

## 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 2021 should be no more than 11 800 salmon. This assumes that the amount of reared salmon released in 2020 does not decrease compared to previous years. Applying the same catch proportions as those estimated to have occurred in 2019, this would correspond to reported commercial landings of 9800 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.

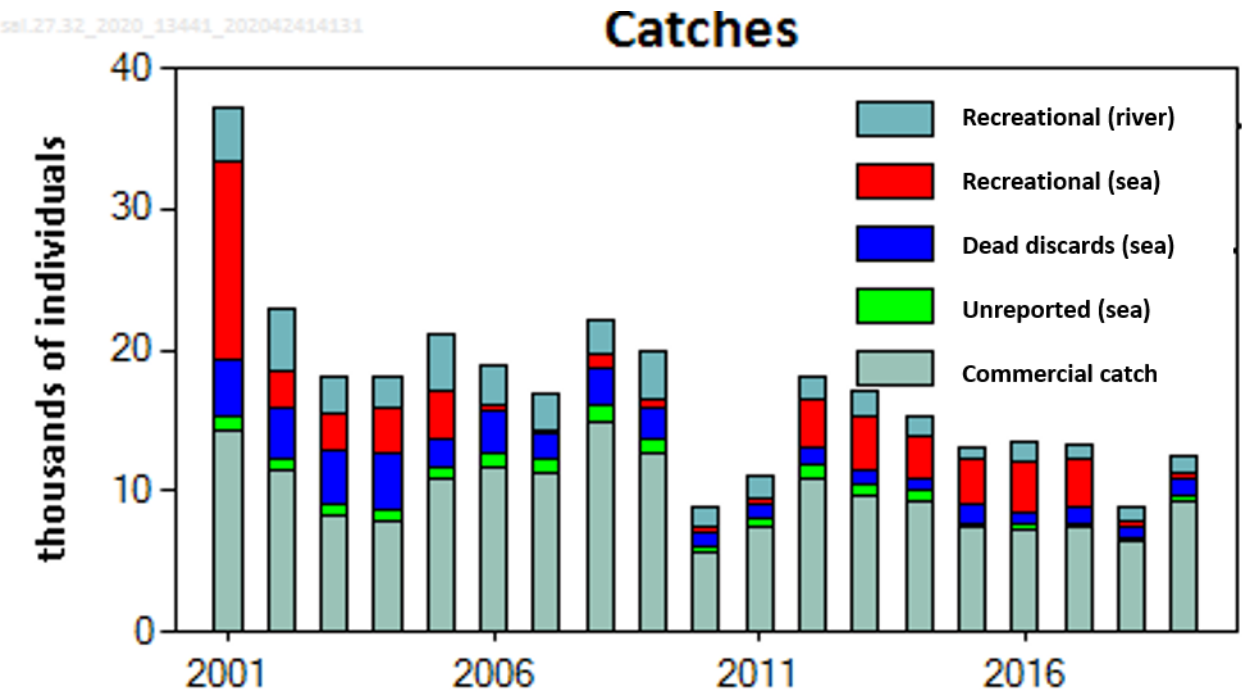
Effort in the salmon fishery should not increase in the Main Basin (subdivisions 24–29), as wild salmon from the Gulf of Finland use the Main Basin as a feeding area.

