6.3.17 Herring (*Clupea harengus*) in subdivisions 20–24, spring spawners (Skagerrak, Kattegat, and western Baltic)

ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2017 should be no more than 56 802 tonnes. This advice applies to the catch of western Baltic spring spawners (WBSS) in subdivisions 20–24 and the eastern part of Subarea 4.

Stock development over time

The spawning-stock biomass (SSB) reached the lowest point in the time-series in 2011, but it has been above MSY $B_{trigger}$ since 2013. Fishing mortality (F) has decreased and has been below F_{MSY} since 2011. The stock appears to remain in a low production period.

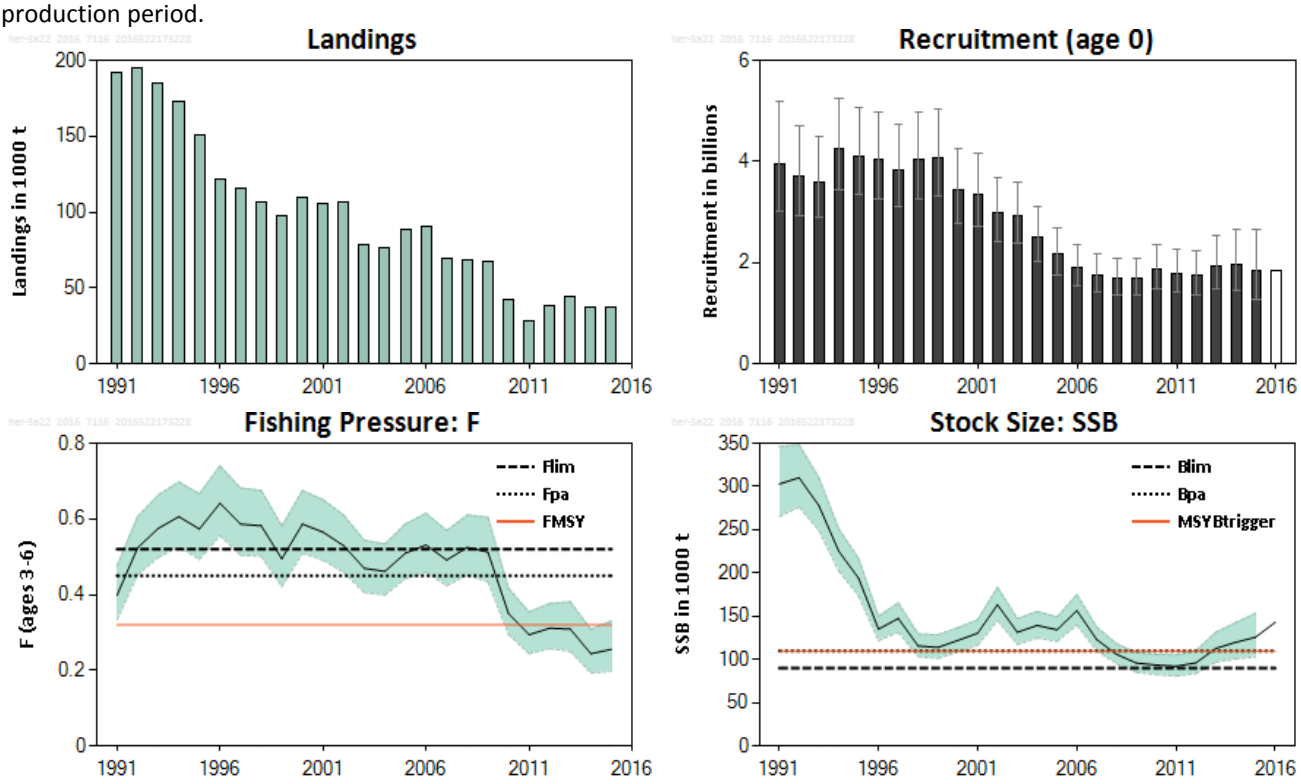

Figure 6.3.17.1 Herring in subdivisions 20–24 (spring spawners). Commercial catches (upper left), and recruitment, fishing mortality, and spawning-stock biomass from the summary of the stock assessment. Unshaded values of the recruitment are geometric mean values.

