

ECOREGION Celtic Sea and West of Scotland
STOCK *Nephrops* on the Aran Grounds (FU 17)

Advice for 2015

ICES advises that, on the basis of the MSY approach and considering that no discard ban is in place in 2015, landings should be no more than 524 tonnes. Assuming that discard rates do not change from the average of the last three years (2011–2013) the resulting catch would be no more than 584 tonnes.

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

Stock status

	Fishing pressure		
	2011	2012	2013
MSY (F_{MSY})	✓	✗	✗ Above target
Precautionary approach (F_{pa} , F_{lim})	?	?	? Undefined
	Stock size		
	2012–2014		
MSY ($B_{trigger}$)	?	Undefined	
Precautionary approach (B_{pa} , B_{lim})	?	Undefined	
Qualitative evaluation	↘	Decreasing	

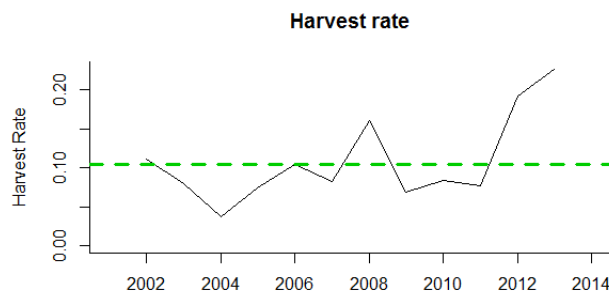
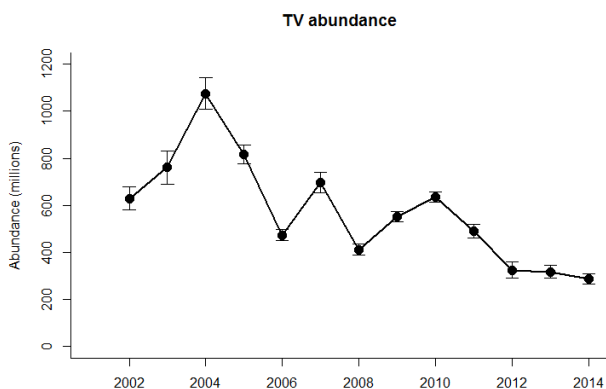
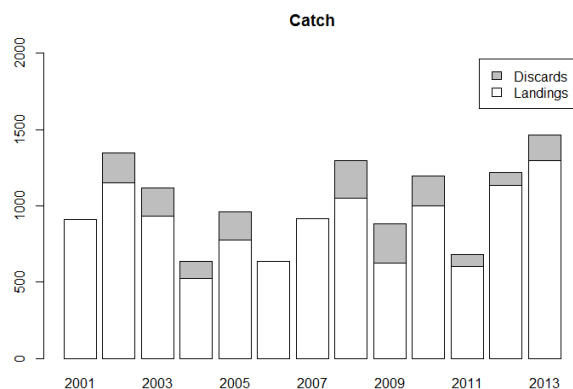


Figure 5.3.21.4.1 *Nephrops* on the Aran Grounds (FU 17). Catches (in tonnes), UWTV abundance with 95% confidence limits (in millions; SSB proxy), and harvest rate (F_{MSY} proxy shown as the dashed green line).

The abundance shows a decreasing trend and the 2014 survey estimate is the lowest in the time-series. The harvest rate (removals/UWTV abundance) has increased significantly since 2011 and is now well above the F_{MSY} proxy.

Management plans

No specific management objectives are known to ICES.

Biology

The Aran Grounds can be characterized as an area with moderate density of small *Nephrops*. The sex ratio in the catches has a strong seasonal pattern.

Environmental influence on the stock

The larval retention mechanisms on the Aran Grounds are not well understood, but fluctuations in UWTV burrow abundance may reflect quite variable recruitment relative to other areas in Subarea VII.

The fisheries

Landings and effort of twin-rig and quad-rig vessels have increased and now account for over 90% of the fishery. In the last few years the fishery has exploited more of the male component of the stock as a higher proportion of catches have been taken in the autumn.

Catch distribution	Total catch (2013) = 1.5 kt, where 1.3 kt were estimated landings (almost 100% otter trawl), and 0.2 kt discards.
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Effects of the fisheries on the ecosystem

Nephrops fisheries in this area also have catches of hake, megrim, and monkfish.

Quality considerations

Biological sampling for this stock is adequate. There is a dedicated annual UWTV survey since 2002 which gives abundance estimates for the Aran Grounds with high precision. The procedure for calculating catch options is considered adequate; although the boundaries of the Aran Grounds could be improved and populations in Galway Bay and Slyne Head could be better integrated.

