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

ICES stock advice

ICES advises that when the Joint Russian–Norwegian Fisheries Commission management plan is applied, catches in 2018 should be no more than 712 000 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, and the most recent estimate is likely to be below F_{MSY}. There has been no strong recruitment since the 2004 and 2005 year classes.

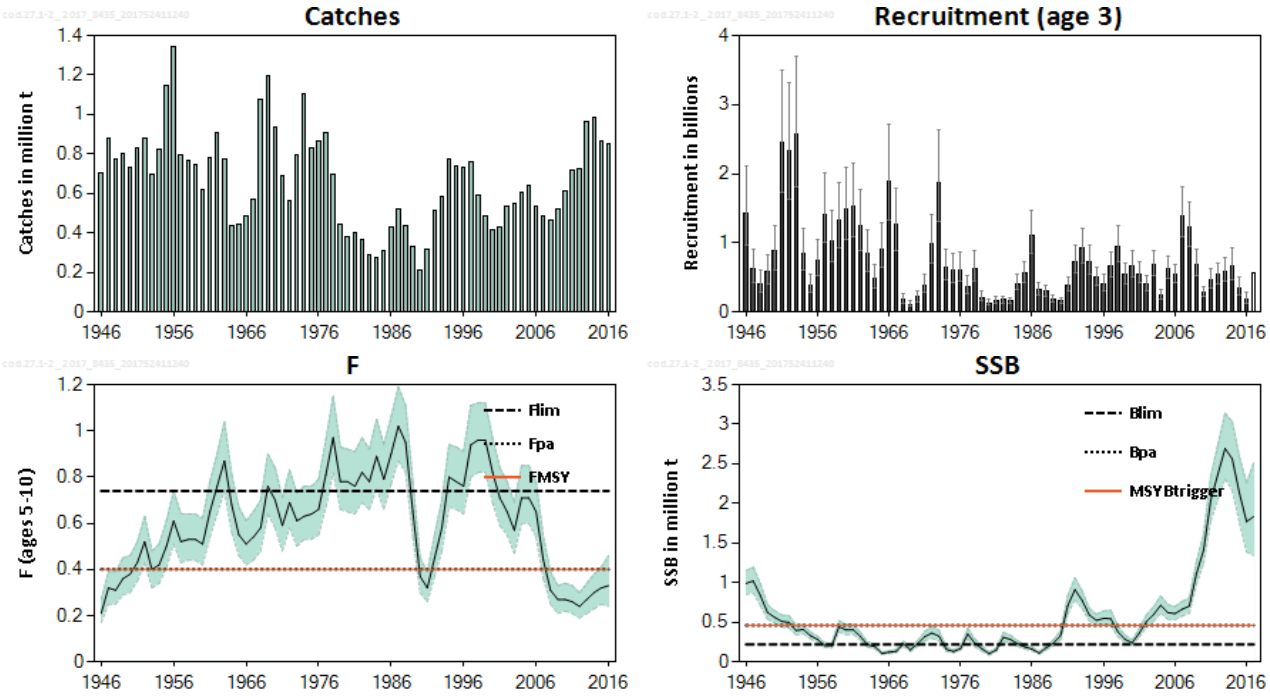


Figure 1 Cod in subareas 1 and 2 (Northeast Arctic). Catch, recruitment, F, and SSB. Recruitment, F, and SSB have confidence intervals (95%) in the plot. For this stock, $F_{MGT} = F_{MSY}$ and SSB_{MGT} = MSY $B_{trigger}$ = B_{pa}; therefore, the horizontal lines representing these points in the graph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

Stock and exploitation status

Table 1 Cod in subareas 1 and 2. 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}	✓	✓	✓	Below	MSY $B_{Trigger}$	✓	✓	✓ Above trigger
Precautionary Approach	F_{pa}, F_{lim}	✓	✓	✓	Harvested sustainably	B_{pa}, B_{lim}	✓	✓	✓ Full reproductive capacity
Management plan	F_{MGT}	✓	✓	✓	Below	B_{MGT}	✓	✓	✓ Above

Catch options

Table 2 Cod in subareas 1 and 2. The basis for the catch options.

