

9.4.2 Mackerel in the Northeast Atlantic (combined Southern, Western, and North Sea spawning components)

State of the stock

Spawning biomass in relation to precautionary limits	Fishing mortality in relation to precautionary limits	Fishing mortality in relation to high long term yield	Fishing mortality in relation to target fishing mortality	Comment
Full reproductive capacity	Increased risk	Overfished	Above target	

Based on the most recent estimate of SSB (in 2009), ICES classifies this stock as having full reproductive capacity. Based on the most recent estimates of fishing mortality (in 2008), ICES classifies the stock as being harvested at increased risk.

Fishing mortality in 2008 is estimated to be just above F_{pa} . SSB has increased by 47% since 2002 and is currently estimated to be above B_{pa} . The 2002 year class is the highest on record. Subsequent year classes are estimated to be about average. There is insufficient information to confirm the sizes of the 2007 and 2008 year-classes.

Management objectives

ICES evaluated the following management plan for mackerel in the Northeast Atlantic:

1. For the purpose of this long-term management plan, "SSB" means the estimate according to ICES of the spawning stock biomass at spawning time in the year in which the TAC applies, taking account of the expected catch.
2. When the SSB is above 2,200,000 tonnes, the TAC shall be fixed according to the expected landings, as advised by ICES, on fishing the stock consistent with a fishing mortality rate in the range of 0.20 to 0.22 for appropriate age groups as defined by ICES.
3. When the SSB is lower than 2,200,000 tonnes, the TAC shall be fixed according to the expected landings as advised by ICES, on fishing the stock at a fishing mortality rate determined by the following:

$$\text{Fishing mortality } F = 0.22 * \text{SSB} / 2,200,000$$

4. Notwithstanding paragraph 2, the TAC shall not be changed by more than 20% from one year to the next, including from 2009 to 2010.
5. In the event that the ICES estimate of SSB is less than 1,670,000 tonnes, the Parties shall decide on a TAC which is less than that arising from the application of paragraphs 2 to 4.
6. The Parties may decide on a TAC that is lower than that determined by paragraphs 2 to 4.
7. The Parties shall, as appropriate, review and revise these management measures and strategies on the basis of any new advice provided by ICES

ICES concluded that the plan is precautionary under the assumption that the TAC equals the total removals from the stock. The plan was agreed by Norway, Faroe Islands and the EU in October 2008.

Reference points

	Type	Value	Technical basis
Precautionary approach	B_{lim}	1.67 million t	B_{loss}
	B_{pa}	2.3 million t	Trigger reference point used in the precautionary management plan given above
	F_{lim}	0.42	F_{loss}
	F_{pa}	0.23	$F_{lim} * 0.55$ (CV 36%)
Targets	F_{target} $B_{triggert}$	Between 0.20 and 0.22 > 2.2 million t	Precautionary management plan given above

unchanged since 2008

Yield and spawning biomass per Recruit

F-reference points (2009):

	Fish Mort Ages 4-8	Yield/R	SSB/R
Average last 3 years	0.24	0.15	0.62
F _{0.1}	0.17	0.14	0.75
F _{med}	0.22	0.15	0.65

F_{max} is not well defined.

Single-stock exploitation boundaries

ICES advises that total catches in 2010 should be between 527 000 tonnes and 572 000 tonnes.

Exploitation boundaries in relation to existing management plans

The precautionary management plan described above for Northeast Atlantic mackerel (F between 0.20 and 0.22) implies catches between 527 000 t and 572 000 t in 2010. The SSB is expected to remain stable in 2011 for a catch in this range.

Exploitation boundaries in relation to precautionary considerations

ICES advises that the existing measures to protect the North Sea spawning component remain in place. These are:

- There should be no fishing for mackerel in Divisions IIIa and IVb,c at any time of the year;
- There should be no fishing for mackerel in Division IVa during the period 15 February–31 July;
- The 30 cm minimum landing size at present in force in Subarea IV should be maintained.

Short-/medium-term implications

Outlook for 2010

Basis: Catch(2009) = 830 (rounded from 832) (TAC plus discards plus 70 TAC overshoot plus 112 TAC set by Iceland plus 36 new unilateral Norway and Faroe Islands declared quota and minus 18 that the UK and Ireland have agreed not to fish); F(2009) = 0.31; R08 = GM 72–06 = 3859 million; SSB(2009) = 2591.

Rationale	Catch (2010)	F(2010 & 2011)	Basis	SSB(2010) Spawning time	SSB(2011) Spawning time	Implied change in catch ¹	Implied change in TAC ²
Zero catch	0	0	F=0	2651	3090	-100%	-100%
Status quo	611	0.24	F 2008	2440	2406	-26%	+1%
Roll over TAC	605	0.23	TAC 2008	2442	2413	-27%	0%
	572	0.22	F(management plan upper bound) 0.22	2454	2448	-31%	-5%
	550	0.21	F(management plan mid point) 0.21	2462	2472	-34%	-9%
	527	0.20	F(management plan lower bound) 0.20	2470	2496	-37%	-13%
	726	0.29	+20% TAC (management plan upper bound)	2397	2285	-13%	+20%
	484	0.18	-20% TAC (management plan lower bound)	2486	2543	-42%	-20%
	996	0.42	+20% catch	2293	2012	+20%	65
	664	0.26	-20% catch	2420	2350	-20%	10

Weights in '000 t.

¹Catches in 2010 relative to estimated catches in 2009

²Catches in 2010 relative to TAC 2009

Shaded scenarios are not considered consistent with the management plan.

