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Results on haddock (*Melanogrammus aeglefinus*), whiting (*Merlangius merlangius*) and Norway lobster (*Nephrops norvegicus*) from the Porcupine Bank Survey (NE Atlantic)

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Abstract

This working document presents the results on haddock (*Melanogrammus aeglefinus*), whiting (*Merlangius merlangius*) and Norway lobster (*Nephrops norvegicus*) caught in the Porcupine Spanish Groundfish Survey (SP-PORC-Q3) in 2019. Biomass, abundance, distribution and length frequency were analysed. These fish species remained low in the study area. In addition, the incidental species *Pleuronectes platessa* and *Solea solea* were not found in 2019 and *Pollachius pollachius* has never been caught in the time series. The crustacean *N. norvergicus* decreased this last survey after the peak of the previous year.

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 (biomass and abundance indices, length frequency and geographic distributions) of the species *Melanogrammus aeglefinus* (haddock), *Merlangius merlangius* (whiting) and *Nephrops norvegicus* (Norway lobster) on the Porcupine bottom trawl surveys after the results presented previously (Ruiz-Pico *et al* 2018; Ruiz-Pico *et al* 2019).

Material and methods

The Spanish Ground Fish Survey on the Porcupine bank (SP-PORC-Q3) has been carried out annually since 2001 on board 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 methodology for the IBTS North Eastern Atlantic surveys (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) has been applied since 2016 to reduce the catches. The biomass indices of the entire time series are not affected by this reduction as the samples are still representative. The results are extrapolated to 30 minutes of trawling time to maintain the consistency of the time series.

Results and discussion

The poor weather conditions posed problems during fishing operations and forced the vessel to shelter at Galway harbour several days. At the end, in 2019, 79 standard valid hauls were carried out but no additional hauls could be done (Figure 1), when usually 5-8 additional hauls are performed each survey. Besides the southeastern area of the strata 1E and the southern slope of sector 2F (Figure 1) were scarcely covered in comparison to other years.

Total stratified catch per haul increased slightly in 2019 (Figure 2). The species analyzed in this report represented only a small percentage of the total fish catch: haddock (0.3%) and whiting (0.01%). However, Norway lobster represented 13% of the total crustacean catch.

In 2019, the biomass and abundance of these two fishes remained quite low. No signs of *M. merlangius* recruits were found, whereas a slight increase was shown in *M. aeglefinus*. In addition, the abundance of specimens around 30 cm of both species also increased slightly. The biomass and abundance of the crustacean *N. norvergicus* decreased in this last survey. Large abundance of adults (> 26 mm), but few juveniles (21-26 mm) and fewer recruits (< 21 mm) were found as in the previous three years.

Melanogrammus aeglefinus (haddock)

In the last four years, the biomass and abundance of *M. aeglefinus* remained among the lower values of the time series after the peak in 2013. In 2019, the values were quite similar to the previous year (Figure 3).

M. aeglefinus was distributed on the Irish shelf, as usual, and a few spots of biomass were found in the south and in the west of the bank (Figure 4).

After the high recruitments in 2016 and 2017, small specimens (< 20 cm) remained being scarce in the study area, although slightly higher than the previous year (Figure 5, Figure 6 and Figure 7). Most specimens ranged from 24 cm to 48 cm, but a few larger specimens (52 to 79 cm) were also found.

Merlangius merlangius (whiting)

Biomass and abundance of *M. merlangius* have been low in the time series. However, the values of the last two surveys were higher than the two previous years (Figure 8) and the rise was more marked in abundance due to the increase of specimens around 30 cm. In 2019, biomass and abundance remained quite similar to the previous year.

A total of 22 specimens were found in three shallow hauls in the north of the Irish shelf, as usual (Figure 9). They ranged from 26 to 44 cm, but the most abundant sizes were around 29 cm (Figure 10).

Nephrops norvegicus (Norway lobster)

Biomass and abundance of *N. norvegicus* decreased in 2019 after the highest peak of the time series in 2018 (Figure 11).

The muddy slope of the Porcupine Seabight is where both adults and recruits of *N. norvegicus* dwell. *Nephrops* remained concentrated in and around the closed area, specifically in 2019, 7 positive catches, representing 49% of the total biomass, were found in the closed area and14 out and around the area, representing 50%. Only 1% of the biomass was found in 21 hauls in the rest of the study area (Figure 12 and Figure 13).

Fewer specimens were found in 2019, fewer recruits (< 21 mm), juveniles (21-26 mm) and adults (> 26mm) (Figure 14). However, the mean individual weight was slightly higher than in 2018 (around 31g.), although still among the lowest values of the time series and reflecting a large abundance of adults, but fewer recruits, as in previous years (Figure 15). Recruits were concentrated mainly in the northern part of the closed area as usual (Figure 16). The length distribution (Figure 17) showed a predominance of adults around 30 mm in this last survey, similarly to the previous three years.

Acknowledgements

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Figures

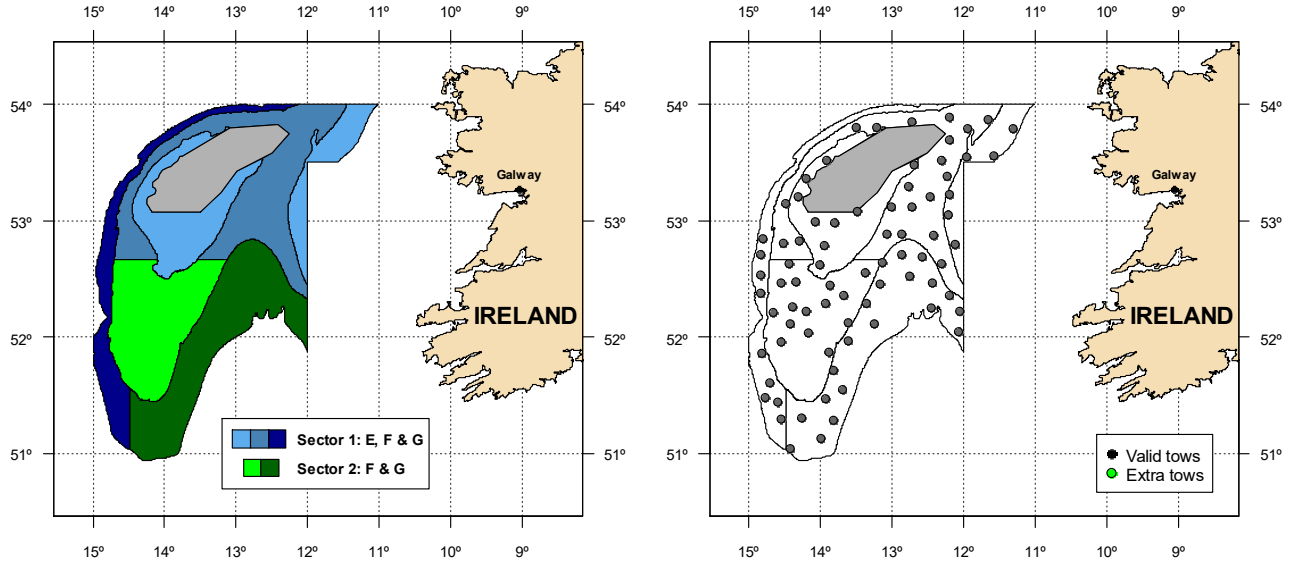

Figure 1. Left: Stratification design used in Porcupine surveys from 2003, previous data were re-stratified. Depth strata are: E) shallower than 300 m, F) 301 – 450 m and G) 451 – 800 m. Grey area in the middle of Porcupine bank corresponds to a large non-trawlable area not considered for area measurements and stratification. Right: hauls performed in 2019

