

UK and Norway request on catch scenarios for alternative interim-year fishing mortality assumptions: Cod (*Gadus morhua*) in Subarea 4, Division 7.d, and Subdivision 20 (North Sea, eastern English Channel, Skagerrak)

Service summary

Catch scenarios are provided for each of six alternative interim-year fishing mortality assumptions, as requested. These six alternative assumptions are that the TAC overshoot for 2021 was 5%, 20%, 25%, 30%, 37%, and 40%.

Request

United Kingdom and Norway have asked ICES to provide the following:

This request for an ICES' Technical Service concerns a follow-up to ICES' advice for North Sea cod released in June 2021.

We understand, and appreciate, that the ICES' reopening protocol did not initiate a revision of ICES' advice and that the June advice is unchanged.

Landings information submitted to ICES as part of the reopening protocol for North Sea cod (Annex 6, ICES WGNSSK 2021 report) indicates that the assumed TAC overshoot in 2021 may not be as high as the 71% underlying the published headline advice, although still uncertain until year-end.

The original WGNSSK forecast published in the 2021 WGNSSK report (assuming a 37% overshoot) along with forecasts based on a range of alternative assumptions (based on the information given in Annex 6) would be informative to the agreement of the 2022 quota for North Sea cod.

We request an ICES' Technical Service to provide an outlook table corresponding to each of the following overshoot assumptions for 2021, in the same format as Table 2 in ICES' June advice:

- 5%
- 20%
- 25%
- 30%
- 37%
- 40%

Please provide a response as soon as possible, with a deadline date of Friday 12th November.

Basis of the advice

This technical service has been produced based on the North Sea cod assessment and forecast methodology (ICES, 2021) but making alternative assumptions about the interim-year fishing mortality, as specified in the request. The alternative interim-year fishing mortalities are those that lead to a 5%, 20%, 25%, 30%, 37%, and 40% overshoot of the TAC set for 2021. Catch scenarios are provided for each of these assumptions.

Results

5% overshoot of the 2021 TAC

Table 1 Values in the forecast and for the interim year.

Variable	Value	Notes
F _{ages 2-4} (2021)	0.21	Based on a median catch of 16 706 tonnes in 2021 assuming a 5% overshoot of the 2021 TAC
SSB (2022)	57 082	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)	16 706	Assuming an overshoot of the TAC in 2021 by 5%; tonnes
Projected landings (2021)	12 851	Assuming 2020 landings rate; tonnes
Projected discards (2021)	3855	Assuming 2020 discard rate; tonnes

Table 2 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}	18364	15350	3014	0.167	0.134	0.033	82497	45	15.4	24	22
Other scenarios											
F = F _{MSY lower} × SSB (2022) /MSY B _{trigger}	12513	10476	2037	0.111	0.089	0.022	87338	53	-21	-15.2	13.6
F = 0	0	0	0	0.00	0.00	0.00	97698	71	-100	-100	3.6
F _{pa}	46606	38693	7913	0.49	0.39	0.097	59528	4.3	193	220	76
F _{lim}	53142	44035	9107	0.58	0.46	0.115	54557	-4.4	230	260	85
SSB (2023) = B _{lim}	33775	28154	5621	0.33	0.26	0.066	69841	22	112	129	50
TAC (2021) -20%	12729	10657	2072	0.113	0.090	0.023	87171	53	-20.0	-13.7	14.3
TAC (2021) -15%	13524	11323	2201	0.120	0.096	0.024	86481	52	-15.0	-8.3	14.6
TAC (2021) -10%	14320	11986	2334	0.128	0.102	0.026	85774	50	-10.0	-2.9	15.5
TAC (2021) -5%	15115	12647	2468	0.135	0.109	0.026	85134	49	-5.0	2.4	16.4
TAC (2021)	15911	13316	2595	0.143	0.115	0.028	84509	48	0.00	7.8	17.6
TAC (2021) +5%	16707	13976	2731	0.151	0.121	0.030	83820	47	5.0	13.2	19.0
TAC (2021) +10%	17502	14636	2866	0.158	0.127	0.031	83177	46	10.0	18.6	20
TAC (2021) +15%	18298	15296	3002	0.166	0.133	0.033	82563	45	15.0	24	22
TAC (2021) +20%	19093	15950	3143	0.174	0.139	0.035	81898	43	20.0	29	24
F = F ₂₀₂₁	23020	19235	3785	0.21	0.171	0.043	78536	38	45	56	30
F = F _{MSY lower}	20308	16965	3343	0.186	0.149	0.037	80841	42	28	38	26
F = F _{MSY}	29261	24425	4836	0.28	0.22	0.055	73668	29	84	98	41
F = F _{MSY upper}	43557	36211	7346	0.45	0.36	0.089	61914	8.5	174	195	71

20% overshoot of the 2021 TAC

Table 3 Values in the forecast and for the interim year.

