

9.3.33 Herring (*Clupea harengus*) in subareas 1, 2, and 5, and in divisions 4.a and 14.a, Norwegian spring-spawning herring (Northeast Atlantic)

ICES stock advice

Please note: an error has been found in this assessment and, therefore, the advice in this document is not valid. The corrected advice for 2017 can be found [here](#) (ICES, 2017).*

ICES advises that when the EU, Faroe Islands, Iceland, Norway, and Russia management plan is applied, catches in 2017 should be no more than 646 075 tonnes.

Stock development over time

The stock is declining and estimated to be close to $MSY B_{trigger}$ in 2016. Since 1998 four large year classes have been produced (1998, 1999, 2002, and 2004). Year classes 2005–2012 are estimated to be small. The estimates of the year classes coming after the 2012 year class are uncertain. Fishing mortality in 2015 was well below F_{MSY} .

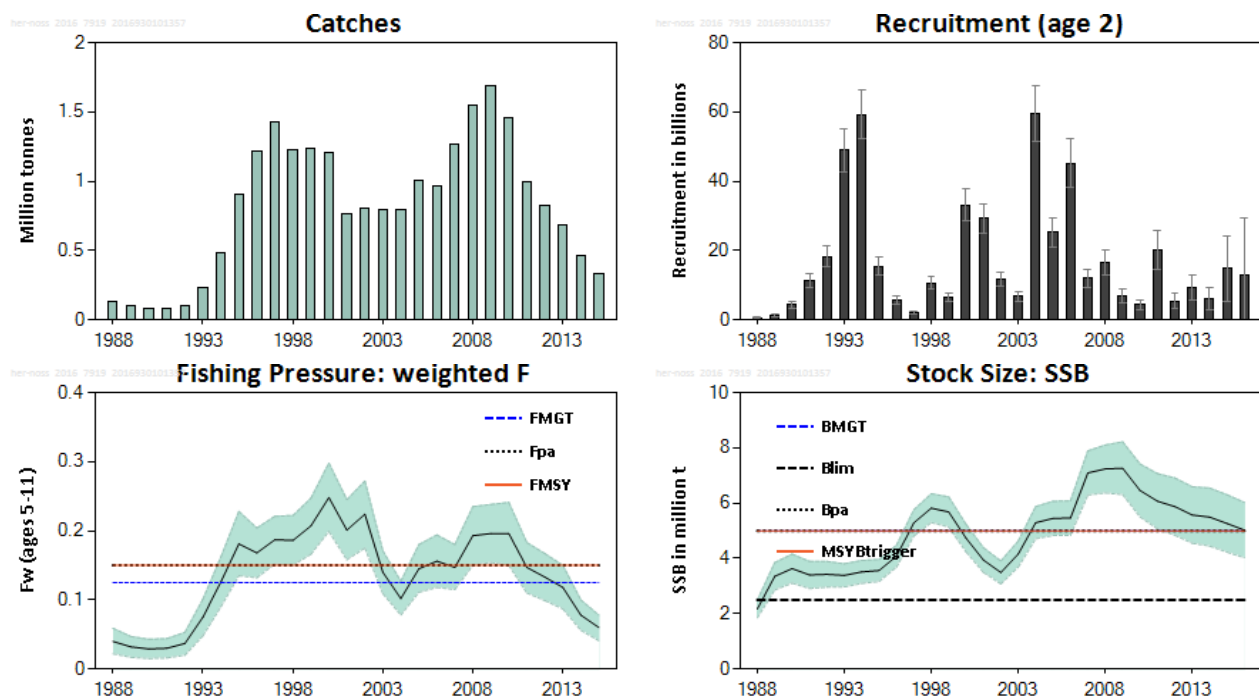


Figure 9.3.33.1 Herring in subareas 1, 2, and 5, and in divisions 4.a and 14.a (Norwegian spring-spawning herring). Summary of stock assessment. Confidence intervals (95%) are included in the recruitment, fishing mortality, and spawning stock biomass plots. F_w is the fishing mortality weighted by the population numbers.

