

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

ICES stock advice

ICES advises that when the MSY approach is applied, fishing mortality in 2018 should be no more than 0.22, corresponding to a catch of no more than 4579 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) has been below B_{lim} since 2005. Fishing mortality (F) has decreased from the year 2000 but is still above F_{msy} . The 2009–2015 year classes are estimated to be below average size. The 2016 year class is estimated to be the highest since 2009, though uncertainty is large.

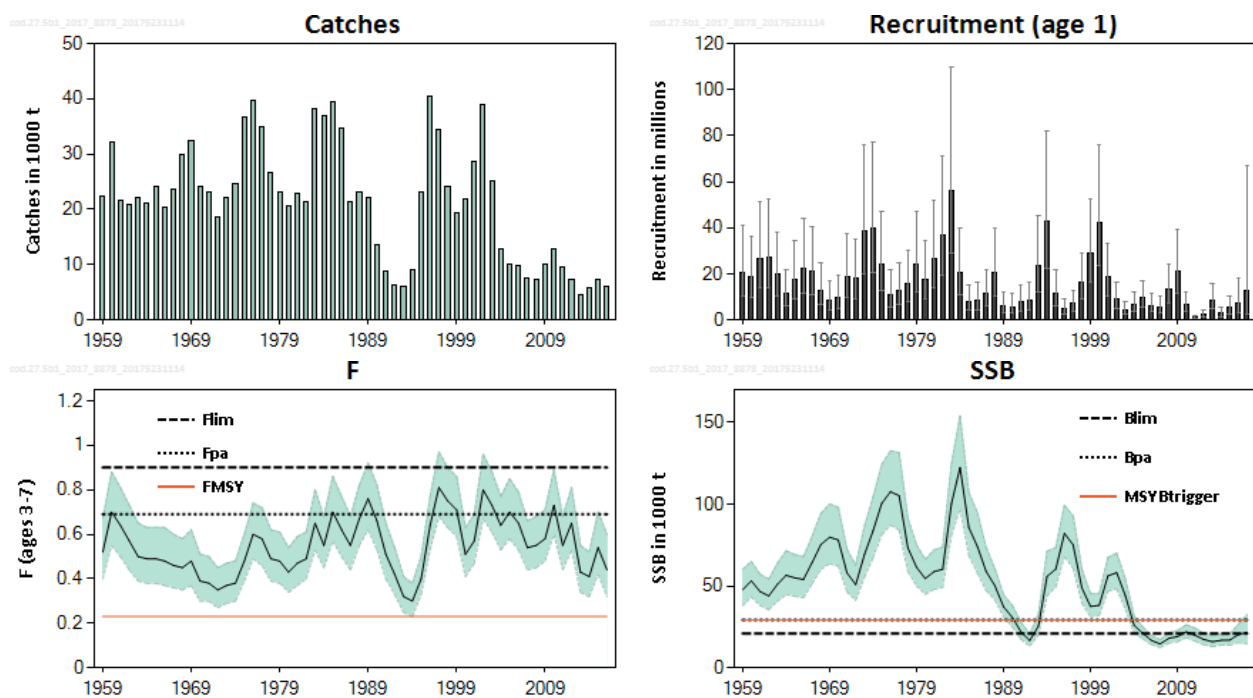


Figure 1 Cod in Subdivision 5.b.1. Summary of the stock assessment with point-wise 95% confidence intervals.

Stock and exploitation status

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

		Fishing pressure			Stock size		
		2014	2015	2016	2015	2016	2017
Maximum Sustainable Yield	F_{MSY}	✘	✘	✘ Above	$MSY B_{Trigger}$	✘	✘ Below trigger
Precautionary Approach	F_{pa} , F_{lim}	✔	✔	✔ Harvested sustainably	B_{pa} , B_{lim}	✘	✘ Increased risk
Management plan	F_{MGT}	—	—	— Not applicable	B_{MGT}	—	— Not applicable

Catch options

Table 2 Cod in Subdivision 5.b.1. The basis for the catch options.

Variable	Value	Source	Notes
F ages 3–7 (2017)	0.44	ICES (2017a)	F ₂₀₁₇ as estimated by SAM
SSB (2018)	27725 t	ICES (2017a)	Based on F(2017) =0.44
R age 1(2018)	5709 thousand	ICES (2017a)	Median of resampled estimates from 2007-2016
R age 1(2019)	5709 thousand	ICES (2017a)	Median of resampled estimates from 2007-2016
Total catch (2017)	6630 t	ICES (2017a)	Based on F(2017) =0.44
Landings (2017)	6630 t	ICES (2017a)	Landings = catches
Discards (2017)	-	ICES (2017a)	Negligible

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

Basis	Total catch (2018)	F _{total} (2018)	SSB (2019)	% SSB change *
ICES advice basis				
MSY approach: $F_{MSY} \times SSB_{2018} / MSY_{B_{trigger}}$	4579	0.22	39003	41
Other options				
F = 0	0	0	44494	60
F = F _{msy}	4729	0.23	38766	40
F = F ₂₀₁₇	8267	0.44	34292	24
F = F _{pa}	11628	0.69	30477	10
F = F _{lim}	13915	0.90	27698	0

* SSB 2019 relative to SSB 2018.

