

ECOREGION Celtic Sea and West of Scotland
STOCK *Nephrops* on Porcupine Bank (FU 16)

Advice for 2014

ICES advises on the basis of the MSY approach that catches from FU 16 in 2014 should be no more than 1848 tonnes. All catches are assumed to be landed.

Stock status

		F (Fishing Mortality)		
		2010	2011	2012
MSY (F_{MSY})		?	?	✓ Appropriate
Precautionary approach (F_{pa}, F_{lim})		?	?	Undefined

		SSB (Spawning-Stock Biomass)	
		2012–2013	
MSY ($B_{trigger}$)		?	Undefined
Precautionary approach (B_{pa}, B_{lim})		?	Undefined
Qualitative evaluation		→	Stable (based on UWTV abundance)

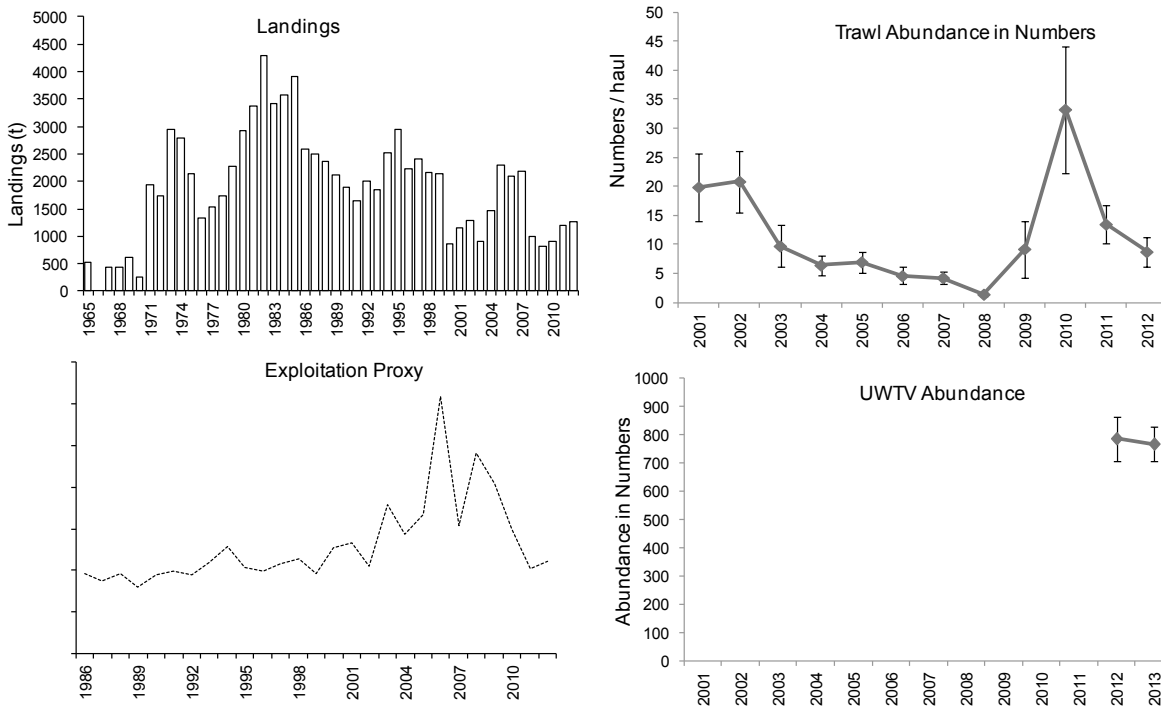


Figure 5.4.21.3.1 *Nephrops* on the Porcupine Bank (FU 16). Top left: ICES landings. Bottom left: exploitation proxy derived from catch length distributions. Top right: Abundance estimate (in numbers haul⁻¹) from Sp-PGFS-WBITS-Q4 survey. Bottom right: UWTV abundance survey.

UWTV surveys for FU 16 were carried out in 2012 and 2013; these provide abundance estimates for this stock. The 2012 harvest ratio (removals/UWTV abundance) is estimated to be 3.2%, which is below the F_{MSY} proxy (5%). Other indicators show that the exploitation rates increased during the 2000s but declined significantly in 2011 and remain low. Bottom trawl survey cpue increased significantly in 2010 and this has been linked to a stronger recruitment first observed in the survey in 2009.

Management plans

No specific management objectives are known to ICES.

