

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

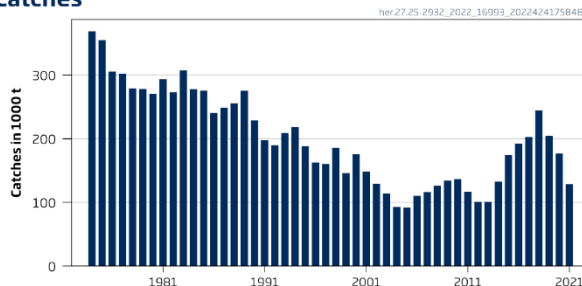
ICES advice on fishing opportunities

ICES advises that when the EU multiannual plan (MAP) for the Baltic Sea is applied, catches in 2023 that correspond to the F ranges in the plan are between 70 130 and 95 643 tonnes. The current advice applies to all catches from the stock, including those taken in Subdivision 28.1.

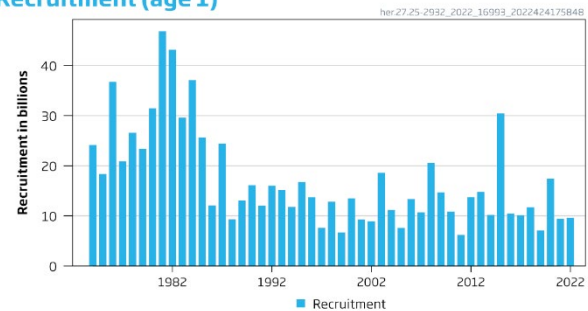
Stock development over time

Fishing pressure on the stock is above F_{MSY} and between F_{pa} and F_{lim} and that spawning-stock size is below $MSY B_{trigger}$ and between B_{pa} and B_{lim} .

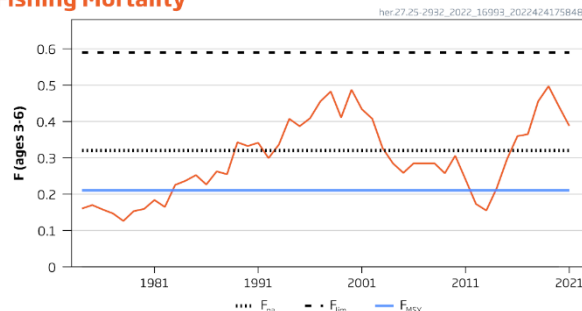
Catches



Recruitment (age 1)



Fishing Mortality



SSB

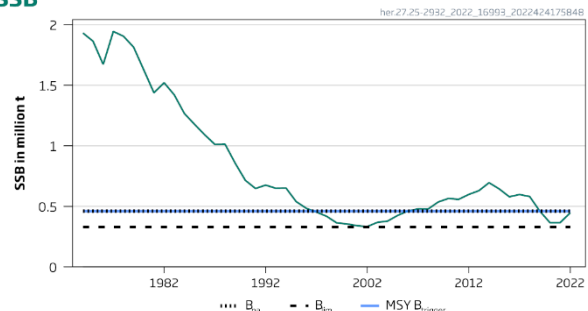


Figure 1 Herring in subdivisions 25–29 and 32, excluding the Gulf of Riga. Summary of the stock assessment. SSB at spawning time in 2022 is predicted.

Catch scenarios

Table 1 Herring in subdivisions 25–29 and 32, excluding the Gulf of Riga. Values in the forecast and for the interim year.

Variable	Value	Notes
$F_{ages\ 3-6}$ (2022)	0.20	Based on a Catch constraint *
SSB (2022)	446 582	Projected at spawning time; tonnes
$R_{age\ 1}$ (2022)	9 597 000	RCT3 estimate; thousands
$R_{age\ 1}$ (2023–2024)	12 085 820	Geometric mean 1988–2020; thousands
Total catch (2022)	83 505	Catch constraint *; tonnes

* Catch constraint in 2022: EU share (53 653 tonnes) + Russian quota (27 100 tonnes) + central Baltic herring stock caught in Gulf of Riga (3 448 tonnes [mean 2016–2020]) – Gulf of Riga herring stock caught in central Baltic Sea (696 tonnes [mean 2016–2020]) = 83 505 tonnes.

