Atlantic salmon (*Salmo salar*) in Subdivision 32 (Gulf of Finland)

ICES advice on fishing opportunities

ICES advises that when the precautionary approach is applied, catches in 2020 should be no more than 11 800 salmon. This assumes that the amount of reared salmon released in 2019 is similar to previous years. Applying the same catch proportions estimated to have occurred in 2018, this would correspond to commercial landings (the reported wanted catch) of 9700 salmon.

Fisheries-related mortality on wild salmon from all wild and mixed (hatchery–wild) rivers in the Gulf of Finland should be as low as possible. Most of the salmon in the Gulf of Finland are of reared origin. Measures to focus the fishing effort on reared salmon should be implemented. Such measures could include seasonal regulations and/or the relocation of coastal fisheries away from sites likely to be on the migration paths of Gulf of Finland wild salmon. Finclipping of reared salmon stocks in all countries would allow wild salmon to be distinguished from reared salmon, while also helping to identify wild salmon locations and fisheries on wild salmon. Relocation of fisheries away from those rivers and river mouths that support wild or mixed-stocks should be maintained. Wild salmon returning to rivers should be protected from poaching.

Effort in the salmon fishery in the Main Basin (subdivisions 24–29) should not increase, as wild salmon from the Gulf of Finland use the Main Basin as a feeding area.

Stock development over time

Most of the salmon in the Gulf of Finland originate from smolt releases. Despite major releases, catches have decreased in the last decade, indicating low post-smolt survival of reared salmon (Figure 1).

Wild stocks: The only wild salmon stocks in Subdivision 32 exist in three Estonian rivers. According to expert judgment, the smolt production in rivers Keila and Kunda has been generally above 50% of the respective potential smolt production capacity (PSPC) in the past four years (2014–2018; Figure 2a). The expected smolt production in 2019 for rivers Kunda and Keila is above 75% of the potential smolt production capacity. In 2018, a dam was removed in river Vasalemma and now salmon have free access to all spawning and rearing areas. The new estimated PSPC for Vasalemma is 2.5 times higher compared to the previous one (before dam removal). As a consequence, although the expected smolt production in river Vasalemma has increased, it is far below 50% of the new PSPC (Figure 2b).

Mixed hatchery–wild stocks: Smolt production in the seven Estonian rivers stocked with hatchery fish (referred to as mixed rivers) is expected to be below 50% of their respective PSPC for smolt year 2019, with the exception of three of those rivers (Pirita, Loobu, and Purtse; Figure 1c and d). Natural smolt production in Estonian mixed rivers is variable, having been generally higher in the last decade. Smolt production in the mixed river Luga (Russia) has stayed well below 50% of the potential, with no obvious trend appearing (Figure 2e). Smolt production in the mixed river Kymijoki (Finland) has in general been at a level of 20–30% in relation to the estimated PSPC, but increased considerably in 2017. The estimated Kymijoki smolt production decreased in 2018 and is expected to decrease further in 2019 (Figure 2e). Wild smolt production in mixed rivers in Subdivision 32 is largely below 50% of respective PSPC (Figure 2c, d, and e).

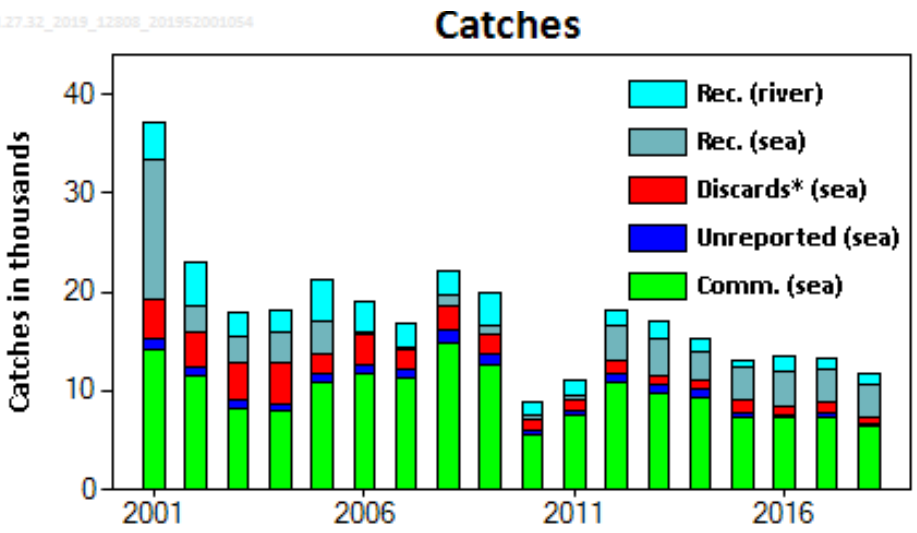
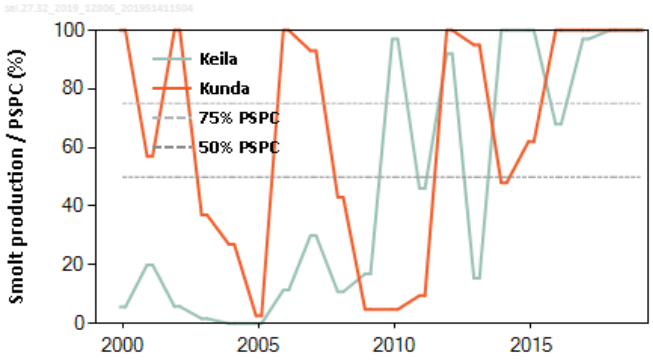


