Ling (*Molva molva*) in Division 5.a (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 6098 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}.

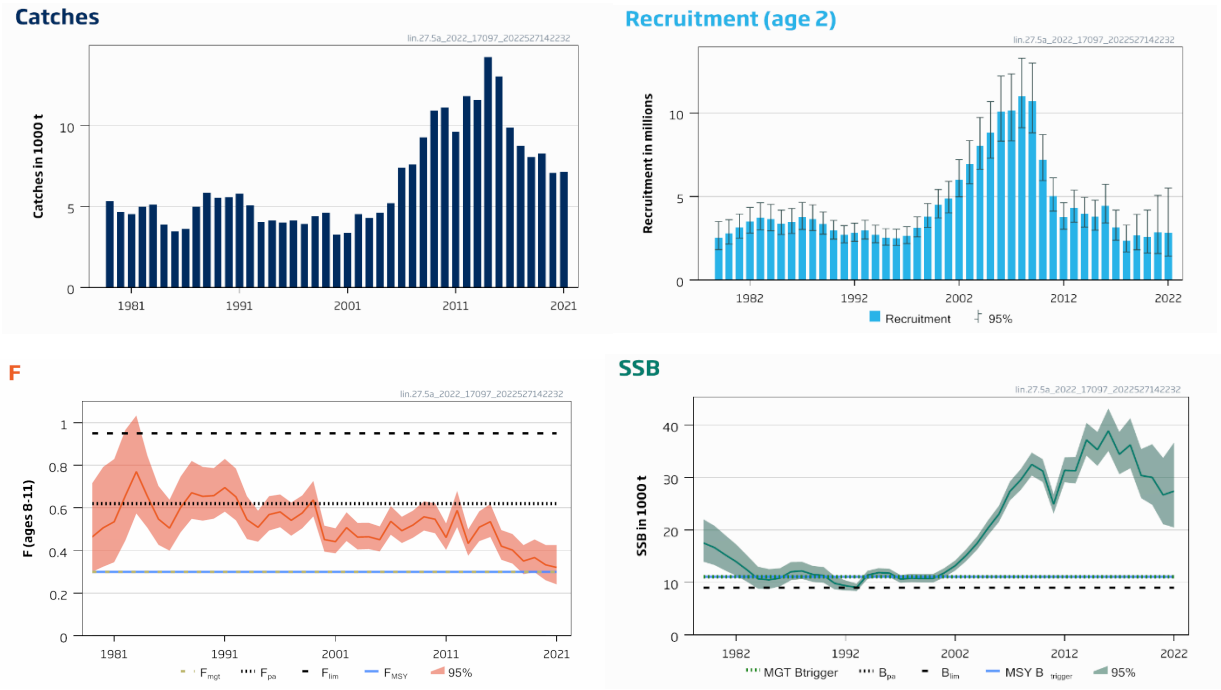

Figure 1 Ling in Division 5.a. Summary of the stock assessment. Top left: total catches; top right: recruitment (age 2); bottom left: fishing mortality (ages 8–11); bottom right: spawning-stock biomass (SSB).

Catch scenarios

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

Table 1 Ling in Division 5.a. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
$F_{ages\ 8–11}$(2022)	0.33	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)	26 183	Short-term forecast; in tonnes
$R_{age\ 2}$ (2023)	3292	Resampled from the years 2013–2022; in thousands
Catch (2022)	6515	Results from $F_{ages\ 8–11}$ (2022); in tonnes

Table 2 Ling in Division 5.a. Annual catch scenario. All weights are in tonnes.

Basis	Total catch (2022/2023)	F (2023)	SSB (2024)	% SSB change*	% TAC change**	% advice change
Management plan	6098	0.3	24 613	−6 %	+28.8 %	+28.8 %

* SSB in 2024 relative to SSB in 2023.
** Advice value for 2022/2023 relative to the TAC for 2021/2022 (4 735 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 Ling in Division 5.a. The basis of the advice.

Advice basis	Management plan (ICES, 2022c)
Management plan	The Icelandic Ministry of Food, Agriculture and Fisheries management plan for Icelandic ling has been evaluated by ICES (ICES, 2022c). 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 ling in Icelandic waters (ICES, 2022c), 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.

