

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

ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2017 should be no more than 806 tonnes.

Since this stock is only partially under the EU landing obligation, ICES is not in a position to advise on landings corresponding to the advised catch.

Stock development over time

The spawning-stock biomass (SSB) has been above $MSY B_{trigger}$ since 2001, but is declining. Fishing mortality (F) has been at or above F_{msy} since 2010 and declined in 2015. Recruitment has been fluctuating around average. The 2015 recruitment is estimated to be the second highest in the time-series.

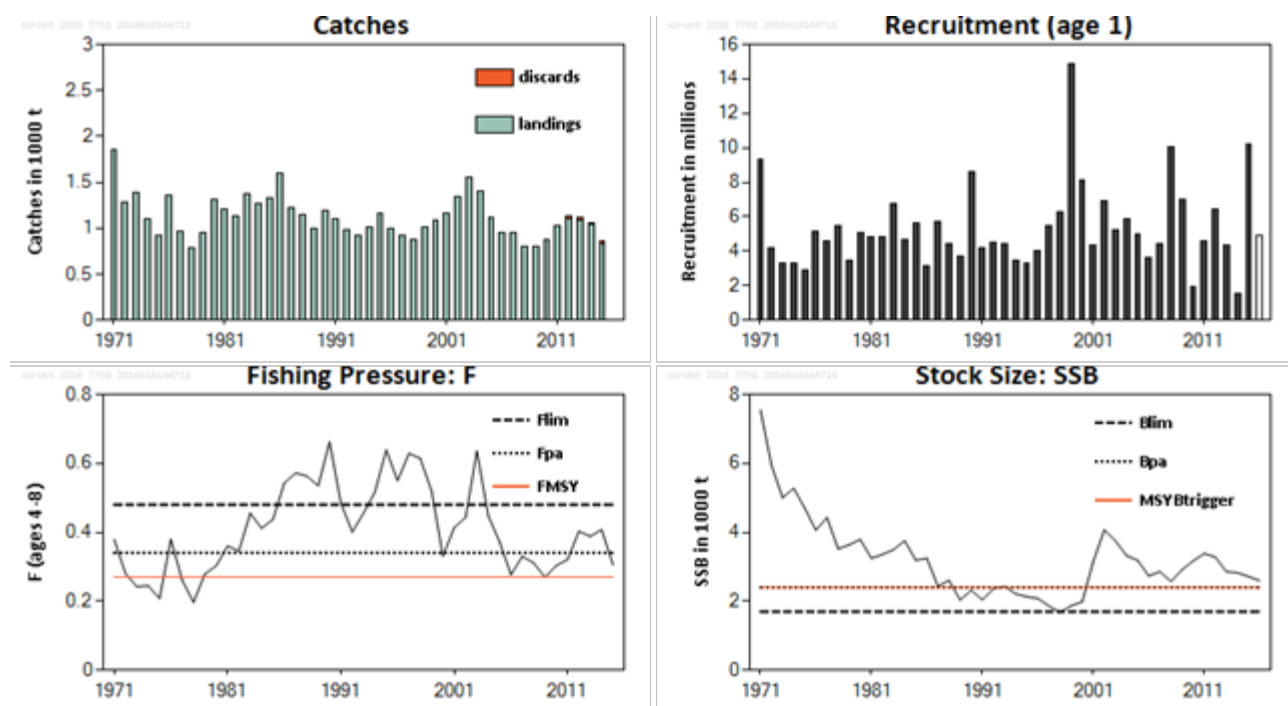


Figure 5.3.61.1 Sole in divisions 7.f and 7.g. Summary of stock assessment. Predicted recruitment values are not shaded.

Stock and exploitation status

Table 5.3.61.1 Sole in divisions 7.f and 7.g. 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}	✗	✗	✗	✓	✓	✓
Precautionary approach	F_{pa} , F_{lim}	○	○	✓	✓	✓	✓
Management plan	F_{MGT}	-	-	-	-	-	-
				Above			Above trigger
				Harvested sustainably			Full reproductive capacity
				Not applicable			Not applicable

Catch options

Table 5.3.61.2 Sole in divisions 7.f and 7.g. The basis for the catch options.

