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

ICES stock advice

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 2013–2015, catches in 2017 should be no more than 6747 tonnes (5755 tonnes for the Firth of Clyde and 992 tonnes for the Sound of Jura). This implies landings of no more than 6185 tonnes (5276 tonnes for the Firth of Clyde and 909 tonnes for the Sound of Jura).

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

Stock development over time

The catches and harvest rate presented here are for the whole functional unit (Firth of Clyde and Sound of Jura combined), owing to the uncertainties in the data by subarea. The combined harvest rate, calculated as (landings + dead discards) (abundance estimate)$^{-1}$, is considered to be more representative for the Firth of Clyde than for the Sound of Jura; it has fluctuated around the F_{MSY} for the Firth of Clyde. The abundance has been above the MSY $B_{trigger}$ in both the Firth of Clyde and the Sound of Jura since 1995.

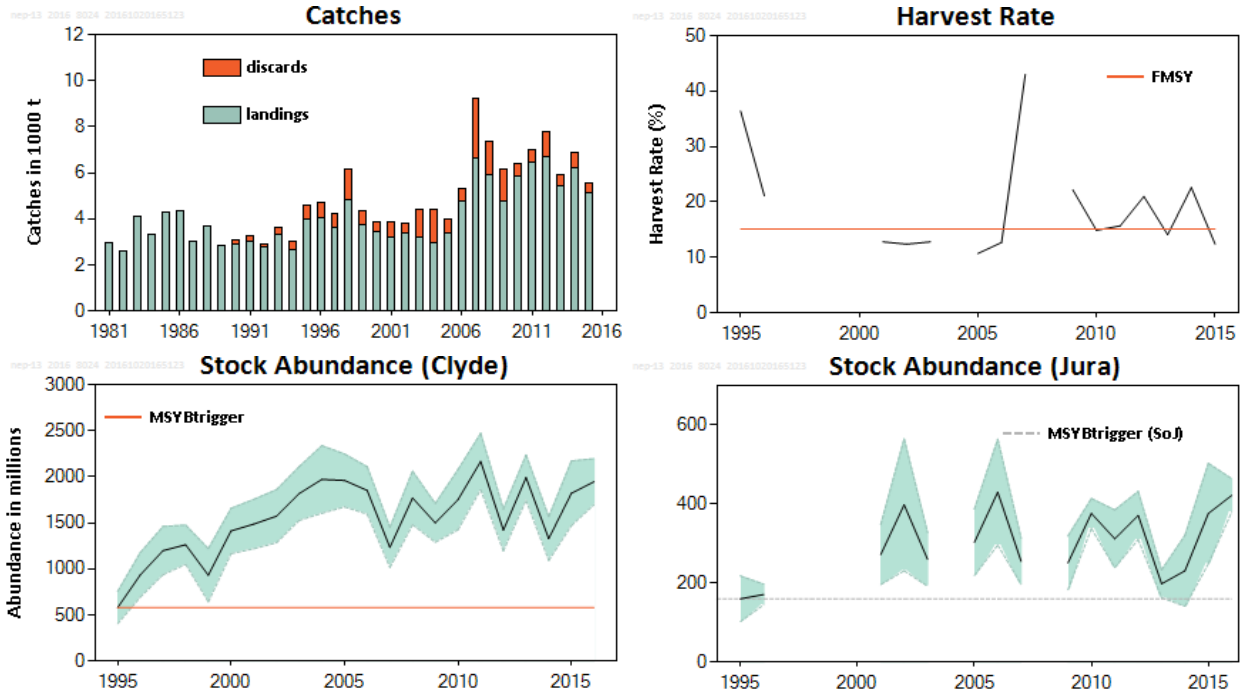

Figure 5.3.39.1 Norway lobster in Division 6.a – FU 13. Catches (thousand tonnes), harvest rate (fishing mortality proxy), survey abundance (Underwater TV, millions; SSB proxy; 95% confidence intervals). Harvest rates before 2006 may be unreliable because of underreporting of landings. Historical harvest rates were calculated using the total catch divided by the total abundance for the two subareas combined. The orange and the dashed grey lines represent the MSY $B_{trigger}$ and the F_{MSY} harvest rate proxy 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

Because the combined harvest rate is considered to be more representative of fishing pressure in the Firth of Clyde than in the Sound of Jura, the tables below are filled as follows: for the Firth of Clyde the combined harvest rate is used, whereas for the Sound of Jura question marks are considered to be more appropriate.