Table 2 Herring in subdivisions 25–29 and 32, excluding the Gulf of Riga. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2023)	F _{total} (2023)	SSB # (2023)	SSB # (2024)	% SSB change *	% Advice change **
ICES advice basis						
EU MAP ^{^^} : $F = F_{MSY} \times SSB_{2022}/MSY B_{trigger}$	95 643	0.20	497 552	543 708	9%	33%
EU MAP ^{^^} : $F = MAP \text{ range } F_{lower} \times SSB_{2022}/MSY B_{trigger}$	70 130	0.146	506 752	577 547	14%	34%***
Other scenarios						
F_{MSY}	98 153	0.21	496 630	540 417	9%	36%
$F = 0$	0	0.00	530 608	674 227	27%	–100%
$F = F_{pa}$	142 511	0.32	479 824	483 450	1%	98%
$F = F_{lim}$	234 722	0.59	441 245	372 387	–16%	226%
$SSB (2024) = B_{lim}$	269 620	0.71	425 098	333 000	–22%	275%
$SSB (2024) = B_{pa}$	161 231	0.37	472 416	460 000	–3%	124%
$SSB (2024) = MSY B_{trigger}$	161 231	0.37	472 416	460 000	–3%	124%
$SSB (2024) = SSB (2023)$	146 680	0.33	478 191	478 212	0%	104%
$F = F_{2022}$	92 956	0.20	498 535	547 237	10%	29%

* SSB 2024 relative to SSB 2023.

** Advice value in 2023 relative to advice value for EU MAP: $F_{MSY 2022} = F_{MSY} \times SSB_{2021}/MSY B_{trigger}$ (71 939 tonnes).

*** Advice value for 2023 relative to advice value for EU MAP range $F_{lower 2022}$ (52 443 tonnes).

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

^{^^} MAP multiannual plan (EU, 2016, 2019).

The increase in catch advice is mainly due to the relatively large 2019 year class, which was revised upwards in this year's assessment.

Basis of the advice

Table 3 Herring in subdivisions 25–29 and 32, excluding the Gulf of Riga. The basis of the advice.

Advice basis	EU Baltic multiannual plan
Management plan	This stock is shared between the EU and Russia. An EU multiannual plan (MAP) in place for stocks in the Baltic Sea includes herring (EU, 2016, 2019). The advice, based on the F_{MSY} ranges used in the management plan, is considered precautionary. Russia does not have a management plan for this stock.

Quality of the assessment

Species misreporting of herring has occurred in the past, and there is evidence of sprat being misreported as herring. These effects have not been quantified nor included in the assessment.

There is uncertainty in the strength of the 2019 year class. In the 2020 assessment this year class was estimated to be strong, while that was not the case in the 2021 assessment. In the current assessment, this year class is again estimated to be large (35% larger than last year's estimate of abundance at age 1).

