

## Haddock (*Melanogrammus aeglefinus*) in Division 5.b (Faroes grounds)

### ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2019 should be no more than 5078 tonnes. ICES is not in a position to advise on the corresponding level of fishing effort.

### Stock development over time

The spawning-stock biomass (SSB) has been below  $B_{lim}$  since 2009 but increases above MSY  $B_{trigger}$  in 2018. The fishing mortality (F) has decreased in recent years but is still above  $F_{MSY}$ . Recruitment has been low from 2004 to 2016, while the 2017 and 2018 recruitments of one-year-olds are estimated to be high.

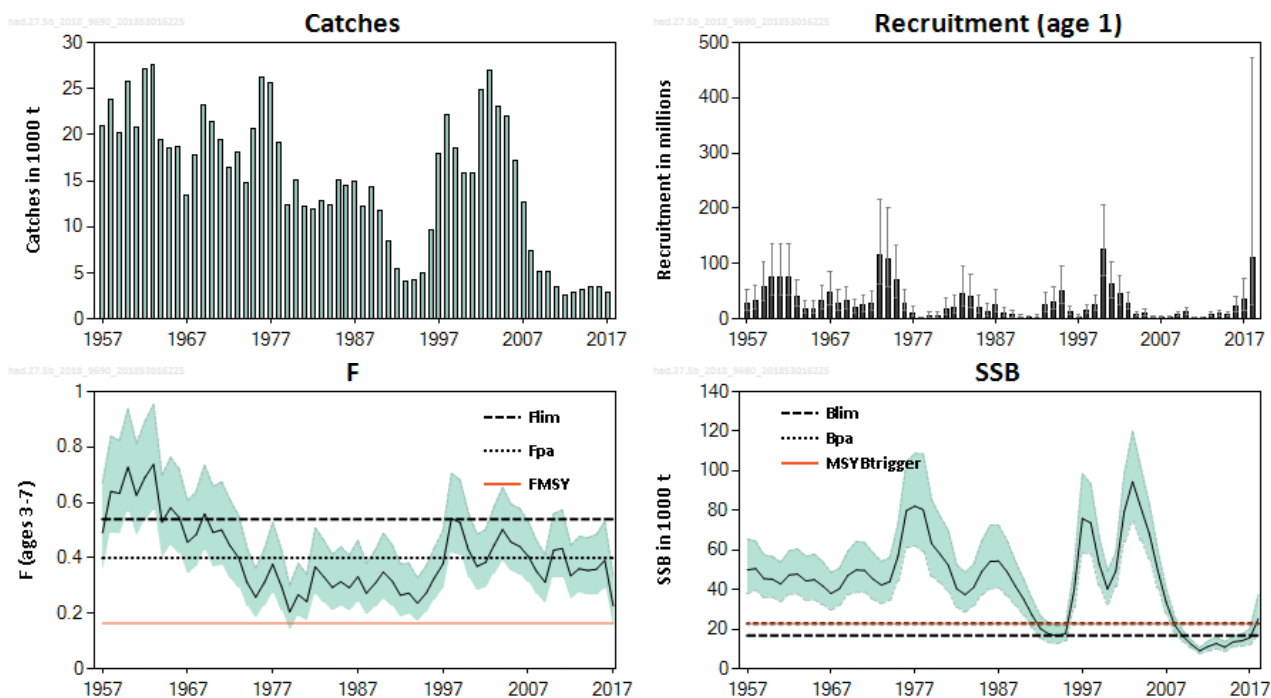


Figure 1 Haddock in Division 5.b. Summary of the stock assessment with 95% confidence intervals.

### Stock and exploitation status

ICES assesses that fishing pressure on the stock is above  $F_{MSY}$  and below  $F_{pa}$  and  $F_{lim}$ , while the spawning stock size is above MSY  $B_{trigger}$ ,  $B_{pa}$ , and  $B_{lim}$ .

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

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

**Catch scenarios**

**Table 2** Haddock in Division 5.b. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
F <sub>ages 3-7</sub> (2018)	0.23	F <sub>2018</sub> = F <sub>2017</sub>
SSB (2019)	50237 tonnes	Based on F <sub>2018</sub> = 0.23
R <sub>age 1</sub> (2019)	9274 thousands	Median of resampled estimates from 2000–2017
R <sub>age 1</sub> (2020)	9274 thousands	Median of resampled estimates from 2000–2017
Total catch (2018)	3718 tonnes	Based on F <sub>2018</sub> = 0.23
Landings (2018)	3718 tonnes	Landings = catches
Discards (2018)	0 tonnes	Negligible

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

Basis	Total catch (2019)	F <sub>total</sub> (2019)	SSB (2020)	% SSB change *	% Advice change **
ICES advice basis					
MSY approach: F <sub>MSY</sub>	5078	0.165	106448	112	11
Other scenarios					
F = 0	0	0	114882	129	-100
F = F <sub>2018</sub>	6758	0.23	104738	108	48
F = F <sub>pa</sub>	10985	0.40	98975	97	140
F = F <sub>lim</sub>	13953	0.54	94602	88	205

\* SSB 2020 relative to SSB 2019.

