

## Haddock (*Melanogrammus aeglefinus*) in subareas 1 and 2 (Northeast Arctic)

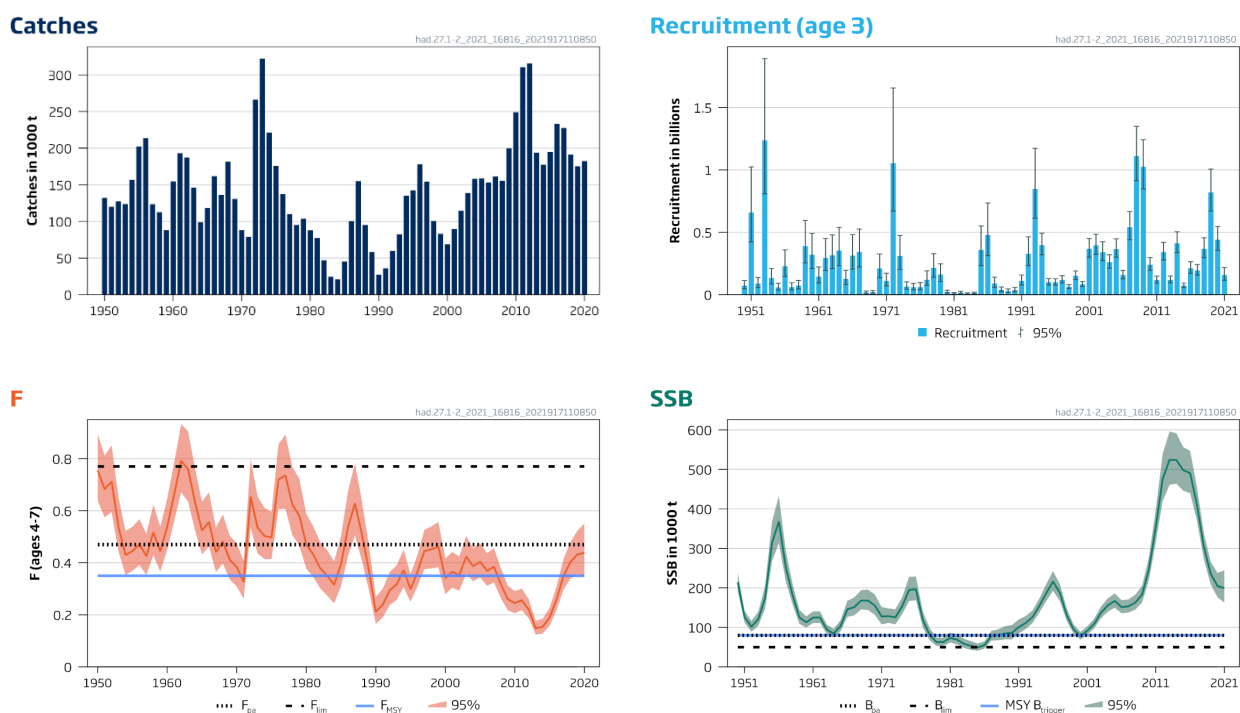
### ICES advice on fishing opportunities

**Please note: The present advice replaces the advice given in June 2021 for catches in 2022.**

ICES advises that when the Joint Norwegian–Russian Fisheries Commission (JNRFC) management plan is applied, catches in 2022 should be no more than 178 532<sup>†</sup> tonnes.

### Stock development over time

ICES assesses that fishing pressure on the stock is above  $F_{MSY}$  but below  $F_{pa}$  and  $F_{lim}$  and that the spawning-stock size is above  $MSY B_{trigger}$  and  $B_{pa}$ .



**Figure 1** Haddock in subareas 1 and 2. Summary of the stock assessment. 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.

