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

ICES stock advice

Please note: This advice was updated in November 2017 (ICES, 2017c).

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 2014–2016, catches in 2018 should be no more than 13 264 tonnes.

In order to ensure the stock in this functional unit (FU) is exploited sustainably, management should be implemented at the FU level. In recent years, the catch in this FU 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. In 2016 the stock size increased and is now above MSY $B_{trigger}$. The harvest rate has declined since 2010 and remains well below F_{MSY}.

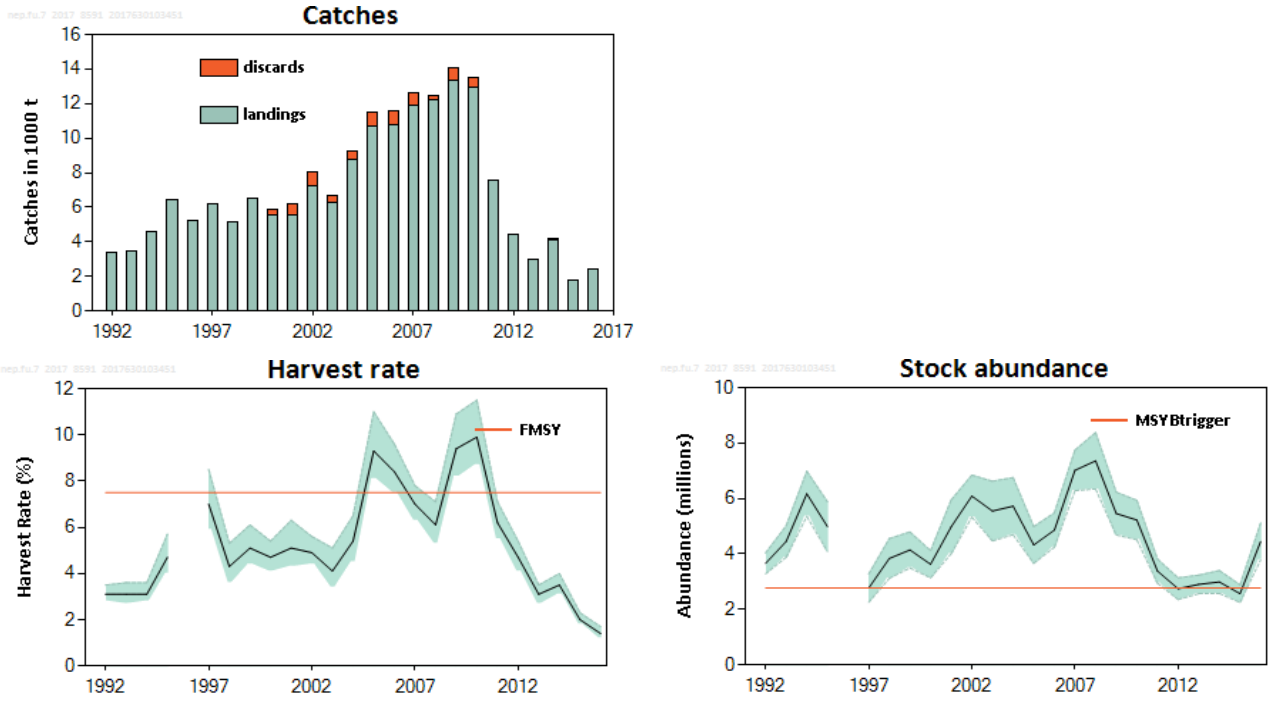

Figure 1 Norway lobster in Division 4.a, Functional Unit 7. Summary of the stock assessment. Long-term trends in catches, harvest rate, and underwater TV survey (UWTV) abundance (for animals greater than 17 mm) – used as F and SSB proxies. Discard data have only been included since 2000. Orange lines 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

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			
		2014	2015	2016		2014	2015	2016	
Maximum sustainable yield	F_{MSY}	✓	✓	✓	Below	MSY $B_{trigger}$	✓	✗	✓	Above trigger
Precautionary approach	F_{pa},F_{lim}	✓	✓	✓	Harvested sustainably	B_{pa},B_{lim}	✓	✗	✓	Full reproductive capacity
Management plan	F_{MGT}	–	–	–	Not applicable	B_{MGT}	–	–	–	Not applicable