\*\* Advice value 2019 relative to advice value 2018.

The increased recruitment in recent years has led to an increase in catch advice.

**Basis of the advice**

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

Advice basis	MSY approach.
Management plan	There is no management plan for this stock.

**Quality of the assessment**

The stock was benchmarked in 2017 and the assessment model and input data were changed. The tendency to over-estimate SSB and underestimate F persists. The 2017 recruitment estimate has been reduced significantly in the latest assessment.



**Figure 2** Haddock in Division 5.b. Historical assessment results. The age of recruitment changed from age 2 to age 1 at the 2017 benchmark; the recruitment plot therefore shows only two lines.

**Issues relevant for the advice**

An effort management system has been in place from 1996 to 2018. A new management system will be implemented for cod, haddock, and saithe after 1 January 2019. This management system operates with catch quotas for large vessels

(trawlers and longliners), whereas it operates with fishing days for the small vessels (mainly longliners). The catch quota for the small vessels needs to be converted into fishing days. However, ICES is currently not in a position to quantify the relationship between effort and F for this stock.

Faroe Plateau cod and Faroe haddock are caught in a mixed fishery.

## Reference points

**Table 5** Haddock in Division 5.b. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	22 843 t	$B_{pa}$	ICES (2017)
	$F_{MSY}$	0.165	Stochastic simulations based on a segmented regression stock–recruitment relationship.	ICES (2017)
Precautionary approach	$B_{lim}$	16 780 t	The lowest biomass that has led to good recruitment.	ICES (2017)
	$B_{pa}$	22 843 t	$B_{lim} \times \exp(1.645 \times \sigma)$ , where $\sigma = 0.19$ .	ICES (2017)
	$F_{lim}$	0.54	Stochastic simulations (ICES, 2017) that give a 50% probability of $SSB > B_{lim}$ .	ICES (2017)
	$F_{pa}$	0.40	$F_{lim} \times \exp(-1.645 \times \sigma)$ , where $\sigma = 0.18$ .	ICES (2017)
Management plan	$SSB_{mgt}$	Not applicable		
	$F_{mgt}$	Not applicable		

## Basis of the assessment

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

ICES stock data category	1 (ICES, 2016)
Assessment type	SAM with catch-at-age data and age-disaggregated indices, using catches in the model and in the forecast (ICES, 2018a).
Input data	Commercial catches (mainly Faroese catches, ages and length frequencies from catch sampling); survey indices (FO-GFS-Q1 and FO-GFS-Q3); annual maturity data from FO-GFS-Q1; natural mortalities set at 0.2.
Discards and bycatch	Discarding is considered negligible.
Indicators	Co-occurrence of high recruitment of haddock with sandeel abundance.
Other information	Benchmarked in 2017 (ICES, 2018b).
Working group report	North-Western Working Group (NWWG)

## Information from stakeholders

No additional information is available.

## History of the advice, catch, and management

**Table 7** Haddock in Division 5.b. ICES advice and catch. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	Agreed TAC*	ICES catch
1987	No increase in F	17000		14882
1988	No increase in F	18000		12178
1989	No increase in F	11000		14325
1990	No increase in F	11000		11726
1991	TAC	11000		8429
1992	TAC	13000–15000		5476
1993	Reduction in F	8000		4026
1994	No fishing	0	6200	4252
1995	No fishing	0	6200	4948
1996	TAC	8300	12600	9642
1997	$F = F(95)$	9300		17924
1998	$F = F(96)$	16000		22210
1999	$F < \text{proposed } F_{pa} (0.25)$	9000		18482
2000	$F < \text{proposed } F_{pa} (0.25)$	22000		15821

