

Cod (*Gadus morhua*) in Subarea 4, Division 7.d, and Subdivision 20 (North Sea, eastern English Channel, Skagerrak)

ICES advice on fishing opportunities

Please note: The present advice replaces the advice given in June 2022 for catches in 2023.

ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 26 008 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} and spawning-stock size is below MSY $B_{trigger}$, B_{pa} , and B_{lim} .

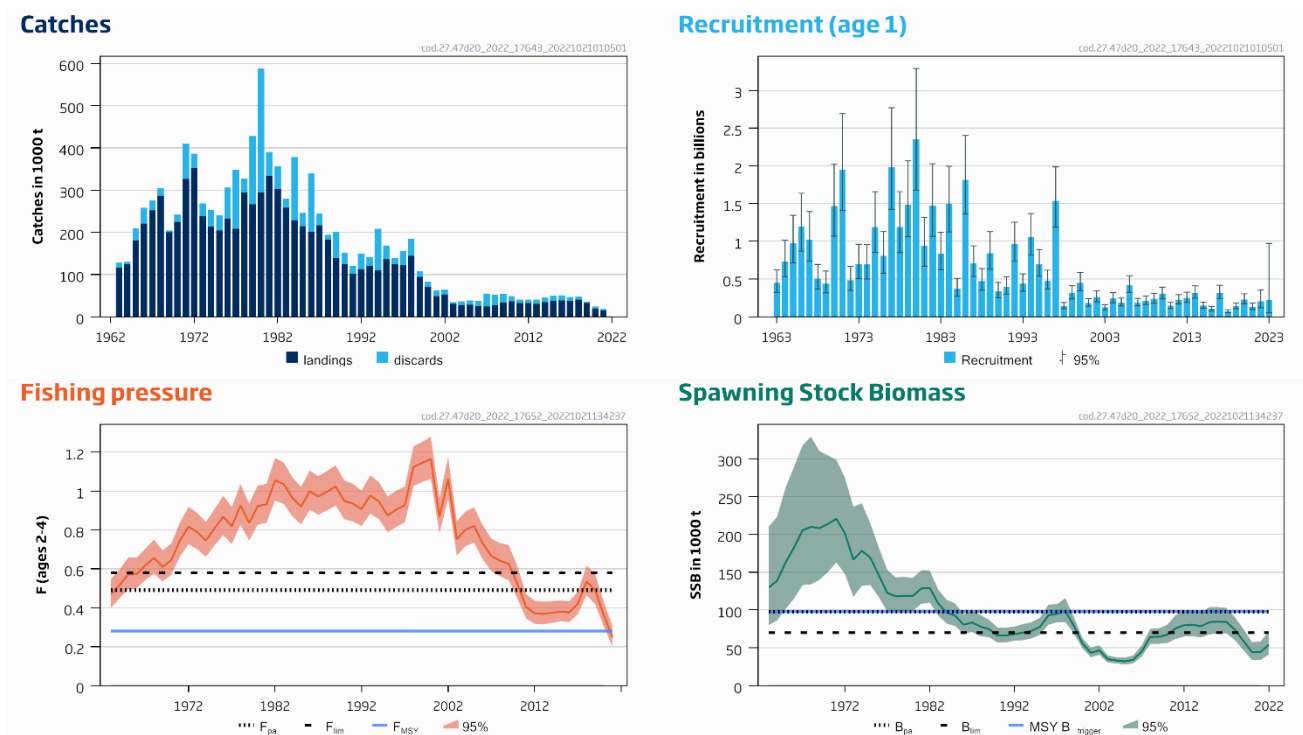


Figure 1 Cod in Subarea 4, Division 7.d, and Subdivision 20. Summary of the stock assessment.

Catch scenarios

Table 1 Cod in Subarea 4, Division 7.d, and Subdivision 20. Values in the forecast and for the interim year.

Variable	Value	Notes
$F_{ages\ 2-4}$ (2022)	0.179	Based on the assumed total catch (2022) and exploitation pattern in 2021
SSB (2023)	73 038	Short-term forecast; tonnes
$R_{age\ 1}$ (2022)	201 238	Median recruitment estimate in 2022; thousands
$R_{age\ 1}$ (2023)	233 050	Median recruitment estimate in 2023; thousands
Total catch (2022)	17 789	Sum of projected landings and projected discards; tonnes
Projected landings (2022)	15 098	Estimated from 2022 quarter 1 and 2 landings data; tonnes
Projected discards (2022)	2691	Assuming 2021 discards ratio at age; tonnes

Table 2 Cod in Subarea 4, Division 7.d, and Subdivision 20. Annual catch scenarios. All weights are in tonnes (t).

