

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

ICES advice on fishing opportunities

ICES advises that when the precautionary approach is applied, commercial sea catches in 2022 should be no more than 11 800 salmon. This assumes that the amount of hatchery reared salmon released in 2021 does not decrease compared to previous years and that spatial and seasonal fishing patterns do not change. Applying the same catch proportions as those estimated to have occurred in 2020, this would correspond to reported commercial landings of 10 100 salmon.

Fisheries-related mortality on wild salmon from all wild and mixed (hatchery reared-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 but fisheries still catch salmon from rivers with wild or mixed (hatchery reared-wild) origin fish. 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. Fincipping 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.

In 2020 ICES advised that the mixing of salmon between the two current management units (subdivisions [SDs] 22–31 and SD 32) is too high to justify two separate management units for Baltic salmon (ICES, 2020). Exploitation in the Main Basin (SDs 22–29) offshore fisheries could affect the status of the Gulf of Finland salmon stocks, as some Gulf of Finland salmon are caught in the Main Basin.

Stock development over time

Most of the salmon caught 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 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) since 2016 (Figure 2a). The expected smolt production in 2021 for rivers Kunda and Keila is expected to remain above 75% of the potential smolt production capacity. In 2018, a dam was removed in the river Vasalemma, giving the salmon free access to all spawning and rearing areas, and the PSPC estimate was consequently revised. However, despite the increase in smolt production in the river Vasalemma, the production has remained below 50% of the revised PSPC estimate (Figure 2b). In 2020, there was first evidence of salmon spawning upstream of the dam. Smolt production in 2021 is expected to reach the 50 % level in relation to PSPC.

Mixed hatchery–wild stocks: Smolt production in the seven Estonian rivers stocked with hatchery-reared fish (referred to as mixed rivers) is expected to be below 50% of their respective PSPC for smolt year 2021, with the exception of one river (Loobu; Figures 2c–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 has increased considerably since 2017. The estimated Kymijoki smolt production was above 50% in relation to PSPC in 2020; however, it is expected to decrease to slightly below 50% of the PSPC level in 2021 (Figure 2e). Wild smolt production in mixed rivers of SD 32 is largely below 50% of the respective PSPC (figures 2c–e).

