Greenland halibut (*Reinhardtius hippoglossoides*) in subareas 5, 6, 12, and 14 (Iceland and Faroes grounds, West of Scotland, North of Azores, East of Greenland)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2023 should be no more than 26 710 tonnes.

Stock development over time

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

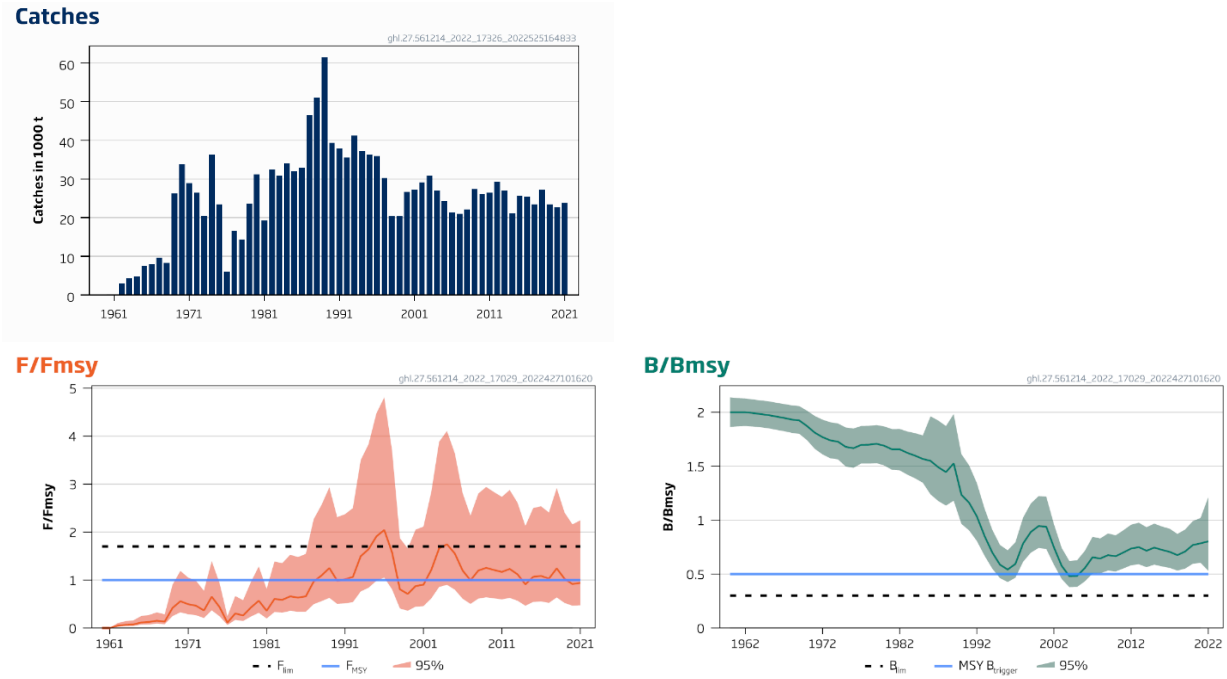

Figure 1 Greenland halibut in subareas 5, 6, 12, and 14. Summary of the stock assessment.

Catch scenarios

Table 1 Greenland halibut in subareas 5, 6, 12, and 14. Values in the forecast and for the interim year.

Variable	Value	Notes
F_{2022}/F_{MSY}	0.93	Based on a catch of 25 000 t in 2022
B_{2023}/B_{MSY}	0.80	Short-term forecast
Total catch (2022)	25000	Assumed catch based on TACs of Iceland, Greenland and catches from Faroe Islands; tonnes

Table 2 Greenland halibut in subareas 5, 6, 12, and 14. Annual catch scenarios (all weights are in tonnes).

Basis	Total catch (2023)	F_{total} (2023) F/F_{MSY}	Biomass (2024) B/B_{MSY}	% biomass change*	% advice change**
ICES advice basis					
MSY approach: F_{MSY}	26710	1	0.84	5	0.23
Other scenarios					
F = 0	0	0	0.88	10	−100
F = F_{2022}	25190	0.93	0.85	6	−5
F = F_{lim}	45380	1.7	0.79	−1	70

* Biomass 2024 relative to biomass 2023 (0.80).
** Advice value for 2023 relative to the advice value for 2022 (26650 tonnes).

