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17 Norway lobster (*Nephrops norvegicus*) in divisions 7.b–c and 7.j–Km Functional Unit 16 (west and southwest of Ireland)

Type of assessment in 2022

Available data on the fishery for 2021 and other stock indicators have been updated here according to the stock annex ([Nephrops FU16](#)). The assessment and catch options follow the agreed procedures set out in the stock annex; however, mean weight calculations for 2020 and 2021 deviated from the stock annex and are detailed in 17.4 Data section below.

ICES advice applicable to 2021

“ICES advises that when the EU multiannual plan (MAP) for Western Waters and adjacent waters is applied, and assuming zero discards, catches in 2021 that correspond to the F ranges in the MAP are between 2653 tonnes and 3290 tonnes. The entire range is considered precautionary when applying the ICES advice rule.

To ensure that the stock in Functional Unit (FU) 16 is exploited sustainably, management should be implemented at the functional unit level.”

ICES advice applicable to 2022

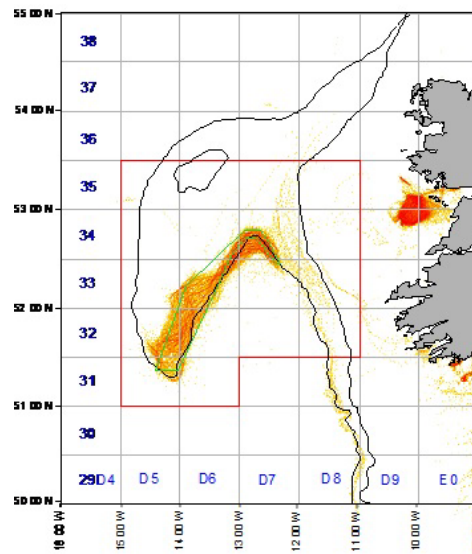
“ICES advises that when the EU multiannual plan (MAP) for Western Waters and adjacent waters is applied, and assuming zero discards, catches in 2022 that correspond to the F ranges in the MAP are between 2261 and 2804 tonnes. The entire range is considered precautionary when applying ICES advice rule.

To ensure that the stock in FU 16 is exploited sustainably, management should be continued at the FU level.”

17.1 General

Stock description and management units

The TAC area is Subarea 7, since 2011 an ‘of which’ clause was introduced specifically for the Porcupine Bank (FU16) see Table 20.1. The Functional Unit for assessment includes some parts of the following ICES divisions 7.b, c, j, and k. The exact stock area is shown on the map below and includes the following ICES Statistical rectangles: 31–35 D5–D6; 32–35 D7–D8.



The FU16 outlined by the red line. The closed area from 1 May–31 July since 2010 (reduced to only May since 2013) is shown with a green line. Irish *Nephrops* directed fishing effort between 2006–2009 derived from integrated VMS and logbook information is shown as a heat map.

Management applicable to 2021 and 2022

TAC in 2021

Council Regulation (EU) 2021/92 of 28 January 2021 fixing for 2021 the fishing opportunities for certain fish stocks and groups of fish stocks, applicable in Union waters and, for Union fishing vessels, in certain non-Union waters.

Species:	Norway lobster <i>Nephrops norvegicus</i>	Zone:	7 (NEP/07.)
Spain	993 ⁽¹⁾	Analytical TAC	
France	4 023 ⁽¹⁾		
Ireland	6 102 ⁽¹⁾		
Union	11 118 ⁽¹⁾		
United Kingdom	6 908 ⁽¹⁾		
TAC	18 026 ⁽¹⁾		

⁽¹⁾ Special condition: within the limits of the abovementioned quotas, no more than the quantities given below may be taken in the following zone:

Functional Unit 16 of ICES Subarea 7 (NEP/*07U16):

Spain	992
France	621
Ireland	1 194
Union	2 807
United Kingdom	483
TAC	3 290

TAC in 2022

Council Regulation (EU) 2022/515 of 31 March 2022 amending Regulation (EU) 2021/109 fixing for 2022 the fishing opportunities for certain fish stocks and groups of fish stocks applicable in Union waters and for Union fishing vessels in certain non-Union waters.

Species:	Norway lobster <i>Nephrops norvegicus</i>	Zone:	7 (NEP/07.)
Spain	924	(1)	Analytical TAC
France	3 746	(1)	
Ireland	5 682	(1)	
Union	10 352	(1)	
United Kingdom	6 686	(1)	
TAC	17 038	(1)	
(1)	Special condition: within the limits of these quotas, no more than the quantities given below may be taken in the following zone: Functional unit 16 of ICES subarea 7 (NEP/*07U16)		
Spain	846		
France	530		
Ireland	1 016		
Union	2 392		
United Kingdom	412		

17.2 Closed area restrictions

A seasonal closed area has been in place for three months May 1–31 July between 2010–2012 (shown in the map above and coordinates below). The period of the EU regulatory closure was reduced to only one month between 2013 and 2019 (Council Regulation 2019/124, *Article 13*).

The following TCMs are in place for *Nephrops* in 7 (excluding 7.a) after EC 850/98 in operation since 2000. Minimum Landing Sizes (MLS); total length >85 mm, carapace length >25 mm, tail length >46 mm. Although it is legal to land smaller prawns from this fishery, marketing restrictions imposed by producer organizations in France mean smaller *Nephrops* (<35 mm CL or 115 mm whole length) are not retained in this fishery.

The mesh size restrictions apply to towed gears in 7.b–k targeting *Nephrops* and are given in Section 7.1. Vessels mainly used 80–99 mm mesh to target *Nephrops* on the Porcupine Bank.

The landing obligation applied since 2016 for certain vessels that matched the criteria set out in the discard plans: https://ec.europa.eu/fisheries/cfp/fishing_rules/discards_en

17.3 Fishery in 2021

WGCSE reviewed effort trends for Irish vessels that accounted for 65% of the total landings in 2021. The Irish fishery in 2021 took place up to April, after which the fishery was closed, but was reopened from October to December. In 2017 the industry reported very good catches of *Nephrops* but commented that the mean size declined significantly; however, mean sizes increased in 2018 and 2019, decreased again in 2020 and increased in 2021 (Figure 20.4).

Effect of regulations

Prior to 2011 TACs and quotas were applied to the whole Subarea 7, so the FU16 fishery was not restricted by quotas. Since 2011, the “of which clause” was implemented in the TAC regulation specifically for the Porcupine Bank. Quotas have been very restrictive for Irish vessels and this has led to various changes in fishing patterns. Vessels have tried to optimise the economic value of the catch by targeting areas and periods with relatively smaller¹ volumes of larger higher value *Nephrops*. The FU16 specific quota has also increased area misreporting in the past and the risk of discarding. An unallocated component related to area misreporting was included in the assessment from 2011 to 2017. Since 2018, following the implementation of new legislation limiting fishing trips to single functional units, misreporting was not included in the assessment.

