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

by

Diana González-Troncoso and Xabier Paz

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

Abstract

Data for roughhead grenadier (*Macrourus berglax*), thorny skate (*Amblyraja radiata*) and white hake (*Urophycis tenuis*) from the Spanish Spring survey are presented. Abundance and biomass were estimated for roughhead grenadier and thorny skate for the period 1997-2013 and for white hake for the period 2001-2013. The length distribution is presented as numbers per haul stratified mean catches for the last five years (2009-2013). The roughhead grenadier indices show no trend during the entire period, reaching a maximum in 2004 - 2006 and afterwards stabilised at levels slightly higher than in the early years. Thorny skate indices follow a large oscillating trend, dropping in 2007 and being since then more or less stable at a low level. White hake biomass index was highest in 2001 and showed an overall decreasing trend since then to 2008, reaching almost the level of 2002 in 2013, although at very low levels compared with the 2001 one. A small recruitment event was detected in 2004 and in 2013, with individuals between 16 - 26 cm.

Material and Methods

Spain has carried out a spring survey in Div. 3NO of the NAFO Regulatory Area since 1995. To this purpose, the vessel *C/V Playa de Menguña*, equipped with a bottom trawl net type *Pedreira* was used until 2001, when it was replaced by the *R/V Vizconde de Eza* with a bottom trawl net type *Campelen*. The technical specifications and geometry of these gears, their rigging profile and the net plan, and an abstract with the survey technical information are described in Walsh *et al.*, 2001. The number of valid tows, the depth strata covered and survey dates for the period 1997-2013 are shown in Table 1. The survey area was stratified following the standard stratification schemes (Bishop, 1994). The number of hauls was assigned to each stratum proportionally to their size on a random way, with a minimum of two planned hauls per stratum

(Doubleday, 1981). Biomass and abundance indices were calculated by swept area method (Cochran, 1997), assuming a catchability factor of 1. The swept area and number of hauls by stratum for the last five years (2009-2013) are presented in Table 2. To know the results of the rest of the years, see González-Troncoso *et al.* (2013).

The catch of each haul is sorted and weighted by species and a sample of each species is length measured. For roughhead grenadier, pre-anal length in 0.5 cm intervals to the inferior 0.5 cm is taken. Thorny skate and white hake are measured to the nearest lower cm of total length. This paper presents the 1997-2013 indices for roughhead grenadier and thorny skate. Years 1995 and 1996 are not representative as the deeper strata were not surveyed those years, thus they are excluded from the analysis. White hake data are only available since 2001.

The indices are presented for each species, transformed until 2000 and no-transformed for the period 2002-2013. 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 2009-2013. To see the results of the rest of the years, see González-Troncoso *et al.* (2013). For 2001 there are both transformed data from C/V *Playa de Menduiña* and original data from R/V *Vizconde de Eza*. White hake data did not need calibration (González Troncoso and Paz, 2005). Further information about the calculation of these indices is available in González Troncoso *et al.* (2005).

Figure 1 presents the maps with the distribution of the catches of the three species during the 2013 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. Grenadier biomass shows a stable or decreasing trend in recent years. Good recruitment is indicated in 2012 but indices of recruitments have high uncertainty (NAFO, 2013).

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 2009-2013. Total biomass and stratified mean catches and SD by year are presented in Table 4 for 1997-2013. The estimated parameters a and b values of length-weight relationship are presented in Table 6 for the last five years.

The roughhead grenadier indices show no trend during the entire period, reaching a maximum in 2004 - 2006 and afterwards stabilised at levels slightly higher than in the early years (Figures 2 and 3).

Length Distribution

Table 7 and Figure 2 present the mean number for 1997-2013, and Table 8 the same index by length besides the sampled size and catch for the period 2009-2013. Results are presented in length intervals of 1 cm. The 1998 cohort is easily followed, but it has started to disappear over the past years. Recruitment seems to be good recently, especially in 2013, whereas all the length classes were poor, specially the largest (Figures 4 and 5).

Thorny skate

Thorny skate catches comprises the most of the skates catches during the Spanish Spring survey and the Canadian surveys. This species has been managed with a TAC since 2004. Nominal catches increased in the mid-1980s with the beginning of a directed fishery, reaching a minimum during the period 1993-1995. Biomass has been relatively stable from 1996 to 2004, but at a lower level than in the mid-1980s. During recent years the biomass has increased slightly (NAFO, 2013).

Mean Catches and Biomass

Mean catch and SD per stratum are presented in Table 8 for 2009-2013, 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 2009-2013 are presented in Table 12.

Thorny skate indices follow a large oscillating trend, with maximum values of roughly 55 000 tons in 2000 and 2006, and minimum values over 10 000 tons in 1997 and 2011. In 2007 the indices dropped, being since then more or less stables at a low level (Figures 6 and 7).

Length Distribution

Total mean number per tow by year for the period 1997-2013 is shown in Table 13 and Figure 6. Length distribution by sex and year, sample size and catch for the period 2009-2013 are presented in Table 14 and Figures 8 and 9. The recruitment modal value was in 1997 and can be roughly followed until 2013. 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.

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. The 1999 year-class was large and prompted the 2000 stock biomass

increase, but following cohorts have been very small in comparison. The stock biomass remains at relatively low levels. No large recruitments have been observed since 2000 (NAFO, 2013).

Mean catches and biomass

Mean catch and SD per stratum are presented in table 15 for years 2009-2013. 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 1997-2013. In Table 18 there are the length weight relationship parameters for the period 2009-2013.

White hake biomass index was highest in 2001 and shows an overall decreasing trend since then to 2008, with a much smaller peak in 2005. Since 2008 an increase can be seen, reaching almost the level of 2002 in 2013, although at very low levels compared with the 2001 one (Figures 10 and 11).

Length distribution

Table 19 presents the mean number per tow by year for 1997-2013. 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 2009-2013. White hake was not sexed in 2011.

Individuals within the length range 30-38 cm were very abundant in 2001 and can be followed the next years, but by 2006 can hardly be seen. A small recruitment event was detected in 2004 and in 2013, with individuals between 16 - 26 cm. All year classes have been poor in 2006-2011. In 2012 a slight increase in the lengths between 40-44 cm can be seen, corresponding to 48-52 cm in 2013.

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Table 1.- Spanish spring bottom trawl surveys in NAFO Div. 3NO: 1997-2013

| Year | Vessel | Valid tows | Depth strata covered (m) | Dates |
|---------------------|------------------------------|------------|--------------------------|-----------------|
| 1997 | <i>C/V Playa de Menduñña</i> | 128 | 42-1263 | April 26-May 18 |
| 1998 | <i>C/V Playa de Menduñña</i> | 124 | 42-1390 | May 06-May 26 |
| 1999 | <i>C/V Playa de Menduñña</i> | 114 | 41-1381 | May 07-May 26 |
| 2000 | <i>C/V Playa de Menduñña</i> | 118 | 42-1401 | May 07-May 28 |
| 2001 ^(*) | <i>R/V Vizconde de Eza</i> | 83 | 36-1156 | May 03-May 24 |
| | <i>C/V Playa de Menduñña</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 |

(*) A total of 83 hauls from the *R/V Vizconde de Eza* and 40 hauls from the *C/V Playa de Menduñña* (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: 2009-2013. Swept area in square miles. n.s. means stratum not surveyed.

| Stratum | 2009 | | 2010 | | 2011 | | 2012 | | 2103 | |
|---------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| | Swept area | Tow number | Swept area | Tow number | Swept area | Tow number | Swept area | Tow number | Swept area | Tow number |
| 353 | 0.0345 | 3 | 0.0225 | 2 | 0.0349 | 3 | 0.0338 | 3 | 0.0349 | 3 |
| 354 | 0.0338 | 3 | 0.0225 | 2 | 0.0345 | 3 | 0.0338 | 3 | 0.0338 | 3 |
| 355 | 0.0233 | 2 | 0.0229 | 2 | 0.0233 | 2 | 0.0229 | 2 | 0.0225 | 2 |
| 356 | 0.0229 | 2 | 0.0225 | 2 | 0.0229 | 2 | 0.0225 | 2 | 0.0225 | 2 |
| 357 | 0.0116 | 2 | 0.0225 | 2 | 0.0225 | 2 | 0.0229 | 2 | 0.0236 | 2 |
| 358 | 0.0341 | 3 | 0.0225 | 2 | 0.0345 | 3 | 0.0330 | 3 | 0.0338 | 3 |
| 359 | 0.0795 | 7 | 0.0705 | 6 | 0.0806 | 7 | 0.0806 | 7 | 0.0829 | 7 |
| 360 | 0.2273 | 20 | 0.1628 | 14 | 0.2374 | 20 | 0.2344 | 20 | 0.2231 | 19 |
| 374 | 0.0225 | 2 | 0.0225 | 2 | 0.0225 | 2 | 0.0229 | 2 | 0.0233 | 2 |
| 375 | 0.0341 | 3 | 0.0364 | 3 | 0.0360 | 3 | 0.0349 | 3 | 0.0360 | 3 |
| 376 | 0.1133 | 10 | 0.0788 | 7 | 0.1178 | 10 | 0.1181 | 10 | 0.1305 | 11 |
| 377 | 0.0225 | 2 | 0.0233 | 2 | 0.0233 | 2 | 0.0229 | 2 | 0.0236 | 2 |
| 378 | 0.0229 | 2 | 0.0225 | 2 | 0.0240 | 2 | 0.0229 | 2 | 0.0225 | 2 |
| 379 | 0.0229 | 2 | 0.0229 | 2 | 0.0221 | 2 | 0.0225 | 2 | 0.0240 | 2 |
| 380 | 0.0229 | 2 | 0.0236 | 2 | 0.0229 | 2 | 0.0229 | 2 | 0.0229 | 2 |
| 381 | 0.0229 | 2 | 0.0244 | 2 | 0.0233 | 2 | 0.0221 | 2 | 0.0244 | 2 |
| 382 | 0.0450 | 4 | 0.0233 | 2 | 0.0450 | 4 | 0.0454 | 4 | 0.0484 | 4 |
| 721 | 0.0229 | 2 | 0.0225 | 2 | 0.0229 | 2 | 0.0233 | 2 | 0.0225 | 2 |
| 722 | 0.0225 | 2 | 0.0225 | 2 | 0.0225 | 2 | 0.0221 | 2 | 0.0221 | 2 |
| 723 | 0.0225 | 2 | 0.0225 | 2 | 0.0218 | 2 | 0.0225 | 2 | 0.0221 | 2 |
| 724 | 0.0233 | 2 | 0.0229 | 2 | 0.0233 | 2 | 0.0225 | 2 | 0.0225 | 2 |
| 725 | 0.0229 | 2 | 0.0233 | 2 | 0.0240 | 2 | 0.0225 | 2 | 0.0229 | 2 |
| 726 | 0.0229 | 2 | 0.0233 | 2 | 0.0225 | 2 | 0.0221 | 2 | 0.0221 | 2 |
| 727 | 0.0113 | 1 | 0.0240 | 2 | 0.0225 | 2 | 0.0233 | 2 | 0.0229 | 2 |
| 728 | 0.0229 | 2 | 0.0240 | 2 | 0.0229 | 2 | 0.0229 | 2 | 0.0233 | 2 |
| 752 | 0.0229 | 2 | 0.0240 | 2 | 0.0236 | 2 | 0.0229 | 2 | 0.0233 | 2 |
| 753 | 0.0116 | 1 | n.s. | n.s. | 0.0225 | 2 | 0.0221 | 2 | 0.0236 | 2 |
| 754 | 0.0113 | 1 | 0.0225 | 2 | 0.0225 | 2 | 0.0221 | 2 | 0.0240 | 2 |
| 755 | 0.0116 | 1 | 0.0120 | 1 | 0.0454 | 4 | 0.0446 | 4 | 0.0454 | 4 |
| 756 | 0.0225 | 2 | 0.0225 | 2 | 0.0206 | 2 | 0.0221 | 2 | 0.0229 | 2 |
| 757 | 0.0229 | 2 | 0.0221 | 2 | 0.0236 | 2 | 0.0214 | 2 | 0.0240 | 2 |
| 758 | 0.0225 | 2 | 0.0225 | 2 | 0.0225 | 2 | 0.0221 | 2 | 0.0225 | 2 |
| 759 | 0.0113 | 1 | 0.0225 | 2 | 0.0218 | 2 | 0.0221 | 2 | 0.0225 | 2 |
| 760 | 0.0229 | 2 | 0.0225 | 2 | 0.0214 | 2 | 0.0225 | 2 | 0.0229 | 2 |
| 761 | 0.0225 | 2 | 0.0229 | 2 | 0.0236 | 2 | 0.0221 | 2 | 0.0225 | 2 |
| 762 | 0.0225 | 2 | 0.0229 | 2 | 0.0225 | 2 | 0.0225 | 2 | 0.0218 | 2 |
| 763 | n.s. | n.s. | n.s. | n.s. | 0.0349 | 3 | 0.0330 | 3 | 0.0341 | 3 |
| 764 | 0.0116 | 1 | n.s. | n.s. | 0.0225 | 2 | 0.0225 | 2 | 0.0214 | 2 |
| 765 | 0.0225 | 2 | 0.0225 | 2 | 0.0225 | 2 | 0.0229 | 2 | 0.0221 | 2 |
| 766 | 0.0225 | 2 | 0.0225 | 2 | 0.0225 | 2 | 0.0225 | 2 | 0.0221 | 2 |
| 767 | n.s. | n.s. | n.s. | n.s. | 0.0233 | 2 | 0.0203 | 2 | 0.0218 | 2 |

Table 3.- Roughhead grenadier mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2009-2013. n.s. means stratum not surveyed.

