

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

ICES advice on fishing opportunities

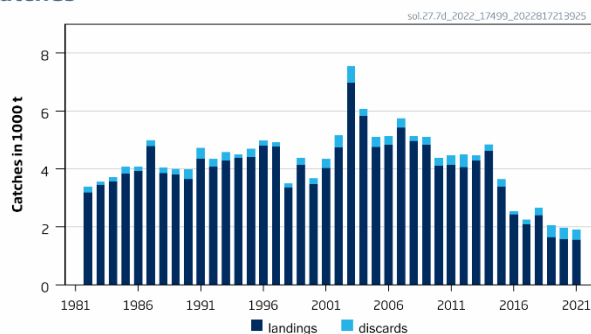
ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 1747 tonnes.

ICES notes the existence of a precautionary management plan, developed and adopted by one of the relevant management authorities for this stock.

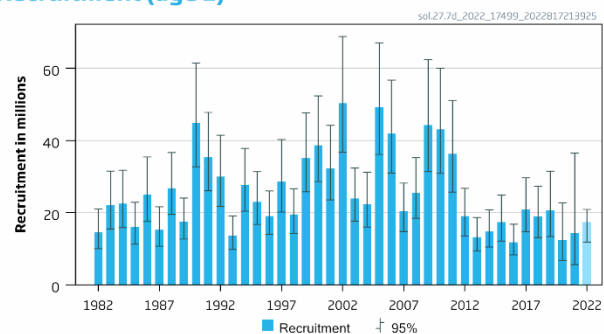
Stock development over time

Fishing pressure on the stock is below F_{MSY} ; spawning-stock size is below MSY $B_{trigger}$ and between B_{pa} and B_{lim} .

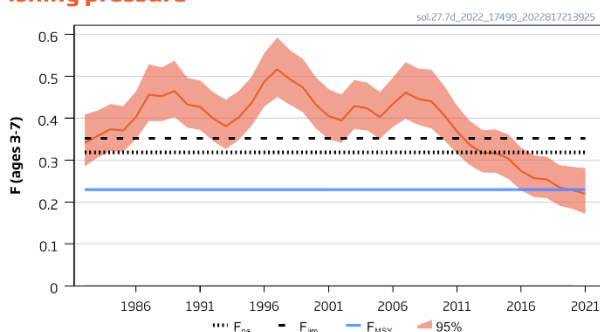
Catches



Recruitment (age 1)



Fishing pressure



Spawning Stock Biomass

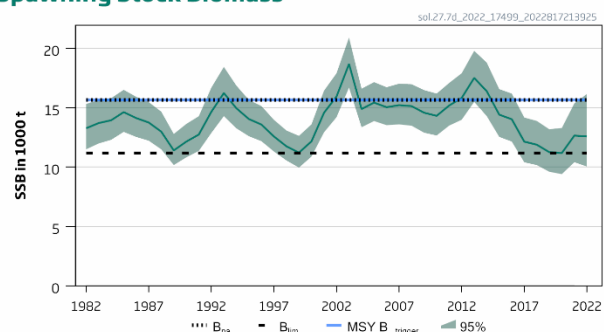


Figure 1 Sole in Division 7.d. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour. Discards are reconstructed prior to 2004 and include BMS (below minimum size) landings.

Catch scenarios

Table 1 Sole in Division 7.d. Values in the forecast and for the interim year.

Variable	Value	Notes
$F_{ages\ 3-7}$ (2022)	0.22	Average exploitation pattern (2017–2021), scaled to average $F_{ages\ 3-7}$ in 2021
SSB (2023)	12682	Short-term forecast (STF); tonnes
R_{age1} (2022, 2023)	17337	Median recruitment, resampled from the years 2012–2020; thousands
Catch (2022)	2005	STF; tonnes
Projected landings (2022)	1763	STF; assuming average landings ratio by age 2017–2021; tonnes
Projected discards (2022)	242	STF; assuming average discard ratio by age 2017–2021; tonnes.

