

ECOREGION Celtic Sea and West of Scotland
STOCK *Nephrops* in Irish Sea West (FU 15)

Advice for 2014

ICES advises on the basis of the MSY approach that landings in 2014 should be no more than 8244 tonnes. If total discard rates do not change from the average of the last three years (2010–2012), this implies total catches of no more than 9914 tonnes. Note that this figure includes discards expected to survive the discarding process – assumed to be 10% of the total number discarded for this stock.

In order to ensure the stock in this functional unit is exploited sustainably, management should be implemented at the functional unit level.

Stock status

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

SSB (Spawning-Stock Biomass)				
	2011	2012	2013	
MSY ($B_{trigger}$)	✓	✓	✓	Above trigger
Precautionary approach (B_{pa}, B_{lim})	?	?	?	Undefined

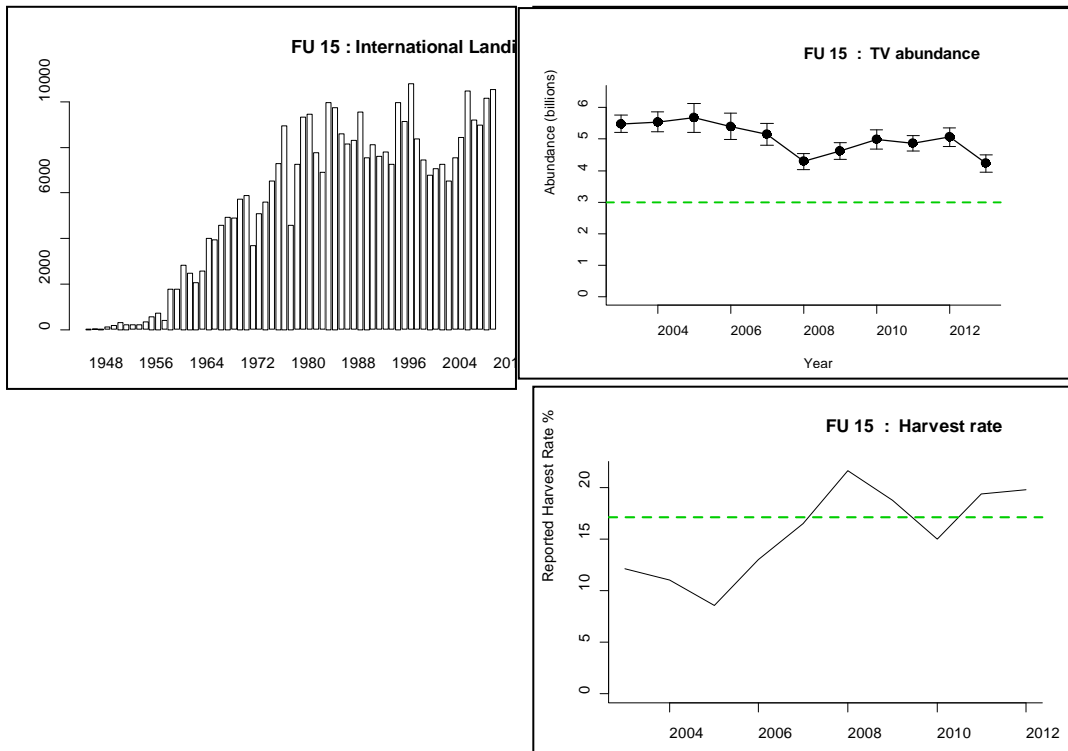


Figure 5.4.21.2.1 *Nephrops* in Irish Sea West (FU 15). Long-term trends in landings (tonnes); recent UWTV abundance (in billions; SSB proxy); and harvest rates (prior to 2007 the harvest rate is considered to be a minimum estimate due to possible underreporting of landings). The horizontal lines represent MSY $B_{trigger}$ (upper panel) and F_{MSY} (lower panel).¹

¹ Version 2: UWTV abundance plot corrected

Since 2003 stock abundance has been above MSY B_{trigger} . Recent harvest rates (removals/UWTV abundance) have fluctuated around the F_{MSY} proxy and are now above it.

