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Norway lobster (*Nephrops norvegicus*) in Division 6.a, Functional Unit 11 (West of Scotland, North Minch)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, and assuming that discard rates and fishery selection patterns do not change from the average of 2015–2017, catches in 2019 should be no more than 3270 tonnes.

To ensure that the stock in Functional Unit 11 is exploited sustainably, management should be implemented at the functional unit level.

Stock development over time

The historical harvest rate has fluctuated around F_{MSY} and has been below F_{MSY} since 2013. The stock has been above MSY $B_{trigger}$ since 1998.

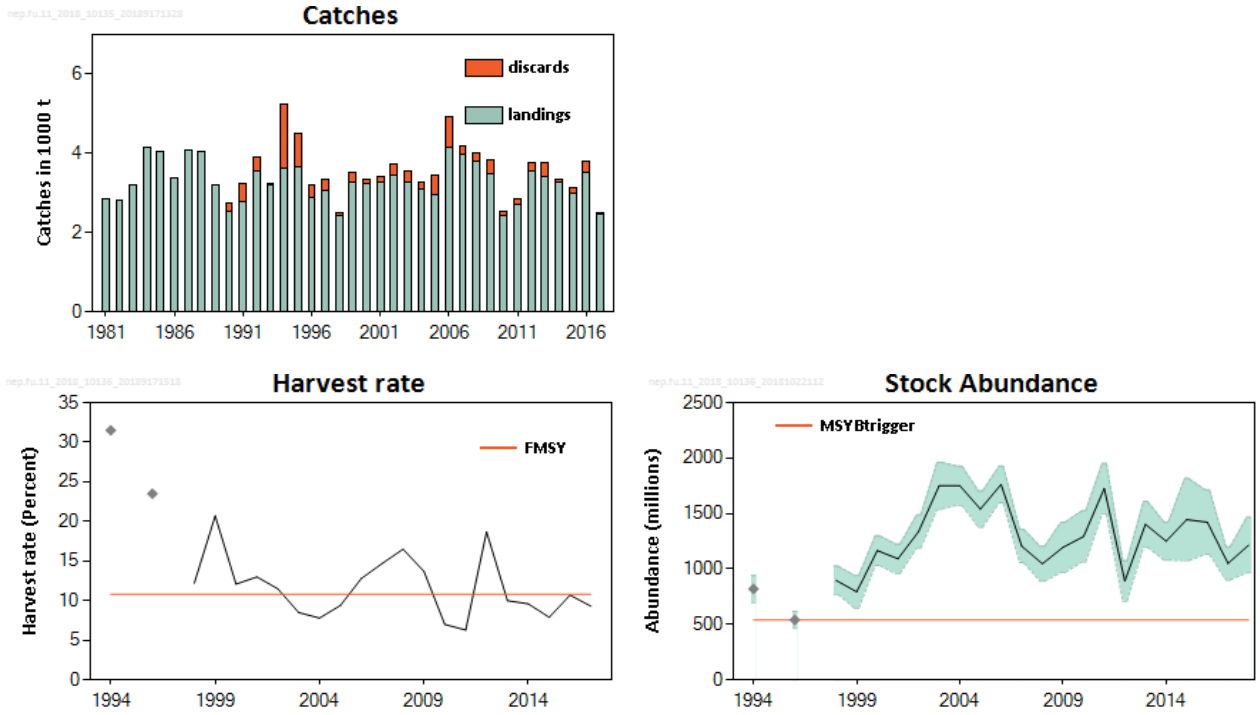

Figure 1 Norway lobster in Division 6.a, Functional Unit 11. Summary of the stock assessment. Catches (discard data only available from 1990), harvest rate (sum of landings and dead discards in numbers, divided by total abundance), survey abundance (Underwater TV, millions; SSB proxy; approximate 95% confidence intervals). Harvest rates before 2006 may be unreliable due to underreporting of landings. Orange lines represent MSY $B_{trigger}$ and the F_{MSY} harvest rate proxy.

Stock and exploitation status

ICES assesses that fishing pressure on the stock is below F_{MSY}, while spawning stock size is above MSY $B_{trigger}$.