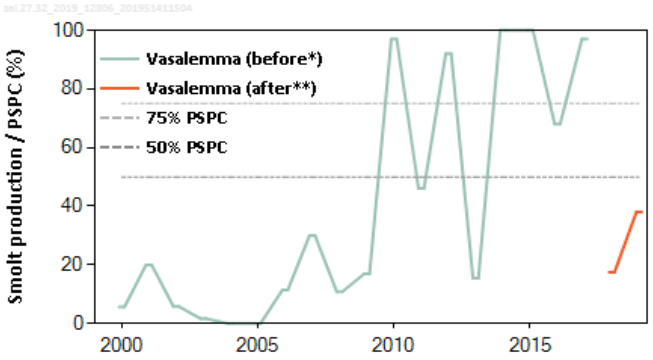
Figure 1 Salmon in Subdivision 32 (Gulf of Finland). Total number of removals (dead catch) in the years 2001–2018: river catches (only recreational) and removals at sea (split into commercial and recreational nominal landings, unreported commercial landings, and dead discards).

*Discards refer to dead discarded catch at sea.

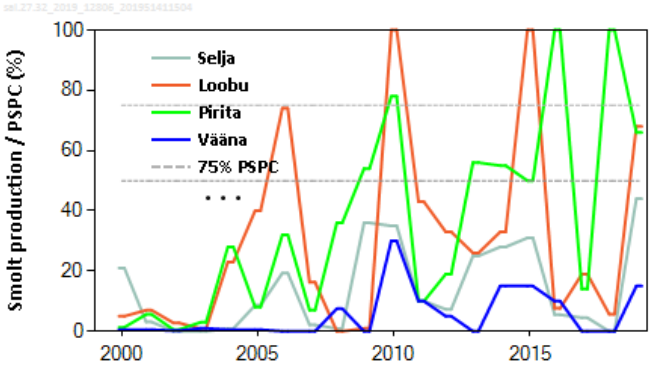
a)


Smolt production / PSPC (%)
Keila
Kunda
75% PSPC
50% PSPC
0
20
40
60
80
100
2000
2005
2010
2015

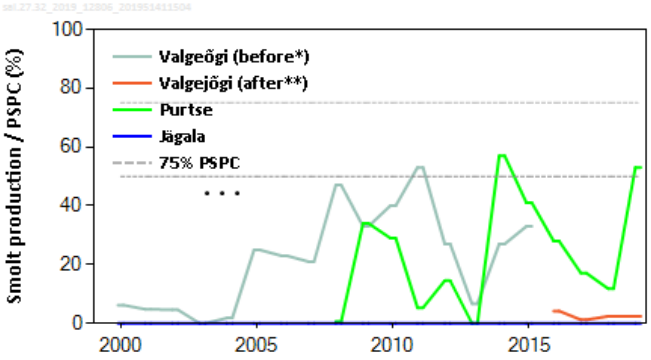
b)


Smolt production / PSPC (%)
Vasalemma (before*)
Vasalemma (after**)
75% PSPC
50% PSPC
0
20
40
60
80
100
2000
2005
2010
2015

c)


Smolt production / PSPC (%)
Selja
Loobu
Pirita
Vääna
75% PSPC
0
20
40
60
80
100
2000
2005
2010
2015

d)


Smolt production / PSPC (%)
Valgeõgi (before*)
Valgejõgi (after**)
Purtse
Jägala
75% PSPC
0
20
40
60
80
100
2000
2005
2010
2015

e)

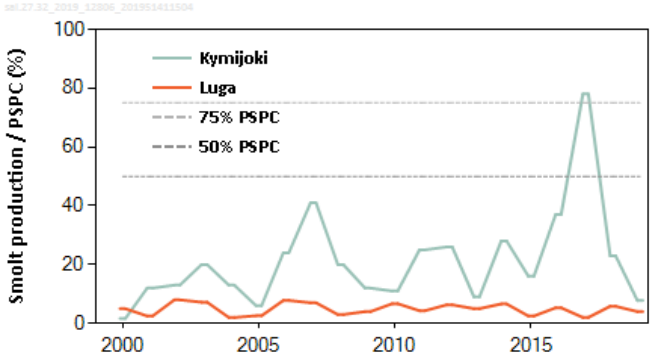


Figure 2 Atlantic salmon in Subdivision 32 (Gulf of Finland). Smolt production in Subdivision 32 in relation to the potential smolt production in three wild (a and b) and seven mixed (c and d) Estonian salmon stocks, as well as in mixed salmon stocks of Russia (river Luga) and Finland (river Kymijoki) (e). The results are based on monitored parr densities and expert judgement. The horizontal lines indicate 50% and 75% of the estimated PSPC.

