Year	Denmark			Sweden	Germany	Belgium	Netherlands	Norway	Total official landings	ICES estimated landings
	Kattegat	Skagerrak	Belts	Skagerrak and Kattegat	Kattegat and the Belts	Skagerrak	Skagerrak	Skagerrak		
1968	290				16				306	306
1969	261				7				268	268
1970	158	25							183	183
1971	242	32			9				283	283
1972	327	31			12				370	370
1973	260	52			13				325	325
1974	388	39			9				436	436
1975	381	55		16	16		9		477	468
1976	367	34		11	21	2	155		590	435
1977	400	91		13	8	1	276		789	513
1978	336	141		9	9		141		636	495
1979	301	57		8	6	1	84		457	373
1980	228	73		9	12	2	5		329	324
1981	199	59		7	16	1			282	282
1982	147	52		4	8	1	1		213	212
1983	180	70		11	15		31		307	276
1984	235	76		13	13		54		391	337
1985	275	102		19	1	+	132		529	397
1986	456	158		26	1	2	109		752	643
1987	564	137		19		2	70		792	722
1988	540	138		24		4			706	706
1989	578	217		21	7	1			824	824
1990	464	128		29		2			623	1 050
1991	746	216		38	+				1 000	1 011
1992	856	372		54					1 282	1 294
1993	1016	355		68	9				1 448	1 439
1994	890	296		12	4				1 202	1 198
1995	850	382		65	6				1 303	1 297
1996	784	203		57	612				1 656	1 059
1997	560	200		52	2				814	814
1998	367	145		90	3				605	605
1999	431	158		45	3				637	637
2000	399	320	13	34	11				777	645
2001	249	286	21	25					581	478
2002*	360	177	18	15	11				581	862
2003*	195	77	17	11	17				317	618
2004*	249	109	40	16	18				432	824
2005*	531	132	118	30	34				845	990
2006	521	114	107	38	43		4	9	836	836
2007	366	81	93	45	39		0	9	633	633
2008	361	102	113	34	35		3	7	655	655
2009	325	103	145	37	27			4	641	641
2010	273	61	125	46	26		3	3	537	538
2011	271	127	65	53	33			3	552	552
2012	154	140	28	30				6	358	358

Year	Denmark			Sweden	Germany	Belgium	Netherlands	Norway	Total official landings	ICES estimated landings
	Kattegat	Skagerrak	Belts	Skagerrak and Kattegat	Kattegat and the Belts	Skagerrak	Skagerrak	Skagerrak		
2013	153	78		54	9			6	300	332
2014	141	104	48	36	2		0.3	3	335	335
2015	95	66	36	9	7		6	5	224	224
2016	164	78	56	14	17		16	2	348	348
2017	215	166	46	19	21		31	2	501	520
2018	158	140	57	16	15		47		434	434
2019	150	88	82	13	15		69	2	417	417
2020	136	109	85	9	24		60	1	424	424
2021	121	116	70	10	23		47		387	387

* Assuming misreporting rates at 50%, 100%, 100%, and 20% in 2002–2005, respectively.

Summary of the assessment

Table 9 Sole in subdivisions 20–24. Assessment summary. Weights are in tonnes, recruitment in thousands. High and Low refer to 95% confidence intervals.

Year	Recruitment (Age 1)			Spawning stock biomass			Landings	Discards	Fishing Mortality (Ages 4-8)		
	R	Low	High	SSB	Low	High			F	Low	High
				tonnes			tonnes	tonnes			
1984	6 421	3 885	10 614	864	696	1 072	337		0.40	0.30	0.54
1985	5 218	3 351	8 126	1 121	895	1 403	397		0.32	0.24	0.42
1986	4 807	3 146	7 345	2 030	1 615	2 550	643		0.37	0.29	0.47
1987	4 333	2 796	6 714	2 099	1 739	2 534	722		0.45	0.36	0.57
1988	5 923	3 876	9 051	2 163	1 818	2 572	706		0.41	0.32	0.52
1989	7 663	5 000	11 743	2 179	1 851	2 565	824		0.42	0.33	0.53
1990	7 544	4 949	11 499	2 709	2 299	3 193	1 050		0.39	0.31	0.49
1991	8 547	5 529	13 213	3 195	2 693	3 791	1 011		0.46	0.38	0.57
1992	6 507	4 258	9 944	4 153	3 525	4 892	1 294		0.53	0.42	0.66
1993	3 544	2 331	5 387	3 961	3 340	4 697	1 439		0.53	0.43	0.67
1994	3 529	2 333	5 338	4 138	3 534	4 846	1 198		0.43	0.34	0.53
1995	2 291	1 501	3 497	3 428	2 964	3 965	1 297		0.46	0.37	0.56
1996	1 529	953	2 454	3 251	2 825	3 742	1 059		0.41	0.33	0.51
1997	3 638	2 364	5 599	2 635	2 288	3 034	814		0.40	0.32	0.49
1998	3 693	2 442	5 586	1 877	1 615	2 182	605		0.38	0.31	0.47
1999	3 096	2 029	4 723	2 252	1 915	2 650	637		0.35	0.28	0.43
2000	4 422	2 926	6 683	2 290	1 953	2 686	645		0.34	0.27	0.42
2001	5 968	3 896	9 142	2 240	1 920	2 612	478		0.29	0.23	0.36
2002	4 406	2 915	6 659	2 599	2 217	3 046	862		0.37	0.29	0.46
2003	4 493	2 986	6 761	2 968	2 535	3 476	618		0.34	0.27	0.43
2004	2 918	2 037	4 180	3 197	2 760	3 703	824		0.39	0.31	0.49
2005	2 485	1 717	3 597	3 483	2 991	4 056	990		0.40	0.32	0.50
2006	3 243	2 234	4 707	2 957	2 528	3 460	836		0.36	0.29	0.45
2007	3 472	2 411	5 001	2 483	2 132	2 893	633		0.32	0.25	0.40
2008	2 048	1 376	3 048	2 055	1 745	2 419	655		0.34	0.27	0.44
2009	2 142	1 489	3 083	2 388	1 991	2 864	641		0.25	0.195	0.33
2010	1 987	1 379	2 863	2 036	1 691	2 451	538	14	0.24	0.181	0.31
2011	1 764	1 200	2 595	2 044	1 680	2 486	552	8	0.190	0.145	0.25
2012	1 519	974	2 370	2 245	1 823	2 765	358	11	0.182	0.138	0.24

Year	Recruitment (Age 1)			Spawning stock biomass			Landings	Discards	Fishing Mortality (Ages 4-8)		
	R	Low	High	SSB	Low	High			F	Low	High
				tonnes			tonnes	tonnes			
2013	1 535	999	2 360	1 749	1 420	2 153	332	10	0.176	0.134	0.23
2014	2 555	1 762	3 706	2 217	1 817	2 706	335	32	0.165	0.126	0.22
2015	3 260	2 204	4 822	1 992	1 631	2 432	224	6	0.142	0.107	0.189
2016	2 666	1 847	3 847	2 210	1 822	2 682	348	17	0.180	0.139	0.23
2017	1 577	1 036	2 400	2 416	2 003	2 915	520	17	0.26	0.195	0.34
2018	3 534	2 313	5 400	2 832	2 333	3 439	434	7	0.23	0.174	0.29
2019	2 574	1 749	3 788	2 405	1 972	2 932	417	8	0.21	0.157	0.27
2020	1 822	1 192	2 784	2 536	2 049	3 140	424	12	0.21	0.155	0.27
2021	1 110	595	2 070	2 680	2 122	3 386	387	6	0.195	0.141	0.27
2022	2485*			2 637	3 614	1 937					

* Resampled from recruitment in 2004–2021.

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Download the stock assessment data and figures.

Recommended citation: ICES. 2022. Sole (*Solea solea*) in subdivisions 20-24 (Skagerrak and Kattegat, western Baltic Sea). *In* Report of the ICES Advisory Committee, 2022. ICES Advice 2022, sol.27.20-24. https://doi.org/10.17895/ices.advice.19453811.

Sprat (*Sprattus sprattus*) in subdivisions 22–32 (Baltic Sea)

ICES advice on fishing opportunities

ICES advises that when the EU multiannual plan (MAP) for the Baltic Sea is applied, catches in 2023 that correspond to the F ranges in the plan are between 183 749 tonnes and 317 905 tonnes. According to the MAP, catches higher than those corresponding to F_{MSY} (249 237 tonnes) can only be taken under conditions specified in the plan, whilst the entire range is considered precautionary when applying ICES advice rule.

Stock development over time

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

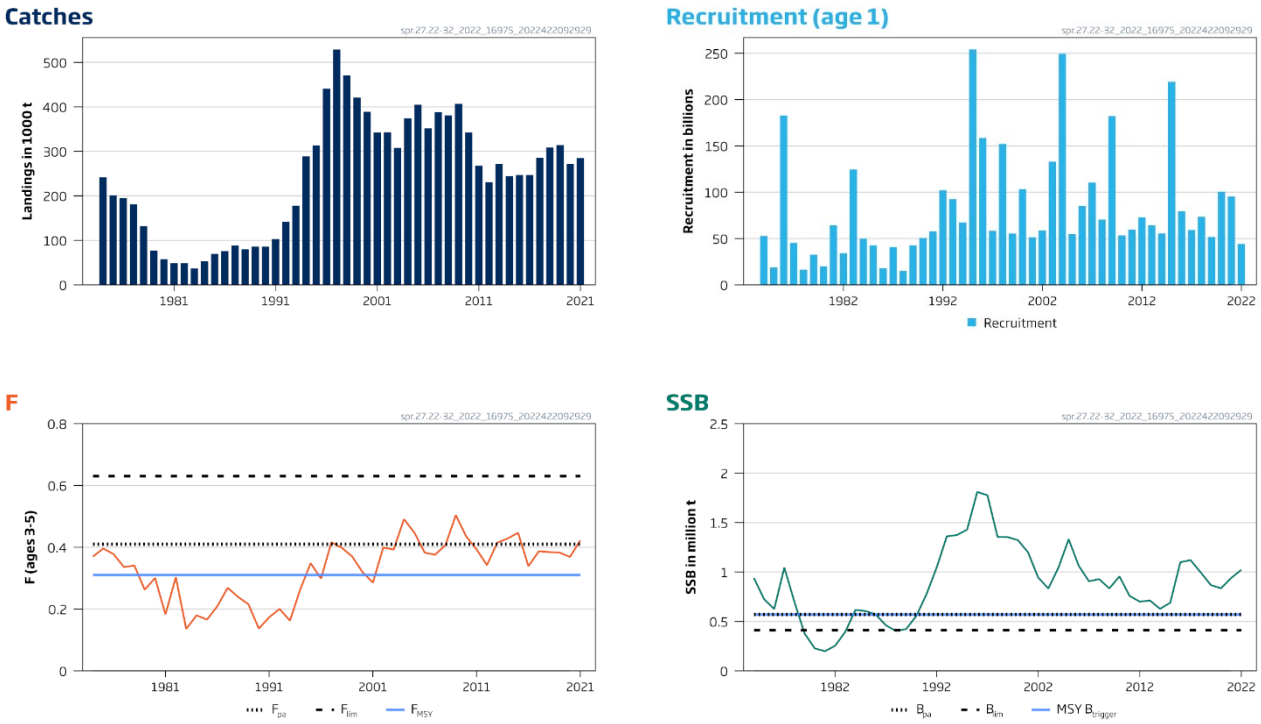

Figure 1 Sprat in subdivisions 22–32. Summary of the stock assessment. SSB at spawning time is predicted for 2022.

Catch scenarios

Table 1 Sprat in subdivisions 22–32. Values in the forecast and for the interim year.

Variable	Value	Notes
$F_{ages\ 3–5}$ (2022)	0.38	F based on catch constraint
SSB (2022)	1 022 000	Predicted SSB at spawning time; tonnes
$R_{age\ 1}$ (2022)	4 421 3000	RCT3 estimate; thousands
$R_{age\ 1}$ (2023–2024)	8 747 2000	Geometric mean 1991–2021; thousands
Total catch (2022)	295 300	Catch constraint (295 300 t = EU quota of 251 900 t + Russian quota of 43 400 t); tonnes

Table 2 Sprat in subdivisions 22–32. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2023)	F_{total} (2023)	SSB (2023)	SSB (2024)	% SSB change *	% TAC change **	% advice change ***
ICES advice basis							
EU MAP^^: F_{MSY}	249 237	0.31	907 905	986 716	8.7	-16	-15
EU MAP^^range F_{lower}	183 749	0.22	935 258	1 067 775	14	-38	-14^
EU MAP^^range F_{upper}	317 905	0.41	878 469	904 540	3.0	7.7	-15^
Other scenarios							
F_{MSY}	249 237	0.31	907 905	986 716	8.7	-16	-15
F = 0	0	0	1 006 000	1 306 000	30	-100	-100
$F = F_{pa}$	317 905	0.41	878 469	904 540	3.0	7.7	9.0
$F = F_{lim}$	452 071	0.63	816 965	753 170	-7.8	53	55
SSB (2024) = B_{lim}	801 586	1.47	623 172	410 000	-34	171	175
SSB (2024) = B_{pa}	630 357	1.01	723 893	570 000	-21	113	116
SSB (2024) = MSY $B_{trigger}$	630 357	1.01	723 893	570 000	-21	113	116
SSB (2024) = SSB (2023)	354 500	0.47	862 333	862 333	0	20	22
$F = F_{2022}$	284 943	0.36	892 853	943 758	5.7	-3.5	-2.3

* SSB_{2024} relative to SSB_{2023}.
** Catch in 2023 relative to the sum of autonomous quotas in 2022 (295 300 tonnes = EU quota of 251 900 tonnes + Russian quota of 43 400 tonnes).
*** Advice value this year relative to the advice value last year (291 745 tonnes).
^ Advice value this year relative to the advice value last year for the MAP range F_{lower} (214 000 tonnes) and MAP range F_{upper} (373 210 tonnes)
^^ MAP multiannual plan (EU, 2016, 2019).

The advised catches for 2023 have declined by 15% compared to those for 2022 mainly because of the low 2021 year class.

Basis of the advice

Table 3 Sprat in subdivisions 22–32. The basis of the advice.

Advice basis	EU Baltic multiannual plan
Management plan	This stock is shared between the EU and Russia. An EU multiannual plan (MAP) in place for stocks in the Baltic Sea includes sprat (EU, 2016, 2019). The advice, based on the F_{MSY} ranges used in the management plan, is considered precautionary. Russia does not have a management plan for this stock.

Quality of the assessment

This year's assessment is consistent with last year's. Species misreporting of sprat has occurred in the past, and there is evidence of sprat being misreported as herring and flounder in recent years. These effects have not been quantified or included in the assessment.

