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Biomass and length distribution for roughhead grenadier, thorny skate, white hake, squid and capelin 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 1997-2019 and for white hake for the period 2001-2019. The length distribution is presented as numbers per haul stratified mean catches for the last five years (2015-2019). The roughhead grenadier indices showed no discernible trend during the whole series, reaching a maximum in 2004 and a minimum in 2019. In 2017 and 2018, a quite good presence of small and medium lengths (1.5-19.5 cm) can be seen. Thorny skate indices follow a large oscillating trend, dropping in 2007 and has been since then more or less stables at a low level, reaching the minimum of the series by far in 2019. In 2017 there is a discrete presence of length between 12 and 18 cm. White hake indices were highest in 2001 and then showed an overall decreasing trend until 2008 with low values, generally increasing since then with some fluctuations. The 2019 biomass is the second lowest of the period studied. Small recruitment events were detected in 2004, 2012 and 2013, with individuals between 16-26 cm. In 2017 the highest numbers are at small lengths, between 20 and 24 cm, being around 34 cm in 2018. In 2019, the mode is around 8 cm. The estimated biomass of squid is inconstant and very low in general. There were no catches of squid during the 2002 and 2013-2015 surveys. In 2018 and 2019, a step increase in biomass was observed during the survey, being 5.5 and 7 times, respectively, the third value of the series in 2011. Length samples were taken in 2011, 2017 and 2019. The lengths range between 3.5 and 19 cm. Capelin biomass reached a maximum in 2012, decreasing sharply since then until 2017. In 2018 the index increased to a level similar to that in the early 2000s, decreasing slightly in 2019.

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 Mendiña*, 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*. For more details about the technical specifications of the surveys, see Walsh *et al.* (2001) and González Troncoso *et al.* (2004).

The number of valid tows, the depth strata covered and survey dates for the period 1997-2019 are shown in Table 1. The swept area and number of hauls by stratum for the last five years (2015-2019) are presented in Table 2. To know the results of the rest of the years, see González-Troncoso *et al.* (2015).



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. Measures of squid are of the total body in 0.5 cm intervals to the inferior 0.5 cm. For capelin, only total biomass is presented as length distributions have not been processed yet. This paper presents the 1997-2019 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. Squid and capelin indices are presented since 2002 as no calibration has been made for these species.

The indices are presented for each species but squid and capelin transformed until 2000 and no-transformed for the period 2002-2019. 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 2015-2019. To see the results of the rest of the years, see González-Troncoso *et al.* (2015). For 2001, there are both transformed data from C/V *Playa de Mendiña* 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.* (2004).

In the case of squid, only total biomass and length distribution in total numbers (abundance) are presented for 2002-2019. For capelin, only biomass is presented for 2002-2019.

Figure 1 presents the maps with the distribution of the catches of the four species during the 2019 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. Although the indices are variable across the whole time series, there is a general decrease over the past decade with the exception of the Canadian 2J3K survey, which has increased. Fishing mortality indices have remained at low levels since 2005. An increase in the abundance of small sized fish (less than 10 cm) after 2010 until 2018 can be observed in the surveys (NAFO, 2019a).

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 2015-2019. Total biomass and stratified mean catches and SD by year are presented in Table 5 for 1997-2019. 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. The three lowest values were found in the last four years, being the 2019 value the lowest by far of the series. Same trend was found for mean catches (Table 5; Figures 2 and 3).

Length Distribution

Table 7 and Figures 4 and 5 present the mean number for 1997-2019, and Table 8 the same index by length besides the sampled size and catch for the period 2015-2019. 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. Some recruitment signal appears in recent years, although all the length classes were poor, specially the largest. In 2017 and 2018, a quite good presence of small and medium lengths (1.5-19.5 cm) can be seen, but in 2019 all the length ranges

are very poor, following the drop of the biomass and abundance (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 of this stock has been increasing very slowly from low levels since the mid-1990s (NAFO, 2019a).

Mean Catches and Biomass

Mean catch and SD per stratum are presented in Table 9 for 2015-2019, 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 2015-2019 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 low level, reaching the minimum of the series by far in 2019 (Table 11; Figures 6 and 7).

Length Distribution

Total mean number per tow by year for the period 1997-2019 is shown in Table 13 and Figure 8. Length distribution by sex and year, sample size and catch for the period 2015-2019 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 2017. 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, although in 2017 there is a discrete presence of length between 12 and 18 cm. In 2019 all the length ranges are very poor, following the drop of the biomass and abundance. 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 remained variable but lower. No large recruitments (<27 cm) have been observed since 2000. Fishing mortality is low (NAFO, 2019a).

Mean catches and biomass

Mean catch and SD per stratum are presented in Table 15 for years 2015-2019. 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 2001-2019. 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 2015-2019 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 with some fluctuations. The 2019 biomass is the second lowest of the period studied (Table 17; Figures 10 and 11).

Length distribution

Table 19 presents the mean number per tow by year for 2001-2019. 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 2015-2019. White hake was not sexed in 2011 and in 2017.

Individuals within the length range 30-38 cm were very abundant in 2001 and can be followed the following years, but by 2006 can hardly be seen. A small recruitment events were detected in 2004, 2012 and 2013, with individuals between 16-26 cm. Some smaller individuals, between 8 and 12 cm, were presented in 2018 and 2019. 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. In 2017 the highest numbers are at relatively small lengths, between 20 and 24 cm, being around 34 cm in 2018. In 2019, the mode is around 8 cm. The mean number presents the same trend as the mean catch (Figures 12 and 13).

Squid

The species has a lifespan of less than one year and is considered a single stock. Since 1999, there has been no directed fishery in Subarea 4 and there were no catches in Subarea 3 during 2013-2015. The highest catch since 1999 occurred during 2006, when 20.5% (6 982 t) of the current quota of 34 000 t was harvested, but since 2007 only 0.04% to 2.1% of the quota has been harvested each year. Overall, biomass indices for the Div. 4VWX surveys, as well as the Div. 4T and Div. 3M surveys were at or near the lowest values for each time series during 2013-2015. During 2017 and 2018, biomass indices for Div. 4T increased and reached the second highest level in the time series in 2018. Although the Div. 4VWX biomass index was unknown for 2018, the 2019 biomass index was the second highest level in the time series. Trends in fishery and research vessel survey data indicate that a period of high productivity (1976-1981) occurred in Subareas 3+4 between two low productivity periods (1970-1975 and 1982-2017). (NAFO, 2019b).

Biomass

The estimated biomass of squid during the survey is shown in Table 21 and Figure 14, and is inconstant and very low in general. There were no catches of squid during the 2002 and 2013-2015 surveys, and in 2016 an unique catch of 8 grams in one haul led to a total biomass of 36 Kg. Before 2018, the highest biomasses are in 2004 and 2011. In 2018 and 2019, a step increase in biomass was observed during the survey, being 5.5 and 7 times, respectively, the third value of the series in 2011.

Length distribution

Table 22 and Figure 15 present the total abundance in thousands for the years in which sampled were taken, 2011, 2017 and 2019. The lengths range between 3.5 and 19 cm. The mode in 2011 was in 14 cm, in 12 cm in 2017 and 9 in 2019.

Capelin

The fishery for capelin started in 1971 and catches were high in the mid-1970s with a maximum catch of 132 000 t in 1975. The stock has been under a moratorium to directed fishing since 1992. No catches have been reported from 1993 to 2013. Small catches (mostly discards) started appearing from 2014 to 2018, with an exception of 2015. Trawl acoustic surveys of capelin on the Grand Bank previously conducted by Russia and Canada on a regular basis have not been repeated since 1995. Available indicators of stock dynamics currently include the capelin biomass index from Canadian and EU spring stratified-random bottom trawl surveys. The Canadian survey index varied greatly from 1995-2018 without any clear trend, however, four of the highest values have been observed in the most recent ten years of the time series (NAFO, 2019b).

Biomass

The estimated biomass of capelin during the survey is shown in Table 23 and Figure 16. With the exception of some years, the biomass of this species shows an increasing trend until 2012, when the maximum of the series was reached. From 2015 to 2017, biomass sharply declined. In 2018 the index increased to a level similar to that in the early 2000s, decreasing slightly in 2019.

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Table 1. Spanish spring bottom trawl surveys in NAFO Div. 3NO: 1997-2019

Year	Vessel	Valid tows	Depth strata covered (m)	Dates
1997	C/V <i>Playa de Mendiúña</i>	128	42-1263	April 26-May 18
1998	C/V <i>Playa de Mendiúña</i>	124	42-1390	May 06-May 26
1999	C/V <i>Playa de Mendiúña</i>	114	41-1381	May 07-May 26
2000	C/V <i>Playa de Mendiúña</i>	118	42-1401	May 07-May 28
2001 ^(*)	R/V <i>Vizconde de Eza</i>	83	36-1156	May 03-May 24
	C/V <i>Playa de Mendiúña</i>	121	40-1500	May 05-May 23
2002	R/V <i>Vizconde de Eza</i>	125	38-1540	April 29-May 19
2003	R/V <i>Vizconde de Eza</i>	118	38-1666	May 11-June 02
2004	R/V <i>Vizconde de Eza</i>	120	43-1539	June 06-June 24
2005	R/V <i>Vizconde de Eza</i>	119	47-1485	June 10-June 29
2005	R/V <i>Vizconde de Eza</i>	119	47-1485	June 10-June 29
2006	R/V <i>Vizconde de Eza</i>	120	45-1480	June 7-June 27
2007	R/V <i>Vizconde de Eza</i>	110	45-1374	May 29-June 19
2008	R/V <i>Vizconde de Eza</i>	122	45-1374	May 27-June 16
2009	R/V <i>Vizconde de Eza</i>	109	45-1374	May 31-June 18
2010	R/V <i>Vizconde de Eza</i>	95	45-1374	May 30-June 18
2011	R/V <i>Vizconde de Eza</i>	122	44-1450	June 5-June 24
2012	R/V <i>Vizconde de Eza</i>	122	44-1450	June 3-June 21
2013	R/V <i>Vizconde de Eza</i>	122	44-1450	June 1-June 21
2014	R/V <i>Vizconde de Eza</i>	122	44-1450	June 2-June 21
2015	R/V <i>Vizconde de Eza</i>	122	44-1450	May 31-June 19
2016	R/V <i>Vizconde de Eza</i>	115	44-1450	May 30-June 18
2017	R/V <i>Vizconde de Eza</i>	113	44-1450	May 23-June 11
2018	R/V <i>Vizconde de Eza</i>	114	44-1450	June 2-June 21
2019	R/V <i>Vizconde de Eza</i>	115	44-1450	June 8-June 24

(*) A total of 83 hauls from the R/V *Vizconde de Eza* and 40 hauls from the C/V *Playa de Mendiúña* (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: 2015-2019. Swept area in square miles. n.s. means stratum not surveyed.

Stratum	2015		2016		2017		2018		2019	
	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number
353	0.0401	3	0.0356	3	0.0360	3	0.0338	3	0.0386	3
354	0.0390	3	0.0345	3	0.0356	3	0.0341	3	0.0383	3
355	0.0263	2	0.0233	2	0.0225	2	0.0233	2	0.0263	2
356	0.0255	2	0.0225	2	0.0233	2	0.0225	2	0.0248	2
357	0.0233	2	0.0233	2	0.0233	2	0.0236	2	0.0251	2
358	0.0349	3	0.0338	3	0.0364	3	0.0345	3	0.0383	3
359	0.0855	7	0.0593	5	0.0596	5	0.0589	5	0.0634	5
360	0.2363	20	0.1995	17	0.2044	17	0.1939	17	0.2213	17
374	0.0229	2	0.0233	2	0.0236	2	0.0225	2	0.0255	2
375	0.0341	3	0.0360	3	0.0364	3	0.0356	3	0.0383	3
376	0.1159	10	0.0945	8	0.0975	8	0.0908	8	0.1043	8
377	0.0233	2	0.0233	2	0.0251	2	0.0233	2	0.0263	2
378	0.0225	2	0.0225	2	0.0236	2	0.0229	2	0.0259	2
379	0.0225	2	0.0229	2	0.0244	2	0.0225	2	0.0263	2
380	0.0229	2	0.0236	2	0.0236	2	0.0225	2	0.0263	2
381	0.0236	2	0.0229	2	0.0229	2	0.0225	2	0.0255	2
382	0.0458	4	0.0465	4	0.0360	3	0.0450	4	0.0645	5
721	0.0240	2	0.0225	2	0.0229	2	0.0229	2	0.0263	2
722	0.0259	2	0.0229	2	0.0233	2	0.0236	2	0.0255	2
723	0.0233	2	0.0225	2	0.0229	2	0.0240	2	0.0248	2
724	0.0236	2	0.0233	2	0.0240	2	0.0233	2	0.0244	2
725	0.0229	2	0.0229	2	0.0244	2	0.0233	2	0.0255	2
726	0.0229	2	0.0225	2	0.0233	2	0.0225	2	0.0259	2
727	0.0225	2	0.0225	2	0.0229	2	0.0225	2	0.0248	2
728	0.0225	2	0.0229	2	0.0229	2	0.0225	2	0.0248	2
752	0.0225	2	0.0236	2	0.0236	2	0.0233	2	0.0266	2
753	0.0233	2	0.0229	2	0.0233	2	0.0236	2	0.0248	2
754	0.0225	2	0.0225	2	0.0218	2	0.0225	2	0.0240	2
755	0.0450	4	0.0458	4	0.0338	3	0.0338	3	0.0356	3
756	0.0229	2	0.0225	2	0.0229	2	0.0229	2	0.0251	2
757	0.0229	2	0.0225	2	0.0225	2	0.0225	2	0.0263	2
758	0.0221	2	0.0221	2	0.0229	2	0.0225	2	0.0259	2
759	0.0229	2	0.0229	2	0.0225	2	0.0225	2	0.0251	2
760	0.0225	2	0.0229	2	0.0236	2	0.0356	3	0.0255	2
761	0.0240	2	0.0225	2	0.0236	2	0.0124	1	0.0236	2
762	0.0229	2	0.0225	2	0.0229	2	0.0225	2	0.0255	2
763	0.0341	3	0.0338	3	0.0353	3	0.0345	3	0.0383	3
764	0.0251	2	0.0225	2	0.0229	2	0.0225	2	0.0248	2
765	0.0236	2	0.0229	2	0.0225	2	0.0233	2	0.0251	2
766	0.0236	2	0.0229	2	0.0225	2	0.0229	2	0.0248	2
767	0.0229	2	0.0229	2	0.0229	2	0.0236	2	0.0244	2

Table 3. Roughhead grenadier mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2015-2019. n.s. means stratum not surveyed.

