Results on main cephalopods from the Spanish Ground Fish Survey on the Porcupine bank (NE Atlantic) (Division 7c and 7k)

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Abstract

This working document presents the results of the most significant cephalopods caught on the Porcupine Spanish Groundfish Survey (SP-PORC-Q3) in 2018. Biomass, abundance, distribution and length frequency were analysed for *Eledone cirrhosa* (horned octopus), *Bathypolypus sponsalis* (globose octopus), *Todarodes sagittatus* (European flying squid), *Todaropsis eblanae* (lesser flying squid), *Loligo forbesi* (veined squid), *Illex coindetii* (broadtail shortfin squid), *Histioteuthis reversa* (reverse jewell squid), *H. bonnelli* and *Rossia macrosoma* (stout bobtail squid). In general the biomass of the most common cephalopods decreased, except *T. eblane*. However the biomass of the species *B. sponsalis* and *R. macrosoma*, which are not as abundant, increased. The cephalopod *Illex coindetti* normally scarce in the survey was found this last survey while *Haliphron altanticus* was not.

Introduction

The Spanish bottom trawl survey on the Porcupine Bank (ICES Divisions 7c and 7k) has been carried out annually in 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 cephalopods on Porcupine bottom trawl surveys after the results presented previously (Blanco *et al.* 2018, Ruiz-Pico *et al* 2012). The species analysed were *Eledone cirrhosa* and *Bathypolypus sponsalis* (fam. Octopodidae), *Todarodes sagittatus*, *Todaropsis eblanae* and *Illex coindetii* (fam. Ommastrephidae), *Loligo forbesi* (fam. Loliginidae) and the scarce species *Histioteuthis reversa* and *H. bonnelli* (fam. Histtioteuthidae), *Haliphron atlanticus* (fam. Alloposidae*)* and *Rossia macrosoma* (fam. Sepiolidae).

Material and methods

The Spanish Ground Fish Survey on the Porcupine bank (SP-PORC-Q3) has been carried out annually 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 reduction in the tow duration (20 instead of 30 minutes) applied since 2016 worked successfully. Now the catches have been reduced and are easier to handle for the team who sorts it, but they are still abundant enough to be representative samples. The biomass indices of the entire time series are not affected by this reduction because the results of these last surveys were extrapolated to 30 minutes of trawling time to keep up the time series.

Results

In 2018, 80 valid standard hauls and 3 additional hauls were carried out (Figure 1).

Cephalopods represented a small percentage of the invertebrates mean stratified biomass caught (2%) but were the 62% of the molluscs mean stratified biomass. The species with the largest stratified biomass were *Eledone cirrhosa* (horned octopus) and *Todarodes sagittatus* (European flying squid), then *Todaropsis eblanae* (lesser flying squid), *Bathypolypus sponsalis* (globose octopus), *Loligo forbesi* (veined squid). Other scarce cephalopods were *Histioteuthis bonnellii, H reversa* (reverse jewell squid) and *Rossia macrosoma* (stout bobtail squid). *Illex coindetti* was barely found this last year and *Haliphron atlanticus* was not found.
In 2018, the biomass of the most common cephalopods decreased, except *T. eblanae*. Specifically *E. cirrhosa* and *T. sagittatus* returned to the average-low values of the time series after the peak in 2016 and *L. forbesi* dropped to the lowest value in the last ten years. However the abundance of *T. eblanae* this last survey reached the highest value of the time series and the species *B. sponsalis* and *R. macrosoma,* which are not as abundant, also increased its abundance.
As usual, *E. cirrhosa*, *T. eblanae*, *L. forbesi* and *R. macrosoma* appeared on the Irish shelf and/or in the shallowest strata around the bank, while *T. sagittatus*, *B. sponsalis* and both species of *Histioteuthis* mainly occurred in the deepest south strata.

Eledone cirrhosa (horned octopus)

E. cirrhosa represented 38% of the cephalopods mean stratified biomass in 2018. The biomass and abundance have been dropping after the peak in 2016, further decreasing this last survey (Figure 2).
The usual distribution of *E. cirrhosa* around the bank and on the Irish shelf was not clearly showed this last survey. The spots in biomass were small and scattered, except one in the northernmost corner of the covered Irish shelf (Figure 3).
The length distribution showed two smooth modes around 2 cm and 7 cm. Despite the low abundance of *E. cirrhosa* in this last survey, an increase of small specimens (2 cm) was found but fewer specimens around 5 cm (Figure 4).

Todarodes sagittatus (European flying squid)

This last survey the biomass of *T. sagittatus* was 32% of the cephalopods mean stratified biomass, more than the previous year. However, the percentage of abundance

remained low, 5% of the stratified abundance caught. The biomass and abundance slightly decreased this last survey, remaining among the lowest values of the time series (Figure 5).
T. sagittatus was distributed as usual, mainly in the deepest strata, but with fewer spots of biomass in the north and western area than the former year. In this last survey, *T. sagittatus* was mainly found in the deeper south (Figure 6).
The length distribution of *T. sagittatus* remained similar to the previous year from 10 cm to 41 cm, although with fewer small specimens around 17 cm (Figure 7).

***Todaropsis eblanae* (lesser flying squid)**

The biomass of *T. eblanae* was only 11% of the cephalopods mean stratified biomass caught this last survey. However, the abundance of *T. eblanae* was 32% of the cephalopods mean stratified abundance, remained more representative than *T. sagittatus*. Figure 8 showed a slight increase in biomass but a peak of abundance in 2018, the highest value of the time series.
T. eblanae was mainly found on the Irish shelf and in the shallow depth strata, 150-300 m as usual (Figure 9).

***Loligo forbesi* (veined squid)**

L. forbesi represented only 5% of the cephalopods mean stratified biomass caught. Biomass and abundance fell this last survey, reaching the lowest value of the last decade (Figure 10).
The few specimens of *L. forbesi* were found in the shallower northern area of the bank and in the southeastern area (Figure 11). They ranged from 19 to 31 cm, although the majority (eight of a total of nine specimens) were from 19 to 22 cm (Figure 12).

Other cephalopods species

This last year, the biomass and abundance of *Bathypolypus sponsalis* increased remarkably (Figure 13). The specimens were found in the deepest south area as usual (Figure 14).
The biomass of *Histiouteuthis bonnellii* has been higher than *H. reversa* since the last two years, although the abundance is lower (Figure 15). Only one specimen of *H. bonnelli* was found in the south, while 30 specimens of *H. reversa* were found in the southeast area and in two hauls in the west (Figure 16).
Illex coindetti was not found in 2017, but this last survey, two specimens were found in two hauls in the north of the Irish shelf (Figure 17 and Figure 18).
In contrast, *Haliphron atlanticus* was not found this latest survey.
The biomass of the sepiolid *Rossia macrosoma* slightly increased, although the value remained among the average values of the time series (Figure 19). However, the abundance was among the lowest values of the time series. A total of fifteen specimens were found in the northwest area (Figure 20).

Acknowledgements

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References

Blanco, M., Ruiz-Pico, S., Velasco, F., Baldó, F. and Silva, L. 2018. Results on main cephalopods species captured in the bottom trawl surveys in the Porcupine Bank (Division 7c and 7k). Working Document presented to ICES WGCEPH 2018. 25 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., Velasco, F., Baldó, F. and Silva, L. 2012. Results on main cephalopods species captured in the bottom trawl surveys in the Porcupine Bank. Working Document presented to ICES WGCEPH 2012. 16 pp.

Velasco, F., and Serrano, A., 2003. Distribution patterns of bottom trawl faunal assemblages in Porcupine bank: Implications for Porcupine surveys stratification design. Working Document presented to IBTSWG 2003. 19 pp.

Figures

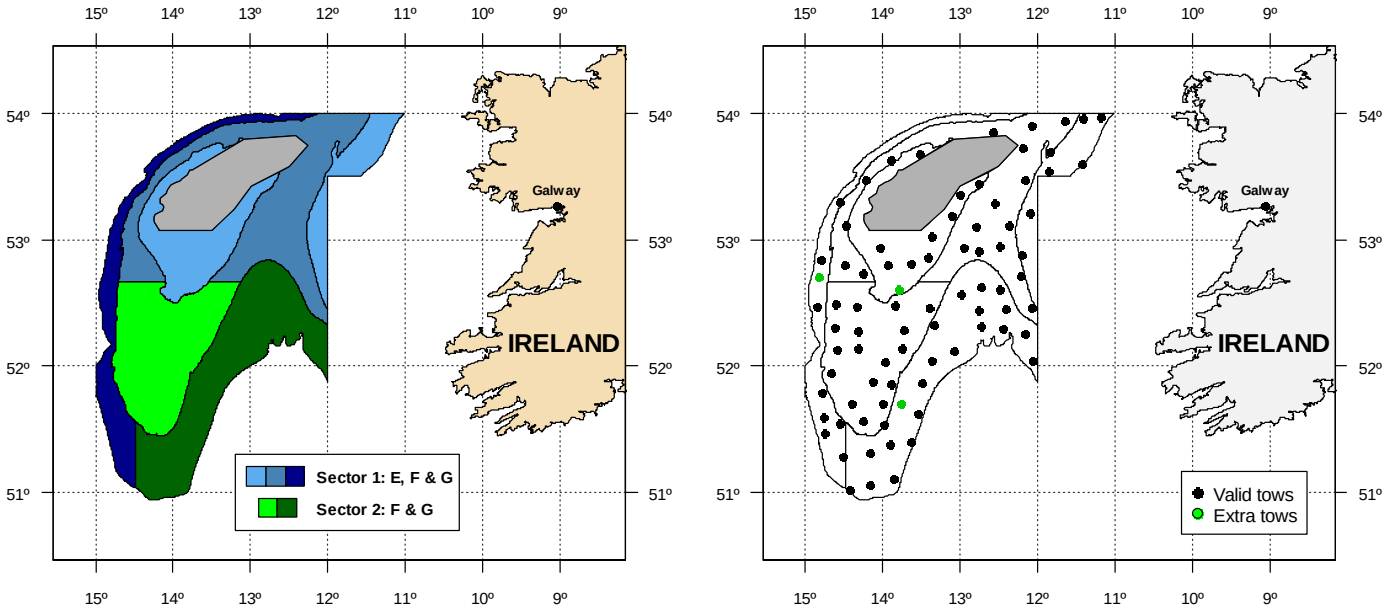


Figure 1 Left: Stratification design used in Porcupine surveys from 2003, previous data were re-stratified. Depth strata are: E) shallower than 300 m, F) 301 – 450 m and G) 451 – 800 m. Grey area in the middle of Porcupine bank corresponds to a large non-trawlable area, not considered for area measurements and stratification. Right: distribution of hauls performed in 2018

