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Sardine (*Sardina pilchardus*) in divisions 8.a–b and 8.d (Bay of Biscay)

ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2018 should be no more than 30 579 tonnes. All catches are assumed to be landed.

Stock development over time

The spawning–stock biomass (SSB) is above MSY $B_{trigger}$. Fishing mortality steeply increased in 2010–2012 and has been above F_{MSY} since then. Recruitment has been variable over time. Recruitment in 2016 is well above the time-series average.

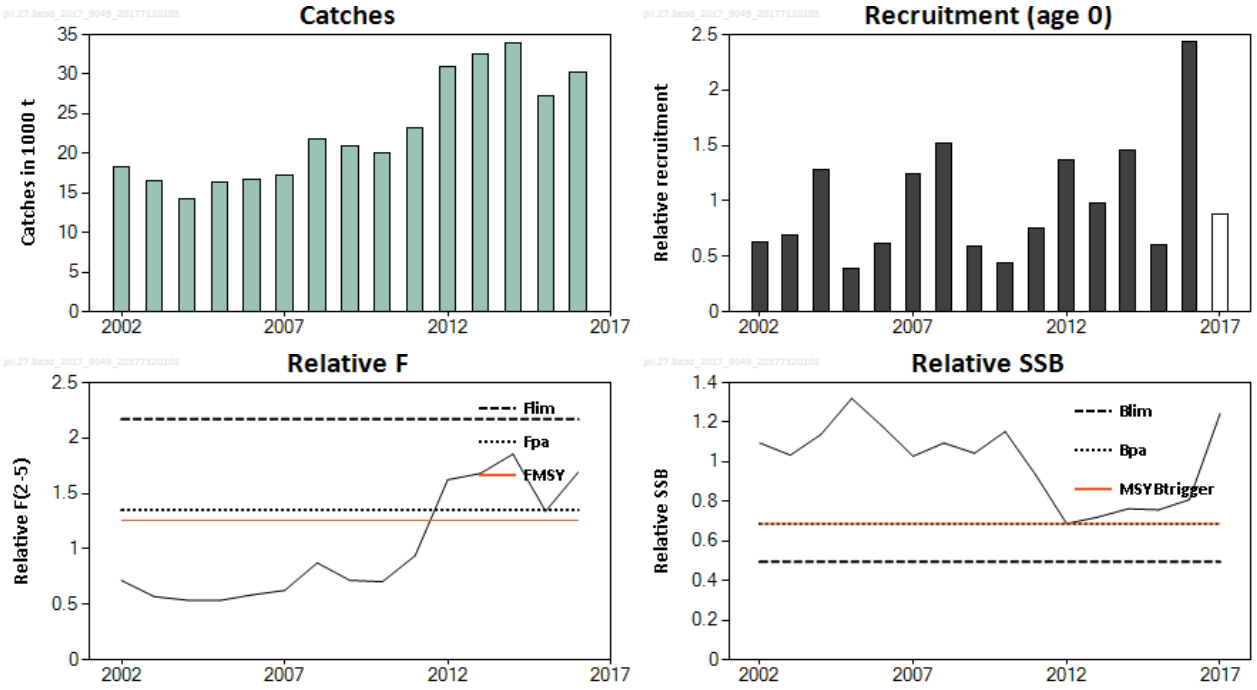

Figure 1 Sardine in divisions 8.a–b and 8.d. Summary of the stock assessment. Recruitment and SSB are estimated at the beginning of the year. The assumed recruitment value is unshaded. R, F, and SSB are expressed relative to the average of the time-series (2002–2017 for SSB, and 2002–2016 for F and recruitment).

Stock and exploitation status

Table 1 Sardine in divisions 8.a–b and 8.d. 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 $B_{trigger}$	✓	✓	✓	Above trigger
Precautionary approach	F_{pa},F_{lim}	o	✓	o	Increased risk	B_{pa},B_{lim}	✓	✓	✓	Full reproductive capacity
Management Plan	F_{MGT}	-	-	-	Not applicable	SSB_{MGT}	-	-	-	Not applicable

Catch options

Table 2 Sardine in divisions 8.a–b and 8.d. The basis for the catch options. All values, except for the catch, are relative to the average of the time-series in the stock assessment.

