

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

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2022 should be no more than 14 276 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 above F_{MSY} but below F_{pa} and F_{lim} ; spawning-stock size is below MSY $B_{trigger}$, B_{pa} , and B_{lim} .

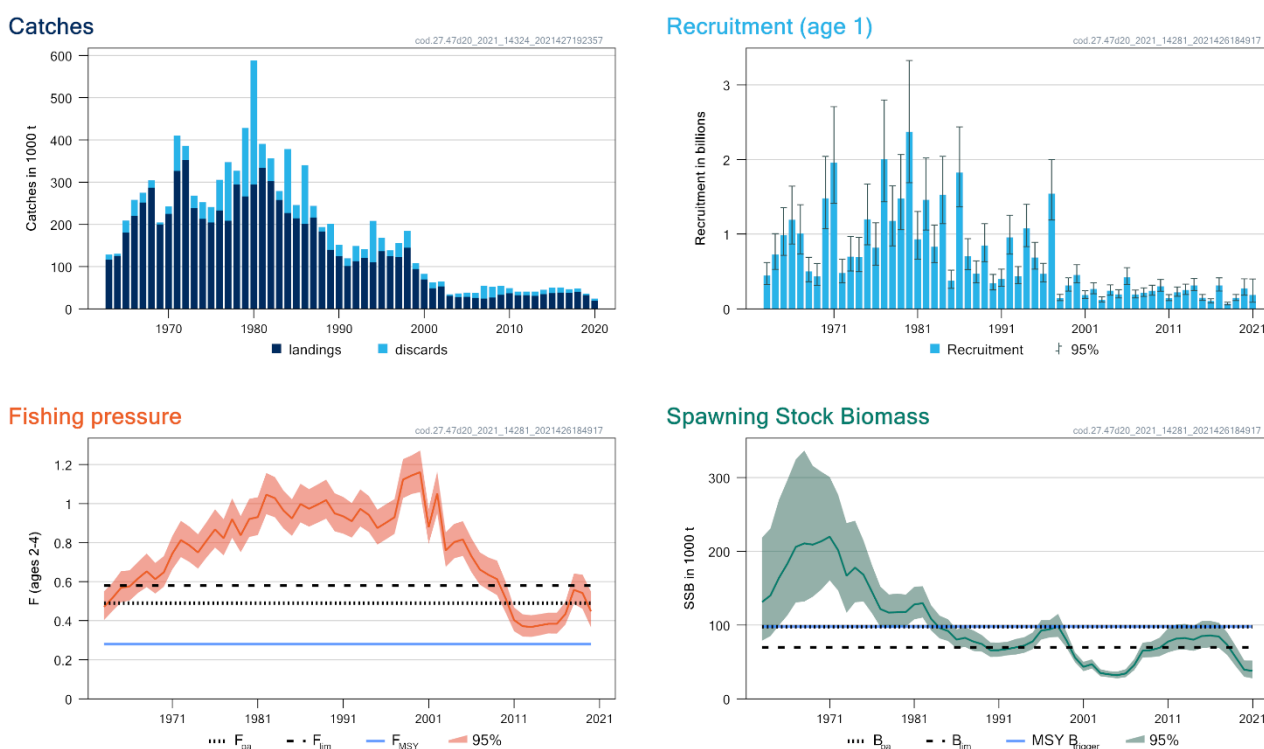


Figure 1 Cod in Subarea 4, Division 7.d, and Subdivision 20. Summary of the stock assessment.

