

Cod (*Gadus morhua*) in subareas 1 and 2 (Northeast Arctic)

ICES advice on fishing opportunities

ICES advises that when the Joint Russian–Norwegian Fisheries Commission management plan is applied, catches in 2019 should be no more than 674 678 tonnes. Bycatch of coastal cod and golden redfish (*Sebastes norvegicus*) should be kept as low as possible.

Stock development over time

The spawning-stock biomass (SSB) has been above $MSY B_{trigger}$ since 2002. The SSB reached a peak in 2013 and now shows a downward trend. Fishing mortality (F) was reduced from well above F_{lim} in 1997 to below F_{MSY} in 2008. It remained below F_{MSY} until 2017 when it became equal to F_{MSY} . There has been no strong recruitment since the 2004 and 2005 year classes.

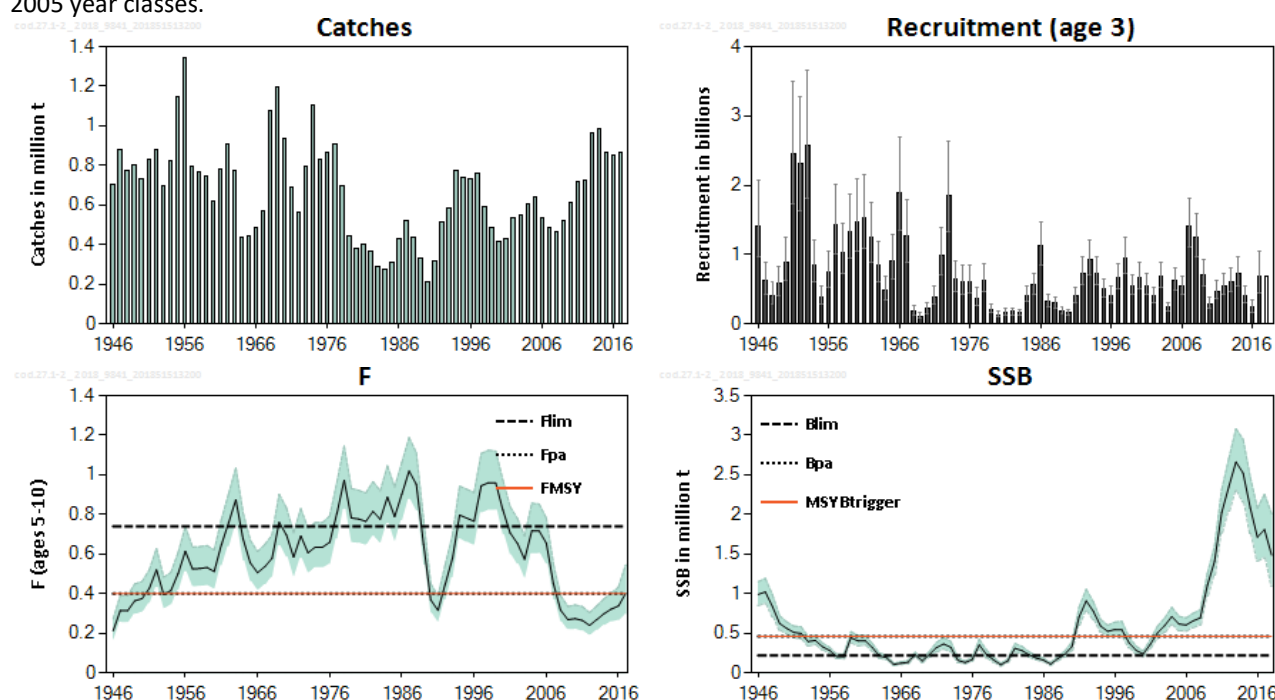


Figure 1 Cod in subareas 1 and 2 (Northeast Arctic). Catch, recruitment, F, and SSB. Recruitment, F, and SSB have confidence intervals (95%) in the plot. For this stock, $F_{MGT} = F_{MSY}$ and $SSB_{MGT} = MSY B_{trigger} = B_{pa}$.