### Catch scenarios

**Table 1** Haddock in subareas 1 and 2. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
$F_{ages\ 4-7}$ (2021)	0.44	Based on catch of 232 537 (TAC); tonnes
SSB (2022)	202 162	Short-term forecast; tonnes
$R_{age\ 3}$ (2021)	158 028	SAM estimates; thousands
$R_{age\ 3}$ (2022)	25 770	RCT3 estimates; thousands
$R_{age\ 3}$ (2023)	88 094	RCT3 estimates; thousands
Total catch (2021)	232 537	TAC for 2021; tonnes

<sup>†</sup> Value corrected. The assessment and advice was revised due to discovery of errors in the calculation of some of the survey indices (Joint Norwegian-Russian survey Barents Sea, Feb–Mar (G5348) bottom trawl (BTr) and acoustic (Aco) indices) for 2021 used in the NEA haddock and cod assessments, changes in the latter changed the M estimates for haddock. Values and figures have been updated in this sheet.

**Table 2** Haddock in subareas 1 and 2. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2022)	$F_{\text{ages 4-7}}$ (2022)	SSB (2023)	% SSB change *	% TAC change **	% Advice change ***
ICES advice basis						
Management plan	178532	0.35	198402	-1.9	-23.2	-23.2
Other scenarios						
MSY approach: $F_{\text{MSY}}$	178532	0.35	198402	-1.9	-23.2	-23.2
$F = 0$	0	0	304533	50.6	-100.0	-100.0
$F = F_{2021}$	214127	0.44	178010	-11.9	-7.9	-7.9
$F_{\text{pa}}$	225224	0.47	171719	-15.1	-3.1	-3.1
$F_{\text{lim}}$	318304	0.77	120428	-40.4	36.9	36.9

\* SSB 2023 relative to SSB 2022.

\*\* Catch in 2022 relative to TAC in 2021 (232 537 tonnes).

\*\*\* Catch for 2022 relative to the advice for 2021 (232 537 tonnes).

The advice for 2022 is 23.2% lower than the advice for 2021 because of the downward revision of stock biomass estimates.

### Basis of the advice

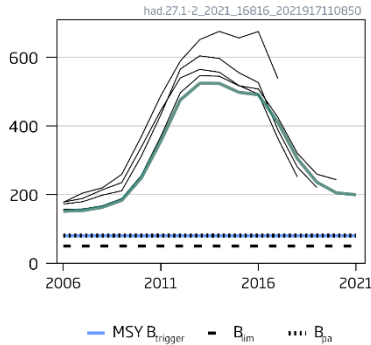
**Table 3** Haddock in subareas 1 and 2. The basis of the advice.

Advice basis	Joint Norwegian–Russian Fisheries Commission management plan
Management plan	The current harvest control rule (HCR) for haddock is as follows (see details in Protocol of the 46th Session of the Joint Norwegian–Russian Fisheries Commission [JNRFC, 2016]):
	<ul style="list-style-type: none"> <li>– TAC for the next year will be set at level corresponding to <math>F_{\text{MSY}}</math>.</li> <li>– The TAC should not be changed by more than <math>\pm 25\%</math> compared with the previous year TAC.</li> <li>– If the spawning stock falls below <math>B_{\text{pa}}</math>, the procedure for establishing TAC should be based on a fishing mortality that is linearly reduced from <math>F_{\text{MSY}}</math> at <math>B_{\text{pa}}</math> to <math>F = 0</math> at SSB equal to zero. At SSB-levels below <math>B_{\text{pa}}</math> in any of the operational years (current year and a year ahead) there should be no limitations on the year-to-year variations in TAC.</li> </ul>
	At the 46 <sup>th</sup> Session of the Joint Norwegian–Russian Fisheries Commission in 2016 it was decided to keep the existing HCR for haddock for the next five years.
	Quota flexibility: 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 HCR in 2016 (ICES, 2016) and rechecked it in 2020 (ICES, 2020). ICES concluded that the HCR is precautionary.

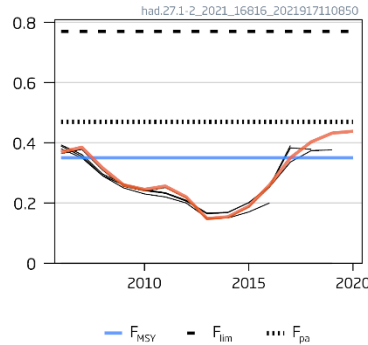
## Quality of the assessment

The assessment from the current year is consistent with the assessment carried out at the latest benchmark (ICES, 2020).

