

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 2019 should be no more than 10 180 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 now increased to above MSY $B_{trigger}$ in 2018. Fishing mortality (F) has decreased since 2010 and is now close to F_{MSY} . The 2009–2015 year classes are estimated to be below average size. The 2016 and 2017 year classes are estimated to be above average, though uncertainty is large.

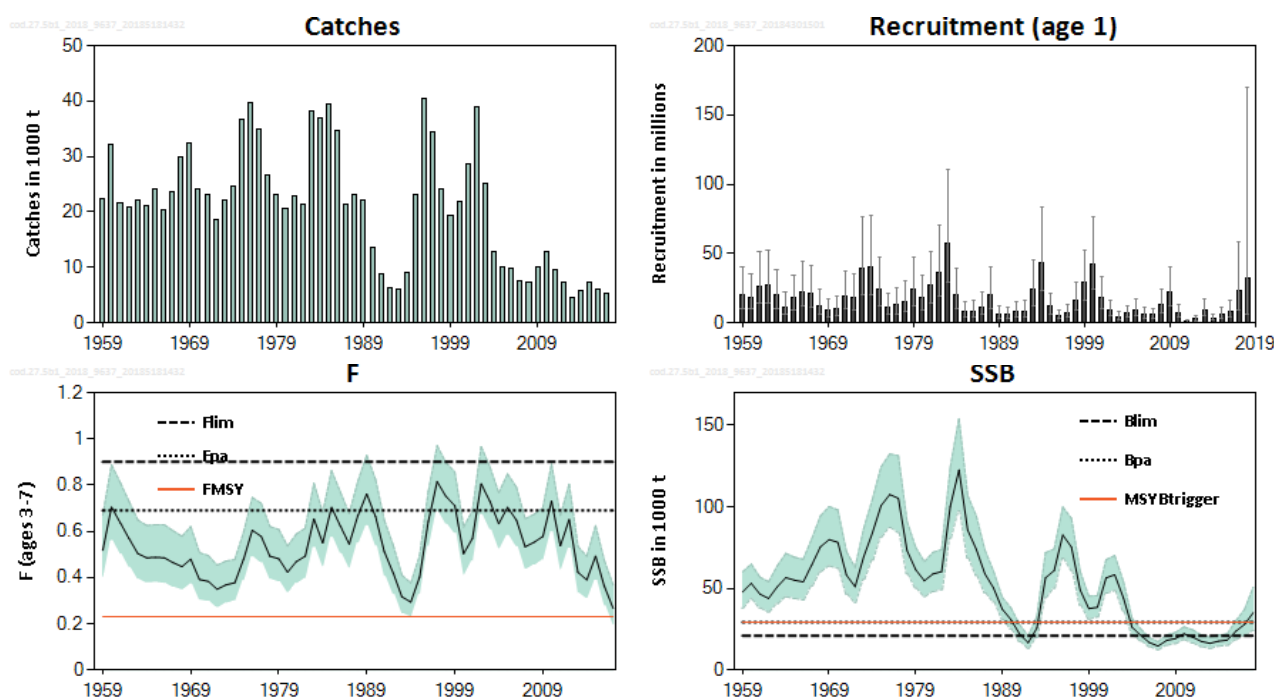


Figure 1 Cod in Subdivision 5.b.1. Summary of the stock assessment with point-wise 95% confidence intervals.

Stock and exploitation status

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 $B_{trigger}$ and B_{pa} .

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

		Fishing pressure			Stock size				
		2015	2016	2017	2016	2017	2018		
Maximum sustainable yield	F_{MSY}	✗	✗	✗	MSY $B_{trigger}$	✗	✗	✓	Above trigger
Precautionary approach	F_{pa} , F_{lim}	✓	✓	✓	B_{pa} , B_{lim}	○	○	✓	Full reproductive capacity
Management plan	F_{MGT}	—	—	—	B_{MGT}	—	—	—	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 _{ages 3-7} (2018)	0.27	F ₂₀₁₈ = F ₂₀₁₇ as estimated by SAM
SSB (2019)	62069	Based on F(2018) = 0.27
R _{age 1} (2019)	8490	In thousands. Median of resampled estimates from 2008 to 2017
R _{age 1} (2020)	8490	In thousands. Median of resampled estimates from 2008 to 2017
Total catch (2018)	7252	Based on F(2018) = 0.27
Landings (2018)	7252	Landings = catches
Discards (2018)	0	Discarding is negligible

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

Basis	Total catch (2019)	F _{total} (2019)	SSB (2020)	% SSB change *	% Advice change **
ICES advice basis					
MSY approach: F _{MSY}	10180	0.23	96232	55	122
Other scenarios					
F = 0	0	0	109042	76	-100
F = F _{MSY}	10180	0.23	96232	55	122
F = F ₂₀₁₈	11413	0.27	94879	53	149
F = F _{pa}	25133	0.69	78149	26	449
F = F _{lim}	30158	0.90	72071	16	559

* SSB 2020 relative to SSB 2019.