Stock and exploitation status

Table 6.3.17.1 Herring in subdivisions 20–24 (spring spawners). 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}	✓	✓	✓	Appropriate	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

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Catch options

All catch options assume a utilization in 2016 of the TAC of 100% for the human consumption fishery (F-fleet) in subdivisions 22–24, 54% for the human consumption fishery (C-fleet) in Division 3.a, and 100% for the small-meshed industrial fishery (D-fleet) in Division 3.a (Table 6.3.17.2) and a small catch of western Baltic spring spawning herring in the North Sea (A-fleet). The ratios between the different herring stocks in Division 3.a and Subarea 4 are based on the average proportions in the landings 2013–2015.

Table 6.3.17.2 Herring in subdivisions 20–24 (spring spawners). The basis for the catch options. All weights are in tonnes.

Variable	Value	Source	Notes
$F_{ages\ 3–6}$ (2016)	0.272	ICES (2016a)	Catch constraint
SSB (2016)	143004	ICES (2016a)	
$R_{age\ 0}$ (2016)	1855751	ICES (2016a)	Geometric mean 2010–2014*
$R_{age\ 0}$ (2017)	1855751	ICES (2016a)	Geometric mean 2010–2014*
$R_{age\ 0}$ (2018)	1855751	ICES (2016a)	Geometric mean 2010–2014*
Total catch (2016)	46362	ICES (2016a)	Agreed catch options, including a 46% transfer (about 23500 t) of C-fleet TAC to the North Sea.

* Currently no specific mechanisms for reduced recruitment have been identified for this stock. To account for this, recent low recruitment is used in the catch forecast.

Table 6.3.17.3 Herring in subdivisions 20–24 (spring spawners). The catch options. All weights are in tonnes.

Option	Rationale	Catch (2017)	Basis	F catch (2017)	SSB (2017)*	SSB (2018)*	% SSB change**	% Advice change***
1	MSY approach	56802	$F = F_{MSY}$	0.32	153971	154361	+0.25	+8.1
2	Zero catch	0	$F = 0$	0	158875	210237	+32.3	−100.0
3	F_{MSY} ranges with Advice Rule included^	42375	$F = MSY\ F_{lower(AR)}$	0.23	155334	168262	+8.3	−19.4
4		70164	$F = MSY\ F_{upper(AR)}$	0.41	152620	141682	−7.2	+33.5
5	Precautionary approach	75784	$F = F_{pa}$	0.45	152023	136410	−10.3	+44.2
6	Other options	85176	F_{lim}	0.52	150985	127684	−15.4	+62.1
		44033	$MSY\ F_{lower(AR)}$ differing by 0.01	0.24	155182	166653	+7.4	−16.2
		45678	$MSY\ F_{lower(AR)}$ differing by 0.02	0.25	155030	165061	+6.5	−13.1
		47308	$MSY\ F_{lower(AR)}$ differing by 0.03	0.26	154878	163485	+5.6	−10.0
		48924	$MSY\ F_{lower(AR)}$ differing by 0.04	0.27	154727	161925	+4.7	−6.9
		50527	$MSY\ F_{lower(AR)}$ differing by 0.05	0.28	154575	160381	+3.8	−3.8
		52115	$MSY\ F_{lower(AR)}$ differing by 0.06	0.29	154424	158853	+2.9	−0.8
		53691	$MSY\ F_{lower(AR)}$ differing by 0.07	0.30	154273	157340	+2.0	+2.2
		55253	$MSY\ F_{lower(AR)}$ differing by 0.08	0.31	154122	155843	+1.1	+5.1
		58337	$MSY\ F_{upper(AR)}$ differing by 0.08	0.33	153820	152894	−0.6	+11.0
		59860	$MSY\ F_{upper(AR)}$ differing by 0.07	0.34	153670	151442	−1.4	+13.9
		61370	$MSY\ F_{upper(AR)}$ differing by 0.06	0.35	153519	150005	−2.3	+16.8
		62867	$MSY\ F_{upper(AR)}$ differing by 0.05	0.36	153369	148582	−3.1	+19.6
		64351	$MSY\ F_{upper(AR)}$ differing by 0.04	0.37	153219	147174	−3.9	+22.5
		65823	$MSY\ F_{upper(AR)}$ differing by 0.03	0.38	153069	145780	−4.8	+25.3
		67282	$MSY\ F_{upper(AR)}$ differing by 0.02	0.39	152919	144400	−5.6	+28.0
		68729	$MSY\ F_{upper(AR)}$ differing by 0.01	0.40	152769	143034	−6.4	+30.8
		48924	F *status quo* (F_{2016})	0.27	154727	161925	+4.7	−6.9
		127302	$SSB_{2018} = B_{lim}$	0.90	145529	90000	−38.2	+142.3
		104592	$SSB_{2018} = B_{PA} = MSY\ B_{trigger}$	0.68	148652	110000	−26.0	+99.0

* For spring-spawning stocks, the SSB is determined at spawning time and is influenced by fisheries and natural mortality between 1 January and spawning time (April).

