

## Herring (*Clupea harengus*) in Division 7.a North of 52°30'N (Irish Sea)

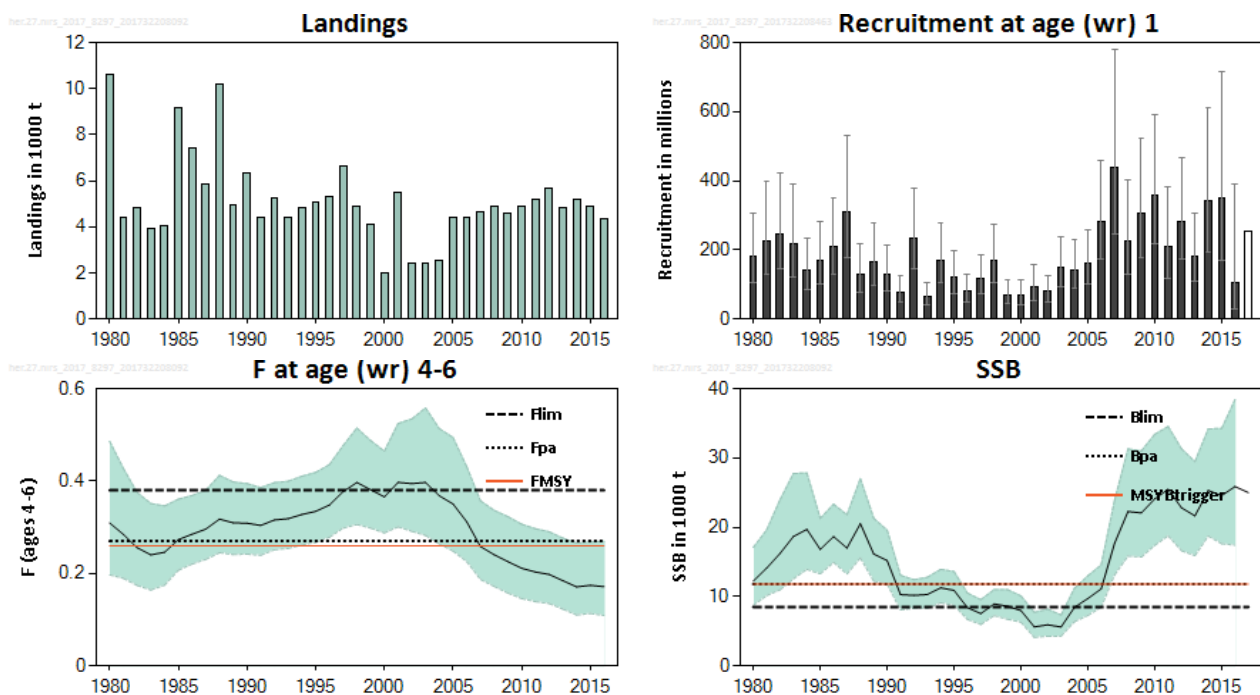
### ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2018 should be no more than 7016 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 above  $MSY B_{trigger}$  since 2007. Fishing mortality (F) has decreased since 2003 and has been below  $F_{MSY}$  since 2007. There has been stronger recruitment (R) since 2006, although the recruitment in 2016 is low.



**Figure 1** Herring in Division 7.a North of 52°30'N. Summary of the stock assessment. The assumed recruitment value is unshaded. The shaded areas on the F and SSB plots represent 95% confidence intervals.

### Stock and exploitation status

**Table 1** Herring in Division 7.a North of 52°30'N. State of the stock and fishery relative to reference points.

	Fishing pressure			Stock size			
		2014	2015	2016	2015	2016	2017
Maximum sustainable yield	$F_{MSY}$	✓	✓	✓ Below	$MSY B_{trigger}$	✓	✓ Above trigger
Precautionary approach	$F_{pa}, F_{lim}$	✓	✓	✓ Harvested sustainably	$B_{pa}, B_{lim}$	✓	✓ Full reproductive capacity
Management plan	$F_{MGT}$	—	—	— Not applicable	$B_{MGT}$	—	— Not applicable

## Catch options

**Table 2** Herring in Division 7.a North of 52°30'N. The basis for the catch options.

Variable	Value	Source	Notes
$F_{\text{ages (wr) 4-6}}$ (2017)	0.155	ICES (2017a)	Catch constraint (TAC in 2017)
SSB (2017)	24998	ICES (2017a)	Fishing at $F=0.155$ . In tonnes.
$R_{\text{age (wr) 1}}$ (2017/2018)	252 045	ICES (2017a)	Geometric mean over 2005–2014. In thousands
Total catch (2017)	4127	ICES (2017a)	TAC 2017. In tonnes.

