

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

ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2017 should be no more than 2487 tonnes.

Stock development over time

The spawning-stock biomass (SSB) has fluctuated without trend and is predicted to drop below $MSY B_{trigger}$ in 2016. Fishing mortality (F) has always been above F_{MSY} and increased over the years 2012–2015. Recruitment has been fluctuating without trend and was in 2012–2014 among the lowest of the time-series, which has resulted in the decrease in recent SSB.

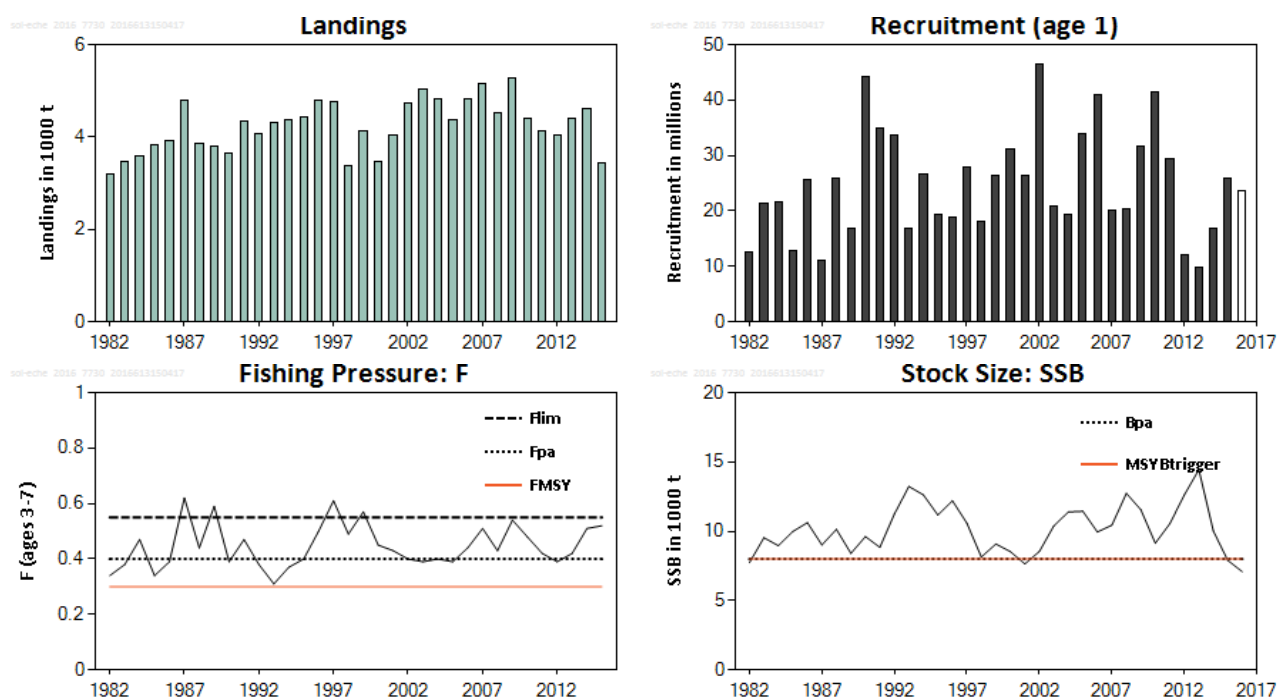


Figure 6.3.47.1 Sole in Division 7.d. Summary of stock assessment. Predicted recruitment values are not shaded.

Stock and exploitation status

Table 6.3.47.1 Sole in Division 7.d. 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}	✖	✖	✖ Above	MSY	✔	✔	✖ Below trigger
Precautionary approach	F_{pa}, F_{lim}	○	○	○ Increased risk	B_{pa}, B_{lim}	✔	✔	○ Increased risk
Management plan	F_{MGT}	-	-	- Not applicable	SSB_{MGT}	-	-	- Not applicable

Catch options

Table 6.3.47.2 Sole in Division 7.d. The basis for the catch options.