Basis of the advice

Table 3 Greenland halibut in subareas 5, 6, 12, and 14. The basis of the advice.

Advice basis	MSY approach
Management plan	ICES is not aware of any agreed precautionary management plan for Greenland halibut in this area

Quality of the assessment

The assessment model provides consistent estimates of biomass and fishing mortality. The assessment results and reference points are dependent upon the CPUE data from trawlers operating in Icelandic fishing grounds; which now represents about 30% of catches and does not contain information from other grounds (ICES Subarea 14 and Subdivision 5.b) and gillnet operations in Icelandic waters (Subdivision 5.a).

There are also gaps in the time-series of surveys, and notably there have been no surveys in Subarea 14 since 2016.

Connectivity to the Northeast Arctic stock (ICES subareas 1 and 2) is known but unquantified (Albert and Vollen, 2015; Westgaard *et al.*, 2017; Vihtakari *et al.*, 2022) and the current assessment may therefore represent trends from more than one population. This issue adds to the uncertainty in the assessment and advice.

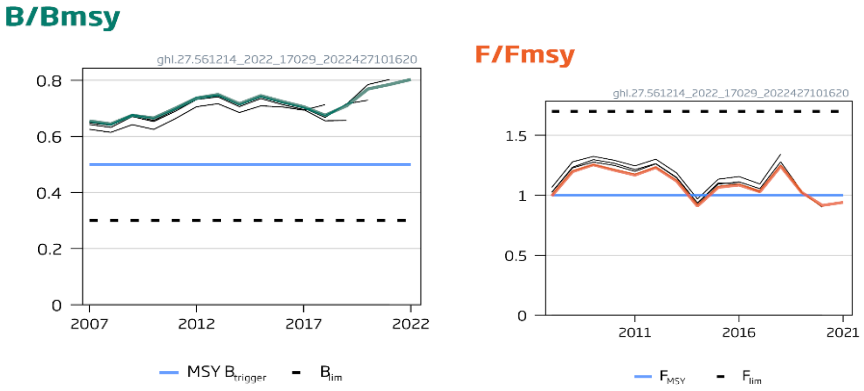

Figure 2 Greenland halibut in subareas 5, 6, 12, and 14. Historical assessment results.

Issues relevant for the advice

Greenland halibut is a relatively slow-growing and late-maturing species. Low abundance of smaller fish has been recorded in the surveys since 2013 (ICES, 2021). These year classes are now entering the fishable biomass, which is likely to cause an overall reduction in total biomass in the future.

Reference points

Table 4 Greenland halibut in subareas 5, 6, 12, and 14. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	0.5 B_{MSY}	B_{MSY} is estimated implicitly from the surplus production model. At 0.5 B_{MSY} production is reduced to 70% of MSY	ICES (2007)
	F_{MSY}	Relative value	F_{MSY} is estimated implicitly from the surplus production model. Fishing mortality values are expressed relative to F_{MSY}	ICES (2007)
Precautionary approach	B_{lim}	0.3 B_{MSY}	Based on a fraction of B_{MSY} where production is reduced to 50% MSY	ICES (2013)
	B_{pa}	Not defined		
	F_{lim}	1.7 F_{MSY}	The F that on average leads to B_{lim}	ICES (2013)
	F_{pa}	Not defined		
Management plan	SSB_{mgt}	Not defined		
	F_{mgt}	Not defined		

Basis of the assessment

Table 5 Greenland halibut in subareas 5, 6, 12, and 14. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2022a)
Assessment type	A probabilistic (Bayesian) version of a surplus production model that uses catches in the model and in the forecast (ICES, 2022b)
Input data	Commercial catches (international landings); one combined survey index (GRL-deep [G5943], 1998–2016, and the Icelandic bottom trawl survey – Autumn (IS-SMH [G4493] since 1996); one commercial index (Icelandic trawlers [since 1985])
Discards and bycatch	Discarding and bycatch are considered negligible
Indicators	None
Other information	A benchmark was conducted in 2013 (WKBUT; ICES, 2013)
Working group	Northwestern Working Group (NWWG)