Stock and exploitation status

ICES assesses that fishing pressure on the stock is at $F_{pa} = F_{MSY}$ and below F_{lim} , while the spawning stock size is above $MSY B_{trigger}$, B_{pa} , and B_{lim} . The stock has full reproductive capacity.

Table 1 Cod in subareas 1 and 2 (Northeast Arctic). 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}	✓	✓	✓	At target	$MSY B_{trigger}$	✓	✓
Precautionary approach	F_{pa}, F_{lim}	✓	✓	✓	Harvested sustainably	B_{pa}, B_{lim}	✓	✓
Management plan	F_{MGT}	✓	✓	✓	Below	B_{MGT}	✓	✓
								Above trigger
								Full reproductive capacity
								Above

Catch scenarios

Table 2 Cod in subareas 1 and 2 (Northeast Arctic). Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
$F_{\text{ages 5-10}}$ (2018)	0.40	<i>F status quo</i> (F_{sq} ; 2017)
SSB (2019)	1 233 772 tonnes	Based on fishing at F_{sq}
$R_{\text{age 3}}$ (2018)	691 000 thousands	Recruitment model estimate
$R_{\text{age 3}}$ (2019)	617 000 thousands	Recruitment model estimate
$R_{\text{age 3}}$ (2020)	588 000 thousands	Recruitment model estimate
Total catch (2018)	693 197 tonnes	Fishing at F_{sq}

Table 3 Cod in subareas 1 and 2 (Northeast Arctic). Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2019)	F_{total} (2019)	SSB (2020)	% SSB change *	% TAC change **	% Advice change ***
ICES advice basis						
Management plan	674678	0.46	1005533	-18	-13	-5.2
Other scenarios						
MSY approach: F_{MSY}	605331	0.40	1059787	-14	-22	-15
$F = 0$	0	0	1557161	26	-100	-100
$F = F_{2018}$	605929	0.4005	1059316	-14	-22	-15
F_{pa}	605331	0.40	1059787	-14	-22	-15
F_{lim}	974662	0.74	779066	-37	26	37

* SSB 2020 relative to SSB 2019.

** Catch advice for 2019 relative to TAC 2018 (775 000 t).

*** Advice value for 2019 relative to the advice value for 2018 (712 000 t).

The advice for 2018 given by ACOM in 2017 was 712 000 tonnes, based on the agreed harvest control rule with the clause of having catch corresponding to -20% change compared to TAC 2017. The quota established by the Joint Russian–Norwegian Fisheries Commission (JNRFC) for 2018 was 775 000 tonnes, as JNRFC decided on a gradual implementation of the change, from a 10% to a 20% limit on annual TAC change.

Since SSB in 2019 is between $2 \times B_{\text{pa}} = 920\,000\text{ t}$ and $3 \times B_{\text{pa}} = 1\,380\,000\text{ t}$, $F = 0.4 \times (1 + 0.5 \times (1234 - 920)/460) = 0.536$ is used in the 3-year prediction, giving catches of 767 000, 656 000, and 602 000 tonnes in 2019, 2020, and 2021, respectively. The average of this is 675 000 tonnes. In the similar calculation in last year's advice, an F of 0.6 was used. Thus, the difference in the advice from last year is larger than indicated by the change in stock estimate in the advice year, as SSB in 2019 is on the rightmost slope of the two-step hockey-stick rule (described below).

Basis of the advice

Table 4 Cod in subareas 1 and 2 (Northeast Arctic). The basis of the advice.

Advice basis	Joint Russian–Norwegian Fisheries Commission management plan
Management plan	At the 46th meeting of the Joint Russian–Norwegian Fisheries Commission (JRNFC) in October 2016, the previously used management plan was amended, and the current plan is as follows: The TAC is calculated as the average catch predicted for the coming 3 years, using the target level of exploitation (F_{tr}). The target level of exploitation is calculated according to the spawning-stock biomass (SSB) in the first year of the forecast as follows: - if $SSB < B_{pa}$, then $F_{tr} = SSB / B_{pa} \times F_{MSY}$; - if $B_{pa} \leq SSB \leq 2 \times B_{pa}$, then $F_{tr} = F_{MSY}$; - if $2 \times B_{pa} < SSB < 3 \times B_{pa}$, then $F_{tr} = F_{MSY} \times (1 + 0.5 \times (SSB - 2 \times B_{pa}) / B_{pa})$; - if $SSB \geq 3 \times B_{pa}$, then $F_{tr} = 1.5 \times F_{MSY}$; where $F_{MSY} = 0.40$ and $B_{pa} = 460\,000$ tonnes. If the spawning-stock biomass in the present year, the previous year, and each of the three years of prediction is above B_{pa}, the TAC should not be changed by more than $\pm 20\%$ compared with the previous year's TAC. In this case, F_{tr} should however not be below 0.30. In 2014, JNRFC decided that from 2015 onwards, Norway and Russia can transfer to or borrow from the following year up to 10% of the country's quota. ICES evaluated this harvest control rule in 2016 (ICES, 2016a) and concluded that it is precautionary.