Management considerations

Catches in 2007 and 2008 have been considerably in excess of the ICES' advice. The absence of effective international agreements on the exploitation of the stock (between all nations involved in the fishery) is a cause of concern and prevents control of the exploitation rate of the stock. According to the short-term forecast, the total estimated catch in 2009 results in an estimated fishing mortality of 0.31, which is above that stipulated in the management plan (it should be noted that this F would be lower without the significant additional catches in excess of the TAC). The 2010 TAC advice given above should apply to all areas fished.

The spawning stock biomass (SSB) has increased from a low of 1.8 million tonnes in 2002 to around 2.5 million tonnes in 2008, a level similar to that seen in the 1990s. Figure 9.4.2.1. indicates the current estimated stock level and recent stock development.

Available information indicates that the distribution of the spawning area and feeding areas of mackerel have expanded in recent years. Mackerel has been commercially fished in areas where it was previously not fished, particularly in the Icelandic EEZ.

An evaluation of unaccounted mortality in the mackerel fishery (Simmonds, 2007) suggested that both biomass and removals were significantly greater than those estimated using the standard assessment model. These analyses also suggested that the historic estimates of fishing mortality provided by the standard assessment are not affected by unaccounted mortality. These conclusions need further investigation. The results from the stock assessment provide the best estimates of biomass for mackerel in the Northeast Atlantic.

Management plan evaluations

In June 2008 ICES provided advice in response to a European Commission (EC) request on evaluation of management plan for mackerel in the Northeast Atlantic (Section 9.3.2.1 ICES, 2008). A number of precautionary harvest rules were presented to stakeholders, for both medium-term expectations and short term catch options. A management plan based on these options was agreed in October 2008.

Factors affecting the fisheries and the stock

Mackerel is mainly exploited in a directed fishery for human consumption. This fishery tends to target bigger fish and there is evidence that this causes discarding of smaller, less marketable fish.

In June 2009, an agreement was concluded between contracting parties to the Coastal States on mackerel banning highgrading, discarding, and slipping from pelagic fisheries targeting mackerel, horse mackerel, and herring beginning in January 2010.

Regulations and their effects

During 1998-2008, management aimed at attaining a fishing mortality for mackerel in the range of 0.15–0.2. The realized fishing mortality during this period ranged between 0.22 to 0.45. The current assessment shows reductions in fishing mortality and increases in biomass from 2003 onwards.

Prior to the late 1960s, spawning biomass of North Sea mackerel was estimated to be above 3 million tonnes. Due to overexploitation, recruitment has failed since 1969 leading to a marked decline in the stock size. The measures advised by ICES have been aimed at protecting the North Sea spawning component and promoting stock recovery. The North Sea spawning component has increased since 1999, but continued protection is needed as the abundance remains low.

The closure of the mackerel fishery in Divisions IVb,c and IIIa throughout the whole year is designed to protect the North Sea component in this area, and also protect juvenile Western mackerel which are numerous, particularly in Division IVb,c during the second half of the year. Unfortunately, the closure has resulted in increased discards of mackerel in the non-directed fisheries (especially horse mackerel fisheries) in these areas as vessels are currently permitted to take only 10% of their catch as mackerel bycatch. As estimates of mackerel bycatch are not available, the reported landings of mackerel in Divisions IIIa and IVb,c from 1997 onwards underestimate catches because they do not include discarded bycatch.

The advised fishery closure of Division IVa during the first half of the year is based on the perception that the Western mackerel enter the North Sea in July/August, and stay there until December before migrating back to their spawning areas. Updated observations in the late 1990s suggest that this return migration actually begins in mid- to late February. This is believed to result in large-scale misreporting from the northern part of the North Sea (Division IVa) to Division

VIa. As a consequence, ICES recommended that the closure for Division IVa be extended to the 15th of February¹. This was adopted for the 1999/2000 fishing season onwards. However, misreporting from Division IVa to VIa continues to occur.

Changes in fishing technology and fishing patterns

In recent years significant catches have been taken in Icelandic waters, an area where almost no catches have been previously reported. In 2008 and 2009, catches in this area constituted approximately 18% of the total catch.

In the southern part of the distribution area, Atlantic mackerel (*Scomber scombrus*) can be caught together with Spanish mackerel (*Scomber colias*). In recent years, catches of Spanish mackerel have increased. The catch in 2005 was the highest since 1982. Catches of both species are landed separately. ICES advice applies to Atlantic mackerel only.

Impacts of environment on the fish stock

Survey data and catch information suggest distributional changes of both juveniles and adult mackerel. This indicates an expansion of mackerel further west and less north compared to previous years, illustrating the interannual dynamics of a fast moving species. The distribution pattern coincided with considerably warmer surface waters in 2009 than in earlier years in both the western part of the Norwegian Sea and in the northern part of the Icelandic zone. Together with temperature, feeding opportunities seem to affect the distribution of the mackerel stock.

Other factors

Stock components: ICES currently uses the term “Mackerel in Northeast Atlantic” to define the mackerel present in the area extending from ICES Division IXa in the south to Division IIa in the north, including mackerel in the North Sea and Division IIIa. The spawning areas of mackerel are widely spread, and only the stock in the North Sea is sufficiently distinct to be clearly identified as a separate spawning component. Tagging experiments have demonstrated that after spawning, fish from Southern and Western areas migrate to feed in the Norwegian Sea and the North Sea during the second half of the year. In the North Sea they mix with the North Sea component. Since it is currently impossible to allocate catches to the stocks previously considered by ICES, for practical reasons all mackerel in the Northeast Atlantic are considered to comprise a single stock (i.e. the mackerel in the Northeast Atlantic stock). Catches cannot be allocated specifically to spawning area components on biological grounds but by convention, catches from the Southern and Western components are separated according to the areas in which these are taken.