Catch options

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

Variable	Value	Source	Notes
Stock abundance	4449 million	ICES (2017a)	UWTV 2016
Mean weight in landings	39.75 g	ICES (2017a)	Average 2014–2016
Mean weight in discards	-	ICES (2017a)	No discards in 2015–2016
Mean weight in unwanted catch >MCS	-	ICES (2017a)	No discards in 2015–2016
Mean weight in unwanted catch < MCS	-	ICES (2017a)	No discards in 2015–2016
Discard rate (total)	0%	ICES (2017a)	No discards in 2015–2016
Discard rate (>MCS)	0%	ICES (2017a)	No discards in 2015–2016
Discard rate (< MCS)	0%	ICES (2017a)	No discards in 2015–2016
Discard survival rate	25%	ICES (2017a)	Proportion by number, only applies in scenarios where discarding is
Dead discard rate (total)	0%	ICES (2017a)	No discards in 2015–2016
Dead discard rate (< MCS)	0%	ICES (2017a)	No discards in 2015–2016

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

Catch options assuming zero discards

Basis	Total catches	Wanted catches*	Unwanted catches*	Harvest rate**
ICES advice basis				
MSY approach	13264	13264	0	7.5%
Other options				
F_{2016}	2476	2476	0	1.4%
$F_{2014–2016}$	4067	4067	0	2.3%
$F_{35\%SpR}$	19807	19807	0	11.2%
F_{max}	29003	29003	0	16.4%

* Wanted" and "unwanted" catch are used to described *Nephrops* that would be landed and discarded in the absence of the EU landing obligation, based on average discard rate estimates for 2015–2016.

** Calculated for dead removals and applied to total catch.

Catch options assuming that discarding continues at the recent average or that discarding would only occur below the MCS are equivalent to the above because the observed discard rate is negligible.

Basis of the advice

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

Advice basis	ICES MSY approach.
Management plan	ICES is not aware of any agreed precautionary management plan for Norway lobster in this area.

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.

Issues relevant for the advice

The results of the 2017 UWTV survey are expected to be available by October 2017, and the advice will be updated before the end of 2017 if there is significant deviation from the 2016 UWTV survey.

Length–frequency of catches in the Fladen Ground area have clearly shifted towards larger animals since 2010 (Figure 3), suggesting a different selection pattern in the fishery. 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). 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.

From 2016 the EU landing obligation is applied to traps and trawl gears (80–99 mm mesh) fishing for Norway lobster in ICES Subarea 4. A *de minimis* exemption was made for animals below the 25 mm minimum conservation size (MCS), up to a maximum of 6% of total landings. Other gears and mesh sizes are not under the landing obligation. Discarding in FU 7 has been close to zero from 2010. The advice assumes zero discards of Norway lobster will continue in FU 7 in 2017.

Results from a North Sea mixed-fisheries analysis are presented in ICES (2017b). For 2018, assuming a strictly implemented discard ban (corresponding to the "Minimum" scenario), whiting would be the most limiting stock, being estimated to constrain 24 out of 42 fleet segments. Haddock is the second most limiting stock, constraining eight fleet segments. Additionally, if Norway lobster was managed by separate TACs for the individual functional units (FUs), Norway lobster in FU 6 would be considered the most limiting stock for ten fleet segments. Conversely, in the "Maximum" scenario, saithe and Eastern Channel plaice would be least limiting for 20 and 11 fleet segments, respectively. Finally, if Norway lobster was managed by separate TACs, Norway lobster in FUs 7, 5, 33, and 4.non-FU would be the least limiting for nine, two, one, and two fleet segments, respectively. 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 2018 within the F_{MSY} range. This scenario returns a fishing mortality by stock which, if used for setting single-stock fishing opportunities for 2018, may reduce the gap between the most and the least restrictive TACs, thus reducing the potential for quota over- and undershoot. This "range" scenario suggests that the potential for mixed-fisheries mismatch would be lowered with a 2018 TAC in the lower part of the F_{MSY} range for Eastern English Channel plaice and saithe, and in the upper part of the range for cod and North Sea plaice. Norway lobster was not included in the 'range' scenario.

There is a single total allowable catch (TAC) for 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 been declining since 2010 and are well below the advice for this area (Table 7). To avoid other FUs suffering from displacement of unused catch options 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.

