

Witch (*Glyptocephalus cynoglossus*) in Subarea 4 and divisions 3.a and 7.d (North Sea, Skagerrak and Kattegat, eastern English Channel)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 1313 tonnes.

Management of witch and lemon sole under a combined species TAC prevents effective control of the single-species exploitation rates and could lead to the overexploitation of either species. ICES advises that management should be implemented at the species level in the entire stock distribution area (Subarea 4 and divisions 3.a and 7.d).

Stock development over time

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

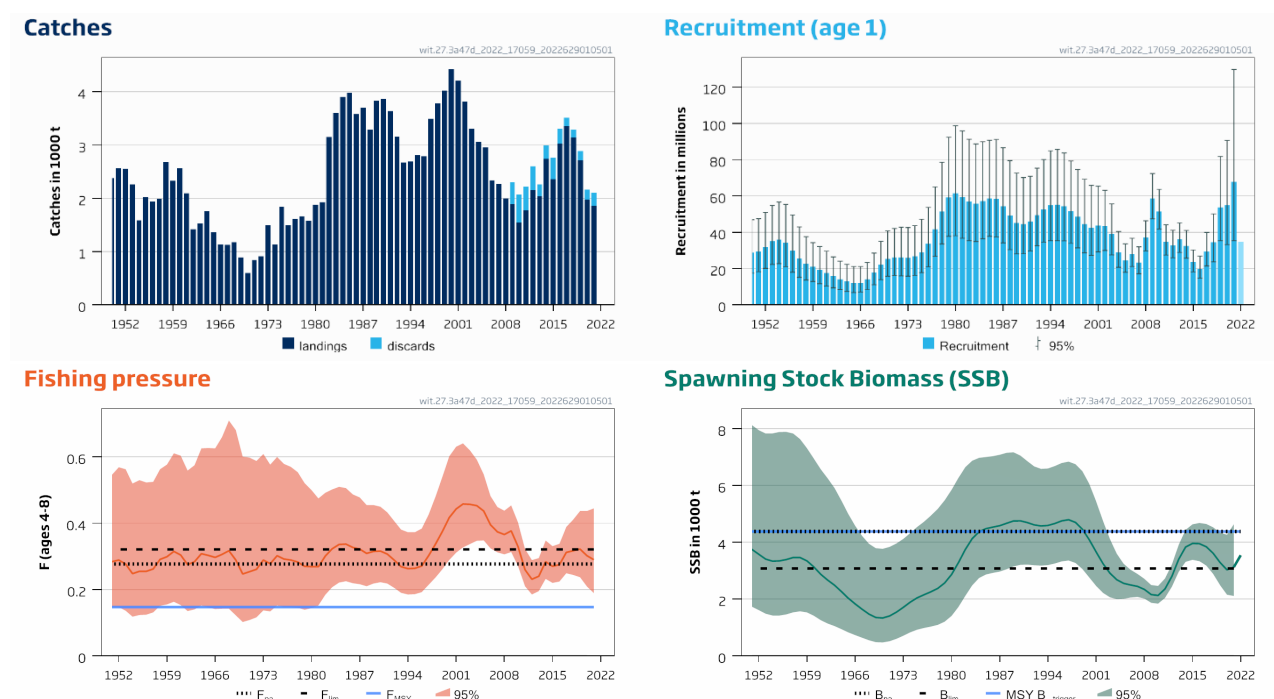


Figure 1 Witch in Subarea 4 and divisions 3.a and 7.d. Discard information is included in the assessment since 2009. The assumed recruitment value for 2022 is shaded in a lighter colour.

Catch scenarios

Table 1 Witch in Subarea 4 and divisions 3.a and 7.d. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
F_{4-8} (2022)	0.29	$F_{sq} = F_{4-8}$ (2021)
SSB (2022)	3544	SSB in the middle of the year (i.e. spawning time) before the TAC year; in tonnes.
$R_{age 1}$ (2022, 2023, 2024)	34 809	Median of the resampled recruitment estimates of 2009–2021; in thousands.
Total catch (2022)	2506	Short-term forecast (STF); in tonnes.
Projected landings (2022)	2263	STF; assuming average landings ratio by age 2019–2021; in tonnes.
Projected discards (2022)	243	STF; assuming average discards ratio by age 2019–2021; in tonnes.

