*ICES Advice on fishing opportunities, catch, and effort*
*Greenland Sea and Icelandic Waters ecoregions*
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International Council for
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## Haddock (*Melanogrammus aeglefinus*) in Division 5.a (Iceland grounds)

### ICES advice on fishing opportunities

ICES advises that when the Iceland management plan is applied, catches in the fishing year 2019/2020 should be no more than 41 823 tonnes.

### Stock development over time

The spawning-stock biomass (SSB) has decreased since 2008, but stabilized above MSY $B_{trigger}$ in recent years. The harvest rate (HR) is currently estimated above the $HR_{MSY}$. Recruitment (R) is highly variable and has increased since 2015.
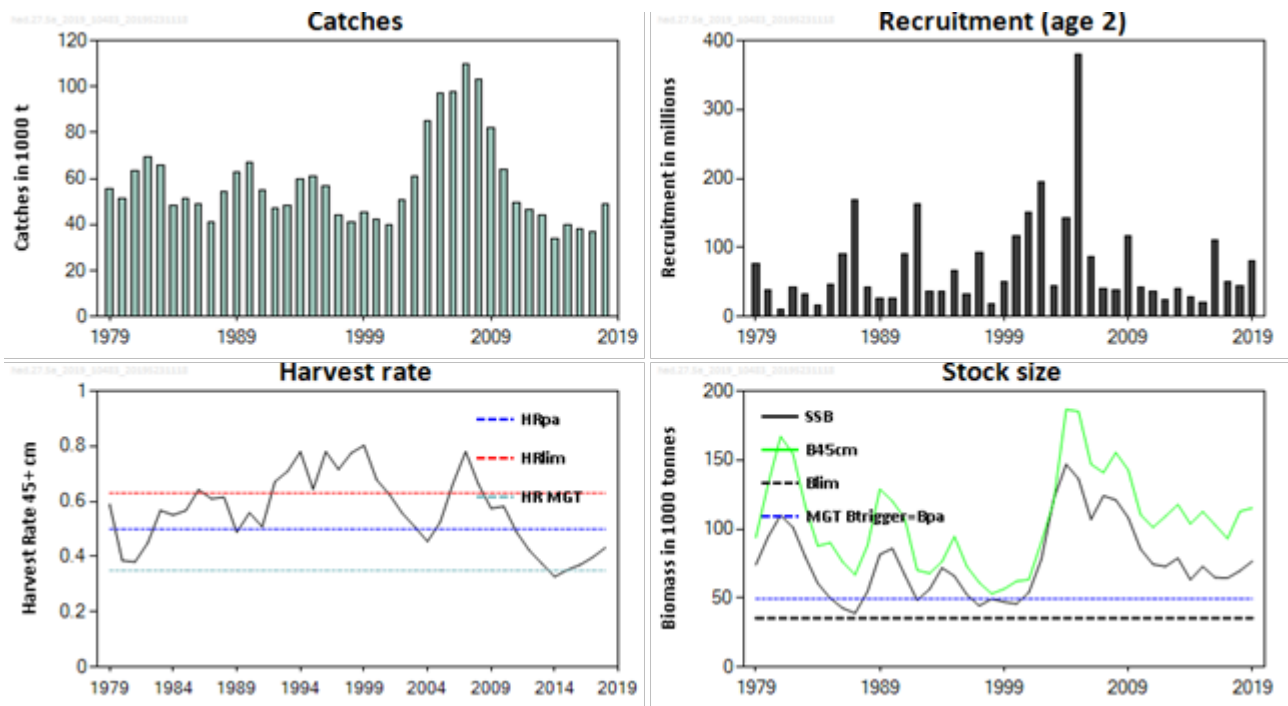


**Figure 1** Haddock in Division 5.a. Summary of the stock assessment. Calculation of harvest rates is based on biomass of fish at length 45+ cm (MSY $B_{trigger}$ = $B_{pa}$ = MGT $B_{trigger}$).

### Stock and exploitation status

ICES assesses that fishing pressure on the stock is above $HR_{MSY}$, and below both $HR_{pa}$ and $HR_{lim}$. Spawning stock size is above MSY $B_{trigger}$, $B_{pa}$, and $B_{lim}$.

