

7.3.37 Sole (*Solea solea*) in divisions 8.a–b (northern and central Bay of Biscay)

ICES stock advice

ICES advises that when the maximum sustainable yield (MSY) approach is applied, catches in 2017 should be no more than 3107 tonnes.

Stock development over time

The spawning-stock biomass (SSB) increased from a historical low in 2003. Although SSB decreased again after 2011 and was below MSY $B_{trigger}$ in 2014 and 2015, it is above MSY $B_{trigger}$ in 2016.. The fishing mortality (F) has been above F_{MSY} for almost the entire time-series. The 2012, 2013, and 2014 recruitments (R) are the lowest in the time-series.



Figure 7.3.37.1 Sole in divisions 8.a–b. Summary of the stock assessment (weights in thousand tonnes). Assumed recruitment values are not shaded.

Stock and exploitation status

Table 7.3.37.1 Sole in divisions 8.a–b. State of the stock and fishery relative to reference points.

		Fishing pressure			Stock size		
		2013	2014	2015	2014	2015	2016
Maximum sustainable yield	F_{MSY}	✗	✗	✗ Above	$MSY B_{trigger}$	✗	✗ Above trigger
Precautionary approach	F_{pa}, F_{lim}	○	○	○ Increased risk	B_{pa}, B_{lim}	○	○ Full reproductive capacity
Management plan	F_{MGT}	-	-	- Not applicable	SSB_{MGT}	-	- Not applicable

Catch options

Table 7.3.37.2 Sole in divisions 8.a–b. The basis for the catch options.

Variable	Value	Source	Notes
F _{ages 3–6} (2016)	0.45	ICES (2016a)	F _{sq} = mean F (2013–2015)
SSB (2017)	11.587 kt	ICES (2016a)	
R _{age2} (2016/2017)	21.3	ICES (2016a)	GM (1993–2013)
Total catch (2016)	3.734 kt	ICES (2016a)	Based on F (2016)
Wanted catch (2016) *	3.734 kt	ICES(2016a)	
Unwanted catch (2016)*	Negligible	ICES(2016a)	

*“Wanted” and “unwanted” catch are used to describe fish that would be landed and discarded in the absence of the EU landing obligation. Discarding is assumed to be negligible for this stock.

Table 7.3.37.3 Sole in divisions 8.a–b. The catch options. Weights in thousand tonnes.

Rationale	Catch (2017)	Basis	F total (2017)	SSB (2018)	%SSB change *	%TAC change **
MSY approach	3.107	F _{MSY}	0.33	13.140	13	-9
Precautionary approach	3.893	F _{pa} (F _{sq} × 0.96)	0.43	12.265	6	14
Zero catch	0.0	F = 0	0.00	16.616	43	-100
Other options	0.473	F _{sq} × 0.1	0.04	16.085	39	-86
	1.147	F _{sq} × 0.25	0.11	15.329	32	-66
	2.196	F _{sq} × 0.5	0.22	14.155	22	-36
	3.149	F _{sq} × 0.75	0.34	13.093	13	-8
	4.021	F _{sq} × 1	0.45	12.123	5	18
	2.907	-15% TAC (F _{sq} × 0.68)	0.30	13.368	15	-15
	3.420	0% TAC change (F _{sq} × 0.83)	0.37	12.786	10	0
	3.933	+15% TAC (F _{sq} × 0.97)	0.43	12.225	6	15
	5.091	F _{lim}	0.60	10.937	-6	49
	5.396	SSB ₂₀₁₈ = MSY B _{trigger} = B _{pa} (F _{sq} × 1.45)	0.65	10.600	-9	58
	8.109	SSB ₂₀₁₈ = B _{lim} (F _{sq} × 2.38)	1.06	7.600	-34	137

* SSB 2018 relative to SSB 2017.

** Catch 2017 relative to TAC 2016 (3420 t).

Basis of the advice

Table 7.3.37.4 Sole in divisions 8.a–b. The basis of the advice.

Advice basis	MSY approach
Management plan	Multiannual plan since 2006 (EU, 2006). ICES has not evaluated this plan.
	Another proposal for a management plan for sole in the Bay of Biscay was evaluated by ICES as being precautionary (2013a, 2014). The evaluation was based on reference points that are no longer valid.

Quality of the assessment

In addition to the two commercial tuning fleets, fisheries-independent data (ORHAGO survey) have been incorporated in the assessment since 2013. This is an improvement in the quality of the assessment.

