

**Working Document for the Celtic Sea Nephrops, anglerfish,
Rockall megrim and seabass Advice Drafting Group
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**Report on *Nephrops* results from Porcupine Bank
2019 Bottom Trawl Survey**

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Porcupine ground fish survey in 2019 was performed between September the 7th and October the 14th, covering the Porcupine Bank (west of Ireland) to provide data and information for the assessment of the commercial fish species in the area (ICES divisions 7c and 7k. The aim of the survey is to perform 80 hauls from longitude 12° W to 15° W and latitude 51° N to 54° N. The sampling design was random stratified with two geographical sectors (North and South) and three depth strata (> 300 m, 300 – 450 m and 450 - 800 m) following the standard IBTS methodology for the western and southern areas (ICES, 2017) Figure 1 left panel. 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.

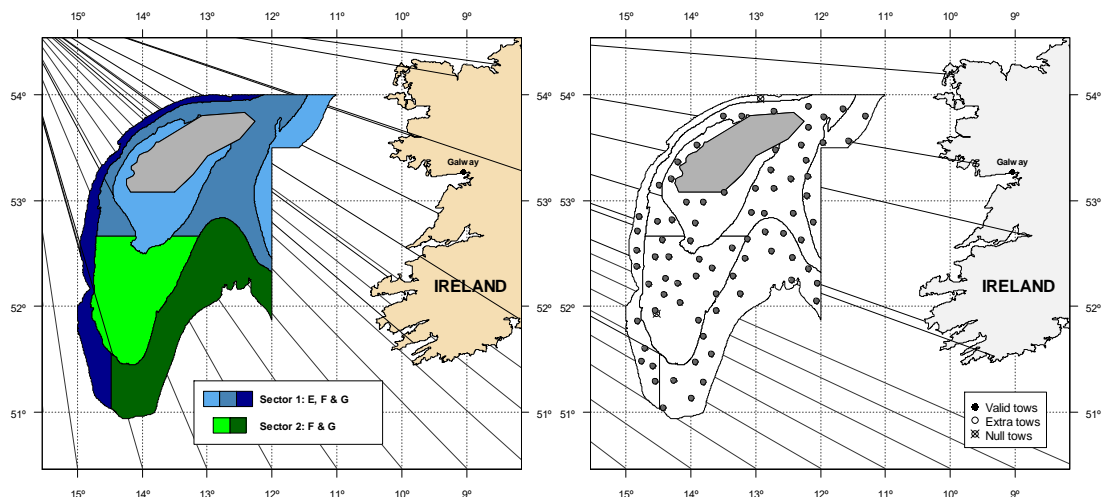


Figure 1 Left: Stratification design and hauls in 2019 Porcupine survey; Straight lines show geographical sectors (North in blue and South in green) and the isobaths delimit the three depth strata (> 300 m light blue (E), 300 – 450 m medium blue and light green (F) and 450 - 800 m dark blue and green (G)). Right: Hauls performed during 2019 Porcupine Survey.

The weather all along the survey was very rough, the vessel had to recall into Galway port four times to shelter from the storms and hurricane Lorenzo, losing there 8 days due to the bad weather conditions and two for a crew exchange. During the survey 79 valid hauls were performed with the standard Porcupine Baca (otter) trawl (Figure 1 right panel), although no special problems with the gear were detected, 2 hauls were invalid due to fasts and damages in the gear, and no extra hauls were performed to fill up the gaps left by the random allocation of the hauls. Among these hauls, due to the bad weather only 7 hauls were performed inside the closure area for *Nephrops* all of them with positive catches although one of them with less than 500 grams and two less than 2 kg. Another 20 hauls were performed around the area, 14 with positive catches and 6 without any *Nephrops* in the catch (Figure 2). Catches inside the closed area this year were not significantly larger than those around the area although the differences were evident, but those three hauls stated with small catches enlarged the range and variability of the catches inside the closed area.

