

Plaice (*Pleuronectes platessa*) in Subarea 4 (North Sea) and Subdivision 20 (Skagerrak)

ICES advice on fishing opportunities

Please note: The present advice replaces the advice given in June 2018 for catches in 2019.

ICES advises that when the MSY approach is applied, catches in 2019 should be no more than 142 217 tonnes.

Stock development over time

The spawning-stock biomass (SSB) is well above $MSY B_{trigger}$ and has markedly increased since 2008, following a substantial reduction in fishing mortality (F) since 1999. Recruitment has been fluctuating around the long-term average since the mid-1990s. Since 2009, fishing mortality (F) has been estimated at around F_{MSY} .

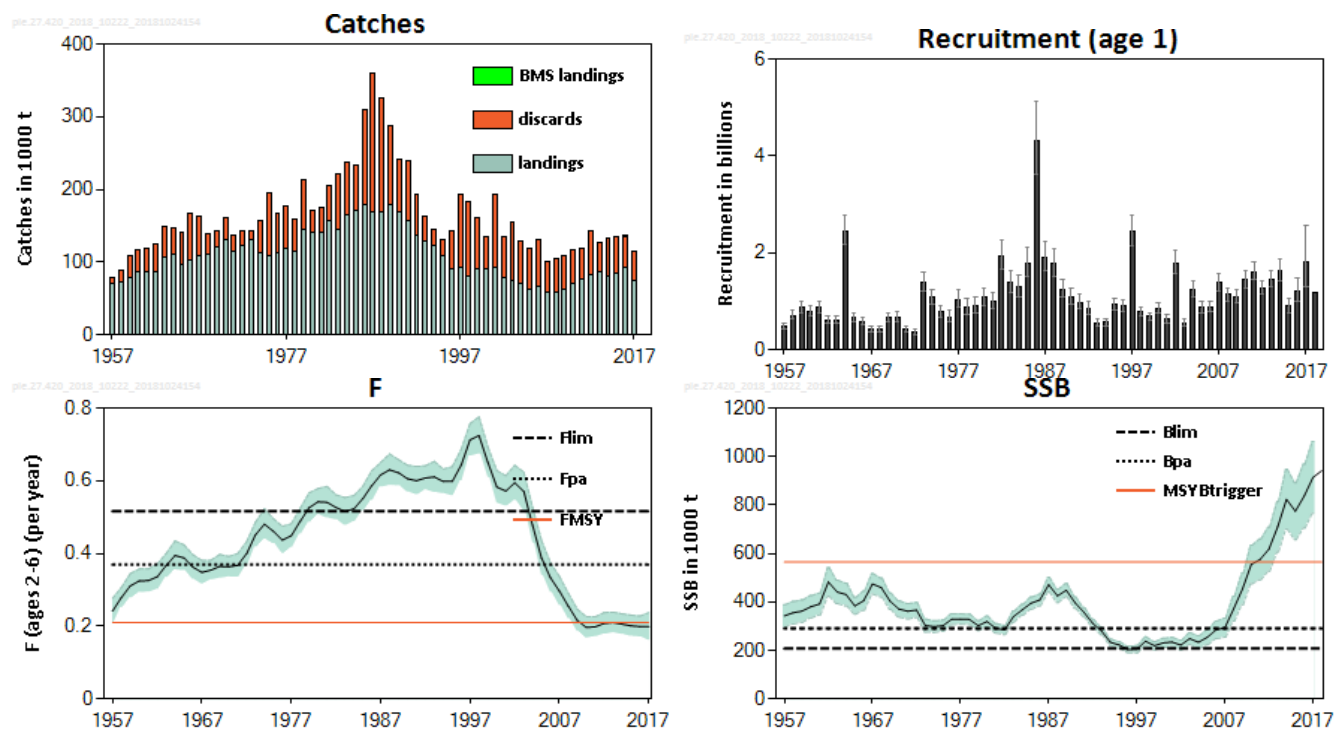


Figure 1 Plaice in Subarea 4 and Subdivision 20. Summary of the stock assessment. Shaded areas (F, SSB) and error bars (R) indicate ± 2 standard errors (approximately 95% confidence intervals).

Stock and exploitation status

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

Table 1 Plaice in Subarea 4 and Subdivision 20. State of the stock and fishery relative to reference points.