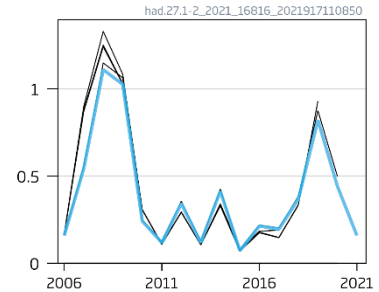
### SSB (1000 t)



### F (ages 4-7)



### Rec (age 3; Billions)



**Figure 2** Haddock in subareas 1 and 2. Historical assessment results. For the 2016 assessment, the fishing mortality plot shows  $F + M_2$  (natural mortality due to predation by cod), instead of only  $F$ . The stock was benchmarked in 2020 (ICES, 2020), and only last two years' assessments should be compared.

## Issues relevant for the advice

A downward revision of the model estimates has occurred as a consequence of low survey indices. This has resulted in a reduction in the catch advice. The catch in 2020 was 15% lower than the TAC and the catch is also expected to be below the TAC in 2021, especially since the TAC in 2021 was higher than the 2020 TAC. The 2018–2020 year classes are estimated to be below the average of the 1990–2017 year classes.

## Reference points

**Table 4** Haddock in subareas 1 and 2. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	80 000 tonnes	$B_{pa}$	ICES (2020)
	$F_{MSY}$	0.35	Stochastic long-term simulations	ICES (2020)
Precautionary approach	$B_{lim}$	50 000 tonnes	$B_{loss}$	ICES (2020)
	$B_{pa}$	80 000 tonnes	$B_{lim} \times \exp(1.645 \times \sigma)$ , where $\sigma = 0.3$	ICES (2020)
	$F_{lim}$	0.77	Determined from replacement line leading from $SSB = 0$ to the geometric mean recruitment at $SSB = B_{lim}$	ICES (2020)
	$F_{pa}$	0.47	$F_{lim} \times \exp(-1.645 \times \sigma)$ , where $\sigma = 0.3$	ICES (2020)
Management plan	$SSB_{MGT}$	80 000 tonnes	$B_{pa}$	ICES (2020)
	$F_{MGT}$	0.35	$F_{MSY}$	ICES (2020)

## Basis of the assessment

**Table 5** Haddock in subareas 1 and 2. Basis of the assessment and advice.

ICES stock data category	1 ( <a href="#">ICES, 2021a</a> ).
Assessment type	Age-based analytical assessment (SAM) that uses catches in the model (ICES, 2021b).
Input data	Commercial landings (international landings, ages, and length frequencies from catch sampling); four survey indices (Joint Norwegian-Russian survey Barents Sea, Feb–Mar (G5348) bottom trawl (BTr) and acoustic (Aco) indices; Russian bottom trawl survey, Oct–Dec (G5348); Joint Norwegian-Russian Ecosystem survey (A5216; Btr)); annual maturity and stock weight-at-age data from surveys; from 1984, the natural mortalities are derived from the consumption of haddock (ages 3–6) by cod.
Discards and bycatch	Discarding is considered negligible in recent years.
Indicators	None.
Other information	Last benchmarked in February 2020 (ICES, 2020).
Working group	Arctic Fisheries Working Group ( <a href="#">AFWG</a> ).

