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Haddock (*Melanogrammus aeglefinus*) in Subarea 4, Division 6.a, and Subdivision 20 (North Sea, West of Scotland, Skagerrak)

ICES stock advice

Please note: The present advice replaces the advice given in June 2018 for catches in 2019.

ICES advises that when the MSY approach is applied, total catches in 2019 should be no more than 33 956 tonnes.

Stock development over time

Fishing mortality (F) has been fluctuating above F_{MSY} for most of the time-series and is above F_{MSY} in 2017. Spawning-stock biomass (SSB) has been above MSY $B_{trigger}$ in most of the years since 2002. Recruitment since 2000 has been characterized by a low average level with occasional larger year classes, the size of which is diminishing.

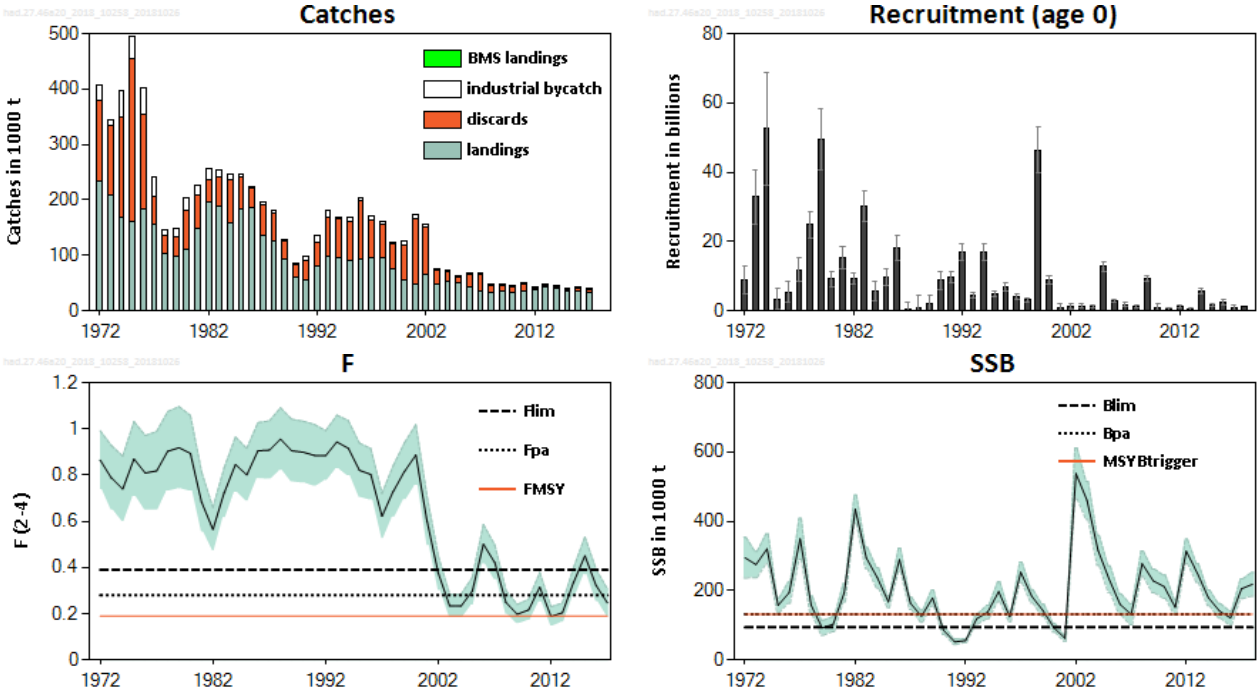

Figure 1 Haddock in Subarea 4, Division 6.a, and Subdivision 20. Summary of the stock assessment. Shaded areas (F, SSB) and error bars (R) indicate ±2 standard error (approximate 95% confidence intervals).

Stock and exploitation status

ICES assessed that fishing pressure on the stock is above F_{MSY} and below F_{pa} and F_{lim}; SSB is above MSY $B_{trigger}$, B_{pa}, and B_{lim}.

Table 1 Haddock in Subarea 4, Division 6.a, and Subdivision 20. State of the stock and fishery relative to reference points.

	Fishing pressure					Stock size				
		2015	2016	2017			2016	2017	2018	
Maximum sustainable yield	F_{MSY}	✗	✗	✗	Above	MSY $B_{trigger}$	✗	✓	✓	Above trigger
Precautionary approach	F_{pa},F_{lim}	✗	o	✓	Harvested sustainably	B_{pa},B_{lim}	o	✓	✓	Full reproductive capacity
Management plan	F_{MGT}	–	–	–	Not applicable	B_{MGT}	–	–	–	Not applicable

Catch options

Table 2 Haddock in Subarea 4, Division 6.a, and Subdivision 20. The basis for the catch options.