History of the advice, catch, and management

Table 6 Greenland halibut in subareas 5, 6, 12, and 14. ICES advice, TACs and catch. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	TAC for Iceland EEZ*	TAC for Greenland EEZ	ICES catch subareas 5, 6, 12, and 14
1987	No increase in F	28 000	30 000		46 622
1988	No increase in F	28 000	30 000		51 118
1989	TAC	33 000	30 000		61 396
1990	No advice	-	45 000		39 326
1991	TAC	40 000	30 000		37 950
1992	TAC	30 000	25 000		35 487
1993	No increase in effort	28 000	30 000		41 247
1994	No increase in effort	34 000	30 000		37 190
1995	TAC	32 000	30 000		36 288
1996	TAC	21 000	20 000		35 932
1997	60% reduction in F from 1995	13 000	15 000		30 309
1998	70% reduction in F from 1996	11 000	10 000	8 100	20 382
1999	65% reduction in F from 1997	11 000	10 000	8 000	20 371
2000	60% reduction in F from 1998	11 000	10 000	8 000	26 644
2001	Catch less than 1998–1999 catch	< 20 000	20 000	14 500	27 291
2002	F reduced below 0.67 × F_{MSY}	< 21 000	20 000	14 500	29 158
2003	F reduced below 0.67 × F_{MSY}	< 23 000	23 000	14 500	30 891
2004	F reduced below 0.67 × F_{MSY}	< 20 000	23 000	14 100	27 102
2005	Effort reduced to 1/3 of the 2003 level	< 15 000	15 000	12 000	24 249

Year	ICES advice	Catch corresponding to advice	TAC for Iceland EEZ*	TAC for Greenland EEZ	ICES catch subareas 5, 6, 12, and 14
2006	Effort reduced to 1/3 of the 2003 level	< 15 000	15 000	10 000	21 432
2007	Adaptive management plan, start at 15 000 tonnes	< 15 000	15 000	11 700	20 957
2008	Adaptive management plan, start at 15 000 tonnes	< 15 000	15 000	11 000	22 169
2009	Adaptive management plan, reduce to 5000 tonnes	< 5000	15 000	10 000	27 349
2010	Adaptive management plan, reduce to 5000 tonnes	< 5000	12 000	12 000	25 995
2011	Adaptive management plan, reduce F substantially below F_{MSY}	< 5000	13 000	12 000	26 424
2012	No directed fishery, multiannual management plan to be developed and implemented	-	13 000	13 000	29 309
2013	F reduced to F_{MSY}	< 20 000	15 000	10 000	27 045
2014	F reduced to F_{MSY}	< 20 000	12 500	8 300	21 069
2015	F reduced to F_{MSY}	< 25 000	14 100	9 500	25 677
2016	Fishing at F_{MSY}	< 22 000	12 400	8 300	25 397
2017	Fishing at F_{MSY}	< 24 000	13 500	9 000	23 466
2018	Fishing at F_{MSY}	< 24 000	13 535	9 024	27 142
2019	MSY approach	< 24 150	13 621	9 080	23 428
2020	MSY approach	≤ 21 360	12 047	8 031	22 669
2021	MSY approach	≤ 23 530	13 271	8 847	23 802
2022	MSY approach	≤ 26 650	15031	10 020	
2023	MSY approach	≤ 26 710			

* For the fishing year ending 31 August.

History of the catch and landings

Table 7 Greenland halibut in subareas 5, 6, 12, and 14. Catch distribution by fleet in 2021 as estimated by ICES.

Catch (2021)	Landings		Discards
23 802 tonnes	Bottom trawl/shrimp trawl 76%	Gillnet/longlines 24%	Discarding is negligible
	23802 tonnes		

Table 8 Greenland halibut in subareas 5, 6, 12, and 14. History of commercial catch; official values are presented for each country participating in the fishery with ICES estimates of total catch. All weights are in tonnes.

Country	1981	1982	1983	1984	1985	1986	1987	1988	1989
Denmark							6	+	
Faroe Islands	767	1532	1146	2502	1052	853	1096	1378	2319
France	8	27	236	489	845	52	19	25	
Germany	3007	2581	1142	936	863	858	565	637	493
Greenland	+	1	5	15	81	177	154	37	11
Iceland	15457	28300	28360	30080	29231	31044	44780	49040	58330
Norway			2	2	3	+	2	1	3
Total	19239	32441	30891	34024	32075	32984	46622	51118	61156
ICES estimate	-	-	-	-	-	-	-	-	61396
Country	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark	-	-	-	-	-	-	1	-	
Faroe Islands	1803	1566	2128	4405	6241	3763	6148	4971	3817
France	-	-	3	2	-	-	29	11	8
Germany	336	303	382	415	648	811	3368	3342	3056
Greenland	40	66	437	288	867	533	1162	1129	747
Iceland	36557	34883	31955	33987	27778	27383	22055	18569	10728
Norway	50	34	221	846	1173	1810	2164	1939	1367
Russia	-	-	5	-	-	10	424	37	52
Spain									89

