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REPORT

Advice on fishing opportunities for Northeast Arctic cod in 2025 in ICES subareas 1 and 2

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Content

Stock Name: Northeast Arctic cod (ICES areas 1 and 2)

Advice on fishing opportunities

The Joint Russian-Norwegian Arctic Fisheries Working Group (JRN-AFWG) advises that when the Joint Norwegian–Russian Fisheries Commission management plan is applied, catches in 2025 should be no more than 311 587 tonnes.

Stock development over time

Fishing pressure on the stock is above F_{pa} and below F_{lim} and within the F_{mgt} range. The spawning-stock biomass is currently above MSY Btrigger, B_{pa} and B_{lim}.

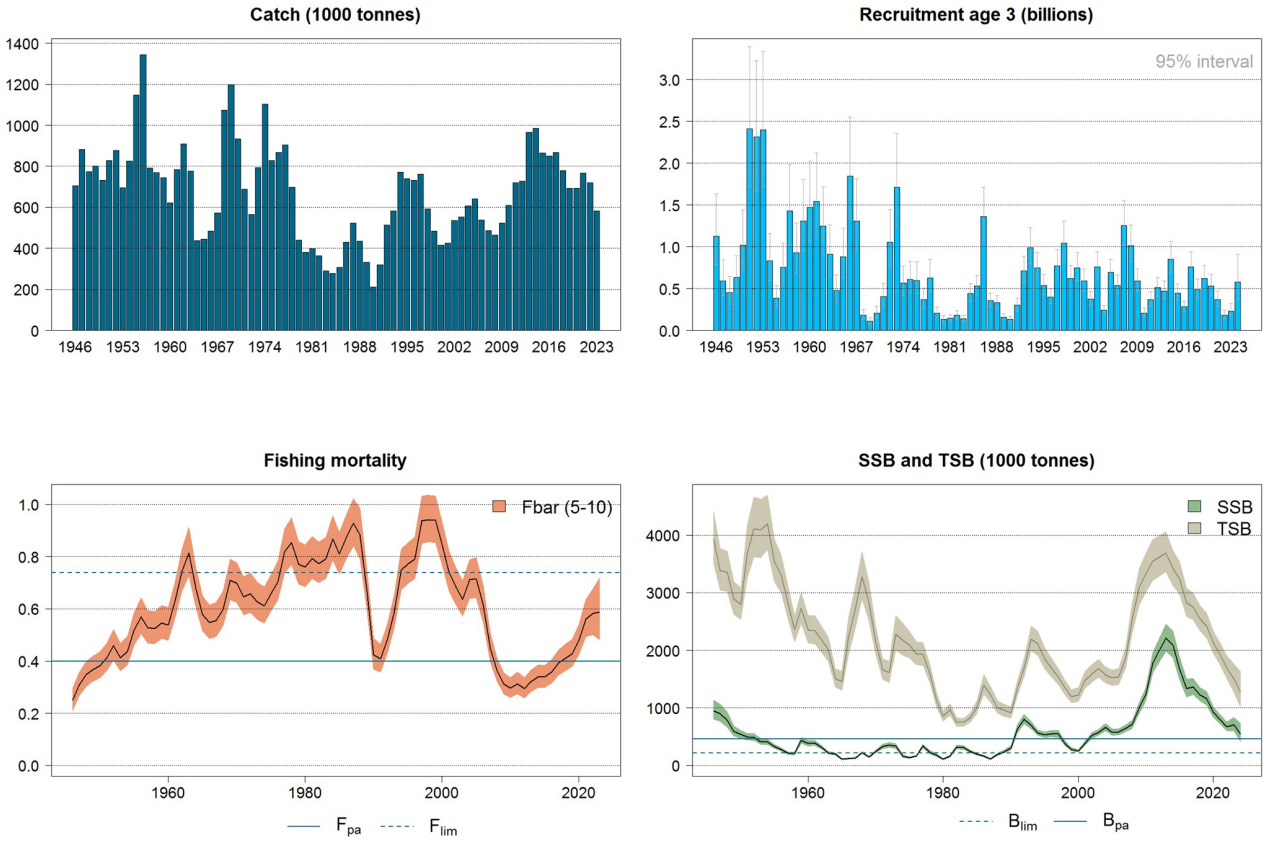

Figure 1. Cod in ICES subareas 1 and 2 (Northeast Arctic). Catch, recruitment, F, SSB and TSB (total stock biomass, age 3+) with 95 % confidence levels. The biomass reference points relate to SSB. For this stock, Fmgt ranges from 0.40 to 0.60, and there are three SSBmgt values (460 000, 920 000 and 1 380 000 tonnes).