Variable	Value	Notes
F ages 2–4 (2018)	0.227	F based on TAC for 2018 of 48 990 tonnes.
SSB (2019)	228 145 tonnes	Short-term forecast (STF)
$R_{age\ 0}$ (2018)	1 231 000 thousands	RCT3
$R_{age\ 0}$ (2019)	3 529 010 thousands	Assessment model forecast
Total catch, excl. industrial bycatch (2018)	48 990 tonnes	TAC 2018
Wanted catch (2018)	44 049 tonnes	STF, relative contribution to total catch by age = average 2015–2017
Unwanted catch (2018)	4 941 tonnes	STF, relative contribution to total catch by age = average 2015–2017
Industrial bycatch (2018)	41 tonnes	STF, relative contribution to total catch by age = average 2015–2017

Table 3 Haddock in Subarea 4, Division 6.a, and Subdivision 20. Annual catch options. All weights are in tonnes.

Basis	Total catch (2019)	Wanted catch * (2019)	Unwanted catch * (2019)	IBC ** (2019)	HC ** catch (2019)	F_{total} (2019)	F_{wanted} (2019)	$F_{unwanted}$ (2019)	F_{IBC} (2019)	SSB (2020)	% SSB change ***	% TAC change ^	% Advice change ^^
ICES advice basis													
MSY approach: F_{MSY}	33956	31120	2799	38	33918	0.194	0.165	0.029	0.00020	202799	−11.1%	−31%	−31%
Other scenarios													
F = MAP^^^ $F_{MSY\ lower}$	29532	27069	2425	38	29494	0.167	0.142	0.025	0.00020	207715	−9.0%	−40%	−40%
F = MAP $F_{MSY\ upper}$#	33956	31120	2799	38	33918	0.194	0.165	0.029	0.00020	202799	−11.1%	−31%	−31%
F = 0##	41	0	0	41	0	0	0	0	0.00020	240935	5.6%	−100%	−100%
F_{pa}	46493	42579	3877	36	46456	0.274	0.23	0.041	0.00020	188923	−17.2%	−5.2%	−5.1%
F_{lim}	62334	57013	5286	35	62299	0.384	0.33	0.058	0.00020	171531	−25%	27%	27%
SSB (2020) = B_{lim}	122118	110341	11751	26	122091	1.02	0.86	0.153	0.00020	94000	−59%	151%	149%
SSB (2020) = B_{pa} = MSY $B_{trigger}$	97084	88381	8672	30	97054	0.68	0.58	0.103	0.00020	132000	−42%	98%	98%
F_{2018}	39199	35916	3246	37	39162	0.23	0.193	0.034	0.00020	196985	−13.7%	−20%	−20%
Rollover TAC	49026	44891	4099	36	48990	0.29	0.25	0.044	0.00020	186130	−18.4%	0%	0.074%
Mixed-fisheries scenarios													
A: Max.	78136					0.522				149569	−34	59	59
B: Min.	21849					0.124				211384	−7	−55	−55
C: COD	21923					0.124				211301	−7	−55	−55
D: SQ effort	39100					0.232				192158	−16	−20	−20
E: Value	39073					0.232				192187	−16	−20	−20
F: range	34046					0.193				203667	−11	−31	−31

* “Wanted” and “unwanted” catch are used to describe fish that would be landed and discarded in the absence of the EU landing obligation, based on discard rate estimates for 2015–2017. Unwanted catch includes discards and below minimum size (BMS) landings.
** IBC = Industrial bycatch, HC = Human Consumption.
*** SSB 2020 relative to SSB 2019.
^ Human Consumption catch in 2019 relative to TAC in 2018: Subdivision 20 (2 569 t) + Subarea 4 (41 767 t) + Division 6.a (4 654 t) = 48 990 t.
^^ Total catch 2019 relative to advice value 2018 (48 990 t).
^^^ Proposed EU multiannual plan (MAP) for the North Sea (EU, 2016).
# For this stock, $F_{MSY\ upper}$ = F_{MSY}.

Mixed-fisheries assumptions (note: "fleet's stock share" is used to describe the share of the fishing opportunities for each particular fleet, which has been calculated based on the single-stock advice for 2018 and the historical proportion of the stock landings taken by the fleet):
A. Maximum scenario: Each fleet stops fishing when its last stock share is exhausted.
B. Minimum scenario: Each fleet stops fishing when its first stock share is exhausted.
C. COD-NS: Each fleet stops fishing when its individual cod share is exhausted.
D. SQ (*status quo*) effort scenario: The effort of each fleet in 2018 and 2019 is as in 2017.
E. Value scenario: The effort of each fleet is equal to the weighted average of the efforts required to catch the fleet's quota share of each of the stocks, where the weights are the relative catch values of each stock in the fleet's portfolio.
F. Range scenario: where the potential for TAC mismatches in 2018 are minimized within the F_{MSY} range, for the demersal fish stocks for which such a range is available (cod.27.47d20, had.27.46a20, pok.27.3a46, ple.27.420, ple.27.7d, sol.27.4, sol.27.7d, whg.27.47d).