Information from stakeholders

The provision of grade information by individual fishers and coops remains a highly important assessment input. However, in 2020 and 2021 graded information was not used in the assessment.

Year	% of Irish landings where grade data were provided
2011	60%
2012	45%
2013	57%
2014	33%
2015	44%
2016	49%
2017	31%
2018	31%
2019	50%

The industry collaborated with the development of an Irish Fisheries Science Research Partnership survey in 2010 (Stokes and Lordan, 2011).

The Irish industry considers that the stock has increased significantly and no longer requires the Functional Unit “*of which*” clause.

¹ There is a large price differential between the large and small grades. So less volume of the larger grade generates an economically viable return for fishing.

17.4 Data

InterCatch

Data were available in InterCatch and used on a trial basis.

Landings

Total international landings increased by 30% in 2021 to 2476 t (Figure 20.1 and Table 20.2). From 2011 to 2017 total landings for FU16 had included “unallocated landings” from other FU due to misreporting. Since 2018 no reallocation has been applied as there was no information concerning misreporting.

Sampling levels

Sampling levels, data aggregating and raising procedures were reviewed by WKNEPH 2013, and are documented in the stock annex. Recent sampling rate is provided in Table 20.3.

Since 2010 landings length distributions have been reconstructed using the methods outlined in the stock annex. This involves using samples of the grade length structure from Irish sampling and estimates of the volume of each commercial size grade provided by the fishing industry. This was used to reconstruct Irish LFDs; landings by other fleets, which accounted for ~23% of the total landings from 2010 to 2019, were unsampled.

In 2020 and 2021, due to the low sampling levels of graded landings caused by COVID-19 restrictions, efforts were made to adapt the sampling programme. Unsorted catch samples were collected from five and 12 *Nephrops* fishing trips, respectively in 2020 and 2021.

Commercial length–frequency distributions

The time-series of raised international length–frequency distributions of the sampled landings by sex are given in Figure 20.2. This also shows significant shift towards larger individuals in the landings between 2002–2009 when few individuals at smaller sizes were observed. The length distribution in 2019 was similar to 2018. The mean lengths by sex and year are presented in Table 20.4. These figures and tables are not updated for 2020 and 2021.

Sex ratio

Previous *Nephrops* working groups have highlighted stability in sex ratio as an important indicator for *Nephrops* stocks. The landings and fishery-independent survey catches show a dramatic switch in the sex ratio for this stock with larger proportions of females in the catches of 2008 and 2009 (Figure 20.3). Both the commercial and survey data indicate that sex ratio switched back to a more usual situation since 2010 with males accounting for larger proportions of the catch/landings.

Nephrops moult once a year shortly after hatching of eggs in April or May. There is a 24-hour period after moulting when the male *Nephrops* can mate with the female (Farmer, 1974). If there are insufficient males in the population to mate with the recently moulted females, this can result in a change in female behaviour whereby unmated females concentrate on feeding and growth instead of reproduction. This so called “sperm limitation” hypothesis could explain the sex ratio changes observed in the Porcupine *Nephrops*. WKNEPH 2013 examined the available scientific data on proportions of females mated observed on the Spanish survey. These results showed

high proportions of unmated females and a high L_{50} for mated females in catches in 2009. Simulations were also carried out to investigate the densities at which sperm limitation may become an issue given plausible ranges of stock density, sex ratios, search radii. The conclusion was that at the densities recently observed on the Porcupine Bank that sperm limitation was a real possibility.

Mean weight explorations

The mean weights in the landings are shown for the full time-series in Figure 20.4 and Table 20.5. In 2020 and 2021, due to COVID-19 restrictions, mean weight calculations deviated from the stock annex and were estimated using the average mean weights of catch samples from five *Nephrops* fishing trips.

Discards

There are few historical estimates of discards for this stock. Irish sampling up to 2016 observed very minimal discarding (mainly limited to small and damaged individuals <5% by number). Four Irish trips were sampled in 2016. Discards were not recorded on one of these trips. However, on the other three trips, discards were estimated to be around 8%, 9% and 15% by number (3%, 3% and 6% by weight). In 2017 there were two trips where discards were recorded, 17% and 43% by number. In 2018 discards were observed on one of the two trips (74% by number) no discards were observed on the other trip. In 2019, discards were observed in two of the four trips (13% and 29% by number). In 2020 discards were observed in two of the five trips. In 2021 discards were observed in four of the 12 trips. The discarding observed on these trips is likely not reflective of the overall discard pattern as the skippers advised the scientist on board that they had increased their discards to remain within quota during the observed trip. This means that the current discard pattern is unknown, but can be no longer considered negligible.

A detailed examination of discard estimates was provided in Spain in 2014. No estimate was provided in InterCatch by Spain since 2015.

Abundance indices from UWTV surveys

Operational details of the 2022 UWTV survey are available (Aristegui *et al.*, 2022). These surveys use the standard UWTV methodology and conforms to WGNPS best practice and guidelines, documented in Dobby H., *et al.*, 2021. WKNEPH 2013 recommended that these surveys could be used for assessment and provision of catch options. The results are given in Table 20.6. Further detail of the survey is provided in the annex and annual survey reports are available at <http://oar.marine.ie/handle/10793/59>.

Trawl surveys

The longest time-series of fishery-independent source of data is from the Spanish Porcupine trawl survey 2001–2021 (SpPGFS-WIBTS-Q4). This survey is carried out in September when *Nephrops* catchability is quite low, particularly of adults. Further information on this survey is provided in the IBTS report (ICES, 2015) and in previous IBTS reports. Data from 2021 survey for this report was taken from Velasco *et al.* (in draft).

Distribution of *Nephrops* catches and biomass in Porcupine surveys between 2001 and 2021 is shown in Figure 20.5. There was a year effect in 2008 when unusual gear parameters were observed. Catch rates in 2011 may also have been reduced due to exceptionally poor weather and gear performance issues. The stratified abundance estimate and biomass increased significantly from 2015 to 2018, decreased in 2019 and 2020, and increased again in 2021 (Figure 20.6).

The size structure of the catches in the survey shows two things: a lower mean size than in the commercial fleets and an increasing trend in mean size for both sexes up to 2008. In 2009, there is large reduction of mean size in both sexes due to a recruiting year class with a modal length at around 27 mm (possibly the 2006 year class). Tracking of cohorts was carried out at WKNEPH 2013 but the results are inconclusive (ICES, 2013). The survey showed increased recruitment between 2013 and 2019 with significantly increased catch rates of individuals <24 mm (Figure 20.7). This has also led to increase catch rates of juveniles and adult *Nephrops* since 2016.