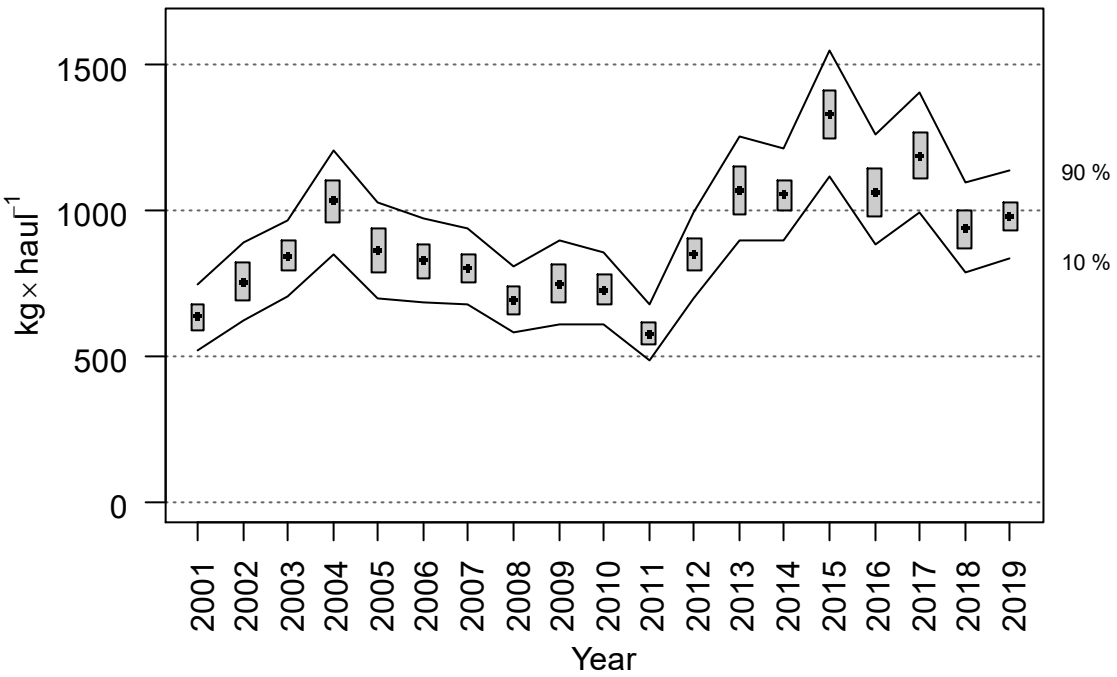

Figure 2. Evolution of the total catch in Porcupine surveys (2001-2019)

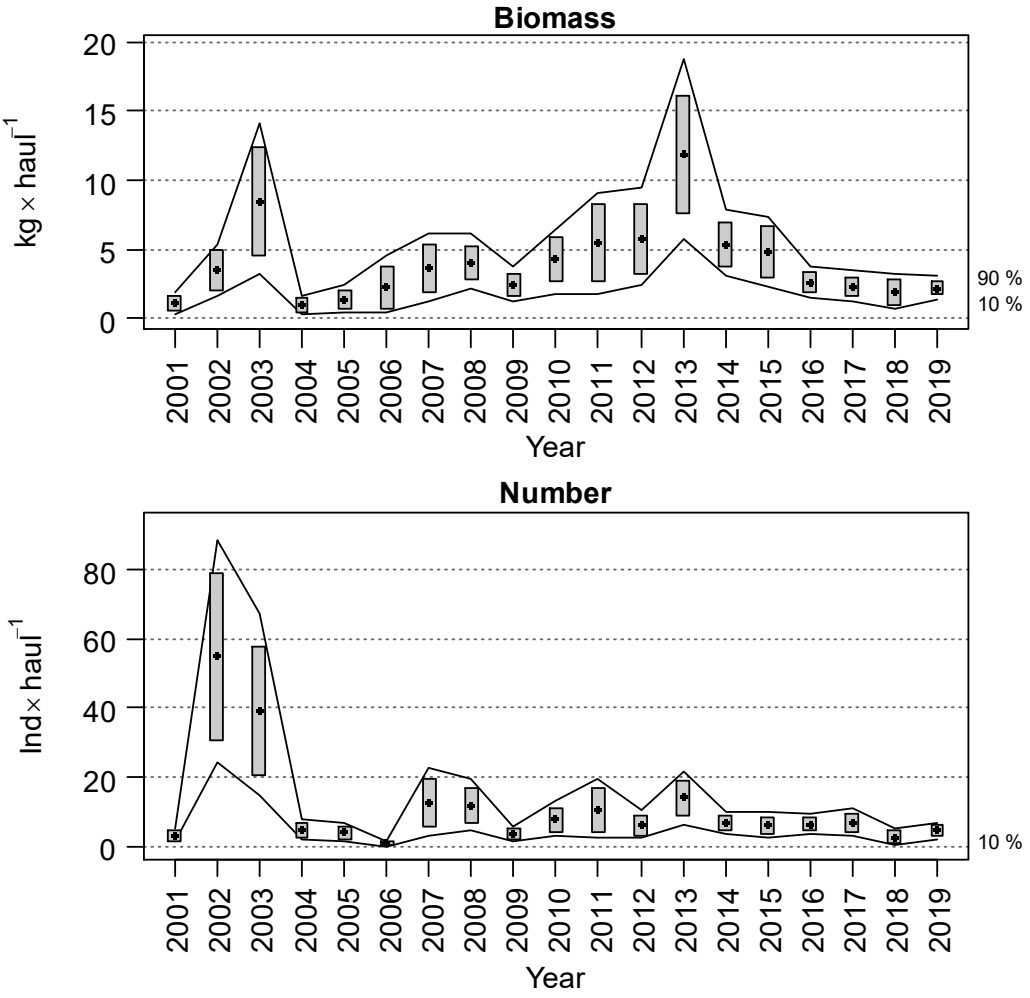

Figure 3. Evolution of *Melanogrammus aeglefinus* biomass and abundance indices in Porcupine surveys (2001-2019). Boxes mark parametric standard error of the stratified abundance index. Lines mark bootstrap confidence intervals (α = 0.80, bootstrap iterations = 1000)