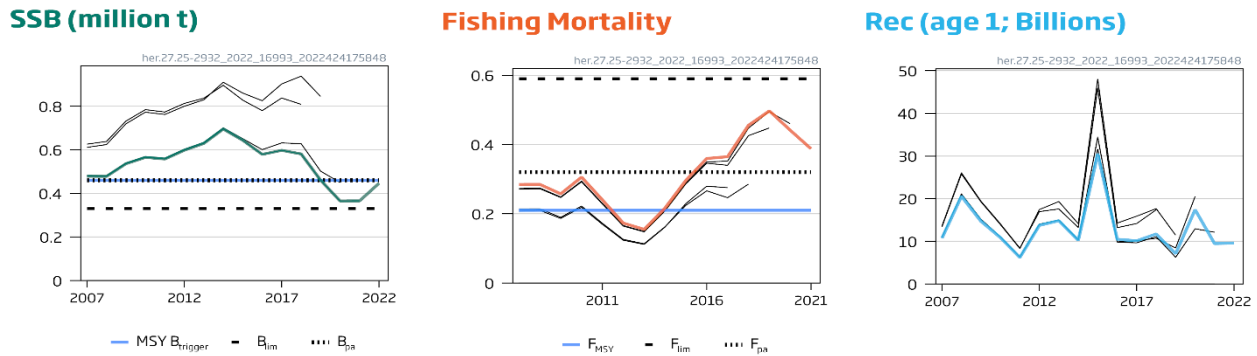


Figure 2 Herring in subdivisions 25–29 and 32, excluding the Gulf of Riga. Historical assessment results (final-year recruitment assumptions included). The stock was interbenchmarked in 2020 with updated natural mortality data. The reference points were revised following the interbenchmark, and only assessment results from the last three years should be compared to the reference points indicated.

Issues relevant for the advice

The 2019 year class appears to be above recent recruitment estimates. There has been no other strong recruitment since 2015, resulting in a low number of older ages and a reliance on a single year class contributing to the spawning stock.

A mixture of central Baltic herring (subdivisions 25–27, 28.2, 29, and 32) and Gulf of Riga herring (Subdivision 28.1) is caught in the central Baltic Sea. In the assessment and the advice, the central Baltic herring stock is considered to be caught both in and outside of the central Baltic Sea. The TAC (sum of the EU and Russian autonomous quotas) is set for herring caught in the central Baltic management area; it includes a small amount of Gulf of Riga herring caught in the central Baltic Sea but excludes central Baltic herring caught outside of the central Baltic Sea.

An example of how TAC setting could address the stock mixing issues is presented based on the ICES MSY approach advice catch for the central Baltic herring stock (95 643 tonnes), plus the assumed catch of Gulf of Riga herring taken in the central Baltic, minus the assumed catch of central Baltic herring taken in the Gulf of Riga. The values of the two latter figures are given by the average over the last five years.

- Central Baltic herring assumed to be taken in the Gulf of Riga in 2023 (Subdivision 28.1) is 3211 tonnes (average 2017–2021).
- Gulf of Riga herring assumed to be taken in Subdivision 28.2 in 2023 is 794 tonnes (average 2017–2021).

As an example, following ICES MSY approach (here identical to the MAP F_{MSY}), catches from the central Baltic herring stock in 2023 should be no more than 95 643 tonnes. The corresponding TAC in the central Baltic management area for 2023 would be calculated as: 95 643 tonnes + 794 tonnes – 3211 tonnes = 93 226 tonnes.

Reference points

Table 4 Herring in subdivisions 25–29 and 32, excluding the Gulf of Riga. Reference points, values, and their technical basis. Weights are in tonnes.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	460 000	B_{pa}	ICES (2020)
	F_{MSY}	0.21	Estimated by EqSim	ICES (2020)
Precautionary approach	B_{lim}	330 000	The lowest SSB that has resulted in above-average recruitment, i.e. year 2002 (the SSB in 2002 happens to correspond to B_{loss})	ICES (2020)
	B_{pa}	460 000	$1.4 \times B_{lim}$	ICES (2020)
	F_{lim}	0.59	Estimated by EqSim as the F with 50% probability of SSB being less than B_{lim}	ICES (2020)
	F_{pa}	0.32	F_{P05} . The F that leads to $SSB \geq B_{lim}$ with 95% probability	ICES (2021)
Management plan	MAP MSY $B_{trigger}$	460 000	MSY $B_{trigger}$	ICES (2020)
	MAP B_{lim}	330 000	B_{lim}	ICES (2020)
	MAP F_{MSY}	0.21	F_{MSY}	ICES (2020)
	MAP target range F_{lower}	0.15–0.21	Consistent with the ranges which result in no more than a 5% reduction in long-term yield compared to MSY	ICES (2020)
	MAP target range F_{upper}	0.21–0.26	Consistent with the ranges which result in no more than a 5% reduction in long-term yield compared to MSY	ICES (2020)