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
$F_{ages\ 2-4}$ (2021)	0.37	Based on the lowest observed F over the time-series
SSB (2022)	49 433	From the short-term forecast; tonnes
$R_{age\ 1}$ (2021)	186 075	Median recruitment estimate in 2021; thousands
$R_{age\ 1}$ (2022)	222 046	Median recruitment, resampled from the years 1998–2021; thousands
Total catch (2021)	27 153	Assuming the lowest observed F over the time-series in 2021; tonnes
Projected landings (2021)	20 790	Assuming 2020 landings rate; tonnes
Projected discards (2021)	6363	Assuming 2020 discard rate; 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 (2022)	Projected landings* (2022)	Projected discards** (2022)	F _{total} (ages 2–4) (2022)	F _{projected} landings (ages 2–4) (2022)	F _{projected} discards (ages 2–4) (2022)	SSB (2023)	% SSB change ***	% TAC change ^	% advice change ^^	% Probability of falling below B _{lim} in 2023
ICES advice basis											
MSY approach: F _{MSY} × SSB (2022) /MSY B _{trigger}	14276	11779	2497	0.144	0.115	0.029	75484	53	-10.3	-3.2	37
Other scenarios											
F = F _{MSY lower} × SSB (2022) /MSY B _{trigger}	9701	8011	1690	0.095	0.076	0.0190	79425	61	-39	-34	28
F = 0	0	0	0	0.00	0.00	0.00	87254	77	-100	-100	13.7
F _{pa}	41914	34250	7664	0.49	0.39	0.097	53444	8.1	163	184	86
F _{lim}	47805	38801	9004	0.58	0.46	0.115	49118	-0.64	200	220	92
SSB (2023) = B _{lim}	21340	17598	3742	0.22	0.178	0.044	69841	41	34	45	50
SSB (2023) = MSY B _{trigger} = B _{pa} #											
TAC (2021) -20%	12729	10493	2236	0.127	0.102	0.025	76741	55	-20.0	-13.7	35
TAC (2021) -15%	13524	11158	2366	0.135	0.109	0.026	76100	54	-15.0	-8.3	36
TAC (2021) -10%	14320	11816	2504	0.144	0.115	0.029	75445	53	-10.0	-2.9	37
TAC (2021) -5%	15116	12473	2643	0.153	0.122	0.031	74779	51	-5.0	2.4	38
TAC (2021)	15912	13131	2781	0.161	0.129	0.032	74116	50	0	7.8	40
TAC (2021) +5%	16707	13788	2919	0.170	0.136	0.034	73494	49	5.0	13.2	41
TAC (2021) +10%	17502	14447	3055	0.179	0.144	0.035	72843	47	10.0	18.6	43
TAC (2021) +15%	18298	15112	3186	0.188	0.151	0.037	72197	46	15.0	24	45
TAC (2021) +20%	19093	15760	3333	0.197	0.158	0.039	71572	45	20.0	29	47
F = F ₂₀₂₁	33282	27259	6023	0.37	0.30	0.073	60299	22	109	126	75
F = F _{MSY lower}	18130	14971	3159	0.186	0.149	0.037	72341	46	13.9	23	44
F = F _{MSY}	26169	21575	4594	0.28	0.22	0.055	65905	33	64	77	60
F = F _{MSY upper}	39128	31980	7148	0.45	0.36	0.089	55565	12.4	146	165	84

* Marketable landings.

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

*** SSB 2023 relative to SSB 2022.

^ Total catch in 2022 relative to TAC in 2021: North Sea (13 246 t) + Skagerrak (1893 t) + eastern English Channel (772 t) = 15 911 t.

^^ Total catch in 2022 relative to advice value for 2021 (14 755 t).

B_{pa} and MSY B_{trigger} cannot be achieved in 2023, even with zero catches.

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.

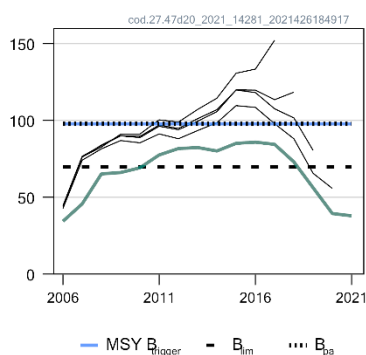
Quality of the assessment

The assessment was updated during a benchmark in 2021, resulting in changes to the input data (maturity, natural mortality, stock weights, and survey indices) and model settings (ICES, 2021a). Reference points were re-estimated based on a truncated recruitment time-series, reflecting a lower recruitment regime for the last two decades (1998–2020; ICES, 2021a).

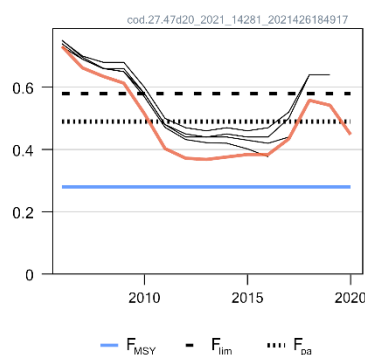
Stock identity remains an issue with this assessment, with multiple populations inhabiting the North Sea and extending to neighbouring areas (ICES, 2020). The 2021 benchmark introduced an *ad hoc* adjustment on natural mortality of ages 3+ from 2011 to account for migration to the West of Scotland area,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

The proportion of landings sampled for ages was lower in 2020 (75%) than in 2019 (89%) 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.

SSB (000 tonnes)



Fishing pressure



Rec (age 1; Billions)

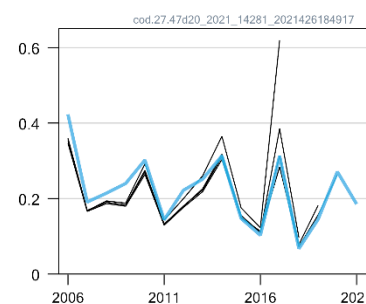


Figure 2 Cod in Subarea 4, Division 7.d, and Subdivision 20. Historical assessment results. The reference points were revised in 2021 following a benchmark, and only assessment results from the last year should be compared to the reference points indicated.

