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Results on silver smelt (*Argentina silus* and *A. sphyraena*), bluemouth (*Helicolenus dactylopterus*), greater forkbeard (*Phycis blennoides*), roughsnout grenadier (*Trachyrincus scabrus*), Spanish ling and ling (*Molva macrophthalma* and *Molva molva*) from the Porcupine Bank Survey (NE Atlantic)

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Abstract

This working document presents the results of the most significant deep fish species caught in 2020 on the Porcupine Spanish Groundfish Survey (SP-PORC-Q3). Biomass, abundance, geographical distribution and length ranges were analysed for silver smelt (*Argentina silus* and *A. sphyraena*), bluemouth (*Helicolenus dactylopterus*), greater fork-beard (*Phycis blennoides*), roughsnout grenadier (*Trachyrincus scabrus*), Spanish ling and ling (*Molva macrophthalma* and *Molva molva*) and other scarce deep sea species. The biomass of most of these species decreased this last survey, only *A. silus* and *P. blennoides* increased, althought *H. dactylopterus* increased in abundance. Signs of recruitment have been found for *H. dactylopterus* and *T. scabrus*.

Introduction

The Spanish bottom trawl survey on the Porcupine Bank (ICES Divisions 7c and 7k) has been carried out annually on the third-quarter (September) since 2001 to study the distribution, relative abundance and biological parameters of commercial fish in the area (ICES 2017).

The aim of this working document is to update the results (abundance indices, length frequency and geographic distributions) of the most common deep water fish species on the Porcupine bottom trawl surveys after the results presented previously (Baldó *et al.* 2008, Velasco *et al.* 2009, 2011, 2012, 2013, Fernández-Zapico *et al*. 2015, 2017, Ruiz-Pico *et al.* 2016, 2018, 2019, 2020). The species analysed were: *Argentina silus* (greater silver smelt), *Argentina sphyraena* (lesser silver smelt), *Helicolenus dactylopterus* (bluemouth), *Phycis blennoides* (greater forkbeard), *Trachyrincus scabrus* (roughsnout grenadier), *Molva molva* (ling), *Molva macrophthalma* (Spanish ling) and some other scarce deep sea species as *Aphanopus carbo* (black scabbardfish), *Coryphaenoides rupestris* (roundnose grenadier) and *Beryx spp.* (alfonsinos).

Material and methods

The Spanish Ground Fish Survey on the Porcupine Bank (SP-PORC-Q3) has been annually carried out since 2001 onboard the R/V "*Vizconde de Eza*", a stern trawler of 53 m and 1800 Kw. The area covered extends from longitude 12° W to 15° W and from latitude 51° N to 54° N, following the

standard IBTS methodology for the western and southern areas (ICES 2017). The sampling design was random stratified to the area (Velasco and Serrano, 2003) with two geographical sectors (Northern and Southern) and three depth strata (< 300 m, 300 – 450 m and 450 - 800 m) (Figure 1). Hauls allocation is proportional to the strata area following a buffered random sampling procedure (as proposed by Kingsley et al., 2004) to avoid the selection of adjacent 5×5 nm rectangles. More details on the survey design and methodology are presented in ICES (2017).

The tow duration is 20 min since 2016, but the results were extrapolated to 30 min of trawling time to keep up the time series.

Results and discussion

In spite of the problems created by the pandemic and the COVID-19 disruption, the Porcupine Groundfish Survey was carried out without major problems, apart from an initial of 9-day delay that did not affect the overall survey duration.

In 2020, 81 valid standard hauls and 10 additional hauls were carried out. Among the additional hauls, three of them have been carried out into the standard stratification, to improve coverage in the gaps left by random sampling and seven of them, between 839 and 1425 m, to explore the continuity of the fish community in Porcupine Seabight (Figure 1).

The total stratified catch per haul increased significantly in 2020 compared to the previous year, becoming the second highest catch in the historical series below the year 2015 (Figure 2). Fish represented 96% of the total catch, and the selected deep water fish represented 14% of that total fish catch, with the following percentages per species: *Argentina silus* (61%), *Helicolenus dactylopterus* (17%), *Argentina sphyraena* (9%), *Trachyrincus scabrus* (5%), *Phycis blennoides* (5%), *Molva macrophtalma* (2%) and *Molva molva* (0.1%).

In 2020, only the biomass of *A. silus* and *P. blennoides* increased compared to the previous year. The rest of the species decreased. However, *H. dactylopterus* increased in abundance due, in part, to a high number of individuals smaller than 11cm, although they were also less than last year. Signs of recruitment have also been found for *T. scabrus*. Only a few specimens of *A. carbo, Beryx spp*. and *C. rupestris* were found.

Argentina silus (greater silver smelt) and *Argentina sphyraena* (lesser silver smelt)

In 2020, both the biomass and the number of *A. silus*, which is the species that historically contributes the most to the genus in the Porcupine survey, increased considerably, breaking the downward trend of recent years and staying in the medium-high values of the historical series. *A. sphyraena*, by contrast, decreased sharply, getting medium-low values of the time series (Figure 3; Figure 4 and Figure 5).

Both species were found in the north of the bank, where the decline of *A. sphyraena* and the increment of *A. silus* with respect to the previous year were observed, and *A. silus* was also present in the south part of the bank, as usual (Figure 6 and Figure 7).

The abundance of small individuals of *A. silus* decreased compared to the previous year, although a mode at 17 cm was appreciated, whereas the abundance around a second mode at 22 cm increased greatly. *A. sphyraena* kept a similar size distribution to the 2019 survey, with a single mode at 22 cm (Figure 8).

***Helicolenus dactylopterus* (bluemouth)**

Although bluemouth is not requested in the ICES DCF Data Call, biomass and abundance are significant in the area and useful for the assessment of the species (ICES, 2015).

The abundance of this species has continued to increase since 2017, reaching the highest value of the time series in 2020. The biomass, however, has decreased slightly in the last survey, keeping medium values in the series (Figure 9). Recruitment broke the increasing trend of the last three years but still has a relatively high value (Figure 10).

The geographical distribution of *H. dactylopterus* was similar to that of the previous year, although the biomass points were more widely distributed throughout the bank, Recruits distributed both on the Irish shelf and in the southeast area of the bank, barely deeper than 500 m (Figure 11).

The figure 12 shows two well defined modes in 8 cm and 14 cm. A slight decrease in the abundance of the largest sizes (25 to 39 cm) can also be seen.

***Trachyrincus scabrus* (roughsnout grenadier)**

T. scabrus has been included in this report since last year.

Biomass and abundance are significant in the area. In the last three years they were among the highest values of the time series, although in this last survey, both biomass and abundance decreased slightly (Figure 13).

The species was found in the deepest southeast area and in the deepest west area, as usual in the time series (Figure 14).

The length distribution in 2020 showed a small mode at 7 cm and a more abundant one at 18.5 cm (Figure 15).

***Phycis blennoides* (greater fork-beard)**

The biomass and abundance of *P. blennoides* followed the pattern observed last year, but they increased slightly in this last survey, although the values still remain among the lowest in the time series. (Figure 16).

Biomass patches were widely found in the south, west and east area, but scarcely in the north, as in previous years (Figure 17).

A small mode is seen at 20 cm and two more abundant at 31 cm and 40 cm (Figure 18).

***Molva molva* (ling) and *Molva macrophthalma* (Spanish ling)**

These two species were comparatively analysed in this working document as in previous reports.

M. molva was scarcer than *M. macrophtalma* in the area, as usual. Both species have followed a downward trend since 2014, although *M. macrophthalma* broke that trend last year with a slight increase, dropping again slightly this last survey. However, *M. molva* continued to decline, reaching the lowest value of the time series in 2020 (0.13 kg haul^{-1} and 0.06 ind. haul^{-1}) (Figure 19).

M. molva showed a scarce geographical distribution in this latest survey, whereas *M. macrophtalma* showed biomass patches around the bank, especially in the south part of the study area (Figure 20).

