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Biomass and length distribution for roughhead grenadier, thorny skate and white hake from the surveys conducted by Spain in NAFO 3NO

by

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Abstract

Data for roughhead grenadier (*Macrourus berglax*), thorny skate (*Amblyraja radiata*) and white hake (*Urophycis tenuis*) from the Spanish Spring survey are presented. Abundance and biomass were estimated for roughhead grenadier and thorny skate for the period 1997-2016 and for white hake for the period 2001-2016. The length distribution is presented as numbers per haul stratified mean catches for the last five years (2012-2016). The roughhead grenadier indices showed no discernible trend during the whole series, reaching a maximum in 2004, and a minimum in 2016. Thorny skate indices follow a large oscillating trend, dropping in 2007 and being since then more or less stables at a low level, reaching the minimum of the series in 2014. White hake indices were highest in 2001 and then showed an overall decreasing trend until 2008 with low values. Indices increased since then until 2013, declined in 2014, and increased since then. Small recruitment events were detected in 2005, 2013 and 2016, with individuals between 16 - 26 cm.

Material and Methods

Spain has carried out a survey in Div. 3NO of the NAFO Regulatory Area, in late Spring, since 1995. To this purpose, the vessel C/V *Playa de Menduíña*, equipped with a bottom trawl net type *Pedreira* was used until 2001, when it was replaced by the R/V *Vizconde de Eza* with a bottom trawl net type *Campelen*. The technical specifications and geometry of these gears, their rigging profile and the net plan, and an abstract with the survey technical information are described in Walsh *et al.*, 2001. The number of valid tows, the depth strata covered and survey dates for the period 1997-2016 are shown in Table 1. The survey area was stratified following the standard stratification schemes (Bishop, 1994). The number of hauls was assigned to each stratum proportionally to their size on a random way, with a minimum of two planned hauls per stratum (Doubleday, 1981). The effect of reducing the number of hauls to improve the biological sampling in each haul was investigated via boostrap, concluding that 7 hauls from the larger strata could be removed with any hardly difference in the indices estimates or their variance. The total number of valid hauls in 2016 was 115. Biomass and abundance indices were calculated by swept area method (Cochran, 1997), assuming a catchability factor of 1. The swept area and number of hauls by stratum for the last five years (2012-2016) are presented in Table 2. To know the results of the rest of the years, see González-Troncoso *et al.* (2013).

The catch of each haul is sorted and weighted by species and a sample of each species is length measured. For roughhead grenadier, pre-anal length in 0.5 cm intervals to the inferior 0.5 cm is taken. Thorny skate and white hake are measured to the nearest lower cm of total length. This paper presents the 1997-2016 indices for roughhead grenadier and thorny skate. Years 1995 and 1996 are not representative as the deeper strata were not surveyed those years, thus they are excluded from the analysis. White hake data are only available since 2001.

The indices are presented for each species, transformed until 2000 and no-transformed for the period 2002-2016. Total biomass and stratified mean catches and numbers per year, with annual variance, are presented for the entire period. Indices by strata and length distribution are presented for 2012-2016. To see the results of the rest of the years, see González-Troncoso *et al.* (2013). For 2001, there are both transformed data from C/V *Playa de Menduiña* and original data from R/V *Vizconde de Eza*. White hake data did not need calibration (González Troncoso and Paz, 2005). Further information about the calculation of these indices is available in González Troncoso *et al.* (2005).

Figure 1 presents the maps with the distribution of the catches of the three species during the 2016 Spanish 3NO survey.

Results

Roughhead grenadier

There is no directed fishery for roughhead grenadier. Most of the catches are taken as by-catch 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, grenadier catches were systematically misreported as roundnose grenadier. There are no surveys indices available covering the total distribution, in depth and area, of this stock. According to other information this species is predominant at depths ranging from 800 to 1 500 m. An increase is shown since 1995 until 2004-2008 for all available indices. In the most recent period (2013-2015) the information from the surveys in the area of the different indices is contradictory (NAFO, 2016).

Mean Catches and Biomass

Mean catch and SD of roughhead grenadier by stratum are presented in Table 3 and biomass in Table 4 for the period 2012-2016. Total biomass and stratified mean catches and SD by year are presented in Table 5 for 1997-2016. The estimated parameters *a* and *b* values of length-weight relationship are presented in Table 6 for the last five years.

The roughhead grenadier biomass fluctuated with no clear trend, reaching the highest values in 2004-2006. Note that lowest values were found in 1997, 2014 and 2016 (Table 5; Figures 2 and 3). Same trend was found for mean catches.

Length Distribution

Table 7 and Figures 2 and 4 present the mean number for 1997-2016, and Table 8 the same index by length besides the sampled size and catch for the period 2012-2016. Results are presented in length intervals of 1 cm. The 1998 cohort is easily followed, but it has started to disappear over the past years. Recruitment seems to be good recently until 2015, although all the length classes were poor, specially the largest. In 2016, all length classes were very low and recruitment was poor (Figures 4 and 5). The mean number presents the same trend as the mean catch (Table 7 and Figure 2).

Thorny skate

Thorny skate catches comprise the most of the skates catches during the Spanish Spring survey and the Canadian surveys. This species has been managed with a TAC since 2004. Nominal catches increased in the mid-1980s with the beginning of a directed fishery, reaching a minimum during the period 1993-1995. Biomass was relatively stable from 1996 to 2004, but maintaining lower values than in the mid-1980s. Biomass of this stock has been increasing very slowly from low levels since the mid-1990s. Recruitment was above average during 2010-2013, but declined to below average in 2014-2015 (NAFO, 2016).

Mean Catches and Biomass

Mean catch and SD per stratum are presented in Table 9 for 2012-2016, and biomass by stratum in Table 10. Total annual biomass and stratified mean catches per tow by year, next to their SD, are presented in Table 11 for the entire period. The estimated parameters *a* and *b* values of length-weight relationship for 2012-2016 are presented in Table 12.

Thorny skate indices oscillated during the entire series. From maximum values in 2000 and 2006, biomass dropped in 2007 and has been since then more or less stables at a lower level, reaching the minimum of the series in 2014 (Table 11; Figures 6 and 7).

Length Distribution

Total mean number per tow by year for the period 1997-2016 is shown in Table 13 and Figure 8. Length distribution by sex and year, sample size and catch for the period 2012-2016 is presented in Table 14 and Figures 8 and 9. The recruitment modal value was in 1997 and the cohort can be roughly followed until 2016. A second modal value at small lengths starting in 1998 can be roughly followed throughout years, reaching a maximum in 2002. Recruitment was also quite good in 2002, but this cohort is not seen in following years. All length classes have been poorer than usual over the last years, but recruitment was quite good in 2010 when all the length classes had more or less the same level. Recruitment was poor over the last years. The mean number presents the same trend as the mean catch (Table 13 and Figure 6).

White hake

Catches of white hake in Div. 3NO peaked in 1987 and then declined until 1994, with non-Canadian landings dropping to 0 following by fishing restriction for foreign countries in 1992. Average catch reached a minimum in 1995-2001, increased in 2002 and 2003 and declined sharply in 2004-2007. Biomass of this stock increased in 1999 and 2000, generated by the large recruitment observed in those years. Subsequently, the biomass index decreased, and remains at very low levels. No large recruitments (<27 cm) have been observed since 2000 (NAFO, 2016).

Mean catches and biomass

Mean catch and SD per stratum are presented in Table 15 for years 2012-2016. Table 16 shows the biomass per stratum for the same period. Table 17 presents the total biomass and the stratified mean catch per tow by year, as well as the annual variance, for 2001-2016. Prior to 2001 there is no available data from the survey for this species. In Table 18 the length weight relationship parameters for the period 2012-2016 are shown.

Biomass index for white hake presented the highest value in 2001, dropping in 2002. Since then until 2008, it showed an overall decreasing trend with low values, generally increasing since then (Table 17; Figures 10 and 11).

Length distribution

Table 19 presents the mean number per tow by year for 2001-2016. The length distribution by sex and year, number of samples, sample size, sampled catch, length range, total catch and numbers of hauls can be seen in Table 20 for years 2012-2016. White hake was not sexed in 2011.

Individuals within the length range 30-38 cm were very abundant in 2001 and can be followed the next years, but by 2006 can hardly be seen. A small recruitment events were detected in 2005, 2013 and 2016, with individuals between 16 - 26 cm. All year classes have been poor in 2006-2011 and 2014-2015. In 2012, a slight increase in the lengths between 40-44 cm can be seen, corresponding to 48-52 cm in 2013. A slight increase for some length classes was also observed in 2016, with modes at 19 cm, 52 cm and 80 cm. The mean number presents the same trend as the mean catch (Figures 12 and 13).

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Table 1.- Spanish spring bottom trawl surveys in NAFO Div. 3NO: 1997-2016

Year	Vessel	Valid tows	Depth strata covered (m)	Dates
1997	C/V *Playa de Menduíña*	128	42-1263	April 26-May 18
1998	C/V *Playa de Menduíña*	124	42-1390	May 06-May 26
1999	C/V *Playa de Menduíña*	114	41-1381	May 07-May 26
2000	C/V *Playa de Menduíña*	118	42-1401	May 07-May 28
2001(*)	R/V *Vizconde de Eza*	83	36-1156	May 03-May 24
	C/V *Playa de Menduíña*	121	40-1500	May 05-May 23
2002	R/V *Vizconde de Eza*	125	38-1540	April 29-May 19
2003	R/V *Vizconde de Eza*	118	38-1666	May 11-June 02
2004	R/V *Vizconde de Eza*	120	43-1539	June 06–June 24
2005	R/V *Vizconde de Eza*	119	47-1485	June 10–June 29
2005	R/V *Vizconde de Eza*	119	47-1485	June 10–June 29
2006	R/V *Vizconde de Eza*	120	45-1480	June 7–June 27
2007	R/V *Vizconde de Eza*	110	45-1374	May 29–June 19
2008	R/V *Vizconde de Eza*	122	45-1374	May 27–June 16
2009	R/V *Vizconde de Eza*	109	45-1374	May 31–June 18
2010	R/V *Vizconde de Eza*	95	45-1374	May 30–June 18
2011	R/V *Vizconde de Eza*	122	44-1450	June 5–June 24
2012	R/V Vizconde de Eza	122	44-1450	June 3–June 21
2013	R/V Vizconde de Eza	122	44-1450	June 1–June 21
2014	R/V Vizconde de Eza	122	44-1450	June 2–June 21
2015	R/V Vizconde de Eza	122	44-1450	May 31-June 19
2016	R/V Vizconde de Eza	115	44-1450	May 30-June 18

(*) A total of 83 hauls from the R/V *Vizconde de Eza* and 40 hauls from the C/V *Playa de Menduíña* (123 hauls in total) were used for data analysis.

Table 2.- Swept area and number of hauls by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2012-2016. Swept area in square miles. n.s. means stratum not surveyed.

	2012		2013		2014		2015		2016	
Stratum	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number
353	0.0338	3	0.0349	3	0.0379	3	0.0401	3	0.0356	3
354	0.0338	3	0.0338	3	0.0394	3	0.0390	3	0.0345	3
355	0.0229	2	0.0225	2	0.0263	2	0.0263	2	0.0233	2
356	0.0225	2	0.0225	2	0.0266	2	0.0255	2	0.0225	2
357	0.0229	2	0.0236	2	0.0263	2	0.0233	2	0.0233	2
358	0.0330	3	0.0338	3	0.0390	3	0.0349	3	0.0338	3
359	0.0806	7	0.0829	7	0.0908	7	0.0855	7	0.0593	5
360	0.2344	20	0.2231	19	0.2629	20	0.2363	20	0.1995	17
374	0.0229	2	0.0233	2	0.0259	2	0.0229	2	0.0233	2
375	0.0349	3	0.0360	3	0.0390	3	0.0341	3	0.0360	3
376	0.1181	10	0.1305	11	0.1324	10	0.1159	10	0.0945	8
377	0.0229	2	0.0236	2	0.0259	2	0.0233	2	0.0233	2
378	0.0229	2	0.0225	2	0.0263	2	0.0225	2	0.0225	2
379	0.0225	2	0.0240	2	0.0255	2	0.0225	2	0.0229	2
380	0.0229	2	0.0229	2	0.0263	2	0.0229	2	0.0236	2
381	0.0221	2	0.0244	2	0.0259	2	0.0236	2	0.0229	2
382	0.0454	4	0.0484	4	0.0521	4	0.0458	4	0.0465	4
721	0.0233	2	0.0225	2	0.0266	2	0.0240	2	0.0225	2
722	0.0221	2	0.0221	2	0.0259	2	0.0259	2	0.0229	2
723	0.0225	2	0.0221	2	0.0259	2	0.0233	2	0.0225	2
724	0.0225	2	0.0225	2	0.0255	2	0.0236	2	0.0233	2
725	0.0225	2	0.0229	2	0.0255	2	0.0229	2	0.0229	2
726	0.0221	2	0.0221	2	0.0248	2	0.0229	2	0.0225	2
727	0.0233	2	0.0229	2	0.0259	2	0.0225	2	0.0225	2
728	0.0229	2	0.0233	2	0.0248	2	0.0225	2	0.0229	2
752	0.0229	2	0.0233	2	0.0240	2	0.0225	2	0.0236	2
753	0.0221	2	0.0236	2	0.0240	2	0.0233	2	0.0229	2
754	0.0221	2	0.0240	2	0.0225	2	0.0225	2	0.0225	2
755	0.0446	4	0.0454	4	0.0454	4	0.0450	4	0.0458	4
756	0.0221	2	0.0229	2	0.0229	2	0.0229	2	0.0225	2
757	0.0214	2	0.0240	2	0.0244	2	0.0229	2	0.0225	2
758	0.0221	2	0.0225	2	0.0221	2	0.0221	2	0.0221	2
759	0.0221	2	0.0225	2	0.0229	2	0.0229	2	0.0229	2
760	0.0225	2	0.0229	2	0.0364	3	0.0225	2	0.0229	2
761	0.0221	2	0.0225	2	0.0240	2	0.0240	2	0.0225	2
762	0.0225	2	0.0218	2	0.0229	2	0.0229	2	0.0225	2
763	0.0330	3	0.0341	3	0.0233	2	0.0341	3	0.0338	3
764	0.0225	2	0.0214	2	0.0259	2	0.0251	2	0.0225	2
765	0.0229	2	0.0221	2	0.0240	2	0.0236	2	0.0229	2
766	0.0225	2	0.0221	2	0.0221	2	0.0236	2	0.0229	2
767	0.0203	2	0.0218	2	0.0221	2	0.0229	2	0.0229	2

Table 3.- Roughhead grenadier mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2012-2016. n.s. means stratum not surveyed.

