

Hake (*Merluccius merluccius*) in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock (Greater North Sea, Celtic Seas, and the northern Bay of Biscay)

ICES advice on fishing opportunities

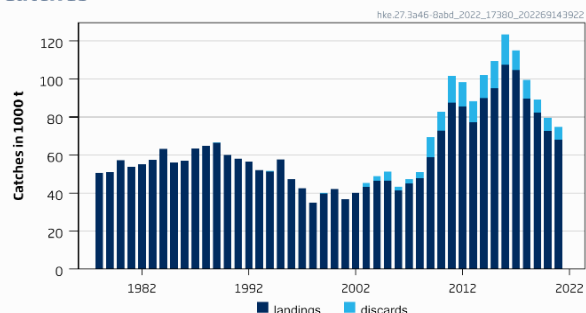
ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 83 130 tonnes.

ICES notes the existence of a precautionary management plan developed and adopted by one of the relevant management authorities for this stock.

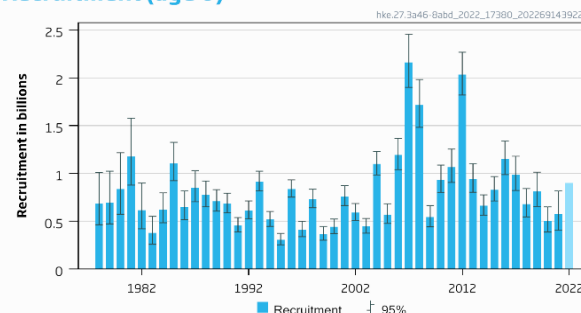
Stock development over time

Fishing pressure on the stock is below F_{MSY} , and spawning-stock size is above MSY $B_{trigger}$, B_{pa} , and B_{lim} .

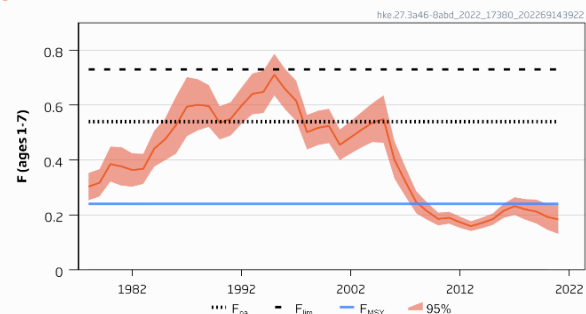
Catches



Recruitment (age 0)



F



SSB

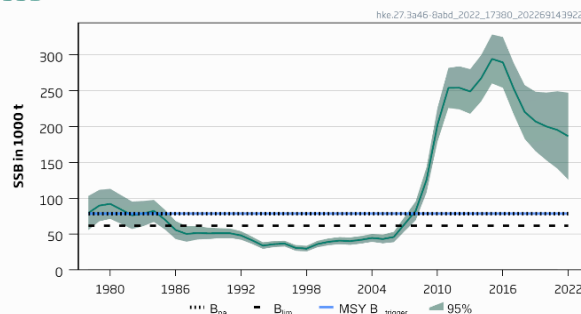


Figure 1 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. Summary of the stock assessment. Discard estimates prior to 2003 are model estimates. Assumed recruitment values for 2022 are shaded in a lighter colour. Estimates for SSB are for females only and the 2022 value is a forecast.

Catch scenarios

Table 1 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. The basis of the catch scenarios.

Variable	Value	Notes
$F_{ages\ 1-7}$ (2022)	0.198	F_{sq} = average F (2019–2021); in tonnes.
SSB (2023)	168765	Short-term forecast (STF); females only, in tonnes.
$R_{age\ 0}$ (2022)	898602	Estimated by the model based on the stock–recruitment relationship; in thousands.
$R_{age\ 0}$ (2023)	891837	Estimated by the model based on the stock–recruitment relationship; in thousands.
Total catch (2022)	74935	STF; in tonnes.
Projected landings (2022)	69563	STF; assuming average landings ratio by length (2019–2021); in tonnes.
Projected discards (2022)	5371	STF; assuming average discards ratio by length (2019–2021); in tonnes.

