Norway lobster (*Nephrops norvegicus*) in Division 4.b, Functional Unit 8 (central North Sea, Firth of Forth)

ICES advice on fishing opportunities

Please note: This advice was updated in November 2019 (ICES, 2019b)

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 2422 tonnes and 3724 tonnes. The entire range is considered pre... when applying the ICES advice rule.

To ensure that the stock in Functional Unit 8 is exploited sustainably, management should ... implemented at ... functional unit level.

Stock development over time

The stock size has been above MSY $B_{trigger}$ for the entire time-series. The harvest rate ... is now below F_{MSY}.

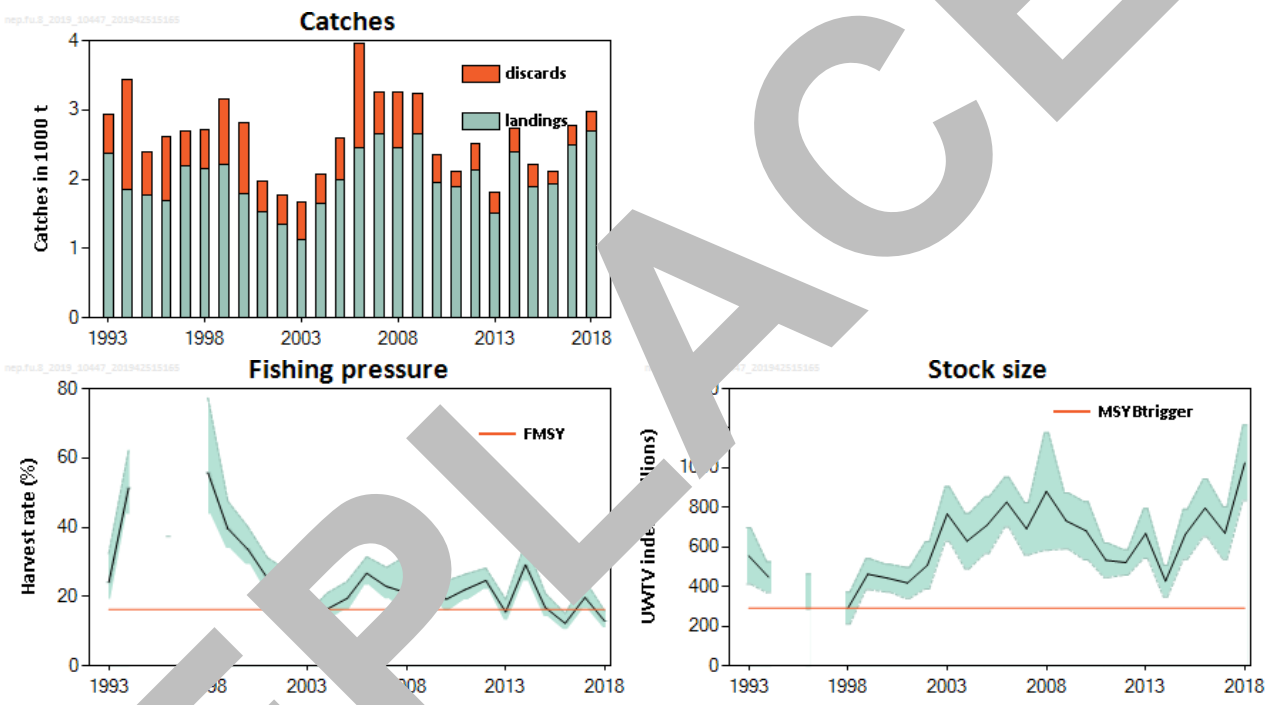

Figure 1 Norwa... ster in Divi... 4.b, Functional Unit 8. Summary of the stock assessment. Long-term trends in catches, har... ate, and u...derwater TV survey (UWTV) abundance (for animals greater than 17 mm carapace length); used ...d SSB pr... Orange lines show proxies for MSY $B_{trigger}$ and F_{MSY}. Shaded areas are 95% confidence intervals. ...t rates ... to 2006 may be unreliable because of the underreporting of landings.