	2012		2013		2014		2015		2016	
Stratum	R. grenadier Mean catch	R. grenadier SD	R. grenadier Mean catch	R. grenadier SD	R. grenadier Mean catch	R. grenadier SD	R. grenadier Mean catch	R. grenadier SD	R. grenadier Mean catch	R. grenadier SD
353	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
354	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
355	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
356	0.00	0.00	0.00	0.00	0.00	0.00	2.10	2.96	0.00	0.00
357	8.39	3.24	2.33	1.65	0.00	0.00	0.00	0.00	0.15	0.21
358	1.47	2.54	0.91	1.57	0.00	0.00	2.35	4.07	0.17	0.30
359	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.33
360	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
374	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
375	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
376	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
377	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
378	2.40	3.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
379	8.22	3.51	13.66	12.96	2.95	2.21	22.58	9.07	0.21	0.30
380	8.30	6.04	9.39	3.60	7.71	6.99	36.10	31.54	6.57	3.59
381	2.47	3.49	5.40	7.64	0.00	0.00	0.00	0.00	0.00	0.00
382	0.27	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
721	2.02	0.86	0.29	0.41	0.00	0.00	0.00	0.00	0.14	0.14
722	8.63	10.28	7.76	8.49	0.64	0.03	0.51	0.71	4.42	6.25
723	10.45	9.96	5.19	0.26	2.59	1.61	7.93	2.71	2.84	0.21
724	5.35	1.69	10.39	0.90	1.82	1.34	6.54	1.71	5.10	5.80
725	13.53	5.63	5.60	0.83	3.94	1.11	9.30	6.60	2.49	3.13
726	30.81	13.02	27.51	3.17	12.28	6.63	25.39	10.25	17.60	0.70
727	8.15	2.49	22.39	18.26	3.34	1.48	18.25	1.63	14.56	0.08
728	10.39	9.21	16.31	11.29	24.52	1.29	11.77	5.89	9.09	8.36
752	11.15	1.34	4.83	4.11	22.82	27.66	13.77	12.40	20.91	14.29
753	76.91	98.85	30.85	42.46	9.80	8.68	45.20	56.99	15.80	12.45
754	42.59	9.25	59.78	42.87	20.96	26.26	76.89	79.08	16.52	3.71
755	52.28	26.15	24.14	18.70	18.79	11.03	16.99	4.27	27.80	19.78
756	57.00	8.77	20.34	12.95	61.06	55.36	21.23	11.51	21.56	28.30
757	156.42	48.62	28.18	33.58	6.82	8.95	37.72	6.48	21.56	23.38
758	25.56	2.90	19.34	3.10	25.57	25.70	34.28	23.08	15.21	0.70
759	16.33	7.16	40.76	5.78	7.58	3.16	26.20	15.70	4.98	2.12
760	2.31	3.27	5.92	0.94	8.66	4.98	12.34	0.58	1.44	0.45
761	6.67	3.75	4.76	6.34	15.56	13.73	24.92	31.85	19.13	18.88
762	29.68	21.80	12.39	4.62	24.15	17.96	24.98	12.90	6.29	3.19
763	5.94	6.08	17.93	13.97	6.23	1.59	10.69	8.97	6.15	2.51
764	1.37	1.93	4.89	1.58	1.86	2.62	4.19	5.92	0.45	0.36
765	2.48	2.59	3.83	4.79	0.00	0.00	1.20	1.59	0.28	0.13
766	1.25	0.92	2.08	1.15	0.71	0.98	0.74	0.12	0.89	1.24
767	0.72	0.02	2.05	1.27	1.31	1.25	0.66	0.93	0.75	0.14

Table 4.- Roughhead grenadier survey biomass (t) by stratum in NAFO Div. 3NO: 2012-2016. n.s. means stratum not surveyed.

Strata	2012	2013	2014	2015	2016
353	0	0	0	0	0
354	0	0	0	0	0
355	0	0	0	0	0
356	0	0	0	8	0
357	120	32	0	0	2
358	30	18	0	46	3
359	0	0	0	0	5
360	0	0	0	0	0
374	0	0	0	0	0
375	0	0	0	0	0
376	0	0	0	0	0
377	0	0	0	0	0
378	29	0	0	0	0
379	77	121	25	213	2
380	70	79	56	303	53
381	32	64	0	0	0
382	8	0	0	0	0
721	11	2	0	0	1
722	66	59	4	3	32
723	144	73	31	106	39
724	59	114	18	69	54

Strata	2012	2013	2014	2015	2016
725	126	51	32	85	23
726	200	179	71	160	113
727	67	188	25	150	124
728	71	109	155	82	62
752	128	54	249	160	232
753	959	360	113	537	191
754	693	897	335	1230	264
755	1804	819	638	581	936
756	520	180	539	187	194
757	1493	239	57	336	196
758	229	170	229	307	136
759	187	460	84	291	55
760	32	80	110	169	19
761	103	72	222	355	291
762	559	242	448	463	119
763	141	411	140	245	143
764	12	46	14	33	4
765	27	43	0	13	3
766	16	27	9	9	11
767	11	30	19	9	10

Table 5.- Roughhead grenadier survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by in NAFO Div. 3NO: 1997-2016.

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Biomass	3340	6922	4357	7000	5568	4968	6860	11402	10064	10010
SD	290	644	431	807	700	1365	1316	2043	1236	1716
MCPT	3.81	7.05	4.53	7.08	5.73	5.46	7.40	12.09	11.10	11.11
SD	0.31	0.61	0.45	0.85	0.77	1.51	1.42	2.17	1.38	1.89

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Biomass	5760	7521	8193	5850	6219	8027	5220	3622	6149	3318
SD	695	1028	286	1773	1508	1073	753	628	1134	496
MCPT	6.93	7.93	9.15	6.97	6.82	8.59	5.81	4.08	6.79	3.65
SD	0.83	1.11	0.40	2.10	1.61	1.18	0.85	0.70	1.25	0.54

Table 6.- Roughhead grenadier length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2012-2016. E(x) means Error of the parameter x.

	Males						Females						Total					
	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N
2012	**0.29835**	**2.55865**	0.1689	0.0654	0.988	551	**0.1725**	**2.7562**	0.0689	0.0242	0.998	1032	**0.3390**	**2.5323**	0.0919	0.0339	0.994	1614
2013	**0.11695**	**2.86549**	0.0803	0.0318	0.996	478	**0.1103**	**2.8903**	0.0447	0.0155	0.998	982	**0.1315**	**2.8331**	0.0474	0.0169	0.998	1580
2014	**0.16008**	**2.78188**	0.1341	0.0552	0.985	352	**0.1353**	**2.8351**	0.0600	0.0210	0.997	661	**0.1564**	**2.7873**	0.0401	0.0145	0.998	1038
2015	**0.18660**	**2.70917**	0.1092	0.0443	0.989	613	**0.1201**	**2.8665**	0.0095	0.0274	0.999	998	**0.1692**	**2.7542**	0.0583	0.0210	0.996	1652
2016	**0.13547**	**2.83036**	0.0728	0.0284	0.998	340	**0.1398**	**2.8252**	0.0545	0.0191	0.997	595	**0.1309**	**2.8465**	0.0590	0.0214	0.996	947

Table 7.- Roughhead grenadier mean number per tow by year in Spanish Spring Surveys in NAFO Div. 3NO: 1997-2016. Indet. means indeterminate.

	1997				1998				1999				2000				2001			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	3.654	5.191	0.000	8.845	8.176	9.385	0.039	17.600	7.712	9.565	0.033	17.309	10.087	13.633	0.050	23.770	8.149	9.677	0.125	17.952
	2002				2003				2004				2005				2006			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	4.352	7.622	0.090	12.063	8.655	11.875	0.108	20.638	11.623	16.579	0.763	28.964	9.762	15.641	0.403	25.807	8.775	13.935	0.152	22.862
	2007				2008				2009				2010				2011			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	5.432	8.365	0.744	14.541	5.260	8.890	0.073	14.223	5.072	11.265	0.372	16.709	4.238	7.705	0.367	12.310	3.923	6.787	0.174	10.884
	2012				2013				2014				2015				2016			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	5.115	10.678	0.304	16.097	3.481	6.879	0.780	11.139	2.169	4.139	0.266	6.574	5.672	8.919	0.246	14.837	3.420	5.185	0.283	8.888

Table 8.- Roughhead grenadier mean number per tow by length class and year. Spanish Spring Survey in NAFO 3NO: 2012-2016. Indet. means indeterminate.

	2012				2013				2014				2015				2016			
Lenght (cm.)	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
1.5	0.000	0.000	0.009	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.5	0.000	0.000	0.083	0.083	0.000	0.000	0.026	0.026	0.005	0.000	0.008	0.013	0.006	0.000	0.039	0.045	0.000	0.000	0.028	0.028
3.5	0.000	0.000	0.178	0.178	0.032	0.018	0.606	0.656	0.010	0.005	0.171	0.185	0.042	0.000	0.186	0.227	0.000	0.000	0.070	0.070
4.5	0.025	0.025	0.026	0.077	0.007	0.008	0.075	0.091	0.008	0.000	0.064	0.072	0.029	0.015	0.015	0.059	0.046	0.010	0.040	0.096
5.5	0.183	0.162	0.007	0.352	0.060	0.054	0.031	0.144	0.044	0.035	0.023	0.102	0.199	0.143	0.006	0.348	0.157	0.237	0.119	0.513
6.5	0.452	0.668	0.000	1.120	0.152	0.121	0.038	0.310	0.134	0.125	0.000	0.259	0.558	0.471	0.000	1.029	0.182	0.268	0.026	0.476
7.5	0.186	0.162	0.000	0.348	0.039	0.078	0.000	0.117	0.024	0.017	0.000	0.041	0.258	0.242	0.000	0.501	0.136	0.144	0.000	0.280
8.5	0.227	0.298	0.000	0.526	0.247	0.328	0.004	0.580	0.125	0.050	0.000	0.175	0.715	0.649	0.000	1.363	0.168	0.186	0.000	0.353
9.5	0.221	0.406	0.000	0.627	0.195	0.364	0.000	0.559	0.100	0.072	0.000	0.172	0.366	0.420	0.000	0.786	0.253	0.267	0.000	0.520
10.5	0.450	0.462	0.000	0.912	0.212	0.238	0.000	0.450	0.135	0.186	0.000	0.321	0.180	0.243	0.000	0.423	0.211	0.308	0.000	0.518
11.5	0.304	0.433	0.000	0.737	0.167	0.284	0.000	0.452	0.108	0.146	0.000	0.254	0.264	0.277	0.000	0.541	0.171	0.188	0.000	0.359
12.5	0.216	0.338	0.000	0.555	0.212	0.317	0.000	0.530	0.094	0.124	0.000	0.218	0.209	0.345	0.000	0.554	0.184	0.211	0.000	0.394
13.5	0.334	0.408	0.000	0.742	0.178	0.295	0.000	0.473	0.175	0.144	0.000	0.319	0.330	0.342	0.000	0.673	0.227	0.202	0.000	0.430
14.5	0.418	0.446	0.000	0.864	0.237	0.314	0.000	0.551	0.134	0.176	0.000	0.309	0.337	0.389	0.000	0.727	0.234	0.407	0.000	0.641
15.5	0.471	0.584	0.000	1.055	0.211	0.287	0.000	0.498	0.203	0.162	0.000	0.365	0.323	0.549	0.000	0.872	0.269	0.280	0.000	0.550
16.5	0.489	0.568	0.000	1.057	0.330	0.437	0.000	0.767	0.237	0.250	0.000	0.487	0.394	0.459	0.000	0.853	0.296	0.296	0.000	0.591
17.5	0.476	0.553	0.000	1.029	0.430	0.361	0.000	0.791	0.194	0.215	0.000	0.409	0.401	0.321	0.000	0.721	0.307	0.270	0.000	0.577
18.5	0.309	0.445	0.000	0.754	0.275	0.361	0.000	0.636	0.144	0.248	0.000	0.392	0.475	0.413	0.000	0.888	0.221	0.307	0.000	0.528
19.5	0.171	0.594	0.000	0.765	0.219	0.339	0.000	0.558	0.127	0.261	0.000	0.389	0.272	0.455	0.000	0.727	0.125	0.246	0.000	0.370
20.5	0.085	0.421	0.000	0.506	0.122	0.368	0.000	0.490	0.078	0.118	0.000	0.196	0.142	0.461	0.000	0.603	0.104	0.199	0.000	0.303
21.5	0.018	0.531	0.000	0.549	0.058	0.318	0.000	0.376	0.051	0.228	0.000	0.279	0.084	0.373	0.000	0.457	0.067	0.152	0.000	0.219
22.5	0.037	0.401	0.000	0.438	0.039	0.244	0.000	0.283	0.028	0.230	0.000	0.258	0.045	0.387	0.000	0.432	0.029	0.169	0.000	0.197
23.5	0.029	0.297	0.000	0.326	0.015	0.212	0.000	0.226	0.000	0.209	0.000	0.209	0.020	0.280	0.000	0.300	0.000	0.132	0.000	0.132
24.5	0.007	0.360	0.000	0.368	0.030	0.217	0.000	0.247	0.000	0.139	0.000	0.139	0.011	0.331	0.000	0.342	0.008	0.144	0.000	0.153
25.5	0.007	0.353	0.000	0.360	0.005	0.192	0.000	0.197	0.000	0.192	0.000	0.192	0.007	0.289	0.000	0.296	0.007	0.122	0.000	0.130
26.5	0.000	0.412	0.000	0.412	0.000	0.193	0.000	0.193	0.000	0.111	0.000	0.111	0.000	0.279	0.000	0.279	0.003	0.091	0.000	0.094
27.5	0.000	0.387	0.000	0.387	0.000	0.203	0.000	0.203	0.010	0.133	0.000	0.143	0.000	0.192	0.000	0.192	0.000	0.084	0.000	0.084
28.5	0.000	0.380	0.000	0.380	0.000	0.148	0.000	0.148	0.000	0.157	0.000	0.157	0.000	0.170	0.000	0.170	0.018	0.099	0.000	0.117
29.5	0.000	0.210	0.000	0.210	0.010	0.208	0.000	0.218	0.000	0.136	0.000	0.136	0.005	0.123	0.000	0.128	0.000	0.027	0.000	0.027
30.5	0.000	0.111	0.000	0.111	0.000	0.112	0.000	0.112	0.000	0.124	0.000	0.124	0.000	0.100	0.000	0.100	0.000	0.029	0.000	0.029
31.5	0.000	0.102	0.000	0.102	0.000	0.093	0.000	0.093	0.000	0.059	0.000	0.059	0.000	0.088	0.000	0.088	0.000	0.049	0.000	0.049
32.5	0.000	0.069	0.000	0.069	0.000	0.053	0.000	0.053	0.000	0.056	0.000	0.056	0.000	0.065	0.000	0.065	0.000	0.015	0.000	0.015
33.5	0.000	0.037	0.000	0.037	0.000	0.054	0.000	0.054	0.000	0.021	0.000	0.021	0.000	0.013	0.000	0.013	0.000	0.020	0.000	0.020
34.5	0.000	0.043	0.000	0.043	0.000	0.035	0.000	0.035	0.000	0.010	0.000	0.010	0.000	0.013	0.000	0.013	0.000	0.015	0.000	0.015
35.5	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.006	0.000	0.000	0.000	0.000
36.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.007	0.000	0.000	0.000	0.000
37.5	0.000	0.006	0.000	0.006	0.000	0.006	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.008	0.000	0.009	0.000	0.009
38.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
39.5	0.000	0.000	0.000	0.000	0.000	0.010	0.000	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
41.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
42.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	5.115	10.678	0.304	16.097	3.481	6.879	0.780	11.139	2.169	4.139	0.266	6.574	5.672	8.919	0.246	14.837	3.420	5.185	0.283	8.888
Nº samples:				57				58				50				52				56
Nº Ind.:	779	1572	49	2400	535	1051	131	1717	350	660	33	1043	877	1396	39	2312	520	809	45	1374
Sampled catch:				1281				883				627				1013				546
Range:				1.5-37.5				2.5-39				2.5-34.5				2-37.5				2.5-37
Total catch:				1341				885				630				1035				549
Total hauls:				122				122				122				122				115

