

## Mackerel (*Scomber scombrus*) in subareas 1–8 and 14, and in Division 9.a (the Northeast Atlantic and adjacent waters)

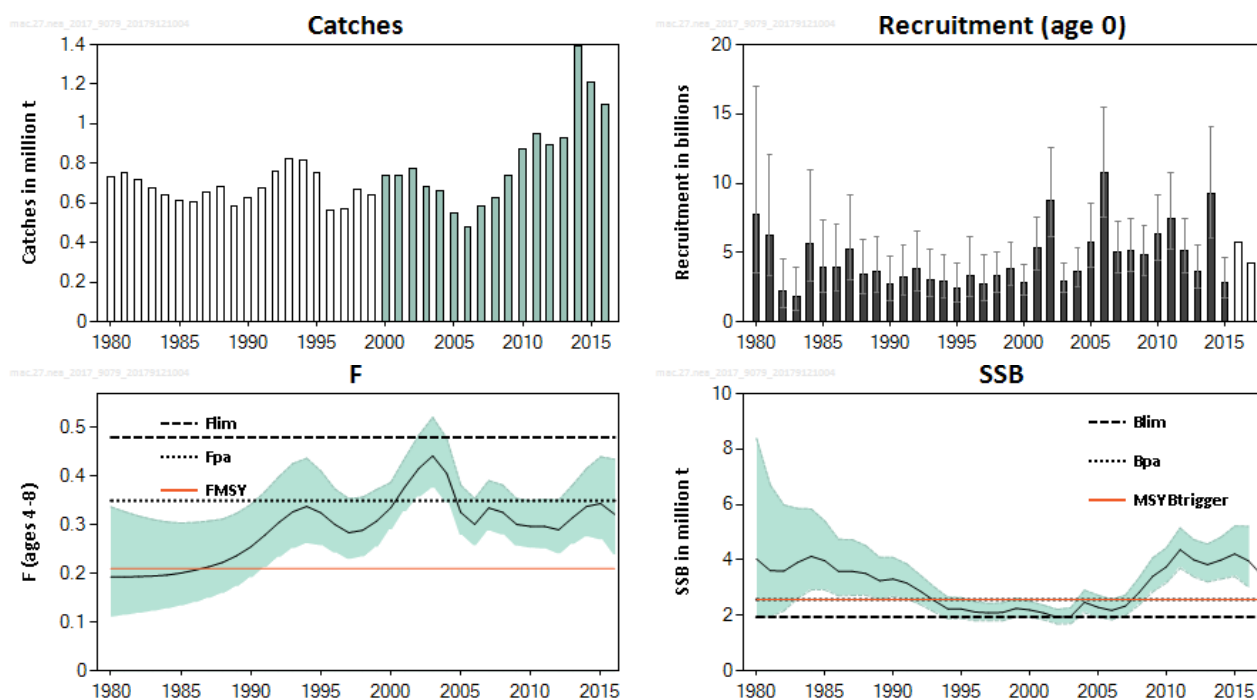
### ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2018 should be no more than 550 948 tonnes.

ICES further advises that the existing measures to protect the North Sea spawning component should remain in place.

### Stock development over time

The spawning-stock biomass (SSB) is estimated to have increased in the late 2000s and 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.



**Figure 1** Mackerel in subareas 1–8 and 14, and in Division 9.a. Summary of the stock assessment. The unshaded catches prior to 2000 are the years that have been down-weighted in the assessment because of the considerable underreporting that is suspected to have taken place. The recruitment value for 2016 is the time-tapered weighted mean of the recruitments from 1990 to 2015 as estimated by the SAM model, and the recruitment value for 2017 is the geometric mean of the recruitments from 1990 to 2015. Confidence intervals (95%) are included in the recruitment, fishing mortality, and spawning-stock biomass plots.

### Stock and exploitation status

**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		
		2014	2015	2016	2015	2016	2017
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 options

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

Variable	Value	Source	Notes
F ages 4–8 (2017)	0.405	ICES (2017a)	Based on the ICES estimate of the total catch for 2017.
SSB (2017) at spawning time	3 443 926 t	ICES (2017a)	Based on the ICES estimate of the total catch for 2017.
$R_{age 0}$ (2017–2018)	4 255 854 thousands	ICES (2017a)	Geometric mean of the recruitment estimates (1990–2015).
Total catch (2017)	1 178 850 t	ICES (2017a)	Sum of declared quotas corrected by the interannual transfers.

