

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

ICES stock advice

Please note: The present advice replaces the advice given in June 2017 for catches in 2018.

ICES advises that when the MSY approach is applied, catches in 2018 should be no more than 142 481 tonnes.

Stock development over time

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

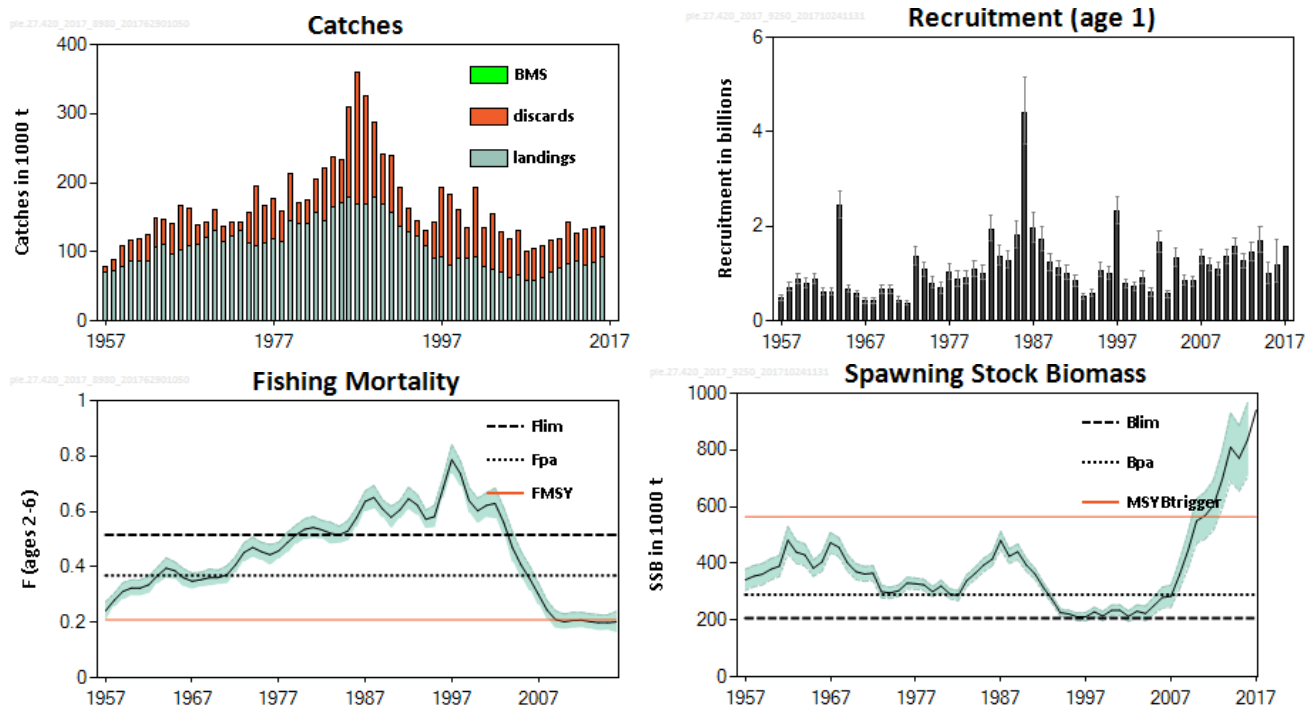


Figure 1 Plaice in Subarea 4 and Subdivision 20. Summary of the stock assessment. Shaded areas (F, SSB) and error bars (R) indicate ± 2 standard errors (approximately 95% confidence intervals).

Stock and exploitation status

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

		Fishing pressure			Stock size				
		2014	2015	2016	2015	2016	2017		
Maximum Sustainable Yield	F_{MSY}	✓	✓	✓	$MSY B_{Trigger}$	✓	✓	✓	Above trigger
Precautionary Approach	F_{pa} F_{lim}	✓	✓	✓	B_{pa} , B_{lim}	✓	✓	✓	Full reproductive capacity
Management plan	F_{MGT}	—	—	—	B_{MGT}	—	—	—	Not applicable

Catch options

Table 2 Plaice in Subarea 4 and Subdivision 20. The basis for the catch options.

