ECOREGION Celtic Sea
STOCK *Nephrops* in Subarea VII

Nephrops are limited to a muddy habitat and the distribution of suitable sediment defines the species distribution. The stocks are assessed as six separate Functional Units (FU) as shown in Figure 5.4.34.1. There are also some smaller catches from areas outside these Functional Units.

Section	FU no.	Name	ICES Divisions	Statistical rectangles
5.4.34.1	14	Irish Sea East	VIIa	35–38E6; 38E5
5.4.34.2	15	Irish Sea West	VIIa	36E3; 35–37 E4–E5; 38E4
5.4.34.3	16	Porcupine Bank	VIIb,c,j,k	31–35 D5–D6; 32–35 D7–D8
5.4.34.4	17	Aran Grounds	VIIb	34–35 D9–E0
5.4.34.5	19	Ireland SW and SE coast	VIIa,g,j	31–33 D9–E0; 31E1; 32E1–E2; 33E2–E3
5.4.34.6	20-21 and 22	Celtic Sea	VIIg,h	28–30 E1; 28–31 E2; 30–32 E3; 31 E4

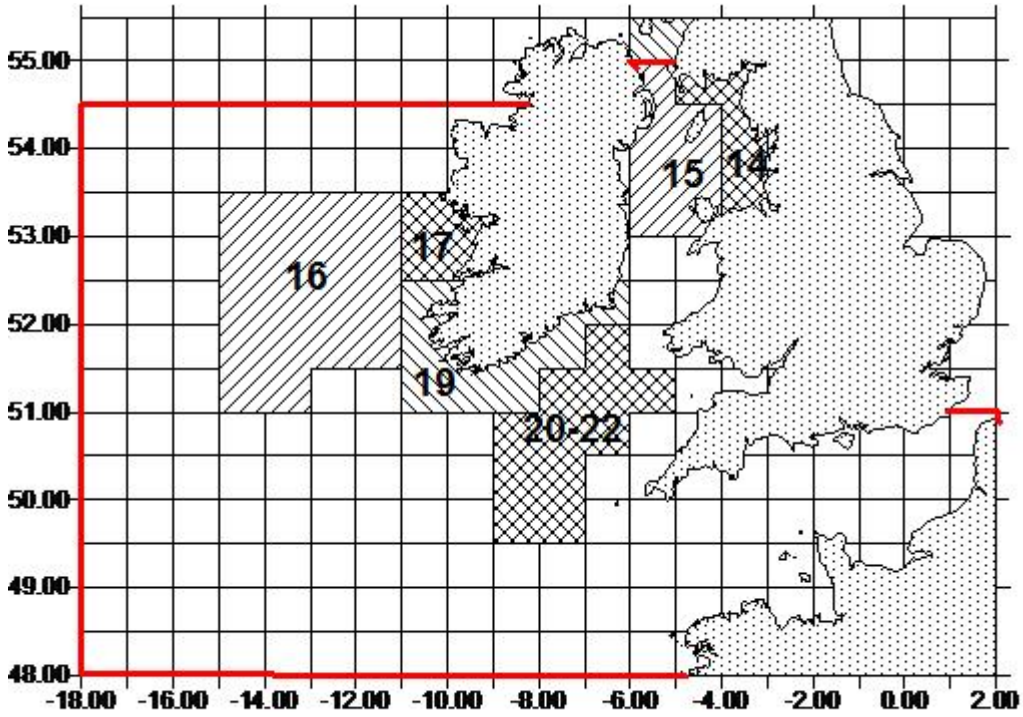

Figure 5.4.34.1 *Nephrops* Functional Units in Subarea VII (around Ireland). The TAC for Subarea VII applies to the area bounded by the red line. The FUs within the TAC area are shaded.

Advice for 2012

The advice for Nephrops stocks is given by functional units in sections 5.4.34.1 – 6. A summary can be found in table 5.4.34.1.

There is no information available on the trends in the stock or exploitation status for FU18 and the rectangles outside the FUs ('other rectangles') for which ICES provides advice. Advice for the FUs in Subarea VIa have slightly increased. On the basis of precautionary considerations, ICES advises that the catches in the FU18 and other rectangles should not increase.

Table 5.4.34.1 *Nephrops* in Subarea VII. ICES advice, management and landings by Functional Unit plus Other rectangles.

Year	Predicted landings corresponding to ICES advice							Agreed TAC	ICES landings
	Irish Sea East (FU14)	Irish Sea West (FU15)	Porcupine Bank (FU16)	Aran Grounds (FU17)	Ireland SW and SE Coast (FU19)	Celtic Sea (FU20–22)	Other rec-tangles [1]		
Manag. Area Division	MA J VIIa		MA L VIIbcjk			MA M VIIfgh		VII	VII
1992	8.9		3.8			~3.8		20.0	15.8
1993	9.4		~4.0			3.8		20.0	16.9
1994	9.4		~4.0			3.8		20.0	17.5
1995	9.4		~4.0			3.8		20.0	18.8
1996	9.4		4.0			3.8		23.0	16.9
1997	9.4		4.0			3.8		23.0	19.1
1998	9.4		4.0			3.8		23.0	18.4
1999	9.4		4.0			3.8		23.0	18.7
2000	9.4		4.0			3.8		21.0	16.4
2001	9.4		4.0			3.8		18.9	16.1
2002	9.55		4.44			3.8		17.79	16.1
2003	9.55		4.44			3.8		17.79	15.7
2004	9.55		3.3			4.6		17.45	15.3
2005	9.55		3.3			4.6		19.544	16.0
2006	9.55		3.3			4.6		21.498	16.2
2007	- [4]	- [4]	- [4]	- [4]	- [4]	- [4]		25.153	19.1
2008	- [4]	- [4]	- [4]	- [4]	- [4]	< 5.3		25.153	20.4
2009	<1.0	< 8.5	< 1.0	< 0.9	< 0.8	< 5.3	< 0.2	24.650	17.6
2010 [2]	<1.0	< 5.5	0	< 0.5	< 0.8	< 5.3	< 0.2	22.432	
2011	<0.68	<9.5	0	<0.9	- [3]	- [3]	< 0.2		
2012	<0.96	<9.8	- [4]	<1.1	- [4]	<2.3 [4] [5]	[6]		

Weights in '000 t.

[1] Prior to advice for 2009, landings corresponding to advice for other rectangles and FU 18 were included in relevant 'Management Areas (MA)'.

[2] The advice for FU 14, 16 and 19-22 was biennial and valid for 2009 and 2010.

[3] See scenarios.

[4] ICES is not advising an absolute level of catches for FU16, FU19 and FU20-21

[5] Predicted catch corresponding to advice for FU22

[6] ICES advises that the catches in the FU18 and other rectangles should not increase.

Biology

Nephrops is limited to muddy habitat, and requires sediment with a silt and clay content of between 10–100% to excavate its burrows. This means that the distribution of suitable sediment defines the species distribution. Adult *Nephrops* only undertake very small scale movements (a few 100 m) but larval transfer may occur between separate mud patches in some areas. This makes some stocks, particularly those with lower average density, vulnerable to localised depletion. Catch rates and composition vary daily and seasonally between different areas and sexes due to different emergence patterns and underlying population densities. After the onset of maturity male *Nephrops* grow faster and attain a large size than female. Density limits growth and grounds with high *Nephrops* density (>0.7/m^2) have smaller average size that those with low density.

Environmental influence on the stock

Temperature and hydrographic factors, particularly during the larval phase are critical to recruitment success in *Nephrops*. Some stocks in Division VII such as FU15 have well known and understood larval retention mechanisms (i.e. Western Irish Sea Gyre). Other stocks such as the Porcupine Bank have less well understood larval retention mechanisms. This results in very different population structure, productivity and vulnerability to fishing. Increasing water temperature leading to shorter larval development times is thought to improve recruitment in areas such as the Irish Sea. Increased storminess related to the NAO has also been linked to reduced recruitment and low catch rates several years later on the Porcupine Bank.

Effects of the fisheries on the ecosystem

Trawling for *Nephrops* results in bycatch and discards of other commercial species, including cod, haddock, whiting, hake, monkfish, and megrim. Given that 80 mm is the predominant mesh size used in *Nephrops* fisheries the resulting discard rates of small *Nephrops* and fish can be high.

The high mud content and soft nature of *Nephrops* grounds means that trawling readily marks the seabed, trawl marks remaining visible for some time. Despite the high intensity of fishing (some areas are impacted >7 times/year) burrowing fauna can be seen re-emerging from freshly trawled grounds, implying that there is some resilience to trawling.

Additional considerations

The overriding management consideration for these stocks is that management should be at the Functional Unit rather than the ICES Subarea/Division level. Management at the Functional Unit level should provide the controls to ensure that catch opportunities and effort are compatible and in line with the scale of the resources in each of the stocks defined by the Functional Units.

Current management of *Nephrops* in Subarea VII (both in terms of TACs and effort) does not provide adequate safeguards to ensure that local effort is sufficiently limited to avoid depletion of resources in separate Functional Units. The current situation allows for catches to be taken anywhere in the TAC area and this could imply inappropriate harvest rates in some FUs. This appears to have been a particular problem in the Porcupine Bank where a large increase in effort occurred from 2002 up to 2007 and the stock declined substantially.

Landings from the northwest coast of Ireland NW (FU 18) have previously been treated as a separate Functional Unit although landings have been negligible in recent years and there is no major *Nephrops* fishery in that area. There are also *Nephrops* catches in other rectangles outside Functional Units in Subarea VII. There is no information available on the trends in the stock or exploitation status for FU18 and the rectangles outside the FUs ('other rectangles') for which ICES provides advice. Advice for the FUs in Subarea VII has slightly increased. On the basis of precautionary considerations, ICES advises that the catches in the other rectangles and FU18 should not increase.

Landings in recent years have been well below the TAC due to low uptake by France and Spain, whereas the UK and Irish landings are close to the quota.

MSY approach

There are no precautionary reference points defined for *Nephrops*. Under the new ICES MSY framework, exploitation rates which are likely to generate high long-term yield (and low probability of stock overfishing) have been explored and proposed for each functional unit. Owing to the way *Nephrops* are assessed, it is not possible to estimate F_{MSY} directly and hence proxies for F_{MSY} are determined. Three candidates for F_{MSY} are $F_{0.1}$, $F_{35\%SpR}$ and F_{max}. There may be strong difference in relative exploitation rates between the sexes in many stocks. To account for this, values for each of the candidates have been determined for males, females and the two sexes combined. The appropriate F_{MSY} candidate has been selected for each Functional Unit independently according to the perception of stock resilience, factors affecting recruitment, population density, knowledge of biological parameters and the nature of the fishery (relative exploitation of the sexes and historical harvest rate *vs* stock status).

A decision making framework based on the table below was used in the selection of preliminary stock specific F_{MSY} proxies. These may be modified following further data exploration and analysis. The combined sex F_{MSY} proxy should be considered appropriate provided that the resulting percentage of virgin spawner per-recruit for males or females does not fall below 20%. In such a case a more conservative sex specific F_{MSY} proxy should be picked over the combined proxy.

		Burrow Density (average burrow/m^2)		
		Low	Medium	High
		<0.3	0.3-0.8	>0.8
Observed harvest rate or landings compared to stock status	> F_{max}	$F_{35\%SpR}$	F_{max}	F_{max}
	F_{max} - $F_{0.1}$	$F_{0.1}$	$F_{35\%SpR}$	F_{max}
	< $F_{0.1}$	$F_{0.1}$	$F_{0.1}$	$F_{35\%SpR}$
	Unknown	$F_{0.1}$	$F_{35\%SpR}$	$F_{35\%SpR}$
Stock Size Estimates	Variable	$F_{0.1}$	$F_{0.1}$	$F_{35\%SpR}$
	Stable	$F_{0.1}$	$F_{35\%SpR}$	F_{max}
Knowledge of biological parameters	Poor	$F_{0.1}$	$F_{0.1}$	$F_{35\%SpR}$
	Good	$F_{35\%SpR}$	$F_{35\%SpR}$	F_{max}
History Fishery	Stable spatially and temporally	$F_{35\%SpR}$	$F_{35\%SpR}$	F_{max}
	Sporadic	$F_{0.1}$	$F_{0.1}$	$F_{35\%SpR}$
	Developing	$F_{0.1}$	$F_{35\%SpR}$	$F_{35\%SpR}$

Preliminary MSY $B_{trigger}$ reference points were proposed at the lowest observed UWTV abundance. However, the time series of surveys in Subarea VII are too short for that. For FU 15 where a longer series of survey trawl cpue was available this has been used to estimate a preliminary MSY $B_{trigger}$.

Factors affecting the fisheries and the stock

Regulations and their effects

Landings by some fleets prior to 2007 are thought to have been underreported. The implementation of the 'Buyers and Sellers' legislation in the UK in 2006 and 'sales notes' in Ireland in 2007, coupled with the increased TAC in 2007, is thought to have improved the reliability of reported landings data. The transition has been accompanied by a large change in reported landings and a significant recent increase in landings per unit effort (lpue) for some countries that cannot completely be attributed to changes in the stock.

Scientific basis

Data and methods

The assessments and advice for *Nephrops* stocks in Functional Units 14 and 15 (Irish Sea), 17 (Aran), and 22 (the Smalls) are primarily based on abundance estimates from under-water TV (UWTV) surveys together with fishery landings data and estimates of quantities of discards. Additional indicators of changes in stocks are derived from trends in length compositions and sex ratio in the catches, fishery lpue, and (for FU15) trawl survey catch rates. The assessments and advice for FU 16 (Porcupine Bank) and FU 20–21 (Celtic Sea) are based on a range of indicators of stock trends including fishery lpue, trawl survey catch-rates, size compositions and sex ratio.

For FUs 14, 15, 17, and 22, the following procedure is adopted for providing assessment and advice based on UWTV survey estimates:

- Total population numbers are estimated from the UWTV surveys, including adjustments for a range of biases associated with the method. WKNEPH (ICES, 2009) proposed that the UWTV surveys provide abundance estimates for *Nephrops* of 17mm carapace length and over.
- Historical harvest ratios are calculated as the ratio of total catch numbers (landings and dead discards) to population numbers from the UWTV survey in each year.
- Recent fishery length compositions (landings and dead discards) are analysed using a length-based assessment model to estimate population numbers and fishing mortality at length for *Nephrops* of 17 mm carapace length and over. This method assumes that the length compositions are representative of a population at equilibrium. The analysis is done separately for males and females using stock-specific growth and maturity parameters.
- Yield-per-recruit and spawning biomass-per-recruit curves are derived for male and female *Nephrops*, based on fishery selectivity parameters from the length-based assessment model. The harvest ratios associated with potential F_{MSY} proxies (e.g. $F_{0.1}$, F_{max}, $F_{35\%SPR}$) for males, females and both sexes combined are computed. These are conditional on a fishery selectivity pattern that includes fishing mortality due to discarding of dead *Nephrops* in the years covered by the assessment model.

Catch options tables for 2012 are derived for a range of F_{MSY} and other options by applying the appropriate harvest ratios to the population numbers estimate from the most recent UWTV survey. This assumes the population numbers

remain stable in the interim year. Landings are derived from the resultant total catch numbers after multiplying by the recent average value for proportion retained and mean weight in the landings.