Stock ar... xploitatio... tus

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

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Table 1 Norway lobster in Division 4.b, Functional Unit 8. State of the stock and fishery relative to reference points.

		Fishing pressure				Stock size			
		2016	2017	2018		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}	✓	✓	✓ Above possible refer
Management plan	F_{MGT}	✓	✗	✓	Within range	MAP MSY $B_{trigger}$	✓	✓	✓ ve

Catch scenarios

Table 2 Norway lobster in Division 4.b, Functional Unit 8. The basis for the catch scenario

Variable	Value	Note
Stock abundance	1025 million individuals	UWTV 2018
Mean weight in wanted catch	23.66 g	Average 201 8
Mean weight in unwanted catch	10.45 g	Average 2016–2
Unwanted catch ratio (total)	17.9%	A 16–201 portio umber)
Discard survival ratio	25%	portion by numbe
Dead unwanted catch ratio (total)	14.1%	verage 2016–2018 (prop n by number)

Table 3 Norway lobster in Division 4.b, Functional Unit 8. Annual ca cenarios. Disc g is assumed to continue at the recent average. All weights are in tonnes (t).

Catch scenarios assuming recent discard rates

Basis	Total catch	Dead removals	ted h	Dead ca d	Surviving unwanted catch	Harvest rate *	% advice change **
	WC+DUC+SUC	WC+DUC	W	DUC	SUC	for WC+DUC	
ICES advice basis							
EU MAP ^: F_{MSY}	372	3642	339	245	82	16.3%	4.3%
F= MAP $F_{MSY\ lower}$	2422	2369	09	160	53	10.6%	−32%
F = MAP $F_{MSY\ upper}$***	4	642	397	245	82	16.3%	4.3%
Other scenarios							
MSY approach	37	3	3397	245	82	16.3%	4.3%
$F_{0.1}$	2	2101	1959	142	47	9.4%	−40%
F_{35SpR}	2	2838	2647	191	64	12.7%	−18.7%
F_{2018}	948	2883	2689	194	65	12.9%	−17.4%
$F_{2016–2018}$	7	3352	3126	226	75	15.0%	−4.0%

Catch scen ssum ero discards

Ba	tal catch	Wanted catch	Unwanted catch	Harvest rate *	% advice change **
	WC+UC	WC	UC	for WC+UC	
F_{MSY}	3558	3245	313	16.3	−0.31%
= MAP lower	2314	2111	203	10.6	−35%
F = MA ***** upper***	3558	3245	313	16.3	−0.31%
Oth					
pproach	3558	3245	313	16.3	−0.31%
	2052	1872	180	9.4	−43%
F_{35S}	2772	2529	243	12.7	−22%
F_{2018}	2815	2568	247	12.9	−21%
$F_{2016–2018}$	3275	2987	288	15	−8.2%

^ EU multiannual plan (MAP) for the North Sea (EU, 2018).
* Calculated for dead removals.
** Total catch 2020 relative to F_{MSY} advice value 2019 (3 569 t).
*** $F_{MSY\ upper}$ = F_{MSY} for this stock.

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The change in advice (+4.3% for the EU MAP F_{MSY} scenario) from November 2018 is a result of updating mean weights and discard rates.

Basis of the advice

Table 4 Norway lobster in Division 4.b, Functional Unit 8. 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 [illegible] 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 length and sex composition of the landings is considered to be well sampled. C[illegible] sampli[illegible]as been conducted on a quarterly basis for Scottish Norway lobster trawlers in this fishery since 1990, and is [illegible]d to repre[illegible]t the fishery adequately. The underwater TV (UWTV) surveys have been conducted for this stock since [illegible], with a [illegible]inuous annual series available since 1998.

Data from the latest UWTV survey (August 2018) have been used as th[illegible]ost up-to-date [illegible]dicator of stock abundance.

Issues relevant for the advice

ICES was requested by the EC to provide advice based o[illegible]ed EU MAP.

The results of the 2019 UWTV survey are expected to be a[illegible]ble b[illegible]019 and the advice will be updated before the end of 2019 if there is significant deviation of the abund[illegible]e e[illegible]mate from the 2018 UWTV survey.