The size distribution of *M. macrophtalma* showed a mode around 56 cm. On the other hand, the smallest and the largest individuals of *M. molva* from last year were not found, the few specimens of this species presented sizes of 50 cm, 53 cm, 67 cm, 69 cm and 70 cm (Figure 21).

Other deep water fish species

In 2020, the deep water species *Aphanopus carbo, Coryphaenoides rupestris* and *Beryx splendes* have been scarcely found in the study area.

The species *A. carbo* and *C. rupestris* were found only in the deep hauls between 839 and 1425 m carried out to explore the continuity of the fish community in Porcupine Seabight, out of the standard stratification, in the southeast part of the bank.

Two individuals of the species *B. splendens*, with sizes 25 and 34 cm, were found in the standard stratification, in the southern part of the bank, in two hauls.

Beryx decadactylus, which was scarcely found other years, has not been caught in 2020.

Acknowledgements

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References

Baldó, F.; Velasco, F.; Blanco, M. and Gil, J. 2008. Results on Argentine (*Argentina spp.*), Bluemouth (*Helicolenus dactylopterus*), Greater forkbeard (*Phycis blennoides*) and Blue ling (*Molva dypterigia*) from the 2001-2007 Porcupine Bank (NE Atlantic) bottom trawl surveys. WD presented to the ICES WGDEEP, Copenhagen, Denmark, 03-10 March 2008. 16 pp.

Fernández-Zapico O., Ruiz-Pico S., Velasco F., Baldó F. 2015. Results on silver smelt (*Argentina silus* and *Argentina sphyraena*), bluemouth (*Helicolenus dactylopterus*), greater forkbeard (*Phycis blennoides*) and ling (*Molva molva* and *Molva macrophthalma*) from 2001 to 2015 Porcupine Bank (NE Atlantic) survey. Working document presented to the WGDEEP, Copenhagen, Denmark, 20-27 March 2015. 18 pp

Fernández-Zapico O., Ruiz-Pico S., Velasco F., Baldó F. 2017. Results on silver smelt (*Argentina silus* and *Argentina sphyraena*), bluemouth (*Helicolenus dactylopterus*), greater forkbeard (*Phycis blennoides*) and Spanish ling (*Molva macrophthalma*) and ling (*Molva molva*) from 2016 Porcupine Bank (NE Atlantic) survey. Working document presented to the WGDEEP, Copenhagen, Denmark, 24 April-1 May 2017.

ICES, 2015. Report of the Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources, Copenhagen, Denmark, 20-27 March 2015. ICES CM 2015/ACOM:17. 738 pp.

ICES, 2017. Manual of the IBTS North Eastern Atlantic Surveys. Series of ICES Survey Protocols SISP 15. 92 pp. http://doi.org/10.17895/ices.pub.35

Kingsley, M.C.S.; Kanneworff, P. and Carlsson, D.M. 2004. Buffered random sampling: a sequential inhibited spatial point process applied to sampling in a trawl survey for northern shrimp Pandalus borealis in West Greenland waters. ICES Journal of Marine Science, 61: 12-24.

Ruiz-Pico S., Fernández-Zapico O., Velasco F., Baldó F. 2016. Results on silver smelt (*Argentina silus* and *Argentina sphyraena*), bluemouth (*Helicolenus dactylopterus*), greater forkbeard (*Phycis blennoides*) and ling (*Molva molva* and *Molva macrophthalma*) from 2001 to 2015 Porcupine Bank (NE Atlantic) survey. Working document presented to the WGDEEP, Copenhagen, Denmark, 20-27 March 2016. 18 pp

Ruiz-Pico S., Fernández-Zapico O., Blanco M., Velasco F., Baldó F. 2018. Results on silver smelt (*A. silus* and *Argentina sphyraena*), bluemouth (*Helicolenus dactylopterus*), greater forkbeard (*Phycis blennoides*) and Spaninsh ling (*Molva macrophthalma*) and ling (*Molva molva*) from the Porcupine Bank survey (NE Atlantic). Working document presented to the WGDEEP, Copenhagen, Denmark, 11-18 Apr 2018. 20 pp

Ruiz-Pico S., Blanco M., Fernández-Zapico O., Velasco F., Baldó F. 2019. Results on silver smelt (*A. silus* and *Argentina sphyraena*), bluemouth (*Helicolenus dactylopterus*), greater forkbeard (*Phycis blennoides*), Spaninsh ling (*Molva macrophthalma*) and ling (*Molva molva*) from the Porcupine Bank survey (NE Atlantic). Working document presented to the WGDEEP, Copenhagen, Denmark, 2-9 May 2019. 20 pp

Ruiz-Pico S., Fernández-Zapico O., Blanco M., Velasco F., Baldó F. 2020. Results on silver smelt (*A. silus* and *Argentina sphyraena*), bluemouth (*Helicolenus dactylopterus*), greater forkbeard (*Phycis blennoides*), roughsnout grenadier (*Trachyrincus scabrus*), Spaninsh ling (*Molva macrophthalma*) and ling (*Molva molva*) from the Porcupine Bank survey (NE Atlantic). Working document presented to the WGDEEP, Copenhagen, Denmark, 25 Apr-1 May 2020. 22 pp

Velasco, F. and Serrano, A., 2003. Distribution patterns of bottom trawl faunal assemblages in Porcupine Bank: implications for Porcupine surveys stratification design. WD presented to the ICES IBTSWG, Lorient, France 25-28 March 2003. 19 pp.

Velasco, F.; Blanco, M.; Baldó, F. and Gil, J. 2009. Results on Argentine (*Argentina* spp.), Bluemouth (*Helicolenus dactylopterus*), Greater forkbeard (*Phycis blennoides*) and Spanish ling (*Molva macrophthalma*) from 2008 Porcupine Bank (NE Atlantic) survey. Working document presented to the WGDEEP, Copenhagen, Denmark, 9-16 March 2009. 17 pp.

Velasco, F.; Blanco, M.; Baldó, F. and Gil, J. 2011. Results on Argentine (*Argentina* spp.), Bluemouth (*Helicolenus dactylopterus*), Greater forkbeard (*Phycis blennoides*) and Spanish ling (*Molva macrophthalma*) from 2010 Porcupine Bank (NE Atlantic) survey. Working document presented to the WGDEEP, Copenhagen, Denmark, 2-8 March 2011. 17 pp.

Velasco, F.; Blanco, M.; Baldó, F. and Gil, J. 2012. Results on Argentine (*Argentina* spp.), Bluemouth (*Helicolenus dactylopterus*), Greater forkbeard (*Phycis blennoides*) and Spanish ling (*Molva macrophthalma*) from 2011 Porcupine Bank (NE Atlantic) survey. Working document presented to the WGDEEP, Copenhagen, Denmark, 28 March-5 April 2012. 20 pp.

Velasco, F.; Blanco, M.; Baldó, F. and Gil, J. 2013. Results on Argentine (*Argentina* spp.), Bluemouth (*Helicolenus dactylopterus*), Greater forkbeard (*Phycis blennoides*) and Spanish ling (*Molva macrophthalma*) from 2012 Porcupine Bank (NE Atlantic) survey. Working document presented to the WGDEEP, Copenhagen, Denmark, 14-20 March 2013. 19 pp.