Uncertainties in assessment and forecast

ICES expert groups in preparation of the benchmark of UWTV assessments (ICES, 2009) have worked to reduce uncertainty and increase precision in the interpretation of survey data. Despite these improvements, there remains a requirement for expert knowledge in the production of bias factors applied to UWTV abundance estimates and these were last estimated in 2009. As further research is conducted and better understanding of the UWTV process is gained, these bias estimates will require revision.

In the provision of catch options based on the survey estimates additional uncertainties related to mean weight in the landings and to the discard rates also arise. The procedure outlined in WKNEPH (ICES, 2009) is to use a multi-annual average to dampen variability. The variability in mean weight and discarding is a key uncertainty in the derivation of catch options. Improved quality of fishery data and knowledge of growth rates are needed for development of analytical assessment models and improvement of MSY reference points.

There is a gap of 16-18 months between the survey and the start of the year for which the assessment is used in management advice. It is assumed that the stock is in equilibrium during this period (i.e. recruitment and growth balance mortality) although this is rarely the case. The effect of this assumption on realised harvest rates has not been investigated. The calculations of harvest ratio and reference points $F_{0.1}$ and F_{max} are all based on yield-per-recruit analyses. In addition, important assumptions are made on growth, natural mortality and discard rates in the derivation of reference points.

Trends in lpue data are subject to uncertainties as a measure of stock abundance due to changes in fishing practices.

Sources of information

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

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011 ICES CM 2011/ACOM:12.

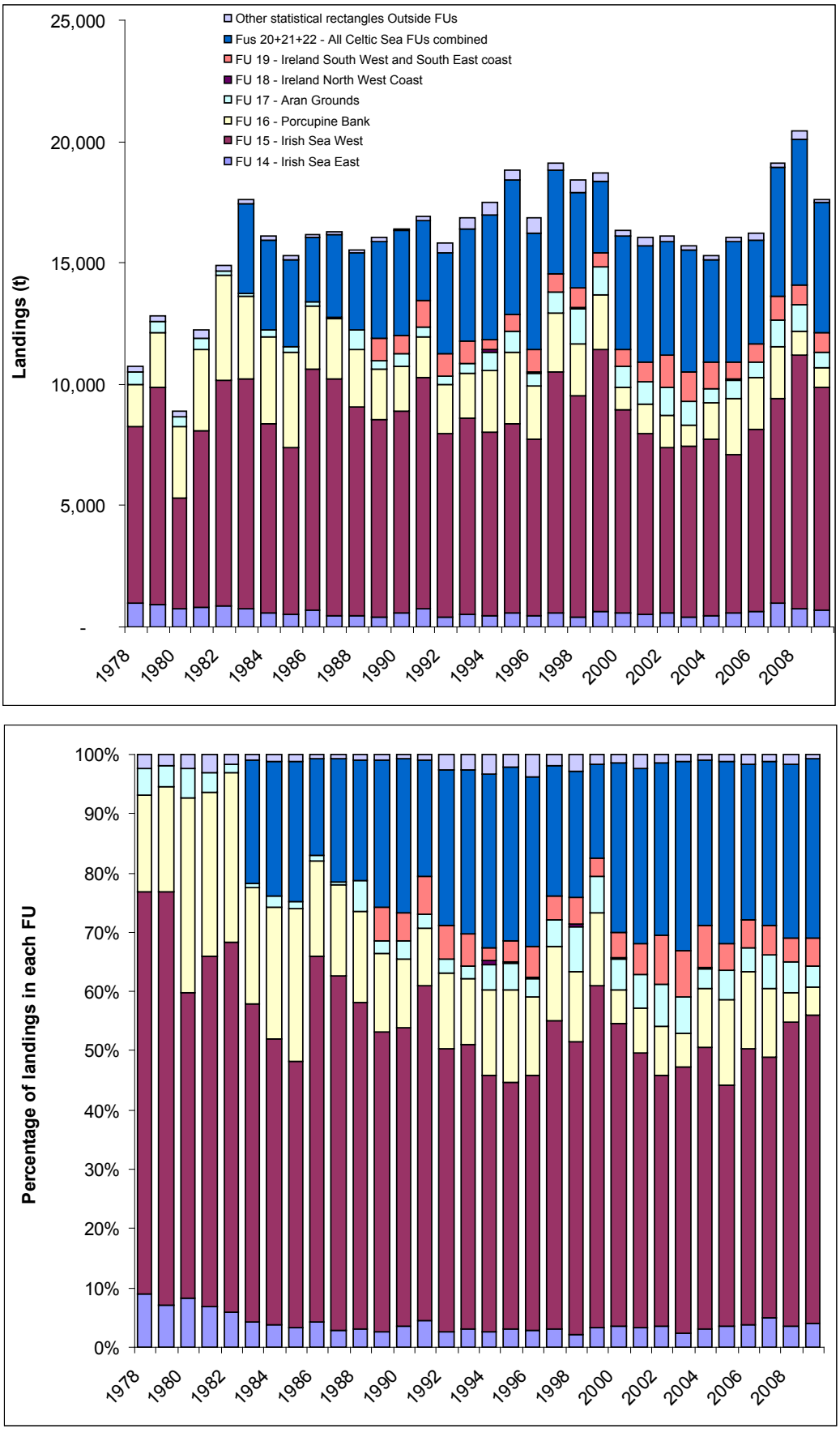

Figure 5.4.34.2 *Nephrops* in Subarea VII. Total landings (in tonnes, top) and percentage of the total landings (bottom) by Functional Unit (FU) and from rectangle outside FUs.

Table 5.4.34.2 *Nephrops* in Subarea VII. ICES estimates of landings (tonnes) from all individual Functional Units within TAC Subarea VII.

Year	FU 14 - Irish Sea East	FU 15 - Irish Sea West	FU 16 - Porcupine Bank	FU 17 - Aran Grounds	FU 18 - Ireland North West Coast	FU 19 - Ireland South West and South East coast	FUs 20+21+22 - All Celtic Sea FUs combined	Other statistical rectangles Outside FUs	Total Landings ICES Sub-area VII	TAC for VII
1978	961	7296	1744	481				249	10731	
1979	900	8948	2269	452				237	12806	
1980	730	4578	2925	442				205	8880	
1981	829	7249	3381	414				382	12255	
1982	869	9315	4289	210				234	14917	
1983	763	9448	3426	131				174	13942	
1984	602	7760	3571	324				187	12444	
1985	498	6901	3919	207				194	11719	
1986	671	9978	2591	147				113	13500	
1987	449	9753	2499	62				107	12870	24700
1988	462	8586	2375	828				140	12391	24700
1989	401	8128	2115	344		899		134	12021	26000
1990	563	8300	1895	519		754		102	12133	26000
1991	747	9554	1640	410		1077		169	13597	26000
1992	427	7541	2015	372		888		409	11652	20000
1993	515	8102	1857	372	10	905	4358	455	16574	20000
1994	447	7606	2512	729	126	390	4843	570	17223	20000
1995	584	7796	2936	866	26	695	5198	397	18498	23000
1996	475	7247	2230	525	46	888	4602	623	16636	23000
1997	566	9971	2409	841	15	756	3991	340	18889	23000
1998	388	9128	2155	1410	78	827	3819	514	18319	23000
1999	624	10786	2290	1140	16	579	2862	322	18619	23000
2000	567	8370	910	880	9	696	4642	243	16317	21000
2001	532	7441	1222	913	2	815	4736	368	16029	18900
2002	577	6793	1327	1154	14	1318	4623	243	16049	17790
2003	376	7052	908	933	16	1239	5003	186	15713	17790
2004	472	7266	1526	525	22	1074	4270	161	15316	17450
2005	570	6529	2315	778	15	711	4942	180	16040	19544
2006	628	7535	2120	637	14	741	4248	270	16193	21498
2007	959	8424	2186	913	3	957	5300	206	18948	25153
2008	681	10482	1000	1057	1	866	6001	322	20410	25153
2009	708	9166	825	625	10	833	5387	107	17661	24650
2010	563	8929	917	1000	7	722	4622	359	17119	22432
Average	609	8241	2191	631	24	846	4636	270	15043	

ECOREGION Celtic Sea
STOCK *Nephrops* in Irish Sea East (FU14)

Advice for 2012

ICES advises on the basis of the transition to the MSY approach that landings in 2012 should be no more than 960 t.

Stock status

F (Fishing Mortality)	2008	2009	2010	
MSY (F_{MSY})	✓	✓	✓	Below target
Precautionary approach (F_{pa},F_{lim})	?	?	?	Undefined
SSB (Spawning Stock Biomass)	2008	2009	**2010**	
MSY ($B_{trigger}$)	?	?	?	Undefined
Precautionary approach (B_{pa},B_{lim})	?	?	?	Undefined

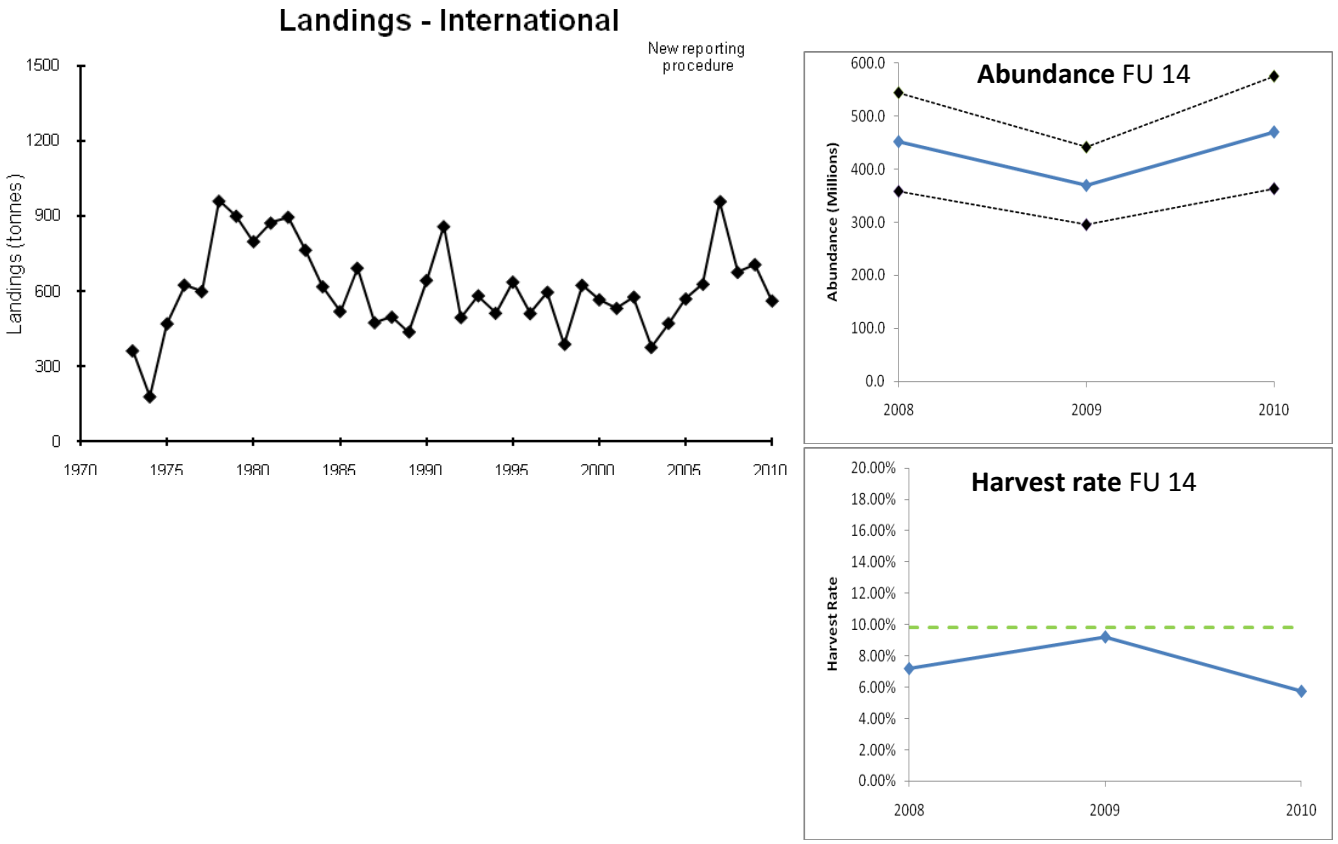

Figure 5.4.34.1.1 *Nephrops*, Irish Sea East (FU14): Long-term trends in landings (in tonnes), UWTV survey abundance with 95% confidence limits (in millions; SSB proxy) and harvest rate (green dashed line is F_{MSY} proxy).

There is not a long enough time series to determine a candidate for MSY $B_{trigger}$. Current harvest rate is below the F_{MSY} proxy.

Management plans

No specific management objectives are known to ICES.

Biology

The Eastern Irish Sea stock is of a relatively low mean density (~0.3burrows/m^2) and is limited to two discrete areas of muddy sediment. The main part of the stock sits between the Isle of Man and the Cumbrian coast of England with a smaller patch in Wigtown Bay off the south coast of Scotland. Whilst females are carrying their eggs their emergence rate from burrows is much reduced. Males are limited in their geographical range for finding mates, hence low densities of males can have a significant impact upon stock spawning potential.

The fisheries

The fleet is made of around 30 English vessels almost entirely single otter trawling and around 40 generally larger Northern Irish vessels over half of which fish multi-rig trawls. The multi riggers take around 1/3 of the landings. 80 mm cod ends are commonly used for both types of trawl. The fishery takes place mainly in spring and early summer, when male *Nephrops* predominate.

Catch by fleet	Total landings (2010): 563 t (32% twin rig otter trawls, 67% single otter trawl). Additional discards estimated at 28% by number.

Effects of the fisheries on the ecosystem

The *Nephrops* trawl fishery takes bycatches of other species, especially plaice, but also, whiting and cod.

Quality considerations

The survey series commenced in 2007. Because of reduced discard sampling in 2009 the discard rate and catch composition for 2009 is uncertain. No reliable length composition is available from 2010.

Scientific basis

Assessment type	UWTV and trends
Input data	1 survey index (UWTV-FU14-15)
Discards and bycatch	Discards included in the assessment and forecast
Indicators	Size structure of catches, sex ratio and lpue
Other information	Process benchmarked at WKNEPH 2009 considered appropriate for this stock
Working group report	WGCSE

ECOREGION Celtic Sea
STOCK *Nephrops* in Irish Sea East (FU14)

Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	Not defined	No available reference. UWTV time series too short.
	F_{MSY}	Harvest ratio 9.8%	Equivalent to $F_{0.1}$ for combined sexes.
Precautionary Approach	Not defined		

(unchanged since: 2011)

Harvest ratio reference points (2010):

	Male	Female	Combined
F_{max}	15.8%	17.4%	16.4%
$F_{0.1}$	9.6%	10.2%	9.8%
$F_{35\%SpR}$	12.5%	13.5%	13.0%

Compared to other *Nephrops* stocks in the ICES area the absolute population density of this stock appears relatively low (around 0.3/m^2) in a highly seasonal male dominant fishery. The area covered by this fishery is relatively small and the confidence intervals for the abundance estimate are large for a geostatistical survey. The annual variability of lpue for the smaller individuals in the catch, suggest that recruitment to this fishery is quite variable. However, the fishery appears to have been sustainable with harvest rates below $F_{0.1}$. In this instance, therefore, the use of $F_{0.1}$ as a proxy for F_{MSY} (for the combined sexes) is considered appropriate as it will should deliver high long term yield with a low probability of recruitment over-fishing.

