

Sole (*Solea solea*) in divisions 7.f and 7.g (Bristol Channel, Celtic Sea)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2019 should be no more than 864 tonnes.

Stock development over time

In recent years, the spawning–stock biomass (SSB) has been fluctuating around MSY $B_{trigger}$, and is in 2018 estimated to be just above MSY $B_{trigger}$. Fishing mortality (F) has been fluctuating above F_{MSY} since 1979. The 2015 and 2017 recruitment are estimated to be well above average with the latter being the second highest in the time-series.

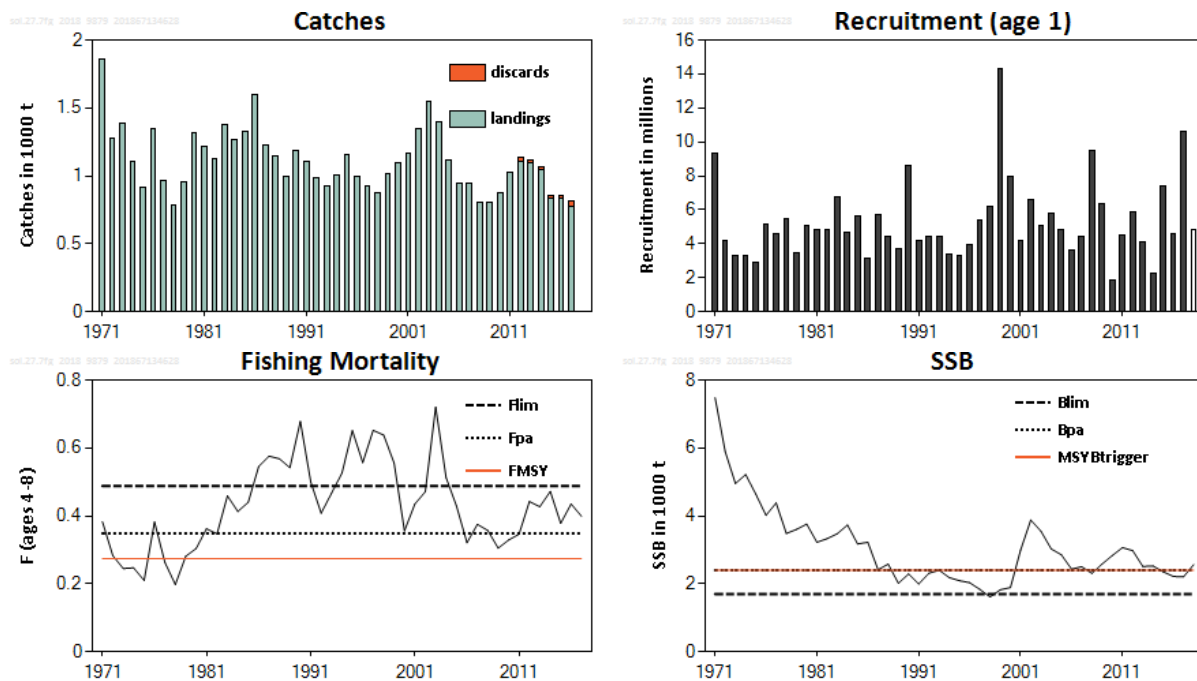


Figure 1 Sole in divisions 7.f and 7.g. Summary of the stock assessment. Assumed recruitment values are not shaded. Discards estimates are available since 2012.

Stock and exploitation status

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

Table 1 Sole in divisions 7.f and 7.g. State of the stock and fishery relative to reference points.

