

Norway lobster (*Nephrops norvegicus*) in Division 4.a, Functional Unit 7 (northern North Sea, Fladen Ground)

ICES advice on fishing opportunities

Please note: The present advice replaces the advice given in June 2018 for catches in 2019.

ICES advises that when the proposed EU multiannual plan (MAP) for the North Sea is applied, catches in 2019 that correspond to the F ranges in the MAP are between 11 596 tonnes and 13 178 tonnes. The entire range is considered precautionary when applying the ICES advice rule.

In order to ensure the stock in Functional Unit (FU) 7 is exploited sustainably, management should be implemented at the FU level. In recent years, the catch in FU 7 has been lower than advised, and if the difference is transferred to other FUs, this could result in non-precautionary exploitation of those FUs.

Stock development over time

The stock size declined from the highest observed value in 2008 to the lowest abundance estimate in the time-series in 2015. The stock size increased in 2016 and 2017, but decreased again in 2018. However, it is still above MSY $B_{trigger}$. The harvest rate has declined since 2010 and remains well below F_{MSY} .

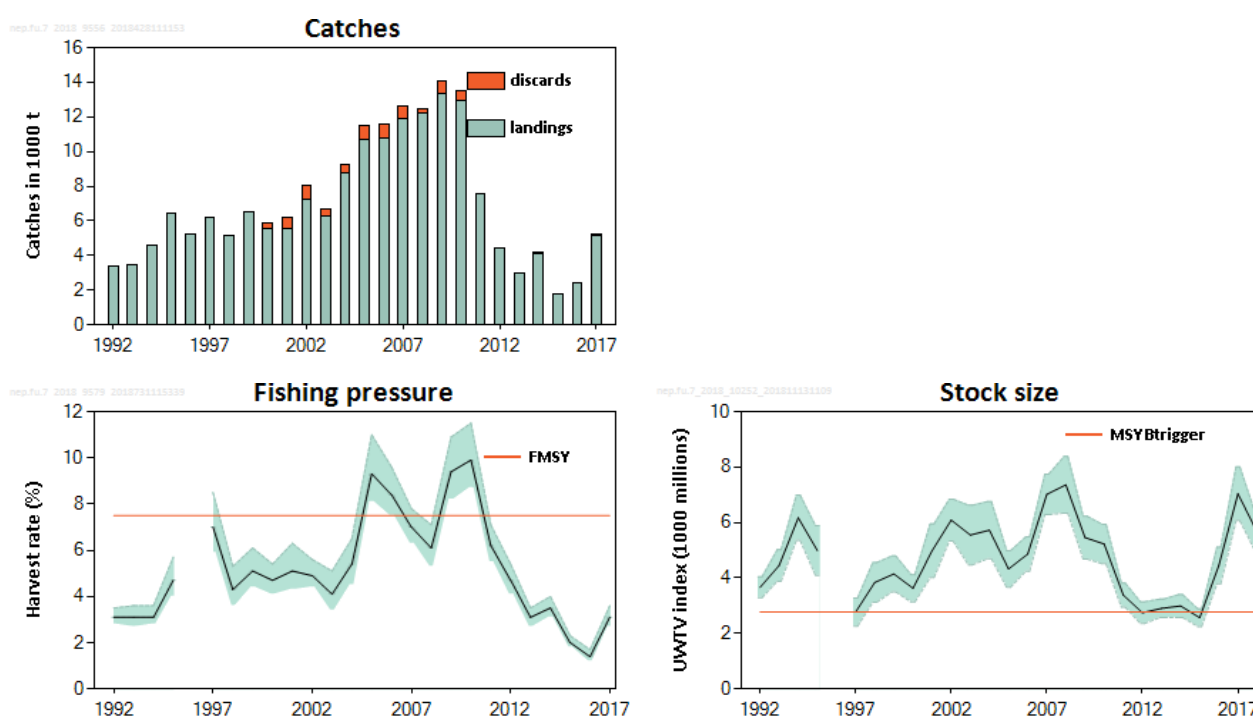


Figure 1 Norway lobster in Division 4.a, Functional Unit 7. Summary of the stock assessment. Long-term trends in catches, harvest rate, and underwater TV survey (UWTV) abundance (for Norway lobster greater than 17 mm carapace) – used as F and SSB proxies. Discard data have only been included since 2000. Orange lines show proxies for MSY $B_{trigger}$ and F_{MSY} . UWTV abundance is calculated using average densities (from a random stratified survey) raised to strata area. Shaded areas for abundance are ± 2 standard deviations (approximately 95% confidence intervals). Confidence intervals for harvest rates are derived from the confidence intervals for abundance. Harvest rates before 2006 may be unreliable due to underreporting of landings.

Stock and exploitation status

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

Table 1 Norway lobster in Division 4.a, Functional Unit 7. 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 possible reference points	B_{pa}, B_{lim}	✓	✓	✓	Below possible reference points
Management plan	F_{MGT}	✓	✓	✓	Below	B_{MGT}	✓	✓	✓	Above

Catch scenarios