To keep track of the development of spawning biomass in the different spawning areas, mackerel in the Northeast Atlantic stock are divided into three area components: the Western Spawning Component, the North Sea Spawning Component, and the Southern Spawning Component:

Mackerel in Northeast Atlantic			
Distributed and fished in ICES Subareas and Divisions IIa, IIIa, IV, V, VI, VII, VIII, and IXa.			
Spawning component	Western	Southern	North Sea
Spawning Areas	VI, VII, VIIIa,b,d,e.	VIIIc, IXa.	IV, IIIa.

The Western Component is defined as mackerel spawning in the western area (ICES Divisions and Subareas VI, VII, and VIII a,b,d,e). This component currently accounts for 76% of the entire Northeast Atlantic stock. Similarly, the Southern Component is defined as mackerel spawning in the southern area (ICES Divisions VIIIc and IXa). Although the North Sea component has been at an extremely low level since the early 1970s, ICES considers that the North Sea Component still exists as a discrete unit. This component spawns in the North Sea and Skagerrak (ICES Subarea IV and Division IIIaN). Current knowledge of the state of the spawning components is summarised below.

Western Component: The catches of this component were low in the 1960s, but increased to more than 800 000 t in 1993. The main catches are taken in directed fisheries by purse-seiners and mid-water trawlers. Large catches of the western component are taken in the northern North Sea and in the Norwegian Sea. The 1996 catch was reduced by about 200 000 t compared with 1995, because of a reduction in the TAC. The catches since 1998 have been stable. The SSB of the Western Component declined in the 1970s from above 3.0 million t to 2.2 million t in 1994, but increased to 2.7 million t in 1999. A separate assessment for this stock component is no longer required, as a recent extension of the time-series of mackerel in the Northeast Atlantic data now allows the estimation of the mean recruitment from 1972 onwards. Estimates of the spawning-stock biomass, derived from egg surveys, indicate a decrease of 14% between 1998 and 2001 and a 6% decrease from 2001 to the 2004 survey. The results from 2007 indicated a 5% increase from 2004 to 2007.

¹ This is incorrectly stated as 1 February in the 2002 ICES Advice.

North Sea Component: Very large catches were taken in the 1960s in the purse-seine fishery, reaching a maximum of about 1 million t in 1967. The component subsequently collapsed and catches declined to less than 100 000 t in the late 1970s. Catches during the last five years are assumed to be about 10 000 t. The 2002 and 2005 triennial egg surveys in the North Sea both indicate similar egg production, but in 2008 egg production decreased by about 40%.

Southern Component: Mackerel is a target species for the hand line fleet during the spawning season in Division VIIIc, during which about one-third of the total catches are taken. Mackerel are also taken as a bycatch in other fleets. The highest catches (87%) from the Southern Component are taken in the first half of the year, mainly from Division VIIIc, and consist of adult fish. In the second half of the year catches consist of juveniles and are mainly taken in Division IXa. Catches from the Southern Component increased from about 20 000 t in the early 1990s to 44 000 t in 1998, and were close to 50 000 t in 2002. Estimates of the spawning-stock biomass, derived from egg surveys, are highly variable, and give average estimates of around 16-20% of the combined mackerel in the Northeast Atlantic stock (1995–2007).

Scientific basis

Data and methods

This assessment is based on catch numbers-at-age for the period 1972–2008 and triennial egg survey estimates of SSB from 1992 to 2007. In the past, estimates of total mortality have been similar to those obtained from tag-recapture studies.

Some sampling for discards has been carried out since 2000 and a formal requirement was initiated in the EU in 2002. Estimating proportions of catch discarded and slipped is problematic in pelagic fisheries due to high variability in discard and slipping practices. In some fleets no sampling for discards is carried out. Recently, information on these practices has been improving; discards from sampled fleets (Scotland, the Netherlands, and Germany) in 2008 amounted to 27 000 tonnes.

Recruit surveys provide information on the distribution of young mackerel, but are subject to high variability and have not proved useful in estimating year-class strength.

Information from the fishing industry

The fishing industry has informed ICES that in all the EU fishing fleets targeting mackerel, large quantities of juvenile and adult mackerel continue to be seen on the fishing grounds, as reported last year. This is not confined to one area or to one member state's fleet. In addition, the abundance of mackerel in the entire distribution area is creating major problems with unwanted bycatches for some fleets not targeting mackerel. Furthermore, the industry has observed that the distribution seems to have changed in a westerly direction, giving more catches of larger fish in the earlier part of the season than usual. Stakeholders are actively seeking mechanisms that would allow inclusion of fishing industry information into the assessment process and are involved in a number of pilot projects in this regard.

Uncertainties in assessment and forecast

Due to the shortage of fishery-independent data, the absence of age-disaggregated information for the spawning-stock index and the uncertainty in the magnitude of catches, SSB estimates are uncertain, but fishing mortality and the trend in SSB are better estimated.

The estimated catch for 2009 used in the forecast is uncertain due to additional catches in excess of the TAC that cannot be quantified precisely at present.

Some information on the level of discards is available and was included in the assessment, but the number of fleets sampled is not sufficient to capture the full scale of discarding.

Comparison with previous assessment and advice

The perception of the stock based on the assessment results is very similar to last year's assessment. The basis of the advice this year is the precautionary management plan given above. Norway, Faroe Islands, and the EU agreed to the plan in 2008, but it has not been agreed to by all of the participants in the fishery. Previous advice was based on a management plan agreed by Norway, Faroe Islands, and the EU in 1999.

Source of information

ICES. 2008. Report of the ICES Advisory Committee, 2008. ICES Advice, 2008. Book 9. 345 pp.

Report of the Working Group on Widely Distributed Stocks, ICES Headquarters, Copenhagen 2-8 September 2009 (ICES CM 2009/ACOM:12).

Simmonds, E. J. 2007. Are reported catches sufficient to account for biomass in the NE Atlantic mackerel stock. ICES CM 2007/ACFM:31/WD:11

Table 9.4.2.1 Mackerel in the Northeast Atlantic. Single-stock exploitation boundaries (advice), management, and catch data for the combined area.

