

Norway lobster (*Nephrops norvegicus*) in Division 4.a, Functional Unit 9 (central North Sea, Moray Firth)

ICES advice on fishing opportunities

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 1008 tonnes and 1307 tonnes. The entire range is considered precautionary when applying the ICES advice rule.

To ensure that the stock in Functional Unit 9 is exploited sustainably, management should be implemented at the functional unit level.

Stock development over time

The stock has been above $MSY B_{trigger}$ for the entire time-series. The harvest rate has fluctuated around F_{MSY} in recent years and is now just below F_{MSY} .

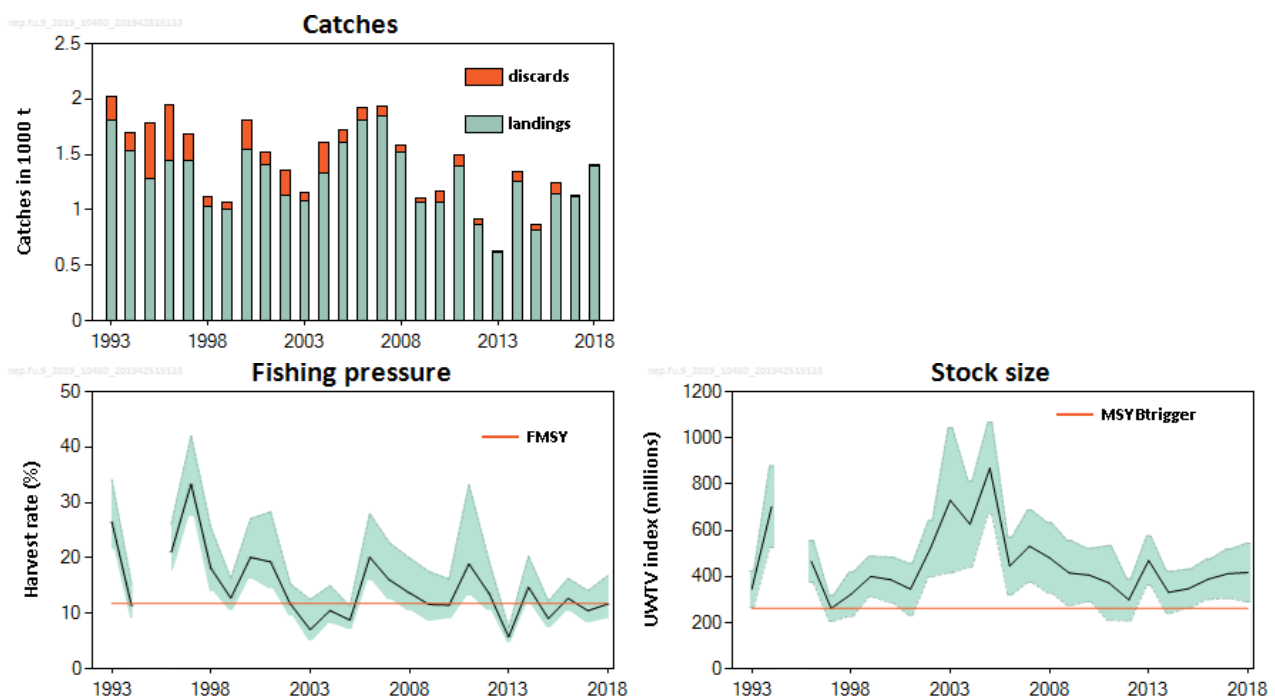


Figure 1 Norway lobster in Division 4.a, Functional Unit 9. Summary of the stock assessment. Long-term trends in catches, harvest rate (used as an F proxy), and underwater TV survey (UWTV) abundance (for animals greater than 17 mm carapace length). Orange lines show proxies for $MSY B_{trigger}$ and F_{MSY} . Shaded areas for harvest rate and abundance correspond to approximate 95% confidence intervals. Harvest rates prior to 2006 may be unreliable because of the 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 9. 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 reference points
Management plan	F_{MGT}	✗	✓	✓ Within range	MAP $MSY B_{trigger}$	✓	✓ Above

Catch scenarios

Table 2 Norway lobster in Division 4.a, Functional Unit 9. The basis for the catch scenarios.