| Stratum | 2009 | | 2010 | | 2011 | | 2012 | | 2013 | |
|---------|----------------------------|--------------------|----------------------------|--------------------|----------------------------|--------------------|----------------------------|--------------------|----------------------------|--------------------|
| | R. grenadier Mean catch | R. grenadier SD | R. grenadier Mean catch | R. grenadier SD | R. grenadier Mean catch | R. grenadier SD | R. grenadier Mean catch | R. grenadier SD | R. grenadier Mean catch | R. grenadier SD |
| 353 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 354 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 355 | 1.23 | 1.73 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 356 | 0.00 | 0.00 | 0.11 | 0.16 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 357 | 15.89 | 19.16 | 3.87 | 3.50 | 7.24 | 10.05 | 8.39 | 3.24 | 2.33 | 1.65 |
| 358 | 0.00 | 0.00 | 0.00 | 0.00 | 0.31 | 0.53 | 1.47 | 2.54 | 0.91 | 1.57 |
| 359 | 0.07 | 0.19 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 360 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 374 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 375 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 376 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 377 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 378 | 0.00 | 0.00 | 1.19 | 1.68 | 0.44 | 0.62 | 2.40 | 3.40 | 0.00 | 0.00 |
| 379 | 7.14 | 3.62 | 17.11 | 1.62 | 1.93 | 0.99 | 8.22 | 3.51 | 13.66 | 12.96 |
| 380 | 7.53 | 9.15 | 25.55 | 0.21 | 53.85 | 58.20 | 8.30 | 6.04 | 9.39 | 3.60 |
| 381 | 0.00 | 0.00 | 0.18 | 0.25 | 119.68 | 136.08 | 2.47 | 3.49 | 5.40 | 7.64 |
| 382 | 0.00 | 0.00 | 0.00 | 0.00 | 7.48 | 14.95 | 0.27 | 0.54 | 0.00 | 0.00 |
| 721 | 4.20 | 0.78 | 1.04 | 0.50 | 0.83 | 0.40 | 2.02 | 0.86 | 0.29 | 0.41 |
| 722 | 0.74 | 0.72 | 3.52 | 2.23 | 1.85 | 0.77 | 8.63 | 10.28 | 7.76 | 8.49 |
| 723 | 18.00 | 3.83 | 4.12 | 0.21 | 3.63 | 0.05 | 10.45 | 9.96 | 5.19 | 0.26 |
| 724 | 9.93 | 4.26 | 5.18 | 0.84 | 3.33 | 4.52 | 5.35 | 1.69 | 10.39 | 0.90 |
| 725 | 5.91 | 1.63 | 10.95 | 3.04 | 8.92 | 7.81 | 13.53 | 5.63 | 5.60 | 0.83 |
| 726 | 34.43 | 22.03 | 41.60 | 18.95 | 21.87 | 20.26 | 30.81 | 13.02 | 27.51 | 3.17 |
| 727 | 7.94 | - | 12.45 | 1.34 | 6.80 | 1.28 | 8.15 | 2.49 | 22.39 | 18.26 |
| 728 | 7.34 | 2.18 | 19.71 | 7.63 | 6.26 | 0.50 | 10.39 | 9.21 | 16.31 | 11.29 |
| 752 | 30.59 | 14.29 | 80.55 | 70.22 | 4.56 | 3.32 | 11.15 | 1.34 | 4.83 | 4.11 |
| 753 | 117.40 | - | n.s. | n.s. | 35.40 | 45.07 | 76.91 | 98.85 | 30.85 | 42.46 |
| 754 | 145.50 | - | 69.06 | 94.82 | 11.42 | 4.15 | 42.59 | 9.25 | 59.78 | 42.87 |
| 755 | 11.29 | - | 10.44 | - | 14.55 | 11.44 | 52.28 | 26.15 | 24.14 | 18.70 |
| 756 | 39.31 | 29.38 | 9.18 | 5.20 | 40.31 | 53.81 | 57.00 | 8.77 | 20.34 | 12.95 |
| 757 | 18.68 | 1.58 | 11.81 | 0.84 | 42.74 | 11.74 | 156.42 | 48.62 | 28.18 | 33.58 |
| 758 | 43.93 | 8.73 | 8.69 | 1.76 | 12.36 | 14.74 | 25.56 | 2.90 | 19.34 | 3.10 |
| 759 | 48.81 | - | 14.24 | 7.30 | 6.93 | 7.50 | 16.33 | 7.16 | 40.76 | 5.78 |
| 760 | 22.89 | 6.63 | 6.66 | 4.97 | 16.44 | 21.69 | 2.31 | 3.27 | 5.92 | 0.94 |
| 761 | 10.15 | 1.92 | 90.08 | 121.09 | 7.83 | 1.08 | 6.67 | 3.75 | 4.76 | 6.34 |
| 762 | 10.32 | 7.90 | 24.26 | 19.01 | 33.37 | 21.68 | 29.68 | 21.80 | 12.39 | 4.62 |
| 763 | n.s. | n.s. | n.s. | n.s. | 10.09 | 8.23 | 5.94 | 6.08 | 17.93 | 13.97 |
| 764 | 20.54 | - | n.s. | n.s. | 9.60 | 13.06 | 1.37 | 1.93 | 4.89 | 1.58 |
| 765 | 6.49 | 0.90 | 1.85 | 1.82 | 1.68 | 1.84 | 2.48 | 2.59 | 3.83 | 4.79 |
| 766 | 1.95 | 0.63 | 1.98 | 1.43 | 3.11 | 3.25 | 1.25 | 0.92 | 2.08 | 1.15 |
| 767 | n.s. | n.s. | n.s. | n.s. | 2.41 | 1.16 | 0.72 | 0.02 | 2.05 | 1.27 |

Table 4.- Roughhead grenadier survey biomass (t) by stratum in NAFO Div. 3NO: 2009-2013. n.s. means stratum not surveyed.

| Strata | 2009 | 2010 | 2011 | 2012 | 2013 | Strata | 2009 | 2010 | 2011 | 2012 | 2013 |
|---------------|-------------|-------------|-------------|-------------|-------------|---------------|-------------|-------------|-------------|-------------|-------------|
| 353 | 0 | 0 | 0 | 0 | 0 | 725 | 54 | 99 | 78 | 126 | 51 |
| 354 | 0 | 0 | 0 | 0 | 0 | 726 | 217 | 258 | 140 | 200 | 179 |
| 355 | 8 | 0 | 0 | 0 | 0 | 727 | 68 | 100 | 58 | 67 | 188 |
| 356 | 0 | 0 | 0 | 0 | 0 | 728 | 50 | 128 | 43 | 71 | 109 |
| 357 | 448 | 56 | 105 | 120 | 32 | 752 | 350 | 879 | 51 | 128 | 54 |
| 358 | 0 | 0 | 6 | 30 | 18 | 753 | 1394 | 0 | 434 | 959 | 360 |
| 359 | 3 | 0 | 0 | 0 | 0 | 754 | 2328 | 1105 | 183 | 693 | 897 |
| 360 | 0 | 0 | 0 | 0 | 0 | 755 | 374 | 335 | 494 | 1804 | 819 |
| 374 | 0 | 0 | 0 | 0 | 0 | 756 | 353 | 82 | 395 | 520 | 180 |
| 375 | 0 | 0 | 0 | 0 | 0 | 757 | 167 | 109 | 369 | 1493 | 239 |
| 376 | 0 | 0 | 0 | 0 | 0 | 758 | 387 | 76 | 109 | 229 | 170 |
| 377 | 0 | 0 | 0 | 0 | 0 | 759 | 551 | 161 | 81 | 187 | 460 |
| 378 | 0 | 15 | 5 | 29 | 0 | 760 | 308 | 91 | 237 | 32 | 80 |
| 379 | 66 | 159 | 18 | 77 | 121 | 761 | 154 | 1347 | 113 | 103 | 72 |
| 380 | 63 | 208 | 452 | 70 | 79 | 762 | 194 | 450 | 629 | 559 | 242 |
| 381 | 0 | 2 | 1482 | 32 | 64 | 763 | n.s. | 0 | 227 | 141 | 411 |
| 382 | 0 | 0 | 228 | 8 | 0 | 764 | 177 | 0 | 85 | 12 | 46 |
| 721 | 24 | 6 | 5 | 11 | 2 | 765 | 71 | 20 | 19 | 27 | 43 |
| 722 | 6 | 26 | 14 | 66 | 59 | 766 | 25 | 25 | 40 | 16 | 27 |
| 723 | 248 | 57 | 52 | 144 | 73 | 767 | n.s. | 0 | 33 | 11 | 30 |
| 724 | 106 | 56 | 36 | 59 | 114 | | | | | | |

Table 5.- Roughhead grenadier survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by in NAFO Div. 3NO: 1997-2013.

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

| Year | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Biomass | 10010 | 5760 | 7521 | 8193 | 5850 | 6219 | 8027 | 5220 |
| SD | 1716 | 695 | 1028 | 286 | 1773 | 1508 | 1073 | 753 |
| MCPT | 11.11 | 6.93 | 7.93 | 9.15 | 6.97 | 6.82 | 8.59 | 5.81 |
| SD | 1.89 | 0.83 | 1.11 | 0.40 | 2.10 | 1.61 | 1.18 | 0.85 |

Table 6.- Roughhead grenadier length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2009-2013. 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 |
| 2009 | 0.08107 | 2.99748 | 0.1408 | 0.0554 | 0.988 | 217 | 0.1202 | 2.8658 | 0.0194 | 0.0551 | 0.997 | 465 | 0.1179 | 2.8704 | 0.0743 | 0.0271 | 0.995 | 710 |
| 2010 | 0.08245 | 3.00029 | 0.2275 | 0.0892 | 0.968 | 210 | 0.1225 | 2.8545 | 0.0986 | 0.0341 | 0.992 | 449 | 0.1506 | 2.7834 | 0.135 | 0.0492 | 0.982 | 665 |
| 2011 | 0.17321 | 2.75079 | 0.1574 | 0.062 | 0.982 | 415 | 0.1350 | 2.8396 | 0.0955 | 0.0334 | 0.992 | 769 | 0.1368 | 2.8363 | 0.0727 | 0.0263 | 0.995 | 1210 |
| 2012 | 0.29835 | 2.55865 | 0.1689 | 0.0654 | 0.988 | 551 | 0.1725 | 2.7562 | 0.0689 | 0.0242 | 0.998 | 1032 | 0.3390 | 2.5323 | 0.0919 | 0.0339 | 0.994 | 1614 |
| 2013 | 0.11695 | 2.86549 | 0.0803 | 0.0318 | 0.996 | 478 | 0.1103 | 2.8903 | 0.0447 | 0.0155 | 0.998 | 982 | 0.1315 | 2.8331 | 0.0474 | 0.0169 | 0.998 | 1580 |

Table 7.- Roughhead grenadier mean number per tow by year in Spanish Spring Surveys in NAFO Div. 3NO: 1997-2013. Indet. means indeterminate.

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

Table 8.- Roughhead grenadier mean number per tow by length class and year. Spanish Spring Survey in NAFO 3NO: 2009-2013. Indet. means indeterminate.