Table 2 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. Annual catch scenarios. All weights are in tonnes. Note: the % change in TAC is not presented because the stock area does not correspond to the area for the TAC.

Basis	Total catch (2023)	Projected landings (2023)	Projected discards (2023)	F _{ages 1–7} total (2023)	F _{ages 1–7} projected landings (2023)	F _{ages 1–7} projected discards (2023)	SSB (2024)	% SSB change*	% advice change**
ICES advice basis									
MSY approach = F _{MSY}	83130	76360	6770	0.24	0.223	0.020	148841	–11.8	10.8
Other scenarios									
EU MAP***: F _{MSY}	83130	76360	6770	0.24	0.22	0	148841	–11.8	10.8
F = MAP***F _{MSY lower}	53284	49067	4218	0.147	0.135	0.0120	168127	–0.38	–29
F = MAP***F _{MSY upper}	117526	107599	9927	0.37	0.34	0.031	126984	–25	57
F = 0	0	0	0	0	0	0	203180	20	–100
F = F _{pa}	155336	141603	13733	0.54	0.49	0.047	103497	–39	107
SSB (2024) = B _{lim}	226111	203813	22298	0.98	0.89	0.097	61563	–64	201
SSB (2024) = B _{pa}	197045	178555	18491	0.77	0.70	0.072	78405	–54	163
SSB (2024) = MSY B _{trigger}	197045	178555	18491	0.71	0.70	0.072	78405	–54	163
SSB (2024) = SSB(2023)	52303	48167	4136	0.14	0.133	0.0110	168765	0.0	–30
F = F ₂₀₂₂	69596	64003	5593	0.198	0.182	0.0160	157552	–6.6	–7.3

* SSB 2024 relative to SSB 2023.

** Total catch advice in 2023 relative to the catch advice for 2022 (75 052 tonnes).

***The EU multiannual plan (MAP; EU, 2019).

The advice for 2023 is 10.8% higher than the advice for 2022 following the benchmark.

Basis of the advice

Table 3 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. The basis for the advice.

Advice basis	MSY approach
Management plan	The EU multiannual plan (MAP) for stocks in the Western Waters and adjacent has been agreed by the EU for this stock (EU, 2019). This plan is not adopted by Norway and UK; thus, it was not used as the basis of the advice for this shared stock. ICES was requested to provide advice based on the MSY approach and to include the MAP as a catch option.

Quality of the assessment

The stock was benchmarked in 2022 (ICES, 2022a). An update of the Stock Synthesis framework was applied with the addition of commercial and survey data. The stock is now sex-separated with sex-dependent growth and natural mortality.

There is no full survey coverage of the entire stock distribution area, and changes in the spatial distribution of the stock are known to increase the uncertainty in the assessment.

On average the new assessment estimates a 71% larger stock size over time (ICES, 2022c). The SSB estimates made prior to 2022 include males and females while estimates in this assessment are female only. The perception of the stock status in relation to reference points is similar. SSB remains above the MSY B_{trigger}, while recent fishing mortalities are now estimated below F_{MSY} (Figure 2). On average the new assessment estimates a 70% larger stock size over time (Figure 3).

Analyses show that the new assessment tends to revise historical SSB downwards and F upwards when a new year's data is added. If this pattern continues, this may result in an inflated advised catch.