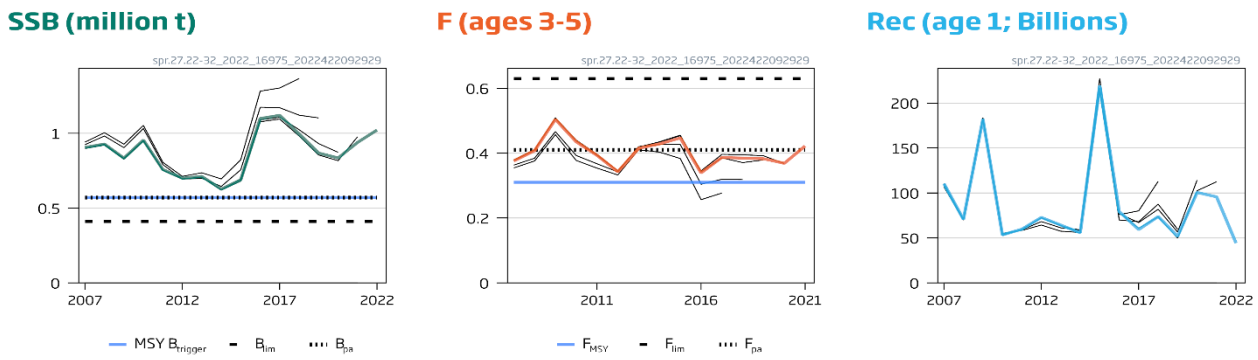

Figure 2 Sprat in subdivisions 22–32. Historical assessment results (final-year recruitment estimates predicted from the survey). The stock was interbenchmarked in 2020 with updated natural mortality data. The fishing mortality reference points were updated at the interbenchmark, and only assessment results from the last three years should be compared to the reference points indicated.

Issues relevant for the advice

Sprat is an important forage species for Baltic cod, and multispecies interactions should be considered when managing the sprat fishery (ICES, 2021a).

Reference points

Table 4 Sprat in subdivisions 22–32. Reference points, values, and their technical basis. Weights in tonnes.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	570 000	B_{pa}	ICES (2020)
	F_{MSY}	0.31	Stochastic simulations with Beverton–Holt stock–recruitment model	ICES (2020)
Precautionary approach	B_{lim}	410 000	Stock–recruitment relationship (average of biomasses which produce half of the maximal recruitment in the Beverton–Holt and Ricker models)	ICES (2020)
	B_{pa}	570 000	$B_{lim} \times \exp(1.645 \times \sigma)$, where $\sigma = 0.2$	ICES (2020)
	F_{lim}	0.63	Consistent with B_{lim}	ICES (2020)
	F_{pa}	0.41	F_{P05}; the F that leads to SSB ≥ B_{lim} with 95% probability	ICES (2021b)
Management plan	MAP MSY $B_{trigger}$	570 000	MSY $B_{trigger}$	ICES (2020)
	MAP B_{lim}	410 000	B_{lim}	ICES (2020)
	MAP F_{MSY}	0.31	F_{MSY}	ICES (2020)
	MAP target range F_{lower}	0.22–0.31	Consistent with the ranges that result in a no more than 5% reduction in long-term yield compared with MSY	ICES (2020)
	MAP target range F_{upper}	0.31–0.41	Consistent with the ranges that result in a no more than 5% reduction in long-term yield compared with MSY	ICES (2020)

Basis of the assessment

Table 5 Sprat in subdivisions 22–32. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2022a)
Assessment type	Age-based analytical assessment, XSA (ICES, 2022b) that uses catches in the model and in the forecast
Input data	Commercial catches; two acoustic surveys (BASS [A7041], BIAS [A1588]); natural mortalities from multispecies model (SMS) until 2018, 2019 =2018 , 2020–2021 from regression with eastern Baltic cod biomass of individuals ≥ 20 cm, fixed maturity ogive
Discards and bycatch	Not included, considered negligible
Indicators	None
Other information	Interbenchmark in 2020 (ICES, 2020)
Working group	Baltic Fisheries Assessment Working Group (WGBFAS)

History of the advice, catch, and management

Table 6 Sprat in subdivisions 22–32. ICES advice, the agreed TAC, and ICES estimates of catch. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	Agreed TAC	ICES catch
1987	Catch could be increased in subdivisions 22, 24, and 25. *Status quo* F for subdivisions 27 and 29–32		117 200	88 200
1988	Catch could be increased in subdivisions 22–25	-	117 200	80 300
1989	Catch could be increased for subdivisions 26 and 28. *Status quo* F for subdivisions 27 and 29–32	72 000	142 000	85 800
1990		72 000	150 000	85 600
1991	TAC	150 000	163 000	103 200
1992	*Status quo* F	143 000	290 000	142 100
1993	Increase in yield by increasing F	-	415 000	178 100
1994	Increase in yield by increasing F	-	700 000	288 800
1995	TAC	205 000	500 000	312 600
1996	Little gain in long-term yield at higher F	279 000	550 000	441 000
1997	No advice	-	550 000	529 400
1998	*Status quo* F	343 000	550 000	470 800
1999	Proposed F_{pa}	304 000	467 005	422 600
2000	Proposed F_{pa}	192 000	400 000	389 100
2001	Proposed F_{pa}	314 000	355 000	342 200
2002	Proposed F_{pa}	369 000	380 000	343 200
2003	Below proposed F_{pa} (TAC should be set on central Baltic herring considerations)	300 000	310 000	308 300
2004	Below proposed F_{pa} (TAC should be set on central Baltic herring considerations)	474 000	420 000	373 700
2005	TAC should be set on central Baltic herring considerations	< 614 000	550 000	405 200
2006	Agreed management plan	439 000	468 000	352 100

Year	ICES advice	Catch corresponding to advice	Agreed TAC	ICES catch
2007	< F_{pa}	< 477 000	454 000*	388 900
2008	< F_{pa}	< 432 000	454 000*	380 500
2009	< F_{pa}	< 291 000	399 000*	407 100
2010	< F_{pa}	< 306 000	380 000*	341 500
2011	< F_{pa}	< 242 000	322 700**	267 900
2012	MSY transition scheme	< 242 000	255 100**	235 000
2013	F < F_{MSY}	< 278 000	278 000**	272 400
2014	MSY approach	< 247 000	267 900**	243 800
2015	MSY approach	< 222 000	240 200**	247 200
2016	MSY approach (F = 0.26)	≤ 205 000	243 000**	246 500
2017	MSY approach (F = 0.26)	≤ 314 000	303 593**	285 701
2018	MAP target F ranges: F_{lower} to F_{upper} (0.19–0.27), but F higher than F_{MSY} = 0.26 only under conditions specified in MAP	219 152–301 722, but catch higher than 291 715 only under conditions specified in MAP	304 900**	308 827
2019	MAP target F ranges: F_{lower} to F_{upper} (0.19–0.27), but F higher than F_{MSY} = 0.26 only under conditions specified in MAP	225 752–311 523, but catch higher than 301 125 only under conditions specified in MAP	313 100**	314 147
2020	MAP target F ranges: F_{lower} to F_{upper} (0.19–0.27), but F higher than F_{MSY} = 0.26 only under conditions specified in MAP	169 965–233 704, but catch higher than 225 786 only under conditions specified in MAP	256 700**	271 531
2021	Management plan	247 952 (range 181 567–316 833)	268 458**	284 890
2022	Management plan	291 745 (range 214 000– 373 210)	295 300***	
2023	Management plan	249 237 (range 183 749–317 905)		

* EU autonomous quota and doesn't include Russian catches.
** TAC is calculated as EU + Russian autonomous quotas.
*** TAC is calculated as EU quota + Russian autonomous quota of 43 400 tonnes.

History of the catch and landings

Table 7 Sprat in subdivisions 22–32. Catch distribution by fleet in 2021 as estimated by ICES.

Catch (2021)	Landings	Discards
284 890 tonnes	Most of the catch is taken by pelagic trawlers	Discarding is considered to be negligible
	284 890 tonnes	

Table 8 Sprat in subdivisions 22–32. History of ICES catches presented for each country participating in the fishery. All weights are in tonnes.

Year	Denmark	Estonia	Finland	German Dem. Rep.	German Fed. Rep.	Latvia	Lithuania	Poland	Russia	Sweden	USSR	Total
1977	7 200		6 700	17 200	800			38 800		400	109 700	180 800
1978	10 800		6 100	13 700	800			24 700		800	75 500	132 400
1979	5 500		7 100	4 000	700			12 400		2 200	45 100	77 100
1980	4 700		6 200	100	500			12 700		2 800	31 400	58 100
1981	8 400		6 000	100	600			8 900		1 600	23 900	49 300
1982	6 700		4 500	1 000	600			14 200		2 800	18 900	48 700
1983	6 200		3 400	2 700	600			7 100		3 600	13 700	37 300
1984	3 200		2 400	2 800	700			9 300		8 400	25 900	52 500
1985	4 100		3 000	2 000	900			18 500		7 100	34 000	69 500
1986	6 000		3 200	2 500	500			23 700		3 500	36 500	75 800
1987	2 600		2 800	1 300	1 100			32 000		3 500	44 900	88 200
1988	2 000		3 000	1 200	300			22 200		7 300	44 200	80 300
1989	5 200		2 800	1 200	600			18 600		3 500	54 000	85 800
1990	800		2 700	500	800			13 300		7 500	60 000	85 600
1991	10 000		1 600		700			22 500		8 700	597 00*	103 200
1992	24 300	4 100	1 800		600	17 400	3 300	28 300	8 100	54 200		142 100
1993	18 400	5 800	1 700		600	12 600	3 300	31 800	11 200	92 700		178 100
1994	60 600	9 600	1 900		300	20 100	2 300	41 200	17 600	135 200		288 800
1995	64 100	13 100	5 200		200	24 400	2 900	44 200	14 800	143 700		312 600
1996	109 100	21 100	17 400		200	34 200	10 200	72 400	18 200	158 200		441 000
1997	137 400	38 900	24 400		400	49 300	4 800	99 900	22 400	151 900		529 400
1998	91 800	32 300	25 700		4 600	44 900	4 500	55 100	20 900	191 100		470 800
1999	90 200	33 200	18 900		200	42 800	2 300	66 300	31 500	137 300		422 600
2000	51 500	39 400	20 200		0	46 200	1 700	79 200	30 400	120 600		389 100
2001	39 700	37 500	15 400		800	42 800	3 000	85 800	32 000	85 400		342 200
2002	42 000	41 300	17 200		1 000	47 500	2 800	81 200	32 900	77 300		343 200
2003	32 000	29 200	9 000		18 000	41 700	2 200	84 100	28 700	63 400		308 300
2004	44 300	30 200	16 600		28 500	52 400	1 600	96 700	25 100	78 300		373 700
2005	46 500	49 800	17 900		29 000	64 700	8 600	71 400	29 700	87 800		405 200
2006	42 100	46 800	19 000		30 800	54 600	7 500	54 300	28 200	68 700		352 100
2007	37 600	51 000	24 600		30 800	60 500	20 300	58 700	24 800	80 700		388 900
2008	45 900	48 600	24 300		30 400	57 200	18 700	53 300	21 000	81 100		380 500
2009	59 700	47 300	23 100		26 300	49 500	18 800	81 900	25 200	75 300		407 100
2010	43 600	47 900	24 400		17 800	45 900	9 200	56 700	25 600	70 400		341 500
2011	31 400	35 000	15 800		11 400	33 400	9 900	55 300	19 500	56 200		267 900
2012	11 400	27 700	9 000		11 300	30 700	11 300	62 100	25 000	46 500		235 000
2013	25 600	29 800	11 100		10 300	33 300	10 400	79 700	22 600	49 700		272 400
2014	26 600	28 500	11 700		10 200	30 800	9 600	56 900	23 400	46 000		243 800
2015	22 500	24 000	12 000		10 300	30 500	11 000	62 200	30 700	44 100		247 200
2016	19 100	23 700	16 900		10 900	28 100	11 600	59 300	34 600	42 400		246 500
2017	27 100	25 300	16 100		13 600	35 700	12 500	68 400	38 700	48 300		285 701
2018	24 590	29 341	16 430		15 213	37 099	16 250	79 395	41 374	49 135		308 827
2019	30 888	29 178	16 136		14 644	38 914	16 228	82 398	40 694	45 062		314 147
2020	26 447	24 270	12 498		8 929	28 893	11 164	72 539	45 716	41 071		271 531***
2021**	24 753	25 582	14 773		11 959	29 091	11 369	79 198	43 360	44 805		284 890***

* Sum of landings by Estonia, Latvia, Lithuania, and Russia.

** Preliminary

*** Possible misreporting of sprat as flounder from subdivisions 24 and 25 of about 2–3 kt not included.

Summary of the assessment

Table 9 Sprat in subdivisions 22–32. Assessment summary. Weights are in tonnes. Numbers in thousands.

Year	Recruitment age 1	SSB*	Catches	F ages 3–5
	thousands	Tonnes		
1974	52 788 000	940 000	242 000	0.37
1975	18 704 000	726 000	201 000	0.40
1976	182 883 000	625 000	195 000	0.38
1977	45 092 000	1 044 000	181 000	0.34
1978	16 404 000	695 000	132 000	0.34
1979	32 558 000	377 000	77 000	0.26
1980	20 055 000	227 000	58 000	0.30
1981	64 216 000	199 000	49 000	0.183
1982	34 160 000	254 000	49 000	0.30
1983	124 733 000	394 000	37 000	0.136
1984	49 916 000	616 000	53 000	0.180
1985	42 731 000	605 000	70 000	0.166
1986	18 170 000	570 000	76 000	0.21
1987	40 820 000	461 000	88 000	0.27
1988	15 299 000	403 000	80 000	0.24
1989	42 788 000	423 000	86 000	0.22
1990	50 562 000	556 000	86 000	0.137
1991	57 662 000	775 000	103 000	0.173
1992	101 915 000	1 045 000	142 000	0.20
1993	92 574 000	1 360 000	178 000	0.163
1994	67 362 000	1 374 000	289 000	0.26
1995	254 162 000	1 429 000	313 000	0.35
1996	158 602 000	1 810 000	441 000	0.30
1997	58 536 000	1 776 000	529 000	0.42
1998	152 162 000	1 354 000	471 000	0.40
1999	55 576 000	1 353 000	421 000	0.37
2000	103 359 000	1 322 000	389 000	0.32
2001	51 398 000	1 199 000	342 000	0.29
2002	58 822 000	944 000	343 000	0.40
2003	133 174 000	833 000	308 000	0.39
2004	249 547 000	1 045 000	374 000	0.49
2005	54 617 000	1 331 000	405 000	0.45
2006	85 250 000	1 061 000	352 000	0.38
2007	110 412 000	906 000	388 000	0.38
2008	70 590 000	928 000	381 000	0.41
2009	182 171 000	834 000	407 000	0.50
2010	53 347 000	955 000	342 000	0.44
2011	59 726 000	758 000	268 000	0.39
2012	72 774 000	700 000	231 000	0.34
2013	64 260 000	712 000	272 000	0.41
2014	55 679 000	627 000	244 000	0.43
2015	219 398 000	689 000	247 000	0.45
2016	79 387 000	1 099 000	247 000	0.34
2017	59 226 000	1 120 000	286 000	0.39
2018	73 710 000	996 000	309 000	0.38
2019	51 786 000	868 000	314 000	0.38
2020	100 551 000	835 000	272 000	0.37
2021	95 644 000	939 000	285 000	0.42
2022	44 213 000**	1 022 000***		

* At spawning time.
** Predicted from survey data (RCT3 analysis).
*** Predicted.

