

8.3.14 Herring (*Clupea harengus*) in subdivisions 25–29 and 32 (central Baltic Sea, excluding Gulf of Riga)

ICES stock advice

ICES advises that when the MSY approach is applied, catches in 2017 should be no more than 216 kt. This applies to all catches from the stock, including those taken in Subdivision 28.1.

Stock development over time

Spawning-stock biomass (SSB) decreased until 2001 and then increased, and it has been above MSY B_{trigger} since 2007. Fishing mortality (F) increased until 2000 and then decreased, remaining below F_{MSY} since 2011. The 2014 year class (recruitment in 2015) is estimated to be the fourth highest of the whole time-series.

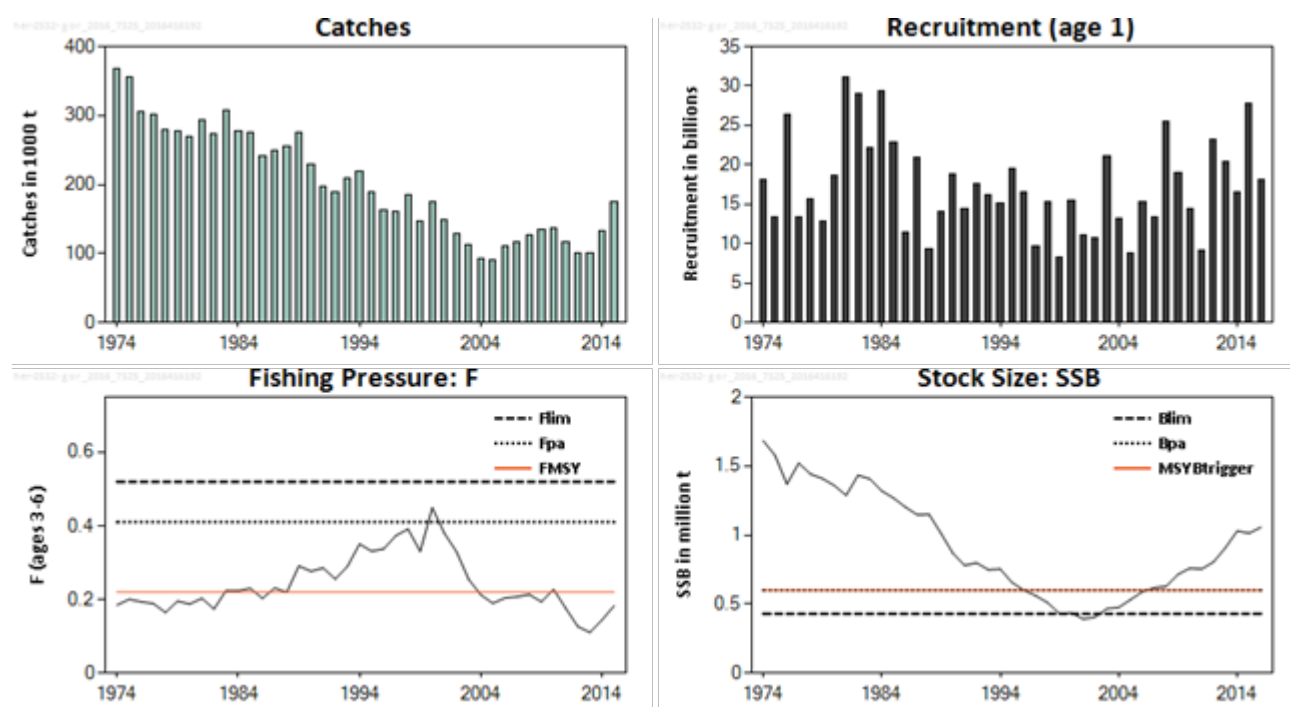


Figure 8.3.14.1 Herring in subdivisions 25–29 and 32 (excluding Gulf of Riga herring). Summary of stock assessment (SSB in 2016 is predicted).

Stock and exploitation status

Table 8.3.14.1 Herring in subdivisions 25–29 and 32. 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}	✓	✓	✓ Below	$\text{MSY } B_{\text{trigger}}$	✓	✓ Above trigger
Precautionary approach	$F_{\text{pa}}, F_{\text{lim}}$	✓	✓	✓ Harvested sustainably	$B_{\text{pa}}, B_{\text{lim}}$	✓	✓ Full reproductive capacity
Management plan	F_{MGT}	-	-	- Not applicable	SSB_{MGT}	-	- Not applicable

Catch options

Table 8.3.14.2 Herring in subdivisions 25–29 and 32 (excluding Gulf of Riga herring). The basis for the catch options.

