

Sole (*Solea solea*) in Division 7.d (eastern English Channel)

ICES advice on fishing opportunities

ICES advises that when the precautionary approach is applied, catches in 2021 should be no more than 3248 tonnes.

Stock development over time

The assessment is indicative of trends only. The spawning–stock biomass (SSB) has been fluctuating without a trend and has been above $MSY B_{trigger}$ since 2010. Fishing pressure (F) has shown a decreasing trend since 2009, and has been below F_{MSY} since 2016. Recruitment has been fluctuating without a trend. In 2019, the recruitment was estimated to be the highest of the time-series.

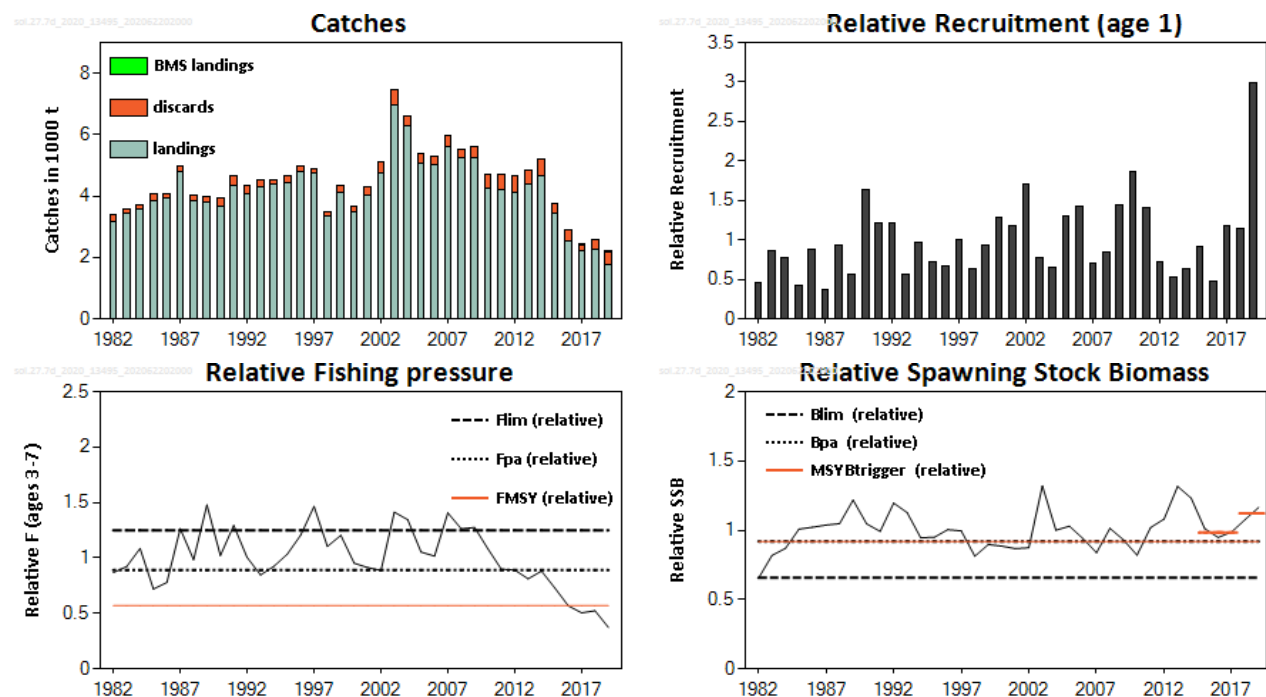


Figure 1 Sole in Division 7.d. Summary of the stock assessment. Recruitment, F, and SSB values are relative to the average of the time-series. The short orange lines in the relative SSB plot indicate the average values of the respective years (2015–2017 and 2018–2019). Landings below minimum conservation reference size (BMS) are those officially reported.

Stock and exploitation status

ICES assesses that fishing pressure is below $F_{MSY proxy}$, F_{pa} , and F_{lim} ; spawning–stock biomass is above $MSY B_{trigger proxy}$ and above B_{pa} and B_{lim} .

Table 1 Sole in Division 7.d. State of the stock and the fishery relative to reference points.

		Fishing pressure			Stock size		
		2017	2018	2019	2017	2018	2019
Maximum sustainable yield	$F_{MSY proxy}$	✓	✓	✓ Below proxy	$MSY B_{trigger proxy}$	✓	✓ Above proxy
Precautionary approach	F_{pa}, F_{lim}	✓	✓	✓ Harvested sustainably	B_{pa}, B_{lim}	✓	✓ Full reproductive capacity
Management plan	F_{MGT}	✓	✓	✓ Below proxy	B_{MGT}	✓	✓ Above proxy

Catch scenarios

The ICES framework for category 3 stocks was applied (ICES, 2019a). The relative SSB estimated by the assessment model was used as the index of stock development. The advice is based on the ratio of the mean of the last two index values (index A: 2018–2019) and the mean of the three preceding values (index B: 2015–2017), multiplied by the advised catch for 2020 (2846 tonnes).