**Table 3** Herring in Division 7.a North of 52°30'N. Annual catch options. All weights are in tonnes.

Basis	Total catch (2018)	$F_{\text{total}}$ (2018)	SSB (2018)*	% SSB change **	SSB (2019)	% TAC change ***
ICES advice basis						
MSY approach: $F_{\text{MSY}}$	7016	0.266	22777	-8.9	21767	70
Other options						
$F = 0$	0	0	28002	12	31695	-100
$F_{\text{pa}}$	7486	0.286	22428	-10	21171	81
$F_{\text{lim}}$	9960	0.397	20591	-18	18171	141
SSB (2018) = $B_{\text{lim}}$	26660	1.582	8500	-66	11236	546
SSB (2018) = $B_{\text{pa}}$	21927	1.131	11831	-53	14047	431
SSB (2018) = MSY $B_{\text{trigger}}$	21927	1.131	11831	-53	14047	431

\* For autumn-spawning stocks, the SSB is determined at spawning time and is influenced by fisheries between 1 January and spawning (set for September).

\*\* SSB 2018 relative to SSB 2017.

\*\*\* Catch 2018 relative to TAC 2017 (4127t).

## Basis of the advice

**Table 4** Herring in Division 7.a North of 52°30'N. The basis of the advice.

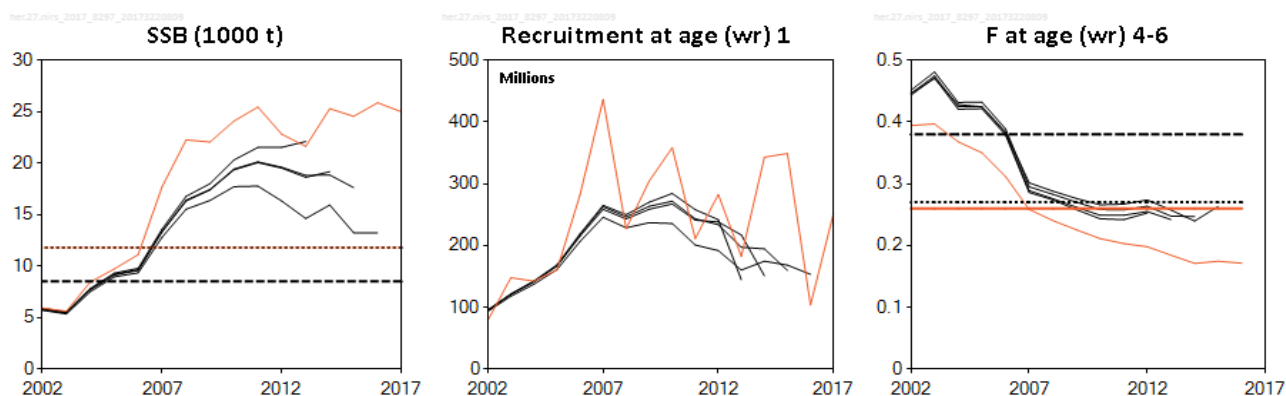
Advice basis	MSY approach
Management plan	ICES is not aware of any agreed precautionary management plan for herring in this area.

## Quality of the assessment

The stock was benchmarked in 2017. A new acoustic survey was included as input to the model. Recruitment assumptions in the assessment were changed, which resulted in higher interannual variability. The new assessment resulted in a revised perception of the stock, with significant upwards revisions of the SSB and recruitment and a downward revision of fishing mortality.