Variable	Value	Notes
Stock abundance	417 million individuals	UWTV 2018
Mean weight in wanted catch	27.34 g	Average 2016–2018
Mean weight in unwanted catch	10.16 g	Average 2016–2018
Unwanted catch ratio (total)	7.2%	Average 2016–2018 (proportion by number)
Discard survival rate	25%	Proportion by number
Dead unwanted catch ratio*	5.5%	Average 2016–2018 (proportion by number)

Table 3 Norway lobster in Division 4.a, Functional Unit 9. 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							
MAP [^] : F_{MSY}	1307	1298	1271	27	9	11.8%	2.6%
$F = MAP^{\wedge} F_{MSY lower}$	1008	1001	980	21	7	9.1%	-21%
$F = MAP^{\wedge} F_{MSY upper}^{***}$	1307	1298	1271	27	9	11.8%	2.6%
Other scenarios							
MSY approach	1307	1298	1271	27	9	11.8%	2.6%
$F_{0.1}$	864	858	840	18	6	7.8%	-32%
$F_{2016-2018}$	1286	1277	1250	27	9	11.6%	0.94%
F_{2018}	1297	1288	1261	27	9	11.7%	1.81%
F_{max}	1652	1640	1605	35	12	14.9%	30%

Catch scenarios assuming zero discards

Basis	Total catch	Wanted catch	Unwanted catch	Harvest rate *	% advice change **
	WC+UC	WC	UC	for WC+UC	
EU MAP [^] : F_{MSY}	1284	1248	36	11.8	0.78%
F = MAP $F_{MSY\ lower}$	991	963	28	9.1	-22%
F = MAP $F_{MSY\ upper}^{***}$	1284	1248	36	11.8	0.78%
Other scenarios					
MSY approach	1284	1248	36	11.8	0.78%
$F_{0.1}$	849	825	24	7.8	-33%
$F_{2016-2018}$	1262	1227	35	11.6	-0.94%
F_{2018}	1274	1238	36	11.7	0.00%
F_{max}	1621	1576	45	14.9	27%

[^] EU multiannual plan (EU MAP) for the North Sea (EU, 2018).

* Calculated for dead removals.

** Total catch 2020 relative to advice value 2019 (1 274 t).

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

The change in advice (+2.6% for the EU MAP F_{MSY} scenario) from June 2018 is a result of the inclusion of the 2018 survey, as well as updating mean weights and discard rates.

Basis of the advice

Table 4 Norway lobster in Division 4.a, Functional Unit 9. The basis of the advice.

Advice basis	EU multiannual plan (EU 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 length and sex composition of the catches is considered to be well-sampled. Catch sampling has been conducted on a quarterly basis for Scottish Norway lobster trawlers in this fishery since 1990 and is considered to represent the fishery adequately. The underwater TV (UWTV) surveys have been conducted for this stock since 1993, with a continuous annual series available since 1996.

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

Issues relevant for the advice

ICES was requested to provide advice based on the agreed EU MAP.

The results of the 2019 UWTV survey are expected to be available by October 2019, and the advice will be updated before the end of 2019 if there is significant deviation of the abundance estimate from the 2018 UWTV survey.

The EU landing obligation was phased in to all catches of Norway lobster fisheries in ICES Subarea 4 since 2016, with several exemptions still in place. Observations from the 2016–2018 fishery indicate that discarding above the minimum conservation reference size (MCRS) has declined (Figure 3). ICES is providing, as a consequence, advice for 2020 assuming the average discard ratio observed over the last three years. This is considered to be a more realistic assumption.

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, 2016) because the survival rates estimated by Fox and Albalat (2018) have not been evaluated by ICES.

