

Cod (*Gadus morhua*) in Subdivision 5.b.1 (Faroe Plateau)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2020 should be no more than 11 679 tonnes. ICES is not in a position to advise on the corresponding level of fishing effort.

Stock development over time

The spawning-stock biomass (SSB) was below B_{lim} for several years, but has increased to above MSY $B_{trigger}$ in 2018. Fishing mortality (F) decreased from 2010 but is still above F_{MSY} in 2018. The 2009–2015 year classes are estimated to be below average size. The 2016–2018 year classes are estimated to be average or above average, though there is large uncertainty around these estimates.

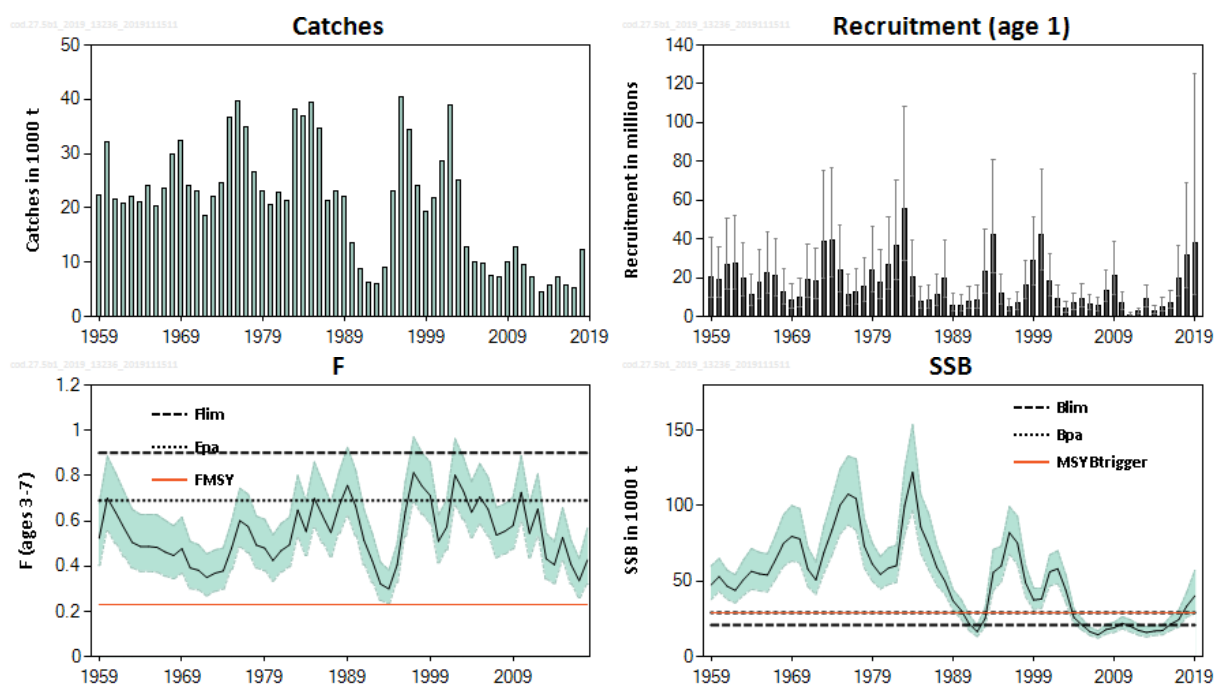


Figure 1 Cod in Subdivision 5.b.1. Summary of the stock assessment with 95% confidence intervals.

Stock and exploitation status

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

Table 1 Cod in Subdivision 5.b.1. State of the stock and fishery relative to reference points.

		Fishing pressure				Stock size		
		2016	2017	2018		2017	2018	2019
Maximum sustainable yield	F_{MSY}	✗	✗	✗	Above	MSY $B_{trigger}$	✗	✓
Precautionary approach	F_{pa}, F_{lim}	✓	✓	✓	Harvested sustainably	B_{pa}, B_{lim}	○	✓
Management plan	F_{MGT}	—	—	—	Not applicable	B_{MGT}	—	—
								Full reproductive capacity
								Above trigger
								Not applicable

Catch scenarios

Table 2 Cod in Subdivision 5.b.1. Assumptions made for the interim year and in the forecast. All weights are in tonnes.

Variable	Value	Notes
$F_{\text{ages 3-7}}$ (2019)	0.43	$F_{2019} = F_{2018}$ as estimated by SAM.
SSB (2020)	69899	Based on $F(2019) = 0.44$.
$R_{\text{age 1}}$ (2020)	7401	In thousands. Median of resampled estimates from 2009 to 2018.
$R_{\text{age 1}}$ (2021)	7401	In thousands. Median of resampled estimates from 2009 to 2018.
Total catch (2019)	13645	Based on $F(2019) = 0.44$.
Landings (2019)	13645	Landings = catches.
Discards (2019)	0	Discarding is considered negligible.