Stratum	2015		2016		2017		2018		2019	
	R. grenadier	R. grenadier	R. grenadier	R. grenadier	R. grenadier	R. grenadier	R. grenadier	R. grenadier	R. grenadier	R. grenadier
	Mean catch	SD	Mean catch	SD	Mean catch	SD	Mean catch	SD	Mean catch	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	1.54	2.18	0.00	0.00	0.00	0.00
356	2.10	2.96	0.00	0.00	0.00	0.00	1.93	2.72	0.00	0.00
357	0.00	0.00	0.15	0.21	3.49	4.93	0.00	0.00	0.00	0.00
358	2.35	4.07	0.17	0.30	0.00	0.00	0.00	0.00	0.00	0.00
359	0.00	0.00	0.15	0.33	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	0.48	0.67	0.00	0.00	0.00	0.00
375	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.04	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	0.27	0.38	0.00	0.00
378	0.00	0.00	0.00	0.00	0.61	0.86	0.00	0.00	0.00	0.00
379	22.58	9.07	0.21	0.30	8.13	1.36	4.76	5.08	1.76	1.98
380	36.10	31.54	6.57	3.59	4.81	0.77	0.73	1.03	1.26	1.77
381	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.15	0.05	0.07
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	0.14	0.14	0.00	0.00	0.00	0.00	0.00	0.00
722	0.51	0.71	4.42	6.25	8.02	6.63	1.18	0.66	1.15	1.58
723	7.93	2.71	2.84	0.21	5.12	0.73	5.87	4.16	2.19	1.85
724	6.54	1.71	5.10	5.80	12.86	7.21	8.04	4.79	2.56	1.46
725	9.30	6.60	2.49	3.13	8.79	0.75	3.37	0.05	7.57	6.50
726	25.39	10.25	17.60	0.70	35.04	19.75	3.23	0.48	15.67	8.95
727	18.25	1.63	14.56	0.08	44.61	40.36	9.84	1.05	4.04	4.57
728	11.77	5.89	9.09	8.36	32.66	12.46	4.00	0.96	3.62	1.90
752	13.77	12.40	20.91	14.29	27.20	21.78	10.64	4.21	2.07	2.92
753	45.20	56.99	15.80	12.45	50.63	42.67	11.99	10.87	5.48	7.37
754	76.89	79.08	16.52	3.71	19.53	5.06	14.66	3.34	11.00	1.28
755	16.99	4.27	27.80	19.78	18.68	7.77	18.77	11.22	1.14	0.60
756	21.23	11.51	21.56	28.30	10.57	13.69	28.86	18.32	2.96	0.18
757	37.72	6.48	21.56	23.38	46.57	39.92	47.46	61.25	7.44	2.90
758	34.28	23.08	15.21	0.70	32.20	1.20	23.03	5.41	0.32	0.45
759	26.20	15.70	4.98	2.12	17.30	4.45	6.66	4.43	4.05	4.13
760	12.34	0.58	1.44	0.45	17.56	9.28	5.78	2.14	1.45	2.05
761	24.92	31.85	19.13	18.88	69.47	38.98	8.17	-	2.98	0.02
762	24.98	12.90	6.29	3.19	11.36	13.44	5.51	3.75	1.56	2.20
763	10.69	8.97	6.15	2.51	18.05	11.17	13.14	3.15	4.60	1.64
764	4.19	5.92	0.45	0.36	1.36	1.12	1.18	1.39	0.02	0.03
765	1.20	1.59	0.28	0.13	8.15	7.46	7.79	4.13	0.12	0.11
766	0.74	0.12	0.89	1.24	1.96	2.00	0.27	0.38	0.01	0.01
767	0.66	0.93	0.75	0.14	1.78	1.58	3.28	3.97	0.00	0.00

Table 4. Roughhead grenadier survey biomass (t) by stratum in NAFO Div. 3NO: 2015-2019. n.s. means stratum not surveyed.

Strata	2015	2016	2017	2018	2019	Strata	2015	2016	2017	2018	2019
353	0	0	0	0	0	725	85	23	76	30	62
354	0	0	0	0	0	726	160	113	217	21	87
355	0	0	0	0	0	727	150	124	374	84	31
356	8	0	0	8	0	728	82	62	223	28	23
357	0	2	2	0	0	752	160	232	302	120	20
358	46	3	3	0	0	753	537	191	601	140	61
359	0	5	5	0	0	754	1230	264	323	235	165
360	0	0	0	0	0	755	581	936	639	642	37
374	0	0	0	0	0	756	187	194	93	255	24
375	0	0	0	1	0	757	336	196	422	430	58
376	0	0	0	0	0	758	307	136	279	203	2
377	0	0	0	2	0	759	291	55	195	75	41
378	0	0	0	0	0	760	169	19	229	75	18
379	213	2	2	45	14	761	355	291	1006	113	43
380	303	53	53	6	9	762	463	119	210	104	26
381	0	0	0	1	1	763	245	143	401	298	94
382	0	0	0	0	0	764	33	4	12	10	0
721	0	1	1	0	0	765	13	3	90	83	1
722	3	32	32	8	8	766	9	11	25	3	0
723	106	39	39	76	27	767	9	10	25	44	0
724	69	54	54	86	26						

Table 5. Roughhead grenadier survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by in NAFO Div. 3NO: 1997-2019.

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Biomass	3340	6922	4357	7000	5568	4968	6860	11402	10064	10010	5760	7521
SD	290	644	431	807	700	1365	1316	2043	1236	1716	695	1028
MCPT	3.81	7.05	4.53	7.08	5.73	5.46	7.40	12.09	11.10	11.11	6.93	7.93
SD	0.31	0.61	0.45	0.85	0.77	1.51	1.42	2.17	1.38	1.89	0.83	1.11

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Biomass	8193	5850	6219	8027	5220	3622	6149	3318	5935	3227	879
SD	286	1773	1508	1073	753	628	1134	496	750	488	105
MCPT	9.15	6.97	6.82	8.59	5.81	4.08	6.79	3.65	6.90	3.57	1.06
SD	0.40	2.10	1.61	1.18	0.85	0.70	1.25	0.54	0.84	0.54	0.13

Table 6. Roughhead grenadier length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2015-2019. 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
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
2017	0.10115	2.94591	0.1296	0.0527	0.994	419	0.1120	2.8977	0.0667	0.0235	0.998	714	0.1260	2.8611	0.0455	0.0163	0.999	1181
2018	0.15392	2.76705	0.10617	0.0412	0.995	337	0.1051	2.9125	0.0464	0.0162	0.999	540	0.1367	2.8250	0.0617	0.0222	0.998	893
2019	0.06572	3.08320	0.09542	0.0374	0.995	95	0.0852	2.9820	0.0605	0.0211	0.997	192	0.0890	2.9681	0.0399	0.0142	0.999	296

Table 7. Roughhead grenadier mean number per tow by year in Spanish Spring Surveys in NAFO Div. 3NO: 1997-2019. Indet. means indeterminate.

	1997				1998				1999				2000				2001				2002			
	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	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	4.352	7.622	0.090	12.063
	2003				2004				2005				2006				2007				2008			
	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	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	5.432	8.365	0.744	14.541	5.260	8.890	0.073	14.223
	2009				2010				2011				2012				2013				2014			
	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	5.072	11.265	0.372	16.709	4.238	7.705	0.367	12.310	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
	2015				2016				2017				2018				2019							
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total				
MNPT	5.672	8.919	0.246	14.837	3.420	5.185	0.283	8.888	5.618	10.304	0.849	16.770	3.161	4.869	0.162	8.192	0.606	1.209	0.074	1.890				

Table 8. Roughhead grenadier mean number per tow by length class and year. Spanish Spring Survey in NAFO 3NO: 2015-2019. Indet. means indeterminate.

Length (cm)	2015				2016				2017				2018				2019			
	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	0.000	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
2.5	0.006	0.000	0.039	0.045	0.000	0.000	0.028	0.028	0.000	0.000	0.157	0.157	0.006	0.000	0.028	0.033	0.000	0.000	0.000	0.000
3.5	0.042	0.000	0.186	0.227	0.000	0.000	0.070	0.070	0.023	0.008	0.415	0.447	0.036	0.005	0.123	0.163	0.007	0.000	0.074	0.081
4.5	0.029	0.015	0.015	0.059	0.046	0.010	0.040	0.096	0.036	0.079	0.139	0.254	0.014	0.019	0.012	0.045	0.000	0.000	0.000	0.000
5.5	0.199	0.143	0.006	0.348	0.157	0.237	0.119	0.513	0.342	0.374	0.074	0.791	0.171	0.233	0.000	0.405	0.013	0.033	0.000	0.047
6.5	0.558	0.471	0.000	1.029	0.182	0.268	0.026	0.476	0.272	0.369	0.006	0.647	0.384	0.392	0.000	0.776	0.034	0.046	0.000	0.081
7.5	0.258	0.242	0.000	0.501	0.136	0.144	0.000	0.280	0.244	0.395	0.000	0.640	0.104	0.145	0.000	0.249	0.009	0.021	0.000	0.030
8.5	0.715	0.649	0.000	1.363	0.168	0.186	0.000	0.353	0.323	0.695	0.000	1.017	0.112	0.199	0.000	0.311	0.069	0.081	0.000	0.150
9.5	0.366	0.420	0.000	0.786	0.253	0.267	0.000	0.520	0.146	0.362	0.000	0.508	0.101	0.112	0.000	0.214	0.044	0.024	0.000	0.068
10.5	0.180	0.243	0.000	0.423	0.211	0.308	0.000	0.518	0.325	0.611	0.008	0.945	0.217	0.207	0.000	0.424	0.033	0.073	0.000	0.106
11.5	0.264	0.277	0.000	0.541	0.171	0.188	0.000	0.359	0.444	0.604	0.000	1.048	0.104	0.225	0.000	0.330	0.049	0.045	0.000	0.094
12.5	0.209	0.345	0.000	0.554	0.184	0.211	0.000	0.394	0.456	0.739	0.000	1.195	0.118	0.127	0.000	0.245	0.025	0.038	0.000	0.064
13.5	0.330	0.342	0.000	0.673	0.227	0.202	0.000	0.430	0.412	0.547	0.038	0.996	0.285	0.209	0.000	0.493	0.014	0.042	0.000	0.056
14.5	0.337	0.389	0.000	0.727	0.234	0.407	0.000	0.641	0.320	0.430	0.013	0.762	0.183	0.232	0.000	0.415	0.074	0.078	0.000	0.152
15.5	0.323	0.549	0.000	0.872	0.269	0.280	0.000	0.550	0.496	0.485	0.000	0.981	0.195	0.233	0.000	0.428	0.066	0.023	0.000	0.089
16.5	0.394	0.459	0.000	0.853	0.296	0.296	0.000	0.591	0.373	0.445	0.000	0.818	0.244	0.193	0.000	0.436	0.039	0.059	0.000	0.097
17.5	0.401	0.321	0.000	0.721	0.307	0.270	0.000	0.577	0.538	0.425	0.000	0.963	0.242	0.281	0.000	0.523	0.057	0.065	0.000	0.123
18.5	0.475	0.413	0.000	0.888	0.221	0.307	0.000	0.528	0.382	0.442	0.000	0.824	0.286	0.295	0.000	0.581	0.026	0.040	0.000	0.067
19.5	0.272	0.455	0.000	0.727	0.125	0.246	0.000	0.370	0.222	0.407	0.000	0.628	0.119	0.269	0.000	0.388	0.012	0.035	0.000	0.047
20.5	0.142	0.461	0.000	0.603	0.104	0.199	0.000	0.303	0.111	0.294	0.000	0.405	0.114	0.264	0.000	0.378	0.011	0.083	0.000	0.094
21.5	0.084	0.373	0.000	0.457	0.067	0.152	0.000	0.219	0.079	0.269	0.000	0.348	0.042	0.197	0.000	0.239	0.000	0.022	0.000	0.022
22.5	0.045	0.387	0.000	0.432	0.029	0.169	0.000	0.197	0.015	0.336	0.000	0.351	0.043	0.154	0.000	0.197	0.009	0.030	0.000	0.039
23.5	0.020	0.280	0.000	0.300	0.000	0.132	0.000	0.132	0.025	0.431	0.000	0.456	0.006	0.096	0.000	0.102	0.000	0.068	0.000	0.068
24.5	0.011	0.331	0.000	0.342	0.008	0.144	0.000	0.153	0.000	0.378	0.000	0.378	0.000	0.159	0.000	0.159	0.007	0.050	0.000	0.057
25.5	0.007	0.289	0.000	0.296	0.007	0.122	0.000	0.130	0.000	0.253	0.000	0.253	0.019	0.083	0.000	0.102	0.007	0.068	0.000	0.075
26.5	0.000	0.279	0.000	0.279	0.003	0.091	0.000	0.094	0.013	0.243	0.000	0.256	0.000	0.168	0.000	0.168	0.000	0.036	0.000	0.036
27.5	0.000	0.192	0.000	0.192	0.000	0.084	0.000	0.084	0.000	0.196	0.000	0.196	0.000	0.088	0.000	0.088	0.000	0.008	0.000	0.008
28.5	0.000	0.170	0.000	0.170	0.018	0.099	0.000	0.117	0.013	0.165	0.000	0.178	0.006	0.073	0.000	0.078	0.000	0.030	0.000	0.030
29.5	0.005	0.123	0.000	0.128	0.000	0.027	0.000	0.027	0.000	0.076	0.000	0.076	0.012	0.065	0.000	0.077	0.000	0.021	0.000	0.021
30.5	0.000	0.100	0.000	0.100	0.000	0.029	0.000	0.029	0.000	0.101	0.000	0.101	0.000	0.054	0.000	0.054	0.000	0.031	0.000	0.031
31.5	0.000	0.088	0.000	0.088	0.000	0.049	0.000	0.049	0.000	0.056	0.000	0.056	0.000	0.015	0.000	0.015	0.000	0.011	0.000	0.011
32.5	0.000	0.065	0.000	0.065	0.000	0.015	0.000	0.015	0.000	0.009	0.000	0.009	0.000	0.038	0.000	0.038	0.000	0.009	0.000	0.009
33.5	0.000	0.013	0.000	0.013	0.000	0.020	0.000	0.020	0.000	0.040	0.000	0.040	0.000	0.007	0.000	0.007	0.000	0.016	0.000	0.016
34.5	0.000	0.013	0.000	0.013	0.000	0.015	0.000	0.015	0.000	0.014	0.000	0.014	0.000	0.012	0.000	0.012	0.000	0.008	0.000	0.008
35.5	0.000	0.006	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.006	0.000	0.006	0.000	0.006
36.5	0.000	0.007	0.000	0.007	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.008	0.000	0.007	0.000	0.007	0.000	0.000	0.000	0.000
37.5	0.000	0.008	0.000	0.008	0.000	0.009	0.000	0.009	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.006	0.000	0.000	0.000	0.000
38.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	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	0.005	0.000	0.005	0.000	0.000	0.000	0.000	0.000	0.009	0.000	0.009
40.5	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.000	0.013	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	5.672	8.919	0.246	14.837	3.420	5.185	0.283	8.888	5.618	10.304	0.849	16.770	3.161	4.869	0.162	8.192	0.606	1.209	0.074	1.890
N° samples:				52				56				56				54				44
N° Ind.:	877	1396	39	2312	520	809	45	1374	811	1543	136	2490	415	695	22	1132	96	191	9	296
Sampled catch:				1013				546				985				526				176
Range:				2-37.5				2.5-37				1.5-40.5				2-37.5				14305
Total catch:				1035				549				1074				531				176
Total hauls:				122				115				113				114				115

Table 9. Thorny skate mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2015-2019. n.s. means stratum not surveyed.

