5.3.30 Haddock (*Melanogrammus aeglefinus*) in divisions 7.b–k (southern Celtic Seas and English Channel)

ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2017 should be no more than 12 444 tonnes. If discard rates do not change from the average of the full time-series (1993–2015), this implies landings of no more than 7751 tonnes.

Stock development over time

The spawning-stock biomass (SSB) peaked in 2011 as the very strong 2009 year class matured; this cohort was followed by three years of below-average recruitment which led to a rapid decline in SSB after 2011. SSB is currently well above $MSY_{Btrigger}$. Fishing mortality (F) has been above FMSY for the entire time-series.

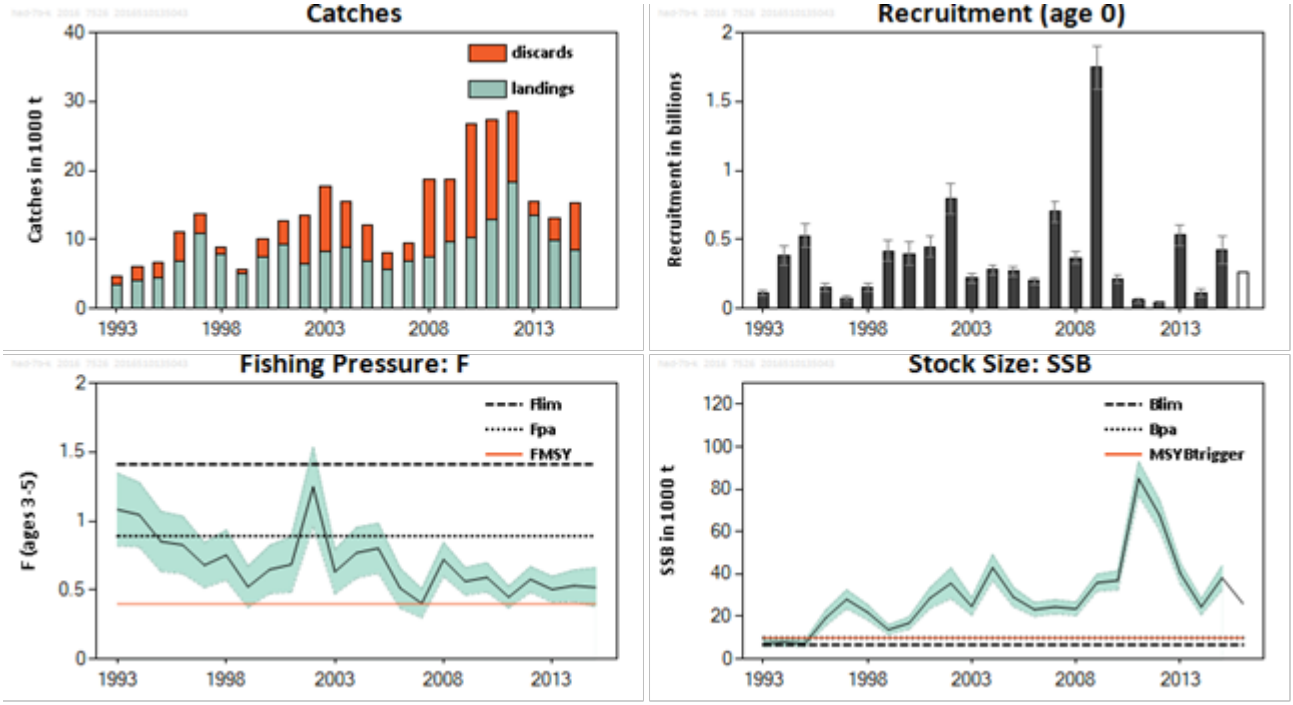

Figure 5.3.30.1 Haddock in divisions 7.b–k. Summary of stock assessment (weights in thousand tonnes). Recruitment, F, and SSB have uncertainty boundaries (1 × standard deviation) in the plot. Recruitment predicted value is not shaded.