An Irish Fisheries Science Research Partnership (IFSRP) survey was developed in collaboration with the Irish fishing industry to obtain data from the closed area in 2010–2012. Details of the design and methodology are presented in Stokes and Lordan (2011). The survey uses both commercial gear (Comm) and a baca trawl similar to the SpPGFS-WIBTS-Q4. WKNEPH concluded that the IFSRP trawl survey is too short (with changes in coverage, gears and vessels) to draw an inference about cpue changes reflecting changing stock abundance (ICES, 2013). The surveys carried out between 2010–2012 provided very useful data on population structure across the ground as well as data on grade structure and maturity-at-length.

Commercial cpue

In the past the *Nephrops* fishery on the Porcupine Bank was both seasonal and opportunistic with increased targeting during periods of high *Nephrops* emergence and good weather. Freezing of catches at sea has become increasingly prevalent since 2006, and the fishery now operates throughout the year, mainly targeting larger more valuable *Nephrops* in lower volumes. Fishing effort has fluctuated considerably in the recent past in response to availability of *Nephrops*.

Effort and lpue/cpue data are generally not standardized, and hence do not take into account vessel capacity, efficiency, seasonality or other factors that may bias perception of lpue/cpue and abundance trends over the longer term. WKNEPH concluded that effort and lpue series should be maintain in the WGCSE report for information purposes (ICES, 2013). WGCSE 2016 recommended presenting the effort in KWDays and lpue in tonnes/ KWDays. Any inferences about changes in stock abundance from these data, should take account of the quality and bias concerns raised above.

These data are presented by country in Table 20.7.

17.5 Stock assessment

Comparison with previous assessments

This assessment is based on UWTV approach outlined in WKNEPH 2013 and using parameter in the stock annex (ICES, 2013). This year's assessment has been updated based on the results of the August 2022 UWTV survey (Aristegui *et al.* 2022).

State of the stock

The UWTV results are shown in Table 20.6. In 2017 the harvest rate was above FMSY for the first time. However, since 2018 the harvest rate has been below FMSY again, due to relatively high abundance estimates on UWTV surveys since 2018, and to the increase in mean weight in the landings, which resulted in a decrease in the landed numbers. Total abundance increased in 2022, and it is the highest value in the time-series.

Catch options table

The inputs to the catch options are given below. At this point, it is not possible to estimate the numbers and mean weights of discards in the fishery, although there are indications that discards have increased since 2016.

Variable	Value	Notes
Stock abundance (2023)	1363	UWTV survey 2022; numbers of individuals in millions
Mean weight in projected landings	44.8	Average 2019 - 2021; in grammes
Mean weight in projected discards	-	Unknown
Projected discard rate	-	Unknown
Discards survival rate	-	Not applicable

17.6 Reference points

New reference points were evaluated by WKMSYREF4 (ICES, 2016a) and advised by ICES (2016b). The F_{MSY} for this stock was increased from 5.0% to 6.2%. The F_{MSY} for this stock is based on $F_{0.1}$ for both sexes combined given the low density of *Nephrops* on the Porcupine Bank.

Stock code	MSY Flower*	F_{MSY} *	MSY F_{upper} * with AR	MSY $B_{trigger}$	MSY F_{upper} * with no AR
nep-16	5.0%	6.2%	6.2%	Not defined	6.2%

* Harvest rate (HR).

17.7 Management strategies

The EU multiannual plan (MAP) for stocks in the Western Waters and adjacent waters applies to this stock. The plan specifies conditions for setting fishing opportunities depending on stock status and for making use of the F_{MSY} range for the stock. ICES considers the MAP to be precautionary when implemented at the FU level. Full details of the plan are described in EU (2019).

17.8 Quality of assessment and forecast

The main quality considerations for this stock are related to mean weight and discarding. The mean weight for this stock has been fluctuating, the most recent estimates maybe overestimate due to the non-inclusion of discards. The mean weight declined from 2014 to 2017 as strong year classes recruit to the fishery. Since 2017 a recent mean weight in the landing was considered the most appropriate basis in the calculation of catch scenarios. In previous years a long-term mean weight was used.

There is good evidence from surveys and length structure of landings that recruitment improved between 2015 and 2017, and this resulted in a reduction in mean weight in the stock in those years. As expected, the mean weight increased in 2018 and 2019 as the stronger cohorts grows;

it decreased in 2020, but increased again in 2021. Currently there is no methodology to take this into account in the calculation of catch options.

Up to 2015 discarding was considered negligible for this functional unit. Since 2016 the amount of discards observed on catch sampling trips have increased. This may be temporary linked to incoming recruitment. Sampling levels are insufficient to estimate total discards accurately, and projections assume no discards. The main concern is that the mean weight derived from the landings grades maybe bias due to unknown discarding levels. Not including discards in the assessment results in an underestimate of the actual fishing pressure. The current estimate is just below FMSY.

The UWTV survey provides abundance since 2012 (except 2015) with high precision, but the time-series is still too short to provide an MSY Btrigger for this FU. The 2022 UWTV survey sampled 88% of the planned stations; this is considered to have had minimal impact on the abundance estimate and quality of the survey, based on burrow densities in adjoining areas and comparing coefficients of variation from the current and previous survey years.

The landings are considered fairly well estimated up to 2021 (an unallocated component related to area misreporting was included from 2011 to 2017).

17.9 Recommendation for next benchmark

This stock was benchmark in 2013 at WKNEPH. WGCSE will keep the stock under close review and recommend future benchmark as required.

17.10 Management considerations

There is a separate catch limit for Functional Unit (FU) 16 within the wider TAC for Subarea 7. This has resulted in very restrictive quotas for some vessels which increased area misreporting and the risk of discarding from 2011 to 2017. Area misreporting diminished in 2018 with the introduction of a national legislation restricting Irish vessels' fishing areas, where since March 2018 Irish vessels targeting *Nephrops* in subareas 6 and 7 may only fish in either of (1) Subarea 6 and Subarea 7, excluding FU16, or (2) FU16 of Sub-area 7 (Fisheries Management Notice No. 20 of 2018). Given the vulnerability of this stock to over exploitation the separate catch limit for Functional Unit (FU) 16 should remain in place.

A seasonal closed area (May 1–July 31) has been in place since 2010. The period of the closure was reduced to one month, May, since 2013. There hasn't been an ICES evaluation of the impact of this closure and whether it provides a conservation benefit over and above catch limits. Some sectors of the fishing industry want to extend the period of closure because they believe that this is a more effective conservation measure than catch limits.

Productivity of deep-water *Nephrops* stocks is generally lower than that in shelf waters, though individual *Nephrops* grow to relatively large sizes and attain high market prices. Other deep-water *Nephrops* stocks off the Spanish and Portuguese coast have collapsed and have been subject to recovery measures for several years e.g. FU25, 26, 27 and 31. Recruitment in *Nephrops* populations in deep water may be more sporadic than for shelf stocks with strong larval retention mechanisms. This makes these stocks more vulnerable to over exploitation and potential recruitment failure as has been observed on the Porcupine Bank in the early 2000s.