Catch scenarios

Table 1. Cod in ICES subareas 1 and 2 (Northeast Arctic). Assumptions made for the interim year and in the forecast. SSB, catch in tonnes, and recruitment in thousands.

Variable	Value	Notes
F ages 5–10 (2024)	0.589	F_{sq} =F_{2023}. From assessment
SSB (2025)	450 572	From assessment
R age 3 (2024)	587 000	From recruitment model
R age 3 (2025)	450 000	From recruitment model
R age 3 (2026)	375 000	From recruitment model
R age 3 (2027)	340 000	From recruitment model
Total catch (2024)	477 185	Corresponding to F_{sq}

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

Basis	Total catch (2025)	F (2025)	SSB (2026)	% SSB change *	% TAC change **	% Advice change ***
Management plan^	311 587	0.43	410 740	-9	-31	-31
Other options						
F_{MSY} ****	292 245	0.40	425 617	-6	-36	-36
F = 0	0	0	664 770	48	-100	-100
F = F_{2023}	395 821	0.589	347 651	-23	-13	-13
F_{pa}	292 245	0.40	425 617	-6	-36	-36
F_{lim}	466 835	0.74	296 859	-34	3	3

* SSB 2026 relative to SSB 2025.

** Advice for 2025 relative to TAC for 2024 (453 427 tonnes).

*** Advice for 2025 relative to advice for 2024.

**** F = 0.40 corresponds to the lower bound of the F_{MSY} range (0.40-0.60), F not reduced for SSB being below B_{pa} .

^ Since SSB in 2025 is below B_{pa} = 460 000 t, F = 0.40*SSB(2025)/B_{pa} = 0.3918 is used in the 3-year prediction, giving catches of 287 330, 309 101 and 338 329 tonnes in 2025, 2026 and 2027, respectively. The average of this is 311 587 tonnes. As SSB is below B_{pa} in 2025, the 20% limit on annual change in TAC does not apply.

The advice for 2025 is 31% lower than the advice for 2024. The downward adjustment of stock size since last year's assessment and the declining stock trend both contribute to the reduction in advice. In addition, the 20% TAC change constraint (Table 3) was applied in the advice for 2024, resulting in higher advice than that resulting from the target F (F_{tr}). The stability constraint does not apply for 2025 because SSB has dropped below B_{pa}, and therefore advice for 2025 corresponds to target F (F_{tr}), and is considerably lower than the advice for 2024.

Basis of the advice

Table 3. Cod in ICES subareas 1 and 2 (Northeast Arctic). The basis of the advice.

Advice basis	Joint Norwegian-Russian Fisheries Commission management plan

Management plan	At the 46th meeting of the Joint Norwegian-Russian Fisheries Commission (JNRFC) 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} × F_{MSY} ; - if B_{pa} ≤ SSB ≤ 2×B_{pa} , then F_{tr} = F_{MSY} ; - if 2 × B_{pa} < SSB < 3 × B_{pa} , then F_{tr} = F_{MSY} × (1 + 0.5 × (SSB – 2 × B_{pa}) / B_{pa}); - if SSB ≥ 3 × B_{pa} , then F_{tr} = 1.5 × 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 ±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. In 2021, this was increased to 15% as an extraordinary measure for transfers between 2021 and 2022 only. ICES evaluated this harvest control rule in 2016 (ICES, 2016) and 2021 (ICES, 2021) and concluded that it is precautionary.

Quality of the assessment

After the 2021 benchmark, the assessment has been relatively consistent from year to year. Recruitment predictions in recent years have been overestimates.

