Haddock (*Melanogrammus aeglefinus*) in Division 6.b (Rockall)

ICES advice on fishing opportunities

ICES advises that when the MSY approach is applied, catches in 2020 should be no more than 10 472 tonnes.

Stock development over time

The spawning–stock biomass (SSB) has increased from the lowest estimated values in 2014 and is currently estimated to be well above MSY $B_{trigger}$. Fishing mortality (F) has been declining and is below F_{MSY} in 2018. Recruitment during 2008–2012 is estimated to have been extremely weak, but has improved since then. Recruitment in 2018 and 2019 is estimated to be below average.

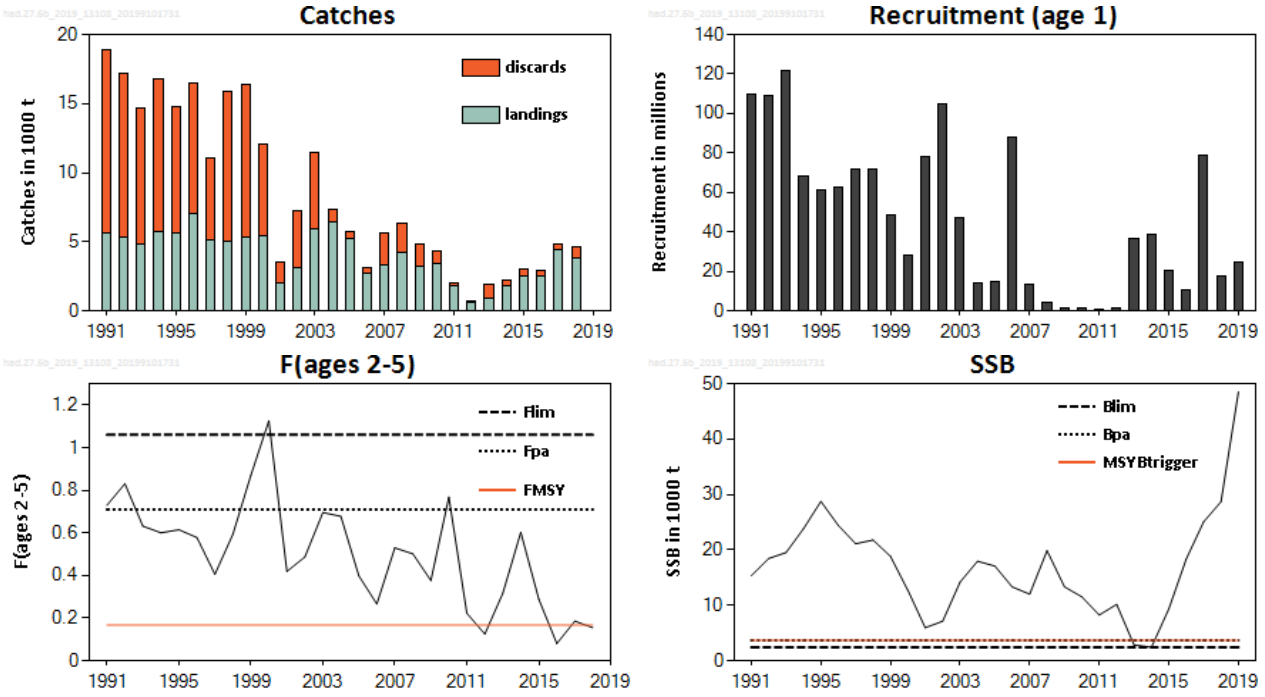

Figure 1 Haddock in Division 6.b. Summary of the stock assessment.

Stock and exploitation status

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

Table 1 Haddock in Division 6.b. State of the stock and fishery relative to reference points.

		Fishing pressure				Stock size			
		2016	2017	2018		2017	2018	2019	
Maximum sustainable yield	F_{MSY}	✓	✗	✓	Below	MSY $B_{trigger}$	✓	✓	✓ Above trigger
Precautionary approach	F_{pa},F_{lim}	✓	✓	✓	Harvested sustainably	B_{pa},B_{lim}	✓	✓	✓ Full reproductive capacity
Management plan	F_{MGT}	–	–	–		B_{MGT}	–	–	–

Catch scenarios

Table 2 Haddock in Division 6.b. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
F_{2019}	0.162	F consistent with assumed catches in 2019.
SSB_{2020}	44411 tonnes	
$R_{age\ 1}$ (2019)	24 444 thousands	Survey estimate in 2018 (RCT3).
$R_{age\ 1}$ (2020)	14 170 thousands	Recruitment corresponding to the 25th percentile rank of the recruitment time-series.
Catch (2019)	9763 tonnes	UK (8439 t) and Irish (824 t) quotas + assumed Russian catch (500 t).
Wanted catch (2019)	8512 tonnes	
Unwanted catch (2019)	1251 tonnes	EU discards based on mean discard rate-at-age for the period 2008–2017.