Stratum	2015		2016		2017		2018		2019	
	T. skate	T. skate	T. skate	T. skate	T. skate	T. skate	T. skate	T. skate	T. skate	T. skate
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
353	27.06	20.81	42.29	33.24	33.84	15.92	39.39	24.09	0.23	0.39
354	58.48	10.58	42.51	59.76	38.26	22.66	12.61	7.80	8.56	5.54
355	11.08	9.59	7.48	10.57	1.97	2.78	1.23	1.73	1.48	2.09
356	45.80	14.07	63.42	43.01	41.25	16.69	16.10	0.02	0.00	0.00
357	8.44	2.02	3.24	4.57	12.04	6.78	7.09	10.02	13.74	1.89
358	52.73	46.99	84.03	119.39	98.08	131.94	1.70	2.95	29.03	24.88
359	39.66	70.22	4.32	5.94	17.44	23.72	116.48	143.42	5.28	4.96
360	22.33	17.22	20.75	33.22	10.38	18.75	14.17	20.45	0.40	1.37
374	2.27	3.20	0.00	0.00	0.00	0.00	4.53	6.40	0.00	0.00
375	18.67	12.68	1.20	2.08	2.39	4.14	1.86	3.22	2.43	2.14
376	27.49	21.65	8.35	11.59	2.07	3.66	25.53	43.16	3.68	5.59
377	9.61	13.59	1.65	2.33	0.00	0.00	1.70	2.40	8.25	11.66
378	64.57	59.57	10.95	6.75	127.82	109.25	6.30	3.81	14.67	15.09
379	2.60	3.68	7.73	2.01	39.82	56.31	3.98	5.63	6.35	8.98
380	4.89	6.92	2.79	0.66	3.02	3.98	3.39	0.58	17.92	14.13
381	22.89	7.65	2.72	0.42	0.74	0.98	6.63	9.38	1.19	1.68
382	35.55	25.27	0.66	1.30	4.23	7.33	4.17	5.03	1.95	4.35
721	0.00	0.00	14.01	6.35	27.91	39.47	13.47	0.71	5.73	0.49
722	4.37	6.18	5.70	0.02	9.69	13.70	8.68	12.27	0.00	0.00
723	0.00	0.00	0.00	0.00	2.23	3.16	3.82	5.40	9.83	7.46
724	0.00	0.00	3.95	5.59	3.65	5.16	2.27	3.21	1.23	1.73
725	0.00	0.00	4.94	6.99	6.52	1.98	2.11	2.99	0.00	0.00
726	2.30	3.25	2.23	3.15	9.42	5.05	2.29	3.23	0.00	0.00
727	27.40	10.42	384.77	221.70	136.69	169.94	45.39	55.13	4.32	6.11
728	9.32	13.18	18.61	0.88	17.93	6.76	3.72	5.26	0.00	0.00
752	0.00	0.00	4.89	1.22	15.17	12.28	6.61	9.34	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	1.09	1.37	0.00	0.00
756	0.00	0.00	12.90	13.15	8.44	6.77	2.10	2.97	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	2.39	3.38	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	2.09	2.96	0.00	0.00	2.78	3.93	0.00	0.00	0.00	0.00
761	0.00	0.00	0.00	0.00	1.26	1.78	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	7.74	10.94	8.30	11.74	11.73	4.14	0.00	0.00	0.00	0.00
765	3.65	5.16	0.00	0.00	1.45	2.05	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 10. Thorny skate survey biomass (t) by stratum in NAFO Div. 3NO: 2015-2019. n.s. means stratum not surveyed.

Strata	2015	2016	2017	2018	2019	Strata	2015	2016	2017	2018	2019
353	544	958	759	942	5	725	0	45	56	19	0
354	1107	909	793	273	165	726	14	14	58	15	0
355	62	48	13	8	8	727	234	3283	1147	387	34
356	169	265	167	67	0	728	65	127	122	26	0
357	119	46	170	98	179	752	0	54	168	74	0
358	1021	1681	1820	33	512	753	0	0	0	0	0
359	1367	153	616	4165	175	754	0	0	0	0	0
360	5262	4920	2402	3459	87	755	0	0	0	37	0
374	42	0	0	86	0	756	0	116	74	19	0
375	445	27	53	42	52	757	0	0	0	0	0
376	3165	944	227	3003	376	758	21	0	0	0	0
377	83	14	0	15	63	759	0	0	0	0	0
378	798	135	1504	77	158	760	29	0	36	0	0
379	24	72	346	38	51	761	0	0	18	0	0
380	41	23	25	29	131	762	0	0	0	0	0
381	279	34	9	85	13	763	0	0	0	0	0
382	1066	19	121	127	52	764	62	74	103	0	0
721	0	81	159	77	28	765	38	0	16	0	0
722	28	42	70	62	0	766	0	0	0	0	0
723	0	0	30	49	123	767	0	0	0	0	0
724	0	42	38	24	12						

Table 11. Thorny skate survey biomass (t) with SD and stratified mean catch per tow (kg) and SD in NAFO Div. 3NO: 1997-2019.

Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Biomass	9779	18875	35004	50521	34948	30072	20508	44429	40473	47415	22223	25946
SD	1544	3114	3736	7991	10687	9699	2371	5281	6171	9207	2898	2641
MCPT	11.57	20.41	40.79	57.86	39.23	33.69	22.27	49.46	45.69	55.81	28.10	28.82
SD	1.74	3.26	4.32	9.12	6.99	10.91	2.57	5.82	7.00	11.22	3.57	2.92

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Biomass	19959	17887	10365	28867	19640	6624	16085	14126	11121	13334	2225
SD	2745	3539	1193	3010	2280	1008	1777	2894	2283	3217	394
MCPT	22.10	21.22	11.71	32.65	22.24	8.39	18.45	15.76	12.79	14.82	2.76
SD	3.13	4.11	1.32	3.38	2.63	1.26	2.02	3.21	2.68	3.58	0.49

Table 12. Thorny skate length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2015-2019. 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
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
2017	0.01061	2.96788	0.1039	0.0266	0.998	308	0.00939	3.00615	0.0953	0.0245	0.998	286	0.01132	2.95483	0.0926	0.0236	0.998	594
2018	0.01692	2.86552	0.1756	0.0439	0.993	199	0.00622	3.11829	0.1341	0.0345	0.997	205	0.00930	3.01404	0.1612	0.0414	0.993	404
2019	0.00983	2.99304	0.1739	0.0429	0.992	66	0.00616	3.11920	0.2710	0.0686	0.987	43	0.00741	3.06616	0.1544	0.0389	0.992	109

Table 13. Thorny skate mean number per tow by year in Spanish Spring Surveys in NAFO Div. 3NO: 1997-2019. Indet. means indeterminate.

	1997				1998				1999				2000				2001				2002			
	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	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	9.903	11.540	0.005	21.448
	2003				2004				2005				2006				2007				2008			
	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	5.660	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	5.501	5.955	0.000	11.456	5.484	5.701	0.000	11.184
	2009				2010				2011				2012				2013				2014			
	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	4.218	3.999	0.000	8.217	5.689	6.037	0.000	11.726	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
	2015				2016				2017				2018				2019							
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total				
MNPT	3.419	3.378	0.000	6.798	3.528	3.493	0.000	7.020	3.708	3.452	0.000	7.160	2.613	2.852	0.000	5.464	0.661	0.294	0.000	0.954				

Table 15. White hake mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2015-2019. n.s. means stratum not surveyed.

Stratum	2015		2016		2017		2018		2019	
	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	0.01	0.01	0.00	0.00	0.00	0.00	0.46	0.80	0.00	0.00
354	4.77	3.99	13.08	15.38	5.49	9.43	4.64	4.20	2.02	1.02
355	7.95	4.24	27.59	8.22	26.76	3.95	4.94	3.96	3.64	2.16
356	17.36	21.67	57.85	41.77	5.62	0.38	5.20	6.05	0.83	0.48
357	26.72	3.90	59.32	35.22	4.48	6.33	9.11	10.88	0.00	0.00
358	10.95	12.45	0.00	0.00	0.00	0.00	1.43	1.25	0.69	1.20
359	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.73	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
379	0.00	0.00	0.03	0.05	0.10	0.14	0.00	0.00	0.00	0.00
380	0.11	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.19
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	23.22	5.62	12.34	3.28	23.54	19.58	6.50	9.20	2.49	3.52
722	1.96	2.76	5.18	7.32	9.71	13.72	0.00	0.00	0.00	0.00
723	1.20	1.69	3.57	2.59	9.31	9.91	2.40	3.39	4.12	5.76
724	2.03	2.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
725	0.00	0.00	1.20	1.70	0.74	1.04	0.00	0.00	0.00	0.00
726	0.00	0.00	0.00	0.00	1.28	1.80	0.00	0.00	0.00	0.00
727	0.00	0.00	0.00	0.00	0.12	0.17	0.03	0.04	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	0.01	0.01	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	0.01
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	0.01	-	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	2.58	3.64	0.00	0.00
765	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	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: 2015-2019. n.s. means stratum not surveyed.

Strata	2015	2016	2017	2018	2019	Strata	2015	2016	2017	2018	2019
353	0	0	0	11	0	725	0	11	4	0	0
354	90	280	380	100	39	726	0	0	3	0	0
355	45	176	289	31	20	727	0	0	8	0	0
356	64	242	14	22	3	728	0	0	0	0	0
357	377	837	21	126	0	752	0	0	0	0	0
358	212	0	0	28	12	753	0	0	0	0	0
359	0	0	0	17	0	754	0	0	0	0	0
360	0	0	0	0	0	755	0	0	0	0	0
374	0	0	0	0	0	756	0	0	0	0	0
375	0	0	0	0	0	757	0	0	0	0	0
376	0	0	0	0	0	758	0	0	0	0	0
377	0	0	0	0	0	759	0	0	0	0	0
378	0	0	0	0	0	760	0	0	0	0	0
379	0	0	4	0	0	761	0	0	0	0	0
380	1	0	0	0	1	762	0	0	0	0	0
381	0	0	0	0	0	763	0	0	0	0	0
382	0	0	0	0	0	764	0	0	0	23	0
721	126	71	40	37	12	765	0	0	0	0	0
722	13	38	14	0	0	766	0	0	0	0	0
723	16	49	34	31	52	767	0	0	0	0	0
724	21	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: 2001-2019.

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Biomass	3498	1784	688	940	2082	1073	440	74	610	293
SD	1107	389	224	464	1270	407	94	46	73	117
MCPT	5.13	2.03	0.75	1.03	2.34	1.26	0.56	0.08	0.61	0.34
SD	1.87	0.43	0.24	0.52	1.44	0.48	0.12	0.05	0.08	0.14

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
Biomass	822	784	1503	389	965	1704	813	427	140
SD	361	308	613	131	182	425	199	136	59
MCPT	0.91	0.86	1.64	0.49	1.12	1.90	0.80	0.48	0.17
SD	0.40	0.34	0.67	0.17	0.19	0.47	0.22	0.15	0.07

Table 18. White hake length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2015-2019. E(x) means Error of the parameter x. In 2017 the individuals were not sexed.

	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
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
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
2017	-	-	-	-	-	-	-	-	-	-	-	-	0.00271	3.26606	0.1185	0.0306	0.997	150
2018	0.01164	2.87207	0.3348	0.0965	0.985	45	0.00231	3.30650	0.2720	0.0695	0.995	29	0.00664	3.04278	0.2497	0.0681	0.990	74
2019	0.00361	3.17780	0.2110	0.0622	0.992	34	0.00138	3.43566	0.2417	0.0667	0.995	20	0.00352	3.18763	0.1696	0.0494	0.992	57

Table 19. White hake mean number per tow by year in Spanish Spring Surveys in NAFO Div. 3NO: 2001-2019. Indet. means indeterminate. In 2011 and 2017 the individuals were not sexed.

	2001				2002				2003				2004				2005				2006				2007			
	Males	Females	Indet.	Total	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	0.115	0.161	0.000	0.275
	2008				2009				2010				2011				2012				2013				2014			
	Males	Females	Indet.	Total	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	0.025	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	0.877	0.891	0.000	1.768	0.272	0.117	0.000	0.389
	2015				2016				2017				2018				2019											
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total								
MNPT	0.239	0.252	0.017	0.508	0.624	0.474	0.000	1.098	0.000	0.000	0.932	0.932	0.290	0.198	0.000	0.488	0.192	0.117	0.019	0.329								

Table 20. White hake mean number per tow by length class and year. Spanish Spring Survey in NAFO 3NO: 2015-2019. Indet. means indeterminate. In 2017 the individuals were not sexed.