Table 2 Norway lobster in Division 4.a, Functional Unit 7. The basis for the catch scenarios.

Variable	Value	Notes
Stock abundance	5656 million individuals	UWTV 2018
Mean weight in wanted catch	32 g	Average 2000–2017
Mean weight in unwanted catch	14.9 g	Average 2000–2017
Unwanted catch rate (total)	7.1%	Average 2000–2017 (proportion by number)
Unwanted catch survival rate	25%	Proportion by number
Dead unwanted catch discard rate (total)	5.4%	Average 2000–2017 (proportion by number)

Table 3 Norway lobster in Division 4.a, Functional Unit 7. Annual catch scenarios. 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							
EU MAP [^] : F_{MSY}	13 178	13 064	12 722	342	114	7.5%	-21%
F = MAP $F_{MSY lower}$	11 596	11 496	11 195	301	100	6.6%	-30%
F = MAP $F_{MSY upper}^{***}$	13 178	13 064	12 722	342	114	7.5%	-21%
Other scenarios							
MSY approach	13 178	13 064	12 722	342	114	7.5%	-21%
$F_{2015-2017}$	3 865	3 832	3 732	100	33	2.2%	-77%
F_{2017}	5 447	5 400	5 258	142	47	3.1%	-67%
$F_{35\%SpR}$	19 679	19 509	18 998	511	170	11.2%	18.7%
F_{max}	28 818	28 568	27 819	749	250	16.4%	74%

[^] Proposed EU multiannual plan (MAP) for the North Sea (EU, 2016).

* Calculated for dead removals.

** Total catch 2019 relative to advice value 2018 (16 577 t).

*** $F_{MSY upper} = F_{MSY}$ for this stock.

The change in the advice (-21% for the EU MAP F_{MSY} scenario) from November 2017 is a result of updating mean weights and discard rates, and incorporating the results of the 2018 UWTV survey.

Basis of the advice

Table 4 Norway lobster in Division 4.a, Functional Unit 7. The basis of the advice.

Advice basis	Proposed EU multiannual plan (MAP) for the North Sea (EU, 2016)
Management plan	The EU MAP for the North Sea is currently being finalized and is not yet adopted. The advice based on the F_{MSY} range used in the EU MAP is considered precautionary.

Quality of the assessment

The Fladen Ground functional unit contains several patches of mud to the north of the grounds which are fished, bringing the overall area of substrate to 30 633 km². This northern area is not surveyed but would add to the abundance estimate. The abundance for the total ground is therefore likely to be higher than currently estimated.

Data from the latest UWTV survey (June 2018) have been used as the most up-to-date indicator of stock abundance.