Variable	Value	Source	Notes
$F_{ages\ 5–10}$ (2017)	0.33	ICES (2017a)	F *status quo* (2016)
SSB (2018)	1 504 567	ICES (2017a)	(in tonnes)
R_{age3} (2017)	566 000	ICES (2017a)	Recruitment model estimate (thousands)
R_{age3} (2018)	607 000	ICES (2017a)	Recruitment model estimate (thousands)
Ra_{ge3} (2019)	543 000	ICES (2017a)	Recruitment model estimate (thousands)
Total catch (2017)	687 997	ICES (2017a)	Catch corresponding to F *status quo* (in tonnes)

Table 3 Cod in subareas 1 and 2. Annual catch options. All weights are in tonnes.

Basis	Total catch (2018)	F_{total} (2018)	SSB (2019)	% SSB change **	% TAC change ***
ICES advice basis					
Management plan^	712 000	0.44	1 187 128	-21	-20
Other options					
MSY approach: F_{MSY}	653 971	0.40	1 238 434	-18	-27
F = 0	0	0	1 837 135	22	-100
$F = F_{2017}$	562 365	0.33	1 320 109	-12	-37
F_{pa}	653 971	0.40	1 238 434	-18	-27
F_{lim}	1 047 620	0.74	898 148	-40	18

^Limited by constraint in HCR of maximum 20% change from year to year. Without this limitation the advice would be 701 000 t.
** SSB 2019 relative to SSB 2018
*** Catch 2018 relative to TAC 2017 (890 000 t)

Basis of the advice

Table 4 Cod in subareas 1 and 2. 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} × 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. ICES evaluated this harvest control rule in 2016 (ICES, 2016a) and concluded that it is precautionary.

Quality of the assessment

For several surveys, adjustments were made for the last data year because of incomplete spatial coverage. The Russian bottom trawl survey in October–December (RU-BTr-Q4) was not carried out in 2016.

The sampling level from commercial catches was reduced around 2010 and has remained at a lower level since then. Insufficient sampling of commercial catches is impairing the quality of the assessment and the advice.

Discarding is known to have taken place but discards cannot be quantified (although assumed to be below 5% in recent years). The use of constant conversion factors between round and gutted weight for all seasons and areas introduces a bias to the catch statistics.

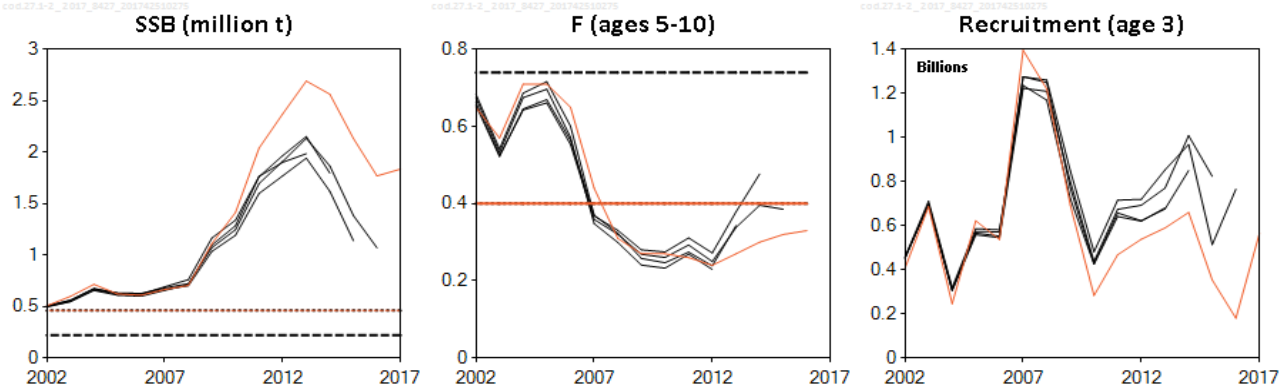


Figure 2 Cod in subareas 1 and 2. Historical assessment results.

Issues relevant for the advice

Fisheries targeting Northeast Arctic (NEA) cod take a considerable part of the total golden redfish (*Sebastes norvegicus)* catch as bycatch, and the bycatch of this species is still far 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 obtain the reductions in fishing mortality implied by the coastal cod (*Gadus morhua*) rebuilding plan.

The assessment model was changed from XSA to SAM this year following an InterBenchmark meeting in April 2017 (ICES, 2017a). There was also a change in the recruitment model. These changes led to a considerable downwards adjustment of the 2008 and later cohorts, while the abundance of the 2007 and older cohorts was revised upwards.

