

Norway lobster (*Nephrops norvegicus*) in Division 6.a, Functional Unit 12 (West of Scotland, South Minch)

ICES advice on fishing opportunities

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 2015–2017, catches in 2019 should be no more than 5844 tonnes.

To ensure that the stock in Functional Unit 12 is exploited sustainably, management should be implemented at the functional unit level.

Stock development over time

The harvest rate has increased since 2014 but remains below F_{MSY} . The stock abundance has generally fluctuated above $MSY B_{trigger}$.

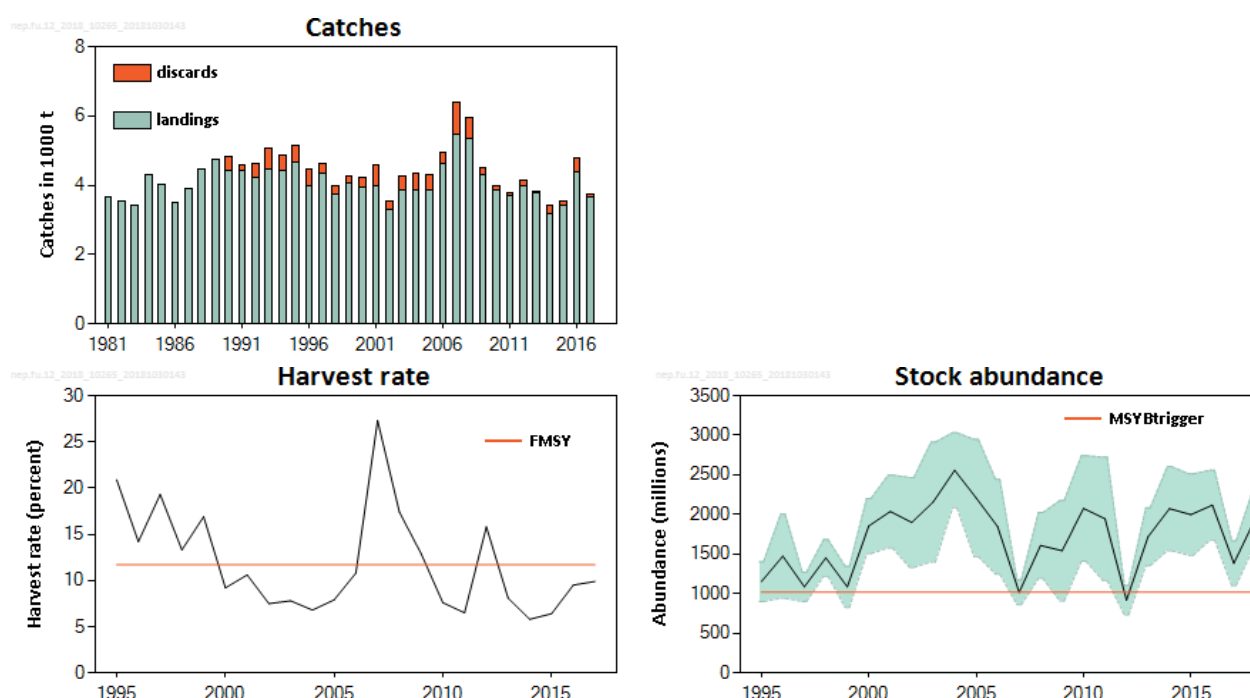


Figure 1 Norway lobster in Division 6.a, Functional Unit 12. Summary of the stock assessment. Catches (discard data only available from 1990), harvest rate (sum of landings and dead discards in numbers, divided by total abundance), survey abundance (Underwater TV, millions; SSB proxy; 95% confidence intervals). Harvest rates before 2006 may be unreliable because of underreporting of landings. Orange lines represent $MSY B_{trigger}$ and the F_{MSY} harvest rate.

Stock and exploitation status

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

Table 1 Norway lobster in Division 6.a, Functional Unit 12. 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 potential reference points		B_{pa}, B_{lim}	✓	✓ Above potential reference points
Management plan	F_{MGT}	—	—	— Not applicable		B_{MGT}	—	— Not applicable

Catch scenarios

Table 2 Norway lobster in Division 6.a, Functional Unit 12. The basis for the catch scenarios.