** SSB (2018) relative to SSB (2017).

*** Catch 2017 relative to ICES advice for 2016 (52 547 t) for the western Baltic spring-spawning herring stock.

^ Ranges with the advice rule (AR) advised by ICES in 2015 (ICES, 2015a). Taking into account that $SSB_{2017} \geq MSY\ B_{trigger}$, $F_{lower(AR)}$ and $F_{upper(AR)}$ are not reduced by the factor SSB / $MSY\ B_{trigger}$ (ICES, 2015a).

Table 6.3.17.4 Herring in subdivisions 20–24 (spring spawners). Catch options for herring in subdivisions 20–24 (WBSS; spring spawners) and herring in the North Sea (NSAS; autumn spawners). The advised catch and resulting catch options by fleet following the agreed EU–Norway management rule. With the North Sea herring long-term management strategy (LTMS) and WBSS F_{MSY} = 0.32, and with 0% and 50% TAC transfer flexibility. All weights are in tonnes.

	Fishing mortality			TACs and catch by fleet									
	NSAS $F_{ages\ (wr)2–6}$	NSAS $F_{ages\ (wr)0–1}$	WBSS $F_{ages\ (wr)3–6}$	A-Fleet		B-Fleet	C-Fleet		D-Fleet		F-Fleet	Total catch	
Area	All	All	All	Subarea 4 and Division 7.d		Subarea 4 and Division 7.d	Division 3.a		Division 3.a		Subdiv. 22–24	NSAS	WBSS
Area TAC (LTMS, F_{MSY})	0.286	0.05	0.339	427964		8020	47586		6659		28401	458926	59704
Stock	NSAS $F_{ages\ (wr)2–6}$	NSAS $F_{ages\ (wr)0–1}$	WBSS $F_{ages\ (wr)3–6}$	NSAS	WBSS	NSAS	NSAS	WBSS	NSAS	WBSS	WBSS	NSAS	WBSS
Predicted catch 0% transfer	0.286	0.05	0.339	426259	1705	8020	19986	27600	4661	1998	28401	458926	59704
Predicted catch 50% transfer	0.298	0.05	0.252	450052	1800	8020	9993	13800	4661	1998	28401	472726	45999

Catch options by stock and area for NSAS and WBSS are based on fleet-wise predictions for five fleets (A, B, C, D, and F). The catch options for the five fleets are interlinked and therefore calculated simultaneously to ensure that options are consistent among stocks and areas. For technical details see ICES (2016b).

This implies that when addressing NSAS options, the catch of NSAS by the A-, B-, C-, and D-fleets in Subarea 4 and divisions 3.a and 7.d have to be considered all at once. For the A-, C-, and D-fleets it is expected that a yearly varying portion of the catch consists of NSAS. The A-fleet catches almost exclusively NSAS herring in Subarea 4 and Division 7.d. The C- and the D-fleet in Division 3.a catch a mixture of WBSS and NSAS. The B- and F-fleets are assumed to only catch NSAS and WBSS, respectively. The combined fishing mortality on NSAS ages (wr) 2−6 and ages 0−1 are determined by the EU−Norway management strategy. Though all fleets cause mortality on a wider age range, the main contribution to $F_{ages\ (wr)\ 2–6}$ comes from the A-fleet whereas the other three fleets contribute mainly to $F_{ages\ (wr)\ 0–1}$.

An optimization routine is used to calculate catch options in which total exploitation of NSAS ages (wr) 2−6 and ages (wr) 0−1 match their targets, as well as catch targets set for the C- and D-fleets; this provides fishing mortality rates for each individual fleet. These rates are then used to calculate TAC options by fleet, comprising all the herring stocks caught by each fleet. Given the mixture of NSAS and WBSS in many of these areas, these TAC options can be split by stock again.

WBSS catch advice is based on the ICES MSY approach. The F-fleet TAC is set as 50% of this catch. The C-fleet TAC is set as a combination of 41% of the WBSS advised catch and 5.7% of the A-fleet TAC. The D-fleet TAC is set to a constant catch each year.

Basis of the advice

Table 6.3.17.5 Herring in subdivisions 20–24 (spring spawners). The basis of the advice.

