ICES
International Council for the Exploration of the Sea
CIEM
Conseil International pour l'Exploration de la Mer

Norway lobster (*Nephrops norvegicus*) in Division 6.a, Functional Unit 13 (West of Scotland, the Firth of Clyde, and the Sound of Jura)

ICES advice on fishing opportunities

ICES advises that when the EU multiannual plan (MAP) for Western Waters and adjacent waters is applied, catches in 2021 that correspond to the F ranges in the MAP are between 3638 tonnes and 5425 tonnes (3142–4791 tonnes for the Firth of Clyde and 496–634 tonnes for the Sound of Jura), assuming recent discard rates. The entire range is considered precautionary when applying the ICES advice rule.

To ensure that *Nephrops* stocks are exploited sustainably, management of *Nephrops* should be implemented at the functional unit level. In this particular functional unit (FU), additional measures should be implemented to ensure that landings taken in each subarea (the Firth of Clyde and the Sound of Jura) are in line with the advice.

Note: This advice sheet is abbreviated due to the COVID-19 disruption. The previous advice issued for 2020 is attached as Annex 1.
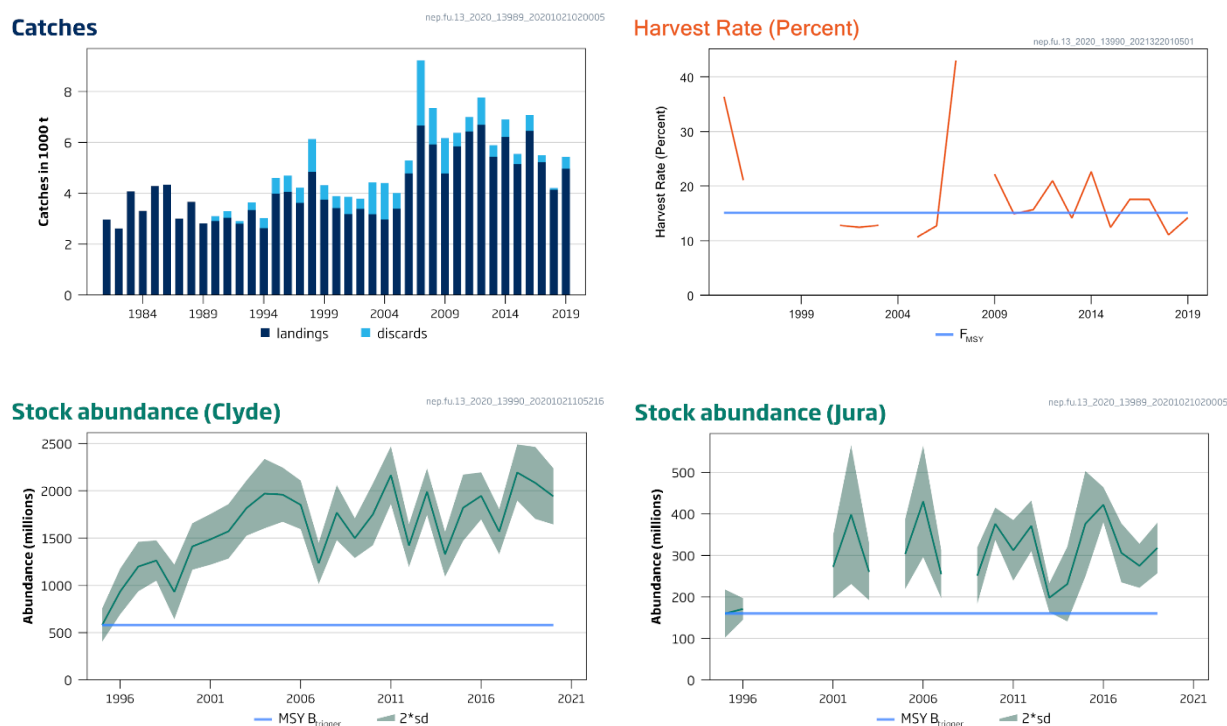
Stock development over time

Figure 1[†]   Norway lobster in Division 6.a, Functional Unit 13. Summary of the stock assessment. Catches (discard data only available from 1990), harvest rate (sum of landings and dead discards in numbers, divided by stock abundance), and stock abundance (underwater TV survey; 2*SD is approximate 95% confidence intervals). No abundance estimate is available for the Sound of Jura in 1997–2000, 2004, 2008, or 2020. Harvest rates before 2006 may be unreliable because of the underreporting of landings. Historical harvest rates were calculated using the total catch divided by the stock abundance for the two subareas combined. The abundance is presented separately for the Firth of Clyde and for the Sound of Jura.

[†] Version 2: Harvest rate figure corrected.

Stock and exploitation status

Table 1 Norway lobster in Division 6.a, Functional Unit 13. State of the stock and the fishery relative to reference points. The combined harvest rate is considered to be more representative of fishing pressure in the Firth of Clyde than in the Sound of Jura. Therefore, in the tables below the combined harvest rate is used for the Firth of Clyde, whereas fishing pressure on the Sound of Jura is unknown.

Firth of Clyde

		Fishing pressure				Stock size			
		2017	2018	2019			2018	2019	2020
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 the range	B_{MGT}	✅	✅	✅ Above trigger

Sound of Jura

		Fishing pressure				Stock size			
		2017	2018	2019			2018	2019	2020
Maximum sustainable yield	F_{MSY}	❓	❓	❓	Unknown	MSY $B_{trigger}$	✅	✅	❓ Unknown
Precautionary approach	F_{pa}, F_{lim}	❓	❓	❓	Unknown	B_{pa}, B_{lim}	✅	✅	❓ Unknown
Management plan	F_{MGT}	❓	❓	❓	Unknown	B_{MGT}	✅	✅	❓ Unknown

Catch scenarios

Table 2 Norway lobster in Division 6.a, Functional Unit 13. The basis for the catch scenarios.

Firth of Clyde

Variable	Value	Notes
Stock abundance (2021)	1941	UWTV Survey 2020; number of individuals in millions
Mean weight in projected landings	16.79	Average 2017–2019 (combined for the Firth of Clyde and the Sound of Jura); in grammes
Mean weight in projected discards	8.39	Average 2017–2019 (combined for the Firth of Clyde and the Sound of Jura); in grammes
Projected discards	10.3	Average 2017–2019 (combined for the Firth of Clyde and the Sound of Jura); percentage by number
Discards survival *	25	Percentage by number
Dead projected discards	7.9	Average 2017–2019 (combined for the Firth of Clyde and the Sound of Jura); percentage by number

*Only applied in scenarios where discarding is allowed.