Variable	Value	Source	Notes
Relative $F_{ages\ 2\text{-}5}$ (2017)	1.61	ICES (2017a)	$F_{sq}=F_{average}$(2014–2016)
Relative SSB (2018)	1.06	ICES (2017a)	Resulting from assuming $F_{2017}=F_{sq}$
$R_{age\ 0}$ (2017/2018)	0.88	ICES (2017a)	Geometric mean (2002–2016)
Total catch (2017)	40 312 tonnes	ICES (2017a)	Resulting from assuming $F_{2017}=F_{sq}$
Discards (2017)	0 tonnes	ICES (2017a)	Negligible

Table 3 Sardine in divisions 8.a–b and 8.d. Annual catch options. Catch is in tonnes. The values in the columns "Relative F" and "Relative SSB" are relative to the average of the time-series in the stock assessment.

Basis	Catch (2018)	Relative F (2018)	Relative SSB (2019)	% SSB change *	% Catch change **
ICES advice basis					
MSY approach: F_{MSY}	30 579	1.26	0.91	-14	1.3
Other options					
F = 0	0	0	1.10	4	-100
$F = F_{pa}$	32 632	1.35	0.90	-15	8
$F = F_{lim}$	49 260	2.2	0.80	-24	63
SSB (2019) = B_{lim}	102 629	5.8	0.50	-53	240
SSB (2019) =B_{pa} = MSY $B_{trigger}$	68 571	3.3	0.69	-35	127
$F = F_{sq}$	38 212	1.61	0.87	-18	27

* SSB 2019 relative to SSB 2018.
** Catch in 2018 relative to catch in 2016 (30 181 t).

Basis of the advice

Table 4 Sardine in divisions 8.a–b and 8.d. The basis of the advice.

Advice basis	MSY approach
Management plan	ICES is not aware of an agreed precautionary management plan for sardine in this area.

Quality of the assessment

This year's assessment is the first following the implementation of a new assessment method (ICES, 2017b) and the split of the previously northern sardine stock (divisions 8.a–b and 8.d and Subarea 7) into two separate stocks. This assessment is considered as category 2 because of unresolved issues, such as a low abundance estimate given by the model compared to the survey estimates. This is partially explained by the time-series of each survey lacking contrast in abundance. This makes it difficult for the assessment to reliably estimate the scale of the population in absolute values.

Issues relevant for the advice

Sardine in this area was previously assessed as a single stock combining Subarea 7 (English Channel and Celtic Sea) and divisions 8.a–b and 8.d (Bay of Biscay). Taking into account the indications of self-sustained populations in each area (whereby sardine at all life-history stages are found in substantial amounts in both regions), and the limited and poor quality of the data available for Subarea 7, the benchmark that took place in 2017 (ICES, 2017b) concluded that it is more appropriate to assess sardine in each area separately. The split is expected to provide a more accurate assessment of the sardine dynamics in divisions 8.a–b and 8.d.

French catches originating from rectangles 25E5 and 25E4 (in Subarea 7) have been allocated by ICES to Division 8.a, as they occur in the boundary and are considered to be more closely associated with the sardine stock in divisions 8.a–b and 8.d.

Reference points

Table 5 Sardine in divisions 8.a–b and 8.d. Reference points, values, and their technical basis. All values are relative to the average of the time-series in the stock assessment.

Framework	Reference point	Relative value	Technical basis	Source
MSY approach	Relative MSY $B_{trigger}$	0.69	B_{pa}	ICES (2017a)
	Relative F_{MSY}	1.26	$F_{MSY} = F_{p.05}$	ICES (2017a)
Precautionary approach	Relative B_{lim}	0.50	$B_{lim} = B_{pa}/1.4$	ICES (2017a)
	Relative B_{pa}	0.69	B_{loss}, lowest observed SSB (2012)	ICES (2017a)
	Relative F_{lim}	2.2	F that results in 50% probability that SSB is above B_{lim} in the long term, using segmented regression with B_{lim} (EqSim)	ICES (2017a)
	Relative F_{pa}	1.35	$F_{pa} = F_{lim} \times \exp(-1.645 \times \text{sigma})$, where sigma=0.29	ICES (2017a)
Management plan	SSB_{MGT}	Not applicable		
	F_{MGT}	Not applicable		

Basis of the assessment

Table 6 Sardine in divisions 8.a–b and 8.d. Basis of assessment and advice.

ICES stock data category	2 (ICES, 2016)
Assessment type	Analytical Assessment (Stock Syntesis Model SS3) that uses catches in the model and in the forecast (ICES, 2017a)
Input data	Commercial catches (international landings; ages and length frequencies from catch sampling); three survey indices (PELGAS (acoustic biomass), BIOMAN (egg counts), DEPM Triennal survey (DEPM)) and age composition.
Discards and bycatch	Not included and are considered negligible
Indicators	None
Other information	This stock was benchmarked in February 2017 (WKPELA; ICES, 2017b).
Working group	Working Group on Southern Horse Mackerel, Anchovy, and Sardine (WGHANSA)

Information from stakeholders

There is no additional available information.