Variable	Value	Notes
Stock abundance (2019)	1946 million	UWTV survey 2018 (number of individuals)
Mean weight in wanted catch	26.77 g	Average 1999–2017
Mean weight in unwanted catch	9.94 g	Average 1999–2017
Unwanted catch	10.6%	Average 2015–2017 (proportion by number)
Discards survival	25%	Proportion by number
Dead unwanted catch	8.2%	Average 2015–2017 (proportion by number)

Table 3 Norway lobster in Division 6.a, Functional Unit 12. Annual catch advice and scenarios; discarding is assumed to continue at recent average. 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							
MSY approach	5844	5782	5597	185	62	11.7	42
Other options							
F _{MSY lower}	4645	4596	4449	147	49	9.3	13
F _{MSY upper} ***	5844	5782	5597	185	62	11.7	42
F ₂₀₁₇	4944	4892	4736	156	52	9.9	20

* By number.

** Advice value for 2019 relative to the advice value for 2018.

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

The change in advice is a result of the increase in stock abundance.

Basis of the advice

Table 4 Norway lobster in Division 6.a, Functional Unit 12. The basis of the advice.

Advice basis	MSY approach.
Management plan	The EU has proposed a multiannual management plan for the Western Waters, which is not yet finalised (EU, 2018).

Quality of the assessment

The underwater TV survey (UWTV) has provided abundance estimates for this functional unit (FU) with acceptable precision since 1995.

Some patches of muddy sediment supporting *Nephrops* populations in the inshore areas and sea lochs of FU 12 are not routinely surveyed and not included in the estimate of abundance. The current estimate of abundance is therefore likely to be a slight underestimate of actual abundance.

In 2017, observer sampling from the Scottish Industry–Science observer sampling scheme was extended to include sampling of Norway lobster catches in FU 12. As a result, the sampling levels have increased.

Biological sampling for this stock is considered sufficient.

The long-term average (rather than a three-year average) was considered to be more appropriate as input for the mean weight in landings and discards in the calculation of catch scenarios; this is due to interannual variation.

Issues relevant for the advice

From 2016 the EU landing obligation was applied to all catches of Norway lobster fisheries in ICES Subarea 6, with several exemptions. Observations from the 2016–2017 fishery indicate that some 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 as observed over the last three years, which is considered to be a more realistic assumption.

For FU 12, the absolute density observed in the UWTV survey is medium (~ 0.44 individuals m^{-2}). This suggests the stock may have a medium productivity capability. The fishery in this area has been in existence since the 1960s. Historical harvest rates in this FU have been variable, but generally around $F_{35\%SPR}$. $F_{35\%SPR}$ (combined between sexes) is expected to deliver high long-term yield with a low probability of recruitment overfishing and is therefore chosen as proxy for F_{MSY} .

A single TAC covers the entire ICES Subarea 6. Management should be implemented at the functional unit level to ensure that fishing opportunities are in line with the scale of the resource for each of the stocks and the corresponding MSY approach in each of the stocks.