Variable	Value	Source	Notes
F ages 2–6 (2017)	0.202	ICES (2017a)	Average exploitation pattern in 2014–2016, rescaled to 2016
SSB (2018)	980021	ICES (2017a)	Short-term forecast (STF), in tonnes
R _{age1} (2017)	1562822	ICES (2017a)	RCT3, in thousands
R _{age1} (2018)	969504	ICES (2017a)	Geometric mean (GM, 1957–2013), in thousands
Total catch (2017)	140662	ICES (2017a)	Short-term forecast (STF), in tonnes
Commercial landings (2017)	96853	ICES (2017a)	Average landings rate by age 2014–2016, in tonnes
Unwanted catch (2017)	43857	ICES (2017a)	Average discard rate by age 2014–2016, in tonnes

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

Basis	Total catch (2018)	Wanted catch * (2018)	Unwanted catch * (2018)	F _{total} ages 2–6 (2018)	F _{wanted} ages 2–6 (2018)	F _{unwanted} ages 2–3 (2018)	SSB (2019)	% SSB change **	% TAC change ***
ICES advice basis									
MSY approach: F _{MSY}	142481	96266	46215	0.21	0.10	0.19	1005667	3	-35
Other options									
Management Plan (MP)	196653	133233	63420	0.30	0.15	0.27	952027	-3	-10
F = 0	0	0	0	0	0	0	1149133	17	-100
F _{pa}	235496	159884	75612	0.37	0.18	0.33	913710	-7	8
F _{lim}	311202	212217	98985	0.52	0.25	0.46	839408	-14	44
SSB (2019) = B _{lim}	1003350	746845	256505	4.79	2.33	4.30	207288	-79	404
SSB (2019) = B _{pa}	902729	657496	245233	3.29	1.60	2.95	290203	-70	343
SSB (2019) = MSY B _{trigger}	597365	416579	180786	1.31	0.64	1.17	564599	-42	181
Rollover TAC	217551	147556	69995	0.34	0.16	0.30	931396	-5	0
F = F ₂₀₁₇	137462	92852	44610	0.20	0.10	0.18	1010647	3	-37
Mixed fisheries options – The mixed-fisheries considerations were published as part of the advice in June 2017 and have not been updated.									
A: Max.	341557			0.65			745833	-25	
B: Min.	106733			0.17			978476	-2	
C: HAD	135962			0.21			978944	-2	
D: POK	185735			0.36			794999	-20	
E: SQ effort	164199			0.28			890225	-11	
F: Value	146365			0.24			938847	-6	
G: Range	140112			0.22			969778	1	

* “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 2014–2016. 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 2018. The subtracted value (946 t of wanted catch and 459 t of unwanted catch) is estimated based on the plaice catch advice for Division 7.d for 2017, using the recent 11-year average (2006–2016) proportion of plaice from Subarea 4 in the annual plaice landings in Division 7.d.

** SSB 2019 relative to SSB 2018.

*** Wanted catch in 2018 relative to the combined TAC of Subarea 4 and Subdivision 20 in 2017 (147 556 t), ignoring that large mesh trawlers (TR1 and BT1) are under landing obligation since 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 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. HAD: Each fleet stops fishing when its individual haddock share is exhausted.
- D. POK: Each fleet stops fishing when its individual saithe share is exhausted.
- E. SQ (*status quo*) effort scenario: The effort of each fleet in 2017 and 2018 is as in 2016.
- F. 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.
- G. Range scenario: where 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).

