

6.3.18 Herring (*Clupea harengus*) in Subarea 4 and divisions 3.a and 7.d, autumn spawners (North Sea, Skagerrak, Kattegat, and eastern English Channel)

ICES stock advice

ICES advises that when the European Union (EU)–Norway management strategy is applied, catches in 2017 should be no more than 458 926 tonnes, including 426 259 tonnes for the A-fleet.

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

Recruitment (R) was below average between 2003 and 2013. In 2014 R was strong and comparable to levels seen before 2003. Recruitment in 2015 is among the lowest in the time-series and 2016 recruitment is estimated to be low again. The spawning-stock biomass (SSB) has been above $MSY B_{trigger}$ since 2009. Fishing mortality (F) has been below F_{MSY} since 1996.

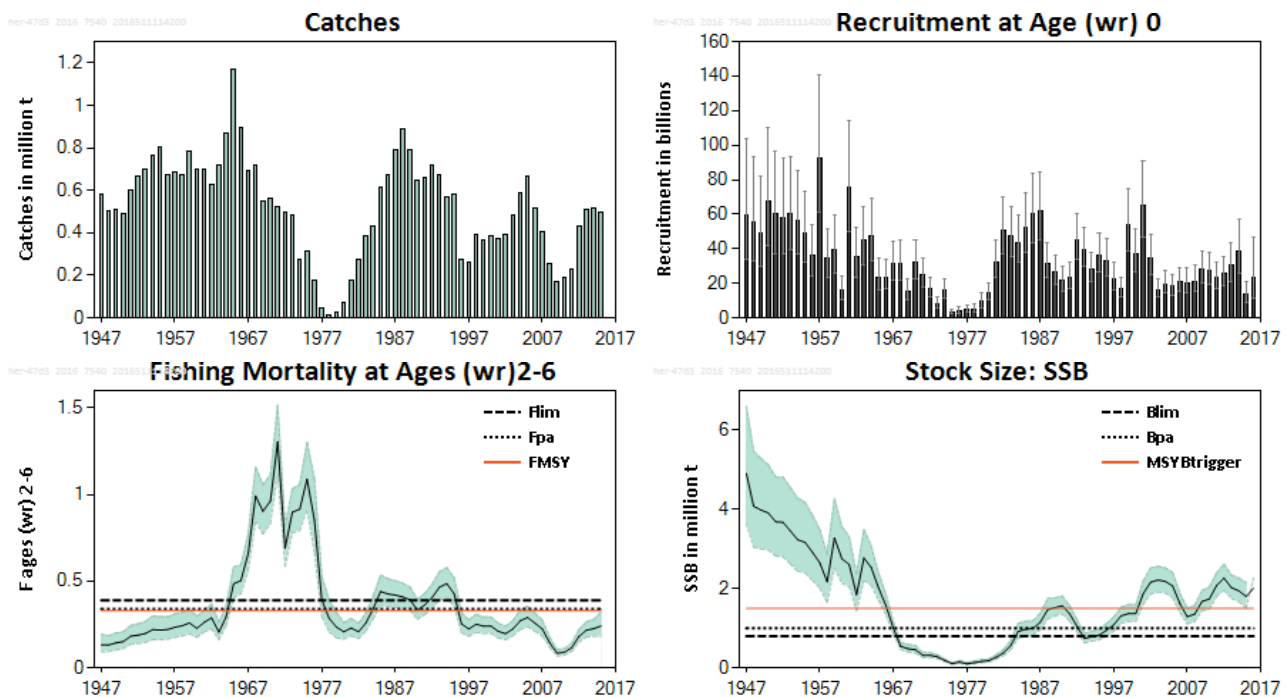


Figure 6.3.18.1 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). Commercial catches (upper left), and from the stock assessment: recruitment, fishing mortality, and spawning-stock biomass.

Stock and exploitation status

Table 6.3.18.1 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). State of the stock and fishery relative to reference points.

	Fishing pressure				Stock size			
		2013	2014		2015	2013	2014	2015
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}	✓	✓	✓ Below	SSB_{MGT}	✓	✓	✓ Above

Catch options

Table 6.3.18.2 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). The basis for the catch options.

Variable	Value	Source	Notes
$F_{\text{ages (wr) 2-6}}$ (2016)	0.32	ICES (2016a)	Catch constraint
SSB (2016)	2008169 t	ICES (2016a)	
$R_{\text{age(wr)0}}$ (2016)	23394231	ICES (2016a)	
$R_{\text{age(wr)0}}$ (2017)	23644739	ICES (2016a)	Geometric mean over 2005–2015
Total catch (2016)	563850 t	ICES (2016a)	Agreed catch options including a 46% transfer (about 23500 t) of C-fleet TAC to the A-fleet in the North Sea.

Table 6.3.18.3 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). The intermediate year (2016) assumptions. Weights are in tonnes.

$F_{\text{ages (wr) 2-6}}$ A-fleet	$F_{\text{ages (wr) 0-1}}$ B-fleet	$F_{\text{ages (wr) 0-1}}$ C-fleet	$F_{\text{ages (wr) 0-1}}$ D-fleet	$F_{\text{ages (wr) 2-6}}$	$F_{\text{ages (wr) 0-1}}$	Catches A-fleet	Catches B-fleet	Catches C-fleet	Catches D-fleet	SSB 2016
0.315	0.036	0.003	0.013	0.320	0.053	539574	8029	11586	4661	2008169

Table 6.3.18.4 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). Catch options for the prediction year (2017) for NSAS herring. All weights are in tonnes.