Table 2 Witch in Subarea 4 and divisions 3.a and 7.d. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2023) ^^	Projected landings (2023)	Projected discards * (2023)	F _{total} ages 4–8 (2023 & 2024)	SSB ^ (2023)	SSB ^ (2024)	% SSB change **	% advice change ***
ICES advice basis								
MSY approach: F _{MSY} × SSB(2022)/MSY B _{trigger}	1313	1215	98	0.12	4543	5948	28	8.90
Other scenarios^^								
F _{MSY lower} × SSB(2022)/MSY B _{trigger}	954	882	72	0.09	4620	6218	30	–21
F = 0	0	0	0	0.00	4814	6942	36	–100
F _{pa}	2871	2644	227	0.28	4206	4848	18.70	138
F _{lim}	3228	2968	260	0.32	4132	4612	16.60	168
F _{sq}	2961	2726	235	0.29	4187	4788	18.10	146
SSB (2024) = B _{lim}	5916	5379	537	0.68	3505	3077	–1.10	390
SSB (2024) = B _{pa}	3595	3307	288	0.36	4051	4381	14.30	198
SSB (2024) = MSY B _{trigger}	3595	3307	288	0.36	4051	4381	14.30	198
Rollover advice	1206	1115	91	0.11	4567	6124	29	0
F _{MSY}	1601	1483	118	0.15	4482	5732	26	33
F _{MSY lower}	1168	1080	88	0.11	4575	6054	29	–3.2

* Including BMS landings, assuming recent discard rate (average of 2019–2021).

** SSB in 2023 relative to SSB in 2022 (3544 tonnes).

*** Advice value for 2023 relative to advice value for 2022 (1206 tonnes).

^ SSB is estimated at spawning time (1 July).

^^ Other scenarios do not include F_{MSY upper} because SSB (2022) < MSY B_{trigger}.

Basis of the advice

Table 3 Witch in Subarea 4 and divisions 3.a and 7.d. The basis of the advice.

Advice basis	MSY approach
Management plan	The EU multiannual plan (MAP) for stocks in the North Sea (EU, 2018a) and adjacent waters applies to bycatches of this stock

Quality of the assessment

Witch went through an interbenchmark process in 2021 (ICES, 2021), changing the perception of stock status and trends compared with previous advice.

Witch are generally distributed in deeper areas, and the current trawl surveys do not cover some of that habitat. A fisheries-independent survey using gears suitable for catching large flatfish and covering the entire distribution of the stock would improve the assessment.

Age information is only included in the assessment from 2009 onwards, increasing the uncertainty prior to 2009.

