

Sole (*Solea solea*) in Division 7.a (Irish Sea)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2020 should be no more than 561 tonnes.

Stock development over time

Spawning–stock biomass (SSB) has been below B_{lim} between 2004 and 2017. SSB has increased since 2014 and is between B_{lim} and $MSY B_{trigger}$ in 2018 and 2019. The fishing mortality (F) has been declining since the late 1980s and is presently below F_{MSY} and close to zero. The 2011–2014 recruitments (R) have been the lowest in the time-series. Higher recruitment was observed in 2016 and 2018.

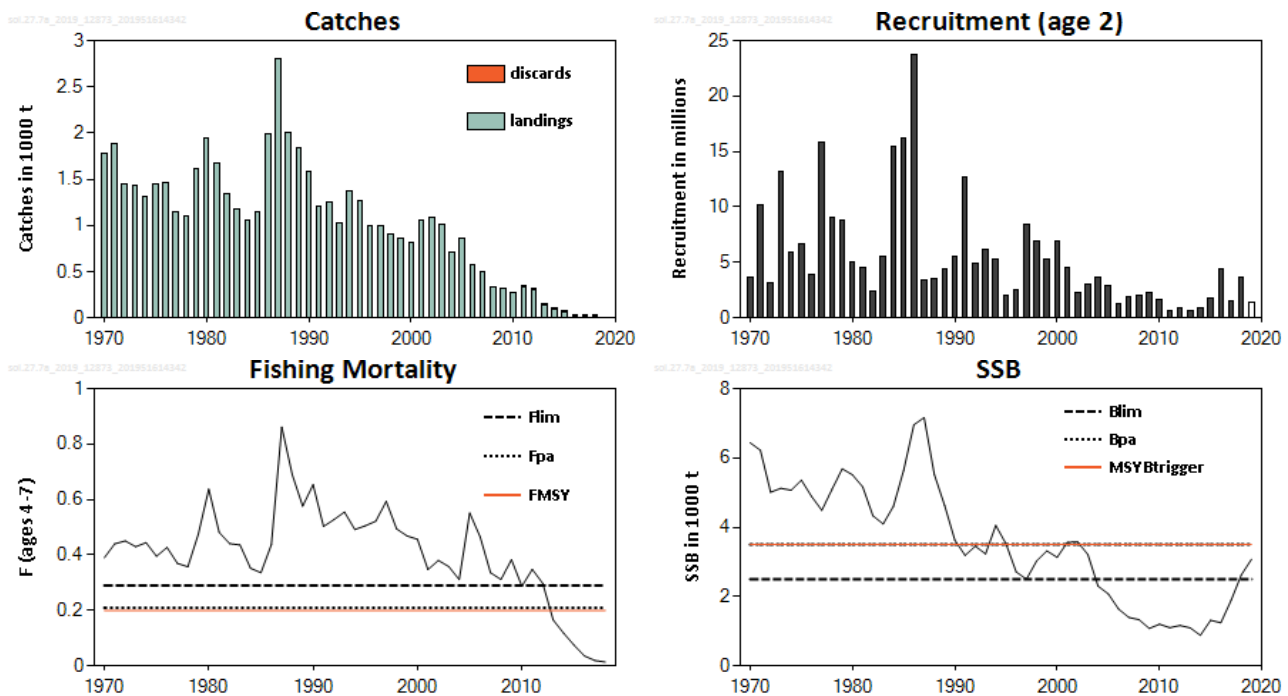


Figure 1 Sole in Division 7.a. Summary of the stock assessment. Discards are only available since 2011. The assumed recruitment for 2019 is unshaded.