Sound of Jura

Due to the lack of survey data in 2020, it was assumed that the stock abundance in 2020 is similar to the one in 2019. The basis for the catch scenarios in the Sound of Jura remains unchanged from last year's advice and is shown in Annex 1 (Table 2).

Table 3   Norway lobster in Division 6.a, Functional Unit 13. Annual catch scenarios. All weights are in tonnes. The figures in the table are rounded. Calculations were done with unrounded inputs and computed values may not match exactly when calculated using the rounded figures in the table.

Firth of Clyde   Catch scenarios assuming discarding continues at the recent average rate.

Basis	Total catch	Dead removals	Projected landings	Projected dead discards	Projected surviving discards	Harvest rate * %	% advice change **
	PL + PDD + PSD	PL + PDD	PL	PDD	PSD	for PL + PDD	
ICES advice basis							
EU MAP ^: F_{MSY}	4791	4726	4531	195	65	15.1	−8.3
F= MAP $F_{MSY\ lower}$	3142	3099	2971	128	43	9.9	−8.3
F = MAP $F_{MSY\ upper}$***	4791	4726	4531	195	65	15.1	−8.3
Other scenarios							
MSY approach	4791	4726	4531	195	65	15.1	−8.3
F_{2019}	4505	4444	4261	183	61	14.2	−13.8

Firth of Clyde   Catch scenarios assuming zero discards.

Basis	Total catch	Projected landings	Projected discards ^^	Harvest rate * %	% advice change **
	PL + PD	PL	PD	for PL + PD	
ICES advice basis					
EU MAP ^: F_{MSY}	4667	4414	253	15.1	−10.7
F = MAP $F_{MSY\ lower}$	3060	2894	166	9.9	−10.7
F = MAP $F_{MSY\ upper}$ ***	4667	4414	253	15.1	−10.7
Other scenarios					
MSY approach	4667	4414	253	15.1	−10.7
F_{2019}	4389	4151	238	14.2	−16

* By number.
** Advice basis values for 2021 relative to the 2020 advice values (MAP advice of 5227, 3428, and 5227 tonnes, respectively); other option values are relative to F_{MSY}.
*** $F_{MSY\ upper}$ = F_{MSY} for this stock.
^ EU multiannual plan (MAP) for the Western Waters and adjacent waters (EU, 2019).
^^ Represents the amount that would normally be discarded.

Sound of Jura

The catch advice for the Sound of Jura remains unchanged and the advice range is 496–634 tonnes, assuming recent discard rates. The catch scenario tables for the Sound of Jura are shown in Annex 1 (Table 3).

Quality of the assessment

Annual underwater television (UWTV) surveys are usually carried out for both subareas. The time-series for the Firth of Clyde has been continuous since 1995, and for the Sound of Jura since 2009. In 2020, sampling was not carried out at the Sound of Jura because of the COVID-19 pandemic.

History of the advice, catch, and management

Table 4   Norway lobster in Division 6.a, Functional Unit 13. ICES advice, landings, and discards. All weights are in tonnes.

Year	ICES advice	Landings advice for the Firth of Clyde (FU 13)	Landings advice for the Sound of Jura (FU 13)	Catch advice for the Firth of Clyde (FU 13)	Catch advice for the Sound of Jura (FU 13)	ICES landings	Total discards *
1989						2812	
1990						2909	193
1991						3038	247
1992	Maintain current effort					2803	100
1993	Maintain current effort					3343	295
1994	Maintain current effort					2630	397
1995	Maintain current effort					3987	619
1996	Maintain current effort					4057	635
1997	As for 1996					3621	598
1998	Maintain current effort					4841	1292
1999	As for 1998					3752	566
2000	Maintain current effort					3417	470
2001	As for 2000					3182	677
2002	Maintain current effort					3384	406
2003	As for 2002					3173	1247
2004	Maintain current effort					2973	1435
2005	As for 2004					3395	611
2006	No increase in effort					4780	515
2007	No increase in effort and harvest rate of 15%	3765				6660	2566
2008	As for 2007	3765				5923	1433
2009	No increase in effort and recent average catch	< 5700				4779	1390
2010	Harvest rate no greater than that equivalent to fishing at $F_{0.1}$	< 3900				5843	536
2011	MSY transition scheme	< 4100	< 500			6432	568
2012	MSY approach	< 4200	< 900			6687	1066
2013	MSY approach	< 5600	< 800			5435	454
2014	MSY approach	< 5744	< 521			6207	696
2015	MSY approach	< 3766	< 614			5147	401
2016	MSY approach			≤ 5554 **	≤ 1014 **	6447	636
2017	MSY approach			≤ 5755 ***	≤ 992 ***	5222	265
2018	MSY approach			≤ 4484 ***	≤ 695 ***	4141	68
2019	MSY approach			≤ 5990 ***	≤ 598 ***	4967	463
2020	Management Plan			5227 (range 3428–5227) ***	634 (range 496–634)***		
2021	Management Plan			4791 (range 3142–4791) ***	634 (range 496–634) ***		

* Dead + surviving discards.

** Assumes all catches are landed.

*** Assuming recent discarding rates.

Summary of the assessment

Table 5   Norway lobster in Division 6.a, Functional Unit 13. Assessment summary.[‡]