Basis of the advice

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

Advice basis	MSY approach
Management plan	There is no management plan for this stock. A preliminary management plan, including a recovery plan, was formulated in 2011, but has not been implemented.

Quality of the assessment

The stock was benchmarked in 2017. Input data and assessment model were changed, and uncertainty estimates are now available to assess the quality of the assessment. The historical stock perception has not changed significantly.

The landings data are considered accurate. There are no strong incentives to discard fish under the effort management system. The sampling of the landings is adequate.

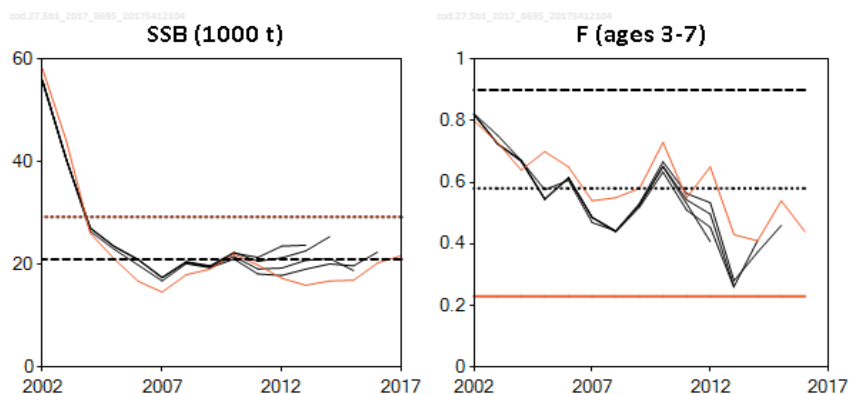


Figure 2 Cod in Subdivision 5.b.1. Historical assessment results. The age of recruitment changed from age 2 to age 1 at the 2017 benchmark; the recruitment plot is therefore not shown this year.

Issues relevant for the advice

An effort management system has been used since 1996. The Faroese Parliament decides the number of allocated fishing days for each new fishing season. The number of fishing days used by the main fleet targeting cod (longliners) only amounts to around half of the allocated days. With surplus allocated fishing days, this system is not limiting fishing pressure. ICES has not quantified the relationship between effort and F for this stock, since there is no apparent relationship between effort and F in the available data.

The Faroese parliament decided in 2007 to cancel all fishing licences for Faroese vessels in Faroese waters by 31 December 2017. A proposal for a new fisheries management system was delivered by the government to the Faroese parliament in May 2017. The new fisheries management system is expected to be implemented on 1 of January 2018.

Faroe Plateau cod and Faroe haddock are caught in a mixed fishery. Further development of management measures that includes the mixed-fishery issue would be useful.

Reference points

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

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

Basis of the assessment

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

ICES stock data category	1 (ICES, 2016)
Assessment type	SAM with catch-at-age data and age-disaggregated indices, using catches in the model and in the forecast
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 mortalities set at 0.2
Discards and bycatch	Discarding is considered negligible.
Indicators	None
Other information	The stock was benchmarked in 2017.
Working group	North-Western Working Group (NWWG)

Information from stakeholders

There is no information available.

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	Predicted catch corresp. 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
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

Fishing Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC***	ICES catch
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		12757
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		5715
2015	MSY approach, reduce F by 23 %	< 4500		7394
2016	Lowest possible level (LPL) and develop a mixed-fishery management plan	LPL		5933
2017	MSY approach ($F \leq 0.16$)	≤ 2800		
2018	MSY approach ($F \leq 0.22$)	≤ 4579		

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

** The TAC was increased during the quota year.

*** Not applicable since 1997.

^ Preliminary

History of the catch and landings

Table 8 Cod in Subdivision 5.b.1. Catch distribution by fleet in 2016 as estimated by ICES.

Catch (2016)	Landings			Discards
5933 tonnes	Longliners 58%	Jiggers 10%	Trawlers 32%	Negligible
	5933 tonnes			

Table 9 Cod in Subdivision 5.b.1. 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. The latter part of the table concerns an adjustment of the Faroese catches in order to account for different round/gutted conversion factors as well as the subtraction of cod originating from the Icelandic cod stock.