The large abundance increase in 2016–2017 is likely to be related to a strong recruitment event. The size of *Nephrops* burrows is not quantified in the TV surveys, but burrow counters participating in the last survey reported a large number of small burrows in FU 7, in particular in 2016. In 2017, increased amounts of small *Nephrops* were anecdotally reported in the Fladen fishery. Analysis of 2017 sampling catch data showed a large decrease in the mean weight in landings and an increase in the discard rate by number to 4.4%. Discard rates in 2011–2016 were close to zero (Figure 3). Given the recent fluctuations in the mean weights and discard rates, the long-term average (2000–2017) was considered to be most appropriate in the calculation of the catch scenarios for 2019.

Issues relevant for the advice

The EU is finalizing a MAP for the North Sea, and ICES was requested to provide advice based on the proposed MAP.

The results of the 2018 UWTV survey became available in June 2018 and showed a significant decrease from the 2017 level. The advice for 2019 has therefore been updated to reflect the more recent data.

Length–frequency of catches in the Fladen Ground area has clearly shifted towards larger individuals from 2010 to 2016 (Figure 3), suggesting a different selection pattern in the fishery and potentially a period of low recruitment. In addition, the discard rate has declined, potentially due to a shift to larger meshes (TR1) and use of highly selective gears (for cod avoidance). Nevertheless, the mean size of catch and landings decreased in 2017, probably due to an increase in recruitment. The larger size of Norway lobster in catches in recent years implies that the L_{50} for both male and female selection is higher than previously estimated. The F_{MSY} reference point for FU 7 was updated in 2015 and takes new selection patterns into account.

In 2017 the EU landing obligation was applied to all catches of Norway lobster fisheries in ICES Subarea 4, with several exemptions. Observations from the 2016–2017 fishery indicate that 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 observed over the last three years, which is considered to be a more realistic assumption.

In 2016 and 2017, no Norway lobster were recorded as below MCRS (BMS category) in FU 7 despite catches having been observed below the MCRS (Figure 3).

A single total allowable catch (TAC) covers the entire ICES Subarea 4, except the Norwegian Deep. The advised catch for the Fladen Ground constitutes a large proportion of the total North Sea advised catch. Catches in the Fladen Ground have declined since 2010 and are well below the advice for this area (Table 7). To avoid other FUs suffering from displacement of unused catch scenarios from Fladen Ground, management should be implemented at the functional unit level. Management should ensure that fishing opportunities are in line with the scale of the resource in each of the stocks.

Mixed-fisheries considerations

Results from a North Sea mixed-fisheries analysis are presented in the ICES mixed-fisheries advice (ICES, 2018a). The analysis has been updated, taking into account the latest changes made to the assessments and forecasts for stocks with reopened advice.

After years of positive development, North Sea cod is again estimated to be the most limiting stock in the Greater North Sea mixed-fisheries model. For 2019, assuming a strictly implemented discard ban (corresponding to the “Minimum”

scenario), cod is estimated to constrain 24 out of 40 fleet segments. Whiting is the second most limiting stock, constraining twelve fleet segments. Conversely, in the "Maximum" scenario, saithe and both plaice stocks (North Sea and eastern English Channel) plaice would be the least limiting for 17, 9, and 3 fleet segments, respectively. Finally, if Norway lobster were managed by separate TACs, Norway lobster in FU 7 would be the least limiting for seven fleet segments (ICES, 2018b).

For those demersal fish stocks for which the F_{MSY} range is available, a "range" scenario is presented that minimizes the potential for TAC mismatches in 2019 within the F_{MSY} range. Currently, these range scenarios do not take into account Norway lobster stocks.