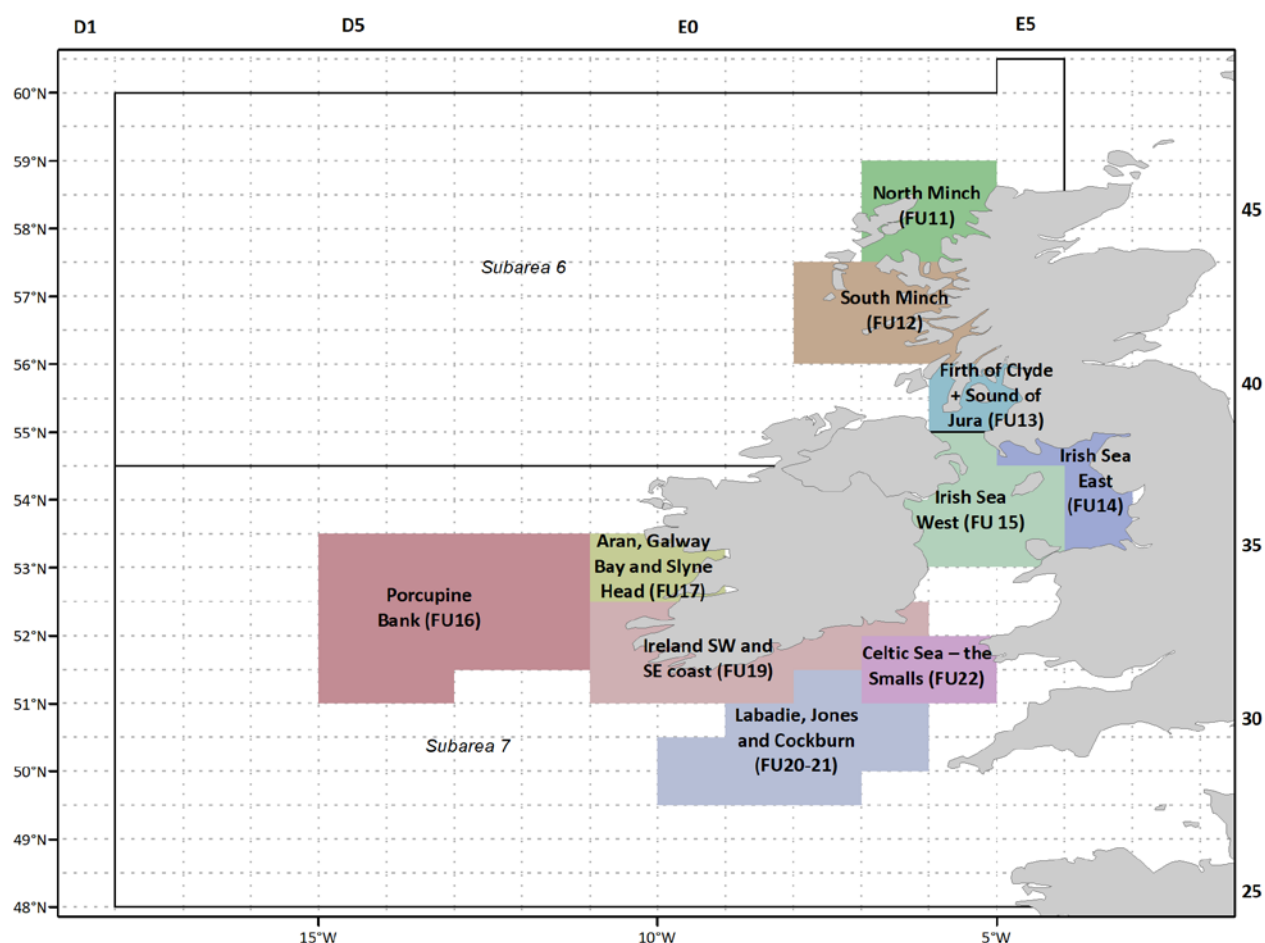


Figure 2 Norway lobster functional units in subareas 6 and 7.

Reference points

Table 5 Norway lobster in Division 6.a, Functional Unit 12. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	1020 million individuals	Lowest observed abundance estimate from UWTV survey time-series as calculated in 2010.	ICES (2016)
	F_{MSY}	11.7% harvest rate	F_{MSY} proxy, equivalent to the $F_{35\%SPR}$ for combined sexes derived from the length-based per recruit analysis.	ICES (2016)
Precautionary approach	B_{lim}	Not defined		
	B_{pa}	Not defined		
	F_{lim}	Not defined		
	F_{pa}	Not defined		
Management plan*	MAP MSY $B_{trigger}$	1020 million individuals	MSY $B_{trigger}$	EU (2018)
	MAP B_{lim}	Not defined		
	MAP F_{MSY}	11.7% harvest rate	F_{MSY}	EU (2018)
	MAP range F_{MSY} lower	9.3–11.7% harvest rate	Consistent with ranges provided by ICES (2016), resulting in no more than 5% reduction in long-term yield compared with MSY.	EU (2018)
	MAP range F_{MSY} upper	11.7–11.7% harvest rate	F_{MSY} upper value capped at F_{MSY} because it has not been possible to evaluate the probability of $SSB < B_{lim}$ (ICES, 2016).	EU (2018)

*Proposed EU multiannual plan (MAP) for the Western Waters (EU, 2018).