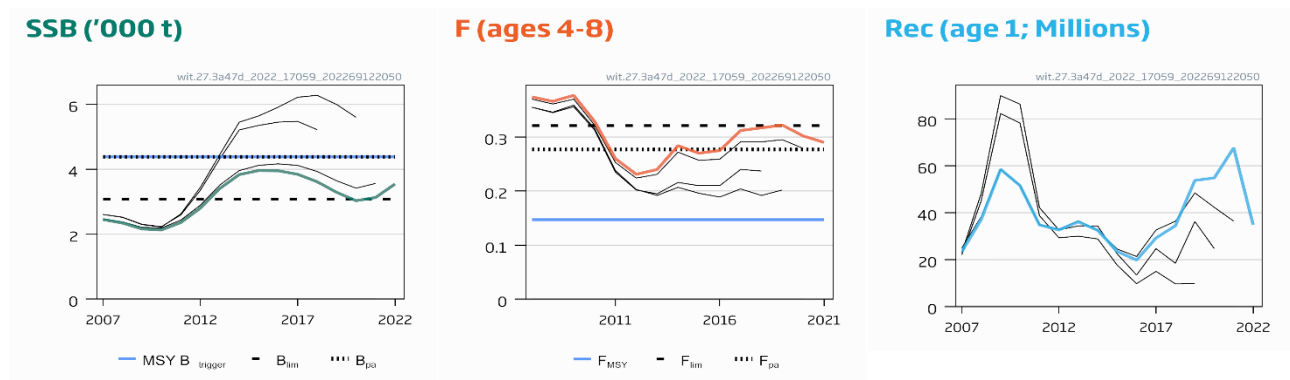


Figure 2 Witch in Subarea 4 and divisions 3.a and 7.d. Historical assessment results (final-year recruitment included for each line, corresponding to the assumed recruitment in the interim year). There was an interbenchmark process in 2021, and only assessment results from the last 2 years should be compared with the reference points indicated.

Issues relevant for the advice

Witch is mainly a bycatch species in mixed demersal fisheries. Witch and lemon sole are largely caught by different fisheries in different areas. Management of lemon sole and witch under a combined species TAC may hinder effective management of the single-species exploitation rates and could potentially lead to the overexploitation of witch. A single-species TAC for witch, covering the entire stock area, would be more appropriate.

Reference points

Table 4 Witch in Subarea 4 and divisions 3.a and 7.d. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	4 381	B_{pa} ; in tonnes	ICES (2021)
	F_{MSY}	0.147	EQsim simulation of long-term yield	ICES (2021)
Precautionary approach	B_{lim}	3 077	Breakpoint in a segmented regression, based on recruitment 1950–2020; in tonnes	ICES (2021)
	B_{pa}	4 381	$B_{lim} \times \exp(1.645 \times \sigma)$, where $\sigma = 0.215$ is the standard deviation of the $\ln(SSB[2020])$; in tonnes	ICES (2021)
	F_{lim}	0.32	Simulation using B_{lim} and B_{pa} with no assessment and advice noise	ICES (2021)
	F_{pa}	0.28	The F that provides a 95% probability for SSB to be above B_{lim} (F_{P05} with advice rule [AR])	ICES (2021)

Basis of the assessment

Table 5 Witch in Subarea 4 and divisions 3.a and 7.d. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2022b)
Assessment type	Age-based analytical assessment (SAM; Nielsen and Berg, 2014)
Input data	Commercial catches (international landings and ages from catch sampling by métier, raised in Intercatch). Three survey indices (IBTS Q1 [G1022] from 1983, IBTS Q3 [G2829] from 1991, and BTS Q3 [B2453] from 1991); age-based from 2009–2021, total biomass until 2008. Assumed constant natural mortality (over ages and years) and maturity ogive (over years). SSB is estimated at the middle of the year (i.e. spawning time).
Discards and bycatch	Discard information included in the assessment since 2009. Discards ranged between 9.5% and 23.3% of the total catches.
Additional indicators	None
Other information	Benchmarked in 2018 (ICES, 2018b); interbenchmark in 2021 (ICES, 2021)
Working group	Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK)

History of the advice, catch, and management

Table 6 Witch in Subarea 4 and divisions 3.a and 7.d. ICES advice and official landings. All weights are in tonnes.