Stock and exploitation status

Table 9.3.33.1 Herring in subareas 1, 2, and 5, and in divisions 4.a and 14.a (Norwegian spring-spawning herring). State of the stock and fishery relative to reference points.

Fishing pressure			Stock size		
2013	2014	2015	2014	2015	2016

* Version 2: Paragraph inserted.

Maximum sustainable yield	F_{MSY}	✓	✓	✓	Appropriate	MSY	✓	✓	✓	At trigger
Precautionary approach	F_{pa}	✓	✓	✓	Harvested sustainably	B_{pa}, B_{lim}	✓	✓	✓	Full reproductive capacity
Management plan	F_{MGT}	✓	✓	✓	Appropriate	SSB_{MGT}	✓	✓	✓	At trigger

Catch options

Table 9.3.33.2 Herring in subareas 1, 2, and 5, and in divisions 4.a and 14.a (Norwegian spring-spawning herring). The basis for the catch options.

Variable	Value	Source	Notes
F ages 5–11 (2016)	0.063	ICES (2016a)	Based on ICES estimated catches 2016.
SSB (2017)	4974000 t	ICES (2016a)	
R_{age2} (2016)	13.015 billion	ICES (2016a)	Estimated by XSAM.
R_{age2} (2017)	12.034 billion	ICES (2016a)	Median of stochastic recruitment estimated by XSAM based on years 1988-2016.
Catch (2016)	376612 t	ICES (2016a)	Sum of declared national quotas.

Table 9.3.33.3 Herring in subareas 1, 2, and 5, and in divisions 4.a and 14.a (Norwegian spring-spawning herring). The catch options. Weights in tonnes.

Rationale	Catches (2017)	Basis	$F_w(2017)^*$	SSB(2018)	% SSB change**	% Catch change***
Agreed management plan	646075	Harvest control rule^	0.124	4898000	-2	72
Other options	766676	ICES MSY approach: $F_{MSY} * SSB(2017) / MSY B_{trigger}$	0.149	4794000	-4	104
	0	$F = 0$	0	5459000	10	-100
	339833	F_{2016}	0.063	5163000	4	-10
	770384	$F_{MSY} (= F_{pa})$	0.150	4791000	-4	105
	528271	$SSB_{2018} = B_{pa} (= MSY B_{trigger})$	0.100	5000000	1	40
	3493537	$SSB_{2018} = B_{lim}$	0.978	2500000	-50	828

* F_w = Fishing mortality weighted by population numbers (age groups 5–11).

** SSB 2018 relative to SSB 2017.

*** Catches 2017 relative to estimated catch 2016.

^ According to the harvest control rule in the management plan $F(2017) = 0.125 * (SSB(2017) - B_{lim}) / (B_{pa} - B_{lim}) + 0.05 * (B_{pa} - SSB(2017)) / (B_{pa} - B_{lim})$, where $B_{pa}=5$, $B_{lim}=2.5$ and $SSB(2017)=4.974$, expressed in million t.

Basis of the advice

Table 9.3.33.4 Herring in subareas 1, 2, and 5, and in divisions 4.a and 14.a (Norwegian spring-spawning herring). The basis of the advice.

Advice basis	Management plan.
Management plan	A long-term management plan was agreed by the EU, Faroe Islands, Iceland, Norway, and Russia in 1999 (see Annex 9.3.11.1 in ICES, 2014). ICES has evaluated the plan and concluded that it is consistent with the precautionary approach (ICES, 2013a).

Quality of the assessment

The new assessment model XSAM is considered to improve the quality of the assessment as it accounts for error structure in the input data and provides results with estimates of uncertainty.