*Before dam removal.
**After dam removal.

Catch scenarios

No quantitative assessment or forecast could be provided.

The new data available (catch statistics [Table 5 and Figure 1] and parr densities [Figure 3]) do not change the perception of the Gulf of Finland salmon stocks. The same catch advice provided since 2015 is, therefore, still applicable for 2020. Assuming that the amount of reared salmon released in 2019 will be similar to previous years, and provided that the fisheries do not target wild salmon, this corresponds to a total commercial catch at sea not exceeding 11 800 salmon (where the fisheries should be focused on the reared stocks).

Applying the same proportions estimated to have occurred in 2018, the total of 11 800 commercial sea catch would be split as follows: 16% unwanted catch (previously discarded) and 84% wanted catch (81% reported and 3% unreported).

Basis of the advice

Table 1 Atlantic salmon in Subdivision 32 (Gulf of Finland). The basis of the advice.

Advice basis	Precautionary approach.
Management plan	EC proposal (EC, 2011), not formally adopted.

Quality of the assessment

Information about the exploitation rate of wild salmon in the Gulf of Finland mixed-stock fisheries is limited, and there is a general lack of knowledge about the level of stock mixing during migrations between the Gulf of Finland, the Main Basin, and the Gulf of Bothnia.

The establishment of a wild index river, where both electrofishing and the counting of smolts and spawners is regularly carried out, is needed in the Gulf of Finland. All of these variables are currently monitored only in the mixed river Pirita (Estonia), where a monitoring programme has been in place since 2014 (renewed for the period 2018–2019).

Recreational sea and river catch statistics are uncertain.

No data on reported catches of salmon from Russian sea fisheries are available. No Russian fishery is currently targeting salmon, but salmon may be caught as a bycatch in the coastal fishery (by trapnets and gillnets).

For assessment purposes and advice, Gulf of Finland salmon stocks are treated as a group separate from salmon in subdivisions 22–31. Construction of a separate full life-history model for the Gulf of Finland, similar to that used for salmon in subdivisions 22–31, is ongoing. Regional differences in the development of wild and mixed salmon stocks have

to be considered in this work. Because of data needs and potential technical difficulties with the model development, it is difficult to determine an exact time frame for an analytical assessment of the Gulf of Finland stocks.

Unwanted catch is made up of undersized salmon, seal-damaged salmon, and salmon discarded for other reasons (Table 5). A proportion of the undersized discards is expected to survive, depending on the gear type. There is considerable uncertainty about the amount of salmon discarded, and even greater uncertainty about the proportion that survives when discarded. Seal-damaged salmon are all dead, but there is also uncertainty about the amount of seal-damaged salmon. The values used in this advice represent the current available knowledge. They are based on data from a variety of sources (such as logbooks or Data Collection Framework (DCF) sampling data), but these data are generally sparse. Expert judgement has been applied when no data are available, or when it is necessary to supplement the sparse data. Because of this uncertainty, current discard estimates should be considered as approximate rather than precise estimates.

Preliminary PSPC values for Gulf of Finland stocks have been proposed, based on expert opinion. No stock–recruitment data exist at the moment, precluding validation of these preliminary PSPC values.

Issues relevant for the advice

In the absence of a quantitative assessment, it is difficult to evaluate the response of Gulf of Finland wild stocks to management measures. Most of the TAC is caught in Finnish waters, where few wild Gulf of Finland salmon are found (ICES, 2018a). Recent genetic results (ICES, 2019) show that in the Finnish commercial catches, the largest stock contribution (50%) was from locally released reared Neva salmon, whereas the contribution of wild stocks originating from the Gulf of Bothnia was 30% and that of released Gulf of Bothnia stocks was about 15%. Wild Gulf of Finland stocks were nearly absent, whereas Eastern Main Basin stocks contributed less than 5% of the total catch.

Approximately 10% of the total Gulf of Finland catch is taken from the coastal Estonian fishery. The compositions of Estonian coastal catches differed substantially from those in the Finnish coastal catches. On average over 80% of the Estonian catches consisted of local wild and released stocks, whereas Eastern Main Basin stocks contributed about 10% and Gulf of Bothnian stocks less than 5% (ICES, 2019).