	Fishing pressure			Stock size				
	2015	2016	2017	2016	2017	2018		
Maximum sustainable yield	F_{MSY}	✓	✓	✓	Below	$MSY B_{trigger}$	✓	Above trigger
Precautionary approach	F_{pa}, F_{lim}	✓	✓	✓	Harvested sustainably	B_{pa}, B_{lim}	✓	Full reproductive capacity
Management plan	F_{MGT}	—	—	—	Not applicable	B_{MGT}	—	Not applicable

Catch scenarios

Table 2 Plaice in Subarea 4 and Subdivision 20. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
F _{ages 2–6} (2018)	0.199	Average exploitation pattern in 2015–2017, scaled to F _{ages 2–6} in 2017.
SSB (2019)	981938	Short-term forecast (STF); in tonnes.
R _{age1} (2018)	1171029	RCT3, including Q3 2018 survey information; in thousands.
R _{age1} (2019)	965555	Geometric mean (GM, 1957–2014); in thousands.
Total catch (2018)	131993	Short-term forecast (STF); in tonnes.
Wanted catch (2018)	84964	Short-term forecast (STF), average landings rate by age 2015–2017; in tonnes.
Unwanted catch (2018)	47029	Short-term forecast (STF), average discard rate by age 2015–2017; in tonnes.

Table 3 Plaice in Subarea 4 and Subdivision 20. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2019)	Wanted catch* (2019)	Unwanted catch* (2019)	^^ F _{total ages 2–6} (2019)	F _{wanted ages 2–6} (2019)	F _{unwanted ages 2–3} (2019)	SSB (2020)	% SSB change **	% TAC change ***	% Advice change ^
ICES advice basis										
MSY approach: F _{MSY}	142217	92764	49453	0.21	0.100	0.195	1032942	5.1	11.1	-0.185
Other scenarios										
F = MAP F _{MSY upper}	196026	128345	67681	0.30	0.143	0.28	980393	0.00	53	38
F = MAP F _{MSY lower}	101322	65915	35407	0.146	0.069	0.135	1073066	9.2	-21	-29
F = 0	0	0	0	0.00	0.00	0.00	1174144	19.4	-100	-100
F _{pa}	234569	154023	80546	0.37	0.175	0.34	942939	-4.1	83	65
F _{lim}	309609	204534	105075	0.52	0.25	0.48	870509	-11.2	142	117
SSB (2020) = B _{lim}	1070822	803306	267516	6.0	2.8	5.5	207288	-79	740	650
SSB (2020) = B _{pa}	962080	702268	259812	4.0	1.91	3.7	290203	-70	650	580
SSB (2020) = MSY B _{trigger}	637266	436555	200711	1.48	0.71	1.38	564599	-43	400	350
Rollover TAC	127986	83139	44847	0.187	0.089	0.173	1047281	7.1	0.00	-10.2
F ₂₀₁₉ = F ₂₀₁₈	135349	88244	47105	0.199	0.095	0.185	1039670	6.1	5.8	-5.0
Mixed-fisheries scenarios –										
A: Max.	196359			0.320			930211	-6	+53	+38
B: Min.	52437			0.077			1070855	9	-59	-63
C: COD	80026			0.120			1043736	6	-37	-44
D: SQ effort	121218			0.187			1003379	2	-5	-14
E: Value	126469			0.196			998247	2	-1	-11
F: Range	112778			0.162			1062841	8	-11	-21

* “Wanted” and “unwanted” catch are used to describe fish that would be landed and discarded in the absence of the EU landing obligation, based on average discard rate estimates for 2015–2017. Both wanted and unwanted catch refer to Subarea 4 and Subdivision 20, calculated as the projected total stock wanted catch (including Division 7.d) deducted by the catch of plaice from Subarea 4 taken in Division 7.d in 2019. The subtracted value (649 t of wanted catch and 398 t of unwanted catch) is estimated based on the plaice catch advice for Division 7.d for 2019.

** SSB 2020 relative to SSB 2019.

*** Total catch in 2019 relative to the combined TAC of Subarea 4 and Subdivision 20 in 2018 (127 986 t).

^ Total catch in 2019 relative to advice value 2018 (142 481 t).

^^ F_{wanted} and F_{unwanted} do not sum up to the F_{total} as they are calculated using different ages.

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 2018 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: Each fleet stops fishing when its individual cod share is exhausted.

D. SQ (*status quo*) effort scenario: The effort of each fleet in 2017 and 2018 is as in 2016.

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.

F. Range scenario: The potential for TAC mismatches in 2018 are minimized within the F_{MSY} range, for the demersal fish stocks for which such a range is available (cod.27.47d20; had.27.46a20; pok.27.3a46; ple.27.420; ple.27.7d; sol.27.4; sol.27.7d).

The advised catch for 2019 is close to the catch advice given for 2018 (-0.185%).

Basis of the advice

Table 4 Plaice in Subarea 4 and Subdivision 20. The basis of the advice.

Advice basis	MSY approach
Management plan	An EU multiannual management plan (MAP) has been proposed for this stock (EU, 2016). This plan is not adopted by Norway and is thus not used as the basis of the advice for this shared stock. ICES was requested by the EC to provide advice based on the MSY approach and to include the MAP as a catch option.