Advice basis	MSY approach
Management plan	There is an agreed TAC setting procedure (EU–Norway, 2015) for herring in Division 3.a. It is based on MSY approach advice for WBSS and long-term management strategy advice for NSAS. The TAC-setting procedure for the C-fleet in Division 3.a with F = 0.28 has been evaluated to be precautionary for WBSS herring, provided an optional quota transfer of greater than 10% (ICES, 2015b) is implemented. The same rule assuming F_{MSY} = 0.32 for WBSS has not been evaluated by ICES; however, it appears likely that if the present transfer rate (46%) is maintained the rule will be precautionary for WBSS herring. There is a proposed EU management plan for subdivisions 22–24. The plan has not been formally implemented.

Quality of the assessment

The inherent uncertainty in the predictions is related to the lack of a firm basis to predict the proportions of North Sea autumn spawners (NSAS) and WBSS in the catches taken in divisions 3.a and 4.a East, due to interannual variability in the herring migration patterns and in the distribution of the fisheries (including the optional transfer of quotas between Division 3.a and Subarea 4). In addition, mixing between WBSS and central Baltic herring in subdivisions 22–24 may increase the uncertainty in the assessment.

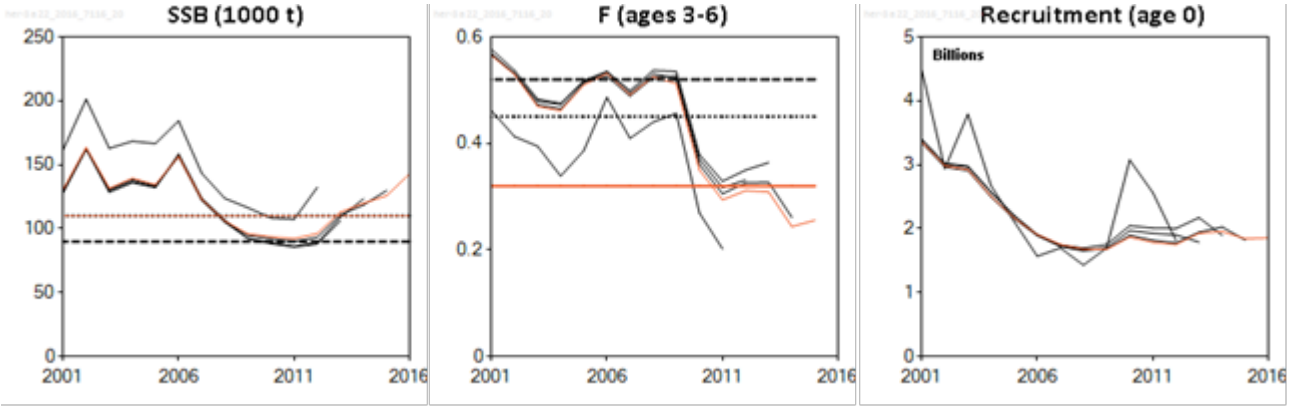

Figure 6.3.17.2 Herring in subdivisions 20–24 (spring spawners). Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

There is a management decision that allows transferring a flexible percentage (up to 50%) of the herring TAC from Division 3.a to the North Sea. Evaluations have shown that the agreed TAC-setting procedure for Division 3.a (C-fleet) requires that a transfer of at least 10% takes place in order to be precautionary for WBSS herring. The transfer reduces the pressure on the WBSS due to the low proportion of this stock in the North Sea, although with transfer rates in the lower end of the range fishing mortality on WBSS may be above F_{MSY}. Conversely, the transfer increases the pressure on NSAS above the F intended by the EU–Norway management strategy.

The advice for the Division 3.a TAC-setting procedure is based on the biomass trigger ($B_{trigger}$) in the current North Sea autumn-spawning (NSAS) herring 2014 management strategy of 1.5 million tonnes. If this value is decreased (which would still be precautionary for NSAS), then the Division 3.a TAC-setting procedure may no longer be precautionary.

Under the EU landing obligation, which entered into force in 2015, up to 9% inter-species quota transfers are allowed for stocks that are considered to be within safe biological limits (see Article 15 of EU, 2013). Quota transfers were not considered in this catch advice. The catch of herring under the other species' quotas (e.g. sprat) under this regulation may result in a

substantial risk of overexploitation of WBSS herring. To achieve F_{MSY} exploitation, any transfer under this regulation should be accounted for in setting the TAC.

Calculation of the catch option for the C-fleet implies that a mathematical solution to the circularity which links the C-fleet TAC to the A-fleet TAC be found (Fig. 6.3.17.3). Once the advised catch for the WBSS is set based on the MSY approach, the circularity is resolved via an iterative process.