Year	ICES advice	Catch corresponding to advice	Agreed TAC*	ICES catch
2001	F < proposed $F_{pa}$ (0.25)	20000		15891
2002	No fishing	0		24933
2003	F < proposed $F_{pa}$ (0.25)	12000		26942
2004	F < proposed $F_{pa}$ (0.25)	21000		23100
2005	F < proposed $F_{pa}$ (0.25)	19000		21944
2006	F < proposed $F_{pa}$ (0.25)	18000		17154
2007	F < 0.20	16000		12631
2008	$F_{pa}$	14000		7393
2009	No fishing and recovery plan	0		5197
2010	No fishing and recovery plan	0		5202
2011	No direct fishing; minimize bycatch, implement recovery plan	0		3546
2012	No direct fishing; minimize bycatch, implement recovery plan	0		2634
2013	No direct fishing; minimize bycatch, implement recovery plan	0		2924
2014	No direct fishing; minimize bycatch, implement recovery plan	0		3253
2015	No direct fishing; minimize bycatch, implement recovery plan	0		3422
2016	No direct fishing; minimize bycatch, implement recovery plan	0		3457
2017	MSY approach ( $F \leq 0.17$ )	$\leq 3500$		2849**
2018	MSY approach ( $F \leq 0.165$ )	$\leq 4570$		
2019	MSY approach	$\leq 5078$		

\* Not applicable since 1997.

\*\* Preliminary.

### History of the catch and landings

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

Catch (2017)	Landings		Discards
	Longliners 57%	Trawlers 43%	
2849	2849		Discarding is negligible

**Table 9** Haddock in Division 5.b. History of commercial catch and landings in subdivisions 5.b.1. and 5.b.2; both the official and ICES estimated values are presented for each country participating in the fishery. All weights are in tonnes. Faroese catches used in the assessment (first column) are obtained by adding catch on the Faroe Bank (Subdivision 5.b.2) to the Faroe Plateau (Subdivision 5.b.1) and correction of conversion factors for round/gutted weight.

Year	Faroe Islands	England	France	Germany	Iceland	Norway	Scotland	Spain	Greenland	Russia	Total
2000	15185	19	6	1	0	403	185	0	22	0	15821
2001	15406	4	8	2	0	323	148	0	0	0	15891
2002	24474	11	2	6	4	255	177	0	4	0	24933
2003	26419	14	4	1	0	319	185	0	0	0	26942
2004	22589	8	0	6	0	246	186	49	0	16	23100
2005	20616	1	0	0	0	257	1070	0	0	0	21944
2006	16975	1	12	1	0	58	106	0	1	0	17154
2007	12499	0	4	0	0	69	50	0	9	0	12631
2008	7284	0	3	0	0	31	65	0	0	10	7393
2009	5087	0	2	0	0	11	91	0	6	0	5197
2010	5110	0	1	0	0	6	73	0	12	0	5202
2011	3544	0	2	0	0	0	0	0	0	0	3546
2012	2631	0	1	0	2	0	0	0	0	0	2634
2013	2924	0	0	0	0	0	0	0	0	0	2924
2014	2827	350	0	0	0	2	74	0	0	0	3253
2015	2967	428	1	0	0	5	21	0	0	0	3422
2016	3189	252	5	0	0	11	0	0	0	0	3457
2017*	2757	86	1	0	0	6	0	0	0	0	2849

\* Preliminary.

### Summary of the assessment

**Table 10** Haddock in Division 5.b. Assessment summary. Weights are in tonnes.

Year	Recruitment			SSB			Catch	F		
	R age 1	97.5 percentile	2.5 percentile	SSB	97.5 percentile	2.5 percentile		F mean ages 3–7	97.5 percentile	2.5 percentile
	thousands									
1957	27980	52727	14847	49942	65551	38050	20995	0.49	0.67	0.36
1958	32968	59531	18257	50599	64411	39749	23871	0.64	0.84	0.49
1959	58214	103563	32723	45563	57464	36127	20239	0.63	0.82	0.49
1960	76309	135825	42871	45246	56682	36117	25727	0.73	0.94	0.56
1961	76100	136403	42457	42851	53832	34111	20831	0.63	0.81	0.48
1962	76397	137095	42572	47465	59586	37809	27151	0.69	0.89	0.53
1963	39814	71742	22095	47862	60601	37800	27571	0.74	0.95	0.57
1964	18536	33638	10214	44443	56788	34782	19490	0.53	0.70	0.40
1965	17934	32624	9858	44990	57960	34922	18479	0.58	0.76	0.44
1966	32716	59432	18009	41925	54143	32465	18766	0.55	0.72	0.42
1967	47782	86858	26286	38054	48624	29782	13381	0.46	0.61	0.34
1968	29156	52863	16080	40474	50757	32275	17852	0.48	0.64	0.37
1969	32540	58908	17975	47152	59331	37473	23272	0.56	0.74	0.43
1970	19809	35947	10916	49909	64325	38724	21361	0.49	0.66	0.37
1971	24270	43991	13389	49692	63755	38732	19393	0.50	0.68	0.37
1972	27284	49592	15011	45400	58571	35191	16485	0.44	0.61	0.32
1973	116002	216792	62071	42315	54256	33003	18035	0.40	0.55	0.29
1974	107599	201563	57439	44003	56053	34543	14773	0.31	0.43	0.22