Year	UWTV abundance estimate (Clyde)	95% Confidence Interval	UWTV abundance estimate (Jura)	95% confidence interval	Landings in number	Total discards in number *	Removals in number	Harvest rate (by number) **	Landings	Total discards *	Discard proportion (by number)	Dead discard proportion (by number)	Mean weight in landings	Mean weight in discards
	millions							%	tonnes		%		grammes	
1995	579	176	160	58	207	82	269	36.4	3987	619	28.4	22.9	19.24	7.54
1996	935	242	171	26	187	61	233	21.1	4057	635	24.7	19.7	21.68	10.35
1997	1198	262	-	-	150	70	202	-	3621	598	32	26.1	24.21	8.5
1998	1262	213	-	-	269	187	409	-	4841	1292	41	34.2	17.98	6.92
1999	930	289	-	-	216	93	286	-	3752	566	30.2	24.5	17.39	6.05
2000	1411	246	-	-	171	48	207	-	3417	470	22	17.4	19.96	9.75
2001	1486	268	272	76	164	82	225	12.8	3182	677	33.5	27.4	19.46	8.23
2002	1571	288	398	167	207	50	245	12.4	3384	406	19.5	15.4	16.35	8.12
2003	1817	292	260	68	166	134	266	12.8	3173	1247	44.7	37.7	19.13	9.31
2004	1970	367	-	-	158	168	284	-	2973	1435	51.5	44.3	18.8	8.54
2005	1959	287	303	84	189	69	241	10.7	3395	611	26.8	21.6	17.96	8.81
2006	1851	257	430	134	248	55	290	12.7	4780	515	18.2	14.3	19.27	9.31
2007	1233	218	255	58	350	387	640	43	6660	2566	52.5	45.3	19.05	6.64
2008	1769	291	-	-	357	207	512	-	5923	1433	36.6	30.3	16.59	6.94
2009	1499	210	251	68	261	169	388	22.2	4779	1390	39.3	32.7	18.31	8.23
2010	1750	327	376	39	276	55	317	14.9	5843	536	16.7	13.1	21.21	9.68
2011	2165	305	312	73	333	74	388	15.7	6432	568	18.2	14.3	19.34	7.65
2012	1421	227	371	61	306	93	376	21	6687	1066	23.4	18.6	21.83	11.42
2013	1990	246	198	35	262	62	309	14.1	5435	454	19	15	20.72	7.37
2014	1328	237	231	90	295	78	353	22.6	6207	696	20.9	16.6	20.79	8.92
2015	1820	351	376	127	232	54	273	12.4	5147	401	18.9	14.8	22.21	7.43
2016	1946	249	422	42	364	69	416	17.6	6447	636	15.9	12.4	17.7	9.21
2017	1568	239	306	71	305	31	329	17.6	5221.8	265	9.2	7.1	17.02	8.55
2018	2193	297	275	53	268	7	273	11.1	4141	68	2.5	1.9	16.14	9.79
2019	2083	381	318	61	289	68	340	14.2	4967	463	19.1	15	17.2	6.82
2020	1941	297	-	-	-	-	-	-	-	-	-	-	-	-

* Values prior to 2006 may be underestimates because of underreporting of landings.
** Dead + surviving discards.

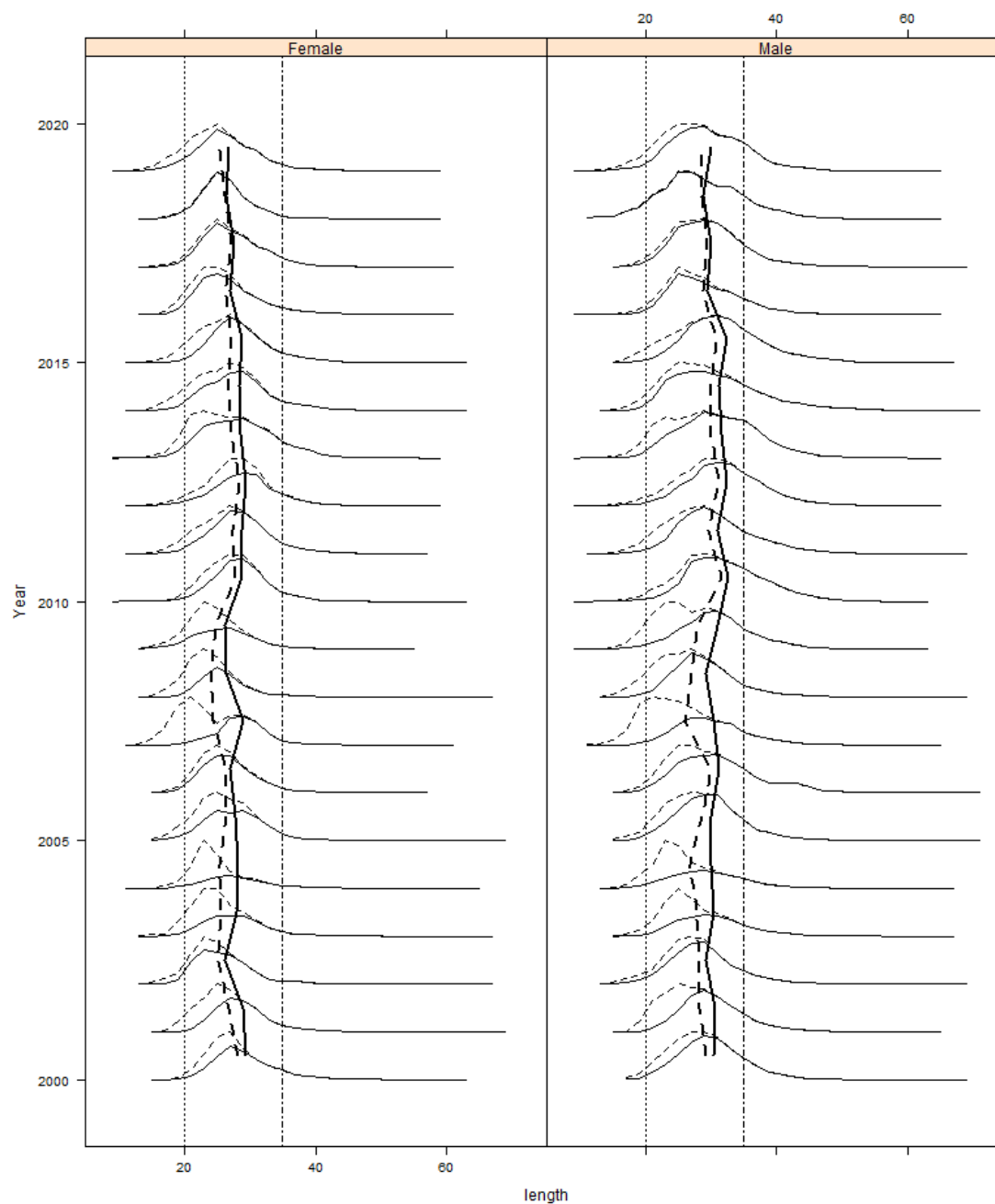[‡] Version 2: Values in harvest rate column corrected.

Figure 2   Norway lobster in Division 6.a, Functional Unit 13. Catch length–frequency distribution and mean size in catches (dotted horizontal lines) and landings (solid horizontal lines). The vertical lines indicate the minimum conservation reference size (20 mm) and the 35 mm visual reference level.