Basis of the assessment

Table 5 Herring in subdivisions 25–29 and 32, excluding the Gulf of Riga. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2022a)
Assessment type	Age-based analytical assessment, XSA (ICES, 2021b) that uses catches in the model and in the forecast
Input data	Commercial catches (international landings, age distributions from catch sampling); one survey acoustic index (BIAS A1588); natural mortalities from multispecies model (SMS) until 2018, 2019 = 2018 (ICES, 2019), 2020–2021 from regression with eastern Baltic cod biomass of individuals ≥ 20 cm, fixed maturity ogive
Discards and bycatch	Discarding is considered negligible
Indicators	None
Other information	Interbenchmark in March 2020 (ICES, 2020)
Working group	Baltic Fisheries Assessment Working Group (WGBFAS)

History of the advice, catch, and management

Table 6 Herring in subdivisions 25–29 and 32, excluding the Gulf of Riga. ICES advice, TACs, and catches. All weights are in tonnes.

Year	ICES advice	Catch corresponding to the advice	Agreed TAC	ICES catch SDs 25–29 + 32	ICES catch
1988 *		204 000	399 000**	286 000	
1989 *		176 000	399 000**	290 000	
1990 *		112 000	399 000**	244 000	
1991 *	TAC for the entire area	293 000	402 000**	213 000	
1992 *	F near present level	343 000	402 000**	210 000	
1993 *	Increase in yield at higher F	371 000	560 000**	231 000	
1994 *	Increase in yield at higher F	317 000–463 000	560 000**	242 000	
1995 *	TAC	394 000	560 000**	221 000	
1996 *	TAC	394 000	560 000**	195 000	
1997 *	No advice	-	560 000**	208 000	
1998 *	No advice	-	560 000**	212 000	
1999 *	Proposed $F_{pa} = (0.17)$	117 000	476 000**	178 000	

Year	ICES advice	Catch corresponding to the advice	Agreed TAC	ICES catch SDs 25–29 + 32	ICES catch
2000 *	Proposed $F_{pa} = (0.17)$	95 000	405 000**	208 000	
2001 *	Proposed $F_{pa} = (0.17)$	60 000	300 000**	188 000	
2002 *	$F < F_{pa}$	< 73 000	Not agreed**	168 000	
2003 *	$F < F_{pa}$	< 72 000	143 000**	154 000	
2004	$F < F_{pa}$	< 80 000	171 000**		93 000
2005	$F < F_{pa}$ (single-stock exploitation boundaries)	< 130 000	130 000***		92 000
2006	$F < F_{pa}$ (single-stock exploitation boundaries)	< 120 000	128 000***		110 000
2007	$F < F_{pa}$ (single-stock exploitation boundaries)	< 164 000	133 000^		116 000
2008	$F < F_{pa}$ (single-stock exploitation boundaries)	< 194 000	153 000^		126 154
2009	$F < F_{pa}$ (single-stock exploitation boundaries)	< 147 000	143 609^		134 126
2010	$F < F_{pa}$ (single-stock exploitation boundaries)	< 103 000	139 776^^		136 706
2011	MSY framework ($F = 0.19$)	< 95 000	120 020^^		116 785
2012	MSY transition ($F = F_{pa} = 0.19$)	< 92 000	93 317^^		100 893
2013	MSY transition ($F = F_{pa} = 0.19$)	< 117 000	101 480^^		100 954
2014	MSY approach	< 164 000	132 225^^		132 700
2015	MSY approach ($F_{MSY} = 0.26$)	< 193 000	186 351^^		174 433
2016	MSY approach ($F_{MSY} = 0.22$)	$\leq 201\ 000$	206 605^^		192 056
2017	MSY approach ($F_{MSY} = 0.22$)	$\leq 216\ 000$	220 629^^		202 517
2018	MAP target F ranges: F_{lower} to F_{upper} (0.16–0.28), but F higher than $F_{MSY} = 0.22$ only under conditions specified in MAP	200 236–331 510 but catch higher than 267745 only under conditions specified in MAP	258 855^^		244 365
2019	MAP target F ranges: F_{lower} to F_{upper} (0.16–0.28), but F higher than $F_{MSY} = 0.22$ only under conditions specified in MAP	115 591–192 787 but catch higher than 155333 only under conditions specified in MAP	200 260^^		204 438
2020	MAP target F ranges: F_{lower} to F_{upper} (0.16–0.28), but F higher than $F_{MSY} = 0.22$ only under conditions specified in MAP	130 546–214 553 but catch higher than 173975 only under conditions specified in MAP	182 484^^		177 079