Basis	F values by fleet and total						Catches by fleet				Total stock catch	Biomass*			
	F _{ages (wr) 2-6} A-fleet	F _{ages (wr) 0-1} B-fleet	F _{ages (wr) 0-1} C-fleet	F _{ages (wr) 0-1} D-fleet	F _{ages (wr) 2-6}	F _{ages (wr) 0-1}	A-fleet	B-fleet	C-fleet	D-fleet		SSB 2017	%SSB change ***	SSB 2018**	%TAC change A-fleet ^
Management strategy ^^	0.274	0.031	0.006	0.012	0.286	0.050	426259	8020	19986	4661	458926	1694363	-16	1510120	-18
F _{MSY}	0.317	0.031	0.007	0.012	0.330	0.051	481608	8020	21311	4661	515601	1655043	-18	1439754	-7
No fishing	0.000	0.000	0.000	0.000	0.000	0.000	0	0	0	0	0	1989011	-1	2169415	-100
No change in A-fleet TAC	0.347	0.031	0.007	0.012	0.360	0.050	518242	8020	21455	4661	552378	1629197	-19	1395540	0
A-fleet TAC increase of 15%	0.414	0.031	0.008	0.012	0.430	0.050	595978	8020	24674	4661	633333	1572050	-22	1300616	15
A-fleet TAC reduction of 15%	0.285	0.031	0.006	0.012	0.296	0.050	440506	8020	18237	4661	471424	1685469	-16	1494984	-15
F status quo (F ₂₀₁₆)	0.308	0.031	0.007	0.012	0.320	0.051	469438	8020	21020	4661	503139	1663727	-17	1455029	-9
F _{lim}	0.376	0.031	0.007	0.012	0.390	0.052	552994	8020	23020	4661	588695	1603686	-20	1352370	7
F _{pa}	0.327	0.031	0.007	0.012	0.340	0.051	493824	8020	21603	4661	528109	1646307	-18	1424535	-5
SSB ₂₀₁₇ = B _{pa}	1.391	0.031	0.016	0.012	1.420	0.064	1328386	8020	41583	4661	1382650	1000000	-50	613934	156
SSB ₂₀₁₇ = B _{lim}	1.956	0.031	0.019	0.012	1.990	0.070	1565361	8020	47256	4661	1625299	800000	-60	454207	202
SSB ₂₀₁₇ = MSY B _{trigger}	0.505	0.031	0.009	0.012	0.521	0.053	694127	8020	26399	4661	733207	1500000	-25	1190247	34

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

** Assuming same catch option in 2018 as in 2017.

*** SSB (2017) relative to SSB (2016).

^ A-fleet catches (2017) relative to TAC 2016 for the A-fleet.

^^ The maximum 10% deviation from the F_{target} (F_{ages (wr) 2-6} = 0.26) allowed for in the Management strategy determined the Management strategy catch option as corresponding to F_{ages (wr) 2-6} = 0.286 in 2017.

Table 6.3.18.5 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). Catch options for herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners; NSAS) and herring in subdivisions 20–24 (spring spawners; WBSS), with 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} approach, 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 D-fleets 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 (wr) 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.

The TAC-setting procedure for the C-fleet in Division 3a with $F = 0.28$ has been evaluated to be precautionary for WBSS herring, provided an optional quota transfer of greater than 10% (ICES, 2015a) is implemented. The same rule assuming $F_{MSY} = 0.32$ for WBSS has not been evaluated by ICES; however, the evaluations carried out do not indicate that this influences precautionary considerations for NSAS.

Basis of the advice

Table 6.3.18.6 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). The basis of the advice.

Advice basis	EU–Norway Management strategy
Management plan	Herring in this area is managed by a joint EU-Norway Management Strategy (EU–Norway, 2015).

Quality of the assessment

Input data from sampling and monitoring programmes are considered to be of good quality. Both the spawning-stock biomass and the fishing mortality are estimated precisely by the stock assessment. Based on consistent observations in different surveys, the recruitment in 2014 is confirmed to be strong and the highest recorded since the onset of a poor recruitment period since 2003.

Inclusion of time varying natural mortality in the assessment model aims to take into account changes in the ecosystem that affect the herring stock size. Natural mortality estimates are derived from a multispecies assessment model (ICES, 2016c), which is updated over time when new knowledge about the ecosystem becomes available. Because of the changed perceptions in, most notably, the cod stock, the natural mortality time-series of herring was revised down by about 15% in recent years. The updates in natural mortality have affected the perception of the stock and result in changes in estimated stock size and fishing mortality (Figure 6.3.18.2).

Because of the changes in the time-series of natural mortality, the fishing mortality reference points for North Sea herring were re-estimated and resulted in a higher F_{MSY} (0.33) compared to the previous estimate (0.27). The short time-series of stock and recruitment was used (2002–2015) to take the low productivity of herring in recent years into account, as was done in the management strategy evaluation (ICES, 2015a). Using a short time-series makes the estimation of reference points sensitive to the addition of new years.

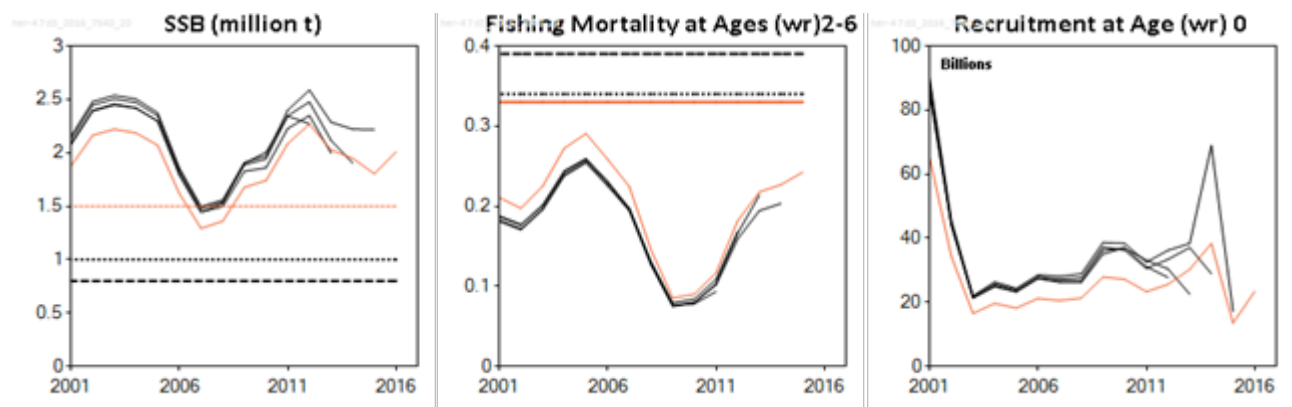


Figure 6.3.18.2 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). Historical assessment results (final-year recruitment estimates included).