The perception of the stock has changed since last year’s assessment (estimated SSB in 2015 is 33% higher in this year’s assessment) mainly because of the high abundance indices from the spawning ground surveys in 2015 and 2016. A revision of the age-at-maturity data in this year’s assessment (following WKPELA 2016; ICES, 2016b) resulted in changes in SSB estimates

for the period 2006–2011. The current assessment shows a slower rate of decline in recent years compared to last year’s assessment.

The stock estimates for recent years from exploratory runs with other models are within the confidence intervals of the current assessment.



Figure 9.3.33.2 Herring in subareas 1, 2, and 5, and in divisions 4.a and 14.a (Norwegian spring-spawning herring). Historical assessment results (final-year recruitment estimates included). Prior to the 2016 assessment, estimates of F refer to ages 5–14. Recruitment estimates from assessments conducted before 2016 are not shown as they refer to age 0 instead of age 2.

Issues relevant for the advice

The catch advice for 2017 is considerably higher than for 2016 (104% increase), whereas the estimated SSB at the beginning of the TAC year is 39% higher in the current assessment when compared to last year’s assessment. The increase in the catch advice is caused by (1) the upward revision of the stock size (see under Quality of the assessment), and (2) the management plan F being sensitive to the SSB estimate because of the linear reduction in fishing mortality when SSB is estimated to be below the management plan trigger SSB_{MGT} of 5 million t. In last year’s assessment $SSB(2016)$ was estimated to be 28% below SSB_{MGT} . Last year, the application of the management plan resulted in an advised F of 0.083. The current assessment estimates the $SSB(2017)$ to be 1% below the management plan trigger SSB_{MGT} , resulting in an advised F of 0.124.

The F in the management plan and reference points refers to ages 5–14, whereas the F from the current assessment is for ages 5–11. Whereas the impact of this change is expected to be relatively minor, a complete exploration will take place as part of a planned review of the management plan and reference points.

Reference points

Table 9.3.33.5 Herring in subareas 1, 2, and 5, and in divisions 4.a and 14.a (Norwegian spring-spawning herring). Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	$MSY B_{trigger}$	5.0 million t	B_{pa}	
	F_{MSY}	0.15	Stochastic equilibrium analysis using a Beverton–Holt stock–recruitment relationship with data from 1950 to 2009.	ICES (2013b)
Precautionary approach	B_{lim}	2.5 million t	MBAL (accepted in 1998).	ICES (2013b)
	B_{pa}	5.0 million t	$B_{lim} \times \exp(0.4 \times 1.645)$.	ICES (2013b)
	F_{lim}	Not defined.	-	
	F_{pa}	0.15	Based on medium-term simulations.	ICES (2013b)
Management strategy	SSB_{MGT}	5.0 million t	Medium-term simulations conducted in 2001 and 2014.	ICES (2014)
	F_{MGT}	0.125	Medium-term simulations conducted in 2001 and 2014.	ICES (2014)

Basis of the assessment

Table 9.3.33.6 Herring in subareas 1, 2, and 5, and in divisions 4.a and 14.a (Norwegian spring-spawning herring). The basis of the assessment.

ICES stock data category	Category 1 (ICES, 2016c)
Assessment type	Statistical assessment model (XSAM; ICES, 2016a, 2016b) that uses catches in the model and in the forecast and also includes error structures in catches and abundance indices.
Input data	Assessment period 1988–2016: Commercial catches-at-age (stock weight-at-age from surveys and since 2009 from catch sampling). Three survey indices: Norwegian acoustic survey on spawning grounds in February/March (NASF, 1994–2005, 2015–2016); International Ecosystem Survey in the Nordic Seas (IESNS) covering the adult stock in the Nordic seas (1996–2016) and the juvenile stock in the Barents Sea (1991–2016). Maturity ogive variable by year-class strength. Natural mortalities are fixed values from historical analyses (age 2 = 0.9, ages greater than 3 = 0.15).
Discards and bycatch	Not included, considered negligible.
Indicators	None
Other information	This stock was benchmarked in 2016 (ICES, 2016b). A re-evaluation of reference points and the current management plan is scheduled for the autumn of 2016.
Working group	Working Group on Widely Distributed Stocks (WGWIDE)

Information from stakeholders

Over the last year the EU pelagic industry has conducted its fishery on the traditional fishing grounds. No changes in distribution have been observed. The fishery has been characterized by large shoals in both the January fishery and in the autumn season. Several year classes have been observed in catches.