Stock and exploitation status

Table 5.3.30.1 Haddock in divisions 7.b–k. State of the stock and fishery relative to reference points.

		Fishing pressure					Stock size				
		2013	2014	2015			2014	2015	2016	
Maximum sustainable yield	F_{MSY}	✗	✗	✗	Above	MSY $B_{trigger}$	✓	✓	✓	Above trigger
Precautionary approach	F_{pa}, F_{lim}	✓	✓	✓	Harvested sustainably	B_{pa}, B_{lim}	✓	✓	✓	Full reproductive capacity
Management plan	F_{MGT}	-	-	-	Not applicable	SSB_{MGT}	-	-	-	Not applicable

Catch options

Table 5.3.30.2 Haddock in divisions 7.b–k. The basis for the catch options.

Variable	Value	Notes	Source
F ages 3–5 (2016)	0.518	Average F (2013–2015)	ICES (2016a)
SSB (2017)	33 560 t	Short-term forecast	ICES (2016a)
$R_{age\ 0}$ (2016 and 2017)	266 437 thousands	Geometric mean (1993–2013)	ICES (2016a)
Catch (2016)	13 542 t	Short-term forecast	ICES (2016a)
Landings (2016)	8893 t	Average discard pattern (1993–2015)	ICES (2016a)
Discards (2016)	4649 t	Average discard pattern (1993–2015)	ICES (2016a)

Table 5.3.30.3 Haddock in divisions 7.b–k. The catch options. Weights are in tonnes.

Rationale	Catch (2017)	Wanted catch* (2017)	Unwanted catch* (2017)	Basis	F catch (2017)	F wanted catch (2017)**	F unwanted catch (2017)	SSB (2018)	% SSB change***	% TAC change^
MSY approach	12 444	7751	4693	F_{MSY}	0.40	0.36	0.04	34 408	+3	+7
Zero catch	0	0	0	F = 0	0.00	0.00	0.00	47 070	+40	−100
Other options	42 212	24 727	17 485	B_{lim}	2.94	2.63	0.31	6700	−80	+241
	38 199	22 710	15 489	B_{pa}	2.23	1.99	0.23	10 000	−70	+213
	38 199	22 710	15 489	$B_{trigger}$	2.23	1.99	0.23	10 000	−70	+213
	13 291	8271	5020	SSB_{2017}	0.43	0.39	0.05	33 560	0	+14
	9879	6169	3709	−15% TAC_{2016}	0.31	0.27	0.03	36 991	+10	−15
	11 643	7258	4385	TAC_{2016}	0.37	0.33	0.04	35 213	+5	0
	13 414	8347	5068	+15% TAC_{2016}	0.44	0.39	0.05	33 436	+0	+15
	30 712	18 617	12 094	F_{lim}	1.41	1.26	0.15	16 683	−50	+157
	23 076	14 181	8895	F_{pa}	0.89	0.8	0.09	23 919	−29	+95
Mixed fisheries options (ICES, 2016b)										
Maximum	20 505			A	0.75			26 418	−21	
Minimum	6743			B	0.20			40 169	20	
Cod	6968			C	0.21			39 940	19	
Haddock	12 444			D	0.40			34 408	3	
Whiting	20 456			E	0.75			26 467	−21	
Status quo *effort*	15 415			F	0.52			31 440	−6	

* "Wanted catch" is used to describe fish that would be landed in the absence of the EU landing obligation. The "unwanted catch" refers to the component that was previously discarded.
** Total F was split into a "wanted" and "unwanted" catch component, based on the average ratio of landings and discards-at-age over the full time-series (see "Issues relevant for the advice" for more detail).
*** SSB 2018 relative to SSB 2017.
^ Wanted catch 2017 relative to TAC 2016 (7258 t).

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 2017 and the historical proportion of the stock landings taken by the fleet.)