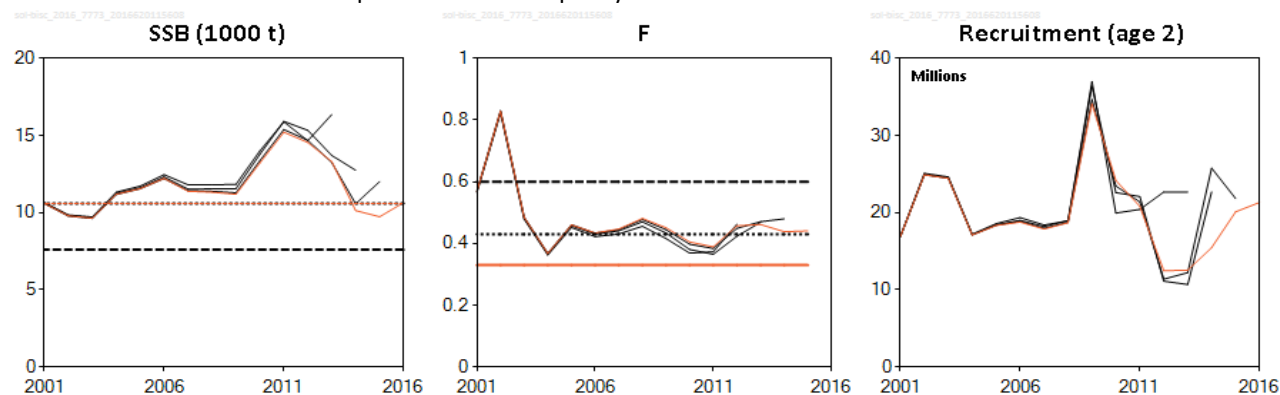


Figure 7.3.37.2 Sole in divisions 8.a–b. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

Most fleets fishing this stock are under the EU landing obligation from 2016.

Reference points

Table 7.3.37.5 Sole in divisions 8.a–b. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	10600 t	$= B_{pa}$	ICES (2016b)
	F_{MSY}	0.33	Stochastic simulations using a segmented regression stock-recruitment model	ICES (2016b)
Precautionary approach	B_{lim}	7600 t	$B_{lim} = B_{pa} / \exp(\sigma \times 1.645)$; $\sigma = 0.20$	ICES (2016c)
	B_{pa}	10600 t	Lowest SSB with good recruitment and increase of SSB	ICES (2016c)
	F_{lim}	0.6	In equilibrium gives a 50% probability of $SSB > B_{lim}$	ICES (2016c)
	F_{pa}	0.43	$F_{pa} = F_{lim} \times \exp(-\sigma \times 1.645)$; $\sigma = 0.20$	ICES (2016c)
Management plan	F_{mgt}	Not applicable		
	B_{mgt}	Not applicable		

Basis of the assessment

Table 7.3.37.6 Sole in divisions 8.a-b. The basis of the assessment.

ICES stock data category	1 (ICES, 2016d)
Assessment type	Age-based analytical assessment (XSA; ICES, 2016a) that uses landings in the model and forecast.
Input data	Commercial catch (French and Belgian), ages and length frequencies from catch sampling); one survey index (FR-ORHAGO in 2007–2015); four commercial indices (FR-SABLES and FR-ROCHELLE in 1991–2009, FR-BB-IN-Q4 in 2000–2015, and FR-BB-OFF-Q2 in 2000–2012). Maturity ogive fixed, estimated in 2000. Assumed natural mortalities fixed (0.1).
Discards and bycatch	Not included, considered negligible.
Indicators	None
Other information	Benchmarked in 2011 and 2013 (ICES, 2011, 2013b)
Working group	Working Group for the Bay of Biscay and the Iberian Waters Ecoregion (WGBIE)

Information from stakeholders

There is no available information.

History of advice, catch, and management

Table 7.3.37.7 Sole in divisions 8.a–b. History of ICES advice, the agreed TAC, and official and ICES estimates of landings. Weights in thousand tonnes.