Year	ICES advice	Witch		Witch and lemon sole		Witch			
		Predicted landings corresponding to advice	Predicted catches corresponding to advice	Agreed TAC*	Official landings	Official landings	ICES landings	ICES discards***	ICES catch
				Div. 2.a and Subarea 4	Subarea 4 and divs. 3.a and 7.d	Subarea 4 and divisions 3.a and 7.d			
2006				6175	6593	2303	2335	296	2631
2007				6175	6725	2237	2271	199	2470
2008				6793	5929	1954	1999	318	2317
2009				6793	5212	1818	1863	455	2319
2010				6521	4691	1490	1531	559	2090
2011				6391	5552	1530	1567	547	2114
2012	Reduce catches			6391	5922	1896	1952	555	2507
2013	No new advice; same as for 2012			6391	5754	1993	2013	254	2267
2014	Decrease landings by 4% (average of the last three years)	< 1574**		6391	6335	2646	2685	307	2992
2015	No new advice; same as for 2014	< 1574**		6391	5752	2359	2240	449	2690
2016	Precautionary approach (increase catches by no more than 20%)		≤ 2212	6391	6463	2658	2744	390	3135
2017	Precautionary approach (same advised catch value as given for 2016)		≤ 2212	6391	6064	2811	2850	236	3085
2018	Precautionary approach (increase catches by no more than 8%)		≤ 2390	6391	5966	3001	3010	199	3209
2019	Precautionary approach (same advised catch value as given for 2018)		≤ 2390	7874	5806	2568	2580	217	2797
2020	Precautionary approach		≤ 1651	6785	4589	1931	1937	198	2135
2021	MSY approach		≤ 1733	5428	3919	1823	1827	279	2105
2022	MSY approach		≤ 1206	4287					
2023	MSY approach		≤ 1313						

* A combined TAC for witch and lemon sole in EU waters of Subarea 4 and Division 2.a. up to 2020 and in United Kingdom and European Union waters of 4; United Kingdom waters of 2.a thereafter.

** Advice based on official landings.

*** Includes BMS landings since 2018.

History of the catch and landings

Table 7 Witch in Subarea 4 and divisions 3.a and 7.d. Catch distribution by fleet in 2021 as estimated by ICES.

Catch	Landings		Discards
2105 tonnes	Bottom otter trawl 91%	Others 9%	279 tonnes
	1827 tonnes		

Table 8 Witch in Subarea 4 and divisions 3.a and 7.d. History of official landings (3.a and 4), official BMS landings, and ICES estimates of landings, catches, and discards (Division 3.a, Subarea 4, and Division 7.d). All weights are in tonnes.

Year	Belgium	Germany		Denmark		Faroe Islands	France	Netherlands		Norway		Sweden		UK	Total landings	BMS landings	ICES estimates (3.a, 4, 7.d)		
	4	3.a	4	3.a	4	4	4	3.a	4	3.a	4	3.a	4	4	3.a and 4		landings	discards	catches
1968	15	0	21	173	108	0	0	0	0	12	5	0	0	840	1174				
1969	3	0	9	150	153	0	0	0	0	6	7	0	0	563	891				
1970	5	0	5	108	112	0	0	0	0	10	9	0	0	348	597				
1971	6	0	6	142	191	0	0	0	0	20	16	0	0	462	843				
1972	0	0	12	219	221	0	0	0	0	16	16	0	0	424	908				
1973	0	0	25	253	215	0	0	0	0	24	516	0	0	461	1494				
1974	0	0	18	291	221	0	0	0	0	13	3	0	0	592	1138				
1975	0	0	20	484	242	0	0	0	0	14	2	474	20	585	1841				
1976	0	0	24	441	175	0	0	0	0	18	3	319	5	511	1496				
1977	0	0	73	444	92	0	0	0	0	13	2	281	0	713	1618				
1978	0	0	37	473	87	0	1	0	0	14	1	232	0	819	1664				
1979	0	0	7	456	91	0	3	0	0	21	1	201	0	792	1572				
1980	0	0	23	569	111	0	2	0	0	49	2	256	0	871	1883				
1981	0	0	17	643	123	0	0	0	0	94	2	307	0	747	1933				
1982	0	0	16	953	495	0	0	0	0	79	2	421	4	1185	3155				
1983	0	0	19	1108	685	0	5	0	0	99	2	391	1	1296	3606				
1984	0	0	11	1158	687	0	4	0	0	158	3	480	3	1399	3903				
1985	0	0	21	1374	460	0	1	0	0	98	2	449	3	1571	3979				
1986	0	0	18	992	436	0	12	0	0	82	2	352	3	1682	3579				
1987	0	0	7	894	571	0	35	0	0	86	5	272	3	1827	3700				
1988	0	0	6	810	447	0	13	0	9	74	9	326	3	1593	3290				
1989	0	0	5	963	452	0	14	0	10	164	15	393	4	1821	3841				
1990	0	0	3	994	532	0	20	0	4	157	40	347	6	1759	3862				
1991	0	0	3	789	512	0	9	0	2	160	75	352	12	1727	3641				
1992	0	0	5	609	460	0	13	0	7	134	46	494	5	1391	3164				
1993	0	0	3	453	383	0	14	0	13	100	52	397	3	1255	2673				