Quality of the assessment

There are some conflicting signals from the different surveys and catch-at-age data. This increases the uncertainty of assessment.

The sampling level from commercial catches was reduced around 2010 and remained at a lower level in the following years, but has improved in 2016–2017. Sampling of trawl catches of cod in the first half of the year, in the parts of Division 2.a that are close to the coast, is not adequate. Also, the aggregation level (time and space) used when splitting these catches into Northeast Arctic cod and Norwegian Coastal Cod may be too coarse.

The selectivity-at-age indicates a strong dome-shape in recent years, with selectivity decreasing above age 11. This is not well supported by the data, which increases the uncertainty on the assessment, particularly of SSB.

The step in retrospective patterns in SSB and recruitment is related to the change in assessment model in 2017.

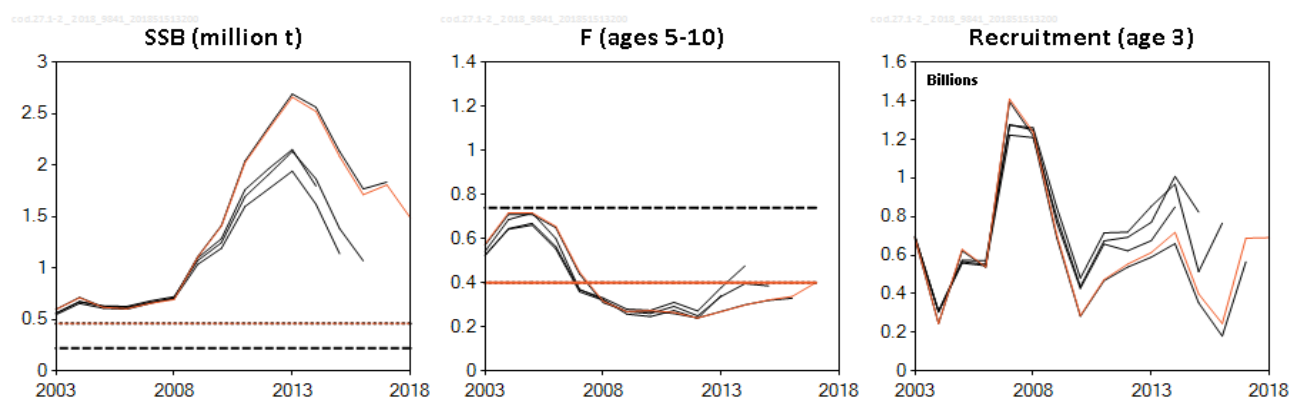


Figure 2 Cod in subareas 1 and 2 (Northeast Arctic). Historical assessment results.

Issues relevant for the advice

Fisheries targeting Northeast Arctic (NEA) cod take as bycatch a considerable part of the total golden redfish (*Sebastes norvegicus*) catch, and the bycatch of the latter species is still above any sustainable catch level. Measures to minimize bycatch levels are essential.

Bycatch of coastal cod should be kept as low as possible in order to promote rebuilding of the coastal cod (*Gadus morhua*) stock.

Surveys indicate that year classes 2015–2017 are below the long-term average; however, there is large uncertainty around the estimates and the ability of these year classes to survive to the fishable biomass.