In 2016–2018, no Norway lobster were recorded as below MCRS (BMS category) in FU 9, despite catches having been observed below the MCRS (Figure 3).

Catches have increased to levels above ICES advice since 2016, highlighting the issue that current management arrangements are not sufficient to contain the fishery within the sustainable limits determined by ICES. A single total allowable catch (TAC) covers all of ICES Subarea 4, except the Norwegian Deep. Management should ensure that fishing opportunities are in line with the scale of the resources in each of the stocks.

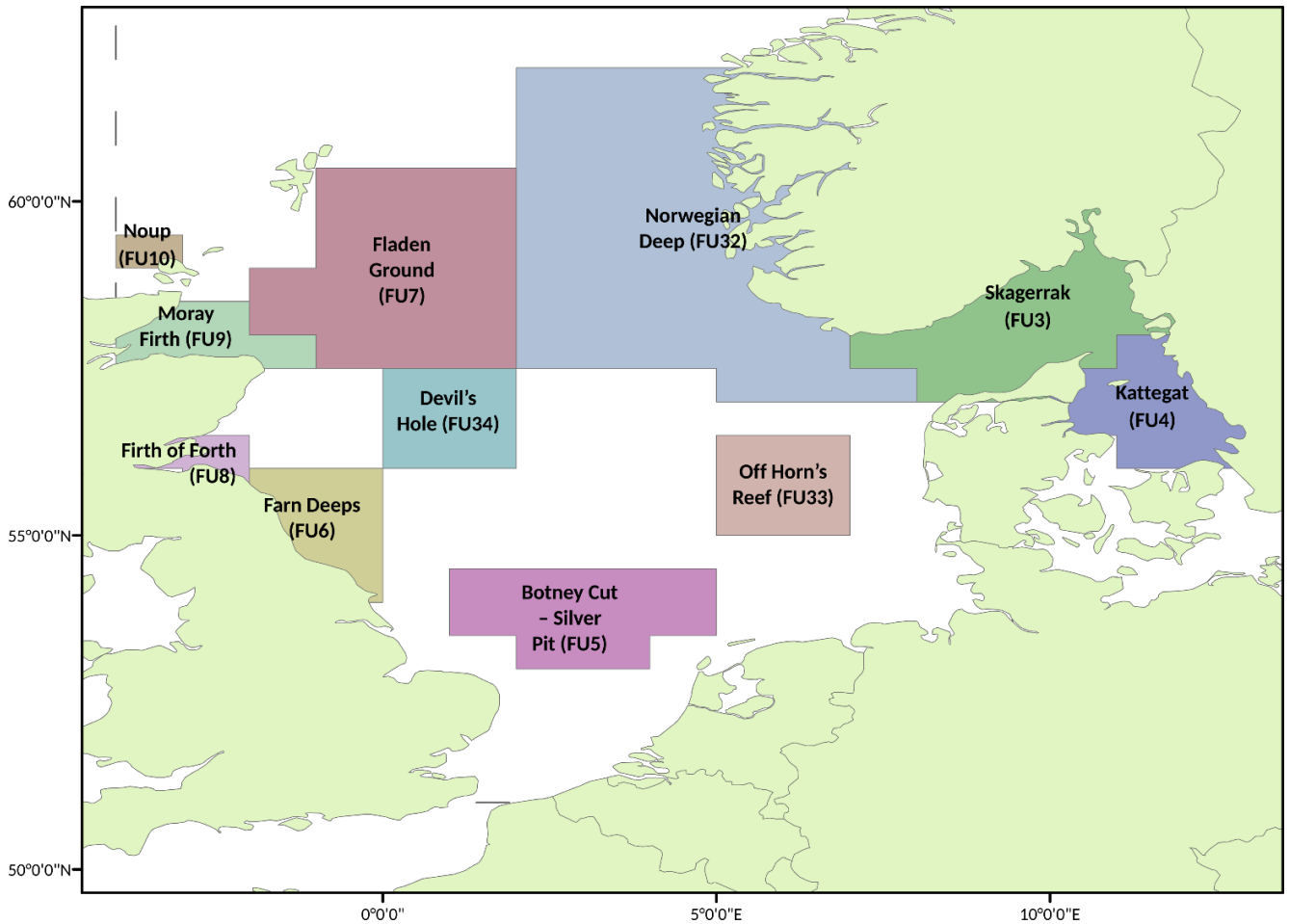


Figure 2 Norway lobster functional units in the North Sea and Skagerrak/Kattegat region.

Reference points

Table 5 Norway lobster in Division 4.a, Functional Unit 9. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	262 million individuals	Lowest observed UWTV survey estimate of abundance (1993–2010)	ICES (2010)
	F_{MSY}	Harvest rate 11.8%	Proxy, equivalent to $F_{35\%SPR}$ for combined sexes	ICES (2012)
Precautionary approach	B_{lim}	Not defined		
	B_{pa}	Not defined		
	F_{lim}	Not defined		
	F_{pa}	Not defined		
EU Management plan (MAP)*	MAP MSY $B_{trigger}$	262 million	MSY $B_{trigger}$	ICES (2010)
	MAP B_{lim}	Not defined		
	MAP F_{MSY}	Harvest rate 11.8%	F_{MSY}	ICES (2012)
	MAP range F_{lower}	Harvest rate 9.1–11.8%	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 11.8–11.8%	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY	ICES (2015)

* 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 9. 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 9 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 52% of the landings in 2018). 49% of the discards were obtained from sampling (51% 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	Latest benchmark was performed in 2009 (ICES, 2009).