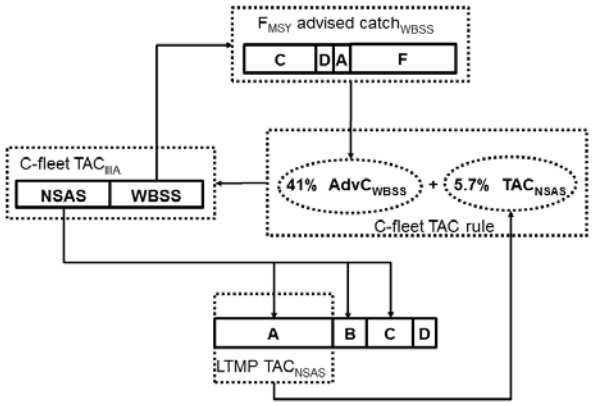

Figure 6.3.17.3 Herring in subdivisions 20–24 (spring spawners). Schematic illustration of the C-fleet TAC rule for North Sea autumn spawners (NSAS; herring in Subarea 4 and divisions 3.a and 7.d) and for the western Baltic spring-spawning herring (WBSS). (Figure revised from ICES, 2015c.)

Reference points

Table 6.3.17.6 Herring in subdivisions 20–24 (spring spawners). Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	110000 t	B_{pa}, equal to the upper 95% confidence limit of B_{lim}.	ICES (2013, 2015a)
	F_{MSY}	0.32	Stochastic simulations with Beverton, Ricker, and segmented regression stock–recruitment curve from the full time-series (1991–2013).	ICES (2015a)
Precautionary approach	B_{lim}	90000 t	Chosen as B_{loss} based on lack of a well-defined recruitment slope at low SSB.	ICES (2013)
	B_{pa}	110000 t	Upper 95% confidence limit of B_{lim} with $\sigma \approx 0.122$ using cv from the final-year SSB estimate in the assessment.	ICES (2013)
	F_{lim}	0.52	$F_{P50\%}$ from stochastic simulations with Beverton, Ricker, and segmented stock–recruitment curve (2004–2015).	ICES (2016a)
	F_{pa}	0.45	$F_{pa} = F_{lim} \times \exp(-1.645 \times \sigma)$ with $\sigma \approx 0.09$, based on the CV from the terminal assessment year.	ICES (2016a)
Management plan	SSB_{MGT}	Not defined		
	F_{MGT}	Not defined		

Basis of the assessment

Table 6.3.17.7 Herring in subdivisions 20–24 (spring spawners). The basis of the assessment.

ICES stock data category	1 (ICES, 2016c)
Assessment type	Age-based analytical assessment (SAM; ICES, 2016a) that uses catches in the model and in the forecast.
Input data	Two acoustic, two trawl, and one larval survey indices (HERAS, GerAS (BIAS), IBTS Q1, IBTS Q3, and N20). Catch statistics and corrections for historical area misreporting. Otolith microstructure and morphometric methods to calculate the proportion of NSAS in the catches.
Discards and bycatch	Discarding is considered to be negligible. The amount of slippage in Division 3.a is unknown.
Indicators	None
Other information	Last benchmarked in 2013 (ICES, 2013).
Working group	Herring Assessment Working Group for the Area South of 62°N (HAWG)

Information from stakeholders

The 46% TAC transfer for the human consumption fishery on herring from Division 3.a to the North Sea in 2016 assumed for the catch forecast was based on information provided by the Pelagic Advisory Council (AC).

History of the advice, catch, and management

Table 6.3.17.8 Herring in subdivisions 20–24 (spring spawners). History of ICES advice, the agreed TAC, and ICES estimates of catches. All weights are in thousand tonnes.