Reference points

Table 5 Cod in subareas 1 and 2 (Northeast Arctic). Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	460 000 t	B_{pa} , and trigger point in HCR	ICES (2003)
	F_{MSY}	0.40	Long-term simulations	ICES (2005)
Precautionary approach	B_{lim}	220 000 t	Change point regression	ICES (2003)
	B_{pa}	460 000 t	The lowest SSB estimate having >90% probability of remaining above B_{lim}	ICES (2003)
	F_{lim}	0.74	F corresponding to an equilibrium stock = B_{lim}	ICES (2003)
	F_{pa}	0.40	The highest F estimate having >90% probability of remaining below F_{lim}	ICES (2003)
Management plan	SSB _{mgt}	460 000 t	Two-step (double hockey-stick) HCR, see Table 4	ICES (2017a)
	F_{mgt}	0.40	Two-step (double hockey-stick) HCR, see Table 4	ICES (2017a)

Basis of the assessment

Table 6 Cod in subareas 1 and 2 (Northeast Arctic). Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2016b).
Assessment type	Age-based analytical assessment (SAM; ICES, 2018) that uses catches in the model and in the forecast.
Input data	Commercial catches (international landings, ages and length frequencies from catch sampling); four survey indices (Joint bottom trawl survey Barents Sea, Feb–Mar (BS-NoRu-Q1 (BTr)); Joint acoustic survey Barents Sea and Lofoten, Feb–Mar (BS-NoRu-Q1 (Aco)); Russian bottom trawl survey, October–December (RU-BTr-Q4)); Joint Ecosystem survey (Eco-NoRu-Q3 (Btr)); annual maturity data from the four surveys; natural mortalities from annual stomach sampling.
Discards and bycatch	Discarding is considered negligible in recent years (below 5%). Bycatch is included.
Indicators	None.
Other information	Last benchmarked in April 2017 (ICES, 2017b).
Working group	Arctic Fisheries Working Group (AFWG)

Information from stakeholders

There is no additional available information.

History of the advice, catch, and management

Table 7 Cod in subareas 1 and 2 (Northeast Arctic). ICES advice, agreed TACs and official and ICES landings. All weights are in tonnes.

Year	ICES advice	Predicted catch corresponding to advice	Agreed TAC	Official landings	ICES landings	Unreported landings (included in ICES landings)
1987	Gradual reduction in F	595000	560000	552000	523071	
1988	F = 0.51; TAC (Advice November 1987, revised advice May 1988)	530000 (320000–360000)	590000 (451000)	459000	434939	
1989	Large reduction in F	335000	300000	348000	332481	
1990	F at F_{low} ; TAC	172000	160000	210000	212000	25000
1991	F at F_{low} ; TAC	215000	215000	294000	319158	50000
1992	Within safe biological limits	250000	356000	421000	513234	130000
1993	Healthy stock	256000	500000	575000	581611	50000
1994	No long-term gains in increased F	649000	700000	795000	771086	25000
1995	No long-term gains in increased F	681000	700000	763000	739999	
1996	No long-term gains in increased F	746000	700000	759000	732228	
1997	Well below F_{med}	< 993000	850000	792000	762403	
1998	F less than F_{med}	514000	654000	615000	592624	
1999	Reduce F to below F_{pa}	360000	480000	506000	484910	
2000	Increase B above B_{pa} in 2001	110000	390000		414870	
2001	High prob. of SSB > B_{pa} in 2003	263000	395000		426471	
2002	Reduce F to well below 0.25	181000	395000		535045	90000
2003	Reduce F to below F_{pa}	305000	395000		551990	115000
2004	Reduce F to below F_{pa}	398000	486000		606445	117000
2005	Take into account coastal cod and redfish bycatches. Apply catch rule.	485000	485000		641276	166000
2006	Take into account coastal cod and redfish bycatches. Apply amended catch rule.	471000	471000		537642	67100
2007	Take into account coastal cod and redfish bycatches. F_{pa}	309000	424000		486883	41087
2008	Take into account coastal cod and redfish bycatches. Apply catch rule.	409000	430000		464171	15000
2009	Take into account coastal cod and redfish bycatches. Apply catch rule.	473000	525000		523431	0
2010	Take into account coastal cod and redfish bycatches. Apply catch rule.	577500	607000		609983	0
2011	Take into account coastal cod and redfish bycatches. Apply catch rule.	703000	703000		719829	0

