	2.192
758	0.0210	2	55.87	79.01	0.0218	2	184.47	248.733	0.0225	2	32.45	41.224
759	0.0210	2	41.86	56.21	0.0221	2	4.93	3.950	0.0225	2	3.70	5.233
760	0.0210	2	12.97	11.59	0.0229	2	6.47	5.282	0.0229	2	1.89	2.673
761	0.0221	2	10.20	13.55	0.0225	2	66.60	89.661	0.0225	2	11.90	4.667
762	0.0203	2	5.54	7.83	0.0116	2	0.00	0.000	0.0225	2	0.00	0.000
763	0.0416	4	0.00	0.00	0.0330	3	0.00	0.000	0.0225	2	0.00	0.000
764	0.0218	2	0.00	0.00	0.0240	2	2.45	3.465	0.0236	2	0.00	0.000
765	0.0203	2	1.35	1.91	0.0113	2	1.03	1.462	0.0236	2	0.71	1.004
766	0.0214	2	0.00	0.00	0.0203	2	0.00	0.000	0.0233	2	0.00	0.000
767	0.0210	2	0.00	0.00	0.0218	2	0.00	0.000	0.0225	2	0.00	0.000

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

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: 1997-2005. Swept area in square miles. n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data, and 2002-2005 data are original from R/V *Vizconde de Eza*. In 2001,there are data from the two vessels.

	2003				2004				2005			
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	0.0334	3	78.36	33.796	0.033750	3	53.70	33.407	0.0353	3	40.97	40.382
354	0.0338	3	40.33	40.683	0.034500	3	147.46	134.348	0.0353	3	48.19	40.450
355	0.0229	2	19.53	22.422	0.022875	2	25.07	4.384	0.0225	2	17.80	2.628
356	0.0225	2	5.19	7.333	0.022125	2	16.31	7.732	0.0233	2	10.81	2.242
357	0.0229	2	2.25	3.182	0.022875	2	46.05	28.438	0.0233	2	51.88	55.763
358	0.0338	3	21.14	25.809	0.033000	3	42.24	13.838	0.0349	3	72.15	80.699
359	0.0791	7	25.86	23.965	0.079125	7	46.56	62.119	0.0814	7	45.11	63.415
360	0.2254	20	35.53	29.397	0.231000	20	93.53	78.305	0.2325	20	59.30	63.584
374	0.0225	2	0.00	0.000	0.023250	2	1.89	2.673	0.0229	2	2.70	1.082
375	0.0330	3	2.29	2.414	0.033750	3	10.32	5.359	0.0349	3	12.31	10.043
376	0.1125	10	10.77	12.802	0.116625	10	89.67	62.815	0.1174	10	154.50	136.423
377	0.0225	2	0.46	0.438	0.021750	2	7.23	9.648	0.0233	2	29.36	30.186
378	0.0225	2	2.98	4.076	0.022500	2	26.20	17.402	0.0225	2	6.10	7.264
379	0.0229	2	0.01	0.014	0.012375	1	13.61	-	0.0236	2	32.60	16.971
380	0.0229	2	4.09	0.559	0.022125	2	119.25	56.639	0.0229	2	66.74	45.199
381	0.0229	2	3.40	3.394	0.022500	2	70.60	17.536	0.0233	2	52.28	28.354
382	0.0454	4	0.00	0.000	0.046125	4	6.28	6.990	0.0458	4	5.06	4.563
721	0.0225	2	10.63	7.481	0.022125	2	2.70	3.818	0.0229	2	6.15	8.697
722	0.0221	2	0.91	0.021	0.021750	2	0.00	0.000	0.0233	2	6.90	9.758
723	0.0229	2	5.19	4.865	0.022875	2	4.85	1.913	0.0233	2	0.00	0.000
724	0.0225	2	26.32	0.226	0.021375	2	0.00	0.000	0.0225	2	4.20	5.940
725	0.0229	2	1.31	0.506	0.022500	2	44.22	57.679	0.0236	2	30.95	43.775
726	0.0225	2	0.00	0.000	0.022500	2	0.00	0.000	0.0113	1	0.00	-
727	0.0218	2	96.69	91.097	0.023250	2	10.16	10.380	0.0229	2	7.57	7.969
728	0.0225	2	17.23	8.301	0.018000	2	2.69	3.804	0.0109	1	0.00	-
752	0.0229	2	183.35	38.537	0.021375	2	0.00	0.000	0.0236	2	0.00	0.000
753	0.0229	2	7.99	1.775	0.021750	2	0.00	0.000	0.0225	2	0.00	0.000
754	0.0218	2	3.35	4.731	0.021375	2	0.00	0.000	0.0225	2	0.00	0.000
755	0.0221	2	0.00	0.000	0.031875	3	1.26	2.188	0.0450	4	0.00	0.000
756	0.0221	2	133.16	187.864	0.021750	2	0.00	0.000	0.0233	2	0.00	0.000
757	0.0221	2	6.99	9.885	0.021750	2	0.00	0.000	0.0225	2	0.00	0.000
758	0.0221	2	4.29	6.060	0.021375	2	0.00	0.000	0.0225	2	0.00	0.000
759	0.0113	1	3.89	#¡DIV/0!	0.021375	2	0.00	0.000	0.0229	2	0.00	0.000
760	0.0218	2	30.68	30.717	0.022125	2	0.00	0.000	0.0229	2	4.43	6.265
761	0.0225	2	0.00	0.000	0.022125	2	2.69	0.912	0.0221	2	0.00	0.000
762	0.0225	2	2.99	1.570	0.023250	2	1.15	1.619	0.0225	2	0.00	0.000
763	0.0311	3	0.00	0.000	0.032625	3	0.00	0.000	0.0334	3	0.00	0.000
764	0.0221	2	42.05	45.064	0.022875	2	4.35	6.152	0.0233	2	0.00	0.000
765	0.0113	1	2.23	-	0.022500	2	0.00	0.000	0.0229	2	0.00	0.000
766	0.0225	2	0.00	0.000	0.022500	2	0.67	0.940	0.0229	2	0.00	0.000
767	0.0229	2	1.13	0.215	0.021750	2	2.41	3.401	0.0113	1	0.00	-