Variable	Value	Source	Notes
F ages 3–6 (2016)	0.22	ICES (2016a)	TAC constraint*
SSB (2016)	1057 kt	ICES (2016a)	
R _{age1} (2016)	18.2 billions	ICES (2016a)	RCT3 estimate
R _{age1} (2017–2018)	14.6 billions	ICES (2016a)	Geometric mean 1988–2014
Total catch (2016)	211 kt	ICES (2016a)	
Discards (2016)	0	ICES (2016a)	

* TAC constraint in 2016: EU share 177 505 t + Russian quota 29 100 t + central Baltic herring stock caught in Gulf of Riga 4 620 t (mean 2010–2014) – Gulf of Riga herring stock caught in central Baltic Sea 220 t (mean 2010–2014) = 211 005 t.

Table 8.3.14.3 Herring in subdivisions 25–29 and 32 (excluding Gulf of Riga herring). The catch options. Weights in thousand tonnes.

Option	Rationale	Catches (2017)	Basis	F (2017)	SSB (2017)	SSB (2018)	%SSB change*	%Advice change**
1	MSY approach	216	F _{MSY}	0.22	1082	1028	–5%	8%
3a	F _{MSY} ranges with Advice Rule included [^]	161	MSY F _{lower(AR)}	0.16	1103	1097	–1%	–20%
3b		268	MSY F _{upper(AR)}	0.28	1062	964	–9%	33%
4	Precautionary approach	372	F _{pa}	0.41	1021	841	–18%	85%
5	Zero catch	0	F = 0	0	1159	1309	13%	–100%
6	Other options	171	MSY F _{lower(AR)} differing by 0.01	0.17	1099	1085	–1%	–15%
		180	MSY F _{lower(AR)} differing by 0.02	0.18	1096	1074	–2%	–10%
		189	MSY F _{lower(AR)} differing by 0.03	0.19	1093	1062	–3%	–6%
		198	MSY F _{lower(AR)} differing by 0.04	0.20	1089	1051	–4%	–1%
		207	MSY F _{lower(AR)} differing by 0.05	0.21	1086	1039	–4%	3%
		225	MSY F _{upper(AR)} differing by 0.05	0.23	1079	1017	–6%	12%
		234	MSY F _{upper(AR)} differing by 0.04	0.24	1076	1006	–6%	16%
		243	MSY F _{upper(AR)} differing by 0.03	0.25	1072	996	–7%	21%
		251	MSY F _{upper(AR)} differing by 0.02	0.26	1069	985	–8%	25%
		260	MSY F _{upper(AR)} differing by 0.01	0.27	1066	975	–9%	29%
		216	F _{sq} (F ₂₀₁₆)	0.22	1082	1028	–5%	8%
		451	F _{lim}	0.52	987	751	–24%	124%
		591	B _{pa} in 2018	0.74	921	600	–35%	194%
		591	MSY B _{trigger} in 2018	0.74	921	600	–35%	194%
		765	B _{lim} in 2018	1.10	828	430	–48%	280%

* SSB 2018 relative to SSB 2017.

** Catches in 2017 relative to 2015 ICES advice for 2016 (201 thousand tonnes).

[^] Ranges with the advice rule (AR) advised by ICES in 2015 (ICES, 2015). 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, 2015).

Basis of the advice

Table 8.3.14.4 Herring in subdivisions 25–29 and 32 (excluding Gulf of Riga herring). The basis of the advice.

Advice basis	MSY approach
Management plan	There is a proposed EU management plan for the Baltic Sea. The plan has not been formally implemented.

Quality of the assessment

Herring in the central Baltic is composed of a number of local populations differing in growth parameters. Among the factors influencing the future mean weight-at-age of the stock is recruitment success for the individual populations. Separate trial assessments for different populations conducted in 2013 (ICES, 2013), however, showed only a limited impact of this complex stock structure on the perception of the overall stock dynamics.