These genetic results suggest that only a small proportion of the total catch in the Gulf of Finland consists of Estonian wild populations. In contrast, the small and geographically restricted Estonian coastal fishery mainly harvests Estonian wild stocks. The present harvest rate seems to be on a sustainable level, as the status of both the Kunda and Keila populations is estimated as good. An increase in smolt production has also occurred in river Vasalemma.

In Estonia, regulations have been in force since 2011 to relocate the coastal fisheries away from river mouth areas; this is where these fisheries are likely to catch Gulf of Finland wild salmon. As part of those regulations, the closed area at the river mouth was extended to 1500 m during the main spawning migration period in all wild and most of the mixed rivers. Extra effort has also been directed towards protecting wild salmon from poaching in the rivers when they return to spawn. These measures may have contributed to the recent positive trend in smolt production.

Reference points

To evaluate the current state of salmon stocks in the Baltic Sea, ICES uses the smolt production relative to the 50% and 75% levels of the natural production capacity (the PSPC) on a river-by-river basis. These reference percentages are also used for the Gulf of Finland.

Basis of the assessment

ICES has established six assessment units (AUs) for salmon in the Baltic Sea, where the Gulf of Finland constitutes AU 6 (Figure 5). The division of stocks into units is based on biological and genetic characteristics. Stocks of a particular unit are assumed to exhibit similar migration patterns. These stocks may, therefore, be assumed to be subject to the same fisheries, experience the same exploitation rates, and to respond equally to a similar use of management tools.

Table 2 Atlantic salmon in Subdivision 32 (Gulf of Finland). The basis of the assessment.

ICES stock data category	3 (ICES, 2018b).
Assessment type	Qualitative assessment based on monitored parr densities and expert judgement.
Input data	Commercial catches (1984–2018; international landings, fishing effort, tag returns). Survey indices (parr densities from all wild and salmon mixed rivers [1992–2018], smolt counts in some mixed rivers [2001–2018]).
Discards and bycatch	Included in the assessment (estimates based partly on data and partly on expert evaluation).
Indicators	None.
Other information	The assessment is based on the benchmark in 2012 (IBP Salmon; ICES, 2012). The data and model options were considered in 2017 (WKBaltSalmon; ICES, 2017).
Working group	Assessment Working Group on Baltic Salmon and Trout (WGBAST).

Information from stakeholders

There is no additional available information.

History of the advice, catch, and management

Table 3 Atlantic salmon in Subdivision (SD) 32 (Gulf of Finland). ICES advice, catch corresponding to advice, and TAC for the Gulf of Finland (Subdivision 32). All numbers are in individual fish.

Year	ICES advice	Catch corresp. to advice	TAC†	Commercial reported landings at sea††	Landings at sea^	Catch at sea^^	River catch^^^
1993	TAC for reared stock.	109000	109000		*	*	*
1994	TAC for reared stock.	65000	120000		*	*	*
1995	Catch as low as possible in offshore and coastal fisheries.	-	120000		*	*	*
1996	Catch as low as possible in offshore and coastal fisheries.	-	120000		*	*	*
1997	Offshore and coastal fisheries should be closed.	-	110000		*	*	*
1998	Offshore and coastal fisheries should be closed.	-	110000		*	*	*
1999	Offshore and coastal fisheries should be closed.	-	100000		*	*	*
2000	Only fishery on released salmon should be permitted.	-	90000		*	*	*
2001	Only fishery on released salmon should be permitted.	-	70000	14190	28371	33480	3702
2002	Only fishery on released salmon should be permitted.	-	60000	11470	14015	18530	4483
2003	Only fishery on released salmon should be permitted.	-	50000	8298	10848	15450	2562
2004	Only fishery on released salmon should be permitted.	-	35000	7934	11023	15860	2260
2005	Only fishery on released salmon should be permitted.	-	17000	10800	14097	17070	4143
2006	Only fishery on released salmon should be permitted.	-	15000	11740	12062	16050	2960
2007	Retain sea fishery low. Special stock rebuilding measures for Estonian wild salmon rivers.	-	15000	11250	11431	14370	2452
2008	No catch of wild salmon in the Gulf of Finland.	-	15000	14860	15887	19690	2417
2009	Same advice as last year.	-	15000	12650	13777	16540	3428
2010	Same advice as last year.	-	15000	5609	6341	7507	1376
2011	No catch of Estonian wild salmon in the Gulf of Finland. Any increase in total catches from present levels should be prevented.	13000	15000	7429	7788	9494	1597
2012	No catch of Estonian and Russian wild salmon in the Gulf of Finland. No increase in total catches from present levels (2006–2010 average).	12000	15000	10890	14337	16570	1544
2013	Catch of wild salmon should be kept to a minimum. Reduce effort.	-	15000	9722	13535	15370	1710
2014	No effort increase in fisheries catching salmon in SD 32. No fishing targeting wild salmon from the Gulf of Finland and measures to reduce bycatch of wild salmon in fisheries. Advice is for total commercial removals (dead catch) in SD 32 (corresponding landings are given in brackets).	9000 (8000)	13000	9318	12323	13990	1251
2015	No effort increase in fisheries catching salmon in SD 32. No fishing targeting wild salmon from the Gulf of Finland and measures to reduce bycatch of wild salmon in fisheries. Advice is for total commercial sea catch in SD 32 (estimates of the split of the catch in 2013 into: unwanted, wanted and reported, wanted and unreported – percentages are given in brackets).	11800 (11%, 81%, 8%)	13100	7394	10601	12330	712

