

Greenland halibut (*Reinhardtius hippoglossoides*) in subareas 1 and 2 (Northeast Arctic)

ICES stock advice

ICES advises that when the precautionary approach is applied, catches in each of the years 2018 and 2019 should be no more than 23 000 tonnes.

Stock development over time

The fishable biomass (length ≥ 45 cm) increased from 1992 to 2013 and has been relatively stable thereafter. The harvest rate has been low since 1992, but has been increasing since a low value in 2009.

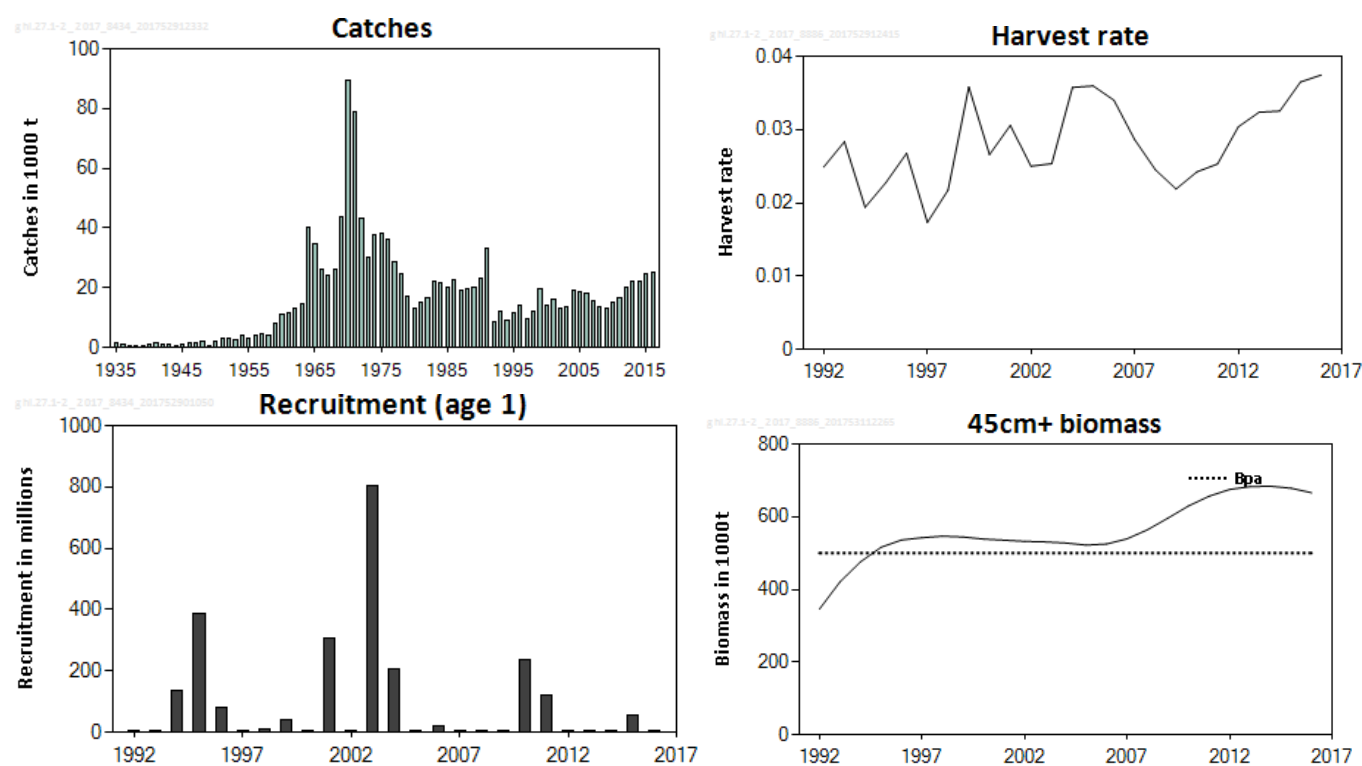


Figure 1 Greenland halibut in subareas 1 and 2. Summary of the stock assessment. Catches (thousand tonnes), harvest rate (defined as catch in a year divided by biomass at the start of the year), recruitment at age 1 (millions), and fishable (length ≥ 45 cm) biomass (thousand tonnes).