Basis of the assessment

Table 6 Norway lobster in Division 6.a, Functional Unit 12. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018a).
Assessment type	Underwater TV survey.
Input data	One survey index (UWTV-FU12); commercial catches (international landings, length frequencies from Scottish catch sampling); fixed maturity parameters (from survey data) and natural mortality. Discard survival rate.
Discards and bycatch	Included in the assessment since 1990; data series from the majority of the main fleets cover almost all landings.
Indicators	Size structure, mean size, and sex ratio of catches.
Other information	The latest benchmark (based on the UWTV survey) was performed in 2009 (WKNEPH; ICES, 2009).
Working group	Working Group for the Celtic Seas Ecoregion (WGCSE)

Information from stakeholders

No additional information is available for this stock.

History of the advice, catch, and management

Table 7 Norway lobster in Division 6.a, Functional Unit 12. ICES advice, landings, and discards. All weights are in tonnes.

Year	ICES advice	Landings advice	Catch advice	ICES landings	Total discards*
1989				4745	
1990				4430	384
1991				4442	122
1992	Maintain current effort			4237	385
1993	Maintain current effort			4458	602
1994	Maintain current effort			4414	435
1995	Maintain current effort			4682	455
1996	Maintain current effort			3995	457
1997	As for 1996			4344	271
1998	Maintain current effort			3730	233
1999	As for 1998			4052	206
2000	Maintain current effort			3953	284
2001	As for 2000			3991	591
2002	Maintain current effort			3305	247
2003	As for 2002			3879	381
2004	Maintain current effort			3869	454
2005	As for 2004			3848	452
2006	No increase in effort			4633	324
2007	No increase in effort and harvest rate of 15%	7200		5471	903
2008	As for 2007	7200		5356	605
2009	No increase effort and recent average catch	< 5000		4285	216
2010	Harvest rate no greater than that equivalent to fishing at $F_{0.1}$	< 4100		3846	133
2011	MSY transition scheme	< 4000		3702	92
2012	MSY approach	< 5500		3989	145
2013	MSY approach	< 5800		3776	50
2014	MSY approach	< 5211		3179	233
2015	MSY approach	< 6382		3400	121
2016	MSY approach		$\leq 6163^{**}$	4402	365
2017	MSY approach		$\leq 6419^{***}$	3652	105
2018	MSY approach		$\leq 4112^{***}$		
2019	MSY approach		$\leq 5844^{***}$		

* Dead + surviving discards.

** Assuming all catches are landed.

*** Assuming recent discard rates.

History of the catch and landings

Table 8 Norway lobster in Division 6.a, Functional Unit 12. Catch distribution by fleet in 2017 as estimated by ICES.

Catch		Landings			Discards	
99.3% dead	0.7% surviving	Directed <i>Nephrops</i> fishery		Mixed <i>Nephrops</i> /demersal fishery	75% dead	25% surviving
3757 t		77% trawl	21.5% creels	1.5%	105 t	
		3652 t				

Table 9 Norway lobster in Division 6.a, Functional Unit 12. History of ICES estimates of landings (for Scotland by gear) and total discards. All weights are in tonnes.

