

ECOREGION North Sea
STOCK *Nephrops* in Subarea IV (North Sea)

Introduction

Nephrops are limited to a muddy habitat. This means that the distribution of suitable sediment defines the species distribution and the stocks are therefore assessed as nine separate functional units (FUs) (Figure 6.4.15b.1). The advice summary for *Nephrops* stocks is given by functional units in Sections 6.4.15.1–9, with updated advice given for Farn Deep in Section 6.4.15b.2.

Section	FU no.	Name	ICES division	Statistical rectangles
6.4.15.1*	5	Botney Gut – Silver Pit	IVb,c	36–37 F1–F4; 35 F2–F3
6.4.15.2 and 6.4.15b.2**	6	Farn Deeps	IVb	38–40 E8–E9; 37 E9
6.4.15.3	7	Fladen Ground	IVa	44–49 E9–F1; 45–46 E8
6.4.15.4	8	Firth of Forth	IVb	40–41 E7; 41 E6
6.4.15.5	9	Moray Firth	IVa	44–45 E6–E7; 44 E8
6.4.15.6*	10	Noup	IVa	47 E6
6.4.15.7*	32	Norwegian Deep	IVa	44–52 F2–F6; 43 F5–F7
6.4.15.8*	33	Off Horn’s Reef	IVb	39–41 F5–F6
6.4.15.9*	34	Devil’s Hole	IVb	41–43 F0–F1

* The advice for these stocks is biennial advice for 2013 and 2014.

** The advice for the Farn Deeps functional unit was reopened in November 2013 on the basis of the information provided by the UWTV survey conducted in 2013.

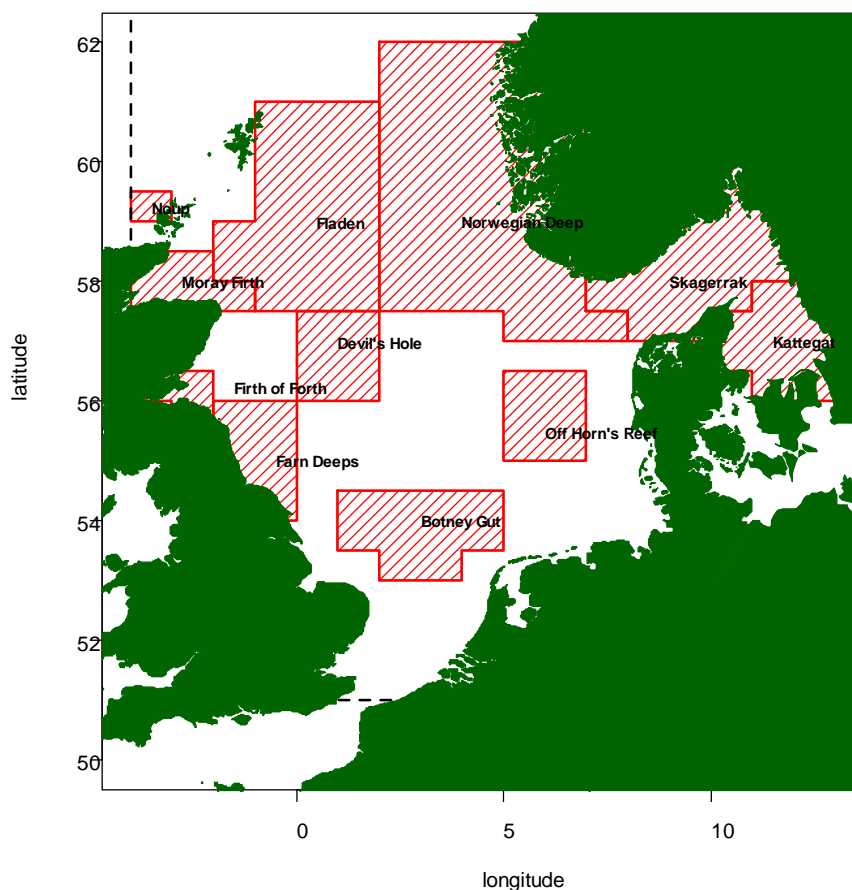


Figure 6.4.15b.1 *Nephrops* functional units in the North Sea and Skagerrak/Kattegat region (see Section 6.4.13).

Summary of the advice for 2014

A summary of the advice can be found in Table 6.4.15b.1. The advice is based on landings; note that this year, for those FUs where this can be calculated, ICES advice states explicitly the total catches (landings + dead and surviving discards) that occur with the landing options.

In order to ensure the stocks are exploited sustainably in the different FUs, management should be implemented at the functional unit level.

There is no information available on the trends in the stock or exploitation status for the rectangles outside the FUs for which ICES provides advice ('other rectangles'). Advice for the FUs in the North Sea show increases as well as decreases. ICES advises that the catches in 'other rectangles' should not change from the 2012 landings of 608 tonnes.

Table 6.4.15b.1 *Nephrops* in Subarea IV. Summary of ICES advice (landings) by functional unit plus other rectangles.

Year	Moray Firth	Noup	Fladen Ground	Norwegian Deeps	Farn Deeps	Firth of Forth	Botney Gut – Silver Pit	Off Horn's Reef	Devils Hole	Other rectangles ²⁾	Total advice ⁵⁾	Agreed TAC ¹⁾	ICES landings
FU	9	10	7	32	6	8	5	33	34				
Mgt Area	MA F		MA G	MA S	MA I		MA H						
1992	~2.4		~2.7			~4.6		0.87			10.6	12.0	9.6
1993	2.4		2.7			4.17		0.87			10.2	12.0	12.6
1994	2.4		5.0			4.17		0.87			12.5	13.0	14.3
1995	2.4		5.0			4.17		0.87			12.5	15.2	14.5
1996	2.4		5.0			4.17		0.87			12.5	15.2	13.5
1997	2.4		5.0			4.17		0.87			12.5	15.2	15.0
1998	2.4		7.0			4.17		1.0			14.6	15.2	13.6
1999	2.4		7.0			4.17		1.0			14.6	15.2	16.4
2000	1.85		9.0			4.17		1.6			16.7	17.2	14.9
2001	1.85		9.0			4.17		1.6			16.7	15.48	15.7
2002	2.0		9.0	1.2		4.17		2.1			18.5	16.623	16.7
2003	2.0		9.0	1.2		4.17		2.1			18.5	16.623	15.8
2004	2.0		12.8	1.5		4.17		2.38			22.9	21.350	18.7
2005	2.0		< 12.8	1.5		4.17		2.38			22.9	21.350	17.6
2006	-		-	NA		-		2.38			- ⁵⁾	28.147	24.7
2007	2.4	0.2	< 10.9	NA	3.5	1.5	NA	NA		24.6 ⁶⁾	- ⁵⁾	26.144	24.7
2008	2.4	0.2	< 10.9	NA	3.5	1.5	NA	NA		9.5 ⁶⁾	- ⁵⁾	26.144	22.1
2009	< 1.8	< 0.24	< 11.3	³⁾	< 3.0	< 2.5	³⁾	³⁾		< 1.4	- ⁵⁾	24.837	24.6
2010	< 1.4	< 0.24	< 16.4	⁴⁾	< 1.2	< 1.6	⁴⁾	⁴⁾		< 1.5	- ⁵⁾	24.688	20.9
2011	< 1.3	NA	< 13.3	⁷⁾	< 1.9	< 2.0	⁷⁾	⁷⁾		< 1.9	- ⁵⁾	23.454	16.9
2012	< 1.1	⁸⁾	< 14.1	⁸⁾	< 1.4	< 1.7	⁸⁾	⁸⁾		⁹⁾	- ⁵⁾	21.929	13.5
2013	< 0.95	< 0.05	< 10	< 0.8	< 1.4	< 1.4	< 1.0	< 1.1	< 0.6	< 0.82	- ⁵⁾	17.350	
2014	< 0.739	⁴⁾	< 8.959	⁴⁾	< 1.026	< 1.417	⁴⁾	⁴⁾	⁴⁾	< 0.608	- ⁵⁾		

Weights in thousand tonnes.

¹⁾ EU zone of Division IIa and Subarea IV.

²⁾ Prior to advice for 2009, landings for other rectangles were included in "Management Areas (MA)". This includes FU 34.

³⁾ No increase in effort.

⁴⁾ Biennial advice.

⁵⁾ ICES advises that stocks should be managed by functional unit.

⁶⁾ Refers to advice for FUs 5, 32, and 33.

⁷⁾ See scenarios.

⁸⁾ Reduce catches.

⁹⁾ No increase in catches.

Mixed-fisheries advice

In contrast to single-species advice there is no single recommendation for mixed fisheries (ICES, 2013b), but rather a range of example scenarios, assuming fishing patterns and catchability in 2013 and 2014 are unchanged from those in 2012. Major differences between the outcomes of the various scenarios indicate potential undershoot or overshoot of the advised landings corresponding to the single-species advice. As a result, fleet dynamics may change, but cannot be determined.

Cod is the main limiting species for the North Sea demersal fisheries in 2014. The ‘minimum’ and ‘cod’ scenarios of the mixed-fisheries analyses are both consistent with the single-species advice for cod. The current single-stock *Nephrops* advice for each of the functional units (with the exception of FU 6) leads to catches of cod which are potentially higher than allowed by the cod management plan, i.e. if the cod management plan is strictly enforced catches of *Nephrops* would be lower than allowed in the single-stock advice.

The revised advice for *Nephrops* in FU 6 and North Sea whiting in November 2013, based on new survey information, has not changed the mixed-fisheries perception, and the mixed-fisheries projections from June remain valid.

Table 6.4.15b.2 *Nephrops* in Subarea IV. Landings of *Nephrops* according to single-stock advice and under different mixed-fisheries scenarios (ICES, 2013b).

FU	Moray Firth 9	Noup 10	Fladen Ground 7	Norwegian Deep 32	Farn Deep 6	Firth of Forth 8	Botney Gut – Silver Pit 5	Off Horn’s Reef 33	Devils Hole 34	Other rectangles ²⁾
<i>Single-stock advice*</i>	0.739	0.050	8.959	0.800	1.026	1.417	1.000	1.100	0.600	0.608
<i>Mixed-fisheries scenarios</i>										
<i>Maximum</i>	1.731	0.080	9.223	1.116	4.847	4.187	1.594	1.754	0.957	0.969
<i>Minimum</i>	0.425	0.019	2.164	0.269	1.190	1.039	0.384	0.423	0.231	0.234
<i>Cod MP</i>	0.434	0.020	2.211	0.275	1.216	1.062	0.393	0.432	0.236	0.239
<i>SQ effort</i>	0.867	0.039	4.417	0.549	2.430	2.121	0.785	0.863	0.471	0.477
<i>Effort</i>	0.266	0.013	1.322	0.176	0.842	0.725	0.252	0.277	0.151	0.153

Weights in thousand tonnes.

*Advised landings no more than the indicated value.

Biology

Nephrops is limited to a 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. Catches typically consist of a lower proportion of females than males due to the lower burrow emergence (resulting in lower catchability) of females during the egg bearing.

Environmental influence on the stock

Cod has been identified as a major predator of *Nephrops* in some areas. The generally low level of the cod in the North Sea is likely to have resulted in reduced predation. Multispecies models applied in the past to the exploitation of Irish Sea stocks indicated that management strategies which lead to an increase in the cod stock are associated with a reduction in *Nephrops* abundance. Therefore it may be expected that *Nephrops* stocks in the North Sea will decrease when cod recovers.

Effects of the fisheries on the ecosystem

Trawling for *Nephrops* results in bycatch and discards of other species, including cod, haddock, and whiting. 80 mm is the predominant mesh size used in *Nephrops* fisheries and the resulting proportion of discarded fish can be high. Initiatives are in place to reduce discarding (see below *Factors affecting the fisheries and the stock*). Discarding of *Nephrops* is also high for several FUs and the mortality of *Nephrops* after discarding is considered to be high (75%; Wileman *et al.*, 1999).

The high mud content and soft nature of *Nephrops* grounds means that trawling readily marks the seabed, with trawl marks remaining visible for some time. 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 (FU) rather than the ICES subarea 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. Functional unit TAC management is therefore only one way of managing the fisheries and other approaches may also deliver the required safeguards. Current management of *Nephrops* in Subarea IV (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 functional units. In the current situation vessels are free to move between grounds, allowing effort to develop on some grounds in a largely uncontrolled way and this has historically resulted in inappropriate harvest rates from some parts. This is a particular problem in the Farn Deeps where increased vessel activity from other parts of the UK occurred, resulting in low stock levels.

MSY approach

No precautionary reference points have been defined for *Nephrops*. Under the ICES MSY approach, exploitation rates that 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 differences 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 (ICES, 2010). These proxies may be modified following further data exploration and analysis. The combined-sex F_{MSY} proxy should be considered appropriate if the resulting percentage of virgin spawner-per-recruit for males or females does not fall below 20%. When this does happen a more conservative sex-specific F_{MSY} proxy should be picked instead of the combined proxy.

		Burrow density (average burrows m ⁻²)		
		Low < 0.3	Medium 0.3–0.8	High >0.8
Observed harvest rate or landings compared to stock status (historical performance)	> 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}
Fishery history	Stable spatially and temporally	$F_{35\%SPR}$	$F_{35\%SPR}$	F_{max}
	Sporadic	$F_{0.1}$	$F_{0.1}$	$F_{35\%SPR}$
	Developing	$F_{0.1}$	$F_{35\%SPR}$	$F_{35\%SPR}$

The proposed preliminary MSY $B_{trigger}$ values were set at the lowest observed UWTV abundance, unless the stock has shown signs of stress at higher abundance (in which case a higher value is used).