| Length (cm) | 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 |
| 1.5 | 0.000 | 0.000 | 0.005 | 0.005 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.009 | 0.009 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2.5 | 0.000 | 0.000 | 0.015 | 0.015 | 0.000 | 0.000 | 0.151 | 0.151 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.083 | 0.083 | 0.000 | 0.000 | 0.026 | 0.026 |
| 3.5 | 0.006 | 0.000 | 0.233 | 0.239 | 0.041 | 0.007 | 0.209 | 0.257 | 0.005 | 0.005 | 0.148 | 0.158 | 0.000 | 0.000 | 0.178 | 0.178 | 0.032 | 0.018 | 0.606 | 0.656 |
| 4.5 | 0.023 | 0.005 | 0.022 | 0.050 | 0.011 | 0.011 | 0.000 | 0.022 | 0.006 | 0.000 | 0.014 | 0.020 | 0.025 | 0.025 | 0.026 | 0.077 | 0.007 | 0.008 | 0.075 | 0.091 |
| 5.5 | 0.029 | 0.041 | 0.043 | 0.114 | 0.074 | 0.045 | 0.007 | 0.125 | 0.027 | 0.013 | 0.000 | 0.040 | 0.183 | 0.162 | 0.007 | 0.352 | 0.060 | 0.054 | 0.031 | 0.144 |
| 6.5 | 0.134 | 0.173 | 0.053 | 0.361 | 0.461 | 0.334 | 0.000 | 0.795 | 0.070 | 0.069 | 0.000 | 0.139 | 0.452 | 0.668 | 0.000 | 1.120 | 0.152 | 0.121 | 0.038 | 0.310 |
| 7.5 | 0.076 | 0.138 | 0.000 | 0.213 | 0.102 | 0.075 | 0.000 | 0.177 | 0.043 | 0.052 | 0.000 | 0.095 | 0.186 | 0.162 | 0.000 | 0.348 | 0.039 | 0.078 | 0.000 | 0.117 |
| 8.5 | 0.220 | 0.261 | 0.000 | 0.481 | 0.132 | 0.059 | 0.000 | 0.191 | 0.152 | 0.149 | 0.000 | 0.301 | 0.227 | 0.298 | 0.000 | 0.526 | 0.247 | 0.328 | 0.004 | 0.580 |
| 9.5 | 0.167 | 0.211 | 0.000 | 0.378 | 0.087 | 0.131 | 0.000 | 0.218 | 0.141 | 0.141 | 0.000 | 0.282 | 0.221 | 0.406 | 0.000 | 0.627 | 0.195 | 0.364 | 0.000 | 0.559 |
| 10.5 | 0.235 | 0.324 | 0.000 | 0.559 | 0.164 | 0.300 | 0.000 | 0.464 | 0.048 | 0.087 | 0.000 | 0.134 | 0.450 | 0.462 | 0.000 | 0.912 | 0.212 | 0.238 | 0.000 | 0.450 |
| 11.5 | 0.275 | 0.421 | 0.000 | 0.696 | 0.173 | 0.229 | 0.000 | 0.403 | 0.067 | 0.103 | 0.013 | 0.183 | 0.304 | 0.433 | 0.000 | 0.737 | 0.167 | 0.284 | 0.000 | 0.452 |
| 12.5 | 0.225 | 0.514 | 0.000 | 0.739 | 0.166 | 0.200 | 0.000 | 0.366 | 0.122 | 0.126 | 0.000 | 0.248 | 0.216 | 0.338 | 0.000 | 0.555 | 0.212 | 0.317 | 0.000 | 0.530 |
| 13.5 | 0.358 | 0.583 | 0.000 | 0.941 | 0.301 | 0.301 | 0.000 | 0.602 | 0.274 | 0.276 | 0.000 | 0.550 | 0.334 | 0.408 | 0.000 | 0.742 | 0.178 | 0.295 | 0.000 | 0.473 |
| 14.5 | 0.592 | 0.834 | 0.000 | 1.426 | 0.282 | 0.413 | 0.000 | 0.696 | 0.260 | 0.380 | 0.000 | 0.640 | 0.418 | 0.446 | 0.000 | 0.864 | 0.237 | 0.314 | 0.000 | 0.551 |
| 15.5 | 0.633 | 0.692 | 0.000 | 1.325 | 0.444 | 0.424 | 0.000 | 0.868 | 0.472 | 0.337 | 0.000 | 0.808 | 0.471 | 0.584 | 0.000 | 1.055 | 0.211 | 0.287 | 0.000 | 0.498 |
| 16.5 | 0.812 | 0.879 | 0.000 | 1.691 | 0.593 | 0.461 | 0.000 | 1.055 | 0.574 | 0.507 | 0.000 | 1.081 | 0.489 | 0.568 | 0.000 | 1.057 | 0.330 | 0.437 | 0.000 | 0.767 |
| 17.5 | 0.476 | 0.849 | 0.000 | 1.324 | 0.491 | 0.520 | 0.000 | 1.011 | 0.598 | 0.419 | 0.000 | 1.017 | 0.476 | 0.553 | 0.000 | 1.029 | 0.430 | 0.361 | 0.000 | 0.791 |
| 18.5 | 0.267 | 0.487 | 0.000 | 0.754 | 0.259 | 0.529 | 0.000 | 0.789 | 0.547 | 0.522 | 0.000 | 1.069 | 0.309 | 0.445 | 0.000 | 0.754 | 0.275 | 0.361 | 0.000 | 0.636 |
| 19.5 | 0.270 | 0.330 | 0.000 | 0.600 | 0.254 | 0.246 | 0.000 | 0.500 | 0.254 | 0.520 | 0.000 | 0.774 | 0.171 | 0.594 | 0.000 | 0.765 | 0.219 | 0.339 | 0.000 | 0.558 |
| 20.5 | 0.101 | 0.408 | 0.000 | 0.509 | 0.052 | 0.321 | 0.000 | 0.374 | 0.148 | 0.540 | 0.000 | 0.689 | 0.085 | 0.421 | 0.000 | 0.506 | 0.122 | 0.368 | 0.000 | 0.490 |
| 21.5 | 0.095 | 0.426 | 0.000 | 0.522 | 0.068 | 0.256 | 0.000 | 0.324 | 0.067 | 0.283 | 0.000 | 0.350 | 0.018 | 0.531 | 0.000 | 0.549 | 0.058 | 0.318 | 0.000 | 0.376 |
| 22.5 | 0.048 | 0.535 | 0.000 | 0.583 | 0.020 | 0.270 | 0.000 | 0.290 | 0.032 | 0.208 | 0.000 | 0.239 | 0.037 | 0.401 | 0.000 | 0.438 | 0.039 | 0.244 | 0.000 | 0.283 |
| 23.5 | 0.027 | 0.390 | 0.000 | 0.418 | 0.016 | 0.321 | 0.000 | 0.337 | 0.000 | 0.282 | 0.000 | 0.282 | 0.029 | 0.297 | 0.000 | 0.326 | 0.015 | 0.212 | 0.000 | 0.226 |
| 24.5 | 0.000 | 0.665 | 0.000 | 0.665 | 0.035 | 0.354 | 0.000 | 0.388 | 0.014 | 0.271 | 0.000 | 0.286 | 0.007 | 0.360 | 0.000 | 0.368 | 0.030 | 0.217 | 0.000 | 0.247 |
| 25.5 | 0.000 | 0.551 | 0.000 | 0.551 | 0.000 | 0.476 | 0.000 | 0.476 | 0.000 | 0.350 | 0.000 | 0.350 | 0.007 | 0.353 | 0.000 | 0.360 | 0.005 | 0.192 | 0.000 | 0.197 |
| 26.5 | 0.000 | 0.519 | 0.000 | 0.519 | 0.000 | 0.436 | 0.000 | 0.436 | 0.000 | 0.307 | 0.000 | 0.307 | 0.000 | 0.412 | 0.000 | 0.412 | 0.000 | 0.193 | 0.000 | 0.193 |
| 27.5 | 0.003 | 0.474 | 0.000 | 0.477 | 0.011 | 0.335 | 0.000 | 0.346 | 0.000 | 0.269 | 0.000 | 0.269 | 0.000 | 0.387 | 0.000 | 0.387 | 0.000 | 0.203 | 0.000 | 0.203 |
| 28.5 | 0.000 | 0.154 | 0.000 | 0.154 | 0.000 | 0.201 | 0.000 | 0.201 | 0.000 | 0.207 | 0.000 | 0.207 | 0.000 | 0.380 | 0.000 | 0.380 | 0.000 | 0.148 | 0.000 | 0.148 |
| 29.5 | 0.000 | 0.177 | 0.000 | 0.177 | 0.000 | 0.201 | 0.000 | 0.201 | 0.000 | 0.163 | 0.000 | 0.163 | 0.000 | 0.210 | 0.000 | 0.210 | 0.010 | 0.208 | 0.000 | 0.218 |
| 30.5 | 0.000 | 0.087 | 0.000 | 0.087 | 0.000 | 0.095 | 0.000 | 0.095 | 0.000 | 0.102 | 0.000 | 0.102 | 0.000 | 0.111 | 0.000 | 0.111 | 0.000 | 0.112 | 0.000 | 0.112 |
| 31.5 | 0.000 | 0.052 | 0.000 | 0.052 | 0.000 | 0.061 | 0.000 | 0.061 | 0.000 | 0.042 | 0.000 | 0.042 | 0.000 | 0.102 | 0.000 | 0.102 | 0.000 | 0.093 | 0.000 | 0.093 |
| 32.5 | 0.000 | 0.024 | 0.000 | 0.024 | 0.000 | 0.043 | 0.000 | 0.043 | 0.000 | 0.029 | 0.000 | 0.029 | 0.000 | 0.069 | 0.000 | 0.069 | 0.000 | 0.053 | 0.000 | 0.053 |
| 33.5 | 0.000 | 0.029 | 0.000 | 0.029 | 0.000 | 0.028 | 0.000 | 0.028 | 0.000 | 0.014 | 0.000 | 0.014 | 0.000 | 0.037 | 0.000 | 0.037 | 0.000 | 0.054 | 0.000 | 0.054 |
| 34.5 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.009 | 0.000 | 0.009 | 0.000 | 0.007 | 0.000 | 0.007 | 0.000 | 0.043 | 0.000 | 0.043 | 0.000 | 0.035 | 0.000 | 0.035 |
| 35.5 | 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 | 0.005 | 0.000 | 0.005 |
| 36.5 | 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 |
| 37.5 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.011 | 0.000 | 0.011 | 0.000 | 0.008 | 0.000 | 0.008 | 0.000 | 0.006 | 0.000 | 0.006 | 0.000 | 0.006 | 0.000 | 0.006 |
| 38.5 | 0.000 | 0.023 | 0.000 | 0.023 | 0.000 | 0.000 | 0.000 | 0.000 | 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 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.010 | 0.000 | 0.010 |
| 40.5 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 41.5 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 42.5 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| Total | 5.072 | 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 |
| N° samples: | | | | 46 | | | | 48 | | | | 62 | | | | 57 | | | | 58 |
| N° Ind.: | 430 | 940 | 45 | 1415 | 580 | 1030 | 48 | 1658 | 470 | 859 | 27 | 1356 | 779 | 1572 | 49 | 2400 | 535 | 1051 | 131 | 1717 |
| Sampled catch: | | | | 723 | | | | 929 | | | | 862 | | | | 1281 | | | | 883 |
| Range: | | | | 1.5-38.5 | | | | 2-37.5 | | | | 3-37 | | | | 1.5-37.5 | | | | 2.5-39 |
| Total catch: | | | | 945 | | | | 940 | | | | 1049 | | | | 1341 | | | | 885 |
| Total hauls: | | | | 110 | | | | 95 | | | | 122 | | | | 122 | | | | 122 |

Table 9.- Thorny skate mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div.
3NO: 2009-2013. n.s. means stratum not surveyed.

| Stratum | 2009 | | 2010 | | 2011 | | 2012 | | 2013 | |
|---------|------------------|----------------|------------------|----------------|------------------|----------------|------------------|----------------|------------------|----------------|
| | T. skate Mean | T. skate SD | T. skate Mean | T. skate SD | T. skate Mean | T. skate SD | T. skate Mean | T. skate SD | T. skate Mean | T. skate SD |
| 353 | 39.40 | 49.72 | 32.65 | 38.25 | 21.75 | 17.88 | 16.21 | 9.68 | 25.00 | 16.04 |
| 354 | 53.70 | 35.95 | 20.00 | 2.55 | 22.70 | 7.23 | 50.23 | 56.37 | 58.00 | 38.97 |
| 355 | 10.80 | 0.57 | 26.03 | 28.95 | 28.30 | 33.98 | 11.00 | 3.82 | 5.84 | 8.26 |
| 356 | 30.59 | 27.17 | 21.48 | 24.36 | 22.69 | 12.07 | 44.78 | 63.33 | 49.23 | 35.62 |
| 357 | 46.26 | 47.49 | 2.10 | 2.97 | 8.07 | 11.41 | 4.07 | 1.00 | 5.06 | 1.22 |
| 358 | 17.42 | 15.08 | 21.60 | 30.55 | 15.61 | 1.80 | 6.68 | 5.90 | 28.31 | 44.81 |
| 359 | 36.17 | 56.57 | 24.75 | 40.89 | 21.97 | 14.37 | 22.32 | 14.07 | 30.80 | 21.34 |
| 360 | 27.22 | 33.73 | 34.64 | 45.58 | 18.21 | 15.05 | 57.72 | 46.64 | 40.01 | 34.95 |
| 374 | 0.00 | 0.00 | 1.92 | 2.71 | 5.67 | 8.02 | 0.00 | 0.00 | 17.11 | 17.68 |
| 375 | 5.27 | 5.35 | 1.44 | 2.49 | 1.17 | 2.03 | 18.17 | 20.62 | 26.36 | 4.11 |
| 376 | 41.19 | 39.19 | 40.33 | 32.79 | 11.78 | 10.84 | 93.55 | 39.65 | 36.09 | 29.69 |
| 377 | 2.44 | 3.44 | 7.11 | 4.83 | 7.82 | 6.03 | 15.78 | 3.49 | 8.85 | 4.99 |
| 378 | 11.87 | 16.79 | 27.23 | 32.15 | 19.33 | 4.29 | 19.84 | 15.67 | 9.87 | 3.75 |
| 379 | 15.35 | 21.71 | 4.19 | 4.94 | 20.33 | 23.14 | 6.60 | 2.55 | 1.98 | 2.80 |
| 380 | 10.38 | 10.21 | 57.37 | 58.61 | 111.27 | 103.65 | 30.57 | 31.27 | 18.07 | 20.54 |
| 381 | 0.00 | 0.00 | 0.14 | 0.16 | 20.31 | 14.74 | 7.62 | 5.73 | 9.16 | 12.95 |
| 382 | 0.00 | 0.00 | 6.79 | 6.52 | 6.38 | 5.39 | 0.10 | 0.20 | 8.70 | 7.54 |
| 721 | 116.69 | 145.25 | 27.81 | 19.22 | 7.23 | 3.80 | 17.40 | 24.61 | 53.58 | 32.88 |
| 722 | 1.90 | 2.69 | 2.50 | 3.54 | 5.63 | 7.95 | 5.60 | 7.92 | 5.21 | 1.96 |
| 723 | 19.28 | 9.23 | 5.46 | 0.44 | 3.05 | 4.31 | 12.27 | 10.39 | 8.13 | 6.70 |
| 724 | 3.40 | 4.81 | 10.22 | 14.45 | 2.95 | 4.17 | 0.00 | 0.00 | 0.00 | 0.00 |
| 725 | 3.23 | 4.56 | 4.61 | 6.49 | 2.44 | 3.45 | 0.00 | 0.00 | 1.90 | 2.51 |
| 726 | 38.98 | 21.11 | 7.20 | 1.36 | 1.98 | 2.80 | 0.00 | 0.00 | 3.34 | 4.72 |
| 727 | 111.50 | - | 28.85 | 16.01 | 9.29 | 13.14 | 5.62 | 3.37 | 2.73 | 3.80 |
| 728 | 53.78 | 27.40 | 5.56 | 3.20 | 0.00 | 0.00 | 12.05 | 6.54 | 11.35 | 5.58 |
| 752 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 753 | 0.00 | - | n.s. | n.s. | 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 |
| 755 | 0.00 | - | 0.00 | - | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 756 | 2.46 | 3.48 | 1.73 | 2.45 | 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 | 3.03 | 4.28 | 0.00 | 0.00 |
| 760 | 2.92 | 4.13 | 2.70 | 3.82 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 761 | 0.00 | 0.00 | 2.80 | 3.96 | 0.00 | 0.00 | 4.80 | 6.79 | 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 | n.s. | n.s. | n.s. | n.s. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 764 | 0.00 | - | n.s. | n.s. | 0.00 | 0.00 | 6.80 | 9.62 | 4.80 | 6.79 |
| 765 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.92 | 1.30 | 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 | n.s. | n.s. | n.s. | n.s. | 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: 2009-2013. n.s. means stratum not surveyed.

