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Herring (*Clupea harengus*) in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k (Irish Sea, Celtic Sea, and southwest of Ireland)

ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2018 should be no more than 5445 tonnes.

ICES advises, under precautionary considerations, that activities that have an impact on the spawning habitat of herring should not occur, unless the effects of these activities have been assessed and shown not to be detrimental.

Stock development over time

The spawning-stock biomass (SSB) has been decreasing significantly since its peak in 2011, and is now below MSY $B_{trigger}$ and close to B_{lim}. The fishing mortality (F) has increased since 2008 and is now above F_{MSY}. Recruitment has been below average since 2013.

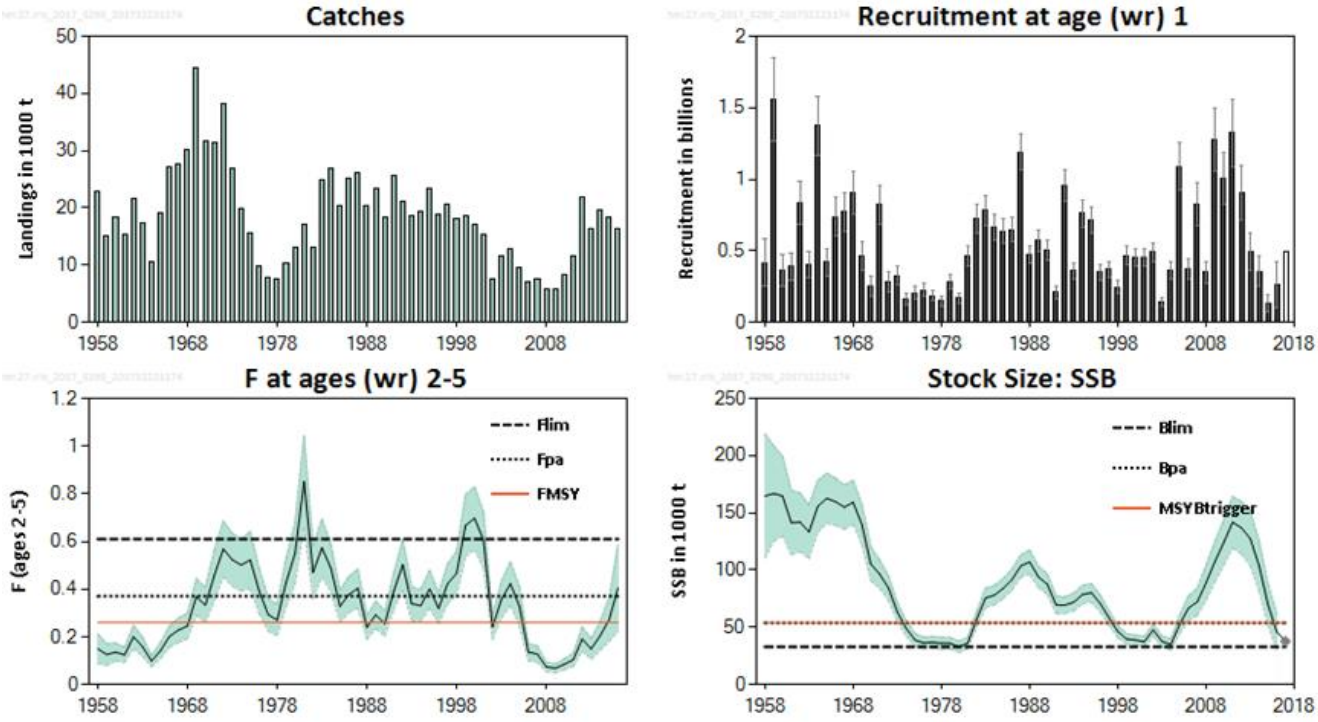

Figure 1 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. Summary of the stock assessment. The assumed recruitment is unshaded and the forecast SSB value is designated by a grey diamond. The shaded areas on the F and SSB plots represent 95 % confidence intervals.