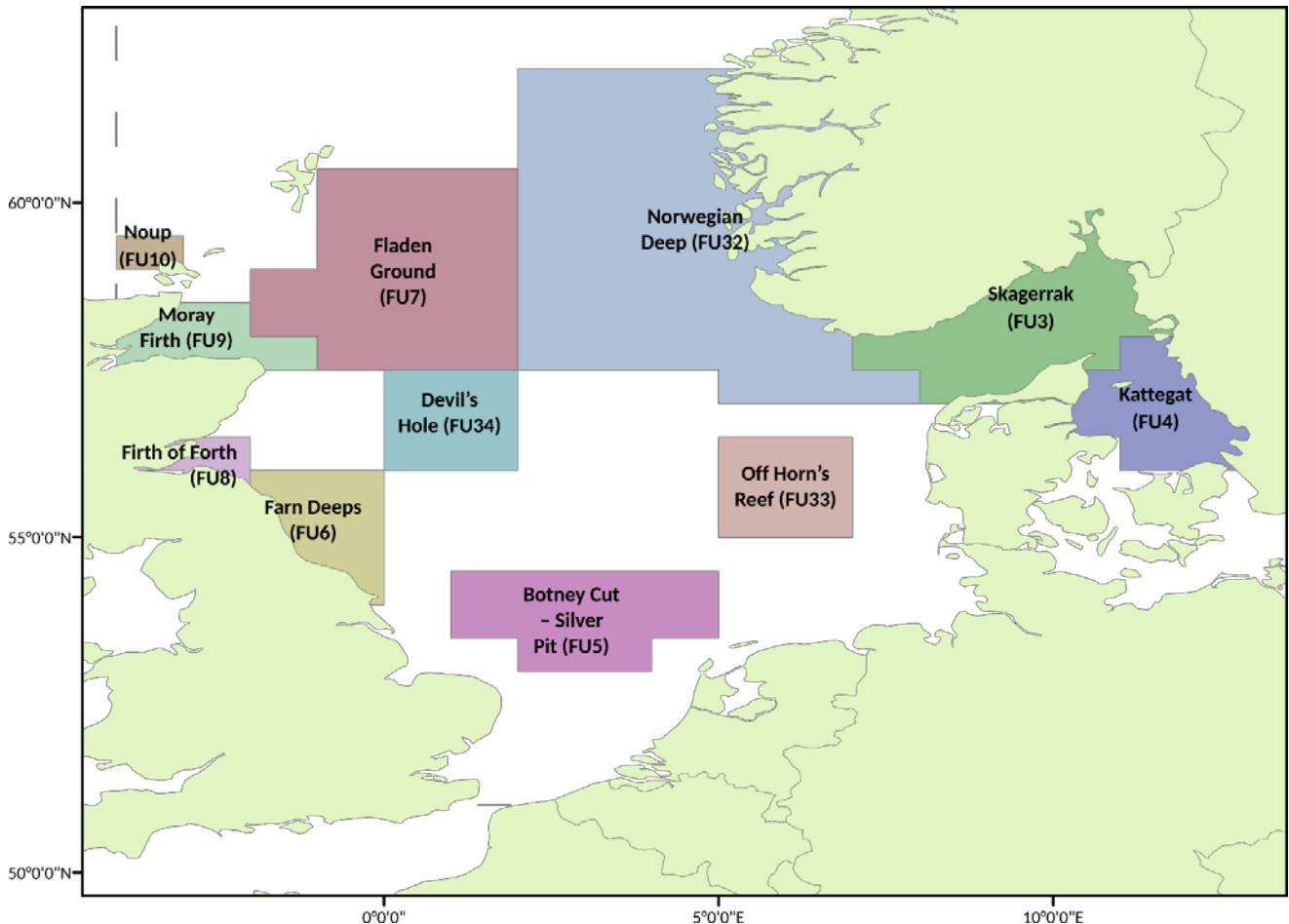


Figure 2 Norway lobster functional units in the North Sea and Skagerrak/Kattegat region.

Reference points

Table 5 Norway lobster in Division 4.a, Functional Unit 7. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	2767 million individuals	Lowest observed UWTV survey estimate of abundance (1992–2010)	ICES (2010)
	F_{MSY}	Harvest rate 7.5%	Proxy, equivalent to the $F_{0.1}$ for combined sexes	ICES (2015a)
Precautionary approach	B_{lim}	Not defined		
	B_{pa}	Not defined		
	F_{lim}	Not defined		
	F_{pa}	Not defined		
Management plan*	MAP MSY $B_{trigger}$	2767 million	MSY $B_{trigger}$	
	MAP B_{lim}	Not defined		
	MAP F_{MSY}	Harvest rate 7.5%	F_{MSY}	
	MAP range F_{lower}	Harvest rate 6.6–7.5%	Consistent with ranges provided by ICES (2015b), resulting in no more than 5% reduction in long-term yield compared with MSY	
	MAP range F_{upper}^{**}	Harvest rate 7.5–7.5%	Consistent with ranges provided by ICES (2015b), resulting in no more than 5% reduction in long-term yield compared with MSY	

* Proposed EU multiannual plan (MAP) for the North Sea (EU, 2016).