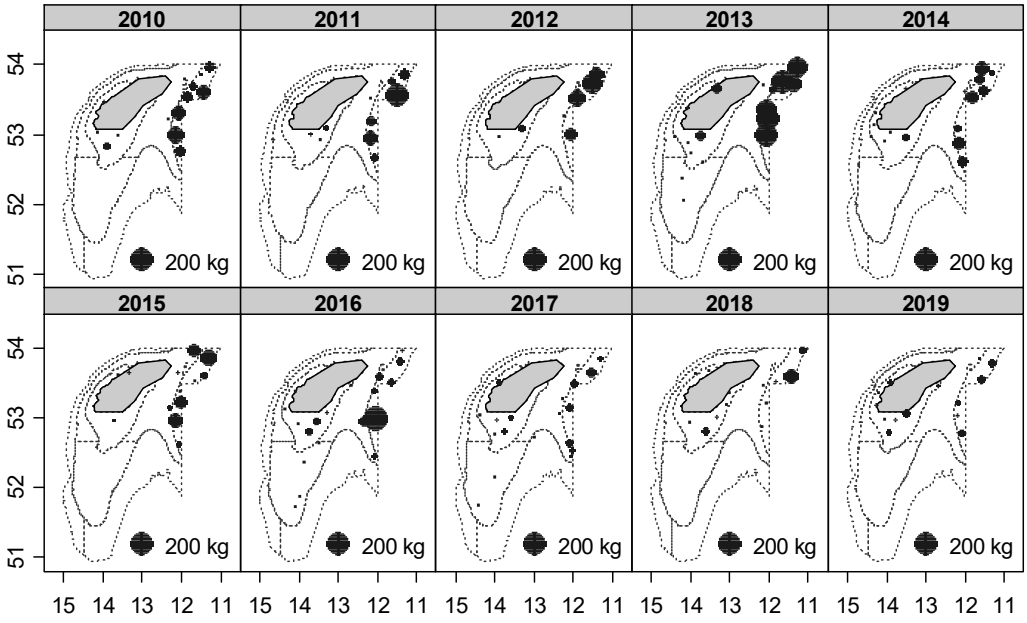

Figure 4. Geographic distribution of *Melanogrammus aeglefinus* catches (kg×30 min haul^{-1}) in Porcupine surveys (2010-2019)

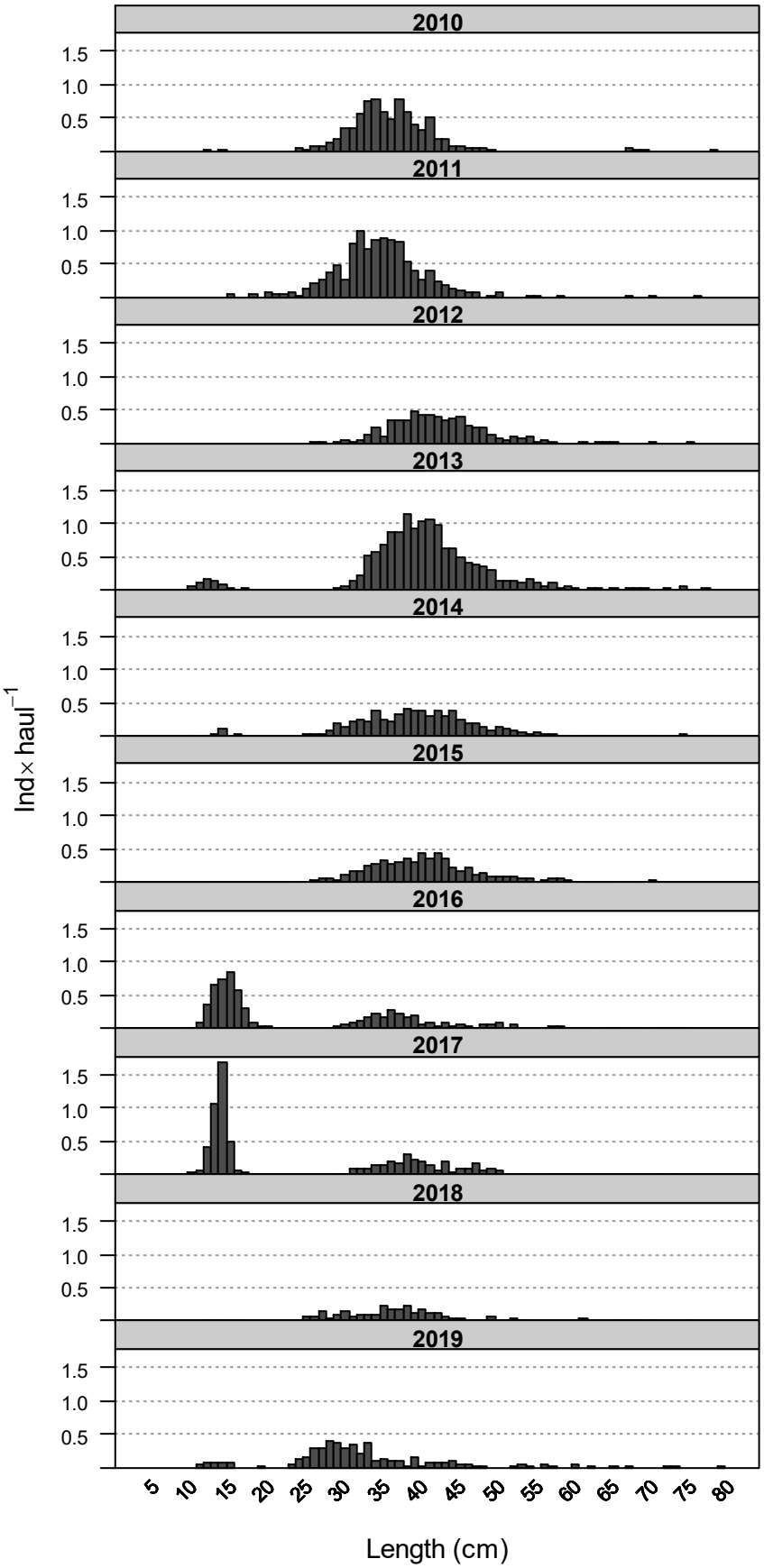

Figure 5. Mean stratified length distributions of *Melanogrammus aeglefinus* in Porcupine surveys (2010-2019)