Sources and references

EU. 2019. Regulation (EU) 2019/472 of the European Parliament and of the Council of 19 March 2019 establishing a multiannual plan for stocks fished in the Western Waters and adjacent waters, and for fisheries exploiting those stocks, amending Regulations (EU) 2016/1139 and (EU) 2018/973, and repealing Council Regulations (EC) No 811/2004, (EC) No 2166/2005, (EC) No 388/2006, (EC) No 509/2007 and (EC) No 1300/2008. Official Journal of the European Union, L 83: 1–17. http://data.europa.eu/eli/reg/2019/472/oj.

ICES. 2020. Working Group for the Celtic Seas Ecoregion (WGCSE). ICES Scientific Reports, 2:40. 924 pp. http://doi.org/10.17895/ices.pub.5978.

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Norway lobster (*Nephrops norvegicus*) in Division 6.a, Functional Unit 13 (West of Scotland, the Firth of Clyde, and the Sound of Jura)

ICES advice on fishing opportunities

ICES advises that when the EU multiannual plan (MAP) for Western waters and adjacent waters is applied, catches in 2020 that correspond to the F ranges in the MAP are between 3924 tonnes and 5861 tonnes (3428–5227 tonnes for the Firth of Clyde and 496–634 tonnes for the Sound of Jura). The entire range is considered precautionary when applying the ICES advice rule.

To ensure that *Nephrops* stocks are exploited sustainably, management of *Nephrops* should be implemented at the functional unit level. In this particular functional unit (FU), additional measures should be implemented to ensure that landings taken in each subarea (the Firth of Clyde and the Sound of Jura) are in line with the advice.

Stock development over time

The catches and harvest rate presented here in Figure 1 are for the whole functional unit (the Firth of Clyde and the Sound of Jura combined), as catch data cannot be separated. The combined harvest rate is considered to be more representative for the Firth of Clyde than for the Sound of Jura; it has fluctuated around F_{MSY} (defined for the Firth of Clyde) since 2009 and is now below F_{MSY}. The abundance has been fluctuating well above the MSY $B_{trigger}$ in both the Firth of Clyde and the Sound of Jura since 1996.
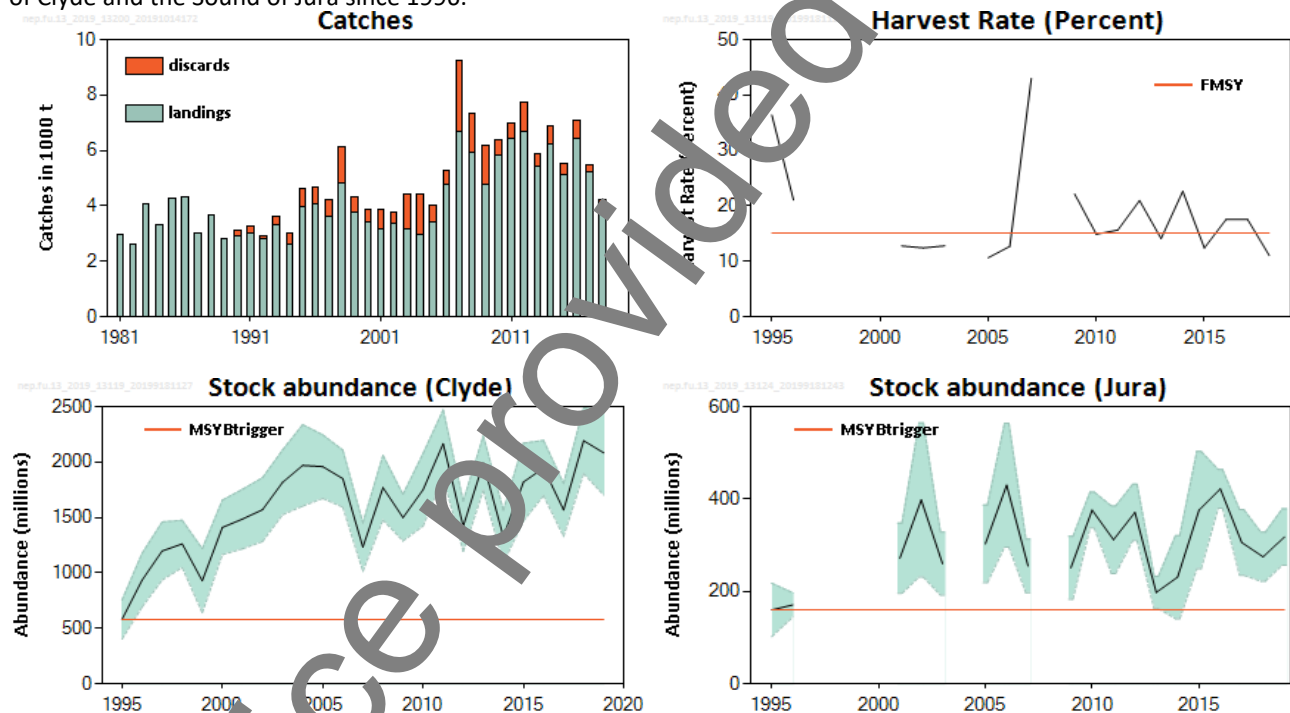

Figure 1   Norway lobster in Division 6.a, Functional Unit 13. Summary of the stock assessment. Catches (discard data only available from 1990), harvest rate (sum of landings and dead discards in numbers, divided by total abundance), and stock abundance (underwater TV survey, in millions; approximate 95% confidence intervals). Harvest rates before 2006 may be unreliable because of the underreporting of landings. Historical harvest rates were calculated using the total catch divided by the total abundance for the two subareas combined. The orange lines represent the MSY $B_{trigger}$ for each of the subareas, and the F_{MSY} harvest rate for the Firth of Clyde. The abundance is presented separately for the Firth of Clyde and for the Sound of Jura.

Stock and exploitation status

ICES assesses that fishing pressure on the stock is below F_{MSY} for the Firth of Clyde, while spawning stock size is above MSY $B_{trigger}$ for both subareas.

Table 1 Norway lobster in Division 6.a, Functional Unit 13. State of the stock and fishery relative to reference points. The combined harvest rate is considered to be more representative of fishing pressure in the Firth of Clyde than in the Sound of Jura. Therefore, in the tables below the combined harvest rate is used for the Firth of Clyde, whereas fishing pressure on the Sound of Jura is unknown.