Table 1 Norway lobster in Division 6.a, Functional Unit 11. State of the stock and fishery relative to reference points.

		Fishing pressure					Stock size				
		2015	2016	2017			2016	2017	2018		
Maximum sustainable yield	F_{MSY}	✓	✓	✓	Below		MSY $B_{trigger}$	✓	✓	✓	Above trigger
Precautionary approach	F_{pa},F_{lim}	✓	✓	✓	Below potential reference points		B_{pa},B_{lim}	✓	✓	✓	Above potential reference points
Management plan	F_{MGT}	–	–	–	Not applicable		B_{MGT}	–	–	–	Not applicable

Catch scenarios

Table 2 Norway lobster in Division 6.a, Functional Unit 11. The basis for the catch scenarios.

Variable	Value	Notes
Stock abundance (2019)	1215 million	UWTV Survey 2018 (number of individuals)
Mean weight in wanted catch	25.83 g	Average 1999–2017
Mean weight in unwanted catch	10.97 g	Average 1999–2017
Unwanted catch	10.6%	Average 2015–2017 (proportion by number)
Discards survival	25%	Proportion by number
Dead unwanted catch	8.2%	Average 2015–2017 (proportion by number)

Table 3 Norway lobster in Division 6.a, Functional Unit 11. Annual catch advice and scenarios; discarding is assumed to continue at the recent average. All weights are in tonnes.

Basis	Total catch	Dead removals	Wanted catch	Dead unwanted catch	Surviving unwanted catch	Harvest rate* %	% advice change**
	WC+DUC+ SUC	WC+DUC	WC	DUC	SUC	for WC+DUC	
ICES advice basis							
MSY approach	3270	3231	3113	118	39	10.8	16.0
Other options							
$F_{MSY\ lower}$	2542	2512	2421	91	30	8.4	−9.8
$F_{MSY\ upper}$***	3270	3231	3113	118	39	10.8	16.0
F_{2017}	2815	2781	2680	101	34	9.3	−0.1

* By number.
** Advice value 2019 relative to the advice value 2018.
*** $F_{MSY\ upper} = F_{MSY}$ for this stock.

The change in advice is a result of the inclusion of the 2018 survey and updating mean weights and discard rates.

Basis of the advice

Table 4 Norway lobster in Division 6.a, Functional Unit 11. The basis of the advice.

Advice basis	MSY approach.
Management plan	The EU has proposed a multiannual management plan for the Western Waters, which is not yet finalized (EU, 2018).

Quality of the assessment

Since 1994 the underwater TV survey (UWTV) has provided abundance estimates by functional unit (FU) with acceptable precision. The UWTV survey for FU 11 does not cover *Nephrops* grounds in the inshore waters and sea lochs, waters that are typically fished by smaller vessels. The total area of these grounds is estimated to be less than 5% of the total stock areas and therefore the exclusion of these inshore areas from the survey is not considered to impact the quality of the assessment.

In 2017, observer sampling from the Scottish Industry–Science observer sampling scheme was extended to include sampling of Norway lobster catches in FU 11. As a result the sampling levels have increased and discard proportions are more precisely estimated.

Biological sampling for this stock is considered sufficient.

The long-term average (rather than a three-year average) was considered more appropriate as input for the mean weight in landings and discards in the calculation of catch scenarios. This is due to interannual variation.

Issues relevant for the advice

From 2016, the EU landing obligation was applied to all catches of Norway lobster fisheries in ICES Subarea 6, with several exemptions. Observations from the 2016–2017 fishery indicate that some discarding above the minimum conservation reference size (MCRS) continues and has not changed markedly (Figure 3). Consequently, ICES is providing advice for 2019 assuming average discard rates as observed over the last three years, which is considered to be a more realistic assumption.

For FU 11, the absolute density observed in the UWTV survey is intermediate compared to other *Nephrops* FUs, with an average density of around 0.6 individuals m^{-2}. This suggests the stock may have a medium productivity capability. Historical harvest ratios in this FU have been around $F_{35\%SPR}$ and landings have been relatively stable in the last thirty years. For these reasons, $F_{35\%SPR}$ (combined between sexes) is considered to deliver high long-term yield with a low probability of recruitment overfishing and is therefore chosen as a proxy for F_{MSY}.