## History of the advice, catch, and management

**Table 6** Haddock in subareas 1 and 2. ICES advice, TAC, and the official and ICES landings. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	Agreed TAC	Official landings*	Unreported landings	ICES landings
1987	No increase in F; TAC	160000	250000	154916		154916
1988	No increase in F	< 240000	240000	95255		95255
1989	Large reduction in F	69000	83000	58518		58518
1990	No directed fishery	-	25000	27182		27182
1991	No directed fishery	-	28000	36216		36216
1992	Within safe biological limits	35000	63000	59922		59922
1993	No long-term gains in increasing F	56000	72000	82379		82379
1994	No long-term gains in $F > F_{med}$	97000**	120000	135186		135186
1995	No long-term gains in $F > F_{med}$	122000**	130000	142448		142448
1996	No long-term gains in $F > F_{med}$	169000**	170000	178128		178128
1997	Well below $F_{med}$	< 242000	210000	154359		154359
1998	Below $F_{med}$	< 120000	130000	100630		100630
1999	Reduce F below $F_{pa}$	< 74000	78000	83195		83195
2000	Reduce F below $F_{pa}$	< 37000	62000	68944		68944
2001	Reduce F below $F_{pa}$	< 66000	85000	89640		89640
2002	Reduce F below $F_{pa}$	< 64000	85000	96062	18736	114798
2003	Reduce F below $F_{pa}$	< 101000	101000	105700	33226	138926
2004	Reduce F below $F_{pa}$	< 120000	130000	124502	33777	158279
2005	Reduce F below $F_{pa}$	< 106000	117000	118015	40283	158751
2006	Reduce F below $F_{pa}$	< 112000	120000	131706	21451	153157
2007	Limit catches	< 130000	150000	146972	14553	161525
2008	Limit catches to 2001–2004 average	< 130000	155000	149776	5828	155604
2009	Apply management plan	< 194000	194000	200061	0	200061
2010	Apply management plan	< 243000	243000	249200	0	249200
2011	Apply management plan	< 303000	303000	309785	0	310618
2012	Apply management plan	< 318000	318000	315627	0	315627
2013	Apply management plan	< 238000	200000	193744	0	193744
2014	Apply management plan	< 150000	178500	177522	0	177522
2015	Apply management plan	< 165000	223000	194756	0	194756
2016	Apply management plan	< 244000^	244000	233416	0	233416
2017	Apply management plan	$\leq 233000$	233000	227588	0	227588
2018	Apply management plan	$\leq 202305$	202305	191276	0	191276

Year	ICES advice	Catch corresponding to advice	Agreed TAC	Official landings*	Unreported landings	ICES landings
2019	Apply management plan	≤ 152000	172000	175402	0	175402
2020	Apply management plan	≤ 215000	215000	182468	0	182468
2021	Apply management plan	≤ 232537	232537			
2022	Apply management plan	≤ 178532				

^ This advice was updated on 7 July 2015 in response to a special request (ICES, 2015) after a mid-year change in TAC in 2015 (from 178 500 tonnes to 223 000 tonnes).

\* Coastal haddock in Norwegian statistical areas 06 and 07 (south of Lofoten) are included.

\*\* Predicted landings at  $F_{med}$ .

## History of the catch and landings

**Table 7** Haddock in subareas 1 and 2. Catch distribution by fleet in 2020, as estimated by ICES.

Catch (2020)	Landings			Discards
182 468 tonnes	trawls 69%	longline 18%	other gears 13%	Discarding is unknown, but assumed to be negligible
	182 468 tonnes			

**Table 8** Haddock in subareas 1 and 2. History of official commercial catch and landings by country. All weights are in tonnes.