From 2019 vessels using highly selective gears in Subarea 7 can be exempted from the landings obligation on the basis of the high survival exemption (see [discard plans](#)). It is unknown if *Nephrops* discarded on the Porcupine Bank could actually survive the discarding process.

Discarding by the *Nephrops* trawl fishery is around 50% of the total catch by weight. The main species that are discarded by weight are blue mouth-red fish, blue whiting and argentines (Marine Institute and Bord Iascaigh Mhara, 2011).

17.11 References

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- Velasco, F., Baldó, F. and González-Herraiz, I., in draft. Report on *Nephrops* results from Porcupine Bank 2021 Bottom Trawl Survey

Table 20.1. *Nephrops* Porcupine Bank (FU 16): Of which catch limit.

Year	France	Ireland	Spain	UK	Total
2011	241	454	377	188	1260
2012	238	457	380	185	1260
2013	340	653	543	264	1800
2014	349	671	557	271	1848
2015	349	671	558	272	1850
2016	349	671	558	272	1850
2017	586	1124	935	455	3100
2018	516	992	825	401	2734
2019	500	959	798	388	2645
2020	498	957	795	387	2637
2021	621	1194	992	483	3290
2022	530	1016	846	412	2804

Table 20.2. *Nephrops* Porcupine Bank (FU 16): Landings (tonnes) by country.

Year	France	Ireland	Spain	UK (E& W)	UK (NI)	UK (Scotland)	Unallocated	Total
1965	514							514
1966	0							0
1967	441							441
1968	441							441
1969	609							609
1970	256							256
1971	500		1444					1944
1972	0		1738					1738
1973	811		2135					2946
1974	900		1894					2794
1975	0		2150					2150
1976	6		1321					1327
1977	0		1545					1545
1978	2		1742					1744
1979	14		2255					2269
1980	21		2904					2925
1981	66		3315					3381
1982	358		3931					4289
1983	615		2811					3426
1984	1067		2504					3571
1985	1181		2738					3919
1986	1060		1462	69				2591
1987	609		1677	213				2499
1988	600		1555	220				2375
1989	324	350	1417	24				2115
1990	336	169	1349	41				1895
1991	348	170	1021	101				1640
1992	665	311	822	217				2015
1993	799	206	752	100				1857

Year	France	Ireland	Spain	UK (E& W)	UK (NI)	UK (Scotland)	Unallocated	Total
1994	1088	512	809	103				2512
1995	1234	971	579	152				2936
1996	1069	508	471	182				2230
1997	1028	653	473	255				2409
1998	879	598	405	273				2155
1999	1047	609	448	185				2290
2000	351	227	213	120				910
2001	425	369	270	158				1222
2002	369	543	276	139				1327
2003	131	307	489	108		29		1064
2004	289	494	468	126		28		1406
2005	397	754	681	208		156		2197
2006	462	731	636	201		155		2185
2007	302	1060	384	146		183		2074
2008	26	562	234	41		138		1000
2009	4	356	348	13		159		879
2010	4	579	240	10		90		922
2011	8	643	182	23		122	301	1278
2012	0.46	605	198	0		134	320	1258
2013	5.8	651	132	1		118	234	1141
2014	3	813	129	0		96	148	1189
2015	3	744	84	0		109	454	1394
2016	35	1052	58	1		160	849	2154
2017	63	743	73	4	245	131	1373	2632
2018	81	2079	158	8	280	144	0	2751
2019	54	1529	112	7	325	201	0	2229
2020	41	1516	82	1	259	<1	0	1899
2021	49	1611	318	1	329	169	0	2476

Table 20.3. *Nephrops* Porcupine Bank (FU 16): Recent sampling used in the assessment.

Year	Spain		France		Ireland	
	Number of Trips	Type	Number of Trips	Type	Number of Trips	Type
2010	0		0		3	Graded Landings
2011	0		0		2	Graded Landings
2012	0		0		3	Graded Landings
2013					3	Graded Landings
2014					3	Graded Landings
2015					3	Graded Landings
2016					4	Graded Landings
2017					2	Graded Landings
2018					2	Graded Landings
2019					4	Graded Landings
2020					5	Unsorted Catch
2021					12	Unsorted Catch

Table 20.4. *Nephrops* Porcupine Bank (FU 16): Mean sizes (mm CL) of male and female *Nephrops* in Spanish, French and Irish landings and the Spanish Porcupine Groundfish survey 1981–2021.

Year	Spain		Ireland		France		Porcupine Survey	
	Landings		Landings		Landings		Catch	
	Males	Females	Males	Females	Males	Females	Males	Females
1981	39.9	34.5	-	-	-	-	-	-
1982	40.9	34.8	-	-	-	-	-	-
1983	40.8	34.0	-	-	-	-	-	-
1984	39.7	33.1	-	-	-	-	-	-
1985	38.7	33.5	-	-	-	-	-	-
1986	40.7	36.4	-	-	-	-	-	-
1987	39.3	35.0	-	-	-	-	-	-
1988	40.7	38.3	-	-	-	-	-	-
1989	40.5	36.8	-	-	-	-	-	-
1990	41.0	36.1	-	-	-	-	-	-
1991	39.4	34.5	-	-	-	-	-	-
1992	39.2	34.1	-	-	-	-	-	-
1993	41.6	36.1	-	-	-	-	-	-
1994	40.8	36.5	-	-	-	-	-	-
1995	41.3	36.6	40.7	36.5	43.2	38.3	-	-
1996	41.6	35.1	34.6	35.3	41.7	38.9	-	-
1997	39.7	34.8	35.9	34.5	41.9	38.4	-	-
1998	41.1	34.6	37.2	35.6	41.9	38.4	-	-
1999	41.5	35.7	36.6	33.7	43.1	39.1	-	-
2000	41.1	34.8	na	na	45.3	40.5	-	-
2001	41.1	36.3	37.8	35.4	45.4	39.4	36.0	28.9
2002	39.7	35.3	36.1	38.5	45.3	40.3	37.5	31.7
2003	41.4	37.8	44.5	36.2	46.2	38.9	39.7	30.9
2004	43.5	38.5	43.5	35.7	46.4	41.5	39.9	30.5
2005	43.4	38.1	46.9	40.6	45.9	41.0	45.1	33.8
2006	43.9	38.0	na	na	48.9	41.4	44.3	35.0

Table 20.5. *Nephrops* Porcupine Bank (FU16): Time-series of numbers landed and mean weight in the landings.