Stock and exploitation status

Table 1 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. State of the stock and fishery relative to reference points.

		Fishing pressure				Stock size			
		2014	2015	2016		2015	2016	2017	
Maximum sustainable yield	F_{MSY}	✓	✗	✗	Above	MSY $B_{trigger}$	✓	✗	✗ Below trigger
Precautionary approach	F_{pa},F_{lim}	✓	✓	o	Increased risk	B_{pa},B_{lim}	✓	o	o Increased risk
Management plan	F_{MGT}	–	–	–	Not applicable	B_{MGT}	–	–	– Not applicable

Catch options

Table 2 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. The basis for the catch options.

Variable	Value	Source	Notes
F ages (wr) 2–5 (2017)	0.56	ICES (2017a)	Catch constraint: F corresponding to the assumed total catch for 2017
R age (wr) 1 (2017/2018)	496445 thousands	ICES (2017a)	Stock-recruitment relationship based on SSB_{2015} from the assessment output
SSB (2017)	37795 t	ICES (2017a)	
Total catch (2017)	15817 t	ICES (2017a)	Catch constraint, including TAC adjusted for estimated uptake, for carry-over of national quotas, and estimated discards.

Table 3 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. Annual catch options. All weights are in tonnes.

Basis	Total catch (2018)	F_{total} (2018)	SSB (2018)	% SSB change *	SSB (2019)	% TAC change **
ICES advice basis						
MSY approach: F_{MSY} x SSB_{2017}/MSY $B_{trigger}$	5445	0.182	42832	13	47611	-62
Other options						
F_{MSY}	7547	0.26	41643	10	46204	-48
F = 0	0	0	45789	21	57778	-100
F_{pa}	10299	0.37	40040	6	44371	-29
F_{lim}	15545	0.61	36824	-3	40906	7
SSB (2018) = B_{lim}	21367	0.94	33000	-13	37116	48
SSB (2018) = B_{pa} ***						
SSB (2018) = MSY $B_{trigger}$***						
F = F_{2017}	14576	0.56	37436	-1	41542	1
F_{mgt} (0.23) in management strategy proposed by Pelagic AC constrained by 30% change rule	10127	0.36	40142	6	44485	-30

* SSB 2019 relative to SSB 2018.
** Total catch in 2018 relative to TAC in 2017 (14467 t).
*** These catch options are left blank because the stated SSB cannot be achieved even with F = 0.

Basis of the advice

Table 4 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. The basis of the advice.

Advice basis	MSY approach
Management plan	The long-term management strategy for Celtic Sea herring that was proposed by the Pelagic AC in 2011 (Pelagic AC, 2011) was evaluated by ICES and found to be precautionary (ICES, 2012; 2015a). ICES is requested by the EC to provide advice based on the MSY approach and to include the management strategy as a catch option.

Quality of the assessment

The 2014 and 2015 acoustic survey estimates were not used in the assessment (ICES, 2015b, 2016b) as the survey did not cover the entire distribution area of the stock. In 2016 the area coverage problem was solved.

Since 2014, herring were observed close to the bottom, and unreliably estimated by the acoustic survey. The current assessment cannot deal with this change in estimation of herring by the survey, and changes to the assessment methodology are required. This means that the assessment may not adequately track recent stock development.

The latest assessment shows retrospective downward revision of previous stock sizes. This is primarily due to the inclusion of the low 2016 acoustic survey index.