Year	ICES advice	Catch corresponding to the advice	Agreed TAC	ICES catch SDs 25–29 + 32	ICES catch
2021	Management Plan	111 852 (range 83 971–138 183)	126 051 ^{^^}		130 012
2022	Management Plan	71 939 (range 52 443–87 581)	80 753 ^{^^^}		
2023	Management Plan	95 643 (range 70 130–95 643)			

* 1987–2003 including Gulf of Riga herring.

** TAC for subdivisions 22–29S and 32.

*** 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.

^{^^^} TAC is calculated as EU quota (subdivisions 25–28(2), 29, and 32) + assumed Russian autonomous quota of 27 100 t.*

History of the catch and landings

Table 7 Herring in subdivisions 25–29 and 32, excluding the Gulf of Riga. Catch distribution by fleet as estimated by ICES.

Total herring catch in the central Baltic management area (2021)	Total catch of stock (2021)	Landings	Discards
127 661 tonnes	130 012 tonnes	Mainly pelagic trawls. Minor part taken by trapnets, gillnets, and purse-seines 130 012 tonnes	Discarding is negligible

Table 8 Herring in subdivisions 25–29 and 32, excluding the Gulf of Riga. History of commercial catch and landings; official catches are presented for each country participating in the fishery. All weights are in tonnes.

Year	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Russia	Sweden	USSR	Total
1977	11 900		33 700				57 200		48 700	112 814	264 314
1978	13 900		38 300	100			61 300		55 400	113 872	282 872
1979	19 400		40 400				70 400		71 300	100 958	302 458
1980	10 600		44 000				58 300		72 500	103 002	288 402
1981	14 100		42 500	1 000			51 200		72 900	93 431	275 131
1982	15 300		47 500	1 300			63 000		83 800	86 423	297 323
1983	10 500		59 100	1 000			67 100		78 600	69 059	285 359
1984	6 500		54 100				65 800		56 900	89 757	273 057
1985	7 600		54 200				72 800		42 500	95 225	272 325
1986	3 900		49 400				67 800		29 700	98 773	249 573
1987	4 200		50 400				55 500		25 400	100 916	236 416
1988	10 800		58 100				57 200		33 400	106 009	265 509
1989	7 300		50 000				51 800		55 400	105 017	269 517
1990	4 600		26 900				52 300		44 200	101 269	229 269
1991	6 800	27 036	18 100		20 709	6 500	47 100	31 900	36 500		194 645
1992	8 100	22 264	30 000		12 533	4 600	39 200	29 500	43 000		189 197
1993	8 900	25 420	32 300		9 576	3 000	41 100	21 600	66 400		208 296
1994	11 300	26 345	38 200	3 700	9 797	4 900	46 100	16 700	61 600		218 641
1995	11 400	30 681	31 400		9 328	3 600	38 700	17 000	47 200		189 309
1996	12 148	35 943	31 502		11 569	4 243	30 712	14 626	25 909		166 652
1997	9 397	42 585	23 749		10 140	3 324	26 229	12 526	44 078		172 028
1998	13 876	34 005	24 777		9 972	2 368	19 344	10 520	70 997		185 860
1999	6 185	35 437	17 850		8 292	1 312	18 121	12 676	48 866		148 739
2000	15 786	30 135	23 330		6 718	1 070	23 066	14 814	60 161		175 080
2001	15 786	27 425	26 103		5 217	1 639	28 358	15 797	29 832		150 156
2002	4 557	21 010	25 724	291	3 917	1 537	28 510	14 168	29 423		129 137
2003	5 339	13 300	14 698	3 860	3 132	2 060	26 311	13 363	31 785		113 848
2004	175	10 912	14 468	4 323	2 655	1 778	22 834	6 526	29 336		93 006
2005	3 053	10 783	6 410	3 713	1 951	748	18 476	7 007	39 426		91 600

* Version 2: assumed Russian autonomous quota and corresponding Agreed TAC for 2022 in Table 6 corrected.