Issues relevant for the advice

The catch advice for 2022 is sensitive to assumptions on fishing mortality and associated catches in 2021, for which there are no quantitative estimates available at the time of the assessment. Fishing mortality in 2021 was assumed to be at the level of the lowest of the time-series. It is recognized that this will give a 71% overshoot of the TAC. This corresponds to a reduction in fishing mortality (from 0.45 to 0.37) which was considered to be realistic given the technical measures in place in 2021.

Because the SSB is currently below B_{lim} , ICES has provided the probability of SSB being below B_{lim} in 2023 for each of the scenarios presented in Table 2. Given the advised catch of 14 276 tonnes, the probability of SSB being below B_{lim} in 2023 is 37%. In comparison, the scenario with 0 catches in 2022 has a 13.7% probability of SSB being below B_{lim} in 2023.

The below minimum size (BMS) landings of cod reported to ICES are currently negligible, and are much lower than the discards below the minimum conservation reference size (MCRS) estimated by observer programmes.

Recreational catches are estimated to account for 3.6–8.9% of total removals between 2010–2019, but values are provisional and not included in the assessment due to unknown age structure and uncertainty.

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

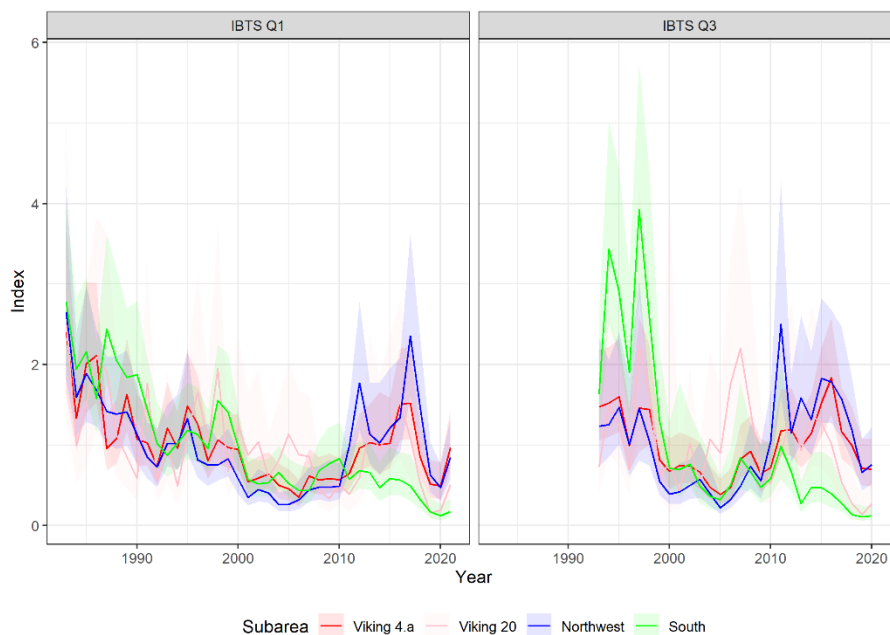


Figure 3 Cod in Subarea 4, Division 7.d, and Subdivision 20. Biomass indices by subregion (see Figure 5), based on the NS-IBTS Q1 (G1022) and Q3 (G2829) survey data. The indices and confidence intervals are mean standardized for each subregion.