**Table 1** Haddock in Division 5.a. State of the stock and fishery relative to reference points.

| | | Fishing pressure | | | | Stock size | | |
|---|---|---|---|---|---|---|---|---|
| | | 2016 | 2017 | 2018 | | 2017 | 2018 | 2019 |
| Maximum sustainable yield | $HR_{MSY}$ | ❌ | ❌ | ❌ Above | MSY $B_{trigger}$ | ✅ | ✅ | ✅ Above |
| Precautionary approach | $HR_{pa}$, $HR_{lim}$ | ✅ | ✅ | ✅ Below | $B_{pa}$, $B_{lim}$ | ✅ | ✅ | ✅ Full reproductive capacity |
| Management plan | $HR_{MGT}$ | ✅ | ✅ | ✅ Within expected range | $B_{MGT}$ | ✅ | ✅ | ✅ Above |

## Catch scenarios

**Table 2**  Haddock in Division 5.a. Assumptions made for the interim year and in the forecast. All weights are in tonnes, recruitment in thousands.

| Variable | Value | Notes |
|---|---|---|
| HR (2019) | 0.47 | Based on catch constraint. |
| SSB (2020) | 80 409 | From the assessment. |
| Reference biomass ($B_{45cm+}$; 2020) | 119 493 | From the assessment. |
| $R_{age\ 2}$ (2020) | 19 792 | From the assessment. |
| $R_{age\ 2}$ (2021) | 62 407 | Geometric mean. |
| Total catch (2019) | 53 579 | Estimated catch until the end of the fishing year (31 August 2019) and estimated catch in the first four months of the next fishing year (1 September–31 December 2019). |

**Table 3**  Haddock in Division 5.a. Annual catch scenarios. All weights are in tonnes.

| ICES advice basis | Total catch (2019/2020) | HR (2019/2020) * | SSB (2021) | % SSB change ** | % Advice change *** |
|---|---|---|---|---|---|
| ICES advice basis | | | | | |
| Management plan | 41 823 | 0.35 | 92 571 | 15 | −28 |

\* HR (2019/2020) is expressed relative to the $B_{45cm+}$ in 2020.
\*\* SSB 2021 relative to SSB 2020.
\*\*\* Catch in 2019/2020 relative to TAC in 2018/2019 (57 982 tonnes).

Advice has decreased as a result of changes in the target harvest rate (from 0.4 to 0.35) when the HCR was revised in 2019. In addition, the predicted reference biomass ($B_{45cm+}$) in 2019 has been revised down in the latest assessment.

## Basis of the advice

**Table 4**  Haddock in Division 5.a. The basis of the advice.

| Advice basis | Management plan |
|---|---|
| Management plan | The Icelandic Ministry of Industries and Innovation has adopted a management plan for the fisheries of Icelandic haddock (Icelandic MII, 2019). The TAC is set in the following way according to the plan: $$\text{TAC}_{y/y+1} = 0.35 B_{45cm+,y+1} \text{ if } \text{SSB}_{y+1} \geq \text{MGTB}_{\text{trigger}}$$ $$\text{TAC}_{y/y+1} = \frac{\text{SSB}_{y+1}}{\text{MGTB}_{\text{trigger}}} 0.35 B_{45cm+,y+1} \text{ if } \text{SSB}_{y+1} < \text{MGTB}_{\text{trigger}}$$ where *MGT $B_{trigger}$* = 49 400 tonnes, y is the assessment year, *$TAC_{y/y+1}$* is the TAC for the fishing year starting 1 September in the assessment year, and *$B_{45cm+,y+1}$* is the estimated biomass of haddock ≥ 45 cm at the beginning of the year following the assessment year. ICES evaluated this HCR in 2019 (ICES, 2019a, c) and concluded that it is precautionary and in accordance with the ICES MSY approach. The expected range of realized harvest rate (HR) following the management plan ($HR_{MGT}$) is between 0.23 and 0.57. |