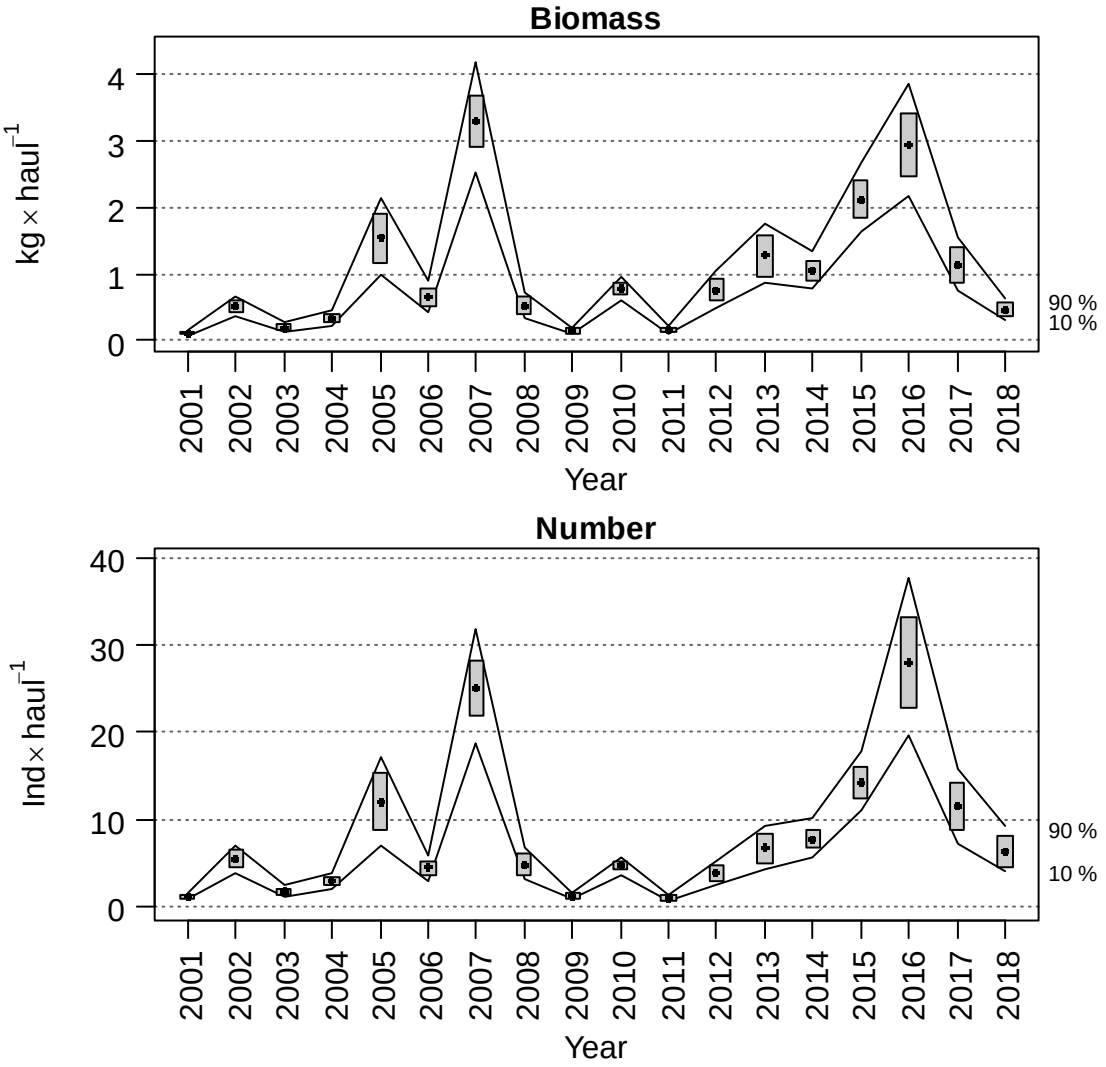


Figure 2 Evolution of *Eledone cirrhosa* biomass and abundance indices in Porcupine surveys (2001-2018). Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000)

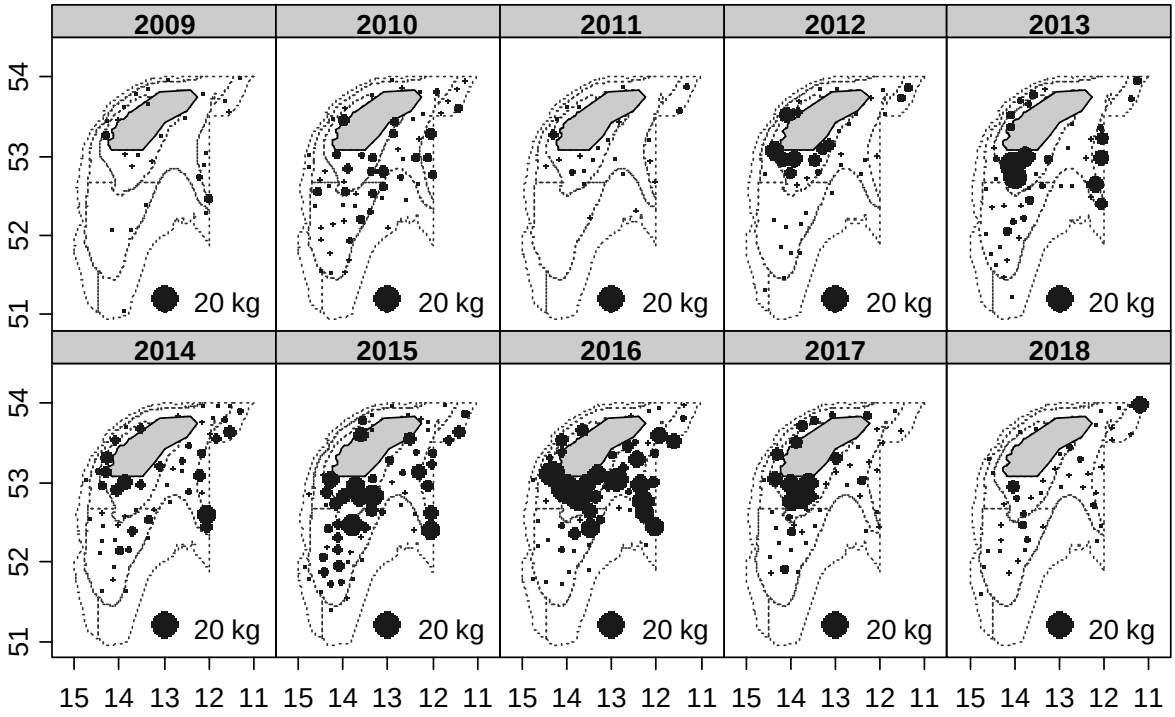


Figure 3 Geographic distribution of *Eledone cirrhosa* catches (kg/30 min haul) in Porcupine surveys (2009-2018)

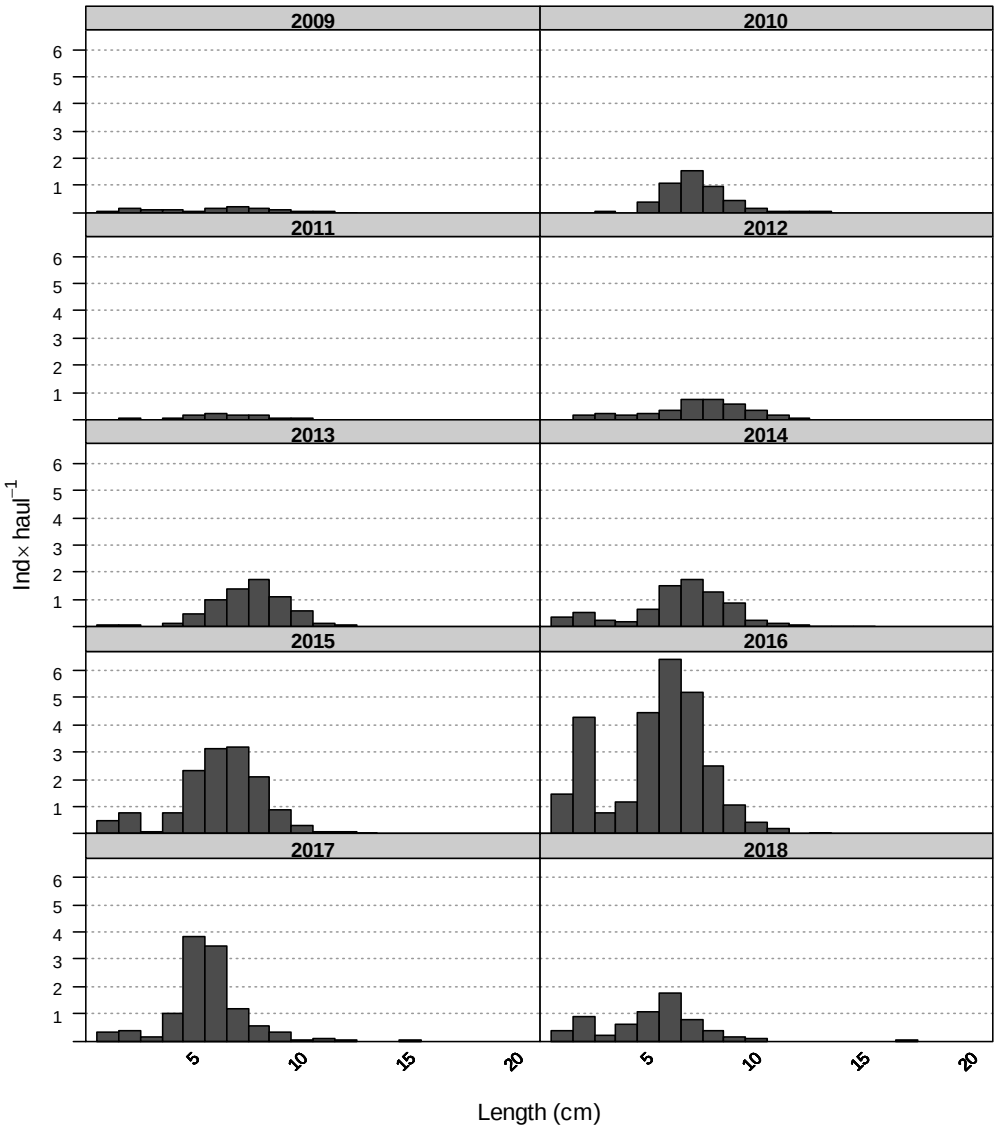


Figure 4 Mean stratified length distributions of *Eledone cirrhosa* in Porcupine surveys (2009-2018)

