

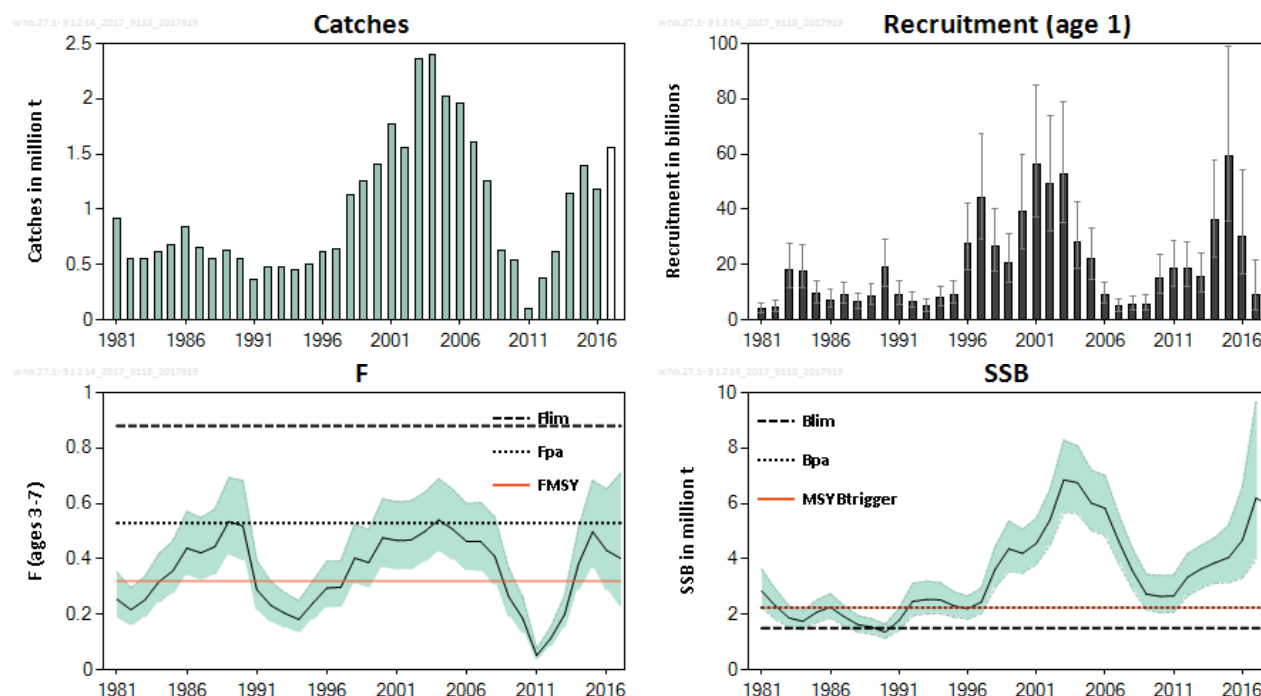
## Blue whiting (*Micromesistius poutassou*) in subareas 1–9, 12, and 14 (Northeast Atlantic and adjacent waters)

### ICES stock advice

ICES advises that when the long term management strategy agreed by the European Union, the Faroe Islands, Iceland and Norway is applied, catches in 2018 should be no more than 1 387 872 tonnes.

### Stock development over time

Fishing mortality (F) has increased from a historical low in 2011 to above  $F_{MSY}$  since 2014. Spawning-stock biomass (SSB) increased since 2010 and is above  $MSY B_{trigger}$ . Recruitment (R) in 2017 is estimated to be low, following a period of high recruitments.



**Figure 1** Blue whiting in subareas 1–9, 12, and 14. Summary of the stock assessment. Catches for 2017 (not shaded) are preliminary. For this stock,  $F_{MGT} = F_{MSY}$  and  $SSB_{MGT} = B_{pa}$ ; therefore, the horizontal lines representing these points in the graph would overlap.