| Strata | 2009 | 2010 | 2011 | 2012 | 2013 | Strata | 2009 | 2010 | 2011 | 2012 | 2013 |
|---------------|-------------|-------------|-------------|-------------|-------------|---------------|-------------|-------------|-------------|-------------|-------------|
| 353 | 922 | 781 | 503 | 388 | 578 | 725 | 30 | 42 | 21 | 0 | 17 |
| 354 | 1174 | 437 | 486 | 1098 | 1268 | 726 | 245 | 45 | 13 | 0 | 22 |
| 355 | 69 | 168 | 180 | 71 | 38 | 727 | 951 | 231 | 79 | 46 | 23 |
| 356 | 126 | 90 | 93 | 187 | 206 | 728 | 367 | 36 | 0 | 82 | 76 |
| 357 | 1305 | 31 | 118 | 58 | 70 | 752 | 0 | 0 | 0 | 0 | 0 |
| 358 | 344 | 432 | 305 | 137 | 566 | 753 | 0 | n.s. | 0 | 0 | 0 |
| 359 | 1347 | 887 | 803 | 816 | 1095 | 754 | 0 | 0 | 0 | 0 | 0 |
| 360 | 6666 | 8293 | 4271 | 13707 | 9483 | 755 | 0 | 0 | 0 | 0 | 0 |
| 374 | 0 | 36 | 108 | 0 | 315 | 756 | 22 | 16 | 0 | 0 | 0 |
| 375 | 125 | 32 | 26 | 423 | 595 | 757 | 0 | 0 | 0 | 0 | 0 |
| 376 | 4852 | 4782 | 1334 | 10564 | 4058 | 758 | 0 | 0 | 0 | 0 | 0 |
| 377 | 22 | 61 | 67 | 138 | 75 | 759 | 0 | 0 | 0 | 35 | 0 |
| 378 | 144 | 336 | 224 | 241 | 122 | 760 | 39 | 37 | 0 | 0 | 0 |
| 379 | 142 | 39 | 195 | 62 | 17 | 761 | 0 | 42 | 0 | 74 | 0 |
| 380 | 87 | 466 | 934 | 257 | 152 | 762 | 0 | 0 | 0 | 0 | 0 |
| 381 | 0 | 2 | 252 | 99 | 108 | 763 | n.s. | n.s. | 0 | 0 | 0 |
| 382 | 0 | 200 | 195 | 3 | 247 | 764 | 0 | n.s. | 0 | 60 | 45 |
| 721 | 663 | 161 | 41 | 97 | 310 | 765 | 0 | 0 | 0 | 10 | 0 |
| 722 | 14 | 19 | 42 | 43 | 40 | 766 | 0 | 0 | 0 | 0 | 0 |
| 723 | 266 | 75 | 43 | 169 | 114 | 767 | n.s. | n.s. | 0 | 0 | 0 |
| 724 | 36 | 111 | 31 | 0 | 0 | | | | | | |

Table 11.- Thorny skate survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by in NAFO Div. 3NO: 1997-2013.

| Year | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Biomass | 9779 | 18875 | 35004 | 50521 | 34948 | 30072 | 20508 | 44429 | 40473 |
| SD | 1544 | 3114 | 3736 | 7991 | 10687 | 9699 | 2371 | 5281 | 6171 |
| MCPT | 11.57 | 20.41 | 40.79 | 57.86 | 39.23 | 33.69 | 22.27 | 49.46 | 45.69 |
| SD | 1.74 | 3.26 | 4.32 | 9.12 | 6.99 | 10.91 | 2.57 | 5.82 | 7.00 |
| Year | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | |
| Biomass | 47415 | 22223 | 25946 | 19959 | 17887 | 10365 | 28867 | 19640 | |
| SD | 9207 | 2898 | 2641 | 2745 | 3539 | 1193 | 3010 | 2280 | |
| MCPT | 55.81 | 28.10 | 28.82 | 22.10 | 21.22 | 11.71 | 32.65 | 22.24 | |
| SD | 11.22 | 3.57 | 2.92 | 3.13 | 4.11 | 1.32 | 3.38 | 2.63 | |

Table 12.- Thorny skate length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2009-2013. 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 |
| 2009 | 0.01044 | 2.97008 | 0.1092 | 0.0274 | 0.995 | 185 | 0.01033 | 2.98056 | 0.2201 | 0.0563 | 0.982 | 193 | 0.00930 | 3.00294 | 0.1144 | 0.0293 | 0.994 | 378 |
| 2010 | 0.00830 | 3.03702 | 0.0793 | 0.0206 | 0.997 | 279 | 0.00756 | 3.06772 | 0.0807 | 0.0213 | 0.997 | 276 | 0.00821 | 3.04177 | 0.0674 | 0.0176 | 0.997 | 555 |
| 2011 | 0.00247 | 3.32621 | 0.4129 | 0.1021 | 0.957 | 186 | 0.00896 | 3.01571 | 0.1255 | 0.0309 | 0.995 | 176 | 0.00349 | 3.24375 | 0.3269 | 0.0827 | 0.964 | 362 |
| 2012 | 0.00875 | 3.01113 | 0.1202 | 0.0299 | 0.997 | 363 | 0.00758 | 3.01571 | 0.0967 | 0.0246 | 0.998 | 354 | 0.09190 | 3.00833 | 0.0919 | 0.0234 | 0.998 | 717 |
| 2013 | 0.01045 | 2.96645 | 0.0932 | 0.0231 | 0.996 | 357 | 0.00735 | 3.05973 | 0.1266 | 0.0315 | 0.994 | 359 | 0.00979 | 2.98369 | 0.0915 | 0.0229 | 0.996 | 716 |

Table 13.- Thorny skate mean number per tow by year in Spanish Spring Surveys in NAFO Div. 3NO: 1997-2013. Indet. means indeterminate.

| | 1997 | | | | 1998 | | | | 1999 | | | | 2000 | | | | 2001 | | | |
|------|-------|---------|--------|--------|-------|---------|--------|--------|--------|---------|--------|--------|--------|---------|--------|--------|--------|---------|--------|--------|
| | Males | Females | Indet. | Total | Males | Females | Indet. | Total | Males | Females | Indet. | Total | Males | Females | Indet. | Total | Males | Females | Indet. | Total |
| MNPT | 4.803 | 5.892 | 0.000 | 10.695 | 7.158 | 7.649 | 0.000 | 14.808 | 11.173 | 11.271 | 0.029 | 22.472 | 13.760 | 14.185 | 0.000 | 27.945 | 8.996 | 10.572 | 0.000 | 19.568 |
| | 2002 | | | | 2003 | | | | 2004 | | | | 2005 | | | | 2006 | | | |
| | Males | Females | Indet. | Total | Males | Females | Indet. | Total | Males | Females | Indet. | Total | Males | Females | Indet. | Total | Males | Females | Indet. | Total |
| MNPT | 9.903 | 11.540 | 0.005 | 21.448 | 5.660 | 6.802 | 0.000 | 12.461 | 11.985 | 13.529 | 0.000 | 25.514 | 11.235 | 12.125 | 0.000 | 23.360 | 11.658 | 15.005 | 0.000 | 26.663 |
| | 2007 | | | | 2008 | | | | 2009 | | | | 2010 | | | | 2011 | | | |
| | Males | Females | Indet. | Total | Males | Females | Indet. | Total | Males | Females | Indet. | Total | Males | Females | Indet. | Total | Males | Females | Indet. | Total |
| MNPT | 5.501 | 5.955 | 0.000 | 11.456 | 5.484 | 5.701 | 0.000 | 11.184 | 4.218 | 3.999 | 0.000 | 8.217 | 5.689 | 6.037 | 0.000 | 11.726 | 1.811 | 1.598 | 0.000 | 3.410 |
| | 2012 | | | | 2013 | | | | | | | | | | | | | | | |
| | Males | Females | Indet. | Total | Males | Females | Indet. | Total | | | | | | | | | | | | |
| MNPT | 5.801 | 5.470 | 0.000 | 11.271 | 4.193 | 3.782 | 0.000 | 7.975 | | | | | | | | | | | | |

Table 15.- White hake mean catch (kg) and SD by stratum. Spanish Spring Surveys in NAFO Div. 3NO: 2009-2013. n.s. means stratum not surveyed.

| Stratum | 2009 | | 2010 | | 2011 | | 2012 | | 2013 | |
|---------|--------------------------|------------------|--------------------------|------------------|--------------------------|------------------|--------------------------|------------------|--------------------------|------------------|
| | 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 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.07 | 1.54 | 2.40 | 0.00 | 0.00 |
| 354 | 9.30 | 3.74 | 0.02 | 0.03 | 20.45 | 28.28 | 0.13 | 0.22 | 45.38 | 47.93 |
| 355 | 24.45 | 1.34 | 4.89 | 4.96 | 24.11 | 6.21 | 47.52 | 42.40 | 26.55 | 6.12 |
| 356 | 6.13 | 6.33 | 7.90 | 0.28 | 9.58 | 5.06 | 29.95 | 33.02 | 17.15 | 16.48 |
| 357 | 6.08 | 2.97 | 5.96 | 8.43 | 0.00 | 0.00 | 0.00 | 0.00 | 1.32 | 1.87 |
| 358 | 2.16 | 3.75 | 2.34 | 3.31 | 3.99 | 6.92 | 0.00 | 0.00 | 2.18 | 1.94 |
| 359 | 0.00 | 0.00 | 0.01 | 0.02 | 1.48 | 2.53 | 6.08 | 14.91 | 4.05 | 5.44 |
| 360 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.02 | 0.04 | 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 | 1.82 | 2.57 | 0.00 | 0.00 |
| 379 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.30 | 0.43 | 0.04 | 0.06 |
| 380 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.68 | 0.96 | 0.56 | 0.79 |
| 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 | 1.80 | 2.55 | 11.48 | 12.89 | 0.00 | 0.00 | 0.49 | 0.69 | 4.53 | 1.88 |
| 722 | 0.00 | 0.00 | 0.00 | 0.00 | 1.70 | 2.40 | 0.00 | 0.00 | 0.65 | 0.91 |
| 723 | 0.00 | 0.00 | 2.01 | 2.84 | 3.03 | 4.29 | 3.75 | 5.30 | 1.64 | 0.22 |
| 724 | 0.01 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 725 | 0.16 | 0.23 | 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 | 0.11 | 0.16 | 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 | - | n.s. | n.s. | 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 |
| 755 | 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 |
| 760 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 761 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 762 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 763 | n.s. | n.s. | n.s. | n.s. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 764 | 0.00 | - | n.s. | n.s. | 0.29 | 0.40 | 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 | n.s. | n.s. | n.s. | n.s. | 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: 2009-2013. n.s. means stratum not surveyed.

| Strata | 2009 | 2010 | 2011 | 2012 | 2013 | Strata | 2009 | 2010 | 2011 | 2012 | 2013 |
|---------------|-------------|-------------|-------------|-------------|-------------|---------------|-------------|-------------|-------------|-------------|-------------|
| 353 | 0 | 0 | 1 | 37 | 0 | 725 | 1 | 0 | 0 | 0 | 0 |
| 354 | 203 | 0 | 437 | 3 | 992 | 726 | 0 | 0 | 0 | 0 | 0 |
| 355 | 156 | 32 | 153 | 307 | 175 | 727 | 0 | 0 | 0 | 1 | 0 |
| 356 | 25 | 33 | 39 | 125 | 72 | 728 | 0 | 0 | 0 | 0 | 0 |
| 357 | 171 | 87 | 0 | 0 | 18 | 752 | 0 | 0 | 0 | 0 | 0 |
| 358 | 43 | 47 | 78 | 0 | 44 | 753 | 0 | n.s. | 0 | 0 | 0 |
| 359 | 0 | 0 | 54 | 222 | 144 | 754 | 0 | 0 | 0 | 0 | 0 |
| 360 | 0 | 0 | 0 | 4 | 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 | 22 | 0 | 760 | 0 | 0 | 0 | 0 | 0 |
| 379 | 0 | 0 | 0 | 3 | 0 | 761 | 0 | 0 | 0 | 0 | 0 |
| 380 | 0 | 0 | 0 | 6 | 5 | 762 | 0 | 0 | 0 | 0 | 0 |
| 381 | 0 | 0 | 0 | 0 | 0 | 763 | n.s. | n.s. | 0 | 0 | 0 |
| 382 | 0 | 0 | 0 | 0 | 0 | 764 | 0 | n.s. | 3 | 0 | 0 |
| 721 | 10 | 66 | 0 | 3 | 26 | 765 | 0 | 0 | 0 | 0 | 0 |
| 722 | 0 | 0 | 13 | 0 | 5 | 766 | 0 | 0 | 0 | 0 | 0 |
| 723 | 0 | 28 | 43 | 52 | 23 | 767 | n.s. | n.s. | 0 | 0 | 0 |
| 724 | 0 | 0 | 0 | 0 | 0 | | | | | | |

Table 17.- White hake survey biomass (t) with SD and stratified mean catch per tow (kg) and SD by in NAFO Div. 3NO: 1997-2013.

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

| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|----------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Biomass | 74 | 610 | 293 | 822 | 784 | 1503 |
| SD | 46 | 73 | 117 | 361 | 308 | 613 |
| MCPT | 0.08 | 0.61 | 0.34 | 0.91 | 0.86 | 1.64 |
| SD | 0.05 | 0.08 | 0.14 | 0.40 | 0.34 | 0.67 |

Table 18.- White hake length weight relationships in Spanish Spring Surveys in NAFO Div. 3NO: 2009-2013. 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 |
| 2009 | 0.00897 | 2.95767 | 0.3934 | 0.0994 | 0.978 | 26 | 0.00342 | 3.20533 | 0.1912 | 0.0493 | 0.996 | 19 | 0.00330 | 3.21086 | 0.2001 | 0.0516 | 0.992 | 49 |
| 2010 | 0.00310 | 3.21865 | 0.2034 | 0.0543 | 0.997 | 13 | 0.00188 | 3.37344 | 0.1809 | 0.0446 | 0.998 | 16 | 0.00200 | 3.35062 | 0.1566 | 0.04 | 0.997 | 29 |
| 2011 | - | - | - | - | - | - | - | - | - | - | - | - | 0.00337 | 3.21512 | 0.1448 | 0.0382 | 0.994 | 122 |
| 2012 | 0.00340 | 3.20604 | 0.2635 | 0.0682 | 0.995 | 42 | 0.00186 | 3.36229 | 0.4467 | 0.1162 | 0.991 | 27 | 0.00327 | 3.21907 | 0.2547 | 0.0649 | 0.994 | 69 |
| 2013 | 0.00336 | 3.19379 | 0.1347 | 0.0358 | 0.995 | 100 | 0.00157 | 3.38530 | 0.1715 | 0.0438 | 0.992 | 110 | 0.00237 | 3.28346 | 0.1089 | 0.029 | 0.996 | 210 |

Table 19.- White hake mean number per tow by year in Spanish Spring Surveys in NAFO Div. 3NO: 1997-2013. Indet. means indeterminate.