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 because of 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.

Under the EU landing obligation, which entered into force in 2015, up to 9% interspecies 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. This should be monitored closely to ensure that catches of herring do not increase above the ICES advised catch. To achieve F_{MSY} exploitation, any transfer under this regulation should be accounted for in setting the TAC. In 2015 no interspecies quota transfer was used in the North Sea (ICES, 2016a).

NSAS herring has several spawning components, including the Downs herring which spawns in divisions 4.c and 7.d. These components are fished on individual spawning grounds and in a mixed-component fishery in the central and northern North Sea. Only the Downs component is caught in the southern North Sea. Sub-TACs have been set for divisions 4.c and 7.d and for the remainder of the area to help protect these components; such measures should be continued to give protection to the different components. To ensure a total production of the stock, all populations within the stock must be protected under the long-term management strategy.

Activities that have a negative 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 (ICES, 2003, 2015b).

Reference points

Table 6.3.18.7 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY B_{trigger}	1 500 000 t	Biomass trigger value that results in < 5% probability of being below B_{lim} when the ICES MSY AR is applied.	ICES (2016a)
	F_{MSY}	0.33	Stochastic simulations with Beverton and Ricker stock–recruitment curve from short time-series (2002–2015).	ICES (2016a)
Precautionary approach	B_{lim}	800 000 t	Breakpoint in the segmented regression of the stock–recruitment time-series (1985–2015).	ICES (2016a)
	B_{pa}	1 000 000 t	$B_{\text{pa}} = B_{\text{lim}} \times \exp(1.645 \times \sigma)$ with $\sigma \approx 0.10$, based on the average CV from the terminal assessment year.	ICES (2012)
	F_{lim}	0.39	FP50% from stochastic simulations with Beverton and Ricker stock–recruitment curve (2002–2015).	ICES (2016a)
	F_{pa}	0.34	$F_{\text{pa}} = F_{\text{lim}} \times \exp(-1.645 \times \sigma)$ with $\sigma \approx 0.08$, based on the average CV from the terminal assessment year.	ICES (2016a)
Management plan	SSB _{MGT}	800 000 t 1 500 000 t	Informed by simulations and chosen by managers.	EU–Norway (2014)
	F_{MGT}	$F_{\text{ages (wr)0-1}} = 0.05$ $F_{\text{ages (wr)2-6}} = 0.26$	SSB is greater than the SSB _{MGT} upper trigger of 1.5 million t (based on simulations).	EU–Norway (2014)
		$F_{\text{ages (wr)0-1}} = 0.05$ $F_{\text{ages (wr)2-6}} = 0.26 - (0.16 \times (1\,500\,000 - \text{SSB}) / 700\,000)$	SSB is between the SSB _{MP} triggers of 0.8 and 1.5 million t (based on simulations).	EU–Norway (2014)
		$F_{\text{ages (wr)0-1}} = 0.04$ $F_{\text{ages (wr)2-6}} = 0.10$	SSB is less than the SSB _{MP} lower trigger of 0.8 million t (based on simulations).	

Basis of the assessment

Table 6.3.18.8 Herring in Subarea 4 and divisions 3.a and 7.d. The basis of the assessment.

ICES stock data category	1 (ICES, 2016d)
Assessment type	Age-based analytical assessment (SAM; ICES, 2016a) that uses catches in the model and in the forecast.
Input data	Commercial catches and four survey indices (IBTS Q1 1-ringer, IBTS0, SCAI, HERAS), annual maturity data from HERAS survey, and natural mortalities from SMS North Sea multispecies model.
Discards and bycatch	Considered to be negligible.
Indicators	None
Other information	The last benchmark for this stock occurred in 2012. Reference points (B_{lim} , F_{lim} , F_{pa} , F_{MSY} , and MSY B_{trigger}) were updated (ICES, 2016a).
Working group	Herring Assessment Working Group for the Area South of 62°N (HAWG)

Information from stakeholders

Stakeholders contributed to the mapping of North Sea herring spawning areas (ICES, 2015b). The data compilation and mapping is ongoing.

History of the advice, catch, and management

Table 6.3.18.9 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). History of ICES advice, the agreed TAC, and ICES estimates of landings. All weights are in thousand tonnes.