History of advice, catch, and management

Table 9.3.33.7 Herring in subareas 1, 2, and 5, and in divisions 4.a and 14.a (Norwegian spring-spawning herring). History of ICES advice, the agreed TAC, and ICES estimates of catch. Weights in thousand tonnes.

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	ICES catch
1987	TAC	150	115	127
1988	TAC	120–150	120	135
1989	TAC	100	100	104
1990	TAC	80	80	86
1991	No fishing from a biological point of view	0	76	85
1992	No fishing from a biological point of view	0	98	104
1993	No increase in F	119	200	232
1994	Gradual increase in F towards $F_{0.1}$; TAC suggested	334	450	479
1995	No increase in F	513	900*	906
1996	Keep SSB above 2.5 million t	-	1425*	1220
1997	Keep SSB above 2.5 million t	-	1500	1427
1998	Do not exceed the harvest control rule	-	1300	1223
1999	Do not exceed the harvest control rule	1263	1300	1235
2000	Do not exceed the harvest control rule	Max 1500	1250	1207
2001	Do not exceed the harvest control rule	753	850	766
2002	Do not exceed the harvest control rule	853	850	808
2003	Do not exceed the harvest control rule	710	711*	790
2004	Do not exceed the harvest control rule	825	825*	794
2005	Do not exceed the harvest control rule	890	1000*	1003
2006	Do not exceed the harvest control rule	732	967*	969
2007	Do not exceed the harvest control rule	1280	1280	1267
2008	Do not exceed the harvest control rule	1518	1518	1546
2009	Do not exceed the harvest control rule	1643	1642	1687
2010	Do not exceed the harvest control rule	1483	1483	1457

2011	See scenarios	988–1170	988	993
2012	Follow the management plan	833	833	826
2013	Follow the management plan	619	692*	685
2014	Follow the management plan	418	436*	461
2015	Follow the management plan	283	328*	329
2016	Follow the management plan	≤ 316.876	377*	
2017	Follow the management plan	≤ 646.075		

* There was no agreement on the TAC; the number is the sum of autonomous quotas from the individual Parties.

History of catch and landings

Table 9.3.33.8 Herring in subareas 1, 2, and 5, and in divisions 4.a and 14.a (Norwegian spring-spawning herring). Catch distribution by fleet in 2015 as estimated by ICES.

Total catch (2015)	Landings		Discards
328 740 t	51% purse seine	49% pelagic trawl	Discarding is considered to be negligible, but some slippage is known to occur.
	328 740 t		

Table 9.3.33.9 Herring in subareas 1, 2, and 5, and in divisions 4.a and 14.a (Norwegian spring-spawning herring). History of the catch. ICES estimated values are presented by country.