Figures

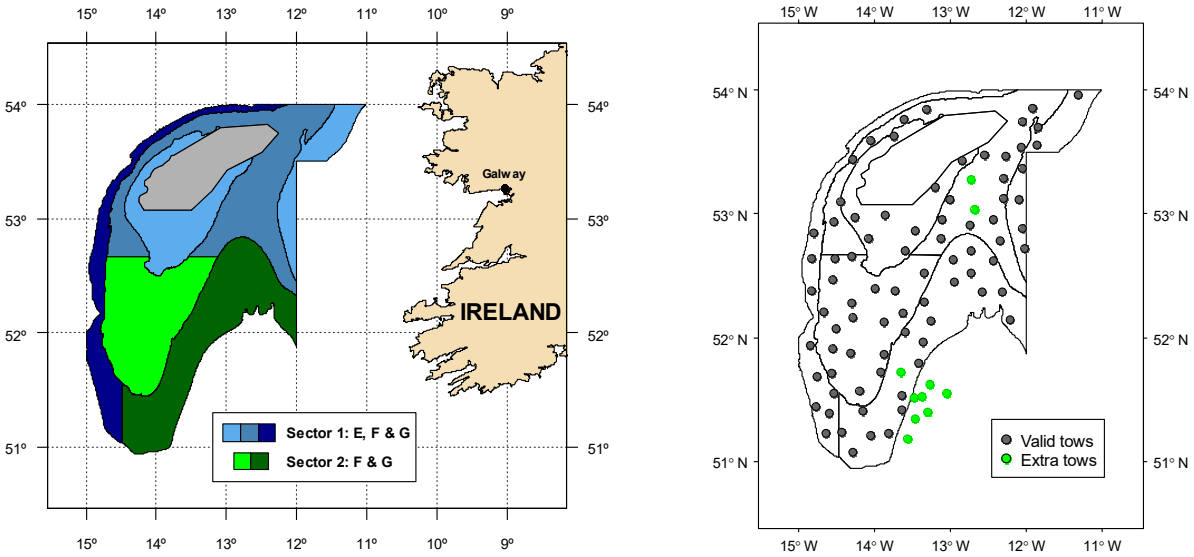

Figure 1. Left: Stratification design used in Porcupine surveys from 2003, previous data were re-stratified. Depth strata are: E) shallower than 300 m, F) 301 – 450 m and G) 451 – 800 m. Grey area in the middle of Porcupine bank corresponds to a large non-trawlable area, not considered for area measurements and stratification. Right: distribution of hauls performed in 2020.

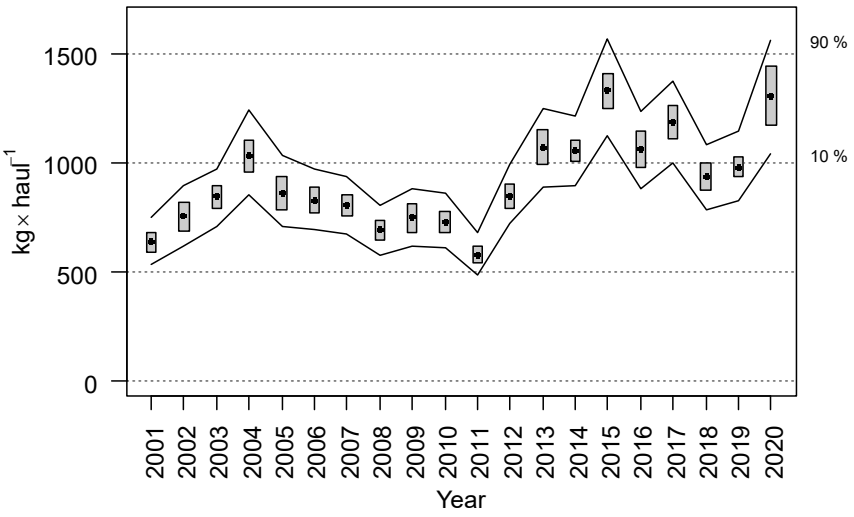

Figure 2. Evolution of the total catch in Porcupine surveys (2001-2020)

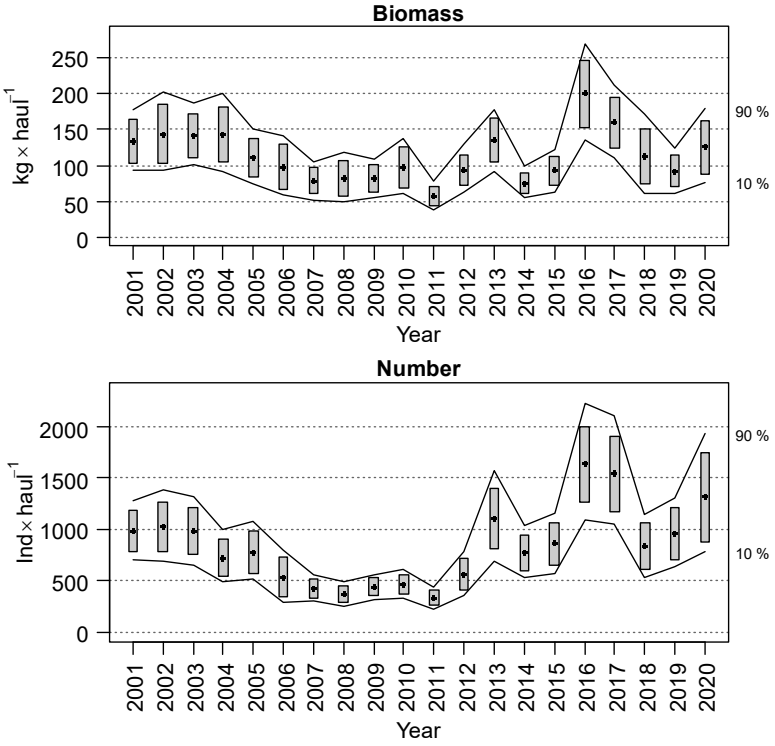

Figure 3. Evolution of *Argentina* spp. (mainly *Argentina silus*) biomass and abundance indices in Porcupine surveys (2001-2020). Boxes mark parametric standard error of the stratified abundance index. Lines mark bootstrap confidence intervals (α = 0.80, bootstrap iterations = 1000)

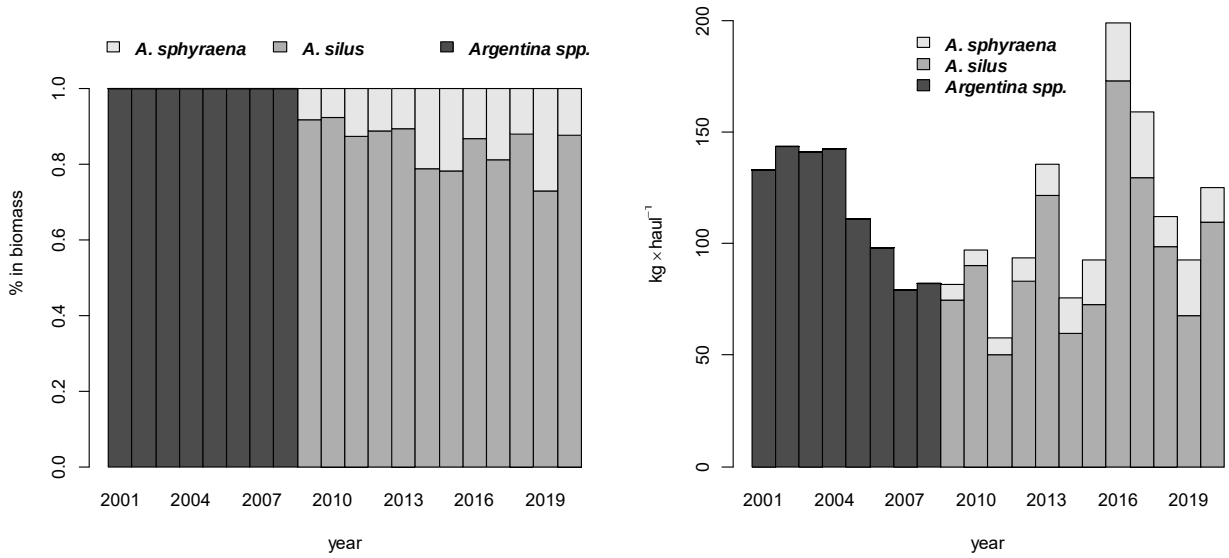

Figure 4. Share and abundance of Argentine species in Porcupine surveys (2001-2020)