Year	Numbers (millions)	Weight Landed (Tonnes)	Mean Weight in landings (gr)
1986	55.7	2591	46.53
1987	60.3	2499	41.42
1988	48.1	2375	49.34
1989	45.6	2115	46.4
1990	38.9	1895	48.67
1991	37.3	1640	43.98
1992	47	2015	42.84
1993	38.5	1857	48.29
1994	54.4	2512	46.15
1995	65.5	2936	44.79
1996	52.9	2230	42.15
1997	59.1	2409	40.73
1998	49.9	2155	43.16
1999	52.3	2290	43.76
2000	15.1	910	60.13
2001	24.6	1222	49.65
2002	32	1327	41.49
2003	18.4	1064	57.76
2004	21.5	1406	65.28
2005	31.5	2197	69.84
2006	28.7	2185	76.24
2007	29.2	2074	71.05
2008	17.9	1000	55.89
2009	16.5	879	53.19
2010	14.1	922	65.32
2011	27.9	1278	45.81
2012	25.0	1258	50.36
2013	19.8	1141	57.54
2014	17.3	1189	68.54

Year	Numbers (millions)	Weight Landed (Tonnes)	Mean Weight in landings (gr)
2015	27.4	1394	50.86
2016	53.5	2154	40.29
2017	84.9	2632	31.01
2018	66.2	2751	41.55
2019	42.2	2251	53.38
2020	49.6	1899	38.26
2021	57.8	2476	42.82
Average 2019–2021			44.82

Table 20.6. *Nephrops* Porcupine Bank (FU16): Assessment summary.

Year	UWTV abundance estimate Millions	95% Confidence Interval	Landings in number	Total discards in number*	Removals in number	Harvest rate (by number)** %	Landings tonnes	Total discards* %	Discard rate (by number) %	Dead discard rate (by number)	Mean weight in landings grammes	Mean weight in discards
2012	787	79	25	0	25	3.2	1258	0	0	0	50.4	NA
2013	768	61	20	0	20	2.6	1141	0	0	0	57.5	NA
2014	722	35	17	0	17	2.4	1189	0	0	0	68.5	NA
2015	NA	NA	27	0	27	3.3***	1394	0	0	0	50.9	NA
2016	958	68	53	NA	53	5.6	2154	NA	NA	NA	40.3	NA
2017	850	90	85	NA	85	10.0	2632	NA	NA	NA	31.0	NA
2018	1117	92	66	NA	66	5.9	2751	NA	NA	NA	41.6	NA
2019	1010	101	42	NA	42	4.2	2251	NA	NA	NA	53.4	NA
2020	1264	94	50	NA	50	3.9	1899	NA	NA	NA	38.3	NA
2021	1018	92	58	NA	58	5.7	2476	NA	NA	NA	42.8	NA
2022	1363	91										

*Discarding up to 2015 was considered to be negligible. Discard estimates are not available since 2016 and are therefore not included in the assessment.

** Values since 2016 onwards may be underestimated owing to insufficient discard data.

*** The harvest rate is estimated based on a linear interpolation of abundance, as no survey was carried out in this year.

NA = not available.

Table 20.7. *Nephrops* Porcupine Bank (FU16): Effort and lpue for the various different fleets exploiting the stock 1971–2021.

Year	Spain ¹		France ²		Ireland ³	
	Effort ('000's Hrs)	Lpue (kg/hr)	Effort ² ('000's Hrs)	Lpue (>10%) (kg/hr)	Effort ³ ('000's KwDays)	Lpue (t/KWdays)
1980	318	9				
1981	272	12				
1982	237	17				
1983	196	14	18	35		
1984	194	13	30	35		
1985	200	14	33	36		
1986	162	9	28	38		
1987	174	10	24	26		
1988	180	9	22	27		
1989	173	8	14	23		
1990	159	9	15	23		
1991	138	7	19	18		
1992	96	9	32	21		
1993	80	9	36	22		
1994	80	10	38	28		
1995	67	9	42	30	584.9	1.4
1996	58	8	41	26	192.5	1.59
1997	57	8	41	25	327.3	1.26
1998	56	7	40	22	284.6	1.59
1999	53	8	43	21	278	1.29
2000	47	5	23	14	92.8	1.25

Year	Spain ¹		France ²		Ireland ³	
	Effort ('000's Hrs)	Lpue (kg/hr)	Effort ² ('000's Hrs)	Lpue (>10%) (kg/hr)	Effort ³ ('000's KwDays)	Lpue (t/KwDays)
2001	44	6	24	15	230.2	1.12
2002	54	5	18	18	339.8	1.3
2003	66	5	7	19	294.7	0.8
2004	59	10	9	25	569.2	0.68
2005	60	13	15	26	756.2	0.83
2006	65	9	22	21	952.8	0.72
2007	58	8	17	18	1199.4	0.81
2008	42	6	4	7	830.7	0.67
2009	44	7	na	na	411.3	0.83
2010	42	6	na	na	704.1	0.81
2011	na	na	na	na	986.9	0.63
2012	15	na	na	na	817.1	0.63
2013	na	na	na	na	885.7	0.92
2014	na	na	na	na	1019.8	0.92
2015	na	na	na	na	1219.2	0.99
2016	na	na	na	na	1359.3	1.43
2017	na	na	na	na	1328.9	1.59
2018	na	na	na	na	1721.2	1.21
2019	na	na	na	na	1463.3	1.01
2020	na	na	na	na	1468.3	0.97
2021	na	na	na	na	1647.1	0.94

¹ = Effort and lpue between 1980 and 2010 was estimated based on fishing days in 7. Effort in 2012 was based on logbooks for FU16.

2 = Effort and lpue for vessels where <10% of landed value was *Nephrops*.
3 = Effort and lpue for vessels where 30% of the landed weight was *Nephrops*.

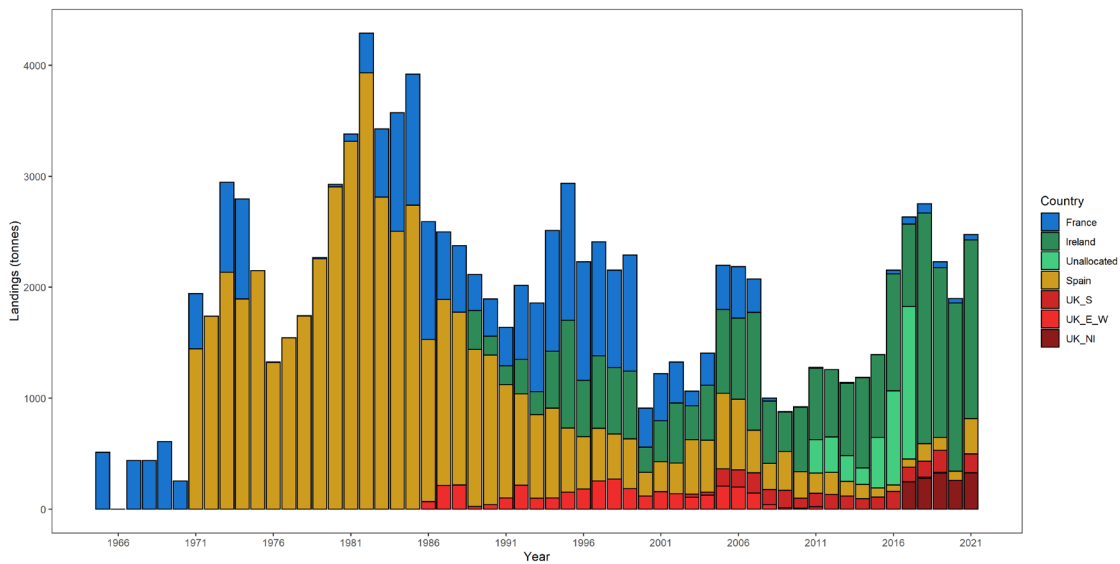


Figure 20.1. *Nephrops* in FU16 (Porcupine Bank). WG's best estimates of landings in tonnes by country.

