



**SCIENTIFIC COUNCIL MEETING - JUNE 2019**

Yellowtail flounder, redfish (*Sebastes spp.*) and witch flounder indices from the Spanish Survey conducted in Divisions 3NO of the NAFO Regulatory Area

by

Diana González-Troncoso<sup>1</sup>, Irene Garrido<sup>2</sup> and Ana Gago<sup>1</sup>

<sup>1</sup>Instituto Español de Oceanografía

<sup>2</sup>Organización de Productores de buques congeladores de merlúcidos, cefalópodos y especies varias (OPPC-3)

e-mail: diana.gonzalez@ieo.es

**Abstract**

Since 1995, Spain carries out a spring stratified random bottom trawl survey in Div. 3NO of the NAFO Regulatory Area. Total mean catches, biomass and mean numbers for yellowtail flounder (*Limanda ferruginea*) are presented for the period 1995-8 for redfish (*Sebastes spp.*) for the period 1997-2018 and for witch flounder (*Glyptocephalus cynoglossus*) for the period 2002-2018. Detailed indices are presented from 2013.

Yellowtail flounder indices do not show a clear trend. Biomass increased from 1997 to 1999 has maintained almost constant values until 2013 and then decreased in 2014-2018. Redfish indices oscillate greatly over time, probably because the gear does not sample adequately aggregating pelagic species. There was a sharp increase in 2009 and since then until 2015, biomass fluctuated maintaining higher values than before 2009. In 2016 biomass dropped and increase again in 2017-2018 to the 2012 level. The 3N division comprises around the 90% of the total biomass in the last years. Good year classes have not been registered recently. Length distribution in thousands (abundance) by Division and year since 2002 is presented. Following the trend of the biomass, most of the abundance corresponds to Division 3N. Witch flounder is very scarce and its indices fluctuated throughout the series reaching the minimum value in 2014 and 2018, with an increasing trend in the middle time. Recruitment was quite good at the beginning of the series but poor in recent years.

**Material and methods**

The Spanish Spring (May/June) survey in Div. 3NO of NAFO Regulatory Area was initiated by Spain in 1995. Until 2001, the survey was carried out on board the Spanish vessel C/V *Playa de Menduïña* (338 GT and 800 HP) using a *Pedreira* type bottom trawl. The R/V *Vizconde de Eza* replaced the C/V *Playa de Menduïña* in 2001, and the *Campelen* 1800 was implemented as survey gear. The main specifications and geometry of these gears, their rigging profile and the net plan, and the survey technical information are described in Walsh *et al.* (2001). The survey area was stratified following the standard stratification schemes (Bishop, 1994). Set number was allocated proportionally to the area of the strata, with a minimum of two planed hauls per stratum, and trawl positions were chosen at random (Doubleday, 1981). Biomass indices were calculated by the swept area method (Cochran, 1997), assuming catchability factor of 1. Table 1 presents the number of valid tows, the depth strata covered and the dates of the total survey series. Table 2 shows the swept area and number of hauls by



stratum for the last five years (2014-2018). To know the results of the rest of the years, see González-Troncoso *et al.*, 2014.

In each haul, all the individuals caught were sorted by species and weighted. Random samples of the catch of each species were length measured (total length) to the nearest lower cm. The obtained length distribution was aggregated into 2 cm intervals (beginning with the pair number) and raised to the catch of each species.

The redfish series for total biomass and total mean catches and mean number per tow start in 1997 because sampling depth in 1995 and 1996 was shallower than 1000 meters so the data are not representative for this species. As all strata where the yellowtail flounder is caught were well surveyed, the series for this species are presented since 1995. As calibration for witch flounder data has not been done yet, only data from 2002 are presented. Data for yellowtail flounder and redfish were calibrated for the period 1995-2000 and non-transformed from 2002 onwards, to create a combined 1995-2018 time-series. Regarding 2001, there are both calibrated (from the former vessel) and non-transformed data (from the new vessel). More information on the calibration method can be found in González-Troncoso *et al.* (2004) and Paz *et al.* (2004).

Mean catch and variance per haul, biomass and length distribution by strata are presented for each species for the last five years (2014-2018). To see the results of the rest of the years, see González-Troncoso *et al.*, 2014. Total biomass and mean catch per tow with SD and mean number per tow by year are presented for the total period series.

Figure 1 presents the maps with the distribution of the catches of the three species during the 2018 Spanish 3NO survey.

## Results

### **Yellowtail flounder**

After a moratorium between 1994 and 1997, the yellowtail flounder fishery has been under TAC. According to the Report of NAFO Scientific Council Meeting, stock size reached a minimum in the mid 1990's, but since 1994 has steadily increased and is now well above  $B_{msy}$ . There is very low risk of the stock being below  $B_{msy}$  or  $F$  being above  $F_{msy}$ . Recent recruitment appears to be higher than average (NAFO, 2018).

### **Mean Catches and Biomass**

Table 3 shows mean catch and SD per haul and stratum and Table 4 the biomass estimates by the swept area method and their SD by stratum for years 2014-2018 for yellowtail flounder. Total biomass (t) and stratified mean catch per tow (kg) and SD by year for the entire series are presented in Table 5 for 1995-2018. Table 6 presents the parameters  $a$  and  $b$  for the calculation of the length-weight relationship for years 2014-2018.

Yellowtail flounder biomass index shows no clear trend throughout the study period. It increased substantially from 1997 to 1999, has maintained almost constant values until 2013 and then decreased in 2014-2018. The 2017 value was the lowest since 1998 (Table 5; Figures 2 and 3).

### **Length Distribution**

The mean number per haul by year is presented in Table 7 and Figure 2 for 1995-2018 and Table 8 presents the same index by length, sex and year besides the sampled size and catch for the period 2013-2017. Figures 4 and 5 present these indices for the entire period. The mean numbers are in concordance with the mean catches (Figure 2). There has not been good recruitment in recent years. In Figure 4, we can follow a length modal value since the beginning of the series, but the presence of juveniles is very low. This mode can be seen until 2009 when it reached 34-35 cm, and since 2010 the mode of the length distribution was about 30-34 cm. In 2013-2018 the mode was at 34-35 cm for females, and at 30-33 cm for males.

### **Redfish**

There are two species of redfish that have been commercially fished in Div. 3NO; the deep-sea redfish (*Sebastes mentella*) and the Acadian redfish (*Sebastes fasciatus*). Due to the difficulty to distinguish the two species, the catches are usually reported by genus as "redfish" (*Sebastes* spp.) in the commercial fishery statistics.

This stock in Div. 3O has been under TAC regulation since 1974. In September 2004, the Fisheries Commission adopted an annual TAC of 20 000 t in the entire area of Div. 3O. The stock appears to have increased since the early 2000s. Catches were stable from 2009 to 2014. Survey index values have declined from those observed in 2012 when values were near time-series highs.

In 3N (the stock is 3LN) a moratorium was implemented from 1998 to 2009. The fishery was reopened in 2010 with the resultant increase of catches but the perception of the stock given by the available surveys has not been altered. At the beginning of 2017, the probability of being below  $B_{msy}$  was less than 1%. The probability of being above  $F_{msy}$  is very low. Between 2006-2007 and 2009-2010 the recruitment index increased rapidly both in commercial catch and Canadian surveys, reaching by then maximum values. The recruitment index drops fast on the following years and is at low levels since 2014-2015. Nevertheless, unusual high numbers of very small redfish pre recruits have been observed on recent years (2015-2017) on Canadian spring and autumn surveys (NAFO, 2018).

### Mean Catches and Biomass

Redfish mean catches and SD are presented in Table 9 and biomass in Table 10 by stratum for 2014-2018. Annual biomass and stratified mean catch and SD per haul for years 1997-2018 are presented in Table 11 by Division. The length-weight relationship parameters  $a$  and  $b$  are presented in Table 12 for years 2014-2018.

Redfish indices oscillate greatly over time, probably because the gear does not sample adequately aggregating pelagic species. They showed a quick increase from 1997 to 2000, followed by a sudden drop until 2002, after which they have increased to the levels of the early years of the time series. The index increased nearly fivefold in 2009 in comparison with 2005. This was not just due to very large catches in few hauls, as redfish catch was over 1 ton in 11 of the 43 hauls in which redfish was caught. Furthermore, redfish catch was over 15 tons in three hauls. In 2015, an increase allowed biomass to reach the second highest value of the series. In this case, redfish catch was over 10 tons in 3 hauls. Then biomass dropped fourfold in 2016 and increase again in 2017-2018 to the 2012 level (Table 10; Figures 6 and 7).

Biomass and mean catch per haul and Division, the number of strata covered in each case, and the percentage of biomass in 3N respect to the total are presented in Table 11. Biomass is always larger in 3N than in 3O (Figure 8), although the percentage is very spread over the time. However, the mean catch per tow was higher in Division 3O until 2004. Since 2005, more than 83% of redfish catches have occurred in Division 3N. In 2010, mean catch per tow in 3O was almost three times higher than in 2009, whereas in 3N was lower than in 2009. In 2013 and 2015, the increase in the total biomass was due to the increase in Division 3N. Last four years indices fluctuated. In 2018, the 3O biomass is the third lowest of the series.

### Length Distribution

Mean number per haul by year is presented in Table 13 and Figure 6 for 1997-2018. Table 14 presents this index per length with sample size and catch for the period 2014-2018. Figures 9 and 10 show the trend of the mean abundance per tow by length class. The y-axis upper limit of Figure 10 has been changed for years 1997-2008 to see the length distribution despite the large catches registered in the period 2009-2017. The last good year class was recorded in 2004 and this cohort can be tracked until 2018. In recent years there was only a discrete presence of juveniles. The clear 18 cm mode in 2009 (20 cm in 2011) seems to be a consequence of the 2004 recruitment. In 2012 and 2013 the mode is in 20-21 cm and from 2014-2018 in 22-23 cm.

Length distribution in thousands (abundance) by Division and year since 2002 is presented in Table 15 in order to see the structure of the population in each Division, and in Table 16 and Figure 11 the total abundance in thousands by year and Division can be seen. Following the trend of the biomass, most of the abundance corresponds to Division 3N.

## **Witch flounder**

This stock occurs mainly in Div. 30, along the South-western slopes of the Grand Bank, but it seems to migrate seasonally onto the shallow banks. It has been fished mainly in winter and springtime, targeting the spawning concentrations. The Div. 3NO estimates of biomass index for the Canadian surveys, although variable, have shown a general decreasing trend from 1985 to 1998 followed by an increase from 1998 to 2003. From 2012 to 2015 biomass indices indicated a downward trend. Biomass values increased slightly in 2016 and 2017.

Recruitment (defined as fish less than 21cm) in both the spring and fall Canadian surveys although somewhat variable has generally been low since 2003. Recruitment in spring and fall surveys in 2016 approached the lowest of the time series. Recruitment in 2017 surveys increased in the fall to a value just above the time series mean while those in the spring increased to a value approaching the time series mean. The stock size increased since 1999 to about 2010 and then declined after 2012. Biomass in 2018 is 0.37 of  $B_{msy}$ . There is 29% risk of the stock being below  $B_{lim}$  and a very low probability of  $F$  being above  $F_{lim}$ . The stock was reopened to fishery in 2015 with a very low TAC (1 000 tons), that was duplicated for 2016 and 2017 (2 172 t and 2 225 t respectively) (NAFO, 2018).

## **Mean Catches and Biomass**

Witch flounder mean catches and SD by stratum are presented in Table 17 and biomass per stratum in Table 18 for 2014-2018. In Table 19 and Figures 12 and 13 the annual stratified mean catch per tow and biomass with SD are presented for the period 2002-2018. The length-weight relationship parameters  $a$  and  $b$  are presented in Table 20 for 2014-2018.

Witch flounder indices fluctuated throughout the period 2002-2018 reaching a depressed level in 2014 and 2018, with an increasing trend in the middle time. Highest values were found in 2004, 2010 and 2017 (Table 19; Figures 12 and 13).

## **Length Distribution**

Table 21 and Figures 14 and 15 present witch flounder mean number per tow and sex by year for 2002-2018, and Table 22 the same index by length with sample size and catch for the period 2014-2018. The best recruitment occurred in the period 2002-2005 and has been very poor since 2008. Some modes can be tracked in Figure 14, probably due to the recruitments at the beginning of the series. In 2012 and 2013 there was a quite good presence of individuals of lengths 34-42 cm, poorly found in 2014, but that we can follow in 2015-2017. In 2018, the presence of all the length ranges is small.

## **Acknowledges**

The data used in this paper have been funded by the EU through the European Maritime and Fisheries Fund (EMFF) within the National Program of collection, management and use of data in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy.

## **References**

- Bishop, C A.. 1994. Revisions and additions to stratification schemes used during research vessel surveys in NAFO subareas 2 and 3. NAFO SCR Doc. 94/43, Serial nº N2413, 23 pp.
- Cochran, W. G.. 1997. Sampling techniques. J. Wiley and Sons, N.Y., 428 pp.
- Doubleday, W. G.. 1981. Manual on groundfish surveys in the Northwest Atlantic. NAFO Sci. Coun. Studies, 2, 55.
- González Troncoso, D., E. Guijarro-García and X. Paz. 2014. Yellowtail flounder, redfish (*Sebastes spp*) and witch flounder indices from the Spanish Survey conducted in Divisions 3NO of the NAFO Regulatory Area. NAFO SCR Doc. 14/06, Serial Number N6296, 32 pp.

- González Troncoso, D., X. Paz and C. González. 2004. Atlantic cod population indices obtained from the Spring surveys conducted by Spain in the NAFO Regulatory Area of Divisions 3NO, 1995-2003. NAFO SCR Doc. 04/12, Serial Number N4957, 21 pp.
- NAFO, 2018. Report of Scientific Council Meeting, 01-14 June 2018. NAFO SCS Doc. 18-19, Serial No. N6849, 292 pp.
- Paz, X., D. González Troncoso and E. Román. 2004. New time series for Yellowtail flounder from the comparative experience between the C/V *Playa de Menduñía* and the R/V *Vizconde de Eza* in the NAFO Regulatory Area of Divisions 3NO, 1995-2003. NAFO SCR Doc. 04/10, Serial Number N4955, 19 pp.
- Walsh, J.S., X. Paz and P. Durán. 2001. A preliminary investigation of the efficiency of Canadian and Spanish Survey bottom trawls on the Southern Bank. NAFO SCR Doc., 01/74, Serial nº N4453, 18 pp.