		Fishing pressure			Stock size			
		2015	2016	2017	2016	2017	2018	
Maximum sustainable yield	F_{MSY}	✘	✘	✘ Above	$MSY B_{trigger}$	✘	✘	✔ Above trigger
Precautionary approach	F_{pa}, F_{lim}	○	○	○ Increased risk	B_{pa}, B_{lim}	○	○	✔ Full reproductive capacity
Management plan	F_{MGT}	—	—	— Not applicable	B_{MGT}	—	—	— Not applicable

Catch scenarios

Table 2 Sole in divisions 7.f and 7.g. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
F _{ages 4–8} (2018)	0.36	Catch constraint (TAC 2018 = 920 tonnes)
SSB (2019)	2913 tonnes	Fishing at F = 0.36
R _{age 1} (2018–2019)	4824 thousands	GM(1971–2015)
N _{age 2} (2018)	9573 thousands	Age 1 (2017) XSA estimate reduced by 23% and exponential decay (ICES, 2014)
Catch (2018)	920 tonnes	TAC 2018
Landings (2018)	873 tonnes	TAC 2018 minus a 5.1% discard ratio in weight
Discards (2018)	47 tonnes	Average ratio of 2015–2017 (5.1%)

Table 3 Sole in divisions 7.f and 7.g. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch * (2019)	Wanted catch** (2019)	Unwanted catch** (2019)	F _{wanted} (2019)	SSB (2020)	% SSB change ***	% TAC change ^	% Advice change ^^
ICES advice basis								
MSY approach: F _{MSY}	864	820	44	0.27	3454	19	-6.1	-7.2
Other scenarios								
F = F _{MSY lower}	504	478	26	0.15	3783	30	-45	-46
F = F _{MSY upper}	1267	1202	65	0.42	3087	6.0	38	36
F = 0	0	0	0	0	4244	46	-100	-100
F _{pa}	1058	1004	54	0.34	3277	12.5	15.0	13.6
F _{lim}	1415	1343	72	0.48	2953	1.37	54	52
SSB (2020) = B _{lim}	2822	2678	144	1.27	1700	-42	207	203
SSB (2020) = B _{pa} = MSY B _{trigger}	2030	1926	104	0.77	2400	-17.6	121	118
F = F ₂₀₁₈	1112	1055	57	0.36	3227	10.8	21	19.4

* Total catches are calculated from wanted catch (fish that would be landed in the absence of the EU landing obligation), based on the average discard rate in 2015–2017 (5.1% in weight).

** “Wanted” and “unwanted” catch are used to describe fish that would be landed and discarded, respectively, in the absence of the EU landing obligation.

*** SSB 2020 relative to SSB 2019.

^ Total catch in 2019 relative to the TAC in 2018 (920 t).

^^ Advice value for 2019 relative to the advice value for 2018 (931 t).

Following the recent assessment, the SSB has been revised downwards and the F revised upwards. The above-average recruitment in 2016 was also revised downwards. This results in a reduction of the advised catches for 2019 (based on the F_{MSY}) compared to last year’s advice for 2018.

Basis of the advice

Table 4 Sole in divisions 7.f and 7.g. The basis of the advice.

Advice basis	MSY approach
Management plan	The EU has proposed a multiannual management plan for the Western Waters, which is not yet finalized (EU, 2018).

Quality of the assessment

There is a retrospective bias in the estimations of F and SSB in the most recent years, with F being underestimated and SSB overestimated. The current assessment shows a substantial downward revision of the SSB and a substantial upward revision of the F back to 2003. The 2015–2016 recruitments were revised downwards. This may be related to a recent change in the selectivity of the Belgian commercial tuning fleet and the lack of tuning data from the UK(E&W)–CBT fleet after 2012.