Basis	Total catch (2023)	Projected landings (2023)	Projected discards* (2023)	F _{total} (ages 2–4) (2023)	F _{projected} landings (ages 2–4) (2023)	F _{projected} discards (ages 2–4) (2023)	SSB (2024)	% SSB change **	% TAC change ***	% advice change ^	% probability of falling below B _{lim} in 2024 ^^
ICES advice basis											
MSY approach: F _{MSY} × SSB (2023) /MSY B _{trigger}	26008	21785	4223	0.21	0.166	0.043	91130	25	63	82	7.5
Other scenarios											
F = F _{MSY lower} × SSB (2023) /MSY B _{trigger}	17863	14989	2874	0.139	0.110	0.029	97892	34	12.3	25	3.4
F = 0	0	0	0	0.00	0.00	0.00	112672	54	-100	-100	0.30
F _{pa}	53641	44359	9282	0.49	0.39	0.100	69181	-5.3	240	280	52
F _{lim}	61064	50279	10785	0.58	0.46	0.119	63339	-13.3	280	330	67
SSB (2024) = B _{lim}	52784	43673	9111	0.48	0.38	0.098	69841	-4.4	230	270	50
SSB (2024) = MSY B _{trigger} = B _{pa}	17997	15099	2898	0.140	0.111	0.029	97777	34	13.1	26	3.6
TAC (2022) -20%	12729	10699	2030	0.097	0.077	0.020	102182	40	-20.0	-10.8	2.2
TAC (2022) -15%	13524	11368	2156	0.104	0.082	0.022	101533	39	-15.0	-5.3	2.5
TAC (2022) -10%	14320	12032	2288	0.110	0.087	0.023	100877	38	-10.0	0.31	2.7
TAC (2022) -5%	15116	12698	2418	0.116	0.093	0.023	100207	37	-5.0	5.9	2.8
TAC (2022)	15911	13370	2541	0.123	0.098	0.025	99554	36	0.00	11.5	2.8
TAC (2022) +5%	16707	14041	2666	0.129	0.103	0.026	98892	35	5.0	17.0	3.3
TAC (2022) +10%	17502	14696	2806	0.136	0.108	0.028	98200	34	10.0	23	3.4
TAC (2022) +15%	18297	15346	2951	0.143	0.113	0.030	97502	33	15.0	28	3.7
TAC (2022) +20%	19093	16011	3082	0.149	0.119	0.030	96820	33	20.0	34	4.1
F = F ₂₀₂₂	22523	18897	3626	0.179	0.142	0.037	93985	29	42	58	5.6
F = F _{MSY lower}	23374	19604	3770	0.186	0.148	0.038	93301	28	47	64	5.9
F = F _{MSY}	33693	28121	5572	0.28	0.22	0.057	84708	16.0	112	136	14.9

* Including below minimum size (BMS) landings, assuming recent discard rate.

** SSB 2024 relative to SSB 2023.

*** Total catch in 2023 relative to TAC in 2022: North Sea (13 246 t) + Skagerrak (1893 t) + eastern English Channel (772 t) = 15 911 t.

^ Total catch in 2023 relative to advice value for 2022 (14 276 t).

^^ This probability relates to the short-term probability of SSB < B_{lim} and is not comparable to the long-term probability of SSB < B_{lim} tested in simulations when estimating fishing mortality reference points.

The change in advice (+82%), comparing to last year, is due to a larger stock size estimated for the start of the advice year which leads to a higher target fishing mortality (F = 0.21 compared to F = 0.144 used last year), according to the MSY approach.

Basis of the advice

Table 3 Cod in Subarea 4, Division 7.d, and Subdivision 20. The basis of the advice.

Advice basis	ICES MSY approach
Management plan	ICES is aware of the EU multiannual management plan (MAP) that has been agreed for this stock (EU, 2018) and considers it to be precautionary. There is no agreement with Norway and the UK regarding this plan, and it is not used as the basis of the advice for this shared stock. ICES provides catch scenarios consistent with the F _{MSY} ranges in the MAP.

Quality of the assessment

Stock identity remains an issue with this assessment, with multiple populations inhabiting the North Sea and extending to neighbouring areas (ICES, 2020a). The 2021 benchmark introduced an *ad hoc* adjustment on natural mortality of ages 3+ from 2011 to account for migration to the West of Scotland area, which is not included in the assessment area.

The proportion of landings sampled for ages was lower in 2020 (75%) and 2021 (78%) than in 2019 (89%), likely because of the COVID-19 situation. Weights-at-age in the catch and selectivity patterns, however, did not exhibit unreasonable deviations from the previous years.

A combination of several major storms and mechanical issues with some vessels resulted in a reduction in the sampling coverage in the IBTS–Q1 survey in 2022. Thus, the survey data was not fully representative of the distribution of cod due to incomplete survey coverage, especially in the central and northern North Sea. However, it was considered appropriate as an abundance index.

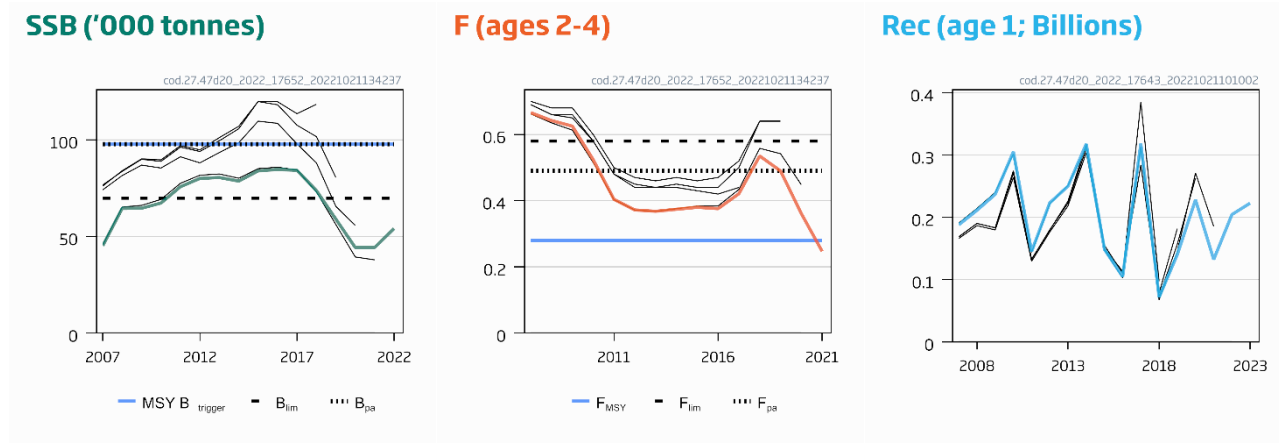


Figure 2 Cod in Subarea 4, Division 7.d, and Subdivision 20. Historical assessment results. The reference points were revised in 2021 following a benchmark, and only assessment results from the last two years should be compared to the reference points indicated.

Issues relevant for the advice

This advice is a revision of the June advice according to the reopening protocol (ICES, 2020b). The IBTS-Q3 survey shows a higher recruitment than was previously assumed which triggered the revision of the advice. The catch advice for 2023 is now based on landings data for 1 January–30 June 2022, which were used to predict annual landings and catches (assuming the same discard ratio by age as in 2021) for the intermediate year. This corresponds to a reduction in fishing mortality in the intermediate year from 0.21 in June advice to 0.179 (Table 1).