Length (cm.)	2015				2016				2017				2018				2019			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
6	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.006	0.012
8	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.016	0.000	0.000	0.016	0.018	0.000	0.013	0.031
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	0.005	0.000	0.000	0.005	0.006	0.000	0.000	0.006
12	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
14	0.000	0.003	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.000	0.008
16	0.000	0.008	0.000	0.008	0.018	0.000	0.000	0.018	0.000	0.000	0.008	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
18	0.000	0.000	0.000	0.000	0.018	0.018	0.000	0.036	0.000	0.000	0.024	0.024	0.008	0.008	0.000	0.017	0.007	0.000	0.000	0.007
20	0.003	0.000	0.000	0.003	0.027	0.018	0.000	0.045	0.000	0.000	0.118	0.118	0.005	0.000	0.000	0.005	0.007	0.022	0.000	0.030
22	0.000	0.000	0.007	0.007	0.040	0.000	0.000	0.040	0.000	0.000	0.213	0.213	0.016	0.000	0.000	0.016	0.007	0.015	0.000	0.022
24	0.000	0.000	0.005	0.005	0.008	0.000	0.000	0.008	0.000	0.000	0.102	0.102	0.024	0.000	0.000	0.024	0.020	0.007	0.000	0.028
26	0.000	0.000	0.005	0.005	0.003	0.000	0.000	0.003	0.000	0.000	0.031	0.031	0.034	0.004	0.000	0.038	0.000	0.011	0.000	0.011
28	0.000	0.000	0.000	0.000	0.018	0.000	0.000	0.018	0.000	0.000	0.020	0.020	0.020	0.008	0.000	0.029	0.005	0.000	0.000	0.005
30	0.000	0.003	0.000	0.003	0.009	0.000	0.000	0.009	0.000	0.000	0.020	0.020	0.008	0.008	0.000	0.017	0.003	0.011	0.000	0.014
32	0.000	0.000	0.000	0.000	0.050	0.000	0.000	0.050	0.000	0.000	0.026	0.026	0.024	0.000	0.000	0.024	0.007	0.000	0.000	0.007
34	0.003	0.000	0.000	0.003	0.014	0.000	0.000	0.014	0.000	0.000	0.015	0.015	0.017	0.045	0.000	0.062	0.003	0.003	0.000	0.007
36	0.006	0.012	0.000	0.019	0.000	0.000	0.000	0.000	0.000	0.000	0.023	0.023	0.027	0.012	0.000	0.039	0.007	0.003	0.000	0.010
38	0.013	0.006	0.000	0.019	0.020	0.000	0.000	0.020	0.000	0.000	0.019	0.019	0.019	0.008	0.000	0.028	0.016	0.000	0.000	0.016
40	0.012	0.005	0.000	0.017	0.016	0.000	0.000	0.016	0.000	0.000	0.029	0.029	0.004	0.000	0.000	0.004	0.019	0.003	0.000	0.023
42	0.000	0.000	0.000	0.000	0.019	0.003	0.000	0.023	0.000	0.000	0.019	0.019	0.006	0.011	0.000	0.017	0.002	0.003	0.000	0.006
44	0.007	0.014	0.000	0.022	0.039	0.003	0.000	0.042	0.000	0.000	0.030	0.030	0.008	0.000	0.000	0.008	0.015	0.011	0.000	0.026
46	0.008	0.008	0.000	0.016	0.020	0.017	0.000	0.037	0.000	0.000	0.006	0.006	0.021	0.008	0.000	0.029	0.016	0.000	0.000	0.016
48	0.006	0.017	0.000	0.024	0.012	0.015	0.000	0.027	0.000	0.000	0.018	0.018	0.004	0.013	0.000	0.017	0.003	0.003	0.000	0.007
50	0.010	0.003	0.000	0.014	0.026	0.014	0.000	0.040	0.000	0.000	0.014	0.014	0.004	0.000	0.000	0.004	0.000	0.000	0.000	0.000
52	0.005	0.010	0.000	0.015	0.038	0.035	0.000	0.073	0.000	0.000	0.008	0.008	0.000	0.000	0.000	0.000	0.000	0.007	0.000	0.007
54	0.015	0.000	0.000	0.015	0.040	0.016	0.000	0.056	0.000	0.000	0.021	0.021	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
56	0.014	0.002	0.000	0.016	0.037	0.030	0.000	0.067	0.000	0.000	0.006	0.006	0.000	0.008	0.000	0.008	0.000	0.000	0.000	0.000
58	0.013	0.000	0.000	0.013	0.024	0.020	0.000	0.044	0.000	0.000	0.027	0.027	0.000	0.000	0.000	0.000	0.008	0.000	0.000	0.008
60	0.060	0.007	0.000	0.067	0.044	0.012	0.000	0.056	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
62	0.021	0.022	0.000	0.043	0.028	0.033	0.000	0.061	0.000	0.000	0.012	0.012	0.000	0.008	0.000	0.008	0.000	0.000	0.000	0.000
64	0.023	0.002	0.000	0.026	0.003	0.020	0.000	0.023	0.000	0.000	0.008	0.008	0.000	0.002	0.000	0.002	0.003	0.008	0.000	0.011
66	0.000	0.008	0.000	0.008	0.019	0.018	0.000	0.037	0.000	0.000	0.008	0.008	0.011	0.000	0.000	0.011	0.003	0.000	0.000	0.003
68	0.009	0.003	0.000	0.012	0.008	0.010	0.000	0.018	0.000	0.000	0.018	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
70	0.000	0.024	0.000	0.024	0.000	0.010	0.000	0.010	0.000	0.000	0.007	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
72	0.008	0.004	0.000	0.012	0.018	0.010	0.000	0.028	0.000	0.000	0.007	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
74	0.000	0.024	0.000	0.024	0.000	0.011	0.000	0.011	0.000	0.000	0.018	0.018	0.008	0.020	0.000	0.028	0.000	0.000	0.000	0.000
76	0.000	0.003	0.000	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
78	0.000	0.008	0.000	0.008	0.008	0.014	0.000	0.021	0.000	0.000	0.002	0.002	0.000	0.008	0.000	0.008	0.000	0.000	0.000	0.000
80	0.000	0.003	0.000	0.003	0.000	0.061	0.000	0.061	0.000	0.000	0.016	0.016	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
82	0.000	0.019	0.000	0.019	0.000	0.057	0.000	0.057	0.000	0.000	0.007	0.007	0.000	0.010	0.000	0.010	0.000	0.000	0.000	0.000
84	0.000	0.003	0.000	0.003	0.000	0.018	0.000	0.018	0.000	0.000	0.016	0.016	0.000	0.000	0.000	0.000	0.000	0.008	0.000	0.008
86	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
90	0.000	0.003	0.000	0.003	0.000	0.002	0.000	0.002	0.000	0.000	0.003	0.003	0.000	0.012	0.000	0.012	0.000	0.000	0.000	0.000
92	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.012	0.012	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	0.003	0.000	0.003	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	0.002	0.000	0.002	0.000	0.008	0.000	0.008	0.000	0.000	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
100	0.000	0.015	0.000	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total	0.239	0.252	0.017	0.508	0.624	0.474	0.000	1.098	0.000	0.000	0.932	0.932	0.290	0.198	0.000	0.488	0.192	0.117	0.019	0.329
N° samples:				18				15				16				19				18
N° Ind.:	44	46	3	93	127	89	0	216	0	0	181	181	45	29	0	74	35	20	2	57
Sampled catch:				192				369				180				77				31
Range:				15-100				16-98				17-92				9-95				7-84
Total catch:				208				373				180				83				31
Total hauls:				122				115				113				114				115

Table 21. Squid total biomass (Kg) by stratum and year, and yearly SD. Spanish Spring Survey in NAFO 3NO: 2002-2019.

Stratum	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
353		0	3427	656	159	281	2034	335	191	3540	0				0	0	3443	22314
354		0	124141	2512	33652	15460	1376	20526	22129	3476108	0				0	26047	60157	1006118
355		0	20510	5986	5561	302	87	22439	1375	17053	0				0	81459	607118	44893
356		0	1381	1395	6541	546	0	210	3839	8749	0				0	4556	112320	42158
357		0	283191	811	3330	1139	113	141954	700	6538	0				0	1340	18049	35698
358		773	14659	3613	26742	0	933	37556	0	18783	0				0	12105	241572	52665
359		4177	37404	1811	222443	335	174	10665	442	418018	0				0	70714	3221052	13551205
360		1235	284806	5626	57194	1557	500	478	19032	9250	166				0	101815	17695284	9762386
374		0	5431	0	0	722	1105	0	4689	0	0				0	6042	2073	208797
375		0	0	0	0	0	341	0	298	0	0				0	0	0	1960921
376		0	6520	5683	0	0	0	0	220	3954	0				0	0	37176	2726
377		0	545517	2968	0	0	443	396	2873	413	0				0	4279	0	133798
378		618	157657	2483	26700	48988	17491	10397	5535	4170	0				0	3283	565	224979
379		0	0	1750	516	18108	12321	13633	2586	2295	0				0	644	0	22613
380		630	1736	252	743	1404	2927	2195	4746	592	0				0	321	158	116586
381		0	448	1858	1303	1602	2587	422	15797	4174	0				0	252	339	19776
382		0	1487	825	841	5559	1747	152	8616	358	0				0	0	5183	603808
721		0	676	176	1032	39	0	369	0	0	0				0	622	7956	8966
722		0	2394	1048	1061	504	102	0	0	575	0				0	2135	1988	2207
723		976	31440	667	2861	39	207	1433	489	3150	0				0	427	4469	95505
724		788	5105	1168	0	773	280	1024	0	0	0				0	1622	3083	860
725		0	327	1333	298	705	2951	2515	5735	446	0				0	370	3744	7358
726		0	512	960	288	1489	218	94	4023	144	0				0	1211	1280	3025
727		309	3716	588	141	444	1718	299	2276	495	0				0	43772	0	2641
728		0	0	430	0	239	807	529	471	0	0				0	184	884	3215
752		115	1103	333	233	0	0	842	136	0	0				0	599	124	2750
753		302	0	215	0	343	830	0	0	0	0				0	1051	280	2665
754		828	0	560	0	128	1084	0	1248	0	0				0	1341	0	1710
755		2958	0	171	0	2738	2277	1523	0	0	0				0	6080	878	19950
756		0	418	391	0	292	376	2797	503	372	0				0	472	296	2416
757		0	1032	227	0	214	2121	2065	189	0	0				0	2067	0	2533
758		0	926	440	273	1104	560	1716	480	13	0				36	489	1153	1657
759		3725	356	555	0	0	1863	2263	806	0	0				0	1146	0	1496
760		1572	2993	424	0	1570	992	734	438	0	0				0	12920	0	405
761		2964	1778	39	1177	3496	760	0	949	0	0				0	4133	0	2114
762		3345	9118	1979	2097	0	1102	306	1687	0	0				0	1001	735	2336
763		2558	1040	2229	766	361	0	0	0	0	0				0	7560	1059	4087
764		226	1574	211	5622	733	0	86	924	0	0				0	2549	3396	18388
765		0	661	163	1680	0	0	0	639	375	0				0	2463	4347	0
766		192	1664	164	3632	0	0	0	736	1632	0				0	4954	38	535
767		0	6175	0	1679	0	0	0	761	0	0				0	5546	0	1990
Total		28289	1561323	52697	408563	110854	59821	280347	113951	3985376	166				36	417571	22040198	28000249
SD		3979	635346	8319	220686	51536	8284	113584	28756	3539602	168				36	134739	17359051	16220583

Table 22. Squid total abundance (thousands) by length class and year, in the years in which samples were taken. Spanish Spring Survey in NAFO 3NO: 2002-2019.

Length	2011	2017	2019
3.5			9301
4.0			0
4.5			2819
5.0			0
5.5			16801
6.0			0
6.5			19798
7.0			0
7.5			64237
8.0			25254050
8.5	0	0	50651160
9.0	0	34	63656536
9.5	0	0	40447332
10.0	163	46	39775496
10.5	653	185	39855940
11.0	653	256	3774981
11.5	3040	425	27493254
12.0	2908	698	35542612
12.5	1765	462	55541180
13.0	5823	278	22471238
13.5	7525	163	60466288
14.0	11520	185	57325412
14.5	9328	46	58965888
15.0	7952	4	38020416
15.5	5597	8	34691328
16.0	4353		10252708
16.5	1866		8625929
17.0	1866		4451427
17.5	1244		546023
18.0	622		275955
18.5			31187
19.0			140994
Total	66875	2788	678370304

Table 23. Capelin total biomass (tons) by stratum and year, and yearly SD. Spanish Spring Survey in NAFO 3NO: 2002-2019.