**Table 1.** Spanish spring bottom trawl surveys in NAFO Div. 3NO: 1995-2018.

Year	Vessel	Valid tows	Depth strata covered (m)	Dates
1995	<i>C/V Playa de Mendiña</i>	77	42-684	May 18-May 29
1996	<i>C/V Playa de Mendiña</i>	112	41-1135	May 07-May 24
1997	<i>C/V Playa de Mendiña</i>	128	42-1263	April 26-May 18
1998	<i>C/V Playa de Mendiña</i>	124	42-1390	May 06-May 26
1999	<i>C/V Playa de Mendiña</i>	114	41-1381	May 07-May 26
2000	<i>C/V Playa de Mendiña</i>	118	42-1401	May 07-May 28
2001 <sup>(*)</sup>	<i>R/V Vizconde de Eza</i>	83	36-1156	May 03-May 24
	<i>C/V Playa de Mendiña</i>	121	40-1500	May 05-May 23
2002	<i>R/V Vizconde de Eza</i>	125	38-1540	April 29-May 19
2003	<i>R/V Vizconde de Eza</i>	118	38-1666	May 11-June 02
2004	<i>R/V Vizconde de Eza</i>	120	43-1539	June 06-June 24
2005	<i>R/V Vizconde de Eza</i>	119	47-1485	June 10-June 29
2005	<i>R/V Vizconde de Eza</i>	119	47-1485	June 10-June 29
2006	<i>R/V Vizconde de Eza</i>	120	45-1480	June 7-June 27
2007	<i>R/V Vizconde de Eza</i>	110	45-1374	May 29-June 19
2008	<i>R/V Vizconde de Eza</i>	122	45-1374	May 27-June 16
2009	<i>R/V Vizconde de Eza</i>	109	45-1374	May 31-June 18
2010	<i>R/V Vizconde de Eza</i>	95	45-1374	May 30-June 18
2011	<i>R/V Vizconde de Eza</i>	122	44-1450	June 5-June 24
2012	<i>R/V Vizconde de Eza</i>	122	44-1450	June 3-June 21
2013	<i>R/V Vizconde de Eza</i>	122	44-1450	June 1-June 21
2014	<i>R/V Vizconde de Eza</i>	122	44-1450	June 2-June 21
2015	<i>R/V Vizconde de Eza</i>	122	44-1450	May 31-June 19
2016	<i>R/V Vizconde de Eza</i>	115	44-1450	May 30-June 18
2017	<i>R/V Vizconde de Eza</i>	113	44-1450	May 23-June 11
2018	<i>R/V Vizconde de Eza</i>	114	44-1450	June 2-June 21

(\*)For the calculation of the series, 83 hauls were taken from the *R/V Vizconde de Eza* and 40 hauls from the *C/V Playa de Mendiña* (123 hauls in total)

**Table 2.** Swept area and number of hauls by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2014-2018. Swept area in square miles. n.s. means stratum not surveyed.

Stratum	2014		2015		2016		2017		2018	
	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number	Swept area	Tow number
353	0.0379	3	0.0401	3	0.0356	3	0.0360	3	0.0338	3
354	0.0394	3	0.0390	3	0.0345	3	0.0356	3	0.0341	3
355	0.0263	2	0.0263	2	0.0233	2	0.0225	2	0.0233	2
356	0.0266	2	0.0255	2	0.0225	2	0.0233	2	0.0225	2
357	0.0263	2	0.0233	2	0.0233	2	0.0233	2	0.0236	2
358	0.0390	3	0.0349	3	0.0338	3	0.0364	3	0.0345	3
359	0.0908	7	0.0855	7	0.0593	5	0.0596	5	0.0589	5
360	0.2629	20	0.2363	20	0.1995	17	0.2044	17	0.1939	17
374	0.0259	2	0.0229	2	0.0233	2	0.0236	2	0.0225	2
375	0.0390	3	0.0341	3	0.0360	3	0.0364	3	0.0356	3
376	0.1324	10	0.1159	10	0.0945	8	0.0975	8	0.0908	8
377	0.0259	2	0.0233	2	0.0233	2	0.0251	2	0.0233	2
378	0.0263	2	0.0225	2	0.0225	2	0.0236	2	0.0229	2
379	0.0255	2	0.0225	2	0.0229	2	0.0244	2	0.0225	2
380	0.0263	2	0.0229	2	0.0236	2	0.0236	2	0.0225	2
381	0.0259	2	0.0236	2	0.0229	2	0.0229	2	0.0225	2
382	0.0521	4	0.0458	4	0.0465	4	0.0360	3	0.0450	4
721	0.0266	2	0.0240	2	0.0225	2	0.0229	2	0.0229	2
722	0.0259	2	0.0259	2	0.0229	2	0.0233	2	0.0236	2
723	0.0259	2	0.0233	2	0.0225	2	0.0229	2	0.0240	2
724	0.0255	2	0.0236	2	0.0233	2	0.0240	2	0.0233	2
725	0.0255	2	0.0229	2	0.0229	2	0.0244	2	0.0233	2
726	0.0248	2	0.0229	2	0.0225	2	0.0233	2	0.0225	2
727	0.0259	2	0.0225	2	0.0225	2	0.0229	2	0.0225	2
728	0.0248	2	0.0225	2	0.0229	2	0.0229	2	0.0225	2
752	0.0240	2	0.0225	2	0.0236	2	0.0236	2	0.0233	2
753	0.0240	2	0.0233	2	0.0229	2	0.0233	2	0.0236	2
754	0.0225	2	0.0225	2	0.0225	2	0.0218	2	0.0225	2
755	0.0454	4	0.0450	4	0.0458	4	0.0338	3	0.0338	3
756	0.0229	2	0.0229	2	0.0225	2	0.0229	2	0.0229	2
757	0.0244	2	0.0229	2	0.0225	2	0.0225	2	0.0225	2
758	0.0221	2	0.0221	2	0.0221	2	0.0229	2	0.0225	2
759	0.0229	2	0.0229	2	0.0229	2	0.0225	2	0.0225	2
760	0.0364	3	0.0225	2	0.0229	2	0.0236	2	0.0356	3
761	0.0240	2	0.0240	2	0.0225	2	0.0236	2	0.0124	1
762	0.0229	2	0.0229	2	0.0225	2	0.0229	2	0.0225	2
763	0.0233	2	0.0341	3	0.0338	3	0.0353	3	0.0345	3
764	0.0259	2	0.0251	2	0.0225	2	0.0229	2	0.0225	2
765	0.0240	2	0.0236	2	0.0229	2	0.0225	2	0.0233	2
766	0.0221	2	0.0236	2	0.0229	2	0.0225	2	0.0229	2
767	0.0221	2	0.0229	2	0.0229	2	0.0229	2	0.0236	2

**Table 3.** Yellowtail flounder mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2014-2018. n.s. means stratum not surveyed.

Stratum	2014		2015		2016		2017		2018	
	Y. flounder Mean catch	Y. flounder SD	Y. flounder Mean catch	Y. flounder SD	Y. flounder Mean catch	Y. flounder SD	Y. flounder Mean catch	Y. flounder SD	Y. flounder Mean catch	Y. flounder SD
353	1.09	1.19	34.18	48.09	7.82	13.54	27.50	23.33	3.40	5.56
354	0.00	0.00	2.28	3.94	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	0.00	0.00
357	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
358	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
359	40.18	93.34	2.27	2.92	0.24	0.36	0.05	0.11	0.44	0.46
360	229.47	190.61	286.35	205.84	277.57	501.85	260.47	349.29	179.78	128.90
374	489.57	33.19	220.08	96.88	227.62	23.37	3.49	4.50	168.18	114.08
375	400.78	131.27	195.40	124.81	84.61	24.64	45.17	54.99	44.41	23.76
376	694.93	899.49	553.63	422.74	722.38	520.54	309.79	234.89	506.07	308.21
377	10.85	14.79	7.53	10.64	0.76	1.07	0.36	0.51	0.00	0.00
378	0.26	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
379	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
380	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
381	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
382	0.00	0.00	0.00	0.00	0.33	0.48	0.25	0.43	0.00	0.00
721	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
722	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
723	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
724	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
728	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
752	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
753	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
754	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
755	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
756	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
757	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
758	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
759	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
760	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
761	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
762	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
763	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
764	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
765	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
766	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
767	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00



**Table 4.** Yellowtail flounder survey biomass (t) by stratum in NAFO Div. 3NO: 2014-2018. n.s. means stratum not surveyed.

<b>Strata</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Strata</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
<b>353</b>	23	688	177	616	81	<b>725</b>	0	0	0	0	0
<b>354</b>	0	43	0	0	0	<b>726</b>	0	0	0	0	0
<b>355</b>	0	0	0	0	0	<b>727</b>	0	0	0	0	0
<b>356</b>	0	0	0	0	0	<b>728</b>	0	0	0	0	0
<b>357</b>	0	0	0	0	0	<b>752</b>	0	0	0	0	0
<b>358</b>	0	0	0	0	0	<b>753</b>	0	0	0	0	0
<b>359</b>	1305	78	9	2	16	<b>754</b>	0	0	0	0	0
<b>360</b>	48586	67463	65826	60296	43872	<b>755</b>	0	0	0	0	0
<b>374</b>	8098	4118	4190	63	3199	<b>756</b>	0	0	0	0	0
<b>375</b>	8355	4655	1911	1010	1014	<b>757</b>	0	0	0	0	0
<b>376</b>	70031	63736	81580	33908	59513	<b>758</b>	0	0	0	0	0
<b>377</b>	84	65	6	3	0	<b>759</b>	0	0	0	0	0
<b>378</b>	3	0	0	0	0	<b>760</b>	0	0	0	0	0
<b>379</b>	0	0	0	0	0	<b>761</b>	0	0	0	0	0
<b>380</b>	0	0	0	0	0	<b>762</b>	0	0	0	0	0
<b>381</b>	0	0	0	0	0	<b>763</b>	0	0	0	0	0
<b>382</b>	0	0	10	7	0	<b>764</b>	0	0	0	0	0
<b>721</b>	0	0	0	0	0	<b>765</b>	0	0	0	0	0
<b>722</b>	0	0	0	0	0	<b>766</b>	0	0	0	0	0
<b>723</b>	0	0	0	0	0	<b>767</b>	0	0	0	0	0
<b>724</b>	0	0	0	0	0						

**Table 5.** Yellowtail flounder survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by year in NAFO Div. 3NO: 1995-2018.

<b>Year</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>
<b>Biomass</b>	9264	43349	38697	122601	197012	144685	182704	148487	136775	169978	156472	160145
<b>SD</b>	2484	6032	8527	31359	22938	19097	25847	23368	19287	18869	15271	16458
<b>MCPT</b>	16.22	59.54	47.74	137.32	232.41	167.76	210.84	164.28	148.92	190.05	176.42	189.32
<b>SD</b>	4.37	8.41	10.69	34.70	27.41	22.21	30.58	24.92	20.84	21.27	17.06	19.83

<b>Year</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
<b>Biomass</b>	160731	160146	183412	189687	203833	195606	187969	136484	140845	153708	95905	107695
<b>SD</b>	18852	17297	25736	22611	30743	23679	22493	29519	18915	34788	22868	15055
<b>MCPT</b>	202.64	178.27	209.43	224.54	231.22	221.33	214.17	173.79	159.25	175.03	112.03	118.41
<b>SD</b>	23.61	19.00	29.75	26.30	35.18	26.27	25.35	38.52	21.37	40.46	25.20	16.47

**Table 6.** Yellowtail flounder length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2014-2018. E(x) means Error of the parameter x.

Year	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
2014	0.01661	2.81259	0.1442	0.0449	0.993	354	0.0119	2.9123	0.1445	0.0428	0.992	506	0.0162	2.8240	0.1218	0.0383	0.993	861
2015	0.00491	3.16089	0.2087	0.0646	0.988	506	0.0069	3.0678	0.0797	0.0233	0.998	611	0.0066	3.0784	0.0242	0.0383	0.997	1144
2016	0.01051	2.94093	0.0867	0.027	0.998	311	0.0086	3.0047	0.0584	0.0175	0.999	441	0.0110	2.9338	0.074	0.0225	0.998	756
2017	0.00720	3.03484	0.1616	0.0513	0.993	284	0.0056	3.1206	0.084	0.0249	0.998	402	0.0063	3.0871	0.0838	0.0256	0.997	689
2018	0.00406	3.21763	0.11755	0.03586	0.99851	358	0.0044	3.2050	0.08925	0.02616	0.99884	436	0.0038	3.2409	0.06576	0.01939	0.99936	794

**Table 7.** Yellowtail flounder mean number per tow by year in Spanish Spring surveys in NAFO Div. 3NO: 1995-2018. Indet. means indeterminate.

	1995				1996				1997				1998				1999				2000			
	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	31.12	47.36	6.14	84.62	73.11	188.83	13.23	275.17	134.85	147.98	0.00	282.83	279.83	343.35	1.61	624.79	508.72	539.70	4.48	1052.90	332.06	376.36	0.00	708.42
	2001				2002				2003				2004				2005				2006			
MNPT	328.27	428.33	6.98	763.57	256.56	333.09	0.81	590.46	215.96	271.49	0.72	488.17	322.91	336.03	1.19	660.14	275.52	308.25	0.30	584.07	281.15	354.69	0.60	636.44
	2007				2008				2009				2010				2011				2012			
MNPT	317.34	365.53	0.10	682.97	295.11	335.10	0.15	630.35	298.01	398.88	0.48	697.37	368.83	414.09	0.00	782.92	305.92	426.42	0.00	732.34	315.50	438.48	0.75	754.73
	2013				2014				2015				2016				2017				2018			
MNPT	294.58	394.06	0.79	689.43	226.69	293.78	0.03	520.50	219.81	248.70	0.11	468.62	227.23	274.70	0.02	501.95	154.84	179.89	0.02	334.75	139.66	193.84	0.00	333.49

**Table 8.** Yellowtail flounder mean number per tow by length class and year. Spanish Spring Survey on NAFO 3NO: 2014-2018. Indet. means indeterminate.

Length (cm)	2014				2015				2016				2017				2018			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000	0.000	0.090	0.090	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
8	0.000	0.000	0.027	0.027	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.066	0.012	0.078	0.000	0.000	0.000	0.000
10	0.090	0.027	0.000	0.117	0.065	0.000	0.023	0.088	0.000	0.048	0.024	0.071	0.009	0.000	0.012	0.021	0.000	0.274	0.000	0.274
12	0.027	0.027	0.000	0.054	0.393	0.168	0.000	0.561	0.290	0.111	0.000	0.401	0.256	0.282	0.000	0.538	0.274	0.468	0.000	0.742
14	0.471	0.458	0.000	0.929	0.429	0.083	0.000	0.512	0.242	0.174	0.000	0.417	0.674	0.638	0.000	1.312	0.824	0.112	0.000	0.936
16	0.724	0.584	0.000	1.308	0.171	0.746	0.000	0.918	0.087	0.024	0.000	0.110	1.004	1.284	0.000	2.288	0.042	0.387	0.000	0.429
18	0.883	0.362	0.000	1.245	0.566	0.407	0.000	0.973	0.322	0.329	0.000	0.651	1.132	1.845	0.000	2.977	1.512	1.004	0.000	2.517
20	1.621	0.831	0.000	2.452	2.428	1.127	0.000	3.555	1.779	0.121	0.000	1.900	4.426	4.100	0.000	8.526	4.222	4.365	0.000	8.587
22	2.910	1.182	0.000	4.093	2.189	1.347	0.000	3.536	1.926	1.404	0.000	3.330	2.020	2.289	0.000	4.309	4.981	4.255	0.000	9.236
24	3.649	3.951	0.000	7.600	2.731	2.106	0.000	4.837	4.847	2.475	0.000	7.321	2.101	1.182	0.000	3.283	6.089	6.847	0.000	12.937
26	10.794	7.617	0.000	18.410	7.828	4.621	0.000	12.449	6.958	4.266	0.000	11.224	4.675	2.929	0.000	7.604	3.499	3.694	0.000	7.193
28	31.696	19.603	0.000	51.299	26.388	9.768	0.000	36.156	20.890	7.345	0.000	28.235	11.436	5.626	0.000	17.062	8.696	5.002	0.000	13.697
30	69.017	39.870	0.000	108.887	65.705	25.661	0.000	91.366	58.091	25.110	0.000	83.201	35.663	7.758	0.000	43.421	25.823	8.614	0.000	34.437
32	65.608	51.680	0.000	117.289	68.516	53.570	0.000	122.086	81.325	46.999	0.000	128.323	54.496	27.290	0.000	81.785	45.404	24.524	0.000	69.928
34	30.734	58.923	0.000	89.656	32.700	54.184	0.000	86.884	37.685	66.522	0.000	104.207	29.456	42.583	0.000	72.039	27.260	45.645	0.000	72.905
36	6.218	49.180	0.000	55.398	8.310	43.816	0.000	52.126	9.676	58.832	0.000	68.507	6.127	40.587	0.000	46.715	9.287	47.535	0.000	56.823
38	1.728	28.656	0.000	30.384	1.097	27.918	0.000	29.014	2.072	39.605	0.000	41.677	1.238	23.231	0.000	24.469	1.484	24.834	0.000	26.318
40	0.377	19.238	0.000	19.615	0.218	14.529	0.000	14.747	1.008	13.539	0.000	14.547	0.124	10.879	0.000	11.002	0.024	9.924	0.000	9.948
42	0.069	8.649	0.000	8.718	0.027	6.371	0.000	6.399	0.037	5.483	0.000	5.520	0.000	5.154	0.000	5.154	0.217	3.461	0.000	3.679
44	0.069	2.164	0.000	2.233	0.048	1.564	0.000	1.612	0.000	1.819	0.000	1.819	0.000	1.644	0.000	1.644	0.000	2.211	0.000	2.211
46	0.000	0.706	0.000	0.706	0.000	0.532	0.000	0.532	0.000	0.454	0.000	0.454	0.000	0.432	0.000	0.432	0.000	0.579	0.000	0.579
48	0.000	0.075	0.000	0.075	0.000	0.154	0.000	0.154	0.000	0.037	0.000	0.037	0.000	0.028	0.000	0.028	0.017	0.093	0.000	0.110
50	0.000	0.000	0.000	0.000	0.000	0.027	0.000	0.027	0.000	0.000	0.000	0.000	0.000	0.066	0.000	0.066	0.000	0.008	0.000	0.008
52	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
54	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
56	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
58	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	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	226.685	293.784	0.027	520.497	219.809	248.701	0.113	468.623	227.233	274.697	0.024	501.954	154.837	179.893	0.024	334.754	139.656	193.837	0.000	333.493
N° samples:				45				44				34				35				35
N° Ind.:	3004	3975	1	6980	3831	4834	4	8669	1595	2466	1	4062	1675	2234	2	3911	1918	3032	0	4950
Sampled catch:				2217				3023				1489				1387				1844
Range:				8-48				6-50				10-48				9-51				10-50
Total catch:				14027				12				11234				7133				7587
Total hauls:				122				122				115				113				114