Variable	Value	Notes
$F_{\text{ages 2-4}}$ (2021)	0.25	Based on a median catch of 19 093 tonnes in 2021 assuming a 20% overshoot of the 2021 TAC
SSB (2022)	55 309	From the short-term forecast; tonnes
$R_{\text{age 1}}$ (2021)	186 075	Median recruitment estimate in 2021; thousands
$R_{\text{age 1}}$ (2022)	222 046	Median recruitment, resampled from the years 1998–2021; thousands
Total catch (2021)	19 093	Assuming an overshoot of the TAC in 2021 by 20%; tonnes
Projected landings (2021)	14 678	Assuming 2020 landings rate; tonnes
Projected discards (2021)	4415	Assuming 2020 discard rate; tonnes

Table 4 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])	$F_{\text{projected landings}}$ (ages 2–4 [2022])	$F_{\text{projected discards}}$ (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: $F_{\text{MSY}} \times \text{SSB (2022)}$ / $\text{MSY } B_{\text{trigger}}$	17405	14524	2881	0.162	0.130	0.032	80843	46	9.4	18.0	26
Other scenarios											
$F = F_{\text{MSY lower}} \times \text{SSB (2022)}$ / $\text{MSY } B_{\text{trigger}}$	11876	9907	1969	0.107	0.086	0.021	85444	54	-25	-19.5	16.2
$F = 0$	0	0	0	0.00	0.00	0.00	95159	72	-100	-100	5.1
F_{pa}	45538	37676	7862	0.49	0.39	0.097	58176	5.2	186	210	78
F_{lim}	51923	42845	9078	0.58	0.46	0.115	53243	-3.7	230	250	87
$\text{SSB (2023)} = B_{\text{lim}}$	30951	25695	5256	0.31	0.25	0.061	69840	26	95	110	50
TAC (2021) -20%	12728	10618	2110	0.116	0.093	0.023	84713	53	-20	-13.7	17.3
TAC (2021) -15%	13524	11283	2241	0.123	0.099	0.024	84023	52	-15.0	-8.3	18.8
TAC (2021) -10%	14320	11946	2374	0.131	0.105	0.026	83403	51	-10.0	-2.9	19.8
TAC (2021) -5%	15115	12605	2510	0.139	0.111	0.028	82790	50	-5.0	2.4	21
TAC (2021)	15911	13270	2641	0.147	0.118	0.029	82113	48	0.00	7.8	23
TAC (2021) +5%	16707	13941	2766	0.155	0.124	0.031	81457	47	5.0	13.2	25
TAC (2021) +10%	17502	14605	2897	0.163	0.130	0.033	80764	46	10.0	18.6	26
TAC (2021) +15%	18297	15265	3032	0.171	0.137	0.034	80119	45	15.0	24	27
TAC (2021) +20%	19093	15922	3171	0.179	0.143	0.036	79403	44	20.0	29	28
$F = F_{2021}$	25610	21343	4267	0.25	0.199	0.049	74180	34	61	74	40
$F = F_{\text{MSY lower}}$	19808	16506	3302	0.186	0.149	0.037	78804	42	24	34	29
$F = F_{\text{MSY}}$	28537	23733	4804	0.28	0.22	0.055	71916	30	79	93	46
$F = F_{\text{MSY upper}}$	42525	35250	7275	0.45	0.36	0.089	60422	9.2	167	188	74

25% overshoot of the 2021 TAC

Table 5 Values in the forecast and for the interim year.