Impacts of fisheries on the ecosystem

In general, catches of cod in the *Nephrops* fisheries have been relatively low, particularly in recent years in inshore grounds of Subarea IV, but can vary amongst functional units. However, it is important that emerging year classes of cod should not be subjected to high discard mortality. The capture of juvenile fish or other species such as whiting and haddock is also a problem in some of the functional units and discarding of these is a problem in some years. This problem is being addressed with the use of more selective gear, and efforts are already being made in Scotland through the Conservation Credits scheme, requiring vessels targeting *Nephrops* to use gear with larger square-meshed panels (110 mm). Subject to evaluation of the effectiveness of these measures, further action may be required to reduce discards.

Trawling for *Nephrops* results in bycatch and discards of other species, including cod, haddock, and whiting. 80 mm is the predominant mesh size used in *Nephrops* fisheries and the resulting proportion of fish discarded can be high. Initiatives are in place to reduce discarding (see below *Factors affecting the fisheries and the stock*).

The high mud content and soft nature of *Nephrops* grounds means that trawling readily marks the seabed, with trawl marks remaining visible for some time. Burrowing fauna can be seen re-emerging from freshly trawled grounds, implying that there is some resilience to trawling.

Cod has been identified as a major predator of *Nephrops* in some areas. The generally low level of the cod in the North Sea has resulted in reduced predation by cod. Multispecies models applied in the past to the exploitation of Irish Sea stocks indicated that management strategies which lead to an increase in the cod stock are associated with a reduction in *Nephrops* abundance. Therefore it may be expected that *Nephrops* stocks in the North Sea will decrease when cod recovers.

Factors affecting the fisheries and the stock

The implementation of the “buyers and sellers” regulations in the UK in 2006 considerably tightened up the levels of reporting for *Nephrops*, and the landings figures since then are considered to be more reliable. Recent increases in landings and lpuue may result from the increase in reporting levels and do not necessarily reflect changes to the stock.

A ban on the use of multitrawl gears (three or more trawls) for all Scottish boats was introduced from April 2008, limiting the expansion of effective effort.

Effort restrictions in the EU were introduced in 2003 (annexes to the annual TAC regulations) for the protection of the North Sea cod stock. In addition, a long-term plan for the recovery of cod stocks was adopted in 2008 (EC regulation 1342/2008). In 2009, the effort management programme switched from a days-at-sea to a kW-day system (EC regulation 43/2009), in which different amounts of kW-days are allocated within each area by member state to different groups of vessels depending on gear and mesh size. Effort ceilings are updated annually. However, for 2013, the European Council decided upon a roll-over of effort level of 2012 into 2013 for both the cod and the sole/plaice management plan.

Overall nominal effort (kW-days) by EU demersal trawls, seines, beam trawls, gill/trammelnets, and longlines (all mesh sizes included) in the North Sea, Skagerrak, and Eastern Channel had been substantially reduced since the implementation of the two successive effort management plans in 2003 and 2008 (–40% between 2003 and 2012, –16% between 2008 and 2012). Following the introduction of days-at-sea regulations in 2003, there was a substantial switch from the larger mesh (>100 mm, TR1) gear to the smaller mesh (70–99 mm, TR2) gear. Subsequently, effort by TR1 has been relatively stable, whereas effort in TR2 and in small-mesh beam trawl (80–120 mm, BT2), has shown a pronounced decline (–14%, –45%, and –48%, respectively, between 2004 and 2012). Gill- and trammelnet fisheries have remained stable (ICES, 2013b). Effort in large mesh size beam trawl (≥ 120 mm, BT1) has increased significantly in 2012 after a decade of continuous decline. Nominal effort reported by Norway has increased since 2011 due to the generalization of electronic logbooks.

The Scottish industry operates under the Conservation Credits scheme and has implemented improved selectivity measures in gears which target *Nephrops* as well as real-time closures with a view to reducing unwanted bycatch of cod and other species. Since 2010 a number of vessels are reported to be using large square-meshed panels (of up to 160 mm).

Data and methods

Assessments of the *Nephrops* functional units of Subarea IV utilized a number of approaches, including underwater TV (UWTV) surveys, length composition information, and basic fishery data such as landings and effort. Owing to uncertainties in the accuracy of historical landings and to inaccurate effort figures in some fisheries, increasing attention is paid to survey information and size composition data as an indicator of stock status.

For those stocks without UWTV surveys, assessment is made on the basis of the ICES approach to data-limited *Nephrops* stocks. Biennial advice for these stocks was given for 2013 and 2014.

In 2009 there were important developments in the methodology to assess the status of *Nephrops* stocks. The use of UWTV surveys has enabled the development of fishery-independent indicators of abundance. STECF (2005) suggested that a combination of an absolute abundance estimate from an UWTV survey and a harvest rate based on $F_{0.1}$ from a combined-sex length cohort analysis (LCA) and the mean weight and selection pattern from the commercial fishery, could be used to calculate appropriate landings. The approach has been further developed and evaluated by ICES workshops in 2007 and 2009 (ICES, 2007, 2009). The 2009 workshop addressed concerns raised

regarding factors which could potentially bias the UWTV survey results. Major sources of bias were quantified for each survey and an overall bias correction factor derived which, when applied to the estimates of abundance from the UWTV survey, allows them to be treated as absolute abundance levels.

In particular the workshop concluded that the burrows of *Nephrops* detected in the UWTV surveys are considerably smaller than the sizes of the *Nephrops* taken by the fishery. Therefore, the abundance estimates used to calculate the harvest ratios presented in the 2009 advice include a component of the stock that is too small to be exploited by the fishery. This has resulted in calculated harvest ratios appearing to have decreased in the current advice compared to previous estimates of harvest ratios. In essence, this is a scaling issue, not a change in exploitation rate. The previous proportion corresponding to fishing at $F_{0.1}$ was in the range of 15–20%, whereas the revised values from the benchmark in 2009 are in the range of 8–10%.

At the *Nephrops* benchmark meeting in February 2013 (ICES, 2013c), stocks in functional units 6, 32, and 34 were examined. For FU 6 new maturity estimates were presented along with a more detailed analysis concerning the possibility of sperm limitation in depleted stocks. For FU 32 available data sources were investigated, but the assessment was not changed. For FU 34, a detailed analysis of spatial distribution of the fishing grounds was presented, leading to an improved methodology for UWTV determination of the abundance in this FU.

Information from the fishing industry

Trends according to the Fishers' North Sea stock survey (Figure 6.4.15b.2) are discussed in the specific FU stock summary sheets.

Uncertainties in assessment and forecast

For moderate exploitation rates the UWTV assessment provides an adequate basis for predicting catches. ICES has worked to reduce uncertainty and increase precision in the interpretation of survey data.

There is a gap of at least 12 months (more commonly 18 months) between the survey and the start of the TAC year. It is assumed that the stock is stable during this period (i.e. recruitment and growth balance mortality). The effect of this assumption on realised harvest rates has not been investigated.

New 2013 UWTV survey abundance estimates were available to ICES in October 2013 for FUs 6 and 7. Compared with the 2012 surveys, the 2013 survey results indicate a significant change in abundance for FU 6, but not for FU 7. Therefore, the advice for 2014 corresponding to FU 6 has been updated (with respect to the advice issued in June 2013). UWTV survey results for FU 8 and FU 9 were not available at the time of the reopening process.

The UWTV survey does not cover the complete spatial distribution of the stock, covering six of nine functional units and not the area outside the functional units. The area covered by the UWTV survey accounts for over 75% of the North Sea *Nephrops* landings in 2012. Landings from outside the FUs accounted for 4.4% of total landings in 2012. Vessel monitoring system (VMS) data for vessels >15 meters are being successfully used to match survey and fishery areas.

The harvest ratios equivalent to F_{MSY} proxies are based on yield-per-recruit analyses from length cohort analyses. These analyses utilize average length–frequency data, discarding rates, and mean weight taken over a three-year period. The benchmark in 2009 used data from 2005–2007 and changes in selection, discarding rates, and mean weights appear to have occurred since then. Consequently the harvest rates used as F_{MSY} proxies are reconsidered every year for FUs assessed annually and updated where significant change in fishing practice is observed to have occurred.

Comparison with previous assessment and advice

For those stocks without UWTV surveys, advice given in 2012 is biennial and applicable for 2013 and 2014. The basis for this *Nephrops* advice has changed from qualitative analysis of landings trends to advice based on habitat extent and population characteristics.

The advice basis for stocks with UWTV surveys has not changed from last year. The MSY approach and transition are used based on the situation of the stock.

Sources

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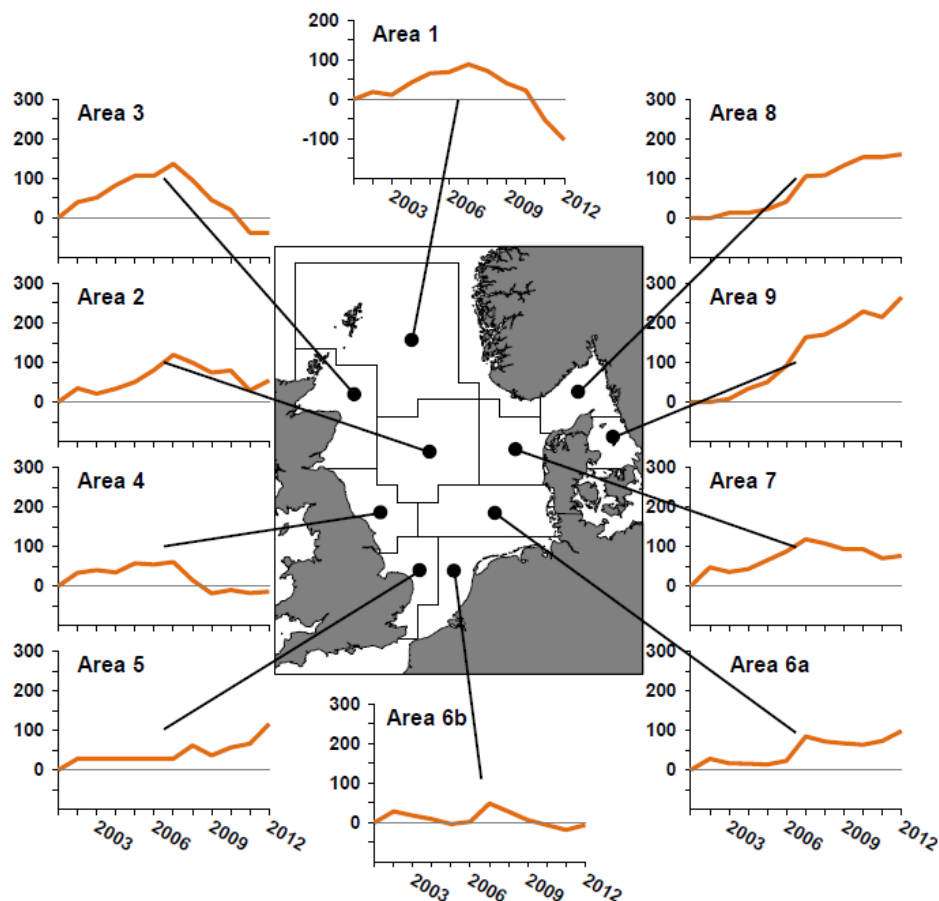


Figure 6.4.15b.2 *Nephrops* in Subarea IV. Results of the North Sea Commission fishers' survey perceptions of the abundance 2012 (Napier, 2012).

Table 6.4.15b.3 *Nephrops* in Subarea IV. Officially reported landings (tonnes) by functional unit plus other rectangles.

Year	FU 5	FU 6	FU 7	FU 8	FU 9	FU 10	FU 32	FU 33	FU 34	Other **	Total
1981		1073	373	1006	1416	36				76	3980
1982		2524	422	1195	1120	19				157	5437
1983		2078	693	1724	940	15				101	5551
1984		1479	646	2134	1170	111				88	5628
1985		2027	1148	1969	2081	22				139	7386
1986		2015	1543	2263	2143	68				204	8236
1987		2191	1696	1674	1991	44				195	7791
1988		2495	1573	2528	1959	76				364	8995
1989		3098	2299	1886	2576	84				233	10176
1990		2498	2537	1930	2038	217				222	9442
1991	862	2063	4223	1404	1519	196				560	10827
1992	612	1473	3363	1757	1591	188				401	9385
1993	721	3030	3493	2369	1808	376	339	160		434	12730
1994	503	3683	4569	1850	1538	495	755	137		703	14233
1995	869	2569	6440	1763	1297	280	489	164		844	14715
1996	679	2483	5217	1688	1451	344	952	77		808	13699
1997	1149	2189	6171	2194	1446	316	760	276		662	15163
1998	1111	2177	5136	2145	1032	254	836	350		694	13735
1999	1244	2391	6521	2205	1008	279	1119	724		988	16479
2000	1121	2178	5569	1785	1541	275	1084	597		900	15050
2001	1443	2574	5541	1528	1403	177	1190	791		1268	15915
2002	1231	1954	7247	1340	1118	401	1170	861		1383	16705
2003	1144	2245	6294	1126	1079	337	1089	929		1390	15633
2004	1070	2153	8729	1658	1335	228	922	1268		1224	18587
2005	1099	3094	10685	1990	1605	165	1089	1050		1120	21897
2006	974	4903	10791	2458	1803	133	1028	1288		1249	24627
2007	1294	2966	11910	2652	1842	155	755	1467		1637	24678
2008	963	1218	12240	2450	1514	173	675	1444		1673	22350
2009	728	2703	13327	2662	1067	89	477	1163		2367	24583
2010	959	1443	12825	1871	1032	38	407	806	865	709	20955
2011	1053	2070	7558	1888	1391	68	395	1191	432	1166	17212
2012*	1240	2460	4369	2091	860	13	310	1084	597	608	13632

* Provisional.