Table 3 Haddock in Division 6.b. Annual catch scenarios. All weights are in tonnes. No information on % TAC change is shown because the TAC area differs from the stock distribution area.

Basis	Total catch* (2020)	Wanted catch** (2020)	Unwanted catch** (2020)	F_{total} (2020)	F_{wanted} (2020)	$F_{unwanted}$ (2020)	SSB (2021)	% SSB change ***	% Advice change ^
ICES advice basis									
MSY approach: F_{MSY}	10472	9221	1251	0.168	0.111	0.057	44936	1.18	0.03
Other scenarios									
NEAFC Proposed management strategy ^^	10471	9220	1251	0.168	0.111	0.057	44936	1.18	0.0191
NEAFC Proposed management strategy ^^^	10472	9221	1251	0.168	0.111	0.057	44936	1.18	0.03
F = 0	0	0	0	0	0	0	57749	30	−100
F_{pa}	30092	26102	3990	0.710	0.467	0.243	20899	−53	187
F_{lim}	36493	31422	5071	1.060	0.697	0.363	13166	−70	249
$SSB_{2021} = B_{lim}$	46084	39013	7071	2.481	1.631	0.850	2474	−94	340
$SSB_{2021} = B_{pa}$ = MSY $B_{trigger}$	44833	38067	6766	2.113	1.390	0.723	3712	−92	328
$F = F_{2019}$	10127	8919	1208	0.162	0.106	0.056	45359	2.1	−3.3
F = MAP# $F_{MSY\ lower}$	6854	6047	807	0.105	0.069	0.036	49368	11.2	−35
F = MAP# $F_{MSY\ upper}$	15531	13632	1899	0.270	0.178	0.092	38734	−12.8	48

* Total catch includes EU, non EU (Russian Federation, Norway, etc.) "wanted catch" (landings) and discards.
** "Wanted" and "unwanted" catch are used to describe fish that would be landed and discarded in the absence of the EU landings obligation.
*** SSB 2021 relative to SSB 2020.
^ Advice value for 2020 relative to the advice value for 2019 (10 469 tonnes).
^^ $TACF_{HCR}$ is derived from a two-step process: F_{MSY} = 0.168 followed by the TAC constraint (a), where the $TAC_{2020} = TAC_{FMSY} + 0.2 \times (TAC_{2019} - TAC_{FMSY})$. To calculate the catch scenario of the proposed management strategy, ICES uses the advised catches for 2019 as the TAC_{2019}; the formula for TAC_{2020}, therefore, corresponds to catches of $10\,472 + 0.2 \times (10\,469 - 10\,472) = 10\,471$ tonnes.
^^^ $TACF_{HCR}$ with TAC constraint (b) which implies no more than 20% below or 25% above of the preceding year (TAC_{y-1}).
# EU multiannual plan (MAP) for the Western Waters (EU, 2019a).

The SSB has increased but the benchmark revised F_{MSY} from 0.2 to 0.168, which resulted in a negligible change in advised catch.

Basis of the advice

Table 4 Haddock in Division 6.b. The basis of the advice.

Advice basis	MSY approach
Management plan	There is no agreed management plan for haddock in this area. Two management strategies (NEAFC and EU MAP) have been assessed to be precautionary. NEAFC has requested ICES to evaluate the harvest control rules using F_{MSY} as target. ICES concluded that the NEAFC harvest control rules in the long-term management strategy for Rockall haddock were consistent with the precautionary approach (ICES, 2019a). The EU multiannual plan (MAP) for stocks in in the Western Waters and adjacent waters applies to this stock. The plan specifies conditions for setting fishing opportunities depending on stock status and making use of the F_{MSY} range for the stock. In accordance with the MAP, catches higher than those corresponding to F_{MSY} can only be taken providing SSB is greater than MSY $B_{trigger}$, and one of the following conditions is met: a) if it is necessary for the achievement of objectives of mixed fisheries; b) if is necessary to avoid serious harm to a stock caused by intra- or inter-species stock dynamics; c) in order to limit variations in fishing opportunities between consecutive years to not more than 20%. ICES considers that the F_{MSY} range for this stock used in the MAP is precautionary. Full details of the plan are described in EU (2019a).