Because the SSB (2022) is currently below B_{lim} , ICES has provided the probability of SSB being below B_{lim} in 2024 for each of the scenarios presented in Table 2. Given the advised catch of 26 008 tonnes, the probability of SSB being below B_{lim} in 2024 is 7.5%.

Cod in the North Sea is under the EU landing obligation, and Norway and UK national legislation regulating discards. The below minimum size (BMS) landings of cod reported to ICES are currently negligible, and are much lower than the discards estimated by observer programmes.

Although F has reduced, recent catches have not been in line with ICES advice. The SSB remains below B_{lim} , with an ongoing high risk of impaired recruitment.

Recreational catches are estimated to account for 4.3–7.6% of total removals between 2010–2020, but values are provisional and not included in the assessment due to unknown age structure in recreational catches and high uncertainty in the estimates.

The North Sea cod stock consists of reproductively isolated populations of Viking cod and Dogger cod, with the Dogger cod population extending to Division 6a (ICES, 2020a). These genetically different groups have different rates of sexual maturity and growth.

Trends in biomass and recruitment from surveys were strongly correlated among subareas of the North Sea in the past but have diverged in the last decade, with no apparent rebuilding in the south (Figures 3–5).

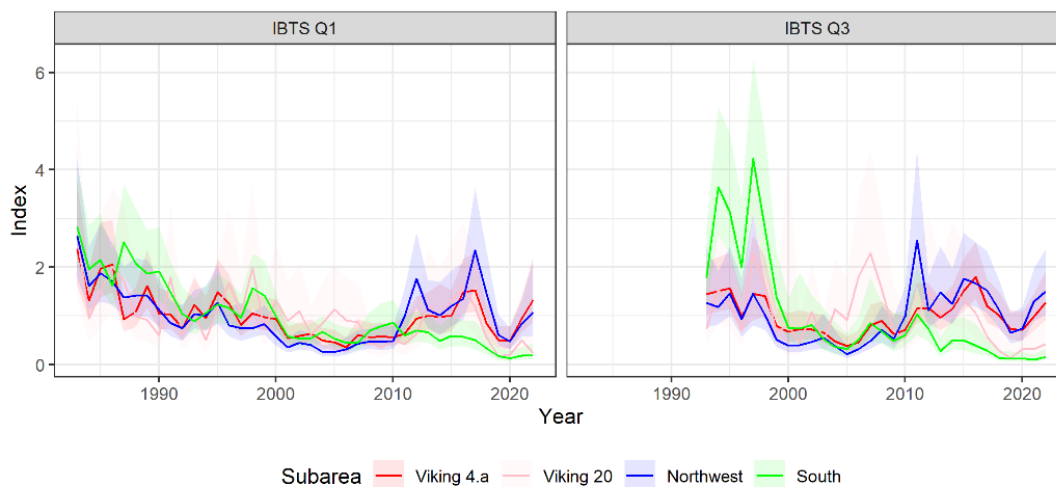


Figure 3 Cod in Subarea 4, Division 7.d, and Subdivision 20. Biomass indices by subregion (see Figure 5), based on the NS-IBTS Q1 and Q3 survey data. The indices and confidence intervals are mean standardized for each subregion.

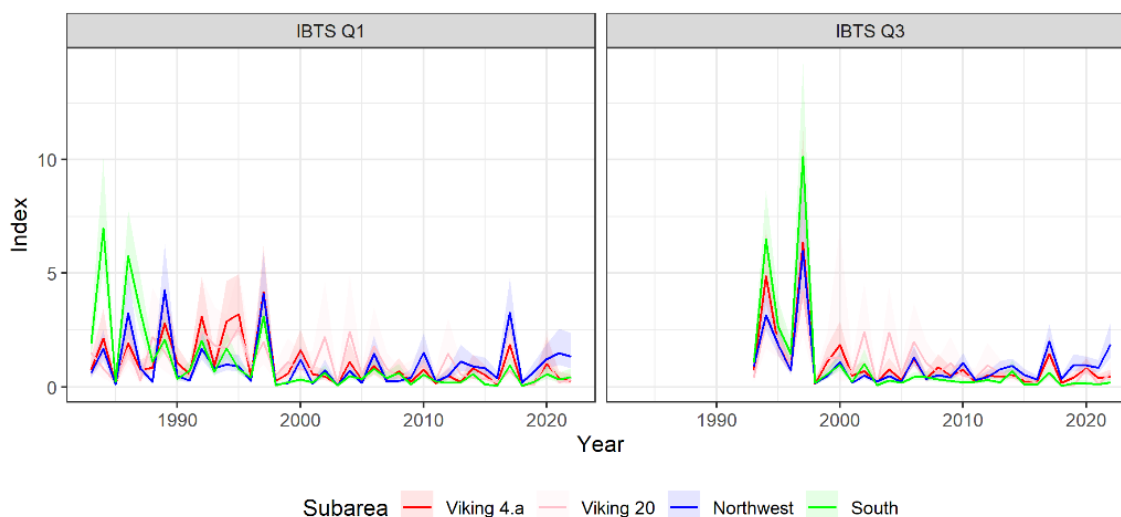


Figure 4 Cod in Subarea 4, Division 7.d, and Subdivision 20. Recruitment indices by subregion (see Figure 5), based on NS-IBTS Q1 and Q3 survey data. The indices and confidence intervals are mean standardized for each subregion.