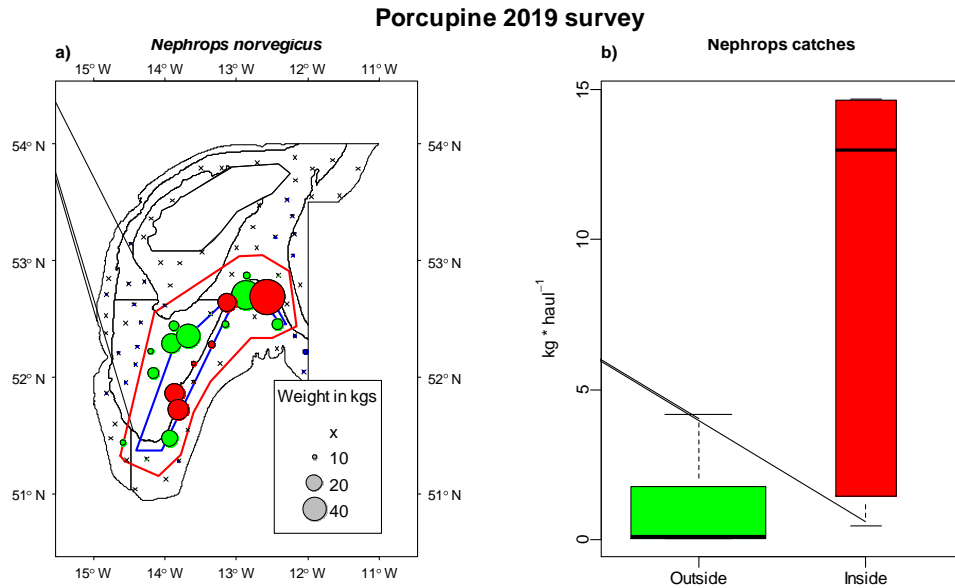


Figure 2. a) *Nephrops norvegicus* catches in Porcupine survey 2019 showing hauls performed inside and outside the area closed to trawl (blue line), and b) boxplot showing the differences in catches inside an outside the closed area (only hauls with *Nephrops* catches are considered)

Nephrops abundance indices in Porcupine 2019 survey (Figure 3) have decreased significantly from previous year results (2019: 2.35 kg/haul, 76 ind/haul, 2018: 2.99 kg/haul, 108 individuals/haul), biomass (21 % decrease) and abundance (30% decrease), but in spite of the decrease 2019 was the second highest values in the time series both in biomass an abundance.

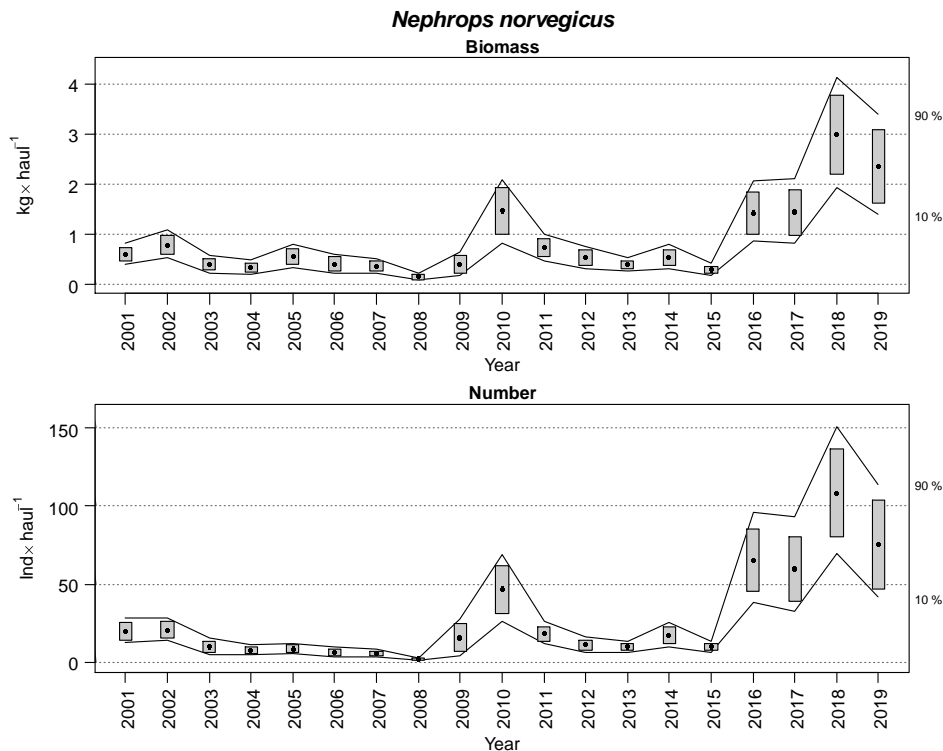


Figure 3. Changes in *Nephrops norvegicus* biomass and number stratified indices during Porcupine Survey time series (2001-2019) Boxes mark parametric standard error of the stratified abundance index. Lines mark bootstrap confidence intervals ($\alpha = 0.80$, bootstrap iterations = 1000).