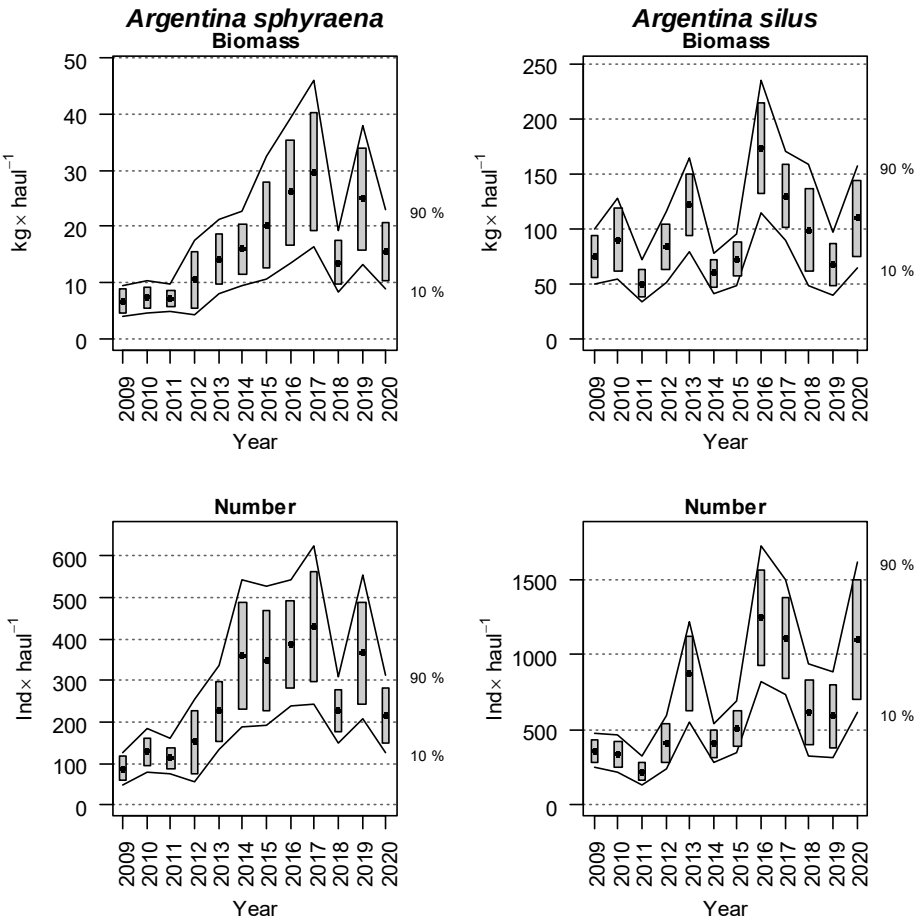

Figure 5. Evolution of *Argentina sphyraena* and *Argentina silus* biomass and abundance indices in Porcupine surveys (2009-2020). Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (a = 0.80, bootstrap iterations =1000)

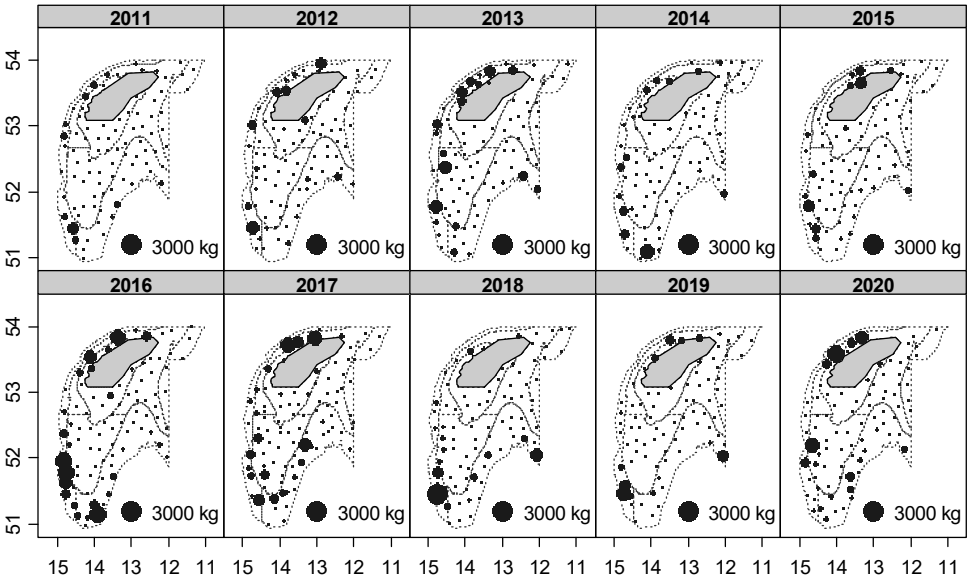

Figure 6. Geographic distribution of *Argentina* spp. catches (kg/30 min haul) in Porcupine surveys (2011-2020)

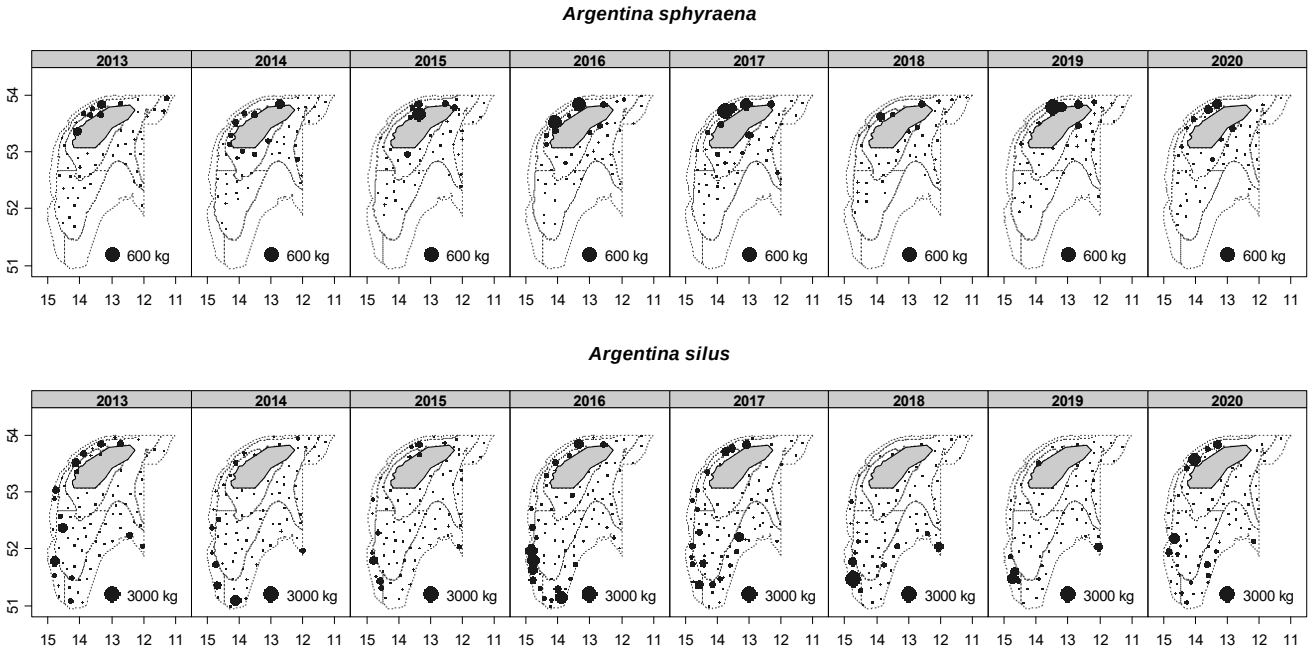

Figure 7. Geographic distribution of *Argentina sphyraena* and *Argentina silus* catches (kg/30 min haul) in Porcupine surveys (2013 - 2020)