Stratum	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
353	557	7015	6460	32	317	6383	1675	22566	2094	5755	8182	1138	21575	5766	5108	284	472	836
354	581	5171	0	7	0	139	11998	17331	14684	0	9073	9	16063	1102	326	1616	0	0
355	1	8	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0
356	1	6	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0
357	5	4	0	1	0	2	0	0	0	0	0	0	1	0	0	0	0	0
358	715	2181	0	0	0	0	0	1	0	0	0	0	0	0	8	0	0	0
359	3721	1326	117	1	0	2502	1817	7860	669	140	12671	16	373	2045	56	406	913	97
360	10934	20252	17562	1995	1588	13432	6771	24323	33371	2345	53594	34222	23330	18756	557	1477	13233	449
374	2	246	0	13	3	10	3	13	123	0	3	11	7	20	1	7	348	2
375	3	355	7	0	34	150	4	27	1	1	3012	95	9	52	1	9	57	4
376	242	713	119	12	667	22	13	308	5382	302	47659	5077	399	2067	17	148	566	1769
377	454	161	1	1	0	3	0	78	881	5	0	0	0	0	84	144	3	18
378	39	4003	0	0	0	1	0	2	33	0	0	0	0	0	8	4	0	0
379	4	5	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0
380	3	102	0	1	0	36	7	8	0	0	0	0	0	0	12	8	6	0
381	230	246	0	1	0	2062	1579	39	3828	0	0	0	2686	716	1	235	3483	2
382	6	30	5	612	4	109	25647	2	3138	11	0	0	3759	946	55	145	6395	12672
721	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
722	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
723	46	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0
724	1	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
725	1	4	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0
726	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
727	140	0	0	0	0	2	0	0	0	0	0	0	0	0	10	0	0	0
728	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
752	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
753	0	0	0	2	0	0	0	0	n.s	0	0	0	0	0	0	0	0	0
754	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
755	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
756	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
757	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
758	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
759	0	0	0	0	0	n.s	0	0	0	0	0	0	0	117	0	0	0	0
760	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
761	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
762	1	0	0	0	0	n.s	0	0	0	0	0	0	0	0	0	0	0	0
763	0	0	0	0	0	n.s	0	n.s	n.s	0	0	0	0	0	0	0	0	0
764	1	0	0	0	0	0	0	0	n.s	0	0	0	0	0	0	0	0	0
765	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
766	0	0	0	0	0	n.s	0	0	0	0	0	0	0	0	0	0	0	0
767	0	0	0	0	0	n.s	0	n.s	n.s	0	0	0	0	0	0	0	0	0
TOTAL	17734	41835	24272	2678	2613	24851	49523	72557	64209	8559	134193	40573	68202	31588	6246	4486	25476	15849
SD	5842	9877	5996	1098	872	11067	18706	21867	23007	3057	30327	14083	18289	8752	8752	4039	8842	8508

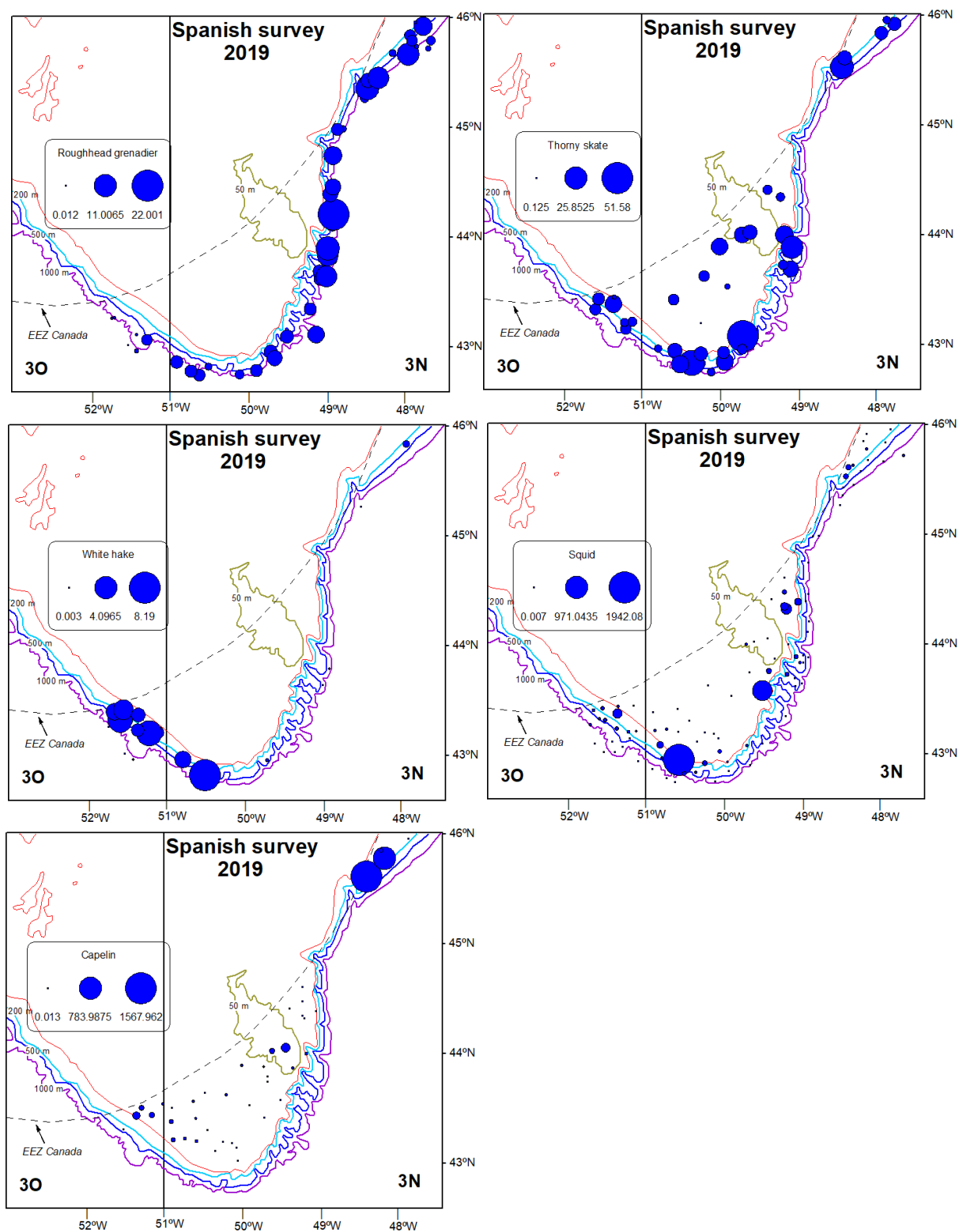


Figure 1. Position of the hauls and the catch of roughhead grenadier, thorny skate, white hake, squid and capelin during the 2019 Spanish 3NO survey. Note that the scale is different in the four graphs.

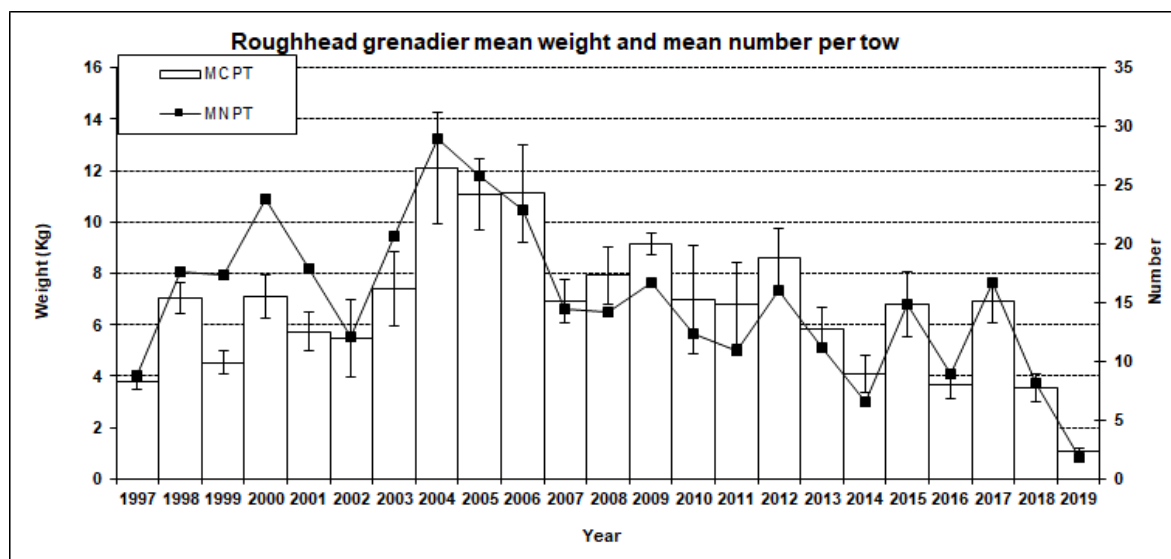


Figure 2. Roughhead grenadier stratified mean catches in Kg and $\pm$ SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2019.

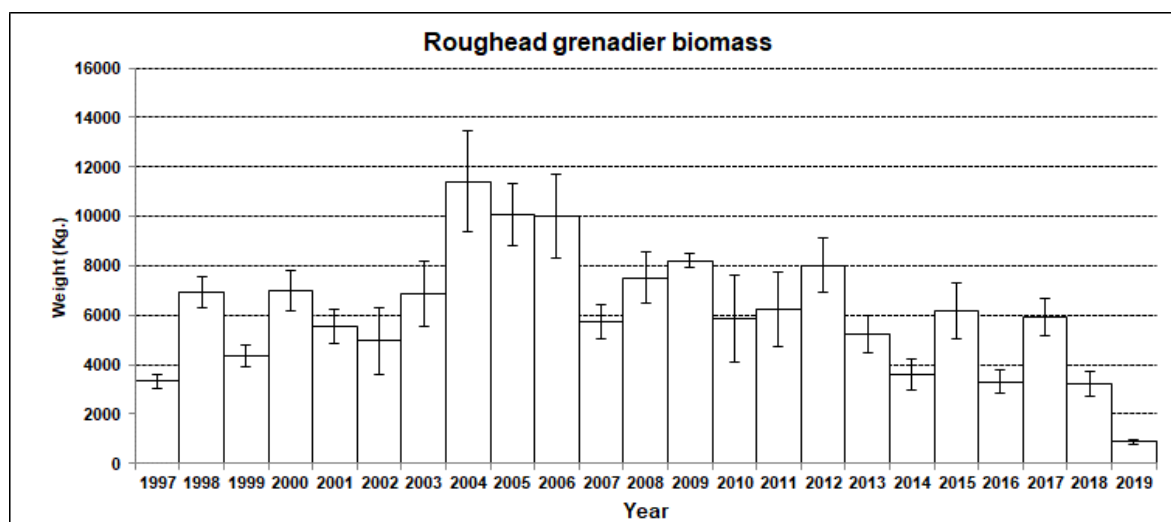


Figure 3. Roughhead grenadier biomass calculated by the swept area method in tons and $\pm$ SD by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2019.

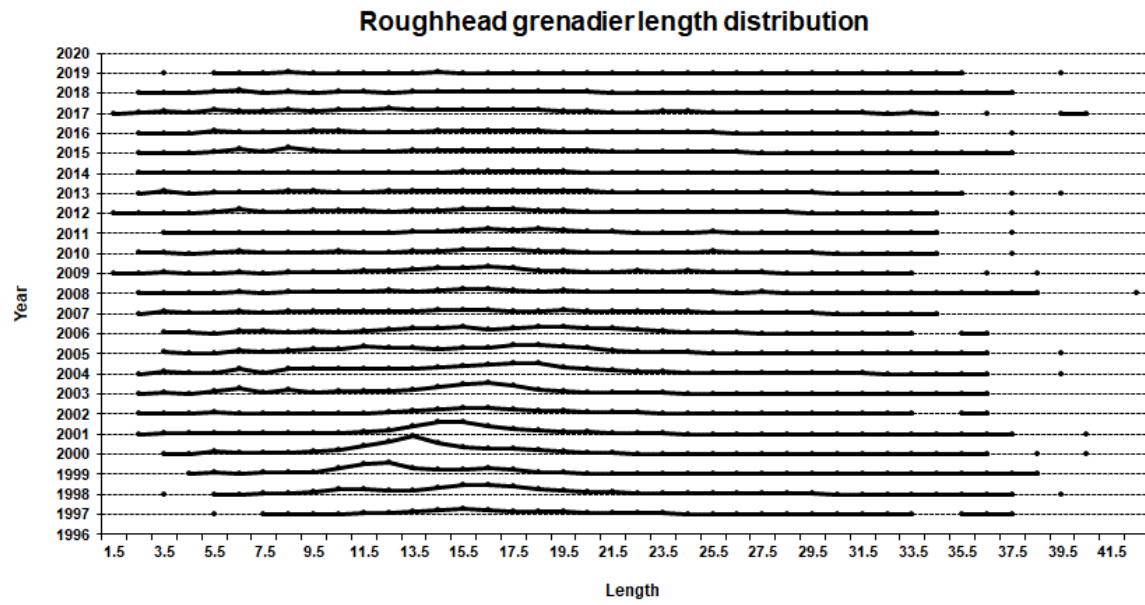


Figure 4. Roughhead grenadier mean number per tow by length (cm) on NAFO 3NO: 1997-2019. Data from 2015 to 2019 are in Table 8; data for 1997-2014 can be seen in SCR Doc 15/09.

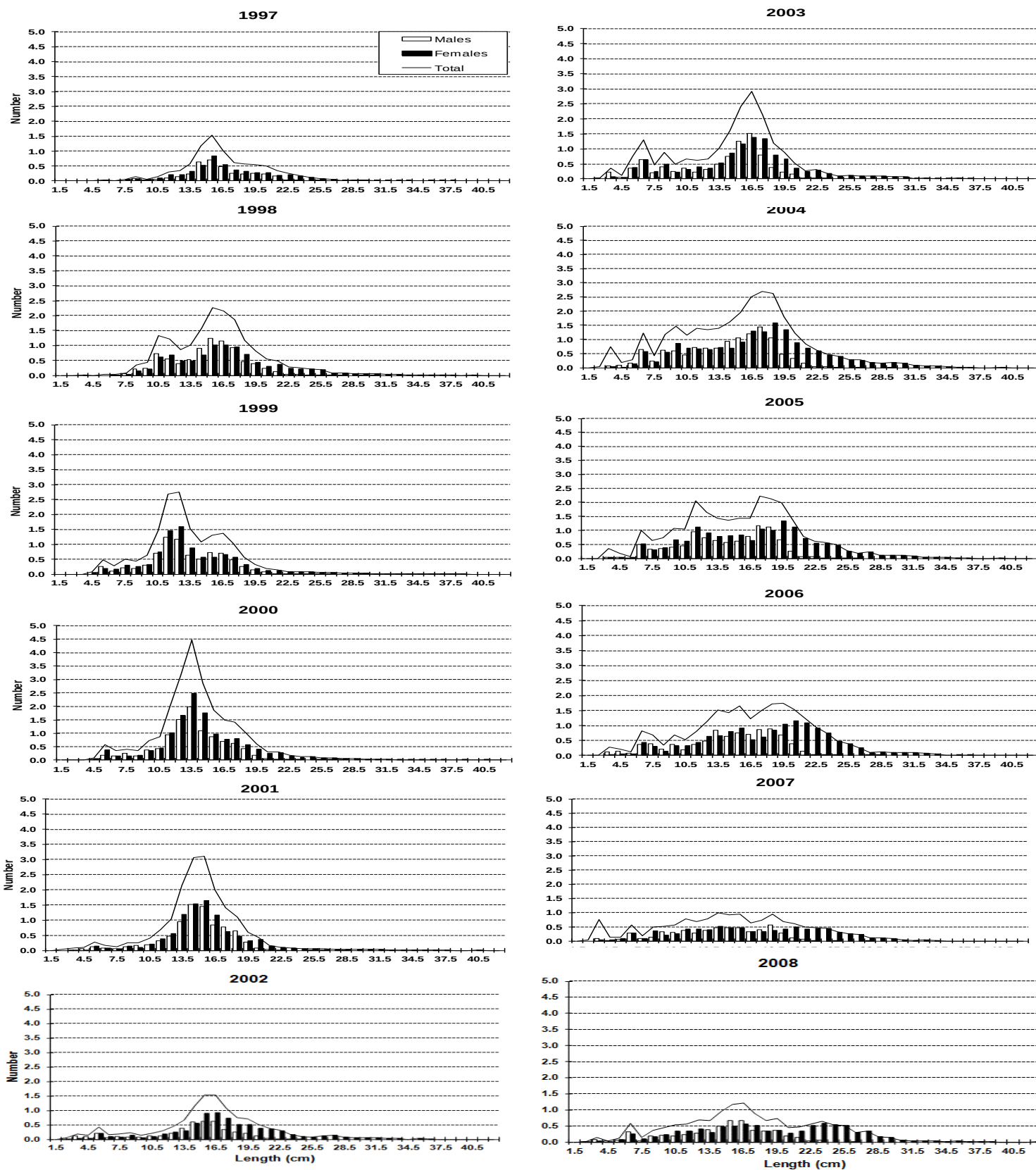


Figure 5. Roughhead grenadier length distribution (cm) on NAFO 3NO: 1997-2019. Mean numbers per tow. Data from 2015 to 2019 are in Table 8; data for 1997-2014 can be seen in SCR Doc 15/09.