Management plans

No specific management objectives are known to ICES.

Biology

Nephrops in the Western Irish Sea occur at very high density (average 0.9 burrow m^{-2}) and have a smaller average size and size-at-maturity than most other stocks. The observed high density implies intense competition for space and food on the seabed. This is thought to make the stock resilient to high fishing pressure.

Environmental influence on the stock

The environment in the Western Irish Sea is very suitable for *Nephrops*, with a large mud patch and a gyre that retains the larvae over the mud patch, thus ensuring good recruitment. *Nephrops* is a major food species for cod in the Irish Sea.

The fisheries

The gears used are a mixture of single- and twin-rig otter trawls. The use of specified species-selective gears has been mandatory for all Irish vessels since March 2012 and similar conditions were introduced in October 2012 for the UK (Northern Ireland) vessels. Some Irish vessels started using multi (quad) rig trawls in 2012. Provisional data suggest a ~30% increase in *Nephrops* catch rates and a reduction in fish bycatch of ~30% due to the lower headline height.

Catch distribution Total catch (2012) = 12.4 kt, where 10.5 kt are landings (100% otter trawls) and 1.9 kt discards.

Effects of the fisheries on the ecosystem

The *Nephrops* trawl fisheries take bycatches of other species, especially juvenile whiting, haddock, plaice, and cod.

Quality considerations

Harvest ratios since 2006 are considered reliable due to more accurate landings data reported under new legislation. The quality of input data and level of sampling are good for this stock.

Scientific basis

Assessment type	UWTV and trends, catch options based on UWTV and F_s from per-recruit analysis.
Stock data category	1
Input data	One survey index (UWTV (FUs 14–15); commercial catches (international landings, length frequencies from catch sampling); fixed maturity ogive based on survey sampling, fixed natural mortality. Discard survival rate.
Discards and bycatch	Discards included in the assessment from the Irish directed <i>Nephrops</i> fleet and the UK(NI) directed <i>Nephrops</i> fleet.
Indicators	One trawl survey index (NI-NEP-Trawl-Summer). Size structure of catches, sex ratio, and lpue.
Other information	The latest benchmark (based on the UWTV survey) was performed in 2009 (ICES, 2009).
Working group report	WGCSE (ICES, 2013).

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Reference points

	Type	Value	Technical basis
MSY approach	MSY B_{trigger}	3 billion individuals.	Minimum abundance observed based on a scaled trawl survey.
	F_{MSY}	HR 17.1%.	Equivalent to F_{max} for combined sexes in 2010.
Precautionary approach	Not defined.		

(unchanged since 2010).

Harvest ratio reference points (2010):

	Male	Female	Combined
F_{max}	17.1	17.1	17.1
$F_{0.1}$	11.0	10.2	10.6
$F_{35\%SPR}$	14.1	12.7	13.4

The density of *Nephrops* in FU 15 is considered very high (average density 0.9 m⁻²). Recent harvest rates have been high (around F_{max}) and the stock size has been stable at a high level. The exploitation rate between the sexes is similar. A harvest ratio consistent with a combined sex F_{max} of 17.1% is suggested as a proxy for F_{MSY} . A preliminary MSY B_{trigger} has been estimated using the longer time-series of survey trawl cpue.

Outlook for 2014

Basis: $F_{2013} = F_{2012} = 19.8\%$; bias-corrected survey index (2013) = 4.31 billion; mean weights in landings (2010–2012) = 15.04 g; dead discard rate (by number) = 25.7%; mean weight in discards (2010–2012) = 7.95 g, survey bias = 1.14; discards survival rate = 10%.

Basis	Total catches*	Landings	Dead discards**	Surviving discards**	Harvest rate
	L+DD+SD	L	DD	SD	for L+DD
F_{MSY} proxy	9914	8244	1504	167	17.1%
F_{2013}	11486	9551	1742	194	19.8%
$F_{0.1}$	6144	5109	932	104	10.6%
$F_{35\%SPR}$	7764	6456	1178	131	13.4%

Weights in tonnes.

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

** Total discard rate is assumed to be 27.9% of the catches (in number, average of the last three years, 2010–2012); discard survival is assumed to be 10%.