The EU landing obligation was phased in to all catches of N[illegible]y lobster fisheries in ICES Subarea 4 since 2016, with several exemptions still in place. Obse[illegible]ons from the 2016–[illegible] fishery indicate that discarding above the minimum conservation reference size (MCRS) co[illegible]s and has no[illegible]changed markedly (Figure 3). ICES is, as a consequence, providing advice for 2020 assu[illegible]verage[illegible]rd rate[illegible]served over the last three years; this is considered to be a more realistic assumption.

Scottish discard survival [illegible]riments[illegible]icate that the trawl discard survival may be around 75% (Fox and Albalat, 2018). As a result, an exe[illegible]ption [illegible]anding obligation based on high survivability has been granted by the European Commission. ICE[illegible]ntinues t[illegible]he survival rate of 25% (ICES, 2016) because the survival rates estimated by Fox and Albalat (2018)[illegible]e not b[illegible]en eva[illegible]d by ICES.

In 2016–2[illegible]nly [illegible]igible amounts of Norway lobsters were recorded as being below MCRS (BMS category) in FU 8, despite catch[illegible]g been o[illegible]ed below the MCRS (Figure 3).

[illegible]tche[illegible]reased t[illegible]bove ICES advice in 2018, highlighting the issue that current management arrangements are not suff[illegible]nt to conta[illegible]e fishery within the sustainable limits determined by ICES. A single total allowable catch (TAC) cover[illegible]ES Subarea 4, except the Norwegian Deep. Management should ensure that fishing opportunities are in [illegible]h the[illegible] the resources in each of the stocks.

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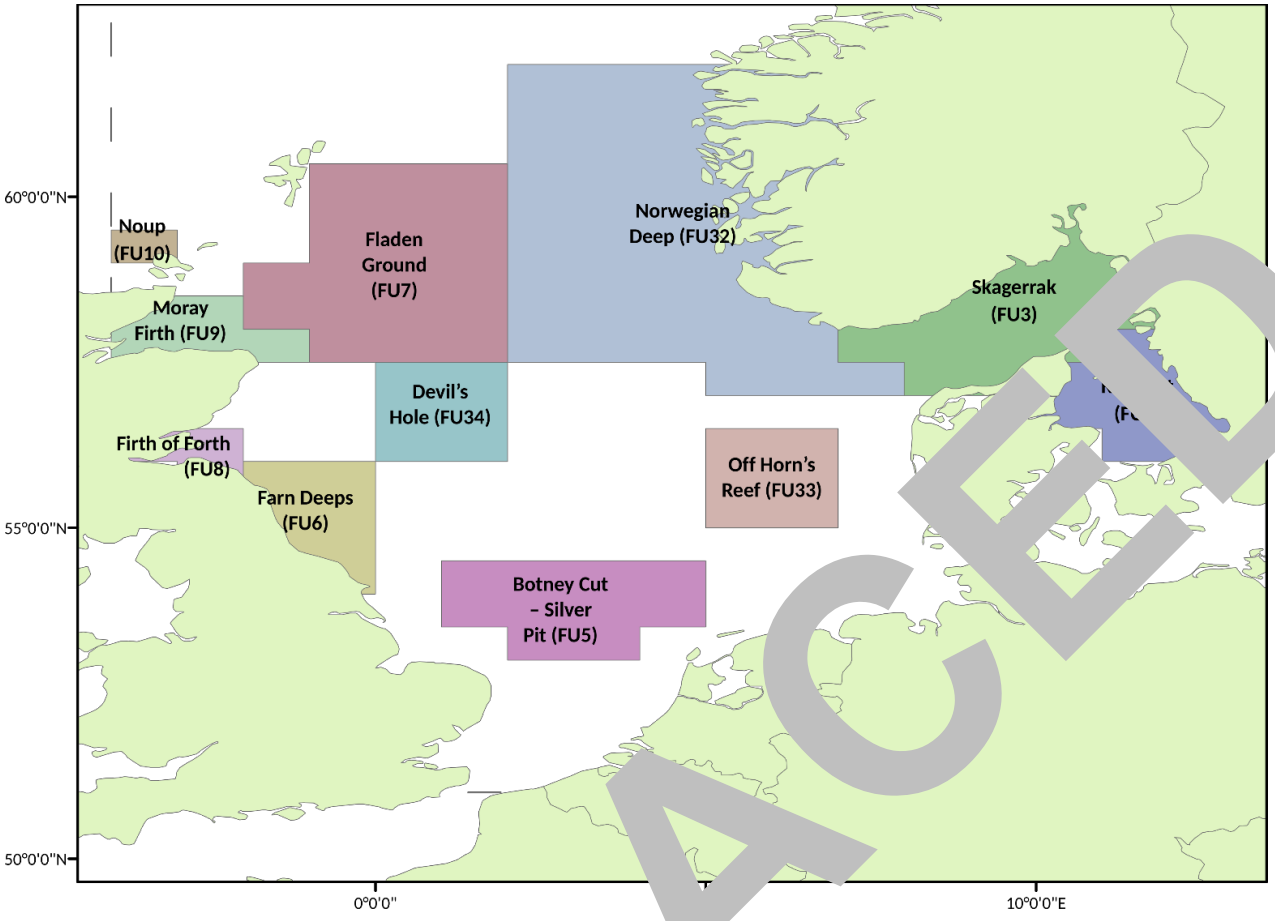