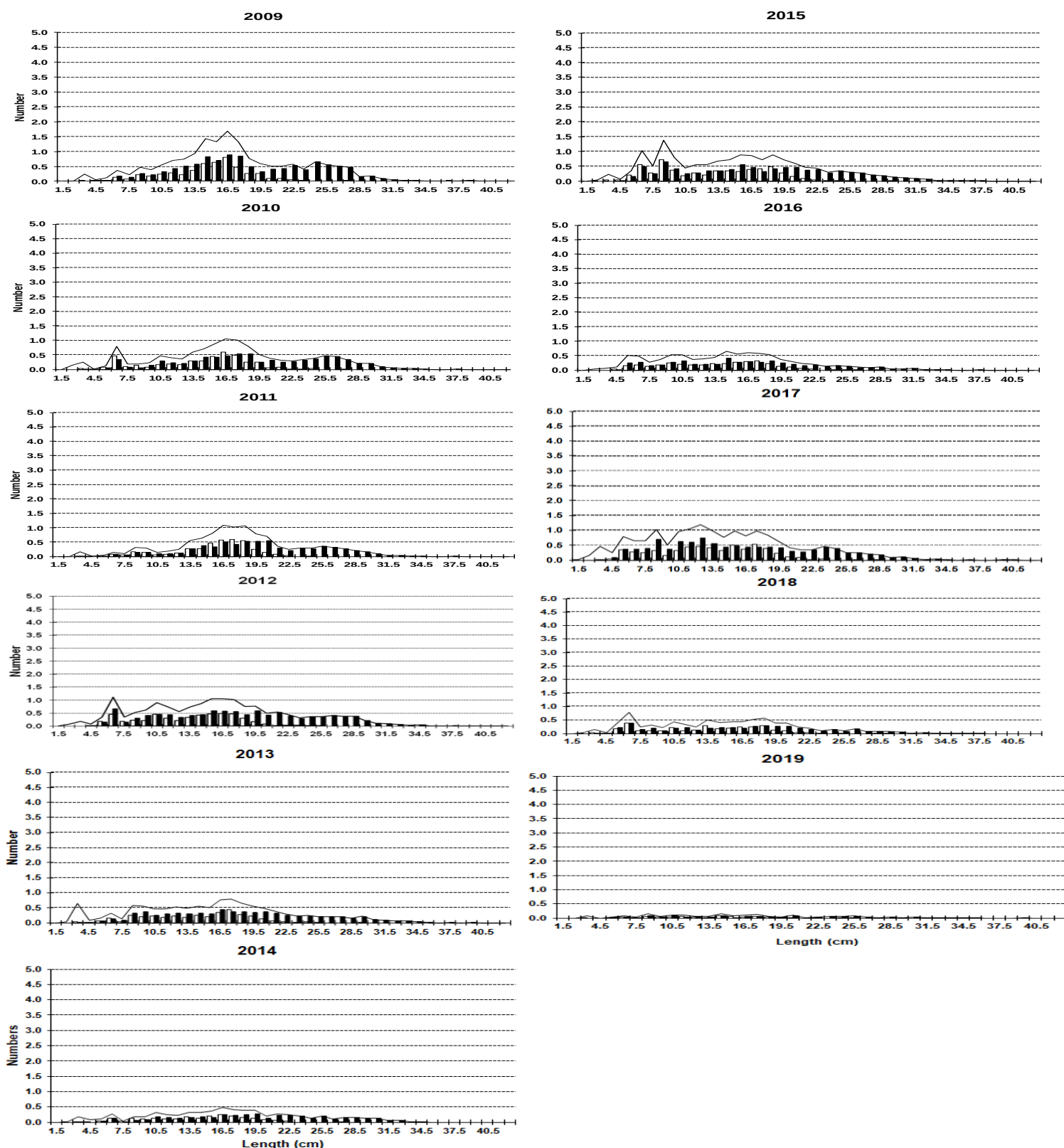


Figure 5 (cont.).

Roughhead grenadier length distribution (cm) on NAFO 3NO: 1997-2019. Mean numbers per tow. Data from 2015 to 2019 are in Table 8; data for 1997-2014 can be seen in SCR Doc 15/09.

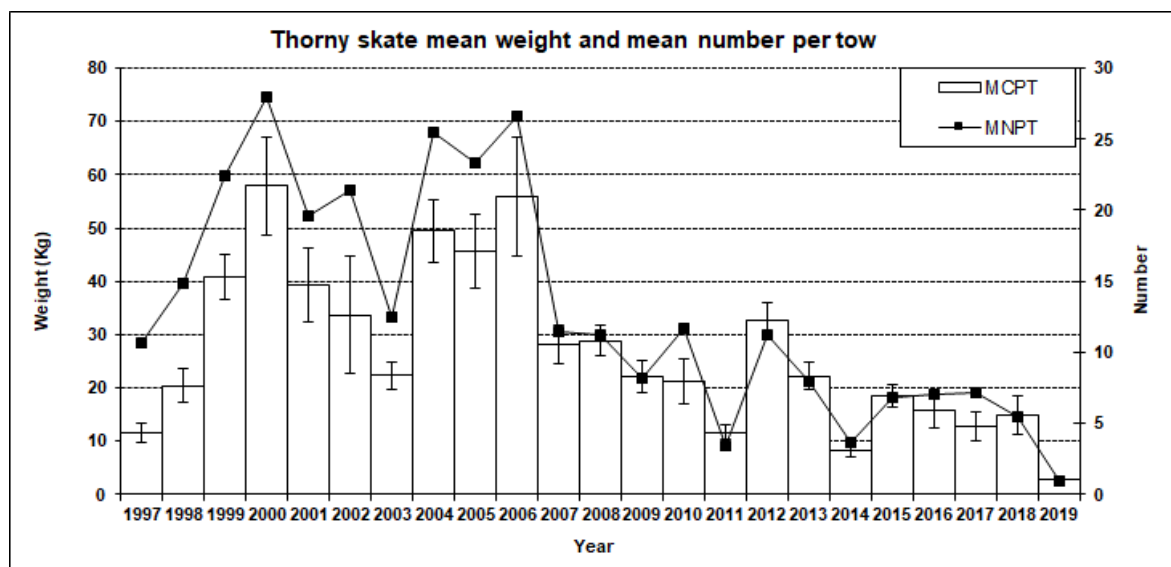


Figure 6. Thorny skate stratified mean catches in Kg and $\pm$ SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2019.

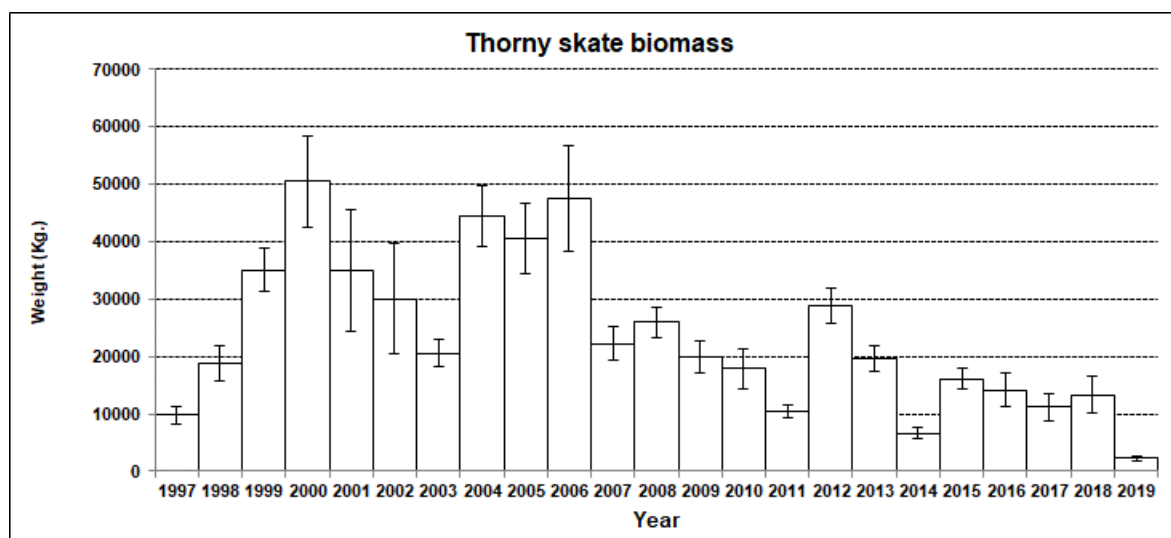


Figure 7. Thorny skate biomass calculated by the swept area method in tons and $\pm$ SD by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2019.

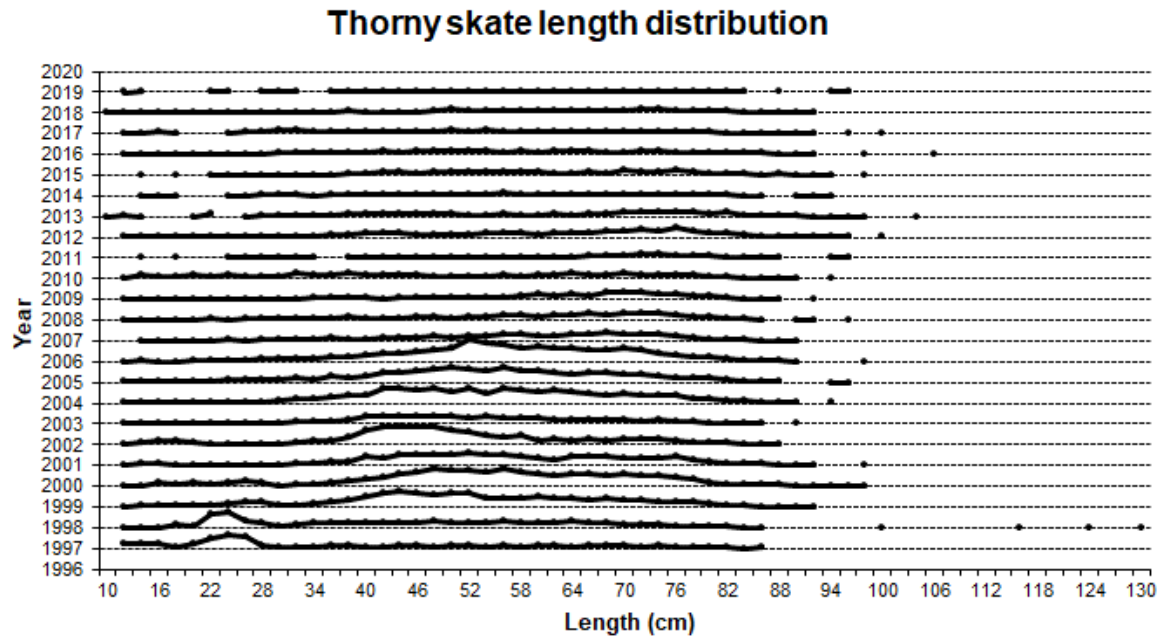


Figure 8. Thorny skate mean number per tow by length (cm) on NAFO 3NO: 1997-2019. Data from 2015 to 2019 are in Table 14; data for 1997-2014 can be seen in SCR Doc 15/09.