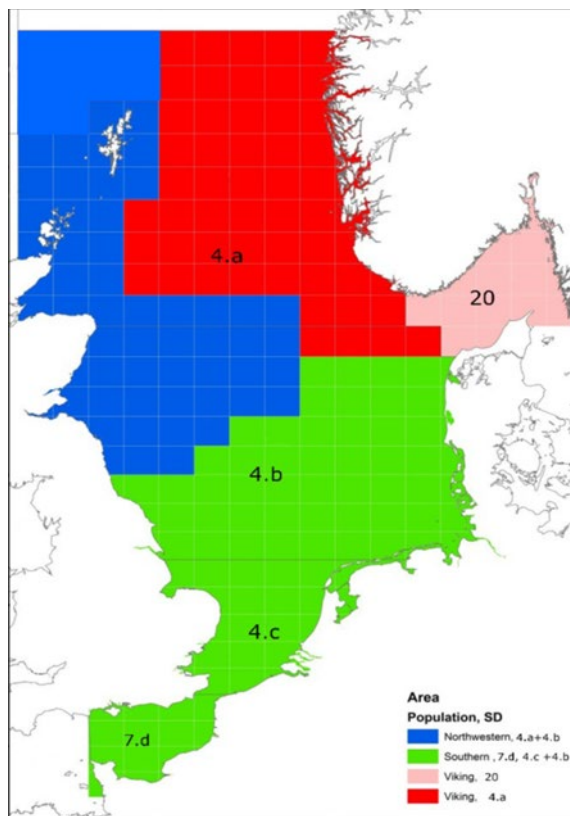


Figure 5 Cod in Subarea 4, Division 7.d, and Subdivision 20. Subregions used to derive area-specific biomass indices, based on NS-IBTS Q1 and Q3 survey data. Note that these areas are used to define the different subpopulations based on ICES (2020).

Reference points

Table 4 Cod in Subarea 4, Division 7.d, and Subdivision 20. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	97 777	B_{pa} ; in tonnes.	ICES (2021)
	F_{MSY}	0.28	Stochastic simulations (EqSim) based on the recruitment period 1998–2020	ICES (2021)
Precautionary approach	B_{lim}	69 841	$B_{pa}/1.4$; in tonnes	ICES (2021)
	B_{pa}	97 777	Highest observed SSB (1998) based on the recruitment period 1998–2020 with 2019 as the last year of catch data; in tonnes	ICES (2021)
	F_{lim}	0.58	The F that on average leads to B_{lim}	ICES (2021)
	F_{pa}	0.49	The F that provides a 95% probability for SSB to be above B_{lim} ($F_{P,0.05}$ with advice rule [AR])	ICES (2021)
EU Management Plan (MAP) EU (2018)	MAP MSY $B_{trigger}$	97 777	MSY $B_{trigger}$	ICES (2021)
	MAP B_{lim}	69 841	B_{lim}	ICES (2021)
	MAP F_{MSY}	0.28	F_{MSY}	ICES (2021)
	MAP range F_{lower}	0.186–0.28	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with F_{MSY}	ICES (2021)
	MAP range F_{upper}	0.28–0.45	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with F_{MSY}	ICES (2021)

Basis of the assessment

Table 5 Cod in Subarea 4, Division 7.d, and Subdivision 20. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2022a)
Assessment type	Age-based analytical assessment (SAM; ICES, 2022b) that uses catches in the model and in the forecast (Nielsen and Berg, 2014)
Input data	Commercial catches (international catches and ages from catch sampling by métier), two survey indices (IBTS Q1 [G1022] 1983–2022 and IBTS Q3 [G2829] 1992–2022) derived by a Delta–GAM approach; a third index for recruits is derived from the same IBTS Q3 Delta–GAM approach. Annually varying maturity data from IBTS Q1 ([G1022]; 1978–2022). Annually varying natural mortalities from the North Sea multispecies model. An <i>ad hoc</i> adjustment of M to mimic emigration of 3+ cod out of the assessment area has been implemented for M values from 2011 and onwards.
Discards, BMS landings, and bycatch	In 2021, 57% of the landings had associated discards reported to ICES and 34% were raised. Below minimum size (BMS) landings, where reported, are included with discards in the assessment from 2016.
Indicators	NS-IBTS (G1022 and G2829) biomass indices by subregion
Other information	Benchmarked in 2021 (ICES, 2021).
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 6a Cod in Subarea 4, Division 7.d, and Subdivision 20. North Sea (Subarea 4). ICES advice, TAC, official landings, and ICES estimates of landings and discards. All weights are in tonnes. Values of official landings and ICES landings for the period 1987 to 1996 are presented to the nearest thousand tonnes.

Year	ICES advice	Landings corresponding to advice	Catch corresponding to advice	Agreed TAC	Official landings*	ICES landings**	ICES discards [^]
1987	SSB recovery; TAC	100 000–125 000		175 000	167 000	182 000	
1988	70% of F (86); TAC	148 000		160 000	142 000	157 000	
1989	Halt SSB decline; protect juveniles; TAC	124 000		124 000	110 000	116 000	
1990	80% of F (88); TAC	113 000		105 000	99 000	105 000	
1991	70% of effort (89)			100 000	87 000	89 000	
1992	70% of effort (89)			100 000	98 000	97 000	
1993	70% of effort (89)			101 000	94 000	105 000	
1994	Significant effort reduction			102 000	87 000	95 000	
1995	Significant effort reduction			120 000	111 000	120 000	
1996	80% of F (94) = 0.7	141 000		130 000	107 000	107 000	
1997	80% of F (95) = 0.65	135 000		115 000	99 423	102 169	
1998	F (98) should not exceed F (96)	153 000		140 000	114 324	122 103	
1999	F = 0.60 to rebuild SSB	125 000		132 400	77 566	78 392	
2000	F less than 0.55	< 79 000		81 000	60 881	59 767	
2001	Lowest possible catch	0		48 600	41 713	40 973	
2002	Lowest possible catch	0		49 300	44 526	42 193	7235
2003	Closure	0		27 300	25 958	24 083	2643
2004	Zero catch	0		27 300	23 806	22 529	5026
2005	Zero catch	0		27 300	22 500	22 855	5236
2006	Zero catch	0		23 205	23 119	21 078	5236
2007	Zero catch	0		19 957	20 102	19 056	22 418
2008	Exploitation boundaries in relation to precautionary limits. Total removals < 22 000 t	< 22 000		22 152	22 262	21 657	20 710
2009	Zero catch	0		28 798	27 497	27 634	13 542
2010	Management plan F (65% of F ₂₀₀₈)	< 40 300 ***		33 552	31 657	30 980	10 122
2011	See scenarios	-		26 842	27 800	26 675	6071
2012	Management plan F (45% of F ₂₀₀₈)	< 31 800		26 475	27 640	26 627	6533
2013	Management plan (TAC –20%)	< 25 441		26 475	26 324	25 315	8421
2014	Management plan long-term phase	< 28 809		27 799	29 355	28 550	7831