Quality of the assessment

In 2019, a benchmark was conducted on this stock (ICES, 2019b). The trends are consistent except for F in 2010, which has been revised upward significantly due to revised catch-at-age of the discards.

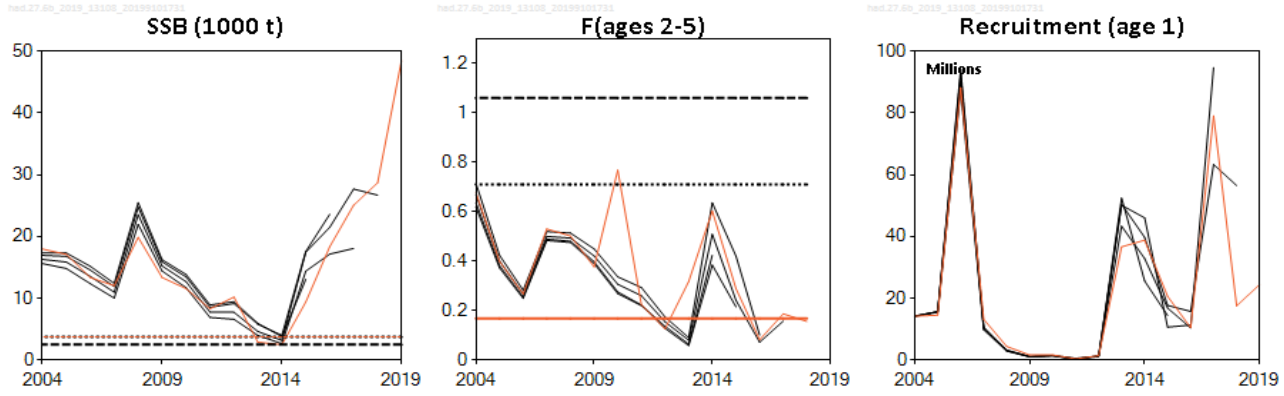

Figure 2 Haddock in Division 6.b. Historical assessment results.

Issues relevant for the advice

ICES provides advice based on the MSY approach because no existing precautionary management plan has been agreed by the relevant management authorities (EU and NEAFC). Catch options associated with the EU MAP and NEAFC management strategies are included in Table 3.

Reference points

Table 5 Haddock in Division 6.b. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	3712 tonnes	B_{pa}	ICES (2019a)
	F_{MSY}	0.168	Segmented regression with B_{loss}, the lowest observed spawning–stock biomass (EqSim).	ICES (2019a)
Precautionary approach	B_{lim}	2474 tonnes	$B_{lim} = B_{loss}$ = SSB in 2014, the lowest observed spawning-stock estimated in previous assessments.	ICES (2019a)
	B_{pa}	3712 tonnes	$B_{pa} = B_{lim} \times 1.4$. This is considered to be the minimum SSB required to obtain a high probability (95%) of maintaining SSB above B_{lim}	ICES (2019a)
	F_{lim}	1.06	Based on a 50% probability of being above B_{lim} in a stochastic simulation with a segmented regression using breakpoint at B_{lim}.	ICES (2019a)
	F_{pa}	0.710	$F_{pa} = F_{lim}/1.5$	ICES (2019a)
Management plan *	SSB_{mgt}	3712 tonnes	B_{pa}	ICES (2019a)
	F_{mgt}	0.168	F_{MSY}	ICES (2019a)
Management plan **	MAP MSY $B_{trigger}$	3712 tonnes	MSY $B_{trigger}$	ICES (2019a)
	MAP B_{lim}	2474 tonnes	B_{lim}	ICES (2019a)
	MAP F_{MSY}	0.168	F_{MSY}	ICES (2019a)
	EU MAP range F_{lower}	0.105	Consistent with range resulting in no more than 5% reduction in long-term yield compared with MSY (see methods in ICES (2016))	ICES (2019a)
	EU MAP range F_{upper}	0.27	Consistent with range resulting in no more than 5% reduction in long-term yield compared with MSY (see methods in ICES (2016)).	ICES (2019a)

* Proposed NEAFC multiannual plan (MAP).