Preliminary investigations indicate that western Baltic spring-spawning herring (Division 3a and subdivisions 22–24) and central Baltic herring (subdivisions 25–29 and 32, excluding Gulf of Riga herring) are mixing in subdivisions 24–26 (Gröhsler *et al.*, 2013). However, this is not taken into account in the current assessment.

Species misreporting of herring has occurred in the past; this is presently considered to be negligible.

Assessments have generally shown an overall upwards revision in SSB and a downwards revision in fishing mortality. However, this does not hold for the last assessment.

Natural mortality (M) in this year's assessment was estimated differently from previous years. In the current assessment, the natural mortalities from 2012 onwards were based on the regression of M against the SSB of eastern Baltic cod, whereas in previous assessment years they were assumed equal to the value of M in 2011 from a multispecies assessment model (SMS). The change of procedure is due to no updated multispecies values being available after 2011 because an analytical assessment for eastern Baltic cod is lacking.

As discarding is considered negligible for this stock, the EU landing obligation should not influence the future perception of this stock.



Figure 8.3.14.2 Herring in subdivisions 25–29 and 32 (excluding Gulf of Riga herring). Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

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 (EU, 2013 – Article 15). 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.

A mixture of central Baltic herring (subdivisions 25–27, 28.2, 29, and 32) and the Gulf of Riga (Subdivision 28.1) herring is caught in the central Baltic Sea. The assessment and the advice consider that the central Baltic herring stock is caught both in and outside the central Baltic Sea. The TAC (sum of the EU and Russia autonomous quotas) is set for herring caught in the

central Baltic management area, which includes also a small amount of Gulf of Riga herring caught in the central Baltic Sea but excludes central Baltic herring caught outside the central Baltic Sea.

The TAC value proposed for the central Baltic area is based on the advised catch for the central Baltic herring stock, plus the assumed catch of the Gulf of Riga herring taken in the central Baltic, minus the assumed catch of herring from the central Baltic stock taken in the Gulf of Riga. The values of the two latter are given by the average over the last five years.

- Central Baltic herring assumed to be taken in the Gulf of Riga in 2017 (Subdivision 28.1) is 4574 t (average 2011–2015);
- Gulf of Riga herring assumed to be taken in Subdivision 28.2 in 2017 is 223 t (average 2011–2015).

Following the ICES MSY approach catches in 2017 should be no more than 216 kt. The corresponding TAC in the central Baltic management area for 2017 would be calculated as 216 kt + 0.223 kt – 4.574 kt = 211.649 kt.

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, 2014).

Reference points

Table 8.3.14.5 Herring in subdivisions 25–29 and 32 (excluding Gulf of Riga herring). Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	F_{MSY}	0.22	Stochastic simulations with Beverton, Ricker, and segmented regression stock–recruitment curve from the full time-series (1974–2013).	ICES (2015)
	$MSY B_{trigger}$	600 000 t	B_{pa}	ICES (2013)
	Multispecies F_{MSY}	0.25–0.35	Multispecies model (SMS). One of several options giving a high sustainable yield of herring as well as of cod and sprat because of low to moderate predation from cod.	ICES (2013)
Precautionary approach	B_{lim}	430 000 t	B_{loss}	ICES (2013)
	B_{pa}	600 000 t	$1.4 \times B_{lim}$	ICES (2013)
	F_{lim}	0.52	Consistent with B_{lim}	ICES (2013)
	F_{pa}	0.41	Consistent with B_{pa}	ICES (2013)
Management plan	SSB_{MGT}	Not defined		
	F_{MGT}	Not defined		

Basis of the assessment

Table 8.3.14.6 Herring in subdivisions 25–29 and 32 (excluding Gulf of Riga herring). The basis of the assessment.

ICES stock data category	1 (see ICES, 2016b)
Assessment type	Age-based analytical assessment (XSA; ICES, 2016a) that uses catches in the model and in the forecast.
Input data	Commercial catches (international landings, age and length frequencies from catch sampling); one survey acoustic index (BIAS); natural mortalities from multispecies model (SMS) until 2011, for 2012–2015 natural mortalities are based on regression of M against eastern Baltic cod SSB; fixed maturity ogive.
Discards and bycatch	Not included; considered negligible.
Indicators	None
Other information	Last benchmarked in 2013 (ICES, 2013).
Working group	Baltic Fisheries Assessment Working Group (WGBFAS)

Information from stakeholders

ICES received information from the EU fishing industry that the provision for interspecies flexibility (EU, 2013 – Article 15) has not been used by most nations. The exception is the Danish sprat fishery in 2015, where bycatches of herring could be accounted for against the sprat quota. The total bycatch of herring in this fishery was 1097.2 t, corresponding to 4% of the total catch of sprat by this fleet. This bycatch is included as herring in the catch statistics and included in the herring assessment.