In the case of *Nephrops* it is relevant to take into account the effect of the area closed to the trawl fishery that affects the areas where *Nephrops* is more abundant (Figure 2a). All the hauls inside the closed area had *Nephrops* catches, and the catches were clearly larger than in the rest of the area (Figure 2b). Nevertheless around the area there were also some hauls with significant catches of *Nephrops*, these were

clearly smaller than in the previous year (Figure 4), being the main difference that in 2018 all hauls inside the closed area had catches larger than 4 kg and almost all more than 8 kg, while in 2019 three of them had less than 2 kg. On the other side in 2019 the largest catch inside the closed area (45 kg) was larger than in 2018 (43.8 kg).

Porcupine 2018 survey

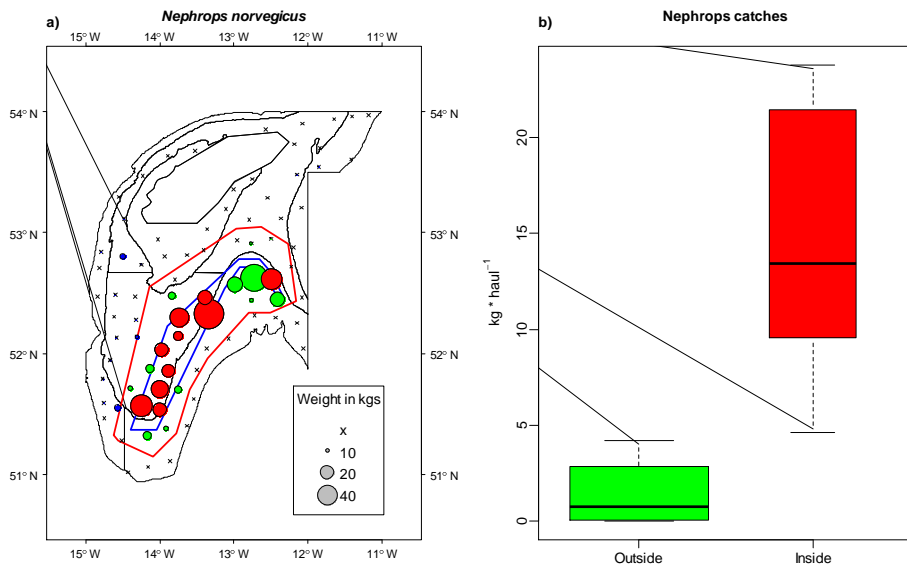


Figure 4. *Nephrops norvegicus* catches in Porcupine survey 2018 showing hauls performed inside and outside the area closed to trawl (blue line).

Regarding length distributions (Figure 5 left panel) show *Nephrops norvegicus* stratified length distributions per 30 min haul in the last eight years, 2019 is similar to the previous three years, 2016 to 2018, but with larger presence of large females in 2018 and 2019. Looking at the density functions (Figure 5 right panel) 2019 appears quite similar to the other years with larger abundances, i.e. 2016, 2017 and 2018.

