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 2019 for catches in 2020.

ICES advises that when the EU multiannual plan (MAP) for the North Sea is applied, catches in 2020 that correspond to the F ranges in the plan are between 12 552 tonnes and 14 263 tonnes. The entire range is considered precautionary when applying the ICES advice rule.

To ensure that the stock in Functional Unit (FU) 7 is exploited sustainably, management should be implemented at the functional unit level. The catch in FU 7 has been lower than advised in recent years, 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 has been above MSY $B_{trigger}$ for most of the time-series. The harvest rate has declined since 2010, and remains well below F_{MSY}.

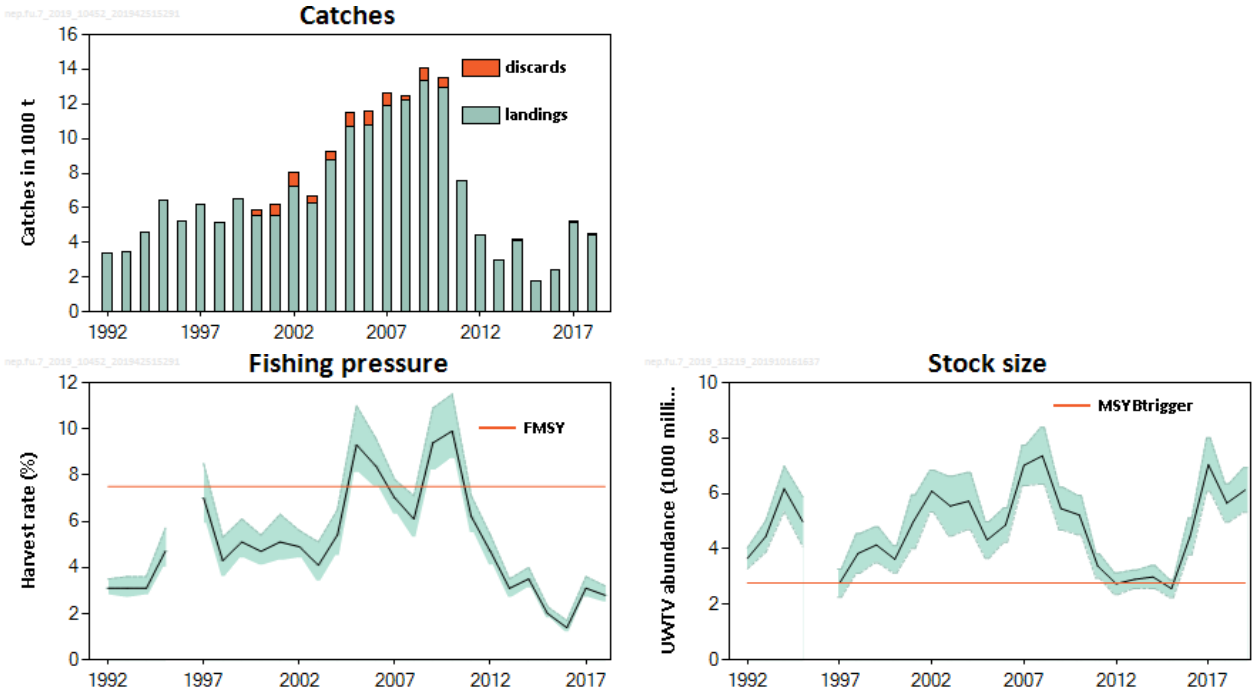

Figure 1 Norway lobster in Division 4.a, Functional Unit 7. Summary of the stock assessment. Long-term trends in catches, harvest rate, and underwater TV survey (UWTV) abundance (for Norway lobster greater than 17 mm carapace length); used as F and SSB proxies. Discard data have only been included since 2000. Orange lines show proxies for MSY $B_{trigger}$ and F_{MSY}. Shaded areas for fishing pressure and abundance are 95% confidence intervals. 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 that 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			
		2016	2017	2018		2017	2018	2019
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}	✓	✓	✓ Above 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	6 129 million individuals	UWTV 2019
Mean weight in wanted catch	31.65 g	Average 2000–2018
Mean weight in unwanted catch	14.86 g	Average 2000–2018
Unwanted catch rate (total)	6.9%	Average 2000–2018 (proportion by number)
Discard survival ratio	25%	Proportion by number
Dead unwanted catch ratio (total)	5.3%	Average 2000–2018 (proportion by number)