The change in advice (−31%) is due to a combination of a reduction in the F needed to reach F_{MSY} and continued low recruitment.

Basis of the advice

Table 4 Haddock in Subarea 4, Division 6.a, and Subdivision 20. The basis of the advice.

Advice basis	MSY approach
Management plan	An EU multiannual management plan (MAP) has been proposed for this stock (EU, 2016). This plan is not adopted by Norway, thus, not used as the basis of the advice for this shared stock. ICES was requested by the EC to provide advice based on the MSY approach and to include the MAP as a catch option.

Quality of the assessment

The assessment is based on the North Sea (Subarea 4 and Subdivision 20) survey indices, which are considered to be sufficiently representative of the whole stock. No combined survey index for the whole area is available. The differences from the 2017 assessment arise due to a new key run for natural mortality estimates, and the addition of data for 2017.

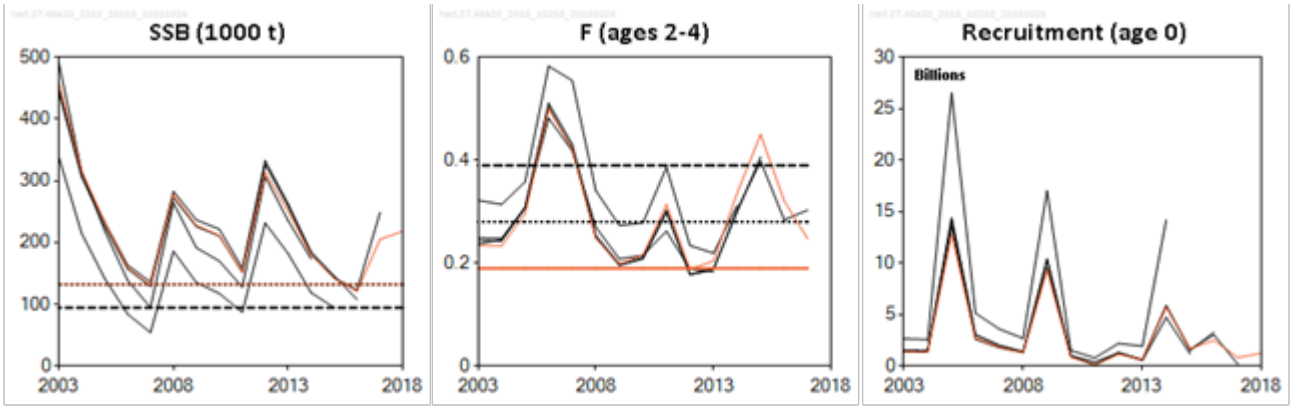

Figure 2 Haddock in Subarea 4, Division 6.a, and Subdivision 20. Historical assessment results.

Issues relevant for the advice

Based on the survey information (IBTS Q3) that has become available in summer 2018, the advice has been updated from that released in June 2018.

More abundant year classes were produced prior to 2000; however, recruitment has tended to be consistently lower since then. Because of the larger 2014 year class, the SSB remains above MSY $B_{trigger}$. The principal driver of the stock is the occasional larger year classes, which results in strongly fluctuating advice. The magnitude of these strong year classes is decreasing.

Landings of fish below the minimum conservation reference size (MCRS) are very low and discarding still takes place despite the fact that the landing obligation has been in place since 2016. The estimated discard amount is 7029 tonnes in

2017 (approximately 17.6%), based on observer data. ICES understands this to be not in accordance with the current regulations.

Mixed-fisheries considerations

Results from a North Sea mixed-fisheries analysis are presented in the ICES mixed-fisheries advice (ICES, 2018b). The analysis has been updated, taking into account the latest changes made to the assessments and forecasts for stocks with reopened advice.

After years of positive development, North Sea cod is again estimated to be the most limiting stock in the Greater North Sea mixed-fisheries model. For 2019, assuming a strictly implemented landing obligation (corresponding to the "Minimum" scenario in Table 3), cod is estimated to constrain 24 out of 40 fleet segments. Whiting is the second most limiting stock, constraining twelve fleet segments. Conversely, in the "Maximum" scenario, saithe and both plaice stocks (North Sea and Eastern Channel) would be the least limiting for 17, 9, and three fleet segments, respectively. Finally, if Norway lobster were managed by separate TACs, Norway lobster in FU 7 would be the least limiting for seven fleet segments (ICES, 2018a). Haddock is not limiting in mixed-fisheries scenarios (ICES, 2018b).