Stock and exploitation status

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

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

		Fishing pressure				Stock size				
		2016	2017	2018		2017	2018	2019		
Maximum sustainable yield	F_{MSY}	✓	✓	✓	Below	$MSY B_{trigger}$	✗	✗	✗	Below trigger
Precautionary approach	F_{pa}, F_{lim}	✓	✓	✓	Harvested sustainably	B_{pa}, B_{lim}	✗	○	○	Increased risk
Management plan	F_{MGT}	—	—	—	Not applicable	B_{MGT}	—	—	—	Not applicable

Catch scenarios

Table 2 Sole in Division 7.a. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
$F_{\text{ages 4-7 (2019)}}$	0.133	Catch constraint (TAC 2019=414 tonnes)
SSB_{2020}	3218	Fishing at $F = 0.133$; in tonnes.
$R_{\text{age 2 (2019-2020)}}$	1339	Geometric mean [GM] (2009–2017); in thousands.
Catch (2019)	414	TAC 2019; in tonnes.
Wanted catch (2019)	400	TAC 2019 minus a 3.5% discard ratio in weight; in tonnes.
Unwanted catch (2019)	14	Average ratio of 2016–2018 (3.5%); in tonnes.

Table 3 Sole in Division 7.a. Annual catch scenarios. Weights are in tonnes.

Basis	Total catch * (2020)	Wanted catch** (2020)	Unwanted catch** (2020)	F_{wanted} (2020)	SSB (2021)	% SSB change ***	% TAC change^	% Advice change ^^
ICES advice basis								
MSY approach: $F_{\text{MSY}} \times SSB_{2020} / \text{MSY } B_{\text{trigger}}$	561	542	19	0.184	3028	-5.9	36	36
Other scenarios								
$F = F_{\text{MSY lower}} \times SSB_{2020} / \text{MSY } B_{\text{trigger}}$	457	441	16	0.147	3126	-2.9	10.3	10.3
$F = F_{\text{MSY upper}} \times SSB_{2020} / \text{MSY } B_{\text{trigger}}$	663	640	23	0.22	2934	-8.8	60	60
$F = F_{\text{MSY}}$	606	585	21	0.20	2987	-7.2	46	46
$F = 0$	0	0	0	0	3552	10.3	-100	-100
F_{pa}	634	612	22	0.21	2961	-8.0	53	53
F_{lim}	844	815	29	0.29	2766	-14	104	104
$SSB_{2021} = B_{\text{lim}}$	1130	1091	39	0.41	2500	-22	173	173
$SSB_{2021} = B_{\text{pa}} = \text{MSY } B_{\text{trigger}}$	55	53	2	0.0168	3500	8.8	-87	-87
$F = F_{2019}$	414	400	14	0.133	3165	-1.7	0	0

* 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 2016–2018 (3.5% in weight).

** The “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 2021 relative to SSB 2020.

^ Total catch in 2020 relative to TAC 2019 (414 tonnes).

^^ Advice value 2020 relative to the advice value 2019 (414 tonnes).

The catch advice for 2020 has increased compared to that for 2019 due to an increase in stock size.

Basis of the advice

Table 4 Sole in Division 7.a. The basis of the advice.

Advice basis	MSY approach
Management plan	ICES is not aware of any agreed precautionary management plan for sole in this area.

Quality of the assessment

The assessment has shown consistency over the recent years in estimating SSB, fishing mortality, and recruitment. Discards are currently not included in the assessment, but given the consistently low discard rates of sole (3.5% in 2016–2018) it is unlikely that the inclusion of discards would change the perception of the stock.