Year	Norway	USSR/ Russia	Denmark	Faroes	Iceland	Ireland	Nether- lands	Green- land	UK (Scotland)	Germany	France	Poland	Sweden	Total
1986	199256	26000	-	-	-	-	-	-	-	-	-	-	-	225256
1987	108417	18889	-	-	-	-	-	-	-	-	-	-	-	127306
1988	115076	20225	-	-	-	-	-	-	-	-	-	-	-	135301
1989	88707	15123	-	-	-	-	-	-	-	-	-	-	-	103830
1990	74604	11807	-	-	-	-	-	-	-	-	-	-	-	86411
1991	73683	11000	-	-	-	-	-	-	-	-	-	-	-	84683
1992	91111	13337	-	-	-	-	-	-	-	-	-	-	-	104448
1993	199771	32645	-	-	-	-	-	-	-	-	-	-	-	232457
1994	380771	74400	-	2911	21146	-	-	-	-	-	-	-	-	479228
1995	529838	101987	30577	57084	174109	-	7969	2500	881	556	-	-	-	905501
1996	699161	119290	60681	52788	164957	19541	19664	-	46131	11978	-	-	22424	1220283
1997	860963	168900	44292	59987	220154	11179	8694	-	25149	6190	1500	-	19499	1426507
1998	743925	124049	35519	68136	197789	2437	12827	-	15971	7003	605	-	14863	1223131
1999	740640	157328	37010	55527	203381	2412	5871	-	19207	-	-	-	14057	1235433
2000	713500	163261	34968	68625	186035	8939	-	-	14096	3298	-	-	14749	1207201
2001	495036	109054	24038	34170	77693	6070	6439	-	12230	1588	-	-	9818	766136
2002	487233	113763	18998	32302	127197	1699	9392	-	3482	3017	-	1226	9486	807795
2003	477573	122846	14144	27943	117910	1400	8678	-	9214	3371	-	-	6431	789510
2004	477076	115876	23111	42771	102787	11	17369	-	1869	4810	400	-	7986	794066
2005	580804	132099	28368	65071	156467	-	21517	-	-	17676	0	561	680	1003243
2006*	567237	120836	18449	63137	157474	4693	11625	-	12523	9958	80	-	2946	968958
2007	779089	162434	22911	64251	173621	6411	29764	4897	13244	6038	0	4333	0	1266993
2008	961603	193119	31128	74261	217602	7903	28155	3810	19737	8338	0	0	0	1545656
2009	101667	210105	32320	85098	265479	10014	24021	3730	25477	14452	0	0	0	1687371
2010	871113	199472	26792	80281	205864	8061	26695	3453	24151	11133	0	0	0	1457015
2011	572641	144428	26740	53271	151074	5727	8348	3426	14045	13296	0	0	0	992997
2012	491005	118595	21754	36190	120956	4813	6237	1490	12310	11945	0	0	705	826000
2013	359458	78521	17160	10503	90729	3815	5626	11788	8342	4244	0	0	23	684743
2014	263253	60292	12513	38529	58828	706	9175	13108	4233	669	0	0	0	461306
2015	176321	45853	9105	33031	42625	1400	5255	12434	55	2660	0	0	0	328740

* In 2006 Scotland and Northern Ireland combined.

Summary of the assessment

Table 9.3.33.10 Herring in subareas 1, 2, and 5, and in divisions 4.a and 14.a (Norwegian spring-spawning herring). Assessment summary; weights in tonnes and recruitment in thousands. High and low are 97.5 and 2.5 percentiles, respectively.