** For this stock, $F_{MSY upper} = F_{MSY}$.

Basis of the assessment

Table 6 Norway lobster in Division 4.a, Functional Unit 7. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018c).
Assessment type	Underwater TV survey linked to yield-per-recruit analysis from length data (ICES, 2018d).
Input data	Commercial catches (international landings, length frequencies from Scottish catch sampling), one survey index (FU 7 UWTV). Maturity data from commercial catch sampling. Natural mortalities from Morizur (1982): 0.3 for males and immature females, 0.2 for mature females for all years.
Discards, BMS landings, and bycatch	Data series from the majority of the fleets/ main fleets (covering 90% of the landings in 2017) were included in the assessment. 90% of the discards were obtained from sampling. BMS landings, where reported, are included as dead removals in the assessments since 2016.
Indicators	Sex ratio, length frequencies, mean size, LPUE.
Other information	The latest benchmark (based on the UWTV survey) took place in 2009 (ICES, 2009).
Working groups	Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK)

Information from stakeholders

In 2017, observer sampling from the Scottish Industry–Science observer sampling scheme was extended to include sampling of Norway lobster catches in FU7.

History of the advice, catch, and management

Table 7 Norway lobster in Division 4.a, Functional Unit 7. ICES advice, official landings, and ICES estimates of landings and discards. All weights are in tonnes.

Year	ICES advice	Landings corresponding to the advice	Catch corresponding to the advice	Official landings	ICES total discards*
1992		~2700		3363	
1993		2700		3492	
1994		5000		4568	
1995		5000		6419	
1996		5000		5210	
1997		5000		6170	
1998		7000		5136	
1999		7000		6518	
2000		9000		5570	340
2001		9000		5542	687
2002		9000		7245	820
2003		9000		6294	349
2004		12800		8730	506
2005		< 12800		10684	823
2006	No increase of effort	-		10791	798
2007	No increase in effort and harvest rate below 7.5%	< 10900		11911	747
2008	No new advice, same as for 2007	< 10900		12239	257
2009	No increase in effort and recent average landings	< 11300		13327	707
2010	Harvest rate no greater than that equivalent to fishing at $F_{0.1}$	< 16400		12968	560
2011	MSY approach	< 13300		7559	0
2012	MSY approach	< 14100		4415	0
2013	MSY approach	< 10000		2951	0
2014	MSY approach	< 8959		4147	37
2015	MSY approach	< 10759		1784	0
2016	MSY approach	< 6847	< 6856 **	2399	0 ^^
2017	MSY approach		≤ 12699 ***	5147	115 ^^
2018	MSY approach		≤ 16577 ^		
2019	MAP^^ F ranges (Harvest rate = 6.6–7.5%)		11596–13178 ^		

* Dead + surviving discards.

** Assuming all catches are landed and selection patterns do not change.

*** Assuming discarding below MCS only.

^ Assuming an average discard rate from year 2000.

^^ Proposed EU multiannual plan (MAP) for the North Sea (EU, 2016).

^^^ Since 2016, discards refer to unwanted catches (including BMS).

History of the catch and landings

Table 8 Norway lobster in Division 4.a, Functional Unit 7. Catch distribution by fleet in 2017 as estimated by ICES.

Catch (2017)		Wanted catch		Unwanted catch	
99% dead	1% surviving	Directed <i>Nephrops</i> fishery 10% TR2	Mixed <i>Nephrops</i> /demersal fishery 90% TR1	75% dead	25% surviving
5262 tonnes		5147 tonnes		115 tonnes	

Table 9 Norway lobster in Division 4.a, Functional Unit 7. ICES estimates of landings by gear for UK Scotland, total landings for Denmark, total discards, and reported BMS. All weights are in tonnes.