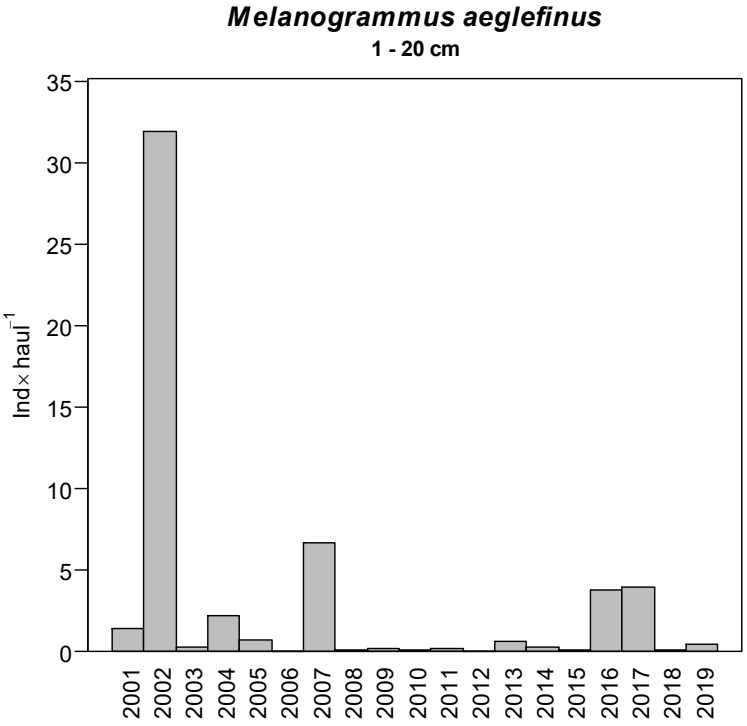

Figure 6. Mean stratified abundance of *Melanogrammus aeglefinus* recruits (< 20 cm) in Porcupine surveys (2001-2019)

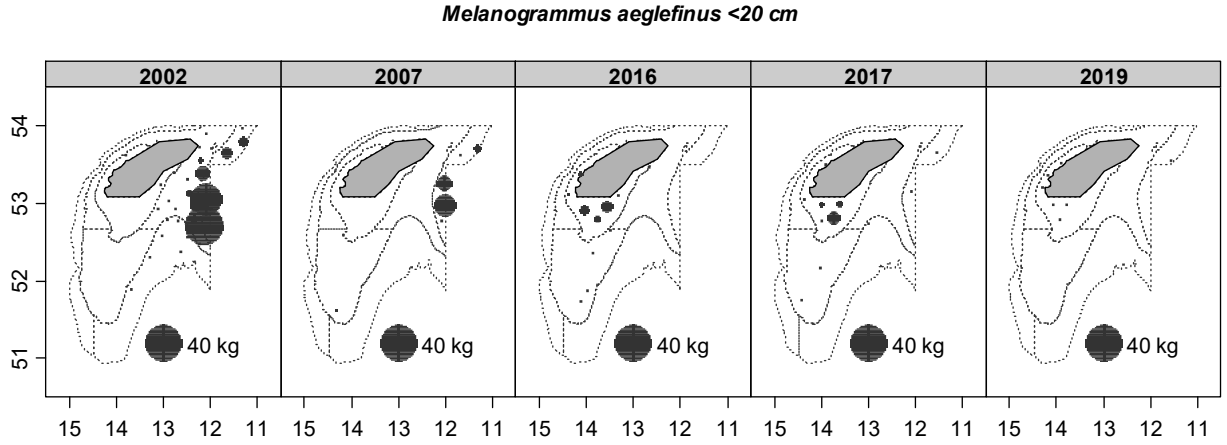

Figure 7. Geographic distribution of *Melanogrammus aeglefinus* recruits (< 20 cm) in Porcupine surveys

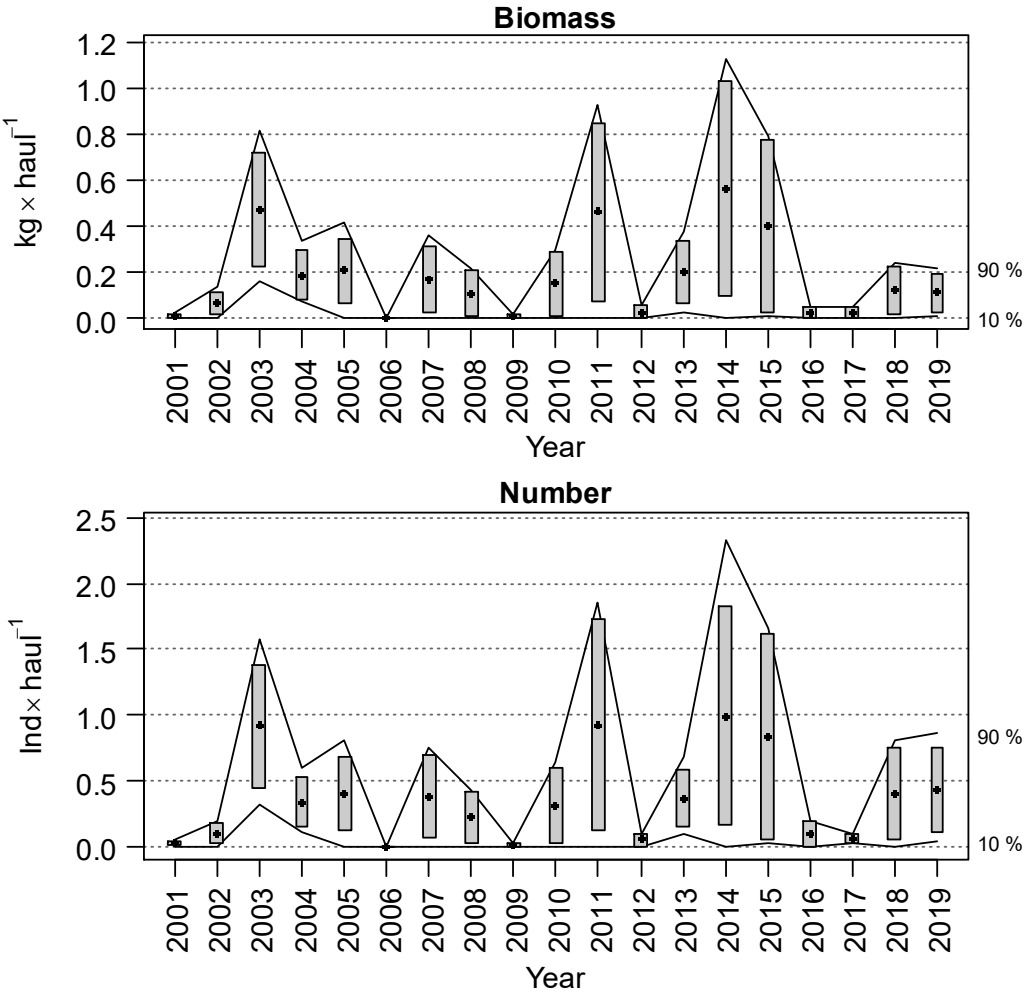

Figure 8. Evolution of *Merlangius merlangus* biomass and abundance indices in Porcupine surveys (2001-2019). Boxes mark parametric standard error of the stratified abundance index. Lines mark bootstrap confidence intervals (α = 0.80, bootstrap iterations = 1000)