Table 5.3.39.1 Norway lobster in Division 6.a – FU 13. State of the stock and fishery relative to reference points.

Firth of Clyde

	Fishing pressure					Stock size				
		2013	2014	2015			2014	2015	2016	
Maximum sustainable yield	F_{MSY}	✓	✗	✓	Appropriate	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}	-	-	-	Not applicable	SSB_{MGT}	-	-	-	Not applicable

Sound of Jura

	Fishing pressure					Stock size				
		2013	2014	2015			2014	2015	2016	
Maximum sustainable yield	F_{MSY}	?	?	?	Undefined	MSY $B_{trigger}$	✓	✓	✓	Above trigger
Precautionary approach	F_{pa}, F_{lim}	?	?	?	Undefined	B_{pa}, B_{lim}	✓	✓	✓	Above possible reference points
Management plan	F_{MGT}	-	-	-	Not applicable	SSB_{MGT}	-	-	-	Not applicable

Catch options

Table 5.3.39.2 Norway lobster in Division 6.a – FU 13. The basis for the catch options.

Firth of Clyde

Variable	Value	Source	Notes
Stock abundance	1946 million individuals	ICES (2016a)	UWTV survey 2016.
Mean weight in landings	21.24 g	ICES (2016a)	Average 2013–2015 (combined for Clyde and Sound of Jura).
Mean weight in discards	7.91 g	ICES (2016a)	Average 2013–2015 (combined for Clyde and Sound of Jura).
Discard rate	19.6%	ICES (2016a)	Average 2013–2015 (by number). Calculated as discards divided by landings + discards (combined for Clyde and Sound of Jura).
Discard survival rate	25%	ICES (2016a)	Only applies in scenarios where discarding is allowed.
Dead discard rate	15.5%	ICES (2016a)	Average 2013–2015 (proportion by number). Calculated as dead discards divided by dead removals (landings + dead discards). Only applies in scenarios where discarding is allowed.

Sound of Jura

Variable	Value	Source	Notes
Stock abundance	422 million individuals	ICES (2016a)	UWTV survey 2016.
Mean weight in landings	21.24 g	ICES (2016a)	Average 2013–2015 (combined for Clyde and Sound of Jura).
Mean weight in discards	7.91 g	ICES (2016a)	Average 2013–2015 (combined for Clyde and Sound of Jura).
Discard proportion	19.6%	ICES (2016a)	Average (by number) 2013–2015 (combined for Clyde and Sound of Jura).
Discard survival rate	25%	ICES (2016a)	Only applies in scenarios where discarding is allowed.
Dead discard rate	15.5%	ICES (2016a)	Average 2013–2015 (proportion by number). Calculated as dead discards divided by dead removals (landings + dead discards). Only applies in scenarios where discarding is allowed.

Table 5.3.39.3 Norway lobster in Division 6.a – FU 13. The catch options. All weights in tonnes.

Firth of Clyde

Catch options assuming zero discards

Rationale	Basis	Total catches	Wanted catches*	Unwanted catches*	Harvest rate**
MSY approach	MSY approach(F_{MSY} proxy)	5473	5018	455	15.1%
Other options	F_{2015}	4495	4121	374	12.4%

* "Wanted" and "unwanted" catches are used to describe *Nephrops* that would be landed and discarded in the absence of the EU landing obligation, based on the average estimated discard rates for 2013–2015.
** Applied to total catch.

Catch options assuming discarding is allowed

Rationale	Basis	Total catches	Dead removals	Landings	Dead discards	Surviving discards	Harvest rate*
		L+DD+SD	L+DD	L	DD	SD	for L+DD
MSY approach	MSY approach(F_{MSY} proxy) assuming recent discard rates	5755	5635	5276	359	120	15.1%

* Applied to dead removals.

Sound of Jura

Catch options assuming zero discards

Rationale	Basis	Total catches	Wanted catches*	Unwanted catches*	Harvest rate**
MSY approach	F_{MSY} proxy	943	865	78	12.0%
Other options	F_{2015}	975	894	81	12.4%

* "Wanted" and "unwanted" catch are used to describe *Nephrops* that would be landed and discarded in the absence of the EU landing obligation, based on the average estimated discard rates for 2013–2015.
** Applied to total catch.

