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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 1997-2015 and for white hake for the period 2001-2015. The length distribution is presented as numbers per haul stratified mean catches for the last five years (2011-2015). The roughhead grenadier indices showed no discernible trend until 2012, reaching a maximum in 2004 - 2006 and afterwards stabilised at levels slightly higher than in the early years. In the last two years a decline was appreciated in the indices, reaching in 2014 one of the lowest values of the entire time-series, increasing again in 2015. 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 but declined again in 2014, increasing sligthly in 2015. A small recruitment event was detected in 2005 and in 2013, 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 1997-2015 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). 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 (2011-2015) 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 1997-2015 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 2002-2015. 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 2011-2015. 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 2015 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. Grenadier biomass shows a stable or decreasing trend in recent years (NAFO, 2015).

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 2011-2015. Total biomass and stratified mean catches and SD by year are presented in Table 5 for 1997-2015. 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 between 1997 and 2012, reaching the highest values in 2004, 2005 and 2006, and then decreased since 2012 to 2014, increasing again in 2015. Note that lowest values were found in 1997 and 2014 (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 1997-2015, and Table 8 the same index by length besides the sampled size and catch for the period 2011-2015. 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, although all the length classes were poor, specially the largest. In 2015, the mode is around 8.5 cm (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 comprises 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 maitaining lower values than in the mid-1980s. During recent years the biomass has increased slightly (NAFO, 2015).

Mean Catches and Biomass

Mean catch and SD per stratum are presented in Table 9 for 2011-2015, 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 2011-2015 are presented in Table 12.

Thorny skate indices oscillated since 1997 to a minimum value found in 2014. Higuest values were found in 2000 and in 2006 (Table 11; Figures 6 and 7).

Length Distribution

Total mean number per tow by year for the period 1997-2015 is shown in Table 13 and Figure 8. Length distribution by sex and year, sample size and catch for the period 2011-2015 are presented in Table 14 and Figures 8 and 9. The recruitment modal value was in 1997 and can be roughly followed until 2015. 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. In 2015 all the length classes were very poor. 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 has since increased in 2014 to the average level observed from 1996-2014. No large recruitments (<27 cm) have been observed since 2000 (NAFO, 2015).

Mean catches and biomass

Mean catch and SD per stratum are presented in Table 15 for years 2011-2015. 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 2001-2015. 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 2011-2015 are shown.

Biomass index for white hake presented the highest value in 2001 and then it dropped in 2002. Since then until 2008, it showed an overall decreasing trend with low values, increasing since then to 2013. In 2014 the biomass decreased, increasing sligthly again in 2015 (Table 17; Figures 10 and 11).

Length distribution

Table 19 presents the mean number per tow by year for 2001-2015. 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 2011-2015. 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 and in 2013, 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. The mean number presents the same trend as the mean catch (Figures 12 and 13).

Acknowledges

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Table 1. Spanish spring bottom trawl surveys in NAFO Div. 3NO: 1997-2015

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

(*) 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: 2011-2015. Swept area in square miles. n.s. means stratum not surveyed.

	2011		2012		2013		2014		2015	
Stratum	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number
353	0.0349	3	0.0338	3	0.0349	3	0.0379	3	0.0401	3
354	0.0345	3	0.0338	3	0.0338	3	0.0394	3	0.0390	3
355	0.0233	2	0.0229	2	0.0225	2	0.0263	2	0.0263	2
356	0.0229	2	0.0225	2	0.0225	2	0.0266	2	0.0255	2
357	0.0225	2	0.0229	2	0.0236	2	0.0263	2	0.0233	2
358	0.0345	3	0.0330	3	0.0338	3	0.0390	3	0.0349	3
359	0.0806	7	0.0806	7	0.0829	7	0.0908	7	0.0855	7
360	0.2374	20	0.2344	20	0.2231	19	0.2629	20	0.2363	20
374	0.0225	2	0.0229	2	0.0233	2	0.0259	2	0.0229	2
375	0.0360	3	0.0349	3	0.0360	3	0.0390	3	0.0341	3
376	0.1178	10	0.1181	10	0.1305	11	0.1324	10	0.1159	10
377	0.0233	2	0.0229	2	0.0236	2	0.0259	2	0.0233	2
378	0.0240	2	0.0229	2	0.0225	2	0.0263	2	0.0225	2
379	0.0221	2	0.0225	2	0.0240	2	0.0255	2	0.0225	2
380	0.0229	2	0.0229	2	0.0229	2	0.0263	2	0.0229	2
381	0.0233	2	0.0221	2	0.0244	2	0.0259	2	0.0236	2
382	0.0450	4	0.0454	4	0.0484	4	0.0521	4	0.0458	4
721	0.0229	2	0.0233	2	0.0225	2	0.0266	2	0.0240	2
722	0.0225	2	0.0221	2	0.0221	2	0.0259	2	0.0259	2
723	0.0218	2	0.0225	2	0.0221	2	0.0259	2	0.0233	2
724	0.0233	2	0.0225	2	0.0225	2	0.0255	2	0.0236	2
725	0.0240	2	0.0225	2	0.0229	2	0.0255	2	0.0229	2
726	0.0225	2	0.0221	2	0.0221	2	0.0248	2	0.0229	2
727	0.0225	2	0.0233	2	0.0229	2	0.0259	2	0.0225	2
728	0.0229	2	0.0229	2	0.0233	2	0.0248	2	0.0225	2
752	0.0236	2	0.0229	2	0.0233	2	0.0240	2	0.0225	2
753	0.0225	2	0.0221	2	0.0236	2	0.0240	2	0.0233	2
754	0.0225	2	0.0221	2	0.0240	2	0.0225	2	0.0225	2
755	0.0454	4	0.0446	4	0.0454	4	0.0454	4	0.0450	4
756	0.0206	2	0.0221	2	0.0229	2	0.0229	2	0.0229	2
757	0.0236	2	0.0214	2	0.0240	2	0.0244	2	0.0229	2
758	0.0225	2	0.0221	2	0.0225	2	0.0221	2	0.0221	2
759	0.0218	2	0.0221	2	0.0225	2	0.0229	2	0.0229	2
760	0.0214	2	0.0225	2	0.0229	2	0.0364	3	0.0225	2
761	0.0236	2	0.0221	2	0.0225	2	0.0240	2	0.0240	2
762	0.0225	2	0.0225	2	0.0218	2	0.0229	2	0.0229	2
763	0.0349	3	0.0330	3	0.0341	3	0.0233	2	0.0341	3
764	0.0225	2	0.0225	2	0.0214	2	0.0259	2	0.0251	2
765	0.0225	2	0.0229	2	0.0221	2	0.0240	2	0.0236	2
766	0.0225	2	0.0225	2	0.0221	2	0.0221	2	0.0236	2
767	0.0233	2	0.0203	2	0.0218	2	0.0221	2	0.0229	2

Table 3. Roughhead grenadier mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2011-2015. n.s. means stratum not surveyed.

	2011		2012		2013		2014		2015	
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	0.00	0.00	2.10	2.96
357	7.24	10.05	8.39	3.24	2.33	1.65	0.00	0.00	0.00	0.00
358	0.31	0.53	1.47	2.54	0.91	1.57	0.00	0.00	2.35	4.07
359	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	0.44	0.62	2.40	3.40	0.00	0.00	0.00	0.00	0.00	0.00
379	1.93	0.99	8.22	3.51	13.66	12.96	2.95	2.21	22.58	9.07
380	53.85	58.20	8.30	6.04	9.39	3.60	7.71	6.99	36.10	31.54
381	119.68	136.08	2.47	3.49	5.40	7.64	0.00	0.00	0.00	0.00
382	7.48	14.95	0.27	0.54	0.00	0.00	0.00	0.00	0.00	0.00
721	0.83	0.40	2.02	0.86	0.29	0.41	0.00	0.00	0.00	0.00
722	1.85	0.77	8.63	10.28	7.76	8.49	0.64	0.03	0.51	0.71
723	3.63	0.05	10.45	9.96	5.19	0.26	2.59	1.61	7.93	2.71
724	3.33	4.52	5.35	1.69	10.39	0.90	1.82	1.34	6.54	1.71
725	8.92	7.81	13.53	5.63	5.60	0.83	3.94	1.11	9.30	6.60
726	21.87	20.26	30.81	13.02	27.51	3.17	12.28	6.63	25.39	10.25
727	6.80	1.28	8.15	2.49	22.39	18.26	3.34	1.48	18.25	1.63
728	6.26	0.50	10.39	9.21	16.31	11.29	24.52	1.29	11.77	5.89
752	4.56	3.32	11.15	1.34	4.83	4.11	22.82	27.66	13.77	12.40
753	35.40	45.07	76.91	98.85	30.85	42.46	9.80	8.68	45.20	56.99
754	11.42	4.15	42.59	9.25	59.78	42.87	20.96	26.26	76.89	79.08
755	14.55	11.44	52.28	26.15	24.14	18.70	18.79	11.03	16.99	4.27
756	40.31	53.81	57.00	8.77	20.34	12.95	61.06	55.36	21.23	11.51
757	42.74	11.74	156.42	48.62	28.18	33.58	6.82	8.95	37.72	6.48
758	12.36	14.74	25.56	2.90	19.34	3.10	25.57	25.70	34.28	23.08
759	6.93	7.50	16.33	7.16	40.76	5.78	7.58	3.16	26.20	15.70
760	16.44	21.69	2.31	3.27	5.92	0.94	8.66	4.98	12.34	0.58
761	7.83	1.08	6.67	3.75	4.76	6.34	15.56	13.73	24.92	31.85
762	33.37	21.68	29.68	21.80	12.39	4.62	24.15	17.96	24.98	12.90
763	10.09	8.23	5.94	6.08	17.93	13.97	6.23	1.59	10.69	8.97
764	9.60	13.06	1.37	1.93	4.89	1.58	1.86	2.62	4.19	5.92
765	1.68	1.84	2.48	2.59	3.83	4.79	0.00	0.00	1.20	1.59
766	3.11	3.25	1.25	0.92	2.08	1.15	0.71	0.98	0.74	0.12
767	2.41	1.16	0.72	0.02	2.05	1.27	1.31	1.25	0.66	0.93

Table 4. Roughhead grenadier survey biomass (t) by stratum in NAFO Div. 3NO: 2011-2015. n.s. means stratum not surveyed.