History of the advice, catch, and management

Table 8.3.14.7 Herring in subdivisions 25–29 and 32 (excluding Gulf of Riga herring). History of ICES advice, the agreed TAC, and ICES estimates of catches. Weights in thousand tonnes.

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC*	ICES catch SDs 25–29+32
1988**		204	399	286
1989**		176	399	290
1990**		112	399	244
1991**	TAC for entire area	293	402	213
1992**	F near present level	343	402	210
1993**	Increase in yield at higher F	371	560	231
1994**	Increase in yield at higher F	317–463	560	242
1995**	TAC	394	560	221
1996**	TAC	394	560	195
1997**	No advice	-	560	208
1998**	No advice	-	560	212
1999**	Proposed $F_{pa} = (0.17)$	117	476	178
2000**	Proposed $F_{pa} = (0.17)$	95	405	208
2001**	Proposed $F_{pa} = (0.17)$	60	300	188
2002**	$F < F_{pa}$	< 73	Not agreed	168
2003**	$F < F_{pa}$	< 72	143	154
2004	$F < F_{pa}$	< 80	171	93 ^{^^}
2005	$F < F_{pa}$ (single-stock exploitation boundaries)	< 130	130 ^{***}	92 ^{^^}
2006	$F < F_{pa}$ (single-stock exploitation boundaries)	< 120	128 ^{***}	110 ^{^^}
2007	$F < F_{pa}$ (single-stock exploitation boundaries)	< 164	133 [^]	116 ^{^^}
2008	$F < F_{pa}$ (single-stock exploitation boundaries)	< 194	153 [^]	126 ^{^^}
2009	$F < F_{pa}$ (single-stock exploitation boundaries)	< 147	144 [^]	132 ^{^^}
2010	$F < F_{pa}$ (single-stock exploitation boundaries)	< 103	126 [^]	137 ^{^^}
2011	MSY Framework ($F = 0.19$)	< 95	120.020 ^{^^}	117 ^{^^}
2012	MSY transition ($F = F_{pa} = 0.19$)	< 92	93.317 ^{^^}	101 ^{^^}
2013	MSY transition ($F = F_{pa} = 0.19$)	< 117	101.480 ^{^^}	101 ^{^^}
2014	MSY approach	< 164	132.225 ^{^^}	133 ^{^^}
2015	MSY approach ($F_{MSY} = 0.26$)	< 193	186.351 ^{^^}	174 ^{^^}
2016	MSY approach ($F_{MSY} = 0.22$)	≤ 201	206.605 ^{^^}	
2017	MSY approach ($F_{MSY} = 0.22$)	≤ 216		

* TAC for subdivisions 22–29S and 32.

** 1987–2003 incl. Gulf of Riga herring.

*** TAC for subdivisions 25–28(2), 29, and 32.

[^] EU TAC for subdivisions 25–28(2), 29, and 32.

^{^^} TAC is calculated as EU (subdivisions 25–28(2), 29, and 32) + Russian autonomous quotas.

^{^^^} Excl. the Gulf of Riga (Subdivision 28.1) herring stock.

History of catch and landings

Table 8.3.14.8 Herring in subdivisions 25–29 and 32 (excluding Gulf of Riga herring). Catch distribution by fleet in 2015 as estimated by ICES.

Total herring catch in the central Baltic management area (2015)	Total catch of stock (2015)	Landings	Discards
170 kt	174 kt	Mainly pelagic trawls 174 kt	Discarding is considered to be negligible.

Table 8.3.14.9 Herring in subdivisions 25–29 and 32 (excluding Gulf of Riga herring). History of central Baltic herring stock catch presented for each country participating in the fishery. Weights in thousand tonnes.