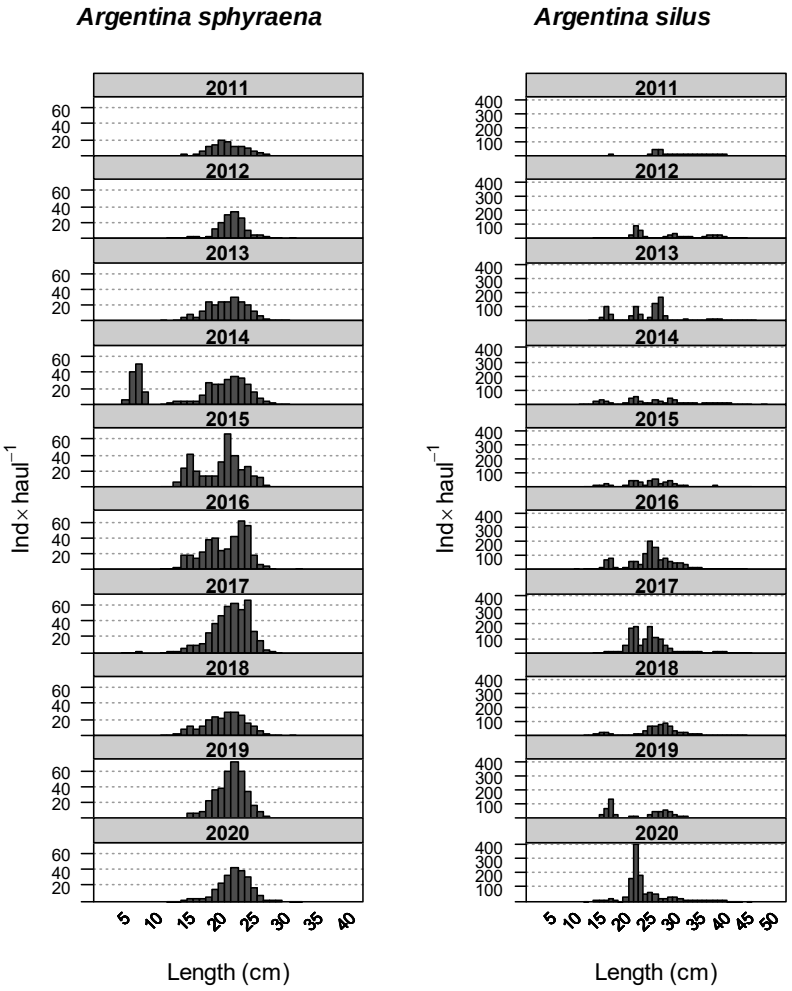

Figure 8. Mean stratified length distributions of *Argentina sphyraena* and *Argentina silus* in Porcupine surveys (2011-2020)

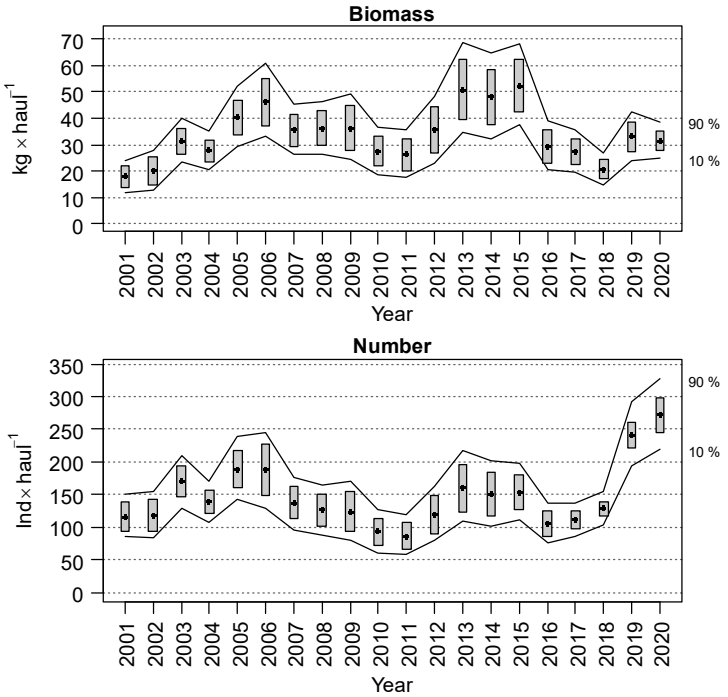

Figure 9. Evolution of *Helicolenus dactylopterus* biomass and abundance indices in Porcupine surveys (2001-2020). Boxes mark parametric standard error of the stratified abundance index. Lines mark bootstrap confidence intervals (α = 0.80, bootstrap iterations = 1000)

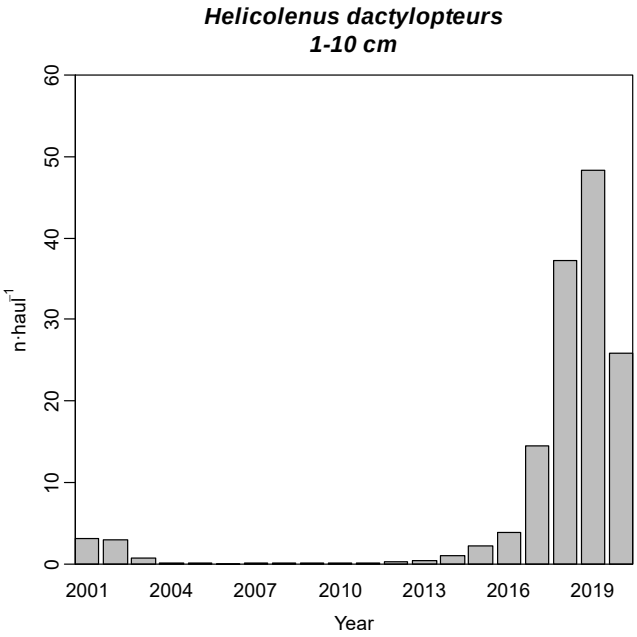

Figure 10. Mean stratified abundance of *Helicolenus dactylopterus* recruits (1-10 cm) in Porcupine surveys (2001-2020)

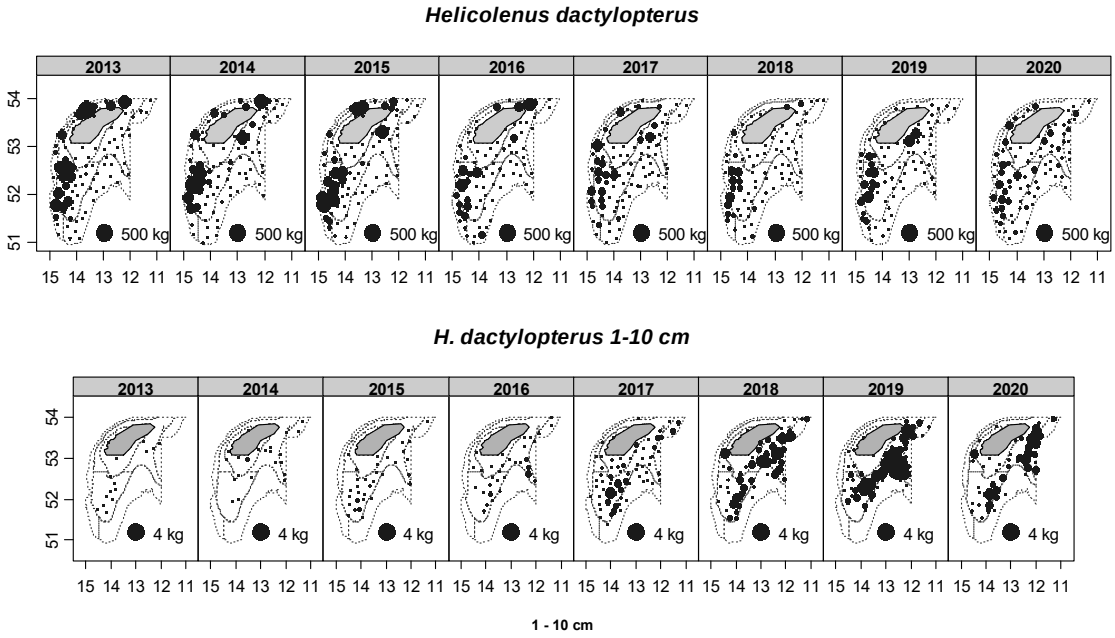

Figure 11. Geographic distribution of *Helicolenus dactylopterus* catches (kg×30 min haul-1) and recruits (1-10 cm) in Porcupine surveys (2013-2020)