Year	ICES advice	Predicted catch corresponding to advice	Agreed TAC	Official landings	ICES landings	Unreported landings (included in ICES landings)
2012	Take into account coastal cod and redfish bycatches. Apply catch rule.	751000	751000		727663	0
2013^^	Take into account coastal cod and <i>S. marinus</i> bycatches. Apply catch rule.	940000	1000000		966209	0
2014^^	Take into account coastal cod and <i>S. marinus</i> bycatches. Apply catch rule.	993000	993000		986449	0
2015	Take into account coastal cod and <i>S. norvegicus</i> bycatches. Apply catch rule.	894000	894000		864384	0
2016	Take into account coastal cod and <i>S. norvegicus</i> bycatches. Apply catch rule.	805000	894000		849422	0
2017	Take into account coastal cod and <i>S. norvegicus</i> bycatches. Apply management plan.	≤ 805000	890000^		868276	0
2018	Take into account coastal cod and <i>S. norvegicus</i> bycatches. Apply management plan.	712000	775000			
2019	Take into account coastal cod and <i>S. norvegicus</i> bycatches. Apply management plan	674678				

^ 2017 TAC was set according to the new management plan agreed by JNRF in October 2016.

^^ Until 2014 this species was named *Sebastes marinus*. From 2015 it was decided to adopt the species list by WoRMS (<http://www.marinespecies.org/>). The name used for this species will hence hereafter be *Sebastes norvegicus*.

History of the catch and landings

Table 8 Cod in subareas 1 and 2 (Northeast Arctic). Catch distribution by fleet in 2017 as estimated by ICES.

Cod in subareas 1 and 2 (Northeast Arctic): Catch distribution by fleet in 2017 as estimated by ICES				
Catch (2017)		Landings		Discards
868 276 tonnes	73% demersal trawls	27% other gear types		Unknown, but discarding is considered to be negligible
	868 276 tonnes			

Table 9 Cod in subareas 1 and 2 (Northeast Arctic). History of commercial landings by country. All weights are in tonnes.

Year	Faroe Islands	France	German Dem. Rep.	Fed. Rep. Germany	Greenland	Iceland	Norway	Poland	United Kingdom	Russia**	Spain	Others	Total all countries
1961	3934	13755	3921	8129			268377	-	158113	325780		1212	783221
1962	3109	20482	1532	6503			225615	-	175020	476760		245	909266
1963	-	18318	129	4223			205056	108	129779	417964		-	775577
1964	-	8634	297	3202			149878	-	94549	180550		585	437695
1965	-	526	91	3670			197085	-	89962	152780		816	444930
1966	-	2967	228	4284			203792	-	103012	169300		121	483704
1967	-	664	45	3632			218910	-	87008	262340		6	572605
1968	-	-	225	1073			255611	-	140387	676758		-	1074084
1969	29374	-	5907	5543			305241	7856	231066	612215		133	1197226
1970	26265	44245	12413	9451			377606	5153	181481	276632		-	933246
1971	5877	34772	4998	9726			407044	1512	80102	144802		215	689048
1972	1393	8915	1300	3405			394181	892	58382	96653		166	565287
1973	1916	17028	4684	16751			285184	843	78808	387196		276	792686
1974	5717	46028	4860	78507			287276	9898	90894	540801		38453	1102434
1975	11309	28734	9981	30037			277099	7435	101843	343580		19368	829377
1976	11511	20941	8946	24369			344502	6986	89061	343057		18090	867463
1977	9167	15414	3463	12763			388982	1084	86781	369876		17771	905301
1978	9092	9394	3029	5434			363088	566	35449	267138		5525	698715
1979	6320	3046	547	2513			294821	15	17991	105846		9439	440538
1980	9981	1705	233	1921			232242	3	10366	115194		8789	380434
1981	12825	3106	298	2228			277818		5262	83000	14500	-	399037
1982	11998	761	302	1717			287525		6601	40311	14515	-	363730
1983	11106	126	473	1243			234000		5840	22975	14229	-	289992
1984	10674	11	686	1010			230743		3663	22256	8608	-	277651
1985	13418	23	1019	4395			211065		3335	62489	7846	4330	307920
1986	18667	591	1543	10092			232096		7581	150541	5497	3505	430113
1987	15036	1	986	7035			268004		10957	202314	16223	2515	523071
1988	15329	2551	605	2803			223412		8107	169365	10905	1862	434939
1989	15625	3231	326	3291			158684		7056	134593	7802	1273	332481
1990	9584	592	169	1437			88737		3412	74609	7950	510	187000
1991	8981	975		2613			126226		3981	119427***	3677	3278	269158
1992	11663	2		3911	3337		168460		6120	182315	6217	1209	383234
1993	17435	3572		5887	5389	9374	221051		11336	244860	8800	3907	531611
1994	22826	1962		8283	6882	36737	318395		15579	291925	14929	28568	746086
1995	22262	4912		7428	7462	34214	319987		16329	296158	15505	15742	739999
1996	17758	5352		8326	6529	23005	319158		16061	305317	15871	14851	732228
1997	20076	5353		6680	6426	4200	357825		18066	313344	17130	13303	762403
1998	14290	1197		3841	6388	1423	284647		14294	244115	14212	8217	592624
1999	13700	2137		3019	4093	1985	223390		11315	210379	8994	5898	484910
2000	13350	2621		3513	5787	7562	192860		9165	166202	8695	5115	414870
2001	12500	2681		4524	5727	5917	188431		8698	183572	9196	5225	426471
2002	15693	2934		4517	6419	5975	202559		8977	184072	8414	5484	445045
2003	19427	2921		4732	7026	5963	191977		8711	182160	7924	6149	436990
2004	19226	3621		6187	8196	7201	212117		14004	201525	11285	6082	489445
2005	16273	3491		5848	8135	5874	207825		10744	200077	9349	7660	475276
2006	16327	4376		3837	8164	5972	201987		10594	203782	9219	6271	470527