Year	UK Scotland				Denmark	Other countries*	Total landings	Total discards***	BMS reported to ICES
	<i>Nephrops</i> trawl	Other trawl	Creel	Sub-total					
1981	304	68	0	372	0	0	372		
1982	381	40	0	421	0	0	421		
1983	588	105	0	693	0	0	693		
1984	552	94	0	646	0	0	646		
1985	1020	120	0	1140	7	0	1147		
1986	1401	92	0	1493	50	0	1543		
1987	1023	349	0	1372	323	0	1695		
1988	1309	185	0	1494	81	0	1575		
1989	1724	410	0	2134	165	0	2299		
1990	1703	598	0	2301	236	3	2540		
1991	3021	772	0	3793	424	6	4223		
1992	1809	1164	0	2973	359	31	3363		
1993	2031	1234	0	3265	224	3	3492		
1994	1816	2356	0	4172	390	6	4568		
1995	3568	2389	19	5976	439	4	6419		
1996	2338	2578	7	4923	286	1	5210		
1997	2712	3221	0	5933	235	2	6170		
1998	2290	2673	0	4963	173	0	5136		
1999	2860	3546	0	6406	96	16	6518		
2000	2916	2546	0	5462	103	5	5570	340	
2001	3540	1936	0	5476	64	2	5542	687	
2002	4511	2546	0	7057	173	15	7245	820	
2003	4175	2033	0	6208	82	4	6294	349	
2004	7274	1319	1	8594	136	0	8730	506	
2005	8849	1508	5	10362	321	1	10684	823	
2006	9470	1026	1	10497	283	11	10791	798	
2007	11055	734	0	11789	119	3	11911	747	
2008	11432	666	0	12098	133	8	12239	257	
2009	12688	499	0	13187	130	10	13327	707	
2010	12544	288	0	12832	124	12	12968	560	
2011	7367	128	0	7495	64	< 0.5	7559	0	
2012	4257	81	0	4338	75	2	4415	0	
2013	2275	663	0	2938	5	8	2951	0	
2014	3928	206	0	4134	10	3	4147	37	
2015	1465	307	0	1772	8	4	1784	0	
2016	2021	374	0	2395	2	2	2399	0^	0
2017**	2853	2291	0	5144	1	2	5147	115^	0

* "Other countries" includes Belgium, Norway, and UK (England).

** Provisional.

*** Dead + surviving discards.

^ Since 2016, discards refer to unwanted catches (including BMS).

Summary of the assessment

Table 10 Norway lobster in Division 4.a, Functional Unit 7. Assessment summary.