Year	ICES advice	Landings corresponding to advice	Catch corresponding to advice	Agreed TAC	Official landings*	ICES landings**	ICES discards [^]
2015	Management plan long-term phase	< 26 713		29 189	32 012	31 244	9601
2016	MSY approach	≤ 40 419	≤ 49 259	33 651	34 265	33 035	10 538
2017	MSY approach		≤ 47 359	39 220	34 746	33 109	7945
2018	MSY approach		≤ 53 058	43 156	35 997	34 444	6873
2019	MSY approach		≤ 28 204	29 437	28 163	28 558	3240
2020	MSY approach		≤ 13 686	14 718	17 095	17 192	2588
2021	MSY approach		≤ 14 755	13 246	12 718	12 737	3129
2022	MSY approach		≤ 14 276	13 246			
2023	MSY approach		≤ 26 008				

* Official landings for Norway include Norwegian fjords.

** Norwegian fjords not included from 2002 onwards.

*** From 2010 onwards, the advice is for Subarea 4 (North Sea), Division 7.d (eastern English Channel), and Subdivision 20 (Skagerrak).

[^] Since 2016, discards include BMS landings.

Table 6b Cod in Subarea 4, Division 7.d, and Subdivision 20. Skagerrak (Subdivision 20). ICES advice, TAC, official landings, and ICES estimates of landings and discards. All weights are in tonnes. Values of official landings and ICES landings for the period 1987 to 1996 are presented to the nearest hundred tonnes.

Year	ICES advice	Landings corresponding to advice	Catch corresponding to advice	Agreed TAC*	Official landings	ICES landings*	ICES discards [^]
1987	$F = F_{max}$	< 21 000		22 500	19 900	20 900	
1988	Reduce F			21 500	17 000	16 900	
1989	F at F_{med}	< 23 000		20 500	18 700	19 600	
1990	F at F_{med} ; TAC	21 000		21 000	17 800	18 600	
1991	TAC	15 000		15 000	12 100	12 400	
1992	70% of F (90)			15 000	14 000	14 800	
1993	Precautionary TAC			15 000	14 700	15 300	
1994	No long-term gain in increased F + precautionary TAC			15 500	15 100	13 900	
1995	If required precautionary TAC; link to North Sea			20 000	19 800	12 100	
1996	If required precautionary TAC; link to North Sea			23 000	17 900	16 400	
1997	If required precautionary TAC; link to North Sea			16 100	15 736	14 946	
1998	If required precautionary TAC; link to North Sea	21 900		20 000	15 586	15 331	
1999	$F = 0.60$ to rebuild SSB	17 900		19 000	11 790	10 974	
2000	F less than 0.55	< 11 300		11 600	9957	9277	
2001	Lowest possible catch	0		7000	7729	7086	
2002	Lowest possible catch	0		7100	7170	6854	4168
2003	Closure	0		3900	4483	3979	1225
2004	Zero catch	0		3900	4516	3914	3552
2005	Zero catch	0		3900	4375	3998	4573
2006	Zero catch	0		3315	3972	3258	6398
2007	Zero catch	0		2851	3751	3020	5946
2008	Exploitation boundaries in relation to precautionary limits. Total removals less than 22 000 t	< 22 000		3165	3769	3393	2697
2009	Zero catch	0		4114	3982	3794	2910
2010	Management plan F (65% of F_{2008})	< 40 300**		4793	4211	4057	2023
2011	See scenarios	-		3835	4117	3956	2050
2012	Management plan F (45% of F_{2008})	< 31 800		3783	4391	4327	2054
2013	Management plan (TAC -20%)	< 25 441		3783	4240	4154	1780
2014	Management plan long-term phase	< 28 809		3972	4650	4687	2210

Year	ICES advice	Landings corresponding to advice	Catch corresponding to advice	Agreed TAC*	Official landings	ICES landings*	ICES discards [^]
2015	Management plan long-term phase	< 26 713		4171	4533	4563	2942
2016	MSY approach	≤ 40 419	≤ 49 259	4807	5006	4774	1704
2017	MSY approach		≤ 47 359	5744	4852	4715	777
2018	MSY approach		≤ 53 058	7995	5332	5484	951
2019	MSY approach		≤ 28 204	4205	3339	3478	367
2020	MSY approach		≤ 13 686	2103	2239	2299	2113
2021	MSY approach		≤ 14 755	1893	1940	2017	663
2022	MSY approach		≤ 14 276	1893			
2023	MSY approach		≤ 26 008				

* Norwegian fjords not included.

** From 2010 onwards, the advice is for Subarea 4 (North Sea), Division 7.d (eastern English Channel), and Subdivision 20 (Skagerrak).

[^] Since 2016 discards include BMS landings.

Table 6c Cod in Subarea 4, Division 7.d, and Subdivision 20. **Eastern English Channel (Division 7.d)**. ICES advice, TAC, official landings, and ICES estimates of landings and discards. All weights are in tonnes. Values of official landings and ICES landings for the period 1987 to 1996 are presented to the nearest hundred tonnes.