Table 3 Cod in Subdivision 5.b.1. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2020)	F_{total} (2020)	SSB (2021)	% SSB change *	% Advice change **
ICES advice basis					
MSY approach: F_{MSY}	11679	0.23	110000	57	25
Other scenarios					
$F = 0$	0	0	124069	77	-100
$F = F_{2019}$	20371	0.43	99899	43	118
$F = F_{\text{pa}}$	29509	0.69	88289	26	215
$F = F_{\text{lim}}$	36058	0.90	81116	16	285

* SSB 2021 relative to SSB 2020 (69 899 t).

** Advice value for 2020 relative to the advice value for 2019 as issued in 2018 (9354 t).

The catch advice for 2020 is increased compared to the advice for 2019; this is due to the increase in biomass resulting from the higher recruitment and lower fishing mortality in recent years.

Basis of the advice

Table 4 Cod in Subdivision 5.b.1. The basis of the advice.

Advice basis	MSY approach
Management plan	ICES is not aware of any agreed precautionary management plan for cod in this area.

Quality of the assessment

The stock was benchmarked in 2017, and the assessment model and input data were changed. The historical trajectory of stock development did not change substantially.

The current assessment confirms the large increase of SSB in recent years, consistent with the rapid increase in survey catch rates. The latest assessment shows a large downward revision in the 2018 recruitment estimate.

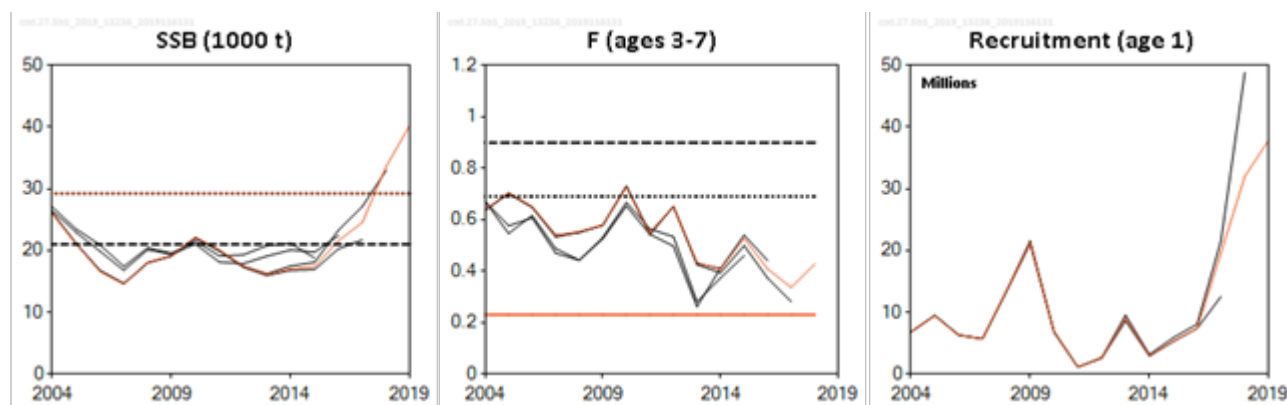


Figure 2 Cod in Subdivision 5.b.1. Historical assessment results. The age of recruitment changed from age 2 to age 1 at the 2017 benchmark; the recruitment plot therefore shows only three lines.

Issues relevant for the advice

An effort management system has been in place since 1996. ICES is currently not in a position to quantify the relationship between effort and F for this stock.

Faroe Plateau cod and Faroe haddock are caught in a mixed fishery.

Reference points

Table 5 Cod in Subdivision 5.b.1. Reference points, values, and their technical basis. All weights are in tonnes.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	29226	$B_{lim} \times \exp(1.645 \times \sigma)$, where $\sigma = 0.20$	ICES (2017)
	F_{MSY}	0.23	Stochastic simulations assuming segmented regression, Ricker and Beverton and Holt stock–recruitment relationships	ICES (2017)
Precautionary approach	B_{lim}	21000	B_{loss} in 1992 from the 1998 assessment	ICES (1998, 2017)
	B_{pa}	29226	$B_{lim} \times \exp(1.645 \times \sigma)$, where $\sigma = 0.20$	ICES (2017)
	F_{lim}	0.90	Stochastic simulations (ICES, 2017): the F that gives a 50% probability of $SSB > B_{lim}$	ICES (2017)
	F_{pa}	0.69	$F_{lim} \times \exp(-1.645 \times \sigma)$, where $\sigma = 0.16$	ICES (2017)
Management plan	SSB_{mgt}	Not applicable		
	F_{mgt}	Not applicable		