For those demersal fish stocks for which the F_{MSY} range is available, a "range" scenario is presented that minimizes the potential for TAC mismatches in 2019 within the F_{MSY} range. This scenario returns a fishing mortality by stock which, if used for setting single-stock fishing opportunities for 2019, may reduce the gap between the most and the least restrictive TACs, thus reducing the potential for quota over- and undershoots. This "range" scenario suggests that the potential for mixed-fisheries mismatch would be lowered with a 2019 TAC in the lower part of the F_{MSY} range for North Sea plaice and North Sea saithe, and at the highest possible value for cod in accordance with the MSY approach and the EU MAP (EU, 2016).

Reference points

Table 5 Haddock in Subarea 4, Division 6.a, and Subdivision 20. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	132 000 t	B_{pa}	ICES (2016)
	F_{MSY}	0.194	EQsim analysis based on the recruitment period 2000–2015	ICES (2017)
Precautionary approach	B_{lim}	94 000 t	Lowest estimated SSB that resulted in high recruitment (1979)	ICES (2016)
	B_{pa}	132 000 t	$B_{lim} \times \exp(1.645 \times 0.2) \approx 1.4 \times B_{lim}$	ICES (2016)
	F_{lim}	0.384	EQsim analysis based on recruitment period 2000–2015	ICES (2016)
	F_{pa}	0.274	$F_{lim} \times \exp(-1.645 \times 0.2) \approx F_{lim} / 1.4$	ICES (2016)
Management plan*	MAP MSY $B_{trigger}$	132 000 t	MSY $B_{trigger}$	
	MAP B_{lim}	94 000 t	B_{lim}	
	MAP F_{MSY}	0.194	F_{MSY}	ICES (2017)
	MAP range F_{lower}	0.167	Consistent with ranges provided by ICES (2017), resulting in no more than 5% reduction in long-term yield compared with MSY.	ICES (2017)
	MAP range F_{upper}	0.194	Consistent with ranges provided by ICES (2017), resulting in no more than 5% reduction in long-term yield compared with MSY.	ICES (2017)

*Proposed EU multiannual plan (MAP) for the North Sea (EU, 2016).

Basis of the assessment

Table 6 Haddock in Subarea 4, Division 6.a, and Subdivision 20. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2018c).
Assessment type	Age-based analytical assessment (TSA; ICES, 2018d) that uses catches in the model and in the forecast.
Input data	Commercial catches (international landings, ages from catch sampling), two survey indices: IBTS Q1, IBTS Q3. Maturity data are assumed fixed over time and knife-edged at age 3, while natural mortality data vary with age and over time (estimates updated ICES, 2018b.
Discards, BMS landings and bycatch	Included in the assessment, dataseries from the main fleets (covering around 90% of the landings). BMS landings, where reported, are included with discards as unwanted catch in the assessment from 2016 onwards.
Indicators	None
Other information	Last benchmarked in 2014 (ICES, 2014), at which it was decided that the previously separate stocks in the North Sea and Skagerrak, and West of Scotland, should be assessed as one stock. WKHAD (ICES, 2014) also updated biological parameters and selected a new assessment model. The 2016 inter-benchmark protocol (ICES, 2016) corrected an error in the computer code and derived a model configuration that reduced the retrospective basis in the extant assessment model, and re-estimated the reference points accordingly.
Working group	Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK)

Information from stakeholders

The amount and coverage of input data for the assessment has increased since 2012 through extended sampling programmes such as fully documented fishery (FDF) and the Scottish Industry/Science observer sampling scheme.

History of the advice, catch, and management

Table 7a Haddock in Subarea 4. ICES advice, TAC, official landings and ICES catch estimates. All weights are in tonnes. Values of landings, discards, and catches for the period 1987 to 2014 are presented to the nearest thousand tonnes.

Year	ICES advice	Wanted catch corresp. to advice	Total catch corresp. to advice ^	Agreed TAC	Official landings	ICES landings	ICES discards	ICES indust. bycatch	ICES total
1987	80% of F(85)	105000		140000	109000	108000	59000	4000	172000
1988	77% of F(86); TAC	185000		185000	105000	105000	62000	4000	171000
1989	Reduce decline in SSB; TAC; protect juveniles	68000		68000	64000	76000	26000	2000	104000
1990	80% of F(88); TAC	50000		50000	43000	51000	33000	3000	87000
1991	70% of effort (89)			50000	45000	45000	40000	5000	90000
1992	70% of effort (89)			60000	51000	70000	48000	11000	129000
1993	70% of effort (89)			133000	80000	80000	80000	11000	170000
1994	Significant reduction in effort; mixed fishery			160000	87000	81000	65000	4000	150000
1995	Significant reduction in effort; mixed fishery			120000	75000	75000	57000	8000	140000
1996	Mixed fishery to be taken into account			120000	75000	76000	73000	5000	154000
1997	Mixed fishery to be taken into account			114000	73000	79000	52000	7000	138000
1998	No increase in F	100300		115000	72000	77000	45000	5000	128000
1999	Reduction of 10% F(95–97)	72000		88600	64000	64000	43000	4000	111000
2000	F less than F_{pa}	< 51700		73000	47000	45000	47000	8000	100000
2001	F less than F_{pa}	< 58000		61000	40000	39000	118000	8000	165000
2002	F less than F_{pa}	< 94000		104000	54000	53000	45000	4000	101000
2003	No cod catches	-		52000	42000	42000	23000	1000	76000
2004	Mixed-fisheries considerations / F should be below F_{pa}	No forecast *		85000	48000	47000	17000	1000	65000