Strata	2011	2012	2013	2014	2015	Strata	2011	2012	2013	2014	2015
353	0	0	0	0	0	**725**	78	126	51	32	85
354	0	0	0	0	0	**726**	140	200	179	71	160
355	0	0	0	0	0	**727**	58	67	188	25	150
356	0	0	0	0	8	**728**	43	71	109	155	82
357	105	120	32	0	0	**752**	51	128	54	249	160
358	6	30	18	0	46	**753**	434	959	360	113	537
359	0	0	0	0	0	**754**	183	693	897	335	1230
360	0	0	0	0	0	**755**	494	1804	819	638	581
374	0	0	0	0	0	**756**	395	520	180	539	187
375	0	0	0	0	0	**757**	369	1493	239	57	336
376	0	0	0	0	0	**758**	109	229	170	229	307
377	0	0	0	0	0	**759**	81	187	460	84	291
378	5	29	0	0	0	**760**	237	32	80	110	169
379	18	77	121	25	213	**761**	113	103	72	222	355
380	452	70	79	56	303	**762**	629	559	242	448	463
381	1482	32	64	0	0	**763**	227	141	411	140	245
382	228	8	0	0	0	**764**	85	12	46	14	33
721	5	11	2	0	0	**765**	19	27	43	0	13
722	14	66	59	4	3	**766**	40	16	27	9	9
723	52	144	73	31	106	**767**	33	11	30	19	9
724	36	59	114	18	69						

Table 5. Roughhead grenadier survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by in NAFO Div. 3NO: 1997-2015.

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
Biomass	5760	7521	8193	5850	6219	8027	5220	3622	6149
SD	695	1028	286	1773	1508	1073	753	628	1134
MCPT	6.93	7.93	9.15	6.97	6.82	8.59	5.81	4.08	6.79
SD	0.83	1.11	0.40	2.10	1.61	1.18	0.85	0.70	1.25

Table 6. Roughhead grenadier length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2011-2015. 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**
2011	**0.17321**	**2.75079**	0.1574	0.0620	0.982	415	**0.1350**	**2.8396**	0.0955	0.0334	0.992	769	**0.1368**	**2.8363**	0.0727	0.0263	0.995	1210
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

Table 7. Roughhead grenadier mean number per tow by year in Spanish Spring Surveys in NAFO Div. 3NO: 1997-2015. 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			
	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

Table 8. Roughhead grenadier mean number per tow by length class and year. Spanish Spring Survey in NAFO 3NO: 2011-2015. Indet. means indeterminate.

	2011				2012				2013				2014				2015			
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	0.000	0.000	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
2.5	0.000	0.000	0.000	0.000	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
3.5	0.005	0.005	0.148	0.158	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
4.5	0.006	0.000	0.014	0.020	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
5.5	0.027	0.013	0.000	0.040	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
6.5	0.070	0.069	0.000	0.139	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
7.5	0.043	0.052	0.000	0.095	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
8.5	0.152	0.149	0.000	0.301	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
9.5	0.141	0.141	0.000	0.282	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
10.5	0.048	0.087	0.000	0.134	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
11.5	0.067	0.103	0.013	0.183	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
12.5	0.122	0.126	0.000	0.248	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
13.5	0.274	0.276	0.000	0.550	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
14.5	0.260	0.380	0.000	0.640	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
15.5	0.472	0.337	0.000	0.808	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
16.5	0.574	0.507	0.000	1.081	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
17.5	0.598	0.419	0.000	1.017	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
18.5	0.547	0.522	0.000	1.069	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
19.5	0.254	0.520	0.000	0.774	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
20.5	0.148	0.540	0.000	0.689	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
21.5	0.067	0.283	0.000	0.350	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
22.5	0.032	0.208	0.000	0.239	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
23.5	0.000	0.282	0.000	0.282	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
24.5	0.014	0.271	0.000	0.286	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
25.5	0.000	0.350	0.000	0.350	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
26.5	0.000	0.307	0.000	0.307	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
27.5	0.000	0.269	0.000	0.269	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
28.5	0.000	0.207	0.000	0.207	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
29.5	0.000	0.163	0.000	0.163	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
30.5	0.000	0.102	0.000	0.102	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
31.5	0.000	0.042	0.000	0.042	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
32.5	0.000	0.029	0.000	0.029	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
33.5	0.000	0.014	0.000	0.014	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
34.5	0.000	0.007	0.000	0.007	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
35.5	0.000	0.000	0.000	0.000	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
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	0.000	0.000	0.000	0.000	0.007	0.000	0.007
37.5	0.000	0.008	0.000	0.008	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
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	0.000	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
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	3.923	6.787	0.174	10.884	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
Nº samples:				62				57				58				50				52
Nº Ind.:	470	859	27	1356	779	1572	49	2400	535	1051	131	1717	350	660	33	1043	877	1396	39	2312
Sampled catch:				862				1281				883				627				1013
Range:				3-37				1.5-37.5				2.5-39				2.5-34.5				2-37.5
Total catch:				1049				1341				885				630				1035
Total hauls:				122				122				122				122				122

Table 9. Thorny skate mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2011-2015. n.s. means stratum not surveyed.

	2011		2012		2013		2014		2015	
Stratum	T. skate Mean	T. skate SD	T. skate Mean	T. skate SD	T. skate Mean	T. skate SD	T. skate Mean	T. skate SD	T. skate Mean	T. skate SD
353	21.75	17.88	16.21	9.68	25.00	16.04	28.18	19.78	27.06	20.81
354	22.70	7.23	50.23	56.37	58.00	38.97	8.08	4.52	58.48	10.58
355	28.30	33.98	11.00	3.82	5.84	8.26	3.17	4.48	11.08	9.59
356	22.69	12.07	44.78	63.33	49.23	35.62	59.53	16.23	45.80	14.07
357	8.07	11.41	4.07	1.00	5.06	1.22	21.65	30.62	8.44	2.02
358	15.61	1.80	6.68	5.90	28.31	44.81	7.28	1.94	52.73	46.99
359	21.97	14.37	22.32	14.07	30.80	21.34	4.47	5.48	39.66	70.22
360	18.21	15.05	57.72	46.64	40.01	34.95	8.65	13.65	22.33	17.22
374	5.67	8.02	0.00	0.00	17.11	17.68	0.48	0.67	2.27	3.20
375	1.17	2.03	18.17	20.62	26.36	4.11	0.00	0.00	18.67	12.68
376	11.78	10.84	93.55	39.65	36.09	29.69	24.07	19.78	27.49	21.65
377	7.82	6.03	15.78	3.49	8.85	4.99	0.00	0.00	9.61	13.59
378	19.33	4.29	19.84	15.67	9.87	3.75	7.12	10.07	64.57	59.57
379	20.33	23.14	6.60	2.55	1.98	2.80	5.60	2.56	2.60	3.68
380	111.27	103.65	30.57	31.27	18.07	20.54	18.17	0.22	4.89	6.92
381	20.31	14.74	7.62	5.73	9.16	12.95	25.04	12.22	22.89	7.65
382	6.38	5.39	0.10	0.20	8.70	7.54	1.05	2.09	35.55	25.27
721	7.23	3.80	17.40	24.61	53.58	32.88	15.80	22.34	0.00	0.00
722	5.63	7.95	5.60	7.92	5.21	1.96	6.15	8.70	4.37	6.18
723	3.05	4.31	12.27	10.39	8.13	6.70	0.00	0.00	0.00	0.00
724	2.95	4.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
725	2.44	3.45	0.00	0.00	1.90	2.51	2.15	1.48	0.00	0.00
726	1.98	2.80	0.00	0.00	3.34	4.72	0.00	0.00	2.30	3.25
727	9.29	13.14	5.62	3.37	2.73	3.80	11.60	10.32	27.40	10.42
728	0.00	0.00	12.05	6.54	11.35	5.58	4.30	6.08	9.32	13.18
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	2.39	3.38
759	0.00	0.00	3.03	4.28	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	2.30	3.98	2.09	2.96
761	0.00	0.00	4.80	6.79	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	6.80	9.62	4.80	6.79	0.00	0.00	7.74	10.94
765	0.00	0.00	0.92	1.30	0.00	0.00	0.00	0.00	3.65	5.16
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: 2011-2015. n.s. means stratum not surveyed.

Strata	2011	2012	2013	2014	2015	Strata	2011	2012	2013	2014	2015
353	503	388	578	600	544	**725**	21	0	17	18	0
354	486	1098	1268	151	1107	**726**	13	0	22	0	14
355	180	71	38	18	62	**727**	79	46	23	86	234
356	93	187	206	210	169	**728**	0	82	76	27	65
357	118	58	70	271	119	**752**	0	0	0	0	0
358	305	137	566	126	1021	**753**	0	0	0	0	0
359	803	816	1095	145	1367	**754**	0	0	0	0	0
360	4271	13707	9483	1831	5262	**755**	0	0	0	0	0
374	108	0	315	8	42	**756**	0	0	0	0	0
375	26	423	595	0	445	**757**	0	0	0	0	0
376	1334	10564	4058	2425	3165	**758**	0	0	0	0	21
377	67	138	75	0	83	**759**	0	35	0	0	0
378	224	241	122	75	798	**760**	0	0	0	29	29
379	195	62	17	47	24	**761**	0	74	0	0	0
380	934	257	152	133	41	**762**	0	0	0	0	0
381	252	99	108	279	279	**763**	0	0	0	0	0
382	195	3	247	28	1066	**764**	0	60	45	0	62
721	41	97	310	77	0	**765**	0	10	0	0	38
722	42	43	40	40	28	**766**	0	0	0	0	0
723	43	169	114	0	0	**767**	0	0	0	0	0
724	31	0	0	0	0						

Table 11. Thorny skate survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by in NAFO Div. 3NO: 1997-2015.