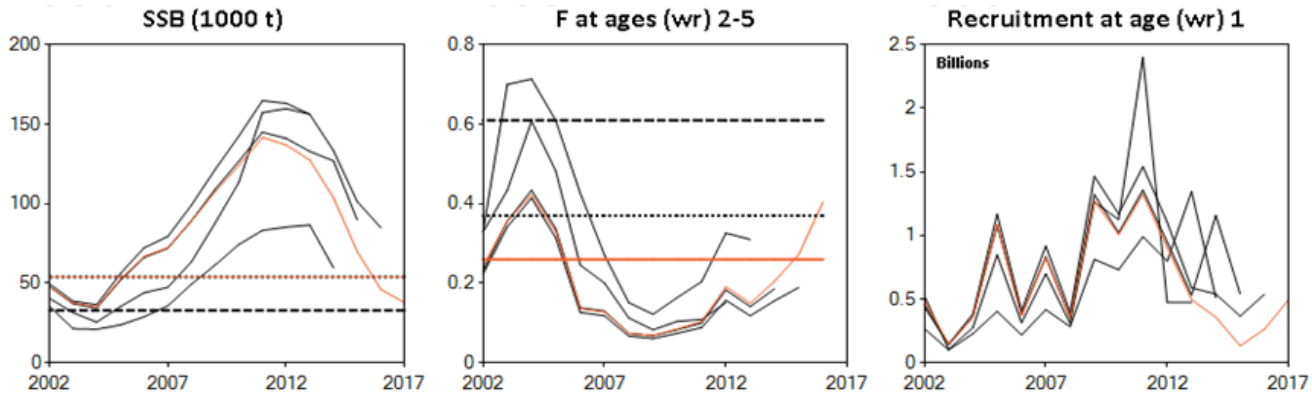

Figure 2 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. Historical assessment results.

Issues relevant for the advice

There has been an increase in marine anthropogenic activity. Any activities that have a negative impact on the spawning habitat of herring, such as dumping of dredge spoil, extraction of marine aggregates (e.g. gravel and sand), and erection of structures in the vicinity of spawning grounds require consideration (see for example, Groot, 1979, 1996; ICES, 2003, 2015d). This is because a gravel substratum is an essential habitat for herring spawning.

Evaluations conducted in 2015 by ICES (ICES, 2015a, 2015c) show that the management strategy is precautionary. The TAC has been set in accordance with the management strategy since 2013. ICES is requested by the EC to provide advice based on the MSY approach and to include the management strategy as a catch option.

Reference points

Table 5 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	54000 t	B_{pa}	ICES (2015a)
	F_{MSY}	0.26	Simulations using segmented regression stock recruit relationship	ICES (2015a)
Precautionary approach	B_{lim}	33000 t	B_{loss} = the lowest observed SSB (1980)	ICES (2015a)
	B_{pa}	54000 t	$B_{pa} = B_{lim} \times \exp(1.645 \times \sigma B)$, with $\sigma B = 0.30$ from assessment uncertainty (capped) in the terminal year.	ICES (2015c, 2016a)
	F_{lim}	0.61	Equilibrium F maintaining SSB > B_{lim} with 50% probability	ICES (2016a)
	F_{pa}	0.37	$F_{pa} = F_{lim} \times \exp(-1.645 \times \sigma F)$, where $\sigma F = 0.30$ from assessment uncertainty (capped) in the terminal year	ICES (2015c, 2016a)
Management plan	SSB_{mgt}	61000 t	Management plan proposed by the Pelagic Advisory Council (PAC)	ICES (2012)
	F_{mgt}	0.23	Simulations using segmented regression stock recruit relationship	ICES (2012)

Basis of the assessment

Table 6 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. Basis of assessment and advice.

ICES stock data category	1 (ICES, 2016c)
Assessment type	Age-based analytical assessment (ASAP; ICES, 2017a) that uses catches in the model and in the forecast.
Input data	Commercial catches (weights, ages and length frequencies from catch sampling); Acoustic survey index (CSHAS) (excluding 2014 and 2015); annual weights in the stock; fixed maturity ogive; natural mortality assumed constant.
Discards and bycatch	Included in the assessment
Indicators	None
Other information	Benchmarked in WKWEST (ICES, 2015c), updated with corrected natural mortalities by ICES (2015a). Assessed on a seasonal basis, 1 April–31 March, to allow for the inclusion of the spawning cycle in the assessment period. This is an autumn/winter spawning stock. Age is given in winter rings (wr), so for example: a 2-year-old fish is termed "1-winter ring".
Working group	Herring Assessment Working Group for the Area South of 62ºN (HAWG)

Information from stakeholders

The Celtic Sea Herring Management Advisory Committee (CSHMAC) is very concerned about the annual acoustic survey which forms part of the stock assessment. The CSHMAC considers that the survey has been producing unrealistic low abundance estimates in recent years. The catching sector noted in 2016 that similar to the previous two years fish have remained very tight on the bottom of the sea and are spread out over a large area, which presents challenges in terms of them being picked up by the acoustic survey.