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Download the stock assessment data and figures.

Recommended citation: ICES. 2022. Sprat (*Sprattus sprattus*) in Subdivisions 22-32 (Baltic Sea). *In* Report of the ICES Advisory Committee, 2022. ICES Advice 2022, spr.27.22-32. https://doi.org/10.17895/ices.advice.19453856.

Tusk (*Brosme brosme*) in Subarea 14 and Division 5.a (East Greenland and Iceland grounds)

ICES advice on fishing opportunities

ICES advises that when the Icelandic management plan is applied, catches in the fishing year 1 September 2022 to 31 August 2023 should be no more than 4464 tonnes.

Stock development over time

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

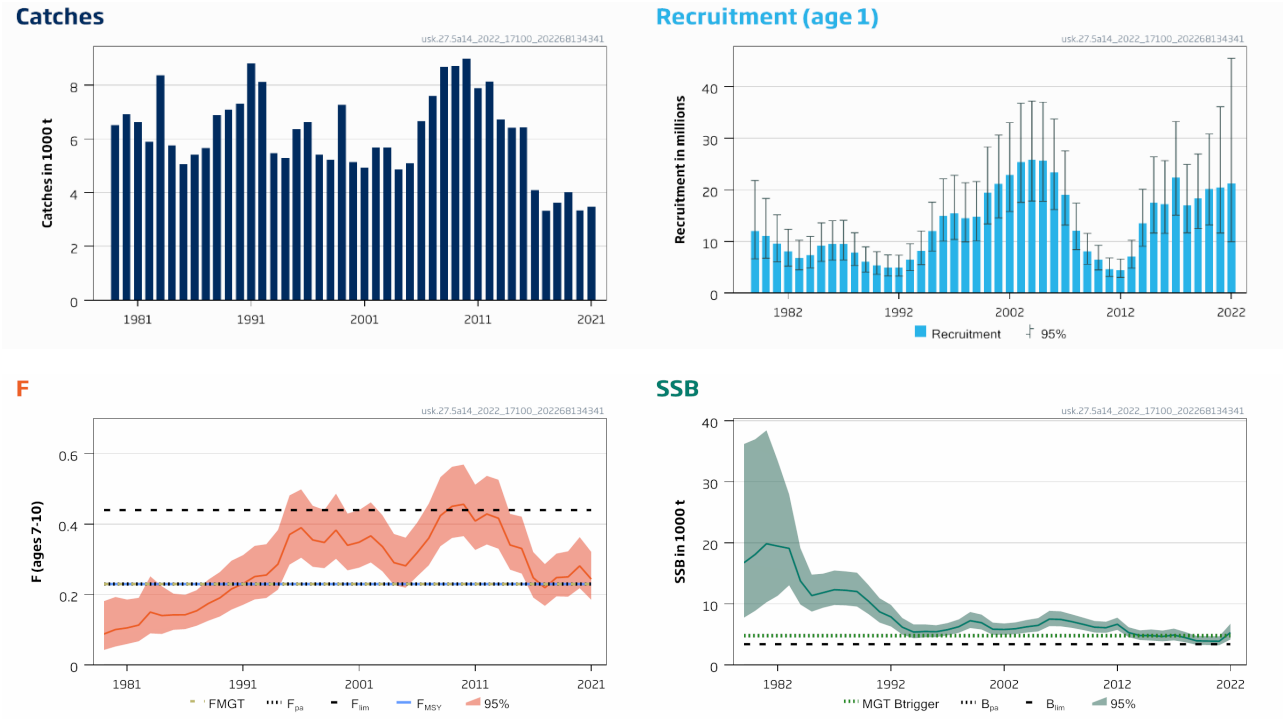

Figure 1 Tusk in Subarea 14 and Division 5.a. Summary of the stock assessment in Division 5.a. The top left panel shows total catches. The top right panel shows recruitment, the final-year recruitment estimate is included. The lower left panel shows trends in F and right panel the SSB.

Catch scenarios

The catch scenario is provided for the fishery year from 1 September 2022 to 31 August 2023.

Table 1 Tusk in Subarea 14 and Division 5.a. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
$F_{ages\ 7–10}$(2022)	0.25	Assuming status quo F (average over the last three years) for the 2022 part of fishing year 2021/2022 and F_{mgt} for the remainder of 2022
SSB 2023	5 902	Short-term forecast; in tonnes
$R_{age\ 1}$ (2023)	17 502	Resampled from the years 2013-2022; in thousands
Catch (2022)	4 224	Results from $F_{ages\ 7–10}$ (2022); in tonnes

Table 2 Tusk in Subarea 14 and Division 5.a. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2022/2023)	F (2023)	SSB (2024)	% SSB change*	% TAC change**	% advice change
Management plan	4 464	0.23	6 945	18%	105.5%	105.5%

* SSB in 2024 relative to SSB in 2023.
** Advice value for 2022/2023 relative to the TAC in 2021/2022 (2172 t).

The advice for 2022/2023 is higher than the advice in 2021/2022 because of a change in the basis of the advice and reference points.

Basis of the advice

Table 3 Tusk in Subarea 14 and Division 5.a. The basis of the advice.

Advice basis	Management plan for the stock component in Division 5.a (ICES, 2017a)
Management plan	The Icelandic Ministry of Food, Agriculture and Fisheries management plan for Icelandic tusk has been evaluated by ICES (ICES, 2022a). It is considered to be precautionary and conforms to ICES MSY approach. According to the management plan, $F_{y/y+1}$, the advice fishing mortality that is applied from 1st September year 'y' to 31st August year 'y+1' is calculated from the HCR as: $$F_{Y/Y+1} = min\left(\frac{SSB_Y}{MGT\ B_{trigger}}, 1\right) * F_{mgt}$$ To calculate the catch in the last four months of the year "y" (September-December), the following F is used in the year "y": $$F_{\mathrm{Y}} = \frac{2}{3} * F_{\mathrm{SQ}} + \frac{1}{3} * F_{\mathrm{mgt}}$$ In year "y+1" $F_{Y/Y+1}$ is used. Finally, the catch advice for the year "y/y+1" is calculated using the following formula: $$C_{Y/Y+1} = \frac{1}{3} * \mathrm{C}[F_{\mathrm{Y}}] + \frac{2}{3} * C[F_{\mathrm{Y/Y+1}}]$$ Where the catch C[.] is calculated using the Baranov catch equation with the corresponding biomass, natural mortality and fishing mortality values in each year.

Quality of the assessment

In the evaluation of the management plan (MP) for tusk in Icelandic waters (ICES, 2022a), the basis for assessment was revised and the adopted harvest control rule (HCR) was considered to be in accordance with the precautionary approach and consistent with ICES MSY framework.

A higher proportion of catches in Subarea 14 have been reported in recent years. If these catches continue, they should be sampled to ensure that data are representative of the full stock. The Greenlandic deep-sea survey has shown that an unknown proportion of the stock extends from the Icelandic exclusive economic zone (EEZ) and along the east Greenland continental shelf edge down to 62°north.

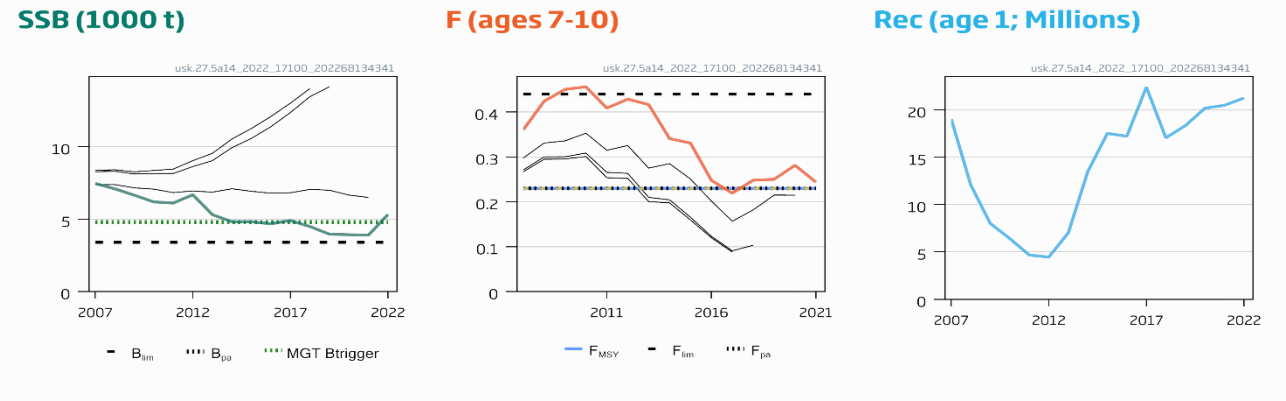

Figure 2 Tusk in Subarea 14 and Division 5.a. Historical assessment results. Final-year recruitment and biomass estimates are included. No ICES assessment was conducted in 2020. Note that this year's assessment was based on a newly benchmarked model. Prior to the benchmark, recruitment was estimated at age 3 and is not shown.

Issues relevant for the advice

This stock is classified as Category 4 in the NEAFC categorization of deep-sea species/stocks (NEAFC, 2016). This implies that fisheries are primarily restricted to coastal state exclusive economic zones (EEZs), and therefore management measures are not taken by NEAFC unless complementary to coastal state conservation and management measures.

Reference points

Table 4 Tusk in Subarea 14 and Division 5.a. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	4800	B_{pa}	ICES (2022a)
	F_{MSY}	0.23	F_{pa}	
Precautionary approach	B_{lim}	3400	$B_{pa} \times e^{-1.645 * \sigma B}$, using the default $\sigma_B = 0.2$	
	B_{pa}	4800	B_{loss} (SSB in 2016)	
	F_{lim}	0.44	Fishing mortality that in stochastic equilibrium will result in median SSB at B_{lim}.	
	F_{pa}	0.23	Maximum F at which the probability of SSB falling below B_{lim} is < 5%	
Management plan	MGT $B_{trigger}$	4800	From the management plan	
	F_{mgt}	0.23	From the management plan	

Basis of the assessment

Table 5 Tusk in Subarea 14 and Division 5.a. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2022b)
Assessment type	Analytical age-based assessment (SAM model)
Input data	Icelandic groundfish survey (G3239), autumn survey (G4493), gillnet survey (N2702) and data from commercial catches
Discards and bycatch	Discarding is considered negligible
Indicators	None
Other information	Last benchmarked in 2022 (ICES, 2022a)
Working group	Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources (WGDEEP)

History of the advice, catch, and management

Table 6 Tusk in Subarea 14 and Division 5.a. ICES advice for Division 5.a, catches and TACs. All weights are in tonnes. The EU sets a small TAC (21 tonnes since 2016) exclusively for bycatches and for subareas 1, 2, and 14 combined.

Year	ICES advice	Catch corresponding to advice	TAC Icelandic Division 5.a*	Greenland TAC for Subarea 14**	ICES catches Division 5.a*	ICES catches **
2005	^		3500		4901	5099
2006	^		3500		5928	6669
2007	^		5000		7942	7581
2008	^		5500		7594	8215
2009	Constrain catches to 5 000 t	< 5000	5500		8162	8295
2010	Biennial	< 5000	5500		8382	8988
2011	Fishing at $F_{0.1}$	< 6000	6000		7777	7565
2012	Biennial	< 6000	7000		7401	8014
2013	Fishing at F_{MSY} (F_{max})	< 6700	6400		6833	6283
2014	No new advice, same as 2013	< 6700	5900		5881	6055
2015	Fishing at F_{MSY}	< 3950	3700	1500	4958	5721
2016	Fishing at F_{MSY}	< 3440	3000	1500	4121	3965
2017	Fishing at F_{MSY}	≤ 3780	3380	1500	2418	3100
2017/2018	Management plan	≤ 4370	3770	1500	3139	3621
2018/2019	Management plan	≤ 3776	3100	1500	3232	4037
2019/2020	Management plan	≤ 3856	3856	1500	3241	3536
2020/2021	No ICES advice		2289***	1500	2949	3480
2021/2022	Management plan	≤ 2172	2172	1500		
2022/2023	Management plan	≤ 4464				

* Icelandic national fishing year from 1 September ending 31 August.
** Calendar year (last year in the Icelandic national fishing year).
*** Domestic advice and TAC (no ICES advice requested due to the COVID-19 disruption).
^ Prior to 2008/2009 the advice for tusk was for the entire Northeast Atlantic and was not split into several assessment units.

History of the catch and landings

This stock is distributed primarily in Icelandic waters and there are no reported catches from the NEAFC Regulatory Area.

Table 7 Tusk in Subarea 14 and Division 5.a. Catch distribution by fleet in the calendar year 2021 as estimated by ICES.

Catch (2021)	Landings		Discards
3480 t	Longlines 95%	Other gears 5%	Negligible
	3480 t		

Table 8 Tusk in Subarea 14 and Division 5.a. History of official catches by country and calendar year in Division 5.a. All weights are in tonnes.