Scientific basis

Stock data category	1 (ICES, 2014a).
Assessment type	Underwater TV survey combined with yield-per-recruit analysis from length data.
Input data	One survey index (UWTV-FU 17); commercial catches (international landings, length frequencies from Irish catch sampling); maturity data (commercial catch and discard sampling, survey sampling); fixed natural mortality. Discard survival rate.
Discards and bycatch	Included in the assessment since 2001, with data series from the majority of the fleet covering 99% of the landings.
Indicators	Commercial effort and l _{pue} series, length distributions by sex of the catches.
Other information	The latest benchmark (based on the UWTV survey) was performed in 2009 (ICES, 2009). A benchmark process is planned for 2015.
Working group	Working Group for the Celtic Seas Ecoregion (WGCSE).

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Reference points

	Type	Value	Technical basis
MSY approach	MSY B _{trigger}	Not defined.	
	F _{MSY}	HR 10.5%.	F _{MSY} proxy equivalent to F _{35% SPR} for combined sexes in 2010.
Precautionary approach	Not defined.		

(Last changed in: 2010)

Harvest ratio reference points (2010):

	Male	Female	Combined
F _{max}	9.8%	13.0%	11.1 %
F _{0.1}	6.4%	9.1%	7.2 %
F _{35%SpR}	8.4%	12.8%	10.5 %

The density of *Nephrops* in FU 17 is considered to be moderate (average density 0.6 individuals m⁻²). For this FU, the exploitation rate on males is usually higher than on females. A harvest ratio consistent with a combined-sex F_{35%SpR} of 10.5% is suggested as a proxy for F_{MSY}.

Outlook for 2015

Basis: Absolute survey abundance index 2015 = 287 million (2014 index); Mean individual weights in landings (2011–2013, 20.6 g), mean individual weights in discards (2011–2013, 11.4 g); Dead discard rate (in numbers) = 15.7% (average 2011–2013).

Basis	Total catches*	Landings	Dead discards**	Surviving discards**	Harvest rate
	L+DD+SD	L	DD	SD	for L+DD
MSY approach	584	524	54	6	10.5%
F _{2011–13}	918	825	84	9	16.5%
F _{0.1} combined	400	359	37	4	7.2%
F _{max}	617	554	57	6	11.1%

Weights in tonnes.

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

** Total discard rate is assumed to be 16.8% of the catches (in numbers, last three years' average, 2011–2013); discard survival is assumed to be 10%.

MSY approach

Since MSY B_{trigger} has not been identified for this stock, the ICES MSY approach has been applied without considering SSB in relation to MSY B_{trigger}. Following the ICES MSY approach implies a harvest ratio of less than 10.5%. Considering that no discard ban is in place in 2015, this results in landings of no more than 524 t. If discard rates do not change from the average of the last three years (2011–2013), this implies total catches of no more than 584 t.

Additional considerations

General considerations for *Nephrops* in Division VII can be found at the beginning of Section 5.3.21.

Advice considerations

In order to ensure the stock in this FU is exploited sustainably, management should be implemented at the functional unit level (see Section 5.3.21).

Management considerations

The low abundance since 2012 is coincident with high exploitation rates, landings, and lpue. Management measures are required to reduce exploitation rates in this FU.

Total discards of *Nephrops* and other organisms by the *Nephrops* trawl fleet is around 47% of the total catch by weight. The main discards are small *Nephrops*. The main fish species discarded are dogfish, haddock, whiting, and megrim (Anon., 2011).

The proportion of discarded *Nephrops* is substantial. On average over the last three years, around 17% (in numbers) or 10% (in weight) of the *Nephrops* caught are estimated to have been discarded.

Changes in fishing technology and fishing patterns

In recent years several newer vessels specializing in *Nephrops* fishing have participated in this fishery. These vessels target *Nephrops* on several other grounds within the TAC area and move around to optimize catch rates. Since 2012 Irish vessels have increasingly been switching to quad-rig gears these are expected to significantly increase catch rates by around 50%. Effort shows a decreasing trend since 1998 (Figure 5.3.21.4.2). Lpue shows an increasing trend since 2004 (Figure 5.3.21.4.2).

Data and methods

The advice takes the 2014 UWTV survey results into account (Hehir *et al.*, 2014).

Uncertainties in assessment

General comments of uncertainties in the assessment and forecast using the information from the UWTV surveys are discussed in the introduction of Section 5.3.21.