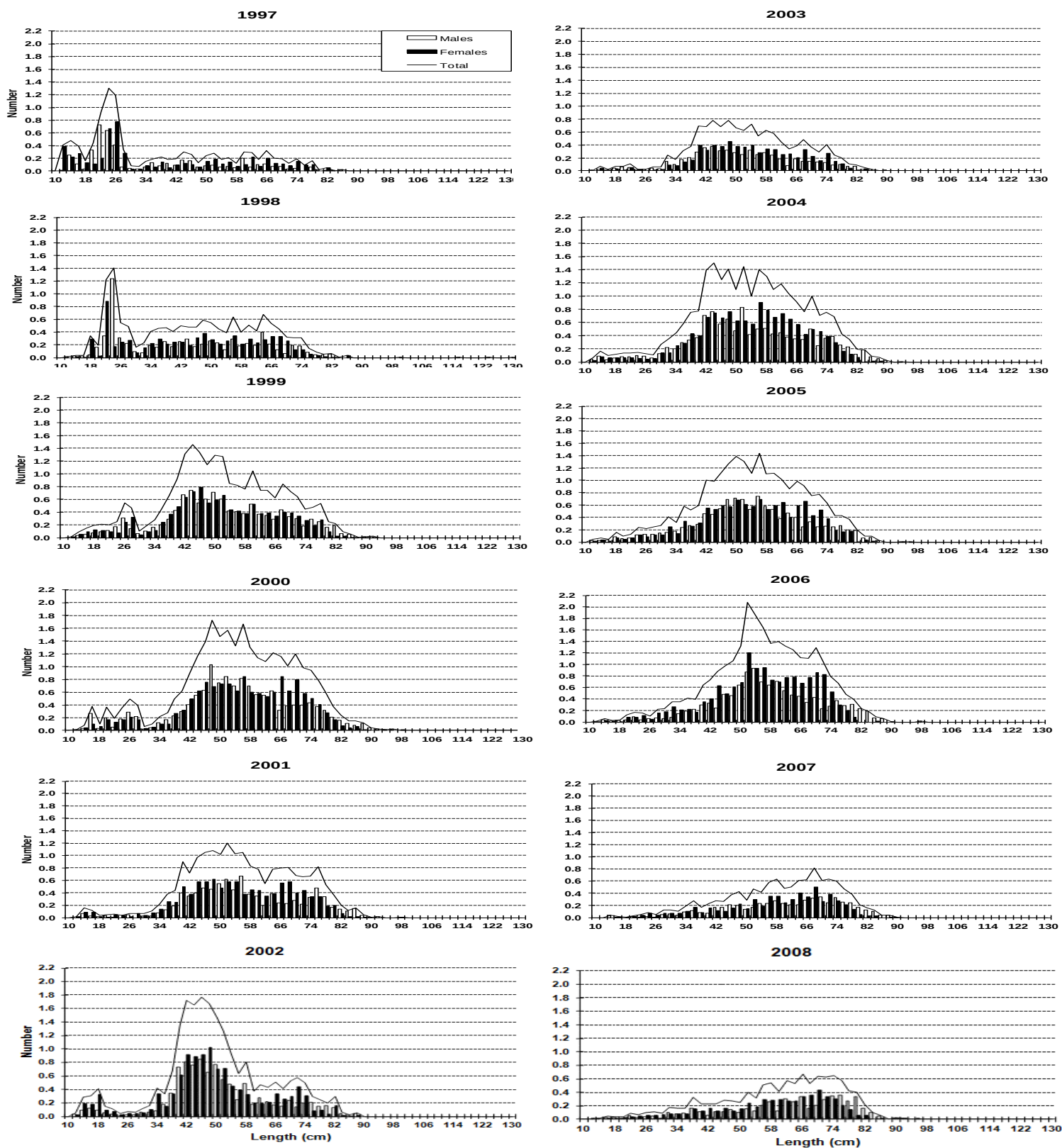


Figure 9. Thorny skate length distribution (cm) on NAFO 3NO: 1997-2019. Mean numbers per tow. Data from 2015 to 2019 are in Table 14; data for 1997-2014 can be seen in SCR Doc 15/09.

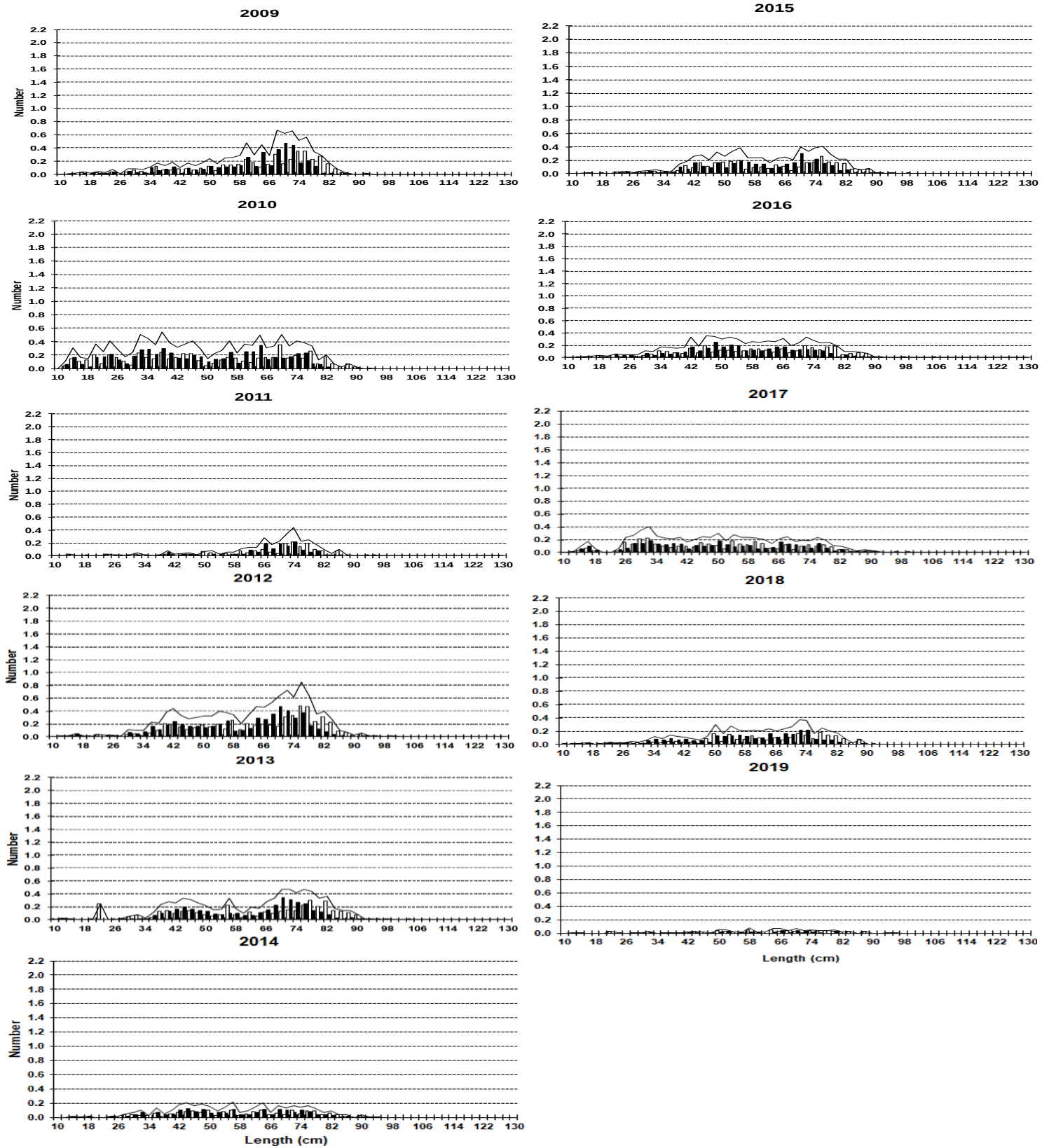


Figure 9 (cont.). Thorny skate length distribution (cm) on NAFO 3NO: 1997-2019. Mean numbers per tow. Data from 2015 to 2019 are in Table 8; data for 1997-2014 can be seen in SCR Doc 15/09.

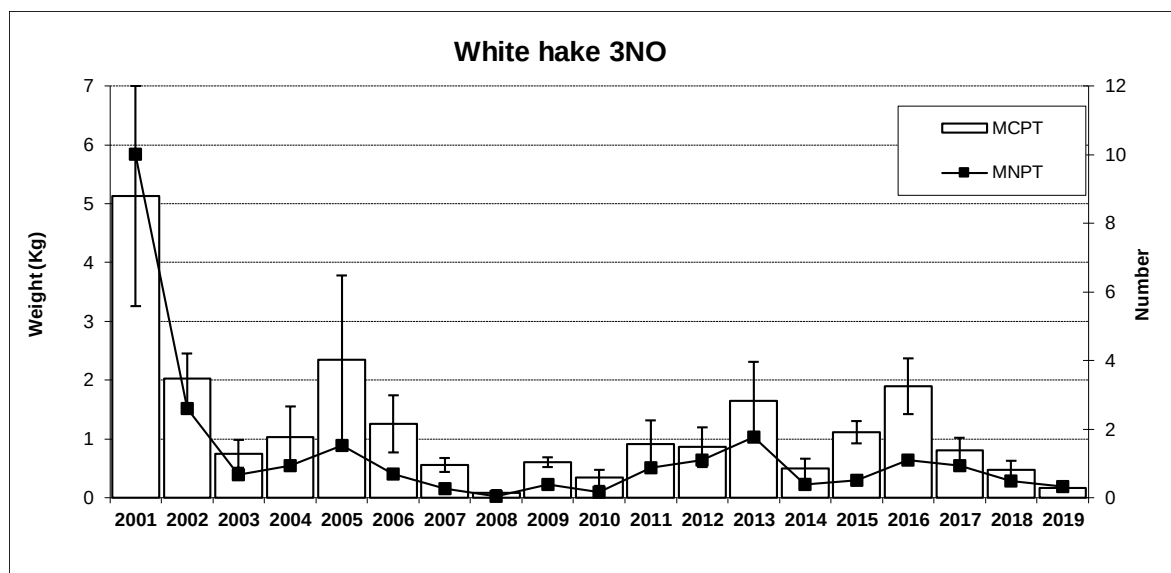


Figure 10. White hake stratified mean catches in Kg and $\pm$ SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 2001-2019.

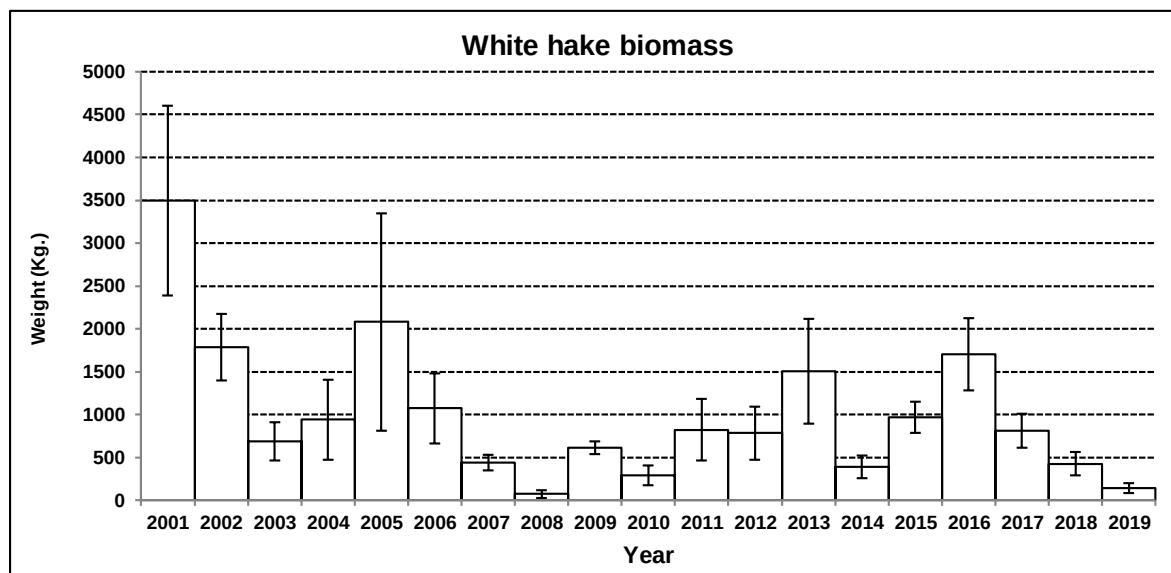


Figure 11. White hake biomass calculated by the swept area method in tons and $\pm$ SD by year. Spanish Spring surveys in NAFO Div. 3NO: 2001-2019.

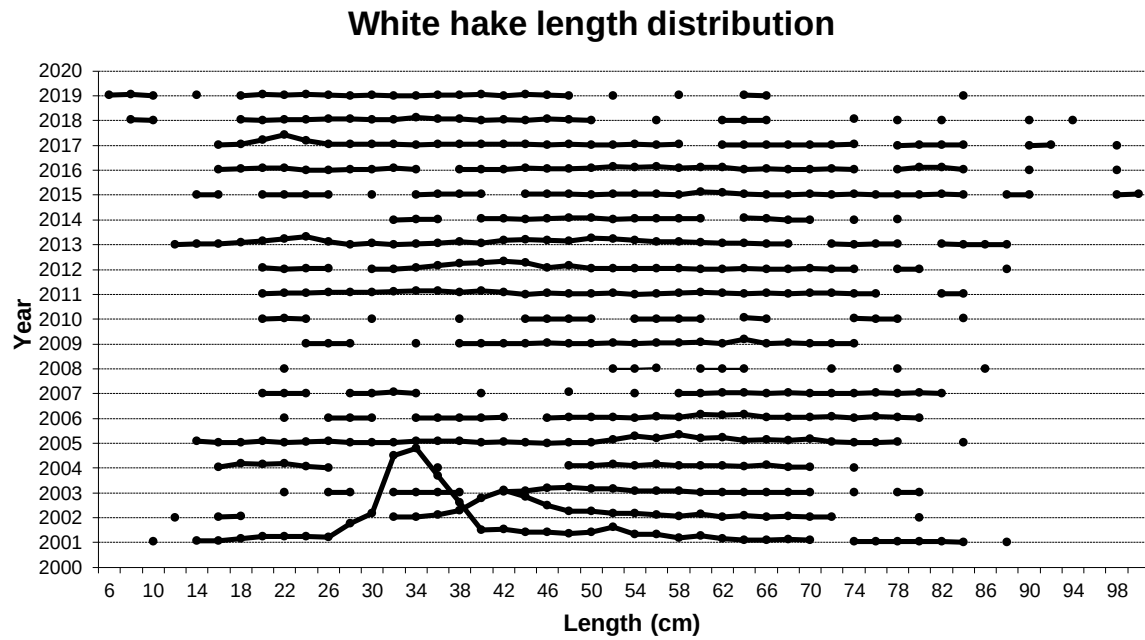


Figure 12. White hake mean numbers per tow by length (cm) on NAFO 3NO: 2001-2019. Data from 2015 to 2019 are in Table 20; data for 2001-2013 can be seen in SCR Doc 15/09.