Firth of Clyde

		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}	❌	❌	✅ Within range	B_{MGT}	✅	✅	✅ Above trigger

Sound of Jura

		Fishing pressure				Stock size		
		2016	2017	2018		2017	2018	2019
Maximum sustainable yield	F_{MSY}	❓	❓	❓ Unknown	MSY $B_{trigger}$	✅	✅	✅ Above trigger
Precautionary approach	F_{pa}, F_{lim}	❓	❓	❓ Unknown	B_{pa}, B_{lim}	✅	✅	✅ Above possible reference points
Management plan	F_{MGT}	❓	❓	❓ Unknown		✅	✅	✅ Above trigger

Catch scenarios

Table 2 Norway lobster in Division 6.a, Functional Unit 13. The basis for the catch scenarios.

Firth of Clyde

Variable	Value	Notes
Stock abundance (2020)	2083 million	Underwater TV (UWTV) survey 2019 (number of individuals).
Mean weight in wanted catch	16.95 grammes	Average 2016–2018 (combined for the Firth of Clyde and the Sound of Jura).
Mean weight in unwanted catch	9.18 grammes	Average 2016–2018 (combined for the Firth of Clyde and the Sound of Jura).
Unwanted catch	9.2%	Average 2016–2018 (proportion by number; combined for the Firth of Clyde and the Sound of Jura).
Discards survival	25%	Proportion by number.
Dead unwanted catch	7.1%	Average 2016–2018 (proportion by number).

Sound of Jura

Variable	Value	Notes
Stock abundance (2020)	318 million	UWTV survey 2019 (number of individuals).
Mean weight in wanted catch	16.95 grammes	Average 2016–2018 (combined for the Firth of Clyde and the Sound of Jura).
Mean weight in unwanted catch	9.18 grammes	Average 2016–2018 (combined for the Firth of Clyde and the Sound of Jura).
Unwanted catch	9.2%	Average 2016–2018 (proportion by number; combined for the Firth of Clyde and the Sound of Jura).
Discards survival	25%	Proportion by number.
Dead unwanted catch	7.1%	Average 2016–2018 (proportion by number).

Table 3　　　Norway lobster in Division 6.a, Functional Unit 13. Annual catch scenarios. All weights are in tonnes. The figures in the table are rounded. Calculations were done with unrounded inputs and computed values may not match exactly when calculated using the rounded figures in the table.

Firth of Clyde　　　Catch scenarios assuming discarding continues at the recent average rate.

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}	5227	5159	4955	204	68	15.1	−12.7
F= MAP $F_{MSY\ lower}$	3428	3383	3249	134	45	9.9	−43
F = MAP $F_{MSY\ upper}$***	5227	5159	4955	204	68	15.1	−12.7
Other options							
MSY approach	5227	5159	4955	204	68	15.1	−12.7
F_{2018}	3842	3792	3642	150	50	11.1	−36

Firth of Clyde　　　Catch scenarios assuming zero discards.

Basis	Total catch	Wanted catch	Unwanted catch	Harvest rate *	% advice change **
	WC + UC	WC	UC	for WC + UC	
ICES advice basis					
EU MAP ^: F_{MSY}	5107	4841	266	15.1	−14.7
F= MAP $F_{MSY\ lower}$	3348	3174	174	9.9	−44
F = MAP $F_{MSY\ upper}$***	5107	4841	266	15.1	−14.7
Other options					
MSY approach	5107	4841	266	15.1	−14.7
F_{2018}	3754	3559	195	11.1	−37

* By number.

** Advice value 2020 relative to the advice value 2019 (5990 tonnes).

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

^ EU multiannual plan (MAP) for the Western waters and adjacent waters (EU, 2019).

The advice for 2020 is lower than for 2019 because of a lower estimated stock abundance, as well as updates of mean discard rates and mean weights.

Sound of Jura　　　Catch scenarios assuming discarding continues at the recent average rate.

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}	634	626	601	25	8	12	6
F= MAP $F_{MSY\ lower}$	496	490	471	19	6	9.4	−17.1
F = MAP $F_{MSY\ upper}$***	634	626	601	25	8	12	6
Other options							
MSY approach	634	626	601	25	8	12	6
F_{2018}	587	579	556	23	8	11.1	−1.84

Sound of Jura   Catch scenarios assuming zero discards.

Basis	Total catch	Wanted catch	Unwanted catch	Harvest rate *	% advice change **
	WC + UC	WC	UC	for WC + UC	
ICES advice basis					
EU MAP^: F_{MSY}	619	587	32	12.0	3.5
F= MAP $F_{MSY\ lower}$	485	460	25	9.4	−18.9
F = MAP $F_{MSY\ upper}$***	619	587	32	12.0	3.5
Other options					
MSY approach	619	587	32	12.0	3.5
F_{2018}	573	543	30	11.1	−4.2

* By numbers.

** Advice value 2020 relative to the advice value 2019 (598 tonnes).

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

^ EU multiannual plan (MAP) for the Western waters and adjacent waters (EU, 2019).

The advice for 2020 is higher than for 2019 because of a higher estimated stock abundance, as well as updates of mean discard rates and mean weights.

Basis of the advice

Table 4   Norway lobster in Division 6.a, Functional Unit 13. The basis of the advice.

Advice basis	The EU multiannual plan (MAP) for stocks in the Western Waters and adjacent waters (EU, 2019)
Management plan	The EU multiannual plan (MAP) for stocks in the Western Waters 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. In accordance with the MAP, catches higher than those corresponding to F_{MSY} can only be taken providing SSB is greater than MSY $B_{trigger}$, and one of the following conditions is met: a) if it is necessary for the achievement of objectives of mixed fisheries; b) if it is necessary to avoid serious harm to a stock caused by intra- or inter-species stock dynamics; c) in order to limit variations in fishing opportunities between consecutive years to not more than 20%. ICES considers that the F_{MSY} range for this stock used in the MAP is precautionary. Full details of the plan are described in EU (2019).

Quality of the assessment

As in previous years, this year's assessment provides estimates of harvest rate for the two subareas of the Firth of Clyde and the Sound of Jura combined (Figure 2). This is because it is not possible to reliably disaggregate the landings (and catch) data for the two areas. As a result, the estimated combined harvest rate does not provide an estimate of fishing pressure on either subarea separately. Given the relative stock sizes and likely magnitude of the landings from the two subareas, the combined harvest rate shown in Figure 1 is expected to be more representative of the harvest rate in the Firth of Clyde than in the Sound of Jura.

Annual underwater television (UWTV) surveys are carried out for both subareas. The time-series for the Firth of Clyde has been continuous since 1995, and for the Sound of Jura since 2009. The surveys have good coverage of the muddy sediment in each area, and provide abundance estimates of each subarea with acceptable precision.