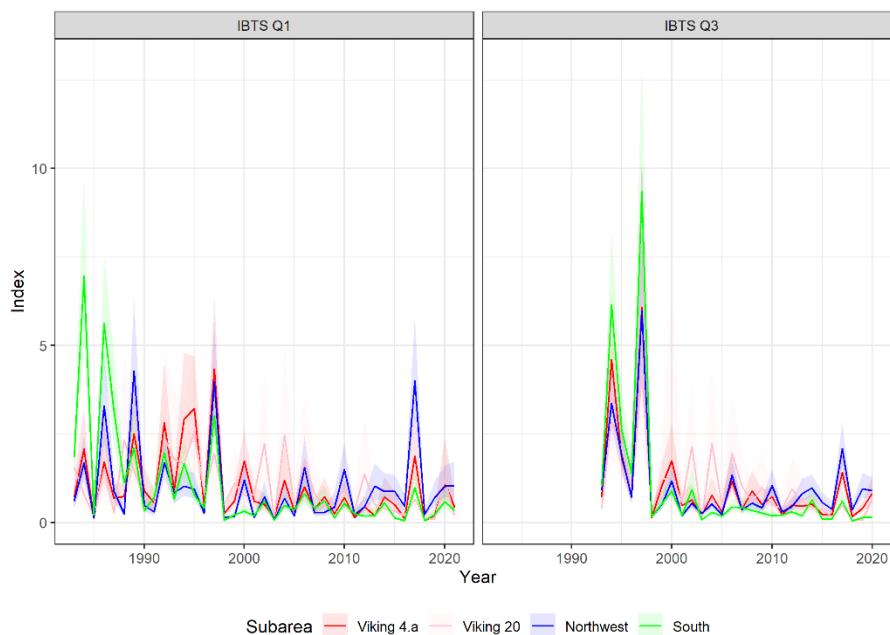


Figure 4 Cod in Subarea 4, Division 7.d, and Subdivision 20. Recruitment indices by subregion (see Figure 5), based on NS-IBTS Q1 (G1022) and Q3 (G2829) survey data. The indices and confidence intervals are mean standardized for each subregion.

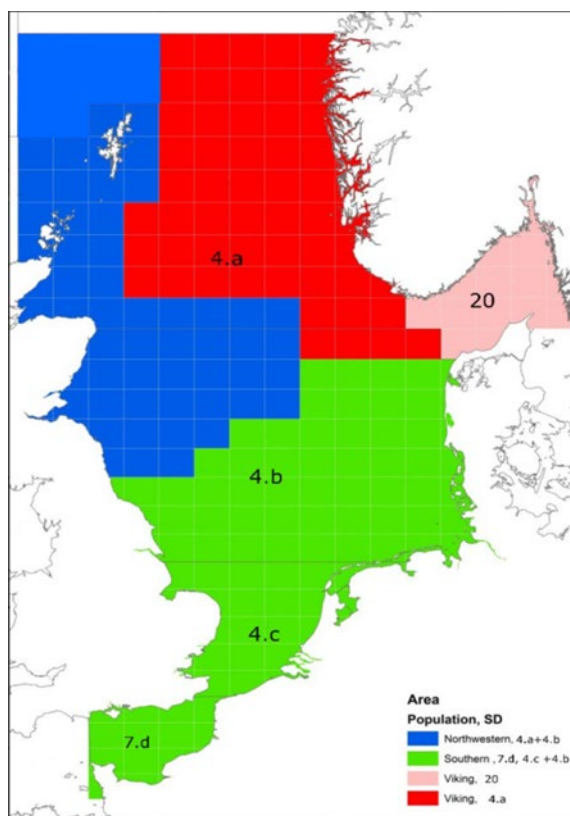


Figure 5 Cod in Subarea 4, Division 7.d, and Subdivision 20. Subregions used to derive area-specific biomass indices, based on NS-IBTS Q1 (G1022) and Q3 (G2829) survey data. Note that these areas do not correspond to the distribution of the different subpopulations.

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 (2021a)
	F_{MSY}	0.28	Stochastic simulations (EqSim) based on the recruitment period 1998–2020	ICES (2021a)
Precautionary approach	B_{lim}	69 841	$B_{pa}/1.4$; in tonnes	ICES (2021a)
	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 (2021a)
	F_{lim}	0.58	The F that on average leads to B_{lim}	ICES (2021a)
	F_{pa}	0.49	The F that provides a 95% probability for SSB to be above B_{lim} (F_{P05} with AR)	ICES (2021a)
EU Management Plan (MAP) EU (2018)	MAP MSY $B_{trigger}$	97 777	MSY $B_{trigger}$	ICES (2021a)
	MAP B_{lim}	69 841	B_{lim}	ICES (2021a)
	MAP F_{MSY}	0.28	F_{MSY}	ICES (2021a)
	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 (2021a)
	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 (2021a)