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

Basis	Total catch (2018)	$F_{4-8}$ (2018 and 2019)	SSB (2018) Spawning time	SSB (2019) Spawning time	% SSB change *	% Catch change **
ICES advice basis						
MSY approach: $F_{MSY}$	550948	0.21	3123519	3162312	1.2	-53
Other options						
F = 0	0	0	3213067	3698314	15	-100
$F_{pa}$	864415	0.35	3065670	2867908	-6.5	-27
$F_{lim}$	1122906	0.48	3013235	2631351	-13	-4.7
SSB(2019) = $B_{lim}$	1915301	1.0	2815222	1944804	-31	62
SSB(2019) = $MSY B_{trigger} = B_{pa}$	1196775	0.52	2997345	2564830	-14	1.5
F = $F_{2017}$	977765	0.405	3043254	2763463	-9.2	-17
Catch(2018) = Catch(2017) -20%	943080	0.39	3050205	2795307	-8.4	-20
Catch(2018) = Catch(2017)	1178850	0.51	3001241	2580927	-14	0.0
Catch(2018) = Catch(2017) +20%	1414620	0.65	2947809	2371562	-20	20
F = 0.20	527025	0.20	3127707	3185107	1.8	-55
F = 0.22	574658	0.22	3119338	3139767	0.7	-51
F = 0.23	598156	0.23	3115166	3117466	0.1	-49
F = 0.24	621445	0.24	3111000	3095407	-0.5	-47
F = 0.25	644527	0.25	3106842	3073588	-1.1	-45
F = 0.26	667404	0.26	3102692	3052005	-1.6	-43
F = 0.27	690078	0.27	3098548	3030654	-2.2	-41
F = 0.28	712551	0.28	3094413	3009535	-2.7	-40
F = 0.29	734825	0.29	3090285	2988642	-3.3	-38
F = 0.30	756903	0.30	3086164	2967975	-3.8	-36

\* SSB 2019 relative to SSB 2018.

\*\* Catch in 2018 relative to estimated catches in 2017 (1 178 850 t). There is no internationally agreed TAC for 2017.

**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	There is no long-term management strategy for Northeast Atlantic (NEA) mackerel agreed by all parties involved in the mackerel fishery. ICES has now evaluated options for the potential management of this fishery, based on a request from Norway, the EU and the Faroe Islands (ICES, 2017b).