** Advice value for 2019 relative to the advice value for 2018 as issued in 2017.

The increased recruitment of 1-year-old fish in recent years along with a large increase in the perception of stock size since the last assessment to above MSY B_{trigger} has led to an increase in the catch advice.

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.

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 results in a large upward revision of SSB in recent years, caused by a rapid increase in survey catch rates.



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 two lines.

Issues relevant for the advice

An effort management system has been in place from 1996 to 2018. A new management system will be implemented for cod, haddock, and saithe after 1 January 2019. This management system operates with catch quotas for large vessels (trawlers and longliners), whereas it operates with fishing days for the small vessels (mainly longliners). The catch quota for the small vessels needs to be converted into fishing days. However, 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): 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, 2016)
Assessment type	SAM with catch-at-age data and age-disaggregated indices, using catches in the model and in the forecast (ICES, 2018a)
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	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 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	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
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	LPL		5933
2017	MSY approach ($F \leq 0.16$)	≤ 2800		5366
2018	MSY approach ($F \leq 0.22$)	≤ 4579		
2019	MSY approach	≤ 10180		

* 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 (2017)	Landings			Discards
	Longliners 38%	Jiggers 9%	Trawlers 53%	
5366	5366			Discarding is negligible

Table 9 Cod in Subdivision 5.b.1. History of commercial catch and landings; official values are presented by area for each country participating in the fishery. All weights are in tonnes.

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	14206
2011		11348	-			0			0	0	11348
2012		8437	0		28	0			0	0	8466
2013		5331	0		20	0	2		0	0	5333
2014		6655				2			0	226	6883
2015		7812				33	14		0	267	8128
2016		6736				31	5		0	515	7289
2017		6208	2			16			0	405	6631

* Preliminary.

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

*** Reported as ICES Division 5.b.

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				Used in the assessment
		In 5.b.1	Corrections in 5.b.1	On Faroese-Iceland ridge	In IIA within Faroese area jurisdiction	UK (E/W/N/I)	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

* Preliminary.

*** Reported to Faroese Coastal Guard.

^ Expected misreporting/discard.

Summary of the assessment

Table 11 Cod in Subdivision 5.b.1. Assessment summary. Weights are in tonnes.