Year	ICES advice	Predicted catch corresponding to advice	Agreed TAC*	Bycatch ceiling B-fleet	ICES landings in 4, 7.d #	ICES catch in 4, 7.d ##	ICES catch autumn spawners 3.a, 4, 7.d
1987	TAC	610	600		625	625	792
1988	TAC	515	530		710	710	888
1989	TAC	514	514		669	717	787
1990	TAC	403	415		523	578	646
1991	TAC	423	420		537	588	657
1992	TAC	406	430		518	572	716
1993	No increase in yield at $F > 0.3$	340	430		495	540	671
1994	No increase in yield at $F > 0.3$	346	440		463	498	571
1995	Long-term gains expected at lower F	429	440		510	516	579
1996	50% reduction of agreed TAC**	156	156***	44	207	233	275
1997	$F = 0.2$	159	159	24	175	238	264
1998	$F(\text{adult}) = 0.2, F(\text{juv}) < 0.1$	254	254	22	268	338	392
1999	$F(\text{adult}) = 0.2, F(\text{juv}) < 0.1$	265	265	30	290	333	363
2000	$F(\text{adult}) = 0.2, F(\text{juv}) < 0.1$	265	265	36	284	346	388
2001	$F(\text{adult}) = 0.2, F(\text{juv}) < 0.1$	See scenarios	265	36	296	323	363
2002	$F(\text{adult}) = 0.2, F(\text{juv}) < 0.1$	See scenarios	265	36	304	353	372
2003	$F(\text{adult}) = 0.25, F(\text{juv}) = 0.12$	See scenarios	400	52	414	450	480
2004	$F(\text{adult}) = 0.25, F(\text{juv}) = 0.1$	See scenarios	460	38	484	550	567
2005	$F(\text{adult}) = 0.25, F(\text{juv}) = 0.1$	See scenarios	535	50	568	639	664
2006	$F(\text{adult}) = 0.25, F(\text{juv}) = 0.12$	See scenarios	455	43	490	511	515
2007	Bring SSB above B_{pa} by 2008	See scenarios	341	32	361	388	407
2008	$F(\text{adult}) = 0.17, F(\text{juv}) = 0.08$ (MP)	See scenarios	201	19	228	245	258
2009	Adopt one of the new proposed HCRs	See scenarios	171	16	167	166	168
2010	$F(\text{adult}) = 0.15, F(\text{juv}) = 0.05$ (MP)	See scenarios	164	14	175	175	188
2011	See scenarios	See scenarios	200	16	218	218	226
2012	2008 Management plan	See scenarios	405	18	425	425	435
2013	2008 Management plan	See scenarios	478	14	498	498	511
2014	2008 Management plan	See scenarios	470	13	504	508	517
2015	2008 Management plan	See scenarios	445	16	480	482	494
2016	2014 Management strategy	555.086	518	13			
2017	2014 Management strategy	458.926					

* Catch in directed fishery in Subarea 4 and Division 7.d (A-fleet).

** Revision of advice given in 1995.

*** Revised in June 1996, down from 263.

Landings are provided by ICES and do not in all cases correspond to official statistics.

ICES catch includes unallocated and misreported landings, discards, and slipping.

History of catch and landings

Table 6.3.18.10 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). Catch distribution by fleet and area in 2015 as estimated by ICES.

Area where NSAS are caught	Fleet	Fishery	NSAS 2015 catches (kt)
North Sea fisheries	A	Directed herring fisheries	472
	B	Bycatches of herring	8
Division 3.a	C	Directed herring fisheries	10
	D	Bycatches of herring	4

Table 6.3.18.11 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). Total catch distribution in 2015 as estimated by ICES.

Total catch (2015)	Landings		Discards
494 kt	97% directed fishery	3% bycatch	0 kt
	494 kt		

Table 6.3.18.12 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). History of commercial catch and landings of all stocks of herring caught in the North Sea. Catch in tonnes by country, 2005–2015. These figures do not in all cases correspond to the official statistics and cannot be used for legal purposes.

Country	2005	2006	2007	2008	2009	2010
Belgium	6	3	1	-	-	-
Denmark *	128380	102322	84697	62864	46238	45869
Faroe Islands	738	1785	2891	2014	1803	3014
France	38829	49475	24909	30347	18114	17745
Germany	46555	40414	14893	8095	5368	7670
Netherlands	81531	76315	66393	23122	24552	23872
Norway	156802	135361	100050	59321	50445	46816
Poland	458	-	-	-	-	90
Sweden	13464	10529	15448	13840	5299	4395
USSR/Russia	99	-	-	-	-	-
UK (England)	25311	22198	15993	11717	652	10770
UK (Scotland)	73227	48428	35115	16021	14006	14373
UK (N. Ireland)	2912	3531	638	331	-	-
Unallocated landings	57788	18764	26641	17151	-726	-
Total landings	626101	509125	387669	244823	165751	174614
Discards	12824	1492	93	224	91	13
Total catch	638925	510617	387762	245047	165842	174627
Parts of the catches which have been allocated to spring-spawning stocks.						
WBSS	7039	10954	1070	124	3941	774
Thames estuary **	74	65	2	7	48	85
Norw. spring spawners ***	417	626	685	2721	44560	56900
Country	2011	2012	2013	2014	2015	
Belgium	4	3	14	27	18	
Denmark *	58726	105707	117367	124423	113481	
Faroe Islands	-	-	-	118	981	
France	16693	23819	30122	29679	30269	
Germany	9427	24515	46922	36767	44377	
Netherlands	34708	72344	80462	74647	70076	
Norway	60705	119253	143718	142002	134349	
Lithuania	-	-	-	9830	-	
Sweden	8086	14092	15615	15583	13184	
Ireland	-	-	221	68	183	
UK (England)	11468	25346	19079	19287	18897	
UK (Scotland)	18564	34414	39243	45119	48332	
UK (N. Ireland)	17	4794	5738	6612	5948	
Unallocated landings	-	321	-	3292	1516	
Total landings	218398	424608	498501	507454	481611	
Discards	-	-	-	31	-	
Total catch	218398	424608	498501	507485	481611	
Parts of the catches which have been allocated to spring-spawning stocks.						
WBSS	308	2095	452	2953	2205	
Thames estuary **	2	63	20	10	10	
Norw. spring spawners ***	12178	9619	3150	2307	2191	

* Including any bycatches in the industrial fishery.