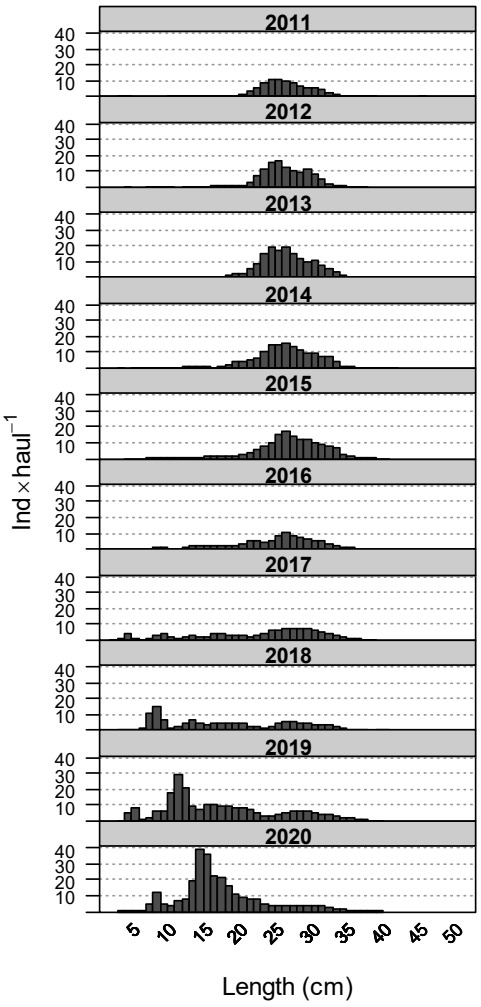

Figure 12. Mean stratified length distributions of *Helicolenus dactylopterus* in Porcupine surveys (2011-2020)

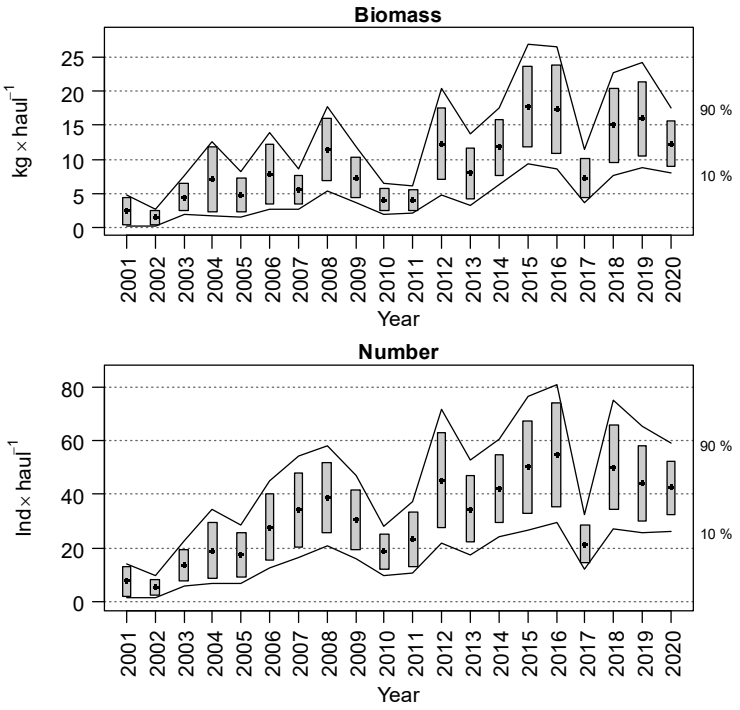

Figure 13. Evolution of *Trachyrincus scabrus* biomass and abundance indices in Porcupine surveys (2001-2020). Boxes mark parametric standard error of the stratified abundance index. Lines mark bootstrap confidence intervals (α = 0.80, bootstrap iterations = 1000)

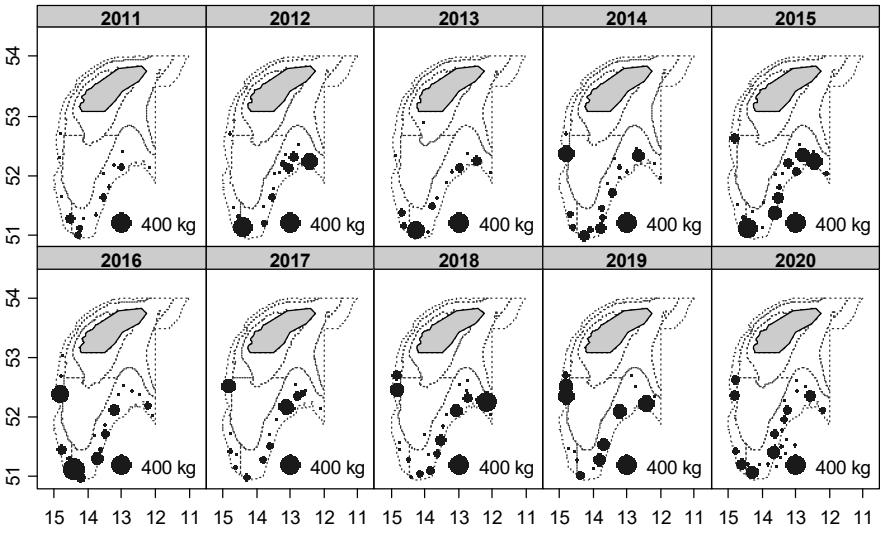

Figure 14. Geographic distribution of *Trachyrincus scabrus* catches (kg/30 min haul) in Porcupine surveys (2011-2020)

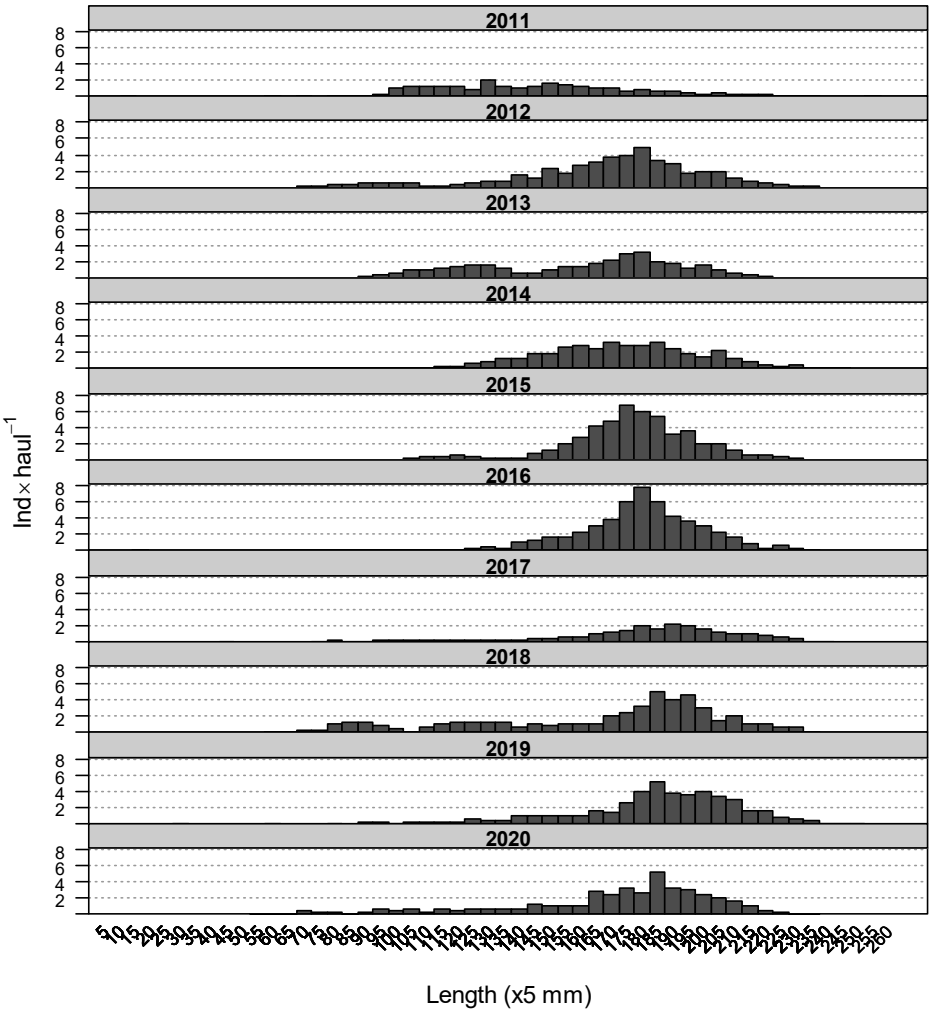

Figure 15. Mean stratified length distributions of *Trachyrincus scabrus* in Porcupine surveys (2011-2020)