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
Biomass	22223	25946	19959	17887	10365	28867	19640	6624	16085
SD	2898	2641	2745	3539	1193	3010	2280	1008	1777
MCPT	28.10	28.82	22.10	21.22	11.71	32.65	22.24	8.39	18.45
SD	3.57	2.92	3.13	4.11	1.32	3.38	2.63	1.26	2.02

Table 12. Thorny skate length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2011-2015. 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**
2011	**0.00247**	**3.32621**	0.4129	0.1021	0.957	186	**0.00896**	**3.01571**	0.1255	0.0309	0.995	176	**0.00349**	**3.24375**	0.3269	0.0827	0.964	362
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

Table 13. Thorny skate mean number per tow by year in Spanish Spring Surveys in NAFO Div. 3NO: 1997-2015. 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			
	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

Table 14. Thorny skate mean number per tow by length class and year. Spanish Spring Survey in NAFO 3NO: 2011-2015. Indet. means indeterminate.

	2011				2012				2013				2014				2015			
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	0.005	0.000	0.000	0.005	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	0.002	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
14	0.026	0.000	0.000	0.026	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
16	0.000	0.000	0.000	0.000	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
18	0.000	0.005	0.000	0.005	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
20	0.000	0.000	0.000	0.000	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
22	0.000	0.000	0.000	0.000	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
24	0.022	0.000	0.000	0.022	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
26	0.000	0.016	0.000	0.016	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
28	0.005	0.000	0.000	0.005	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
30	0.011	0.000	0.000	0.011	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
32	0.028	0.021	0.000	0.049	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
34	0.000	0.012	0.000	0.012	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
36	0.000	0.000	0.000	0.000	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
38	0.011	0.008	0.000	0.020	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
40	0.026	0.057	0.000	0.083	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
42	0.021	0.000	0.000	0.021	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
44	0.011	0.021	0.000	0.032	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
46	0.025	0.023	0.000	0.048	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
48	0.006	0.013	0.000	0.019	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
50	0.068	0.000	0.000	0.068	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
52	0.045	0.032	0.000	0.077	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
54	0.000	0.032	0.000	0.032	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
56	0.038	0.015	0.000	0.053	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
58	0.031	0.031	0.000	0.062	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
60	0.083	0.023	0.000	0.106	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
62	0.049	0.087	0.000	0.136	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
64	0.075	0.062	0.000	0.137	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
66	0.096	0.180	0.000	0.276	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
68	0.061	0.112	0.000	0.173	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
70	0.038	0.185	0.000	0.223	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
72	0.192	0.156	0.000	0.348	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
74	0.218	0.219	0.000	0.437	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
76	0.141	0.085	0.000	0.226	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
78	0.193	0.055	0.000	0.248	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
80	0.095	0.080	0.000	0.175	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
82	0.084	0.020	0.000	0.104	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
84	0.019	0.019	0.000	0.037	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
86	0.079	0.016	0.000	0.095	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
88	0.000	0.013	0.000	0.013	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
90	0.000	0.000	0.000	0.000	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
92	0.000	0.000	0.000	0.000	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
94	0.008	0.000	0.000	0.008	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
96	0.006	0.000	0.000	0.006	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
98	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012	0.000	0.000	0.012	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.005
100	0.000	0.000	0.000	0.000	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
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	0.000	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
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	0.000	0.000	0.000	0.000
108	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	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	1.811	1.598	0.000	3.410	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
Nº samples:				71				74				79				55				74
Nº Ind.:	183	174	0	357	496	480	0	976	357	362	0	719	183	179	0	362	339	321	0	660
Sampled catch:				1216				2912				2150				907				1907
Range:				14-96				13-100				11-104				14-94				14-99
Total catch:				1398				2940				2253				948				2075
Total hauls:				122				122				122				122				122

Table 15. White hake mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2011-2015. n.s. means stratum not surveyed.

	2011		2012		2013		2014		2015	
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	0.04	0.07	1.54	2.40	0.00	0.00	0.00	0.00	0.01	0.01
354	20.45	28.28	0.13	0.22	45.38	47.93	2.45	4.24	4.77	3.99
355	24.11	6.21	47.52	42.40	26.55	6.12	21.15	24.23	7.95	4.24
356	9.58	5.06	29.95	33.02	17.15	16.48	11.87	6.70	17.36	21.67
357	0.00	0.00	0.00	0.00	1.32	1.87	4.54	6.41	26.72	3.90
358	3.99	6.92	0.00	0.00	2.18	1.94	2.03	3.51	10.95	12.45
359	1.48	2.53	6.08	14.91	4.05	5.44	1.08	2.58	0.00	0.00
360	0.00	0.00	0.02	0.04	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	0.00	0.00	1.82	2.57	0.00	0.00	0.00	0.00	0.00	0.00
379	0.00	0.00	0.30	0.43	0.04	0.06	0.00	0.00	0.00	0.00
380	0.00	0.00	0.68	0.96	0.56	0.79	0.00	0.00	0.11	0.16
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	0.00	0.00	0.49	0.69	4.53	1.88	2.99	4.22	23.22	5.62
722	1.70	2.40	0.00	0.00	0.65	0.91	1.15	1.63	1.96	2.76
723	3.03	4.29	3.75	5.30	1.64	0.22	2.79	2.55	1.20	1.69
724	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.03	2.86
725	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
726	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
727	0.00	0.00	0.11	0.16	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	0.29	0.40	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: 2011-2015. n.s. means stratum not surveyed.

Strata	2011	2012	2013	2014	2015
353	1	37	0	0	0
354	437	3	992	46	90
355	153	307	175	119	45
356	39	125	72	42	64
357	0	0	18	57	377
358	78	0	44	35	212
359	54	222	144	35	0
360	0	4	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	0	22	0	0	0
379	0	3	0	0	0
380	0	6	5	0	1
381	0	0	0	0	0
382	0	0	0	0	0
721	0	3	26	15	126
722	13	0	5	7	13
723	43	52	23	33	16
724	0	0	0	0	21

Strata	2011	2012	2013	2014	2015
725	0	0	0	0	0
726	0	0	0	0	0
727	0	1	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	3	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: 2001-2015.

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
Biomass	610	293	822	784	1503	389	965
SD	73	117	361	308	613	131	182
MCPT	0.61	0.34	0.91	0.86	1.64	0.49	1.12
SD	0.08	0.14	0.40	0.34	0.67	0.17	0.19

Table 18. White hake length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2011-2015. 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**
2011	-	-	-	-	-	-	-	-	-	-	-	-	**0.00337**	**3.21512**	0.1448	0.0382	0.994	122
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**	0.1709	0.0440	0.995	45	**0.00156**	**3.40183**	0.1500	0.0371	0.996	43	**0.00209**	**3.33109**	0.1172	0.0295	0.996	89

Table 19. White hake mean number per tow by year in Spanish Spring Surveys in NAFO Div. 3NO: 2001-2015. Indet. means indeterminate.

	2001				2002				2003				2004				2005			
	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

	2006				2007				2008				2009				2010			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	0.512	0.172	0.000	0.684	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

	2011				2012				2013				2014				2015			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	0.000	0.000	0.882	0.882	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

Table 20. White hake mean number per tow by length class and year. Spanish Spring Survey in NAFO 3NO: 2011-2015. Indet. means indeterminate.

	2011				2012				2013				2014				2015			
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	0.000	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
14	0.000	0.000	0.000	0.000	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
16	0.000	0.000	0.000	0.000	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
18	0.000	0.000	0.000	0.000	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
20	0.000	0.000	0.018	0.018	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
22	0.000	0.000	0.022	0.022	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
24	0.000	0.000	0.025	0.025	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
26	0.000	0.000	0.044	0.044	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
28	0.000	0.000	0.037	0.037	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
30	0.000	0.000	0.047	0.047	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
32	0.000	0.000	0.059	0.059	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
34	0.000	0.000	0.069	0.069	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
36	0.000	0.000	0.076	0.076	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
38	0.000	0.000	0.046	0.046	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
40	0.000	0.000	0.074	0.074	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
42	0.000	0.000	0.036	0.036	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
44	0.000	0.000	0.005	0.005	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
46	0.000	0.000	0.021	0.021	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
48	0.000	0.000	0.007	0.007	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
50	0.000	0.000	0.012	0.012	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
52	0.000	0.000	0.020	0.020	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
54	0.000	0.000	0.004	0.004	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
56	0.000	0.000	0.020	0.020	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
58	0.000	0.000	0.029	0.029	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
60	0.000	0.000	0.049	0.049	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
62	0.000	0.000	0.028	0.028	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
64	0.000	0.000	0.015	0.015	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
66	0.000	0.000	0.028	0.028	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
68	0.000	0.000	0.010	0.010	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
70	0.000	0.000	0.024	0.024	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
72	0.000	0.000	0.020	0.020	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
74	0.000	0.000	0.008	0.008	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
76	0.000	0.000	0.008	0.008	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
78	0.000	0.000	0.000	0.000	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
80	0.000	0.000	0.000	0.000	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
82	0.000	0.000	0.008	0.008	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
84	0.000	0.000	0.015	0.015	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
86	0.000	0.000	0.000	0.000	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
88	0.000	0.000	0.000	0.000	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
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	0.000	0.000	0.000	0.000	0.003	0.000	0.003
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	0.000	0.000	0.000	0.000	0.002	0.000	0.002
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	0.000	0.000	0.000	0.000	0.015	0.000	0.015
Total	0.000	0.000	0.882	0.882	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
Nº samples:				14				12				20				12				18
Nº Ind.:	0	0	156	156	156	98	0	254	145	139	0	284	54	23	0	77	44	46	3	93
Sampled catch:				149				217				274				109				192
Range:				20-84				20-89				13-89				33-79				15-100
Total catch:				161				217				276				110				208
Total hauls:				122				122				122				122				122