Year	Belgium	Germany		Denmark		Faroe Islands	France	Netherlands		Norway		Sweden		UK	Total landings	BMS landings	ICES estimates (3.a, 4, 7.d)		
	4	3.a	4	3.a	4	4	4	3.a	4	3.a	4	3.a	4	4	3.a and 4		landings	discards	catches
1994	0	0	5	400	458	1	2	0	14	61	57	310	3	1385	2696				
1995	0	0	9	513	384	4	0	0	7	86	14	340	2	1451	2810				
1996	0	0	7	563	434	0	0	0	0	66	14	273	2	1431	2790				
1997	0	0	9	1074	488	1	0	0	1	76	10	352	3	1480	3494				
1998	0	0	13	1430	476	1	0	0	4	112	27	444	4	1275	3786				
1999	0	1	8	1629	486	1	0	0	9	111	23	499	2	1256	4025				
2000	0	0	13	1821	517	0	0	0	7	85	12	571	8	1388	4422				
2001	0	0	8	1304	744	0	0	0	1	72	16	563	12	1486	4206				
2002	0	0	5	1364	543	0	0	0	0	66	16	576	8	1062	3640		3813	1529	5341
2003	0	0	2	1036	771	0	0	0	0	64	23	546	3	836	3281		3308	349	3657
2004	0	1	3	1188	623	0	0	0	1	51	36	549	3	575	3030		3059	369	3428
2005	0	3	4	1006	715	0	0	0	4	42	40	557	2	443	2816		2960	419	3379
2006	0	2	6	635	654	0	0	0	3	37	31	369	2	564	2303		2335	296	2631
2007	0	2	10	618	531	0	0	0	7	45	28	284	6	706	2237		2271	199	2470
2008	0	1	6	476	351	0	0	0	19	46	58	260	19	717	1953		1999	318	2317
2009	0	0	5	593	350	0	0	0	12	28	57	152	6	615	1816		1863	455	2319
2010	0	1	7	537	251	0	0	0	9	25	40	112	1	507	1489		1531	559	2090
2011	0	1	25	565	245	0	0	0	18	23	25	104	1	523	1530		1567	547	2114
2012	0	0	4	921	246	0	0	0	19	31	20	153	2	499	1895		1952	555	2507
2013	5	1	6	803	252	0	0	0	21	28	89	169	1	618	1993		2013	254	2267
2014	15	1	7	1275	237	0	0	2	24	24	119	260	1	681	2646		2685	307	2992
2015	12	0	7	943	291	0	0	2	12	25	92	282	0	532	2196		2240	449	2690
2016	12	0	10	989	534	0	0	10	20	39	164	210	2	694	2684		2744	390	3135
2017	9	0	8	945	542	0	0	3	70	27	107	214	1	939	2865	< 0.5	2850	236	3086
2018	16	1	15	795	499	0	0	2	108	20	255	160	1	1129	3001	< 0.5	3010	199	3209
2019	23	1	18	571	641	0	0	0	108	11	213	115	3	863	2567	1	2580	216	2797
2020*	16	7	9	525	371	0	0	0	85	13	123	79	8	695	1931	1	1937	198	2135
2021*	2	2	5	505	282	0	0	0	54	8	124	33	6	803	1824	< 0.5	1827	279	2105

* Preliminary

Summary of the assessment

Table 9 Witch in Subarea 4 and divisions 3.a and 7.d. Assessment summary. Weights are in tonnes, recruitment is in thousands.