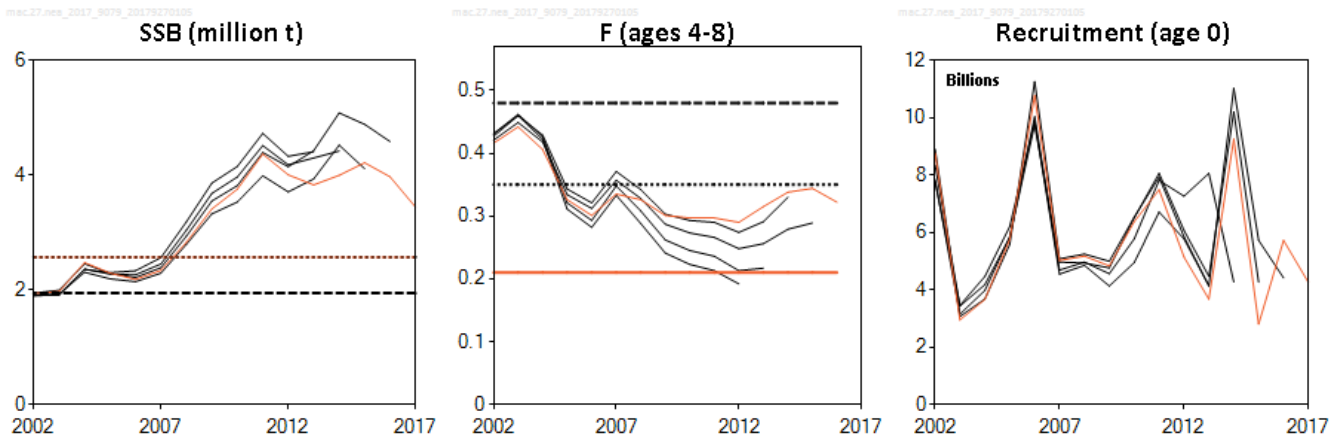
**Quality of the assessment**

The assessment was benchmarked in 2017 (ICES, 2017c). The method to derive the International Ecosystem Summer Survey in the Nordic Seas (IESSNS) index has been improved: years with poor spatial coverage (2007 and 2011) have been removed, younger age classes (3–5) are now incorporated in the assessment, and the assessment model now accounts for the year effects in the IESSNS survey. The new and methodologically improved tag-and-recapture data time-series of fish released since 2011 is now also included, providing information for the recent years. This has resulted in a downward revision in the estimates of SSB and an upwards revision of the estimates of F in recent years.

Some of the data series are still short (IESSNS: 7 years, new tagging data: 5 years of recapture). The assessment may still be unstable until longer time-series are available. Abundance estimates of the juvenile part of the stock are uncertain because the model only has information from two sources, namely the recruitment index (not updated this year because of a number of data quality issues) and the commercial catch data for age groups not fully recruited in the fishery and therefore more uncertain (ICES, 2017d).

Because the recruitment survey was not updated in 2016, the assumption about the size of the 2016 year class was based on a weighted mean of estimates from the assessment for the period 1990–2015. This is as close as possible to the approach normally followed for this stock.

The surveys give contradictory information on the recent development of the stock. The 2016 egg survey suggests a decrease in the SSB since 2013, while the abundances-at-age from the IESSNS index have increased between those years.



**Figure 2** Mackerel in subareas 1–8 and 14, and in Division 9.a. Historical assessment results.

## Issues relevant for the advice

There is a downward revision of the perception of the SSB compared to the 2016 assessment. This is due to the changes made in the assessment methodology during the benchmark, and to a revision of the tagging recapture dataset after the benchmark. In addition, the SSB is estimated to have decreased from 2016 to 2017. These factors combined explain the lower catch advice for 2018.

All biological reference points have been evaluated and updated following the benchmark.

ICES considers the NEA mackerel stock to consist of three spawning components: western, southern, and North Sea (ICES, 2016a), although the stock structure and spawning behaviour is likely more complex (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 11% in 2016). While the biomass of the western component estimated by the egg survey also decreased in the same period, its relative contribution to the mackerel stock increased from 73% to 85%. The biomass of the North Sea component (egg survey conducted in 2015) remains stable at a low level around 4%.

Prior to the late 1960s, 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 and unfavorable environmental conditions 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, 2017c). The existing management measures to ensure the protection on the North Sea component (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 conservation reference size) should therefore remain in place for precautionary reasons. However, an evaluation of the relevance of the minimum conservation reference 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 $B_{trigger}$	2 570 000 t	$B_{pa}$	ICES (2017c)
	$F_{MSY}$	0.21	Stochastic simulations	ICES (2017d)
Precautionary approach	$B_{lim}$	1 940 000 t	$B_{loss}$ in 2002 from the 2017 benchmark assessment.	ICES (2017c)
	$B_{pa}$	2 570 000 t	$\exp(1.654 \times \sigma) \times B_{lim}$ , $\sigma = 0.17$ .	ICES (2017c)
	$F_{lim}$	0.48	The F that on average leads to $B_{lim}$	ICES (2017d)
	$F_{pa}$	0.35	$F_{lim} \times \exp(-1.645 \times \sigma)$ , with $\sigma = 0.2$	ICES (2017d)
Management plan	$SSB_{mgt}$			
	$F_{mgt}$			

## 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 ( <a href="#">ICES, 2016b</a> ).
Assessment type	Age-based analytical model (SAM; ICES, 2017a) that uses catches in the model and in the forecast.
Input data	Catch data, tagging data (1980–2006 and 2012–2016 recapture years), 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, 1998–2015), and from the IESSNS survey (ages 3–11, 2010, 2012–2017). 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, but is only quantified for part of the fisheries (1.2% in weight for reporting countries in 2016); the proportion of the landings covered cannot be calculated. Partial discard estimates are included in the assessment and overall discarding is assumed negligible.
Indicators	None.
Other information	Benchmarked in 2017 (WKWIDE; ICES, 2017c).
Working group	Working Group on Widely Distributed Stocks ( <a href="#">WGWIDE</a> )

## Information from stakeholders

Over the last nine years the pelagic industry has encountered large shoals of mackerel over the entire distribution area which has expanded both south and north. Based upon these observations the industry believes the stock size has greatly 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 (above average) recruitment to the fishery (ages 2–3) in recent years, particularly in 2014 and 2015. The same signs were not evident during 2016. 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). Danish fishers have reported catches of spawning mackerel in the sandeel fishery. In 2017, the main spawning migration (of the western component) began at the end of January, roughly three weeks later than normal.