A single TAC covers the entire ICES Subarea 6. Management should be implemented at the functional unit level to ensure that fishing opportunities are in line with the scale of the resource for each of the stocks and the corresponding MSY approach.

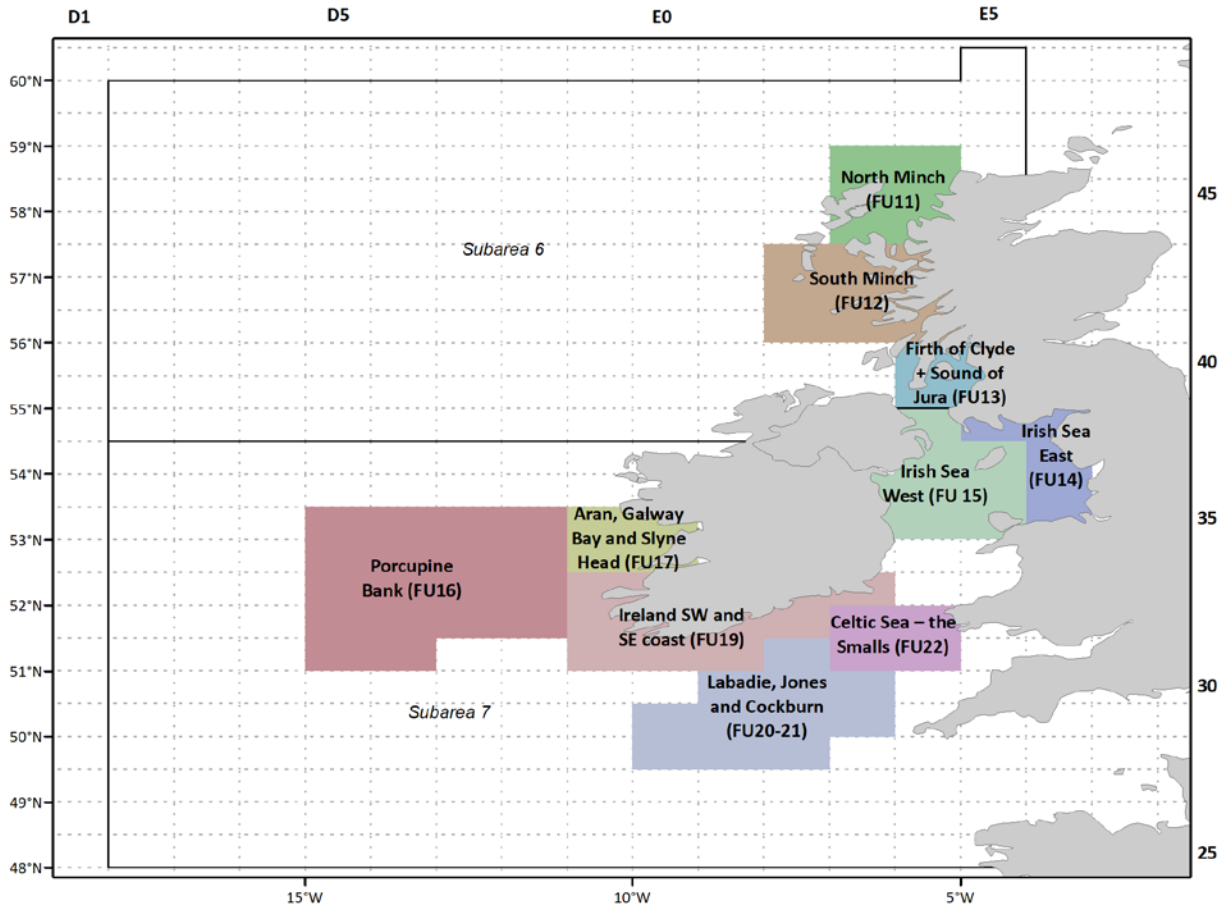

Figure 2 Norway lobster functional units in subareas 6 and 7.