Year	Denmark	Faroe Islands	France	Germany	Iceland	Norway	Greenland	Portugal	UK (E/W/NI)	UK (Scotland)	Total
1986	8	34492	4	8		83	-		0	0	34595
1987	30	21303	17	12		21	-		8	0	21391
1988	10	22272	17	5		163	-		0	0	22467
1989	-	20535	-	7		285	-		0	0	20827
1990	-	12232	-	24		124	-		0	0	12380
1991	-	8203	-**	16		89	-		1	0	8309
1992	-	5938	3***	12		39	-		74	0	6066
1993	-	5744	1***	+		57	-		186	0	5988
1994	-	8724	-	2***		36	-		56	0	8818
1995	-	19079	2***	2		38	-		43	0	19164
1996	-	39406	1***	+		507	-		126	0	40040
1997	-	33556	-	+		410	-		61***	0	34027

1998	-	23308	-*	-	-	405	-	-	27***	0	23740
1999	-	19156	-*	39	-	450	-	-	51	0	19696
2000		0	1	2	-	374	-	-	18	0	395
2001		29762	9***	9	-	531*	-	-	50	0	30361
2002		40602	20	6	5	573	-	-	42	0	41248
2003		30259	14	7	-	447	-	-	15	0	30742
2004		17540	2	3	***	414	-	1	15	0	17975
2005		13556	-	-	-	201	-	-	24	0	13781
2006		11629	7	1	***	49	5	-	0	0	11691
2007		9905	1***	-	-	71	7	-	0	360	10344
2008		9394	1	-	-	40	-	-	0	383	9818
2009		10736	1	-	-	14	7	-	0	300	11058
2010		13878	1	-	-	10	-	-	0	312	14201
2011		11348	-	-	-	0	-	-	0	0	11348
2012		8437	0	-	28	0	-	-	0	0	8465
2013		5331	0	-	20	0	2	-	0	0	5333
2014		6655	-	-	-	6	-	-	0	226	6887
2015		7812	-	-	-	33	14	-	0	382	8241
2016		6736	-	-	-	31	5	-	0	515	7287

* Preliminary, ** Included in 5.b.2, *** Reported as 5.b.

Year	Officially reported	Faroese catches				Catches reported as 5.b.2			Foreign catches				Used in assessment
		In 5.b.1	Corrections in 5.b.1	On Faroe-Iceland ridge	In IIA 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

Year	Officially reported	Faroese catches				Catches reported as 5.b.2			Foreign catches				Used in assessment
		In 5.b.1	Corrections in 5.b.1	On Faroe-Iceland ridge	In IIA within Faroe area jurisdiction	UK (E/W/Ni)	UK (Scotland)	UK	France***	Greenland***	Russia***	UK***	
2007	10344		-588	-2304			53			6			7511
2008	9818		-557	-1978			32						7315
2009	11058		-637	-510			38			26	4		9979
2010	14201		-823	-680			54			5			12757
2011	11348		-673	-986						3			9692
2012	8465		-500	-766						5			7204
2013	5333		-316	-544							0		4473
2014	6887		-395	-777									5715
2015	8241		-463	-384									7394
2016	7289*		-399	-958									5933

*) Preliminary, **) In order to be consistent with procedures used previous years, ***) Reported to Faroese Coastal Guard, ****) expected misreporting/discard.

Summary of the assessment

Table 10 Cod in Subdivision 5.b.1. Assessment summary. Weights are in tonnes.

Year	Recruitment (Age 1)	Rec. 97.5 percentile	Rec. 2.5 percentile	SSB	SSB 97.5 percentile	SSB 2.5 percentile	Catch	Mean F (Ages 3-7)	Mean F 97.5 percentile	Mean F 2.5 percentile
								Per year		
	thousands			tonnes			tonnes			
1959	20517	41078	10248	47701	60114	37851	22415	0.52	0.67	0.4
1960	18774	36041	9780	53127	65074	43373	32255	0.7	0.88	0.55
1961	26633	51096	13882	46618	57150	38027	21598	0.64	0.81	0.5
1962	27310	52579	14185	43918	54196	35590	20967	0.57	0.73	0.44
1963	19889	38253	10341	50954	63850	40662	22215	0.5	0.65	0.39
1964	11279	21848	5822	56575	71537	44742	21078	0.49	0.63	0.38
1965	17823	34490	9210	54975	69121	43724	24212	0.49	0.63	0.38
1966	22607	43855	11653	53990	67909	42924	20418	0.48	0.63	0.37
1967	20930	40611	10787	64341	80439	51464	23562	0.46	0.6	0.36
1968	12595	24495	6476	75370	94360	60201	29930	0.45	0.58	0.35
1969	8762	17140	4479	79830	100203	63599	32371	0.48	0.62	0.37
1970	9826	19340	4992	78136	98059	62260	24183	0.39	0.51	0.3
1971	18947	37130	9668	58015	72415	46478	23010	0.38	0.5	0.3
1972	18040	35179	9251	50844	62668	41250	18727	0.35	0.45	0.27
1973	38875	75753	19950	69201	86496	55364	22228	0.37	0.47	0.29
1974	39863	77392	20533	83773	104428	67203	24581	0.38	0.48	0.3
1975	24373	47235	12576	100568	124308	81361	36775	0.48	0.6	0.39
1976	11150	21737	5720	107642	132696	87318	39799	0.6	0.74	0.49
1977	12882	25015	6634	105152	131414	84138	34927	0.58	0.72	0.46
1978	15463	30041	7959	73277	91212	58869	26585	0.49	0.62	0.39
1979	24061	46770	12378	61343	75116	50095	23112	0.48	0.61	0.38
1980	17770	34443	9168	54552	66255	44915	20513	0.43	0.54	0.34
1981	26745	51601	13862	58756	72028	47930	22963	0.47	0.59	0.37
1982	36749	70881	19053	60222	73748	49176	21489	0.49	0.61	0.4