UK (Engl. and Wales)	27	38	109	811	513	1436	386	218	190
UK (Scotland)	-	-	19	26	84	232	25	26	43
Total	38813	36890	35259	40780	37305	36006	35762	30242	20360
ICES estimate	39326	37950	35423	40817	36958	36300	35825	30309	20382
Country	1999	2000	2001	2002	2003	2004	2005	2006	2007
Estonia				8			5	3	
Faroe Islands	3884		121	334	458	338	1150	855	1141
France		2	32	290	177	157		62	17
Germany	3082	3265	2800	2050	2948	5169	5150	4299	4930
Greenland	200	1740	1553	1887	1459				
Iceland	11180	14537	16590	19224	20366	15478	13023	11798	9567
Ireland			56						
Lithuania					2	1		2	3
Norway	1187	1750	2243	1998	1074	1233	1124	1097	78
Poland			2	16	93	207			
Portugal			6	130				1094	
Russia	138	183	187	44		262		552	501
Spain		779	1698	1395	3075	4721	506	33	
UK (Engl. and Wales)	261	370	227	71	40	49	10	1	
UK (Scotland)	69	121	130	181	367	367	391	1	
United Kingdom		166	252	255	841	1304	220	93	17
Total	20001	22913	25897	27609	30900	29286	21579	19890	16410
ICES estimate	20371	26644	27291	29158	30891	27102	24249	21432	20957
Country	2008	2009	2010	2011	2012	2013	2014	2015	2016
Estonia							429		
Faroe Islands	26	270	1408	1705	2811	2788	3393	3214	4656
France	114			150	67	133		117	88
Germany	4846	423	5287	5782	4620	3814	3701	3808	4420
Greenland		2819		3415	5239	3251	1897	3642	1511
Iceland	11671	15765	13293	13192	13749	14859	9861	12400	12652
Lithuania	566				99				
Norway	639	124	233	171	856	614	764	1126	1007
Poland	1354	988	960		786				
Russia	799	762	1070	1095	1168	1369	587	600	600
Spain								110	2105
United Kingdom	422	581	577	323	12	95		127	348
Total	20411	22247	22901	25693	29407	26923	20743	25145	27388
ICES estimate	22169	27349	25995	26424	29309	27045	21069	25677	25397
Country	2017	2018	2019	2020	2021*				
Faroe Islands	3999	2949	1973	1888	2070				
France	51	71	78	97	82				
Germany	2994	4463	4483	4769	4354				
Greenland	2692	2970	2999	1992	2834				
Iceland	11926	15214	12390	12535	12837				
Norway	1002	937	995	813	993				
Russia	599	400	398	399	390				
Spain	114	125	82	100					
United Kingdom	90	13	29	76	243				
Total	23466	27142	23428	22669	23802				
ICES estimate	23466	27142	23428	22643	23802				

* Provisional data.

Summary of the assessment

Table 9 Greenland halibut in subareas 5, 6, 12, and 14. Assessment summary. High and low values correspond to 95% confidence intervals.