Table 9.- Thorny skate mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2012-2016. n.s. means stratum not surveyed.

	2012		2013		2014		2015		2016	
	T. skate	T. skate	T. skate	T. skate	T. skate	T. skate	T. skate	T. skate	T. skate	T. skate
Stratum	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
353	16.21	9.68	25.00	16.04	28.18	19.78	27.06	20.81	42.29	33.24
354	50.23	56.37	58.00	38.97	8.08	4.52	58.48	10.58	42.51	59.76
355	11.00	3.82	5.84	8.26	3.17	4.48	11.08	9.59	7.48	10.57
356	44.78	63.33	49.23	35.62	59.53	16.23	45.80	14.07	63.42	43.01
357	4.07	1.00	5.06	1.22	21.65	30.62	8.44	2.02	3.24	4.57
358	6.68	5.90	28.31	44.81	7.28	1.94	52.73	46.99	84.03	119.39
359	22.32	14.07	30.80	21.34	4.47	5.48	39.66	70.22	4.32	5.94
360	57.72	46.64	40.01	34.95	8.65	13.65	22.33	17.22	20.75	33.22
374	0.00	0.00	17.11	17.68	0.48	0.67	2.27	3.20	0.00	0.00
375	18.17	20.62	26.36	4.11	0.00	0.00	18.67	12.68	1.20	2.08
376	93.55	39.65	36.09	29.69	24.07	19.78	27.49	21.65	8.35	11.59
377	15.78	3.49	8.85	4.99	0.00	0.00	9.61	13.59	1.65	2.33
378	19.84	15.67	9.87	3.75	7.12	10.07	64.57	59.57	10.95	6.75
379	6.60	2.55	1.98	2.80	5.60	2.56	2.60	3.68	7.73	2.01
380	30.57	31.27	18.07	20.54	18.17	0.22	4.89	6.92	2.79	0.66
381	7.62	5.73	9.16	12.95	25.04	12.22	22.89	7.65	2.72	0.42
382	0.10	0.20	8.70	7.54	1.05	2.09	35.55	25.27	0.66	1.30
721	17.40	24.61	53.58	32.88	15.80	22.34	0.00	0.00	14.01	6.35
722	5.60	7.92	5.21	1.96	6.15	8.70	4.37	6.18	5.70	0.02
723	12.27	10.39	8.13	6.70	0.00	0.00	0.00	0.00	0.00	0.00
724	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.95	5.59
725	0.00	0.00	1.90	2.51	2.15	1.48	0.00	0.00	4.94	6.99
726	0.00	0.00	3.34	4.72	0.00	0.00	2.30	3.25	2.23	3.15
727	5.62	3.37	2.73	3.80	11.60	10.32	27.40	10.42	384.77	221.70
728	12.05	6.54	11.35	5.58	4.30	6.08	9.32	13.18	18.61	0.88
752	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.89	1.22
753	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
754	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
755	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
756	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.90	13.15
757	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
758	0.00	0.00	0.00	0.00	0.00	0.00	2.39	3.38	0.00	0.00
759	3.03	4.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
760	0.00	0.00	0.00	0.00	2.30	3.98	2.09	2.96	0.00	0.00
761	4.80	6.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
762	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
763	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
764	6.80	9.62	4.80	6.79	0.00	0.00	7.74	10.94	8.30	11.74
765	0.92	1.30	0.00	0.00	0.00	0.00	3.65	5.16	0.00	0.00
766	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
767	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 10.- Thorny skate survey biomass (t) by stratum in NAFO Div. 3NO: 2012-2016. n.s. means stratum not surveyed.

Strata	2012	2013	2014	2015	2016	Strata	2012	2013	2014	2015	2016
353	388	578	600	544	958	**725**	0	17	18	0	45
354	1098	1268	151	1107	909	**726**	0	22	0	14	14
355	71	38	18	62	48	**727**	46	23	86	234	3283
356	187	206	210	169	265	**728**	82	76	27	65	127
357	58	70	271	119	46	**752**	0	0	0	0	54
358	137	566	126	1021	1681	**753**	0	0	0	0	0
359	816	1095	145	1367	153	**754**	0	0	0	0	0
360	13707	9483	1831	5262	4920	**755**	0	0	0	0	0
374	0	315	8	42	0	**756**	0	0	0	0	116
375	423	595	0	445	27	**757**	0	0	0	0	0
376	10564	4058	2425	3165	944	**758**	0	0	0	21	0
377	138	75	0	83	14	**759**	35	0	0	0	0
378	241	122	75	798	135	**760**	0	0	29	29	0
379	62	17	47	24	72	**761**	74	0	0	0	0
380	257	152	133	41	23	**762**	0	0	0	0	0
381	99	108	279	279	34	**763**	0	0	0	0	0
382	3	247	28	1066	19	**764**	60	45	0	62	74
721	97	310	77	0	81	**765**	10	0	0	38	0
722	43	40	40	28	42	**766**	0	0	0	0	0
723	169	114	0	0	0	**767**	0	0	0	0	0
724	0	0	0	0	42						

Table 11.- Thorny skate survey biomass (t) with SD and stratified mean catch per tow (kg) and SD in NAFO Div. 3NO: 1997-2016.

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Biomass	9779	18875	35004	50521	34948	30072	20508	44429	40473	47415
SD	1544	3114	3736	7991	10687	9699	2371	5281	6171	9207
MCPT	11.57	20.41	40.79	57.86	39.23	33.69	22.27	49.46	45.69	55.81
SD	1.74	3.26	4.32	9.12	6.99	10.91	2.57	5.82	7.00	11.22

Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Biomass	22223	25946	19959	17887	10365	28867	19640	6624	16085	14126
SD	2898	2641	2745	3539	1193	3010	2280	1008	1777	2894
MCPT	28.10	28.82	22.10	21.22	11.71	32.65	22.24	8.39	18.45	15.76
SD	3.57	2.92	3.13	4.11	1.32	3.38	2.63	1.26	2.02	3.21

Table 12.- Thorny skate length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2012-2016. E(x) means Error of the parameter x.

	Males						Females						Indet.					
	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N
2012	**0.00875**	**3.01113**	0.1202	0.0299	0.997	363	**0.00758**	**3.01571**	0.0967	0.0246	0.998	354	**0.09190**	**3.00833**	0.0919	0.0234	0.998	717
2013	**0.01045**	**2.96645**	0.0932	0.0231	0.996	357	**0.00735**	**3.05973**	0.1266	0.0315	0.994	359	**0.00979**	**2.98369**	0.0915	0.0229	0.996	716
2014	**0.01493**	**2.89738**	0.1439	0.0359	0.991	186	**0.01202**	**2.94873**	0.1055	0.0265	0.995	177	**0.01218**	**2.94525**	0.1019	0.0258	0.995	363
2015	**0.01529**	**2.89416**	0.0997	0.0247	0.996	339	**0.01072**	**2.98652**	0.1568	0.0395	0.989	322	**0.01090**	**2.97680**	0.0281	0.0258	0.994	661
2016	**0.01210**	**2.93868**	0.0676	0.0170	0.998	247	**0.00891**	**3.01588**	0.1109	0.0285	0.994	257	**0.01018**	**2.98135**	0.0630	0.0163	0.998	504

Table 13.- Thorny skate mean number per tow by year in Spanish Spring Surveys in NAFO Div. 3NO: 1997-2016. Indet. means indeterminate.

	1997				1998				1999				2000				2001			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	4.803	5.892	0.000	10.695	7.158	7.649	0.000	14.808	11.173	11.271	0.029	22.472	13.760	14.185	0.000	27.945	8.996	10.572	0.000	19.568

	2002				2003				2004				2005				2006			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	9.903	11.540	0.005	21.448	5.660	6.802	0.000	12.461	11.985	13.529	0.000	25.514	11.235	12.125	0.000	23.360	11.658	15.005	0.000	26.663

	2007				2008				2009				2010				2011			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	5.501	5.955	0.000	11.456	5.484	5.701	0.000	11.184	4.218	3.999	0.000	8.217	5.689	6.037	0.000	11.726	1.811	1.598	0.000	3.410

	2012				2013				2014				2015				2016			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	5.801	5.470	0.000	11.271	4.193	3.782	0.000	7.975	1.753	1.904	0.000	3.657	3.419	3.378	0.000	6.798	3.528	3.493	0.000	7.020

Table 14.- Thorny skate mean number per tow by length class and year. Spanish Spring Survey in NAFO 3NO: 2012-2016. Indet. means indeterminate.