Figure 2 Norway lobster functional units in the North Sea ar agerrak/Kattegat region.

Reference points

Table 5 Norway lobste 4.b, Fu l U Reference points, values, and their technical basis.

Framework	Reference	Value	Technical basis	Source
MSY approach	MSY B_{trig}	illion individuals	Lowest observed UWTV survey estimate of abundance (1993–2010).	ICES (2010)
	F	Harvest rate 16.3%	Proxy, equivalent to F_{max} for combined sexes.	ICES (2012)
Precautiona approach		Not defined		
	B_{pa}	Not defined		
	F_{lim}	Not defined		
	F	Not defined		
	MSY B_{tri}	292 million	MSY $B_{trigger}$	ICES (2010)
	lim	Not defined		
	MA	Harvest rate 16.3%	F_{MSY}	ICES (2012)
EU Man	AP range F_{lower}	Harvest rate 10.6–16.3%	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY.	ICES (2015)
	MAP range F_{upper} **	Harvest rate 16.3–16.3%	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY.	ICES (2015)

* EU mu annual plan (MAP) for the North Sea (EU, 2018). The values for the reference points will be based on ICES advice.
** For this stock, $F_{MSY\ upper} = F_{MSY}$.

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Basis of the assessment

Table 6 Norway lobster in Division 4.b, Functional Unit 8. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018).
Assessment type	Underwater TV survey (UWTV) linked to yield-per-recruit analysis from length data (ICES, 2019a).
Input data	Commercial catches (international landings, length frequencies from Scottish catch sampling), one survey index (FU 8 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 96% [illegible] in 2018). 97% of the discards were obtained from sampling (3% raised discards). BMS [illegible]ings, wh[illegible] 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) was performed in 20[illegible] (ICES, 2[illegible]
Working groups	Working Group on the Assessment of Demersal Stocks in the North S[illegible]d Skagerrak ([illegible]SSK)

Information from stakeholders

Since 2017, observer sampling from the Scottish Industry–Science observer sampling [illegible]e was ex[illegible]ed to include sampling of Norway lobster catches in FU 8. In 2018, approximately 50% [illegible]amples [illegible]n th[illegible]scard estimation for this stock were collected by industry observers.

History of the advice, catch, and management

Table 7 Norway lobster in Division 4.b, Functional Unit 8. ICES advice an[illegible]catche[illegible]weights are in tonnes.