History of the advice, catch, and management

Table 7 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. ICES advice and official landings. All weights are in tonnes.

Year	ICES advice	Predicted catch corresponding to advice	Agreed TAC	Official landings	Discards	ICES estimated catch^
1987	Precautionary TAC	18000	18000	18000	4200	27300
1988	TAC	13000	18000	17000	2400	19200
1989	TAC	20000	20000	18000	3500	22700
1990	TAC	15000	17500	17000	2500	20200
1991	TAC (TAC excluding discards)	15000 (12500)	21000	21000	1900	23600
1992	TAC	27000	21000	19000	2100	23000
1993	Precautionary TAC (including discards)	20000–24000	21000	20000	1900	21100
1994	Precautionary TAC (including discards)	20000–24000	21000	19000	1700	19100
1995	No specific advice		21000	18000	700	19100
1996	TAC	9800	16500–21000**	21000	3000	21800
1997	If required, precautionary TAC	< 25000	22000	20700	700	18800
1998	Catches below 25	< 25000	22000	20500	0	20300
1999	F = 0.4	19000	21000	19400	0	18100
2000	F< 0.3	20000	21000	18800	0	18300
2001	F< 0.34	17900	20000	19000	0	17700
2002	F< 0.35	11000	11000	11500	0	10600
2003	Substantially less than recent catches	-	13000	12000	0	10900
2004	60% of average catch 1997–2000	11000	13000	12000		11100
2005	60% of average catch 1997–2000	11000	13000	10000		8500
2006	Further reduction 60% avg. catch 2002–2004	6700	11000	9000		8500
2007	No fishing without rebuilding plan		9400	9600		8300
2008	No targeted fishing without rebuilding plan		7900	7800		6900
2009	No targeted fishing without rebuilding plan		5900	6200	***	5800
2010	F_{mgt} = 0.19	10150	10150	9600	***	8400
2011	See scenarios		13200	11700	***	11500
2012	MSY approach	< 26900	21100	21600	+	21600
2013	MSY approach	< 18500	17200	16200	+	16200
2014	MSY approach	< 35942	22300	18800	600	19600
2015	MSY approach	< 15140	*15700	17600	200	17800
2016	MSY approach	< 23164^^	*15400	16100	200	16300
2017	MSY approach	< 16145	*14500			
2018	MSY approach	≤5445				

*Initial TAC before carryover of unused quota from previous year.
** Revised in 1996 after the ACFM May meeting.
*** Increased risk of discarding.
+ Values of less than 0.5 tonnes.
^ By calendar year.
^^ Version 2: See also the ICES advice provided 15 September 2015 in response to an EU request. (http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/Special_Requests/EU_her-irls_update.pdf).

History of the catch and landings

Table 8 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. Catch distribution by fleet in 2016 as estimated by ICES.

Catch (2016)	Landings		Discards
16 318 tonnes	Pelagic trawlers 100%	Driftnets (negligible)	182 tonnes
	16 136 tonnes		

Table 9 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–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. All weights are in tonnes.