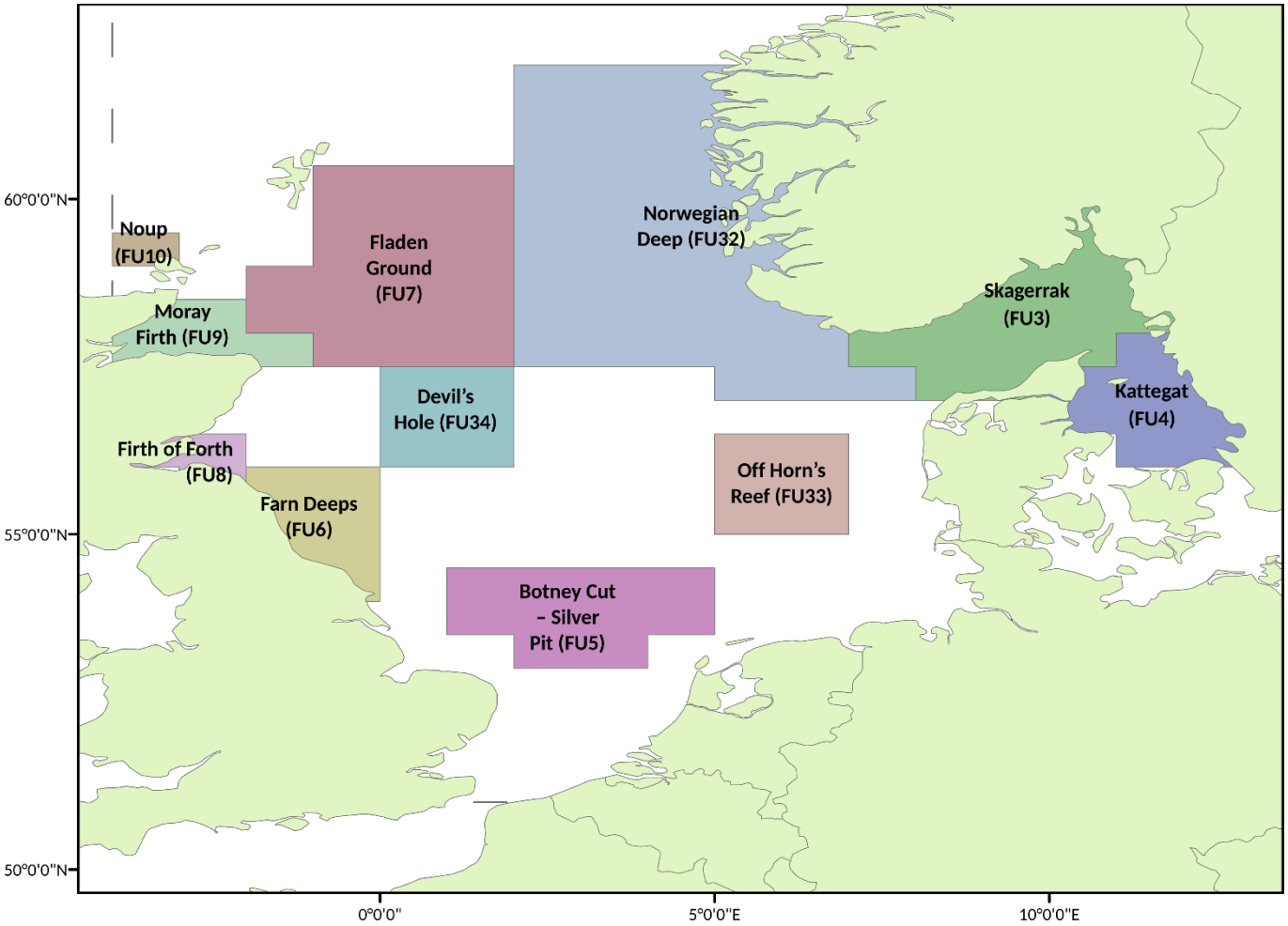

Figure 2 Norway lobster functional units in the North Sea and Skagerrak/Kattegat region.

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 (2015)
Precautionary approach	B_{lim}	Not defined		
	B_{pa}	Not defined		
	F_{lim}	Not defined		
	F_{pa}	Not defined		
Management plan	SSB_{mgt}	Not defined		
	F_{mgt}	Not defined		

Basis of the assessment

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

ICES stock data category	1 (ICES, 2016).
Assessment type	Underwater TV survey linked to yield-per-recruit analysis from length data (ICES, 2017a).
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 series from the majority of the fleets/ main fleets (covering 60% of the landings in 2016). Negligible discards observed in 2016. Below minimum size (BMS) landings, where reported, are included as dead removals in the assessment from 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

There is no additional available information.

History of the advice, catch, and management

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

Year	ICES advice	Landings advice	Catch advice	Official landings	ICES total discards*	BMS reported to ICES
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	0
2017	MSY approach		≤ 12699***			
2018	MSY approach		≤ 13264^			

* Dead + surviving discards.
** Assuming all catches are landed and selection patterns do not change.
*** Assuming discarding below MCS only.
^ Assuming recent discard rate (0%).

History of the catch and landings

Table 8 Norway lobster in Division 4.a, Functional Unit 7. Catch distribution by fleet in 2016 as estimated by ICES.

Catch (2016)		Landings		Unwanted catch
100% dead	0% surviving	directed *Nephrops* fishery 6% TR2	mixed *Nephrops*/demersal fishery 94% TR1	negligible
2399 tonnes		2399 tonnes		

Table 9 Norway lobster in Division 4.a, Functional Unit 7. History of commercial catch and landings; Official landings and ICES estimated discards are presented by country. All weights are in tonnes.