Working group	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 9. In 2018, approximately 65% 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 9. ICES advice and ICES estimated landings and discards. All weights are in tonnes.

Year	ICES advice	Landings corresponding to advice	Catch corresponding to advice	ICES landings	ICES total discards *
1993				1809	214
1994				1537	153
1995				1279	502
1996	<i>Status quo</i> TAC			1451	492
1997	<i>Status quo</i> TAC			1447	230
1998				1032	89
1999				1009	55

Year	ICES advice	Landings corresponding to advice	Catch corresponding to advice	ICES landings	ICES total discards *
2000				1539	269
2001				1401	125
2002	Catches to be maintained at the 2000 level			1132	220
2003	Catches to be maintained at the 2000 level			1080	70
2004	Catches to be maintained at the 2000 level			1333	272
2005	Catches to be maintained at the 2000 level			1605	122
2006	No increase in effort			1805	117
2007	No increase in effort, and harvest rate below 15%	2400		1843	95
2008	No new advice, same as for 2007	2400		1515	74
2009	No increase in effort and recent average landings	< 1800		1067	33
2010	Harvest rate no greater than that equivalent to fishing at F ₂₀₀₈	< 1400		1063	104
2011	MSY transition	< 1300		1391	102
2012	MSY approach	< 1100		866	54
2013	MSY approach	< 1000		623	10
2014	MSY approach	< 739		1253	87
2015	MSY approach	< 1185		816	56
2016	MSY approach	< 923	≤ 943**	1146	95 ^{^^}
2017	MSY approach		≤ 1070***	1119	12 ^{^^}
2018	MSY approach		≤ 1219 [^]	1399	4 ^{^^}
2019	MAP ^{^^} F ranges (Harvest rate = 9.1–11.8%)		982–1 274 [^]		
2020	Management Plan		1008–1307 [^]		

* Dead + surviving discards.

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

*** Assuming discarding below MCRCs 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).

History of the catch and landings

Table 8 Norway lobster in Division 4.a, Functional Unit 9. Catch distribution by fleet in 2018 as estimated by ICES.