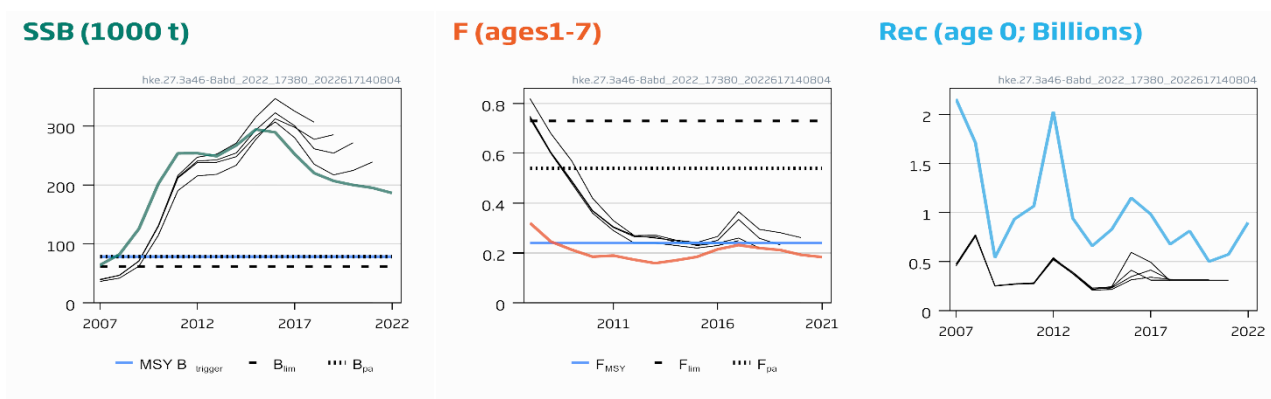


Figure 2 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. Historical assessment results. The reference points and assessment results were revised following a benchmark in 2022. Thus the 2022 estimates are not comparable to the previous assessments. The final-year recruitment values are assumptions.

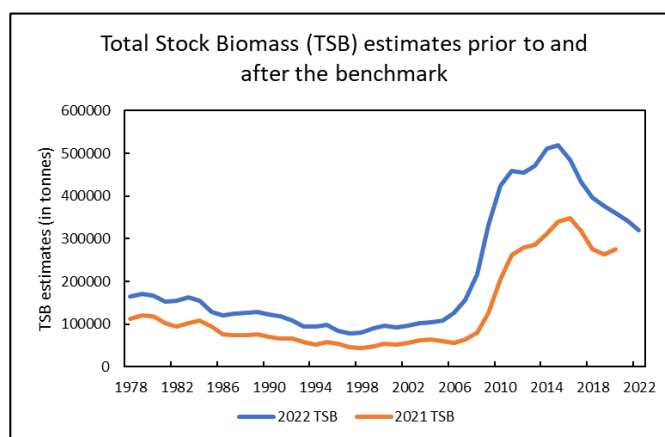


Figure 3 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. Comparison of Total Stock Biomass from before the last benchmark (2021 assessment) and after the benchmark (current assessment).

Issues relevant for the advice

Analyses show that the new assessment tends to revise historical SSB downwards and F upwards when a new year of data is added. If this pattern continues, this may result in an inflated advised catch.

Reference points

Table 4 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	78405	B_{pa} ; females only, in tonnes.	ICES (2022a)
	F_{MSY}	0.24	Stock Synthesis simulations.	ICES (2022a)
Precautionary approach	B_{lim}	61563	The breakpoint of the segmented regression stock–recruitment relationship; females only, in tonnes.	ICES (2022a)
	B_{pa}	78405	$\exp(1.654 \times \sigma) \times B_{lim}$, with $\sigma = 0.147$; females only, in tonnes.	ICES (2022a)
	F_{lim}	0.73	The F that provides a 50% probability for SSB to be above B_{lim} .	ICES (2022a)
	F_{pa}	0.54	F_{P05} with advice rule (AR): the F that provides a 95% probability for SSB to be above B_{lim} .	ICES(2022a)
	F_{mgt}	Not defined		

Framework	Reference point	Value	Technical basis	Source
Management plan	SSB _{mgt}	Not defined		
	MAP MSY B _{trigger}	78405	MSY B _{trigger} ; females only, in tonnes.	ICES (2022a), EU (2019)
	MAP B _{lim}	61563	B _{lim} ; females only, in tonnes.	ICES (2022a), EU (2019)
	MAP F _{MSY}	0.24	F _{MSY}	ICES (2022a), EU (2019)
	MAP range F _{lower}	0.147	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY.	ICES (2022a), EU (2019)
	MAP range F _{upper}	0.37	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY.	ICES (2022a), EU (2019)