MSY approach

Following the ICES MSY approach implies that the harvest ratio for the western Irish Sea FU 15 is reduced to less than 17.1%, resulting in landings of no more than 8244 t in 2014. If discard rates do not change from the average of the last three years (2010–2012, assuming 10% discard survival), this implies total catches of no more than 9914 t.

Additional considerations

The advice takes into account the 2013 UWTV survey results.

The *Nephrops* trawl fishery takes bycatches of other species, especially plaice, but also whiting and cod. In response to the long-term management plan for cod (EC 1342/2008), Northern Ireland and Ireland have introduced more species-selective gears primarily to reduce bycatch of cod, but the devices thus far introduced are also known to reduce discards

of other species. Despite this, selectivity of this fishery needs to be further improved to reduce bycatches of juvenile whiting in particular.

The proportion of discarded *Nephrops* is substantial. On average over the last three years, around 28% in numbers (or 17% in weight) of the *Nephrops* caught are estimated to have been discarded.

The FU 15 *Nephrops* fishery first developed in the late 1950s. The environment in the Western Irish Sea is very suitable for *Nephrops*, with a large mud patch and a gyre that retains the larvae over the mud patch, thus ensuring good recruitment. The ground can be characterized as an area of very high densities of small *Nephrops*. All available information indicates that size structure of catches appears to have changed little since the fishery first began.

Regulations and their effects

The cod long-term plan was introduced in 2009 (EC 1342/2008). Annual effort baselines in *Nephrops* trawl fisheries (Effort group TR2 OTB 70–99 mm) in Division VIIa have been reduced by 25% annually since 2009. There are provisions in the cod long-term plan to be exempt from these effort restrictions, or have it reduced, making the impact of this regulation on overall effort difficult to assess. The use of species-selective gears to mitigate effort restrictions to avoid effort limits has increased steadily since 2009. An authorisation was introduced by Ireland in March 2012 requiring the use of grids or separator panels for all TR2 boats fishing in the Irish Sea. Around 55% of the Irish vessels use separator trawls, while 45% have opted to use Swedish grids to reduce bycatch.

Since October 2012, all TR2 vessels in the UK (Northern Ireland) fleet are required to use a highly selective fishing gear. In the Irish Sea these currently include Seltra 300 mm box trawl, 270 mm diamond mesh panel Seltra box trawl, and 300 mm square mesh panel. All these gears are being developed with the aim of achieving exemption from the cod recovery plan under Article 11 (less than 1.5% cod catch). Enforcement is through the issue of cod recovery zone fishing authorisations, where no authorisation is given to a vessel that is not using a highly selective gear.

The minimum landing size for *Nephrops* is 20 mm carapace length (CL), and less than 1% of the animals landed are undersized.

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.

Uncertainties in the survey, in mean weight in the landings, and in discard rates are not taken into account in the advice. Mean weights in the landings and discard rates are based on 2010–2012 sampling by Northern Ireland and by Ireland.

The harvest ratio prior to 2006 may be underestimated due to underreporting of landings.

The calculation of harvest ratio and reference points $F_{0.1}$ and F_{max} is based on yield-per-recruit analyses and biological parameters, estimated under the assumption that the stock is in equilibrium. However, it is unlikely that the *Nephrops* in FU 15 is in equilibrium due to variable recruitment. In addition, important assumptions are made on growth, natural mortality, and discard rates in the derivation of reference points.

Comparison with previous assessment and advice

The advice for 2014 was delayed until autumn to take account of the most up-to-date survey information.

The basis for the assessment and advice is the same as last year, the MSY approach.

Sources

ICES. 2009. Report of the Benchmark Workshop on *Nephrops* (WKNEPH), 2–6 March 2009, Aberdeen, UK. ICES CM 2009/ACOM:33.

ICES. 2013. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 8–17 May 2013, Copenhagen, Denmark. ICES CM 2013/ACOM:12.