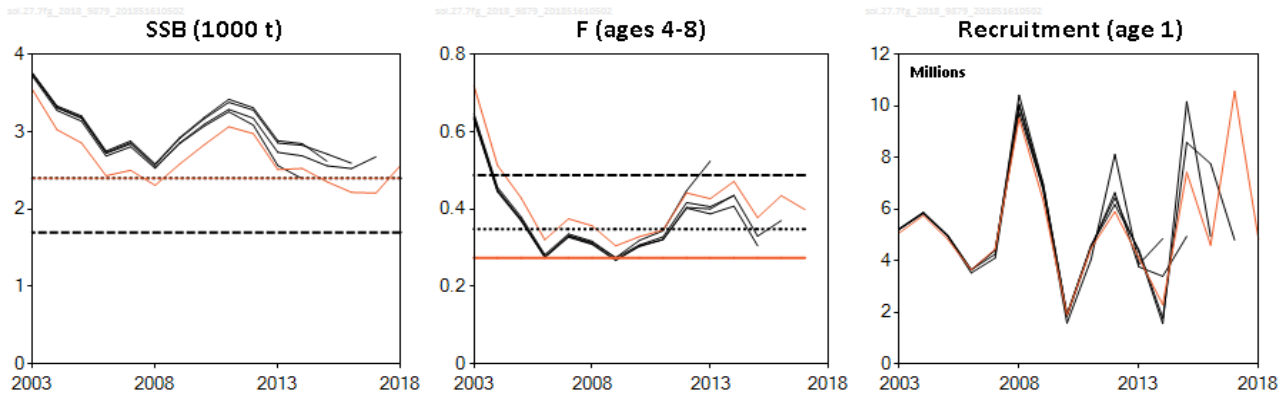


Figure 2 Sole in divisions 7.f and 7.g. Historical assessment results.

Issues relevant for the advice

A TAC constraint has been applied in the forecast because recent landings have been close to the TAC. The strong 2017 recruitment may be overestimated and was revised down by 23% in the short-term forecast, based on assessment revisions of previous strong year-class estimates.

Reference points

Table 5 Sole in divisions 7.f and 7.g. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	2400 tonnes	B_{pa}	ICES (2016a)
	F_{MSY}	0.27	Stochastic simulations with a segmented regression stock–recruitment relationship	ICES (2016a)
Precautionary approach	B_{lim}	1700 tonnes	B_{loss} estimated in 2015	ICES (2016a)
	B_{pa}	2400 tonnes	$B_{lim} \times 1.4$	ICES (2016a)
	F_{lim}	0.48	F with 50% probability of $SSB < B_{lim}$	ICES (2016a)
	F_{pa}	0.34	$F_{lim}/1.4$	ICES (2016a)
Management plan	MAP MSY $B_{trigger}$	2400 tonnes	MSY $B_{trigger}$	
	MAP B_{pa}	2400 tonnes	B_{pa}	
	MAP B_{lim}	1700 tonnes	B_{lim}	
	MAP F_{MSY}	0.27	F_{MSY}	
	MAP range F_{lower}	0.15	Minimum F which produces at least 95% of maximum yield	ICES (2016a)
	MAP range F_{upper}	0.42	Maximum F which produces at least 95% of maximum yield	ICES (2016a)

Basis of the assessment

Table 6 Sole in divisions 7.f and 7.g. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2016b)
Assessment type	Age-analytical assessment (XSA) that uses landings in the model; discards are then included to calculate a catch forecast (ICES, 2018).
Input data	International landings, ages and length frequencies from catch sampling by métier; one survey index (UK(E&W)-BTS-Q3); three commercial indices (BE-CBT, BE-CBT2, and UK(E&W)-CBT (1991–2012)); maturity data from a combined-sex maturity (ICES, 1998); natural mortality is assumed to be constant.
Discards and bycatch	Not included in the assessment, but used to provide catch advice
Indicators	None
Other information	Benchmarked in 2014 (ICES, 2014)
Working group	Working Group for the Celtic Seas Ecoregion (WGCSE)

Information from stakeholders

There is no additional available information.

History of the advice, catch, and management

Table 7 Sole in divisions 7.f and 7.g. History of ICES advice, agreed TAC, official landings, and ICES estimates for landings and discards. All weights are in tonnes.