**Table 9.** Redfish mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2014-2018. n.s. means stratum not surveyed.

Stratum	2014		2015		2016		2017		2018	
	Redfish Mean catch	Redfish SD	Redfish Mean catch	Redfish SD	Redfish Mean catch	Redfish SD	Redfish Mean catch	Redfish SD	Redfish Mean catch	Redfish SD
353	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.07
354	25.50	40.21	972.97	883.47	482.34	791.85	540.03	923.90	1.26	1.15
355	302.90	220.62	1954.04	1984.34	513.80	79.20	708.98	623.84	35.22	32.22
356	1974.78	1028.04	707.30	62.72	210.70	127.84	1146.51	193.97	301.03	103.63
357	435.45	75.73	3886.69	2152.38	835.95	247.78	2502.83	2277.84	5876.23	3065.60
358	2333.82	689.93	16765.95	10954.46	3706.23	3517.46	6005.13	4962.78	5435.00	7779.65
359	1181.28	1710.64	356.78	723.22	1.55	1.46	1379.60	3054.66	119.55	248.28
360	0.03	0.14	0.00	0.00	0.37	1.37	0.00	0.00	0.07	0.29
374	0.00	0.00	0.00	0.00	0.00	0.00	2.63	3.71	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	0.49	1.20	0.00	0.00	0.00	0.00
377	0.00	0.00	0.00	0.00	0.00	0.00	1.30	1.84	3.09	3.27
378	4448.60	6291.27	6175.36	8441.67	164.55	220.41	3472.11	4099.57	811.36	920.67
379	2629.50	2732.39	3080.27	3492.78	611.70	12.55	318.93	10.01	5747.14	1716.66
380	1781.93	178.80	1175.26	110.17	607.60	758.98	3.91	1.82	1062.54	1501.58
381	0.03	0.01	25.28	28.59	0.03	0.04	0.29	0.38	0.54	0.74
382	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
721	687.85	800.66	445.63	481.01	106.80	1.27	148.93	42.46	362.65	29.84
722	40.18	50.43	5.07	7.17	14.68	16.72	5.92	2.66	20.91	28.86
723	844.10	439.25	576.35	407.93	437.23	319.80	1544.42	1811.07	1633.62	1493.64
724	71.34	33.14	72.34	86.36	1.71	1.07	40.04	6.88	221.00	275.42
725	86.50	33.52	633.76	720.63	1138.33	1230.83	391.65	321.52	253.61	157.39
726	6.34	4.33	35.40	29.27	18.44	1.68	50.81	37.60	21.44	17.13
727	31.90	19.80	207.30	73.40	208.40	230.66	195.29	45.17	116.90	153.16
728	5.82	7.75	10.11	13.28	9.40	1.98	4.30	1.85	82.65	100.62
752	0.12	0.17	0.00	0.00	0.25	0.35	1.74	1.84	1.57	2.22
753	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
754	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
755	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
756	0.60	0.11	0.73	0.00	1.62	2.28	0.00	0.00	2.39	3.37
757	0.44	0.62	0.38	0.54	1.74	2.46	0.41	0.58	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	2.42	3.42	0.00	0.00	0.00	0.00
760	0.50	0.86	0.00	0.00	0.07	0.09	0.36	0.51	0.00	0.00
761	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	0.09	0.15	0.00	0.00
764	0.07	0.10	0.00	0.00	0.00	0.00	0.07	0.09	0.00	0.00
765	0.00	0.00	1.02	1.44	0.00	0.00	0.35	0.49	0.00	0.00
766	0.00	0.00	0.00	0.00	3.30	4.67	0.00	0.00	0.59	0.83
767	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

**Table 10.** Redfish survey biomass (t) by stratum in NAFO Div. 3NO: 2014-2018. n.s. means stratum not surveyed.

<b>Strata</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>Strata</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
<b>353</b>	0	0	0	0	1	<b>725</b>	712	5818	10450	3374	2291
<b>354</b>	478	18412	10318	11187	27	<b>726</b>	37	223	118	315	137
<b>355</b>	1708	11017	3271	4663	224	<b>727</b>	237	1769	1778	1639	998
<b>356</b>	6972	2607	880	4635	1258	<b>728</b>	37	70	64	29	573
<b>357</b>	5441	54832	11793	35309	81583	<b>752</b>	1	0	3	19	18
<b>358</b>	40393	324502	74125	111435	106337	<b>753</b>	0	0	0	0	0
<b>359</b>	38361	12297	55	48706	4274	<b>754</b>	0	0	0	0	0
<b>360</b>	7	0	87	0	17	<b>755</b>	0	0	0	0	0
<b>374</b>	0	0	0	48	0	<b>756</b>	5	6	14	0	21
<b>375</b>	0	0	0	0	0	<b>757</b>	4	3	16	4	0
<b>376</b>	0	0	56	0	0	<b>758</b>	0	0	0	0	0
<b>377</b>	0	0	0	10	27	<b>759</b>	0	0	27	0	0
<b>378</b>	47113	76300	2033	40857	9860	<b>760</b>	6	0	1	5	0
<b>379</b>	21861	29023	5669	2774	54151	<b>761</b>	0	0	0	0	0
<b>380</b>	13034	9864	4938	32	9067	<b>762</b>	0	0	0	0	0
<b>381</b>	0	308	0	4	7	<b>763</b>	0	0	0	2	0
<b>382</b>	0	0	0	0	0	<b>764</b>	1	0	0	1	0
<b>721</b>	3359	2414	617	846	2061	<b>765</b>	0	11	0	4	0
<b>722</b>	261	33	108	43	149	<b>766</b>	0	0	42	0	7
<b>723</b>	10113	7685	6024	20930	21101	<b>767</b>	0	0	0	0	0
<b>724</b>	694	759	18	414	2357						

**Table 11.** Redfish survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by year and Division in NAFO Div. 3NO: 1997-2018.

Div	Year	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>3NO</b>	<b>Biomass</b>	5947	40909	76564	99226	63350	11172	15714	35275	157716	103029	98805
	<b>SD</b>	988	20512	27740	33453	41460	2374	3224	7332	52646	23332	15893
	<b>MCPT</b>	6.79	43.25	85.45	112.71	73.14	12.43	17.21	38.60	175.79	118.76	125.66
	<b>SD</b>	1.15	19.50	29.56	40.03	48.13	2.60	3.55	8.05	58.86	27.83	20.19
	<b>N° Strata</b>	36	41	41	41	41	41	41	41	41	41	41
<b>3N</b>	<b>Biomass</b>	4753	22540	46459	68928	53855	7620	11031	27016	146918	87830	87602
	<b>SD</b>	353	17632	25022	33109	41371	2106	3199	7174	52267	22675	15364
	<b>MCPT</b>	6.14	26.32	58.78	90.12	71.16	9.62	13.83	33.95	187.61	115.44	124.79
	<b>SD</b>	0.46	18.33	30.08	45.16	55.00	2.61	4.05	9.06	67.31	30.96	22.09
	<b>N° Strata</b>	27	31	31	31	31	31	31	31	31	31	31
<b>3O</b>	<b>Biomass</b>	1194	18369	30105	30298	9494	3552	4684	8259	10797	15199	11203
	<b>SD</b>	922	10490	12129	6073	2702	1117	369	1326	2728	5279	3362
	<b>MCPT</b>	11.41	159.86	269.16	268.32	86.80	31.74	40.55	70.63	94.35	141.64	132.90
	<b>SD</b>	8.68	87.87	107.03	54.27	24.47	9.78	3.10	11.68	24.19	52.04	39.93
	<b>N° Strata</b>	9	10	10	10	10	10	10	10	10	10	10
<b>3N/Total (%) Biomass</b>		80	55	61	69	85	68	70	77	93	85	89
Div	Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
<b>3NO</b>	<b>Biomass</b>	74172	763980	431296	487655	294033	458716	190832	557954	132505	287284	296546
	<b>SD</b>	26168	145765	69575	107982	62954	76825	54478	143611	44195	84550	97593
	<b>MCPT</b>	82.20	670.46	506.43	543.17	320.52	502.58	240.24	628.14	145.51	330.49	331.74
	<b>SD</b>	29.14	172.93	81.06	124.68	72.27	79.94	69.17	164.37	46.90	98.46	106.48
	<b>N° Strata</b>	41	39	37	41	41	41	41	41	41	41	41
<b>3N</b>	<b>Biomass</b>	68059	735743	359536	418305	265238	429532	178055	523461	117270	265904	292819
	<b>SD</b>	25890	143334	58306	99454	60304	76128	54133	143235	43583	83567	85221
	<b>MCPT</b>	86.51	721.67	473.94	533.85	330.89	539.18	256.34	669.86	147.23	350.85	375.19
	<b>SD</b>	33.12	194.48	76.53	132.71	80.20	91.06	79.00	187.34	52.24	111.75	121.94
	<b>N° Strata</b>	31	30	29	31	31	31	31	31	31	31	31
<b>3O</b>	<b>Biomass</b>	6113	28238	71760	69350	28795	29184	12778	34493	15235	21379	3727
	<b>SD</b>	3258	16762	37821	41858	16754	7503	3927	12527	10014	12196	12371
	<b>MCPT</b>	52.55	280.98	772.76	607.40	249.04	250.43	129.36	340.74	133.66	190.25	32.41
	<b>SD</b>	28.27	163.87	402.81	362.85	140.90	64.52	39.61	125.38	85.91	103.27	3.37
	<b>N° Strata</b>	10	9	8	10	10	10	10	10	10	10	10
<b>3N/Total (%) Biomass</b>		92	96	83	86	90	94	93	94	89	93	99

**Table 12.** Redfish length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2014-2018. E(x) means Error of the parameter x.

Year	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
2014	0.01117	3.05050	0.0736	0.0234	0.998	424	0.0136	2.9921	0.1084	0.0318	0.997	387	0.0113	3.0464	0.0625	0.0199	0.998	821
2015	0.00757	3.17016	0.1274	0.0387	0.995	517	0.0087	3.1206	0.1057	0.0315	0.997	502	0.0073	3.1798	0.092	0.0283	0.997	1095
2016	0.01212	3.01441	0.0982	0.0308	0.997	339	0.0100	3.0707	0.0981	0.0307	0.997	382	0.0128	2.9877	0.2684	0.0892	0.967	751
2017	0.01640	2.93220	0.0997	0.0306	0.998	283	0.0156	2.9555	0.1401	0.0434	0.997	265	0.0140	2.9828	0.0516	0.0167	0.999	668
2018	0.00917	3.10609	0.10771	0.03455	0.99778	576	0.0095	3.0930	0.08685	0.02793	0.99854	489	0.0100	3.0804	0.09921	0.03176	0.99793	1105

**Table 13.** Redfish mean number per tow by year in Spanish Spring surveys in NAFO Div. 3NO: 1997-2018. 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	22.38	14.94	0.00	37.32	108.36	114.09	0.02	222.47	289.50	200.84	0.39	490.73	518.31	326.79	0.00	845.10	279.45	158.85	1.10	439.41	46.49	37.53	1.05	85.06
	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	71.00	46.21	0.82	118.03	122.61	94.97	19.57	237.15	573.80	502.15	95.21	1171.16	398.90	293.94	247.70	940.54	368.68	313.47	3.01	685.15	329.78	259.80	2.00	591.59
	2009				2010				2011				2011				2012				2013			
	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	3754.48	2846.50	3.64	6604.62	2009.91	1807.51	0.23	3817.65	2385.24	1906.21	9.10	4300.55	2385.24	1906.21	9.10	4300.55	1184.89	981.01	0.31	2166.20	2034.96	1542.08	0.38	3577.42
	2014				2015				2016				2016				2017				2018			
	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	742.09	639.39	0.41	1381.88	2120.95	1721.56	11.42	3853.93	475.14	409.51	0.26	884.92	475.14	409.51	0.26	884.92	964.13	853.43	15.02	1832.58	1024.93	710.51	1.35	1736.79



**Table 14.** Redfish mean number per tow by length class and year. Spanish Spring Survey on NAFO 3NO: 2014-2018. Indet. means indeterminate.