### Stock and exploitation status

**Table 1** Blue whiting in subareas 1–9, 12, and 14. State of the stock and fishery relative to reference points.

		Fishing pressure				Stock size			
		2015	2016	2017		2016	2017	2018	
Maximum sustainable yield	$F_{MSY}$	✗	✗	✗	Above	$MSY B_{trigger}$	✓	✓	✓ Above trigger
Precautionary approach	$F_{pa}, F_{lim}$	✓	✓	✓	Harvested sustainably	$B_{pa}, B_{lim}$	✓	✓	✓ Full reproductive capacity
Management plan	$F_{MGT}$	✗	✗	✗	Above	$SSB_{MGT}$	✓	✓	✓ Above

## Catch options

**Table 2** Blue whiting in subareas 1–9, 12, and 14. The basis for the catch options.

Variable	Value	Source	Notes
F ages 3–7 (2017)	0.40	ICES (2017)	From assessment (preliminary 2017 catches).
SSB (2018)	5906696 t	ICES (2017)	From assessment and GM recruitment.
R <sub>age 1</sub> (2018)	14823908	ICES (2017)	GM (1981–2016); in thousands.
R <sub>age 1</sub> (2019)	14823908	ICES (2017)	GM (1981–2016); in thousands.
Total catch (2017)	1559400 t	ICES (2017)	Preliminary 2017 catches estimated by ICES, based on declared quotas and expected uptake.

**Table 3** Blue whiting in subareas 1–9, 12, and 14. Annual catch options. All weights are in tonnes.

Basis	Total catch (2018)	F <sub>total</sub> (2018)	SSB (2019)	% SSB change *	% Catch change **
ICES advice basis					
Long-term management strategy (F = F <sub>MSY</sub> )	1387872	0.32	5181388	–12	–11
Other options					
MSY approach: F <sub>MSY</sub>	1387872	0.32	5181388	–12	–11
F = 0	0	0	6509015	10	–100
F <sub>pa</sub>	2116435	0.53	4491803	–24	36
F <sub>lim</sub>	3088351	0.88	3582582	–39	98
SSB (2019) = B <sub>lim</sub>	5410452	2.51	1500131	–75	247
SSB (2019) = B <sub>pa</sub>	4546226	1.68	2253487	–62	192
SSB (2019) = MSY B <sub>trigger</sub>	4546226	1.68	2253487	–62	192
F = F <sub>2017</sub>	1688386	0.40	4896239	–17	8
SSB (2019) = SSB (2018)	631861	0.135	5902594	0	–59
Catch (2019) = Catch (2018)	1554741	0.37	5022934	–15	0

\* SSB 2019 relative to SSB 2018.

\*\* Catch in 2018 relative to catch in 2017 (1 559 400 t, ICES estimate).

## Basis of the advice

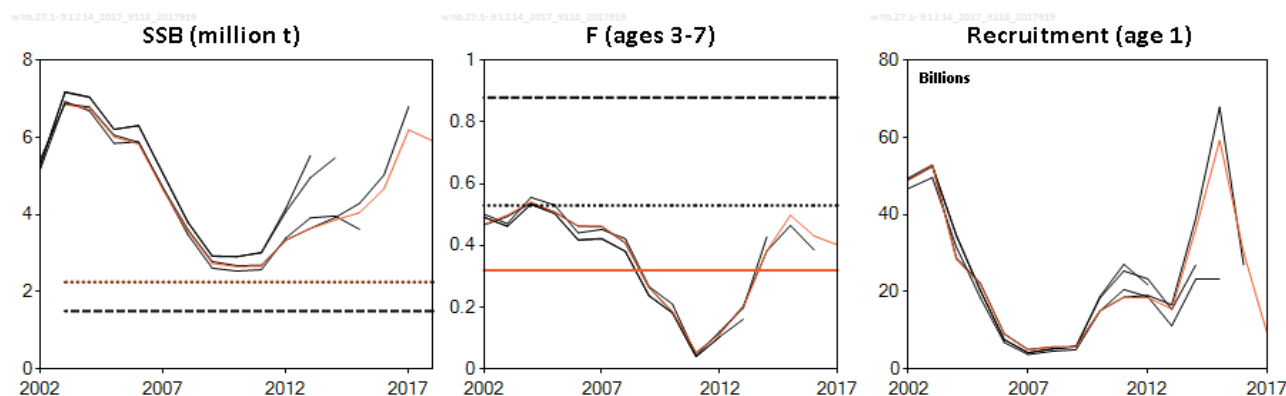
**Table 4** Blue whiting in subareas 1–9, 12, and 14. The basis of the advice.