Year	Recruitment (Age 1)	Rec. 97.5 percentile	Rec. 2.5 percentile	SSB	SSB 97.5 percentile	SSB 2.5 percentile	Catch	Mean F (Ages 3-7)	Mean F 97.5 percentile	Mean F 2.5 percentile
	thousands			tonnes			tonnes	Per year		
1983	56195	109688	28790	100271	124417	80811	38133	0.65	0.8	0.53
1984	20546	39652	10646	122500	154024	97428	36979	0.55	0.68	0.45
1985	7854	15374	4012	85830	107199	68721	39484	0.7	0.86	0.57
1986	8523	16555	4388	73939	94572	57807	34595	0.62	0.77	0.5
1987	11372	21886	5909	58926	73587	47185	21391	0.55	0.68	0.44
1988	20331	39836	10376	50180	60521	41606	23182	0.67	0.82	0.55
1989	6062	11854	3100	37235	44581	31099	22068	0.76	0.92	0.62
1990	5785	11327	2955	30928	38196	25042	13692	0.66	0.82	0.53
1991	7793	15405	3942	22016	27789	17441	8750	0.51	0.65	0.4
1992	8289	16411	4187	16615	20829	13254	6396	0.42	0.54	0.33
1993	23391	45035	12150	25407	32471	19880	6107	0.32	0.41	0.25
1994	42660	81798	22248	55852	71220	43800	9046	0.3	0.38	0.23
1995	11687	21682	6300	60334	73428	49576	23045	0.4	0.5	0.33
1996	4970	9156	2697	82137	99336	67916	40422	0.64	0.77	0.53
1997	7073	12860	3890	75189	92845	60891	34304	0.81	0.97	0.68
1998	16369	29118	9202	48902	60350	39625	24005	0.75	0.9	0.63
1999	29119	52338	16201	37472	45243	31035	19245	0.71	0.86	0.59
2000	42486	76259	23670	38201	45351	32179	21833	0.51	0.63	0.41
2001	18499	33085	10343	56177	67368	46845	28577	0.57	0.69	0.47
2002	8960	16222	4949	58186	70058	48325	38834	0.8	0.96	0.67
2003	4399	7916	2445	44089	54249	35833	25167	0.73	0.88	0.61
2004	6786	12089	3809	26057	31556	21516	12840	0.64	0.77	0.53
2005	9469	16872	5314	21080	25072	17724	10119	0.7	0.85	0.58
2006	6316	11241	3548	16707	19700	14169	9844	0.65	0.79	0.53
2007	5709	10196	3197	14594	17261	12339	7511	0.54	0.66	0.44
2008	13305	24132	7336	17976	21427	15081	7315	0.55	0.68	0.45
2009	21057	39083	11345	19074	22753	15991	9979	0.58	0.71	0.48
2010	6709	12311	3656	21981	26267	18394	12757	0.73	0.89	0.6
2011	1100	2032	596	19897	24295	16295	9692	0.55	0.68	0.44
2012	2531	4565	1404	17296	21193	14117	7204	0.65	0.81	0.53
2013	8583	15935	4623	15945	19692	12911	4473	0.43	0.55	0.34
2014	2864	5423	1513	16773	20335	13834	5715	0.41	0.52	0.32
2015	5228	10016	2729	16920	20655	13860	7394	0.54	0.7	0.42
2016	7374	18226	2983	20277	26681	15410	5933	0.44	0.6	0.32
2017	12523	66805	2347	21720	32464	14532				

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