The index is estimated to have increased by less than 20%; thus, the uncertainty cap was not applied. The stock size is considered to be above $MSY B_{trigger}$ proxy, and fishing pressure is considered to be below F_{MSY} proxy. Therefore, the precautionary buffer was not applied.

Table 2 Sole in Division 7.d. The basis for the catch scenarios.*

Index A (2018–2019)		1.12
Index B (2015–2017)		0.98
Index ratio (A/B)		1.14
Uncertainty cap	Not applied	-
Advised catch for 2020		2846 tonnes
Discard rate (2017–2019)		12.7%
Precautionary buffer	Not applied	-
Catch advice **		3248 tonnes
Projected landings corresponding to the advice ***		2834 tonnes
% advice change ^		14.1%

* The figures in the table are rounded. Calculations were done with unrounded inputs and computed values may not match exactly when calculated using the rounded figures in the table.

** $[Advised\ catch\ for\ 2020] \times [index\ ratio]$.

*** $[Advised\ catch\ for\ 2020] \times [index\ ratio] \times (1 - discard\ rate)$.

^ Advice value for 2021 relative to the advice value for 2020 (2846 tonnes).

Basis of the advice

Table 3 Sole in Division 7.d. The basis of the advice.

Advice basis	Precautionary approach.
Management plan	The European Parliament and the European Council have published a multiannual management plan (MAP) for the Western Waters (EU, 2019). This plan applies to demersal stocks, including sole in Division 7.d. The MAP stipulates that when the F_{MSY} ranges are not available, the precautionary approach should be applied.

Quality of the assessment

This stock was inter-benchmarked in 2019 (ICES, 2019b); this resulted in a minor upward revision in SSB and a downward revision in F , especially in more recent years. Further investigation found that the assessment model cannot reliably estimate the plus-group, which has had an increasing contribution to the stock size in recent years.

Another benchmark was conducted in 2020 (ICES, 2020a). During the benchmark, unresolved data issues made the 2016, 2017, and 2018 catch data unreliable. For these reasons, the assessment was not considered reliable in absolute terms, and remains in Category 3 (indicative of trends only). This issue will be investigated during the benchmark in 2021.

Issues relevant for the advice

Technical measures applicable to the mixed demersal beam-trawl fishery affect both sole and plaice. The minimum mesh size of 80 mm for the sole fishery generates high discards of plaice, which have a larger minimum landing size than sole.

The use of larger mesh sizes would reduce the catch of undersized plaice and sole, but would also result in a loss of marketable sole in the short term.

Reference points

Table 4 Sole in Division 7.d. Reference points, values, and their technical basis.

Framework	Reference point	Relative value **	Technical basis	Source
MSY approach	$MSY B_{trigger proxy}$	0.92	B_{pa}	ICES (2020b)
	$F_{MSY proxy}$	0.57	EQsim analysis, based on the recruitment period 1982–2016	ICES (2020b)
Precautionary approach	B_{lim}	0.66	B_{loss}	ICES (2020b)
	B_{pa}	0.92	$B_{lim} \times \exp(1.645 \times 0.2) \approx 1.4 \times B_{lim}$	ICES (2020b)
	F_{lim}	1.25	EQsim analysis, based on the recruitment period 1982–2016	ICES (2020b)
	F_{pa}	0.89	$F_{lim} \times \exp(-1.645 \times 0.2) \approx F_{lim} / 1.4$	ICES (2020b)
Management plan *	MAP $MSY B_{trigger proxy}$	0.92	$MSY B_{trigger proxy}$	ICES (2020b)
	MAP $F_{MSY proxy}$	0.57	$F_{MSY proxy}$	ICES (2020b)

* EU multiannual plan (MAP) for the Western Waters (EU, 2019).

** All values are relative to the average of the time-series in the stock assessment (see Table 9).

Basis of the assessment

Table 5 Sole in Division 7.d. Basis of the assessment and advice.