Year	ICES advice	Landings advi[illegible]	Catch advice[illegible]	[illegible]ES landings	ICES total discards *
1993				2368	567
1994				1850	1584
1995				1762	620
1996				1687	930
1997				2193	494
1998				2144	578
1999				2207	938
2000				1785	1032
2001				1527	436
2002				1340	421
2003				1127	546
2004				1657	406
2005				1989	602
2006	No incre[illegible]n effort			2458	1510
2007	No i[illegible]e in effort, harv[illegible]te < [illegible]	1500		2651	614
2008	[illegible]w advi[illegible]ame as for 200[illegible]	1500		2450	796
2009	No [illegible] effort and [illegible]ent averag[illegible]dings	< 2500		2663	573
[illegible]010	[illegible]arvest r[illegible] gr[illegible] than that [illegible]uivalent t[illegible]g at F_{max}	< 1600		1950	407
2011	[illegible]SY transition	< 2000		1889	231
201[illegible]	[illegible]ion	< 1700		2129	379
[illegible]	MSY t[illegible]ion	< 1400		1503	301
[illegible]	MSY transition	< 1417		2384	353
2[illegible]	MSY approach	< 1769		1897	311
201[illegible]	[illegible]SY approach	< 1866	≤ 2040 **	1935	167 ^^^
2017	MSY approach		≤ 2548 ***	2493	280 ^^^

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Year	ICES advice	Landings advice	Catch advice	ICES landings	ICES total discards *
2018	MSY approach		≤ 2376 ^	2690	275 ^^^
2019	MAP ^^ F ranges (Harvest rate = 10.6–16.3%)		2321–3569 ^		
2020	Management Plan		2422–3724 ^		

* Dead + surviving discards.
** Assuming all catches are landed and selection patterns do not change.
*** Assuming discarding includes Norway lobster below MCRS only.
^ Assuming discard ratio average for the last three years.
^^ EU multiannual plan (MAP) for the North Sea (EU, 2018).
^^^ Since 2016, discards refer to unwanted catches (including BMS landings).

History of the catch and landings

Table 8 Norway lobster in Division 4.b, Functional Unit 8. Catch distribution by fleet in 2 as estimated by IC

Catch (2018)		Wanted catches			Unwanted catches	
98% dead	2% surviving	Directed *Nephrops* fishery 86% TR2	Mixed *Nephrops*/demersal fishery 14% TR1	< 0.5% creel	75% dea	25% surviving
2965 tonnes		2690 tonnes			275 tonnes	

Table 9 Norway lobster in Division 4.b, Functional Unit 8. ICES estim s of landings b r for UK Scotland, total landings for UK (E, W & NI), and total discards. All weights are in tonne

Year	UK Scotland				UK	Total landings *	Total discards ***
	Nephrops trawl	Other trawl	Creel	Subtotal			
1981	947	60	0	007	0	1007	
1982	1138	57	0		0	1195	
1983	1681	43	0		0	1724	
1984	2078	56	0	134	0	2134	
1985	1907	61	0	1968	0	1968	
1986	2204	59	0	2263	0	2263	
1987	1583		2	1675	0	1675	
1988	2455		0	2529	0	2529	
1989	1834	53	0	1887	1	1888	
1990	1900	30		1930	1	1931	
1991	1362	43		1405	0	1405	
1992	171	41	0	1756	0	1756	
1993	2349	17	0	2366	2	2368	567
1994	627	17	0	1844	6	1850	1584
1995	1707	53	0	1760	2	1762	620
1996	162	66	0	1687	0	1687	930
1997	2	55	0	2191	2	2193	494
1998	05	37	0	2142	2	2144	578
1999	2193	10	1	2204	3	2207	938
	75	9	0	1784	1	1785	1032
2001		34	0	1518	9	1527	436
2002	13	31	1	1334	6	1340	421
200	1116	8	0	1124	3	1127	546
	1650	4	0	1654	3	1657	406
5	1974	0	4	1978	11	1989	602
	2438	3	12	2453	5	2458	1510
200	2627	10	7	2644	7	2651	614
2008	2435	2	8	2445	5	2450	796
2009	2620	8	26	2654	9	2663	573
2010	1923	5	13	1941	9	1950	407
2011	1789	6	89	1884	5	1889	231

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Year	UK Scotland				UK (E, W & NI)	Total landings *	Total discards ***
	Nephrops trawl	Other trawl	Creel	Subtotal			
2012	1944	17	126	2087	42	2129	379
2013	1409	24	58	1491	12	1503	301
2014	2344	4	14	2362	22	2384	353
2015	1784	2	43	1829	68	1897	311
2016	1786	1	116	1903	32	1935	167 ^
2017	2406	16	10	2432	61	2493	280 ^
2018**	2638	7	4	2649	41	269[illegible]	[illegible]75 ^

* There are no landings by other countries from this FU.
** Provisional.
*** Dead + surviving discards.
^ Since 2016, discards refer to unwanted catches (including BMS landings).