Year	UK Scotland				Denmark	Other countries*	Total landings	Total discards***	BMS reported to ICES
	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		
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

* Other countries includes Belgium, Norway, and UK (England).
** Provisional.
*** Dead + surviving discards.

Summary of the assessment

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

Year	Adjusted abundance* (millions)	2 standard deviations	Harvest ratio (%)	Landings numbers (millions)	Discards numbers (millions)	Removals numbers (millions)	Landings (tonnes)	Discards (tonnes)	Dead discards (tonnes)	Discard rate (%)	Mean weight in landings (g)	Mean weight in discards (g)	Dead discard rate (%)
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

* For animals greater than 17 mm.

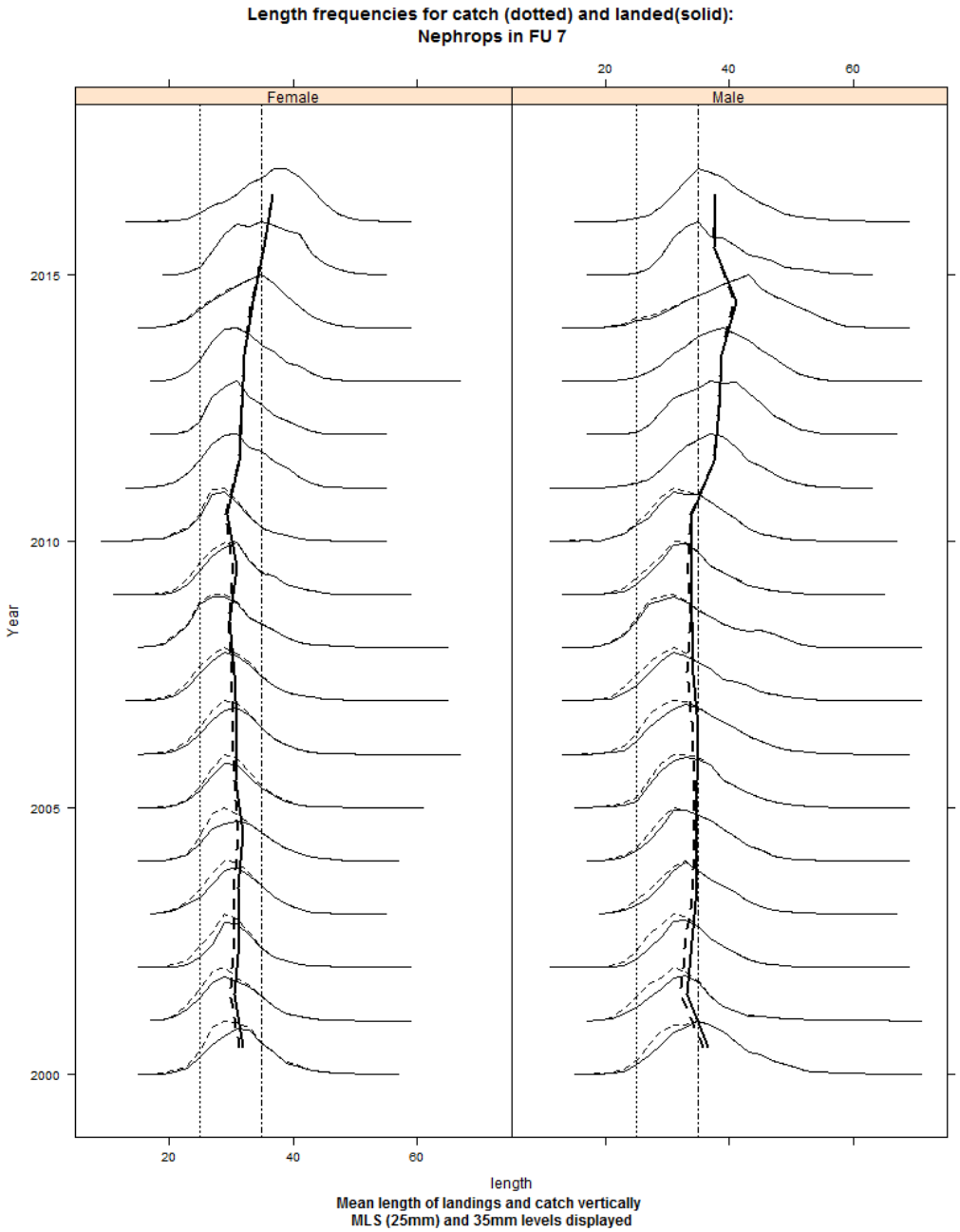

Figure 3 Norway lobster in Fladen Ground (FU 7). Catch length–frequency distribution and mean size in catches and landings. Vertical lines are minimum landing size (25 mm) and 35 mm.

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