Catch (2018)		Wanted catches			Unwanted catches	
99.9% dead	0.1% surviving	Directed <i>Nephrops</i> fishery TR2 46%	Mixed <i>Nephrops</i> /demersal fishery TR1 53%	1% creel	75% dead	25% surviving
1403 tonnes		1399 tonnes			4 tonnes	

Table 9 Norway lobster in Division 4.a, Functional Unit 9. ICES estimates of landings by country (presented by gear for Scotland), and discards. All weights are in tonnes.

Year	UK Scotland				UK England	Total landings	Total discards **
	<i>Nephrops</i> trawl	Other trawl	Creel	Sub-total			
1981	1299	117	0	1416	0	1416	
1982	1033	86	0	1119	0	1119	
1983	850	91	0	941	0	941	
1984	960	209	0	1169	0	1169	
1985	1908	173	0	2081	0	2081	
1986	1932	211	0	2143	0	2143	

Year	UK Scotland				UK England	Total landings	Total discards **
	Nephrops trawl	Other trawl	Creel	Sub-total			
1987	1724	268	0	1992	0	1992	
1988	1637	322	0	1959	0	1959	
1989	2102	474	0	2576	0	2576	
1990	1698	339	0	2037	0	2037	
1991	1285	235	0	1520	0	1520	
1992	1285	306	0	1591	0	1591	
1993	1505	304	0	1809	0	1809	214
1994	1179	358	0	1537	0	1537	153
1995	967	312	0	1279	0	1279	502
1996	1084	364	1	1449	2	1451	492
1997	1103	343	0	1446	1	1447	230
1998	739	289	4	1032	0	1032	89
1999	813	194	2	1009	0	1009	55
2000	1341	196	2	1539	0	1539	269
2001	1186	213	2	1401	0	1401	125
2002	883	247	2	1132	0	1132	220
2003	873	196	11	1080	0	1080	70
2004	1222	103	8	1333	0	1333	272
2005	1526	64	12	1602	3	1605	122
2006	1751	42	11	1804	1	1805	117
2007	1818	17	6	1841	2	1843	95
2008	1444	68	3	1515	0	1515	74
2009	1033	31	2	1066	1	1067	33
2010	1026	28	9	1063	0	1063	104
2011	1358	23	9	1390	1	1391	102
2012	834	24	8	866	0	866	54
2013	497	116	7	620	3	623	10
2014	1183	56	2	1241	12	1253	87
2015	774	40	0	814	2	816	56
2016	1105	37	4	1146	< 0.5	1146	95 ^
2017	931	183	4	1118	1	1119	12 ^
2018 *	1204	184	9	1397	2	1399	4 ^

* 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 9. Assessment summary.