### Stock development over time

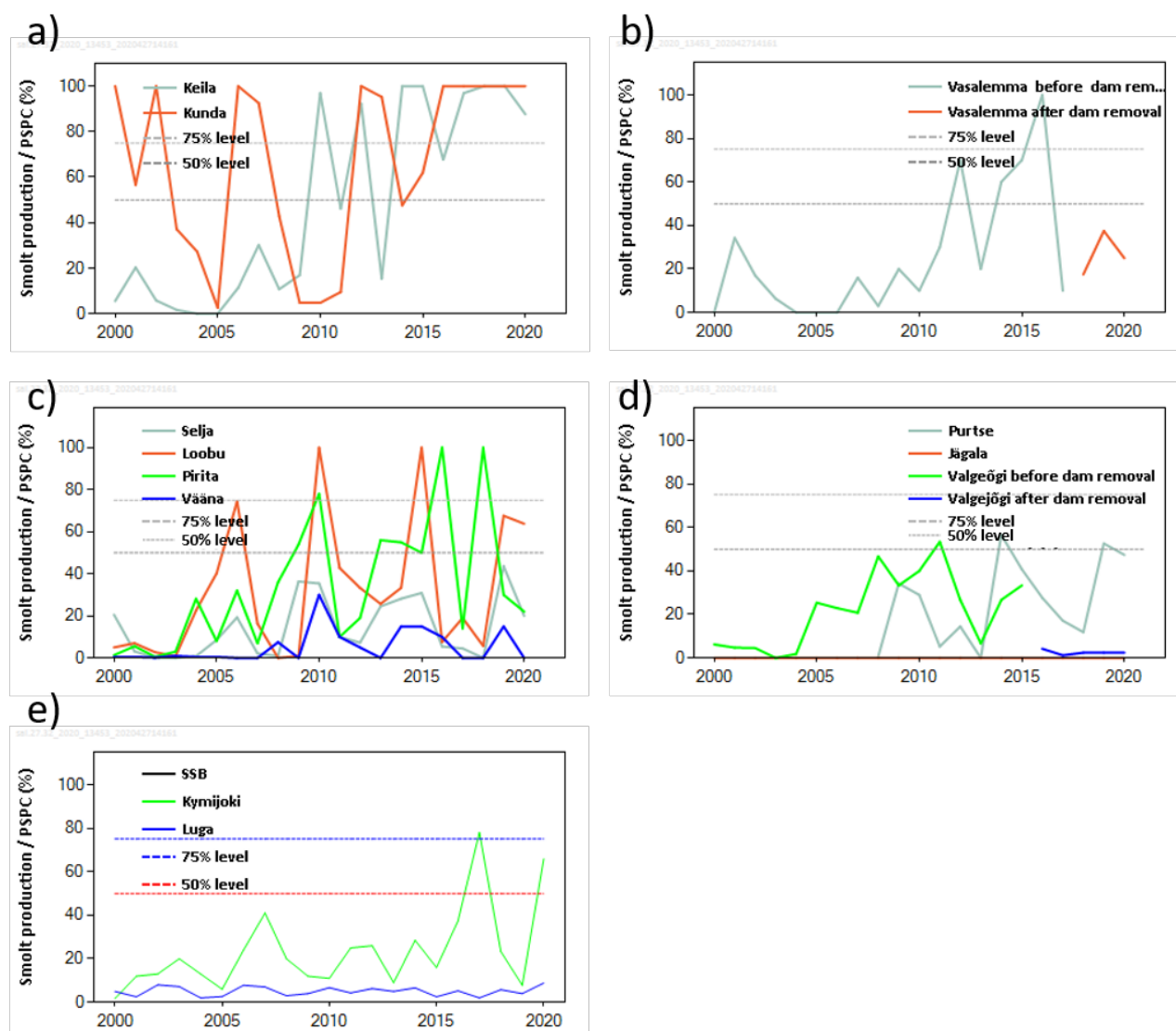
Most of the salmon in the Gulf of Finland originate from smolt releases. Catches have remained relatively stable in the last decade (Figure 1).

*Wild stocks:* The only wild salmon stocks that exist are in three Estonian rivers in Subdivision (SD) 32. According to expert judgment, the smolt production in rivers Keila and Kunda has been generally above 75% of the respective potential smolt production capacity (PSPC) in recent years (Figure 2a). The expected smolt production in 2020 for rivers Kunda and Keila is expected to remain above 75% of the potential smolt production capacity. In 2018, a dam was removed in river Vasalemma and now the salmon have free access to all spawning and rearing areas. The new PSPC estimate for Vasalemma is 2.5 times higher than the previous one (before dam removal). However, despite the increase in smolt production in river Vasalemma, this production remains markedly below 50% of the new PSPC estimate that takes the dam removal into account (Figure 2b). In 2019, there was no evidence of salmon spawning upstream of the dam.