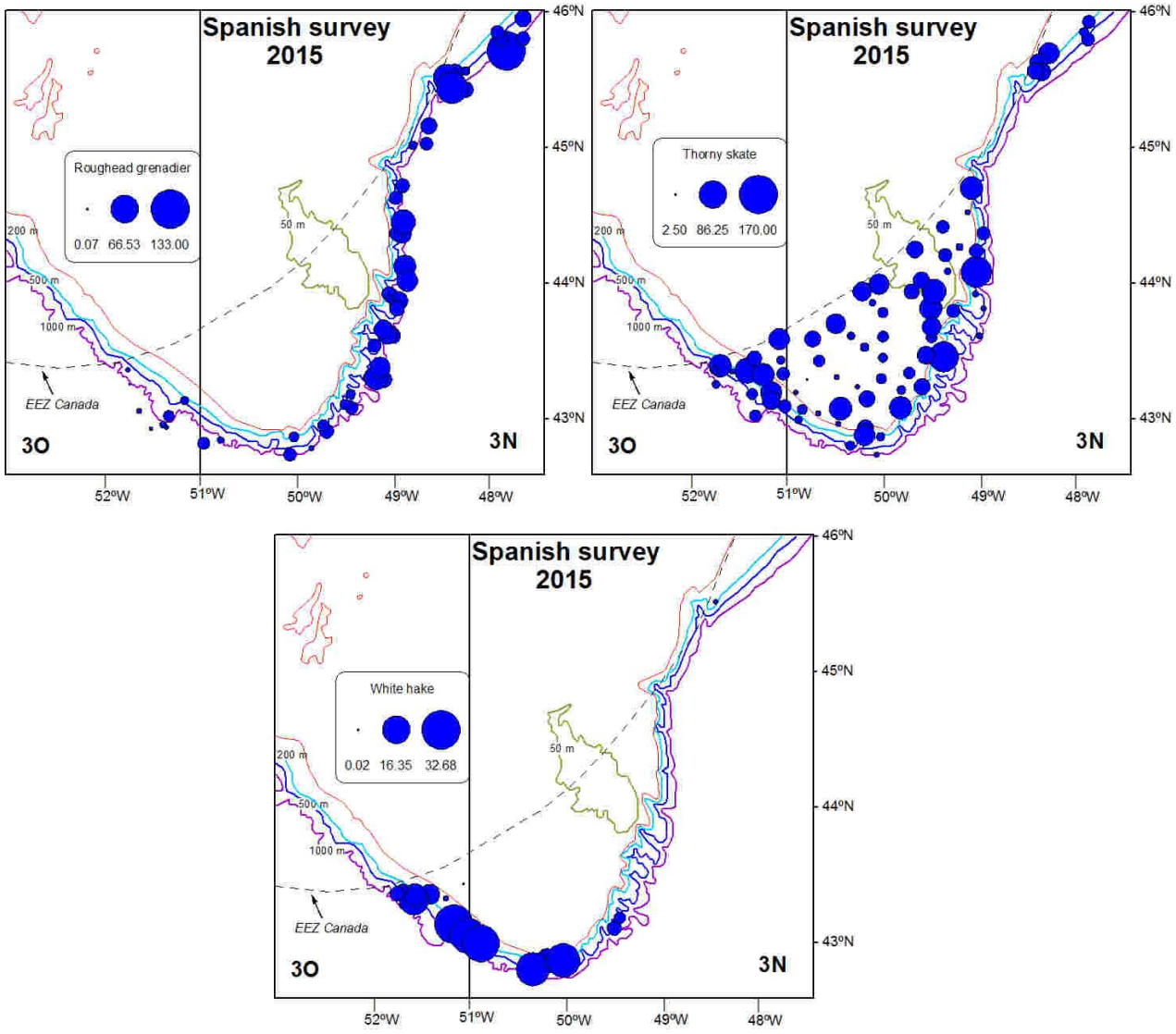

Fig. 1. Position of the hauls and the catch of roughhead grenadier, thorny skate and white hake during the 2015 Spanish 3NO survey. Note that the scale is different in the three graphs.

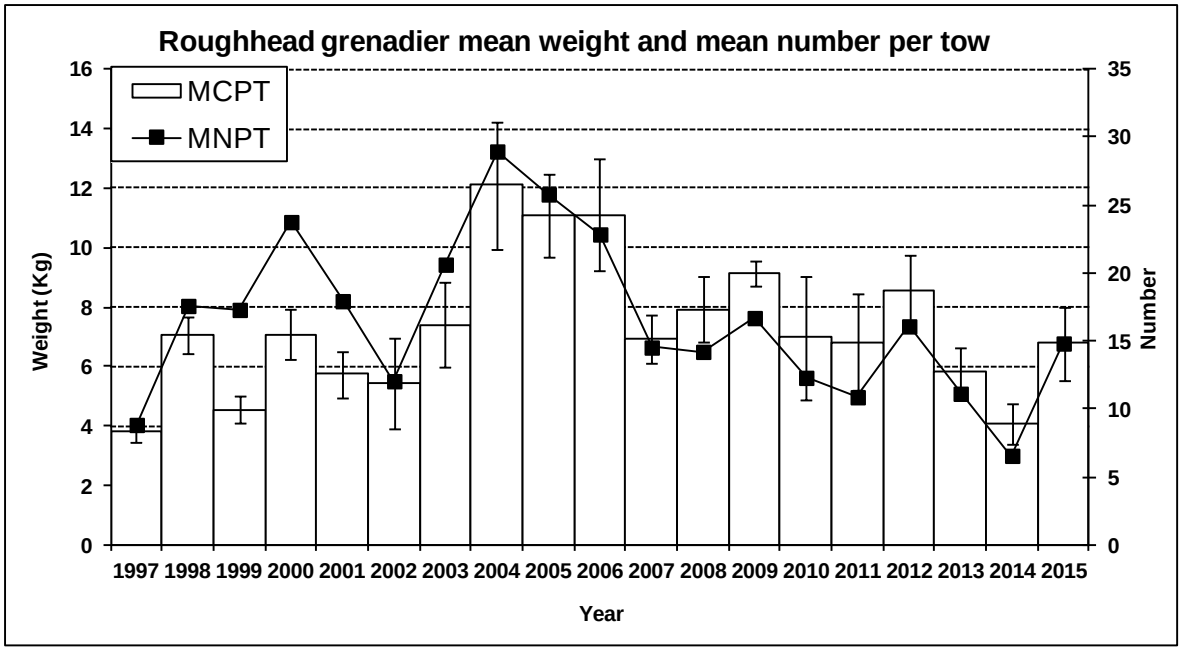

Fig. 2. Roughhead grenadier stratified mean catches in Kg and ±SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2015.

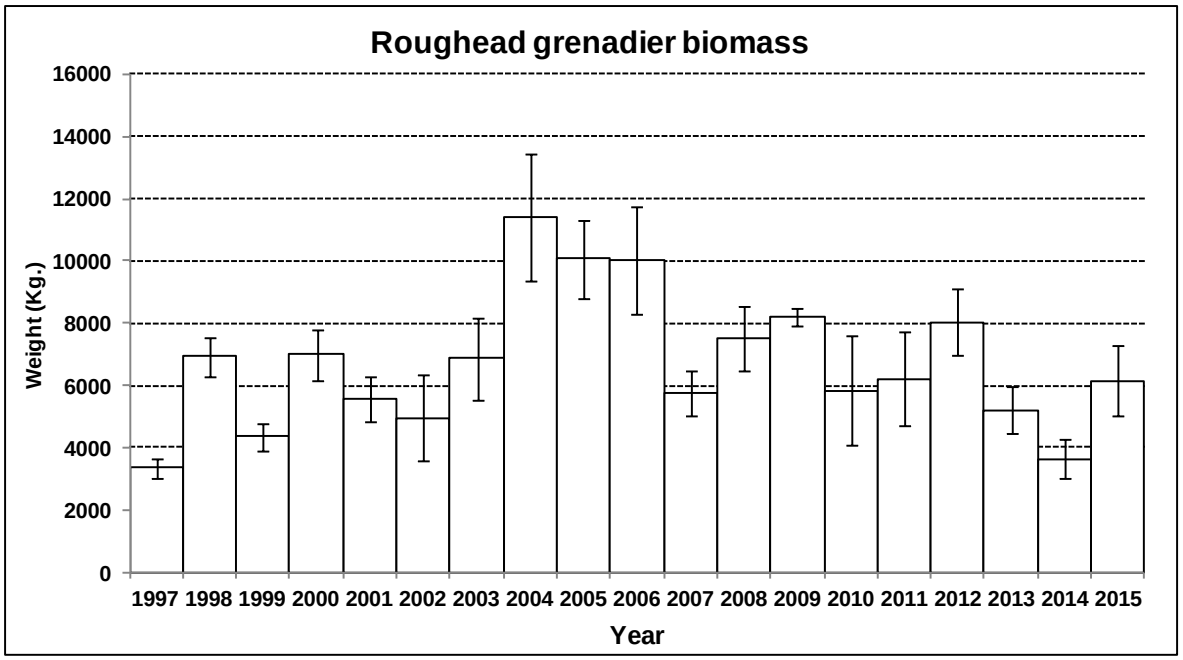

Fig. 3. Roughhead grenadier biomass calculated by the swept area method in tons and ±SD by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2015.

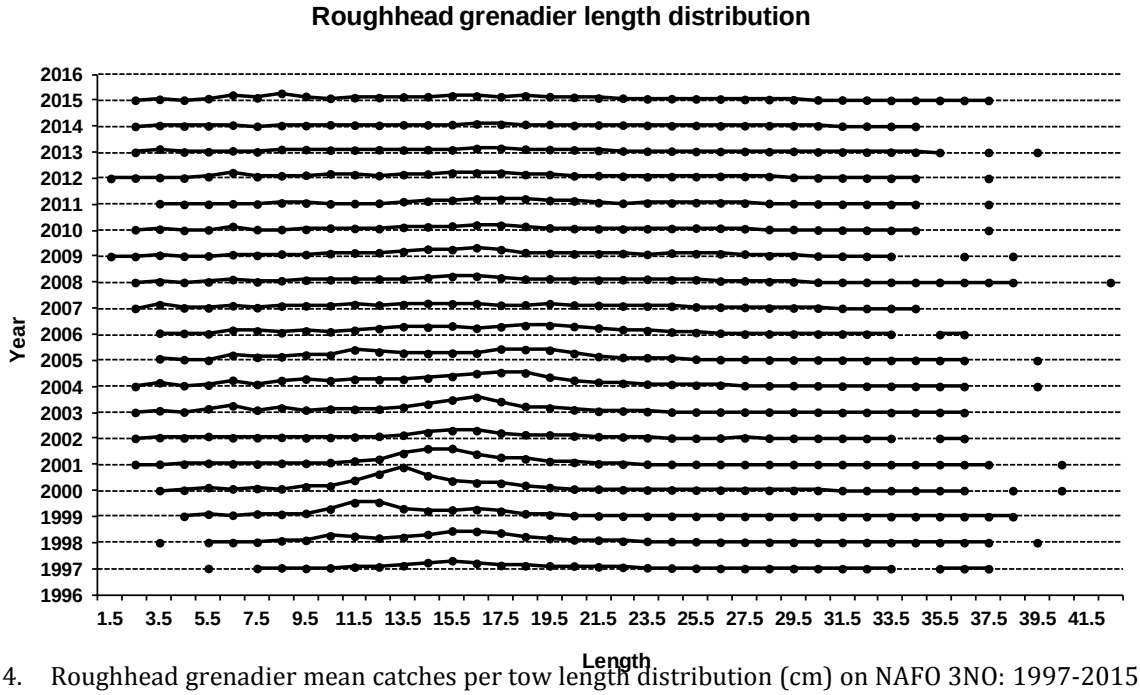

Fig. 4. Roughhead grenadier mean catches per tow length distribution (cm) on NAFO 3NO: 1997-2015. Data from 2011 to 2015 are in Table 8; data for 1997-2010 can be seen in SCR Doc 13/12.