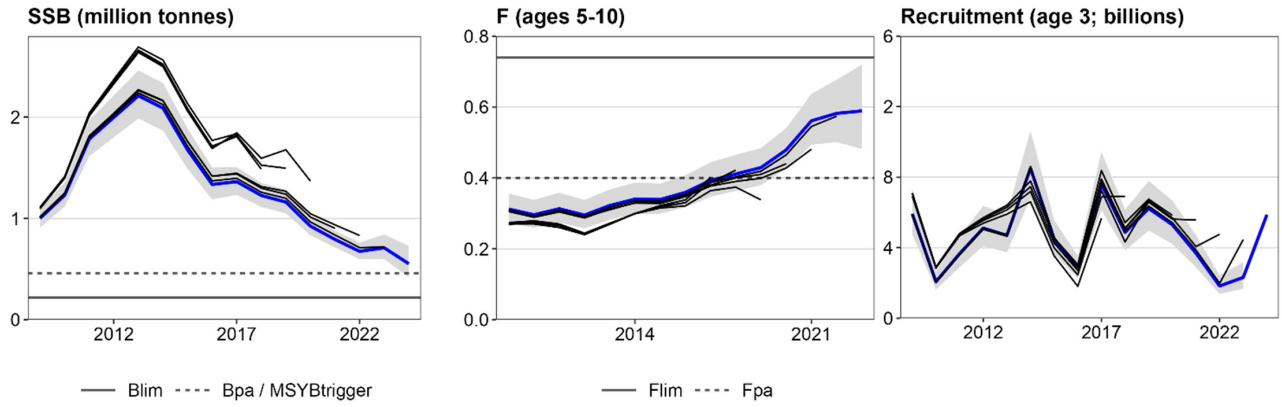

Figure 2 Cod in ICES subareas 1 and 2 (Northeast Arctic). Historical assessment results. There was a benchmark revision in 2021. The shaded areas indicate the 95% confidence intervals for the 2024 assessment

Issues relevant for the advice

Due to the temporary suspension of Russian scientists from ICES, this assessment was as in 2022 and 2023 conducted by a Joint Russian-Norwegian Arctic Fisheries Working Group (JRN-AFWG) consisting of scientists from VNIRO (Russia) and IMR (Norway) (Howell et al., 2024).

This advice has been conducted outside ICES and should not be considered as ICES advice. However, this assessment and advice has been produced following the methodology agreed at the ICES benchmark in 2021 (ICES, 2021).

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. Bycatch of golden redfish should be kept as low as possible. Bycatch of coastal cod should be kept as low as possible in order to avoid overfishing of the coastal cod (*Gadus morhua*) stocks (ICES, 2024).

The model for predicting recruitment has been revised. The new model only uses survey data, and environmental data are no longer used (Howell et al., 2024). Estimated recruitment has been below the long-term average since the 2014 year class.

The predictions for 2025 and following years indicate that SSB will be below B_{pa} and that catches and total stock biomass will increase slightly after 2025, while SSB will reach its lowest level in 2027 and then increase slightly.

In recent years stock size has been overestimated (particularly before the 2021 benchmark) and the stock is declining due to recruitment being below average. In this situation, the 20% limit on annual TAC change has led to fishing pressure well above the target in the HCR for several years. The SSB has now fallen below B_{pa}, and to continue to apply the stability constraint would no longer be precautionary. The allowed 10% quota transfer between years compounds this issue in the current situation with the spawning stock declining below B_{pa}.

Reference points

Table 4. Cod in ICES 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, 2021)
	F_{MSY} range	0.40 – 0.60	Long-term simulations	ICES (2003, 2021)
Precautionary approach	B_{lim}	220 000 t	Change point regression	ICES (2003, 2021)
	B_{pa}	460 000 t	The lowest SSB estimate having >90% probability of remaining above B_{lim}	ICES (2003, 2021)
	F_{lim}	0.74	F corresponding to an equilibrium stock = B_{lim}	ICES (2003, 2021)
	F_{pa}	0.40	The highest F estimate having >90% probability of remaining below F_{lim}	ICES (2003, 2021)
Management plan	SSB_{mgt}	460 000 t	Two-step (double hockey-stick) HCR, see Table 3	ICES (2017)
	F_{mgt}	0.40 – 0.60	Two-step (double hockey-stick) HCR, see Table 3	ICES (2017)

Basis of the assessment

Table 5. Cod in ICES subareas 1 and 2 (Northeast Arctic). Basis of the assessment and advice.

ICES stock data category	1
Assessment type	Age-based analytical assessment (SAM) 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, Jan–Mar; Joint acoustic survey Barents Sea and Lofoten, Feb–Mar; Russian bottom trawl survey, October–December; Joint Ecosystem survey); 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	The methodology of assessment adopted by the last ICES benchmark for the stock in February 2021 (ICES, 2021) was followed, except for the recruitment predictions.
Working group	Joint Russian-Norwegian Arctic Fisheries Working Group (JRN-AFWG).