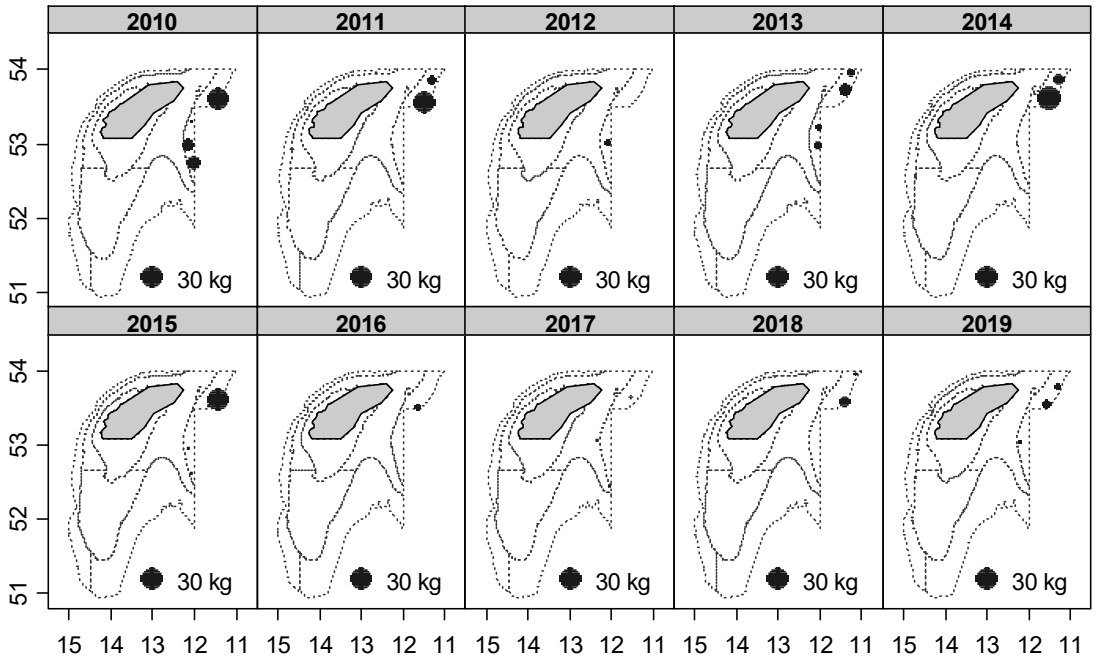

Figure 9. Geographic distribution of *Merlangius merlangus* catches (kg×30 min haul^{-1}) in Porcupine surveys (2010-2019)

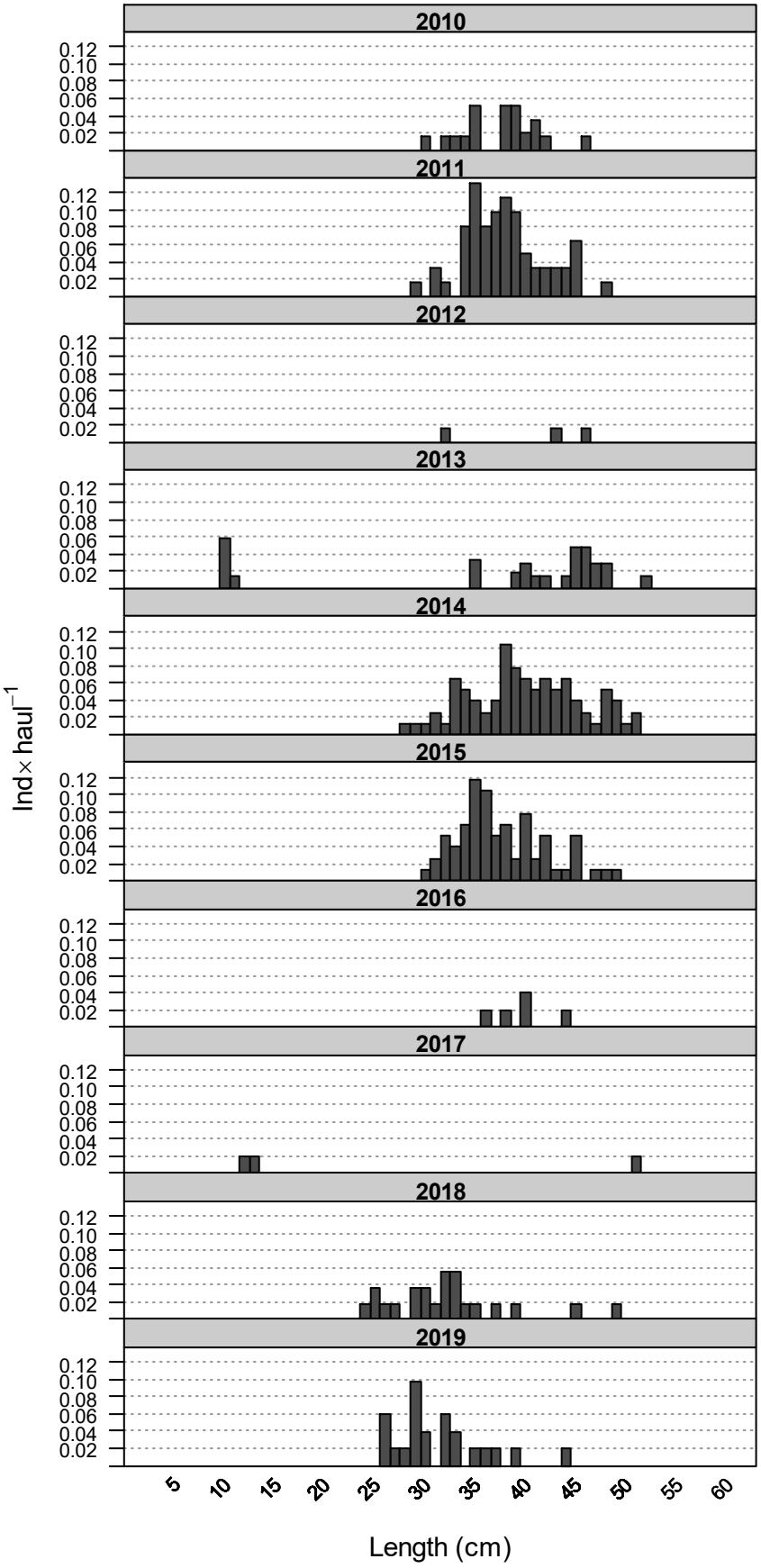

Figure 10. Mean stratified length distribution of *Merlangius merlangus* in Porcupine surveys (2010-2019)