Year	ICES Advice	Predicted catch corresp. to advice	Total Agreed TAC ³	Official Landings ⁵	Disc. ¹ slip	ICES catch ^{2,4}
1987	Given by stock component		442	616	11	655
1988	Given by stock component		610	622	36	680
1989	Given by stock component		532	576	7	590
1990	Given by stock component		562	580	16	628
1991	Given by stock component		612	609	31	668
1992	Given by stock component		707	729	25	760
1993	Given by stock component		767	784	18	825
1994	Given by stock component		837	794	5	821
1995	Given by stock component		645	729	8	756
1996	Significant reduction in F	-	452	509	11	564
1997	Significant reduction in F	-	470	517	19	570
1998	F between 0.15 and 0.2	498	549	627	8	667
1999	F of 0.15 consistent with PA	437	562	585	n/a	640
2000	F=0.17: F _{pa}	642	612	655	2	738
2001	F=0.17: F _{pa}	665	670	660	1	737
2002	F=0.17: F _{pa}	694	683	685	24	773
2003	F=0.17: F _{pa}	542	583	600	9	670
2004	F=0.17: F _{pa}	545	532	587	11	650
2005	F=0.15 to 0.20	[320–420]	422	447	20	543
2006	F=0.15 to 0.20	[373–487]	444	318 ⁶	18	473
2007	F=0.15 to 0.20	[390–509]	502	558	8	579
2008	F=0.15 to 0.20	[349–456]	458	420	27	611
2009	F=0.15 to 0.20	[443–578]	605 ⁷			
2010	harvest control rule	[527-572]				

Weights in '000 t.

¹Data on discards and slipping from only two fleets.

²Landings and discards from Divisions and Subareas IIa, IIIa, IV, V, VI, VII, VIII, and IXa.

³All areas except some catches in international waters in Subarea II.

⁴Catches updated in 2003 with revisions from SGDRAMA in 2002.

⁵ Updated with ICES FishStats data.

⁶ Incomplete.

⁷ Does not includes the unilateral Norway/Faroe Islands TAC first declared in 2009 and Icelandic TAC.

Table 9.4.2.2 Mackerel in the Northeast Atlantic. Single-stock exploitation boundaries (advice), management, and catch data for Western component.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹	Disc. slip	ICES catch ^{2,4}
1987	SSB = 1.5 mill. t; TAC	380	405	11	633
1988	F = F _{0.1} ; TAC; closed area; landing size	430	573	36	656
1989	Halt SSB decline; TAC	355	495	7	571
1990	TAC; F = F _{0.1}	480	525	16	606
1991	TAC; F = F _{0.1}	500	575	31	647
1992	TAC for both 1992 and 1993	670	670	25	742
1993	TAC for both 1992 and 1993	670	730	18	805
1994	No long-term gains in increased F	831 ³	800	5	796
1995	20% reduction in F	530	608	8	728
1996	No separate advice	-	422	11	529
1997	No separate advice	-	416	19	529
1998	No separate advice	-	514	8	623
1999	No separate advice	-	520	0	597
2000	No separate advice	-	573	2	703
2001	No separate advice	-	630	1	694
2002	No separate advice	-	642	24	723
2003	No separate advice	-	548	9	644
2004	No separate advice	-	500	11	615
2005	No separate advice	-	397	20	494
2006	No separate advice	-	418 ⁵	17	420
2007	No separate advice	-	472	8	519
2008	No separate advice	-	431	27	551
2009	No separate advice	-	569		
2010	No separate advice	-			

Weights in '000 t.

¹TAC for mackerel taken in all Divisions and Subareas VI, VII, VIIIa,b,d, Vb, IIa, IIIa, and IVa.

²Landings and discards of Western component; includes some catches of North Sea component.

³Catch at *status quo* F.

⁴Catches updated in 2003 with revisions from SGDRAMA in 2002.

⁵Revised from previous year (was 392).

Table 9.4.2.3 Mackerel in the Northeast Atlantic. Single-stock exploitation boundaries (advice), management, and catch data for North Sea component.

Year	ICES Advice	Predicted catch corresp. to advice ¹	Agreed TAC ²	ICES catch ³
1987	Lowest practical level	LPL	55	3
1988	Closed areas and seasons; min. landing size; bycatch regulations	LPL	55	6
1989	Closed areas and seasons; min. landing size; bycatch regulations	LPL	49.2	7
1990	Closed areas and seasons; min. landing size; bycatch regulations	LPL	45.2	10
1991	Closed areas and seasons; min. landing size; bycatch regulations	LPL	65.5	- ⁴
1992	Closed areas and seasons; min. landing size; bycatch regulations	LPL	76.3	- ⁴
1993	Maximum protection; closed areas and seasons; min landing size	LPL	83.1	- ⁴
1994	Maximum protection; closed areas and seasons; min landing size	LPL	95.7	- ⁴
1995	Maximum protection; closed areas and seasons; min landing size	LPL	76.3	- ⁴
1996	Maximum protection; closed areas and seasons; min landing size	LPL	52.8	- ⁴
1997	Maximum protection; closed areas and seasons; min landing size	LPL	52.8	- ⁴
1998	Maximum protection; closed areas and seasons; min landing size	LPL	62.5	- ⁴
1999	Maximum protection; closed areas and seasons; min landing size	LPL	62.5	- ⁴
2000	Maximum protection; closed areas and seasons; min landing size	LPL	69.7	- ⁴
2001	Maximum protection; closed areas and seasons; min landing size	LPL	71.4	- ⁴
2002	Maximum protection; closed areas and seasons; min landing size	LPL	72.9	- ⁴
2003	Maximum protection; closed areas and seasons; min landing size	LPL	62.5	- ⁴
2004	Maximum protection; closed areas and seasons; min landing size	LPL	57.7	- ⁴
2005	Maximum protection; closed areas and seasons; min landing size	LPL	44.9	- ⁴
2006	Maximum protection; closed areas and seasons; min landing size	LPL	47.1	- ⁴
2007	Maximum protection; closed areas and seasons; min landing size	LPL	53.1	- ⁴
2008	Maximum protection; closed areas and seasons; min landing size	LPL	48.6	- ⁴
2009	Maximum protection; closed areas and seasons; min landing size	LPL	62	- ⁴
2010	Maximum protection; closed areas and seasons; min landing size	LPL		

Weights in '000 t.