Length (cm.)	2014				2015				2016				2017				2018			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
4	0.000	0.000	0.022	0.022	0.000	0.000	0.174	0.174	0.000	0.000	0.051	0.051	0.000	0.000	0.522	0.522	0.000	0.000	0.023	0.023
6	0.064	0.000	0.085	0.150	0.000	0.000	9.091	9.091	0.000	0.000	0.068	0.068	0.000	0.000	1.414	1.414	0.135	0.065	0.594	0.795
8	0.021	0.000	0.106	0.127	0.000	0.000	2.003	2.003	0.654	0.000	0.030	0.684	0.103	0.000	2.273	2.376	0.455	0.271	0.680	1.406
10	0.010	0.000	0.201	0.211	0.000	0.094	0.046	0.140	2.414	0.108	0.017	2.539	2.049	0.017	2.794	4.860	0.295	0.135	0.015	0.445
12	0.034	0.008	0.000	0.042	0.010	0.000	0.065	0.075	3.306	0.205	0.096	3.607	0.521	0.394	2.895	3.810	0.567	0.428	0.036	1.031
14	0.147	0.000	0.000	0.147	0.729	0.061	0.036	0.826	0.024	0.104	0.000	0.129	1.928	3.715	4.102	9.745	1.346	1.645	0.000	2.991
16	2.111	3.014	0.000	5.125	1.054	0.190	0.000	1.244	1.001	0.096	0.000	1.097	3.574	0.280	1.024	4.878	0.491	0.568	0.000	1.058
18	57.245	17.786	0.000	75.031	97.663	29.361	0.000	127.025	5.055	9.300	0.000	14.355	13.894	5.673	0.000	19.567	6.094	1.182	0.000	7.276
20	353.948	126.173	0.000	480.121	960.679	291.918	0.000	1252.597	178.277	46.371	0.000	224.648	224.661	62.895	0.000	287.556	115.665	7.446	0.000	123.111
22	242.008	252.294	0.000	494.302	803.867	668.544	0.000	1472.411	232.550	148.387	0.000	380.938	524.060	265.947	0.000	790.006	618.083	102.038	0.000	720.121
24	63.344	135.739	0.000	199.083	171.811	428.572	0.000	600.384	40.976	126.419	0.000	167.396	163.745	346.359	0.000	510.104	235.460	301.058	0.000	536.518
26	18.428	42.912	0.000	61.340	72.813	151.935	0.000	224.748	6.659	47.352	0.000	54.011	24.377	123.100	0.000	147.476	36.221	207.276	0.000	243.497
28	2.230	31.128	0.000	33.358	3.194	78.432	0.000	81.626	2.794	17.318	0.000	20.112	3.004	32.317	0.000	35.321	5.991	55.082	0.000	61.074
30	0.866	18.874	0.000	19.740	1.919	46.678	0.000	48.597	0.547	8.397	0.000	8.944	0.866	8.863	0.000	9.729	1.521	21.102	0.000	22.624
32	0.468	8.424	0.000	8.891	3.066	18.828	0.000	21.894	0.267	3.708	0.000	3.975	0.380	2.558	0.000	2.938	1.374	9.091	0.000	10.465
34	0.483	1.840	0.000	2.324	2.027	4.225	0.000	6.252	0.251	1.081	0.000	1.332	0.393	0.749	0.000	1.142	0.721	2.097	0.000	2.818
36	0.456	0.877	0.000	1.332	0.944	1.598	0.000	2.542	0.121	0.442	0.000	0.563	0.226	0.290	0.000	0.516	0.350	0.645	0.000	0.995
38	0.138	0.203	0.000	0.340	0.760	0.756	0.000	1.516	0.104	0.159	0.000	0.263	0.243	0.140	0.000	0.383	0.103	0.342	0.000	0.445
40	0.060	0.084	0.000	0.144	0.391	0.198	0.000	0.590	0.132	0.041	0.000	0.174	0.077	0.074	0.000	0.151	0.034	0.019	0.000	0.053
42	0.015	0.018	0.000	0.033	0.024	0.112	0.000	0.137	0.012	0.020	0.000	0.032	0.027	0.047	0.000	0.073	0.000	0.004	0.000	0.004
44	0.000	0.000	0.000	0.000	0.000	0.054	0.000	0.054	0.000	0.000	0.000	0.000	0.004	0.010	0.000	0.014	0.000	0.000	0.000	0.000
46	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
48	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50	0.000	0.011	0.000	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
52	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
54	0.011	0.000	0.000	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
56	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
58	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
60	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000	0.020
62	0.000	0.000	0.000	0.000	0.000	0.000	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	0.016
Total	742.086	639.385	0.414	1381.885	2120.954	1721.558	11.415	3853.927	475.144	409.509	0.262	884.915	964.130	853.427	15.025	1832.582	1024.927	710.511	1.348	1736.786
N° samples:				46				43				49				46				46
N° Ind.:	2851	3000	27	5878	3508	4328	1318	9154	1614	2108	22	3744	3013	3302	221	6536	3133	2410	183	5726
Sampled catch:				1230				1977				1162				1460				1298
Range:				5-54				5-44				5-43				5-45				5-63
Total catch:				42046				93699				22361				47617				50017
Total hauls:				122				122				115				114				114

**Table 15.** Redfish total abundance (thousands) by length class and year by Division. Spanish Spring Survey on NAFO 3NO: 2014-2018. Indet. means indeterminate.

Length	2002			2003			2004			2005			2006			2007			2008			2009			2010			
	3N	3O	3NO	3N	3O	3NO	3N	3O	3NO	3N	3O	3NO	3N	3O	3NO	3N	3O	3NO	3N	3O	3NO	3N	3O	3NO	3N	3O	3NO	
4	29	0	29	42	0	42	0	0	0	0	0	0	0	0	0	0	0	0	48	0	48	31	0	31	106	0	106	
6	726	43	769	428	0	428	653	929	1581	607	406	1013	497	1098	1595	229	3552	3781	546	0	546	115	73	188	89	0	89	
8	131	12	143	131	32	163	4396	8998	13394	2013	8785	10798	786	5725	6511	369	2823	3193	211	0	211	566	681	1247	12	15	27	
10	61	0	61	135	15	150	1593	1281	2873	35799	17710	53509	14502	1126	15628	291	264	555	438	0	438	12940	312	13252	12	0	12	
12	125	0	125	123	0	123	2138	2006	4143	4287	6308	10595	118480	4441	122921	8675	1573	10248	1527	0	1527	26864	991	27855	18	0	18	
14	734	23	757	774	64	838	2584	1189	3773	4609	8374	12983	67571	31801	99372	46902	5006	51909	18189	9	18198	78624	4510	83135	150	0	150	
16	4160	732	4892	3196	540	3736	8402	1352	9754	37024	2328	39352	37857	12852	50708	59160	15372	74532	150631	2232	152863	771311	28800	800111	93890	16567	110457	
18	10453	3442	13895	12690	4939	17629	16326	3649	19975	168240	6004	174244	44352	6510	50862	39188	10467	49655	86322	5448	91770	2344608	117755	2462363	898104	217029	1115134	
20	13463	8295	21759	18058	11493	29551	26775	8016	34791	126477	15256	141733	121634	18361	139995	42951	10299	53250	36304	4946	41250	695022	63782	758804	817919	254757	1072677	
22	9370	10144	19514	15054	10203	25256	29641	10372	40012	155507	14535	170042	110607	27252	137859	81649	13426	95074	57152	10878	68030	380843	21782	402626	293054	61525	354580	
24	5805	2815	8621	9743	3844	13586	19847	8258	28105	139730	11076	150807	56333	14126	70460	84550	11182	95732	70582	9288	79870	335607	14713	350320	222493	27002	249495	
26	2366	298	2664	4561	708	5269	12458	5658	18116	67260	3914	71174	38066	4318	42384	49687	4884	54570	41454	3137	44591	170424	3550	173973	112364	6967	119331	
28	1987	118	2105	1939	213	2152	10449	2492	12940	42356	1691	44047	19299	1375	20674	24839	2397	27236	15101	908	16010	70008	846	70854	45699	2080	47779	
30	1270	153	1423	935	132	1066	6997	706	7703	17495	514	18009	9822	464	10286	20358	1253	21611	5532	155	5687	26297	365	26661	23031	457	23488	
32	1123	125	1248	979	96	1075	3488	282	3770	7835	210	8045	5391	201	5591	17150	798	17948	4357	102	4459	6432	28	6460	10924	132	11056	
34	433	68	501	549	91	640	2407	97	2504	3442	62	3504	2540	113	2653	9784	681	10465	2955	60	3016	4239	21	4261	6129	141	6270	
36	188	33	221	208	23	231	618	31	649	2466	8	2474	905	67	971	7544	476	8020	988	57	1045	4887	30	4917	2279	61	2341	
38	32	4	36	96	18	114	128	4	132	597	8	605	330	30	360	2102	216	2318	386	56	442	371	0	371	1160	20	1180	
40	0	3	3	62	14	75	118	0	118	324	0	324	264	14	277	267	59	326	160	21	181	99	0	99	786	0	786	
42	6	0	6	36	0	36	0	0	0	224	0	224	56	6	62	90	0	90	64	3	66	121	0	121	193	0	193	
44	0	0	0	16	0	16	9	0	9	21	0	21	0	0	0	11	0	11	16	0	16	37	0	37	164	0	164	
46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	12	0	0	0	0
54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	52465	26307	176772	69754	32425	102019	149025	55318	204344	918315	97189	913504	620152	129879	779171	498716	84727	586524	492948	67300	530274	492948	158238	518766	252881	586755	3115333	

**Table 16.** Redfish total abundance (thousands) by Division and year. Spanish Spring Survey on NAFO 3NO: 2014-2018.

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
3N	52465	69754	149025	816315	649292	495796	492974	4929448	2528578	3268047	1759450	2933210	992827	3031839	671956	1439141	1563889
3O	26307	32425	55318	97189	129879	84727	37300	258238	586755	540668	244084	210680	78047	217546	98464	118579	23528
3NO	78772	102179	204344	913504	779171	580524	530274	5187686	3115333	3808715	2003533	3143891	1070873	3249385	770420	1557720	1587417



**Table 17.** Witch flounder mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2014-2018. n.s. means stratum not surveyed.

Stratum	2014		2015		2016		2017		2018	
	W. flounder	W. flounder	W. flounder	W. flounder	W. flounder	W. flounder	W. flounder	W. flounder	W. flounder	W. flounder
	Mean catch	SD	Mean catch	SD	Mean catch	SD	Mean catch	SD	Mean catch	SD
353	4.03	0.67	3.83	3.32	9.04	12.20	0.00	23.33	5.23	4.95
354	1.89	0.86	2.15	2.69	7.07	7.52	27.83	0.00	0.85	0.60
355	0.64	0.07	2.05	0.06	1.74	0.52	6.48	0.00	0.07	0.09
356	0.45	0.64	3.85	5.35	1.26	0.79	1.90	0.00	0.27	0.39
357	0.63	0.88	0.96	0.25	5.13	5.30	1.91	0.00	0.73	1.03
358	3.97	3.83	4.60	4.48	50.02	55.56	8.29	0.00	0.32	0.55
359	1.91	2.51	18.27	21.53	4.01	6.05	37.44	0.11	5.12	8.26
360	0.17	0.37	0.35	0.63	0.00	0.00	0.00	349.29	0.28	0.47
374	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.50	0.00	0.00
375	0.00	0.00	0.00	0.00	0.00	0.00	0.00	54.99	0.00	0.00
376	0.00	0.00	0.00	0.00	0.00	0.00	0.00	234.89	0.30	0.86
377	0.00	0.00	0.78	1.10	0.00	0.00	0.00	0.51	0.00	0.00
378	1.06	1.49	2.83	2.07	0.28	0.40	3.25	0.00	0.00	0.00
379	0.92	0.14	0.29	0.40	0.58	0.82	1.69	0.00	0.21	0.30
380	1.41	1.99	0.73	0.10	1.20	0.65	0.00	0.00	0.00	0.00
381	0.00	0.00	1.24	1.18	0.00	0.00	0.00	0.00	0.00	0.00
382	0.21	0.42	0.00	0.00	0.00	0.00	0.23	0.43	0.00	0.00
721	0.61	0.86	0.76	0.22	1.18	0.99	0.55	0.00	0.75	0.94
722	1.66	0.52	1.19	0.08	1.22	0.08	0.58	0.00	0.57	0.47
723	5.32	3.26	4.71	1.86	2.77	3.72	4.26	0.00	6.78	9.26
724	4.17	0.64	8.16	4.06	7.20	4.53	1.84	0.00	3.39	3.14
725	2.58	2.07	7.12	5.54	10.09	12.18	6.89	0.00	0.09	0.12
726	4.89	2.10	2.95	0.26	6.17	6.54	2.60	0.00	5.34	3.00
727	3.00	4.24	0.78	0.52	11.86	10.24	34.08	0.00	6.40	6.80
728	11.94	9.54	11.70	7.50	22.92	21.46	10.18	0.00	6.48	9.16
752	7.85	11.10	9.88	5.51	14.46	12.22	8.53	0.00	13.49	19.08
753	1.20	0.26	0.81	1.13	0.00	0.00	1.14	0.00	1.19	1.68
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	9.31	6.52	5.15	3.29	16.99	22.22	5.87	0.00	1.23	1.02
757	5.92	8.37	3.29	4.65	0.40	0.56	4.96	0.00	3.86	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	3.42	4.30	16.15	20.72	3.04	2.14	5.15	0.00	4.04	3.50
761	0.93	0.18	2.61	0.94	0.91	1.28	2.27	0.00	8.24	-
762	0.00	0.00	0.45	0.64	0.89	1.26	0.00	0.00	0.11	0.15
763	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
764	0.58	0.23	0.68	0.14	1.10	0.85	1.45	0.00	1.37	1.26
765	0.76	0.82	0.37	0.24	0.17	0.03	0.97	0.00	2.08	2.94
766	0.12	0.16	0.25	0.35	0.00	0.00	0.00	0.00	0.06	0.08
767	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00

**Table 18.** Witch flounder survey biomass (t) by stratum in NAFO Div. 3NO: 2014-2018. n.s. means stratum not surveyed.

Strata	2014	2015	2016	2017	2018	Strata	2014	2015	2016	2017	2018
353	86	77	205	0	125	725	21	65	93	59	1
354	35	41	151	576	18	726	28	19	40	16	34
355	4	12	11	43	0	727	22	7	101	286	55
356	2	14	5	8	1	728	75	81	156	69	45
357	8	13	72	27	10	752	86	115	160	95	152
358	69	89	1000	154	6	753	14	10	0	13	14
359	62	630	142	1322	183	754	0	0	0	0	0
360	36	82	0	0	68	755	0	0	0	0	0
374	0	0	0	0	0	756	82	46	152	52	11
375	0	0	0	0	0	757	50	29	4	45	35
376	0	0	0	0	36	758	0	0	0	0	0
377	0	7	0	0	0	759	0	0	0	0	0
378	11	35	3	38	0	760	43	221	41	67	52
379	8	3	5	15	2	761	13	37	14	33	114
380	10	6	10	0	0	762	0	8	17	0	2
381	0	15	0	0	0	763	0	0	0	0	0
382	6	0	0	7	0	764	4	5	10	13	12
721	3	4	7	3	4	765	8	4	2	11	22
722	11	8	9	4	4	766	1	3	0	0	1
723	64	63	38	58	88	767	0	0	0	1	0
724	41	86	77	19	36						

**Table 19.** Witch flounder survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by year and Division in NAFO Div. 3NO: 2002-2018.

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010
<b>Biomass</b>	1784	3145	3348	2633	2570	1480	2118	1872	3239
<b>SD</b>	426	690	523	488	629	229	481	423	777
<b>MCPT</b>	2.00	3.42	3.66	2.95	3.01	1.84	2.32	2.13	3.82
<b>SD</b>	0.49	0.75	0.56	0.56	0.73	0.28	0.52	0.48	0.91
Year	2011	2012	2013	2014	2015	2016	2017	2018	
<b>Biomass</b>	1428	2763	2078	903	1834	2526	3033	1132	
<b>SD</b>	248	648	367	134	376	737	1199	251	
<b>MCPT</b>	1.58	3.06	2.32	1.09	2.11	2.79	3.47	1.27	
<b>SD</b>	0.28	0.74	0.41	0.16	0.42	0.78	1.35	0.28	

**Table 20.** Witch flounder length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2014-2018. E(x) means Error of the parameter x.