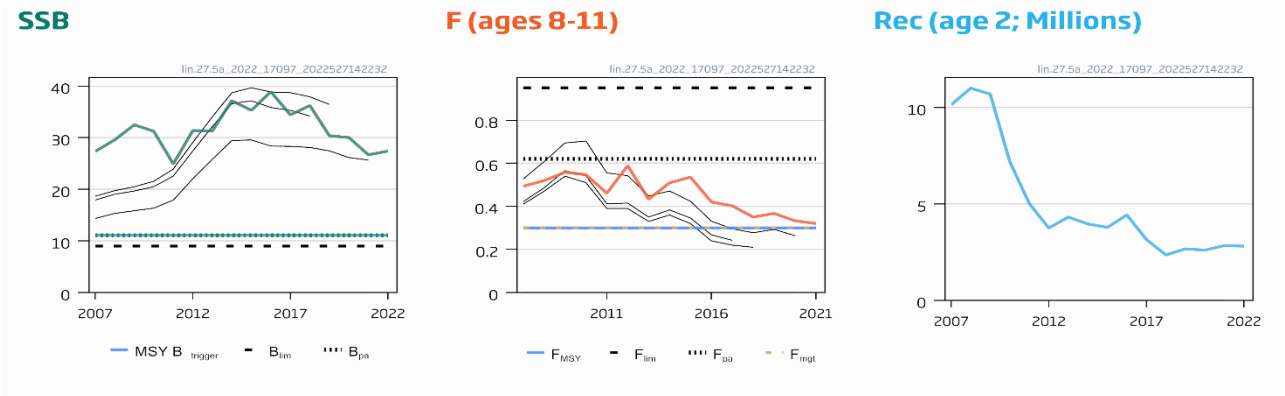

Figure 2 Ling in Division 5.a. Historical assessment results. Final-year recruitment and biomass estimates are included. No ICES assessment was conducted in 2020. Note that this year´s assessment was based on a newly benchmarked model. Prior to the benchmark, recruitment was estimated at age 3 and is 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 Ling in Division 5.a. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY Approach	MSY $B_{trigger}$	11 100	B_{pa}	ICES (2022c)
	F_{MSY}	0.30	Stochastic simulations (EqSim) with segmented regression fixed at B_{lim}	
Precautionary Approach	B_{lim}	9000	B_{loss} (SSB in 1993)	
	B_{pa}	11 100	$B_{lim} \times e^{1.645 * \sigma B}$, using the default $\sigma_B = 0.2$	
	F_{lim}	0.95	Fishing mortality that in stochastic equilibrium will result in median SSB at B_{lim}	
	F_{pa}	0.62	Maximum F at which the probability of SSB falling below B_{lim} is < 5%	
Management plan	MGT $B_{trigger}$	11 100	From the management plan	
	F_{mgt}	0.30	From the management plan	

Basis of the assessment

Table 5 Ling in Division 5.a. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2022a)
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	Not included; discarding is considered negligible
Indicators	None
Other information	Last benchmarked in 2022 (ICES, 2022c)
Working group	Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources (WGDEEP)

History of the advice, catch, and management

Table 6 Ling in Division 5.a. ICES advice, official landings and TAC. Prior to 2016/2017 ICES advice was for the calendar year. All weights are in tonnes.

Year*	ICES advice	Catch corresponding to advice	ICES catches Division 5.a**	TAC Icelandic Division 5.a	ICES catches Division 5.a
2003/2004^	30% reduction on fishing effort	-	4621	3000	4608
2004/2005^	Biennial	-	5195	3000	5238
2005/2006^	30% reduction on fishing effort	-	7431	4000	6961
2006/2007^	Biennial	-	7619	5000	7617
2007/2008	Maintain catches at 2001–2004 level	3800	9279	5000	8560
2008/2009	Biennial	3800	10948	7000	10489
2009/2010	Constrain catches to 2006–2007 average	7500	11150	7000	10713
2010/2011	Biennial	7500	9650	7500	10095
2011/2012	Same advice as previously	7500	11829	9000	11133
2012/2013	F_{proxy} target	12000	11536	12000	12445
2013/2014	No new advice, same as 2013	12000	14346	14000	14983
2014/2015	Fishing at F_{MSY}	14362	13036	14300	13166
2015/2016	Fishing at F_{MSY}	≤ 16156	9884	16200	11229
2016/2017	Fishing at F_{MSY}	≤ 9343	8765	9343	8426
2017/2018	Management plan	≤ 8598	8062	8598	8573
2018/2019	Management plan	≤ 6255	8269	6255	8028
2019/2020	Management plan	≤ 6599	7061	6599	7155
2020/2021	No ICES advice		7128	5700***	7214
2021/2022	Management plan	≤ 4735		4735	
2022/2023	Management plan	≤ 6098		6098	

* Icelandic national fishing year from 1 September ending on 31 August.
** Calendar year (refers to the second year in the national fishing year).
*** Domestic advice and TAC (no ICES advice requested due to the COVID-19 disruption).
^ Prior to 2007/2008 the advice for ling 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 does not extend into the NEAFC Regulatory Area.