The selectivity at age indicates a strong dome-shape in recent years, with low selectivities at age 12 and older. As recent average selectivity is used in the prediction, and strong year classes are in this age range during the prediction years, the predictions may be too pessimistic. On the other hand, the assumed catch for 2017, corresponding to F *status quo*, is well below the agreed TAC for 2017, and this assumption makes the predictions too optimistic.

Surveys indicate that year classes 2014–2016 are below the long-term average.

The strong 2004 and 2005 year classes were distributed over a much larger area as immatures than other year classes in the assessment. Only a modest fraction of these cohorts was observed as immatures and they recruited to the fishery at a relatively high age. The 2004 and 2005 year classes have made a large impact on neighbouring year classes, as prey, predator, and competition. The varying ability to observe year class strength in scientific surveys may violate basic assumptions in the stock assessment model and forecast, as will variation in the exploitation pattern and uncertainty due to limited biological sampling of commercial fisheries. Given these concerns, future assessments may see relatively large revisions in the perception of fishable biomass. Such revisions will not change the current perception of stock status relative to B_{pa}.

Reference points

Table 5 Cod in subareas 1 and 2. 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	Two-step (double hockey stick) HCR see Table 4	ICES (2017b)
	F_{mgt}	0.40	Two-step (double hockey stick) HCR see Table 4	ICES (2017b)

Basis of the assessment

Table 6 Cod in subareas 1 and 2. Basis of assessment and advice.

ICES stock data category	1 (ICES, 2016b).
Assessment type	Statistical catch-at-age (SAM)
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, 2017a)
Working group	Arctic Fisheries Working Group (AFWG)

Information from stakeholders

There is no information provided.

History of the advice, catch, and management

Table 7 Cod in subareas 1 and 2. ICES advice and official landings. All weights are in tonnes.

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES landings	Unreported landings (included in ICES landings)
1987	Gradual reduction in F	595 000	560 000	552 000	523 071	
1988	F = 0.51; TAC (Advice November 1987, revised advice May 1988)	530 000 (320 000–360 000)	590 000 (451 000)	459 000	434 939	
1989	Large reduction in F	335 000	300 000	348 000	332 481	
1990	F at Flow; TAC	172 000	160 000	210 000	212 000	25 000
1991	F at Flow; TAC	215 000	215 000	294 000	319 158	50 000
1992	Within safe biological limits	250 000	356 000	421 000	513 234	130 000
1993	Healthy stock	256 000	500 000	575 000	581 611	50 000
1994	No long-term gains in increased F	649 000	700 000	795 000	771 086	25 000
1995	No long-term gains in increased F	681 000	700 000	763 000	739 999	
1996	No long-term gains in increased F	746 000	700 000	759 000	732 228	
1997	Well below F_{med}	< 993 000	850 000	792 000	762 403	
1998	F less than F_{med}	514 000	654 000	615 000	592 624	
1999	Reduce F to below F_{pa}	360 000	480 000	506 000	484 910	
2000	Increase B above B_{pa} in 2001	110 000	390 000		414 870	
2001	High prob. of SSB >B_{pa} in 2003	263 000	395 000		426 471	
2002	Reduce F to well below 0.25	181 000	395 000		535 045	90 000
2003	Reduce F to below F_{pa}	305 000	395 000		551 990	115 000
2004	Reduce F to below F_{pa}	398 000	486 000		606 445	117 000
2005	Take into account coastal cod and redfish bycatches. Apply catch rule.	485 000	485 000		641 276	166 000
2006	Take into account coastal cod and redfish bycatches. Apply amended catch rule.	471 000	471 000		537 642	67 100
2007	Take into account coastal cod and redfish bycatches. F_{pa}	309 000	424 000		486 883	41 087
2008	Take into account coastal cod and redfish bycatches. Apply catch rule.	409 000	430 000		464 171	15 000
2009	Take into account coastal cod and redfish bycatches. Apply catch rule.	473 000	525 000		523 431	0
2010	Take into account coastal cod and redfish bycatches. Apply catch rule.	577 500	607 000		609 983	0
2011	Take into account coastal cod and redfish bycatches. Apply catch rule.	703 000	703 000		719 829	0
2012	Take into account coastal cod and redfish bycatches. Apply catch rule.	751 000	751 000		727 663	0
2013^^	Take into account coastal cod and *S. marinus* bycatches. Apply catch rule.	940 000	1000 000		966 209	0
2014^^	Take into account coastal cod and *S. marinus* bycatches. Apply catch rule.	993 000	993 000		986 449	0
2015	Take into account coastal cod and *S. norvegicus* bycatches. Apply catch rule.	894 000	894 000		864 384	0
2016	Take into account coastal cod and *S. norvegicus* bycatches. Apply catch rule.	805 000	894 000		849 422	0
2017	Take into account coastal cod and *S. norvegicus* bycatches. Apply management plan.	≤ 805 000	890 000^			