¹Subarea IV and Division IIIa.

²TAC for Subarea IV, Divisions IIIa, IIIb,c,d (EU zone), and Division IIa (EU zone).

³Estimated landings of North Sea component.

⁴No information.

LPL = Lowest Practical Level.

Table 9.4.2.4 Mackerel in the Northeast Atlantic. Single-stock exploitation boundaries (advice), management, and catch data for Southern component.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC ¹	ICES Catch ²
1987	Reduce juvenile exploitation	-	36.57	22
1988	Reduce juvenile exploitation	-	36.57	25
1989	No advice	-	36.57	18
1990	Reduce juvenile exploitation	-	36.57	21
1991	Reduce juvenile exploitation	-	36.57	21
1992	No advice	-	36.57	18
1993	No advice	-	36.57	20
1994	No advice	-	36.57	25
1995	No advice	-	36.57	28
1996	No separate advice	-	30.00	34
1997	No separate advice	-	30.00	41
1998	No separate advice	-	35.00	44
1999	No separate advice	-	35.00	44
2000	No separate advice	-	39.20	36
2001	No separate advice	-	40.18	43
2002	No separate advice	-	41.10	50
2003	No separate advice	-	35.00	26
2004	No separate advice	-	32.31	35
2005	No separate advice	-	24.87	50
2006	No separate advice	-	26.18	53
2007	No separate advice	-	29.61	63
2008	No separate advice	-	27.01	60
2009	No separate advice	-	35.83	
2010	No separate advice			

Weights in '000 t.

¹Division VIIIc, Subareas IX and X, and CECAF Division 34.1.1 (EU waters only).

²Catches updated in 2003 with revisions from SGDRAMA in 2002.

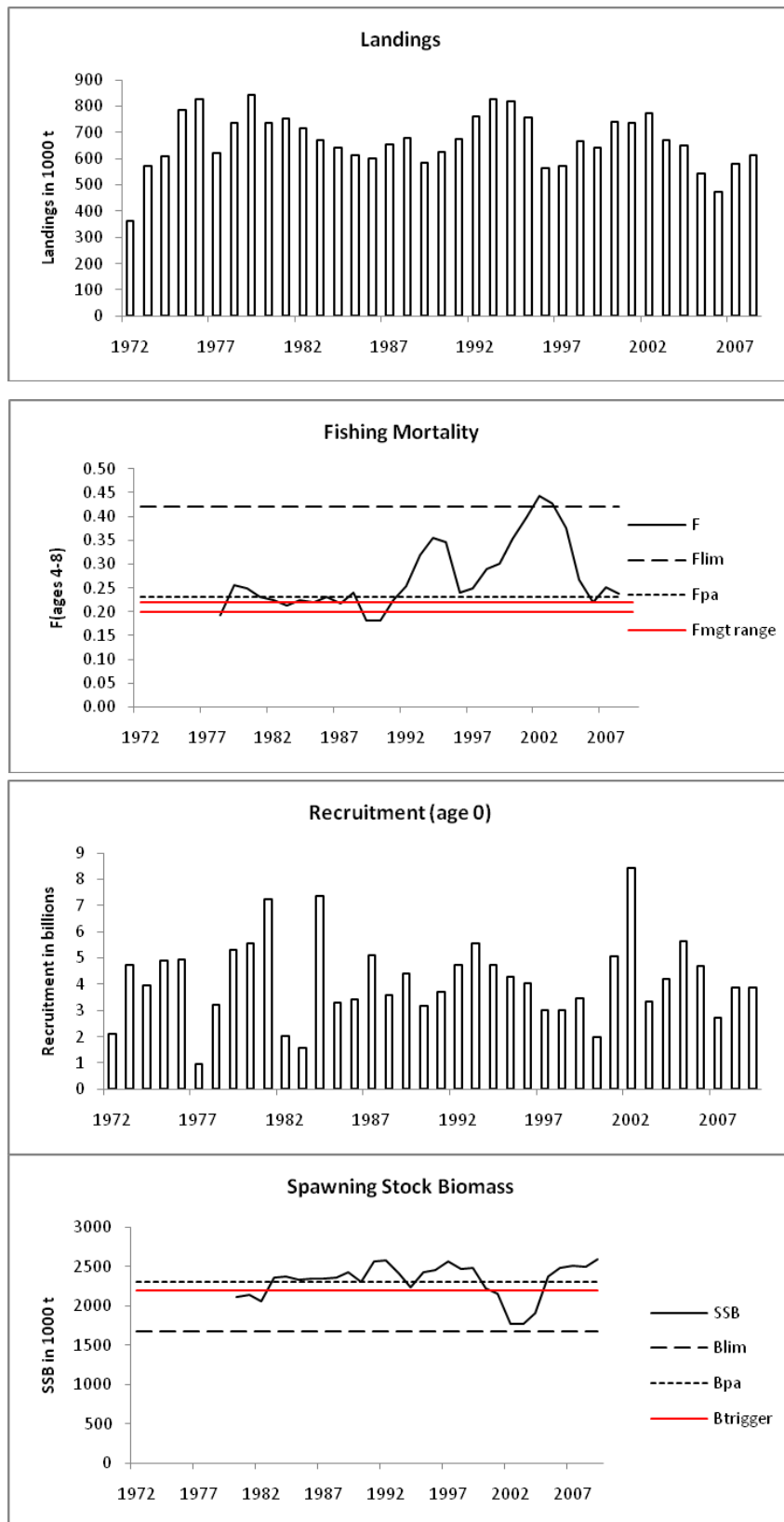


Figure 9.4.2.1 Mackerel in the Northeast Atlantic (combined Southern, Western, and North Sea spawning components). Summary of stock assessment: landings, fishing mortality, recruitment, and SSB.