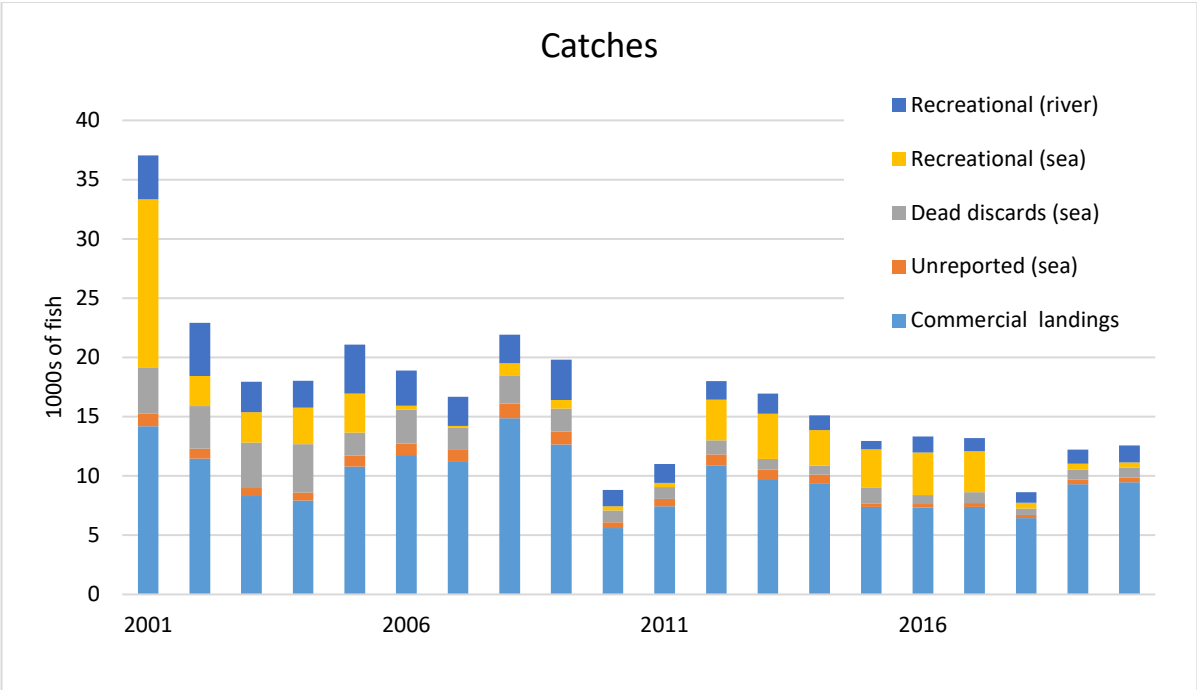


Figure 1 Atlantic salmon in Subdivision 32 (Gulf of Finland). Total number of removals (dead catch) in the years 2001–2019: river catches (only recreational) and removals at sea (split into commercial and recreational nominal landings, unreported commercial landings, and dead discards).