Table 2 Sole in Division 7.d. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2023)	Projected landings [^] (2023)	Projected discards ^{^^} (2023)	F _{total} (ages 3–7) (2023)	F _{projected landings} (ages 3–7) (2023)	F _{projected discards} (ages 3–7) (2023)	SSB (2024)	% SSB change*	% TAC change**	% advice change**
ICES advice basis										
MSY approach: F _{MSY} × SSB (2023)/MSY B _{trigger}	1747	1529	218	0.186	0.156	0.030	13162	3.8	–27	–27
Other scenarios										
F = F _{MSY lower} × SSB(2023)/ MSY B _{trigger}	1221	1067	154	0.126	0.106	0.021	13789	8.7	–49	–49
F = 0	0	0	0	0	0	0	15237	20	–100	–100
F _{pa}	2821	2468	353	0.318	0.27	0.052	11933	–5.9	18.5	18.5
F _{lim}	3070	2689	381	0.352	0.29	0.057	11641	–8.2	29	29
SSB (2024) = B _{lim}	3463	3032	431	0.41	0.34	0.066	11181	–11.8	46	46
SSB (2024) = B _{pa} = MSY B _{trigger} [#]										
F = F ₂₀₂₂	2032	1777	255	0.22	0.184	0.036	12836	1.21	–14.6	–14.6
F = F _{MSY lower}	1487	1300	187	0.156	0.131	0.025	13484	6.3	–38	–38
F = F _{MSY}	2116	1851	265	0.230	0.193	0.037	12737	0.43	–11.1	–11.1

[^] Marketable landings.

^{^^} Including BMS landings, assuming recent discard rate.

* SSB 2024 relative to SSB 2023 (12 682 tonnes).

** Total catch in 2023 relative to the advice value 2022 and TAC (2380 tonnes).

[#] B_{pa} and MSY B_{trigger} cannot be achieved in 2024, even with zero catches.

The 27% decrease in advice is the result of a revision of the assessment during the 2022 interbenchmark, which led to a large downward revision of recent recruitment and the recalculation of the reference points (ICES, 2022a).

Basis of the advice

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

Advice basis	MSY approach
Management plan	ICES is aware of the multiannual management plan (MAP) which has been adopted by the EU for this stock (EU, 2019) and which ICES considers to be precautionary. There is no agreed shared management plan with UK for this stock, and ICES provides advice according to ICES MSY approach. Catch scenarios consistent with the MAP F_{MSY} ranges are provided.

Quality of the assessment

This stock was interbenchmarked in 2022 (ICES, 2022a) because of 1) a trend in the survey catchability of the UK beam trawl survey (UK BTS) likely related to the smaller size of sole in more recent years and 2) a poor fit of the state-space assessment model (SAM) to the observed catches.

During the interbenchmark, changes were made to the configuration of the model to improve the fit to the catch data. Poorer tracking of the cohorts in the most recent part of the time-series (from 2010 onwards) led to the exclusion of ages 1–3 from the UK BTS index from 2010–2021. As a result, recruitment in 2019 was revised downward about 52% compared to the previous estimate, and reference points were recalculated.

The discard sampling coverage in 2020 was lower due to the COVID-19 pandemic (54% versus 71% in 2019 and 75% in 2021).

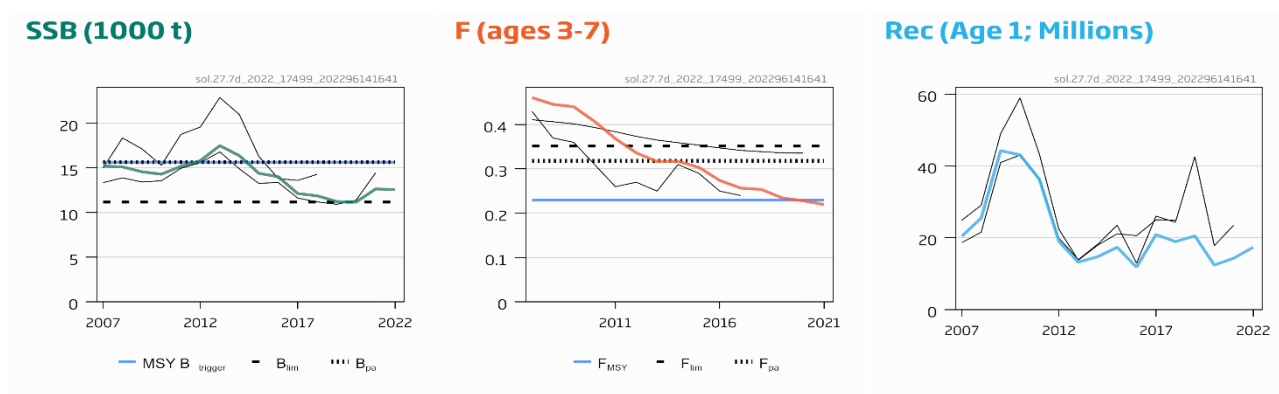


Figure 2 Sole in Division 7.d. Historical assessment results (final-year recruitment included for each line, corresponding to the forecast recruitment in the interim year). The reference points were revised in 2022 following the interbenchmark protocol (ICES, 2022a), and only assessment results from the last year should be compared to the reference points indicated. The 2019 and 2020 assessment results are missing because category 3 advice was provided.