Year	Faroe Islands	France	German Dem. Rep.	Fed. Rep. Germany.	Greenland	Norway <sup>^</sup>	Poland	Russia <sup>**</sup>	Spain	United Kingdom	Others	Unreported catches <sup>***</sup>	Total
1960	172	-	-	5597		46263	-	57025		45469	125	-	154651
1961	285	220	-	6304		60862	-	85345		39650	558	-	193224
1962	83	409	-	2895		54567	-	91910		37486	58	-	187408
1963	17	363	-	2554		59955	-	63526		19809	-	-	146224
1964	-	208	-	1482		38695	-	43870		14653	250	-	99158
1965	-	226	-	1568		60447	-	41750		14345	242	-	118578
1966	-	1072	11	2098		82090	-	48710		27723	74	-	161778
1967	-	1208	3	1705		51954	-	57346		24158	23	-	136397
1968	-	-	-	1867		64076	-	75654		40129	-	-	181726
1969	2	-	309	1490		67549	-	24211		37234	25	-	130820
1970	541	-	656	2119		37716	-	26802		20423	-	-	88257
1971	81	-	16	896		45715	43	15778		16373	3	-	78905
1972	137	-	829	1433		46700	1433	196224		17166	2231	-	266153
1973	1212	3214	22	9534		86767	34	186534		32408	2501	-	322226
1974	925	3601	454	23409		66164	3045	78548		37663	7348	-	221157
1975	299	5191	437	15930		55966	1080	65015		28677	3163	-	175758
1976	536	4459	348	16660		49492	986	42485		16940	5358	-	137264
1977	213	1510	144	4798		40118	-	52210		10878	287	-	110158
1978	466	1411	369	1521		39955	1	45895		5766	38	-	95422
1979	343	1198	10	1948		66849	2	26365		6454	454	-	103623
1980	497	226	15	1365		66501	-	20706		2948	246	-	92504
1981	381	414	22	2402		63435		13400		1682	-	-	81736
1982	496	53	-	1258		43702		2900	-	827	-	-	49236
1983	428	-	1	729		22364		680	139	259	-	-	24600
1984	297	15	4	400		18813		1103	37	276	-	-	20945
1985	424	21	20	395		21272		22690	77	153	-	-	45052
1986	893	12	75	1079		52313		45738	22	431	-	-	100563
1987	464	7	83	3105		72419		78211	59	563	5	-	154916
1988	1113	116	78	1323		60823		31293	72	435	2	-	95255
1989	1217	-	26	171		36451		20062	1	590	-	-	58518
1990	705	-	5	167		20621		5190	-	494	-	-	27182
1991	1117	-		213		22178		12177	-	514	17	-	36216
1992	1093	151		387	1719	36238		19699	38	596	1	-	59922

Year	Faroe Islands	France	German Dem. Rep.	Fed. Rep. Germany.	Greenland	Norway <sup>^</sup>	Poland	Russia**	Spain	United Kingdom	Others	Unreported catches***	Total
1993	546	1215		1165	880	40978		35071	76	1802	646	-	82379
1994	2761	678		2412	770	71171		51822	22	4673	877	-	135186
1995	2833	598		2675	1097	76886		54516	14	3111	718	-	142448
1996	3743	6		942	1510	94527		74239	669	2275	217	-	178128
1997	3327	540		972	1877	103407		41228	364	2340	304	-	154359
1998	1903	241		385	854	75108		20559	257	1229	94	-	100630
1999	1913	64		641	437	48182		30520	652	694	92	-	83195
2000	631	178		880	432	42009		22738	502	747	827	-	68944
2001	1210	324		554	553	49067		34307	1497	1068	1060	-	89640
2002	1564	297		627	858	52247		37157	1505	1125	682	18736	114798
2003	1959	382		918	1363	56485		41142	1330	1018	1103	33226	138926
2004	2484	103		823	1680	62192		54347	54	1250	1569	33777	158279
2005	2138	333		996	15	60850		50012	963	1899	1262	40283	158751
2006	2390	883		989	1830	69272		53313	703	1164	1162	21451	153157
2007	2307	277		1123	1464	71244		66569	125	1351	2511	14553	161525
2008	2687	311		535	1659	72779		68792	283	971	1759	5828	155604
2009	2820	529		1957	1410	104354		85514	317	1315	1845	0	200061
2010	3173	764		3539	1970	123384		111372	379	1758	2862	0	249200
2011	1759	268		1724	2110	158202		139912	502	1379	4763	0	310618
2012	2055	322		1111	3984	159602		143886	441	833	3393	0	315627
2013	1886	342		500	1795	99215		85668	439	639	3260	0	193744
2014	1470	198		340	1150	91306		78725	187	355	3791	0	177522
2015	2459	145		124	1047	95094		91864	246	450	3327	0	194756
2016	2460	340		170	1401	108718		115710	200	575	3838	0	233416
2017	2776	108		170	1810	113132		106714	228	372	2279	0	227588
2018	2333	183		385	1317	93839		90486	169	453	2173	0	191276
2019	1515	143		204	1208	93860		76125	280	456	1611	0	175402
2020*	1392	96		282	910	88108		89030	45	320	2286	0	182468

\* Provisional figures.