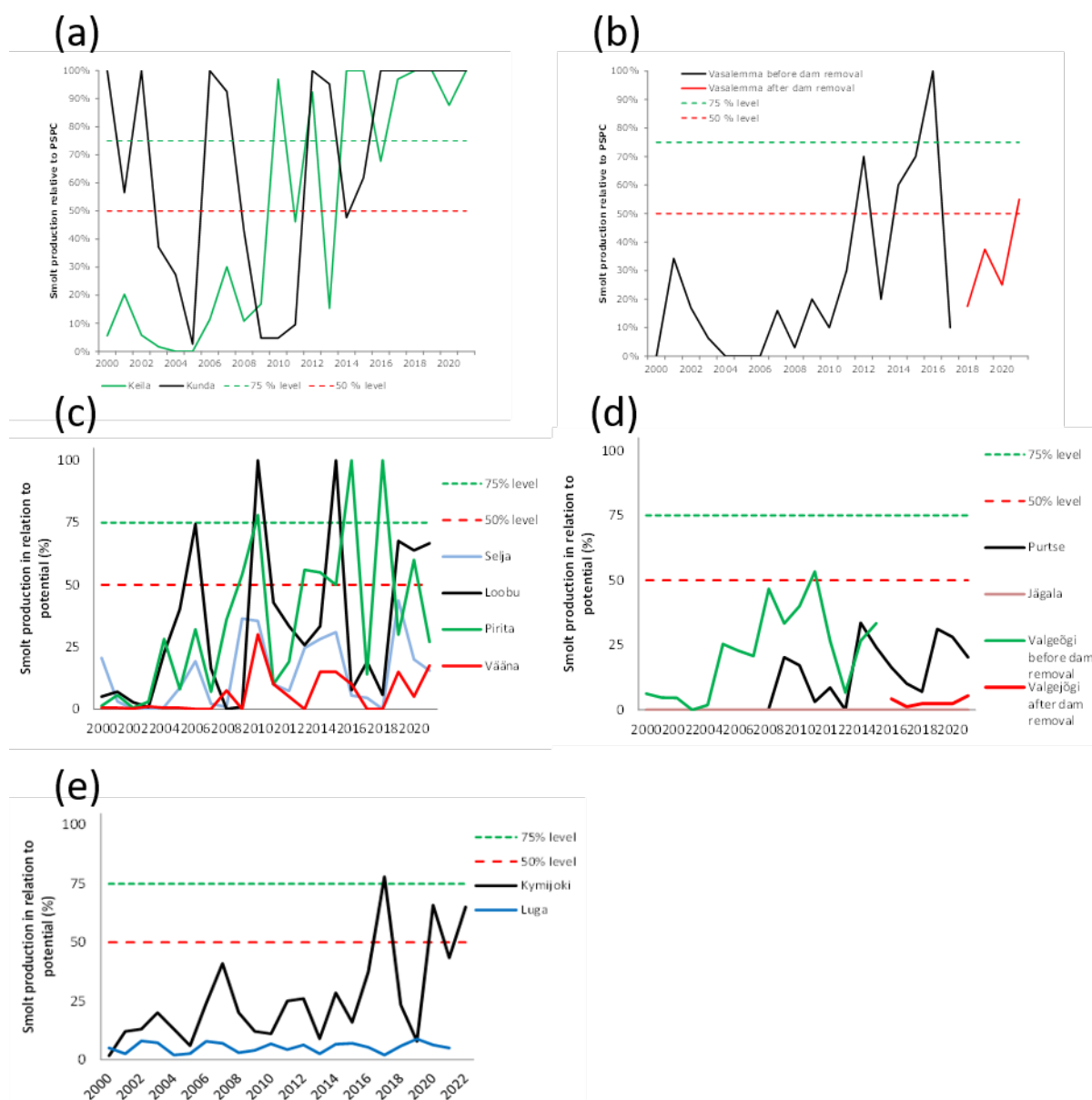


Figure 2 Atlantic salmon in Subdivision 32 (Gulf of Finland). Smolt production in Subdivision 32, in relation to the potential smolt production in three wild (a and b) and seven mixed (c and d) Estonian salmon stocks, as well as in mixed salmon stocks of Russia (river Luga) and Finland (river Kymijoki [e]). The results are based on monitored parr densities and expert judgement. The horizontal lines indicate 50% and 75% of the estimated PSPC. The values above 100% are capped.

Catch scenarios

No quantitative assessment or forecast could be provided.

The bulk of catches in the Gulf of Finland are reared salmon.

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 wild stocks, which are either in good status (close to 100% PSPC) or improving. The same catch advice provided since 2015 is, therefore, still considered to be applicable. Assuming that the amount of reared salmon released in 2021 does not decrease from previous years, and that the fisheries do not target weak 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 discards¹ for 2022 are those estimated to have occurred in 2020 landings: (89%; 86% reported and 3% unreported) and discards (11%).

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 (EC, 2011), not formally adopted and recently withdrawn (EC, 2020).

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.

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.

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 of SD 32, where few wild Gulf of Finland salmon are caught (ICES, 2018). 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 from river stocks in good status (e.g. Tornionjoki and Kalixälven). The proportion of released Gulf of Bothnia stocks was about 15%. Wild Gulf of Finland stocks were nearly absent, whereas Eastern Main Basin stocks contributed about 3% 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 (Assessment Unit [AU] 6) wild and released stocks, whereas contributions from Eastern Main Basin stocks were about 9% and from Gulf of Bothnian stocks less than 5% of the catches (ICES, 2019). Most dominant Eastern Main Basin stock (6%) originated from Daugava hatchery. About 3% of fish originated from river Salaca (wild river in AU 5). River Salaca has the highest smolt production level in relation to PSPC within AU 5. Average smolt production in relation to PSPC in the river Salaca over the past three years is 40%, and this is predicted to rise to 70% in 2021, which is considered to be at or above R_{lim} (see ICES [2021a]).

¹ The terms ‘projected landings’ and ‘projected discards’ were previously referred to as ‘wanted’ and ‘unwanted’ catch, respectively.

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 the 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.

Effort in the salmon fishery should not increase in the Main Basin (SDs 24–30), as wild salmon from the Gulf of Finland use the Main Basin as a feeding area.

Reference points

To evaluate the current state of salmon stocks in the Gulf of Finland, in the absence of a full analytical assessment, 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.

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, 2021b)
Assessment type	Qualitative assessment based on monitored parr densities and expert judgement (ICES, 2021c)
Input data	Commercial catches (1984–2020; international landings, fishing effort, tag returns). Survey indices (parr densities from all wild and salmon mixed rivers [1992–2020], smolt counts in some mixed rivers [2001–2020]).
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)

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 [†]	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	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 2018 into: unwanted, wanted and reported and unreported – percentages are given in brackets).	11800(14%, 83%, 3%)	9703	9470	10296	11511	1118
2021	Precautionary approach	11800 (14%, 83%, 3%)	8883				
2022	Precautionary approach	11800 (11%, 86%, 3%)					

[†] TAC applies to the commercial catch at sea.

^{††} Commercial reported landings at sea do 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 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 two tonnes; in 2018 and 2019 these catches were about one 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 2020 as estimated by ICES (median values from probability distributions).