The interannual variation in herring migration patterns affects the quality of the assessment. The timing of the acoustic survey is occasionally mismatched with the migration pattern of the spawning-stock into the Irish Sea from the Malin Shelf.

The assessment is performed on a mixed stock (including juveniles from the Celtic Sea), which affects the estimates of the younger ages. Both the catches and acoustic survey indices contain an unknown amount of fish from other stocks. Due to the presence of herring from other stocks, the assessment may overestimate the Irish Sea stock.



**Figure 2** Herring in Division 7.a North of 52°30'N. Historical assessment results. The stock was benchmarked in 2017.

### Issues relevant for the advice

Management of this stock should be considered as part of a metapopulation. The consequence of this needs to be further evaluated for management and advice.

There has been an increase in marine anthropogenic activity, especially in the area of marine renewables. Construction and development of, for example wind farms, results in disturbance to the seabed. Any activities that have a negative impact on the spawning habitat of herring, such as extraction of marine aggregates (e.g. gravel and sand) and construction in the vicinity of spawning grounds require consideration (see for example, Groot, 1979, 1996; ICES, 2003, 2015). This is because a gravel substratum is an essential habitat for herring spawning.

### Reference points

**Table 5** Herring in Division 7.a North of 52°30'N. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	11831 t	Equal to $B_{pa}$	ICES (2017b)
	$F_{MSY}$	0.266	$F_{p0.5}$ based on stochastic simulations	ICES (2017b)
Precautionary approach	$B_{lim}$	8500 t	Highest SSB producing above average recruitment below highest value	ICES (2017b)
	$B_{pa}$	11831 t	$B_{pa} = B_{lim} \times \exp(1.645 \times \sigma)$ with $\sigma \approx 0.201$ , based on the average CV from the terminal assessment year	ICES (2017b)
	$F_{lim}$	0.397	Equilibrium F maintaining SSB > $B_{lim}$ with 50% probability	ICES (2017b)
	$F_{pa}$	0.286	$F_{pa} = F_{lim} \times \exp(-1.645 \times \sigma)$ with $\sigma \approx 0.231$ , based on the average CV from the terminal assessment year	ICES (2017b)
Management plan	SSB <sub>mgt</sub>	Not applicable		
	$F_{mgt}$	Not applicable		

### Basis of the assessment

**Table 6** Herring in Division 7.a North of 52°30'N. Basis of assessment and advice.

ICES stock data category	1 (ICES, 2016b)
Assessment type	Age-based analytical assessment (FLSAM; ICES, 2017a) that uses catches in the model and in the forecast
Input data	Two survey indices (Northern Ireland Acoustic Surveys: AC (Division 7.a North)) and SSB acoustic survey included as an absolute index); commercial catch-at-age data and annual maturity ogives, annual stock weights from AC(Division 7.a North).
Discards and bycatch	Discards are considered to be negligible.
Indicators	None
Other information	Benchmarked in WKIRISH3 and HAWG (ICES, 2017a, 2017b). 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 62°N (HAWG)

### Information from stakeholders

There is no additional available information.

### History of the advice, catch, and management

**Table 7** Herring in Division 7.a North of 52°30'N. ICES advice and official landings. All weights are in tonnes.

Year	ICES advice	Predicted catch corresponding to advice	Agreed TAC	ICES estimated catch
1987	TAC	4300	4500	5823
1988	TAC (Revised advice in 1988)	10500 (5600)	10500	10172
1989	TAC	5500	6000	4962
1990	Precautionary TAC	5700	7000	6312
1991	TAC	5600	6000	4398
1992	TAC	6600	7000	5270
1993	TAC	4900–7400	7000	4408
1994	Precautionary TAC	5300	7000	4828
1995	Precautionary TAC	5100	7000	5076
1996	If required, precautionary TAC	5000	7000	5302
1997	No advice given	-	9000	6651
1998	<i>Status quo</i> F	6500	9000	4905
1999	F = Proposed $F_{pa} = 0.36$	4900	6600	4127
2000	F = 90% F(98) = 0.31	3900	5400	2002
2001	<i>Status quo</i> F = 0.26	5100	6900	5461
2002	Average catch of 1996–2000	4800	4800	2393
2003	2002 TAC	4800	4800	2399
2004	Advice 2003 catch	4800	4800	2531
2005	<i>Status quo</i> TAC	4800	4800	4387
2006	<i>Status quo</i> TAC	4800	4800	4402
2007	<i>Status quo</i> TAC	4800	4800	4629
2008	Recent catches	4400	4800	4895
2009	Same advice as last year	4400	4800	4594
2010	Recent TAC	4800	4800	4894
2011	No increase in catch	< 4800	5200	5202
2012	No increase in catch	-	5280	5693
2013	MSY approach	< 5100	4993	4828
2014	MSY approach	< 5251	5251	5208
2015	MSY approach	< 4854	4854	4891
2016	MSY approach	≤ 4575	4575	4327
2017	MSY approach	≤ 4127	4127	
2018	MSY approach	≤ 7016		