Year	Recruitment age 2 (thousands)	High	Low	Stock size: SSB (tonnes)	High	Low	Catches (tonnes)	Fishing pressure: F_w (5–11)	High	Low
1988	642000	931000	353000	2168000	2488000	1849000	135301	0.04	0.059	0.022
1989	1159000	1620000	698000	3352000	3847000	2858000	103830	0.032	0.047	0.017
1990	4290000	5365000	3216000	3631000	4156000	3107000	86411	0.029	0.043	0.015
1991	11374000	13483000	9266000	3401000	3891000	2912000	84683	0.03	0.044	0.016
1992	18302000	21301000	15304000	3425000	3892000	2958000	104448	0.037	0.053	0.02
1993	48971000	55207000	42735000	3388000	3806000	2969000	232457	0.075	0.101	0.048
1994	59085000	66113000	52058000	3511000	3927000	3096000	479228	0.126	0.162	0.09
1995	15409000	17980000	12837000	3561000	3959000	3164000	905501	0.181	0.228	0.135
1996	5587000	6766000	4409000	4082000	4479000	3685000	1220283	0.168	0.204	0.132
1997	2064000	2620000	1508000	5287000	5761000	4813000	1426507	0.187	0.221	0.152
1998	10605000	12519000	8692000	5818000	6340000	5296000	1223131	0.186	0.222	0.15
1999	6409000	7712000	5105000	5681000	6226000	5137000	1235433	0.207	0.247	0.166
2000	33151000	37771000	28530000	4733000	5231000	4236000	1207201	0.248	0.298	0.199
2001	29265000	33530000	25001000	3940000	4386000	3494000	766136	0.201	0.245	0.158
2002	11709000	13870000	9547000	3491000	3907000	3076000	807795	0.224	0.272	0.175
2003	6779000	8204000	5355000	4157000	4629000	3686000	789510	0.14	0.171	0.109
2004	59565000	67485000	51644000	5292000	5875000	4709000	794066	0.102	0.127	0.078
2005	25164000	29333000	20995000	5447000	6066000	4828000	1003243	0.145	0.18	0.111
2006	45195000	52304000	38086000	5461000	6085000	4837000	968958	0.156	0.194	0.118
2007	11958000	14459000	9456000	7092000	7890000	6294000	1266993	0.147	0.18	0.115
2008	16558000	20080000	13036000	7235000	8101000	6368000	1545656	0.193	0.235	0.15
2009	6847000	8706000	4988000	7263000	8218000	6307000	1687373	0.196	0.238	0.154
2010	4389000	5796000	2982000	6458000	7416000	5501000	1457014	0.196	0.241	0.15
2011	20181000	25726000	14635000	6068000	7067000	5070000	992998	0.147	0.183	0.11
2012	5419000	7484000	3353000	5874000	6910000	4838000	825999	0.133	0.167	0.099
2013	9185000	12853000	5517000	5571000	6591000	4550000	684743	0.118	0.15	0.087
2014	5967000	9209000	2724000	5496000	6545000	4447000	461306	0.078	0.1	0.056
2015	14748000	24120000	5376000	5264000	6302000	4227000	328740	0.06	0.078	0.041
2016	13015000*	29483000	0**	5023000	6024000	4023000				
Average	17344552	21104483	13703655	4867931	5517759	4218448	815177	0.135	0.167	0.103

*Estimated by XSAM.

**Approximately lower 2.5 percentiles.

Sources and references

ICES. 2013a. NEAFC request to ICES to evaluate possible modifications of the long-term management arrangement for the Norwegian spring-spawning herring stock. *In* Report of ICES Advisory Committee, 2013. ICES Advice 2013, Book 9, Section 9.3.3.2.

ICES. 2013b. Report of the Blue Whiting/Norwegian Spring-Spawning (Atlanto-Scandian) Herring Workshop (WKBWNSSH), 11–13 March 2013, Bergen, Norway. ICES CM 2013/ACOM:69. 88 pp.

ICES. 2014. Herring in Subareas I, II, V and Divisions IVa and XIVa (Norwegian spring-spawning herring). *In* Report of the ICES Advisory Committee, 2014. ICES Advice 2014, Book 9, Section 9.3.11.

ICES. 2016a. Report of the Working Group on Widely Distributed Stocks (WGWIDE), 31 August–6 September 2016, ICES HQ, Copenhagen, Denmark. ICES CM 2016/ACOM:16.

ICES. 2016b. Report of the Benchmark Workshop on Pelagic stocks (WKPELA), 29 February–4 March 2016, ICES Headquarters, Copenhagen, Denmark. ICES CM 2016/ACOM:34. 106 pp.

ICES. 2016c. General context of ICES advice. *In* Report of the ICES Advisory Committee, 2016. ICES Advice 2016, Book 1, Section 1.2.

ICES. 2017. Herring (*Clupea harengus*) in subareas 1, 2, and 5, and in divisions 4.a and 14.a, Norwegian spring-spawning herring (the Northeast Atlantic and the Arctic Ocean). *In* Report of the ICES Advisory Committee, 2017. ICES Advice 2017, her.27.1-24a514a.[†]

[†] Version 2: Reference inserted.