** Landings from the Thames estuary area are included in the North Sea catch figure for UK (England).

*** These catches (including some local fjord-type spring spawners) are taken by Norway under a separate quota south of 62°N and are not included in the Norwegian North Sea catch figure for this area.

Table 6.3.18.13 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). History of commercial catch and landings of all stocks of herring caught in Division 4.a West. Catch in tonnes by country, 2005–2015. These figures do not in all cases correspond to the official statistics and cannot be used for legal purposes.

Country	2005	2006	2007	2008	2009	2010
Denmark *	80990	60462	45948	28426	16550	25092
Faroe Islands		580	1118	2	288	1110
France	13474	18453	8570	13068	7067	6412
Germany	22278	18605	4985	498	-	505
Netherlands	36619	39209	42622	11634	11017	13593
Norway	66232	38363	40279	40304	25926	38897
Poland	458	-	-	-	-	90
Sweden	8261	4957	7658	7025	1435	2310
Russia	99	-	-	-	-	-
UK (England)	15523	12031	11833	8355	578	7384
UK (Scotland)	71941	47368	35115	14727	10249	13567
UK (N. Ireland)	2912	3531	638	331	-	-
Unallocated landings **	39324	10981	22215	14952	-977	0
Total landings	358111	253048	220981	139322	72133	108960
Discards	10861	1492	93	194	91	13
Total catch	368972	254540	221074	139516	72224	108973
Country	2011	2012	2013	2014	2015	
Denmark *	26523	42867	80874	74719	68017	
Faroe Islands	-	-	-	118	981	
France	7885	11131	9750	12620	13401	
Germany	2642	13060	19323	23245	32253	
Netherlands	15202	46654	18418	37380	44309	
Norway	45200	72581	49517	89974	47010	
Lithuania	-	-	-	8129	-	
Sweden	5121	6065	12280	7760	10388	
Ireland	-	-	221	68	183	
UK (England)	4555	18289	10874	10085	12249	
UK (Scotland)	17909	33352	37889	41844	46931	
UK (N. Ireland)	17	4794	5738	6021	4878	
Unallocated landings **	0	-3416	0	3292	1939	
Total landings	125054	245377	244884	315255	282539	
Discards	-	-	-	31	-	
Total catch	125054	245 377	244 884	315 286	282 539	

* Including any bycatches in the industrial fishery.

** May include misreported catch from Division 6.a N and discards. Negative unallocated catches due to misreporting into other areas.

Table 6.3.18.14 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). History of commercial catch and landings of all stocks of herring caught in Division 4.a East. Catch in tonnes by country, 2005–2015. These figures do not in all cases correspond to the official statistics and cannot be used for legal purposes.

Country	2005	2006	2007	2008	2009	2010
Denmark *	5761	8614	2646	1587	499	-
Faroe Islands	738	975	577	400	700	719
France	-	-	-	-	-	-
Germany	-	34	-	-	-	-
Netherlands	-	-	263	-	-	-
Norway	89925	90065	54424	17474	6981	7362
UK (Scotland)	-	83	-	-	-	-
Sweden	3510	2857	640	-	1735	1505
Unallocated landings **	0	0	-96	0	0	0
Total landings	99934	102628	58454	19461	9915	9586
Discards	-	-	-	-	-	-
Total catch	99934	102628	58454	19461	9915	9586
Norw. spring spawners ***	417	626	685	2721	44560	56900
Country	2011	2012	2013	2014	2015	
Denmark *	1590	1822	1162	-	16739	
Faroe Islands	-	-	-	-	-	
France	-	-	-	30	-	
Germany	-	-	15	-	-	
Netherlands	-	-	-	-	-	
Norway	12922	32714	76894	44060	67254	
UK (Scotland)	167	-	-	124	1369	
Sweden	150	815	865	940	570	
Unallocated landings	0	0	0	0	-423	
Total landings	14829	35351	78936	45154	85509	
Discards	-	-	-	-	-	
Total catch	14829	35351	78936	45154	85509	
Norw. spring spawners ***	12178	9619	3150	2307	2191	

* Including any bycatches in the industrial fishery.

** Negative unallocated catches due to misreporting into other areas.

*** These catches (including some fjord-type spring spawners) are taken by Norway under a separate quota south of 62°N and are not included in the Norwegian North Sea catch figure for this area.

Table 6.3.18.15 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). History of commercial catch and landings of all stocks of herring caught in Division 4.b. Catch in tonnes by country, 2005–2015. These figures do not in all cases correspond to the official statistics and cannot be used for legal purposes.

Country	2005	2006	2007	2008	2009	2010
Denmark*	41423	32277	35990	32230	29164	19671
Faroe Islands	-	200	1196	1612	815	1185
France	10205	17385	8421	9687	4316	2349
Germany	14381	14222	2205	2415	1061	1994
Netherlands	10038	13363	8550	904	3164	-
Norway	645	6933	5347	1543	17538	830
Sweden	1694	2715	7150	6815	2129	-
UK (England)	3869	4924	577	833	2	557
UK (Scotland)	1286	977	-	1293	3757	580
Unallocated landings**	10233	2364	-203	-904	-166	1577
Total landings	93774	95360	69233	56428	61780	805
Discards	1963	-	-	30	-	0
Total catch	95737	95360	69233	56458	61780	29548
Country	2011	2012	2013	2014	2015	
Denmark*	30498	60503	34707	49118	28551	
Faroe Islands	-	-	-	-	-	
France	1687	3898	8728	7839	6342	
Germany	1778	4187	17701	4424	107	
Lithuania	-	-	-	1701	-	
Netherlands	7314	9202	43339	22628	10606	
UK (N. Ireland)	-	-	-	591	1070	
Norway	2537	13958	17307	7968	20077	
Sweden	2815	7212	2470	6883	2226	
UK (England)	4748	3045	4391	4498	3484	
UK (Scotland)	488	1062	1312	3151	32	
Unallocated landings**	0	411	42	0	0	
Total landings	51865	103478	129955	108801	72495	
Discards	-	-	-	-	-	
Total catch	51865	103478	129997	108801	72495	

* Including any bycatches in the industrial fishery.

