

## Norway special request for revised 2019 advice on mackerel (*Scomber scombrus*) in subareas 1–8 and 14, and in Division 9.a (the Northeast Atlantic and adjacent waters)

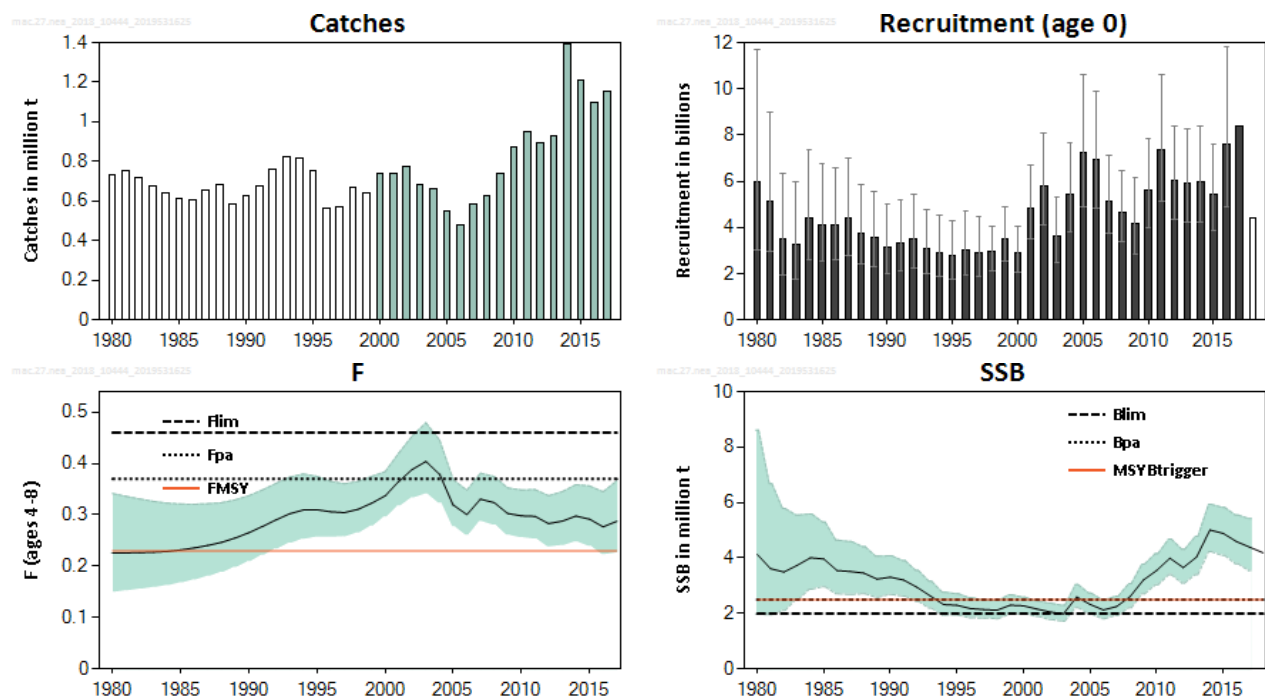
### ICES advice on fishing opportunities

Please note: The present advice replaces the advice given in October 2018 for catches in 2019.

ICES advises that when the MSY approach is applied, catches in 2019 should be no more than 770 358 tonnes.

### Stock development over time

The spawning-stock biomass (SSB) is estimated to have increased in the late 2000s, reaching a maximum in 2014. It has declined since, but has remained above MSY  $B_{trigger}$  since 2008. The fishing mortality (F) has declined from high levels in the mid-2000s, but remains above  $F_{MSY}$ . There has been a succession of large year classes since the early 2000s, with year classes since 2012 estimated to be above average.



**Figure 1** Mackerel in subareas 1–8 and 14, and in Division 9.a. Summary of the stock assessment. The catches prior to 2000 are unshaded because of the considerable underreporting that is suspected to have taken place in those years. The recruitment value for 2017 is estimated using the recruitment survey and a model (RCT3), and the recruitment value for 2018 is the geometric mean of the recruitments from 1990 to 2016. Confidence intervals (95%) are included in the recruitment, fishing mortality, and spawning-stock biomass plots.

### Stock and exploitation status

ICES assesses that fishing pressure on the stock is above  $F_{MSY}$  but below  $F_{pa}$  and  $F_{lim}$ , while spawning stock size is above MSY  $B_{trigger}$ ,  $B_{pa}$ , and  $B_{lim}$ .

**Table 1** Mackerel in subareas 1–8 and 14, and in Division 9.a. State of the stock and fishery relative to reference points.

		Fishing pressure			Stock size					
		2015	2016	2017	2016	2017	2018			
Maximum sustainable yield	$F_{MSY}$	✗	✗	✗	Above	MSY	✓	✓	✓	Above trigger
Precautionary approach	$F_{pa}, F_{lim}$	✓	✓	✓	Harvested sustainably	$B_{pa}, B_{lim}$	✓	✓	✓	Full reproductive capacity
Management plan	$F_{MGT}$	–	–	–	Not applicable	$B_{MGT}$	–	–	–	Not applicable

### Catch scenarios

**Table 2** Mackerel in subareas 1–8 and 14, and in Division 9.a. The basis for the catch scenarios.

Variable	Value	Notes
$F_{ages\ 4-8}$ (2018)	0.28	From the forecast for 2018, based on catch constraint (total catch 2018)
SSB (2018) at spawning time	4 186 496 t	From the forecast for 2018
$R_{age\ 0}$ (2018–2019)	4 397 874 thousands	Geometric mean of the recruitment estimates (1990–2016)
Total catch (2018)	1 000 559 t	Sum of declared quotas, expected discards, and corrected by the interannual transfers