Quality of the assessment

This assessment is consistent between years.

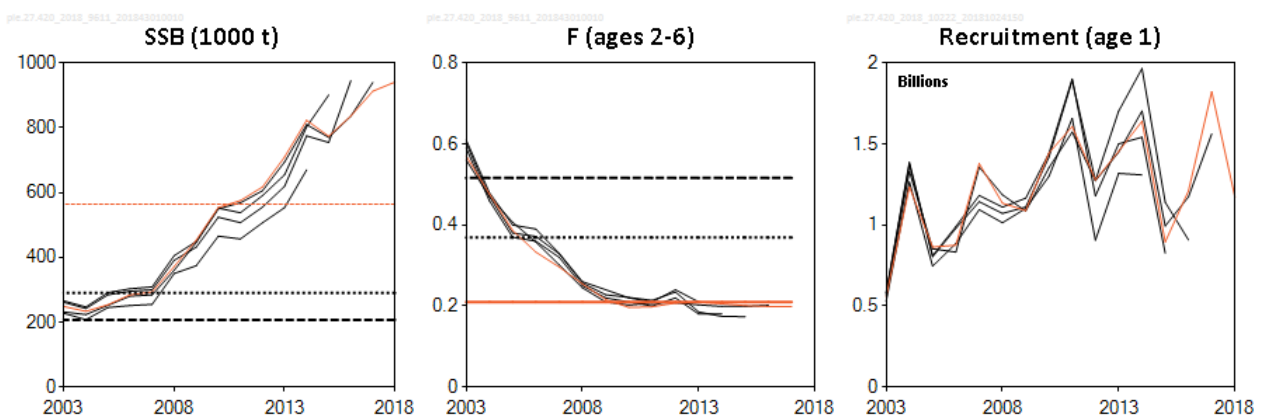


Figure 2 Plaice in Subarea 4 and Subdivision 20. Historical assessment results.

Issues relevant for the advice

Based on the BTS survey information that became available in summer 2018 (except for the UK-BTS data, which is only provided in the new year), the advice has been updated from that released in June 2018.

Since 2016, large mesh trawlers (TR1 and BT1) are under landing obligation in Subarea 4. The fleets (BT2 and TR2) that contribute most to the total discards are currently not under landing obligation in Subarea 4.

Despite the introduction of the landing obligation 34% of the total catch was discarded in 2017. The reported BMS for fleets that are under the landing obligation in Subarea 4 are currently much lower than the estimates of discards from observer programmes.

A large proportion of the catch in the western Skagerrak is considered to originate from the North Sea component of the stock, mainly in the summer on mixed feeding aggregations. Local plaice components also reside in the Skagerrak. These cannot be easily distinguished and assessed separately. There does not appear to be much mixing of the combined stock with these local components in eastern Skagerrak. The status of these components is unknown; to avoid local depletion catches should not increase in the eastern Skagerrak.

Mixed-fisheries considerations

Results from a North Sea mixed-fisheries analysis are presented in the ICES mixed-fisheries advice (ICES, 2018a). The analysis has been updated, taking into account latest changes made to the assessments and forecasts for stocks with reopened advice.

After years of positive development, North Sea cod is again estimated to be the most limiting stock in the Greater North Sea mixed-fisheries model. For 2019, assuming a strictly implemented landing obligation (corresponding to the “Minimum” scenario), cod is estimated to constrain 24 out of 40 fleet segments. Whiting is the second most limiting

stock, constraining twelve fleet segments. Conversely, in the “Maximum” scenario, saithe and both plaice stocks (North Sea and eastern English Channel) would be the least limiting for 17, 9, and 3 fleet segments, respectively. Finally, if Norway lobster were managed by separate TACs, Norway lobster in FU 7 would be the least limiting for seven fleet segments (ICES, 2018b).

For those demersal fish stocks for which the F_{MSY} range is available, a “range” scenario is presented that minimizes the potential for TAC mismatches in 2019 within the F_{MSY} range. This scenario returns a fishing mortality by stock which, if used for setting single-stock fishing opportunities for 2019, may reduce the gap between the most and the least restrictive TACs, thus reducing the potential for quota over- and undershoots. This “range” scenario suggests that the potential for mixed-fisheries mismatch would be lowered with a 2019 TAC in the lower part of the F_{MSY} range for North Sea plaice and North Sea saithe, and at the highest possible value for cod in accordance with the MSY approach and the MAP (EU multiannual plan).