Year	USSR/Russia	Faroes	Germany	Iceland	Norway	UK	Total
1973	0	3363	576	2377	911	391	7618
1974	0	3172	375	1898	893	230	6568
1975	0	2445	384	1694	975	254	5752
1976	0	2397	334	3073	1352	94	7150
1977	0	2818	212	3170	1796	0	7996
1978	0	2168	0	3386	812	0	6366
1979	0	2050	0	3580	845	0	6475
1980	0	2873	0	3109	928	0	6910
1981	0	2624	0	2864	1025	0	6513
1982	0	2410	0	2801	666	0	5877
1983	0	4046	0	3468	772	0	8286
1984	0	2008	0	3430	254	0	5692
1985	0	1885	0	3064	111	0	5060
1986	0	2811	0	2549	21	0	5381
1987	0	2638	0	2987	19	0	5644

Year	USSR/Russia	Faroes	Germany	Iceland	Norway	UK	Total
1988	0	3757	0	3087	20	0	6864
1989	0	3908	0	3158	10	0	7076
1990	0	2475	0	4821	0	0	7296
1991	0	2286	0	6449	0	0	8735
1992	0	1567	0	6432	0	0	7999
1993	0	1333	0	4086	0	0	5419
1994	0	1217	0	4065	0	0	5282
1995	0	1168	1	5151	0	0	6320
1996	11	916	1	5540	3	0	6471
1997	0	579	0	4816	0	0	5395
1998	0	1080	1	4130	0	0	5211
1999	0	1041	2	5821	391	2	7257
2000	0	10	0	4727	374	2	5114
2001	0	1150	1	3397	285	5	4838
2002	0	1279	0	3910	372	2	5563
2003	0	1198	1	4024	373	2	5598
2004	0	1478	1	3135	214	2	4830
2005	0	1157	4	3539	303	41	5044
2006	0	1244	2	5054	299	2	6601
2007	0	1250	0	5987	300	1	7538
2008	0	1398	0	6934	298	0	8629
2009	0	1516	0	6953	210	0	8679
2010	0	1794	0	6919	263	0	8976
2011	0	1655	0	5847	198	0	7701
2012	0	1310	0	6344	217	0	7872
2013	0	1132	0	4979	192	0	6302
2014	0	742	0	4995	425	0	6163
2015	0	637	0	4001	198	0	4836
2016	0	543	0	2649	302	0	3494
2017	0	492	0	1833	216	0	2541
2018	0	517	0	2097	326	0	2940
2019	0	549	0	2579	316	0	3445
2020	0	558	0	2358	271	0	3187
2021	0	342	0	2049	388	0	2779

Table 9 Tusk in Subarea 14 and Division 5.a. History of official catches by country and calendar year in Subarea 14. All weights are in tonnes. There have been no catches in the NEAFC Regulatory Area since 2010.

Year	Faroes	Germany	Greenland	Iceland	Norway	USSR/Russia*	Spain	UK	Total
1973	16	9	0	0	0	0	0	2	27
1974	259	2	0	15	0	0	0	1	277
1975	29	17	0	13	138	0	0	0	197
1976	0	5	0	89	47	0	0	1	142
1977	167	16	0	0	40	0	0	1	224
1978	0	47	0	0	38	0	0	0	85
1979	0	27	0	0	0	0	0	0	27
1980	0	13	0	0	0	0	0	0	13
1981	110	10	0	0	0	0	0	0	120
1982	0	10	0	0	0	0	0	0	10
1983	74	11	0	0	0	0	0	0	85
1984	0	5	0	0	58	0	0	0	63
1985	0	4	0	0	0	0	0	0	4
1986	33	2	0	0	0	0	0	0	35
1987	13	2	0	0	0	0	0	0	15
1988	19	2	0	0	0	0	0	0	21
1989	13	1	0	0	0	0	0	0	14
1990	0	2	0	0	7	0	0	0	9
1991	0	2	0	0	68	0	0	1	71

Year	Faroes	Germany	Greenland	Iceland	Norway	USSR/Russia*	Spain	UK	Total
1992	0	0	0	3	120	0	0	0	123
1993	0	0	0	1	39	0	0	0	40
1994	0	0	0	0	17	0	0	0	17
1995	0	0	0	0	30	0	0	0	30
1996	0	0	0	0	158	0	0	0	158
1997	0	0	0	10	9	0	0	0	19
1998	0	0	0	0	12	0	0	0	12
1999	0	0	0	0	8	0	0	0	8
2000	0	0	0	11	11	0	3	0	25
2001	3	0	0	20	69	0	0	0	92
2002	4	0	0	86	30	0	0	0	120
2003	0	0	0	2	88	0	0	0	90
2004	0	0	0	0	40	0	0	0	40
2005	7	0	0	0	41	8	0	0	56
2006	3	0	0	0	19	51	0	0	73
2007	0	0	0	0	40	6	0	0	46
2008	0	0	33	0	7	0	0	0	40
2009	12	0	15	0	5	11	0	0	43
2010	7	0	0	0	5	0	0	0	12
2011	20	0	0	131	24	0	0	0	175
2012	33	0	0	174	46	0	0	0	253
2013	2	0	0	401	24	0	0	0	427
2014	145	0	74	0	35	0	0	0	254
2015	759	0	785	0	55	0	0	0	1599
2016	243	3	182	0	178	0	0	0	606
2017	281	0	358	0	141	0	0	0	781
2018	345	0	108	0	228	0	0	0	681
2019	41	1	66	0	458	0	0	0	566
2020	0	2	41	0	114	0	0	0	157
2021**	260	2	59	0	380	0	0	0	701

*Russian catches were taken in Subdivision 14.b.1 (Mid-Atlantic Ridge).
**Preliminary.

Summary of the assessment

Table 10 Tusk in Subarea 14 and Division 5.a. Assessment summary by calendar year in Division 5.a and Subarea 14. 'High' and 'Low' indicate 95% confidence intervals.

Year	Recruitment			Spawning-stock biomass			Catches	Fishing mortality		
	Age 1	High	Low	SSB	High	Low		Ages 7–10	High	Low
	thousands			tonnes			tonnes			
1979	12029	21824	6630	16740	36198	7741	6502	0.088	0.182	0.043
1980	11131	18350	6752	18117	36984	8874	6923	0.101	0.193	0.052
1981	9585	15161	6061	19868	38446	10268	6633	0.105	0.186	0.060
1982	8024	12348	5214	19476	33431	11347	5887	0.114	0.191	0.067
1983	6781	10230	4495	19104	27968	13049	8371	0.150	0.25	0.090
1984	7323	10992	4879	13763	19148	9892	5755	0.140	0.22	0.088
1985	9134	13608	6131	11377	14808	8741	5065	0.142	0.20	0.100
1986	9433	14005	6353	11850	14970	9380	5416	0.143	0.200	0.102
1987	9496	14107	6392	12333	15488	9820	5659	0.154	0.21	0.112
1988	7894	11687	5332	12238	15342	9762	6885	0.175	0.24	0.126
1989	6031	8956	4062	12030	15127	9567	7090	0.191	0.26	0.138
1990	5377	8016	3606	10471	13137	8347	7305	0.22	0.30	0.157
1991	4937	7386	3300	8713	10936	6942	8806	0.23	0.31	0.171
1992	4907	7330	3285	7875	9846	6299	8122	0.25	0.34	0.186
1993	6434	9543	4337	6198	7710	4982	5459	0.26	0.34	0.190
1994	8127	12021	5495	5396	6650	4378	5298	0.29	0.38	0.21
1995	11967	17617	8129	5491	6662	4526	6351	0.37	0.48	0.28

Year	Recruitment			Spawning-stock biomass			Catches	Fishing mortality		
	Age 1	High	Low	SSB	High	Low		Ages 7–10	High	Low
	thousands			tonnes			tonnes			
1996	14926	22152	10058	5451	6523	4554	6628	0.39	0.50	0.30
1997	15385	22809	10377	5782	6882	4858	5413	0.36	0.45	0.28
1998	14548	21386	9896	6284	7482	5278	5223	0.35	0.44	0.28
1999	14770	21614	10094	7257	8696	6055	7265	0.38	0.49	0.30
2000	19491	28323	13412	6929	8263	5811	5139	0.34	0.43	0.27
2001	21114	30628	14555	5863	6955	4942	4930	0.35	0.44	0.28
2002	22841	33034	15793	5814	6813	4962	5683	0.37	0.46	0.29
2003	25412	36793	17552	5940	6987	5050	5688	0.34	0.43	0.27
2004	25764	37205	17842	6264	7384	5314	4870	0.29	0.37	0.23
2005	25640	37010	17763	6497	7691	5488	5100	0.28	0.36	0.22
2006	23373	33760	16182	7523	8884	6370	6674	0.32	0.40	0.25
2007	19057	27555	13180	7466	8799	6334	7584	0.36	0.46	0.28
2008	12101	17430	8401	7098	8291	6077	8669	0.42	0.53	0.34
2009	8022	11568	5563	6659	7756	5717	8722	0.45	0.56	0.36
2010	6423	9258	4456	6192	7216	5314	8988	0.46	0.57	0.37
2011	4674	6800	3213	6115	7104	5264	7876	0.41	0.51	0.33
2012	4464	6577	3030	6684	7763	5755	8125	0.43	0.54	0.34
2013	7017	10235	4811	5317	6197	4562	6729	0.42	0.53	0.33
2014	13498	20136	9049	4825	5684	4097	6417	0.34	0.43	0.27
2015	17521	26405	11627	4825	5834	3991	6434	0.33	0.42	0.26
2016	17228	25658	11568	4680	5649	3877	4100	0.25	0.32	0.192
2017	22411	33259	15100	4904	5971	4027	3321	0.22	0.29	0.168
2018	17062	24946	11670	4493	5416	3727	3621	0.25	0.32	0.195
2019	18347	26945	12493	3965	4777	3292	4011	0.25	0.32	0.194
2020	20183	30835	13211	3928	4736	3257	3344	0.28	0.36	0.22
2021	20493	36125	11625	3899	4705	3232	3480	0.24	0.32	0.185
2022	21258	45511	9930	5322	6781	4177				

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Download the stock assessment data and figures.

Recommended citation: ICES. 2022. Blue ling (*Molva dypterygia*) in Subarea 14 and Division 5.a (East Greenland and Iceland grounds). *In* Report of the ICES Advisory Committee, 2022. ICES Advice 2022, usk.27.5a14. https://doi.org/10.17895/ices.advice.19453874

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

ICES advice on fishing opportunities[†]

Please note: the present advice replaces the advice given in September 2022.

ICES advises that when the long-term management strategy agreed by the European Union, the Faroe Islands, Iceland, and Norway is applied, catches in 2023 should be no more than 1 359 629 tonnes.

Stock development over time

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

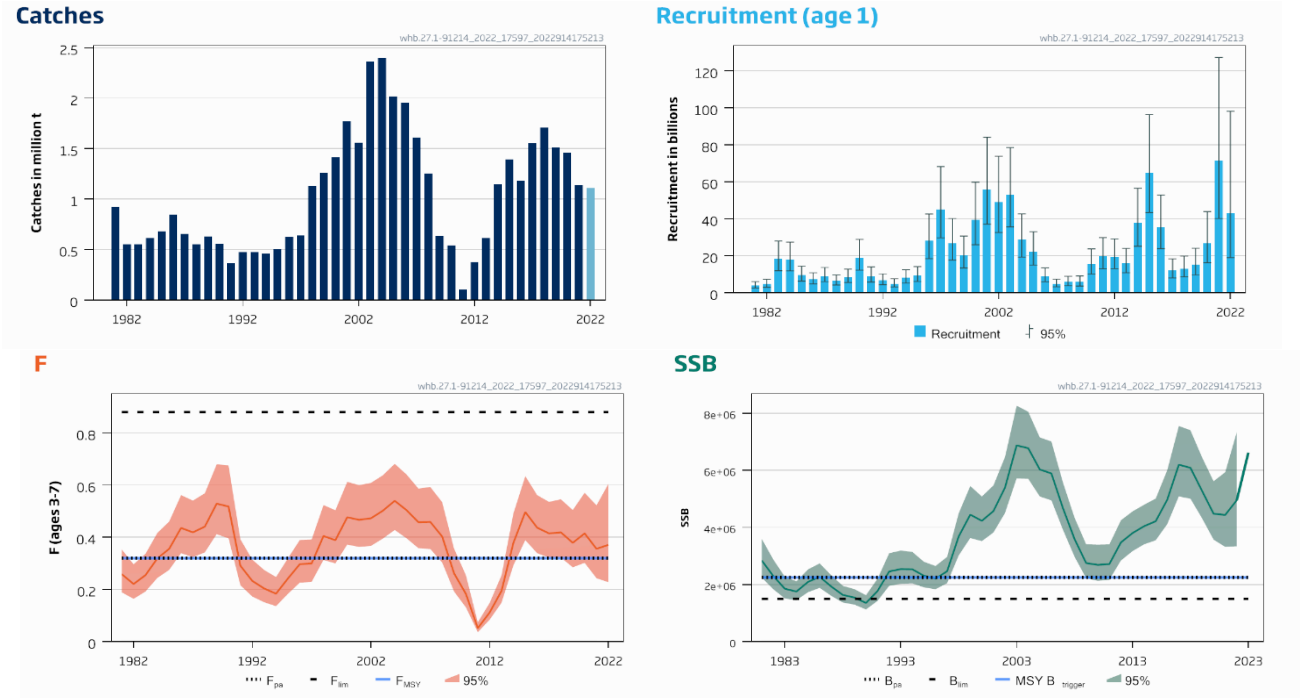

Figure 1 Blue whiting in subareas 1–9, 12, and 14. Summary of the stock assessment. The catch estimate for 2022 is preliminary. The assumed recruitment value for 2023 is shaded in a lighter colour.

Catch scenarios

Table 1 Blue whiting in subareas 1–9, 12, and 14. Values in the forecast and for the interim year.

Variable	Value	Notes
$F_{ages\ 3–7}$ (2022)	0.37	From the assessment (based on assumed 2022 catches)
SSB (2023)	6 621 207	From the assessment; in tonnes
$R_{age\ 1}$ (2022)	43 220 294	From the assessment; in thousands
$R_{age\ 1}$ (2023–2024)	22 537 250	Geometric mean (1996–2021); in thousands
Total catch (2022)	1 107 529	As estimated by ICES, based on declared national quotas and expected uptake; in tonnes

[†] Basis for the advice has changed. Text and tables throughout the advice sheet have been updated to reflect this.

Table 2 Blue whiting in subareas 1–9, 12, and 14. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2023)	F (2023)	SSB (2024)	% SSB change*	% catch change**	% advice change***
ICES advice basis						
Long-term management strategy: $F = F_{mgt}$	1359629	0.32	7781444	17.5	23	81
Other scenarios						
MSY approach: F_{MSY}	1359629	0.32	7781444	17.5	23	81
F = 0	0	0	9039585	37	−100	−100
F_{pa}	1359629	0.32	7781444	17.5	23	81
F_{lim}	3146002	0.88	6157129	−7	184	318
$SSB_{2024} = B_{lim}$^	8696303	6.503	1499996	−77	685	1055
$SSB_{2024} = B_{pa}$^	7715688	4.401	2249993	−66	597	925
$SSB_{2024} = MSY\ B_{trigger}$^	7715688	4.401	2249993	−66	597	925
$F = F_{2022}$	1550784	0.371	7605942	14.9	40	106
$SSB_{2024} = SSB_{2023}$	2631402	0.698	6621196	0	138	250
$Catch_{2023} = catch_{2022}$ ^	1107553	0.255	8013430	21	0	47
$Catch_{2023} = catch_{2022}$ −20%	886105	0.2	8217731	24	−20	17.7
$Catch_{2023} = catch_{2022}$ +25%	1384385	0.327	7758694	17.2	25	84
$Catch_{2023} = advice_{2022}$ −20%	602183	0.133	8480325	28	−46	−20
$Catch_{2023} = advice_{2022}$ +25%	940871	0.214	8167163	23	−15.0	25

* SSB 2024 relative to SSB 2023.
** Catch 2023 relative to expected catch in 2022 (1 107 529 tonnes).
*** Catch 2023 relative to advice for 2022 (752 736 tonnes).
^ SSB_{2024} and $Catch_{2023}$ values are the closest available approximation to either B_{lim}, B_{pa} and $B_{trigger}$ or target catches.