Year	Adjusted abundance*	2 standard deviations	Harvest ratio	Landings numbers	Discard numbers	Removals numbers	Landings	Discards	Dead discards	Discard rate	Mean weight in landings	Mean weight in discards	Dead discard rate
	millions		%	millions			tonnes			%	grammes		%
1992	3661	376	3.1	114	0	114	3363	0	0	0	29.61	NA	0
1993	4450	569	3.1	138	0	138	3492	0	0	0	25.38	NA	0
1994	6170	814	3.1	193	0	193	4568	0	0	0	23.72	NA	0
1995	4987	896	4.7	233	0	233	6419	0	0	0	27.51	NA	0
1996	NA	NA	NA	175	0	175	5210	0	0	0	29.82	NA	0
1997	2767	510	7	192	0	192	6170	0	0	0	32.08	NA	0
1998	3838	717	4.3	164	0	164	5136	0	0	0	31.37	NA	0
1999	4146	649	5.1	213	0	213	6518	0	0	0	30.55	NA	0
2000	3628	491	4.7	153	21	169	5570	340	255	12	36.35	16.24	9.3
2001	4981	970	5.1	221	43	253	5542	687	515	16.3	25.1	15.94	12.8
2002	6087	757	4.9	259	55	301	7245	820	615	17.4	27.93	14.97	13.7
2003	5547	1076	4.1	209	24	226	6294	349	262	10.1	30.15	14.83	7.8
2004	5725	1030	5.4	282	34	307	8730	506	379	10.6	30.98	15.06	8.2
2005	4325	662	9.3	368	46	403	10684	823	617	11.2	29.05	17.74	8.6
2006	4862	619	8.4	369	54	409	10791	798	599	12.7	29.25	14.87	9.8
2007	7017	730	7	447	55	488	11911	747	560	10.9	26.63	13.67	8.4
2008	7360	1019	6.1	434	18	448	12239	257	192	3.9	28.18	14.54	3.0
2009	5457	772	9.4	473	51	511	13327	707	530	9.7	28.20	13.85	7.5
2010	5224	711	9.9	492	34	517	12968	560	420	6.5	26.38	16.44	4.9
2011	3382	435	6.2	209	0	209	7559	0	0	0	36.17	NA	0
2012	2748	392	4.7	128	0	128	4415	0	0	0	36.91	NA	0
2013	2902	335	3.1	89	0	89	2951	0	0	0	34.90	NA	0
2014	2990	412	3.5	102	3	104	4147	37	28	2.5	43.11	13.9	1.9
2015	2569	320	2.0	51	0	51	1784	0	0	0	36.7	NA	0
2016	4449	662	1.4	63	0	63	2399	0	0	0	39.43	NA	0
2017	7036	968	3.1	212	10	219	5147	115	86	4.4	25.37	11.66	3.4
2018	5656	689											

* For animals greater than 17 mm.
NA = not available.