All F_{MSY} proxy harvest rate values are considered preliminary and may be modified following further data exploration and analysis.

Outlook for 2012

Basis: F2011 =F2008-10 =7.4%, Bias corrected survey index (2010) = 469 million, Mean weight in landings (2006-08) =28.9 g, and retention factors (72.1%) based on 2006–2008 sampling.

Basis	Harvest rate (%)	Landings 2012 (tonnes)
Closure	0%	0
F_{sq}	7.4%	700
$F_{35\%SpR}$	13%	1270
MSY framework	9.8%	960
F_{max}	16.4%	1600

MSY approach

Following the ICES MSY framework implies the harvest ratio to be no more than 9.8%, resulting in landings of 960 t in 2012.

Additional considerations

The *Nephrops* trawl fishery takes by-catches of other species, especially plaice, but also, whiting and cod. Selectivity of this fishery needs to be improved to reduce bycatches of cod, whiting and undersized plaice

The fishery peaks in summer. Some UK vessels temporarily relocate, targeting the Farn Deeps *Nephrops* fishery on the east coast of England for the winter months.

The effects of regulations

The cod recovery measures introduced in 2000 includes effort limitations. The cod long-term plan was introduced in 2009 (EC 1342/2008). Annual effort in *Nephrops* trawl fisheries (Effort group TR2 OTB 70–99 mm) in Division VIIa as a whole has been reduced by 25% in 2009 and a further 25% in 2010. However, *Nephrops* effort is free to move between FUs and therefore the effect of this regulation may not be restrictive on a FU basis.

Changes in fishing technology and fishing patterns

In contrast to the overall effort reductions in Division VIIa, effort in FU 14 has remained relatively stable since 2001. Fuel prices have affected the choice of gears. Despite reasonable catch rates some skippers are less inclined to go to sea unless they can guarantee to cover their costs. This might bias the lpues as a measure of stock abundance.

Uncertainties in assessment and forecast

General comments are made at the start of section 5.4.34.

The short time series of more reliable commercial data and UWTV surveys means that biological reference points for this stock are imprecise.

Uncertainties in the survey, mean weight in the landings and discard rates are not taken into account in the advice.

Comparison with previous assessment and advice

In the 2010 advice for the fishery in 2011 the evaluation was based on trends in population indicators and catch options derived from short time series of UWTV surveys. The present assessment is based on revised survey data. The present advice for the fishery in 2012 is based on the MSY approach adopting $F_{0.1}$ as an F_{MSY} proxy.

Sources

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

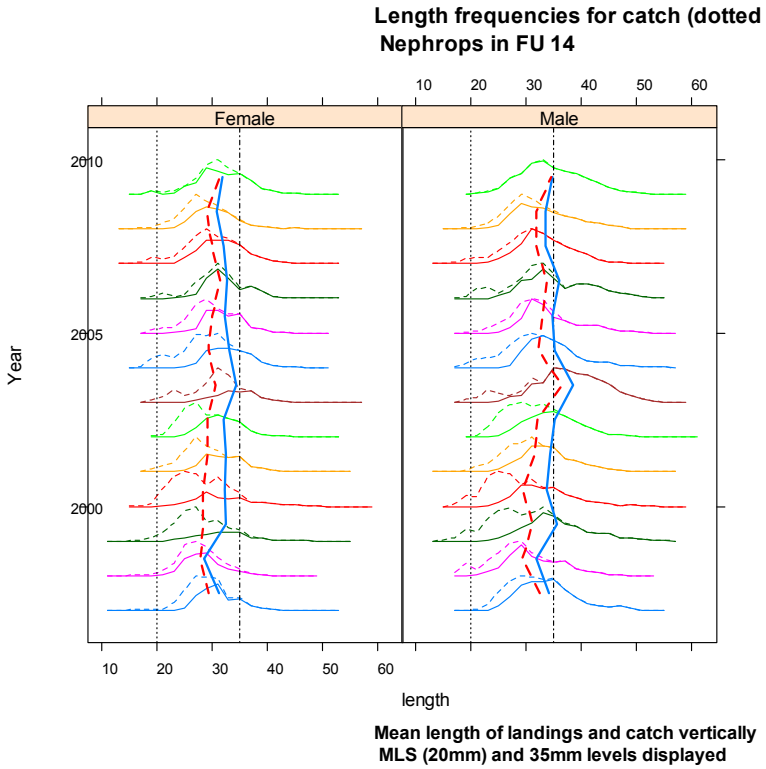

Figure 5.4.34.1.2 *Nephrops* in Irish Sea East (FU 14). Length composition of catch (dotted) and landed (solid) of males (right) and females left from 1996 (bottom) to 2009 (top). Mean sizes of catch and landings (using same line types) is shown in relation to Minimum Landing Size (MLS). Sampling levels in 2010 were insufficient to provide robust data, this figure was not, therefore, updated.

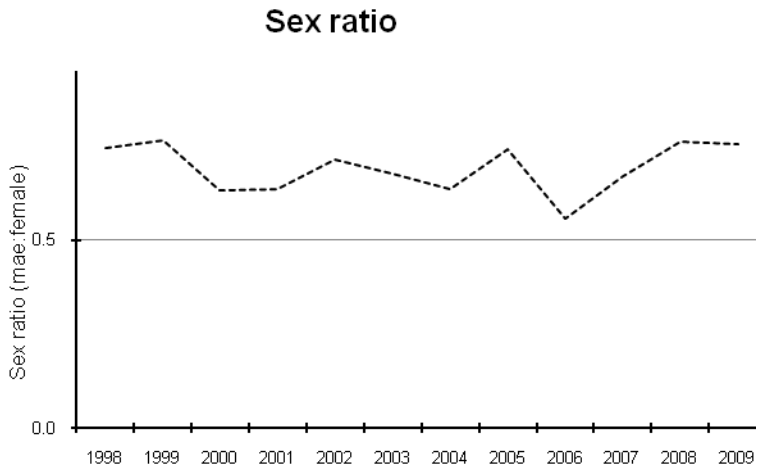

Figure 5.4.34.1.3 *Nephrops* in Irish Sea East (FU 14). Time-series of sex ratio in the landings of *Nephrops* - directed trawlers. Sampling levels in 2010 were insufficient to provide robust data, this figure was not, therefore, updated.

Table 5.4.34.1.1 *Nephrops* in Irish Sea East (FU14). ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice (FU14)	Recommended Landings (FU14 +FU15)	ICES Landings (FU14)
1989				0.40
1990				0.56
1991				0.75
1992			8.9	0.43
1993			9.4	0.52
1994			9.4	0.45
1995			9.4	0.58
1996			9.4	0.48
1997			9.4	0.57
1998			9.4	0.39
1999			9.4	0.62
2000			9.4	0.57
2001			9.4	0.53
2002	Set TAC in line with 1995–99 landings		9.55	0.58
2003	Set TAC in line with 1995–99 landings		9.55	0.38
2004	Set TAC in line with 1995–99 landings		9.55	0.47
2005	Set TAC in line with 1995–99 landings		9.55	0.57
2006	No increase in effort		9.55	0.63
2007	No increase in effort		-	0.96
2008	As for 2007		-	0.68
2009	No increase in effort and landings (2007)	<1.0	-	0.70
2010	No new advice, same as for 2009	<1.0	-	0.56
2011	Transition towards the ICES MSY framework	<0.68	**	
2012	ICES MSY framework	<0.96	**	

Weights in '000 t.
*Preliminary.
** It is not recommended to manage the two stocks as a single unit.

Table 5.4.34.1.2 *Nephrops* in Irish Sea East (FU 14). Landings (tonnes) by country.

	Rep. Of Ireland	UK	Other Countries	Total
2000	114	451	2	567
2001	26	506	0	532
2002	203	373	1	577
2003	69	306	1	376
2004	62	409	1	472
2005	34	536	0	570
2006	34	594	0	628
2007	86	873	0	959
2008	29	652	0	681
2009	16	692	0	708
2010	25	538	0	563

Table 5.4.34.1.3 *Nephrops* in Irish Sea East (FU 14). Results from UWTV-FU14 survey of *Nephrops* grounds in 2008–2010.

Year	No stations	Mean station density	Mean Kriged density	Bias-corrected abundance (millions)	95% CI	Removals (millions)	Harvest Rate
2008	32	0.43	0.49	451.4	93	32.4	7.19%
2009	32	0.33	0.40	369.0	73	33.9	9.20%
2010	26	0.42	0.51	469.5	106	27.0	5.75%

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

Advice for 2012

ICES advises on the basis of the MSY approach that landings in 2012 should be no more than 9800 t.

Stock status

F (Fishing Mortality)	2008	2009	2010	
MSY (F_{MSY})	✗	✗	✓	Below target
Precautionary approach (F_{pa},F_{lim})	?	?	?	Undefined

SSB (Spawning Stock Biomass)	2008	2009	2010	
MSY ($B_{trigger}$)	✓	✓	✓	Above trigger
Precautionary approach (B_{pa},B_{lim})	?	?	?	Undefined

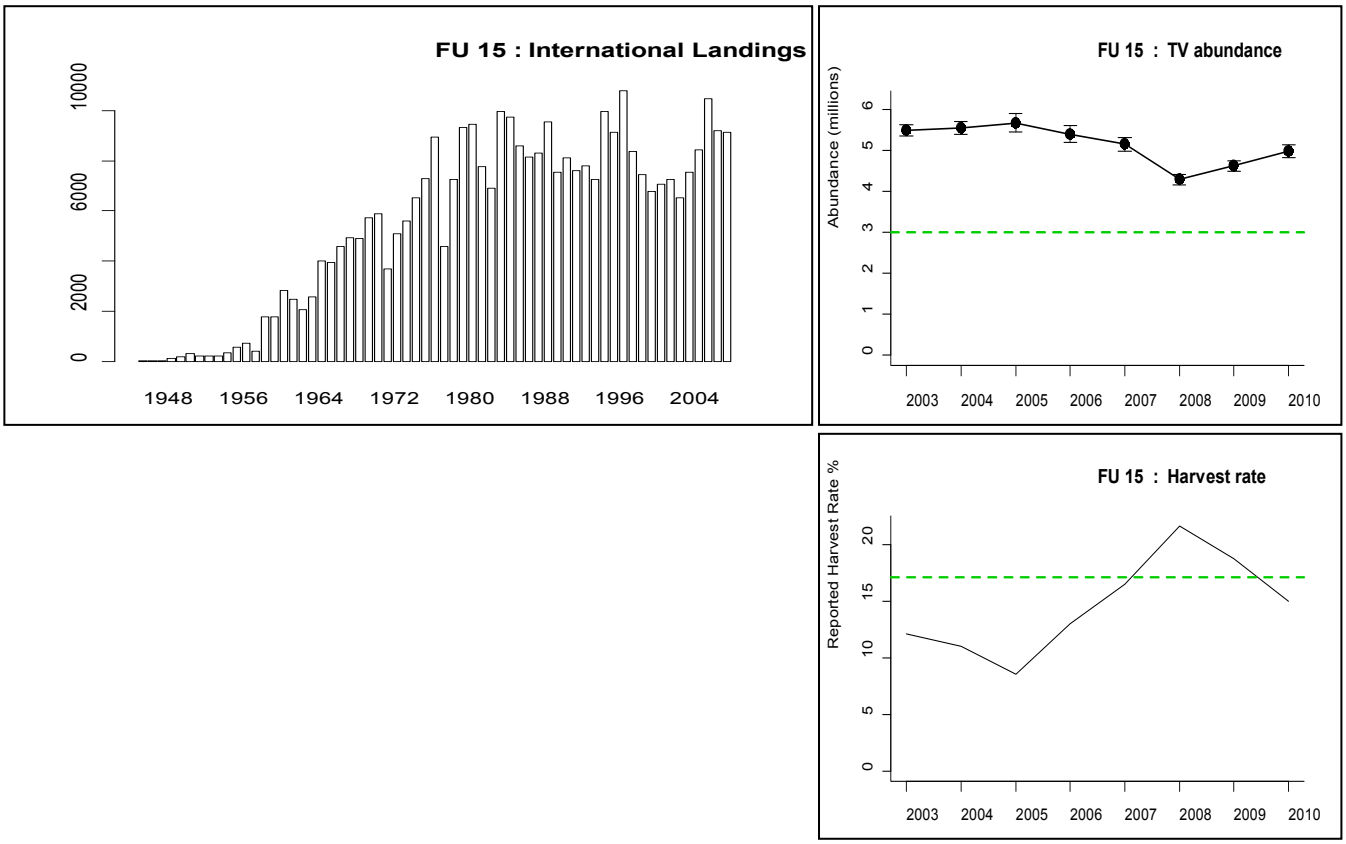

Figure 5.4.34.2.1 *Nephrops* in Irish Sea West (FU 15). Long-term trends in landings (tonnes), recent UWTV abundance (in millions; SSB proxy) (with scaled trawl survey cpue) and harvest rates (prior to 2007 the harvest rate is considered to be a minimum estimate due to possible under-reporting of landings. The horizontal lines represent MSY $B_{trigger}$ (upper panel) F_{MSY} (lower panel).

This stock has sustained landings at around 9000 t for many years. The stock increased until 2003, based on information from the NI-NEP-Trawl-Summer survey (Figure 5.4.34.2.4). Since then, the stock has decreased, but is still at high levels and above MSY $B_{trigger}$. Recent harvest rates have fluctuated around F_{MSY}.

Management plans

No specific management objectives are known to ICES.

Biology

Nephrops in the Western Irish Sea occur at very high density (average 1.1burrow/m^2) and have a smaller average size and size at maturity than most other stocks. The high observed density implies intense competition for space and food on the sea bed. 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 gyre which retains the larvae over the mud patch thus ensuring good recruitment. *Nephrops* are a major food species of cod in the Irish Sea.

The fisheries

Gears used are a mixture of single and twin-rig otter trawls. A around 16% of Irish vessels are using separator trawls and Swedish grids to reduce bycatch.

Catch by fleet	Total catch (2010) 10.7 kt where 9.0 kt landings (>99% otter trawls), 1.5 kt discards.

Effects of the fisheries on the ecosystem

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

Quality considerations

The assessment is mainly based on an UWTV survey which is considered to be very precise but various uncertainties and assumptions do arise in the estimation by expert judgement of the bias correction factor. In the provision of catch options based on the survey estimates additional uncertainties related to mean weight in the landings and to the discard rates also arise. Harvest ratios since 2006 are considered reliable due to more accurate landings data reported under new legislation.