Year	UK Scotland				Other UK	Ireland	Total	Total discards*
	<i>Nephrops</i> trawl	Other trawl	Creel	Subtotal				
1981	2966	254	432	3652	0	0	3652	
1982	2925	206	421	3552	0	0	3552	
1983	2595	362	456	3413	0	0	3413	
1984	3229	477	594	4300	0	0	4300	
1985	3096	424	488	4008	0	0	4008	
1986	2694	288	502	3484	0	0	3484	
1987	2928	418	546	3892	0	0	3892	
1988	3544	364	555	4463	10	0	4473	
1989	3846	338	561	4745	0	0	4745	
1990	3732	263	435	4430	0	0	4430	384
1991	3596	342	503	4441	1	0	4442	122
1992	3478	209	549	4236	1	0	4237	385
1993	3609	194	650	4453	5	0	4458	602
1994	3742	264	405	4411	3	0	4414	435
1995	3443	717	508	4668	14	0	4682	455
1996	3108	417	469	3994	1	0	3995	457
1997	3518	329	493	4340	3	1	4344	271
1998	2851	340	538	3729	0	1	3730	233
1999	3165	359	514	4038	0	14	4052	206
2000	2940	311	700	3951	0	2	3953	284
2001	2823	391	768	3982	0	9	3991	591
2002	2234	314	743	3291	0	14	3305	247
2003	2812	203	858	3873	0	6	3879	381
2004	2864	105	879	3848	0	21	3869	454
2005	2812	46	955	3813	1	34	3848	452
2006	3570	97	922	4589	9	35	4633	324
2007	4437	21	959	5417	19	35	5471	903
2008	4433	12	896	5341	2	13	5356	605
2009	3346	24	900	4270	4	11	4285	216
2010	2836	19	969	3824	16	6	3846	133
2011	2876	11	783	3670	23	9	3702	92
2012	3159	32	773	3964	19	6	3989	145
2013	2490	543	729	3762	13	1	3776	50
2014	2490	3	637	3130	32	17	3179	233
2015	2662	18	665	3345	22	33	3400	121
2016	3450	22	838	4310	33	59	4402	365
2017	2741	54	768	3563	23	66	3652	105

* Dead + surviving discards.

Summary of the assessment

Table 10 Norway lobster in Division 6.a, Functional Unit 12. Assessment summary.

Year	UWTV abundance estimate	95% CI	Harvest rate (by number)*	Landings (in numbers)*	Total discards (in numbers)**	Removals (in numbers)	Landings*	Total discards**	Discard proportion (by number)	Mean weight in landings	Mean weight (in discards)	Dead discard proportion (by number)
	millions		%	millions			tonnes		%	grammes		%
1995	1152	251	20.9	213	37	241	4682	455	14.8	21.96	12.28	11.5
1996	1473	530	14.2	173	48	209	3995	457	21.6	23.1	9.61	17.1
1997	1086	185	19.3	186	31	209	4344	271	14.3	23.37	8.7	11.2
1998	1452	232	13.3	168	32	192	3730	233	16.1	22.18	7.23	12.6
1999	1086	260	16.9	161	29	183	4052	206	15.4	25.14	7	12
2000	1854	348	9.2	145	33	170	3953	284	18.7	27.3	8.5	14.7
2001	2037	459	10.6	168	65	216	3991	591	27.9	23.79	9.11	22.5
2002	1899	567	7.5	123	26	143	3305	247	17.6	26.83	9.37	13.8
2003	2157	756	7.8	139	38	168	3879	381	21.3	27.86	10.1	16.9
2004	2558	473	6.8	141	44	175	3869	454	23.8	27.37	10.26	19
2005	2208	740	7.9	137	49	174	3848	452	26.5	28.11	9.17	21.2
2006	1845	598	10.8	177	30	199	4633	324	14.3	26.24	10.97	11.1
2007	1016	155	27.3	228	66	278	5471	903	22.4	23.95	13.73	17.8
2008	1608	415	17.4	224	74	279	5356	605	24.7	23.91	8.23	19.8
2009	1542	634	12.9	179	26	199	4285	216	12.5	23.87	8.44	9.6
2010	2076	665	7.6	149	12	158	3846	133	7.7	25.86	10.76	5.9
2011	1945	778	6.5	118	11	126	3702	92	8.2	31.1	8.78	6.3
2012	919	185	15.8	133	16	145	3989	145	10.8	29.17	9.05	8.3
2013	1718	365	8.1	136	4	140	3776	50	3.1	27.48	11.31	2.4
2014	2073	530	5.8	105	19	120	3179	233	15.6	29.91	12.04	12.1
2015	1998	514	6.4	120	10	128	3400	121	7.7	28.15	12.04	5.9
2016	2118	440	9.5	177	31	201	4402	365	14.9	24.76	11.74	11.6
2017	1384	282	9.9	127	13	137	3652	105	9.1	27.76	8.29	7
2018	1946	371										

* Values prior to 2006 may be underestimates because of underreporting of landings.