## History of the advice, catch, and management

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

Year	ICES advice	Predicted catch corresp. to advice	Total agreed TAC*	Official landings**	Disc.*** & slipping	ICES catch
1987	Given by stock component		442000	616000	11000	654992
1988	Given by stock component		610000	622000	36000	680491
1989	Given by stock component		532000	576000	7000	585920
1990	Given by stock component		562000	580000	16000	626107
1991	Given by stock component		612000	609000	31000	675665
1992	Given by stock component		707000	729000	25000	760690
1993	Given by stock component		767000	784000	18000	824568
1994	Given by stock component		837000	794000	5000	819087
1995	Given by stock component		645000	729000	8000	756277
1996	Significant reduction in F	-	452000	509000	11000	563472
1997	Significant reduction in F	-	470000	517000	19000	573029
1998	F between 0.15 and 0.2	498000	549000	627000	8000	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	2000	738606
2001	F = 0.17: F <sub>pa</sub>	665000	670000	660000	1000	737463
2002	F = 0.17: F <sub>pa</sub>	694000	683000	685000	24000	771422
2003	F = 0.17: F <sub>pa</sub>	542000	583000	600000	9000	679287
2004	F = 0.17: F <sub>pa</sub>	545000	532000	587000	11000	660491
2005	F = 0.15 to 0.20	320000–420000	422000	447000	20000	549514
2006	F = 0.15 to 0.20	373000–487000	444000	318000 <sup>^</sup>	18000	481181

Year	ICES advice	Predicted catch corresp. to advice	Total agreed TAC*	Official landings**	Disc.*** & slipping	ICES catch
2007	F = 0.15 to 0.20	390000–509000	502000	558000	8000	586206
2008	F = 0.15 to 0.20	349000–456000	458000	420000	27000	623165
2009	F = 0.15 to 0.20	443000–578000	605000^^	442000	13000	737969
2010	harvest control rule	527000–572000	885000^^^	862000	7000	875515
2011	See scenarios	529000–672000	959000^^^	930000	9000	946661
2012	Follow the management plan	586000–639000	927000^^^	877000	15000	892353
2013	Follow the management plan	497000–542000	906000^^^	927000	5000	931732
2014	Follow the management plan	927000–1011000	1392000^^^	1388000	6000	1393000
2015	Follow the management plan	831000–906000	1229000^^^	1199000	10000	1208990
2016	MSY approach	≤ 773 842	1057000^^^	1085000	6000	1094066
2017	MSY approach	≤ 857 185†	1194000^^^			
2018	MSY approach	≤ 550 948				

n/a: not available.

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

\*\* Updated with ICES FishStat data.

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

^ Incomplete.

^^ Does not include 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.

† Catch advice for 2017, as corrected in January 2017.

**Table 8** Mackerel in subareas 1–7 and 14, and in divisions 8.a–e and 9.a. History of ICES advice, the agreed TAC, and ICES estimates of catch for the Western component. All weights are in tonnes.

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC*	Disc. & slipping	ICES catch**
1987	SSB = 1.5 mill. t; TAC	380000	405000	11000	633000
1988	F = $F_{0.1}$ ; TAC; closed area; landing size	430000	573000	36000	656000
1989	Halt SSB decline; TAC	355000	495000	7000	571000
1990	TAC; F = $F_{0.1}$	480000	525000	16000	606000
1991	TAC; F = $F_{0.1}$	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
2014	No separate advice	-	^	6000	1342000
2015	No separate advice	-	^	3000	1161000
2016	No separate advice	-	^	3000	1058000
2017	No separate advice	-	^		
2018	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 1–7 and 14, and in divisions 8.a–e and 9.a. History of ICES advice, the agreed TAC, and ICES estimates of catch for the North Sea component. All weights are in tonnes.