Table 3 Norway lobster in Division 4.a, Functional Unit 7. Annual catch scenarios. All weights are in tonnes.

Catch scenarios assuming recent discard rates

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}	14263	14143	13783	360	120	7.5	8.2%
F = MAP $F_{MSY\ lower}$	12552	12446	12129	317	106	6.6	−4.8%
F = MAP $F_{MSY\ upper}$ ***	14263	14143	13783	360	120	7.5	8.2%
Other scenarios							
MSY approach	14263	14143	13783	360	120	7.5	8.2%
$F_{2016–2018}$	4563	4525	4410	115	38	2.4	−65%
F_{2018}	5325	5280	5146	134	45	2.8	−60%
$F_{35\%SpR}$	21298	21119	20582	537	179	11.2	62%
F_{max}	31187	30925	30138	787	262	16.4	137%

Catch scenarios assuming zero discards

Basis	Total catch WC+UC	Wanted catch WC	Unwanted catch UC	Harvest rate * for WC+UC	% advice change **
EU MAP ^: F_{MSY}	14016	13545	471	7.5	6.4%
F= MAP $F_{MSY\ lower}$	12334	11919	415	6.6	−6.4%
F = MAP $F_{MSY\ upper}$***	14016	13545	471	7.5	6.4%
Other scenarios					
MSY approach	14016	13545	471	7.5	6.4%
$F_{2016–2018}$	4485	4334	151	2.4	−66%
F_{2018}	5233	5057	176	2.8	−60%
$F_{35\%SpR}$	20931	20227	704	11.2	59%
F_{max}	30649	29618	1031	16.4	133%

^ EU multiannual plan (MAP) for the North Sea (EU, 2018).
* Calculated for dead removals.
** Total catch 2020 relative to the F_{MSY} advice value 2019 (13 178 tonnes).
*** $F_{MSY\ upper}$ = F_{MSY} for this stock.

The change in the advice (+8.2% for the EU MAP F_{MSY} scenario, assuming recent discard rates) from November 2018 is mainly a result of increased abundance observed in the 2019 UWTV survey.

Basis of the advice

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

Advice basis	EU multiannual plan (MAP) for the North Sea (EU, 2018)
Management plan	The EU multiannual plan (MAP) for stocks in the North Sea and adjacent waters applies to this stock. The plan specifies conditions for setting fishing opportunities depending on stock status and making use of the F_{MSY} range for the stock. ICES considers that the F_{MSY} range for this stock used in the MAP is 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 km^2. 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.

Analysis of 2017–2018 sampling catch data showed a large decrease in the mean weight in landings, and a small increase in the discard rate. 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 (2000–2018) was considered to be most appropriate in the calculation of the catch scenarios for 2020.

Issues relevant for the advice

The EU MAP for the North Sea is finalized, and ICES was requested to provide advice based on the agreed EU MAP.

The results of the 2019 UWTV became available in June 2019, and showed a significant increase in stock abundance from the 2018 level. The advice for 2020 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. The mean size of catch and landings decreased in 2017–2018, probably due to an increase in recruitment.

Since 2016 the EU landing obligation was phased in to all catches of Norway lobster fisheries in ICES Subarea 4, with several exemptions still in place. Observations from the 2017–2018 fishery indicate that discarding above the minimum conservation reference size (MCRS) continues (Figure 3). ICES is consequently providing advice for 2020 assuming average discard rates observed since 2000, which is considered to be a more realistic assumption for this FU.