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, 2021b)
Assessment type	Age-based analytical assessment (SAM; ICES, 2021c) 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] and IBTS Q3 [G2829]) 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]; 1978–2021). Annually varying natural mortalities from multispecies model (1974–2019) with an <i>ad hoc</i> adjustment to mimic emigration of 3+ cod out of the assessment area from 2011.
Discards, BMS landings, and bycatch	In 2020, 57% of the landings had associated discards reported to ICES and 43% 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, 2021a).
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	100000–125000		175000	167000	182000	
1988	70% of F (86); TAC	148000		160000	142000	157000	
1989	Halt SSB decline; protect juveniles; TAC	124000		124000	110000	116000	
1990	80% of F (88); TAC	113000		105000	99000	105000	
1991	70% of effort (89)			100000	87000	89000	
1992	70% of effort (89)			100000	98000	97000	
1993	70% of effort (89)			101000	94000	105000	
1994	Significant effort reduction			102000	87000	95000	
1995	Significant effort reduction			120000	111000	120000	
1996	80% of F (94) = 0.7	141000		130000	107000	107000	
1997	80% of F (95) = 0.65	135000		115000	99423	102169	
1998	F (98) should not exceed F (96)	153000		140000	114324	122103	
1999	F = 0.60 to rebuild SSB	125000		132400	77566	78392	
2000	F less than 0.55	< 79000		81000	60881	59767	
2001	Lowest possible catch	0		48600	41713	40973	
2002	Lowest possible catch	0		49300	44526	42193	7235
2003	Closure	0		27300	25958	24083	2643
2004	Zero catch	0		27300	23806	22529	5026
2005	Zero catch	0		27300	22500	22855	5236
2006	Zero catch	0		23205	23119	21078	5236
2007	Zero catch	0		19957	20102	19056	22418
2008	Exploitation boundaries in relation to precautionary limits. Total removals < 22 000 t	< 22000		22152	22262	21657	20710
2009	Zero catch	0		28798	27497	27634	13542
2010	Management plan F (65% of F ₂₀₀₈)	< 40300 ***		33552	31657	30980	10122
2011	See scenarios	-		26842	27800	26675	6071
2012	Management plan F (45% of F ₂₀₀₈)	< 31800		26475	27640	26627	6533
2013	Management plan (TAC –20%)	< 25441		26475	26324	25315	8421
2014	Management plan long-term phase	< 28809		27799	29356	28550	7831
2015	Management plan long-term phase	< 26713		29189	32011	31244	9601
2016	MSY approach	≤ 40419	≤ 49259	33651	34265	33035	10538
2017	MSY approach		≤ 47359	39220	34198	33109	7945
2018	MSY approach		≤ 53058	43156	35789	34444	6873
2019	MSY approach		≤ 28204	29437	28130	28558	3240
2020	MSY approach		≤ 13686	14718	17095	17192	2588
2021	MSY approach		≤ 14755	13246			
2022	MSY approach		≤ 14276				

* 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	$F = F_{max}$	< 21000		22500	19900	20900	
1988	Reduce F			21500	17000	16900	
1989	F at F_{med}	< 23000		20500	18700	19600	
1990	F at F_{med} ; TAC	21000		21000	17800	18600	
1991	TAC	15000		15000	12100	12400	
1992	70% of F (90)			15000	14000	14800	
1993	Precautionary TAC			15000	14700	15300	
1994	No long-term gain in increased F + precautionary TAC			15500	15100	13900	
1995	If required precautionary TAC; link to North Sea			20000	19800	12100	
1996	If required precautionary TAC; link to North Sea			23000	17900	16400	
1997	If required precautionary TAC; link to North Sea			16100	15736	14946	
1998	If required precautionary TAC; link to North Sea	21900		20000	15586	15331	
1999	$F = 0.60$ to rebuild SSB	17900		19000	11790	10974	
2000	F less than 0.55	< 11300		11600	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	< 22000		3165	3769	3393	2697
2009	Zero catch	0		4114	3982	3794	2910
2010	Management plan F (65% of F_{2008})	< 40300**		4793	4211	4057	2023
2011	See scenarios	-		3835	4117	3956	2050
2012	Management plan F (45% of F_{2008})	< 31800		3783	4391	4327	2054
2013	Management plan (TAC -20%)	< 25441		3783	4240	4154	1780
2014	Management plan long-term phase	< 28809		3972	4650	4687	2210
2015	Management plan long-term phase	< 26713		4171	4533	4563	2942
2016	MSY approach	≤ 40419	≤ 49259	4807	5006	4774	1704
2017	MSY approach		≤ 47359	5744	4848	4715	777
2018	MSY approach		≤ 53058	7995	5327	5484	951
2019	MSY approach		≤ 28204	4205	3338	3478	367
2020	MSY approach		≤ 13686	2103	2239	2299	2113
2021	MSY approach		≤ 14755	1893			
2022	MSY approach		≤ 14276				

* 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	179	170	9
2018	MSY approach	-	≤ 53058	1733	92	84	0
2019	MSY approach	-	≤ 28204	1715	37	36	0
2020	MSY approach	-	≤ 13686	858	40	32	0
2021	MSY approach	-	≤ 14755	772			
2022	MSY approach	-	≤ 14276				

* 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 2020 as estimated by ICES.

Catch (2020)	Landings					Discards*
	Demersal trawls and seines >100 mm	Gillnets	Demersal trawls 70–99 mm	Beam trawls	Other gears	
24 224 tonnes	75%	10.5%	5.5%	4.5%	4.5%	4701 tonnes
19 523 tonnes						

* Discards include BMS landings.