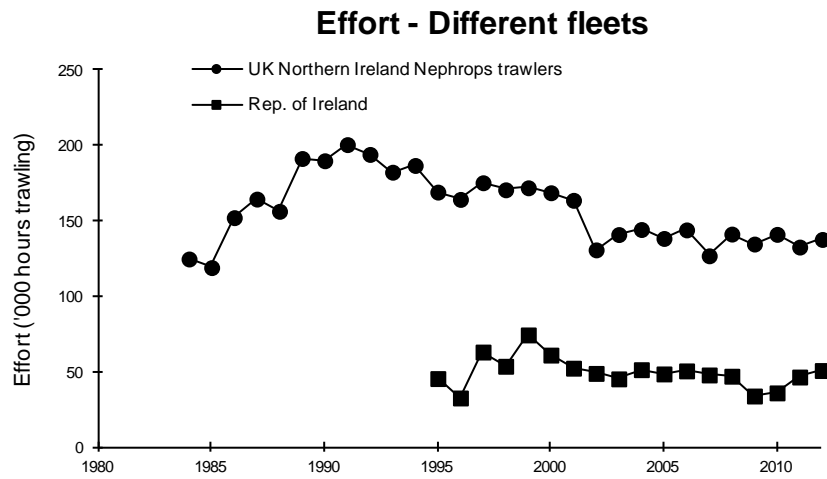


Figure 5.4.21.2.2 *Nephrops* Irish Sea West (FU 15). Effort trends of *Nephrops* fleets. Effort from UK Northern Ireland *Nephrops* trawlers fleet represented with dots and effort from Irish fleet represented with squares.