Variable	Value	Source	Notes
F ages 3–7 (2016)	0.45	ICES (2016a)	TAC constraint
SSB (2017)	7853	ICES (2016a)	Short-term forecast (STF), tonnes
R _{age1} (2016–2017)	23722	ICES (2016a)	Geometric mean (GM, excluding 2013–2015), thousands
Total catch (2016)	3258	ICES (2016a)	STF, tonnes
Commercial landings (2016)*	2957	ICES (2016a)	STF, tonnes
Discards (2016)	301	ICES (2016a)	Average discard rate 2014–2015, tonnes

* Commercial landings in 2016 based on the catch TAC for 2016 (Total catch = TAC(2016) = 3258 tonnes) and the WGNSSK discard estimate (average 2014–2015 = 9.24%). The same values for Total catch and Wanted catch are taken forward in the forecasted Stable TAC scenario (Table 6.3.47.3).

Table 6.3.47.3 Sole in Division 7.d. The catch options. All weights are in tonnes.

Rationale	Total catch * (2017)	Wanted catch * (2017)	Basis	Fwanted catch (2017)	SSB (2018)	%SSB change **	%TAC change ***
MSY approach	2487	2257	$(SSB_{2017}/MSY_{Btrigger}) \times F_{MSY}$	0.29	9440	20	-24
F _{MSY}	2528	2294	F _{MSY}	0.3	9400	20	-22
Precautionary approach	3224	2926	F _{pa}	0.4	8716	11	-1
	4157	3773	F _{lim}	0.55	7803	-1	28
Zero catch	0	0	F = 0	0	11887	51	-100
Other options	3524	3198	F ₂₀₁₆	0.45	8423	7	8
	3955	3590	SSB > B _{pa}	0.52	8000	2	21
	3955	3590	SSB > MSY B _{trigger}	0.52	8000	2	21
	2769	2513	TAC -15%	0.33	9162	17	-15
	3258	2957	Stable TAC	0.41	8683	11	0
	3747	3401	TAC + 15%	0.48	8204	4	15

<i>Mixed fisheries options –differences with calculations above can occur because of the different methodology used (ICES, 2016b)[†]</i>							
Maximum	5532		A	1.12	5212	-34	
Minimum	1915		B	0.28	9106	16	
Cod	2934		C	0.46	8003	2	
SQ effort	3473		D	0.57	7420	-6	
Value	3164		E	0.50	7754	-1	

*“Wanted catch” is used to describe fish that would be landed in the absence of the EU landing obligation. Total catch is calculated from the predicted wanted catch, based on the average discard rate in 2014–2015 (9.24%).

**SSB 2018 relative to SSB 2017.

***Total catch 2017 relative to TAC 2016.

Mixed-fisheries assumptions

(note: “fleet’s stock share” is used to describe the share of the fishing opportunities for each particular fleet, which has been calculated based on the single-stock advice for 2017 and the historical proportion of the stock landings taken by the fleet):

- A. Maximum scenario: Each fleet stops fishing when its last stock share is exhausted.
- B. Minimum scenario: Each fleet stops fishing when its first stock share is exhausted.
- C. Cod scenario: Each fleet stops fishing when its cod stock share is exhausted.
- D. SQ (status quo) effort scenario: The effort of each fleet in 2016 and 2017 is as in 2015.
- E. Value scenario: The effort of each fleet is equal to the weighted average of the efforts required to catch the fleet’s quota share of each of the stocks, where the weights are the relative catch values of each stock in the fleet’s portfolio.

[†] Version 2: Mixed-fisheries considerations added

Basis of the advice

Table 6.3.47.4 Sole in Division 7.d. The basis of the advice.

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

Quality of the assessment

Due to the uncertainty in the most recent recruitment estimates, the estimates of incoming year classes may change significantly when the stock is assessed next year.

Prior to 2014, discards were assumed to be negligible, but new information indicates that discard rates are currently higher than previously assumed. The rate now used when calculating catch advice from wanted catch is 9.24%.

Since 2015, F_{bar} has been estimated for ages 3–7, while F_{MSY} has been calculated for ages 3–8 (ICES, 2015). No new F_{MSY} evaluation was conducted because the selectivity pattern has not changed. The stock will be benchmarked in 2017.