Reference points

Table 5 Plaice in Subarea 4 and Subdivision 20. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	564 599 t	Fifth percentile of the current SSB ($SSB_{2015}/1.4$), as estimated at the benchmark.	ICES (2017)
	F_{MSY}	0.21	EQsim analysis based on the recruitment period 1958–2012.	ICES (2017)
Precautionary approach	B_{lim}	207 288 t	Break-point of hockey stick stock–recruit relationship, based on the recruitment period 1958–2012.	ICES (2017)
	B_{pa}	290 203 t	$B_{lim} \times \exp(1.645 \times 0.2) \approx 1.4 \times B_{lim}$	ICES (2017)
	F_{lim}	0.516	EQsim analysis based on the recruitment period 1958–2012.	ICES (2017)
	F_{pa}	0.369	$F_{lim} \times \exp(-1.645 \times 0.2) \approx F_{lim} / 1.4$	ICES (2017)
Management plan*	MAP MSY $B_{trigger}$	564 599 t	MSY $B_{trigger}$	
	MAP B_{lim}	201 288 t	B_{lim}	
	MAP F_{MSY}	0.21	F_{MSY}	
	MAP target range F_{lower}	0.146	Consistent with ranges provided by ICES (2017), resulting in no more than 5% reduction in long-term yield compared with MSY.	
	MAP target range F_{upper}	0.30	Consistent with ranges provided by ICES (2017), resulting in no more than 5% reduction in long-term yield compared with MSY.	

* Proposed EU multiannual plan (MAP) for the North Sea (EU, 2016).

Basis of the assessment

Table 6 Plaice in Subarea 4 and Subdivision 20. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018c).
Assessment type	An age structured stock assessment, based on Aarts and Poos (2009), that uses catches in the model and the forecast (ICES, 2018d).
Input data	Commercial catch, ages and length frequencies from port and observer sampling. Six survey indices: combined BTS (Tridens, Isis, Belgica, Solea, UK-BTS; 1996–2017), BTS-Isis (1985–1995), SNS (split into two series, SNS1 1970–1999 and SNS2 2000–2017), IBTS Q1 (2007–2017), and IBTS Q3 (1997–2017). Both the combined BTS Tridens and Isis and IBTS (Q1 and Q3) survey indices are yearly updated using a delta-GAM model (Berg <i>et al.</i> , 2014). Maturity-at-age is assumed constant; natural mortality-at-age is assumed constant at 0.1 year ⁻¹ (ICES, 2017).
Discards, BMS landings, and bycatch	Data series from the majority of the fleet were included in the assessment. In 2017, 75% of the total discards in Subarea 4 were obtained from sampling programmes. For Subdivision 20, 59% of the total discards were obtained from sampling programmes. BMS landings, where reported, are included with discards as unwanted catch in the assessment from 2016.
Indicators	None.
Other information	Catch information, landings since 1984, and discards since 2002 for plaice from Subdivision 20 (Skagerrak) are now added to plaice for Subarea 4 (North Sea). The SNS survey was split into two time-series, 1984–1999 and 2000–2017. Plaice migrate into Division 7.d during quarter 1; therefore, 50% of the mature catches in Division 7.d were assigned to the North Sea plaice stock during the stock assessment. This stock was last benchmarked in 2017 (WKNSEA; ICES, 2017).
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

No additional information is available for this stock.

History of the advice, catch, and management

Table 7 Plaice in Subarea 4. ICES advice, TAC, and official and ICES estimates of landings and discards. 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	F < F(84); TAC	120000		150000	130794	153670	190524
1988	70% of F(85); TAC	150000		175000	138412	154475	156423
1989	Reduce F; Buffer SSB	< 175000		185000	152408	169818	107793
1990	<i>Status quo</i> F; TAC	171000		180000	156261	156240	71225
1991	No increase in F; TAC	169000		175000	143565	148003	80935
1992	No long-term gains in increasing F	-*		175000	123482	125190	57049
1993	No long-term gains in increasing F	170000 *		175000	115278	117113	35016
1994	No long-term gains in increasing F	-*		165000	109679	110392	23785
1995	Significant reduction in F	87000 **		115000	96410	98356	21828
1996	Reduction in F of 40%	61000		81000	80033	81673	52049
1997	Reduction in F of 20%	80000		91000 ***	81483	83048	100145
1998	Fish at F = 0.3	82000		87000	70365	71534	103751
1999	Fish at F = 0.3	106000		102000	78617	80662	70976
2000	Fish at F = 0.3	95000		97000	82151	81150	44311
2001	Fish at F = 0.26	78000		78000	79700	81847	100309
2002	F < F _{pa}	< 77000		77000	69705	70217	54525
2003	Fish at F = 0.23	60000		73000	65669	66489	77838
2004	Recovery plan	-		61000	61008	61436	54605
2005	Rebuild the SSB above B _{pa} in 2006	35000		59000	54908	55700	54169
2006	Rebuild the SSB above B _{pa} in 2007	48000		57000	55933	57943	61917
2007	Rebuild the SSB above B _{pa} in 2008	< 32000		50000	49031	49744	39511
2008	Rebuild the SSB above B _{pa} in 2009	< 35000		49000	47682	48875	45950
2009	Limit total landings to 55 500 t	< 55500		55500	NA	54973	45292
2010	Limit total landings to 63 825 t	< 63800		63800	50666	60674	45728
2011	See scenarios	< 64200		73400	65923	67386	40553
2012	Apply first stage of the management plan	< 84410		84400	71246	73830	59068
2013	Apply first stage of the management plan	< 97070		97100	78982	78905	38864
2014	Apply first stage of the management plan	< 111631		111600	69179	70847	51915
2015	(November update) Apply second stage of the management plan	< 128376	179301	128376	74807	74963	49432
2016	Apply second stage of the management plan	-	≤ 216345 [^]	131714	78659	81059	42063 ^{^^}
2017	MSY approach	-	≤ 158201 [^]	129917	64352	65442	37613 ^{^^}
2018	MSY approach	-	≤ 142481 [^]	112643			
2019	MSY approach	-	≤ 142217 [^]				