A. Maximum: Each fleet stops fishing when its last stock share is exhausted.
B. Minimum: Each fleet stops fishing when its first stock share is exhausted.
C. Cod: Each fleet stops fishing when its cod stock share is exhausted.
D. Haddock: Each fleet stops fishing when its haddock stock share is exhausted.
E. Whiting: Each fleet stops fishing when its whiting stock share is exhausted.
F. *Status quo* effort: The effort of each fleet remains as it was in 2015.

Basis of the advice

Table 5.3.30.4 Haddock in divisions 7.b–k. The basis of the advice.

Advice basis	MSY approach
Management plan	There is no management plan for haddock in this area.

Quality of the assessment

There is considerable uncertainty around the historical discard estimates, but the stock trends in the assessment appear to be robust to this uncertainty.

Because of the introduction of square-mesh panels during 2012, the selectivity might have been expected to have changed. However, the assessment does not show evidence for such changes and the assumption of a constant selectivity pattern in the model still appears to be valid.

Fishing mortality for 2012 and 2013 was overestimated and SSB underestimated by the assessments performed in 2013 and 2014 (Figure 5.3.30.2). However, recent estimates of fishing mortality and SSB are more consistent.

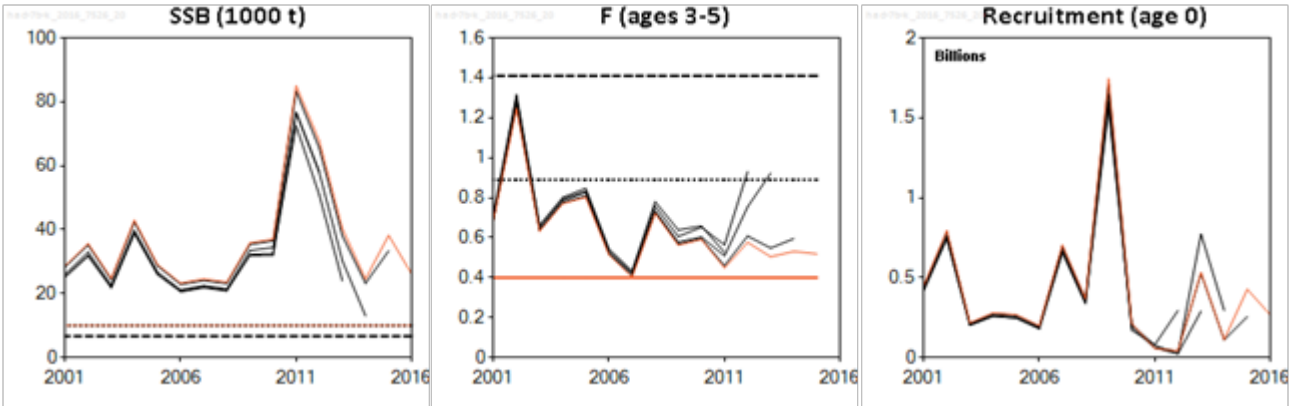

Figure 5.3.30.2 Haddock in divisions 7.b–k. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

Poor recruitment after 2009 led to a decrease in the volume of discards, but as the moderately strong 2013 cohort entered the fishery, the discard volume increased again in 2015 (to more than twice the 2014 value). There is no evidence of improved selectivity of young fish due to the introduction of square-mesh panels in 2012.

Haddock are caught in mixed fisheries with cod and whiting; management should take this into account. The mixed-fisheries analysis carried out by ICES shows that cod will be the limiting species for most of the fleets in 2017 (Section 5.2.7.2; ICES, 2016c).

Landings in the south of Division 7.a (33E2 and 33E3) are included in the assessment because they are considered to be part of this stock.

The TAC has been very restrictive in recent years, which has resulted in increased levels of discarding of fish over the minimum conservation reference size (MCRS). The average discard pattern of the full time-series has been used to split catch into wanted and unwanted catch in the forecast. This approach will reduce the proportion of fish over the MCRS in the unwanted catch component of the forecast.