The advice for 2023 is 81 % higher than that for 2022 because of a large upward revision of estimated recruitment in 2021 (age 1).

Basis of the advice

Table 3 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 (Anon., 2016) and subsequently by UK in 2021 (Anon., 2021). ICES has evaluated the strategy, including clause 6.b, and found it to be precautionary (ICES, 2016a, 2017).

Quality of the assessment

This year's assessment shows a substantial revision of the historical values of F, SSB and recruitment for 2021. The 2020 year class (recruitment at age 1 in 2021) is now estimated to be at a historical high (71.6 billion), while last year's estimate was 22.8 billion. Fishing mortality (F) in 2021 is revised downward by 29%, and SSB in 2021 upward by 46%. The revision of the 2020 year class is due to a historically high survey index value in 2022 and is corroborated by high commercial catch-at-age of the same year class in 2021 and 2022. The catch for 2021 was 9.1% lower than the preliminary value used last year, which contributes to the revision of F and SSB in this year's assessment.

Other surveys, which are not presently used in the assessment, confirm a very large 2020 year class.

Preliminary catch data from Russian Federation for 2021 were used in the assessment, together with Russian catch samples that were available for the first half year. Historically, preliminary catches are comparable to ICES final estimated catch. Russian data on age composition of the catch in 2022 are not available. ICES used the historical (2019–2021) Russian proportion (13%) of total international catch weight to estimate the total catches for 2022. It was assumed that the age distribution of Russian catches is similar to the-catch-at age distribution available from other nations.

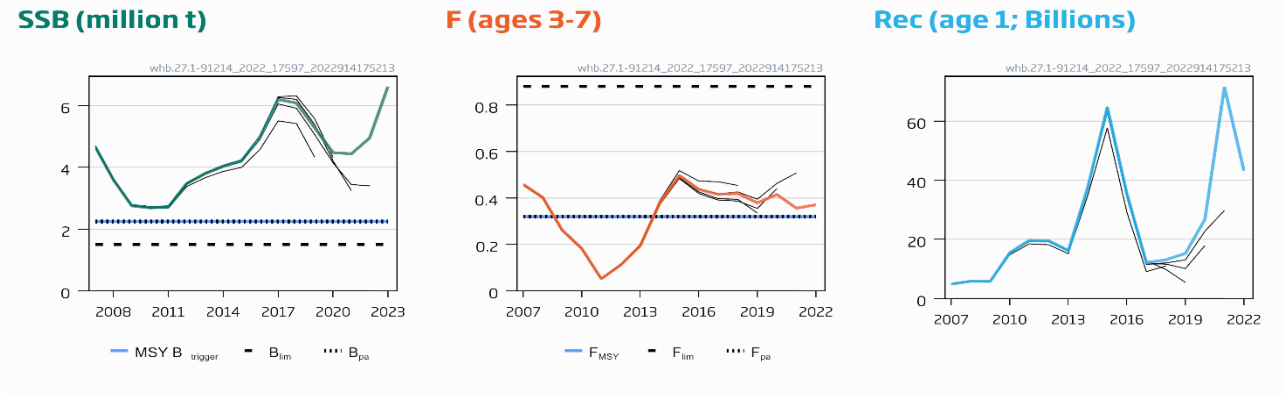

Figure 2 Blue whiting in subareas 1–9, 12, and 14. Historical assessment results.

Issues relevant for the advice

In the application of the long term management strategy, the 25% restriction in the increase of catch advice is not applied this year because clause 6.b states that a constraint on annual TAC variation shall not be applied when the catch advice deviates more than 40% from the catch advice of the preceding year. This clause was evaluated by ICES and found precautionary in 2017 (ICES, 2017).

There have been consistent deviations from the long-term management strategy since 2018 as evident from the sum of unilateral quotas. During the evaluation of the management strategy (ICES, 2016a), the implementation error in the form of a consistent overshoot of the TAC was not included. Therefore, failing to adhere to the advised catches as derived from the application of the MSY approach or the long-term management strategy may not be precautionary. Specifically, this may result in an increased risk for the stock to fall below B_{lim}, loss of catch in the long term and unsustainable utilization of the resource.

The 2020 year class is estimated to be historically high and will be fully recruited to the fishery in 2023.

F has exceeded F_{pa} since 2014. This does not adhere to the precautionary approach and in the long term could result in increased risk of SSB to fall below B_{lim} and loss of yields.

Reference points

Table 4 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 capped to F_{P05}	ICES (2016a)
Precautionary approach	B_{lim}	1500000 t	Approximately B_{loss}	ICES (2013a, 2013b, 2016a)
	B_{pa}	2250000 t	B_{lim} exp(1.645 × σ), with σ = 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}	0.32	F_{P05}; the F that leads to SSB ≥ B_{lim} with 95% probability	ICES(2016a, 2021a)
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 5 Blue whiting in subareas 1–9, 12, and 14. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2022a)
Assessment type	Age-based analytical assessment (SAM; ICES, 2021a) that uses catches in the model and the forecast
Input data	Commercial catches, preliminary estimate of catch-at-age in the year (Q1–Q2) in which the assessment is carried out. One survey index (International Blue Whiting Spawning Stock Survey [IBWSS; A1142] ages 1–8, 2004–2022, excluding 2010 and 2020). Time invariant maturity at age was estimated in 1994 by combining maturity ogives from the southern and northern areas. Time invariant natural mortality fixed at 0.2 for all ages, derived in the 1980s from age compositions before the targeted fishery started.
Discards and bycatch	Discard data since 2014 have been included in the assessment
Indicators	Estimates of recruitment from surveys: Joint Norwegian-Russian survey Barents Sea (G5348), International Ecosystem Survey in the Nordic Seas in May (A3675, [IESNS]), the Faroese bottom-trawl surveys (G1264 [FO-GFS-Q1], G3284 [FO-GFS-Q3]) and the Icelandic bottom-trawl survey in spring (G3239 [IS-SMB]).
Other information	The stock was benchmarked in 2012 (WKPELA; ICES, 2012). An interbenchmark protocol was conducted in the spring of 2016 (ICES, 2016b).
Working group	Working Group on Widely Distributed Stocks (WGWIDE; ICES 2022b)

History of the advice, catch, and management

Table 6 Blue whiting in subareas 1–9, 12, and 14. ICES advice and catch. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	TAC	ICES estimated landings	ICES estimated discards§	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 *status quo* 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}	628000	-			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
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^^^	1389953	6291	1396244
2016	MSY approach	≤ 76391	1147000^^^	1178180	5007	1183187

Year	ICES advice	Catch corresponding to advice	TAC	ICES estimated landings	ICES estimated discards§	ICES catch
2017	MSY approach	≤ 1342330	1675400^^^	1556030	2030	1558061
2018	Long-term management strategy	≤ 1387872	1727964^^^	1707152	4325	1711477
2019	Long-term management strategy	≤ 1143629	1483208^^^	1512922	2604	1515527
2020	Long-term management strategy	≤ 1161615	1478358^^^	1492420	2828	1495248
2021	Long-term management strategy	929292	1157604^^^	1139514	3936	1143450
2022	Long-term management strategy	≤ 752736	752736 §§§			1107529§§
2023	Long-term management strategy	≤ 1359629				

* NEAFC proposal for NEAFC regions 1 and 2.
** Agreed TAC from the four Coastal States of 2 million tonnes and an additional allocation of 100 000 tonnes to Russian Federation in the international zone.
*** Agreed TAC from the four Coastal States of 1.7 million tonnes and an additional allocation of 147 000 tonnes to Russian Federation and Greenland.
^ Agreed TAC from the four Coastal States of 1.1 million tonnes and an additional allocation to Russian Federation and Greenland.
^^ Agreed TAC from the four Coastal States of 0.59 million tonnes and an additional allocation of 16 000 tonnes to Russian Federation.
^^^ Sum of unilateral quotas (Note: the Coastal States agree a TAC of 1 161 615 tonnes for 2020 and 929 292 tonnes for 2021).
§ Discards estimates include BMS landings.
§§ Preliminary.
§§§ Official TAC agreed between the coastal states who have signed up to the MP.

History of the catch and landings

Table 7 Blue whiting in subareas 1–9, 12, and 14. Catch distribution by fleet in 2021, as estimated by ICES.

Total catch (2021)	Landings		Discards
1143450 tonnes	96% pelagic trawl	4% other gears	3936 tonnes
	1139514 tonnes		

Table 8 Blue whiting in subareas 1–9, 12, and 14. History of commercial catch; ICES estimated values are presented for each country participating in the fishery. Discard data are included since 2014. All weights are in tonnes.

Country	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Denmark	48659	18134	248	140	165	340	2167	35256	45178	39395	60868	87348	68716	58997	40321
Estonia													0		
Faroe Islands	317859	225003	58354	49979	16405	43290	85768	224700	282502	282416	356501	349838	336569	343372	202415
France	16638	11723	8831	7839	4337	9799	8978	10410	9659	10345	13369	16784	16095	13769	14612
Germany	34404	25259	5044	9108	278	6239	11418	24487	24107	20025	45555	47708	38244	42362	35327
Iceland	236538	159307	120202	87942	5887	63056	104918	182879	214870	186914	228934	292944	268356	243725	190146
Ireland	31132	22852	8776	8324	1195	7557	13205	21466	24785	27657	43238	49903	38836	40135	39514
Lithuania	9812	5338						4717		1129	5300			9543	21183
Netherlands	79875	78684	35686	33762	4595	26526	51635	38524	56397	58148	81156	121864	75020	62309	62017
Norway	539587	418289	225995	194317	20539	118832	196246	399520	489439	310412	399363	438426	351429	354033	233968
Poland											15889	12152	27185	47616	26077
Portugal	3897	4220	2043	1482	603	1955	2056	2150	2547	2586	2046	2497	3481	2819	2522
Spain	13557	14342	20637	12891	2416	6726	15274	32065	29206	31952	28920	24718	22782	23676	25509
Sweden	464	4	3	50	1	4	199	2	32	42	90	16**	54	25	40
UK (England + Wales)	12926	14147	6176	2475	27	1590	4100	11	131	1374+	3447	1864	4062	7458	8783
UK (Northern Ireland)							1232	2205	1119			4508	2899	2958	
UK (Scotland)	43540	38150	173	5496	1331	6305	8166	24630	30508	37173	64724	66682	54040	41344	65085
Russia	236369	225163	149650	112553	45841	88303	120674	152256	185763	173655	188449	170892	188006	181496	133605^
Greenland							2133				20212	23333	19753	19611	20190
Unallocated						3499									22137
Total	1625255	1260615	641818	526357	103620	384021	628169	1155279	1396244	1181850	1558061	1711461	1515527	1495248	1143450

* Only landings.

^ Russia 2021 preliminary data (Q1+Q2) submitted to WGWIDE 2021.

Table 9 Blue whiting in subareas 1–9, 12, and 14. ICES estimated catches by main fishing areas. All weights are in tonnes.

Area	Norwegian Sea fishery (subareas 1 and 2; divisions 5.a, 14.a–b)	Fishery in the spawning area (Subarea 12; divisions 5.b, 6.a–b, 7.a–c)	Directed- and mixed fisheries in the North Sea (Subarea 4; Division 3.a)	Total northern areas	Total southern areas (subareas 8, 9; divisions 7.d–k)	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***
2017	136565	1284105	45474	1466144	91917	1558061
2018	143204	1445957	43484	1632646	78831	1711477
2019	68593	1271883	44856	1385333	130194	1515527
2020	92084	1059197	64327	1215608	279640	1495248
2021	112082	801768	39509	953359	190091	1143450

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

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

*** The total includes only 1336 tonnes from UK (England + Wales; 2016 total catch from UK [England + Wales] = 1374 tonnes).

Table 10 Blue whiting in subareas 1–9, 12, and 14. Landings inside and outside the NEAFC Regulatory Area (RA), as estimated by ICES, as well as total landings. Weights are in tonnes.

Year	Inside the NEAFC RA	Outside the NEAFC RA	Total catches	Percentage inside the NEAFC RA
2017	263019	1295042	1558061	17
2018	176399	1535078	1711477	10
2019	340062	1175465	1515527	22
2020	246412	1248836	1495248	16
2021	154661	833047	987708*	16

* Without the Russian 2021 preliminary catch data (quarter 1 and 2) submitted to WGWIDE 2021 and the unallocated catch data.