Stock and exploitation status

Table 1 Greenland halibut in subareas 1 and 2. State of the stock and fishery relative to reference points.

		Fishing pressure				Stock size				
		2014	2015	2016		2015	2016	2017		
Maximum sustainable yield	F_{MSY}	?	?	?	Undefined	$MSY B_{trigger}$?	?	?	Undefined
Precautionary approach	F_{pa}, F_{lim}	?	?	?	Undefined	B_{pa}, B_{lim}	✓	✓	✓	Undefined
Management plan	F_{MGT}	—	—	—	Not applicable	B_{MGT}	—	—	—	Not applicable

Catch options

Table 2 Greenland halibut in subareas 1 and 2. The basis for the catch options.

Variable	Value	Source	Notes
Harvest rate (2017)	0.037	ICES (2017)	Corresponding to average fishing intensity in 2015–2016
Biomass \geq 45 cm (2017)	666 000 t	ICES (2017)	On 1 January
R (2017)	N/A	ICES (2017)	R(2017) does not intervene in the short-term forecast
Expected catch (2017)	25 000 t	ICES (2017)	Assuming recent exploitation rate

Table 3 Greenland halibut in subareas 1 and 2. The catch options. Weights in tonnes.*

Basis	Catches (2018)	Harvest rate 2018–2021	Mean catch 2018–2021	Biomass 45cm+ 1st January 2022	% 45cm+ Biomass Change^^
ICES advice basis					
FI_{2017}^{\wedge}	23000	0.039	21800	525000	-21%
Other options					
$F = 0$	0	0	0	602000	-10%
$FI_{2017} \times 0.5$	11600	0.023	11300	562000	-16%
$FI_{2017} \times 0.75$	17300	0.031	16600	543000	-18%
$FI_{2017} \times 1.5$	34300	0.054	31500	490000	-26%
$FI_{2017} \times 2$	45400	0.069	40700	458000	-31%
$FI_{2017} \times 3$	67200	0.098	57100	401000	-40%

[^] FI = fishing intensity. Note that "fishing intensity" refers to numbers and "harvest rate" to tonnes. The two are, therefore, not linearly related.

^{^^} 45cm+ biomass in 2022 relative to 2017.

Basis of the advice

Table 4 Greenland halibut in subareas 1 and 2. The basis of the advice.

Advice basis	Precautionary approach
Management plan	None

Quality of the assessment

The assessment uses an age–length-structured Gadget model (ICES, 2015a). However, there is no agreement on age-reading methodology between Norway and Russia and the model is tuned using only length data. This gives uncertainty on the absolute

* Version2: updated values for mean catch 2018-2021 for $FI_{2017} \times 0.5$ and $FI_{2017} \times 0.75$ options

levels of modelled biomass and F , and on the recruitment pattern. The peaks of recruitment identified by the model are corroborated by survey length distributions, but the weaker year classes may be poorly modelled.

None of the surveys individually covers the complete stock distribution and there are discrepancies between the surveys, leading to high uncertainty and a marked retrospective pattern.

Based on ICES procedures for stocks with sporadic recruitment and low exploitation rates, the lowest observed stock biomass with high recruitment is used as B_{pa} in the current advice. There are indications of good recruitment from a lower stock size before the start of the period in the model; the B_{pa} is, therefore, likely to be on the conservative side.