Scientific basis

Assessment type	UWTV and trends, catch options based on UWTV and Fs from per-recruit analysis
Input data	One survey index (UWTV (FU 14 &15) One trawl survey index (NI-NEP-Trawl-Summer)
Discards and bycatch	Discards included in the assessment
Indicators	Size structure of catches, sex ratio and lpue
Other information	Latest benchmark was performed in 2009
Working group report	WGCSE

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

Reference points

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

(unchanged since 2010).

Yield and spawning biomass per Recruit F-reference points (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%

Density of *Nephrops* in FU15 is considered very high (average density 1.1/m^2),. Recent harvest rates have been high (>F_{max}) and the stock size has been stable at a high level. The stock has sustained landing around 9000 t for more than 35 years and knowledge of the biological parameters in the stock is good. 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.

All F_{MSY} proxy harvest rate values are considered preliminary and may be modified following further data exploration and analysis.

Outlook for 2012

Basis: F_{2011} =F_{2010}= 15%, Bias corrected survey index (2010) = 5.0 billion, Mean weights in landings (2009-10, 16.5g) and retention factors (70%) based on 2009–2010 sampling.

Basis	Harvest ratio	Landings 2012 (tonnes)
MSY framework	17.1%	9800
F_{2011}	15.0%	8600
$F_{0.1}$	11.0%	6300
$F_{35\%}$	13.4%	7700

MSY approach

Following the ICES MSY framework implies a harvest ratio to be less than 17.1%, resulting in landings of 9800 t in 2012.

Additional considerations

The *Nephrops* trawl fishery takes bycatches of other species, especially plaice, but also, whiting and cod. Selectivity of this fishery needs to be improved to reduce bycatches of cod, whiting and undersized plaice

The FU15 *Nephrops* fishery first developed in the late 1950s. Since then it has sustained landings of around 9000 t for more than 35 years. The environment in the Western Irish Sea is very suitable for *Nephrops* with a large mud patch and gyre which retains the larvae over the mud patch thus ensuring good recruitment. The ground can be characterised 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 has been reduced by 25% in 2009 and a further 25% in 2010. Irish effort in 2010 decreased by 23% relative to 2008, UK-NI effort in 2010 is similar to 2008. Since 2009, four Irish vessels have been using "Swedish grids" in the fishery to reduced bycatches of cod, whiting and haddock.

The minimum landing size for *Nephrops* is 20 mm carapace length (CL), and less than 5% of the animals landed are under sized. Highgrading of *Nephrops* from FU15 since 2009 has increased.

Nephrops vessels are derogated to fish in designated parts of the cod closed area (early spring) in the western Irish Sea.

Uncertainties in assessment and forecast

General comments are found at the start of section 5.4.34.

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 2008-2010 sampling by Northern Ireland and Ireland.

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

The calculation of harvest ratio and reference points $F_{0.1}$ and F_{max} are based on yield-per-recruit analyses and biological parameters estimated assuming the stock is in equilibrium. However, it is unlikely that the *Nephrops* in FU15 is 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 assessment in 2011 is based on trends in population indicators and catch options derived from UWTV surveys as last year. The advice for 2012 is based on the MSY approach adopting F_{max} as an appropriate F_{MSY} proxy as last year.

Source

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

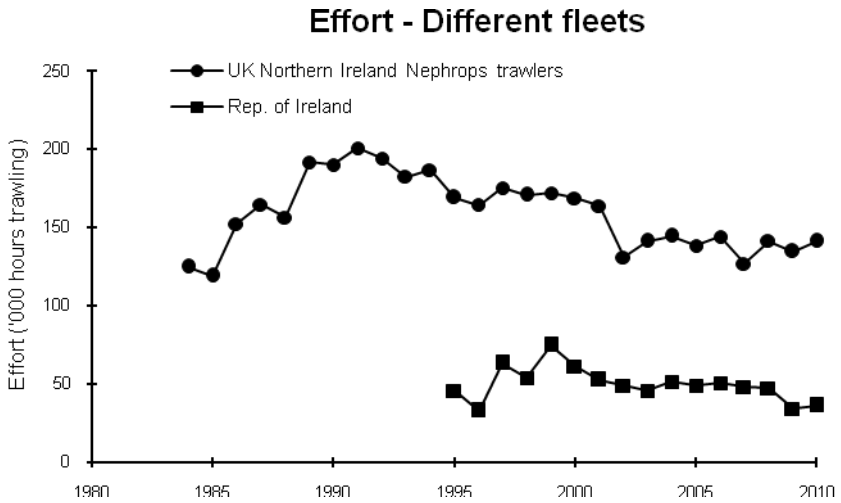

Figure 5.4.34.2.2 *Nephrops* Irish Sea West (FU 15). Effort trends of *Nephrops* fleets.

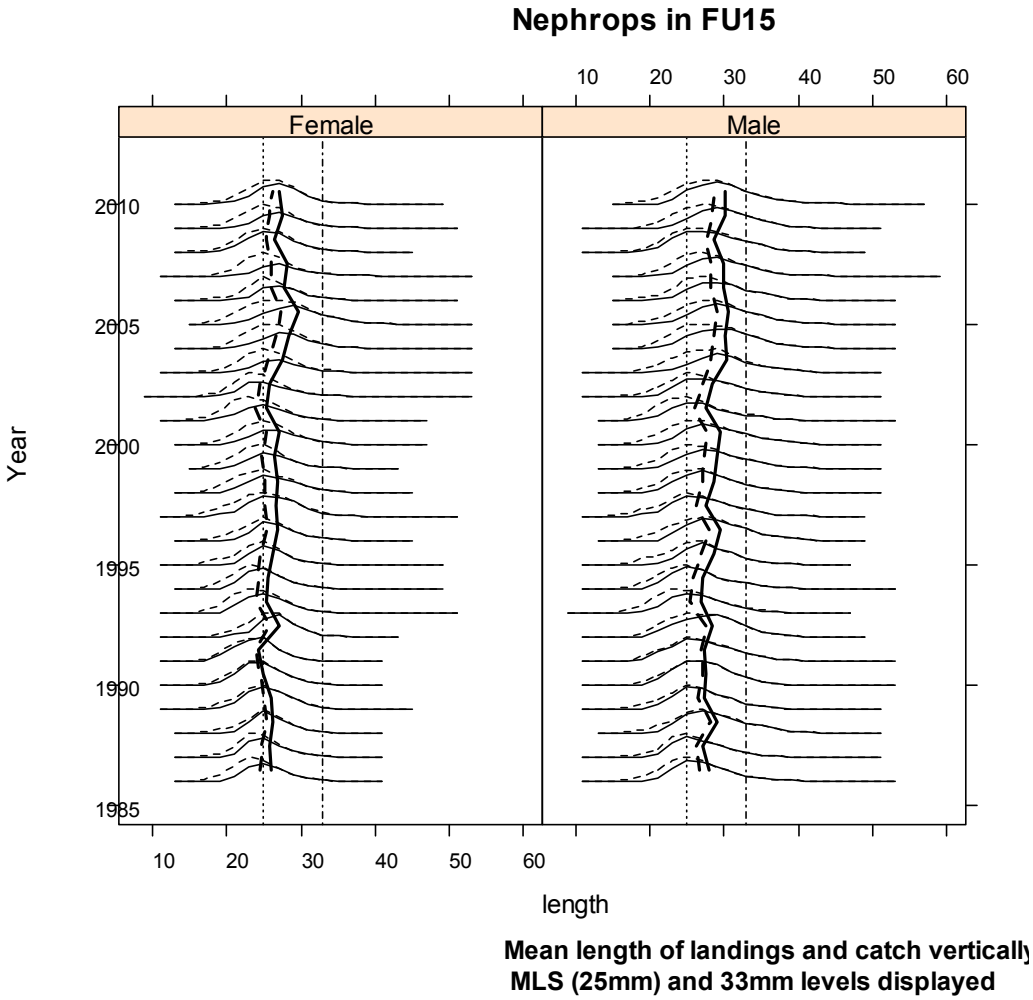

Figure 5.4.34.2.3 *Nephrops* Irish Sea West (FU 15). Length composition of catch (dotted) and landed (solid) of males (right) and females left from 2000 (bottom) to 2010 (top).

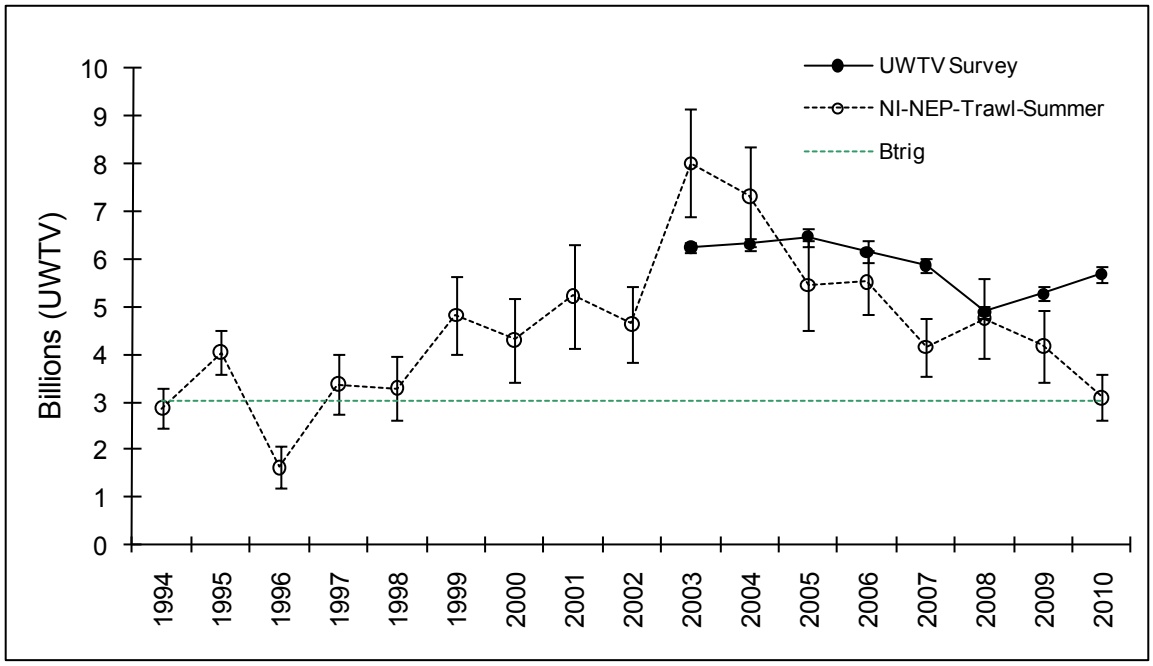

Figure 5.4.34.2.4 *Nephrops* Irish Sea West (FU 15). UWTV index (in billions) and scaled NI-NEP-Trawl-Summer survey. Green dotted line is MSY $B_{trigger}$.

Table 5.4.34.2.1 *Nephrops* in Irish Sea West (FU 15). ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice (FU 15)	Recommended Landings (FU14 + FU15)	ICES Landings (FU15)
1989				8.1
1990				8.3
1991				9.6
1992			8.9	7.5
1993			9.4	8.1
1994			9.4	7.6
1995			9.4	7.8
1996			9.4	7.3
1997			9.4	10.0
1998			9.4	9.1
1999			9.4	10.8
2000			9.4	8.4
2001			9.4	7.4
2002	Set TAC in line with 1995–99 landings		9.55	6.8
2003	Set TAC in line with 1995–99 landings		9.55	7.1
2004	Set TAC in line with 1995–99 landings		9.55	7.3
2005	Set TAC in line with 1995–99 landings		9.55	6.5
2006	No increase in effort		9.55	7.5
2007	No increase in effort		-	8.4
2008	No increase in effort		-	10.5
2009	No increase in effort and landings	< 8.5	-	9.2
2010	Harvest Ratio no greater than that equivalent to fishing at $F_{0.1}$	< 5.5	-	9.0
2011	Transition scheme towards the ICES MSY framework	<9.5	-	
2012	MSY framework	<9.8		

Weights in '000 t.

Table 5.4.34.2.3 *Nephrops* in Irish Sea West (FU 15). Results from UWTV-FU15 survey of *Nephrops* grounds in 2003–2010.

Ground	Year	Number of stations	Mean Density (No./M^2)	Domain Area (km^2)	Revised Estimate (billions)	CV on Burrow estimate
Western Irish Sea	2003	160	1.12	5295	6.3	3%
	2004	147	1.13	5310	6.3	3%
	2005	141	1.16	5281	6.5	4%
	2006	138	1.10	5194	6.2	4%
	2007	148	1.06	5285	5.9	3%
	2008	141	0.88	5287	4.9	3%
	2009	142	0.95	5267	5.3	3%
	2010	149	1.02	5307	5.7	3%

Table 5.4.34.2.4 *Nephrops* in Irish Sea West (FU 15). Landings (tonnes) by country, 1965–2010.

Year	Ireland	UK	UK E&W	UK NI	UK Isle of Man	Grand 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	2,696	4,352			4	7,052
2004	2,782	4,470			13	7,266
2005	2,116	4,413			0	6,529
2006	2,048		56	5,429	1	7,535
2007	2,736		102	5,585	0	8,424
2008	3,132		131	7,166	50	10,482
2009	2,343		200	6,622	1	9,166
2010*	2,578		100	6,251		8,929

* Provisional

ECOREGION Celtic Sea
STOCK *Nephrops* on Porcupine Bank (FU 16)

Advice for 2012

ICES advises on the basis of the precautionary considerations that catches in 2012 should not increase to allow the stock to rebuild.