Summary of the assessment

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

Year	Recruitment age 1 (thousands)			SSB (tonnes)			Catches (tonnes)*	F ages 3–7		
	Low	Value	High	Low	Value	High		Low	Value	High
1981	2549746	3948198	6113656	2245456	2846036	3607250	922980	0.189	0.259	0.354
1982	3001694	4696698	7348843	1835126	2299742	2881988	550643	0.164	0.221	0.297
1983	11937083	18293953	28036056	1512075	1854216	2273776	553344	0.192	0.255	0.337
1984	11900836	18077398	27459608	1454927	1756125	2119676	615569	0.244	0.319	0.417
1985	6312234	9550303	14449447	1732609	2095632	2534718	678214	0.275	0.356	0.461
1986	4792760	7206799	10836753	1884455	2274475	2745217	847145	0.339	0.436	0.562
1987	6047121	9113538	13734894	1603976	1933155	2329890	654718	0.324	0.419	0.541
1988	4251396	6409993	9664593	1370653	1638205	1957983	552264	0.342	0.441	0.569
1989	5609692	8492388	12856438	1297863	1546404	1842541	630316	0.412	0.529	0.680
1990	12270809	18840757	28928337	1128145	1356528	1631147	558128	0.396	0.518	0.676
1991	5826489	9049081	14054068	1429325	1777830	2211309	364008	0.216	0.291	0.393
1992	4365051	6698667	10279865	1951887	2460102	3100643	474592	0.173	0.233	0.315
1993	3184796	4942776	7671146	2027313	2543671	3191545	475198	0.151	0.204	0.275
1994	5277115	8113390	12474069	2042807	2535468	3146943	457696	0.136	0.184	0.248
1995	6125353	9322644	14188844	1901995	2308211	2801183	505176	0.183	0.242	0.320
1996	18496998	28090039	42658289	1836837	2207682	2653398	621104	0.226	0.297	0.390
1997	29748090	45080996	68316864	2048273	2467358	2972189	639681	0.229	0.300	0.392
1998	17717886	26696161	40224044	3017327	3685247	4501018	1131955	0.313	0.405	0.524
1999	13419599	20303064	30717343	3630259	4449851	5454480	1261033	0.300	0.389	0.504
2000	26002313	39448363	59847495	3521792	4233012	5087862	1412449	0.372	0.477	0.613
2001	37187292	55947436	84171646	3821738	4575712	5478433	1771805	0.363	0.467	0.600
2002	32631938	49106855	73899478	4504809	5401566	6476838	1556955	0.367	0.473	0.609
2003	35655989	52947963	78625974	5716742	6875173	8268346	2365319	0.395	0.502	0.638
2004	19302031	28714768	42717673	5701925	6778079	8057341	2400795	0.428	0.540	0.682
2005	14998683	22271163	33069881	5083744	6031586	7156150	2018344	0.396	0.504	0.641
2006	6005043	9009113	13515995	4948048	5891687	7015288	1956239	0.358	0.458	0.587
2007	3264414	4913368	7395256	3915203	4673775	5579322	1612269	0.355	0.459	0.593
2008	3862867	5883847	8962167	2971047	3593824	4347144	1251851	0.303	0.403	0.535
2009	3702391	5813482	9128311	2222003	2754203	3413874	634978	0.192	0.262	0.357
2010	10141289	15534228	23795027	2129607	2690487	3399087	539539	0.131	0.183	0.255
2011	12986631	19713440	29924598	2166277	2717639	3409333	103771	0.036	0.052	0.075
2012	13074672	19509226	29110475	2840438	3476370	4254677	375692	0.084	0.112	0.149
2013	10896851	16196200	24072726	3168694	3803134	4564602	613863	0.149	0.195	0.255
2014	25189811	37769539	56631551	3409524	4045006	4798933	1147650	0.292	0.379	0.492
2015	43428474	64728113	96474232	3548784	4218197	5013883	1390656	0.389	0.497	0.635
2016	23913789	35567778	52901145	4114630	4974200	6013339	1180786	0.339	0.437	0.562
2017	8062125	12172965	18379902	5085700	6199504	7557239	1555069	0.322	0.415	0.536
2018	8655930	13119298	19884169	5006887	6090429	7408460	1709856	0.322	0.419	0.546
2019	9638265	15254049	24141898	4319920	5284355	6464102	1512026	0.285	0.379	0.505
2020	16299607	26772174	43973408	3571612	4480563	5620836	1460507	0.302	0.415	0.571
2021	40213851	71562826	127350103	3320100	4440379	5938666	1139531	0.243	0.356	0.523
2022	19011128	43220294	98257917	3341999	4955777	7348815	1107529***	0.228	0.371	0.605
2023		22537250**			6621207^					

* Catches presented are the sum of product (SOP) values from catch- and weight-at-age used in the assessment model.
** Geometric mean (1996–2021).
*** Preliminary catches.
^ SSB calculated from the assessment and assumed recruitment for 2023.

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Download the stock assessment data and figures.

Recommended citation: ICES. 2022. Blue whiting (*Micromesistius poutassou*) in subareas 1-9, 12, and 14 (Northeast Atlantic and adjacent waters). *In* Report of the ICES Advisory Committee, 2022. ICES Advice 2022, whb.27.1-91214. https://doi.org/10.17895/ices.advice.21493974

Whiting (*Merlangius merlangus*) in Division 6.a (West of Scotland)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 4155 tonnes.

Management should be implemented at the stock level.

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}.

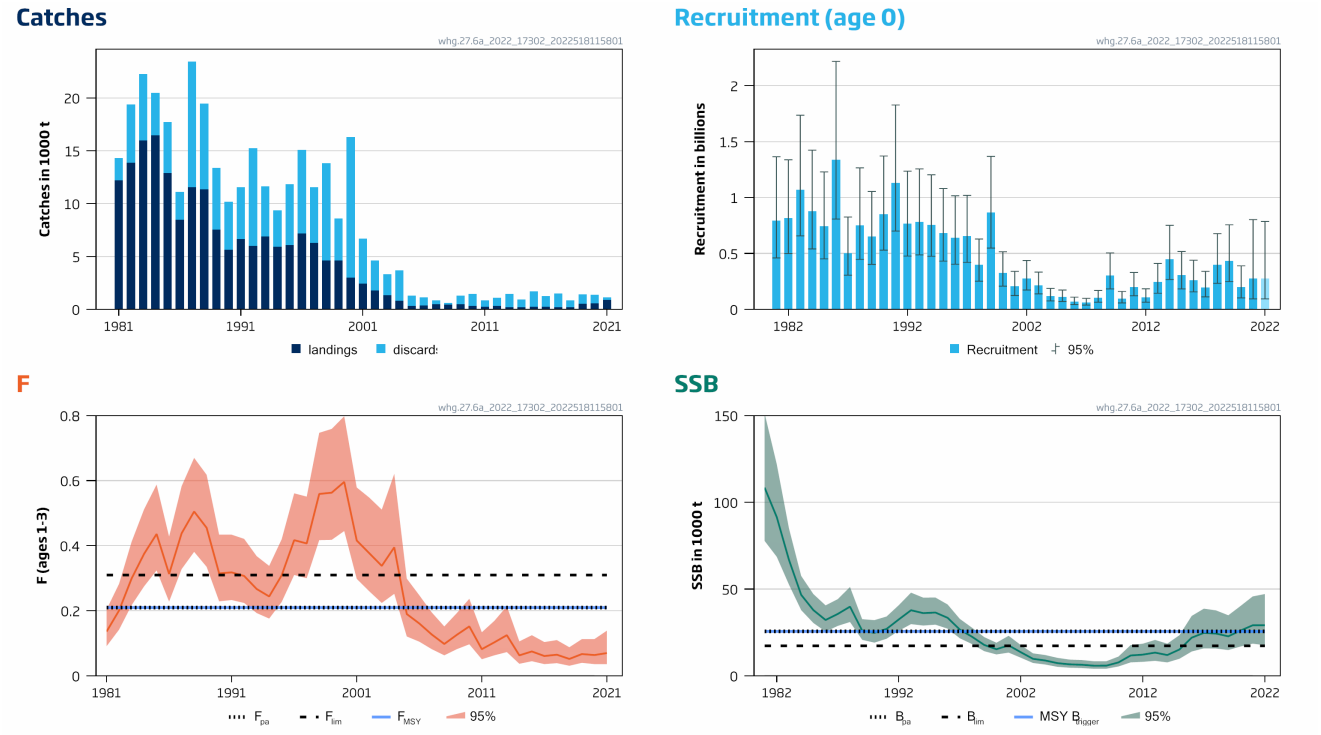

Figure 1 Whiting in Division 6.a. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour.

Catch scenarios

Table 1 Whiting in Division 6.a. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
$F_{ages\ 1–3}$ (2022)	0.07	$F = F_{average\ (2017–2021)}$ rescaled to F_{2021}
SSB (2023)	28 727	Short-term forecast; in tonnes
$R_{age\ 0}$ (2022-2023)	273 676	Median recruitment, resampled from the years 2012–2021; in thousands
Catch (2022)	1484	Short-term forecast; in tonnes
Projected landings (2022)	766	Short-term forecast; assuming average landings ratio by age 2019–2021^; in tonnes
Projected discards (2022)	718	Short-term forecast; assuming average discard ratio by age 2019–2021^; in tonnes

^ Due to inadequate discard sampling coverage of the fishery in 2021, average landings and discards proportions from 2019 –2020 are used for ages 0 and 1.

Table 2 Whiting in Division 6.a. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2023)	Projected landings* (2023)	Projected discards** (2023)	F_{total} (2023)	$F_{projected\ landings}$ (2023)	$F_{projected\ discards}$ (2023)	SSB (2024)	% SSB change ***	% advice change^
ICES advice basis									
MSY approach: F_{MSY}	4155	2081	2074	0.21	0.043	0.167	25 692	−10.6	1
Other scenarios									
F = 0	0	0	0	0	0	0	30 665	6.7	−100
F= $F_{MSY\ lower}$	3472	1735	1737	0.173	0.036	0.137	26 463	−7.9	−15.6
F= $F_{MSY\ upper}$	4155	2081	2074	0.21	0.043	0.167	25 692	−10.6	1
F= F_{pa}	4155	2081	2074	0.21	0.043	0.167	25 692	−10.6	1
F= F_{lim}	5907	2978	2929	0.31	0.064	0.25	23 765	−17.3	44
SSB (2024) = B_{lim}	12 447	6432	6015	0.77	0.158	0.61	17 286	−40	200
SSB (2024) = B_{pa} = MSY $B_{trigger}$	4241	2124	2117	0.22	0.044	0.171	25 597	−10.9	3.1
SSB (2024) = SSB (2023)	1547	766	781	0.074	0.0153	0.059	28 727	0	−62
F = F_{2022}	1468	728	740	0.070	0.0145	0.055	28 825	0.34	−64

* Marketable landings, assuming recent discard rate.
** Including BMS landings (EU stocks), assuming recent discard rate.
*** SSB 2024 relative to SSB 2023.
^ Advice value for 2023 relative to the corresponding 2022 value (4114 tonnes).

Basis of the advice

Table 3 Whiting in Division 6.a. The basis of the advice.

Advice basis	MSY approach
Management plan	The EU multiannual plan (MAP) for stocks in Western Waters and adjacent waters (EU, 2019) takes bycatch of this species into account. There is no agreed shared management plan with UK for this stock, and ICES provides advice according to ICES MSY approach.

Quality of the assessment

Due to vessel breakdown, the UK-SCOGFS-Q1 survey was not carried out in 2022. In addition, a lack of discard sampling from the Nephrops trawl fleet (due to COVID-19 disruption) means that total discards were not adequately sampled for ages 1 and 2 in 2021, therefore catch numbers for ages 1 and 2 for 2021 were estimated by the model. Sensitivity analyses indicate that these issues are likely to have minimal impact on the assessment.

Recent changes in fishery selectivity pattern are accounted for in the fishing mortality assumption in the intermediate year.

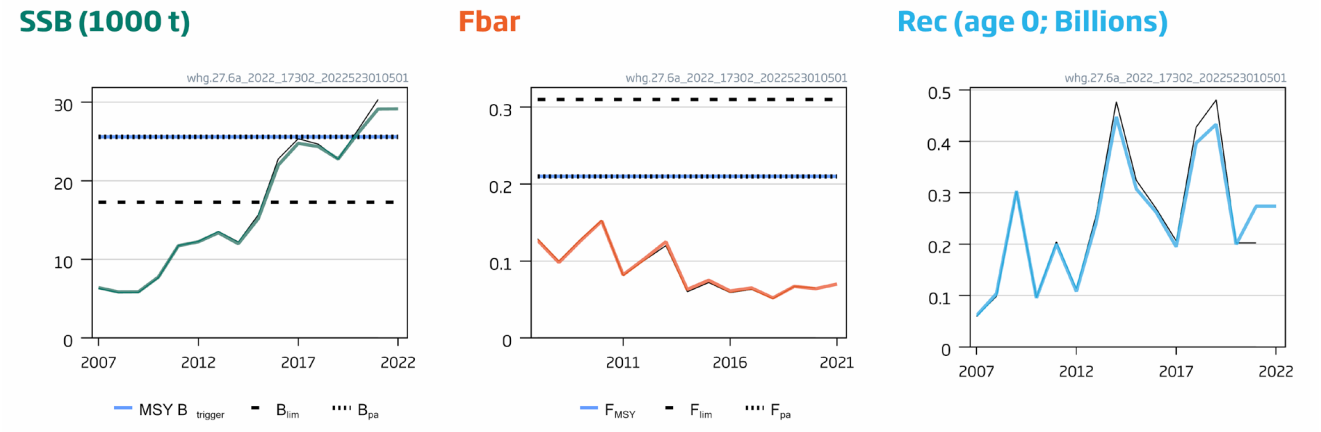

Figure 2 Whiting in Division 6.a. Historical assessment results (final-year SSB and recruitment estimates included). This stock was benchmarked in 2021.

Issues relevant for the advice

The TAC is for ICES Subarea 6 and European Union and international waters of Division 5.b and subareas 12 and 14, which includes Division 6.b, for which advice is given separately. By mixing the biological and TAC areas for different whiting stocks, it will be difficult to fully achieve management objectives for both stock areas. Hence, ICES recommends that the TAC area corresponds to the assessment area.

In 2019–2021, there was a significant decrease in the proportion of discards likely because of an increase in TAC compared to recent years. The partition of catch into projected landings and discards in the forecast is based on the assumption that the discard pattern by age seen in 2019–2021 will continue in 2022 and 2023.

Reference points

Table 4 Whiting in Division 6.a. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	25 597	B_{pa}; in tonnes	ICES (2021)
	F_{MSY}	0.21	Stochastic simulations (EqSim)	ICES (2021)
Precautionary approach	B_{lim}	17 286	Lowest SSB (1999) within period of high recruitment (pre- 2000); in tonnes	ICES (2021)
	B_{pa}	25 597	$B_{lim} \times \exp(1.645 \times \sigma)$; $\sigma = 0.239$ (CV on estimate of SSB 2020); in tonnes	ICES (2021)
	F_{lim}	0.31	F giving 50% probability of SSB < B_{lim} in stochastic simulation (EqSim) uses segmented regression recruitment with breakpoint = B_{lim} (S-R pairs from 1985 onwards)	ICES (2021)
	F_{pa}	0.21	F_{P05}; the F that leads to SSB ≥ B_{lim} with 95% probability	ICES (2021)
Management plan	SSB_{mgt}	Not applicable		
	F_{mgt}	Not applicable		

Basis of the assessment

Table 5 Whiting in Division 6.a. The basis of the assessment.

ICES stock data category	1 (ICES, 2022a)
Assessment type	Analytical age-based assessment (SAM) that uses catches in the model and in the forecast (ICES, 2022b)
Input data	Commercial landings, estimated discards, age composition of catches. Three survey indices: ScoGFS-WIBTS-Q1 (G1179), UK-SCOWCGFS-Q1 (G4748) and a modelled Q4 index estimated using ScoGFS-WIBTS-Q4 (G4299), IGFS-WIBTS-Q4 (G7212), and UK-SCOWCGFS-Q4 (G4815). A fixed maturity ogive; natural mortalities-at-age (Lorenzen, 1996); stock weights-at-age from survey and catch data.
Discards and bycatch	Due to lack of discard sampling from the *Nephrops* fleet in 2021 (due to COVID-19 disruption), total discards were underestimated for 2021. Discard and catch numbers at age 0 and 1 for 2021 were estimated by the assessment model.
Indicators	SURBAR analysis
Other information	The stock was last benchmarked in 2021 (WKNSEA; ICES, 2021)
Working group	Working Group for the Celtic Seas Ecoregion (WGCSE).