Year	ICES advice	Landings corresponding to advice	Catch corresponding to advice	Agreed TAC*	Official landings	ICES landings	ICES discards [^]
1987	Not assessed	-		-	9400	14200	
1988	Precautionary TAC	-		-	10100	10700	
1989	No increase in F; TAC	10000**		-	n/a	5500	
1990	No increase in F; TAC	9000**		-	n/a	2800	
1991	Precautionary TAC	3000**		-	n/a	1900	
1992	If required, precautionary TAC	5500**		-	2700	2700	
1993	If TAC required, consider SSB decline	-		-	2500	2400	
1994	Reduce F + precautionary TAC			-	2900	2900	
1995	Significant effort reduction; link to North Sea			-	4000	4000	
1996	Reference made to North Sea advice			-	3500	3500	
1997	No advice			-	7178	7043	
1998	Link to North Sea	4900		-	8665	8580	
1999	F = 0.60 to rebuild SSB	4000		-	629	6858	
2000	F less than 0.55	< 2500		-	3583	2325	
2001	Lowest possible catch	0		-	2036	1573	
2002	Lowest possible catch	0		-	1563	3139	507
2003	Closure	0		-	1941	2131	213
2004	Zero catch	0		-	974	1014	225
2005	Zero catch	0		-	1230	1259	278
2006	Zero catch	0		-	1480	1479	377
2007	Zero catch	0		-	2073	2147	2086
2008	Exploitation boundaries in relation to precautionary limits; total removals less than 22 000 t	< 22000		-	1662	1629	1674
2009	Zero catch	0		1678	2023	1887	4513
2010	Management plan F (65% of F ₂₀₀₈)	< 40300***		1955	1836	1708	343
2011	See scenarios	-		1564	1311	1319	623
2012	Management plan F (45% of F ₂₀₀₈)	< 31800		1543	1064	1120	102
2013	Management plan (TAC -20%)	< 25441		1543	959	916	123
2014	Management plan long-term phase	< 28809		1620	1548	1436	624
2015	Management plan long-term phase	< 26713		1701	1434	1398	19
2016	MSY approach	≤ 40419	≤ 49259	1961	459	421	72
2017	MSY approach		≤ 47359	2059	180	170	9
2018	MSY approach		≤ 53058	1733	92	84	0
2019	MSY approach		≤ 28204	1715	38	36	0
2020	MSY approach		≤ 13686	858	40	32	0

Year	ICES advice	Landings corresponding to advice	Catch corresponding to advice	Agreed TAC*	Official landings	ICES landings	ICES discards [^]
2021	MSY approach		≤ 14755	772	28	37	1
2022	MSY approach		≤ 14276	772			
2023	MSY approach		≤ 26008				

* Until 2008, this area was included in the TAC for Subarea 7 (except Division 7.a). From 2009, a separate TAC was set.

** Including Division 7.e.

*** From 2010 onwards, the advice is for Subarea 4 (North Sea), Division 7.d (eastern English Channel), and Subdivision 20 (Skagerrak).

[^] Since 2016, discards include BMS landings.

History of the catch and landings

Table 7 Cod in Subarea 4, Division 7.d, and Subdivision 20. Catch distribution by fleet in 2021 as estimated by ICES.

Catch	Landings					Discards*
18 583 tonnes	Demersal trawls and seines >100 mm 73%	Gillnets 10%	Demersal trawls 70–99 mm 8%	Beam trawls 5%	Other gears 4%	3792 tonnes
	14 791 tonnes					

* Discards include BMS landings.

Table 8 Cod in Subarea 4, Division 7.d, and Subdivision 20. History of commercial landings; both the official and ICES estimated values are presented by area for each country participating in the fishery. All weights are in tonnes.

Subarea 4																		
Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020***	2021***
Belgium	1627	1722	1309	1008	894	946	666	653	862	1075	1258	1223	1103	695	817	727	666	553
Denmark	5889	6291	5105	3430	3831	4402	5686	4863	4803	4536	5457	6026	6713	6119	5493	4967	3064	2021
Faroe Islands	37	34	3	-	16	45	32	-	-	-	-	-	-	-	-	< 0.5	1	-
France	294	664	354	659	573	950	782	619	369	287	637	517	391	401	583	450	265	284
Germany	2213	2648	2537	1899	1736	2374	2844	2211	2385	1921	2257	2133	2083	2300	1510	824	755	767
Greenland	-	35	23	17	17	11	-	-	-	-	-	-	2	1	-	-	-	-
Netherlands	1726	1660	1585	1523	1896	2649	2657	1928	1955	1344	1242	1403	1365	653	515	719	590	618
Norway	3223	2900	2749	3057	4128	4234	4495	4898	4601	4080	4600	5404	5627	5521	5539	4509	2330	1659
Poland	-	-	-	1	2	3	-	2	-	-	-	-	-	-	-	-	-	-
Sweden	240	319	309	386	439	378	362	316	471	332	401	415	373	387	274	344	354	396
UK (E/W/NI)	1890	1270	1491	1587	1546	2383	2553	2169	1629	2129	2962	-	-	-	-	-	-	-
UK (Scotland)	6650	4936	6857	6511	7185	9052	11 567	10 141	10 565	10 619	10 517	-	-	-	-	-	-	-
UK (combined)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	14 889	16 603	18 523	21 265	15 621	9061	6416
Others	-	-	786	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5
Danish industrial bycatch	17	21	11	23	1	72	12	< 0.5	< 0.5	2	24	< 0.5	5	147	< 0.5	2	11	5
Norwegian industrial bycatch*	-	-	48	101	22	4	201	1	-	-	-	-	-	-	-	-	-	-
Total nominal catch	23 806	22 500	23 119	20 102	22 262	27 497	31 657	27 800	27 640	26 324	29 355	32 012	34 265	34 746	35 997	28 163	17 095	12 718
Unallocated landings	-1277	356	-2041	-1046	-605	136	-677	-1125	-1013	-1009	-805	-768	-1230	-1637	-1553	395	97	19
BMS landings	-	-	-	-	-	-	-	-	-	-	-	-	-	1	8	41	32	8
ICES estimate of total landings	22 529	22 855	21 078	19 056	21 657	27 634	30 980	26 675	26 627	25 315	28 550	31 244	33 035	33 109	34 444	28 558	17 192	12 737
Agreed TAC	27 300	27 300	23 205	19 957	22 152	28 798	33 552	26 842	26 475	26 475	27 799	29 189	33 651	39 220	43 156	29 437	14 718	13 246