Stock status

F (Fishing Mortality)		2008-2010
MSY (F_{MSY})	?	Undefined
Precautionary approach (F_{pa},F_{lim})	?	Undefined
Qualitative evaluation	✗	High exploitation rate

SSB (Spawning Stock Biomass)		2008-2010
MSY ($B_{trigger}$)	?	Undefined
Precautionary approach (B_{pa},B_{lim})	?	Undefined
Qualitative evaluation	↗	Increasing, from critically low abundance

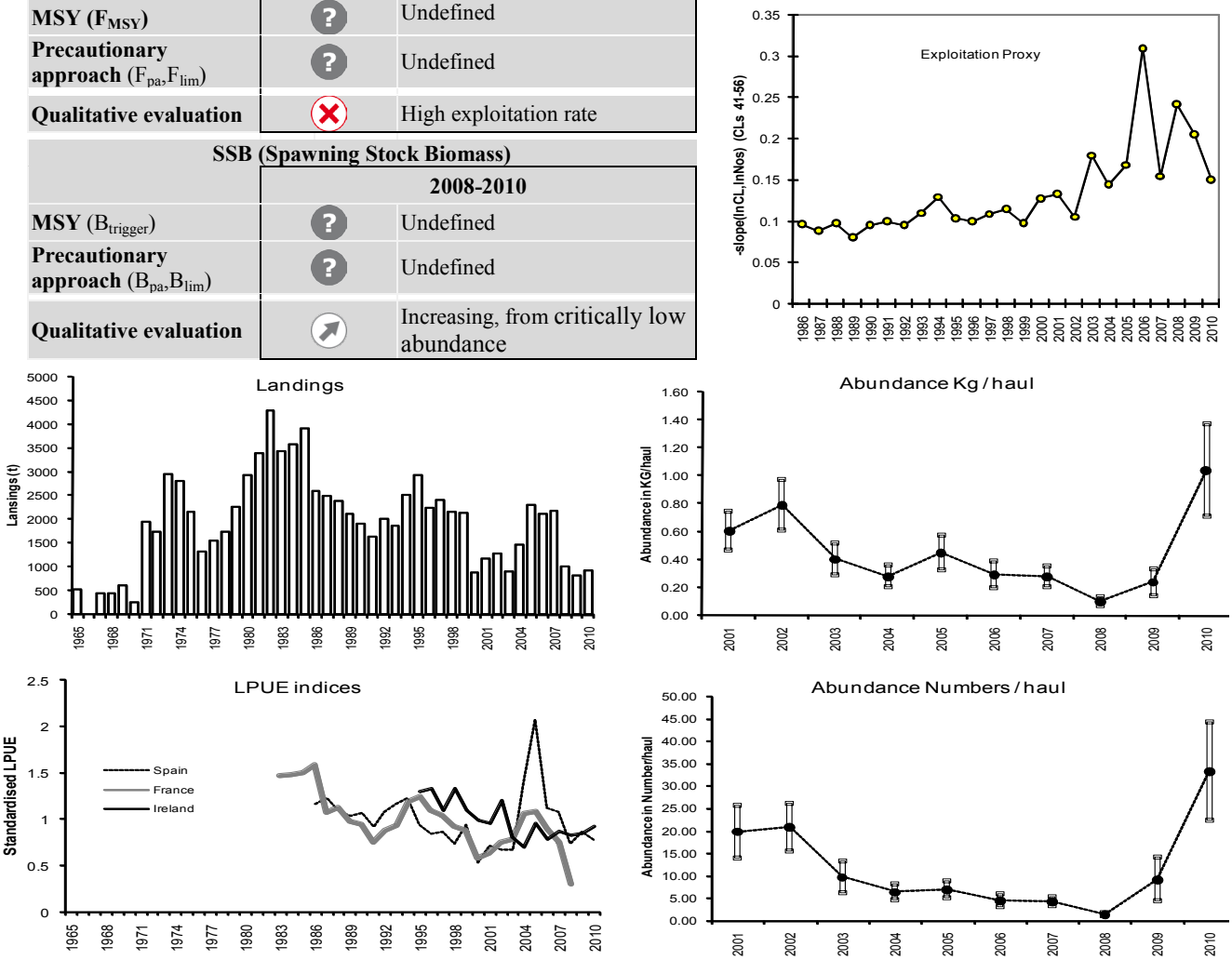

Figure 5.4.34.3.1 *Nephrops*, on the Porcupine Bank (FU16): Left, top; ICES landings over the years, bottom; standardised (scaled to mean by index) lpues by fleet (bottom). Right, top; Trends in an exploitation proxy for this stock (this is derived from the slope of the length-frequency for male *Nephrops* between carapace lengths of 41–56 mm which are considered fully selected in the fishery), middle; Trends over the years in biomass (in kg/haul) (top), bottom; abundance (individuals/haul) from the Sp-PGFS-WBITS-Q4 survey.

Effort, landings and size distribution indicate that exploitation rate has been high in the last 7 years. Survey information indicates that recruitment to the fishery has been very weak between 2004 and 2008 and the stock declined to a low level. The average recruitment observed in the 2009 survey has resulted in increased abundance and biomass in 2010. The fisheries lpue in 2010 is influenced by the seasonal closure introduced between May-July 2010.

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. There is a wide variation in size structure of the catches spatially and temporally. Given the sedentary nature of *Nephrops* populations closed areas may be an appropriate management tool to recover the stock. The switch in sex ratio in landings and catches in 2007-2009 may be the result of over exploitation of the male component of the stock leading to sperm limitation in those years. The sex ratio in 2010 has switched back to a more usual situation where males account for the majority of the catches.

Environmental influence on the stock

Productivity of deep water *Nephrops* stocks is generally lower than those on the shelf although 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. FUs 25, 26, 27 and 31. Increased storminess related to the NAO has been linked to reduced recruitment and low lpues several years later on the Porcupine Bank (González Herraiz *et al,* 2009).

The fisheries

The fishery takes place throughout the year with a peak between April and July. A seasonal closure was introduced between May-July 2010 that covers much of the stock distribution area. 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 by fleet	Total catch (2010) >917 t where 917 t landings (100% otter) and minimal discards.

Effects of the fisheries on the ecosystem

Fishing effort directed at *Nephrops* will also have bycatches of hake, megrim, and anglerfish in mixed fisheries.

Quality considerations

The survey series is short but gives consistent indications of recent changes in the stock. Landings length frequency data for all countries involved in the fishery have been very sparse in recent years. This influences the calculation of exploitation and recruitment proxies. There are concerns about the accuracy of the catch statistics and lpue information in some fleets. Growth rates cannot be well determined. Analytical assessments are not feasible at present.

Scientific basis

Assessment type	Trends based on cpue and lpue and size composition in the catches and landings
Input data	1trawl survey (SpPGFS-WIBTS-Q4) cpue and catch size Commercial lpue for Ireland, Spain and France
Discards and bycatch	Not included in the assessment and estimated to be minimal
Indicators	Sex ratio
Other information	Irish industry science survey in 2010
Working group report	WGCSE

ECOREGION Celtic Sea
STOCK *Nephrops* on Porcupine Bank (FU 16)

Reference points

No reference points are defined for this stock.

Outlook for 2012

The assessment is based on several indicators, including survey cpue, commercial lpue, size and sex ratio. All of these indicate that the stock has decline to a very low abundance in 2008. The improved recruitment observed in the 2009 survey catches has resulted in a stock size increase for the first time in several years.

Precautionary considerations

Effort, landings and size distribution data indicate that the stock is overfished. Biomass has increased in the last year. Therefore, catches should not increase to allow the stock to rebuild.

Additional considerations

The *Nephrops* trawl fishery takes by-catches of other species, especially plaice, but also, whiting and cod. Selectivity of this fishery needs to be improved to reduce bycatches of cod, whiting and undersized plaice

The closure introduced between May and July 2010 was respected by the fleet. It has therefore afforded some protection to the majority of the stock area (~75%). For this part of the stock area fishing effort and mortality will have 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 ~25% of the stock area not currently covered by the closure.

Nephrops on the Porcupine Bank are fished in relatively deep waters over a widespread area where they occur at low abundance. Given the sedentary nature of *Nephrops* populations the closure of the Porcupine bank for fisheries (1 May – 31 July) as introduced in 2010 (EC Reg. 53/2010) may be an appropriate management tool to substantially reduce catches and allow the stock to recover.

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. 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 over exploitation and potential recruitment failure as has been observed on the Porcupine Bank over the last decade.

Landings per unit effort (lpue) show a generally declining trend in most fleets over the time-series available. Mean size indicators in all commercial fleets and a survey indicate a large increase in mean size for both sexes in the past six years. There has been a large change in sex ratio in the survey catches and fishery landings with females *Nephrops* accounting for a larger proportion. Landings in 2009 ~825 t are the lowest observed since the development for the fishery.

Changes in fishing technology and fishing patterns

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 *Nephrops* in lower volumes. Fishing effort has fluctuated considerably in the recent past in response to availability of *Nephrops*.

Uncertainties in assessment and forecast

Large differences are seen in the length compositions from different countries, this could indicate different selection patterns or different high grading practices between fleets, but is more likely to be because of spatial differences in size structure. Nevertheless all data shows a similar trend to larger size over the last decade due to poor recruitment. International landed length distributions are used to calculate the exploitation and recruitment proxies. Several uncertainties are associated with this approach, particularly the poor levels of catch sampling.

The size distribution and catch rates in fishery-independent survey confirm the weak recent recruitment (except 2009) and decline in stock abundance up to 2008.

The increase in the length based proxy for exploitation rate coincides with an increase in effort and landings. There are concerns about the accuracy of the lpue information in some fleets due to change fishing practices. Growth rates cannot be well determined. Analytical assessments or catch forecasts are not feasible at present.

Comparison with previous assessment and advice

The assessment and advice is based on similar indicators to last year. The 2010 data confirm a good recruitment for the first time in several years. The survey abundance indices show a stock increase to the highest levels observed in the last decade.

The advice last year was to reduce catches to the lowest possible level. The advice this year is less stringent because of the recent increase in stock size.

Sources

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, pp1–7.

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

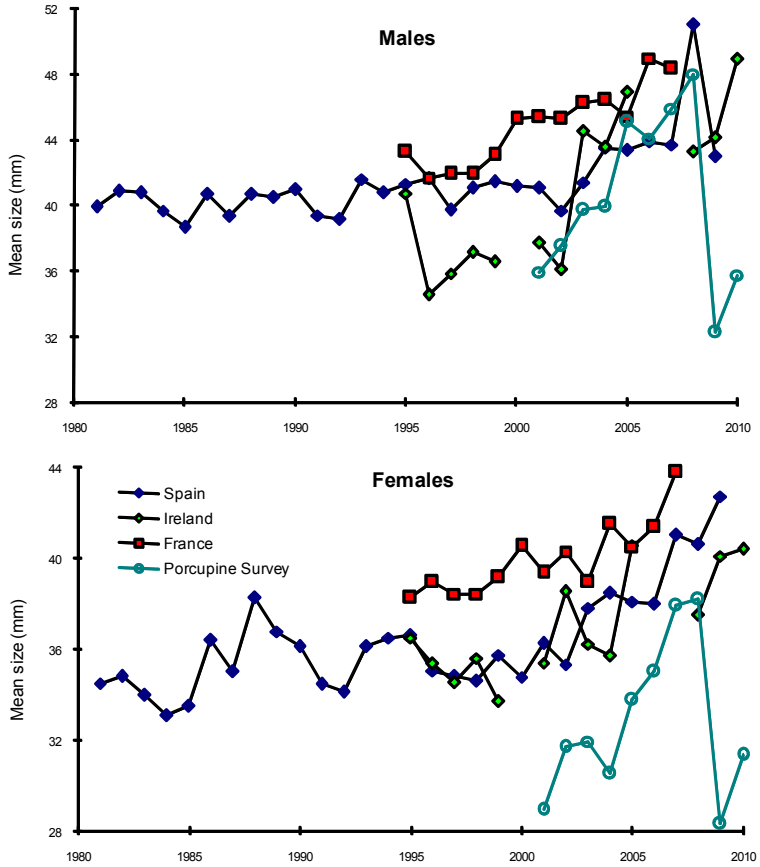

Figure 5.4.34.3.2 *Nephrops* on Porcupine Bank (FU 16). Mean sizes of ICES landings by sex and country and in mean size in the catch for the SpPGFS-WIBTS-Q4 survey.

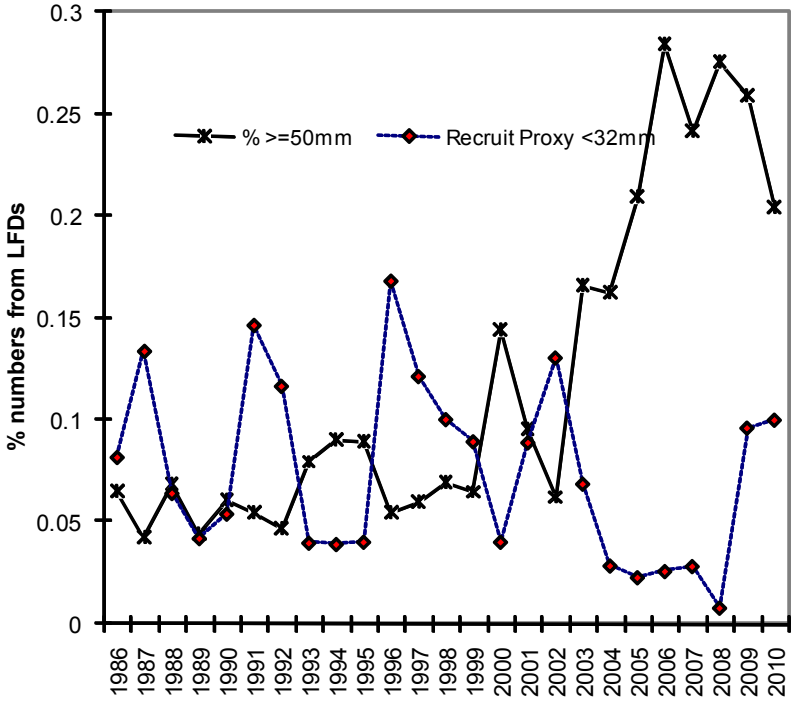

Figure 5.4.34.3.3 *Nephrops* on Porcupine Bank (FU 16). Trends in the percentages of the sampled male *Nephrops* landings <32 mm carapace length (a possible recruitment proxy) and >50 mm carapace length.

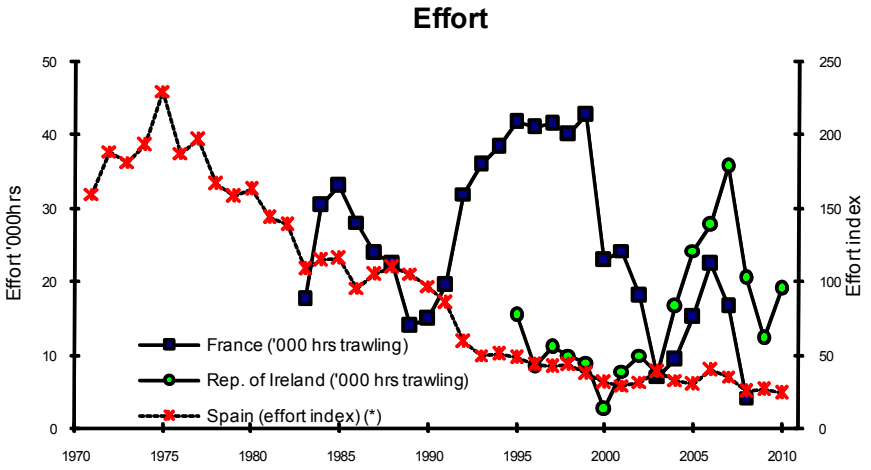

Figure 5.4.34.3.4 *Nephrops* on Porcupine Bank (FU 16). Effort trends for fleets.