** Negative unallocated catches due to misreporting into other areas.

Table 6.3.18.16 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). History of commercial catch and landings of all stocks of herring caught in Divisions 4.c and 7.d. Catch in tonnes by country, 2005–2015. These figures do not in all cases correspond to the official statistics and cannot be used for legal purposes.

Country	2005	2006	2007	2008	2009	2010
Belgium	6	3	1	-	-	-
Denmark*	206	969	113	621	25	1106
Faroe Islands	-	30	-	-	-	8984
France	15150	13637	7918	7592	6731	5171
Germany	9896	7553	7703	5182	4307	9449
Netherlands	34874	23743	14958	10584	10371	-
UK (England)	5919	5243	3583	2529	72	1809
UK (Scotland)	-	-	-	1	-	1
Unallocated landings	8231	5419	4725	3103	417	0
Total landings	74282	56597	39001	29612	21923	26520
Discards	-	-	-	-	-	-
Total catch	74282	56597	39001	29612	21923	26520
**Coastal spring spawners included above	74	65	2	7	48	85
Country	2011	2012	2013	2014	2015	
Belgium	4	3	14	27	18	
Denmark*	115	515	624	586	174	
France	7121	8790	11644	9190	10526	
Germany	5007	7268	9883	9098	12017	
Netherlands	12192	16488	18705	14639	15161	
Norway	46	-	-	-	8	
UK (England)	2165	4012	3814	4704	3164	
UK (Scotland)	-	-	42	-	-	
***Unallocated landings	0	3326	-42	0	0	
Total landings	26650	40402	44684	38244	41068	
Discards	-	-	-	-	-	
Total catch	26650	40402	44684	38244	41068	
**Coastal spring spawners included above	2	63	20	10	10	

* Including any bycatches in the industrial fishery.

** Landings from the Thames estuary area are included in the North Sea catch figure for UK (England).

*** Negative unallocated catches due to misreporting into other areas.

Table 6.3.18.17 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). The “Wonderful Table”, which shows herring TACs and catches (in thousand tonnes) in Subarea 4 and divisions 7.d and 3.a.

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Subarea 4 and Division 7.d: TAC												
Agreed divisions 4.a–b	460.7	404.7	303.5	174.6	147.4	149.0	173.5	360.4	427.7	418.3	396.3	461.2
Agreed divisions 4.c and 7.d	74.3	50.0	37.5	26.7	23.6	15.3	26.5	44.6	50.3	51.7	49.0	57.0
Bycatch ceiling in the small-mesh fishery *	50.0	42.5	31.9	18.8	16.0	13.6	16.5	17.9	14.4	13.1	15.7	13.4
CATCH (Subarea 4 & Division 7.d)												
National catch divisions 4.a–b **	502.3	439.2	326.8	201.2	145.0	148.1	191.7	387.2	453.8	465.9	439.0	
Unallocated catch divisions 4.a–b	49.6	13.3	21.9	14.0	-1.1	0.0	0.0	-3.0	0.0	3.3	1.5	
Discard/slipping divisions 4.a–b ***	12.8	1.5	0.1	0.2	0.1	0.0	-	-	-	0.0	-	
Total catch divisions 4.a–b #	564.6	454.0	348.8	215.4	143.9	148.1	191.7	384.2	453.9	469.2	440.5	
National catch divisions 4.c and 7.d **	66.1	51.2	34.3	26.5	21.5	26.5	26.7	37.1	44.7	38.2	41.1	
Unallocated catch divisions 4.c and 7.d	8.2	5.4	4.7	3.1	0.4	0.0	0.0	3.3	0.0	0.0	0.0	
Discard/slipping divisions 4.c and 7.d ***	-	-	-	-	-	-	-	-	-	-	-	
Total catch divisions 4.c and 7.d	74.3	56.6	39.0	29.6	21.9	26.5	26.7	40.4	44.7	38.2	41.1	
Total catch in Subarea 4 and Division 7.d as used by ICES #	638.9	510.6	387.8	245.0	165.8	174.6	218.4	424.6	498.5	507.5	481.6	
CATCH BY FLEET/STOCK (Subarea 4 and Division 7.d) ##												
North Sea autumn spawners directed fisheries (A-fleet)	610.0	487.1	379.6	236.3	152.1	164.8	209.2	411.8	489.9	490.5	471.5	
North Sea autumn spawners industrial (B-fleet)	21.8	11.9	7.1	8.6	9.8	9.1	8.9	10.6	8.1	14.0	7.9	
North Sea autumn spawners in Subarea 4 and Division 7.d total	631.9	499.0	386.7	244.9	161.9	173.9	218.1	422.5	498.1	504.5	479.4	
Baltic-3a-type spring spawners in Subarea 4	7.0	11.0	1.1	0.1	3.9	0.8	0.3	2.1	0.5	3.0	2.2	
Coastal-type spring spawners	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	
Norw. spring spawners caught under a separate quota in Subarea 4 ###	0.4	0.6	0.7	2.7	44.6	56.9	12.2	9.6	3.2	2.3	2.2	
Division 3.a: TAC (Division 3.a)												
Agreed herring TAC	96.0	81.6	69.4	51.7	37.7	33.9	30.0	45.0	55.0	46.8	43.6	51.1
Bycatch ceiling in the small-mesh fishery	24.2	20.5	15.4	11.5	8.4	7.5	6.7	6.7	6.7	6.7	6.7	6.7
CATCH (Division 3.a)												
National catch	90.8	88.9	47.3	38.2	38.8	37.3	20.0	27.7	31.2	28.9	27.8	
Catch as used by ICES	69.6	51.2	47.4	38.2	38.8	37.3	20.0	27.7	31.2	28.9	27.8	
CATCH BY FLEET/STOCK (Division 3.a) ##												
Autumn spawners human consumption (C-fleet)	22.9	11.6	16.4	9.2	5.1	12.0	6.6	7.8	11.8	9.5	10.2	
Autumn spawners mixed clupeoid (D-fleet)	9.0	3.4	3.4	3.7	1.5	1.8	1.8	4.4	1.6	3.3	4.4	
Autumn spawners in Division 3.a total	31.9	15.0	19.8	12.9	6.5	13.8	8.4	12.2	13.4	12.8	14.7	
Spring spawners human consumption (C-fleet)	32.5	30.2	25.3	23.0	29.4	23.0	10.8	14.5	16.6	15.4	11.3	
Spring spawners mixed clupeoid (D-fleet)	5.1	5.9	2.3	2.2	2.9	0.5	0.8	1.0	1.3	0.6	1.8	
Spring spawners in Division 3.a total	37.6	36.1	27.6	25.2	32.3	23.5	11.6	15.5	17.9	16.1	13.1	
North Sea autumn spawners: Total as used by ICES	663.8	514.6	406.5	257.9	168.4	187.6	226.5	434.6	511.4	517.3	494.1	