Year	ICES advice	Catches corresponding to advice	Landings corresponding to advice	Agreed TAC	Official landings	ICES discards	ICES landings
1987	Status quo F; TAC		1600	1600	1264		1222
1988	F = F(pre-86); TAC		900	1100	1204		1146
1989	F at F(81–85); TAC		1000	1000	992		992
1990	No increase in F		1200	1200	1239		1189
1991	No increase in F		1100	1200	1496		1107
1992	No long-term gains in increasing F		1100	1200	1060		981
1993	No long-term gains in increasing F		-	1100	1030		928
1994	No long-term gains in increasing F		-	1100	1018		1009
1995	No increase in F		1000	1100	1165		1157
1996	20% reduction in F		800	1000	1081		995
1997	20% reduction in F		800	900	1038		927
1998	20% reduction in F		700	850	1013		875
1999	Reduce F below F_{pa}		810	960	947		1012
2000	Reduce F below F_{pa}		< 1160	1160	1040		1091
2001	Reduce F below F_{pa}		< 810	1020	1120		1168
2002	Reduce F below F_{pa}		< 1000	1070	1118		1345
2003	Reduce F below F_{pa}		< 1240	1240	1207		1392
2004	Reduce F below F_{pa}		< 1000	1050	1130		1249
2005	Reduce F below F_{pa}		< 840	1000	997		1044
2006	Reduce F below F_{pa}		< 880	950	921		946
2007	Reduce F below F_{pa}		< 840	893	943		945
2008	Keep F below F_{pa}		< 1000	964	780		800
2009	No long-term gains in increasing F		< 940	993	807		805
2010	No long-term gains in increasing F		< 920	993	871		876
2011	See scenarios		-	1241	1013		1029
2012	MSY approach		< 1060	1060	1099	34	1104
2013	MSY approach		< 1100	1100	1086	22	1092

Year	ICES advice	Catches corresponding to advice	Landings corresponding to advice	Agreed TAC	Official landings	ICES discards	ICES landings
2014	MSY approach		< 920	1001	1044	21	1042
2015	MSY approach		< 652	851	827	26	830
2016	MSY approach	≤ 760	≤ 745	779	831*	26	831
2017	MSY approach	≤ 806		845	780*	42	776
2018	MSY approach	≤ 931		920			
2019	MSY approach	≤ 864					

*Preliminary.

History of the catch and landings

Table 8 Sole in divisions 7.f and 7.g. Catch distribution by fleet in 2017 as estimated by ICES.

Catch (2017)	Landings			Discards
	Beam trawlers 85%	Otter trawlers 10%	Other gear 5%	
818 tonnes	776 tonnes			42 tonnes

Table 9 Sole in divisions 7.f and 7.g. History of commercial landings. All weights are in tonnes.

Year	Belgium	Denmark	France	Ireland	UK (E&W,NI)	UK (Scotland)	Netherlands	Total-official	Unallocated landings	ICES landings
1986	1039*	2	146	188	611	-	3	1989	-389	1600
1987	701*	-	117	9	437	-	-	1264	-42	1222
1988	705*	-	110	72	317	-	-	1204	-58	1146
1989	684*	-	87	18	203	-	-	992	0	992
1990	716*	-	130	40	353	0	-	1239	-50	1189
1991	982*	-	80	32	402	0	-	1496	-389	1107
1992	543*	-	141	45	325	6	-	1060	-79	981
1993	575*	-	108	51	285	11	-	1030	-102	928
1994	619*	-	90	37	264	8	-	1018	-9	1009
1995	763*	-	88	20	294	-	-	1165	-8	1157
1996	695*	-	102	19	265	0	-	1081	-86	995
1997	660*	-	99	28	251	0	-	1038	-111	927
1998	675*	-	98	42	198	-	-	1013	-138	875
1999	604	-	61	51	231	0	-	947	65	1012
2000	694	-	74	29	243	-	-	1040	51	1091
2001	720	-	77	35	288	-	-	1120	48	1168
2002	703	-	65	32	318	-	-	1118	227	1345
2003	715	-	124	26	342	-	-	1207	340	1547
2004	735	-	79	33	283	-	-	1130	268	1398
2005	645	-	101	34	217	-	-	997	121	1118
2006	576	-	75	38	232	-	-	921	25	946
2007	582	-	85	32	244	-	-	943	2	945
2008	466	-	68	28	218	-	-	780	20	800
2009	513	-	74	26	194	-	-	807	-2	805
2010	620	-	45	27	179	-	-	871	5	876
2011	766	-	50	30	168	-	-	1013	16	1029
2012	843	-	48	33	175	-	-	1099	5	1104
2013	789	-	49	42	206	-	-	1086	6	1092
2014	705	-	59	28	252	-	-	1044	-2	1042
2015	671	-	24	27	105	-	-	827	3	830
2016**	563	-	72	21	175	-	-	831	0	831
2017**	553	-	49	28	149	-	-	780	-4	776

* Including divisions 7.g-k.