**Quality of the assessment**

This assessment is considered to be internally consistent and of good quality. The stock was benchmarked in 2019 (ICES, 2019a), resulting in a redefinition of the spawning-stock biomass (fishing and natural mortality before spawning are now taken into account).
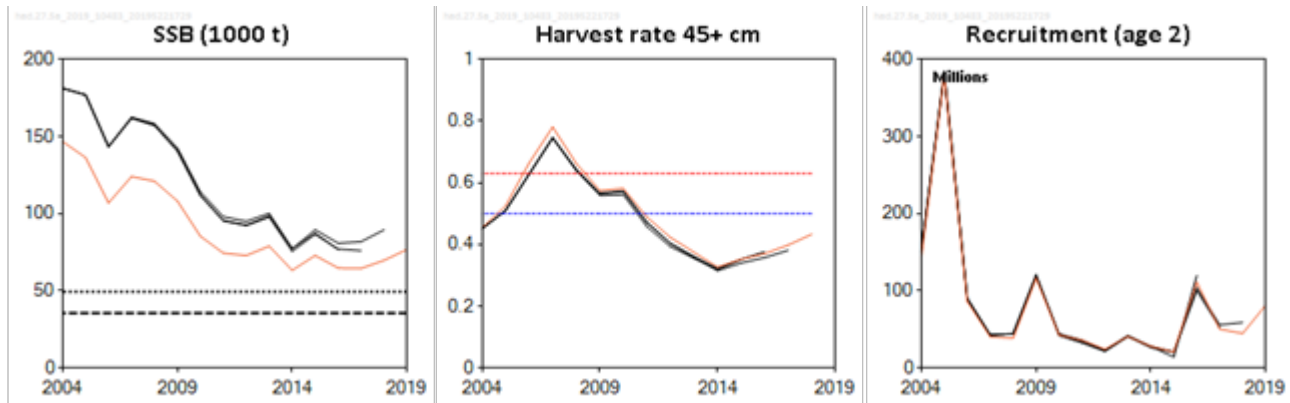


**Figure 2**          Haddock in Division 5.a. Historical assessment results.

**Issues relevant for the advice**

The stock was benchmarked in 2019, together with a management strategy evaluation which resulted in new reference points being defined (ICES, 2019a). ICES concluded that the HCR used from 2013 to 2018 was no longer precautionary and proposed a reduction in the target harvest rate from 0.4 to 0.35. The new management plan is now consistent with both the precautionary approach and the ICES MSY approach (ICES, 2019a).

**Reference points**

**Table 5**          Haddock in Division 5.a. Reference points, values, and their technical basis. All weights are in tonnes.

| Framework | Reference point | Value | Technical basis | Source |
|---|---|---|---|---|
| MSY approach | MSY $B_{trigger}$ | 49 400 | $B_{pa}$ | ICES (2019a) |
| | $F_{MSY}$ | 0.3 | Median F when $HR_{MSY}$ is applied | ICES (2019a) |
| | $HR_{MSY}$ | 0.35 | The harvest rate that maximizes the median long term catch in stochastic simulations, limited by $HR_{p0.05}$ | ICES (2019a) |
| Precautionary approach | $B_{lim}$ | 35 500 | $B_{loss}$ | ICES (2019a) |
| | $B_{pa}$ | 49 400 | $B_{lim} \times e^{1.645 \times 0.2}$ | ICES (2019a) |
| | $F_{lim}$ | 0.71 | Median F when $HR_{lim}$ is applied | ICES (2019a) |
| | $F_{pa}$ | 0.5 | $F_{lim} \times e^{-1.645 \times 0.2}$ | ICES (2019a) |
| | $HR_{lim}$ | 0.63 | HR leading to median SSB at $B_{lim}$ | ICES (2019a) |
| | $HR_{pa}$ | 0.5 | HR corresponding to $F_{pa}$ | ICES (2019a) |
| Management plan | MGT $B_{trigger}$ | 49 400 | Stochastic simulations | ICES (2019a) |
| | $F_{MGT}$ | Not defined | | |
| | $HR_{MGT}$ | 0.35 | Management plan. Realized harvest rates can range from 0.23 to 0.57 | ICES (2019a) |

## Basis of the assessment

**Table 6**  Haddock in Division 5.a. Basis of the assessment and advice.

| ICES stock data category | 1 (ICES, 2018). |
|---|---|
| Assessment type | Statistical catch at age model that uses catches in the model and in the forecast (ICES, 2019b). |
| Input data | Catch-at-age and two survey indices (Icelandic spring IS-SMB and autumn groundfish IS-SMH surveys). |
| Discards and bycatch | Discarding is considered negligible. |
| Indicators | None. |
| Other information | The stock was benchmarked and harvest control rules evaluated in 2019 (ICES, 2019a). |
| Working group | North-Western Working Group (NWWG) |

## Information from stakeholders

There is no additional available information for this stock.