Year	Recruitment (Age 1)			Spawning-stock biomass**			Catches***		Fishing pressure (Ages 4–8)		
	R	High	Low	SSB	High	Low	Landings	Discards	F	High	Low
	thousands			tonnes			tonnes				
1950	28 595	46 886	17 440	3857	8291	1794	2379		0.27	0.52	0.142
1951	29 433	47 494	18 240	3751	8131	1730	2568		0.28	0.55	0.147
1952	32 027	50 925	20 142	3578	7949	1610	2554		0.29	0.57	0.147
1953	34 935	54 825	22 261	3408	7832	1483	2263		0.28	0.56	0.136
1954	35 867	56 698	22 689	3336	7836	1420	1590		0.25	0.52	0.118
1955	34 152	55 356	21 070	3345	7887	1418	2027		0.26	0.53	0.123
1956	29 813	49 494	17 958	3392	7889	1459	1936		0.26	0.52	0.124
1957	25 522	42 968	15 159	3464	7832	1532	1991		0.26	0.53	0.131
1958	22 685	37 576	13 695	3462	7635	1569	2678		0.29	0.56	0.151
1959	20 977	34 252	12 847	3346	7317	1530	2333		0.30	0.58	0.155
1960	19 336	32 157	11 627	3131	6948	1411	2563		0.32	0.61	0.163
1961	17 494	29 583	10 345	2874	6575	1256	2093		0.30	0.60	0.153
1962	15 715	26 444	9339	2669	6257	1139	1419		0.28	0.56	0.135
1963	14 228	24 061	8414	2490	5916	1048	1523		0.28	0.57	0.140
1964	12 840	22 339	7380	2266	5473	939	1760		0.31	0.63	0.152
1965	11 946	21 153	6746	2032	5000	826	1356		0.30	0.63	0.146
1966	12 203	21 157	7038	1829	4585	730	1137		0.30	0.63	0.141
1967	13 993	23 339	8390	1644	4230	639	1125		0.31	0.66	0.142
1968	17 806	28 546	11 107	1471	3951	548	1174		0.32	0.71	0.142
1969	22 064	35 027	13 899	1351	3793	482	891		0.29	0.68	0.122
1970	25 380	40 824	15 779	1334	3772	472	597		0.25	0.60	0.102
1971	26 083	42 108	16 157	1404	3839	514	843		0.25	0.60	0.108
1972	26 158	42 826	15 978	1540	3960	599	908		0.26	0.59	0.116
1973	25 973	42 580	15 843	1710	4122	709	1494		0.29	0.61	0.137
1974	26 608	43 653	16 219	1891	4327	827	1138		0.28	0.58	0.134
1975	28 922	47 165	17 736	2044	4540	920	1841		0.30	0.60	0.152
1976	33 556	53 748	20 950	2152	4726	980	1496		0.29	0.58	0.147
1977	41 670	65 000	26 713	2256	4941	1030	1618		0.29	0.57	0.147
1978	51 371	78 587	33 581	2376	5179	1090	1664		0.28	0.55	0.145
1979	59 084	92 404	37 779	2568	5480	1203	1572		0.27	0.52	0.139
1980	61 348	98 741	38 115	2865	5848	1404	1883		0.27	0.50	0.144
1981	59 326	95 875	36 711	3283	6270	1719	1933		0.27	0.48	0.152
1982	56 793	91 305	35 326	3746	6648	2110	3155		0.30	0.49	0.184
1983	55 646	88 711	34 905	4129	6874	2480	3606		0.32	0.50	0.21
1984	57 240	89 947	36 426	4372	6976	2740	3903		0.34	0.51	0.22
1985	58 547	90 715	37 786	4480	7005	2865	3979		0.34	0.51	0.23
1986	58 423	91 179	37 435	4534	7034	2922	3579		0.33	0.49	0.22
1987	54 394	86 604	34 164	4585	7084	2968	3700		0.32	0.48	0.22
1988	49 181	79 483	30 431	4670	7153	3049	3290		0.31	0.46	0.21
1989	45 171	72 684	28 072	4751	7171	3148	3841		0.32	0.46	0.22
1990	44 433	70 168	28 136	4755	7055	3205	3862		0.32	0.45	0.22
1991	45 867	70 863	29 689	4695	6861	3213	3641		0.31	0.43	0.22
1992	49 506	75 351	32 525	4614	6674	3190	3164		0.29	0.41	0.21
1993	52 613	80 112	34 553	4575	6587	3177	2673		0.27	0.38	0.190
1994	54 808	84 921	35 374	4593	6601	3196	2696		0.26	0.37	0.185
1995	55 037	85 697	35 347	4662	6686	3251	2810		0.26	0.37	0.186
1996	54 351	83 722	35 284	4754	6793	3327	2790		0.27	0.38	0.192
1997	51 837	79 320	33 877	4795	6843	3359	3494		0.30	0.43	0.21
1998	48 415	74 605	31 419	4700	6752	3271	3786		0.34	0.48	0.24
1999	44 566	69 266	28 674	4460	6507	3057	4024		0.38	0.54	0.26
2000	42 423	65 849	27 331	4090	6062	2759	4422		0.42	0.60	0.29
2001	43 719	65 432	29 211	3661	5445	2461	4206		0.44	0.63	0.31