History of the advice, catch and management

Table 6 Whiting in Division 6.a. History of ICES advice, the agreed TAC, ICES estimates of landings and discards. Weights in tonnes.

Year	ICES advice/ single-stock exploitation boundaries since 2004	Catch corresponding to advice	Agreed TAC*	Official landings	ICES landings	ICES discards^	ICES catch
1987	No increase in F	15 000	16 400	12 399	11 544	11 918	23 462
1988	No increase in F; TAC	15 000	16 400	11 879	11 352	8132	19 458
1989	No increase in F; TAC	13 000	16 400	7669	7531	5876	13 407
1990	No increase in F; TAC	11 000	11 000	6026	5643	4530	10 173
1991	70% of effort (89)	-	9000	6908	6660	4883	11 543
1992	70% of effort (89)	-	7500	6010	6004	9249	15 253
1993	70% of effort (89)	-	8700	6751	6872	4759	11 631
1994	30% reduction in effort	-	6800	5786	5901	3455	9356
1995	Significant reduction in effort	-	6800	6277	6076	5771	11 847
1996	Significant reduction in effort	-	10 000	6642	7156	7940	15 096
1997	Significant reduction in effort	-	13 000	6178	6285	5251	11 536
1998	No increase in F	6500	9000	4657	4631	216	13 847
1999	Reduce F below F_{pa}	4300	6300	4677	4613	3975	8588
2000	Reduce F below F_{pa}	< 4300	4300	3203	3010	13 285	16 295
2001	Reduce F below F_{pa}	< 4200	4000	2543	2438	4263	6701
2002	SSB > B_{pa} in the short term	< 2000	3500	1735	1709	2851	4560
2003	No cod catches	-	2000	1365	1331	1984	3316
2004	SSB > B_{pa} in the short term	< 2100	1600	819	798	2887	3686
2005	Exploitation not allowed to increase	< 1600	1600	289	335	972	1307
2006	Lowest possible level	0	1360	383	378	746	1124
2007	Lowest possible level	0	1020	488	481	366	847
2008	Lowest possible level	0	765	440	441	156	598
2009	Same advice as last year	0	574	482	480	826	1305
2010	Same advice as last year	0	431	349	345	1091	1436
2011	See scenarios	-	323	230	231	630	861
2012	Reduce catches	-	307	301	300	742	1042
2013	Lowest possible catch, improve selectivity	0	292	214	215	1172	1387
2014	Lowest possible catch, improve selectivity	0	292	181	181	745	926
2015	Lowest possible catch	0	263	221	221	1458	1679
2016	Precautionary approach (minimize all catches)	0	213	232	227	1040	1266
2017	MSY approach	0	213	169	168	1331	1498
2018	MSY approach	0	213	180	189	666	855
2019	Precautionary approach	0	1112	327†	484	960	1444
2020	Precautionary approach	0	937	537^^	541	834	1375
2021	Precautionary approach	0	937	851^^	852	261	1113
2022	MSY approach	≤ 4114	1800				
2023	MSY approach	≤ 4155					

* Subarea 6; waters of Division 5.b (EU until 2020; UK thereafter); and international waters of subareas 12 and 14.

^ Pre-2003 discards are estimated for ages 1+ only.

^^ Preliminary official landings.

†Incomplete/missing as a result of part of the data being unavailable under data confidentiality clauses.

History of the catch and landings

Table 7 Whiting in Division 6.a. Catch distribution by fleet in 2021 as estimated by ICES.

Catch	Landings			Discards		
1 113 tonnes*	Finfish directed otter trawl 97%	*Nephrops* directed otter trawl < 1%	Other gear 2%	Finfish directed otter trawl 27%	*Nephrops* directed otter trawl* 73%	Other gear < 1%
	852 tonnes			261 tonnes*		

* Underestimate because of lack of discard sampling from the *Nephrops* fleet.

Table 8 Whiting in Division 6.a. History of official landings by country, and BMS (below minimum size) landings (tonnes).

Year	Belgium	Denmark	Faroe Islands	France	Germany	Ireland	Netherlands	Norway	Spain	UK (E W & NI)	UK (Scot.)	UK (total)	Official BMS landings	Total official landings
1989	1	1	-	199	+	1315	-	-	-	44	6109			7669
1990	-	+	-	180	-	977	-	-	-	50	4819			6026
1991	-	3	-	352	+	1200	-	-	-	218	5135			6908
1992	-	1	-	105	1	1377	-	-	-	196	4330			6010
1993	-	1	-	149	1	1192	-	-	-	184	5224			6751
1994	-	+	-	191	+	1213	-	-	-	233	4149			5786
1995	-	+	-	362	-	1448	-	-	1	204	4263			6277
1996	-	+	-	202	-	1182	-	-	-	237	5021			6642
1997	1	+	-	108	-	977	-	-	1	453	4638			6178
1998	1	-	-	82	-	952	-	-	2	251	3369			4657
1999	+	-	-	300	-	1121	-	-	+	210	3046			4677
2000	-	-	-	48	-	793	-	-	-	104	2258			3203
2001	-	-	-	52	-	764	-	-	2	71	1654			2543
2002	-	-	-	21	-	577	-	-	-	73	1064			1735
2003	-	+	-	11	-	568	-	-	-	35	751			1365
2004	+	+	-	6	-	356	-	-	-	13	444			819
2005	-	-	-	9	-	172	-	-	-	5	103			289
2006	-	-	-	7	-	196	-	-	-	2	178			383
2007	-	-	-	6	1	56	-	-	-	20	405			488
2008	-	-	-	1	-	69	-	-	-	2	368			440
2009	-	-	+	1	-	125	-	2	-	-	354			482
2010	-	-	-	3	-	99	-	-	-	2	245			349
2011	-	-	1	-	-	149	-	-	-	-	-	80		230
2012	-	-	1	-	-	96	-	-	-	-	-	204		301
2013	-	-	-	1	-	97	-	-	-	-	-	116		215
2014	-	-	-	1	-	97	-	-	-	-	-	83		181
2015	-	-	-	+	-	88	11	-	-	-	-	122		221
2016	-	-	-	-	-	77	52	-	-	-	-	98		232
2017	-	-	-	3	-	53	19	-	-	-	-	94		169
2018	-	2	-	2	-	72	2	+	-	-	-	108	2	189
2019	-	56	-	7	-	†	23	-	+	-	-	241	+	327†
2020*	-	10	-	10	-	126	4	-	-	-	-	387	11	548
2021*	-	-	-	35	-	161	+	-	+	-	-	654	+	852

* Preliminary.

\+ Landings < 0.5 tonnes.

† Incomplete/missing as a result part of the data being unavailable under data confidentiality clauses.

Summary of the assessment

Table 9 Whiting in Division 6.a. Assessment summary with weights in tonnes and recruitment in thousands. 'High' and 'Low' refer to 95% confidence intervals.

Year	Recruitment age 0			SSB			Landings *	Discards *	Fishing mortality ages 1–3		
	Low	Value	High	Low	Value	High			Low	Value	High
1981	459 996	792 418	1 365 066	77 786	108 518	151 393	12 194	2132	0.09	0.14	0.20
1982	498 421	816 452	1 337 413	68 579	91 467	121 993	13 880	5485	0.14	0.20	0.28
1983	657 345	1068 364	1 736 379	52 550	66 838	85 011	15 962	6294	0.22	0.30	0.41
1984	539 881	876 855	1 424 156	37 862	46 702	57 605	16 459	4017	0.28	0.38	0.51
1985	451 474	744 978	1 229 290	30 455	37 889	47 137	12 879	4840	0.32	0.44	0.59
1986	807 581	1 338 213	2 217 501	25 504	32 190	40 629	8458	2669	0.23	0.31	0.43
1987	305 224	502 134	826 076	28 783	35 679	44 227	11 542	11 918	0.33	0.44	0.58
1988	446 791	752 010	1 265 733	31 030	39 873	51 236	11 349	8132	0.38	0.51	0.67
1989	402 020	651 153	1 054 675	20 737	26 023	32 657	7523	5876	0.34	0.46	0.62
1990	529 516	852 259	1 371 717	19 138	24 796	32 126	5642	4530	0.23	0.32	0.43
1991	700 276	1 131 396	1 827 931	21 377	27 048	34 224	6657	4883	0.23	0.32	0.43
1992	476 492	767 342	1 235 727	25 955	32 522	40 749	6004	9249	0.22	0.31	0.42
1993	487 073	782 199	1 256 149	29 801	37 808	47 966	6871	4759	0.19	0.27	0.37
1994	474 415	755 541	1 203 255	28 991	36 153	45 084	5900	3455	0.18	0.24	0.34
1995	431 387	682 976	1 081 293	29 491	36 487	45 144	6078	5771	0.23	0.31	0.42
1996	403 631	640 194	1 015 406	27 181	33 447	41 156	7158	7940	0.31	0.42	0.56
1997	419 932	654 177	1 019 088	21 653	26 670	32 849	6291	5251	0.30	0.41	0.55
1998	251 844	398 209	629 639	18 297	22 542	27 771	4628	9216	0.42	0.56	0.75
1999	547 489	865 524	1 368 304	14 208	17 817	22 344	4613	3975	0.42	0.56	0.76
2000	207 196	326 837	515 561	12 326	15 340	19 091	3011	13 285	0.45	0.60	0.80
2001	123 439	204 756	339 642	13 389	17 587	23 100	2439	4263	0.30	0.42	0.58
2002	172 978	274 808	436 584	10 429	13 606	17 752	1768	2851	0.26	0.38	0.55
2003	138 692	214 958	333 162	7411	9806	12 976	1331	1991	0.22	0.34	0.51
2004	75 301	118 957	187 922	6531	8857	12 011	798	2897	0.25	0.40	0.62
2005	69 310	109 455	172 852	5175	7333	10 389	334	975	0.12	0.19	0.30
2006	42 299	68 001	109 321	4684	6631	9386	378	750	0.11	0.16	0.25
2007	37 923	60 957	97 979	4489	6399	9120	481	365	0.08	0.13	0.20
2008	63 495	103 708	169 388	4067	5848	8409	442	156	0.06	0.10	0.15
2009	182 966	303 805	504 451	4093	5870	8419	480	832	0.08	0.13	0.19
2010	56 780	95 360	160 152	5395	7753	11 143	337	1104	0.10	0.15	0.24
2011	121 253	200 140	330 352	7755	11 738	17 766	229	631	0.05	0.08	0.13
2012	63 597	108 065	183 626	8077	12 242	18 557	305	772	0.06	0.10	0.17
2013	143 857	243 043	410 615	8647	13 389	20 730	216	1223	0.07	0.13	0.21
2014	266 623	447 703	751 764	7749	11 995	18 569	181	745	0.04	0.06	0.11
2015	182 614	307 589	518 092	9838	15 192	23 458	224	1459	0.05	0.08	0.13
2016	156 219	261 930	439 172	14 014	22 004	34 551	227	1039	0.04	0.06	0.10
2017	111 597	194 799	340 036	15 845	24 777	38 744	178	1329	0.04	0.07	0.11
2018	232 604	396 956	677 437	15 732	24 363	37 728	191	648	0.03	0.05	0.09
2019	248 326	433 379	756 332	14 861	22 780	34 917	502	929	0.04	0.07	0.11
2020	102 183	199 449	389 299	16 902	26 085	40 258	544	817	0.04	0.06	0.11
2021	93 253	273 676	803 174	18 547	29 141	45 786	875	262***	0.04	0.07	0.14
2022	108 065	273 676**	447 703	17 660	29 167	47 163					

* Calculated using sum of products from the catch numbers-at-age and mean weights-at-age. Pre-2003 discards are estimated for ages 1+ only.

** Median resampled recruitment (2012–2021).

*** Underestimate due to lack of discard sampling from the *Nephrops* fleet.

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Download the stock assessment data and figures.

Recommended citation: ICES. 2022. Whiting (*Merlangius merlangus*) in Division 6.a (West of Scotland). *In* Report of the ICES Advisory Committee, 2022. ICES Advice 2022, whg.27.6a. https://doi.org/10.17895/ices.advice.19457426.

Whiting (*Merlangius merlangus*) in divisions 7.b–c and 7.e–k (southern Celtic Seas and western English Channel)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 1715 tonnes.

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

Management should be implemented at the stock level.

Stock development over time

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

Figure 1 Whiting in divisions 7.b–c and 7.e–k. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour.

Catch scenarios

Table 1 Whiting in divisions 7.b–c and 7.e–k. The basis for the catch scenarios.

Variable	Value	Notes
$F_{ages\ 2–5}$ (2022)	0.701	$F_{sq} = F_{average}$ (2019–2021), unscaled
SSB (2023)	30 343	Short-term forecast; in tonnes.
Recruitment age 0 (2022–2023)	400 108	Median resampled (2015–2021); in thousands
Catch (2022)	10 741	Short-term forecast; in tonnes.
Projected landings (2022)	9228	Short-term forecast assuming average 2019–2021 landings pattern; in tonnes
Projected discards (2022)	1513	Short-term forecast assuming average 2019–2021 discard pattern; in tonnes

Table 2 Whiting in divisions 7.b–c and 7.e–k. Annual catch scenarios. All weights are in tonnes. No information on % TAC change can be shown because the TAC area differs from the stock area.

Basis	Total catch (2023)	Projected landings (2023)	Projected discards (2023)	F_{total} (2023)	$F_{projected\ landings}$ (2023)	$F_{projected\ discards}$ (2023)	SSB (2024)	% SSB change *	% advice change **	% probability of being below B_{lim} in 2024
ICES advice basis										
$SSB_{2024} = B_{lim}$	1715	1512	203	0.090	0.079	0.011	36571	21	−-61	50
Other options										
MSY and precautionary considerations: F = 0	0	0	0	0.000	0.000	0.000	38109	26	−100	40
MSY approach: $F_{MSY} \times SSB_{2023}/MSY\ B_{trigger}$	4030	3542	488	0.224	0.199	0.025	34568	14	−9.5	62
EU MAP^^: $F_{MSY} \times SSB_{2023}/MSY\ B_{trigger}$	4030	3542	488	0.224	0.199	0.025	34568	14	−9.5	62
EU MAP^^: $F_{MSY\ lower} \times SSB_{2023}/MSY\ B_{trigger}$	3441	3026	415	0.188	0.167	0.021	35065	16	−23	59
$F = F_{MSY} = F_{pa}$	6322	5532	790	0.375	0.333	0.042	32641	8	42	72
$SSB_{2024} = B_{pa} = B_{trigger}$^										
$F = F_{2022}$	10376	9013	1363	0.701	0.622	0.079	29323	−3	133	86
$SSB_{2024} = SSB_{2023}$	9108	7939	1169	0.590	0.523	0.067	30343	0	105	82

* SSB 2024 relative to SSB 2023.
** Advice value for 2023 relative to the advice value for 2022 (4452 tonnes).
^ The B_{pa} and MSY $B_{trigger}$ options were left blank because neither can be achieved in 2024, even with zero catches.
^^ EU multiannual plan (MAP) for the Western Waters and adjacent waters (EU, 2019).