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.

From 2011, catches have been lower than the TAC. The advised catch for 2023 is similar to the catch in recent years.

Reference points

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

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	15654	B_{pa} ; in tonnes	ICES (2022a)
	F_{MSY}	0.230	Stochastic simulations (EqSim) with segmented regression fixed at B_{lim} based on recruitment period 1982–2020	ICES (2022a)
Precautionary approach	B_{lim}	11181	B_{loss} , lowest observed SSB (2020) with 2021 as the last year of catch data; in tonnes	ICES (2022a)
	B_{pa}	15654	$B_{lim} \times 1.4$; in tonnes	ICES (2022a)
	F_{lim}	0.352	The F that on average leads to B_{lim} from EqSim	ICES (2022a)
	F_{pa}	0.318	The F that provides a 95% probability for SSB to be above B_{lim} (F_{P05} with advice rule [AR])	ICES (2022a)
Management plan *	MAP MSY $B_{trigger}$	15654	MSY $B_{trigger}$; in tonnes	ICES (2022a)
	MAP B_{lim}	11181	B_{lim} ; in tonnes	ICES (2022a)
	MAP F_{MSY}	0.230	F_{MSY}	ICES (2022a)
	MAP range F_{lower}	0.156–0.230	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with F_{MSY}	ICES (2022a)
	MAP range F_{upper}	0.230–0.287	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with F_{MSY}	ICES (2022a)

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

Basis of the assessment

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

ICES stock data category	1 (ICES, 2022b)
Assessment type	Age-based analytical assessment (SAM; Nielsen and Berg, 2014; ICES, 2022c) that uses catches in the model and in the forecast
Input data	Commercial catches: international landings and discards, age compositions from catch data; three survey indices: UK(E&W)-BTS [B2453], UK(E&W)-YFS [B6805] and FR-YFS [B5507]; three commercial indices: BE-CBT, FR-COTB, and UK(E&W)-CBT; natural mortality and maturity-at-age are assumed to be time invariant (ICES, 2017, 2021, 2022a)
Discards, BMS landings, and bycatch	Discards are reconstructed from 1982–2003. Discards (including ICES estimated BMS) are combined with the landings as input in the model. In 2021, 82% of the landings had associated discarding information, and 75% of the discards were sampled.
Indicators	None
Other information	This stock was benchmarked in 2021 (ICES, 2021) and interbenchmarked in 2022 (ICES, 2022a)
Working group	Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK)

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	197
1988	<i>Status quo</i> (shot) TAC	3400		3850	3302	3853	198
1989	<i>Status quo</i> (shot) TAC	3800		3850	2945	3805	192
1990	No effort increase; TAC	3700		3850	3036	3647	342
1991	<i>Status quo</i> F; TAC	3400		3850	3784	4351	368
1992	TAC	2700		3500	3794	4072	275
1993	70% of F(91)~ 2800 tonnes	2800		3200	3862	4299	273
1994	Reduce F	< 3800		3800	4038	4383	122
1995	No increase in F	3800		3800	3743	4420	282
1996	No long-term gain in increasing F	4700		3500	4098	4797	174
1997	No advice	-		5230	3941	4764	147
1998	No increase in effort	4500		5230	3047	3363	127
1999	Reduce F to F_{pa}	3800		4700	3900	4135	247
2000	$F < F_{pa}$	< 3900		4100	3832	3476	201
2001	$F < F_{pa}$	< 4700		4600	4617	4025	317
2002	$F < F_{pa}$	< 5200		5200	5399	4733	444
2003	$F < F_{pa}$	< 5400		5400	6247	6977	584
2004	$F < F_{pa}$	< 5900		5900	5667	5819	258
2005	$F < F_{pa}$	< 5700		5700	4620	4748	344
2006	$F < F_{pa}$	< 5700		5720	4832	4830	315
2007	$F < F_{pa}$	< 6440		6220	5313	5421	332
2008	$F < F_{pa}$	< 6590		6590	4972	4963	183
2009	$F < F_{pa}$	< 4380		5274	5282	4828	287
2010	$F < F_{pa}$	< 3190		4219	4449	4108	273
2011	See scenarios	< 4840		4852	4203	4136	342
2012	MSY transition	< 5600		5580	4043	4058	445
2013	MSY transition	< 5900		5900	4442	4295	180
2014	MSY transition	< 3251		4838	4651	4626	216
2015	MSY approach	< 1931		3483	3411	3385	263
2016	MSY approach		≤ 2685	3258	2529	2433	106
2017	MSY approach		≤ 2487	2724	2223	2090	156
2018	MSY approach		≤ 3866	3405	2312	2395	263
2019	MSY approach		≤ 2571	2515	1773	1648	404
2020	Precautionary approach		< 2846	2797	1706	1562	409*
2021	Precautionary approach		< 3248	3248	1664	1561	348*
2022	MSY approach		≤ 2380	2380			
2023	MSY approach		≤ 1747				