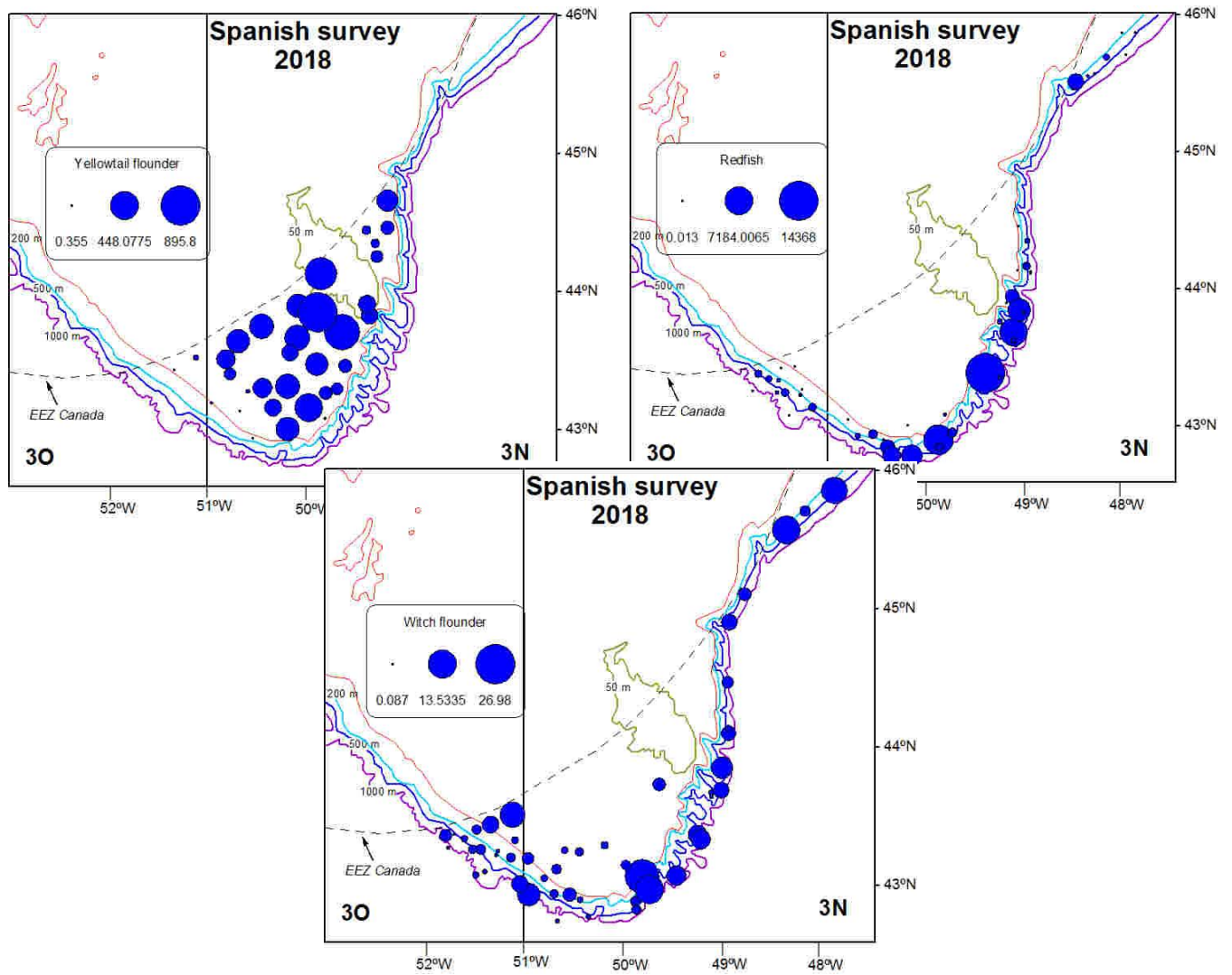
Year	Males						Females						Total					
	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N	a	b	E(a)	E(b)	R2	N
2014	<b>0.00060</b>	<b>3.65925</b>	0.2494	0.0709	0.991	134	<b>0.00096</b>	<b>3.52772</b>	0.1025	0.0286	0.998	278	<b>0.00217</b>	<b>3.30510</b>	0.1540	0.0440	0.994	415
2015	<b>0.00103</b>	<b>3.51249</b>	0.1701	0.0489	0.995	306	<b>0.00154</b>	<b>3.39857</b>	0.0807	0.0230	0.998	440	<b>0.00206</b>	<b>3.31598</b>	0.1112	0.0329	0.996	762
2016	<b>0.00102</b>	<b>3.49955</b>	0.1145	0.0327	0.998	222	<b>0.00147</b>	<b>3.40745</b>	0.1089	0.0314	0.997	354	<b>0.00209</b>	<b>3.30679</b>	0.2052	0.0610	0.985	584
2017	<b>0.00104</b>	<b>3.49803</b>	0.1432	0.0405	0.997	247	<b>0.00120</b>	<b>3.45370</b>	0.0990	0.0286	0.998	299	<b>0.00173</b>	<b>3.35493</b>	0.0907	0.0263	0.998	595
2018	<b>0.00167</b>	<b>3.37049</b>	0.1496	0.0444	0.997316	149	<b>0.00210</b>	<b>3.30161</b>	0.1524	0.0447	0.996171	279	<b>0.00230</b>	<b>3.28003</b>	0.1309	0.0384	0.997059	430

**Table 21.** Witch flounder mean number per tow by year in Spanish Spring Surveys in NAFO Div. 3NO: 2002-2018. Indet. means indeterminate.

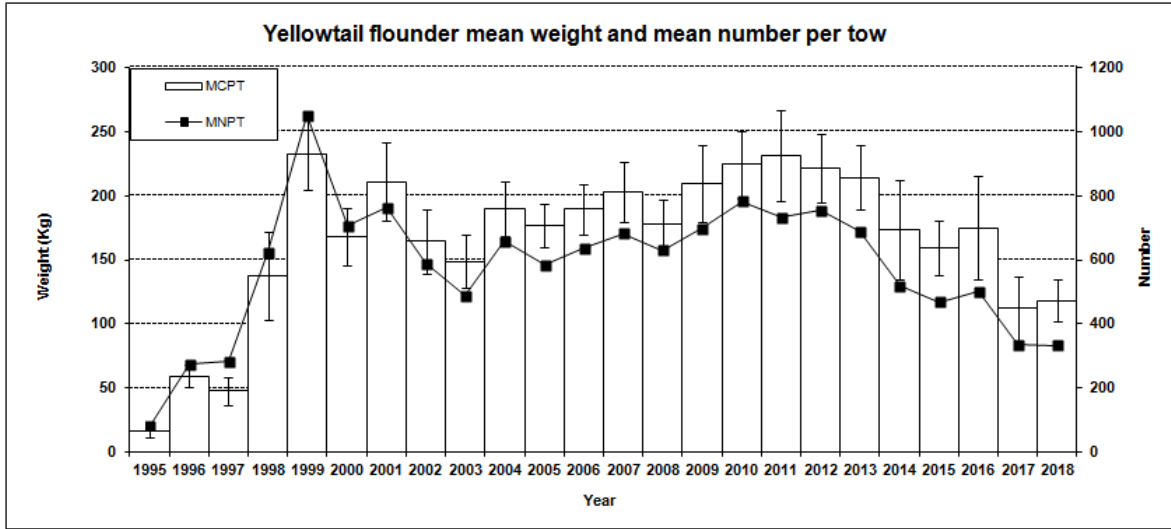
	2002				2003				2004				2005				2006				2007			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
MNPT	2.602	3.488	0.459	6.548	4.499	5.864	0.057	10.420	4.182	6.088	0.211	10.480	4.160	5.570	0.605	10.336	3.384	4.937	0.040	8.360	1.952	3.050	0.061	5.063
	2008				2009				2010				2011				2012				2013			
	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	2.061	3.384	0.027	5.472	2.352	4.107	0.043	6.502	3.538	5.411	0.000	8.949	1.326	2.529	0.033	3.887	3.350	4.078	0.056	7.483	2.009	3.908	0.159	6.076
	2014				2015				2016				2017				2018							
	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	0.756	1.626	0.012	2.395	1.941	2.810	0.125	4.875	2.466	3.419	0.046	5.931	3.611	3.773	0.034	7.418	1.435	2.125	0.007	3.567				

**Table 22.** Witch flounder mean number per tow by length class and year. Spanish Spring Surveys in NAFO Div. 3NO: 2014-2018. Indet. means indeterminate.

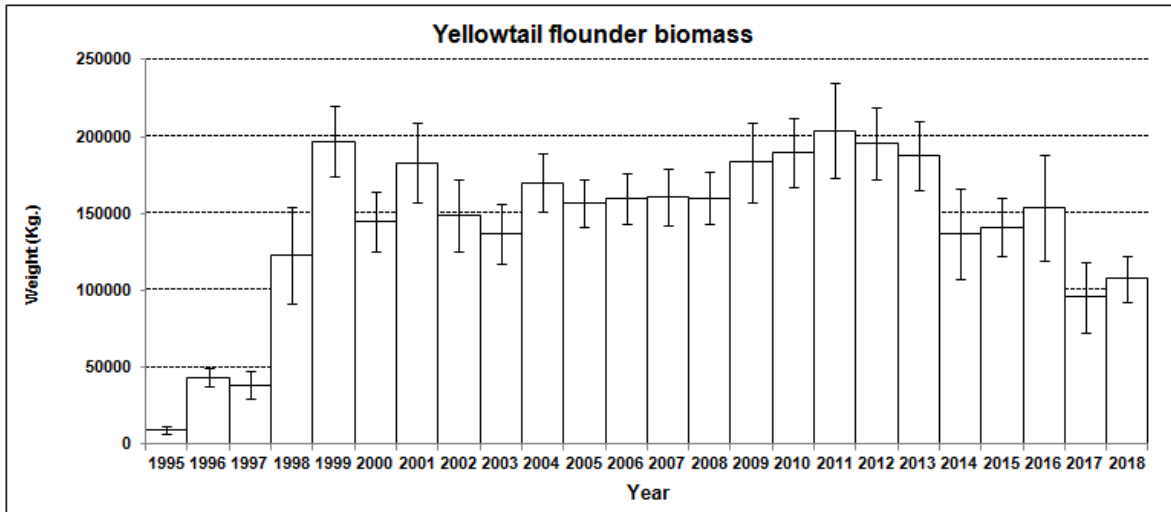
Lenght (cm.)	2014				2015				2016				2017				2018			
	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total	Males	Females	Indet.	Total
4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
6	0.000	0.000	0.000	0.000	0.000	0.000	0.064	0.064	0.000	0.000	0.028	0.028	0.000	0.000	0.000	0.000	0.000	0.005	0.000	0.005
8	0.000	0.000	0.004	0.004	0.000	0.000	0.042	0.042	0.000	0.006	0.000	0.006	0.000	0.000	0.008	0.008	0.000	0.000	0.000	0.000
10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.026	0.008	0.033	0.000	0.000	0.019	0.019	0.000	0.007	0.000	0.007
12	0.000	0.003	0.000	0.003	0.000	0.008	0.000	0.008	0.007	0.008	0.010	0.025	0.000	0.000	0.000	0.000	0.022	0.021	0.000	0.042
14	0.000	0.000	0.000	0.000	0.009	0.000	0.000	0.009	0.002	0.000	0.000	0.002	0.000	0.000	0.007	0.007	0.022	0.053	0.007	0.082
16	0.000	0.000	0.004	0.004	0.000	0.007	0.000	0.007	0.000	0.007	0.000	0.007	0.003	0.008	0.000	0.011	0.013	0.033	0.000	0.046
18	0.000	0.004	0.004	0.009	0.022	0.018	0.000	0.040	0.000	0.014	0.000	0.014	0.010	0.012	0.000	0.022	0.000	0.005	0.000	0.005
20	0.004	0.014	0.000	0.018	0.006	0.000	0.000	0.006	0.012	0.012	0.000	0.024	0.006	0.030	0.000	0.036	0.008	0.039	0.000	0.047
22	0.003	0.007	0.000	0.010	0.016	0.014	0.000	0.030	0.000	0.040	0.000	0.040	0.000	0.028	0.000	0.028	0.024	0.014	0.000	0.039
24	0.014	0.008	0.000	0.022	0.010	0.025	0.000	0.036	0.016	0.004	0.000	0.020	0.008	0.028	0.000	0.036	0.035	0.031	0.000	0.066
26	0.027	0.020	0.000	0.047	0.037	0.004	0.000	0.042	0.025	0.037	0.000	0.061	0.024	0.044	0.000	0.069	0.048	0.030	0.000	0.078
28	0.054	0.036	0.000	0.090	0.057	0.058	0.000	0.115	0.070	0.062	0.000	0.132	0.108	0.050	0.000	0.158	0.154	0.100	0.000	0.254
30	0.030	0.078	0.000	0.108	0.118	0.114	0.000	0.232	0.105	0.153	0.000	0.257	0.129	0.112	0.000	0.241	0.203	0.188	0.000	0.391
32	0.066	0.090	0.000	0.156	0.179	0.099	0.000	0.278	0.086	0.132	0.000	0.218	0.105	0.128	0.000	0.233	0.264	0.157	0.000	0.421
34	0.096	0.136	0.000	0.232	0.245	0.196	0.004	0.445	0.127	0.163	0.000	0.290	0.210	0.104	0.000	0.314	0.156	0.188	0.000	0.344
36	0.103	0.124	0.000	0.227	0.352	0.259	0.000	0.611	0.280	0.181	0.000	0.461	0.341	0.125	0.000	0.466	0.081	0.137	0.000	0.218
38	0.125	0.168	0.000	0.293	0.339	0.268	0.000	0.607	0.428	0.244	0.000	0.672	0.790	0.344	0.000	1.134	0.117	0.195	0.000	0.312
40	0.141	0.170	0.000	0.311	0.358	0.423	0.000	0.781	0.518	0.440	0.000	0.958	1.029	0.629	0.000	1.658	0.096	0.151	0.000	0.247
42	0.056	0.204	0.000	0.260	0.110	0.384	0.004	0.497	0.423	0.571	0.000	0.994	0.617	0.643	0.000	1.260	0.121	0.119	0.000	0.240
44	0.025	0.220	0.000	0.246	0.040	0.377	0.007	0.425	0.276	0.673	0.000	0.949	0.111	0.628	0.000	0.739	0.025	0.172	0.000	0.197
46	0.012	0.174	0.000	0.186	0.026	0.262	0.000	0.287	0.072	0.322	0.000	0.394	0.100	0.379	0.000	0.479	0.025	0.225	0.000	0.250
48	0.000	0.067	0.000	0.067	0.016	0.176	0.004	0.196	0.019	0.144	0.000	0.164	0.020	0.256	0.000	0.276	0.017	0.156	0.000	0.173
50	0.000	0.067	0.000	0.067	0.000	0.063	0.000	0.063	0.000	0.090	0.000	0.090	0.000	0.143	0.000	0.143	0.004	0.035	0.000	0.039
52	0.000	0.022	0.000	0.022	0.000	0.042	0.000	0.042	0.000	0.048	0.000	0.048	0.000	0.048	0.000	0.048	0.000	0.025	0.000	0.025
54	0.000	0.005	0.000	0.005	0.000	0.012	0.000	0.012	0.000	0.035	0.000	0.035	0.000	0.033	0.000	0.033	0.000	0.014	0.000	0.014
56	0.000	0.007	0.000	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.024	0.000	0.024
58	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000
60	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	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	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
64	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>Total</b>	<b>0.756</b>	<b>1.626</b>	<b>0.012</b>	<b>2.395</b>	<b>1.941</b>	<b>2.810</b>	<b>0.125</b>	<b>4.875</b>	<b>2.466</b>	<b>3.419</b>	<b>0.046</b>	<b>5.931</b>	<b>3.611</b>	<b>3.773</b>	<b>0.034</b>	<b>7.418</b>	<b>1.435</b>	<b>2.125</b>	<b>0.007</b>	<b>3.567</b>
N° samples:				53				69				50				51				50
N° Ind.:	131	271	3	405	304	443	21	768	330	513	8	851	360	455	6	821	171	303	2	476
Sampled catch:				188				336				401				387				180
Range:				8-57				7-54				6-59				8-55				7-57
Total catch:				189				346				442				509				181
Total hauls:				122				122				115				113				114



**Figure 1.** Position of the hauls and the catch of yellowtail flounder, redfish and witch flounder during the 2018 Spanish 3N0 survey. Note that the scale is different in the three graphs.