Reference points

Table 5 Norway lobster in Division 6.a, Functional Unit 11. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	540 million individuals	Lowest observed abundance estimate from UWTV survey time-series.	ICES (2016)
	F_{MSY}	10.8% harvest rate	F_{MSY} proxy equivalent to $F_{35\%SPR}$ combined sexes derived from length-based per recruit analysis.	ICES (2016)
Precautionary approach	B_{lim}	Not defined		
	B_{pa}	Not defined		
	F_{lim}	Not defined		
	F_{pa}	Not defined		
Management plan*	MAP MSY $B_{trigger}$	540 million individuals	MSY $B_{trigger}$	EU (2018)
	MAP B_{lim}	Not defined		
	MAP F_{MSY}	10.8% harvest rate	F_{MSY}	EU (2018)
	MAP range F_{lower}	8.4–10.8% harvest rate	Consistent with ranges provided by ICES (2016), resulting in no more than 5% reduction in long-term yield compared with MSY.	EU (2018)
	MAP range F_{upper}	10.8–10.8% harvest rate	$F_{MSY\ upper}$ value capped at F_{MSY} because it has not been possible to evaluate the probability of SSB < B_{lim} (ICES, 2016).	EU (2018)

*Proposed EU multiannual plan (MAP) for the Western Waters (EU, 2018).

Basis of the assessment

Table 6 Norway lobster in Division 6.a, Functional Unit 11. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018a).
Assessment type	Underwater TV survey.
Input data	One survey index (UWTV-FU11); commercial catches (international landings, length frequencies from Scottish catch sampling); fixed maturity parameters from survey data; fixed natural mortalities. Discard survival rate.
Discards and bycatch	Included in the assessment since 1990, data series from the majority of the main fleets covering all landings.
Indicators	Size structure, mean size, and sex ratio of catches.
Other information	The latest benchmark (based on the UWTV survey) was performed in 2013 (ICES, 2013).
Working group	Working Group for the Celtic Seas Ecoregion (WGCSE)

Information from stakeholders

No additional information is available for this stock.

History of the advice, catch, and management

Table 7 Norway lobster in Division 6.a, Functional Unit 11. ICES advice, landings and discards. All weights are in tonnes.

Year	ICES advice	Landings advice	Catch advice	ICES landings	Total discards*
1989				3205	
1990				2546	199
1991				2793	441
1992	Maintain current effort			3559	353
1993	Maintain current effort			3193	29
1994	Maintain current effort			3614	1637
1995	Maintain current effort			3655	856
1996	Maintain current effort			2872	323
1997	As for 1996			3046	286
1998	Maintain current effort			2441	67
1999	As for 1998			3257	273
2000	Maintain current effort			3247	100
2001	As for 2000			3259	160
2002	Maintain current effort			3440	277
2003	As for 2002			3269	299
2004	Maintain current effort			3082	202
2005	As for 2004			2949	507
2006	No increase in effort			4166	757
2007	No increase in effort and harvest rate of 15%	3200		3978	214
2008	As for 2007	3200		3799	194
2009	No increase in effort and recent average catch	< 4100		3496	327
2010	Harvest rate no greater than that equivalent to fishing at $F_{0.1}$	< 1000		2413	128
2011	MSY transition scheme	< 3100		2697	154
2012	MSY approach	< 3200		3542	213
2013	MSY approach	< 4200		3413	364
2014	MSY approach	< 3485		3257	77
2015	MSY approach	< 3092		3002	143
2016	MSY approach		≤ 3770**	3529	266
2017	MSY approach		≤ 3814***	2448	64
2018	MSY approach		≤ 2819***		
2019	MSY approach		≤ 3270***		

* Dead + surviving discards.
** Assuming all catches are landed.
*** Assuming recent discarding rates.

History of the catch and landings

Table 8 Norway lobster in Division 6.a, Functional Unit 11. Catch distribution by fleet in 2017 as estimated by ICES.

Catch		Landings			Total discards	
99.4% dead	0.6% surviving	Directed *Nephrops* fishery		Mixed *Nephrops*/demersal fishery	75% dead	25% surviving
		83.4% trawl	14.8% creels	1.8% trawl		
2512 t		2448 t			64 t	

Table 9 Norway lobster in Division 6.a, Functional Unit 11. History of ICES estimates of landings (for Scotland by gear) and total discards. All weights are in tonnes.