Year	ICES advice	Catch corresp. to advice	TAC†	Commercial reported landings at sea††	Landings at sea^	Catch at sea^^	River catch^^^
2016	Fishing mortality on wild salmon as low as possible. No effort increase in fisheries catching salmon and improved measures to focus selection on the reared stocks. Advice is for total commercial sea catch in SD 32 (estimates of the split of the catch in 2014 into: unwanted, wanted and reported, wanted and unreported – percentages are given in brackets).	11800 (10%, 83%, 7%)	13100	7323	10924	12060	1342
2017	Fishing mortality on wild salmon as low as possible. No effort increase in fisheries catching salmon and improved measures to focus selection on the reared stocks. Advice is for total commercial sea catch in SD 32 (estimates of the split of the catch in 2015 into: unwanted, wanted and reported, wanted and unreported – percentages are given in brackets).	11800 (16%, 81%, 3%)	10486	7383	10841	12260	1126
2018	Fishing mortality on wild salmon as low as possible. No effort increase in fisheries catching salmon and improved measures to focus selection on the reared stocks. Advice is for total commercial sea catch in SD 32 (estimates of the split of the catch in 2016 into: unwanted, wanted and reported, wanted and unreported – percentages are given in brackets).	11800 (16%, 81%, 3%)	10003	6436	9726	10700	1071
2019	Fishing mortality on wild salmon as low as possible. No effort increase in fisheries catching salmon and improved measures to focus selection on the reared stocks. Advice is for total commercial sea catch in SD 32 (estimates of the split of the catch in 2017 into: unwanted, wanted and reported, wanted and unreported – percentages are given in brackets).	11800 (15%, 82%, 3%)	9879				
2020							

† TAC applies to the commercial catch at sea.

†† Commercial reported landings at sea does not include misreported or unreported catch.

^ Total reported landings, including recreational catches.

^^ Estimated total catches, including landings, discards (dead and alive), and mis- and unreporting.

^^^ Estimated total catches including unreporting.

* Estimates for the total catch (including unreporting and discards) are compiled only for 2001 onwards.

History of catch and landings

Exploitation patterns of salmon in the Gulf of Finland over the last twenty years have changed substantially, from targeting mixed-stocks offshore to focusing on local stocks in coastal areas and rivers (Table 6).

The major commercial salmon fishery in the area is the trapnet fishery at the Finnish coast. Since 2010, the Finnish salmon fisheries have caught about 90% of the commercial landings in Subdivision 32. The fishing effort has been decreasing since 2013.

The major part of the recreational salmon catch is taken at sea using gillnets. The river fishery takes place in the Finnish and Estonian rivers and is mainly rod fishing. The river Kymijoki has comprised the major proportion of the recreational river catches in the area. However, in 2017 total river catches in Estonian rivers increased to almost 2 tonnes. In 2018 catches in Estonian rivers were about 1 tonne. River fishing is allowed in all but one (Loobu) of the mixed rivers, and it is prohibited in the three wild rivers.

Table 4 Atlantic salmon in Subdivision 32 (Gulf of Finland). Catch distribution by category in 2018 as estimated by ICES (median values from probability distributions).

Catch in 2018 (dead catch, including non-commercial and river catches)	Landings		Discards (dead)
66.9 tonnes	Nominal landings (commercial and non-commercial in sea and in rivers) 97.6%	Unreported and misreported 2.4%	3.5 tonnes
	63.4 tonnes		

Table 5 Atlantic salmon in Subdivision 32 (Gulf of Finland). Catches in sea and river fisheries by year (in numbers). Commercial sea landings are split into reported (nominal) and unreported (proportional to the reported component, based on expert evaluation). Discard estimates of undersized fish are proportional to the reported commercial landings, based on expert evaluation. Estimates of seal damages are based partly on logbook data and partly on expert evaluations. Estimates of discards for other reasons are from logbooks. Recreational catch at sea is only Finnish and is estimated by national surveys. River catches are based on the catch reports from the recreational fishers and unreported catch (proportional to the reported component, based on expert evaluation). The final column of the table (total commercial sea removal) is obtained by subtracting from the total commercial sea catch the undersized discards estimated to survive (around 50% survival, although the survival estimate is very uncertain). With the exception of commercial reported landings, all values in the table are imprecise and should be considered only as approximate.