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

TABLE 8. Stratified mean catches (Kg) by stratum and year and SD by year of Thorny skate (1997-2005). n.s. means stratum not surveyed. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2005 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
353	1669.97	7010.90	85905.05	40337.51	94661.10	95844.70	21079.74	14444.04	11021.83
354	295.14	16784.41	4970.54	20279.74	16637.80	22090.80	9922.00	36275.57	11854.08
355	2012.42	254.06	917.88	2452.15	1524.40	197.40	1444.85	1855.18	1317.05
356	127.82	32.39	72.76	104.05	13.63	72.85	243.70	766.45	507.84
357	216.74	276.48	488.38	0.00	385.40	328.00	369.00	7551.46	8508.73
358	351.96	223.34	632.19	3484.89	910.50	2580.00	4755.75	9504.23	16232.63
359	3142.88	3339.74	5577.75	30200.14	6505.05	30455.91	10885.26	19600.14	18990.11
360	28142.65	49941.51	188345.34	367770.68	188311.70	57415.52	98885.56	260307.63	165039.55
374	490.16	87.78	1264.01	151.68	156.22	64.20	0.00	404.46	576.73
375	226.76	533.56	1780.76	942.07	137.31	379.40	619.69	2796.27	3336.91
376	20225.18	32095.39	101299.43	91833.65	30244.45	16788.39	14361.84	119622.45	206104.33
377	127.98	31.99	103.98	56.97	569.50	117.05	46.00	723.25	2935.50
378	287.36	287.36	1156.26	769.70	22.24	2.09	413.87	3641.11	847.41
379	57.26	179.13	80.48	116.74	0.00	577.70	1.06	1442.66	3455.60
380	121.68	432.36	380.38	121.44	129.94	423.84	392.16	11448.00	6406.99
381	887.94	1102.17	148.85	567.92	106.50	102.24	489.60	10166.40	7528.46
382	220.75	350.60	1522.42	1838.77	607.79	224.32	0.00	2153.18	1734.72
721	148.37	531.10	75.19	425.20	0.00	0.00	690.95	175.50	399.75
722	633.11	3220.86	906.51	1158.73	848.40	0.00	76.02	0.00	579.60
723	979.42	406.26	584.98	627.32	372.00	93.00	804.45	752.22	0.00
724	254.82	1524.34	1219.17	288.39	8355.12	3205.40	3263.68	0.00	520.80
725	28.43	408.29	381.16	431.94	200.22	191.10	137.81	4642.58	3250.12
726	n.s.	18.61	63.79	697.27	95.29	237.60	0.00	0.00	0.00
727	323.68	577.66	271.70	56.11	61.43	292.80	9281.76	975.36	726.24
728	113.26	364.73	382.97	143.97	128.62	521.43	1343.94	209.82	0.00
752	556.95	7679.60	293.39	157.17	1170.32	63.54	24018.85	0.00	0.00
753	1871.36	553.60	2364.16	416.05	1808.52	1780.20	1101.93	0.00	0.00
754	8157.59	20204.97	2999.07	9892.06	17777.36	107217.00	602.10	0.00	0.00
755	n.s.	3017.84	0.00	1054.11	54.48	0.00	0.00	486.38	0.00
756	1404.41	6429.24	1636.83	372.60	711.08	945.36	13449.16	0.00	0.00
757	3333.76	6873.20	1095.75	5660.73	1540.20	158.10	712.98	0.00	0.00
758	5201.49	23360.86	11631.70	5530.78	18262.55	3212.55	424.22	0.00	0.00
759	n.s.	14493.27	54.38	5316.60	626.68	469.90	494.03	0.00	0.00
760	0.00	1036.58	1417.48	1997.36	995.61	291.06	4724.72	0.00	682.22
761	10133.38	3013.25	121.20	1744.82	11388.60	2034.90	0.00	459.14	0.00
762	10763.16	1111.32	1755.68	1173.93	0.00	0.00	633.88	242.74	0.00
763	n.s.	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
765	1844.78	1498.40	0.00	167.85	128.17	88.04	276.52	0.00	0.00
766	2192.53	73.89	0.00	0.00	0.00	0.00	0.00	95.76	0.00
767	n.s.	446.89	0.00	0.00	0.00	0.00	178.22	379.99	0.00
TOTAL	108029.16	211054.49	421901.59	598341.10	405693.16	348466.38	230329.79	511556.95	472557.21
$(\bar{Y})$	11.57	20.41	40.79	57.86	39.23	33.69	22.27	49.46	45.69
S.D.	1.74	3.26	4.32	9.12	6.99	10.91	2.57	5.82	7.00

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

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

TABLE 11. Thorny skate length distribution. Estimated numbers per haul stratified mean catches. Spanish Spring Survey on NAFO 3NO: 1997-2005. Indet. means indeterminate. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2005 data are original R/V *Vizconde de Eza* data. In 2001, there are data from the two vessels. (*) indicates untransformed data.

	1997				1998				1999			
Length (cm.)	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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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
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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.004	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	0.003	0.000	0.000	0.003	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	0.003	0.000	0.000	0.003	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	0.002	0.000	0.002	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
Nº samples (*):				33				33				88
Nº Ind. (*):	404	425	0	829	723	812	0	1535	2082	2200	4	4286
Sampled catch:				212				461				1526
Range (*):				12-87				13-131				13-93
Total catch:				1580				2696				3672
Total hauls (*):				128				124				114

TABLE 11 (cont.). Thorny skate length distribution. Estimated numbers per haul stratified mean catches. Spanish Spring Survey on NAFO 3NO: 1997-2005. Indet. means indeterminate. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2005 data are original R/V *Vizconde de Eza* data. In 2001, there are data from the two vessels. (*) indicates untransformed data.