Catch in 2020 (dead catch, including non-commercial and river catches)	Landings		Discards (dead)
77 tonnes	Nominal landings (commercial and non-commercial in sea and in rivers) 96.6%	Unreported and misreported 3.4%	5 tonnes
	72 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 (i.e. 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. Estimates from the 2020 survey will be available in autumn 2021; the same estimate as in 2018 and 2019 surveys is currently assumed. 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 uncertain). Other than commercial reported landings, values in the table 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	alive						
2001	14190	1096	168	197	3701	15	14180 (±5780)	3702	19367	19170
2002	11470	821	202	129	3411	32	2550 (±750)	4483	16065	15936
2003	8299	688	74	123	3759	2	2550 (±750)	2562	12945	12822
2004	7935	661	69	125	4018	14	3090 (±1430)	2260	12822	12697
2005	10800	905	74	172	1872	2	3090 (±1430)	4143	13825	13653
2006	11740	977	71	196	2804	9	180 (±110)	2960	15796	15601
2007	11250	938	41	199	1826	1	180 (±110)	2452	14255	14056
2008	14860	1249	53	269	2318	0	730 (±350)	2417	18749	18480
2009	12650	1075	70	215	1872	2	730 (±350)	3428	15884	15669
2010	5609	476	30	97	967	2	360 (±400)	1376	7181	7084
2011	7430	627	61	134	928	31	360 (±400)	1597	9210	9077
2012	10890	926	121	194	1057	73	3450 (±3170)	1544	13261	13067
2013	9722	829	289	172	593	227	3450 (±3170)	1710	11831	11660
2014	9318	796	96	165	657	54	2730 (±3270)	1251	11086	10921
2015	7395	298	43	123	1300	10	2730 (±3270)	712	9169	9046
2016	7323	302	48	122	699	14	3000 (±3000)	1342	8508	8386
2017	7383	326	82	276	824	30	3000 (±3000)	1126	8921	8645
2018	6444	274	49	244	478	2	200 (CV > 50%)	899	7491	7247
2019	9300	374	44	376	811	0	200 (CV > 50%)	1174	10905	10529
2020	9470	395	66	362	787	0	200 (CV > 50%)	1118	11080	10718

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	1000 fish	tonnes	1000 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

Year	River**	Coastal**	Offshore**	Commercial coastal and offshore***		Total^	
	tonnes			tonnes	1000 fish	tonnes	1000 fish
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	62	1	60	9	67	11
2020*	6	67	0	64	9	73	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