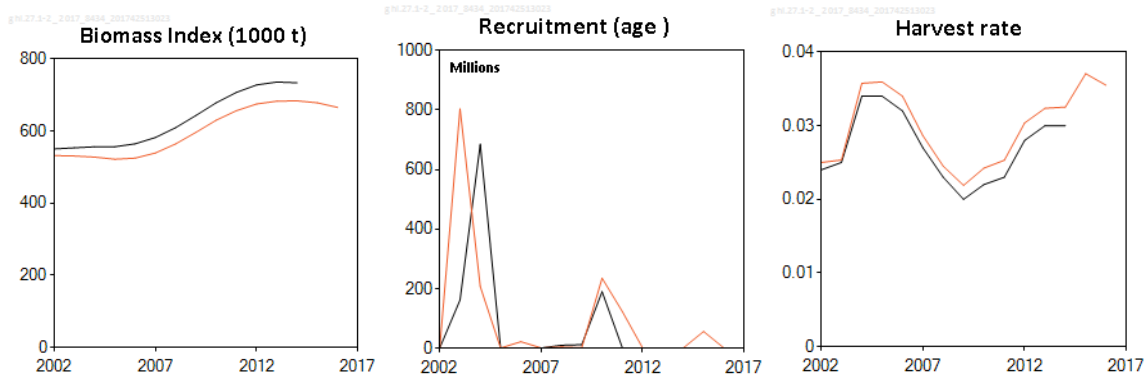


Figure 2 Greenland halibut in subareas 1 and 2. Historical assessment results. Assessment 2017 (red line) compared to 2015 (black line).

Issues relevant for the advice

In the absence of a harvest control rule or MSY reference points, the advice is based on a precautionary approach where priority is given to keeping the stock biomass above B_{pa} . Given the late recruitment to the fishery, the model is able to produce a 5-year forecast of fishable biomass. At the recent (last 2-year average) fishing intensity level, the stock is forecast to remain above B_{pa} over this five-year period, and this forms the basis of the advice. This approach of averaging the fishing intensity over the two most recent years is preliminary and does not necessarily constitute a standard for the future. Evaluation of an appropriate longer-term advice rule will take place at the earliest practicable opportunity. The fishery has a history of quotas being set above scientific advice and catches being above the quota. If this trend continues it would invalidate the basis of the scientific advice, which could then not be considered precautionary.

As the model is developed, it is likely that the basis of the advice will be revised. Reconstruction of pre-1992 stock and exploitation levels would provide a better basis for reference points and evaluation of MSY and harvest control rules.

This is a long-lived, low productivity species which requires low fishing pressure and the stock is currently in a relatively stable state. There is, therefore, no need for annual updates to the advice. Furthermore, one of the key surveys is only conducted every two years. ICES provides advice for a two-year period.

Reference points

Table 5 Greenland halibut in subareas 1 and 2. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	Not defined		
	F_{MSY}	Not defined		
Precautionary approach	B_{lim}	Not defined		
	B_{pa}	500 000 t	Fishable biomass (length \geq 45 cm) in 1995, based on the lowest observed stock size for which good recruitment has been observed	ICES (2015)
	F_{lim}	Not defined		
	F_{pa}	Not defined		
Management plan	SSB_{mgt}	Not defined		
	F_{mgt}	Not defined		

Basis of the assessment

Table 6 Greenland halibut in subareas 1 and 2. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2016).
Assessment type	Age-length-structured (Gadget model), but with only length data used for tuning.
Input data	Trends in biomass and length distributions for four survey indices: the Norwegian slope survey (NO-GH-Btr-Q3), the Russian autumn survey (RU-BTr-Q4), and the newly derived EcoSouth and EcoJuv indices; catch-in-tonnes and length distributions from four aggregated commercial fleets (Norwegian trawl and seine, Russian trawl and seine, Norwegian gillnet and longline, Russian gillnet and longline); and maturity-at-length data from the Norwegian slope survey (NO-GH-Btr Q3).
Discards and bycatch	Not included, considered negligible.
Indicators	None.
Other information	Inter-benchmark process May–August 2015 (ICES, 2015).
Working group	Arctic Fisheries Working Group (AFWG)

Information from stakeholders

No information was provided.

History of the advice, catch, and management

Table 7 Greenland halibut in subareas 1 and 2. ICES advice and official landings. All weights are in tonnes.