Variable	Value	Source	Notes
F ages 4–8 (2016)	0.3	ICES (2016a)	F consistent with the 2016 TAC
SSB (2017)	2595 t	ICES (2016a)	Short-term forecast
R _{age1} (2016 and 2017)	4933 thousands	ICES (2016a)	GM(1971–2013)
N _{age2} (2016)	7087 thousands	ICES (2016a)	Age 1 (2015) XSA estimate reduced by 23% and exponential decay (ICES, 2014)
Catch (2016)	803 t	ICES (2016a)	TAC 2016 plus a 3% discard rate in weight
Landings (2016)	779 t	ICES (2016a)	TAC 2016
Discards (2016)	3%	ICES (2016a)	average of 2013–2015

Table 5.3.61.3 Sole in divisions 7.f and 7.g. The catch options. Weights are in tonnes.

Rationale	Total catch (2017)*	Wanted catch** (2017)	Basis	F wanted catch (2017)	SSB (2018)	% SSB change***	% TAC change^
MSY approach	806	782	F _{MSY}	0.27	2947	11	3
Precautionary approach	985	955	F _{pa}	0.34	2781	5	26
Zero catch	0	0	F = 0	0	3703	40	–100
Other options	682	662	TAC ₂₀₁₆ – 15%	0.22	3062	16	–12
	876	850	F ₂₀₁₆	0.3	2881	9	12
	803	779	TAC ₂₀₁₆	0.27	2950	11	3
	924	896	TAC ₂₀₁₆ + 15%	0.32	2837	7	19
	1309	1270	F _{lim}	0.48	2480	–6	68
	1396	1354	SSB ₂₀₁₈ = MSY B _{trigger} = B _{pa}	0.52	2400	–9	79
	2154	2089	SSB ₂₀₁₈ = B _{lim}	0.88	1700	–36	177

* Catches are calculated based on wanted catch (fish that would be landed in the absence of the EU landing obligation) and 3% discard rate (in weight).

** The “wanted catch” is used to describe fish that would be landed in the absence of the EU landing obligation.

*** SSB 2018 relative to SSB 2017.

^ Total catch 2017 relative to TAC 2016.

Basis of the advice

Table 5.3.61.4 Sole in divisions 7.f and 7.g. The basis of the advice.

Advice basis	MSY approach
Management plan	There is no management plan for sole in this area.

Quality of the assessment

Because of effort reporting issues, the most recent UK commercial beam trawl tuning indices were not used in the assessment since 2013. The strong 2014 year class may be overestimated and was revised down by 23% (based on assessment revisions of previous strong year-class estimates) in the short-term forecast.

Discards are currently not included in the assessment, but given the low discard rates of sole (average discard rate 2013–2015 = 3% of catch) it is unlikely that the inclusion of discards would change the perception of the stock.



Figure 5.3.61.2 Sole in divisions 7.f and 7.g. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

A TAC constraint has been applied in the forecast because recent landings have been close to the TAC. The EU landings obligation will apply to some fleets catching sole in 2016. The landings advice has been adjusted to account for discard information to give catch advice.

Reference points

Table 5.3.61.5 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 t	B_{pa}	ICES (2016b)
	F_{MSY}	0.27	Stochastic simulations with segmented regression stock–recruitment relationship	ICES (2016b)
Precautionary approach	B_{lim}	1700 t	B_{loss} estimated in 2015	ICES (2016c)
	B_{pa}	2400 t	$B_{lim} \times 1.4$	ICES (2016c)
	F_{lim}	0.48	Based on segmented regression with B_{lim} as breakpoint	ICES (2016c)
	F_{pa}	0.34	$F_{lim}/1.4$	ICES (2016c)
Management plan	SSB_{MGT}	Not applicable		
	F_{MGT}	Not applicable		

Basis of the assessment

Table 5.3.61.6 Sole in divisions 7.f and 7.g. The basis of the assessment.