Year	ICES advice	Wanted catch corresp. to advice	Total catch corresp. to advice ^	Agreed TAC	Official landings	ICES landings	ICES discards	ICES indust. bycatch	ICES total
2005	Mixed-fisheries considerations / F should be below F_{pa}	92 000*		66000	31000	48000	10000	0	57000
2006	Mixed-fisheries considerations / F < 0.3	39 000*		52000	36000	36000	17000	0	55000
2007	Mixed-fisheries considerations / F < 0.3	554 00*		55000	31000	31000	30000	0	61000
2008	Mixed-fisheries considerations / 15% TAC reduction	49300 *,**		46000	30000	29000	13000	0	42000
2009	Mixed-fisheries considerations / Apply management plan	44700 *,**		42000	31000	31000	10000	0	41000
2010	Mixed-fisheries considerations / Apply management plan	38000 *,**		36000	28000	28000	10000	0	38000
2011	See scenarios	-		34000	26000	34000	11000	0	46000
2012	Apply management plan	41575 *,**		39000	30000	30000	4000	1000	35000
2013	Apply management plan	47811 *,**		45041	37000 ***	39000 ***	2000 ***	0 ***	41000 ***
2014	Apply management plan	38201 *		38284	35000	35000	4000	65 ***	39000
2015	(November update) MSY approach		68690	40711	35520	30165	4151	18	34334
2016	MSY approach		≤ 59945	61933	30061	29687	6099^^	29	36006
2017	MSY approach		≤ 39461	33643	29765	29182	5246^^	18	34539
2018	MSY approach		≤ 48990	41767					
2019	MSY approach		≤ 33956						

* The exploitation of this stock should be conducted in the context of mixed fisheries, protecting stocks outside safe biological limits.
** Including industrial bycatch.
*** Subarea 4 and Subdivision 20 combined.
^ Catch advice since 2015 is given for Subarea 4, Division 6.a, and Subdivision 20.
^^ Since 2016 discards correspond to unwanted catch (including BMS landings).

Table 7b Haddock in Subdivision 20. ICES advice, TAC, official landings and ICES catch estimates. All weights are in tonnes. Values of landings, discards, and catches for the period 1987 to 2014 are presented to the nearest hundred tonnes.

Year	ICES advice	Predicted landings corresp. to advice	Predicted catch corresp. to advice **	Agreed TAC	Official landings	ICES landings	ICES discards	ICES Indust. bycatch	ICES total catch
1987	Precautionary TAC	-		11500		3800		1400	5300
1988	Precautionary TAC	-		10000		2900		1500	4300
1989	Precautionary TAC	-		10000		4100		400	4500
1990	Precautionary TAC	-		10000		4100		2000	6100
1991	Precautionary TAC	4600		4600		4100		2600	6700
1992	TAC	4600		4600		4400		4600	9000
1993	Precautionary TAC	-		4600		2000		2400	4400
1994	Precautionary TAC	-		10000		1800		2200	4000
1995	If required, precautionary TAC; link to North Sea	-		10000		2200		2200	4400
1996	If required, precautionary TAC; link to North Sea	-		10000		3100		2900	6100
1997	Combined advice with North Sea	-		7000		3400		600	4000
1998	Combined advice with North Sea	4700		7000		3800		300	4000
1999	Combined advice with North Sea	3400		5400		1400		300	1700
2000	Combined advice with North Sea	< 1800		4500		1500		600	2100
2001	Combined advice with North Sea	< 2000		4000		1900		200	2100
2002	Combined advice with North Sea	< 3000		6300		4100		60	4100
2003	Combined advice with North Sea	-		3200		1800	200	n/a	1800
2004	Combined advice with North Sea / F should be below F_{pa}	No forecast		4900		1400	100	n/a	1400
2005	Combined advice with North Sea / F should be below F_{pa}	-		4000		800	200	0	800
2006	Combined advice with North Sea / F < 0.3	-		3200		1500	1000	0	1500
2007	Combined advice with North Sea / F < 0.3	-		3400		1600	800	0	2500
2008	Combined advice with North Sea / 15% TAC reduction	2900		2900		1400	600	0	2000
2009	Combined advice with North Sea / Apply management plan	-		2600		1500	600	0	2100
2010	Combined advice with North Sea / Apply management plan	-		2200		1300	600	0	1900
2011	See scenarios	-		2100		9900	1700	0	11600
2012	Apply management plan North Sea	-		2095	2500	2600	700	0	3300