Variable	Value	Notes
$F_{\text{ages 2-4}} (2021)$	0.26	Based on a median catch of 19 889 tonnes in 2021 assuming a 25% overshoot of the 2021 TAC
SSB (2022)	54 691	From the short-term forecast; tonnes
$R_{\text{age 1}} (2021)$	186 075	Median recruitment estimate in 2021; thousands
$R_{\text{age 1}} (2022)$	222 046	Median recruitment, resampled from the years 1998–2021; thousands
Total catch (2021)	19 889	Assuming an overshoot of the TAC in 2021 by 25%; tonnes
Projected landings (2021)	15 282	Assuming 2020 landings rate; tonnes
Projected discards (2021)	4607	Assuming 2020 discard rate; tonnes

Table 6 Annual catch scenarios. All weights are in tonnes (t).

Basis	Total catch (2022)	Projected landings (2022)	Projected discards (2022)	$F_{\text{total}} (ages 2-4) [2022]$	$F_{\text{projected landings}} (ages 2-4) [2022]$	$F_{\text{projected discards}} (ages 2-4) [2022]$	SSB (2023)	% SSB change	% TAC change	% advice change	% probability of falling below B_{lim} in 2023
ICES advice basis											
MSY approach: $F_{\text{MSY}} \times \text{SSB} (2022) / \text{MSY } B_{\text{trigger}}$	17082	14233	2849	0.160	0.128	0.032	80364	47	7.4	15.8	26
Other scenarios											
$F = F_{\text{MSY lower}} \times \text{SSB} (2022) / \text{MSY } B_{\text{trigger}}$	11642	9707	1935	0.106	0.085	0.021	84856	55	-27	-21	17.3
$F = 0$	0	0	0	0.00	0.00	0.00	94392	73	-100	-100	6.0
F_{pa}	45204	37318	7886	0.49	0.39	0.097	57645	5.4	184	210	79
F_{lim}	51570	42500	9070	0.58	0.46	0.115	52841	-3.4	220	250	88
$\text{SSB} (2023) = B_{\text{lim}}$	30006	24890	5116	0.30	0.24	0.059	69841	28	89	103	50
TAC (2021) -20%	12729	10610	2119	0.117	0.094	0.023	83884	53	-20.0	-13.7	19.0
TAC (2021) -15%	13524	11270	2254	0.124	0.100	0.024	83249	52	-15.0	-8.3	20
TAC (2021) -10%	14320	11940	2380	0.132	0.106	0.026	82615	51	-10.0	-2.9	22
TAC (2021) -5%	15115	12600	2515	0.140	0.112	0.028	82011	50	-5.0	2.4	23
TAC (2021)	15911	13264	2647	0.148	0.119	0.029	81317	49	0.00	7.8	25
TAC (2021) +5%	16707	13924	2783	0.156	0.125	0.031	80675	48	5.0	13.2	26
TAC (2021) +10%	17502	14581	2921	0.164	0.132	0.032	79980	46	10.0	18.6	27
TAC (2021) +15%	18298	15246	3052	0.172	0.138	0.034	79277	45	15.0	24	28
TAC (2021) +20%	19093	15901	3192	0.180	0.145	0.035	78615	44	20.0	29	30
$F = F_{2021}$	26442	21988	4454	0.26	0.21	0.051	72809	33	66	79	44
$F = F_{\text{MSY lower}}$	19636	16350	3286	0.186	0.149	0.037	78197	43	23	33	31
$F = F_{\text{MSY}}$	28296	23509	4787	0.28	0.22	0.055	71318	30	78	92	48
$F = F_{\text{MSY upper}}$	42200	34944	7256	0.45	0.36	0.089	60020	9.7	165	186	75

30% overshoot of the 2021 TAC

Table 7 Values in the forecast and for the interim year.

Variable	Value	Notes
$F_{\text{ages 2-4}} (2021)$	0.27	Based on a median catch of 20 684 tonnes in 2021 assuming a 30% overshoot of the 2021 TAC
SSB (2022)	54 135	From the short-term forecast; tonnes
$R_{\text{age 1}} (2021)$	186 075	Median recruitment estimate in 2021; thousands
$R_{\text{age 1}} (2022)$	222 046	Median recruitment, resampled from the years 1998–2021; thousands
Total catch (2021)	20 684	Assuming an overshoot of the TAC in 2021 by 30%; tonnes
Projected landings (2021)	15 890	Assuming 2020 landings rate; tonnes
Projected discards (2021)	4794	Assuming 2020 discard rate; tonnes