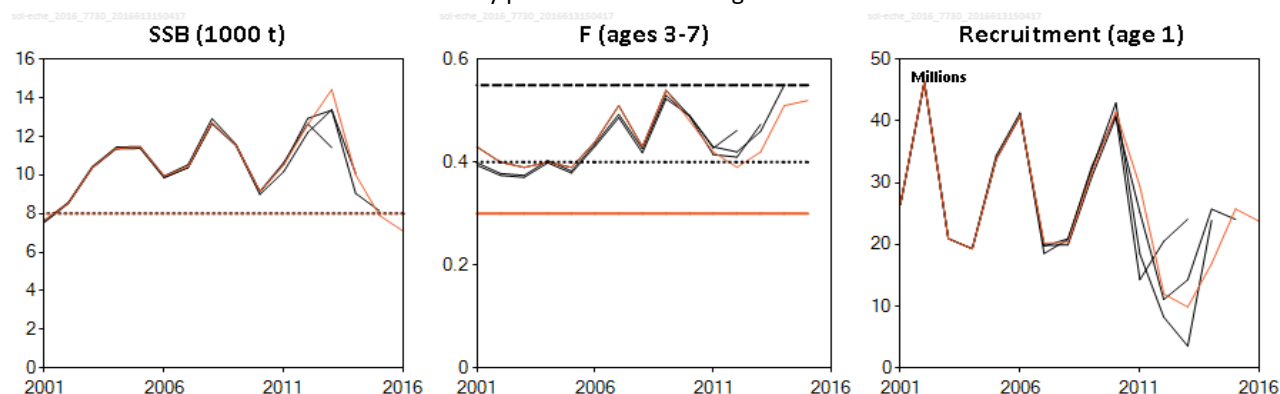


Figure 6.3.47.2 Sole in Division 7.d. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

In 2014–2016, the agreed TAC was higher than the advised catch (almost double in 2015) which led to fishing mortality close to F_{lim} in 2014 and 2015. If sustained, this would result in a continued stock decline.

Technical measures applicable to the mixed flatfish beam-trawl fishery affect both sole and plaice. The minimum mesh size of 80 mm generates high discards of plaice which have a larger minimum landing size than sole. Preliminary discard estimates for sole in 2011–2015 are in the order of 10% in weight. 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.

In response to the drop in SSB and the poor recruitment in 2012–2014, the two main countries participating in the fishery have already implemented additional conservation measures (STECF, 2016). For Belgian beam trawlers in Division 7.d (and in divisions 7.f, 7.g, and 7.a) it has been mandatory since 1 April 2015 to incorporate a 3 m long section with 120 mm mesh size before the codend, in order to reduce the catches of small sole. France engaged in 2016 to i) strengthen the protection of the nursery areas by prohibiting more gears in these areas, ii) increase the area closed to fishing within the nursery areas, and iii) increase the minimum conservation reference size to 25 cm for French vessels in accordance with EU legislation, where appropriate.

STECF evaluated scenarios of a proposed management strategy by the NWWAC and considered them to be in line with ICES precautionary approach (STECF, 2015, 2016). Given that SSB is below B_{pa} in 2016, following this management strategy would

lead to fishing at a level corresponding to a fishing mortality = F_{MSY} and would imply a catch of no more than 2528 tonnes in 2017. ICES has not evaluated the proposed management strategy.

Results from a North Sea mixed-fisheries analysis are presented in ICES (2016b). For 2017, assuming a strictly implemented discard ban (corresponding to the “Minimum” scenario), haddock would be the most limiting stock (assuming that the full advised catch is taken), constraining 36 out of 41 fleet segments (corresponding to 91% of the 2015 kW days of effort). Cod and eastern Channel sole would be limiting for fleets, corresponding to 5% and 4% of the 2015 effort, respectively. Conversely, in the “Maximum” scenario with *Nephrops* managed by separate TACs for the individual functional units (FUs), *Nephrops* would be considered the least limiting stocks in many FUs. *Nephrops* in FU 33, FU 5, FU 32, FU 7, and FU Others would be the least limiting stocks for fleets in these FUs, representing 32%, 16%, 10%, 4%, and 17% of the 2015 effort, respectively. Eastern Channel plaice and saithe would be least limiting for other fleet segments, representing 12% and 9% of the 2015 effort, respectively.

Results for the eastern Channel sole stock are also included as additional rows in the catch options table of this advice sheet.