Year	Abundance* (millions)	2 standard deviations	Harvest rate (% by number)	Landings numbers (millions)	Discards numbers (millions)	Removals numbers (millions)	Landings (tonnes)	Discards (tonnes)	Dead discards (tonnes)	Discard ratio (% by number)	Mean weight in landings (grammes)	Mean weight in discards (grammes)	Dead discard ratio (% by number)
1993	345	78	26.5	77	19	91	1809	214	161	19.8	23.42	11.26	15.6
1994	702	176	11.4	69	15	80	1537	153	115	17.8	22.25	10.21	14
1995	NA	NA	NA	62	72	116	1279	502	376	53.8	20.59	6.93	46.6
1996	465	90	21.1	68	41	98	1451	492	369	37.5	21.4	12.11	31
1997	262	55	33.3	71	22	87	1447	230	172	23.8	20.43	10.42	18.9
1998	323	95	18.1	50	11	58	1032	89	67	17.6	20.47	8.29	13.8
1999	400	87	12.8	46	6	51	1009	55	41	12	21.79	8.63	9.3
2000	386	98	20.1	61	23	78	1539	269	201	27.5	25.44	11.73	22.1
2001	345	112	19.3	58	11	66	1401	125	94	16.3	24.18	11.04	12.8
2002	521	121	11.7	41	27	61	1132	220	165	39.7	27.68	8.18	33.1
2003	730	314	7.1	46	7	52	1080	70	52	13.7	23.32	9.51	10.6
2004	626	186	10.5	48	23	66	1333	272	204	32.6	27.57	11.62	26.6
2005	869	198	8.8	67	12	76	1605	122	92	15.0	23.84	10.31	11.7
2006	445	124	20.1	81	12	90	1805	117	87	12.8	22.34	9.86	9.9
2007	531	156	16	80	7	85	1843	95	72	7.9	23.04	13.95	6.0
2008	481	151	13.7	60	8	66	1515	74	55	11.4	25.29	9.60	8.8
2009	415	140	11.6	45	4	48	1067	33	25	7.6	23.46	8.72	5.8
2010	406	115	11.5	39	10	47	1063	104	78	19.8	26.94	10.63	15.7
2011	372	161	18.9	63	10	70	1391	102	77	13.9	21.63	10.12	10.8
2012	299	90	13.7	37	6	41	866	54	41	13.2	23.16	9.72	10.3
2013	469	106	5.8	26	1	27	623	10	8	3.3	24.95	11.21	2.5
2014	331	90	14.7	43	7	49	1253	87	65	14.6	28.94	11.79	11.3
2015	347	84	9.1	28	5	32	816	56	42	15.1	29.10	11.35	11.8
2016	388	87	12.7	42	9	49	1146	95	71	18.0	26.83	10.16	14.2
2017	412	106	10.5	42	1	43	1119	12	9	2.6	26.34	10.74	2
2018	417	126	11.7	48	0	49	1399	4	3	0.9	28.86	9.58	0.7

* For Norway lobster greater than 17 mm carapace length.