**Table 3** Mackerel in subareas 1–8 and 14, and in Division 9.a. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2019)	F4–8(2019 and 2020)	SSB spawning time (2019)	SSB spawning time (2020)	% SSB change *	% Catch change **	% Advice change ^
ICES advice basis							
MSY approach: $F = F_{MSY}$	770358	0.23	4297228	4236240	-1.4%	-23.0%	39.8%
Other scenarios							
Norway–EU–Faroes LTMS: 0.21 ^^	709253	0.21	4307974	4294601	-0.3%	-29.1%	28.7%
F = 0	0	0	4422923	4986009	12.7%	-100.0%	-100.0%
$F_{pa}$	1170325	0.37	4222970	3859262	-8.6%	17.0%	112.4%
$F_{lim}$	1403791	0.46	4176110	3643403	-12.8%	40.3%	154.8%
SSB(2020) = MSY $B_{trigger} = B_{pa}$	2715924	1.14	3843070	2494475	-35.1%	171.4%	393.0%
SSB(2020) = $B_{lim}$	3345122	1.65	3615909	1987368	-45.0%	234.3%	507.2%
$F = F_{2018}$	931614	0.2845	4268136	4083191	-4.3%	-6.9%	69.1%
Catch(2019) = Catch(2018) -20%	800447	0.2400	4291882	4207576	-1.96%	-20.0%	45.3%
Catch(2019) = Catch (2018)	1000559	0.3085	4255358	4018189	-5.57%	0.0%	81.6%
Catch(2019) = Catch (2018) +25%	1250699	0.4002	4207154	3784592	-10.04%	25.0%	127.0%
F = 0.20	678308	0.2	4313359	4324232	0.3%	-32.2%	23.1%
F = 0.22	739936	0.22	4302596	4265271	-0.9%	-26.0%	34.3%
F = 0.24	800522	0.24	4291868	4207504	-2.0%	-20.0%	45.3%
F = 0.25	830432	0.25	4286517	4179059	-2.5%	-17.0%	50.7%
F = 0.26	860088	0.26	4281174	4150902	-3.0%	-14.0%	56.1%
F = 0.27	889495	0.27	4275840	4123030	-3.6%	-11.1%	61.4%
F = 0.28	918654	0.28	4270515	4095440	-4.1%	-8.2%	66.7%
F = 0.29	947567	0.29	4265198	4068127	-4.6%	-5.3%	72.0%

\* SSB 2020 relative to SSB 2019.

\*\* Catch in 2019 relative to estimated catches in 2018 (1 000 559 t). There is no internationally agreed TAC for 2018.

^ Advice value for 2019 relative to advice value for 2018.

^^ Following the consultations between Norway, the European Union, and the Faroe Islands on the management of mackerel in the northeast Atlantic for 2018, a total catch of 816 797 t was set for 2018. Fishing at  $F_{target}$  (0.21) in 2019 leads to a less than 20% reduction in catches from that value.

The revised catch advice for 2019 is higher than that previously issued and the advice for 2018 because:

- there has been an upward revision of the stock size, now estimated to be above  $MSY B_{trigger}$ , and a downward revision of F, now closer to  $F_{MSY}$ , compared to the assessment used for the advice issued in 2018. This is based on changes in methodology and time-series of data agreed during the 2019 interbenchmark process (see Quality of the assessment);
- the new  $F_{MSY}$  value (0.23), estimated during the 2019 interbenchmark process and based on the new assessment, is slightly higher than the value used previously (0.21).

### Basis of the advice

**Table 4** Mackerel in subareas 1–8 and 14, and in Division 9.a. The basis of the advice.

Advice basis	MSY approach
Management plan	In 2017 ICES evaluated potential options for a management plan for this fishery, based on a request from Norway, the EU, and the Faroe Islands (ICES, 2017a). However, while there is no long-term management strategy for Northeast Atlantic (NEA) mackerel agreed by all parties involved in the mackerel fishery, Coastal State Delegations from Norway, the EU, and the Faroes have agreed an arrangement for a long-term management strategy for mackerel (Anon., 2017).

## Quality of the assessment

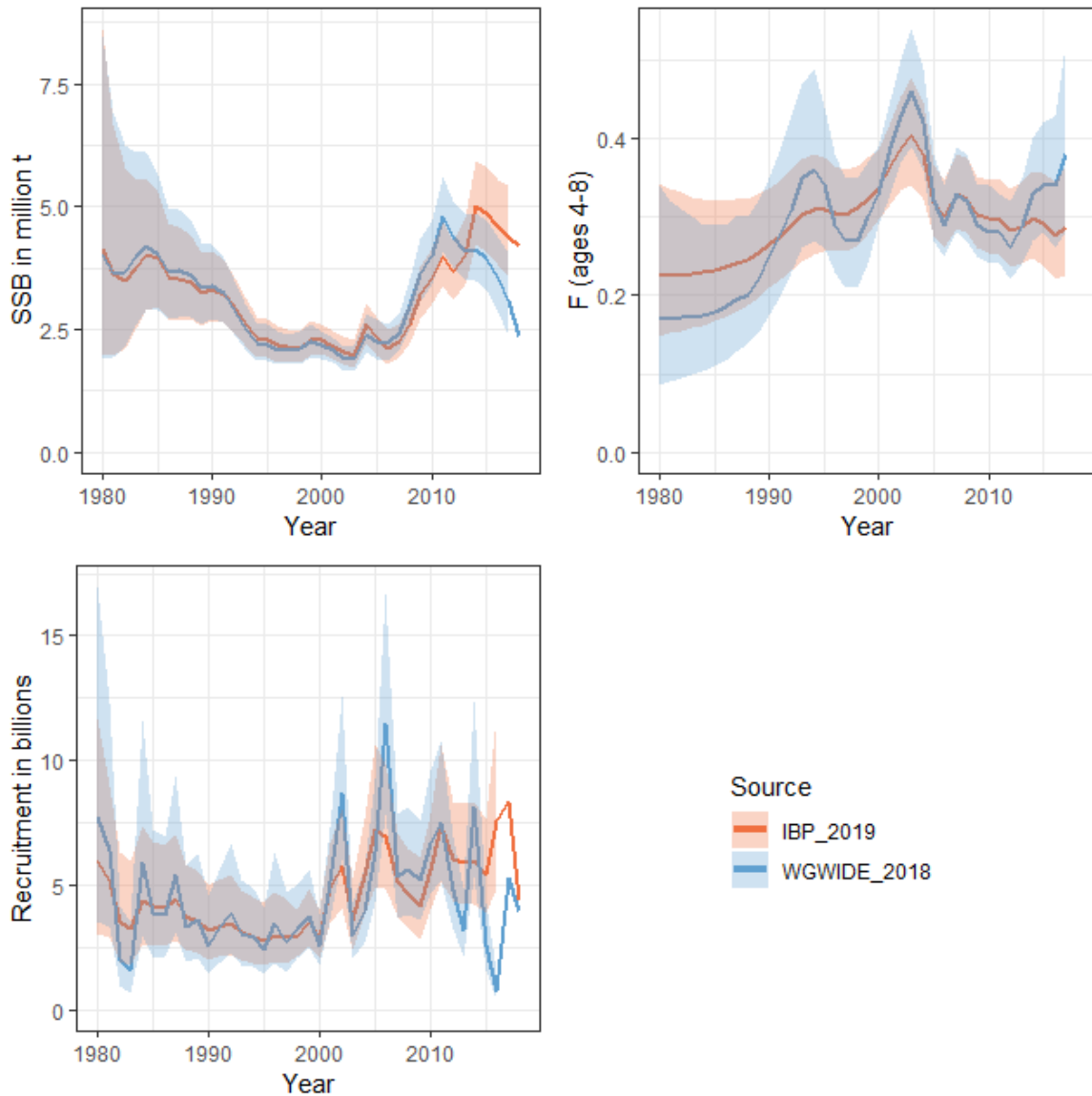
The assessment procedure was modified during an interbenchmark process in 2019 (ICES, 2019). The assessment results are very sensitive to both input data and model settings and the minor changes implemented in the assessment model in 2019 have led to a significant upward revision in the estimates of SSB, a downwards revision of the estimates of F in recent years, and a change in the pattern of estimated recruitment in recent years (Figure 2). This, together with previous revisions to stock trends, highlights the instability in the mackerel assessment.