Division 7.d																		
Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020***	2021***
Belgium	47	51	80	84	154	73	57	56	40	53	72	78	39	18	8	3	8	12
Denmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
France	810	986	1124	1743	1326	1779	1606	1078	885	768	1270	1142	279	92	35	16	10	5
Netherlands	14	9	9	59	30	35	45	51	40	38	50	52	40	22	10	3	2	1
UK (E/W/NI)	103	184	267	174	144	133	127	125	99	100	156	-	-	-	-	-	-	-
UK (Scotland)	-	-	1	12	7	3	1	1	-	-	-	-	-	-	-	-	-	-
UK (combined)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	162	102	48	39	17	20	11
Others	-	-	-	-	-	-	-	-	-	-	-	-	-	< 0.5	-	< 0.5	-	-
Total nominal catch	974	1230	1480	2073	1662	2023	1836	1311	1064	959	1548	1434	459	180	92	38	40	28
Unallocated landings	40	29	-2	74	-33	-135	-128	8	56	-43	-112	-36	-38	-10	-8	-3	-8	9
BMS landings	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 0.5	< 0.5
ICES estimate of total landings	1014	1259	1479	2147	1629	1887	1708	1319	1120	916	1436	1398	421	170	84	36	32	37
Agreed TAC	n/a	n/a	n/a	n/a	n/a	1678	1955	1564	1543	1543	1620	1701	1961	2059	1733	1715	858	772

Subdivision 20 **																		
Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020***	2021***
Denmark	3038	3019	2513	2246	2553	3024	3286	3118	3178	3033	3430	3344	3696	3665	4222	2740	1857	1597
Germany	99	86	84	67	52	55	56	60	78	69	84	87	94	67	86	52	35	25
Norway	856	759	628	681	779	440	375	421	615	575	533	500	551	486	288	151	94	68
Sweden	495	488	372	370	365	459	458	518	520	529	570	571	641	557	670	355	223	238
Others	24	21	373	385	13	2	26	-	-	33	29	26	25	38	58	40	18	11
Danish industrial by-catch	4	2	3	2	7	2	10	< 0.5	1	1	5	5	< 0.5	40	7	1	13	1
Total nominal catch	4516	4375	3972	3751	3769	3982	4211	4117	4391	4240	4650	4533	5006	4852	5332	3339	2239	1940
Unallocated landings	-602	-376	-715	-731	-376	-188	-154	-161	-64	-86	37	31	-232	-137	152	139	61	77
BMS landings	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4	3	4	5
ICES estimate of total landings	3914	3998	3258	3020	3393	3794	4057	3956	4327	4154	4687	4563	4774	4715	5484	3478	2299	2017
Agreed TAC	3900	3900	3315	2851	3165	4114	4793	3835	3783	3783	3972	4171	4807	5744	7995	4205	2103	1893

Subarea 4, Division 7.d, and Subdivision 20 combined																		
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020***	2021***
Total nominal catch	29 296	28 104	28 572	25 926	27 693	33 502	37 704	33 228	33 095	31 523	35 554	37 978	39 730	39 778	41 421	31 540	19 373	14 686
Unallocated landings	-1839	9	-2757	-1703	-1014	-187	-958	-1277	-1022	-1138	-881	-773	-1500	-1784	-1409	532	150	105
BMS landings	-	-	-	-	-	-	-	-	-	-	-	-	-	2	12	44	36	13
ICES estimate of total landings	27 457	28 113	25 815	24 223	26 679	33 315	36 746	31 950	32 074	30 386	34 673	37 205	38 230	37 994	40 012	32 072	19 523	14 791
Sum of agreed TACs	31 200	31 200	26 520	22 808	25 317	34 590	40 300	32 241	31 801	31 801	33 391	35 061	40 419	47 023	52 884	35 357	17 679	15 911

Subarea 4 and Subdivision 20 landings not included in the assessment																		
Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Norwegian industrial bycatch *	.	.	48	101	22	4	201	1	.	.	.	.	.	.	.	.	.	.
Total	.	.	48	101	22	4	201	1	.	.	.	.	.	.	.	.	.	.

* The Norwegian industrial bycatch is not included in the (working group estimate of) total landings.

** Skagerrak/Kattegat split derived from national statistics prior to 2016.

*** Official landings are preliminary.

^ No agreed TAC in division 7d prior to 2009

. = Magnitude not available.

- = Magnitude known to be nil.

< 0.5 = Magnitude less than half the unit used in the table.

n/a = Not applicable.

Summary of the assessment

Table 9 Cod in Subarea 4, Division 7.d, and Subdivision 20. Assessment summary. Highs and lows refer to 95% confidence intervals. Catches (landings and discards) are assessment inputs.