Year	ICES advice	Predicted catch corresponding to advice	Agreed TAC 3.a##	ICES estimated catch###			
				22–24	3a	4	Total
1987	Reduction in F	224	218	102	59	14	175
1988	No increase in F	196	218	99	129	23	251
1989	TAC	174	218	95	71	20	186
1990	TAC	131	185	78	118	8	204
1991	TAC	180	155	70	112	10	192
1992	TAC	180	174	85	101	9	195
1993	Increased yield from reduction in F; reduction in juvenile catches	188	210	81	95	10	186
1994	TAC	130–180	191	66	92	14	172
1995	If required, TAC not exceeding recent catches	168–192	183	74	80	10	164
1996	If required, TAC not exceeding recent catches	164–171	163	58	71	1	130
1997	3a: managed together with autumn spawners 22–24: if required, TAC not exceeding recent catches	66–85*	100	68	55	1	124
1998	Should be managed in accordance with NSAS	-	97	51	53	8	112
1999	3a: managed together with autumn spawners 22–24: if required, TAC not exceeding recent catches	-	99	50	43	5	98
2000	3a: managed together with autumn spawners 22–24: if required, TAC not exceeding recent catches	~60 for subdivisions 22–24	101	54	57	7	118
2001	3a: managed together with autumn spawners 22–24: if required, TAC not exceeding recent catches	~50 for subdivisions 22–24	101	64	42	6	112
2002	3a: managed together with autumn spawners 22–24: if required, TAC not exceeding recent catches	~50 for subdivisions 22–24	101	53	47	7	107
2003	Reduce F	< 80	101	40	36	2	78
2004	Separate management regime. Reduce F	< 92	91	42	28	7	77
2005	Separate management regime. *Status quo* F	95	120	44	38	7	89

Year	ICES advice	Predicted catch corresponding to advice	Agreed TAC 3.a##	ICES estimated catch###			
				22–24	3a	4	Total
2006	Separate management regime. *Status quo* F	95	102**/47.5***	42	36	11	89
2007	Separate management regime. *Status quo* F	99	69/49.5***	40	28	1	69
2008	Separate management regime. Reduce F 20% towards $F_{0.1}$	71	51.7**/45***	44	25	0	69
2009	Separate management regime. Reduce F to F = 0.25	< 32.8	37.7**/27.2***	31	32	4	67
2010	Separate management regime. Reduce F to F = 0.25	< 39.8	33.9**/22.7***	18	24	1	42
2011	MSY transition in 1–5 years and no increase in catches of WBSS herring in the North Sea	26.5–53.6	30**/15.8***	16	12	0.3	28
2012	F_{MSY} = 0.25 and no increase in catches of WBSS herring in the North Sea	< 42.7	45**/20.9***	21	15	2	39
2013	F_{MSY} = 0.25 and no *optional* transfer of catch options to the North Sea	< 51.9	55**/25.8***	26	17	0.5	44
2014	Transition to MSY approach	< 41.602	46.8**/19.8***	18	16	3	37
2015	MSY approach (F_{MSY} = 0.28)#	< 44.439	43.6**/22.2***	22	13	2	37
2016	MSY approach (F_{MSY} = 0.32)	< 52.547	51.1**/26.3***				
2017	MSY approach (F_{MSY} = 0.32)	< 56.802					

* Catch in subdivisions 22–24.

** Human consumption in Division 3.a, not including industrial bycatch or mixed clupeoids, but including North Sea autumn-spawner catch in fleet C, with an optional 50% transfer from Division 3.a to Subarea 4 since 2011.

*** Separate TAC for Baltic subdivisions 22–24.

Advice for 2015 was for wanted catch.

Including mixed clupeoid TAC and bycatch ceiling in small-mesh fishery.

Limited to WBSS.

History of catch and landings

Table 6.3.17.9 Herring in subdivisions 20–24 (spring spawners). Catch distribution of WBSS and NSAS herring by stock and by fleet in 2015 as estimated by ICES. See Table 6.3.18.17 in the advice for North Sea autumn spawners for a historical presentation of this information.

Area where WBSS are caught	Fleet	Fishery	WBSS 2015 catch (t)	NSAS 2015 catch (t)
Division 3.a	C	Directed herring fisheries with purse-seiners and trawlers.	11315	10244
	D	Bycatches of herring caught in the small-mesh fisheries.	1828	4448
subdivisions 22–24	F	All herring fisheries in subdivisions 22–24.	22144	0
Subarea 4	A	Directed herring fisheries with purse-seiners and trawlers.	2205	-
Total area	C,D,F,A	All	37491	-

Table 6.3.17.10 Herring in subdivisions 20–24 (spring spawners). Catch distribution of WBSS in 2015 as estimated by ICES.

Total catch (2015)	Landings		Discards
37.491 kt	95.1% directed fishery	4.9% bycatch	Negligible
	37.491 kt		

Table 6.3.17.11 Herring in subdivisions 20–24 (spring spawners). History of commercial catch as estimated by ICES by area and country for all herring stocks caught within the management area for subdivisions 20–24.