The model configuration has been updated to more appropriately reflect the lack of information in the catch data with regard to the abundance of younger fish (0- and 1-year-olds). This has resulted in increased influence of the survey index for young fish and an upward revision in recent recruitment estimates.

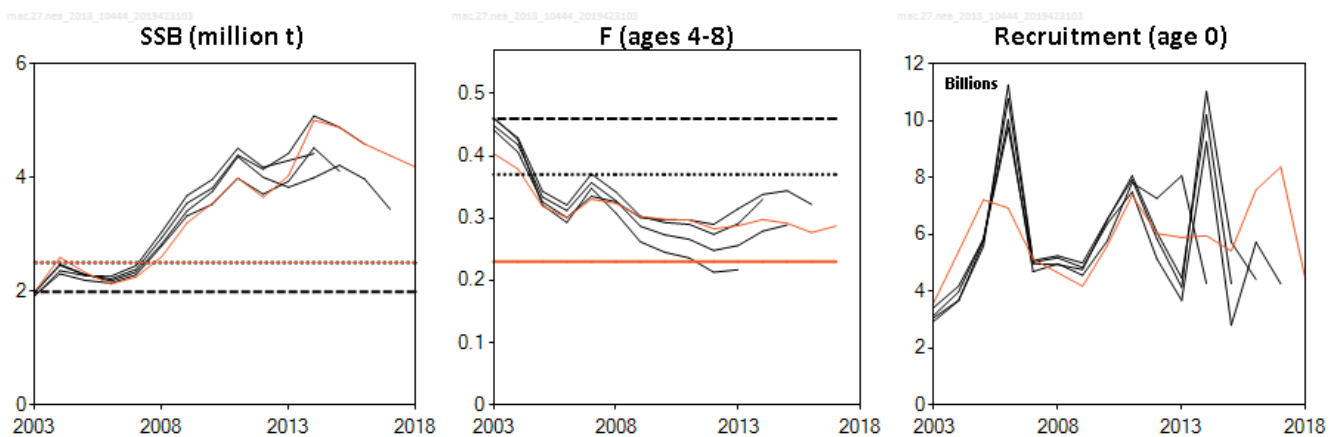
Analysis of data available since the previous benchmark in 2017 (ICES, 2017b) indicates that after tagging, younger fish may not mix evenly throughout the population and that fish at liberty for several years may suffer from additional unquantifiable natural mortality and tag loss currently not accounted for within the assessment. The number of factories scanning catches has increased since the start of the Radio Frequency Identification (RFID) tagging programme. Before 2014, less catches were scanned and they originated from a more restricted geographical area. To account for these issues, the new assessment used only data on fish tagged when older than age 4, recaptured after less than 3 years after being tagged, and recovered since 2014. This has reduced the influence of the tagging data on the assessment.

The changes resulting from the most recent benchmark indicate that the assessment is less sensitive to individual data series, compared to previous model formulations. However, some of the data series remain short relative to the egg survey time-series (International Ecosystem Summer Survey in the Nordic Seas [IESSNS]: 8 years; new tagging data: 4 years of recapture). The inclusion of an additional year of data for these short time-series may modify the relative weight of the different data sources in the assessment and therefore cause a future revision in the level of the SSB, mean F, and recruitment. Furthermore, some of the surveys do not fully contain the distribution of the stock consistently due to changes in stock distribution over time, which may make those estimates more uncertain. The triennial egg survey will provide new data for the 2019 assessment.

Catches prior to 2000 have been down-weighted in the assessment because of the considerable underreporting that is suspected to have taken place. This impacts the estimates of stock size, F, and recruitment in the past.



**Figure 2** Mackerel in subareas 1–8 and 14, and in Division 9.a. Comparison of the 2018 assessment (WGWISE\_2018) and the Interbenchmark assessment used for the present advice (IBP\_2019).



**Figure 3** Mackerel in subareas 1–8 and 14, and in Division 9.a. Historical assessment results. The stock was benchmarked in 2017 and had an interbenchmark in March 2019. The last two years of each recruitment line are assumed values used in the forecast up to 2017. In 2018 only the last value is assumed.

## Issues relevant for the advice

All biological reference points have been evaluated and updated during the 2019 interbenchmark.

The stronger recruitment of recent years has led to an increase in stock size, supporting the increase in catches seen since the mid-2000s. This stronger recruitment may not continue in the future. Fishing mortality has been above  $F_{MSY}$  since 1985. Current catches would not be sustainable if recruitment goes back to the levels estimated during the period 1985 to 2000.

ICES currently considers the NEA mackerel stock to consist of three spawning components: western, southern, and North Sea (ICES, 2016), although the stock structure and spawning behaviour is likely more dynamic (Jansen and Gislason, 2013). The results of the recent egg surveys indicate a decrease in the relative importance of the southern component (from 24% of the mackerel stock in 2013 to 10% in 2017). While the biomass of the western component also decreased in the same period, as estimated by the 2016 egg survey, the relative contribution of the western component to the mackerel stock increased from 73% to 83%. The biomass of the North Sea component was estimated by the egg survey to have increased in 2017, and this component is now estimated to represent 7% of the spawning stock.