** Dead + surviving discards.

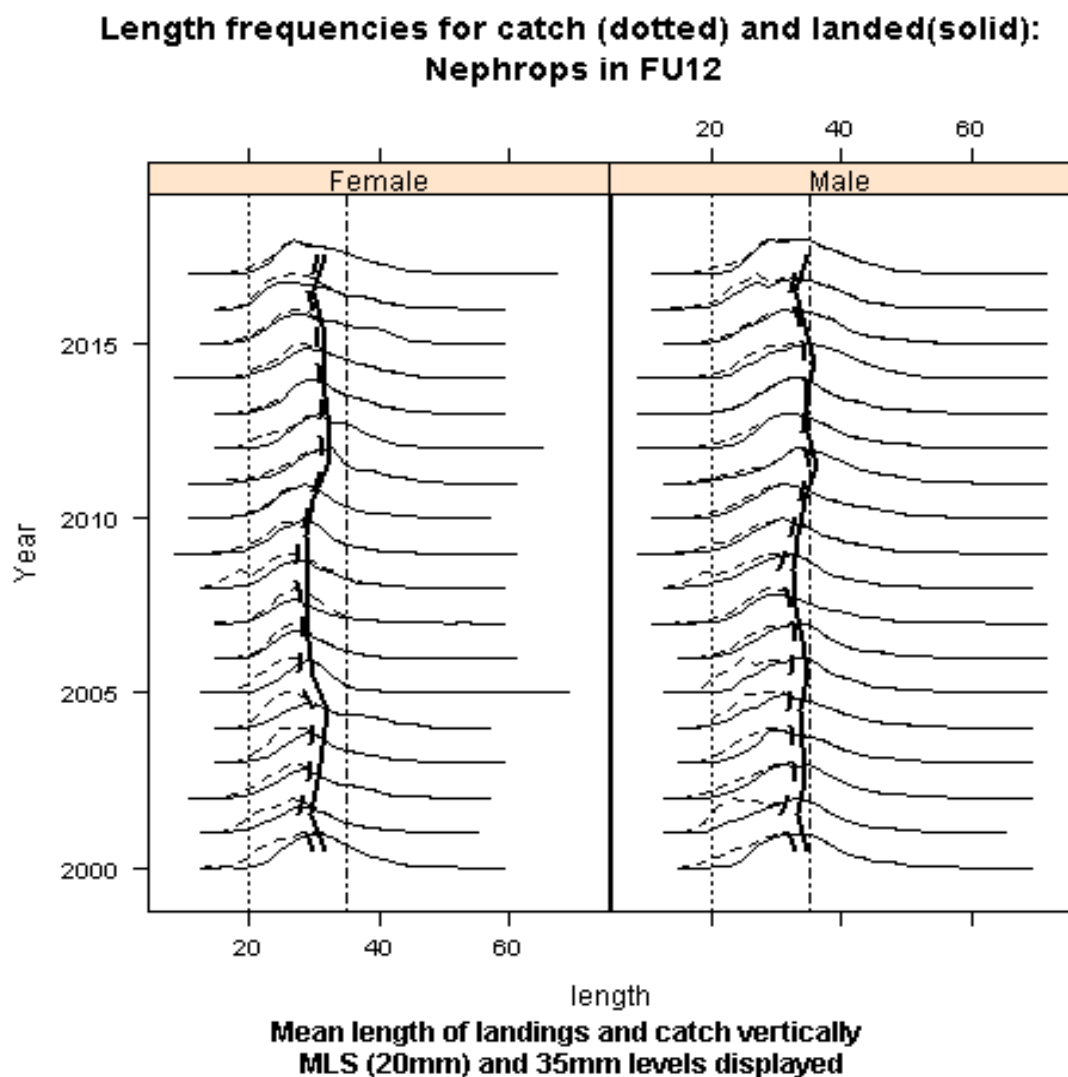


Figure 3 Norway lobster in Division 6.a, Functional Unit 12. Catch length–frequency distribution and mean size in catches and landings. Vertical lines are minimum landing size (20 mm) and 35 mm.

Sources and references

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