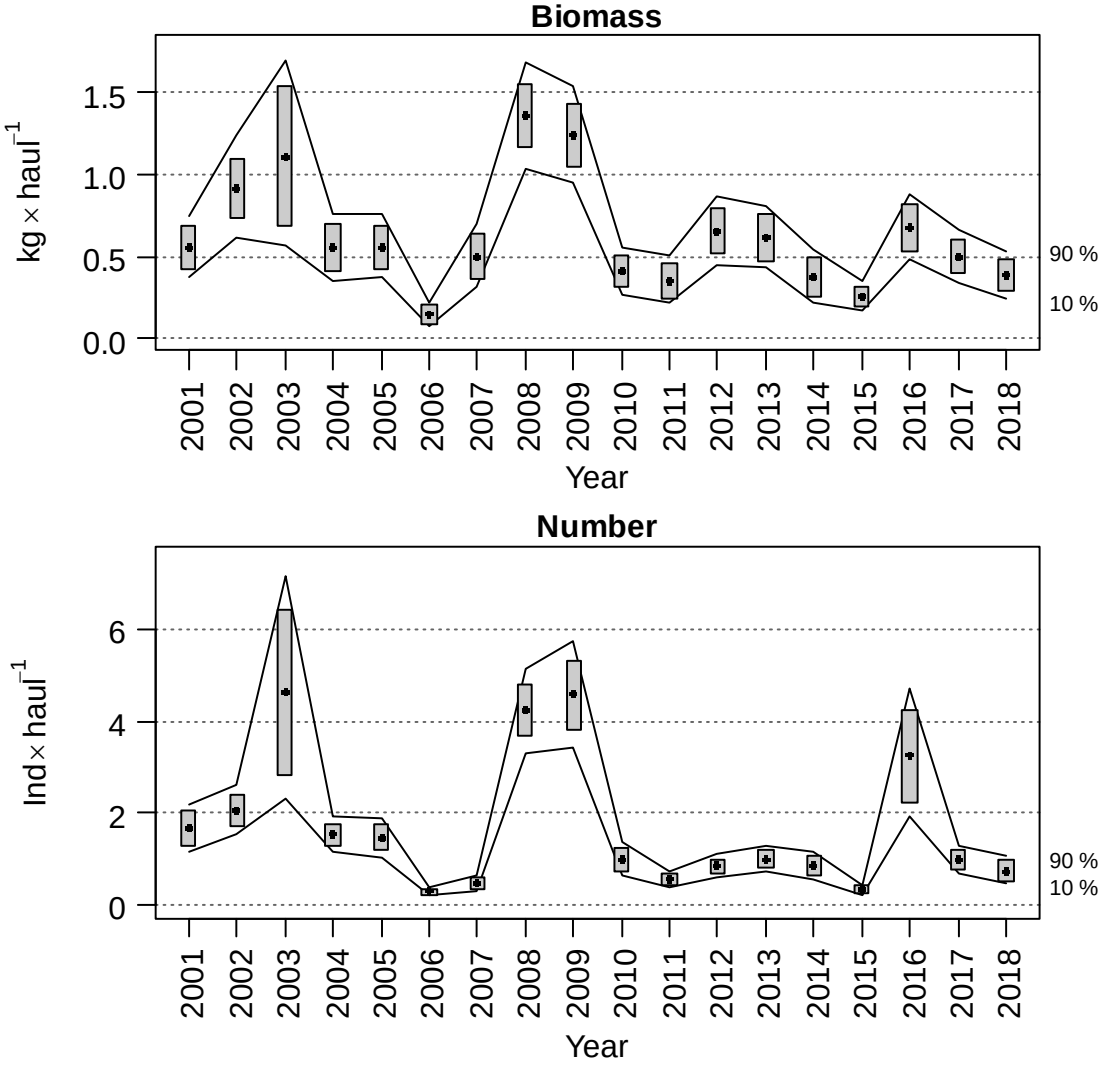


Figure 5 Evolution of *Todarodes sagitattus* biomass and abundance indices in Porcupine surveys (2001-2018). Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000)

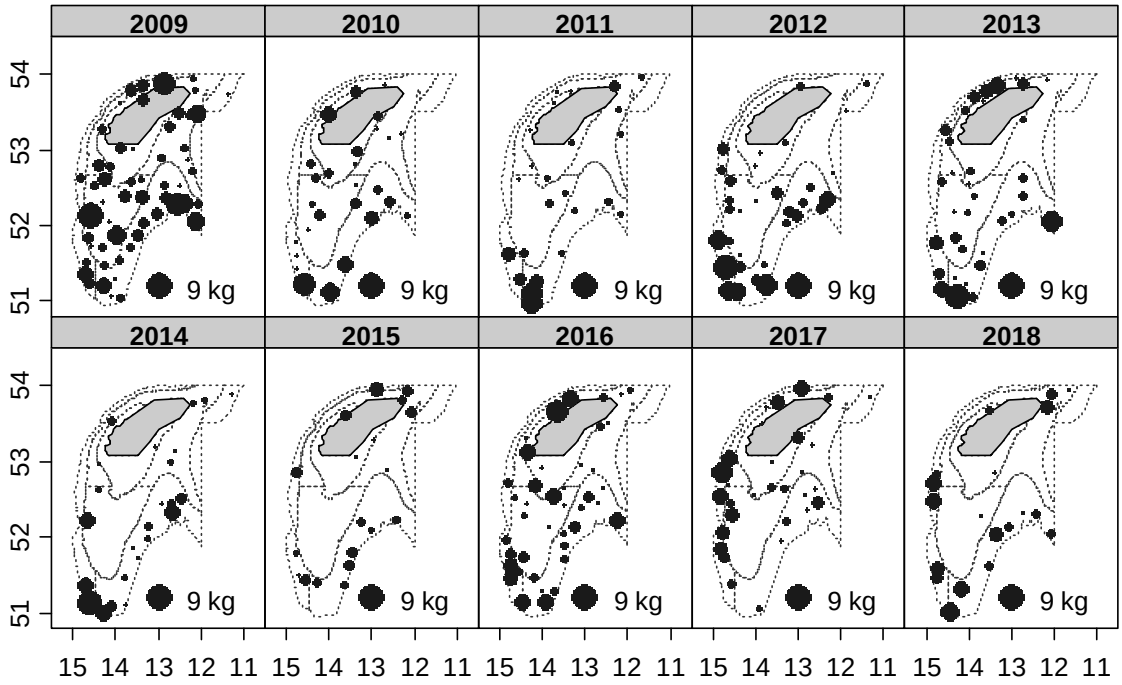


Figure 6 Geographic distribution of *Todarodes sagittatus* catches (kg/30 min haul) in Porcupine surveys (2009-2018)