Year	France	Germany	Ireland	Netherlands	U.K.	Unallocated	Discards	Total
1988			16800				2400	19200
1989	+		16000	1900		1300	3500	22700
1990	+		15800	1000	200	700	2500	20200
1991	+	100	19400	1600		600	1900	23600
1992	500		18000	100	+	2300	2100	23000
1993			19000	1300	+	-1100	1900	21100
1994	+	200	17400	1300	+	-1500	1700	19100
1995	200	200	18000	100	+	-200	700	19000
1996	1000	0	18600	1000		-1800	3000	21800
1997	1300	0	18000	1400		-2600	700	18800
1998	+		19300	1200		-200	na	20300
1999		200	17900	1300	+	-1300	na	18100
2000	573	228	18038	44	1	-617	na	18267
2001	1359	219	17729			-1578	na	17729
2002	734		10550	257		-991	na	10550
2003	800		10875	692	14	-1506	na	10875
2004	801	41	11024			-801	na	11065
2005	821	150	8452	799		-1770	na	8452
2006			8530	518	5	-523	na	8530
2007	581	248	8268	463	63	-1355	na	8268
2008	503	191	6853	291		-985	na	6853
2009	364	135	5760			-499	na	5760
2010	636	278	8406	325		-1239	na	8406
2011	241		11503	7		-248	na	11503
2012	3	230	16132	3135		2104	161*	21765
2013		450	14785	832			118	16185
2014	244	578	17287	821			644	19574
2015		477	15798	1304	+		247	17825
2016		419	14584	1025	559	-451	182	16318

* Added in 2014 after report of 1% discarding.
\+ Designates catch of less than 0.5 tonnes.

Summary of the assessment

Table 10 Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k. Assessment summary. Weights are in tonnes and recruitment in thousands. High and Low refers to 95% confidence intervals.

Year ^	Recruitment at age (wr)	Low	High	SSB**	Low	High	Catch	F at ages Year (wr) 2-5 Year-1	Low	High
1958	416132	247582	584682	164767	110343	219191	22978	0.150	0.088	0.21
1959	1556490	1264460	1848520	166792	125070	208514	15086	0.126	0.080	0.171
1960	360855	252935	468775	164858	130269	199447	18283	0.136	0.098	0.173
1961	388774	291828	485720	141465	113428	169502	15372	0.125	0.093	0.156
1962	832844	682624	983064	141843	116330	167356	21552	0.20	0.151	0.25
1963	402677	308002	497352	133336	109858	156814	17349	0.159	0.120	0.20
1964	1373820	1168740	1578900	155841	133347	178335	10599	0.097	0.074	0.12
1965	418496	320641	516351	162655	140729	184581	19126	0.142	0.109	0.175
1966	737645	604215	871075	159801	139205	180397	27030	0.20	0.156	0.25
1967	771353	635683	907023	154947	135581	174313	27658	0.23	0.177	0.28
1968	903588	755978	1051198	159294	140204	178384	30236	0.25	0.192	0.30
1969	467116	367477	566755	139707	122291	157123	44389	0.37	0.291	0.44
1970	253033	179562	326504	105402	90678	120126	31727	0.33	0.26	0.41
1971	822709	685999	959419	96520.1	84146.1	108894.1	31396	0.46	0.35	0.56