Table 8 Cod in Subarea 4, Division 7.d, and Subdivision 20. History of commercial catch and 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***
Belgium	1627	1722	1309	1008	894	946	666	653	862	1075	1258	1223	1103	695	817	727	666
Denmark	5889	6291	5105	3430	3831	4402	5686	4863	4803	4536	5457	6026	6713	6119	5493	4964	3064
Faroe Islands	37	34	3	-	16	45	32	-	-	-	-	-	-	-	-	< 0.5	.
France	294	664	354	659	573	950	782	619	369	287	637	517	391	401	583	450	265
Germany	2213	2648	2537	1899	1736	2374	2844	2211	2385	1921	2257	2133	2083	2300	1510	822	755
Greenland	.	35	23	17	17	11	-	-	-	-	-	-	2	1	-	.	.
Netherlands	1726	1660	1585	1523	1896	2649	2657	1928	1955	1344	1242	1403	1365	653	515	716	590
Norway	3223	2900	2749	3057	4128	4234	4495	4898	4601	4080	4600	5404	5627	5521	5539	4518	2330
Poland	-	-	-	1	2	3	-	2	-	-	-	-	-	-	-	.	.
Sweden	240	319	309	386	439	378	362	316	471	332	401	415	373	387	274	344	354
UK (E/W/Ni)	1890	1270	1491	1587	1546	2383	2553	2169	1629	2129	2962	.	.	.	.	.	.
UK (Scotland)	6650	4936	6857	6511	7185	9052	11567	10141	10565	10619	10517	.	.	.	.	.	.
UK (combined)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	14889	16603	18523	21265	15589	9061
Others	-	-	786	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Danish industrial bycatch	17	21	11	23	1	72	12	< 0.5	< 0.5	2	24	< 0.5	5	147	< 0.5	2	11
Norwegian industrial bycatch*	.	.	48	101	22	4	201	1	.	.	.	.	.	.	.	.	.
Total nominal catch	23806	22500	23119	20102	22262	27497	31657	27800	27640	26324	29355	32012	34265	34746	35997	28130	17095
Unallocated landings	-1277	356	-2041	-1046	-605	136	-677	-1125	-1013	-1009	-805	-768	-1230	-1637	-1553	428	98
BMS landings	-	-	-	-	-	-	-	-	-	-	-	-	-	1	8	41	32
ICES estimate of total landings	22529	22855	21078	19056	21657	27634	30980	26675	26627	25315	28550	31244	33035	33109	34444	28558	17192
Agreed TAC	27300	27300	23205	19957	22152	28798	33552	26842	26475	26475	27799	29189	33651	39220	43156	29437	14718

Division 7.d																	
Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019***	2020***
Belgium	47	51	80	84	154	73	57	56	40	53	72	78	39	18	8	3	8
Denmark	-	-	-	-	-	-	-	-	-	-	-	-	-	.	.	.	.
France	810	986	1124	1743	1326	1779	1606	1078	885	768	1270	1142	279	92	35	15	10
Netherlands	14	9	9	59	30	35	45	51	40	38	50	52	40	22	10	3	2
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
Others	-	-	-	-	-	-	-	-	-	-	-	-	-	< 0.5	-	< 0.5	-
Total nominal catch	974	1230	1480	2073	1662	2023	1836	1311	1064	959	1548	1434	459	180	92	37	40
Unallocated landings	40	29	-2	74	-33	-135	-128	8	56	-43	-112	-36	-38	-10	-8	-2	-8
BMS landings	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	< 0.5
ICES estimate of total landings	1014	1259	1479	2147	1629	1887	1708	1319	1120	916	1436	1398	421	170	84	36	32
Agreed TAC	n/a	n/a	n/a	n/a	n/a	1678	1955	1564	1543	1543	1620	1701	1961	2059	1733	1715	858

Subdivision 20 **																	
Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019***	2020***
Denmark	3038	3019	2513	2246	2553	3024	3286	3118	3178	3033	3430	3344	3696	3665	4222	2740	1857
Germany	99	86	84	67	52	55	56	60	78	69	84	87	94	67	87	53	35
Norway	856	759	628	681	779	440	375	421	615	575	533	500	551	486	288	152	94
Sweden	495	488	372	370	365	459	458	518	520	529	570	571	641	557	670	354	223
Others	24	21	373	385	13	2	26	-	-	33	28	26	25	37	58	40	18
Danish industrial by-catch	4	2	3	2	7	2	10	< 0.5	1	1	5	5	< 0.5	40	7	1	13
Total nominal catch	4516	4375	3972	3751	3769	3982	4211	4117	4391	4240	4650	4533	5006	4852	5333	3338	2239
Unallocated landings	-602	-376	-715	-731	-376	-188	-154	-161	-64	-86	37	31	-232	-137	151	140	61
BMS landings	-	-	-	-	-	-	-	-	-	-	-	-	-	1	4	3	4
ICES estimate of total landings	3914	3998	3258	3020	3393	3794	4057	3956	4327	4154	4687	4563	4774	4715	5484	3478	2299
Agreed TAC	3900	3900	3315	2851	3165	4114	4793	3835	3783	3783	3972	4171	4807	5744	7995	4205	2103