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES landings	Discards	ICES catch
1987	Not assessed	-	4.4	4.4	5.1	0.2	5.3
1988	Precautionary TAC	3.7	4.0	4.4	5.4	0.3	5.6
1989	No increase in effort; TAC	4.5	4.8	5.8*	5.8	0.4	6.2
1990	No increase in F; TAC	5.1	5.2	5.5*	5.9	0.3	6.2
1991	Precautionary TAC	4.7	5.3	4.7*	5.6	0.2	5.8
1992	F = F(90)	5.0	5.3	6.4*	6.6	0.1	6.7
1993	No long-term gain in increasing F	-	5.7	6.5	6.4	0.1	6.5
1994	No long-term gain in increasing F	-	6.6	7.1	7.2	0.2	7.4
1995	No long-term gain in increasing F	5.4**	6.6	5.9	6.2	0.1	6.3
1996	No increase in F	5.0	6.6	4.3	5.9	0.1	6.0
1997	40% reduction in F	3.1	5.4	5.0	6.3	0.1	6.4
1998	No increase in F	7.6	6.0	4.3	6.0	0.1	6.1
1999	Reduce F below F_{pa}	< 5.0	5.4	3.8	5.2	0.2	5.4
2000	F at F_{pa}	< 5.8	5.8	5.7	5.7	0.1	5.8
2001	TAC 2001, at most TAC 2000	< 5.8	6.3	4.9	4.8	0.0	4.9
2002	Establish rebuilding plan or no fishing	-	4.0	4.0	5.5	0.0	5.5
2003	Establish rebuilding plan or no fishing	-	3.8	4.1	4.1	0.0	4.0
2004	65% reduction in F or recovery plan [#]	< 2.0	3.6	4.1	4.0	-	-
2005	F at F_{pa}	< 4.1	4.14	4.4	4.5	-	-
2006	F at F_{pa}	< 4.2 or management plan	4.1	4.4	4.8	-	-
2007	Management plan: 10% reduction in F	4.54	4.54	4.1	4.4	-	-
2008	Reach B_{pa} in 2009	3.85	4.58	3.3	4.3	-	-
2009	F at F_{pa}	< 4.43	4.39	4.8	3.6	-	-
2010	F at $F_{status\ quo}$	< 4.9	4.83	4.7	4.0		
2011	See scenarios	-	4.25	4.6	4.6		
2012	MSY transition	4.0	4.25	4.2 ^{##}	4.3 ^{##}		
2013	MSY transition	3.5	4.1	4.5	4.2		
2014	MSY transition	3.27	3.8	4.1	3.9		
2015	MSY approach	2.407	3.8	3.8	3.6		
2016	MSY approach	≤ 2.393	3.4				
2017	MSY approach	≤ 3.107					

* Not reported for all countries.

** Landings assuming current discarding practice.

[#] Single-stock boundaries; the exploitation of this stock should be conducted in the context of mixed fisheries.

^{##} A carry-over of 10% for the French quota was decided.

History of catch and landings

Table 7.3.37.8 Sole in divisions 8.a–b. Catch distribution by fleet in 2015 as estimated by ICES.

Total catch (2015)	Landings				Discards
3.6 kt	70% Fixed nets	15% Offshore otter trawlers	8% Offshore beam trawlers	7% Inshore trawlers	Not quantified; considered to be negligible
	3.6 kt				

Table 7.3.37.9 Sole in divisions 8.a-b. History of commercial catch and landings. Both official and ICES estimated values are presented by area for each country participating in the fishery.

Year	Official landings						ICES landings	Discards ##	ICES catches
	Belgium	France #	Netherlands	Spain	Others	Total			
1979	0	2376		62*		2443	2619	-	-
1980	33*	2549		107*		2689	2986	-	-
1981	4*	2581*	13*	96*		2694	2936	-	-
1982	19*	1618*	52*	57*		1746	3813	-	-
1983	9*	2590	32*	38*		2669	3628	-	-
1984	na	2968	175*	40*		3183	4038	99	4137
1985	25*	3424	169*	308*		3925	4251	64	4315
1986	52*	4228	213*	75*		4567	4805	27	4832
1987	124*	4009	145*	101*		4379	5086	198	5284
1988	135*	4308		0		4443	5382	254	5636
1989	311*	5471		0		5782	5845	356	6201
1990	301*	5231		0		5532	5916	303	6219
1991	389*	4315		3		4707	5569	198	5767
1992	440*	5928		0		6359	6550	123	6673
1993	400*	6096		13		6496	6420	104	6524
1994	466*	6627		2**		7095	7229	184	7413
1995	546*	5326		0		5872	6205	130	6335
1996	460*	3842		0		4302	5854	142	5996
1997	435*	4526		0		4961	6259	118	6377
1998	469*	3821	44	0		4334	6027	127	6154
1999	504	3280		0		3784	5249	110	5359
2000	451	5293		5**		5749	5760	51	5811
2001	361	4350	201	0		4912	4836	39	4875
2002	303	3680		2**		3985	5486	21	5507
2003	296	3805		4**		4105	4108	20	4128
2004	324	3739		9**		4072	4002	-	-
2005	358	4003		10		4371	4539	-	-
2006	393	4030		9		4432	4793	-	-
2007	401	3707		9		4117	4363	-	-
2008	305	3018		11	2*	3336	4299	-	-
2009	364	4391				4755	3650	-	-
2010	451	4248				4699	3966	-	-
2011	386	4259				4645	4632	-	-
2012	385	3819				4204	4321	-	-
2013	312	4181				4492	4235	-	-
2014	307	3793		10		4110	3928		
2015*	302	3465		8		3775	3641		

* Reported in Subarea 8.

