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}.

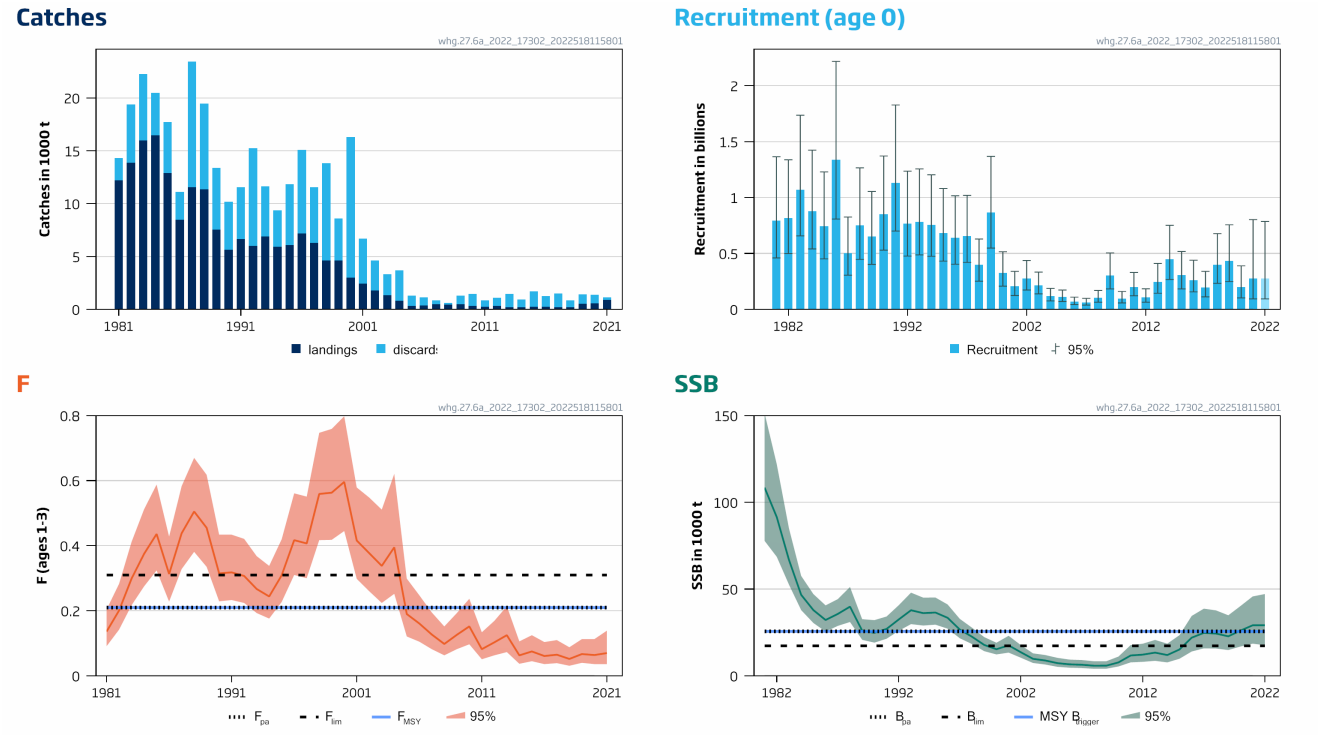

Figure 1 Whiting in Division 6.a. Summary of the stock assessment. The assumed recruitment value for 2022 is shaded in a lighter colour.

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.

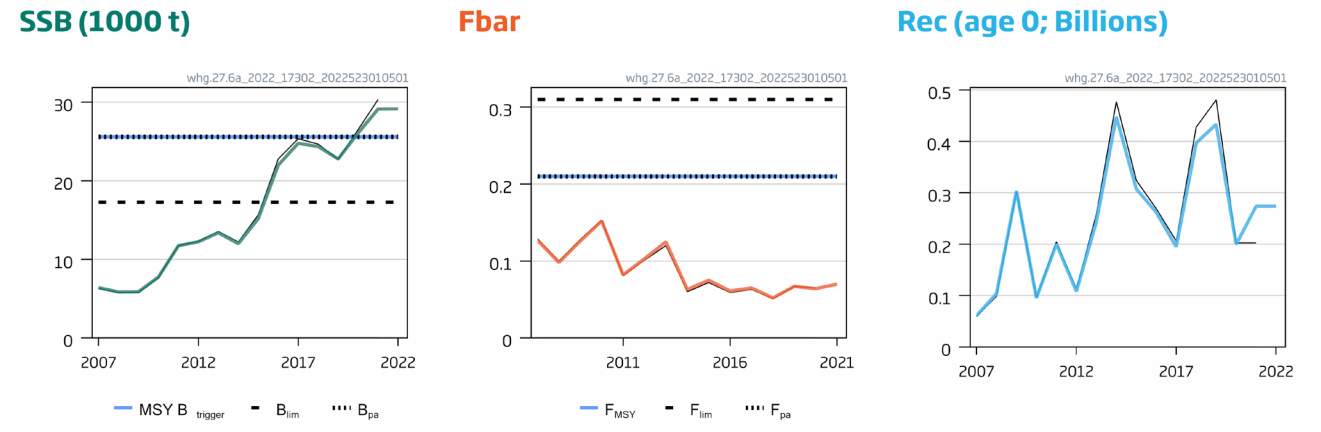

Figure 2 Whiting in Division 6.a. Historical assessment results (final-year SSB and recruitment estimates included). This stock was benchmarked in 2021.

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.

Sources and references

EU. 2019. Regulation (EU) 2019/472 of the European Parliament and of the Council of 19 March 2019 establishing a multiannual plan for stocks fished in the Western Waters and adjacent waters, and for fisheries exploiting those stocks, amending Regulations (EU) 2016/1139 and (EU) 2018/973, and repealing Council Regulations (EC) No 811/2004, (EC) No 2166/2005, (EC) No 388/2006, (EC) No 509/2007 and (EC) No 1300/2008. Official Journal of the European Union, L 83. 17 pp. http://data.europa.eu/eli/reg/2019/472/oj.

ICES. 2021. Benchmark Workshop on North Sea Stocks (WKNSEA). ICES Scientific Reports, 3:25. 756 pp. https://doi.org/10.17895/ices.pub.7922.

ICES. 2022a. Advice on fishing opportunities. *In* Report of the ICES Advisory Committee, 2022. ICES Advice 2022, Section 1.1.1. https://doi.org/10.17895/ices.advice.19928060.

ICES. 2022b. Working Group for the Celtic Seas Ecoregion (WGCSE). Draft report. ICES Scientific Reports. 4:45. http://doi.org/10.17895/ices.pub.19863796. Publication of the full report is expected end of 2022.

Lorenzen, K. 1996. The relationship between body weight and natural mortality in juvenile and adult fish: a comparison of natural ecosystems and aquaculture. Journal of Fish Biology, 49(4): 627–642. https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1095-8649.1996.tb00060.x.

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.