\*\* USSR prior to 1991.

\*\*\* Figures based on Norwegian/Russian illegal, unreported, and unregulated fisheries (IUU) estimates.

<sup>^</sup> Landings of coastal haddock in Norwegian statistical areas 06 and 07 (south of Lofoten) are included from 1983.

**Table 9** Haddock in subareas 1 and 2. Catches inside and outside the NEAFC Regulatory Area (RA) as estimated by ICES.

Year	Inside the NEAFC RA (tonnes)	Outside the NEAFC RA (tonnes)	Total catches (tonnes)	Proportion inside the NEAFC RA (%)
2018	24	191252	191276	0.013%
2019	394	175008	175402	0.23%
2020	0	182468	182468	0%

## Summary of the assessment

**Table 10** Haddock in subareas 1 and 2. Assessment summary. High and low represent 95% confidence limits.

Year	Recruitment (thousands)			SSB (tonnes)			Total catch (tonnes)	F		
	Age 3	High	Low	SSB	High	Low		Ages 4–7	High	Low
1950	72529	113746	46247	214382	239470	191923	132125	0.76	0.90	0.64
1951	657545	1022501	422851	126152	142137	111964	120077	0.68	0.81	0.57
1952	88481	138715	56439	101678	116575	88685	127660	0.71	0.85	0.60
1953	1236658	1891351	808587	120595	139788	104037	123920	0.54	0.65	0.44
1954	133383	208791	85210	174506	206243	147653	156788	0.43	0.52	0.35
1955	58708	92889	37105	313687	368231	267223	202286	0.45	0.54	0.37
1956	229162	359433	146106	367975	432534	313051	213924	0.47	0.57	0.39
1957	60355	95123	38295	253534	296048	217125	123583	0.43	0.51	0.35