Scottish discard survival experiments indicate that the trawl discard survival may be around 75% (Fox and Albalat, 2018). As a result, an exemption from the landing obligation based on high survivability has been granted by the European Commission. ICES continues to use the survival rate of 25% (ICES, 2019), because the survival rates estimated by Fox and Albalat (2018) have not been evaluated by ICES.

In 2016–2018, no Norway lobster were officially 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.

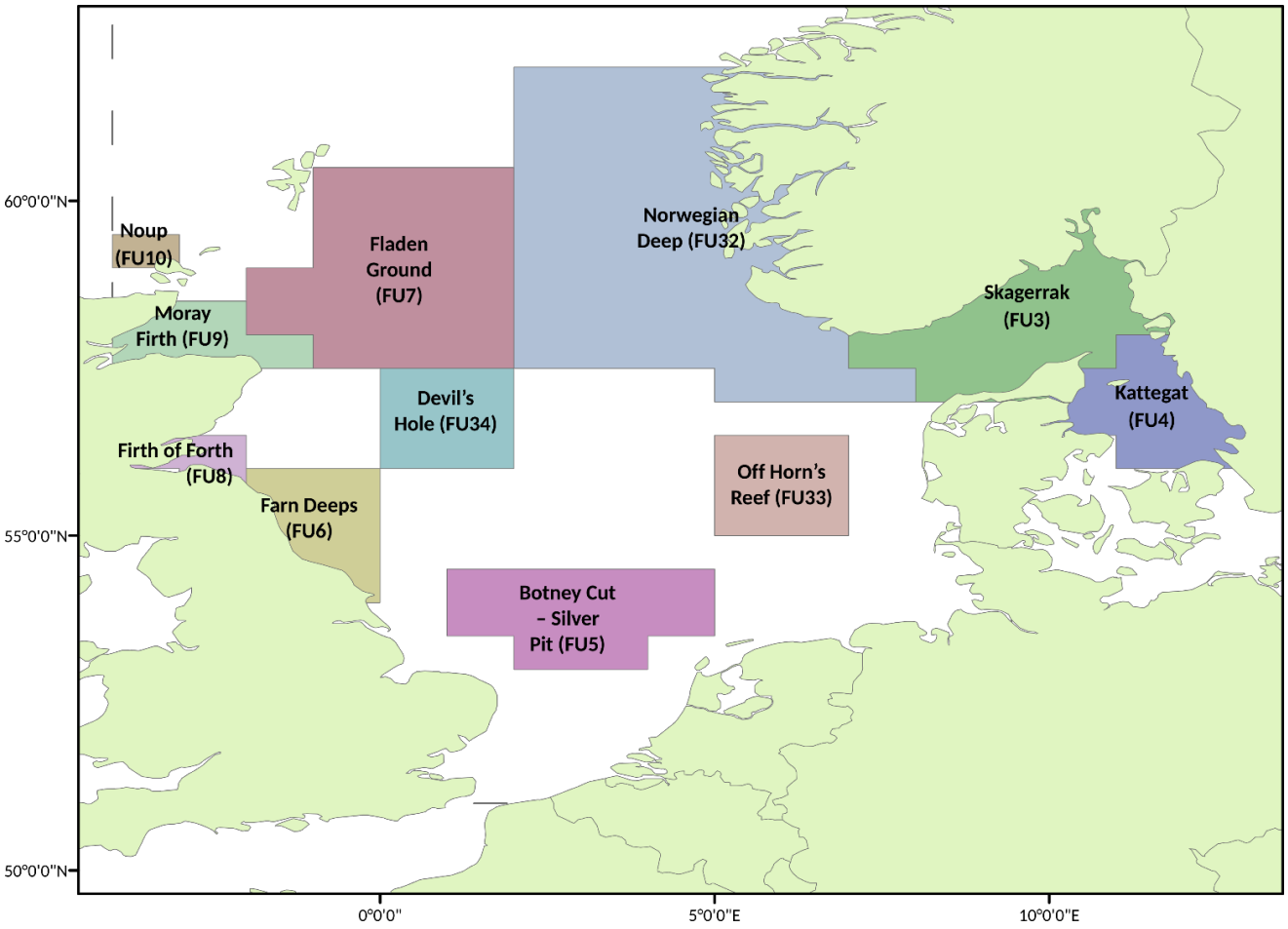

Figure 2 Norway lobster functional units in the North Sea and Skagerrak/Kattegat region.