Reference points

Table 5.3.30.5 Haddock in divisions 7.b–k. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	10 000 t	B_{pa}.	ICES (2015)
	F_{MSY}	0.40	Median point estimates of EqSim with segmented regression S–R relationship (landings: 0.36 + discards: 0.04).	ICES (2015)
Precautionary approach	B_{lim}	6700 t	Lowest observed SSB	ICES (2015)
	B_{pa}	10 000 t	B_{lim} combined with the assessment error; $B_{lim} \times \exp(1.645 \times \sigma)$; $\sigma = 0.26$	ICES (2015)
	F_{lim}	1.41	F with 50% probability of SSB< B_{lim}	ICES (2015)
	F_{pa}	0.89	F_{lim} combined with the assessment error; $F_{lim} \times \exp(-1.645 \times \sigma)$; $\sigma = 0.28$	ICES (2015)
Management plan	SSB_{MGT}	Not applicable.		
	F_{MGT}	Not applicable.		

Basis of the assessment

Table 5.3.30.6 Haddock in divisions 7.b–k. The basis of the assessment.

ICES stock data category	1 (ICES, 2016d).1 (ICES, 2016d)
Assessment type	ASAP (Age-Structured Assessment Programme; NOAA toolbox) that uses catches in the model and in the forecast.
Input data	Commercial catches (age composition of landings and discards); survey index (combined IGFS-WIBTS-Q4 and EVHOE-WIBTS-Q4); commercial index (IRL_OTB_HAD); maturity data (surveys and observer data; constant for all years); natural mortalities (based on Lorenzen, 1996).
Discards and bycatch	Included in the assessment for the full time-series.
Indicators	None
Other information	This stock was benchmarked in 2012 (ICES, 2012).
Working groups	Working Group for the Celtic Seas Ecoregion (WGCSE) and Working Group on Mixed Fisheries Advice (WGMIXFISH-ADVICE)

Information from stakeholders

The French and Irish fishing industries have reported that the abundance and distribution of haddock has increased substantially in 2016. Due to the restrictive TAC and perceived recruitment levels, the industry have reported to national scientists that there is increased discarding with the potential for haddock being a “choke” species. Some of the Irish industry representatives have put forward a proposal to increase mesh size and/or include square-mesh panels (SMPs) for trawlers and seiners with a cod-end mesh size greater than 100 mm. Obtaining industry data on recent catches and technical conservation measure proposals will be discussed at the North Western Waters Advisory Council (NWWAC) in July 2016.

If information from stakeholders is to be used in the development of stock assessments and allow for more robust input to the advice process, a clearer process to transmit stakeholder information to the expert group should be developed.

History of the advice, catch, and management

Table 5.3.30.7 Haddock in divisions 7.b–k. History of ICES advice, the agreed TAC, and ICES estimates of landings, discards, and catch. Weights are in thousand tonnes.