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Skagerrak													
Denmark	47.4	62.3	58.7	64.7	87.8	44.9	43.7	28.7	14.3	10.3	10.1	16.0	16.2
Norway	1.6	5.6	8.1	13.9	24.2	17.7	16.7	9.4	8.8	8.0	7.4	9.7	
Sweden	47.9	56.5	54.7	88.0	56.4	66.4	48.5	32.7	32.9	46.9	36.4	45.8	30.8
Total	96.9	124.4	121.5	166.6	168.4	129.0	108.9	70.8	56.0	65.2	53.9	71.5	47.0
Kattegat													
Denmark	57.1	32.2	29.7	33.5	28.7	23.6	16.9	17.2	8.8	23.7	17.9	18.9	18.8
Sweden	37.9	45.2	36.7	26.4	16.7	15.4	30.8	27.0	18.0	29.9	14.6	17.3	16.2
Total	95.0	77.4	66.4	59.9	45.4	39.0	47.7	44.2	26.8	53.6	32.5	36.2	35.0
Subdivisions 22+24													
Denmark	21.7	13.6	25.2	26.9	38.0	39.5	36.8	34.4	30.5	30.1	32.5	32.6	28.3
Germany	56.4	45.5	15.8	15.6	11.1	11.4	13.4	7.3	12.8	9.0	9.8	9.3	11.4
Poland	8.5	9.7	5.6	15.5	11.8	6.3	7.3	6.0	6.9	6.5	5.3	6.6	9.3
Sweden	6.3	8.1	19.3	22.3	16.2	7.4	15.8	9.0	14.5	4.3	2.6	4.8	13.9
Total	92.9	76.9	65.9	80.3	77.1	64.6	73.3	56.7	64.7	49.9	50.2	53.3	62.9
Subdivision 23													
Denmark	1.5	1.1	1.7	2.9	3.3	1.5	0.9	0.7	2.2	0.4	0.5	0.9	0.6
Sweden	0.1	0.1	2.3	1.7	0.7	0.3	0.2	0.3	0.1	0.3	0.1	0.1	0.2
Total	1.6	1.2	4.0	4.6	4.0	1.8	1.1	1.0	2.3	0.7	0.6	1.0	0.8
Grand total	286.4	279.9	257.8	311.4	294.9	234.4	231.0	172.7	149.8	169.4	137.2	162.0	145.7

Year	2002	2003	2004	2005	2006**	2007	2008	2009	2010	2011	2012	2013	2014	2015*
Skagerrak														
Denmark	26.0	15.5	11.8	14.8	5.2	3.6	3.9	12.7	5.3	3.6	3.2	4.9	6.4	4.1
Faroe Islands				0.4			0.0	0.6	0.4					0.5
Netherlands														0.03
Germany		0.7	0.5	0.8	0.6	0.5	1.6	0.3	0.1	0.1	0.6	0.2	0.1	0.1
Lithuania									0.4					
Norway						3.5	4.0	3.3	3.3	0.1	0.4	3.0	2.0	2.5
Sweden	26.4	25.8	21.8	32.5	26.0	19.4	16.5	12.9	17.4	9.5	16.2	16.7	12.6	12.9
Total	52.3	42.0	34.1	48.5	31.8	26.9	26.0	29.7	27.0	13.2	20.5	24.8	21.2	20.1
Kattegat														
Denmark	18.6	16.0	7.6	11.1	8.6	9.2	7.0	4.9	7.6	5.2	6.3	3.9	4.3	4.0
Sweden	7.2	10.2	9.6	10.0	10.8	11.2	5.2	3.6	2.7	1.7	0.8	2.6	3.4	3.8
Germany								0.6	0.0					
Total	25.9	26.2	17.2	21.1	19.4	20.3	12.2	9.1	10.3	6.8	7.1	6.5	7.7	7.7
Subdivisions 22+24														
Denmark	13.1	6.1	7.3	5.3	1.4	2.8	3.1	2.1	0.8	3.1	4.1	5.1	4.3	4.5
Germany	22.4	18.8	18.5	21.0	22.9	24.6	22.8	16.0	12.2	8.2	11.2	14.6	10.2	13.3
Poland		4.4	5.5	6.3	5.5	2.9	5.5	5.2	1.8	1.8	2.4	3.1	2.4	2.6
Sweden	10.7	9.4	9.9	9.2	9.6	7.2	7.0	4.1	2.0	2.2	2.7	2.1	1.1	1.5
Total	46.2	38.7	41.2	41.8	39.4	37.6	38.5	27.4	16.8	15.3	20.4	24.8	18.0	21.9
Subdivision 23														
Denmark	4.6	2.3	0.1	1.8	1.8	2.9	5.3	2.8	0.1***	0.03	0.04	0.04	0.05	0.0
Sweden		0.2	0.3	0.4	0.7		0.3	0.8	0.9	0.5	0.7	0.6	0.3	0.2
Total	4.6	2.6	0.4	2.2	2.5	2.9	5.7	3.6	1.0	0.6	0.7	0.7	0.4	0.2
Grand total	128.9	109.5	92.8	113.6	93.0	87.7	82.3	69.9	55.2	35.9	48.8	56.7	47.2	50.0

* Preliminary data.