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	Official landings	ICES landings	Unreported landings (included in ICES landings)
2018	Take into account coastal cod and *S. norvegicus* bycatches. Apply management plan.	712 000				

^2017 TAC was set according to the new management plan agreed by JNRFC 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. Catch distribution by fleet in 2016 as estimated by ICES.

Catch (2016)	Landings		Discards
849 422 tonnes	70% demersal trawls	30% other gear types	Unknown but considered to be negligible
	849 422 tonnes		

Table 9 Cod in subareas 1 and 2. History of commercial catch and landings. 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
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

* Provisional figures.

** USSR prior to 1991.

*** Includes Baltic countries.

^ Includes unspecified EU catches.

^^ Revised figures

Summary of the assessment

Table 10 Cod in subareas 1 and 2. Assessment summary. Weights are in tonnes.

Year	Recruitment Age 3 thousands	High 95%	Low 95%	SSB tonnes	High 95%	Low 95%	Landings tonnes	F Ages 5–10 Year -1	High 95%	Low 95%
1946	1421137	2104580	959636	990981	1152310	852239	706000	0.21	0.27	0.17
1947	619634	896449	428297	1021872	1195095	873757	882017	0.32	0.39	0.25
1948	407762	604680	274972	836996	986833	709909	774295	0.31	0.39	0.25
1949	578565	830820	402900	624616	722463	540020	800122	0.36	0.45	0.29
1950	877601	1252836	614752	561981	643263	490969	731982	0.38	0.46	0.3
1951	2461844	3505148	1729079	510901	590937	441704	827180	0.43	0.52	0.35
1952	2322345	3306802	1630967	499119	583650	426830	876795	0.52	0.63	0.43
1953	2579157	3689078	1803175	395821	461179	339725	695546	0.4	0.48	0.32
1954	849884	1207233	598312	409596	471988	355452	826021	0.42	0.51	0.34
1955	389185	553293	273752	331508	378339	290475	1147841	0.5	0.61	0.41
1956	744525	1056528	524660	284260	324675	248876	1343068	0.61	0.74	0.51
1957	1415728	2006410	998941	206864	236690	180796	792557	0.52	0.64	0.43
1958	1031305	1461540	727719	204204	235875	176785	769313	0.53	0.64	0.44
1959	1324681	1878733	934023	442805	519861	377170	744607	0.53	0.64	0.44
1960	1480139	2100406	1043042	402759	474224	342064	622042	0.51	0.62	0.42
1961	1527582	2157982	1081338	406019	471645	349524	783221	0.65	0.78	0.54
1962	1250396	1761018	887834	320176	372150	275461	909266	0.76	0.9	0.64
1963	840775	1190880	593596	214506	249853	184159	776337	0.87	1.04	0.74
1964	484574	692563	339047	192073	224503	164328	437695	0.68	0.81	0.56
1965	906560	1287336	638412	106493	123532	91805	444930	0.55	0.67	0.46
1966	1899664	2705735	1333731	121933	141567	105022	483711	0.51	0.61	0.42
1967	1262781	1797985	886890	133557	155860	114446	572605	0.54	0.65	0.44
1968	186558	264132	131767	228964	263589	198888	1074084	0.58	0.7	0.48
1969	111271	158190	78269	151405	176112	130164	1197226	0.76	0.9	0.64
1970	213799	302600	151058	230733	270530	196791	933246	0.7	0.84	0.58
1971	389156	551266	274717	319399	384621	265237	689048	0.59	0.71	0.48
1972	992424	1400187	703411	365204	445955	299075	565254	0.69	0.83	0.58
1973	1863225	2641350	1314331	324226	397265	264616	792685	0.61	0.73	0.5
1974	641881	902259	456644	159573	193884	131334	1102433	0.63	0.76	0.53
1975	598663	841225	426042	130599	149460	114119	829377	0.64	0.76	0.53
1976	611097	859701	434383	167889	194222	145126	867463	0.66	0.79	0.55
1977	373265	520463	267697	352361	425114	292058	905301	0.81	0.96	0.67
1978	629293	875982	452074	234779	290887	189493	698715	0.97	1.15	0.82
1979	213022	294375	154151	165107	203309	134083	440538	0.78	0.93	0.66
1980	129637	177029	94932	102610	122422	86004	380434	0.78	0.92	0.65
1981	159337	215238	117954	151761	177396	129830	399038	0.76	0.91	0.64
1982	174522	231699	131454	311677	372175	261013	363730	0.82	0.97	0.69
1983	155637	206430	117342	282330	335438	237630	289992	0.78	0.92	0.66
1984	412323	541017	314242	228215	265292	196320	277651	0.89	1.05	0.75
1985	557902	731006	425790	187689	217872	161687	307920	0.79	0.94	0.66
1986	1115427	1466485	848407	162281	187360	140559	430113	0.9	1.06	0.77
1987	328128	430277	250230	110474	127933	95398	523071	1.02	1.19	0.87
1988	298195	392293	226668	179824	210581	153560	434939	0.95	1.11	0.82
1989	187904	245926	143570	236593	277359	201819	332481	0.65	0.78	0.54
1990	153907	205040	115526	333958	395640	281892	212000	0.37	0.45	0.3
1991	392367	514140	299436	711318	836161	605115	319158	0.32	0.39	0.26
1992	729437	958166	555309	912173	1059618	785245	513234	0.45	0.55	0.37