Basis of the advice

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

Advice basis	MSY approach
Management plan	The EU management plan (EU, 2007) for North Sea plaice and sole does not cover the current stock area for this stock. ICES evaluated the plan (ICES, 2010) and found it to be precautionary for the North Sea component. ICES was requested to provide advice based on the MSY approach and to include the management plan as a catch option.

Quality of the assessment

Since 2015, plaice in the Skagerrak has been assessed together with the North Sea stock (ICES, 2015). In addition, part of the catches in Division 7.d in the first quarter (Q1) are included in the North Sea plaice assessment because North Sea plaice migrates into the area in that season (ICES, 2010). Since 2016, 50% of the mature catches from Division 7.d in Q1 were added to the North Sea plaice catches due to the migration of the North Sea plaice in that season (ICES, 2010), whereas previously 50% of the total catches in Q1 were added. Catches of North Sea plaice in Division 7.d comprise around 1% of the total catch for the North Sea stock in recent years.

The assessment was conducted after a benchmark in 2017 (ICES, 2017b). Tuning surveys were expanded to include IBTS quarters 1 and 3. The assessment model was changed from XSA to a smoother-based age-structured stock assessment (Aarts and Poos, 2009). Natural mortality and the maturity ogive were re-assessed, but it was decided to keep the historical parameters. Reference points were updated, and $MSY B_{trigger}$ has been changed substantially.

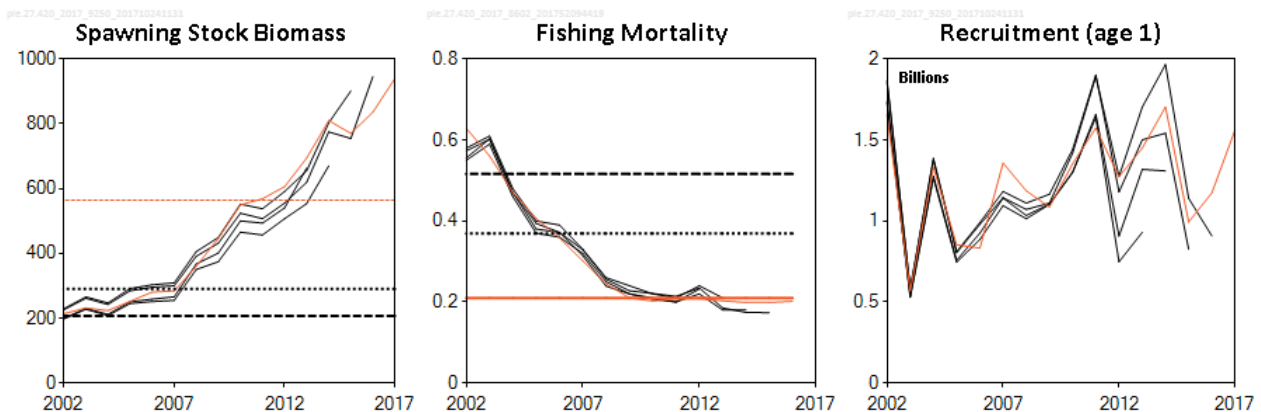


Figure 2 Plaice in Subarea 4 and Subdivision 20. Historical assessment results.

Issues relevant for the advice

Based on the survey information (IBTS Q3) that has become available in summer 2017, the advice has been updated from that released in June 2017 (ICES, 2017c).

ICES previously provided advice on the F_{MSY} range for this stock in 2015 (ICES, 2015). F_{MSY} was revised in 2017 and the F_{MSY} range was updated as follows:

Description	Value	Source
F_{MSY} lower	0.146	ICES (2017b)
F_{MSY} upper	0.30	ICES (2017b)

Since 2016, large mesh trawlers (TR1 and BT1) are under landing obligation in Subarea 4.

It is expected that under the EU landing obligation, below minimum size fish that would formerly have been discarded would now be reported as below minimum size (BMS) landings in logbooks. However, BMS landings reported to ICES may be lower than expected for several reasons: fish caught below minimum size could either not have been landed and not recorded in logbooks, or they are landed but not recorded as BMS. Furthermore, BMS landings recorded in logbooks may not have been reported to ICES.