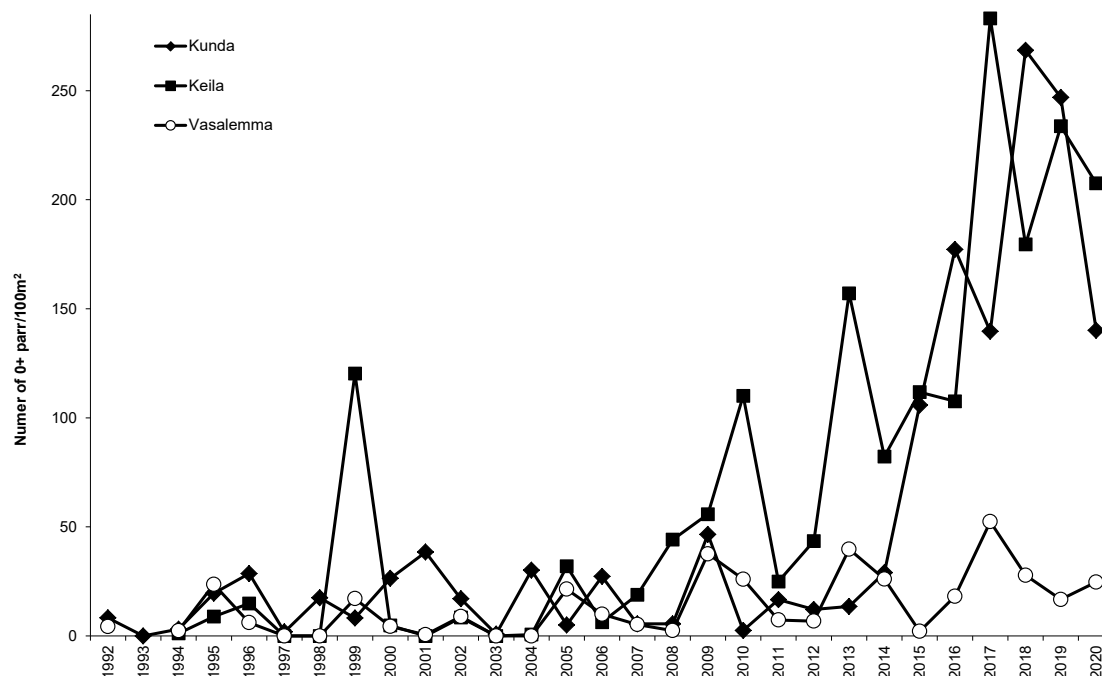


Figure 3 Atlantic salmon in Subdivision 32 (Gulf of Finland). Densities of 0+ (one-summer-old) salmon parr in the three wild Estonian salmon rivers. The exceptionally high parr density in river Keila in 1999 was observed under conditions of summer drought.

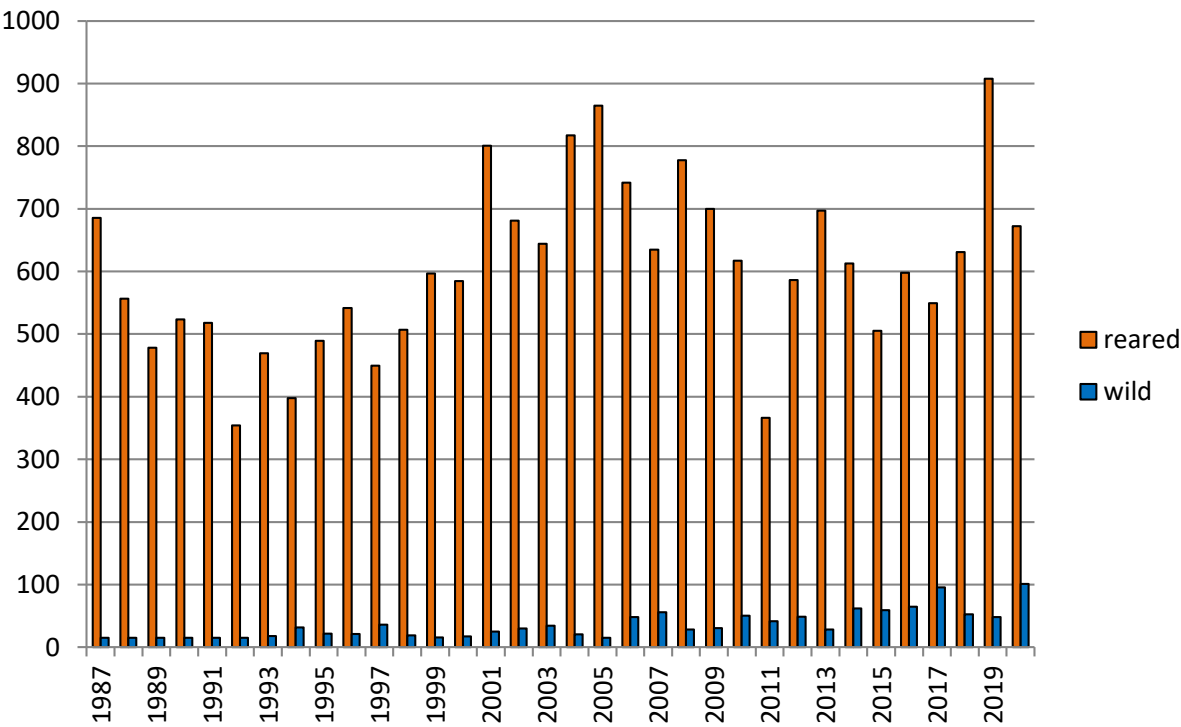


Figure 4 Atlantic salmon in Subdivision 32 (Gulf of Finland). Annual production (in thousands of fish) of wild and released smolts in the Gulf of Finland.