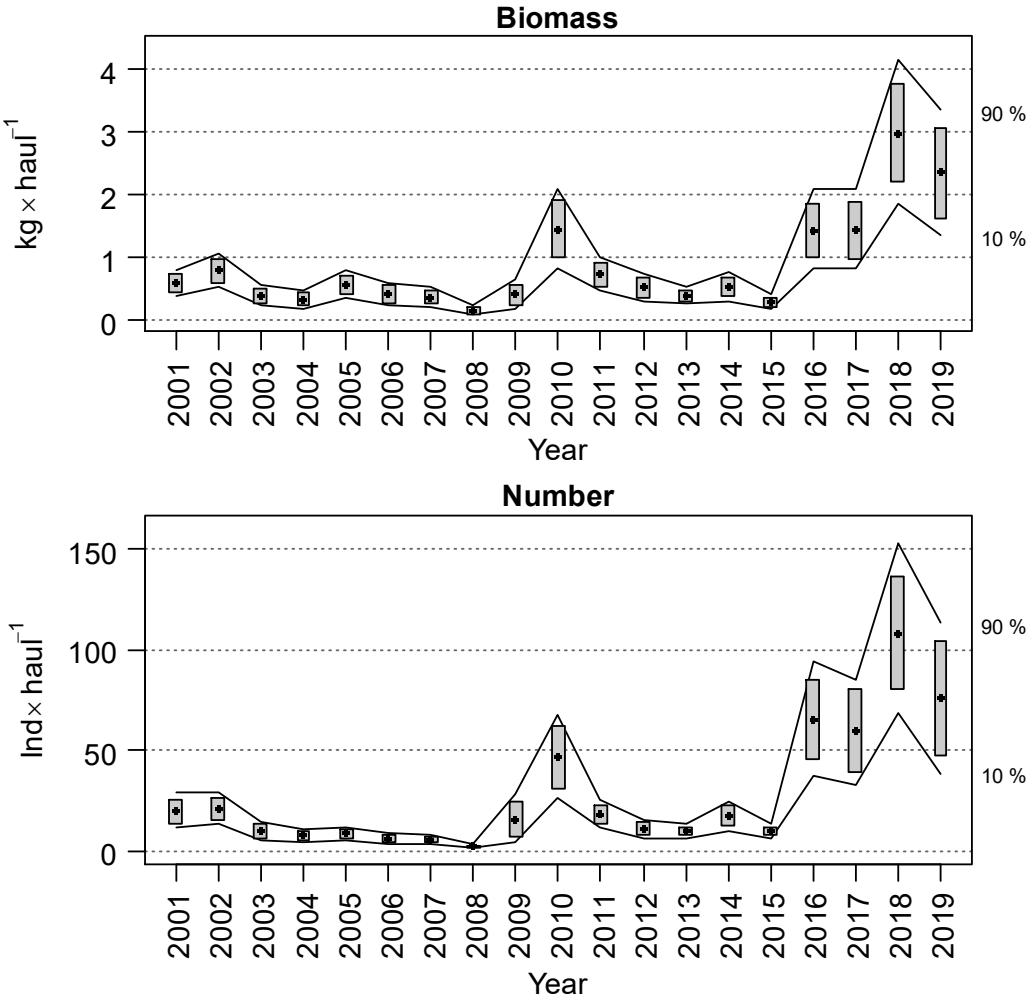

Figure 11. Evolution of *Nephrops norvegicus* biomass and abundance indices in Porcupine surveys (2001-2019). Boxes mark parametric standard error of the stratified abundance index. Lines mark bootstrap confidence intervals (α = 0.80, bootstrap iterations = 1000)

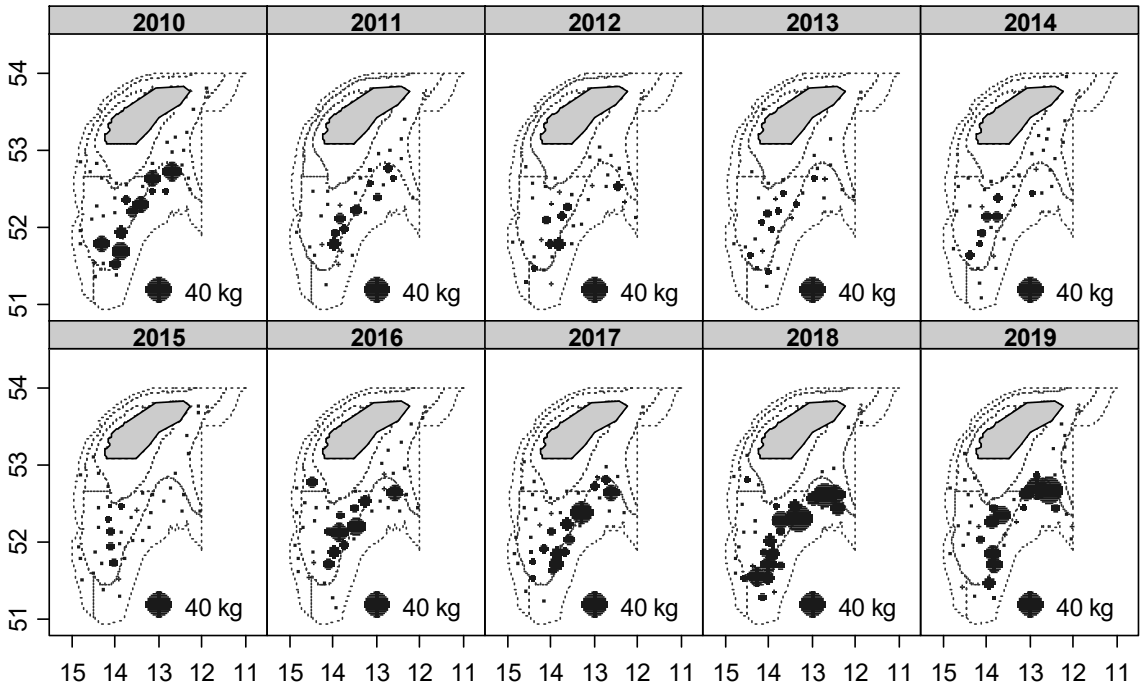

Figure 12. Geographic distribution of *Nephrops norvegicus* catches (kg×30 min haul-1) in Porcupine surveys (2010-2019)