In the case of plaice, there is no indication that fish that would formerly have been discarded are being reported as BMS, based on the observation that BMS landings reported to ICES are currently much lower than the estimates of discards from observer programmes, which estimate discards at 32% of the total catch.

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. There are also local plaice components resident 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 and catches should not increase in the eastern Skagerrak to avoid local depletion.

Results from a North Sea mixed-fisheries analysis are presented in ICES (2017d); this analysis has not been updated. The analysis for 2018, assuming a strictly implemented discard ban (corresponding to the "Minimum" scenario), indicated that whiting would be the most limiting stock, being estimated to constrain 24 out of 42 fleet segments. Haddock is the second most limiting stock, constraining eight fleet segments. Additionally, if Norway lobster was managed by separate TACs for the individual functional units (FUs), Norway lobster in FU 6 would be considered the most limiting stock for ten fleet segments. Conversely, in the "Maximum" scenario, saithe and eastern English Channel plaice would be least limiting for 20 and 11 fleet segments, respectively. Finally, if Norway lobster was managed by separate TACs, Norway lobster in FUs 7, 5, 33, and outside the FUs in Subarea 4 would be the least limiting for nine, two, one, and two fleet segments, respectively. 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 2018 within the F_{MSY} range. This scenario returns a fishing mortality by stock which, if used for setting single-stock fishing opportunities for 2018, may reduce the gap between the most and the least restrictive TACs, thus reducing the potential for quota over- and undershoot. This "Range" scenario suggests that the potential for mixed-fisheries mismatch would be lowered with a 2018 TAC in the lower part of the F_{MSY} range for eastern English Channel plaice and saithe, and in the upper part of the range for cod and North Sea plaice.

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 $B_{trigger}$	564599 t	Fifth percentile of the current SSB ($SSB_{2015}/1.4$), as estimated at the benchmark	ICES (2017b)
	F_{MSY}	0.210	EQsim analysis based on the recruitment period 1958–2012	ICES (2017b)
Precautionary approach	B_{lim}	207288 t	Break-point of hockey stick stock–recruit relationship, based on the recruitment period 1958–2012	ICES (2017b)
	B_{pa}	290203 t	$B_{lim} \times \exp(1.645 \times 0.2) \approx 1.4 \times B_{lim}$	ICES (2017b)
	F_{lim}	0.516	EQsim analysis based on the recruitment period 1958–2012	ICES (2017b)
	F_{pa}	0.369	$F_{lim} \times \exp(-1.645 \times 0.2) \approx F_{lim} / 1.4$	ICES (2017b)
Management plan	SSB_{mgt}	230000 t	Stage one: Article 2	EU management plan (EU, 2007)
	F_{mgt}	0.30	Management strategy evaluation	EU management plan (EU, 2007)

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, 2016)
Assessment type	An age structured stock assessment, based on Aarts and Poos (2009), that uses catches in the model and the forecast
Input data	Commercial catch, ages and length frequencies from port and observer sampling. Six survey indices: combined BTS (Tridens, Isis, Belgica, Solea, UK-BTS; 1996–2016), BTS-Isis (1985–1995), SNS (split into two series, SNS1 1970–1999 and SNS2 2000–2016), IBTS Q1 (2007–2016), and IBTS Q3 (1997–2016). 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, 2017b).
Discards, BMS landings, and bycatch	Included in the assessment, data series from the majority of the fleet. In 2016 81% of the total discards in Subarea 4 were obtained from sampling. For Subdivision 20, 34% of the total discards were obtained from sampling. BMS landings, where reported, are included with discards as unwanted catch in the assessment from 2016.
Indicators	IBTS and commercial CPUE indicators in Subdivision 20
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 2000–2015. 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, 2017b).
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 additional available information for this stock.