Biology

Nephrops on the Porcupine Bank are fished in relatively deep waters occurring over a fairly widespread area at relatively low abundance. In the past there was a wide variation in size structure of the catches spatially and between fleets. The switch in sex ratio in commercial landings and survey catches in 2008–2009 (see Figure 5.4.21.3.3) is thought to be the result of overexploitation of the male component of the stock, leading to sperm limitation for females in those years. The sex ratio since 2010 has switched back to a more normal situation where male *Nephrops* make up the majority of the catches.

Environmental influence on the stock

Increased storminess related to the North Atlantic Oscillation (NAO) has been linked to reduced recruitment and low lpuues on the Porcupine Bank several years later (González Herraiz *et al.*, 2009). Favourable environmental conditions in 2006 are thought to have led to a good recruitment after several years of poor recruitment. The fishery is now dependent on the 2006 year class (2009 recruitment).

The fisheries

The fishery takes place throughout the year with a peak between April and July. A seasonal closure covering much of the stock distribution area has been in place between 1 May and 31 July each year from 2010 to 2012. In 2013 the closure was only in place in the month of May. Most vessels are relatively large (between 20 and 35 m in total length) multi-purpose otter trawlers using single or twin rigs. Freezing of catches at sea has become increasingly prevalent since 2006.

Catch distribution Total landings (2012) were 1260 t (100% otter trawl). Available discard estimates show discarding to be negligible (< 2% by number).

Effects of the fisheries on the ecosystem

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 redfish, blue whiting, and argentines (Anon., 2011). Discarding of *Nephrops* in the fishery has been negligible up to 2011 (ICES, 2013a, 2013b).

Quality considerations

The landings are considered fairly well estimated (an unallocated component related to area misreporting and non-reporting is included from 2011). Discard observer coverage is low and should be increased, to sample the landings and any discards that might be occurring.

Two years of UWTV survey data are now available and the abundance estimates have high precision. Landings length–frequency data have improved significantly since 2010. The fishing industry has collaborated with scientists by providing data on the grade composition of landings since 2010 and carrying out a trawl survey between 2010 and 2012. This survey provides information on population structure across the ground, grade structure, and maturity-at-length.

Scientific basis

Assessment type	UWTV and trends of the size structure of catches.
Stock data category	1
Input data	Commercial catches (international landings and length frequencies reconstructed from sampling and industry data); one UWTV survey (UWTV-FU 16); fixed maturity and natural mortality.
Discards and bycatch	Discards were not included and are assumed negligible.
Indicators	Two trawl surveys (SpPGFS-WIBTS-Q4, Irish IFSRP), cpue, and catch size.
Other information	Commercial lpuue for Ireland, Spain, and France. Sex ratio. This stock was benchmarked in 2013 (ICES, 2013a).
Working group report	WGCSE (ICES, 2013b).

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Reference points

	Type	Value	Technical basis
MSY approach	MSY B_{trigger}	Not defined.	
	F_{MSY}	HR 5.0%.	Equivalent to $F_{0.1}$ for combined sex in 2013.
Precautionary approach	Not defined.		

(unchanged since 2013)

Harvest ratio reference points (2013):

	Male	Female	Combined
F_{max}	6.6%	19.0%	11.1%
$F_{0.1}$	4.2%	12.3%	5.0%
$F_{35\%SpR}$	5.0%	14.3%	7.7%

The density of *Nephrops* in FU 16 is considered very low (low density $< 0.3 \text{ m}^{-2}$). The stock size has increased in recent years and exploitation rates have declined. For this FU, the exploitation rate on males is higher than on females. A harvest ratio consistent with a combined sex $F_{0.1}$ of 5.0% is suggested as a proxy for F_{MSY} .

Outlook for 2014

Basis: $F_{2013} = F_{2012} = 3.2\%$, Bias-corrected survey index (2013) = 768 million; Mean weights in landings (48.1 g, 2011–2012); discard rates by number (0%). Survey bias = 1.26.

Basis	Total Catches*	Landings	Dead Discards**	Surviving Discards**	Harvest Rate
	L+DD+SD	L	DD	SD	for L+DD
$F_{\text{MSY proxy}}$	1848	1848	0	0	5.0%
F_{2013}	1183	1183	0	0	3.2%
$F_{35\%SpR}$	2846	2846	0	0	7.7%
F_{max}	4103	4103	0	0	11.1%

Weights in tonnes.

* Total catches are the landings plus dead and surviving discards.

** Based on negligible discards during observer trips.

MSY approach

No MSY B_{trigger} has been identified for this FU. Following the ICES MSY approach implies a harvest ratio for the FU 16 that is less than 5%, resulting in catches of no more than 1848 t in 2014. All catches are assumed to be landed.