Advice basis	Long-term management strategy.
Management plan	A long-term management strategy was agreed by the European Union, the Faroe Islands, Iceland and Norway in 2016 ( <a href="#">Anon, 2016</a> ). ICES has evaluated the strategy and found it to be precautionary (ICES, 2017).

## Quality of the assessment

Since 2016, the assessment has used a preliminary estimate of catch-at-age in the year in which the assessment is carried out to supplement information from the acoustic survey conducted in the spring. In most recent years more than 90% of the annual catches of the age 3+ fish are consistently taken in the first half year, which makes it reasonable to estimate the total annual catch-at-age from preliminary first semester data. This is expected to provide an assessment that is more robust to the year effects sometimes observed in the survey index from the International Blue Whiting Spawning Stock Survey (IBWSS).

The historical assessment results show a consistent picture of SSB and F for the assessments since 2016; these assessments include a preliminary estimate of the catch-at-age for the year in which the assessment is carried out.



**Figure 2** Blue whiting in subareas 1–9, 12, and 14. Historical assessment results. Since 2016, the SSB time series include the TAC year.

### Issues relevant for the advice

The assessment estimates a low 2016 year class, which is confirmed by a series of surveys not used in the assessment model. This is likely to result in a decrease in stock size, and a reduction in fishing opportunities when the 2016 year class is fully selected in the fishery from 2019.

### Reference points

**Table 5** Blue whiting in subareas 1–9, 12, and 14. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	2250000 t	$B_{pa}$	ICES (2013a, 2013b, 2016a)
	$F_{MSY}$	0.32	Stochastic simulations with segmented regression stock–recruitment relationship	ICES (2016a)
Precautionary approach	$B_{lim}$	1500000 t	Approximately $B_{loss}$	ICES (2013a, 2013b, 2016a)
	$B_{pa}$	2250000 t	$B_{lim} \exp(1.645 \times \sigma)$ , with $\sigma = 0.246$	ICES (2013a, 2013b, 2016a)
	$F_{lim}$	0.88	Equilibrium scenarios with stochastic recruitment: F value corresponding to 50% probability of ( $SSB < B_{lim}$ )	ICES (2016a)
	$F_{pa}$	0.53	Based on $F_{lim}$ and assessment uncertainties. $F_{lim} \exp(-1.645 \times \sigma)$ , with $\sigma = 0.299$	ICES (2016a)
EU–Faroes–Iceland–Norway long-term management strategy	$SSB_{MGT\_lower}$	1500000 t	$B_{lim}$	Anon (2016)
	$SSB_{MGT}$	2250000 t	$B_{pa}$	
	$F_{MGT\_lower}$	0.05	Arbitrary low F	
	$F_{MGT}$	0.32	$F_{MSY}$	

## Basis of the assessment

**Table 6** Blue whiting in subareas 1–9, 12, and 14. Basis of the assessment and advice.

ICES stock data category	1 ( <a href="#">ICES, 2016b</a> ).
Assessment type	Age-based analytical assessment (SAM; Berg and Nielsen, 2016) that uses catches for the model and the forecast.
Input data	Commercial catches, preliminary estimate of catch-at-age in the year in which the assessment is carried out, ages and length frequencies from catch sampling. One survey index (International Blue Whiting Spawning Stock Survey (IBWSS) ages 1–8, 2004–2017, excluding 2010). Fixed maturity estimated in 1994 by combining maturity ogives from the southern and northern areas. Natural mortalities fixed at 0.2, derived in the 1980s from age compositions before the targeted fishery started.
Discards and bycatch	Discard data have been included since 2014.
Indicators	Qualitative estimate of recruitment from surveys: Norwegian bottom trawl survey in the Barents Sea, International Ecosystem Survey in the Nordic Seas in May (IESNS) and the International Ecosystem Summer Survey in the Nordic Seas in July (IESSNS), the Faroese bottom trawl surveys in spring, the Icelandic bottom trawl survey in spring, and the French Bay of Biscay and Celtic Sea groundfish survey (EVHOE).
Other information	The stock was benchmarked in 2012 (WKPELA; ICES, 2012). An inter-benchmark protocol was conducted in the spring of 2016 (ICES, 2016c).
Working group	Working Group on Widely Distributed Stocks ( <a href="#">WGWIDE</a> ).