*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 2020, with the exception of one river (Loobu; Figure 1c–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 production, with no obvious trend appearing (Figure 2e). In general, smolt production in the mixed river Kymijoki (Finland) has been at a level of 20–30% in relation to the estimated PSPC, but increased considerably since 2017. The estimated Kymijoki smolt production was low in 2018 and 2019; however, it is expected to increase above 50% of the PSPC level in 2020 (Figure 2e). Wild smolt production in mixed rivers of SD 32 is largely below 50% of the respective PSPC (Figure 2c–e).



**Figure 1** Salmon in Subdivision 32 (Gulf of Finland). Total number of removals (dead catch) in the years 2001–2019: river catches (only recreational) and removals at sea (split into commercial and recreational nominal landings, unreported commercial landings, and dead discards).



**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.

## 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 considered to be applicable: 11 800 salmon for 2021 from the at-sea commercial fishery. Assuming that the amount of reared salmon released in 2020 does not decrease from 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). The proportions used to derive the projected landings and projected discards<sup>1</sup> for 2021 are those estimated to have occurred in 2019: landings (86%; 83% reported and 3% unreported) and discards (14%).

<sup>1</sup> The terms projected landings and projected discards were previously referred to as wanted and unwanted catch, respectively.

## 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 for a multiannual plan ( <a href="#">EC, 2011</a> ), not formally adopted. A new multiannual plan is being considered.

## 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.

At present, no established wild index river exists in the Gulf of Finland, where both electrofishing and the counting of smolts and spawners is regularly carried out. All of these variables are currently monitored only in the mixed river Pirita (Estonia). No salmon releases have been made to this river from 2018 onward and the population will be reclassified as wild in coming years.

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 bycatch in the coastal fishery (by trapnets and gillnets).

The smolts released by Russia are not finclipped and therefore it is not possible to visually distinguish these released fish from wild fish.

For assessment purposes and advice, Gulf of Finland salmon stocks are treated as a group separate from the salmon in SDs 22–31. However, ICES advises that the mixing of salmon between the two current management units (SDs 22–31 and SD 32) is too high to justify two separate management units for Baltic salmon (ICES, 2020). Exploitation in the offshore fisheries of the Main Basin (SDs 22–29) affects possibilities for the recovery of the Gulf of Finland salmon stocks, as some Gulf of Finland salmon are caught in the Main Basin.

Construction of a separate full life-history model for the Gulf of Finland, similar to that used for salmon in SDs 22–31, is in progress. 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.

Discards consist 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 discarded salmon, and even greater uncertainty about the proportion that survives when discarded. Seal-damaged salmon are all dead, but the amount of seal-damaged salmon is uncertain. The values in this advice represent the current available knowledge. They are based on data from a variety of sources (e.g. logbooks or Data Collection Framework [DCF] sampling data), but these data are generally sparse. Expert judgement has been applied when no data were available, or when it was 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, 2018). Recent genetic results (ICES, 2019a) 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 by less than 5% of the total catch.

Approximately 10% of the total Gulf of Finland catch is harvested in 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 contributions from Eastern Main Basin stocks were about 10% and from Gulf of Bothnian stocks less than 5% of the catches (ICES, 2019a).

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 the Keila populations have been estimated as “good” in recent years. 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, where these fisheries are most 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 overall 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 ( <a href="#">ICES, 2019b</a> ).
Assessment type	Qualitative assessment based on monitored parr densities and expert judgement.
Input data	Commercial catches (1984–2019; international landings, fishing effort, tag returns). Survey indices (parr densities from all wild and salmon mixed rivers [1992–2019], smolt counts in some mixed rivers [2001–2019]).
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 ( <a href="#">WGBAST</a> ).

## Information from stakeholders

There is no additional available information.

## History of the advice, catch, and management

**Table 3** Atlantic salmon in Subdivision 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 <sup>†</sup>	Commercial reported landings at sea <sup>††</sup>	Landings at sea <sup>^</sup>	Catch at sea <sup>^^</sup>	River catch <sup>^^^</sup>
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 <sup>†</sup>	Commercial reported landings at sea <sup>††</sup>	Landings at sea <sup>^</sup>	Catch at sea <sup>^^</sup>	River catch <sup>^^^</sup>
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	6444	6934	7895	899
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	9300	9804	11350	1174
2020	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(14%, 83%, 3%)	9703				
2021	Precautionary approach.	11800 (14%, 83%, 3%)					

<sup>†</sup> TAC applies to the commercial catch at sea.