	2000				2001				2002			
Length (cm.)	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
12	0.006	0.006	0.000	0.013	0.000	0.011	0.000	0.011	0.035	0.021	0.000	0.056
14	0.037	0.047	0.000	0.083	0.063	0.089	0.000	0.153	0.089	0.192	0.005	0.285
16	0.271	0.106	0.000	0.377	0.026	0.088	0.000	0.114	0.125	0.181	0.000	0.305
18	0.039	0.065	0.000	0.104	0.018	0.020	0.000	0.038	0.094	0.320	0.000	0.415
20	0.197	0.167	0.000	0.364	0.033	0.010	0.000	0.043	0.049	0.096	0.000	0.146
22	0.058	0.135	0.000	0.193	0.008	0.042	0.000	0.050	0.034	0.074	0.000	0.109
24	0.178	0.175	0.000	0.353	0.000	0.037	0.000	0.037	0.014	0.027	0.000	0.041
26	0.290	0.206	0.000	0.496	0.045	0.019	0.000	0.064	0.023	0.047	0.000	0.070
28	0.217	0.174	0.000	0.391	0.000	0.070	0.000	0.070	0.021	0.044	0.000	0.065
30	0.028	0.038	0.000	0.066	0.023	0.040	0.000	0.063	0.060	0.056	0.000	0.115
32	0.048	0.054	0.000	0.101	0.029	0.077	0.000	0.106	0.059	0.105	0.000	0.164
34	0.119	0.105	0.000	0.224	0.075	0.140	0.000	0.215	0.082	0.336	0.000	0.419
36	0.170	0.105	0.000	0.275	0.124	0.255	0.000	0.379	0.180	0.151	0.000	0.331
38	0.228	0.265	0.000	0.493	0.184	0.249	0.000	0.434	0.344	0.333	0.000	0.677
40	0.300	0.322	0.000	0.621	0.400	0.497	0.000	0.897	0.733	0.617	0.000	1.350
42	0.410	0.498	0.000	0.908	0.343	0.372	0.000	0.715	0.811	0.913	0.000	1.724
44	0.549	0.617	0.000	1.166	0.396	0.575	0.000	0.971	0.763	0.887	0.000	1.650
46	0.629	0.762	0.000	1.391	0.474	0.576	0.000	1.049	0.849	0.920	0.000	1.769
48	1.035	0.690	0.000	1.725	0.452	0.623	0.000	1.075	0.651	1.024	0.000	1.675
50	0.745	0.730	0.000	1.475	0.548	0.473	0.000	1.021	0.773	0.698	0.000	1.471
52	0.847	0.726	0.000	1.573	0.618	0.582	0.000	1.199	0.551	0.711	0.000	1.261
54	0.702	0.623	0.000	1.325	0.452	0.580	0.000	1.032	0.482	0.452	0.000	0.934
56	0.814	0.849	0.000	1.663	0.672	0.381	0.000	1.053	0.244	0.389	0.000	0.633
58	0.700	0.605	0.000	1.305	0.377	0.448	0.000	0.825	0.487	0.325	0.000	0.812
60	0.562	0.581	0.000	1.143	0.342	0.434	0.000	0.776	0.179	0.196	0.000	0.375
62	0.548	0.532	0.000	1.080	0.197	0.349	0.000	0.547	0.279	0.187	0.000	0.466
64	0.621	0.600	0.000	1.221	0.392	0.389	0.000	0.781	0.221	0.212	0.000	0.433
66	0.317	0.842	0.000	1.159	0.233	0.561	0.000	0.794	0.171	0.334	0.000	0.505
68	0.387	0.621	0.000	1.008	0.228	0.580	0.000	0.808	0.155	0.254	0.000	0.409
70	0.398	0.799	0.000	1.197	0.274	0.401	0.000	0.675	0.240	0.292	0.000	0.532
72	0.398	0.585	0.000	0.983	0.218	0.438	0.000	0.656	0.142	0.437	0.000	0.580
74	0.434	0.505	0.000	0.939	0.327	0.342	0.000	0.668	0.195	0.305	0.000	0.501
76	0.373	0.405	0.000	0.778	0.481	0.335	0.000	0.816	0.210	0.086	0.000	0.296
78	0.317	0.282	0.000	0.599	0.334	0.189	0.000	0.523	0.152	0.092	0.000	0.245
80	0.209	0.167	0.000	0.377	0.171	0.196	0.000	0.367	0.164	0.035	0.000	0.199
82	0.166	0.077	0.000	0.243	0.131	0.067	0.000	0.198	0.135	0.157	0.000	0.292
84	0.109	0.040	0.000	0.149	0.109	0.011	0.000	0.120	0.048	0.013	0.000	0.062
86	0.087	0.066	0.000	0.153	0.142	0.014	0.000	0.157	0.015	0.008	0.000	0.023
88	0.116	0.010	0.000	0.126	0.031	0.010	0.000	0.041	0.041	0.013	0.000	0.054
90	0.046	0.000	0.000	0.046	0.009	0.000	0.000	0.009	0.000	0.000	0.000	0.000
92	0.023	0.000	0.000	0.023	0.011	0.000	0.000	0.011	0.000	0.000	0.000	0.000
94	0.011	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
96	0.022	0.000	0.000	0.022	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
98	0.000	0.001	0.000	0.001	0.004	0.003	0.000	0.008	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	13.760	14.185	0.000	27.945	8.996	10.572	0.000	19.568	9.903	11.540	0.005	21.448
Nº samples (*):				83				66				78
Nº Ind. (*):	2397	2429	0	4826	629	632	0	1261	888	928	1	1817
Sampled catch:				2289				2777				2961
Range (*):				13-99				13-99				12-89
Total catch:				5076				3413				4271
Total hauls (*):				118				123				125

TABLE 11 (cont.). Thorny skate length distribution. Estimated numbers per haul stratified mean catches. Spanish Spring Survey on NAFO 3NO: 1997-2005. Indet. means indeterminate. 1997-2000 data are transformed C/V *Playa de Menduíña* data. 2002-2005 data are original R/V *Vizconde de Eza* data. In 2001, there are data from the two vessels. (*) indicates untransformed data.

	2003				2004				2005			
Length (cm.)	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
12	0.007	0.000	0.000	0.007	0.038	0.019	0.000	0.057	0.030	0.015	0.000	0.045
14	0.026	0.043	0.000	0.069	0.090	0.076	0.000	0.166	0.030	0.039	0.000	0.070
16	0.016	0.011	0.000	0.027	0.036	0.058	0.000	0.094	0.034	0.013	0.000	0.047
18	0.040	0.035	0.000	0.075	0.061	0.059	0.000	0.120	0.085	0.070	0.000	0.155
20	0.059	0.008	0.000	0.067	0.076	0.062	0.000	0.138	0.053	0.045	0.000	0.098
22	0.050	0.056	0.000	0.106	0.078	0.057	0.000	0.135	0.066	0.064	0.000	0.130
24	0.007	0.020	0.000	0.027	0.095	0.048	0.000	0.143	0.116	0.117	0.000	0.233
26	0.027	0.000	0.000	0.027	0.085	0.042	0.000	0.127	0.128	0.089	0.000	0.217
28	0.040	0.019	0.000	0.059	0.064	0.047	0.000	0.111	0.123	0.120	0.000	0.243
30	0.038	0.023	0.000	0.061	0.129	0.133	0.000	0.263	0.149	0.115	0.000	0.264
32	0.145	0.095	0.000	0.239	0.217	0.133	0.000	0.349	0.158	0.247	0.000	0.405
34	0.096	0.078	0.000	0.174	0.200	0.244	0.000	0.444	0.180	0.136	0.000	0.316
36	0.175	0.137	0.000	0.312	0.295	0.284	0.000	0.579	0.241	0.338	0.000	0.579
38	0.209	0.172	0.000	0.382	0.332	0.422	0.000	0.755	0.266	0.255	0.000	0.521
40	0.295	0.399	0.000	0.694	0.373	0.402	0.000	0.776	0.286	0.306	0.000	0.592
42	0.358	0.323	0.000	0.681	0.709	0.681	0.000	1.390	0.455	0.554	0.000	1.009
44	0.382	0.400	0.000	0.782	0.760	0.744	0.000	1.504	0.454	0.534	0.000	0.987
46	0.309	0.374	0.000	0.683	0.575	0.672	0.000	1.247	0.541	0.592	0.000	1.134
48	0.320	0.456	0.000	0.776	0.653	0.759	0.000	1.413	0.693	0.575	0.000	1.268
50	0.283	0.377	0.000	0.660	0.469	0.627	0.000	1.096	0.711	0.680	0.000	1.390
52	0.257	0.372	0.000	0.630	0.824	0.621	0.000	1.444	0.686	0.615	0.000	1.302
54	0.324	0.394	0.000	0.718	0.419	0.576	0.000	0.995	0.531	0.581	0.000	1.112
56	0.256	0.285	0.000	0.541	0.498	0.899	0.000	1.398	0.741	0.696	0.000	1.436
58	0.284	0.342	0.000	0.626	0.511	0.781	0.000	1.293	0.576	0.525	0.000	1.100
60	0.247	0.330	0.000	0.578	0.424	0.680	0.000	1.104	0.527	0.586	0.000	1.114
62	0.186	0.257	0.000	0.443	0.449	0.735	0.000	1.184	0.375	0.640	0.000	1.016
64	0.083	0.259	0.000	0.342	0.383	0.655	0.000	1.038	0.469	0.394	0.000	0.863
66	0.187	0.203	0.000	0.390	0.349	0.562	0.000	0.911	0.398	0.586	0.000	0.984
68	0.152	0.332	0.000	0.484	0.343	0.418	0.000	0.761	0.252	0.664	0.000	0.916
70	0.144	0.221	0.000	0.365	0.503	0.492	0.000	0.994	0.324	0.433	0.000	0.757
72	0.136	0.159	0.000	0.295	0.245	0.461	0.000	0.705	0.248	0.523	0.000	0.771
74	0.134	0.274	0.000	0.408	0.360	0.392	0.000	0.752	0.254	0.377	0.000	0.631
76	0.091	0.150	0.000	0.240	0.392	0.299	0.000	0.692	0.242	0.186	0.000	0.428
78	0.096	0.111	0.000	0.207	0.259	0.164	0.000	0.423	0.263	0.168	0.000	0.431
80	0.073	0.040	0.000	0.113	0.226	0.117	0.000	0.342	0.193	0.178	0.000	0.371
82	0.074	0.014	0.000	0.088	0.121	0.073	0.000	0.194	0.190	0.004	0.000	0.194
84	0.020	0.033	0.000	0.053	0.180	0.003	0.000	0.183	0.062	0.034	0.000	0.096
86	0.023	0.000	0.000	0.023	0.076	0.018	0.000	0.094	0.074	0.020	0.000	0.094
88	0.000	0.000	0.000	0.000	0.055	0.014	0.000	0.069	0.026	0.000	0.000	0.026
90	0.009	0.000	0.000	0.009	0.028	0.000	0.000	0.028	0.000	0.000	0.000	0.000
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	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.005	0.003	0.006	0.000	0.009
96	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.004
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
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	5.660	6.802	0.000	12.461	11.985	13.529	0.000	25.514	11.235	12.125	0.000	23.360
Nº samples (*):				88				83				78
Nº Ind. (*):	743	811	0	1554	1150	1290	0	2440	1012	1102	0	2114
Sampled catch:				2627				4666				4130
Range (*):				13-90				12-95				12-96
Total catch:				2656				4674				4249
Total hauls (*):				118				120				119