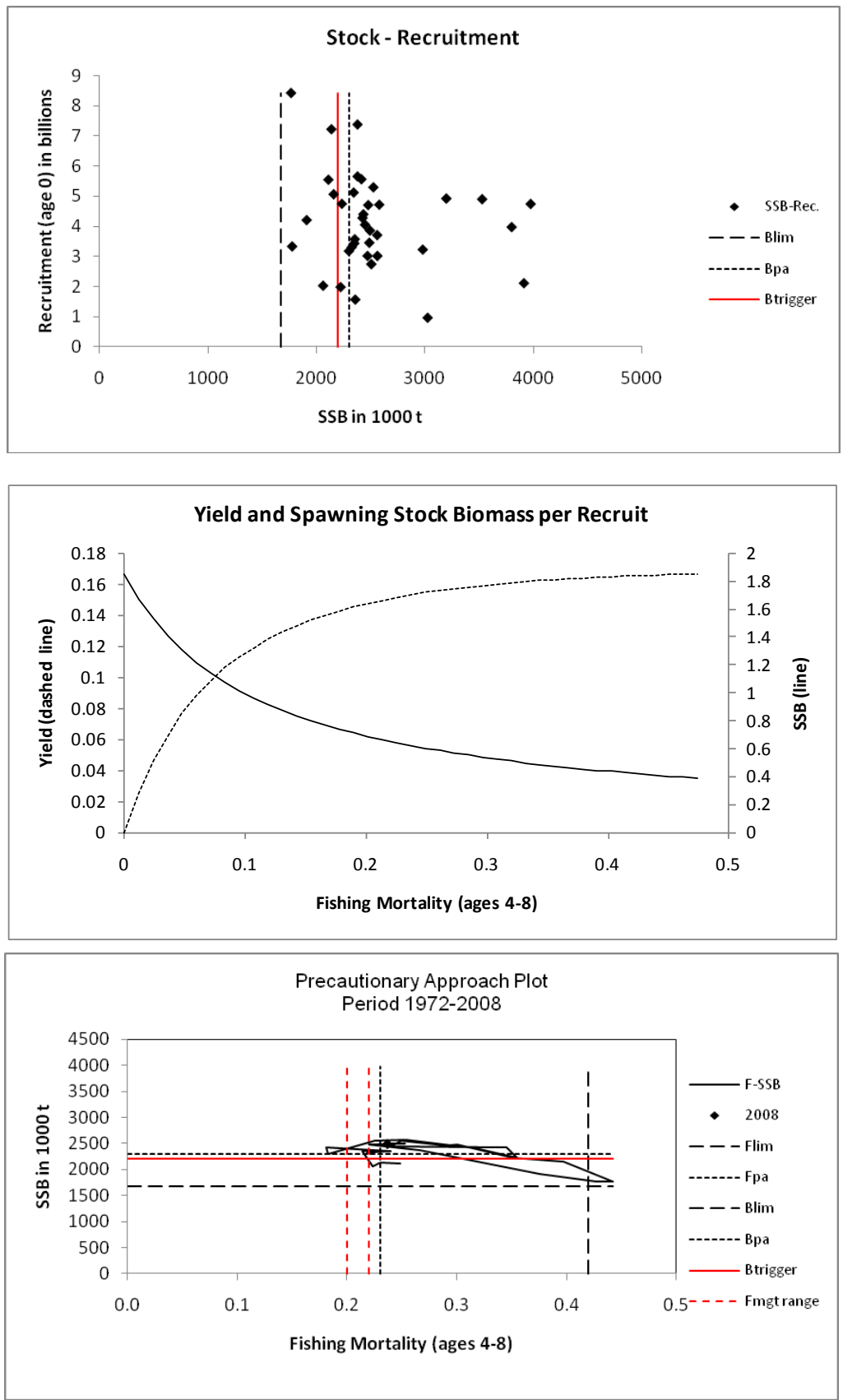


Figure 9.4.2.2 Mackerel in the Northeast Atlantic (combined Southern, Western, and North Sea spawning components). Stock - recruitment plot, yield per recruit analysis, and PA plot.