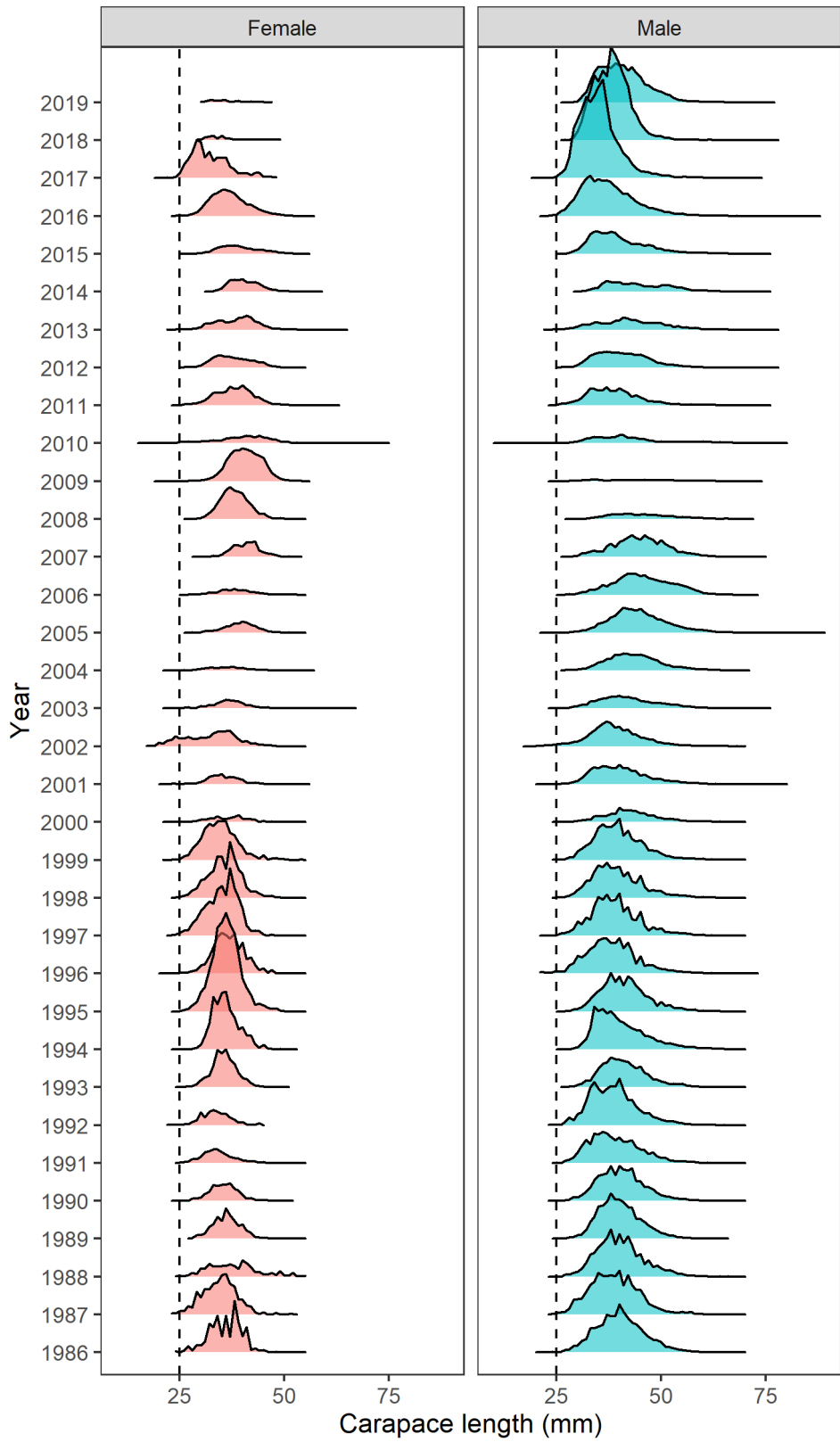


Figure 20.2. *Nephrops* in FU16 (Porcupine Bank). Female and male length distributions of raised international landings. Vertical dashed lines refer to Minimum Landing Size (25 mm).

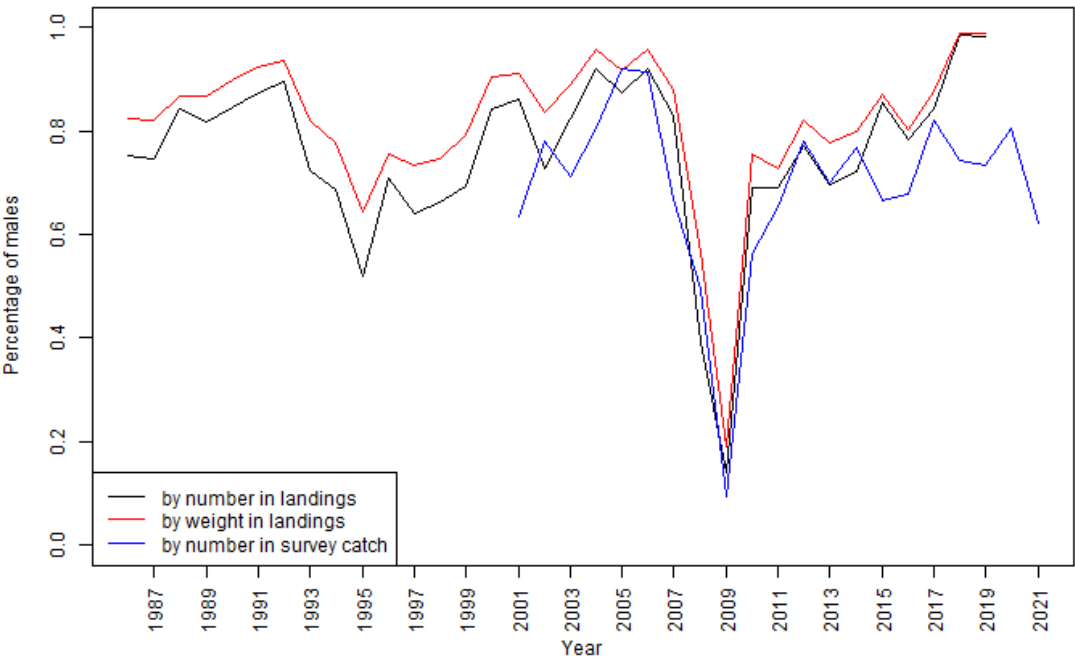


Figure 20.3. *Nephrops* in FU16 (Porcupine Bank). The percentage males in the landings and survey over time.