* Catch at *status quo* F.

** Catch at 20% reduction in F.

*** After revision from 77 000 t.

[^] From 2016 onwards, the advice is for the combined North Sea and Skagerrak stock.

^{^^} Since 2016 discards correspond to unwanted catch (including BMS landings).

NA = not available.

Table 8 Plaice in Subdivision 20. ICES advice, TAC, and ICES estimates of landings and discards. All weights are in tonnes. Advice until 2012 was given for Skagerrak and Kattegat separately. Since 2016 the Skagerrak component has been merged with plaice in Subarea 4.

Year	ICES advice	Landings corresponding to advice	Catch corresponding to advice	Agreed TAC	ICES landings	ICES discards
1992	TAC	14000		11200	9554	
1993	Precautionary TAC	-		11200	9854	
1994	If required, precautionary TAC	-		11200	9551	
1995	If required, precautionary TAC	-		11200	9380	
1996	If required, precautionary TAC	-		11200	8003	
1997	No advice	-		11200	7814	
1998	No increase in F from the present level	11900		11200	6449	
1999	No increase in F from the present level	11000		11200	7049	
2000	$F < F_{pa}$	11800		11200	6989	
2001	$F < F_{pa}$	9400		9400	9231	
2002	$F < F_{pa}$	8510		6420	7102	574
2003	$F < F_{pa}$	18400		10400	7143	1437
2004	$F < F_{pa}$	*		9500	8033	2873
2005	$F < F_{pa}$	< 9500		7600	6099	2081
2006	No increase in F	< 9600		7600	8345	2243
2007	Maintain current TAC	< 9600		8500	7621	2862
2008	No increase in catch	< 9400		9300	8356	1043
2009	Same advice as last year	< 9400		9300	6514	610
2010	Same advice as last year	< 9400		9300	8700	842
2011	Last three years' average landings (2007–2009)	< 8000		7900	8218	1040
2012	Reduce catch	-		7900	7680	846
2013	Increase catch by 7% – protect Eastern component		< 8400	9142	6812	1161
2014	Increase catch by 7% – protect Eastern component	< 8972	< 10196	10056	9213	1022
2015	Decrease catch (2012–2013) by 13% – protect Eastern component	≤ 6287	≤ 7232	10056	9804	676
2016	Apply second stage of the management plan	-	≤ 216345 [^]	11766	10900	1908 ^{**}
2017	MSY approach	-	≤ 158201 [^]	17639	8775	1353 ^{**}
2018	MSY approach	-	≤ 142481 [^]	15343		
2019	MSY approach	-	≤ 142217 [^]			

* The exploitation of this stock should be conducted in the context of mixed fisheries.

** Since 2016 discards correspond to unwanted catch (including BMS landings).

[^] From 2016 onwards, the advice is for the combined North Sea and Skagerrak stock.

History of the catch and landings

Table 9 Plaice in Subarea 4 and Subdivision 20. Catch distribution by fleet in 2017 as estimated by ICES. Weights are in tonnes.

Catch (2017)	Wanted catch			Unwanted catch
	Beam trawl 53%	Trawl 36%	Other 11%	
113184	74217			38967

Table 10 Plaice in Subarea 4 and Subdivision 20. History of official commercial catch and landings of plaice in Subarea 4, along with ICES estimates for individual areas. All weights are in tonnes.
 NS = North Sea, SK = Skagerrak.