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	Official catches
1987	Precautionary TAC	-	-	19112
1988	No decrease in SSB	19000	-	19587
1989	$F = F(87)$; TAC	21000	-	20138
1990	$F = F(89)$; TAC	15000	-	23183
1991	F at F_{med} ; TAC; improved expl. pattern	9000	-	33320
1992	Rebuild SSB(1991)	6000	7000*	8602
1993	TAC	7000	7000*	11933
1994	$F < 0.1$	< 12000	11000*	9226
1995	No fishing	0	2500**	11734
1996	No fishing	0	2500**	14347
1997	No fishing	0	2500**	9410
1998	No fishing	0	2500**	11893
1999	No fishing	0	2500**	19517
2000	No fishing	0	2500**	14297

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	Official catches
2001	Reduce catch to rebuild stock	< 11000	2500**	16365
2002	Reduce F substantially	< 11000	2500**	13293
2003	Reduce catch to increase stock	< 13000	2500**	13447
2004	Do not exceed recent low catches	< 13000	2500**	18899
2005	Do not exceed recent low catches	< 13000	2500**	18834
2006	Do not exceed recent low catches	< 13000	2500**	17904
2007	Reduce catch to increase stock	< 13000	2500**	15453
2008	Reduce catch to increase stock	< 13000	2500**	13792
2009	Same advice as last year	< 13000	2500**	12990
2010	Same advice as last year	< 13000	15000***	15229
2011	Same advice as last year	< 13000	15000***	16606
2012	No increase in catches	< 15000	18000***	20288
2013	No increase in catches	< 15000	19000***	22173
2014	No new advice, same as for 2013	< 15000	19000***	23025
2015	Same as for 2014	< 15000	19000***	24748
2016	Precautionary approach	< 19800	22000***	24927
2017	Same advice as last year	< 19800	24000***	
2018	Precautionary approach	< 23000		
2019	Same advice as last year	< 23000		

* Set by Norwegian authorities.

** Set by Norwegian authorities for the non-trawl fishery; allowable bycatch in the trawl fishery is additional to this.

*** Set by the Joint Norwegian-Russian Fisheries Commission.

History of the catch and landings

Table 8 Greenland halibut in subareas 1 and 2. Catch distribution by fleet in 2016 as estimated by ICES.

Catch (2016)	Landings				Discards
	Trawl 57%	Longline 30%	Gillnet 10%	Others 3%	
24 927 tonnes	24 927 tonnes				Discarding is considered negligible

Table 9 Greenland halibut in subareas 1 and 2. History of commercial catch and landings; both the official and ICES estimated values are presented by area for each country participating in the fishery. All weights are in tonnes.