Additional considerations

The advice takes into account the 2013 UWTV survey results.

Since 2011 a maximum limit on landings from FU 16 is included in the TAC regulation (the “of which limit”). This has increased the risk of highgrading and area-misreporting in this fishery. Area misreporting and highgrading in the fishery should be discouraged through management measures.

A seasonal closed area (1 May–31 July) was in place between 2010 and 2012. The duration of the closure was reduced to one month (May) in 2013. The closure has been respected by the fleet and has therefore afforded some protection to the majority of the stock area (~75%). For this part of the stock area fishing effort and mortality has been reduced at a time of peak female emergence and typically high lpue and landings. The closure will also have inadvertently

concentrated effort and fishing mortality in the ~25% of the stock area that is not currently covered by the closure. Survey information indicates that abundance was 2.5 times higher inside the closed area than outside in 2011.

Productivity of deep-water *Nephrops* stocks is generally lower than 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. in FUs 25, 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 overexploitation and potential recruitment failure as has been observed on the Porcupine Bank over the last decade.

Changes in fishing technology and fishing patterns

In the past the *Nephrops* fishery on the Porcupine Bank has been 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 *Nephrops* in lower volumes. Fishing effort has fluctuated considerably in the recent past in response to the availability of *Nephrops* (Figure 5.4.21.3.2). Lpue have increased since 2008 (Figure 5.4.21.3.2).

Information from the fishing industry

The Irish industry has provided grade information for around 45% of the landings in 2012. Graded landings data have been used to reconstruct the size distribution of landings between 2010 and 2012. The industry has also been collaborating on the development of a trawl survey largely funded by the allocation of scientific quota between 2010 and 2012. These are major improvements to the information base for this stock and should be maintained.

Data and methods

The short time-series of UWTV survey is used as the basis for advice. The Spanish Porcupine survey (SpPGFS-WIBTS-Q4) and commercial fisheries data provide longer-term stock indicators. A historical exploitation proxy is derived from commercial catch, based on the slope of annual length–frequency distributions for male *Nephrops* with carapace lengths between 41 and 56 mm, which are considered fully selected in the fishery. The benchmark meeting (ICES, 2013a) concluded that the Irish industry trawl survey initiated in 2010 is too short (with changes in coverage, gears, and vessels) to be used as an indicator of stock abundance. The survey, however, provides useful data on population structure across the ground, grade structure, and maturity-at-length.

Uncertainties in assessment and forecast

General comments of uncertainties in the assessment and forecast using the information from the UWTV surveys are discussed in the introduction of Section 5.4.21.

This stock was benchmarked in 2013 (ICES, 2013a) and the UWTV survey approach used was accepted as an appropriate basis for assessment and catch advice. The 2013 survey achieved good spatial coverage of the ground and the abundance estimate is expected to be accurate and have high precision. New harvest ratio reference points were estimated in 2013 and these were similar to the provisional ones established in 2012. The main uncertainties relate to catch, i.e. accuracy of landings and discard practices (discard sampling levels remain low and there is thought to be increased risk of highgrading due to restrictive quotas). The impact of this is likely to be a small underestimate of harvest rate.

Comparison with previous assessment and advice

The assessment is based on indicators and an UWTV survey as last year. The advice for 2014 was delayed until autumn to take account of the most up-to-date survey information.

This year's advice is based on the MSY approach, as last year.

Sources

- Anon. 2011. Atlas of Demersal Discarding, Scientific Observations and Potential Solutions, Marine Institute, Bord Iascaigh Mhara, September 2011. ISBN 978-1-902895-50-5. 82 pp.
- González Herraiz, I., Torres, M. A., Farina, A. C, Freire, J., and Cancelo, J. R. 2009. The NAO index and the long-term variability of *Nephrops norvegicus* population and fishery off West of Ireland. Fisheries Research, 98: 1–7.
- ICES 2013a. Report of the Benchmark Workshop on *Nephrops* assessment (WKNEPH). ICES CM: 2013/ACOM:45.