ICES recommends that the existing measures to protect the North Sea spawning component should remain in place. Prior to the late 1960s, the spawning biomass of the North Sea component (i.e. mackerel with an affinity for spawning in the North Sea) was estimated to be above 2.5 million tonnes. Overexploitation reduced the size of the North Sea component and it has not recovered despite decades of protection. A recent study has indicated that the lack of recovery is related to unfavourable environmental conditions (Jansen, 2014). Consequently, ICES considers that the North Sea spawning mackerel should be protected to conserve stock structure and dynamics in the NEA mackerel stock (ICES, 2017b). The existing management measures to ensure the protection of the North Sea component, i.e. no mackerel fishing in divisions 3.a and 4.b–c, or in Division 4.a during the period 15 February–31 July, and a 30 cm minimum landings size (or minimum conservation reference size [MCRS]) should therefore remain in place for precautionary reasons. However, an evaluation of the relevance of the minimum landings size in relation to stock production and conservation is needed.

## Reference points

**Table 5** Mackerel in subareas 1–8 and 14, and in Division 9.a. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	2 500 000 t	$B_{pa}$	ICES (2019)
	$F_{MSY}$	0.23	Stochastic simulations	ICES (2019)
Precautionary approach	$B_{lim}$	1 990 000 t	$B_{loss}$ in 2003 from the 2019 interbenchmark assessment	ICES (2019)
	$B_{pa}$	2 500 000 t	$B_{lim} \times \exp(1.654 \times \sigma)$ , $\sigma = 0.14$	ICES (2019)
	$F_{lim}$	0.46	The F that on average leads to $B_{lim}$	ICES (2019)
Management plan	$F_{pa}$	0.37	$F_{lim} \times \exp(-1.645 \times \sigma)$ , with $\sigma = 0.14$	ICES (2019)
	$SSB_{mgt}$			
	$F_{mgt}$			

## Basis of the assessment

**Table 6** Mackerel in subareas 1–8 and 14, and in Division 9.a. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018b).
Assessment type	Age-based analytical model (SAM) that uses catches in the model and in the forecast.
Input data	Catch data, coded wire tagging data (1980–2006) and RFID tagging data (2014–2017), and three survey indices: SSB index from the triennial egg survey (1992–2016), abundance indices from the IBTS survey (combined Q1 and Q4; age 0, 1998–2017), and from the IESSNS survey (ages 3–11, 2010, 2012–2018). Catches prior to 2000 are given a very low weight in the assessment. Natural mortality (0.15 for all ages and years) is based on tagging studies from the early 1980s.
Discards	Discarding is known to take place (0.25% of the total catch in weight in 2017), but is only quantified for part of the fisheries; the proportion of the landings covered cannot be calculated. Partial discard estimates are included in the assessment and overall discarding in recent years is assumed negligible.
Indicators	None.
Other information	Benchmarked in 2019 (IBPNEAMac; ICES, 2019).
Working group	Working Group on Widely Distributed Stocks (WGWISE).

## Information from stakeholders

No additional information has been provided by stakeholders since the interbenchmark in March 2019. The comments that follow are therefore based on the 2018 assessment.

Over the last ten years the pelagic industry has encountered large shoals of mackerel over the entire distribution area. Based upon these observations the industry believes the stock size has increased. This increase in the stock is not confined to one area or observed by only one fleet. The industry has noted signs of good recruitment to the fishery (above average numbers of 2- to 3-year-old fish) in recent years, particularly in 2014 and 2015, and again in 2017 and at the start of 2018. Mackerel is also caught in substantial amounts outside of the directed mackerel fishery and in places where it has not been caught in recent years (e.g. during the herring fishery in the North Sea). The main spawning period in 2018 was found to be consistent with last year at the end of January. In 2018 the IESSNS survey was expanded into the North Sea using a Danish commercial vessel.

## History of the advice, catch, and management

**Table 7** Mackerel in subareas 1–8 and 14, and in Division 9.a. History of ICES advice, the TAC, and ICES estimates of catch. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	TAC*	Official landings	Disc. & slipping**	ICES catch
1987	Given by stock component		442000	616000	10789	654992
1988	Given by stock component		610000	622000	35566	680491
1989	Given by stock component		532000	576000	7090	585920
1990	Given by stock component		562000	580000	15600	626107
1991	Given by stock component		612000	609000	30700	675665
1992	Given by stock component		707000	729000	25000	760690
1993	Given by stock component		767000	784000	18180	824568
1994	Given by stock component		837000	794000	5370	819087
1995	Given by stock component		645000	729000	7721	756277
1996	Significant reduction in F	-	452000	509000	11415	563472
1997	Significant reduction in F	-	470000	517000	18864	573029
1998	F between 0.15 and 0.2	498000	549000	627000	8012	666316
1999	F of 0.15 consistent with PA	437000	562000	585000	n/a	640309
2000	F = 0.17: F <sub>pa</sub>	642000	612000	655000	2084	738606
2001	F = 0.17: F <sub>pa</sub>	665000	670000	660000	1188	737463
2002	F = 0.17: F <sub>pa</sub>	694000	683000	685000	23774	771422
2003	F = 0.17: F <sub>pa</sub>	542000	583000	600000	19427	679287
2004	F = 0.17: F <sub>pa</sub>	545000	532000	587000	19962	660491
2005	F = 0.15 to 0.20	320000–420000	422000	447000	25788	549514
2006	F = 0.15 to 0.20	373000–487000	444000	318000^	26594	481181

Year	ICES advice	Catch corresponding to advice	TAC*	Official landings	Disc. & slipping**	ICES catch
2007	F = 0.15 to 0.20	390000–509000	502000	558000	15444	586206
2008	F = 0.15 to 0.20	349000–456000	458000	420000	37075	623165
2009	F = 0.15 to 0.20	443000–578000	605000^^	442000	15934	737969
2010	harvest control rule	527000–572000	885000^^^	862000	13045	875515
2011	See scenarios	529000–672000	959000^^^	930000	10894	946661
2012	Follow the management plan	586000–639000	927000^^^	877000	15174	892353
2013	Follow the management plan	497000–542000	906000^^^	927000	4732	931732
2014	Follow the management plan	927000–1011000	1392000^^^	1388000	6451	1393000
2015	Follow the management plan	831000–906000	1229000^^^	1199000	10431	1208990
2016	MSY approach	≤ 773 842	1057000^^^	1085000	5971	1094066
2017	MSY approach	≤ 857 185	1194000^^^	1153112	2832	1155944
2018	MSY approach	≤ 550 948	1009180^^^			
2019	MSY approach	≤ 770 358‡				

n/a: not available.