Reference points

Table 6.3.47.5 Sole in Division 7.d. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	8000 t	B_{pa}	ICES (2014)
	F_{MSY}	0.3	Stochastic simulations assuming a smooth hockey-stick relationship. Calculations based on ages 3–8.	ICES (2014)
Precautionary approach	B_{lim}	Not defined.	Poor biological basis for definition.	ICES (2009)
	B_{pa}	8000 t	This is the lowest observed biomass at which there is no indication of impaired recruitment. Smoothed B_{loss}	ICES (2009)
	F_{lim}	0.55	F_{loss} , but poorly defined; analogy to North Sea and setting of $1.4 F_{pa} = 0.55$. This is a fishing mortality at or above which the stock has shown continued decline.	ICES (2009)
	F_{pa}	0.4	Between F_{med} and the 5th percentile of F_{loss} ; $SSB > B_{pa}$ and probability ($SSB_{mt} < B_{pa}$), 10%: 0.4.	ICES (2009)
Management plan*	SSB_{MGT}	8000 t	B_{pa}	STECF (2016)
	F_{MGT}	Not defined.		

* The management plan for this stock has not been evaluated by ICES.

Basis of the assessment

Table 6.3.47.6 Sole in Division 7.d. The basis of the assessment.

ICES stock data category	1 (ICES 2016c)
Assessment type	Age-based analytical assessment (XSA; ICES, 2016a) that uses landings in the model, and discards are then included to calculate a catch forecast.
Input data	Commercial catches: international landings, ages and length frequencies from catch sampling by métier; 3 survey indices: UK(E&W)-BTS, UK(E&W)-YFS, and FR-YFS; 2 commercial indices: BE-CBT and UK(E&W)-CBT; natural mortality is assumed to be constant; maturity-at-age is assumed to be constant and knife-edged.
Discards and bycatch	Discards have been quantified for 2014 and 2015 (discard rates 11.5% and 7%, respectively). Discard information was available for 40% of the landings and was used for the advice. 42% of the discards were observed discards, 58% were raised values. Discards are not used in the assessment but have been used to provide catch advice.
Indicators	None
Other information	This stock was benchmarked in 2009 (ICES, 2009).
Working groups	Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK) and Working Group on Mixed Fisheries Advice (WGMIXFISH-ADVICE)

Information from stakeholders

There is no available information.

History of the advice, catch, and management

Table 6.3.47.7 Sole in Division 7.d. History of ICES advice, the agreed TAC, and ICES estimates of landings. All weights are in thousand tonnes.

Year	ICES advice	Predicted landings corresp. to advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES landings	ICES discards
1987	Precautionary TAC	3.1		3.85	3.8	4.8	
1988	<i>Status quo</i> (Shot) TAC	3.4		3.85	3.3	3.9	
1989	<i>Status quo</i> (Shot) TAC	3.8		3.85	2.9	3.8	
1990	No effort increase; TAC	3.7		3.85	3.0	3.6	
1991	<i>Status quo</i> F; TAC	3.4		3.85	3.8	4.4	
1992	TAC	≤ 2.7		3.5	3.8	4.1	
1993	70% of F(91)~2 800 t	2.8		3.2	3.8	4.3	
1994	Reduce F	< 3.8		3.8	4.0	4.4	
1995	No increase in F	3.8		3.8	3.7	4.4	
1996	No long-term gain in increasing F	4.7		3.5	4.1	4.8	
1997	No advice	-		5.23	3.9	4.8	
1998	No increase in effort	4.5		5.23	3.0	3.4	
1999	Reduce F to F_{pa}	3.8		4.7	3.9	4.1	
2000	$F < F_{pa}$	< 3.9		4.1	3.8	3.5	
2001	$F < F_{pa}$	< 4.7		4.6	4.6	4.0	
2002	$F < F_{pa}$	< 5.2		5.2	5.4	4.7	
2003	$F < F_{pa}$	< 5.4		5.4	6.2	5.0	
2004	$F < F_{pa}$	< 5.9		5.9	5.7	4.8	
2005	$F < F_{pa}$	< 5.7		5.7	4.6	4.4	
2006	$F < F_{pa}$	< 5.7		5.72	4.8	4.8	
2007	$F < F_{pa}$	< 6.44		6.22	5.3	5.2	
2008	$F < F_{pa}$	< 6.59		6.59	4.4	4.5	
2009	$F < F_{pa}$	< 4.38		5.274	5.1	5.3	
2010	$F < F_{pa}$	< 3.19		4.219	4.4	4.4	
2011	See scenarios	< 4.84		4.852	4.2	4.1	
2012	MSY Transition	< 5.60		5.580	4.0	4.0	0.4
2013	MSY Transition	< 5.90		5.900	4.4	4.4	0.5
2014	MSY Transition	< 3.251		4.838	4.6	4.6	0.7
2015	MSY approach	< 1.931		3.483	3.4	3.4	0.26
2016	MSY approach		2.685	3.258*			
2017	MSY approach		≤ 2.487				

* Catch TAC.