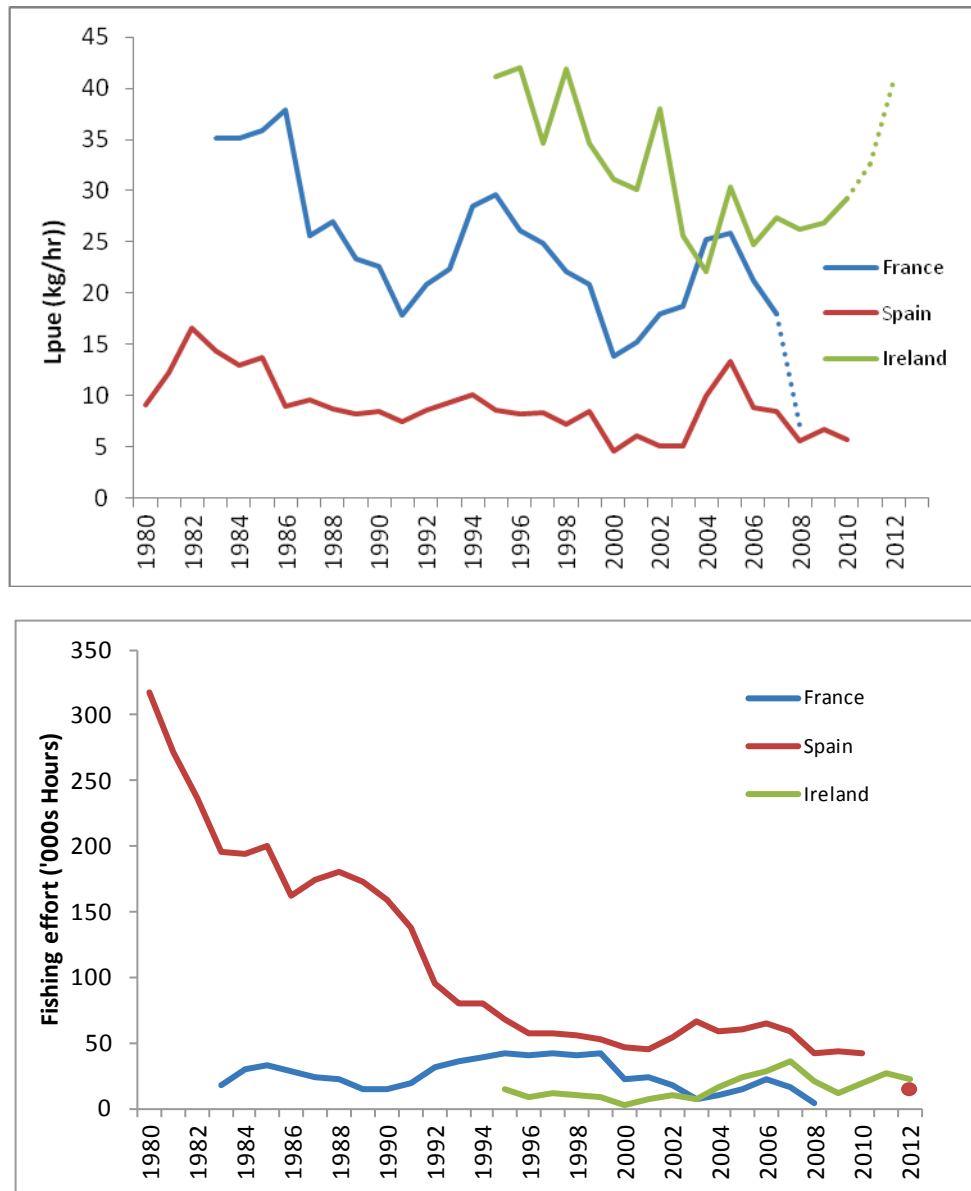


Figure 5.4.21.3.2 *Nephrops* on the Porcupine Bank (FU 16). Lpue and *Nephrops*-directed effort trends for fleets. Dotted line indicates that Lpue values should be considered uncertain (an unallocated component related to area misreporting and non-reporting is included since 2011 for the Irish landings; the French landings and effort have been very low since 2008).