Year	Faroe Islands	France	German Dem.Rep.	Fed.Rep.Germany	Greenland	Iceland	Norway	Poland	United Kingdom	Russia**	Spain	Others	Total all countries
2007	14788	3190		4619	5951	7316	199809		9298	186229	9496	5101	445796
2008	15812	3149		4955	5617	7535	196598		8287	190225	9658	7336	449171
2009	16905	3908		8585	4977	7380	224298		8632	229291	12013	7442	523431
2010	15977	4499		8442	6584	11299	264701		9091	267547	12657	9185	609983
2011	13429	1173		4621	7155	12734	331535		8210	310326	13291	17354^	719829
2012	17523	2841		8500	8520	9536	315739		11166	329943	12814	11081	727663
2013	13833	7858		8010	7885	14734	438734		12536	432314	15042	15263	966209
2014	33298	8149		6225	10864	18205	431846		14762	433479	16378	13243	986449
2015	26568	7480		6427	7055	16120	377983		11778	381778	19905	9880	864384
2016	24084	7946		6336	8607	16031	348949		13583	394107	14640	15139	849422
2017*	28637	9554		5977	13638	11925	357419		16731	396180	14414	13802	868276

* Provisional figures.

** USSR prior to 1991.

*** Includes Baltic countries.

^ Includes unspecified EU catches.

Summary of the assessment

Table 10 Cod in subareas 1 and 2 (Northeast Arctic). Assessment summary. Weights are in tonnes.