The length-based model and yield-per-recruit analysis used to determine harvest ratio reference points were based on 2008 and 2009 sampling data. The fit of the length-based model to the data was problematic, so F_{MSY} proxies are likely to be uncertain.

The current assessment and advice is based on the Aran Grounds only and does not include Galway Bay and Slyne Head, which account for around 10% of the *Nephrops* abundance in this FU.

Comparison of the basis of previous assessment and advice

The basis for the assessment has not changed from last year. The basis for the advice this year is the same as last year: the MSY approach.

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.
- Hehir, I., Doyle, J., Lordan, C., O'Cuaig, M., Hannify, O., Fitzgerald, R., *et al.* 2014. Aran, Galway Bay and Slyne Head *Nephrops* Grounds (FU17) 2014 UWTV Survey Report and catch options for 2015. Marine Institute UWTV Survey report.
- ICES. 2009. Report of the Benchmark Workshop on *Nephrops* (WKNEPH), 2–6 March 2009, Aberdeen, UK. ICES CM 2009/ACOM:33.
- ICES. 2014a. Advice basis. In Report of the ICES Advisory Committee, 2014. ICES Advice 2014, Book 1, Section 1.2.
- ICES. 2014b. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 13–22 May 2014, Copenhagen, Denmark. ICES CM 2014/ACOM:12.

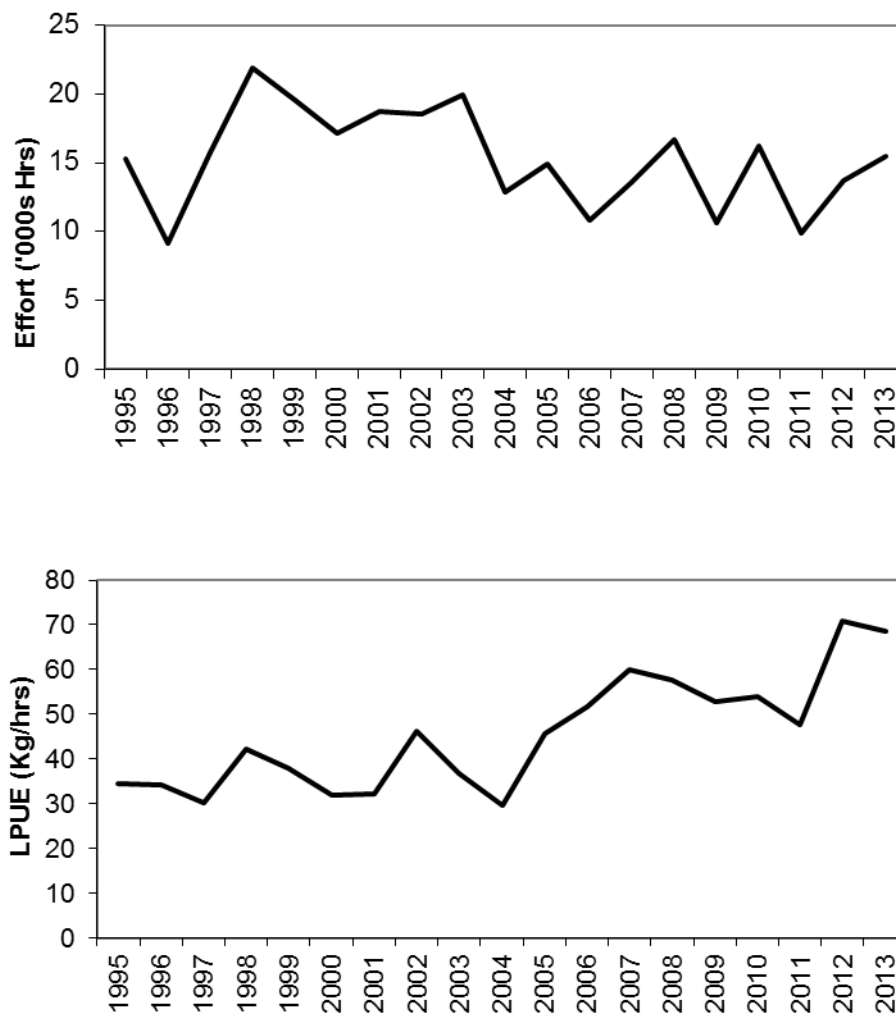


Figure 5.3.21.4.2 *Nephrops* on the Aran Grounds (FU 17). Irish effort (top) and lpue (bottom) for the *Nephrops*-directed fleet.