## History of the advice, catch, and management

**Table 7**  Haddock in Division 5.a. ICES advice, TAC, and landings estimates. All weights are in tonnes.

| Year | ICES advice | Catch corresponding to advice | Agreed TAC | ICES landings for the fishing year | ICES landings for the calendar year |
|---|---|---|---|---|---|
| 1987 * | National advice | < 50000 | 60000 | | 40760 |
| 1988 * | National advice | < 60000 | 65000 | | 54204 |
| 1989 * | National advice | < 60000 | 65000 | | 62885 |
| 1990 * | National advice | < 60000 | 65000 | | 67198 |
| 1991 ** | National advice | < 38000 | 48000 | | 54692 |
| 1991/1992 | National advice | < 50000 | 50000 | 48123 | 47121 |
| 1992/1993 | National advice | < 60000 | 65000 | 47255 | 48123 |
| 1993/1994 | National advice | < 65000 | 65000 | 58443 | 59502 |
| 1994/1995 | National advice | < 65000 | 65000 | 60829 | 60884 |
| 1995/1996 | National advice | < 55000 | 60000 | 53972 | 56890 |
| 1996/1997 | National advice | < 40000 | 45000 | 49764 | 43764 |
| 1997/1998 | National advice | < 40000 | 45000 | 37811 | 41192 |
| 1998/1999 | National advice | < 35000 | 35000 | 45146 | 45411 |
| 1999/2000 | F reduced below $F_{med}$ | < 35000 | 35000 | 41150 | 42105 |
| 2000/2001 | F reduced below provisional $F_{pa}$ | < 31000 | 30000 | 39143 | 39654 |
| 2001/2002 | F reduced below provisional $F_{pa}$ | < 30000 | 41000 | 41069 | 50498 |
| 2002/2003 | F reduced below provisional $F_{pa}$ | < 55000 | 55000 | 55269 | 60883 |
| 2003/2004 | F reduced below provisional $F_{pa}$ | < 75000 | 75000 | 77916 | 84828 |
| 2004/2005 | F reduced below provisional $F_{pa}$ | < 97000 | 90000 | 96617 | 97225 |
| 2005/2006 | F reduced below provisional $F_{pa}$ | < 110000 | 105000 | 99926 | 97614 |
| 2006/2007 | F reduced below provisional $F_{pa}$ | < 112000 | 105000 | 99763 | 109966 |
| 2007/2008 | F reduced below provisional $F_{pa}$ | < 120000 | 100000 | 109810 | 102872 |
| 2008/2009 | F reduced below 0.35 | < 83000 | 93000 | 88617 | 82045 |
| 2009/2010 | F reduced below 0.35 | < 57000 | 63000 | 67579 | 64169 |
| 2010/2011 | F reduced below 0.35 | < 51000 | 50000 | 50042 | 49433 |
| 2011/2012 | F reduced below 0.35 | < 42000 | 45000 | 49179 | 46208 |
| 2012/2013 | F reduced below 0.35 | < 32000 | 36000 | 40512 | 44097 |
| 2013/2014 | TAC 0.4 × $B_{45+cm}$, 2014 | < 38000 | 38000 | 39628 | 33900 |
| 2014/2015 | TAC 0.4 × $B_{45+cm}$, 2015 | < 30400 | 30400 | 36656 | 39646 |
| 2015/2016 | TAC 0.4 × $B_{45+cm}$, 2016 | < 36400 | 36400 | 40117 | 38109 |
| 2016/2017 | TAC 0.4 × $B_{45+cm}$, 2017 | < 34600 | 34600 | 36399 | 37058 |
| 2017/2018 | TAC 0.4 × $B_{45+cm}$, 2018 | < 41390 | 41390 | 43700 | 48864 |
| 2018/2019 | Management plan | < 57982 | 57982 | | |
| 2019/2020 | Management plan | ≤ 41823 | | | |

* Calendar year.
** January to August.