History of catch and landings

Table 6.3.47.8 Sole in Division 7.d. Catch distribution by fleet in 2015 as estimated by ICES.

Table 2: Catch and discards in EU waters for catch distribution by gear in 2015 as estimated by ICES					
Catch (2015)	Landings				Discards
3702 t	34% beam trawls	45% trammel-/gillnets	14% otter trawls	7% other gears	261 t
	3441 t				

Table 6.3.47.9 Sole in Division 7.d. History of commercial catch and landings; both the official and ICES estimated values are presented by area for each country participating in the fishery.

Year	Official landings					ICES total landings	TAC
	Belgium	France	UK(E+W)	others	Total		
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	
1983	502	1120	419	.	2041	3458	
1984	592	1309	505	.	2406	3575	
1985	568	2545	520	.	3633	3837	
1986	858	1528	551	.	2937	3932	
1987	1100	2086	655	.	3841	4791	3850
1988	667	2057	578	.	3302	3853	3850
1989	646	1610	689	.	2945	3805	3850
1990	996	1255	785	.	3036	3647	3850
1991	904	2054	826	.	3784	4351	3850
1992	891	2187	706	10	3794	4072	3500
1993	917	2322	610	13	3862	4299	3200
1994	940	2382	701	14	4037	4383	3800
1995	817	2248	669	9	3743	4420	3800
1996	899	2322	877	.	4098	4797	3500
1997	1306	1702	933	.	3941	4764	5230
1998	541	1703	803	.	3047	3363	5230
1999	880	2251	769	.	3900	4135	4700
2000	1021	2190	621	.	3832	3476	4100
2001	1313	2482	822	.	4617	4025	4600
2002	1643	2780	976	.	5399	4733	5200
2003	1657	3475	1114	1	6247	5038	5400
2004	1485	3070	1112	.	5667	4826	5900
2005	1221	2832	567	.	4620	4384	5700
2006	1547	2627	678	.	4852	4834	5720
2007	1530	2981	801	1	5313	5166	6220
2008	1368	2880	724	.	4972	4517	6593
2009	1475	2886	754	6	5121	5266	5274
2010	1294	2407	674	.	4374	4409	4219
2011	1181	2283	686	.	4150	4133	4852
2012	920	2475	623	0.25	4018	4048	5580
2013	954	2865	605	.	4424	4390	5900
2014	1493	2479	649	0.1	4621	4620	4838
2015*	1048	1856	468	.	3372	3441	3483

* Preliminary.

Summary of the assessment

Table 6.3.47.10 Sole in Division 7.d. Assessment summary. Weights are in tonnes.

Year	Recruitment Age 1 (thousands)	SSB	Landings	F Ages 3–7 (mean)
1982	12686	7732	3190	0.34
1983	21296	9532	3458	0.38
1984	21545	8957	3575	0.47
1985	12943	9985	3837	0.34
1986	25756	10623	3932	0.39
1987	10993	9016	4791	0.62
1988	25806	10136	3853	0.44
1989	16819	8404	3805	0.59
1990	44324	9619	3647	0.39
1991	34875	8837	4351	0.47
1992	33667	11242	4072	0.38
1993	16788	13228	4299	0.31
1994	26539	12620	4383	0.37
1995	19397	11164	4420	0.4
1996	18880	12200	4797	0.5
1997	27805	10586	4764	0.61
1998	18041	8139	3363	0.49
1999	26314	9081	4135	0.57
2000	31229	8532	3476	0.45
2001	26510	7648	4025	0.43
2002	46410	8545	4733	0.4
2003	20955	10385	5038	0.39
2004	19274	11390	4826	0.4
2005	33856	11439	4383	0.39
2006	40884	9950	4833	0.44
2007	20200	10436	5166	0.51
2008	20361	12732	4517	0.43
2009	31721	11555	5266	0.54
2010	41504	9142	4409	0.48
2011	29433	10542	4133	0.42
2012	12001	12619	4048	0.39
2013	9866	14439	4390	0.42
2014	16902	10017	4620	0.51
2015	25774	7899	3441	0.52
2016	23722	7083		

Sources and references

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[†] Version2: Reference added