**Length frequencies for catch (dotted) and landed(solid):
Nephrops in FU17**

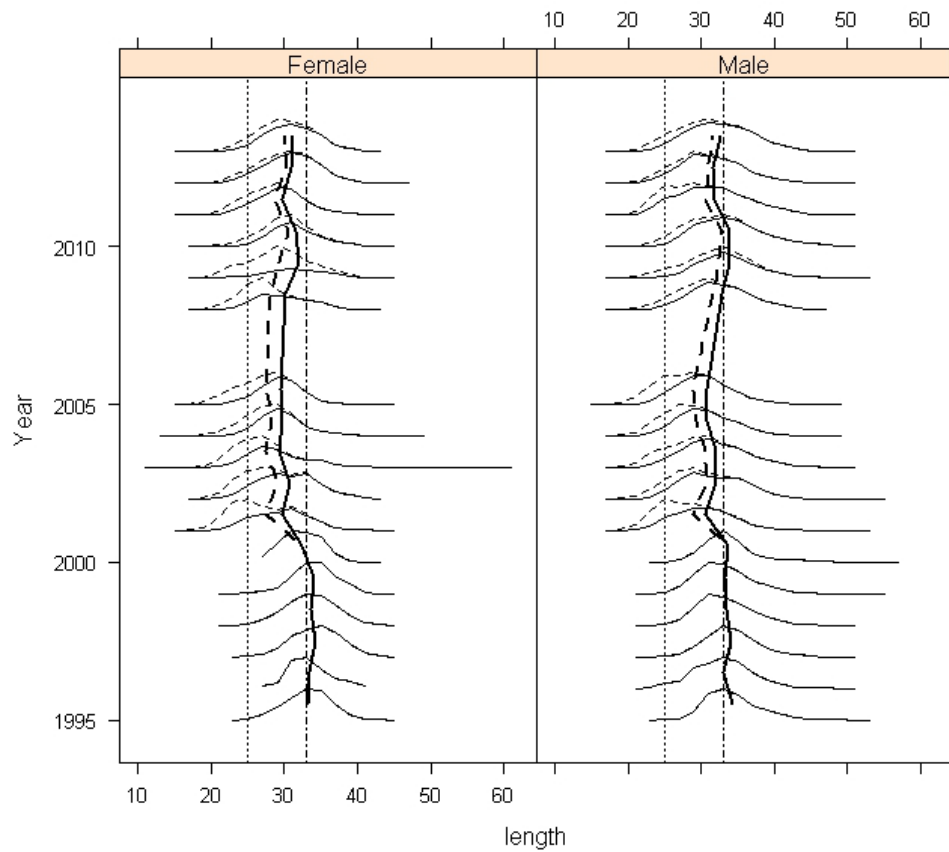


Figure 5.3.21.4.3 *Nephrops* on the Aran Grounds (FU 17). Annual length composition of catch (dashed) and landings (solid). Males (right) and females (left) from 1995 (bottom) to 2013 (top). The vertical dashed line is mean length in the catches and the vertical solid line is mean length in the landings. The straight vertical lines correspond to 25 mm (MLS) and 33 mm carapace length.

Table 5.3.21.4.1 *Nephrops* on the Aran Grounds (FU 17). ICES advice, management, landings, and discards.

Year	ICES advice	Predicted landings corresp. to advice (FU 17)	Recommended landings Divisions VIIbcjk ¹⁾	ICES landings FU 17	Discards ²⁾ FU 17
1987				0.1	
1988				0.1	
1989				0.8	
1990				0.3	
1991				0.5	
1992			3.8	0.4	
1993			~4.0	0.4	
1994			~4.0	0.7	
1995			~4.0	0.9	
1996			4.0	0.5	
1997			4.0	0.8	
1998			4.0	1.4	
1999			4.0	1.1	
2000			4.0	0.9	
2001			4.0	0.9	
2002			4.44	1.2	0.2
2003			4.44	0.9	0.2
2004	Restrict landings to 2000–2002 levels		3.3	0.5	0.1
2005	Restrict landings to 2000–2002 levels		3.3	0.8	0.2
2006	Restrict landings to 2000–2002 levels		3.3	0.6	
2007	Constrain effort at recent levels		--	0.9	
2008	Constrain effort at recent levels		--	1.1	0.2
2009	No increase in effort and landings (2007)	< 0.9		0.6	0.3
2010	Harvest ratio no greater than the lower bound of the range of $F_{0.1}$ for similar stocks	< 0.5		1.0	0.2
2011	MSY approach	< 0.95		0.6	0.1
2012	MSY approach	< 1.1		1.1	0.1
2013	MSY approach (Updated November 2012)	< 0.59		1.3	0.2
2014	MSY approach	< 0.59			
2015	MSY approach	< 0.524			

Weights in thousand tonnes.