Year	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Russia**	Sweden	Total
1977	11.9		33.7	0.0			57.2	112.8	48.7	264.3
1978	13.9		38.3	0.1			61.3	113.9	55.4	282.9
1979	19.4		40.4	0.0			70.4	101.0	71.3	302.5
1980	10.6		44.0	0.0			58.3	103.0	72.5	288.4
1981	14.1		42.5	1.0			51.2	93.4	72.9	275.1
1982	15.3		47.5	1.3			63.0	86.4	83.8	297.3
1983	10.5		59.1	1.0			67.1	69.1	78.6	285.4
1984	6.5		54.1	0.0			65.8	89.8	56.9	273.1
1985	7.6		54.2	0.0			72.8	95.2	42.5	272.3
1986	3.9		49.4	0.0			67.8	98.8	29.7	249.6
1987	4.2		50.4	0.0			55.5	100.9	25.4	236.4
1988	10.8		58.1	0.0			57.2	106.0	33.4	265.5
1989	7.3		50.0	0.0			51.8	105.0	55.4	269.5
1990	4.6		26.9	0.0			52.3	101.3	44.2	229.3
1991	6.8	27.0	18.1	0.0	20.7	6.5	47.1	31.9	36.5	194.6
1992	8.1	22.3	30.0	0.0	12.5	4.6	39.2	29.5	43.0	189.2
1993	8.9	25.4	32.3	0.0	9.6	3.0	41.1	21.6	66.4	208.3
1994	11.3	26.3	38.2	3.7	9.8	4.9	46.1	16.7	61.6	218.6
1995	11.4	30.7	31.4	0.0	9.3	3.6	38.7	17.0	47.2	189.3
1996	12.1	35.9	31.5	0.0	11.6	4.2	30.7	14.6	25.9	166.7
1997	9.4	42.6	23.7	0.0	10.1	3.3	26.2	12.5	44.1	172.0
1998	13.9	34.0	24.8	0.0	10.0	2.4	19.3	10.5	71.0	185.9
1999	6.2	35.4	17.9	0.0	8.3	1.3	18.1	12.7	48.9	148.7
2000	15.8	30.1	23.3	0.0	6.7	1.1	23.1	14.8	60.2	175.1
2001	15.8	27.4	26.1	0.0	5.2	1.6	28.4	15.8	29.8	150.2
2002	4.6	21.0	25.7	0.3	3.9	1.5	28.5	14.2	29.4	129.1
2003	5.3	13.3	14.7	3.9	3.1	2.1	26.3	13.4	31.8	113.8
2004	0.2	10.9	14.5	4.3	2.7	1.8	22.8	6.5	29.3	93.0
2005	3.1	10.8	6.4	3.7	2.0	0.7	18.5	7.0	39.4	91.6
2006	0.1	13.4	9.6	3.2	3.0	1.2	16.8	7.6	55.3	110.4
2007	1.4	14.0	13.9	1.7	3.2	3.5	19.8	8.8	49.9	116.0
2008	1.2	21.6	19.1	3.4	3.5	1.7	13.3	8.6	53.7	126.2
2009	1.5	19.9	23.3	1.3	4.1	3.6	18.4	11.8	50.2	134.1
2010	5.4	17.9	21.6	2.2	3.9	1.5	25.0	9.1	50.0	136.7
2011	1.8	14.9	19.2	2.7	3.4	2.0	28.0	8.5	36.2	116.8
2012	1.4	11.4	18.0	0.9	2.6	1.8	25.5	13.0	26.2	101.0
2013	3.4	12.6	18.2	1.4	3.5	1.7	20.6	10.0	29.5	101.0
2014	2.7	15.3	27.9	1.7	4.9	2.1	27.3	15.9	34.9	132.7
*2015	0.3	18.8	31.6	2.9	5.7	4.7	39.0	20.9	50.6	174.4

* Preliminary.

** In 1977–1990 sum of catches for Estonia, Latvia, Lithuania, and Russia.

Table 8.3.14.10 Herring in subdivisions 25–29 and 32 (excluding Gulf of Riga herring). Catches (in thousand tonnes) from the central Baltic management area and of the central Baltic stock.