	2012				2013				2014				2015				2016			
Lenght (cm.)	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
10	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
12	0.002	0.005	0.000	0.007	0.015	0.015	0.000	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.008
14	0.009	0.011	0.000	0.021	0.005	0.010	0.000	0.016	0.009	0.007	0.000	0.016	0.000	0.021	0.000	0.021	0.009	0.009	0.000	0.018
16	0.004	0.048	0.000	0.052	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.007	0.000	0.000	0.000	0.000	0.026	0.000	0.000	0.026
18	0.013	0.000	0.000	0.013	0.000	0.000	0.000	0.000	0.000	0.016	0.000	0.016	0.009	0.000	0.000	0.009	0.034	0.009	0.000	0.042
20	0.007	0.000	0.000	0.007	0.006	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.017	0.000	0.025
22	0.034	0.000	0.000	0.034	0.249	0.000	0.000	0.249	0.000	0.000	0.000	0.000	0.021	0.009	0.000	0.031	0.000	0.063	0.000	0.063
24	0.000	0.027	0.000	0.027	0.000	0.000	0.000	0.000	0.005	0.014	0.000	0.019	0.014	0.026	0.000	0.039	0.009	0.041	0.000	0.049
26	0.014	0.013	0.000	0.027	0.005	0.000	0.000	0.005	0.015	0.000	0.000	0.015	0.000	0.019	0.000	0.019	0.000	0.050	0.000	0.050
28	0.009	0.000	0.000	0.009	0.014	0.014	0.000	0.028	0.034	0.019	0.000	0.053	0.023	0.014	0.000	0.037	0.029	0.016	0.000	0.045
30	0.041	0.069	0.000	0.110	0.047	0.008	0.000	0.055	0.033	0.036	0.000	0.069	0.005	0.041	0.000	0.046	0.037	0.072	0.000	0.109
32	0.053	0.045	0.000	0.098	0.064	0.014	0.000	0.078	0.029	0.070	0.000	0.099	0.041	0.014	0.000	0.054	0.062	0.039	0.000	0.101
34	0.018	0.082	0.000	0.100	0.014	0.015	0.000	0.029	0.023	0.000	0.000	0.023	0.019	0.021	0.000	0.040	0.110	0.064	0.000	0.174
36	0.060	0.164	0.000	0.223	0.036	0.071	0.000	0.107	0.055	0.074	0.000	0.128	0.008	0.031	0.000	0.039	0.104	0.061	0.000	0.165
38	0.101	0.115	0.000	0.215	0.134	0.105	0.000	0.239	0.013	0.035	0.000	0.048	0.050	0.095	0.000	0.145	0.079	0.077	0.000	0.156
40	0.205	0.182	0.000	0.387	0.148	0.134	0.000	0.282	0.048	0.051	0.000	0.099	0.117	0.064	0.000	0.181	0.072	0.088	0.000	0.159
42	0.198	0.242	0.000	0.440	0.096	0.166	0.000	0.261	0.069	0.104	0.000	0.173	0.092	0.166	0.000	0.258	0.154	0.177	0.000	0.331
44	0.156	0.182	0.000	0.338	0.136	0.193	0.000	0.329	0.081	0.122	0.000	0.203	0.164	0.111	0.000	0.276	0.079	0.106	0.000	0.186
46	0.114	0.165	0.000	0.279	0.144	0.165	0.000	0.309	0.089	0.076	0.000	0.165	0.114	0.095	0.000	0.209	0.198	0.152	0.000	0.350
48	0.139	0.164	0.000	0.303	0.111	0.148	0.000	0.259	0.074	0.108	0.000	0.182	0.162	0.165	0.000	0.327	0.092	0.249	0.000	0.342
50	0.180	0.144	0.000	0.324	0.074	0.137	0.000	0.212	0.100	0.059	0.000	0.158	0.170	0.090	0.000	0.260	0.124	0.176	0.000	0.301
52	0.157	0.161	0.000	0.318	0.060	0.092	0.000	0.152	0.029	0.065	0.000	0.094	0.183	0.155	0.000	0.338	0.121	0.210	0.000	0.331
54	0.197	0.198	0.000	0.395	0.084	0.075	0.000	0.159	0.082	0.058	0.000	0.140	0.194	0.191	0.000	0.385	0.103	0.195	0.000	0.298
56	0.120	0.251	0.000	0.371	0.230	0.101	0.000	0.331	0.099	0.113	0.000	0.212	0.072	0.170	0.000	0.242	0.115	0.109	0.000	0.223
58	0.258	0.086	0.000	0.344	0.077	0.096	0.000	0.174	0.028	0.039	0.000	0.067	0.092	0.141	0.000	0.233	0.140	0.120	0.000	0.261
60	0.109	0.102	0.000	0.211	0.033	0.071	0.000	0.105	0.043	0.041	0.000	0.085	0.100	0.141	0.000	0.241	0.142	0.110	0.000	0.252
62	0.207	0.134	0.000	0.341	0.124	0.072	0.000	0.195	0.075	0.072	0.000	0.148	0.083	0.081	0.000	0.164	0.123	0.144	0.000	0.267
64	0.179	0.289	0.000	0.469	0.063	0.111	0.000	0.174	0.096	0.108	0.000	0.204	0.129	0.102	0.000	0.232	0.089	0.170	0.000	0.258
66	0.193	0.266	0.000	0.459	0.127	0.154	0.000	0.281	0.032	0.041	0.000	0.073	0.108	0.144	0.000	0.252	0.139	0.176	0.000	0.315
68	0.180	0.359	0.000	0.539	0.105	0.231	0.000	0.336	0.057	0.107	0.000	0.164	0.046	0.166	0.000	0.211	0.074	0.120	0.000	0.194
70	0.168	0.470	0.000	0.638	0.133	0.339	0.000	0.473	0.037	0.095	0.000	0.132	0.101	0.299	0.000	0.400	0.108	0.128	0.000	0.236
72	0.317	0.411	0.000	0.728	0.156	0.310	0.000	0.466	0.101	0.064	0.000	0.165	0.161	0.168	0.000	0.330	0.198	0.133	0.000	0.331
74	0.331	0.290	0.000	0.621	0.146	0.267	0.000	0.413	0.049	0.097	0.000	0.146	0.172	0.215	0.000	0.386	0.164	0.119	0.000	0.283
76	0.484	0.370	0.000	0.855	0.224	0.246	0.000	0.470	0.085	0.076	0.000	0.161	0.256	0.149	0.000	0.405	0.131	0.109	0.000	0.240
78	0.473	0.171	0.000	0.644	0.299	0.141	0.000	0.440	0.088	0.032	0.000	0.120	0.175	0.119	0.000	0.293	0.175	0.070	0.000	0.245
80	0.240	0.117	0.000	0.357	0.207	0.123	0.000	0.331	0.032	0.036	0.000	0.069	0.168	0.053	0.000	0.221	0.184	0.009	0.000	0.193
82	0.316	0.081	0.000	0.397	0.291	0.078	0.000	0.369	0.058	0.031	0.000	0.089	0.158	0.062	0.000	0.220	0.051	0.046	0.000	0.097
84	0.232	0.041	0.000	0.273	0.147	0.030	0.000	0.176	0.035	0.004	0.000	0.039	0.071	0.012	0.000	0.083	0.069	0.028	0.000	0.097
86	0.088	0.009	0.000	0.096	0.137	0.009	0.000	0.146	0.021	0.018	0.000	0.039	0.054	0.002	0.000	0.056	0.079	0.011	0.000	0.090
88	0.071	0.000	0.000	0.071	0.114	0.032	0.000	0.146	0.000	0.000	0.000	0.000	0.070	0.014	0.000	0.084	0.069	0.004	0.000	0.073
90	0.024	0.000	0.000	0.024	0.082	0.006	0.000	0.087	0.028	0.004	0.000	0.032	0.007	0.006	0.000	0.013	0.014	0.006	0.000	0.020
92	0.052	0.005	0.000	0.057	0.015	0.000	0.000	0.015	0.002	0.000	0.000	0.002	0.008	0.000	0.000	0.008	0.003	0.000	0.000	0.003
94	0.013	0.000	0.000	0.013	0.012	0.000	0.000	0.012	0.000	0.004	0.000	0.004	0.004	0.005	0.000	0.008	0.000	0.000	0.000	0.000
96	0.020	0.000	0.000	0.020	0.009	0.000	0.000	0.009	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	0.012	0.000	0.000	0.012	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.005	0.008	0.000	0.000	0.008
100	0.013	0.000	0.000	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
102	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
104	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
106	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.000	0.005
108	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
110	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
112	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
114	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
118	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
120	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
122	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
126	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
128	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	5.801	5.470	0.000	11.271	4.193	3.782	0.000	7.975	1.753	1.904	0.000	3.657	3.419	3.378	0.000	6.798	3.528	3.493	0.000	7.020
Nº samples:				74				79				55				74				58
Nº Ind.:	496	480	0	976	357	362	0	719	183	179	0	362	339	321	0	660	388	350	0	738
Sampled catch:				2912				2150				907				1907				1789
Range:				13-100				11-104				14-94				14-99				12-107
Total catch:				2940				2253				948				2075				2074
Total hauls:				122				122				122				122				115

Table 15.- White hake mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2012-2016. n.s. means stratum not surveyed.

	2012		2013		2014		2015		2016	
Stratum	White hake Mean catch	White hake SD	White hake Mean catch	White hake SD	White hake Mean catch	White hake SD	White hake Mean catch	White hake SD	White hake Mean catch	White hake SD
353	1.54	2.40	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
354	0.13	0.22	45.38	47.93	2.45	4.24	4.77	3.99	13.08	15.38
355	47.52	42.40	26.55	6.12	21.15	24.23	7.95	4.24	27.59	8.22
356	29.95	33.02	17.15	16.48	11.87	6.70	17.36	21.67	57.85	41.77
357	0.00	0.00	1.32	1.87	4.54	6.41	26.72	3.90	59.32	35.22
358	0.00	0.00	2.18	1.94	2.03	3.51	10.95	12.45	0.00	0.00
359	6.08	14.91	4.05	5.44	1.08	2.58	0.00	0.00	0.00	0.00
360	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
374	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
375	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
376	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
377	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
378	1.82	2.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
379	0.30	0.43	0.04	0.06	0.00	0.00	0.00	0.00	0.03	0.05
380	0.68	0.96	0.56	0.79	0.00	0.00	0.11	0.16	0.00	0.00
381	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
382	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
721	0.49	0.69	4.53	1.88	2.99	4.22	23.22	5.62	12.34	3.28
722	0.00	0.00	0.65	0.91	1.15	1.63	1.96	2.76	5.18	7.32
723	3.75	5.30	1.64	0.22	2.79	2.55	1.20	1.69	3.57	2.59
724	0.00	0.00	0.00	0.00	0.00	0.00	2.03	2.86	0.00	0.00
725	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.20	1.70
726	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
727	0.11	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
728	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
752	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
753	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
754	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
755	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
756	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
757	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
758	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
759	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
760	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
761	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
762	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
763	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
764	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
765	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
766	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
767	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 16.- White hake survey biomass (t) by stratum in NAFO Div. 3NO: 2012-2016. n.s. means stratum not surveyed.

Strata	2012	2013	2014	2015	2016
353	37	0	0	0	0
354	3	992	46	90	280
355	307	175	119	45	176
356	125	72	42	64	242
357	0	18	57	377	837
358	0	44	35	212	0
359	222	144	35	0	0
360	4	0	0	0	0
374	0	0	0	0	0
375	0	0	0	0	0
376	0	0	0	0	0
377	0	0	0	0	0
378	22	0	0	0	0
379	3	0	0	0	0
380	6	5	0	1	0
381	0	0	0	0	0
382	0	0	0	0	0
721	3	26	15	126	71
722	0	5	7	13	38
723	52	23	33	16	49
724	0	0	0	21	0

Strata	2012	2013	2014	2015	2016
725	0	0	0	0	11
726	0	0	0	0	0
727	1	0	0	0	0
728	0	0	0	0	0
752	0	0	0	0	0
753	0	0	0	0	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	0	0	0
765	0	0	0	0	0
766	0	0	0	0	0
767	0	0	0	0	0

Table 17.- White hake survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by in NAFO Div. 3NO: 2001-2016.

Year	2001	2002	2003	2004	2005	2006	2007	2008
Biomass	3498	1784	688	940	2082	1073	440	74
SD	1107	389	224	464	1270	407	94	46
MCPT	5.13	2.03	0.75	1.03	2.34	1.26	0.56	0.08
SD	1.87	0.43	0.24	0.52	1.44	0.48	0.12	0.05

Year	2009	2010	2011	2012	2013	2014	2015	2016
Biomass	610	293	822	784	1503	389	965	1704
SD	73	117	361	308	613	131	182	425
MCPT	0.61	0.34	0.91	0.86	1.64	0.49	1.12	1.90
SD	0.08	0.14	0.40	0.34	0.67	0.17	0.19	0.47

Table 18.- White hake length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2012-2016. E(x) means Error of the parameter x.

	Males						Females						Indet.					
	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N
2012	**0.00340**	**3.20604**	0.2635	0.0682	0.995	42	**0.00186**	**3.36229**	0.4467	0.1162	0.991	27	**0.00327**	**3.21907**	0.2547	0.0649	0.994	69
2013	**0.00336**	**3.19379**	0.1347	0.0358	0.995	100	**0.00157**	**3.38530**	0.1715	0.0438	0.992	110	**0.00237**	**3.28346**	0.1089	0.029	0.996	210
2014	**0.01681**	**2.79697**	0.7591	0.192	0.902	50	**0.00169**	**3.39285**	0.7146	0.1792	0.973	19	**0.01320**	**2.85934**	0.6838	0.1732	0.901	69
2015	**0.00395**	**3.16657**	0.170868	0.0440309	0.995	45	**0.00156**	**3.40183**	0.149995	0.0370665	0.996	43	**0.00209**	**3.33109**	0.117162	0.0295058	0.996	89
2016	**0.00279**	**0.15016**	3.2451	0.0398	0.997	89	**0.00409**	**0.22876**	3.1684	0.0552	0.995	72	**0.00252**	**0.11825**	3.2787	0.0300	0.998	161

Table 19.- White hake mean number per tow by year in Spanish Spring Surveys in NAFO Div. 3NO: 2001-2016. Indet. means indeterminate.

	2001				2002				2003				2004				2005				2006			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	5.462	4.544	0.015	10.022	1.511	1.091	0.000	2.602	0.387	0.295	0.000	0.682	0.480	0.447	0.000	0.927	0.953	0.579	0.000	1.532	0.512	0.172	0.000	0.684

	2007				2008				2009				2010				2011				2012			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	0.115	0.161	0.000	0.275	0.025	0.012	0.000	0.037	0.184	0.208	0.002	0.394	0.078	0.085	0.000	0.162	0.000	0.000	0.882	0.882	0.676	0.418	0.000	1.094

	2013				2014				2015				2016			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	0.877	0.891	0.000	1.768	0.272	0.117	0.000	0.389	0.239	0.252	0.017	0.508	0.624	0.474	0.000	1.098

Table 20.- White hake mean number per tow by length class and year. Spanish Spring Survey in NAFO 3NO: 2012-2016. Indet. means indeterminate.