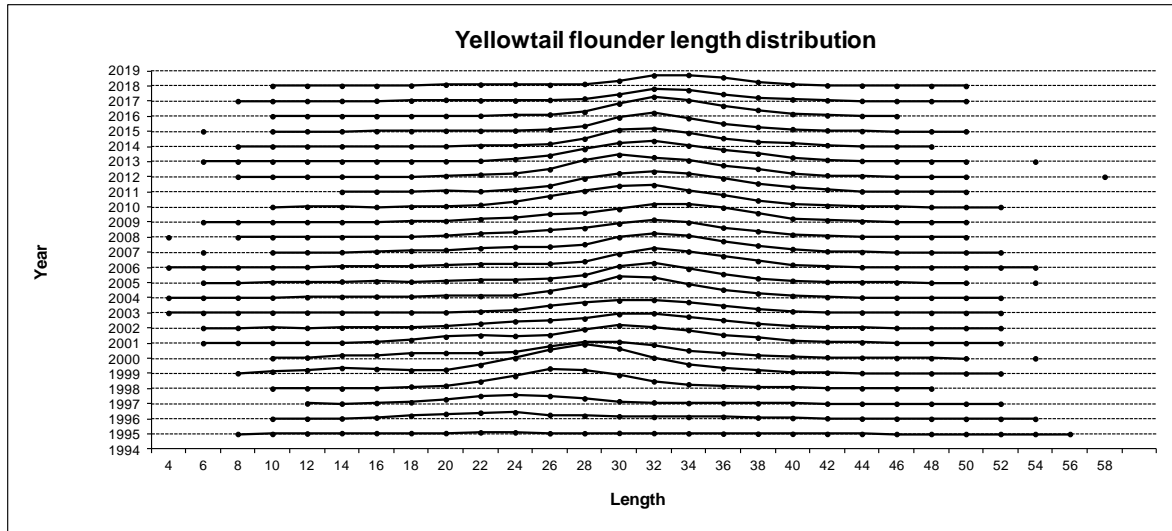


**Figure 2.** Yellowtail flounder stratified mean catches in Kg and  $\pm$ SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 1995-2018.

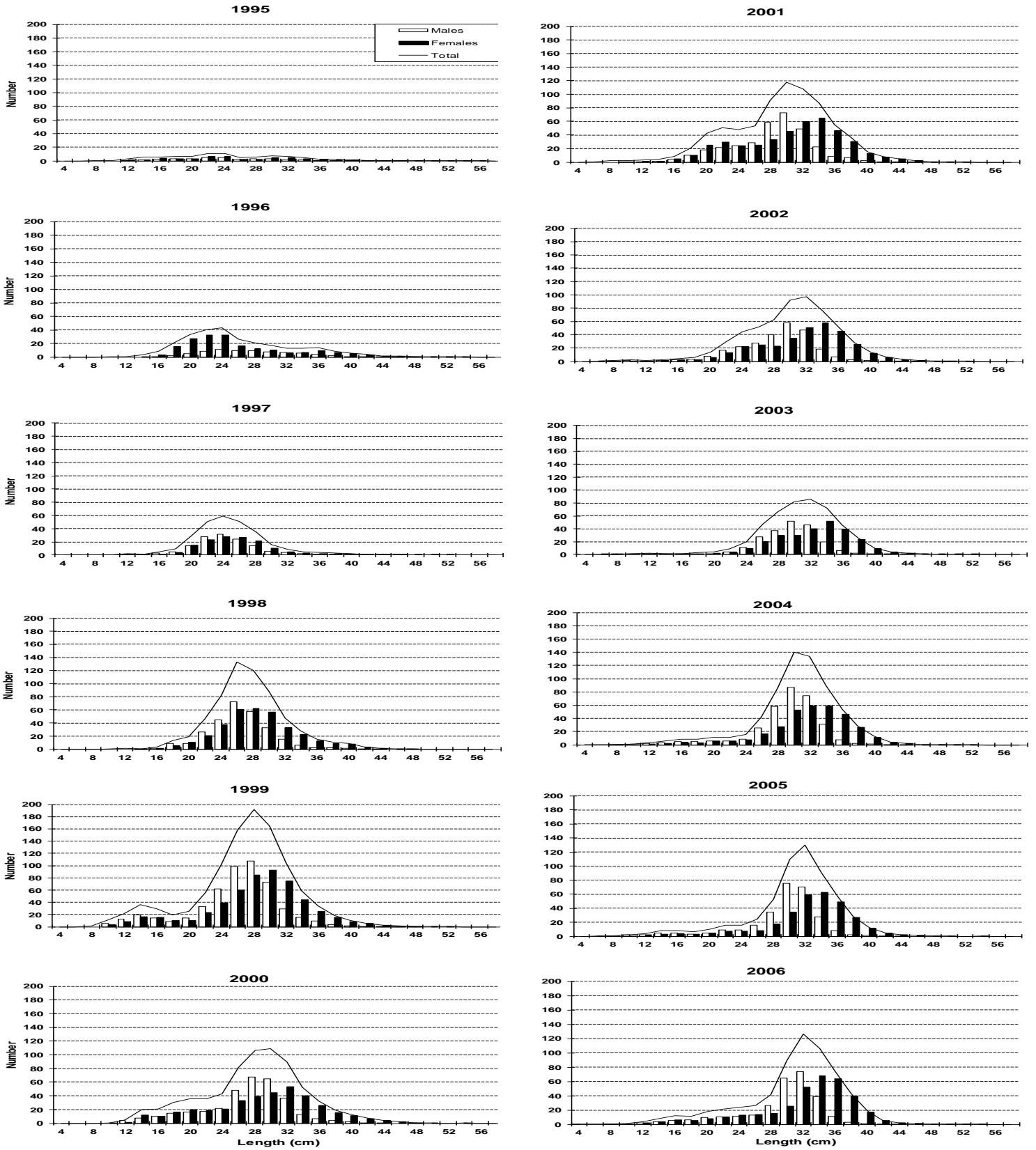


**Figure 3.** Yellowtail flounder biomass calculated by the swept area method in tons and  $\pm$ SD by year. Spanish Spring surveys in NAFO Div. 3NO: 1995-2018.

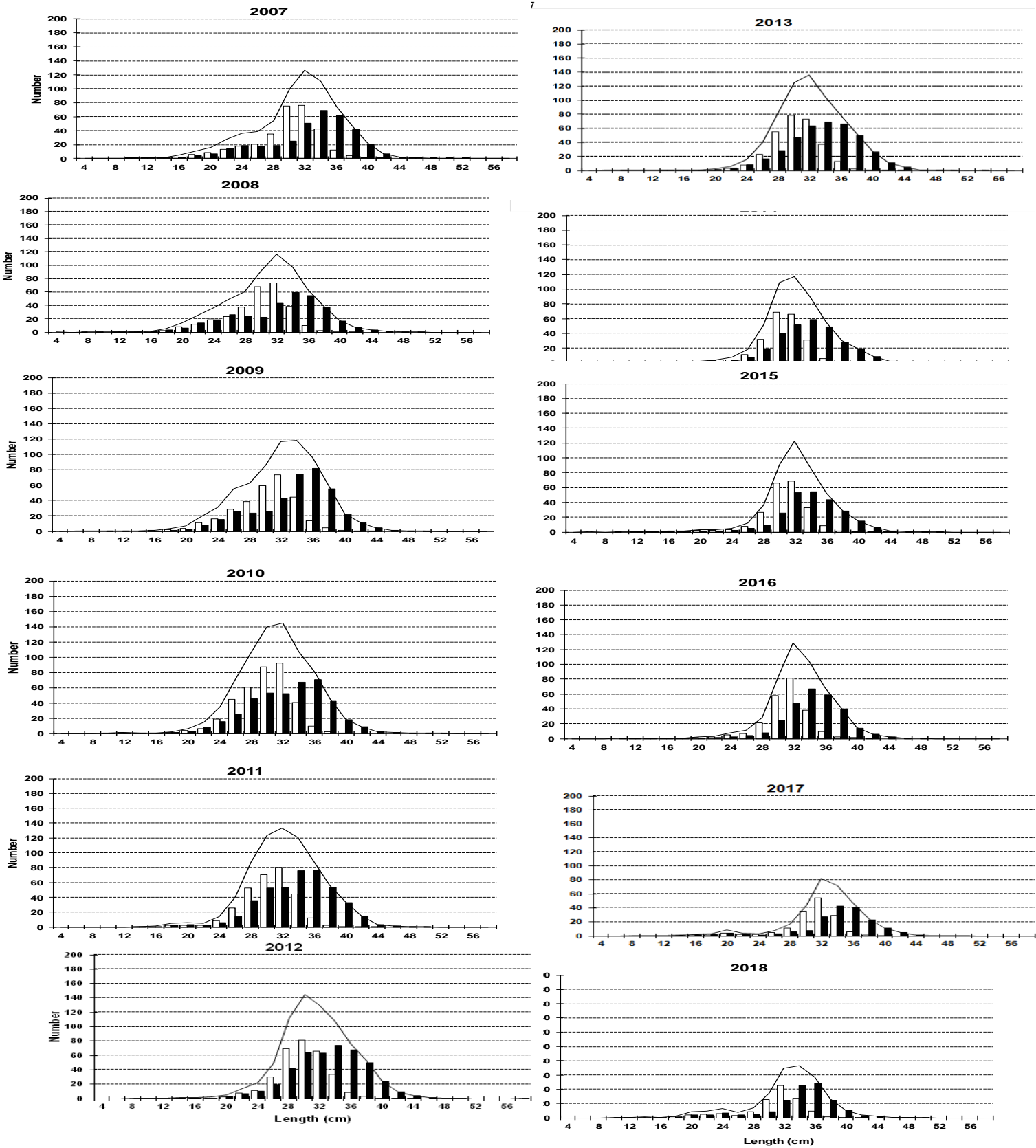




**Figure 4.** Yellowtail flounder mean catches per tow length distribution (cm) on NAFO 3NO: 1995-2018. Data from 2014 to 2018 are in Table 8; data for 1995-2013 can be seen in SCR Doc 14/006.

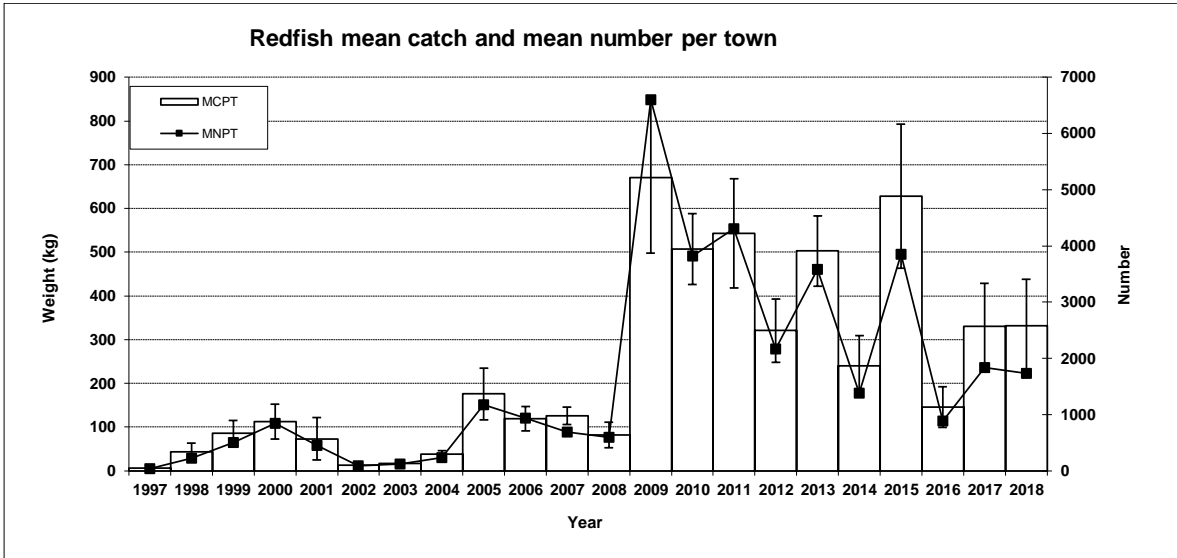


**Figure 5.-** Yellowtail flounder length distribution (cm) on NAFO 3NO: 1995-2018. Mean catches per tow number. Data from 2014 to 2018 are in Table 8; data for 1995-2013 can be seen in SCR Doc 14/006.

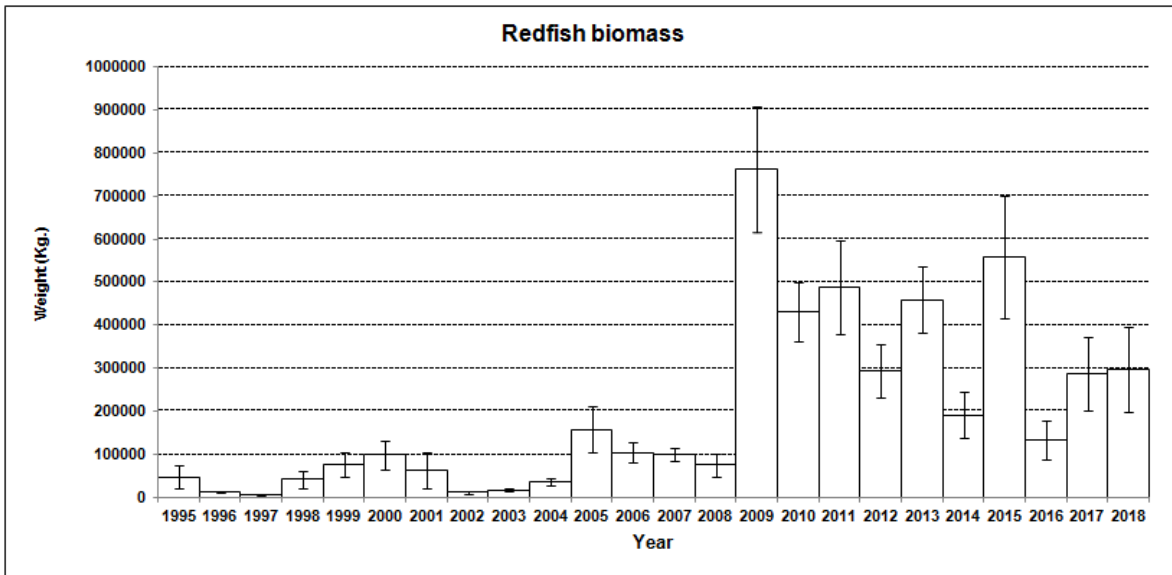


**Figure 5 (cont.).** Yellowtail flounder length distribution (cm) on NAFO 3NO: 1995-2018. Mean catches per tow number. Data from 2014 to 2018 are in Table 8; data for 1995-2013 can be seen in SCR Doc 14/006.