Year	ICES advice	Predicted catch corresp. to advice*	Agreed 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		
2018	Maximum protection; closed areas and seasons; min. landing size			

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** Subareas 1–7 and 14, and in divisions 8.a–e and 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	Predicted catch corresp. to advice	Agreed 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	-		
2018	No separate advice	-		

\*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. Catch distribution by fleet in 2016 as estimated by ICES.

Catch (2016)	Landings			Discards
	Pelagic trawl 77.8%	Purse seine 20.3%	Others 1.9%	
1 094 066 tonnes	1 088 094 tonnes			5 972 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; both the official and ICES estimated values are presented by area for each country participating in the fishery. All weights are in tonnes.

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

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Belgium	22	2	5	1	3	1	2	3	29	21	39	62	56	52	143
Denmark	34376	27900	25665	23212	24219	25223	26726	23491	41445	35958	36501	33218	42222	46871	41139
Estonia												1367			
Faroe Islands	19768	14014	13030	9769	12067	13430	11289	14062	70987	122050	107630	143001	150236	108412	93267
France	21878	22906	20266	16338	14953	20038	15602	18340	11379	12766	20467	14643	21719	25704	20189
Germany, Fed. Rep.	26532	24061	23244	19040	16608	18221	15502	22703	19055	24083	18944	20931	28456	28257	23411
Germany, Dem. Rep.															
Greenland									62	7402	54148	78581	30351	36142	
Guernsey				10					10	5	9	9	4		
Iceland	53	122		363	4222	36706	112286	116160	121008	159263	149282	151235	172960	169333	170374
Ireland	72172	67355	61102	45687	40664	49259	44760	61056	57994	61596	63049	56511	103178	88744	76526

Country	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Jersey				9	8	6	7	8	6	7	8	8	7	3	3
Latvia															
Lithuania					95	7				23			9598	554	2540
Netherlands	33444	30424	27532	22734	24157	24244	19972	23568	23088	28395	25817	21159	46665	39807	37929
Norway	184291	163406	157363	119678	121993	131691	121524	121229	233952	208065	176023	164607	277731	242231	209352
Poland				570	1368	978								24	
Portugal	2934	2749	2289	1509	2620	2605	2381	1753	2363	962	824	254	618	1456	619
Romania															
Spain	50123	23762			54136	62946	64637	114074	52737	18725	19386	16414	37806	34530	30036
Sweden	5232	445	4437	3204	3209	3858	3664	7303	3429	3248	4564	2906	4422	3930	3663
United Kingdom	194045	183008	214771	152801	95815	133688	112394	157010	160417	180972	169745	163807	287851	247986	217633
USSR/Russia	45811	40026	49489	40495	33580	35408	32728	41414	59310	73601	74587	80817	116433	128433	121644
Misreported	6009														
Unallocated	50543	59172	41335	68414	4954	12453	1069	-139	5271	5961	5237	3336	9457	1876	3480
Discards	23774	9481	19962	25788	26594	15444	37075	15934	13045	10894	15174	4732	6451	10430	5971
Total	771007	668833	660491	549514	481276	586206	621618	737969	875515	946662	894684	933165	1394456	1208988	1094066

**Table 13** Mackerel in subareas 1–7 and 14, and in divisions 8.a–e and 9.a. History of catch and landings; both the official and ICES estimated values 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

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
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	44 164		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
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