	2012				2013				2014				2015				2016			
Lenght (cm.)	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	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	0.008	0.000	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14	0.000	0.000	0.000	0.000	0.016	0.000	0.000	0.016	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.003	0.000	0.000	0.000	0.000
16	0.000	0.000	0.000	0.000	0.016	0.008	0.000	0.023	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.008	0.018	0.000	0.000	0.018
18	0.000	0.000	0.000	0.000	0.047	0.000	0.000	0.047	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.018	0.018	0.000	0.036
20	0.017	0.026	0.000	0.044	0.059	0.019	0.000	0.078	0.000	0.000	0.000	0.000	0.003	0.000	0.000	0.003	0.027	0.018	0.000	0.045
22	0.009	0.000	0.000	0.009	0.070	0.047	0.000	0.117	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.007	0.040	0.000	0.000	0.040
24	0.026	0.000	0.000	0.026	0.064	0.094	0.000	0.158	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.005	0.008	0.000	0.000	0.008
26	0.000	0.017	0.000	0.017	0.031	0.036	0.000	0.067	0.000	0.000	0.000	0.000	0.000	0.000	0.005	0.005	0.003	0.000	0.000	0.003
28	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.018	0.000	0.000	0.018
30	0.000	0.005	0.000	0.005	0.012	0.012	0.000	0.025	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.003	0.009	0.000	0.000	0.009
32	0.011	0.000	0.000	0.011	0.008	0.000	0.000	0.008	0.004	0.000	0.000	0.004	0.000	0.000	0.000	0.000	0.050	0.000	0.000	0.050
34	0.012	0.018	0.000	0.030	0.016	0.000	0.000	0.016	0.016	0.000	0.000	0.016	0.003	0.000	0.000	0.003	0.014	0.000	0.000	0.014
36	0.044	0.032	0.000	0.076	0.016	0.016	0.000	0.031	0.008	0.000	0.000	0.008	0.006	0.012	0.000	0.019	0.000	0.000	0.000	0.000
38	0.083	0.041	0.000	0.124	0.042	0.019	0.000	0.061	0.000	0.000	0.000	0.000	0.013	0.006	0.000	0.019	0.020	0.000	0.000	0.020
40	0.088	0.054	0.000	0.142	0.013	0.016	0.000	0.028	0.012	0.016	0.000	0.028	0.012	0.005	0.000	0.017	0.016	0.000	0.000	0.016
42	0.098	0.068	0.000	0.166	0.048	0.042	0.000	0.090	0.008	0.016	0.000	0.024	0.000	0.000	0.000	0.000	0.019	0.003	0.000	0.023
44	0.082	0.054	0.000	0.136	0.077	0.024	0.000	0.101	0.013	0.002	0.000	0.016	0.007	0.014	0.000	0.022	0.039	0.003	0.000	0.042
46	0.021	0.018	0.000	0.039	0.051	0.045	0.000	0.096	0.010	0.014	0.000	0.024	0.008	0.008	0.000	0.016	0.020	0.017	0.000	0.037
48	0.054	0.021	0.000	0.075	0.041	0.040	0.000	0.082	0.026	0.012	0.000	0.038	0.006	0.017	0.000	0.024	0.012	0.015	0.000	0.027
50	0.018	0.009	0.000	0.028	0.058	0.072	0.000	0.130	0.036	0.000	0.000	0.036	0.010	0.003	0.000	0.014	0.026	0.014	0.000	0.040
52	0.014	0.004	0.000	0.017	0.065	0.059	0.000	0.124	0.016	0.000	0.000	0.016	0.005	0.010	0.000	0.015	0.038	0.035	0.000	0.073
54	0.008	0.007	0.000	0.015	0.020	0.077	0.000	0.097	0.016	0.006	0.000	0.022	0.015	0.000	0.000	0.015	0.040	0.016	0.000	0.056
56	0.009	0.015	0.000	0.025	0.021	0.042	0.000	0.062	0.025	0.007	0.000	0.033	0.014	0.002	0.000	0.016	0.037	0.030	0.000	0.067
58	0.013	0.002	0.000	0.015	0.023	0.038	0.000	0.061	0.018	0.003	0.000	0.021	0.013	0.000	0.000	0.013	0.024	0.020	0.000	0.044
60	0.009	0.004	0.000	0.013	0.020	0.027	0.000	0.047	0.028	0.002	0.000	0.031	0.060	0.007	0.000	0.067	0.044	0.012	0.000	0.056
62	0.013	0.002	0.000	0.015	0.010	0.016	0.000	0.026	0.000	0.000	0.000	0.000	0.021	0.022	0.000	0.043	0.028	0.033	0.000	0.061
64	0.010	0.006	0.000	0.016	0.000	0.027	0.000	0.027	0.024	0.013	0.000	0.037	0.023	0.002	0.000	0.026	0.003	0.020	0.000	0.023
66	0.006	0.000	0.000	0.006	0.015	0.008	0.000	0.023	0.004	0.020	0.000	0.023	0.000	0.008	0.000	0.008	0.019	0.018	0.000	0.037
68	0.005	0.002	0.000	0.007	0.002	0.014	0.000	0.017	0.002	0.000	0.000	0.002	0.009	0.003	0.000	0.012	0.008	0.010	0.000	0.018
70	0.012	0.004	0.000	0.015	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.002	0.000	0.024	0.000	0.024	0.000	0.010	0.000	0.010
72	0.006	0.002	0.000	0.008	0.005	0.011	0.000	0.017	0.000	0.000	0.000	0.000	0.008	0.004	0.000	0.012	0.018	0.010	0.000	0.028
74	0.004	0.000	0.000	0.004	0.003	0.000	0.000	0.003	0.000	0.002	0.000	0.002	0.000	0.024	0.000	0.024	0.000	0.011	0.000	0.011
76	0.000	0.000	0.000	0.000	0.000	0.011	0.000	0.011	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.003	0.000	0.000	0.000	0.000
78	0.002	0.000	0.000	0.002	0.000	0.016	0.000	0.016	0.006	0.000	0.000	0.006	0.000	0.008	0.000	0.008	0.008	0.014	0.000	0.021
80	0.002	0.000	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.003	0.000	0.061	0.000	0.061
82	0.000	0.000	0.000	0.000	0.000	0.023	0.000	0.023	0.000	0.000	0.000	0.000	0.000	0.019	0.000	0.019	0.000	0.057	0.000	0.057
84	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.003	0.000	0.018	0.000	0.018
86	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.008	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	0.008	0.000	0.008	0.000	0.008	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.008	0.000	0.000	0.000	0.000
90	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.003	0.000	0.002	0.000	0.002
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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
94	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	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	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	0.000	0.002	0.000	0.002	0.000	0.008	0.000	0.008
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	0.000	0.015	0.000	0.015	0.000	0.000	0.000	0.000
Total	0.676	0.418	0.000	1.094	0.877	0.891	0.000	1.768	0.272	0.117	0.000	0.389	0.239	0.252	0.017	0.508	0.624	0.474	0.000	1.098
Nº samples:				12				20				12				18				15
Nº Ind.:	156	98	0	254	145	139	0	284	54	23	0	77	44	46	3	93	127	89	0	216
Sampled catch:				217				274				109				192				369
Range:				20-89				13-89				33-79				15-100				16-98
Total catch:				217				276				110				208				373
Total hauls:				122				122				122				122				115

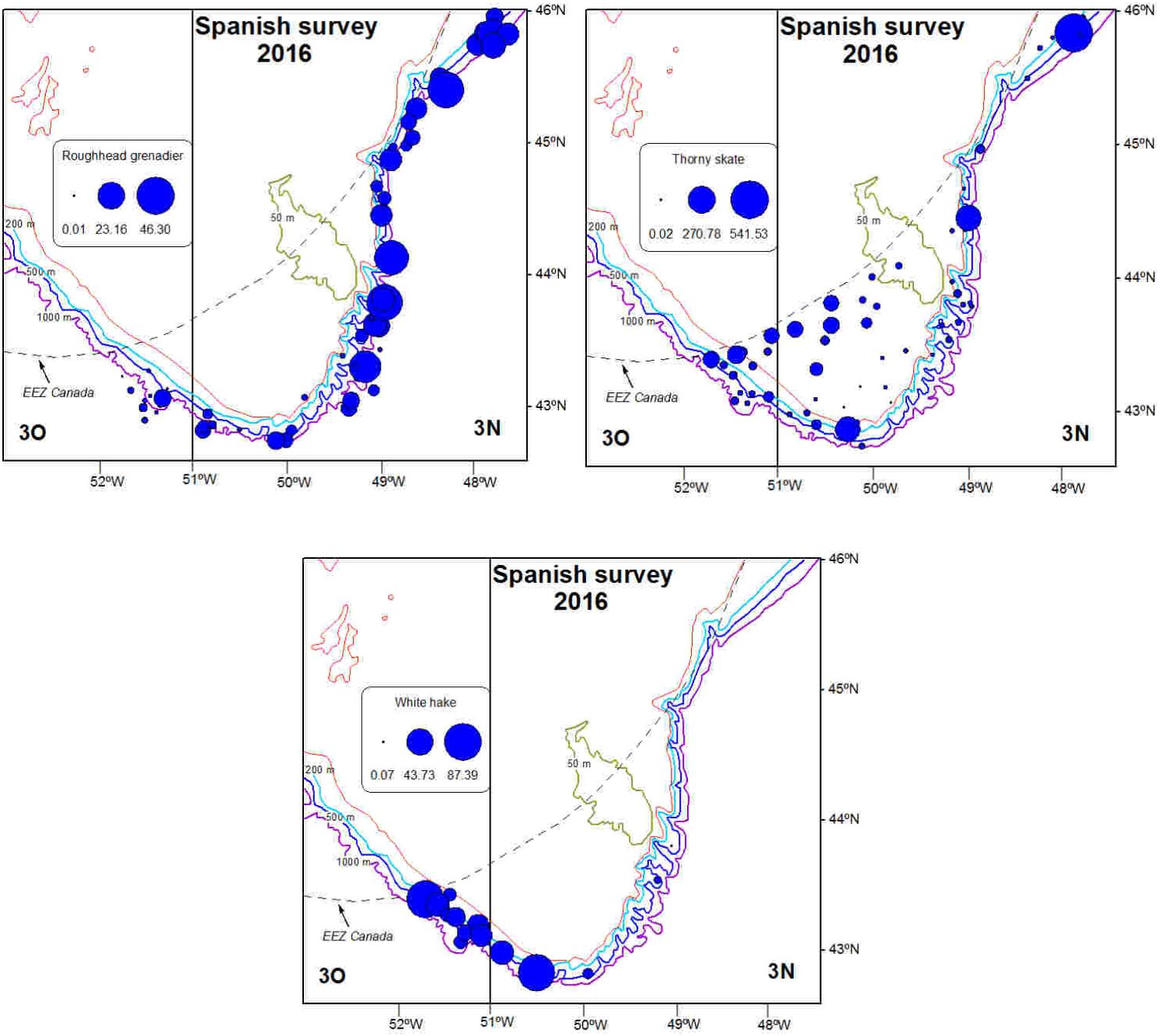

Fig.1. Position of the hauls and the catch of roughhead grenadier, thorny skate and white hake during the 2016 Spanish 3NO survey. Note that the scale is different in the three graphs.

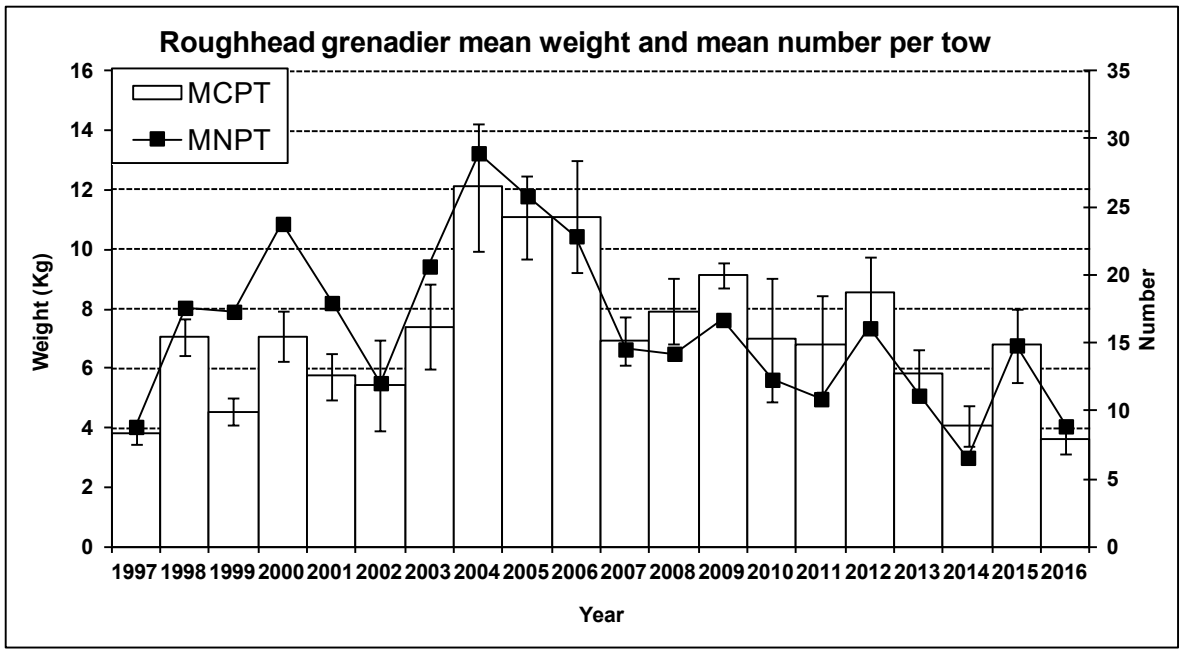

Fig 2. Roughhead grenadier stratified mean catches in Kg and ±SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2016

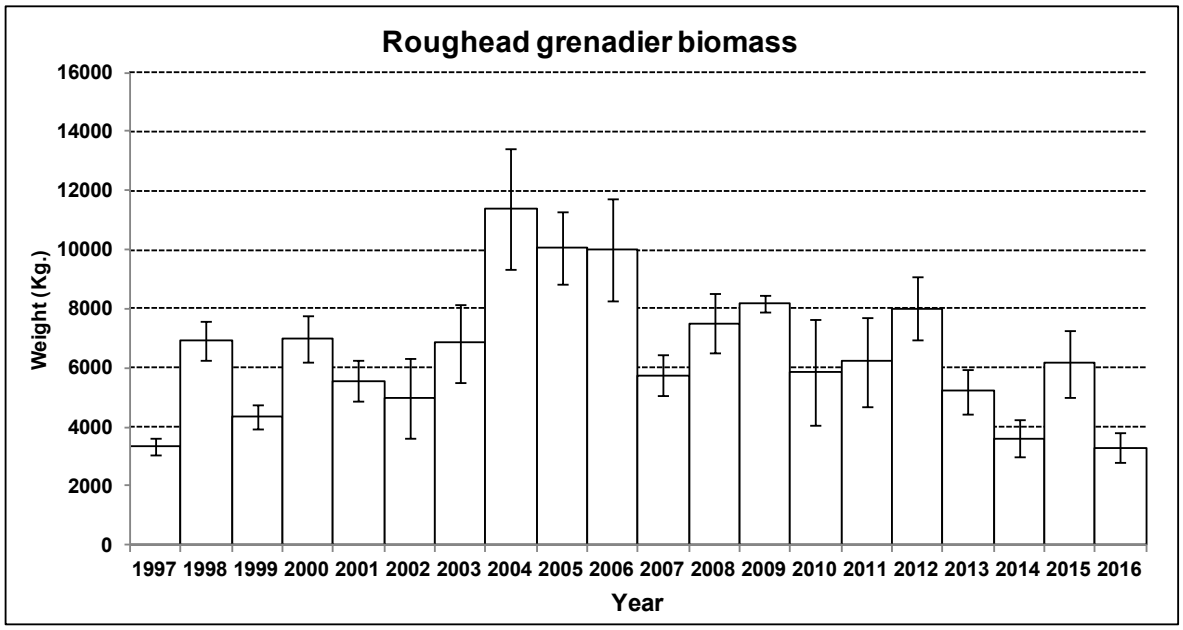

Fig. 3. Roughhead grenadier biomass calculated by the swept area method in tons and ±SD by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2016.