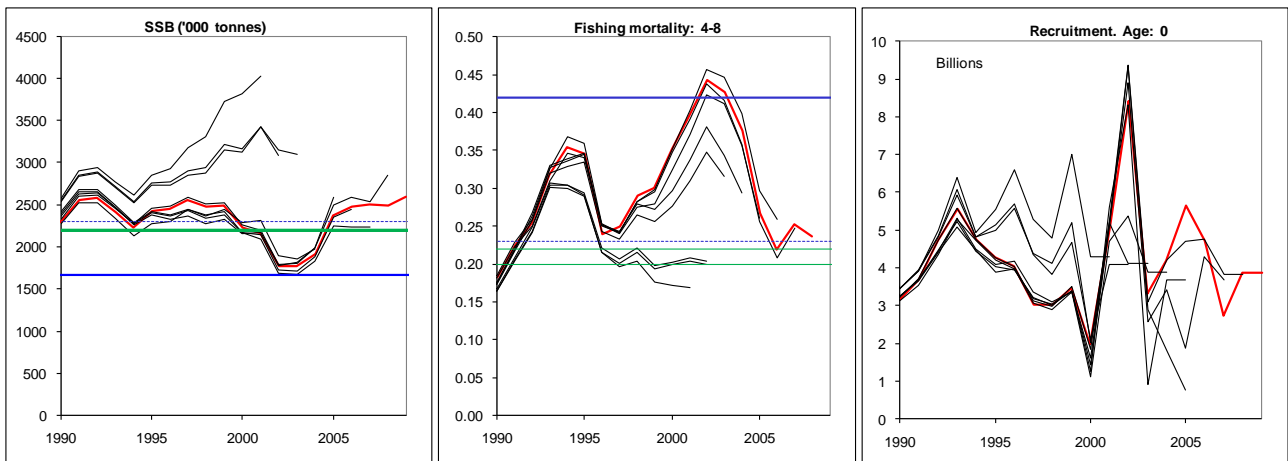


Figure 9.4.2.3 Mackerel in the Northeast Atlantic (combined Southern, Western, and North Sea spawning components). Comparison of current assessment with previous assessments (solid blue line – Limit reference points; dashed blue line – precautionary reference points; and green lines management plan biomass trigger and upper and low limits)

Table 9.4.2.5a Mackerel in the Northeast Atlantic (combined Southern, Western, and North Sea spawning components). Catches by country 1988-2008 (data submitted by Working Group members).

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	50145	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							1					
Guernsey														
Iceland									92	925	357	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
Russia/USSR	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	66325	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

Table 9.4.2.5b Mackerel in the Northeast Atlantic (combined Southern, Western, and North Sea spawning components). Catches by country 1988-2008 (cont.) (data submitted by Working Group members).

Country	2002	2003	2004	2005	2006	2007	2008
Belgium	22	2	5	1	3	1	2
Denmark	34376	27900	25665	23212	24219	25223	26726
Estonia							
Faroe Islands	19768	14014	13029	9769	12067	13429	11289
France	21878	22906	20266	16338	14953	20038	15602
Germany, Fed. Rep.	26532	24061	23244	19040	16608	18221	15502
Germany, Dem. Rep.							
Guernsey					10		
Iceland	53	122		363	4222	36706	112286
Ireland	72172	67355	61102	45687	40664	49260	44759
Jersey				9	8	6	7
Latvia							
Lithuania					95	7	
Netherlands	33444	30424	27532	25127	24157	24234	19972
Norway	184291	163406	157364	119678	121993	131691	121524
Poland				570		978	
Portugal	2934	2749	2289	1509	2620	2605	2381
Romania							
Spain	50123	23762	34455	52753	54136	62946	64648
Sweden	5232	445	4437	3204	3209	3858	3664
United Kingdom	194045	183008	174730	152801	95815	133688	112149
USSR (Russia from 1990)	45811	40026	49489	40495	33580	35408	32728
Misreported	6009		31				
Unallocated	50543	59172	46596	13171	4954	12453	1069
Discards	23774	9481	10972	19760	17970	8615	26766
Total	771007	668833	651206	543487	471283	579367	611074

Table 9.4.2.6 Mackerel in the Northeast Atlantic (combined Southern, Western, and North Sea spawning components). Catches by area. Discards not estimated prior to 1978. (Data submitted by Working Group members.)