Basis of the assessment

Table 5 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2022b).
Assessment type	Length-based and sex-disaggregated model (Stock Synthesis; ICES, 2022a, 2022c) that uses landings and discards in the assessment and forecast.
Input data	Commercial landings; four survey indices including the French Southern Atlantic Bottom trawl survey (EVHOF-WIBTS-Q4 [G9527]), the Spanish Porcupine Bottom Trawl Survey (SpPGFS-WIBTS-Q3 [G5768]), the Irish Groundfish Survey (IGFS-WIBTS-Q4 [G7212]), the Irish Anglerfish and Megrim Survey (IE-IAMS [G3098]), and French surveys in the Bay of Biscay (FR-RESSGACQ [G2537]); constant maturity, and sex- and age-dependent natural mortality.
Discards and bycatch	Discard estimates from most fleets are available and included in the assessment.
Indicators	None.
Other information	Last benchmarked in 2022 (ICES, 2022a).
Working group	Working Group for the Bay of Biscay and the Iberian Waters Ecoregion (WGBIE).

History of the advice, catch, and management

Table 6 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. ICES advice and catch. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	Landings corresponding to advice	Agreed TAC*	ICES landings	ICES discards	ICES catch
1987	Precautionary TAC; juvenile protection			63500	63369		
1988	Precautionary TAC; juvenile protection		54000	66200	64823	**	
1989	Precautionary TAC; juvenile protection		54000	59700	66473	**	
1990	Precautionary TAC; juvenile protection		59000	65100	59954		
1991	Precautionary TAC; juvenile protection		59000	67000	58129		
1992	If required, precautionary TAC		61500	69000	56617		
1993	Enforce juvenile protection legislation		-	71500	52144		
1994	F significantly reduced		-	60000	51259	**	
1995	30% reduction in F		31000	55100	57621		
1996	30% reduction in F		39000	51100	47210		
1997	20% reduction in F		54000	60100	42465		
1998	20% reduction in F		45000	59100	35060		
1999	Reduce F below F _{pa}		-	55100	39814	**	
2000	50% reduction in F		-	42100	42026	**	
2001	Lowest possible catch, recovery plan		-	22600	36675		

Year	ICES advice	Catch corresponding to advice	Landings corresponding to advice	Agreed TAC*	ICES landings	ICES discards	ICES catch
2002	Lowest possible catch/recovery plan		-	27000	40105		
2003	Lowest possible catch/recovery plan		-	30000	43162	1393	44555
2004	70% reduction in F or recovery plan		-	39100	46416	2614	49029
2005	F = 0.19		33000	42600	46550	4583	51133
2006	F = 0.25		44000	43900	41469	1222	42691
2007	Recovery plan limits		50500	52700	45093	2165	47258
2008	Recovery plan limits		54000	54000	47822	3368	51190
2009	F = 0.25 = F _{pa}		51500	51500	58781	11033	69814
2010	F = 0.25 = F _{pa}		55200	55105	72760	12118	84878
2011	See scenarios		50600	55105	87540	13903	101443
2012	MSY transition		51900	55105	85677	14870	100547
2013	MSY transition		45400	69440	86148	15450	101598
2014	MSY approach		81846	81846	89940	9832	99772
2015	MSY approach		78457	90849	95041	10921	105962
2016	MSY approach	≤ 109592	≤ 96651	108764	107546	11115	118662
2017	MSY approach	≤ 123777		119765	104671	7100	111771
2018	MSY approach	≤ 115335		111785	89695	7038	96733
2019	MSY approach	≤ 142240		141160	82291	4940	87238
2020	MSY approach	≤ 104763		112903	72579	3955	76534
2021	MSY approach (value revised in June 2021)	≤ 102888		98658	68058	3085	71142
2022	MSY approach	≤ 75052		78926			
2023	MSY approach	≤ 83130					

* Sum of area TACs, corresponding to Northern stock (subareas 4, 6, and 7 and in divisions 3.a, 8.a–b, and 8.d), Division 2.a (EU zone only; from 2021 onwards UK only) and divisions 3.b–d (except for 2019 onwards). There is no agreed TAC for Norwegian waters of Subarea 4.

** Partial discard estimates are available and used in the assessment. For remaining years where values are not presented, there are no valid discard estimates available for the assessment.