TABLE 12. Swept area, number of hauls and White hake mean catch (kg) and SD (**) by stratum. Spanish Spring Surveys on NAFO Div. 3NO: 2001-2005. 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

$$(**)\ SD = \frac{\sum (x_i - \bar{x})}{n-1}$$

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: 2001-2005. Swept area in square miles. n.s. means strata not surveyed.

	2004				2005			
Stratum	Swept area	Tow number	White hake Mean catch	White hake SD	Swept area	Tow number	White hake Mean catch	White hake SD
353	0.033750	3	0.00	0.000	0.0353	3	0	0.023
354	0.034500	3	23.15	32.074	0.0353	3	54.33	91.362
355	0.022875	2	14.95	15.203	0.0225	2	41.75	40.489
356	0.022125	2	4.15	5.869	0.0233	2	12.32	6.795
357	0.022875	2	0.90	1.273	0.0233	2	0.00	0.000
358	0.033000	3	12.02	20.597	0.0349	3	30.64	53.008
359	0.079125	7	0.00	0.000	0.0814	7	0.00	0.000
360	0.231000	20	0.07	0.172	0.2325	20	0.00	0.007
374	0.023250	2	0.00	0.000	0.0229	2	0.00	0.000
375	0.033750	3	0.00	0.000	0.0349	3	0.00	0.000
376	0.116625	10	0.00	0.000	0.1174	10	0.01	0.019
377	0.021750	2	0.00	0.000	0.0233	2	0.00	0.000
378	0.022500	2	0.00	0.000	0.0225	2	0.00	0.000
379	0.012375	1	0.00	-	0.0236	2	0.07	0.099
380	0.022125	2	0.04	0.049	0.0229	2	0.53	0.049
381	0.022500	2	0.00	0.000	0.0233	2	0.00	0.000
382	0.046125	4	0.00	0.000	0.0458	4	0.00	0.000
721	0.022125	2	3.50	0.544	0.0229	2	0.00	0.000
722	0.021750	2	1.29	1.824	0.0233	2	0.00	0.000
723	0.022875	2	1.05	1.485	0.0233	2	1.51	2.128
724	0.021375	2	0.00	0.000	0.0225	2	0.00	0.000
725	0.022500	2	0.00	0.000	0.0236	2	0.00	0.000
726	0.022500	2	0.00	0.000	0.0113	1	0.00	-
727	0.023250	2	0.00	0.000	0.0229	2	0.00	0.000
728	0.018000	2	0.06	0.078	0.0109	1	0.00	-
752	0.021375	2	0.00	0.000	0.0236	2	0.00	0.000
753	0.021750	2	0.73	1.025	0.0225	2	0.00	0.000
754	0.021375	2	0.00	0.000	0.0225	2	0.00	0.000
755	0.031875	3	0.00	0.000	0.0450	4	0.00	0.000
756	0.021750	2	0.00	0.000	0.0233	2	0.00	0.000
757	0.021750	2	0.00	0.000	0.0225	2	0.00	0.000
758	0.021375	2	0.00	0.000	0.0225	2	0.00	0.000
759	0.021375	2	0.00	0.000	0.0229	2	0.00	0.000
760	0.022125	2	0.00	0.000	0.0229	2	0.00	0.000
761	0.022125	2	0.00	0.000	0.0221	2	0.00	0.000
762	0.023250	2	0.00	0.000	0.0225	2	0.01	0.014
763	0.032625	3	0.00	0.000	0.0334	3	0.00	0.000
764	0.022875	2	0.00	0.000	0.0233	2	0.00	0.000
765	0.022500	2	0.00	0.000	0.0229	2	0.00	0.000
766	0.022500	2	0.00	0.000	0.0229	2	0.00	0.000
767	0.021750	2	0.00	0.000	0.0113	1	0.00	-

$$(**)\ SD = \frac{\sum (x_i - \overline{x})}{n-1}$$

TABLE 13. Stratified mean catches (Kg) by stratum and year and SD by year of White hake (2001-2005). n.s. means strata not surveyed.