¹⁾ Previously ICES gave combined advice for FUs 16, 17, 18, and 19, and other rectangles in this area.²⁾ 10% of discards are assumed to survive.

Table 5.3.21.4.2 *Nephrops* on the Aran Grounds (FU 17). ICES landings (tonnes) by country.

YEAR	FRANCE	REP. OF IRELAND	UK	TOTAL
1974	477			477
1975	822			822
1976	131			131
1977	272			272
1978	481			481
1979	452			452
1980	442			442
1981	414			414
1982	210			210
1983	131			131
1984	324			324
1985	207			207
1986	147		1	148
1987	62		0	62
1988	14	814		828
1989	27	317	3	347
1990	30	489		519
1991	11	399		410
1992	11	361	2	374
1993	11	361	0	372
1994	18	707	4	729
1995	91	774	2	867
1996	2	519	7	528
1997	2	839	0	841
1998	9	1401	0	1410
1999	0	1140	0	1140
2000	1	879	0	880
2001	1	912	0	913
2002	2	1152	0	1154
2003	0	933	0	933
2004	0	525	0	525
2005	0	778	0	778
2006	0	637	0	637
2007	0	913	0	913
2008	0	1050	7	1057
2009	0	625	0	625
2010	0	991	9	1000
2011	0	600	0	600
2012	0	1135	0	1135
2013*	0	1295	0	1295

* Preliminary.

Table 5.3.21.4.3 *Nephrops* on the Aran Grounds (FU 17). Results from the UWTV-FU 17 survey of *Nephrops* on the Aran Grounds.

Year	Number of stations	Mean density adjusted (burrows m ⁻²)	Estimation standard deviation	Domain area (km ²)	Geostatistical abundance estimate (millions of burrows)	CV on burrow estimate
2002	49	0.65	0.04	943	629	4%
2003	41	0.78	0.06	943	761	5%
2004	64	1.10	0.05	943	1075	3%
2005	70	0.84	0.03	936	818	3%
2006	67	0.49	0.02	932	474	3%
2007	71	0.71	0.03	942	697	3%
2008	63	0.43	0.02	906	412	3%
2009	82	0.56	0.02	940	552	2%
2010	91	0.65	0.01	937	636	2%
2011	76	0.51	0.02	909	491	3%
2012	31*	0.34	0.02	942	325	5%
2013	31*	0.32	0.02	941	317	4%
2014	33*	0.29	0.01	939	287	4%

* Reduced isometric grid 3.5 nmi.

Table 5.3.21.4.4 *Nephrops* on the Aran Grounds (FU 17). Landings, discards, and removals by number, proportion of removals retained, absolute UWTV survey abundance and 95% confidence intervals, estimated harvest rate, and landings and discards mean weights.

Year	Landings in numbers (millions)	Discards in numbers (millions)	Removals in numbers (millions)	Propor. removals retained	Absolute survey abundance (millions)	95% Confidence interval survey abundance (millions)	Harvest ratio (%)	Landings (t)	Discards (t)	Mean weight in landings (g)	Mean weight in discards (g)
2001	48.7	25.4	71.6	0.68				912			
2002	54.5	17.7	70.4	0.77	629	48	11.2	1 152	192	21.2	10.8
2003	44.1	18.3	60.6	0.73	761	71	8.0	933	183	21.2	10.0
2004	29.0	11.4	39.3	0.74	1075	68	3.7	525	112	18.1	9.9
2005	42.4	19.7	60.1	0.70	818	41	7.4	778	182	18.4	9.2
2006	na	na	49.5*	na	474	25	10.4	636	na	na	na
2007	na	na	57.3*	na	697	42	8.2	913	na	na	na
2008	47.2	21.7	66.7	0.71	412	24	16.2	1,057	246	22.4	11.3
2009	23.5	15.7	37.6	0.62	552	23	6.8	625	256	26.6	16.3
2010	41.0	13.3	53.0	0.77	636	20	8.3	1 000	194	24.4	14.5
2011	30.8	7.7	37.7	0.82	491	28	7.7	600	83	19.5	10.8
2012	55.6	7.6	62.4	0.89	325	34	19.2	1 135	85	20.4	11.3
2013	59.2	14.178	72.0	0.82	317	27	22.7	1 295	170	21.9	12.0
2014					287	22					
Average 2011–2013				0.843			16.52			20.6	11.4

na= not available.

* No discard samples; an average discard rate was used to estimate removals (including dead discards).