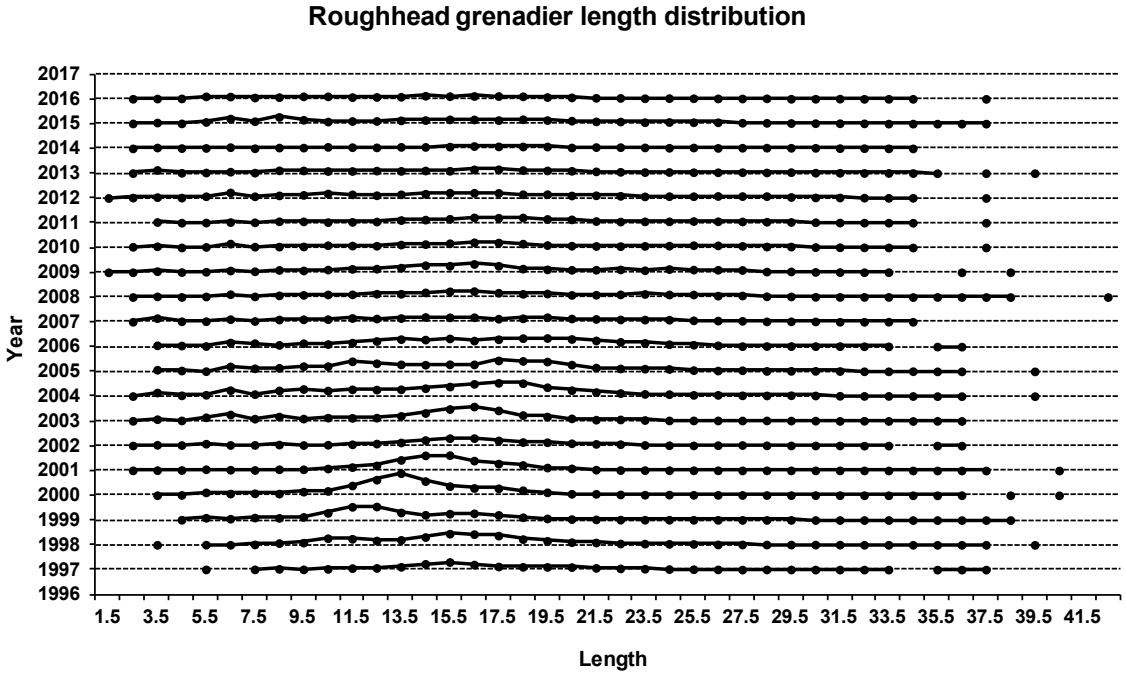

Fig. 4. Roughhead grenadier mean catches per tow length distribution (cm) on NAFO 3NO: 1997-2016. Data from 2012 to 2016 are in Table 8; data for 1997-2011 can be seen in SCR Doc 13/12.

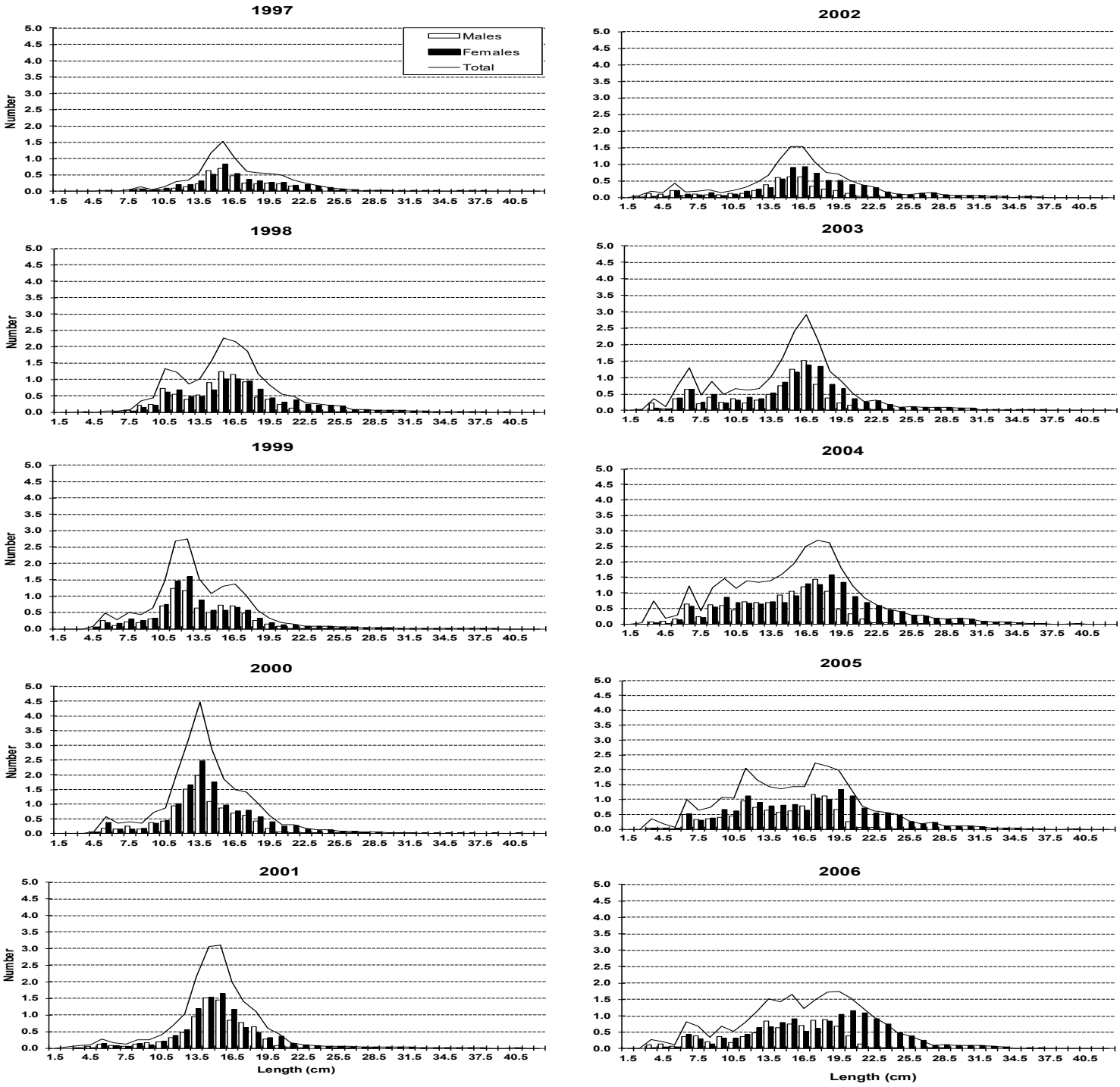

Fig. 5. Roughhead grenadier length distribution (cm) on NAFO 3NO: 1997-2016. Mean catches per tow number. Data from 2012 to 2016 are in Table 8; data for 1997-2011 can be seen in SCR Doc 13/12.

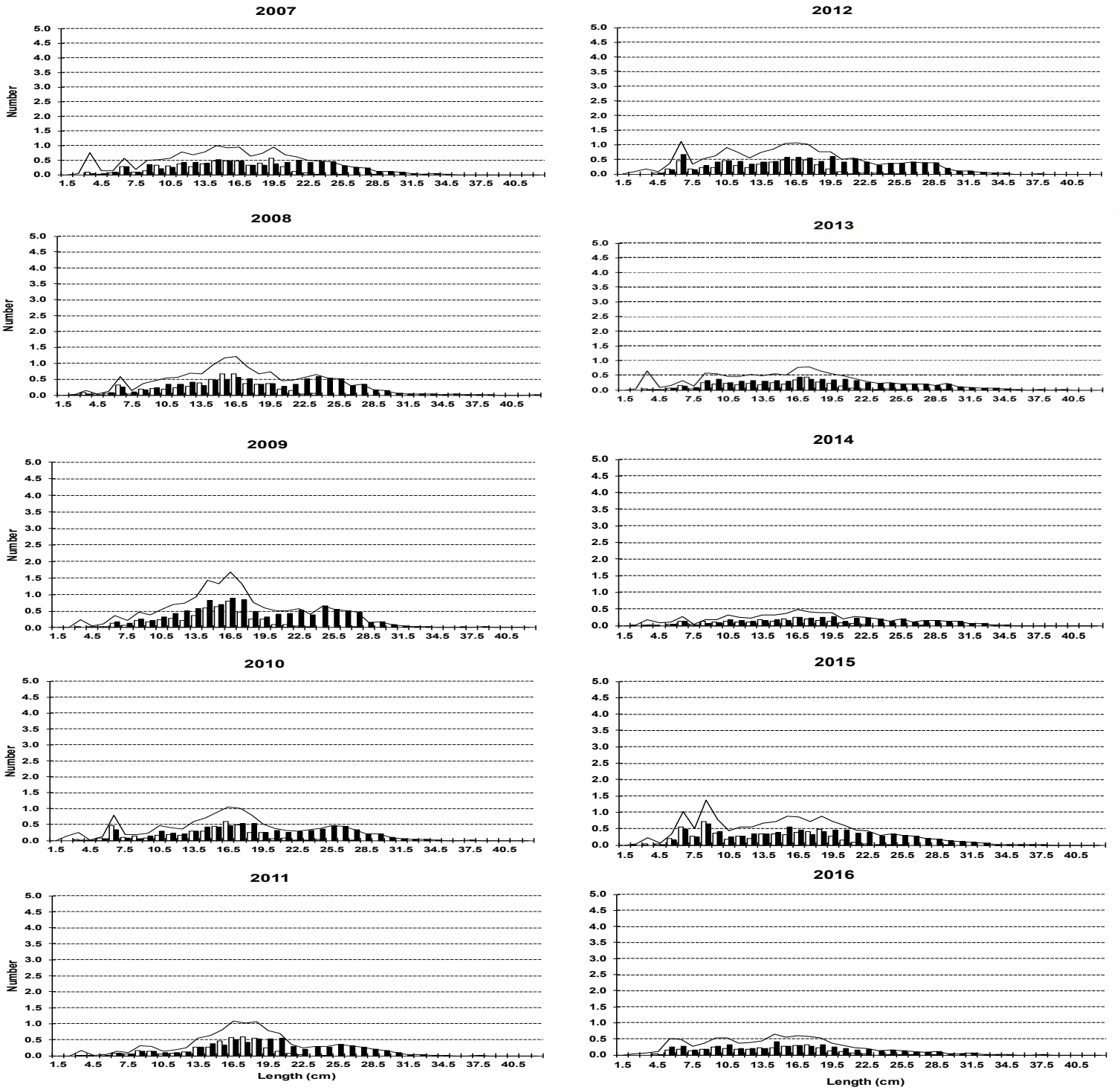

Fig. 5 (cont.). Roughhead grenadier length distribution (cm) on NAFO 3NO: 1997-2016. Mean catches per tow number. Data from 2012 to 2016 are in Table 8; data for 1997-2011 can be seen in SCR Doc 13/12.

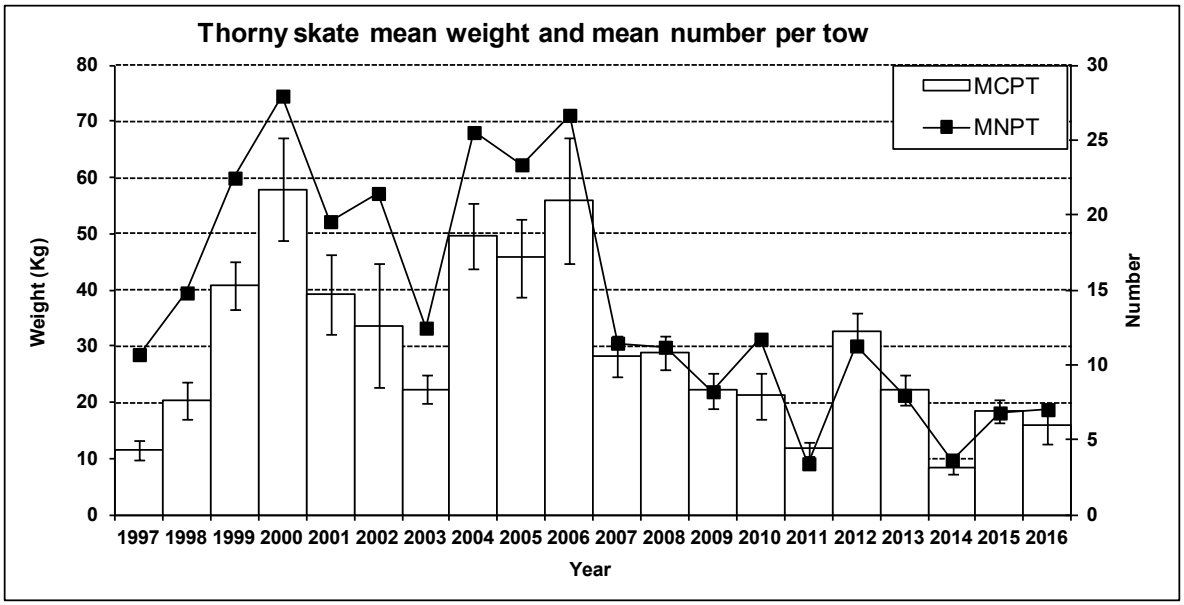

Fig. 6. Thorny skate stratified mean catches in Kg and ±SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2016.