Year	UK Scotland					Other UK & Ireland	Total landings	Total discards*
	Nephrops trawl	Other trawl	Creel	Below minimum size (BMS)	Subtotal			
1981	2320	171	370	0	2861	0	2861	
1982	2323	105	371	0	2799	0	2799	
1983	2784	96	317	0	3197	0	3197	
1984	3449	160	534	0	4143	0	4143	
1985	3235	117	708	0	4060	0	4060	
1986	2641	203	537	0	3381	0	3381	
1987	3459	143	482	0	4084	0	4084	
1988	3450	148	437	0	4035	0	4035	
1989	2603	112	490	0	3205	0	3205	
1990	1941	134	471	0	2546	0	2546	199
1991	2229	126	438	0	2793	0	2793	441
1992	2978	149	432	0	3559	0	3559	353
1993	2699	86	408	0	3193	0	3193	29
1994	2916	246	453	0	3614	0	3614	1637
1995	2940	183	532	0	3655	0	3655	856
1996	2354	148	370	0	2872	0	2872	323
1997	2553	102	391	0	3046	0	3046	286
1998	2023	68	350	0	2441	0	2441	67
1999	2792	56	409	0	3257	0	3257	273
2000	2695	28	524	0	3247	0	3247	100
2001	2649	42	568	0	3259	0	3259	160
2002	2775	79	586	0	3440	0	3440	277
2003	2606	45	618	0	3269	0	3269	299
2004	2391	30	661	0	3082	0	3082	202
2005	2270	23	656	0	2949	0	2949	507
2006	3446	23	697	0	4166	0	4166	757
2007	3361	26	591	0	3978	0	3978	214
2008	3229	13	557	0	3799	0	3799	194
2009	2849	34	613	0	3496	0	3496	327
2010	1783	9	621	0	2413	0	2413	128
2011	2109	17	571	0	2697	0	2697	154
2012	2963	12	565	0	3540	2	3542	213
2013	2356	480	575	0	3411	2	3413	364
2014	2752	13	490	0	3255	2	3257	77
2015	2561	23	418	0	3002	0	3002	143
2016	3039	15	475	0.4**	3529	0	3529	266
2017	2041	45	361	na	2447	1	2448	64

* Dead + surviving discards.
** Below minimum size landings are not rounded, showing the reported values.
na = Not available.

Summary of the assessment

Table 10 Norway lobster in Division 6.a, Functional Unit 11. Assessment summary.

Year	UWTV abundance estimate	95% CI	Harvest rate*	Landings (in numbers)	Total discards in numbers**	Removals (in numbers)	Landings	Total discards**	Discard proportion (by number)	Mean weight in landings	Mean weight in discards	Dead discard proportion (by number)
	millions		%	millions			tonnes		%	grammes		%
1994	820	121	31.5	154	139	258	3614	1637	47.4	23.45	11.8	40.3
1995	No survey			164	80	225	3655	856	32.8	22.24	10.65	26.8
1996	541	77	23.5	108	26	127	2872	323	19.4	26.68	12.49	15.3
1997	No survey			140	26	159	3046	286	15.4	21.71	11.18	12
1998	898	126	12.2	103	8	110	2441	67	7.5	23.65	8.04	5.7
1999	794	147	20.7	144	28	165	3257	273	16.4	22.7	9.69	12.8
2000	1166	134	12.1	134	10	142	3247	100	6.9	24.19	10.08	5.2
2001	1092	133	13	129	17	141	3259	160	11.7	25.33	9.32	9.1
2002	1337	149	11.5	133	28	154	3440	277	17.6	25.93	9.78	13.8
2003	1751	211	8.5	126	30	148	3269	299	19.2	26.03	10	15.2
2004	1751	175	7.8	122	18	136	3082	202	13	25.16	11.02	10.1
2005	1540	164	9.4	107	50	144	2949	507	32	27.65	10.09	26.1
2006	1762	165	12.8	170	74	225	4166	757	30.3	24.52	10.27	24.6
2007	1206	150	14.7	168	12	177	3978	214	6.5	23.61	18.1	5
2008	1047	157	16.5	159	19	173	3799	194	10.5	23.9	10.36	8.1
2009	1195	227	13.7	138	35	164	3496	327	20.3	25.42	9.34	16
2010	1293	231	7	82	12	91	2413	128	12.4	29.39	10.98	9.6
2011	1726	226	6.3	96	16	108	2697	154	14.2	27.56	9.66	11
2012	891	181	18.7	151	21	167	3542	213	12.6	23.43	10.33	9.3
2013	1403	206	10	122	24	140	3413	364	16.4	27.52	15.18	12.8
2014	1251	171	9.6	115	8	121	3257	77	6.3	27.96	9.99	4.8
2015	1445	370	7.9	103	15	114	3002	143	12.6	28.74	9.66	9.8
2016	1422	290	10.7	136	22	152	3529	266	14	25.76	12.05	10.9
2017	1050	149	9.3	93	5	97	2448	64	5.2	25.89	12.51	4
2018	1215	250										