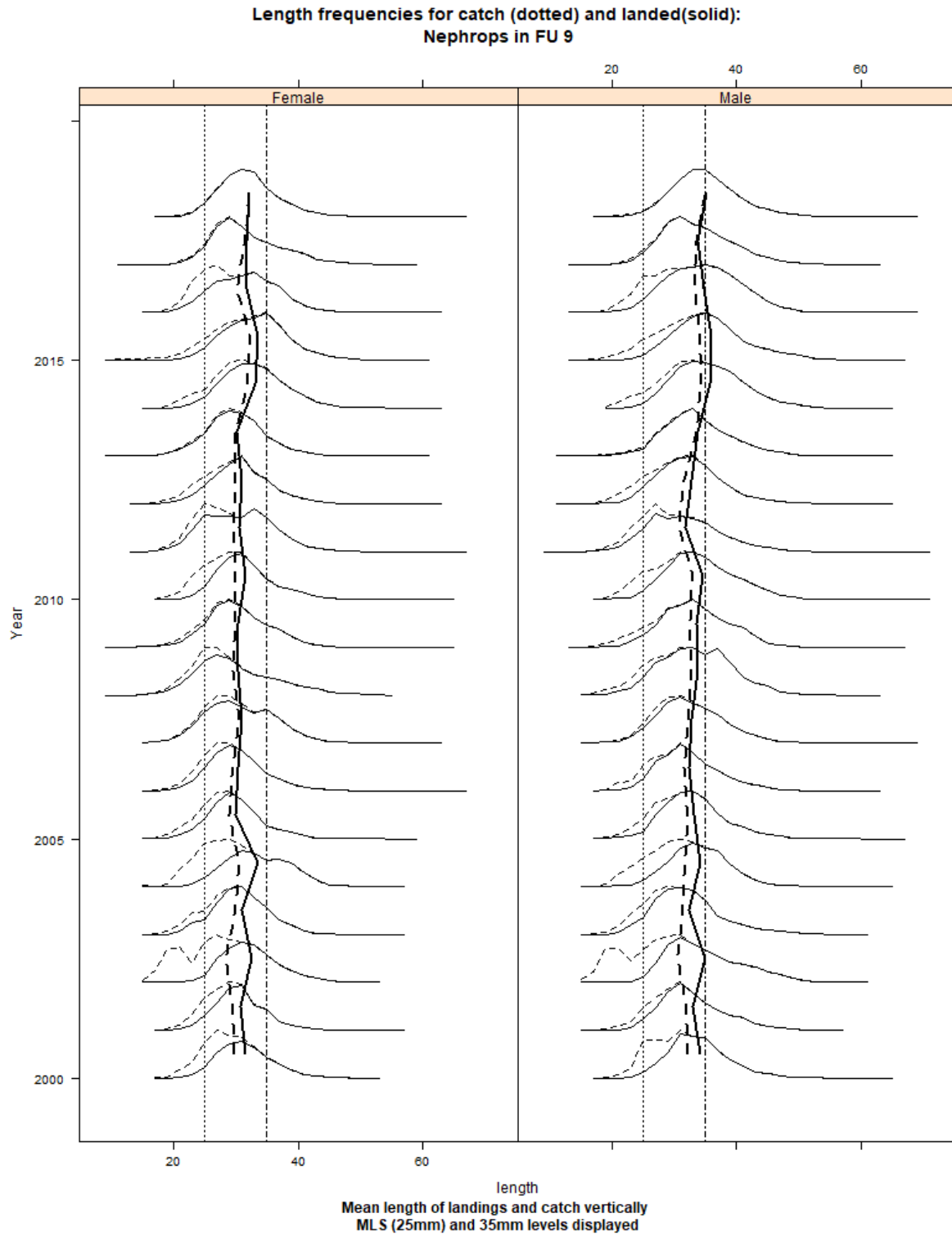


Figure 3 Norway lobster in Moray Firth (FU 9). Catch length–frequency distribution and mean size in catches (broken vertical line) and landings (solid vertical line). Vertical straight lines are minimum landing size (25 mm) and 35 mm.

Sources and references

- EU. 2018. Regulation (EU) 2018/973 of the European Parliament and of the council of 4 July 2018 establishing a multiannual plan for demersal stocks in the North Sea and the fisheries exploiting those stocks, specifying details of the implementation of the landing obligation in the North Sea and repealing Council Regulations (EC) No 676/2007 and (EC) No 1342/2008. Official Journal of the European Union, L 179: 1–13. <http://data.europa.eu/eli/reg/2018/973/oj>
- Fox, C. and Albalat, A. 2018. Post-catch survivability of discarded Norway lobsters (*Nephrops norvegicus*): Further investigations within the large-scale fleet operation. Final project report FIS projects FIS015. Fisheries Innovation Scotland. 219 pp. <https://fiscot.org/wp-content/uploads/2019/06/fis015-revised.pdf>. Accessed: 18 June 2019.
- ICES. 2009. Report of the Benchmark Workshop on *Nephrops* (WKNEPH), 2–6 March 2009, Aberdeen, UK. ICES CM 2009/ACOM:33. 156 pp. <https://doi.org/10.17895/ices.pub.5337>
- 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 CM 2010/ACOM:13. 1058 pp. <https://doi.org/10.17895/ices.pub.5335>
- ICES. 2012. Report of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK), 4–10 May 2011, ICES Headquarters, Copenhagen. ICES CM 2011/ACOM:13. 1197 pp.
- ICES. 2015. 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. 2018. 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. 2019. Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK). ICES Scientific Reports. 1:7. <http://doi.org/10.17895/ices.pub.5402>
- Morizur, Y. 1982. Estimation de la mortalité pour quelque stocks de langoustine, *Nephrops norvegicus*. ICES CM 1982/K:10. 19 pp.

Recommended citation: ICES. 2019. Norway lobster (*Nephrops norvegicus*) in Division 4.a, Functional Unit 9 (central North Sea, Moray Firth). In Report of the ICES Advisory Committee, 2019. ICES Advice 2019, nep.fu.9, <https://doi.org/10.17895/ices.advice.4868>