Stratum	2001	2002	2003	2004	2005
353	279.76	13.45	0.00	0.00	3.59
354	18868.20	16.40	0.00	5694.08	13365.18
355	9764.30	11599.50	2311.76	1106.30	3089.50
356	1125.65	4037.30	696.78	195.05	578.81
357	287.00	0.00	369.00	147.60	0.00
358	97.50	37.50	90.00	2703.75	6894.98
359	6946.50	0.00	0.00	0.00	0.00
360	13.92	0.00	0.00	201.77	6.26
374	0.00	0.00	0.00	0.00	0.00
375	0.00	0.00	0.00	0.00	0.00
376	0.00	0.00	0.00	0.00	8.14
377	0.00	0.00	0.00	0.00	0.00
378	4.17	0.00	0.00	0.00	0.00
379	0.00	2.44	0.00	0.00	7.42
380	n.s.	0.00	0.00	3.36	50.40
381	n.s.	0.00	0.00	0.00	0.00
382	n.s.	0.00	0.00	0.00	0.00
721	708.50	3250.00	1539.85	227.18	0.00
722	1827.00	1528.38	2358.30	108.36	0.00
723	248.00	0.00	0.00	162.75	233.28
724	166.16	254.20	0.00	0.00	0.00
725	0.00	0.00	0.00	0.00	0.00
726	0.00	0.00	0.00	0.00	0.00
727	n.s.	0.00	0.00	0.00	0.00
728	n.s.	0.00	0.00	4.29	0.00
752	n.s.	0.00	0.00	0.00	0.00
753	n.s.	0.00	0.00	100.05	0.00
754	n.s.	0.00	0.00	0.00	0.00
755	n.s.	0.00	0.00	0.00	0.00
756	0.00	0.45	0.00	0.00	0.00
757	n.s.	0.00	0.00	0.00	0.00
758	n.s.	0.00	0.00	0.00	0.00
759	n.s.	0.00	0.00	0.00	0.00
760	0.00	0.00	0.00	0.00	0.00
761	0.00	0.00	0.00	0.00	0.00
762	0.00	0.00	0.00	0.00	2.12
763	n.s.	0.00	0.00	0.00	0.00
764	0.00	0.00	377.50	0.00	0.00
765	0.00	204.60	0.00	0.00	0.00
766	n.s.	0.00	0.00	0.00	0.00
767	n.s.	0.00	0.00	0.00	0.00
TOTAL	40336.66	20944.22	7743.19	10654.53	24239.66
$(\bar{Y})$	5.13	2.03	0.75	1.03	2.34
S.D.	1.87	0.43	0.24	0.52	1.44

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

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: 2002-2005. To calculate the parameters for the indeterminate individuals, we used the total data (males + females + indeterminate individuals).

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

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: 2001-2005. 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: 2001-2005. Indet. means indeterminate.

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

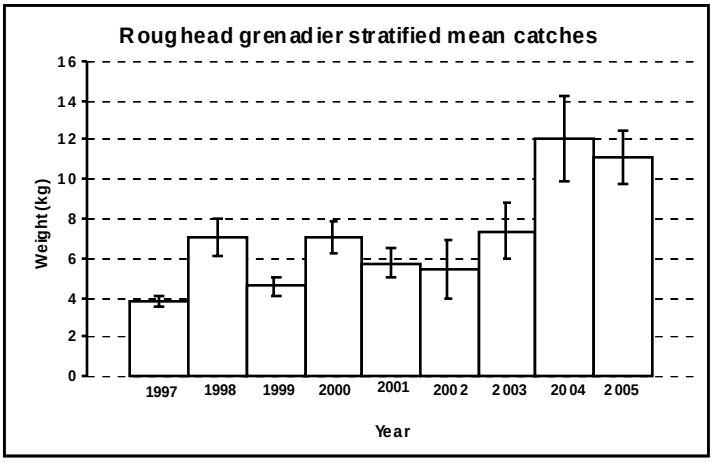

Fig. 1. Roughhead grenadier stratified mean catches in Kg and ±SD by year. Spanish Spring surveys on NAFO Div. 3NO: 1997-2005 (1997-2000 transformed data from C/V *Playa de Menduíña*; 2002-2005 original data from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels).

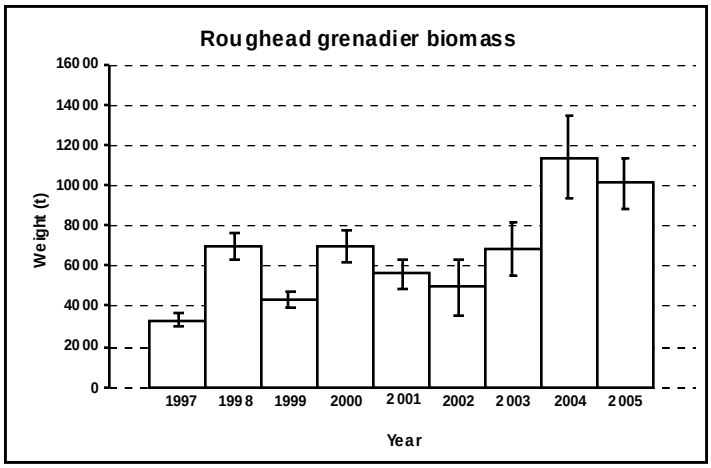

Fig. 2. Roughhead grenadier biomass in tons and ±SD by year. Spanish Spring surveys on NAFO Div. 3NO: 1997-2005 (1997-2000 transformed data from C/V *Playa de Menduíña*; 2002-2005 original data from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels).

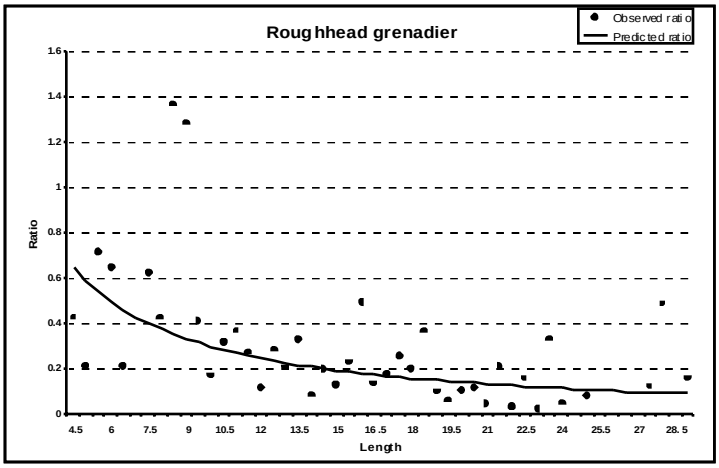

Fig. 3. Ratios of *Campelen* catch to *Pedreira* catch, by length group, of Roughead grenadier, from comparative fishing trials between the two gears on the C/V *Playa de Menduíña* and the R/V *Vizconde de Eza*. The dots are the observed ratios and the curve is the fitted line.