Table 7 Ling in Division 5.a. Catch distribution by fleet in 2021 as estimated by ICES.

Catch (2021)	Landings			Discards
7128	Longlines 68%	Bottom trawl 29%	Other gears 3%	Negligible
	7128 tonnes			

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

Year	Belgium	Faroes	France	Germany	Iceland	Norway	UK	Total
1973	1080	984	0	586	3615	418	829	7512
1974	681	890	0	486	3946	318	532	6853
1975	736	732	23	375	3853	522	562	6803
1976	431	498	0	404	4634	502	268	6737
1977	442	613	0	254	3605	506	0	5420
1978	541	534	0	0	3577	484	0	5132
1979	508	536	0	0	3872	399	0	5315
1980	445	607	0	0	3170	423	0	4645
1981	196	489	0	0	34420	415	0	4520
1982	116	524	0	0	3738	612	0	4990
1983	128	644	0	0	4236	115	0	5123
1984	103	450	0	0	3306	21	0	3880
1985	59	384	0	0	2989	17	0	3449
1986	88	556	0	0	2948	4	0	3596
1987	157	657	0	0	4154	6	0	4974
1988	134	619	0	0	5083	10	0	5846
1989	95	614	0	0	4833	5	0	5547
1990	42	399	0	0	5119	0	0	5560
1991	69	530	0	0	5181	0	0	5780
1992	34	526	0	0	4526	0	0	5086
1993	20	501	0	0	3522	0	0	4046
1994	3	548	0	0	3561	0	0	4115
1995	0	463	0	0	3479	0	0	4015
1996	0	358	0	0	3696	20	0	4125
1997	0	299	0	0	3606	0	0	3906
1998	0	699	0	0	3659	0	0	4394
1999	0	500	0	0	4002	120	1	4625
2000	0	0	0	0	3209	67	3	3284
2001	0	362	0	2	2872	116	1	3362
2002	0	1629	0	0	2843	45	0	4519
2003	0	565	0	2	3585	108	5	4270
2004	0	739	0	1	3727	139	0	4606
2005	0	682	0	1	4313	180	20	5198
2006	0	960	0	1	6283	158	0	7405
2007	0	807	0	0	6599	185	0	7591
2008	0	1366	0	0	7738	176	0	9283
2009	0	1157	0	0	9616	172	0	10945
2010	0	1095	0	0	9868	168	0	11131
2011	0	588	0	0	8789	249	0	9626
2012	0	875	0	0	10695	248	0	11817
2013	0	1030	0	0	10198	294	0	11581
2014	0	1738	0	0	12350	158	0	14246
2015	0	1233	0	0	11552	250	0	13035
2016	0	1072	0	0	8583	230	0	9884
2017	0	829	0	0	7692	244	0	8765
2018	0	1103	0	0	6756	203	0	8062

Year	Belgium	Faroes	France	Germany	Iceland	Norway	UK	Total
2019	0	1093	0	0	6992	184	0	8268
2020	0	989	0	0	5836	237	0	7061
2021	0	926	0	0	6111	91	0	7128

Summary of the assessment

Table 9 Ling in Division 5.a. Assessment summary by calendar year. Catches are ICES estimates. 'High' and 'Low' indicate 95% confidence intervals.