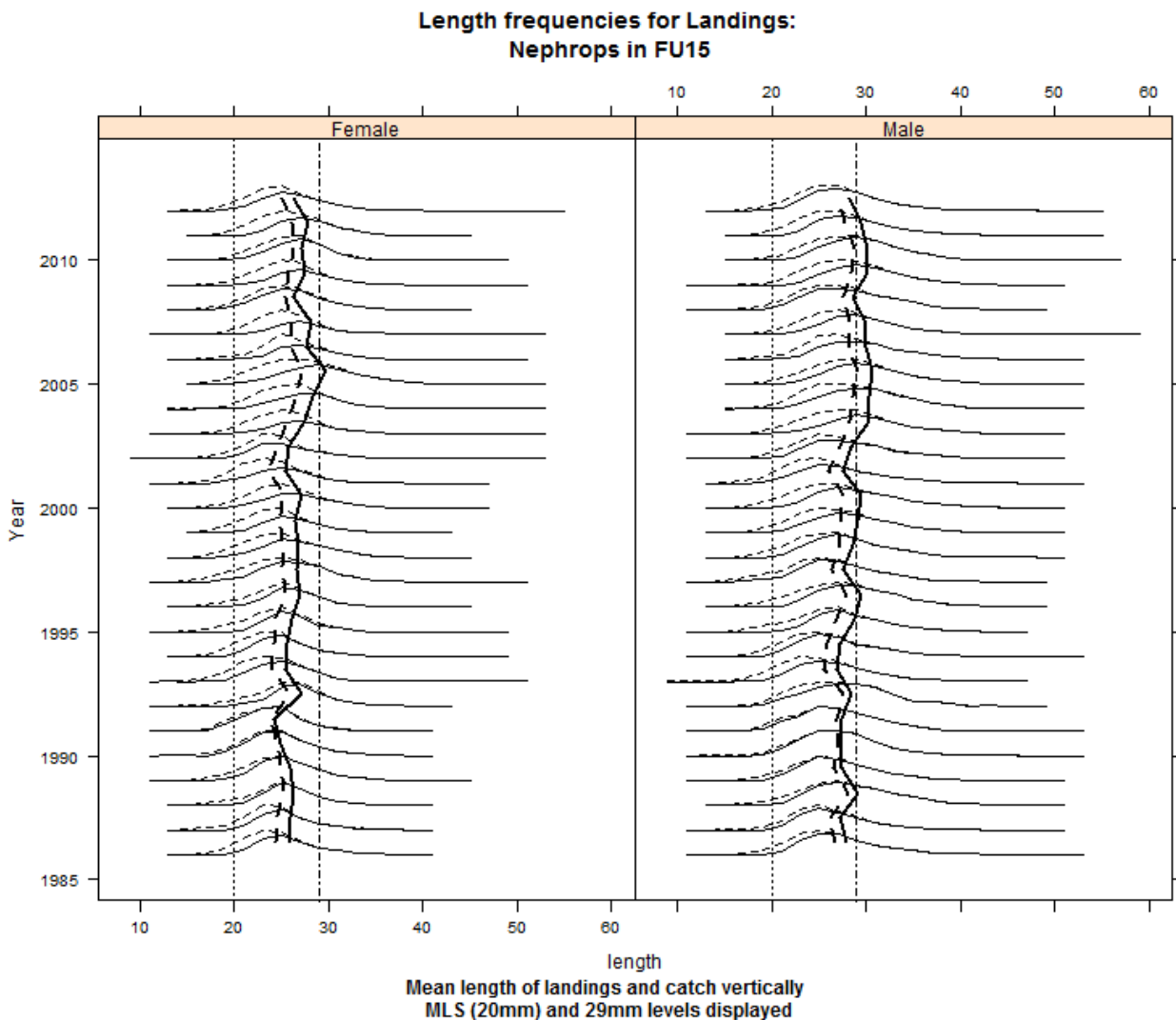


Figure 5.4.21.2.3 *Nephrops* Irish Sea West (FU 15). Annual length composition of catch (dashed) and landed (solid). Males (right) and females (left) from 1986 (bottom) to 2012 (top). The vertical dashed line is mean length in the catches and the vertical solid line is mean length in the landings. The straight vertical lines correspond to 20 mm (MLS) and 29 mm carapace length..