Basis of the assessment

Table 6 Cod in Subdivision 5.b.1. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018a).
Assessment type	SAM with catch-at-age data and age-disaggregated indices, using catches in the model and in the forecast (ICES, 2019).
Input data	Commercial catches, ages, and length frequencies from catch sampling; survey indices (FO-GFS-Q1 and FO-GFS-Q3); annual maturity data from FO-GFS-Q1; natural mortality set at 0.2.
Discards and bycatch	Discarding is considered negligible.
Indicators	Co-occurrence of high recruitment of cod with sandeel abundance.
Other information	The stock was benchmarked in 2017 (ICES, 2018b).
Working group	North-Western Working Group (NWWG)

Information from stakeholders

There is no additional available information.

History of the advice, catch, and management

Table 7 Cod in Subdivision 5.b.1. ICES advice and catch. All weights are in tonnes.

Fishing year	ICES advice	Catch corresponding to advice	Agreed TAC***	ICES catch
1987	No increase in F	< 31000		21391
1988	No increase in F (Revised estimate)	< 29000 (23000)		23182
1989	No increase in F	< 19000		22068
1990	No increase in F	< 20000		13692
1991	TAC	< 16000		8750
1992	No increase in F	< 20000		6396
1993	No fishing	0		6107
1994	No fishing	0	8500/12500***	9046
1995	No fishing	0	12500*	23045
1996	F at lowest possible level	-	20000**	40422
1997	80% of F(95)	< 24000		34304

Fishing year	ICES advice	Catch corresponding to advice	Agreed TAC***	ICES catch
1998	30% reduction in effort from 1996/97	-		24005
1999	F less than proposed F_{pa} (0.35)	< 19000		19245
2000	F less than proposed F_{pa} (0.35)	< 20000		21833
2001	F less than proposed F_{pa} (0.35)	< 16000		28577
2002	75% of F(2000)	< 22000		38834
2003	75% of F(2001)	< 32000		25167
2004	25% reduction in effort	-		12840
2005	Rebuilding plan involving large reduction	-		10119
2006	Rebuilding plan involving large reduction	-		9844
2007	Rebuilding plan involving large reduction in effort	-		7511
2008	No fishing. Development of a rebuilding plan	0		7315
2009	No fishing. Development of a rebuilding plan	0		9979
2010	No fishing. Development of a rebuilding plan	0		12762
2011	Reduce F to below F_{pa}	< 16000		9692
2012	MSY framework, reduce F by 30%	< 10000		7204
2013	MSY approach, $F < 0.20$	< 4800		4473
2014	MSY approach, reduce F by 69%	< 3600		5711
2015	MSY approach, reduce F by 23%	< 4500		7281
2016	Lowest possible level (LPL) and develop a mixed-fishery management plan	-		5933
2017	MSY approach ($F \leq 0.16$)	≤ 2800		5366
2018	MSY approach ($F \leq 0.22$)	≤ 4579		12311
2019	MSY approach	≤ 9354		
2020	MSY approach	≤ 11679		

* In the quota year 1 September–31 August the following year.

** The TAC was increased during the quota year.

*** Not applicable since 1997.

History of the catch and landings

Table 8 Cod in Subdivision 5.b.1. Catch distribution by fleet in 2017 as estimated by ICES. All weights are in tonnes.

Catch (2018)	Landings			Discards
12311	Longlines 41%	Handlines 11%	Trawls 48%	Negligible
	12311			

Table 9 Cod in Subdivision 5.b.1. History of commercial catch and landings; catches in this table are those officially reported by each country and may differ from the ICES estimated catch. All weights are in tonnes.

Year	Denmark	Faroe Islands	France	Germany	Iceland	Norway	Greenland	Portugal	UK (E/W/N/I)	UK (Scotland)	Total
1986	8	34492	4	8		83			-		34595
1987	30	21303	17	12		21			8		21391
1988	10	22272	17	5		163					22467
1989		20535		7		285					20827
1990		12232		24		124					12380
1991		8203	**	16		89			1		8309
1992		5938	3***	12		39			74		6066
1993		5744	1***	+		57			186		5988
1994		8724		2***		36			56		8818
1995		19079	2***	2		38			43		19164
1996		39406	1***	+		507			126		40040
1997		33556		+		410			61***		34027
1998		23308				405			27***		23740