** Preliminary.

Summary of the assessment

Table 10 Sole in divisions 7.f and 7.g. Assessment summary. Weights are in tonnes and recruitment in thousands.

Year	Recruitment (age 1)	SSB	Landings	Discards*	F (ages 4–8)
1971	9332	7481	1861		0.38
1972	4163	5893	1278		0.28
1973	3304	4954	1391		0.25
1974	3291	5216	1105		0.25
1975	2923	4643	919		0.21
1976	5149	4018	1350		0.38
1977	4579	4381	961		0.26
1978	5433	3483	780		0.198
1979	3497	3604	954		0.28
1980	5091	3759	1314		0.30
1981	4837	3223	1212		0.36
1982	4860	3330	1128		0.35
1983	6742	3474	1373		0.46
1984	4657	3730	1266		0.41
1985	5596	3173	1328		0.44
1986	3125	3225	1600		0.55
1987	5682	2416	1222		0.58
1988	4443	2581	1146		0.57
1989	3727	2016	992		0.54
1990	8584	2291	1189		0.68
1991	4221	1997	1107		0.50
1992	4455	2313	981		0.41
1993	4428	2401	928		0.47
1994	3422	2183	1009		0.53
1995	3313	2093	1157		0.65
1996	3971	2033	995		0.56
1997	5352	1837	927		0.65
1998	6227	1612	875		0.64
1999	14334	1824	1012		0.56
2000	7938	1890	1091		0.36
2001	4215	2999	1168		0.44
2002	6619	3880	1345		0.47
2003	5086	3547	1547		0.72
2004	5754	3028	1398		0.51
2005	4848	2856	1118		0.43
2006	3644	2432	946		0.32
2007	4449	2503	945		0.38
2008	9526	2308	800		0.36
2009	6356	2583	805		0.31
2010	1893	2833	876		0.33
2011	4478	3066	1029		0.35
2012	5901	2977	1104	32	0.44
2013	4108	2511	1093	22	0.43
2014	2297	2526	1042	21	0.47
2015	7429	2354	830	26	0.38
2016	4599	2218	831	27	0.44
2017	10580**	2208	776	42	0.40
2018	4824***	2565			

* Discards are not included in the assessment.

** Estimated value from the model (13 740 thousands), reduced by 23% and by exponential decay to 9573 thousands (age 2 in 2018) in the short-term forecast.

*** Geometric mean (1971–2015).

Sources and references

EU 2018. Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing a multiannual plan for fish stocks in the Western Waters and adjacent waters, and for fisheries exploiting those stocks, amending Regulation (EU) 2016/1139 establishing a multiannual plan for the Baltic Sea, and repealing Regulations (EC) No 811/2004, (EC) No 2166/2005, (EC) No 388/2006, (EC) 509/2007 and (EC) 1300/2008. COM/2018/0149 final. 30 pp. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018PC0149&from=EN>.

ICES. 1998. Report of the Study Group on Precautionary Approach to Fisheries Management, 3–6 February 1998, ICES Headquarters, Copenhagen, Denmark. ICES CM 1998/ACFM:10. 43 pp.

ICES. 2014. Report of the Benchmark Workshop on Celtic Sea stocks (WKCELT), 3–7 February 2014, Copenhagen, Denmark. ICES CM 2014/ACOM:42. 194 pp.

ICES. 2016a. 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. 13 pp.

ICES. 2016b. Advice basis. *In* Report of the ICES Advisory Committee, 2017. ICES Advice 2016, Book 1, Section 1.2.

ICES. 2018. Report of the Working Group for the Celtic Seas Ecoregion (WGCSE), 9–18 May 2018, ICES Headquarters, Copenhagen, Denmark. ICES CM 2018/ACOM:13. In prep.