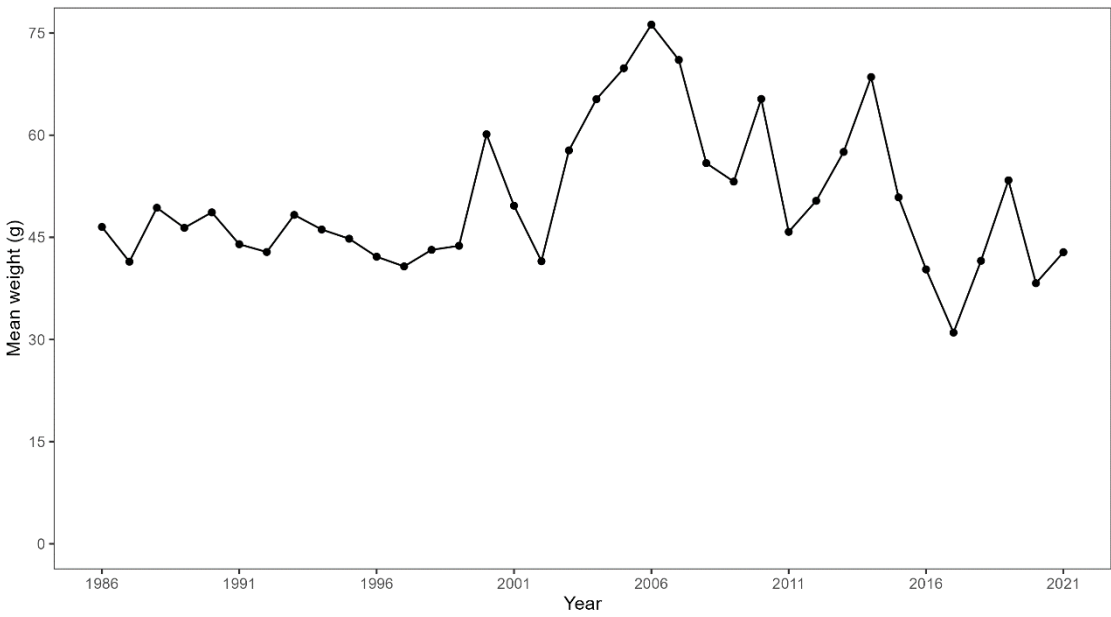


Figure 20.4. *Nephrops* in FU16 (Porcupine Bank). Mean weight in the commercial landings.

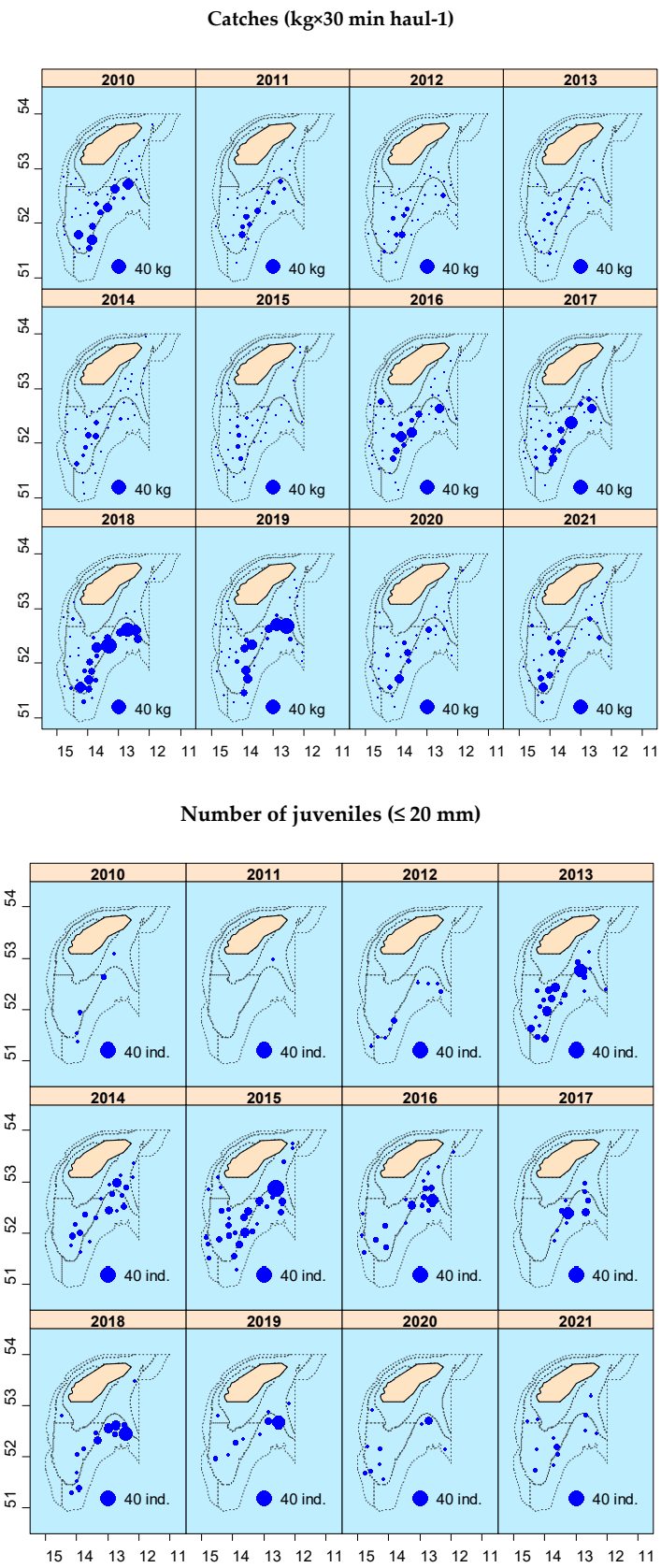


Figure 20.5. *Nephrops* in FU16 (Porcupine Bank). Geographic distribution of *Nephrops norvegicus* in Porcupine surveys between 2010 and 2021. Top panel: catches (kg×30 min haul-1). Bottom panel: Number of juveniles (≤ 20 mm carapace length). (Velasco *et al.* in draft)