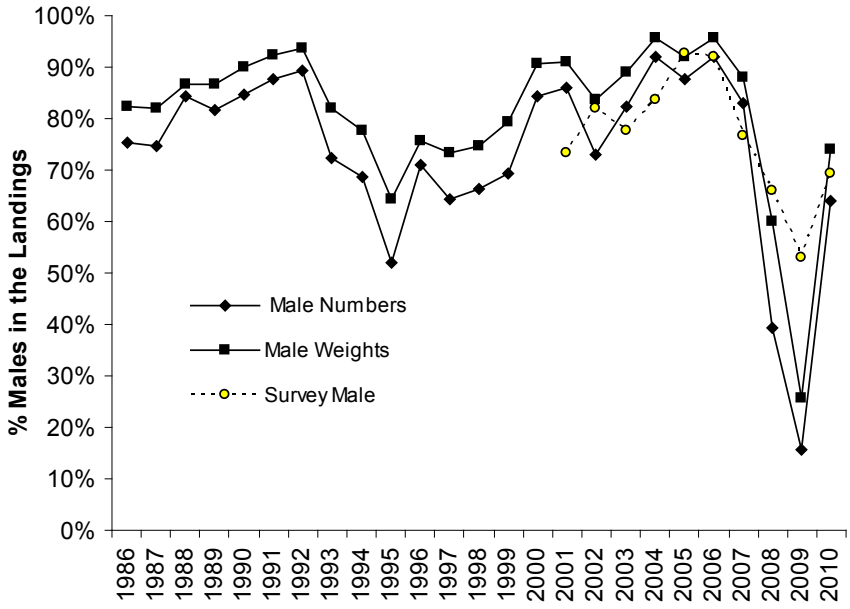

Figure 5.4.34.3.5 *Nephrops* on Porcupine Bank (FU 16). Sex ratio of landings and survey (SpPGFS-WIBTS-Q4) catches.

Table 5.4.34.3.1 *Nephrops* on Porcupine Bank (FU 16). ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice (FU16)	Recommended Landings VIIbcjk[1]	ICES Landings FU16 [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		--	10.0
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		
2012	No increase in catch	-		

Weights in '000t

[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 5.4.34.3.2 *Nephrops* on Porcupine Bank (FU 16). ICES landings (tonnes) by country.

Year	France	Rep. of Ireland	Spain	UK E& W	UK Scotland	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

ECOREGION Celtic Sea
STOCK *Nephrops* on Aran Grounds (FU 17)

Advice for 2012

ICES advises on the basis of the MSY approach that landings in 2012 should be no more than 1100 t.

Stock status

F (Fishing Mortality)	2008	2009	2010	
MSY (F_{MSY})	✗	✓	✓	Below target
Precautionary approach (F_{pa},F_{lim})	?	?	?	Undefined

SSB (Spawning Stock Biomass)	2008	2009	2010	
MSY ($B_{trigger}$)	?	?	?	Undefined
Precautionary approach (B_{pa},B_{lim})	?	?	?	Undefined

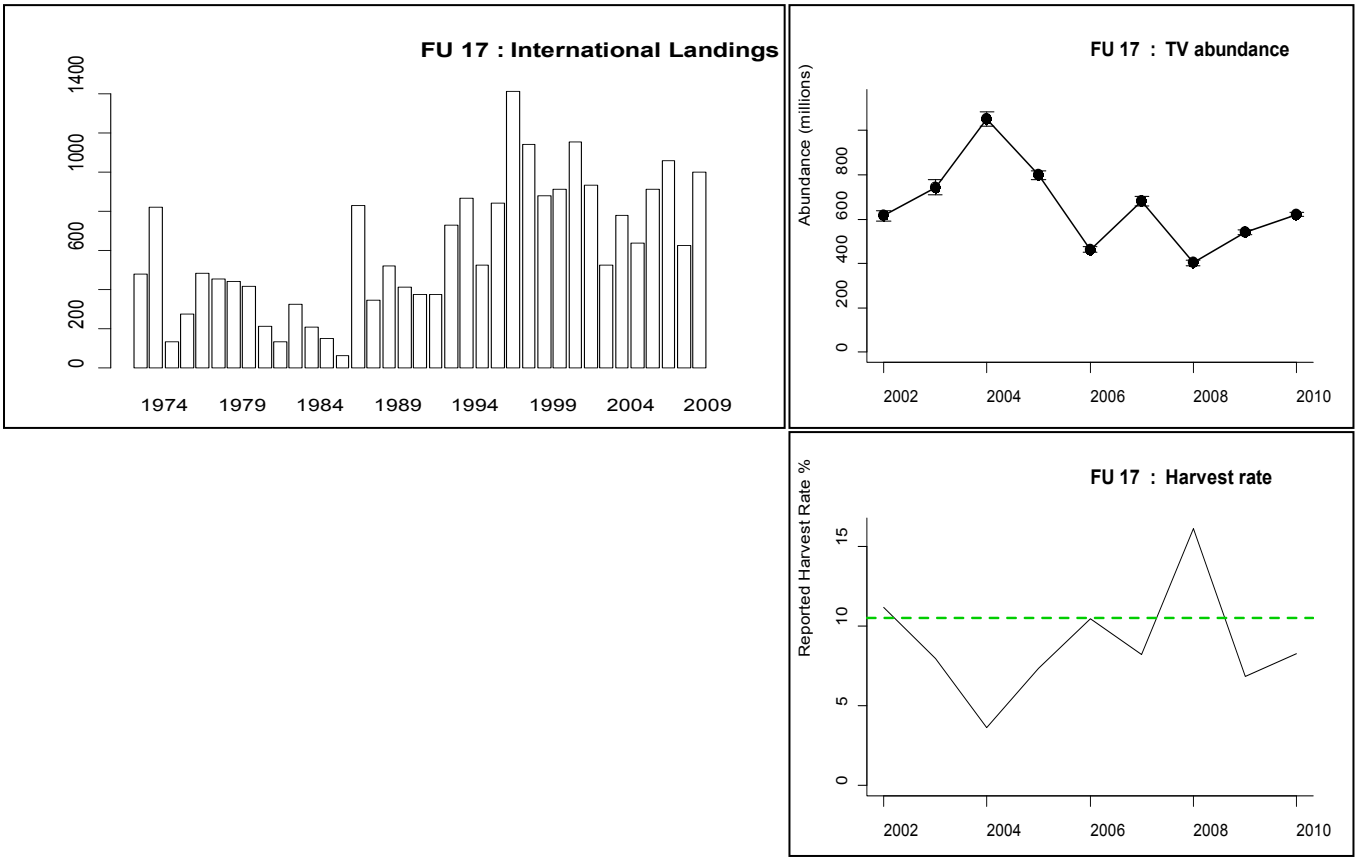

Figure 5.4.34.4.1 *Nephrops* on Aran Grounds (FU 17). Long-term trends in landings (in tonnes), UWTV abundance (in millions; SSB proxy) and harvest rates (F_{MSY} proxy shown as the broken green line).

The UWTV surveys conducted since 2002 give estimates of abundance that have fluctuated widely without a significant trend. The generally low harvest rate (9% average) appears to have little impact on observed stock fluctuations and is below F_{MSY}.

Management plans

No specific management objectives are known to ICES.

Biology

The Aran grounds can be characterised as an area of relatively high 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 vessels has increased to 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 by fleet	Total catch (2010) 1.2 kt where 1.0 kt landings (99% otter trawls, 1% other gear-types), 0.2 kt discards

Effects of the fisheries on the ecosystem

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

Quality considerations

Uncertainties in the survey, mean weight in the landings and discard rates are not taken into account in the advice.

Scientific basis

Assessment type	UWTV and trends of the size structure of catches
Input data	One survey index (UWTV-FU17), size structure of catches
Discards and bycatch	Discards are included in the assessment
Indicators	Sex ratio and lpue
Other information	Latest benchmark was performed in 2009
Working group report	WGCSE

ECOREGION Celtic Sea
STOCK *Nephrops* on Aran Grounds (FU 17)

Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	Not defined	
	F_{MSY}	HR 10.5%	Equivalent to $F_{35\%\ SPR}$ for combined sex in 2010
Precautionary Approach			No reference points are defined

(unchanged since: 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 %

Density of *Nephrops* in FU17 is considered high (average density 0.9/m^2), recent harvest rates have been low and the stock size has been fluctuating. For this FU, the exploitation rate on males is usually higher than on females. A harvest ratio consistent with a combined sex F35%SpR of 10.5% is suggested as a proxy for F_{MSY}.

All F_{MSY} proxy harvest rate values are considered preliminary and may be modified following further data exploration and analysis.

Outlook for 2012

Basis: F2011 = F2010 = 8.3%; Bias corrected survey index (2010) = 827 million, Mean weights in landings (2008-2010, 24.5 g) and retention factors based (70%) on 2008–10 sampling.

Basis	Harvest ratio	Landings 2012 (tonnes)
MSY framework	10.5%	1100
$F_{0.1\ Combined}$	7.2%	800
F_{2011}	8.3%	900
$F_{35\%Combined}$	10.5%	1100
$F_{max\ Combined}$	11.1%	1200

MSY approach

No MSY $B_{trigger}$ has been identified for this FU. Hence the ICES MSY framework has been applied only in relation to F_{MSY}. This implies harvest ratio of 10.5 %, resulting in landings of 1100 t in 2012.

Additional considerations

The *Nephrops* trawl fishery takes bycatches of other species, especially plaice, but also, whiting and cod. Selectivity of this fishery needs to be improved to reduce bycatches of cod, whiting and undersized plaice

Changes in fishing technology and fishing patterns

In recent years several newer vessels specialising in *Nephrops* fishing have participated in this fishery. These vessels target *Nephrops* on several other grounds within the TAC area and move around to optimise catch rates. Since the introduction of effort management associated with the cod long term plan (EC 1342/2008) there have been concerns that effort could be displaced towards the Aran and other *Nephrops* grounds where effort control has not been put in

place. Effort decreased in 2009 due to decommissioning of several vessels that actively participated in the fishery but effort in 2010 increased again.

Uncertainties in assessment

Some general uncertainties are discussed in section 5.4.34.

New UWTV survey information should be available after June 2011 which will provide a more up to date prognosis of stock status. The use of the most up to date survey information will be evaluated by ICES, and if appropriate this advice might be revised during this year.

There are several uncertainties in the survey, mean weight in the landings and discard rates which are not taken into account in the advice. The Separable Cohort Analysis (SCA) and yield per recruit analysis was based on 2008 and 2009 sampling, the fit to the SCA model was problematic so F_{MSY} proxies are likely to be uncertain.

Comparison with previous assessment and advice

The assessment and advice basis is consistent with last year.

Sources

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

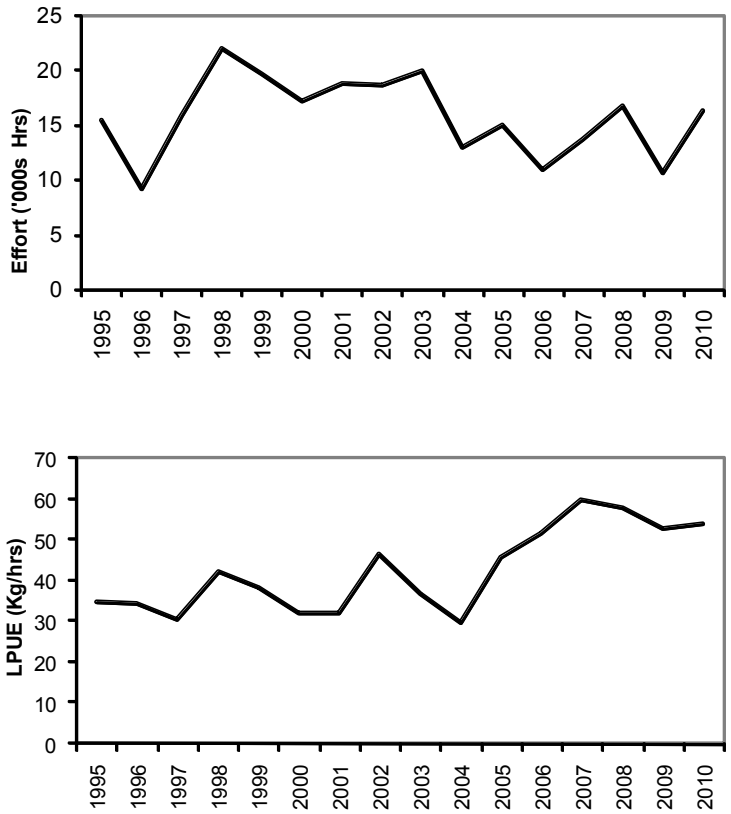

Figure 5.4.34.4.2 *Nephrops* in Aran Grounds (FU 17). Irish effort and lpue for *Nephrops*-directed fleet.

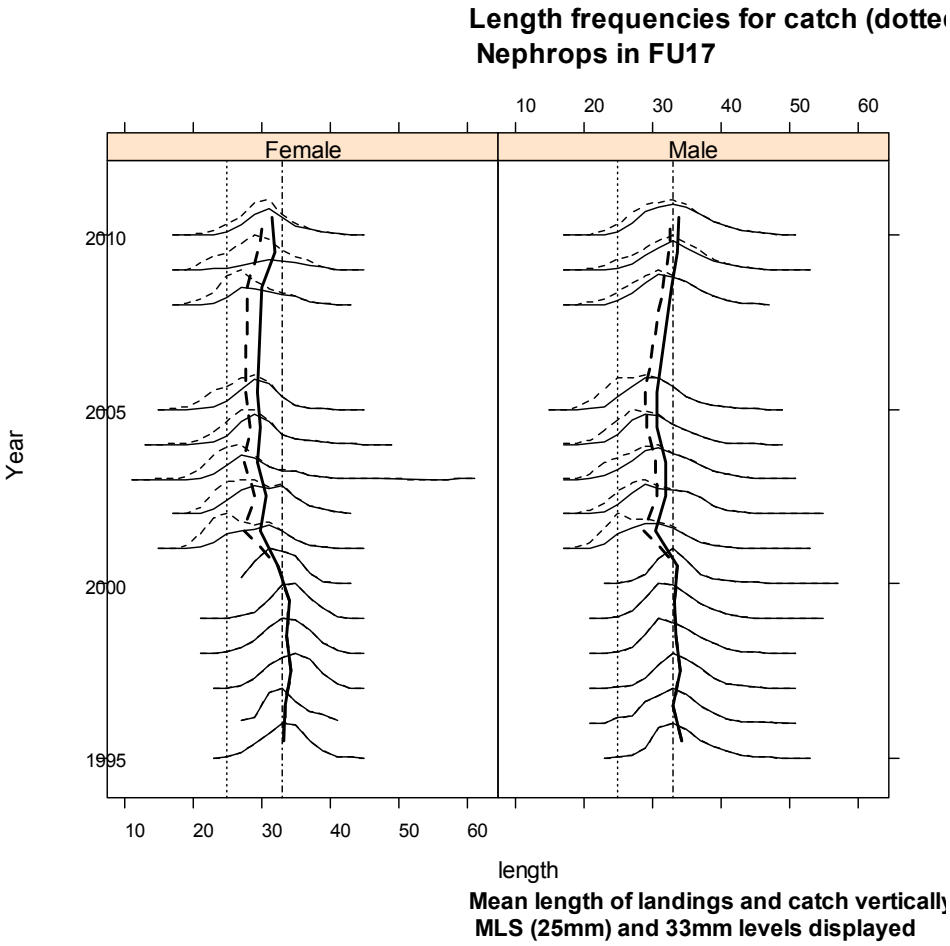

Figure 5.4.34.4.3 *Nephrops* in Aran Grounds (FU 17) Length distributions in the catches 2001–2005, 2008–2010 and in the landings 1995–2001.