History of the advice, catch, and management

Table 7 Plaice in Subarea 4. ICES advice and official landings. All weights are in tonnes.

Year	ICES advice	Predicted landings corresp. to advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES landings	ICES discards	BMS reported to ICES
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	Status quo 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	20
2017	MSY approach	-	≤ 158201 [^]	129917				
2018	MSY approach	-	≤ 142481 [^]					

* 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.

NA = not available.

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

Year	ICES advice	Predicted landings corresp. to advice	Predicted catch corresp. to advice	Agreed TAC	ICES landings	ICES discards	BMS reported to ICES
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	-	-	-	11766	10900	1908	0.49
2017	-	-	-	17639			
2018	-	-	-				

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

History of the catch and landings

Table 9 Plaice in Subarea 4 and Subdivision 20. Catch distribution by fleet in 2016 as estimated by ICES. Weights are in tonnes.

Catch (2016)	Wanted catch			Unwanted catch	
	Beam trawl 62%	Trawl 30%	Other 8%	Discards	BMS
135950	91959			43970	21

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)
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
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

* 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
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	8981
2015	7808	274	14		69	1639	9804
2016	8035	218	14	0	84	2550	10900

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 thousands	Low	High	Spawning- stock biomass	Low	High	Fishing mortality Ages 2–6	Low	High	Wanted catch	Unwanted catch*
1957	475276	421161	536719	342134	304818	379442	0.24	0.21	0.27	70563	7880
1958	710510	629726	802077	355228	317688	392772	0.28	0.25	0.30	73354	14837
1959	876603	775867	990796	361918	324662	399178	0.31	0.28	0.34	79300	29864
1960	789141	697284	893634	379581	342286	416874	0.32	0.30	0.35	87541	29793
1961	878551	775476	995269	390555	353858	427242	0.32	0.29	0.35	85984	32490
1962	614870	540628	699075	481698	433694	529706	0.34	0.30	0.37	87472	37903
1963	614690	541852	697496	439847	400274	479426	0.37	0.34	0.40	107118	41258
1964	2435440	2164872	2741808	430218	391780	468660	0.40	0.36	0.43	110540	37031
1965	667809	593824	751376	383318	354490	412150	0.39	0.35	0.42	97143	43080
1966	579750	515954	650976	405151	372620	437680	0.36	0.33	0.39	101834	64718
1967	424497	375888	479718	473182	437468	508892	0.35	0.32	0.38	108819	54546
1968	417472	367455	474323	456929	423826	490034	0.35	0.33	0.38	111534	27987
1969	668795	584283	765175	402002	373660	430340	0.36	0.33	0.39	121651	21169
1970	671843	587588	768517	371011	343054	398966	0.36	0.34	0.39	130342	29640
1971	436656	380512	501184	362809	336620	389000	0.37	0.34	0.40	113944	22995
1972	367347	320450	421055	365750	339796	391704	0.41	0.38	0.44	122843	19632
1973	1361240	1186096	1562538	300367	278190	322550	0.45	0.42	0.49	130429	13354
1974	1079870	936258	1244636	296348	276557	316143	0.47	0.43	0.51	112540	44945
1975	799278	687294	928645	303466	283366	323574	0.46	0.42	0.49	108536	86699
1976	684635	578029	811484	330752	310318	351182	0.44	0.41	0.48	113670	53247
1977	1030590	873356	1217003	328754	309228	348272	0.46	0.43	0.49	119188	57501
1978	875828	734797	1044083	324458	305368	343552	0.49	0.45	0.52	113984	45655
1979	910524	775966	1068895	300491	282812	318168	0.52	0.48	0.55	145347	67935
1980	1080290	927661	1258685	320390	300124	340656	0.54	0.50	0.57	140764	31080
1981	1010250	872420	1170538	293392	275853	310927	0.54	0.50	0.58	141233	33031
1982	1941050	1679727	2244196	286215	268417	304023	0.53	0.50	0.57	156153	49127
1983	1363380	1168772	1588874	339008	318390	359630	0.52	0.48	0.56	145779	74483
1984	1282770	1103253	1492892	365104	343548	386652	0.52	0.48	0.55	165772	70816
1985	1806160	1536393	2124511	394412	370436	418384	0.53	0.49	0.57	171838	60549
1986	4389140	3742169	5151631	414899	391848	437952	0.58	0.54	0.61	178878	129953
1987	1953250	1669162	2285666	481114	449630	512590	0.64	0.60	0.67	168759	190524
1988	1724090	1484998	2000837	425331	399506	451154	0.65	0.61	0.69	168552	156423
1989	1224500	1064596	1408300	441343	413748	468932	0.61	0.58	0.64	178891	107793
1990	1110790	963144	1282141	394926	372788	417072	0.58	0.54	0.62	169453	71225
1991	1004210	867244	1163478	364116	344742	383498	0.61	0.57	0.64	157277	80935
1992	838128	722070	972983	315700	298549	332851	0.65	0.60	0.69	136727	57049
1993	511439	445050	587751	274439	260313	288567	0.62	0.59	0.66	128506	35016
1994	572617	501047	654446	226610	213895	239325	0.57	0.54	0.61	121925	23785
1995	1071900	928803	1237184	222254	209846	234654	0.58	0.54	0.62	109348	21828
1996	1004330	873923	1154586	211544	198138	224942	0.68	0.65	0.72	91386	52049
1997	2308750	2039489	2612426	212127	196834	227426	0.79	0.73	0.84	92958	100145
1998	774939	688482	873057	229506	213491	245529	0.74	0.69	0.78	79810	103751
1999	728518	643232	825496	214732	198520	230940	0.64	0.59	0.69	89726	70976
2000	916459	800981	1048015	234642	216228	253052	0.60	0.56	0.65	90754	44311
2001	601963	527100	687525	235083	216112	254048	0.62	0.58	0.67	92912	100309
2002	1659280	1456027	1891306	213591	194941	232239	0.63	0.57	0.68	79178	55099
2003	568719	497829	649519	231608	209030	254190	0.56	0.51	0.61	74722	79275