* Divisions 4.a–b and EC zone of Division 2.a.

** ICES estimates.

*** Incomplete, only some countries providing discard information.

Includes spring spawners not included in the assessment.

Based on sum-of-products (number × mean weight-at-age).

These catches (including local fjord-type spring spawners) are taken by Norway under a separate quota south of 62°N and are not included in the Norwegian North Sea catch figure.

Summary of the assessment

Table 6.3.18.18 Herring in Subarea 4 and divisions 3.a and 7.d (autumn spawners). Assessment summary with weights (in tonnes).

Year	R _{Age} (w _r) ₀ (thousands)	High	Low	SSB * (tonnes)	High	Low	ICES estimated catch (tonnes)	F _{Ages} (w _r) ₂₋₆	High	Low	Model catch tonnes	High	Low
1947	59233629	104050030	33720536	4911058	6606908	3650496	581760	0.134	0.193	0.092	847461	105043	683705
1948	55895811	93497121	33416448	4081602	5465368	3048188	502100	0.133	0.185	0.095	688314	828325	571968
1949	49229323	81872916	29601074	3984809	5287870	3002855	508500	0.144	0.201	0.103	714258	860783	592675
1950	67524429	109742668	41547637	3909813	5128294	2980842	491700	0.152	0.208	0.111	657368	759496	568974
1951	60008693	96215902	37426696	3689494	4816415	2826245	600400	0.183	0.245	0.137	770658	880132	674801
1952	58235169	92094557	36824487	3674766	4813293	2805544	664400	0.189	0.254	0.141	830680	939136	734749
1953	60430228	93114158	39218660	3457305	4553468	2625023	698500	0.198	0.267	0.147	842391	949608	747280
1954	56344771	85398031	37175719	3233255	4285090	2439608	762900	0.221	0.300	0.163	918043	103408	815024
1955	48690768	73213882	32381713	3169232	4183642	2400787	806400	0.219	0.295	0.162	864581	970436	770272
1956	35855230	53844025	23876326	2916807	3851326	2209048	675200	0.221	0.295	0.166	850007	955555	756118
1957	92711215	140747773	61069310	2655119	3495024	2017055	682900	0.234	0.312	0.176	784655	878908	700511
1958	34483793	51277509	23190127	2173828	2867491	1647965	670500	0.243	0.321	0.184	791749	887295	706492
1959	39467969	59604808	26134144	3282120	4267681	2524160	784500	0.260	0.342	0.197	114052	134432	967620
1960	16014418	24478859	10476860	2757955	3565304	2133427	696200	0.228	0.297	0.176	835679	954882	731357
1961	75300701	114453090	49541656	2610363	3314789	2055635	696700	0.263	0.334	0.207	762990	877650	663310
1962	35180412	52315434	23657672	1846865	2365706	1441814	627800	0.288	0.369	0.226	678066	775036	593229
1963	44678368	64589241	30905404	2774552	3489199	2206277	716000	0.207	0.262	0.163	654744	773386	554303
1964	47870021	69054210	33184637	2535750	3077887	2089105	871200	0.296	0.359	0.244	930056	106352	813340
1965	23700341	34304037	16374346	2014739	2388769	1699273	1168800	0.486	0.583	0.405	123428	142331	1070358
1966	23724053	33893696	16605764	1576945	1861499	1335889	895500	0.504	0.593	0.428	972864	109848	861614
1967	31046604	44083883	21864944	1003496	1174912	857088	695500	0.663	0.777	0.566	832343	940459	736656
1968	31484314	44840540	22106380	546888	639915	467386	717800	0.992	1.159	0.849	820771	952604	707184
1969	15556669	22513741	10749433	484562	593052	395918	546700	0.904	1.058	0.772	552937	638150	479103
1970	31832553	44677564	22680543	459089	563575	373975	563100	0.962	1.113	0.832	534453	618795	461608
1971	24618285	34261554	17689213	320296	388221	264255	520100	1.305	1.515	1.124	542531	624182	471561
1972	16869199	23377879	12172614	322223	391398	265275	497500	0.691	0.816	0.584	469301	544109	404778
1973	8418986	11816431	5998370	280408	335585	234303	484000	0.898	1.034	0.780	445521	512612	387211
1974	15855072	22330214	11257541	188339	223639	158611	275100	0.916	1.058	0.793	273211	310692	240252