Year	Recruitment (Age 1)			Spawning Stock Biomass			Landings**	Discards**	Fishing pressure (Ages 2–4)		
	R	High	Low	SSB	High	Low			F	High	Low
	thousands			tonnes			tonnes				
1963	448879	620375	324792	129744	210245	80067	115893	12199	0.47	0.55	0.40
1964	735304	1014232	533085	138581	223177	86052	125393	4656	0.52	0.60	0.45
1965	979441	1344669	713413	162757	262001	101106	180120	28973	0.57	0.66	0.50
1966	1193002	1637204	869320	182574	289529	115129	220197	37862	0.57	0.66	0.50
1967	1015848	1395321	739578	205322	317573	132748	251687	23285	0.62	0.70	0.54
1968	505145	694954	367177	209979	329277	133903	286948	17468	0.66	0.75	0.57
1969	438697	607138	316988	208284	310334	139792	199746	4757	0.61	0.70	0.54
1970	1469677	2022564	1067927	213929	304482	150307	224993	17663	0.65	0.73	0.57
1971	1949023	2692632	1410772	220614	298732	162924	326492	84007	0.75	0.84	0.66
1972	482251	666750	348806	201619	275331	147641	352161	33603	0.82	0.92	0.73
1973	696940	962380	504713	166614	236677	117292	237874	29966	0.79	0.89	0.70
1974	691259	956185	499735	178411	241121	132011	213215	39533	0.75	0.84	0.66
1975	1189072	1657764	852892	169146	214920	133122	204249	36841	0.81	0.91	0.72
1976	806197	1130803	574772	146131	182698	116883	233007	72397	0.87	0.98	0.77
1977	1985757	2769946	1423576	122529	153155	98027	208318	139027	0.82	0.92	0.73
1978	1188124	1658601	851102	118197	143164	97585	294640	32434	0.93	1.03	0.83
1979	1481562	2067952	1061449	118543	143849	97689	266019	162278	0.84	0.94	0.75
1980	2348608	3290782	1676185	118543	142443	98654	293753	294208	0.92	1.03	0.83
1981	940544	1315525	672449	128378	152613	107991	333616	57076	0.93	1.04	0.84
1982	1470717	2027785	1066685	129400	152447	109838	302365	54008	1.05	1.17	0.95
1983	834323	1120493	621240	108670	127355	92726	257634	21430	1.03	1.15	0.93
1984	1497219	1994591	1123872	96563	113545	82121	227070	151004	0.96	1.07	0.87
1985	371613	508210	271730	92500	108713	78705	214354	31298	0.92	1.02	0.83
1986	1811547	2405169	1364437	80540	94673	68518	201279	138604	1.00	1.11	0.90
1987	708292	940420	533461	83513	98409	70871	216041	27706	0.97	1.08	0.88
1988	473589	639310	350826	78012	93443	65129	183202	10504	1.00	1.10	0.90
1989	844008	1130051	630369	74712	87090	64093	139578	61656	1.02	1.13	0.93
1990	339517	455209	253228	66205	76940	56968	124835	26747	0.95	1.05	0.85
1991	398867	529576	300420	66219	76704	57167	101442	18199	0.94	1.04	0.84
1992	964171	1254474	741048	68143	78201	59378	112740	36193	0.91	1.00	0.82
1993	439577	568694	339775	69976	81499	60083	119947	21412	0.98	1.08	0.88
1994	1057585	1367359	817990	72382	83891	62451	109915	98208	0.95	1.05	0.86
1995	692028	890702	537669	77700	89888	67164	136397	31707	0.88	0.97	0.79
1996	477477	618701	368489	92943	107263	80535	124721	14030	0.90	1.00	0.82

Year	Recruitment (Age 1)			Spawning Stock Biomass			Landings**	Discards**	Fishing pressure (Ages 2–4)		
	R	High	Low	SSB	High	Low			F	High	Low
	thousands			tonnes			tonnes				
1997	1535829	1985258	1188143	94962	107719	83716	122434	33184	0.93	1.02	0.84
1998	142751	190042	107228	98574	115824	83892	144637	40102	1.12	1.23	1.02
1999	312322	411390	237112	79182	90767	69075	94108	13642	1.15	1.25	1.05
2000	451128	587169	346605	56004	63449	49433	69567	13360	1.16	1.28	1.06
2001	183102	239937	139729	43384	50309	37413	48440	13519	0.87	0.96	0.78
2002	261754	344485	198891	46653	53399	40760	53152	11901	1.06	1.18	0.96
2003	121914	160599	92547	34911	40030	30446	30426	4007	0.75	0.85	0.67
2004	241882	317924	184028	33269	37742	29327	27748	8721	0.80	0.90	0.72
2005	189014	249036	143459	32081	37038	27786	28165	9932	0.82	0.92	0.73
2006	420206	543831	324684	34227	39994	29291	25665	11923	0.73	0.82	0.65
2007	187994	244872	144327	45174	53087	38441	24215	30422	0.67	0.76	0.59
2008	211252	274338	162672	64486	75183	55312	26814	24984	0.64	0.73	0.56
2009	236841	310798	180483	64626	75613	55236	33177	20846	0.63	0.72	0.54
2010	305331	393809	236731	67293	80470	56274	36762	12341	0.52	0.61	0.45
2011	145183	191241	110218	75754	93151	61607	31979	8711	0.40	0.47	0.35
2012	223399	294019	169740	80025	98807	64813	32124	8638	0.37	0.44	0.32
2013	250024	326315	191570	80507	99452	65171	30474	10289	0.37	0.43	0.32
2014	317889	409986	246480	78644	97090	63702	34651	10538	0.37	0.44	0.32
2015	148615	193276	114275	83922	103942	67758	37373	12537	0.38	0.44	0.33
2016	104716	136879	80111	84688	104019	68950	38104	12203	0.38	0.43	0.33
2017	318508	417095	243223	84181	102658	69030	37668	8702	0.42	0.48	0.37
2018	71823	93817	54985	73762	90579	60068	40153	7744	0.54	0.62	0.46
2019	140015	182281	107549	58998	74816	46524	32361	3555	0.49	0.57	0.42
2020	228230	304585	171016	44289	57644	34029	19373	4700	0.36	0.43	0.30
2021	132322	181993	96208	44335	58383	33667	14660	3744	0.25	0.31	0.20
2022*	204530	351748	118927	54148	71276	41137					
2023*	222820	974261	50960								

* Recruitment in 2022–2023 are the assessment estimates. The values provided in Table 1 are the medians from a normal distribution of the assessment estimates required for stochastic projections.

** Any differences in landings and discards values between Table 9 and others in the advice are due to SOP correction.

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