Year	Recruitment Age 3 thousands	High 95%	Low 95%	SSB tonnes	High 95%	Low 95%	Landings tonnes	F Ages 5–10 Year -1	High 95%	Low 95%
1993	919650	1204418	702211	777338	896953	673675	581611	0.58	0.7	0.48
1994	727595	957651	552806	591837	675413	518603	771086	0.8	0.94	0.67
1995	495919	650174	378261	523800	601364	456239	739999	0.78	0.93	0.66
1996	407919	537971	309306	548513	642027	468620	732228	0.76	0.91	0.64
1997	667174	872359	510250	546605	653158	457435	762403	0.94	1.11	0.8
1998	951011	1246895	725339	381012	455636	318610	592624	0.96	1.12	0.82
1999	541276	708330	413621	285386	339096	240184	484910	0.96	1.12	0.82
2000	669000	877515	510032	239875	276326	208232	414868	0.82	0.97	0.69
2001	548496	719355	418220	364038	422874	313389	426471	0.71	0.84	0.59
2002	406016	531657	310067	507252	591205	435220	535045	0.65	0.78	0.55
2003	686290	892832	527529	597729	695488	513711	551990	0.57	0.69	0.47
2004	245683	315086	191568	714855	832884	613553	606445	0.71	0.85	0.6
2005	622294	798577	484925	621686	720280	536587	641276	0.71	0.85	0.6
2006	537053	694228	415463	609655	699967	530996	537642	0.65	0.78	0.54
2007	1396185	1802655	1081367	664380	762665	578761	486883	0.44	0.54	0.36
2008	1219978	1582780	940337	704486	809545	613061	464171	0.31	0.39	0.25
2009	691126	907466	526361	1111746	1266663	975775	523430	0.27	0.33	0.21
2010	283196	373741	214588	1413785	1614039	1238376	609983	0.27	0.34	0.22
2011	467808	624218	350590	2040520	2342501	1777469	719830	0.26	0.33	0.21
2012	538425	708660	409083	2371480	2741680	2051268	727663	0.24	0.3	0.19
2013	589602	790077	439996	2692927	3139308	2310017	966209	0.27	0.34	0.21
2014	659968	918338	474289	2563812	3033216	2167050	986449	0.3	0.38	0.23
2015	353296	505592	246875	2133663	2588867	1758498	864384	0.32	0.41	0.25
2016	180347	280492	115957	1769635	2256988	1387517	849422	0.33	0.46	0.24
2017	566000			1835962						
Average	745354			591280			667652	0.6		

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