| | 2001 | | | | 2002 | | | | 2003 | | | | 2004 | | | | 2005 | | | |
|------|-------|---------|--------|--------|-------|---------|--------|-------|-------|---------|--------|-------|-------|---------|--------|-------|-------|---------|--------|-------|
| | Males | Females | Indet. | Total | Males | Females | Indet. | Total | Males | Females | Indet. | Total | Males | Females | Indet. | Total | Males | Females | Indet. | Total |
| MNPT | 5.462 | 4.544 | 0.015 | 10.022 | 1.511 | 1.091 | 0.000 | 2.602 | 0.387 | 0.295 | 0.000 | 0.682 | 0.480 | 0.447 | 0.000 | 0.927 | 0.953 | 0.579 | 0.000 | 1.532 |
| | 2006 | | | | 2007 | | | | 2008 | | | | 2009 | | | | 2010 | | | |
| | Males | Females | Indet. | Total | Males | Females | Indet. | Total | Males | Females | Indet. | Total | Males | Females | Indet. | Total | Males | Females | Indet. | Total |
| MNPT | 0.512 | 0.172 | 0.000 | 0.684 | 0.115 | 0.161 | 0.000 | 0.275 | 0.025 | 0.012 | 0.000 | 0.037 | 0.184 | 0.208 | 0.002 | 0.394 | 0.078 | 0.085 | 0.000 | 0.162 |
| | 2011 | | | | 2012 | | | | 2013 | | | | | | | | | | | |
| | Males | Females | Indet. | Total | Males | Females | Indet. | Total | Males | Females | Indet. | Total | | | | | | | | |
| MNPT | 0.000 | 0.000 | 0.882 | 0.882 | 0.676 | 0.418 | 0.000 | 1.094 | 0.877 | 0.891 | 0.000 | 1.768 | | | | | | | | |

Table 20.- White hake mean number per tow by length class and year. Spanish Spring Survey in NAFO 3NO: 2009-2013. Indet. means indeterminate.

| Lenght (cm.) | 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 |
| 10 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 12 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.008 | 0.000 | 0.000 | 0.008 |
| 14 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 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 |
| 16 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.016 | 0.008 | 0.000 | 0.023 |
| 18 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.047 | 0.000 | 0.000 | 0.047 |
| 20 | 0.000 | 0.000 | 0.000 | 0.000 | 0.007 | 0.000 | 0.000 | 0.007 | 0.000 | 0.000 | 0.018 | 0.018 | 0.017 | 0.026 | 0.000 | 0.044 | 0.059 | 0.019 | 0.000 | 0.078 |
| 22 | 0.000 | 0.000 | 0.000 | 0.000 | 0.009 | 0.008 | 0.000 | 0.017 | 0.000 | 0.000 | 0.022 | 0.022 | 0.009 | 0.000 | 0.000 | 0.009 | 0.070 | 0.047 | 0.000 | 0.117 |
| 24 | 0.000 | 0.003 | 0.000 | 0.003 | 0.004 | 0.000 | 0.000 | 0.004 | 0.000 | 0.000 | 0.025 | 0.025 | 0.026 | 0.000 | 0.000 | 0.026 | 0.064 | 0.094 | 0.000 | 0.158 |
| 26 | 0.000 | 0.007 | 0.000 | 0.007 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.044 | 0.044 | 0.000 | 0.017 | 0.000 | 0.017 | 0.031 | 0.036 | 0.000 | 0.067 |
| 28 | 0.007 | 0.007 | 0.000 | 0.014 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.037 | 0.037 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.009 | 0.000 | 0.009 |
| 30 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.008 | 0.000 | 0.008 | 0.000 | 0.000 | 0.047 | 0.047 | 0.000 | 0.005 | 0.000 | 0.005 | 0.012 | 0.012 | 0.000 | 0.025 |
| 32 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.059 | 0.059 | 0.011 | 0.000 | 0.000 | 0.011 | 0.008 | 0.000 | 0.000 | 0.008 |
| 34 | 0.007 | 0.008 | 0.000 | 0.014 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.069 | 0.069 | 0.012 | 0.018 | 0.000 | 0.030 | 0.016 | 0.000 | 0.000 | 0.016 |
| 36 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.076 | 0.076 | 0.044 | 0.032 | 0.000 | 0.076 | 0.016 | 0.016 | 0.000 | 0.031 |
| 38 | 0.008 | 0.000 | 0.000 | 0.008 | 0.000 | 0.008 | 0.000 | 0.008 | 0.000 | 0.000 | 0.046 | 0.046 | 0.083 | 0.041 | 0.000 | 0.124 | 0.042 | 0.019 | 0.000 | 0.061 |
| 40 | 0.008 | 0.007 | 0.000 | 0.014 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.074 | 0.074 | 0.088 | 0.054 | 0.000 | 0.142 | 0.013 | 0.016 | 0.000 | 0.028 |
| 42 | 0.008 | 0.003 | 0.000 | 0.011 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.036 | 0.036 | 0.098 | 0.068 | 0.000 | 0.166 | 0.048 | 0.042 | 0.000 | 0.090 |
| 44 | 0.000 | 0.007 | 0.000 | 0.007 | 0.003 | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.005 | 0.005 | 0.082 | 0.054 | 0.000 | 0.136 | 0.077 | 0.024 | 0.000 | 0.101 |
| 46 | 0.007 | 0.011 | 0.000 | 0.018 | 0.004 | 0.002 | 0.000 | 0.006 | 0.000 | 0.000 | 0.021 | 0.021 | 0.021 | 0.018 | 0.000 | 0.039 | 0.051 | 0.045 | 0.000 | 0.096 |
| 48 | 0.013 | 0.000 | 0.000 | 0.013 | 0.003 | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.007 | 0.007 | 0.054 | 0.021 | 0.000 | 0.075 | 0.041 | 0.040 | 0.000 | 0.082 |
| 50 | 0.014 | 0.000 | 0.000 | 0.014 | 0.008 | 0.000 | 0.000 | 0.008 | 0.000 | 0.000 | 0.012 | 0.012 | 0.018 | 0.009 | 0.000 | 0.028 | 0.058 | 0.072 | 0.000 | 0.130 |
| 52 | 0.018 | 0.007 | 0.000 | 0.024 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.020 | 0.020 | 0.014 | 0.004 | 0.000 | 0.017 | 0.065 | 0.059 | 0.000 | 0.124 |
| 54 | 0.000 | 0.014 | 0.000 | 0.014 | 0.000 | 0.002 | 0.000 | 0.002 | 0.000 | 0.000 | 0.004 | 0.004 | 0.008 | 0.007 | 0.000 | 0.015 | 0.020 | 0.077 | 0.000 | 0.097 |
| 56 | 0.011 | 0.008 | 0.000 | 0.019 | 0.000 | 0.006 | 0.000 | 0.006 | 0.000 | 0.000 | 0.020 | 0.020 | 0.009 | 0.015 | 0.000 | 0.025 | 0.021 | 0.042 | 0.000 | 0.062 |
| 58 | 0.014 | 0.000 | 0.002 | 0.016 | 0.003 | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.029 | 0.029 | 0.013 | 0.002 | 0.000 | 0.015 | 0.023 | 0.038 | 0.000 | 0.061 |
| 60 | 0.028 | 0.016 | 0.000 | 0.044 | 0.004 | 0.003 | 0.000 | 0.007 | 0.000 | 0.000 | 0.049 | 0.049 | 0.009 | 0.004 | 0.000 | 0.013 | 0.020 | 0.027 | 0.000 | 0.047 |
| 62 | 0.010 | 0.003 | 0.000 | 0.014 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.028 | 0.028 | 0.013 | 0.002 | 0.000 | 0.015 | 0.010 | 0.016 | 0.000 | 0.026 |
| 64 | 0.003 | 0.086 | 0.000 | 0.089 | 0.032 | 0.000 | 0.000 | 0.032 | 0.000 | 0.000 | 0.015 | 0.015 | 0.010 | 0.006 | 0.000 | 0.016 | 0.000 | 0.027 | 0.000 | 0.027 |
| 66 | 0.011 | 0.000 | 0.000 | 0.011 | 0.000 | 0.008 | 0.000 | 0.008 | 0.000 | 0.000 | 0.028 | 0.028 | 0.006 | 0.000 | 0.000 | 0.006 | 0.015 | 0.008 | 0.000 | 0.023 |
| 68 | 0.008 | 0.011 | 0.000 | 0.019 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.010 | 0.010 | 0.005 | 0.002 | 0.000 | 0.007 | 0.002 | 0.014 | 0.000 | 0.017 |
| 70 | 0.003 | 0.000 | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.024 | 0.024 | 0.012 | 0.004 | 0.000 | 0.015 | 0.000 | 0.000 | 0.000 | 0.000 |
| 72 | 0.000 | 0.003 | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.020 | 0.020 | 0.006 | 0.002 | 0.000 | 0.008 | 0.005 | 0.011 | 0.000 | 0.017 |
| 74 | 0.008 | 0.008 | 0.000 | 0.015 | 0.000 | 0.011 | 0.000 | 0.011 | 0.000 | 0.000 | 0.008 | 0.008 | 0.004 | 0.000 | 0.000 | 0.004 | 0.003 | 0.000 | 0.000 | 0.003 |
| 76 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.003 | 0.000 | 0.003 | 0.000 | 0.000 | 0.008 | 0.008 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.011 | 0.000 | 0.011 |
| 78 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.007 | 0.000 | 0.007 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.002 | 0.000 | 0.016 | 0.000 | 0.016 |
| 80 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.002 | 0.000 | 0.000 | 0.000 | 0.000 |
| 82 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.008 | 0.008 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.023 | 0.000 | 0.023 |
| 84 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.017 | 0.000 | 0.017 | 0.000 | 0.000 | 0.015 | 0.015 | 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 | 0.008 | 0.000 | 0.008 |
| 88 | 0.000 | 0.000 | 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 | 0.008 | 0.000 | 0.008 | 0.000 | 0.008 |
| Total | 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 |
| Nº samples: | | | | 9 | | | | 10 | | | | 14 | | | | 12 | | | | 20 |
| Nº Ind.: | 38 | 25 | 1 | 64 | 14 | 16 | 0 | 30 | 0 | 0 | 156 | 156 | 156 | 98 | 0 | 254 | 145 | 139 | 0 | 284 |
| Sampled catch: | | | | 100 | | | | 562 | | | | 149 | | | | 217 | | | | 274 |
| Range: | | | | 24-75 | | | | 20-84 | | | | 20-84 | | | | 20-89 | | | | 13-89 |
| Total catch: | | | | 112 | | | | 69 | | | | 161 | | | | 217 | | | | 276 |
| Total hauls: | | | | 109 | | | | 95 | | | | 122 | | | | 122 | | | | 122 |

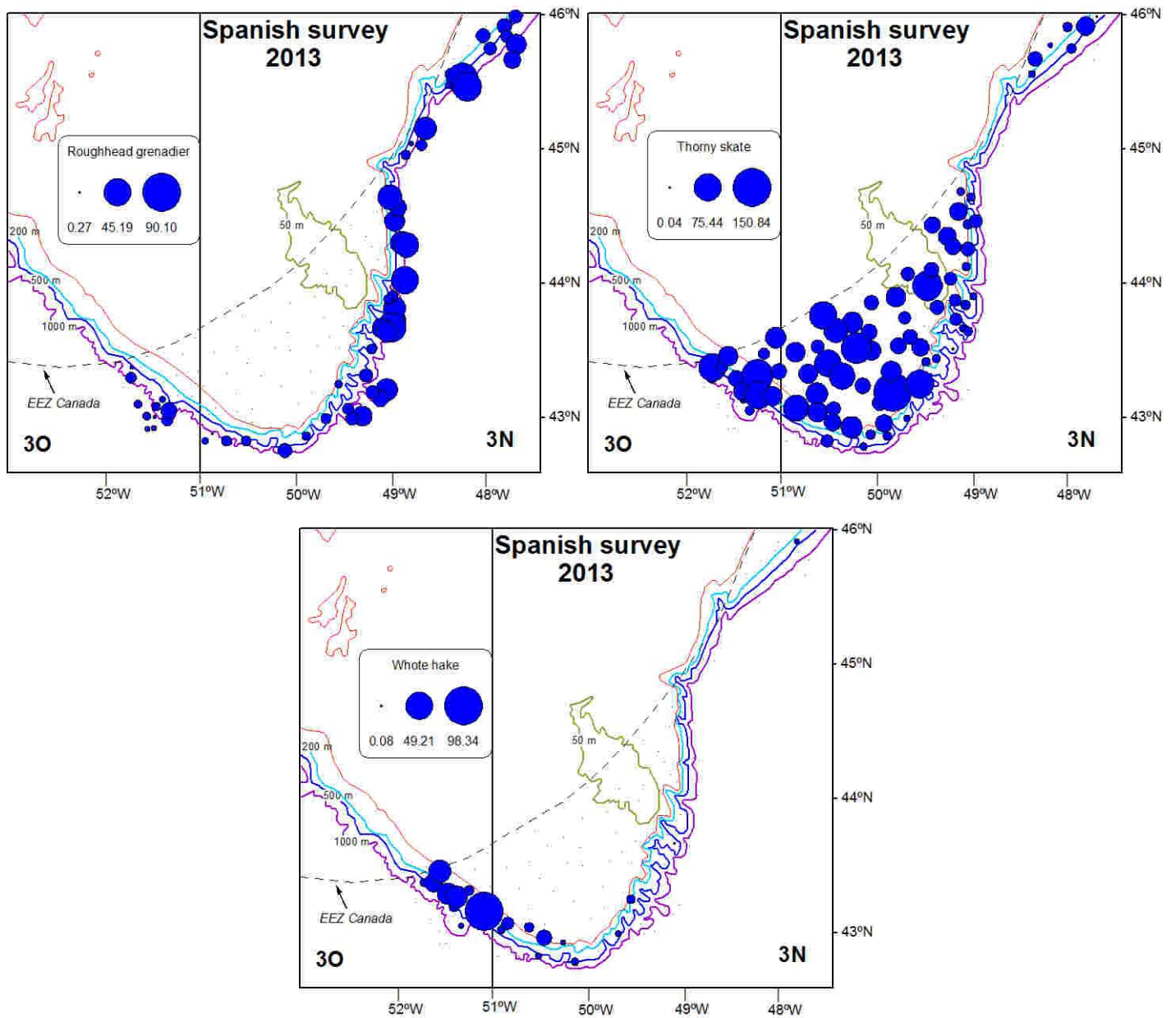


Figure 1.- Position of the hauls and the catch of roughhead grenadier, thorny skate and white hake during the 2013 Spanish 3NO survey. Note that the scale is different in the three graphs.