** Devil's Hole landings only separated from 2011.

ECOREGION North Sea
STOCK *Nephrops* in Botney Gut–Silver Pit (FU 5)

Advice for 2014

The 2012 advice for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)): *Based on the ICES approach for data-limited stocks, ICES advises that landings should be no more than 1000 tonnes.*

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

Scientific basis

Assessment type	Data-limited method for <i>Nephrops</i> (category 4.1.4).
Input data	Commercial catches (international landings and length frequencies from Dutch catch sampling), two survey indices (two UWTV estimates of density per m ² in 2010 and 2012), Habitat extent from VMS analysis and sediment maps.
Discards and bycatch	Discards are assumed to be similar to those observed in FU6.
Indicators	None.
Other information	None.
Working group report	WGNSSK (ICES, 2013a)

Sources

ICES. 2012. *Nephrops* in Botney Gut–Silver Pit (FU 5). In Report of the ICES Advisory Committee, 2012. ICES Advice, 2012. Book 6, Section 6.4.14.1.

Table 6.4.15.1.1 *Nephrops* in Botney Gut–Silver Pit (FU 5). ICES advice and landings.

Year	ICES advice	Predicted landings corresp. to advice	ICES landings ¹⁾
1991			0.9
1992		0.87	0.6
1993		0.87	0.7
1994		0.87	0.5
1995		0.87	0.9
1996		0.87	0.7
1997		0.87	1.1
1998		1.0	1.1
1999		1.0	1.2
2000		1.6	1.1
2001		1.6	1.4
2002		2.1	1.2
2003		2.1	1.1
2004		2.38	1.1
2005		2.38	1.1
2006		2.38 ²⁾	1.0
2007	No increase in effort	-	1.3
2008	No new advice, same as for 2007	-	0.9
2009	No increase in effort	-	0.7
2010	No new advice, same as for 2009	-	1.0
2011	See scenarios	-	1.0
2012	Reduce catches	-	1.2
2013	Average landings (last 10 yrs)	< 1.0	
2014	Same catch advice as for 2013	< 1.0	

Weights in thousand tonnes.

¹⁾ Does not include discards.

²⁾ Includes Off Horns Reef FU 33.

ECOREGION North Sea
STOCK *Nephrops* in Farn Deep (FU 6)

Advice for 2014

ICES advises on the basis of the MSY transition that landings in 2014 should be no more than 1026 tonnes. If total discard rates do not change from the average of the last three years (2010–2012), this implies total catches of no more than 1169 tonnes. Note that this figure includes discards expected to survive the discarding process – assumed to be 15% of the total number discarded for this stock.

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

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✗	✗	✗ Above
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined
SSB (Spawning-Stock Biomass)			
	2011	2012	2013
MSY ($B_{trigger}$)	✓	✗	✗ Below trigger
Precautionary approach (B_{pa}, B_{lim})	?	?	? Undefined

FU6: International Landings

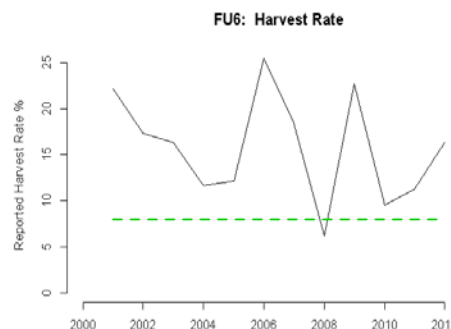
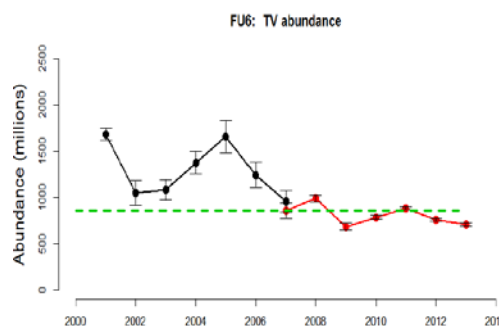
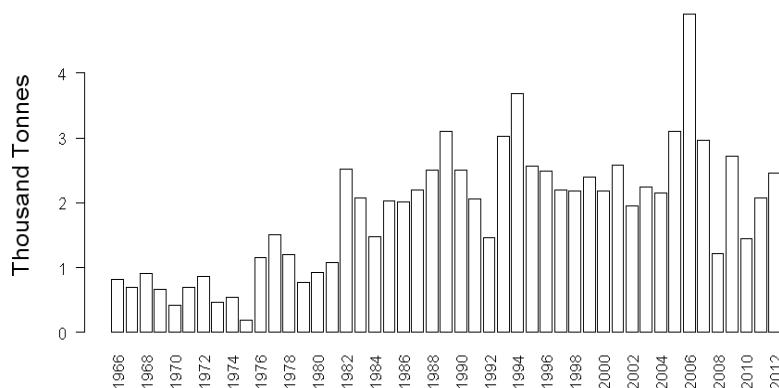


Figure 6.4.15b.2.1 *Nephrops* in Farn Deep (FU 6). Long-term trends in landings, harvest rate, and UWTV abundance (used as F and SSB proxies). Weights in thousand tonnes, abundance in millions). Dashed green lines show proxies for F_{MSY} and MSY $B_{trigger}$. For the UWTV abundance calculation a geostatistical method has been determined from 2007 onwards (red line).

The UWTV survey indicates that the stock status has declined since 2005 and has been fluctuating near MSY $B_{trigger}$ since 2007. Changes in survey methodology in 2007 make exact comparisons with the preceding series difficult, but the general trend is considered reliable.

Management plans

No specific management objectives are known to ICES.

The fisheries

Nephrops in FU 6 are predominantly caught in trawl fisheries using meshes in the 80–99 mm category. A small amount of creeling takes place. Increases in the numbers of vessels using twin-rig and multi-rig gears observed in this area are likely to have increased the effective fishing power per kW hour.

Catch distribution Total catch (2012) = 2805 t, of which 87.7% were landings (almost entirely taken in demersal trawl fisheries, either a directed *Nephrops* or a mixed *Nephrops*/demersal fishery) and 12.3% discards in weight.

Quality considerations

Market sampling misses portions of the tailed category of landings. For assessment purposes, only sampling of the full unsorted catch is used to estimate the size composition of removals. The method used to raise the abundances in years prior to 2007 has been found to be statistically flawed and a raising procedure has been developed to avoid these errors. Improvements in the recording of position (GPS) for the underwater TV survey from 2007 permit a more accurate estimate of absolute abundance than previously possible. Prior to this date there is a potential upward bias in the absolute estimate due to underestimation of the distance covered.

Revisions in 2013 of UWTV abundances (going back to 2007) have made small (< 5%) changes in the series, including the 2007 point used as the MSY B_{trigger} point; however, the general conclusions about stock status remain unchanged.

Scientific basis

Assessment type	Underwater TV survey linked to yield-per-recruit analysis from length data.
Input data	One survey index (UWTV); Length–frequency data from the fishery. Commercial catches (international landings and length frequencies from English catch sampling), one survey index (FU6 UWTV). Maturity data from commercial catch sampling. Natural mortalities from Morizur (1982).
Discards and bycatch	Discards are included in the assessment since 2000, from English trawls (TR1 & TR2).
Indicators	None.
Other information	Latest benchmark was performed in 2013 (ICES, 2013c). The advice was reopened in November 2013 based on information provided by the UWTV survey conducted in 2013.
Working group report	WGNSSK (ICES, 2013a).

ECOREGION North Sea
STOCK *Nephrops* in Farn Deeps (FU 6)

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY	MSY B_{trigger}	858 million	UWTV survey index at start of current decline (2007) as measured by a geostatistical method.
Approach	F_{MSY}	Harvest rate 8.1%.	Equivalent to $F_{35\% \text{SPR}}$ males in 2011.
Precautionary Approach	$F_{0.1}$	Not agreed.	
	F_{max}	Not agreed.	

(Changed in 2013)

Harvest rate reference points (2013):

	Male	Female	Combined
F_{max}	11.6 %	21.6 %	15.3 %
$F_{0.1}$	7.1%	14.0 %	8.7 %
$F_{35\% \text{SPR}}$	8.1 %	15.2 %	11.1 %

For this functional unit (FU), the exploitation rate on males is usually considerably higher than on females and there is evidence of sperm-limitation following harvest rates in the region of 20%. There is evidence to suggest that in both 2006 and 2010 mature females have not been able to successfully mate and therefore a larger male spawning potential is desirable. To this effect the harvest rate equivalent to fishing at $F_{35\% \text{SPR}}$ for males is suggested as a proxy for F_{MSY} ($F_{35\% \text{SPR}}$, males = 8.1%). New size-at-maturity data were analyzed at the 2013 benchmark meeting, leading to revisions in the harvest rate reference points.

Outlook for 2014

Basis: $F_{2010-2012}$ = average harvest rate over 2010–2012 = 12.3 %; Bias-corrected survey index (2014 index =2013 index) = 706 million; Mean weight in landings (2010–2012) = 25.56 g; Mean weight in discards (2010–2012) = 11.10 g.

Basis	Total catches*	Landings	Dead discards**	Surviving discards**	Harvest rate
	L+DD+SD	L	DD	SD	for L+DD
	323	283	34	6	2%
	646	567	67	11	4%
MSY approach	1078	947	112	19	6.7%
MSY transition	1169	1026	122	21	7.2%
F_{MSY}	1310	1151	137	23	8.1%
	1453	1275	151	26	9%
	1775	1559	185	31	11%
	1937	1700	202	34	12%
$F_{2010-2012}$	1985	1743	207	35	12.3%
	2421	2126	252	43	15%
	3228	2834	336	57	20%

Weights in tonnes.

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

** The total discard rate is assumed to be 24.34% of the catches (in number, average of the last three years (2010–2012)); discard survival is assumed to be 15% (ICES, 2013c).

MSY approach

Following the ICES MSY approach implies a harvest rate of 6.7% (below F_{MSY} because biomass is below MSY B_{trigger}), resulting in landings of 947 t in 2014.

Following the transition scheme towards the ICES MSY approach implies fishing mortality to be reduced to $(0.2 \times F_{2010} + 0.8 \times (F_{\text{MSY}} \times (SSB_{2014}/MSY B_{\text{trigger}}))) = 7.2\%$, corresponding to landings of no more than 1026 t in 2014. If

discard rates do not change from the average of the last three years (2010–2012, assuming 15% discard survival), this implies total catches of no more than 1169 t.

Additional considerations

In mixed fisheries projections the ‘min’ scenario (where fishing is assumed to stop when the catch for any one of the stocks considered meets the single-stock advice) estimates that the *Nephrops* stock in FU 6 is one of the main limiting species for 2014, together with cod.

Declines in abundance in other FUs (i.e. Firth of Forth and the Fladen grounds) may increase the risk of higher effort being deployed in this FU which would be inadvisable, given the current low level of the stock.

The stock has shown signs of overexploitation in recent years, with an unbalanced sex ratio leading to poor recruitment. Without suitable controls on the movement of effort between functional units there is nothing to prevent the effort in 2014 from increasing and moving the observed harvest ratios even further beyond the level of F_{MSY} .

The effects of regulations

The minimum landing size for *Nephrops* in the North Sea is 25 mm carapace length. Discarding rates of *Nephrops* are fairly stable between 2007 to 2012 at around 25% by number.

Changes in fishing technology and fishing patterns

The number of vessels using multi-rig gear had been increasing but now appears to have stabilized. These gears have a higher fishing power than single rigs for *Nephrops* and may have a higher environmental impact due to the additional weight required for deployment.

Information from the fishing industry

There is a fair level of consistency between the overall abundance track and the scientific survey. The Fishers’ Stock Survey trajectory (Napier, 2012) for area 4 shows less increase than in other areas, consistent with the scientific perception that the Farn Deeps stock had not experienced the stock increases of other functional units. There is also agreement that the stock in this area has declined in recent years..

Uncertainties in assessment and forecast

General comments are found at the beginning of Section 6.4.15b.

Revisions to the UWTV survey calculations for 2007–2010 (in 2012) have resulted in changes to the bias-corrected abundance indices, particularly in 2010 which is reduced by 15% from 892 million to 753 million. The value used for the $MSY B_{trigger}$ biomass proxy (the 2007 value) has decreased from 879 million to 858 million (–2%).

Comparison with previous assessment and advice

The historical abundance is not revised from one year to the next because abundances are based on direct observation.

The basis for the advice has not changed, but the advice for 2014 has been updated from the advice issued in June 2013, based on the information provided by the UWTV survey conducted in 2013.