ICES stock data category	1 (ICES, 2016d)
Assessment type	Age-analytical assessment (XSA) that uses landings in the model; discards are then included to calculate a catch forecast.
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); 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 available information.

History of the advice, catch, and management

Table 5.3.61.7 Sole in divisions 7.f and 7.g. History of ICES advice, the agreed TAC, and ICES estimates of landings. Weights are in thousand tonnes.

Year	ICES advice	Predicted catches corresp. to advice	Predicted landings corresp. to advice	Agreed TAC	Official landings	ICES discards	ICES landings
1987	<i>Status quo</i> F; TAC		1.6	1.6	1.23		1.22
1988	F = F(pre-86); TAC		0.9	1.1	1.2		1.15
1989	F at F(81–85); TAC		1.0	1.0	0.99		0.99
1990	No increase in F		1.2	1.2	1.24		1.19
1991	No increase in F		1.1	1.2	1.50		1.11
1992	No long-term gains in increasing F		1.1	1.2	1.06		0.98
1993	No long-term gains in increasing F		-	1.1	1.03		0.93
1994	No long-term gains in increasing F		-	1.1	1.02		1.01
1995	No increase in F		1.0	1.1	1.17		1.16
1996	20% reduction in F		0.8	1.0	1.08		1.00
1997	20% reduction in F		0.8	0.9	1.04		0.93
1998	20% reduction in F		0.7	0.85	1.01		0.88
1999	Reduce F below F_{pa}		0.81	0.96	0.95		1.01
2000	Reduce F below F_{pa}		< 1.16	1.16	1.04		1.09
2001	Reduce F below F_{pa}		< 0.81	1.02	1.12		1.17
2002	Reduce F below F_{pa}		< 1.00	1.07	1.12		1.35
2003	Reduce F below F_{pa}		< 1.24	1.24	1.21		1.39
2004	Reduce F below F_{pa}		< 1.00	1.05	1.13		1.25
2005	Reduce F below F_{pa}		< 0.84	1.00	1.00		1.04
2006	Reduce F below F_{pa}		< 0.88	0.95	0.89		0.95
2007	Reduce F below F_{pa}		< 0.84	0.89	0.94		0.95
2008	Keep F below F_{pa}		< 1.00	0.964	0.75		0.80
2009	No long-term gain in increasing F		< 0.94	0.993	0.73		0.79
2010	No long-term gain in increasing F		< 0.92	0.993	0.87		0.86
2011	See scenarios		-	1.241	1.01		1.03
2012	MSY approach		< 1.06	1.060	1.08	0.034	1.1
2013	MSY approach		< 1.10	1.100	1.09	0.022	1.10
2014	MSY approach		< 0.92	1.001	1.04	0.021	1.04
2015	MSY approach		< 0.652	0.851	0.90*	0.026	0.83
2016	MSY approach	≤ 0.760	≤ 0.745	0.779			
2017	MSY approach	≤ 0.806					

*Preliminary.

History of catch and landings

Table 5.3.61.8 Sole in divisions 7.f and 7.g. Catch distribution by fleet in 2015 as estimated by ICES.

Total catch (2015)	Landings			Discards	
856 t	Beam trawlers	Otter trawlers	Other gear	Beam trawlers	Otter trawlers
	89%	9%	2%	77%	23%
	830 t			26 t	

Table 5.3.61.9 Sole in divisions 7.f and 7.g. History of commercial catch and landings; both the official and ICES estimated values are presented for each country participating in the fishery.