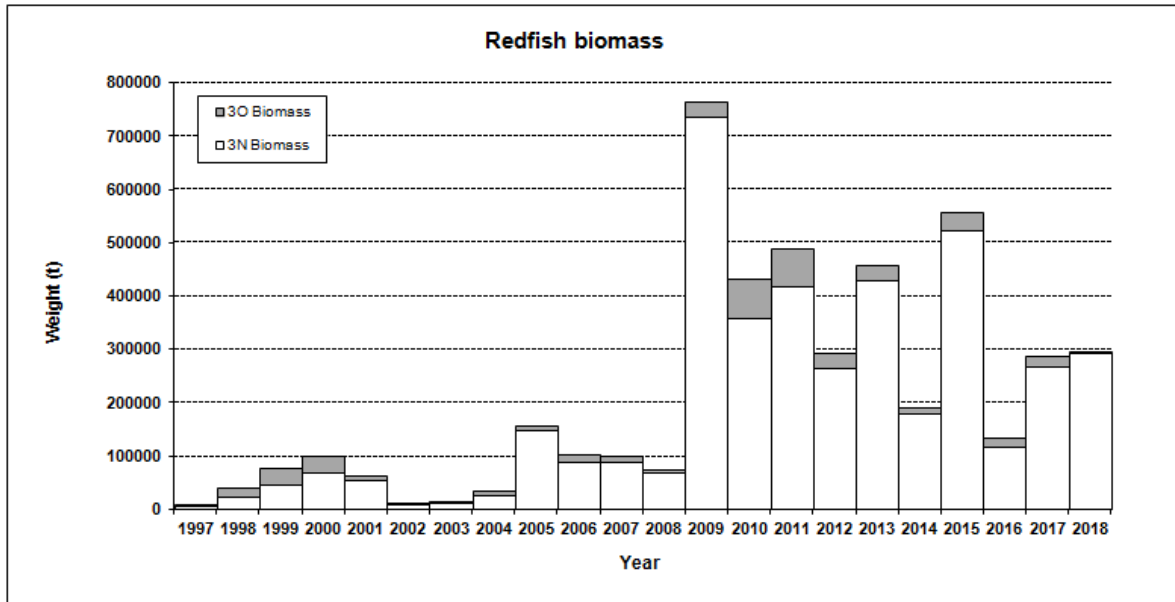




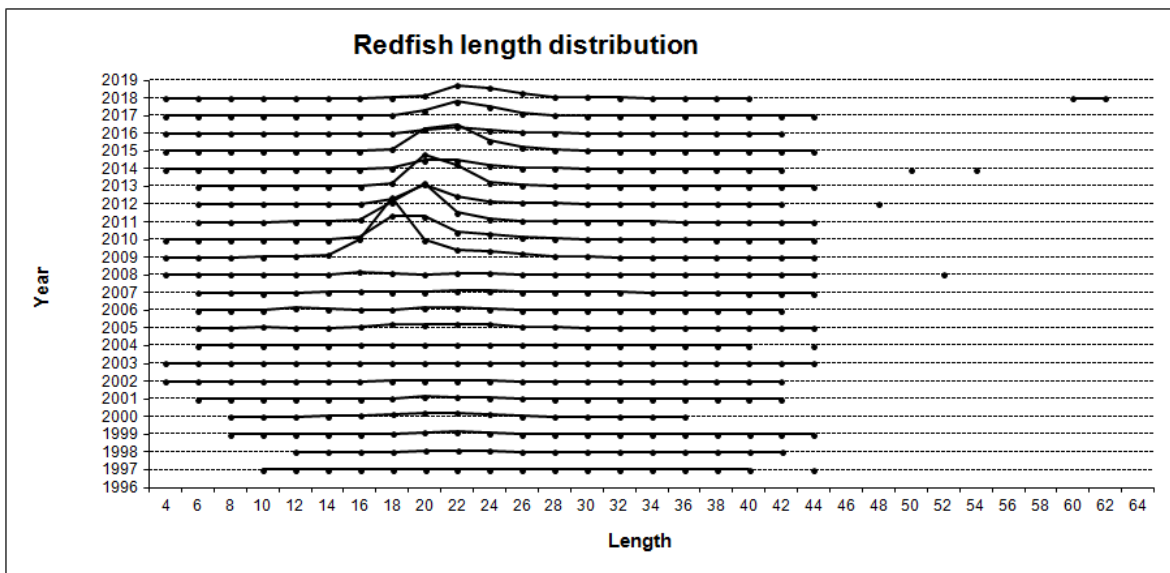
**Figure 6.** Redfish stratified mean catches in Kg and  $\pm$ SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2018.



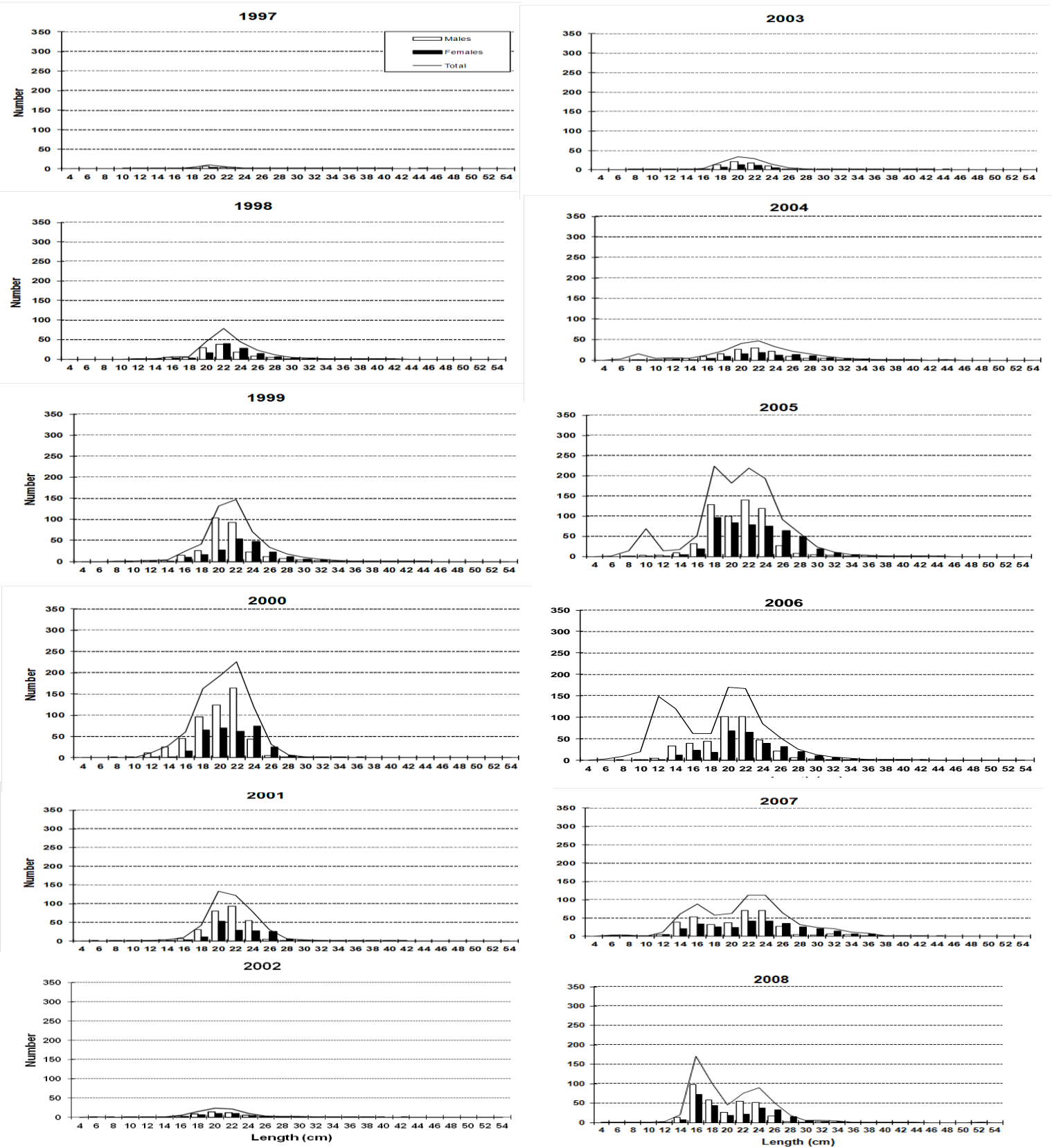
**Figure 7.** Redfish biomass calculated by the swept area method in tons and  $\pm$ SD by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2018.



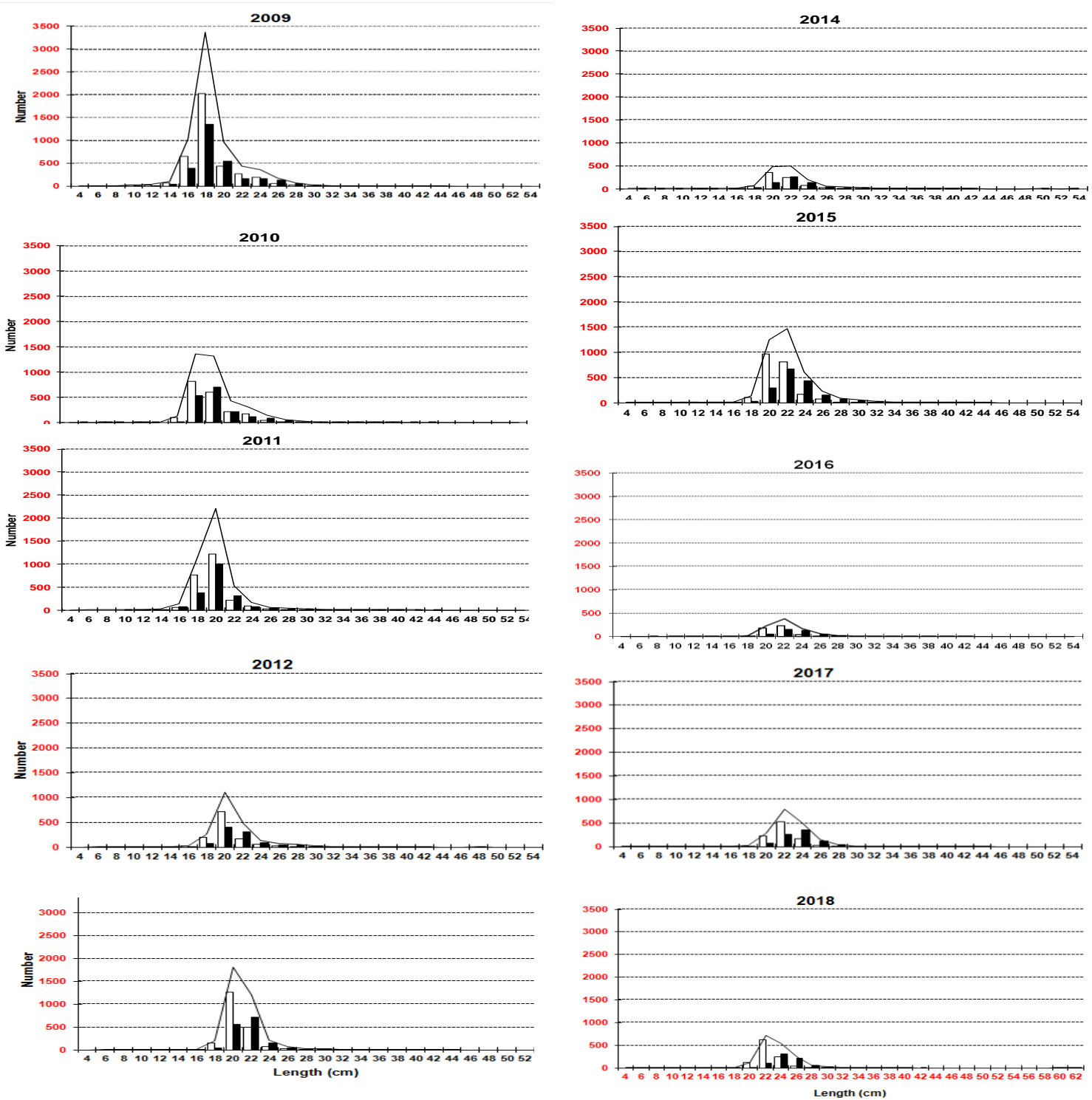
**Figure 8.** Redfish biomass calculated by the swept area method in tons by year and Division. Spanish Spring surveys in NAFO Div. 3NO: 1997-2018.



**Figure 9.** Redfish mean catches per tow length distribution (cm) on NAFO 3NO: 1997-2018. Data from 2014 to 2018 are in Table 14; the data for 1997-2013 can be seen in SCR Doc 14/006.

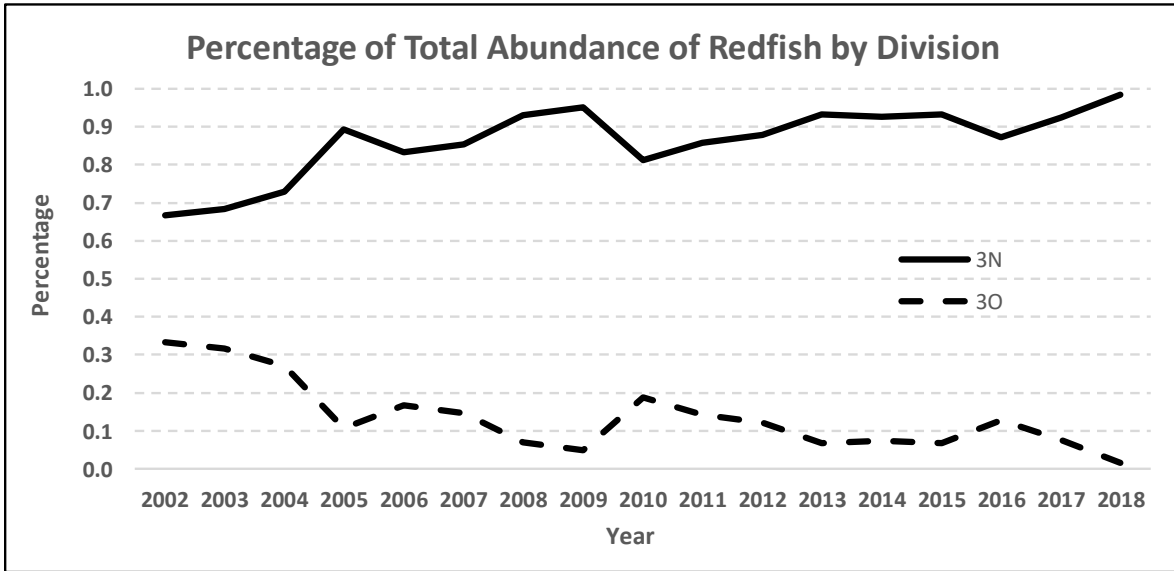


**Figure 10.** Redfish length distribution (cm) on NAFO 3NO: 1997-2018. Mean catches per tow number. Data from 2014 to 2018 are in Table 14; the data for 1997-2013 can be seen in SCR Doc 14/006. The 2010-2018 graphs have a different y-axis upper limit.