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		
EU Management plan (MAP) *	MAP MSY $B_{trigger}$	2767 million	MSY $B_{trigger}$	ICES (2010)
	MAP B_{lim}	Not defined		
	MAP F_{MSY}	Harvest rate 7.5%	F_{MSY}	ICES (2015a)
	MAP range F_{lower}	Harvest rate 6.6–7.5%	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY.	ICES (2015b)
	MAP range F_{upper} **	Harvest rate 7.5–7.5%	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY.	ICES (2015b)

* EU multiannual plan (MAP) for the North Sea (EU, 2018).
** 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, 2018).
Assessment type	Underwater TV survey linked to yield-per-recruit analysis from length data (ICES, 2019).
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	Included in the assessment, data from the majority of the main fleets (covering 92% of the landings in 2018). 91% of the discards were obtained from sampling (9% raised discards). BMS landings, where reported, are included as dead removals in the assessment since 2016.
Indicators	Sex ratio, length frequencies, mean size, LPUE.
Other information	The latest benchmark (on the use of UWTV surveys) 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

Since 2017, observer sampling from the Scottish Industry–Science observer sampling scheme was extended to include sampling of Norway lobster catches in FU 7. In 2018, approximately 60% of the samples used in the discard estimation for this stock were collected by industry observers.

History of the advice, catch, and management

Table 7 Norway lobster in Division 4.a, Functional Unit 7. ICES advice 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	ICES 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	

Year	ICES advice	Landings corresponding to the advice	Catch corresponding to the advice	ICES landings	ICES total discards *
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^	4418	68 ^^^
2019	MAP ^^ F ranges (Harvest rate = 6.6–7.5%)		11596–13178 ^		
2020	Management Plan		12552–14263 ^		

* Dead + surviving discards.
** Assuming all catches are landed and selection patterns do not change.
*** Assuming discarding below MCS only.
^ Assuming an average discard ratio from year 2000 onwards.
^^ EU multiannual plan (MAP) for the North Sea (EU, 2018).
^^^ 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 2018 as estimated by ICES.

Catch (2018)		Wanted catch		Unwanted catch	
99.6% dead	0.4% surviving	Directed *Nephrops* fishery 8% TR2	Mixed *Nephrops*/demersal fishery 92% TR1	75% dead	25% surviving
4 486 tonnes		4 418 tonnes		68 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, and total discards. All weights are in tonnes.

Year	UK (Scotland)				Denmark	Other countries *	Total landings	Total discards ***
	Nephrops 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	

Year	UK (Scotland)				Denmark	Other countries *	Total landings	Total discards ***
	Nephrops trawl	Other trawl	Creel	Sub-total				
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^
2017	2853	2291	0	5144	1	2	5147	115 ^
2018 **	2283	2130	0	4413	1	4	4418	68 ^

* “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	UWTV abundance *	2 standard deviations	Harvest rate	Landings numbers	Discard numbers	Removals numbers	Landings	Discards	Dead discards	Discard ratio	Mean weight in landings	Mean weight in discards	Dead discard ratio
	millions		% by number	millions			tonnes			% by number	grammes		% by number
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	2.8	155	5	159	4418	68	51	2.9	30.58	14.42	2.2
2019	6129	802											