Although the commercial catch-at-length samples are considered representative of the combined *Nephrops* fishery in the Firth of Clyde and the Sound of Jura, sampling levels remain insufficient to provide estimates of mean weights and

discard rates for the Sound of Jura separately. The discard rates and mean weights used in the catch scenarios are for the two subareas combined.

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 2016–2018 fishery indicate that some discarding above the minimum conservation reference size (MCRS) continues (Figure 3). Consequently, ICES is providing advice for 2020 assuming average discard rates as observed over the last three years. This is considered to be the most realistic assumption.

Scottish discard survival experiments indicate that the trawl discard survival may be greater than 50% (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 new survival rates have not been evaluated by ICES.

Nephrops in the Firth of Clyde occur at a very high density (with an average of around 0.8 individuals m^{-2}), suggesting a relatively high productivity. The fishery in the Clyde area has been in existence since the 1960s, with the population and biological parameters having been studied numerous times. Historical harvest rates in this FU have been generally high, at or above F_{max}. F_{max} is considered an appropriate F_{MSY} proxy, expected to deliver high long-term yield with a low probability of recruitment overfishing in the Firth of Clyde. For the Sound of Jura the density is also relatively high. However, the fishery here has been sporadic and sampling is at a relatively low level; therefore, a more cautious $F_{35\%SPR}$ (the fishing mortality that gives 35% virgin SSB per recruit) is considered an appropriate F_{MSY} proxy in the Sound of Jura.

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. The two subareas in FU 13 imply that additional controls should be implemented to ensure that landings taken in each subarea are in line with the advice.
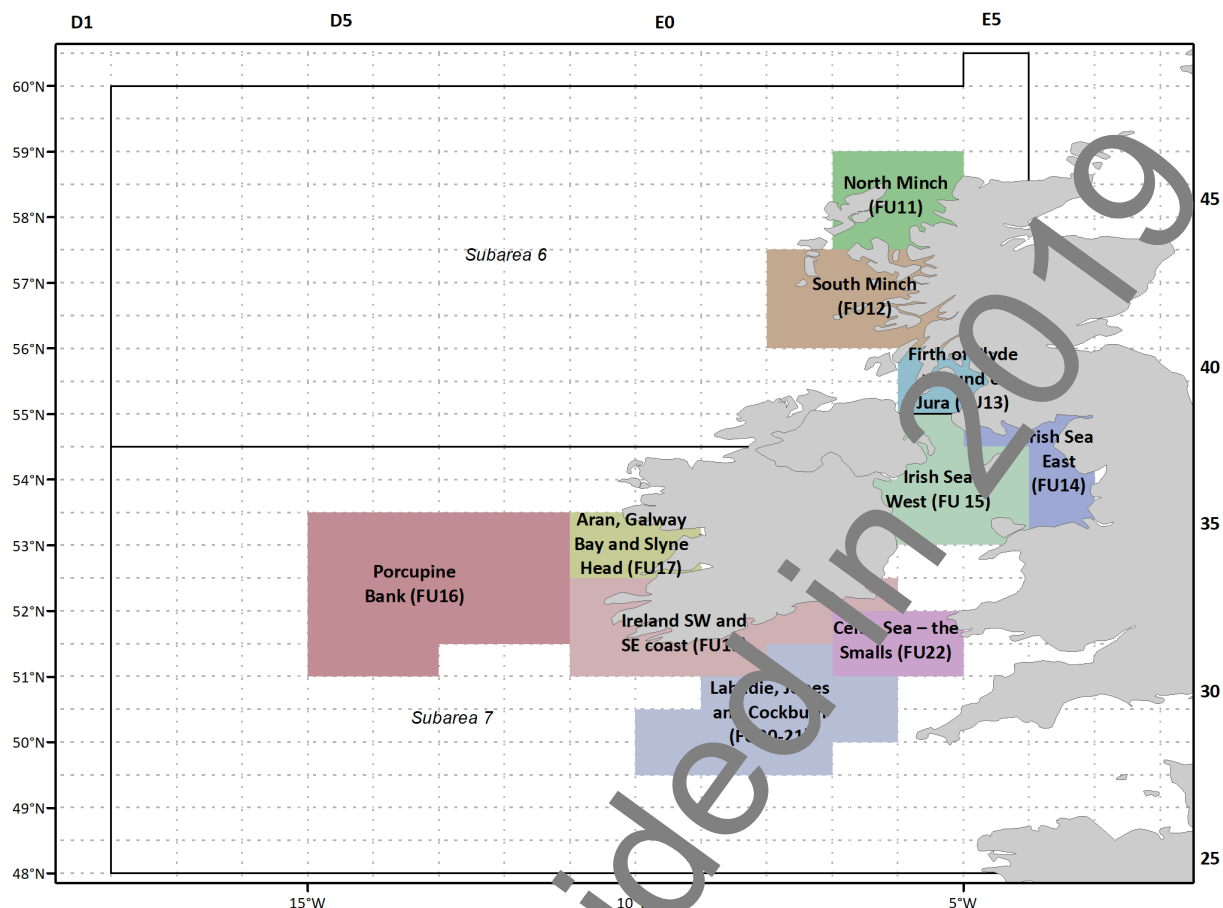
Figure 2   Norway lobster functional units in subareas 6 and 7.

Reference points

Table 5   Norway lobster in Division 6.a, Functional Unit 13. Reference points, values, and their technical basis.

Firth of Clyde

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	580 million individuals	Lowest observed abundance estimate (Firth of Clyde).	ICES (2016)
	F_{MSY}	15.1% harvest rate	F_{MSY} proxy equivalent to F_{max} for combined sexes, derived from a 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 $B_{trigger}$	580 million individuals	MSY $B_{trigger}$	EU (2019), ICES (2016)
	MAP B_{lim}	Not defined		
	MAP F_{MSY}	15.1% harvest rate	F_{MSY}	EU (2019), ICES (2016)
	MAP range F_{lower}	9.9–15.1% harvest rate	Consistent with ranges provided by ICES (2016), resulting in no more than 5% reduction in long-term yield compared with MSY.	EU (2019), ICES (2016)
	MAP range F_{upper}	15.1–15.1% 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 (2019), ICES (2016)