Year	Sea fisheries					Recreational catch sea (± 95% C.I.)	River fishery	Total commercial sea catch	Total commercial sea removal (dead catch)
	Commercial fisheries								
	Landings		Discards						
	Reported	Unreported	Discarded undersized (dead and alive)	Seal damages (dead)	Discarded for other reasons				
2001	14 190	1 096	475	3 701	15	14 180 (± 5 780)	3 702	19 477	19 280
2002	11 470	821	396	3 411	32	2 550 (± 750)	4 483	16 130	16 001
2003	8 299	688	272	3 759	2	2 550 (± 750)	2 562	13 020	12 896
2004	7 935	661	270	4 018	14	3 090 (± 1 430)	2 260	12 898	12 772
2005	10 800	905	351	1 872	2	3 090 (± 1 430)	4 143	13 930	13 758
2006	11 740	977	385	2 804	9	180 (± 110)	2 960	15 915	15 719
2007	11 250	938	362	1 826	1	180 (± 110)	2 452	14 376	14 177
2008	14 860	1 249	484	2 318	0	730 (± 350)	2 417	18 911	18 643
2009	12 650	1 075	415	1 872	2	730 (± 350)	3 428	16 014	15 798
2010	5 609	476	186	967	2	360 (± 400)	1 376	7 239	7 142
2011	7 430	627	276	928	31	360 (± 400)	1 597	9 292	9 159
2012	10 890	926	435	1 057	73	3 450 (± 3 170)	1 544	13 381	13 186
2013	9 722	829	565	593	227	3 450 (± 3 170)	1 710	11 936	11 763
2014	9 318	796	364	657	54	2 730 (± 3 270)	1 251	11 189	11 022
2015	7 395	298	242	1 300	10	2 730 (± 3 270)	712	9 245	9 121
2016	7 323	302	244	699	14	3 000 (± 3 000)	1 342	8 582	8 460
2017	7 384	326	520	824	30	3 000 (± 3 000)	1 126	9 084	8 808
2018	6 436	272	440	479	2	3 000 (± 3 000)	1 071	7 629	7 385

Table 6 Atlantic salmon in Subdivision 32 (Gulf of Finland). Nominal landings in round fresh weight, from sea, coast, and river in Subdivision 32.

Year	River**	Coastal**	Offshore**	Commercial coastal and offshore***		Total****	
	tonnes			tonnes	thousand fish	tonnes	thousand fish
1987	2	61	290			353	
1988	2	112	156			270	
1989	2	145	254			401	
1990	6	369	178			553	
1991	5	398	250			653	
1992	3	418	111			532	
1993	6	310	133			449	111
1994	7	142	106			255	57
1995	7	201	58			266	39
1996	12	337	83			432	80
1997	10	349	89			448	77
1998	13	160	21			194	31
1999	10	137	29			176	30
2000	16	172	32	125	23	219	40
2001	16	150	14	86	14	180	31
2002	16	56	18	60	11	90	18
2003	9	57	3	46	8	70	13
2004	11	62	3	47	8	75	13
2005	18	79	3	64	11	100	17
2006	13	70	3	72	12	87	14
2007	11	69	3	71	11	83	13
2008	10	100	2	96	15	112	18
2009	14	13	0	76	13	28	16
2010	5	39	1	38	6	45	7
2011	5	45	0	44	7	51	9
2012	6	89	0	70	11	96	16
2013	7	84	0	64	10	92	15
2014	6	79	0	63	9	85	13
2015	3	59	0	42	7	62	11
2016	5	69	0	47	7	74	12
2017	4	62	1	40	7	67	12
2018*	5	59	1	38	6	64	11

* Preliminary.
** Total of recreational and commercial catches.
*** For comparison with TAC. Catch data in 1987–1999 are missing because commercial and recreational catches could not be separated in those years.
**** Total catch includes catches from recreational fisheries.