Catch options assuming discarding is allowed

Rationale	Basis	Total catches	Dead removals	Landings	Dead discards	Surviving discards	Harvest rate*
		L+DD+SD	L+DD	L	DD	SD	for L+DD
MSY approach	MSY approach (F_{MSY} proxy) assuming recent discard rates	992	971	909	62	21	12.0%

* Applied to dead removals.

All harvest rates are calculated in numbers and refer to the dead removals. The difference in catch weights between catch options with the same harvest rates is related to the fact that, in the scenario allowing for discarding, a proportion of the discards is assumed to survive.

Basis of the advice

Table 5.3.39.4 Norway lobster in Division 6.a – FU 13. The basis of the advice.

Advice basis	MSY approach.
Management plan	There is no management plan for Norway lobster in this area.

Quality of the assessment

As last year, this year's assessment provides estimates of harvest rate for the two subareas of Firth of Clyde and Sound of Jura combined. 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 is not entirely indicative 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 5.3.39.1 is expected to be more representative of the harvest rate in the Firth of Clyde than in the Sound of Jura.

Annual 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 fishery (Firth of Clyde and Sound of Jura), sampling levels are 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 options are for the two subareas combined.

Issues relevant for the advice

From 2016, fisheries catching *Nephrops* in Division 6.a are covered by the EU landings obligation (EU, 2015). Creel fisheries are exempted from the landings obligation, with a *de minimis* exemption consisting of a 7% discard rate by weight for the trawl fishery in 2016 and 2017. The average discard rate by weight in the trawl fishery for FU 13 over the last three years is 8.7%. The catch advice is based on the assumption that the discard rate will be 8.3% by weight in 2017 for the entire fishery.

Nephrops in the Firth of Clyde occur at a very high density (average around 0.8 individuals m^{-2}), suggesting a relatively high productivity. The fishery in the Clyde area has been in existence since the 1960s and the population and biological parameters have 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 fishery has been sporadic, the time-series of UWTV data is more fragmented, and sampling is at a relatively low level. A more cautious $F_{35\%SPR}$ is considered an appropriate F_{MSY} proxy in the Sound of Jura.

MSY reference points were recalculated at WKMSYREF4 (ICES, 2016b). Previous reference points ($F_{0.1}$) were not recalculated and hence not included in the catch options table.

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 landings taken in each subarea are in line with the advice.