**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 thousands	Recruitment 97.5th percentile	Recruitment 2.5th percentile	SSB*** tonnes	SSB 97.5th percentile	SSB 2.5th percentile	Total catch tonnes	F Ages 4–8	F Ages 4–8 97.5th percentile	F Ages 4–8 2.5th percentile Low
1980	7773191	16935421	3567817	4036576	8383104	1943665	734950	0.193	0.337	0.11
1981	6285233	12033906	3282738	3615334	6702543	1950102	754045	0.193	0.327	0.114
1982	2180823	4513296	1053773	3599277	5982488	2165453	716987	0.194	0.318	0.118
1983	1797083	3937823	820125	3910341	5855386	2611402	672283	0.195	0.311	0.122
1984	5616260	10931574	2885438	4130866	5840077	2921889	641928	0.197	0.306	0.127
1985	3944367	7336748	2120562	3971447	5400004	2920811	614371	0.201	0.304	0.133
1986	3905543	7000520	2178876	3583193	4742362	2707359	602201	0.207	0.305	0.14
1987	5278605	9145419	3046735	3590025	4730852	2724305	654992	0.214	0.308	0.149
1988	3441359	5907336	2004787	3510794	4513203	2731026	680491	0.223	0.312	0.159
1989	3590783	6179382	2086572	3250962	4093200	2582028	585920	0.237	0.324	0.173
1990	2673069	4744120	1506137	3312346	4086258	2685009	626107	0.255	0.342	0.191
1991	3273685	5572759	1923108	3166759	3853422	2602456	675665	0.279	0.368	0.212
1992	3854604	6566333	2262751	2867966	3443940	2388319	760690	0.305	0.399	0.233
1993	3057498	5191829	1800578	2535427	3026746	2123861	824568	0.327	0.426	0.251
1994	2887906	4867209	1713507	2234166	2653432	1881148	819087	0.338	0.437	0.261
1995	2470007	4184824	1457872	2232404	2634299	1891822	756277	0.325	0.411	0.257
1996	3363562	6104308	1853371	2120986	2493028	1804466	563472	0.301	0.374	0.242
1997	2742677	4804928	1565533	2093848	2430976	1803473	573029	0.284	0.354	0.229
1998	3306357	5063689	2158900	2105465	2453092	1807100	666316	0.289	0.357	0.234
1999	3849324	5737989	2582314	2254352	2615808	1942842	640309	0.308	0.373	0.254
2000	2863744	4178371	1962734	2196893	2504551	1927028	738606	0.335	0.387	0.29
2001	5285076	7511048	3718792	2091244	2369382	1845757	737463	0.378	0.437	0.327
2002	8772674	12593039	6111298	1937534	2216042	1694029	771422	0.416	0.484	0.357
2003	2948913	4182966	2078929	1967596	2274933	1701779	679287	0.442	0.521	0.375
2004	3661615	5350064	2506031	2474424	2911208	2103173	660491	0.406	0.478	0.345
2005	5756518	8525497	3886870	2290788	2725558	1925370	549514	0.326	0.382	0.278
2006	10776411	15497542	7493514	2181467	2576868	1846737	481181	0.301	0.354	0.257
2007	5022076	7218602	3493924	2337973	2731954	2000809	586206	0.335	0.391	0.287
2008	5174147	7426967	3604674	2826957	3358217	2379741	623165	0.326	0.382	0.279
2009	4831392	6935332	3365715	3410558	4076832	2853173	737969	0.301	0.354	0.256
2010	6375424	9169466	4432759	3754871	4437698	3177110	875515	0.297	0.35	0.252
2011	7489933	10794914	5196809	4368310	5150587	3704846	946661	0.297	0.353	0.25
2012	5142363	7458338	3545547	4006048	4731555	3391787	892353	0.29	0.351	0.24
2013	3674235	5493566	2457420	3830769	4573176	3208884	931732	0.315	0.382	0.26

Year	Recruitment Age 0 thousands	Recruitment 97.5th percentile	Recruitment 2.5th percentile	SSB*** tonnes	SSB 97.5th percentile	SSB 2.5th percentile	Total catch tonnes	F Ages 4–8	F Ages 4–8 97.5th percentile	F Ages 4–8 2.5th percentile Low
2014	9258549	14095345	6081492	3997626	4823358	3313256	1393000	0.338	0.416	0.275
2015	2802372	4618782	1700294	4216594	5220280	3405884	1208990	0.344	0.44	0.269
2016	5724540*			3970981	5213451	3024616	1094066	0.322	0.435	0.238
2017	4255854**			3443926†						
<b>Average</b>	<b>4608099</b>	<b>7439146</b>	<b>2875230</b>	<b>3090187</b>	<b>3995402</b>	<b>2424122</b>	<b>742468</b>	<b>0.296</b>	<b>0.375</b>	<b>0.231</b>

\* Time-tapered weighted mean of recruitment estimates for 1990–2015.

\*\* Geometric mean 1990–2015.

\*\*\* SSB is at spawning time

† Estimated value from the forecast.

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