Summary of the assessment

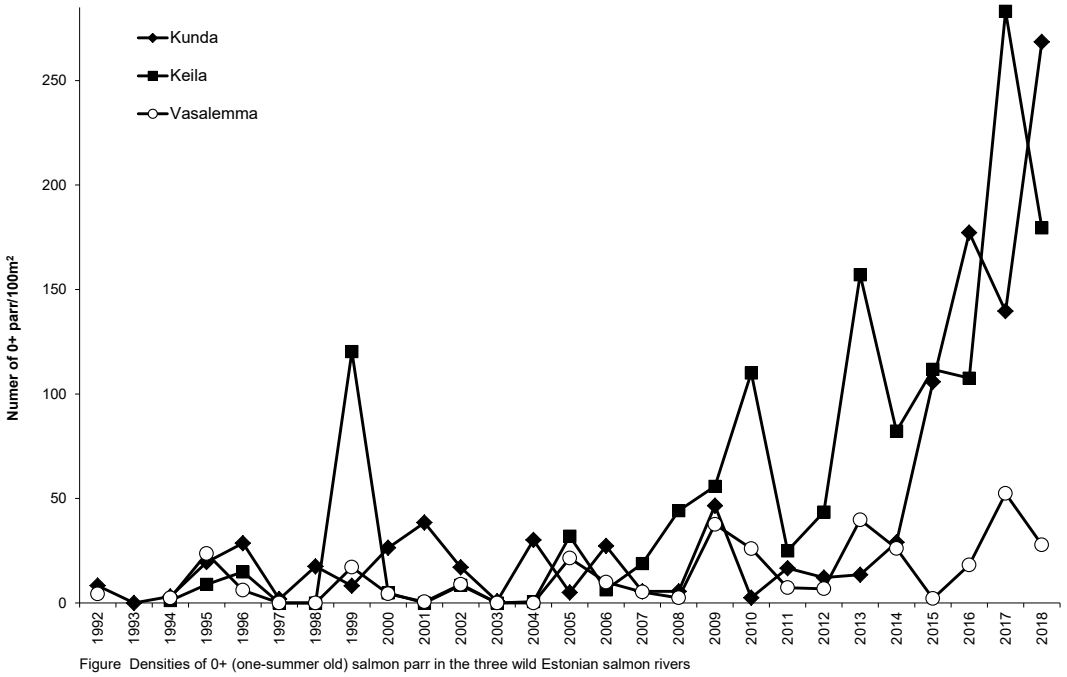


Figure Densities of 0+ (one-summer old) salmon parr in the three wild Estonian salmon rivers

Figure 3 Atlantic salmon in Subdivision 32 (Gulf of Finland). Densities of 0+ (one-summer-old) salmon parr in the three wild Estonian salmon rivers. The exceptionally high parr density in river Keila in 1999 was observed under conditions of summer drought.

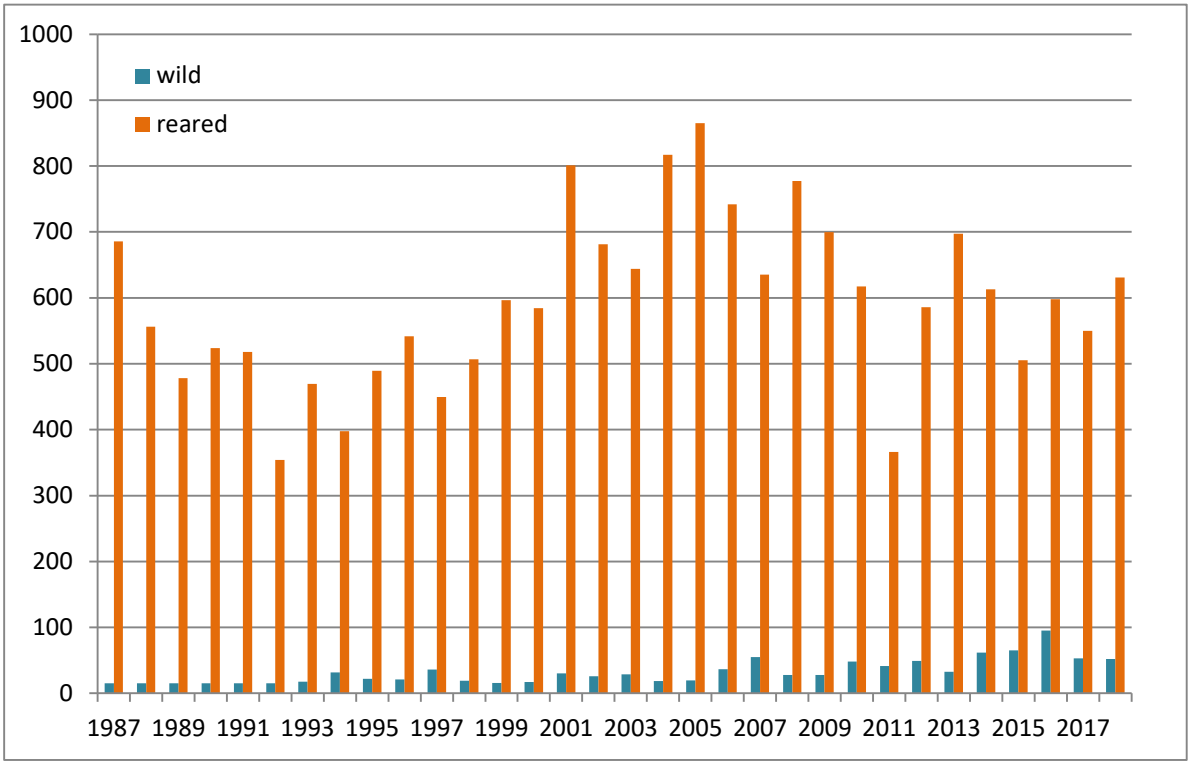


Figure 4 Atlantic salmon in Subdivision 32 (Gulf of Finland). Annual production (in thousands of fish) of wild and released smolts in the Gulf of Finland.