Year	ICES advice	Predicted landings corresp. to advice	Predicted catch corresp. to advice **	Agreed TAC	Official landings	ICES landings	ICES discards	ICES Indust. bycatch	ICES total catch
2013	Apply management plan North Sea	-		2770	200	*	*	*	*
2014	Apply management plan North Sea	2438		2355	2100	2300	100	*	2400
2015	(November update) MSY approach		68690	2504	1429	1419	86	3	1508
2016	MSY approach		≤ 59945	3926	1300	1212	97^	7	1316
2017	MSY approach		≤ 39461	2069	1101	1101	105^	1	1207
2018	(November update) MSY approach		≤ 48990	2569					
2019	MSY approach		≤ 33956						

* Combined in Table 7a.
** Catch advice since 2015 is given for Subarea 4, Division 6.a, and Subdivision 20.
^ Since 2016 discards correspond to unwanted catch (including BMS landings).

Table 7c Haddock in Division 6.a. ICES advice, TAC, official landings, and ICES catch estimates. All weights are in tonnes. Values for the period 1987 to 2014 are presented to the nearest thousand (official landings) or nearest hundred (ICES landings, discards, and total) tonnes.

Year	ICES advice/ Single-stock exploitation boundaries from 2004 onwards *	Predicted landings corresp. to advice	Predicted catch corresp. to advice^^	Agreed TAC	Official landings	ICES landings	ICES discards	ICES indust. bycatch	ICES total catch
1987	Reduce F towards F_{max}	20000		32000	27000	27000	16200		43200
1988	No increase in F; TAC	25000		35000	21000	21200	9500		30700
1989	80% of F(87); TAC	15000		35000	24000	16700	3000		19700
1990	80% of F(88); TAC	14000		24000	13000	10100	5400		15500
1991	70% of effort (89)	-		15200	10000	10600	8700		19200
1992	70% of effort (89)	-		12500	7000	11400 **	9300 **		20500 **
1993	70% of effort (89)	-		17600	13000	19100 **	16800 **		35900 **
1994	30% reduction in effort	-		16000	9000	14200 **	11100 **		25000 **
1995	Significant reduction in effort	-		21000	13000	12400	8600		20900
1996	Significant reduction in effort	-		22900	13000	13500	11400		24800
1997	Significant reduction in effort	-		20000	13000	12900	6500		19300
1998	No increase in F	20800 ***		25700	14000	14400	5500		19900
1999	F reduced to F_{pa}	14300 ***		19000	11000	10500	4900		15300
2000	Maintain F below F_{pa}	< 14900 ***		19000	7000	7000	7900		14900
2001	Reduce F below F_{pa}	< 11200 ***		13900	7000	6870	6600		13400
2002	Reduce F below F_{pa}	< 14100 ***		14100	7000	7100	8900		16000
2003	No cod catches	-		8700	4900	5300	4100		9400
2004	F_{pa}*	12200		6500	3000	3900	3700		7600
2005	$0.75 \times F_{pa}$*	7600		7600	3200	3800	2900		6700
2006	$0.7 \times F_{pa}$*	8000		7810	5700	6300	4600		10900
2007	$0.87 \times F_{pa}$*	7200		7200	3700	3800	4000		7700
2008	$SSB > B_{pa}$*	4200		6120	2800	2800	1200		4100
2009	No fishing and recovery plan*	0		3520	2800	2900	1600		4500
2010	No fishing and recovery plan	0		2670	2900	3000	2800		5800

Year	ICES advice/ Single-stock exploitation boundaries from 2004 onwards *	Predicted landings corresp. to advice	Predicted catch corresp. to advice^^	Agreed TAC	Official landings	ICES landings	ICES discards	ICES indust. bycatch	ICES total catch
2011	See scenarios	0		2005	1700	1700	1500		3300
2012	MSY framework	5600		6015	5000	5100	500		5600
2013	MSY framework	3100		4211	4700	4600	1000		5600
2014	MSY approach	6432^		3988	4000	4000	800		4800
2015	(November update) MSY approach		68690	4536	3876	3888	1347		5235
2016	MSY approach		≤ 59945	6462	4253	4247	1553[#]	0	5809
2017	MSY approach		≤ 39461	3697	3262	3255	1583[#]	0	4838
2018	(November update) MSY approach		≤ 48990	4654					
2019	MSY approach		≤ 33956						

* Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries, protecting stocks outside safe biological limits.
** Adjusted for misreporting.
*** For Division 6.a only.
^ This value (6432) refers to total catch, including discards. Therefore, it is not directly comparable to the value advised for 2013 (3100), which referred only to landings.
^^ Catch advice since 2015 is given for Subarea 4, Division 6.a, and Subdivision 20.
[#] Since 2016 discards correspond to unwanted catch (including BMS landings).