**Length frequencies for catch (dotted) and landed(solid):
Nephrops in fu6**

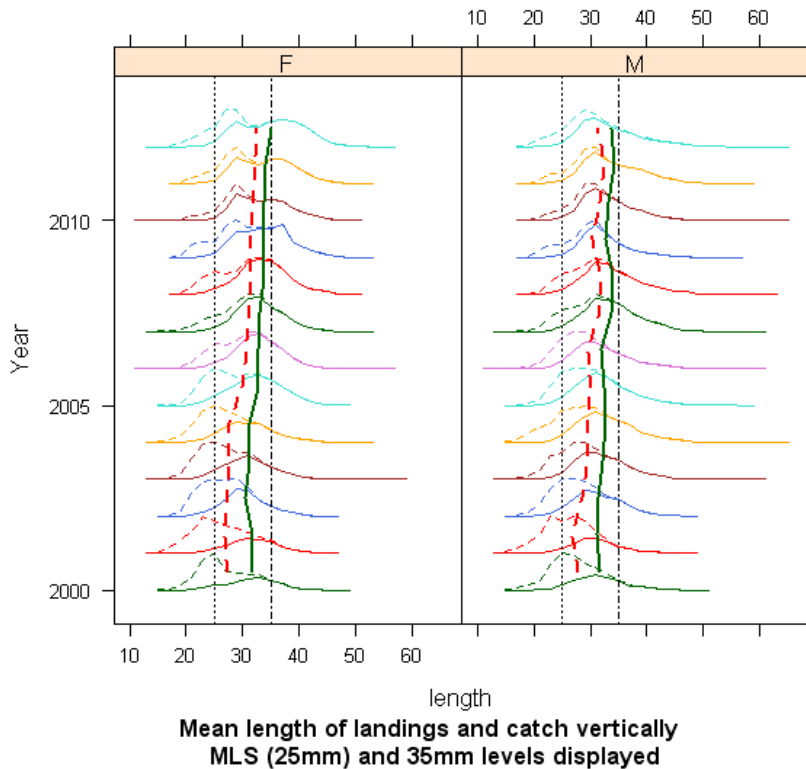


Figure 6.4.15b.2 *Nephrops* Farn Deepes (FU 6). Length composition of catch (dotted) and landed (solid) of males (right) and females (left) from 1996 (bottom) to 2012 (top). Mean sizes of catch and landings (using same line types) is shown in relation to minimum landing size (MLS).

Table 6.4.15b.2.1 *Nephrops* Farn Deepes (FU 6). ICES advice, management, and landings.

Year	ICES advice	Predicted landings corresp. to advice Farn Deepes (FU 6)	Recommended landings FUs 6 and 8	ICES landings FU 6 ¹⁾
2004			4.17	2.2
2005			4.17	3.1
2006	No increase in effort		-	4.9
2007	No increase in effort, harvest rate < 15%	3.5	5.0	3.0
2008	No new advice, same as for 2007	3.5	5.0	1.2
2009	No increase in effort and landings (2007)	< 3.0	²⁾	2.7
2010	Harvest rate no greater than that equivalent to fishing at F ₂₀₀₈	< 1.2	²⁾	1.4
2011	MSY transition	< 1.9	²⁾	2.1
2012	MSY transition	< 1.4	²⁾	2.5
2013	MSY transition	< 1.4	²⁾	
2014	MSY transition	< 1.026	²⁾	

Weights in thousand tonnes.

¹⁾ Does not include discards.

²⁾ Advice given at FU level only.

Table 6.4.15b.2.2 *Nephrops* Farn Deeps (FU 6). Official landings (tonnes).

Year	UK England & N. Ireland	UK Scotland	Sub total	Other countries**	Total
1981	1006	67	1073	0	1073
1982	2443	81	2524	0	2524
1983	2073	5	2078	0	2078
1984	1471	8	1479	0	1479
1985	2009	18	2027	0	2027
1986	1987	28	2015	0	2015
1987	2158	33	2191	0	2191
1988	2390	105	2495	0	2495
1989	2930	168	3098	0	3098
1990	2306	192	2498	0	2498
1991	1884	179	2063	0	2063
1992	1403	60	1463	10	1473
1993	2941	89	3030	0	3030
1994	3530	153	3683	0	3683
1995	2478	90	2568	1	2569
1996	2386	96	2482	1	2483
1997	2109	80	2189	0	2189
1998	2029	147	2176	1	2177
1999	2197	194	2391	0	2391
2000	1947	231	2178	0	2178
2001	2319	255	2574	0	2574
2002	1739	215	1954	0	1954
2003	2031	214	2245	0	2245
2004	1952	201	2153	0	2153
2005	2936	158	3094	0	3094
2006	4430	434	4864	39	4903
2007	2525	437	2962	4	2966
2008	976	244	1220	0	1220
2009	2299	414	2713	0	2713
2010	1258	185	1443	0	1443
2011	1806	250	2056	14	2070
2012*	2177	256	2433	27	2460
na = not available.					
* Provisional.					
** Other countries includes Netherlands, Belgium, and Denmark.					

Table 6.4.15b.2.3 *Nephrops* Farn Deepes (FU 6). Summary of the assessment.

Year	TV abundance index	Landings (t)	Discard rate (number)	Mean weight – Landings (g)	Mean weight – Discards (g)	Number removed	Observed harvest rate
2001	1685	2574	66.60%	20.67	9.62	374	22.2%
2002	1048	1953	46.10%	20.00	9.50	182	17.3%
2003	1085	2245	42.10%	21.89	9.56	177	16.3%
2004	1377	2152	41.70%	23.14	9.22	160	11.6%
2005	1657	3094	34.50%	23.58	10.32	200	12.1%
2006	1244	4858	31.30%	22.53	10.58	317	25.5%
2007	858	2966	25.00%	24.95	10.89	158	18.5%
2008	987	1213	24.90%	26.63	10.97	61	6.2%
2009	682	2711	29.30%	24.45	10.54	155	22.7%
2010	785	1443	23.00%	25.18	11.74	74	9.5%
2011	878	2072	22.60%	27.05	11.02	99	11.3%
2012	758	2457	27.42%	27.30	10.16	123	16.2%
2013	706						

ECOREGION North Sea
STOCK *Nephrops* in Fladen Ground (FU 7)

Advice summary for 2014

ICES advises on the basis of the MSY approach that landings in 2014 should be no more than 8959 tonnes. If total discard rates do not change from the average of the last 3 years (2010–2012), this implies total catches of no more than 9059 tonnes. Note that this figure includes discards expected to survive the discarding process – assumed to be 25% of the total number discarded for this stock.

In order to ensure the stock in this FU is exploited sustainably, management should be implemented at the functional unit level. Should the catch in this FU be lower than advised, the difference should not be transferred to other FUs.

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✓	✓	✓ Below target
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined
SSB (Spawning-Stock Biomass)			
	2010	2011	2012
MSY ($B_{trigger}$)	✓	✓	✗ Below trigger
Precautionary approach (B_{pa}, B_{lim})	?	?	? Undefined

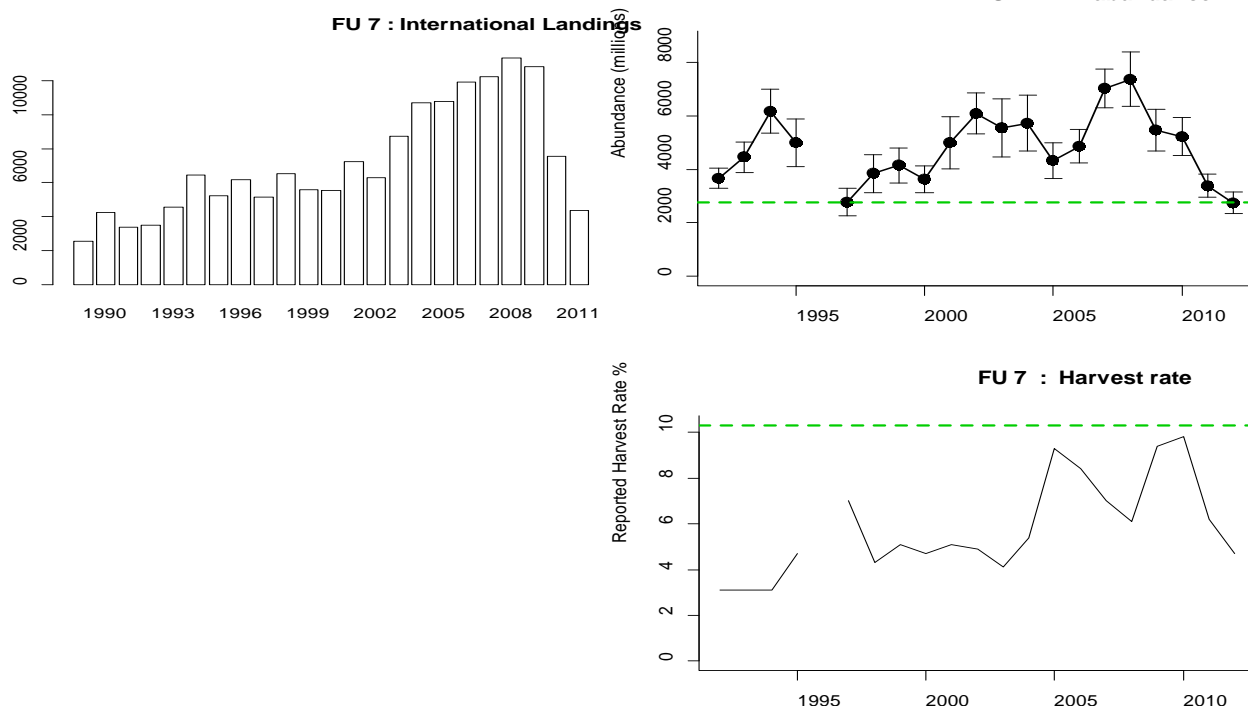


Figure 6.4.15.3.1 *Nephrops* in Fladen Ground (FU 7). Long-term trends in landings, harvest rate, and bias-adjusted UWTV abundance (used as F and SSB proxies. Weights in thousand tonnes, UWTV in millions). Dashed green lines show proxies for F_{MSY} and MSY $B_{trigger}$. Harvest rates before 2007 may be unreliable due to underreporting of landings.

The stock has declined from the highest observed value in 2008 and is now just below the MSY $B_{trigger}$. The harvest rate has fluctuated in recent years, and fell to approximately 4% in 2012 which is below F_{MSY} .

Management plans

No specific management objectives are known to ICES.

Biology

See Section 6.4.15 for general comments. The *Nephrops* population at the Fladen is characterized by a low density of individuals compared to other FUs. There also appears to be fewer competing burrowing species in this area.

The fisheries

Over 95% of the landings are taken by Scottish vessels. Most of the landings are made by single-rig vessels. 80 mm mesh is the most common mesh size although there is anecdotal evidence of increasing use of meshes larger than 80 mm. Whitefish represents an important bycatch for a significant component of the Scottish *Nephrops* trawlers operating at the Fladen.

Catch distribution Total catch (2012) = 4.4 kt. Almost all landings are taken in demersal trawl fisheries, either in a directed *Nephrops* or a mixed *Nephrops*/demersal fishery. Observer trips recorded no *Nephrops* discards in 2012.

Quality considerations

See Section 6.4.15 for general comments. The UWTV survey in this area is conducted over the main part of the ground, representing an area of around 28 200 km² of suitable mud substrate. The Fladen Ground functional unit contains several patches of mud to the north of the ground which are fished, bringing the overall area of substrate to 30 633 km². This area is not surveyed but would add to the abundance estimate. The bias-corrected absolute abundance estimate for this ground is therefore likely to be underestimated by the current methodology.

Scientific basis

Assessment type	Underwater TV survey linked to yield-per-recruit analysis from length data.
Input data	Commercial catches (international landings, length frequencies from Scottish catch sampling), one survey index (FU 7 UWTV-Scotia-June). Maturity data from commercial catch sampling and natural mortalities from Morizur (1982)
Discards and bycatch	Discards included in the assessment since 2000, from Scottish trawls (TR1 and TR2)
Indicators	Size structure of catches, mean size, lpue.
Other information	Latest benchmark (based on the UWTV survey) was performed in 2009.
Working group report	WGNSSK (ICES, 2013a)

ECOREGION North Sea
STOCK *Nephrops* in Fladen Ground (FU 7)

Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY	MSY B_{trigger}	2767 million individuals.	Lowest observed UWTV survey estimate of abundance (1992–2011).
Approach	F_{MSY}	Harvest rate 10.3%.	Equivalent to $F_{0.1}$ combined sex in 2011. F_{MSY} proxy based on length-based Y/R.
Precautionary Approach	Not defined.		

(unchanged since: 2011)

Harvest rate reference points (2011):

	Male	Female	Combined
F_{max}	16.2%	24.1%	18.5%
$F_{0.1}$	9.5%	12.1%	10.3%
$F_{35\%}$	11.4%	14.4%	12.4%

For this FU, the absolute density observed on the UWTV survey is low with a long term average (1992–2012) of just below 0.2 burrows m^{-2} , suggesting the stock may have low productivity. Historical harvest ratios in this FU have been below that equivalent to fishing at $F_{0.1}$, and therefore an appropriate proxy for F_{MSY} would be $F_{0.1}$ for combined sexes.

The F_{MSY} proxy harvest rate values were updated in 2011 from the per-recruit analysis based on input parameters from a combined-sex length cohort analysis of 2008–2010 catch-at-length data. Previous analysis used 2005, 2006, and preliminary 2007 data which showed substantially greater discard rates than have recently been observed.

Outlook for 2014

Basis: $F_{2010-2012}$ = average harvest rate of 2010–2012=6.9%; Survey abundance (2012) = 2748 million; Mean weight in landings (2010–2012) = 33.15 g; Discard rate (dead, by number) = 1.7% (average 2010–2012), Mean weight in discards (2010 only as no discards in 2011 and 2012) = 16.4g.