ICES stock data category	3 (ICES, 2019a).
Assessment type	Age-based analytical assessment, XSA that uses catches in the model, indicative of stock trends (ICES, 2020b).
Input data	Commercial catches: international landings and discards, ages and length frequencies from catch sampling by métier; 3 survey indices: UK(E&W)-BTS, UK(E&W)-YFS, and FR-YFS; 3 commercial indices: BE-CBT, FR-COT, and UK(E&W)-CBT; natural mortality is assumed to be constant; maturity-at-age data vary with age (ICES, 2017).
Discards, BMS landings, and bycatch	Discards are included in the assessment. Discards (1982–2003) are reconstructed and combined with the landings as input in the model. In 2019, 73% of the landings had associated discarding information, and 44% of the discards were sampled.
Indicators	None.
Other information	This stock was benchmarked in 2017 (ICES, 2017), inter-benchmarked in 2019 (ICES, 2019b), and benchmarked in 2020 (ICES, 2020a).
Working group	Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK)

Information from stakeholders

There is no additional information.

History of the advice, catch, and management

Table 6 Sole in Division 7.d. ICES advice, TAC, official landings, and ICES catch estimates. All weights are in tonnes.

Year	ICES advice	Landings corresponding to advice	Catch corresponding to advice	Agreed TAC	Official landings	ICES landings	ICES discards
1987	Precautionary TAC	3100		3850	3841	4791	179
1988	<i>Status quo</i> (Shot) TAC	3400		3850	3302	3853	188
1989	<i>Status quo</i> (Shot) TAC	3800		3850	2945	3805	171
1990	No effort increase; TAC	3700		3850	3036	3647	300
1991	<i>Status quo</i> F; TAC	3400		3850	3784	4351	317
1992	TAC	2700		3500	3794	4072	251
1993	70% of F(91)~ 2800 tonnes	2800		3200	3862	4299	247
1994	Reduce F	< 3800		3800	4037	4383	123
1995	No increase in F	3800		3800	3743	4420	249
1996	No long-term gain in increasing F	4700		3500	4098	4797	166
1997	No advice	-		5230	3941	4764	143
1998	No increase in effort	4500		5230	3047	3363	120
1999	Reduce F to F_{pa}	3800		4700	3900	4135	227
2000	$F < F_{pa}$	< 3900		4100	3832	3476	180
2001	$F < F_{pa}$	< 4700		4600	4617	4025	280
2002	$F < F_{pa}$	< 5200		5200	5399	4733	390
2003	$F < F_{pa}$	< 5400		5400	6247	6977	473
2004	$F < F_{pa}$	< 5900		5900	5667	6283	308
2005	$F < F_{pa}$	< 5700		5700	4620	5056	319
2006	$F < F_{pa}$	< 5700		5720	4852	5040	229
2007	$F < F_{pa}$	< 6440		6220	5313	5588	379
2008	$F < F_{pa}$	< 6590		6590	4972	5256	256
2009	$F < F_{pa}$	< 4380		5274	5121	5251	360
2010	$F < F_{pa}$	< 3190		4219	4374	4269	438
2011	See scenarios	< 4840		4852	4150	4225	477
2012	MSY transition	< 5600		5580	4018	4131	533
2013	MSY transition	< 5900		5900	4424	4372	466

Year	ICES advice	Landings corresponding to advice	Catch corresponding to advice	Agreed TAC	Official landings	ICES landings	ICES discards
2014	MSY transition	< 3251		4838	4621	4655	528
2015	MSY approach	< 1931		3483	3372	3443	294
2016	MSY approach		≤ 2685	3258*	2527	2538	344
2017	MSY approach		≤ 2487	2724*	2218	2228	200
2018	MSY approach		≤ 3866	3405*	2307	2287	297
2019	MSY approach		≤ 2571	2515*	1762	1778	421
2020	Precautionary approach		< 2846	2797*			
2021	Precautionary approach		< 3248				

* Catch TAC.

History of the catch and landings

Table 7 Sole in Division 7.d. Catch distribution by fleet in 2019 as estimated by and reported to ICES.

Catch (2019)	Landings				Discards
2200 tonnes	Trammel-/gillnets 30%	Beam trawls 38%	Otter trawls 27%	Other gears 4.1%	421 tonnes
	1778 tonnes				

Table 8 Sole in Division 7.d. History of commercial catch and landings; both the official and ICES estimated values are presented by country. All weights are in tonnes.