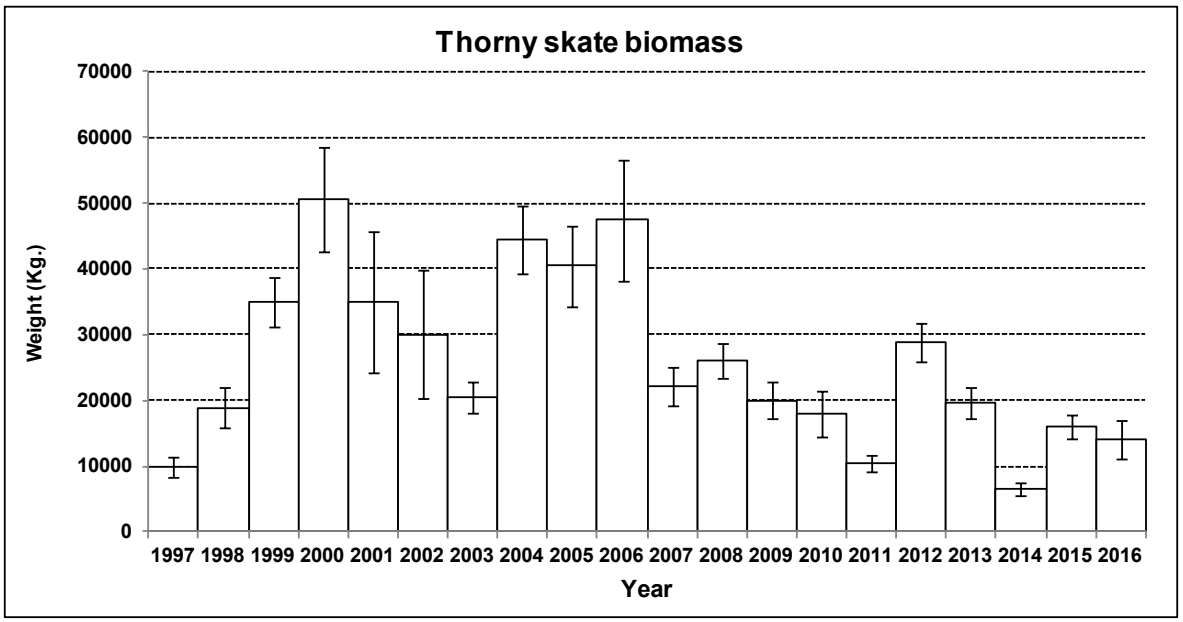

Fig. 7. Thorny skate biomass calculated by the swept area method in tons and ±SD by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2016.

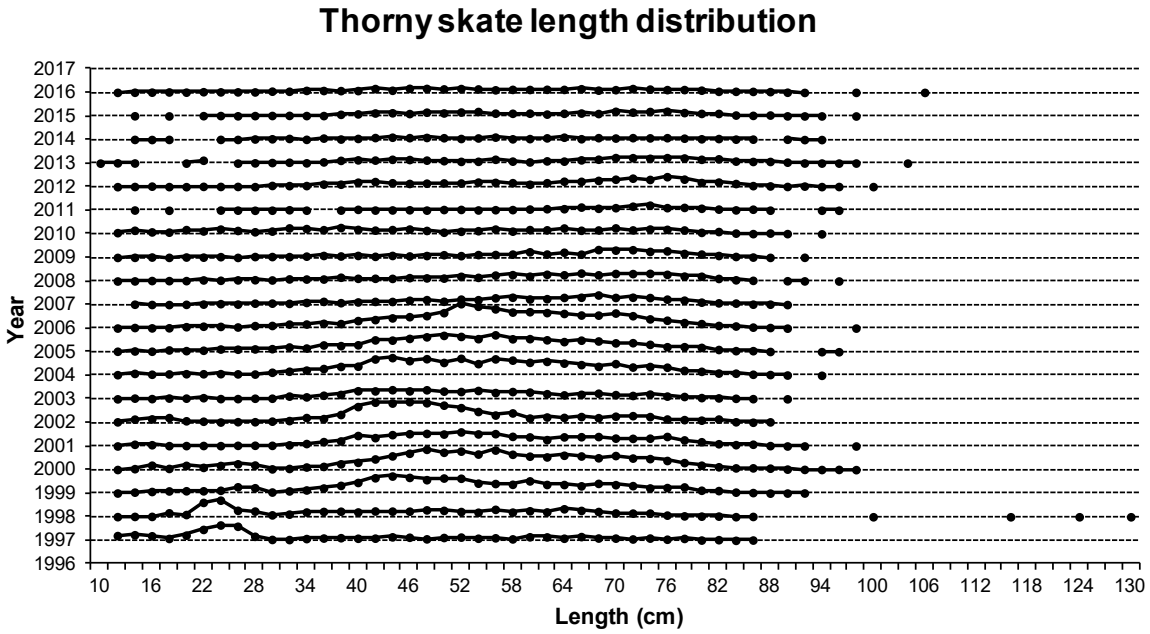

Fig. 8. Thorny skate mean catches per tow length distribution (cm) on NAFO 3NO: 1997-2016. Data from 2012 to 2016 are in Table 14; data for 1997-2011 can be seen in SCR Doc 13/12.

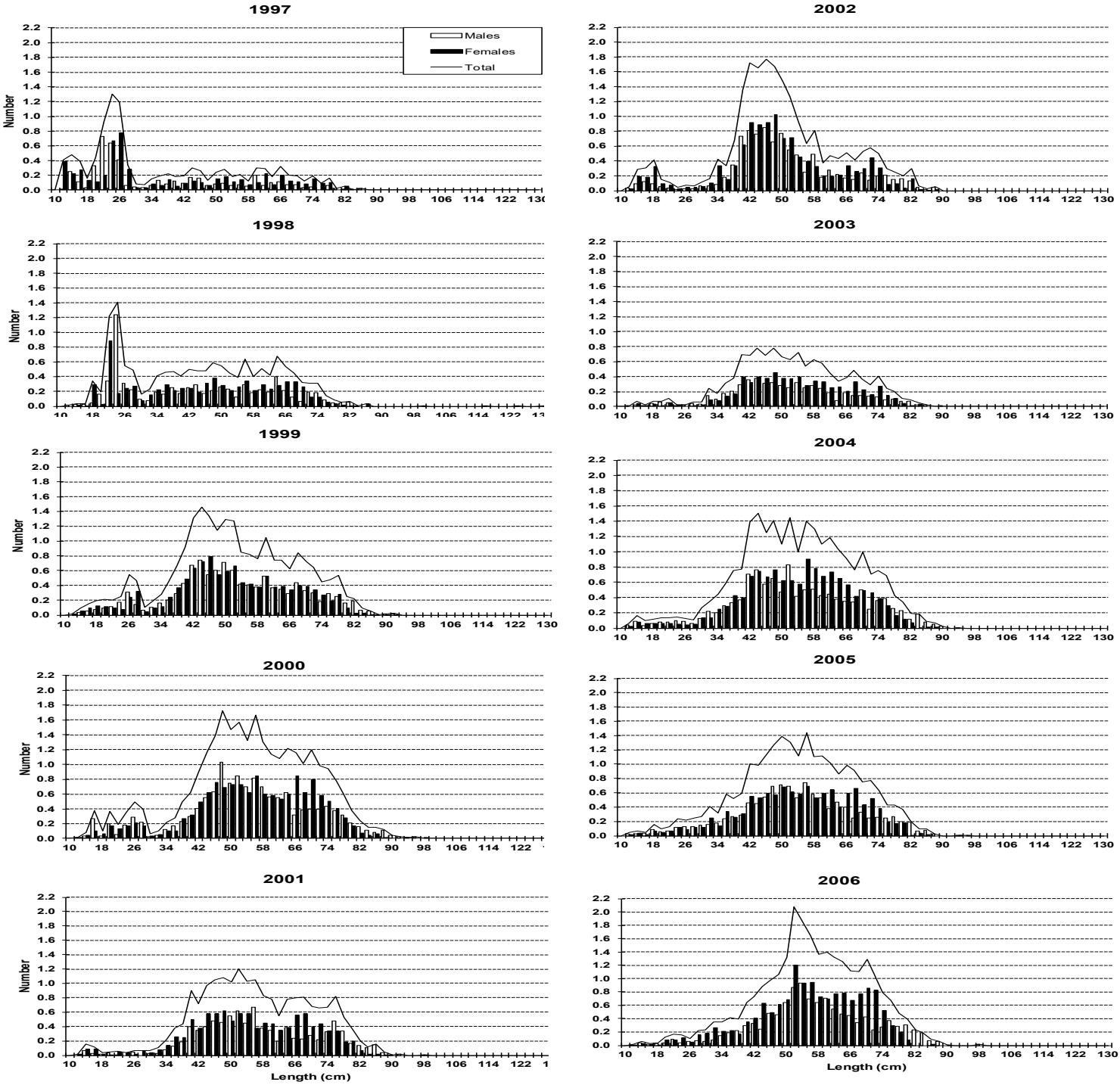

Fig. 9. Thorny skate length distribution (cm) on NAFO 3NO: 1997-2016. Mean catches per tow number. Data from 2012 to 2016 are in Table 14; data for 1997-2011 can be seen in SCR Doc 13/12.

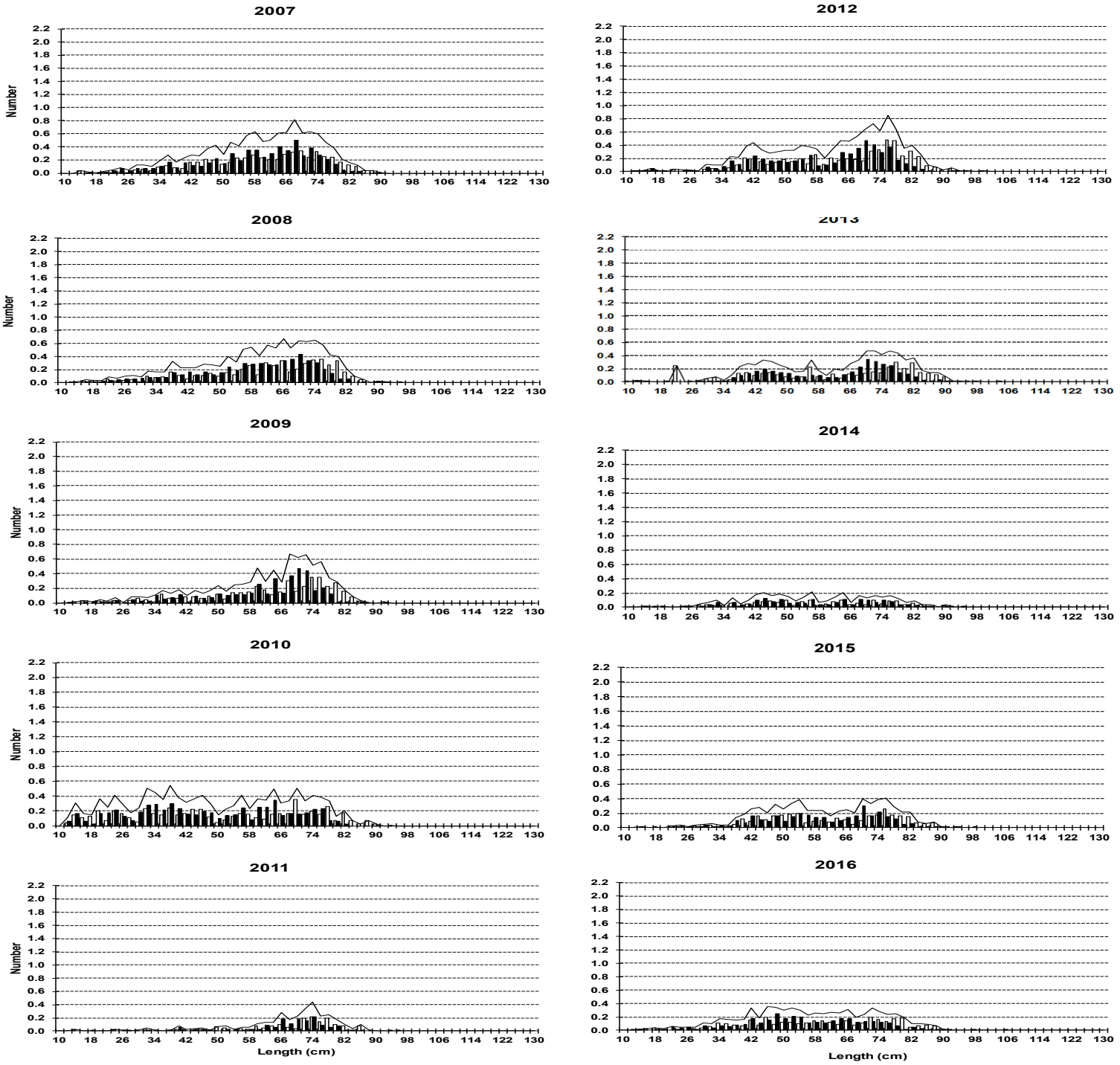

Fig. 9 (cont.). Thorny skate length distribution (cm) on NAFO 3NO: 1997-2016. Mean catches per tow number. Data from 2012 to 2016 are in Table 8; data for 1997-2011 can be seen in SCR Doc 13/12.

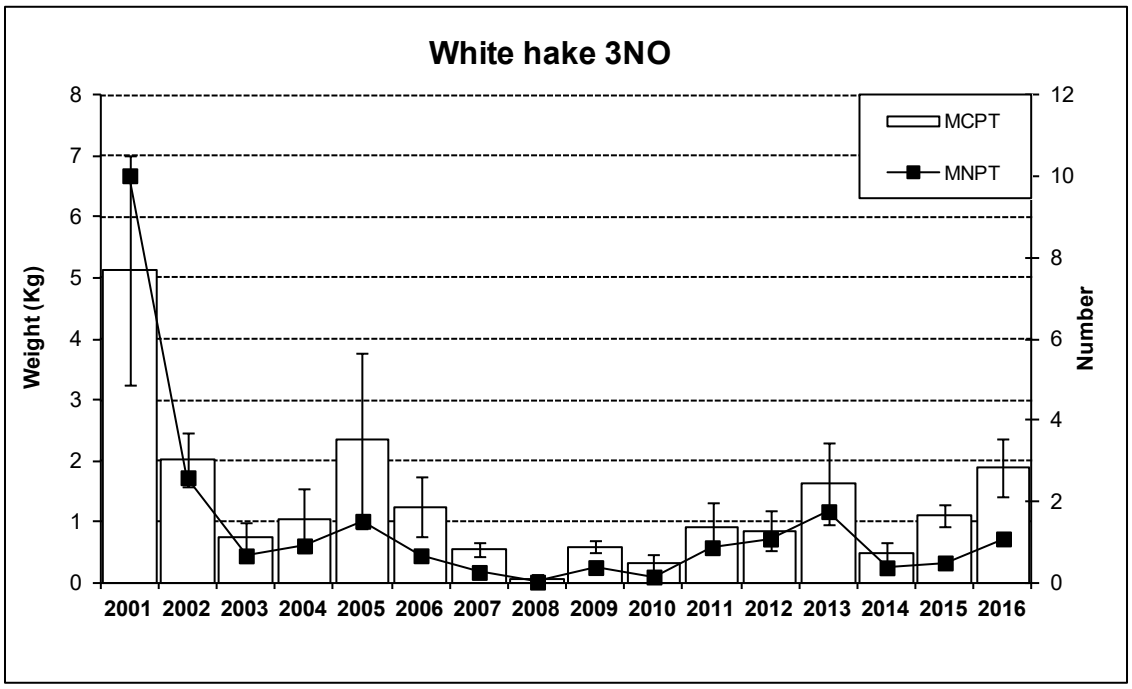

Fig. 10. White hake stratified mean catches in Kg and ±SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 2001-2016.