* Values prior to 2006 may be underestimates because of underreporting of landings.

** Dead + surviving discards.

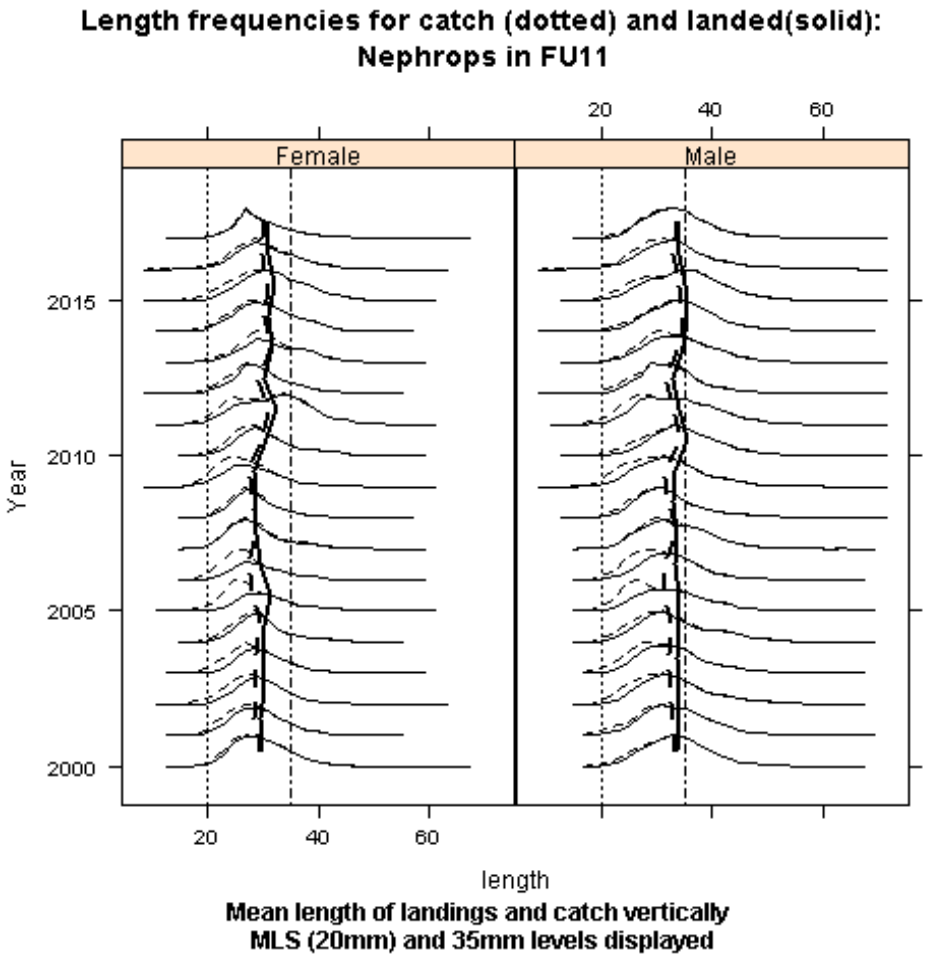

Figure 3 Norway lobster in Division 6.a, Functional Unit 11. Catch length–frequency distribution and mean size in catches and landings. Vertical lines are minimum landing size (20 mm) and 35 mm.

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