History of the catch and landings

Table 7 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. Catch distribution by fleet in 2021 as estimated by ICES. All weights are in tonnes.

Catch	Landings				Discards
74799	9.53%	28.8%	32% gillnet	29.6% trawl	6738
	unspecified gear	longline			
68061					

Table 8 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. History of commercial catch and landings; ICES estimated values (i.e. landings by area and total landings minus unallocated) are presented by area for each country participating in the fishery. All weights are in tonnes.

Year	ICES estimated landings*							ICES estimated discards						Total catches**
	3	4	6	7	8abd	Unallocated	Total	3	4	6	7	8abd	Total	
1961			-	-	-	95600	95600						-	95600
1962			-	-	-	86300	86300						-	86300
1963			-	-	-	86200	86200						-	86200
1964			-	-	-	76800	76800						-	76800
1965			-	-	-	64700	64700						-	64700
1966			-	-	-	60900	60900						-	60900
1967			-	-	-	62100	62100						-	62100
1968			-	-	-	62000	62000						-	62000

Year	ICES estimated landings*							ICES estimated discards						Total catches**
	3	4	6	7	8abd	Unallocated	Total	3	4	6	7	8abd	Total	
1969			-	-	-	54900	54900						-	54900
1970			-	-	-	64900	64900						-	64900
1971			8500	1940 0	2340 0	0	51300						-	51300
1972			9400	1490 0	4120 0	0	65500						-	65500
1973			9500	3120 0	3760 0	0	78300						-	78300
1974			9700	2890 0	3450 0	0	73100						-	73100
1975			11000	2920 0	3250 0	0	72700						-	72700
1976			12900	2670 0	2850 0	0	68100						-	68100
1977			8500	2100 0	2470 0	0	54200						-	54200
1978			8000	2030 0	2450 0	-2249	50551						-	50551
1979			8700	1760 0	2720 0	-2404	51096						-	51096
1980			9700	2200 0	2840 0	-2835	57265						-	57265
1981			8800	2560 0	2230 0	-2782	53918						-	53918
1982			5900	2520 0	2620 0	-2306	54994						-	54994
1983			6200	2630 0	2710 0	-2093	57507						-	57507
1984			9500	3300 0	2290 0	-2114	63286						-	63286
1985			9224	2745 9	2104 4	-1628	56099						-	56099
1986			7320	2740 8	2390 3	-1539	57092						-	57092
1987			7800	3290 0	2470 0	-2031	63369						-	63369
1988			8800	3090 0	2660 0	-1477	64823						-	64823
1989			7375	2693 8	3195 7	203	66473						-	66473
1990			6680	2301 1	3442 4	-4161	59954						-	59954
1991			8328	2154 6	3163 5	-3380	58129						-	58129
1992			8561	2247 5	2346 5	2116	56617						-	56617
1993			8484	2046 5	1984 9	3346	52144						-	52144
1994			5421	2108 0	2472 7	31	51259						+	51259
1995			5335	2405 6	2814 4	86	57621						-	57621
1996			4445	2473 8	1803 6	-9	47210						-	47210
1997			3312	1894 9	2033 9	-135	42465						-	42465
1998			3208	1870 5	1314 7	0	35060						-	35060
1999			4256	2395 5	1160 4	-1	39814						+	39814
2000			4033	2599 1	1199 8	4	42026						+	42026
2001			4367	2306 5	9244	0	36675						-	36675