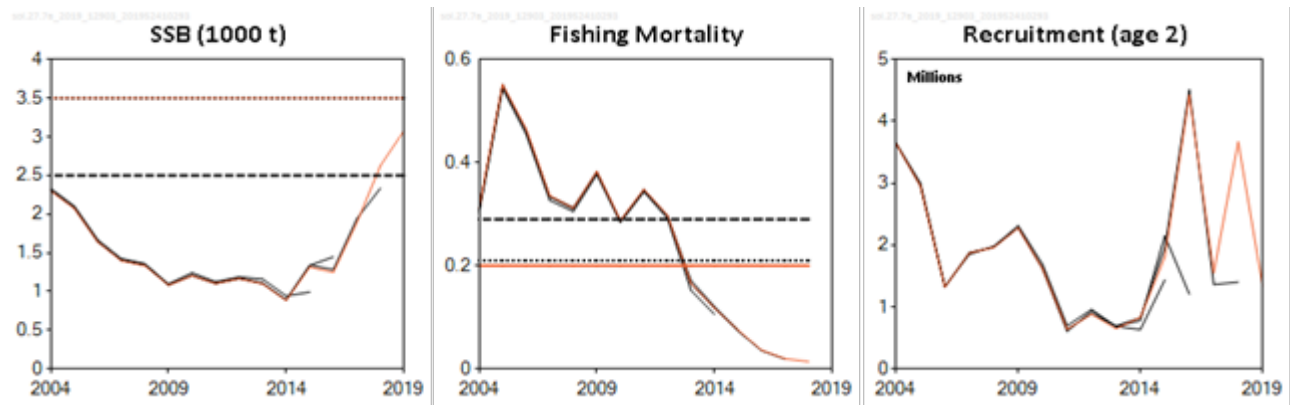


Figure 2 Sole in Division 7.a. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

The stock is slowly recovering and is projected to remain close to B_{lim} in 2020 and 2021. It may fall below B_{lim} if future recruitment is below average.

Reference points

Table 5 Sole in Division 7.a. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	3500	B_{pa} ; in tonnes.	ICES (2016)
	F_{MSY}	0.20	Stochastic simulations with a segmented regression stock–recruitment relationship.	ICES (2016)
	$F_{MSY lower}$	0.16	The minimum F which produces at least 95% of maximum yield.	ICES (2016)
	$F_{MSY upper}$	0.24	The maximum F which produces at least 95% of maximum yield.	ICES (2016)
Precautionary approach	B_{lim}	2500	The lowest value with above-average recruitment; in tonnes.	ICES (2017)
	B_{pa}	3500	$B_{pa} \sim B_{lim} \times 1.4$; in tonnes.	ICES (2017)
	F_{lim}	0.29	Based on simulated recruitment to give median biomass = B_{lim} .	ICES (2017)
	F_{pa}	0.21	$F_{lim} 1.4^{-1}$	ICES (2017)
Management plan	MAP MSY $B_{trigger}$			
	MAP B_{pa}			
	MAP B_{lim}			
	MAP F_{MSY}			
	MAP range F_{lower}			
	MAP range F_{upper}			

Basis of the assessment

Table 6 Sole in Division 7.a. The basis of the assessment.

ICES stock data category	1 (ICES, 2018).
Assessment type	Age-based analytical assessment (XSA) that uses landings in the model.
Input data	International landings, age and length frequencies from catch sampling; one survey index (UK(E&W)-BTS-Q3); fixed maturity data from UK survey information; 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	This stock was benchmarked in 2011 (ICES, 2011).
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 Division 7.a. History of ICES advice, the agreed TAC, official landings, and ICES estimates of landings and discards. Weights are in tonnes.