Year	Estonia	Denmark	Faroe Isl.	France	Fed. Rep. Germ any	Greenland	Iceland	Ireland	Lithuania	Norway	Poland	Portugal	Russia*	Spain	UK (Engl. & Wales)	UK (Scotland)	Total
1984	0	0	0	138	2165	0	0	0	0	4376	0	0	15181	0	23	0	21883
1985	0	0	0	239	4000	0	0	0	0	5464	0	0	10237	0	5	0	19945
1986	0	0	42	13	2718	0	0	0	0	7890	0	0	12200	0	10	2	22875
1987	0	0	0	13	2024	0	0	0	0	7261	0	0	9733	0	61	20	19112
1988	0	0	186	67	744	0	0	0	0	9076	0	0	9430	0	82	2	19587
1989	0	0	67	31	600	0	0	0	0	10622	0	0	8812	0	6	0	20138
1990	0	0	163	49	954	0	0	0	0	17243	0	0	4764	0	10	0	23183
1991	2564	11	314	119	101	0	0	0	0	27587	0	0	2490	132	0	2	33320
1992	0	0	16	111	13	13	0	0	0	7667	0	31	718	23	10	0	8602
1993	0	2	61	80	22	8	56	0	30	10380	0	43	1235	0	16	0	11933
1994	0	4	18	55	296	3	15	5	4	8428	0	36	283	1	76	2	9226
1995	0	0	12	174	35	12	25	2	0	9368	0	84	794	1106	115	7	11734
1996	0	0	2	219	81	123	70	0	0	11623	0	79	1576	200	317	57	14347
1997	0	0	27	253	56	0	62	2	0	7661	12	50	1038	157	67	25	9410
1998	0	0	57	67	34	0	23	2	0	8435	31	99	2659	259	182	45	11893
1999	0	0	94	0	34	38	7	2	0	15004	8	49	3823	319	94	45	19517
2000	0	0	0	45	15	0	16	1	0	9083	3	37	4568	375	111	43	14297
2001	0	0	0	122	58	0	9	1	0	10896	2	35	4694	418	100	30	16365
2002	219	0	0	7	42	22	4	6	0	7143	5	14	5584	178	41	28	13293
2003	0	0	459	2	18	14	0	1	0	8216	5	19	4384	230	41	58	13447
2004	0	0	0	0	9	0	9	0	0	13939	1	50	4662	186	43	0	18899
2005	170	0	0	32	8	0	0	0	0	13011	0	23	4883	660	29	18	18834
2006	0	0	204	46	8	0	8	0	196	11119	201	26	6055	29	10	2	17904
2007	0	0	203	41	8	198	15	0	0	8230	200	47	6484	8	11	8	15453
2008	0	0	663	42	5	0	28	0	0	7393	201	46	5294	94	16	10	13792
2009	0	0	422	16	19	16	15	2	0	8446	204	237	3335	210	9	60	12990
2010	0	0	272	102	14	15	16	0	0	7700	3	11	6888	182	4	22	15229
2011	0	0	538	46	80	4	7	0	234	8270	169	21	7053	144	36	4	16606
2012	0	0	564	40	40	12	13	0	0	9331	22	1	10041	190	21	14	20288
2013	6	0	783	168	49	22	106	1	0	10403	30	7	10310	196	17	75	22173

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2014	0	0	887	269	33	20	86	0	0	11232	19	0	10061	206	28	184	23025
2015	0	0	312	227	33	14	53	0	5	10874	13	1	12953	159	25	79	24748
2016	353	0	468	229	9	17	79	0	0	12932	8	19	10576	198	20	19	24927

* USSR prior to 1991.

Summary of the assessment

Table 10 Greenland halibut in subareas 1 and 2. Assessment summary. Weights are in tonnes.

Year	Recruitment (age 1)	45cm+ biomass	Landings	Harvest rate
	thousands	tonnes	tonnes	ages
1992	1014	345836	8602	0.025
1993	2283	420673	11933	0.028
1994	135304	475744	9226	0.019
1995	388040	515790	11734	0.023
1996	83064	535941	14347	0.027
1997	1692	542337	9410	0.017
1998	11697	546566	11893	0.022
1999	39616	544204	19517	0.036
2000	1015	538570	14297	0.027
2001	305116	535477	16365	0.031
2002	1000	532234	13293	0.025
2003	804425	530841	13447	0.025
2004	207347	527711	18899	0.036
2005	1000	521879	18834	0.036
2006	21913	525009	17904	0.034
2007	1022	539178	15453	0.029
2008	4179	564311	13792	0.024
2009	1685	596542	12990	0.022
2010	235513	629992	15229	0.024
2011	122916	656462	16606	0.025
2012	1005	675089	20288	0.03
2013	1002	682820	22173	0.032
2014	1003	683839	23025	0.033
2015	56363	678294	24748	0.036
2016	1015	665655	24927	0.037

Sources and references

ICES. 2015. Report of the Inter Benchmark Process on Greenland Halibut in ICES areas I and II (IBPHALI), August 2015, By correspondence. ICES CM 2015\ACOM:54. 41 pp.

ICES. 2016. Advice basis. *In* Report of the ICES Advisory Committee, 2016. ICES Advice 2016, Book 1, Section 1.2.

ICES. 2017. Report of the Arctic Fisheries Working Group (AFWG), 19–25 April 2017, ICES HQ, Copenhagen, Denmark. ICES CM 2017\ACOM:06. 486 pp.