<sup>††</sup> Commercial reported landings at sea do not include misreported or unreported catch.

<sup>^</sup> Total reported landings, including recreational catches.

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

<sup>^^^</sup> Estimated total catches, including unreporting.

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

## History of catch and landings

Exploitation patterns of salmon in the Gulf of Finland have changed substantially over the last twenty years, 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 harvested about 90% of the commercial landings in SD 32. The fishing effort has been decreasing since 2013.

The major part of the recreational salmon catch is harvested at sea, using gillnets. The river fishery takes place in Finnish and Estonian rivers and is mainly rod fishing. The major proportion of the recreational river catches in the area are taken



in the river Kymijoki. In 2017, total river catches in Estonian rivers increased to almost 2 tonnes; in 2018 and 2019 these catches were about 1 tonne. River fishing is allowed in all but one (river 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 2019 as estimated by ICES (median values from probability distributions).

Catch in 2019 (dead catch, including non-commercial and river catches)	Landings		Discards (dead)
70.3 tonnes	Nominal landings (commercial and non-commercial in sea and in rivers) 96.7%	Unreported and misreported 3.3%	6.1 tonnes
	64.1 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 purely Finnish and is estimated by national surveys. River catches are based on catch reports from 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					Partial recreational catch at sea (± 95% C.I.)	River fishery	Total commercial catch at sea	Total commercial sea removal (dead catch)
	Commercial fisheries								
	Landings		Discards						
	Reported	Unreported	Discarded undersized	Seal-damaged (dead)	Discarded for other reasons				
			(dead and alive)						
2001	14190	1096	475	3701	15	14180 (±5780)	3702	19477	19280
2002	11470	821	396	3411	32	2550 (±750)	4483	16130	16001
2003	8299	688	272	3759	2	2550 (±750)	2562	13020	12896
2004	7935	661	270	4018	14	3090 (±1430)	2260	12898	12772
2005	10800	905	351	1872	2	3090 (±1430)	4143	13930	13758
2006	11740	977	385	2804	9	180 (±110)	2960	15915	15719
2007	11250	938	362	1826	1	180 (±110)	2452	14376	14177
2008	14860	1249	484	2318	0	730 (±350)	2417	18911	18643
2009	12650	1075	415	1872	2	730 (±350)	3428	16014	15798
2010	5609	476	186	967	2	360 (±400)	1376	7239	7142
2011	7430	627	276	928	31	360 (±400)	1597	9292	9159
2012	10890	926	435	1057	73	3450 (±3170)	1544	13381	13186
2013	9722	829	565	593	227	3450 (±3170)	1710	11936	11763
2014	9318	796	364	657	54	2730 (±3270)	1251	11189	11022
2015	7395	298	242	1300	10	2730 (±3270)	712	9245	9121
2016	7323	302	244	699	14	3000 (±3000)	1342	8582	8460
2017	7383	326	520	824	30	3000 (±3000)	1126	9083	8807
2018	6444	274	438	478	2	200 (CV > 50%)	899	7635	7392
2019	9300	374	646	865	0	200 (CV > 50%)	1174	11185	10810