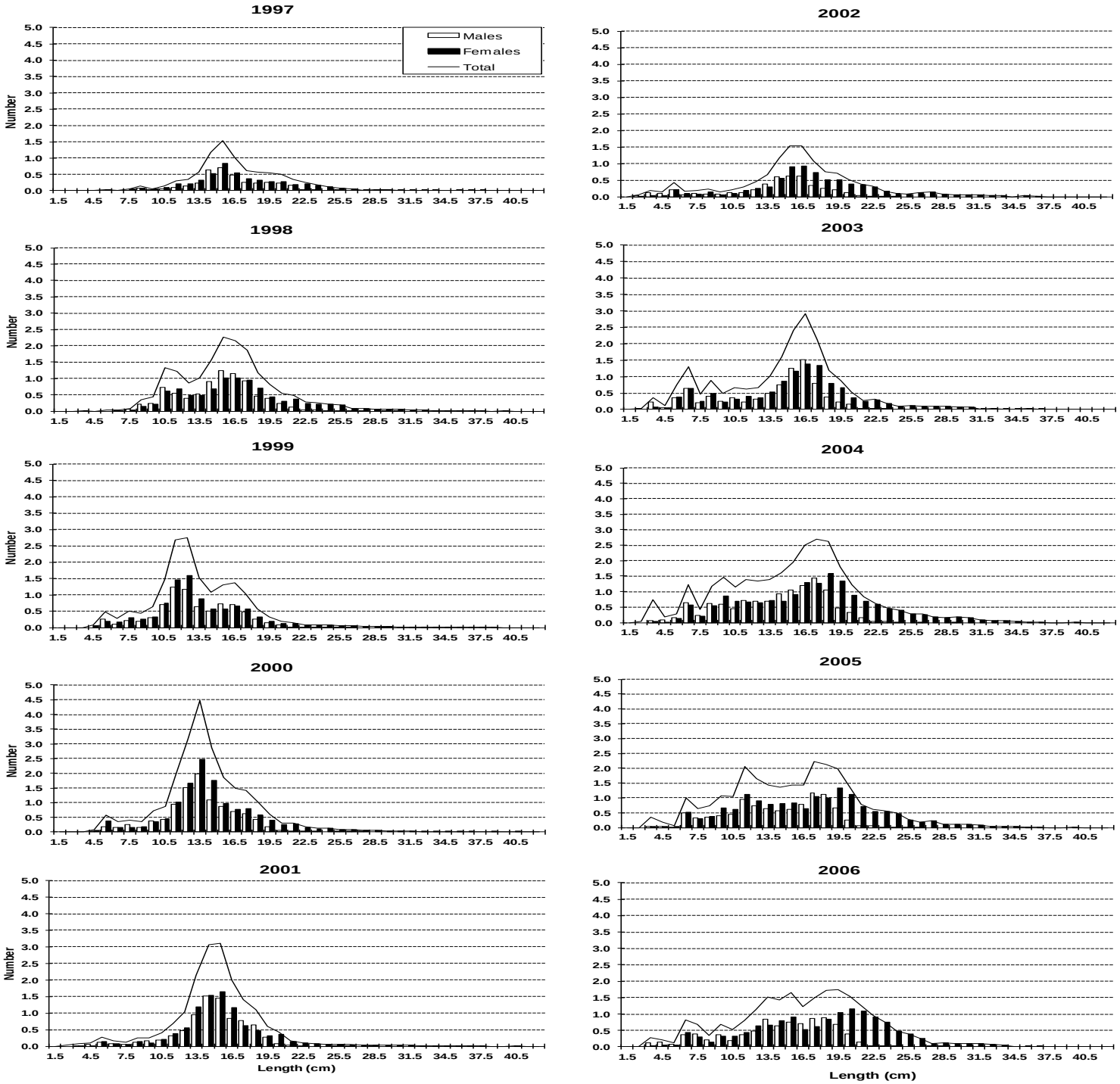

Fig. 5. Roughhead grenadier length distribution (cm) on NAFO 3NO: 1997-2015. Mean catches per tow number. Data from 2010 to 2015 are in Table 8; data for 1997-2010 can be seen in SCR Doc 13/12.

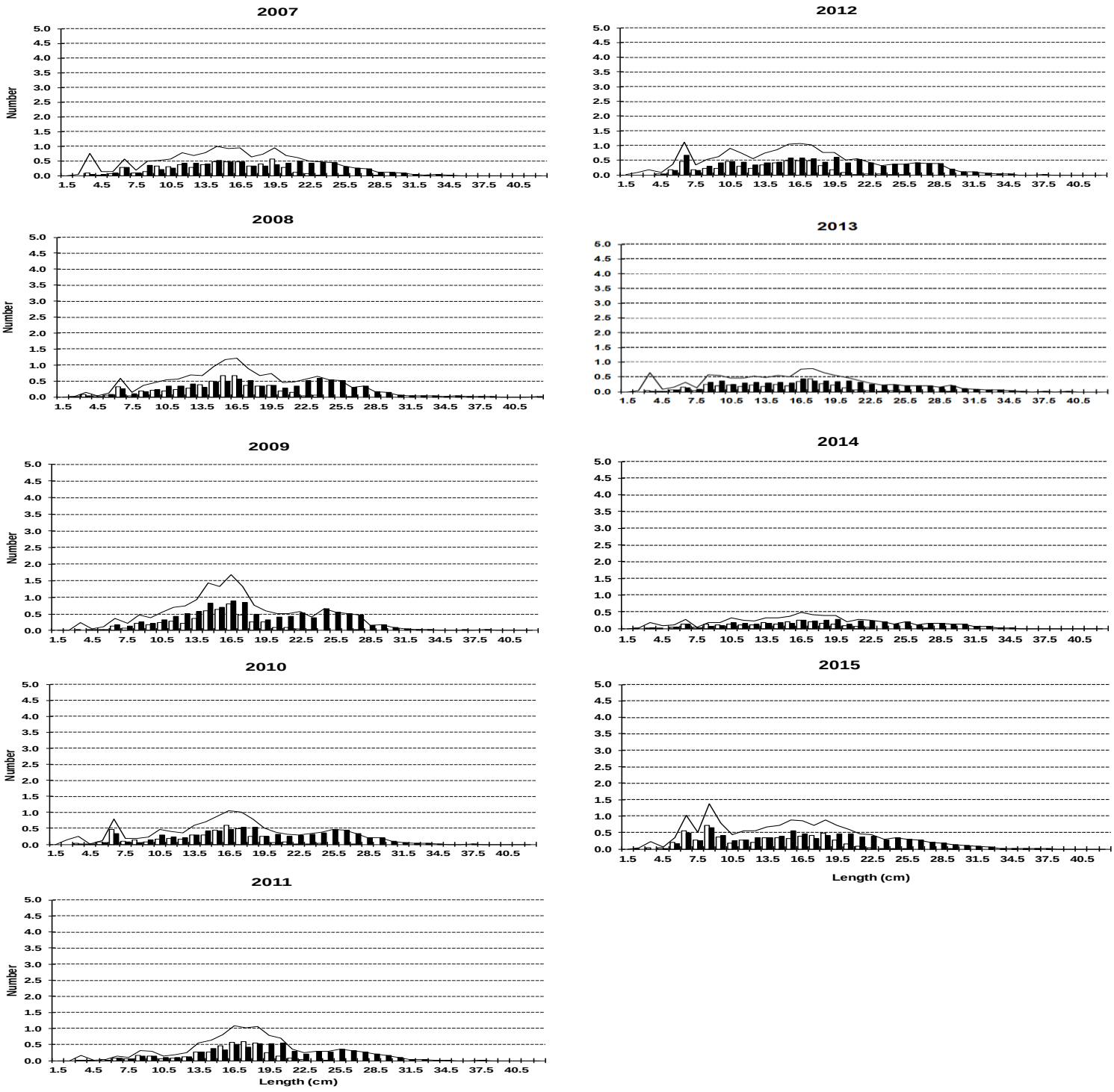

Fig. 5 (cont.). Roughhead grenadier length distribution (cm) on NAFO 3NO: 1997-2015. Mean catches per tow number. Data from 2011 to 2015 are in Table 8; data for 1997-2010 can be seen in SCR Doc 13/12.