Year	Recruitment (thousands)			SSB (tonnes)			Total catch (tonnes)	F		
	Age 3	High	Low	SSB	High	Low		Ages 4–7	High	Low
1958	73036	114340	46653	181939	209595	157933	112672	0.52	0.62	0.43
1959	389148	594317	254807	125359	144523	108735	88211	0.44	0.54	0.37
1960	320164	491681	208478	112870	128101	99449	154651	0.54	0.65	0.45
1961	144961	222004	94654	124828	140239	111109	193224	0.66	0.79	0.56
1962	294526	449909	192806	125176	140955	111164	187408	0.79	0.93	0.67
1963	315562	478396	208152	94296	107221	82930	146224	0.76	0.91	0.64
1964	354033	539713	232233	84476	96238	74151	99158	0.63	0.76	0.52
1965	126850	196116	82048	103158	118350	89915	118578	0.52	0.64	0.43
1966	313482	481277	204188	145730	167576	126732	161778	0.56	0.67	0.46
1967	341537	525935	221791	151240	175682	130198	136397	0.44	0.54	0.36
1968	18058	29237	11153	168126	194423	145385	181726	0.48	0.59	0.40
1969	20592	33095	12813	167896	195723	144025	130820	0.41	0.50	0.34
1970	209704	325704	135018	155422	183519	131626	88257	0.38	0.47	0.31
1971	109784	171958	70091	127612	151627	107401	78905	0.33	0.41	0.26
1972	1053324	1656106	669940	128495	148109	111478	266153	0.65	0.80	0.53
1973	310514	475128	202932	125208	145906	107446	322226	0.53	0.66	0.44
1974	66066	102014	42785	153735	176606	133826	221157	0.50	0.61	0.41
1975	59409	91724	38479	194928	227849	166763	175758	0.50	0.60	0.41
1976	61736	96895	39334	196370	228767	168561	137264	0.72	0.86	0.61
1977	120369	190899	75897	118837	141108	100080	110158	0.74	0.89	0.61
1978	214488	327920	140294	81213	98202	67163	95422	0.62	0.77	0.51
1979	161689	247736	105529	62597	74491	52602	103623	0.58	0.72	0.47
1980	22192	35989	13685	62953	74240	53381	87889	0.47	0.59	0.38
1981	10318	17376	6128	73027	86526	61635	77153	0.43	0.54	0.35
1982	16750	27263	10290	68789	83325	56789	46955	0.38	0.48	0.30
1983	8626	14661	5075	58404	71248	47874	24600	0.35	0.45	0.27
1984	13240	21528	8143	53224	65417	43304	20945	0.32	0.41	0.24
1985	358481	550529	233427	49172	59203	40841	45052	0.40	0.50	0.31
1986	478694	733514	312397	54896	64852	46469	100563	0.54	0.68	0.43
1987	90358	140874	57957	77856	91179	66480	154916	0.63	0.78	0.51
1988	39052	62346	24461	80012	95221	67232	95255	0.51	0.64	0.41
1989	28807	46446	17867	84555	102825	69532	58518	0.37	0.47	0.30
1990	37076	57821	23774	85934	105816	69787	27182	0.21	0.27	0.165
1991	110955	157942	77947	100651	120096	84355	36216	0.24	0.30	0.190
1992	328300	462678	232951	111069	128722	95837	59922	0.29	0.37	0.24
1993	847700	1172438	612907	125691	142799	110632	82379	0.32	0.39	0.26
1994	397210	493251	319869	154194	172850	137551	135186	0.37	0.45	0.31
1995	100364	128828	78189	186377	209483	165820	142448	0.30	0.36	0.25
1996	99779	127504	78082	216099	242624	192475	178128	0.37	0.43	0.31
1997	119550	152485	93729	187239	210326	166687	154359	0.45	0.53	0.38
1998	63394	82086	48959	131142	148285	115980	100630	0.45	0.54	0.38
1999	151382	189366	121017	94965	107390	83977	83195	0.46	0.56	0.38
2000	83406	106637	65237	78276	88647	69119	68944	0.34	0.42	0.28
2001	367740	450041	300490	91443	102674	81441	89640	0.37	0.44	0.30
2002	395711	485470	322548	108769	122037	96944	114798	0.35	0.42	0.29
2003	340422	424082	273265	137172	153041	122948	138926	0.42	0.50	0.36
2004	260831	319584	212879	155628	173655	139471	158279	0.39	0.46	0.33
2005	366584	446958	300663	167067	186335	149791	158751	0.40	0.48	0.34
2006	157485	194877	127268	151220	168840	135438	153157	0.37	0.44	0.31
2007	541008	665041	440107	153318	170869	137569	161525	0.39	0.46	0.32
2008	1109972	1349262	913121	162732	182762	144898	155604	0.32	0.38	0.26
2009	1025300	1241670	846634	183169	205684	163119	200061	0.26	0.31	0.22
2010	240970	296724	195693	247829	278623	220439	249200	0.25	0.29	0.21
2011	117684	148938	92988	355379	399830	315870	310618	0.26	0.30	0.22
2012	340844	418769	277420	475693	539207	419660	315627	0.22	0.26	0.186

Year	Recruitment (thousands)			SSB (tonnes)			Total catch (tonnes)	F		
	Age 3	High	Low	SSB	High	Low		Ages 4–7	High	Low
2013	119421	150382	94835	524196	596118	460952	193744	0.148	0.177	0.124
2014	412333	504047	337307	523850	591574	463878	177522	0.154	0.185	0.128
2015	72619	92984	56715	498101	556431	445885	194756	0.189	0.23	0.158
2016	212591	264306	170994	490750	547446	439926	233416	0.26	0.31	0.22
2017	195003	241921	157185	410321	454946	370073	227588	0.35	0.42	0.30
2018	367432	455906	296128	304651	340259	272770	191276	0.40	0.48	0.34
2019	820674	1005980	669502	235815	266514	208652	175402	0.43	0.52	0.36
2020	440809	546968	355254	204814	237985	176266	182468	0.44	0.55	0.35
2021	158028	216626	115281	199478	244689	162620				

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