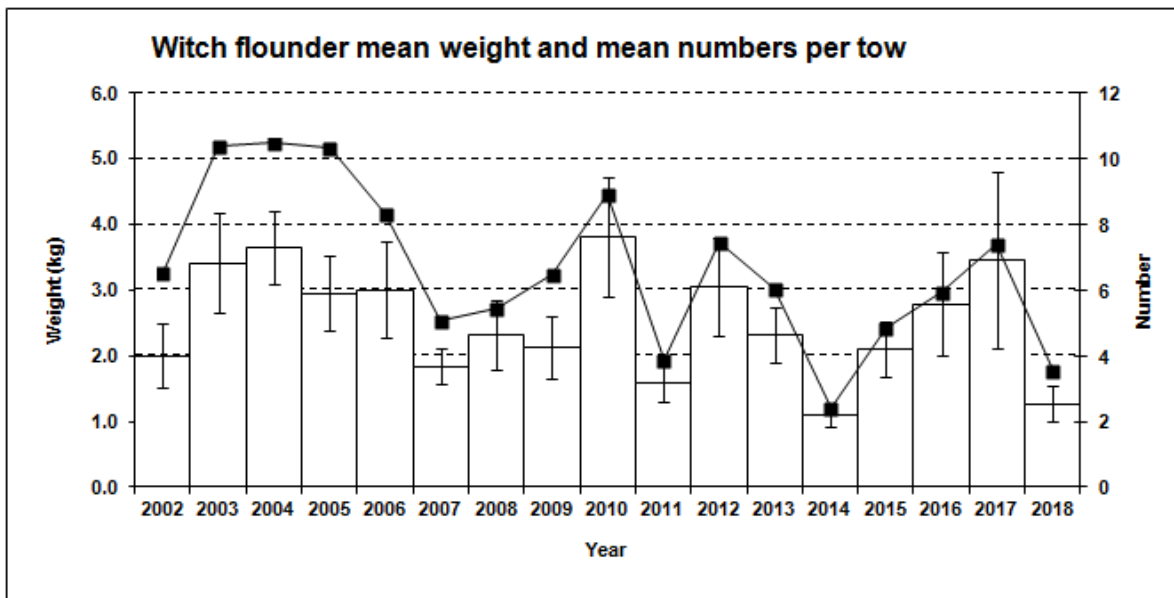


**Figure 10 (cont.).** Redfish length distribution (cm) on NAFO 3NO: 1997-2018. Mean catches per tow number. The data from 2014 to 2018 is in Table 8; the data for 1997-2013 can be seen in SCR Doc 14/006. The 2010-2018 graphs have a different y-axis upper limit.



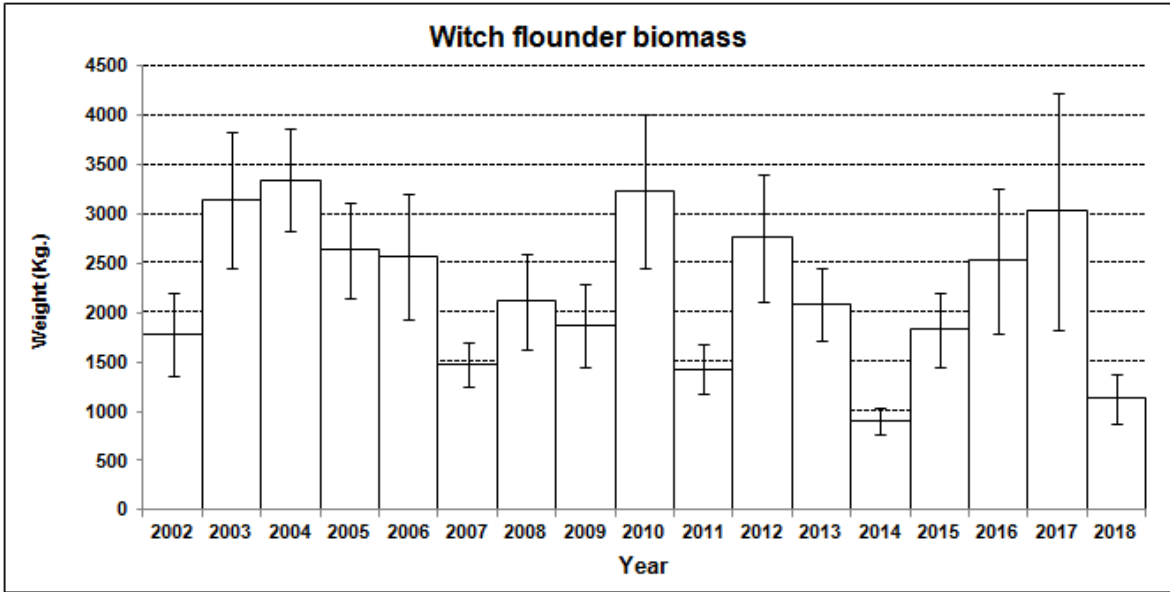


**Figure 11.** Redfish percentage of total abundance by Division and year. Spanish Spring surveys in NAFO Div. 3NO: 2002-2018.

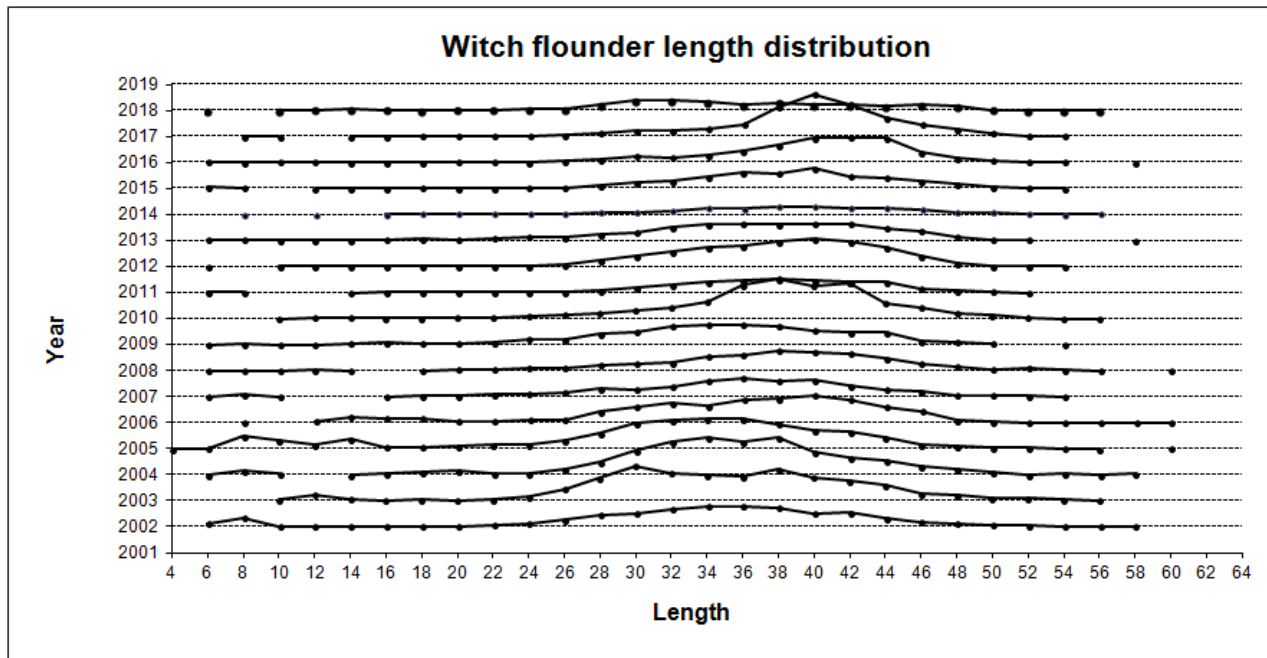


**Figure 12.** Witch flounder stratified mean catches in Kg and  $\pm$ SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 2002-2018.

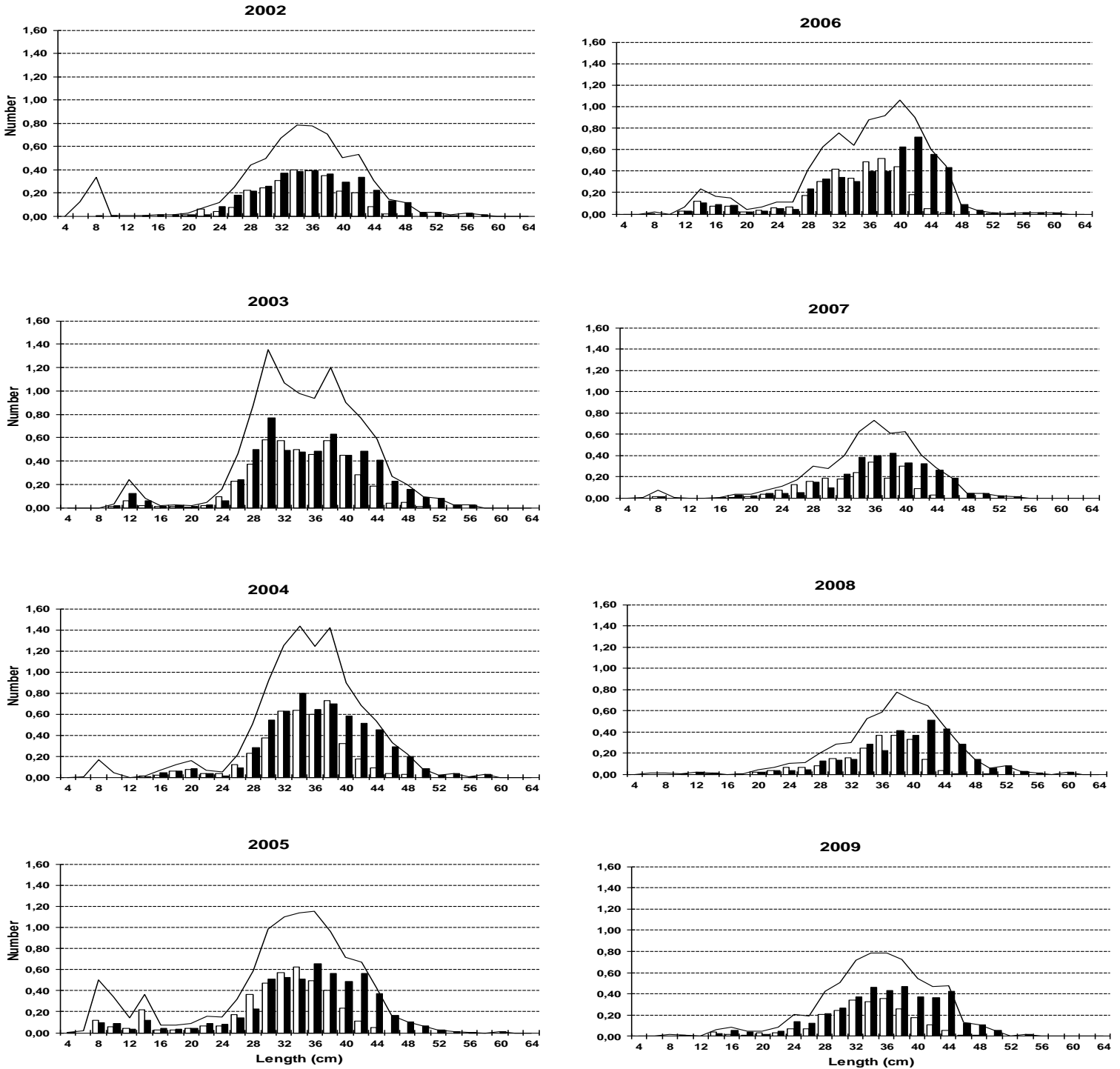




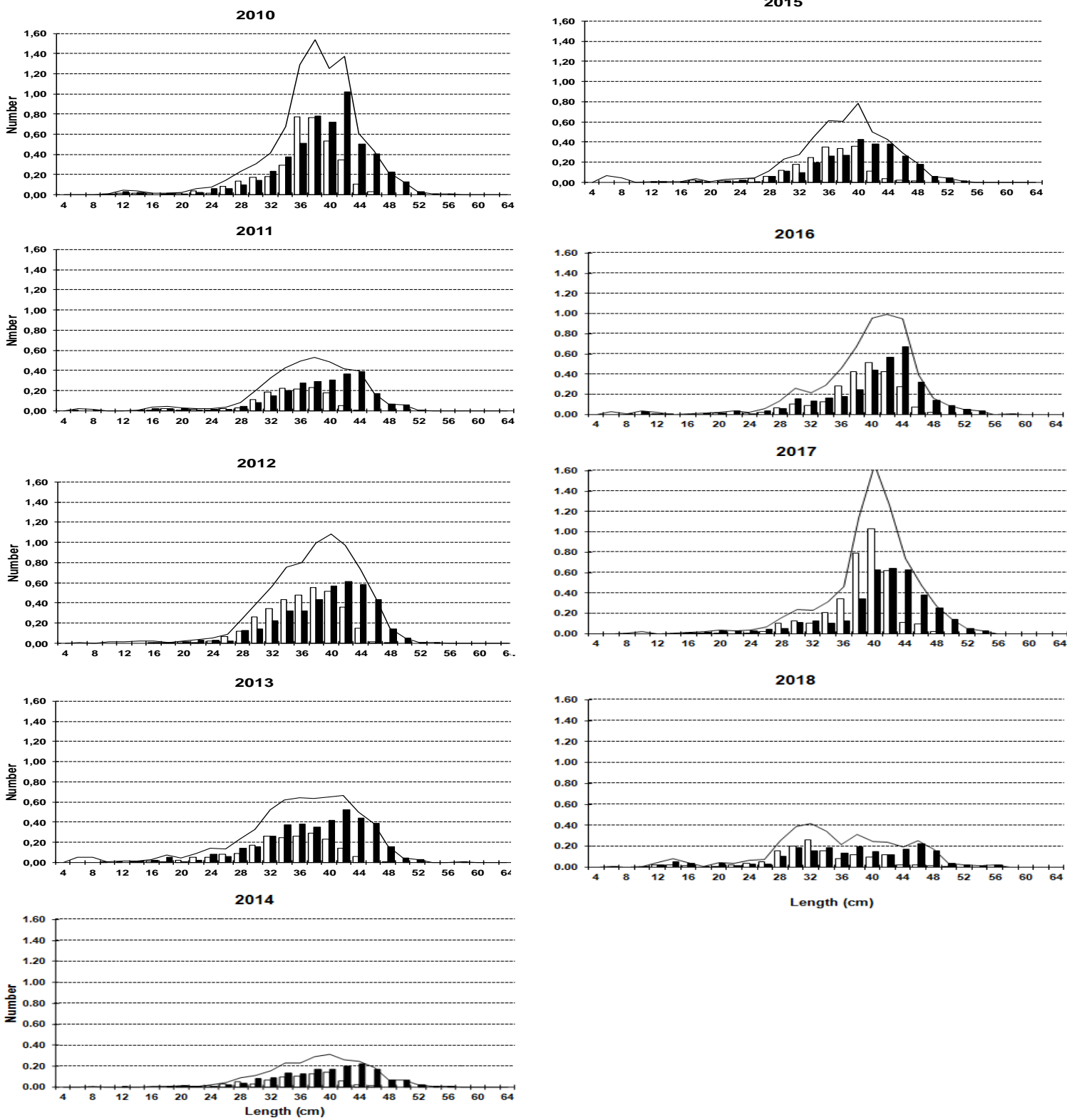
**Figure 13.** Witch flounder biomass calculated by the swept area method in tons and  $\pm$ SD by year. Spanish Spring surveys in NAFO Div. 3NO: 2002-2018.



**Figure 14.-** Witch flounder mean catches per tow length distribution (cm) on NAFO 3NO: 2002-2018. Data from 2014 to 2018 are in Table 20; data for 2002-2013 can be seen in SCR Doc 14/006.



**Figure 15.** Witch flounder length distribution (cm) on NAFO 3NO: 2002-2018. Mean catches per tow numbers. Data from 2014 to 2018 are in Table 20; data for 2002-2013 can be seen in SCR Doc 14/006.



**Figure 15 (cont.).** Witch flounder length distribution (cm) on NAFO 3NO: 2002-2018. Mean catches per tow numbers. Data from 2014 to 2018 are in Table 20; data for 2002-2013 can be seen in SCR Doc 14/006.