Year	Recruitment			SSB			Catch	F		
	Age 3 (thousands)	97.5 percentile	2.5 percentile	SSB	97.5 percentile	2.5 percentile		Mean F ages 5–10	97.5 percentile	2.5 percentile
	thousands			tonnes						
1946	1414614	2080359	961917	990934	1150602	853422	706000	0.21	0.27	0.166
1947	619663	891042	430936	1021533	1193274	874510	882017	0.32	0.39	0.25
1948	411710	606652	279410	837191	985969	710863	774295	0.31	0.39	0.25
1949	579737	827729	406045	624679	721825	540607	800122	0.36	0.45	0.30
1950	879176	1248110	619297	561960	642560	491470	731982	0.38	0.46	0.31
1951	2462102	3486485	1738698	511174	590545	442471	827180	0.43	0.52	0.35
1952	2317108	3282065	1635858	499388	583284	427559	876795	0.52	0.63	0.43
1953	2574350	3662179	1809655	396109	460947	340391	695546	0.40	0.48	0.32
1954	849182	1199995	600928	409613	471500	355849	826021	0.42	0.51	0.34
1955	388317	549133	274596	331349	377786	290621	1147841	0.50	0.61	0.42
1956	745849	1053069	528257	284131	324213	249004	1343068	0.61	0.74	0.51
1957	1421315	2004361	1007870	206845	236408	180979	792557	0.53	0.64	0.43
1958	1027987	1449754	728921	204290	235694	177070	769313	0.53	0.64	0.44
1959	1323033	1867654	937228	443045	519464	377869	744607	0.53	0.64	0.44
1960	1477129	2086573	1045691	403077	474008	342759	622042	0.51	0.62	0.42
1961	1525833	2145463	1085158	406118	471303	349949	783221	0.65	0.77	0.54
1962	1250103	1752012	891978	320257	371881	275799	909266	0.76	0.90	0.64
1963	843440	1188452	598586	214454	249566	184283	776337	0.87	1.03	0.74
1964	486159	691109	341988	192056	224240	164491	437695	0.68	0.81	0.56
1965	908344	1283264	642962	106520	123428	91928	444930	0.56	0.67	0.46
1966	1898219	2689867	1339559	121926	141387	105144	483711	0.51	0.61	0.42
1967	1261515	1787201	890453	133552	155673	114574	572605	0.54	0.65	0.44
1968	186414	262583	132340	228959	263299	199098	1074084	0.58	0.70	0.48
1969	111496	157675	78842	151324	175849	130220	1197226	0.76	0.90	0.64
1970	213984	301305	151969	230581	270056	196877	933246	0.70	0.83	0.58
1971	389880	549515	276619	319255	383987	265436	689048	0.59	0.71	0.48
1972	995265	1397690	708707	365225	445458	299443	565254	0.69	0.83	0.58
1973	1859149	2623134	1317673	324190	396635	264978	792685	0.61	0.73	0.51
1974	640859	896850	457936	159560	193612	131498	1102433	0.64	0.76	0.53
1975	598970	838082	428079	130571	149293	114197	829377	0.64	0.76	0.53
1976	609034	853029	434830	167868	194007	145251	867463	0.66	0.79	0.55
1977	372580	517096	268452	352496	424796	292501	905301	0.81	0.96	0.68
1978	629621	871980	454624	234828	290576	189776	698715	0.97	1.15	0.83
1979	211340	290674	153658	165061	202967	134234	440538	0.78	0.93	0.66
1980	130233	177036	95804	102562	122237	86054	380434	0.78	0.92	0.65
1981	159906	214898	118987	151682	177199	129840	399038	0.77	0.91	0.64
1982	174366	230512	131896	310647	370677	260339	363730	0.82	0.97	0.69
1983	156040	206079	118151	281459	334082	237125	289992	0.78	0.92	0.66
1984	413625	540334	316629	227821	264578	196170	277651	0.89	1.04	0.75
1985	555957	725318	426142	187561	217522	161727	307920	0.79	0.94	0.66
1986	1118230	1463265	854553	162029	186883	140481	430113	0.90	1.06	0.77
1987	326684	426202	250403	110512	127890	95496	523071	1.02	1.19	0.88
1988	297500	389544	227204	179777	210397	153613	434939	0.95	1.11	0.82
1989	188615	245724	144779	234911	275045	200633	332481	0.65	0.78	0.54