Year	Denmark	Estonia	Finland	Germany	Latvia	Lithuania	Poland	Russia	Sweden	USSR	Total
2006	100	13 400	9 600	3 200	3 000	1 200	16 800	7 600	55 300		110 400
2007	1 352	13 979	13 890	1 672	3 212	3 474	19 802	8 772	49 879		116 030
2008	1 250	21 581	19 134	3 358	3 520	1 749	13 331	8 551	53 681		126 154
2009	1 463	19 937	23 329	1 252	4 108	3 576	18 441	11 800	50 208		134 127
2010	5 367	17 915	21 602	2 235	3 903	1 492	25 028	9 126	50 037		136 706
2011	1 848	14 924	19 229	2 730	3 432	1 997	27 998	8 471	36 156		116 785
2012	1 415	11 380	18 049	896	2 637	1 847	25 472	13 044	26 153		101 000
2013	3 419	12 601	18 175	1 415	3 548	1 724	20 568	10 046	29 458		100 954
2014	2 723	15 334	27 905	1 731	4 853	2 096	27 316	15 854	34 888		132 700
2015	332	18 782	31 571	2 917	5 657	4 694	39 024	20 889	50 568		174 433
2016	4 040	20 097	28 852	4 340	8 362	5 184	40 990	24 179	56 011		192 056
2017	9 342	23 320	40 692	3 594	7 912	4 037	40 102	22 327	51 191		202 517
2018	11 368	24 269	45 363	3 951	11 187	6 564	49 280	25 437	66 946		244 365
2019	8 852	21 485	37 037	1 752	7 620	6 085	40 271	25 759	55 577		204 438
2020	9 275	17 074	31 890	833	5 241	5 558	35 879	26 039	45 289		177 079
2021*	6 625	13 572	19 822	631	3 828	4 338	26 695	23 744	30 757		130 012

* Preliminary.

Table 9 Herring in subdivisions 25–29 and 32 (excluding Gulf of Riga herring). Catches (in 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 the Gulf of Riga	Total catch of central Baltic herring stock
1977	261 900	-	261 900	2 400	264 300
1978	276 600	-	276 600	6 300	282 900
1979	297 800	-	297 800	4 700	302 500
1980	282 700	-	282 700	5 700	288 400
1981	269 200	-	269 200	5 900	275 100
1982	292 600	-	292 600	4 700	297 300
1983	280 600	-	280 600	4 800	285 400
1984	269 300	-	269 300	3 800	273 100
1985	267 700	-	267 700	4 600	272 300
1986	248 300	-	248 300	1 300	249 600
1987	231 600	-	231 600	4 800	236 400
1988	262 500	-	262 500	3 000	265 500
1989	263 600	-	263 600	5 900	269 500
1990	223 300	-	223 300	6 000	229 300
1991	188 500	-	188 500	6 100	194 600
1992	185 700	1 300	187 000	3 500	189 200
1993	204 000	1 200	205 200	4 300	208 300
1994	213 600	2 100	215 700	5 000	218 600
1995	183 200	2 400	185 600	6 100	189 300
1996	162 300	4 300	166 600	4 400	166 700
1997	167 700	2 900	170 600	4 300	172 000
1998	181 800	2 800	184 600	4 100	185 900
1999	144 400	1 900	146 300	4 300	148 700
2000	170 500	1 900	172 400	4 600	175 100
2001	147 300	1 200	148 500	2 900	150 200
2002	125 600	400	126 000	3 500	129 100
2003	109 500	400	109 900	4 300	113 800
2004	89 700	200	89 900	3 300	93 000
2005	89 300	500	89 800	2 300	91 600
2006	107 200	400	107 600	3 200	110 400
2007	114 500	100	114 600	1 500	116 000
2008	120 100	100	120 200	6 100	126 154
2009	129 200	100	129 300	4 900	134 126
2010	131 500	400	131 900	5 200	136 706
2011	111 300	100	111 400	5 500	116 785
2012	97 200	200	97 400	3 800	100 893