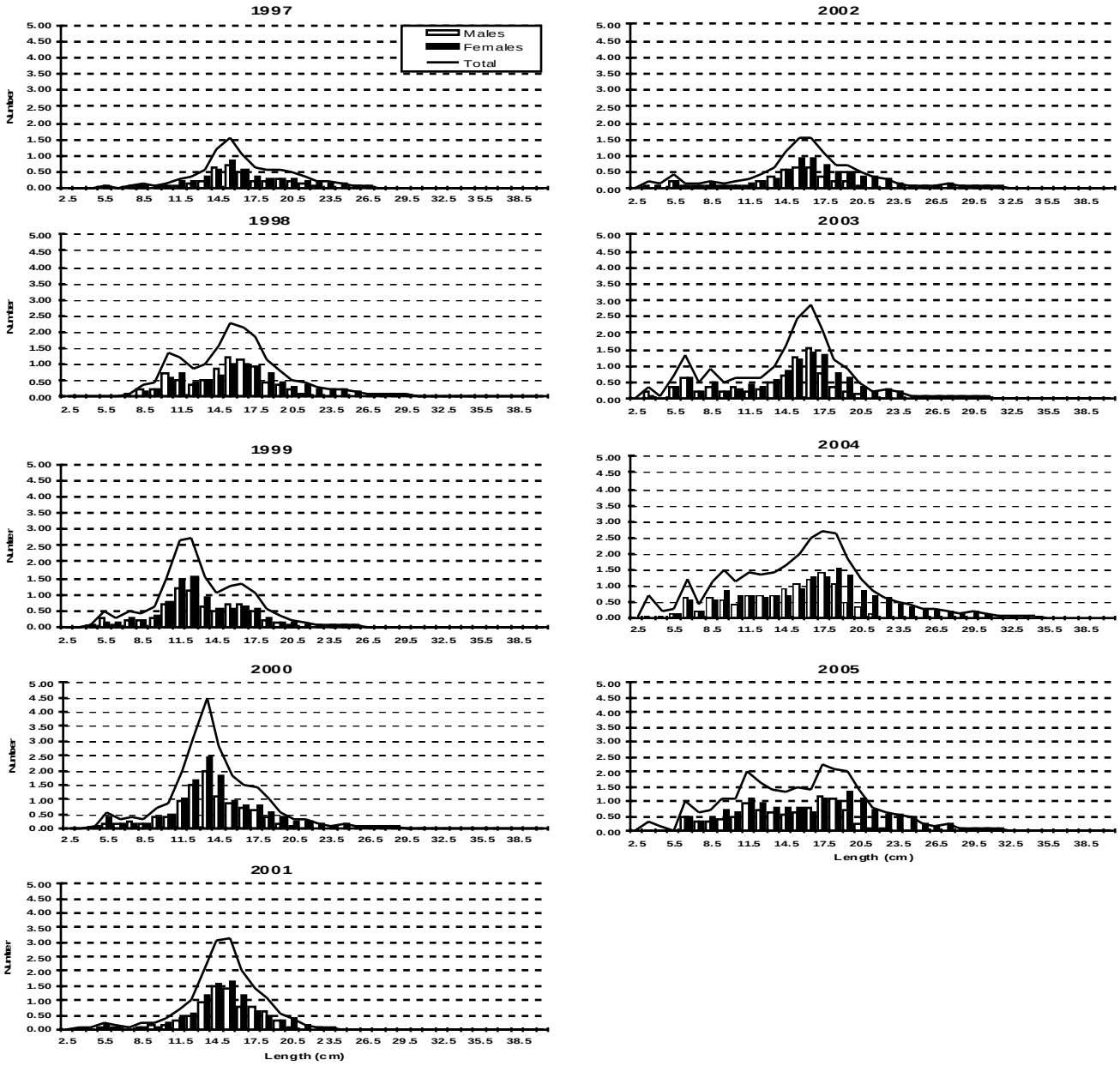

Fig. 4. Roughhead grenadier length distribution (cm) on NAFO 3NO: 1997-2005. Estimated numbers per haul stratified mean catches. 1997-2000 data are transformed data from C/V *Playa de Menduíña*, and 2002-2005 data are original from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels.

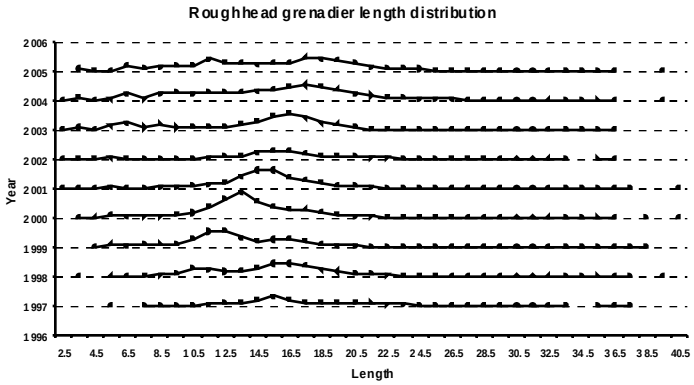

Fig. 5. Roughhead grenadier length distribution (cm) on NAFO 3NO: 1997-2005.

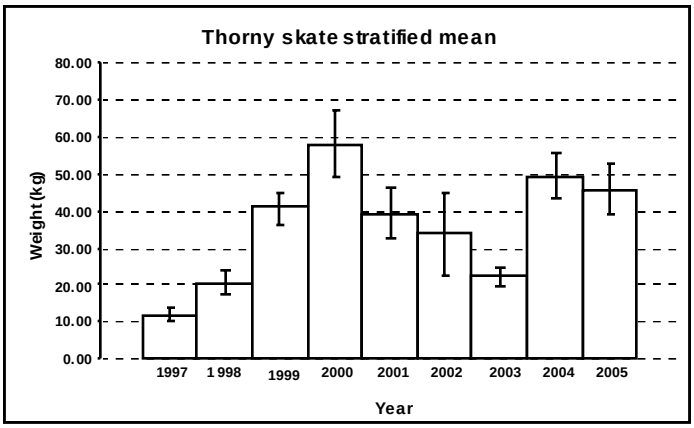

Fig. 6. Thorny skate stratified mean catches in Kg and ±SD by year. Spanish Spring surveys on NAFO Div. 3NO: 1997-2005 (1997-2000 transformed data from C/V *Playa de Menduíña*; 2002-2005 original data from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels).

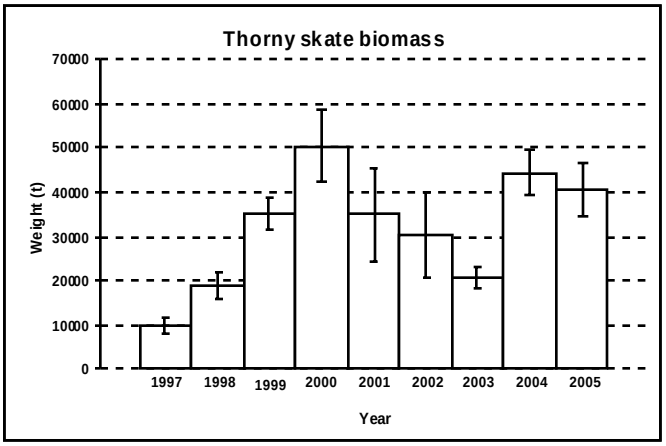

Fig. 7. Thorny skate biomass in tons and ±SD by year. Spanish Spring surveys on NAFO Div. 3NO: 1997-2005 (1997-2000 transformed data from C/V *Playa de Menduíña*; 2002-2005 original data from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels).