## Information from stakeholders

The EU industry reported that the fishery for blue whiting in 2017 was very good. High catch rates were maintained all through the season and the vessels had no difficulty catching their allocations. There was a higher proportion of smaller blue whiting in the catch in the Spring this year (February, March and April) than in the previous year. The industry considers recruitment to have been good over the last three years.

## History of the advice, catch, and management

**Table 7** Blue whiting in subareas 1–9, 12, and 14. ICES advice and catch. All weights are in tonnes.

Year	ICES advice	Predicted catch corresp. to advice	TAC	ICES catch
1987	TAC for northern areas; no advice for southern areas	950000	-	655000
1988	TAC for northern areas; no advice for southern areas	832000	-	557847
1989	TAC for northern areas; no advice for southern areas	630000	-	627447
1990	TAC for northern areas; no advice for southern areas	600000	-	561610
1991	TAC for northern areas; no advice for southern areas	670000	-	369524
1992	No advice	-	-	475026
1993	Catch at <i>status quo</i> F (northern areas); no assessment for southern areas	490000	-	480679
1994	Precautionary TAC (northern areas); no assessment for southern areas	485000	650000*	459414
1995	Precautionary TAC for combined stock	518000	650000*	578905
1996	Precautionary TAC for combined stock	500000	650000*	645982
1997	Precautionary TAC for combined stock	540000	-	672437
1998	Precautionary TAC for combined stock	650000	-	1128969
1999	Catches above 650 000 t may not be sustainable in the long run	650000	-	1256228
2000	F should not exceed the proposed $F_{pa}$	800000	-	1412927
2001	F should not exceed the proposed $F_{pa}$	628.000	-	1780170
2002	Rebuilding plan	0	-	1556792
2003	F should be less than the proposed $F_{pa}$	600000	-	2321406
2004	Achieve 50% probability that F will be less than $F_{pa}$	925000	-	2380161
2005	Achieve 50% probability that F will be less than $F_{pa}$	1075000	-	2034309

Year	ICES advice	Predicted catch corresp. to advice	TAC	ICES catch
2006	F old management plan	1500000	2100000**	1976176
2007	F should be less than the proposed $F_{pa}$	980000	1847000***	1625255
2008	F should be less than $F_{pa}$	835000	1250000^	1260615
2009	Maintain stock above $B_{pa}$	384000	606000^^	641818
2010	Follow the agreed management plan	540000	548000	526357
2011	See scenarios	40100–223000	40000	103620
2012	Follow the agreed management plan	391000	391000	384021
2013	Follow the agreed management plan	643000	643000	628169
2014	Follow the agreed management plan	948950	1200000	1155279
2015	Follow the agreed management plan	839886	1260000^^^	1396244
2016	MSY approach	$\leq 776391$	1147000^^^	1183187
2017	MSY approach	$\leq 1342330$	1675400^^^	1559400 <sup>§</sup>
2018	Long-term management strategy	$\leq 1387872$		

\* NEAFC proposal for NEAFC regions 1 and 2.

\*\* Agreed TAC from four Coastal States of 2 million tonnes, and an additional allocation to Russia in the international zone of 100 000 t.

\*\*\* Agreed TAC from four Coastal States of 1.7 million tonnes, and an additional allocation to Russia and Greenland of 147 000 t.

^ Agreed TAC from four Coastal States of 1.1 million tonnes, and an additional allocation to Russia and Greenland.

^^ Agreed TAC from four Coastal States of 0.59 million tonnes, and an additional allocation to Russia of 16 000 t.

^^^ No agreed TAC by the Coastal States, sum of unilateral quotas.

<sup>§</sup> Preliminary.

## History of the catch and landings

**Table 8** Blue whiting in subareas 1–9, 12, and 14. Catch distribution by fleet in 2016 as estimated by ICES.

Total catch (2016)	Landings		Discards
1 183 187 t	98% pelagic trawl	2% bottom trawl	4 822 t
	1 178 365 t		

**Table 9** Blue whiting in subareas 1–9, 12, and 14. History of commercial catch and landings; ICES estimated values are presented for each country participating in the fishery. Discard data are included since 2014. All weights are in tonnes.

Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Denmark	89500	41450	54663	48659	18134	248	140	165	340	2167	35256	45178	39395
Estonia	*												
Faroes	322322	266799	321013	317859	225003	58354	49979	16405	43290	85768	224700	282502	282416
France		8046	18009	16638	11723	8831	7839	4337	9799	8978	10410	9659	10345
Germany	15293	22823	36437	34404	25259	5044	9108	278	6239	11418	24487	24107	20025
Iceland	379643	265516	309508	236538	159307	120202	87942	5887	63056	104918	182879	214870	186914
Ireland	75393	73488	54910	31132	22852	8776	8324	1195	7557	13205	21466	24785	27657
Lithuania			4635	9812	5338						4717		1129
Netherlands	95311	147783	102711	79875	78684	35686	33762	4595	26526	51635	38524	56397	58148
Norway	957684	738490	642451	539587	418289	225995	194317	20539	118832	196246	399520	489439	310412
Poland													
Portugal	3937	5190	5323	3897	4220	2043	1482	603	1955	2056	2150	2547	2586
Spain	15612	17643	15173	13557	14342	20637	12891	2416	6726	15274	32065	29206	31952
Sweden **	19083	2960	101	464	4	3	50	1	4	199	2	32	42
UK (England + Wales)	2593	7356	10035	12926	14147	6176	2475	27	1590	4100	11	131	1338
UK (Northern Ireland)										1232	2205	1119	
UK (Scotland)	57028	104539	72106	43540	38150	173	5496	1331	6305	8166	24630	30508	37173
Russia	346762	332226	329100	236369	225163	149650	112553	45841	88303	120674	152256	185763	173655
Greenland***										2133			
Unallocated									3 499				
TOTAL	2380161	2034309	1976176	1625255	1260615	641818	526357	103620	384021	628169	1155279	1396244	1183187

\* Landings of 19 467 tonnes were reported to the EU, but not to the ICES WGNPBW.

\*\* Estimates from Sweden and Greenland are not included in the catch-at-age number.

\*\*\* From 2012.

**Table 10** Blue whiting in subareas 1–9, 12, and 14. ICES estimated catches (tonnes) by main fishing areas.

Year	Norwegian Sea fishery (SAs 1 and 2; ICES divisions 5.a and 14.a–b)	Fishery in the spawning area (SA 12.; ICES divisions 5.b, 6.a–b, and 7.a–c)	Directed- and mixed fisheries in the North Sea (SA 4; ICES Division 3.a)	Total northern areas	Total southern areas (SAs 8 and 9; ICES divisions 7.d–k)	Grand total
1988	55829	426037	45143	527009	30838	557847
1989	42615	475179	75958	593752	33695	627447
1990	2106	463495	63192	528793	32817	561610
1991	78703	218946	39872	337521	32003	369524
1992	62312	318018	65974	446367	28722	475026
1993	43240	347101	58082	448423	32256	480679
1994	22674	378704	28563	429941	29473	459414
1995	23733	423504	104004	551241	27664	578905
1996	23447	478077	119359	620883	25099	645982
1997	62570	514654	65091	642315	30122	672437
1998	177494	827194	94881	1099569	29400	1128969
1999	179639	943578	106609	1229826	26402	1256228
2000	284666	989131	114477	1388274	24654	1412928
2001	591583	1045100	118523	1755206	24964	1780170
2002	541467	846602	145652	1533721	23071	1556792
2003	931508	1211621	158180	2301309	20097	2321406
2004	921349	1232534	138593	2292476	85093	2377569
2005	405577	1465735	128033	1999345	27608	2026953
2006	404362	1428208	105239	1937809	28331	1966140
2007	172709	1360882	61105	1594695	17634	1612330
2008	68352	1111292	36061	1215704	30761	1246465
2009	46629	533996	22387	603012	32627	635639
2010	36214	441521	17545	495280	28552	523832
2011	20599	72279	7524	100401	3191	103592
2012	24391	324545	5678	354614	29402	384016*
2013	31759	481356	8749	521864	103973	625837**
2014	45580	885483	28596	959659	195620	1155279
2015	150828	895684	44661	1091173	305071	1396244
2016	59744	905087	55774	1020604	162583	1183187

\* Official catches by area from Sweden are not included (2012).

\*\* Official catches by area from Sweden and Greenland are not included (2013).