Sound of Jura

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	160 million individuals	Lowest observed abundance estimate (Sound of Jura).	ICES (2016)
	F_{MSY}	12.0% harvest rate	F_{MSY} proxy equivalent to $F_{35\%SPR}$ for combined sexes, derived from a 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 $B_{trigger}$	160 million individuals	MSY $B_{trigger}$	EU (2019), ICES (2016)
	MAP B_{lim}	Not defined		
	MAP F_{MSY}	12.0% harvest rate	F_{MSY}	EU (2019), ICES (2016)
	MAP range F_{lower}	9.4–12.0% harvest rate	Consistent with ranges provided by ICES (2016), resulting in no more than 5% reduction in long-term yield compared with MSY.	EU (2019), ICES (2016)
	MAP range F_{upper}	12.0–12.0% 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 (2019), ICES (2016)

Basis of the assessment

Table 6   Norway lobster in Division 6.a, Functional Unit 13. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018).
Assessment type	Underwater TV survey (ICES, 2019).
Input data	One survey index (UWTV-FU13); commercial catches (international landings, length frequencies from Scottish and Northern Ireland catch sampling); fixed maturity parameters (from survey data); fixed natural mortalities. Discard survival rate.
Discards and bycatch	Included in the assessment since 1990; dataseries 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 (ICES, 2009).
Working group	Working Group for the Celtic Sea Ecoregion (WGCSE)

Information from stakeholders

Since 2017, observer sampling from the Scottish Industry–Science observer sampling scheme was extended to include the sampling of Norway lobster catches in FU 13. In 2018, approximately 33% 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 6.a, Functional Unit 13. ICES advice, landings, and discards. All weights are in tonnes.

Year	ICES advice	Landings advice for the Firth of Clyde (FU 13)	Landings advice for the Sound of Jura (FU 13)	Catch advice for the Firth of Clyde (FU 13)	Catch advice for the Sound of Jura (FU 13)	ICES landings	Total discards*
1989						2812	
1990						2909	193
1991						3088	247
1992	Maintain current effort					2803	100
1993	Maintain current effort					3343	295
1994	Maintain current effort					2630	397
1995	Maintain current effort					3987	619
1996	Maintain current effort					4057	635
1997	As for 1996					3621	598
1998	Maintain current effort					4841	1292
1999	As for 1998					3752	566
2000	Maintain current effort					3417	470
2001	As for 2000					3182	677
2002	Maintain current effort					3384	406
2003	As for 2002					3173	1247
2004	Maintain current effort					2973	1435
2005	As for 2004					3395	611
2006	No increase in effort					4780	515
2007	No increase in effort and harvest rate of 15%	3765				6660	2566
2008	As for 2007	3765				5923	1433
2009	No increase effort and recent average catch	< 5700				4779	1390
2010	Harvest rate no greater than that equivalent to fishing at $F_{0.1}$	< 3900				5843	536
2011	MSY transition scheme	< 4100	< 500			6432	568
2012	MSY approach	< 4400	< 900			6687	1066
2013	MSY approach	< 5600	< 800			5435	454
2014	MSY approach	< 5744	< 521			6207	696
2015	MSY approach	< 3765	< 614			5147	401
2016	MSY approach			≤ 5554**	≤ 1014**	6447	636
2017	MSY approach			≤ 5755***	≤ 992***	5222	265
2018	MSY approach			≤ 4484***	≤ 695***	4141	68
2019	MSY approach			≤ 5990***	≤ 598***		
2020	Management Plan			5227 (range 3428–5227)***	634 (range 496–634)***		

* Dead + surviving discards.
** Assumes all catches are landed.
*** Assuming recent discarding rates.

History of catch and landings

Table 8   Norway lobster in Division 6.a, Functional Unit 13. Catch distribution by fleet in 2018 as estimated by ICES. All weights are in tonnes.

Catch		Landings		Total discards	
99.6% dead	0.4% surviving	Directed *Nephrops* trawl fishery	*Nephrops* creel fishery	75% dead	25% surviving
4209 t		93.5% trawls (70–99 mm)	6.5% creels	68 t	
		4141 t			

Table 9 Norway lobster in Division 6.a, Functional Unit 13. History of ICES estimates of landings (for Scotland by gear) and total discards. All weights are in tonnes.

Year	UK Scotland				Other UK	Total landings	Discards*
	Nephrops trawl	Other trawl	Creel	Subtotal			
1981	2498	404	66	2968	0	2968	
1982	2372	169	79	2620	0	2620	
1983	3889	121	52	4062	14	4076	
1984	3070	153	77	3300	10	3310	
1985	3921	293	65	4279	7	28	
1986	4073	176	79	4328	13	4341	
1987	2860	82	64	3006	3	3009	
1988	3507	107	43	3657	7	3664	
1989	2577	184	35	2796	16	2812	
1990	2731	121	23	2875	34	2909	193
1991	2844	145	26	3015	23	3038	247
1992	2530	247	9	2786	17	2803	100
1993	3200	110	5	3315	28	3343	295
1994	2503	50	28	2581	49	2630	397
1995	3766	131	26	3923	64	3987	619
1996	3880	108	27	4015	42	4057	635
1997	3486	46	26	3558	63	3621	598
1998	4540	79	39	4658	183	4841	1292
1999	3476	29	37	3542	210	3752	566
2000	3142	63	75	3280	137	3417	470
2001	2890	65	95	3050	132	3182	677
2002	3075	53	105	3233	151	3384	406
2003	2954	20	119	3093	80	3173	1247
2004	2619	8	88	2715	258	2973	1435
2005	3148	5	94	3247	148	3395	611
2006	4356	1	179	4536	244	4780	515
2007	6069	4	221	6294	366	6660	2566
2008	5320	3	184	5507	416	5923	1433
2009	4304	1	191	4496	283	4779	1390
2010	5162	5	211	5378	465	5843	536
2011	5664	9	219	5892	540	6432	568
2012	5617	4	203	5824	863	6687	1066
2013	4708	4	212	4924	511	5435	454
2014	4770	1	258	5029	1178	6207	696
2015	4035	8	206	4249	898	5147	401
2016	4922	6	267	5195	1248	6447	636
2017	4021	3	256	4280	941	5222	265
2018	3584	3	251	3838	303	4141	68

*Dead + surviving discards.

Summary of the assessment

Table 10   Norway lobster in Division 6.a, Functional Unit 13. Assessment summary.