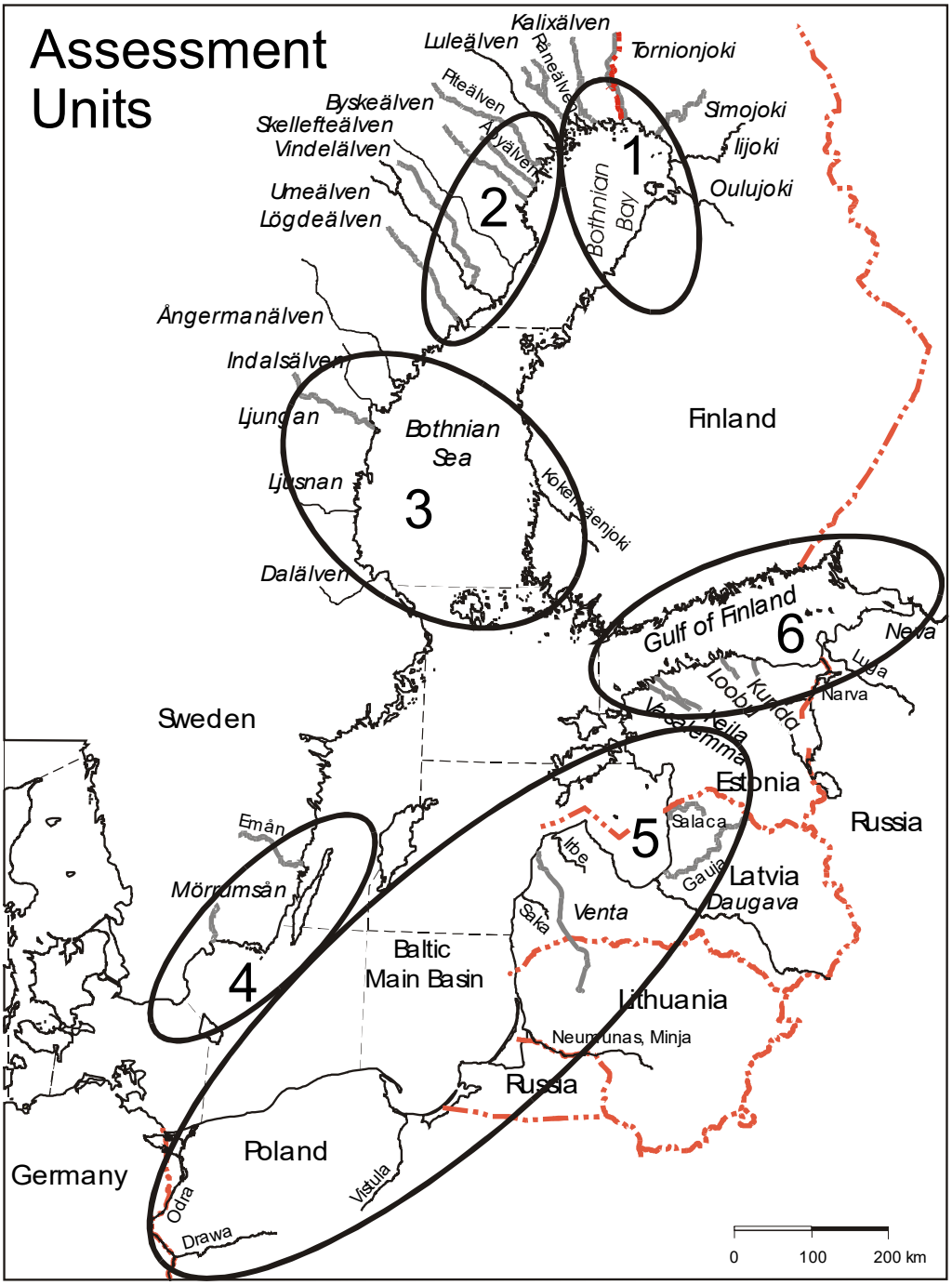


Figure 5 Atlantic salmon in Subdivision 32 (Gulf of Finland). Grouping of salmon stocks in six assessment units in the Baltic Sea. Assessment Unit 6 corresponds to Subdivision 32.

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