Basis	Total Catches*	Landings	Dead Discards**	Surviving Discards**	Harvest Rate
	L+DD+SD	L	DD	SD	for L+DD
	4530	4479	38	13	5.0%
$F_{2010-2012}$	6250	6181	52	17	6.9%
	6794	6719	56	19	7.5%
MSY approach	9059	8959	75	25	10.0%
F_{MSY}	9330	9227	77	26	10.3%
	11323	11198	94	31	12.5%
	13589	13438	113	38	15.0%
	15853	15678	131	44	17.5%
	18117	17917	150	50	20.0%

Weights in tonnes

* Total catches are the landings including dead and surviving discards

** Total discard rate is assumed to be 2% of the catches (in number, last 3 years average, 2010–2012), discard survival is assumed 25% (ICES, 2009).

MSY approach

Following the ICES MSY approach implies a harvest rate of 10.0%, (lower than the F_{MSY} because SSB is below MSY B_{trigger}), resulting in landings of less than 8959 t in 2013. If discards rates do not change from the average of the last 3 years (2010–2012, assuming 25 % discard survival), this implies total catches of no more than 9059 t.

ICES notes that this implies an increase in harvest rate when the stock has shown a steady decline since 2008, and is now below MSY Btrigger. Considering the harvest options for this FU have not been utilised, utilisation of the harvest options from FU 7 elsewhere, may result in overexploitation of other FUs.

Additional considerations

In mixed fisheries projections the maximum scenario ('max', where fishing stops when all stocks considered have been caught up to the ICES single-stock advice) the *Nephrops* stock in FU7 is one of the least limiting stocks. The advice for FU 7 has not been restrictive to landings from the area since 2010. Should the catch in this FU be lower than advised, the difference should not be transferred to other FUs where this would cause local overfishing.

In the Fladen area the *Nephrops* stock is restricted to a generally continuous area of muddy sediments extending from 57°30'N to 60°N, and from 1°W to 1°30'E, with other smaller patches to the north. The Fladen is one of the largest known *Nephrops* grounds; fishing activity can shift spatially so that effort can vary on parts of the ground.

The effects of regulations

The minimum landing size for *Nephrops* in the North Sea is 25 mm carapace length. Discarding of both undersize and poor quality *Nephrops* sometimes takes place at a low rate in this FU. Values have fallen in recent years, from about 10% in the early 2000s to around 5% by number in the period covered by the Y/R analysis (2008–2010); in 2011 and 2012 there were zero discards of *Nephrops*. Discard rates in this FU have historically been low compared to other North Sea functional units because of the generally larger size of *Nephrops* found at the Fladen.

Changes in fishing technology and fishing patterns

In the early years of the fishery, effort was primarily directed to a region that could be reached within 12 hours' steaming from ports along the northeast coast of Scotland. In recent years, logbook information and VMS show that vessels are fishing more widely over the ground, including to the farther easterly and northerly edges of the extensive mud area.

The reduction in the discard rate since 2000 appears to be caused partly by increased retention of small individuals (lower mean sizes of the < 35 mm component of the landings for part of the time-series) and possibly, in the most recent years, by a period of reduced recruitment which has led to some changes in the size composition of the catch.

Information from the fishing industry

The Fishers' North Sea stock survey in 2012 shows that perceived abundance increased to 2007 and have subsequently declined to below the level at the start of the series. This is broadly in line with the results of the UWTV survey.

Uncertainties in assessment and forecast

General comments are found at the beginning of Section 6.4.15.

The population has not been well-studied and biological parameters such as growth are considered particularly uncertain.

The UWTV survey is conducted over the main part of the ground, representing an area of around 28 200 km² of suitable mud substrate (the largest ground in Europe). The Fladen functional unit contains several patches of mud to the north of the ground which are fished, bringing the overall area of substrate to 30 633 km². This area is not surveyed but would add to the abundance estimate. The absolute abundance estimate for this ground is therefore likely to be underestimated by the current methodology.

Comparison with previous assessment and advice

The perception of the state of the stock in previous years has not changed (i.e. based on an absolute abundance estimate from a survey).

The advice given in 2013 is based on the MSY approach (as last year).

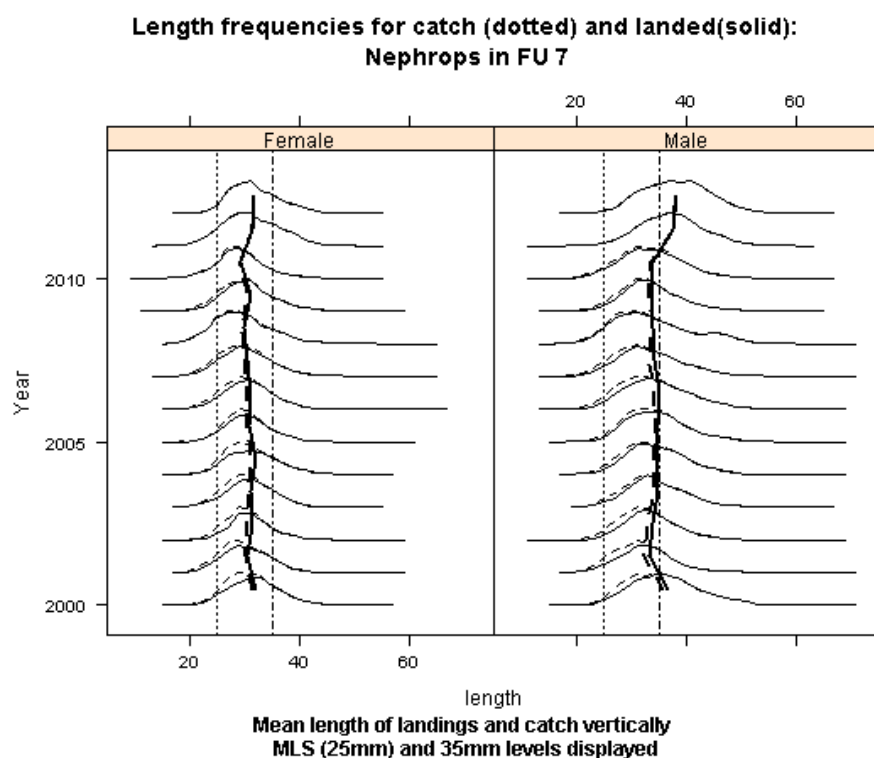


Figure 6.4.15.3.2 *Nephrops*, Fladen (FU 7). Catch length–frequency distribution and mean sizes in the catch and landings. Vertical lines are minimum landing size (25 mm) and 35 mm.

Table 6.4.15.3.1 *Nephrops* in Fladen Ground (FU 7). ICES advice, management, and landings.

Year	ICES advice	Predicted landings corresp. to advice Fladen grounds (FU 7)	ICES landings FU 7 ¹⁾
1992		~2.7	3.4
1993		2.7	3.5
1994		5.0	4.6
1995		5.0	6.4
1996		5.0	5.2
1997		5.0	6.2
1998		7.0	5.1
1999		7.0	6.5
2000		9.0	5.6
2001		9.0	5.5
2002		9.0	7.2
2003		9.0	6.3
2004		12.8	8.7
2005		<12.8	10.7
2006	No increase of effort	-	10.8
2007	No increase in effort and harvest rate below 7.5%	<10.9	11.9
2008	No new advice, same as for 2007	<10.9	12.24
2009	No increase in effort and recent average landings	<11.3	13.33
2010	Harvest Rate no greater than that equivalent to fishing at $F_{0.1}$	<16.4	12.82
2011	MSY approach	< 13.3	7.6
2012	MSY approach	< 14.1	4.4
2013	MSY approach	< 10.	
2014	MSY approach	<8.959	

Weights in thousand tonnes.

¹⁾ Does not include discards.

Table 6.4.15.3.2

Nephrops in Fladen Ground (FU 7). Official landings (tonnes) of *Nephrops*, as reported to ICES.

Year	Denmark	UK Scotland			Other countries*	Total
		<i>Nephrops</i> trawl	Other trawl	Sub-total		
1981	0	304	69	373	0	373
1982	0	382	40	422	0	422
1983	0	548	145	693	0	693
1984	0	549	97	646	0	646
1985	7	1016	125	1141	0	1148
1986	50	1398	95	1493	0	1543
1987	323	1024	349	1373	0	1696
1988	81	1306	186	1492	0	1573
1989	165	1719	415	2134	0	2299
1990	236	1703	598	2301	3	2540
1991	424	3024	769	3793	6	4223
1992	359	1794	1179	2973	31	3363
1993	224	2033	1233	3266	3	3493
1994	390	1817	2356	4173	6	4569
1995	439	3569	2428	5997	4	6440
1996	286	2338	2592	4930	1	5217
1997	235	2713	3221	5934	2	6171
1998	173	2291	2672	4963	0	5136
1999	96	2860	3549	6409	16	6521
2000	103	2915	2546	5461	5	5569
2001	64	3539	1936	5475	2	5541
2002	173	4513	2546	7059	15	7247
2003	82	4175	2033	6208	4	6294
2004	136	7274	1319	8593	0	8729
2005	321	8849	1514	10363	1	10685
2006	283	9396	1101	10497	11	10791
2007	119	11055	733	11788	3	11910
2008	133	11432	667	12099	8	12240
2009	130	12696	491	13187	10	13327
2010	124	12410	279	12689	12	12825
2011	64	7372	122	7494	<0.5	7558
2012	75	4225	67	4292	2	4369

na = not available
 **Other countries includes Belgium, Norway and UK England

Table 6.4.13.3.3 *Nephrops* in Fladen (FU 7). Results of the 1992–2012 UWTV surveys (abundances and confidence interval).

Year	Stations	Abundance	Mean density	95% confidence interval
		millions	burrows/m ²	millions
1992	69	3661	0.13	376
1993	74	4450	0.16	569
1994	59	6170	0.22	814
1995	61	4987	0.18	896
1996		No survey		
1997	56	2767	0.10	510
1998	60	3838	0.13	717
1999	62	4146	0.15	649
2000	68	3628	0.13	491
2001	50	4981	0.17	970
2002	54	6087	0.21	757
2003	55	5547	0.20	1076
2004	52	5725	0.20	1030
2005	72	4325	0.16	662
2006	69	4862	0.17	619
2007	82	7017	0.25	730
2008	74	7360	0.26	1019
2009	59	5457	0.19	772
2010	67	5224	0.19	710
2011	73	3382	0.12	435
2012	70	2748	0.10	392

Table 6.4.13.3.4 *Nephrops* in Fladen (FU 7). Adjusted TV survey abundance, landings, total discard rate (proportion by number), dead discard rate (by number), and estimated harvest rate.

	Adjusted abundance (millions)	Landings (tonnes)	Discard rate	Dead discard rate	Harvest ratio
2003	5547	6294	0.1	0.08	0.04
2004	5725	8729	0.11	0.08	0.05
2005	4325	10685	0.11	0.09	0.09
2006	4862	10791	0.13	0.1	0.08
2007	7017	11910	0.11	0.08	0.07
2008	7360	12240	0.04	0.03	0.06
2009	5457	13327	0.1	0.07	0.09
2010	5224	12825	0.06	0.05	0.1
2011	3382	7558	0	0	0.062
2012	2748	4369	0	0	0.047

ECOREGION North Sea
STOCK *Nephrops* in Firth of Forth (FU 8)

Advice for 2014

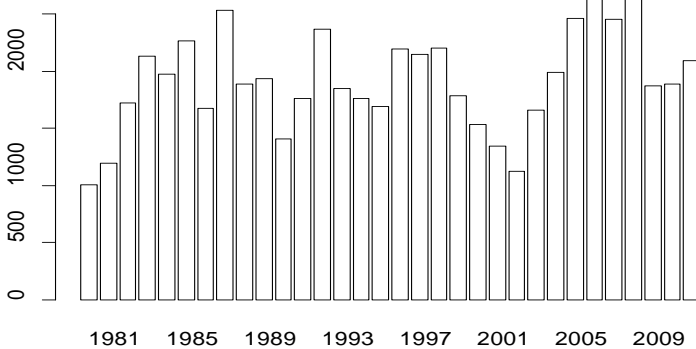
ICES advises on the basis of the transition to the MSY approach that landings in 2013 should be no more than 1417 tonnes. If total discard rates do not change from the average of the last 3 years (2010–2012), this implies total catches of no more than 1646 tonnes. Note that this figure includes discards expected to survive the discarding process – assumed to be 25% of the total number discarded for this stock.