Year	Catches of herring from the central Baltic area			Central Baltic herring stock catches	
	Central Baltic herring stock	Gulf of Riga herring stock	Total	Central Baltic herring caught in Gulf of Riga	Total catch of central Baltic herring stock
1977	261.9	-	261.9	2.4	264.3
1978	276.6	-	276.6	6.3	282.9
1979	297.8	-	297.8	4.7	302.5
1980	282.7	-	282.7	5.7	288.4
1981	269.2	-	269.2	5.9	275.1
1982	292.6	-	292.6	4.7	297.3
1983	280.6	-	280.6	4.8	285.4
1984	269.3	-	269.3	3.8	273.1
1985	267.7	-	267.7	4.6	272.3
1986	248.3	-	248.3	1.3	249.6
1987	231.6	-	231.6	4.8	236.4
1988	262.5	-	262.5	3.0	265.5
1989	263.6	-	263.6	5.9	269.5
1990	223.3	-	223.3	6.0	229.3
1991	188.5	-	188.5	6.1	194.6
1992	185.7	1.3	187.0	3.5	189.2
1993	204.0	1.2	205.2	4.3	208.3
1994	213.6	2.1	215.7	5.0	218.6
1995	183.2	2.4	185.6	6.1	189.3
1996	162.3	4.3	166.6	4.4	166.7
1997	167.7	2.9	170.6	4.3	172.0
1998	181.8	2.8	184.6	4.1	185.9
1999	144.4	1.9	146.3	4.3	148.7
2000	170.5	1.9	172.4	4.6	175.1
2001	147.3	1.2	148.5	2.9	150.2
2002	125.6	0.4	126.0	3.5	129.1
2003	109.5	0.4	109.9	4.3	113.8
2004	89.7	0.2	89.9	3.3	93.0
2005	89.3	0.5	89.8	2.3	91.6
2006	107.2	0.4	107.6	3.2	110.4
2007	114.5	0.1	114.6	1.5	116.0
2008	120.1	0.1	120.2	6.1	126.2
2009	129.2	0.1	129.3	4.9	134.1
2010	131.5	0.4	131.9	5.2	136.7
2011	111.3	0.1	111.4	5.5	116.8
2012	97.2	0.2	97.4	3.8	101.0
2013	96.9	0.3	97.2	4.1	101.0
2014	128.2	0.2	128.4	4.5	132.7
2015	169.5	0.3	169.8	5.0	174.4

Summary of the assessment

Table 8.3.14.11 Herring in subdivisions 25–29 and 32 (excluding Gulf of Riga herring). Assessment summary with weights (in tonnes). Recruitment (in thousands).

Year	Recruitment (age 1)	SSB*	Total catch	Mean F (ages 3–6)
1974	18110427	1682942	368652	0.185
1975	13326217	1576946	354851	0.2
1976	26350654	1368401	305420	0.194
1977	13394927	1521341	301952	0.189
1978	15694347	1441096	278966	0.164
1979	12846860	1409250	278182	0.195
1980	18701103	1358036	270282	0.187
1981	31164727	1287374	293615	0.203
1982	29059396	1432878	273134	0.174
1983	22091938	1406255	307601	0.224
1984	29393587	1319032	277926	0.224
1985	22824876	1267672	275760	0.23
1986	11483004	1202236	240516	0.203
1987	20934696	1146459	248653	0.231
1988	9339887	1149871	255734	0.219
1989	14109675	1011958	275501	0.291
1990	18832157	868482	228572	0.276
1991	14470328	779647	197676	0.286
1992	17595434	798250	189781	0.255
1993	16122172	748273	209094	0.29
1994	15183340	753058	218260	0.351
1995	19536301	655277	188181	0.331
1996	16475168	599326	162578	0.337
1997	9688306	560805	160002	0.373
1998	15314962	509025	185780	0.391
1999	8276822	430939	145922	0.33
2000	15472212	436319	175646	0.449
2001	11103407	390937	148404	0.38
2002	10765549	404834	129222	0.329
2003	21038789	466643	113584	0.254
2004	13124032	475198	93006	0.213
2005	8719496	531875	91592	0.19
2006	15265208	589385	110372	0.204
2007	13331061	617797	116030	0.207
2008	25527474	628514	126155	0.214
2009	18921364	714242	134127	0.194
2010	14378664	759222	136706	0.227
2011	9173344	753878	116785	0.176
2012	23276495	804999	100893	0.126
2013	20427114	907367	100954	0.111
2014	16568898	1029218	132700	0.144
2015	27746226	1013132	174433	0.183
2016	18192000**	1056648***		
Average	17287271	927094	202219	0.241

* At spawning time.

** Output from survey data (RCT3 analysis).

*** Predicted.

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