### History of the catch and landings

**Table 8** Herring in Division 7.a North of 52°30'N. Catch distribution by fleet in 2016 as estimated by ICES.

Catch (2016)	Landings		Discards
	4327 tonnes	98% pelagic trawlers	
	4327 tonnes		negligible

**Table 9** Herring in Division 7.a North of 52°30'N. History of commercial catch and landings; ICES estimated values presented for each country participating in the fishery. All weights are in tonnes.

Year	Country		Total
	Ireland	UK	
1987	1200	3290	7156
1988	2579	7593	10172
1989	1430	3532	4962
1990	1699	4613	6312
1991	80	4318	4398
1992	406	4864	5270
1993	0	4408	4408
1994	0	4828	4828
1995	0	5076	5076
1996	100	5180	5324
1997	0	6651	6651
1998	0	4905	4905
1999	0	4127	4127
2000	0	2002	2002
2001	862	4599	5461
2002	286	2107	2393
2003	0	2399	2399
2004	749	1782	2531
2005	1153	3234	4387
2006	581	3821	4402
2007	0	4629	4629
2008	0	4895	4895
2009	0	4594	4594
2010	0	4894	4894
2011	0	5202	5202
2012	18	5675	5693
2013	0	4828	4828
2014	119	5089	5208
2015	0	4868	4913
2016*	82	4245	4327

\*preliminary

**Summary of the assessment**

**Table 10** Herring in Division 7.a North of 52°30'N. Assessment summary. Weights are in tonnes. Recruitment is in thousands. Highs and lows refer to 95% confidence intervals.