Year	Firth of Clyde UWTV abundance	Firth of Clyde 95% CI	Sound of Jura UWTV abundance	Sound of Jura 95% CI	Harvest rate (by number)**	Landings (in numbers)**	Total discards (in numbers)*	Removals (in numbers)	Landings**	Total discards*	Discard rate (by number)	Mean weight in landings	Mean weight in discards	Dead discard rate (by number)
	millions				%	millions			tonnes		%	grammes		%
1995	579	176	160	58	36.4	207	82	269	3987	619	18.4	19.24	7.54	22.9
1996	935	242	171	26	21.1	187	61	233	4057	635	24.7	21.68	10.35	19.7
1997	1198	262	NA	NA	NA	150	70	202	3621	59?	32	24.21	8.5	26.1
1998	1262	213	NA	NA	NA	269	187	409	4841	129?	41	17.98	6.92	34.2
1999	930	289	NA	NA	NA	216	93	286	3752	566	3?.?	17.39	6.05	24.5
2000	1411	246	NA	NA	NA	171	48	207	3417	470	?2	19.96	9.75	17.4
2001	1486	268	272	76	12.8	164	82	225	3182	?77	33.5	19.46	8.23	27.4
2002	1571	288	398	167	12.4	207	50	245	3384	40?	19.5	16.35	8.12	15.4
2003	1817	292	260	68	12.8	166	134	266	3173	1247	44.7	19.13	9.31	37.7
2004	1970	367	NA	NA	NA	158	168	284	2973	14?5	51.5	18.8	8.54	44.3
2005	1959	287	303	84	10.7	189	69	24?	3395	611	26.8	17.96	8.81	21.6
2006	1851	257	430	134	12.7	248	55	290?	4780	515	18.2	19.27	9.31	14.3
2007	1233	218	255	58	43	350	387	64?	66?9	2566	52.5	19.05	6.64	45.3
2008	1769	291	NA	NA	NA	357	207	512	59?3	1433	36.6	16.59	6.94	30.3
2009	1499	210	251	68	22.2	261	169	3??	4779	1390	39.3	18.31	8.23	32.7
2010	1750	327	376	38	14.9	276	55	?17	5843	536	16.7	21.21	9.68	13.1
2011	2165	305	312	73	15.7	333	?	?89	6432	568	18.2	19.34	7.65	14.3
2012	1421	227	371	61	21	306	?3	376	6687	1066	23.4	21.83	11.42	18.6
2013	1990	246	198	35	14.1	262	?2	309	5435	454	19	20.72	7.37	15
2014	1328	237	231	90	22.6	295	?8	353	6207	696	20.9	20.79	8.92	16.6
2015	1820	351	376	127	12.4	232	5?	273	5147	401	18.9	22.21	7.43	14.8
2016	1946	249	422	42	17.6	264	69	416	6447	636	15.9	17.7	9.21	12.4
2017	1568	239	306	71	17.6	305	?31	329	5222	265	9.2	17.02	8.55	7.1
2018	2193	297	275	53	11.1	26?	7	273	4141	68	2.5	16.14	9.79	1.9
2019	2083	381	318	61										

* Dead + surviving discards.

** Values prior to 2006 may be underestimates because of underreporting of landings.
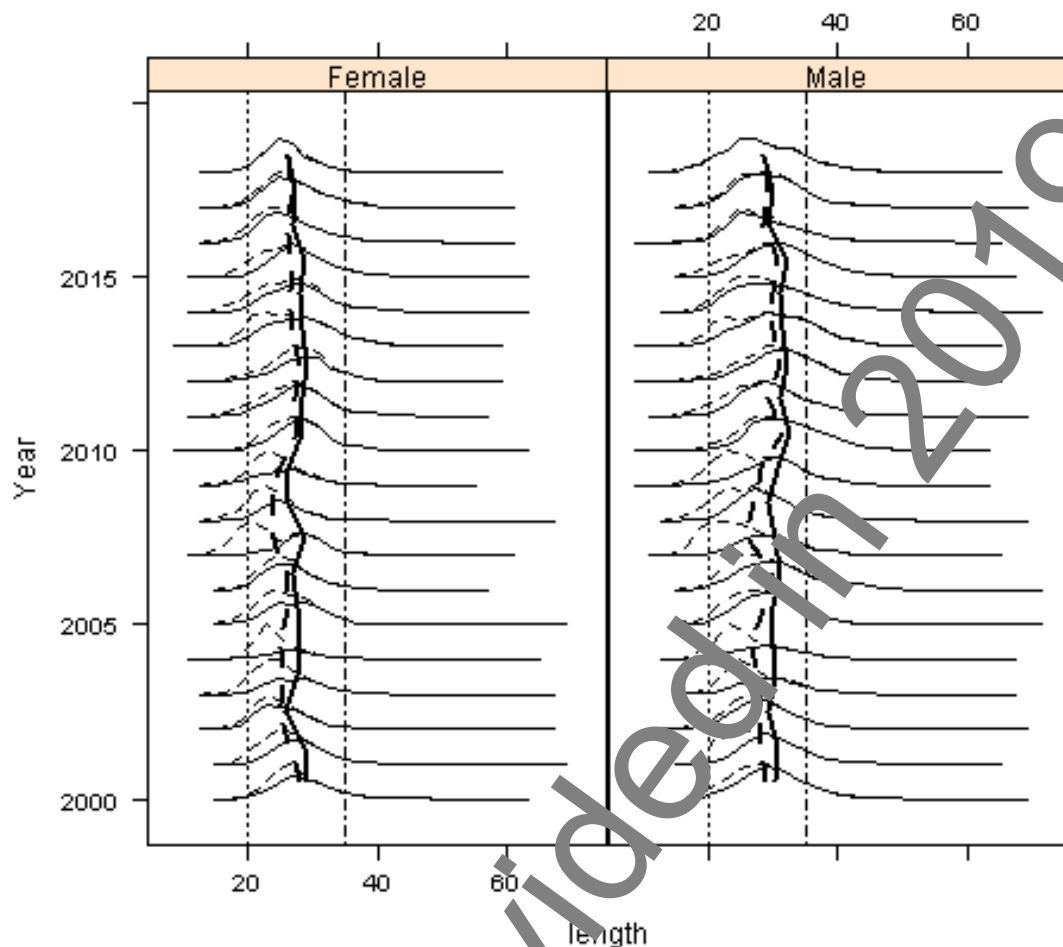
NA = not available.

Figure 3   Norway lobster in Division 6.a, Functional Unit 13. Catch length–frequency distribution and mean size in catches (dotted horizontal lines) and landings (solid horizontal lines). The vertical lines indicate the minimum conservation reference size (20 mm) and the 35 mm visual reference level.

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