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Summary of the assessment

Table 10 Norway lobster in Division 4.b, Functional Unit 8. Assessment summary.

Year	UWTV abundance * (millions)	2 standard deviations	Harvest rate (% by number)	Landings numbers (millions)	Discards numbers (millions)	Removals numbers (millions)	Landings (tonnes)	Discards (tonnes)	[illegible]ards [illegible]nes)	Discard [illegible] (% by [illegible]umber)	[illegible]ight [illegible]dings (grammes)	Mean weight in discards (grammes)	Dead discard ratio (% by number)
1993	555	142	24.1	97	49	134	2368	567		33	24.3	11.64	27.3
1994	448	78	51.3	95	180	230	1850	[illegible]			19.51	8.79	58.8
1995	NA	NA	NA	90	59	134	1762		4[illegible]	[illegible]9.5	19.55	10.54	32.9
1996	375	88	37.3	81	78	140	1687	930	697	49.2	20.81	11.85	42.1
1997	NA	0	NA	116	56	158	2193	494	[illegible]371	32.6	18.87	8.79	26.6
1998	292	81	55.7	118	60	163	2144	578	[illegible]34	33.9	18.23	9.6	27.8
1999	463	78	39.6	110	97	183	2207	938	[illegible]04	47	20.05	9.63	39.9
2000	443	70	33.7	82	90	150	1785	[illegible]	[illegible]774	52.5	21.83	11.42	45.3
2001	419	79	25.3	72	45	10[illegible]	1527		327	38.7	21.22	9.59	32.1
2002	508	119	21.1	68	52	10[illegible]		421	316	43.1	19.62	8.16	36.2
2003	767	138	12.4	51	59	95	11[illegible]	[illegible]546	410	53.9	22.31	9.25	46.7
2004	630	140	16.4	74	40	103	1[illegible]	[illegible]406	304	34.9	22.45	10.25	28.7
2005	710	143	19.4	89	65	138	[illegible]9	602	452	42.1	22.33	9.28	35.3
2006	827	126	26.7	115	142	221	[illegible]458	1510	1133	55.2	21.43	10.67	48.1
2007	692	132	22.9	126	[illegible]3	159	[illegible]51	614	461	25.3	20.97	14.34	20.3
2008	881	297	21.1	142	[illegible]	186	[illegible]50	796	597	29.1	17.23	13.65	23.5
2009	732	142	26	137	[illegible]7	190	2663	573	430	34.1	19.41	8.09	27.9
2010	682	147	19.2	99	43	13[illegible]	1950	407	305	30.2	19.76	9.55	24.5
2011	533	87	22.1	10[illegible]	[illegible]24	[illegible]	1889	231	173	19.5	19.75	9.56	15.3
2012	522	64	24.6	[illegible]	[illegible]8	[illegible]29	2129	379	284	27.2	21.66	10.10	21.9
2013	668	126	15.6	[illegible]	[illegible]31	104	1503	301	226	27.4	19.30	9.82	22.0
2014	428	80	29.1	1[illegible]	30	124	2384	353	265	22.9	24.30	11.66	18.3
2015	664	127	16.8	90	29	112	1897	311	234	24.4	21.84	10.74	19.5
2016	797	146	1[illegible]	85	[illegible]17 **	98	1935	167 **	123	16.4	23.62	9.86	12.8
2017	670	133	[illegible]	[illegible]1	[illegible]**	132	2493	280 **	210	20	23.07	10.07	15.8
2018	1025	190	[illegible]9	114	24 **	132	2690	275 **	206	17.4	24.29	11.42	13.6

* For Norway lobster greater than 17 mm carap[illegible]

** Since 2016, discards refer to unwa[illegible]catches [illegible]ding BMS[illegible]ings).

NA = not available.