Year	ICES advice	Landings corresponding to advice	Catch corresponding to advice	Agreed TAC	Official landings	ICES discards	ICES landings
1987	No increase in F	1900		2100	2041	-	2808
1988	80% of F(86); TAC	1600		1750	1885	-	1999
1989	80% of F(87); TAC	< 1480		1480	1823	-	1833
1990	Interim advice	1050*		1500	1576	-	1583
1991	90% of F(89); TAC	1300		1500	1223	-	1212
1992	No long-term gains in increased F	1200**		1350	1234	-	1259
1993	F = F(91) ~ 920 t	920		1000	971	-	1023
1994	No long-term gains in increased F	1510**		1500	1367	-	1374
1995	20% reduction in F	800		1300	1300	-	1266
1996	20% reduction in F	800		1000	1023	-	1002
1997	20% reduction in F	800		1000	1027	-	1003
1998	20% reduction in F	850		900	895	-	911
1999	Reduce F below F_{pa}	830		900	810	-	863
2000	Reduce F below F_{pa}	< 1080		1080	833	-	818
2001	Reduce F below F_{pa}	< 930		1100	1012	-	1053
2002	Keep F below F_{pa}	< 1100		1100	1085	-	1090
2003	Keep F below F_{pa}	< 1010		1010	1014	-	1014
2004	Maintain SSB above B_{pa}	< 790		800	712	-	709
2005	$F < F_{pa}$	< 1000		960	854	-	855
2006	Recent catch levels (2002–2004)	< 930		960	576	-	569
2007	Maintain SSB above B_{pa}	0		820	491	-	492
2008	Zero catch	0		669	320	-	332
2009	Zero catch and recovery plan	0		502	325	-	325
2010	Zero catch and recovery plan	0		402	277	-	277
2011	See scenarios	-		390	330	14	330
2012	MSY transition	< 200		300	296	22	298
2013	No directed fisheries, bycatch and discards should be minimized	0		140	148	11	148
2014	No directed fisheries, bycatch and discards should be minimized	0		95	96	7	99
2015	No directed fisheries, bycatch and discards should be minimized	0		90	76	7	76
2016	MSY approach (minimize all catches)	0		40	35	2	35
2017	MSY approach		0	40	32^	2	34
2018	MSY approach		0	40	36^	2	36
2019	MSY approach		≤ 414	414			
2020	MSY approach		≤ 561				

* Revised to 1500 tonnes in 1990.

** Catch at *status quo* F.

^ Preliminary.

History of the catch and landings

Table 8 Sole in Division 7.a. Catch distribution by fleet in 2018 as estimated by ICES.

Total catch	Landings			Discards	
	Beam trawlers	Otter trawlers	Other gears	Beam trawlers	Otter trawlers
	38 tonnes	66%	30%	4%	51%
36 tonnes			2 tonnes		

Table 9 Sole in Division 7.a. History of commercial landings by country; both the official and ICES estimated values are presented. Weights are in tonnes.

Year	Belgium	France	Ireland	Netherlands	UK (E+W)	UK (Isle of Man)	UK (NI)*	UK (Scotland)	Officially reported	ICES landings	TAC
1973	793	12	27	281	258	-	46	11	1428	1428	-
1974	664	54	28	320	218	-	23	-	1307	1307	-
1975	805	59	24	234	281	-	24	15	1442	1441	-
1976	674	72	74	381	195	-	49	18	1463	1463	-
1977	566	39	84	227	160	-	49	21	1146	1147	-
1978	453	65	127	177	189	-	57	30	1098	1106	-
1979	779	48	134	247	290	-	47	42	1587	1614	-
1980	1002	41	229	169	367	-	44	68	1920	1941	-
1981	884	13	167	186	311	-	41	45	1647	1667	-
1982	669	9	161	138	277	-	31	44	1329	1338	-
1983	544	3	203	224	219	-	33	29	1255	1169	-
1984	425	10	187	113	230	-	38	17	1020	1058	-
1985	589	9	180	546	269	-	36	28	1657	1146	-
1986	930	17	235	-	637	1	50	46	1916	1995	-
1987	987	5	312	-	599	3	72	63	2041	2808	2100
1988	915	11	366	-	507	1	47	38	1885	1999	1750
1989	1010	5	155	-	613	2	-	38	1823	1833	1480
1990	786	2	170	-	569	10	-	39	1576	1583	1500
1991	371	3	198	-	581	44	-	26	1223	1212	1500
1992	531	11	164	-	477	14	-	37	1234	1259	1350
1993	495	8	98	-	338	4	-	28	971	1023	1000
1994	706	7	226	-	409	5	-	14	1367	1374	1500
1995	675	5	176	-	424	12	-	8	1300	1266	1300
1996	533	5	133	149	194	4	-	5	1023	1002	1000
1997	570	3	130	123	189	5	-	7	1027	1003	1000
1998	525	3	134	60	161	3	-	9	895	911	900
1999	469	< 1	120	46	165	1	-	8	810	863	900
2000	493	3	135	60	133	1	-	8	833	818	1080
2001	674	4	135	-	195	+	-	4	1012	1053	1100
2002	817	4	96	-	165	+	-	3	1085	1090	1100
2003	687	4	103	-	217	+	-	3	1014	1014	1010
2004	527	1	77	-	106	+	-	1	712	709	800
2005	662	3	85	-	103	+	-	1	854	855	960
2006	419	1	85	-	69	+	-	2	576	569	960
2007	305	1	115	-	66	< 1	-	4	491	492	820
2008	216	1	66	-	37	n/a	-	n/a	320	332	669
2009	257	n/a	47	-	19	1	-	1	325	325	502
2010	217	< 1	47	-	12	< 1	-	n/a	277	277	402