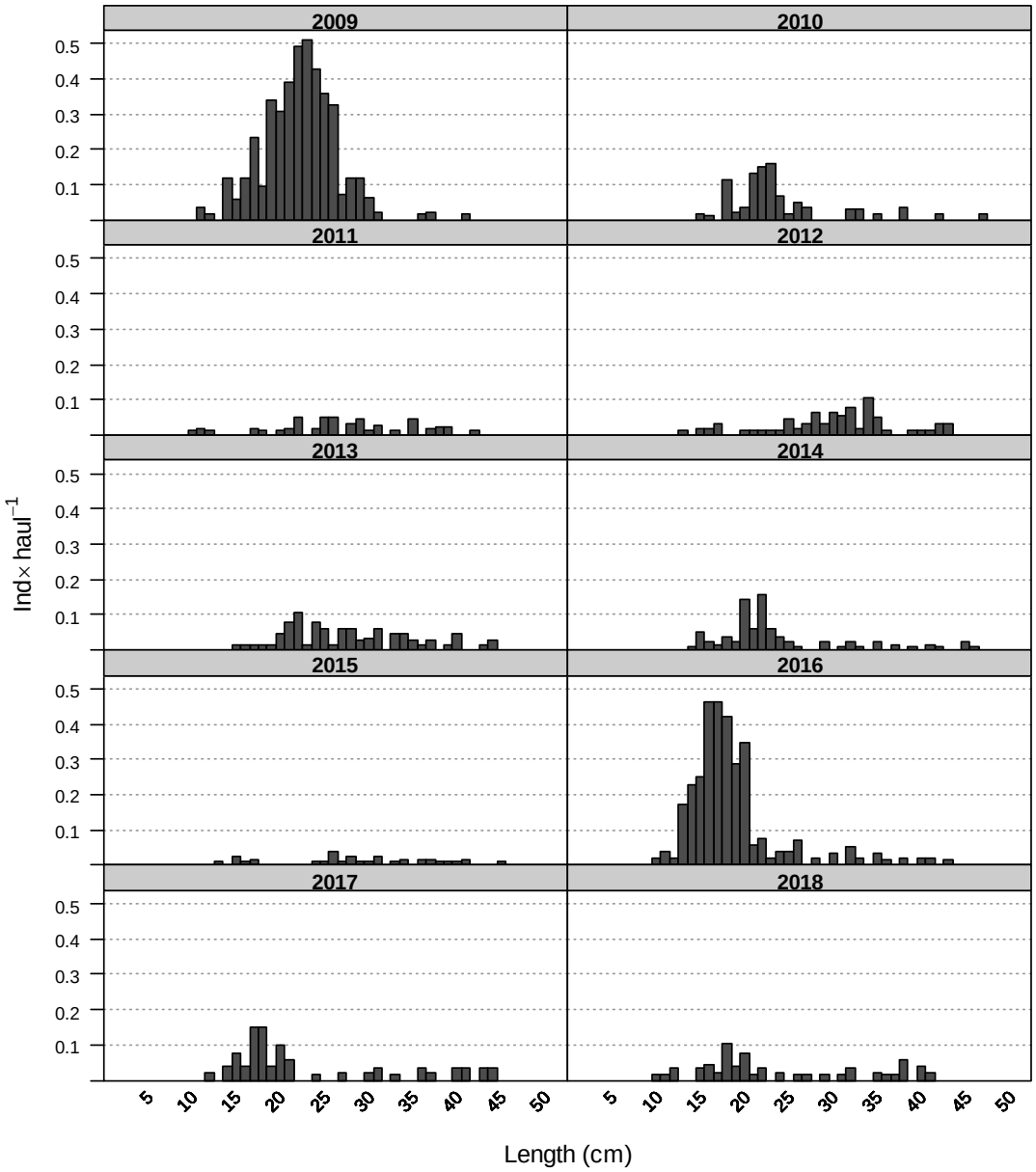


Figure 7 Mean stratified length distributions of *Todarodes sagitattus* in Porcupine surveys (2009-2018)

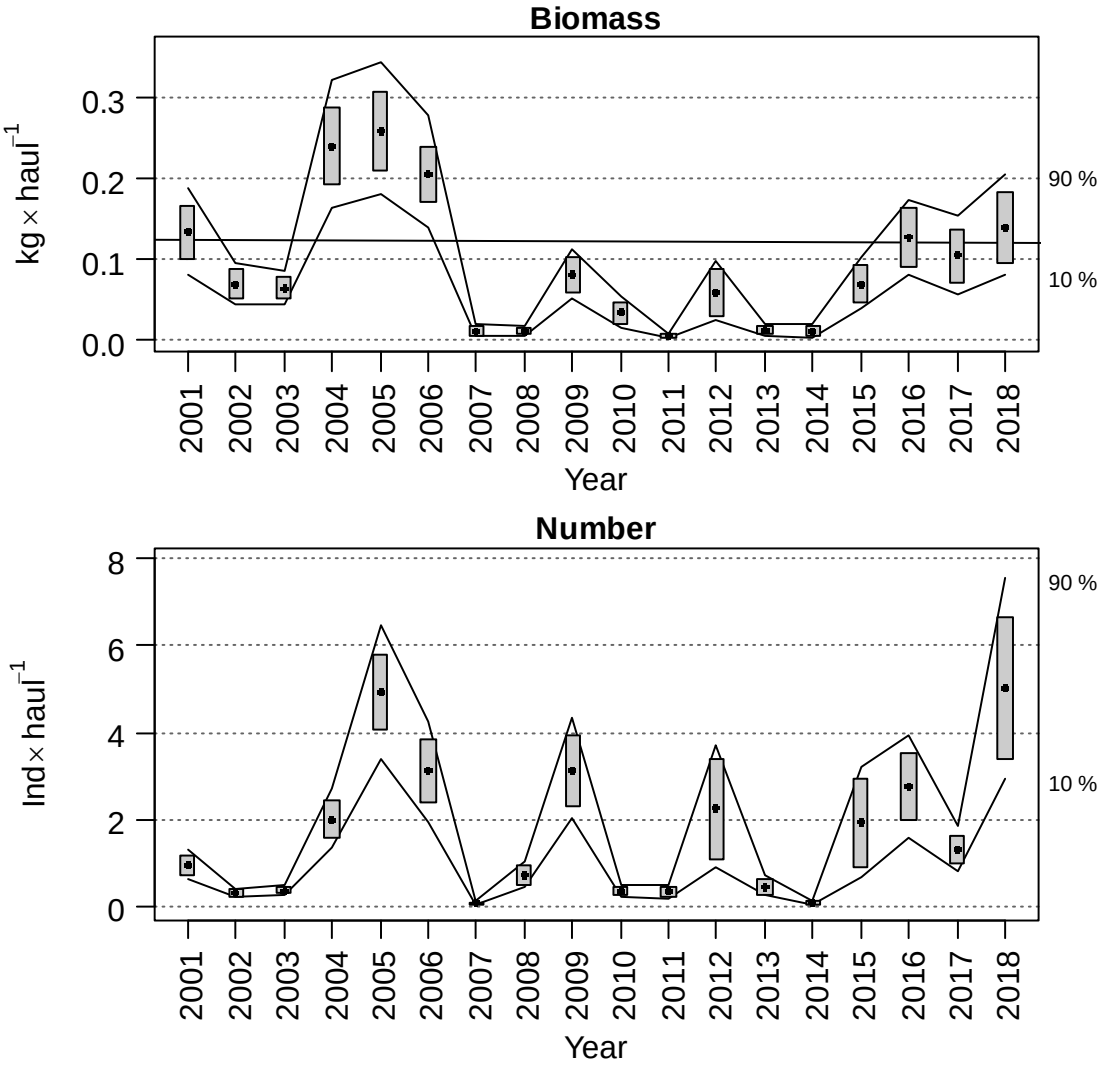


Figure 8 Evolution of *Todaropsis eblanae* biomass and abundance indices in Porcupine surveys (2001-2018). Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000)

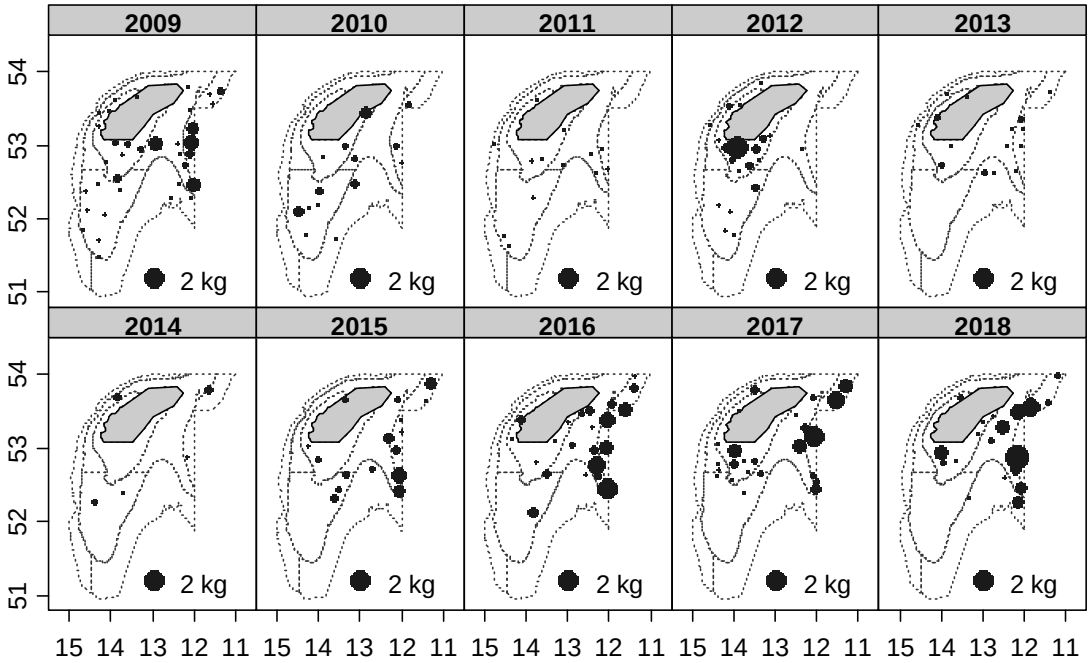


Figure 9 Geographic distribution of *Todaropsis eblanae* catches (kg/30 min haul) in Porcupine surveys (2009-2018)