Year	ICES advice	Predicted catch corresp. to advice	Predicted landings corresp.to advice	Agreed TAC	Official landings	ICES landings	Discards	ICES catch
1987	Not dealt with				3.0	2.6	n/a	2.6
1988	Not dealt with				4.0	3.6	n/a	3.6
1989	Not dealt with				4.2	3.2	n/a	3.2
1990	Not dealt with				2.9	2.0	n/a	2.0
1991	Not dealt with				2.9	2.3	n/a	2.3
1992	Not dealt with				2.9	2.7	n/a	2.7
1993	Not dealt with				3.4	3.3	1.2	4.6
1994	Not dealt with				4.1	4.1	1.9	6.0
1995	Not dealt with			6*	4.5	4.5	2.2	6.7
1996	Not dealt with			7**	6.7	6.8	4.3	11.1
1997	Not dealt with			14	10.3	10.8	2.9	13.7
1998	Not dealt with			20	7.4	7.7	0.9	8.6
1999	Not dealt with			22***	5.2	4.9	0.6	5.5
2000	No expansion of catches			16.6***	6.7	7.4	2.5	9.9
2001	No expansion of catches			12***	9.7	8.6	3.4	12.1
2002	No expansion of catches		8.0	9.3***	7.1	6.4	7.1	13.5
2003	No expansion of catches		7.2	8.185***	8.2	8.2	9.5	17.7
2004	No increase in F		-	9.600***	8.5	8.6	6.7	15.4
2005	No increase in effort		-	11.520***	6.9	6.6	5.2	11.8
2006	No increase in effort		-	11.520***	5.6	5.4	2.5	7.9
2007	No increase in effort		-	11.520***	6.6	6.7	2.7	9.5
2008	Same advice as last year		-	11.579***	6.2	7.3	11.2	18.5
2009	Same advice as last year		-	11.579^	9.3	9.6	9.1	18.6
2010	Same advice as last year		-	11.579^	10.0	10.1	16.5	26.7
2011	See scenarios		-	13.316^	13.4	12.9	14.4	27.3
2012	No increase in catch and technical measures to reduce discards rates		-	16.645^	18.2	18.1	10.2	28.3
2013	MSY transition		< 9.5	14.148^	13.1	13.4	2.1	15.5
2014	MSY transition	< 5.281	< 3.602	9.479^	9.2	9.9	3.2	13.0
2015	MSY approach	< 10.434	< 5.605	8.342^	8.2	8.5	6.7	15.2
2016	MSY approach	≤ 8.590	≤ 6.078^^	7.258^				
2017	MSY approach	≤ 12.444	≤ 7.751					

n/a = not available.
* Applies to subareas 7–10.
** Increased in-year to 14 000 t.
*** Includes separate Division 7.a allocation.
^Applies to divisions 7.b–k and subareas 8–10.
^^ Wanted catch.

History of catch and landings

Table 5.3.30.8 Haddock in divisions 7.b–k. Catch distribution by fleet in 2015 as estimated by ICES.

Total catch (2015)	Landings				Discards			
15 239 t	otter trawls	seines	beam trawls	others	otter trawls	seines	beam trawls	others
	79%	4%	15%	2%	85%	8%	5%	2%
	8545 t				6694 t			

Table 5.3.30.9 Haddock in divisions 7.b–k. History of commercial catch and landings; both the official and ICES estimated values are presented by area for each country participating in the fishery.

Year	Official landings							ICES estimates			33E2 & 33E3**
	Belgium	France	Ireland	UK	Others	Total	Unallocated	Landings	Discards	Catch	
1993	51	1839	1262	256	0	3408	−60	3348	1208	4557	
1994	123	2788	908	240	17	4076	55	4131	1886	6017	
1995	189	2964	966	266	83	4468	2	4470	2218	6688	
1996	133	4527	1468	439	86	6653	103	6756	4309	11 064	
1997	246	6581	2789	569	85	10 270	557	10 827	2883	13 710	
1998	142	3674	2788	444	312	7360	308	7668	934	8603	
1999	51	2725	2034	278	159	5247	−365	4882	586	5468	
2000	90	3088	3066	289	123	6656	755	7411	2503	9913	
2001	165	4842	3608	422	665	9702	−1070	8632	3418	12050	
2002	132	4348	2188	315	106	7089	−686	6403	7073	13 476	
2003	118	5781	1867	393	82	8241	−31	8210	9456	17 666	64
2004	136	6130	1715	313	159	8453	181	8634	6750	15 384	53
2005	167	4174	2037	292	197	6867	−277	6590	5191	11 781	35
2006	99	3190	1875	274	209	5647	−239	5408	2484	7893	26
2007	119	4142	1930	386	52	6629	103	6732	2739	9471	222
2008	108	3639	1800	566	121	6234	1100	7334	11 187	18 521	194
2009	131	5429	2983	716	48	9307	254	9561	9080	18 641	285
2010	170	6240	2609	852	128	9999	136	10 135	16 547	26 682	267
2011	211	8070	3322	1658	129	13 390	−492	12 898	14 378	27 276	374
2012	231	11 793	4130	1901	167	18 222	−81	18 141	10 191	28 331	473
2013	173	8748	2699	1455	21	13 068	365	13 424	2085	15 298	410
2014	99	6375	2092	785	18	9171	684	9855	3177	13 032	444
2015*	117	5681	1656	759	4	8342	203	8545	6693	15 238	322