Year ^	Recruitment at age (wr)	Low	High	SSB**	Low	High	Catch	F at ages Year (wr) 2-5 Year-1	Low	High
1972	281054	210732	351376	84564.1	73848.1	95280.1	38203	0.57	0.45	0.69
1973	325801	259312	392290	63401.1	55171.4	71630.8	26936	0.52	0.41	0.63
1974	162111	120893	203329	49201.7	42390.3	56013.1	19940	0.50	0.39	0.61
1975	203103	158480	247726	38958.6	33331.6	44585.6	15588	0.52	0.40	0.64
1976	226247	182437	270057	36255.7	31244.3	41267.1	9771	0.39	0.30	0.49
1977	185503	149118	221888	37006.6	31951.5	42061.7	7833	0.29	0.22	0.36
1978	147208	115887	178529	35919.9	30788.9	41050.9	7559	0.27	0.21	0.33
1979	280881	231854	329908	35947.4	30952.3	40942.5	10321	0.43	0.33	0.53
1980	167500	129516	205484	32988	28097.8	37878.2	13130	0.55	0.42	0.68
1981	464006	392847	535165	36292.9	31311.5	41274.3	17103	0.85	0.66	1.042
1982	721610	623029	820191	57056.5	50131.4	63981.6	13000	0.47	0.36	0.58
1983	781099	676839	885359	75684.1	67226.8	84141.4	24981	0.57	0.45	0.69
1984	662563	570040	755086	78063.5	69608.9	86518.1	26779	0.49	0.39	0.59
1985	637792	551854	723730	83967.1	75252	92682.2	20426	0.33	0.26	0.40
1986	648198	565525	730871	91661.3	82543.5	100779.1	25024	0.38	0.30	0.45
1987	1189280	1065190	1313370	103654	93956.7	113351.3	26200	0.40	0.32	0.48
1988	473219	408178	538260	107080	96605	117555	20447	0.24	0.190	0.29
1989	572427	497394	647460	94036.7	84708.6	103364.8	23254	0.30	0.23	0.35
1990	501415	431412	571418	87666.9	78541.2	96792.6	18404	0.25	0.20	0.31
1991	207514	166819	248209	69598.1	61790.3	77405.9	25562	0.39	0.31	0.47
1992	954574	845284	1063864	69382.8	62212	76553.6	21127	0.50	0.40	0.61
1993	358080	299623	416537	72004.9	64282.6	79727.2	18618	0.34	0.27	0.41
1994	762863	668312	857414	78742.2	70651.4	86833	19300	0.33	0.26	0.40
1995	714985	625103	804867	80166.9	72201.2	88132.6	23305	0.40	0.32	0.48
1996	349939	293826	406052	70750.2	63344	78156.4	18816	0.32	0.25	0.38
1997	368348	309977	426719	58228.3	51927.4	64529.2	20496	0.42	0.34	0.51
1998	244887	200047	289727	46259.5	40853.2	51665.8	18041	0.47	0.37	0.56
1999	467131	401702	532560	39744.7	35194.3	44295.1	18485	0.67	0.54	0.80
2000	449799	388161	511437	38858.1	34466.1	43250.1	17191	0.70	0.57	0.83
2001	451961	387790	516132	37397	32985.1	41808.9	15269	0.61	0.49	0.72
2002	490296	427177	553415	47722.9	42196.9	53248.9	7465	0.24	0.190	0.29
2003	143963	112999	174927	37602.3	32913.8	42290.8	11536	0.36	0.28	0.43
2004	359862	300406	419318	35015.4	30057.2	39973.6	12743	0.42	0.33	0.51
2005	1087700	919940	1255460	52586.1	44690.3	60481.9	9494	0.33	0.25	0.41
2006	370229	297952	442506	66860.9	56179.9	77541.9	6944	0.136	0.0100	0.172
2007	823782	676092	971472	72267.5	60231.5	84303.5	7636	0.128	0.094	0.162
2008	348151	269675	426627	89064.5	73798.5	104330.5	5872	0.074	0.054	0.094
2009	1274910	1057480	1492340	107503	89837	125169	5745	0.068	0.050	0.087
2010	1006760	822650	1190870	124130	104373	143887	8370	0.085	0.062	0.107
2011	1325620	1089400	1561840	141733	119301	164165	11470	0.104	0.076	0.131
2012	905675	718625	1092725	136910	113906	159914	21820	0.191	0.140	0.24
2013	494823	363613	626033	127485	103855	151115	16247	0.149	0.107	0.192
2014	357287	249807	464767	103650	81819	125481	19574	0.20	0.144	0.27
2015	132033	76246	187820	69979	52069	87889	18355	0.27	0.181	0.36
2016	263363	103103	423623	46048.2	30282.2	61814.2	16318	0.41	0.22	0.59
2017	496445***			37796*						

* From the short-term forecast

** The SSB is set at spawning time (1st October).

*** Stock-recruit relationship based on SSB_{2015} from the assessment output.

^ Assessment year (1st April – 31st March).

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