Year	Denmark	Faroe Islands	France	Germany	Iceland	Norway	Greenland	Portugal	UK (E/W/Nl)	UK (Scotland)	Total
1999		19156		39		450			51		19696
2000		^	1	2		374			18		395
2001		29762	9***	9		531*			50		30361
2002		40602	20	6	5	573			42		41248
2003		30259	14	7		447			15		30742
2004		17540	2	3***		414		1	15		17975
2005		13556				201			24		13781
2006		11629	7	1***		49	5				11691
2007		9905	1***			71	7			360	10344
2008		9394	1			40				383	9818
2009		10736	1			14	7			300	11058
2010		13878	1			10				312	14206
2011		11348									11348
2012		8437			28						8466
2013		5331			20		2				5333
2014		6655				2				226	6883
2015		7812				33	14			267	8128
2016		6736				31	5			515	7289
2017		6208	2			16				405	6631
2018		13372	2			69				530	13973

* Preliminary.

** Included in ICES Subdivision 5.b.2.

*** Reported as ICES Division 5.b.

^ No reported catch.

Table 10 Cod in Subdivision 5.b.1. Total officially reported landings, Faroese catches by area with corrections (to account for different round/gutted conversion factors as well as the subtraction of cod originating from the Icelandic cod stock), catches reported by other nations, and ICES catches used in the assessment. All weights are in tonnes.

Year	Officially reported	Faroese catches				Catches reported as Subdivision 5.b.2			Foreign catches in Subdivision 5.b.1				ICES catch (Used in the assessment)
		In 5.b.1	Corrections in 5.b.1	On Faroe-Iceland ridge	In Division 2.a within Faroe area jurisdiction	UK (E/W/Nl)	UK (Scotland)	UK-	France**	Greenland**	Russia**	UK**	
1986	34595												34595
1987	21391												21391
1988	22467				715								23182
1989	20827				1229				12				22068
1990	12380				1090		205		17				13692
1991	8309				351		90						8750
1992	6066				154	+	176						6396
1993	5988					1	118						6107
1994	8818					1	227						9046
1995	19164	3330***					551						23045
1996	40040						382						40422
1997	34027						277						34304
1998	23740						265						24005
1999	19696			-661			210						19245
2000	395	21793		-600			245						21833
2001	30361		-1766	-306			288						28577
2002	41248		-2409	-223			218						38834
2003	30742		-1795	-4034			254						25167
2004	17975		-1041	-4338			244						12840
2005	13781		-804	-3987			1129						10119
2006	11691		-690	-1435			278						9844
2007	10344		-588	-2304			53			6			7511
2008	9818		-557	-1978			32						7315
2009	11058		-637	-510			38			26	4		9979
2010	14206		-823	-680			54			5			12762
2011	11348		-673	-986						3			9692
2012	8466		-500	-766						5			7205
2013	5333		-316	-544							0		4473
2014	6883		-395	-777									5711
2015	8128		-463	-384									7381
2016	7289		-399	-958									5933
2017	6631		-368	-896									5366
2018	13973*		-793	-869									12311

* Preliminary.

** Reported to the Faroese Coastal Guard.

*** Expected misreporting/discarding.

Summary of the assessment

Table 11 Cod in Subdivision 5.b.1. Assessment summary.

