

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 2018/2019 should be no more than 57 982 tonnes.

Stock development over time

The spawning-stock biomass (SSB) increased from 2001 to 2004, after several strong year classes, and was large until 2008. The SSB has decreased since 2008, but stabilized above B_{pa} in recent years. The harvest rate is currently estimated near the management target of 0.4. Recruitment (R) is highly variable. The 2014 year class is estimated to be strong, and the 2015 and 2016 year classes are close to the average.

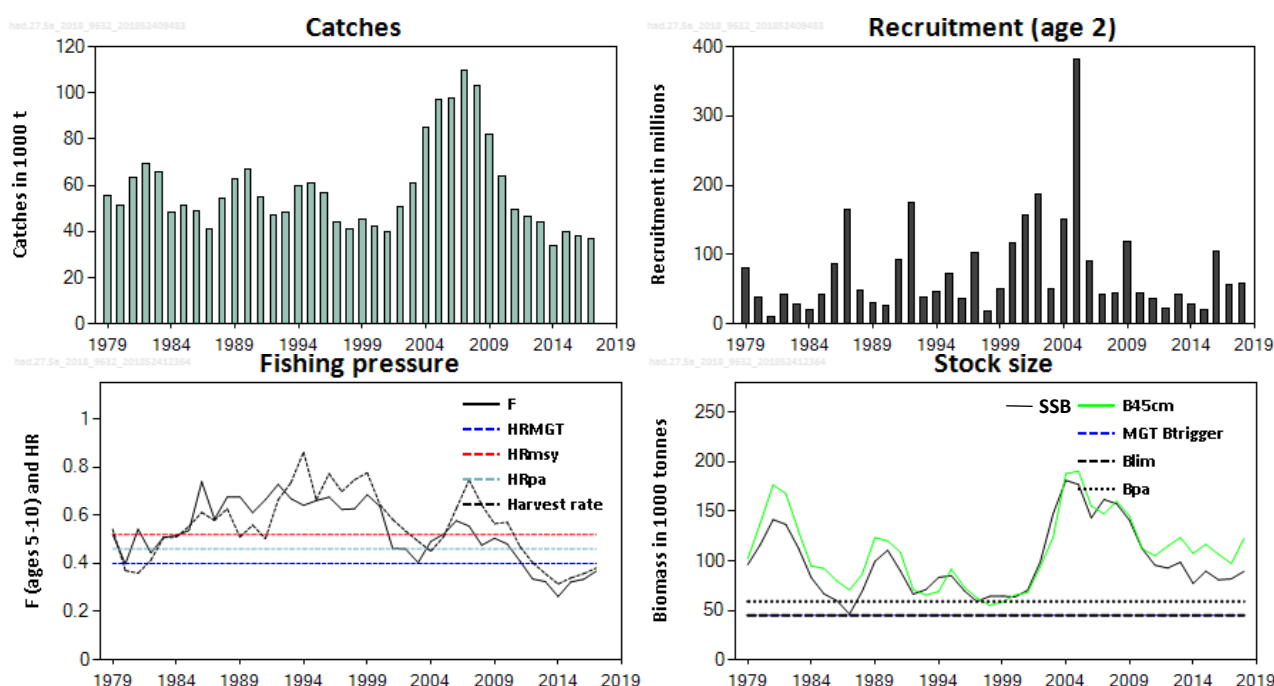


Figure 1 Haddock in Division 5.a. Summary of the stock assessment. Calculation of harvest rates is based on biomass of fish at length 45+ cm. Biomass > 45 cm is shown as a green line, SSB is shown as a black line. $MGT B_{trigger} = B_{lim}$, thus, the horizontal lines on the stock size graph overlap.

Stock and exploitation status

ICES assesses that fishing pressure on the stock is below HR_{MSY} and HR_{MGT} . Spawning stock size is above $MGT B_{trigger}$, 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		
	2015	2016	2017	2016	2017	2018
Maximum Sustainable Yield	HR_{MSY} ✓	✓	✓ Appropriate	$MSY B_{Trigger}$?	?	? Undefined
Precautionary Approach	HR_{pa} ✓	✓	✓ Harvested sustainably	B_{pa}, B_{lim} ✓	✓	✓ Full reproductive capacity
Management plan	HR_{MGT} ✓	✓	✓ Within expected range	$MGT B_{trigger}$ ✓	✓	✓ 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 millions.