* Including BMS reported to ICES

History of the catch and landings

Table 7 Sole in Division 7.d. Catch distribution by fleet in 2021 as estimated by and reported to ICES.

Table 1: Total catch distribution by gear in 2012 as estimated by and reported to FISH.					
Catch	Landings				Discards*
1909 tonnes	Trammel-/gillnets 32%	Beam trawls 35%	Bottom trawls 31%	Other gears 2.7%	348 tonnes
	1561 tonnes				

* Discards include BMS landings.

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	BMS landings	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	196
1983	502	1120	419	-		2041	3458	101
1984	592	1309	505	-		2406	3575	141
1985	568	2545	520	-		3633	3837	242
1986	858	1528	551	-		2937	3932	145
1987	1100	2086	655	-		3841	4791	197
1988	667	2057	578	-		3302	3853	198
1989	646	1610	689	-		2945	3805	192
1990	996	1255	785	-		3036	3647	342
1991	904	2054	826	-		3784	4351	368
1992	891	2187	706	10		3794	4072	275
1993	917	2322	610	13		3862	4299	273
1994	940	2382	701	15		4038	4383	122
1995	817	2248	669	9		3743	4420	282
1996	899	2322	877	-		4098	4797	174
1997	1306	1702	933	-		3941	4764	147
1998	541	1703	803	-		3047	3363	127
1999	880	2251	769	-		3900	4135	247
2000	1021	2190	621	-		3832	3476	201
2001	1313	2482	822	-		4617	4025	317
2002	1643	2780	976	-		5399	4733	444
2003	1657	3475	1114	1		6247	6977	584
2004	1485	3070	1112	-		5667	5819	258
2005	1221	2832	567	-		4620	4748	344
2006	1547	2627	658	0		4832	4830	315
2007	1530	2981	801	1		5313	5421	332
2008	1368	2880	724	0		4972	4963	183
2009	1475	3047	760	0		5282	4828	287
2010	1294	2476	679	0		4449	4108	273
2011	1222	2281	700	0		4203	4136	342
2012	941	2475	627	< 1		4043	4058	445

Year	Official landings						ICES estimates	
	Belgium	France	UK (E + W)	Others	BMS landings	Total	Landings	Discards
2013	952	2884	605	0		4442	4295	180
2014	1496	2507	648	< 1		4651	4626	216
2015	1048	1895	468	0		3411	3385	263
2016	799	1337	392	< 1		2529	2433	106
2017	697	1178	349	< 1		2223	2090	156
2018	653	1265	394	< 1		2312	2395	263
2019	603	925	245	< 1	< 1	1773	1648	404
2020*	686	827	193	< 1	< 1	1706	1562	409**
2021*	620	806	233	1	4	1664	1561	348**

* Preliminary.

** Including BMS reported to ICES

Summary of the assessment

Table 9 Sole in Division 7.d. Assessment summary. Weights are in tonnes and recruitment in thousands. High and low refer to 95% confidence intervals.