## Summary of the assessment

**Table 11** Blue whiting in subareas 1–9, 12, and 14. Assessment summary. Weights are in tonnes.

Year	Recruitm. (age 1) Thousands	Recruitm. 97.5th percentile	Recruitm. 2.5th percentile	SSB	SSB 97.5th percentile	SSB 2.5th percentile	Catch*	Mean F (ages 3–7)	Mean F 97.5th percentile	Mean F 2.5th percentile
1981	3873800	6013224	2495554	2848318	3628731	2235745	922980	0.255	0.352	0.184
1982	4631025	7267142	2951145	2311530	2912735	1834417	550643	0.217	0.295	0.159
1983	17917609	27541203	11656742	1869746	2305591	1516293	553344	0.252	0.337	0.188
1984	17867374	27180858	11745142	1751579	2120102	1447113	615569	0.318	0.419	0.241
1985	9478922	14361216	6256431	2077490	2520389	1712420	678214	0.357	0.465	0.274
1986	7216911	10879800	4787202	2262124	2740548	1867219	847145	0.439	0.571	0.339
1987	9088875	13737512	6013290	1919302	2320704	1587329	654718	0.422	0.549	0.324
1988	6417562	9706583	4243007	1631183	1955338	1360766	552264	0.444	0.579	0.341
1989	8591218	13053146	5654501	1544207	1845862	1291849	630316	0.535	0.693	0.412
1990	18959441	29244024	12291756	1362283	1642892	1129603	558128	0.519	0.683	0.394
1991	9048738	14111111	5802496	1784519	2225362	1431007	364008	0.289	0.394	0.212
1992	6718375	10338787	4365750	2466363	3119035	1950265	474592	0.233	0.318	0.171
1993	4960963	7723651	3186466	2539304	3196705	2017097	475198	0.204	0.278	0.150
1994	7946169	12263829	5148604	2528268	3149099	2029832	457696	0.182	0.249	0.134
1995	9246816	14120704	6055195	2311005	2813751	1898087	505176	0.240	0.320	0.180
1996	27616800	42081382	18124111	2205180	2659052	1828780	621104	0.295	0.391	0.223
1997	44328895	67418753	29146948	2451549	2957578	2032100	639681	0.298	0.393	0.225
1998	26694986	40334879	17667644	3630276	4445229	2964731	1131955	0.403	0.526	0.309
1999	20415668	31009360	13441086	4364768	5367340	3549467	1261033	0.387	0.505	0.296
2000	39326162	59865207	25833821	4203899	5066590	3488100	1412449	0.476	0.617	0.368
2001	56189765	84873383	37199998	4561996	5472840	3802744	1771805	0.467	0.606	0.360
2002	49008984	74077342	32423957	5413532	6510405	4501459	1556955	0.468	0.609	0.360
2003	52753701	78644576	35386458	6851741	8279354	5670292	2365319	0.499	0.640	0.389
2004	28329330	42768020	18765212	6751329	8078601	5642121	2400795	0.541	0.689	0.424
2005	22004054	32947342	14695522	6014719	7200212	5024413	2018344	0.507	0.651	0.395
2006	8910800	13492269	5885027	5827692	7010600	4844377	1956239	0.463	0.599	0.358
2007	4895088	7453977	3214645	4636984	5598488	3840613	1612269	0.463	0.604	0.354
2008	5664722	8732128	3674829	3570518	4374147	2914533	1251851	0.410	0.551	0.305
2009	5670783	9070085	3545477	2735187	3442819	2173000	634978	0.264	0.366	0.19
2010	15066348	23473998	9670054	2649614	3406490	2060906	539539	0.186	0.263	0.131
2011	18528179	28637073	11987727	2664433	3416484	2077927	103771	0.052	0.077	0.035
2012	18460860	28205206	12082995	3342454	4189684	2666549	375692	0.113	0.154	0.083
2013	15528181	23995120	10048893	3639536	4491255	2949336	613863	0.200	0.268	0.149
2014	36212714	58028446	22598584	3859746	4768937	3123890	1147650	0.383	0.513	0.286
2015	59245602	98913860	35485840	4051466	5220383	3144285	1390656	0.498	0.683	0.364
2016	30197756	54149058	16840634	4671649	6584629	3314432	1180786	0.431	0.652	0.285
2017	8857470	21779510	3602229	6197320	9666741	3973084	1559437	0.402	0.709	0.228
2018				5906696						

\*Catches presented are the sum of product (SOP) values from catch- and weight-at-age used in the assessment model.



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