Table 8 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])	$F_{\text{projected landings}}$ (ages 2–4 [2022])	$F_{\text{projected discards}}$ (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: $F_{\text{MSY}} \times \text{SSB} (2022) / \text{MSY } B_{\text{trigger}}$	16758	13954	2804	0.158	0.127	0.031	79798	47	5.3	13.6	28
Other scenarios											
$F = F_{\text{MSY lower}} \times \text{SSB} (2022) / \text{MSY } B_{\text{trigger}}$	11427	9517	1910	0.105	0.084	0.021	84181	56	-28	-23	18.4
$F = 0$	0	0	0	0.00	0.00	0.00	93583	73	-100	-100	6.4
F_{pa}	44811	36965	7846	0.49	0.39	0.097	57165	5.6	182	200	80
F_{lim}	51150	42069	9081	0.58	0.46	0.115	52404	-3.2	220	250	88
$\text{SSB} (2023) = B_{\text{lim}}$	29050	24083	4967	0.29	0.23	0.058	69841	29	83	97	50
TAC (2021) -20%	12729	10606	2123	0.118	0.094	0.024	83082	53	-20.0	-13.7	20
TAC (2021) -15%	13524	11271	2253	0.126	0.101	0.025	82475	52	-15.0	-8.3	22
TAC (2021) -10%	14320	11931	2389	0.133	0.107	0.026	81859	51	-10.0	-2.9	23
TAC (2021) -5%	15115	12584	2531	0.141	0.113	0.028	81224	50	-5.0	2.4	25
TAC (2021)	15911	13249	2662	0.149	0.120	0.029	80555	49	0.00	7.8	26
TAC (2021) +5%	16707	13912	2795	0.158	0.126	0.032	79845	47	5.0	13.2	28
TAC (2021) +10%	17502	14576	2926	0.166	0.133	0.033	79124	46	10.0	18.6	28
TAC (2021) +15%	18298	15244	3054	0.174	0.140	0.034	78456	45	15.0	24	30
TAC (2021) +20%	19093	15902	3191	0.182	0.146	0.036	77845	44	20.0	29	32
$F = F_{2021}$	27275	22634	4641	0.27	0.22	0.054	71355	32	71	85	48
$F = F_{\text{MSY lower}}$	19451	16197	3254	0.186	0.149	0.037	77569	43	22	32	33
$F = F_{\text{MSY}}$	28075	23285	4790	0.28	0.22	0.055	70666	31	76	90	49
$F = F_{\text{MSY upper}}$	41871	34586	7285	0.45	0.36	0.089	59539	10.0	163	184	76

37% overshoot of the 2021 TAC

Table 9 Values in the forecast and for the interim year.

Variable	Value	Notes
$F_{\text{ages 2-4}}$ (2021)	0.29	Based on a median catch of 21 798 tonnes in 2021 assuming a 37% overshoot of the 2021 TAC
SSB (2022)	53 406	From the short-term forecast; tonnes
$R_{\text{age 1}}$ (2021)	186 075	Median recruitment estimate in 2021; thousands
$R_{\text{age 1}}$ (2022)	222 046	Median recruitment, resampled from the years 1998–2021; thousands
Total catch (2021)	21 798	Assuming an overshoot of the TAC in 2021 by 37%; tonnes
Projected landings (2021)	16 747	Assuming 2020 landings rate; tonnes
Projected discards (2021)	5051	Assuming 2020 discard rate; tonnes