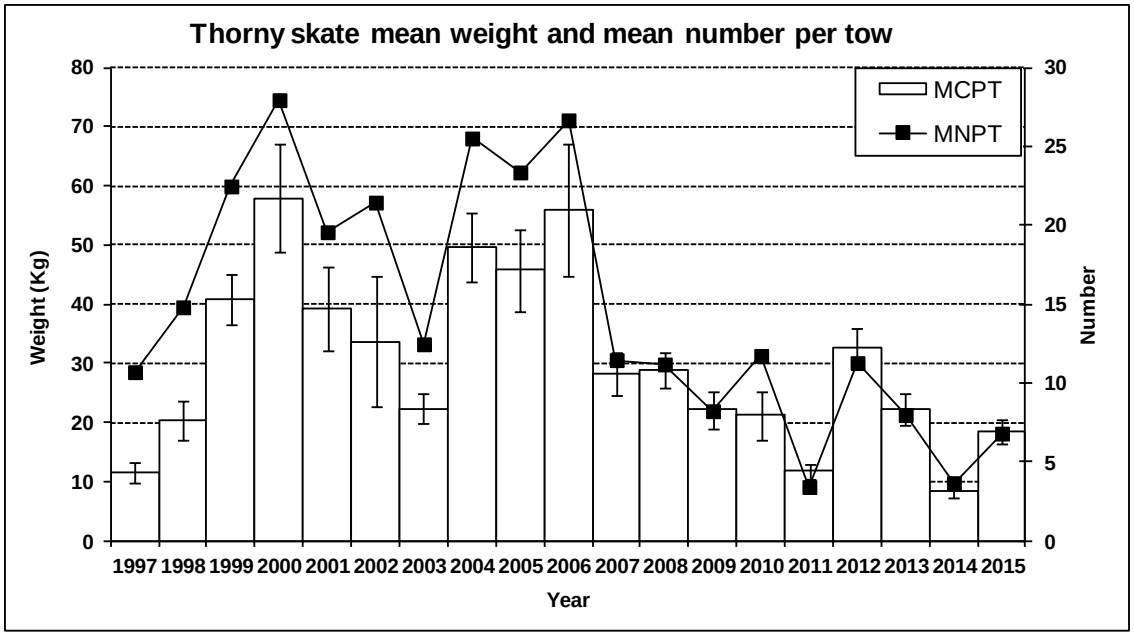

Fig. 6. Thormy skate stratified mean catches in Kg and ±SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2015.

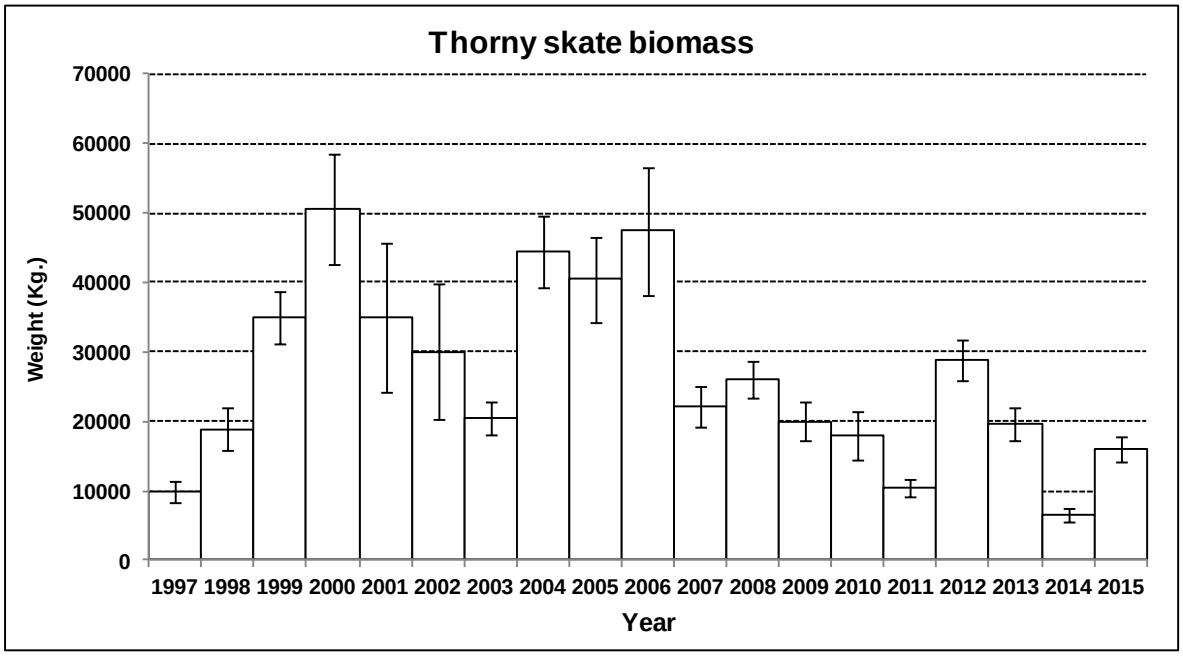

Fig. 7. Thorny skate biomass calculated by the swept area method in tons and ±SD by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2015.

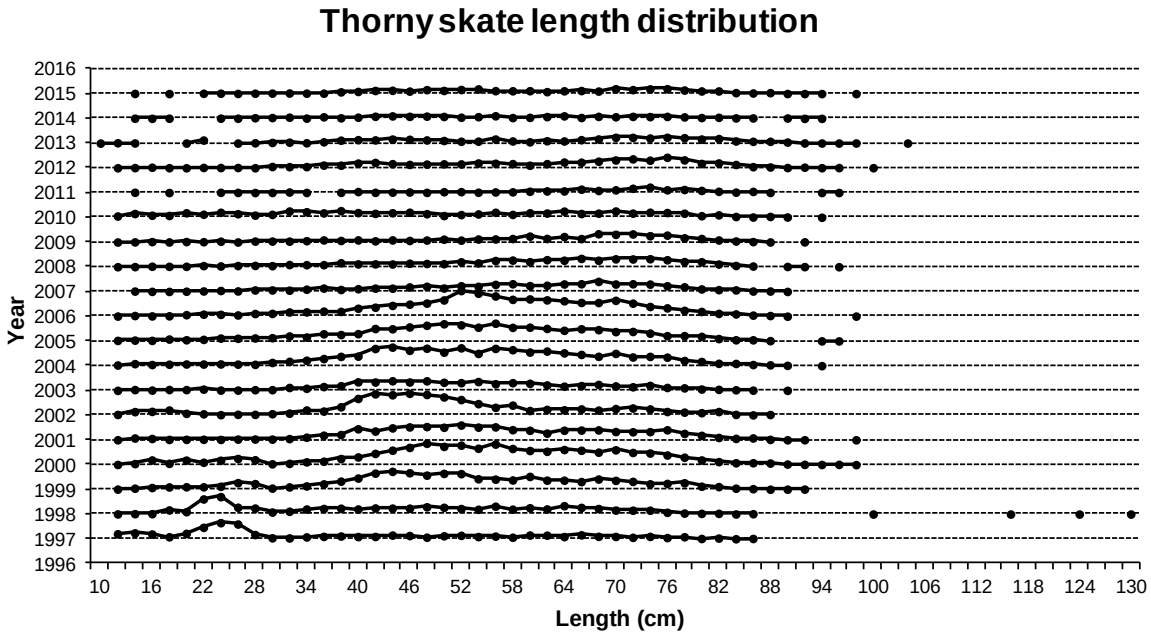

Fig. 8. Thorny skate mean catches per tow length distribution (cm) on NAFO 3NO: 1997-2015. Data from 2011 to 2015 are in Table 14; data for 1997-2010 can be seen in SCR Doc 13/12.

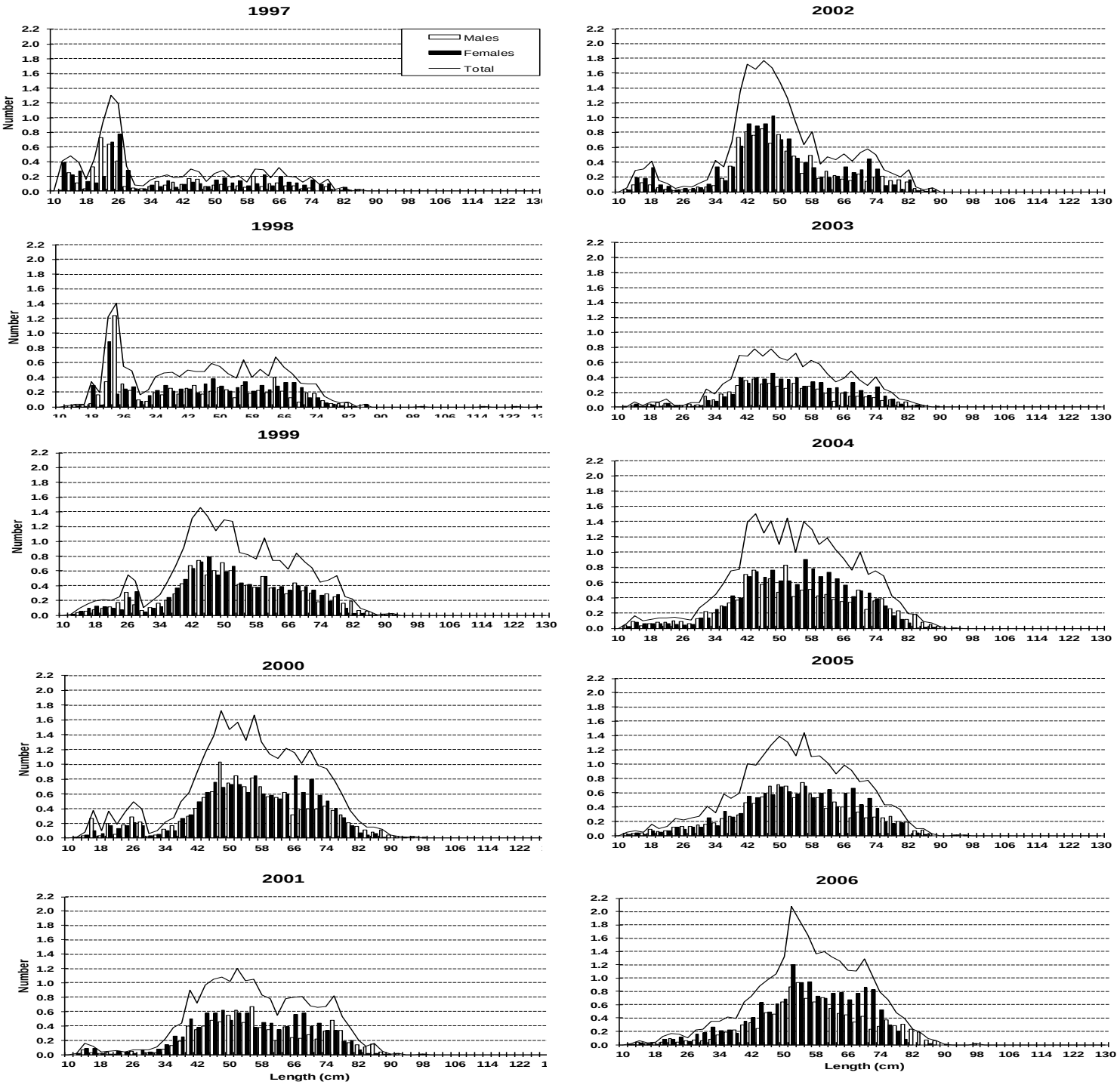

Fig. 9. Thorny skate length distribution (cm) on NAFO 3NO: 1997-2015. Mean catches per tow number. Data from 2011 to 2015 are in Table 14; data for 1997-2010 can be seen in SCR Doc 13/12.