Year	ICES estimated landings*							ICES estimated discards						Total catches**
	3	4	6	7	8abd	Unallocated	Total	3	4	6	7	8abd	Total	
2002	2944			2122 6	1593 5	0	40105						-	40105
2003	3284			2543 8	1444 0	0	43162						1393	44555
2004	4438			2748 3	1449 4	0	46416						2614	49029
2005	5461			2662 3	1446 7	0	46550						4583	51133
2006	6127			2470 9	1063 3	0	41469						1222	42691
2007	7017			2745 6	1062 0	0	45093						2165	47258
2008	10654			2283 4	1433 4	0	47822						3368	51190
2009	13057			2530 0	2042 4	0	58781						1103 3	69814
2010	14187			3350 0	2507 3	0	72760						1211 8	84878
2011	18789			1857 4	1660 4	32000^	87540						1390 3	101443
2012	22415			2216 6	1671 6	19300^	85677						1487 0	100547
2013	292	1068 4	5232	5005 4	1988 5	0	86148	31 4	294 5	1545	658 4	406 1	1545 0	101598
2014	350	1208 2	11415	4053 8	2555 4	0 ^	89940	28 8	310 4	952	402 6	146 2	9832	99772
2015	450	1461 5	7079^^	4440 0	2849 8	0 ^	95041	93	344 4	72	421 2	310 0	1092 1	105962
2016	698	1959 1	11379^^	4938 8	2649 0	0	107546	14 4	418 7	348^ ^	228 5	415 1	1111 5	118662
2017	775	1969 0	9615^^	4573 7	2885 4	0	104671	14 9	177 7	314	116 8	369 2	7100	111771
2018	698	1891 5	7281^^	3690 6	2589 4	0	89695	28 7	125 6	266	212 4	310 5	7038	96733
2019	152 2	1556 9	6835^^	3687 3	2149 2	8	82291	23 5	926	297	142 3	205 9	4940	87238
2020	605	1308 0	4113^^	3510 0	1967 4	7	72579	28 0	336	296	106 3	197 9	3955	76534
2021	791	9300	3823^^	3339 3	2075 0	0	68058	11 0	340	619	926	109 0	3085	71142

* Data for Subarea 8 for 1973–1978 include those for divisions 8.a and 8.b only. Divisions 3.a and 4.b–c are included in the column "3, 4, and 6" only after 1976. There are some unallocated landings.

** The working group used total catches from 1978.

^ Unallocated landings for the years 2011–2014 were revised in 2015.

^^ Landings and discards data from Subarea 5 are included.

Table 9 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. History of commercial catches by country as estimated by ICES. All weights are in tonnes.

Year	Belgium	Denmark	France	Germany	Ireland	Netherlands	Norway	Spain	Sweden	UK (England)	UK (Northern Ireland)	UK (Scotland)
2014	218	3407	41290	835	4919	221	3031	30747	106	2310	29	12659
2015	144	4242	46034	786	3873	693	4181	33471	103	3148	134	9154
2016	155	4617	49103	845	4168	883	5781	34503	94	2722	116	15675
2017	451	5125	47557	737	3477	188	3974	33317	90	2329	222	14303
2018	212	4529	41804	1212	4440	519	3960	26078	119	2689	130	11039
2019	362	3427	35341	760	4700	503	4144	25538	148	2763	127	9425
2020	190	4225	31635	409	4399	318	2968	23540	94	1879	96	6737
2021	141	3598	29208	696	4721	305	1995	23171	100	1779	155	5273

Summary of the assessment

Table 10 Hake in subareas 4, 6, and 7, and in divisions 3.a, 8.a–b, and 8.d, Northern stock. Assessment summary. ‘High’ and ‘Low’ refer to 95% confidence intervals. SSB is for females only, all weights are in tonnes, and recruitment is in thousands.