Variable	Value	Notes
F _{ages 4–7} (2018)	0.37	Based on catch constraint
SSB (2019)	128766	
R _{age 2} (2019)	112405	Assessment model
R _{age 2} (2020)	56997	Geometric mean
Total catch (2018)	47331	Estimated catch until the end of the fishing year (31.08.2018) and estimated catch in the first four months of the next fishing year (01.09–31.12.2018).
Landings (2018)	47331	
Discards (2018)	0	
Reference biomass (B _{45cm+} ; 2019)	144955	

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

Basis	Total catch (2018/2019)	F _{total} (2018/2019)	HR (2018/2019) *	SSB (2020)	% SSB change **	% Advice change ***
ICES advice basis						
Management plan	57982	0.37	0.4	139559	8.4	40

* HR(2018/2019) is expressed relative to the B_{45cm+} in 2019.

** SSB 2020 relative to SSB 2019.

*** Catch in 2018/2019 relative to TAC in 2017/2018 (41 390 t).

Advice has increased, due to incoming above-average year classes after a period of low recruitment. This has led to an increase in predicted harvestable biomass (B_{45cm+}).

Basis of the advice

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

Advice basis	Management plan
Management plan	<p>The Icelandic Ministry of Industries and Innovation has adopted a management plan for the fisheries of Icelandic haddock (Icelandic MII, 2013). The TAC is set in the following way according to the plan:</p> $TAC_{y/y+1} = 0.4B_{45cm+,y+1} \text{ if } SSB_{y+1} \geq MGTB_{trigger}$ $TAC_{y/y+1} = \frac{SSB_{y+1}}{SSB_{trigger}} 0.4B_{45cm+,y+1} \text{ if } SSB_{y+1} < MGTB_{trigger}$ <p>where $MGTB_{trigger} = 45\,000$ tonnes, y is the assessment year, $TAC_{y/y+1}$ is the TAC for the fishing year starting September 1st 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.</p> <p>ICES evaluated this HCR in 2013 (ICES, 2013a) 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}) can also be found in the management plan evaluation advice.</p>

Quality of the assessment

This assessment is considered consistent.

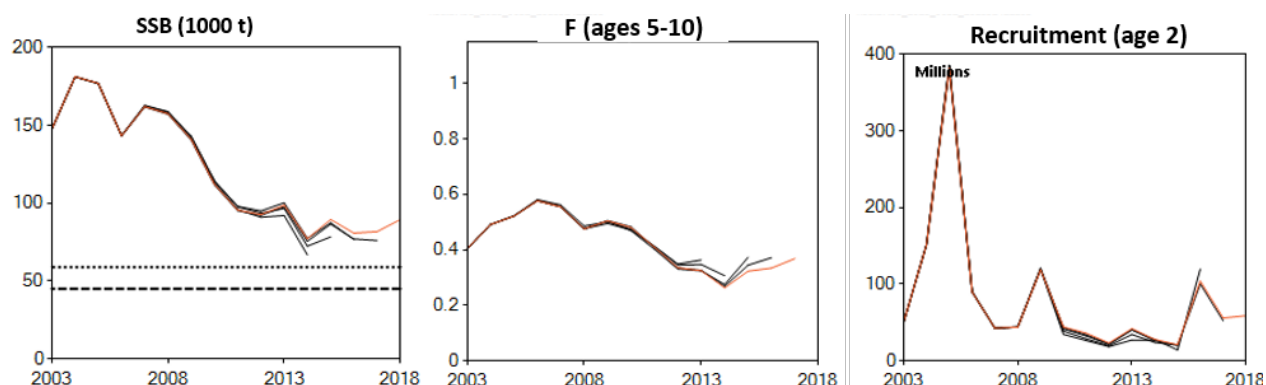


Figure 2 Haddock in Division 5.a. Historical assessment results.

Issues relevant for the advice

There is no additional information available.