Table 5.4.34.4.1 *Nephrops* in Aran Grounds (FU 17). ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice (FU17)	Recommended TAC VIIbcjk[1]	ICES Landings FU17[2]
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
2003			4.44	0.9
2004	Restrict landings to 2000–2002 levels		3.3	0.5
2005	Restrict landings to 2000–2002 levels		3.3	0.8
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
2009	No increase in effort and landings (2007)	< 0.9		0.6
2010	Harvest Ratio no greater than the lower bound of the range of $F_{0.1}$ for similar stocks	< 0.5		1.0
2011	MSY framework	<0.95		
2012	MSY framework	<1.1		

Weights in '000t

[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 5.4.34.4.2 *Nephrops* in Aran Grounds (FU17). Landings (tonnes) by country.

	FU 17			
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

Table 5.4.34.4.3 *Nephrops* in Aran Grounds (FU 17). Results from UWTV-FU17 survey of *Nephrops* Aran grounds in 2002–2010.

Ground	Year	Number of stations	Mean Density (No./M^2)	Domain Area (km^2)	Revised Estimate (millions)	CV on Burrow estimate
Aran Grounds	2002	49	0.84	943	818	4%
	2003	41	1.01	943	989	5%
	2004	64	1.43	943	1397	3%
	2005	70	1.09	936	1063	3%
	2006	67	0.64	932	616	3%
	2007	71	0.93	942	906	3%
	2008	63	0.56	906	536	3%
	2009	82	0.73	940	718	2%
	2010	91	0.85	937	827	2%

ECOREGION Celtic Sea
STOCK *Nephrops* off the south-eastern and south-western coasts of Ireland (FU 19)

Advice for 2012

ICES advises on the basis of the precautionary considerations that catches in 2012 should be reduced.

Stock status

F (Fishing Mortality)		
		2008-2010
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa},F_{lim})	?	Unknown
SSB (Spawning Stock Biomass)		
		2008-2010
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa},B_{lim})	?	Unknown
Qualitative evaluation	→	Stable

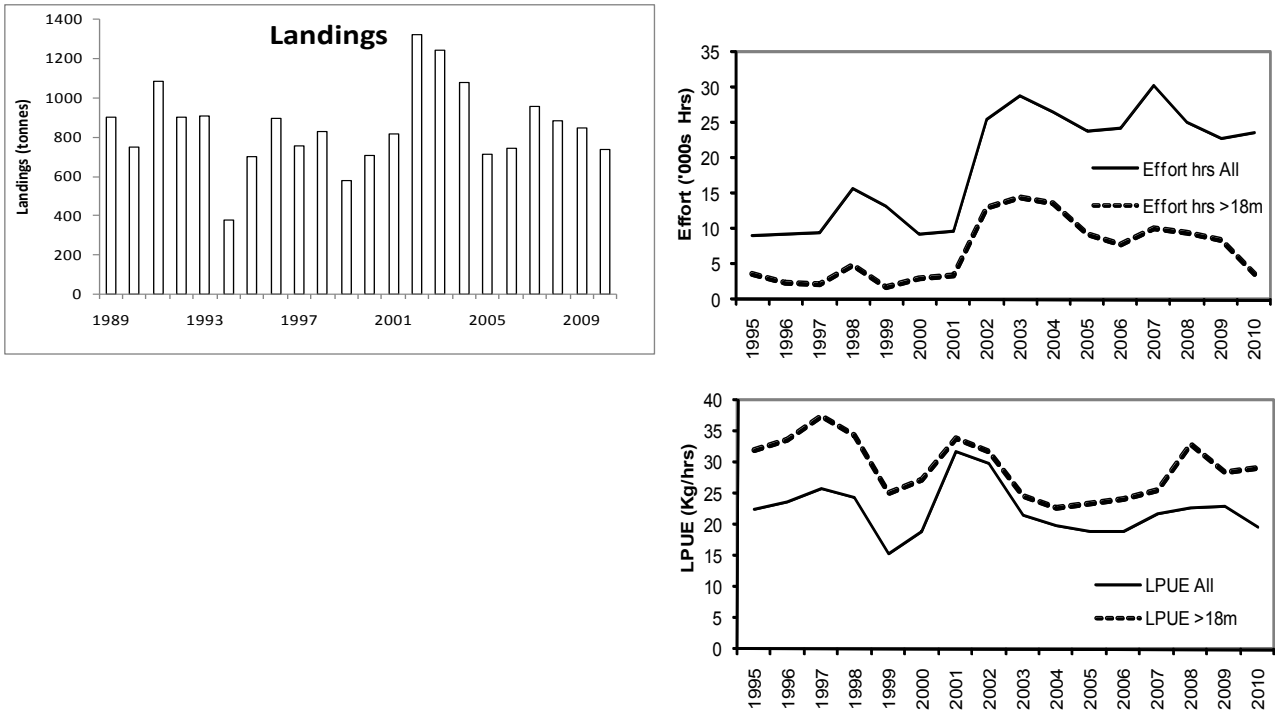

Figure 5.4.34.5.1 *Nephrops* off the south-eastern and south-western coasts of Ireland (FU 19): Long-term trends in landings (tonnes) top left. Fishing effort by all Irish *Nephrops* targeting vessels (solid line) and vessels >18m total length (dashed line) top right. Landings per unit effort (lpue, kg/hr) for all Nephrops targeting vessels (solid line) and those >18m total length (dashed line) bottom right.

The available information is insufficient to evaluate the exploitation status. Commercial lpues have fluctuated without trend since 1995. Therefore, the state of the stock is unknown.

Management plans

No specific management objectives are known to ICES.

Biology

This area has numerous small and spatially distinct mud patches. Survey information indicates consistent differences in mean length in catches between mud patches, suggesting variable population densities and growth. Sampling of commercial landings shows large variations in size because of this.

The fisheries

This is mainly an otter trawl fishery using single and twin-rigs and cod end mesh size of 80–99 mm.

Catch by fleet	Total catch (2010) 700 t where 700 t landings (98% otter trawls, 2% other gear-types), and unknown discards.

Effects of the fisheries on the ecosystem

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

Quality considerations

Lpue data are the only available indicator of stock trend. The accuracy of this is uncertain because of changes in fleet composition, targeting behaviour, fishing patterns and the patchy distribution of *Nephrops* within this area.

Scientific basis

Assessment type	No assessment
Input data	Landings
Discards and bycatch	Unknown
Indicators	Mean size in landings. Historical survey indicators (UK-WCGFS) discontinued since 2006
Other information	None
Working group report	WGCSE

ECOREGION Celtic Sea
STOCK *Nephrops* off the south-eastern and south-western coasts of Ireland (FU 19)

Reference points

No reference points are defined for this stock.

Outlook for 2012

No assessment can be presented for this stock.

Precautionary considerations

The exploitation status is unknown and stock trends indicators have been stable. Therefore, ICES considers that catches should be reduced.

Additional considerations

Nephrops fisheries in this area are fairly mixed also landing megrim, anglerfish, haddock and other demersal species. The main discarded species are haddock, whiting and dogfish.*"*

Comparison with previous assessment and advice

The perception of the stock has not changed. The advice in 2010 was based on the transition to the MSY approach and precautionary considerations. This year the advice is based on precautionary considerations.

Sources

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

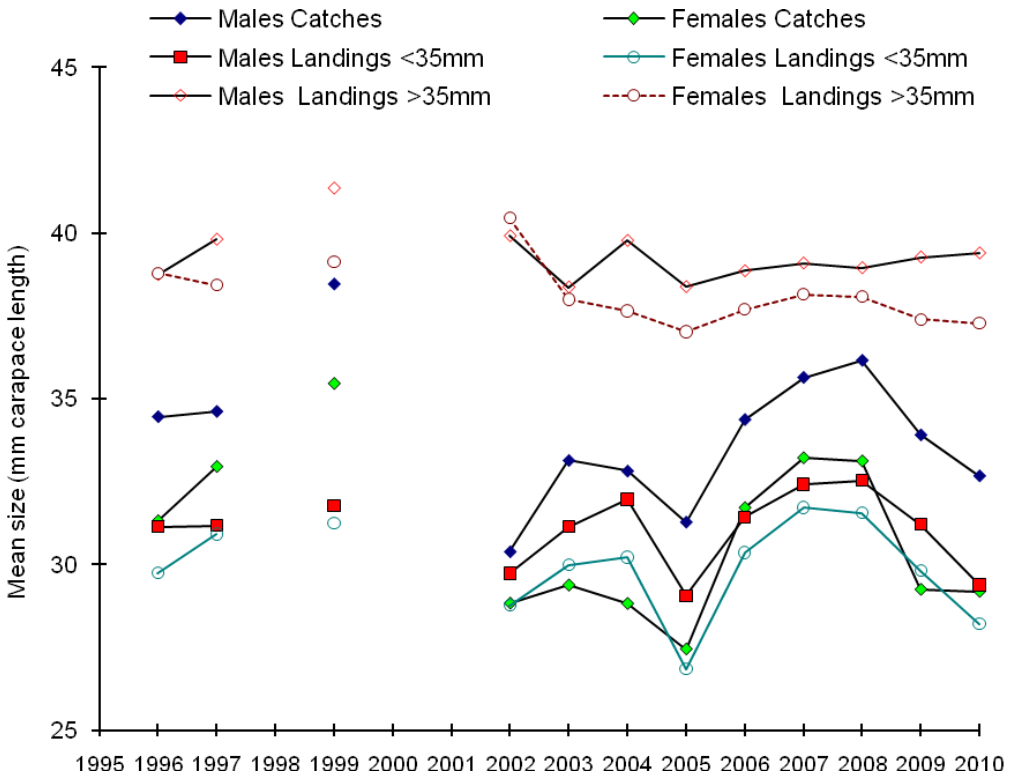

Figure 5.4.34.5.2 *Nephrops* off the southeastern and southwestern coasts of Ireland (FU 19). Mean size trends for catches and whole landings by sex.

Table 5.4.34.5.1 *Nephrops* off the southeastern and southwestern coasts of Ireland (FU 19). ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice (FU19)	Recommended Landings VIIbcjk[1]	ICES Landings FU19 [2]
1989				0.9
1990				0.8
1991				1.1
1992			3.8	0.9
1993			~4.0	0.9
1994			~4.0	0.4
1995			~4.0	0.7
1996			4.0	0.9
1997			4.0	0.8
1998			4.0	0.8
1999			4.0	0.6
2000			4.0	0.7
2001			4.0	0.8
2002			4.44	1.3
2003			4.44	1.2
2004	Restrict landings to 2000–2002 levels		3.3	1.1
2005	Restrict landings to 2000–2002 levels		3.3	0.7
2006	Restrict landings to 2000–2002 levels		3.3	0.7
2007	Constrain effort at recent levels		--	1.0
2008	Constrain effort at recent levels		--	0.9
2009	No increase in effort and landings (2007)	<0.8	--	0.8
2010	No new advice, same as for 2009	<0.8	--	0.7
2011	See scenarios	-		
2012	Reduce catches	-		

Weights in '000t

[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 5.4.34.5.2 *Nephrops* off the southeastern and southwestern coasts of Ireland (FU 19).Landings (in tonnes).

Year	FU 19			
	France	Rep. of Ireland	UK	Total
1989	245	652	2	899
1990	181	569	4	754
1991	212	860	5	1077
1992	233	640	15	888
1993	229	672	4	905
1994	216	153	21	390
1995	175	507	12	695
1996	145	736	7	888
1997	93	656	7	756
1998	92	733	2	827
1999	77	499	3	579
2000	144	541	11	696
2001	111	702	2	815
2002	188	1130	0	1318
2003	165	1075	0	1239
2004	76	997	1	1074
2005	62	648	2	711
2006	65	675	1	741
2007	63	894	0	957
2008	46	805	15	866
2009	55	764	15	833
2010	14	694	13	722

ECOREGION Celtic Sea
STOCK *Nephrops* in the Celtic Sea (FU 20–22)

Advice for 2012

ICES advises on the basis of the MSY approach that landings from FU22 in 2012 should be no more than 2300 t.

For the remaining areas FU20-21 ICES advise on the basis of precautionary considerations that landings should be reduced.

Stock status

FU 20-21

F (Fishing Mortality)	2008 - 2010	
MSY (F_{MSY})	?	Unknown
Precautionary approach (F_{pa},F_{lim})	?	Unknown

SSB (Spawning Stock Biomass)	2008 - 2010	
MSY ($B_{trigger}$)	?	Unknown
Precautionary approach (B_{pa},B_{lim})	?	Unknown
Qualitative information	→	Stable

FU 22

F (Fishing Mortality)	2008	2009	2010	
MSY (F_{MSY})	✗	✓	✓	Appropriate
Precautionary approach (F_{pa},F_{lim})	?	?	?	Unknown

SSB (Spawning Stock Biomass)	2008	2009	2010	
MSY ($B_{trigger}$)	?	?	?	Unknown
Precautionary approach (B_{pa},B_{lim})	?	?	?	Unknown
Qualitative information	→	→	→	Stable

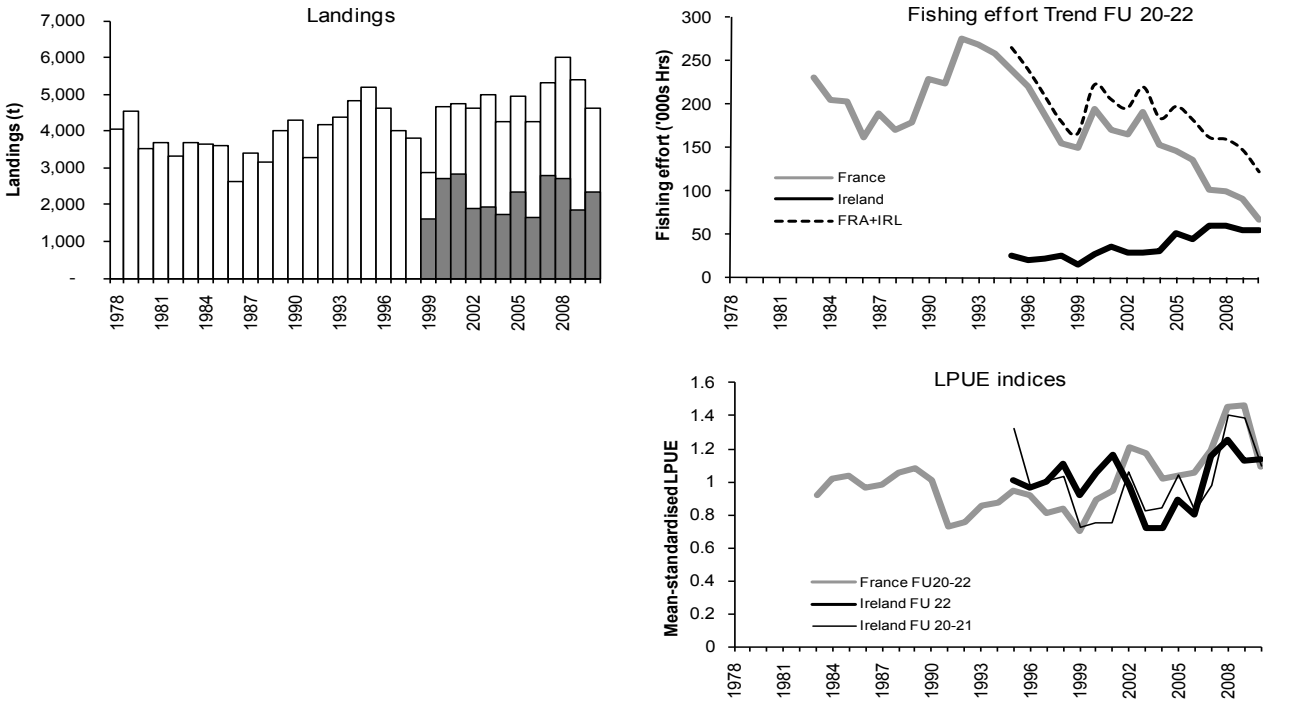

Figure 5.4.34.6.1 *Nephrops* in the Celtic Sea (**FU 20–22**). Long-term trends landings (t) for the whole area and from FU 22 since 1999 (grey bars) (top left). *Nephrops* directed fishing effort by country and total *Nephrops* directed effort (top right). Mean standardise lpue indices for Ireland FU 22 and FU 20-21 and France for FU 20-22 (mainly operating in FU20-21 during the last decade) (bottom right).