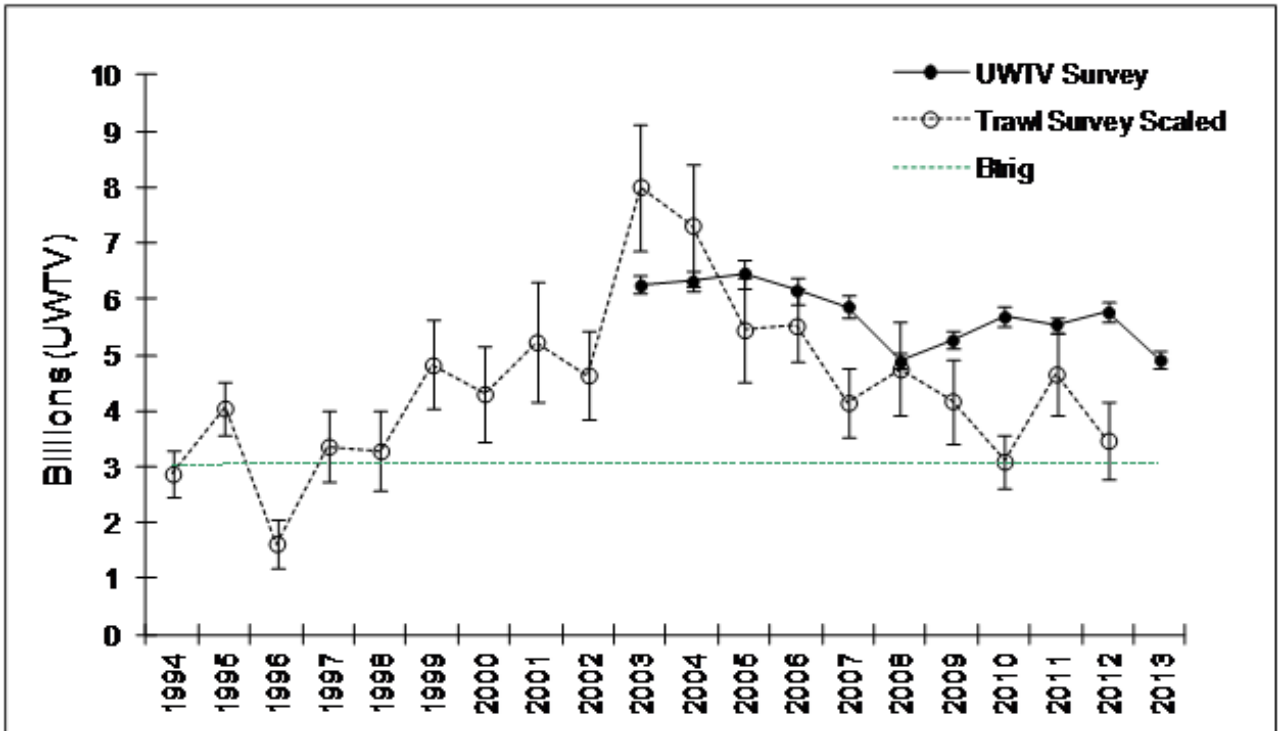


Figure 5.4.21.2.4 *Nephrops* Irish Sea West (FU 15). UWTV index (in billions) and scaled NI-NEP-Trawl-Summer survey. The green dotted line is MSY $B_{trigger}$. Abundance figures have not been bias corrected.²

² Version 2: Added sentence 'Abundance figures have not been bias corrected'

Table 5.4.21.2.1 *Nephrops* in Irish Sea West (FU 15). ICES advice, management, landings, and discards.

Year	ICES advice	Predicted landings corresp. to advice (FU 15)	Recommended landings (FUs 14 + 15)	ICES landings (FU 15)	Discards ¹⁾ (FU 15)
1989				8.1	0.7
1990				8.3	0.3
1991				9.6	0.3
1992			8.9	7.5	1.1
1993			9.4	8.1	1.6
1994			9.4	7.6	1.2
1995			9.4	7.8	1.7
1996			9.4	7.3	1.2
1997			9.4	10.0	1.3
1998			9.4	9.1	1.6
1999			9.4	10.8	2.9
2000			9.4	8.4	2.3
2001			9.4	7.4	2.1
2002	Set TAC in line with 1995–99 landings		9.55	6.8	1.7
2003	Set TAC in line with 1995–99 landings		9.55	7.1	2.7
2004	Set TAC in line with 1995–99 landings		9.55	7.3	2.0
2005	Set TAC in line with 1995–99 landings		9.55	6.5	1.4
2006	No increase in effort		9.55	7.5	2.3
2007	No increase in effort		-	8.4	3.2
2008	No increase in effort		-	10.5	1.4
2009	No increase in effort and landings	< 8.5	-	9.2	2.9
2010	Harvest ratio no greater than that equivalent to fishing at $F_{0,1}$	< 5.5	-	9.0	1.5
2011	Transition scheme towards the ICES MSY framework	< 9.5	-	10.2	2.7
2012	MSY approach	< 9.8		10.5	1.9
2013	MSY approach	< 9.3			
2014	MSY approach	< 8.2			

Weights in thousand tonnes.

¹⁾ The discard survival rate is assumed at 10%.

Table 5.4.21.2.2 *Nephrops* in Irish Sea West (FU 15). Landings (tonnes) by country, 1965–2012.

Year	Ireland	UK	UK E&W	UK NI	UK Scotland	UK Isle of Man	Total
1965		1.018					1.018
1966		1.701					1.701
1967		2.077					2.077
1968		1.987					1.987
1969	1.011	2.803					3.814
1970	1.392	3.001					4.393
1971	1.384	3.190					4.574
1972	1.604	4.120					5.724
1973	1.863	4.031					5.894
1974	982	2.689					3.671
1975	909	4.165					5.074
1976	1.614	3.989					5.603
1977	2.469	4.045					6.514
1978	2.921	4.375					7.296
1979	3.436	5.512					8.948
1980	1.709	2.869					4.578
1981	3.202	4.047					7.249
1982	4.398	4.917					9.315
1983	4.324	5.124					9.448
1984	3.306	4.454					7.760
1985	2.421	4.480					6.901
1986	4.682	5.296					9.978
1987	4.639	5.114					9.753
1988	3.201	5.385					8.586
1989	2.477	5.651					8.128
1990	2.710	5.590					8.300
1991	3.371	6.183					9.554
1992	2.370	5.171					7.541
1993	2.715	5.387					8.102
1994	1.768	5.838					7.606
1995	2.259	5.538					7.796
1996	1.574	5.673					7.247
1997	3.349	6.622					9.971
1998	3.101	6.027					9.128
1999	4.582	6.198				6	10.786
2000	3.433	4.937				0	8.370
2001	2.689	4.749				3	7.441
2002	2.291	4.501				1	6.793
2003	2.709	4.352				4	7.065
2004	2.786	4.470				13	7.270
2005	2.133	4.420				0	6.554
2006	2.051		56	5.429	23	1	7.561
2007	2.767		102	5.585	36	0	8.491
2008	3.132		131	7.166	26	50	10.508
2009	2.343		200	6.622	32	1	9.198
2010	2.578		100	6.251	33	0	8.963
2011	3.575		88	6.444	52	2	10.162
2012*	3.794		106	6.586	39	2	10.527