History of the catch and landings

Table 8 Haddock in Subarea 4, Division 6.a, and Subdivision 20. Catch distribution by fleet in 2017 as estimated by ICES.

Catch (2017)	Wanted catch			Unwanted catch	Industrial bycatch
39 875 tonnes	Demersal trawl and seine > 100 mm 96%	Trawl 70–99 mm < 1%	Others 4%	7029 tonnes	19 tonnes
	32 827 tonnes				

Table 9 Haddock in Subarea 4, Division 6.a, and Subdivision 20. History of official commercial catch and landings, along with ICES estimates for individual areas. All weights are in tonnes.

Subdivision 20										
Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Germany	87	105	65	102	120	90	114	103	125	0
Denmark	1052	1263	1139	1661	1916	1456	1763	1057	973	852
Netherlands	0	0	1	0	0	5	6	4	2	20
Norway	170	121	81	125	239	223	81	63	70	65
Portugal	0	0	0	0	0	0	0	0	0	0
Sweden	276	166	126	198	210	217	219	202	129	103
UK	0	0	0	0	0	3	0	0	0	0
BMS landings										< 1
Subarea 4										
Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Belgium	112	108	78	106	78	78	98	45	53	30
Germany	393	657	634	575	548	677	677	599	554	534
Denmark	501	552	725	697	947	1283	1079	1426	1213	1185
Spain	0	0	0	0	0	0	0	0	0	0
Faroes	3	32	5	0	0	0	0	0	0	0
France	448	135	276	320	175	177	209	101	121	140
Greenland	0	4	0	0	0	0	0	0	0	0
Ireland	0	0	0	0	0	0	0	0	0	0
Iceland	0	0	0	0	0	0	0	0	0	0
Netherlands	29	24	41	71	191	172	99	43	146	75
Norway	1482	1278	1126	1195	1069	1661	2705	2004	1484	2164
Poland	16	0	0	0	0	0	0	0	0	0
Portugal	0	0	0	0	0	0	0	0	0	0
Sweden	83	141	90	128	103	113	154	135	117	179
UK	27365	28393	24983	23343	0	32993	29758	25852	26374	25376
BMS landings										< 1
Division 6.a										
Country	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Germany	1	0	1	0	0	0	0	0	0	o
Denmark	0	0	0	0	0	0	0	0	2	2
Spain	10	21	28	36	15	0	19	9	33	28
Faroes	0	0	0	0	0	0	0	0	0	0
France	151	136	89	73	32	51	67	41	62	68
Ireland	879	297	396	290	845	746	653	768	1033	641
Netherlands	0	0	0	0	0	0	0	0	28	31
Norway	28	18	9	4	0	6	15	7	5	1
UK	1776	2380	2415	1364	0	3878	3230	3051	3090	2492
BMS landings										0
Northern shelf										
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Official landings	34862	35831	32308	30288	6488	43830	40945	35520	35614	32290
ICES landings	33058	35590	31940	36570	38162	43681	41143	35316	35058	32827
ICES discards	14503	12326	13071	13067	5032	3038	5090	6255	7749^	6936^
ICES IBC	199	52	431	24	1	54	65	21	37	19
ICES total catch	47760	47968	45442	49661	43195	46773	46298	41592	43045	39875
TAC 4	46444	42110	35794	34057	39000	45041	38284	40711	61933	33643
TAC 3.a 20	2856	2590	2201	2100	2095	2770	2355	2504	3926	2069
TAC 6.a	6120	3520	2670	2005	6015	4211	3988	4536	6462	3697
Total TAC	55420	48220	40665	38162	47110	52022	44627	47751	72321	46538

^ Since 2016 discards correspond to unwanted catch (including BMS landings).

Summary of the assessment

Table 10 Haddock in Subarea 4, Division 6.a, and Subdivision 20. Assessment summary. Recruitment in thousands. Weights are in tonnes. High and low refers to 95% confidence intervals.