Year	Belgium NS	Denmark NS	France NS	Germany NS	Netherlands NS	Norway NS	Sweden NS	UK NS	Others NS	Landings (official) NS	Total landings NS (ICES estimates)	Landings SK (ICES estimates)	Landings NS+SK (ICES estimates)	Discards NS+SK (ICES estimates)	Landings SK (official)	BMS landings (official)
1980	7005	27057	711	4319	39782	15	7	23032	0	101928	139951	10510	150461	31080	-	
1981	6346	22026	586	3449	40049	18	3	21519	0	93996	139697	8501	148198	33031		
1982	6755	24532	1046	3626	41208	17	6	20740	0	97930	154546	8073	162619	49127		
1983	9716	18749	1185	2397	51328	15	22	17400	0	100812	144030	7130	151160	74483		
1984	11393	22154	604	2485	61478	16	13	16853	0	114996	156149	7921	164070	70816		
1985	9965	28236	1010	2197	90950	23	18	15912	0	148311	159838	10095	169933	60549		
1986	7232	26332	751	1809	74447	21	16	17294	0	127902	165347	11378	176725	129953		
1987	8554	21597	1580	1794	76612	12	7	20638	0	130794	153670	12503	166173	190524	15694	
1988	11527	20259	1773	2566	77724	21	2	24497	43	138412	154475	10820	165295	156423	12858	
1989	10939	23481	2037	5341	84173	321	12	26104	0	152408	169818	5997	175815	107793	7710	
1990	13940	26474	1339	8747	78204	1756	169	25632	0	156261	156240	10048	166288	71225	12078	
1991	14328	24356	508	7926	67945	560	103	27839	0	143565	148003	6679	154682	80935	8685	
1992	12006	20891	537	6818	51064	836	53	31277	0	123482	125190	9554	134744	57049	11823	
1993	10814	16452	603	6895	48552	827	7	31128	0	115278	117113	9854	126967	35016	11407	
1994	7951	17056	407	5697	50289	524	6	27749	0	109679	110392	9551	119943	23785	11334	
1995	7093	13358	442	6329	44263	527	3	24395	0	96410	98356	9380	107736	21828	10766	
1996	5765	11776	379	4780	35419	917	5	20992	0	80033	81673	8003	89676	52049	10517	
1997	5223	13940	254	4159	34143	1620	10	22134	0	81483	83048	7814	90862	100145	10292	
1998	5592	10087	489	2773	30541	965	2	19915	1	70365	71534	6449	77983	103751	8431	
1999	6160	13468	624	3144	37513	643	4	17061	0	78617	80662	7049	87711	70976	8719	
2000	7260	13408	547	4310	35030	883	3	20710	0	82151	81150	6989	88139	44311	8826	
2001	6369	13797	429	4739	33290	1926	3	19147	0	79700	81847	9231	91078	100309	11653	
2002	4859	12552	548	3927	29081	1996	2	16740	0	69705	70217	7102	77319	55099	8789	
2003	4570	13742	343	3800	27353	1967	2	13892	0	65669	66489	7143	73632	79275	9110	
2004	4314	12123	231	3649	23662	1744	1	15284	0	61008	61436	8033	69469	57478	9090	
2005	3396	11385	112	3379	22271	1660	0	12705	0	54908	55700	6099	61799	56250	6764	
2006	3487	11907	132	3599	22764	1614	0	12429	0	55933	57943	8345	66288	64160	9565	
2007	3866	8128	144	2643	21465	1224	4	11557	0	49031	49744	7621	57365	42373	8747	
2008	3396	8229	125	3138	20312	1051	20	11411	0	47682	48875	8356	57231	46993	8657	
2009	3474	N/A*	N/A*	2931	29142	1116	1	13143	0	N/A*	54973	6514	61487	45902	6748	
2010	3699	435	383	3601	26689	1089	5	14765	0	50666	60674	8700	69374	46570	9057	
2011	4466	11634	344	3812	29272	1223	3	15169	0	65923	67386	8218	75604	41593	8251	

Year	Belgium NS	Denmark NS	France NS	Germany NS	Netherlands NS	Norway NS	Sweden NS	UK NS	Others NS	Landings (official) NS	Total landings NS (ICES estimates)	Landings SK (ICES estimates)	Landings NS+SK (ICES estimates)	Discards NS+SK (ICES estimates)	Landings SK (official)	BMS landings (official)
2012	4862	12245	281	3742	32201	1022	5	16888	0	71246	73830	7680	81510	59914	7611	
2013	6462	13650	249	4903	33537	843	3	19334	0	78982	78905	6812	85717	40025	6911	
2014	7105	12004	276	4203	29309	577	5	17370	0	69179	70847	9213	80060	52937	9004	
2015	5522	14401	223	5171	32074	169	7	17240	0	74807	74963	9804	84767	50108	10171	
2016	6659	16398	169	4371	32227	94	9	18731	0	78659	81059	10900	91959	43970	10883	
2017	5317	12518	151	2526	28775	67	5	14993	0	64352	65442	8775	74217	38967	8467	5

* N/A = not available.