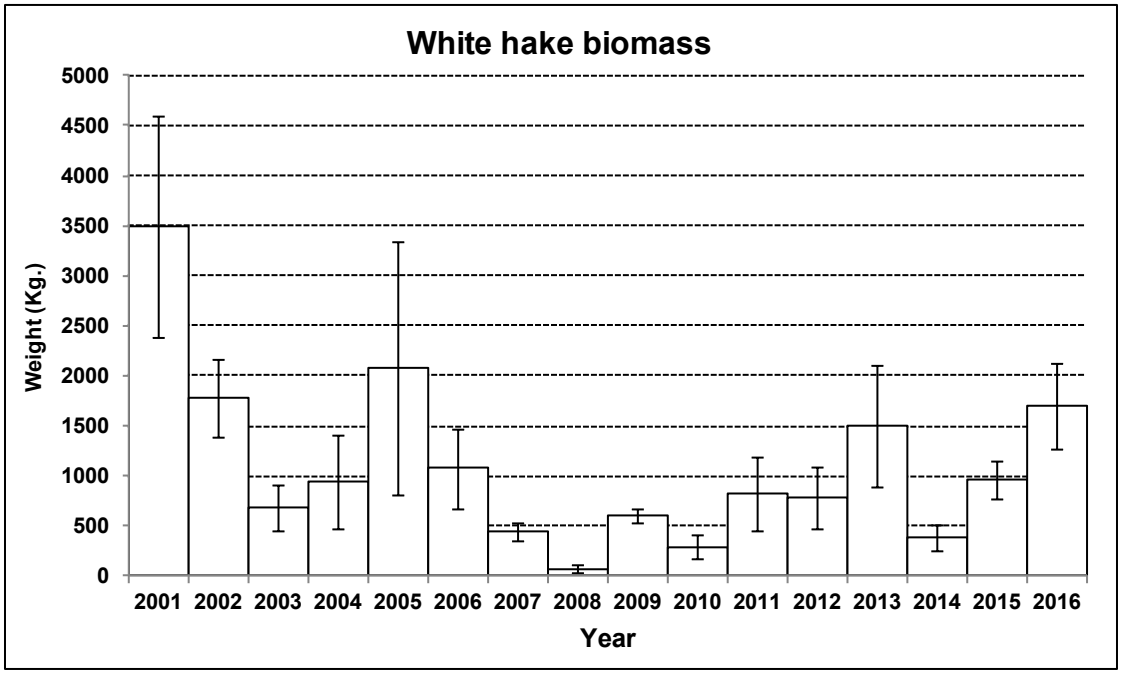

Fig. 11. White hake biomass calculated by the swept area method in tons and ±SD by year. Spanish Spring surveys in NAFO Div. 3NO: 2001-2016.

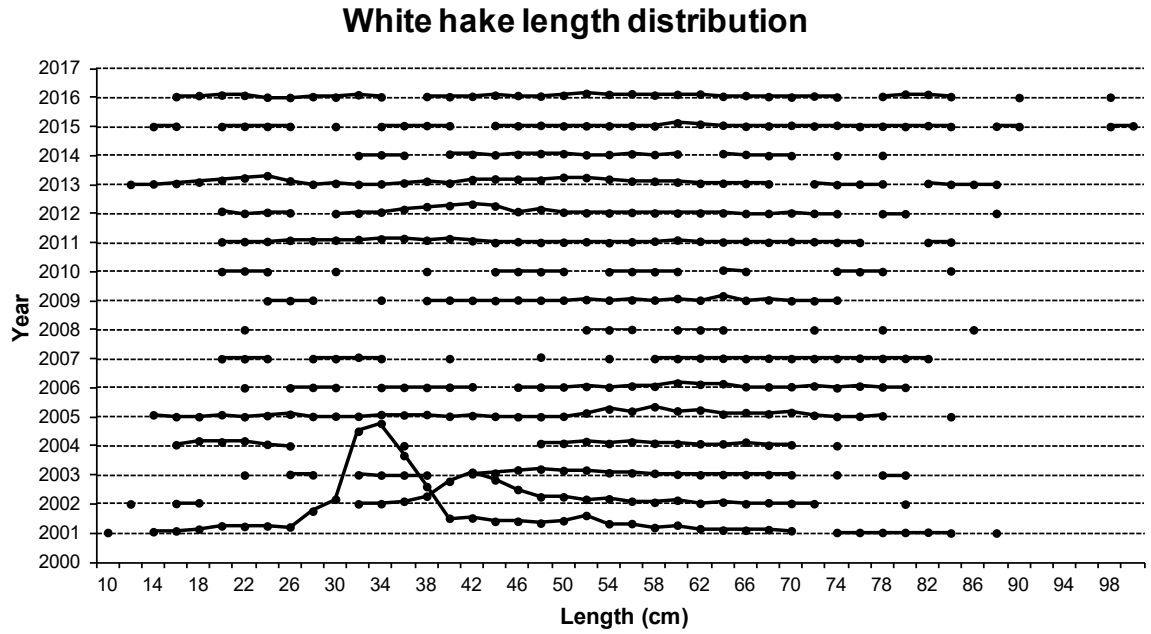

Fig. 12. White hake mean catches per tow length distribution (cm) on NAFO 3NO: 2001-2016. Data from 2012 to 2016 are in Table 20; data for 2001-2011 can be seen in SCR Doc 13/12.

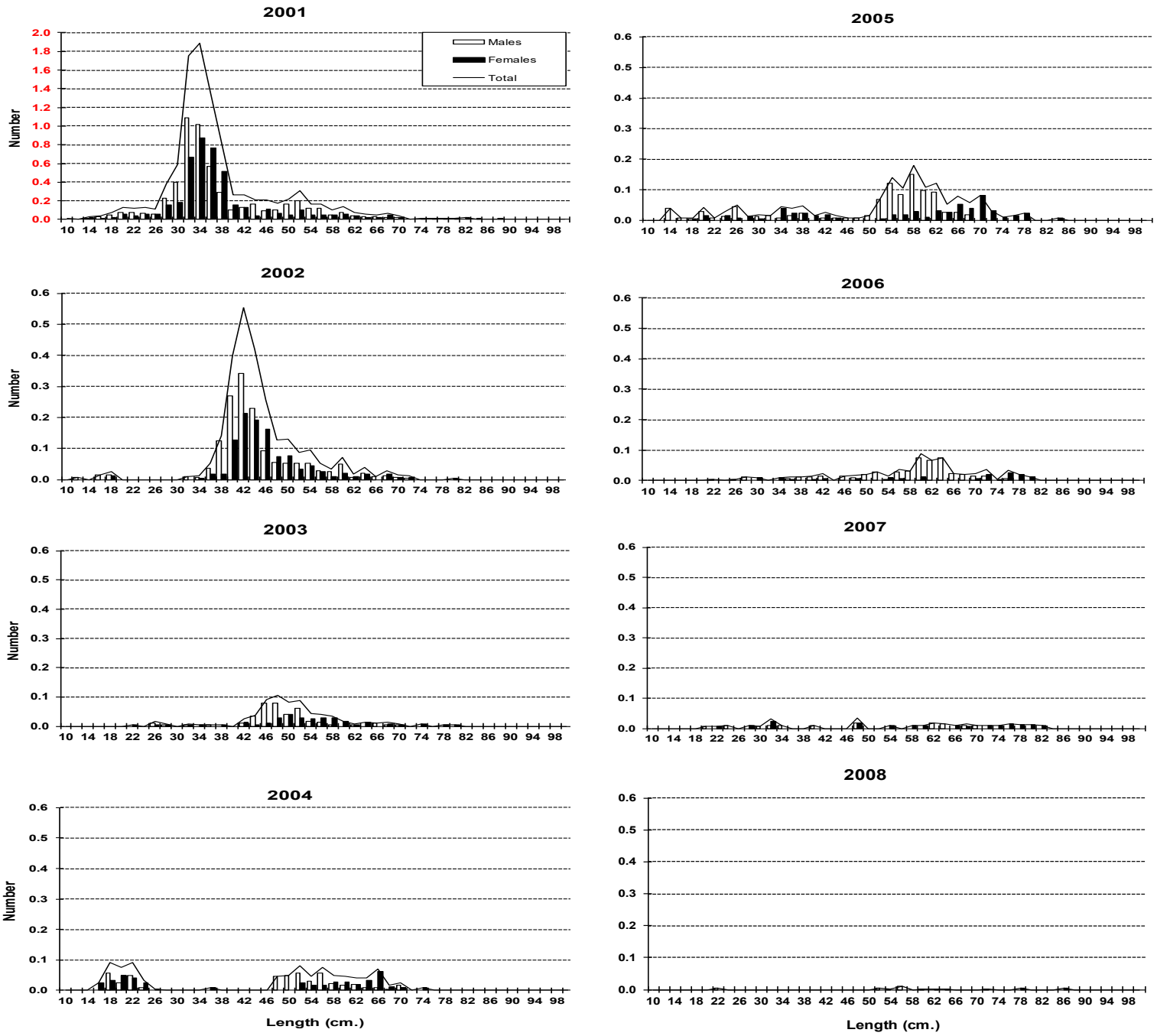

Fig.13. White hake length distribution (cm) on NAFO 3NO: 2001-2016. Mean catches per tow number. Data from 2012 to 2016 are in Table 20; data for 2001-2011 can be seen in SCR Doc 13/12.

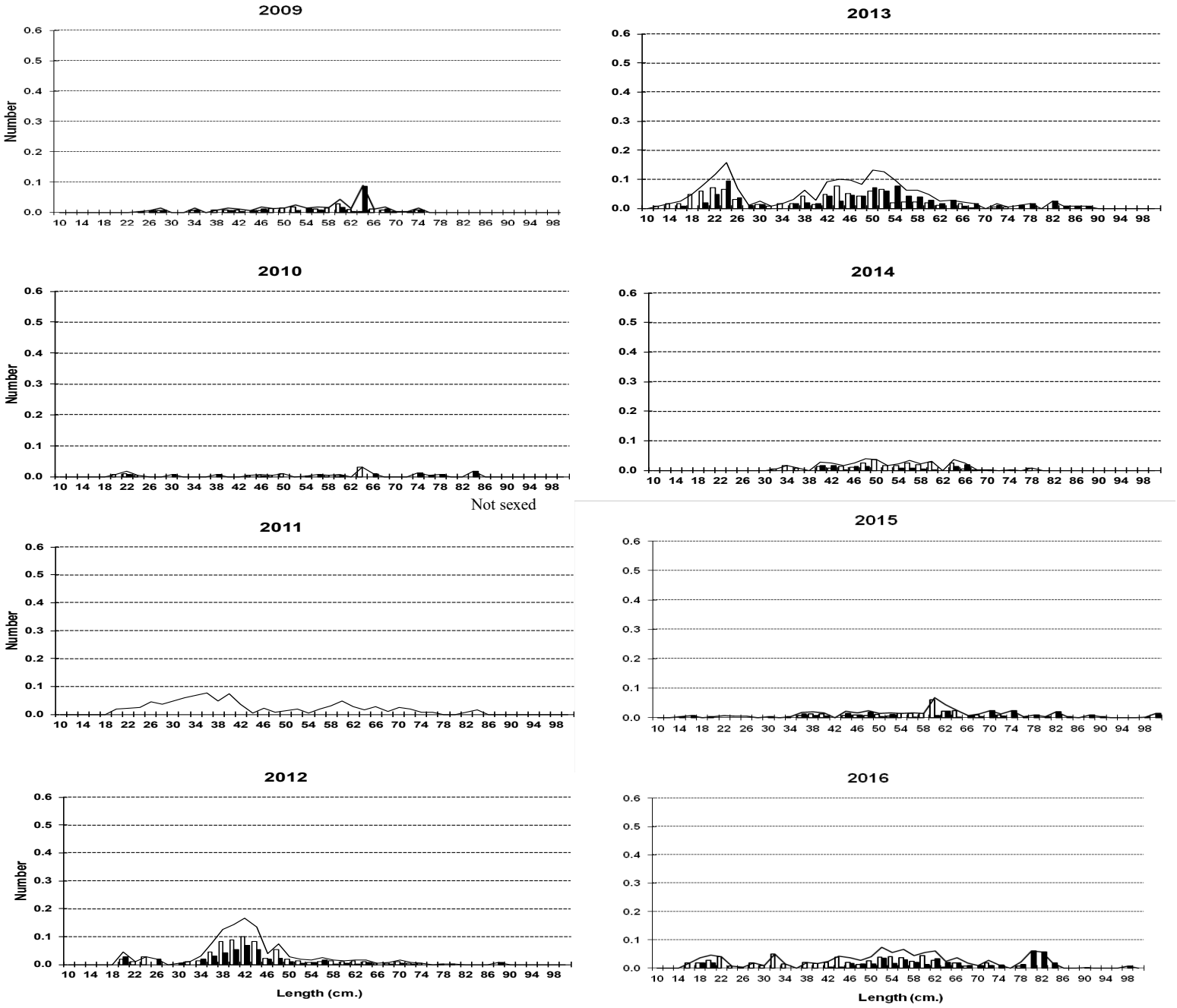

Fig. 13 (cont.). White hake length distribution (cm) on NAFO 3NO: 2001-2016. Mean catches per tow number. Data from 2012 to 2016 are in Table 20; data for 2001-2011 can be seen in SCR Doc 13/12.