Year	Recruitment			SSB			Catch	F		
	R age 1	97.5 percentile	2.5 percentile	SSB	97.5 percentile	2.5 percentile		F mean ages 3–7	97.5 percentile	2.5 percentile
	thousands									
1975	70115	132363	37142	57031	73150	44464	20715	0.26	0.36	0.185
1976	27243	52102	14245	79980	104597	61157	26211	0.31	0.43	0.22
1977	10861	23769	4963	82160	108712	62093	25555	0.38	0.53	0.27
1978	1004	2216	455	80340	108583	59444	19200	0.30	0.43	0.21
1979	5966	11603	3068	63276	85491	46834	12424	0.21	0.30	0.141
1980	5990	12392	2895	58003	77095	43639	15016	0.27	0.38	0.188
1981	18068	37362	8738	52348	69925	39190	12233	0.24	0.34	0.174
1982	21211	43920	10244	40458	52474	31193	11937	0.37	0.51	0.27
1983	46251	96195	22238	37479	48737	28821	12894	0.33	0.46	0.24
1984	41275	79759	21360	41035	52661	31975	12378	0.29	0.41	0.21
1985	20422	42631	9783	49246	64693	37488	15143	0.31	0.44	0.23
1986	13347	27949	6374	54259	72593	40556	14477	0.29	0.41	0.21
1987	24915	52496	11825	54442	72483	40892	14882	0.33	0.46	0.24
1988	9900	20800	4712	49020	64879	37037	12178	0.27	0.38	0.196
1989	7417	15449	3561	41844	54353	32214	14325	0.31	0.43	0.22
1990	3273	6792	1577	35092	45146	27278	11726	0.35	0.49	0.25
1991	2835	5858	1372	27168	35232	20950	8429	0.32	0.45	0.23
1992	3906	8111	1881	20294	26652	15452	5476	0.27	0.38	0.187
1993	24750	48313	12679	17614	23167	13392	4026	0.27	0.38	0.195
1994	31221	56942	17119	16649	21533	12872	4252	0.24	0.33	0.172
1995	51755	96015	27897	17799	22293	14211	4948	0.27	0.37	0.20
1996	13225	22128	7904	39453	50419	30872	9642	0.33	0.44	0.25
1997	4040	7004	2330	75879	98548	58424	17924	0.38	0.50	0.29
1998	15437	26190	9099	73709	93468	58127	22210	0.54	0.71	0.42
1999	26599	43248	16359	53043	66592	42251	18482	0.53	0.68	0.41
2000	126466	205458	77843	40299	49410	32868	15821	0.43	0.56	0.33
2001	62807	102445	38506	49459	58812	41593	15891	0.37	0.49	0.28
2002	44940	77435	26082	79418	98454	64063	24933	0.38	0.50	0.29
2003	28820	49153	16898	94566	119977	74537	26942	0.45	0.59	0.34
2004	8387	13770	5108	81070	101172	64963	23100	0.50	0.65	0.39
2005	10540	17913	6202	68097	83130	55782	21944	0.46	0.59	0.35
2006	3261	5537	1921	49701	60000	41169	17154	0.44	0.58	0.34
2007	3156	5341	1865	33667	40382	28068	12631	0.41	0.53	0.31
2008	3562	5925	2142	22227	26406	18709	7393	0.35	0.46	0.27
2009	7581	12823	4481	16386	19384	13852	5197	0.31	0.41	0.24
2010	11832	20303	6895	12420	14552	10601	5202	0.43	0.56	0.33
2011	930	1667	519	9108	10706	7749	3546	0.43	0.57	0.33
2012	2083	3620	1199	11310	14078	9085	2634	0.34	0.45	0.25
2013	7221	12256	4254	12781	16205	10081	2924	0.36	0.48	0.27
2014	9274	15750	5461	10975	13556	8886	3253	0.36	0.47	0.27
2015	7350	12656	4268	13638	16590	11211	3422	0.36	0.48	0.27
2016	23408	41081	13338	14144	17400	11497	3457	0.39	0.53	0.29
2017	34761	74220	16281	15748	20196	12280	2849	0.23	0.33	0.155
2018	110629	472101	25924	25312	37335	17161				

## Sources and references

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