** The EU multiannual plan (MAP) for stocks in the Western Waters and adjacent has been agreed by the EU for this stock (EU, 2019).

Basis of the assessment

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

ICES stock data category	1 (ICES, 2018).
Assessment type	Age-structured model (FLXSA) that uses catches in the model and in the forecast. (ICES, 2019b)
Input data	Commercial landings, estimated discards, age composition of catches; one survey index (Rock-WIBTS-Q3); fixed maturity ogive (knife-edge at age 3), fixed natural mortality (0.2).
Discards and bycatch	Discards are included in the assessment.
Indicators	Russian trawl-acoustic survey and the trawl survey-based assessment, statistical catch-at-age analysis (StatCam analytical model).
Other information	This stock was benchmarked in 2019 (ICES, 2019b).
Working group	Working Group for the Celtic Seas Ecoregion (WGCSE)

Information from stakeholders

Since 2014, there has been effort by the Scottish industry/science observer sampling scheme to improve coverage in subareas 4 and 6. However, the number of samples remains low for this stock. Increasing observer coverage of catches at Rockall, including the collection of age data from the landing component of the catch during observer trips, will help improve the overall biological sampling for the stock. Recognizing the low sampling levels, Scottish industry will continue to liaise with science on sampling opportunities.

History of the advice, catch, and management

Table 7 Haddock in Division 6.b. ICES advice and official landings. All weights are in tonnes.

Year	ICES advice single-stock exploitation boundaries from 2004 onwards	Catch corresponding to advice	Landings corresponding to advice	Agreed TAC ^^	Official landings	ICES landings	Discards
1987	Precautionary TAC	10000			7995	8432	n/a
1988	Precautionary TAC	10000			7574	7929	n/a
1989	Status quo F; TAC	18000			6643	6728	n/a
1990	Precautionary TAC	5500			8213	3884	n/a
1991	Precautionary TAC	5500			5853	5655	13228
1992	Precautionary TAC	3800			4520	5320	11871
1993	80% of F(91)	3000			4113	4784	9853
1994	If required, precautionary TAC	-			3735	5733*	11023
1995	No long-term gain in increasing F	5100**			5491	5112	9168
1996	No long-term gains in increasing F	6900**			6818	6275	9356
1997	No advice given	4900**			5220	4629	5894
1998	No increase in F	4900			5098	4499	10862
1999	Reduce F below F_{pa}	3800	-		5990	5139	11062
2000	Reduce F below F_{pa}	< 3500	-		5688	5331	6609
2001	Reduce F below F_{pa}	< 2700	-		2315	2036	1535
2002	Reduce F below 0.2	< 1300	-		3037	3336	4152
2003	Lowest possible F	-	-		6148	6242	5521
2004	Lowest possible catch ^		-	702	6306	6445	883
2005	Lowest possible catch ^		-	702	5178	5179	505
2006	Lowest possible catch ^		-	597	2765	2765	386
2007	Reduce F below F_{pa} ^	< 7110	-	4615	3349	3349	2242
2008	Keep F below F_{pa} ^	< 10600	-	6916	4221	4221	2100
2009	No long-term gains in increasing F ^	-	< 4300	5879	3445	3445	1557
2010	No long-term gains in increasing F ^	-	< 3300	4997	3405	3405	306
2011	See scenarios	-		3748	1903	1903	152
2012	MSY approach	-	< 3300	3300	710	710	16
2013	No directed fisheries, minimize bycatch and discards	0	0	990	826	826	1143
2014	MSY approach	< 1620	< 980	1210	1675	1675	274
2015	MSY approach	< 4310	< 2930	2580	2445	2445	527
2016	MSY approach	≤ 3932	≤ 3225	3225	2585	2585	301
2017	MSY approach	≤ 4690	≤ 4130	4690	4610	4610	396
2018	MSY approach	≤ 5163		5163	3868^^^	3868^^^	788
2019	MSY approach	≤ 10469		10469			
2020	MSY approach	≤ 10472					

* Including misreporting.
** Landings at *status quo* F.
^ Single-stock boundary and the exploitation of this stock should be conducted in the context of mixed fisheries, protecting stocks outside safe biological limits.
^^ Agreed EU TAC for Division 6.b and subareas 12 and 14.
^^^ Preliminary.
n/a = Not available.