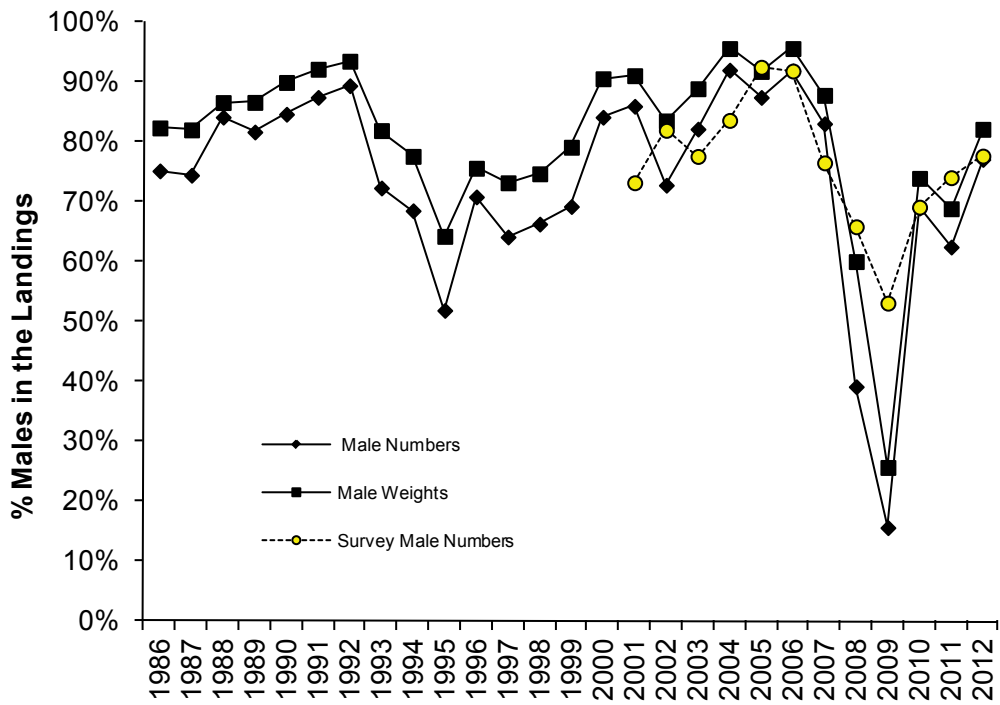


Figure 5.4.21.3.3 *Nephrops* on the Porcupine Bank (FU 16). Sex ratio of landings and survey (SpPGFS-WIBTS-Q4) catches.

Table 5.4.21.3.1 *Nephrops* on the Porcupine Bank (FU 16). ICES advice, management, and landings.

Year	ICES advice	Predicted landings corresp. to advice (FU 16)	'Of which limit' in TAC regulation	Recommended landings in Divisions VIIbcjk ¹	ICES landings FU 16 ²
1987					2.5
1988					2.4
1989					2.1
1990					1.9
1991					1.6
1992				3.8	2.0
1993				~4.0	1.9
1994				~4.0	2.5
1995				~4.0	2.9
1996				4.0	2.2
1997				4.0	2.4
1998				4.0	2.2
1999				4.0	2.3
2000				4.0	0.9
2001				4.0	1.2
2002				4.44	1.3
2003				4.44	0.9
2004	Restrict landings to 2000–2002 levels			3.3	1.5
2005	Restrict landings to 2000–2002 levels			3.3	2.3
2006	Restrict landings to 2000–2002 levels			3.3	2.1
2007	Constrain effort at recent levels			--	2.2
2008	Constrain effort at recent levels			--	1.0
2009	No increase in effort, and average landings (2000–2003)	< 1.0			0.8
2010	Reduce catches to lowest possible level	0			0.9
2011	Reduce catches to lowest possible level	0	1.26		1.2
2012	No increase in catch	-	1.26		1.26
2013	MSY approach (updated November 2012)	< 1.8	1.8		
2014	MSY approach	< 1.848			

Weights in thousand tonnes.

¹ Previously ICES gave combined advice for FUs 16, 17, 18, and 19, and “other rectangles” in this area.

² This includes inshore rectangles along the southern and southeastern coast of Ireland.

Table 5.4.21.3.2 *Nephrops* on the Porcupine Bank (FU 16). ICES landings (tonnes) by country.

Year	France	Ireland	Spain	UK E& W	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
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	333	108	29		908
2004	289	494	588	126	28		1526
2005	397	754	799	208	156		2315
2006	462	731	571	201	155		2120
2007	302	1060	496	146	183		2186
2008	26	562	234	41	138		1000
2009	4	356	294	13	159		825
2010	4	579	235	10	90		917
2011	8	643	109	23	122	301	1205
2012*	0	605	201	0	134	320	1260

* Preliminary.

Table 5.4.21.3.3 *Nephrops* on the Porcupine Bank (FU 16). UWTV abundance, confidence intervals, harvest ratio, landings by number, mean weight in landings (na – not available).

Year	UWTV abundance (millions)	95% CI	Harvest ratio	Landings by number (millions)	Mean weight in landings (g)
2011	na	na	na	na	45.8
2012	787	78.7	3.2%	25.0	50.4
2013	768	61.4	na	na	na