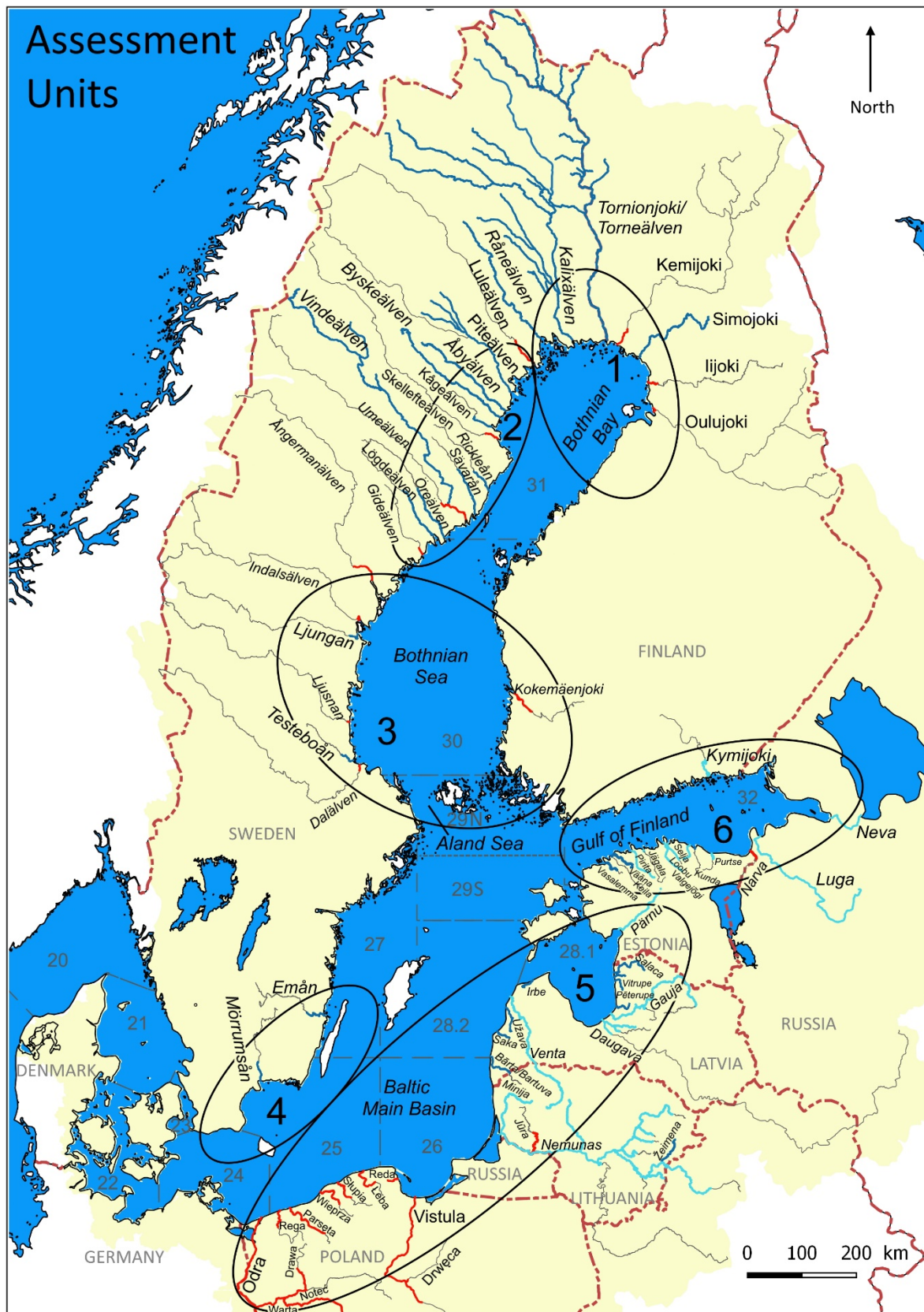


Figure 5 Atlantic salmon in Subdivision 32 (Gulf of Finland). Grouping of salmon stocks in six assessment units in the Baltic Sea. Assessment Unit 6 corresponds to Subdivision 32. Wild salmon rivers (dark blue), mixed salmon rivers (light blue), reared salmon rivers (red), and river stretches not accessible for salmon (grey).

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