\* For all areas, except some catches in international waters in Subarea 2.

\*\* Data on discards and slipping from only two fleets.

^ Incomplete.

^^ Includes neither the unilateral Norway/Faroe Islands TAC first declared in 2009, nor the Icelandic quota.

^^^ No internationally agreed quotas. Values presented are the sum of unilateral quotas.

‡ This replaces the value of 318 403 t from the October 2018 advice (ICES, 2018c).

**Table 8** Mackerel in subareas 1–8 and 14, and in Division 9.a. History of ICES advice, the TAC, and ICES estimates of catch for the **Western component**. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	TAC*	Disc. & slipping	ICES catch**
1987	SSB = 1.5 mill. t; TAC	380000	405000	11000	633000
1988	F = F <sub>0.1</sub> ; TAC; closed area; landing size	430000	573000	36000	656000
1989	Halt SSB decline; TAC	355000	495000	7000	571000
1990	TAC; F = F <sub>0.1</sub>	480000	525000	16000	606000
1991	TAC; F = F <sub>0.1</sub>	500000	575000	31000	647000
1992	TAC for both 1992 and 1993	670000	670000	25000	742000
1993	TAC for both 1992 and 1993	670000	730000	18000	805000
1994	No long-term gains in increased F	831000***	800000	5000	796000
1995	20% reduction in F	530000	608000	8000	728000
1996	No separate advice	-	422000	11000	529000
1997	No separate advice	-	416000	19000	529000
1998	No separate advice	-	514000	8000	623000
1999	No separate advice	-	520000	0	597000
2000	No separate advice	-	573000	2000	703000
2001	No separate advice	-	630000	1000	694000
2002	No separate advice	-	642000	24000	723000
2003	No separate advice	-	548000	9000	644000
2004	No separate advice	-	500000	11000	615000
2005	No separate advice	-	397000	20000	494000
2006	No separate advice	-	418000	17000	420000
2007	No separate advice	-	472000	8000	519000
2008	No separate advice	-	431000	27000	552000
2009	No separate advice	-	569000	13000	627000
2010	No separate advice	-	^	4000	817000
2011	No separate advice	-	^	8000	920000
2012	No separate advice	-	^	11000	864000
2013	No separate advice	-	^	2000	910000



Year	ICES advice	Catch corresponding to advice	TAC*	Disc. & slipping	ICES catch**
2014	No separate advice	-	^	6000	1342000
2015	No separate advice	-	^	3000	1161000
2016	No separate advice	-	^	3000	1058000
2017	No separate advice	-	^	3000	1120298
2018	No separate advice	-	^		
2019	No separate advice	-			

\* TAC for mackerel taken in all divisions and subareas 6, 7, 8.a, 8.b, 8.d, 5.b, 2.a, 3.a, and 4.a.

\*\* Landings and discards of the Western component; includes some catches from the North Sea component.

\*\*\* Catch at *status quo* F.

^ No internationally agreed TAC.

**Table 9** Mackerel in subareas 1–8 and 14, and in Division 9.a. History of ICES advice, the TAC, and ICES estimates of catch for the **North Sea component**. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice*	TAC**	ICES catch
1987	Lowest practical level	LPL	55000	3000
1988	Closed areas and seasons; min. landing size; bycatch regulations	LPL	55000	6000
1989	Closed areas and seasons; min. landing size; bycatch regulations	LPL	49200	7000
1990	Closed areas and seasons; min. landing size; bycatch regulations	LPL	45200	10000
1991	Closed areas and seasons; min. landing size; bycatch regulations	LPL	65500	n/a
1992	Closed areas and seasons; min. landing size; bycatch regulations	LPL	76300	n/a
1993	Maximum protection; closed areas and seasons; min. landing size	LPL	83100	n/a
1994	Maximum protection; closed areas and seasons; min. landing size	LPL	95700	n/a
1995	Maximum protection; closed areas and seasons; min. landing size	LPL	76300	n/a
1996	Maximum protection; closed areas and seasons; min. landing size	LPL	52800	n/a
1997	Maximum protection; closed areas and seasons; min. landing size	LPL	52800	n/a
1998	Maximum protection; closed areas and seasons; min. landing size	LPL	62500	n/a
1999	Maximum protection; closed areas and seasons; min. landing size	LPL	62500	n/a
2000	Maximum protection; closed areas and seasons; min. landing size	LPL	69700	n/a
2001	Maximum protection; closed areas and seasons; min. landing size	LPL	71400	n/a
2002	Maximum protection; closed areas and seasons; min. landing size	LPL	72900	n/a
2003	Maximum protection; closed areas and seasons; min. landing size	LPL	62500	n/a
2004	Maximum protection; closed areas and seasons; min. landing size	LPL	57700	n/a
2005	Maximum protection; closed areas and seasons; min. landing size	LPL	44900	n/a
2006	Maximum protection; closed areas and seasons; min. landing size	LPL	47100	n/a
2007	Maximum protection; closed areas and seasons; min. landing size	LPL	53100	n/a
2008	Maximum protection; closed areas and seasons; min. landing size	LPL	48600	n/a
2009	Maximum protection; closed areas and seasons; min. landing size	LPL	63800	n/a
2010	Maximum protection; closed areas and seasons; min. landing size	LPL	-	n/a
2011	Maximum protection; closed areas and seasons; min. landing size	LPL	-	n/a
2012	Maximum protection; closed areas and seasons; min. landing size	LPL	-	n/a
2013	Maximum protection; closed areas and seasons; min. landing size	LPL	-	n/a
2014	Maximum protection; closed areas and seasons; min. landing size	LPL	-	n/a
2015	Maximum protection; closed areas and seasons; min. landing size	LPL	-	n/a
2016	Maximum protection; closed areas and seasons; min. landing size	LPL	-	n/a
2017	Maximum protection; closed areas and seasons; min. landing size	LPL	-	n/a
2018	Maximum protection; closed areas and seasons; min. landing size	LPL	-	n/a
2019	Maximum protection; closed areas and seasons; min. landing size	LPL	-	n/a

LPL = Lowest Practical Level.