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***
Total nominal catch	29296	28104	28572	25926	27693	33502	37704	33228	33095	31523	35554	37978	39730	39778	41422	31506	19373
Unallocated landings	-1839	9	-2757	-1703	-1014	-187	-958	-1277	-1022	-1138	-880	-773	-1500	-1784	-1410	566	150
BMS landings	-	-	-	-	-	-	-	-	-	-	-	-	-	2	12	44	36
ICES estimate of total landings	27457	28113	25815	24223	26679	33315	36746	31950	32074	30386	34673	37205	38230	37994	40012	32072	19523

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
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 2017.

*** Official landings are preliminary.

. = 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			Spawning Stock Biomass			Landings**	Discards**	Fishing pressure		
	Age 1	High	Low	SSB	High	Low			Ages 2–4	High	Low
	thousands			tonnes			tonnes				
1963	446529	619281	321966	131187	218526	78755	115893	12199	0.47	0.55	0.40
1964	727964	1007225	526131	140120	231032	84982	125393	4656	0.52	0.60	0.45
1965	985009	1356350	715333	163823	269660	99526	180120	28973	0.57	0.65	0.50
1966	1193302	1642398	867006	183167	296630	113104	220197	37862	0.58	0.66	0.50
1967	1012126	1393595	735076	206032	324690	130737	251687	23285	0.62	0.70	0.54
1968	500385	690696	362511	210716	336705	131869	286948	17468	0.65	0.74	0.57
1969	435718	604853	313878	209070	315962	138341	199746	4757	0.61	0.70	0.54
1970	1479665	2040800	1072818	213550	307991	148068	224993	17663	0.65	0.73	0.57
1971	1956201	2707235	1413516	219837	300883	160622	326492	84007	0.74	0.83	0.66
1972	479664	664352	346319	201530	276820	146718	352161	33603	0.81	0.91	0.73
1973	698722	966697	505031	166750	238274	116695	237874	29966	0.79	0.88	0.70
1974	689808	955667	497909	177838	241477	130971	213215	39533	0.75	0.84	0.67
1975	1197898	1672902	857767	168209	214656	131812	204249	36841	0.81	0.91	0.72
1976	820106	1152792	583430	145059	181451	115967	233007	72397	0.87	0.97	0.78
1977	2002052	2796253	1433422	121682	152097	97348	208318	139027	0.82	0.92	0.74
1978	1177574	1648111	841376	116822	141500	96448	294640	32434	0.92	1.03	0.83
1979	1478518	2066177	1058000	117511	142704	96765	266019	162278	0.84	0.94	0.75
1980	2370072	3325825	1688976	117719	141300	98074	293753	294208	0.92	1.02	0.83
1981	931094	1303729	664966	127896	151856	107717	333616	57076	0.93	1.03	0.84
1982	1459702	2019840	1054901	129629	152656	110076	302365	54008	1.05	1.16	0.95
1983	831936	1122263	616716	108283	126678	92559	257634	21430	1.03	1.14	0.93
1984	1526121	2041366	1140924	96066	112765	81840	227070	151004	0.97	1.07	0.87
1985	376392	517103	273971	91854	107766	78291	214354	31298	0.92	1.02	0.84
1986	1825626	2436128	1368117	80288	94203	68428	201279	138604	1.00	1.10	0.90
1987	701797	940026	523942	82608	97164	70233	216041	27706	0.97	1.07	0.88
1988	471493	638694	348063	77578	92718	64911	183202	10504	1.00	1.10	0.90
1989	846975	1140434	629030	74208	86296	63813	139578	61656	1.02	1.12	0.92
1990	340447	459563	252205	65876	76423	56785	124835	26747	0.95	1.05	0.86
1991	398707	531742	298956	65972	76306	57037	101442	18199	0.94	1.03	0.85
1992	957698	1252210	732453	67467	77256	58919	112740	36193	0.91	1.00	0.83
1993	436538	565612	336918	69739	81080	59985	119947	21412	0.97	1.07	0.88
1994	1078364	1398912	831267	72155	83477	62368	109915	98208	0.94	1.04	0.85
1995	687763	889489	531786	77792	89922	67297	136397	31707	0.88	0.97	0.79