## History of the catch and landings

**Table 8**    Haddock in Division 5.a. Catch distribution by fleet in 2018 as estimated by ICES. All weights are in tonnes.

| Catch (2018) | Landings | | | | Discard |
|---|---|---|---|---|---|
| 48 864 | 33.4% bottom trawls | 54.3% longline | 11.4% Demersal seine | 0.9% other gears | Discarding is negligible |
| | 48 864 | | | | |

## Summary of the assessment

**Table 9**    Haddock in Division 5.a. Assessment summary. Weights are in tonnes. Recruitment in thousands.

| Year | Recruitment (Age 2) | SSB | B45cm+ | Harvest rate | Catch |
|---|---|---|---|---|---|
| 1979 | 75949 | 74036 | 93711 | 0.59 | 55330 |
| 1980 | 38199 | 94381 | 132529 | 0.386 | 51110 |
| 1981 | 9701 | 110012 | 167016 | 0.381 | 63558 |
| 1982 | 42697 | 101173 | 154424 | 0.45 | 69428 |
| 1983 | 32553 | 79615 | 116256 | 0.567 | 65942 |
| 1984 | 16864 | 60604 | 87662 | 0.551 | 48282 |
| 1985 | 45769 | 49826 | 90091 | 0.567 | 51102 |
| 1986 | 90160 | 42630 | 76067 | 0.642 | 48859 |
| 1987 | 168451 | 38917 | 66830 | 0.61 | 40760 |
| 1988 | 42394 | 54751 | 88096 | 0.615 | 54204 |
| 1989 | 26158 | 81603 | 128843 | 0.488 | 62885 |
| 1990 | 26591 | 85851 | 120189 | 0.559 | 67198 |
| 1991 | 89989 | 66769 | 107696 | 0.508 | 54692 |
| 1992 | 162479 | 48422 | 70168 | 0.672 | 47121 |
| 1993 | 37064 | 56429 | 67847 | 0.709 | 48123 |
| 1994 | 35677 | 71815 | 76300 | 0.78 | 59502 |
| 1995 | 66288 | 65890 | 94526 | 0.644 | 60884 |
| 1996 | 31682 | 52546 | 72917 | 0.78 | 56890 |
| 1997 | 92607 | 44343 | 61151 | 0.716 | 43764 |
| 1998 | 17890 | 49330 | 53127 | 0.775 | 41192 |
| 1999 | 50667 | 47124 | 56583 | 0.803 | 45411 |
| 2000 | 116017 | 45784 | 62127 | 0.678 | 42105 |
| 2001 | 149915 | 54026 | 63417 | 0.625 | 39654 |
| 2002 | 194323 | 78105 | 90507 | 0.558 | 50498 |
| 2003 | 45403 | 121663 | 119899 | 0.508 | 60883 |
| 2004 | 142375 | 146780 | 186568 | 0.455 | 84828 |
| 2005 | 379875 | 136334 | 185146 | 0.525 | 97225 |
| 2006 | 86081 | 106937 | 146960 | 0.664 | 97614 |
| 2007 | 40289 | 124015 | 140847 | 0.781 | 109966 |
| 2008 | 38331 | 121075 | 155379 | 0.662 | 102872 |
| 2009 | 116302 | 108116 | 142698 | 0.575 | 82045 |
| 2010 | 42740 | 85360 | 110313 | 0.582 | 64168 |
| 2011 | 35801 | 74368 | 101186 | 0.489 | 49433 |
| 2012 | 24071 | 72876 | 109256 | 0.423 | 46208 |
| 2013 | 40773 | 78921 | 117738 | 0.375 | 44097 |
| 2014 | 27910 | 63221 | 103696 | 0.327 | 33900 |
| 2015 | 20576 | 72845 | 112575 | 0.352 | 39646 |
| 2016 | 111089 | 64759 | 102901 | 0.37 | 38109 |
| 2017 | 50230 | 64458 | 93098 | 0.398 | 37058 |
| 2018 | 44681 | 69714 | 112786 | 0.433 | 48864 |
| 2019 | 81247 | 76758 | 115226 | | |

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