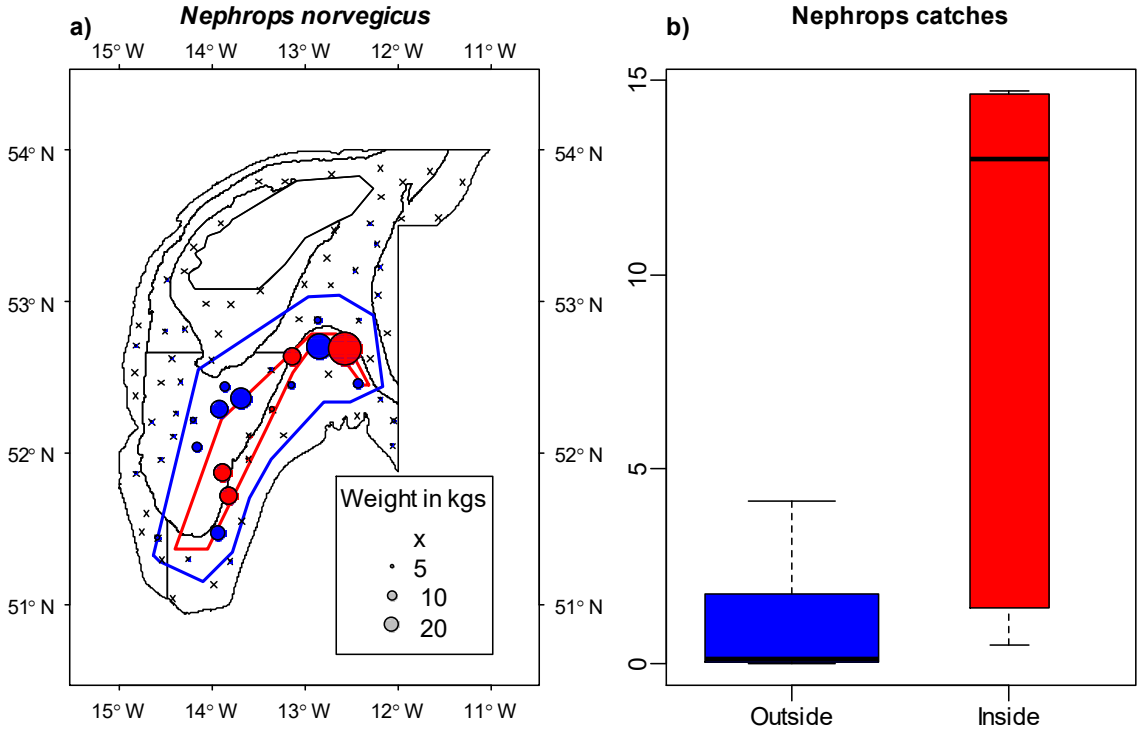

Figure 13. a*) Nephrops norvegicus* catches in Porcupine survey 2019 showing hauls performed inside and outside the area closed to trawl (red line). b) boxplot showing the differences in catches inside an outside the closed area (only hauls with *Nephrops* catches are considered)

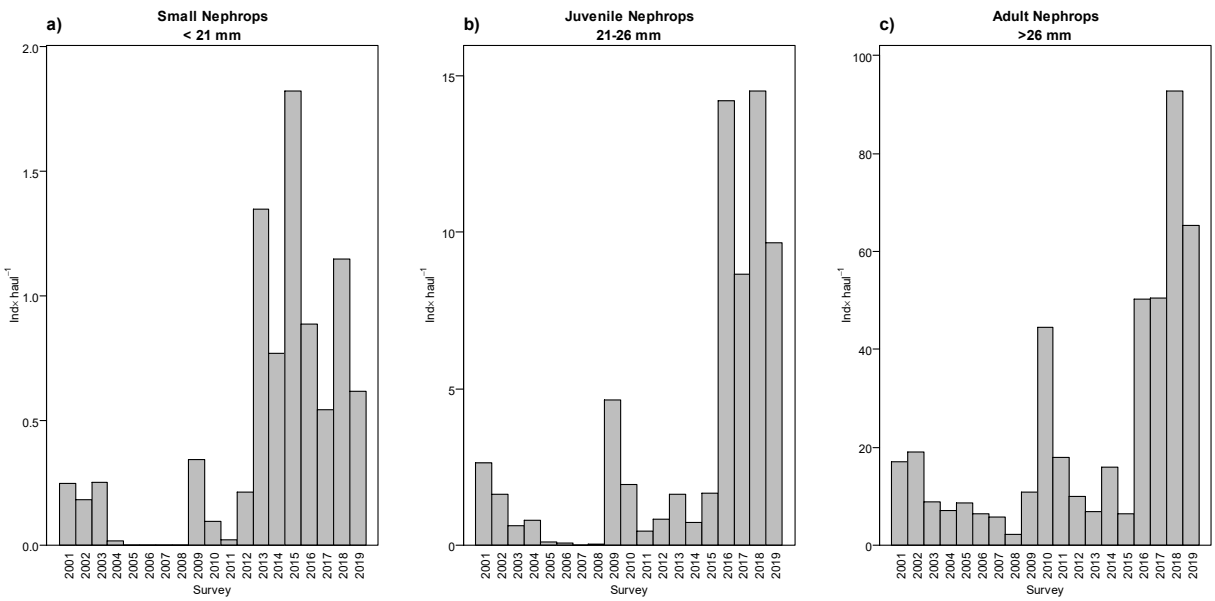

Figure 14. Abundance of small *Nephrops* (<21 mm), juveniles between 21-26 mm and adults (>26 mm) in Porcupine survey 2001-2019