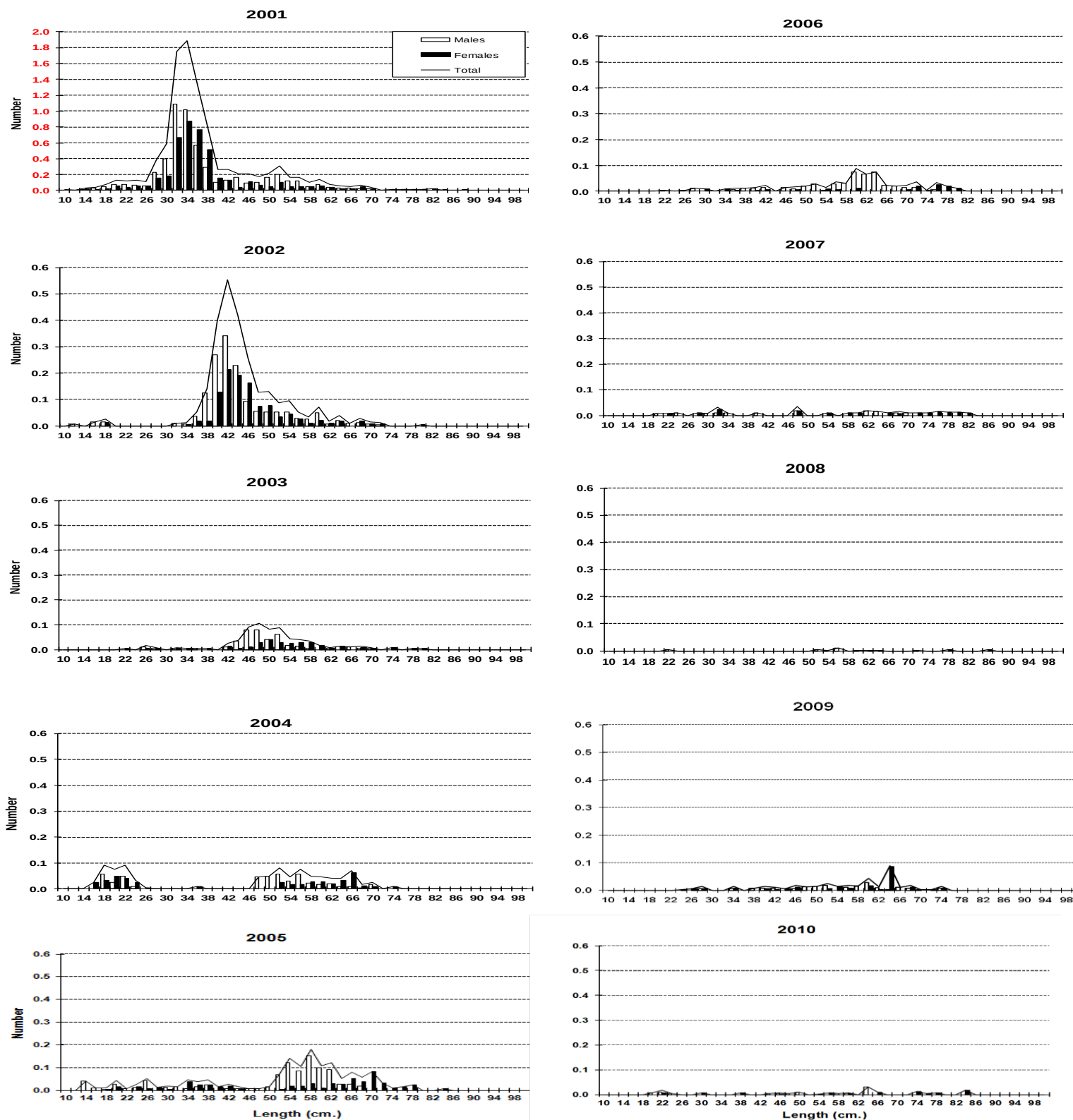


Figure 13. White hake length distribution (cm) on NAFO 3NO: 2001-2019. Mean numbers per tow. Data from 2015 to 2019 are in Table 20; data for 2001-2014 can be seen in SCR Doc 15/09. In 2011 and 2017 the individuals were not sexed. From 2018, the X-axis has a different range.

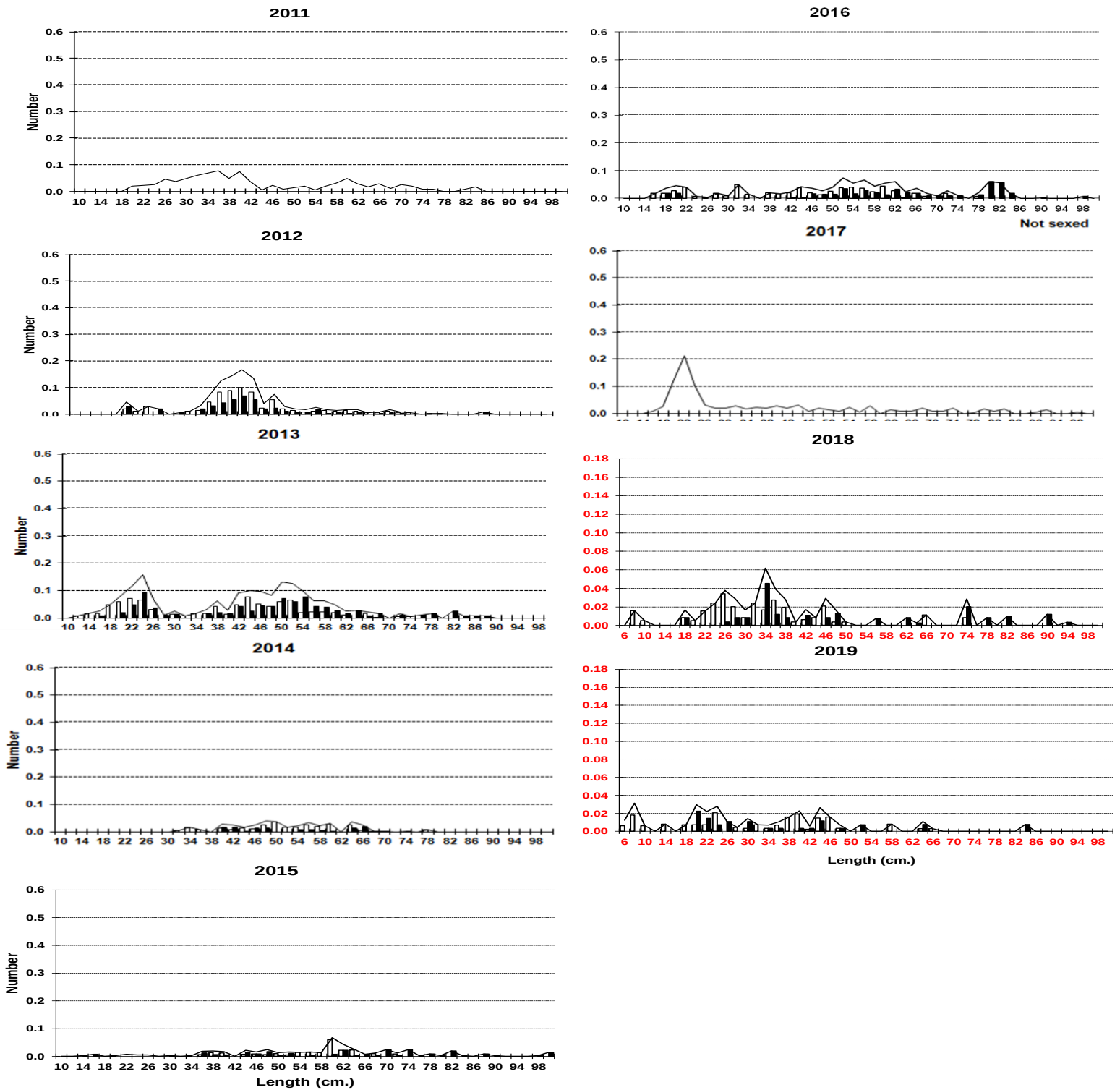


Figure 13 (cont.).

White hake length distribution (cm) on NAFO 3NO: 2001-2019. Mean numbers per tow. Data from 2015 to 2019 are in Table 20; data for 2001-2014 can be seen in SCR Doc 15/09. In 2011 and 2017 the individuals were not sexed. From 2018, the X-axis has a different range.

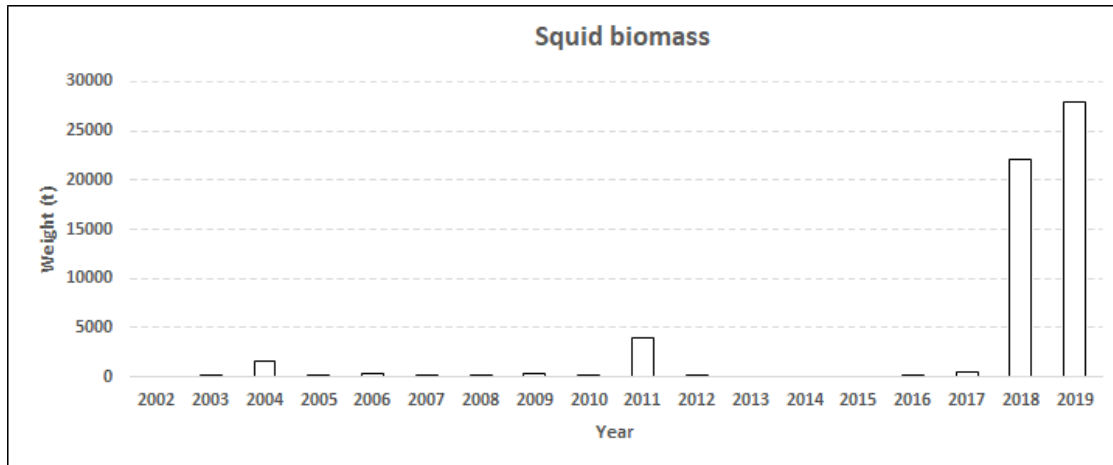


Figure 14. Squid biomass calculated by the swept area method in tons and $\pm$ SD by year. Spanish Spring surveys in NAFO Div. 3NO: 2002-2019.

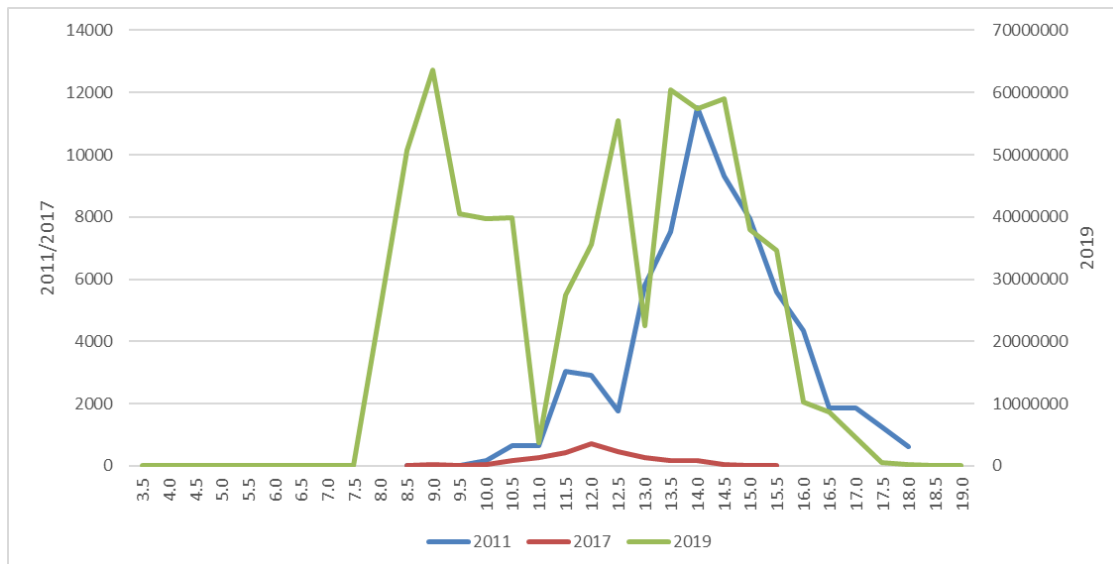


Figure 15. Squid length distribution (cm), in the years in which samples were taken, on NAFO 3NO: 2002-2019. Total abundance in thousands. 2011/2017 and 2019 are represented in a different Y-axis.

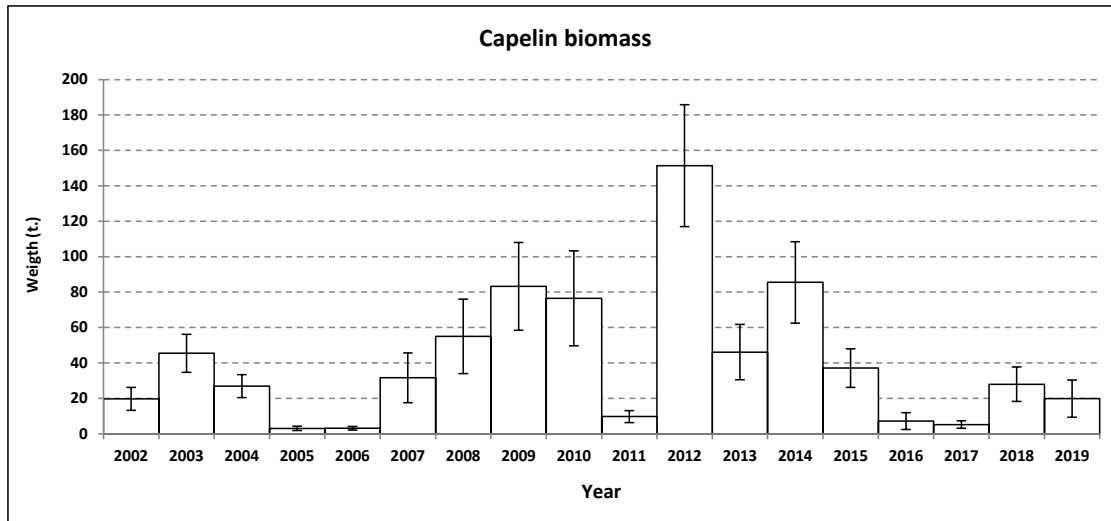


Figure 16. Capelin biomass calculated by the swept area method in tons and $\pm$ SD by year. Spanish Spring surveys in NAFO Div. 3NO: 2002-2019.