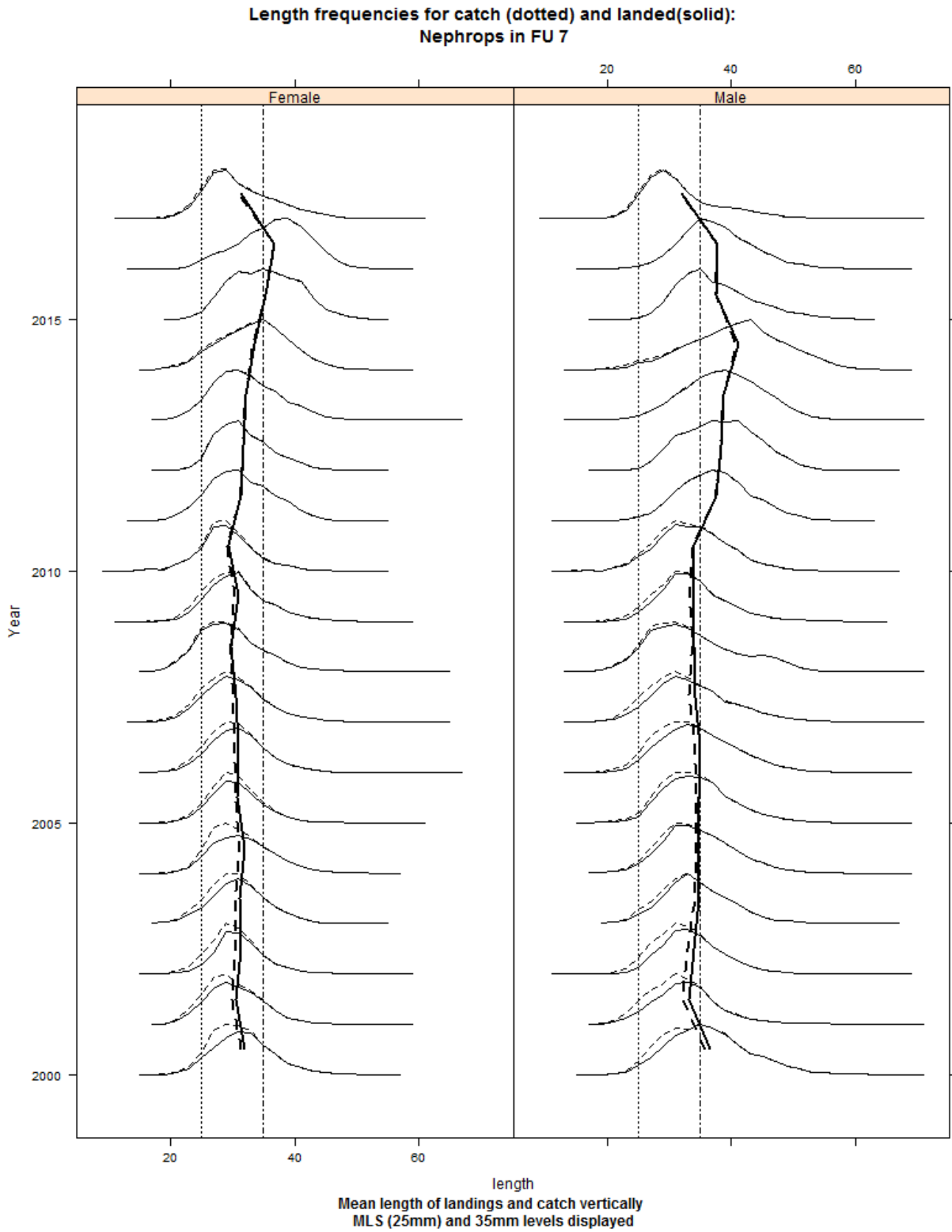


Figure 3 Norway lobster in Fladen Ground (FU 7). Catch length–frequency distribution and mean size in catches and landings. Vertical lines are minimum landing size (25 mm) and 35 mm.

Sources and references

- EU. 2016. Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on establishing a multi-annual plan for demersal stocks in the North Sea and the fisheries exploiting those stocks and repealing Council Regulation (EC) 676/2007 and Council Regulation (EC) 1342/2008. COM(2016) 493 final. 23 pp. https://eur-lex.europa.eu/resource.html?uri=cellar:9aa2aaae-5956-11e6-89bd-01aa75ed71a1.0008.02/DOC_1&format=PDF.
- ICES. 2009. Report of the Benchmark Workshop on *Nephrops* (WKNEPH), 2–6 March 2009, Aberdeen, UK. ICES CM 2009/ACOM:33. 156 pp.
- ICES. 2010. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 5–11 May 2010, ICES Headquarters, Copenhagen. ICES CM 2010/ACOM:13. 1058 pp.
- ICES. 2015a. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 28 April–7 May 2015, ICES HQ, Copenhagen, Denmark. ICES CM 2015/ACOM:13. 1229 pp.
- ICES. 2015b. EU Request to ICES to provide F_{MSY} ranges for selected North Sea and Baltic Sea stocks. ICES Advice 2015, Book 6, Section 6.2.3.1, Version 6, 30-6-2016. 11 pp.
- ICES. 2018c. Mixed-fisheries advice for Subarea 4, Division 7.d, and Subdivision 3.a.20 (North Sea, eastern English Channel, Skagerrak). *In* Report of the ICES Advisory Committee, 2018. ICES Advice 2018, mix-ns. 16 pp. <https://doi.org/10.17895/ices.pub.4612>
- ICES. 2018b. Report of the Working Group on Mixed-Fisheries Advice (WGMIXFISH-ADVICE), 21–26 May 2018, ICES Headquarters, Copenhagen, Denmark. ICES CM 2018/ACOM:19. In preparation.
- ICES. 2018c. Advice basis. *In* Report of the ICES Advisory Committee, 2018. ICES Advice 2018, Book 1, Section 1.2. <https://doi.org/10.17895/ices.pub.4503>.
- ICES. 2018d. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 24 April–3 May 2018, Ostend, Belgium. ICES CM 2018/ACOM:22. In preparation.
- Morizur, Y. 1982. Estimation de la mortalité pour quelque stocks de langoustine, *Nephrops norvegicus*. ICES CM 1982/K:10. 19 pp.