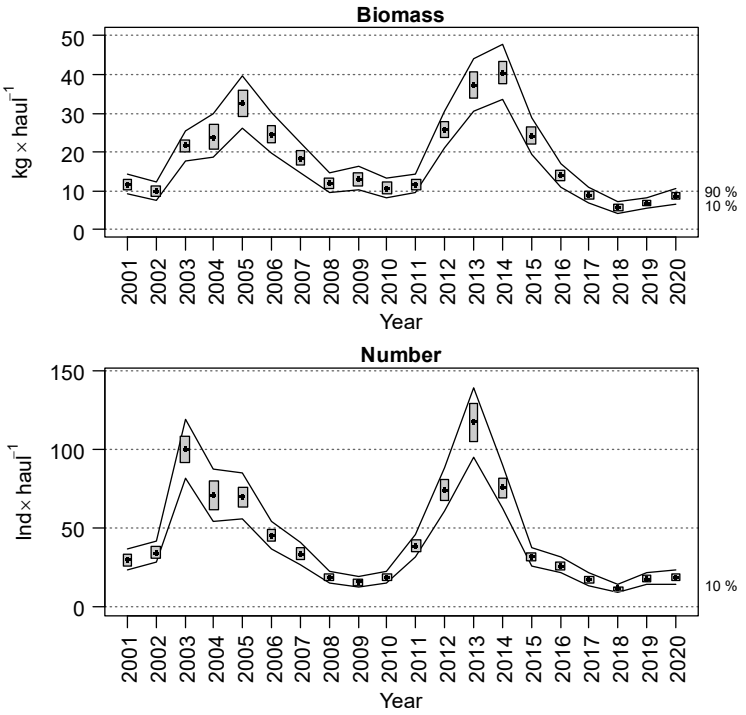

Figure 16. Evolution of *Phycis blennoides* biomass and abundance indices in Porcupine surveys (2001-2020). Boxes mark parametric standard error of the stratified abundance index. Lines mark bootstrap confidence intervals (α = 0.80, bootstrap iterations = 1000)

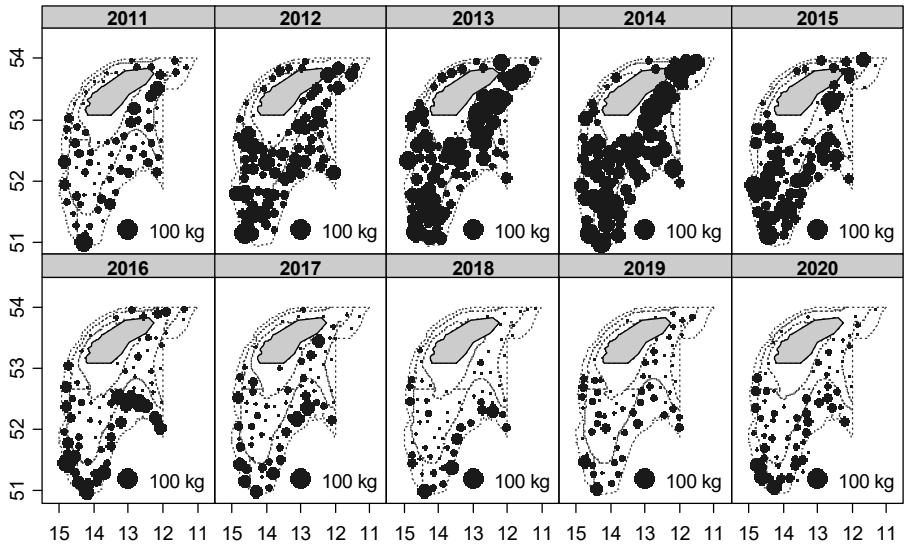

Figure 17. Geographic distribution of *Phycis blennoides* catches (kg×30 min haul^{-1}) in Porcupine surveys (2011-2020)

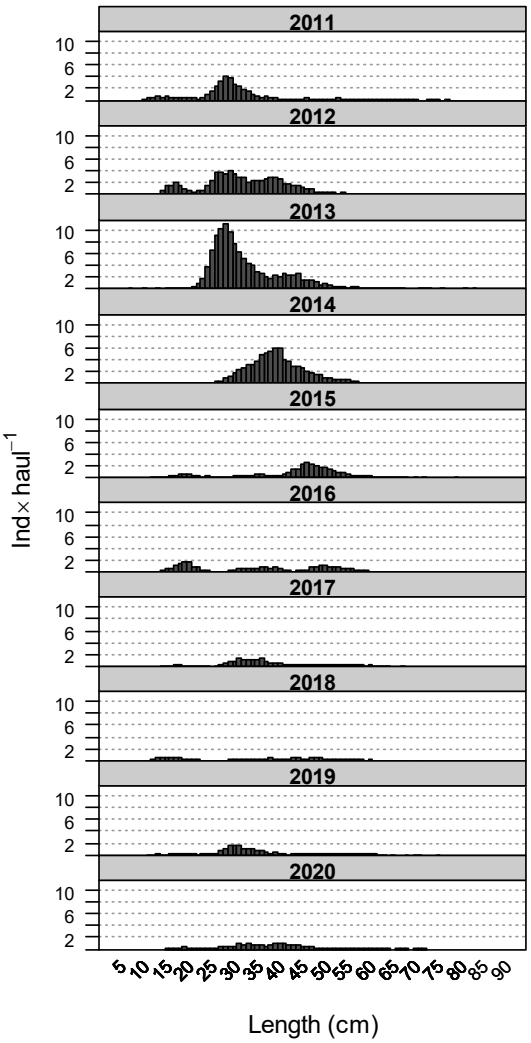

Figure 18. Mean stratified length distributions of *Phycis blennoides* in Porcupine surveys (2011-2020)