Year	Recruitment			SSB			Wanted catch*	Unwanted catch**	Industrial bycatch	F		
	Age 0	High	Low	SSB	High	Low				Ages 2–4	High	Low
1972	8943270	12938190	4948350	294770	353310	236230	234019	144366	29585	0.86	0.99	0.74
1973	32931300	40747600	25115000	275070	312910	237230	207489	126105	11267	0.79	0.93	0.65
1974	52623630	68905930	36341330	320420	363700	277140	167528	181802	47505	0.74	0.88	0.60
1975	3373420	6409160	337680	157530	178790	136270	160271	293321	41487	0.87	1.03	0.71
1976	5452360	8315500	2589220	193770	224230	163310	184421	169776	48163	0.81	0.97	0.65
1977	11874670	15272150	8477190	349260	408140	290380	156639	48732	35022	0.82	0.99	0.65
1978	24784890	28657710	20912070	157310	184090	130530	102970	32860	10903	0.90	1.07	0.73
1979	49566390	58340290	40792490	92580	114040	71120	97896	35054	16240	0.92	1.10	0.74
1980	9101630	11158410	7044850	102720	124080	81360	111371	68831	22472	0.89	1.06	0.73
1981	15398990	18632530	12165450	193950	220030	167870	147806	61683	17041	0.68	0.81	0.55
1982	9254480	10929380	7579580	434790	475670	393910	195456	41297	19383	0.56	0.66	0.47
1983	30169940	34461760	25878120	294330	324690	263970	188754	51584	12898	0.72	0.83	0.62
1984	5827690	8606930	3048450	236970	266330	207610	158205	79012	10080	0.85	0.97	0.73
1985	9593360	12023440	7163280	167430	184270	150590	182946	58373	5998	0.80	0.92	0.69
1986	18110550	21593490	14627610	289060	322000	256120	185137	36063	2643	0.91	1.03	0.78
1987	265070	2544910	0	163170	181090	145250	135022	55674	4410	0.91	1.03	0.78
1988	1044190	4473870	0	126000	143160	108840	126227	49833	4002	0.96	1.09	0.82
1989	1978730	4520910	0	178520	201440	155600	92840	32453	2410	0.91	1.04	0.77
1990	8710820	11305820	6115820	85070	96830	73310	61605	22548	2589	0.90	1.03	0.77
1991	9817750	11361950	8273550	52110	59950	44270	55208	36610	5386	0.89	1.02	0.75
1992	17033390	19525050	14541730	55850	61470	50230	81566	42477	10927	0.88	0.99	0.78
1993	4304560	5086300	3522820	118470	133330	103610	98631	70748	10766	0.94	1.06	0.83
1994	17004120	19303840	14704400	138020	157300	118740	95141	70668	3576	0.92	1.04	0.80
1995	4796300	5574920	4017680	196870	225170	168570	89859	71262	7695	0.82	0.94	0.70
1996	6890100	8049980	5730220	124570	138910	110230	92615	107207	5000	0.80	0.92	0.69
1997	4149970	4941190	3358750	252820	282220	223420	95391	67879	6684	0.62	0.72	0.52
1998	3126270	3689870	2562670	183380	202620	164140	95472	61399	5101	0.73	0.84	0.62
1999	46386980	53052360	39721600	142890	160430	125350	76009	43562	3835	0.82	0.94	0.69
2000	9058770	10282610	7834930	92660	105360	79960	54504	64185	8134	0.89	1.02	0.75
2001	914490	2233570	0	62710	71450	53970	47592	117882	7879	0.60	0.71	0.49
2002	1222950	1883370	562530	537860	611040	464680	65405	86051	3717	0.37	0.45	0.30
2003	1362610	1899190	826030	460410	515450	405370	47282	25975	1150	0.23	0.28	0.184
2004	1337620	1713400	961840	315950	359330	272570	51896	20020	554	0.23	0.28	0.183
2005	12763560	14107220	11419900	232970	270830	195110	51528	12389	168	0.30	0.36	0.24
2006	2727540	3134940	2320140	160040	190500	129580	43334	23094	535	0.50	0.59	0.41
2007	1813230	2471150	1155310	131260	161360	101160	34672	32651	48	0.42	0.50	0.35
2008	1269310	1791470	747150	277520	313860	241180	33058	14503	199	0.25	0.30	0.196
2009	9336940	10283840	8390040	227970	262370	193570	35590	12326	52	0.198	0.24	0.156
2010	857280	2119400	0	211370	244650	178090	31940	13071	431	0.22	0.26	0.170
2011	64900	1033060	0	151640	173760	129520	36570	13067	24	0.31	0.38	0.25
2012	1136960	1585720	688200	313510	348130	278890	38162	5032	1	0.188	0.23	0.146
2013	607300	997360	217240	250330	277190	223470	43734	3305	54	0.20	0.25	0.162
2014	5711610	6533390	4889830	179490	202190	156790	41143	5090	65	0.34	0.40	0.27
2015	1663010	2034450	1291570	141520	162140	120900	35295	6255	21	0.45	0.53	0.37
2016	2490960	3298760	1683160	120730	141510	99950	35058	7749	37	0.32	0.39	0.25
2017	816110	1668830	0	205170	233590	176750	32827	6936	19	0.25	0.31	0.187
2018	1231000***			218270	252470	184070						

* ICES estimates of catch.

** Unwanted catch values include discards and BMS landings from 2016.

***RCT3 estimate.

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