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 $B_{trigger}$	Not defined		
	F_{MSY}	Not defined		
	HR_{MSY}	0.52	Stochastic simulations	Björnsson (2013)
Precautionary approach	B_{lim}	45000	B_{loss}	ICES (2012)
	B_{pa}	59000	$B_{lim} e^{1.645 \times 0.16}$	ICES (2016a)
	F_{lim}	Not defined		
	F_{pa}	Not defined		
	HR_{lim}	Not defined		
	HR_{pa}	0.46	Stochastic simulations	Björnsson (2013)
Management plan	MGT $B_{trigger}$	45000	Stochastic simulations	Björnsson (2013)
	F_{mgt}	Not defined		
	HR_{mgt}	0.4	Management plan	

Basis of the assessment

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

ICES stock data category	1 (ICES, 2016b).
Assessment type	Adapt-type model (in ADMB) that uses catches in the model and in the forecast (ICES, 2018).
Input data	Catch-at-age and two survey indices (Icelandic spring and autumn groundfish surveys).
Discards and bycatch	Discarding is considered negligible (estimates of < 2% in recent years).
Indicators	None.
Other information	The stock was benchmarked in 2013 (ICES, 2013b) and a harvest control rule evaluated in 2013 (ICES, 2013a).
Working group	North-Western Working Group (NWWG)

Information from stakeholders

There is no additional available information.

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 $0.4 \times B_{45+cm}$, 2014	< 38000	38000	39628	33900
2014/2015	TAC $0.4 \times B_{45+cm}$, 2015	< 30400	30400	36656	39646
2015/2016	TAC $0.4 \times B_{45+cm}$, 2016	< 36400	36400	40117	38109
2016/2017	TAC $0.4 \times B_{45+cm}$, 2017	< 34600	34600	36399	37062
2017/2018	TAC $0.4 \times B_{45+cm}$, 2018	< 41390	41390		
2018/2019	Management plan	< 57982			

* Calendar year.

** January to August.

History of the catch and landings

Table 8 Haddock in Division 5.a. Catch distribution by fleet in 2017 as estimated by ICES. All weights are in tonnes.

Catch (2017)	Landings				Discards
	44% bottom trawls	43% longline	12% Danish seine	1% other gears	
37062	37062				Discarding is negligible

Summary of the assessment

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

Year	Recruitment age 2	Stock size		Fishing pressure		Total catch
		SSB	B _{45cm+}	F ages 4–7	Harvest rate	
1979	80923	96072	102046	0.52	0.542	55330
1980	37390	116521	138008	0.40	0.37	51110
1981	10426	141628	176712	0.54	0.36	63558
1982	42788	136817	167992	0.44	0.413	69428
1983	29306	112589	129725	0.51	0.508	65942
1984	20574	82961	94816	0.52	0.509	48282
1985	42788	66652	92245	0.54	0.554	51102
1986	86501	59837	79886	0.74	0.612	48859
1987	164036	46298	70459	0.58	0.579	40760
1988	48742	69391	86468	0.68	0.627	54204
1989	29778	99537	123495	0.68	0.509	62885
1990	27094	110745	120191	0.61	0.559	67198
1991	92280	89825	108816	0.66	0.503	54692
1992	175094	66379	70980	0.73	0.664	47121
1993	38437	71000	65525	0.67	0.734	48123
1994	46842	83295	69023	0.64	0.862	59502
1995	72857	85054	91664	0.66	0.664	60884
1996	36341	70008	73657	0.68	0.772	56890
1997	102509	58993	62686	0.62	0.698	43764
1998	17976	64203	55132	0.63	0.747	41192
1999	50160	64439	58498	0.68	0.776	45411
2000	117423	63509	65450	0.64	0.643	42105
2001	156535	70366	68080	0.46	0.583	39654
2002	187267	99344	94392	0.46	0.535	50498
2003	50394	147523	123728	0.40	0.492	60883
2004	151499	181306	188076	0.49	0.451	84828
2005	381560	177013	190489	0.52	0.51	97225
2006	89766	143387	155387	0.58	0.628	97614
2007	42716	162055	147457	0.56	0.746	109966
2008	44050	157445	160217	0.48	0.642	102872
2009	118862	140977	145288	0.50	0.565	82045
2010	44162	112094	112353	0.48	0.571	64168
2011	36054	95592	105077	0.41	0.47	49433
2012	23206	92745	114737	0.34	0.403	46208
2013	42043	98690	123441	0.33	0.357	44097
2014	27986	77205	107624	0.26	0.315	33900
2015	20925	89562	116618	0.32	0.34	39646
2016	103859	80828	106581	0.33	0.358	38109
2017	55809	81802	97278	0.37	0.381	37062
2018	58887	128766	122611			

Sources and references

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