*Preliminary data.

**Landings from rectangles 33E2 and 33E3 are added to the stock area.

Summary of the assessment

Table 5.3.30.10 Haddock in divisions 7.b–k. Assessment summary. Weights are in tonnes.

Year	Recruitment Age 0 thousands	High	Low	Stock size: SSB tonnes	High	Low	Landings tonnes	Discards tonnes	Fishing pressure: Ages 3–F	High	Low
1993	110 096	133 551	86 641	7450	9026	5875	3348	1208	1.083	1.345	0.82
1994	379 440	449 577	309 303	7889	9627	6151	4131	1886	1.045	1.279	0.812
1995	525 427	609 865	440 989	7276	8704	5848	4470	2218	0.851	1.068	0.634
1996	148 671	178 244	119 098	19 341	22 904	15 778	6756	4309	0.827	1.034	0.619
1997	74 881	91 536	58 226	28 135	32 555	23 715	10 827	2883	0.68	0.843	0.517
1998	156 252	186 515	125 989	22 059	25 587	18 532	7928	934	0.753	0.934	0.571
1999	415 616	491 358	339 874	13 784	16 019	11 549	4970	586	0.523	0.672	0.373
2000	397 128	479 090	315 166	16 932	19 794	14 070	7499	2503	0.649	0.823	0.475
2001	447 315	525 407	369 223	28 701	33 515	23 888	9278	3418	0.685	0.885	0.485
2002	794 001	905 451	682 551	35 681	42 935	28 426	6488	7073	1.246	1.532	0.96
2003	217 180	251 292	183 068	24 770	28 869	20 672	8292	9456	0.632	0.792	0.471
2004	279 376	316 431	242 321	42 993	49 087	36 900	8777	6750	0.77	0.953	0.587
2005	268 300	302 141	234 459	29 134	33 613	24 656	6787	5191	0.802	0.983	0.622
2006	199 004	226 979	171 029	23 299	26 545	20 053	5593	2484	0.513	0.658	0.369
2007	703 067	778 451	627 683	24 568	27 842	21 294	6781	2739	0.403	0.507	0.298
2008	367 665	416 003	319 327	23 584	26 712	20 457	7455	11 187	0.721	0.843	0.598
2009	1 744 006	1 902 466	1 585 546	35 897	39 890	31 905	9608	9080	0.562	0.661	0.463
2010	213 086	243 250	182 922	37 011	41 509	32 514	10 262	16 547	0.591	0.697	0.486
2011	57 276	68 486	46 066	84 951	92 933	76 969	12 879	14 378	0.448	0.526	0.37
2012	40 855	49 603	32 107	67 709	74 717	60 700	18 376	10 191	0.577	0.669	0.485
2013	531 251	606 707	455 795	40 295	45 050	35 540	13 424	2085	0.504	0.598	0.411
2014	112 602	139 940	85 264	24 534	28 228	20 839	9854	3177	0.531	0.644	0.418
2015	426 645	526 206	327 084	38 229	43 916	32 541	8545	6694	0.519	0.66	0.377
2016	266 437*			26 082							
Average	**369 816**	**429 502**	**319 119**	**29 596**	**33 895**	**25 603**	**8362**	**5521**	**0.692**	**0.853**	**0.531**

*Geometric mean (1993–2013).

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