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

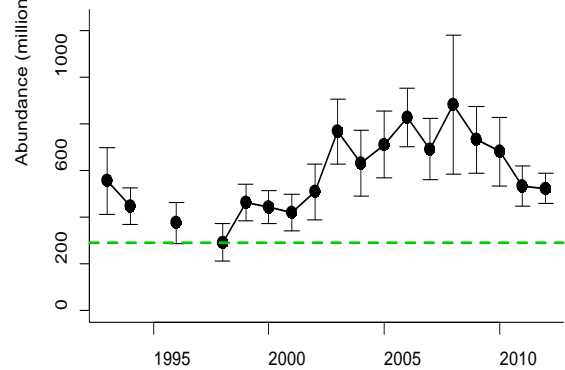
Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✗	✗	✗ Above target
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined
SSB (Spawning-Stock Biomass)			
	2010	2011	2012
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	?	?	? Undefined

FU 8 : International Landir



FU 8 : TV abundance



FU 8 : Harvest rate

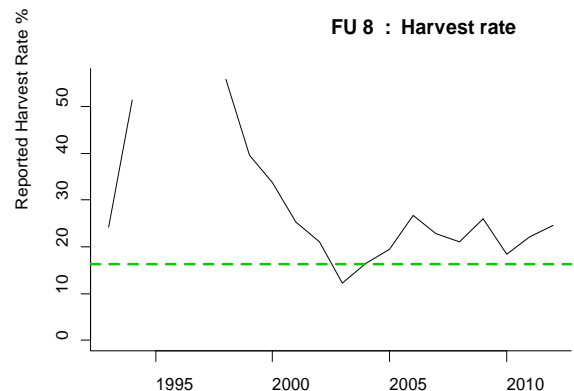


Figure 6.4.15.4.1 *Nephrops* in Firth of Forth (FU 8). Long-term trends in landings, harvest rate, and UWTV biomass (used as F and SSB proxies; weights in thousand tonnes and UWTV in millions). Dashed green lines show proxies for F_{MSY} and MSY $B_{trigger}$. Harvest rates before 2007 may be unreliable due to underreporting of landings.

The stock remains above MSY $B_{trigger}$ but has declined since 2008. The harvest rate remains above F_{MSY} .

Management plans

No specific management objectives are known to ICES.

Biology

The population of *Nephrops* in the Firth of Forth appears to consist of a high density of small individuals in comparison to other FUs.

The fisheries

The *Nephrops* fishery in the Firth of Forth is dominated by UK (Scotland) vessels, with low landings reported by other UK nations. *Nephrops* discard rates are higher than in a number of other areas but the rates have declined to 25% by number and 13% by weight (average 2011–2012).

Catch distribution Total catch (2012) = 2091, where 87% are landings taken in demersal trawl fisheries, either a directed *Nephrops* or a mixed *Nephrops*/demersal fishery, and 13% are discards (in weight).

Quality considerations

See Section 6.4.15 for general comments.

Scientific basis

Assessment type	Underwater TV survey linked to yield-per-recruit analysis from length data.
Input data	Commercial catches (international landings, length frequencies from Scottish catch sampling), 1 survey index (FU 8 UWTV). Maturity data from commercial catch sampling, natural mortalities from Morizur (1982)
Discards and bycatch	Discards included in the assessment since 1990, from Scottish trawls (TR1 and TR2)
Indicators	Information on size structure; mean size; lpue.
Other information	Latest benchmark (on use of UWTV survey) was performed in 2009.
Working group report	WGNSSK (ICES, 2013a)

ECOREGION North Sea
STOCK Nephrops in Firth of Forth (FU 8)

Reference points

	Type	Value	Technical basis
MSY Approach	MSY B _{trigger}	292 million individuals.	Lowest observed UWTV survey estimate of abundance (1993-2010).
	F _{MSY}	Harvest rate 16.3%.	Equivalent to F _{max} combined-sex in 2011. <i>F_{MSY} proxy based on length-based Y/R -</i>
Precautionary Approach	Not defined.		

(unchanged since: 2011)

Harvest rate reference points (2011):

	Male	Female	Combined
F _{max}	12.7%	26.7%	16.3%
F _{0.1}	7.7%	15.2%	9.4%
F _{35%}	9.4%	18.3%	12.7%

For this FU, the absolute density observed on the UWTV survey is relatively high (average of ~ 0.8 burrows m⁻²). A long time-series of relatively stable landings (average reported landings ~ 2000 tonnes), well above those predicted by currently fishing at F_{max} while the stock abundance has been stable, suggest a productive stock. It is suggested that F_{max} for combined sexes is chosen as the F_{MSY} proxy.

The F_{MSY} proxy harvest rate values were updated in 2011 on the basis of per-recruit analysis, based on input parameters from a combined-sex length cohort analysis of 2008–2010 catch-at-length data. Previous analysis used 2005, 2006, and preliminary 2007 data, which showed greater discard rates than those observed recently.

Outlook for 2014

Basis: F₂₀₁₀₋₂₀₁₂ = average harvest rate of 2010–2012 = 21.7%; Survey abundance (2012) = 522 million; Mean weight in landings (2010–2012) = 20.39 g; Mean weight in discards (2010–2012) = 9.70 g Discard rate (dead, by number) = 20.3% (average 2010–2012).

Basis	Total Catches*	Landings	Dead Discards**	Surviving Discards**	Harvest Rate
	L+DD+SD	L	DD	SD	for L+DD
	492	424	51	17	5.0%
	739	636	77	26	7.5%
	985	848	103	34	10.0%
	1232	1060	129	43	12.5%
	1477	1272	154	51	15.0%
F _{MSY}	1605	1381	168	56	16.3%
MSY transition	1646	1417	172	57	16.7%
	1971	1696	206	69	20.0%
F ₂₀₁₀₋₂₀₁₂	2137	1840	223	74	21.7%
	2463	2120	257	86	25.0%

* Total catches are the landings including dead and surviving discards

** Total discard rate is assumed to be 25.3% of the catches (in number, last 3 years average, 2010-2012), discard survival is assumed 25% (ICES, 2009).

MSY approach

To follow the ICES MSY approach the harvest rate should be reduced to 16.3%, corresponding to maximum landings of 1381 t in 2014.

To follow the transition scheme towards the ICES MSY – approach, the harvest rate should be reduced to 16.7% (0.2* F₂₀₁₀+ 0.8* F_{MSY}), corresponding to landings of no more than 1417 t in 2013 (where F₂₀₁₀ is the observed harvest rate

in 2010 (18.4%)). If discards rates do not change from the ratio in 2012, assuming 25% discard survival), this implies total catches of no more than 1646 t.

Additional considerations

Factors affecting the fisheries and the stock

Landings from the Firth of Forth fishery are predominantly reported from Scotland, with very small contributions from England. The area is periodically visited by vessels from other parts of the UK. The Firth of Forth is close inshore and is of small geographic size so that any significant increase of effort could rapidly lead to overexploitation.

Catches of marketable bycatch fish are small from this area and there are few other species in the area for vessels to target.

Estimated discarding rates of *Nephrops* are 27% by number in the Firth of Forth in 2012. This arises from the use of mainly small-meshed (80 mm) nets and the population size structure, which appears to arise from slower growth. Local markets for small whole *Nephrops* are seasonally important.

The effects of regulations

The minimum landing size for *Nephrops* in the North Sea is 25 mm carapace length. The apparent small size of *Nephrops* in this area results in higher discard rates than in some other areas around Scotland.

Changes in fishing technology and fishing patterns

The Firth of Forth resident fleet contains numerous small boats which are generally restricted to more sheltered inshore waters. There are, however, observations of shifts of *Nephrops* fishing by larger vessels from the fleet to grounds such as the Devil's Hole (FU 34).

Information from the fishing industry

The Fishers' North Sea stock survey (Figure 6.4.15.2) does not include specific information for the Firth of Forth. Area 3 covers the Moray Firth, Firth of Forth and areas of the Devil's Hole. The 2012 report shows a decrease in abundance since 2008 which matches the UWTV survey results.

Uncertainties in assessment and forecast

General comments are found at the beginning of Section 6.4.15.

Comparison with previous assessment and advice

The perception of the state of the stock in earlier years has not changed – assessments are based on direct observations.

The advice given for 2014 is based on the MSY transition scheme (as the advice given for 2013).

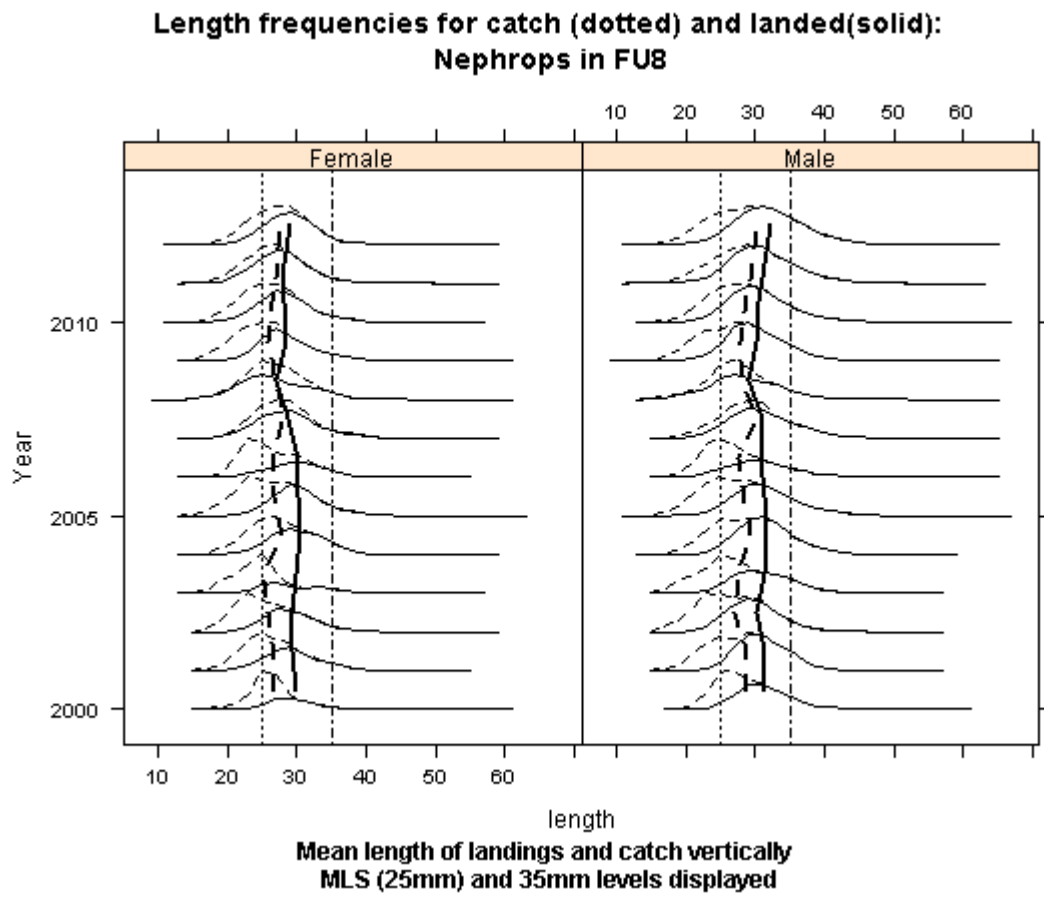


Figure 6.4.15.4.2 *Nephrops* in Firth of Forth (FU 8). Catch length–frequency distribution and mean sizes in the catch and landings. Vertical lines are minimum landing size (25 mm) and 35 mm.

Table 6.4.15.4.1 *Nephrops* in Firth of Forth (FU 8). ICES advice, management, and landings.

Year	ICES advice	Predicted landings corresp. to advice Firth of Forth (FU 8)	Recommended landings FUs 6 and 8	ICES landings FU 8 ¹⁾
1992			~4.6	1.8
1993			4.17	2.4
1994			4.17	1.9
1995			4.17	1.8
1996			4.17	1.7
1997			4.17	2.2
1998			4.17	2.1
1999			4.17	2.2
2000			4.17	1.8
2001			4.17	1.5
2002			4.17	1.3
2003			4.17	1.1
2004			4.17	1.7
2005			4.17	2.0
2006	No increase in effort		-	2.4
2007	No increase in effort, harvest rate <15%	1.5	5.0	2.6
2008	No new advice, same as for 2007	1.5	5.0	2.5
2009	No increase in effort and recent average landings	< 2.5	2.4	2.7
2010	Harvest rate no greater than that equivalent to fishing at F_{max}	< 1.6	-- ²⁾	1.9
2011	MSY transition	< 2.0	-- ²⁾	1.9
2012	MSY transition	< 1.7		2.1
2013	MSY transition	< 1.4		
2014	MSY transition	< 1.417		

Weights in thousand tonnes.

¹⁾ Does not include discards.

²⁾ It is not advised to manage these stocks as a single unit.

Table 6.4.15.4.2 *Nephrops* in Firth of Forth (FU 8). Nominal landings (tonnes) of *Nephrops*, as reported to ICES.

Year	UK Scotland				UK (E, W & NI)	Total **
	Nephrops trawl	Other trawl	Creel	Sub-total		
1981	945	61	0	1006	0	1006
1982	1138	57	0	1195	0	1195
1983	1681	43	0	1724	0	1724
1984	2078	56	0	2134	0	2134
1985	1908	61	0	1969	0	1969
1986	2204	59	0	2263	0	2263
1987	1582	92	0	1674	0	1674
1988	2455	73	0	2528	0	2528
1989	1833	52	0	1885	1	1886
1990	1901	28	0	1929	1	1930
1991	1359	45	0	1404	0	1404
1992	1714	43	0	1757	0	1757
1993	2349	18	0	2367	2	2369
1994	1827	17	0	1844	6	1850
1995	1708	53	0	1761	2	1763
1996	1621	66	1	1688	0	1688
1997	2137	55	0	2192	2	2194
1998	2105	38	0	2143	2	2145
1999	2192	9	1	2202	3	2205
2000	1775	9	0	1784	1	1785
2001	1484	35	0	1519	9	1528
2002	1302	31	1	1334	6	1340
2003	1115	8	0	1123	3	1126
2004	1651	4	0	1655	3	1658
2005	1973	0	6	1979	11	1990
2006	2437	4	12	2453	5	2458
2007	2628	9	8	2645	7	2652
2008	2435	3	7	2445	5	2450
2009	2626	1	26	2653	9	2662
2010	1848	3	12	1862	9	1871
2011	1793	1	89	1883	5	1888
2012*	1918	7	124	2049	42	2091
* provisional na = not available						
** There are no landings by other countries from this FU						
*** 4 trawl gears in 2011;also includes 5 t other gears						

Table 6.4.15.4.3 *Nephrops* in Firth of Forth (FU 8): Results of the TV surveys (abundance and confidence interval).