Year	Recruitment			SSB			Catch	F		
	Age 1	2.5 percentile	97.5 percentile	SSB	2.5 percentile	97.5 percentile		Mean F ages 3–7	2.5 percentile	97.5 percentile
	thousands			tonnes				tonnes		
1959	20461	10235	40902	47636	37722	60156	22415	0.523	0.404	0.677
1960	18780	9801	35984	53087	43256	65152	32255	0.701	0.555	0.885
1961	26625	13900	51001	46676	38013	57313	21598	0.637	0.5	0.811
1962	27269	14189	52405	43947	35571	54296	20967	0.569	0.443	0.73
1963	19940	10383	38293	50966	40632	63927	22215	0.505	0.392	0.651
1964	11315	5853	21875	56617	44726	71670	21078	0.487	0.377	0.628
1965	17851	9244	34471	54932	43645	69137	24212	0.487	0.377	0.629
1966	22627	11690	43800	54104	42972	68120	20418	0.483	0.373	0.627
1967	20899	10791	40474	64364	51436	80541	23562	0.462	0.356	0.602
1968	12554	6468	24370	75194	60013	94215	29930	0.447	0.345	0.578
1969	8782	4499	17142	79713	63453	100140	32371	0.477	0.368	0.617
1970	9901	5046	19426	78089	62178	98073	24183	0.392	0.301	0.509
1971	19000	9721	37139	57999	46429	72453	23010	0.382	0.295	0.495
1972	18095	9298	35215	50861	41243	62720	18727	0.35	0.27	0.454
1973	38709	19908	75267	69169	55316	86490	22228	0.369	0.289	0.472
1974	39666	20473	76852	83969	67335	104712	24581	0.379	0.299	0.48
1975	24214	12519	46834	100432	81181	124250	36775	0.48	0.386	0.597
1976	11176	5746	21736	107781	87351	132988	39799	0.601	0.485	0.744
1977	12871	6641	24947	104708	83690	131004	34927	0.575	0.46	0.718
1978	15507	7997	30068	73338	58849	91394	26585	0.493	0.392	0.621
1979	24058	12401	46671	61360	50056	75218	23112	0.48	0.38	0.607
1980	17816	9209	34467	54564	44890	66323	20513	0.425	0.335	0.538
1981	26722	13873	51470	58772	47893	72121	22963	0.469	0.374	0.589
1982	36610	19017	70479	60351	49227	73990	21489	0.494	0.397	0.616
1983	55656	28593	108332	100067	80607	124226	38133	0.648	0.524	0.801
1984	20472	10627	39436	122229	97206	153693	36979	0.553	0.447	0.685
1985	7911	4056	15433	85912	68647	107519	39484	0.699	0.569	0.86
1986	8563	4422	16582	73853	57595	94700	34595	0.622	0.502	0.77
1987	11346	5906	21798	59089	47226	73933	21391	0.548	0.442	0.68
1988	20025	10254	39106	50162	41503	60627	23182	0.667	0.546	0.816
1989	6028	3091	11753	37119	30953	44513	22068	0.757	0.619	0.925
1990	5777	2958	11283	30832	24933	38126	13692	0.664	0.535	0.824
1991	7808	3966	15372	21957	17375	27747	8750	0.514	0.406	0.651
1992	8368	4251	16472	16570	13215	20776	6396	0.424	0.329	0.545
1993	23505	12269	45031	25388	19916	32364	6107	0.321	0.248	0.417
1994	42514	22296	81066	55879	43956	71038	9046	0.3	0.235	0.383
1995	11837	6418	21832	60222	49540	73207	23045	0.405	0.329	0.498
1996	4968	2721	9069	82211	67980	99422	40422	0.642	0.533	0.774
1997	6991	3873	12621	75411	61072	93117	34304	0.813	0.682	0.97
1998	16188	9166	28592	49036	39724	60532	24005	0.754	0.631	0.901
1999	28899	16207	51530	37588	31147	45361	19245	0.712	0.59	0.859
2000	42467	23841	75644	38250	32233	45391	21833	0.51	0.415	0.626
2001	18360	10351	32568	56285	46948	67480	28577	0.573	0.473	0.693
2002	8987	5010	16120	58327	48435	70240	38834	0.802	0.667	0.963

Year	Recruitment			SSB			Catch	F		
	Age 1	2.5 percentile	97.5 percentile	SSB	2.5 percentile	97.5 percentile		Mean F ages 3–7	2.5 percentile	97.5 percentile
	thousands			tonnes			tonnes			
2003	4516	2532	8055	44053	35813	54188	25167	0.732	0.607	0.882
2004	6819	3857	12057	25996	21463	31485	12840	0.638	0.527	0.773
2005	9401	5315	16627	21112	17755	25104	10119	0.706	0.584	0.853
2006	6249	3536	11041	16597	14074	19572	9844	0.651	0.534	0.793
2007	5688	3208	10083	14526	12284	17178	7511	0.537	0.438	0.659
2008	13439	7469	24182	18047	15148	21500	7315	0.554	0.454	0.675
2009	21263	11588	39016	19168	16075	22855	9979	0.579	0.476	0.704
2010	6819	3755	12386	22183	18562	26511	12762	0.726	0.594	0.888
2011	1095	599	2000	20105	16485	24519	9692	0.545	0.438	0.676
2012	2609	1464	4650	17489	14289	21406	7205	0.653	0.528	0.807
2013	9017	4940	16461	16128	13113	19836	4473	0.433	0.343	0.546
2014	2957	1603	5455	16994	14144	20418	5711	0.406	0.324	0.509
2015	5343	2967	9621	17373	14514	20795	7329	0.527	0.422	0.659
2016	7401	4052	13520	21567	17429	26689	5876	0.408	0.323	0.516
2017	19574	10423	36757	24538	19590	30735	5366	0.336	0.26	0.433
2018	31993	14895	68718	33595	26389	42768	12311	0.427	0.321	0.569
2019	37889	11438	125509	40370	28478	57228				

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