\* Subarea 4 and Division 3.a.

\*\* TAC for Subarea 4, divisions 3.a and 3.b–d (EU zone), and Division 2.a (EU zone).

n/a: no information available.

**Table 10** Mackerel in subareas 1–8 and 14, and in Division 9.a. History of ICES advice, the agreed TAC, and ICES estimates of catch for the **Southern component**. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	TAC*	ICES catch
1987	Reduce juvenile exploitation	-	36570	22000
1988	Reduce juvenile exploitation	-	36570	25000
1989	No advice	-	36570	18000
1990	Reduce juvenile exploitation	-	36570	21000
1991	Reduce juvenile exploitation	-	36570	21000
1992	No advice	-	36570	18000
1993	No advice	-	36570	20000
1994	No advice	-	36570	25000
1995	No advice	-	36570	28000
1996	No separate advice	-	30000	34000
1997	No separate advice	-	30000	41000
1998	No separate advice	-	35000	44000
1999	No separate advice	-	35000	44000
2000	No separate advice	-	39200	36000
2001	No separate advice	-	40180	43000
2002	No separate advice	-	41100	50000
2003	No separate advice	-	35000	26000
2004	No separate advice	-	32310	35000
2005	No separate advice	-	24870	50000
2006	No separate advice	-	26180	53000
2007	No separate advice	-	29610	63000
2008	No separate advice	-	27010	60000
2009	No separate advice	-	35830	108000
2010	No separate advice	-	33880	52000
2011	No separate advice	-	37140	19000
2012	No separate advice	-	36740	29000
2013	No separate advice	-	31160	22000
2014	No separate advice	-	56640	51000
2015	No separate advice	-	48140	44000
2016	No separate advice	-	40920	36000
2017	No separate advice	-	46631	33000
2018	No separate advice	-	37305	
2019	No separate advice	-	29844	

\*Division 8.c, subareas 9 and 10, and CECAF Division 34.1.1 (EU waters only).

### History of the catch and landings

**Table 11** Mackerel in subareas 1–8 and 14, and in Division 9.a. Landings distribution by fleet and discards as estimated by ICES.

Catch (2017)	Landings			Discards
1 155 944 tonnes	Pelagic trawl 80.4%	Purse seine 19.3%	Others 0.3%	2832 tonnes*
	1 153 112 tonnes			

\* Only quantified for part of the fisheries.

**Table 12** Mackerel in subareas 1–8 and 14, and in Division 9.a. History of commercial catch and landings; the official values are presented by country. All weights are in tonnes. “Misreported” refers to assumed area misreporting between divisions 4.a and 6.a and “Unallocated” indicates differences between official reported values and ICES estimates.

Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Belgium	20	37		125	102	191	351	106	62	114	125	177	146	97	22
Denmark	36853	34264	35800	41505	42164	42502	50142	36780	28526	21971	27416	30011	29177	22522	34376
Estonia					616		3302	2286	3741	4422	7356	3595	2673	219	
Faroe Islands	2622	5032	10000	11131	3347	12575	21568	31199	16851	11513	11229	11620	21023	24184	19768
France	10706	14911	19000	6480	962	3836	11573	11782	15663	20916	17835	16367	19445	20956	21878
Germany, Fed.	16457	22512	21600	14537	13719	13236	26508	24415	16227	15374	21412	19949	22979	25307	26532
Germany, Dem.		2409													
Greenland															
Guernsey															
Iceland									92	925	357				53
Ireland	85800	69980	74300	30138	35088	36982	89028	78534	54313	53129	66650	59675	71233	70452	72172
Jersey															
Latvia					311	4700	1508	389	233						
Lithuania													2085		
Netherlands	28664	31343	38200	69418	82860	89543	44335	35789	36760	23700	30163	28621	32385	36095	33444
Norway	163450	150400	151700	208266	239965	257800	258094	202205	136436	137523	158177	160738	174098	180372	184291
Poland						600				22					
Portugal	4388	3112	3819	2789	3576	2015	2158	2893	3023	2080	2897	2002	2253	3119	2934
Romania							2903								
Spain	21884	16609	17892	22011	17234	20864	27113	29165	33371	46470	44607	45915	38321	44142	50123
Sweden	1003	6601	6400	4227	5100	5934	7099	6285	5307	4714	5146	5233	4994	5098	5232
United Kingdom	210815	187760	193900	200019	232829	256275	237841	212147	146205	321821	185948	160152	184902	192631	194045
USSR/Russia	27924	12088	28900	13361	42440	49600	28041	44537	44545	53732	67836	51348	50772	41567	45811
Misreported							109625	18647				-211	4816		6009
Unallocated	34330	25361	8100	12956	15038		4632	29228	10839	5679	11498	38996	66235	62825	50543
Discards	35576	7090	15600	30750	25000	18380	5370	7721	11415	18864	8030		3832	1188	23774
Total	680492	589509	625211	667713	760351	815033	931194	774108	563610	742969	666682	634545	731459	730774	771007

Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Belgium	2	5	1	3	1	2	3	29	21	39	62	56	52	143	128
Denmark	27900	25665	23212	24219	25223	26726	23491	41445	35958	36501	33218	42222	46871	41139	40028
Estonia											1367				
Faroe Islands	14014	13030	9769	12067	13430	11289	14062	70987	122050	107630	143001	150236	108412	93267	99667
France	22906	20266	16338	14953	20038	15602	18340	11379	12766	20467	14643	21719	25704	20189	22950
Germany, Fed. Rep.	24061	23244	19040	16608	18221	15502	22703	19055	24083	18944	20931	28456	28257	23411	24858
Germany, Dem. Rep.															
Greenland									62	7402	54148	78581	30351	36142	46388
Guernsey				10					10	5	9	9	4		
Iceland	122		363	4222	36706	112286	116160	121008	159263	149282	151235	172960	169333	170374	167366
Ireland	67355	61102	45687	40664	49259	44760	61056	57994	61596	63049	56511	103178	88744	76526	84915
Jersey			9	8	6	7	8	6	7	8	8	7	3	3	
Latvia															
Lithuania				95	7				23			9598	554	2540	
Netherlands	30424	27532	22734	24157	24244	19972	23568	23088	28395	25817	21159	46665	39807	37929	43766
Norway	163406	157363	119678	121993	131691	121524	121229	233952	208065	176023	164607	277731	242231	209352	222356
Poland			570	1368	978								24		1
Portugal	2749	2289	1509	2620	2605	2381	1753	2363	962	824	254	618	1456	619	634
Romania															
Spain	23762			54136	62946	64637	114074	52737	18725	19386	16414	37806	34530	30036	32885
Sweden	445	4437	3204	3209	3858	3664	7303	3429	3248	4564	2906	4422	3930	3663	3701
United Kingdom	183008	214771	152801	95815	133688	112394	157010	160417	180972	169745	163807	287851	247986	217633	225410
USSR/Russia	40026	49489	40495	33580	35408	32728	41414	59310	73601	74587	80817	116433	128433	121644	138061
Misreported															
Unallocated	59172	41335	68414	4954	12453	1069	-139	5271	5961	5237	3336	9457	1876	3480	
Discards	9481	19962	25788	26594	15444	37075	15934	13045	10894	15174	4732	6451	10430	5971	2832
Total	668833	660491	549514	481276	586206	621618	737969	875515	946662	894684	933165	1394456	1208988	1094066	1155944

**Table 13** Mackerel in subareas 1–8 and 14, and in Division 9.a. History of catch and landings; the ICES estimates are presented by area.

Year	Subarea 6			Subarea 7 and Divisions 8.a, b, d, e			Subareas 3 and 4			Subareas 1, 2, 5, and 14			Divisions 8.c and 9.a			Total		
	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch
1969	4800		4800	47404		47404	739175		739175	7		7	42526		42526	833912		833912
1970	3900		3900	72822		72822	322451		322451	163		163	70172		70172	469508		469508
1971	10200		10200	89745		89745	243673		243673	358		358	32942		32942	376918		376918
1972	13000		13000	130280		130280	188599		188599	88		88	29262		29262	361229		361229
1973	52200		52200	144807		144807	326519		326519	21600		21600	25967		25967	571093		571093
1974	64100		64100	207665		207665	298391		298391	6800		6800	30630		30630	607586		607586
1975	64800		64800	395995		395995	263062		263062	34700		34700	25457		25457	784014		784014
1976	67800		67800	420920		420920	305709		305709	10500		10500	23306		23306	828235		828235
1977	74800		74800	259100		259100	259531		259531	1400		1400	25416		25416	620247		620247
1978	151700	15100	166800	355500	35500	391000	148817		148817	4200		4200	25909		25909	686126	50600	736726
1979	203300	20300	223600	398000	39800	437800	152323	500	152823	7000		7000	21932		21932	782555	60600	843155
1980	218700	6000	224700	386100	15600	401700	87931		87931	8300		8300	12280		12280	713311	21600	734911
1981	335100	2500	337600	274300	39800	314100	64172	3216	67388	18700		18700	16688		16688	708960	45516	754476
1982	340400	4100	344500	257800	20800	278600	35033	450	35483	37600		37600	21076		21076	691909	25350	717259
1983	320500	2300	322800	235000	9000	244000	40889	96	40985	49000		49000	14853		14853	660242	11396	671638
1984	306100	1600	307700	161400	10500	171900	43696	202	43898	98222		98222	20208		20208	629626	12302	641928
1985	388140	2735	390875	75043	1800	76843	46790	3656	50446	78000		78000	18111		18111	606084	8191	614275
1986	104100		104100	128499		128499	23309	7431	243740	101000		101000	24789		24789	594697	7431	602128
1987	183700		183700	100300		100300	290829	10789	301618	47000		47000	22187		22187	644016	10789	654805
1988	115600	3100	118700	75600	2700	78300	308550	29766	338316	120404		120404	24772		24772	644926	35566	680492
1989	121300	2600	123900	72900	2300	75200	279410	2190	281600	90488		90488	18321		18321	582419	7090	589509
1990	114800	5800	120600	56300	5500	61800	300800	4300	305100	118700		118700	21311		21311	611911	15600	627511
1991	109500	10700	120200	50500	12800	63300	358700	7200	365900	97800		97800	20683		20683	637183	30700	667883
1992	141906	9620	151526	72153	12400	84553	364184	2980	367164	139062		139062	18046		18046	735351	25000	760351
1993	133497	2670	136167	99828	12790	112618	387838	2720	390558	165973		165973	19720		19720	806856	18180	825036
1994	134338	1390	135728	113088	2830	115918	471247	1150	472397	72309		72309	25043		25043	816025	5370	821395
1995	145626	74	145700	117883	6917	124800	321474	730	322204	135496		135496	27600		27600	748079	7721	755800
1996	129895	255	130150	73351	9773	83124	211451	1387	212838	103376		103376	34123		34123	552196	11415	563611
1997	65044	2240	67284	114719	13817	128536	226680	2807	229487	103598		103598	40708		40708	550749	18864	569613
1998	110141	71	110212	105181	3206	108387	264947	4735	269682	134219		134219	44164		44164	658652	8012	666664
1999	116362		116362	94290		94290	313014		313014	72848		72848	43796		43796	640311		640311
2000	187595	1	187595	115566	1918	117484	285567	165	304898	92557		92557	36074		36074	736524	2084	738608
2001	143142	83	143142	142890	1081	143971	327200	24	339971	67097		67097	43198		43198	736274	1188	737462
2002	136847	12931	149778	102484	2260	104744	375708	8583	394878	73929		73929	49576		49576	749131	23774	772905
2003	135690	1399	137089	90356	5712	96068	354109	11785	365894	53883		53883	25823	531	26354	659831	19427	679288
2004	134033	1705	134738	103703	5991	109694	306040	11329	317369	62913	9	62922	34840	928	35769	640529	19962	660491
2005	79960	8201	88162	90278	12158	102436	249741	4633	254374	54129		54129	49618	796	50414	523726	25788	549514