Year	Recruitment Age 1 thousands	Low	High	Spawning- stock biomass	Low	High	Fishing mortality Ages 2–6	Low	High	Wanted catch	Unwanted catch*
2004	1331210	1160245	1528593	223538	197904	249176	0.47	0.42	0.53	70511	57478
2005	853271	751337	969359	251805	221566	282034	0.41	0.36	0.46	62796	56250
2006	832698	738674	937890	280355	243800	316900	0.36	0.31	0.40	67143	64160
2007	1357950	1208780	1524044	284014	245178	322842	0.30	0.26	0.34	58576	42373
2008	1186450	1056745	1330807	360136	309736	410544	0.24	0.21	0.28	58336	46993
2009	1086170	962077	1225856	445985	382810	509170	0.21	0.178	0.24	62360	45902
2010	1353540	1210464	1512820	549923	471586	628254	0.20	0.175	0.23	70340	46570
2011	1574020	1405042	1762814	568768	486192	651348	0.21	0.178	0.24	76507	41593
2012	1272860	1131533	1432477	605787	517092	694488	0.21	0.180	0.24	82018	59914
2013	1449990	1268792	1656842	694432	593664	795196	0.20	0.175	0.23	86222	40025
2014	1704070	1450168	2004309	809922	689572	930268	0.20	0.170	0.23	80686	52937
2015	993983	798508	1236135	770556	655372	885748	0.20	0.171	0.23	85360	49100
2016	1173720	802735	1717225	836066	705542	966598	0.20	0.164	0.24	92744	44205
2017	1562822**			940411							

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

** RCT3.

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