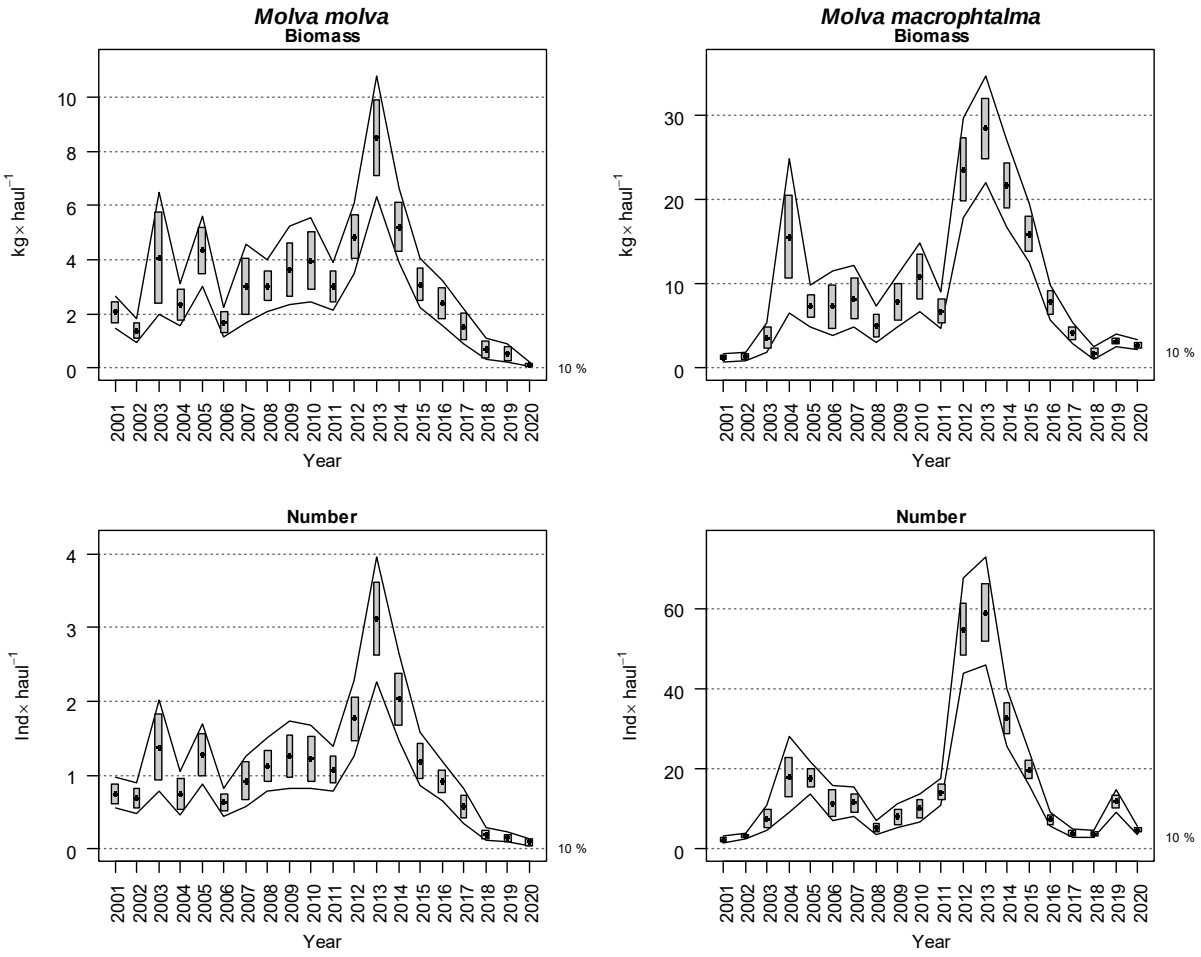

Figure 19. Evolution of *Molva molva* and *Molva macrophtalma* biomass and abundance indices in Porcupine surveys (2001-2020). Boxes mark parametric standard error of the stratified abundance index. Lines mark bootstrap confidence intervals (α = 0.80, bootstrap iterations = 1000)

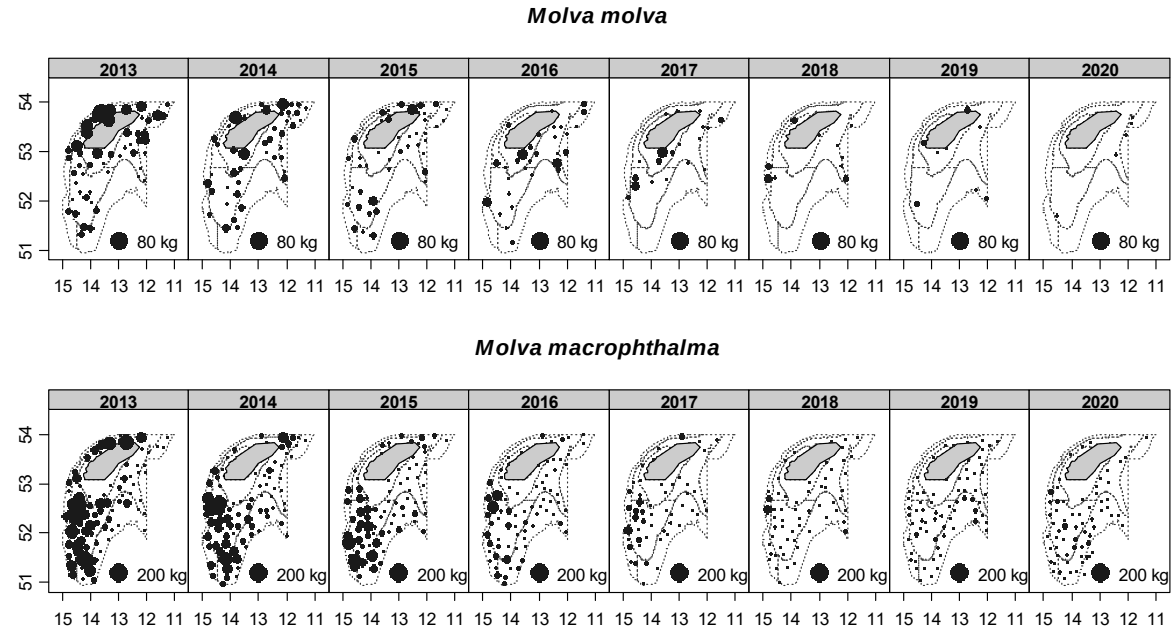

Figure 20. Geographic distribution of *Molva molva* and *Molva macrophtalma* catches (kg×30 min haul^{-1}) in Porcupine surveys (2013-2020)

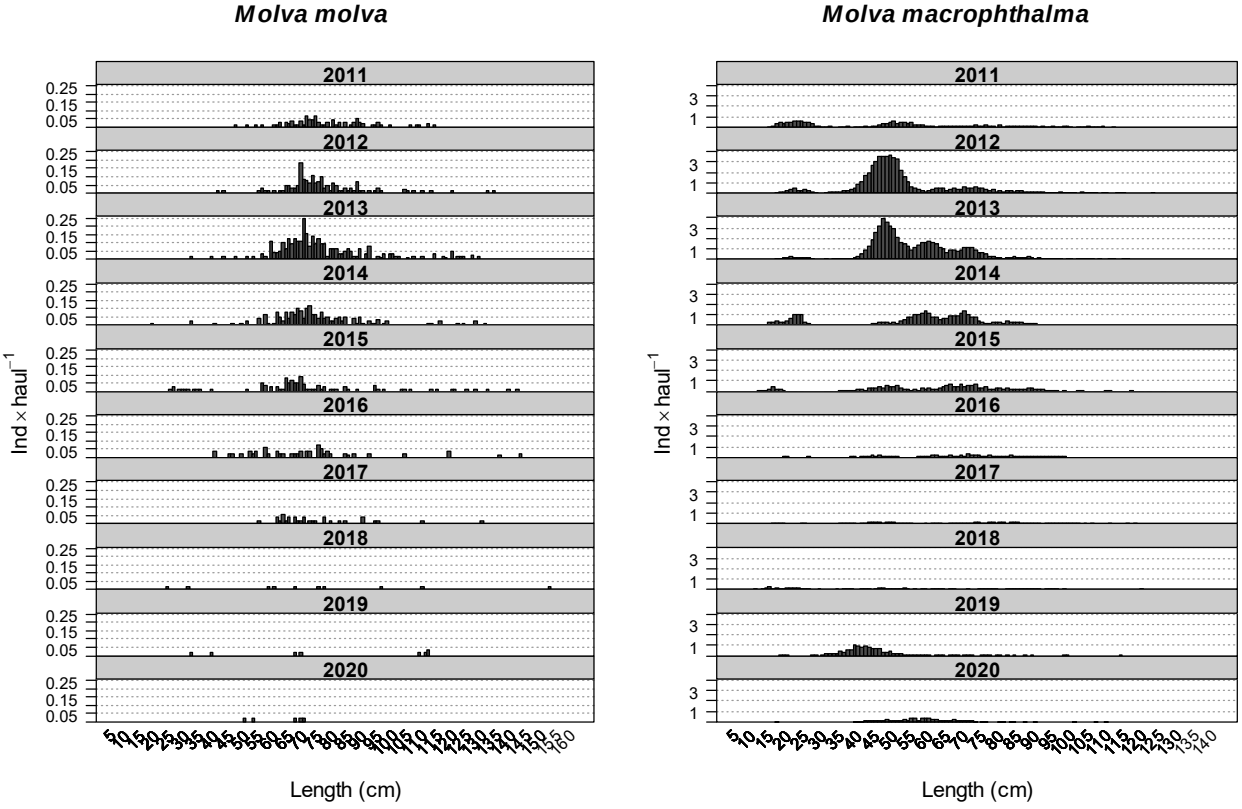

Figure 21. Mean stratified length distributions of *Molva molva* and *Molva macrophtalma* in Porcupine surveys (2011-2020)