Year	Stations	Mean Density	Abundance	95% conf interval
		burrows/m ²	millions	millions
1993	37	0.61	555	142
1994	30	0.49	448	78
1995		no survey		
1996	27	0.41	375	88
1997		no survey		
1998	32	0.32	292	81
1999	49	0.51	463	78
2000	53	0.48	443	70
2001	46	0.46	419	79
2002	41	0.56	508	119
2003	36	0.84	767	138
2004	37	0.69	630	141
2005	54	0.78	710	143
2006	43	0.91	827	125
2007	49	0.76	692	132
2008	38	0.97	881	297
2009	45	0.80	732	142
2010	39	0.75	681	147
2011	45	0.58	533	87
2012	66	0.57	522	64

Table 6.4.15.4.4 *Nephrops* in Firth of Forth (FU 8): Adjusted TV survey abundance, landings, total discard rate (proportion by number), dead discard rate (by number), and estimated harvest rate.

	Adjusted abundance (millions)	Landings (tonnes)	Discard rate	Dead discard rate	Harvest ratio
2003	767	1126	0.54	0.47	0.123
2004	630	1658	0.35	0.29	0.164
2005	710	1990	0.42	0.35	0.194
2006	827	2458	0.55	0.48	0.267
2007	692	2652	0.25	0.2	0.229
2008	881	2450	0.29	0.24	0.211
2009	732	2662	0.34	0.28	0.26
2010	682	1871	0.3	0.24	0.184
2011	533	1888	0.19	0.15	0.221
2012	522	2091	0.27	0.22	0.246

ECOREGION North Sea
STOCK *Nephrops* in Moray Firth (FU 9)

Advice for 2014

ICES advises on the basis of the MSY approach that landings in 2014 should be no more than 739 tonnes. If total discard rates do not change from the average of the last 3 years (2010–2012), this implies total catches of no more than 796 tonnes. Note that this figure includes discards expected to survive the discarding process – assumed to be 25% of the total number discarded for this stock.

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

Stock status

F (Fishing Mortality)			
	2010	2011	2012
MSY (F_{MSY})	✓	✗	✗ Above target
Precautionary approach (F_{pa}, F_{lim})	?	?	? Undefined
SSB (Spawning-Stock Biomass)			
	2010	2011	2012
MSY ($B_{trigger}$)	✓	✓	✓ Above trigger
Precautionary approach (B_{pa}, B_{lim})	?	?	? Undefined

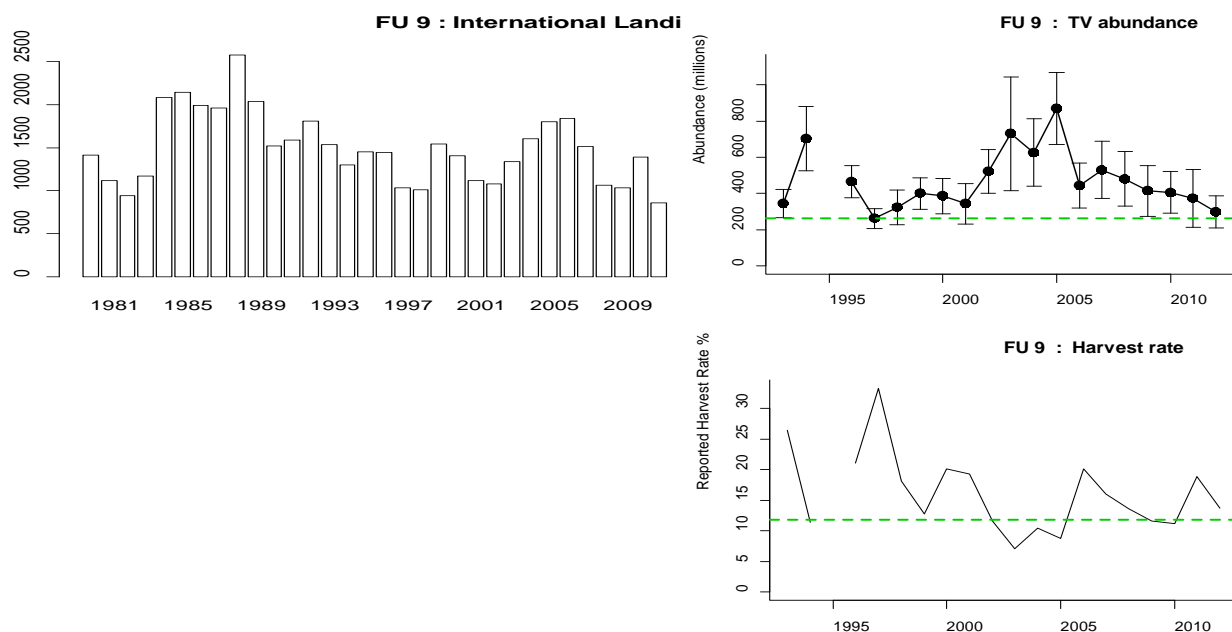


Figure 6.4.15.5.1 *Nephrops* in Moray Firth (FU 9). Long-term trends in landings, harvest rate, and UWTV abundance (used as F and SSB proxies; weights in thousand tonnes and UWTV in millions). Dashed green lines show proxies for F_{MSY} and MSY $B_{trigger}$. Harvest rates before 2007 may be unreliable due to underreporting of landings.

The stock is declining but remains just above MSY $B_{trigger}$. The harvest rate was above F_{MSY} in 2011 and decreased in 2012, although it is still above F_{msy} .

Management plans

No specific management objectives are known to ICES.

Biology

See Section 6.4.15 for general comments.

The fisheries

The Moray Firth *Nephrops* fishery is essentially a Scottish fishery, with only occasional landings made by vessels from elsewhere in the UK. Vessels typically conduct day trips from the nearby ports along the Moray Firth coast. Occasionally larger vessels fish the outer Moray Firth grounds on their way to/from the Fladen or in times of poor weather.

Catch distribution Total catch (2012) = 860 t, where 93% are landings taken in demersal trawl fisheries, either in a directed *Nephrops* or a mixed *Nephrops*/demersal fishery, and 7% are discards in weight.

Quality considerations

See Section 6.4.15 for general comments.

Scientific basis

Assessment type	Underwater TV survey linked to yield-per-recruit analysis from length data.
Input data	Commercial catches (international landings, length frequencies from Scottish catch sampling), One survey index (UWTV-Alba na mara-August); Maturity data from (commercial catch surveys), Natural mortalities from Morizur (1982).
Discards and bycatch	Discards included in the assessment since 1990, from Scottish trawls (TR1 and TR2)
Indicators	Size structure information; mean size; lpue.
Other information	Latest benchmark was performed in 2009.
Working group report	WGNSK (ICES, 2013a)

ECOREGION North Sea
STOCK Nephrops in Moray Firth (FU 9)

Reference points

	Type	Value	Technical basis
MSY	MSY B _{trigger}	262 million individuals.	Bias-adjusted lowest observed UWTV survey estimate of abundance (1997).
Approach	F _{MSY}	Harvest rate 11.8%.	Proxy, equivalent to F _{35%SPR} combined sex in 2011. F _{MSY} proxy based on length-based Y/R.
Precautionary Approach	Not defined.		

(unchanged since: 2011)

Harvest rate reference points (2011):

	Male	Female	Combined
F _{max}	12.3%	23.8%	14.9%
F _{0.1}	7.2%	11.6%	7.8%
F _{35%}	9.1%	17.1%	11.8%

Moderate absolute densities are generally observed on the UWTV survey of this FU. Although variable, harvest ratios (which are likely to have been underestimated prior to 2006) appear to have been around or above F_{35%SPR}, and in addition there is a long time-series of relatively stable landings (average reported landings ~ 1500 tonnes, above those predicted by currently fishing at F_{35%SPR}). It is suggested that F_{35%SPR(combined)} is chosen as the F_{MSY} proxy.

The F_{MSY} proxy harvest rate values were updated in 2011 on the basis of per-recruit analysis, based on input parameters from a combined-sex length cohort analysis of 2008–2010 catch-at-length data. Previous analysis used 2005, 2006, and preliminary 2007 data.

Outlook for 2014

Basis: F₂₀₁₀₋₂₀₁₂=average harvest rate of 2010–2012 = 14.6% (based on average (F₂₀₁₀ to F₂₀₁₂); Survey abundance (2012) = 299 million; Mean weight in landings (2010–2012) = 23.91 g; Discard rate (dead, by number) = 12.3% (average 2010–2012); Mean weight in discards (2010–2012) = 9.95 g..

Basis	Total Catches*	Landings	Dead Discards**	Surviving Discards**	Harvest Rate
	L+DD+SD	L	DD	SD	for L+DD
	337	313	18	6	5.0%
	507	470	28	9	7.5%
	676	627	37	12	10.0%
F _{MSY}	796	739	43	14	11.8%
	844	783	46	15	12.5%
F ₂₀₁₀₋₂₀₁₂	987	915	54	18	14.6%
	1013	940	55	18	15.0%
	1350	1253	73	24	20.0%

Weights in tonnes

* Total catches are the landings including dead and surviving discards

** Total discard rate is assumed to be 15.7% of the catches (in number, last 3 years average, 2010-2012), discard survival is assumed 25% (ICES, 2009).

MSY approach

Following the ICES MSY approach implies the harvest rate should be less than 11.8%, resulting in landings of less than 739 t in 2014. If discards rates do not change from the average of the last 3 years (2010–2012, assuming 25% discard survival), this implies total catches of no more than 796 t.

Additional considerations

See Section 6.4.15 for general comments.

Changes in fishing technology and fishing patterns

Discarding rates averaged over the period 2006–2012 for this stock were about 10% by number. This represents a reduction in discarding rate compared to the average for the period 2000–2005. This may arise from the increasing use of larger mesh sizes in the northern North Sea, although reduction in recruitment may also account for this change.

Information from the fishing industry

The Fishers' North Sea stock survey (Figure 6.4.15.2) does not include specific information for the Moray Firth. Area 3 covers covers the Moray Firth, Firth of Forth and areas of the Devil's Hole. The 2012 report shows a decrease in abundance since 2008 which matches the UWTV survey results.

Comparison with previous assessment and advice

The historical abundance is not revised from one year to the next because abundances are based on direct observation.

The basis for the advice is the same as last year: the MSY approach.

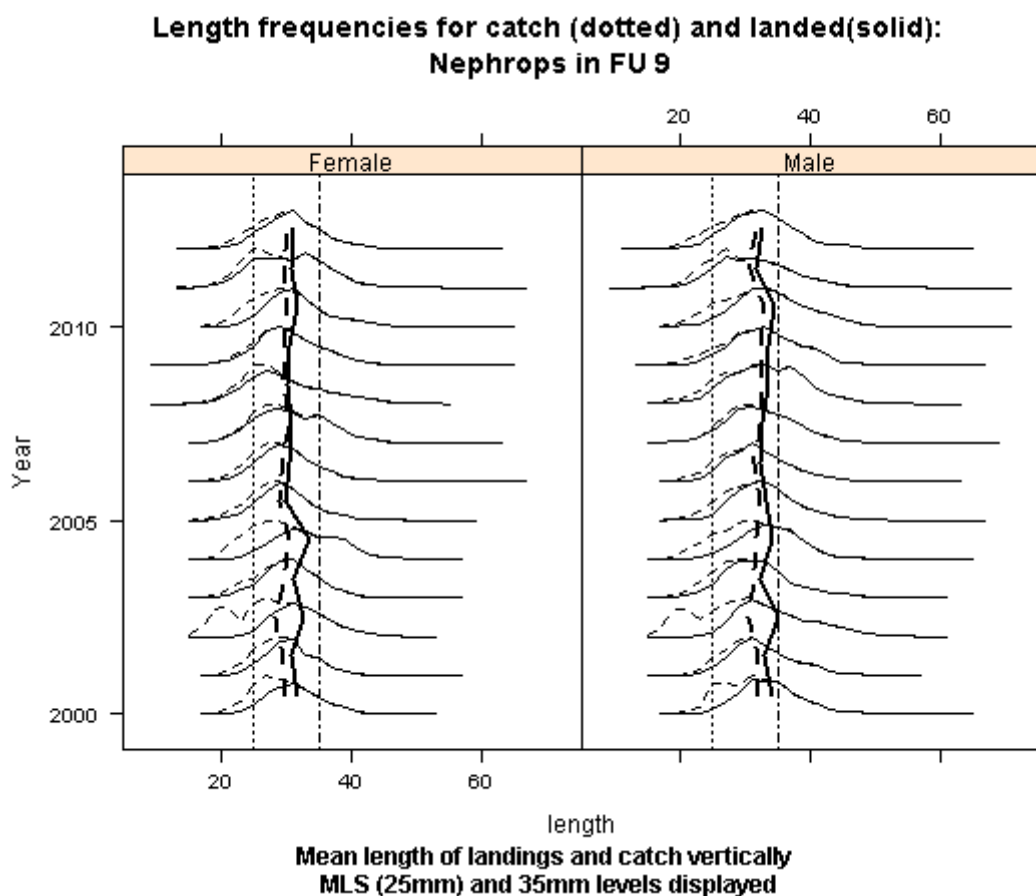


Figure 6.4.15.2 *Nephrops* in Moray Firth (FU 9). Catch length–frequency distribution and mean size in catches and landings. Vertical lines are minimum landing size (25 mm) and 35 mm.