** 2000 t of Danish catches are missing (ICES, 2007).

*** 3103 t officially reported catches (ICES, 2011).

Summary of the assessment

Table 6.3.17.12 Herring in subdivisions 20–24 (spring spawners). Assessment summary with weights (in tonnes).

Year	Recruitment (age 0)	High	Low	Stock size: SSB*	High	Low	ICES estimated catch	Fishing mortality (ages 3–6)	High	Low	Model catch	High	Low
	Thousands			tonnes			tonnes				tonnes		
1991	3957013	5187357	3018484	302852	346051	265046	191573	0.398	0.475	0.333	178439	213134	149391
1992	3707988	4688631	2932450	310209	348208	276356	194411	0.524	0.606	0.452	203618	234975	176445
1993	3594804	4486124	2880575	277895	310050	249076	185010	0.575	0.663	0.498	183322	210166	159907
1994	4256680	5248565	3452243	225258	250852	202274	172438	0.606	0.698	0.527	170587	195663	148725
1995	4110273	5058416	3339848	193881	216561	173576	150831	0.573	0.666	0.493	130483	150438	113176
1996	4024857	4961459	3265063	135131	149931	121792	121266	0.641	0.74	0.556	127262	147266	109975
1997	3843908	4743884	3114668	147561	165453	131605	115588	0.586	0.681	0.504	119850	140171	102475
1998	4032915	4975193	3269100	115728	129520	103405	107032	0.582	0.675	0.502	103363	120163	88912
1999	4077522	5031800	3304222	114005	128520	101130	97240	0.495	0.581	0.421	88876	103906	76020
2000	3433189	4243902	2777346	122027	136687	108940	109914	0.586	0.675	0.51	104402	121812	89480
2001	3355126	4146999	2714462	130353	145947	116425	105803	0.565	0.651	0.491	96086	111279	82968
2002	2984671	3677703	2422235	163244	183504	145221	106191	0.529	0.61	0.459	97343	112941	83900
2003	2922646	3601629	2371666	131531	147339	117420	78309	0.469	0.544	0.405	78669	90659	68264
2004	2508010	3092543	2033961	139386	155444	124987	76815	0.461	0.534	0.399	77653	88857	67861
2005	2167316	2671974	1757973	134323	149234	120901	88406	0.51	0.587	0.443	85819	98543	74738
2006	1905014	2350622	1543880	156530	175095	139932	90549	0.531	0.615	0.459	88787	102089	77219
2007	1751530	2163439	1418046	123007	137389	110131	68997	0.491	0.569	0.424	69913	80045	61063
2008	1679489	2080686	1355650	105979	118274	94963	68484	0.525	0.61	0.452	70263	80260	61511
2009	1676133	2087056	1346117	95894	107816	85291	67262	0.512	0.604	0.434	61023	69945	53238
2010	1867292	2351248	1482949	93620	106011	82677	42214	0.35	0.417	0.295	41274	47290	36024
2011	1786913	2255555	1415641	92226	105167	80878	27771	0.294	0.354	0.244	31761	36569	27585
2012	1749779	2231571	1372005	96086	110175	83799	38648	0.311	0.377	0.257	38523	44084	33663
2013	1928012	2521151	1474418	112871	131432	96931	43827	0.309	0.381	0.25	41440	47996	35780
2014	1955194	2655470	1439588	119850	142565	100755	37358	0.244	0.308	0.193	38292	44541	32920
2015	1843175	2666674	1273982	125744	153475	103023	37491	0.256	0.331	0.198	37123	42892	32130
2016	1855751**			143004***									
Average	**2806738**	**3567186**	**2271063**	**150315**	**170028**	**133461**	**96937**	**0.477**	**0.558**	**0.408**	**94566.84**	**109427.36**	**81734.8**

* SSB measured at spawning time (April).

** Recruitment is the geometric mean 2010–2014.

*** SSB is predicted.

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