Year	Official landings					ICES estimates	
	Belgium	France	UK (E + W)	Others	Total	Landings	Discards
1974	159	383	309	3	854	884	
1975	132	464	244	1	841	882	
1976	203	599	404	-	1206	1305	
1977	225	737	315	-	1277	1335	
1978	241	782	366	-	1389	1589	
1979	311	1129	402	-	1842	2215	
1980	302	1075	159	-	1536	1923	
1981	464	1513	160	-	2137	2477	
1982	525	1828	317	4	2674	3190	183
1983	502	1120	419	-	2041	3458	100
1984	592	1309	505	-	2406	3575	131
1985	568	2545	520	-	3633	3837	219
1986	858	1528	551	-	2937	3932	139
1987	1100	2086	655	-	3841	4791	179
1988	667	2057	578	-	3302	3853	188
1989	646	1610	689	-	2945	3805	171
1990	996	1255	785	-	3036	3647	300
1991	904	2054	826	-	3784	4351	317
1992	891	2187	706	10	3794	4072	251
1993	917	2322	610	13	3862	4299	247
1994	940	2382	701	15	4038	4383	123
1995	817	2248	669	9	3743	4420	249
1996	899	2322	877	-	4098	4797	166
1997	1306	1702	933	-	3941	4764	143
1998	541	1703	803	-	3047	3363	120
1999	880	2251	769	-	3900	4135	227
2000	1021	2190	621	-	3832	3476	180
2001	1313	2482	822	-	4617	4025	280
2002	1643	2780	976	-	5399	4733	390
2003	1657	3475	1114	1	6247	6977	473
2004	1485	3070	1112	-	5667	6283	308
2005	1221	2832	567	-	4620	5056	319
2006	1547	2627	678	0	4852	5040	229
2007	1530	2981	801	1	5313	5588	379
2008	1368	2880	724	0	4972	5256	256
2009	1475	3047	760	0	5282	5251	360
2010	1294	2476	679	0	4449	4269	438
2011	1222	2281	700	0	4203	4225	477
2012	941	2475	627	0.25	4043	4131	533

Year	Official landings					ICES estimates	
	Belgium	France	UK (E + W)	Others	Total	Landings	Discards
2013	952	2884	605	0	4441	4372	466
2014	1496	2507	648	0.100	4651	4655	528
2015	1048	1895	468	0	3411	3443	294
2016	799	1337	391	0.044	2527	2538	344
2017	696	1178	344	0.154	2218	2228	200
2018	651	1265	391	0.180	2307	2287	297
2019*	603	914	245	0.043	1762	1778	421

* Preliminary.

Summary of the assessment

Table 9 Sole in Division 7.d. Assessment summary. Recruitment, SSB, and F are relative to the mean of the time-series (1982–2019). Official BMS landings, landings, and discards are in tonnes.

Year	Relative recruitment (age 1)	Relative SSB	Relative F (ages 3–7)	Landings	Discards*	Official BMS landings
1982	0.46	0.65	0.87	3190	183	
1983	0.87	0.82	0.92	3458	100	
1984	0.77	0.87	1.09	3575	131	
1985	0.43	1.01	0.72	3837	219	
1986	0.87	1.02	0.78	3932	139	
1987	0.37	1.04	1.26	4791	179	
1988	0.94	1.05	0.98	3853	188	
1989	0.57	1.22	1.48	3805	171	
1990	1.63	1.05	1.02	3647	300	
1991	1.21	0.99	1.29	4351	317	
1992	1.21	1.20	1.01	4072	251	
1993	0.56	1.13	0.85	4299	247	
1994	0.97	0.95	0.92	4383	123	
1995	0.73	0.95	1.03	4420	249	
1996	0.67	1.00	1.21	4797	166	
1997	1.01	1.00	1.47	4764	143	
1998	0.64	0.81	1.10	3363	120	
1999	0.94	0.90	1.20	4135	227	
2000	1.29	0.89	0.95	3476	180	
2001	1.17	0.87	0.91	4025	280	
2002	1.70	0.87	0.89	4733	390	
2003	0.77	1.32	1.41	6977	473	
2004	0.66	1.00	1.35	6283	308	
2005	1.29	1.03	1.05	5056	319	
2006	1.42	0.94	1.02	5040	229	
2007	0.71	0.84	1.41	5588	379	
2008	0.84	1.01	1.26	5256	256	
2009	1.45	0.93	1.27	5251	360	
2010	1.87	0.82	1.08	4269	438	
2011	1.41	1.02	0.90	4225	477	
2012	0.72	1.08	0.89	4131	533	
2013	0.52	1.32	0.81	4372	466	
2014	0.63	1.23	0.88	4655	528	
2015	0.91	1.01	0.73	3443	294	
2016	0.48	0.95	0.57	2538	344	
2017	1.17	0.99	0.51	2228	200**	0.144
2018	1.14	1.08	0.52	2287	297	0
2019	3.0	1.17	0.37	1778	421**	0.0028

* Discard estimates prior to 2004 assume the average discard proportion by age for 2004–2008 (WKNSEA; ICES, 2017).

** Discards minus BMS landings from EU fleets officially reported in logbooks.

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