Year	Recruitment (age 1)			Spawning-stock biomass			Landings	Discards*	Fishing pressure (ages 3–7)		
	R	High	Low	SSB	High	Low			F	High	Low
	thousands			tonnes			tonnes	tonnes			
1982	14483	20990	9993	13269	15314	11497	3190	196	0.34	0.41	0.28
1983	22072	31478	15477	13706	15669	11988	3458	101	0.36	0.42	0.31
1984	22416	31739	15831	13943	15809	12297	3575	141	0.37	0.43	0.32
1985	16039	22855	11255	14629	16508	12963	3837	242	0.37	0.43	0.32
1986	24937	35428	17553	14127	15917	12537	3932	145	0.40	0.46	0.35
1987	15187	21600	10678	13751	15472	12222	4791	197	0.46	0.53	0.39
1988	26733	36668	19489	12984	14669	11493	3853	198	0.45	0.52	0.39
1989	17459	24056	12671	11402	12784	10169	3805	192	0.46	0.54	0.40
1990	44835	61464	32705	12143	13632	10816	3647	342	0.43	0.50	0.38
1991	35274	47767	26049	12740	14286	11361	4351	368	0.43	0.49	0.37
1992	30010	41449	21728	14653	16686	12868	4072	275	0.40	0.46	0.35
1993	13662	19036	9805	16233	18438	14292	4299	273	0.38	0.44	0.33
1994	27762	37784	20398	14954	16861	13262	4383	122	0.40	0.46	0.35
1995	22904	31381	16716	14045	15657	12599	4420	282	0.44	0.50	0.38
1996	19035	26009	13932	13581	15141	12181	4797	174	0.49	0.56	0.43
1997	28490	40269	20157	12576	13980	11312	4764	147	0.52	0.59	0.45
1998	19472	26627	14240	11749	13079	10554	3363	127	0.49	0.56	0.43
1999	35029	47624	25766	11212	12628	9955	4135	247	0.47	0.54	0.41
2000	38689	52362	28587	12165	13598	10882	3476	201	0.43	0.50	0.38
2001	32247	44218	23516	14571	16431	12922	4025	317	0.41	0.47	0.35
2002	50278	68808	36738	15939	17898	14195	4733	444	0.39	0.46	0.34
2003	23873	32336	17625	18685	20912	16696	6977	584	0.43	0.49	0.37
2004	22334	31182	15997	14889	16599	13354	5819	258	0.42	0.49	0.37
2005	49199	67037	36108	15428	17154	13876	4748	344	0.40	0.46	0.35
2006	41896	56716	30949	15042	16725	13529	4830	315	0.43	0.50	0.38
2007	20393	28167	14764	15213	17022	13596	5421	332	0.46	0.53	0.40
2008	25481	35232	18429	15130	16978	13484	4963	183	0.45	0.52	0.38
2009	44239	62394	31367	14578	16483	12894	4828	287	0.44	0.52	0.38
2010	43045	60012	30876	14315	16189	12658	4108	273	0.41	0.48	0.35
2011	36225	51071	25694	15184	17086	13493	4136	342	0.37	0.43	0.32
2012	18977	26718	13478	15823	17903	13985	4058	445	0.34	0.39	0.29
2013	13213	18630	9371	17510	19791	15491	4295	180	0.32	0.37	0.27
2014	14721	20741	10449	16391	18798	14293	4626	216	0.32	0.37	0.27

Year	Recruitment (age 1)			Spawning-stock biomass			Landings	Discards*	Fishing pressure (ages 3–7)		
	R	High	Low	SSB	High	Low			F	High	Low
	thousands			tonnes			tonnes	tonnes			
2015	17337	24854	12093	14414	16566	12542	3385	263	0.30	0.36	0.26
2016	11805	16802	8294	14028	16194	12151	2433	106	0.27	0.33	0.23
2017	20880	29652	14704	12142	14175	10401	2090	156	0.26	0.31	0.21
2018	18904	27271	13105	11883	13886	10170	2395	263	0.25	0.31	0.21
2019	20508	31461	13369	11252	13185	9603	1648	404	0.23	0.29	0.191
2020	12387	22724	6752	11181	13295	9404	1562	409	0.23	0.28	0.184
2021	14305	36517	5604	12650	15367	10413	1561	348	0.22	0.28	0.172
2022	17337**	20880	11805	12582	16154	10044					

* Discard estimates prior to 2004 assume the average discard proportion by age for 2004–2008 (WKNSEA; ICES, 2021).

** Median recruitment resampled from the years 2012–2020.

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[Download the stock assessment data and figures.](#)

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