* Provisional.

Table 5.4.21.2.3 *Nephrops* in Irish Sea West (FU 15). Results from the UWTV-FU 15 survey of *Nephrops* grounds in 2003–2013.

Ground	Year	Number of stations	Mean density (No. m⁻²)	Domain area (km²)	Abundance estimate (billions)	CV on burrow estimate
Western Irish Sea	2003	160	0.99	5295	5.5	3%
	2004	147	1.00	5310	5.5	3%
	2005	141	1.02	5281	5.7	4%
	2006	138	0.97	5194	5.4	4%
	2007	148	0.93	5285	5.1	3%
	2008	141	0.77	5287	4.3	3%
	2009	142	0.83	5267	4.6	3%
	2010	149	0.90	5307	5.0	3%
	2011	156	0.88	5289	4.9	2%
	2012	99	0.91	5291	5.1	3%
	2013	80	0.78	5278	4.3	3%

Table 5.4.21.2.4 *Nephrops* in Irish Sea West (FU 15). UWTV abundance, confidence intervals, harvest ratio, landings in number, and mean weight in landings. (Note: a 10% survivorship of discards is assumed in the calculation of removals and HR).

Year	Landings in number (millions)	Discards in number (millions)	Removals in number (millions)	Proportion removals retained	Adjusted survey (billions)	Harvest ratio	Landings (t)	Discards (t)	Mean weight in landings (grams)
1986	740	268	981				9 978	1 680	
1987	774	242	992				9 753	1 608	
1988	576	104	669				8 586	639	
1989	644	121	753				8 147	673	
1990	678	53	726				8 308	276	
1991	792	65	850				9 566	345	
1992	525	151	661				7 547	1 079	
1993	679	275	926				8 102	1 622	
1994	619	203	801				7 606	1 185	
1995	554	260	787				7 796	1 724	
1996	469	170	622				7 247	1 202	
1997	731	214	924				9 971	1 330	
1998	616	229	822				9 128	1 560	
1999	710	388	1060				10 780	2 913	
2000	533	298	801				8 370	2 293	
2001	573	315	857				7 438	2 112	
2002	491	223	692				6 792	1 732	
2003	404	291	666	0.61	5.5	0.12	7 052	2 659	17.5
2004	416	218	612	0.68	5.5	0.11	7 267	1 993	17.5
2005	346	157	488	0.71	5.7	0.09	6 530	1 412	18.9
2006	467	261	701	0.67	5.4	0.13	7 534	2 285	16.1
2007	511	375	848	0.60	5.1	0.16	8 424	3 246	16.5
2008	755	191	927	0.81	4.3	0.22	10 478	1 421	13.9
2009	567	335	868	0.65	4.6	0.19	9 199	2 934	16.2
2010	572	180	733	0.78	5.0	0.15	8 963	1 539	15.7
2011	644	332	943	0.68	4.9	0.19	10 162	2 683	15.8
2012	770	258	1003	0.77	5.1	0.20	10 527	1 866	13.7
Max	792	388	1060	0.81	5.67	0.22	10 780	3 246	18.9
Min	346	53	488	0.60	4.29	0.09	6 530	276	13.7
Average	598	229	804	0.70	5.11	0.16	8 565	1 704	16.2