Year	Recruitment age 0			Stock size				Landings	Discards **	Fishing pressure (15–80 cm)		
	R	High	Low	SSB	High	Low	TSB^			F	High	Low
	thousands			tonnes						tonnes		
1978	683793	1009868	463004	79409	103239	55579	165452	50551		0.30	0.35	0.25
1979	694155	1022100	471433	89683	111632	67734	170824	51096		0.32	0.37	0.27
1980	834917	1216139	573196	92068	113116	71021	166150	57265		0.39	0.45	0.32
1981	1175640	1575799	877097	84112	104211	64014	152225	53918		0.38	0.45	0.31
1982	614691	899366	420124	76137	95392	56883	154363	54994		0.36	0.42	0.30
1983	377577	551118	258682	78414	96056	60773	162353	57507		0.37	0.42	0.31
1984	620641	796870	483385	82226	97655	66796	155018	63286		0.44	0.51	0.38
1985	1106470	1325017	923970	70174	83943	56405	128792	56099		0.48	0.55	0.40
1986	647799	816081	514218	55524	68159	42888	120085	57092		0.53	0.63	0.42
1987	850153	1027361	703511	50084	60954	39214	124434	63369		0.59	0.70	0.49
1988	774160	920602	651013	51547	60782	42312	127307	64823		0.60	0.69	0.51
1989	708777	829472	605644	50868	58858	42878	129460	66473	68	0.60	0.67	0.52
1990	681849	791933	587067	51134	58166	44101	123406	59954		0.54	0.60	0.47
1991	455911	537741	386534	51017	57649	44385	118811	58129		0.55	0.61	0.49
1992	609905	711541	522786	47917	53873	41960	108362	56617		0.60	0.66	0.53
1993	912648	1021946	815039	41246	46392	36101	93438	52144		0.64	0.72	0.57
1994	517928	601140	446235	33808	38426	29190	93348	51259	356	0.65	0.73	0.57
1995	305821	371666	251641	35902	40119	31684	97616	57621		0.71	0.79	0.63
1996	836512	932012	750797	36507	40527	32487	84926	47210		0.66	0.73	0.58
1997	410473	498368	338080	30644	34689	26600	79002	42465		0.62	0.69	0.54
1998	731414	835575	640237	29633	33642	25624	80969	35060		0.50	0.56	0.44
1999	366120	445304	301017	35976	40499	31453	90711	39814	349	0.52	0.58	0.45
2000	439243	521290	370110	39052	43844	34260	95484	42026	77	0.52	0.59	0.46
2001	759622	871031	662463	40741	45746	35736	91736	36675		0.46	0.51	0.40
2002	589414	684584	507475	40092	45344	34839	97172	40107		0.48	0.54	0.42
2003	445111	528048	375200	41880	47195	36565	102175	43162	2110	0.51	0.57	0.45
2004	1099150	1227784	983993	44536	50074	38998	103502	46417	2548	0.54	0.61	0.47
2005	569922	681568	476564	43042	49145	36939	107877	46550	4676	0.55	0.64	0.46
2006	1192020	1366735	1039639	45885	53199	38571	126169	41467	1816	0.40	0.47	0.33
2007	2159010	2454608	1899009	64178	74307	54048	156177	45028	2191	0.32	0.37	0.27
2008	1712400	1980798	1480370	82270	95552	68989	216267	47739	3248	0.25	0.29	0.21
2009	540533	662387	441096	125660	143465	107855	332726	58818	10590	0.21	0.24	0.182
2010	932764	1086960	800442	202255	226085	178425	423769	72799	9978	0.185	0.21	0.162
2011	1065940	1254941	905404	253759	281786	225732	458471	87540	14156	0.190	0.21	0.168
2012	2031050	2267092	1819584	253980	284062	223898	454241	85677	12680	0.173	0.194	0.153
2013	940460	1102399	802309	248863	280080	217646	470863	77343	11098	0.159	0.177	0.141
2014	659779	775330	561449	267180	299560	234800	511899	89940	12131	0.171	0.190	0.151
2015	828652	965837	710952	294240	328413	260067	518740	95043	14446	0.185	0.21	0.164

Year	Recruitment age 0			Stock size				Landings	Discards **	Fishing pressure (15–80 cm)		
	R	High	Low	SSB	High	Low	TSB^			F	High	Low
	thousands			tonnes								
2016	1149080	1337644	987097	289381	324867	253895	484606	107547	16041	0.22	0.24	0.189
2017	983549	1178767	820661	252412	288453	216371	433388	104670	10488	0.23	0.26	0.20
2018	676762	841934	543994	220187	257774	182600	395442	89695	9934	0.22	0.26	0.182
2019	812397	1011782	652303	206897	248472	165322	375357	82298	6966	0.21	0.26	0.168
2020	500739	649526	386035	199969	247338	152600	359331	72579	6946	0.193	0.24	0.146
2021	573606	815318	403553	195117	249154	141080	342088	68061	6738	0.184	0.24	0.131
2022	898602*			186358	247139	125577	320420					

* Recruitment estimated by the model; to carry out the short-term forecast.

** Model estimates.

[^] Total stock size.

Sources and references

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