**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	4	40	1	38	6	45	8
2019*	5	60	1	60	9	66	11

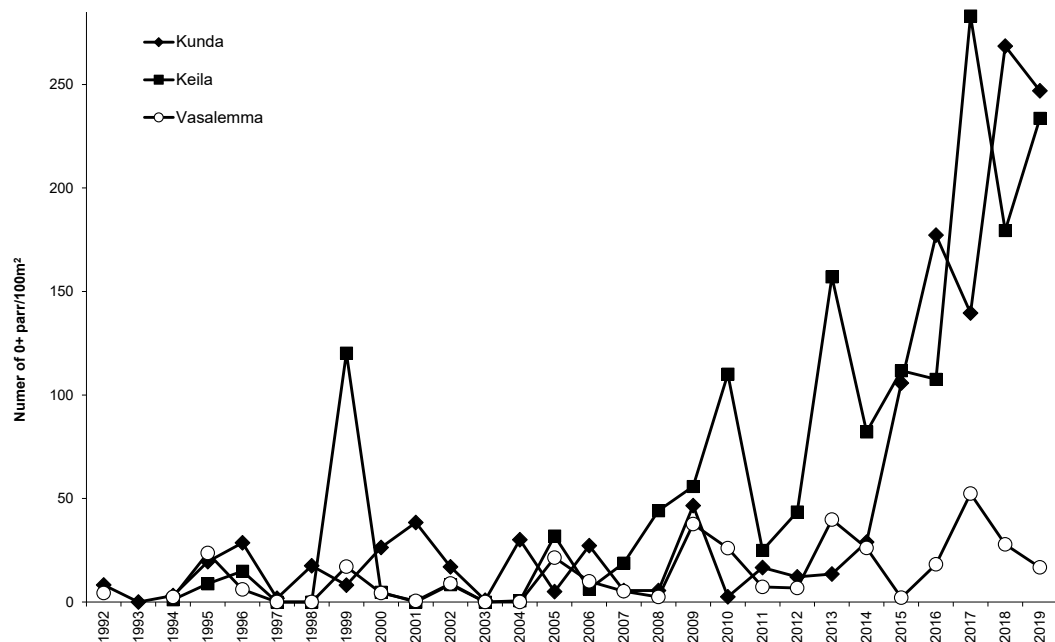
\* Preliminary.

\*\* Total of recreational and commercial catches.

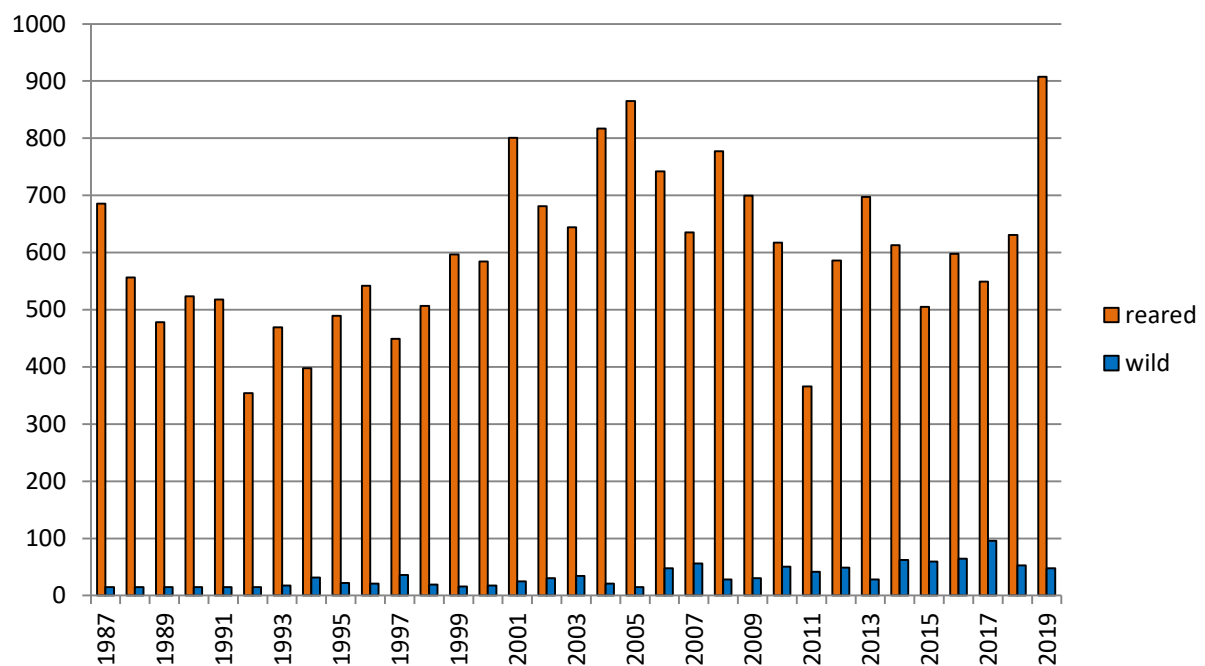
\*\*\* For comparison with TAC. Catch data in 1987–1999 are missing, because commercial and recreational catches could not be separated in those years.