History of the advice, catch, and management

Table 6. Cod in ICES subareas 1 and 2 (Northeast Arctic). ICES advice, agreed TACs, the official and unreported landings, and ICES catches. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	Agreed TAC	Official catches	Unreported landings (included in ICES catches)	ICES catches
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 Flow; TAC	172000	160000	210000	25000	212000
1991	F at Flow; TAC	215000	215000	294000	50000	319158
1992	Within safe biological limits	250000	356000	421000	130000	513234
1993	Healthy stock	256000	500000	575000	50000	581611
1994	No long-term gains in increased F	649000	700000	795000	25000	771086
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 Fmed	< 993000	850000	792000		762403
1998	F less than Fmed	514000	654000	615000		592624
1999	Reduce F to below Fpa	360000	480000	506000		484910
2000	Increase B above Bpa in 2001	110000	390000			414870
2001	High probability of SSB> Bpa in 2003	263000	395000			426471
2002	Reduce F to well below 0.25	181000	395000		90000	535045
2003	Reduce F to below Fpa	305000	395000		115000	551990
2004	Reduce F to below Fpa	398000	486000		117000	606445
2005	Take into account coastal cod and redfish bycatches. Apply catch rule.	485000	485000		166000	641276
2006	Take into account coastal cod and redfish bycatches. Apply amended catch rule.	471000	471000		67100	537642
2007	Take into account coastal cod and redfish bycatches. Fpa	309000	424000		41087	486883
2008	Take into account coastal cod and redfish bycatches. Apply catch rule.	409000	430000		15000	464171
2009	Take into account coastal cod and redfish bycatches. Apply catch rule.	473000	525000		0	523431

Year	ICES advice	Catch corresponding to advice	Agreed TAC	Official catches	Unreported landings (included in ICES catches)	ICES catches
2010	Take into account coastal cod and redfish bycatches. Apply catch rule.	577500	607000		0	609983
2011	Take into account coastal cod and redfish bycatches. Apply catch rule.	703000	703000		0	719829
2012	Take into account coastal cod and redfish bycatches. Apply catch rule.	751000	751000		0	727663
2013	Take into account coastal cod and S. marinus ^^ bycatches. Apply catch rule.	940000	1000000		0	966209
2014	Take into account coastal cod and S. marinus^^ bycatches. Apply catch rule.	993000	993000		0	986449
2015	Take into account coastal cod and S. norvegicus bycatches. Apply catch rule.	894000	894000		0	864384
2016	Take into account coastal cod and S. norvegicus bycatches. Apply catch rule.	805000	894000		0	849422
2017	Take into account coastal cod and S. norvegicus bycatches. Apply management plan.	≤ 805000	890000 ^		0	868276
2018	Take into account coastal cod and S. norvegicus bycatches. Apply management plan.	712000	775000		0	778627
2019	Take into account coastal cod and S. norvegicus bycatches. Apply management plan.	674678	725000		0	692609
2020	Apply management plan	≤ 689672	738000		0	692903
2021	Apply management plan	≤ 885600	885600		0	767284^^^
2022	Apply management plan	≤ 708480	708480		0	719211^^^
2023	Apply management plan^^^	≤ 566784	566784		0	582552^^^
2024	Apply management plan^^^	≤ 453427	453427			
2025	Apply management plan^^^	≤ 311587				

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

^^ Until 2014 this species was named *Sebastes marinus* , thereafter *Sebastes norvegicus*.

^^^ In 2022-2024 assessment and advice was carried out by the Joint Russian-Norwegian Arctic Fisheries working group (JRN-AFWG) which compiled catches for 2021-2023 and gave advice for 2023-2025.