Year	Recruitment (Age 1)			Spawning-stock biomass**			Catches***		Fishing pressure (Ages 4–8)		
	R	High	Low	SSB	High	Low	Landings	Discards	F	High	Low
	thousands			tonnes			tonnes				
2002	43 514	63 161	29 978	3247	4757	2217	3813		0.46	0.64	0.33
2003	39 139	55 697	27 504	2914	4118	2062	3308		0.46	0.62	0.34
2004	28 955	40 447	20 728	2681	3599	1998	3059		0.45	0.59	0.35
2005	24 561	33 625	17 941	2554	3244	2010	2960		0.44	0.55	0.35
2006	27 857	36 696	21 146	2497	3035	2054	2335		0.40	0.48	0.32
2007	23 363	31 951	17 083	2448	2888	2074	2271		0.37	0.45	0.31
2008	37 075	46 343	29 660	2341	2716	2017	1999		0.37	0.44	0.31
2009	58 569	72 368	47 402	2159	2497	1867	1894	409	0.38	0.45	0.31
2010	51 564	63 676	41 755	2128	2466	1837	1550	524	0.33	0.40	0.27
2011	34 809	44 145	27 448	2357	2726	2038	1772	448	0.26	0.32	0.21
2012	32 684	41 128	25 973	2799	3222	2432	2153	447	0.23	0.29	0.185
2013	36 134	45 189	28 893	3406	3919	2960	2033	225	0.24	0.30	0.195
2014	32 489	41 043	25 718	3834	4440	3311	2741	251	0.28	0.35	0.23
2015	23 474	30 244	18 219	3959	4634	3382	2363	399	0.27	0.33	0.22
2016	19 841	26 857	14 658	3951	4682	3334	3025	287	0.28	0.34	0.22
2017	29 242	39 951	21 404	3843	4647	3178	3360	150	0.31	0.39	0.25
2018	34 483	50 137	23 716	3612	4527	2883	3141	152	0.32	0.41	0.24
2019	53 782	81 771	35 374	3288	4344	2489	2707	183	0.32	0.44	0.24
2020	54 869	90 656	33 209	3030	4266	2152	1980	184	0.30	0.44	0.21
2021	67 729	129 765	35 350	3128	4639	2109	1857	245	0.29	0.45	0.189
2022	34 809*			3544							

* Median of the resampled recruitment estimates of 2009–2021.

** SSB is estimated at spawning time.

*** Any differences between catches values in Table 9 and others in the advice are due to SOP correction.

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