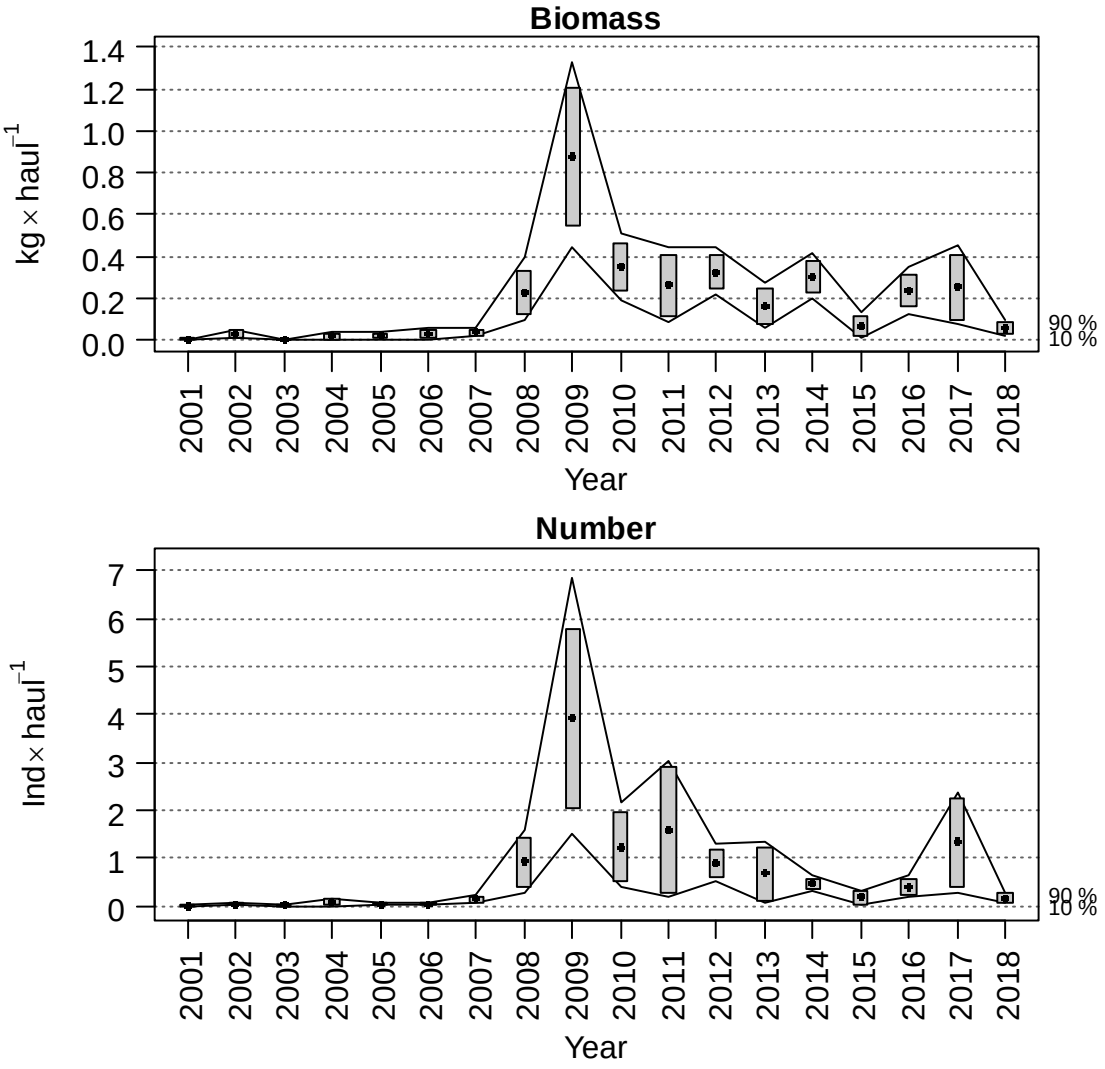


Figure 10 Evolution of *Loligo forbesi* biomass and abundance indices in Porcupine surveys (2001-2018). Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000)

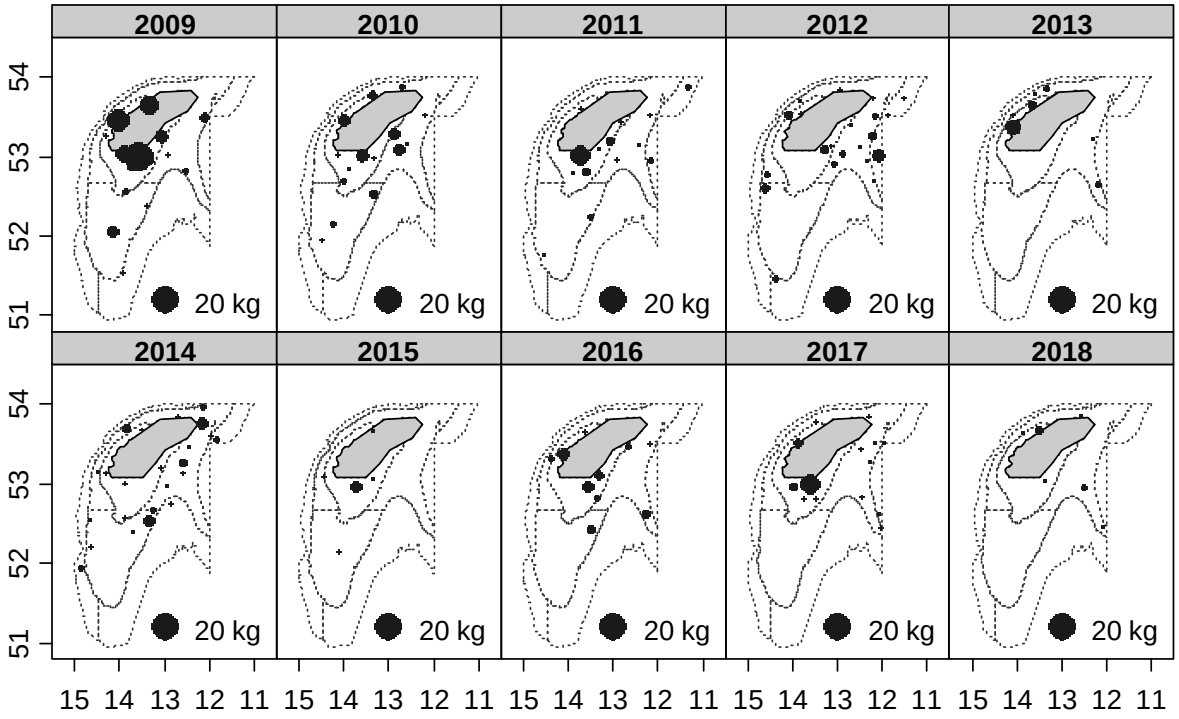


Figure 11 Geographic distribution of *Loligo forbesi* catches (kg/30 min haul) in Porcupine surveys (2009-2018)

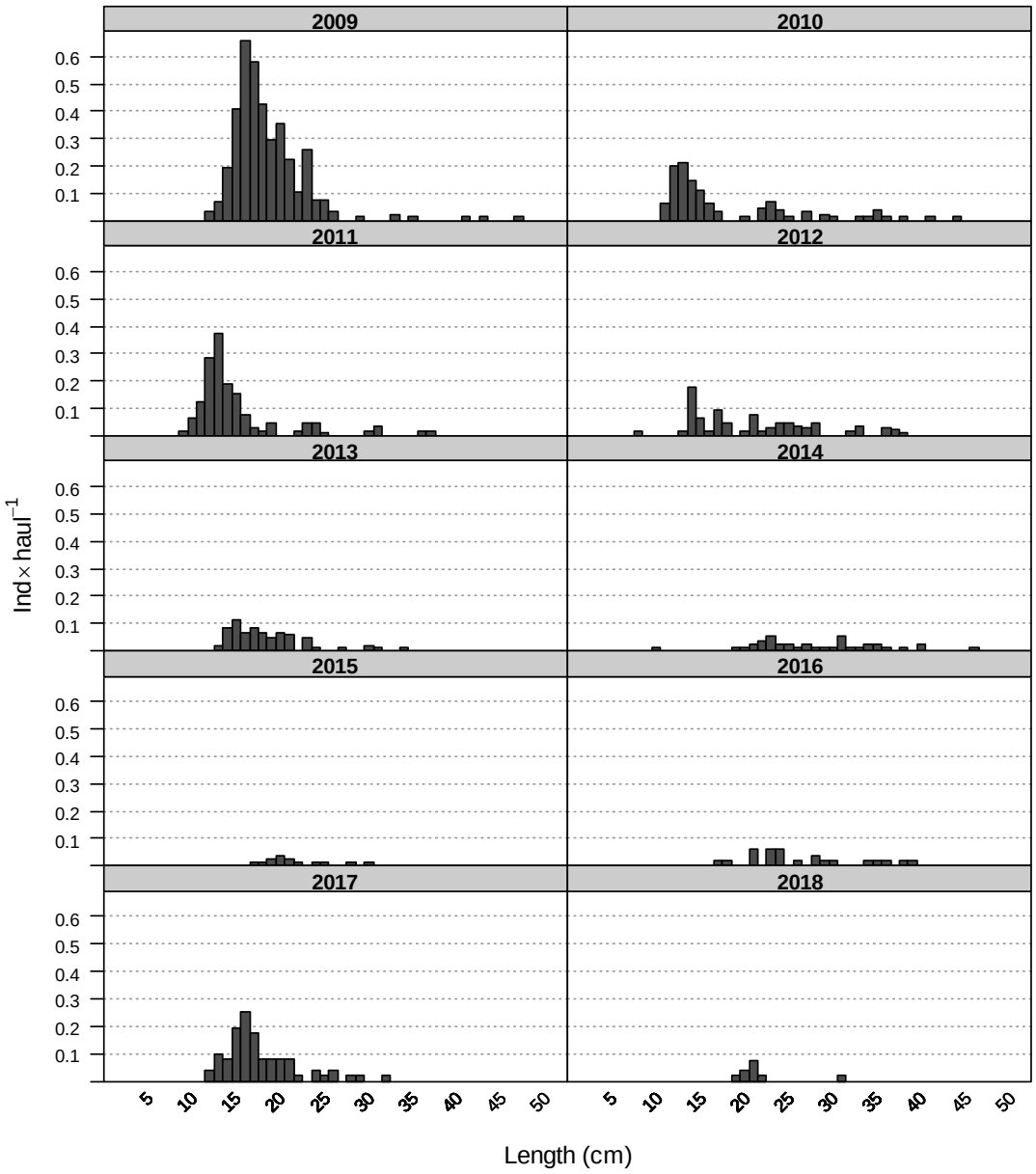


Figure 12 Mean stratified length distributions of *Loligo forbesi* in Porcupine surveys (2009-2018)