Table 11 Plaice in Subarea 4 and Subdivision 20. ICES estimated landings for plaice in Subdivision 20 for each country participating in the fishery. All weights are in tonnes.

Year	Denmark	Sweden	Germany	Belgium	Norway	Netherlands	Total landings SD 20	BMS landings (official)
1972	5095	70			3		5168	
1973	3871	80			6		3957	
1974	3429	70			5		3504	
1975	4888	77			6		4971	
1976	9251	51		717	6		10025	
1977	12855	142		846	6		13849	
1978	13383	94		371	9		13857	
1979	11045	67		763	9		11884	
1980	9514	71		914	11		10510	
1981	8115	110		263	13		8501	
1982	7789	146		127	11		8073	
1983	6828	155		133	14		7130	
1984	7560	311		27	22		7920	
1985	9646	296		136	18		10096	
1986	10645	202		505	26		11378	
1987	11327	241		907	27		12502	
1988	9782	281		716	41		10820	
1989	5414	320		230	33		5997	
1990	8729	779		471	69		10048	
1991	5809	472	15	315	68		6679	
1992	8514	381	16	537	106		9554	
1993	9125	287	37	326	79		9854	
1994	8783	315	37	325	91		9551	
1995	8468	337	48	302	224		9379	
1996	7304	260	11		428		8003	
1997	7306	244	14		249		7813	
1998	6132	208	11		98		6449	
1999	6473	233	7		336		7049	
2000	6680	230	5		67		6982	
2001	9045	125			61		9231	
2002	6773	141	3		164	3	7084	
2003	5079	143	8		385	1484	7098	
2004	5999	545	67		111	1288	8011	
2005	4684	554	14		9	823	6084	
2006	6563	366	21		352	1059	8361	
2007	5656	281	21		166	1503	7626	
2008	7163	220	17		117	775	8292	
2009	5828	92	13		62	506	6500	
2010	7101	127	13		103	1331	8676	
2011	7746	179	13		230	15	8183	
2012	7338	155	12		136	10	7651	
2013	6326	160	10		138	181	6815	
2014	7484	240	46		48	506	8324	
2015	7808	274	14		69	1639	9804	
2016	8035	218	14	0	84	2550	10900	
2017	6864	159	11	0	154	1588	8775	2

Summary of the assessment

Table 12 Plaice in Subarea 4 and Subdivision 20. Assessment summary. Recruitments are in thousands. Weights are in tonnes. High and low are ± 2 standard error (approximately 95% confidence intervals).