History of catch and landings

Table 7. Cod in ICES 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
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

Year	Faroe Islands	France	German Dem.Rep.	Fed.Rep. Germany	Greenland	Iceland	Norway	Poland	United Kingdom	Russia**	Spain	Others	Total
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

Year	Faroe Islands	France	German Dem.Rep.	Fed.Rep. Germany	Greenland	Iceland	Norway	Poland	United Kingdom	Russia**	Spain	Others	Total
2005	16273	3491		5848	8135	5874	207825		10744	200077	9349	7660	475276
2006	16327	4376		3837	8164	5972	201987		10594	203782	9219	6271	470527
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
2018	26152	6605		9768	12743	10708	333539		11533	340364	13143	14071	778627
2019	22270	6371		8470	7553	12294	282120		11214	316813	13939	11565	692609
2020	21679	5796		9725	7391	9734	289472		12113	312683	11403	12908	692903
2021	21767	4459		6190	8246	8933	337931		5426	352064	11080	11188	767284^^
2022	21530	4988		7134	7688	6214	310145		7024	333697	12214	8577	719211^^
2023*	17556	4632		5630	3994	5157	242117		5972	276923	8030	12539	582552^^

* Provisional figures.

** USSR prior to 1991.

*** Includes Baltic countries.

^ Includes unspecified EU catches.

^^ In 2022-2024 assessment and advice was carried out by the Joint Russian-Norwegian Arctic Fisheries working group (JRN-AFWG) which compiled catches for 2021-2023 and gave advice for 2023-2025.

Summary of the assessment

Table 8. Cod in ICES subareas 1 and 2 (Northeast Arctic). Assessment summary. High and low refer to 95% confidence bounds.

Year	Recruitment			Spawning-stock biomass			Total catch	Fishing mortality		
	Recruitment (Age 3)	Low	High	SSB	Low	High		F (ages 5–10)	Low	High
	thousands			Tonnes			tonnes			
1946	1130233	782413	1632676	952985	800875	1133985	706000	0.25	0.21	0.297
1947	591326	415003	842564	902641	766858	1062465	882017	0.309	0.268	0.357
1948	451445	314708	647594	784654	662164	929804	774295	0.348	0.303	0.399
1949	632170	446972	894103	594887	511210	692260	800122	0.369	0.323	0.421
1950	1020622	724002	1438764	535869	471032	609630	731982	0.382	0.335	0.436
1951	2411969	1715606	3390985	495077	440550	556353	827180	0.412	0.363	0.468
1952	2316011	1661589	3228179	488765	431752	553306	876795	0.459	0.404	0.521
1953	2400790	1726293	3338828	412395	362012	469790	695546	0.412	0.362	0.468
1954	832049	598733	1156285	408300	361237	461494	826021	0.438	0.386	0.496
1955	384305	276330	534471	327878	294448	365103	1147841	0.518	0.46	0.584
1956	752521	542353	1044132	281174	253768	311540	1343068	0.57	0.505	0.642
1957	1430781	1033581	1980624	212263	191141	235718	792557	0.528	0.468	0.594
1958	929342	673739	1281916	205421	183124	230432	769313	0.526	0.467	0.591
1959	1310632	953458	1801609	434410	385584	489419	744607	0.546	0.486	0.613
1960	1473685	1071921	2026033	384829	339043	436798	622042	0.539	0.48	0.606
1961	1541584	1120349	2121198	386500	343409	434997	783221	0.634	0.569	0.706
1962	1249285	907074	1720602	315322	283702	350467	909266	0.743	0.667	0.827
1963	909205	656361	1259451	215906	194672	239457	776337	0.815	0.728	0.913
1964	473764	339569	660992	200247	179799	223021	437695	0.678	0.606	0.758
1965	880243	633004	1224048	108045	96205	121342	444930	0.578	0.514	0.65
1966	1844090	1333855	2549503	121054	109013	134425	483711	0.548	0.487	0.616
1967	1310906	948031	1812679	128761	115864	143094	572605	0.556	0.495	0.624
1968	182428	131677	252740	222997	203163	244768	1074084	0.599	0.536	0.669
1969	110961	80030	153849	148877	134375	164944	1197226	0.709	0.635	0.791
1970	207795	149675	288485	242004	218242	268354	933246	0.698	0.625	0.778
1971	406859	294328	562415	330344	294058	371107	689048	0.646	0.577	0.723
1972	1052424	766767	1444501	353349	312102	400047	565254	0.659	0.587	0.739
1973	1711725	1243345	2356549	334153	291007	383695	792685	0.627	0.56	0.702
1974	566788	417220	769972	159026	135878	186119	1102433	0.611	0.546	0.684
1975	607022	445669	826792	133536	119587	149111	829377	0.658	0.592	0.732
1976	600127	438284	821735	167187	151747	184198	867463	0.705	0.635	0.783
1977	371249	273380	504156	335946	299959	376250	905301	0.818	0.737	0.907