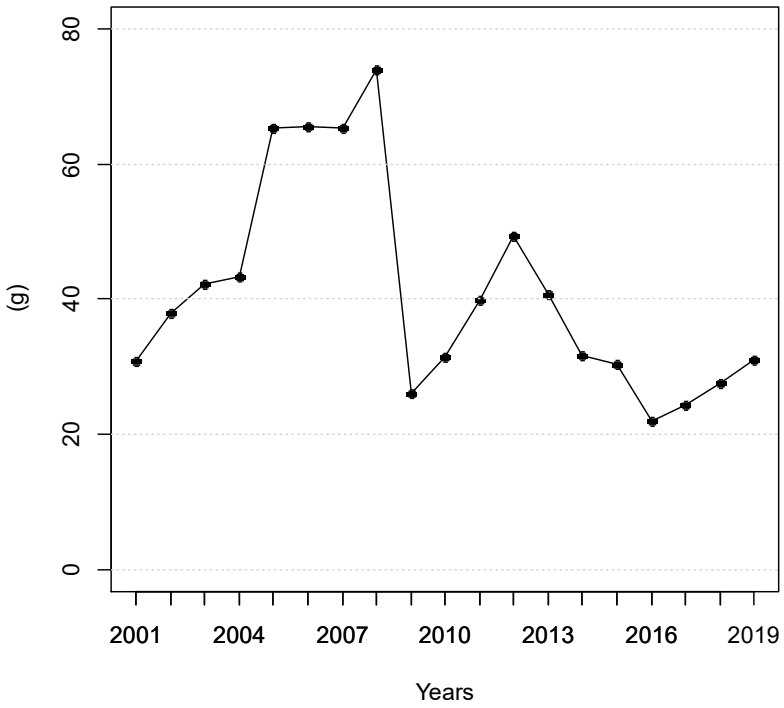

Figure 15. Mean individual weight in Porcupine survey 2001-2019

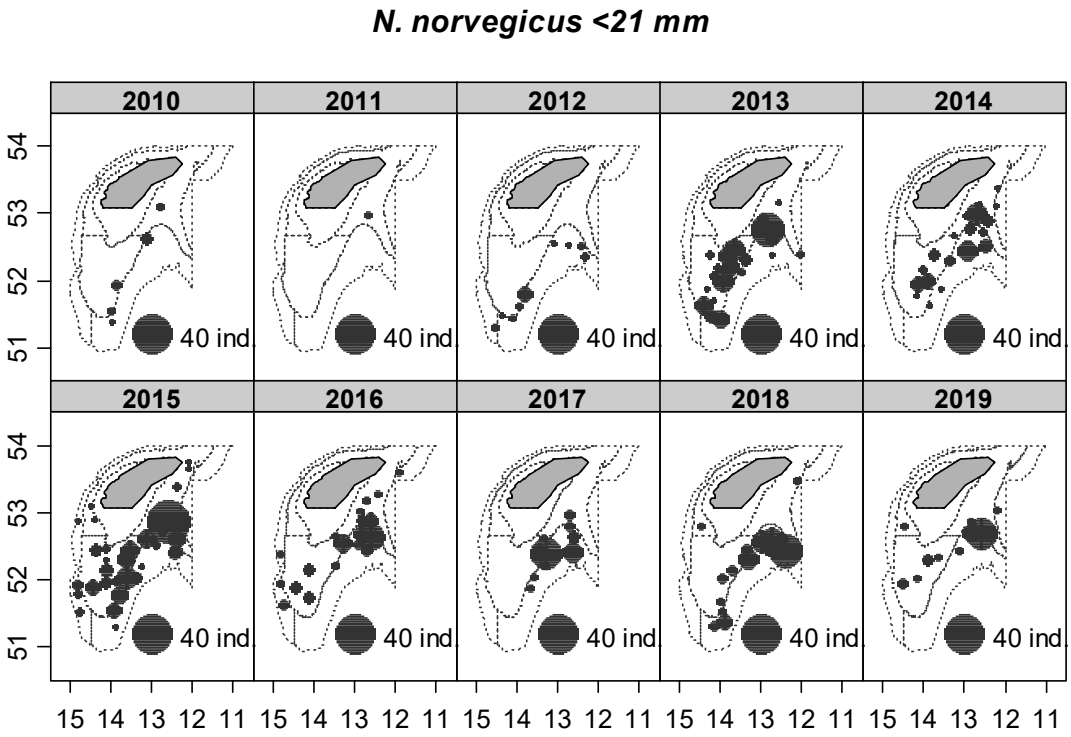

Figure 16. Geographic distribution of *Nephrops norvegicus* recruits (< 21 mm) in Porcupine surveys (2010-2019)

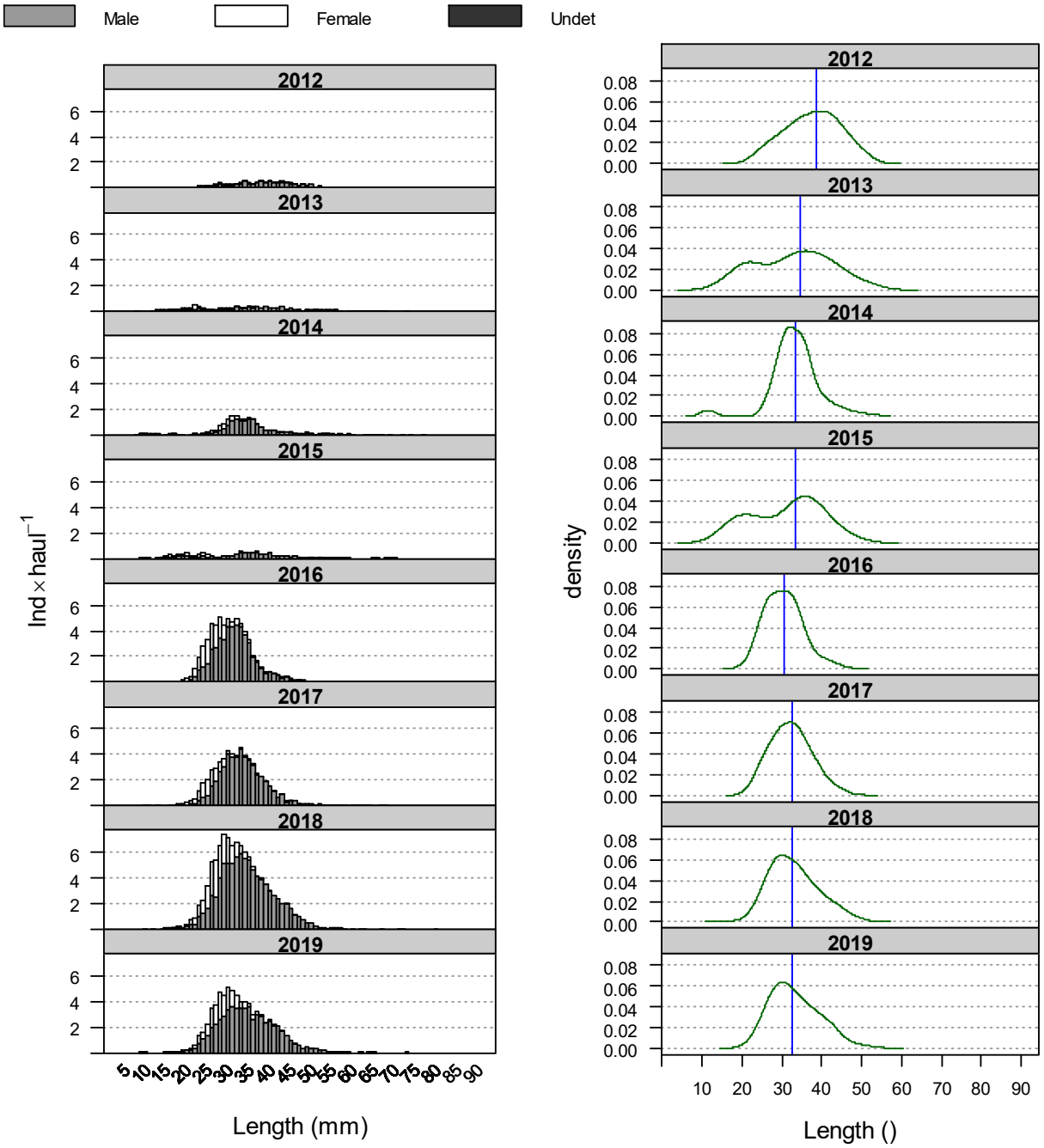

Figure 17. Mean stratified length distributions and length density plots of *Nephrops norvegicus* in Porcupine surveys (2012-2019)