Table 10 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])	$F_{\text{projected landings}}$ (ages 2–4 [2022])	$F_{\text{projected discards}}$ (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: $F_{\text{MSY}} \times \text{SSB (2022)}$ / $\text{MSY } B_{\text{trigger}}$	16311	13573	2738	0.156	0.125	0.031	79031	48	2.5	10.5	28
Other scenarios											
$F = F_{\text{MSY lower}} \times \text{SSB (2022)}$ / $\text{MSY } B_{\text{trigger}}$	11111	9252	1859	0.103	0.083	0.0200	83308	56	-30	-25	19.9
$F = 0$	0	0	0	0.00	0.00	0.00	92503	73	-100	-100	7.0
F_{pa}	44319	36540	7779	0.49	0.39	0.097	56552	5.9	179	200	81
F_{lim}	50556	41494	9062	0.58	0.46	0.115	51836	-2.9	220	240	89
$\text{SSB (2023)} = B_{\text{lim}}$	27714	22953	4761	0.28	0.22	0.056	69841	31	74	88	50
TAC (2021) -20%	12729	10597	2132	0.119	0.096	0.023	82025	54	-20.0	-13.7	23
TAC (2021) -15%	13524	11258	2266	0.127	0.102	0.025	81449	53	-15.0	-8.3	25
TAC (2021) -10%	14321	11924	2397	0.135	0.109	0.026	80796	51	-10.0	-2.9	26
TAC (2021) -5%	15115	12588	2527	0.143	0.115	0.028	80141	50	-5.0	2.4	27
TAC (2021)	15911	13245	2666	0.151	0.122	0.029	79386	49	0.00	7.8	28
TAC (2021) +5%	16707	13901	2806	0.160	0.128	0.032	78649	47	5.0	13.2	30
TAC (2021) +10%	17502	14556	2946	0.168	0.135	0.033	78007	46	10.0	18.6	32
TAC (2021) +15%	18298	15223	3075	0.176	0.141	0.035	77393	45	15.0	24	33
TAC (2021) +20%	19093	15885	3208	0.185	0.148	0.037	76781	44	20.0	29	35
$F = F_{2021}$	28387	23525	4862	0.29	0.23	0.057	69286	30	78	92	52
$F = F_{\text{MSY lower}}$	19220	15992	3228	0.186	0.149	0.037	76673	44	21	30	35
$F = F_{\text{MSY}}$	27752	22984	4768	0.28	0.22	0.055	69808	31	74	88	50
$F = F_{\text{MSY upper}}$	41374	34115	7259	0.45	0.36	0.089	58811	10.1	160	180	77

40% overshoot of the 2021 TAC

Table 11 Values in the forecast and for the interim year.

Variable	Value	Notes
F _{ages 2–4} (2021)	0.30	Based on a median catch of 22 276 tonnes in 2021 assuming a 40% overshoot of the 2021 TAC
SSB (2022)	53 036	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)	22 276	Assuming an overshoot of the TAC in 2021 by 40%; tonnes
Projected landings (2021)	17 109	Assuming 2020 landings rate; tonnes
Projected discards (2021)	5167	Assuming 2020 discard rate; tonnes

Table 12 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}	16127	13413	2714	0.155	0.124	0.031	78698	48	1.36	9.3	30
Other scenarios											
F = F _{MSY lower} × SSB (2022) /MSY B _{trigger}	10982	9142	1840	0.103	0.082	0.021	82942	56	-31	-26	21
F = 0	0	0	0	0.00	0.00	0.00	92041	74	-100	-100	7.4
F _{pa}	44131	36323	7808	0.49	0.39	0.097	56294	6.1	177	199	82
F _{lim}	50318	41248	9070	0.58	0.46	0.115	51595	-2.7	220	240	90
SSB (2023) = B _{lim}	27134	22482	4652	0.28	0.22	0.055	69841	32	71	84	50
TAC (2021) -20%	12729	10596	2133	0.120	0.096	0.024	81633	54	-20.0	-13.7	24
TAC (2021) -15%	13524	11260	2264	0.128	0.103	0.025	80981	53	-15.0	-8.3	26
TAC (2021) -10%	14320	11923	2397	0.136	0.109	0.027	80334	51	-10.0	-2.9	27
TAC (2021) -5%	15115	12578	2537	0.144	0.116	0.028	79634	50	-5.0	2.4	28
TAC (2021)	15912	13235	2677	0.152	0.122	0.030	78909	49	0.0063	7.8	29
TAC (2021) +5%	16707	13896	2811	0.161	0.129	0.032	78181	47	5.0	13.2	31
TAC (2021) +10%	17503	14557	2946	0.169	0.135	0.034	77547	46	10.0	18.6	33
TAC (2021) +15%	18298	15218	3080	0.177	0.142	0.035	76934	45	15.0	24	34
TAC (2021) +20%	19093	15875	3218	0.186	0.149	0.037	76321	44	20.0	29	36
F = F ₂₀₂₁	28834	23899	4935	0.30	0.24	0.059	68500	29	81	95	54
F = F _{MSY lower}	19127	15904	3223	0.186	0.149	0.037	76295	44	20	30	36
F = F _{MSY}	27593	22869	4724	0.28	0.22	0.055	69462	31	73	87	51
F = F _{MSY upper}	41179	33948	7231	0.45	0.36	0.089	58500	10.3	159	179	78

Sources and references

ICES. 2021. Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK). ICES Scientific Reports. 3:66. 1281 pp. <https://doi.org/10.17895/ices.pub.8211>.

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