Year	Recruitment at age (wr) 1	High	Low	SSB	High	Low	Landings	F at age (wr) 4–6	High	Low
1980	179872	304372	106297	12220	17085	8740	10613	0.31	0.49	0.197
1981	225709	398717	127771	14108	19623	10143	4377	0.29	0.43	0.190
1982	246718	424067	143538	16228	23985	10980	4855	0.26	0.38	0.174
1983	218600	390506	122370	18670	27758	12558	3933	0.24	0.35	0.164
1984	140225	233435	84233	19697	27844	13933	4066	0.25	0.35	0.175
1985	167544	281286	99795	16808	21281	13275	9187	0.27	0.36	0.21
1986	211082	349935	127325	18654	23320	14921	7440	0.29	0.37	0.22
1987	308353	530953	179077	16995	21794	13253	5823	0.30	0.38	0.23
1988	127644	217000	75083	20513	27016	15575	10172	0.32	0.41	0.25
1989	165545	277397	98794	16133	21292	12223	4949	0.31	0.40	0.24
1990	130614	214099	79683	15204	19584	11803	6312	0.31	0.39	0.24
1991	76573	125239	46818	10281	13067	8090	4398	0.30	0.39	0.24
1992	233281	378638	143726	10171	12435	8319	5270	0.32	0.40	0.25
1993	64408	103149	40218	10300	12773	8306	4409	0.32	0.40	0.25
1994	170587	277950	104695	11268	13928	9115	4828	0.33	0.41	0.26
1995	120692	195608	74469	10899	13608	8729	5076	0.33	0.42	0.27
1996	80178	128900	49872	8398	10512	6709	5301	0.35	0.44	0.28
1997	117360	184971	74462	7551	9554	5968	6651	0.38	0.48	0.30
1998	170416	272844	106441	8937	11010	7254	4905	0.40	0.52	0.31
1999	69148	111148	43019	8602	10993	6731	4127	0.38	0.49	0.30
2000	67914	113380	40680	7980	10091	6311	2002	0.37	0.47	0.29
2001	91583	157197	53356	5634	7724	4109	5461	0.40	0.52	0.30
2002	78826	126061	49290	5923	8185	4286	2393	0.39	0.53	0.29
2003	147709	235910	92484	5611	7340	4289	2399	0.40	0.56	0.28
2004	142344	229836	88157	8452	11182	6389	2531	0.37	0.51	0.26
2005	160492	258957	99467	9721	13000	7269	4387	0.35	0.49	0.25
2006	282095	456318	174391	11118	14575	8481	4402	0.31	0.43	0.23
2007	436699	781402	244056	17716	23902	13130	4629	0.26	0.36	0.187
2008	227294	402424	128379	22270	31293	15849	4895	0.24	0.34	0.172
2009	304370	520788	177887	22071	31017	15705	4594	0.23	0.32	0.158
2010	358613	590197	217899	24101	33414	17383	4894	0.21	0.31	0.146
2011	211293	383214	116500	25463	34531	18777	5202	0.20	0.30	0.139
2012	282660	466464	171281	22811	31310	16619	5693	0.20	0.29	0.135
2013	182225	304075	109204	21647	29472	15899	4828	0.180	0.28	0.123
2014	343176	612880	192158	25311	34191	18737	5202	0.170	0.27	0.110
2015	349060	714040	170639	24563	34241	17621	4891	0.174	0.27	0.114
2016	103777	388680	27708	25874	38414	17428	4327	0.171	0.27	0.109
2017	252045*			24998**						

\* Geometric mean recruitment 2005–2014 and SSB from assessment model.

\*\* For autumn-spawning stocks, the SSB is determined at spawning time and is influenced by fisheries between 1 January and spawning (September).

## Sources and references

- Groot, S. J. de. 1979. The potential environmental impact of marine gravel extraction in the North Sea. *Ocean Management*, 5: 233–249.
- Groot, S. J. de. 1996. The physical impact of marine aggregate extraction in the North Sea. *ICES Journal of Marine Science*, 53: 1051–1053.
- ICES. 1998. Report of the Herring Assessment Working Group for the Area South of 62°N, 10–19 March 2015. ICES CM 2015/ACFM:14. 388 pp.
- ICES. 2000. Report of the Herring Assessment Working Group for the area south of 62°N. ICES CM 2000/ACFM:10.
- ICES. 2003. Report of the Working Group on Fish Ecology (WGFE). ICES CM 2003/G:04; 113 pp.
- ICES. 2010. Report of the Herring Assessment Working Group for the Area South of 62°N (HAWG), 15–23 March 2010, ICES Headquarters, Copenhagen, Denmark. 688 pp.
- ICES. 2012. Report of the Benchmark Workshop on Pelagic Stocks (WKPELA 2012), 13–17 February 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:47. 572 pp.
- ICES. 2015. Second Interim Report of the Working Group on Maritime Systems (WGMARS), 2–5 December 2014, ICES HQ, Copenhagen, Denmark. ICES CM 2014/SSGSUE:08. 35 pp.
- ICES. 2016a. Report of the Herring Assessment Working Group for the Area South of 62°N (HAWG) 29 March–7 April 2016. ICES CM 2016/ACOM:07.
- ICES. 2016b. Advice basis. *In* Report of the ICES Advisory Committee, 2016. ICES Advice 2016, Book 1, Section 1.2.
- ICES 2017a. Benchmark Workshop on sharing information on the Irish Sea Ecosystem, stock assessments, and fisheries issues, and scoping needs for assessment and management advice (WKIRISH3), 30 January -3 February 2017. Galway, Ireland. ICES CM 2017/BSG:01.
- ICES. 2017b. Report of the Herring Assessment Working Group for the Area South of 62°N (HAWG) 16-22 March 2017. ICES CM 2017/ACOM:07.