** Reported as *Solea* spp (*Solea lascaris* and *Solea solea* in Subarea 8).

*** Preliminary.

Including reported in Subarea 8 or divisions 8.c–d.

Discards = partial estimates for the French offshore trawlers fleet.

Summary of the assessment

Table 7.3.37.10 Sole in divisions 8.a–b. Assessment summary (weights in tonnes).

Year	Recruitment Age 2 (thousands)	SSB (tonnes)	Landings (tonnes)	Mean F Ages 3–6
1984	24161	12320	4038	0.312
1985	29526	13365	4251	0.307
1986	28343	14478	4805	0.365
1987	24921	15477	5086	0.371
1988	26744	15356	5382	0.4
1989	28167	14462	5845	0.495
1990	32107	14819	5916	0.453
1991	35743	14789	5569	0.419
1992	35347	15976	6550	0.607
1993	24903	16379	6420	0.524
1994	26230	15854	7229	0.646
1995	23609	14251	6205	0.574
1996	29429	13833	5854	0.543
1997	23707	13340	6259	0.608
1998	22578	13262	6027	0.538
1999	24411	12357	5249	0.623
2000	24963	11879	5760	0.626
2001	16910	10596	4836	0.569
2002	24907	9796	5486	0.829
2003	24456	9641	4108	0.485
2004	17109	11190	4002	0.368
2005	18343	11557	4539	0.46
2006	18771	12220	4793	0.434
2007	17875	11387	4363	0.447
2008	18684	11328	4299	0.481
2009	34100	11193	3650	0.451
2010	24167	13221	3966	0.405
2011	20808	15213	4632	0.389
2012	12466	14548	4321	0.458
2013	12547	13316	4235	0.462
2014	15476	10134	3928	0.438
2015	20110	9733	3641	0.441
2016	21322*	10644		

* Geometric mean (1993–2013).

Sources and references

EU. 2006. COUNCIL REGULATION (EC) No. 388/2006 of 23 February 2006 establishing a multiannual plan for the sustainable exploitation of the stock of sole in the Bay of Biscay. Official Journal of the European Union, L 65/1.

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:065:0001:0004:EN:PDF>.

ICES. 2010. Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk, and Megrim (WGMMM), 5–11 May 2010, Bilbao, Spain. ICES CM 2010/ACOM:11. 571 pp.

ICES. 2011. Report of the Benchmark Workshop on Flatfish (WKFLAT), 1–8 February 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:39. 257 pp.

ICES. 2013a. EU request for the evaluation of the harvest control rule for sole in the Bay of Biscay. *In* Report of the ICES Advisory Committee, 2013. ICES Advice 2013, Book 7, Section 7.3.5.2.

ICES. 2013b. Report of the Working Group on the Assessment of Southern Shelf Stocks of Hake, Monk, and Megrim (WGHMM), 10–16 May 2013, ICES Headquarters, Copenhagen. ICES CM 2013/ACOM:11A. 701 pp.

ICES. 2014. EU request for clarification on the request for the evaluation of the harvest control rule for sole in the Bay of Biscay, October 2013. *In* Report of the ICES Advisory Committee, 2014. ICES Advice 2014, Book 7, Section 7.2.3.1.

ICES. 2016a. Report of the Working Group for the Bay of Biscay and the Iberian waters Ecoregion (WGBIE), 13-19 May 2016, ICES HQ, Copenhagen, Denmark. ICES CM/ACOM:12.

ICES. 2016b. EU request to ICES to provide F_{MSY} ranges for selected stocks in ICES subareas 5 to 10. *In* Report of the ICES Advisory Committee, 2016. ICES Advice 2016, Book 5, Section 5.4.1.

http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2016/Special_Requests/EU_FMSY_ranges_for_selected_Western_Waters_Stocks.pdf

ICES. 2016c. Report of the Workshop to consider FMSY ranges for stocks in ICES categories 1 and 2 in Western Waters (WKMSYREF4), 13–16 October 2015, Brest, France. ICES CM 2015/ACOM:58. 187 pp.

ICES. 2016d. Advice basis. *In* Report of the ICES Advisory Committee, 2016. ICES Advice 2016, Book 1, section 1.2. http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2016/2016/Introduction_to_advice_2016.pdf