Year	Recruitment age 1	Low	High	Spawning-stock biomass	Low	High	Fishing mortality ages 2–6	Low	High	Wanted catch*	Unwanted catch*, **
	thousands			tonnes						tonnes	
1957	477074	419798	541701	342223	296354	388086	0.24	0.21	0.28	70563	7880
1958	710748	626535	806162	355375	309206	401534	0.28	0.25	0.31	73354	14837
1959	874712	769843	994562	362119	316250	407990	0.31	0.28	0.34	79300	29864
1960	797702	700660	907294	380052	334194	425906	0.32	0.29	0.36	87541	29793
1961	870799	764288	991823	391386	346534	436246	0.33	0.29	0.36	85984	32490
1962	615691	539089	703881	482245	423286	541214	0.34	0.3	0.37	87472	37903
1963	610017	535274	694860	440658	392412	488908	0.37	0.33	0.4	107118	41258
1964	2449900	2170521	2767686	430475	383644	477316	0.39	0.35	0.43	110540	37031
1965	664500	588872	750156	383583	349048	418112	0.39	0.35	0.42	97143	43080
1966	579075	513306	653026	404516	365536	443504	0.36	0.33	0.4	101834	64718
1967	428110	377209	485747	473938	431588	516292	0.35	0.32	0.38	108819	54546
1968	418228	366051	478051	458977	420112	497848	0.35	0.33	0.38	111534	27987
1969	666902	578243	768542	402865	369044	436676	0.36	0.33	0.4	121651	21169
1970	671454	583881	771852	370472	336826	404114	0.36	0.33	0.39	130342	29640
1971	433599	375834	500367	361610	330102	393118	0.37	0.33	0.4	113944	22995
1972	367450	317978	424328	366129	335212	397048	0.4	0.37	0.43	122843	19632
1973	1391430	1203391	1609358	302365	275756	328964	0.45	0.42	0.49	130429	13354
1974	1074920	922820	1252698	298094	274634	321546	0.48	0.44	0.52	112540	44945
1975	787372	673115	920183	301757	278896	324624	0.46	0.43	0.5	108536	86699
1976	674010	563485	806214	328726	305864	351596	0.44	0.4	0.47	113670	53247
1977	1033740	865711	1235139	329116	307684	350556	0.45	0.42	0.48	119188	57501
1978	879043	731128	1057752	327544	306104	348976	0.49	0.45	0.52	113984	45655
1979	915553	767850	1091049	302271	282244	322296	0.53	0.49	0.57	145347	67935
1980	1078660	919186	1265219	319090	296764	341416	0.54	0.51	0.58	140764	31080
1981	999968	856166	1166805	290780	271099	310461	0.54	0.5	0.58	141233	33031
1982	1935350	1665790	2249436	284211	265128	303292	0.53	0.49	0.56	156153	49127
1983	1375880	1170362	1618768	339238	316736	361744	0.52	0.48	0.55	145779	74483
1984	1302060	1102521	1536304	367251	344754	389746	0.52	0.49	0.56	165772	70816
1985	1792220	1512862	2123308	394666	369708	419632	0.55	0.52	0.58	171838	60549
1986	4303680	3621750	5114202	407972	384094	431846	0.59	0.55	0.63	178878	129953
1987	1910200	1627341	2243487	470952	440768	501132	0.62	0.58	0.65	168759	190524
1988	1774940	1513571	2080290	424696	397296	452104	0.63	0.59	0.67	168552	156423
1989	1250510	1077159	1451578	448230	421018	475442	0.62	0.59	0.66	178891	107793
1990	1083810	933209	1258733	396458	373140	419780	0.61	0.57	0.64	169453	71225
1991	981356	841711	1144877	356947	338005	375895	0.6	0.56	0.64	157277	80935
1992	854841	733448	996982	311431	294309	328551	0.61	0.57	0.64	136727	57049
1993	550376	473453	639340	279962	264568	295352	0.61	0.57	0.65	128506	35016
1994	566448	492607	651175	233481	220433	246527	0.6	0.56	0.63	121925	23785
1995	932162	811375	1070369	222203	208709	235691	0.6	0.56	0.64	109348	21828
1996	893056	775660	1027388	203391	190672	216108	0.64	0.6	0.69	91386	52049
1997	2431310	2138027	2765152	204948	189968	219932	0.71	0.67	0.76	92958	100145
1998	778427	689453	878829	237863	220386	255334	0.72	0.67	0.78	79810	103751
1999	683151	604538	771259	219149	202404	235896	0.65	0.61	0.69	89726	70976
2000	857525	752103	978105	230902	211987	249813	0.58	0.54	0.63	90754	44311
2001	634808	553305	728204	234211	215428	252992	0.57	0.53	0.61	92912	100309
2002	1792880	1559070	2060378	221902	201996	241804	0.59	0.55	0.64	79178	55099
2003	557844	486992	639215	248312	224094	272526	0.57	0.52	0.62	74722	79275
2004	1235790	1083373	1409027	233478	206758	260202	0.48	0.43	0.53	70511	57478
2005	863893	751065	993264	253737	223012	284468	0.39	0.34	0.43	62796	56250
2006	875191	772348	991337	284447	248038	320862	0.33	0.29	0.37	67143	64160
2007	1379750	1220533	1558450	293330	254032	332628	0.3	0.26	0.34	58576	42373

Year	Recruitment age 1	Low	High	Spawning-stock biomass	Low	High	Fishing mortality ages 2–6	Low	High	Wanted catch*	Unwanted catch*, **
	thousands			tonnes						tonnes	
2008	1135050	1011420	1273315	371837	320780	422900	0.25	0.22	0.29	58336	46993
2009	1088820	969256	1224099	453026	388658	517402	0.22	0.185	0.25	62360	45902
2010	1444570	1282549	1626010	554245	474658	633822	0.196	0.167	0.23	70340	46570
2011	1608190	1440294	1797023	575459	491462	659458	0.198	0.171	0.23	76507	41593
2012	1278010	1142811	1429733	617539	526744	708336	0.21	0.178	0.24	82018	59914
2013	1455050	1294457	1637036	709948	606664	813236	0.21	0.181	0.24	86222	40025
2014	1640700	1432131	1881022	823276	699976	946584	0.21	0.177	0.23	80686	52937
2015	895620	764514	1048639	774157	656800	891520	0.2	0.171	0.23	85360	49100
2016	1211320	983940	1490586	836453	704330	968570	0.199	0.17	0.23	92744	44205
2017	1823000	1289829	2576597	913290	765068	1061512	0.199	0.16	0.24	74928	39361
2018	1171029***			941449							

* These values include part of the catches in Division 7.d in the first quarter (Q1).

** Unwanted catch values include discards and BMS landings since 2016.

*** RCT3 estimate.

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