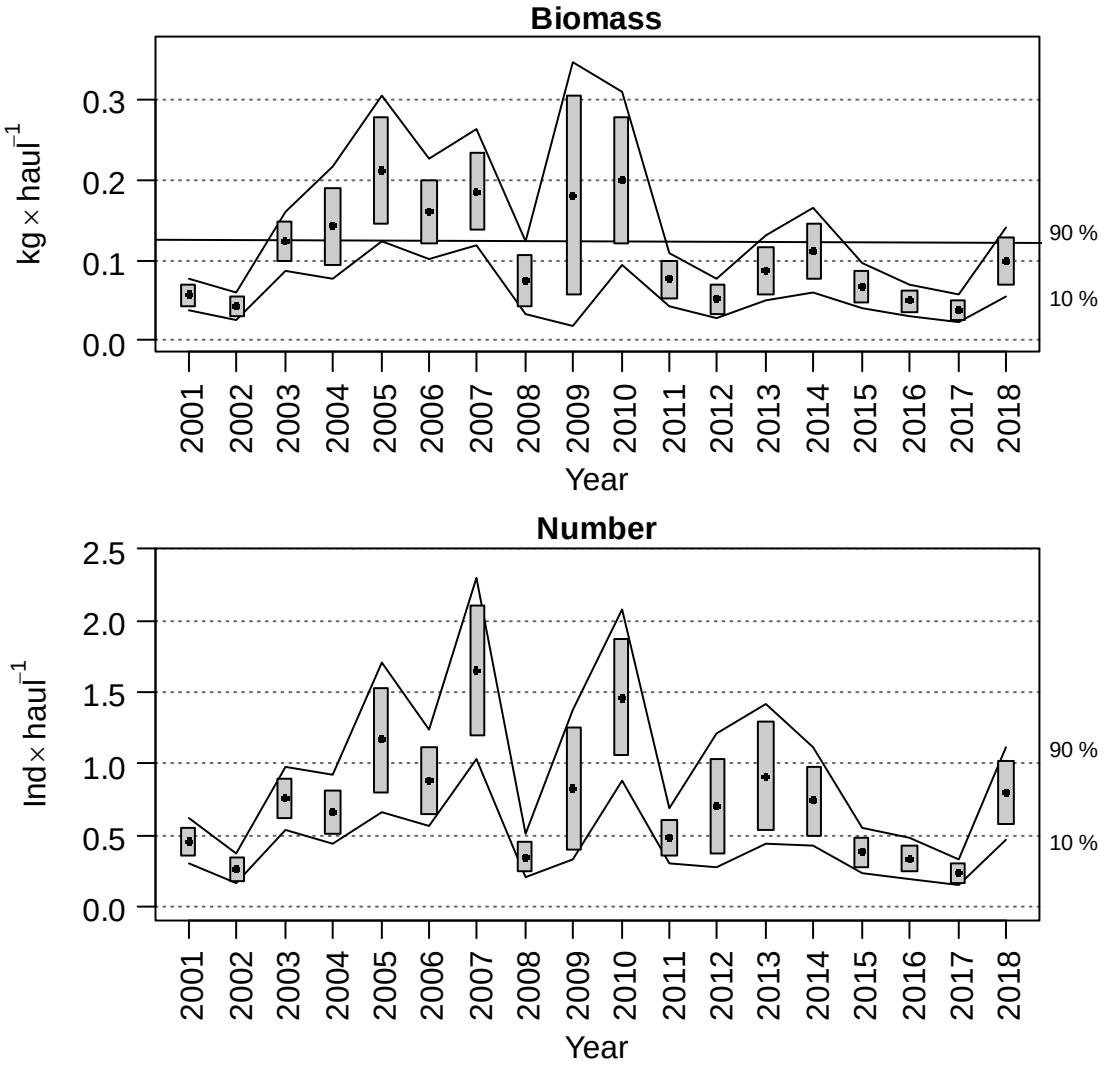


Figure 13 Evolution of *Bathypolypus sponsalis* biomass and abundance indices in Porcupine surveys (2001-2018). Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000)

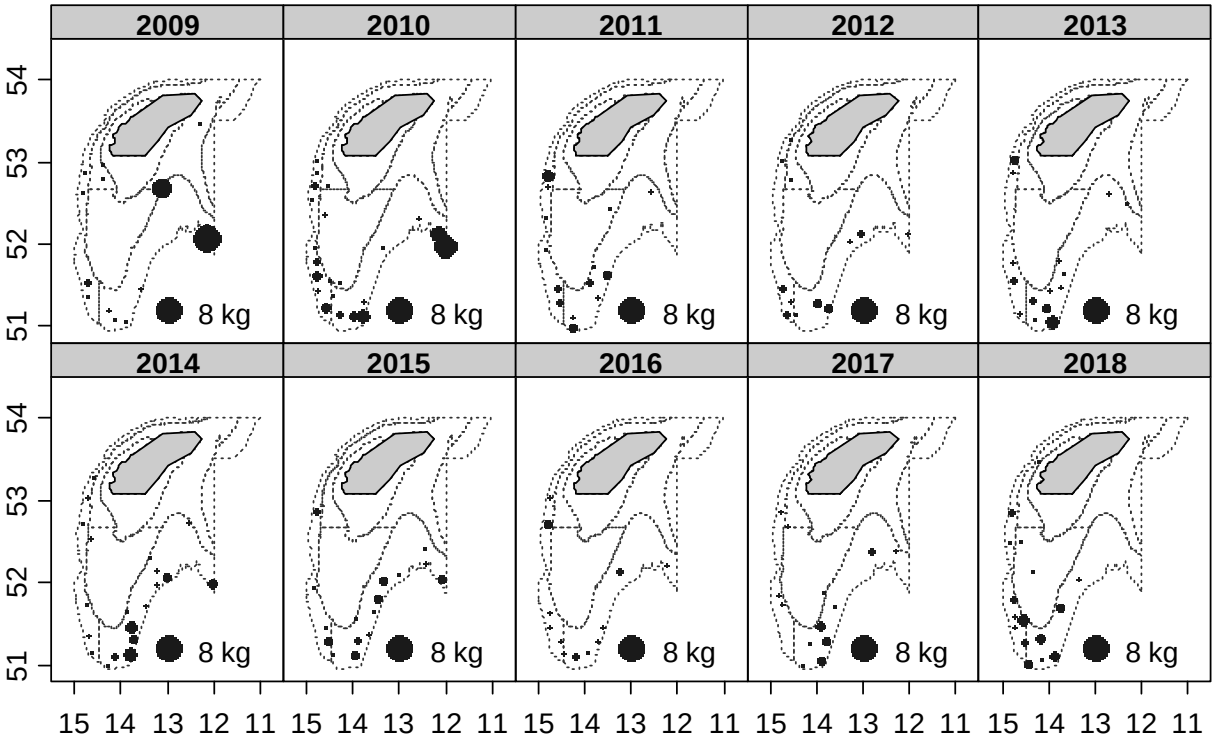


Figure 14 Geographic distribution of *Bathypolypus sponsalis* catches (kg/30 min haul) in Porcupine surveys (2009-2018)

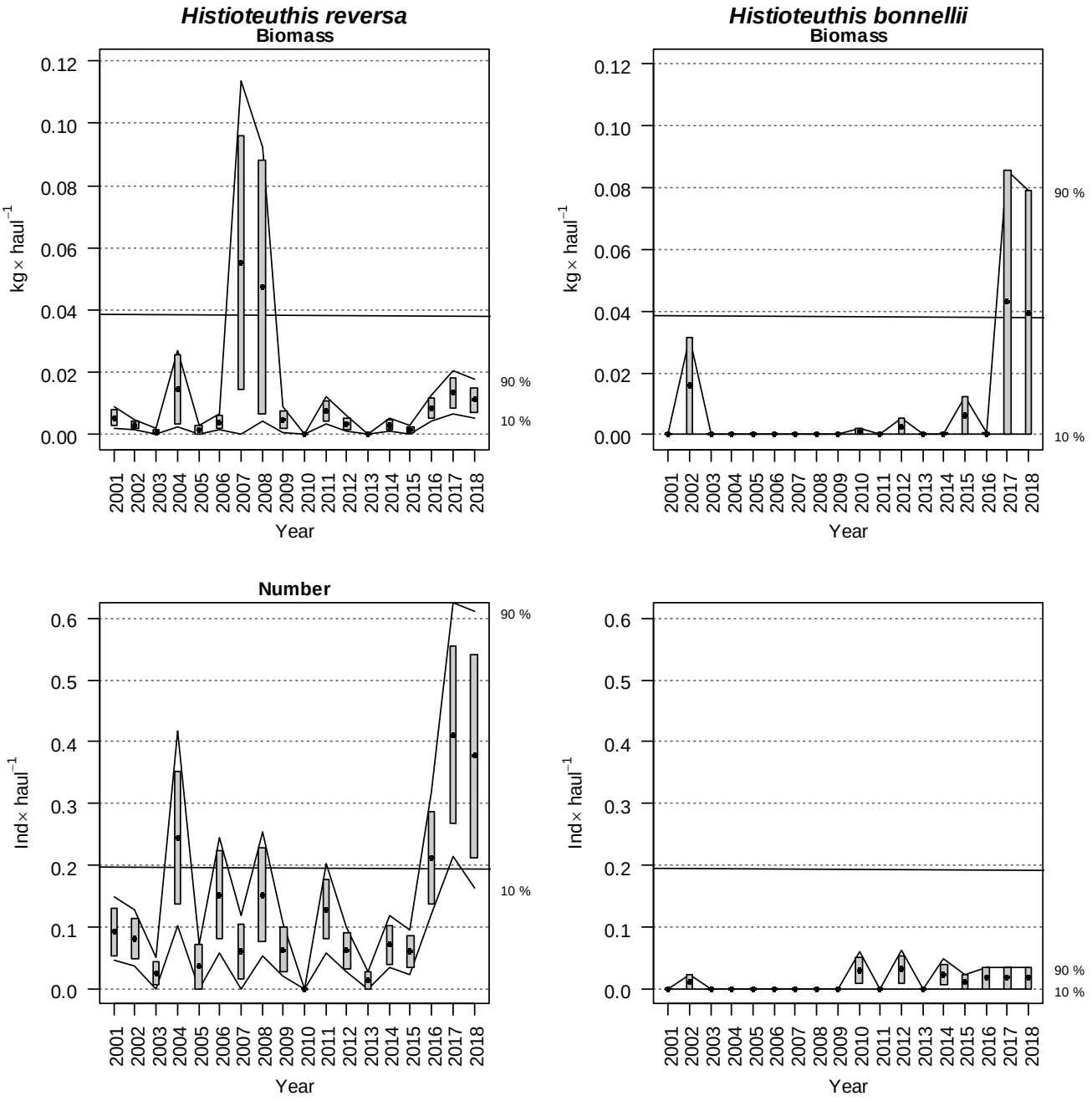


Figure 15 Evolution of *Histioteuthis reversa* and *Histioteuthis bonnellii* biomass and abundance indices in Porcupine surveys (2001-2018). Boxes mark parametric standard error of the stratified abundance index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000)