1978	625497	458765	852825	227795	199875	259615	698715	0.855	0.77	0.95
1979	204057	149622	278296	180383	157725	206297	440538	0.772	0.694	0.859
1980	131441	98688	175064	108436	96869	121385	380434	0.76	0.684	0.845
1981	144740	110608	189404	161279	146194	177921	399038	0.793	0.715	0.878
1982	182264	141795	234284	321325	288801	357511	363730	0.774	0.7	0.857
1983	140731	109488	180889	311431	280593	345658	289992	0.791	0.716	0.874
1984	441833	347228	562213	243534	222581	266459	277651	0.868	0.787	0.958
1985	528650	424589	658215	195541	178748	213912	307920	0.81	0.734	0.894
1986	1361054	1081645	1712640	163901	150099	178972	430113	0.874	0.794	0.961
1987	355144	281787	447598	114908	104606	126225	523071	0.928	0.842	1.023
1988	331994	263852	417735	191457	173310	211504	434939	0.885	0.794	0.986
1989	158526	127189	197583	237314	212827	264618	332481	0.668	0.595	0.749
1990	132617	104649	168058	303355	266838	344869	212000	0.424	0.368	0.488
1991	299280	237247	377533	635806	565709	714589	319158	0.408	0.358	0.465
1992	714113	574019	888397	801872	721261	891493	513234	0.487	0.434	0.545
1993	986989	793395	1227821	698491	632804	770997	581611	0.587	0.527	0.653
1994	749130	601448	933073	568725	519659	622423	771086	0.748	0.674	0.83
1995	536724	431259	667981	532870	486039	584213	739999	0.771	0.697	0.854
1996	400745	321069	500193	551369	498113	610319	732228	0.791	0.715	0.876
1997	772850	618928	965051	546260	488948	610291	762403	0.938	0.852	1.032
1998	1043689	833201	1307350	386165	346209	430732	592624	0.942	0.857	1.036
1999	622788	496660	780947	280597	252555	311752	484910	0.94	0.855	1.033
2000	745072	596683	930364	255138	233866	278344	414868	0.849	0.77	0.937
2001	590310	473196	736410	383239	347133	423101	426471	0.741	0.669	0.822
2002	374816	301025	466696	520404	471126	574838	535045	0.682	0.615	0.756
2003	758231	610705	941395	570813	518018	628988	551990	0.637	0.573	0.709
2004	242815	198411	297155	664368	603916	730870	606445	0.711	0.641	0.789
2005	692086	564235	848906	576671	525642	632655	641276	0.716	0.643	0.797
2006	538831	439149	661139	579579	528937	635069	537642	0.615	0.549	0.69
2007	1255333	1018126	1547806	644011	584199	709947	486883	0.449	0.398	0.506
2008	1015424	818187	1260209	712366	646771	784613	464171	0.366	0.323	0.415
2009	591345	475309	735708	1001388	911248	1100444	523430	0.312	0.273	0.356
2010	206731	161844	264066	1229135	1116992	1352537	609983	0.296	0.259	0.338
2011	365681	288806	463018	1782709	1613658	1969470	719830	0.313	0.274	0.358
2012	510602	409951	635966	1997429	1801933	2214136	727663	0.295	0.258	0.338
2013	469476	372948	590989	2211080	1987269	2460098	966209	0.322	0.282	0.367
2014	849995	680610	1061536	2089429	1868257	2336785	986449	0.34	0.298	0.387

2015	449183	363260	555428	1676734	1490336	1886445	864384	0.339	0.299	0.384
2016	283071	226982	353021	1335743	1188294	1501487	849422	0.359	0.317	0.407
2017	760664	613566	943027	1363003	1232725	1507049	868276	0.393	0.347	0.444
2018	486272	384693	614674	1226591	1113929	1350648	778627	0.411	0.363	0.465
2019	622063	497411	777954	1161583	1050075	1284932	692609	0.429	0.38	0.484
2020	529571	420661	666679	923962	834092	1023515	692903	0.479	0.425	0.54
2021	368238	288158	470574	792317	714444	878678	767284	0.561	0.494	0.637
2022	182355	137222	242331	674790	597676	761853	719211	0.582	0.501	0.677
2023	231028	168283	317168	709740	599149	840745	582552	0.589	0.482	0.719
2024	587000*			552219	418582	728522				

* Recruitment model estimate.

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