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

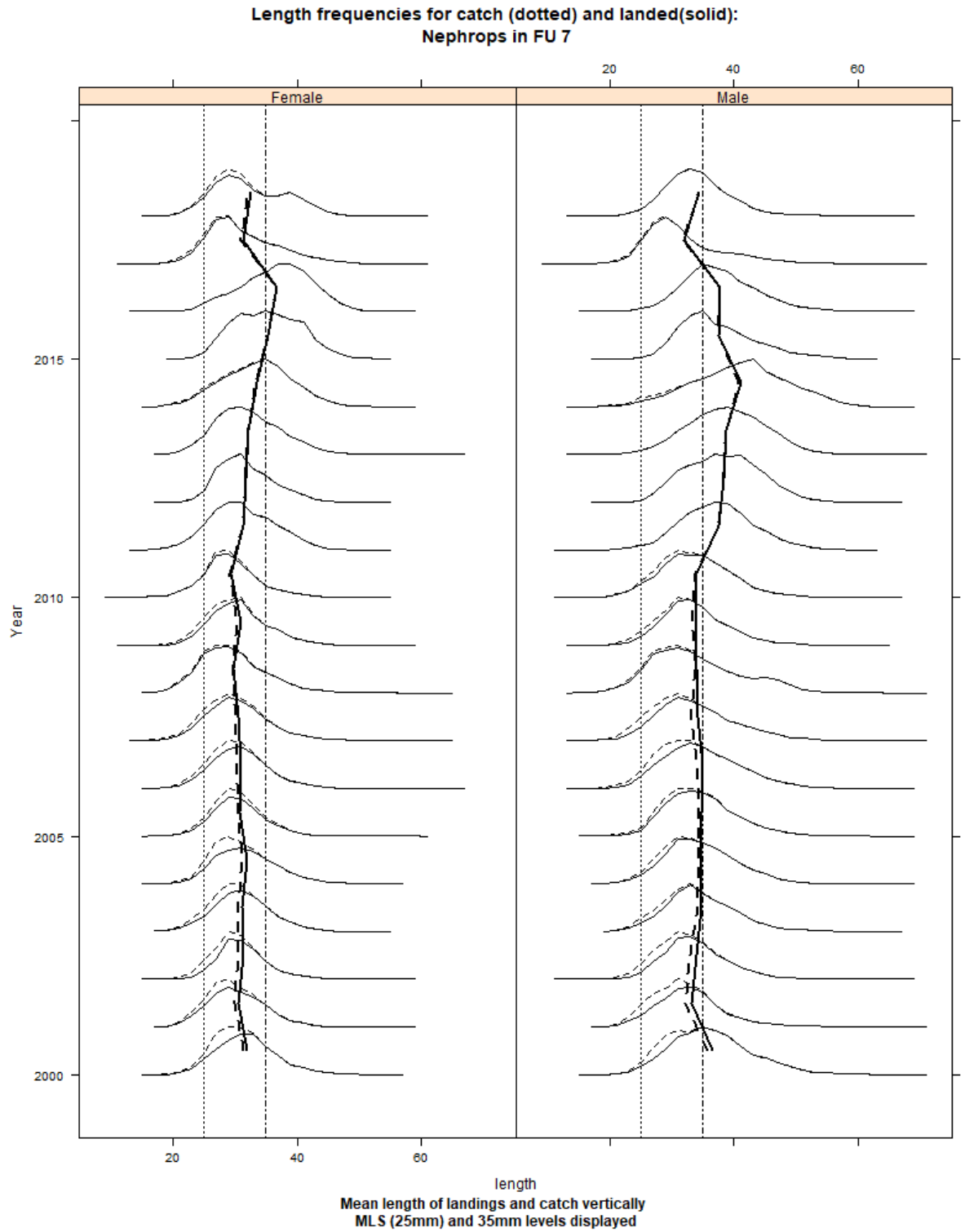

Figure 3 Norway lobster in Fladen Ground (FU 7). Catch length–frequency distribution and mean size in catches (broken vertical line) and landings (solid vertical line). Vertical straight lines are minimum landing size (25 mm) and 35 mm.

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