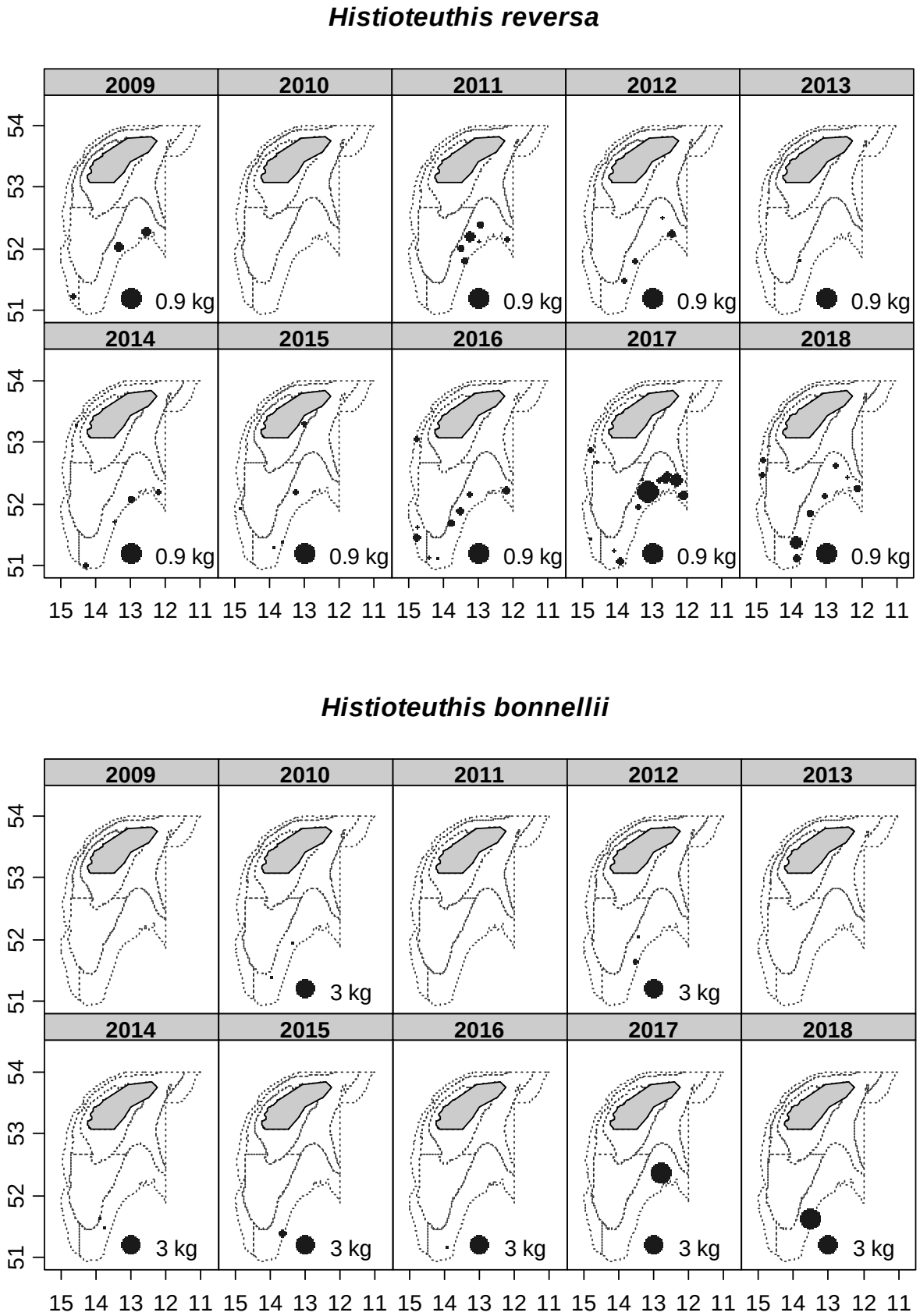


Figure 16 Geographic distribution of *Histioteuthis reversa* and *Histioteuthis bonnellii* catches (kg×30 min haul-1) in Porcupine surveys (2009-2018)

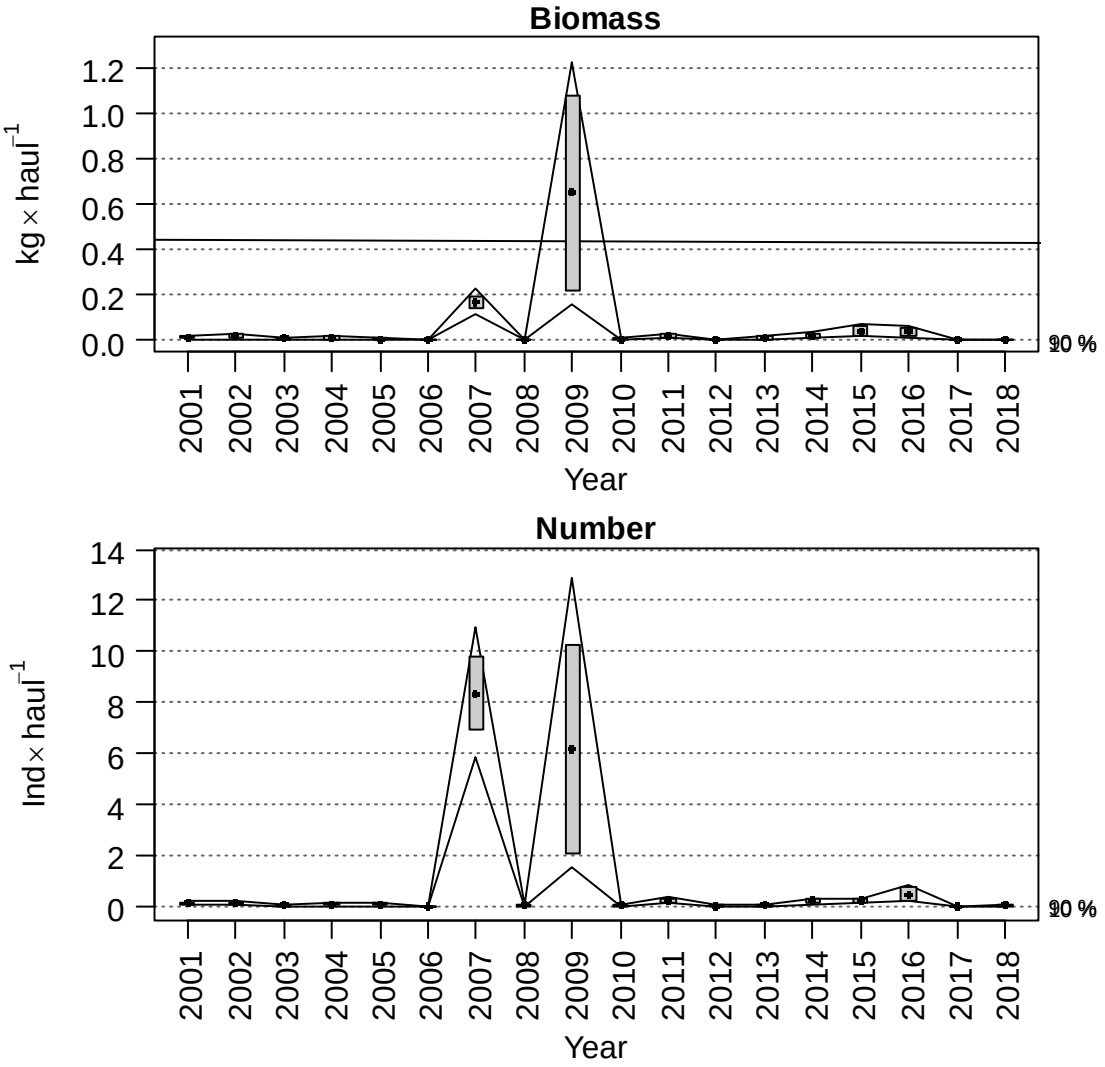
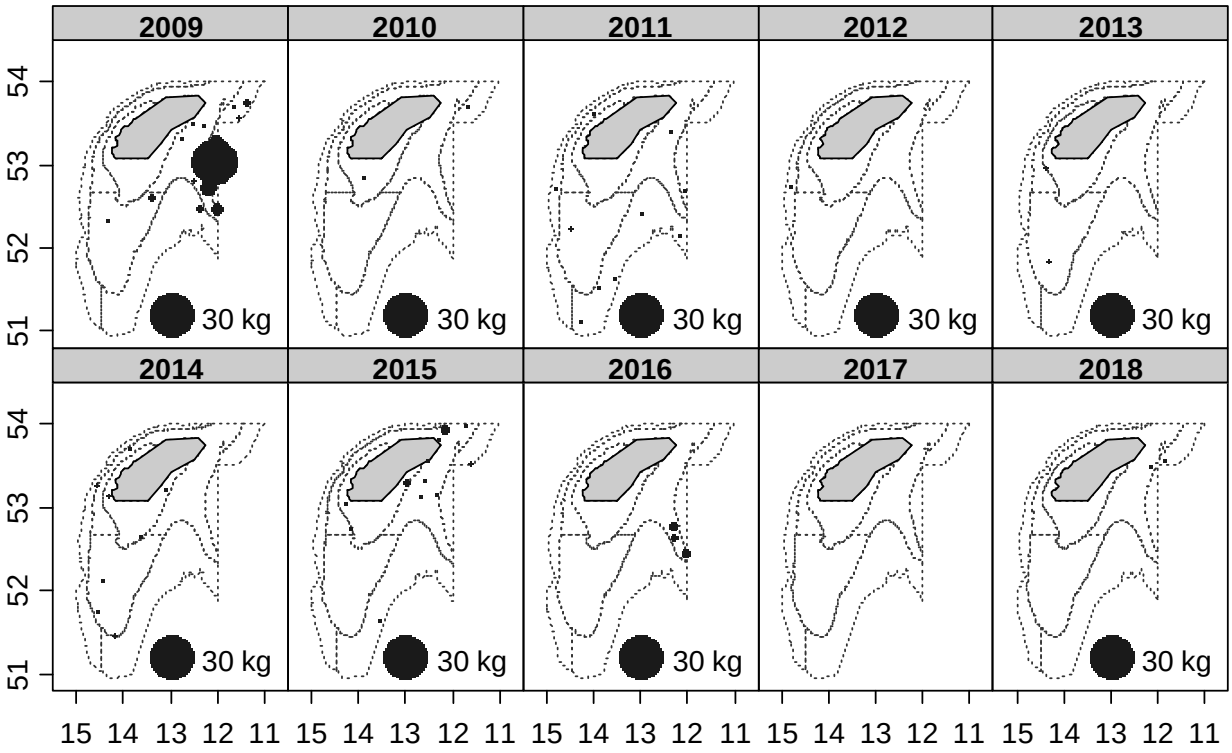