Year	Recruitment			Spawning-stock biomass			Total catch	Fishing mortality		
	Age 2	High	Low	SSB	High	Low		Ages 8–11	High	Low
	thousands			tonnes			tonnes			
1979	2531	3505	1827	17538	22057	13946	5315	0.46	0.72	0.30
1980	2790	3618	2152	16669	20838	13335	4645	0.51	0.79	0.32
1981	3142	3951	2499	15276	19031	12263	4520	0.54	0.83	0.35
1982	3496	4350	2810	13958	17265	11284	4990	0.66	0.97	0.45
1983	3734	4631	3010	12384	15160	10117	5123	0.77	1.03	0.57
1984	3654	4530	2947	10693	12996	8799	3880	0.65	0.85	0.51
1985	3379	4185	2728	10499	12563	8775	3450	0.55	0.70	0.43
1986	3458	4287	2789	10845	12717	9248	3596	0.51	0.64	0.40
1987	3753	4650	3029	12038	13911	10418	4974	0.60	0.75	0.48
1988	3655	4502	2967	12207	13964	10672	5846	0.67	0.82	0.55
1989	3344	4075	2744	11535	13159	10111	5547	0.65	0.79	0.54
1990	2959	3574	2449	11329	12937	9920	5560	0.66	0.79	0.55
1991	2699	3265	2231	9839	11185	8655	5780	0.70	0.83	0.58
1992	2813	3405	2324	9385	10390	8478	5086	0.65	0.79	0.54
1993	2967	3579	2459	9054	9807	8358	4046	0.55	0.65	0.45
1994	2711	3285	2237	11420	12245	10651	4115	0.51	0.59	0.44
1995	2535	3077	2088	11881	12728	11091	4015	0.57	0.66	0.49
1996	2513	3048	2072	11789	12622	11011	4125	0.58	0.66	0.51
1997	2642	3196	2183	10655	11435	9928	3906	0.54	0.63	0.47
1998	3128	3783	2586	10822	11651	10051	4394	0.58	0.66	0.50
1999	3795	4582	3144	10760	11590	9989	4625	0.64	0.73	0.56
2000	4490	5418	3721	10786	11638	9996	3284	0.45	0.52	0.39
2001	4876	5910	4023	11826	12739	10978	3362	0.44	0.50	0.39
2002	5994	7213	4981	13190	14203	12249	4519	0.51	0.58	0.44
2003	6935	8346	5762	15144	16318	14055	4270	0.46	0.53	0.40
2004	8032	9727	6633	17446	18755	16228	4606	0.46	0.53	0.41
2005	8829	10686	7294	20357	21849	18967	5198	0.45	0.51	0.40
2006	10077	12210	8316	23032	24644	21526	7405	0.54	0.61	0.47
2007	10139	12336	8334	27359	29239	25599	7591	0.49	0.56	0.44
2008	11005	13278	9121	29572	31640	27640	9283	0.52	0.59	0.46
2009	10697	12991	8808	32494	34765	30372	10945	0.56	0.63	0.49
2010	7201	8710	5953	31249	33514	29137	11131	0.55	0.62	0.48
2011	5024	6120	4125	24921	26865	23118	9626	0.46	0.53	0.40
2012	3751	4629	3040	31376	33843	29089	11817	0.59	0.68	0.51
2013	4316	5381	3462	31302	33942	28867	11581	0.43	0.50	0.38
2014	3961	4955	3167	37169	40433	34169	14246	0.51	0.58	0.44
2015	3781	4785	2988	35300	38695	32203	13035	0.54	0.62	0.46
2016	4430	5735	3421	38903	43189	35042	9884	0.42	0.50	0.36
2017	3158	4190	2380	34432	38714	30624	8766	0.40	0.48	0.34
2018	2355	3298	1681	36224	41318	31759	8062	0.35	0.43	0.29

Year	Recruitment			Spawning-stock biomass			Total catch	Fishing mortality		
	Age 2	High	Low	SSB	High	Low		Ages 8–11	High	Low
	thousands			tonnes			tonnes			
2019	2668	3929	1812	30387	35445	26050	8269	0.37	0.45	0.30
2020	2602	4187	1617	30032	36361	24804	7061	0.33	0.43	0.26
2021	2840	5073	1590	26688	33760	21097	7128	0.32	0.43	0.24
2022	2810	5507	1434	27405	36698	20464				

Sources and references

ICES. 2017a. Iceland request to evaluate the harvest control rule for ling in Division 5.a. *In* Report of the ICES Advisory Committee, 2017. ICES Advice 2017, sr.2017.09.

ICES. 2017b. Report of the Workshop on Evaluation of the Adopted Harvest Control Rules for Icelandic Summer Spawning Herring, Ling and Tusk (WKICEMSE), 21–25 April 2017, Copenhagen, Denmark. ICES CM 2017/ACOM:45. 196 pp.

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 on the Biology and Assessment of Deep-sea Fisheries Resources (WGDEEP). ICES Scientific Reports. 4:40. 995 pp. http://doi.org/10.17895/ices.pub.20037233.

ICES 2022c. Workshop on the evaluation of assessments and management plans for ling, tusk, plaice and Atlantic wolffish in Icelandic waters (WKICEMP). ICES Scientific Reports. 4:37. 211 pp. https://doi.org/10.17895/ices.pub.19663971.v1.

NEAFC. 2016. The NEAFC approach to conservation and management of deep-sea species and categorization of deep-sea species/stocks. Adopted at the 35th Annual Meeting, November 2016 https://www.neafc.org/system/files/NEAFC_approach_to_DSS_conservation-and-management_Nov16.pdf.

Download the stock assessment data and figures.

Recommended citation: ICES. 2022. Ling (*Molva molva*) in Division 5.a (Iceland grounds). *In* Report of the ICES Advisory Committee, 2022. ICES Advice 2022, lin.27.5a. https://doi.org/10.17895/ices.advice.19448045.