Year	B/B_{MSY}* (ratio)	B/B_{MSY} high*	B/B_{MSY} low*	Catches (tonnes)	F/F_{MSY} (ratio)	F/F_{MSY} high	F/F_{MSY} low
1960	2	2.14	1.86	0	0.00	0.00	0.00
1961	2	2.13	1.87	29	0.00044	0.00096	0.00027
1962	2	2.13	1.87	3071	0.047	0.102	0.028
1963	1.99	2.12	1.87	4275	0.066	0.142	0.039
1964	1.98	2.11	1.86	4748	0.074	0.159	0.044
1965	1.97	2.1	1.85	7421	0.115	0.25	0.069
1966	1.96	2.09	1.84	8030	0.126	0.27	0.075
1967	1.95	2.08	1.82	9597	0.152	0.33	0.090
1968	1.93	2.06	1.81	8337	0.133	0.29	0.079
1969	1.92	2.06	1.8	26200	0.42	0.90	0.25
1970	1.87	2.01	1.74	33823	0.56	1.19	0.33
1971	1.81	1.97	1.66	28973	0.50	1.05	0.29
1972	1.77	1.93	1.61	26473	0.46	0.98	0.27
1973	1.74	1.91	1.57	20463	0.37	0.78	0.21
1974	1.73	1.9	1.56	36280	0.65	1.40	0.37
1975	1.68	1.86	1.5	23494	0.44	0.93	0.24
1976	1.67	1.85	1.48	6045	0.113	0.24	0.063
1977	1.7	1.87	1.52	16578	0.30	0.67	0.169
1978	1.7	1.87	1.52	14349	0.26	0.58	0.146
1979	1.71	1.88	1.53	23622	0.43	0.96	0.24
1980	1.69	1.87	1.51	31157	0.57	1.28	0.32
1981	1.66	1.84	1.47	19239	0.36	0.81	0.198
1982	1.66	1.85	1.46	32441	0.60	1.39	0.33
1983	1.62	1.82	1.42	30891	0.59	1.35	0.32
1984	1.6	1.81	1.39	34024	0.66	1.53	0.36
1985	1.57	1.78	1.35	32075	0.63	1.48	0.34
1986	1.55	1.96	1.24	32984	0.66	1.54	0.34
1987	1.49	1.92	1.18	46622	0.97	2.3	0.50
1988	1.45	1.87	1.13	51118	1.09	2.6	0.56
1989	1.53	1.98	1.18	61396	1.25	2.9	0.63
1990	1.24	1.61	0.96	39326	0.99	2.3	0.50
1991	1.16	1.51	0.9	37950	1.01	2.4	0.51
1992	1.03	1.34	0.81	35487	1.06	2.5	0.54
1993	0.85	1.11	0.67	41247	1.50	3.5	0.76
1994	0.7	0.91	0.55	37190	1.64	3.8	0.84
1995	0.59	0.77	0.46	36288	1.91	4.5	0.98
1996	0.54	0.72	0.43	35932	2.0	4.8	1.05
1997	0.59	0.8	0.47	30309	1.57	3.7	0.80
1998	0.78	1.02	0.61	20382	0.81	1.87	0.41
1999	0.89	1.15	0.7	20371	0.71	1.66	0.36
2000	0.94	1.22	0.74	26644	0.87	2.0	0.44
2001	0.94	1.22	0.73	27291	0.90	2.1	0.46
2002	0.75	0.96	0.59	29158	1.21	2.8	0.62
2003	0.58	0.74	0.45	30891	1.66	3.9	0.85
2004	0.48	0.62	0.38	27102	1.75	4.1	0.90
2005	0.48	0.63	0.38	24249	1.55	3.6	0.80
2006	0.56	0.72	0.43	21432	1.20	2.8	0.61
2007	0.66	0.85	0.5	20957	0.99	2.3	0.50
2008	0.64	0.83	0.51	22169	1.20	2.8	0.61
2009	0.68	0.88	0.53	27349	1.25	2.9	0.64
2010	0.67	0.86	0.52	25995	1.21	2.8	0.62
2011	0.7	0.91	0.55	26424	1.17	2.7	0.60
2012	0.74	0.96	0.58	29309	1.23	2.9	0.63

Year	B/B_{MSY}* (ratio)	B/B_{MSY} high*	B/B_{MSY} low*	Catches (tonnes)	F/F_{MSY} (ratio)	F/F_{MSY} high	F/F_{MSY} low
2013	0.75	0.98	0.59	27045	1.12	2.6	0.57
2014	0.72	0.93	0.56	21069	0.91	2.1	0.46
2015	0.75	0.97	0.59	25677	1.07	2.5	0.54
2016	0.72	0.94	0.57	25397	1.08	2.5	0.55
2017	0.71	0.92	0.56	23466	1.03	2.4	0.52
2018	0.68	0.87	0.53	27141	1.24	2.9	0.64
2019	0.71	0.91	0.55	23428	1.02	2.4	0.52
2020	0.77	0.99	0.6	22643	0.92	2.2	0.46
2021	0.78	1.02	0.6	23802	0.94	2.2	0.48
2022	0.8	1.21	0.53				

*B/B_{MSY} at the beginning of the year.

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Download the stock assessment data and figures.

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