Year	Belgium	Denmark	France	Ireland	UK(E.&W,Nl.)	UK(Scotland)	Netherlands	Total-official	Unallocated	ICES total used landings	TAC
1986	1039*	2	146	188	611	-	3	1989	-389	1600	
1987	701*	-	117	9	437	-	-	1264	-42	1222	1600
1988	705*	-	110	72	317	-	-	1204	-58	1146	1100
1989	684*	-	87	18	203	-	-	992	0	992	1000
1990	716*	-	130	40	353	0	-	1239	-50	1189	1200
1991	982*	-	80	32	402	0	-	1496	-389	1107	1200
1992	543*	-	141	45	325	6	-	1060	-79	981	1200
1993	575*	-	108	51	285	11	-	1030	-102	928	1100
1994	619*	-	90	37	264	8	-	1018	-9	1009	1100
1995	763*	-	88	20	294	-	-	1165	-8	1157	1100
1996	695*	-	102	19	265	0	-	1081	-86	995	1000
1997	660*	-	99	28	251	0	-	1038	-111	927	900
1998	675*	-	98	42	198	-	-	1013	-138	875	850
1999	604	-	61	51	231	0	-	947	65	1012	960
2000	694	-	74	29	243	-	-	1040	51	1091	1160
2001	720	-	77	35	288	-	-	1120	48	1168	1020
2002	703	-	65	32	318	+	-	1118	227	1345	1070
2003	715	-	124	26	342	+	-	1207	340	1547	1240
2004	735	-	79	33	283	-	-	1130	268	1398	1050
2005	645	-	101	34	217	-	-	997	121	1118	1000
2006	576	-	75	38	232	-	-	921	25	946	950
2007	582	-	85	32	244	-	-	943	2	945	890
2008	466	-	68	28	218	-	-	780	20	800	964
2009	513	-	74	26	194	-	-	807	-2	805	993
2010	620	-	45	27	179	-	-	871	5	876	993
2011	766	-	50	30	168	-	-	1013	16	1029	1241
2012	843	-	48	33	175	-	-	1099	5	1104	1060
2013	789	-	49	42	206	-	-	1086	6	1092	1100
2014	705	-	59	28	252	-	-	1044	2	1042	1001
2015^	671	-	24	27	105	-	-	827	3	830	851

^Preliminary.

* Including divisions 7.g–k.

Summary of the assessment

Table 5.3.61.10 Sole in divisions 7.f and 7.g. Assessment summary. Weights in tonnes and recruitment in thousands.

Year	Recruitment (Age 1)	Stock size: SSB	Landings	Discards	Fishing Mortality (Ages 4–8)
1971	9363	7554	1861		0.38
1972	4177	5950	1278		0.28
1973	3315	5004	1391		0.242
1974	3305	5280	1105		0.245
1975	2930	4696	919		0.208
1976	5157	4060	1350		0.38
1977	4588	4426	961		0.261
1978	5441	3519	780		0.197
1979	3502	3635	954		0.279
1980	5096	3790	1314		0.303
1981	4838	3247	1212		0.36
1982	4862	3356	1128		0.346
1983	6754	3496	1373		0.455
1984	4672	3755	1266		0.412
1985	5617	3189	1328		0.437
1986	3135	3243	1600		0.542
1987	5706	2432	1222		0.572
1988	4464	2605	1146		0.563
1989	3720	2036	992		0.535
1990	8631	2318	1189		0.662
1991	4218	2038	1107		0.485
1992	4484	2360	981		0.401
1993	4463	2434	928		0.456
1994	3446	2216	1009		0.516
1995	3320	2133	1157		0.639
1996	4025	2079	995		0.55
1997	5438	1861	927		0.629
1998	6303	1675	875		0.614
1999	14836	1868	1012		0.519
2000	8105	1982	1091		0.331
2001	4339	3151	1168		0.414
2002	6916	4072	1345		0.443
2003	5237	3750	1547		0.635
2004	5870	3320	1398		0.448
2005	5001	3186	1118		0.372
2006	3648	2733	946		0.277
2007	4416	2860	945		0.33
2008	10 080	2571	800		0.311
2009	6961	2913	805		0.269
2010	1928	3169	876		0.303
2011	4580	3382	1029		0.321
2012	6443	3281	1104	34	0.403
2013	4338	2856	1093	22	0.388
2014	1559	2826	1042	21	0.408
2015	10 172**	2714	830	26	0.305
2016	4933*	2595			
Average	5312	3209	1122	26	0.409

* GM(1971–2013).

** Value was reduced by 23% to 7832 thousands in the short-term forecast.

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