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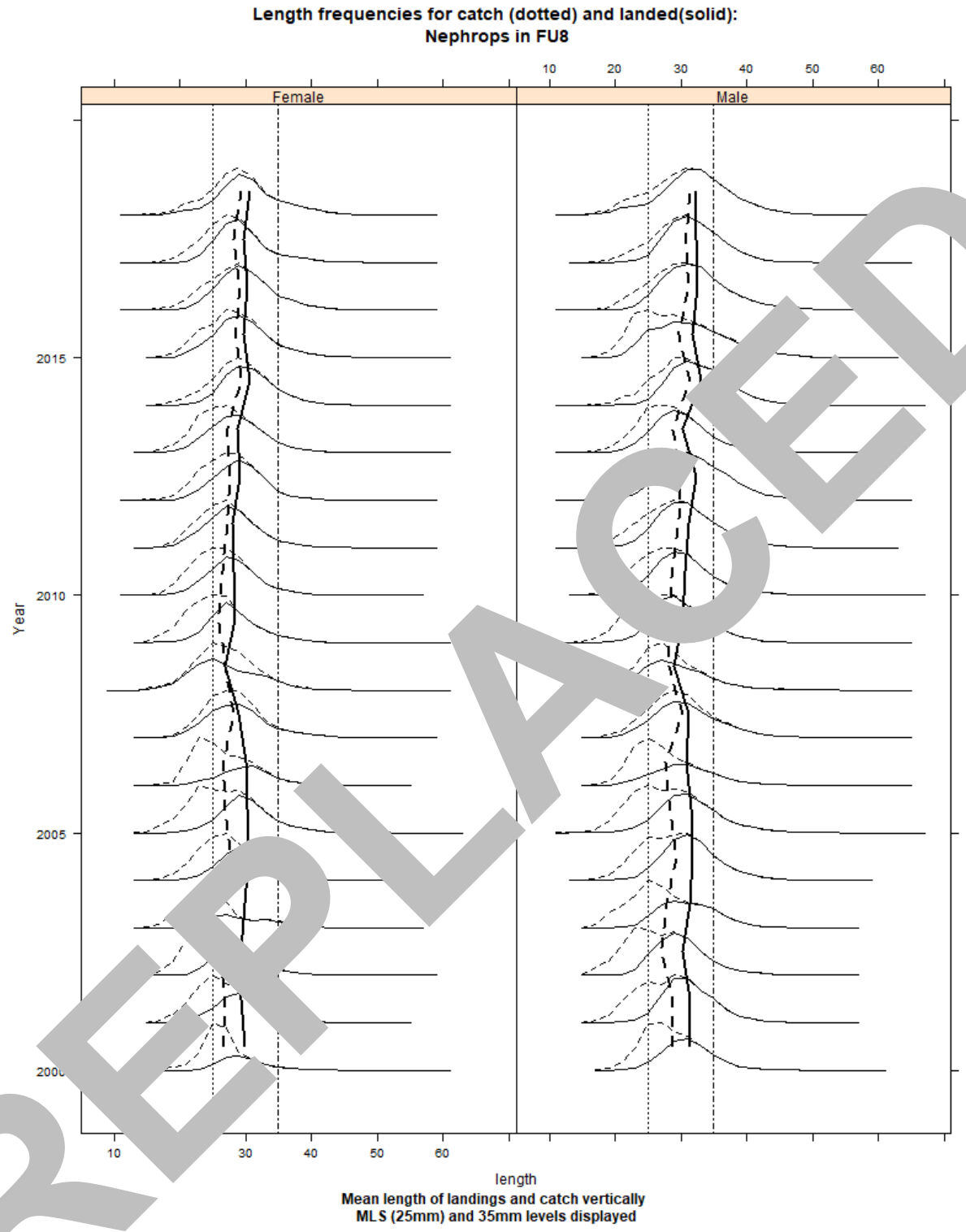

Norway lobster in Firth of Forth (FU 8). Catch length–frequency distribution and mean size in catches (broken vertical line) and landings (solid vertical line). Vertical straight lines are minimum landing size (25 mm) and 35 mm.

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