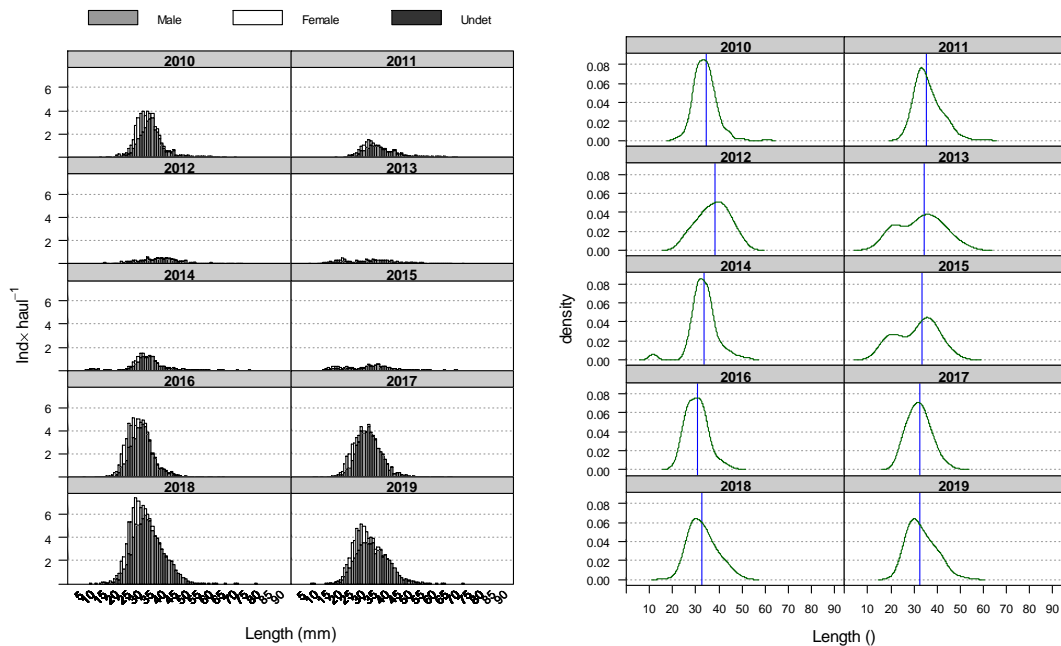


Figure 5. Left panel: Mean stratified length distributions of *Nephrops norvegicus* in the last 10 years of Porcupine survey time series.
Right panel: Length distributions of *Nephrops* as density functions.

Figure 6 shows the abundances of different age groups 0, 1, 2 and 3+ years. On Figure 6 a) in 2019 there were more small *Nephrops* than in 2018, being the third value in the series. But in 2019, there has been also a decrease in all age groups except 0 compared to 2018, but in general 2019 is the third largest value of the series after 2018 and 2016, and it is the second in large individuals 3+.

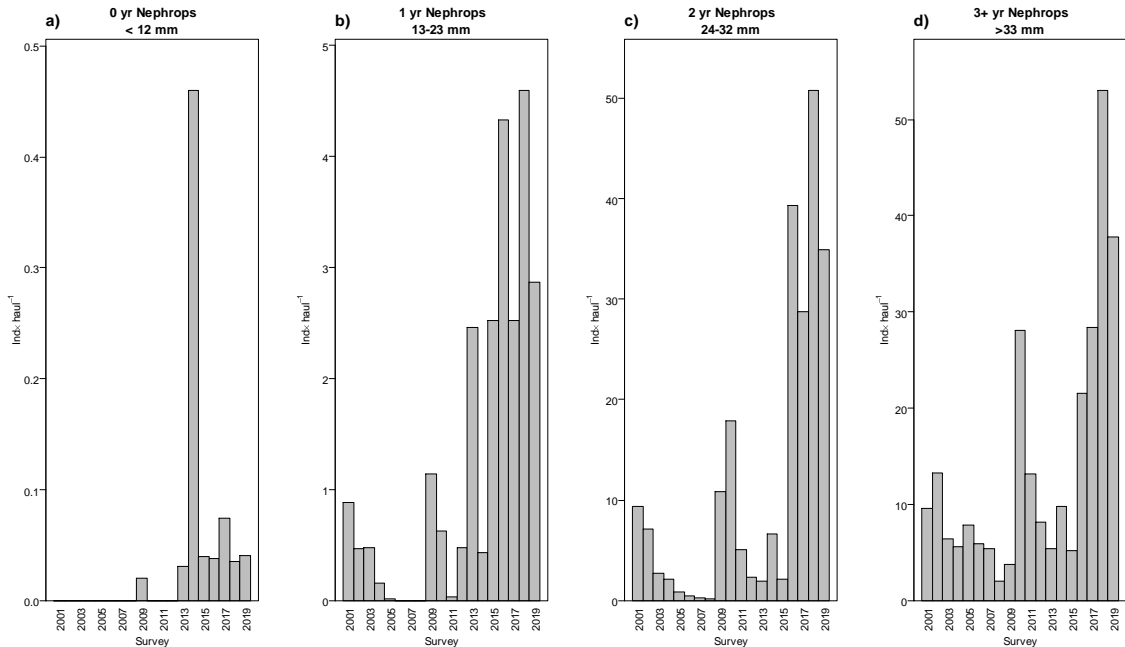


Figure 6. Abundance of a) 0 year *Nephrops* (<12 mm), b) 1 year *Nephrops* (13-23 mm), c) 2 yrs *Nephrops* (24-32 mm) and 3+ *Nephrops* (>33 mm) in Porcupine survey 2001-2019.

The geographical distribution of *Nephrops* around the Porcupine Bank in 2019, follows the usual pattern found in most of the years, especially in the years with large abundance of *Nephrops* i.e. 2010 and 2016-2019 (Figure 7), that also shows how the muddy slope of the Porcupine Seabight is where both adults and juveniles dwell, but in 2018 the *recruits* appeared in an enlarged area compared to 2017 when most recruits were centred in a smaller area where they have been mostly found in 2019.