History of the catch and landings

Table 8 Haddock in Division 6.b. Catch distribution by fleet in 2018 as estimated by ICES.

Catch	Landings		Discards
4656 tonnes (t)	Otter trawl 99.6 %	Longline 0.4%	788 t
	3868 t		

Table 9 Haddock in Division 6.b. History of commercial catch and landings. All weights are in tonnes.

Year	Faroe Islands	France	Iceland	Ireland	Norway	Portugal	Russian Federation	Spain	UK (E,W, & NI)	UK (Scot.)	Total	Unallocated catch	Landings from NEAFC area	ICES landings estimate
1996	-	-**	-	747	24	-	-	1	293	5753	6818	-543	NA	6275
1997	-	-	+	895	24	-	-	22	165	4114	5220	-591	NA	4629
1998	-	-	-	704	40	4	-	21	561	3768	5098	-599	NA	4499
1999	-	-	167	1021	61	-	458	25	288	3970	5990	-851	NA	5139
2000	NA	5	-	824	152	-	2154	47	36	2470	5688	-357	NA	5331^
2001	NA	2	-	357	70	-	630	51	-	1205	2315	-279	NA	2036^
2002	-	-	-	206	49	-	1630	7	-	1145	3037	299	NA	3336^
2003	-	1	-	169	60	-	4237	19	56	1607	6148	94^^	NA	6242^
2004	-	-	-	19	32	-	5844	-	-	411***	6306	139^^	NA	6445
2005	-	-	-	105	33	-	4708	-	-	332***	5178	1	NA	5179
2006	2	-	-	41	123	-	2154	5	-	440***	2765	0	NA	2765
2007	2	-	-	338	84	-	1282	-	-	1643***	3349	0	NA	3349
2008	16	-	-	721	36	-	1669	-	-	1779***	4221	0	NA	4221
2009	16	-	-	352	71	-	55	-	-	2951***	3445	0	NA	3445
2010	42	-	-	169	65	-	198	-	-	2931***	3405	0	NA	3405
2011	2	< 1	-	123	40	-	-	-	-	1738***	1903	0	NA	1903
2012	53	-	-	31	48	-	1	-	-	577***	710	0	26	710
2013	-	-	-	105	121	-	4	-	-	596	826	0	91	826
2014	1	2	-	95	38	-	388	-	-	1152	1675	0	86	1675
2015	1	-	-	190	66	-	136	-	-	2052	2445	0	202	2445
2016	-	-	-	362	63	-	-	-	-	2160	2585	0	624	2585
2017*	-	-	-	500	26		153			3930	4610	0	309	4610
2018*				433	16		-			3418	3868	0	494	3868

*Preliminary.
** Included in Division 6.a.
*** Includes UK England, Wales, and N. Ireland landings.
^ Includes the total Russian catch.
^^ Non-official.
NA = not available.

Summary of the assessment

Table 10 Haddock in Division 6.b. Assessment summary. Weights are in tonnes and recruitment in thousands.

Year	Recruitment age 1	SSB	Landings	Discards	F ages 2–5
1991	109540	15357	5655	13240	0.73
1992	109143	18471	5320	11878	0.83
1993	121862	19544	4784	9858	0.63
1994	68327	23854	5733	11030	0.60
1995	61262	28760	5587	9173	0.61
1996	62439	24438	7075	9365	0.58
1997	71687	21117	5166	5900	0.41
1998	71695	21795	4984	10903	0.59
1999	48472	18844	5358	11066	0.87
2000	28158	12730	5445	6637	1.13
2001	78115	5981	2020	1536	0.42
2002	104614	7155	3116	4158	0.49
2003	47320	14205	5967	5522	0.70
2004	14170	17971	6437	883	0.68
2005	14506	17107	5238	505	0.40
2006	88242	13346	2756	386	0.27
2007	13174	12031	3348	2242	0.53
2008	4368	19862	4221	2104	0.50
2009	1576	13357	3242	1556	0.38
2010	1606	11548	3404	907	0.77
2011	343	8274	1861	152	0.22
2012	1370	10184	686	29	0.126
2013	36658	2872	889	1065	0.32
2014	38814	2474	1845	332	0.60
2015	20623	9371	2510	554	0.29
2016	10472	18346	2504	401	0.082
2017	79118	25077	4431	379	0.187
2018	17509	28703	3850	788	0.156
2019	24444*	48513			

* RCT3 estimate.

Sources and references

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