Year	Subarea 6			Subarea 7 and Divisions 8.a, b, d, e			Subareas 3 and 4			Subareas 1, 2, 5, and 14			Divisions 8.c and 9.a			Total		
	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch	Land.	Disc.	Catch
2006	88077	6081	94158	66209	8642	74851	200929	8263	209192	46716		46716	52751	3607	56358	454587	26594	481181
2007	110788	2450	113238	71235	7727	78962	253013	4195	257208	72891		72891	62834	1072	63906	570762	15444	586206
2008	76358	21889	98247	73954	5462	79416	227252	8862	236113	148669	112	148781	59859	750	60609	586090	37075	623165
2009	135468	3927	139395	88287	2921	91208	226928	8120	235049	163604		163604	107747	966	108713	722035	15934	737969
2010	106732	2904	109636	104128	4614	108741	246818	883	247700	355725	5	355729	49068	4640	53708	862470	13045	875515
2011	160756	1836	162592	51098	5317	56415	301746	1906	303652	398132	28	398160	24036	1807	25843	935767	10894	946661
2012	121115	952	122067	65728	9701	75429	218400	1089	219489	449325	1	449326	24941	3431	28372	879510	15174	894684
2013	132062	273	132335	49871	1652	51523	260921	337	261258	465714	15	465729	19733	2455	22188	928433	4732	933165
2014	180068	340	180408	93709	1402	95111	383887	334	384221	684082	91	684173	46257	4284	50541	1388003	6451	1394454
2015	134728	30	134757	98563	3155	101718	295877	34	295911	632493	78	632571	36899	7133	44033	1198560	10431	1208990
2016	206326	200	206526	37300	1927	39227	248041	570	248611	563440	54	563494	32987	3220	36207	1088094	5971	1094066
2017	225959	151	226110	21128	1992	23119	269404	400	269804	603806	62	603869	32815	227	33042	1153112	2832	1155944

## Summary of the assessment

**Table 14** Mackerel in subareas 1–8 and 14, and in Division 9.a. Assessment summary. Weights are in tonnes.

Year	Recruitment age 0	Recruitment 2.5th percentile	Recruitment 97.5th percentile	SSB***	SSB 2.5th percentile	SSB 97.5th percentile	Total catch	F ages 4–8	F ages 4–8 2.5th percentile	F ages 4–8 97.5th percentile Low
	thousands			tonnes			tonnes			
1980	5960461	3033559	11711358	4127954	1978236	8613736	734950	0.226	0.149	0.342
1981	5144419	2940073	9001493	3615055	1955633	6682552	754045	0.226	0.152	0.336
1982	3511225	1954346	6308351	3493495	2110609	5782457	716987	0.226	0.155	0.331
1983	3259719	1784277	5955227	3735481	2514353	5549667	672283	0.227	0.158	0.326
1984	4384312	2618259	7341593	4007395	2875482	5584877	641928	0.229	0.162	0.323
1985	4130379	2530008	6743072	3963573	2965637	5297314	614371	0.232	0.167	0.321
1986	4119384	2577643	6583273	3546426	2709923	4641142	602201	0.236	0.173	0.321
1987	4428756	2794035	7019911	3512079	2686792	4590863	654992	0.241	0.180	0.322
1988	3737917	2394965	5833916	3456899	2710955	4408096	680491	0.246	0.188	0.324
1989	3550530	2272992	5546110	3240691	2584908	4062843	585920	0.255	0.197	0.329
1990	3166568	1992256	5033066	3309485	2684817	4079494	626107	0.265	0.209	0.337
1991	3331422	2141528	5182456	3204802	2628641	3907250	675665	0.277	0.221	0.348
1992	3471695	2229426	5406172	2943216	2439302	3551230	760690	0.290	0.233	0.361
1993	3100017	2004462	4794356	2631753	2192907	3158421	824568	0.302	0.244	0.373
1994	2926192	1896946	4513887	2318632	1944828	2764284	819087	0.310	0.252	0.380
1995	2767201	1783211	4294164	2295743	1940777	2715632	756277	0.310	0.256	0.375
1996	3000516	1905561	4724643	2177785	1845951	2569269	563472	0.306	0.256	0.365
1997	2908386	1898005	4456633	2141099	1837063	2495454	573029	0.304	0.257	0.360
1998	2941916	2135751	4052379	2117060	1812195	2473212	666316	0.311	0.264	0.365
1999	3509809	2528211	4872521	2296536	1971144	2675643	640309	0.323	0.278	0.375
2000	2897968	2079983	4037636	2274402	1996604	2590852	738606	0.337	0.296	0.384
2001	4831325	3500124	6668820	2160026	1900312	2455236	737463	0.365	0.317	0.420
2002	5774456	4116151	8100853	2053288	1782342	2365423	771422	0.388	0.333	0.454
2003	3607560	2454548	5302195	1986872	1723399	2290625	679287	0.404	0.340	0.479
2004	5402906	3802047	7677810	2595241	2214463	3041494	660491	0.379	0.322	0.446
2005	7217807	4910056	10610215	2327648	1983751	2731160	549514	0.319	0.276	0.368
2006	6927969	4853424	9889258	2124887	1811615	2492330	481181	0.301	0.260	0.348
2007	5129692	3712088	7088663	2249385	1932677	2617993	586206	0.330	0.286	0.381
2008	4649953	3354315	6446045	2604212	2204992	3075711	623165	0.324	0.280	0.375
2009	4175133	2842415	6132722	3201050	2708972	3782512	737969	0.303	0.260	0.352
2010	5604580	4005451	7842142	3550655	3030672	4159854	875515	0.298	0.255	0.348
2011	7377195	5117508	10634670	3990908	3400666	4683597	946661	0.297	0.253	0.349
2012	6030494	4347878	8364275	3653725	3096765	4310855	892353	0.283	0.237	0.337
2013	5891935	4207219	8251269	4032619	3404967	4775968	931732	0.288	0.240	0.345
2014	5952378	4240414	8355508	5009997	4230569	5933025	1393000	0.298	0.247	0.359
2015	5417215	3851126	7620165	4885392	4095139	5828144	1208990	0.292	0.239	0.356
2016	7569733	4857571	11796195	4590401	3795807	5551332	1094066	0.277	0.222	0.345
2017	8374576*			4387307	3549005	5423622	1155944	0.287	0.225	0.366
2018	4397874**			4186496†						

\* RCT3 estimate.

\*\* Geometric mean 1990–2016.

\*\*\* SSB is at spawning time.

† Estimated value from the forecast.

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