Year	Belgium	France	Ireland	Netherlands	UK (E+W)	UK (Isle of Man)	UK (NI)*	UK (Scotland)	Officially reported	ICES landings	TAC
2011	250	< 1	48	-	31	< 1	-	n/a	330	330	390
2012	222	< 1	51	-	21	< 1	-	n/a	294	294	300
2013	96	< 1	40	-	12	< 1	-	n/a	148	148	140
2014	43	n/a	43	-	10	< 1	-	n/a	96	99	95
2015	37	n/a	32	-	7	n/a	-	n/a	76	76	90
2016	14	n/a	15	-	6	n/a	-	n/a	35	35	40
2017**	14	n/a	14	-	4	n/a	-	n/a	32	34	40
2018**	14	n/a	16	-	6	n/a	-	n/a	36	36	40

* 1989 onwards: N. Ireland included with England & Wales.

** Preliminary.

n/a = not available.

Summary of the assessment

Table 10 Sole in Division 7.a. Assessment summary. Weights are in tonnes and recruitment in thousands.

Year	Recruitment age 2	SSB	Landings	Discards**	F ages 4–7
1970	3695	6436	1785		0.39
1971	10177	6222	1882		0.44
1972	3186	5011	1450		0.45
1973	13133	5123	1428		0.43
1974	5870	5068	1307		0.44
1975	6680	5359	1441		0.40
1976	3857	4888	1463		0.43
1977	15772	4490	1147		0.37
1978	9041	5092	1106		0.36
1979	8848	5685	1614		0.47
1980	5071	5514	1941		0.64
1981	4498	5166	1667		0.48
1982	2462	4331	1338		0.44
1983	5559	4096	1169		0.44
1984	15479	4604	1058		0.35
1985	16250	5642	1146		0.34
1986	23752	6956	1995		0.44
1987	3462	7165	2808		0.86
1988	3498	5519	1999		0.69
1989	4374	4633	1833		0.58
1990	5564	3628	1583		0.65
1991	12686	3189	1212		0.50
1992	4955	3452	1259		0.53
1993	6191	3231	1023		0.55
1994	5250	4051	1374		0.49
1995	2006	3521	1266		0.51
1996	2499	2712	1002		0.52
1997	8383	2500	1003		0.59
1998	6899	3027	911		0.49
1999	5256	3320	863		0.47
2000	6968	3132	818		0.46

Year	Recruitment age 2	SSB	Landings	Discards**	F ages 4–7
2001	4560	3565	1053		0.35
2002	2332	3578	1090		0.38
2003	3059	3213	1014		0.36
2004	3644	2299	709		0.31
2005	2959	2076	855		0.55
2006	1321	1640	569		0.47
2007	1871	1398	492		0.34
2008	1962	1334	332		0.31
2009	2278	1081	325		0.38
2010	1615	1204	277		0.29
2011	638	1103	330	14	0.35
2012	883	1166	298	22	0.30
2013	648	1099	148	11	0.166
2014	831	883	99	7	0.118
2015	1807	1316	76	7	0.075
2016	4422	1247	35	2	0.036
2017	1553	1891	34	2	0.0193
2018	3670	2627	36	1.56	0.0138
2019	1339*	3079			

* GM (2009–2017).

**Discards are not included in the assessment.

Sources and references

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