The advice for 2023 is 61% lower than last year because the stock remains below B_{lim}, incoming recruitment remains low, and a larger reduction in fishing mortality is needed to bring the stock above B_{lim} with 50% probability in 2024

Basis of the advice

Table 3 Whiting in divisions 7.b–c and 7.e–k. The basis of the advice.

Advice basis	MSY approach
Management plan	ICES is aware of the multiannual management plan (MAP) which has been adopted by the EU for this stock (EU, 2019) and which ICES considers to be precautionary. There is no agreed shared management plan with UK for this stock, and ICES provides advice according to ICES MSY approach. Catch scenarios consistent with the MAP F_{MSY} ranges are provided.

Quality of the assessment

This year's assessment shows an increasing retrospective pattern. There is a tendency for the assessment to result in overestimates of biomass and underestimates of fishing mortality, which may indicate model or data issues. If this pattern continues, the forecast will be overly optimistic in terms of SSB and the probabilities of the stock remaining below B_{lim} will be higher.

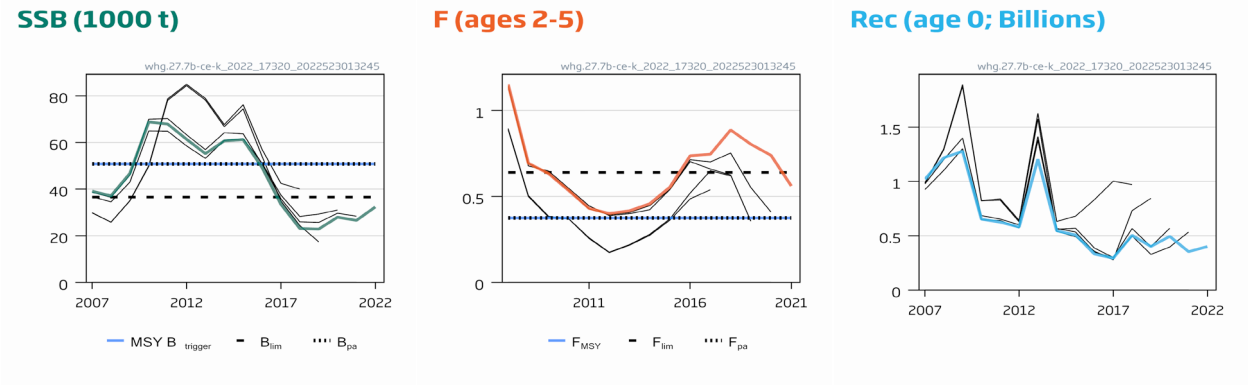

Figure 2 Whiting in divisions 7.b–c and 7.e–k. Historical assessment results (final-year SSB estimate and recruitment assumptions included). The stock was benchmarked in 2020 (ICES, 2020) and an interbenchmark completed in 2021 (ICES, 2021a). The reference points were revised in 2020 (following a benchmark), and only assessment results from the last three years should be compared to the reference points indicated.

Issues relevant for the advice

Distinct changes in recruitment are apparent for this stock, therefore intermediate year assumptions for recruitment were truncated to the recent seven years. The assumed recruitment in 2022 and 2023 used in the forecast constitutes a significant part (56.3%) of the projected SSB in 2024.

The forecast is also highly dependent on the assumption on F (or catch) for the intermediate year (2022). Using the catch assumptions derived from mixed-fishery analysis, under the haddock scenario (as done in 2021), was not considered to be appropriate this year. An average of the last three years' F is more appropriate to account for the tendency to underestimate recent F.

The assessment and advice are for divisions 7.b–c and 7.e–k, including reallocations from rectangles 33E2 and 33E3 of 59 t in Division 7.a.

Whiting in divisions 7.b–c and 7.e–k is fished under a common TAC with whiting in Division 7.d. By mixing the biological and TAC areas for different whiting stocks, it will be difficult to achieve the objective of fishing at maximum sustainable yield (MSY) for both stock areas. Hence, ICES recommends that the TAC area corresponds to the assessment area.

Mixed-fisheries considerations

Whiting in divisions 7.b–c and 7.e–k is caught as part of a mixed fishery. Most whiting are caught by otter trawls targeting fish; these trawls also catch haddock and varying amounts of other benthic and gadoid species (ICES, 2021b).

Reference points

Table 5 Whiting in divisions 7.b–c and 7.e–k. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	50818	B_{pa}; in tonnes	ICES (2021a)
	F_{MSY}	0.375	From EqSim with segmented regression and fixed breakpoint (B_{lim}) capped to F_{P05}.	ICES (2021a)
Precautionary approach	B_{lim}	36571	B_{loss}; lowest observed SSB (2008) from which stock recovery was observed; in tonnes	ICES (2021a)
	B_{pa}	50818	B_{lim} combined with the assessment error; $B_{lim} \times \exp(1.645 \times \sigma)$; $\sigma = 0.20$ (default setting); in tonnes	ICES (2021a)
	F_{lim}	0.64	F with 50% probability of SSB less than B_{lim}	ICES (2021a)
	F_{pa}	0.375	F_{P05}; the F that leads to SSB ≥ B_{lim} with 95% probability	ICES (2021a)
Management plan	MAP MSY $B_{trigger}$	50818	MSY $B_{trigger}$; in tonnes	EU (2019), ICES (2021a)
	MAP B_{lim}	36571	B_{lim}; in tonnes	EU (2019), ICES (2021a)
	MAP F_{MSY}	0. 375	F_{MSY}.	EU (2019), ICES (2021a)
	MAP range F_{lower}	0.315	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY	EU (2019), ICES (2021a)
	MAP range F_{upper}	0.375	Consistent with ranges resulting in no more than 5% reduction in long-term yield compared with MSY capped to F_{P05}.	EU (2019), ICES (2021a)

Basis of the assessment

Table 6 Whiting in divisions 7.b–c and 7.e–k. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2022a).
Assessment type	Analytical age-based assessment (State-space fish stock assessment model; SAM) that uses catches in the model and the forecast (ICES, 2022b).
Input data	Commercial catches (age composition of landings and discards); vector autoregressive spatiotemporal (VAST) standardized survey index (combined IGFS-WIBTS-Q4 [G7212] and EVHOE-WIBTS-Q4 [G9527]); maturity data (surveys and observer data; constant for all years); age-dependent natural mortalities (Lorenzen, 1996)
Discards and bycatch	Included in the assessment for the full time-series. Full observer-based estimates from 2003, partial observer-based estimates from 1999 to 2002.
Indicators	None.
Other information	This stock was benchmarked in 2020 (ICES, 2020) and interbenchmarked in 2021 (ICES, 2021a).
Working group	Working Group for the Celtic Seas Ecoregion (WGCSE).

History of the advice, catch, and management

Table 7 Whiting in divisions 7.b–c and 7.e–k. ICES advice and landings, as used in the assessment. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	Landings corresponding to advice	Agreed TAC^	ICES landings	ICES discards
1987	*Status quo* F; TAC	-	7100*	18500	13720	
1988	Precautionary TAC	-	7000*	18500	15822	
1989	Precautionary TAC	-	7900*	19300	24276	
1990	No increase in F; TAC	-	8400*	24000	24099	
1991	Precautionary TAC	-	8000*	24000	14402	
1992	If required, precautionary TAC	-	8000*	22000	14419	
1993	Within safe biological limits	-	6600*	22000	17904	
1994	Within safe biological limits	-	< 9400*	29000	21659	
1995	20% reduction in F	-	8200**	31000	23559	
1996	20% reduction in F	-	600**	28000	19539	
1997	At least 20% reduction in F	-	< 7300***	27000	21067	
1998	At least 20% reduction in F	-	< 8200***	27000	19710	

Year	ICES advice	Catch corresponding to advice	Landings corresponding to advice	Agreed TAC^	ICES landings	ICES discards
1999	No increase in F	-	12400***	25000	24260	5420
2000	17% reduction in F	-	< 13100***	22200	16030	4400
2001	No increase in F	-	13500***	21000	13832	9877
2002	No increase in F	-	27700***	31700	14295	7336
2003	No increase in F	-	20200***	27000	11788	10337
2004	No increase in F	-	14000***	27000	10321	19522
2005	No increase in F	-	10600***	21600	12575	13598
2006	No increase in F	-	10800***	19940	9908	5098
2007	No increase in F	-	-	19940	9424	8439
2008	Reduction in F	-	-	19940	6080	3760
2009	Same advice as last year	-	-	16949	6574	4281
2010	Same advice as last year	-	-	14407	9570	5346
2011	See scenarios	-	-	16658	10084	3750
2012	No increase catch and improved gear selection	-	-	19053	10834	5116
2013	MSY approach	-	< 17500***	24500	12131	4026
2014	MSY approach	-	< 15562***	19162	12983	4672
2015	MSY approach	< 18501	< 14230	17742	13110	6528
2016	MSY approach	≤ 19076	≤ 15395	22778	15201	8259
2017	MSY approach	≤ 25125	≤ 19825	27500	12377	2791
2018	MSY approach	≤ 19429	≤ 13759	22213	9007	2139
2019	MSY approach	≤ 15841		19184	6588†	970
2020	Management plan	6481 (range 4157–6481)		10863	5931	1266
2021	Management plan	5261 (range 4458–5261)		10259	6153	1224
2022	MSY approach	≤ 4452		8352		
2023	MSY approach	≤ 1715				

^ TAC covers Subarea 7 (except Division 7.a).
* For the divisions 7.f and 7.g stock component.
** For the divisions 7.f–h stock component.
*** For the divisions 7.e–k stock component.
† Incomplete/missing as a result of part of the data being unavailable under data confidentiality clauses.

History of the catch and landings

Table 8 Whiting in divisions 7.b–c and 7.e–k. Catch distribution by fleet in 2021, as estimated by ICES.

Catch	Landings					Discards				
7377 tonnes	Otter trawls 76%	Seine nets 18%	Beam trawls 3%	Gillnets 1%	Other gears 2%	Otter trawls 83%	Seine nets 5%	Beam trawls 10%	Gillnets 1%	Other gears 2%
	6153 tonnes					1224 tonnes				

Table 9 Whiting in divisions 7.b –c and 7.e–k. History of commercial landings; the official landings by country and landings in rectangles 33E2 and 33E3. All weights are in tonnes.

Year	Belgium	France	Ireland	UK England and Wales	Others	Rectangles 33E2 and 33E3 **	Total
1998	479	6322	5549	1755	179		19710
1999	448	5119	6013	1354	27		24260
2000	194	5961	5358	1255	39		16032
2001	171	4731	5365	948	31		13832
2002	149	3596	5718	847	35		14297
2003	129	2871	4634	757	75		11788
2004	180	2776	4406	567	49		10321
2005	217	3402	5826	471	101		12575
2006	128	4287	4594	384	72		9908
2007	126	3866	5048	574	80		9424
2008	121	3986	2451	602	36		6080
2009	87	4928	2862	811	38		6574
2010	103	5623	4424	745	896		9570
2011	99	6281	4826	691	181		10084
2012	171	5290	5884	723	191	32	10834
2013	226	3625	6916	741	261	34	12131
2014	222	3221	6929	742	161	49	12983
2015	152	2697	6477	601	257	32	13110
2016	186	6322	7782	801	151	40	15201
2017	102	5119	6338	592	54	20	12377
2018	103	5961	4650	588	40	18	9007
2019	73	3203	2599†	487	125	24	6488 †
2020	80	2697	2669	337	147	14	5931
2021*	81	2681	2973	354	65	59	6153

* Preliminary.

** Included in Irish landings. Landings in the southern part of Division 7.a (rectangles 33E2 and 33E3) are included in the assessment and are considered to be part of the stock.

† Incomplete/missing as a result of part of the data being unavailable under data confidentiality clauses.

Summary of the assessment

Table 10 Whiting in divisions 7.b–c and 7.e–k. Assessment summary. All weights are in tonnes and recruitment in thousands. 'Low' and 'High' refer to 95% confidence intervals.

Year	Recruitment age 0			SSB			Landings	Discards	Ages 2–5		
	Low	Value	High	Low	Value	High			Low	Value	High
1999	1362089	2027897	3019160	48260	54302	61100	20180	5420	0.69	0.80	0.94
2000	1163986	1701339	2486760	45815	52501	60164	15644	4400	0.69	0.81	0.94
2001	1046908	1421549	1930257	51288	61432	73583	13196	9877	0.76	0.89	1.03
2002	943722	1267864	1703340	59469	70799	84286	13640	7336	0.52	0.62	0.75
2003	739785	998197	1346874	60286	68985	78939	11788	10337	0.47	0.57	0.69
2004	643630	871785	1180819	57440	65094	73768	10321	19522	0.61	0.72	0.85
2005	557406	749519	1007845	41340	46453	52199	12575	13598	0.65	0.76	0.88
2006	601247	826353	1135740	36574	41147	46292	9908	5098	0.55	0.65	0.79
2007	757667	1020649	1374910	34226	39139	44757	9424	8439	0.99	1.15	1.34
2008	904652	1218297	1640683	32306	37123	42658	6080	3760	0.58	0.69	0.83
2009	873636	1278262	1870293	40539	46729	53865	6574	4281	0.52	0.63	0.77
2010	483184	652585	881377	59205	68742	79815	9570	5346	0.43	0.53	0.66
2011	466120	624387	836391	58664	67898	78585	10084	3750	0.34	0.43	0.54
2012	426262	579921	788972	53784	61381	70051	10834	5116	0.32	0.40	0.50
2013	749170	1205680	1940367	48902	55194	62296	12131	4026	0.34	0.42	0.52
2014	406667	545184	730884	53033	60670	69406	12983	4672	0.38	0.46	0.56
2015	371843	507319	692155	53992	61195	69360	13110	6528	0.47	0.56	0.66
2016	221522	330789	493952	42957	49278	56528	15201	8259	0.63	0.74	0.87

Year	Recruitment age 0			SSB			Landings	Discards	Ages 2–5		
	Low	Value	High	Low	Value	High			Low	Value	High
2017	197994	293206	434204	29806	33504	37662	12377	2791	0.64	0.75	0.87
2018	358994	504093	707837	20529	23130	26061	9007	2139	0.75	0.89	1.04
2019	279923	400108	571894	19251	22862	27150	6588	970	0.65	0.80	0.99
2020	312172	494034	781842	22428	27954	34842	5931	1266	0.51	0.74	1.06
2021	170388	353025	731427	20180	26600	35064	6153	1224	0.31	0.56	1.01
2022	293206	400108*	507319	22581	32346	46048					

* Median resampled (2010–2021).

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