Year	Recruitment			SSB			Catch	F		
	Age 3 (thousands)	97.5 percentile	2.5 percentile	SSB	97.5 percentile	2.5 percentile		Mean F ages 5–10	97.5 percentile	2.5 percentile
	thousands			tonnes						
1990	155384	205924	117248	332002	392581	280771	212000	0.37	0.45	0.30
1991	395216	515576	302954	707466	829974	603041	319158	0.32	0.39	0.26
1992	732230	957568	559919	909866	1055284	784486	513234	0.45	0.55	0.37
1993	925351	1206537	709696	776726	895032	674058	581611	0.58	0.69	0.48
1994	730875	957555	557857	592309	675376	519459	771086	0.80	0.94	0.67
1995	498667	650923	382025	524227	601467	456905	739999	0.78	0.93	0.66
1996	408240	536021	310920	547314	640163	467931	732228	0.77	0.91	0.64
1997	668993	870957	513862	544511	650019	456128	762403	0.95	1.11	0.81
1998	952273	1243020	729532	378861	452477	317222	592624	0.96	1.12	0.82
1999	542446	706687	416375	283778	336741	239144	484910	0.96	1.12	0.82
2000	671163	876397	513991	239618	275788	208192	414868	0.82	0.97	0.70
2001	549501	717432	420878	364366	422959	313890	426471	0.71	0.84	0.60
2002	408103	531880	313131	506600	589959	435019	535045	0.65	0.78	0.55
2003	691817	895630	534384	596195	693087	512849	551990	0.57	0.69	0.48
2004	245941	313426	192986	710679	827457	610382	606445	0.72	0.86	0.60
2005	630342	804072	494149	617366	714541	533407	641276	0.72	0.85	0.60
2006	538769	691242	419927	604725	693420	527376	537642	0.66	0.78	0.55
2007	1410572	1806246	1101574	656899	752447	573484	486883	0.45	0.55	0.37
2008	1238767	1595334	961895	694325	794922	606458	464171	0.32	0.39	0.26
2009	706486	919987	542532	1106913	1257339	974484	523430	0.27	0.34	0.22
2010	287140	375942	219315	1406781	1600544	1236474	609983	0.27	0.34	0.22
2011	473404	625609	358229	2023705	2313497	1770213	719830	0.27	0.34	0.21
2012	553893	718052	427264	2350356	2703522	2043324	727663	0.24	0.30	0.190
2013	613740	804777	468051	2662341	3082049	2299788	966209	0.27	0.34	0.21
2014	718586	965449	534845	2522612	2947130	2159243	986449	0.30	0.37	0.24
2015	399021	541159	294216	2085035	2469503	1760423	864384	0.32	0.40	0.26
2016	245294	351551	171153	1713359	2078165	1412592	849422	0.34	0.43	0.26
2017	688190	1045704	452906	1809027	2253416	1452274	868276	0.40	0.55	0.29
2018	691000			1485912	2008461	1099321				

Sources and references

ICES. 2003. Report of the Study Group on Biological Reference Points for Northeast Arctic Cod, 13–17 January 2003, Svanhovd, Norway. ICES CM 2003/ACFM:11. 39 pp.

ICES. 2005. Report of the Arctic Fisheries Working Group (AFWG), 19–28 April 2005, Murmansk, Russia. ICES CM 2005/ACFM:20. 564 pp.

ICES. 2016a. Norway/Russia request for evaluation of harvest control rules for Northeast Arctic cod and haddock and for Barents Sea capelin. In Report of the ICES Advisory Committee, 2016. ICES Advice 2016, Book 3, Section 3.4.1. 12 pp. [http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2016/Special Requests/Norway-Russia_HCR_Northeast_Arctic_cod_haddock_capelin.pdf](http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2016/Special%20Requests/Norway-Russia_HCR_Northeast_Arctic_cod_haddock_capelin.pdf).

ICES. 2016b. Advice basis. In Report of the ICES Advisory Committee, 2016. ICES Advice 2016, Book 1, Section 1.2.

ICES. 2017a. Report of the Arctic Fisheries Working Group (AFWG), 19–25 April 2017, ICES HQ, Copenhagen, Denmark. ICES CM 2017/ACOM:06. 493 pp.

ICES. 2017b. Report of the Inter-Benchmark Protocol on Northeast Arctic cod (IBPArticCod), 4–6 April 2017, ICES HQ, Copenhagen, Denmark. ICES CM 2017/ACOM:29. 5 pp.

ICES. 2018. Report of the Arctic Fisheries Working Group (AFWG), 18–24 April 2018, JRC, Ispra, Italy. ICES CM 2018/ACOM:06.