Year	R _{Age} (w _r) ₀ (thousands)	High	Low	SSB * (tonnes)	High	Low	ICES estimated catch (tonnes)	F _{Ages} (w _r) ₂₋₆	High	Low	Model catch tonnes	High	Low
1975	3392237	5059118	2274560	108120	130393	89652	312800	1.089	1.301	0.912	269682	318322	228475
1976	4210113	6454954	2745961	147561	193974	112254	174800	0.851	1.090	0.665	150995	186143	122483
1977	4723214	7421107	3006121	104925	141797	77641	46000	0.394	0.528	0.294	59755	72132	49501
1978	4985279	8013306	3101468	132191	174968	99872	11000	0.286	0.393	0.207	51226	71253	36828
1979	9426166	14535452	6112820	164391	209827	128793	25100	0.235	0.320	0.173	64667	90544	46185
1980	14461493	20574134	10164937	183139	226887	147826	70764	0.208	0.261	0.166	80902	94983	68909
1981	32443154	45225028	23273799	270493	335226	218259	174879	0.230	0.285	0.185	159532	195193	130386
1982	51084925	69803087	37386162	378511	465395	307847	275079	0.208	0.257	0.169	271034	332036	221240
1983	47583661	64420187	35147442	571489	700607	466166	387202	0.259	0.317	0.212	402721	479198	338450
1984	43618852	59291422	32089030	919881	1127935	750205	428631	0.342	0.414	0.283	453160	514873	398843
1985	52169052	72106504	37744306	975787	1176486	809326	613780	0.441	0.535	0.363	612314	697089	537849
1986	60068732	83232129	43351679	995500	1189074	833438	671488	0.427	0.514	0.354	765282	874334	669832
1987	61898097	84313521	45441993	1153141	1379390	964002	792058	0.420	0.503	0.351	786226	889216	695165
1988	31610503	43214161	23122603	1468864	1752797	1230925	887686	0.409	0.488	0.343	103302	118324	901871
1989	26376922	35993755	19329520	1521185	1766344	1310052	787899	0.394	0.467	0.332	796514	890438	712497
1990	21638831	29933763	15642504	1569080	1812616	1358265	645229	0.333	0.396	0.280	693149	772997	621548
1991	23324153	31864172	17072972	1362729	1570034	1182796	658008	0.363	0.430	0.307	673336	747339	606661
1992	45262978	60162079	34053630	1047587	1213926	904041	716799	0.406	0.482	0.342	700115	784415	624875
1993	39586551	52620251	29781215	741922	869432	633113	671397	0.466	0.555	0.391	682829	766083	608623
1994	28036001	37672118	20864698	790167	921695	677409	568234	0.487	0.579	0.409	600790	679435	531247
1995	36433528	49488457	26822456	829020	977517	703082	579371	0.428	0.520	0.353	549630	626257	482378
1996	33264456	45916799	24098458	946949	1118315	801842	275098	0.254	0.318	0.203	294196	338010	256061
1997	22953936	32209320	16358098	1091431	1288433	924550	264313	0.225	0.277	0.182	281813	321953	246678
1998	16751527	23382396	12001066	1314543	1532269	1127755	391628	0.252	0.309	0.205	386930	435052	344132
1999	53865459	75175595	38596139	1372302	1601859	1175642	363163	0.241	0.293	0.198	363306	412995	319595
2000	37132383	51728239	26654954	1373675	1599949	1179402	388157	0.242	0.293	0.200	377377	422607	336988
2001	65136785	90838376	46707140	1874776	2192088	1603397	374065	0.211	0.258	0.172	384616	431904	342505
2002	34346133	47912472	24621081	2162985	2518886	1857371	394709	0.197	0.241	0.162	407176	461754	359049
2003	16518640	22983778	11872090	2219961	2565590	1920894	482281	0.225	0.273	0.186	496828	558352	442084
2004	19638451	27210797	14173373	2184724	2525892	1889637	587698	0.272	0.334	0.222	587717	661710	521997
2005	18201235	25176934	13158272	2069878	2407568	1779552	663813	0.291	0.355	0.238	641138	731736	561757

Year	R _{Age} (w _r) ₀ (thousands)	High	Low	SSB *	High	Low	ICES estimated catch (tonnes)	F _{Ages} (w _r) ₂₋₆	High	Low	Model catch tonnes	High	Low
2006	21189154	29344474	15300334	1618483	1884011	1390378	514597	0.258	0.316	0.211	509915	577882	449943
2007	20542367	29022652	14539982	1292385	1507253	1108148	406482	0.224	0.276	0.182	369165	431325	315964
2008	21295365	30290043	14971671	1358647	1579044	1169013	257870	0.145	0.177	0.119	253470	289513	221914
2009	27896171	38974385	19966867	1676133	1953101	1438442	168443	0.085	0.107	0.068	181498	209308	157383
2010	27180218	38027738	19426984	1739312	2041223	1482055	187611	0.090	0.111	0.073	193300	217040	172157
2011	23324153	32473223	16752760	2084418	2404222	1807153	226478	0.117	0.142	0.096	234685	263800	208783
2012	25597366	35716438	18345198	2267073	2619185	1962297	434710	0.182	0.222	0.149	416649	473913	366304
2013	30280061	43436749	21108442	2026863	2342149	1754020	511416	0.218	0.267	0.178	482145	545462	426178
2014	38339835	57098682	25743904	1947389	2267215	1672679	517356	0.227	0.280	0.184	505347	569194	448662
2015	13524319	21294837	8589274	1803068	2160125	1505030	494099	0.242	0.323	0.182	474967	547312	412184
2016	23394231	47074857	11625952	2008169 **									
Avg.	34185253	50033589	23485574	1671339	2064348	1343627	518898	0.362	0.443	0.297	564341	646561	492902

* At spawning time (September).

** Predicted.

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