Year	Recruitment			SSB			Catch tonnes	F		
	Age 1	97.5 percentile	2.5 percentile	SSB	97.5 percentile	2.5 percentile		Mean F ages 3–7	97.5 percentile	2.5 percentile
	thousands			tonnes						
1959	20410	40730	10228	47781	60111	37981	22415	0.52	0.67	0.40
1960	18649	35739	9731	53097	64890	43447	32255	0.70	0.89	0.56
1961	26599	50987	13876	46463	56859	37967	21598	0.64	0.81	0.50
1962	27347	52627	14211	43823	54001	35563	20967	0.57	0.73	0.44
1963	19886	38252	10338	50911	63720	40676	22215	0.50	0.65	0.39
1964	11213	21719	5789	56561	71442	44779	21078	0.49	0.63	0.38
1965	17857	34568	9225	54999	69075	43792	24212	0.49	0.63	0.38
1966	22691	44026	11695	53957	67785	42950	20418	0.49	0.63	0.37
1967	21018	40796	10829	64379	80409	51545	23562	0.46	0.60	0.36
1968	12609	24536	6479	75499	94435	60360	29930	0.45	0.58	0.35
1969	8765	17152	4479	79868	100148	63695	32371	0.48	0.62	0.37
1970	9818	19324	4989	78212	98101	62356	24183	0.39	0.51	0.30
1971	19072	37381	9730	58130	72512	46602	23010	0.38	0.50	0.30
1972	18010	35140	9230	50986	62814	41385	18727	0.35	0.45	0.27
1973	39193	76399	20106	69423	86738	55566	22228	0.37	0.47	0.29
1974	40063	77795	20632	83930	104528	67391	24581	0.38	0.48	0.30
1975	24443	47387	12608	100736	124398	81575	36775	0.48	0.60	0.39
1976	11089	21618	5688	107517	132362	87335	39799	0.60	0.75	0.49
1977	12905	25069	6643	105229	131314	84326	34927	0.58	0.72	0.46
1978	15465	30058	7957	73254	91068	58925	26585	0.49	0.62	0.39
1979	24217	47090	12454	61395	75105	50188	23112	0.48	0.61	0.38
1980	17725	34369	9141	54658	66345	45030	20513	0.42	0.54	0.33
1981	26781	51692	13875	58857	72091	48052	22963	0.47	0.59	0.37
1982	36730	70856	19040	60250	73703	49253	21489	0.49	0.61	0.40
1983	56864	110939	29147	100237	124192	80903	38133	0.65	0.81	0.53
1984	20579	39728	10660	122609	154034	97596	36979	0.55	0.68	0.45
1985	7811	15280	3993	85763	106931	68786	39484	0.70	0.86	0.57
1986	8524	16552	4390	73950	94399	57931	34595	0.62	0.77	0.50
1987	11368	21882	5906	58927	73460	47268	21391	0.55	0.68	0.44
1988	20574	40276	10509	50225	60475	41712	23182	0.67	0.82	0.55
1989	6048	11829	3093	37239	44487	31171	22068	0.76	0.93	0.62
1990	5812	11385	2967	30908	38113	25066	13692	0.66	0.82	0.54
1991	7878	15566	3987	22029	27775	17471	8750	0.51	0.65	0.40
1992	8343	16497	4219	16668	20874	13310	6396	0.42	0.54	0.33
1993	23749	45695	12343	25615	32679	20078	6107	0.32	0.41	0.24
1994	43607	83459	22785	56461	71882	44347	9046	0.29	0.38	0.23
1995	11699	21692	6310	60906	74068	50084	23045	0.40	0.49	0.33
1996	4911	9015	2676	82673	99836	68461	40422	0.64	0.77	0.53
1997	7037	12755	3882	75357	92847	61162	34304	0.81	0.97	0.68
1998	16449	29187	9271	49036	60379	39824	24005	0.75	0.90	0.63
1999	29076	52138	16215	37580	45272	31195	19245	0.71	0.86	0.59
2000	42578	76180	23797	38374	45496	32366	21833	0.50	0.62	0.41
2001	18457	32899	10355	56423	67576	47111	28577	0.57	0.69	0.47
2002	9043	16345	5003	58349	70107	48563	38834	0.81	0.97	0.67
2003	4381	7860	2442	44128	54185	35939	25167	0.73	0.88	0.61

Year	Recruitment			SSB			Catch	F		
	Age 1	97.5 percentile	2.5 percentile	SSB	97.5 percentile	2.5 percentile		Mean F ages 3–7	97.5 percentile	2.5 percentile
	thousands			tonnes				tonnes		
2004	6819	12120	3837	26153	31614	21634	12840	0.63	0.77	0.52
2005	9531	16938	5363	21172	25135	17833	10119	0.70	0.85	0.58
2006	6338	11251	3571	16790	19766	14263	9844	0.65	0.79	0.53
2007	5707	10164	3205	14653	17304	12408	7511	0.53	0.65	0.44
2008	13506	24413	7472	18039	21470	15157	7315	0.55	0.67	0.45
2009	21720	40143	11752	19199	22874	16115	9979	0.58	0.70	0.48
2010	6946	12713	3795	22138	26417	18552	12762	0.73	0.89	0.60
2011	1120	2059	609	20112	24545	16480	9692	0.54	0.67	0.43
2012	2669	4794	1486	17485	21393	14290	7205	0.65	0.80	0.53
2013	9528	17547	5173	16292	20084	13216	4473	0.42	0.53	0.33
2014	3238	6066	1728	17606	21293	14558	5711	0.39	0.49	0.31
2015	5994	11071	3245	18274	22129	15091	7281	0.49	0.62	0.39
2016	8490	16352	4408	23735	30187	18662	5933	0.36	0.47	0.28
2017	23457	58005	9486	27932	37108	21025	5366	0.27	0.37	0.194
2018	32711	169609	6309	35046	50711	24219				

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