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 the Gulf of Riga	Total catch of central Baltic herring stock
2013	96 900	300	97 200	4 100	100 954
2014	128 200	200	128 400	4 500	132 700
2015	169 465	316	169 781	4 968	174 433
2016	187 741	289	188 029	4 315	192 056
2017	198 621	234	198 855	3 896	202 517
2018	240 157	530	240 687	4 208	244 365
2019	200 878	1 200	202 078	3 560	204 438
2020	175 815	1 229	177 044	1 264	177 079
2021*	126 886	775	127 661	3 126	130 012

* Preliminary.

Summary of the assessment

Table 10 Herring in subdivisions 25–29 and 32, excluding the Gulf of Riga. Assessment summary. Weights are in tonnes. Recruitment in thousands.

Year	Recruitment age 1	SSB*	Catches	F ages 3–6
1974	24 152 396	1 932 049	368 652	0.1603
1975	18 378 024	1 864 358	354 851	0.1700
1976	36 763 692	1 672 283	305 420	0.1579
1977	20 897 926	1 944 702	301 952	0.1469
1978	26 593 278	1 905 016	278 966	0.1263
1979	23 355 852	1 814 695	278 182	0.1533
1980	31 483 436	1 626 620	270 282	0.1593
1981	46 830 484	1 438 156	293 615	0.1839
1982	43 152 104	1 520 923	273 134	0.1648
1983	29 643 208	1 421 081	307 601	0.2255
1984	37 097 924	1 266 531	277 926	0.2369
1985	25 646 666	1 177 170	275 760	0.2524
1986	12 108 219	1 090 962	240 516	0.2265
1987	24 377 732	1 011 768	248 653	0.2626
1988	9 326 093	1 013 758	255 734	0.2547
1989	13 072 021	856 399	275 501	0.3426
1990	16 148 029	714 738	228 572	0.3324
1991	12 081 950	647 405	197 676	0.3415
1992	16 005 570	675 675	189 781	0.2990
1993	15 151 085	649 450	209 094	0.3366
1994	11 817 790	651 933	218 260	0.4073
1995	16 772 708	540 068	188 181	0.3869
1996	13 713 703	484 751	162 578	0.4088
1997	7 640 494	454 223	160 002	0.4553
1998	12 842 558	419 320	185 780	0.4826
1999	6 703 138	364 352	145 922	0.4107
2000	13 499 970	354 684	175 646	0.4874
2001	9 294 614	337 937	148 404	0.4337
2002	8 924 963	327 979	129 222	0.4076
2003	18 591 826	356 515	113 584	0.3267
2004	11 191 155	366 701	93 006	0.2846
2005	7 584 684	408 566	91 592	0.2586
2006	13 371 659	443 921	110 372	0.2851
2007	10 727 826	461 666	116 030	0.2847
2008	20 542 962	461 038	126 155	0.2849
2009	14 695 621	517 884	134 127	0.2575
2010	10 864 127	544 829	136 706	0.3058
2011	6 218 677	537 669	116 785	0.2400

Year	Recruitment age 1	SSB*	Catches	F ages 3–6
2012	13 725 282	574 973	100 893	0.1731
2013	14 821 888	606 569	100 954	0.1550
2014	10 213 996	672 220	132 700	0.2165
2015	30 461 546	625 069	174 433	0.2965
2016	10 494 777	560 793	192 056	0.3596
2017	10 126 062	582 760	202 517	0.3648
2018	11 721 181	571 495	244 365	0.4554
2019	7 085 511	464 975	204 438	0.4971
2020	17 421 222	384 556	177 079	0.4414
2021	9 463 690	387 052	128 961^	0.3877
2022	9 597 000**	446 582***		

* At spawning time.

** Output from survey data (RCT3 analysis).

*** Predicted.

^ Catches of 1051 tonnes (<1% of total catches) were not delivered at the time of the working group.

Sources and references

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