Table 6.4.15.5.1 *Nephrops* in Moray Firth (FU 9). ICES advice, management, and landings.

Year	ICES advice	Predicted landings corresp. to advice Moray Firth (FU 9)	Recommended landings FUs 9 and 10	ICES landings FU 9 ¹⁾
1992			~2.4	1.6
1993			2.4	1.8
1994			2.4	1.5
1995			2.4	1.3
1996	<i>Status quo</i> TAC		2.4	1.5
1997	<i>Status quo</i> TAC		2.4	1.4
1998			2.4	1.0
1999			2.4	1.0
2000			1.85	1.5
2001			1.85	1.4
2002	Catches to be maintained at the 2000 level		2.0	1.1
2003	Catches to be maintained at the 2000 level		2.0	1.1
2004	Catches to be maintained at the 2000 level		2.0	1.3
2005	Catches to be maintained at the 2000 level		2.0	1.6
2006	No increase in effort		-	1.8
2007	No increase in effort, and harvest rate below 15%	2.4	2.64	1.8
2008	No new advice, same as for 2007	2.4	2.64	1.5
2009	No increase in effort and recent average landings	< 1.8		1.1
2010	Harvest Rate no greater than that equivalent to fishing at F ₂₀₀₈	< 1.4	-- ²⁾	1.0
2011	MSY transition	< 1.3	-- ²⁾	1.4
2012	MSY approach	< 1.1		< 1.0
2013	MSY approach	< 1.0		
2014	MSY approach	< 0.739		

Weights in thousand tonnes.

¹⁾ Does not include discards.

²⁾ It is not advised to manage these stocks as a single unit.

Table 6.4.15.5.2 *Nephrops* in Moray Firth (FU 9). Nominal landings (tonnes) of *Nephrops*, as reported to ICES.

Year	UK Scotland				UK England	Total *
	Nephrops trawl	Other trawl	Creel	Sub-total		
1981	1298	118	0	1416	0	1416
1982	1034	86	0	1120	0	1120
1983	850	90	0	940	0	940
1984	960	210	0	1170	0	1170
1985	1908	173	0	2081	0	2081
1986	1933	210	0	2143	0	2143
1987	1723	268	0	1991	0	1991
1988	1638	321	0	1959	0	1959
1989	2101	475	0	2576	0	2576
1990	1698	340	0	2038	0	2038
1991	1285	234	0	1519	0	1519
1992	1285	306	0	1591	0	1591
1993	1505	303	0	1808	0	1808
1994	1178	360	0	1538	0	1538
1995	967	330	0	1297	0	1297
1996	1084	364	1	1449	2	1451
1997	1102	343	0	1445	1	1446
1998	739	289	4	1032	0	1032
1999	813	193	2	1008	0	1008
2000	1344	194	3	1541	0	1541
2001	1188	213	2	1403	0	1403
2002	884	232	2	1118	0	1118
2003	874	194	11	1079	0	1079
2004	1223	103	9	1335	0	1335
2005	1526	64	12	1602	3	1605
2006	1718	73	11	1802	1	1803
2007	1816	17	7	1840	2	1842
2008	1443	67	4	1514	0	1514
2009	1042	22	2	1066	1	1067
2010	999	24	10	1032	0	1032
2011	1363	18	9	1390	1	1391
2012	832	20	8	860	0	860

* No landings by non UK countries from this FU

Table 6.4.15.5.3 *Nephrops* in Moray Firth (FU 9): Results of the 1993–2012 UWTV surveys.

Year	Stations	Mean density	Abundance	95% confidence interval
		burrows/m ²	millions	millions
1993	31	0.16	345	78
1994	29	0.32	702	176
1995		no survey		
1996	27	0.21	465	90
1997	34	0.12	262	55
1998	31	0.15	323	95
1999	52	0.18	400	87
2000	44	0.17	386	98
2001	45	0.16	345	112
2002	31	0.24	521	121
2003	32	0.33	730	314
2004	42	0.29	626	186
2005	42	0.40	869	198
2006	50	0.21	445	124
2007	40	0.24	531	156
2008	45	0.21	479	151
2009	50	0.19	415	140
2010	43	0.18	406	116
2011	37	0.17	373	160
2012	44	0.14	298	90

Table 6.4.15.5.4 *Nephrops* in Moray Firth (FU 9): UWTV survey abundance, landings, total discard rate (proportion by number), dead discard rate (by number), and estimated harvest rate.

	Adjusted abundance (millions)	Landings (tonnes)	Discard rate	Dead discard rate	Harvest ratio
2003	730	1079	0.14	0.11	0.07
2004	626	1335	0.33	0.27	0.11
2005	869	1605	0.15	0.12	0.09
2006	445	1803	0.13	0.1	0.2
2007	531	1842	0.08	0.06	0.16
2008	481	1514	0.11	0.09	0.14
2009	415	1067	0.08	0.06	0.12
2010	406	1032	0.2	0.16	0.11
2011	372	1391	0.14	0.11	0.19
2012	299	860	0.13	0.1	0.137

ECOREGION North Sea
STOCK *Nephrops* in Noup (FU 10)

Advice for 2014

The 2012 advice for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)): *Based on the ICES approach for data-limited stocks, ICES advises that landings should be no more than 50 tonnes.*

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

Scientific basis

Assessment type	Data-limited approach for <i>Nephrops</i> (category 4.1.4).
Input data	Habitat extent, mean size, occasional UWTV surveys (incomplete time-series 1994, 1999, 2006, 2007). Commercial catches not included in the assessment but available for monitoring (international landings, length frequencies from Scottish catch sampling) One survey index (UWTV survey – limited time series)
Discards and bycatch	No discard information available.
Indicators	Size structure information; lpue.
Other information	Latest benchmark was performed in 2013 (ICES, 2013c)).
Working group report	WGNSSK (ICES, 2013a)

Sources

ICES. 2012. *Nephrops* in Noup (FU 10). In Report of the ICES Advisory Committee, 2012. ICES Advice, 2012. Book 6, Section 6.4.14.6.

Table 6.4.15.6.1 *Nephrops* in Noup (FU 10). ICES advice, management, and landings.

Year	ICES advice	Predicted landings corresp. to advice FU 10	Recommended landings FUs 9 and 10	ICES landings ¹⁾
1992			~2.4	0.19
1993			2.4	0.38
1994			2.4	0.50
1995			2.4	0.28
1996	<i>Status quo</i> TAC		2.4	0.34
1997	<i>Status quo</i> TAC		2.4	0.32
1998			2.4	0.25
1999			2.4	0.28
2000			1.85	0.28
2001			1.85	0.18
2002	Catches to be maintained at the 2000 level		2.0	0.40
2003	Catches to be maintained at the 2000 level		2.0	0.34
2004	Catches to be maintained at the 2000 level		2.0	0.23
2005	Catches to be maintained at the 2000 level		2.0	0.17
2006	No increase in effort		-	0.13
2007	No increase in effort, and recent average landings	0.24	2.64	0.16
2008	No new advice, same as for 2007	0.24	2.64 ²⁾	0.17
2009	No increase in effort, and average landings 2003–2005	< 0.24		0.09
2010	No new advice, same as for 2009	< 0.24		0.04
2011	No advice	-		0.07
2012	Reduce catch	-		0.01
2013	20% Reduction in landings (last 3 years' average)	< 0.05		
2014	No new advice, same as 2013	< 0.05		

Weights in thousand tonnes.

¹⁾ Does not include discards.

²⁾ Based on a 15% harvest rate applied to TV survey abundance data. Includes Moray Firth (FU 9).

ECOREGION North Sea
STOCK *Nephrops* in the Norwegian Deep (FU 32)

Advice for 2014

The 2012 advice for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)): *Based on the ICES approach for data-limited stocks, ICES advises that landings should be no more than 800 tonnes.*

For the stock in this functional unit (FU), management is implemented at the functional unit level.

Scientific basis

Assessment type	Data-limited approach for <i>Nephrops</i> (category 4.1.4).
Input data	Commercial catches (international landings, and length frequencies from catch sampling) One commercial index (Danish lpue)
Discards and bycatch	Discards not included in the assessment but available for monitoring (Danish)
Indicators	Danish commercial lpue.
Other information	Benchmark in 2013 (ICES, 2013c).
Working group report	WGNSSK (ICES, 2013a)

Sources

ICES. 2012. *Nephrops* the Norwegian Deep (FU 32). In Report of the ICES Advisory Committee, 2012. ICES Advice, 2012. Book 6, Section 6.4.14.7.

Table 6.4.15.7.1 *Nephrops* in the Norwegian Deep (FU 32). ICES advice, management, and landings.

Year	ICES advice	Predicted landings corresp. to advice	TAC ¹⁾	ICES landings
1987				< 0.1
1988				< 0.1
1989				< 0.1
1990				0.2
1991				0.2
1992				0.2
1993				0.3
1994				0.8
1995				0.5
1996				1.0
1997				0.8
1998				0.8
1999				1.1
2000				1.1
2001				1.2
2002		1.2	No TAC agreed	1.2
2003		1.2	No TAC agreed	1.1
2004		1.5	1.0	0.9
2005		1.5	1.0	1.1
2006	No increase in effort		1.3	1.0
2007	No increase in effort		1.3	0.8
2008	No new advice, same as for 2007		1.3	0.7
2009	No increase in effort		1.2	0.5
2010	No new advice, same as for 2009		1.2	0.4
2011	See scenarios	-	1.2	0.4
2012	Reduce catches	-	1.2	0.3
2013	Average landings (last 10 years)	< 0.8	1.0	
2014	No new advice, same as 2013	< 0.8		

Weights in thousand tonnes.

¹⁾ EU TAC for Norwegian zone of Subarea IV.

ECOREGION North Sea
STOCK *Nephrops* off Horn's Reef (FU 33)

Advice for 2014

The 2012 advice for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)): *Based on the ICES approach for data-limited stocks, ICES advises that landings should be no more than 1100 tonnes*

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

Scientific basis

Assessment type	Data-limited approach for <i>Nephrops</i> (category 4.1.4).
Input data	Commercial catches (international landings, and length frequencies from catch sampling)
Discards and bycatch	Discards not included in the assessment
Indicators	Commercial lpue.
Other information	None.
Working group report	WGNSSK (ICES, 2013a)

Sources

ICES. 2012. *Nephrops* off Horn's Reef (FU 33). In Report of the ICES Advisory Committee, 2012. ICES Advice, 2012. Book 6, Section 6.4.14.8.

6.4.15.8.1 *Nephrops* off Horn's Reef (FU 33). ICES advice, management, and landings.

Year	ICES advice	Predicted landings corresp. to advice	ICES landings ¹⁾
1992		0.87	
1993		0.87	0.2
1994		0.87	0.1
1995		0.87	0.2
1996		0.87	<0.1
1997		0.87	0.3
1998		1.0	0.3
1999		1.0	0.7
2000		1.6	0.6
2001		1.6	0.8
2002		2.1	0.9
2003		2.1	0.9
2004		2.38	1.3
2005		2.38	1.1
2006		2.38 ²⁾	1.3
2007	No increase in effort	-	1.5
2008	No new advice, same as for 2007	-	1.1
2009	No increase in effort	-	1.2
2010	No new advice, same as for 2009	-	0.8
2011	See scenarios	-	1.2
2012	Reduce catches	-	1.1
2013	Average landings (last 10 years)	< 1.1	
2014	No new advice, same as 2013	< 1.1	

Weights in thousand tonnes.

¹⁾ Does not include discards.

²⁾ Includes Farn Deepes (FU 6).

ECOREGION North Sea
STOCK *Nephrops* in Devil's Hole (FU 34)

Advice for 2014

The 2012 advice for this stock is biennial and valid for 2013 and 2014 (see [ICES, 2012](#)): *Based on the ICES approach for data-limited stocks, ICES advises that landings should be no more than 600 tonnes.*

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

Scientific basis

Assessment type	Data-limited method for <i>Nephrops</i> (category 4.1.4).
Input data	Commercial catches (international landings, length frequencies from Scottish catch sampling 2006–2011), habitat extent, mean size, occasional UWTV surveys (incomplete time-series 2003, 2005, 2009–2012), one survey index (FU 34 UWTV)
Discards and bycatch	Discards not included in the assessment but available for monitoring (Scottish TR1 and TR2 fleets (2009 and 2010))
Indicators	Size structure information; lpue.
Other information	Latest benchmark was performed in 2013.
Working group report	WGNSSK (ICES, 2013a)

Sources

ICES. 2012. *Nephrops* in Devil's Hole (FU 34). In Report of the ICES Advisory Committee, 2012. ICES Advice, 2012. Book 6, Section 6.4.14.9.

Table 6.4.15.9.1 *Nephrops* in Devil's Hole (FU 34). ICES advice, management, and landings.

Year	ICES advice	Predicted landings corresp. to advice	ICES landings ¹⁾
2009	No separate advice		1.3
2010	No separate advice		0.76
2011	No separate advice		0.43
2012	No separate advice	-	0.59
2013	Average landings (last 10 yrs)	< 0.6	
2014	No new advice, same as 2013	< 0.6	

Weights in thousand tonnes.

¹⁾ Provisional international landings, only available from 2009. Does not include discards.