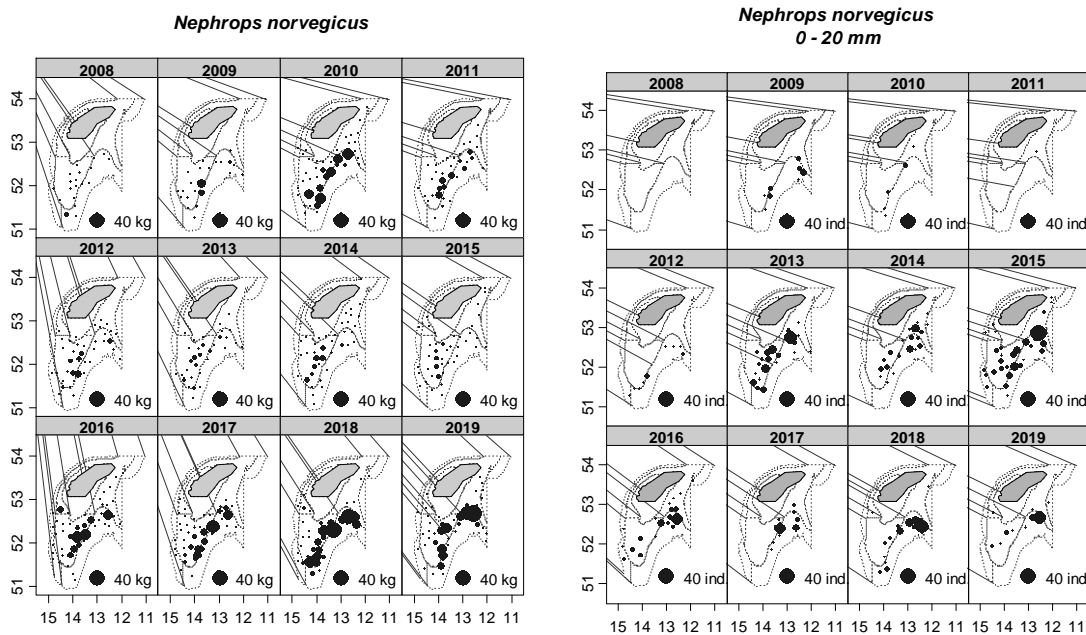


Figure 7. Distribution of *Nephrops norvegicus* in Porcupine surveys between 2008 and 2019
left panel: Biomass
right panel: No. juveniles (≤ 20 mm carapace length)

The mean weight per individual (Figure 8) keeps the increasing trend after 2016, reaching again values similar to those in 2015 and 2010, still much smaller than in most of the years, reflecting the relatively large abundance of juveniles and adults, but less recruits (Figure 6).

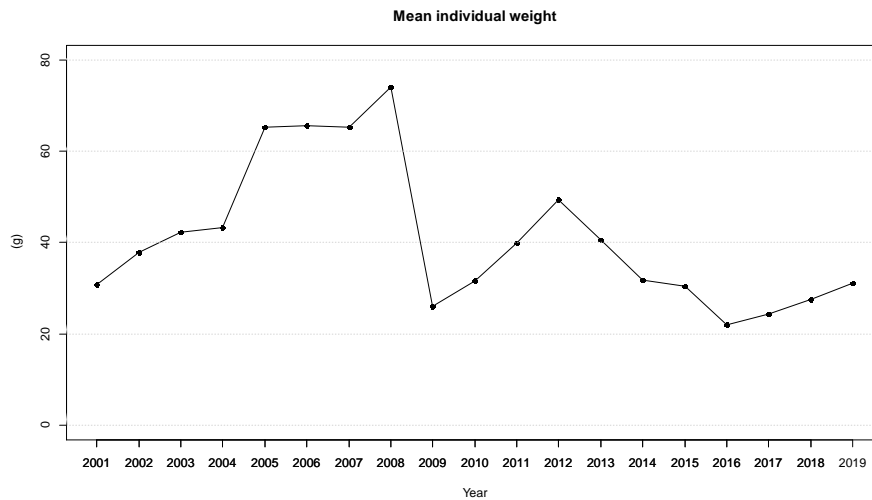


Figure 8. Mean weight per individual along the Porcupine Bank surveys carried out between 2001 and 2019.

Acknowledgements

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References

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