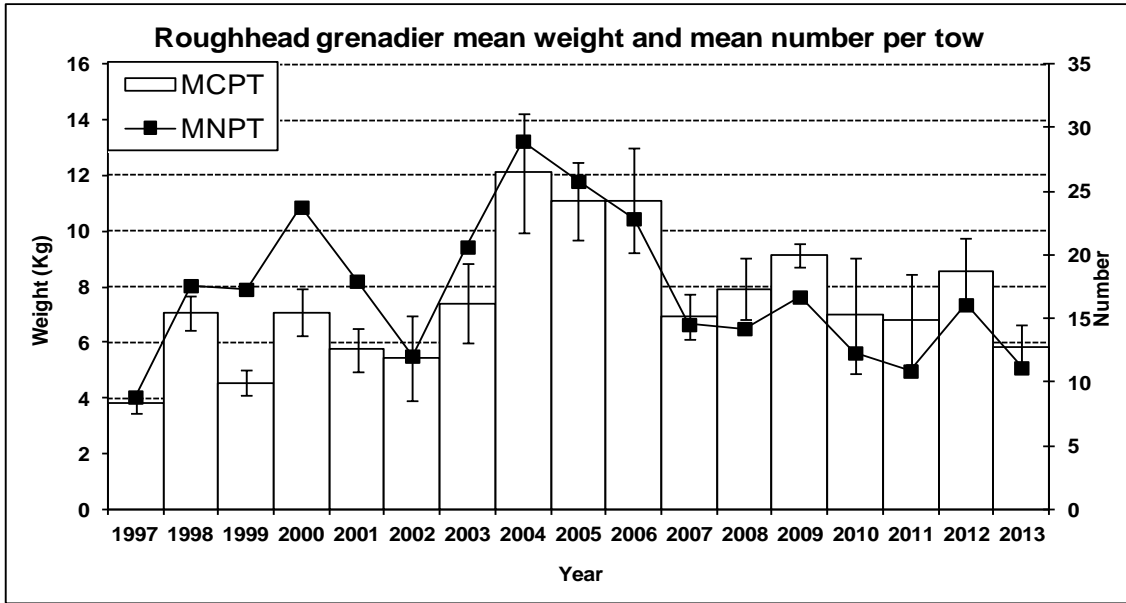


Figure 2.- Roughhead grenadier stratified mean catches in Kg and \pm SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2013.

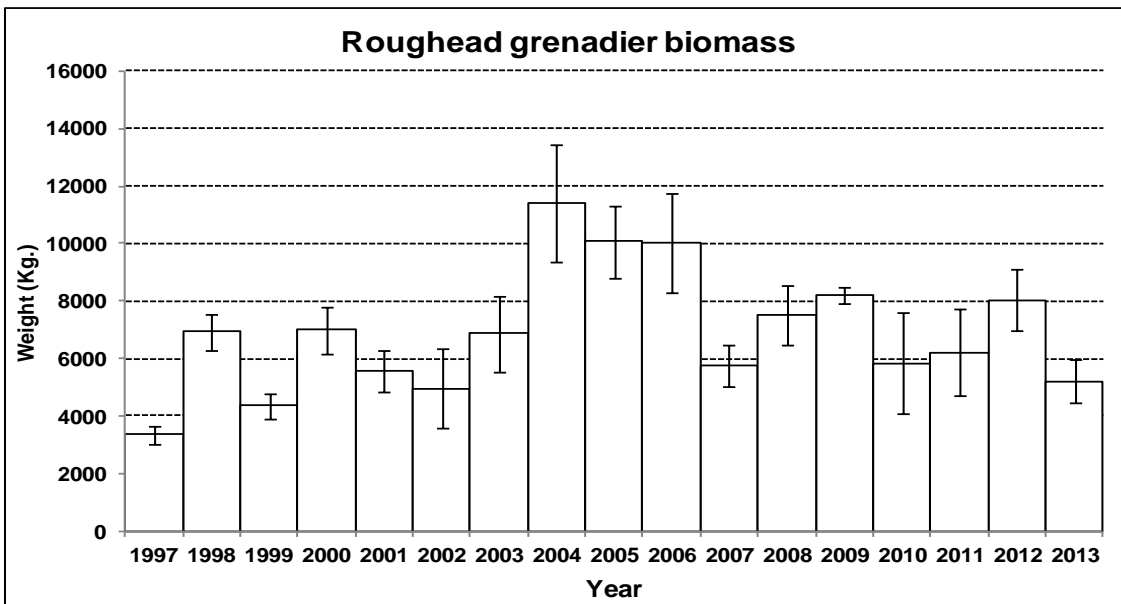


Figure 3.- Roughhead grenadier biomass calculated by the swept area method in tons and \pm SD by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2013.

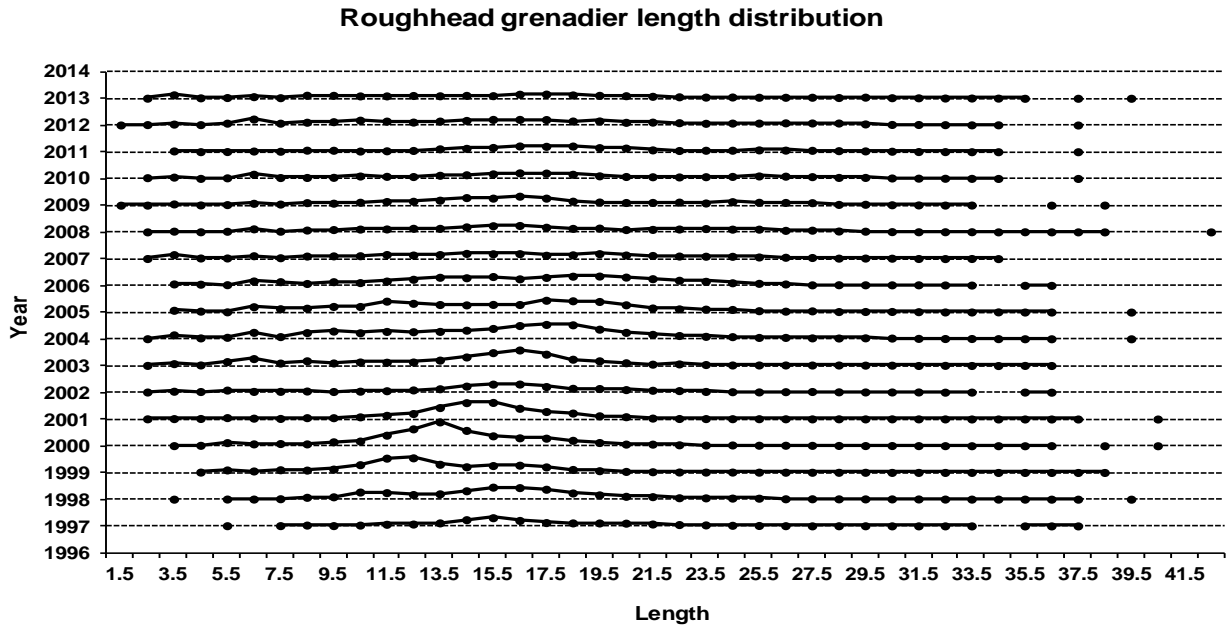


Figure 4.- Roughhead grenadier mean catches per tow length distribution (cm) on NAFO 3NO: 1997-2013. Data from 2009 to 2013 are in Table 8; data for 1997-2008 can be seen in SCR Doc 13/12.

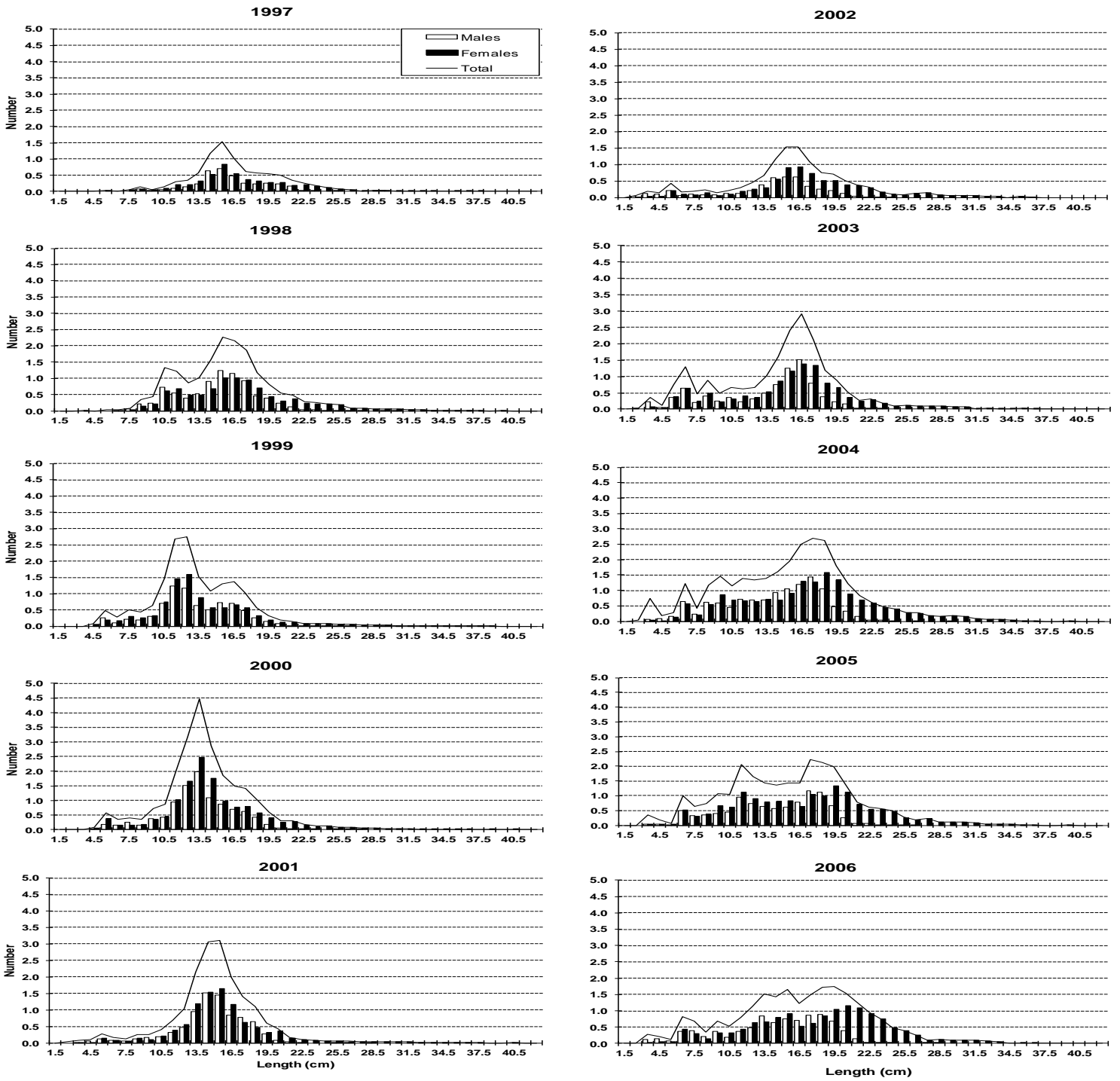


Figure 5.- Roughhead grenadier length distribution (cm) on NAFO 3NO: 1997-2013. Mean catches per tow number. Data from 2009 to 2013 are in Table 8; data for 1997-2008 can be seen in SCR Doc 13/12.

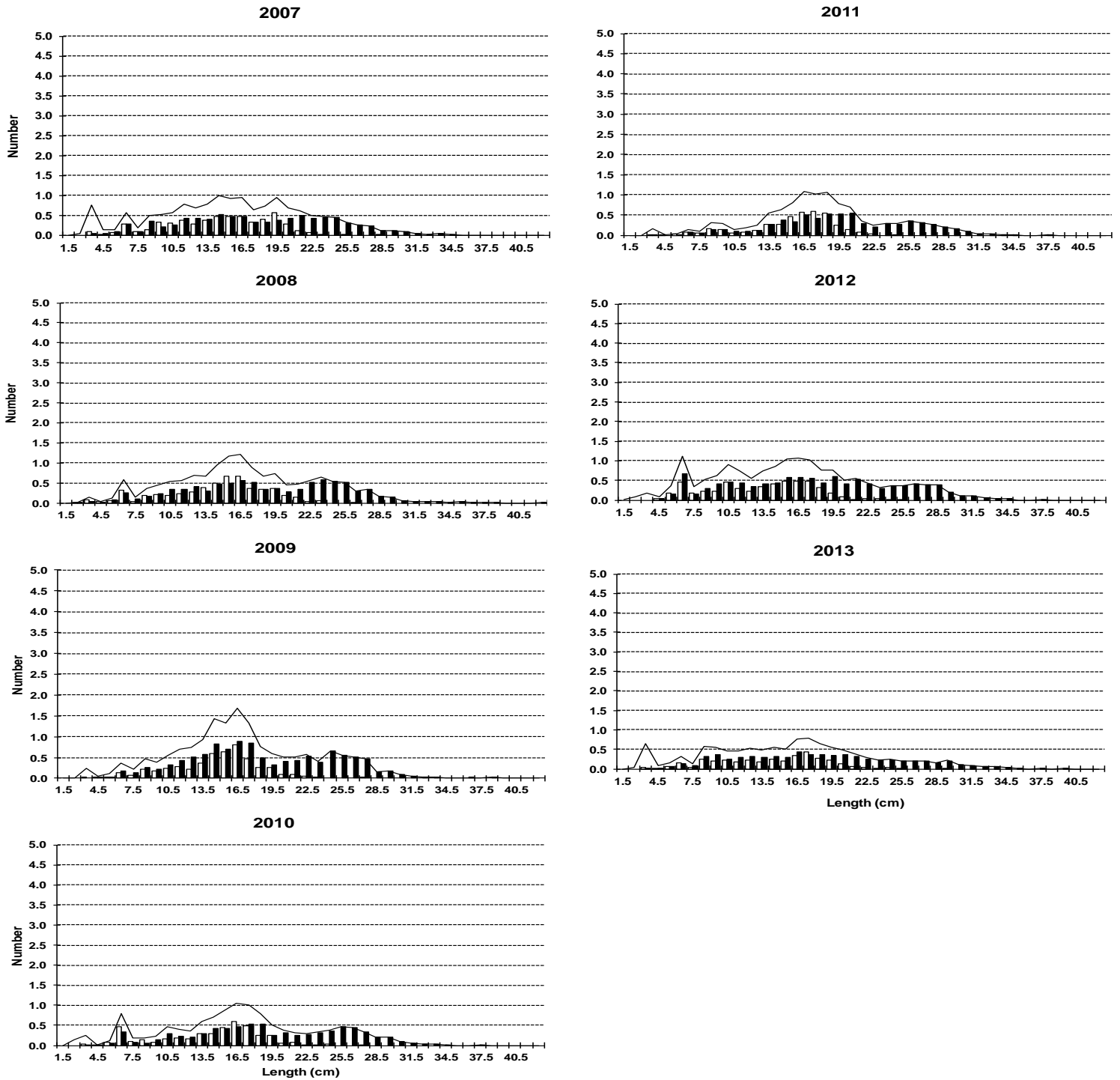


Figure 5 (cont.).- Roughhead grenadier length distribution (cm) on NAFO 3NO: 1997-2013. Mean catches per tow number. Data from 2009 to 2013 are in Table 8; data for 1997-2008 can be seen in SCR Doc 13/12.