Figure 17 Evolution of *Illex coindetii* biomass and abundance indices in Porcupine surveys (2001-2018). Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000)



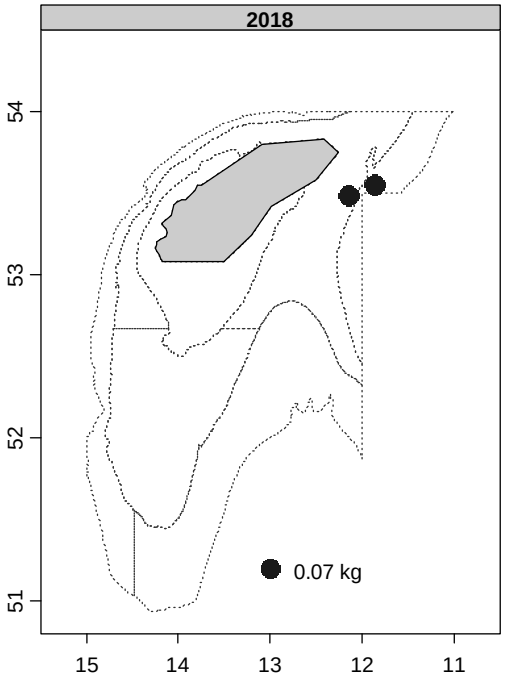


Figure 18 Geographic distribution of *Illex coindetii* catches (kg/30 min haul) in Porcupine surveys (2009-2018)

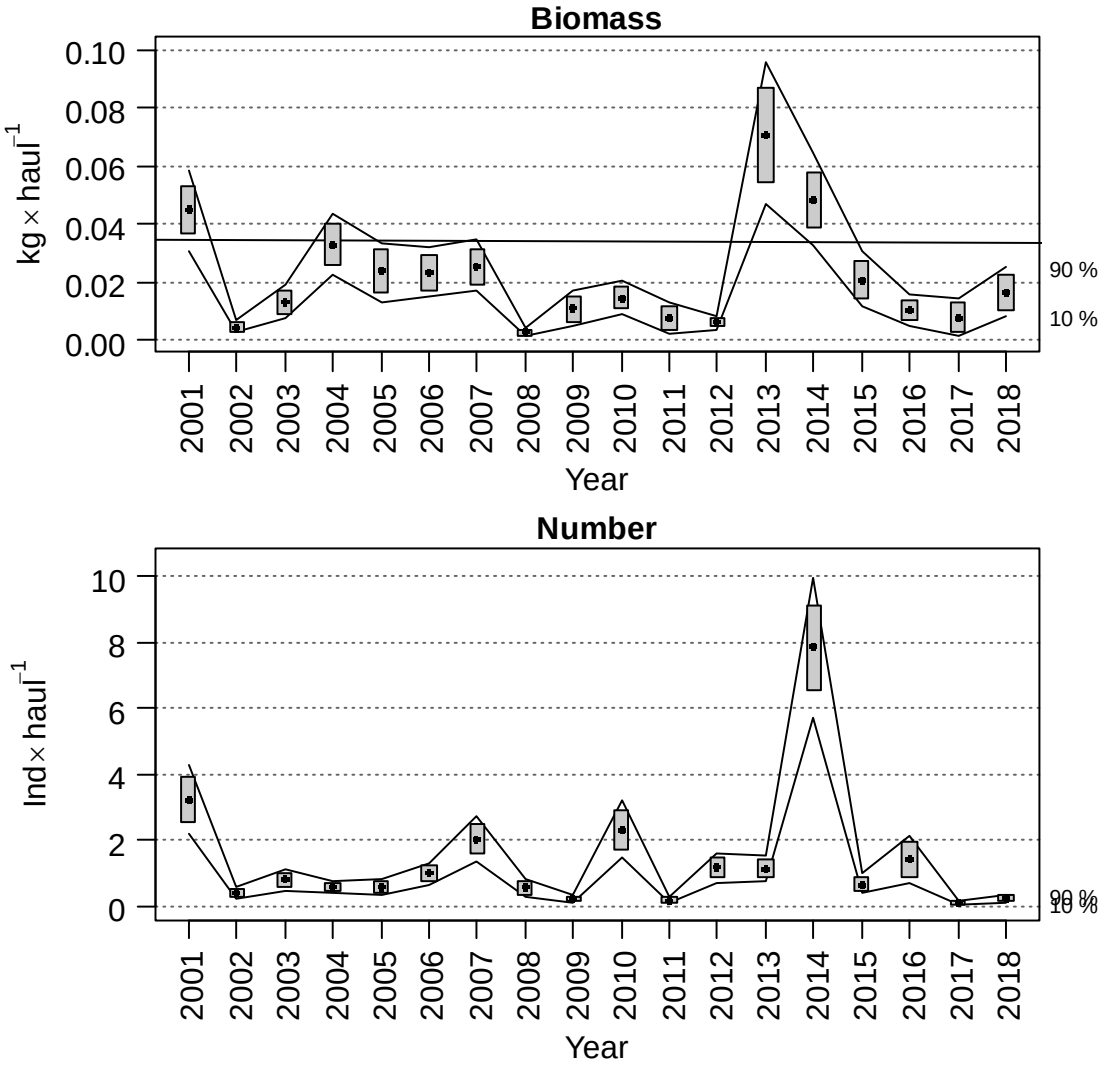


Figure 19 Evolution of *Rossia macrosoma* biomass and abundance indices in Porcupine surveys (2001-2018). Boxes mark parametric standard error of the stratified biomass index. Lines mark bootstrap confidence intervals (α= 0.80, bootstrap iterations = 1000)

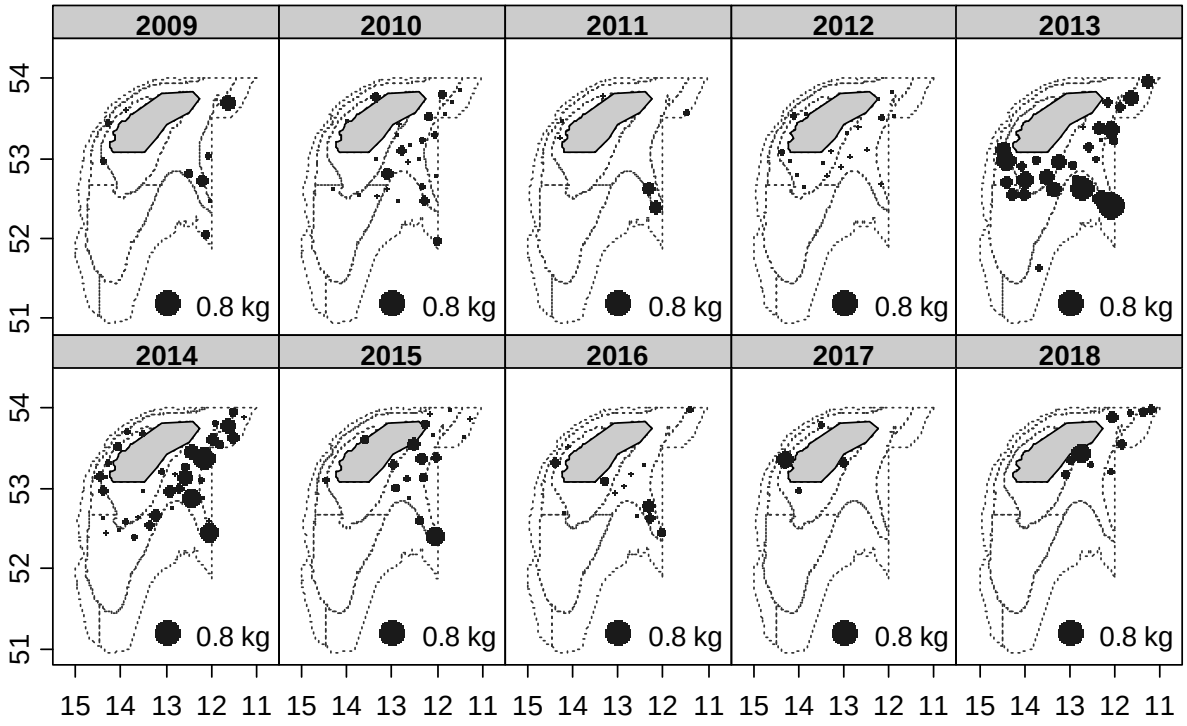


Figure 20 Geographic distribution of *Rossia macrosoma* catches (ind/30 min haul) in Porcupine surveys (2009-2018)