1996	469770	608862	362453	92444	106528	80222	124721	14030	0.90	1.00	0.82
1997	1542688	2000950	1189378	94210	106655	83217	122434	33184	0.93	1.02	0.85
1998	144395	192916	108078	98224	115113	83813	144637	40102	1.12	1.23	1.03
1999	312967	414085	236541	79094	90422	69186	94108	13642	1.14	1.25	1.05
2000	452949	590851	347232	55878	63078	49499	69567	13360	1.16	1.27	1.06
2001	183390	241562	139227	43323	50177	37406	48440	13519	0.88	0.97	0.79
2002	265362	350121	201122	46869	53519	41046	53152	11901	1.05	1.16	0.95
2003	120876	159831	91416	34964	40070	30509	30426	4007	0.76	0.85	0.68
2004	241790	319372	183054	33092	37569	29148	27748	8721	0.80	0.90	0.72
2005	192080	254040	145231	31978	36938	27683	28165	9932	0.82	0.91	0.73
2006	423208	550622	325278	34362	40199	29372	25665	11923	0.73	0.82	0.65
2007	190907	250440	145525	45667	53735	38811	24215	30422	0.66	0.75	0.58
2008	214364	279489	164414	65201	76147	55828	26814	24984	0.64	0.72	0.56
2009	240060	317144	181712	66101	77487	56388	33177	20846	0.61	0.71	0.53
2010	302150	391149	233401	69172	82857	57747	36762	12341	0.52	0.60	0.44
2011	143866	190462	108669	77527	95574	62887	31979	8711	0.40	0.47	0.35
2012	222046	293415	168037	81688	100901	66134	32124	8638	0.37	0.43	0.32
2013	251482	329801	191761	82352	101635	66727	30474	10289	0.37	0.43	0.32
2014	313474	406192	241919	80119	98773	64988	34651	10538	0.38	0.43	0.33
2015	147284	191993	112986	85085	105522	68605	37373	12537	0.38	0.44	0.34
2016	102928	134808	78587	85860	105641	69782	38104	12203	0.38	0.44	0.33
2017	313264	413582	237280	84416	103177	69067	37668	8702	0.43	0.50	0.38
2018	67402	88354	51419	73006	89997	59223	40153	7744	0.56	0.64	0.49
2019	145193	191869	109871	56169	71672	44019	32361	3555	0.54	0.64	0.46
2020	271264	401022	183492	39390	52077	29794	19373	4700	0.45	0.55	0.37
2021	185468*	398970	86218	37912	51884	27703					

* Recruitment in 2021 is the assessment estimate. The value provided in Table 1 is the median from a normal distribution of the assessment estimate required for stochastic projections.

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

Sources and references

EU. 2018. Regulation (EU) 2018/973 of the European Parliament and of the Council of 4 July 2018 establishing a multiannual plan for demersal stocks in the North Sea and the fisheries exploiting those stocks, specifying details of the implementation of the landing obligation in the North Sea and repealing Council Regulations (EC) No 676/2007 and (EC) No 1342/2008. Official Journal of the European Union, L 179: 1–13. <http://data.europa.eu/eli/reg/2018/973/oj>.

ICES. 2020. Workshop on Stock Identification of North Sea Cod (WKNSCodID). ICES Scientific Reports, 2:89. 82 pp. <http://doi.org/10.17895/ices.pub.7499>.

ICES. 2021a. Benchmark Workshop on North Sea Stocks (WKNSEA). ICES Scientific Reports, 3:25. 756 pp. <https://doi.org/10.17895/ices.pub.7922>.

ICES. 2021b. Advice on fishing opportunities. *In* Report of the ICES Advisory Committee, 2021. ICES Advice 2021, section 1.1.1. <https://doi.org/10.17895/ices.advice.7720>.

ICES. 2021c. Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK). ICES Scientific Reports. 3:66. <https://doi.org/10.17895/ices.pub.8211>. *In prep.*

Nielsen, A. and Berg, C. W. 2014. Estimation of time-varying selectivity in stock assessments using state–space models. *Fisheries Research*, 158: 96–101. <https://doi.org/10.1016/j.fishres.2014.01.014>.

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Recommended citation: ICES. 2021. Cod (*Gadus morhua*) in Subarea 4, Division 7.d, and Subdivision 20 (North Sea, eastern English Channel, Skagerrak). *In* Report of the ICES Advisory Committee, 2021. ICES Advice 2021, cod.27.47d20. <https://doi.org/10.17895/ices.advice.7746>.