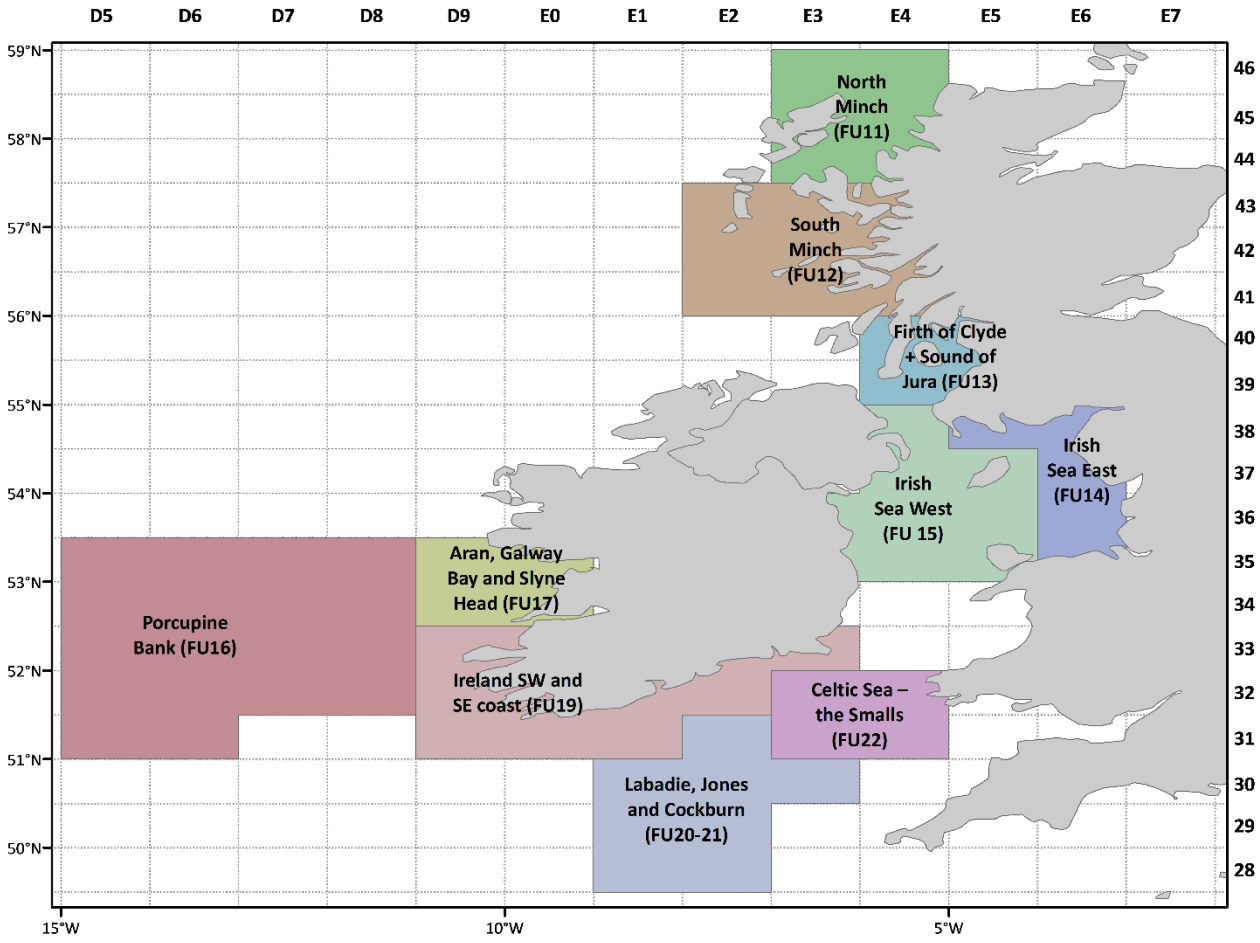

Figure 5.3.39.2 *Nephrops* functional units in Division 6.a and Subarea 7.

Reference points

Table 5.3.39.5 Norway lobster in Division 6.a – FU 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 (2016c)
	F_{MSY}	15.1% harvest rate	F_{MSY} proxy equivalent to F_{max} for combined sexes.	ICES (2016c)
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		

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 (2016c)
	F_{MSY}	12.0% harvest rate	F_{MSY} proxy equivalent to $F_{35\%SPR}$ for combined sexes.	ICES (2016c)
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 5.3.39.6 Norway lobster in Division 6.a – FU 13. The basis of the assessment.

ICES stock data category	1 (ICES, 2016d).
Assessment type	Underwater TV survey combined with yield-per-recruit analysis from length data.
Input data	One survey index (UWTV-FU13); commercial catches (international landings, length frequencies from Scottish catch sampling); fixed maturity parameters (from survey data); fixed natural mortalities. 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 (ICES, 2009).
Working group	Working Group for the Celtic Seas Ecoregion (WGCSE).

Information from stakeholders

There is no available information.

History of the advice, catch, and management

Table 5.3.39.7 Norway lobster in Division 6.a – FU 13. History of ICES advice, and ICES estimates of landings. All weights are in thousand tonnes.