The status of the FU20-21 component of the stock is unknown. Landings are stable and the effort by the French and Irish fleets are showing opposite direction, respectively downward and upward. Overall, the effort is steadily decreasing since the early 90's. The lpues of the French and Irish fleets in this area, although variable, are very similar over the last 5 years (when the figures may be compared since the French fleet has mainly operated in FU20-21 during that period). The lpues alternate period of increasing and decreasing trends, so that the overall perception is mainly stability.

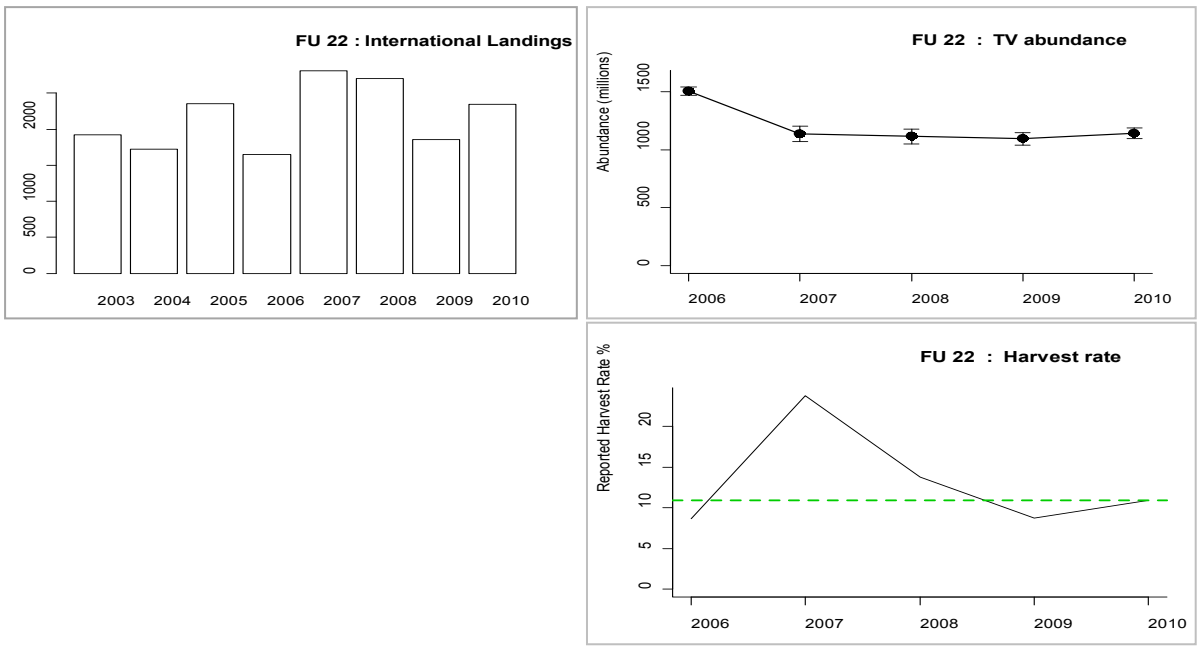

Figure 5.4.34.6.2 *Nephrops* in the Celtic Sea **(FU 22)**. Recent international landings in tonnes for FU22 (Smalls) (top left); UWTV survey abundance for FU 22 (top right, proxy for SSB), and harvest rate (green dashed line represents F_{MSY} harvest ratio) (bottom right).

The FU 22 stock component is considered to be stable based on indicators (lpue, mean size) and recent UWTV survey data. There have been indications of strong recruitment in recent years (*e.g.* 2006) as underlined by the Irish UWTV survey in 2006 and by commercial lpue for Irish in 2007 and for French trawlers in 2008 and 2009 (Figure 5.4.34.6.1).

Management plans

No specific management objectives are known to ICES.

Biology

This area has several distinct mud patches. Survey information indicates consistent differences in mean size of catches between mud patches, suggesting variable population densities and growth. Sampling of commercial landings shows large variations in size between areas within FU20-22.

The fisheries

The fishery is prosecuted by twin and single trawlers. Landings are almost exclusively (more than 90%) provided by France and Republic of Ireland.

Catch by fleet	Total catch (2010) 4.62 kt landings (100% trawling); total discards 1.23 kt

Effects of the fisheries on the ecosystem

Nephrops fishery in Celtic Sea has bycatches of whiting, cod, and to a lesser extent haddock and hake.

Quality considerations

Discards are thought to be extensive, but observations are insufficient to provide a reliable time-series.

Scientific basis

Assessment type	UWTV and trends, catch options based on UWTV for FU 22
Input data	1 commercial index (French trawlers: threshold 10%; Irish trawlers: threshold: 30% split in two components: Smalls ground [FU 22] surveyed by the UWTV and other areas [FU 20-21]) and 1 survey index (UWTV-FU22).
Discards and bycatch	Used for FU 22, historical discards for other areas uncertain.
Indicators	Mean size.
Other information	None.
Working group report	WGCSE

ECOREGION Celtic Sea
STOCK *Nephrops* in the Celtic Sea (FU 20–22)

Reference points

	Type	*Value*	*Technical basis*
MSY Approach	MSY $B_{trigger}$	Not defined	
	F_{MSY} (whole FU20-22) harvest rate	Not defined	
	F_{MSY} (FU22) harvest rate	10.9%	MSY under SCA model
Precautionary Approach		Not defined	

(updated in 2011)

For FU 22, the absolute density observed on the UWTV survey is medium (~ 0.5/m^2) suggesting the stock has moderate productivity. The fishery in this area has been in existence since the 1960's and has been relatively stable for many years. Recent harvest ratios in this FU have been variable but generally around the $F_{35\%SpR}$. $F_{35\%SpR}$ (combined between sexes) is expected to deliver high long term yield with a low probability of recruitment overfishing and therefore is chosen as the FU22 F_{MSY} proxy.

For FU 20 and 21 it is not possible to currently estimate an F_{MSY} proxy.

All F_{MSY} proxies remain preliminary and may be modified following further data exploration and analysis. The time series is too short to propose a MSY $B_{trigger}$.

Outlook for 2012

There is no analytical assessment or UWTV survey for FU 20-21 and it is therefore not possible to provide catch options for 2012.

Catch options can be proposed for the Smalls (FU 22) based on an UWTV survey and sampling for that component of the stock.

FU 22: Basis: F_{2011} =F_{2010}= 10.9%; bias corrected survey index (2010) = 1.1 billion; mean weights in landings (2009-10, 23.2g) and retention factors based (80%) on 2009–2010 sampling.

Basis	Harvest ratio	Landings 2012 in the Smalls (FU 22) (tonnes)
MSY framework	10.9%	2300
F_{2011}	10.9%	2320
$F_{0.1}$	7.5%	1580
$F_{35\%}$	10.9%	2300
F_{max}	12.3%	2600

MSY approach

Following the ICES MSY framework implies the harvest ratio for the Smalls FU22 to be less than 10.9 %, resulting in landings of less than 2300 t in 2012.

Precautionary considerations

Considering the recent stable lpues and unknown exploitation status for FU20 and 21, catches should be reduced.

Additional considerations

The *Nephrops* trawl fishery take bycatches of other species, especially whiting, much of which is discarded. Any measure to reduce discarding and to improve the fishing pattern would be beneficial to the whiting stock (see section 5.4.6).

In 2010, French official landings reached the lowest historical level mainly due to the strong reduction of the number of vessels because of European decommissioning schemes. Fishing effort in this fleet has declined more than 70% since early-1990. This fleet operates mainly in FU 20-21. The Irish effort has increased over time mainly in FU 22. Irish landings declined between 2008 and 2009 although they changed upwards in 2010. However, information on mean sizes in landings, discard rate, abundances provided by UWTV survey suggest no major change in the status of this stock.

French *Nephrops* trawlers usually switch to finfish (cod, whiting, and haddock) when *Nephrops* catch rates are low. This can occur within a trip (e.g. because of diurnal variations of catchability for Nephrops) making the analysis of catches of fish from so-called *Nephrops* trips difficult. An analysis of the catch composition on a haul by haul basis is needed to estimate the actual amount of by-catch and discards really caught in Nephrops-directed activity.

The effects of regulations

The minimum EU landing size (MLS) for *Nephrops* in this area is 8.5 cm of total size (25 mm CL), whereas French Producers' Organizations adopted for a long time a specific regulation of 11.5 cm of total size (35 mm CL). This has led to discarding of *Nephrops* above the legal minimum landing size by the French fleet. The proportion of individuals landed as tails in French landings increased significantly over the recent period (up to 20% in the late 2000s). These are mainly individuals below 35 mm (CL) which would have been discarded previously. French fleet use mesh size 100 mm, and Irish fleet 80 mm.

Uncertainties in assessment and forecast

The discards observations are insufficient to provide a full time-series of discards.

There are several key uncertainties and bias sources in the method base on UWTV survey used for projections in FU22. The survey estimates themselves are very precisely estimated (CVs 2–6%) given the homogeneous distribution of burrow density and the modelling of spatial structuring. The cumulative bias estimates for FU22 are largely based on expert opinion. The precision of these bias corrections cannot yet be characterised, but is likely to be lower than that observed in the survey.

In the provision of catch options based on the absolute survey estimates additional uncertainties related to mean weight in the landings and the discard rates also arise. For FU22 deterministic estimates of the mean weight in the landings and discard rates for 2008-2010 are used although there is some variability in these over time. Particularly when large recruitments are observed in the stock as was the case in 2006 and 2007.

Comparison with previous assessment and advice

This year the assessment was extended to make use of the FU22 UWTV survey to provide catch options for that component of the stock. The basis of the advice is precautionary considerations for FU20-21 and MSY approach for FU22.

Source

ICES. 2011. Report of the Working Group on the Celtic Seas Ecoregion (WGCSE), 11–19 May 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:12.

Table 5.4.34.6.1 *Nephrops* in the Celtic Sea (FU 20–22). ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice (FU 20-22)	ICES landings[2]
1987			3.4
1988			3.2
1989			4.0
1990			4.3
1991			3.3
1992		~3.8	4.2
1993		3.8	4.6
1994		3.8	5.1
1995		3.8	5.5
1996		3.8	4.8
1997		3.8	4.2
1998		3.8	3.9
1999		3.8	2.9
2000		3.8	4.7
2001		3.8	4.8
2002		3.8	4.7
2003		3.8	5.0
2004	Adjust TAC in line with landings of most recent 10 years	4.6	4.3
2005	Adjust TAC in line with landings of most recent 10 years	4.6	4.9
2006	Recent average landings 2000–2002	4.6	4.3
2007	No increase in effort	-	5.3
2008	No increase in effort	<5.3	6.0
2009	No increase in effort	<5.3	5.4
2010	No new advice, same as for 2009	<5.3	4.6
2011	See scenarios	-	
2012	FU20-21: reduce catch FU22: MSY framework	- 2.3	

Weights in '000 t.
[1)] Subarea VII.
[2)] Does not include discards.

Table 5.4.34.6.2 *Nephrops* in the Celtic Sea (FU 20–22). Landings (t) by FU as used by ICES.

Year	FU20-22	FU22	FU20-21
1978	4056		
1979	4542		
1980	3535		
1981	3680		
1982	3316		
1983	3667		
1984	3653		
1985	3599		
1986	2638		
1987	3409		
1988	3165		
1989	4005		
1990	4290		
1991	3295		
1992	4165		
1993	4358		
1994	4843		
1995	5198		
1996	4602		
1997	3991		
1998	3819		
1999	2862	1588	1274
2000	4642	2702	1940
2001	4736	2817	1919
2002	4623	1881	2742
2003	5003	1921	3082
2004	4270	1726	2544
2005	4942	2355	2587
2006	4248	1647	2601
2007	5300	2807	2493
2008	6001	2704	3297
2009	5387	1857	3530
2010*	4622	2345	2277

*Preliminary

Table 5.4.34.6.3 *Nephrops* in the Celtic Sea (FU 20–22). Landings (t) by country as used by ICES.

Year	France	Rep. of Ireland	UK	Other Countries[1]	Total reported	Unallocated	Total
1983	3667		65				
1984	3653		36				
1985	3599		3				
1986	2638						
1987	3080	329					
1988	2926	239	1				
1989	3221	784	13				
1990	3762	528	14				
1991	2651	644	13				
1992	3415	750	84				
1993	3815	770	47	0	4632	-274	4358
1994	3658	1415	42	2	5117	-274	4843
1995	3803	1575	100	2	5480	-282	5198
1996	3363	1377	77	2	4819	-217	4602
1997	2589	1552	59	4	4204	-213	3991
1998	2241	1619	48	1	3909	-90	3819
1999	2078	824	38	0	2940	-78	2862
2000	2848	1793	44	1	4686	-44	4642
2001	2626	2123	19	1	4769	-33	4736
2002	3154	1496	15	8	4673	-50	4623
2003	3595	1389	19	N/A	5003	0	5003
2004	2605	1629	36	N/A	4270	0	4270
2005	2502	2387	53	N/A	4942	0	4942
2006	2368	1848	32	N/A	4248	0	4248
2007	2033	3214	47	6	5300	0	5300
2008	2348	3411	242	N/A	6001	0	6001
2009	2165	2844	378	N/A	5387	0	5387
2010	1112	3110	400	N/A	4565	0	4622

[1]Other countries include Belgium

Table 5.4.34.6.4 *Nephrops* in Smalls **FU22** (Celtic Sea). Results from UWTV survey of *Nephrops* Smalls grounds in 2006–2010.

Ground	Year	Number of stations	Mean Density (No./M^2)	Domain Area (km^2)	Revised Estimate (millions)	CV on Burrow estimate
Smalls	2006	100	0.63	2962	1954	2%
	2007	107	0.48	2955	1477	6%
	2008	76	0.47	2698	1448	6%
	2009	67	0.47	2824	1421	5%
	2010	90	0.49	2861	1483	4%