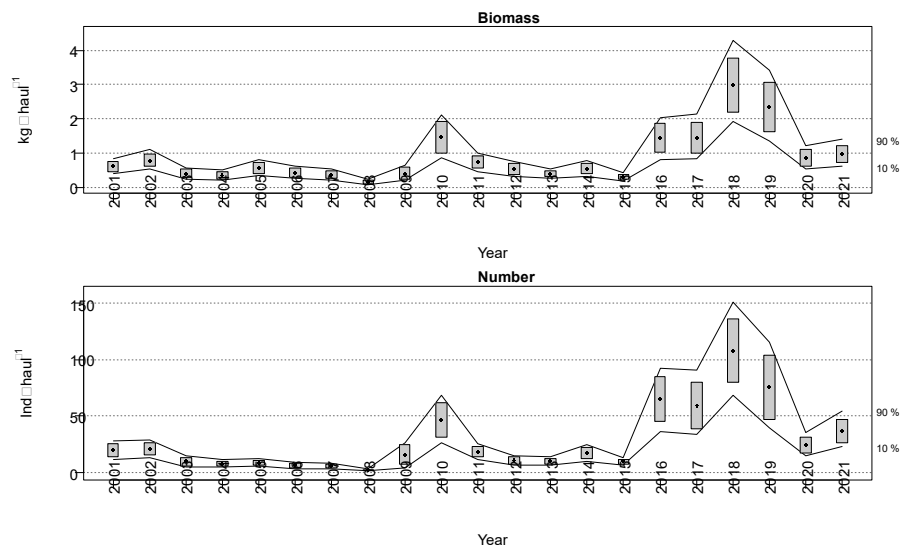


Figure 20.6. *Nephrops* in FU16 (Porcupine Bank). Evolution of *Nephrops norvegicus* biomass and abundance indices in Porcupine surveys (2001-2021). Boxes mark parametric standard error of the stratified abundance index. Lines mark boot-strap confidence intervals ($\alpha = 0.80$, bootstrap iterations = 1000). (Velasco *et al.* in draft)

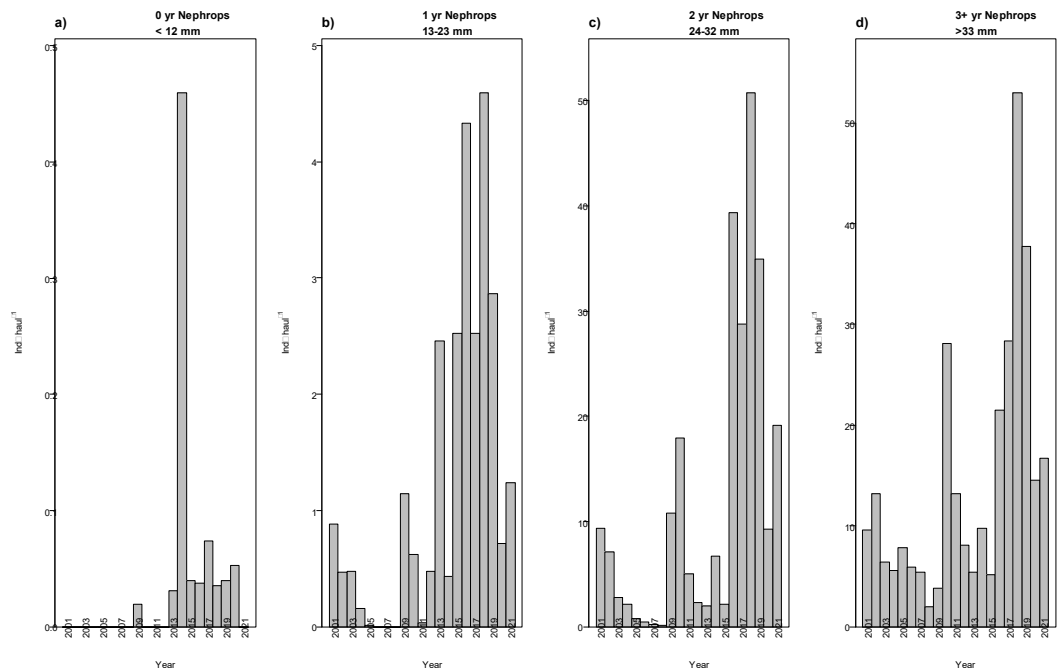


Figure 20.7. Abundance of a) 0 year *Nephrops* (<12 mm), b) 1 year *Nephrops* (13-23 mm), c) 2 years *Nephrops* (24-32 mm) and 3+ *Nephrops* (>33 mm) in Porcupine survey 2001-2021. (Velasco *et al.* in draft)

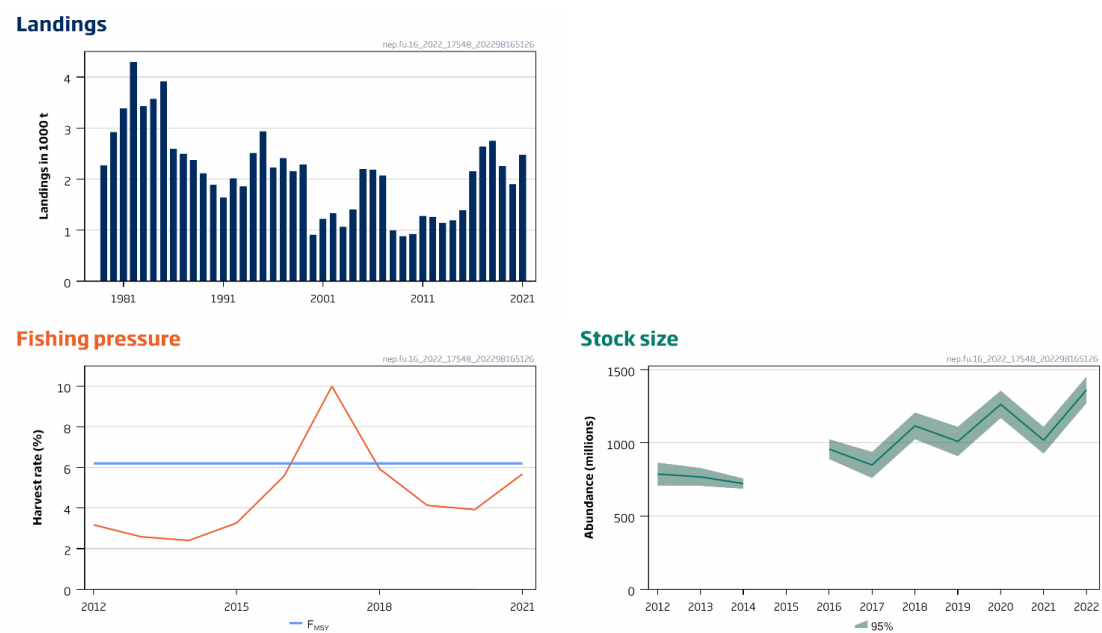


Figure 20.8. *Nephrops* in FU16 (Porcupine Bank). Summary of stock status for Porcupine *Nephrops*.