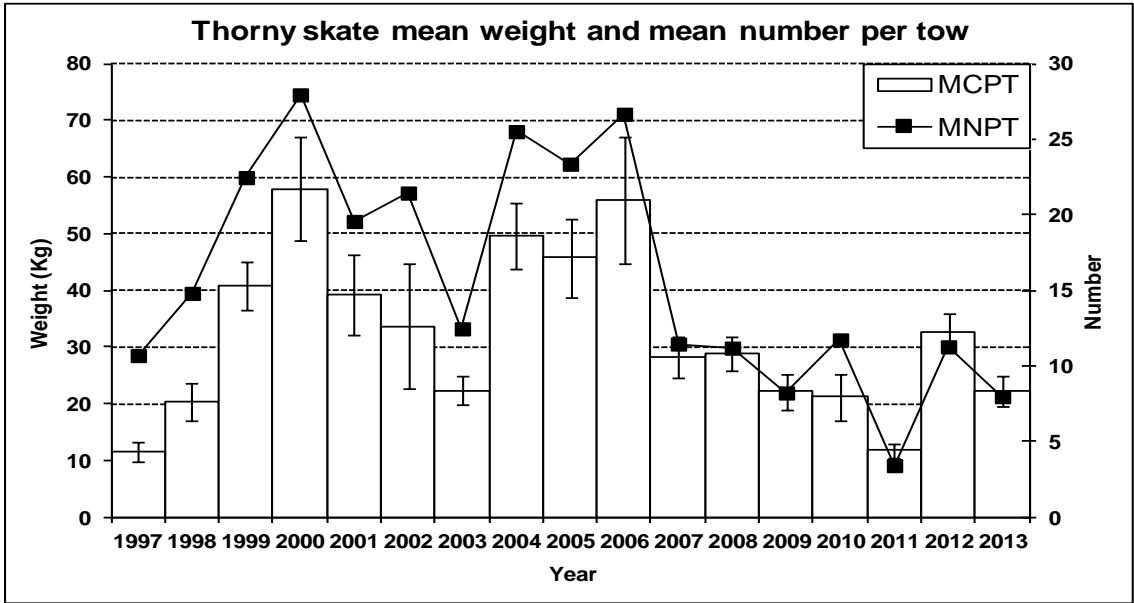


Figure 6.- Thorny skate stratified mean catches in Kg and \pm SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2013.

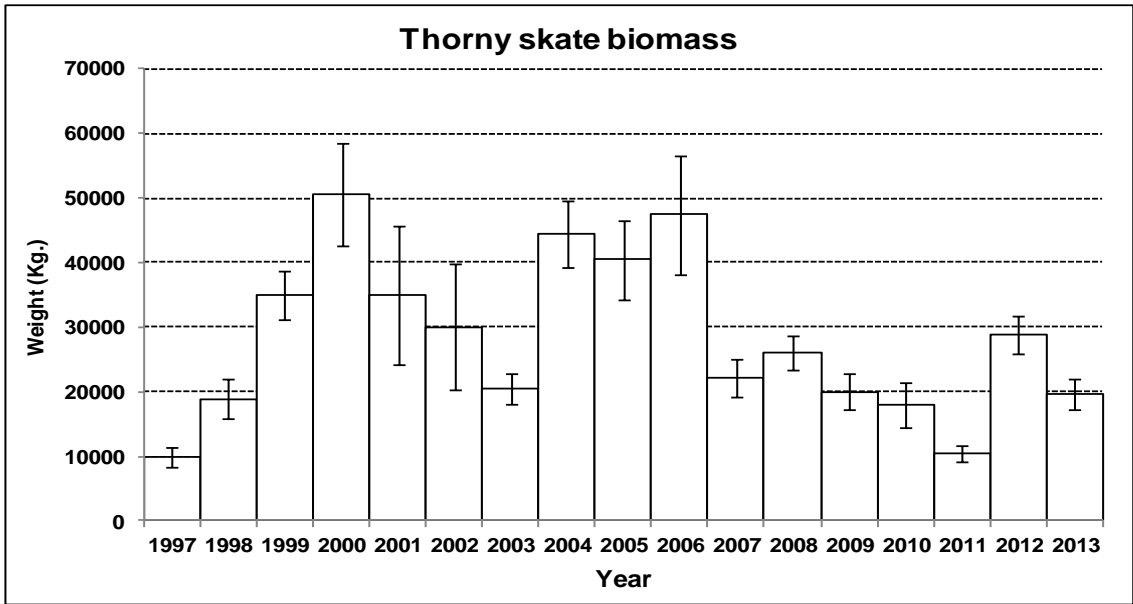


Figure 7.- Thorny skate biomass calculated by the swept area method in tons and \pm SD by year. Spanish Spring surveys in NAFO Div. 3NO: 1997-2013.

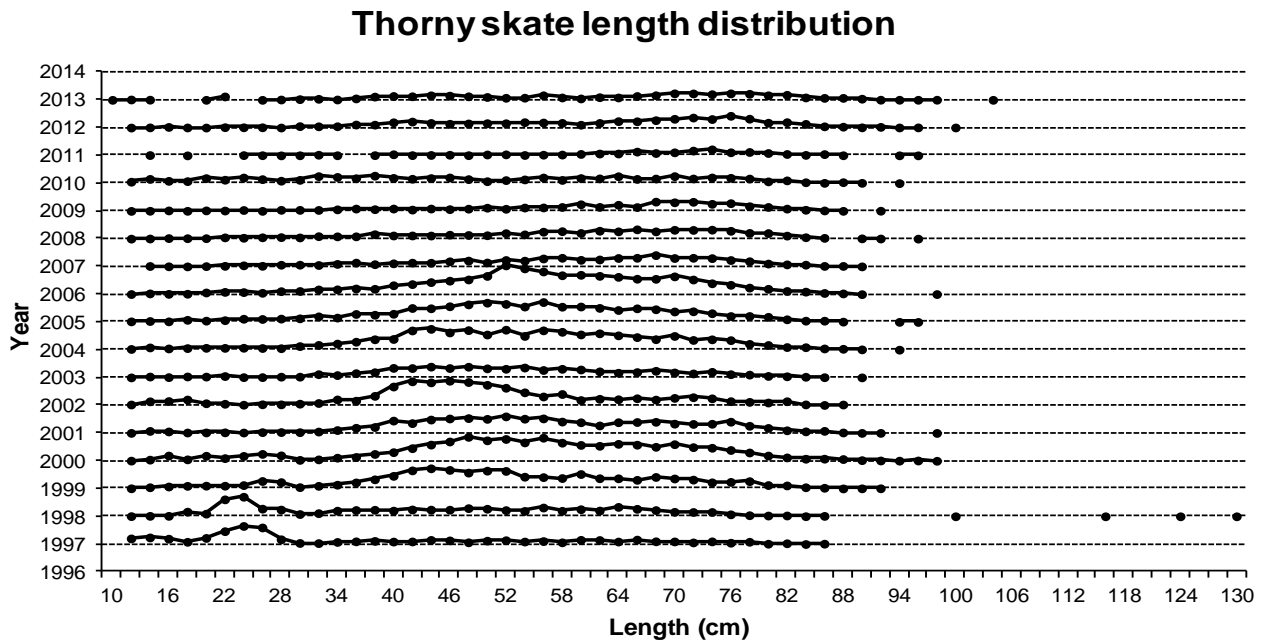


Figure 8.- Thorny skate mean catches per tow length distribution (cm) on NAFO 3NO: 1997-2013. Data from 2009 to 2013 are in Table 14; data for 1997-2008 can be seen in SCR Doc 13/12.

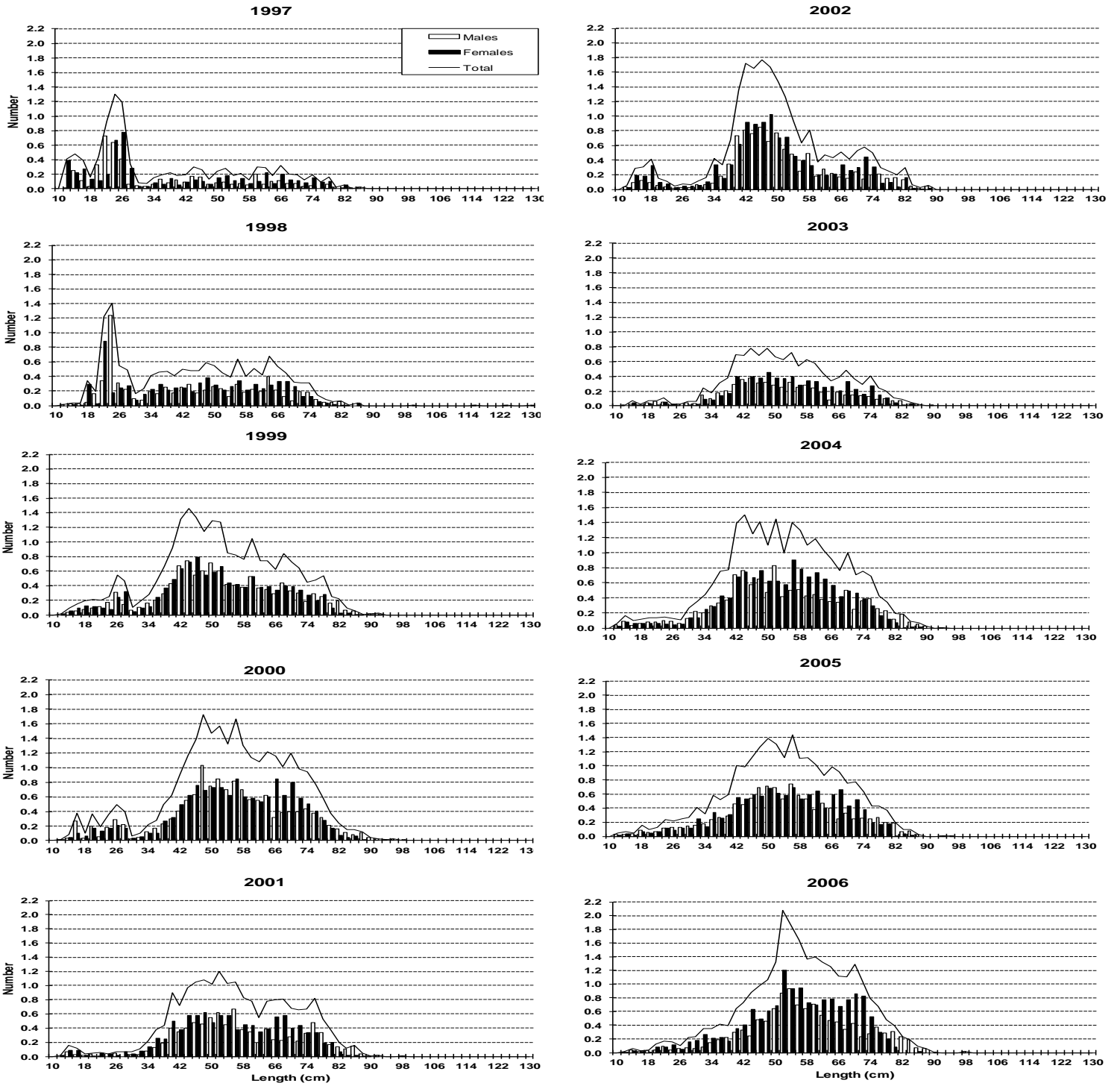


Figure 9.- Thorny skate length distribution (cm) on NAFO 3NO: 1997-2013. Mean catches per tow number. Data from 2009 to 2013 are in Table 14; data for 1997-2008 can be seen in SCR Doc 13/12.