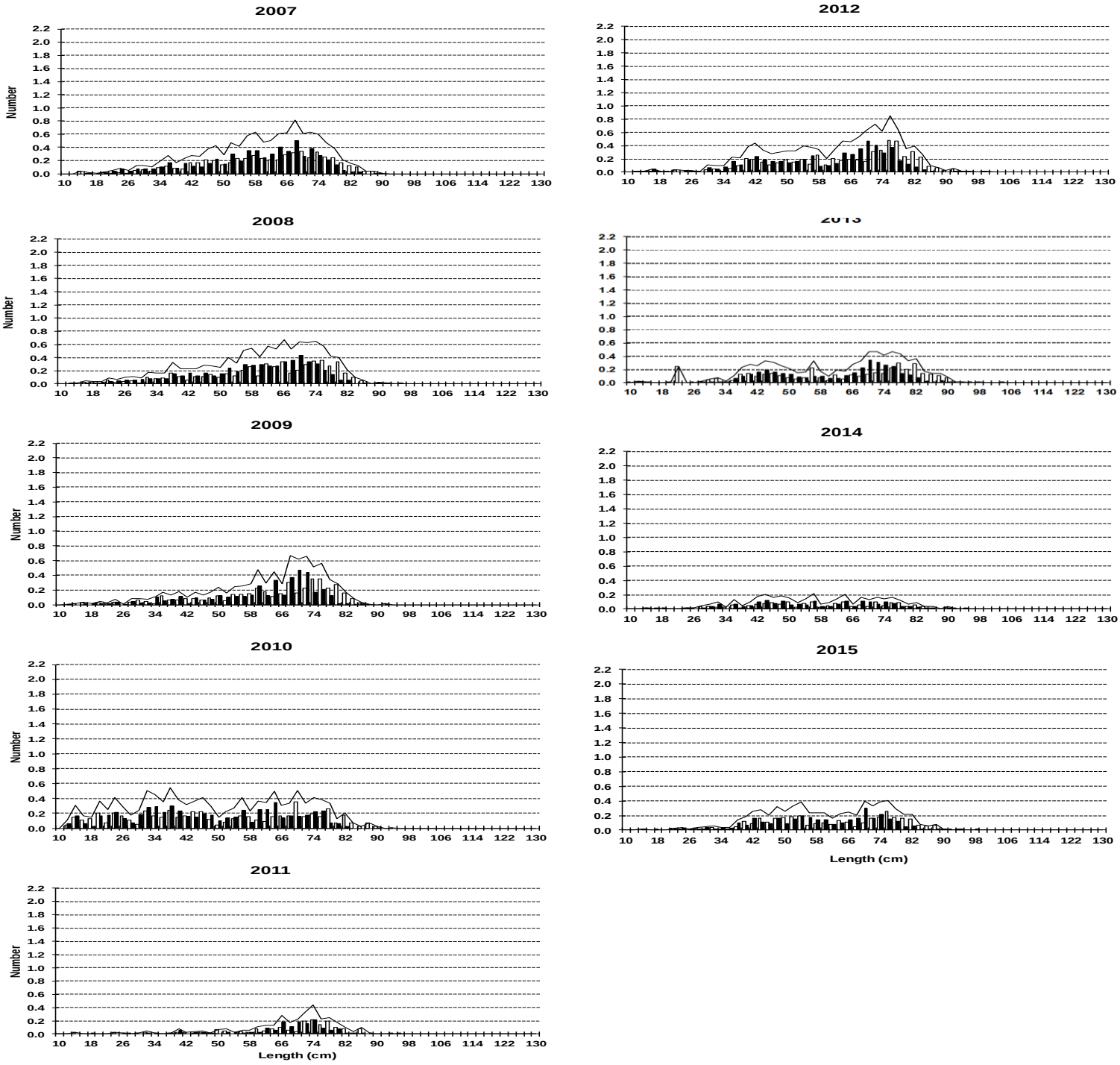

Fig. 9 (cont.). Thorny skate length distribution (cm) on NAFO 3NO: 1997-2015. Mean catches per tow number. Data from 2011 to 2015 are in Table 8; data for 1997-2010 can be seen in SCR Doc 13/12.

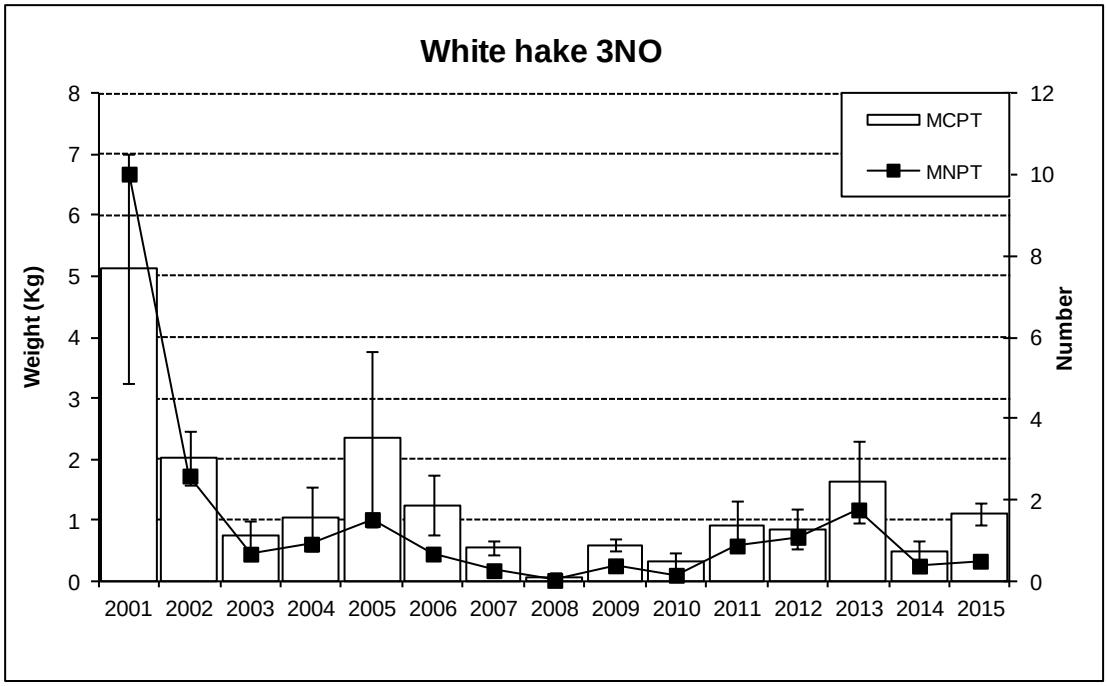

Fig. 10. White hake stratified mean catches in Kg and ±SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 2001-2015.

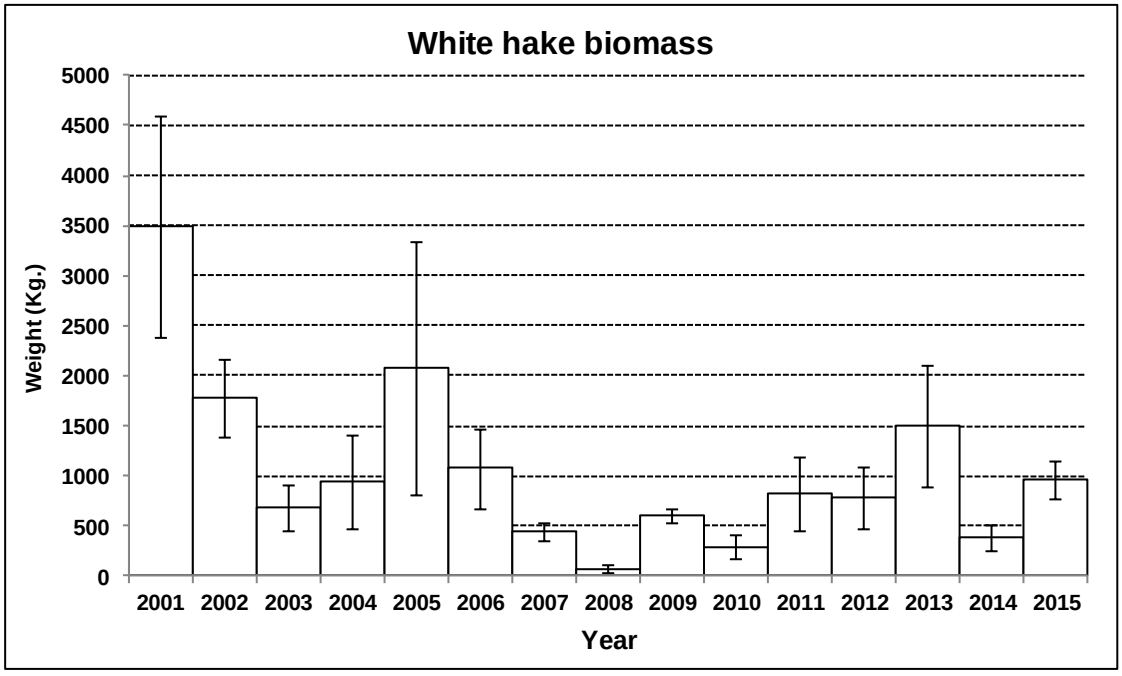

Fig. 11. White hake biomass calculated by the swept area method in tons and ±SD by year. Spanish Spring surveys in NAFO Div. 3NO: 2001-2015.

