

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.

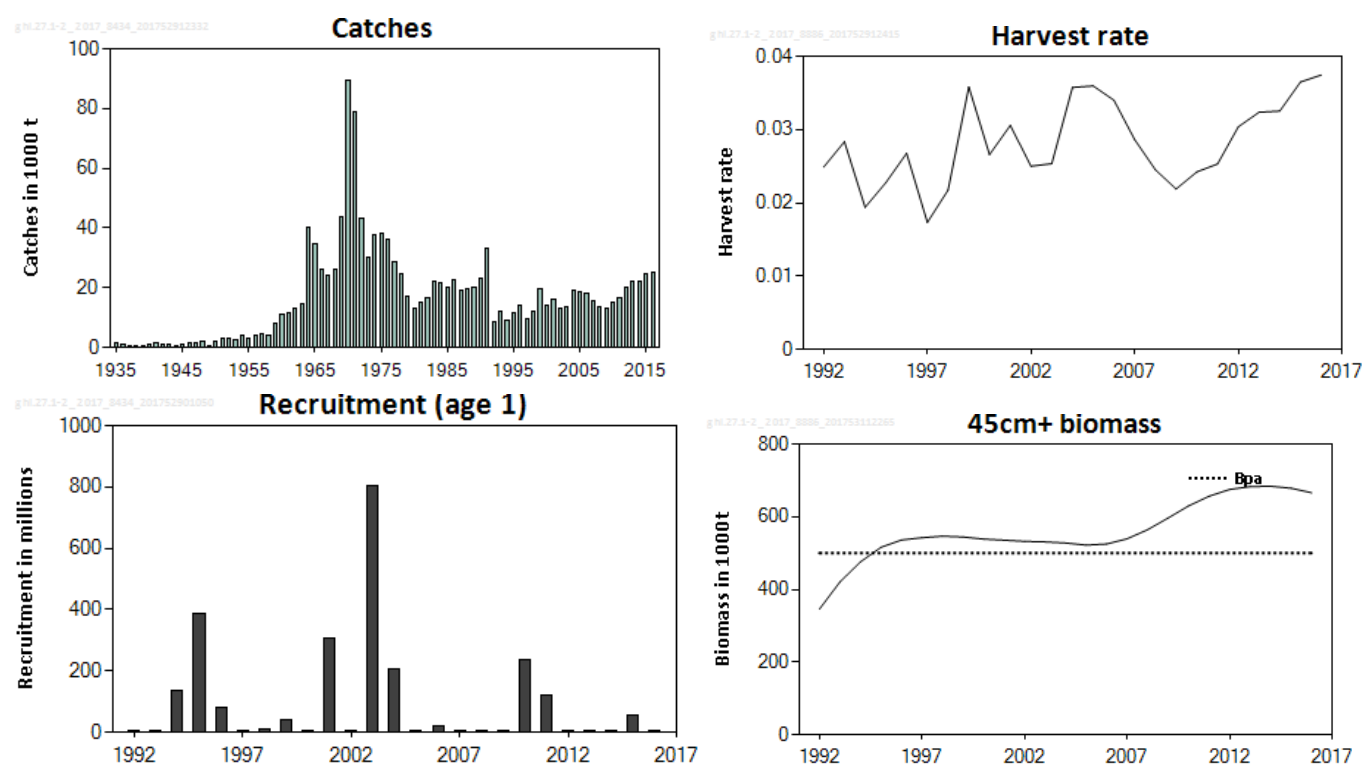


Figure 1 Greenland halibut in subareas 1 and 2. Summary of the stock assessment. Catches (thousand tonnes), harvest rate (defined as catch in a year divided by biomass at the start of the year), recruitment at age 1 (millions), and fishable (length ≥ 45 cm) biomass (thousand tonnes).

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.

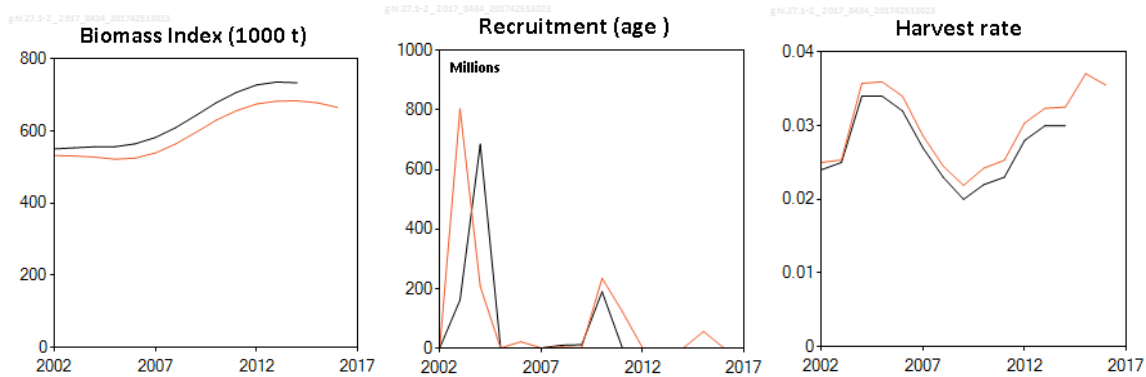


Figure 2 Greenland halibut in subareas 1 and 2. Historical assessment results. Assessment 2017 (red line) compared to 2015 (black line).

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 |

ghl.27.1-2

| | | | | | | | | | | | | | | | | | |
|------|-----|---|-----|-----|----|----|----|---|---|-------|----|----|-------|-----|----|-----|-------|
| 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.