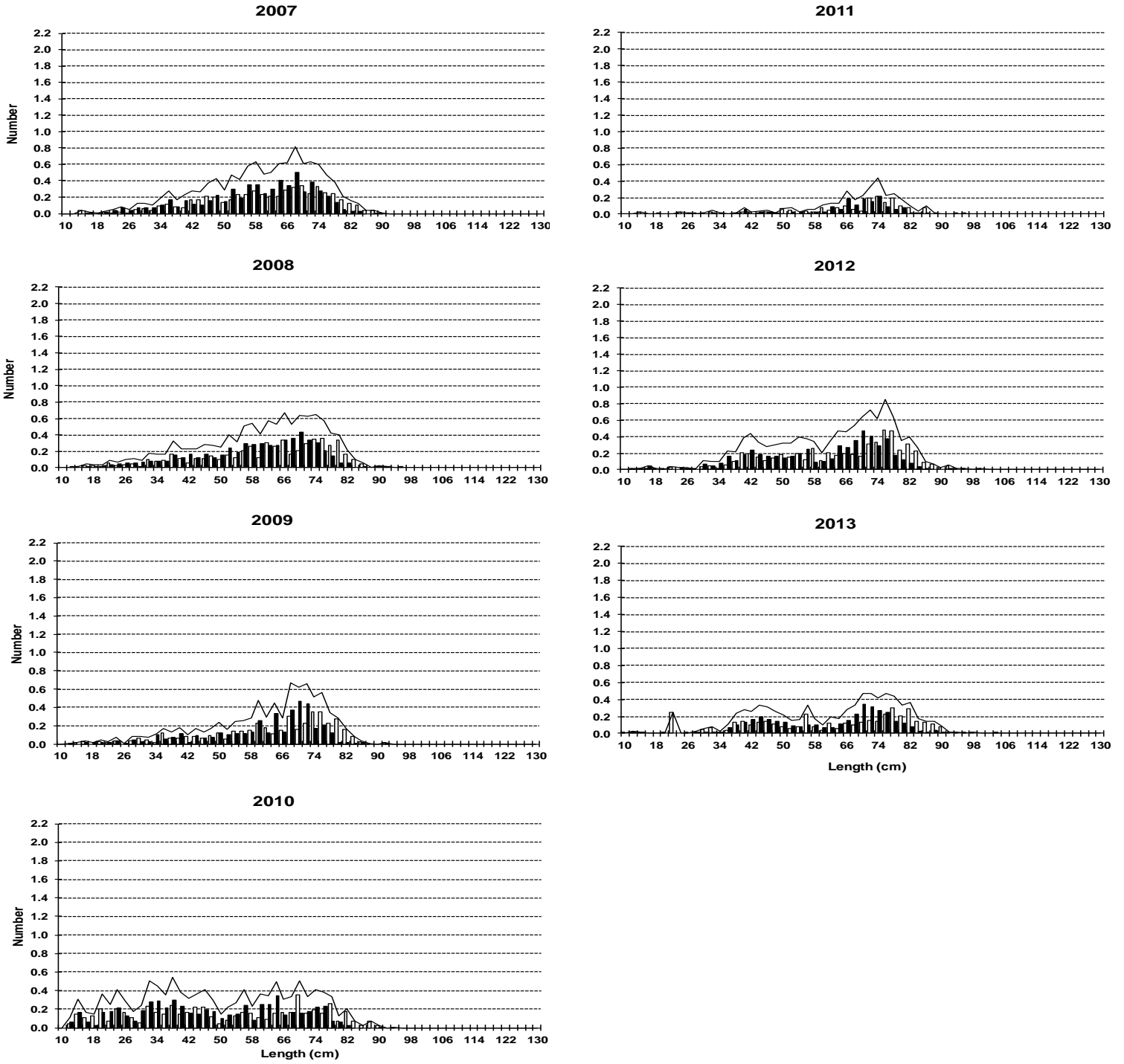


Figure 9 (cont.).- Thorny skate length distribution (cm) on NAFO 3NO: 1997-2013. Mean catches per tow number. Data from 2009 to 2013 are in Table 8; data for 1997-2008 can be seen in SCR Doc 13/12.

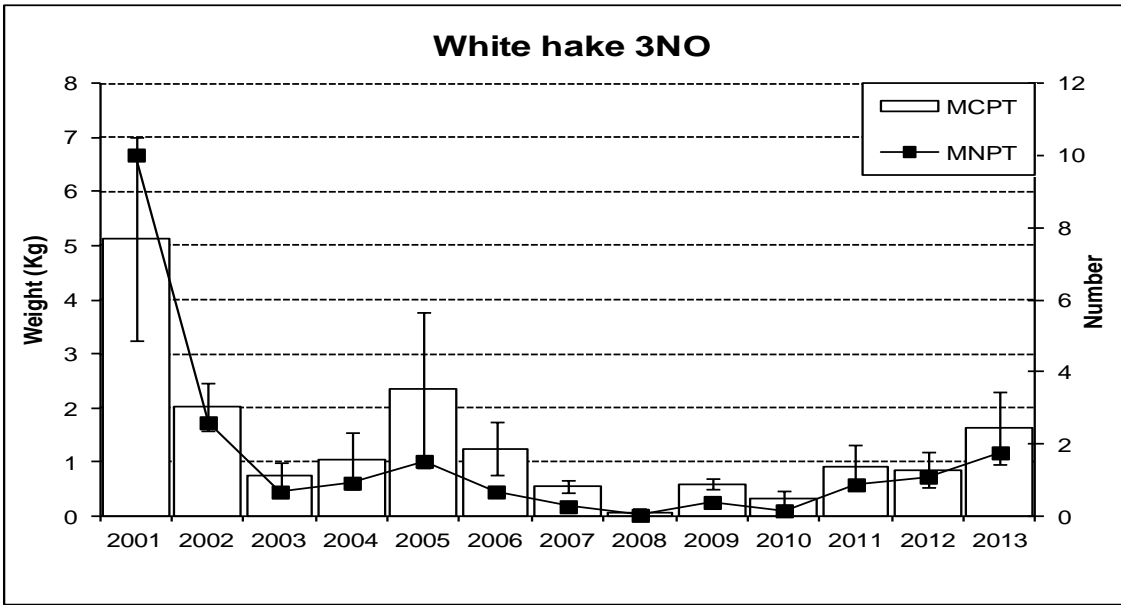


Figure 10.- White hake stratified mean catches in Kg and \pm SD by year and mean number by year. Spanish Spring surveys in NAFO Div. 3NO: 2001-2013.

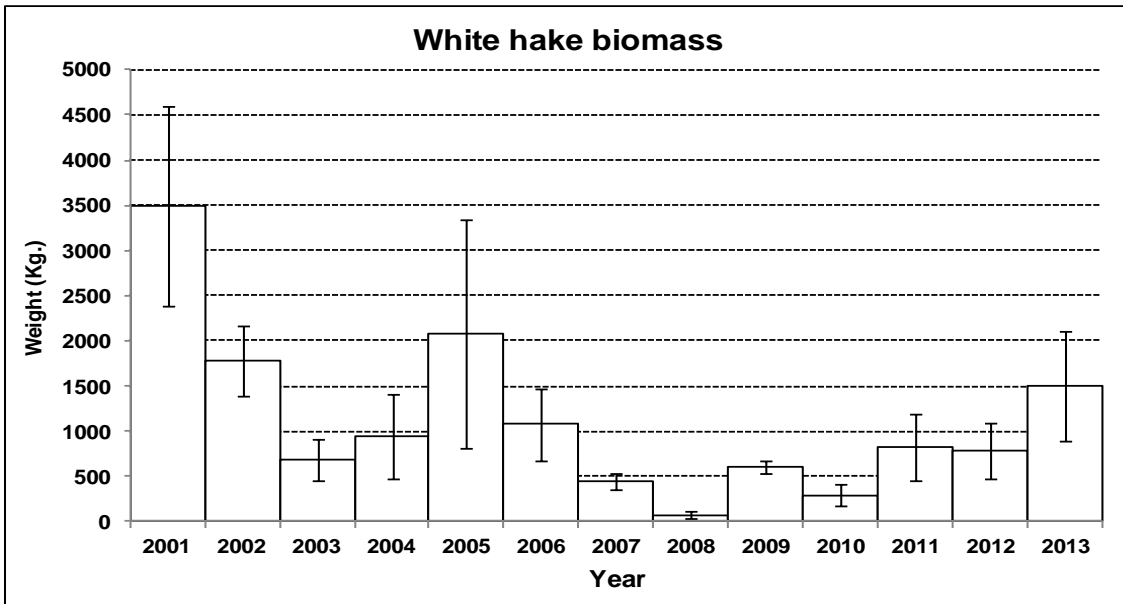


Figure 11.- White hake biomass calculated by the swept area method in tons and \pm SD by year. Spanish Spring surveys in NAFO Div. 3NO: 2001-2013.

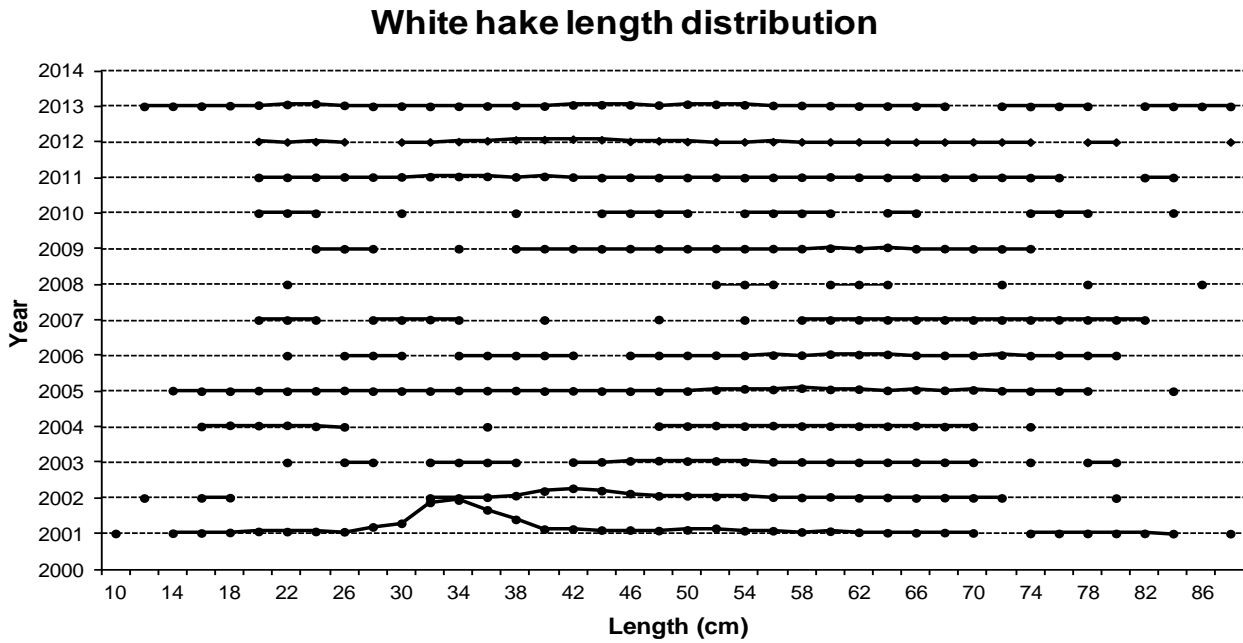


Figure 12.- White hake mean catches per tow length distribution (cm) on NAFO 3NO: 2001-2013. Data from 2009 to 2013 are in Table 20; data for 2001-2008 can be seen in SCR Doc 13/12.

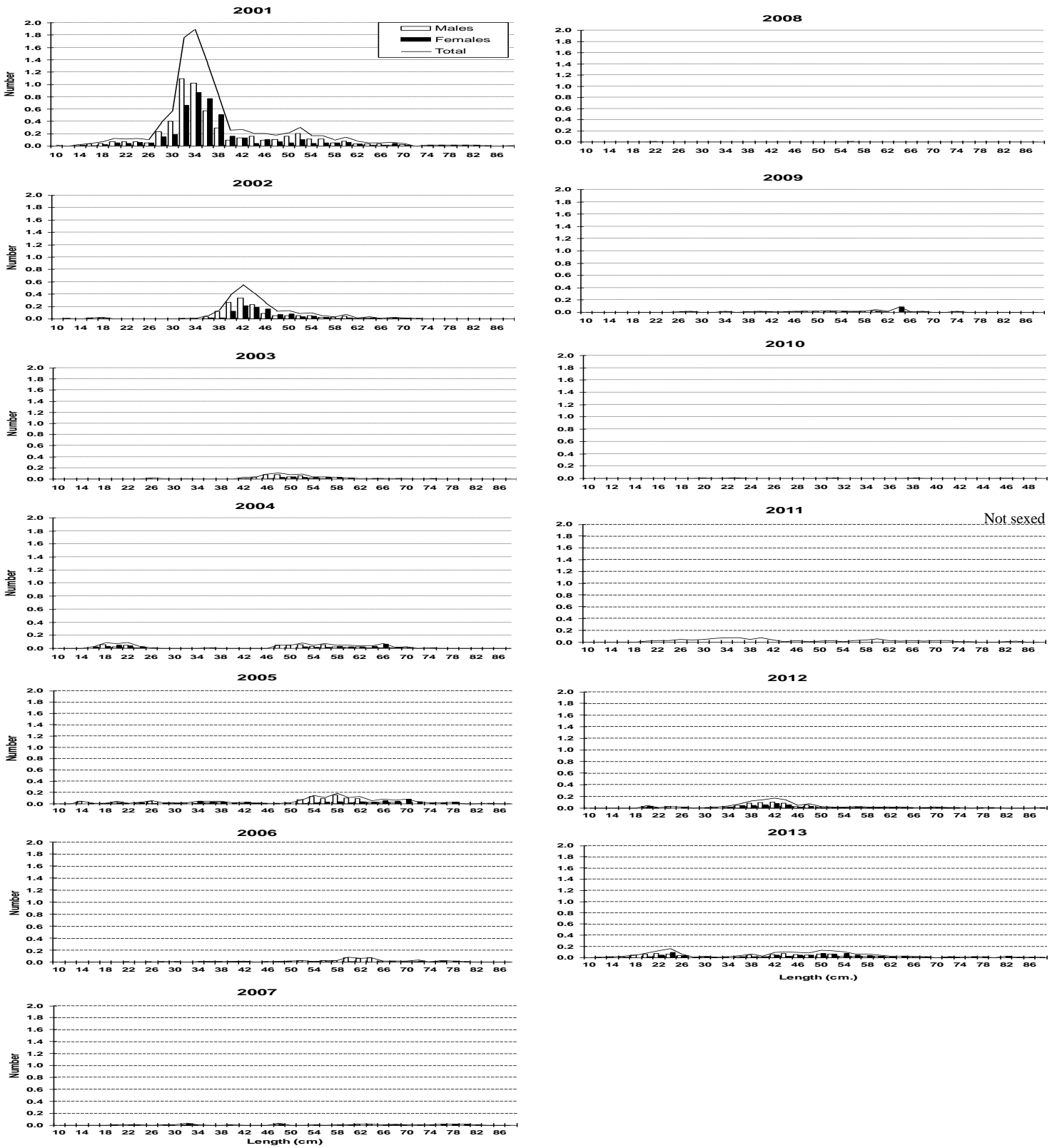


Figure 13.- White hake length distribution (cm) on NAFO 3NO: 2001-2013. Mean catches per tow number. Data from 2009 to 2013 are in Table 20; data for 2001-2008 can be seen in SCR Doc 13/12.