History of the advice, catch, and management

Table 7a Sardine in divisions 8.a–b and 8.d and Subarea 7. ICES advice, official landings and ICES catches. All weights are in tonnes.

Year	ICES advice	Predicted catch corresp. to advice	Official landings	ICES catches
2010	None		32592	32224
2011	None		28847	30847
2012	None		37214	37214
2013	None		40971	39681
2014	20% Reduction of catches (average of last 3 years)	< 27554	45312	40254
2015	No new advice, same as for 2014	< 27554	36928	36598
2016	Precautionary approach (increase catches by no more than 20%)	≤ 33065	47324	49587
2017	Precautionary approach (same advised catch value as given for 2016)	≤ 33065		

Table 7b Sardine in divisions 8.a–b and 8.d. ICES advice, official landings and ICES catches. All weights are in tonnes.

Year	ICES advice	Predicted catch corresp. to advice	Official landings	ICES catches
2018	MSY approach	≤30579		

History of the catch and landings

Table 8 Sardine in divisions 8.a–b and 8.d. Catch distribution by fleet in 2016 as estimated by ICES.

Catch (2016)	Landings		Discards
30 181 tonnes	83% purse-seiners	17% pelagic trawl	Negligible
	30 181 tonnes		

Table 9 Sardine in divisions 8.a–b and 8.d. History of commercial landings; the official values are presented for each country participating in the fishery. All weights are in tonnes.

Year	Divisions 8.a–b and 8.d									
	France*	Spain	Netherlands	Ireland	United Kingdom	Denmark	Germany	Lithuania	Belgium	Total
1999	0	2384	0	0	0	124	11	0	0	2519
2000	10444	1989	34	0	0	0	38	0	0	12505
2001	10121	0	333	0	0	0	135	0	0	10589
2002	12316	2881	23	19	276	0	4	0	0	15519
2003	10631	2408	68	1750	68	0	0	0	0	14925
2004	9971	1853	6	1401	0	0	0	0	0	13231
2005	15462	1203	1	974	0	0	54	0	0	17694
2006	16000	839	2	49	0	12	78	5	0	16986
2007	16060	706	0	0	0	48	0	0	0	16814
2008	21104	1989	0	0	1	39	0	0	0	23133
2009	20627	602	0	0	0	0	0	0	0	21229
2010	19484	2948	0	0	0	0	0	0	0	22432
2011	17927	5283	5	0	0	0	0	0	0	23215
2012	15952	14948	0	0	0	0	0	0	0	30900
2013	20066	12423	445	0	252	0	0	0	0	33187
2014	17706	21295	0	0	0	0	0	0	0	39001
2015	14429	13055	0	25	7	0	0	0	0	27515
2016	23289	6824	67	0	0	0	1	0	0	30181

* ICES has included landings from rectangles 25E5 and 25E4, because they are considered to belong to this stock.

Summary of the assessment

Table 10 Sardine in divisions 8.a–b and 8.d. Assessment summary. Catch weights are in tonnes. All other quantities are relative to the average of the time-series in the stock assessment (2002–2017 for SSB and 2002–2016 for recruitment and F).

Year	Relative recruitment age 0	Relative SSB	Catch*	Relative F ages 2–5
2002	0.63	1.10	18277	0.72
2003	0.69	1.03	16607	0.57
2004	1.28	1.14	14197	0.54
2005	0.39	1.32	16360	0.54
2006	0.62	1.18	16741	0.59
2007	1.25	1.03	17323	0.63
2008	1.52	1.09	21821	0.87
2009	0.59	1.04	20855	0.72
2010	0.44	1.15	20127	0.70
2011	0.75	0.93	23208	0.94
2012	1.37	0.69	30900	1.62
2013	0.98	0.72	32489	1.68
2014	1.46	0.76	33943	1.86
2015	0.61	0.76	27284	1.34
2016	2.4	0.81	30181	1.69
2017	0.88**	1.24		
Average***	1	1	22688	1

* ICES estimates of catch.
** Geometric mean (2002–2016).
*** Average of years 2002–2017 for the relative SSB column, and 2002–2016 for all all other columns.

Sources and references

ICES. 2016. Advice basis. *In* Report of the ICES Advisory Committee, 2016. ICES Advice 2016, Book 1, Section 1.2.

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