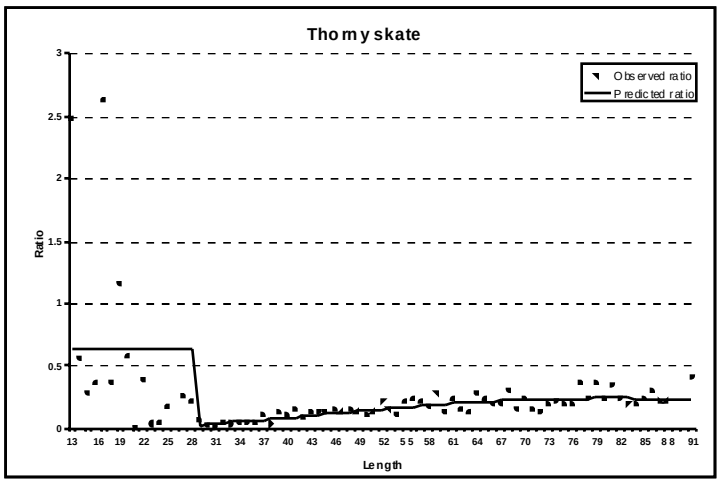

Fig. 8. Ratios of *Campelen* catch to *Pedreira* catch, by length group, of Thorny skate, from comparative fishing trials between the two gears on the C/V *Playa de Menduíña* and the R/V *Vizconde de Eza*. The dots are the observed ratios and the curve is the fitted line.

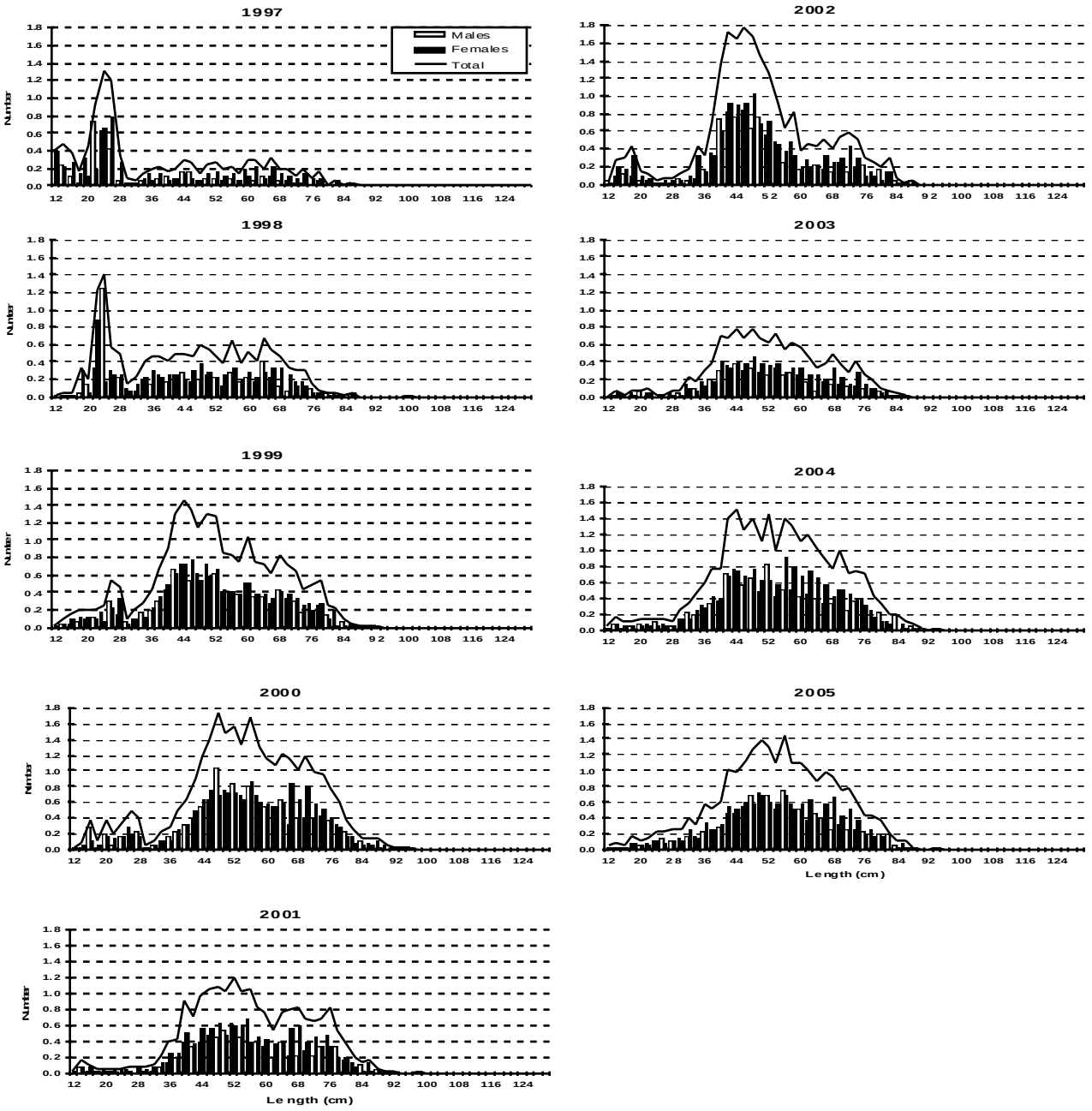

Fig. 9. Thorny skate length distribution (cm) on NAFO 3NO: 1997-2005. Estimated numbers per haul stratified mean catches. 1997-2000 data are transformed data from C/V *Playa de Menduíña*, and 2002-2005 data are original from R/V *Vizconde de Eza*. In 2001, there are data from the two vessels

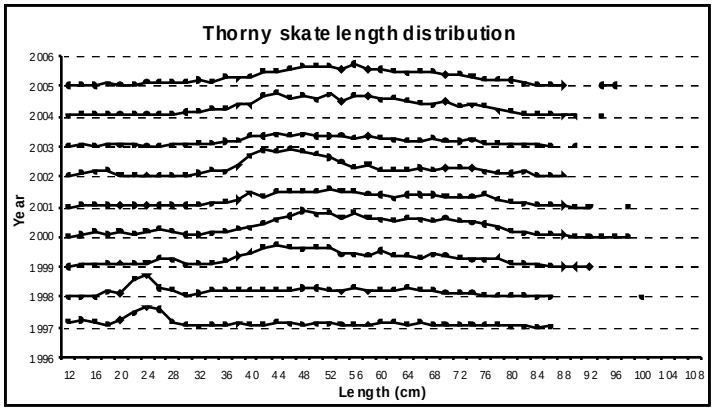

Fig. 10. Thorny skate length distribution (cm) on NAFO 3NO: 1997-2005.