Year	ICES advice	Landings advice for Firth of Clyde (FU 13)	Landings advice for Sound of Jura (FU 13)	Catch advice for Firth of Clyde (FU 13)	Catch advice for Sound of Jura (FU 13)	ICES landings	Total discards**
1989						2.8	
1990						2.9	0.2
1991						3	0.2
1992	Maintain current effort					2.8	0.1
1993	Maintain current effort					3.3	0.3
1994	Maintain current effort					2.6	0.4
1995	Maintain current effort					4	0.6
1996	Maintain current effort					4	0.6
1997	As for 1996					3.6	0.6
1998	Maintain current effort					4.8	1.3
1999	As for 1998					3.8	0.5
2000	Maintain current effort					3.4	0.4
2001	As for 2000					3.2	0.6
2002	Maintain current effort					3.4	0.4
2003	As for 2002					3.2	1.2
2004	Maintain current effort					3	1.3
2005	As for 2004					3.4	0.6
2006	No increase in effort					4.8	0.5
2007	No increase effort and harvest rate of 15%	3.765				6.5	2.4
2008	As for 2007	3.765				5.9	1.3
2009	No increase effort and recent average catch	< 5.7				4.7	1.2
2010	Harvest rate no greater than that equivalent to fishing at $F_{0.1}$	< 3.9				5.7	0.5
2011	MSY transition scheme	< 4.1	< 0.5			6.4	0.6
2012	MSY approach	< 4.2	< 0.9			6.6	1
2013	MSY approach	< 5.6	< 0.8			5.4	0.4
2014	MSY approach	< 5.7	< 0.5			6.2	0.7
2015	MSY approach	< 3.8	< 0.6			5.1	0.4
2016	MSY approach			≤ 5.554*	≤ 1.014*		
2017	MSY approach			≤ 5.755***	≤ 0.992***		

* Assumes all catches are landed.
** Dead + surviving discards.
*** Assuming discarding at average rates (2013–2015).

History of catch and landings

Table 5.3.39.8 Norway lobster in Division 6.a – FU 13. Catch distribution by fleet in 2015 as estimated by ICES.

Total catch		Landings		Total discards	
98.2% dead	1.8% surviving	Directed *Nephrops* trawl fishery	*Nephrops* creel fishery	75% dead	25% surviving
5534 t		96% TR2 (trawls 70–99 mm)	4% creels	401 t	
		5133 t			

Table 5.3.39.9 Norway lobster in Division 6.a – FU 13. History of commercial catch and landings. ICES estimated values are presented for each country participating in the fishery. All weights are in tonnes.

Year	UK Scotland				Other UK	Total	Total 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	4286	
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	4769	1	258	5028	1178	6206	696
2015*	4012	17	206	4235	898	5133	401

* Preliminary.

** Dead + surviving discards.

Summary of the assessment

Table 5.3.39.10 Norway lobster in Division 6.a – FU 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**	Landings numbers	Total discards numbers*	Removals numbers	Landings	Total discards*	Discard rate	Mean weight in landings	Mean weight in discards	Dead discard .rate
	millions	millions	millions	millions	%	millions	millions	millions	tonnes	tonnes	%	grammes	grammes	%
1995	579	176	160	58	36.4	207	82	269	3987	619	28.4	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	598	32	24.21	8.5	26.1
1998	1262	213	NA	NA	NA	269	187	409	4841	1292	41	17.98	6.92	34.2
1999	930	289	NA	NA	NA	216	93	286	3752	566	30.2	17.39	6.05	24.5
2000	1411	246	NA	NA	NA	171	48	207	3417	470	22	19.96	9.75	17.4
2001	1486	268	272	76	12.8	164	82	225	3182	677	33.5	19.46	8.23	27.4
2002	1571	288	398	167	12.4	207	50	245	3384	406	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	1435	51.5	18.8	8.54	44.3
2005	1959	287	303	84	10.7	189	69	241	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	43.0	350	387	640	6660	2566	52.5	19.05	6.64	45.3
2008	1769	291	NA	NA	NA	357	207	512	5923	1433	36.6	16.59	6.94	30.3
2009	1499	210	251	68	22.2	261	169	388	4779	1390	39.3	18.31	8.23	32.7
2010	1750	327	376	38	14.9	276	55	317	5843	536	16.7	21.21	9.68	13.1
2011	2165	305	312	73	15.7	333	74	388	6432	568	18.2	19.34	7.65	14.3
2012	1421	227	371	61	21.0	306	93	376	6687	1066	23.4	21.83	11.42	18.6
2013	1990	246	198	35	14.1	262	62	309	5435	454	19	20.72	7.37	15
2014	1328	237	231	90	22.6	295	78	353	6206	696	20.9	20.79	8.92	16.6
2015	1820	351	376	127	12.4	232	54	273	5133	401	18.9	22.21	7.43	14.8
2016	1946	249	422	42										

* Dead + surviving discards.

** Harvest ratios prior to 2006 may be underestimates due to underreporting of landings.

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