^ Total catch includes catches from recreational fisheries.

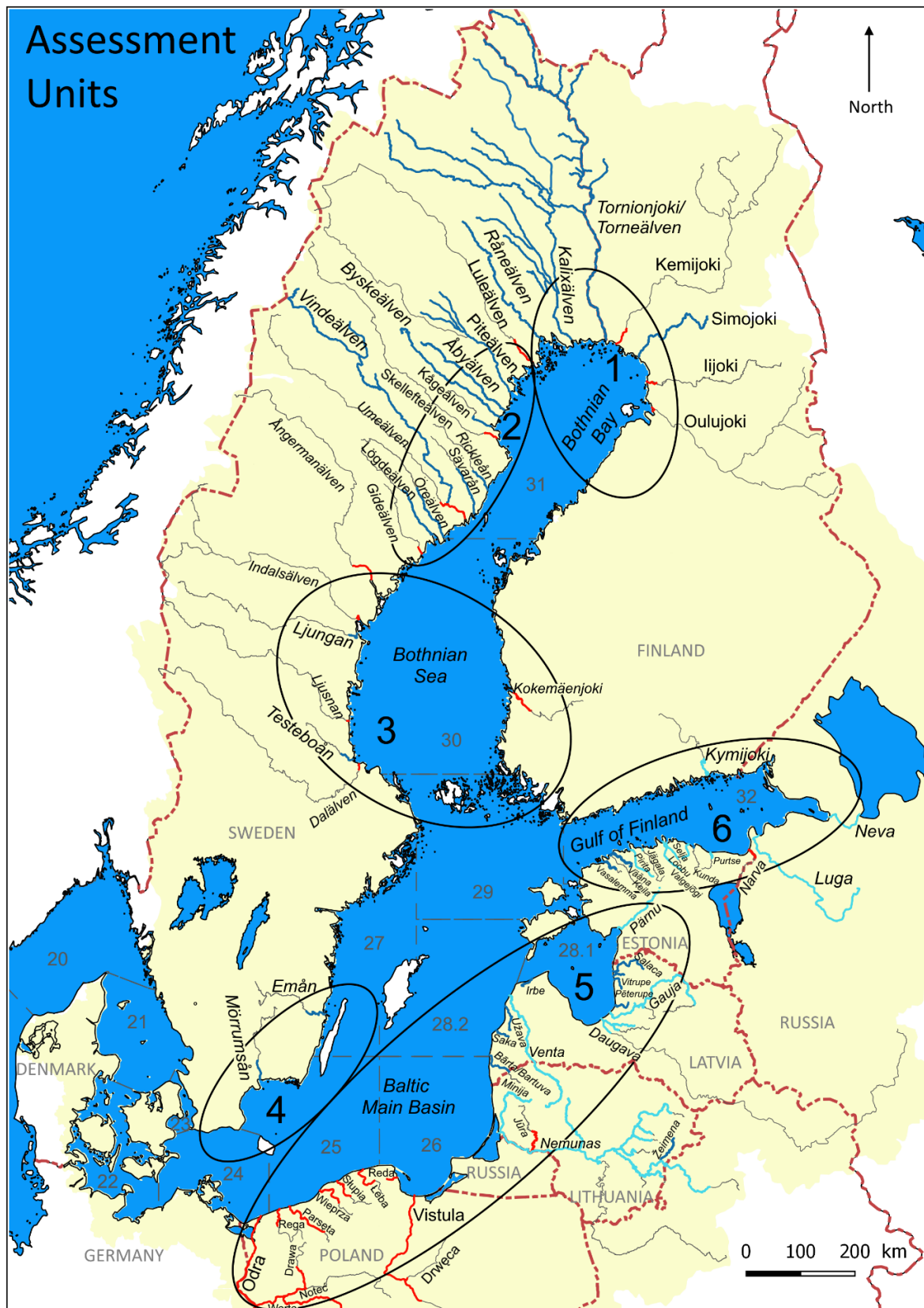
## Summary of the assessment



**Figure 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. Wild salmon rivers (dark blue), mixed salmon rivers (light blue), reared salmon rivers (red), and river stretches not accessible for salmon (grey).

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