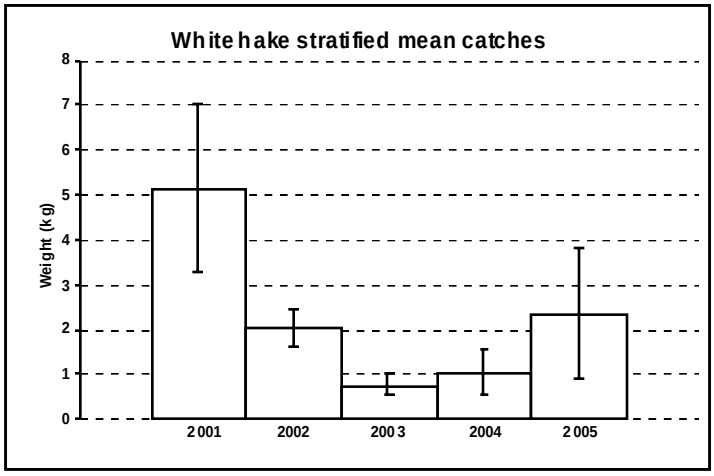

Fig. 11. White hake stratified mean catches in Kg and ±SD by year. Spanish Spring surveys on NAFO Div. 3NO: 2001-2005

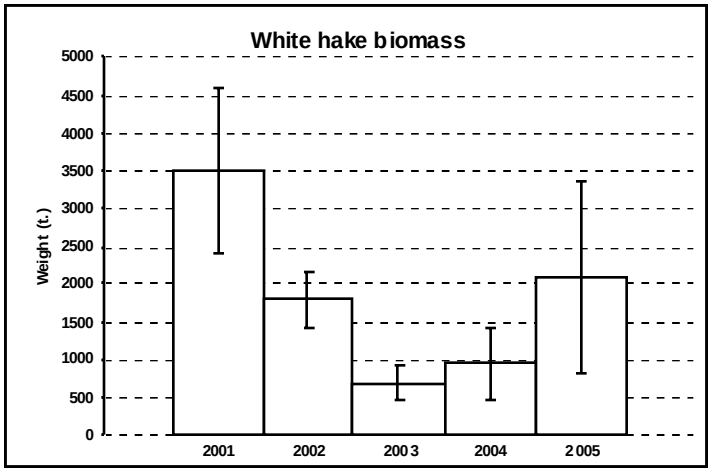

Fig. 12. White hake biomass in tons and ±SD by year. Spanish Spring surveys on NAFO Div. 3NO: 2001-2005

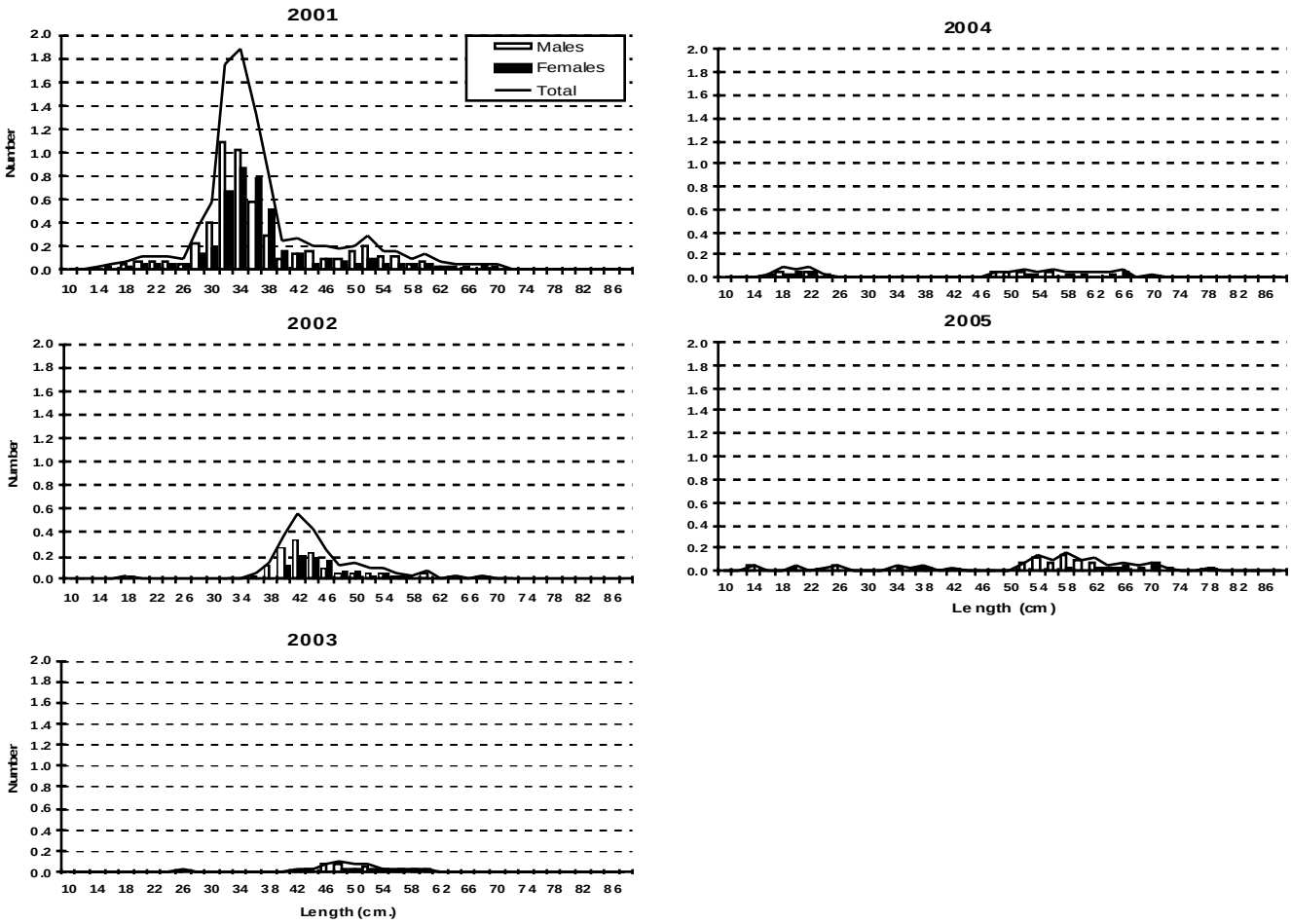

Fig. 13. White hake length distribution (cm) on NAFO 3NO: 2001-2005. Number per stratified mean catches.

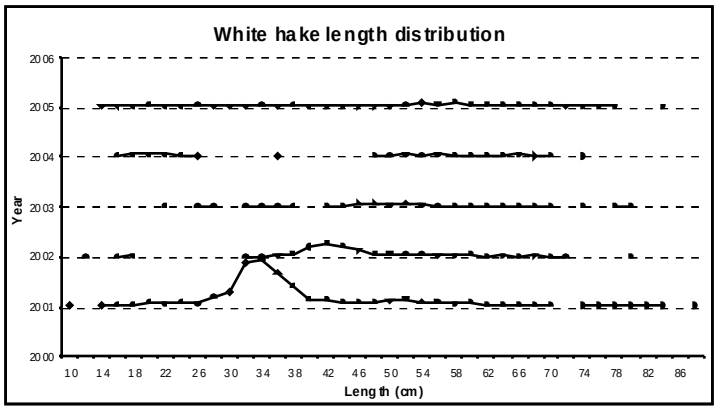

Fig. 14. White hake length distribution (cm) on NAFO 3NO: 2001-2005.