Year	Sub-area VI		Sub-area VII and Divisions			Sub-area IV and III		Sub-area Divs.	Total				
	Landings	Discards Catch	Landings	Discards	Catch	Landings	Discards Catch		Landings	Discards Catch			
1969	4.800	4.800	47.404		47.404	739.175		739.175	7	42.526	833.912		833.912
1970	3.900	3.900	72.822		72.822	322.451		322.451	163	70.172	469.508		469.508
1971	10.200	10.200	89.745		89.745	243.673		243.673	358	32.942	376.918		376.918
1972	13.000	13.000	130.280		130.280	188.599		188.599	88	29.262	361.229		361.229
1973	52.200	52.200	144.807		144.807	326.519		326.519	21.600	25.967	571.093		571.093
1974	64.100	64.100	207.665		207.665	298.391		298.391	6.800	30.630	607.586		607.586
1975	64.800	64.800	395.995		395.995	263.062		263.062	34.700	25.457	784.014		784.014
1976	67.800	67.800	420.920		420.920	305.709		305.709	10.500	23.306	828.235		828.235
1977	74.800	74.800	259.100		259.100	259.531		259.531	1.400	25.416	620.247		620.247
1978	151.700	15.100 166.800	355.500	35.500	391.000	148.817		148.817	4.200	25.909	686.126	50.600	736.726
1979	203.300	20.300 223.600	398.000	39.800	437.800	152.323	500	152.823	7.000	21.932	782.555	60.600	843.155
1980	218.700	6.000 224.700	386.100	15.600	401.700	87.931		87.931	8.300	12.280	713.311	21.600	734.911
1981	335.100	2.500 337.600	274.300	39.800	314.100	64.172	3.216	67.388	18.700	16.688	708.960	45.516	754.476
1982	340.400	4.100 344.500	257.800	20.800	278.600	35.033	450	35.483	37.600	21.076	691.909	25.350	717.259
1983	320.500	2.300 322.800	235.000	9.000	244.000	40.889	96	40.985	49.000	14.853	660.242	11.396	671.638
1984	306.100	1.600 307.700	161.400	10.500	171.900	43.696	202	43.898	98.222	20.208	629.626	12.302	641.928
1985	388.140	2.735 390.875	75.043	1.800	76.843	46.790	3.656	50.446	78.000	18.111	606.084	8.191	614.275
1986	104.100	104.100	128.499		128.499	236.309	7.431	243.740	101.000	24.789	594.697	7.431	602.128
1987	183.700	183.700	100.300		100.300	290.829	10.789	301.618	47.000	22.187	644.016	10.789	654.805
1988	115.600	3.100 118.700	75.600	2.700	78.300	308.550	29.766	338.316	120.404	24.772	644.926	35.566	680.492
1989	121.300	2.600 123.900	72.900	2.300	75.200	279.410	2.190	281.600	90.488	18.321	582.419	7.090	589.509
1990	114.800	5.800 120.600	56.300	5.500	61.800	300.800	4.300	305.100	118.700	21.311	611.911	15.600	627.511
1991	109.500	10.700 120.200	50.500	12.800	63.300	358.700	7.200	365.900	97.800	20.683	637.183	30.700	667.883
1992	141.906	9.620 151.526	72.153	12.400	84.553	364.184	2.980	367.164	139.062	18.046	735.351	25.000	760.351
1993	133.497	2.670 136.167	99.828	12.790	112.618	387.838	2.720	390.558	165.973	19.720	806.856	18.180	825.036
1994	134.338	1.390 135.728	113.088	2.830	115.918	471.247	1.150	472.397	72.309	25.043	816.025	5.370	821.395
1995	145.626	74 145.700	117.883	6.917	124.800	321.474	730	322.204	135.496	27.600	748.079	7.721	755.800
1996	129.895	255 130.150	73.351	9.773	83.124	211.451	1.387	212.838	103.376	34.123	552.196	11.415	563.611
1997	65.044	2.240 67.284	114.719	13.817	128.536	226.680	2.807	229.487	103.598	40.708	550.749	18.864	569.613
1998	110.141	71 110.212	105.181	3.206	108.387	264.947	4.735	269.682	134.219	44.164	658.652	8.012	666.664
1999 ^{2,3}	116.362	§ 116.362	94.290	§	94.290	313.014	§	313.014	72.848	43.796	640.311	§	640.311
2000 ^{2,3}	187.595	1 187.595	115.566	1.918	117.484	285.567	165	304.898	92.557	36.074	736.524	2.084	738.608
2001 ^{2,3}	143.142	83 143.142	142.890	1.081	143.971	327.200	24	339.971	67.097	43.198	736.274	1.188	737.462
2002 ^{2,3}	136.847	12.931 149.778	102.484	2.260	104.744	375.708	8.583	394.878	73.929	49.576	749.131	23.774	772.905
2003 ³	142.728	91 142.819	89.492		89.492	334.639	9.390	357.766	53.701	25.823	660.119	9.481	669.600
2004 ³	134.251	240 134.491	99.922	1.862	101.784	300.768	8.870	316.620	62.486	34.840	639.248	10.972	650.221
2005	79.960	11.400 91.361	90.278	5.878	96.156	249.740	2.482	252.223	54.129	49.618	523.726	19.760	543.486
2006	88.077	6.031 94.108	66.209	6.556	72.765	200.929	5.383	206.312	46.716	52.751	454.682	17.970	472.652
2007	110.788	405 111.193	71.235	2.024	73.259	253.013	6.187	259.200	72.891	62.834	570.761	8.616	579.379
2008	75.142	21.793 96.935	73.377	1.987	75.364	227.251	2.986	230.237	148.669	59.859	584.297	26.766	611.063

¹ FOR 1976–1985 ONLY DIVISION IIA, SUB-AREA I, AND DIVISION IIB INCLUDED IN 2000 ONLY

² DATA REVISED FOR NORTHERN IRELAND

³ DATA REVISED FOR UNALLOCATED CATCH

§ DISCARDS REPORTED AS PART OF UNALLOCATED CATCHES

Table 9.4.27

Mackerel in the Northeast Atlantic (combined Southern, Western, and North Sea spawning components). Summary of stock assessment.

Year	Recruitment Age 0 (Thousands)	TSB (Tonnes)	SSB (Tonnes)	Fbar age 4-8	Catches (Tonnes)
1972	2107710				361262
1973	4740947				570719
1974	3972009				607473
1975	4898680				784329
1976	4921339				828434
1977	959498				620016
1978	3224330			0.193	736519
1979	5293791			0.256	842739
1980	5545867	3170793	2109885	0.248	734950
1981	7223223	3294253	2137584	0.231	754045
1982	2025972	3227927	2061195	0.224	716987
1983	1564509	3348280	2357237	0.214	672283
1984	7381492	3123975	2377858	0.224	641928
1985	3304438	3310145	2325294	0.219	614371
1986	3431405	3316289	2348414	0.232	602201
1987	5119691	3183050	2342935	0.218	654992
1988	3570179	3261221	2352917	0.240	680491
1989	4397057	3342866	2432299	0.181	585920
1990	3176776	3130777	2299116	0.182	626107
1991	3706513	3423846	2559251	0.225	675665
1992	4716451	3536234	2577894	0.254	760690
1993	5562702	3466635	2413766	0.318	824568
1994	4745812	3339450	2233526	0.355	819087
1995	4275449	3542342	2423915	0.345	756277
1996	4050038	3369042	2447523	0.239	563472
1997	3014543	3514795	2560826	0.249	573029
1998	3014644	3337419	2470494	0.290	666316
1999	3452126	3375918	2486482	0.301	640309
2000	1980116	3098108	2222260	0.352	738606
2001	5064315	2983811	2158363	0.397	737463
2002	8427720	2664323	1765975	0.443	772905
2003	3330106	2958967	1775602	0.427	669600
2004	4204636	2825813	1909235	0.376	650221
2005	5655568	3256519	2378330	0.267	543486
2006	4703184	3441403	2476318	0.220	472652
2007	2740833	3491284	2505033	0.252	579379
2008	3858779*	3324007	2491963	0.237	611063
2009	3858779*		2591221		

* Geometric mean of recruitment series (1972-2006)