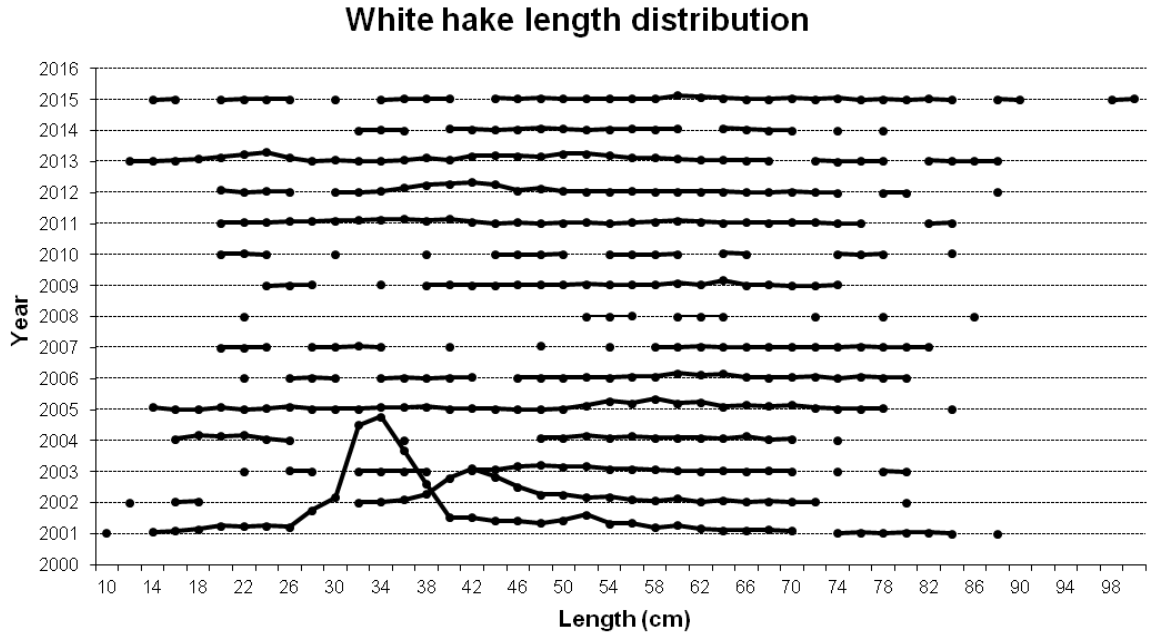

Fig. 12. White hake mean catches per tow length distribution (cm) on NAFO 3NO: 2001-2015. Data from 2011 to 2015 are in Table 20; data for 2001-2010 can be seen in SCR Doc 13/12.

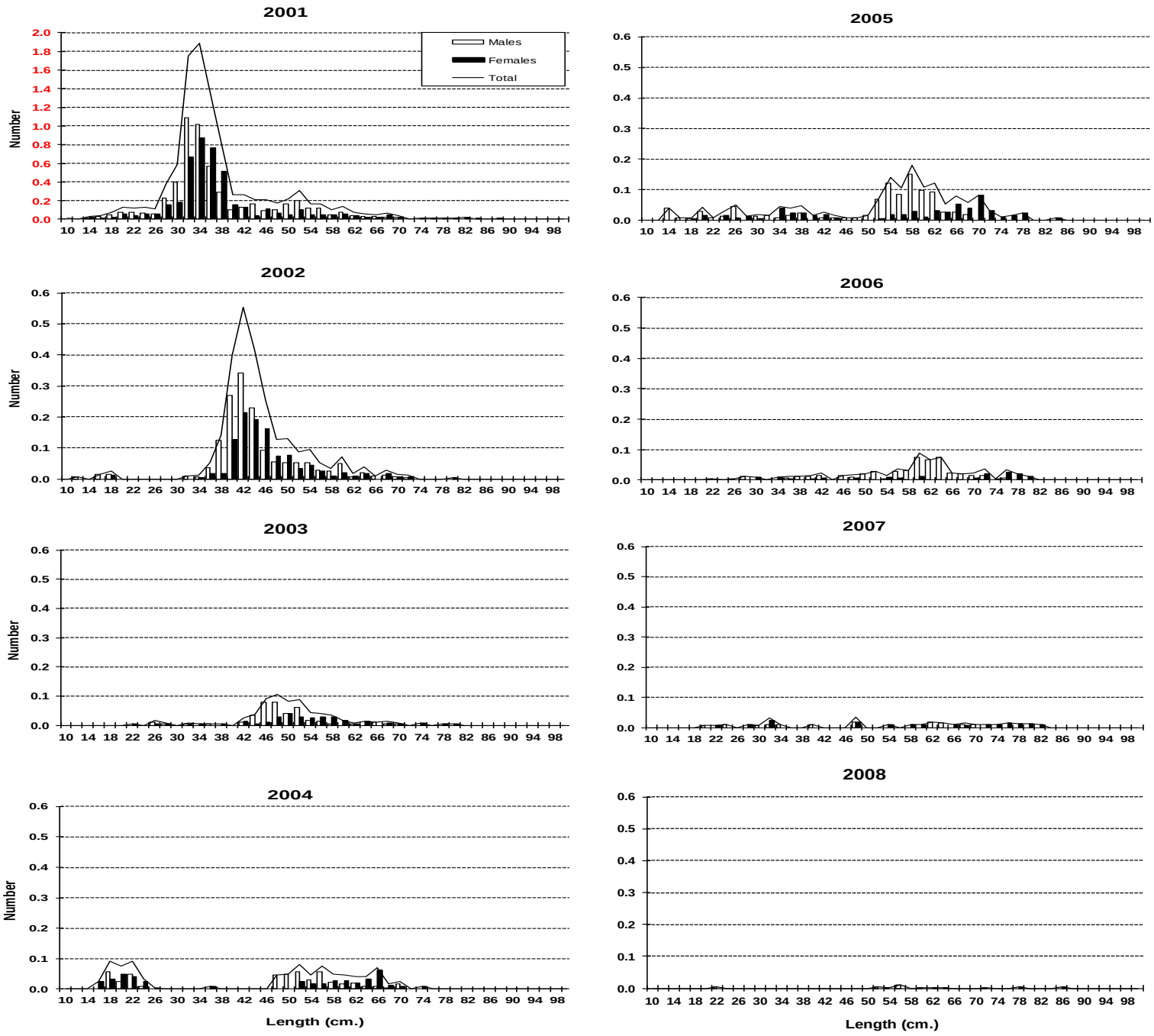

Fig. 13. White hake length distribution (cm) on NAFO 3NO: 2001-2015. Mean catches per tow number. Data from 2011 to 2015 are in Table 20; data for 2001-2010 can be seen in SCR Doc 13/12.

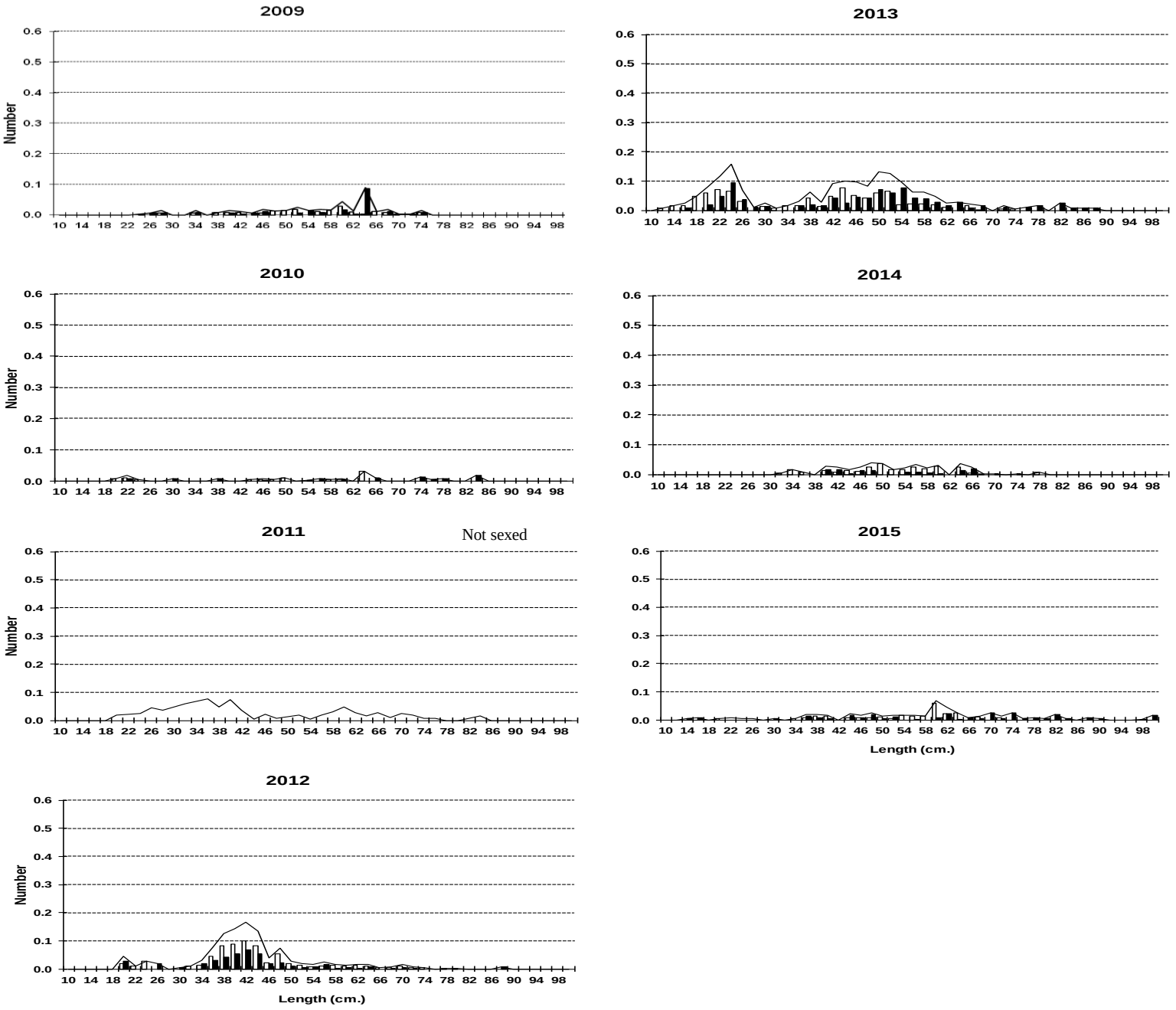

Fig. 13. White hake length distribution (cm) on NAFO 3NO: 2001-2015. Mean catches per tow number. Data from 2011 to 2015 are in Table 20; data for 2001-2010 can be seen in SCR Doc 13/12.